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MELSEC Q series

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CC-Link

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001 (standards for quality assurance management systems)

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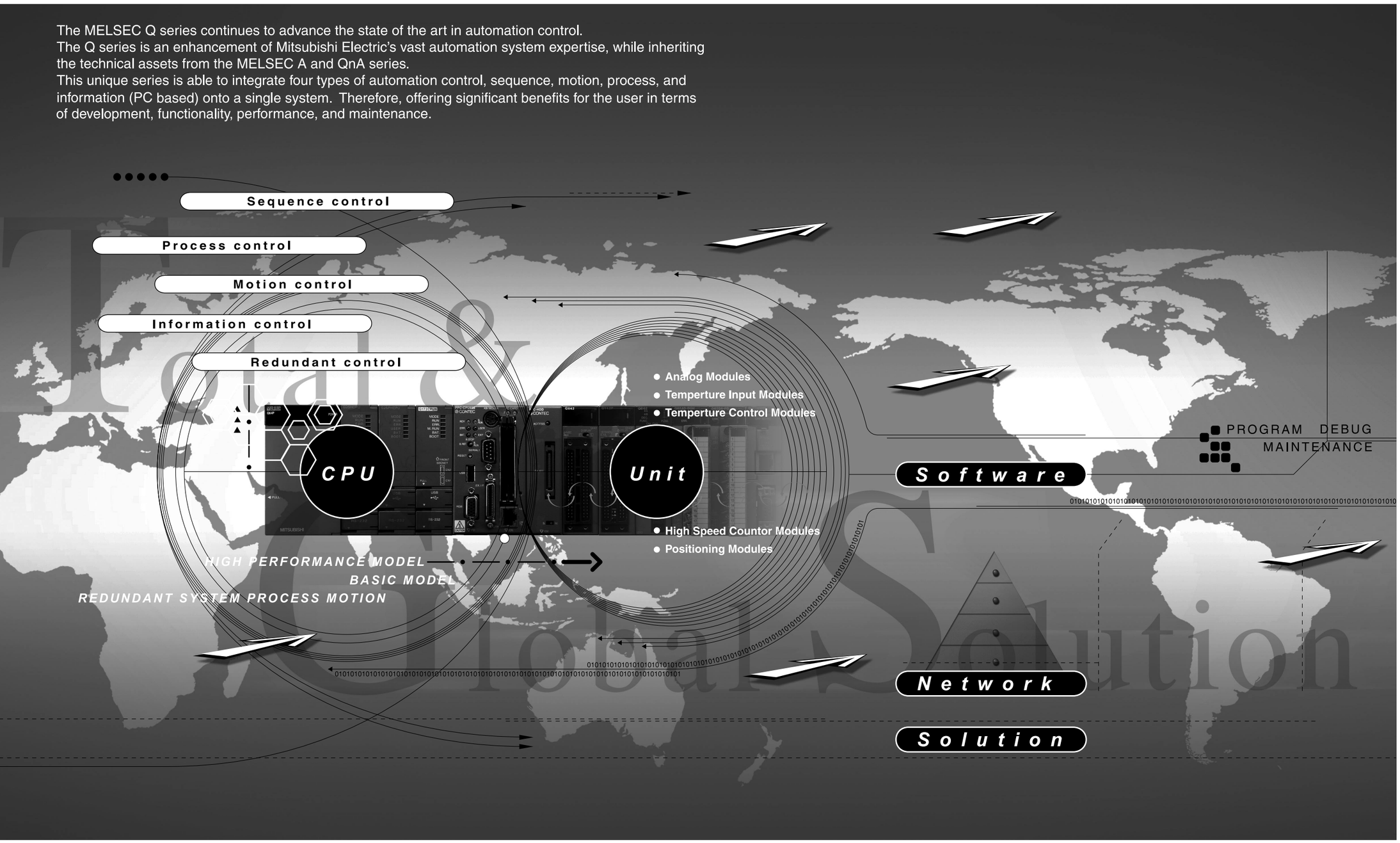
The automation solution specific to your needs

The MELSEC Q series offers 'total and global' solutions for a diverse range of applications.

The MELSEC Q series continues to advance the state of the art in automation control.
The Q series is an enhancement of Mitsubishi Electric's vast automation system expertise, while inheriting the technical assets from the MELSEC A and QnA series.
This unique series is able to integrate four types of automation control, sequence, motion, process, and information (PC based) onto a single system. Therefore, offering significant benefits for the user in terms of development, functionality, performance, and maintenance.



Total & Global Solution MELSEC Q series

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INTRODUCTION

SELECTION GUIDE

Selecting a CPU module

Choice

Choose the model most suitable for your use from this lineup.

Q25PRHCPU

(1) (2) (3)

(1) Program capacity

- 00:8 K steps
- 01:14 K steps
- 02:28 K steps
- 06:60 K steps
- 12:124 K steps
- 25:252 K steps

(2) P: Instrumentation compatible CPU
R: Redundant dedicated CPU
J: Power supply and base integrated CPU

(3) H: High-speed type

● Large number of I/O points

The Q Series CPU module supports the following number of actual I/O points accessible to the I/O modules mounted on the base unit.

(1) Basic model QCPU

• Q00JCPU: 256 points (X/Y0 to FF)
• Q00CPU, Q01CPU: 1024 points (X/Y0 to 3FF)
Up to 2048 points (X/Y0 to 7FF) are supported as the number of I/O device points usable for refreshing the remote I/O of the CC-Link and link I/O (LX, LY) of the MELSECNET/H.

(2) High performance model QCPU

One module can support 4096 points (X/Y0 to FFF).
Up to 8192 points (X/Y0 to 1FFF) are supported as the number of I/O device points usable for the remote I/O stations in the MELSECNET/H remote I/O network, the CC-Link data link system, and the MELSECNET/MINI-S3 data link system.

(3) Process CPU and redundant CPU

One module can support 4096 points (X/Y0 to FFF).
Up to 8192 points (X/Y0 to 1FFF) are supported as the number of I/O device points usable for the remote I/O stations such as MELSECNET/H remote I/O net and CC-Link data link.

● Lineup for various program capacities

The optimum CPU module for the program capacity can be selected

(1) Basic model QCPU

• Q00JCPU, Q00CPU : 8k steps
• Q01CPU : 14k steps

(2) High performance model QCPU

• Q02CPU, Q02HCPU : 28k steps
• Q06HCPU : 60k steps
• Q12HCPU : 124k steps
• Q25HCPU : 252k steps

(3) Process CPU

• Q12PHCPU : 124k steps
• Q25PHCPU : 252k steps

(4) Redundant CPU

• Q12PRHCPU : 124k steps
• Q25PRHCPU : 252k steps

● Realised high speed processing

Processing speed (LD instruction)

CPU module type		LD instruction processing speed
Basic model QCPU	Q00JCPU	0.20μs
	Q00CPU	0.16μs
	Q01CPU	0.10μs
High performance model QCPU	Q02CPU	0.079μs
	Q02HCPU Q06HCPU Q12HCPU Q25HCPU	0.034μs
Process CPU	Q12PHCPU Q25PHCPU	
Redundant CPU	Q12PRHCPU Q25PRHCPU	

The MELSEC Q series base unit high-speed system bus has achieved faster access to an intelligent function module and link refresh with a network module.

(1) Basic model QCPU

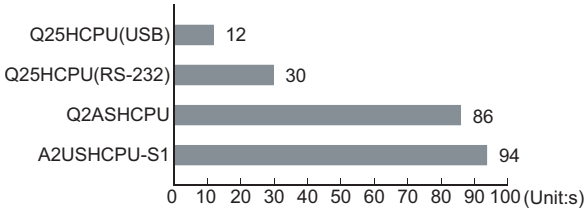
MELSECNET/H link refreshing: 2.2ms/2k words*1
*1: This is the case that the Q01CPU is used without using SB/SW and the MELSECNET/H network module is installed to the main base unit.

(2) High performance model QCPU, process CPU or redundant CPU

Access to the intelligent function module:
20s/word (approximately 7 times*2)
MELSECNET/H link refreshing:
4.6ms/8k words (approximately 4.3 times*2)
*2: These are the values resulted from the following comparison:
• Comparing Q02HCPU with Q2ASHCPU-S1
• Comparing Q25PHCPU with Q4ARCPU
• Comparing Q25PRHCPU with Q4ARCPU

● Increase in debugging efficiency through high speed communication with GX Developer

In the Q Series CPU module, a time required for program writing/reading or monitoring has been reduced through the high speed communication at a speed of 115.2kbps max. by the RS-232, and a communication time efficiency at the time of debugging has been increased.
In addition, high performance model QCPUs (except for the Q02CPU), process CPUs and redundant CPUs support USB, so that high-speed communications of 12Mbps are available.

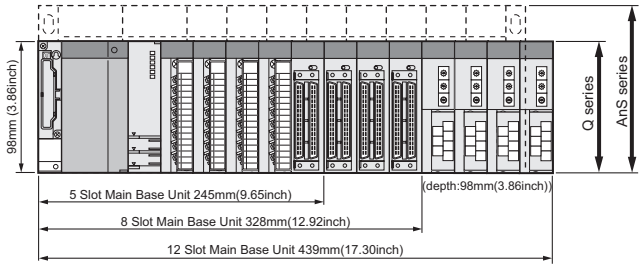


● A/AnS series I/O module or special function module are available.

The A/AnS series I/O module or special function module can be used with the High Performance model QCPU by using the QA65B/QA68B and QA1S65B/QA1S68B extension base unit.

● Saved space by downsizing

The installation space for the Q series has been reduced by approx. 60% compared with the AnS series.



Redundant Note 1

● Connection of up to 7 extension base units.

The Q Series CPU module can connect extension base units for the number of stages shown in the following table

Item		Max. number of extension stages	Max. number of modules installed
Basic model QCPU	Q00JCPU	2 stages	16 modules
	Q00CPU Q01CPU	4 stages	24 modules
High performance model QCPU		7 stages	64 modules
Process CPU			
Redundant CPU		N/A	11 modules

The overall distance of the extension cables is up to 13.2m allowing highly flexible extension base unit layout.

Basic Note 2

● Memory extension by memory card

The Q Series CPU module has a memory card installation connector to which a memory card of 32 Mbytes max. can be connected (32 Mbytes are available when an ATA card is used).
When a memory card of large capacity is installed, large files can be managed, enabling setting comments to all data devices and storing the past programs in the memory as they are in the form of the corrected histories.
Even if a memory card is not installed, a program can be stored onto the standard ROM built in the CPU module, and file registers can be handled by the standard RAM.

POINT

For the high performance model QCPU, the number of usable file register points is different depending on the functional version and serial number.

Basic Note 3

● Automatic writing to standard ROM

The Q Series CPU module enables writing the parameters or programs saved on a memory card into the standard ROM of the CPU modules without using GX Developer.
When the standard ROM is used to perform ROM operation, you can load a memory card into the CPU module and write parameters/programs on the memory card to the standard ROM. Hence, you need not carry GX Developer (personal computer) to rewrite the parameters/programs.

Basic Note 3

● Forced ON/OFF of external I/O

The Q Series CPU module enables forcedly turning on/off the external I/O by operating GX Developer regardless of the program execution status (even if the CPU module is running).
Using the Q Series CPU module allows the wiring test and/or operation test execution by turning on/off the I/O forcedly without halting the CPU module.

● Remote password can be set

When access to an Ethernet module, serial communication module or modem interface module is made from the outside, whether access to the CPU module is enabled or not can be selected with a remote password.

Basic Note 3

● Remote I/O network of MELSECNET/H can be configured

The Q Series CPU module allows construction of the MELSECNET/H remote I/O system by attaching the remote master station of the MELSECNET/H.

Redundant Note 4

● Supporting multiple CPU system

The Q series CPU module supports the multiple CPU system.
The multiple CPU system can be constructed in combination with CPU modules, motion CPU(s), and PC CPU module(s).
For the details of the multiple CPU system, refer to CHAPTER 1.6

● Supporting the redundant power supply system

The redundant power supply system can be created using a redundant base unit and redundant power supply modules.
The system can continue operation even if one of the power supply modules fails, since the other will supply the power.

POINT

1. The remote password can be set up when the Ethernet module, serial communication module or modem interface module of function version B or later is used.
2. The MELSECNET remote I/O network can be implemented when the MELSECNET/H network module of function version B or later is used.

Redundant
Note 1

When a redundant CPU is used, no extension base units can be connected.

Basic
Note 2

Memory cards are not available for the basic model QCPU.

Basic
Note 3

The basic model QCPU does not support the following functions:
ÅEAutomatic writing into the standard ROM
ÅEForced on/off of the external I/O
ÅEMELSECNET/H remote I/O network

Redundant
Note 4

The redundant CPU does not support the multiple CPU system.

Selecting a base/power supply module

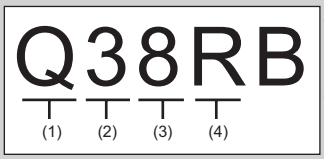
Choice — Choose the model most suitable for your use from this lineup.

[Selecting a base]

When 12 or less fuzznction modules used	Select from bases for 2, 3, 5, 8, or 12 slots according to the installing space.
When 13 or more function modules used	Consider using an extension base.
When A series function modules needed	Consider using the dedicated extension base.

Available extension bases are the following two types.

- The type fed by a main base (No power supply module mounted)
- The type fed by a power supply module on the extension base. The main base and extension base have separated power supply.



(1) Q :For Q series modules
QA :For A series modules
QA1S :For AnS series modules

(2) 3: Main base unit
5: Extension base unit (without slots for a power supply)
6: Extension base unit (with slots for a power supply)

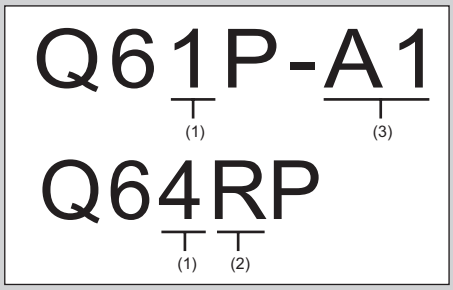
(3) The number of I/O slots excluding slots for the power supply and CPU

(4) R: For power supply redundant system
S: For slim power supply module

Choice — Choose the model most suitable for your use from this lineup.

[Selecting a power supply module]

Refer to the specifications for the PLC CPU and each function module to calculate the sum of current consumption.
Select a power supply module that meets the obtained sum of current consumption.
For more details, refer to Chapter 1.2.

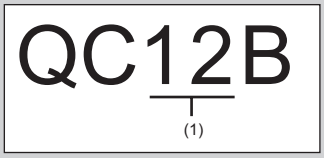


(1) 1:100VAC and/or 200VAC input
2:100VAC and/or 200VAC input, VDC24 output
3:VDC24 input
4:Large capacity power supply

(2) R:For power supply redundant systems
S:Slim

(3) A1:100 to 120VAC input
A2:100 to 240VAC input
None:100 to 240VAC wide-range input

[Selecting an extension cable]

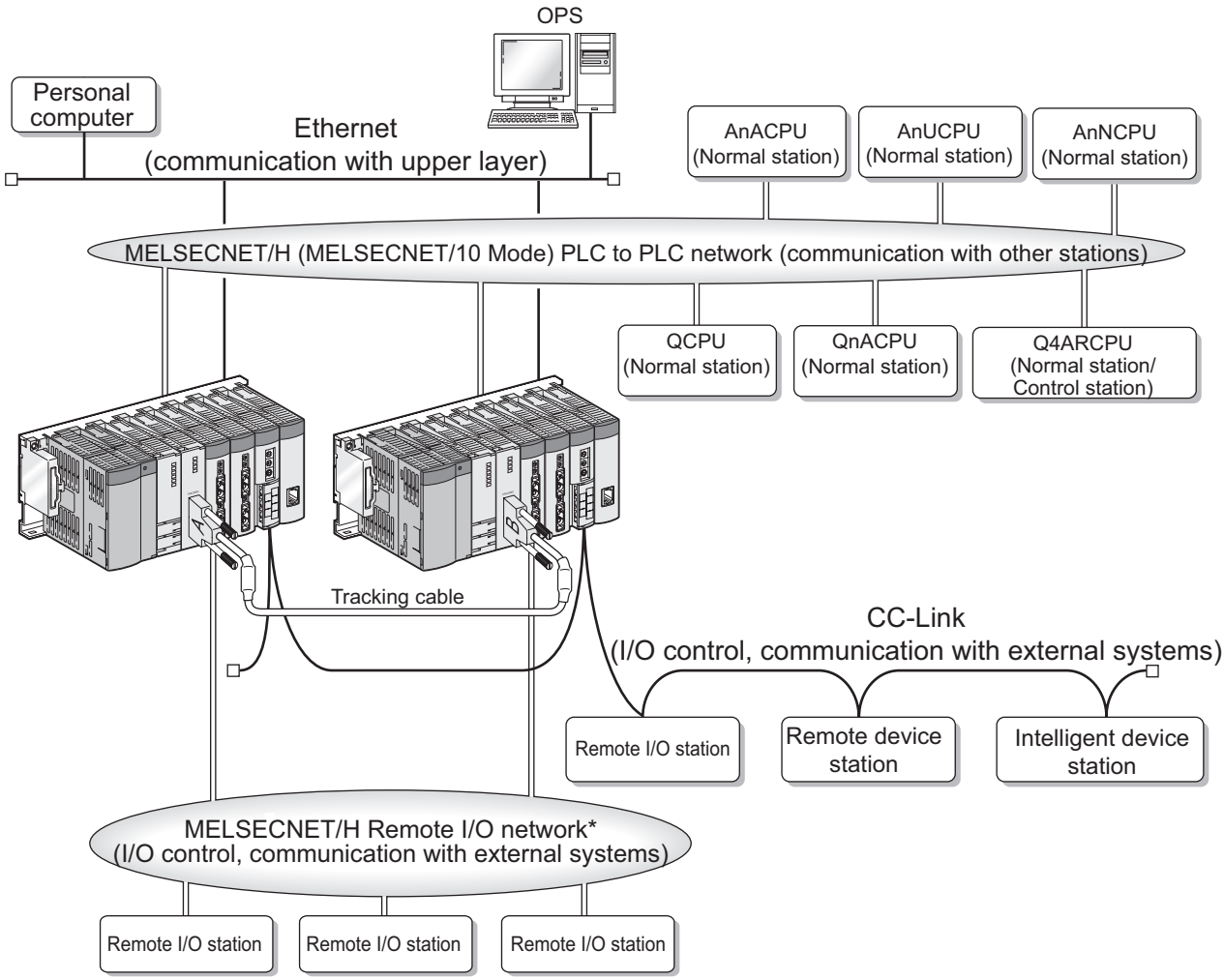


(1)05 :0.45m
06 :0.6m
12 :1.2m
30 :30m
50 :50m
100 :100m

Selecting a redundant system

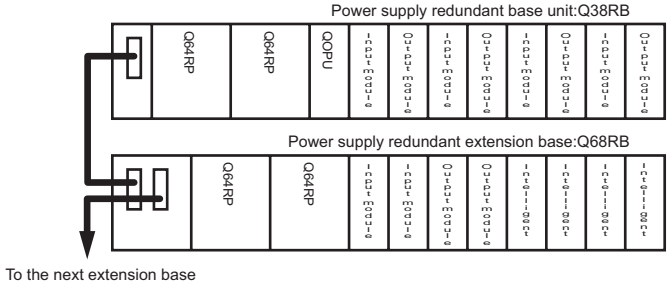
(1) Making function a module (including a power supply, CPU) redundant

Base systems for CPU modules, power supply modules, and network modules can be made to redundant. This provides more reliable systems as, when a module error occurs, the module can continue operating normally using the other system.
To configure the redundant system, first make two systems where the above modules are mounted on the main base unit, and then connect the CPU modules each other using a tracking cable.



(2) Making only a power supply redundant

For Q series CPU modules, a power supply module can be made redundant by using a redundant base unit and redundant power supply module.
Even if an error occurs on one power supply, operation can be continued using the other power supply.

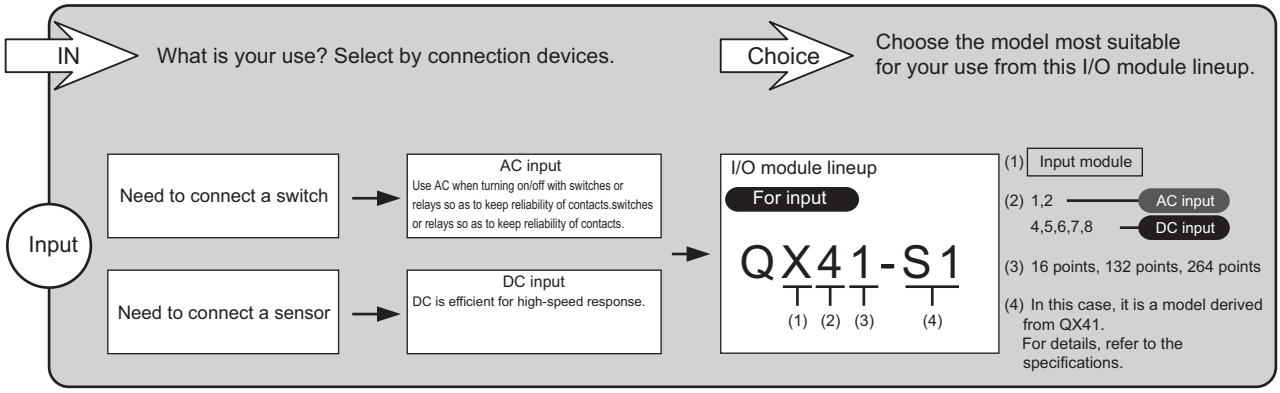


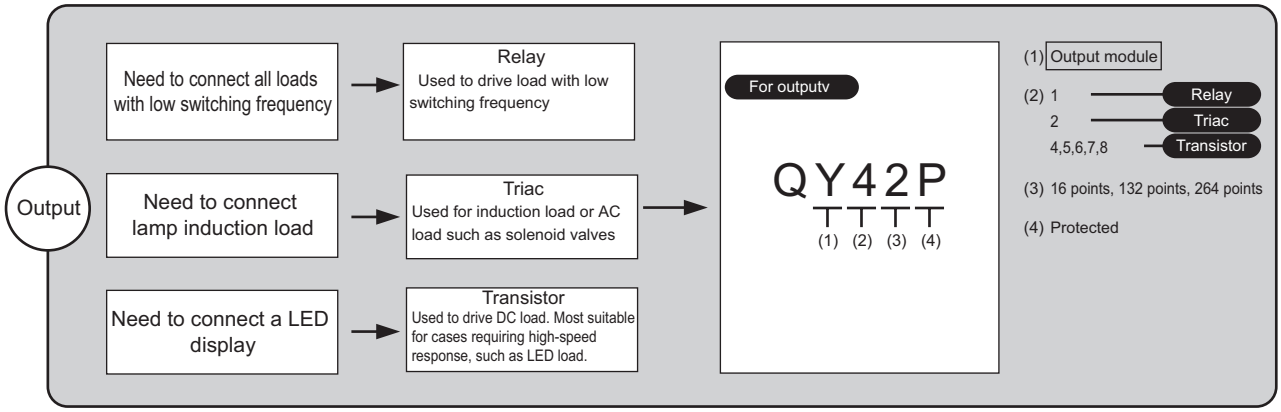
Remark

Q63RP and Q64RP can be installed together with one redundant base unit.

Selecting an I/O module

I/O control is a base of sequence control. Select an I/O module most suitable for your control target.





<Response time and noise resistance>

Response time is in inverse proportion to noise resistance. Use a high-speed response input module to import an input fast in a less noise condition.

<Number of modules turned on simultaneously>

Keeping a point turned on generates heat. Pay attention to the number of modules turned on simultaneously to avoid over heat. Note that it is not possible to keep all points turned on depending on an input voltage or ambient temperature.

<Relay output>

Relay outputs are mechanical contacts. Exceeding the rated value may cause them to be heat-sealed. Also note that contacts are consumable components.

<Triac output>

Low current consumption of active load may cause abnormal turning on/off. To avoid this, connect load that satisfies the minimum load current.

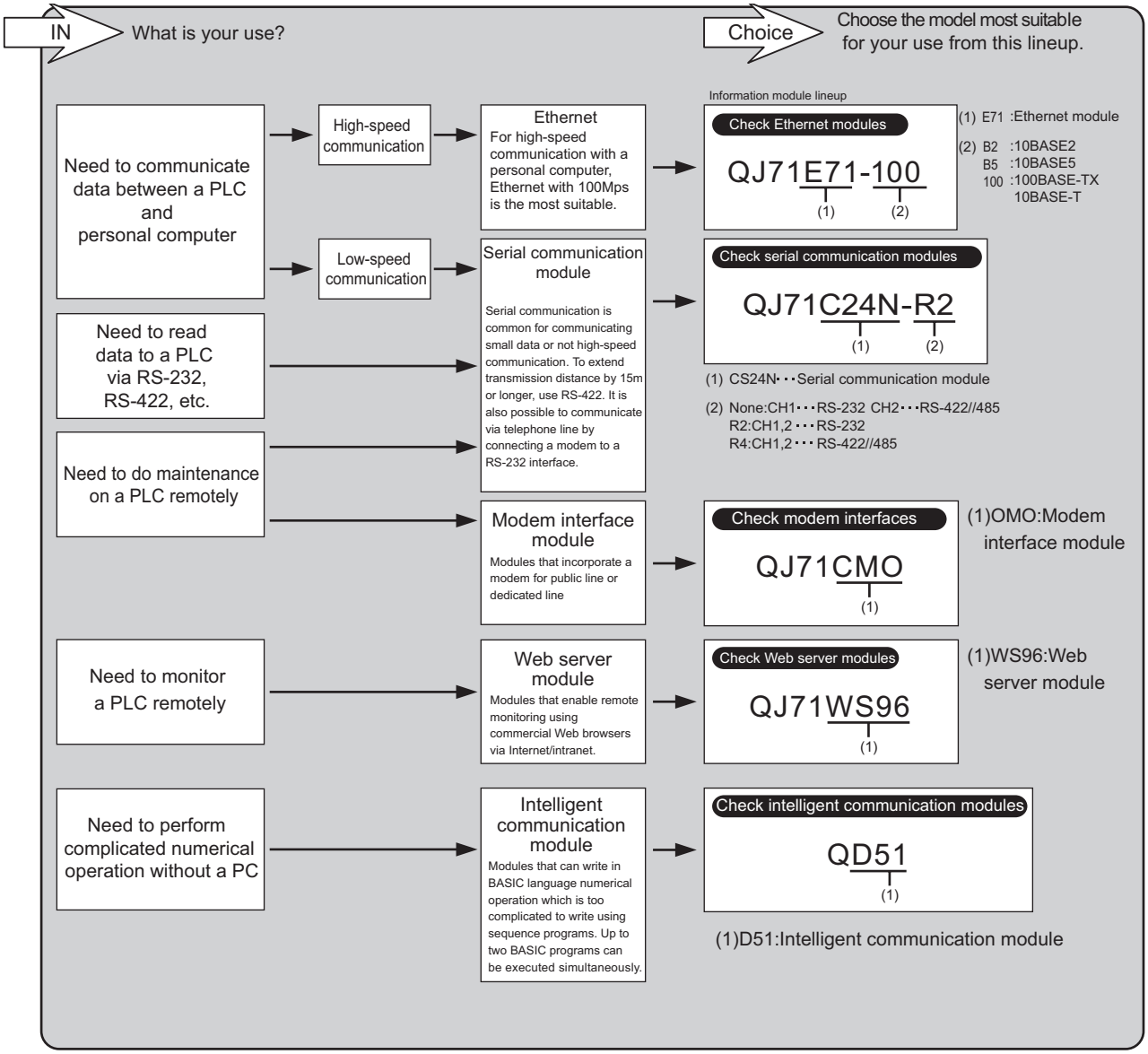
<Transistor output>

Transistor output modules have small leakage current even when they turned off. In such case, load, which occurs due to this small leakage current, may operate in a fault.

Selecting an information module

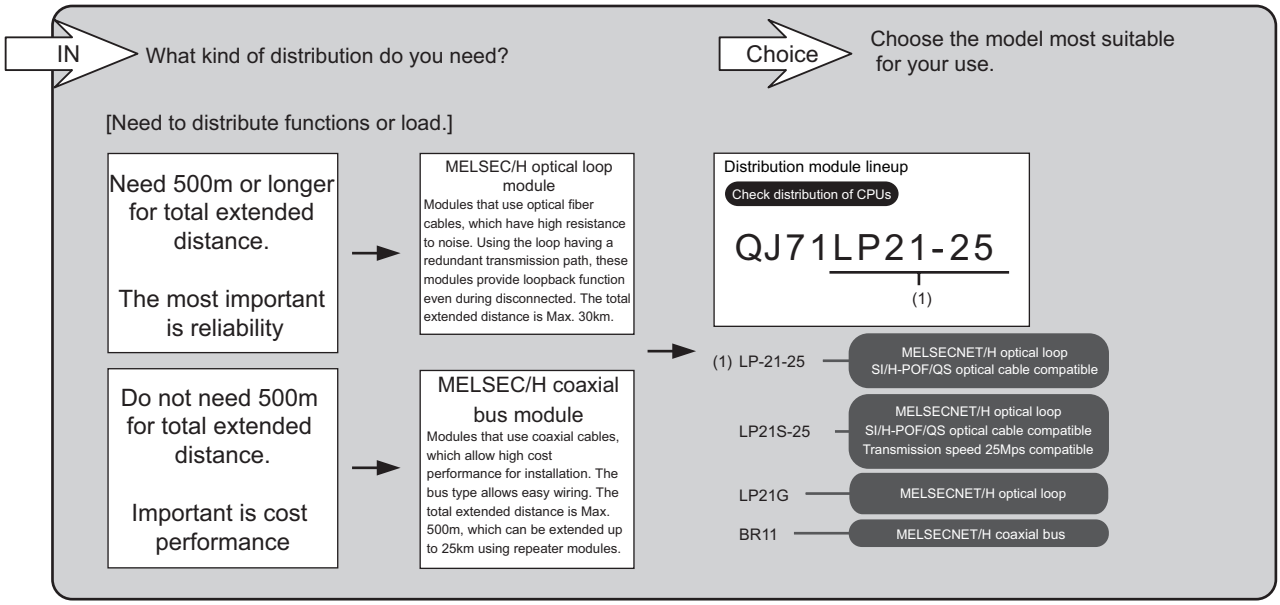
Dissemination of personal computers and Internet is now accelerating the fusion of FA and OA. In the FA filed, demands for the "data control", which are enabled by personal computers or barcodes, are now increasing in addition to the commonly known demand "load control".

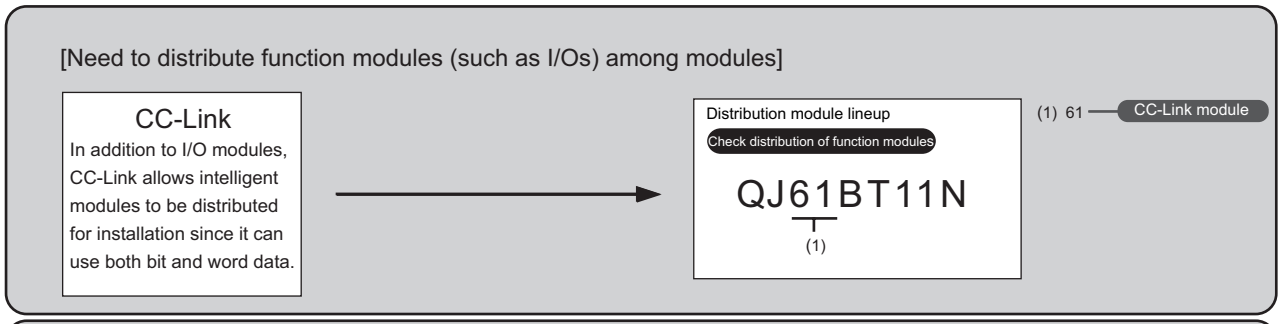
This document refers to function modules that feature this "data control" as an "information module".

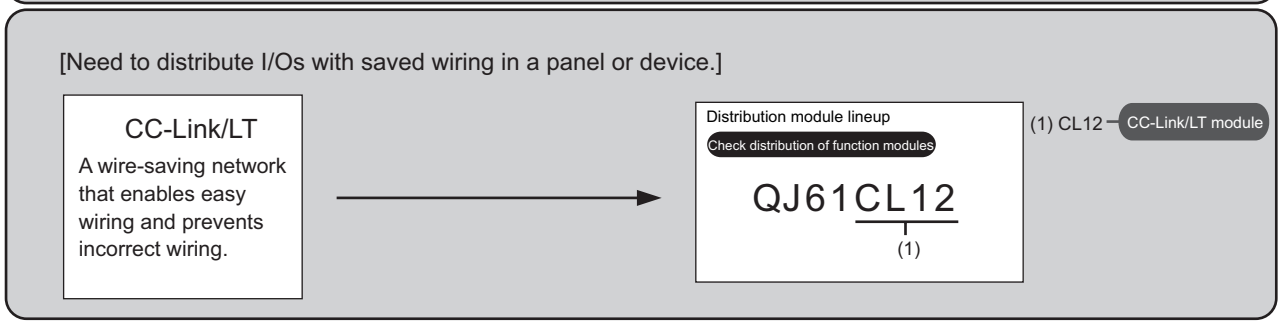


Selecting a distribution module

By using a network, distribution modules allow you to easily distribute PLC CPUs or I/Os, which are intensively installed in the same place, to separated places. Our distribution system provides seamless communication from any layer including the host network "Ethernet".







<MELSECNET/H Inter-PC network>

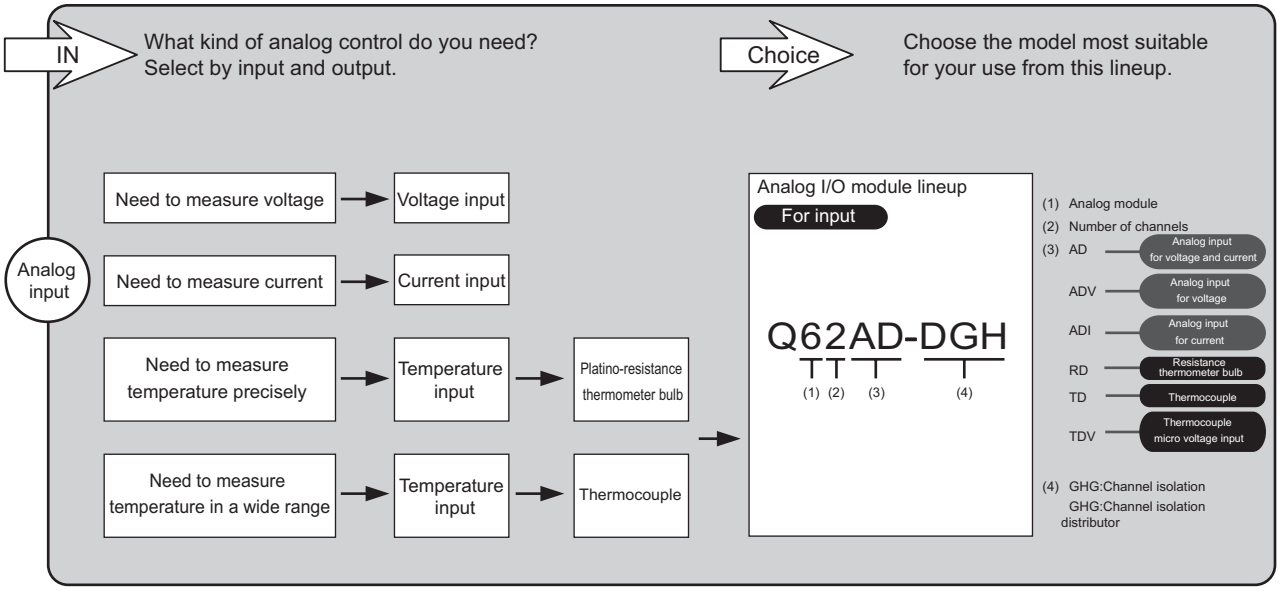
This network enables distributing load, faults, etc., by arranging PLC CPUs according to their functions and sharing data via the network. Distributing load allows a PLC to have fewer programs, comparing to a case where load is not distributed. This shortens scan time and achieves more stable control.

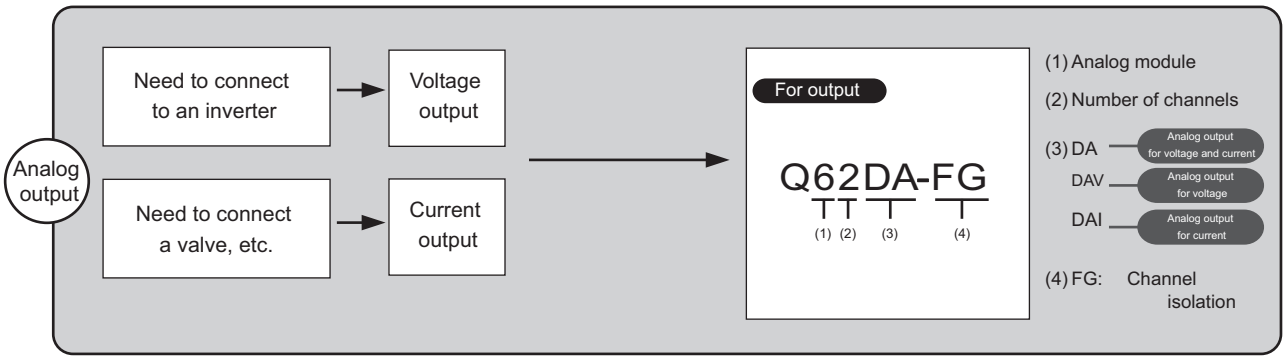
<MELSECNET/H remote I/O network>

This network is suitable for simply separating I/Os without distributing functions or load, and for fast transfer of bit information such as turning on/off of switches. Another advantage of this network is in thinner wiring which enables easier pulling, comparing to the case where wiring is performed from an I/O module on the base unit to devices via I/O relays. Note, however, that transmission delay may occur when mounting a positioning module, etc. on a remote I/O station.

Selecting an analog module

Analog control means controlling external motors or actuators by inputting analog quantity data such as temperature, weight, flow, etc., using a sensor for current, thermocouple, resistance thermometer bulb, etc., and by changing voltage or current for output. Our product lineup offers an analog module most suitable for your needed preciseness, conversion speed, and so on.





<Selecting by conversion speed>

Generally, the less the number of channels are, the higher conversion speed. Some types of modules can provide higher conversion speed by limiting the number of channels used.

<Modules with the temperature adjustment function>

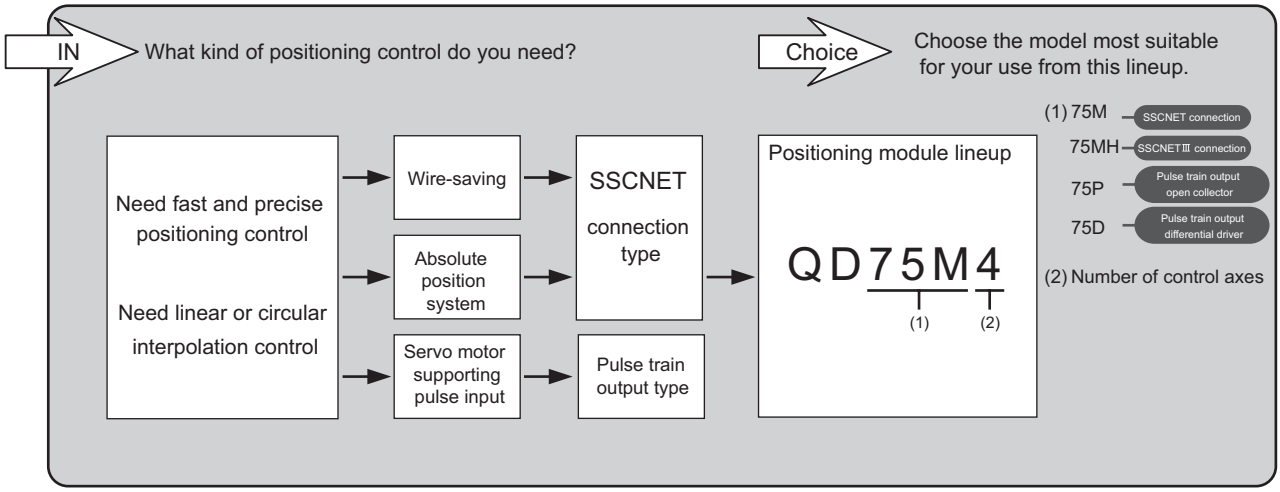
Our product lineup includes the modules featuring the temperature adjustment function in addition to simple analog I/O function. To adjust temperature, these products control an external heater by first measuring temperature with platino-resistance thermometer bulb/ thermocouple and second performing PID operation in the module.

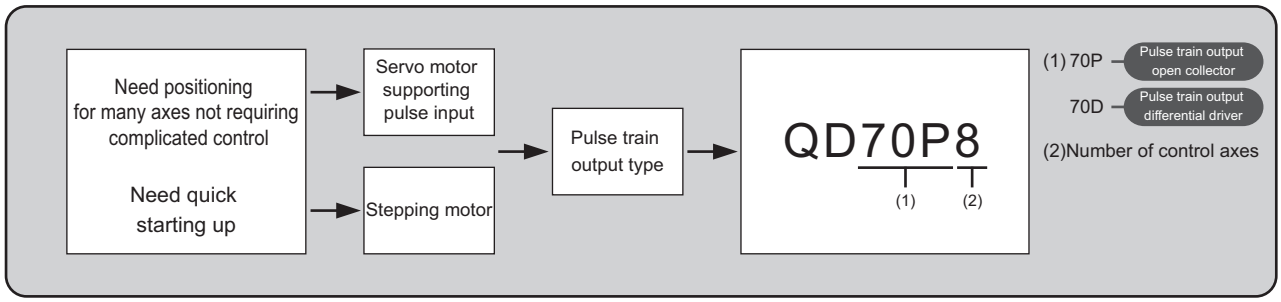
platino-resistance thermometer bulb	Disconnected wiring detection function incorporated

Thermocouple	Disconnected wiring detection function incorporated

Selecting a positioning module

Positioning control means running a servo motor or stepping motor with high-preciseness in order to operate devices.
Using our know-how of developing servo motors, we offer a wide product lineup of positioning modules, which will meet your particular need of control.





<Merit of home-position return and absolute position system>

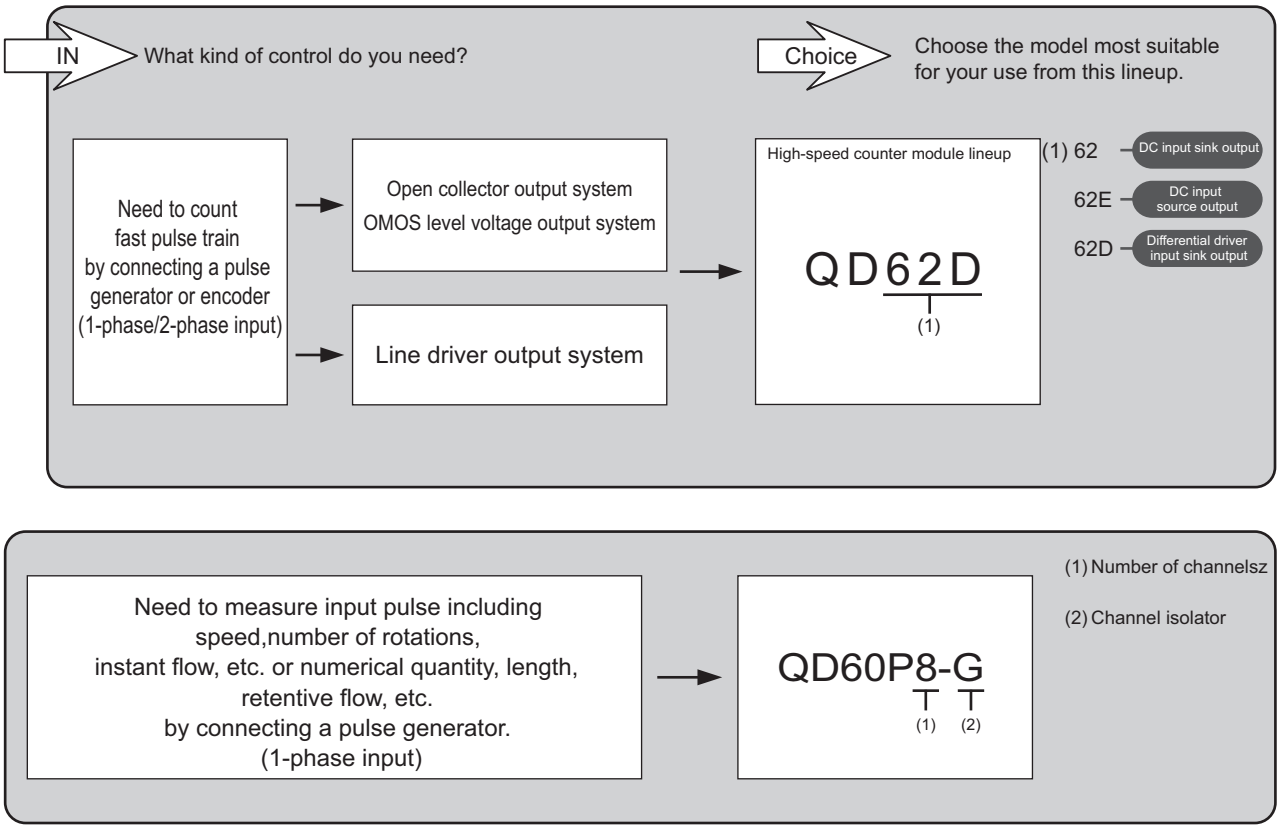
● Home-position return

Home-position return is an operation for high-preciseness positioning. By returning to the original point set in advance, preciseness, which was lost during control, can be recovered.
For example, when an electrical power failure occurs during control, the fudge factor due to the power failure can be corrected by returning to the original position (home-position return). Note, however, that home-position return is not suitable for some control targets. For example, when controlling cutting operation, home-position return may cause damage to the object being cut. In such a case, use the absolute position system.

● Absolute position system

Absolute position system
Absolute position system can recover the position of object to be moved. To do this, in this system, a positioning module reads where the axis was right before the electrical power failure when the power is recovered to the servo motor that is backed up with a battery. This system also enables home-position return, so it contains general positioning systems.

Selecting a counter module



<QD62(E/D) pulse input system>

The following systems are available for 1-phase/2-phase pulse input.

- Multiply 1-phase pulse input by 1
- Multiply 1-phase pulse input by 2
- CW/CCW
- Multiply 2-phase pulse input by 1
- Multiply 2-phase pulse input by 2
- Multiply 2-phase pulse input by 4

<QD60P8-G pulse input system>

In the QD60P8-G pulse input system, 1-phase input and adding counting are available (subtraction not available).
Note, however, that it is possible to choose pulse rising or falling for counting.

MEMO

Chapter 1

CPU, POWER SUPPLY, BASE

1.1 CPU Module

1.1.1 Characteristics

● Generic terms and abbreviations

Unless otherwise specified, this manual uses the following generic terms and abbreviations to explain the Q series CPU modules.

Generic Term/Abbreviation	Description
Basic model QCPU	General name for Q00JCPU, Q00CPU and Q01CPU modules.
High Performance model QCPU	General name for Q02CPU, Q02HCPU, Q06HCPU Q12HCPU and Q25HCPU modules.
Process CPU	General name for Q12PHCPU and Q25PHCPU
Redundant CPU	General name for Q12PRHCPU and Q25PRHCPU.
CPU module	General name for Basic model QCPU, High performance model QCPU, Process CPU and Redundant CPU.
Q Series	Abbreviation for Mitsubishi MELSEC-Q Series Programmable Logic Controller.
AnS series	Abbreviation for compact types of Mitsubishi MELSEC-A Series Programmable Logic Controller.
GX Developer	Product name for Q series compatible SW☐D5C-GPPW-E type GPP function software package. ☐ indicates the version.
Q3☐B	General name for Q33B, Q35B, Q38B and Q312B main base units on which CPU module (except Q00JCPU), Q series power supply module, I/O module and intelligent function module can be mounted.
Q3☐SB	General name for Q32SB, Q33SB and Q35SB slim type main base units on which Basic model QCPU (except Q00JCPU) High Performance model QCPU, slim type power supply module, I/O module and intelligent function module can be mounted.
Q3☐RB	General name for Q38RB redundant power supply base unit on which CPU module (except Q00JCPU), redundant power supply module, Q series I/O module and intelligent function module can be mounted.
Q5☐B	General name for Q52B and Q55B extension base unit on which the Q Series I/O and intelligent function module can be mounted.
Q6☐B	General name for Q63B, Q65B, Q68B and Q612B extension base unit on which Q Series power supply module, I/O module, intelligent function module can be mounted.
Q6☐RB	General name for Q68RB redundant power supply base unit on which redundant power supply module, Q series I/O module and intelligent function module can be mounted.
QA1S6☐B	General name for QA1S65B and QA1S68B extension base units on which AnS Series power supply module, I/O module, special function module can be mounted.
QA6☐B	General name for QA65B and QA68B extension base unit on which the A (large-size) series power supply modules, A (large-size) series I/O modules, and special function modules can be installed
Main base unit	General name for Q3☐B, Q3☐SB and Q3☐RB.
Extension base unit	General name for Q5☐B, Q6☐B, Q6☐RB and QA1S6☐B.
Slim type main base unit	General name for Q3☐SB.
Redundant main base unit	General name for Q3☐RB.
Redundant extension base unit	General name for Q6☐RB.
Base unit	General name for main base unit, extension base unit, slim type main base unit, redundant main base unit and redundant extension base unit.
Redundant base unit	General name for redundant main base unit and redundant extension base unit.
Extension cable	General name for QC05B, QC06B, QC12B, QC30B, QC50B, QC100B extension cables.
Tracking cable	General name for QC10TR and QC30TR tracking cables for Redundant CPU.
Q series power supply module	General name for Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P and Q64P power supply modules.
Slim type power supply module	General name for Q61SP slim type power supply module.
Redundant power supply module	General name for Q63RP and Q64RP redundant power supply module.

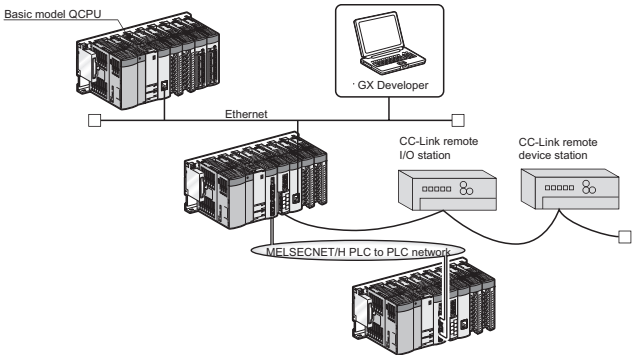
This section explains the features of the CPU modules.

Features of Basic model QCPU

The features specific to the Basic model QCPU are described below.

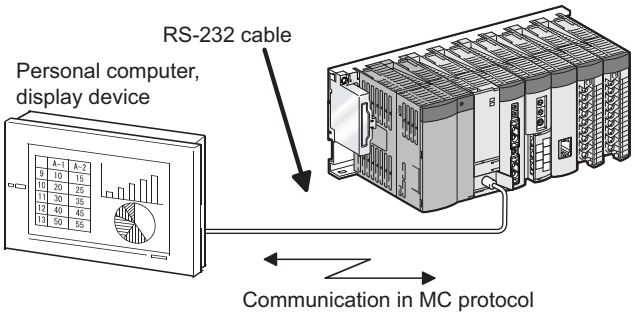
● Cost performance optimum for small-scaled system

The Basic model QCPU is a module targeted for a small-scaled system and optimum for controlling a simple, compact system.
The Basic model QCPU realizes the cost performance optimum for a small-scaled system.



● Communications with personal computer or indicator by serial communication function

The Q00CPU or Q01CPU can communicate with a personal computer/indicator via the RS-232 interface under the MELSEC communication protocol (hereafter abbreviated to the MC protocol).

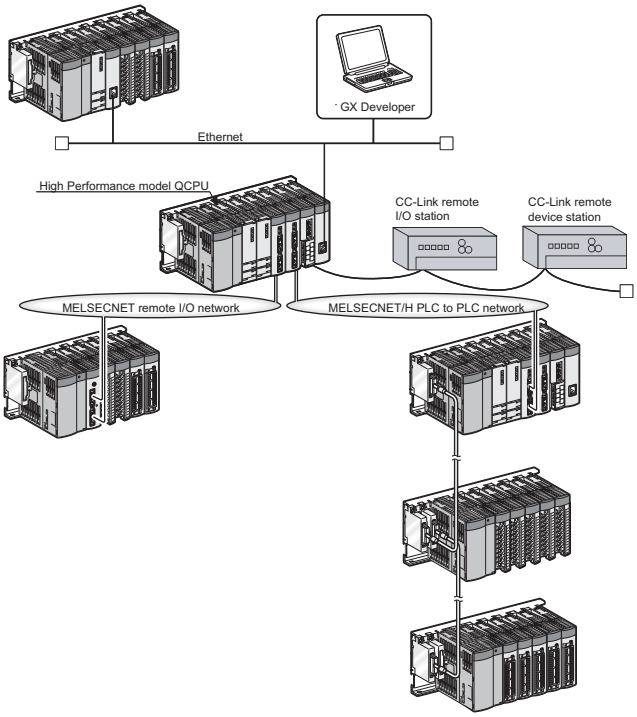


Features of High Performance model QCPU

The features specific to the High Performance model QCPU are described below.

● High performance and large capacity

The High Performance model QCPU is a module targeted for small-scaled to large-scaled systems and capable of high-speed massive data processing.
The High Performance model QCPU realizes construction of the optimum and high-performance system.



● A series I/O modules and special function modules are available

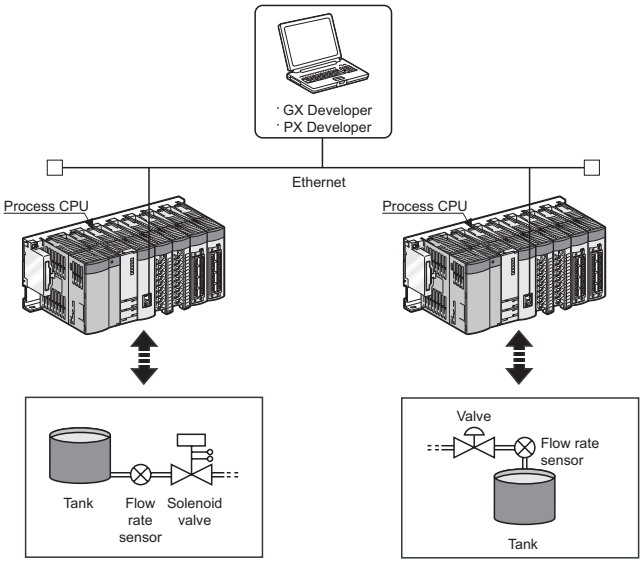
The QA6□B or QA1S6□B type extension base units allow the High Performance model QCPU to use the A series I/O modules and special function modules.

Features of Process CPU

The features specific to the Process CPU are described below.

● Additional 52 process control functions

Fifty-two instructions supporting high-leveled process controls have been added to the CPU based on the High Performance model QCPU.



● Two-degree-of-freedom PID control system

The Two-degree-of-freedom PID control system has been adopted to enable optimum responses to both set value changes and disturbance.

● Auto tuning function (PID constant initial value setting)

The auto tuning function enables automatic control parameter tuning, decreases the tuning time and labor of operators and control engineers, and eliminates differences between individuals in tuning results.

● Module can be replaced online (Online module change)

When a module becomes faulty, it can be replaced without the system being stopped.
Modules available for this are the Q series I/O modules, and the A/D converter modules, D/A converter modules, temperature input modules, temperature control modules, loop control module and pulse input modules of function version C.

● Configuration of MELSECNET/H multiplexed remote I/O system

A MELSECNET/H multiplexed remote I/O system can be configured,mounting a remote master station in the MELSECNET/H network system.

● Supporting software package dedicated to process control

Using the process control software package (PX Developer), PID control programs can be created easily with function block diagram.
The combination of the Process CPU and the process control software package (PX Developer) offers an excellent engineering environment.

POINT

1. When using the Process CPU, use GX Developer Version 7.10L or later.
2. Use PX Developer together with GX Developer Version 7.20W or later.

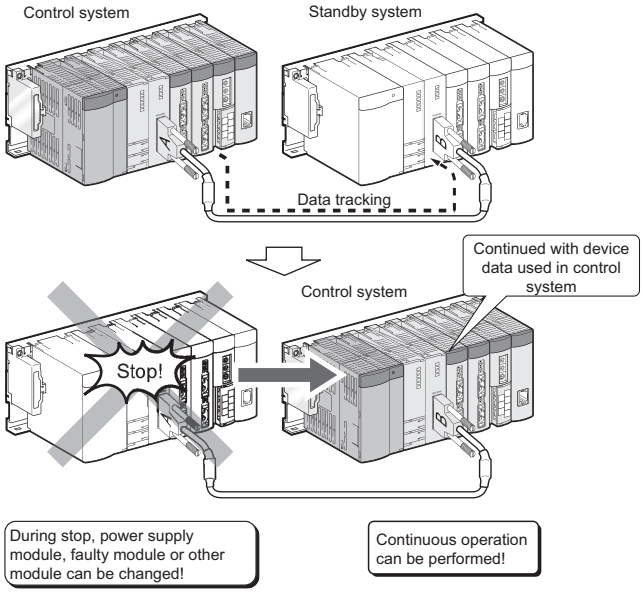
Features of Redundant CPU

The features specific to the Redundant CPU are described below.

● Supporting redundant system in addition to the Process CPU functions

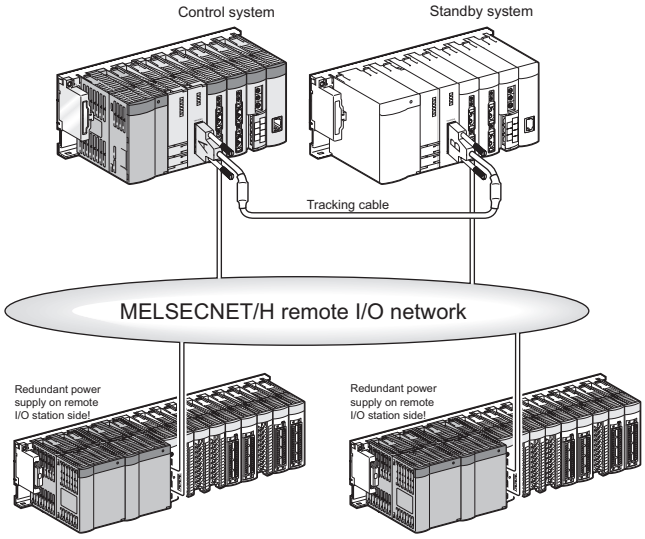
(1) Redundant system using Redundant CPU

Using the Redundant CPUs, the whole system including a base unit, a power supply module and a CPU module (Redundant CPU) can be doubled.
Since the standby system takes over the control even if a failure occurs in the control system, a highly reliable system can be created.



(2) Redundant power supply system

Using the redundant main base unit (Q3□RB) and redundant power supply module (Q6□RP) on the remote I/O station side, the remote I/O station side power supply can be redundant.
This enables the power supply module to be changed without stopping the system if the remote I/O station side power supply module becomes faulty.



POINT

1. When using the Redundant CPU, use GX Developer Version 8.17T or later.
2. Use PX Developer in combination with GX Developer Version.
   When using the Redundant CPU, use PX Developer Version 1.05F or later.

1.1.2 General specifications

The following table lists the general specifications of PLC

Item	Specifications					
Operating ambient temperature	0 to 55℃					
Storage ambient temperature	-25 to 75℃ *3					
Operating ambient humidity	5 to 95%RH *4, non-condensing					
Storage ambient humidity	5 to 95%RH *4, non-condensing					
Vibration resistance	Conforming to JIS B 3502, IEC 61131-2		Frequency	Acceleration	Amplitude	Sweep count
		Under intermittent vibration	10 to 57Hz	----	0.075mm (0.003inch)	10 times each in X, Y, Z directions (for 80 min.)
			57 to 150Hz	9.8m/s^2	----	
		Under continuous vibration	10 to 57Hz	----	0.035mm (0.001inch)	
			57 to 150Hz	4.9m/s^2	----	
Shock resistance	Conforming to JIS B 3502, IEC 61131-2 (147 m/s^2, 3 times in each of 3 directions X, Y, Z)					
Operating ambience	No corrosive gases					
Operating altitude *5	2000m (6562ft.) max.					
Installation location	Inside control panel					
Overvoltage category *1	II max.					
Pollution level *2	2 max.					

*1: This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises. Category II applies to equipment for which electrical power is supplied from fixed facilities. If rated voltage of a device is up to 300V, the surge voltage is 2500V.

*2: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used. Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

*3: The storage ambient temperature is -20 to 75℃ if the system includes the AnS series modules.

*4: The operating ambient humidity and storage ambient humidity are 10 to 90%RH if the system includes the AnS series modules.

*5: Do not use or store the PLC under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause a malfunction. When using the PLC under pressure, please contact your sales representative.

1.1.3 Performance specifications

The following table lists the performance specifications of CPU module.

Item		Basic model QCPU			High performance model QCPU		
		Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU	Q06HCPU
Control method		Sequence program control method					
I/O control mode		Refresh mode					
Program language	Sequence control language	Relay symbol language, logic symbolic language, MELSAP3 (SFC), MELSAP-L, function block, and structured text (ST)					
	Process control language	----					
Processing speed (sequence instruction)	LD X0	0.20μs	0.16μs	0.10μs	0.079μs	0.034μs	
	MOV D0 D1	0.70μs	0.56μs	0.35μs	0.237μs	0.102μs	
Processing speed (redundant function)	Tracking execution time (extended scan time)	----					
Constant scan (Function for keeping regular scan time)		1 to 2000ms (Setting available in1ms unit.)			0.5 to 2000ms (Setting available in 0.5ms unit.)		
Program capacity *1, *2		8k steps (32k bytes)		14k steps (56k bytes)	28k steps (112k bytes)		60k steps (240k bytes)
Memory capacity*1	Program memory (drive 0)	58k bytes	94k bytes		112k bytes		240k bytes
	Memory card (RAM) (drive 1)	----			Capacity of the installed memory card (2M bytes max.)		
	Memory card (ROM) (drive 2)	----			Capacity of the installed memory card (Flash card: 4M bytes max., ATA card: 32M bytes max.)		
	Standard RAM (drive 3)	0	128k bytes *3		64k bytes	128k bytes *3	
	Standard ROM (drive 4)	58k bytes	94k bytes		112k bytes		240k bytes
	CPU shared memory *3, *4	----	1k bytes		8k bytes		

*1: The unit of the file size stored in the memory area varies depending on the CPU module.
*2: The maximum number of executable sequence steps is as shown below.(Program capacity) - (File header size (default: 34 steps))
*3: The capacity has been increased due to the function upgrade of the CPU module.
*4: The CPU shared memory is not latched.
The CPU shared memory is cleared by turning on the PLC or resetting the CPU module.

High performance model QCPU		Process CPU		Redundant CPU		Remarks
Q12HCPU	Q25HCPU	Q12PHCPU	Q25PHCPU	Q12PRHCPU	Q25PRHCPU	
Sequence program control method						----
Refresh mode						Direct access I/O is available by specifying direct access I/O (DX□, DY□).
Relay symbol language, logic symbolic language, MELSAP3 (SFC), MELSAP-L, function block and structured text (ST)						----
----		FBD for process control				Programming by PX Developer.
0.034μs						----
0.102μs						----
----				Device memory 48k words: 22ms Device memory 100k words: 40ms		----
0.5 to 2000ms (Setting available in 0.5ms unit.)						Setting by parameters.
124k steps (496 bytes)	252k steps (1008 bytes)	124k steps (496 bytes)	252k steps (1008 bytes)	124k steps (496 bytes)	252k steps (1008 bytes)	----
496k bytes	1008k bytes	496k bytes	1008k bytes	496k bytes	1008k bytes	----
Capacity of the installed memory card (2M bytes max.)						----
Capacity of the installed memory card (Flash card: 4M bytes max., ATA card: 32M bytes max.)						----
256k bytes *3						----
496k bytes	1008k bytes	496k bytes	1008k bytes	496k bytes	1008k bytes	----
8k bytes				----		----

Item			Basic model QCPU			High performance model QCPU		
			Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU	Q06HCPU
Max. number of files stored	Program memory		6 *5			28		60
	Memory card (RAM)		----			256		
	Memory card (ROM)	Flash card	----			288		
		ATA card	----			512		
	Standard RAM		----	1 *7		3*6		
	Standard ROM		6 *5			28		60
No. of times of writing data into the standard ROM			Max. 100000 times					
No. of I/O device points			2048 points (X/Y0 to 7FF)			8192 points (X/Y0 to 1FFF)		
No. of I/O points			256 points (X/Y0 to FF)	1024 points (X/Y0 to 3FF)		4096 points (X/Y0 to FFF)		
No. of device points	Internal relay [M]		8192 points by default (M0-8191) (changeable)					
	Latch relay [L]		2048 points by default (L0 to 2047) (changeable)			8192 points by default (L0 to 8191) (changeable)		
	Link relay [B]		2048 points by default (B0 to 7FF) (changeable)			8192 points by default (B0 to 1FFF) (changeable)		
	Timer [T]		512 points by default (T0 to 511) (changeable) (Sharing of low- and high-speed timers)			2048 points by default (T0 to 2047) (changeable) (Sharing of low- and high-speed timers)		
			The low- and high-speed timers are specified by the instructions. The measurement unit of the low- and high-speed timers is set up by parameters. (Low-speed timer: 1 to 1000ms, 1ms unit, 100ms by default) (High-speed timer: 0.1 to 100ms, 0.1ms unit, 10ms by default)					
	Retentive timer [ST]		0 point by default (sharing of the low- and high-speed retentive timers) (changeable) The low- and high-speed retentive timers are specified by the instructions. The measurement unit of the low- and high-speed retentive timers is set up by parameters. (Low-speed retentive timer: 1 to 1000ms, 1ms unit, 100ms by default) (High-speed retentive timer: 0.1 to 100ms, 0.1ms unit, 10ms by default)					
	Counter [C]		Normal counter: 512 points by default (C0 to 511) (changeable) Interrupt counter: 128 points max. (0 point by default, setting by parameters)			Normal counter, 1024 points by default (C0 to 1023) (changeable) Interrupt counter: 256 points max. (0 point by default, setting by parameters)		
	Data register [D]		11136 points by default (D0 to 11135) (changeable)			12288 points by default (D0 to 12287) (changeable)		
	Link register [W]		2048 points by default (W0 to 7FF) (changeable)			8192 points by default (W0 to 1FFF) (changeable)		
	Annunciator [F]		1024 points by default (F0 to 1023) (changeable)			2048 points by default (F0 to 2047) (changeable)		
	Edge relay [V]		1024 points by default (V0 to 1023) (changeable)			2048 points by default (V0 to 2047) (changeable)		

*5: Each of parameter, intelligent function module parameter, sequence program, SFC program, device comment, and device initial value files can be stored.
*6: Extended by the upgraded functions of CPU module.
*7: As for the basic model QCPU, only one file register can be stored.
*8: The CPU module can execute up to 124 programs. The CPU module cannot execute 125 or more programs.

High performance model QCPU		Process CPU		Redundant CPU		Remarks
Q12HCPU	Q25HCPU	Q12PHCPU	Q25PHCPU	Q12PRHCPU	Q25PRHCPU	
124	252 *8	124	252 *8	124	252 *8	----
256						----
288						----
512						----
3*6						One file register, one local device and sampling trace file only *7
124	252	124	252	124	252	----
Max. 100000 times						----
8192 points (X/Y0 to 1FFF)						No. of points usable on program
4096 points (X/Y0 to FFF)						No. of points accessible to the actual I/O module
8192 points by default (M0 to 8191) (changeable)						The number of points can be changed within the setting range.
8192 points by default (L0 to 8191) (changeable)						
8192 points by default (B0 to 1FFF) (changeable)						
2048 points by default (T0 to 2047) (sharing of low- and high-speed timers) (changeable)						
The low- and high-speed timers are specified by the instructions. The measurement unit of the low- and high-speed timers is set up by parameters. (Low-speed timer: 1 to 1000ms, 1ms unit, 100ms by default) (High-speed timer: 0.1 to 100ms, 0.1ms unit, 10ms by default)						
0 point by default (sharing of low- and high-speed retentive timers) (changeable) The low- and high-speed retentive timers are specified by the instructions. The measurement unit of the low- and high-speed retentive timers is set up by parameters. (Low-speed retentive timer: 1 to 1000ms, 1ms unit, 100ms by default) (High-speed retentive timer: 0.1 to 100ms, 0.1ms unit, 10ms by default)						
Normal counter: 1024 points by default (C0 to 1023) (changeable) Interrupt counter: 256 points max. (0 point by default, setting by parameters)						
12288 points by default (D0 to 12287) (changeable)						
8192 points by default (W0 to 1FFF) (changeable)						
2048 points by default (F0 to 2047) (changeable)						
2048 points by default (V0 to 2047) (changeable)						

Item			Basic model QCPU			High performance model QCPU		
			Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU	Q06HCPU
No. of device points	File register	[R]	----	Up to 65536 points can be used by block switching in units of 32768 points (R0 to 32767)		When the standard RAM is used: Q02CPU32768 points (R0 to 32767). Q02HCPU, Q06HCPU32768 points Up to 65536 points can be used by block switching in units of 32768 points (R0 to 32767). When the SRAM card (1M bytes) is used: Up to 517120 points can be used by block switching in units of 32768 points (R0 to 32767). When the SRAM card (2M bytes) is used: Up to 1041408 points can be used by block switching in units of 32768 points (R0 to 32767). When the Flash card (2M bytes) is used: Up to 1041408 points can be used by block switching in units of 32768 points (R0 to 32767). When the Flash card (4M bytes) is used: Up to 1042432 points can be used by block switching in units of 32768 points (R0 to 32767).		
		[ZR]	----	65536 points (ZR0 to 65535)		When the standard RAM is used: Q02CPU32768 points (ZR0 to 32767). Q02HCPU, Q06HCPU65536 points (ZR0 to 65535) Block switching is not needed. When the SRAM card (1M bytes) is used: 517120 points (ZR0 to 517119), Block switching is not needed. When the SRAM card (2M bytes) is used: 1041408 points (ZR0 to 1041407), Block switching is not needed. When the Flash card (2M bytes) is used: 1041408 points (ZR0 to 1041407), Block switching is not needed. When the Flash card (4M bytes) is used: 1042432 points (ZR0 to 1042431), Block switching is not needed.		
	Link special relay [SB]		1024 points (SB0 to 3FF)			2048 points (SB0 to 7FF)		
	Link special register [SW]		1024 points (SW0 to 3FF)			2048 points (SW0 to 7FF)		
	Step relay [S] *9		2048 points (S0 to 127/block)			8192 points (S0 to 8191)		
	Index register [Z]		10 points (Z0 to 9)			16 points (Z0 to 15)		
	Pointer [P]		300 points (P0 to 299)			4096 points (P0 to 4095), The use ranges of the local pointers and common pointers can be set up by parameters.		
	Interrupt pointer [I]		128 points (I0 to 127) The cyclic interval of system interrupt pointers I28 to 31 can be set up by parameters. (2 to 1000ms, 1ms unit) Default values I28: 100ms, I29: 40ms, I30: 20ms, I31: 10ms			256 points (I0 to 255) The constant cyclic interval of system interrupt pointers I28 to 31 can be set up by parameters. (0.5 to 1000ms, 0.5ms unit) Default values I28: 100ms, I29: 40ms, I30: 20ms, I31: 10ms		

*9: The step relay is the device for the SFC function.

High performance model QCPU		Process CPU		Redundant CPU		Remarks
Q12HCPU	Q25HCPU	Q12PHCPU	Q25PHCPU	Q12PRHCPU	Q25PRHCPU	
When the standard RAM is used: Up to 131072 points can be used by block switching in units of 32768 points (R0 to 32767). When the SRAM card (1M bytes) is used: Up to 517120 points can be used by block switching in units of 32768 points (R0 to 32767). When the SRAM card (2M bytes) is used: Up to 1041408 points can be used by block switching in units of 32768 points (R0 to 32767). When the Flash card (2M bytes) is used: Up to 1041408 points can be used by block switching in units of 32768 points (R0 to 32767). When the Flash card (4M bytes) is used: Up to 1042432 points can be used by block switching in units of 32768 points (R0 to 32767).						When the basic model QCPU is used: No. of device points is fixed. When the high performance model QCPU, process CPU, or redundant CPU is used: Only reading is available when the Flash card is used. The ATA card is not usable.
When the standard RAM is used: 131072 points (ZR0 to 131071), block switching is not needed. When the SRAM (1M bytes) card is used: 517120 points (ZR0 to 517119), block switching is not needed. When the SRAM (2M bytes) card is used: 1041408 points (ZR0 to 1041407), block switching is not needed. When the Flash card (2M bytes) is used: 1041408 points (ZR0 to 1041407), block switching is not needed. When the Flash card (4M bytes) is used: 1042432 points (ZR0 to 1042431), block switching is not needed.						When the basic model QCPU is used: No. of device points is fixed. When the high performance model QCPU, process CPU, or redundant CPU is used: Only reading is available when the Flash card is used. The ATA card is not usable.
2048 points (SB0 to 7FF)						The number of device points is fixed.
2048 points (SW0 to 7FF)						
8192 points (S0 to 8191)						
16 points (Z0 to 15)						
4096 points (P0 to 4095), The use ranges of the local pointers and common pointers can be set up by parameters.						
256 points (I0 to 255) The constant cyclic interval of system interrupt pointers I28-31 can be set up by parameters. (0.5 to 1000ms, 0.5ms unit) Default values I28: 100ms, I29: 40ms, I30: 20ms, I31: 10ms						

Item		Basic model QCPU			High performance model QCPU		
		Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU	Q06HCPU
No. of device points	Special relay [SM]	1024 points (SM0 to 1023)			2048 points (SM0 to 2047)		
	Special register [SD]	1024 points (SD0 to 1023)			2048 points (SM0 to 2047)		
	Function input [FX]	16 points (FX0 to F)					
	Function output [FY]	16 points (FY0 to F)					
	Function register [FD]	5 points (FD0 to 4)					
No. of device tracking words		----					
Link direct device		Device for accessing the link device directly. Exclusively used for MELSECNET/H. Specified form: J□□\X□□, J□□\Y□□, J□□\W□□, J□□\B□□, J□□\SW□□, J□□\SB□□					
Intelligent function module device		Device for accessing the buffer memory of the intelligent function module directly. Specified form: U□□\G□□					
Latch range		L0 to 2047 (default) (Latch range can be set up for B, F, V, T, ST, C, D, and W.)			L0 to 8191 (default) (Latch range can be set up for B, F, V, T, ST, C, D, and W.)		
RUN/PAUSE contact		One contact can be set up in X0 to 7FF for each of RUN and PAUSE.			One contact can be set up in X0 to 1FFF for each of RUN and PAUSE.		
Timer function		Year, month, date, hour, minute, second and day-of-week (leap year automatically identified) Accuracy: -3.2 to +5.27s(TYP.+1.98s)/d at 0℃ Accuracy: -2.57 to +5.27s(TYP.+2.22s)/d at 25℃ Accuracy: -11.68 to +3.65s(TYP.-2.64s)/d at 55℃			Year, month, date, hour, minute, second, and day-of-week (leap year automatically identified) Accuracy: -3.18 to +5.25s(TYP.+2.12s)/d at 0℃ Accuracy: -3.93 to +5.25s(TYP.+1.90s)/d at 25℃ Accuracy: -14.69 to +3.53s(TYP.-3.67s)/d at 55℃		
Allowable instantaneous power failure period		20ms or less (100VAC or more)	Varies depending on the power supply module.				
Protection degree		IP1X	IP2X				
5VDC internal current consumption		0.22A *10	0.25A	0.27A	0.60A	0.64A	
External dimensions	H	98mm	98mm				
	W	245mm *11	27.4mm				
	D	97.5mm	89.3mm				
Weight		0.66kg *11	0.13kg	0.13kg	0.20kg		

*10 : The value includes those of the CPU module and base unit.

*11: The value includes those of the CPU module, base unit, and power supply module.

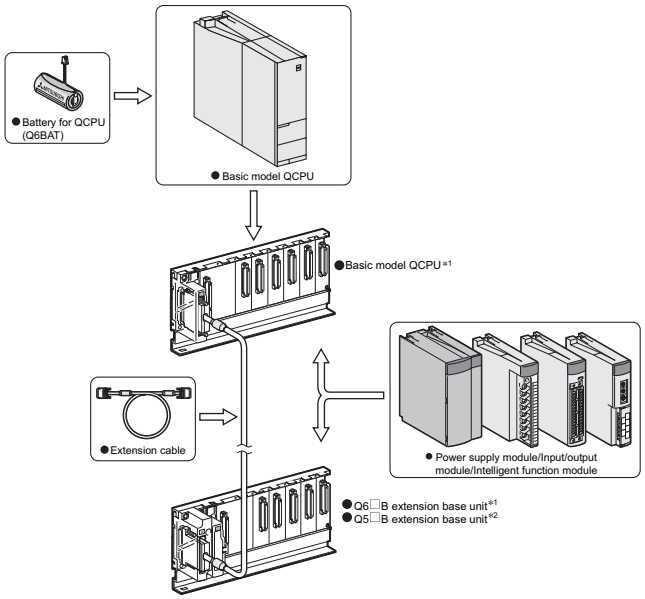
High performance model QCPU		Process CPU		Redundant CPU		Remarks
Q12HCPU	Q25HCPU	Q12PHCPU	Q25PHCPU	Q12PRHCPU	Q25PRHCPU	
2048 points (SM0 to 2047)						No. of device points is fixed.
2048 points (SD0 to 2047)						
16 points (FX0 to F)						
16 points (FY0 to F)						
5 points (FD0 to 4)						
----				Max. 100k words		----
Device for accessing the link device directly. Used exclusively for MELSECNET/H. Specified form: J□□\X□□, J□□\Y□□, J□□\W□□, J□□\B□□, J□□\SW□□, J□□\SB□□						----
Device for accessing the buffer memory of the intelligent function module directly. Specified form: U□□\G□□						----
L0-8191 (default) (Latch range can be set up for B, F, V, T, ST, C, D, and W.)						Setting by parameters.
One contact can be set up in X0 to 1FFF for each of RUN and PAUSE.						
Year, month, date, hour, minute, second, and day-of-week (leap year automatically identified) Accuracy: -3.18 to +5.25s(TYP.+2.12s)/d at 0℃ Accuracy: -3.93 to +5.25s(TYP.+1.90s)/d at 25℃ Accuracy: -14.69 to +3.53s(TYP.-3.67s)/d at 55℃				Year, month, date, hour, minute, second, and day-of-week (leap year automatically identified) Accuracy: -3.2 to +5.27s (TYP.+2.07s)/d at 0℃ Accuracy: -2.77 to +5.27s (TYP.+2.22s)/d at 25℃ Accuracy: -12.14 to +3.65s (TYP.-2.89s)/d at 55℃		----
Varies depending on the power supply module.						----
IP2X						----
0.64A				0.89A		----
98mm						----
27.4mm				55.2mm		----
89.3mm				89.3mm		----
0.20kg				0.30kg		----

1.1.4 System configuration

System Configuration for Single CPU System

● System configuration using basic model QCPU (Q00CPU/Q01CPU)

(1) When the main base unit (Q3□B) is used



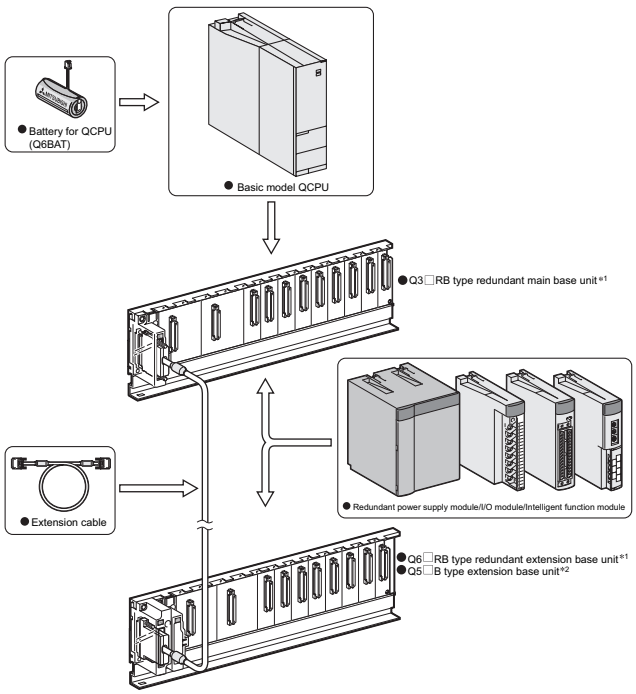
*1: As a power supply module, use the Q series power supply module.
The slim type power supply module and the redundant power supply module are not available for the power supply module.

*2: The Q series power supply module is not required for the Q5□B type extension base unit

POINT

Because the Q00JCPU is the CPU module with a power supply module and main base unit incorporated, no power supply module and main base unit are required.

(2) When the redundant main base unit (Q3□RB) is used



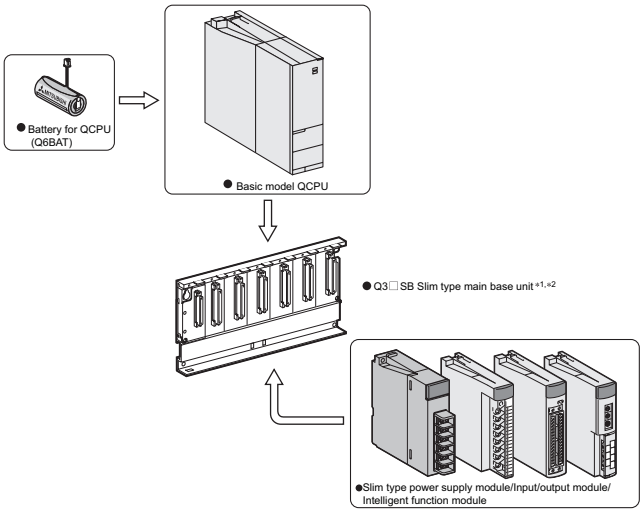
*1: Use the redundant power supply module for the power supply module.
The Q series power supply module and the slim type power supply module are not available for the power supply module.
The redundant power supply module can use the both Q63RP and Q64RP together with one redundant base unit.

*2: The Q series power supply module is not required for the Q5□B type extension base unit

POINT

Because the Q00JCPU is the CPU module with a power supply module and main base unit incorporated, no power supply module and main base unit are required.

(3) When the slim type main base unit (Q3□SB) is used



*1: Because the slim type main base unit does not have an extension cable connector, the extension base unit cannot be connected and bus connection of GOT is not available.

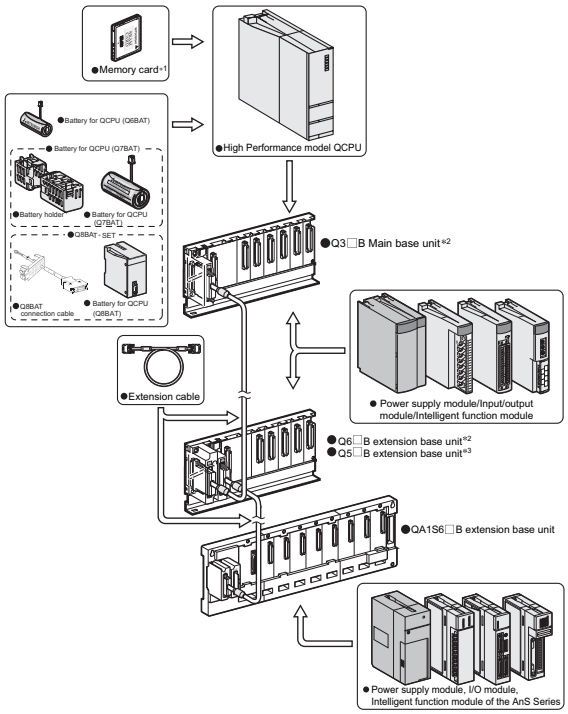
*2: As a power supply module, use the slim type power supply module.
The Q series power supply module and the redundant power supply module are not available for the power supply module.

POINT

Because the Q00JCPU is the CPU module with a power supply module and main base unit incorporated, the slim type main base unit is not available.

●System configuration using the high performance model QCPU

(1) If the main base unit (Q3□B) is used

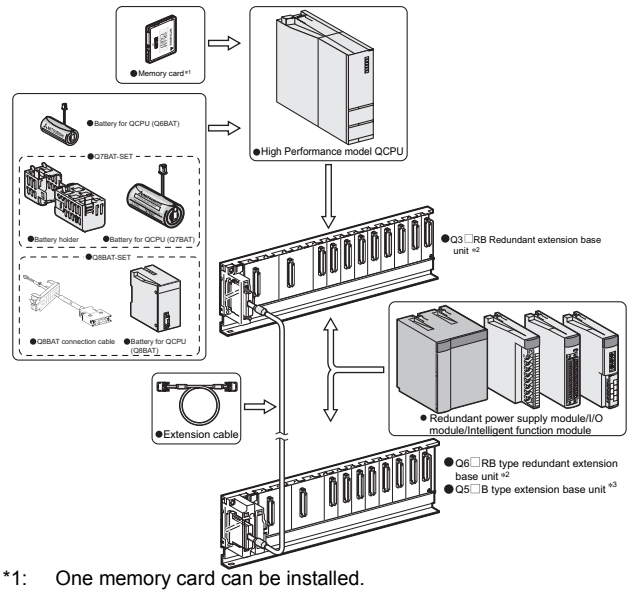


*1: One memory card can be installed.
Select a memory card from SRAM card, Flash card, and ATA card according to the application and capacity.

*2: As a power supply module, use the Q series power supply module.
The slim type power supply module and the redundant power supply module are not available for the power supply module.

*3: The Q series power supply module is not required for the Q5□B type extension base unit.

(2) When the redundant main base unit (Q3□RB) is used

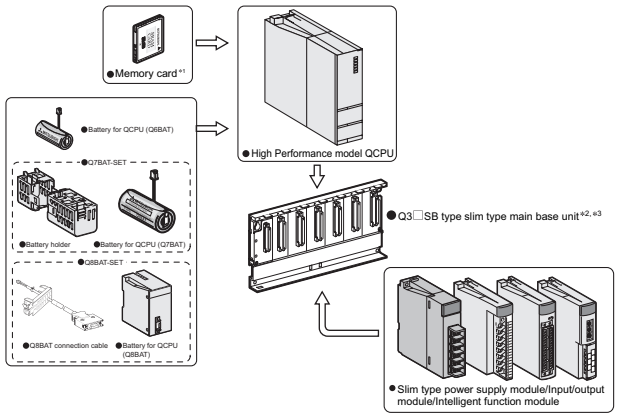


*1: One memory card can be installed.
Select a memory card from SRAM card, Flash card, and ATA card according to the application and capacity.

*2: Use the redundant power supply module for the power supply module.
The redundant power supply module can use the both Q63RP and Q64RP together with one redundant base unit.
The Q series power supply module and the slim type power supply module are not available for the power supply module.

*3: The Q series power supply module is not required for the Q5□B type extension base unit.

(3) When the slim type main base unit (Q3□SB) is used



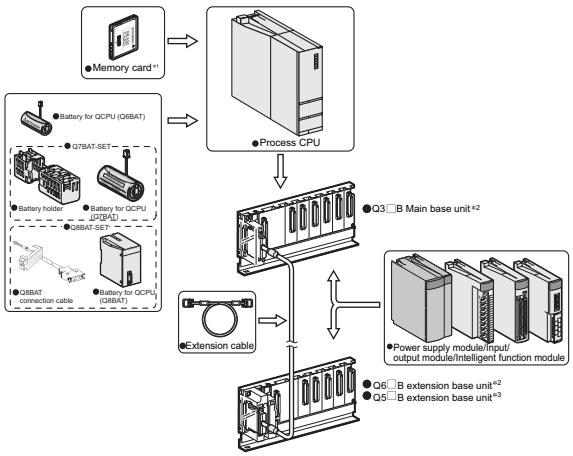
*1: One memory card can be installed.
Select a memory card from SRAM card, Flash card, and ATA card according to the application and capacity.
With commercial memory cards, the operation is not assured.

*2: The slim type main base unit does not have an extension cable connector.
The extension base unit cannot be connected and bus connection of GOT is not available.

*3: As a power supply module, use the slim type power supply module.
The Q series power supply module and the redundant power supply module are not available for the power supply module.

● System configuration using the process CPU

(1) When the main base unit (Q3□B) is used



*1: One memory card can be installed.
Select a memory card from SRAM card, Flash card, and ATA card according to the application and capacity.
With commercial memory cards, the operation is not assured.

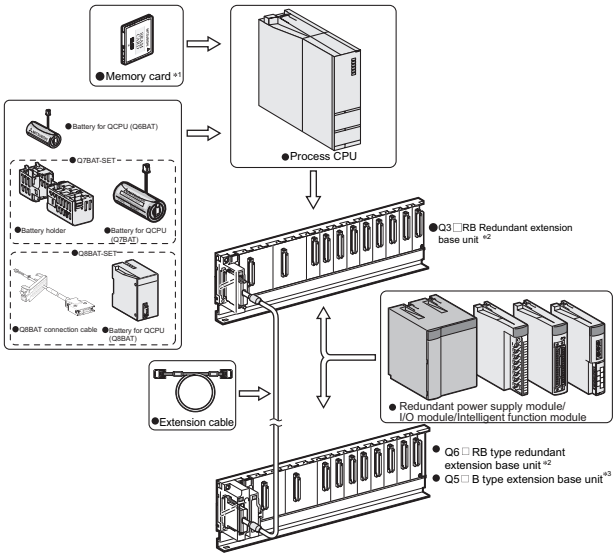
*2: As a power supply module, use the Q series power supply module.
The slim type power supply module and the redundant power supply module are not available for the power supply module.

*3: The Q series power supply module is not required for the Q5□B type extension base unit.

POINT

The Process CPU cannot be mounted on the slim type main base unit.

(2) When the redundant main base unit (Q3□RB) is used



*1: One memory card can be installed.
Select a memory card from SRAM card, Flash card, and ATA card according to the application and capacity.

*2: Use the redundant power supply module for the power supply module.
The redundant power supply module can use the both Q63RP and Q64RP together with one redundant base unit.
The Q series power supply module and the slim type power supply module are not available for the power supply module.

*3: The Q series power supply module is not required for the Q5□B type extension base unit.

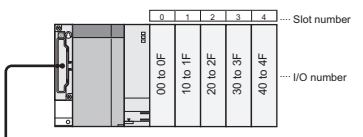
POINT

The Process CPU cannot be mounted on the slim type main base unit.

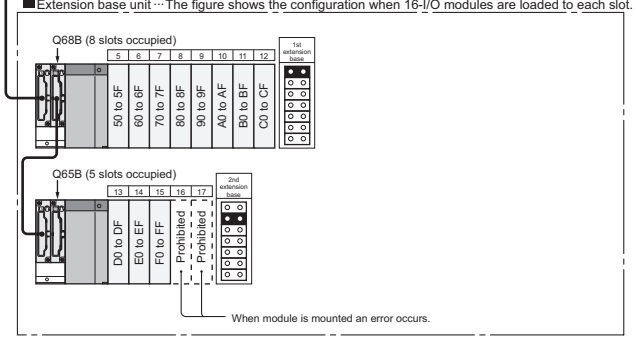
● Outline of system configuration

(1) When Q00JCPU is used

■Q00JCPU ···The figure shows the configuration when 16-I/O modules are loaded to each slot.



■Extension base unit ···The figure shows the configuration when 16-I/O modules are loaded to each slot.



(a) Restrictions on the system configuration and applicable base units, extension cables and power supply modules

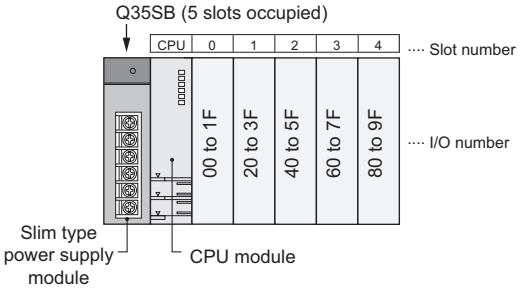
Maximum number of extension stages of extension base units	2 extension stages	
Maximum number of I/O modules loaded	16 modules	
Applicable extension base unit type	Module requiring no power supply module	Q52B, Q55B
	Module requiring a Q series power supply module	Q63B, Q65B, Q68B, Q612B
Extension cable	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
Q series power supply module	Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P, Q64P	

■ Cautions

- Do not use extension cables exceeding an overall extension length of 13.2m (43.31ft.).
- When using an extension cable, keep it away from the main circuit (high voltage and heavy current) line.
- Set up the number of extension stages so that the number is not duplicated with another.
- The QA1S6□B, QA6□B or Q6□RB cannot be connected as an extension base unit.
- If both the Q5□B and Q6□B are used together, the order of connection is not restricted.
- Connect the extension cable from OUT of the extension cable connector of the base unit to IN of the extension base unit on the next stage.
- If the number of installed modules has exceeded the maximum number of I/O modules loaded, an error "SP.UNIT LAY ERR." (error code: 2124) occurs.

(2)When the slim type main base unit (Q3□SB) is use

■ Slim type main base unit ··· The figure shows the configuration when 32-I/O modules are loaded to each slot.



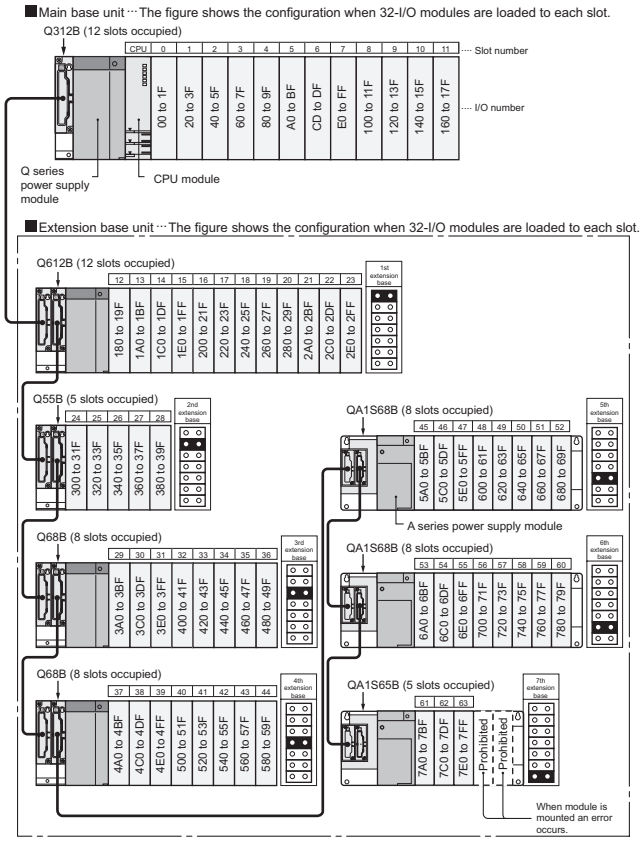
(a) Restrictions on the system configuration and applicable base units and power supply modules

Maximum number of I/O modules loaded	5 modules
Applicable slim type main base unit	Q32SB, Q33SB, Q35SB
Slim type power supply module	Q61SP

■ Cautions

- The process CPU and redundant CPU are not allowed to use with the slim type main base unit.
- The slim type main base unit does not have an extension cable connector.
- The extension base unit cannot be connected and bus connection of GOT is not available.

(3) When the main base unit (Q3☐B) is used



(a) Restrictions on the system configuration and applicable base units, extension cables and power supply modules

Basic Note 1.1	Maximum number of extension stages of extension base units	7 extension stages *Note1.1*	
	Maximum number of I/O modules loaded	64 modules *Note1.1*	
	Applicable main base unit type	Q33B, Q35B, Q38B, Q312B	
High Performance Note 1.2	Applicable extension base unit type	Module types requiring no power supply module	Q52B, Q55B
		Module types requiring a Q series power supply module	Q63B, Q65B, Q68B, Q612B
		Module types requiring an A series power supply module *Note1.2*	QA1S65B, QA1S68B, QA65B, QA68B
	Extension cable	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
	Q series power supply module	Q61P-A1, Q61P-A2, Q61P, Q62P, Q63P, Q64P	
	A series power supply module *Note1.2*	A1S61PN, A1S62PN, A1S63P A61P, A61PEU, A62P, A62PEU, A63P	

■ Cautions

- Do not use extension cable longer than an overall extension length of 13.2m (43.31ft.).
- When using an extension cable, do not bind it together with the main circuit (high voltage and heavy current) line or do not lay down them closely to each other.
- Set up the number of extension stages so that the number is not duplicated with another.
- When Q5☐B, Q6☐B, QA6☐B and QA1S6☐B types of extension base units are used together, first connect the Q5☐B, Q6☐B type and then connect the QA6☐B and QA1S6☐B type.
  When setting the extension stage numbers, start from Q5☐B/Q6☐B in order.
  Although there are no particular restrictions on the order of the installation of the Q5☐B and Q6☐B.
- The Q6☐RB cannot be connected as an extension base unit.
- Connect the extension cable from OUT of the extension cable connector of the base unit to IN of the extension base unit on the next stage.
- If the number of installed modules has exceeded the maximum number of I/O modules loaded, an error "SP.UNIT LAY ERR." (error code: 2124) occurs.

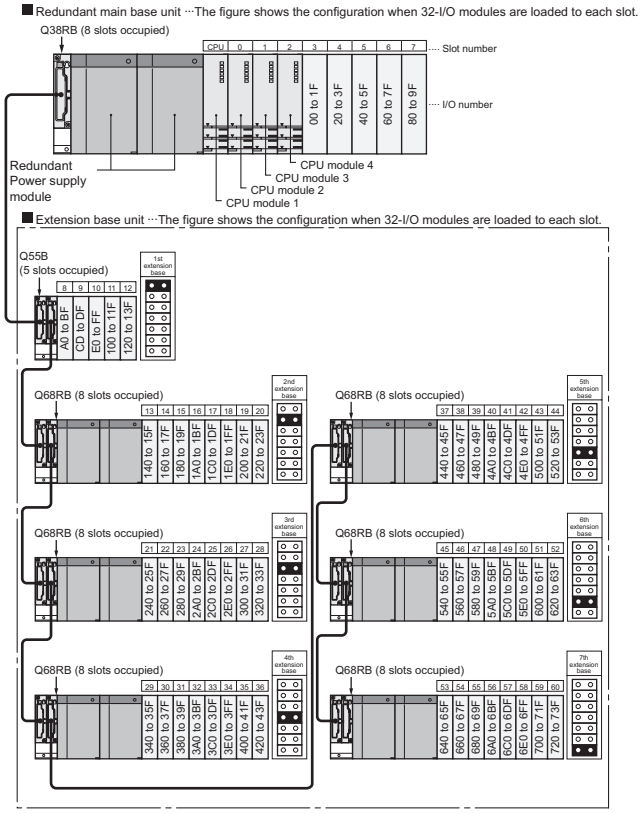
Basic Note 1.1

When the Q00CPU or Q01CPU is used:
Maximum number of extension stages of the extension base units : 4 stages
Maximum number of I/O modules loaded : 24 modules

High Performance Note 1.2

Usable only when the high performance model QCPU is used.

(4) When the redundant main base unit (Q3□RB) is used



(a) Restrictions on system configuration and applicable base units, extension cables and power supply modules

Basic Note 1.3

Maximum number of extension stages of extension base units	7 extension stages *Note1.3*	
Maximum number of I/O modules loaded	64 modules *Note1.3*	
Applicable redundant base unit type	Q38RB	
Applicable extension base unit type	Models requiring no power supply module	Q52B, Q55B
	Models requiring a redundant power supply module	Q68RB
Extension cable	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
Redundant power supply module	Q63RP, Q64RP	

■ Cautions

- Do not use extension cables exceeding an overall extension length of 13.2m (43.31ft.).
- When using an extension cable, keep it away from the main circuit (high voltage and heavy current) line.
- Set up the number of extension stages so that the number is not duplicated with another.
- If both the Q5□B and Q6□RB extension base units are used together, the order of connection is not restricted.
- The QA6□B, QA1S6□B or Q6□B cannot be connected as an extension base unit.
- Connect the extension cable from OUT of the extension cable connector of the base unit to IN of the extension base unit on the next stage.
- If the number of installed modules has exceeded the maximum number of I/O modules loaded, an error "SP.UNIT LAY ERR." (error code: 2124) occurs.
- When the redundant base unit is used, bus connection of GOT is not available.

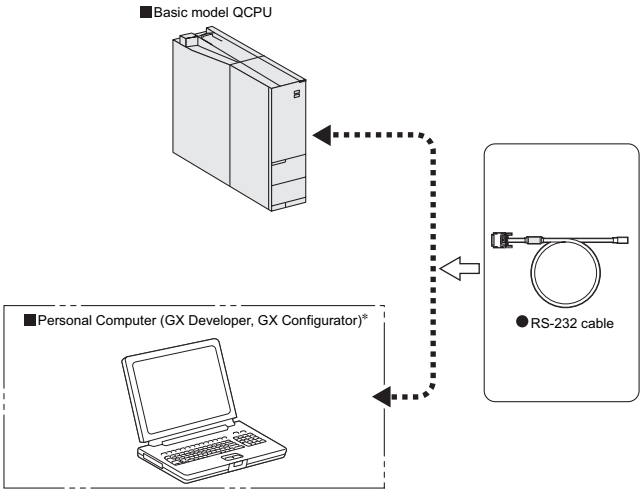
Basic Note 1.3

When Q00CPU or Q01CPU is used:
Maximum number of extension stages of the extension base units : 4 stages
Maximum number of I/O modules loaded : 24 modules

Configuration of peripheral devices

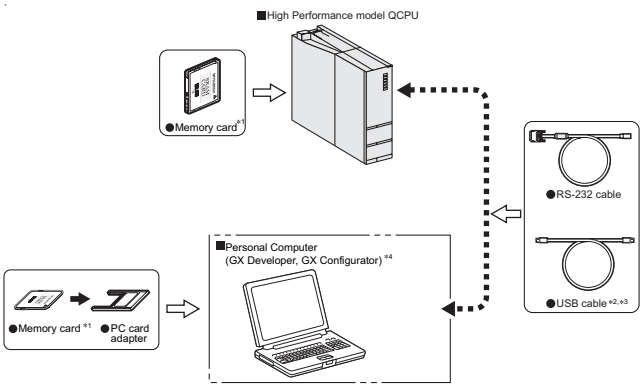
This section describes the configurations of the peripheral devices usable in the system where the basic model QCPU, the high performance model QCPU or the process CPU is used.

● When the basic model QCPU is used



*: For the GX Developer and GX Configurator versions compatible with the basic model QCPU, refer to the next page or later.

● When the high performance model QCPU is used



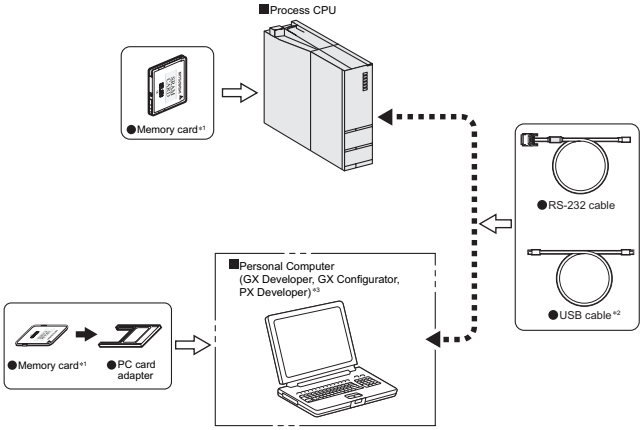
*1: Format the ATA card by GX Developer only.
*2: Not usable for the Q02CPU.
*3: For versions of GX Developer and GX Configurator, which are compatible with high-performance model QCPUs, refer to the following pages.
*4: To obtain more information or make an order of the programming module (EPU01) and connection cable (EPU20R2CBL), contact the following numbers.

☞ Mitsubishi Electric Engineering Company Limited.

East Japan Sales Department	TEL:03-3288-1743
Central Japan Sales Department	TEL:052-565-3435
West Japan Sales Departmen	TEL:06-6347-2969
Kyushu Sales G	TEL:092-721-2202

*5: Programming modules cannot be used when writing the parameter "High-speed interruption fixed scan" to a high-performance model CPU having a serial number "04012" or later as the first 5 digits.

● When the process CPU is used



*1: Format the ATA card by GX Developer only.
*2: For the GX Developer, GX Configurator and PX Developer versions compatible with the process CPU

Applicable Devices and Software

This section describes the applicable devices and software packages for configuring a system.

● Modules replaceable online

The modules controlled by the process CPU or redundant CPU can be replaced online. The modules controlled by the basic model QCPU, high performance model QCPU, motion CPU, or PC CPU module cannot be replaced online.

Module type		Restriction
Input module		No restriction
Output module		
I/O composite module		
Intelligent function module	Analog-digital converter module	Supporting with function version C. (Online module change is not available when the redundant CPU is used.)
	Digital-analog converter module	
	Temperature input module	
	Temperature control module	
	Loop control module	
	Pulse input module	

● Applicable software

(1) GX Developer and PX Developer versions applicable in the single CPU system

CPU module	Applicable software version	
	GX Developer	PX Developer
Basic model QCPU	Version 7.00A or later	N/A
High performance model QCPU	Version 4.00A or later	
Process CPU	Version 7.10L or later*	Version 1.02C or later

*: When using PX Developer, use GX Developer version 7.20W or later.

(2) GX Configurator versions applicable in the single CPU system

CPU Module	Applicable software version	
	Product name	Version
Basic Model QCPU	GX Configurator-AD	Version 1.10L or later *1,*2
	GX Configurator-DA	Version 1.10L or later *3, *10
	GX Configurator-SC	Version 1.10L or later
	GX Configurator-CT	Version 1.10L or later *4
	GX Configurator-TI	Version 1.10L or later *5,*6
	GX Configurator-TC	Version 1.10L or later *8
	GX Configurator-FL	Version 1.10L or later
	GX Configurator-QP	Version 2.10L or later *9
	GX Configurator-PT	Version 1.10L or later
	GX Configurator-AS	Version 1.13P or later
High Performance Model QCPU	GX Configurator-AD	SW0D5C-QADU 00A or later *1,*2
	GX Configurator-DA	SW0D5C-QADU 00A or later *3, *10
	GX Configurator-SC	SW0D5C-QSCU 00A or later *7
	GX Configurator-CT	SW0D5C-QCTU 00A or later *4
	GX Configurator-TI	Version 1.00A or later *5,*6
	GX Configurator-TC	SW0D5C-QCTU 00A or later *8
	GX Configurator-FL	SW0D5C-QFLU 00A or later
	GX Configurator-QP	Version 2.00A or later *9
	GX Configurator-PT	Version 1.00A or later
	GX Configurator-AS	Version 1.13P or later
Process CPU	GX Configurator-AD	Version 1.13P or later *1,*2
	GX Configurator-DA	Version 1.13P or later *3, *10
	GX Configurator-SC	Version 1.13P or later
	GX Configurator-CT	Version 1.13P or later *4
	GX Configurator-TI	Version 1.13P or later *6
	GX Configurator-TC	Version 1.13P or later *8
	GX Configurator-FL	Version 1.13P or later
	GX Configurator-QP	Version 2.13P or later *9
	GX Configurator-PT	Version 1.13P or later
	GX Configurator-AS	Version 1.13P or later

*1: To use the Q64AD-GH, use version 1.13P or later.
*2: To use the Q62AD-DGH, use version 1.14Q or later.
*3: To use the Q62DA-FG, use version 1.14Q or later.
*4: To use the QD60P8-G, use version 1.14Q or later.
*5: To use the Q64TDV-GH, use version 1.13P or later.
*6: To use the Q64RD-G, use version 1.17T or later.
*7: To use the QJ71CMO, use version 1.10L or later.
*8: To use the Q62HLC, use version 1.20W or later.
*9: To use the QD75MH, use version 2.20W or later.
*10: Model name selection of Q62DAN, Q64DAN, Q68DAVN and Q68DAIN can be made with version 2.03D or later.To use the software package earlier than version 2.03D, select a model name without "N" for each model.

Precaution on system configuration

This section describes the restrictions on configuring a system with a Q Series CPU module.

● Number of modules loaded

The number of modules to be installed and functions are limited depending on the type of the modules.

(1) When the basic model QCPU is used

Applicable Module	Type	Limitation of installable modules per system
Q Series MELSECNET/H network module	QJ71BR11 QJ71LP21-25 QJ71LP21S-25 QJ71LP21G	One module only
Q series Ethernet interface module	QJ71E71-B2 QJ71E71-B5 QJ71E71-100	One module only
Q series CC-Link system master local module	QJ61BT11N	Up to 2 modules *1
Interrupt module	QI60	Up to one module *2

*1: Products of function version B or higher are applicable.
*2: This is the number of the interrupt modules to which the interrupt pointer settings have not been done.
There is no restriction on the number of loaded modules when the interrupt pointer settings have been done.

(2) When the high performance model QCPU or process CPU is used

Applicable Module	Type	Number limitation of installable modules per system
Q Series MELSECNET/H network module	QJ71LP21-25 QJ71LP21S-25 QJ71LP21G QJ71LP21GE	Up to 4 in total of PLC to PLC network and remote I/O network modules
Q series Ethernet interface module	QJ71E71-B2 QJ71E71-B5 QJ71E71-100	Up to 4 units
Q series CC-Link system master local module	QJ61BT11N	No limit *3
MELSECNET/MINI-S3 data link module	AJ71T32-S3 AJ71PT32-S3 A1SJ71T32-S3	No limit (setting of automatic refresh function not allowed)
Special function module for the A series *4	AD51 AD51H-S3 AJ71J92-S3 A1SD51S A1SJ71J92-S3	Total of 6 units
Interrupt module	AI61 *4 AI61-S1 *4 A1SI61 *4	One unit only
	QI60	One module only

*3: Up to 4 modules per CPU can be controlled with the CC-Link network parameter setting by GX Developer. If the parameters are set up by CC-Link dedicated instructions, the number of modules installed is not limited.
*4: This is applicable only when the high performance model QCPU is used.

● Combination of power supply module, base unit and CPU module

The combination of the power supply module, base unit, and CPU module is restricted.

(Ex.) The redundant power supply module (Q6☐RP) can be installed to the redundant main base unit (Q3☐RB) and redundant extension base unit (Q6☐RB) only.

● Caution for use of the high performance model QCPU

(1) When the A series special-function modules shown below are used, a limitation is given to an accessible device range.

- •AJ71J92-S3 type JEMANET interface module
- •A1SJ71J92-S3 type JEMANET interface module
- •AD51-S3 type intelligent communication module
- •A1SD51S type intelligent communication module

Device	Accessible device range
Input (X), Output (Y)	X/Y0 to 7FF
Internal relay (M), Latch relay (L)	M0 to 8191
Link relay (B)	B0 to FFF
Timer (T)	T0 to 2047
Counter (C)	C0 to 1023
Data register (D)	D0 to 6143
Link register (W)	W0 to FFF
Annunciator (F)	F0 to 2047

(2) The modules shown below cannot be used.

Product name	Model
MELSECNET/10 network module	AJ71LP21, AJ71LP21G, AJ71LR21, AJ71BR11, AJ71QLP21, AJ71QLP21G, AJ71QLR21, AJ71QLP21S, AJ71QBR11, A1SJ71LP21, A1SJ71LR21, A1SJ71BR11, A1SJ71QLP21, A1SJ71QLR21, A1SJ71QLP21S, A1SJ71QBR11
MELSECNET(II)/B data link module	AJ71AP21, AJ71AR21, AJ71AT21B, A1SJ71AP21, A1SJ71AR21, A1SJ71AT21B
Ethernet interface module	AJ71E71N-B2(-B5), AJ71E71N3-T, AJ71QE71N-B2(-B5), AJ71QE71N3-T, A1SJ71E71N-B2(-B5), A1SJ71E71N3-T, A1SJ71QE71N-B2(-B5), A1SJ71QE71N3-T
Serial communication module Computer link module	AJ71UC24, AJ71QC24N(-R2), A1SJ71UC24-R2(-R4/-PRF), A1SJ71QC24N(-R2), A1SJ71QC24N1(-R2)
CC-Link master/local module	AJ61BT11, AJ61QBT11, A1SJ61BT11, A1SJ61QBT11
Modem interface module	A1SJ71CMO-S3

(3) The QnA/A series dedicated instructions for the following modules are not available.
Re-writing using the FROM/TO instruction is required.

Module Name	Type
High speed counter module	A1SD61, A1SD62, AD61, AD61S1, A1SD62D(-S1), A1SD62E
MELSECNET/MINI-S3	A1SJ71PT32-S3, AJ71PT32-S3, AJ71T32-S3
Positioning module	A1SD75P1-S3(P2-S3/P3-S3)

(4) Some system configurations and functions are restricted when writing the parameters set under the "High speed interrupt fixed scan interval" setting.

● Caution for GOT connection

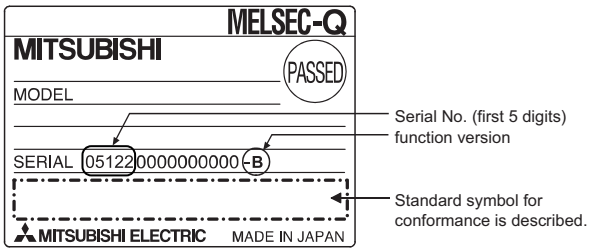
Only the GOT1000, GOT-A900 and GOT-F900 series are usable. (It is necessary to install the basic OS and communication driver compatible with the Q mode.)
The GOT800 series, A77GOT, and A64GOT are not usable.
For connecting type supported by GOT1000 series, GOT-A900 series and GOT-F900 series, refer to the catalog of each of GOT series.

Confirming Serial No. and Function Version

The serial No. and function version of the CPU module can be confirmed on the rated plate and GX Developer's system monitor.

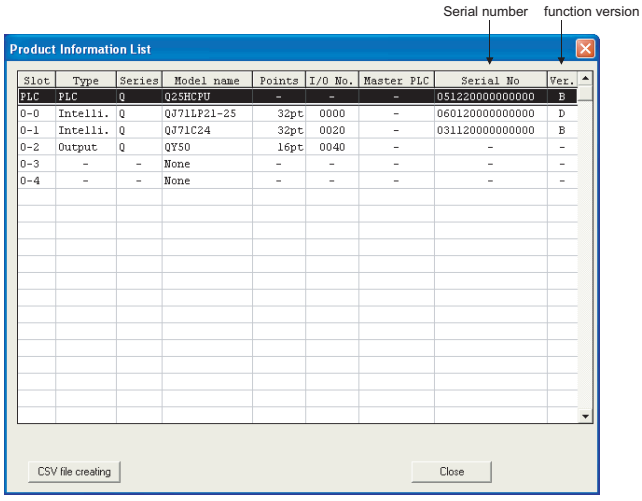
● Confirming the serial No. on the rated plate

The rated plate is situated on the side of the CPU module.



● Confirming the serial No. on the system monitor (Product Information List)

To display the system monitor, select [Diagnostics] [System Monitor] of GX Developer.
On the system monitor, the serial No. and function version of the intelligent function module can also be confirmed.



● **Precautions for confirming serial No.**

The serial No. described on the rated plate may not match with the serial No.displayed on the product information of GX Developer.

- The serial No. on the rated plate describes the management informationof the product.
- The serial No. displayed on the product information of GX Developer describes the function information of the product.
  The function information of the product is updated when adding functions.

Production discontinuation of MELSECNET-A(large-size) series

The production of the A (large-size) series I/O modules and special function modules, which can be used with a high-performance model QCPU, is discontinued after the period indicated below.

● **Production discontinuation timing**

Order acceptance and production transition start	October 1, 2005
Order deadline	August 31, 2006
Final production	September 30, 2006

For details of the production discontinuation, refer to the technical news T99-0050.

Production discontinuation of MELSECNET/MINI-S3

The production of the MELSECNET/MINI-S3 data link module, which can be used with a high-performance model QCPU, is discontinued after the period indicated below.

● **Production discontinuation timing**

Order acceptance and production transition start	October 1, 2007
Order deadline	August 31, 2008
Final production	September 30, 2008

For details of the production discontinuation, refer to the technical news T99-0070.

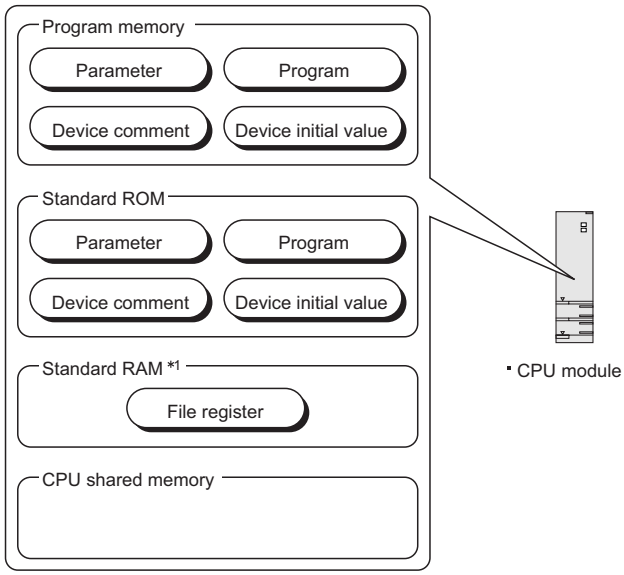
1.1.5 Memories and files handled on CPU modules

Basic Model QCPU

■ Memory configuration and storable data

This section explains the memories handled by the Basic model QCPU and the data that can be stored into the memories.

● Memory configuration



*1: The Q00JCPU does not have the standard RAM. File registers are unavailable

(1) Program memory

The program memory stores the program used by the Basic model QCPU to perform operation.

(2) Standard ROM

The standard ROM is used to execute boot run by the Basic model QCPU.

(3) Standard RAM

The standard RAM is provided to use file registers.

(4) CPU shared memory

The CPU shared memory is used to write/read data between CPU modules of a multiple CPU system.

● Data that can be stored into memories

The following table indicates the data that can be stored into the program memory, standard RAM and standard ROM and the corresponding drive Nos.

	CPU module built-in memories			File name and extension
	Program memory	Standard RAM*5	Standard ROM	
Drive No.*7	0	3	4	
Parameter	◎	×	○	PARAM.QPA
Intelligent function module parameter	○	×	○	IPARAM.QPA
Sequence program	◎*4	×	○*1	MAIN.QPG
SFC program	◎*4	×	○*1	MAIN-SFC.QPG
File register	×	○*3	×	MAIN.QDR
Device comment	○*2	×	○*2	MAIN.QCD
Device initial value	○	×	○	MAIN.QDI
User setting system area*6	○	×	×	--

◎ : Necessary data, ○: Storable data, ×: Unstorable data

*1: To execute the program stored in the standard ROM, boot file setting to the program memory is required in the PLC parameter dialog box.

*2: Data can be written only from GX Developer. Device comments cannot be used in sequence program instructions.

*3: Only one file of file register can be stored into the standard RAM.

*4: Any of sequence program, ST program and SFC program data is necessary.

*5: The Q00JCPU does not have the standard RAM.

*6: Set the area used by the system.

*7: The drive numbers are used for specifying the target memory which an external device reads from/writes to using sequence programs or MC protocol. Note that it is not necessary to consider the drive numbers if using GX Developer, which specifies the target memory with its name.

● Memory capacity and necessity of formatting

The following table indicates the memory capacity and formatting necessity of each memory.

	Q00JCPU	Q00CPU	Q01CPU	Formatting
Program memory	58k byte	94k byte	94k byte	Necessary*1
Standard ROM	58k byte	94k byte	94k byte	Unnecessary
Standard RAM	None	128k byte		*2

*1: Before use, be sure to format the memory using GX Developer.

*2: Make sure to format the standard RAM by GX Developer before using Q00CPU or Q01CPU of thefunction version A Q00CPU and Q01CPU of the function version B don't need to be formatted. (Formatting the standard RAM using GX Developer to Q00CPU or Q01CPU of the function B, an error code "4150H" will be displayed on the GX Developer

POINT

When data are written to each memory, the unit of storage capacity changes depending on the target CPU module and the memory area.

■ Program memory

● Definition of program memory

The program memory stores the program used by the Basic model QCPU to perform operation.
The program stored in the standard ROM is booted (read) to the program memory to perform operation.

● Storable data

The program memory can store parameters, intelligent function module parameters, programs, device comments, device initial values and user setting system area data.

POINT

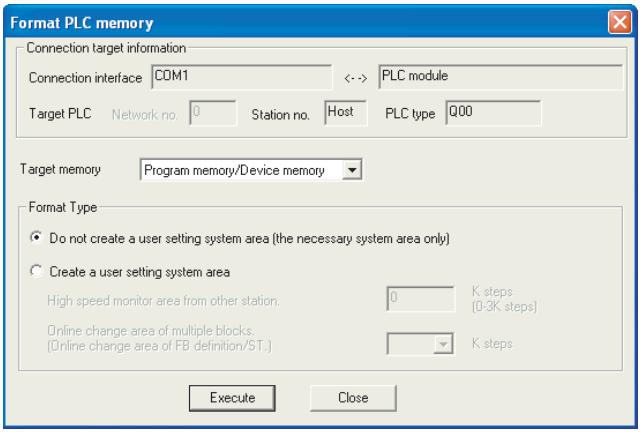
If the total volume of the data to be stored into the program memory exceeds its capacity, examine reducing the user setting system area data.

● Before using the program memory

Before using the program memory, be sure to format it by GX Developer.

(1) Formatting

To format the program memory, choose [Online] → [Format PLC memory] on GX Developer, and select "Program memory/Device memory" as the target memory.



(2) Create a user setting system area

When formatting the program memory, set the user setting system area capacity.

(a) Do not create a user setting system area
The program memory is formatted without the user setting system area being created.

(b) Create a user setting system area
The user setting system area is created during formatting.
There are two user setting system areas (the following table).

System area type	Description
High speed monitor area from other station	Setting this area speeds up monitoring from GX Developer connected to a module such as a serial communication module. When monitor is to be executed simultaneously from multiple locations, this area is used to register the monitor data from GX Developers connected to modules such as serial communication modules.
Online change area of multiple blocks (Online change area of FB definition/ST)	Setting this area enables multiple blocks of data to be changed online.

POINT

When the user setting system area is created, the available area decreases by the number of created area steps.
The memory capacity can be checked from the Read from PLC screen of GX Developer.

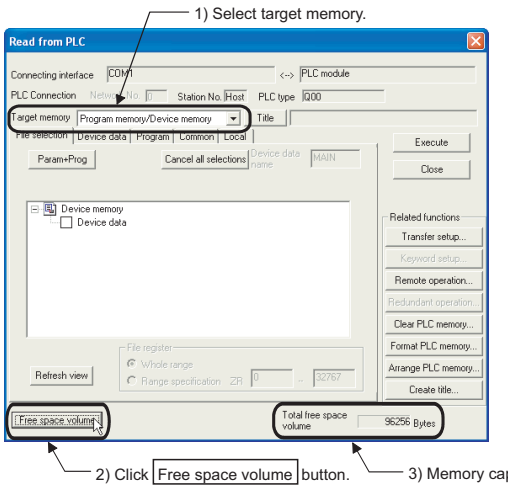
(3) Checking the memory capacity after formatting

To check the memory capacity, choose [Online] → [Read from PLC] on GX Developer.

(a) Select "Program memory/Device memory" as the target memory on the Read from PLC screen.

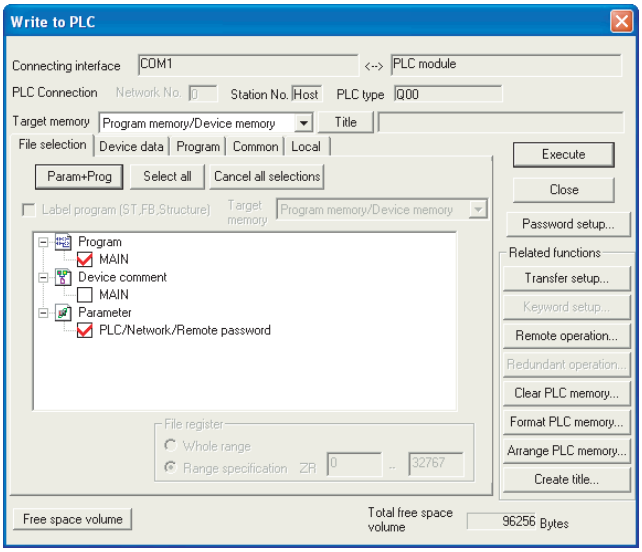
(b) Click the Free space volume button.

(c) The memory capacity appears in the Total free space volume field



● Write to program memory

To write data to the program memory, choose [Online] → [Write to PLC] on GX Developer.
Select "Program memory/Device memory" as the target memory on the Write to PLC screen and write data to the PLC.



POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.

■ Standard ROM

● Definition of standard ROM

The standard ROM is used to execute boot run by the Basic model QCPU.
The standard ROM is used to save programs and parameters without battery backup.
The program stored in the standard ROM is booted (read) to the program memory to perform operation.

● Storable data

The standard ROM can store parameters, intelligent function module parameters, programs, device comments and device initial value data.

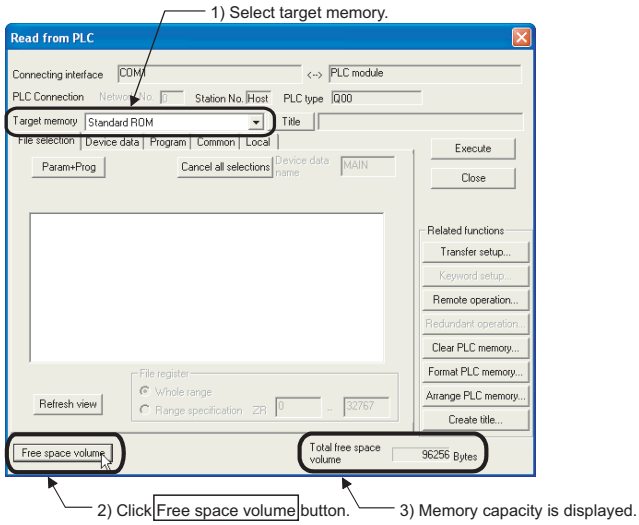
● Checking the memory capacity

To check the memory capacity, choose [Online] [Read from PLC] on GX Developer.

(1) Select "Standard ROM" as the target memory on the Read from PLC screen.

(2) Click the Free space volume button.

(3) The memory capacity appears in the Total free space volume field.



● Write to standard ROM

To write data to the standard ROM, choose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...] on GX Developer.

POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.

● How to use the program stored in the standard ROM

Since operation cannot be executed by the program stored in the standard ROM, use that program by booting (reading) it to the program memory.

■ Standard RAM

● Definition of standard RAM

The standard RAM is provided to use file registers. (Q00CPU and Q01CPU only)
The file registers of the standard RAM allow fast access like the data registers.

● Storable data

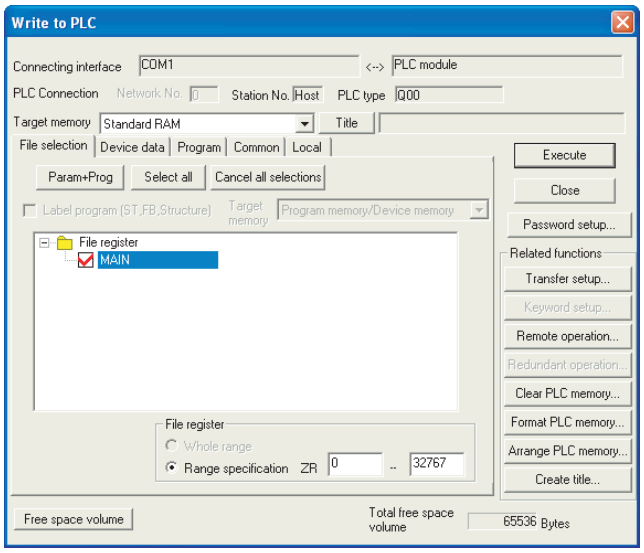
The standard RAM can store one file of file register.

● Before using the standard RAM

- Make sure to format the standard RAM by GX Developer before using Q00CPU or Q01CPU of the function version A
- Q00CPU and Q01CPU of the function version B don't need to be formatted.
  (Formatting the standard RAM using GX Developer to Q00CPU or Q01CPU of the function B, an error code "4150H" will be displayed on the GX Developer.)

● Write to standard RAM

To write data to the standard RAM, choose [Online] → [Write to PLC] on GX Developer.
Select "Standard RAM" as the target memory on the Write to PLC screen and write data to the PLC.



POINT

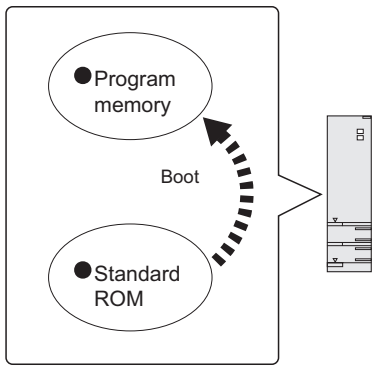
The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.

■ Standard ROM program execution (boot run) and writing

● Standard ROM program execution (boot run)

(1) Standard ROM program execution

The Basic model QCPU performs operation of the program stored in the program memory.
It does not operate the program stored in the standard ROM.
The program stored in the standard ROM is booted (read) to the program memory to perform operation.

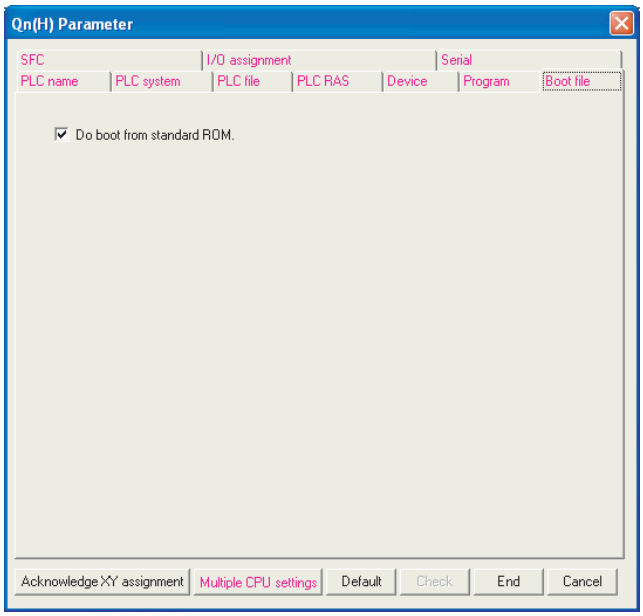


(2) Procedure for boot run

The following provides the procedure for boot run.

(a) Program creation by GX Developer
Create a program for executing boot run.

(b) Boot setting by GX Developer
Set "Do boot from Standard ROM" in the Boot file of the PLC parameter dialog box.



(c) Write to standard ROM by GX Developer
1) Choose [Online] → [Write to PLC] on GX Developer and write the files to the program memory.
2) Choose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...] on GX Developer, and write to the standard ROM the files written to the program memory.

(d) Program execution
Resetting with the RUN/STOP/RESET switch of the Basic model QCPU boots the program from the standard ROM.

(e) Check for normal boot completion
Whether the boot is normally completed or not can be checked by the special relay (SM660) status.

(3) Operation to stop boot run

Perform the following operation using GX Developer to stop boot run and execute operation by the parameter program written to the program memory.

(a) Format the program memory.

(b) Choose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...].
(Parameters and sequence program data in the standard ROM are cleared.)

(c) Write parameters and sequence program data to the program memory.

(4) Precautions for standard ROM program execution

(a) Files stored into standard ROM
Before executing boot run, store the following files into the standard ROM.

1) Parameter*1
2) Intelligent function module parameter
3) Program*2
4) Device comment
5) Device initial value

*1: Must be stored into the standard ROM.
*2: Any of the sequence program, ST program and SFC program is necessary.

(b) Online program change during boot run
If online program change is made to a program in the program memory during boot run from the standard ROM, the change is not updated on the program in the boot source standard ROM.
Hence, write the program to the standard ROM when the CPU module is put in a STOP status.

(c) When program memory contents change at power OFF → ON or reset
If the sequence program written to the program memory changes when the PLC is powered ON or reset, boot run may be in execution.
Refer to "(this section)(c)Operation to stop boot run" in this section, and stop the boot run.

● Write to standard ROM

The program memory files are written to the standard ROM by batch-copying them to the standard ROM.

(1) Before write

Check the following points before writing the files to the standard ROM.

(a) Saving the standard ROM files
When files are written to the standard ROM, all files previously stored in the standard ROM are automatically deleted.
Before writing files to the standard ROM, choose [Online] → [Read from PLC] on GX Developer and save the stored files using GX Developer in advance.

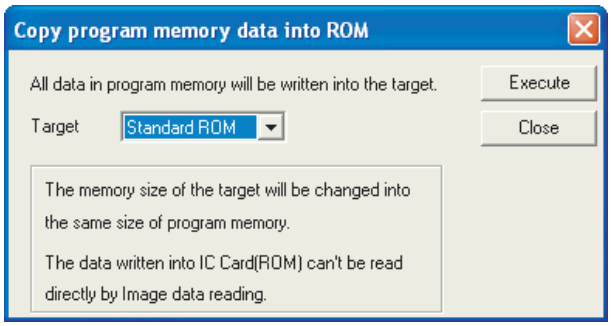
(b) Preparation of files to be written
Since all files stored in the standard ROM are automatically deleted when files are to be written to the standard ROM, prepare all files to be stored in advance.Before writing to the standard ROM, choose [Online] → [Write to PLC] and write all files, which are to be written to the ROM, in the program memory.

(2) Write procedure

The procedure to write files to the standard ROM will be explained.

(a) Choose [Online] → [Write to PLC (Flash ROM)] → [Copy program memory data into ROM] on GX Developer.

(b) The Write the program memory to ROM screen appears.



(c) Select the write destination and copy the program memory files to the standard ROM.

● Additions/changes to standard ROM files

Since all files stored in the standard ROM are automatically deleted when files are to be written to the standard ROM, additions/changes to the stored files cannot be made directly. Observe the following steps.

(1) Choose [Online] → [Read from PLC] on GX Developer and read all files from the standard ROM.
(2) Make necessary additions/changes to the read files.
(3) Write the modified files to the program memory.
(4) hoose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...], and copy these files to the standard ROM.

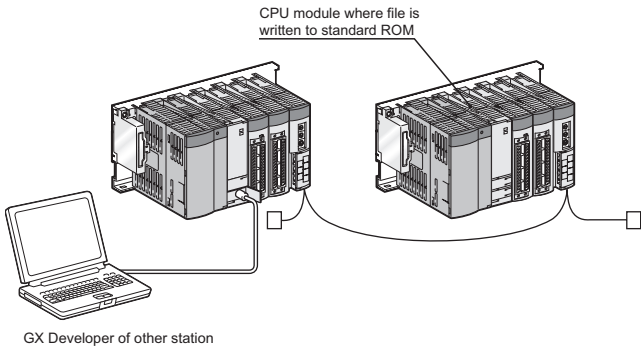
● Precautions

(1) Setting of communication time check of GX Developer

When files are written to the standard ROM with the communication time check time set to 180 seconds or less on GX Developer, they are checked 180 seconds.

(2) When writing files from GX Developer of other station via CC-Link

Since long processing time is required for writing files to the standard ROM, set the CPU monitoring time setting (SW0A) of CC-Link to 180 seconds or more.

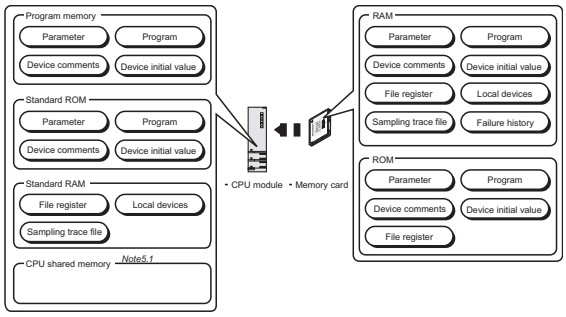


High Performance Model QCPU, Process CPU and Redundant CPU

■ Memory configuration and storable data

This section explains the memories handled by the High Performance model QCPU, Process CPU and Redundant CPU and the data that can be stored into the memories.

● Memory configuration



(1) Program memory

The program memory stores the program used by the High Performance model QCPU, Process CPU or Redundant CPU to perform operation.
The program stored in the standard ROM or memory card is booted (read) to the program memory to perform operation.

(2) Standard ROM

The standard ROM stores parameters, programs and other data used to execute boot run by the High Performance model QCPU, Process CPU or Redundant CPU.

(3) Standard RAM

The standard RAM is provided to use the file registers, local devices and sampling trace file without installation of a memory card.

(4) Memory card

The memory card is used to increase memory in addition to the built-in memory of the High Performance model QCPU, Process CPU or Redundant CPU.
An SRAM card, Flash card and ATA card are available as memory cards.

(5) CPU shared memory

The CPU shared memory is used to write/read data between CPU modules of a multiple CPU system.

● Data that can be stored into memories

The following table indicates the data that can be stored into the program memory, standard RAM, standard ROM and memory cards and the corresponding drive Nos.

	CPU module built-in memories			Memory card (RAM)	Memory cards (ROM)		File name and extension	Remarks
	Program memory	Standard RAM	Standard ROM	SRAM card	Flash card	ATA card		
Drive No.*8	0	3	4	1	2			
Parameter	○	×	○	○	○	○	PARAM.QPA	1 data/drive
Intelligent function module parameter	○	×	○	○	○	○	IPARAM.QPA	1 data/drive
Program	◎	×	○*1	○*1	○*1	○*1	***.QPG	--
Device comment	○*2	×	○	○	○	○*3	***.QCD	--
Device initial value	○	×	○	○	○	○	***.QDI	--
File register	×	○*5	×	○	○*4	×	***.QDR	--
Local device	×	○	×	○	×	×	***.QDL	1 data/CPU module
Sampling trace file	×	○*5, *9	×	○	×	×	***.QTD	--
Failure history data	×	×	×	○	×	×	***.QFD	--
PLC user data	×	×	×	×	×	○*6	***.***	--
User setting system area*7	○	×	×	×	×	×	--	--

◎: Necessary data, ○: Storable data, ×: Unstorable data

*1: To execute the program stored in the standard ROM or memory card, boot setting to the program memory is required in the PLC parameter dialog box.
*2: Data can be written by operating from the GX Developer.
Device comments cannot be used in an instruction of a sequence program.
*3: The read from a sequence program requires several scans.
*4: A sequence program allows the read only.
No data can be written through access from a sequence program.
*5: One file register file, one local device file and sampling trace file can be stored into the standard RAM.
*6: Data can be written or read with the following instructions:
• S.FREAD (allows the batch read from a specified file on a memory card)
• S.FWRITE (allows the batch write to a specified file on a memory card)
*7: Set the area used by the system.
*8: The drive No. is used to specify the target memory of read/write from the external device, etc. using a sequence program or MC protocol.
Since the target memory name is specified on GX Developer, it is not necessary to take into account the drive No.
*9: When the sampling trace file is stored in the standard RAM, check the version of the CPU module and GX Developer.

High Performance
Note 1.4

● Memory capacities and formatting necessities

The following table indicates the memory capacity and formatting necessity of each memory.

		Q02CPU	Q02HCPU	Q06HCPU	Q12HCPU	Q25HCPU	Q12PH CPU	Q25PH CPU	Q12RPH CPU	Q25RPH CPU	Formatting
Program memory		112k bytes (28k steps)	112k bytes (28k steps)	240k bytes (60k steps)	496k bytes (124k steps)	1008k bytes (252k steps)	496k bytes (124k steps)	1008k bytes (252k steps)	496k bytes (124k steps)	1008k bytes (252k steps)	*1
Standard ROM		112k bytes	112k bytes	240k bytes	496k bytes	1008k bytes	496k bytes	1008k bytes	496k bytes	1008k bytes	Unnecessary
Standard RAM *Note1.4*		64k bytes	128k bytes		256k bytes						*1
Memory card	SRAM card	Q2MEM-1MBS : 1M bytes Q2MEM-2MBS : 2M bytes									Necessary (Executed by GX Developer)
	Flash card	Q2MEM-2MBF : 2M bytes Q2MEM-4MBF : 4M bytes									Unnecessary
	ATA card	Q2MEM-8MBA : 8M bytes Q2MEM-16MBA : 16M bytes Q2MEM-32MBA : 32M bytes									Necessary (Executed by GX Developer)

*1: When the memory contents become indefinite in an initial status or due to a dead battery, the memory is automatically formatted when the PLC is powered off and on, or reset. Before use, however, be sure to format the memory using GX Developer.

POINT

1. When data are written to each memory, the unit of storage capacity changes depending on the target CPU module and memory area.
2. For memory capacity calculation, 1 step is equal to 4 bytes.

High Performance Note 1.4

On the High Performance model QCPU, the standard RAM capacity varies depending on the function improvement.

■ Program memory

● Definition of program memory

The program memory stores the program used by the High Performance model QCPU, Process CPU or Redundant CPU to perform operation.
The program stored in the standard ROM or memory card is booted (read) to the program memory to perform operation.

● Storable data

The program memory can store parameters, intelligent function module parameters, programs, device comments, device initial values and user setting system area data.

POINT

The capacity of the program memory is the same as the program capacity of each module.
If the total volume of the data to be stored into the program memory exceeds its capacity, examine the following.

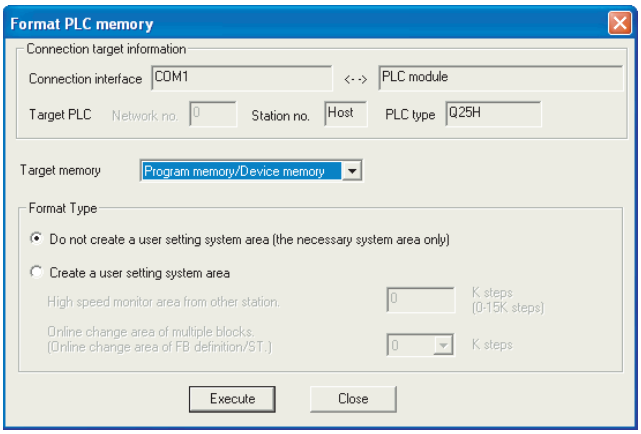
1. Reduce the user setting system area.
2. Transfer the data other than the programs to the standard ROM or a memory card.

● Before using the program memory

Before using the program memory, be sure to format it by GX Developer.

(1) Formatting

To format the program memory, choose [Online] → [Format PLC memory] on GX Developer, and select "Program memory/Device memory" as the target memory.



(2) Create a user setting system area

When formatting the program memory, set the user setting system area capacity.

(a) Do not create a user setting system area
The program memory is formatted without the user setting system area being created.

(b) Create a user setting system area
The user setting system area is created during formatting.
There are the following user setting system areas (the following table).

System area type	Description
High speed monitor area from other station	Setting this area speeds up monitoring from GX Developer connected to a module such as a serial communication module. When using RS-232 and USB concurrently on GX Developer, this area is used to register the monitor data from GX Developer connected to a module such as a serial communication module.
Online change area of multiple blocks (Online change area of FB definition/ST)	Setting this area enables multiple blocks of data to be changed online.

POINT

When the user setting system area is created, the available area decreases by the number of created area steps.
The memory capacity can be checked from the Read from PLC screen of GX Developer.

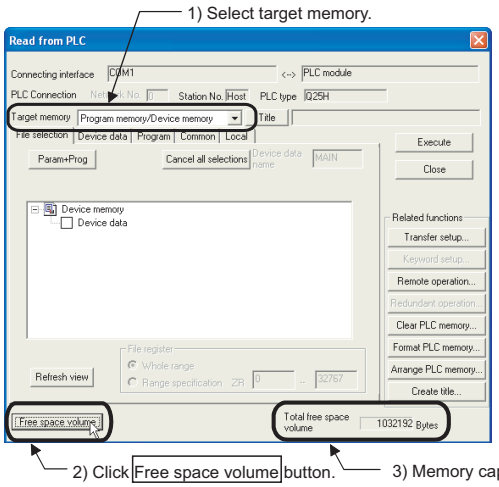
(3) Checking the memory capacity after formatting

To check the memory capacity, choose [Online] → [Read from PLC] on GX Developer.

(a) Select "Program memory/Device memory" as the target memory on the Read from PLC screen.

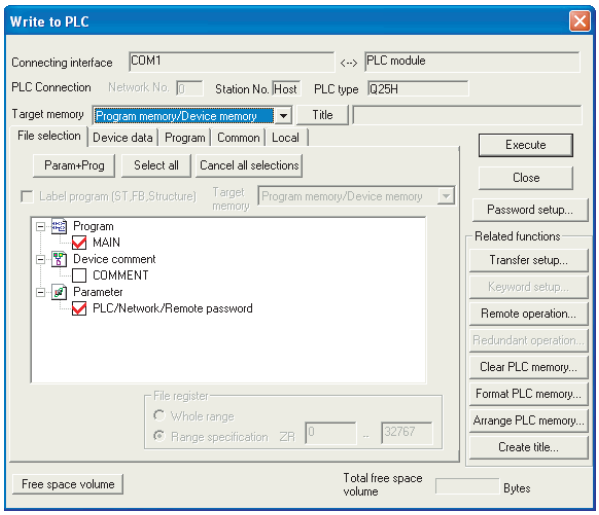
(b) Click the Free space volume button.

(c) The memory capacity appears in the Total free space volume field.



● Write to program memory

To write data to the program memory, choose [Online] → [Write to PLC] on GX Developer.
Select "Program memory/Device memory" as the target memory on the Write to PLC screen and write data to the PLC



POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.
Note that as the number of files rises, the difference between the occupied memory capacity and actual file size increases.

■ Standard ROM

● Definition of standard ROM

The standard ROM stores parameters, programs and other data for running boot on the High Performance model QCPU, Process CPU or Redundant CPU.
The standard ROM is used to save programs and parameters without battery backup.

● Storable data

The standard ROM can store parameters, intelligent function module parameters, programs, device comments and device initial value data.

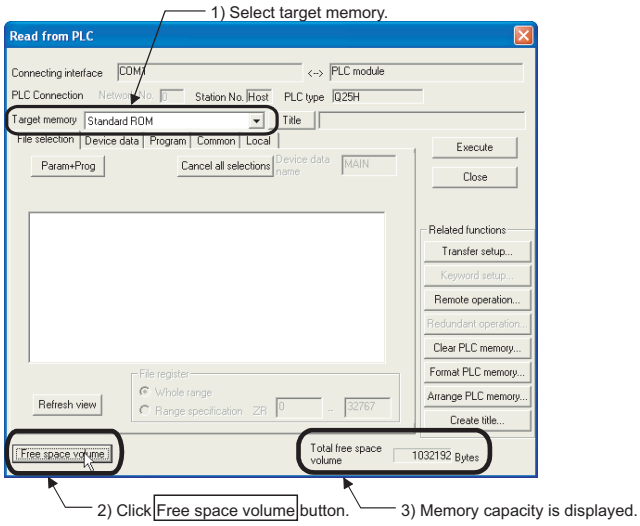
● Checking the memory capacity

To check the memory capacity, choose [Online] → [Read from PLC] on GX Developer.

(1) Select "Standard ROM" as the target memory on the Read from PLC screen.

(2) Click the Free space volume button.

(3) The memory capacity appears in the Total free space volume field.



● Write to standard ROM

There are the following 3 methods for writing data to the standard ROM.

(1) Choose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...] on GX Developer to batch-copy the program memory data to the standard ROM.

(2) Choose [Online] → [Write to PLC (Flash ROM)] → [Write to PLC (Flash ROM)] on GX Developer to write data to the standard ROM.

(3) Use the automatic write of all data from memory card to standard ROM.

POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.
Note that as the number of files rises, the difference between the occupied memory capacity and actual file size increases.

● How to use the program stored in the standard ROM

Since operation cannot be executed by the program stored in the standard ROM, use that program by booting (reading) it to the program memory.

■ Standard RAM

● Definition of standard RAM

The standard RAM is provided to use file registers, local devices and sampling trace file without installation of a memory card.
The standard RAM used as file registers allows fast access like the data registers.

● Storable data

The standard RAM can store one file register file, one local device file and sampling trace file (a total of three files).

POINT

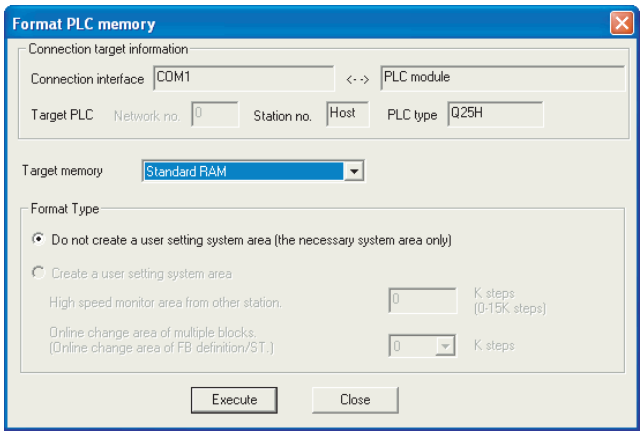
1. If the volume of the files to be stored into the standard RAM exceeds the standard RAM capacity, examine the following.
   • Store the file into a memory card.
   • Examine to reduce points of the file register, local device and sampling trace.
   However, note that in the case of 1. above, access speed will be lower than that of the standard RAM.
2. If the sampling trace file is stored into the standard RAM, check the version of the CPU module and GX Developer.

● Before using the standard RAM

Before using the standard RAM, be sure to format it by GX Developer.

(1) Formatting

To format the standard RAM, choose [Online] → [Format PLC memory] on GX Developer, and select "Standard RAM" as the target memory



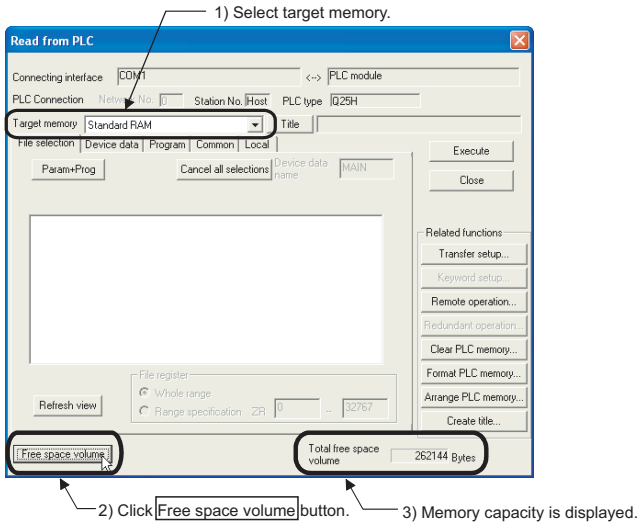
(2) Checking the memory capacity after formatting

To check the memory capacity, choose [Online] → [Read from PLC] on GX Developer.

(a) Select "Standard RAM" as the target memory on the Read from PLC screen.

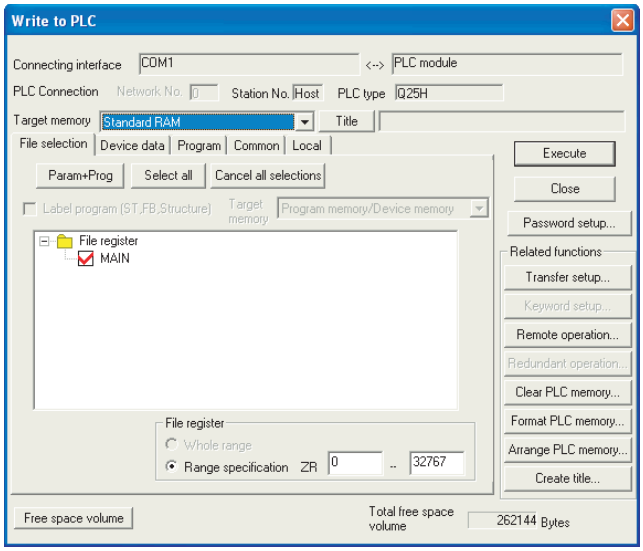
(b) Click the Free space volume button.

(c) The memory capacity appears in the Total free space volume field.



● Write to standard RAM

To write data to the standard RAM, choose [Online] → [Write to PLC] on GX Developer.
Select "Standard RAM" as the target memory on the Write to PLC screen and write data to the PLC.



POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.
Note that as the number of files rises, the difference between the occupied memory capacity and actual file size increases.

■ Memory card

● Memory card

A memory card is used to increase memories in addition to the built-in memory of the High Performance model QCPU, Process CPU or Redundant CPU.
Available memory cards are the SRAM card, Flash card and ATA card.

(1) SRAM card

Data can be written/read by a sequence program.
The SRAM card is used in the following cases.

(a) When the number of file register points is greater than the standard RAM capacity

(b) When using the sampling trace function

(c) When using the sampling trace function

When the SRAM card is used as file registers, a maximum of 1017k points can be written/read by a sequence program.

(2) Flash card

Data can be read by a sequence program only.
Write data by GX Developer and read it by a sequence program.
Use the Flash card when data change will not be made.
It can store a maximum of 1018k points of file registers.

(3) ATA card

This is used for PLC user data (general-purpose data).
Using a file access instruction (such as the FWRITE instruction) in a sequence program, access the PLC user data on the ATA card in CSV format/binary format.

● Storable data

The following data indicated in the following table can be stored into the memory cards.

Data name	Memory card (RAM)	Memory cards (ROM)	
	SRAM card	Flash card	ATA card
Parameter	○	○	○
Intelligent function module parameter	○	○	○
Program	○	○	○
Device comment	○	○	○
Device initial value	○	○	○
File register	○	○	×
Local device	○	×	×
Sampling trace file	○	×	×
Failure history data	○	×	×
PLC user data	×	×	○
User setting system area	×	×	×

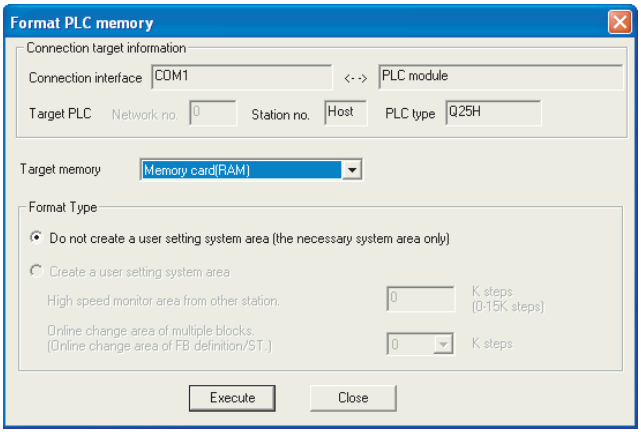
○: Storable data, ×: Unstorable data

● Before using the SRAM or ATA card

Before using the SRAM or ATA card, be sure to format it by GX Developer.

(1) Formatting

To format the program memory, choose [Online] → [Format PLC memory] on GX Developer.
When formatting the SRAM card, select "Memory card (RAM)" as the target memory.
When formatting the ATA card, select "Memory card (ROM)" as the target memory.



POINT

1. Use only GX Developer to format the ATA card.
   If formatted by the formatting function of Microsoft® Windows® , the card may not be used with the CPU module.
2. When the SRAM or ATA card is formatted, the memory card information area is automatically secured. Therefore, the memory capacity is reduced by that amount.
   The memory capacity can be checked from the Read from PLC screen of GX Developer.

Remark

The Flash card need not be formatted.

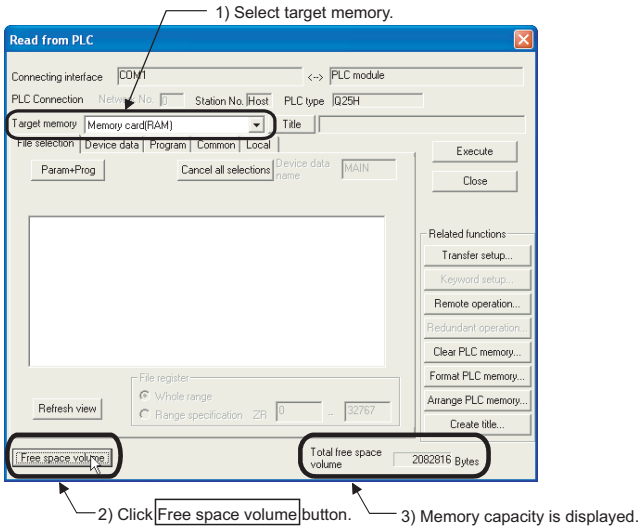
(2) Checking the memory capacity after formatting

To check the memory capacity, choose [Online] → [Read from PLC] on GX Developer.

(a) Select "Memory card (RAM)" or "Memory card (ROM)" as the target memory on the Read from PLC screen.

(b) Click the Free space volume button.

(c) The memory capacity appears in the Total free space volume field.

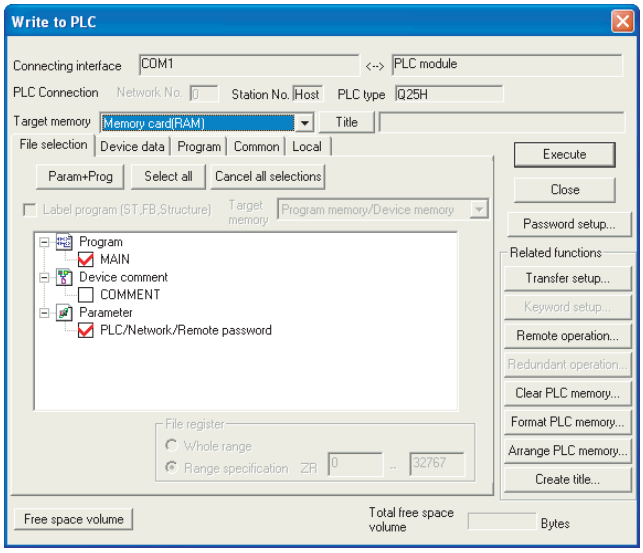


●Write to memory card

The following explains the pre-write operation and the types of wriring methods.

(1) Write to SRAM or ATA card

To write data to the SRAM or ATA card, choose [Online] → [Write to PLC] on GX Developer.
When writing data to the SRAM card, select "Memory card (RAM)" as the target memory on the Write to PLC screen.
When writing data to the ATA card, select "Memory card (ROM)" as the target memory on the Write to PLC screen.



(2) Write to Flash card

To write data to the Flash card, there are the following two methods.

(a) Choose [Online] → [Write to PLC (Flash ROM)] → [Write the program memory to ROM...] on GX Developer to batch-write the program memory data to the Flash card.

(b) Choose [Online] → [Write to PLC (Flash ROM)] → [Write to PLC (Flash ROM)] on GX Developer to write data to the Flash card.

POINT

The file size has the minimum unit.
The occupied memory capacity may be greater than the actual file size.
Note that as the number of files rises, the difference between the occupied memory capacity and actual file size increases.

●How to use the program stored in the memory card

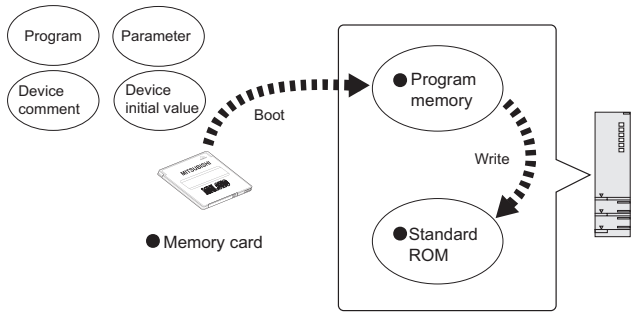
Since operation cannot be executed by the program stored in the memory card, use that program by booting (reading) it to the program memory.

High Performance Note 1.5

■ Automatic all data write from memory card to standard ROM

●Definition of automatic all data write from memory card to standard ROM

The automatic all data write from memory card to standard ROM (hereafter abbreviated to the automatic write to standard ROM) is the function that automatically writes the parameters and programs previously written to a memory card to the standard ROM.
As shown in the following diagram, the automatic write to standard ROM function boots the parameters, sequence programs, etc. from the memory card to the program memory and writes the booted ones from the program memory to the standard ROM.



● Applications of automatic write to standard ROM

Using the automatic write to standard ROM, the parameters and programs written to the memory card in advance can be written to the standard ROM without use of GX Developer (personal computer).
Therefore, it is connvenient to use the standard ROM in the following cases.

(a) When writing the same parameters and programs to multiple CPU modules.
(b) When creating the same environment at a remote site.

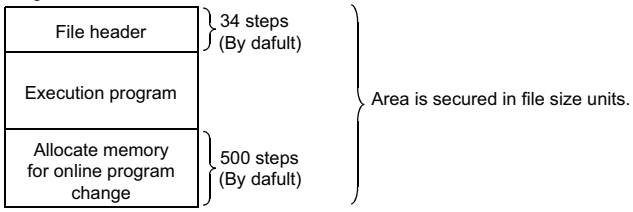
High Performance Note 1.5

When using the automatic write to standard ROM on the High Performance model QCPU, check the versions of the CPU module and GX Developer.
When the memory card set for the automatic write to standard ROM is installed in the High Performance model QCPU incompatible with the function, it performs boot run from the standard ROM.

Program File Structure

A program file consists of a file header, execution program and allocate memory for online program change.

Program file structure



● Structure details

The capacity of the program stored in the program memory of the CPU module is the total of the above three areas.

(1) File header

This area stores the file name, size, creation date, etc.
The file header size ranges from 25 to 35 steps (100 to 140 bytes) depending on the device setting of the PLC parameter dialog box.
(Default: 34 steps)

(2) Execution program

This area stores the created program.

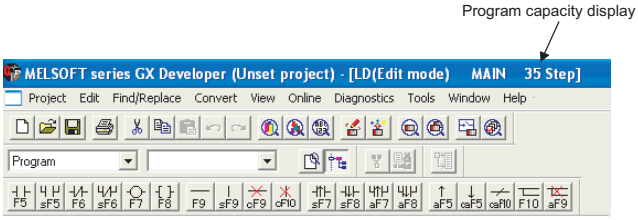
(3) Allocate memory for online program change

This area is used when online program change that increases the number of steps is performed by GX Developer.
When such an online program change is performed by GX Developer, the number of remaining allocate memory for online program change is displayed.

(a) Default number of allocate memory for online program change
The default setting is 500 steps (2000 bytes).
(b) Changing the number of allocate memory for online program change
The number of allocate memory for online program change can be changed by GX Developer (by choosing [Online] → [Write to PLC] → "Program", tab).
When the number of steps is insufficient for online program change, it can be set again.

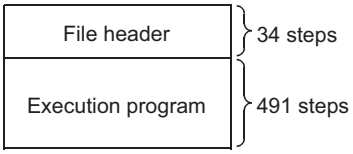
● Display of program capacity by GX Developer

During programming by GX Developer, the program capacity (sum of the file header capacity and the numbers of steps in the created program) is displayed in terms of the number of steps as shown in the following diagram.
When a program is created, the capacity of the crea.ted program can be confirmed.



POINT

1. The program capacity displayed during programming by GX Developer is the capacity of the file header and execution program and does not include the capacity of the allocate memory for online program change (500 steps).
(Example) The capacity of the program having the execution program area of 491 steps is displayed on GX Developer as shown below. (The file header is fixed to 34 steps.)



Display on GX Developer:
34 steps + 491 steps = 525 steps.

2. Since a file is stored in file size units on the program memory, the program capacity displayed during programming by GX Developer may differ from the capacity of the program file on the CPU module.

■ Memory capacities of files

The sizes of the files used by the CPU module change depending on their types.
This section indicates the memory capacities of the files for each CPU module.
When files are written to the memory area, the units of the storage capacities change depending on the target CPU module and memory area.

●When Basic model QCPU is used

When using the program memory, standard RAM or standard ROM, calculate the rough size of each file according to the following table.

Function	Rough file capacity (unit: byte)
Drive heading	64
Parameter	Default: 522 (increases depending on the parameter setting) Reference Boot setting → 96 MELSECNET/H setting made → Max. 4096 increased Ethernet setting made → Max. 922 increased CC-Link setting made → Max. 251/module increased Remote password setting made → 64 + 20 + (number of target modules × 10), max. 164 increased
Sequence program	136*+ (4 × ((number of steps) + (number of allocate memory for online program change)))
Device comment	74 + (sum of comment data sizes of devices) • Comment data size of one device = 10 + 10250 × a + 40 × b • a : Quotient of ((device points)/256) • b : Remainder of ((device points)/256)
File register	2 × (number of file register points)
Device initial value	66 + 44 × n + 2 × (total number of device points set for the device initial value) • n : Number of set device initial values
Intelligent parameter	68 + (24 × number of set modules) + parameter sizes of utilities
User setting area	Value set at formatting (0 to 3k)
Multi-block online program change	Value set at formatting (0/1.25k/2.5k)

*: 136 is the default value (increases depending on the parameter setting)

●When High Performance model QCPU, Process CPU or Redundant CPU is used

When using the program memory, standard RAM, standard ROM or memory card, calculate the rough size of each file according to the following table.

Function	Rough file capacity (unit: byte)
Drive heading	64
Parameter	Default: 564 (increases depending on the parameter setting) Reference Boot setting → 70 + (18 × (number of files)) MELSECNET/H setting made → Max. 4096/module increased Ethernet setting made → Max. 922/module increased CC-Link setting made → Max. 251/module increased Remote password setting made → 64 + 20 + (number of target modules × 10), max. 164 increased
Sequence program	136*1+ (4 × (number of steps) + (number of allocate memory for online program change)))
Device comment	74 + (sum of comment data sizes of devices) • Comment data size of one device = 10 + 10250 × a + 40 × b • a : Quotient of ((device points)/256) • b : Remainder of ((device points)/256)
Device initial value	66 + 44 × n + 2 × (total number of device points set for the device initial value) • n : Number of set device initial values
User setting area	Value set at formatting (0 to 15k)
Multi-block online program change	Value set at formatting (0/2k/4k)
File register	2 × (number of file register points)
Sampling trace data	362 + (number of word device points + number of bit device points) × 12 + (N1 +N2 + N3 + number of word device points × 2 + (number of bit device points/16) × 2) × number of traces (total number of traces) *2 • The following values are added to the N1 to N3 corresponding to the items set in trace Additional information of trace condition settings screen. N1 : Add "4" at setting time N2 : Add "10" at setting step No. N3 : Add "8" at setting program name
Failure history data	72 + 54 × (number of failures stored)
Local device	72 + 6 × (set device type) + (2 × ((total number of M and V points)/16 + (number of D points) +18 × (total number of T, ST and C points)/16)) × (number of programs) M, V, D, T, ST and C indicate the following set devices. M : Internal relay V : Edge relay D : Data register T : Timer ST : Retentive timer C : Counter

*1: 136 is the default value (increases depending on the parameter setting)
*2: The fractional portions of the (number of bit device points)16 are rounded up.

■ File size units

● What is file size unit?

When files are written to the memory area, the unit of storage capacity changes depending on the target CPU module and memory area.
This unit is called a file size unit.

(1) File size units classified by memory areas

The following table indicates the file size units classified by the target CPU modules and memory areas.

Module name	Memory area
	File size unit of program memory/standard ROM/Flash card*1
Q00JCPU	1 step/4 bytes
Q00CPU	
Q01CPU	
Q02CPU	128 steps/512 bytes*2
Q02HCPU	
Q06HCPU	
Q12HCPU	256 steps/1024 bytes*2
Q25HCPU	512 steps/2048 bytes*2
Q12PHCPU	256 steps/1024 bytes*3
Q25PHCPU	512 steps/2048 bytes*3
Q12PRHCPU	256 steps/1024 bytes
Q25PRHCPU	512 steps/2048 bytes

*1: The file size unit of the Flash card applies to the case where files are written to the Flash card using [Write the program memory to ROM...]on GX Developer. Note1.6

*2: 1024 steps/4096 bytes for the High Performance model QCPU whose first 5 digits of serial No. are "04121" or earlier.

*3: 1024 steps/4096 bytes for the Process CPU whose first 5 digits of serial No. are "07031" or earlier.

Basic Note 1.6 The Basic model QCPU cannot use the Flash card.

(2) File size units classified by memory cards Note1.7

Type	Memory card model name	File size unit (cluster size)
SRAM card	Q2MEM-1MBS	512 bytes
	Q2MEM-2MBS	1024 bytes
Flash card*1	Q2MEM-2MBF	1024 bytes
	Q2MEM-4MBF	1024 bytes
ATA card	Q2MEM-8MBA	4096 bytes
	Q2MEM-16MBA	4096 bytes
	Q2MEM-32MBA	2048 bytes

*1: The file size unit of the Flash card applies to the following cases.
- When files are written to the Flash card using [Write the program memory to ROM...]on GX Developer.
- When files are written to the Flash card using GX Developer without the CPU module being relayed.

● Memory capacity calculation example

The following indicates an example of calculating the memory capacity when the parameter and sequence program files are written to the program memory.

(1) Conditions

(a) Write target CPU module: Q25HCPU

(b) Written files

File name	File capacity*1
PARAM.QPA (Parameter file)	564 bytes
MAIN.QPG (Sequence program)	525 steps/2100 bytes*2

*1: Refer to the former page for the file capacity.

*2: Indicates the program capacity (file header + execution program) displayed by GX Developer.

(c) Allocate memory for online program change: 500 steps/2000 byets

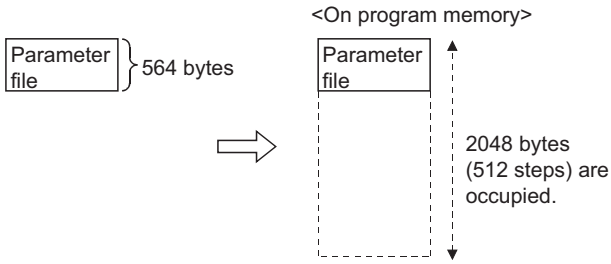
Basic Note 1.7 The Basic model QCPU cannot use the memory card.

(2) Memory capacity calculation

The memory capacity is calculated on the basis of the file size unit of the write target CPU module.
The file size unit of the Q25HCPU in this example is 512 steps/2048 bytes according to (1) in this section.

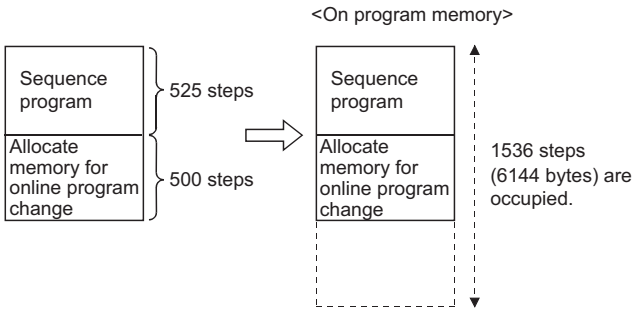
(a) Calculation of parameter file capacity

Although the parameter file capacity is 564bytes, the file occupies a capacity of 512 steps/2048 bytes since it is stored on the program memory in file size unit.



(b) Calculation of program capacity

The program capacity is the sequence program capacity + allocate memory for online program change. In this example, it is 525 steps + 500 steps = 1025 steps. However, the file occupies a capacity of 1536 steps/6144 bytes since it is stored on the program memory in file size unit (512-step unit for the Q25HCPU in this example).



(c) Calculation result

File name	File capacity		Memory capacity
PARAM.QPA	564 bytes		512 steps (2048 bytes)
MAIN.QPG	Sequence program capacity	525 steps	1536 steps (6144 bytes)
	Allocate memory for online program change	500 steps	
	Total	1025 steps	
Total memory capacity			2048 steps (8192 bytes)

POINT

The file size unit of the following CPU modules has beenchanged.

- High Performance model QCPU whose first 5 digits of serial No. is "04122" or later.
- Process CPU whose first 5 digits of serial No. is "07032" or later.

Hence, note the following points.

1. Depending on the file capacity, the file executed by the CPU module of above serial No. or later may not be stored into the CPU module of above serial No. or before.
2. Combination of PLC write and GX Developer
   The following table indicates the combination of High Performance model QCPU/Process CPU and GX Developer versions when a file is read from the High Performance model QCPU/Process CPU to GX Developer and then written to another High Performance model QCPU/Process CPU. (High Performance model QCPU)

(High Performance model QCPU)

Legends ◎: Write to PLC enabled ○: Restriction on write to PLC

Write destination	Write source: GX Developer Version8		GX Developer Version7	
	File executed by CPU of serial No. "04122" or later	File executed by CPU of serial No. "04121" or earlier	File executed by CPU of serial No. "04122" or later	File executed by CPU of serial No. "04121" or earlier
Serial No. "04122" or later	◎	◎	◎*2	○*2
Serial No. "04121" or earlier	○*1	◎	○*1 *2	○*2

*1: Because of different file size units, the file may not be stored into the High Performance model QCPU depending on the file capacity.

*2: Unless the number of allocate memory for online program change is decreased, the file may not be stored into the High Performance model QCPU depending on the file capacity.

(Process CPU)

Legends ◎: Write to PLC enabled ○: Restriction on write to PLC

Write destination	Write source: GX Developer Version8		GX Developer Version7	
	File executed by CPU of serial No. "04122" or later	File executed by CPU of serial No. "04121" or earlier	File executed by CPU of serial No. "04122" or later	File executed by CPU of serial No. "04121" or earlier
Serial No. "07032" or later	◎	◎	◎*2	○*2
Serial No. "07031" or earlier	○*1	◎	○*1 *2	○*2

*1: Because of different file size units, the file may not be stored into the High Performance model QCPU depending on the file capacity.

*2: Unless the number of allocate memory for online program change is decreased, the file may not be stored into the High Performance model QCPU depending on the file capacity.

1.1.6 Function

Function of CPU module is as follows:

Function List

Functions of CPU module are listed in the following table.
The Nos. in the "CPU module" field correspond to the CPU modules as indicated below.

Nos. in "CPU module" field and the corresponding CPU modules

No.	CPU module
1)	Basic model QCPU
2)	High Performance model QCPU
3)	Process CPU
4)	Redundant CPU

CCPU module function list

Item	Description	CPU module			
		1)	2)	3)	4)
Constant scan	This function executes the program in a set time interval regardless of the program scan time.	○	○	○	○
Latch function	This function maintains the device data when performing the reset operation during power off.	○	○	○	○
Output status selection function for transition from STOP status to RUN status	This function selects the output Y status (output before STOP/output after the calculation execution) when the CPU module is set from STOP status to RUN status.	○	○	○	○
Clock function	This function executes the CPU module internal clock.	○	○	○	○
Remote RUN/ STOP	This function stops and starts operating the CPU module.	○	○	○	○
Remote PAUSE	This function stops the CPU module operation while retaining the output (Y) of the CPU module.	○	○	○	○
Remote RESET	This function resets the CPU module when the CPU module is in a STOP status.	○	○	○	○
Remote latch clear	This function clears the latch data of the CPU module when the CPU module is in a STOP status.	○	○	○	○
Input response time selection	This function selects the response time of the Q series input module, I/O combined module, high speed input module or interrupt module.	○	○	○	○
Error time output mode setting	This function sets whether the output to the Q series compatible output module, hybrid I/O module or intelligent function module will be cleared or held when the CPU module results in a stop error.	○	○	○	○
Hardware error time CPU operation mode setting	This function sets whether the operation of the CPU module will be stopped or continued when the hardware error of the intelligent function module occurs.	○	○	○	○
Switch setting of intelligent function module	Use this function for various settings of the intelligent function module. (Refer to the manual of the corresponding intelligent function module for settings.)	○	○	○	○
Monitoring function	This function monitors the status of programs and devices on the CPU module by operating from the GX Developer.	○	○	○	○
Set monitor conditions	This function monitors using a fine timing of the CPU module.	×	○	○	○
Monitor/test local Devices	This function monitors and/or tests the local devices of the designated program using the GX Developer.	×	○	○	○
Turn ON/OFF external I/O	This function forcibly turns the external I/O of the CPU module on or off from the GX Developer.	×	○	○	○
Write during RUN	This function writes programs when the CPU module is in the RUN status.	○	○	○	○
Program list monitor	This function displays the processing time of a program being executed.	○	○	○	○
Interrupt program monitor	This function displays the number of times to execute an interrupt program.	○	○	○	○
Scan time measurement	This function measures the execution time of a program between selected steps.	×	○	○	○
Sampling trace function	This function samples specified device data from the CPU module at a specified timing.	×	○	○	○
Multiple-user debugging function	This function enables multiple users to debug programs by using several GX Developers.	○	○	○	○
Watchdog timer	This function monitors operational delays caused by CPU module's hardware and program errors.	○	○	○	○
Self-Diagnosis function	This function enables the CPU module to check for failures.	○	○	○	○
Failure history	This function stores a failure history of diagnosis results in the memory.	○	○	○	○
System protect	This function prevents the programs from being modified from GX Developer, serial communication module Ethernet module or like.	○	○	○	○
Password registration	This function provides read/write protection for files stored in the CPU module against access from the GX Developer.	○	○	○	○
Remote password	A function to prevent illegal access from external sources with serial communication modules and Ethernet modules.	○	○	○	○
System display	This function connects to the GX Developer and monitors system configuration.	○	○	○	○
LED display	This function enables the front-mounted LEDs to indicate the operating conditions of the CPU module.	○	○	○	○
Preference setting	This function sets failure preferences to turn off LED displays.	○	○	○	○

Item	Description	CPU module			
		1)	2)	3)	4)
High speed interrupt function	This function executes an interrupt program by fixed scan interrupt at 0.2ms to 1.0ms intervals using the interrupt pointer I49.	×	○	×	×
Interrupt from intelligent function module	This function executes an interrupt program at the time of interrupt request from the intelligent function module.	○	○	○	○
Serial communication function	This function connects the RS-232 interface of the Q00CPU or Q01CPU and the personal computer/display device or like with the RS-232 cable and makes the communication by MC protocol.	○	×	×	×
Module service interval time read	This function monitors the access interval time (time between the access acceptance of the CPU module and the next access acceptance) of the intelligent function module, network module or peripheral device.	×	○	○	○
Device initial value	This function registers the data used by a program to devices or intelligent function module buffer memory without use of any program.	○	○	○	○
Online module change	This function replaces the Q series I/O module, the intelligent function module of function version C, or the I/O module or intelligent function module mounted on a MELSECNET/H remote I/O station online. In a redundant power supply system, the power supply module can also be changed online.	×	×	○	○
Auto tuning function	This function is used to initialize the PID constants. Auto tuning can be used in a relatively slow response system that performs the temperature adjustment by S.PID or S.2PID instruction or similar operation.	×	×	○	○
Redundant function	This function configures a redundant system including two sets of CPU modules, power supply modules, network modules or main base units.	×	×	×	○
System switching (between control system and standby system) function	This function switches between the control system and standby system (switches the control system to the standby system or the standby system to the control system). There are two different methods: system switching and user switching.	×	×	×	○
Operation mode change	This function changes between the separate mode and backup mode.	×	×	×	○
Tracking function	This function is used to share data between the control system and standby system. (Transfers the control system data to the standby system.) If system switching occurs at the time of a control system failure or error, control can be continued with the same data.	×	×	×	○
Redundant online program change function	This function transfers the data, which was written to the control system by write to PLC or online program change, to the standby system.	×	×	×	○
Memory copy from control system to standby system	This function copies the program memory contents of the control system to the standby system. (When the standby system CPU module is replaced, the program memory contents of the control system and standby system can be matched.) There are two different methods: by GX Developer and by special relay and special register.	×	×	×	○

○: Available ×: N/A

Constant scan

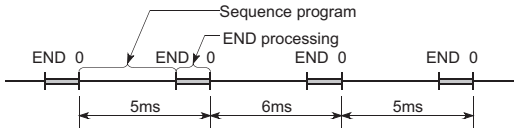
● Definition of Constant Scan

The scan time differs because the processing time differs depending on whether the instruction, which is used in the sequence program, is executed or not.
Constant scan is a function to execute the sequence program repeatedly while maintaining the scan time at a constant time.

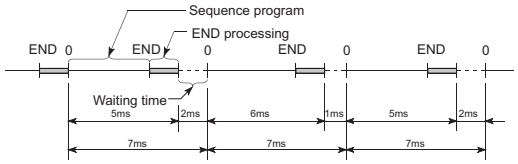
● Applications of constant scan

I/O refresh is performed before sequence program execution. Using the constant scan function, the I/O refresh intervals can be made constant if the sequence program execution time varies.[1]

Scan time when constant scan is not used

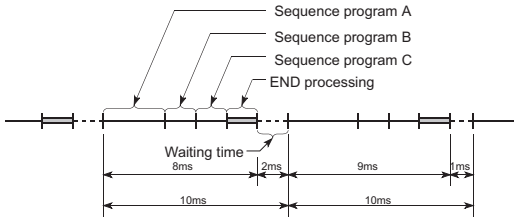


Scan time when constant scan setting is set to 7 ms



Basic Note 1.8

Scan time when constant scan is set to 10 ms during multiple program execution*Note1.8*



Basic Note 1.8

Since the Basic model QCPU cannot execute multiple programs, it is not necessary to be consider of the scan time taken for execution of multiple programs.

Latch Function

● Definition of Latch Functions

The values of each High Performance model QCPU device are set back to the default (bit device: OFF and word device: 0) when;

- The PLC is powered OFF and then ON.
- The reset operation is performed.
- Power failure longer than the permissible momentary power failure time occurs

Latch function maintains the device information when the above conditions occur.

● Program operation when latch is used

Program operation is the same, independently of whether latch is used or not.

● Applications of latch function

Latch can be used to hold the data, which is being managed by continuous control, to continue control if the PLC is powered OFF, reset operation is performed, or a power failure longer than the permissible momentary power failure time occurs.

● Devices that can be latched

The following devices can be latched.
(By default, only the latch relay is enabled for latch.)

- Latch relay(L)
- Link relay(B)
- Annunciator(F)
- Edge relay(V)
- Timer(T)
- Retentive timer(ST)
- Counter(C)
- Data register(D)
- Link register(W)

Setting of Output (Y) Status when Changing between STOP and RUN

● Definition

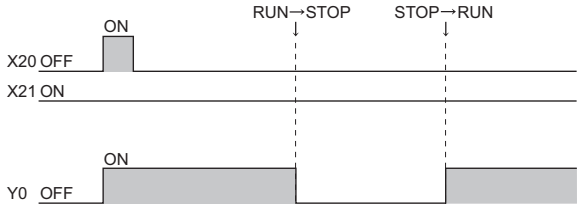
When changed from the RUN or other status to the STOP status, the CPU module stores the output (Y) in the RUN status into the PLC and turns all outputs (Y) OFF.
The status after transition from STOP to RUN can be selected from the following two options with the CPU module.

(1) The output (Y) status prior to STOP is output.
(2) The output is cleared.

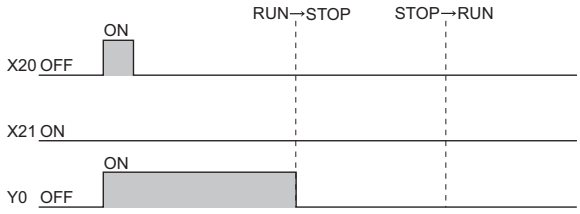
● Setting applications

Using a holding circuit or similar, it is possible to select whether the output is resumed from the previous status or not when the STOP status is changed to the RUN status.

(1) When the output (Y) status prior to STOP is set to output



(2) When output (Y) is set to clear



Clock Function

● Definition of Clock Function

The clock function reads the internal clock data of the CPU module to use it for time management.
The clock data is used by the CPU module system to perform time management, e.g. storage of date into the error history.

● Clock operation at power OFF and momentary power failure

Clock operation is continued by the internal battery of the CPU module during power OFF of the PLC or when a power failure longer than the permissible momentary power failure time occurs.

● Clock Data

Clock data is used in the CPU module and includes the data indicated in the following table.

Data Name	Contents	
Year	Four digits in AD (Countable from 1980 to 2079)	
Month	1 to 12	
Day	1 to 31(Automatic leap year calculation)	
Hour	0 to 23 (24 hours)	
Minute	0 to 59	
Second	0 to 59	
Day of the week	0	Sunday
	1	Monday
	2	Tuesday
	3	Wednesday
	4	Thursday
	5	Friday
	6	Saturday

● Accuracy of Clock Data

The accuracy of the clock function differs with the ambient temperature, as shown below:

(1) Accuracy of Basic model QCPU

Ambient Temperature (°C)	Accuracy (Day difference, S)
0	- 3.2 to + 5.27(TYP.+ 1.98)
+ 25	- 2.57 to + 5.27(TYP.+ 2.22)
+ 55	- 11.68 to + 3.65(TYP.- 2.64)

(2) Accuracy of High Performance model QCPU and Process CPU

Ambient Temperature (°C)	Accuracy (Day difference, S)
0	- 3.18 to + 5.25(TYP.+ 2.12)
+ 25	- 3.93 to + 5.25(TYP.+ 1.9)
+ 55	- 14.69 to + 3.53(TYP.- 3.67)

(3) Accuracy of Redundant CPU

Ambient Temperature (°C)	Accuracy (Day difference, S)
0	- 3.2 to + 5.27(TYP.+ 2.07)
+ 25	2.77 to + 5.27(TYP.+ 2.22)
+ 55	- 12.14 to + 3.65(TYP.- 2.89)

Remote Operation

Remote operation changes the operating status of the CPU module by the operation performed from outside (e.g. GX Developer, external device using MC protocol, link dedicated instruction of MELSECNET/H network module, remote contact).

The following four options are available for remote operations.

- Remote RUN/STOP
- Remote PAUSE
- Remote RESET
- Remote LATCH CLEAR

■ Remote RUN/STOP

● Definition of Remote RUN/STOP

The remote RUN/STOP performs RUN/STOP of the CPU module externally with the CPU module RUN/STOP switch (RUN/STOP/RESET switch for the Basic model QCPU) at RUN.

● Applications of remote RUN/STOP

Using remote RUN/STOP for the following remote operations are useful.

- When the CPU module is at a position out of reach
- When performing RUN/STOP of the control board CPU module externally

● Calculations during Remote RUN/STOP

The program calculation that performs remote RUN/STOP is as follows:

(1) Remote STOP

Executes the program to the END instruction and enters the STOP status.

(2) Remote RUN

When remote RUN is performed while in the STOP status using remote STOP, the status changes to RUN and executes the program from step 0.

■ Remote PAUSE

(1) Definition of Remote PAUSE

The remote PAUSE performs PAUSE of the CPU module externally with the CPU module RUN/STOP switch (RUN/STOP/RESET switch for the Basic model QCPU) at RUN position.
In the PAUSE status, the CPU module operation is stopped with the ON/OFF states of all outputs (Y) held.

(2) Applications of remote PAUSE

This can be used to maintain the output (Y) on even if the CPU module is changed to STOP status, in such areas as process control.

■ Remote RESET

● Definition of Remote RESET

The remote RESET resets the CPU module externally when the CPU module is in STOP status.
Even if RUN/STOP switch (RUN/STOP/RESET switch for the Basic model QCPU) is in RUN, the reset can be performed when the CPU module is stopped and an error that can be detected by the self-diagnosis function occurs.

● Applications of remote RESET

Remote RESET allows the faulty CPU module in a remote location to be reset by remote operation.

■ Remote latch clear

● Definition of Remote Latch Clear

Remote latch clear resets the latched device data from GX Developer or similar device when the CPU module is in the STOP status.

● Applications of remote latch clear

Remote latch clear is useful when the CPU module is in the following areas. In these cases, the operations are performed in combination with the remote RUN/STOP.

- When the CPU module is at a position out of reach
- When externally performing latch clear of the CPU module inside a control panel.

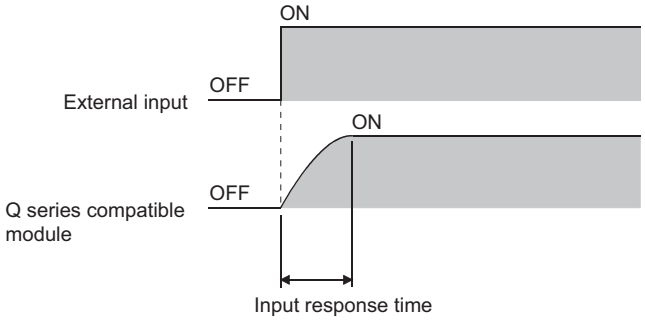
Input Response Time Selection of Q Series Modules (I/O response time)

● Input response time selection

This function changes the input response times of each Q series corresponding module.
The following table indicates the modules of which input response time can be changed and the applicable setting times.

Module of which input response time can be changed	Type	Applicable setting times
Input module	Input	1ms,5ms,10ms,20ms,70ms (Default: 10ms)
I/O combined module	I/O Mix	
High-speed input module	Hi Input	0.1ms,0.2ms,0.4ms,0.6ms,1ms (Default: 0.2ms)
Interrupt module	Interrupt	

The above Q series corresponding modules import external input in the set input response time.



● **Reactions**

(1) Restrictions on GX Developer version and the relevant modules

When changing the input response time of the high-speed input module or interrupt module, use GX Developer version indicated in the following table.
If GX Developer version earlier than the version indicated in the following is used, the module will operate with the default value of the input response time.

Module	Applicable GX Developer version
High-speed input module	GX Developer Version 5 (SW5D5C-GPPW-E) or later
Interrupt module	GX Developer Version 6 (SW6D5C-GPPW-E) or later

(2) When input response time is shortened

Higher input response time may result in response to inputs being influenced by noise. Set the desired input response time by taking into consideration the operating environment of an input module in use.

(3) When A series corresponding input module is used Note1.9

Basic Note 1.9
Process Note 1.9
Redundant Note 1.9

No change can be made to the input response time of an A Series corresponding input module. When the input response speed is set to the slot of the A series compatible input module or interrupt module, the settings will be ignored.

(4) Timing when settings are ensured

The input response speed setting is valid in the following cases.

- When the PLC is powered OFF and then ON
- When the CPU module's RESET switch is set to neutral position

Basic Note 1.9 Process Note 1.9 Redundant Note 1.9

The Basic model QCPU, Process CPU and Redundant CPU do not support the A series corresponding modules.

Error Time Output Mode Setting

Error time Output Mode Setting

The error time output mode setting is to set whether the output to the Q series corresponding output module, I/O combined module, intelligent function module or interrupt module will be cleared or held when the CPU module results in a stop error.

Hardware Error Time PLC Operation Settings

Hardware Error time PLC Operation Mode Setting

The hardware error time PLC operation mode setting is to set whether the operation of the CPU module will be stopped or continued when a hardware error occurs in the intelligent function module or interrupt module.

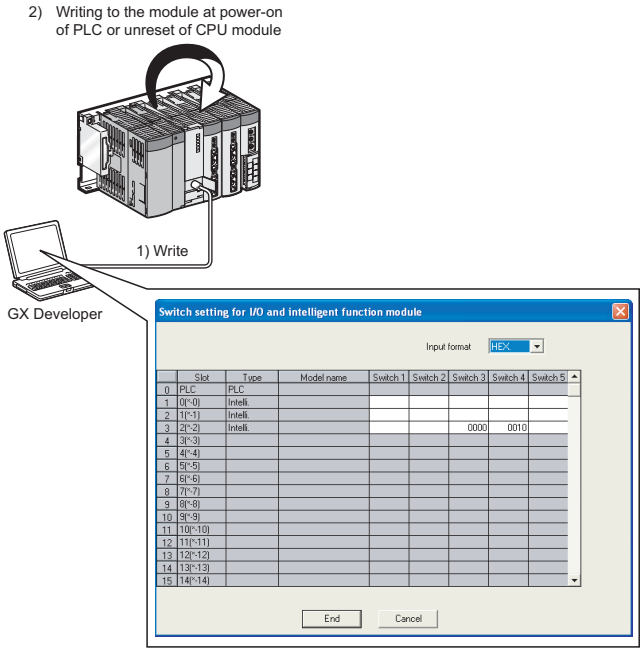
Intelligent Function Module Switch Setting

● **Definition**

The intelligent function module/interrupt module switch setting is to set the switches of the Q series compatible intelligent function modules using GX Developer.

● **Timing when switch setting is written**

The specified switch setting is written from the CPU module to the corresponding intelligent function modules and interrupt modules when the PLC is powered on or the CPU module is unreset, i.e., CPU module's RESET switch is set to the neutral position.



Intelligent function module switch settings

Monitor Function

● **Definition of Monitoring Function**

This is a function to read the program, device and intellignet function module status of the CPU module by using GX Developer.

Monitor function	Applicability for CPU modules			
	Basic model QCPU	High Performance model QCPU	Process CPU	Redundant CPU
Ladder monitor	○	○	○	○
Device/buffer memory batch monitor	○	○	○	○
Device registration monitor	○	○	○	○
Device test	○	○	○	○
Ladder registration monitor	○	○	○	○
Monitor condition setting	×	○	○	○
Local device monitor/test	×*1	○	○	○
Enforced ON/OFF of external I/O	△*2	○	○	○

○: Available △: Partly applicable ×: N/A

*1: The Basic model QCPU is irrelevant to the difference between global devices and local devices.
Therefore, it is not necessary to make the monitor setting of the local devices on GX Developer.

*2: The Basic model QCPU can only execute enforced ON/OFF by device test.

● Monitor request processing timing and displayed data

The CPU module performs the END processing to handle monitor requests from GX Developer.
The results of CPU module END processing are displayed on the GX Developer side.

● Monitor with monitor condition setting Note1.10

Basic Note 1.10

By setting the monitor condition on GX Developer for debugging, the CPU module operation status can be monitored under the specified condition.
It is also possible to maintain the monitoring status under the specified conditions by setting the monitoring stop conditions.

● Local device monitor Note1.11

Basic Note 1.11

The use of local devices for execution of multiple programs makes it possible to monitor local device data.

Basic Note 1.10

The Basic model QCPU cannot execute monitor with monitor conditions set.

Basic Note 1.11

The Basic model QCPU is irrelevant to the difference between global devices and local devices.Therefore, it is not necessary to make the monitor setting of the local devices on GX Developer.

■ Local device monitor/test

Basic Note 1.12

Local devices specified at the Device tab screen in the (PLC) Parameter dialog box can be monitored or tested by operating from GX Developer. This function is useful when debugging a program and monitoring local devices in a program monitored by GX Developer.Note 1.12

● Monitoring the Local Devices

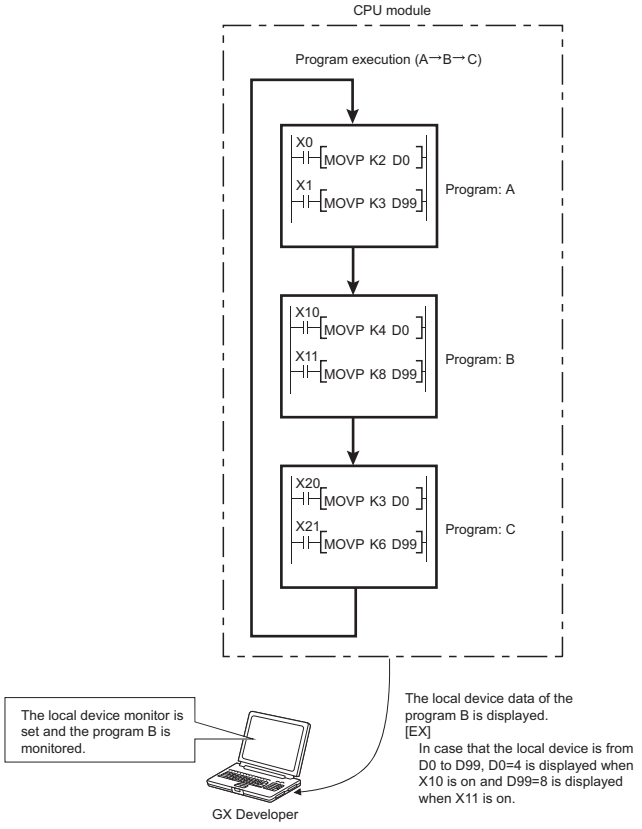
Table6.16 shows the status of three programs "A", "B", and "C" being executed on the CPU module, with local devices D0 to 99 specified. It assumes that these three programs are executed in the order of A → B → C → (END processing) → A → B ....

Setting	Monitor Device	
	D0 (Local device)	D100 (Global device)
When local devices are not specified	D0 in Program "C" is monitored.	D100 is monitored after Program "C" is executed.
When local devices are specified	D0 in the displayed program is monitored.	D100 is monitored after the displayed program is executed.

Basic Note 1.12

The Basic model QCPU is irrelevant to the difference between global devices and local devices. Therefore, it is not necessary to make the monitor setting of the local devices on GX Developer.

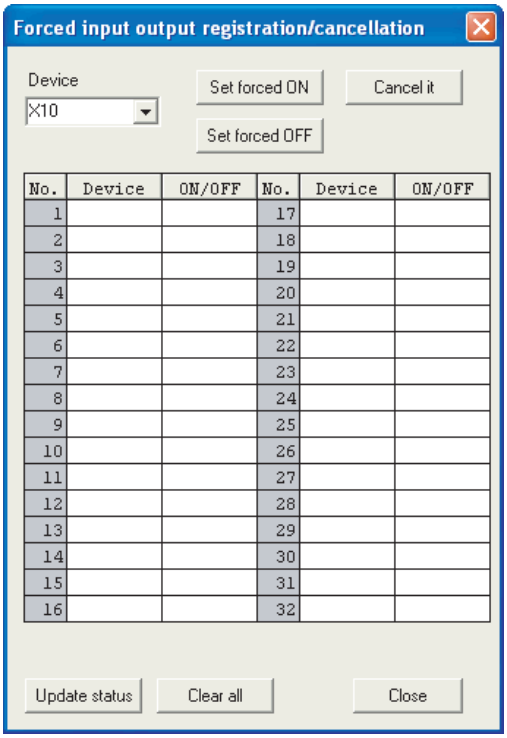
If the local device monitor setting is made and Program "B" is displayed, for example, this makes it possible to monitor the local devices in Program "B".



■ Enforced ON/OFF of external I/O

High Performance Note 1.13

Enforced ON/OFF operations from GX Developer will forcibly switch the external I/O on and off.
The information registered for ON/OFF will be cancelled with GX Developer operations.



● Operation performed at enforced ON/OFF

Basic Note 1.14

It is possible to perform enforced ON (Set forced ON) enforced OFF (Set forced OFF) and cancel enforced ON/OFF (Cancel it) with the enforced ON/OFF function.Note1.14
The operations for performing enforced ON, enforced OFF and canceling enforced ON/OFF are shown in the following table.

Operation	Input (X) operation	Output (Y) operation
During canceling (no operations)	Performs sequence program operations with external input.	Outputs the results of sequence program operations externally.Note1.15
During enforced ON	Performs sequence program operations in the enforced ON status.	Outputs "ON" externally regardless of the results of sequence program operations.Note1.15
During enforced OFF	Performs sequence program operations in the enforced OFF status.	Outputs "OFF" externally regardless of the results of sequence program operations.Note1.15

Redundant Note 1.15

POINT

1. A GX Developer Version 6 or higher is required to use this function.
2. When system switching occurs in the redundant system, the new control system continues enforced ON/OFF with the ON/OFF data registered to the old control system.

High Performance Note 1.13

When using the enforced ON/OFF of the external I/O on the High Performance model QCPU, check the versions of the CPU module and GX Developer.

Basic Note 1.14

The enforced ON registration and enforced OFF registration cannot be executed for Basic model QCPU by selecting [Online] [Debug] [Forced input output registration/cancellation]. This operation can be executed for Basic model QCPU by conducting device test with GX Developer.

Redundant Note 1.15

In the backup mode, the enforced ON/OFF cannot be executed for the output (Y) of the standby system.

Writing in Program during CPU Module RUN

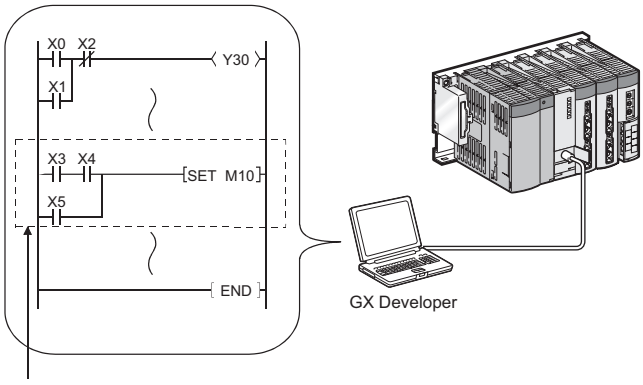
When the High Performance model QCPU is in the RUN status, you can write programs or files in any of the steps shown in the following table.

CPU module	Write during RUN type
Basic model QCPU	• Writing data in the circuit mode during RUN • Writing a batch of files during RUN
High Performance model QCPU Process CPU Redundant CPU	• Writing data in the circuit mode during RUN • File-write during RUN • Writing a batch of files during RUN

■ Write during RUN in ladder mode

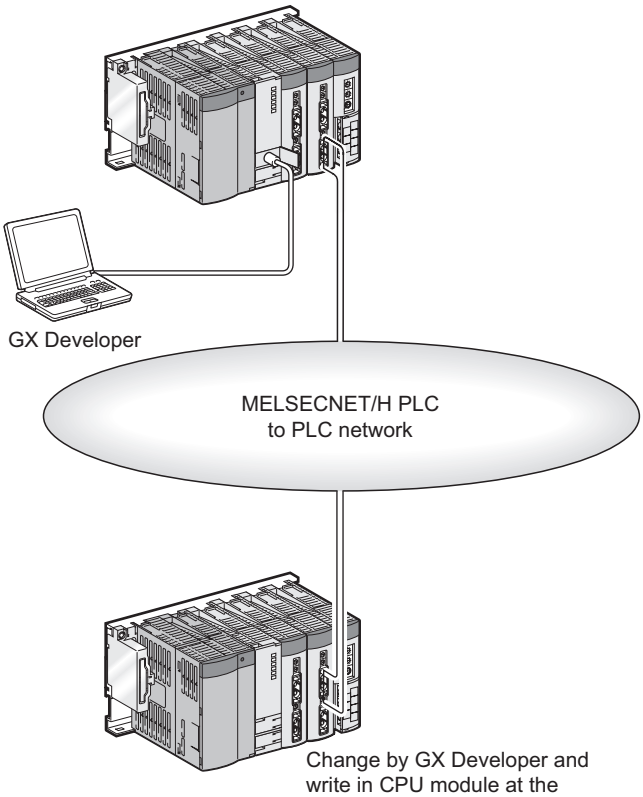
● Writing data in the circuit mode during RUN Status

Writing data in the circuit mode during RUN is a function to write a program during the CPU module RUN status.
The program can be changed without stopping the process in CPU module program by performing writing data in the circuit mode during RUN status.



Change by GX Developer and write in CPU module at the conversion.

Also, write during RUN is enabled from GX Developer connected to another station on the network.



● Precautions

Take a note of the following when writing during RUN:

(1) Memory enabled for write during RUN

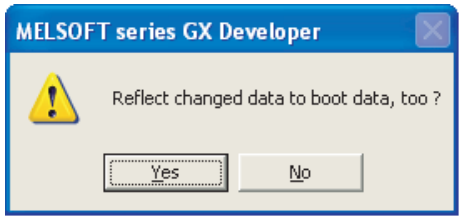
The memory that can be written during RUN is only program memory.

(2) Write during RUN performed during boot run

The operation performed when online change is executed during boot run differs depending on the CPU module and boot source memory to be used.

Boot source		Boot source program status: Basic model QCPU High Performance model QCPU Process CPU	Boot source program status: Redundant CPU
Basic Note 1.16 Memory card *Note1.16*	SRAM card ATA card	When online change is executed, the boot source program is also changed.*1	When online change is executed, the boot source program is also changed.*1
	Flash card	When online change is executed, the boot source program is not changed.*2	When online change is executed, the boot source program is also changed.*1
Standard ROM		When online change is executed, the boot source program is not changed.*2	When online change is executed, the boot source program is also changed.*1

* 1: The boot source program can be changed by clicking "Yes"on the following message box. When this operation is executed simultaneously with online change,the online change completion takes time.



The boot source program does not change when "No" is selected. After online change, write the content of the program memory to a memory card/standard ROM and then turn the PLC OFF or reset the CPU module.

* 2: After online change, write the content of the program memory to a memory card(Flash card)/standard ROM and then turn the PLC OFF or reset the CPU module.

(3) Number of steps enabled for write during RUN at once

A maximum of 512 steps can be written at once during RUN.

Basic Note 1.16 The Basic model QCPU cannot execute boot run from the memory card.

Basic Note 1.17

■ File-write during RUN

● File-Write During RUN function

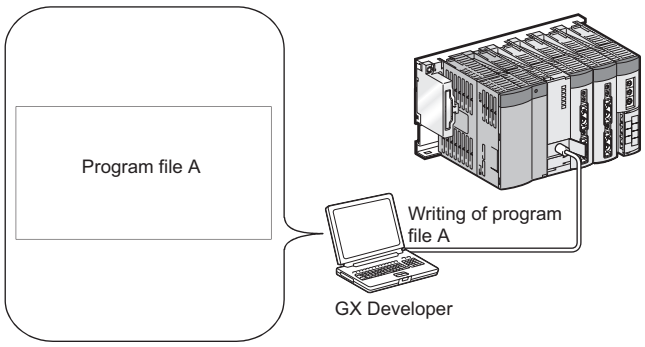
The file-write during RUN function is used to write a batch of files to the CPU module as shown in the following table.

Memory Name	Built in CPU module			Memory Card (RAM)	Memory Card (ROM)	
	Program Memory	Standard RAM	Standard ROM	SRAM Card	Flash Card	ATA Card
Parameter	×	×	×	×	×	×
Intelligent function module parameter	×	×	×	×	×	×
Program	○	×	×	○	×	○
Device comment	○	×	×	△	×	△
Device initial value	×	×	×	×	×	×
File register	×	△	×	△	×	×
Local device	×	×	×	×	×	×
Sampling trace file	×	○	×	○	×	×
Failure history data	×	×	×	×	×	×
PLC user data	×	×	×	×	×	×

○:Writable data

×:Unwritable data

△:Writable data if access is not being made in sequence program



Basic Note 1.17 The Basic model QCPU cannot execute file-write during RUN.

Execution Time Measurement

●Definition

This is a function to display the processing time of the program being executed.

●Applications and types of execution time measurement

This is used to find out the effect of each program's processing time on the total scan time.
There are three functions to the execution time measurement.

- Program list monitor
- Interrupt program list monitor
- Scan time measurement

■ Program list monitor

●Definition of Program List Monitor

This is a function to display the processing time of the program being executed.
The scan time, number of times executed, and processing time by item can be displayed for each program.

■ Interrupt program list monitor

●Definition of Interrupt Program List Monitor

This function displays execution count of the interrupt program. This is used to confirm the execution status of the interrupt program.

Basic Note 1.18

■ Scan time measurement

●Definition of Scan Time Measurement

This function displays the set program interval processing time. The time for the subroutines and interrupt program can be measured as well.

Basic Note 1.18 The Basic model QCPU does not support the scan time measurement.

Basic Note 1.19

Sampling Trace Function

●Definition of Sampling Trace Function?[2]

This function samples the device continuously on the High Performance model QCPU at specified timings.
The sampling trace samples the contents of the specified device at a set interval (sampling cycle), and stores the trace results at the sampling trace file in the memory card.

●Applications of sampling trace

The changed contents of the device that program uses during debugging can be checked at the specified timing.
The sampling trace function reads device contents if trigger conditions are satisfied.

Basic Note 1.19 The Basic model QCPU does not support the sampling trace function.

POINT

1. The sampling trace file can be stored into only the standard RAM or SRAM card.
2. When the sampling trace file is stored into the standard RAM, check the version of CPU module and GX Developer.

Debug Execution by Multiple Users

Basic Note 1.20

●Debug Execution by Multiple Users

This function performs debugging from multiple GX Developer connected to CPU module or Serial communication module at the same time.
When a file has been divided according to the process, function, etc., the divided files can be debugged simultaneously from multiple GX Developer.*Note1.20*

●Function Description

The debug function combination for multiple users are as follows:

Combined use of Debug function and other functions *Note1.21*

Basic Note 1.21

Functions being executed	Functions executed later			
	Monitor	Online change	Execution time measurement	Sampling trace
Monitor	○*1	×*2	○	○
Online change	×*2	×	×	×
Execution time measurement	○	×	×*3	○
Sampling trace	○	×	○	×*3

Basic Note 1.22

○: Can be executed simultaneously.
×: Can only be performed from one GX Developer.
*1: Since monitor condition setting is only available from a single GX Developer, the setting can not be made from other GX Developers.*Note1.22*
*2: Monitoring with monitor conditions can not be executed simultaneously with online change.
*3: The items of × cannot be executed simultaneously by multiple users.
For executing from the other GX Developers, stop or interrupt the execution time measurement and sampling trace being executed.

Basic Note 1.20 The Basic model QCPU can not use the debug of another files, since a file cannot be divided according to the process or function.

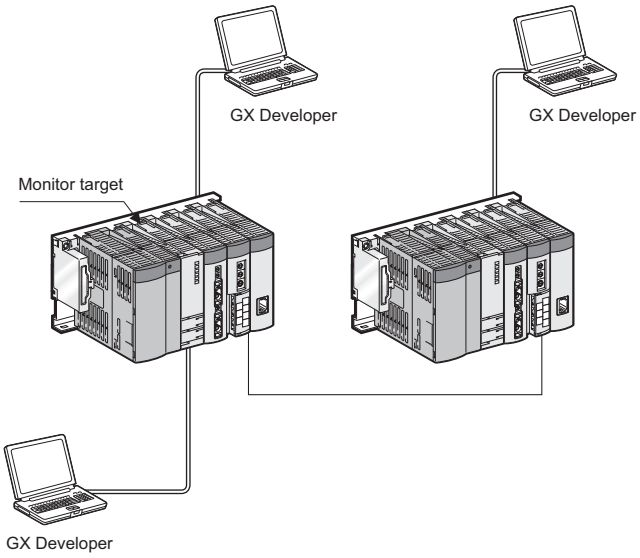
Basic Note 1.21 The Basic model QCPU does not support sampling trace.

Basic Note 1.22 The Basic model QCPU does not support the monitor condition-set monitor.

■ Simultaneous monitoring execution by multiple users

● Simultaneous monitoring execution by multiple users

The CPU module, serial communication module or similar module can be simultaneously monitored by multiple GX Developer, when they are connected.



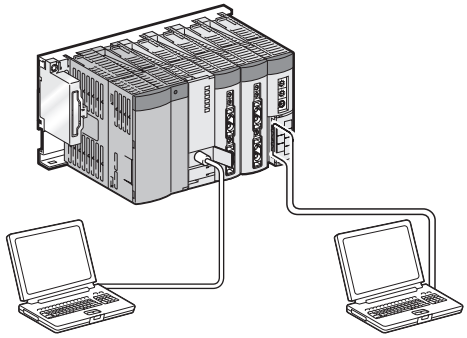
Multiple users can monitor at the same time. By setting a station monitor file, high speed monitoring can be performed. (It is not necessary to set host station monitor file.)

■ Simultaneous write during RUN by multiple users

Basic Note 1.23

● Simultaneous write during RUN by multiple users

Run write can be simultaneously executed to one or more files by multiple users



Basic Note 1.23 When Write during RUN is executed by multiple users simultaneously for the Basic model QCPU, check the versions of the CPU module and GX Developer.

Watchdog Timer (WDT)

● Definition of Watchdog Timer (WDT)

The watchdog timer is an internal sequence timer to detect CPU module hardware and sequence program error.

● When watchdog timer expires

When the watchdog timer expires, a watchdog timer error occurs.
The CPU module responds to the watchdog timer error as follows:

(1) The CPU module turns off all outputs.
(2) The front-mounted RUN LED turned off, and the ERR. LED starts flicking.
(3) SM1 turns ON and the error code 5000, 5001 ("WDT ERROR") is stored into SD0.

Self-diagnostics Function

● Definition of Self-Diagnosis Function

The self-diagnosis is a function performed by the High Performance model CPU itself to diagnose whether there is an error in the CPU module.
The self-diagnosis function is used to prevent the CPU module erroneous operation as well as preventive maintenance.

● Self-diagnostics timing

The self-diagnosis processing detects and displays the error when an error occurs at the CPU module power on or during CPU module RUN mode. It also stops CPU module calculations.

● Error checking

(1) LED ON

When the CPU module detects an error, it turns on ERR. LEDs.

(2) Error information storage destination and checking

When the CPU module detects an error, it turns ON the special relay (SM0, SM1) and stores the information (error code) into the special register (SD0).
When multiple errors are detected, error codes of the latest errors are stored in the special register SD0. For error detection, use special relays and special registers in programs so that these devices can interlock with sequencers and mechanical systems.

● CPU module operation at the time of error detection

(1) Mode at error detection

When an error is detected from the self-diagnosis, there are two types of modes that the CPU module operation can change to.

(a) CPU module calculation stop mode
At detection of an error, the CPU module stops operation and turns OFF all external outputs of the modules set to "Clear" (default) in the "error time output mode" in the I/O assignment setting of the PLC parameter dialog box. (The output (Y) on the device memory is held.)
Note that the external outputs of the modules set to "Hold" in the "error time output mode" are held. (The output (Y) of the device memory is held.)

(b) CPU module calculation continue mode
At detection of an error, the CPU module executes programs other than the one that has developed the error.

(2) Errors that can be set to continue/stop the operation

The following errors can be set to "continue/stop" the operation when they have occurred.

(a) Errors that can be set to continue/stop the operation in PLC RAS setting of PLC parameter dialog box

Basic Note 1.24

- Computation error
- Expanded Command error
- Fuse blown
- I/O module comparison error
- Intelligent module program execution error
- Memory card access error Note1.24
- Memory card operation error Note1.24
- External power supply OFF Note1.24

For example, when the I/O module verification error is set to "continues", the calculations are continued in the I/O address before the error occurred.

(b) Error can be set to continue/stop the operation in detail setting of I/O assignment setting of PLC parameter dialog box
- Intelligent function module error

● Error check selection

The following error checking can be set to "yes/no" at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box.
(All parameter defaults are set at "Yes".)
(1) Battery check
(2) Fuse blown check
(3) I/O module comparison

POINT

1. On a redundant CPU, the alive system stores error description, which occurred on the other system, to the special relays (SM1610 to 1626) and special registers (SD1610 to 1636).
   Note, however, that the above does not apply in the following conditions.
   - The other system's power supply is off or reset, or its hardware has an error.
   - During a watchdog timer error (error code: 5000, 5001)
   - Tracking cable error (unconnected, disconnected, malfunction, etc.)
2. At the occurrence of the following errors, which indicate CPU module status, their descriptions are not stored on the special relays (SM0, SM1) and special registers (SD0 to 26).
   ERR.LED does not turn on.
   The error descriptions are stored in the error history.
   • Standby system → Control system change occurred (Error message: CONTROL EXE. Error code: 6200)
   • Control system → Standby system change occurred (Error message: STANBY. Error code: 6210)

Basic Note 1.24

In the case of the Basic model QCPU, a memory card access error, memory card operation error or external power supply OFF cannot be set.

Basic Note 1.25

■ Interrupt due to error occurrence

The CPU module can execute the interrupt program of the interrupt pointer that is set as the interrupt object when an error occurs.

● Interrupt caused by the error that can be set to continue/stop in PLC RAS setting

Only when the error set to "continue" at the "PLC RAS" tab screen in the "(PLC) Parameter" dialog box occurs, the High Performance model QCPU executes the interrupt program corresponding to the error. When the error set to "stop" there occurs, the interrupt program (I32) for "Stop all errors" is executed.

High Performance Note 1.26 Process Note 1.26

● Interrupt pointers and corresponding errors

Note1.26

Diagram 6.66 indicates the interrupt pointers and corresponding errors.

Interrupt pointer	Corresponding error message
I32	Stop all errors *1
I33	SINGLE PS.DOWN
I34	UNIT VERIFY ERR. FUSE BREAK OFF SP.UNIT ERROR
I35	OPERATION ERROR SFCP OPE.ERROR SFCP EXE.ERROR
I36	ICM.OPE.ERROR FILE OPE.ERROR
I37	EXTEND INS.ERR.
I38	PRG.TIME OVER
I39	CHK instruction Annunciator detect
I40	CAN'T SWITCH
I41	STANDBY
I42 to 48	Empty

Errors that occur when the system can continue the drive mode, where or "continue" is selected from "continues/stops".

*1: The I32 interrupt program is not executed upon the following serious errors.
- MAIN CPU DOWN
- END NOT EXECUTE
- RAM ERROR
- OPE CIRCUIT ERR.

Basic Note 1.25

Since the Basic model QCPU does support interrupt pointers for error occurrence, it cannot perform interrupts caused by the error occurrence of the CPU module itself.

High Performance Note 1.26 Process Note 1.26

The High Performance model QCPU and Process CPU do not support the interrupt pointers, I40 and I41. In addition, I33 applies to the CPU of which the serial No. of first 5 digits is "07032" or later.

Error History

The CPU module can store the error history (results detected from the self-diagnosis function and the time) in the memory. The error history can be checked by choosing [Diagnostics] → [PLC diagnostics] on GX Developer.

■ Basic model QCPU

● Storage area

The 16 latest errors are stored into the latched error history storage memory of the Basic model QCPU.

● Stored data

If the same error occurs two or more times while the PLC power is ON, the data is stored only once into the error history storage memory.

■ High Performance model QCPU, Process CPU, Redundant CPU

● Storage Area

The latest 16 errors are stored in the latched CPU module error history storage memory.
When storing more than 17, the history can be stored in the memory card file using PLC RAS setting in the "(PLC) Parameter" box.

● Stored data

When the history count set in the parameter and that stored in the memory card are different after the following operation is performed, the contents of the memory card history file is cleared, then the 16 error data in the CPU module error history storage memory is trandferred to the history file.
- When the history count in the parameter history file is changed in the middle of operation.
- When a memory card, which has a different history count from that set in the parameter, is mounted.

The storage area in the error history file is as follows:

Storage area	File in the set memory card
Amount that can be stored	Max. 100 (can be changed) *1

*1: When the number of storable files is exceeded, the oldest data is overwritten by the latest one.

POINT

Even if the failure history file set in the parameter does not exist in the memory card, the error will not occur in the CPU module. In this case, the CPU module stores the latest error into only the error history storage memory of the CPU module.

System Protect

The CPU model has a few protection functions (system protect) to prevent the program changes by a third party other than the designer (from GX Developer function or serial communication module).

	Item to protect	Protect valid file	Protection description	Method	Valid Timing	Remarks
Basic Note 1.27	All of CPU *Note1.27*	All files	Prohibits all write/control instructions to the CPU module	Set the CPU module system setting switch SW1 on.	Always	Valid for devices too
Basic Note 1.27	Memory card module *Note1.27*	All files	Performs drive protect for the memory card, and write protect.	Set write-protect switch on the memory card on.	Always	--
	File module	Programs Device comments Device initial values	Changes the attribute for each file as follows: Read/Write display prohibit Write prohibit	Change the attribute for the file in the Password Registration.	Always	--

*: The control instruction, read/write display, and write mentioned above are as follows:

Item	Description
Control instruction	CPU module operation instruction by remote operation. (Remote RUN, remote STOP, etc.)
Read/Write display	Program read/write operations.
Write	Operation related with write processing such as program writes the program and tests.

Basic Note 1.28

POINT

The following functions set the "(PLC) Parameter" and CPU module dip switches are performed even when the CPU module system's SW1 setup switch is set to ON and the system protect function is activated.*Note1.28*

- Booting from the standard ROM and the memory card
- Automatic write to standard ROM

Basic Note 1.27

The Basic model QCPU does not support the system protection on a whole CPU and memory card basis.

Basic Note 1.28

Since the Basic model QCPU does not include the system protect function by DIP switch setting, it is not necessary to consider of the restrictions described in POINT.

■ Password registration

Password is used to prohibit reading and writing data of the program and comments in CPU module from GX Developer.

Basic Note 1.29

● Valid password range

The read- and rewrite-prohibited range is set for the specified memory (program memory/standard memory/memory card) program file, device comment file, and device initial file. *Note1.29*

● Operation that can be disabled by password

Either of the following two descriptions is to be registered.

- The file name is not displayed and read/write cannot be performed as well.
- Write cannot be performed to the file. (Read only)

If the password is registered, file operations from GX Developer cannot be performed unless the same password is input.

Basic Note 1.29

The valid password range of the Basic model QCPU can set for the program file of the program memory, the device comment file, and the device initial value file.
It cannot be set for the standard ROM and memory card.

■ Remote password

Basic Note 1.30

High Performance Note 1.30

● Definition

The remote password prevents illegal access to the CPU module by users in remote locations.
After remote passwords have been set, a remote password check is performed when the CPU module is accessed from users in remote locations.

● Modules that support remote password setting

The following modules support remote password setting.

- Serial communication module
- Ethernet module
- Modem interface module

● Number of remote password-set modules

The number of remote password-set modules changes depending on the version of used GX Developer.
The following table indicates the number of remote password-set modules depending on the GX Developer version.

GX Developer Version	Module Name	Maximum Number of Set Modules
Version 6 Version 7	Ethernet module	4 modules
	Serial communication module	4 modules
	Modem interface module	
Version8 or later	Ethernet module	4 modules
	Serial communication module	8 modules
	Modem interface module	

POINT

The maximum number of set modules in the above table indicates the number of modules for which remote passwords can be set by GX Developer.
It is not the maximum number of modules mounted in the system that uses the CPU module.

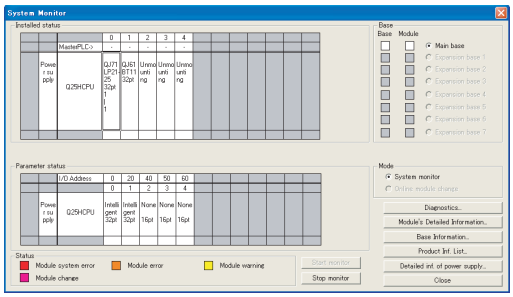
Basic High Performance Note 1.30

When using the remote password for the Basic model QCPU or High Performance model QCPU, check the versions of the CPU module and GX Developer.

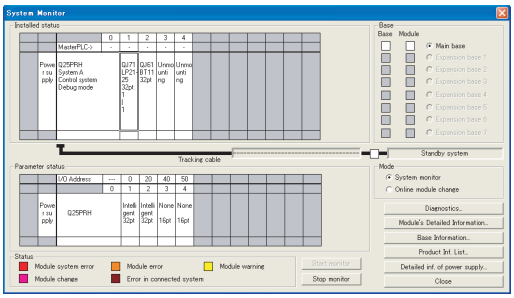
CPU Module System Display by GX Developer

After GX Developer is connected to the CPU module, the following items can be checked in the system monitor (see the following diagram).

- Installed status
- Parameter status
- Module' s detailed information
- Product information



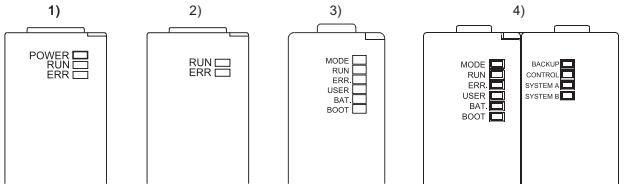
System monitor screen (except for Redundant CPU)



System monitor screen (for Redundant CPU)

LED Display

The CPU module has an LED to indicate the CPU module operation status on the front of the CPU module.



1) : Basic model QCPU (Q00JCPU)
2) : Basic model QCPU (Q00CPU, Q01CPU)
3) : High Performance model QCPU, Process CPU
4) : Redundant CPU

High Speed Interrupt Function

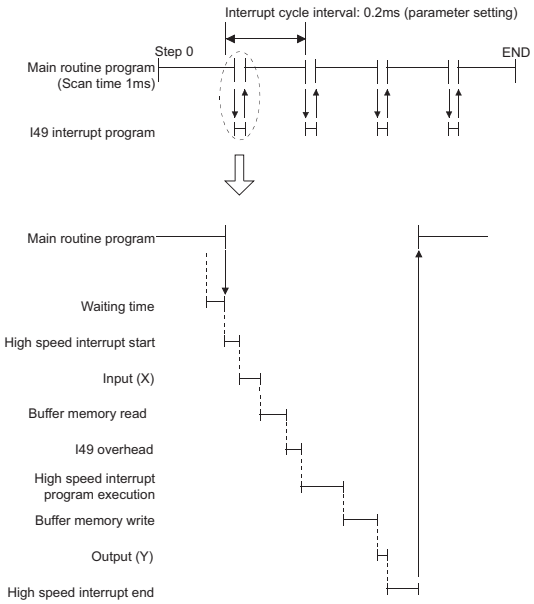
Basic Note 1.31

Process Note 1.31

Redundant Note 1.31

When an interrupt program is created using the interrupt pointer I49, the QnHCPU can run a program by making high speed, fixed-cycle interrupts at intervals of 0.2ms to 1.0ms.
And, the QnHCPU improves the I/O response by refreshing the I/O signals and intelligent function module buffer memories in the parameter-set ranges before and after the execution of the high speed interrupt program.
This enables accurate control such as precision position detection.

High Performance Note 1.32



● Compatible CPUs

Compatible CPU modules	Remarks
Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU	There are restrictions on CPU module versions

● Specifications of high speed interrupt function

Item	Description	Remarks
Interrupt cycle interval	0.2 to 1.0ms	0.1ms units
Number of interrupt programs	1	Interrupt pointer I49

To set the high speed interrupt function, choose "PLC system" - "System interrupt settings" - "High speed interrupt setting" on the PLC parameter screen.

● Detailed items of high speed interrupt function

Item	Description
Interrupt program execution	Runs the interrupt program created with I49.
High speed I/O refresh	Updates I/O signals between the I/O, intelligent function modules and CPU module at interrupt cycle intervals.
High speed buffer transfer	Updates data between the intelligent function module buffer memories and CPU module devices at interrupt cycle intervals.

POINT

Since the high speed interrupt function need to pick up interrupts at very short intervals of 0.2ms to 1.0ms with the interrupt pointer I49, please do not run the interrupt programs, which use the other interrupt pointers and fixed scan execution type programs.
If any of the interrupt and fixed scan execution type programs is executed, interrupt cannot be made at the cycle intervals set for the high speed interrupt function.

Basic Process Redundant
Note 1.31 Note 1.31 Note 1.31

The Basic model QCPU, Process CPU and Redundant CPU do not support the high-speed interrupt function.

High Performance
Note 1.32

The Q02CPU cannot use the high speed interrupt function.
When using the high speed interrupt function with the QnHCPU, check the versions of the CPU module and GX Developer.

Basic
Note 1.33

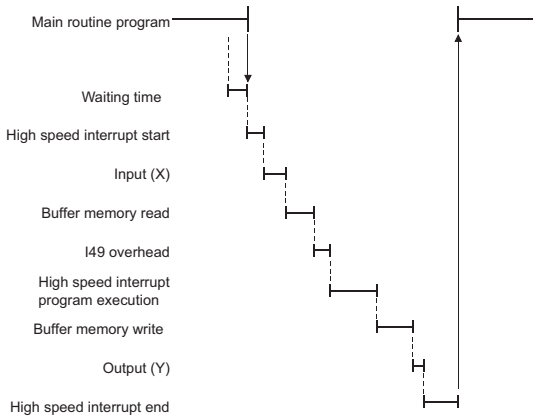
■ Processing time

Process
Note 1.33

The following chart shows the processing times of the high speed interrupt function from a start to an end.

Redundant
Note 1.33

High Performance
Note 1.34



Processing Item	Processing Time
Waiting time	Max. 37.5μs or more than 37.5μs instruction processing time Max. 40μs when MELSECNET/H, CC-Link or intelligent function modules are mounted on extension base unit.
High speed interrupt start high speed interrupt end	22 μs
X input	<Main base unit> Time = 0.14 × (total number of X points)+0.65 × (number of settings)+0.85μs <Extension base unit> Time = 0.21 × (total number of X points)+0.65 × (number of settings)+0.85μs (Calculation example) 3.74μs when the module is mounted on the main base unit, the number of settings is 1, and the number of X points is 16
Buffer memory read	<Main base unit> 16 words or less Time = 0.47 × (total number of transferred words)+2.85 × (number of settings)+0.95μs More than 16 words Time = 0.5 × (total number of transferred words)+0.95μs <Extension base unit> 16 words or less Time = 1.07 × (total number of transferred words)+2.85 × (number of settings)+0.95μs More than 16 words Time = 1.1 × (total number of transferred words)+0.95μs (Calculation example) 4.74μs when the module is mounted on the main base unit, the number of settings is 1, and the number of words is 2
I49 overhead	41μs
High speed interrupt program execution	Depends on the user-created interrupt program.
Buffer memory write	<Main base unit> 16 words or less Time = 0.47 × (total number of transferred words)+2.65 × (number of settings)+0.95μs More than 16 words Time = 0.55 × (total number of transferred words)+0.95μs <Extension base unit> 16 words or less Time = 1.07 × (total number of transferred words)+2.65 × (number of settings) + 0.95μs More than 16 words Time = 1.15 × (total number of transferred words)+0.95μs (Calculation example) 4.54μs when the module is mounted on the main base unit, the number of settings is 1, and the number of words is 2
Y output	<Main base unit> Time = 0.13 × (total number of Y points) +1.55μs <Extension base unit> Time = 0.2 × (total number of Y points)+1.55μs (Calculation example) 3.63μs when the module is mounted on the main base unit, the number of settings is 1, and the number of Y points is 16

Basic Process Redundant
Note 1.33 Note 1.33 Note 1.33

Since the Basic model QCPU, Process CPU and Redundant CPU do not support the high speed interrupt function, it is not necessary to be consider of the description in this section.

High Performance
Note 1.34

Since the Q02CPU does not support the high speed interrupt function, it is not necessary to be consider of the description in this section.

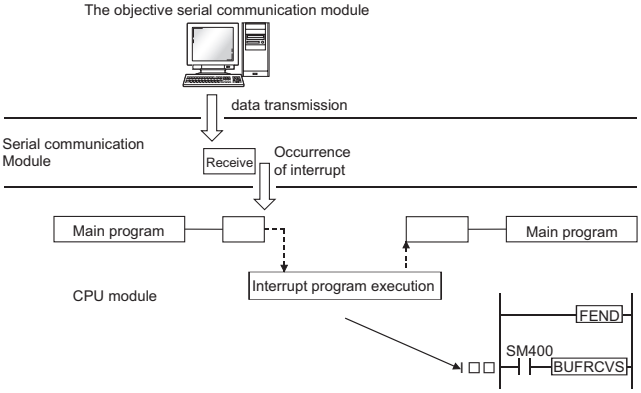
Basic
Note 1.35

Interrupt from the Intelligent Function Module

CPU module executes an interrupt program (I☐) by the interrupt request from the intelligent function module.
For example, the serial communication module processes the data reception by an interrupt program when the following data communication functions are executed.

- Data reception during the communication with no handshaking protocol
- Data reception during the communication with bi-directional protocol

Processing data reception with an interrupt program improves the data reception speed of CPU module.



Basic
Note 1.35

When using an interrupt from the intelligent function module on the Basic model QCPU, check the versions of the CPU module and GX Developer.

Serial Communication Function

Basic Note 1.36

● Definition

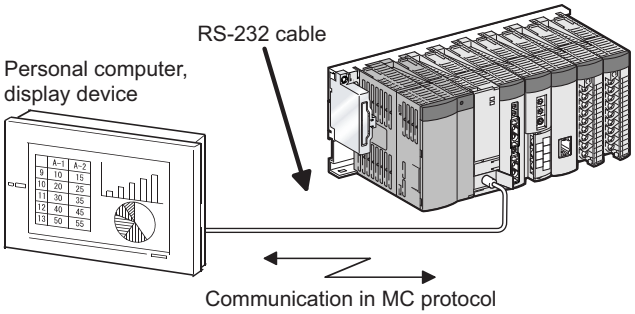
High Performance Note 1.37 Process Note 1.37 Redundant Note 1.37

The serial communication function is designed to make communication in the MC protocol *1 by connecting the RS-232 interface of the CPU module and personal computer, display device or the like by an RS-232 cable.

The serial communication can be executed by the Q00CPU or Q01CPU only.
(The other CPU modules do not support the serial communication function.)

The following explains the specifications, functions and various settings needed to make communication with a personal computer, display device or the like using the serial communication function.

*1: The MC protocol is the abbreviation of the MELSEC communication protocol.
The MELSEC communication protocol is a name of the communication method to make access from the mating equipment to the CPU module in accordance with the communication procedure of the Q series PLC.



POINT

1. The CPU that can make communication with a personal computer, display device or the like using the serial communication function is only the CPU module that is connected with the personal computer, display device or the like.
Communication cannot be made with the other station of MELSECNET/H, Ethernet or CC-Link via the CPU module that is connected with the personal computer, display device or the like.
2. The serial communication function is not used for connection of GX Developer or GX Configurator and CPU module.

Basic Note 1.36

The Q00JCPU does not support the serial communication function.

High Performance Note 1.37 Process Note 1.37 Redundant Note 1.37

The High Performance model QCPU, Process CPU and Redundant CPU do not support the serial communication function.

● Specifications

(1) Transmission specifications

The following table indicates the transmission specifications of RS-232 used for the serial communication function of the CPU module.
Use the serial communication function after making sure that the specifications of the personal computer, Display device or the like match those of the following table.

Item	Default	Setting Range
Communication system	Full duplex communication	------
Synchronization system	Asynchronous system	------
Transmission speed*1	19.2kbps	9.6kbps, 19.2kbps, 38.4kbps, 57.6kbps, 115.2kbps
Data format	Start bit: 1 Data bit: 8 Parity bit: Odd Stop bit: 1	------
MC protocol format *2 (Automatic judgment)	Format 4 (ASCII) Format 5 (binary)	------
Frame*2	QnA-compatible 3C frame QnA-compatible 4C frame	------
Transmission control	DTR/DSR control	------
Sum check*1	No	Yes, No
Transmission wait time*1	No wait	No wait, 10ms to 150ms (10ms increments)
Write during RUN setting*1	Not enabled	Enabled, Not enabled
Extension distance	15m	------

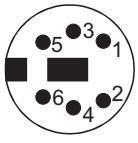
*1: Can be set in the PLC parameter setting of GX Developer.
*2: The relationships between the MC protocol formats and frames are indicated in the following table.

Function		Format 4	Format 5
Communication in ASCII code	QnA-compatible 3C frame	○	×
	QnA-compatible 4C frame	○	×
Communication in binary code	QnA-compatible 4C frame	×	○

○: Usable, ×: Unusable

(2) RS-232 connector specifications

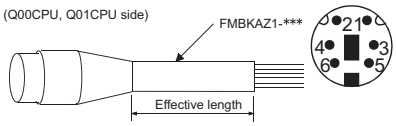
The following table indicates the applications of the RS-232 connector of the CPU module.

Appearance	Pin No.	Signal Symbol	Signal Name
 Mini-Din 6 pins (female)	1	RD (RXD)	Receive data
	2	SD (TXD)	Send data
	3	SG	Signal ground
	4	------	------
	5	DSR (DR)	Data set ready
	6	DTR (ER)	Data terminal ready

(3) RS-232 cable

The following RS-232 cable can be used for connection of the CPU module with the personal computer, display device or the like.

- QC30R2 (cable length: 3m)
- MBKAZ1-***(KURAMO ELECTRIC) manufactured
  Cable with a mini-DIN connector on one side and without connector on the other side
  ***indicates the cable length, which can be specified up to 15ms in 0.1m increments
  Contact: Kuramo Electric Co., Ltd. Nagoya Office
  TEL :052-332-2781
  FAX :052-331-2430



FMBKAZ1-***
Q00CPU, Q01CPU side
connector signal layout

Pin No.	1	2	3	4	5	6	Metal shell
Signal name	RD	SD	SG	--	DR	ER	
Wire core	Red	Black	Green White	--	Yellow	Brown	Shield

● Functions

The serial communication function allows the MC protocol commands in Table6.47 to be executed.

Function			Command	Processing	Processing Points
Device memory	Batch read	in bits	0401(00□1)	Reads bit devices by 1 point.	ASCII: 3584 points BIN: 7168 points
		in words	0401(00□0)	Reads bit devices by 16 points.	480 words (7680 points)
				Reads word devices by 1 point.	480 points
	Batch write*1	in bits	1401(00□1)	Writes to bit devices by 1 point.	ASCII: 3584 points BIN: 7168 points
		in words	1401(00□0)	Writes to bit devices by 16 points	4480 words (7680 points)
				Writes to word devices by 1 point.	480 words
	Random read	in words	0403(00□0)	Reads bit devices by 16 points or 32 points by designating the devices at random.	96 points
				Reads word devices by 1 point or 2 points by designating the devices at random.	
	Test*1 (Random write)	in bits	1402(00□1)	Sets/resets bit devices by 1 point by designating the devices at random.	94 points
		in words	1402(00□0)	Sets/resets bit devices by 16 points or 32 points by designating the units at random.	*2
				Writes to word devices by 1 point or 2 points by designating the devices at random.	
	Monitor registration	in words	0801(00□0)	Registers the bit devices to be monitored by 16 points or 32 points.	96 points
				Registers the word devices to be monitored by 1 point or 2 points.	96 points
	Monitor	in words	0802(00□0)	Monitors the devices registered for monitoring.	Number of points registered for monitor

*1: When performing write during RUN of the CPU module, set write during RUN setting to "Enable".

*2: Set the number of processing points within the range of the following expression.

(Number of word access points)× 12 + (number of double word access points) × 14 ≦ 960

One point of a bit device corresponds to 16 bits for word access or to 32 bits for double word access.
One point of a word device corresponds to one word for word access or to two words for double word access.

● **Accessible devices**

Class	Device		Device Code	Device Number Range *1 (Default Value)		Write	Read
Internal system device	Function input		FX*2	000000 to 00000F	Hexadecimal	×	×
	Function output		FY*2	000000 to 00000F	Hexadecimal		
	Function register		FD	000000 to 000004	Decimal		
	Special relay		SM	000000 to 001023	Decimal	○	○
	Special register		SD	000000 to 001023	Decimal		
Internal user device	Input		X	000000 to 0007FF	Hexadecimal		
	Output		Y	000000 to 0007FF	Hexadecimal		
	Internal relay		M	000000 to 008191	Decimal		
	Latch relay		L	000000 to 002047	Decimal		
	Annunciator		F	000000 to 001023	Decimal		
	Edge relay		V	000000 to 001023	Decimal		
	Link relay		B	000000 to 0007FF	Hexadecimal		
	Data register		D	000000 to 011135	Decimal		
	Link register		W	000000 to 0007FF	Hexadecimal		
	Timer	Contact	TS	000000 to 000511	Decimal		
		Coil	TC				
		Current value	TN				
	Retentive timer	Contact	SS	------	Decimal		
		Coil	SC				
		Current value	SN				
	Counter	Contact	CS	000000 to 000511	Decimal		
		Coil	CC				
		Current value	CN				
	Link special relay		SB	000000 to 0003FF	Hexadecimal		
	Link special register		SW	000000 to 0003FF	Hexadecimal		
	Step relay		S	000000 to 002047	Decimal	×	
	Direct input		DX	000000 to 0007FF	Hexadecimal	○	
	Direct output		DY	000000 to 0007FF	Hexadecimal		
	Index register		Z	000000 to 000009	Decimal		
	File register		R	000000 to 032767	Decimal		
			ZR	000000 to 00FFFF	Hexadecimal		

○: Read/write enabled, ×: Write disabled

*1: After changing the number of CPU module device points on GX Developer, use the devices in the new device No. range. Decimal and hexadecimal indicate that the device specified for the MC protocol command is decimal or hexadecimal.

*2: 000005 through 00000F of FX and FY correspond to indefinite numbers.

Reading the Module Service Interval Time

The module service interval indicates the time between a transient request such as monitor, test, program read/write. The CPU module can monitor the service interval time (time from service acceptance to next service acceptance) of the intelligent function module, network module or GX Developer. This indicates the frequency at which access to the CPU occurs from outside.

Device Initial Value

Basic Note 1.38

Basic Note 1.39

Process Note 1.39

Redundant Note 1.39

(1) Definition

The device initial value is a function that registers the data used in a program to the device or intelligent function module/special function module*Note1.39* buffer memory without any program.

(2) Application of device initial value

The use of device initial values provides a shortcut to specify device data in a program without using a device data setting program (initial program.)

Basic Note 1.38

When using the device initial value on the Basic model QCPU, check the versions of the CPU module and GX Developer.

Basic Note 1.39 Process Note 1.39 Basic Note 1.39

The Basic model QCPU, Process CPU and Redundant CPU do not support the special function modules.

Online module change

Basic Note 1.40 High Performance Note 1.40

An online module change[Note1.40] is a function that allows the Q series module mounted on the main base unit or extension base unit to be changed during system control executed by the Process CPU or Redundant CPU.
Using an online module change, the module that failed during control can be replaced with the module of the same model name.

POINT

1. An online module change cannot add a module or change the current module for another module.
2. When executing an online module change for the Process CPU in the multiple CPU system, it is necessary to specify "Online module change enable for other CPU" in the multiple CPU setting of the PLC parameter dialog box. Also, there are restrictions on the versions of the CPU modules that comprise the multiple CPU system.
3. Perform an online module change after confirming that the system outside the PLC will not malfunction.
4. To prevent an electric shock, operating module malfunction, etc., provide a switch or similar individually cutting-off means for the external power supply of the module to be changed online.
5. It is recommended to verify that the operations of the unchanged modules will not be affected by executing an online module change in an actual system beforehand to confirm the following.
   The means and structure that will cut off the connection with the external device are correct.
   ON/OFF of switches, etc. has no influence.
6. Do not mount/remove the module onto/from base unit more than 50 times (IEC61131-2-compliant), after the first use of the product.
   Failure to do so may cause the module to malfunction due to poor contact of connector.

Basic High Performance Note 1.40

The Basic model QCPU and High Performance model QCPU are not compatible with an online module change.

● Conditions for performing online module change

An online module change can be made under the following conditions.

(1) Modules that can be changed online

The modules that can be changed online are shown in the following table.

Module type		Restrictions
Input module		No restrictions
Output module		
Hybrid I/O module		
Intelligent function module	Analog-digital converter module	Supported by function version C. (Online module change cannot be made when the Redundant CPU is used.)
	Digital-analog converter module	
	Temperature input module	
	Temperature control module	
	Loop control module	
	Pulse input module	

The other modules cannot be changed online.

(2) GX Developer that supports online module change

GX Developer is required to perform an online module change.
Refer to the following for the GX Developer version.
When Process CPU is used, refer to version 7.10L or later.
When Redundant CPU is used, refer to version 8.17 or later.
An online module change can also be performed from GX Developer via a network.

(3) Base unit for online module change

(a) When the slim type main base unit (Q3□SB) is used, an online module change cannot be performed.

(b) When the extension base unit of the type that requires no power supply module (Q5□SB) is used, an online module change cannot be performed for the modules mounted on all base units connected.

(4) Control status of CPU module

(a) An online module change can be executed when a stop error has not occurred.
Whether an online module change can be executed or not depending on the control status of the CPU module is shown in the following table.

Control status	RUN status*1	STOP status	PAUSE status	At stop error
Whether online module change can be executed or not	Can be executed	Can be executed	Can be executed	Can't be executed

*1: Including the case where a continue error has occurred in the RUN status.

(b) An online module change can be continued if the control status of the CPU module is changed to the STOP/PAUSE status during the online module change.
In either of the following cases, however, the online module change cannot be continued.
- When the CPU module is reset
- When a stop error occurs

(5) Number of modules that can be changed online

The number of modules that can be changed online at one time is one for each CPU module.
Multiple modules cannot be changed simultaneously.

1.2 Power Supply Module

1.2.1 List of available combination of power supply module and base unit or CPU module

This section describes the combination of the base units and CPU modules that can be used with each of the power supply module types.

Power supply module	Base unit *1							CPU module *2			
	Main base unit			Extension base unit							
	Q33B Q35B Q38B Q312B	Q32SB Q33SB Q35SB	Q38RB	Q52B Q55B	Q63B Q65B Q68B Q612B	Q68RB	QA1S65B QA1S68B	Q00CPU Q01CPU	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Q12PHCPU Q25PHCPU	Q12PRHCPU Q25PRHCPU
Q61P-A1 Q61P-A2 Q61P Q62P Q63P Q64P	○	×	×	×	○	×	×	○	○	○	○
Q61SP	×	○	×	×	×	×	×	○	○	×	×
Q63RP Q64RP	×	×	○*3	×	×	○*3	×	○*3	○*3	○*3	○*3
A1S61PN A1S62PN A1S63P	×	×	×	×	×	×	○	×	○ *4	×	×

○: Combination available ×: Combination not available

*1: The main base unit (Q3□B) cannot be used with the redundant extension base unit (Q6□RB).
The redundant main base unit (Q3□RB) cannot be used with the extension base unit (Q6□B, QA1S6□B).
If the CPU module is Q12PRHCPU or Q25PRHCPU, no extension base unit is available.

*2: nstall the CPU module to the main base unit.
Q12PRHCPU and Q25PRHCPU occupy 2 slots for each. (Other CPU modules occupy 1 slot.)

*3: Q63RP and Q64RP can be used together on the same base unit.

*4: Available only when QA1S6□B is used as an extension base unit.

1.2.2 List of power supply module specifications

The following table lists the power supply module specifications.

Item		Performance Specifications						
		Q61P-A1	Q61P-A2	Q61P	Q62P	Q63P	Q64P	Q61SP
Base loading position		Q series power supply module loading slot						Slim type power supply module loading slot
Applicable base unit		Q3□B, Q6□B						Q3□SB
Input power supply		100 to 120VAC +10% -15% (85 to 132VAC)	200 to 240VAC +10% -15% (170 to 264VAC)	100 to 240VAC +10% -15% (85 to 264VAC)		24VDV +10% -15% (15.6 to 31.2VDD)	100 to 120VAC/200 to 240VAC +10% -15% (85V to 132VAC/170 to 264VAC)	100 to 240VAC +10% -15% (85 to 264VAC)
Input frequency		50/60Hz ±5%				----	50/60Hz ±5%	
Input voltage distortion factor		Within 5%				----	Within 5%	
Max. input apparent power		105VA		130VA	105VA	----	160VA	40VA
Max. input power		----				45W	----	
Inrush current		20A within 8ms*5				100A within 1ms (at 24VDC input)	20A within 8ms*5	
Rated output current	5VDC	6A			3A	6A	8.5A	2A
	24VDC	----			0.6A	----		
External output voltage		----			24VDC ±10%	----		
Overcurrent protection*1	5VDC	6.6A or more		6.6 to 7.9A	3.3A or more	6.6A or more	9.9A or more	2.2A or more
	24VDC	----			0.66A or more	----		
Overvoltage protection *2	5VDC	5.5 to 6.5V						
	24VDC	----						
Efficiency		70% or more			65% or more	70% or more		
Allowable momentary power failure period *3		Within 20ms				Within 10ms (at 24VDC input)	Within 20ms	Within 20ms (AC100VAC or more)
Dielectric withstand voltage		Across inputs/LG and outputs/FG 2830VAC rms (1780VAC rms for Q61P-A1)/3 cycles (2000 m (6562 ft.))				500VAC across primary and 5VDC	Across inputs/LG and outputs/FG 2830VAC rms/3 cycles (2000 m (6562 ft.))	
Insulation resistance		Across inputs/LG and outputs/FG, across inputs and LG, across outputs and FG 10MΩ or more by insulation resistance tester				10MΩ or more by insulation resistance tester	Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG 10MΩ or more by insulation resistance tester	
Noise durability		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV				By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV	
Operation indication		LED indication (Normal: ON (green), Error: OFF)						
Fuse		Built-in (Unchangeable by user)						

Item			Performance Specifications						
			Q61P-A1	Q61P-A2	Q61P	Q62P	Q63P	Q64P	Q61SP
Contact output section	Application		$\overline{\text{ERR}}$ contact						
	Rated switching voltage, current		24VDC, 0.5A						
	Minimum switching load		5VDC, 1mA						
	Response time		OFF to ON: 10ms max. ON to OFF: 12ms max.						
	Life		Mechanical : More than 20 million times Electrical : More than 100 thousand times at rated switching voltage, current						
	Surge suppressor		No						
	Fuse		No						
Terminal screw size			M3.5 screw						
Applicable wire size			0.75 to 2mm^2						
Applicable solderless terminal			RAV1.25 to 3.5, RAV2 to 3.5						
Applicable tightening torque			0.66 to 0.89N•m						
Protection degree			IP1X				IP2X	IP1X	
External dimensions		H	98mm (3.86inch)						
		W	55.2mm (2.33inch)						27.4mm
		D	90mm (3.55inch)					115mm (4.53inch)	104mm (4.09nch)
Weight			0.31kg		0.4kg	0.39kg	0.33kg	0.40kg	0.18kg

Item		Performance Specifications	
		Q63RP	Q64RP
Base loading position		Redundant power supply module loading slot	
Applicable base unit		Q3□RB, Q6□RB	
Input power supply		24VDC $^{+30\%}_{-35\%}$ (15.6 to 31.2VDC)	100 to 120VAC/200 to 240V $^{+10\%}_{-15\%}$ (85 to 132VAC/170 to 264VAC)
Input frequency		50/60Hz ±5%	
Input voltage distortion factor		Within 5%	
Max. input apparent power		65W	160VA
Inrush current		150A within 1ms	20A within 8ms*5
Rated output current	5VDC	8.5A	
	24VDC	----	
Overcurrent protection*1	5VDC	9.35A or more	
	24VDC	----	
Overvoltage protection*2	5VDC	5.5 to 6.5V	
	24VDC	----	
Efficiency		65% or more	
Allowable momentary power failure period*3		Within 10ms (at 24V DC input)	Within 20ms (100VAC or more)
Dielectric withstand voltage		500VAC across Primary and 5VDC	Across inputs/LG and outputs/FG 2830VAC rms/3 cycles (2000 m (6562 ft.))
Insulation resistance		Across inputs/LG and outputs/FG, across inputs and LG, across outputs and FG 10MΩ or more by insulation resistance tester	
Noise durability		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV
Operation indication		LED indication (Normal: ON (green), Error: ON (red)) *6	
Fuse		Built-in (Unchangeable by user)	
Contact output section	Application	ERR contact	
	Rated switching voltage, current	24VDC, 0.5A	
	Minimum switching load	5VDC, 1mA	
	Response time	OFF to ON: 10ms max. ON to OFF: 12ms max.	
	Life	Mechanical : More than 20 million times Electrical : More than 100 thousand times at rated switching voltage, current	
	Surge suppressor	No	
	Fuse	No	
Terminal screw size		M3.5 screw	
Applicable wire size		0.75 to 2mm^2	
Applicable solderless terminal		RAV1.25-3.5, RAV2-3.5	
Applicable tightening torque		0.66 to 0.89N•m	
Protection degree		IP.2X	IP.1X
External dimensions	H	98mm (3.86inch)	
	W	83mm (3.27inch)	
	D	115mm (4.53inch)	
Weight		0.60kg	0.47kg

*6: Although the "POWER" LED momentarily lights up in red immediately after the power supply is turned on or off, the Q63RP/ Q64RP is not faulty.

Item		Performance Specifications
		Q00JCPU
Input power supply		100 to 240VAC $^{+10\%}_{-15\%}$ (85 to 264VAC)
Input frequency		50/60Hz ±5%
Input voltage distortion factor		Within 5%
Max. input apparent power		105VA
Inrush current		40A within 8ms[*5]
Rated output current	5VDC	3A
Overcurrent protection[*1]	5VDC	3.3A or more
Overvoltage protection[*2]	5VDC	5.5 to 6.5V
Efficiency		65% or more
Allowable momentary power failure period[*3]		Within 20ms (100VAC or more)
Dielectric withstand voltage		Across inputs/LG and outputs/FG 2830VAC rms/3 cycles (2000 m (6562 ft.))
Insulation resistance		Across inputs/LG and outputs/FG, across inputs and LG, across outputs and FG 10MΩ or more by insulation resistance tester
Noise durability		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV
Operation indication		LED indication (The POWER LED of the CPU part: Normal: ON (green), Error: OFF)
Fuse		Built-in (Unchangeable by user)
Contact output section		No
Terminal screw size		M3.5×7
Applicable wire size		0.75 to 2mm^2
Applicable solderless terminal		RAV1.25-3.5, RAV2-3.5
Applicable tightening torque		0.66 to 0.89N•m

Item		Performance Specifications		
		A1S61PN	A1S62PN	A1S63P
Base loading position		AnS series power supply module loading slot		
Applicable base unit		QA1S6□B		
Input power supply		100 to 240VAC +10% -15% (85 to 264VAC)		24VDC +30% -35% (15.6 to 31.2VDC)
Input frequency		50/60Hz ±5%		----
Input voltage distortion factor		Within 5%		
Max. input apparent power		105VA		----
Max. input power		----		41W
Inrush current		20A within 8ms*5		81A within 1ms
Rated output current	5VDC	5A	3A	5A
	24VDC	----	0.6A	----
Overcurrent protection*1	5VDC	5.5A or more	3.3A or more	5.5A or more
	24VDC	----	0.66A or more	----
Overvoltage protection*2	5VDC	5.5 to 6.5V		
	24VDC	----		
Efficiency		65% or more		
Allowable momentary power failure period*3		Within 20ms		Within 10ms (at 24VDC input)
Dielectric withstand voltage		Across inputs/LG and outputs/FG 2830VAC rms/3 cycles (2000 m (6562 ft.))		500VAC across primary and 5VDC
Insulation resistance		Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG 10MΩ or more by insulation resistance tester		5MΩ or more by insulation resistance tester
Noise durability		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency Noise voltage IEC61000-4-4, 2kV		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
Operation indication		LED indication (Normal: ON (green), Error: OFF)		
Fuse		Built-in (Unchangeable by user)		
Contact output section		No		
Terminal screw size		M3.5 screw		
Applicable wire size		0.75 to 2mm^2		
Applicable solderless terminal		RAV1.25 to 3.5, RAV2 to 3.5		
Applicable tightening torque		0.66 to 0.89N•m		
External dimensions	H	130mm (5.12inch)		
	W	55mm (2.17inch)		
	D	93.6mm (3.69inch)		
Weight		0.60kg		0.50kg

POINT

*1: Overcurrent protection
The overcurrent protection function shuts off the 5 V, 24 VDC circuit and stops the system if the current flowing in the circuit exceeds the specified value.
The LED of the power supply module is turned off or lights up in dim green when voltage is lowered. (As for the redundant power supply module (Q64RP), the LED is turned off or lights up in red.) If this device is activated, switch the input power supply off and eliminate the cause such as insufficient current capacity or short. Then, a few minutes later, switch it on to restart the system.
The initial start for the system takes place when the current value becomes normal.

*2: Overvoltage protection
The overvoltage protection function shuts off the 5 VDC circuit and stops the system if a voltage of 5.5 VDC or more is applied to the circuit.
When this device is activated, the power supply module LED is switched OFF.
If this happens, switch the input power OFF, then a few minutes later ON. This causes the initial start for the system to take place. The power supply module must be changed if the system is not booted and the LED remains OFF (As for the redundant power supply module (Q64RP), the LED lights up in red).

*3: Allowable momentary power failure period

(1) For AC input power supply
• An instantaneous power failure lasting less than 20ms will cause AC down to be detected, but operation will continue.
• An instantaneous power failure lasting in excess of 20ms may cause the operation to continue or initial start to take place depending on the power supply load.
Further, when the AC supply of the AC input module (QX10, etc.) is the same as that of the power supply module, it prevents the sensor connected to the AC input module (QX10, etc.), which is ON at power-off, from turning OFF by switching off the power supply. However, if only the AC input module (QX10, etc.) is connected to the AC line, which is connected to the power supply, detection of the AC down for the power supply module may be delayed by the capacitor in the AC input module (QX10, etc.). Thus, connect a load of approx. 30mA per AC input module (QX10, etc.) to the AC line.
If an instantaneous power failure of 20ms or more occurs in either of AC input power supplies in a system including two redundant power supply module, initial start of the system will not be executed.
However, if the instantaneous power failure occurs in both of AC input power supplies, initial start of the system may be executed.

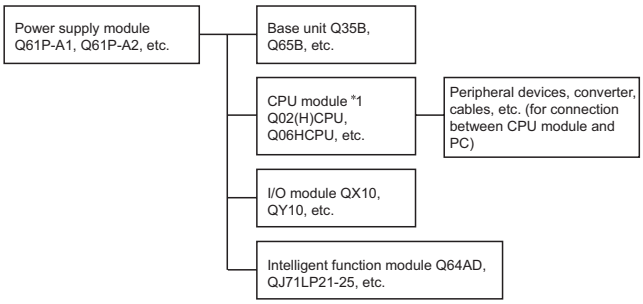
(2) For DC input power supply
• An instantaneous power failure lasting less than 10ms (*4) will cause 24VDC down to be detected, but operation will continue.
• An instantaneous power failure lasting in excess of 10ms (*4) may cause the operation to continue or initial start to take place depending on the power supply load.
(*4: This is for a 24VDC input. This is 10ms or less for 24VDC or less.)

*5: Inrush current
When power is switched on again immediately (within 5 seconds) after power-off, an inrush current of more than the specified value (2ms or less) may flow. Reapply power 5 or more seconds after power-off. When selecting a fuse and breaker in the external circuit, take account of the blowout, detection characteristics and above matters.

1.2.3 Selecting a power supply module

The power supply module is selected according to the total of current consumption of the base units, I/O modules, intelligent function module, special function module, and peripheral devices supplied by its power supply module.
For the internal current consumption of 5 VDC of the base unit, refer to section 1.3.1.
For the internal current consumption of 5 VDC of the I/O modules, intelligent function module, special function module, and peripheral devices, refer to the Manuals of their respective modules.

● When the base unit is Q3☐B or Q6☐B



*1: The CPU module is loaded on the Q3☐B main base unit.

Keep the current consumption of the base unit (Q3☐B, Q6☐B) below the 5VDC rated output current of the Q series power supply module.

5VDC rated output current	Type
6.0A	Q61P-A1, Q61P-A2, Q61P, Q63P
3.0A	Q62P
8.5A	Q64P

(1) Caution on using the extension base unit (Q5☐B)

When Q5☐B is used, a power of 5VDC is supplied from the power supply module on the main base unit (Q3☐B) through an extension cable.
Pay attention to the following to use Q5☐B.

- Select a power supply module of a proper 5VDC rated output current as the one to be installed to the main base unit (Q3☐B) so that it will cover the current used by Q5☐B.
  For example, if current consumption is 3.0A on the main base unit (Q3☐B) and 1.0A on Q5☐B, any of the power supply modules shown in the following must be mounted on the main base unit (Q3☐B).

5VDC rated output current	Type
6.0A	Q61P-A1, Q61P-A2,Q61P, Q63P
8.5A	Q64P

- Because 5VDC is supplied to Q5☐B through an extension cable, voltage is lowered in the extension cable. The power supply module and extension cable must be selected so that a voltage of 4.75VDC or more is supplied at the "IN" connector of Q5☐B.
  For details of the voltage drop, refer to section1.3.2.

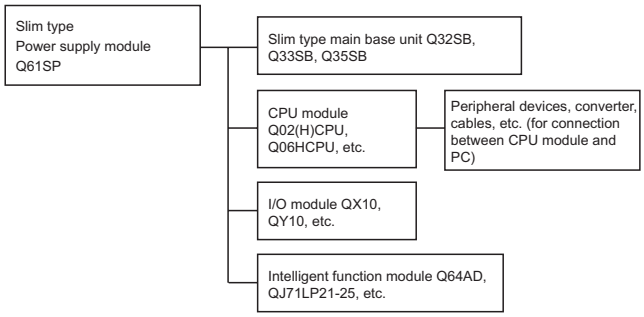
(2) Methods for reducing voltage drops

The following methods are effective to reduce voltage drops at the extension cables.

(a) Changing the module loading positions
Load large current consumption modules on the main base unit (Q3☐B).
Load small current consumption modules on the extension base unit (Q5☐B).

(b) Using short extension cables
The shorter the extension cable is, the smaller the resistance and voltage drops are.
Use the shortest possible extension cables.

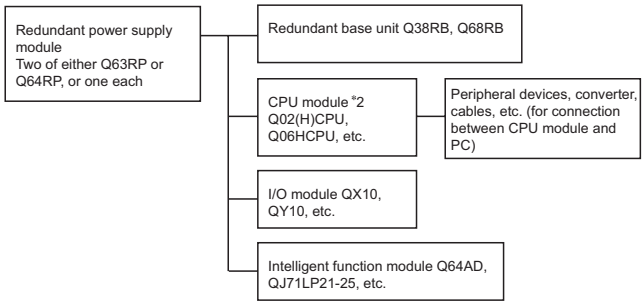
● When the base unit is Q3☐SB



Keep the current consumption of the slim type main base unit (Q3☐SB) not exceeding the 5VDC rated output current of the slim type power supply module (Q61SP)

5VDC Rated output current	Type
2.0A	Q61SP

● When the base unit is Q3☐RB or Q6☐RB



*2: Mounted on the redundant main base unit (Q3☐RB)

5VDC rated output current	Type
8.5A	Q63RP, Q64RP

POINT

When a redundant power supply system is configured and one redundant power supply module (Q63RP/Q64RP) has failed, the system is operated using the other redundant power supply module only during replacement of the failed redundant power supply module.
Therefore, keep the current consumption of the redundant base unit (Q3☐RB/Q6☐RB) not exceeding the 5VDC rated output current (8.5A) for one redundant power supply module.

(1) Cautions for using the extension base unit (Q5□B)

When Q5□B is used, a power of 5VDC is supplied from the redundant power supply module (Q63RP or Q64RP) on the redundant main base unit (Q3□RB) through an extension cable.

Pay attentions to the following to use Q5□B.

- Keep the sum of the current consumption on Q3□RB and Q5□B not exceeding the 5VDC rated output current for one redundant power supply module (Q63RP or Q64RP)

5VDC rated output current	Type
8.5A	Q63RP, Q64RP

- Because 5VDC is supplied to Q5□B through an extension cable, voltage drop occurs in the extension cable.
  Select an appropriate extension cable so that a voltage of 4.75VDC or more is supplied at the "IN" connector of Q5□B.
  For details of the voltage drop, refer to Section 1.3.2.

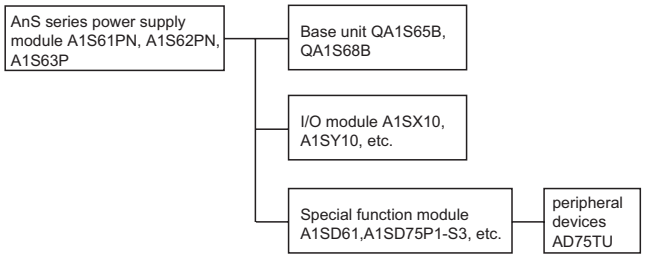
(2) Methods for reducing voltage drops

The following methods are effective to reduce voltage drops at the extension cables.

(a) Changing the module loading positions
Mount a module with large current consumption on the redundant main base unit (Q3□RB).
Load small current consumption modules on the extension base unit (Q5□B).

(b) Using short extension cables
The shorter the extension cable is, the smaller the resistance and voltage drops are.
Use the shortest possible extension cables.

● When the base unit is QA1S6□B



Select the power supply module also in consideration of the current consumption of the peripheral devices connected to the special function module.
For example, when the AD75TU is connected to the A1SD75P1-S3, the current consumption of the AD75TU must also be taken into account.

■ Precaution when connecting the uninterruptive power supply

Be sure of the following terms when connecting the Q Series CPU Module system to the uninterruptive power supply (abbreviated as UPS hereafter):

As for UPS, use the online power system or online interactive system with a voltage distortion rate of 5% or less.
For the UPS of the commercial online power system, use Mitsubishi Electric's F Series UPS (serial number P or later) (Ex.: FW-F10-0.3K/0.5K).
Do not use any UPS of the commercial online power system other than the F series mentioned above.

■ Cautions on power supply capacity

The Q64RP and Q64P automatically recognize the rated input voltage waveform to switch the input voltage between 100VAC and 200VAC.
Select the power supply for the Q64RP/Q64P power supply module, considering the power supply capacity. (Reference: At least twice as much as the current consumption)
If the power supply of insufficient capacity is applied, the power supply module might fail when 200VAC power is supplied.

1.3 Base Unit, Extension Cable

1.3.1 List of base unit specifications

● Main base unit

Item		Type			
		Q33B	Q35B	Q38B	Q312B
Number of I/O modules installed		3	5	8	12
Possibility of extension		Extendable			
Applicable module		Q series modules			
Protection degree		IPOX			
5 VDC internal current consumption		0.105A	0.110A	0.114A	0.121A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)			
External dimensions	H	98mm (3.86inch)			
	W	189mm (7.44inch)	245mm (9.65inch)	328mm (12.92inch)	439mm (17.30inch)
	D	44.1mm (1.74inch)			
Weight		0.21kg	0.25kg	0.35kg	0.45kg
Attachment		Mounting screw M4×14 4 pieces (DIN rail mounting adapter to be sold separately)			
DIN rail mounting Adapter type		Q6DIN3	Q6DIN2	Q6DIN1	

● Slim type main base unit

Item		Type		
		Q32SB	Q33SB	Q35SB
Number of I/O modules installed		2	3	5
Possibility of extension		Cannot connect extension modules.		
Applicable module		Q series modules		
Protection degree		IPOX		
5 VDC internal current consumption		0.086A	0.086A	0.091A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)		
External dimensions	H	98mm (3.86inch)		
	W	114mm (4.49inch)	142mm (5.59inch)	197.5mm (7.78inch)
	D	18.5mm (0.73inch)		
Weight		0.12kg	0.15kg	0.21kg
Attachment		Mounting screw M4×12 4 pieces (DIN rail mounting adapter to be sold separately)		
DIN rail mounting Adapter type		Q6DIN3		

● Redundant main base unit

Item		Type
		Q38RB
Number of I/O modules installed		8
Possibility of extension		Extendable
Applicable module		Q series modules
Protection degree		IPOX
5 VDC internal current consumption		0.117A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)
External dimensions	H	98mm (3.86inch)
	W	439mm (17.28inch)
	D	44.1mm (1.74inch)
Weight		0.45kg
Attachment		Mounting screw M4×14 5 pieces (DIN rail mounting adapter to be sold separately)
DIN rail mounting Adapter type		Q6DIN1

● Extension base unit (Type not requiring power supply module)

Item		Type	
		Q52B	Q55B
Number of I/O modules installed		2	5
Possibility of extension		Extendable	
Applicable module		Q series modules	
Protection degree		IPOX	
5 VDC internal current consumption		0.080A	0.100A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)	
External dimensions	H	98mm (3.86inch)	
	W	106mm (4.17inch)	189mm (7.44inch)
	D	44.1mm (1.74inch)	
Weight		0.14kg	0.23kg
Attachment		Mounting screw M4×14 4 pieces (DIN rail mounting adapter to be sold separately)	
DIN rail mounting Adapter type		Q6DIN3	

● Extension base unit (Type requiring power supply module)

Item		Type			
		Q63B	Q65B	Q68B	Q612B
Number of I/O modules installed		3	5	8	12
Possibility of extension		Extendable			
Applicable module		Q series modules			
Protection degree		IPOX			
5 VDC internal current consumption		0.105A	0.110A	0.114A	0.121A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)			
External dimensions	H	98mm (3.86inch)			
	W	189mm (7.44inch)	245mm (9.65inch)	328mm (12.92inch)	439mm (17.30inch)
	D	44.1mm (1.74inch)			
Weight		0.23kg	0.25kg	0.35kg	0.45kg
Attachment		Mounting screw M4×14 , 4 pieces (DIN rail mounting adapter sold separately)			
DIN rail mounting Adapter type		Q6DIN3	Q6DIN2	Q6DIN1	

● A/AnS series module installed extension base unit

Item		Type			
		QA1S65B	QA1S68B	QA65B	QA68B
Number of I/O modules installed		5	8	5	8
Possibility of extension		Extendable			
Applicable module		AnS series modules		A large-size series module	
Protection degree		IPOX			
5 VDC internal current consumption		0.117A	0.118A	0.117A	
Mounting hole size		M5 screw hole or ϕ5.5 hole (for M5 screw)		M5 screw hole or &drpai6 hole (for M5 screw)	
External dimensions	H	130mm (5.12inch)		250mm (9.85inch)	
	W	315mm (12.41inch)	420mm (16.55inch)	352mm(13.87inch)	466mm (18.36inch)
	D	51.2mm (2.02inch)		47mm (18.52inch)	
Weight		0.75kg	1.00kg	1.60kg	2.00kg
Attachment		Mounting screw M5×25 4 pieces			
DIN rail mounting Adapter type		----	----	----	----

● **Redundant extension base unit**

Item		Type
		Q68RB
Number of I/O modules installed		8
Possibility of extension		Extendable
Applicable module		Q series modules
Protection degree		IPOX
5 VDC internal current consumption		0.117A
Mounting hole size		M4 screw hole or ϕ4.5 hole (for M4 screw)
External dimensions	H	98mm (3.86inch)
	W	439mm (17.30inch)
	D	44.1mm (1.74inch)
Weight		0.47kg
Attachment		Mounting screw M4×14 , 5 pieces (DIN rail mounting adapter sold separately)
DIN rail mounting Adapter type		Q6DIN1

1.3.2 Specification standard of extension base unit (Q5☐B)

Since the extension base unit (Q5☐B) is supplied with 5VDC from the power supply module on the main base unit, a voltage drop occurs at extension cables.
Improper I/O may be provided if the specified voltage (4.75VDC or higher) is not supplied to the "IN" connector of the Q5☐B.
When using the Q5☐B, make sure that the "IN" connector of the Q5☐B is supplied with 4.75VDC or higher.
And it is recommend to connect it with the shortest possible extension cable right after connecting the main base unit, so as to minimize the effects of voltage drop.

Extension Cable Type	Extension Cable Conductor Resistance
QC05B	0.044Ω
QC06B	0.051Ω
QC12B	0.082Ω
QC30B	0.172Ω
QC50B	0.273Ω
QC100B	0.530Ω

Symbol	Description
V1	Voltage drop at the extension cable between the main base unit (Q3☐B) and extension base unit (Q5☐B)
Vn	Voltage drop at the extension cable between the extension base unit (Q5☐B) (extension stage n-1) and extension base unit (Q5☐B) (extension stage n)
R1	Extension cable resistance between the main base unit (Q3☐B) and extension base unit (Q5☐B)
Rn	Extension cable resistance between the extension base unit (Q5☐B) (extension stage n-1) and extension base unit (Q3☐B) (extension stage n)
I1 to I7	5VDC current consumption among extension stage 1 to 7 *1

*1: Sum total of current consumed by Q5☐B and currents consumed by the I/O, intelligent function modules loaded on the Q5☐B. The symbols including "I" (I1 to I7) vary with the modules loaded on the Q5☐B. For details of the symbol, refer to the user's manuals of the module used.

●When only the Q5☐B is connected to the extension base unit

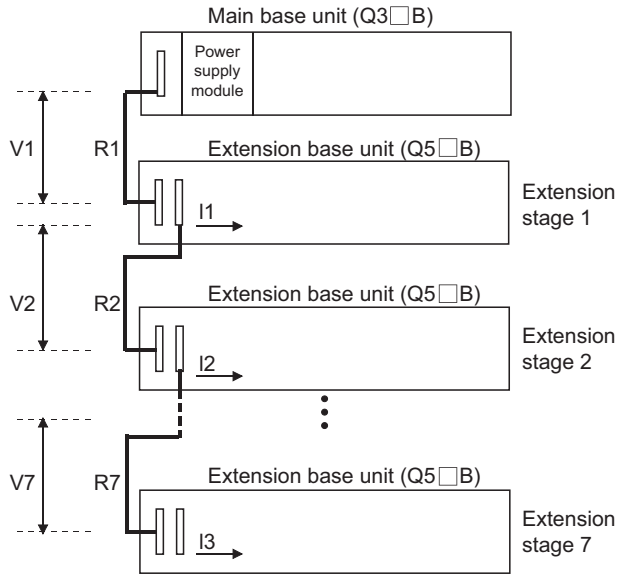
(1) Selection condition

4.75VDC or higher should be supplied to the "IN" connector of the Q5B in the final extension stage.

(2) How to calculate voltage to "IN" connector

The 5VDC output voltage of the power supply module on the main base unit is set to at least 4.90VDC.

Therefore, the Q5☐B can be used if the voltage drop is 0.15VDC or lower (4.9VDC - 4.75VDC = 0.15VDC).



Q5☐B Loading Position	Voltage Drop at Extension Cable on Corresponding Extension Unit							Sum Total of Voltage Drops to "IN" Connector of Q5☐B (V)
	V1	V2	V3	V4	V5	V6	V7	
Extension stage 1	R1•I1	----	----	----	----	----	----	V=V1
Extension stage 2	R1 (I1+I2)	R2•I2	----	----	----	----	----	V= V1+V2
Extension stage 3	R1 (I1+I2+I3)	R2 (I2+I3)	R3•I3	----	----	----	----	V=V1+V2+V3
Extension stage 4	R1 (I1+I2+I3+I4)	R2 (I2+I3+I4)	R3 (I3+I4)	R4•I4	----	----	----	V=V1+V2+V3+V4
Extension stage 5	R1 (I1+I2+I3+I4+I5)	R2 (I2+I3+I4+I5)	R3 (I3+I4+I5)	R4 (I4+I5)	R5•I5	----	----	V=V1+V2+V3+V4+V5
Extension stage 6	R1 (I1+I2+I3+ I4+I5+I6)	R2 (I2+I3+I4+I5+I6)	R3 (I3+I4+I5+ I6)	R4 (I4+I5+I6)	R5 (I5+I6)	R6•I6	----	V=V1+V2+V3+V4+V5 +V6
Extension stage 7	R1 (I1+I2+I3+ I4+I5+I6+I7)	R2 (I2+I3+I4+ I5+I6+I7)	R3 (I3+I4+I5+I6+I7)	R4 (I4+I5+I6+I7)	R5 (I5+I6+I7)	R6 (I6+I7)	R7•I7	V=V1+V2+V3+V4+V5 +V6+V7

The voltage supplied to "IN" connector of the Q5☐B in the final extension reaches 4.75 VDC or higher on the condition that the sum total of voltage drop to "IN" connector of Q5☐B (V) is 0.15V or lower.

● When the Q6☐B is connected between the Q3☐B and the Q5☐B

(1) Selection condition

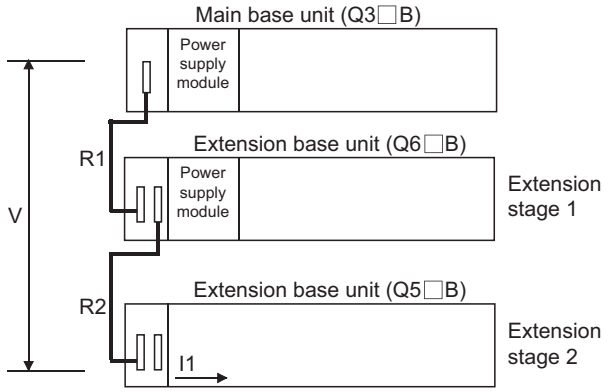
4.75VDC or higher should be supplied to the "IN" connector of the Q5☐B in the final extension.

(2) How to calculate voltage to "IN" connector

The 5VDC output voltage of the power supply module on the main base unit is set to at least 4.90VDC.

Therefore, the Q5☐B can be used if the voltage drop is 0.15VDC or lower (4.9VDC -4.75VDC = 0.15VDC).

[When the Q5☐B is connected to Extension stage 2.]



Extension Cable Type	Extension Cable Conductor Resistance
QC05B	0.044Ω
QC06B	0.051Ω
QC12B	0.082Ω
QC30B	0.172Ω
QC50B	0.273Ω
QC100B	0.530Ω

Symbol	Description
V	Voltage drop at the extension cable between the main base unit (Q3☐B) and extension base unit (Q5☐B)
In	5VDC current consumption when the extension base unit (Q5☐B) is used as Extension n+1, n = 1 to 6, n: Extension No. of extension base unit (Q6☐B) connected (Sum total of current consumed by Q5☐B and currents consumed by the I/O, intelligent function modules loaded on the Q5☐B.)
Rn	Extension cable resistance between the main base unit (Q3☐B) and the extension base unit (Q6☐B) or the extension base unit (Q6☐B) and the extension base unit (Q6☐B)
R_{n+1}	Extension cable resistance between the extension base unit (Q6☐B) and extension base unit (Q5☐B)

List of voltage drop calculation at the extension cable when Q6☐B is connected between Q3☐B and Q5☐B

Position of extension base unit		Voltage drop caused by extension cable from the main base unit to the Q5☐B IN connector (V)
Q6☐B	Q5☐B	
Extension stage 1	Extension stage 2	V=(R1+R2)I1
Extension stage 1, Extension stage 2	Extension stage 3	V=(R1+R2+R3)I2
Extension stage 1 to 3	Extension stage 4	V=(R1+R2+R3+R4)I3
Extension stage 1 to 4	Extension stage 5	V=(R1+R2+R3+R4+R5)I4
Extension stage 1 to 5	Extension stage 6	V=(R1+R2+R3+R4+R5+R6)I5
Extension stage 1 to 6	Extension stage 7	V=(R1+R2+R3+R4+R5+R6+R7)I6

The voltage supplied to the "IN" connector of the Q5☐B reaches 4.75 VDC or later on the condition that the voltage drop (V) at the extension cable between the main base unit and Q5☐B is 0.15 VDC or lower.

1.3.3 List of extension cable specifications

The extension cables are connected to transfer signals between a main base unit and an extension base unit or between extension base units.

Item	Type					
	QC05B	QC06B	QC12B	QC30B	QC50B	QC100B
Cable length	0.45m	0.6m	1.2m	3.0m	5.0m	10.0m
Conductor resistance value	0.044Ω	0.051Ω	0.082Ω	0.172Ω	0.273Ω	0.530Ω
Weight	0.15kg	0.16kg	0.22kg	0.40kg	0.60kg	1.11kg

POINT

When the extension cables are used in combination, limit the overall distance of the combined cable within 13.2 m (43.28 ft.).

1.4 Memory Card, Battery

Basic Note 1.41

The memory card[Note1.41] is used for storing programs and file registers as well as storing ebugged data by the tracing function.
It is also used when handling a file register that exceeds the number of points storable in the standard RAM.

List of Usable Memory Cards

Three types of memory cards, SRAM cards, Flash cards, and ATA cards, are available.The memory cards usable for each CPU module are shown in Table7.1

Memory card *		CPU module			
		Q00JCPU Q00CPU Q01CPU	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Q12PHCPU Q25PHCPU	Q12PRHCPU Q25PRHCPU
SRAM card	Q2MEM-1MBS	×	○	○	○
	Q2MEM-2MBS	×	○	○	○
Flash card	Q2MEM-2MBF	×	○	○	○
	Q2MEM-4MBF	×	○	○	○
ATA card	Q2MEM-8MBA	×	○	○	○
	Q2MEM-16MBA	×	○	○	○
	Q2MEM-32MBA	×	○	○	○

○: Usable ×: Not usable

*:Only one memory card can be installed for each CPU module.

Basic Note 1.41

Memory cards are not available for the basic model QCPU.

Memory Card Specifications

The specifications of the memory card which can be used on the CPU module conform to those of the PCMCIA small PC card.

● SRAM card

Item		Type	
		Q2MEM-1MBS	Q2MEM-2MBS
Memory capacity after format		1011.5 kbyte	2034 kbyte
Storable number of files		256	288
Number of insertions and extractions		5000 times	
External dimensions	H	45mm (1.77 inch)	
	W	42.8mm (1.69 inch)	
	D	3.3mm (0.13 inch)	
Weight		15g	

● Flash card

Item		Type	
		Q2MEM-2MBS	Q2MEM-4MBS
Memory capacity		2035 kbyte	4079 kbyte
Storable number of files		288	
Number of insertions and extractions		5000 times	
Number of writings		100000 times	
External dimensions	H	45mm (1.77 inch)	
	W	42.8mm (1.69 inch)	
	D	3.3mm (0.13 inch)	
Weight		15g	

● ATA card

Item		Type		
		Q2MEM-8MBA	Q2MEM-16MBA	Q2MEM-32MBA
Memory capacity after format		7940 kbyte	15932 kbyte	31854 kbyte
Storable number of files		512		
Number of insertions and extractions		5000 times		
Number of writings		1000000 times		
External dimensions	H	45mm (1.77 inch)		
	W	42.8mm (1.69 inch)		
	D	3.3mm (0.13 inch)		
Weight		15g		

Handling the Memory Card

● Formatting of memory card

Any SRAM or ATA card must have been formatted to use on the High Performance model QCPU.
Since the SRAM or ATA card purchased is not yet formatted, format it using GX Developer before use.
(The Flash card need not be formatted.)

POINT

Do not format an ATA card using other than GX Developer.
(If it is formatted using format function of Microsoft® Windows® Operating System, the ATA card may not be usable with set in a CPU module.)

● Installation of SRAM card battery

A battery used for instantaneous power failure is suppplied with the SRAM card.
Before using the SRAM card, install the battery.

POINT

Even if the CPU module battery is installed, if the SRAM card battery is not installed, the memory of the SRAM card will not be backed up. Ensure to install the battery on the SRAM card.
Also, if the battery is installed on the SRAM card but the CPU module has no battery, the program memory, standard RAM and latch devices of the CPU module are not backed up. Therefore, also ensure to install the battery on the CPU module.

● Battery (Q6BAT, Q7BAT, Q8BAT)

Batteries (Q6BAT and Q7BAT, Q8BAT) are installed in the CPU module to retain data of the program memory, standard RAM, and latch device in case of power failure.

Battery Specifications

This section describes the specifications of the battery used for the CPU module.

Basic Note 1.42

Item	Type		
	Q6BAT	Q7BAT Note1.42	Q8BAT Note1.42
Classification	Manganese dioxide lithium primary battery		Manganese dioxide lithium primary battery (assembled battery)
Initial voltage	3.0V		
Nominal current	1800mAh	5000mAh	1800mAh (1800mAh × 10pieces)
Storage life	Actually 5 years (room temperature)		
Application	Power failure backup for program memory, standard RAM and latch devices		
Accessory	----	Battery holder	Q8BAT connection cable

Basic Note 1.42

The Q7BAT and Q8BAT is not available for the basic model QCPU.

Specifications of the Battery for Memory Card

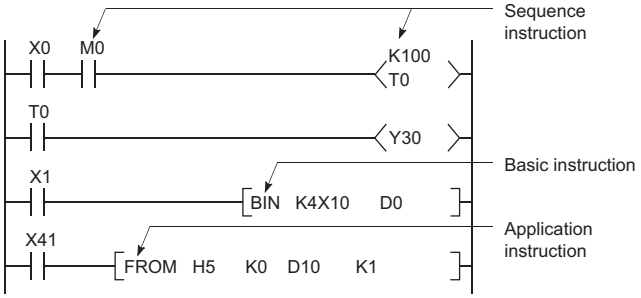
This section describes the specifications of the battery used for the memory card (SRAM card).

Item	Type
	Q2MEM-BAT
Classification	Graphite fluoride primary battery
Initial voltage	3.0V
Nominal current	48mAh
Storage life	Actually 5 years (room temperature)
Application	Power failure backup for SRAM card

1.5 Programming

1.5.1 Sequence program

A sequence program is created using the sequence instructions, basic instructions, application instructions, etc.

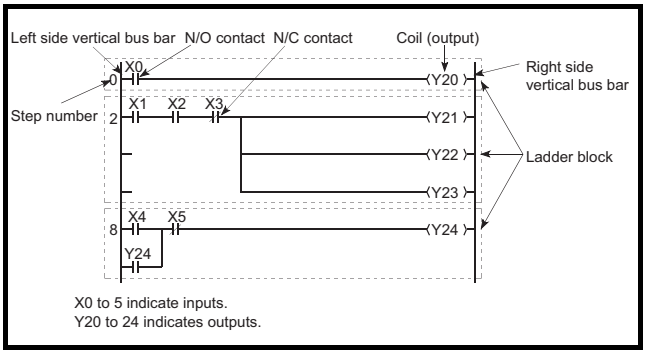


● Sequence program description method

There are two different methods for describing sequence programs: ladder mode and list mode.

(1) Ladder mode

The ladder mode is based on the concept of a sequence circuit of relay control. It enables programming in representation close to a sequence circuit.
In the ladder mode, programming is performed in ladder block units.
A ladder block is the minimum unit for performing sequence program operation, which starts from the left side vertical bus bar and ends at the right side vertical bus bar.



(2) List mode

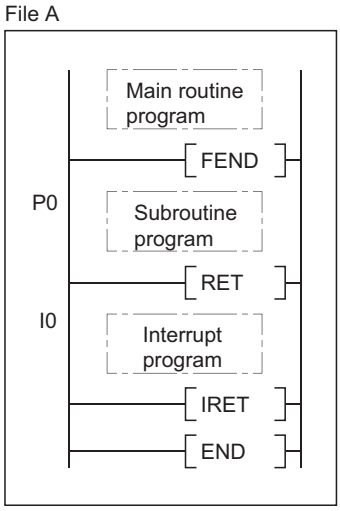
In the list mode, the contacts and coils indicated by symbols in the ladder mode are programmed using dedicated instructions.
The following instructions are used for N/O contacts (a contact), N/C contacts (b contact) and coils.
•N/O contact ••••• LD,AND,OR
•N/C contact ••••• LDI,ANI,ORI
•Coil •••••••••••••• OUT

● Sequence program classification

Sequence programs are classified into the following three types.

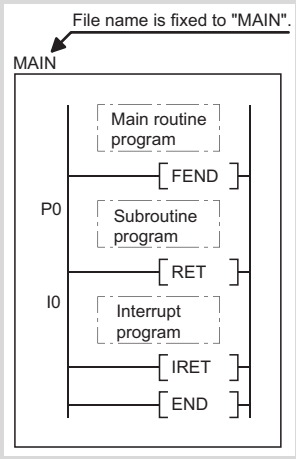
Basic
Note 1.43

- Main routine program
- Subroutine program
- Interrupt program



Basic
Note 1.43

Since the Basic model QCPU cannot execute multiple programs, the file name is fixed to "MAIN".



■ Main routine programs

●Definition of main routine program

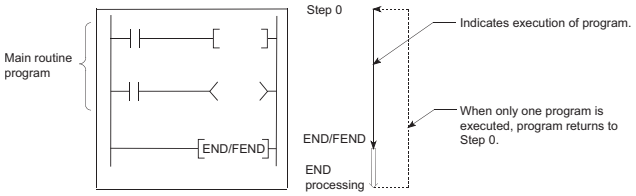
A main routine program is a program from Step 0 to the END/FEND instruction.

●Execution operation of main routine program

When the main routine program is executed, it operates as described below.

(1) When only one program is executed

The main routine program is executed from Step 0 to the END/FEND instruction, where END processing is performed.
After the END processing, the program restarts operation from Step 0.



(2) When multiple programs are executed

The main routine program operation after execution of the END/FEND instruction varies depending on the preset execution conditions.

Basic Note 1.44

●Execution types for main routine programs Note1.44

When multiple programs are to be executed, the following five different execution types can be set to main routine programs depending on the application.

Redundant Note 1.45

- Initial execution type program
- Scan execution type program
- Low speed execution type program Note1.45
- Stand-by type program
- Fixed scan execution type program

POINT

When no execution type is set for execution of only one program, the main routine program operates as a scan execution type program.

Basic Note 1.44

The Basic model QCPU cannot execute multiple programs. Therefore, it is not necessary to set the program execution type.

Redundant Note 1.45

The low speed execution type program is not available for the Redundant CPU.

■ Subroutine programs

●Definition of subroutine program

A subroutine program is a program section from a pointer (P) to the RET instruction.
The subroutine program is executed only when it is called by a subroutine program call instruction (e.g. CALL(P), FCALL(P)) from the main routine program.

●Subroutine program applications

Using a subroutine program as described below reduces the number of program steps.

- Changing a section, which is executed several times during one scan, to a subroutine program reduces the number of steps in the whole program.
- Changing a section, which is executed only when a certain condition is satisfied, to a subroutine program reduces the number of steps in a normally executed program.

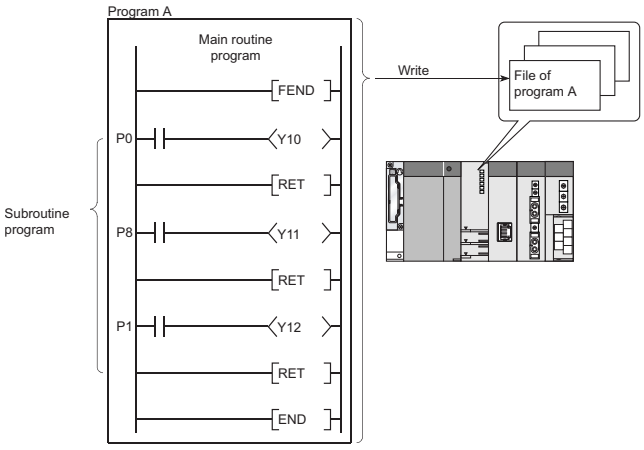
●Subroutine program management

Subroutine programs are created after a main routine program (after the FEND instruction).
Subroutine programs can also be managed as a single program.

(1) Creating subroutine programs after main routine program

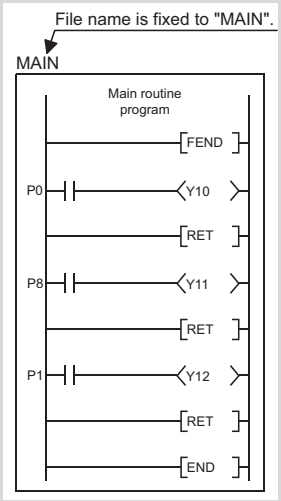
(a) Location of creating subroutine programs
Create subroutine programs between the FEND and END instructions of the main routine program.
Note1.46

Basic Note 1.46



Basic Note 1.46

Since the Basic model QCPU cannot execute multiple programs, the file name is fixed to "MAIN".



(b) Restrictions on creation order

When creating multiple subroutine programs, it is not necessary to set the pointer numbers in ascending order.

(c) Available pointers

Local pointers and common pointers are available for subroutine programs.*Note1.47*

Basic Note 1.47

Note that when a local pointer is used, the subroutine program cannot be called from another program.

Use ECALL instruction to call the subroutine program from another program when a local pointer is used.

(2) Managing subroutine program as another program

Basic Note 1.48

Note1.48

Subroutine programs can be managed as one program (Stand-by type program).

Basic Note 1.47

Since the Basic model QCPU cannot execute multiple programs, it has no distinction between the local and common pointers.

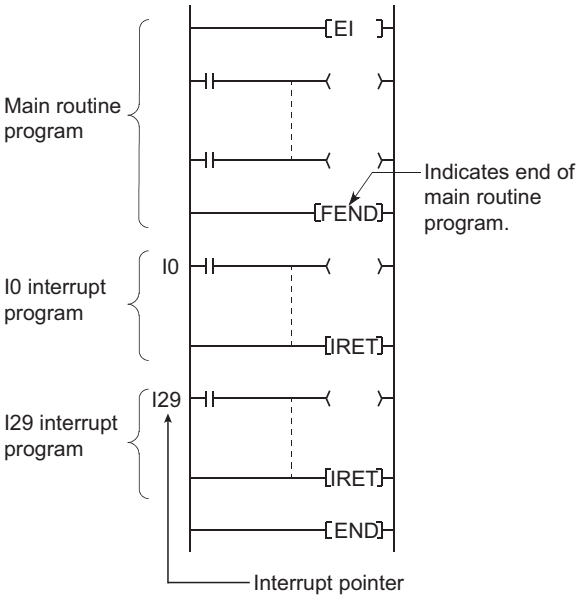
Basic Note 1.48

Since the Basic model QCPU cannot execute multiple programs, subroutine programs cannot be managed as another program.

■ Interrupt programs

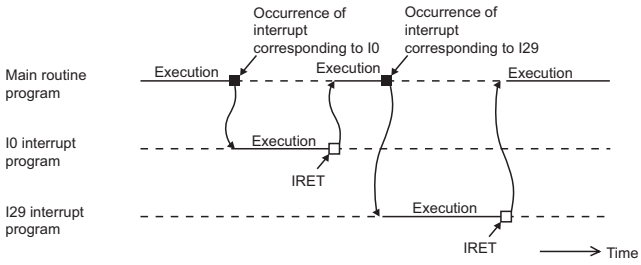
● Definition of interrupt program

An interrupt program is a program section from an interrupt pointer (I□) to the IRET instruction



The interrupt factor varies depending on the interrupt pointer (I□) number.

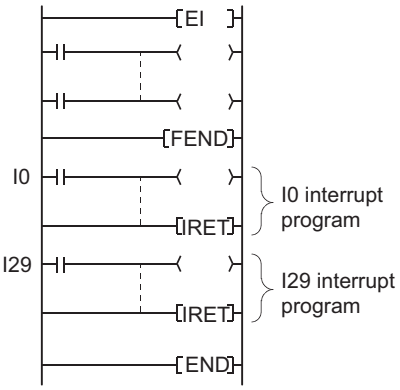
When an interrupt factor occurs, the interrupt program of the interrupt pointer number corresponding to that factor is executed. (The interrupt program is executed only when the interrupt factor occurs.)



POINT

Basic Note 1.49
Process Note 1.49
Redundant Note 1.49
High Performance Note 1.50

1.A pointer dedicated to the high-speed interrupt function (I49) is available as an interrupt pointer.*Note1.49, Note1.50*
When using I49, do not execute the following:
•Other interrupt pointers (Interrupt pointers other than I49)
•Interrupt program
•Fixed scan execution type program
If any of the above is executed, the interrupt program of I49 cannot be executed in the preset interrupt cycles.
2.Only one interrupt program can be created with one interrupt pointer number



Basic Note 1.49 Process Note 1.49 Redundant Note 1.49
The pointer dedicated to the high-speed interrupt function (I49) is not available for the Basic model QCPU, Process CPU and Redundant CPU.

High Performance Note 1.50
IIn the case of the High Performance model QCPU, the pointer dedicated to the high-speed interrupt function (I49) is available for the QnHCPU only.
It is not available for the other CPU modules.

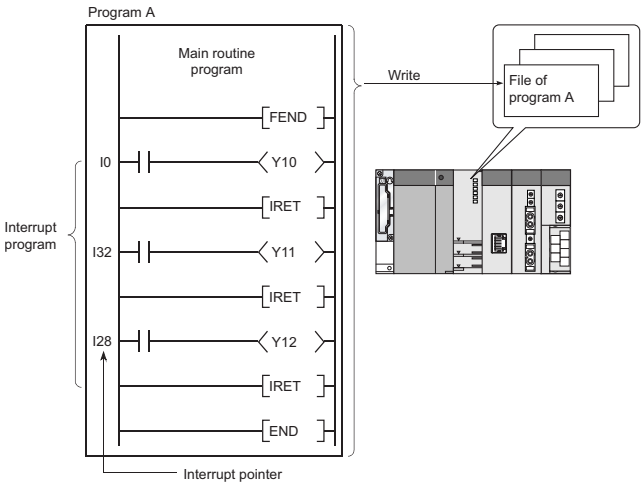
●Interrupt program management

Interrupt programs are created after the main routine program (after the FEND instruction).
The interrupt programs can also be managed as a single program.

(1) Creating interrupt programs after main routine program

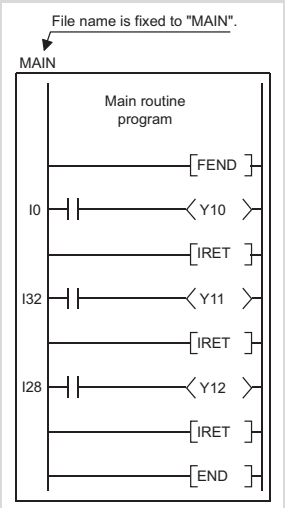
(a) Location of creating interrupt programs
Create interrupt programs between the FEND and END instructions of the main routine program.
Note1.51

Basic Note 1.51



(b) Restrictions on creation order
When creating multiple interrupt programs, it is not necessary to set the interrupt pointer numbers in ascending order.

Basic Note 1.51
Since the Basic model QCPU cannot execute multiple programs, the file name is fixed to "MAIN".



Basic
Note 1.52

(2) Managing interrupt programs as another program *Note1.52*

Interrupt programs can be managed as one program (stand-by type program).

● Before executing interrupt programs

Before executing interrupt programs, execute the following instructions to enable the interrupts.

(1) Basic model QCPU

Execute the EI instruction to enable the interrupts.

(2) High Performance model QCPU, Process CPU or Redundant CPU

When executing interrupt programs of interrupt pointers I32 to 47, execute the IMASK and EI instructions to enable the interrupts.
The interrupt programs of interrupt pointers I0 to 31 or I48 to 255 can be executed after enabling the interrupts with the EI instruction.

Basic
Note 1.52

Since the Basic model QCPU cannot execute multiple programs, interrupt programs cannot be managed as another program.

1.5.2 SFC program

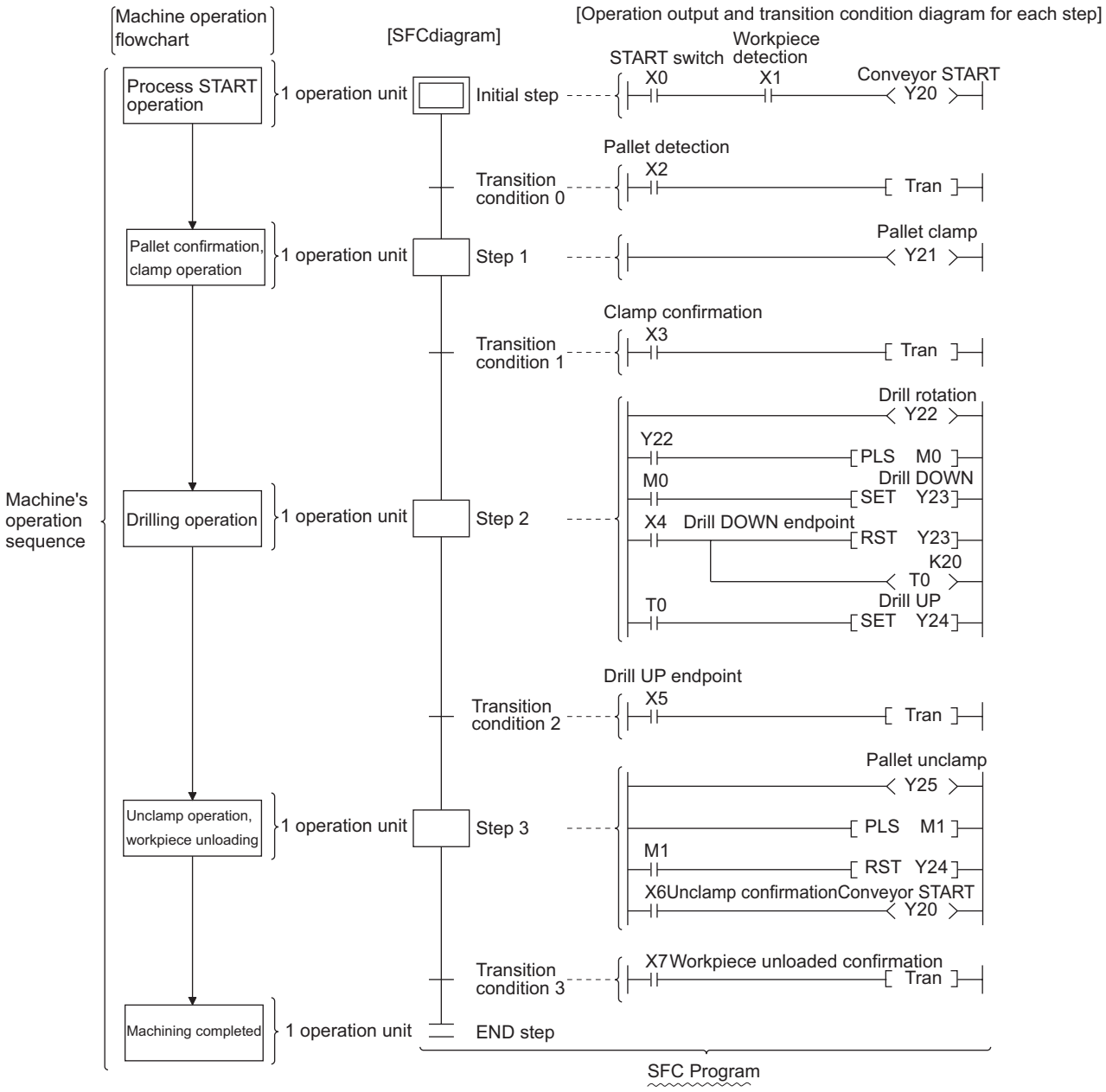
The SFC program consists of steps that represent units of operations in a series of machine operations.
In each step, the actual detailed control is programmed by using a ladder circuit.

The SFC program performs a series of operations, beginning from the initial step, proceeding to execute each subsequent step as the transition conditions are satisfied, and ending with the END step.

(1) When the SFC program is started, the "initial" step is executed first.

(2) Execution of the initial step continues until transition condition 1 is satisfied. When this transition condition is satisfied, execution of the initial step is stopped, and processing proceeds to the step which follows the initial step.

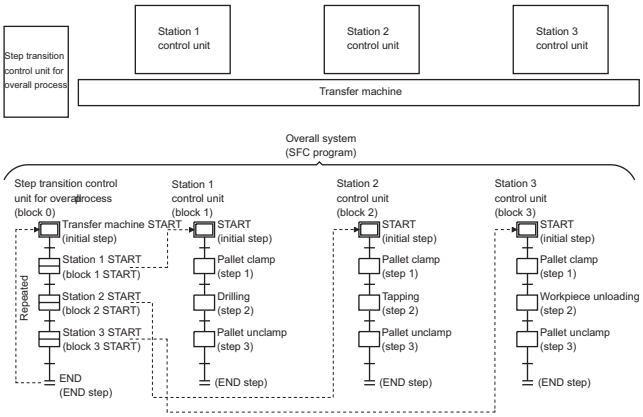
Processing of the SFC program continues from step to step in this manner until the END step has been executed.



SFC programs can be created with GX Developer.
Main features of SFC are explained below.

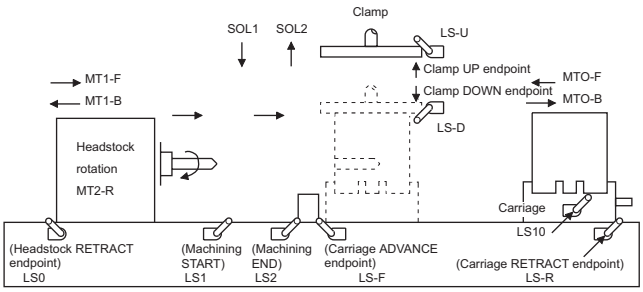
● Easy to design and maintain systems

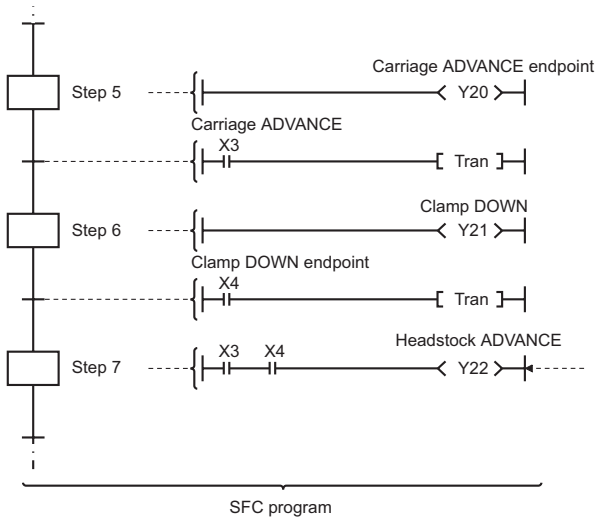
It is possible to correspond the controls of the entire facility, mechanical devices of each station, and all machines to the blocks and steps of the SFC program on a one-to-one basis. Because of this capability, systems can be designed and maintained with ease even by those with relatively little knowledge of sequence programs. Moreover, programs designed by other programmers using this format are much easier to decode than sequence programs.



● Requires no complex interlock circuitry

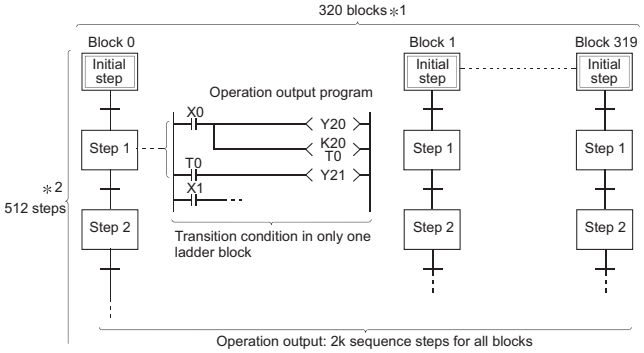
Interlock circuits are used only in the operation output program for each step. Because no interlocks are required between steps in the SFC program, it is not necessary to consider interlocks with regard to the entire system.





● Block and step configurations can easily be changed for new control applications

- A total of 320 blocks 1 can be created in an SFC program.
- A total of 512 steps 1 can be created in a block.
- Up to 2k sequence steps can be created for all blocks for operation outputs.
- Each transition condition can be created in only one ladder block.
  Reduced tact times, as well as easier debugging and trial run operations are possible by dividing blocks and steps as follows:
- Divide blocks properly according to the operation units of machines.
- Divide steps in each block properly.



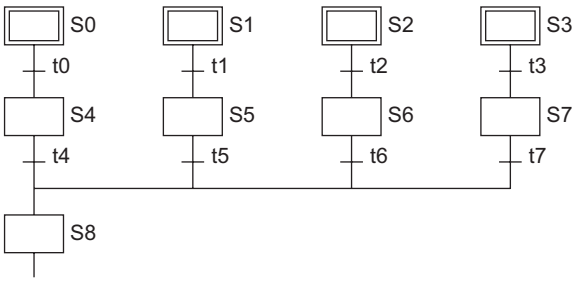
*1: 128 blocks for the Basic model QCPU.
*2: 128 steps for the Basic model QCPU.

● Creation of multiple initial steps is possible

Multiple processes can easily be executed and combined. Initial steps are linked using a "selection coupling" format.
When multiple initial steps (S0 to S3) are active, the step where the transition condition (t4 to t7) immediately prior to the selected coupling is satisfied becomes inactive, and a transition to the next step occurs. Moreover, when the transition condition immediately prior to an active step is satisfied, the next step is executed in accordance with the parameter settings.

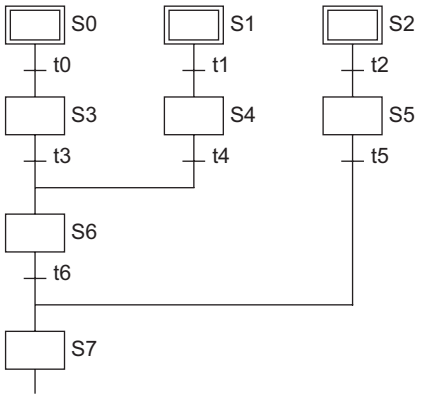
*: The Basic model QCPU cannot be selected in the parameter. It operates in the default "Transfer" mode.

- Wait ••••••••••••Transition to the next step occurs after waiting for the next step to become inactive.
- Transfer ••••••••Transition to the next step occurs even if the next step is active. (Default)
- Pause ••••••••••An error occurs if the next step is active.



Remark

Linked steps can also be changed at each initial step.

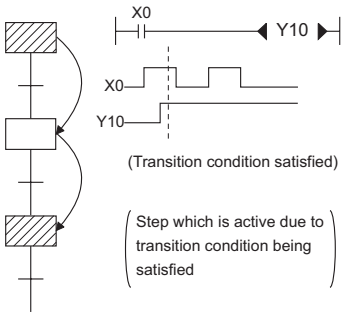


● Program design is easy due to a wealth of step attributes

A variety of step attributes can be assigned to each step. Used singly for a given control operation, or in combination, these attributes greatly simplify program design procedures.

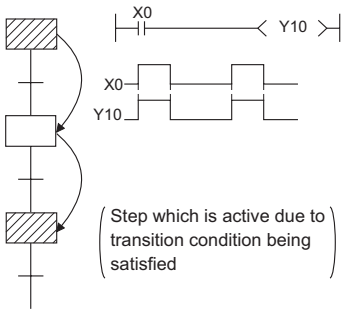
(1) Types of HOLD steps, and their operations

(a) Coil HOLD step (SC)



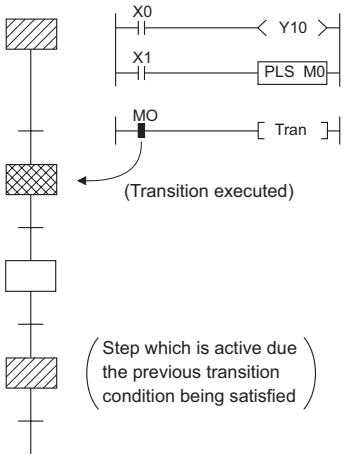
- After a transition, operation output processing continues (is maintained), and the coil output status at the time when the transition condition is satisfied is maintained regardless of the ON/OFF status of the interlock condition (X0).
- Transition will not occur even if the transition condition is satisfied again.
- Convenient for maintaining an output until the relevant block is completed (hydraulic motor output, pass confirmation signal, etc.).

(b) Operation HOLD step (no transition check) (SE)



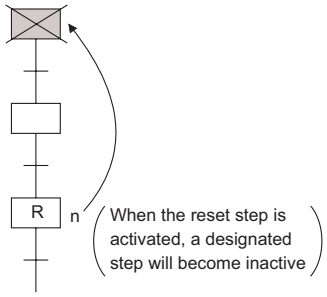
- Even after a transition, operation output processing continues (is maintained), and when the interlock condition (X0) turns ON/OFF, the coil output (Y10) also turns ON/OFF.
- Transition will not occur if the transition condition is satisfied again.
- Convenient for repeating the same operation (cylinder advance/retract, etc.) while the relevant block is active.

(c) Operation HOLD step (with transition check) (ST)



- Even after a transition, operation output processing continues (is maintained), and when the interlock condition (X0) turns ON/OFF, the coil output (Y10) also turns ON/OFF.
- When the transition condition is again satisfied, the transition is executed, and the next step is activated.
- Operation output processing is executed at the reactivated next step. When the transition condition is satisfied, transition occurs, and the step is deactivated.
- Convenient for outputs where there is an interlock with the next operation, for example where machining is started on completion of a repeated operation (workpiece transport, etc.).

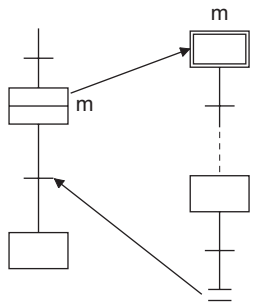
(2) Reset step (R n)



• When a HOLD status becomes unnecessary for machine control, or on selective branching to a manual ladder occurs after an error detection, etc., a reset request can be designated for the HOLD step, deactivating the relevant step.

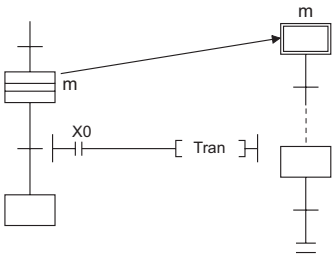
(3) Types of block START steps, and their operations

(a) Block START step (with END check) (m)



• In the same manner as for a subroutine CALL-RET, a START source block transition will not occur until the end of the START destination block is reached.
• Convenient for starting the same block several times, or to use several blocks together, etc.
• A convenient way to return to the START source block and proceed to the next process block when a given process is completed in a processing line, for example.

(b) Block START step (Without END check) (m)



• Even if the START destination block is active, a START source block transition occurs when the transition condition associated with the block START step is satisfied.
At this time, the processing of the START destination block will be continued unchanged until the end step is reached.

• By starting another block at a given step, the START destination block can be controlled independently and asynchronously with the START source block until processing of the current block is completed.

● A given function can be controlled in a variety of ways according to the relevant application

Block functions such as START, END, temporary stop, restart, and forced activation and ending of specified steps can be controlled by SFC diagram symbols, SFC control instructions, or by SFC information registers.

• Control by SFC diagram symbols
  •••••• Convenient for control of automatic operations with easy sequential control.

• Control by SFC instructions
  •••••• Enables requests from program files other than the SFC, and is convenient for error processing, for example after emergency stops, and interrupt control.

• Control by SFC information devices
  •••••• Enables control of SFC peripheral devices, and is convenient for partial operations such as debugging or trial runs.

Functions which can be controlled by these 3 methods are shown below.

Function	Control Method		
	SFC Diagram	SFC Control Instructions	SFC Information Registers
Block START (with END wait)	m	----	----
Block START (without END wait)	m	SET BLm	Block START/END bit ON
Block END	⊥	RST BLm	Block START/END bit OFF
Block STOP	----	PAUSE BLm	Block STOP/ RESTART bit ON
Restart stopped block	----	RSTART BLm	Block STOP/ RESTART bit OFF
Forced step activation	----	SET Sn	----
Forced step END	R n	RST Sn	----

(1) In cases where the same function can be executed by a number of methods, the first control method which has been designated by the request output to the relevant block or step will be the effective control method.

(2) Functions controlled by a given control method can be canceled by another control method.
Example:For block START

The active block started by the SFC diagram (m) can be forcibly ended by executing the SFC control instruction (RST BLm) before the END step (⊥) or by turning OFF the block START/END bit of the SFC information devices.

Performance Specifications

● Performance specifications of Basic model QCPU

Item		Q00JCPU	Q00CPU	Q01CPU
SFC program *2	Capacity	Max. 8k steps	Max. 8k steps	Max. 14k steps
	Number of files	Scannable SFC program: 1 file *1		
	Number of blocks	Max. 128 blocks (0 to 127)		
	Number of SFC steps	Max. 1024 steps for all blocks, max. 128 steps for one block		
	Number of branches	Max. 32		
	Number of concurrently active steps	Max. 1024 steps for all blocks (including Max. 128 steps for one block HOLD steps)		
	Number of operation output sequence steps	Max. 2k steps for all blocks No restriction on one step		
	Number of transition condition sequence steps	One ladder block only		

*1: Program management SFC program cannot be created.

*2: When creating SFC programs using a basic model QCPU, check the version of the CPU module and GX Developer.

● Performance specifications of High Performance model QCPU, Process CPU and Redundant CPU

Item		Q02CPU Q02HCPU	Q06HCPU	Q12HCPU Q12PH CPU Q12PRH CPU	Q25HCPU Q25PH CPU Q25PRH CPU
SFC program	Capacity	Max. 28k steps	Max. 60k steps	Max. 124k steps	Max. 252k steps
	Number of files	Scannable SFC program: 2 files (1 normal SFC program and 1 program execution management SFC program)*1			
	Number of blocks	Max. 320 blocks (0 to 319)			
	Number of SFC steps	Max. 8192 steps for all blocks, max. 512 steps for one block			
	Number of branches	Max. 32			
	Number of concurrently active steps	Max. 1280 steps for all blocks (including HOLD steps) Max. 256 steps for one block			
	Number of operation output sequence steps	Max. 2k steps for all blocks *1 No restriction on one step			
	Number of transition condition sequence steps	One ladder block only			
Step transition watchdog timer function		Provided (10 timers)			

*1: When "Peripheral" is selected for note editing with the operation output (Peripheral Note), up to 2k steps may not be secured for one block. When note editing is not performed or "Unite" is selected for note editing (United Note), up to 2k steps can be secured for one block.

Calculating the SFC Program Capacity

In order to express the SFC diagram using instructions, the memory capacity shown below is required. The method for calculating the SFC program capacity and the number of steps when the SFC diagram is expressed by SFC dedicated instructions is described in this section.

● Method for calculating the SFC program capacity

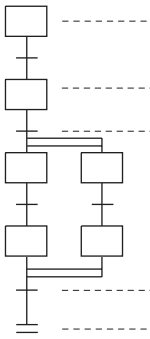
SFC program capacity = 2 + { 8 × (max. created block No.+1) } + (block 0 capacity)+(block 1 capacity)+¼+(block n capacity) / Number of blocks being used

- { 8 × (max. created block No.+1) } : SFC file header capacity
- 2 : SFC program START (SFCP) and END (SFCPEND) instructions

Capacity of blocks = 2 + { number of steps where SFC diagram is exparessed by SFC dedicated instructions } + (operation output total for all steps) + (total number of transition conditions)

- ※ As shown below
- 2 : Block START (BLOCK BLm) and END (BEND) instructions

*** Number of steps where SFC diagram is expressed by SFC dedicated instructions**



- Step(□, ⊟ ⊟)
  3 sequence steps (+) for step START (STEP□Sn) and END (SEND) instructions.
- Transition conditions (+)
  1) For serial transition or selective branching coupling
  4 sequence steps for transition START instruction (TRAN□TRn) and transition destination instruction (TSET Sn).
  2) For parallel branching
  Total number of steps for the transition START instruction (TRAN□TRn), and transition destination instructions (TSET Sn) for the number of parallel branches.
  3) For parallel coupling
  Total number of steps for the transition START instruction (TRAN□TRn), and the transition destination instructions (TSETSn) and coupling check instructions (TAND Sn) for the number of parallel branchings 1.
- Jump (↳) , end step (⊥)
  Calculated as step 0 because it is included in the previous transition condition.
- Operation outputs for each step: The capacity per step is as follows
- Total number of sequence steps for all instructions.
- Transition conditions: The capacity per transition condition is as follows:
- Total number of sequence steps for all instructions.

● Number of steps required for expressing the SFC diagram as SFC dedicated instructions

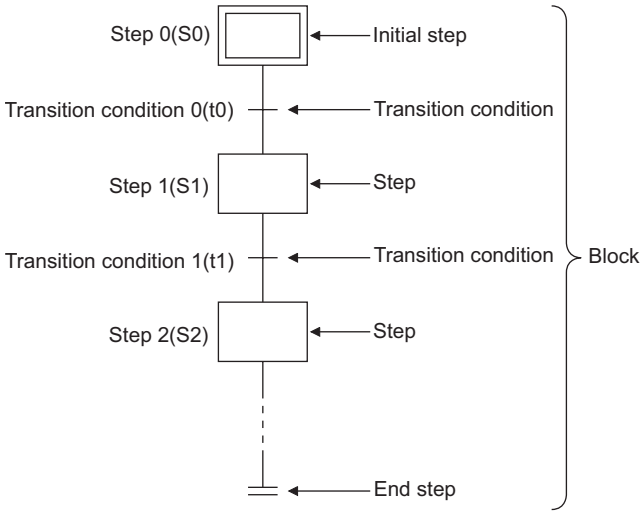
The following table shows the number of steps required for expressing the SFC diagram as SFC dedicated instructions.

Name	Ladder Expression	Number of Steps	Description	Required Number of Steps
SFCP START instruction	[SFCP]	1	Indicates the SFC program START	1 per program
SFCP END instruction	[SFCPEND]	1	Indicates the SFC program END	1 per program
Block START instruction	[BLOCK BLm]	1	Indicates the block START	1 per block
Block END instruction	[BEND]	1	Indicates the block END	1 per block
Step START instruction	[STEP□Si]	2	Indicates the step START ("□" varies according to the step attribute)	1 per step
Transition START instruction	[TRAN□TRj]	2	Indicates the transition START ("□" varies according to the step attribute)	1 per transition condition
Coupling check instruction	[TAND Si]	2	"Coupling completed" check occurs at parallel coupling	"[Number of parallel couplings] - [1]" per parallel coupling
Transition designation instruction	[TSET Si]	2	Designates the transition destination step	For serial transitions and selection transitions, 1 per transition condition; for parallel branching transitions, the number of steps is the same as the number of parallel couplings
Step END instruction	[SEND]	1	Indicates the step / transition END	1 per step

SFC program configuration

This chapter explains the SFC program symbols, SFC control instructions and SFC information devices that comprise an SFC program.

(1) As shown below, an SFC program consists of an initial step, transition conditions, intermediate steps, and an END step. The data beginning from the initial step and ending at the END step is referred to as a block.



(2) An SFC program starts at an initial step, executes a step following a transition condition in due order every time that transition condition is satisfied, and ends a series of operations at an end step.

(a) When the SFC program is started, the initial step is executed first.
While the initial step is being executed, whether the transition condition following the initial step (transition condition 0 (t0) in the figure) has been satisfied or not is checked.

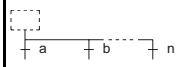
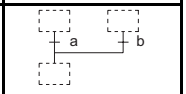
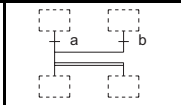
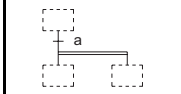
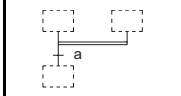
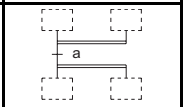
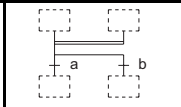
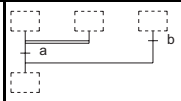
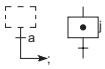
(b) Only the initial step is executed until transition condition 0 (t0) is satisfied.
When transition condition 0 (t0) is satisfied, the execution of the initial step is stopped, and the step following the initial step (step 1 (S1) in the figure) is executed.
While step 1 (S1) is being executed, whether the transition condition following step 1 (transition condition 1 (t1) in the figure) has been satisfied or not is checked.

(c) When transition condition 1 (t1) is satisfied, the execution of step 1 (S1) is stopped, and the next step (step 2 (S2) in the figure) is executed.

(d) Every time the transition condition is satisfied in order, the next step is executed, and the block ends when the end step is executed.

List of SFC Diagram Symbols

Class	Name		SFC Diagram Symbol	Remarks
Step	Initial step	When step No. is "0"	□ 0	Any of these steps in 1 block *: Initial step at top left (column 1) of SFC diagram is fixed to No. 0. n = reset destination step No.
	Dummy initial step		⊠ 0	
	Coil HOLD initial step		SC 0	
	Operation HOLD step (without transition check) initial step		SE 0	
	Operation HOLD step (with transition check) initial step		ST 0	
	Reset initial step		R 0 Sn	
	Initial step	When initial step No. is other than "0"	□ i	Up to 31 steps in 1 block. i = step No. (1 to 511) n = reset destination step No.
	Dummy initial step		⊠ i	
	Coil HOLD initial step		SC i	
	Operation HOLD step (without transition check) initial step		SE i	
	Operation HOLD step (with transition check) initial step		ST i	
	Reset initial step		R i Sn	
	Step	Steps other than "initial" step	□ i	Up to 512 steps in 1 block, including initial step (128 steps for Basic model QCPU) i = step No. (1 to 511) n = reset destination step No. m = movement destination block No.
	Dummy step		⊠ i	
	Coil HOLD step		SC i	
	Operation HOLD step (without transition check)		SE i	
	Operation HOLD step (with transition check)		ST i	
	Reset step		R i Sn	
	Block START step (with END check)		i BLm	
	Block START step (without END check)		i BLm	
	End step			More than one step can be used in 1 block.

Class	Name	SFC Diagram Symbol	Remarks
Transition	Serial transition		a, b = Transition condition No.
	Selection branching		
	Selection coupling		
	Selection coupling - parallel branching		
	Parallel branching		
	Parallel coupling		
	Parallel coupling - parallel branching		
	Parallel coupling - selection branching		
	Selection branching - parallel branching		
	Parallel coupling - selection coupling		
	Jump transition		a = Transition condition No. j = jump destination step No.

1.5.3 ST program

ST is a kind of program (structured text programs) written in ST language.

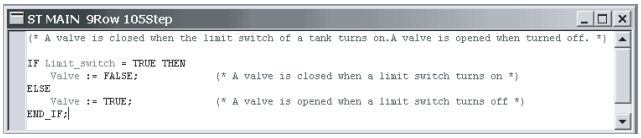
The ST language is defined in the International Standard IEC61131-3 that stipulates the logic description system in open controllers.
The ST language supports operators, control syntaxes and functions to permit the following descriptions.

- Control syntaxes such as conditional statement-dependent selective branch and repeated statement-based repetition
- Expressions using operators (*, /, +, -, <, >, =, etc.)
- Call of user-defined function blocks (FB)
- Call of functions (MELSEC functions, IEC functions)
- Description of comments

The main features of the ST language are as described below.

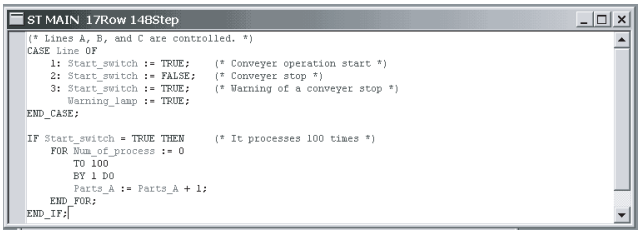
● Free description in text format

The ST language is described in text format of alphanumeric characters, comments and labels.



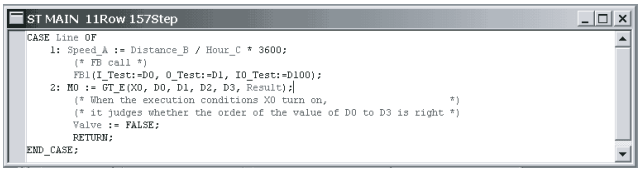
● Programming on the same level as those of the C and other high-level languages

Like the high-level languages such as C, the ST language can describe control with control syntaxes such as conditional statement-dependent selective branches and repeated statement-based repetitions. Hence, easy-to-read programs can be written briefly.



● Ease of describing operation processings

Capable of briefly describing easy-to-read operation processings that are difficult to describe in lists or ladders, the ST language has a high level of program readability and is suitable for the fields where complex arithmetic operations, comparison operations, etc. are performed.



ST programs can be created with GX Developer.
Main features of ST program are explained below.

● Design efficiency improved by defining processings as parts

With often used processings defined as parts in the form of function blocks (FB) in ST language, they can be used in necessary areas of each program. This not only enhances the efficiency of program development but also reduces program mistakes, improving program quality.

● Restoration of ST program read from PLC

In the MELSEC-Q series, the created ST program is written to the PLC and executed, and can be read from the PLC and then restored to enable editing in the ST language format.

● Program change during system operation (online change)

Part of a running program can be changed without the PLC CPU being stopped.

● Connection with other language programs

Since the MELSEC-Q series also supports languages other than the ST, the language adequate for processing can be used to create efficient programs.
Execution conditions can be set on a file basis in each program, and multiple program files can be written to a single PLC CPU. Multiple languages support widespread application under optimum control.

● A wealth of functions group

The MELSEC functions compatible with various common instructions for the MELSEC-Q series and the IEC functions defined in IEC61131-3 are available for ST programs in the MELSEC-Q series.

Handling of characters and numeric values in st programs

● Usable Characters

The ST language is a programming language described in text format.
It can be described as in document editing using a general text editor, but the grammar and usable characters and symbols have been defined.
The following characters can be used in ST programs.

Character Type	Locations of Application				Character Examples
	Program statement	Comment	Character string	Label	
Alphanumeric characters	○	○	○	○	ABC, IF, D0
Symbols + - * / = < > [ ] ( ) . , _ : ; $ # " ' { }	○	○	△	×	(D0 * D1)
Space	×	○	○	×	
Line feed code	○	○	×	×	
TAB code	○	○	×	×	

The characters used in ST programs can be classified as indicated below.

Classification		Description	Example
Label name		Character string defined as desired by the user. It includes a function block name, array name, structure name, etc.	Switch_A
Constant		Value written directly to a program. (Integer, real number, character string, etc.)	123,"abc"
Comment		Commentary statement that is not the processing target of control in a program.	(* Turns ON *)
Reserved word	Data type name	Word that represents a data type.	BOOL, DWORD
	Control syntax	Word whose meaning has been defined grammatically for use as a control syntax.	IF,CASE,WHILE, RETURN
	Device name	Data name for MELSEC PLC	X,Y,M,ZR
	Function name	MELSEC function/IEC function name already defined.	OUT_M REAL_TO_STR_E
Operator		Character code whose meaning has been defined for an expression or assignment statement.	+ - < > =
Delimiter		Character code whose meaning has been defined to clarify a program structure.	; ( )
Other symbols		Code for putting a layout in order.	Space Line feed code, TAB

● Data Handling

The following data types can be used in ST programs.

Data Type	Definition	Range	Type in Ladder	Type in C Language
BOOL	Boolean type	TRUE• FALSE, 1•0*1	Bit	bool
INT	Integer type		Word	signed short
DINT	Double precision integer type		Double word	signed long
REAL	Real number type	-3.402823^{+38} to -1.175495^{-38},0.0, $+1.175495^{-38}$ to $+3.402823^{+38}$	Real number	float
STRING	Character string type	Up to 50 characters can be defined.	Character string	char
ARRAY	Array data type	Depends on the data type of the specified element.	Array	char[ ], etc.
STRUCT	Structured data type	Depends on the data type of the specified element.	Structure	struct

*1: K0, K1, H0 and H1 for specification of K and H cannot be used as the BOOL type.

● Array and structure

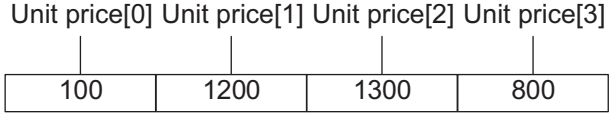
In ST programs, arrays and structures can be used as data. Arrays and structures are data having a structure that can be handled as one block in a program when their elements are defined with local or global labels before use.

(1) Array

same type.
For an array in an ST program, each element can be referred to individually by specifying its element number within [ ] after the variable (label) name defined for the array type.
The specification numbers of the array elements are counted from 0.

[Format]
Array name[specification number of array element]

[Image diagram]
When a word type array having four elements is set to have the array name of Unit price, the specification numbers of the array elements are 0, 1, 2, 3.



For a word type array, word data enters each array element.

[Description example]
Unit price [0] := 100;(* 10 is assigned to the first element of the array *)

(* 1200 is assigned to the second element of the array using device D1 *)

D1 := 1;
Unit price[D1] := 1200;

Data type INT can be used as the specification number of the array element.

(*Unit price [0] + Unit price [1] is assigned to the third element of the array *)
Unit price [2] := Unit price [0] + Unit price [1];

pen1 := 3;
Unit price[pen1] := 800;

A label can be used as t he specification number of the array element.

POINT

1. Precaution for use of the specification numbers of the array elements
   When an array has n elements, the specification numbers of the array elements are 0 to n-1. Hence, if n or more is specified, an error will occur at the time of conversion.
   Example: When an array has four elements
   Unit price [4]: = 100; ← Error occurs.
2. Precaution for use of arrays in the specification number of the array element
   Arrays can be used in the specification number of the array element. Up to five arrays can be nested. Using 17 or more arrays will result in a conversion error.
   Example: When five arrays are nested
   Unit price [Unit price [Unit price [Unit price [Unit price [D1]]]]] = 100;
3. Precaution for setting the specification number of the array element
   Since there is a possibility that the data of the other devices may be corrupted, be careful so that the value specified as the array element number does not exceed the number of array elements.
4. Precaution for setting the number of array elements
   Enter the number of elements on the global (local) variable setting screen. The number of elements that can be entered is 256.

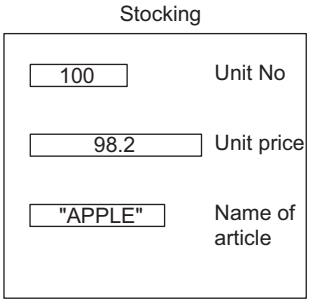
(2) Structure

A structure is a data type defined by combining the data of any types.
Each element can be referred to individually by describing the element name after the variable (label) name defined for the structure type, with a period (.) placed between them.
The element name is also called a member variable.

[Format]
Structure name.structure element name

[Image diagram]
When the setting is as follows
Structure name stocking
Structure element:

One word type Structure element name Unit No
One real number type Structure element name unit price
One character string type Structure element name name of article



[Description example]
(* 100 is assigned to structure element Unit No *)
Stocking.Unit No := 100;

(* 98.2 is assigned to structure element Unit price *)
Stocking.Unit price := E98.2;

(* "APPLE" is assigned to structure element Name of article *)
Stocking.Name of article := "APPLE";

POINT

Precaution for use of the member variables of a structure
The number of members that can be entered on the structure variable setting screen is 128.

● Data Representation Methods

Constants, labels and devices can be used as data in ST programs.

Item	Description	Representation Example
Constant	Numeric value or character string data written directly to a program. It does not change during program execution.	123, "ABC"
Label	Data whose type and name are defined by the user.	Switch_A
Device	Device used by the MELSEC PLC. It is identified by the device name and device number.	X0,Y0,D100, J1\X0

(1) Constants

Each constant is represented as described below in ST programs.

Data Type	Numeric Notation	Representation Method	Example
BOOL	----	TRUE •VEFALSE 1•0	M0 := TRUE;
	Binary	The used binary number is preceded by "2#".	2#0,2#1
	Octal	The used octal number is preceded by "8#".	8#0,8#1
	Hexadecimal	The used hexadecimal number is preceded by "16#".	16#0,16#1
INT DINT	Binary	The used binary number is preceded by "2#".	D0 := 2#110;
	Octal	The used octal number is preceded by "8#".	D0 := 8#377;
	Decimal	The used decimal number is preceded by "10#". (The numeric value may be preceded by "K".)	D0 := 123; D0 := K123;
	Hexadecimal	The used hexadecimal number is preceded by "16#". (The numeric value may be preceded by "H".)	D0 := 16#FF; D0 := HFF;
REAL	----	The used real number is directly input. (The numeric value may be preceded by "E".)	ABC := 2.34; Rtest := E2.34;
STRING	----	A character string is enclosed by ' ' (or " ").	Stest := 'ABC'; Stest := "ABC";

(2) Labels

In ST programs, labels can be used with data.
When labels are used in an ST program, label declaration must be made on the local variable setting screen or global variable setting screen before use.
Label representation examples in ST programs are as follows.

```
Example:  Switch_A:= FALSE;
(* FALSE is assigned to Switch_A. *)

Example:  IF INT_TO_BOOL(Unit_No) = FALSE THEN
Line_No := 2147483647;
END_IF;
(* IF INT_TO_BOOL (Unit_No) is FALSE *)
(* 2147483647 is assigned to Unit_Number. *)

Example:  Limit_A := E1.0;
(* 1.0 is assigned to Limit_A *)

Example:  Conveyor[4] := Unit_No;
(* The value of Unit_No is assigned to *)
(* the fifth element of Conveyor. *)

Example:  stPressure.Status := TRUE;
(* TRUE is assigned to *)
(* element name Status of stPressure. *)

Example:  stPressure.eLimit := E1.0;
(* 1.0 is assigned to *)
(* element name eLimit of stPressure. *)
```

POINT

1. Precaution for use of the pointer type, timer type, counter type and retentive timer type labels
   The pointer type, timer type, counter type or retentive timer type label can be declared, but if it is used in an ST program as a label, a conversion error will occur and the label cannot be used.
2. Precaution for use of the timer type, counter type and retentive timer type labels
   If the timer type, counter type or retentive timer type label is defined in the member variable of a structure, that member variable cannot be used on the ST edit screen. However, the other member variables of a structure that include the timer type, counter type and retentive timer type labels can be used.

(3) Devices

In an ST program, MELSEC devices can be used by directly describing them without labels being used. Devices can be used in the left and right members of an expression and the argument, return value, etc. of a function.

```
[Description example]
M0 := TRUE;(* M0 is turned ON. *)

IF INT_TO_BOOL(D0) = FALSE THEN
(* If INT_TO_BOOL(D0) is FALSE *)
W0 := 1000;
(* 1000 is assigned to W0. *)
END_IF;
```

The following three methods can be used as the device modification and specifying methods.
These can be used in the same usage as when devices are used in ladder programs.

(a) Index modification
(b) Bit No. specification
(c) Digit specification

ST program expressions

● Assignment Statement

An assignment statement has a function to assign the result of an expression in the right member to a label or device in the left member.
In the assignment statement, the result of the expression in the right member must be equal to the data type in the left member. If they are different, a conversion error will occur.

[Description example]
When actual device is used
D0 : = 0;
When this expression is executed, a decimal number of 0 is assigned to D0.

When label is used
When the character string type label of Stest is used
Stest : = "APPLE";
When this expression is executed, character string "APPLE" is assigned to Stest.

☒POINT

1. Precaution for assigning a character string
   A character string of up to 32 characters can be assigned. A conversion error will occur if a character string of more than 32 characters is assigned.
2. Precaution for use of a device in the left member of an assignment statement
   The TS, TC, STS, STC, CS, CC, BL, DX, BL☐/S☐ , or BL☐/TR☐ device cannot be used in the left member of an assignment statement. A conversion error will occur if any of the above devices is used in the left member.

● Operators

The following table lists the operators used in ST programs and indicates the priorities at the time of operation execution.

Operator	Description	Priority
( )	Parenthesis expression	Highest
Function( )	Function parameter list	
**	Exponent (exponentiation) tei**shisuu	
NOT	Boolean complement (Bit inverted value)	
* / MOD	Multiplication Division Modulus operation	
+ -	Addition Subtraction	
<,>,<=,>=	Comparison	
= <>	Equality Inequality	
AND,&	Logical product	
XOR	Exclusive logical add	
OR	Logical sum	Lowest

When the priorities are the same, evaluation is made from the left-hand side to the right-hand side operators.

The following table lists the operators, applicable data types and operation result data types.

Operator	Applicable Data Type	Operation Result Data Type
*, /, +, -	ANY_NUM	ANY_NUM
< , >, <=, >=,=, <>	ANY_SIMPLE	BOOL
MOD	ANY_INT	ANY_INT
AND, &, XOR, OR, NOT	ANY_BIT (*1)	ANY_BIT (*1)
**	ANY_ REAL (base) ANY_NUM (exponent)	ANY_REAL

(*1) Except the label and constant (negative range).

☒POINT

1. Precaution 1 for use of operator
   A conversion error will occur if the applicable data in the right member of an operator is not the same in data type as the applicable data in the left member.
2. Precaution 2 for use of operator
   The number of used operators that can be described in a single expression is up to 1024. A conversion error will occur if 1025 or more operators are used.

● Control Syntaxes

Conditional statements and repeat statements are available for ST programs to perform comparison and repetition.

Conditional statement: When a certain condition is satisfied, the selected statement is executed.
Repeat statement: One or more statements are executed repeatedly according to the state of a certain variable or condition.

The following table lists the control syntaxes.

Conditional statement	IF conditional statement
	CASE conditional statement
Repeat statement	FOR ... DO syntax
	WHILE ... DO syntax
	REPEAT ... UNTIL syntax
Other control syntaxes	RETURN syntax
	EXIT syntax

☒POINT

Precaution for use of a hierarchy for a control syntax
A hierarchy of up to 16 levels is enabled for a control syntax. A conversion error will not occur if 17 or more levels are used. However, since a deep hierarchy may make a program difficult to understand, it is recommended to program a hierarchy up to 4 or 5 levels at the deepest.

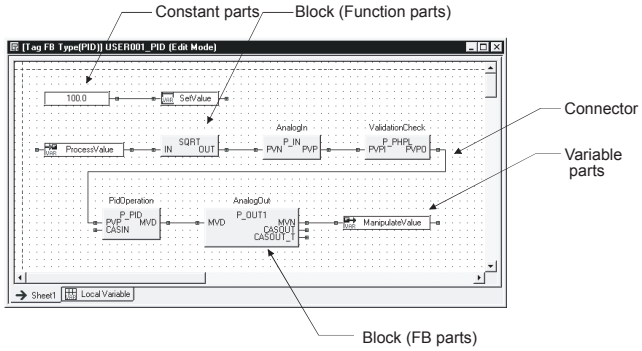
1.5.4 FBD program

The PX Developer programming tool enables the user to create FBD programs on Process CPUs and Redundant CPUs.

(1) To create a program with the programming tool, use the FBD language, which is the compliant language specified in IEC61131-3.
Note that FBD programs are written in the FBD language.

(2) The FBD language is a visually understandable graphic language.
To perform programming, the FBD language connects blocks that performs a specified task (function parts, FB parts), variable parts, and constant parts together according to flow of data or signals.
The blocks are reusable and can be used anywhere in a program. Also, they can be made with user-definition.

(Example) Example of FBD program



A block diagram connected as shown above can be compared with the diagram of an electrical circuit. In FBD programs, data flows from the output of a block, variable part, and constant part to the input of another block or variable part.

(3) Parts that configure a FBD program are called FBD parts. Users use these FBD parts to perform programming.

FBD part name	FBD part drawing	Description
Function part	SQRT IN OUT	Indicates execution of a function. The left pin shows input and the right pin output. The upper center in the part shows a function name.
FB part	PidOperation P_PID PVP MVD CASIN	Indicates execution of a FB. The left pin shows input and the right pin output. The upper center in the part shows a model name of a FB, and above the part shows a variable name of a FB. *For a module FB, an module model name is shown in the lower center of a part.
Variable part	ProcessValue	Indicates a variable. This part obtains and stores values. The middle center shows a variable name.
Constant part	3.141592	Indicates a constant. This part directly sets values or character strings to a part. Set constant values are shown in the middle center of a part.
Connection line		Indicates a data flow. This line connects parts and passes data from left to right. To use these connection lines, data type on the left must corresponds with that on the right.
Comment part	Comment	Indicates user-made comments. This part does not have influences on an execution code of compiling results. (does not have influences on FBD programs.)

(4) The FBD language allows users to easily create DDC programs, on which ladder programs required users to do large task. This language realizes more efficient production.

(5) PX Developer provides the computing control dedicated instructions for QnP(R)HCPU and various loop function blocks incorporating tag data (tag FB).
The FBD programs consisting of the above parts realizes reduced work steps for creating a DDC program.

(6) Variables used in a FBD program are automatically assigned to PLC devices. So, no manual assigning task is needed.

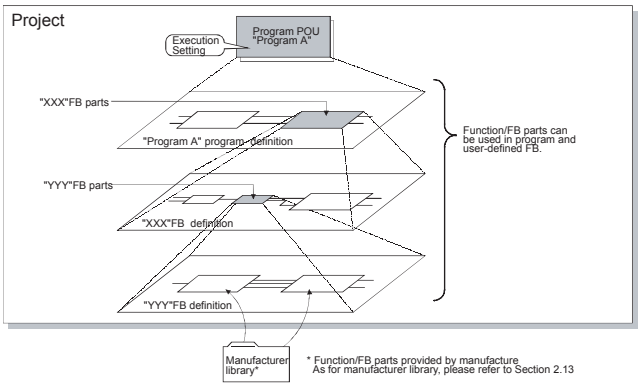
(7) In a system such as a batch system providing both sequence control and loop control, it is possible to simultaneously execute a ladder program, which is suitable for sequence control, and a FBD program, which is suitable for loop control, together on a single QnP(R)HCPU.

Program organization unit

The factors that configure a FBD program is called Program Organization Unit (hereinafter POU).
Types of POU are program, FB, and function.

● Layered structural design of FBD program

FBD program is comprised of layers of POUs.



(1) When a user creates a program in FBD language so as to make a QnP(R)HCPU perform the desired processing, it is necessary to define the processing in a FBD programs after writing one or more FBD programs. To define the processing, use combinations of FB components, function components, and so on.

(2) Users can define FB components used in a FBD program, and these user-defined FB components can be used along with previously defined FB components or function components.

(3) The POU of the lowest layer is a manufacturer-provided function, FB, or tag FB.

(4) A project manages all the user-defined factors (POU definition, structure definition, global variables, etc.), which are necessary to convert a FBD program into a ladder program which is executable by QnP(R)HCPU.

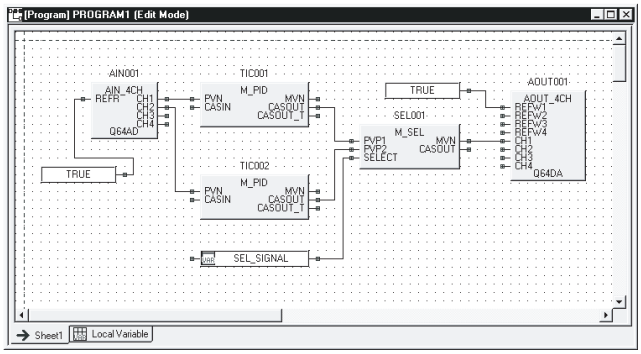
● Program

(1) A program is a definition of the processing executed by a QnP(R)HCPU. The definition is made by combining functions, FBs, etc., which are stated later.
A program is at the highest position in the layer of FBD program components.

(2) A program performs processing based on the execution condition specified in the program execution settings on the programming tool.

(3) Up to 200 programs can be created in the project.

(ex.) Program editorial window



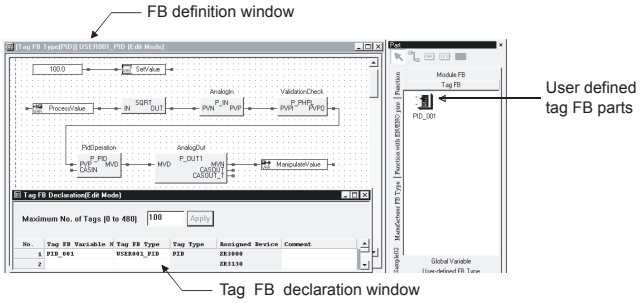
● FB

(1) FB have internal memory and perform control according to input and the internal memory.
This component is necessary for control using user-defined FB components or program.

(2) A FB is named with a variable for use.
A FB component with a variable name independently performs control.

(3) Both user-defined and manufacturer-provided FB components are available.

(ex.) User-defined tag FB



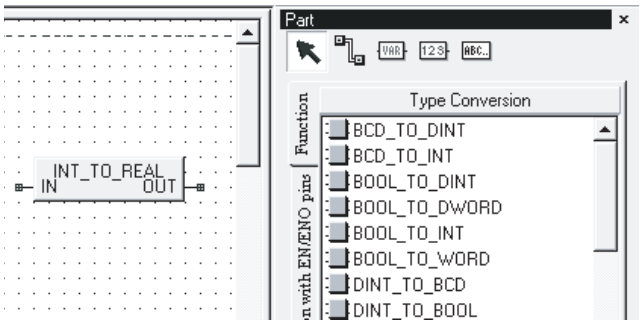
● Functions

(1) Functions perform control processing on an input.
They are components for performing control processing by using programs or user-defined FB components.

(2) Functions perform the same operation to the same input, as they do not have internal memory.
Function components do not need to have variable names and can operate independently.

(3) Function components must be provided from manufacturer. They cannot be defined by users.

(Function component diagram)



Definition of POU interface

POU interfaces include two types; input variables and output variables.

● Input variables and output variables

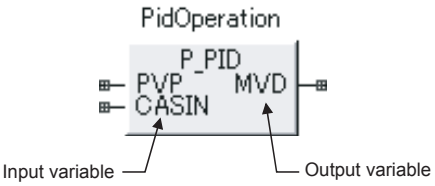
(1) Programs

Programs are located at the top of the POU layer configuring the FBD program and do not exchange parameters. Therefore they do not have input variables or output variables.

(2) Function/FB

Function/FBs have input variables and output variables. (Note, however, that some function/FB components do not have input variables or output variables.)

- Input variable: Variable that receives data when processing is executed by function components or FB components
- Output variable: Variable that passes the result of processing executed by function components or FB components



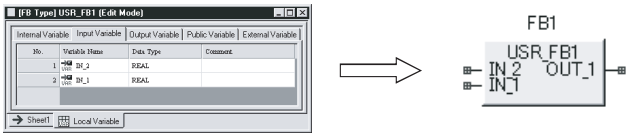
● Definition of input variables and output variables in user-defined FB/tag FB components

Input variables and output variables can be defined using user-defined FB/tag FB components.

(1) The FB definition window allows defining variable components, whose variable type is input variable or output variable, to use input and output variables.

(2) Inserted input variables and output variables are automatically reflected on the local variable sheet. The order of the variables on this sheet corresponds to the assignment of I/O pins of user-defined FBs/tag FBs.

(Example) Definition of input variables and output variables for user-defined FB components



The arrangement of input/output pins on user-defined FB/tag FB parts is corresponding to the column order of input and output variables on the local variable sheet.

Definition of POU processing

POU processing can be defined by creating a block diagram on the FBD sheet shown on the program/FB definition window. POUs available for user-definition are programs and FBs (including tag FBs).

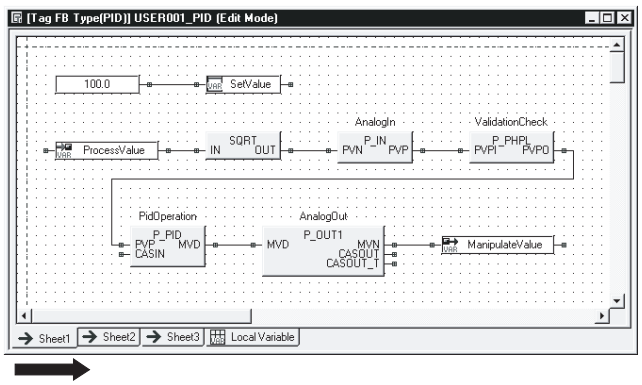
● Programming POU definition

To program a POU definition, first FBD components including insert manufacturer-provided functions/FB components, user-defined FB components, variable components, etc. onto the FBD sheet, and second connect them each other according to control operation.

● For FBD sheet

FBD sheet means a work area where the user insets FBD components and connects them.
When writing a POU definition in FBD language, it is available to add maximum 32 FBD sheets to confirm the written contents more easily and certainly.
When a program is created on several FBD sheets, the processing starts from a left tab to a right tab.

(Example) Processing of POU (User-defined FB)



POU processing is executed from the left tag FB sheet to the right tag FB sheet.

Compiling FBD program

FBD programs can be compiled with a programming tool to the codes (such as a ladder program, PC parameter), which can be executed by QnP(R)HCPUs.
For compiling, the cold start compiling, the hot start compiling, and during RUN write compiling are available.

● Cold start compiling

The cold start compiling cancels assigned devices of existing variables and assign them again from the beginning. (Values of variables return to default.))
To compile a FBD program, the cold start compiling must be performed first.
QnP(R)HCPUs stop operating when the PC write is performed after the cold start compiling. With a QnP(R)HCPU at stop, FBD programs and user ladders stop operation and all outputs (Y) are turned off. Analog outputs can be retained. (Settable on the module side.))

● Hot start compiling

The hot start compiling can be executed without changing assigned devices of existing variables. (Values of variables are to be retained.))
This compiling is suitable for the case of which is the need for modifying or adding processing by using a FBD program, with the current status kept during operation.
QnP(R)HCPUs pause operating when the PC write is performed after the hot start compiling. With a QnP(R)HCPU at pause, FBD programs and user ladders stop operation, and all outputs (Y) returns to the state prior to the pause. Analog outputs can be retained. (Settable on the module side.))

● During RUN write compiling

The during RUN write compiling enables compiling without changing assigned devices of existing variables, and allows QnP(R) HCPU not to stop or pause while the during the RUN write is performed.
This compiling is suitable for the case of which is the need for modifying or adding processing using a FBD program without stopping system. (Values of variables are to be retained as the case of the hot start compiling.))

Local variables and global variables

The local variables are variables that are declared in each FBD program (program, user-defined FB type/tag FB type), and can be used in the FBD program only.
The global variables are variables that are declared in the global variable declaration window of the programming tool, and can be browsed from all FBD programs in PX Developer's project to use.
Each FBD program browses global variables via external variable, which are declared as local variables.
The global variables enables exchanging data with other FBD program.
Up to 32000 global variables can be defined.

Basic data type

Data type	Description	Range
INT	Integer with 16-bit code	-32768 to 32767
DINT	Integer with 32-bit code	-2147483648 to 2147483647
REAL	32-bit real value (Floating-point number)	$\pm1.17549^{-38}$ to $\pm3.40282^{+38}$, 0
STRING	Variable-length string	0 to 255bytes
BOOL	1-bit data	TRUE,FALSE
WORD	16-bit data	0_H to $FFFF_H$
DWORD	32-bit data	0_H to $FFFFFFFF_H$
ADR_REAL	Used when tracking via cascade connection	----

Structure type

A structure consists of up to 255 basic data type variables, and is suitable for grouping variables relevant each other.
A structure can handle variables that differ from each other in their basic data type. Note, however, that declarable data type is basic data type only. Structure type and FB type cannot be declared.

Constant

Constants do not have specified data types at the beginning. The data type is defined according to the data type of the input variable for function components/FB components, which are connected with the constant component via a connection line. The following shows possible basic data types according to the input format of constants.

Input format *1	INT	DINT	REAL	WORD	DWORD	STRING	BOOL *2	Display format example
Character string	-	-	-	-	-	○	-	"ABC"
Decimal integer	○	○	○	○	○	-	○	100
Hexa-decimal integer	○	○	-	○	○	-	○	H123A
Real value	-	-	○	-	-	-	-	(Displayed in radix point) 100.0 / (Displayed in exponential form) 2E+010
True/ false	-	-	-	-	-	-	○	TRUE

○ :Available -:Not available

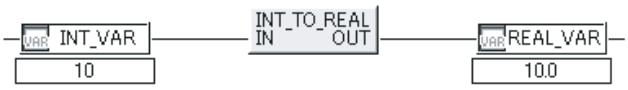
*1 The following shows input formats.
Character string: String of up to 32 characters with double-quotation " "
Decimal integer: Numerical vales consisting of codes (+, -) and numbers
Hexadecimal integer: Numerical values starting with "H" and consisting of alphabets of "A" to "F"
Real value: Numerical values consisting of arithmetic point indication (e.g.:100.0) or index indication (e.g.: "E+010)
True/false: "TURE" or "FALSE"

*2 TRUE and FALSE of BOOL type are input as follows.
Decimal integer0:FALSE, 1:TRUE
Hexadecimal integerH0:FALSE, H1:TRUE

Funciton

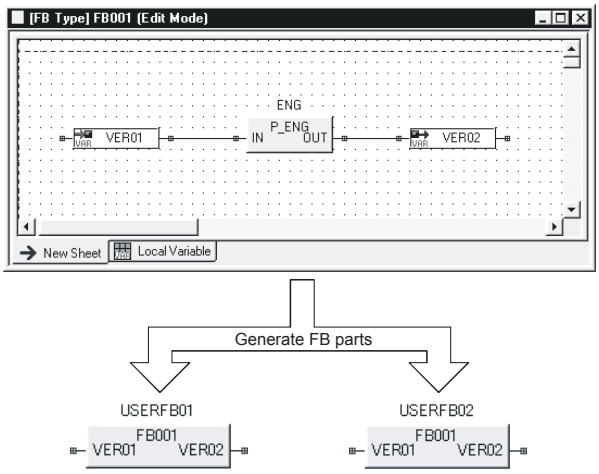
Functions always perform the same operation on input values provided by input variables, and outputs the operation result from output variables. Functions do not have internal memory.

(Example) Type conversion function (INT_TO_REAL)
When 10 in INT type is input, 10.0 in REAL type is output.



FB

FBs are used with a variable name on each component.
Each of FB with a variable name has internal memory, and performs operation according to the internal memory and the input value from input variables. After that, FBs output the result of operation from output variables.
FBs differ from functions in that FBs do not cause to a compiling error even if they have input pins that are not connected with other FBD components via a connection line.



USERFB01 and USERFB02 both perform the processing defined by user as "FB001".
USERFB01 and USERFB02 work separately by using internal memories.

Tag

Tags are identifiers attached on each DDC processing in process control systems. Tag-indicated information involving DDC processing is called tag data. Using tag FBs enables easy installation of tags.
By monitoring tag data inside the tag FB components using monitor tool, status of DDC processing can be monitored.
The device area of QnP(R)HCPU contains the tag data area having the maximum tag data quantity, which is set in the tag FB declaration window of programming tool. The head device address of each tag FB's tag data is fixed.

Module FB

Module FBs perform I/O processing on data from modules, which are connected with PLC base units.
Module FB allows users to create programs for data transmission/reception without consideration to X/Y devices of data I/O from modules and buffer memory addresses.
The following shows module models that can be used with programming tool.

Type		Compatible module model
Digital I/O module		QX10, QX28, QX40, QX40-S1, QX41, QX42, QX70, QX71, QX72, QX80, QX81, QX82, QX82-S1, QY10, QY18A, QY22, QY40P, QY41P, QY42P, QY50, QY68A, QY70, QY71, QY80, QY81P, QH42P, QX48Y57
Analog module		Q64AD, Q68ADV, Q68ADI, Q62DA, Q64DA, Q68DAV, Q68DAI, Q64AD-GH, Q62AD-DGH, Q62DA-FG
Temperature input module		Q64TD, Q64RD, Q64RD-G, Q64TDV-GH
Counter module		QD62, QD62E, QD62D, QD60P8-G
Remote module via CC-Link master module*1	Master module	QJ61BT11, QJ61BT11N
	For remote I/O station	CC-Link remote general-purpose (Occupying 1 to 4 stations)
	For remote device station	CC-Link remote general-purpose (Occupying 1 to 4 stations)

*1:Not compatible with CC-Link Ver.2

1.5.5 Label program

■ Label program

Using labels for programming allows users to standardize programs.

Label programming improves efficient designing.

- General programs created with the label programming allow device assignment numbers to be changed according to the device configuration, therefore can be easily used in another program.
- Using labels allow creating programs even when device configuration is not defined.
- When device configuration is defined, execution programs can be easily created simply by associating the labels with actual devices
- The user can simply specify the label assignment method to assign device automatically with compile operation without considering the device name/number.
- Using label names to monitor/debug programs is possible. This improves efficiency of debugging.

Precautions for using label programs

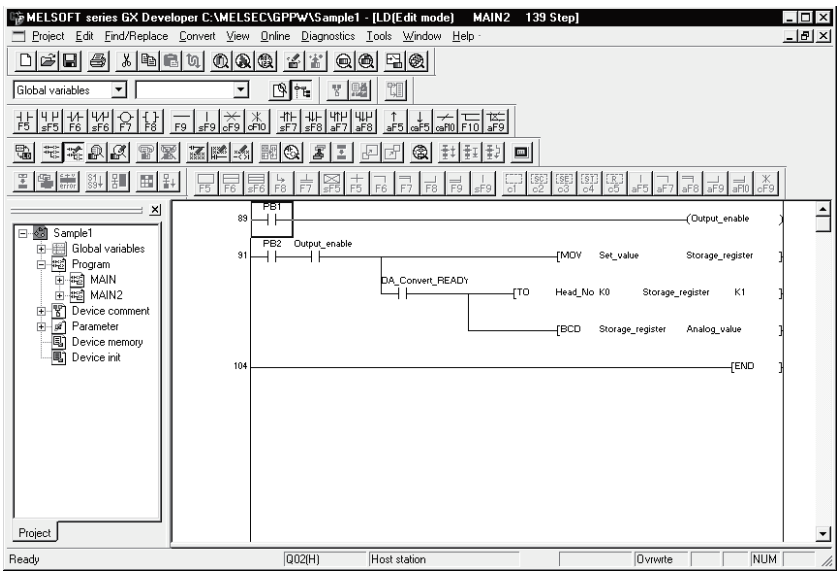
(1) Labels cannot be used for SFC, MELSAP-L.

(2) Device comments display the comments that are set in the global variable/local variable setting screen.
Comments created in the device comment batch editing screen are not displayed.
Settable characters are up to 64 characters while characters that can be displayed are up to 32.

(3) When the same label is set to both the global variable and local variable, the local variable has priority on the label comment.

(4) Using labels disables index modification.
To perform index modification, specify an actual device for the target device.

Label program



Global variable: Label variables that become valid when two or more label programs are created in a project.

Local variable : Label variables that are valid in each label program only. One local variable is set for one label program.

1.5.6 Function block

The FB is a function designed to convert a ladder block, which is used in a sequence program repeatedly, into a component (FB) to utilize it in the sequence program.
This not only increases the efficiency of program development but also reduces programming mistakes to improve program quality.

GX Developer can create the FB.

The FB has the following features.

● Conversion of program into component

Displaying a standard program as a single block improves the reuse and readability of the program, facilitating editing and debugging. This ensures ease of configuring a large-scale program.

● Uniform program quality

Reusing the components of a standard program provides uniform program quality, which is independent of the technological level of a program developer. It also prevents programming mistakes during utilization.

● Editing function of high operability

The FB can be utilized easily in a sequence program by drag and drop operation.

● Selecting a programming language suitable for desired use

The FB can be created in a ladder program or structured text (ST) program.

FB specifications

● For creation of FB definition program

(1) Specifications

Item	Specifications
Program capacity*1	2048 steps (For ST Program: FB Definition Convert, maximum 2048 steps [Label step])
Number of labels usable as devices	500 pcs. Input variables + I/O variables = 24 pcs. Output variables + I/O variables = 24 pcs. (At least one input variable and one output variable are needed.) Labels other than the input, output and I/O variables are used as internal variables.
Programming language	Ladder, list,ST

*1: Supported by GX Developer version 8.30G or later.
500 steps for the versions earlier than 8.30G

(2) Precautions

(a) The FB cannot be used within the FB.

(b) Index qualification is not available for labels.
To make index qualification, use an actual device as the target device.

(c) Since the numerical device that may be handled by an input variable is up to a double word, the instruction exceeding three words in input count cannot be input from the outside.
To input three or more words from the outside, use an actual device as the device for storing an input value or create the input instructions by the number of necessary times.

(d) Since the numerical device that may be handled by an output variable is up to a double word, the instruction whose result will be three or more words cannot be output to the outside.
To output three or more words to the outside, use an actual device as the device for storing the result.

● For creation of sequence program including FB

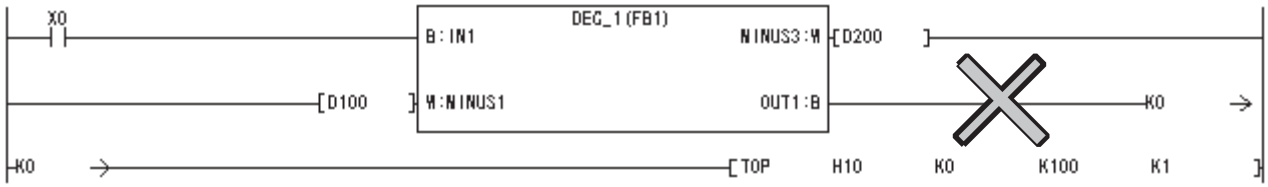
(1) Specifications

Item	Specifications
Language of sequence program that can be created	Ladder,ST
Pastable FB	Already compiled FB If you attempt to paste the FB not yet compiled, GX Developer displays an error message.
Number of FBs that may be pasted to one ladder block	1 pc. The output from the FB cannot be connected directly to the input of the other FB. If you want to connect the FBs, receive the output from the FB with a coil once, and then connect the contact of that coil to the input of the other FB.

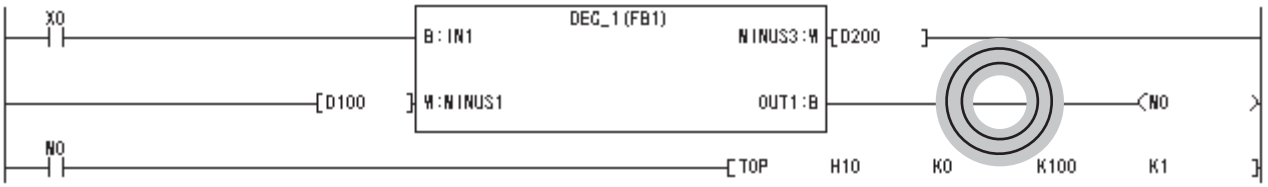
(2) Precautions

(a) A return connection cannot be used with an input ladder section and an output ladder section.

- Return connection cannot be programmed.



- Receive it with a coil once and then use the contact of that coil as the condition of the target instruction.



(b) The FB cannot be used in SFC and MELSAP-L programs.

(c) If the device type of the FB differs from that of the input or output ladder section, GX Developer displays an error message. There are the following five FB device types.

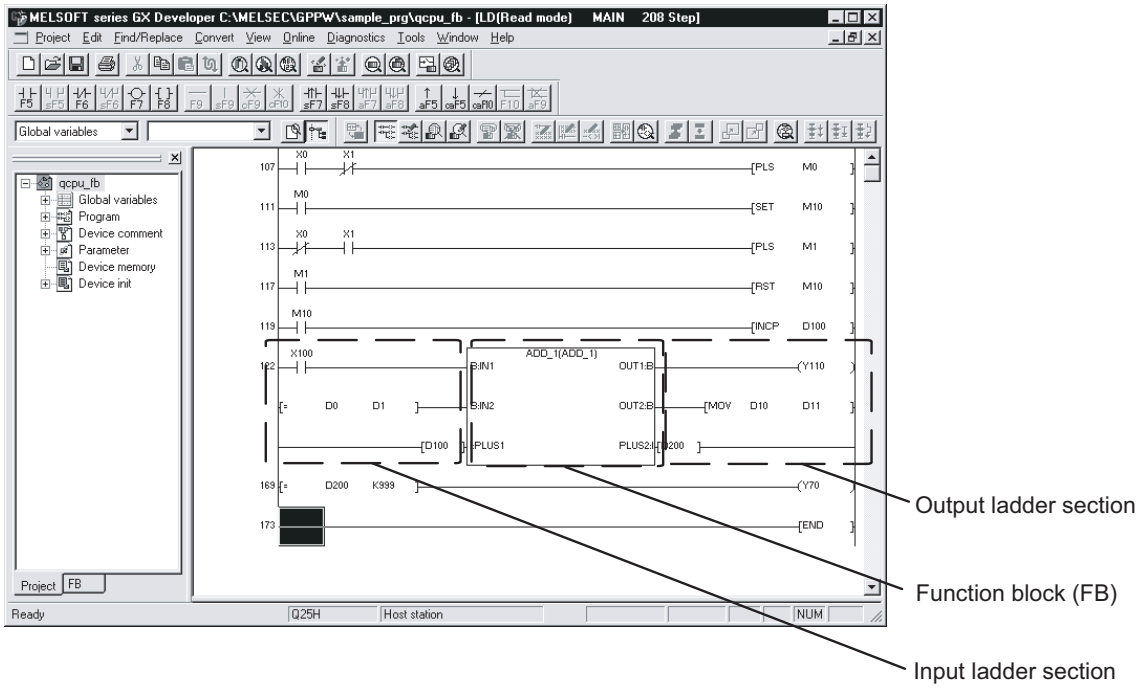
(1) BOOL : Data represented by ON/OFF.
(2) INT : Data represented by 16 bits.
(3) DINT : Data represented by 32 bits.
(4) REAL : Floating-point data represented by 32 bits.
(5) STRING : Character string data represented by JIS8 code.

For example, connection of a contact to the input of the FB whose device type is a word will result in an error.

(d) The FB definition automatically assigns devices to the labels used in a program. When creating a sequence program, avoid automatically assigned devices.

Like local devices, the automatically assigned devices are set in accordance with the automatically assigned device setting, which defaults to the following device ranges.

(1) Word device : D6144 to D12287
(2) Bit device : M4096 to M8191
(3) Timer : T64 to T2047
(4) Counter : C512 to C1023



1.5.7 Executing a single sequence program

A sequence program performs operation from Step 0 to the END/FEND instruction.
It performs an END processing when the END/FEND instruction is executed.
After the END processing, operation restarts from Step 0.
As described above, the sequence program repeats the operation from Step 0 to the END/FEND instruction.

● Scan time

The scan time consists of the sequence program execution time and the END processing time.
When either of the following programs is executed, the execution time of that program is added to the scan time.

Basic Note 1.53

- Interrupt program
- Fixed scan execution type program *Note1.53*

(1) Scan time storage location

The CPU module measures the current value and minimum and maximum values of the scan time and stores them into the special registers (SD520, SD521, SD524 to 527).
The scan time can be checked by monitoring SD520, SD521 and SD524 to 527

Current value	SD520	SD521
Minimum value	SD524	SD525
Maximum value	SD526	SD527

→ Stores scan time of 1ms or less (unit μs).
→ Stores scan time in 1ms units.

When SD520 is 3 and SD521 is 400, the scan time is 3.4ms.

(2) Accuracy and measurement of scan time

The accuracy of each scan time stored into the special registers is ± 0.1ms.
Even if the watchdog timer reset instruction (WDT) is executed in the sequence program, the measurement of each scan time is continued.

Basic Note 1.53

The fixed scan execution type programs are not available for the Basic model QCPU.

● WDT (Watchdog timer)

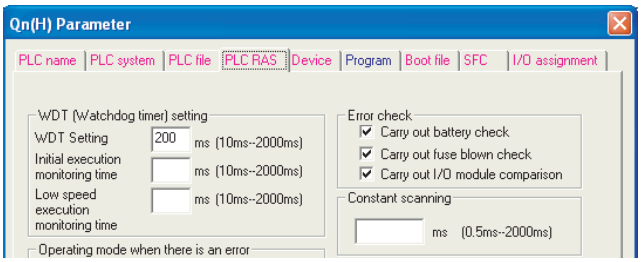
The watchdog timer (hereafter abbreviated to the WDT) watches the scan time.
The default value is 200ms.

(1) WDT error

A WDT error is 10ms.
When the WDT (t) is set to 10ms, a "WDT ERROR" occurs within a scan time range of 10ms < t < 20ms.

(2) WDT Setting

The WDT setting can be changed within a range of 10ms to 2000ms in the PLC RAS of the PLC parameter dialog box. (Setting unit: 10ms)



● Function that repeats program at fixed intervals

The constant scan function allows a program to be executed repeatedly at fixed intervals.
When the constant scan is set, a program is executed at intervals of the preset constant scan time.

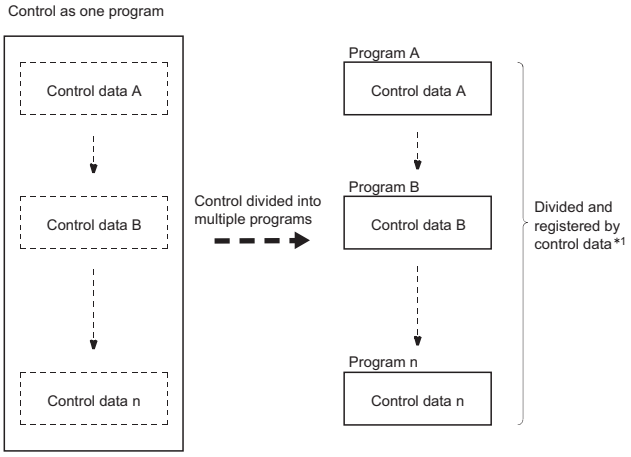
1.5.8 Executing several sequence programs

Basic Note 1.54

When multiple sequence programs are created, the execution type can be specified for each program, e.g. a program started only once at startup or a program executed at fixed intervals.

●Applications for multiple sequence programs creation

A program can be divided into multiple programs on the basis of each control unit and stored into the CPU module. (They can also be stored as a single program.)
This enables programming to be shared by each designer for each processing unit.



●Settings required for execution of multiple programs

When multiple programs are to be executed by the CPU module, the file names (program names) and execution conditions of the programs must be preset.

●Program storage location

The programs executed by the CPU module can be stored into the following memories.

- Program memory
- Standard ROM
- Memory card

●Available execution types

The following program execution types can be set on the CPU module.

Redundant Note 1.55

- Initial execution type program
- Scan execution type program
- Low speed execution type program Note1.55
- Stand-by type program
- Fixed scan execution type program

Basic Note 1.54

Since the Basic model QCPU cannot execute multiple programs, the settings for creation and execution of multiple sequence programs are not available.

Redundant Note 1.55

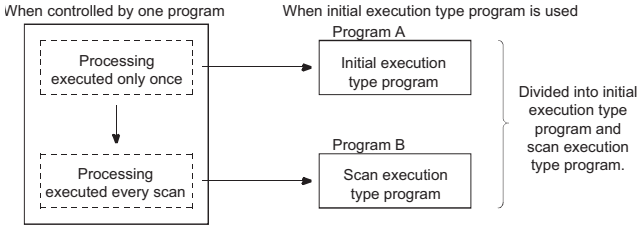
The low speed execution type programs are not available for the Redundant CPU.

Initial execution type program

Basic Note 1.56

●Definition of initial execution type program

An initial execution type program is executed only once when the PLC is powered ON or the STOP status is changed to the RUN status.
The initial execution type program can be used for a program that need not be executed from the next scan or later once it is executed.e.g. initial processing for the intelligent function module



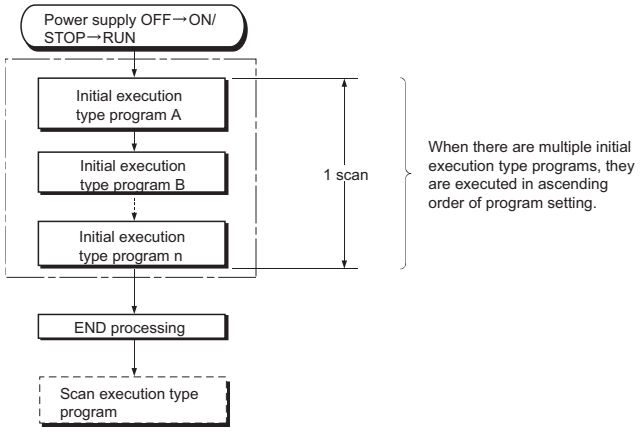
Basic Note 1.56

The initial execution type programs are not available for the Basic model QCPU.

●Initial execution type program processing

(1) Execution sequence

When the execution of all the initial execution type program is completed, an END processing is performed and a scan execution type program is executed at the next scan.

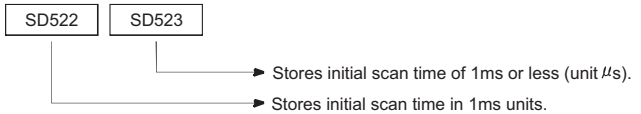


(2) Initial scan time

The initial scan time is the execution time of an initial execution type program.
When multiple initial execution type programs are executed, the initial scan time is the time taken until the execution of all initial execution type programs is completed.

(a) Initial scan time storage location

The CPU module measures the initial scan time and stores it into the special registers (SD522, SD523).
The initial scan time can be checked by monitoring SD522 and SD523



Example: When SD522 is 3 and SD523 is 400, the scan time is 3.4ms.

(b) Accuracy and measurement of initial scan time

The accuracy of the initial scan time stored into the special registers is ±0.1ms.

The measurement of the initial scan time is continued even if the watchdog timer reset instruction (WDT) is executed in a sequence program.

(c) When interrupt program/fixed scan execution type program is executed

When an interrupt program/fixed scan execution type program is executed before completion of the initial execution type program execution, the interrupt program/ fixed scan execution type program execution time is added to the initial execution type program execution time.

(3) Initial execution watch time

The initial execution watch time is measured by the timer that watches the initial scan time.
The setting range is 10 to 2000ms (setting unit: 10ms).
No default value is preset to the initial execution watch time (There is no default value.).

(a) When initial execution watch time is exceeded

A "WDT ERROR" occurs when the initial scan time exceeds the preset initial execution watch time.

The CPU module stops the operation.

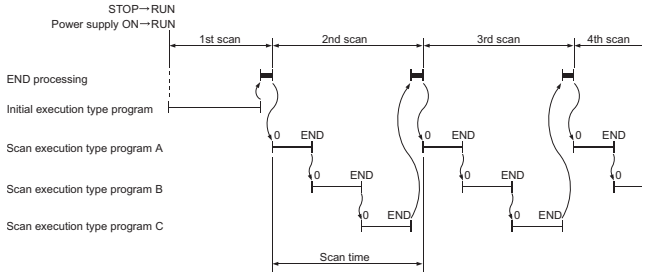
Scan execution type program

Basic

Note 1.57

● Definition of scan execution type program

A scan execution type program is executed once for each scan, starting at the next scan after execution of the initial execution type program.



● Scan execution type program processing

(1) Scan time

Scan time is the sum of the scan execution type program execution time and END processing time.

(a) Scan time storage places

The CPU module measures the current value and minimum and maximum values of the scan time and stores them into the special registers (SD520, SD521, SD524 to 527).

The scan time can be checked by monitoring SD520, SD521 and SD524 to 527.

Example : When SD520 is 3 and SD521 is 400, the scan time is 3.4ms.

(b) Accuracy and measurement of scan time

The accuracy of each scan time stored into the special registers is ± 0.1ms.

Even if the watchdog timer reset instruction (WDT) is executed in a sequence program, the measurement of each scan time is continued.

(c) Execution of multiple scan execution type programs

When multiple scan execution type programs are executed, the scan execution type program execution time is the time taken until the execution of all scan execution type programs is completed.

When an interrupt program/fixed scan execution type program is executed, the interrupt program/fixed scan execution type program execution time is added to the scan time.

(2) END processing

When all scan execution type programs are executed, an END processing is performed and the first scan execution type program is executed again.
By placing the COM instruction at the end of each scan execution type program, the END processing (network refresh) can be performed for each program.

(3) WDT (Watchdog timer)

The watchdog timer (hereafter abbreviated to the WDT) watches the scan time.
The default value is 200ms.

(a) WDT error

A WDT error is 10ms.
When the WDT (t) is set to 10ms, a "WDT ERROR" occurs within a scan time range of 10ms < t < 20ms.

(b) WDT setting

The WDT setting can be changed in the PLC RAS setting of the PLC parameter dialog box.

(4) Scan execution type program can be repeated at fixed intervals

When the constant scan function is used, a scan execution type program can be executed repeatedly at fixed intervals.
When the constant scan is set, a scan execution type program is executed at intervals of the preset constant scan time.

Basic Note 1.57

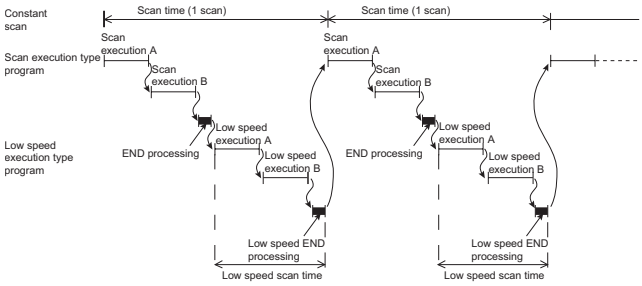
The Basic model QCPU cannot use multiple scan execution type programs.

Low speed execution type program

●Definition of low speed execution type program

Basic Note 1.58
Redundant Note 1.58

A low speed execution type program is executed only during the excess time of constant scan or the preset low speed program execution time.
The low speed execution type program can be used for the program that need not be executed every scan (e.g. output to a printer).



●Low speed execution type program processing

(1) Execution operation

The low speed execution type program execution varies depending on the following settings.
Use a desired setting as necessary.

(a) When giving priority to the control accuracy at fixed scan time

Set the constant scan.

(b) When securing the execution time for the low speed execution type program

Set the low speed program execution time.

(2) When there is excess time after completion of all low speed execution type program execution within one scan

The processing performed after completion of low speed execution type program operation varies depending on the ON/OFF status of the special relay SM330 and low speed execution type program execution condition.

(a) Asynchronized tracking mode (SM330 = OFF)

The low speed execution type program operation is continued within excess time.

(b) Synchronized tracking mode (SM330 = ON)

If there is excess time, operation is started at the next scan without the low speed execution type program operation being continued.

(3) When low speed execution type programs could not be processed within the excess time of constant scan or the low speed execution program execution time

Program execution is suspended once and the remaining programs are executed at the next scan.

(4) Low speed END processing

When the low speed execution type programs are all executed, low speed END processing is performed.
Low speed END processing performs the following:
Setting of special relays/special registers for low speed execution type programs*1
Online program change of low speed execution type programs
Measurement of low speed scan time
Reset of watchdog timers for low speed execution type programs
When low speed END processing is finished, the first low speed execution type program is executed again.

*1 : The special relays/special registers for low speed execution type programs are given below.
SM330,SM404,SM405,SM510
SD430,SD510,SD528 to 535,SD544 to 547

POINT

When low speed execution type programs are executed, the constant scan may be shifted by the maximum processing time of the executed instructions + low speed END processing time .

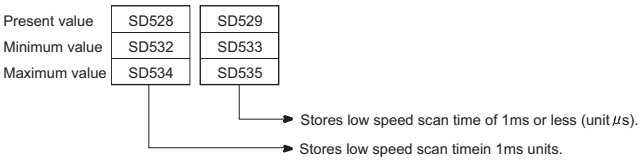
(5) Low speed scan time

Low speed scan time is the sum of all the low speed execution type program execution times and the low speed END processing time.

(a) Low speed scan time storage location

The CPU module measures the low speed scan time and stores it into the special registers (SD528 to 535).

The low speed scan time can be checked by monitoring SD528 to 535



Example: When SD528 is 50 and SD529 is 400, the low speed scan time is 50.4ms.

(b) Accuracy and measurement of low speed scan time

The accuracy of each scan time stored into the special register is ± 0.1ms.

Even if the watchdog timer reset instruction (WDT) is executed in a sequence program, the measurement of each scan time is continued.

(c) When interrupt program/fixed scan execution type program is executed

The execution time of the interrupt program/ fixed scan execution type program is added to the low speed scan time.

(6) Low speed execution watch time

The low speed execution watch time is measured by the timer that watches the low speed scan time.

The setting range is 10 to 2000ms (setting unit: 10ms).

No default time is preset to the low speed execution watch time (There is no default value.).

(a) When low speed execution watch time is exceeded

A "PRG. TIME OVER (error code: 5010)" occurs when the low speed scan time exceeds the preset low speed execution watch time.

Basic Note 1.58
Redundant Note 1.58

The low speed execution type program is not available for the Basic model QCPU.

Stand-by type program

Basic Note 1.59

● Definition of stand-by type program

A stand-by type program is executed only when its execution is requested.

It can also be changed to another execution type by a sequence program instruction.

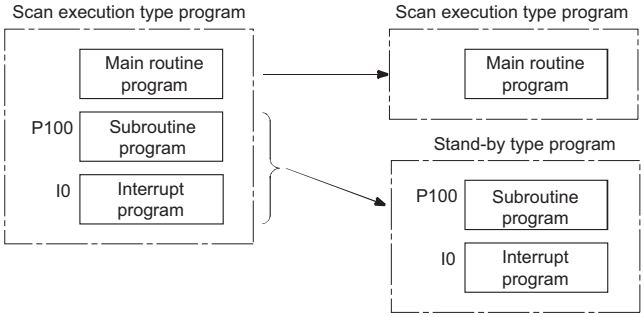
● Applications of stand-by type program

The stand-by type program is used in the following applications.

(1) Library of programs

This application is used to set a subroutine program and an interrupt program as a stand-by type program and manage it separately from the main routine program.

Multiple subroutine programs and interrupt programs can also be created in a single stand-by type program.



(2) Program setup change

This is applicable when only a necessary program is to be executed among pre-created programs corresponding to all systems.

For example, the program preset as a stand-by (wait) in the PLC parameter dialog box can be changed to a scan execution type program and executed by a sequence program.

● Stand-by type program execution method

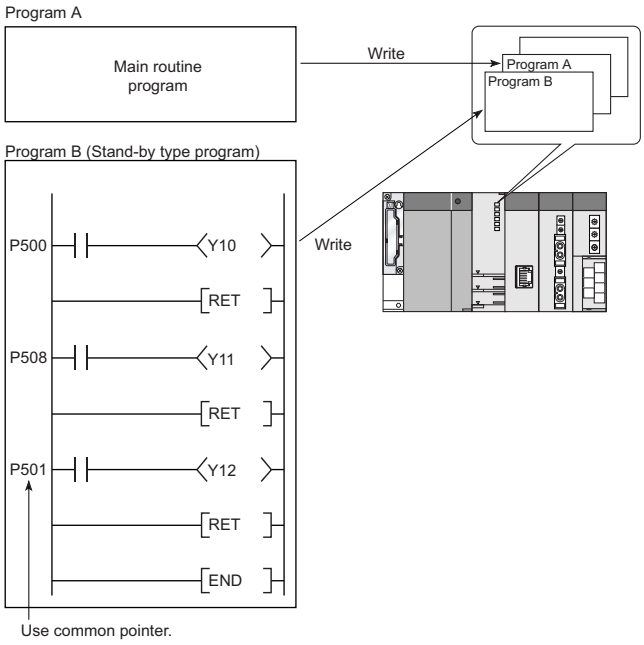
A stand-by type program can be executed in either of the following methods.

- Create subroutine and/or interrupt programs in a stand-by type program and call them using a pointer or when an interrupt occurs.
- Change a stand-by type program to any other execution type using an instruction

(1) When placing subroutine or interrupt programs in a single stand-by type program

When creating subroutine or interrupt programs in a single stand-by type program, start it from Step 0.

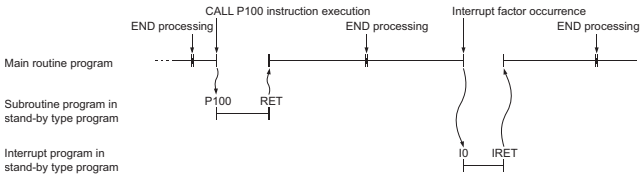
The FEND instruction used for creation of subroutine or interrupt programs is not required after the main routine program.



(a) Operation of subroutine and interrupt programs in stand-by type program

When the execution of the stand-by type program is finished, a program in the stand-by type program is called and its execution is resumed.

The following shows the operation performed when the subroutine and interrupt programs in the stand-by type program is executed.



Basic
Note 1.59

The stand-by type program is not available for the Basic model QCPU.

Redundant
Note 1.60

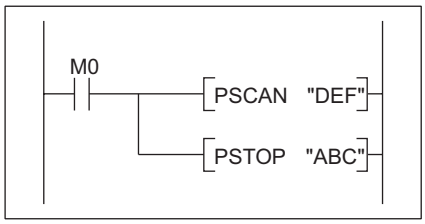
(2) When changing execution type by instruction

Use the PSCAN, PLOW[Note1.60], PSTOP and/or POFF instruction to change the execution type.

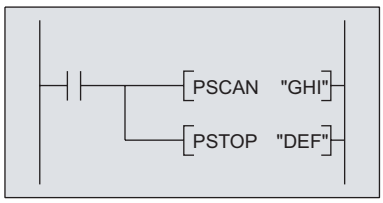
(a) Example of changing the execution type in scan execution type program

- Set programs "ABC" and "GHI" as scan execution type programs.
  Set program "DEF" as a stand-by type program.
- When the condition is satisfied (the internal relay (M0) in the following Diagram turns ON), "DEF" is changed into a scan execution type program and "ABC" into a stand-by type program.

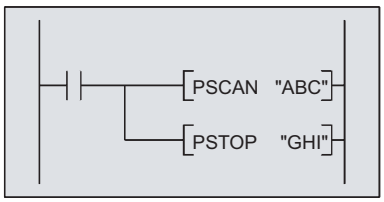
Scan execution type program: ABC



Stand-by type program: DEF



Scan execution type program: GHI

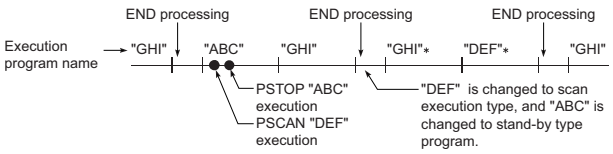


(b) Timing for execution type change

The program execution type is changed in the END processing.

Hence, it is not changed midway through program execution.

When different types are set to the same program in the same scan, it is changed to the execution type executed by the latest instruction.



*: The "GHI" and "DEF" programs are executed in the order set in the program setting of the PLC parameter dialog box.

Redundant
Note 1.60

Since the Redundant CPU cannot use low speed execution type programs, it cannot change the execution type using the PLOW instruction.

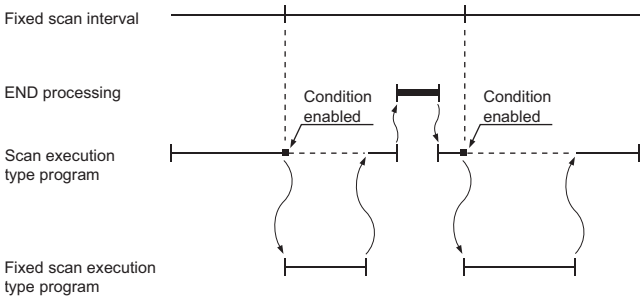
Fixed scan execution type program

Basic Note 1.61

● Definition of fixed scan execution type program

This program is executed at the specified time intervals.

It can be executed at fixed cycle intervals for each file without description of interrupt pointers and IRET instructions.



● Fixed scan execution type program processing

Fixed scan execution type program processing is explained below.

(1) When there are multiple fixed scan execution type programs

Fixed scan execution type programs are executed at the specified time intervals.

When multiple fixed scan execution type programs reach the specified time at the same time, they are executed in ascending order of the numbers set in the program setting of the PLC parameter dialog box.

(2) When there are fixed scan execution type program and interrupt program

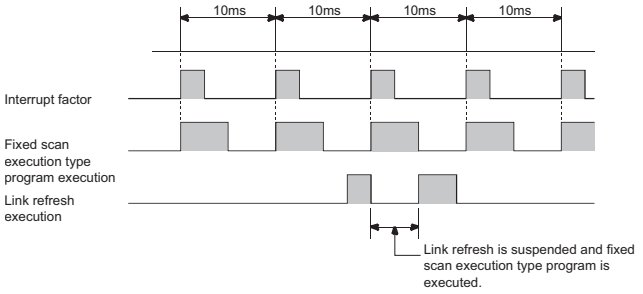
When the fixed scan execution type program and an interrupt program (I28 to 31) reach the specified time at the same time, the interrupt program is executed first with priority.

(3) Execution during network refresh

When the execution condition for the fixed scan execution type program is satisfied during network refresh, network refresh is suspended and the fixed scan execution type program is executed.

Even if the cyclic data block has been guaranteed for each station in the MELSECNET/H network system, it is not available when the device set as a network refresh target is used in the fixed scan execution type program.

In the fixed scan execution type program, do not use the device set as a network refresh target.

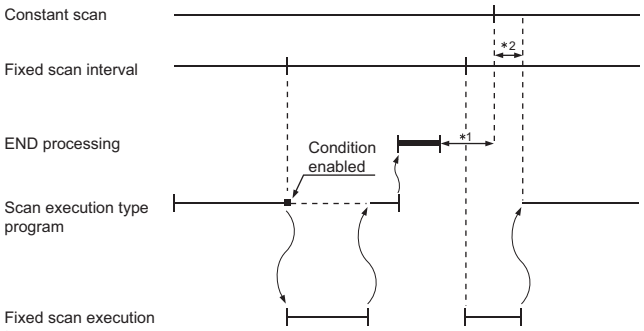


Basic Note 1.61

The fixed scan execution type program is not available for the Basic QCPU.

(4) Execution during END processing

When the execution condition for the fixed scan execution type program is satisfied during constant scan execution or during END instruction waiting time, the fixed scan execution type program is executed.



*1: Wait time
*2: If processing is not completed during wait time, scan time increases.

(5) High speed execution setting and overhead time of fixed scan execution type program

The following processing is performed when the fixed scan execution type program is executed.

- Save and restoration of index register data
- Save and restoration of file name of file register being used

The above processing is not executed when "High speed execution" of an interrupt program/fixed scan execution type program is selected in the PLC system of the PLC parameter dialog box.

Basic Note 1.62

Execution type setting and example of type changing

● Execution type setting

Program setting necessary for executing multiple programs is explained in this section. Set the program execution type in the program of the PLC parameter dialog box of GX Developer.

The CPU module executes the programs of set execution types in the setting order.

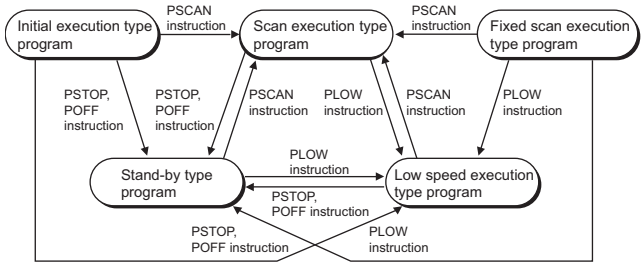
● Example of instruction-triggered execution type changing

(1) Execution type changing instruction

Using this instruction can change the execution type even during sequence program execution.

Redundant Note 1.63

Use any of the PSCAN, PLOW*Note1.63*,PSTOP and/or POFF instructions to change the execution type.



Redundant Note 1.63

Execution type before change	Execution instructions			
	PSCAN	PSTOP	POFF	PLOW*Note1.63*
Scan execution type	Remains unchanged from the scan execution type.	Changes to the stand-by type.	Turns OFF the output at the next scan. Changes to the stand-by type at the next or later scan.	Changes to the low speed execution type.
Initial execution type	Changes to the scan execution type.			
Stand-by type		Remains unchanged from the stand-by type.	No operation	
Low speed execution type *Note1.63*	Suspends the execution of the low speed execution type and changes to the scan execution type at the next scan. (Executed at Step 0)	Suspends the execution of the low speed execution type and changes to the stand-by type at the next or later scan.	Suspends the execution of the low speed execution type and turns OFF the output at the next scan. Changes to the stand-by type at the next or later scan.	Remains unchanged from the low speed execution type.
Fixed scan execution type	Changes to the scan execution type.	Changes to the stand-by type.	Turns OFF the output at the next scan. Changes to the stand-by type at the next or later scan.	Changes to the low speed execution type.

Basic Note 1.62

Since the Basic model QCPU cannot execute multiple programs, the execution type setting and instruction-triggered changing are not available.

Redundant Note 1.63

Since the Redundant CPU cannot use low speed execution type programs, "Low speed" cannot be selected as the execution type.

I/O Processing and Response Lag

The CPU module performs I/O processing in a refresh mode. Using direct access I/O in a sequence program, however, allows the CPU module to perform direct mode I/O processing corresponding to each instruction.
This section explains these I/O processing modes and response lags of the CPU module.

(1) Refresh mode
The refresh mode batch-accesses I/O modules before start of sequence program operation.

(2) Direct access mode
The direct mode accesses an I/O module when each instruction is executed in a sequence program.
To access an I/O module in the direct mode, use the direct access input or direct access output in a sequence program.

● Differences between refresh mode and direct access mode

Since the direct access mode makes direct access to an I/O module at execution of an instruction, it imports input data faster than the refresh mode.
However, its instruction processing time is longer than that of the refresh mode.
The direct access mode is available for the I/O used with the I/O modules and intelligent function modules mounted on the main base unit and extension base units.
The differences between the refresh mode and the direct access mode are shown in the following table.

Item	Refresh mode	Direct access mode
Basic Note 1.64 / Redundant Note 1.65: I/O module mounted on base unit	Available	Available
Basic Note 1.64 / Redundant Note 1.65: I/O of intelligent function module mounted on base unit		
Basic Note 1.64 / Redundant Note 1.65: I/O of I/O link mounted on extension base unit *Note1.64,Note1.65*		
I/O used in MELSECNET/H network system or CC-Link system	Available	N/A

Basic Note 1.64: The Basic model QCPU cannot use the I/O of the I/O link mounted on extension base units.

Redundant Note 1.65: Since the Redundant CPU cannot use extension base units, the I/O of the I/O link mounted on the extension base units is not available.

■ Refresh mode

● Definition of refresh mode

The refresh mode batch-accesses I/O modules before start of sequence program operation.

● Input

The ON/OFF information of the input module is batch-imported to the area for communication with the input module inside the CPU module before start of sequence program operation.
When a sequence program is executed, the ON/OFF data of the input (X) device memory are used for the operation.

● Output

The operation result in an output (Y) sequence program is output to the output (Y) device memory in the CPU module every time the operation is performed, and the ON/OFF data of the output (Y) device memory are batch-output to the output module before start of sequence program operation.

■ Direct mode

● Definition of direct mode

The direct mode accesses an I/O module when each instruction is executed in a sequence program.
The CPU module uses the direct access input (DX) and direct access output (DY) to perform the direct mode I/O processing.

1.5.9 Explanation of devices

Internal User Devices

● Definition

Internal user devices can be used for various user applications. The "number of usable points" setting is designated in advance (default value) for internal user devices.
However, this setting can be changed at the "Device" tab screen in the "(PLC) Parameter" dialog box.

● Internal user device setting range

The number of used internal user devices other than the input (X), output (Y), step relay (S), link special relay (SB) and link special register (SW) of the CPU module can be changed within the following range in the device setting of the PLC parameter dialog box.

CPU module	Changeable range
Basic model QCPU	16.4k words (Including 1.5k words for the above devices)
High Performance model QCPU Process CPU Redundant CPU	29k words (Including 3.7k words for the above devices)

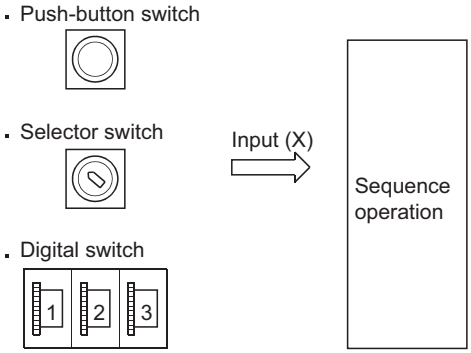
The following gives more information.

(1) Setting range

The number of device points is designated in 16-point units. A maximum of 32 k points can be designated for one device.
1 point is calculated as 2 points (1 for coil, 1 for contact) for the timer, retentive timer, and counter.

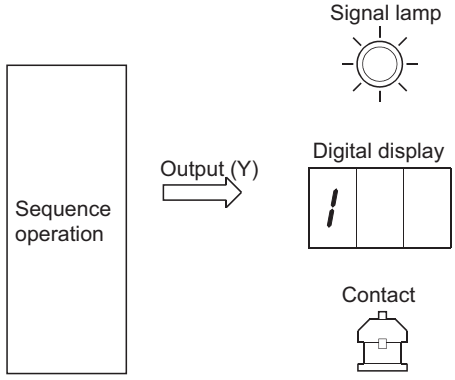
■ Input (X)

Inputs transmit commands or data to the High Performance model QCPU from an external device such as push-button switches, selector switches, limit switches, digital switches.



■ Output (Y)

Outputs give out the program control results to the external devices such as solenoid, electromagnetic switch, signal lamp and digital display.
Outputs give out the result equivalent to one N/O contact.



■ Internal relay (M)

Internal relays are auxiliary relays used in the CPU module.
All internal relays are switched OFF at the following times:

- When the PLC is powered OFF and then ON
- When the CPU module is reset
- When latch clear operation is executed.

● Latch execution of internal devices (backed up for power failure)

(1) For Basic model QCPU, High Performance model QCPU, Process CPU

The internal relays cannot be latched (backed up for power failure).

(2) For Redundant CPU

When the start mode is set to the hot start mode, the internal relays are latched (backed up for power failure).
When the start mode is set to the initial start mode, the internal relays are not latched (backed up for power failure).

■ Latch relay (L)

Latch relays are auxiliary relays which can be latched by the programmable controller's internal latch (memory backup).
Latch relay operation results (ON/OFF information) are saved even in the following cases:

- When the PLC is powered OFF and then ON
- When the CPU module is reset

The latch is backed up by the CPU module battery.

Basic
Note 1.66

● Latch relay clear

Turn OFF the latch relays by latch clear operation. However, the latch relay set to "Latch (2) first/last" in the device setting of the PLC parameter dialog box cannot be turned OFF if latch clear is performed by the RESET/L.CLR switch Note1.66.

Basic
Note 1.66

In the case of the Basic model QCPU, latch clear cannot be performedd by switch operation.

■ Annunciator (F)

Annunciators are internal relays that support programs to detect errors and faults of user-made equipment.

● Special relay and special registers at annunciator ON

When annunciators switch ON, a special relay (SM62) switches ON, and the Nos. and quantity of the annunciators which switched ON are stored at the special registers (SD62 to 79).

• Special relay	: SM62 • • • • •	Switches ON if even one annunciator switches ON.
• Special register	: SD62 • • • • •	No. of first annunciator which switched ON is stored here.
	SD63 • • • • •	The number (quantity) of annunciators which are ON is stored here.
	SD64 to 79 • • •	Annunciator Nos. are stored in the order in which they switched ON. (The same annunciator No. is stored at SD62 and SD64.)

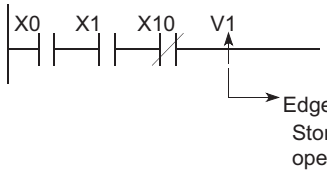
The annunciator No. stored at SD62 is also registered in the "fault history area".

● Applications of annunciators

Using annunciators for a fault detection program, an equipment fault or fault presence/absence (annunciator number) can be checked by monitoring the special register (SD62 to 79) when the special relay (SM62) switches ON.

■ Edge relay (V)

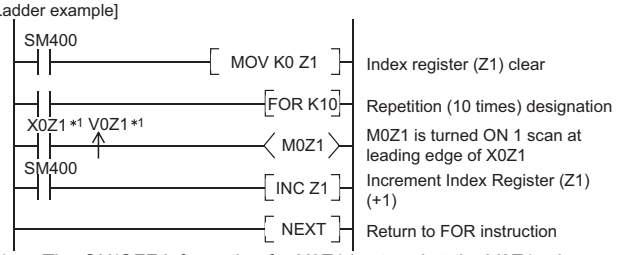
An edge relay is a device which stores the operation results (ON/OFF information) from the beginning of the ladder block. Edge relays can only be used at contacts, and cannot be used as coils.



● Edge relay applications

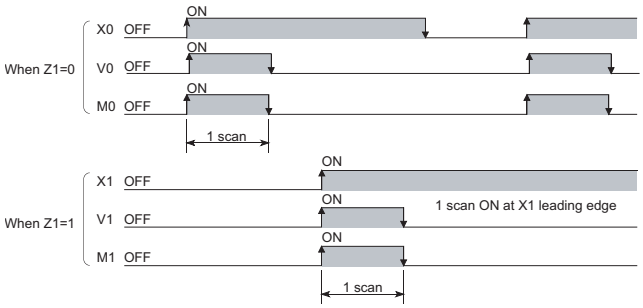
Edge relays are used for detecting the leading edge (OFF to ON) in programs configured using index modification.

[Ladder example]



*1: The ON/OFF information for X0Z1 is stored at the V0Z1 edge relay.
For example, the X0 ON/OFF information is stored at V0, and the X1 ON/OFF information is stored at V1.

[Timing chart]



■ Link relay (B)

Link relays are CPU module side relays used when refreshing the link relay (LB) data of the MELECNET/H network module, etc. to the CPU module or when refreshing the CPU module data to the link relays (LB) of the MELECNET/H network module, etc.

■ Link special relay (SB)

A link special relay indicates the communication status and error detection of an intelligent function module, such as the MELSECNET/H Network Module.
ON/OFF of the link special relays are controlled by various causes that occur during data link.
By monitoring the link special relays, the communication status, error status and others of data link can be grasped.

CPU module	Number of link special relay points
Basic model QCPU	1024 points (SB0 to 3FF). 512 points assigned for the intelligent function module having link special relays, such as the MELSECNET/H network module.
High Performance model QCPU Process CPU Redundant CPU	2048 points (SB0 to 7FF). 512 points assigned to the intelligent function module having link special relays, such as the MELSECNET/H network module. The link special relays can be assigned as shown below. Link special relay SB0 ≀ SB1FF: For 1st network module — 512 points SB200 ≀ SB3FF: For 2nd network module — 512 points SB400 ≀ SB5FF: For 3rd network module — 512 points SB600 ≀ SB7FF: For 4th network module — 512 points 2048 points

■ Step relay (S)

Step relays are devices for SFC programs.

POINT

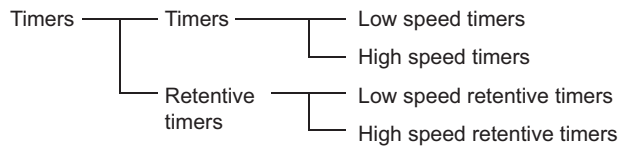
Because the step relay is a device exclusively for the SFC program, it cannot be used as an internal relay in the sequence program.
If used in this manner, a SFC error will occur, and system operation will be stopped (system down).

■ Timer (T)

A timer (T) is a device that starts counting when its coil turns ON, and times-out and turns ON its contact when the current value reaches or exceeds the set value.
The timer is of an up-counting type.
The current value matches the set value when a "time-out" occurs.

● Timer types

There are two types of timers: a low/high speed that allows the current value to return to "0" when a timer coil switches OFF, and a retentive timer that retains the current value even when a timer coil switches OFF.



● How to use timers

With a timer setting (instruction format), a device is assigned for a low speed timer or high speed timer. The OUT T0 instruction is used to assign a device for a low -speed timer. The OUTH T0 instruction is used to assign a device for a high speed timer.
With a timer setting (instruction format), a device is assigned for a low speed retentive timer or high speed retentive timer. The OUT T0 instruction is used to assign a device for a low speed retentive timer. The OUTH T0 instruction is used to assign a device for a high speed retentive timer.

● Low-speed timers

(1) Definition

Low-speed timers perform counting in 1 to 1000ms units.
The timer is valid only while its coil is ON.
The time measurement begins when the timer's coil switches ON, and the contact switches ON when a "time-out" occurs. When the timer's coil switches OFF, the current value becomes "0", and the contact switches OFF.

(2) Measurement units

The default time measurement units setting for low speed timers is 100 ms.
The time measurement units setting can be designated in 1 ms units within a 1 ms to 1000 ms range.
This setting is designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

● High-speed timers

(1) Definition

High-speed timers performs counting in 0.1 to 100ms units.
The timer is valid only while its coil is ON, and has a symbol "H".
The time measurement begins when the timer's coil switches ON, and the contact switches ON when the time elapses. When the timer's coil switches OFF, the current value becomes "0", and the contact switches OFF.

(2) Measurement units

The default time measurement units setting for high speed timers is 10 ms.
The time measurement units setting can be designated in 0.1ms units within a 0.1 ms to 100 ms range.
This setting is designated at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.

● Retentive timers

(1) Definition

Retentive timers measure the "coil ON" time.
The measurement begins when the timer coil switches ON, and the contact switches ON when a time up (coil OFF) occurs.
Even when the timer coil is OFF, the current value and the contact ON/OFF status are saved. When the coil is switched ON again, the time measurement resumes from the current value which was saved.

(2) Retentive timer types

There are 2 retentive timer types: low speed retentive timer, and high speed retentive timer.

(3) Retentive timer clear

The RST T□ instruction is used to clear (reset) the current value and switch the contact OFF.

(4) Measurement units

The measurement units settings for retentive timers are the same as those for low speed timers and high speed timers.
• Low speed retentive timer : Same as low speed timer
• High speed retentive timer : Same as high speed timer

● Timer Processing and accuracy

(1) Processing method

When an OUT T□ instruction is executed, the following is processed: timer coil ON/OFF, current value update and contact ON/OFF processing. Timer current value update and contact ON/OFF processing are not performed at END processing.

(2) Accuracy

When the OUT T□ instruction is executed, the current value is added to the scan time measured at the END instruction.
If the timer coil is OFF when the OUT T□ instruction is executed, the current value is not updated.

■ Counter (C)

A counter is a device which counts the number of input condition leading edges in sequence programs.
When the count value matches the set value, the counter counts up and its contact turns ON.
The counter is of an up-counting type.

● Counter types

There are two counter types: counters which count the number of input condition start-ups (leading edges) in sequence programs, and counters which count the number of interrupt factor occurrences.

● Count processing

(1) When OUT C□ instruction is executed

When and OUT C□ instruction is executed, the following counter processing occurs: coil ON/OFF, current value update (count value + 1), and contact ON/OFF.
Counter current value update and contact ON/OFF processing are not performed at END processing.

(2) Current value update (count value + 1)

The current value update (count value + 1) is performed at the leading edge (OFF to ON) of the OUT C instruction.
The current value is not updated in the following OUT C instruction statuses: OFF, ON to ON, ON to OFF

(3) Resetting the counter

Counter current values are not cleared even if the OUT C□ instruction switches OFF. Use the RST C□ instruction to clear the counter's current value and switch the contact OFF.
The count value is cleared and the contact is switched OFF at execution of when the RST C□ instruction

● Interrupt counters

(1) Definition of interrupt counter

Interrupt counters are devices which count the number of interrupt factor occurrences.

(2) Count processing

(a) When interrupt occurs

The interrupt counter's current value is updated when an interruption occurs. It is not necessary to create a program which includes an interrupt counter function.

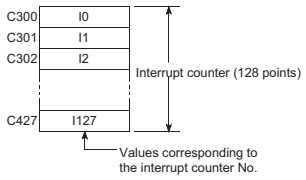
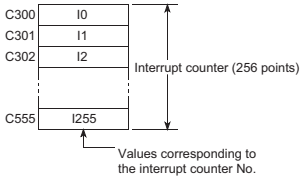
(b) Counting of interrupt counter

Interrupt counter operation requires more than the simple designation of a set value.

To use the interrupt counter for control purposes, comparison instructions (=, <=, etc.) must also be used to enable comparisons with the set value, with an internal relay (M), etc., being switched ON or OFF according to the comparison result.

(3) Setting the interrupt counter

In order to use interrupt counters, set Interrupt counter start No. at the "PLC system" tab screen in the "(PLC) Parameter" dialog box.
The number of points indicated in Table9.6 starting from the set counter number is used as interrupt counters.

Basic model QCPU	High Performance model QCPU, Process CPU, Redundant CPU
128 points, starting from the set counter number, are used as interrupt counters. When the first interrupt counter No. is set to C300, C300 to 427 are used as interrupt counters.  	256 points, starting from the set counter number, are used as interrupt counters. When the first interrupt counter No. is set to C300, C300 to 555 are used as interrupt counters. 

■ Data register (D)

Data registers are memory devices which store numeric data (-32768 to 32767, or 0000H to FFFFH).

● Bit configuration of data register

(1) Bit configuration and read and write units

Data registers, which consist of 16 bits per point, read and write data in 16-bit units.

(2) When data register is used for 32-bit instruction

If the data registers are used for 32-bit instructions, the data will be stored in registers Dn and Dn + 1. The lower 16 bits of data are stored at the data register No. (Dn) designated in the sequence program, and the higher 16 bits of data are stored in the designated register No. + 1 (Dn + 1).
Two data registers can store a range of numeric data from -2147483648 to 2147483647 or from 0H to FFFFFFFFH. (The most significant bit in a 32-bit configuration is a sign bit.)

● Holding of stored data

The data stored in the data register is held until the other data is stored.
The data stored in the data register is initialized when the PLC is powered OFF or the CPU module is reset.

■ Link register (W)

A link register is the CPU module memory used to refresh the CPU module with data from the link registers (LW) of intelligent function modules including MELSECNET/H network module.

● Bit configuration of link register

(1) Bit configuration and read and write units

Link registers, which consist of 16 bits per point, read and write data in 16 bit units.

(2) When link register is used for 32-bit instruction

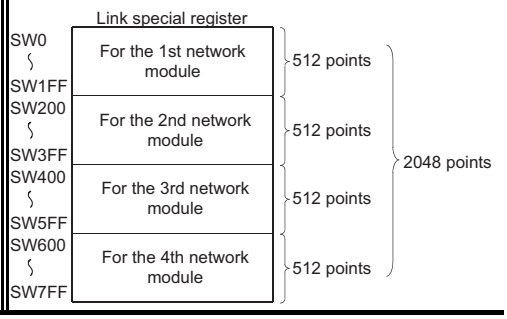
If the link registers are used for 32-bit instructions, the data is stored in registers Wn and Wn + 1. The lower 16 bits of data are stored in the link register No. (Wn) designated in the sequence program, and the higher 16 bits of data are stored in the designated register No. + 1 (Wn + 1).
Two link registers can store a range of numeric data from -2147483648 to 2147483647 or from 0H to FFFFFFFFH. (The most significant bit in a 32-bit configuration is a sign bit.)

● Holding of stored data

Data stored by the link register is maintained until another data is save.
The data stored in the link register is initialized when the PLC is powered OFF or the CPU module is reset.

■ Link special register (SW)

Link special registers are used to store data on the communication status and errors of an intelligent function module.
Because the data link information is stored as numeric data, the link special registers serve as a tool for identifying the locations and causes of faults.

CPU module	Number of link special relay points
Basic model QCPU	1024 points (SW0 to 3FF). 512 points assigned to each intelligent function module such as the MELSECNET/H network module.
High Performance model QCPU Process CPU Redundant CPU	2048 points (SW0 to 7FF). 512 points assigned to each intelligent function module such as the MELSECNET/H network module. The link special registers can be assigned as shown below. 

Internal System Devices

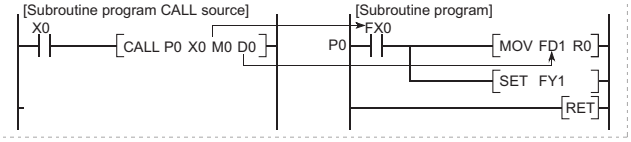
Internal system devices are used for system operations.
The allocations and sizes of internal system devices are fixed, and cannot be changed by the user.

■ Function devices (FX, FY, FD)

Function devices are used in subroutine programs with arguments.
The function devices write/read data between a subroutine call source with argument and a subroutine program with argument.

Example

If FX0 and FD1 are used at the subroutine program, and if M0 and D0 are designated by the subroutine CALL instruction, the M0 ON/OFF data is transferred to FX0, and the D0 data is transferred to FD1.



● Applications of function devices

Because the function devices used for each subroutine program CALL source can be set, the same subroutine program can be used without regard to other subroutine CALL sources.

● Types of function devices

There are 3 function device types: function input devices (FX), function output devices (FY), and function register devices (FD).

(1) Function input devices (FX)

- These devices are used to designate inputs of ON/OFF data to a subroutine program.
- In the subroutine program, these devices are used for reading and processing bit data designated by subroutine with argument CALL instruction.
- All the CPU module bit data designation devices can be used.

(2) Function output devices (FY)

- These devices are used to designate outputs of subroutine program operation results (ON/OFF data) to the subroutine program CALL source.
- The operation results are stored at the device designated by using subroutine programs with arguments.
- All bit data designation devices except CPU module inputs (X, DX) can be used.

(3) Function registers (FD)

- Function registers are used to perform write/read of data between the sub-routine call source and the subroutine program.
- The function register I/O condition is automatically determined by the High Performance model QCPU. If the subroutine program data is the source data, the data is designated as subroutine input data.
  If the subroutine program data is the destination data, the data is designated as subroutine output data.
- 1 function register occupies a maximum of 4 words.
  The number of words used depends on an instruction in a subroutine program.

■ Special relay (SM)

A special relay is used to store CPU module status data.

■ Special register (SD)

A special register is used to store CPU module status data (diagnosis and system information).

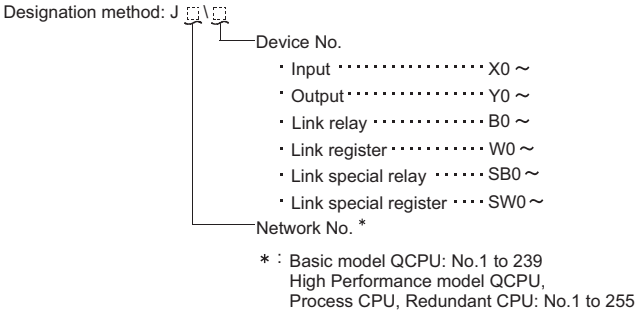
Link direct device(J□\□)

Link direct devices are used to directly access the link devices in the MELSECNET/H network modules.
At END processing of sequence program, a data refresh (data transfer) is performed between the High Performance model QCPU.

● Designation method and application example of link direct device

(1) Designation method

Link direct devices are designated by network No. and device No.



(2) Application example

For link register 10 (W10) of network No.2, the designation would be "J2\W10"

- For a bit device (X, Y, B, SB), digit designation is necessary.

Designation example : J1\K1X0, J10\K4B0

● Differences between "link direct devices" and "link refresh"

The differences between "link direct devices" and "link refresh" are shown in the folloing table.

Item		Link Direct Device	Link Refresh
Program notation method	Link relay	J□\K4B0 or later	B0 or later
	Link register	J□\W0 or later	W0 or later
	Link special relay	J□\K4SB0 or later	SB0 or later
	Link special register	J□\SW0 or later	SW0 or later
Number of steps		2 steps	1 step
Network module access range		All network module link devices	Refresh parameter designated range
Access data guarantee range		Word units (16 bits)	

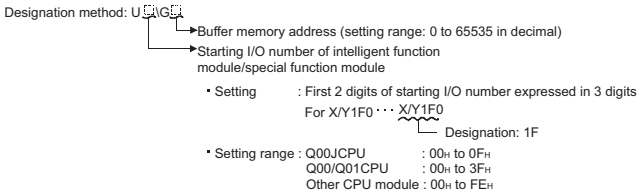
Intelligent Function Module Device (U□\G□)

The intelligent function module devices allow the CPU module to directly access the buffer memories of intelligent function modules/special function modules which are mounted on at the main base unit and extension base units.

● Designation method and application example of intelligent function module device

(1) Designation method

Intelligent function module devices are designated by the intelligent function module/special function module I/O No. and the buffer memory address.



● Processing speed

Basic Note 1.67 / Process Note 1.67 / Redundant Note 1.67

The processing speed for intelligent function module devices is;

- The processing speed of read/write by the intelligent function module device is slightly higher than that of read/write by the FROM/TO instruction. (For example, "MOV U2\G11 D0")
- To conduct reading the buffer memory of the intelligent function module/special function module *Note1.67* and another process in a single instruction, add the processing speed of FROM/TO instruction and processing speed of instruction to setup the reference value.

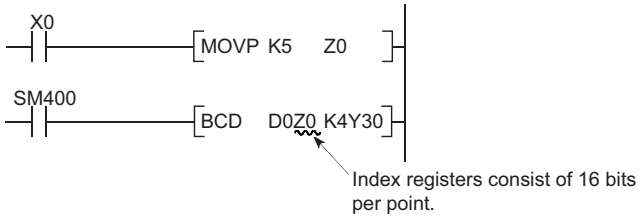
(For example, case of "+ U2\G11 D0 D10")

Basic Note 1.67 Process Note 1.67 Redundant Note 1.67

The Basic model QCPU, Process CPU and Redundant CPU do not support the special function modules.

Index Register (Z)

Index registers are used in the sequence program for indirect setting (index qualification) designations.
An index register point is used for index modification.



File Register (R)

File registers are expansion devices for data registers.
The file registers can be used at the same processing speed as the data registers.

● Bit configuration of file register

(1) Bit configuration and read and write units

File registers, which consist of 16 bits per point, read and write data in 16bit units.

(2) When file register is used for 32-bit instruction

If the file registers are used for 32-bit instructions, the data will be stored in registers Rn and Rn + 1.
The lower 16 bits of data are stored in the file register No. (Rn) designated in the sequence program, and the upper 16 bits of data are stored in the designated file register No.+ 1.

● Clearing the file register

The file register contents are backed up by the battery built in the CPU module.
They are backed up if the PLC is powered OFF or the CPU is reset. (It is not initialized if latch clear is conducted.)
To initialize the file register contents, perform data clear operation in a sequence program or using GX Developer.

■ File register data storage location

As the memory for storing the file register data, there are three different memories: standard RAM, SRAM card and Flash card. The file register data storage location changes depending on the CPU module.
The file register data storage location of each CPU module is as described in the following table.

CPU module		Storage location
Basic model QCPU	Q00JCPU	None (File registers unavailable)
	Q00CPU, Q01CPU	Standard RAM
High Performance model QCPU Process CPU Redundant CPU		Standard RAM, memory card (SRAM card, Flash card)

■ File register capacity

● Using the Standard RAM

The standard RAM can store the following points of file registers.

CPU module		Number of points*1*2
Basic model QCPU	Q00JCPU	File registers unavailable
	Q00CPU, Q01CPU	64k points
High Performance model QCPU	Q02CPU	32k points
	Q02HCPU, Q06HCPU	64k points
	Q12HCPU, Q25HCPU	128k points
Process CPU	Q12PHCPU, Q25PHCPU	128k points
Redundant CPU	Q12PRHCPU, Q25PRHCPU	128k points

*1: Since the Basic model QCPU does not have local devices, it can use the above number of file register points.
The High Performance model QCPU, Process CPU and Redundant CPU can use the above number of point when they do not use local devices.

*2: The number of available points changes since the standard RAM capacity changes depending on the CPU module version.

Basic
Note 1.68

● Using the SRAM Card Note1.68

The size of a file can be expanded at the rate of 32 k words per block, up to 32 blocks, 1017 k words. The number of expandable blocks depends on the size of programs or device comments stored on a memory card.

Basic
Note 1.68

● Using the Flash Card Note1.68

The size of a file can be expanded at the rate of 32 k words per block up to 32 blocks, 1018 k words. The number of expandable blocks depends on the size of programs or device comments stored on a memory card.

■ Differences in access methods by storage destination memory

Basic Note 1.68

The file register access method changes depending on the memory.

How to Access		Standard RAM	SRAM Card *Note1.68*	Flash Card *Note1.68*
Read with a user's program		○	○	○
Write with a user's program		○	○	×
PLC read through the device setting		○	○	○
PLC write through the device setting		○	○	×
How to Modify the Stored Data	Online test operation from GX Developer	○	○	×
	PLC write from GX Developer	○	○	×
	PLC write from GX Developer (Flash ROM)	×	×	○
	Batch write from serial communication module	○	○	×
	Device write from GOT900 Series	○	○	×
	Random write command from GOT 900 Series	○	○	×

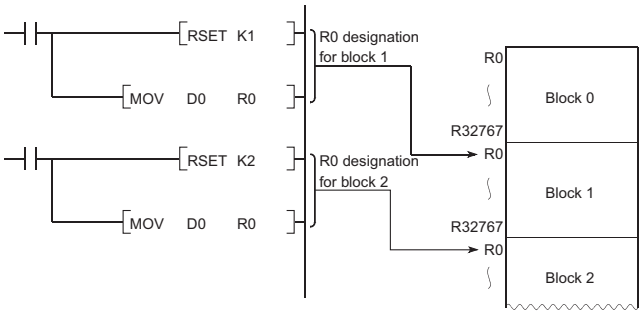
Basic Note 1.68

The Basic model QCPU does not support the memory card.

■ File register designation method

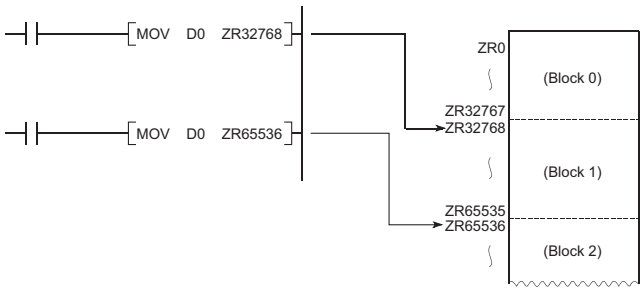
● Block switching format

The block switching format designates the number of file register points in 32k point (R0 to 32767) units.
If multiple blocks are used, switch to the block No. to be used in the RSET instruction for further file register settings.
Settings are designated in the R0 to 32767 range for each block.



● Serial number access format

This format is used for designating file register beyond 32k points by device number.
Multiple blocks of file registers can be used as a continuous file register. Use "ZR" as the device name.



Nesting (N)

Nesting is a device used in the master control instruction (MC instruction, MCR instruction) to program operation conditions in a nesting structure.

Pointer (P)

Pointer devices are used in jump instructions (CJ, SCJ, JUMP) or subroutine call instructions (CALL).

● Pointer types

(1) Basic model QCPU

Since the Basic model QCPU cannot execute multiple programs, it is irrelevant to the difference between local pointers and common pointers.

(2) High Performance model QCPU, Process CPU, Redundant CPU

There are the following two different pointer types.

- Local pointer
  Pointer used independently in each program.
- Common pointer
  Pointer that can be called by all executed programs using the subroutine call instruction.

Interrupt pointer (I)

Interrupt pointers are used as labels at the beginning of interrupt programs.
The interrupt pointers can be used in all running programs.

High Performance Note 1.69

● Interrupt factors

The following table indicates the interrupt factors of the interrupt pointers.

Interrupt factor	Interrupt pointer No.	Description	Applicable CPU module*6			
			1)	2)	3)	4)
Interrupt module*1 factor Note1.69	I0 to 15	Interrupt input from the interrupt module*1	○	○	○	○
Sequence start generator module factor	I16 to 27	Interrupt from the special function module that can make the CPU module start an interrupt. (Except QI60 and A1SI61)	×	○	×	×
Internal timer factor	I28 to 31, I49	Fixed scan interrupt by the internal timer of the CPU module.	△ *2	△ *2 *3	△ *3	△ *2
Error factor*5	I32 to 41	Interrupt made by occurrence of error that continues sequence program operation.	×	△ *4	△ *4	○
Intelligent function module factor	I50 to 255 (I50 to 127 for Basic model QCPU)	Interrupt from the intelligent function module.	○	○	○	○

○: Available △: Some interrupt pointers unavailable ×: N/A

*1: Refer to section 1.1.4 for the available interrupt modules.
*2: The interrupt pointer I49 (high-speed interrupt function dedicated pointer) is available for the QnHCPU only.
It is not available for the other CPUs.
*3: The Q02CPU cannot use the interrupt pointer I49 (high-speed interrupt function dedicated pointer).
*4: The interrupt pointers I40, I41 are available for the Redundant CPU only.
*5: For the error to which the error-time operation mode can be set in the PLC RAS setting of the PLC parameter dialog box, an interrupt is executed only when the setting is "Continue".
When 132 (all the stopping errors) occurs, the CPU stops operating after executing the processing of 132.
*6: The following table shows the the number in the Applicable CPU module field and the corresponding CPU module
Applicable CPU module

No.	CPU module
1)	Basic model QCPU
2)	High Performance model QCPU
3)	Process CPU
4)	Redundant CPU

High Performance Note 1.69

When using the interrupt module with the High Performance model QCPU, check the versions of the CPU module and GX Developer.

Other Devices

■ SFC block device (BL)

This device is used for checking if the block designated by the SFC program is valid.

■ SFC transition device (TR)

Basic Note 1.70

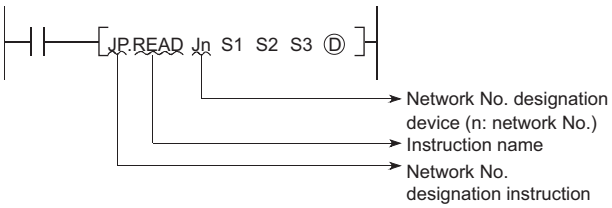
This device is used for checking if a forced transition is designated for a specified transition condition in a specified SFC program block.

■ Network No. designation device (J)

The network No. designation device is used to designate the network No. in data link instructions.

● Designating network No. designation device

The network No. designation device is designated in the data link instruction as shown in the following diagram.

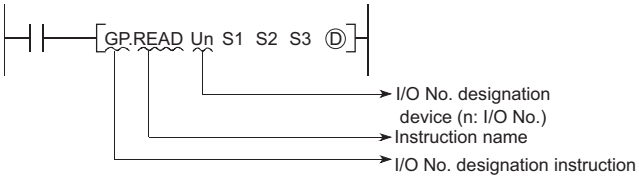


■ I/O No. designation device (U)

I/O No. designation devices are used with instructions dedicated to intelligent function module to designate I/O numbers.

● Designating the I/O No. designation device

I/O No. designation devices are designated with the intelligent function module instructions as shown in the following diagram.



■ Macro instruction argument device (VD)

Macro instruction argument devices are used with ladders registered as macros.

When a VD□ setting is designated for a ladder registered as a macro, conversion to the designated device is performed when the macro instruction is executed.

Basic Note 1.70

The Basic model QCPU cannot use the SFC transition device (TR).

Constants

■ Decimal constant (K)

Decimal constants are devices that designate decimal data in sequence programs.

Specify it as K □ (example: K1234) in a sequence program.

● Designation range

The designation ranges for decimal constants are as follows:

- For word data (16 bits)
  K-32768 to 32767
- For 2-word data (32 bits)
  K-2147483648 to 2147483647

■ Hexadecimal constant (H)

Hexadecimal constants are devices which designate hexadecimal or BCD data in sequence programs.
(For BCD data designations, 0 to 9 digit designations are used.)

Hexadecimal constants are designated as "H " □ settings (e.g. H1234).

● Designation range

The setting ranges for hexadecimal constants are as follows:

- For word data (16 bits)
  H0 to FFFF
  (H0 to 9999 for BCD)
- For 2-word data (32 bits)
  H0 to FFFFFFFF
  (H0 to 99999999 for BCD)

■ Real number (E)

Basic Note 1.71

Real numbers are devices which designate real numbers in the sequence program.

Specify it as E □ (example: E1.234) in a sequence program.

● Designation range

The setting ranges for real numbers are as follows:

$\pm 2^{-126} \leqq$ Device $\leqq \pm 2^{128}$
(Except -0)

● Designation method

Real numbers can be designated in sequence programs by a "normal expression" or an "exponential expression".

•Normal expression

The specified value is designated as it is.
For example, 10.2345 becomes E10.2345.

•Exponential expression

The specified value is multiplied by a " × 10n" exponent.

For example, 1234 becomes E1.234 + 3. *1

*1: + 3 in E1.234 + 3 indicates 10^3.

■ Character string (" ")

Basic Note 1.72

Character string constants are devices used to designate character strings in sequence programs. They are designated by quotation marks (e.g. "ABCD1234").

● Usable characters

All JIS8 code characters can be used in character strings.
The QCPU is sensitive to uppercase and lowercase characters.

● Number of designated characters

Character strings extend from the designated character to the NUL code (00H).
You can use up to 32 characters for a character string in an instruction such as $MOV.

Basic Note 1.71

When using the real number operation function for the Basic model QCPU, check the versions of the CPU module and GX Developer.

Basic Note 1.72

The Basic model QCPU can use character strings for only the $MOV, STR, DSTR, VAL, DVAL, ESTR and EVAL instructions.

Convenient Usage of Devices

Basic Note 1.73

When executing multiple programs in the CPU module, local devices among the internal user devices can be designated to execute each of the programs in an independent manner.
Note1.73

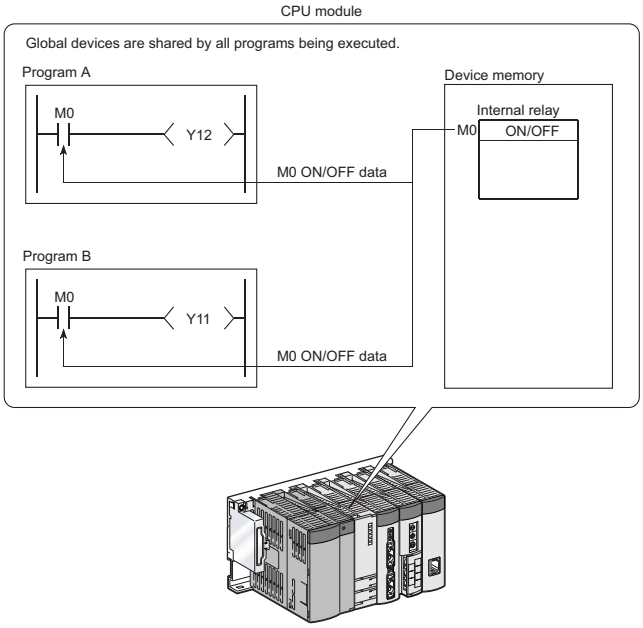
■ Global devices and local devices

Basic Note 1.74

A number of programs can be stored and executed in the CPU module.
CPU module devices are classified into "global devices" shared by all the programs being executed and "local devices" used independently by each of the programs.

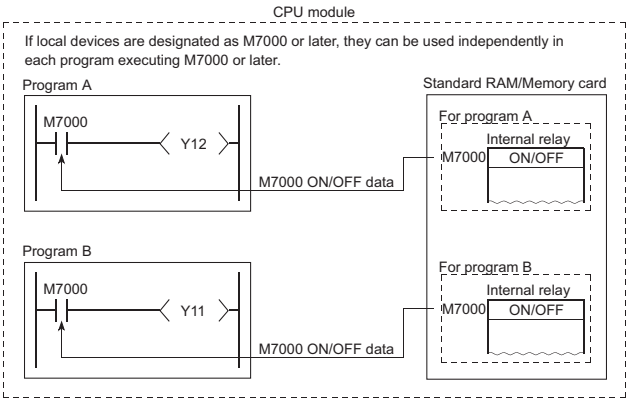
● Global devices

Global devices can be shared by all the programs being executed in the CPU module. Global device data are stored in the CPU module device memory, and can be used by all programs.



● Local devices

Local devices are used independently by the programs.
The use of local devices permits programming of multiple "independent execution" programs without regard to other programs.
However, the local device data can be stored into the standard RAM and memory card only.



(1) Devices that can be used as local devices

The following devices can be used as local devices.
- internal relays (M)
- edge relays (V)
- timers (T, ST)
- counters (C)
- data registers (D)

(2) Saving and restoration of local device file

Programs used as local devices exchange the local device file data stored in the memory card with the data in the device memory of CPU module.
Therefore, the scan time is extended by this data exchange time.

Basic Note 1.73

Since the Basic model QCPU cannot execute multiple programs, it does not support the function that makes each program independent by local device designation.

Basic Note 1.74

Since the Basic model QCPU cannot execute multiple programs, it is irrelevant to the difference between local devices and common devices. When the Basic model QCPU is used, it is not necessary to consider of the description in this section.

(3) Setting the ranges of devices used as local devices

When using as local devices, set the ranges of the devices used as local devices in the device of the PLC parameter dialog box.
Note that the range designated for local devices applies to all programs, and cannot be changed for individual programs.

(4) Using local devices used by the file where a subroutine program is stored

It is possible to use local devices that are used by the file where a subroutine program is stored when executing a subroutine program.
Whether or not such local devices are used is set by special relay (SM776) ON/OFF setting.

(5) Using local devices when executing an interrupt/fixed scan execution type program

It is possible to use local devices in the file where an interrupt/fixed scan execution type program is stored when executing an interrupt/fixed scan execution type program.
The local devices can be set available/unavailable by special relay "SM777" ON/OFF setting.

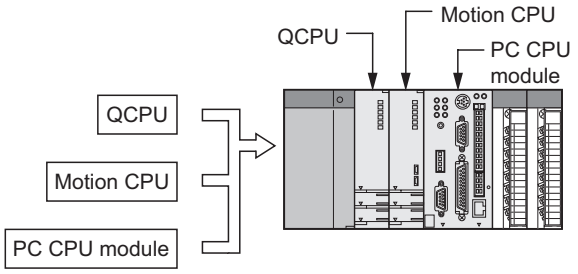
1.6 Multiple CPU system

1.6.1 Definition of multiple CPU system

● Configuration of multiple CPU system

Basic Note 1.75
Process Note 1.75

A multiple CPU system is a system in which more than one CPU module are mounted on several a main base unit Note1.75 in order to control the I/O modules and intelligent function modules.*1



*1: A multiple CPU system can be configured with up to 3 CPU modules for a Basic model QCPU and up to 4 CPU modules for a High Performance model QCPU or Process CPU.

Redundant Note 1.76
Basic Note 1.77

Applicable CPU modules are shown in the following table Note1.76

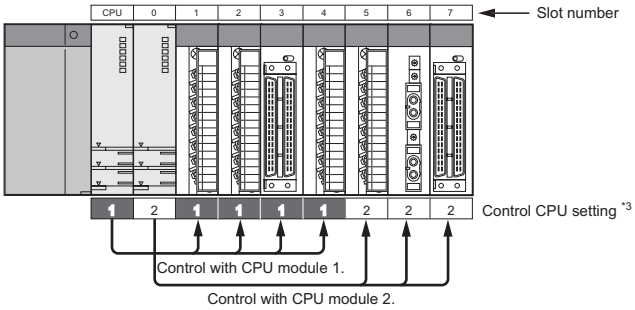
QCPU	Basic model QCPU Note1.77	Q00CPU, Q01CPU
	High Performance model QCPU	Q02CPU,Q02HCPU,Q06HCPU,Q12HCPU, Q25HCPU
	Process CPU	Q12PHCPU,Q25PHCPU
Motion CPU		Q172CPU,Q173CPU,Q172CPUN,Q173CPUN, Q172HCPU,Q173HCPU
PC CPU module		CONTEC Co., Ltd.*2

Choose the CPU modules suitable for the system size and application to configure the system.

*2: For further information on PC CPU module, consult CONTEC Co.,Ltd.
Tel:+81-6-6472-7130

● Method for controlling I/O module and intelligent function module

It is necessary to set (control CPU setup) which CPU modules are to control which I/O modules and intelligent function modules with a multiple CPU system.



The CPU module that controls the I/O modules and intelligent function modules is called as a "Control CPU".
The I/O modules and intelligent function modules controlled by the control CPU are called "controlled modules".
Other modules not controlled by the control CPU are called as "non-controlled modules".

*3: Indicates the grouping configuration on the GX Developer. CPU module1 indicates the "CPU No.1," and "1" on the I/O module and intelligent function module indicates that their control CPU is the CPU No.1.

● Multiple CPU system setting

Basic Note 1.78
Process Note 1.78

For control in the multiple CPU system, it is necessary to set up the "Number of mounted CPU modules" and the "Control CPU" with PLC parameters for all CPU modules mounted on the main base unit Note1.78.

Basic Process Note 1.75

The Basic model QCPU cannot be used with the slim type main base unit in the multiple CPU system.
The Process CPU cannot be used with the slim type main base unit.

Redundant Note 1.76

The redundant CPU is not available for the multiple CPU system.

Basic Note 1.77

The Q00JCPU is not available for the multiple CPU system.

Basic Process Note 1.78

The Basic model QCPU cannot be used with the slim type main base unit in the multiple CPU system.
The Process CPU cannot be used with the slim type main base unit.

● Access range of multiple CPU system

In the multiple CPU system, the access ranges are different between the controlled module and the non-controlled module.

(1) Controlled module

The multiple CPU system's control CPU can refresh the I/O data of controlled modules and read/write the buffer memory data of intelligent function modules in the same way as in a single CPU system.

(2) Non-controlled module

It is possible to access non-controlled modules in the following ways.

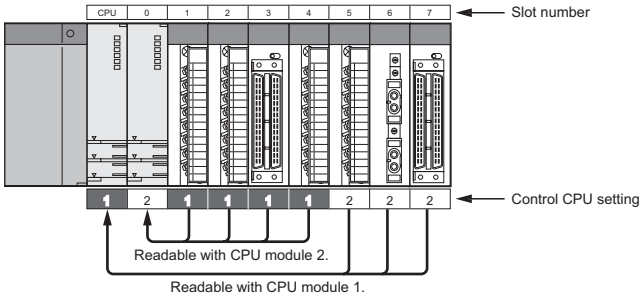
- Refreshing the input for I/O modules, I/O composite module and intelligent function modules

(the PLC parameter's multiple CPU setup is necessary.)

- Reading the intelligent function module's buffer memory.
- Downloading the output data from the output module, the I/O composite module and the intelligent function modules.

However, it is not possible to access non-controlled modules in the following ways.

- Outputting data to output modules, I/O composite module and intelligent function modules.
- Writing data into the intelligent function module's buffer memory.



(3) Range of access to other station's CPU module

To access to a CPU on other station from GX Developer, access can be made through a network module controlled by any CPU module in the multiple CPU system.
When other station has multiple CPUs, specifying the CPU No. allows access to the desired CPU.

● Multi-control system

(1) Configuration optimum for system

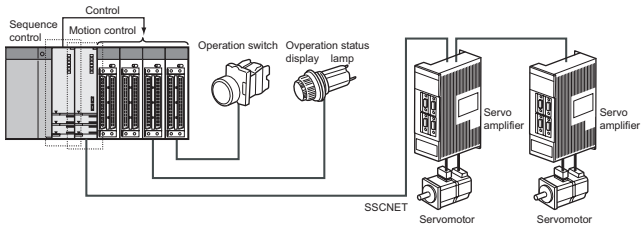
Since each system uses not only one QCPU but any combinations of the QCPU, Motion CPU, and PC CPU module according to the system, the development efficiency and ease of maintenance of the system can be enhanced.

(2) Module control

Each CPU module in the multiple CPU system controls the I/O module and intelligent function module on the base unit by each slot.
GX Developer groups the I/O modules and intelligent function modules controlled by each CPU module in the multiple CPU system.

● Sequence control and motion control systems can be configured on the same base.

In a Multiple CPU System consisting of the QCPU and Motion CPU, sequence control and motion control can be implemented together to achieve a high-level motion system.

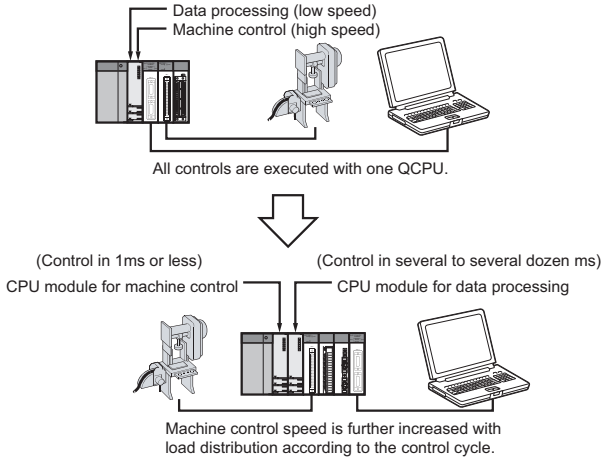


Basic
Note 1.79

● System configuration based on load distribution.*Note1.79*

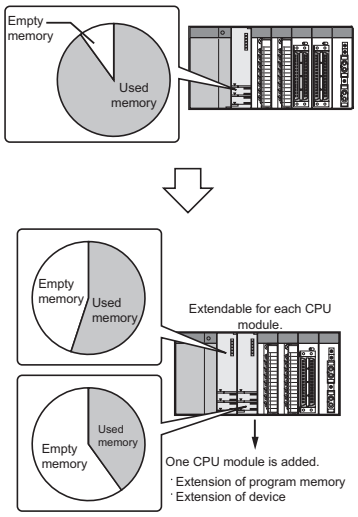
(1) Distribution of processing

By distributing the high-load processing performed on a single QCPU over several CPU modules, it is possible to reduce the overall system scan time.



(2) Distribution of memory

It is possible to increase the amount of memory used throughout the entire system by distributing the memory used over several CPU modules.



Basic
Note 1.79

Using multiple Basic model QCPUs is not allowed. Also, the Basic model QCPU cannot be used together with the High Performance model QCPU or Process CPU.

● Enables system configuration through function distributing

By distributing the functions, control for production line A and control for production line B is performed on different CPU modules, allowing easy program development.

● Communication between CPU modules in the multiple CPU system

The following data transfer can be made between CPU modules in the multiple CPU system.

(1) Data transfer between CPU modules

The following data transfer can be made between CPU modules in the multiple CPU system.

(2) Reading other CPU data

The QCPU can use the FROM instruction/intelligent function module device (U☐\G☐) to read data from other CPU as necessary.

(3) Control instruction to Motion CPU

Instructions dedicated to the Motion CPU can be used to issue control commands from the QCPU to the Motion CPU.

(4) Read/write of Motion CPU's device data

The QCPU can issue instructions dedicated to communication between multiple CPUs, to read or write device data from/to the Motion CPU.

(5) Event issue to PC CPU module

With the instruction dedicated to the communication between multiple CPUs, an event can be issued from a QCPU to a PC CPU module.

1.6.2 Configuration example of multiple CPU system

Differences between the single CPU system and the multiple CPU system are described in this section.

● When using the Basic model QCPU

		Single CPU system	Multiple CPU system
System configuration	Maximum number of extension stages	4 stages	
	Maximum number of mounted I/O modules	25 - (No. of CPUs)*1, *2	
	Main base unit model	Q3□B, Q3□SB, Q3□RB	Q3□B
	Extension base unit model	Q5□B, Q6□B, Q6□RB	Q5□B, Q6□B
	Extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
	Overall distance of extension cable	Within 13.2 m	
	Power supply module model	Q6□P, Q6□SP, Q6□RP	Q6□P
Available module	Basic model QCPU	Function version A or later	Function version B or later
	I/O module	Function version A or later	
	Intelligent function module	Function version A or later	Function version B or later (Function version A or later for QD62, QD62D and QD62E. No version restriction for QI60.)
Available software package	GX Developer	Version 7 or later	Version 8 or later
	GX Configurator-AD	Version 1.10L or later*3	
	GX Configurator-DA	Version 1.10L or later*3	
	GX Configurator-SC	Version 1.10L or later	
	GX Configurator-CT	Version 1.10L or later*3	
	GX Configurator-TI	Version 1.10L or later*3	
	GX Configurator-TC	Version 1.10L or later	
	GX Configurator-FL	Version 1.10L or later	
	GX Configurator-QP	Version 2.10L or later	
	GX Configurator-PT	Version 1.10L or later	
	GX Configurator-AS	Version 1.13P or later	
Concept	CPU module mounting position and CPU No.	CPU slot only (no CPU No.)	CPU slot = CPU No. 1 Slot 0 = CPU No. 2 Slot 1 = CPU No. 3
	I/O number assignment	Slot 0 is 00H.	The number assigned to the right of the CPU module placed in the rightmost position in the multiple CPU setting is 00H.*4
	Restrictions on number of mountable modules	The number of mountable modules per QCPU is restricted depending on the module type.	The number of mountable modules per QCPU and per system is restricted depending on the module type.

(Continued on next page)

*1: "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
It is 1 for the single CPU system.
*2: When the PC CPU module is mounted on the multiple CPU system, the maximum number of mounted I/O modules is 25 - (No. of CPUs +1).
*3: For some intelligent function modules, different version may be used.
*4: When the PC CPU module is mounted, the slot to the right of the PC CPU module is 10H.

1.6.3 Differences from single CPU system

(continued)

		Single CPU system	Multiple CPU system
Access range	Access from CPU module to other modules	All modules can be controlled.	Setting the relations between the CPU module and other modules with the PLC parameters (control CPU) is required.
	Access from GOT	Accessible	
	Access with instruction using link direct	Accessible	Only control CPU is accessible.
	Access to CC-Link	Accessible	Only control CPU is accessible.
	Access from peripheral devices	Accessible through RS-232 cable or via network.	Accessible through RS-232 cable or via network. When the Motion CPU or PC CPU module is connected, refer to the relevant manual for details.
Clock function	Clock data used by intelligent function module (QD75, etc.)	Clock data of the Basic model QCPU is used.	Clock data of the Basic model QCPU (CPU No. 1) is used.
Operation	CPU module resetting operation	The entire system is reset by resetting the Basic model QCPU.	The entire system is reset by resetting the Basic model QCPU (CPU No. 1). (Resetting CPU No. 2 and 3 individually is not allowed.)
	Operation for CPU module stop error	The system stops.	For a stop error of the Basic model QCPU of CPU No. 1, the multiple CPU system stops. (CPU modules No. 2 and 3 are in "MULTI CPU DOWN (Error code: 7000)" status. For a stop error occurred in CPU No. 2 or 3, the operation depends on the parameter setting of "Operation mode".
Communication between CPU modules	Communication using CPU shared memory by auto refresh	----	Basic model QCPU = 320 points Motion CPU = 2048 points PC CPU module = 2048 points Total points of all CPU modules: 4416 points
	Communication using CPU shared memory by programs	----	With TO, S.TO and/or FROM instructions and instruction using the intelligent function module device (U□\G□).
	Communication from Basic model QCPU to Motion CPU	----	Instructions dedicated to the Motion CPU: 5 types, Instructions dedicated to the communication between multiple CPUs: 3 types
	Communication from Basic model QCPU to PC CPU module	----	Communication dedicated instruction between multiple CPUs: 1 type
Scan time	Factors for increasing scan time	Writing data during RUN or communication processing time setting, etc.	In addition to factors for the single CPU system, refresh processing and waiting time may increase the scan time.
Parameter	Parameters added for multiple CPU system	----	1)No. of CPU modules (Multiple CPU setting) 2)Control CPU (detailed I/O assignment setting) 3)Out-of-group I/O setting (Multiple CPU setting) 4)Operation mode for CPU error stop (Multiple CPU setting) 5)Auto refresh setting of CPU shared memory (Multiple CPU setting) Some parameters must be set to the same for all CPU modules while others may be different for each CPU module.
Caution	When A compatible modules is mounted	A series compatible modules cannot be used.	

----:Not available

● **When using the High Performance model QCPU**

		Single CPU system	Multiple CPU system
System configuration	Maximum number of extension stages	7 stages	
	Maximum number of mountable I/O modules	65 - (No. of CPUs)*1, *2	
	Main base unit model*3	Q3□B, Q3□SB, Q3□RB	
	Extension base unit model*4	Q5□B, Q6□B, QA1S6□B, Q6□RB	
	Extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
	Overall distance of extension cable	Within 13.2 m	
	Power supply module model*5	Q6□P, Q6□SP, Q6□RP, A1S6□P	
Available module	High Performance model QCPU	Function version A or later	Function version B or later
	I/O module	Function version A or later	
	Intelligent function module	Function version A or later	Function version B or later (Function version A or later for QD62, QD62D and QD62E. No function restriction for QI60.)
Available software	GX Developer	Version 4 or later	Version 6 or later
	GX Configurator-AD	SW0D5C-QADU 00A or later*6	SW05D5C-QADU 20C or later*6
	GX Configurator-DA	SW0D5C-QDAU 00A or later*6	SW05D5C-QDAU 20C or later*6
	GX Configurator-SC	SW0D5C-QSCU 00A or later*6	SW05D5C-QSCU 20C or later*6
	GX Configurator-CT	SW0D5C-QCTU 00A or later*6	SW05D5C-QCTU 20C or later*6
	GX Configurator-TI	Version 1.00A or later*6	
	GX Configurator-TC	SW0D5C-QCTU 00A or later	
	GX Configurator-FL	SW0D5C-QFLU 00A or later	
	GX Configurator-QP	Version 2.00A or later	
	GX Configurator-PT	Version 1.00A or later	
	GX Configurator-AS	Version 1.13P or later	
Concept	CPU module mounting position and CPU No.	CPU slot only (no CPU No.)	CPU slot = CPU No. 1 Slot 0 = CPU No. 2 Slot 1 = CPU No. 3 Slot 2 = CPU No. 4

(Continued on next page)

*1: "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
It is 1 for the single CPU system.

*2: When the PC CPU module is mounted on the multiple CPU system, the maximum number of mounted I/O modules is 65 - (No. of CPUs +1).

*3: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q3□RB is not available.

*4: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q6□RB is not available.

*5: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q6□RP is not available.

*6: For some intelligent function modules, different version may be used.

*7: When the PC CPU module is mounted, the slot to the right of the PC CPU module is 10.

(continued)

		Single CPU system	Multiple CPU system
Access range	Access from CPU module to other modules	All modules can be controlled.	Setting the relations between the CPU module and other modules with the PLC parameter (control CPU) is required.
	Access from GOT	Accessible	Accessible to the High Performance model QCPU of the specified CPU No.
	Access with instruction using link direct	Accessible	Only control CPU is accessible.
	Access to CC-Link	Accessible	Only control CPU is accessible.
	Access from peripheral devices	Accessible through USB or RS-232 cable, or via network.	Accessible through USB or RS-232 cable, or via network. When the Motion CPU or PC CPU module is connected, refer to the relevant manual for details.
Clock function	Clock data used by intelligent function module (QD75, etc.)	Clock data of the High Performance model QCPU is used.	Clock data of the High Performance model QCPU (CPU No. 1) is used.
Operation	CPU module resetting operation	The entire system is reset by resetting the High Performance model QCPU.	The entire system is reset by resetting the High Performance model QCPU (CPU No. 1). (Resetting CPU No. 2 to 4 individually is not allowed.)
	Operation for CPU module stop error	The system stops.	For a stop error of the High Performance model QCPU of CPU No. 1, the multiple CPU system stops. (CPU modules No. 2 to 4 are in "MULTI CPU DOWN (Error code: 7000)" status. For a stop error occurred in any of CPU No. 2 to 4, the operation depends on the parameter setting of "Operation mode".
Communication between CPU modules	Communication using CPU shared memory by auto refresh	----	Up to 2K words in total of 4 settings per CPU. The total for all CPU modules is 8K words.
	Communication using CPU shared memory by programs	----	With TO and/or FROM instructions and instruction using the intelligent function module device (U□\G□).
	Communication from high performance model QCPU to Motion CPU	----	Instructions dedicated to the Motion CPU: 5 types, Instructions dedicated to the communication between multiple CPUs: 3 types
	Communication from high performance model QCPU to PC CPU module	----	Instruction dedicated to the communication between multiple CPUs: 1 type
Scan time	Factors for increasing scan time	Writing data during RUN or communication processing time setting, etc.	In addition to factors for the single CPU system, refresh processing and waiting time may increase the scan time.
Parameter	Parameters added for multiple CPU system	----	1)No. of CPU modules (Multiple CPU setting) 2)Control CPU (detailed I/O assignment setting) 3)Out-of-group I/O setting (Multiple CPU setting) 4)Operation mode for CPU error stop (Multiple CPU setting) 5)Auto refresh setting of CPU shared memory (Multiple CPU setting) Some parameters must be set to the same for all CPU modules while others may be different for each CPU module.
Caution	When AnS compatible modules is mounted	Use is allowed.	Use is allowed when the High Performance model QCPU is set to the control CPU.

----: Not available

● **When using the Process CPU**

		Single CPU system	Multiple CPU system
System configuration	Maximum number of extension stages	7 stages	
	Maximum number of mounted I/O modules	65 - (No. of CPUs)*1,*2	
	Main base unit model*3	Q3□B, Q3□RB	
	Extension base unit model*4	Q5□B, Q6□B, Q6□RB	
	Extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
	Overall distance of extension cable	Within 13.2 m	
	Power supply module model*5	Q6□P, Q6□RP	
Available module	Process CPU	No restrictions on function version	
	I/O module	Function version A or later	
	Intelligent function module	Function version A or later	Function version B or later (Function version A or later for QD62, QD62D and QD62E. No version restriction for QI60.)
Available software	GX Developer	Version 7.10L or later	
	GX Configurator-AD	Version 1.13P or later*6	
	GX Configurator-DA	Version 1.13P or later*6	
	GX Configurator-SC	Version 1.13P or later	
	GX Configurator-CT	Version 1.13P or later*6	
	GX Configurator-TI	Version 1.13P or later*6	
	GX Configurator-TC	Version 1.13P or later	
	GX Configurator-FL	Version 1.13P or later	
	GX Configurator-QP	Version 2.13P or later	
	GX Configurator-PT	Version 1.13P or later	
	GX Configurator-AS	Version 1.13P or later	
Concept	CPU module mounting position and CPU No.	CPU slot only (no CPU No.)	CPU slot = CPU No. 1 Slot 0 = CPU No. 2 Slot 1 = CPU No. 3 Slot 2 = CPU No. 4
	I/O number	Slot 0 is 00_H	The slot is 00_H when it is on the right of the right most CPU module.
	Restiriction on number of mounted modules	Restirictions on the number per QCPU, which are depend on module types.	Restirictions on the number per module/system of CPU , which are depend on module types.

(Continued on next page)

*1: "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
It is 1 for the single CPU system.

*2: When the PC CPU module is mounted on the multiple CPU system, the maximum number of mounted I/O modules is 65 - (No. of CPUs +1).

*3: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q3□RB is not available.

*4: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q6□RB is not available.

*5: When the Motion CPU or PC CPU module is mounted on the multiple CPU system, Q6□RP is not available.

*6: For some intelligent function modules, different version may be used.

*7: When the PC CPU module is mounted, the slot to the right of the PC CPU module is 10_H.

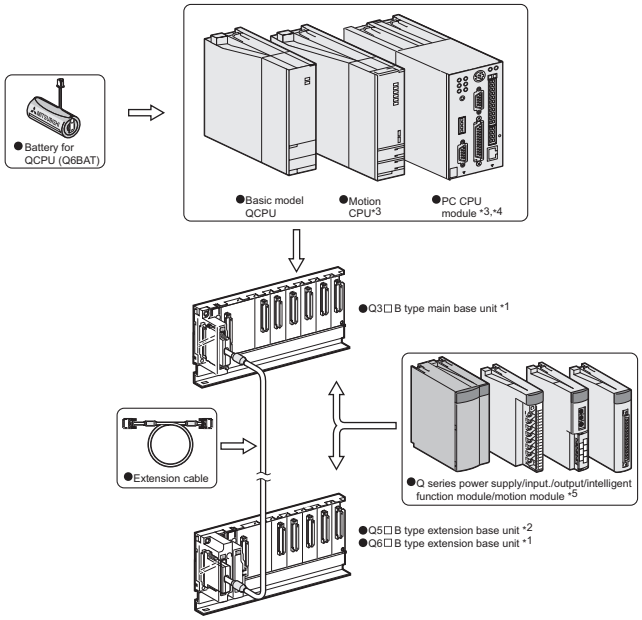
(continued)

		Single CPU system	Multiple CPU system
Access range	Access from CPU module to other modules	All modules can be controlled.	Setting the relations between the CPU module and other modules with the PLC parameter (control CPU) is required.
	Access from GOT	Accessible	Accessible to the Process CPU of the specified CPU No.
	Access with instruction using link direct	Accessible	Only control CPU is accessible.
	Access to CC-Link	Accessible	Only control CPU is accessible.
	Access from peripheral devices	Accessible through USB or RS-232 cable, or via network.	Accessible through USB or RS-232 cable, or via network. When the Motion CPU or PC CPU module is connected, refer to the relevant manual for details.
Clock function	Clock data used by intelligent function module (QD75, etc.)	Clock data of the Process CPU is used.	Clock data of the Process CPU (CPU No. 1) is used.
Operation	CPU module resetting operation	The entire system is reset by resetting the Process CPU.	The entire system is reset by resetting the Process CPU (CPU No. 1). (Resetting CPU No. 2 to 4 individually is not allowed.)
	Operation for CPU module stop error	The system stops.	For a stop error of the Process CPU of CPU No. 1, the multiple CPU system stops. (CPU modules No. 2 to 4 are in "MULTI CPU DOWN (Error code: 7000)" status. For a stop error occurred in any of CPU No. 2 to 4, the operation depends on the parameter setting of "Operation mode".
Communication between CPU modules	Communication using CPU shared memory by auto refresh	----	Up to 2K words in total of 4 settings per CPU. The total for all CPU modules is 8K words.
	Communication using CPU shared memory by programs	----	With TO and/or FROM instructions and instruction using the intelligent function module device (U□\G□).
	Communication from Process CPU to Motion CPU	----	Instructions dedicated to the Motion CPU: 5 types, Instructions dedicated to the communication between multiple CPUs: 3 types
	Communication from Process CPU to PC CPU module	----	Communication dedicated instruction between multiple CPUs: 1 type
Scan time	Factors for increasing scan time	Writing data during RUN or communication processing time setting, etc.	In addition to factors for the single CPU system, refresh processing and waiting time may increase the scan time.
Parameter	Parameters added for multiple CPU system	----	1) No. of CPU modules (Multiple CPU setting) 2) Control CPU (detailed I/O assignment setting) 3) Out-of-group I/O setting (Multiple CPU setting) 4) Operation mode for CPU error stop (Multiple CPU setting) 5) Auto refresh setting of CPU shared memory (Multiple CPU setting) Some parameters must be set to the same for all CPU modules while others may be different for each CPU module.
Caution	When A compatible modules is mounted	A series compatible modules cannot be used.	

----: Not available

1.6.4 System configuration

● System configuration using Basic model QCPU (Q00CPU, Q01CPU)



*1: As a power supply module, use the Q61P, Q61P-A1, Q61P-A2, Q62P, Q63P or Q64P.
Make the power consumption within the rated output current value of the power supply module.
The Q61SP and Q6□RP cannot be used as a power supply module.

*2: No Q series power supply module is required for the Q5□B type extension base unit.

*3: The QCPU battery (Q6BAT) cannot be installed to the Motion CPU and the PC CPU module.

*4: For further information on PC CPU module, consult CONTEC Co., Ltd
Tel: +81-6-6472-7130(2)

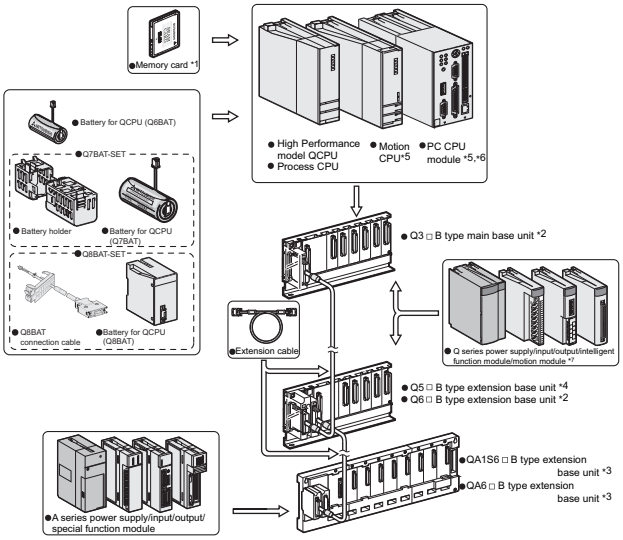
*5: Be sure to set the control CPU of motion modules to the Motion CPU.

POINT

1. The Q00JCPU is not available for the multiple CPU system.
2. When the multiple CPU system is configured using the Basic model QCPU, use of the High Performance model QCPU and the Process CPU in combination is not allowed.
3. When the multiple CPU system is configured using the Basic model QCPU, use of the redundant base unit (Q3□RB/Q6□RB) is not allowed.
4. For the multiple CPU system using the Basic model QCPU, the slim type main base unit (Q3□SB) is not available.

● System configuration using High Performance model QCPU or Process CPU

(1) When using the main base unit (Q3□B)



*1: Only one memory card can be mounted. Select an appropriate memory card from the SRAM, Flash and ATA in accordance with application and capacity.
When a commercial memory card is used, the operation is not guaranteed.

*2: Use the Q61P, Q61P-A1, Q61P-A2, A62P, Q63P or Q64P for the power supply module. Keep the current consumption within the rated output current of the power supply module. The Q61SP and Q6□RP are not available for the power supply module.

*3: When the High Performance model QCPU is set to the control CPU of the A series module, extension is allowed.
When the Process CPU is used, extension is not allowed.
The additional QA65B, QA68B, QA1S65B and QA1S68B base units are used as the A Series power supply module, the I/O module and the special function module.

*4: The Q Series power supply module is not required for the Q5□B extension base unit.

*5: The motion CPU and PC CPU module do not accept battery for QCPU (Q6BAT, Q7BAT-SET and Q8BAT-SET) and memory card.

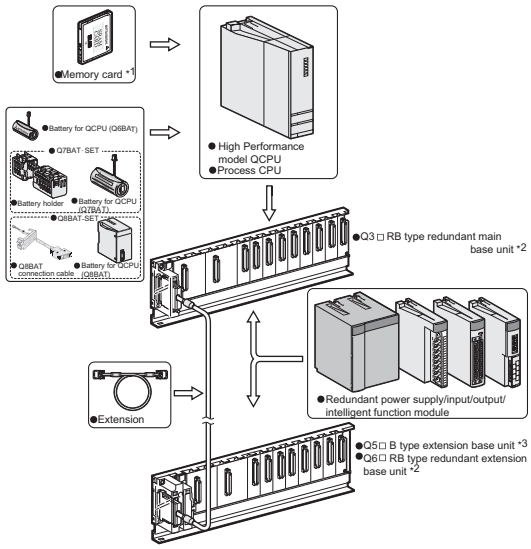
*6: For further information on PC CPU module, consult CONTEC Co., Ltd Tel: +81-6-6472-7130

*7: Be sure to set the control CPU of the motion module to the Motion CPU.

POINT

When the multiple CPU system is configured using the High Performance model QCPU and the Process CPU, use of the Basic model QCPU is not allowed.

(2) When using the redundant main base unit (Q3□RB)



*1: Only one memory card can be mounted. Select an appropriate memory card from the SRAM, Flash and ATA in accordance with application and capacity.
When a commercial memory card is used, the operation is not guaranteed.

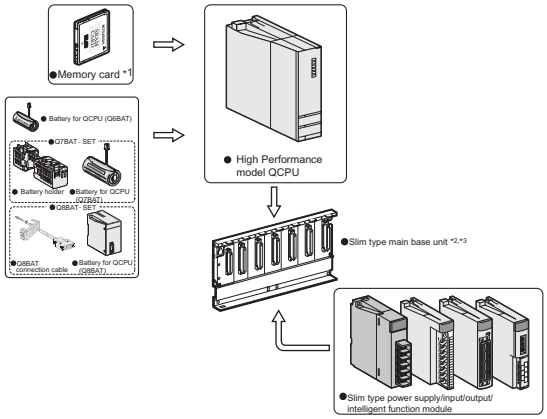
*2: As a power supply module, use the Q6□RP. Keep the current consumption whitin the rated output current of the power supply module. The Q61P, Q61P-A1, Q61P-A2, Q62P, Q63P, Q64P and Q61SP cannot be used as a power supply module.

*3: The Q Series power supply module is not required for the Q5□B extension base unit

POINT

1. When the multiple CPU system is configured using the High Performance model QCPU and the Process CPU, use of the Basic model QCPU is not allowed.
2. When the redundant main base unit (Q3□RB) is used, the Motion CPU and the PC CPU module cannot be used as a power supply module.
3. For power supply redundancy, use the redundant base unit (Q3□RB/ Q6□RB) and the redundant power supply modules (Q6□RP).
   On the redundant base unit (Q3□RB/ Q6□RB) only the redundant power supply module (Q6□RP) can be used as a power supply module.

(3) When using the slim type main base unit (Q3□SB)



*1: One memory card is installed. Select an appropriate memory card from the SRAM, Flash and ATA cards according to the application and capacity.
When the memory card is used, operation is not guaranteed.

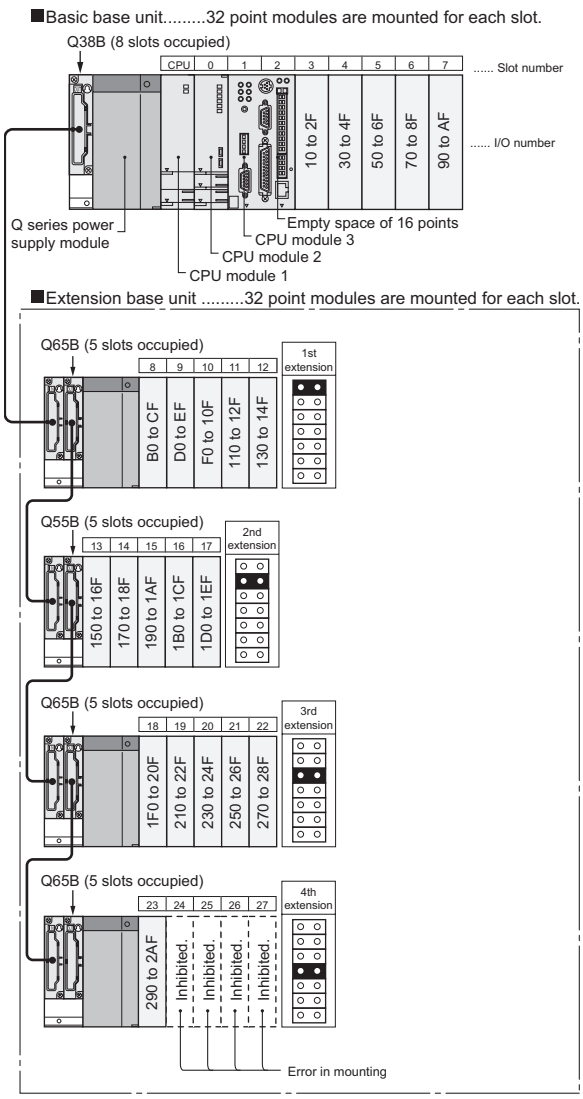
*2: The slim type main base unit does not have an extension cable connector.
The extension base or GOT cannot be connected via the bus connection.

*3: As a power supply module, use the slim type power supply module (Q61SP).
Keep the current consumption within the rated output current of the power supply module.
The Q61P, Q61P-A1, Q61P-A2, Q62P, Q63P, Q64P or Q6□RP cannot be used as a power supply module.

POINT

When the multiple CPU system is configured using the slim type main base unit, the available CPU module is only the High Performance model QCPU.

● Outline of system configuration when Basic model QCPU is mounted



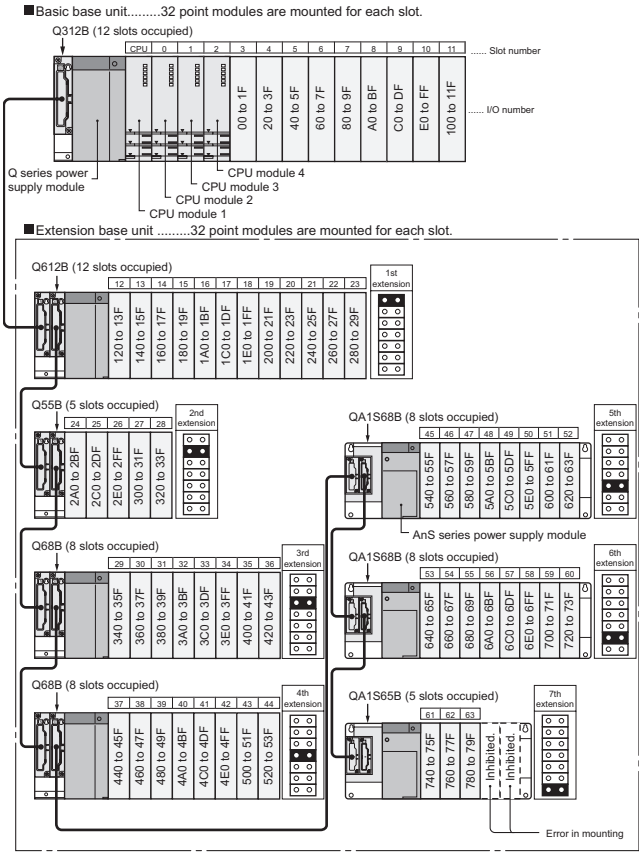
CPU number	CPU1: CPU No. 1 (Basic model QCPU), CPU2: CPU No. 2 (Motion CPU), CPU3: CPU No. 3 (PC CPU module)	
Maximum number of extension units	4 extension units	
Maximum number of mounted I/O modules	25 - (No. of CPUs)	
Available main base unit model	Q33B, Q35B, Q38B, Q312B	
Available extension base unit model	Model not requiring power supply module	Q52B, Q55B
	Model requiring Q series power supply module	Q63B, Q65B, Q68B, Q612B
Available extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
Available power supply module model	Q61P, Q61P-A1, Q61P-A2, Q62P, Q63P, Q64P	

Caution

- Do not use extension cable longer than 13.2m (43.28 feet).
- When using the extension cable, keep it away from the main circuit (high voltage, large current).
- Set the extension unit numbers not to overlap the same number for different extension base units.
- The QA6□B/QA1S6□B/Q6□RB cannot be connected as an extension base unit.
- When both Q5□B and Q6□B extension base units exists, there is no restriction on the connection order for them.
- Connect the extension cable from OUT of the extension cable connector of the base unit to IN of the next extension base unit.
- When 26 modules or more are mounted, an error, "SP. UNIT LAY ERR." (error code: 2124) occurs. (including one CPU module (CPU No.1)).
- On the multiple CPU system using the Basic model QCPU, use of the redundant base unit (Q3□RB/ Q6□RB) is not allowed.
- "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
- The PC CPU module occupies 2 slots. When the number of CPUs is 2 and the PC CPU module is used, the maximum number of I/O modules is decreased by 1 from the value indicated in the table.

● Outline of system configuration when High Performance model QCPU and Process CPU are mounted

(1) When using the main base unit (Q3□B)

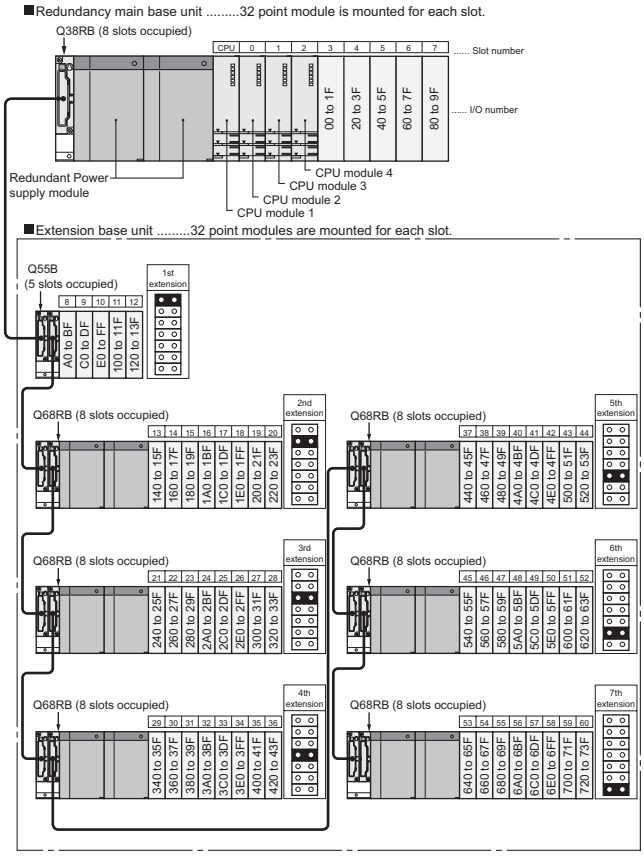


Number of CPU	CPU module1: CPU No.1, CPU module 2: CPU No.2, CPU module 3: CPU No.3, CPU module 4: CPU No.4	
Maximum number of extension stages	7 extension stages	
Maximum number of mounted I/O modules	65 - (No. of CPUs)	
Available main base unit model	Q33B, Q35B, Q38B, Q312B	
Available extension base unit model	Type not requiring power supply module	Q52B, Q55B
	Type requiring Q series power supply module	Q63B, Q65B, Q68B, Q612B
	Type requiring A series power supply module	QA1S65B, QA1S68B, QA65B, QA68B
Available extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
Available power supply module model	Q series power supply module	Q61P, Q61P-A1, Q61P-A2, Q62P, Q63P, Q64P
	A series power supply module	A1S61PN, A1S62PN, A1S63P, A61P, A61PEU, A62P, A62PEU, A63P

Caution

- Do not use extension cable longer than 13.2 m (43.28 feet).
- When using an extension cable, keep it away from the main circuit (high voltage and large current).
- When setting the number of extension stages, set the number in ascending order to avoid duplicated setting.
- If Q5☐B / Q6☐B and QA6☐B / QA1S6☐B are to be mounted on the same extension base unit, be sure to connect Q5☐B / Q6☐B at first and then QA6☐B / QA1S6☐B.
  Make the setting of the stage number of extension base units, starting with Q5☐B / Q6☐B in ascending order. There is no restriction on the connection order for them.
- The QA6☐B / QA1S6☐B extension unit can be used when the High Performance model QCPU is set to the control CPU of the A series module.
  It cannot be used when the Process CPU is used.
- The Q6☐RB cannot be connected as an extension base unit.
- Connect an extension cable between the OUT connector of an extension base unit and the IN connector of another extension base unit.
- When 66 modules or more are mounted, an error, "SP. UNIT LAY ERR." (error code: 2124) occurs. (Including CPU module of CPU No.1)
- "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
- The PC CPU module occupies 2 slots. When the PC CPU module is used, the maximum number of I/O modules is decreased by 1 from the value indicated in the table.

(2) When using the redundant main base unit (Q3☐RB)



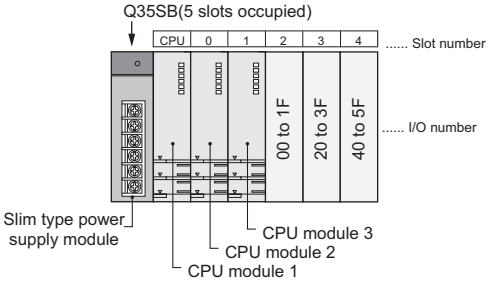
Number of CPU	CPU module1: CPU No.1, CPU module 2: CPU No.2, CPU module 3: CPU No.3, CPU module 4: CPU No.4	
Maximum number of extension stages	7 extension stages	
Maximum number of mounted I/O modules	65 - (No. of CPUs)	
Available main base unit model	Q38RB	
Available extension base unit model	Type not requiring power supply module	Q52B, Q55B
	Type requiring redundant power supply module	Q68RB
Available extension cable type	QC05B, QC06B, QC12B, QC30B, QC50B, QC100B	
Available power supply module model	Q64RP, Q63RP	

Caution

- Do not use an extension cable longer than 13.2 m (43.28 feet).
- When using an extension cable, keep it away from the main circuit (high voltage and large current).
- When setting the number of extension stages, set the number not to overlap to avoid duplicated setting.
- When both Q5□B and Q6□RB extension base units exists, there is no restriction on the connection order for them.
- The QA6□B, QA1S6□B or Q6□B cannot be connected as an extension base unit.
- Connect an extension cable between the OUT connector of an extension base unit and the IN connector of another extension base unit.
- When 66 modules or more are mounted, an error, "SP.UNIT LAY ERR." (error code: 2124) occurs. (Including CPU module of CPU No. 1)
- No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.
- When the redundant main base unit (Q3□RB) is used, GOT bus connection is not allowed.
- When the redundant main base unit (Q3□RB), the Motion CPU or PC CPU module cannot be used.

(3) When using the slim type main base unit (Q3□SB)

■Slim type main base unit .....32 point module is mounted for each slot.



CPU number	CPU module 1: CPU No.1 (High Performance model QCPU) CPU module 2: CPU No.2 (High Performance model QCPU) CPU module 3: CPU No.3 (High Performance model QCPU)	
Maximum number of extension units	Extension not allowed	
Maximum number of mounted I/O modules	Q32SB	3 - (No. of CPUs)
	Q33SB	4 - (No. of CPUs)
	Q35SB	6 - (No. of CPUs)
Available main base unit model	Q32SB, Q33SB, Q35SB	
Available power supply module model	Q61SP	

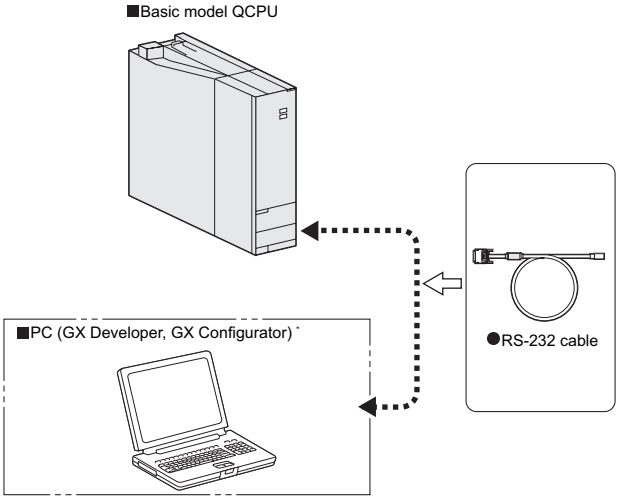
Notes

- When the multiple CPU system is configured using the slim type main base unit, the available CPU module is only the High Performance model QCPU.
- The slim type main base unit has no extension cable connector. The extension base or GOT cannot be connected.
- Since the current consumption of the CPU module exceeds the rated output current of the power supply module (Q61SP), mounting 4 CPU modules is not allowed.
- "No. of CPUs" indicates the number of CPU modules set in the "No. of CPUs" of the GX Developer.

Configuration of peripheral devices

This section describes the system configurations of peripheral devices that can be used with the Basic model QCPU, High Performance model QCPU and Process CPU.

● When using basic model QCPU

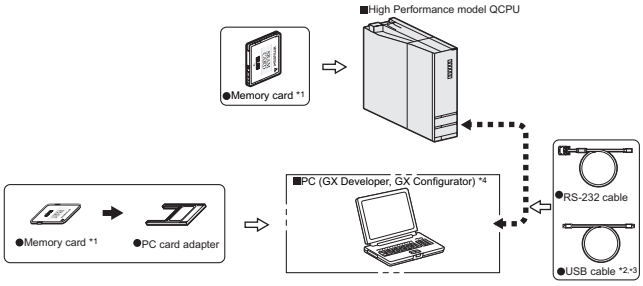


*: The available version varies depending on the system configuration.

POINT

For connection between the Motion CPU or PC CPU module and peripheral devices in the multiple CPU system, refer to the relevant manual of each CPU module.

● When using the High Performance model QCPU

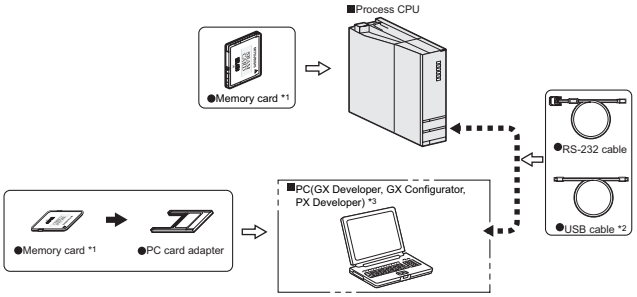


*1: Do not format the ATA card by other than GX Developer.
*2: It is not used for the Q02CPU.
*3: The available version varies depending on the system configuration.
*4: To obtain more information or make an order of the programming module (EPU01) and connection cable (EPU20R2CBL), contact the following numbers.
East Japan Sales DepartmentTEL:03-3288-1743
Central Japan Sales DepartmentTEL:052-565-3435
West Japan Sales DepartmentTEL:06-6347-2969
Kyushu Sales GGTEL:092-721-2202
*5: Programming modules cannot be used when writing the parameter "High-speed interruption fixed scan" to a high-performance model CPU having a serial number 04012 or later as the first 5 digits.

POINT

1. For connection between the Motion CPU or PC CPU module and peripheral devices in the multiple CPU system, refer to the relevant manual of each CPU module.
2. When the PC with GX Developer installed is connected to the Motion CPU in the multiple CPU system, communications are not available from GX Developer to the High Performance model QCPU and the Process CPU.

● When using the Process CPU



*1: Do not format the ATA card by other than GX Developer.
*2: The available version varies depending on the system configuration.

POINT

1. For connection between the Motion CPU or PC CPU module and peripheral devices in the multiple CPU system, refer to the relevant manual of each CPU module.
2. When the PC with GX Developer installed is connected to the Motion CPU in the multiple CPU system, communications are not available from GX Developer to the High Performance model QCPU and the Process CPU.

Configurable device and available software

Information on devices and software packages used for the system configuration is described in this section.

● CPU modules available for multiple CPU system

There are some restrictions on the CPU module model and function version as shown in the table below.
The restriction of each CPU module is explained in the following table.

CPU module	Model	Restrictions
Basic model QCPU *1	Q00CPU,Q01CPU	Function version B or later
High Performance model QCPU	Q02CPU,Q02HCPU, Q06HCPU, Q12HCPU,Q25HCPU	Function version B or later
Process CPU	Q12PHCPU,Q25PHCPU	No version restriction
Redundant CPU	Q12PRHCPU, Q25PRHCPU	Use not allowed
Motion CPU *2	Q172CPU,Q173CPU, Q172CPUN,Q173CPUN, Q172HCPU,Q173HCPU	Refer to each CPU manual
PC CPU module *3, *4, *5	PPC-CPU686(MS)-64, PPC-CPU686(MS)-128	

*1: The Q00JCPU is not available for the multiple CPU system.
*2: When using the Motion CPU, install OS software.
*3: When using the Basic model QCPU, use the bus interface driver software (PPC-DRV-01) of version 1.07 or later for the PC CPU module.
*4: When using the High Performance model QCPU and the PC CPU module together, use the following High Performance model QCPU and Motion CPU.
•High Performance model QCPU: Function version B with the first 5 digits of the serial number, "03051" or later
•Motion CPU: The first digit of the serial number is:
Q172CPU..."H" or later
Q173CPU..."G" or later

*5: When using the Process CPU, Motion CPU and PC CPU module together, use the following Motion CPU.
•Motion CPU: The first digit of the serial number is:
Q172CPU..."H" or later
Q173CPU..."G" or later

● Precautions when using Q Series I/O modules and intelligent function modules

(1) Compatible I/O modules

All I/O modules (QX□, QY□) are compatible with the multiple CPU system.
They can be used by setting any of CPU No.1 to No.4 as a control CPU.

(2) Compatible intelligent function modules

(a) The intelligent function modules compatible with the multiple CPU system are those of function version B or later.
They can be used by setting any of CPU No.1 to No.4 as a control CPU.

(b) Q Series high speed counter modules (QD62, QD62D, QD62E) compatible with the multiple CPU system are those of function version A or later.
They can be used by setting any of CPU No.1 to No.4 as a control CPU.

(c) Q Series interrupt modules (QI60) do not have a function version, but are supported by the multiple CPU system.
They can be used by setting any of CPU No.1 to No.4 as a control CPU.

(d) Intelligent function modules of function version A can be used in the multiple CPU system by setting CPU No.1 as a control CPU.
However, only control CPU can be accessed from serial communication modules and other external modules. (MELSECNET/H, serial communication modules and other external modules cannot access non-control CPUs.)
The "SP. UNIT VER. ERR. (error code: 2150)" occurs if any of CPU No.2 to No.4 has been set as a control CPU, and the multiple CPU system will not start up.

(3) Ranges of access to controlled and non-controlled modules

In a multiple CPU system, non-controlled modules can be accessed by setting "Out-of-group I/O setting" at the "Multiple CPU settings" dialog box in "PLC Parameter".

● Module replaceable online

(1) I/O modules and intelligent function modules

When a multiple CPU system includes a Process CPU, online module change is allowed.
The modules controlled by the Process CPU can be changed online.
The modules controlled by the High Performance model QCPU, Motion CPU and PC CPU module cannot be changed online.
Modules changeable online are shown in the following table.

Module type		Restriction
Input module		No restriction
Output module		
I/O composite module		
Intelligent function module	Analog-digital converter module	Function version "C" or later
	Digital-analog converter module	
	Thermocouple input module	
	Temperature control module	
	Loop control module	
	Pulse input module	

(2) CPU modules

To replace a module used with the Process CPU without stopping the system, configure a multiple CPU system with the CPU modules given in the following table.

CPU Module Type	Model	Function Version/ Serial No.
High Performance model QCPU	Q02CPU,Q02HCPU, Q06HCPU, Q12HCPU,Q25HCPU	First 5 digits of serial No. "04012" or later
Process CPU	Q12PHCPU,Q25PHCPU	No version restriction
Motion CPU	Q172CPU	Version "P" or later
	Q173CPU	Version "N" or later
	Q172CPUN,Q172HCPU, Q173CPUN,Q173HCPU	Version "A" or later
PC CPU module	PPC-CPU685(MS)-64, PPC-CPU686(MS)-128	Bus interface driver (PPC-DRV-01) version "1.05" or later

● Applicable software

(1) GX Developer and PX Developer

Versions of the GX Developer and the PX Developer applicable in the multiple CPU system are shown in the following table.

QCPU	Applicable software version	
	GX Developer	PX Developer
Basic model QCPU *2	Version 8.00A or later	Use not allowed
High Performance model QCPU	Version 6.00A or later	
Process CPU	Version 7.10L or later *1	Version 1.02C or later

*1: When using PX Developer, use GX Developer of version 7.20W or later.
*2: The Q00JCPU is not available for the multiple CPU system.

(2) Applicable GX Configurator

Versions of GX Configurator applicable in the multiple CPU system are shown in the following table.

QCPU	Applicable software version	
	Product name	Version
Basic model QCPU	GX Configurator-AD	Version 1.10L or later *1, *2
	GX Configurator-DA	Version 1.10L or later *3, *10
	GX Configurator-SC	Version 1.10L or later
	GX Configurator-CT	Version 1.10L or later *4
	GX Configurator-TI	Version 1.10L or later *5, *6
	GX Configurator-TC	Version 1.10L or later *8
	GX Configurator-FL	Version 1.10L or later
	GX Configurator-QP	Version 2.10L or later *9
	GX Configurator-PT	Version 1.10L or later
	GX Configurator-AS	Version 1.13P or later
High performance model QCPU	GX Configurator-AD	SW0D5C-QADU 20C or later *1, *2
	GX Configurator-DA	SW0D5C-QDAU 20C or later *3, *10
	GX Configurator-SC	SW0D5C-QSCU 20C or later *7
	GX Configurator-CT	SW0D5C-QCTU 20C or later *4
	GX Configurator-TI	Version 1.00A or later *5, *6
	GX Configurator-TC	SW0D5C-QCTU 00A or later *8
	GX Configurator-FL	SW0D5C-QFLU 00A or later
	GX Configurator-QP	Version 2.00A or later *9
	GX Configurator-PT	Version 1.00A or later
	GX Configurator-AS	Version 1.13P or later
Process CPU	GX Configurator-AD	Version 1.13P or later *1, *2
	GX Configurator-DA	Version 1.13P or later *3, *10
	GX Configurator-SC	Version 1.13P or later
	GX Configurator-CT	Version 1.13P or later *4
	GX Configurator-TI	Version 1.13P or later *6
	GX Configurator-TC	Version 1.13P or later *8
	GX Configurator-FL	Version 1.13P or later
	GX Configurator-QP	Version 2.13P or later *9
	GX Configurator-PT	Version 1.13P or later
	GX Configurator-AS	Version 1.13P or later

*1: When using the Q64AD-GH, use version 1.13P or later.
*2: When using the Q62AD-DGH, use version 1.14Q or later.
*3: When using the Q62DA-FG, use version 1.14Q or later.
*4: When using the QD60P8-G, use version 1.14Q or later.
*5: When using the Q64TDV-GH, use version 1.13P or later.
*6: When using the Q64RD-G, use version 1.17T or later.
*7: When using the QJ71CMO, use version 1.10L or later.
*8: To use the Q62HLC, use version 1.20W or later.
*9: To use the QD75MH, use version 2.20W or later.
*10: Model name selection of Q62DAN, Q64DAN, Q68DAVN and Q68DAIN can be made with version 2.03D or later.To use the software package earlier than version 2.03D, select a model name without "N" for each model.

● Modules of restricted quantity

The number of mountable modules and supported functions are restricted depending on the module type.
For the number of modules that can be mounted for each Motion CPU or PC CPU module, refer to each CPU module manual.

(1) When using the Basic model QCPU

Product	Model	Number of modules that can be mounted per system	Quantity restriction per QCPU
Q series MELSECNET/H network modules	QJ71LP21-25 QJ71LP21S-25 QJ71LP21G	Up to 4 on the PLC to PLC network. (However, the module that can be controlled by the Basic model QCPU is only one module on the PLC to PLC network)	One module only on the PLC to PLC network
Q series Ethernet interface modules	QJ71E71-B2 QJ71E71-B5 QJ71E71-100	One module only (Controllable with QCPU only)	One module only
Q series CC-Link system master/local modules	QJ61BT11N	Up to 10 *1 (Up to 2 modules can be controlled by QCPU.)	Up to 2 modules *1
Interrupt modules	QI60	Up to three modules *2 (One module only can be controlled by QCPU.)	One module only *2

*1: Modules of function version B or later can be used.
*2: Indicates the number of interrupt modules to which the interrupt pointer setting has not been made.
When the interrupt pointer setting has been made, the number of modules are not restricted.

(2) When using the High Performance model QCPU or Process CPU

Product	Model	Number of modules that can be mounted per system	Quantity restriction per QCPU
Q series MELSECNET/H network modules	QJ71BR11 QJ71LP21-25 QJ71LP21S-25 QJ71LP21G	Up to 4 on the PLC to PLC network and remote I/O network	Up to 4 on the PLC to PLC network and remote I/O network
Q series Ethernet interface modules	QJ71E71-B2 QJ71E71-B5 QJ71E71-100	Up to 4	Up to 4
Q series CC-Link system master/local modules	QJ61BT11N	No restriction *3	No restriction *3
AnS series corresponding Special function modules *4	A1SJ71PT32-S3 A1SJ71T32-S3	No restriction (Auto refresh setting not allowed)	No restriction (Auto refresh setting not allowed)
	A1SD51S A1SD21-S1 A1SJ71J92-S3 (When using GET/PUT service)	Up to 6	Up to 6
Interruption modules	A1SI61 *4	Only one	Only one
	QI60	Up to 4 (Up to 3 when the A1SI61 is in use)	

*3: The number of modules controlled by setting CC-Link network parameters on GX Developer is up to 4 per QCPU and 16 per system.
When setting parameters with the CC-Link dedicated instruction, the number is not restricted.

*4: This module can be used when a High Performance model QCPU is set to a controlled module.
When a Process QCPU is used, however, it cannot be used.

1.6.5 Concept of multiple CPU

Mounting position of CPU module

●When using Basic model QCPU

(1) Mounting position of Basic model QCPU

Only one Basic model QCPU can be mounted on the CPU slot (slot on the right-hand side of the power supply module) of the main base unit.

(2) Mounting position of Motion CPU

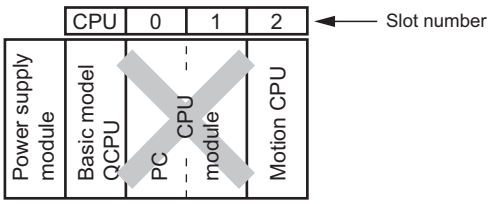
Only one Motion CPU can be mounted to slot 0 on the right of the Basic model QCPU. (It cannot be mounted to other than slot 0.)

(3) Mounting position of PC CPU module

Only one PC CPU module can be mounted on the right side of the other CPU module.
(No CPU module can be mounted on the right side of the PC CPU module.)

(a) When mounting the Motion CPU
The PC CPU module can be mounted to slots 1 and 2.

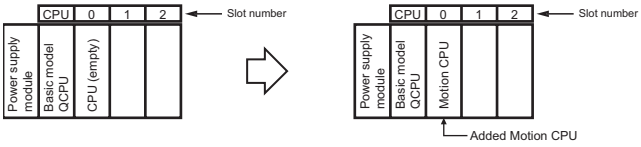
(b) When not mounting the Motion CPU
The PC CPU module can be mounted to slots 0 and 1.



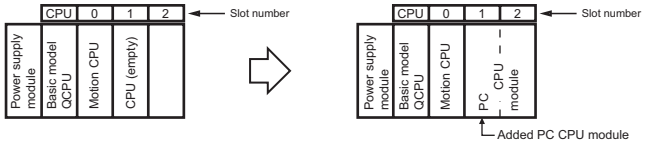
(4) "CPU (Empty)" setting

An empty slot can be reserved for future addition of a CPU module.
Set the number of CPU modules including empty slots in the number of CPUs setting, and set the type of the empty slot as "CPU (Empty)".

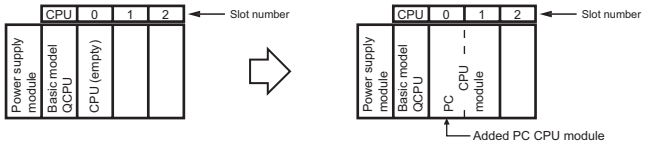
(a) When adding the Motion CPU in the future.
Set slot 0 as "CPU (Empty)."



(b) When adding the PC CPU module in the future.
•When mounting the Motion CPU
Set slot 1 as "CPU (Empty)."

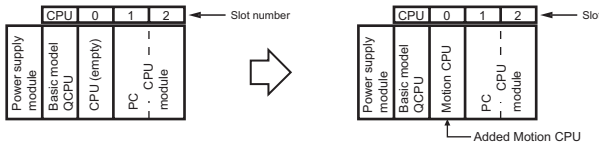


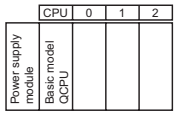
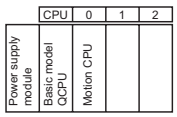
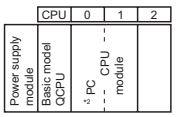
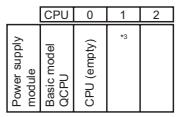
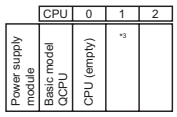
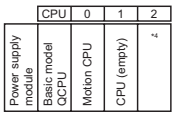
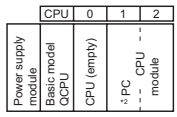
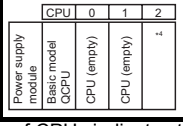
•When not mounting CPU
Set slot 0 as "CPU (Empty)."



POINT

For the Basic model QCPU, "CPU (Empty)" can be set between CPU modules.
When a Motion CPU is to be added to the system using the Basic model QCPU and the PC CPU modules in the future, CPU No. of the PC CPU module is not changed. Therefore, the program does not have to be changed.



No. of CPUs *1	Mounting position of CPU module		
1		----	----
2			
3			
		----	----

*1: No. of CPUs indicates the value set in the multiple CPU setting of the PLC parameter.
*2: The PC CPU module occupies 2 slots.
*3: When mounting a PC CPU module to slot 0 in the future, do not mount any module to slot 1.
*4: When mounting a PC CPU module to slot 1 in the future, do not mount any module to slot 2.

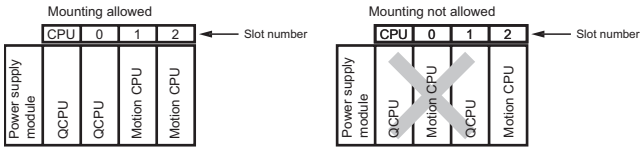
● When using High Performance model QCPU or Process CPU

(1) Mounting position of High Performance model QCPU or Process CPU

Up to four modules of High Performance model QCPUs or Process CPUs can be mounted from the CPU slot (the slot on the right side of power supply module) to slot 2.
There must be no empty slot between CPU modules.

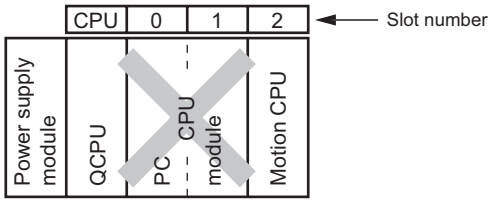
(2) Mounting position of Motion CPU

Up to 3 Motion CPU modules can be mounted starting from the slot located next to the High Performance model QCPU/ Process CPU to slot 2.
(The High Performance model QCPU/Process CPU cannot be mounted on the right of the Motion CPU.)



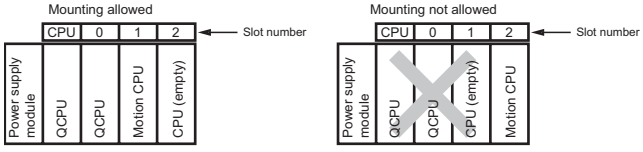
(3) Mounting position of PC CPU module

Only one PC CPU module can be mounted on the right side of the other CPU modules.
(No CPU module can be mounted on the right side of the PC CPU module.)



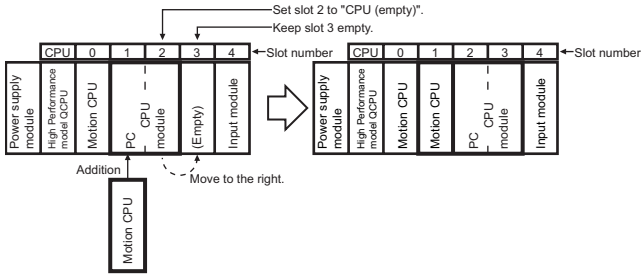
(4) "CPU (Empty)" setting

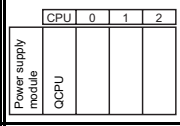
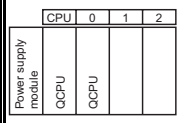
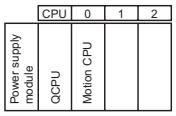
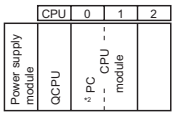
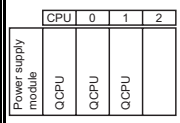
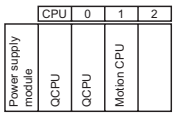
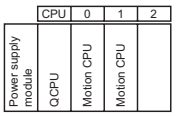
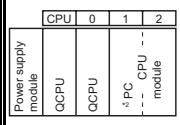
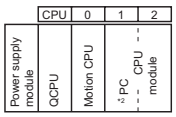
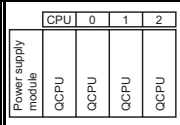
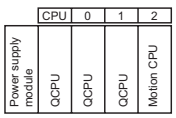
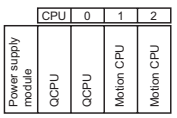
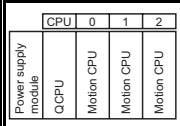
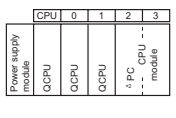
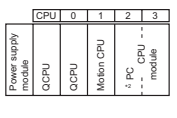
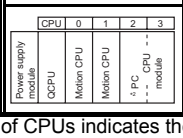
An empty slot can be reserved for future addition of a CPU module.
The number of CPU modules including empty slots is set in the No. of CPU setting, and the type of the empty slot is set as "CPU (empty)". Make the setting on the "I/O Assignment" tab screen in the "(PLC) Parameter" dialog box.
(Example) When 4 CPU modules have been set in the multiple CPU setting and 2 High Performance model QCPUs and one Motion CPU are to be mounted.
Mount the High Performance model QCPUs in the CPU slot and slot 0 and the Motion CPU in slot 1, and leave slot 2 empty.
Note that "CPU(empty)" must be set for the slot next to the other CPU modules.



POINT

When using the High Performance model QCPU or Process CPU, "CPU (Empty)" cannot be set between CPU modules.
To add a High Performance model QCPU or Motion CPU to a system where the PC CPU module is used, shift the PC CPU module to the right because no CPU module is allowed on the right side of the PC CPU module.



No. of CPUs *1	Mounting position of CPU module		
1		----	----
2			
3			
			----
4			
			
		----	----

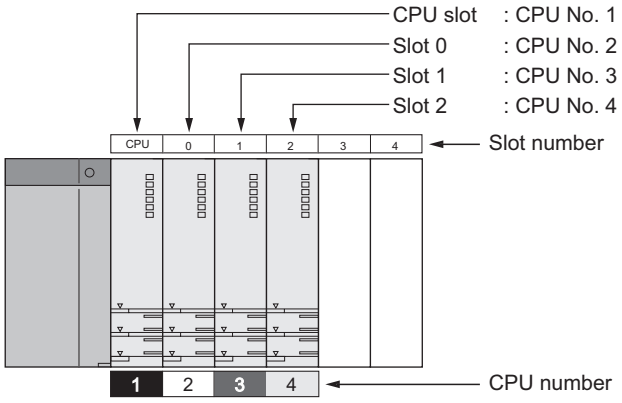
*1: No. of CPUs indicates the value set in the multiple CPU setting of the PLC parameter.
*2: The PC CPU module occupies 2 slots.

CPU No. of CPU module

Basic Note 1.80

(1) CPU No. allocation

CPU numbers are allocated for identifying the CPU modules mounted on the main base unit in the multiple CPU system. CPU No.1 is allocated to the CPU slot, and CPU No.2, No.3 and No.4 are allocated to the right of the CPU No.1 in this order.*Note1.80*



Basic Note 1.80

For the Basic Model QCPU, CPU modules can only be mounted up to CPU No. 3. Therefore, CPU No. 4 is not available.

Concept of I/O number assignment

In the multiple CPU system, I/O numbers are used for interactive transmission between a CPU module and the I/O modules and intelligent function modules, or between CPU modules.

■ I/O number assignment of each module

The multiple CPU system is different from the Single CPU system in the position (slot) of I/O number 00H.
However, the concept of the order of allocating I/O numbers, I/O numbers for each slot and empty slots is the same for both types.

● Position of I/O number "00H"

(1) Slots occupied by CPU modules

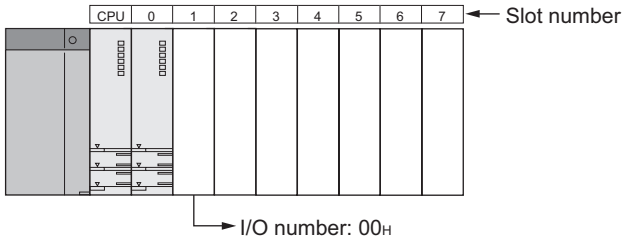
The number of slots set with the PLC parameters' multiple CPU settings are occupied by the CPU modules on the multiple CPU system.

(2) Positions of I/O modules and intelligent function modules

I/O modules and intelligent function modules are mounted from the right of the slots occupied by CPU modules.

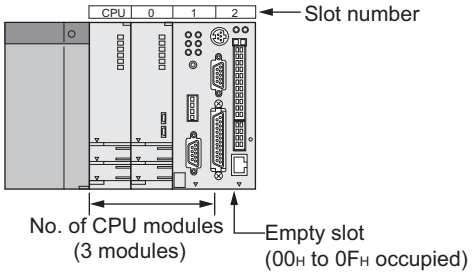
(3) When not using the PC CPU module

The I/O number for an I/O module or intelligent function module mounted to the next slot to those occupied by CPU modules is set as "00H" and consecutive numbers are then allocated sequentially to the right.
Example: Two CPU modules are mounted



(4) When using the PC CPU module

The PC CPU module occupies two slots. The one on the right side among the two slots is handled as an empty slot. (16 empty points are occupied by default.) Therefore the I/O number of the next slot on the right side of the PC CPU module is "10H." (Set the empty slot to zero point on the I/O assignment of PLC Parameters dialog box, to assign "00H" to the first I/O number.)
(Example) When "No. of CPUs" is set to 3.



Remark

1. If the number of CPU modules mounted on the main base unit is less than the number set at the "Multiple CPU setting", set the open slot(s) to "CPU (Empty)".
2. The I/O numbers for the multiple CPU system can be confirmed with the system monitor.

■ I/O number of each CPU module

In the multiple CPU system, I/O numbers are assigned to each CPU module to specify mounted CPU modules.
The I/O number for each CPU module is fixed to the corresponding slot and cannot be changed in the I/O assignment of the PLC Parameter.
The following table shows the I/O number allocated to each CPU module when the multiple CPU system is composed.

Basic Note 1.81

CPU module mounting position	CPU slot	Slot 0	Slot 1	Slot 2 *Note1.81*
First I/O number	3E00H	3E10H	3E20H	3E30H

The CPU modules I/O numbers are used in the following cases.

- When making communications between CPU modules*1
- When specifying a target CPU module for communication with MC protocol*2

*1: Refer to Section 1.6.6 for communication between CPU modules.
*2: Refer to "Q Corresponding MELSEC Communication Protocol Reference Manual" for access to QCPU with MC protocol.

Basic
Note 1.81

When the Basic model QCPU is used, available slot is limited up to slot 1 (3E20H).

Access range of CPU module and other modules

■ Access range with controlled module

In the multiple CPU system a CPU can refresh I/O data of its controlled modules and write or read data of the buffer memory of intelligent function modules in the same way as a single CPU system.

■ Access range with non-controlled module

CPU modules can obtain input (X) ON/OFF data of non-controlled modules and output (Y) ON/OFF data of CPUs of other No. by the PLC parameter setting.
Therefore, ON/OFF data of input modules, composite I/O modules or intelligent function modules controlled by other CPUs can be used as interlocks for the host CPU, and the output status to external equipment being controlled by other CPUs can be confirmed.
Also, the contents of the intelligent function module's buffer memory can be read by non-control CPUs regardless of the PLC parameter setting.

However, it is not possible for non-control CPUs to output ON/OFF data to non-controlled output modules, composite I/O module or intelligent function modules, and to write data to the buffer memory of intelligent function modules.

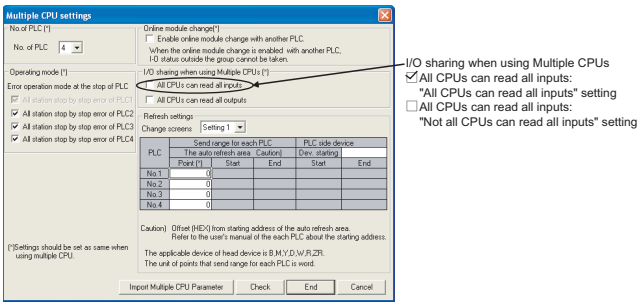
The following table indicates accessibility to the non-controlled modules in the multiple CPU system.

Access target		I/O setting outside of the group	
		Disabled (Not checked)	Enabled (Checked)
Input (X)		×	○
Output (Y)	Read	×	○
	Write	×	×
Buffer memory of intelligent function module	Read	○	○
	Write	×	×

○ :Accessible × :Inaccessible

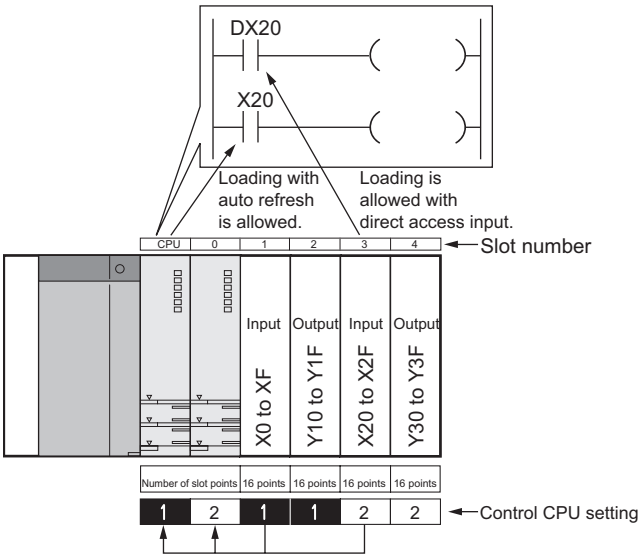
● Input (X) loading from input module and intelligent function module

The "I/O sharing when using Multiple CPUs" setting in the PLC parameter's Multiple CPU settings determines whether input can be loaded from input modules and intelligent function modules being controlled by other CPUs.



(1) When "All CPUs can read all inputs" has been set

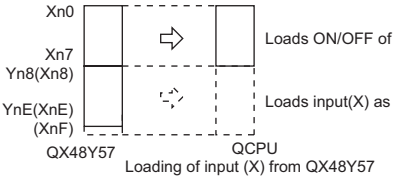
(a) Loads ON/OFF data from the input and intelligent function modules being controlled by the other CPUs by performing input refresh before a sequence program operation starts.
It is possible to read ON/OFF data from input modules or intelligent function modules by using direct access input (DX).



(b) Input (X) loading is performed for the following modules, which are mounted to the main base unit or extension base unit(s).

I/O allocation type	Mounted module
None	Input module
	High speed input module
	I/O composite module*1
	Intelligent function module
Input High speed input I/O mix	Input module
	High speed input module
	Output module*2
	I/O composite module*1
Intelli.	Intelligent function module

* 1: When input(X) loading is performed for QX48Y57 of I/O composite module, input(X) is loaded as all points OFF in Xn8 to XnF assigned to output part.



* 2: When input(X) loading is performed for output module, input(X) is loaded as all points OFF.

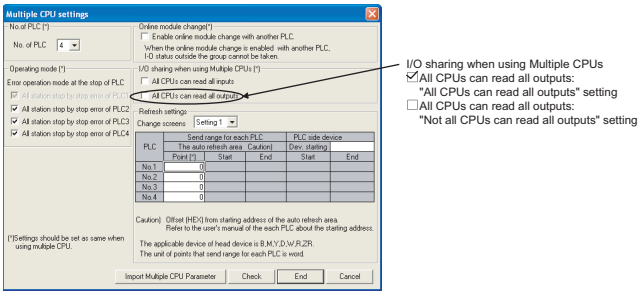
(c) Input data cannot be loaded from empty slots, remote stations on MELSECNET/H and CC-Link networks.
Use automatic refresh of device data to use the ON/OFF input data for MELSECNET/H, CC-Link and other remote stations in other CPUs.

(2) When "Not all CPUs can read all Inputs" has been set

It is not possible to loads ON/OFF data from input modules and intelligent function modules being controlled by other CPUs (remains at OFF.)

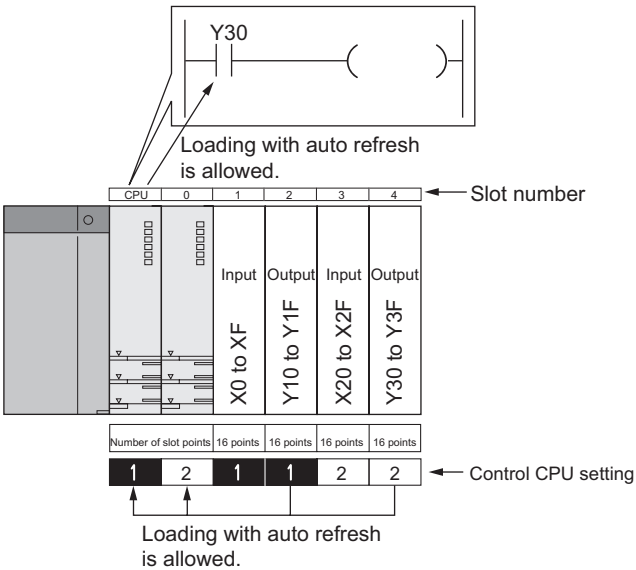
●Loading output (Y)

The "I/O sharing when using Multiple CPUs" setting in the PLC parameter's Multiple CPU settings determines whether output can be loaded from output modules and intelligent function modules being controlled by other CPUs.



(1) When "All CPUs can read all outputs" has been set

(a) Loads to the host CPU's output (Y) the ON/OFF data that is output from other CPUs to the output and intelligent function modules by performing output refresh before a sequence program operation starts.



(b) Output (Y) loading is performed for the modules mounted to the following slots of the main base unit or extension base unit(s).

I/O allocation type	Mounted module
None	Output module
	I/O composite module
	Intelligent function module
Output I/O composite mixing	Input module
	Output module
	I/O composite module
Intelli.	Intelligent function module

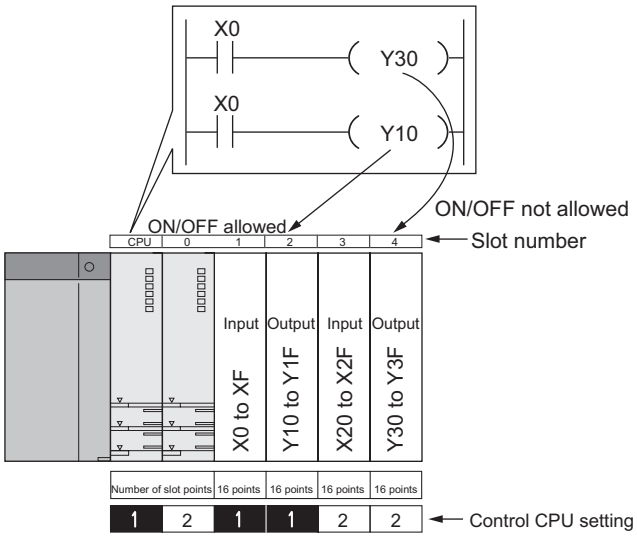
(c) Output data cannot be loaded from empty slots, or remote station on MELSECNET/H and CC-Link networks.
Use automatic refresh of CPU shared memory and send the ON/OFF output data for remote stations to use the ON/OFF output data for MELSECNET/H, CC-Link and other remote stations in other CPUs.

(2) When "Not all CPUs can read all outputs" has been set

It is not possible to load ON/OFF data output to output modules and intelligent function modules by other PLCs into the host CPU's output (Y) (remains at OFF.)

●Output to output modules and intelligent function modules

It is not possible to output ON/OFF data to non-controlled modules.
Devices will be turned ON or OFF inside the QCPU when the output from output modules or intelligent function modules controlled by other CPUs is turned ON/OFF by a sequence program, but this will not be actually output to the output modules or intelligent function modules.

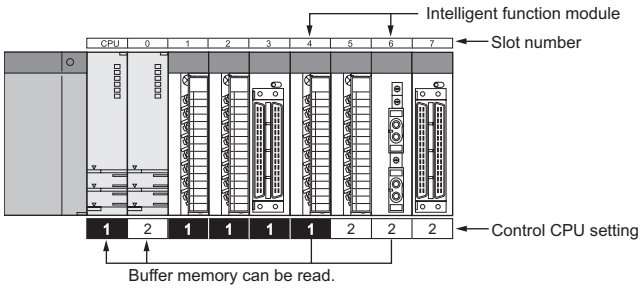


● Accessing the intelligent function module buffer memory

(1) Reading from buffer memory

It is possible to read data from the buffer memory of intelligent function modules being controlled by other CPUs with the instructions listed below.

- FROM instruction
- Instructions that use intelligent function module devices (U□\G□)

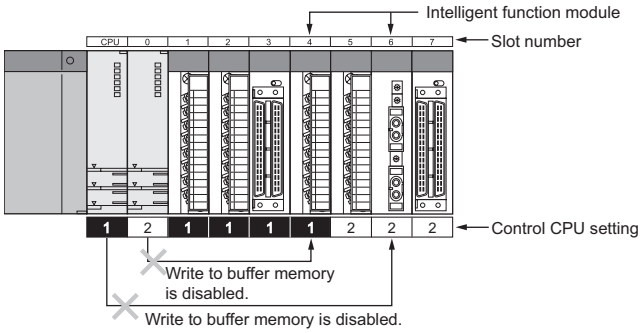


(2) Writing to buffer memory

The following instructions cannot be used to write data to the buffer memory of intelligent function modules being controlled by other CPUs.

- TO instruction
- Instructions that use intelligent function module devices (U□\G□)
- Intelligent function modules dedicated instructions

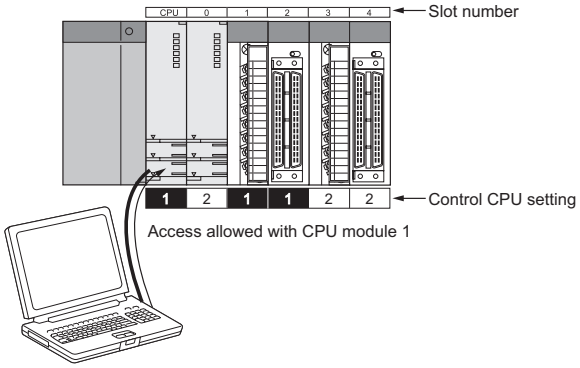
An "SP. UNIT ERROR (error code: 2116)" will be triggered if an attempt to write to the intelligent function module controlled by other CPU is carried out.



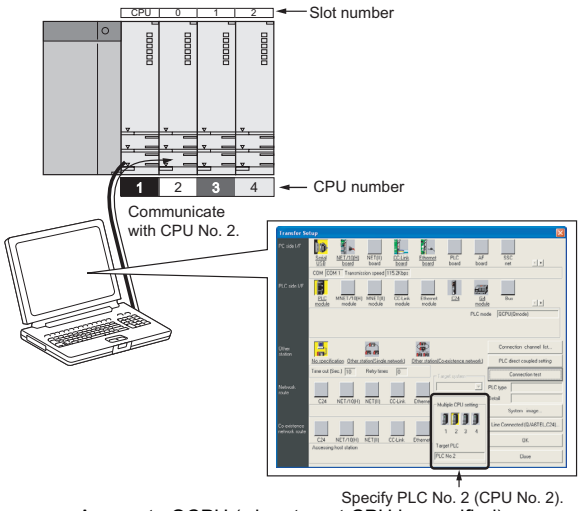
Access range of GX Developer

● Access to QCPU

It is possible to write parameters and programs and perform monitoring and tests on QCPUs connected to GX Developer. To access QCPUs of other CPU No. via a QCPU connected to GX Developer, specify the target CPU No. in the mulple CPU setting of the GX Developer.



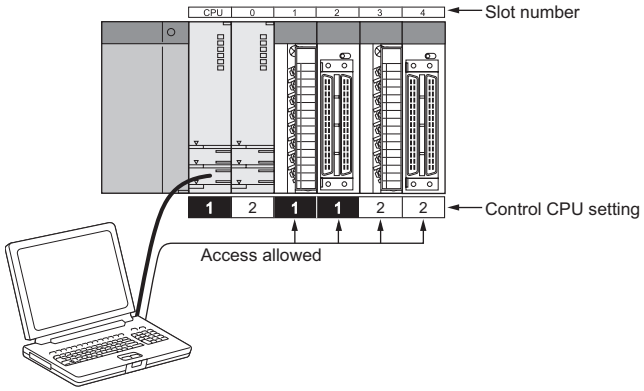
Access to QCPU (when target CPU is not specified)



Access to QCPU (when target CPU is specified)

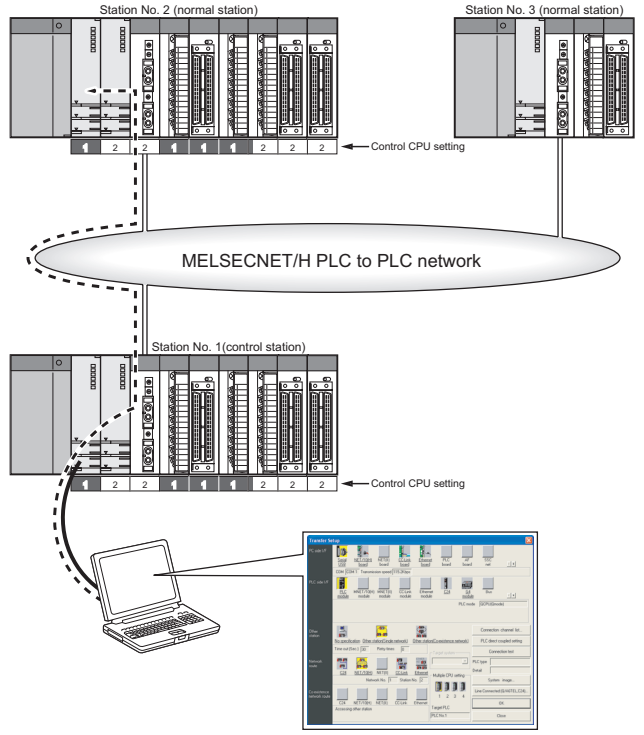
● Access to controlled module and non-controlled module

GX Developer can access the modules regardless of whether they are controlled or non-controlled by the QCPU connected to the GX Developr.
By connecting GX Developer to a single QCPU, it is possible to perform monitoring and tests on all modules being controlled by the multiple CPU system's QCPU.
Other station QCPUs on the same MELSECNET/H, Ethernet or other network can also be accessed.



● Access from GX Developer in other station

From GX Developer connected to other station on the same network, all QCPUs in the multiple CPU system can be accessed.

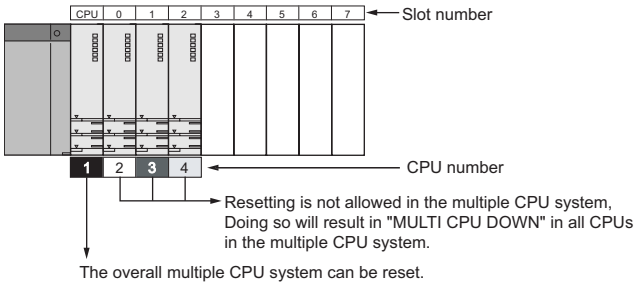


Resetting the multiple CPU system

The entire multiple CPU system can be reset by resetting CPU No.1.
The CPU modules of No.2 to No.4, I/O modules and intelligent function modules will be reset when CPU No.1 is reset.

If a stop error occurs in any of the CPUs on the multiple CPU system, either reset CPU No.1 or restart the PLC system (power supply ON → OFF → ON) for recovery.

(Recovery is not allowed by resetting the error-stopped CPU modules other than CPU No.1.
(Example) For High Performance model QCPU or Process CPU



POINT

1. It is not possible to reset the CPU modules of No.2 to No.4 individually in the multiple CPU system.
   If an attempt to reset any of those CPU modules during operation of the multiple CPU system, a "MULTI CPU DOWN (error code: 7000)" error will occur for the other CPUs, and the entire multiple CPU system will be halted. However, depending on the timing in which any of CPU modules other than No.1 has been reset, an error other than the "MULTI CPU DOWN" may halt the other CPUs.
2. A "MULTI CPU DOWN (error code: 7000)" error will occur regardless of the operation mode(All stop by stop error of CPU "n"/continue)station set at the "Multiple CPU settings" screen within the "(PLC) Parameter" dialog box when any of CPU modules of No.2 to No.4 is reset

Operation for CPU module stop error

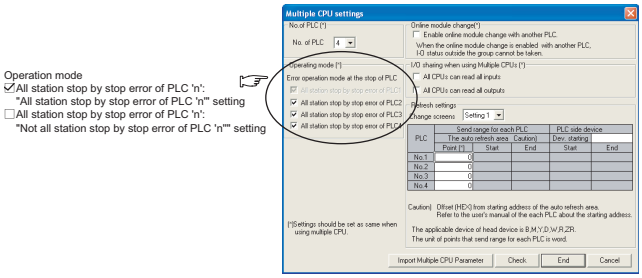
The entire system will behaves differently depending whether a stop error occurs in CPU No.1 or any of CPU No.2 to No.4 in the multiple CPU system.

● When a stop error occurs at CPU No.1

(1) A "MULTI CPU DOWN (error code: 7000)" error occurs at the other CPUs and the multiple CPU system will be halted when a stop error occurs at the CPU No.1

● When a stop error occurs at CPU other than No.1

Whether the entire system is halted or not is determined by the multiple CPU setting's "Operating Mode" setting when a stop error occurs in a CPU other than CPU No.1.
The default is set for all CPUs to be stopped with a stop error. When you do not want to stop all CPUs at occurrence of a stop error in a specific CPU module, remove the check mark that corresponds to the CPU No. so that its error will not stop all CPUs.



(1) When "All station stop by stop error of CPU 'n'" is set

When a stop error occurs in the CPU module for which "All station stop by stop error of CPU 'n' " has been set, a "MULTI CPU DOWN (error code: 7000)" error occurs for the other CPU modules and the multiple CPU system will be halted.

(2) When "Not all station stop by stop error of CPU 'n'" is set

When a stop error occurs in the CPU module for which " All station stop by stop error of CPU 'n' " has not been set, a "MULTI EXE. ERROR (error code: 7010)" error occurs in all other CPUs but operations will continue.

● System recovery procedure

Observe the following procedures to restore the system.

(1) Confirm the error-derected CPU No. and error cause with the PLC diagnostics on GX Developer.
(2) Remove the error cause.
(3) Either reset the CPU No.1 or restart the power to the PLC (power ON→OFF →ON).

All CPUs on the entire multiple CPU system will be reset and the system will be restored when CPU No.1 is reset or the power to the CPU is reapplied.

1.6.6 Communication between CPU modules

In the multiple CPU system, the following methods are available to read/write data between CPU modules:

- CCommunication using CPU shared memory by auto refresh
  Data reading/writing between CPU modules
- Communication using CPU shared memory by programs
  Reading data from or writing data to other QCPU and PC CPU module
  Reading CPU shared memory from QCPU to Motion CPU
- Instructions dedicated to Motion CPU
  Control instruction from QCPU to Motion CPU with instructions dedicated to Motion CPU
- Instructions dedicated to communication between multiple CPUs
  Reading or writing of device data from QCPU to Motion CPU
  Event issue from QCPU to Motion CPU or PC CPU module

●Communications between CPU modules

In the multiple CPU system, various communications between CPU modules are available depending on the communication source and destination CPU module types as shown the following table.
For communications from the Motion CPU and the PC CPU module, refer to each CPU module manual.

Communication source CPU module	Communication destination CPU module	Communication using CPU shared memory		Using Instructions dedicated to Motion CPU*1	Using instructions dedicated to communication between multiple CPUs
		Automatic refresh	By program		
Basic model QCPU	Basic model QCPU	----	----	----	----
	High Performance model QCPU/ Process CPU	----	----	----	----
	Motion CPU	○	○	○	○
	PC CPU module	○	○	×	○
High Performance model QCPU/ Process CPU	Basic model QCPU	----	----	----	----
	High Performance model QCPU/ Process CPU	○	○	×	×
	Motion CPU	○	○	○	○
	PC CPU module	○	○	×	○

○:Available, × :Not available, ----:Combination not allowed

*1: Available instructions are restricted depending on the version of the Motion CPU.

Communications between CPU modules using CPU shared memory

This chapter describes communication methods between CPU modules of the multiple CPU system using the CPU shared memory.
First, the CPU shared memory is described.

■ CPU shared memory

The CPU shared memory is a memory provided for each CPU module and by which data are written or read between CPU modules of the multiple CPU system.

The CPU shared memory consists of four areas;

- Host CPU operation information area
- System area
- Auto refresh area
- User free area

The memory configuration and the communication availability using the CPU shared memory by program are shown in the following diagram.

●For Basic model QCPU

CPU shared memory		Host CPU		Other CPUs	
		Write	Read	Write	Read
0H to 5FH	Host CPU operation information area	×	○	×	○
60H to BFH	System area	×	×	×	○ *1
C0H	Auto refresh area	×	×	×	×
to 1FFH	User free area	○	○	×	○

○: Communication allowed, ×: Communication not allowed

*1: System area is used for communicating with instructions dedicated to Motion CPU.
Refer to the programming manual of Motion CPU for applications and usage methods of system area used with instructions dedicated to Motion CPU.

●For High Performance model QCPU or Process CPU

CPU shared memory		Host CPU		Other CPUs	
		Write	Read	Write	Read
0H to 1FFH	Host CPU operation information area	×	×	×	○
200H to 7FFH	System area	×	×	×	○ *1
800H	Auto refresh area	×	×	×	×
to FFFH	User free area	○	×	×	○

○: Communication allowed, ×: Communication not allowed

*1: System area is used for communicating with instructions dedicated to Motion CPU.
Refer to the programming manual of Motion CPU for applications and usage methods of system area used with instructions dedicated to Motion CPU.

● **Host CPU operation information area**

(1) Information stored in the host CPU operation information area

The following information is stored in the host CPU operation infomation area in the multiple CPU system. *1 These will all remain as "0" and will not change in the case of single CPU system.

*1: For the Motion CPU, 5H to 1CH of the host CPU's operation information area is not used. If 5H to 1CH of the host CPU's operation information area is read from the Motion CPU, it will be read as "0."

CPU shared memory address	Name	Detail	Description	Corresponding special register
0_H	Information availability	Information availability flag	The area to confirm if information is stored in the host CPU's operation information area (1_H to $1F_H$,) or not. 0:Information not stored in the host CPU's operation information area 1:Information stored in the host CPU's operation information area	----
1_H	Diagnostic error	Diagnostic error number	An error No. identified during diagnostics is stored in BIN.	SD0
2_H	Time the diagnostic error occurred	Time the diagnosis error occurred	The year and month that the error number was stored in the CPU shared memory's 1_H address is stored with two digits of the BCD code.	SD1
3_H			The day and time that the error number was stored in the CPU shared memory's 1_H address is stored with two digits of the BCD code.	SD2
4_H			The minutes and seconds that the error number was stored in the CPU shared memory's 1_H address is stored with two digits of the BCD code.	SD3
5_H	Error information identification code	Error information identification code	Stores an identification code to determine what error information has been stored in the common error information and individual error information.	SD4
6_H to 10_H	Common error information	Common error information	The common information corresponding to the error number identified during diagnostic is stored.	SD5 to SD15
11_H to $1B_H$	Individual error information	Individual error information	The individual information corresponding to the error number identified during diagnostic is stored.	SD16 to SD26
$1C_H$	Empty	----	Cannot be used	----
$1D_H$	Switch status	CPU switch status	Stores the CPU module switch status.	SD200
$1E_H$	LED status	CPU-LED status	Stores the CPU module's LED bit pattern.	SD201
$1F_H$	CPU operation status	CPU operation status	Stores the CPU module's operation status.	SD203

(2) Reading of host CPU operation information area

Other QCPU can use FROM instruction or intelligent function module device to read data from the host CPU operation information area of the host CPU.
However, because there is a delay in data updating, use the read data for monitoring purposes.

● System area

The area used by the system of the CPU module (OS.)

● Auto refresh area

The area used when the multiple CPU system is automatically refreshed.
The points from the address next to the last address in the system area are used for auto refresh.

● User free area

The area for performing communication between CPU modules.
The points after the ones used for the automatic refresh area are used.
(An area including the auto refresh area can be used as the user free area when automatic refresh is not performed.)

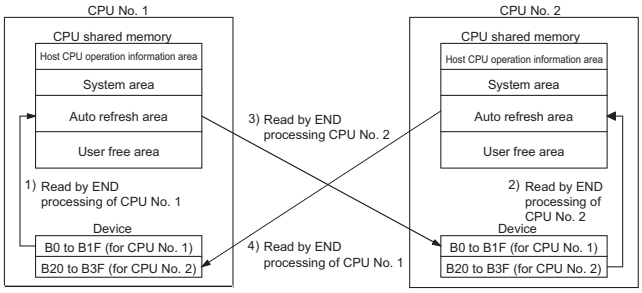
■ Auto refresh using CPU shared memory

● Communication using auto refresh

(1) Operation of auto refresh

Auto refresh allows communications using the auto refresh area of the CPU shared memory.
By making multiple CPU settings in "PLC parameter", data are automatically written/read between all CPU modules of the multiple CPU system.
As device memory data of other CPUs are automatically read by the automatic refresh function, the host CPU can use those device data.

The following diagram shows an outline of operations when CPU No.1 performs automatic refresh of 32 points for B0 to B1F, and when CPU No.2 performs automatic refresh of 32 points for B20 to B3F.



The processes performed during CPU No.1 END process.

1): Transfers B0 to B1F transmission device data for CPU No.1 to the host CPU shared memory's automatic refresh area.

4): Transfers data in the CPU No.2 CPU shared memory's automatic refresh area to B20 to B3F in the host CPU.

The processes performed during CPU No.2 END process.

2): Transfers B20 to B3F transmission device data of CPU No.2 to the CPU shared memory's automatic refresh area.

3): Transfers data in CPU No.1 CPU shared memory's automatic refresh area to B0 to B1F in CPU No.2

(2) Executing automatic refresh

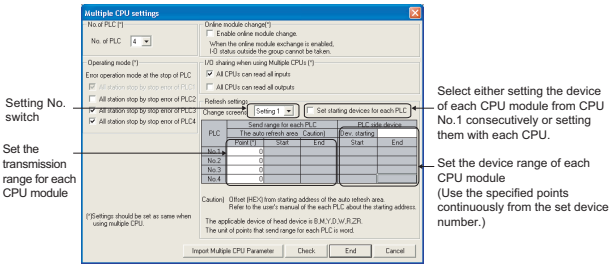
Automatic refresh is executed when the CPU module is in RUN, STOP or PAUSE status. Automatic refresh cannot be performed when a stop error has been triggered in the CPU module.
If a stop error occurs on one module, the other modules without any error will save the data prior to the stop error being triggered.
For example, if a stop error occurs in CPU No.2 when B20 is ON, the B20 in CPU No.1 will remain ON.

(3) Settings required for auto refresh

When automatic refresh is carried out, it is necessary to set the points to be transmitted by each CPU and the device in which the data is to be stored (the device that will perform automatic refresh) with the PLC parameter's multiple CPU settings.

● Refresh settings

Set the points to be transmitted by each CPU and the device in which the data is to be stored in the PLC parameter's multiple CPU settings.



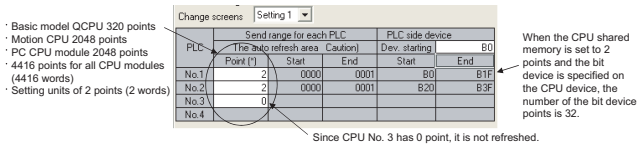
(1) Setting switching and transmission range for each CPU (Refresh range)

(a) It is possible to set 4 ranges from Setting 1 to 4 for the refresh setting with the setting switching.
For example, ON/OFF data can be set to bit devices and other data can be set to word devices separately.

(b) In the transmission range for each CPU, the points of the CPU shared memory are set in 2-point units (2 words.) (2 points in the word device specification and 32 points in the bit device specification)
Data for which the point is set to "0" in the transmission range for each CPU will not be refreshed.
When refresh is performed for 32 points (B0 to B1F) on CPU No.1 and 32 points (B20 to B3F) on CPU No.2, the number of transmission points is 2 for CPU No.1 and 2 for CPU No.2 since 1 point of the CPU shared memory is equal to 16 points of bit devices.

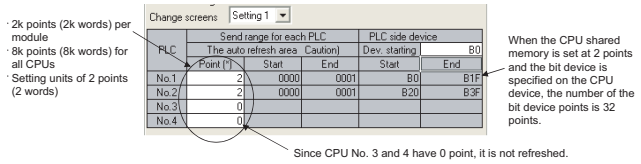
(c) The number of transmission points is as follows:

• For Basic model QCPU
The numbers of transmission points are 320 words for the Basic model QCPU and 2048 words for the Motion CPU/PC CPU module, making a total of 4416 points (4416 words) for all CPU modules

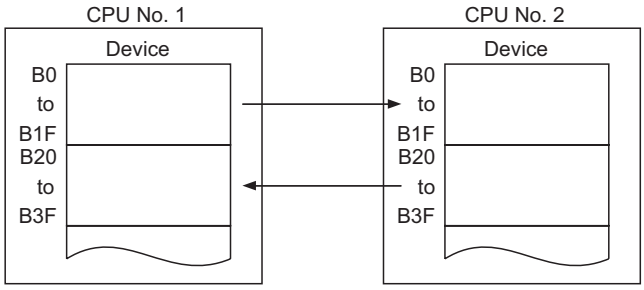


•For High Performance model QCPU or Process CPU

The number of transmission points is a maximum of 2 k points (2 k words) for a total of four ranges for each CPU module, making a total of 8 k points (8 k words) for all CPUs.



[Processing of auto refresh]

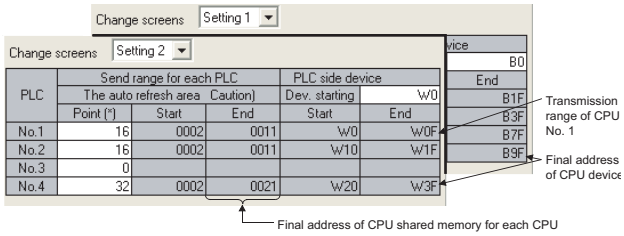


(d) The area occupied for auto refresh in the CPU shared memory is a total of Setting 1 to 4.

When transmission points are set, the first and last addresses of the auto refresh area are automatically displayed as hexadecimal offset values.

For example, the CPU that has transmission point setting in Setting 1 and 2 has the last address of "the first address of the auto refresh area + offset value of Setting 2". (In the following diagram, up to "the first address of the auto refresh area + 11H" are set for CPU No. 1 and 2, and "the first address of the auto refresh area + 21H" is set for CPU No. 4.)

When a CPU has setting in Setting 1 only, the last address in Setting 1 is the one of the CPU's auto refresh area.



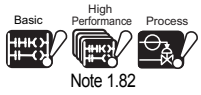
(e) The same number of transmission points must be set for all CPUs in the multiple CPU system.

If different number of transmission points is set for a CPU, "PARAMETER ERROR" occurs in the consistency check between CPUs.

(2) CPU devices

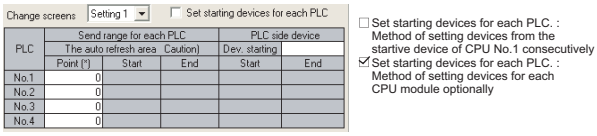
The following devices can be used for automatic refresh purposes (other devices cannot be set up with the GX Developer.)

Settable devices	Caution
Data register (D) Link register (W) File register (R, ZR)	None
Link relay (B) Internal relay (M) Output (Y)	Specify 0 or multiples of 16 for the first number.



For setting the CPU side devices, the following 2 methods are available.*Note1.82*

- Method of setting devices from the startive device of CPU No.1 co53nsecutively
- Method of setting devices for each CPU module optionally



(a) Method of setting devices from the startive device of CPU No.1 consecutively

CPU side devices are consecutively used for the total number of transmission points of all CPU modules from the device number specified in one setting range.

Set a device number so that the necessary amount of transmission point devices can be secured.

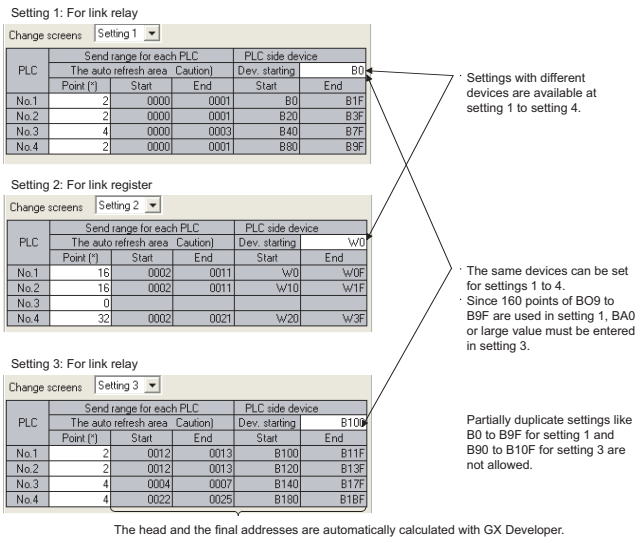
Sixteen times the number of transmission points will be set if a bit device is specified in the CPU device.

(Example) If the total number of transmission points for all CPU modules is 10,then 160 points of B0 to B9F are set when B0 link relay is specified.

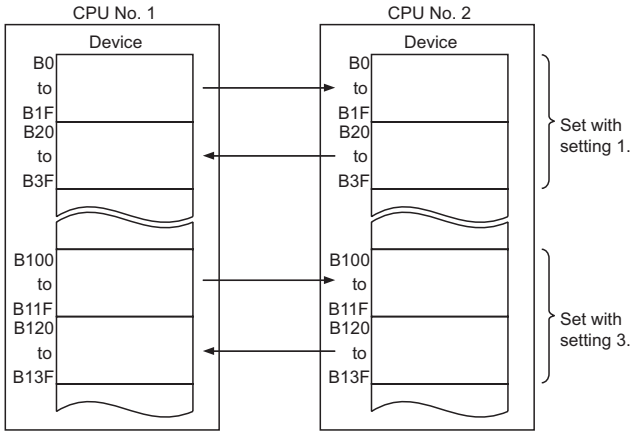
The CPU devices are set as follows.

It is possible to change the device for settings 1 to 4.

The same devices can also be specified as long as the device range for settings 1 to 4 are not overlapped.



[Processing of auto refresh]



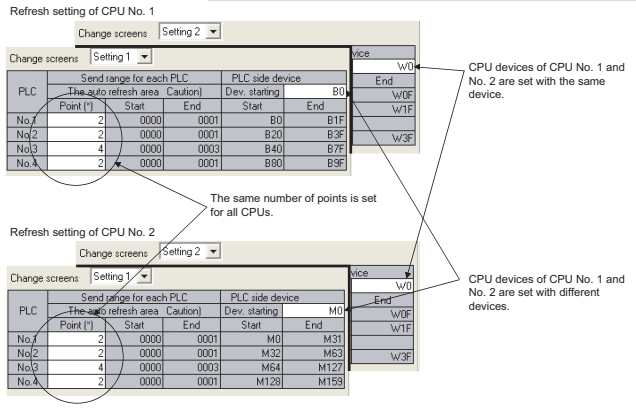
- Devices of setting 1 to 4 can be set independently for each CPU.

For example, devices of CPU No.1 can be set up as link relays, and those of CPU No.2 can be set up as internal relays

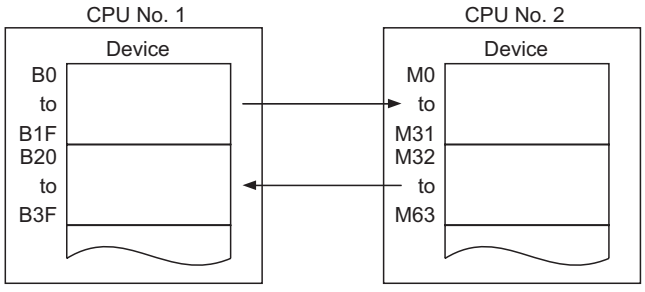
Basic High Performance Process

Note 1.82

For Basic model QCPUs and High Performance model QCPUs/Process CPUs of which the first 5 digits of serial No. is "07031" or earlier, auto refresh is available only by setting devices consecutively from the starting device of CPU No.1.
In addition, when using GX Developer of Version 8.22Y or earlier, auto refresh is also available only by setting devices consecutively from the starting device of CPU No.1.



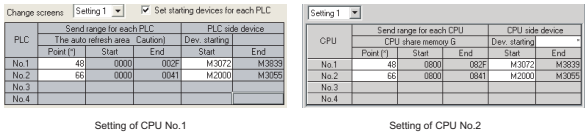
[Automatic refresh processing]



(b) Method of setting devices for each CPU module optionally

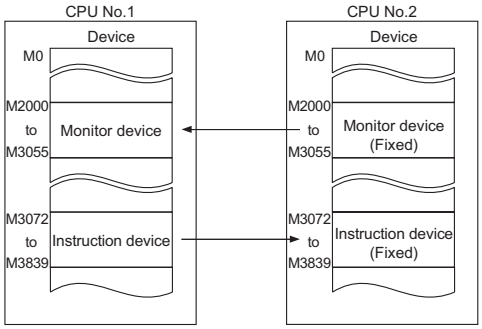
- The order of the transmission range for each module can be changed,since devices can be set individually.
- The system scan time can be reduced, since it is possible to set for not performing unnecessary refresh.

(Example) When changing the order of transmission range for each CPUThe following shows the example performing auto refresh between High Performance model QCPU of CPU No.1 and Motion CPU of CPU No.2. By setting devices optionally, it is possible to match the device of Performance model QCPU to the fixed device in Motion CPU.



Setting of CPU No.1 Setting of CPU No.2

Setting of CPU device



Outline of auto refresh operation

(3) Assurance of data sent between CPUs

Depending on the timing of refreshing in the host CPU and reading from other CPU, old and new data may coexist in each CPU.
For execution of the auto refresh, create an interlock program using the first refresh devices of each CPU.
When old and new data exists concurrently, do not use data of the other CPUs.

■ Communication using CPU shared memory by program

● Communication made by program

In the multiple CPU system, the QCPU can communicate with each CPU module using the user free area of the CPU shared memory with write and read instructions.
The following write and read instructions are available:

	Description
Write instruction (High Performance, Note 1.83)	TO instruction Note1.82 S.TO instruction Instruction using the intelligent function module device (U□\G□)
Read instruction (Process, Note 1.83)	FROM instruction Instruction using the intelligent function module device (U□\G□)

The data written to the CPU shared memory of the host CPU with a write instruction can be read by another CPU using a read instruction.
Unlike the automatic refresh of the CPU shared memory, it is possible to read up-to-date data directly when this instruction is executed.

High Performance Process Note 1.83

For the High Performance model QCPU or the Process CPU, write to the CPU shared memory with TO instruction is not allowed.

Communications with instructions dedicated to Motion CPU

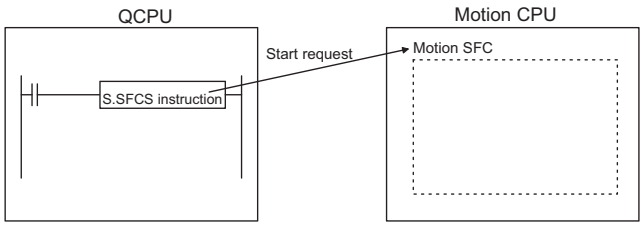
■ Control instruction from QCPU to Motion CPU

Control instructions can be issued from the QCPU to Motion CPU with the instructions dedicated to Motion CPU as listed in the following table.
(Control instructions from a Motion CPU to other Motion CPU is not allowed.)

Instruction name	Description
S.SFCS SP.SFCS	Requests startup of the motion SFC program.
S.SVST*1 SP.SVST*1	Requests the start of the servo program.
S.CHGV*1 SP.CHGV*1	Changes the speed of the axes during positioning and JOG operations.
S.CHGT*1 SP.CHGT*1	Changes the torque control value during operation and suspension when in the real mode.
S.CHGA*1 SP.CHGA*1	Changes the current values of the halted axes, the synchronized encoder, and the cam axes.

*1: The following version restrictions apply to the Motion CPU.
Q172CPU :Version N or later
Q173CPU :Version M or later
Q172CPUN, Q173CPUN:No version restriction
Q172HCPU, Q173HCPU

(Example) When using the S.SFCS instruction
It is possible to start up the Motion CPU's motion SFC from the QCPU.



POINT

One QCPU can concurrently issue up to 32 instructions of "Instructions dedicated to Motion CPU" and "Instructions dedicated to communication between multiple CPUs (except for S(P).GINT)".
Note that multiple instructions are executed in order starting from the first instruction.
When 33 or more incomplete instructions are identified, an "OPERATION ERROR (error code: 4107)" occurs.

Communication between multiple CPUs with dedicated instructions

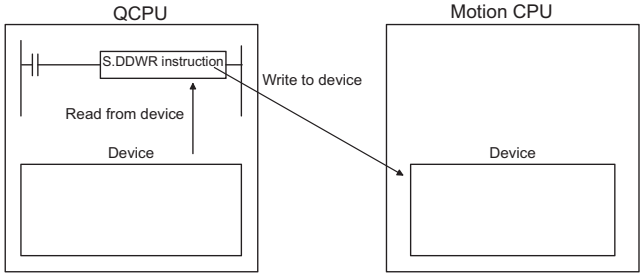
■ Write/read of device data from QCPU to Motion CPU

Device data can be read or written from the QCPU to the Motion CPU with the instructions dedicated to communication between multiple CPUs listed in the following table.
(Read/write from a Motion CPU to other CPU module including the Motion CPU is not allowed.)

Instruction name	Description
S.DDWR SP.DDWR	Writes host CPU device data into other CPU devices.
S.DDRD SP.DDRD	Reads other CPU device data into the host CPU devices.
S.GINT SP.GINT	Requests start up of other CPU interrupt programs.

(Example) Using the S.DDWR instruction

The QCPU device data can be written to the Motion CPU devices.



POINT

One QCPU can concurrently issue up to 32 instructions of "Instructions dedicated to Motion CPU" and "Instructions dedicated to communication between multiple CPUs (except for S(P).GINT)".
Note that multiple instructions are executed in order starting from the first instruction.
When 33 or more incomplete instructions are identified, an "OPERATION ERROR (error code: 4107)" occurs.

Remark

Refer to the Motion CPU Programming Manual for details on the use of the instructions dedicated to communication between multiple CPUs.

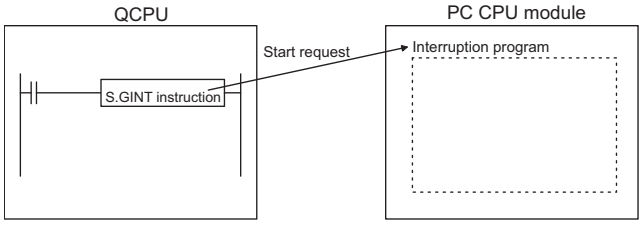
■ Start of interrupt program from QCPU to PC CPU module

The interrupt program from the QCPU to the PC CPU module can be started with the instructions dedicated to communication between multiple CPUs in the following table.
(The interrupt program from the PC CPU module to other CPU module cannot be started.)

Instruction name	Description
S.GINT SP.GINT	Requests start up of other CPU's interrupt programs.

(Example) When using the S.GINT instruction

The interrupt program from the QCPU to the PC CPU module can be started.



Remark

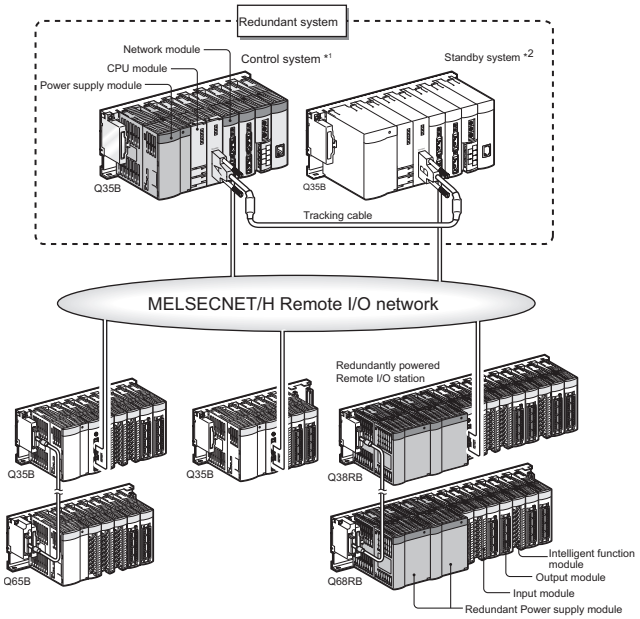
Refer to the PC CPU module Manual for details on the use of the instructions dedicated to communication between multiple CPUs.

1.7 Redundant system

1.7.1 Overview of redundant system

A redundant system offers improved system reliability, as it consists of two basic systems, each of which includes the CPU module, power supply module, network module and others, so that even if a module error occurs in one basic system, the other one continues the system control.
To configure a redundant system, prepare two sets of systems, i.e., two redundant main base units on which the abovementioned modules are mounted. Then, connect the CPU modules of both systems with a tracking cable.

When using the I/O module and intelligent function module for redundant system control, mount them to the MELSECNET/H remote I/O station in order that system control will be continued after control/standby system switching occurs.
When redundant power supply modules are used, a redundant power supply system can also be configured.

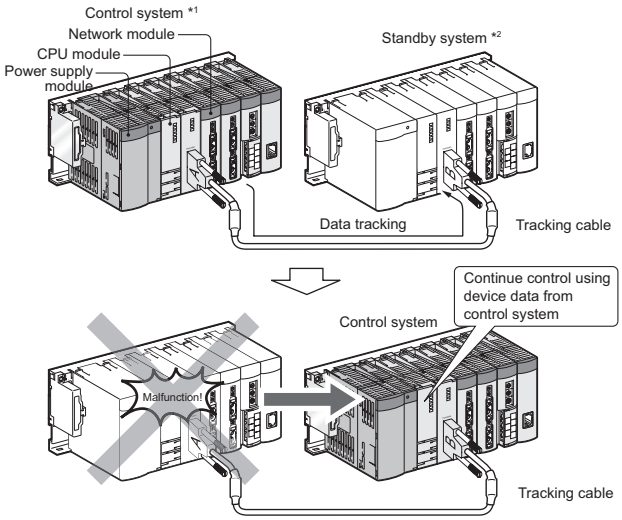


*1: The control system indicates the system that actually controls the redundant system.
*2: The standby system indicates the backup system within a redundant system.
If an error occurs in the control system, the standby system takes over the control of the redundant system.

Features of redundant system are indicated below.

● Redundant Configuration of Basic System

As a redundant system consists two basic systems, i.e., two sets of CPU modules, power supply modules, main base units, network module, etc., one of the basic systems controls the whole system, while the other one performs backup.
Data of the CPU module performing control is transmitted to the backup CPU module in order to make the data consistent. This enables the backup system to take over the redundant system control after the control system goes down and system switching occurs.

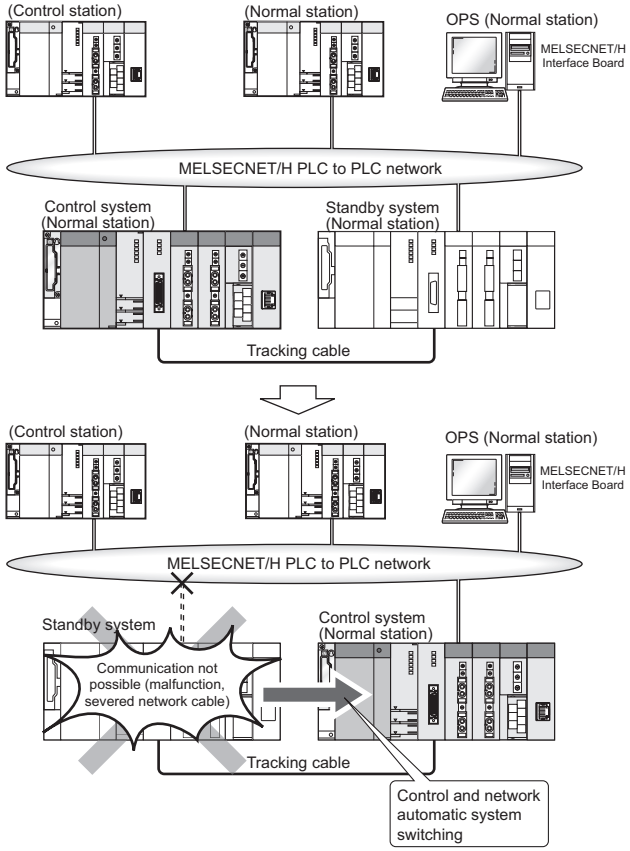


*1: The control system indicates the system that actually controls the a redundant system.
*2: The standby system indicates the backup system within a redundant system.
If an error occurs in the control system, the standby system takes over the control of the redundant system.

● Network Configuration Including Redundant System.

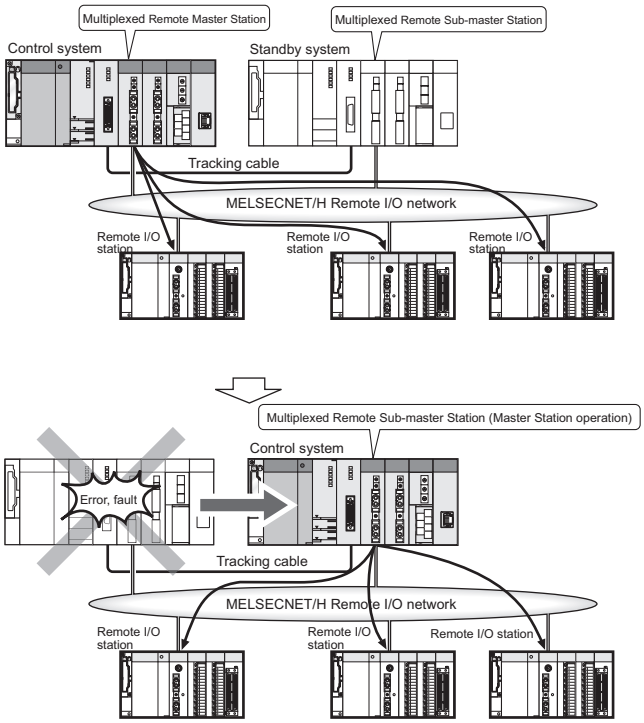
(1) MELSECNET/H PLC to PLC Network and Ethernet

In the case of MELSECNET/H PLC to PLC network and Ethernet, control/standby system switching occurs and system control and network communication is continued even when a network module fails or when network cable disconnection is detected.



(2) MELSECNET/H Remote I/O Network

MELSECNET/H remote I/O stations can continue the operation even when control/standby system switching occurs.

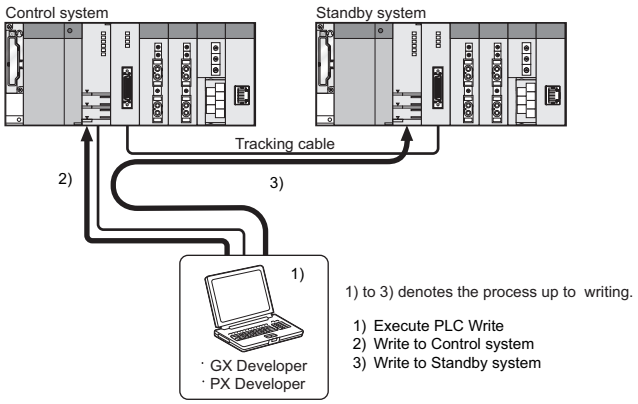


● Redundant system settings using parameters.

Redundant system settings such as tracking settings, network pairing settings, etc. can be made easily in the parameter settings of GX Developer.

● Writing parameters and programs to control system and standby system without the need to identify each system

Parameters and programs can be written into both of control system and standby system using GX Developer. There is no need to identify each system.

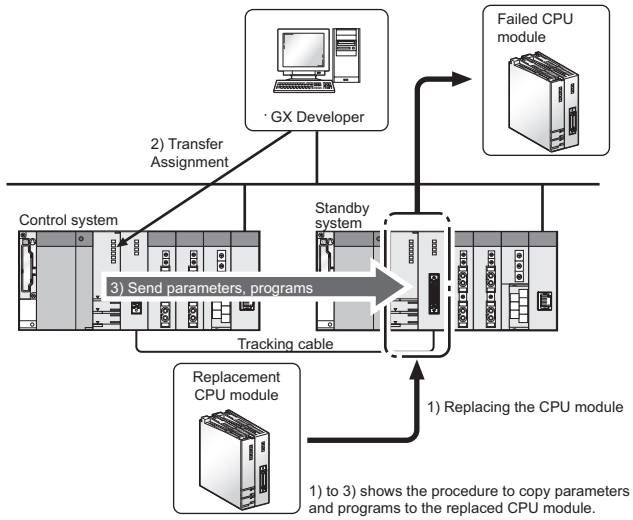


1) to 3) denotes the process up to writing.

1) Execute PLC Write
2) Write to Control system
3) Write to Standby system

● Copy of parameters and programs from control system to standby system

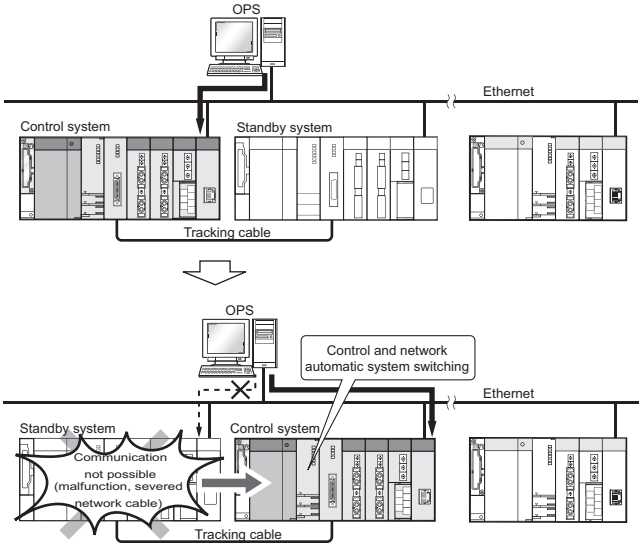
After the CPU module is replaced in standby system, parameters and programs can be copied from the CPU module of control system to the new CPU module by executing the transfer command from GX Developer. This operation can also be done via special relays and special registers.



1) to 3) shows the procedure to copy parameters and programs to the replaced CPU module.

● Access to redundant system from host network

When accessing to a redundant system, the host OPS can automatically identify and directly access to the control system, if it has been specified as destination in advance.

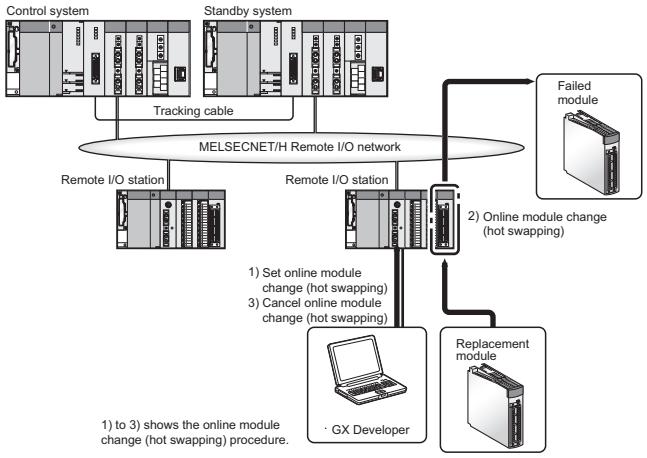


● Compatible with Q-series modules

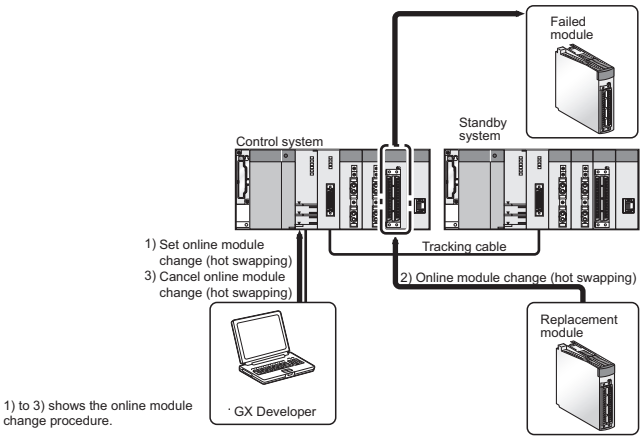
Q-series modules such as the I/O module, intelligent function module, and network module can be applied to a redundant system without making any modifications.
(Some models are irrelevant)
Therefore, equipments within factories can be utilized, maintenance costs can be reduced, and the system can be expanded.

● Online module change (hot swapping)

The I/O module mounted on a main base unit with a redundant CPU module and the module mounted on a remote I/O station can be replaced online (hot swapping) using GX Developer. The replacement can be performed even while an I/O module, which is mounted on a main base unit with a redundant CPU, is in fault or a remote I/O module is in fault.



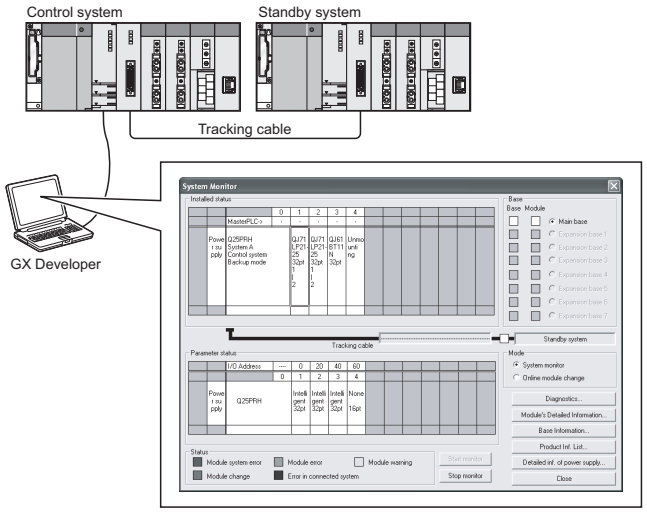
Online Module Change (Hot Swapping) of Remote I/O Stations



Online Module Change (Hot Swapping) of I/O Modules mounted on a Main Base Unit

● System status can be monitored.

The operation status of the whole redundant system can be monitored using the System Monitor of GX Developer.

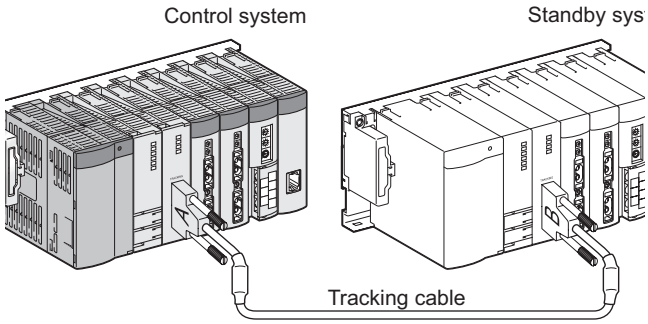


● Compact Redundant System

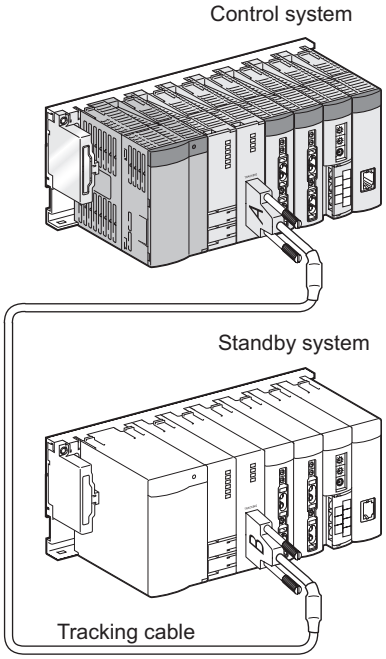
The space of control panel can be saved, as Q-series modules (other than the CPU module, redundant power supply module, and tracking cable) are applicable.

● Flexible layout

The layout can be changed flexibly because the main base unit is divided into two units for the control system and standby system.



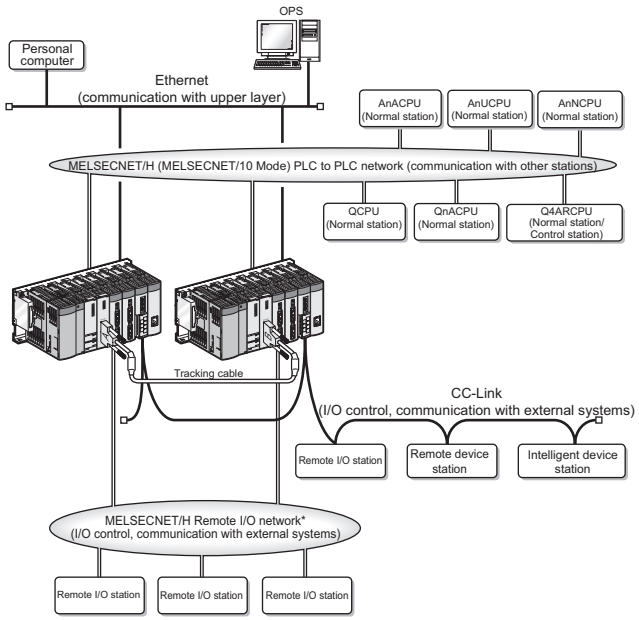
Horizontal Arrangement of Control System and Standby System



Vertical Arrangement of Control System and Standby System

1.7.2 System configuration

An example of redundant system configuration is illustrated in the following diagram.



*: In a coaxial bus system, use double shielded coaxial cables.

● Redundant System

(1) System Configuration

A redundant system consists of two sets of power supply modules, CPU modules, main base units, and network modules.

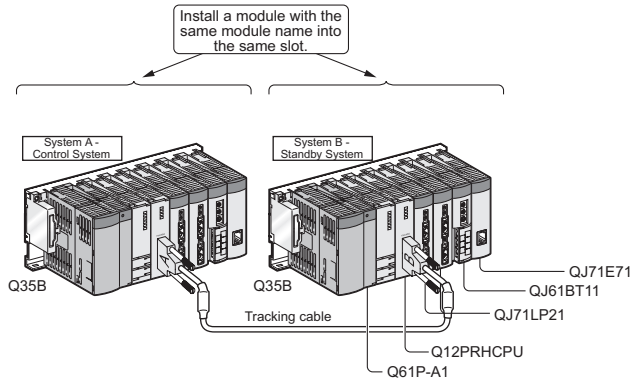
To configure a redundant system, prepare two sets of systems, i.e., mount the same model of power supply module, CPU module, and network module on each main base unit, then connect the CPU modules of both systems with a tracking cable.

The connection direction (connectors) of the tracking cable determines which one is system A or B.

If system A and system B are started up simultaneously, system A becomes the control system.

If one of the systems is started up before the other, the system started up first becomes the control system.*

*: If system A and system B are started up within three seconds of one another, system A becomes the control system.

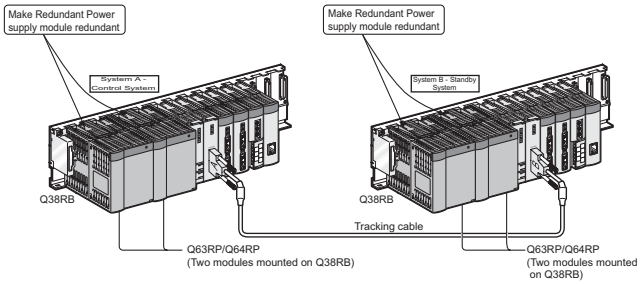


(2) Backup of Power Supply Module

The power supply module of each system can be baked up. By adding backup power supply modules to system A and system B, even if an error occurs in the power supply system connected to one power supply module, or if the power supply module fails, the other power supply module can continue the operation.

This enables the faulty power supply system to be restored, and the faulty power supply module can be replaced while the system is running.

The power supply module can also be replaced for preventive maintenance while the system is running



POINT

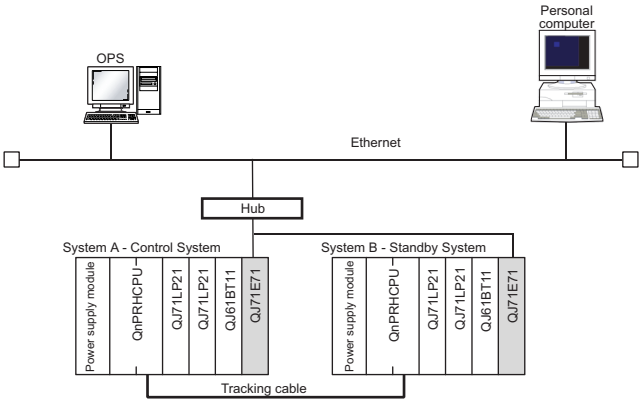
Extension base units cannot be connected to the main base unit on which a redundant CPU is mounted.

If connected, it will result in a "BASE LAY ERROR (error code: 2010)" stop error.

● Communication with a Host OPS, PC, etc.

(1) Communication via Ethernet

Communication between a host OPS, PC, etc. and redundant CPU can be performed via Ethernet.



● Communication via MELSECNET/H PLC to PLC Network

(1) Connecting Redundant System to MELSECNET/H and MELSECNET/10 PLC to PLC Network

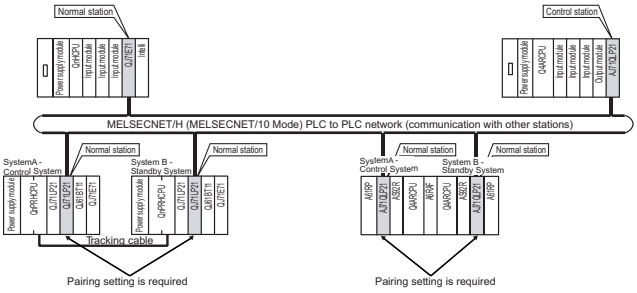
A redundant system can communicate with Q series CPU modules connected to MELSECNET/H PLC to PLC network.
The system can also connect to MELSECNET/10 PLC to PLC network and communicate with Q-series, QnA-series, and A-series CPU modules.

(2) Pairing Settings and Relevant CPU Modules

Pairing settings must be made using the control station network parameters when connecting a redundant system to MELSECNET/H or MELSECNET/10.
The following CPU modules include the network parameters for paring settings.

- Redundant CPU*1
- High Performance Model QCPU*1
- Process CPU*1
- Basic Module QCPU *1
- Q4ARCPUs*2

When connecting a redundant system to a network, set any of the above CPU modules as the control station.
CPU modules other than above can be set as the normal station only.



*1: Use GX Developer Version 8-18U or later when making the pairing settings.

*2: The Q4ARCPU makes pairing settings using the "S.PAIRSET" instruction.

● Communication via MELSECNET/H Remote I/O Network

(1) Controlling External Devices

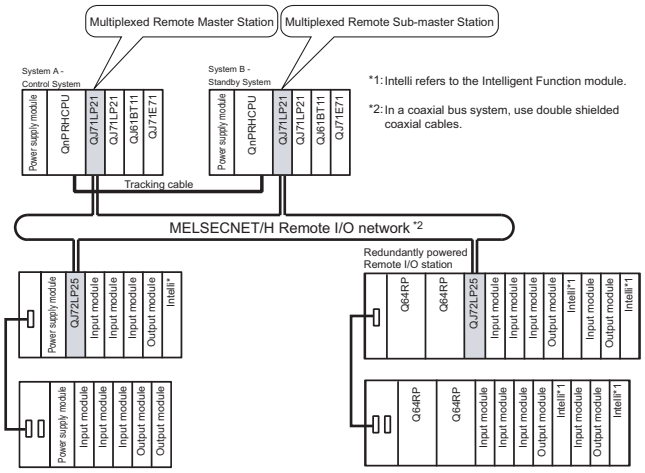
A redundant system controls external devices using I/O modules and intelligent function modules mounted on MELSECNET/H remote I/O network remote I/O stations.
Communication modules that cannot be mounted on main base units of a redundant system can be mounted on remote I/O stations in order to communicate with external devices.

(2) Backup of Power Supply Module

The power supply module for each remote I/O station can be backed up.
By adding a backup power supply module to a remote I/O station, the remote I/O station can continue to operate, even if an error occurs in either power supply system, or if the power supply module fails.
This enables the faulty power supply system to be restored and power supply modules that have failed can be replaced, even when the remote I/O station power supply is on.
The power supply module can also be replaced for preventive maintenance, etc. when the remote I/O station power supply is on.

(3) Online Module Change (Hot Swapping) Using GX Developer

The I/O module mounted on a remote I/O station and the analog module of function version C can be replaced online (hot swapping) using GX Developer.



● Communication via CC-Link

(1) Controlling External Devices

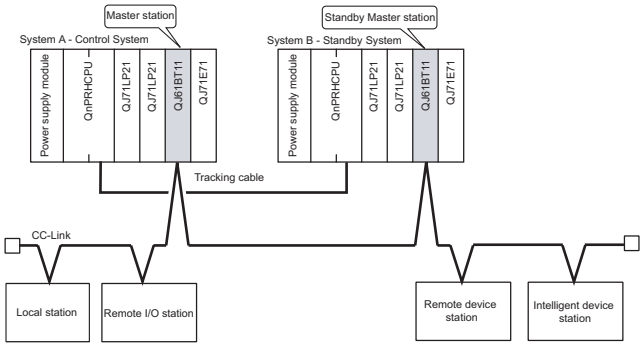
A redundant system controls external devices using remote I/O stations, remote device stations, and intelligent device stations connected to CC-Link.

(2) Settings of Master and Local Modules

Set the CC-Link master and local modules as follows.

- System A master station
- System B standby master station

(Data link is disabled when system A is the standby master station and system B is the master station.)
Start up the system so that System A is the control system.
If system B starts up as the control system, CC-Link communication cannot be made, as it does not include the CC-Link master station.



Applicable Devices and SoftwarePackage

● Modules Applicable to Redundant System and the Confirmation Measures

Modules that can be mounted on the same main base unit as a redundant CPU and the serial numbers are indicated in the following table.

Module Name	Model	Serial Number
Power Supply Module *1	Q61P-A1 Q61P-A2 Q61P Q62P Q63P Q64P	–
Redundant Power Supply Module *2	Q63RP Q64RP	–
CPU Module	Q12PRHCPU Q25PRHCPU	Function version: D or later*5
MELSECNET/H Network Module	QJ71LP21-25 QJ71LP21S-25 QJ71LP21G QJ71LP21GE QJ71BR11	
Ethernet Interface Module	QJ71E71-B2 QJ71E71-B5 QJ71E71-100	
CC-Link Master/Local Module	QJ61BT11N*4	Serial No. (first 5 digits): 06052 or later
Input Module	QX□□ *3	–
Output Module	QY□□ *3	–
I/O Combined Module	QH42 QX48Y57	–

*1: Applicable only when using the main base unit (Q32B, Q33B, Q35B, Q38B, Q312B)

*2: Applicable only when using the redundant main base unit (Q38RB).

*3: □□indicates the type of input module and output module.

*4: The QJ61BT11 cannot be mounted on the same main base as the redundant CPU.

● Modules applicable for mounting on remote I/O stations

For modules that can be mounted on remote I/O stations, refer to section 2.5.2.

● Applicable Software Packages

The version shown in the following table or later of GX Developer, PX Developer or GX Simulater is applicable to a redundant system.

Product Name	Model	Version
GX Developer	SW8D5C-GPPW	Ver.8.17T
PX Developer	SW1D5C-FBDQ	Ver.1.05F

System Configuration Cautions

● Restrictions on use of extension base units.

Extension base units cannot be connected to the main base unit on which a redundant CPU is mounted. (A main base unit-only system.)

If connected, it will result in a "BASE LAY ERROR (error code: 2010)" stop error.

● Modules that can be mounted on a Main Base Unit

The I/O modules used independently by the network module and System A or System B CPU module can be mounted on the same main base unit as a redundant CPU is mounted.

I/O modules and intelligent function modules used to control a redundant system must be mounted on MELSECNET/H remote I/O stations.

Remote I/O stations, remote device stations, and intelligent device stations can be used by mounting CC-Link master/local modules on a main base unit.

● System A/System B Configuration

Set up system A and system B so that they will be configured the same.

If they are configured differently, a stop error will occur, and they will not start up as a system.

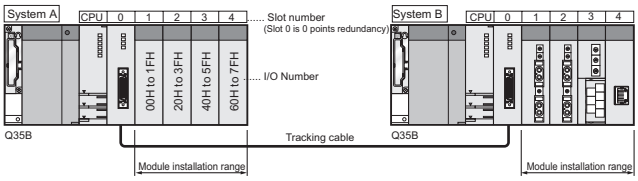
(In some cases, they may start up as a system, even when configured differently.)

● Number of Slots Occupied by a Redundant CPU

A redundant CPU occupies two slots.

Main base unit slot 0 is set as follows, type: redundant, points: 0 points.

The I/O number for slot 1, in which modules are mounted, is X/Y0H.



● Restrictions on Online Module Change (Hot Swapping)

The I/O module mounted on a main base unit with a redundant CPU module and the module mounted on a remote I/O station can be the target of online module change (hot swapping) using GX Developer.

The target modules of online module change are shown in the following table.

Module	Function Version	Mounting Position	
		Main Base Units on which a Redundant CPU is mounted	MELSECNET/H Remote I/O Station
Input Module	–	○	○
Output Module	–	○	○
I/O Combined Module	–	○	○
Analog Input Module	"C" or later	×	○
Analog Output Module	"C" or later	×	○
Temperature Input Module	"C" or later	×	○
Temperature Adjustment Module	"C" or later	×	○
Loop control Module	"C" or later	×	○
Pulse Input Module	"C" or later	×	○

○: Online Module Change (Hot Swapping) Possible

×: Online Module Change (Hot Swapping) not Possible (because cannot be mounted on a main base unit.)

Tracking cable

■ Specifications

Item	Name	
	QC10TR	QC30TR
Cable Length	1.0 m (3.29ft.)	3.0 m (9.87ft.)
Purpose	Connecting the CPU modules of a redundant system	
Mass	0.15 kg	0.28 kg
Tightening Torque	29.4N•cm	

1.7.3 Function of redundant system

Basic Concept of Redundant System

● Determination of System A and System B

In a redundant system, one basic system is called "System A", and the other, "System B", to identify each of the two systems connected with a tracking cable.

● Control System and Standby System

In a redundant system, the CPU module of either system performs operations and controls the redundant system.
The other system, which is for backup, does not perform operations.
The controlling system is referred to as "Control system", and the backup system, "Standby system".

● Switching Between the Control System and Standby System

If a fault occurs in the control system, the backup system takes over the system control and continues the operation.

● Consistency Check between Control System and Standby System

A redundant system conducts "Consistency check between Systems A and B" to check if the control system and standby system are consistent so that control continues without the system going down when system switching occurs.

● Operation Mode

The redundant system operates in the following three modes: the "Backup mode" for continuing the control by system switching when the control system develops an error, the "Separate mode" for maintenance (program modification, replacing the module mounted on the main base unit, etc.) without stopping control, the "Debug mode" for enabling only one basic system to perform debugging prior to the system operation.

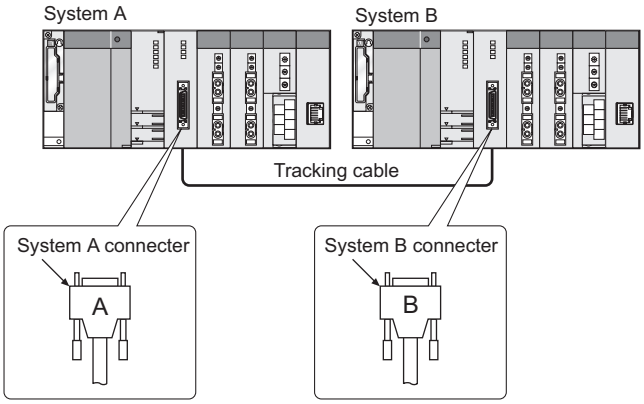
■ Determination of System A/System B

● Determination of System A/System B

The system that includes the CPU module connected with the tracking cable system A connector will be "System A" and the other one with the system B connector will be "System B".

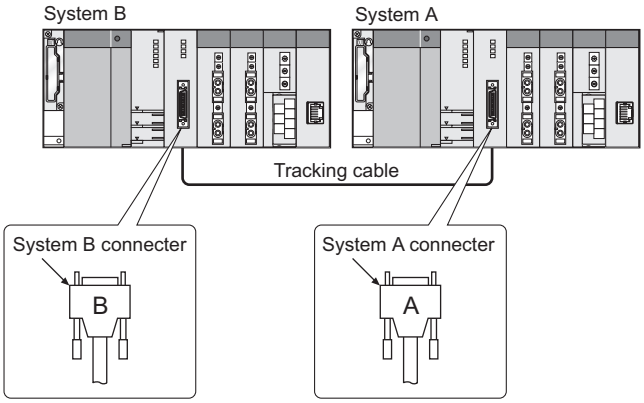
(1) When the System A connector is connected to the left system

When the system A connector is connected to the CPU module of the left system, system A/B will be determined as shown in the following table.



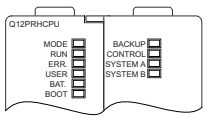
(2) When the System A connector is connected to the right system

When the system A connector is connected to the CPU module of the right system, system A/B will be determined as shown in the following table.



● Confirming system A/System B *

Identify system A and system B by checking the "SYSTEMA" and "SYSTEM B" LEDs of CPU modules.

CPU Module LED	LED StatusesL
	

LED Name	System A	System B
SYSTEM A	ON	OFF
SYSTEM B	OFF	ON

● Precautions

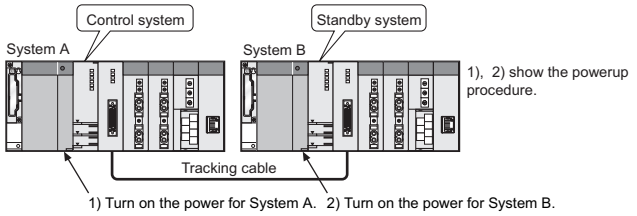
When using the redundant system in the backup mode, connect the tracking cable to the control system and the standby system CPU modules.
If both systems are powered on without the tracking cable connected to the CPU models, the "TRK.CABLE ERR. (error code: 6120)" stop error will occur and the system cannot run.
If "TRK. CABLE ERR." occurs at power-on, power off System A and System B, then connect the tracking cable to the CPU modules, and power the systems on again.

■ Determination of Control System and Standby System

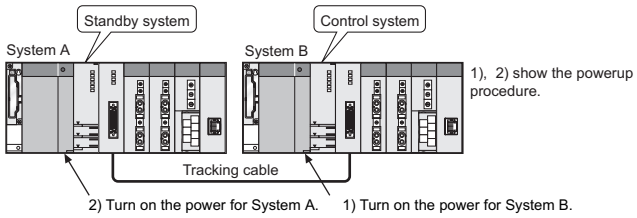
● When One of the Systems Starts Up Before the Other One *1

If either system A or system B starts up before the other one, the system that starts up first will be the "Control system", and the other one will be the "Standby system". *2
When both CPU modules of the system A and system B are reset, the system with the CPU module of which RESET/L.CLR switch is set to the neutral position first will be the "Control system", and the other one will be the "Standby system".*2

(a) When system A starts up first



(b) When system B starts up first

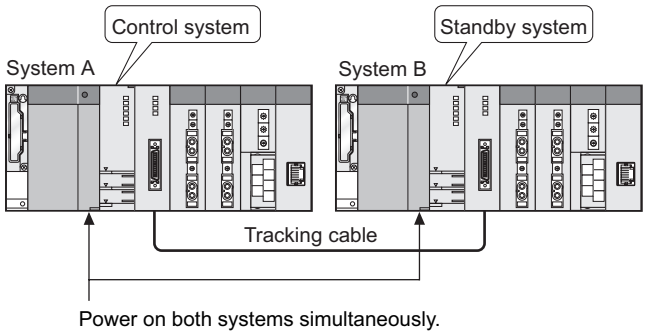


*1: Indicates the case where one system starts up within 3 seconds after the other system.

*2: If the second system does not start up within 3 seconds of the first one, the "STANDBY SYS. DOWN(error code: 6300)" continuation error will occur in the control system CPU module.
By disabling "Check standby system malfunction," at the standby System Monitor settings in the redundant parameter operation mode settings with GX Developer, the control system will not detect the "STANDBY SYS. DOWN" continuation error.

● When System A and System B Start Up Simultaneously *3

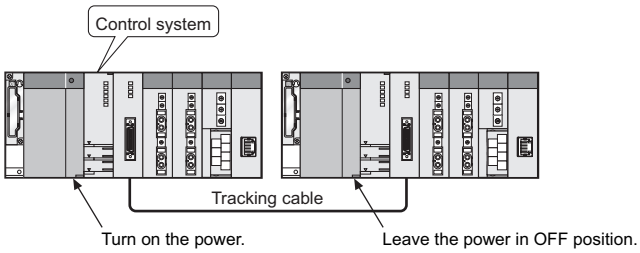
If system A and system B start up simultaneously, system A will be the "Control system", and system B will be the "Standby system".
If the system A and system B CPU modules are reset (RESET/L.CLR switch is set to the RESET position) and unreset (RESET/L.CLR switch is set to the neutral position) simultaneously, system A will be the "Control system", and system B will be the "Standby system".



*3: This indicates the following cases:
- One system starts up and the other starts up within 3 seconds.
- When one CPU module is unreset (RESET/L.CLR switch is set to the neutral position) within 3 seconds of the other.

● When Only One System Starts Up

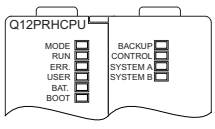
Whichever system that starts up first will be the "Control system".*4
Also, if the control system is already on, the other system will be the "Standby" system when it starts up.



*4: A continuation error "STANDBY SYS.DOWN (error code: 6300)" will occur in the control system CPU module.
By disabling "Check standby system malfunction" at the standby System Monitor settings in the redundant parameter operation mode settings with GX Developer, the control system will not detect the "STANDBY SYS. DOWN" continuation error.

● Confirming the Control System/Standby System

Identify the control system and standby system by checking the "CONTROL" LEDs. of CPU modules.

CPU module LED	LED status
	

LED Name	Control System	Standby System
CONTROL	ON	OFF

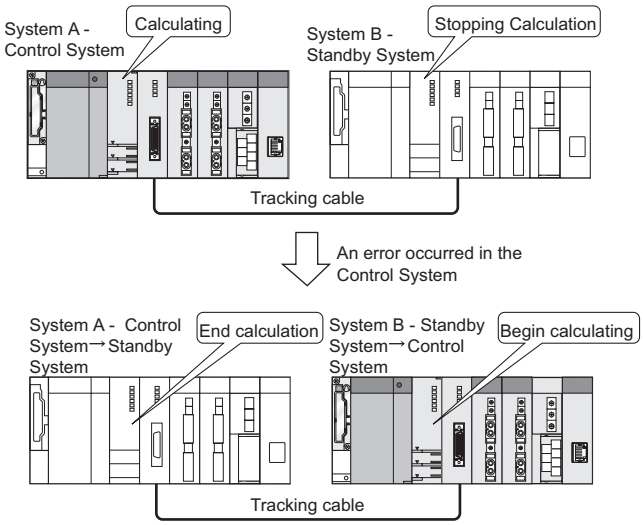
● Precautions

When using the redundant system in the backup mode, connect the tracking cable to the control system and the standby system CPU modules.
If both systems are powered on without the tracking cable connected to the CPU models, the "TRK.CABLE ERR. (error code: 6120)" stop error will occur and the system cannot run.
If "TRK. CABLE ERR." occurs at power-on, power off System A and System B, then connect the tracking cable to the CPU modules, and power the systems on again.

■ Operation Mode

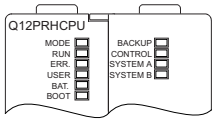
● Backup Mode

The backup mode is for normal operation of redundant system.
If a fault or failure occurs in the control system, the standby system takes over the control and continues the system operation.
To enable the standby system to continue the system operation when the control system goes down, the data of the control system are to be continuously transferred to the standby system through the tracking cable.



(a) Confirming Backup Mode
Confirm that the redundant system is running in the backup mode by checking the "BACKUP" LEDs of CPU modules.

CPU Module LED	LED status



LED Name	Control System	Standby System
BACKUP	ON (green)	ON (green)

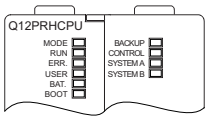
● Separate Mode

The separate mode is for maintenance (program modification, replacing the module mounted on the main base unit, etc.) without stopping control.
In the separate mode, different programs can be run in the control system and standby system CPU modules.

(a) Enabling/Disabling the Tracking Function
In the separate mode, it is possible to select whether the tracking function is enabled or not, in order to perform the tracking.

(b) Confirming the Separate Mode
Confirm that the redundant system is running in the backup mode by checking the "BACKUP" LEDs of CPU modules.

CPU Module LED	LED Status

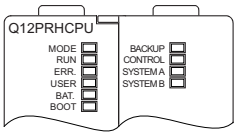


LED Name	Control System	Standby System
BACKUP	ON (amber)	ON (amber)

● Debug Mode

The debug mode is for performing a debug using a single system prior to redundant system operation.
No need to connect the tracking cable to perform the operation. (An error will not occur if the tracking cable is not connect.)
In the debug mode, the CPU module is fixed to system A, control system.
Confirm that the redundant system is running in the debug mode by checking the relevant LEDs of the CPU module.

CPU module LED	LED Status



LED Name	LED Status
BACKUP	OFF
CONTROL	ON
SYSTEM A	ON
SYSTEM B	OFF

■ System Consistency Check And The Operations

In order to continue the redundant system control after system switching, the system configurations, parameters and programs of the control system and standby system must be consistent.

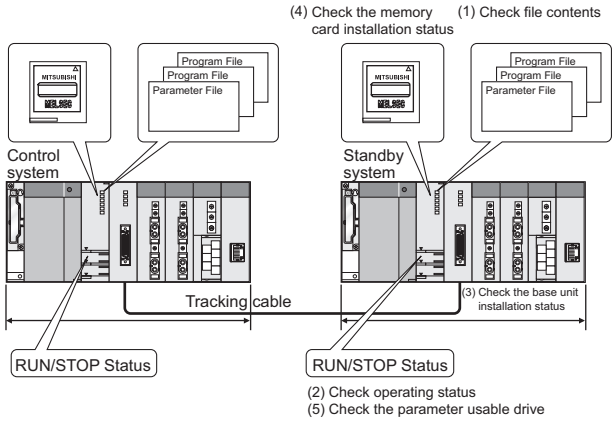
In the backup mode, the standby system CPU module checks if the system configurations, parameters and programs of both systems are consistent. The redundant system operates as shown below according to the check results. *

- If the control system and standby system are consistent in the system configuration, parameters and programs, the redundant system operates normally.
- If the control system and standby system are inconsistent in the system configuration, parameters and programs, an error will occur in the standby system CPU module.

*: This check is referred to as "Consistency Check.

The consistency check is executed in the following cases:

- When both systems are powered on simultaneously
- When both system CPU modules are unreset (RESET/ L.CLR switch is set to the neutral position) simultaneously.
- During END processing by the control system CPU module
- When the tracking cable is reconnected



Check Points		Description
(1)	File Contents	Checks parameters, programs and initial device values. Checks the memory capacity of the area for online change of multiple blocks.
(2)	Operating Status	Checks the CPU module operation status (RUN / STOP / PAUSE).
(3)	Basic System Configuration	Checks the CPU modules, I/O modules and network modules mounted on the main base units.
(4)	Memory Card Setting	Checks the set memory card setting and the type, i.e., SRAM, Flash and ATA card.
(5)	Parameter Valid Drive Settings	Checks the parameter valid drive settings (dip switch SW2,SW3)

Conditions *1				Description				
Execution Timing	Operation Mode	Standby System Operating Status	Control System Operating Status	File	Operating Status	Basic System Configuration	Memory Card Settings	Parameter Valid Drive Settings
Both systems powered on simultaneously	Backup Mode	–	–	○	○	○	○	○
Both systems Unreset *3 simultaneously	Backup Mode	–	–	○	○	○	○	○
END processing	Backup Mode	RUN	RUN	○ *1	○	–	–	–
			STOP PAUSE	–	○	–	–	–
			STOP→RUN	○	○	–	–	–
		STOP PAUSE	RUN	○	○	–	–	–
			STOP PAUSE	–	○	–	–	–
			STOP→RUN	–	○	–	–	–
		STOP→RUN	RUN	○	○	–	–	–
			STOP PAUSE	–	○	–	–	–
		Power ON Unreset *3	RUN	○	○	○	–	○
			STOP PAUSE	–	○	○	–	○
	Changing from Separate Mode to Backup Mode	RUN STOP→RUN Power ON Unreset *3	RUN	○	○	○	–	○
			STOP PAUSE	–	○	○	–	○
Tracking cable reconnected	Backup Mode	RUN	RUN	○	○	○	–	○
		STOP PAUSE	RUN STOP PAUSE	–	○	○	–	○

○ : Consistency Check Target, - : Out of Consistency Check Target

*1: The consistency check is executed only in the following cases:
- After online program change is completed (the consistency check is executed only for the program files.)
- At system switching

*2: The consistency check will not be executed during the following:
- Memory copy from control system to standby system

*3: The consistency check is not executed if the execution condition is not mentioned on the table above.

● File consistency check

(1) Targets files and check details

Target Files	Details
Parameters	• Checks the parameters stored in the drive set as parameter valid drive (PLC parameters, redundant parameters, network parameters) and the intelligent function module parameters set with GX Configurator. • Checks the remote password stored in the program memory.
Programs	• Checks the program file set in the PLC parameters program settings. • The password set in the password registration is irrelevant.
Initial Device Values	• Checks the initial device value file set in the PLC parameter PLC file settings. • The password set in the password registration is irrelevant.
Area for Online Change of Multiple-Block Write	Checks the memory capacity of the area for online change of multiple blocks set during formatting.

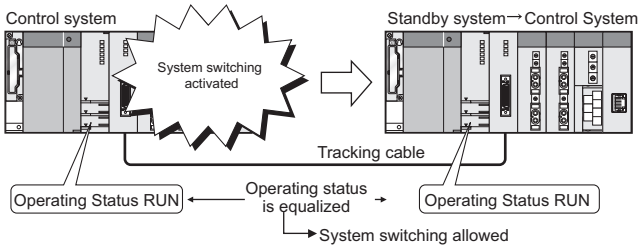
(2) Inconsistency errors

Execution Conditions	Error Description
• When both systems are powered ON simultaneously. • When both system CPU modules are unreset (RESET/L.CLR switch is set to the neutral position) simultaneously. • When one system starts up after the other. • When the separate mode is changed to the backup mode.	The following stop error will occur only in the standby system CPU module only: "FILE DIFF. (error code: 6000)".*2

● Operating Status Consistency Check

(1) Check points

The operating status consistency check means checking the CPU module operating status (RUN / STOP / PAUSE).



(2) Inconsistency Errors

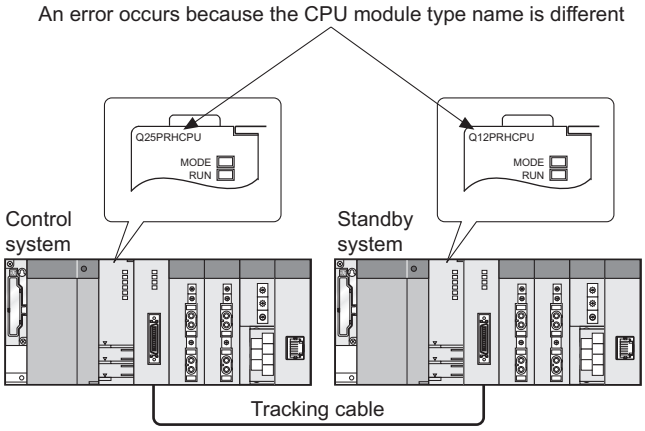
Execution Conditions	Error Description
• When both systems are powered ON simultaneously. • When both system CPU modules are unreset (RESET/L.CLR switch is set to the neutral position) simultaneously.	The following stop error will occur in the control system and standby system CPU modules: "OPE.MODE DIFF. (error code: 6020)".
• When one system starts up after the other. • During normal operation. • When the separate mode is changed to the backup mode. • When reconnecting the tracking cable.	The following continuation error will occur in the standby system CPU module only: "OPE.MODE DIFF. (error code: 6010)".

● Basic System Configuration Consistency Check

(1) Check points

The basic system configuration consistency check means checking the followings:
(If the number of slots of the main base unit has been set in the PLC parameter I/O assignment, only the specified number of slots will be checked.)

- CPU module model
- Model and type of modules mounted on each slot in the main base unit
- Network module mode settings



A consistency check is not executed for the followings:

- Model of battery set in the CPU module
- Main base unit model and number of available slots
- Serial Nos. of modules mounted in the main base unit
- Number of power supply modules mounted in the main base unit
- Model of power supply modules mounted in the main base unit
- Slots set to "Open" in the PLC parameter I/O assignment
- Modules being replaced online
- Modules mounted on slots after the number of those in the PLC parameter I/O assignment

(2) Inconsistency Errors

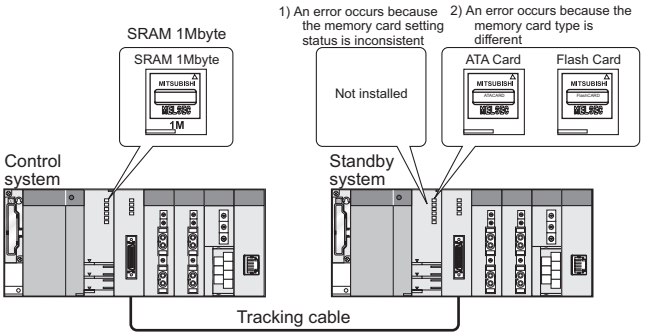
Execution Conditions	Error Description
When both systems are powered ON simultaneously When both system CPU modules are unreset (RESET/L.CLR switch is set to the neutral position) simultaneously	The following stop error will occur in the control system and standby system CPU modules: "UNIT LAY. DIFF. (error code: 6030 or 6035)".
When one system starts up after the other. When the separate mode is changed to the backup mode When reconnecting the tracking cable	The following stop error will occur in the standby system CPU module only: "UNIT LAY. DIFF. (error code: 6030 or 6035)". *

● Memory Card Setting Status Consistency Check

(1) Check points

The memory card setting consistency check means checking if a memory card is set and the type.

Check Points	Description
Memory Card Setting	Checks if a memory card is set or not.
Memory Card Type	Checks if type of memory cards set in the control system and standby system (SRAM card, Flash card, ATA card) are the same.



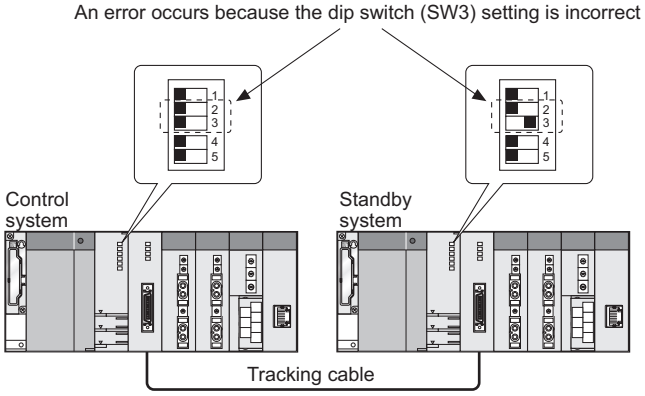
(2) Inconsistency Errors

Execution Conditions	Error Description
• When both systems are powered ON simultaneously. • When both system CPU modules are unreset (RESET/ L.CLR switch is set to the neutral position) simultaneously.	The following stop error occurs in the control system and standby system CPU modules: "CARD TYPE DIFF." (error code: 6040 or 6041)".

● Parameter Valid Drive Settings Consistency Check

(1) Check points

The control system and standby system parameter valid drive settings (dip switch SW2,SW3) are checked.



(2) Inconsistency Errors

Execution Conditions	Error Description
• When both systems are powered ON simultaneously • When both system CPU modules are unreset (RESET/ L.CLR switch is set to the neutral position) simultaneously	The following stop error occurs in the control system and standby system CPU modules: "FILE DIFF. (error code: 6001)".
• When one system starts up after the other • When the separate mode is changed to the backup mode • When reconnecting the tracking cable	The following stop error occurs in the standby system CPU module only: "FILE DIFF. (error code: 6001)".*

■ Self Diagnostics Function

● Self Diagnostics Function

The self diagnostics function means that the redundant CPU checks for its own error, in order to prevent malfunction as well as to perform preventive maintenance.
If an error occurs when the redundant system is powered on or while the redundant CPU is running, the redundant CPU detects the error and displays it and performs system switching, etc.

● Error Detection Processing

(1) Error detection processing

When detecting an error, the redundant CPU will perform the following process:

(a) Turning the ERR.LED etc. on

(b) Turning the special relays (SMO, SM1) on

(c) Storing the error information (error code) into the special resistor (SD0)

When detecting multiple errors, the redundant CPU will store only the latest error code into the SDO.

Use the special relay and special register in a program to make a PLC or machine system interlock.

(2) Error history confirmation

The redundant CPU records the 16 latest error codes as error history.
The error history can be checked in the PLC diagnostics of GX Developer.
The error history is backed up by the battery even if the PLC is powered off.

● Redundant CPU Operation upon an error detection

(1) Operation Mode when detecting an error

When detecting an error through the self diagnostics, the redundant CPU operates in the following two ways:

(a) Stop of redundant CPU operation

Upon an error detection, the redundant CPU stops the operation and performs system switching.

The redundant CPU holds all outputs (Y) that have not been assigned to the main base unit, while it processes the outputs (Y) that have been assigned to the main base unit according to "Output Mode on Error Detection" of the PLC parameters I/O assignment settings as shown below:

- Turns off all output of modules set to "Clear Output" (default). (Device memory output (Y) is held.)
- Output of modules set to "Maintain output" is held. (Device memory output (Y) is maintained.)

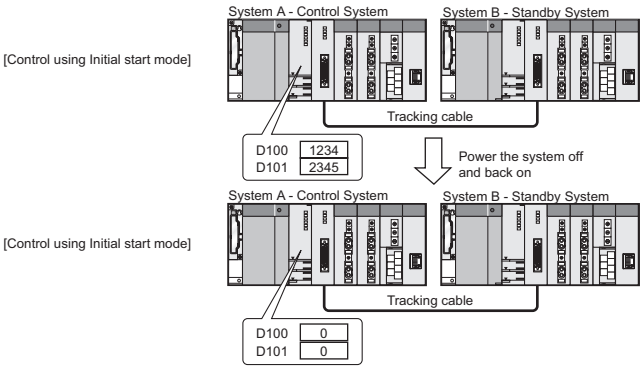
(b) Continuation of redundant CPU operation

Upon an error detection, the redundant CPU executes all programs other than the program (instruction) where the error occurred.

■ Start Mode

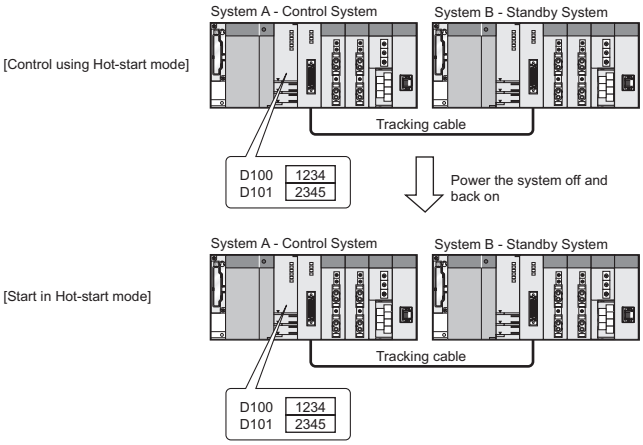
● Initial start mode (Default)

This mode is for clearing all devices except the file register and the latch range settings device (word device: 0; bit device: OFF) before performing the operation.



● Hot-start mode

This mode is for performing the operation from when holding the device.
(Some devices such as the step relay and the index register will be cleared.)
As holding the devices even when the redundant system goes down due to power OFF or CPU module reset, the system can continue the operation when it is powered on or the CPU modules are unreset (RESET/L.CLR switch is set to the neutral position) .



● Differences Between Initial Start Mode and Hot-start Mode

The following table shows the differences between Initial start mode and Hot-start Mode.

			Initial Start Mode	Hot Start Mode
Device Memory	All Other Than Index Register and Step Relay	Not held in power OFF	Cleared	Held *
		Held in power OFF	Held	
	Index Register and Step Relay		Cleared	
	Special Relay and Special Register		Initial value is set	
	Link special relay, link special register		Cleared	
	Initial Device Value Setting Range		Initial value is set	
	Local Device		Cleared	
	File Register		Held	
Program Execution	Initial Execution Type Program		Executed only one time during STOP→RUN	
	Interrupt Permitted / Not Permitted		Set to not permit interrupt	
	SM402 (After RUN, ON for 1 scan)		Turned ON 1 scan during STOP→RUN	
	SM403 (After RUN, OFF for 1 scan)		Turned OFF 1 scan during STOP→RUN	
Program Execution Type (Initial / Scan / Standby)			Based on the PLC parameter settings	
File Register Settings			Based on the PLC parameter settings	
Comment File Settings			Based on the PLC parameter settings	
SFC Program Startup Mode			Based on the PLC parameter settings	
Boot from Memory Card / Standard ROM			Based on the PLC parameter settings	
Intelligent Module Parameter Initial Settings			The intelligent module parameters are reflected	

*: Clear device data by latch clear.

The System Switching Function (Switching Between The Control System And The Standby System)

■ System Switching Method

2 methods of system switching are available: automatic system switching and manual system switching that is performed by the user.

System Switching Method	Description	Operation Modes
Automatic system switching	System switching when a fault occurs in the control system System switching by the system switching request issued from the network module	Backup Mode
Manual System Switching	System switching using GX Developer System switching by system switching instruction	Backup Mode Separate Mode

● Automatic System Switching

In automatic system switching, the redundant CPU determines if a system switching is necessary and automatically switches the control system and standby system.

2 types of automatic system switching are available: automatic system switching when a fault occurs in the control system, and system switching requested by the network module.

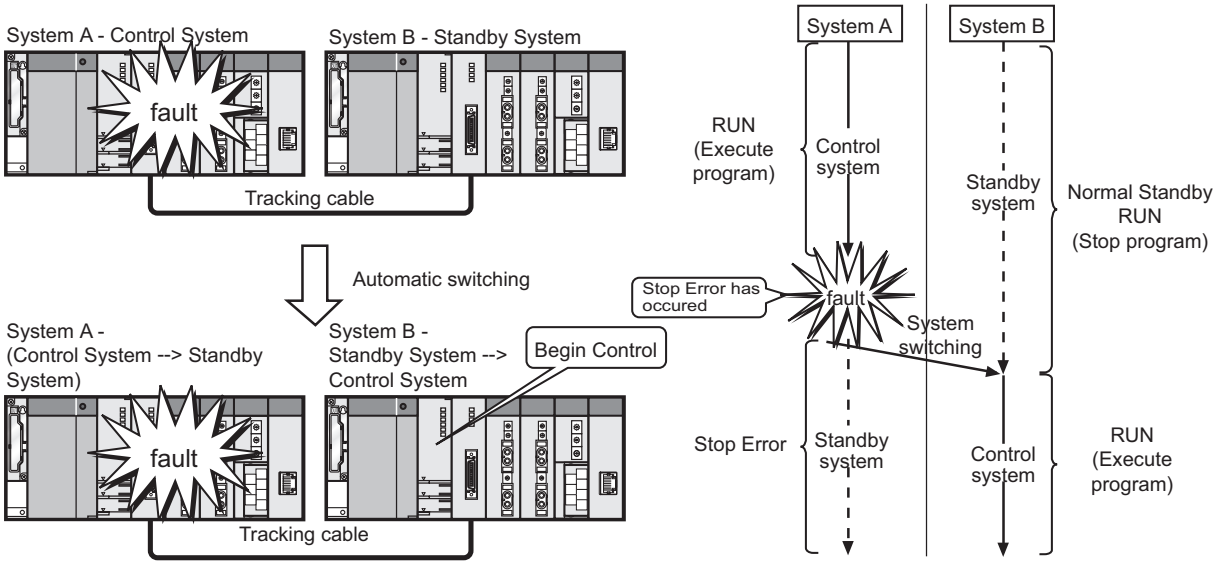
(1) System switching when a fault occurs in the control system

In the redundant system, the standby system CPU module monitors the control system operating status.

When the control system is in any of the following status and is not able to continue the redundant system control, the standby system CPU module switches to the control system and continues the redundant system control.

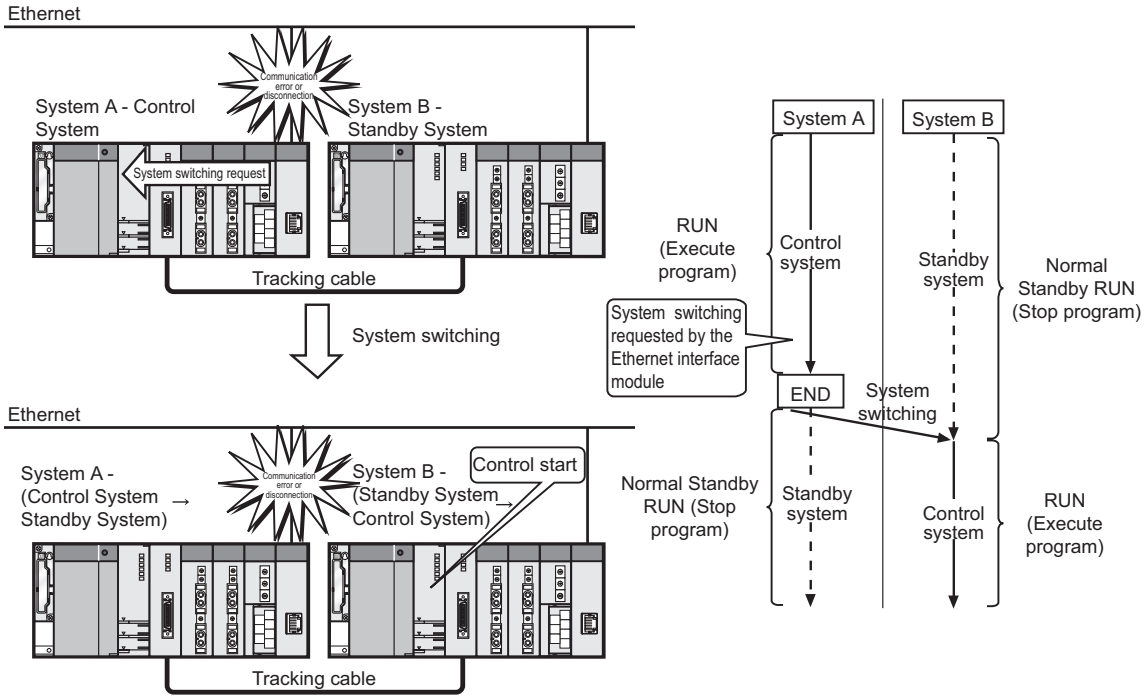
- A stop error occurs in the control system CPU module
- The control system is powered OFF
- The control system CPU module is reset

If a continuation error occurs in the control system CPU module, system switching will not occur.



(2) System switching requested by the network module

When detecting a network fault or disconnection*1, the control system MELSECNET/H network module or the Ethernet interface module issues a system switching request to the CPU module. (The standby system MELSECNET/H network module and the Ethernet interface module will not issue a system switching request, if they detect a network fault or disconnection.*1)
When receiving the system switching request from the network module, the control system CPU module will perform a system switching at END processing.



*1: Only QJ71E71-100 can detect a wire breakage among the Ethernet interface modules.

● Manual System Switching

Manual system switching means the system switching that is done manually by the user while the system is running.
2 types of manual system switching are available: system switching using GX Developer and that by the system switching instruction (SP.CONTSW instruction).

The manual system switching is performed for the control system CPU module.

(1) System switching using GX Developer

When executing the system switching in the control system CPU module using GX Developer, the system switching operation is done at END processing.

(a) System switching using GX Developer is done in the following procedure:

- Turn on the "Enable/disable user system switching" flag (SM1592) in the control system CPU module.

↓

- The system switching request is issued to the control system CPU module by GX Developer remote operation.

(2) System switching by the system switching instruction (SP. CONTSW instruction)

When the system switching instruction is executed in the control system CPU module, the system switching is performed at END processing after instruction execution.

(a) The system switching by system switching instruction is done in the following procedure:

- Turn on the "Enable/disable user system switching" flag (SM1592) in the control system CPU module.

↓

- Turn on the system switching instruction condition in the control system CPU module and execute the instruction.

● System Switching Priority

	Priority	Reasons for System Switching
High	1	Control system powered off Control system CPU module reset
↓	2	Stop error in control system CPU module
	3	Execution of system switching instruction
	4	System switching operation using GX Developer
Low	5	System switching request by network module

■ System Switching Execution Timing

System Switching Method	Reasons for System Switching in Control System	Execution Timing
Automatic System Switching	Stop error	System switching is executed when the reason for system switching occurs.
	Power off	
	Reset	
	System switching request by network module	System switching is executed at END processing of the scan where the reason for system switching occurred. *1
Manual Switching	System switching using GX Developer	
	System switching by system switching instruction	

*1: Even if the COM instruction is executed after a reason for system switching occurs, system switching will not be executed by END processing.

■ System Switching Execution Possibility

● In Backup Mode

Standby System Operating Status *1	Control System Switching Condition						
	Automatic System Switching					Manual System Switching	
	Stop Error Other Than Watchdog Timer Error	Watchdog Timer Error *3	Hardware Failure	Power Off Reset	System Switching requested by the Network Module	System Switching using GX Developer	System Switching by System Switching Instruction
Normal	○	○	○	○	○	○	○
Continuation ERROR	○	○	○	○	○	○	○
Power OFF *2 Resetting *2 Hardware Failure *2	×	○ *4	○ *4	×	×	×	×
Watchdog Timer Error *2*3	×	○	○	○	×	×	×
Stop Error Other Than Watchdog Timer Error *2	○	○	○	○	×	×	×
Network Fault Detection	○	○	○	○	×	×	×
Memory Copy from Control System to Standby System	○	○	○	○	×	×	×
During Online Program Change	○	○	○	○	×	×	×
Operating Status Inconsistency	○	○	○	○	×	×	×
Tracking Cable Disconnection	×	○ *4	○ *4	×	×	×	×
Preparing for Tracking	×	○	○	○	×	×	×
System Switching Request Timeout	×	○	○	○	×	×	×
Executing System Switching	○	○	○	○	○	×	×

○ : System switching enabled × : System switching disabled

*1: Standby System Operating Status is displayed in the following table.
*2: When the reasons for system switching failure such as standby system power off/being reset, standby system stop error, tracking cable disconnection, are removed, the system switching may occur.
*3: Watchdog timer error corresponds to the "WDT ERROR (error code: 5000 OR 5001)".
*4: The control system switches to the standby system, but the standby system status does not change.

Operating Status	Description
Normal	The CPU module is in the RUN, STOP or PAUSE status, where no error such as a continuation error or stop error has occurred.
Continuation Error	The CPU module is in the RUN, STOP and PAUSE status, where a continuation error has occurred.
Stop Error	The CPU module has stopped, as a stop error has occurred.
Power Off	The system power is OFF.
Resetting	The CPU module is being reset.
Network Fault Detection	A fault has been detected by at least one module of (maximum of) 8 standby system network modules (MELSECNET/H network modules: up to 4; Ethernet interface modules: up to 4)
Preparing for Tracking	The communication is not made between the control system and standby system via tracking cable.
System Switching Request Timeout	The system switching has not been completed, as a data error occurred due to noise, etc., in the communication between the control system and standby system during system switching processing.
Executing System Switching	System switching cannot be executed since the control system or standby system is executing system switching due to the previous system switching condition.

● **In Separate Mode**

Standby System Operating Status *1	Control System Switching Condition						
	Automatic System Switching					Manual System Switching	
	Stop Error Other Than Watchdog Timer Errors	Watchdog Timer Error *2	Hardware Failure	Power OFF Reset	System Switching requested by the Network Module	System Switching Using GX Developer	System Switching with System Switching Instruction
Normal	×	×	×	×	×	○	○
Continuation Error	×	×	×	×	×	○	○
Power OFF Resetting Hardware Failure	×	×	×	×	×	×	×
Watchdog Timer Error *2	×	×	×	×	×	×	×
Stop Error Other Than Watchdog Timer Errors	×	×	×	×	×	×	×
Network Fault Detection	×	×	×	×	×	○	○
Copying memory from Control System to Standby System	×	×	×	×	×	×	×
During Online Program Change	×	×	×	×	×	○	○
Operating Status Inconsistency	×	×	×	×	×	○	○
Tracking Cable Disconnection	×	×	×	×	×	×	×
Preparing for Tracking	×	×	×	×	×	×	×
System Switching Request Timeout	×	×	×	×	×	×	×
Executing System Switching	×	×	×	×	×	×	×

○ : Indicates system switching possible × : Indicates system switching not possible

*1: Standby system Operating status is displayed in the following table.

*2: Watchdog timer error corresponds to the "WDT ERROR (error code: 5000 OR 5001)"

Operating Status	Description
Normal	The CPU module is in the RUN, STOP or PAUSE status, where no error such as a continuation error or stop error has occurred.
Continuation Error	The CPU module is in the RUN, STOP and PAUSE status, where a continuation error has occurred.
Stop Error	The CPU module has stopped, as a stop error has occurred.
Power Off	The system power is OFF.
Resetting	The CPU module is being reset.
Network Fault Detection	A fault has been detected by at least one module of (maximum of) 8 standby system network modules (MELSECNET/H network modules: up to 4; Ethernet interface modules: up to 4)
Preparing for Tracking	The communication is not made between the control system and standby system via tracking cable.
System Switching Request Timeout	The system switching has not been completed, as a data error occurred due to noise, etc., in the communication between the control system and standby system during system switching processing.
Executing System Switching	System switching cannot be executed since the control system or standby system is executing system switching due to the previous system switching condition.

*2: Watchdog timer error corresponds to "WDT ERROR (error code: 5000 OR 5001").

■ Both Systems Operations After System Switching

● CPU Module Operations

Item		New Control System CPU Module	New Standby System CPU Module
Program Execution*	Initial Execution Type Program	Does not execute the program. However, executes the initial execution type program from the 0 step again, if it was not completed in the previous control system at the time of system switching.	Stops program execution.
	Scan Execution Type Program	Executes scan execution type program based on the tracked device data from step 0.	
	Fixed Scan Execution Type Program	Starts counting the interrupt interval time from 0.	
	Standby Type Program	Not executed.	
	Interrupt Program	Executes when the interrupt factor is established.	
Tracking		Starts tracking to the new standby system.	Starts reception of tracking data. However, stops the reception of tracking data if a stop error has occurred.
Online Program Change		Continues the write operation after system switching.	Continues the write operation after system switching.
Online Change of Batch of Files		Continues the write operation after system switching.	Continues the write operation after system switching.
General Data Processing		Executes the request received after system switching.	Executes the request received at time of system switching. However, may develope a communication error if a system switching is executed during general data processing.
Device Memory		Holds the data.	Holds the data. Sets the received tracking data to specified device.
Signal Flow Memory		Holds the tracked data. Turns ON signal flow memory in all steps if has not been tracked. Stores the execution results in the signal flow memory, after program execution.	Holds the data Sets the received tracking data in the signal flow memory.
Initial Device Value Setting		Does not set the value.	Does not process it.
Special Relays and Special Registers		Holds the data. However, stores the statuses of control system and standby system after system switching in SM1515 and SM1516.	Holds the data. However, stores the statuses of control system and standby system after system switching in SM1515 and SM1516. Sets the received tracking data in the corresponding special relay and special register.
Output (Y)		Holds the output. Outputs program execution results.	Turns OFF the output (Y) from modules mounted on the main base unit. Holds the output (Y) from modules other than above.
Local Device Settings		Sets devices according to parameter settings.	Does not process it.
File Register Settings		Holds the file register settings prior to system switching.	Not processed.
Direct Input (DX)		Takes in (X) from the input module when executing the direct input instruction in a program after system switching.	Not processed.
Direct Output (DY)		Outputs (Y) to the output module when executing the direct output instruction in a program after switching.	Not processed.
Intelligent Function Module Dedicated Instruction		Executes the instruction in a program after system switching if the corresponding execution condition has been satisfied, and does not execute it if it has not been satisfied.	Not processed.
FROM/TO Instruction		Executes the instruction in a program after system switching if the corresponding execution condition has been satisfied, and does not execute if it has not been satisified.	Not processed.
Access Request from Intelligent Function Module		Ignores the access request.	Not processed.

*:The redundant CPU cannot execute the low speed execution type programs.

● **Network Module Operations**

Item	New Control System Network Module	New Standby System Network Module
MELSECNET/H PLC to PLC network	Starts cyclic transmission.	Continues cyclic transmission. However does not perform output.
MELSECNET/H Remote I/O network	Starts cyclic transmission. Operates as master station.	Continues cyclic transmission as sub-master station. However, does not perform output.
Ethernet	Communicates with the control system when it is specified by external device. Transfers a message to the standby system when it is specified by external device.	Communicates with the standby system when it is specified by external device. Transfers message to the control system when it is specified by external device.

Tracking Function

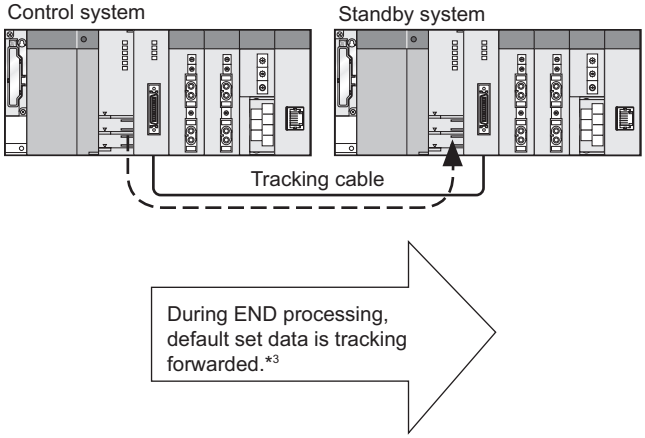
■ Tracking Function Overview

● Tracking Function

The tracking function maintains the data of the control system and standby systems consistent so that the redundant system can continue to operate with the standby system in case the control system goes down.

As the tracking data settings have been made by the default in the redundant CPU, tracking can be done without changing the tracking settings. *1

Tracking can be done in either backup mode or separate mode. *2



*1: Following tracking data are set by default:
- Internal devices
- SFC data
- PID control instruction data

*2: Please refer to the table below, for data tracking in the backup mode and separate mode.

*3: If the data for tracking is changed, data after the change will be tracked.

● Tracking Data

There are 2 types of tracking data: tracking data based on the range set by the user and tracking data regardless of the settings, i.e., automatic tracking data.

(1) Tracking Data Range Setting by User

The tracking data range and tracking timing can be set by the user.
As the tracking data range has been set by default in the redundant CPU, tracking will be executed even without the user making the tracking settings.

(2) Automatic Tracking Data

Tracking will be exeecuted even without the settings.

● Changing Tracking Data Settings

The tracking data range settings can be changed in the following cases:

- To shorten the tracking time
- To add to the tracking data (file register, etc.)
- To change the tracking timing in a program
- To track signal flow memory

Change the tracking data setting at the tracking settings in the redundant parameter settings of GX Developer.

■ Tracking Data

Type		Description	Auto Tracking *1	Setting Change by User *2	Operating Mode *3	
					Backup Mode	Separate Mode
Device Data	Internal Device	Data of input (X), output (Y), internal relay (M) and others used in programs	○ *4	○	○	○
	Special Relay	Data turned ON and OFF by user:	○	×	○	○
	Special Register	Data stored by user	○	×	○	○
Signal Flow Memory		Data that determines whether the rise and fall instructions will be executed or not in sequence programs	×	○	○	×
SFC data		Data used to execute SFC	○	×	○	×
PID Control Instruction data		PID control data specified by PIDINIT and S.PIDINIT instructions	○	×	○	×

*1: ○ Auto tracking enabled × Auto tracking disabled

*2: ○ Setting change enabled × Setting change disabled

*3: ○ Tracking enabled × Tracking disabled

*4: The device range set by default will be transferred.

● Tracking Data Range Setting by User

The tracking data range and tracking timing can be set by the user.

This applies to the internal devices and signal flow memory. (Set whether the signal flow memory will be tracked or not.)

Up to 100k words of internal devices and signal flow memory can be transferred for each tracking.

(1) Internal devices

Internal devices are data of input (X), output (Y), internal relay (M) and others used in programs.

(a) Internal Device Default Setting Range

The default tracking range is set to the internal devices as shown in the following table.

When changing the number of the device points to be used in the PLC parameter device setting using GX Developer, the number after change will be the tracking range.

By default, all device points in the tracking range are to be tracked.

Device	Default Tracking Range	Tracking Range Set by User
Input	X0 to X1FFF	X0 to X1FFF
Output	Y0 to Y1FFF	Y0 to Y1FFF
Internal relay *1	M0 to M8191	M0 to M8191
Latch Relay *1	L0 to L8191	L0 to L8191
Step Relay	S0 to S8191	S0 to S8191
Annunciator *1	–	F0 to F2047 *7
Edge Relay *1	V0 to V2047	V0 to V2047
Link Relay *1	B0 to B1FFF	B0 to B1FFF
Link Special Relay	–	SB0 to SB7FF *6
Timer (Contact Points and Current Value) *1	T0 to T2047	T0 to T2047
Retentive Timer (Contact Points and Current Value)	*2	*2
Counter (Contact Points and Current Value) *1	C0 to C1023	C0 to C1023
Data Register *1	D0 to D12287	D0 to D12287
Link Register *1	W0 to W1FFF	W0 to W1FFF
Link Special Register	–	SW0 to SW7FF *6
Index Register	Z0 to Z15	Z0 to Z15
Special Relay	*3	*5
Special Register	*4	*5
File Register	–	ZR0 to ZR1042431

- :Indicates data that is set to be not tracked by default.

*1: The number of device points to be used can be changed in the PLC parameter device settings using GX Developer.
If the number of points to be used is changed, the number after change will be the "default tracking range" or the "tracking range set by user."

*2: The number of retentive timer points is 0 by default.
When setting the number of retentive timer points to be used in the PLC parameter device settings by GX Developer, the set number will be the "default tracking range" or the "tracking range set by user."

*3: For the special relays, the data in the range shown at page 1-180 will be automatically tracked:

*4: For the special registers, the data in the range shown at page 1-180 will be automatically tracked:

*5: The special relays and special registers used in the redundant system are automatically tracked.
It is not necessary to set the tracking range manually.

*6: The link special relay (SB) and link special register used in the network module system need not be tracked , as they are dedicated to a station.

(b) Changing the Internal Device Settings

Objective	Tracking Setting
• To shorten tracking time	• Change the settings so that only the devices actually used will be tracked. • Divide the tracking data range into multiple blocks and change the tracking timing for each block.
• To add file register or annunciator	• Set the file register or annunciator to tracking blocks No. 1 to 64.
• Program tracking timing to any time.	• Change the settings so that the tracking trigger of tracking block No. 1 will be turned on and off manually. • Divide the tracking data range into multiple blocks and turn the tracking trigger of each block on and off in the program.

(2) Signal Flow Memory

Signal flow memory records the operation execution result of each sequence program step, i.e., whether each sequence program step was executed or not.

The signal flow memory information determines whether the rise, fall and SCJ instructions will be executed or not.

(a) Default Tracking Settings

By default, signal flow memory is set to be not tracked.

(b) Changing the Tracking Setting

When signal flow memory has not been tracked, the rise, fall and SCJ instructions may not function normally in the new control system after system switching.

In order to ensure these instructions function even if system switching occurs, change the settings so that signal flow memory will be tracked.

This setting reduces the number of internal device points that can be tracked at a time by 16k words.

● Automatic Tracking Data

Automatic tracking data is the data that the redundant CPU tracks regardless of the redundant parameter tracking settings. The data settings cannot be changed by changing the redundant parameter tracking settings .

This applies to the SFC data, PID control instruction data. some special relays and special registers.

(1) SFC data

SFC data is necessary for continuing the SFC program. SFC data is tracked when using the SFC program in the backup Mode.

(2) PID control instruction data

PID control instruction data to be automatically tracked is the data that is specified for PID control by the PIDINIT and S.PIDINIT instructions.

The PID control data is tracked when executing the PIDINIT and S.PIDINIT instructions in the backup mode.

(3) Special Relays

Special relays are only transferred in Backup Mode.

Number	Name
SM90 to SM99	Startup watchdog timer for step transition
SM202	LED OFF command
SM206	PAUSE enable coil
SM210	Clock data set request
SM213	Clock data read request
SM250	Max. loaded I/O read
SM254	All stations refresh command
SM255 to SM257	MELSECNET/H module 1 information
SM260 to SM262	MELSECNET/H module 2 information
SM265 to SM267	MELSECNET/H module 3 information
SM270 to SM272	MELSECNET/H module 4 information
SM321	Startup/stop SFC program
SM322	SFC program start status
SM323	Resence/absence of Continuous transition for entire blocks
SM325	Output mode at block stop
SM326	SFC device clear mode
SM327	Output during end step execution
SM402	After RUN, ON for 1 scan only
SM403	After RUN, OFF for 1 scan only
SM551	Reads module service interval
SM701	Number of output characters selection
SM702	Search method
SM703	Sort order
SM710	CHK instruction priority ranking flag
SM715	EI flag
SM722	BIN/DBIN instruction error disenabling flag
SM774	PID bumpless processing (for PIDCONT instruction)
SM775	Selection of link refresh processing during COM instruction execution
SM776	Enable/disenable local device at CALL
SM777	Enable/disenable local device in interrupt program
SM794	PID bumpless processing (for S.PIDCONT instruction)
SM1500 SM1501	Hold mode (S.IN, S.OUT instruction)
SM1520 to SM1583	Data tracking block specefication trigger
SM1591	Standby system error detection disable flag at system switching
SM1592	Enable/disable user system switching
SM1598	Copy contents of standard ROM during memory copy
SM1649	Standby system cancel error flag
SM1709	Disable prohibition of system switching during online program change
SM1710	Transfer tracking data during online program change enable flag

(4) Special registers

Special registers are only transferred in Backup Mode.

Number	Name
SD90 to SD99	Step transition watchdag timer setting value (Enabled only when SFC program exists)
SD207 to SD209	LED display priority ranking
SD210 to SD213	Clock data
SD250	Loaded maximum I/O
SD315	Time reserved for comminication processing
SD414	2n second clock setting
SD415	2n ms clock setting
SD550	Service interval measurement module
SD774 to SD775	PID limit setting (for PIDCONT instruction)
SD778	Refresh processing selection with the COM instruction is executed
SD794 to SD795	PID limit setting (for S.PIDCONT instruction)
SD1500 to SD1501	Basic period
SD1649	Error number reset on standby system CPU
SD1710	Waiting time for online program change (standby system)

■ Tracking Block And Tracking Trigger

● Tracking Blocks

(1) Tracking Block Overview

The internal device tracking range can be divided into multiple blocks, i.e., tracking blocks (tracking block No. 1 to 64) at the tracking settings in the redundant parameter settings of GX Developer.

(2) Tracking the Tracking Blocks

Set whether the tracking block will be tracked or not with the data tracking block specification trigger (SM1520 to SM1583) that corresponds to the target tracking block. When the data tracking block specification trigger is turned ON, the device data set to the corresponding tracking block No. will be tracked.

(3) Default Tracking Block Setting

When the tracking settings are not made (default settings), devices will be set to tracking block No.1, based on the Default Tracking Range at page 1-179.

X0 to X1FFF
Y0 to Y1FFF
M0 to M8191
(
W0 to W1FFF
Z0 to Z15

Page 1-179 "Default Transfer Range" is set.

● Tracking Trigger

(1) Tracking Trigger Overview

A tracking block trigger is a special relay that determines whether to track the multiple blocks of internal device data. Tracking block triggers are assigned to each tracking block. When executing tracking, turn on the tracking trigger that corresponds to each tracking No. to execute tracking in the program.

(2) Setting Tracking Trigger for Tracking Block No. 1

It is possible to make the settings at the tracking settings in the redundant parameter settings, so that the data tracking trigger (SM1520) for tracking block No. 1 will turn on automatically when power is turned on.
(By default, the tracking trigger for tracking block No. 1 turns on automatically and automatically tracks the device data in tracking block No. 1.)

■ Tracking Execution

When a tracking trigger is turned on, device data of the tracking block No. that corresponds to the tracking trigger will be tracked.
Tracking target data is different depending on the operation mode and the operating statuses of both systems.

● In Backup Mode

Operating Status		Tracking Data				
		Device Data *				
Control System	Standby System	Internal Device	Special Relay and Special Register	Single Flow	SFC Data	PID Control Instruction Data
RUN	RUN	○	○	○	○	○
	STOP PAUSE	○	○	○	○	○
	Stop Error	×	×	×	×	×
STOP PAUSE	RUN	○	○	○	○	○
	STOP PAUSE	○	○	○	○	○
	Stop Error	×	×	×	×	×

○:To be tracked ×:To be not tracked

● In Separate Mode

Operating Status		Tracking Data				
		Device Data *				
Control System	Standby System	Internal Device	Special Relay and Special Register	Signal Flow	SFC Data	PID Control Instruction Data
RUN	RUN	○	×	×	×	×
	STOP PAUSE	○	×	×	×	×
	Stop Error	×	×	×	×	×
STOP PAUSE	RUN	○	×	×	×	×
	STOP PAUSE	○	×	×	×	×
	Stop Error	×	×	×	×	×
Stop Error	RUN	×	×	×	×	×
	STOP PAUSE	×	×	×	×	×
	Stop Error	×	×	×	×	×

○:Performs tracking ×:Does not perform tracking

■ Tracking Mode

Tracking mode determines processing when a new tracking request occurs before the previous tracking processing is completed.
(If the previous tracking has been completed while the control system CPU module is executing the END processing, the next tracking will be initiated.)

There are 2 types of tracking modes:
- Synchronized tracking mode
- Asynchronized tracking mode

● Tracking Mode For Each Operation Mode and System Operating Status

Tracking mode is determined by the operation mode and system operating status.

Operating Status		Operation Mode			
Control System	Standby System	Backup Mode	Separate Mode	Backup Mode to Separate Mode	Separate Mode to Backup Mode
RUN	RUN	Synchronized tracking mode*3	Asynchronized tracking mode	Synchronized to asynchronized tracking mode *1	Asynchronized to synchronized tracking mode *2
	STOP PAUSE	Asynchronized tracking mode		Asynchronized to asynchronized tracking mode	Aynchronized to asynchronized tracking mode
	Stop Error				
STOP PAUSE	RUN				
	STOP PAUSE				
	Stop Error				
Stop Error	RUN	–		–	–
	STOP PAUSE				
	Stop Error				

*1: Tracking mode will change to asynchronized mode when the backup mode is changed to separate mode.

*2: Tracking mode will change to synchronized mode within maximum 150ms after the separate mode is changed to backup mode.

*3: When the special relay "Device memory tracking during RUN write (SM1710)" is turned on to execute tracking during online program change, tracking during online program change is executed in the asynchronized tracking mode.

● Synchronized Tracking Mode

This method performs tracking to the standby system for each scan while the control system CPU module is executing the END processings.
If the previous tracking is not complete during END processing, the system will wait and perform the next tracking after it has been completed.
2 types of synchronized tracking modes are available: synchronized tracking mode and program priority mode.
The default tracking mode is synchronized tracking mode.
Change the tracking mode settings at the tracking settings in the redundant parameter settings.

(1) Synchronized Tracking Mode

In synchronized tracking mode, the control system CPU stands from tracking start to finish, and executes the scan execution type program upon tracking completion.
For this reason, when system switching occurs, the new control system CPU starts operation based on the scan tracking data of up to 1 scan before.
However, scan time increases by the amount of tracking time.

(2) Program Priority Mode

In program priority mode, the control system CPU module executes the scan execution type program as soon as tracking starts.
If tracking time is longer than program execution time, the next tracking cannot start until the current tracking is completed.
In this mode, the scan time can be made shorter than in synchronized tracking mode.
However, if system switching occurs, the new control system CPU starts operation based on the tracking data of up to 2 scans before.

● Asynchronized Tracking Mode

In this mode, the control system CPU prioritizes program operation over tracking processing.
If the previous tracking is not complete while executing the END processings, the control system CPU module suspends the next tracking and starts the program operation.

Writing To The Both Systems Using GX Developer

In the backup mode, GX Developer writes the same program to the control system and standby system CPU modules to keep them consistent.

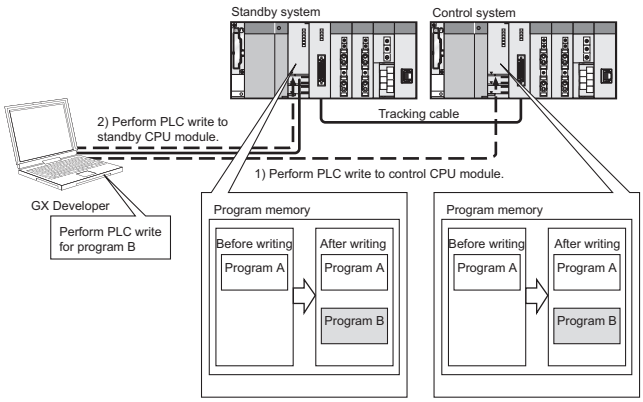
■ Writing to the CPU Module in STOP Status

● Operation When Writing to CPU Module in STOP status

When writing the parameters and programs either system CPU module, GX Developer will write the same parameters and programs to the other system as well.

● Procedure for Writing to the Control System and Standby System

GX Developer writes to the control system first and then the standby system, regardless of connection route, i.e., the system to which GX Developer is connected.



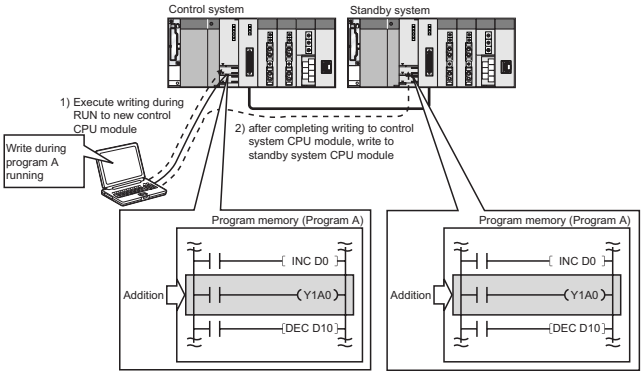
■ Program Change While CPU is Running

● Operations When Changing Programs While CPU is running

When changing the program of the control system CPU module during RUN in the backup mode, the same program will be written to the standby system CPU module.
Even if a stop error occurs in the control system during the online program change and system switching occurs, the online program change to both systems will continue.

● Procedure for Writing to the Control System and Standby System

When performing the online program change to the control system CPU module by GX Developer, regardless of the connection route.
When the online program change is performed to the control system CPU module, data will be written to the control system and standby system CPU modules.



● Tracking Execution During Online Program Change

Use the special relay "SM1710" (Transfer tracking data during online program change enable flag) to enable or disable the tracking execution of the following control data during online program change.
Make sure to set SM1710 to on or off (whether or not to execute tracking) before executing online program change.
If the special relay is turned on during online program change, tracking will not be executed.

(1) When SM1710 is OFF (Default)

When SM1710 is off, tracking will be suspended until online program change is complete.
If a system switching occurs during online program change, the new control system CPU module may output old data.

(2) When SM1710 is ON

When SM1710 is on, if a system switching occurs, old data will not be output because tracking is performed also during online program change.

(3) System Switching During Online Program Change

Type	System swiching Condition	System Switching Execution During RUN Write
Automatic System Switching	Stop error	○
	System swiching request by network module	×
	System power OFF	○
	CPU module reset	○
	CPU module hardware malfunction	○
Manual System Switching	System swiching instruction	×
	System swiching request from GX Developer	×

○ Yes × No

Memory Copy From Control System To Standby System

● Overview of Memory Copy From Control System To Standby System Function

Memory copy form control system to standby system function transfers the parameters, programs, file register and other data from the control system CPU module to the standby system CPU module to make the standby system and control system consistent.
The applicable memory is standard RAM, standard ROM and program memory.
(Memory cards are irrelevant.)
This function is used to make the memory contents of the control system and standby system CPU modules consistent when replacing the standby system CPU module, etc.

(1) Executing memory copy

Memory copy can be executed using either of the followings.

- GX Developer
- Special relays and special registers

Online Module Change (Hot Swapping)

● Module Mounted on the MELSECNET/H Remote I/O Station

The MELSECNET/H remote I/O station is compatible with online module change.
If a module mounted on the MELSECNET/H remote I/O station develops an error, the module can be replaced without stopping system control.

● Redundant Power Supply Module

When a pair of redundant power supply modules is used in each system of the redundant system, one redundant power supply module can be replaced at a time after powering off the module.
As another redundant power supply module supplies power to the modules mounted on the same base unit, the redundant system control can be continued during the replacement.

● I/O Module Mounted on the Main Base Unit

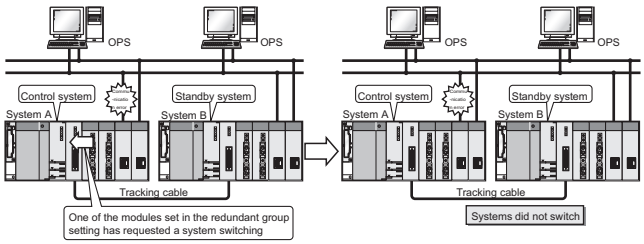
The I/O modules mounted on the control system and standby system main base units can be replaced online.
If an error occurs in an I/O module mounted on the control system or standby system main base unit, the module can be replaced without stopping system control.

Network Module Redundant Group Settings

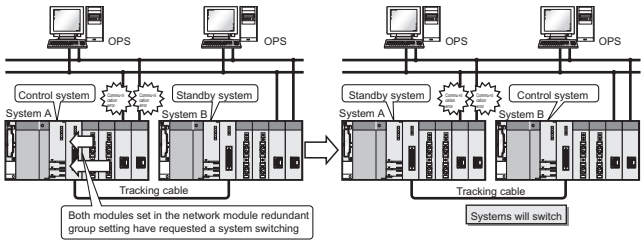
● Network Module Redundant Group Settings

When a pair of Ethernet modules is used in each system of the redundant system, by making the network module redundant group settings of the Ethernet modules, system switching can be disabled even if an error occurs in one network.
However, if a communication error occurs in both Ethernet modules, system switching will occur.

- The following diagram shows the processes that take place when a malfunction occurs on one of the networks with network module redundant group settings.



- The following diagram shows the processes that take place when a malfunction occurs on both networks with network module redundant group settings.



1.7.4 Redundant system network

This chapter explains the redundant system networks on the assumption that the operation mode has been set to backup mode.

Redundant System Network Overview

A redundant system can be applied to the following four networks.
(Network modules must be mounted on the main base units.)

- MELSECNET/H PLC to PLC Network
- MELSECNET/H Remote I/O Network
- Ethernet
- CC-Link

The above networks can continue the data link and communication with external devices, even when an error occurs in the control system.
However, system switching does not occur when an error occurs in the CC-Link. The system switching-dedicated instruction is necessary to perform system switching.

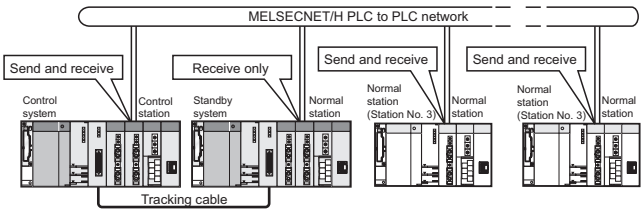
The network modules for networks other than the abovementioned and serial communication modules, etc., cannot be mounted on a main base unit for redundant system. Mount them on remote I/O stations of the MELSECNET/H remote I/O network.

■ MELSECNET/H PLC to PLC network

In a redundant system, the data link is continued through system switching even when an error occurs in the control system or control system network.

● Overview of Communication between Control System and Standby System Network Modules

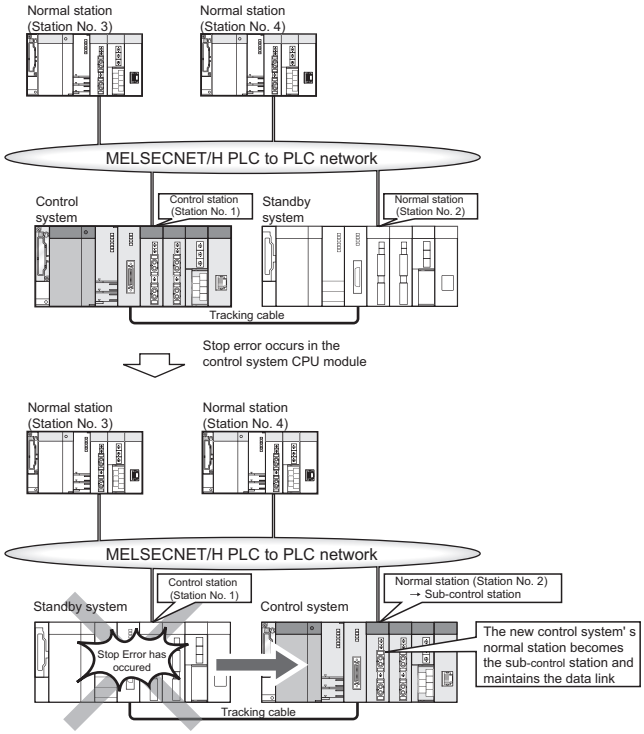
In a redundant system, the control system network module carries out cyclic data communication, as the control system and standby system form one system.
The standby system network module receives cyclic data from the other station in order to continue control even when system switching occurs.



● Redundant System Operation at System Switching due to Control System Error

When system switching occurs due to a control system error, the data link is continued by the network module mounted on the new control system.

The following diagram shows the redundant system operation when a stop error occurs in the control system CPU module, on the assumption that the control system network module is the control station of station No. 1, and the standby system network module is the normal station of station No. 2.



● Redundant System Operation when a Communication Error Occurs in the MELSECNET/H PLC to PLC Network

(1) Continuation of Data Link via System Switching

When a communication error occurs in the MELSECNET/H PLC to PLC network, system switching is performed according to the following procedure so that the data link will be continued.

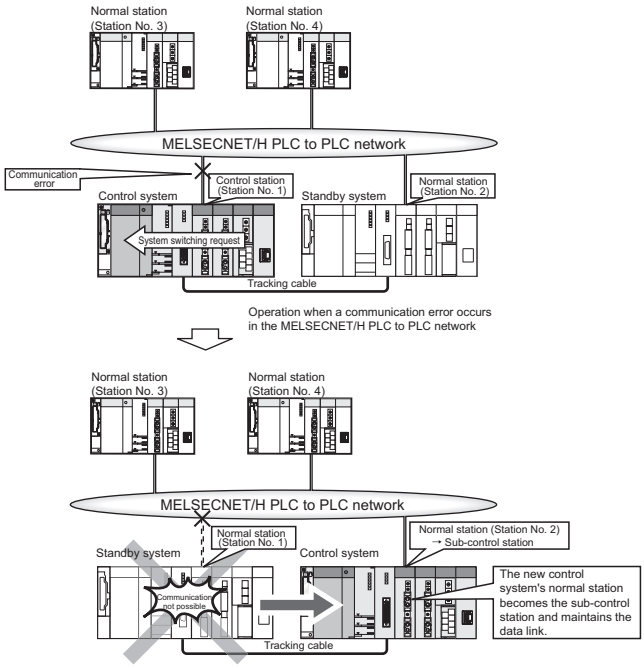
(a) When detecting a communication error, the control system network module issues a system switching request to the control system CPU module.

(b) When receiving the system switching request from the network module, the control CPU module performs END processing. Through the processing, system switching is performed.

(c) After system switching is completed, the new control system network module continues the data link.
The standby system network module does not issue a system switching request even when a communication error occurs in the MELSECNET/H PLC to PLC network.

The following diagram shows the redundant system operation when the control system network module detects a communication error, on the assumption that the control system

network module is the control station of station No.1, and the standby system network module is the normal station of station No. 2.

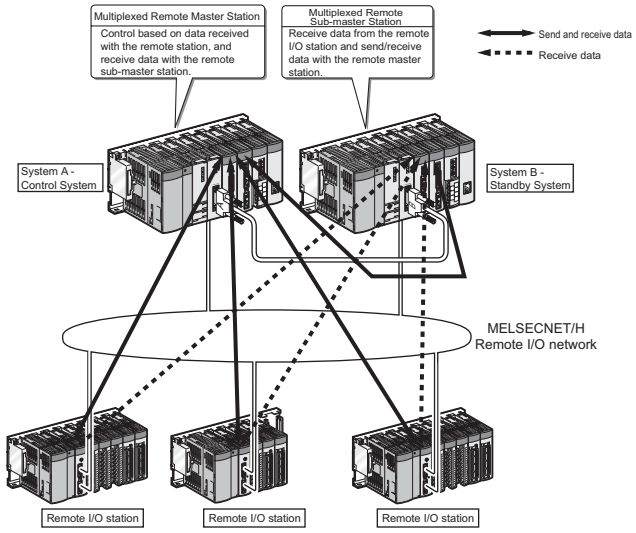


■ MELSECNET/H Remote I/O network

A redundant system uses a multiplexed remote I/O system of MELSECNET/H remote I/O network to continue the control of remote I/O stations even when system switching occurs.
The multiplexed remote I/O network system consists of "multiplexed remote master station" that controls remote I/O stations, and "multiplexed remote sub-master stations" that is for backup of multiplexed remote master station.
In a redundant system, make sure to set system A as the multiplexed remote master station, and system B as the multiplexed remote sub-master station.

● Overview of Remote I/O Stations

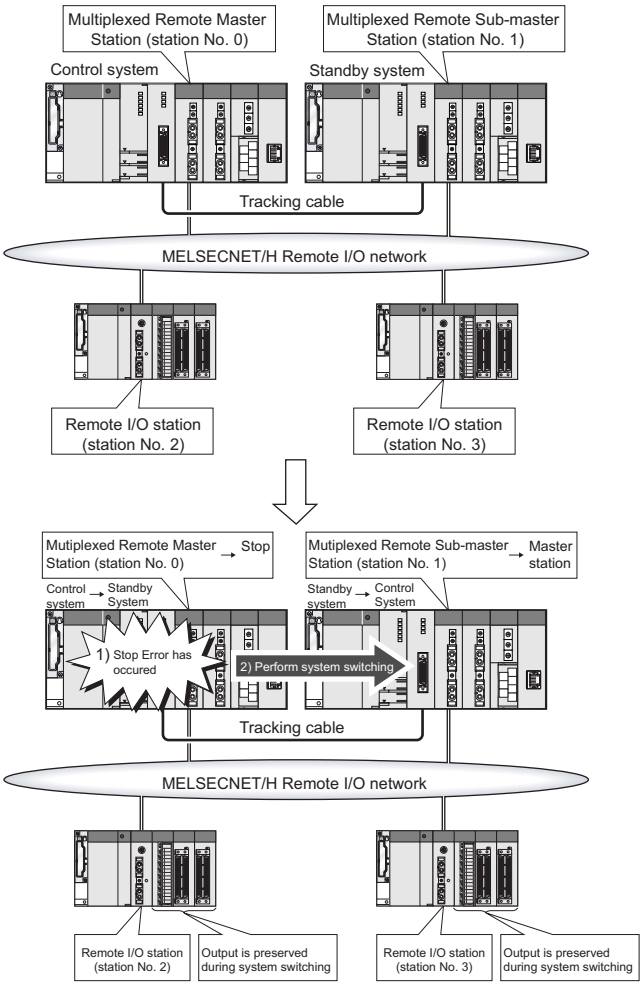
The control system network module (multiplexed remote master station) performs data control with remote I/O station by data transmission, and data transmission with the multiplexed remote sub-master station.
The standby system network module (multiplexed remote sub-master station) receives data from remote I/O stations and sends/receives data to/from the multiplexed remote master station in order to take over the control of remote I/O stations even when system switching occurs.



● Redundant System Operation at System Switching

When system switching occurs, the new control system network module operates as the master station, and takes over the control of remote I/O stations.

The following diagram shows a redundant system operation when a stop error occurs in the control system CPU module.



● Redundant System Operation when a Communication Error Occurs in the MELSECNET/H Remote I/O Network

(1) System Switching Procedure

When a communication error occurs in the MELSECNET/H remote I/O network, system switching is performed according to the following procedure, so that the data link will be continued.

(a) When a communication error occurs in the MELSECNET/H remote I/O network, the control system network module issues a system switching request to the control system CPU module.

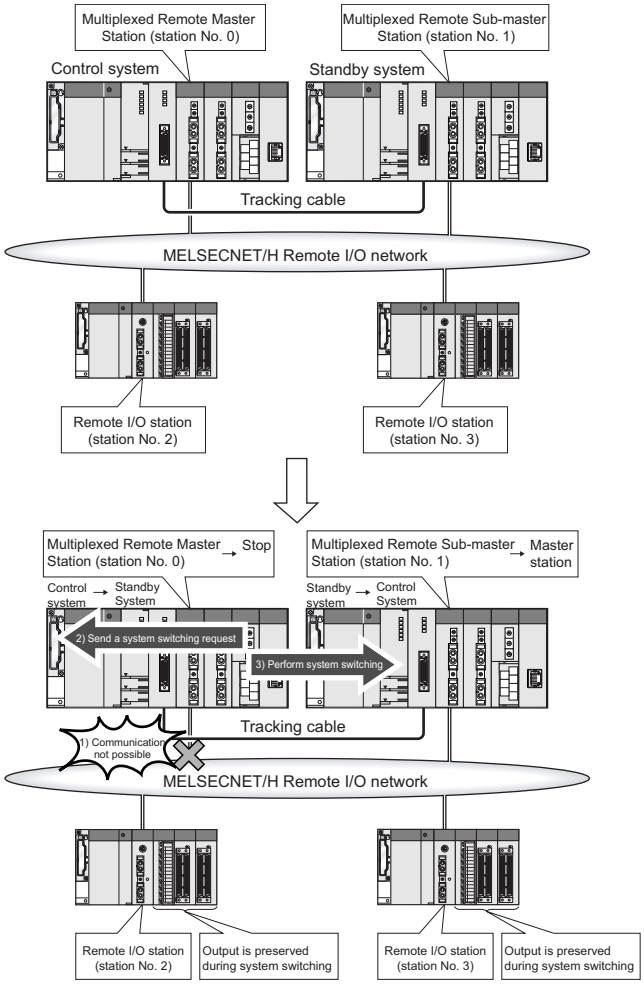
(b) When receiving the system switching request from the network module, the control system CPU module performs END processing. Through the processing, system switching is performed.

(c) After system switching is completed, the new control system network module continues the data link.

(2) Output Status during System Switching

The remote I/O station's output is held during system switching.

The following diagram shows the redundant system when the control system network module detects a communication error, on the assumption that the control system network module is the master station, and the standby system network module is the sub-master station.



■ Ethernet

External devices use MC protocol, fixed buffers, random access buffers, data link instructions, etc. to communicate with the CPU modules of a redundant system.

Partner products including EZ Socket*1 can also communicate with them through OPS connection.

The control system Ethernet interface module can issue a system switching request to the control system CPU module when it detects a communication error or disconnection*2. System switching is carried out when the control system CPU module receives the system switching request from that Ethernet interface module.

*1: Indicates the FA communication middleware for programmable logic controllers, servos, robots, NC, etc. made by Mitsubishi Electric, which consists of the Windows API (Application Programming Interface). By using EZ Socket, each partner company can easily develop FA-related application software using FA devices made by Mitsubishi Electric, which operate on Windows personal computers.

*2: Only the QJ71E71-100 can detect disconnection.

● Overview of Communication with External Devices

(1) Communication by MC Protocol, and Data Link Instructions

For MC protocol, external devices can communicate with the specified system, i.e., control system, standby system, system A, or system B.

(2) Communication by Fixed Buffers and Random Access Buffers

For fixed buffers and random access buffers, external devices can communicate with the control system Ethernet interface module only, as processing via sequence programs is necessary.

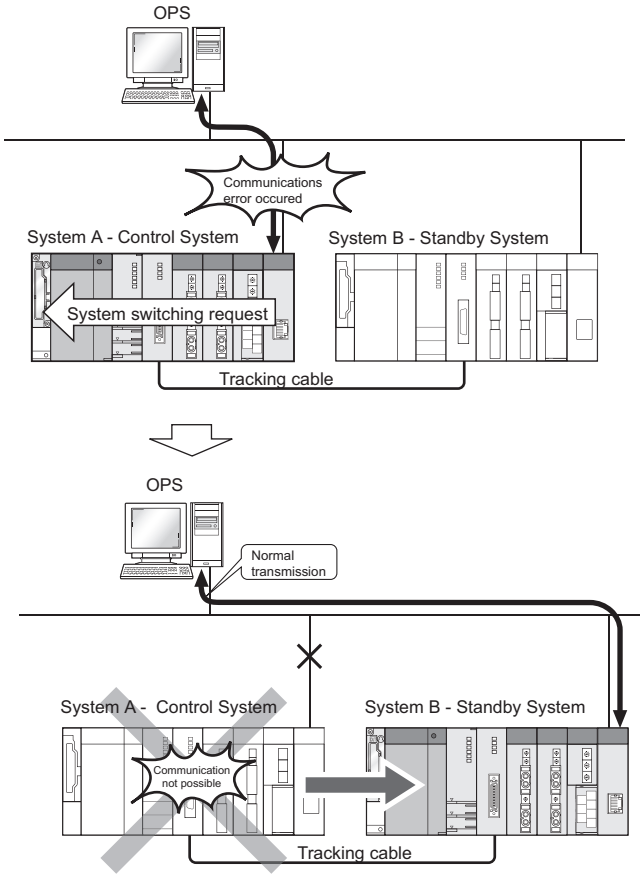
● External Device Operation at System Switching

When system switching occurs in a redundant system, external devices operate differently according to the communication method.

(1) In the case of OPS connection

When system switching occurs in a redundant system, the OPS automatically switches the connection path, and continues the communication.

The following diagram shows the external device operation when the control system Ethernet interface module detects a communication error.



(2) Communication with the Control System/Standby System by MC Protocol or Data Link Instructions

Even when system switching occurs in a redundant system, communication can be continued if the communication path is normal.

When the communication cannot be continued, the external device develops a communication error. In this case, review the communication path and restart the communication.

(3) Communication other than above

When system switching occurs in a redundant system, the external device develops a communication error occurs.

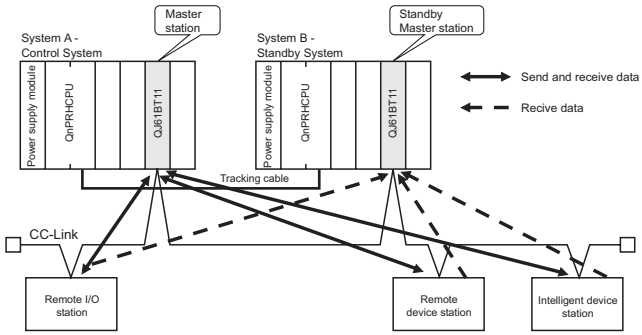
In this case, review the communication path and restart the communication.

■ CC-Link

A redundant system can continue the CC-Link control by CC-Link standby master function, even when system switching occurs.
When using this function, set the system A as "master station" that controls the data link, and system B as "standby master station" for backup of "master station".

● Overview of Remote Stations

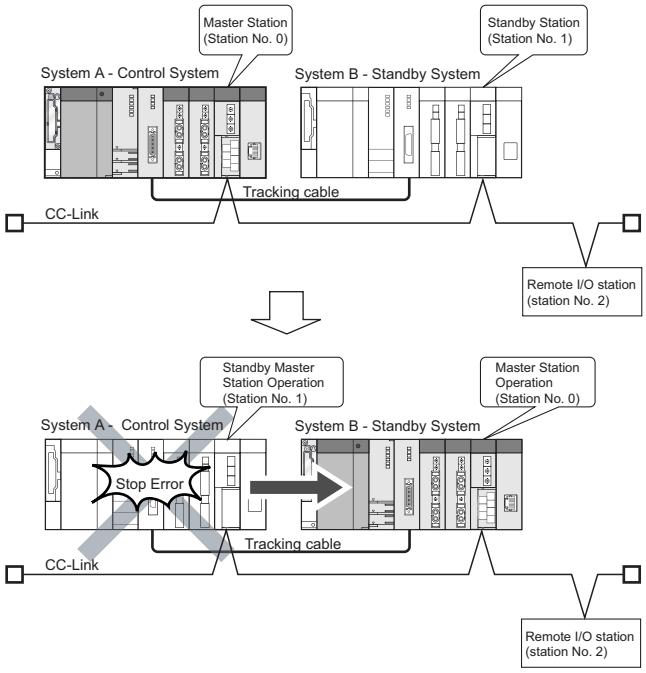
In a redundant system, the control system master station controls remote stations and sends/receives data to/from standby system master station.
The standby system standby master station receives data from the remote stations and sends/receives data to/from the master station, in order to continue the CC-Link control even when system switching occurs.



● Redundant system Operation at the time of System Switching

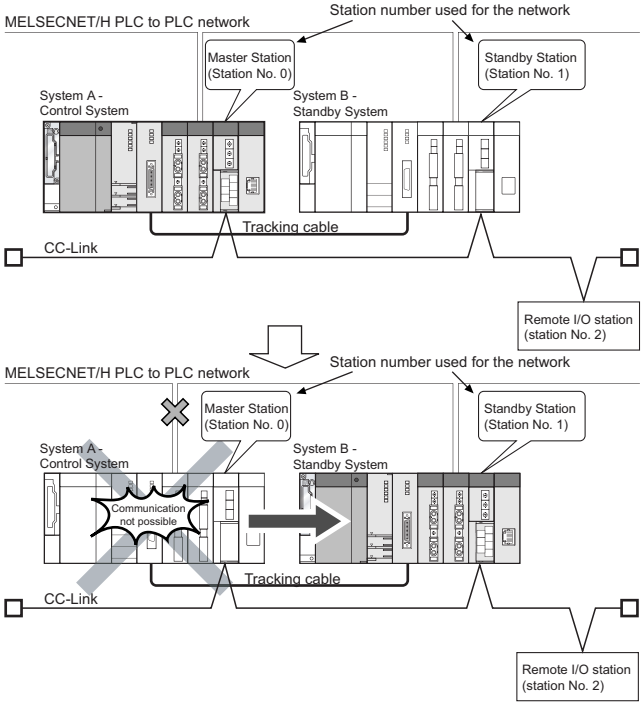
(1) When System Switching Occurs due to Control System Error

When an error occurs in the control system and system switching occurs, the new control system standby master station starts to operate as the master station and takes over the control of the remote stations.
The following diagram shows the redundant system operation when a stop error occurs in the control system CPU module.



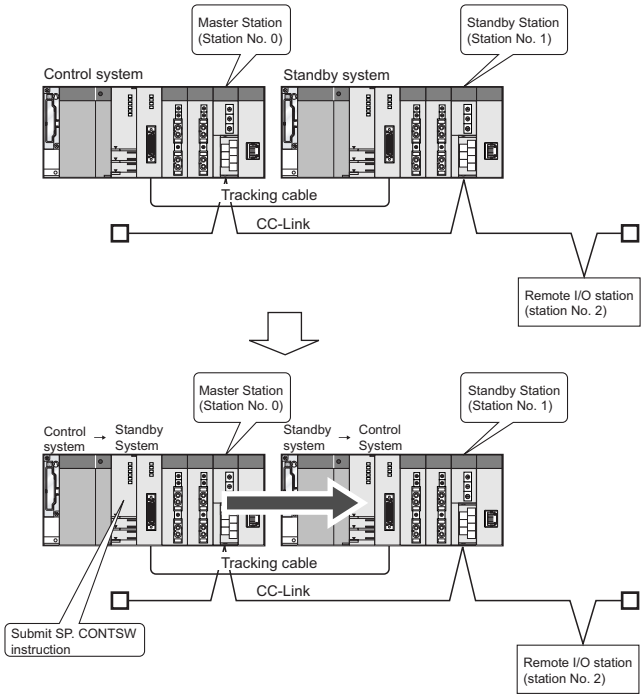
(2) When System Switching Occurs due to Communication Error in Network other than CC-Link

When a communication error occurs in a network other than CC-Link, system switching occurs and the new control system takes over the control of the redundant system. However, the new standby system master station does not switch to the standby master station, as it can communicate with remote stations.
Also, the new control system standby master station remains as the standby master station, and cannot control remote stations as the master station.
As a result, the new control system is unable to control the CC-Link.
Make sure to switch the data link control from the standby master station to the master station using the new control system's program.



(3) When System Switching is Manually Carried Out

When system switching is manually carried out, the new control system takes over the control of the redundant system.
However, the new standby system master station does not switch to the standby master station, as it can communicate with remote stations.
Also, the new standby system master station remains as the standby station and cannot control remote stations as the master station.
As a result, the new control system is unable to control the CC-Link.
Make sure to switch the data link control from the standby master station to the master station using the new control system's program.



■ Serial Communication Modules

Mount serial communication modules on MELSECNET/H remote I/O stations. (Serial communication modules cannot be mounted on main base units on which redundant CPUs are mounted.)

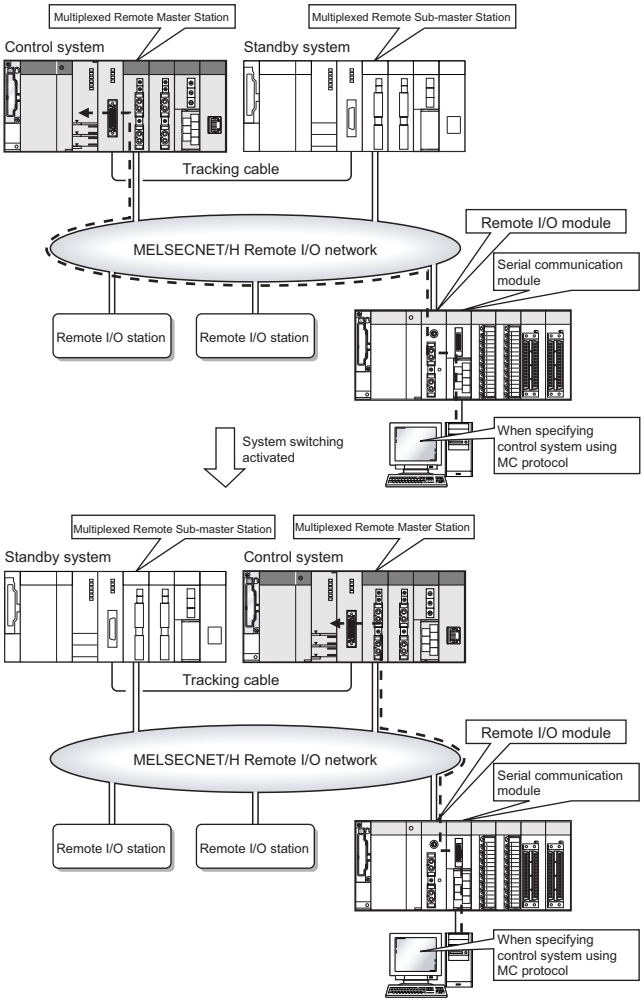
Communication from the serial communication module to external devices can be made by MC protocol, nonprocedural protocol, and bidirectional protocol.

For MC protocol, external devices can communicate with the specified system, i.e., control system, standby system, system A, or system B.

● Communication between External Devices and Control System CPU Module

(1) Communication by MC Protocol

Specify the "control system" by MC protocol on each eternal device, and perform the communication with the control system CPU module.
If the "control system" is specified by MC protocol, communication with the new control system CPU module can be performed, even when system switching occurs.



(2) Communication by Nonprocedural Protocol/ Bidirectional Protocol

For nonprocedural protocol/bidirectional protocol, communication with external devices can be performed using the control system CPU module's programs.

● Communication between External Devices and the Standby System CPU Module

(a) Communication by MC Protocol

Specify the "standby system" by MC protocol on each external device, and perform the communication with the control system CPU module. If the "standby system" is specified by MC protocol, communication with the new standby system CPU module can be performed, even when system switching occurs.
Communication can be performed by MC protocol only.

● Communication between External Devices and System A/System B

(a) Communication by MC Protocol

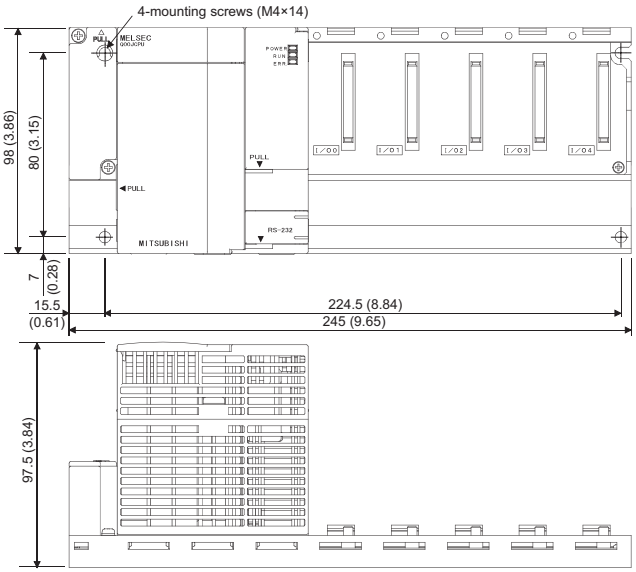
In order to perform the communication with the system A/system B CPU module, specify "System A" or "System B" on each external device by MC protocol.
If "System A" or "System B" is specified by MC protocol, communication with the specified system CPU module can be performed even when system switching occurs.
This communication can be performed by MC protocol only.

1.8 External Dimensions

1.8.1 CPU module

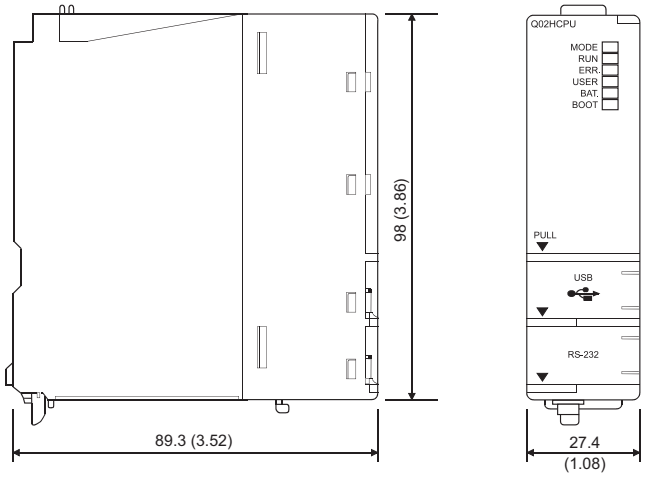
CAD data (DXF format) of product external form is available for downloading from the MELFANS web.

(1) Q00JCPU



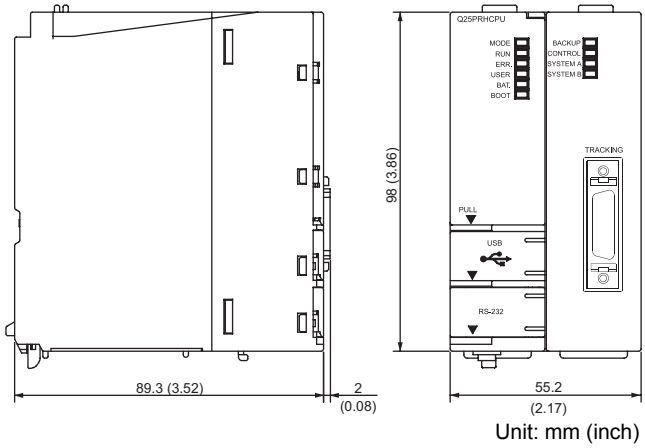
Unit: mm (inch)

(2) Q00CPU,Q01CPU,Q02CPU,Q02HCPU, Q06HCPU,Q12HCPU,Q25HCPU,Q12PHCPU, Q25PHCPU



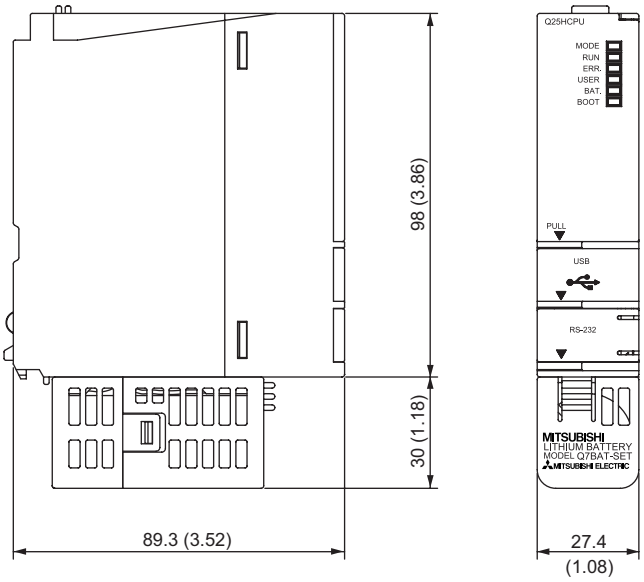
Unit: mm (inch)

(3) Q12PRHCPU,Q25PRHCPU

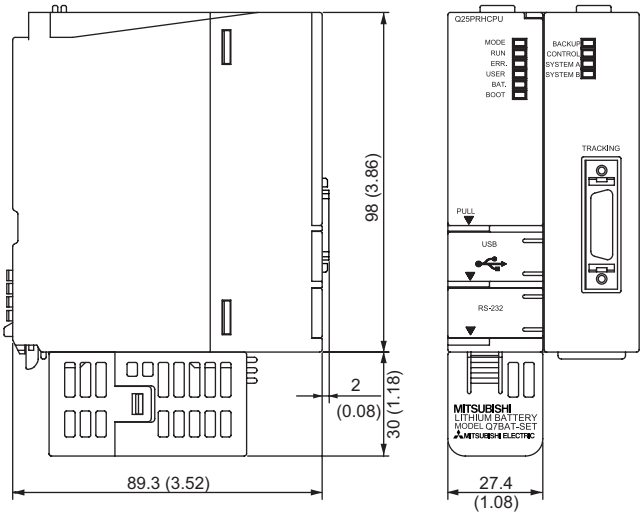


Unit: mm (inch)

(4) When Q7BAT-SET is mounted on CPU module



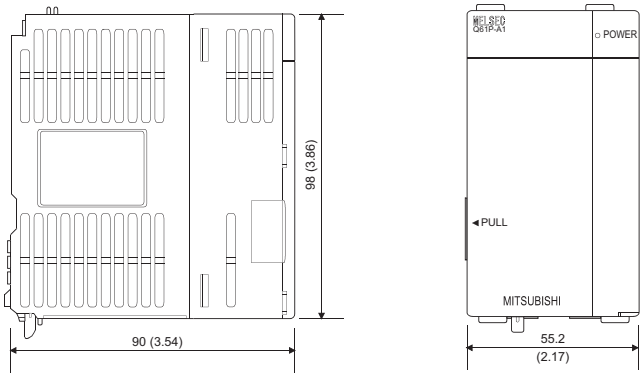
Unit: mm (inch)



Unit: mm (inch)

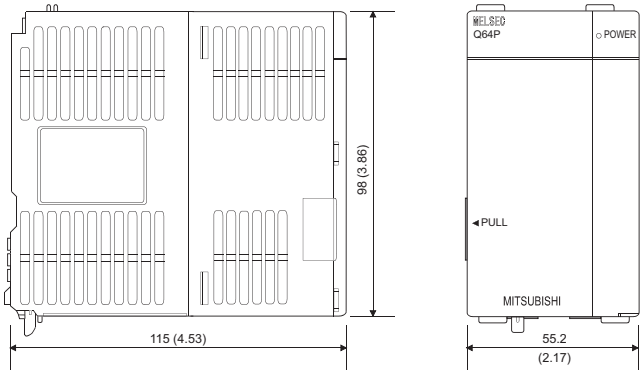
1.8.2 Power supply module

(1) Q61P,Q61P-A1,Q61P-A2,Q62P,Q63P



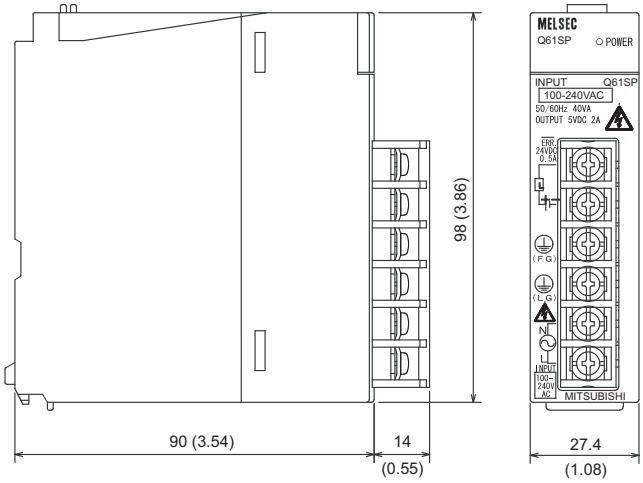
Unit: mm (inch)

(2) Q64P



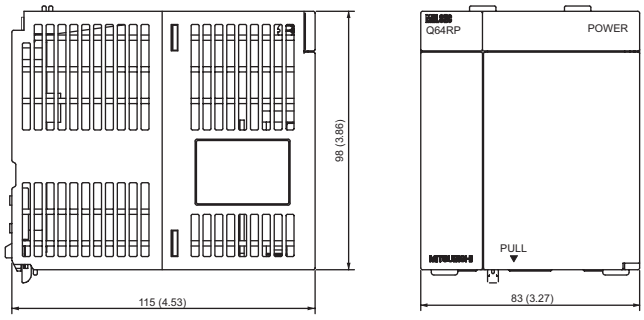
Unit: mm (inch)

(3) Q61SP



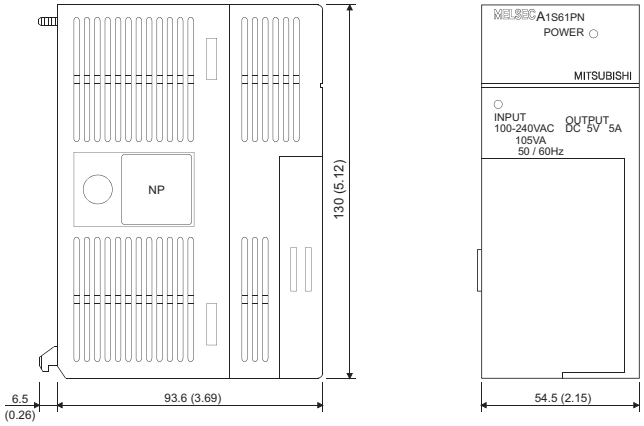
Unit: mm (inch)

(4) Q63RP,Q64RP



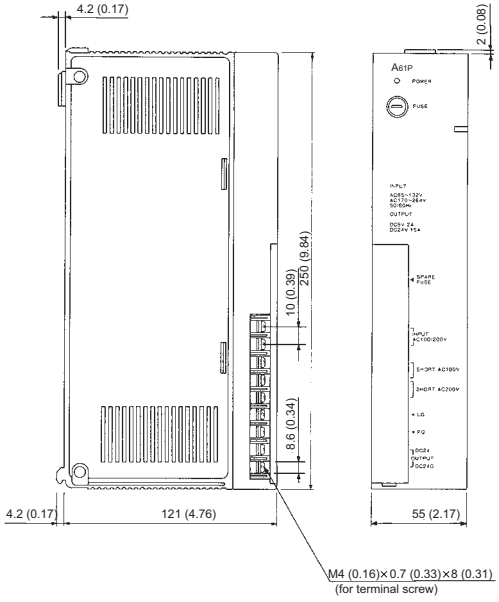
Unit: mm (inch)

(5) A1S61PN,A1S62PN,A1S63P



Unit: mm (inch)

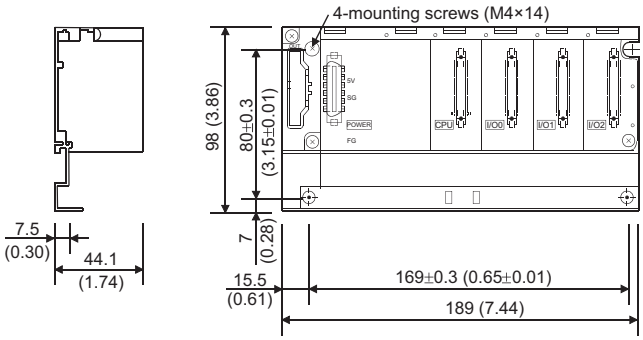
(6) A61P,A61PEU,A62P,A62PEU,A63P



Unit: mm (inch)

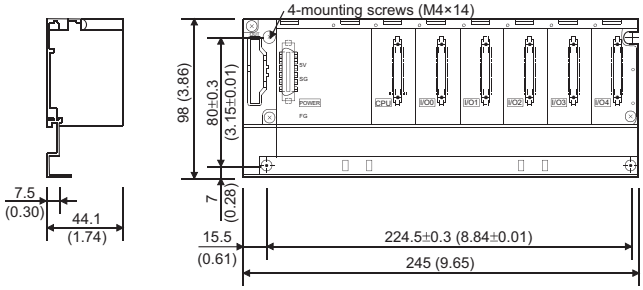
1.8.3 Main base Unit

(1) Q33B



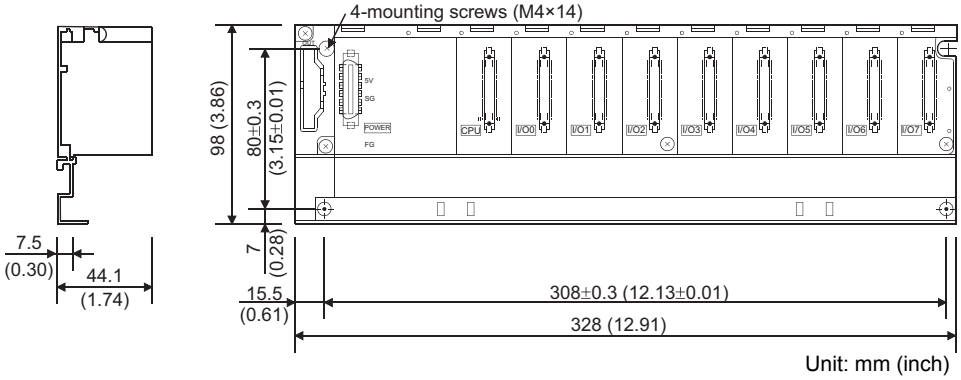
Unit: mm (inch)

(2) Q35B



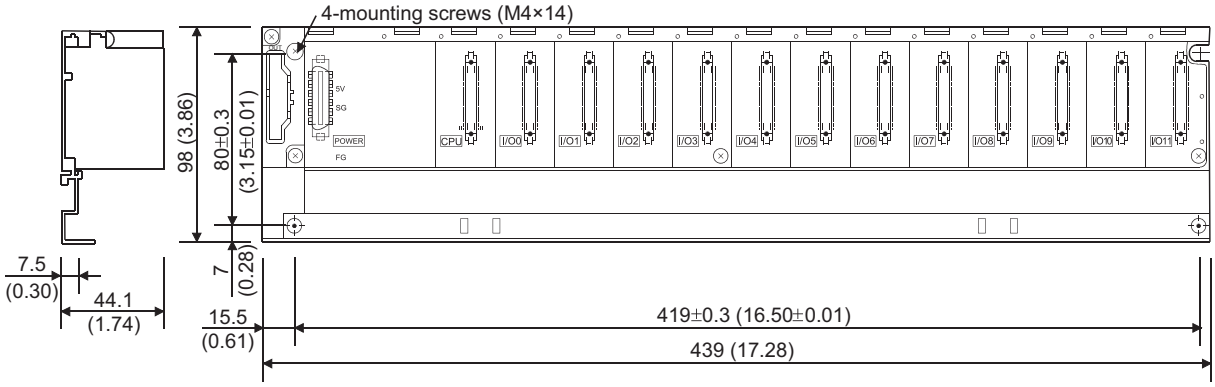
Unit: mm (inch)

(3) Q38B



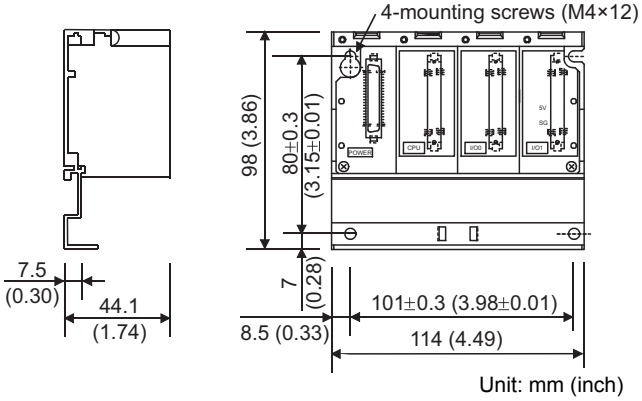
Unit: mm (inch)

(4) Q312B



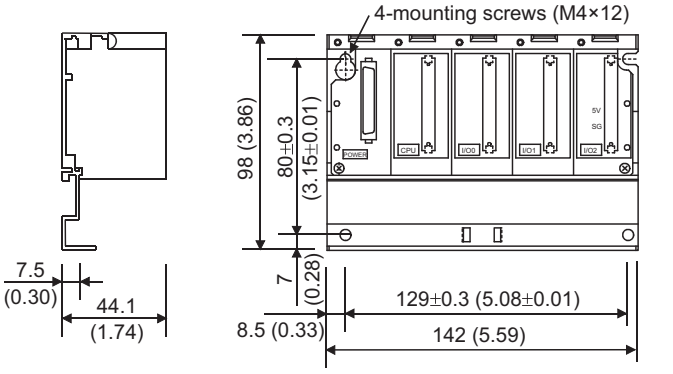
Unit: mm (inch)

(5) Q32SB



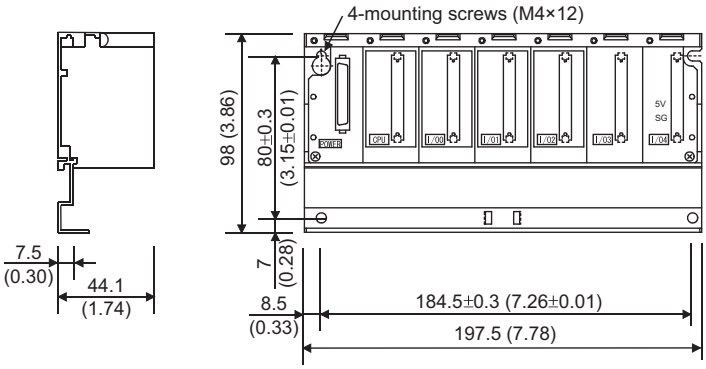
Unit: mm (inch)

(6) Q33SB



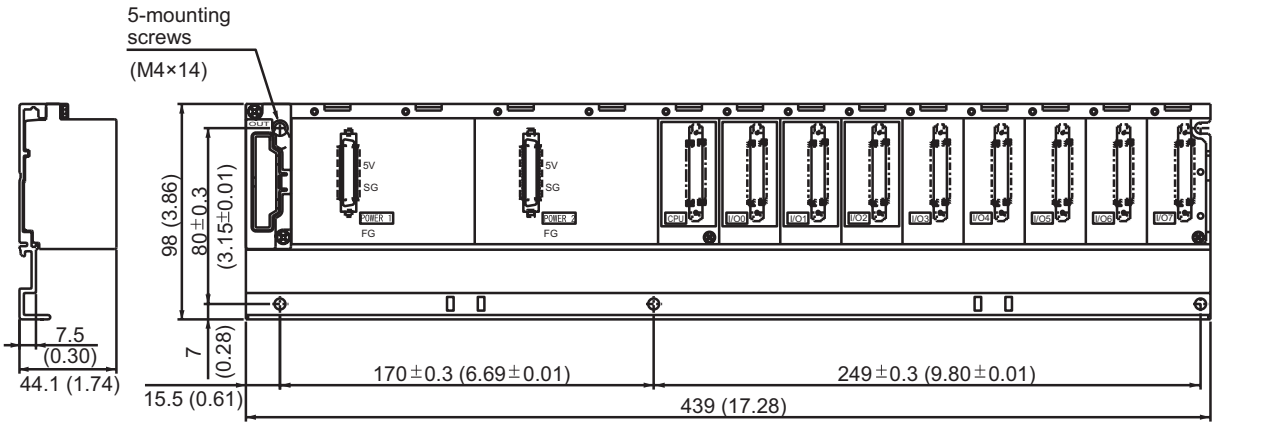
Unit: mm (inch)

(7) Q35SB



Unit: mm (inch)

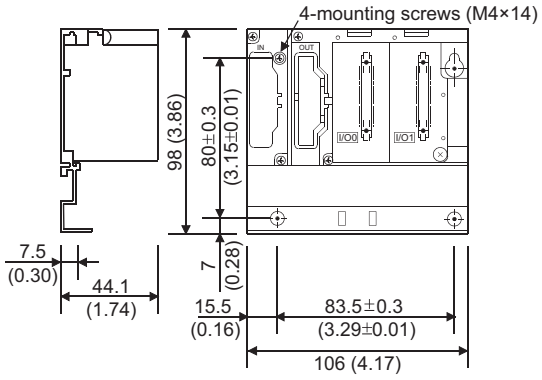
(8) Q38RB



Unit: mm (inch)

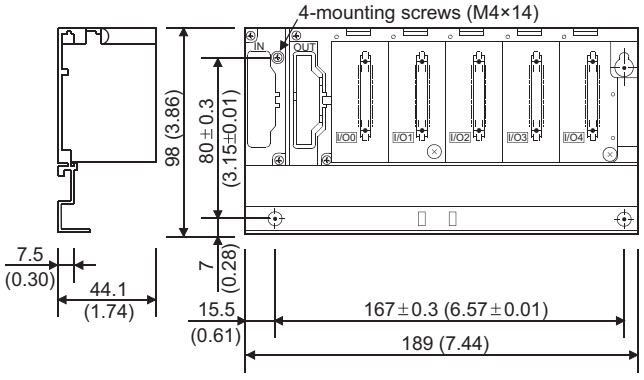
1.8.4 Extension base Unit

(1) Q52B



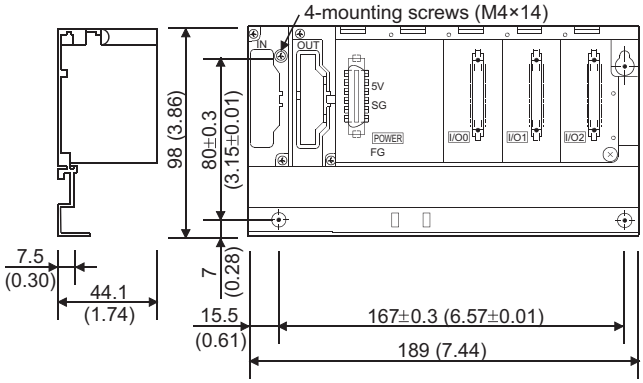
Unit: mm (inch)

(2) Q55B



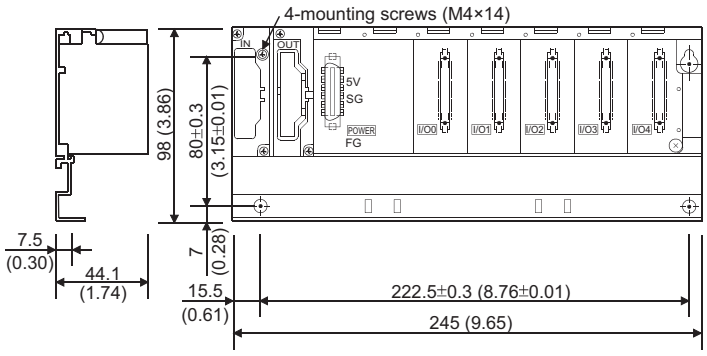
Unit: mm (inch)

(3) Q63B



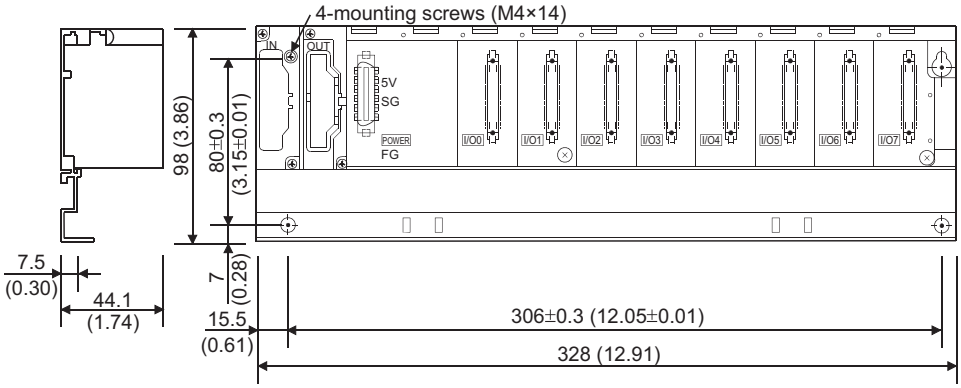
Unit: mm (inch)

(4) Q65B



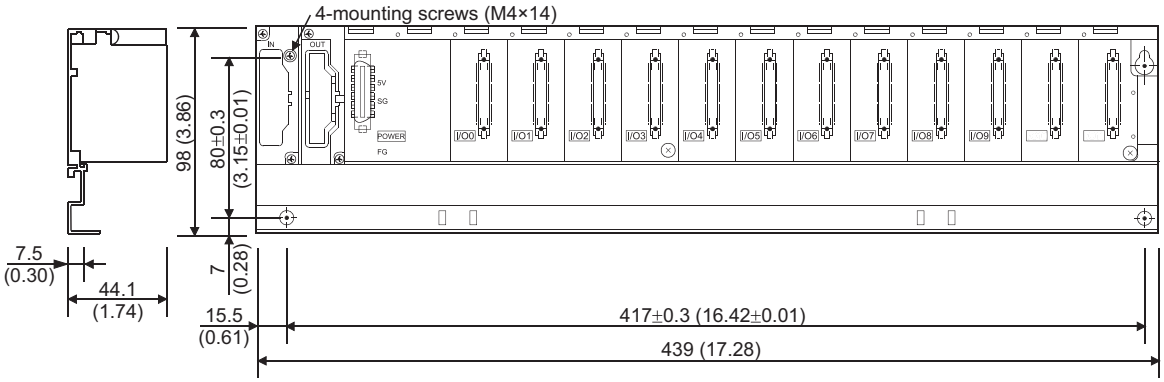
Unit: mm (inch)

(5) Q68B



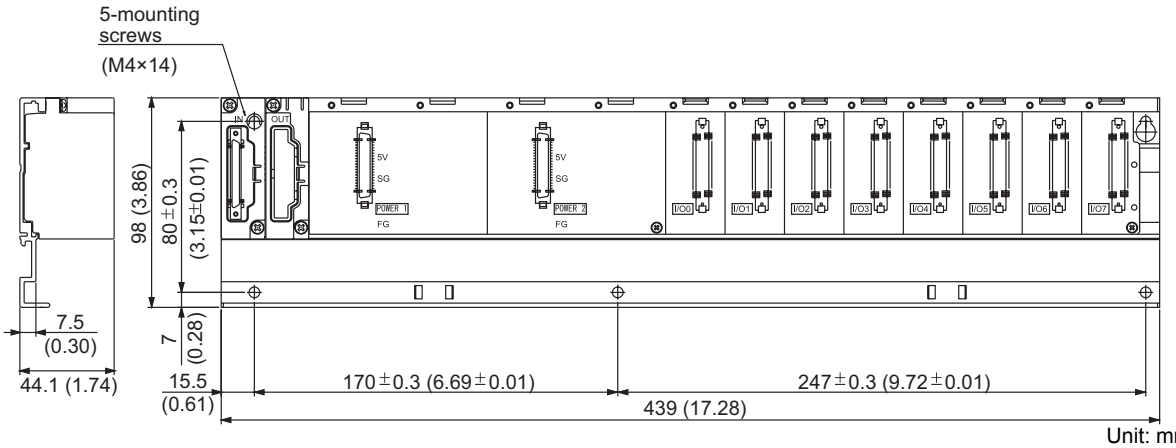
Unit: mm (inch)

(6) Q612B



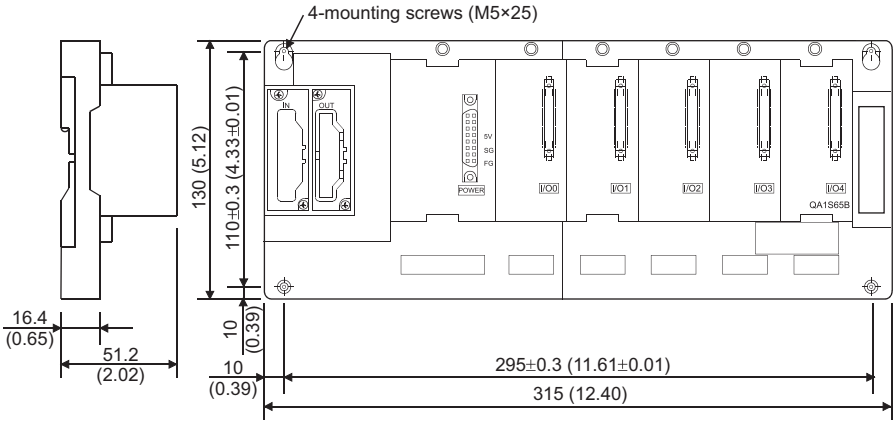
Unit: mm (inch)

(7) Q68RB



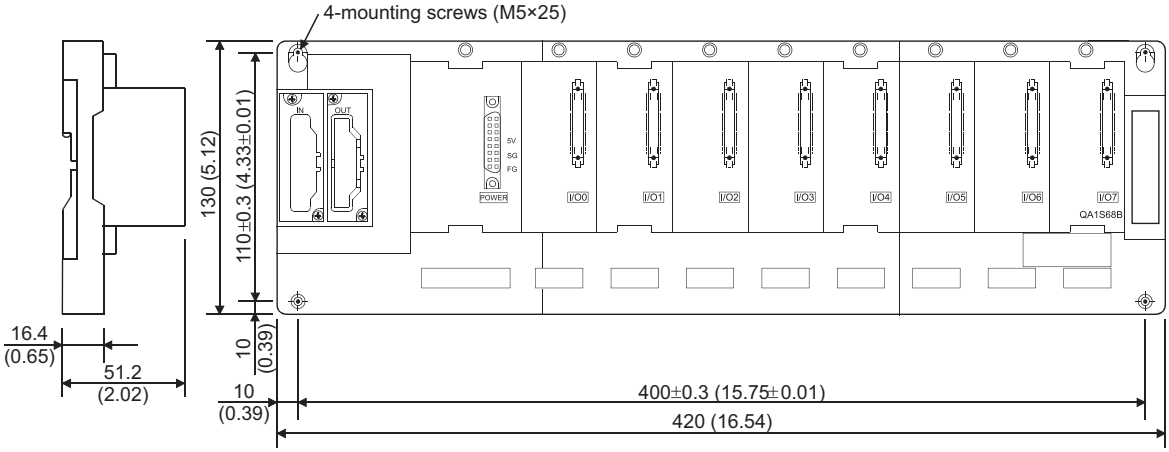
Unit: mm (inch)

(8) QA1S65B



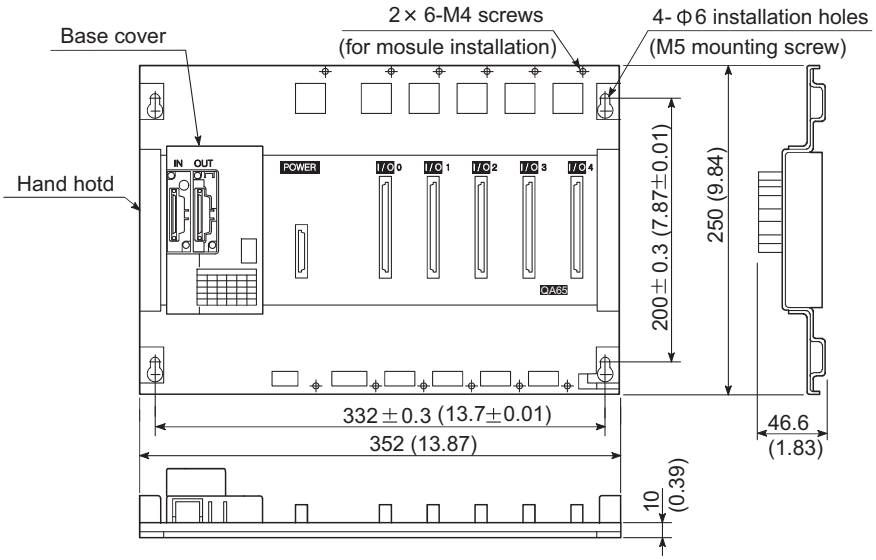
Unit: mm (inch)

(9) QA1S68B



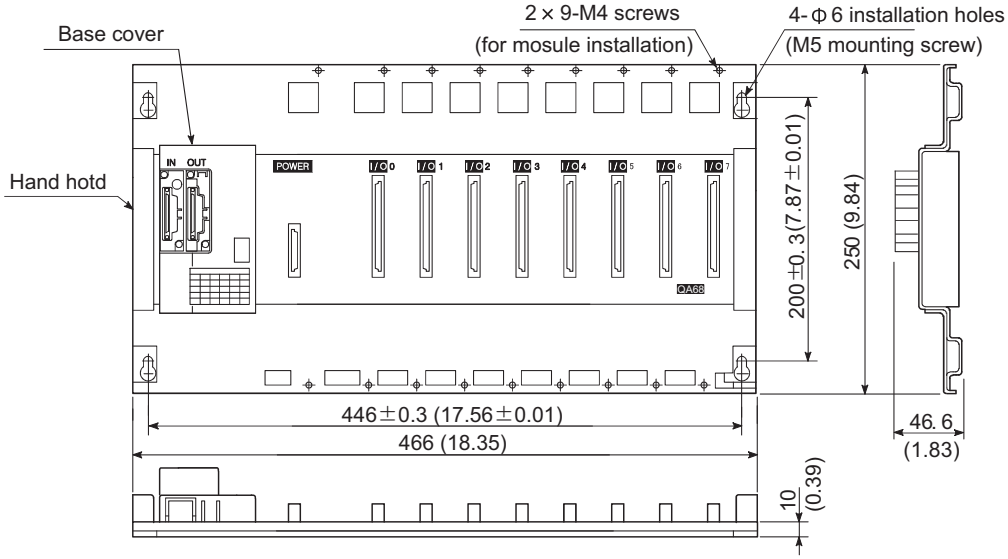
Unit: mm (inch)

(10)QA65B



Unit: mm (inch)

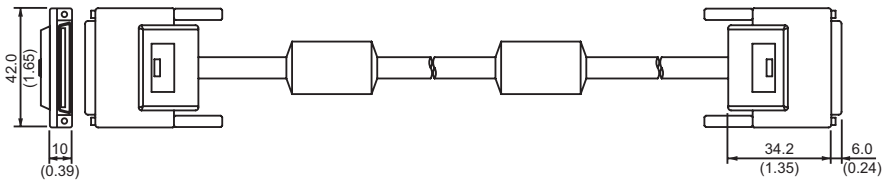
(11)QA68B



Unit: mm (inch)

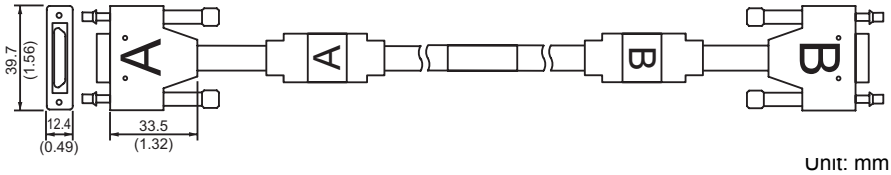
1.8.5 Extension cable and tracking cable

QC05B,QC06B,QC12B,QC30B,QC50B,QC100B



Unit: mm (inch)

QC10TR,QC30TR

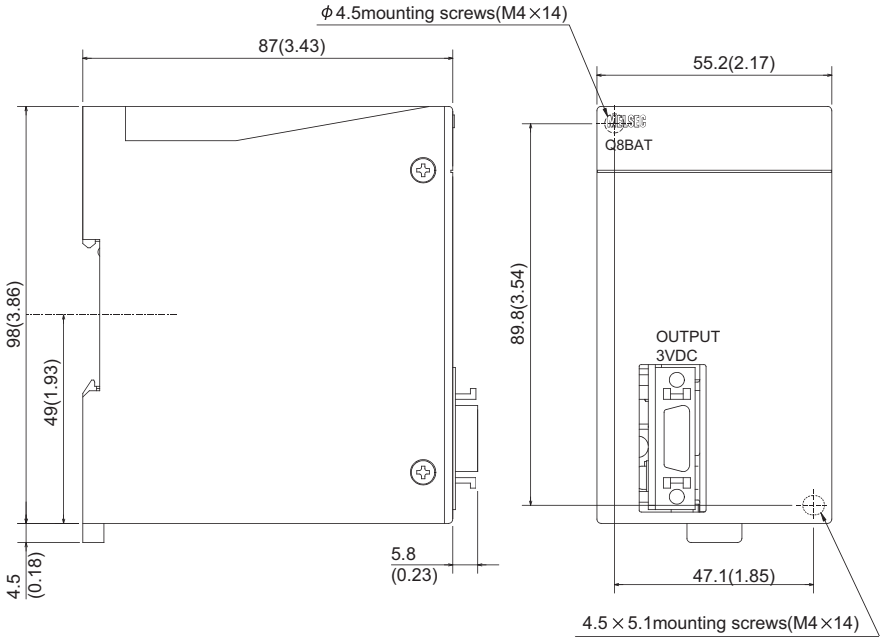


Unit: mm (inch)

1.8.6 Large capacity battery unit

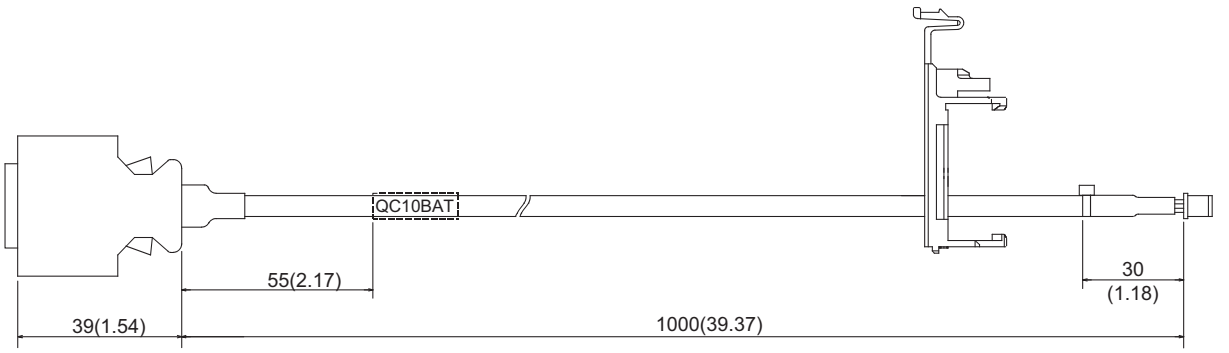
Q8BAT-SET

Q8BAT



Unit: mm (inch)

QC10BAT



Unit: mm (inch)

Chapter 2

NETWORK

2.1 Network Overview

Overview

In production sites, the introduction of a network system suited to applications and objectives, is significant to ensure efficient production and appropriate quality control, in order to reduce equipment size and cost by labor saving and wire-saving.
The QCPU (Q mode) inherits the conventional MELSEC network and offers a network with advanced performance, functions and user-friendliness.

Features

■ Hierarchical network

Assuming a four-level network, the Q mode offers optimal network products for respective applications.

● Information network [Ethernet]

We assume that an information network is on the highest network level in production sites. Designed to transfer production control information, quality control information, equipment operating status and other information between the PLC or equipment controller and the production control computer, the information network assumes the use of the most general-purpose Ethernet. Ethernet accepts not only a wide variety of computers such as Windows® and UNIX type personal computers but also various Factory Automation equipment. The Q mode has functions that make the best use of the Ethernet features in an easy way.

● Control network [MELSECNET/H]

We assume that a control network which links control devices, e.g. PLC and CNC, is on the middle network level in production sites. Designed to transfer data directly related to the operations of machinery and equipment between the control devices, the control network is required to provide excellent real-time capabilities. MELSECNET(II/10), the MELSEC control network, is highly regarded in the market for its excellent real-time capabilities, simple network settings, highly redundant reliability typified by duplex loop, and boasts the largest share in Japan and a great number of installations throughout the world. In the Q mode, the MELSECNET/H inherits the features of this excellent MELSECNET(II/10), with extra real-time capabilities and data capacities to meet further market needs.

● Field network [CC-Link, CC-Link/LT]

We assume that a field network which links control devices, such as PLC, with sensors and drive equipment is on the lowest network level in production sites. While control devices were previously linked with sensors and drive equipment by wires on a point-by-point basis, the field network can connect multiple sensors and drive equipment with a single network cable, reducing the wires and wiring processes. When connected with intelligent equipment such as the ID system, bar-code reader, inverter and display, the field network allows production data to be controlled at network ends through transfer of various data, in addition to ON/OFF data. This improves maintenance efficiency by centralizing the control of equipment operating statuses. In the Q mode, the CC-Link functions having high speed and excellent data transmission performance have been improved to ensure easier use.

● Wire-saving network/CC-Link/LT

CC-Link/LT is an in-panel/device wire-saving network for reducing complicated wiring work, improper wiring, etc on the shop floor. It achieves wire saving between sensors, actuators and controllers.

■ Seamless communication

The Q mode networks are seamless networks that remove the influence of differences between network types. You can send/receive data, remote-monitor or correct/change programs regardless of differences in network level and type.

■ Ease of setting network parameters

For the Ethernet, MELSECNET/H and CC-Link networks of Q mode, you can set the parameters and various functions required for network connection in GX Developer, which greatly reduces the complexity related to network setting, and can easily confirm the settings on the screen.
Also, a dedicated utility package is available for the RS-232/422/485 serial communication module, with which you can set the functions and communication parameters of the module on screen.

■ Cyclic communication

The basis of MELSECNET/H or CC-Link communication having close relationships with machine control is the cyclic communication. Since the data of the pre-specified region is transferred periodically (cyclically) and automatically, the cyclic communication does not need a sequence program for data transfer.
The cyclic communication data of MELSECNET/H or CC-Link is sent by broadcast. Broadcasting is a method in which the data sent from a station is received by all other stations. Broadcasting allows data to be transmitted to multiple stations at once and to be shared by all stations.

■ Network modules incompatible with the Q mode

MELSECNET(II) and MELSECNET/B cannot be used with the QCPU (Q mode).
Also, the Ethernet, MELSECNET/10, CC-Link and serial communication/computer link modules for AnS/Q2AS series cannot be used. Use the Q series modules.

■ Other networks

The Ethernet, MELSECNET/H, CC-Link network, RS-232/422/485 serial communication modules (modem interface module included), ID interface module and FL-net (OPCN-2) interface module, etc. developed for Q mode can be used with the QCPU (Q mode). In addition, the other network-compatible modules developed for AnS/A series can be used with the High Performance Model QCPU. When using any of those network modules, mount it on the extension base for AnS/A series modules QA1S6□B/QA65B.
Since there may be restrictions on their use, refer to the explanation sections of the corresponding modules.

AnS/A series network modules available for High Performance Model QCPU

Network Name	Module Type
MELSECNET/MINI-S3	A1SJ71PT32-S3
	A1SJ71T32-S3
	AJ71PT32-S3
	AJ71T32-S3
I/OLINK	A1SJ51T64
	AJ51T64
OPCN-1	A1SJ71J92-S3
	AJ71J92-S3
S-LINK	A1SJ71SL92N

■ Ranges accessible by GX Developer/MX Component using the routing function

The ranges accessible by GX Developer and MX Component using the routing function are given below. Refer to the following table for the PLC types given in the description.

Type	CPU Type	Ethernet Module Type *1	MELSECNET/10 MELSECNET/H Module Type	Serial Communication Module Type	CC-Link Module Type
I	Q00J, Q00, Q01, Q02, Q02H, Q06H, Q12H, Q25H, Q12PH, Q25PH, Q12PRH, Q25PRH	QJ71E71-100 QJ71E71-B2 QJ71E71-B5	QJ71LP21-25 QJ71LP21S-25 QJ71BR11 QJ71LP21G	QJ71C24N QJ71C24N-R2 QJ71C24N-R4 QJ71CMO *2	QJ61BT11N
II	Q2A(S1), Q3A, Q4A Q2AS(S1), Q2ASH(S1)	AJ71QE71N-T AJ71QE71N3-T AJ71QE71N-B2 AJ71QE71N-B5 A1SJ71QE71N-T A1SJ71QE71N3-T A1SJ71QE71N-B2 A1SJ71QE71N-B5	AJ71QLP21 AJ71QLP21G AJ71QLP21S AJ71QBR11 A1SJ71QLP21 A1SJ71QLP21S A1SJ71QBR11	AJ71QC24N AJ71QC24N-R2 AJ71QC24N-R4 A1SJ71QC24N A1SJ71QC24N-R2	AJ61QBT11 A1SJ61QBT11
III	A2U(S1), A3U, A4U Q02-A, Q02H-A, Q06H-A A2US(S1), A2USH-S1	AJ71E71N-T AJ71E71N3-T AJ71E71N-B2 AJ71E71N-B5 A1SJ71E71N-T A1SJ71E71N3-T A1SJ71E71N-B2 A1SJ71E71N-B5	AJ71LP21 AJ71LP21G AJ71BR11 A1SJ71LP21 A1SJ71BR11	AJ71UC24 A1SJ71UC24-R2 A1SJ71UC24-R4	AJ61BT11 A1SJ61BT11
IV	Other than above				

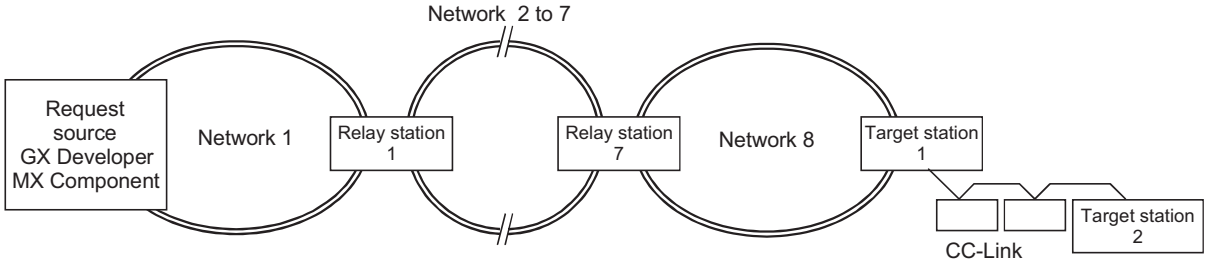
If the combinations of CPU module and communication module type are other than what is shown in the above list, the accessible range may differ from the one given.

*1: The Ethernet modules which can perform relay processing for making other station access from a request source to a target station, having the MELSECNET/H, MELSECNET/10 relay communication function, are shown below.
- Q series Ethernet modules (modules corresponding to Type-I in the above table)
- QnA series Ethernet modules (function version B modules among modules corresponding to Type-II in the above table)

The other Ethernet modules cannot perform relay processing for making other station access.

*2: Cannot be mounted to the same main base as that of Q12PRH/Q25PRHCPU, but mounted to MELSECNET/H remote I/O station.

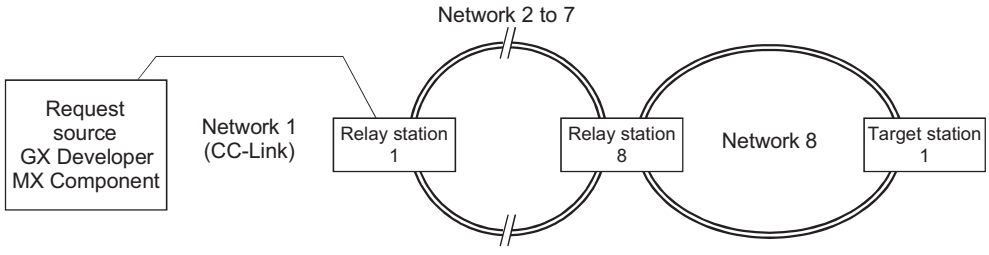
● **When connecting via MELSECNET/H, MELSECNET/10, or Ethernet**



Request Source	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Access Range
	Type of network 1	Type of relay station	Type of networks 2 to 8	Type of relay stations 2 to 7	Type of target station 1	
GX Developer	Ethernet	I	MELSECNET/10 MELSECNET/H	I	I	PLC on path up to target station 2
		I		I, II or III	II, III or IV	PLC of type II or III on path up to target station 1
		II		I, II or III	-	PLC of type II on path up to target station 1
		III		-	-	Inaccessible
		IV		-	-	PLC of type IV on network 2
	MELSECNET/10 MELSECNET/H *1	I		I	I	PLC on path up to target station 2
		I, II or III		I, II or III	II, III or IV	PLC of type II or III on path up to target station 1 when relay stations 1 to 7 are type I or II PLC of type III on path up to target station 1 when any of relay stations 1 to 7 is Type III
MX Component	Ethernet	I		I	I, II, III or IV	PLC of type I, II or III on path up to target station 1
		II or III		I, II or III	-	PLC of the same type as relay station 1 on path up to target station 1
		IV		-	-	PLC of type IV on network 2
	MELSECNET/10 MELSECNET/H	I, II or III		I, II or III	I, II, III or IV	PLC of type I, II or III on path up to target station 1

*1: The MELSECNET/H(10) board for the personal computer is required to connect the personal computer installed with GX Developer or MX Component to MELSECNET/10 or MELSECNET/H.
To connect to MELSECNET/H, use GX Developer of SW6D5C-GPPW or later or MX Component of SW2D5C-ACT or later, which are corresponding to the accessed CPU.

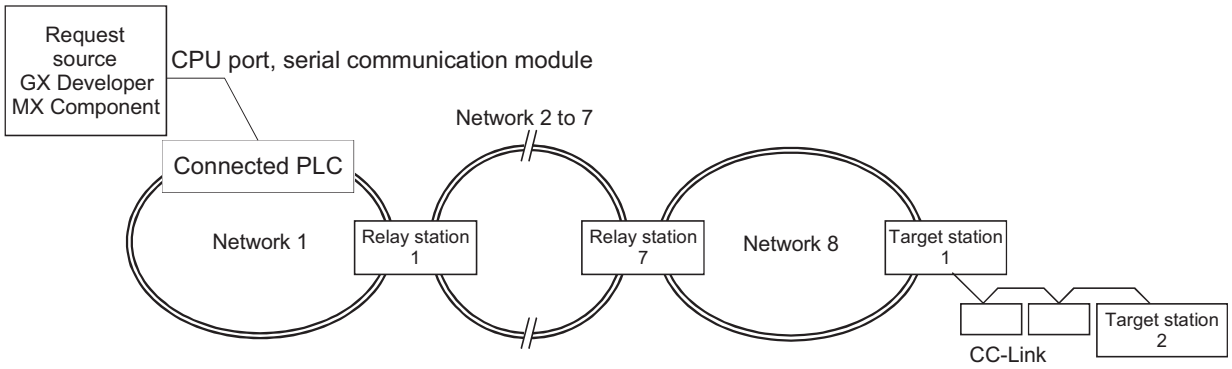
● **When connecting via CC-Link**



Request Source	Condition 1	Condition 2	Condition 3	Access Range
	Type of relay station 1	Type of networks 2 to 8	Type of relay stations 2 to 8	
GX Developer	I	MELSECNET/10 MELSECNET/H	I	PLC on path up to target station 1
	II		II	PLC of type II on path up to target station 1
	III or IV		-	PLC on network 1
MX Component	I		I	PLC of type I on path up to target station 1
	II		II	PLC of type II on path up to target station 1
	III or IV		-	PLC on network 1

Note) The CC-Link board for the personal computer is required to connect the personal computer installed with GX Developer or MX Component to CC-Link.
In addition, use GX Developer and MX Component corresponding to the accessed CPU.

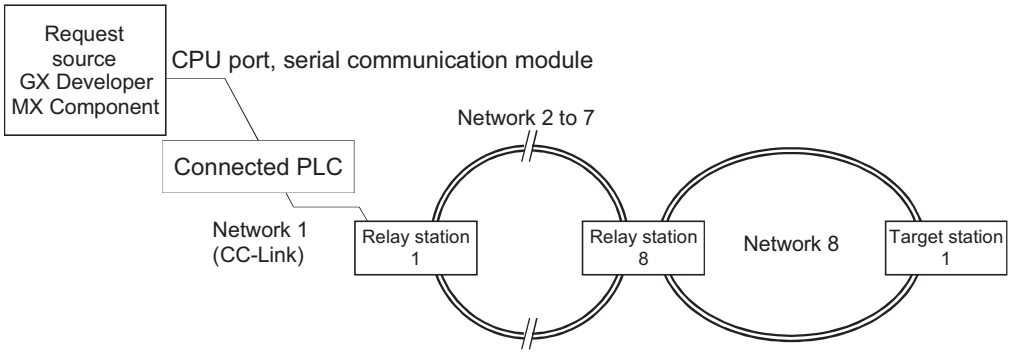
● **When connecting via CPU port or serial communication/computer link module (1)**



Request source	Condition 1	Condition 2	Condition 3	Condition 4	Access Range
	Type of connected PLC	Type of networks 1 to 8	Type of relay stations 1 to 7	Type of target station 1	
GX Developer	I	MELSECNET/10 MELSECNET/H	I	I	PLC on path up to target station 2
	II		I, II or III	II, III or IV	PLC of type II on path up to target station 1
	III		I, II or III	II, III or IV	PLC of type III or IV on path up to target station 1
	IV		-	-	PLC of type III or IV on network 1
MX Component	I		I	I, II, III or IV	PLC on path up to target station 1
	II		I, II or III	I, II, III or IV	PLC of type II on path up to target station 1
	III		I, II or III	I, II, III or IV	PLC of type III or IV on path up to target station 1
	IV		-	-	PLC of type III or IV on network 1

Note) Use GX Developer and MX Component corresponding to the accessed CPU.

● **When connecting via CPU port or serial communication/computer link module (2)**



Request source	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Access Range
	Type of connected PLC	Type of network 1	Type of relay station 1	Type of networks 2 to 8	Type of relay stations 2 to 8	
GX Developer	I	CC-Link	I	MELSECNET/10 MELSECNET/H	I	PLC of type I on path up to target station 1
			II or III		-	PLC of type I on path up to relay station 1
	II, III or IV		-	-	-	Accessible to connected PLC only
MX Component	I		I, II or III	MELSECNET/10 MELSECNET/H	-	PLC of type I on path up to relay station 1
	II, III or IV		-	-	-	Accessible to connected PLC only

Note) Use GX Developer and MX Component corresponding to the accessed CPU.

■ Ranges accessible by MELSEC communication protocol of Ethernet module

The ranges accessible using the MELSEC communication protocol of the Ethernet module are given below. Refer to the following table for the PLC types given in the description.

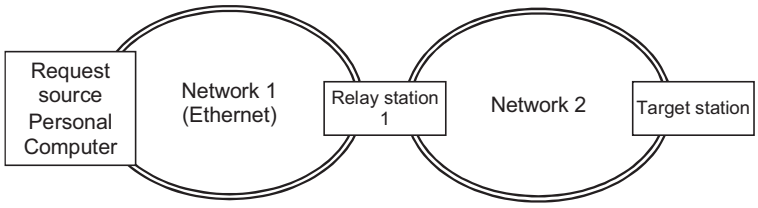
Type	CPU Type	Ethernet Module Type	MELSECNET/10 Module Type	CC-Link Module Type
I	Q00J, Q00, Q01, Q02, Q02H, Q06H, Q12H, Q25H, Q12PH, Q25PH, Q12PRH, Q25PRH	QJ71E71-100 QJ71E71-B2 QJ71E71-B5	QJ71LP21-25 QJ71LP21S-25 QJ71BR11 QJ71LP21G	QJ61BT11N
II	Q2A(S1), Q3A, Q4A Q2AS(S1), Q2ASH(S1)	AJ71QE71N-T AJ71QE71N3-T AJ71QE71N-B2 AJ71QE71N-B5 A1SJ71QE71N-T A1SJ71QE71N3-T A1SJ71QE71N-B2 A1SJ71QE71N-B5	AJ71QLP21 AJ71QLP21G AJ71QLP21S AJ71QBR11 A1SJ71QLP21 A1SJ71QLP21S A1SJ71QBR11	AJ61QBT11 A1SJ61QBT11
III	A2U(S1), A3U, A4U Q02-A, Q02H-A, Q06H-A A2US(S1), A2USH-S1	AJ71E71N-T AJ71E71N3-T AJ71E71N-B2 AJ71E71N-B5 A1SJ71E71N-T A1SJ71E71N3-T A1SJ71E71N-B2 A1SJ71E71N-B5	AJ71LP21 AJ71LP21G AJ71BR11 A1SJ71LP21 A1SJ71BR11	AJ61BT11 A1SJ61BT11
IV	Other than above			

Note) 1) If the combination of CPU module and communication module type is other than that shown in the above list, the accessible range may differ from the one given.
2) Relay stations can handle the largest data at one access.
3) Use GX Developer and MX Component corresponding to the accessed CPU.

The levels of the MELSEC communication protocol supported by the Ethernet modules are as listed below.

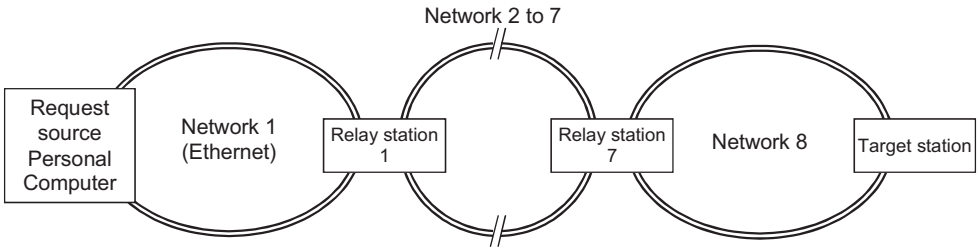
Ethernet Module Type	Protocol Level
QJ71E71-100, QJ71E71-B2, QJ71E71-B5	1,2,3,4
AJ71QE71N-T, AJ71QE71N3-T, AJ71QE71N-B2, AJ71QE71N-B5, A1SJQE71N-T, A1SJ71QE71N3-T, A1SJ71QE71N-B2, A1SJ71QE71N-B5	1,2,3
AJ71E71N-T, AJ71E71N3-T, AJ71E71N-B2, AJ71E71N-B5, A1SJ71E71N-T, A1SJ71E71N3-T, A1SJ71E71N-B2, A1SJ71E71N-B5	1

● Protocol level 1 and level 2



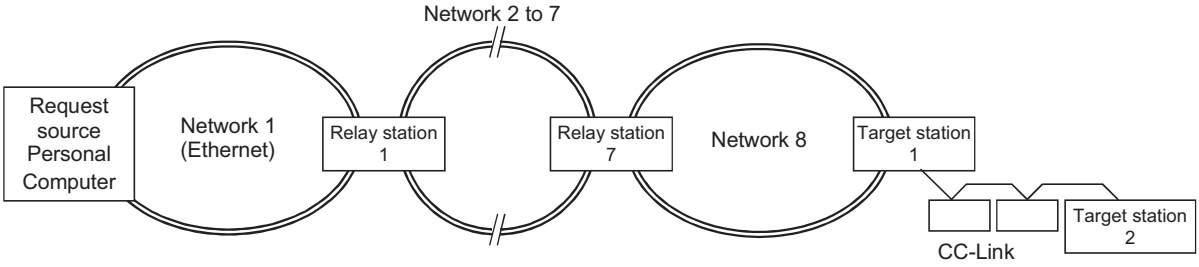
Request Source	Condition 1 Type of relay station 1	Condition 2 Type of network 2	Access Range
Personal computer	I, II, III or IV	MELSECNET/10 MELSECNET/H	PLC on path up to target station

● **Protocol level 3**



Request Source	Condition 1	Condition 2	Condition 3	Access Range
	Type of relay station 1	Type of networks 2 to 8	Type of relay stations 2 to 7	
Personal computer	I or II	MELSECNET/ 10,MELSECNET/H	I, II or III	PLC on path up to target station
	III or IV	-	-	Protocol level 3 is unusable.

● **Protocol level 4**



Request Source	Condition 1	Condition 2	Condition 3	Condition 4	Access Range
	Type of relay station 1	Type of networks 2 to 8	Type of relay stations 2 to 7	Type of target station 1	
Personal computer	I	MELSECNET/ 10,MELSECNET/H	I, II or III	I	PLC on path up to target station 2
	I	MELSECNET/ 10,MELSECNET/H	I, II or III	II or III	PLC on path up to target station 1
	II, III or IV	-	-	-	Protocol level 4 is unusable.

■ Ranges accessible by MELSEC communication protocol of serial communication module

The ranges accessible using the MELSEC communication protocol of the serial communication module are given below. Refer to the following table for the PLC types given in the description.

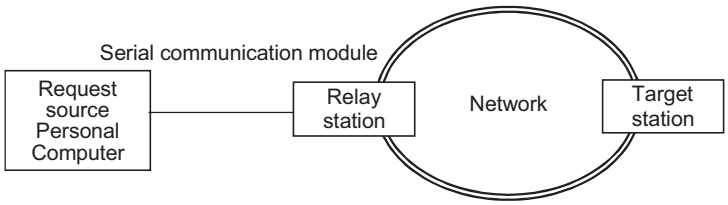
Type	CPU Type	Serial Communication Module Type	MELSECNET/10 Module Type	CC-Link Module Type
I	Q00J, Q00, Q01, Q02, Q02H, Q06H, Q12H, Q25H, Q12PH, Q25PH, Q12PRH, Q25PRH	QJ71C24N,QJ71C24N-R2, QJ71C24N-R4,QJ71CMO	QJ71LP21-25,QJ71LP21S-25, QJ71BR11,QJ71LP21G	QJ61BT11N
II	Q2A(S1), Q3A, Q4A Q2AS(S1), Q2ASH(S1)	AJ71QC24N, AJ71QC24N-R2, AJ71QC24N-R4, A1SJ71QC24N,A1SJ71QC24N-R2	AJ71QLP21,AJ71QLP21G, AJ71QLP21S,AJ71QBR11 A1SJ71QLP21, A1SJ71QLP21S, A1SJ71QBR11	AJ61QBT11 A1SJ61QBT11
III	A2U(S1), A3U/A4U Q02-A, Q02H-A, Q06H-A A2US(S1), A2USH-S1	AJ71UC24 A1SJ71UC24-R2 A1SJ71UC24-R4	AJ71LP21,AJ71LP21G,AJ71BR11 A1SJ71LP21, A1SJ71BR11	AJ61BT11 A1SJ61BT11
IV	Other than above			

Note) 1) If the combination of CPU module and communication module type is other than what is shown in the above list, the accessible range may differ from the one given.
2) Relay stations can handle the largest data at one access.
3) Use GX Developer and MX Component corresponding to the accessed CPU.

The levels of the MELSEC communication protocol supported by the serial communication modules are as listed below.

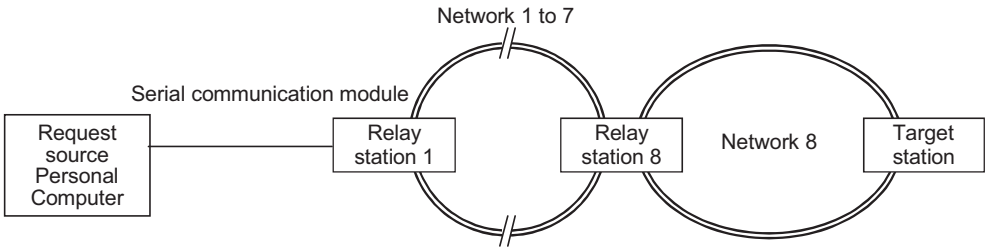
Serial Communication Module Type	Protocol Levels
QJ71C24N,QJ71C24N-R2,QJ71C24N-R4,QJ71CMO	1, 2, 3, 4
AJ71QC24N, AJ71QC24N-R2, AJ71QC24N-R4, A1SJ71QC24N,A1SJ71QC24N-R2	1, 2, 3
AJ71UC24, A1SJ71UC24-R2, A1SJ71UC24-R4	1

● **Protocol level 1 and level 2**



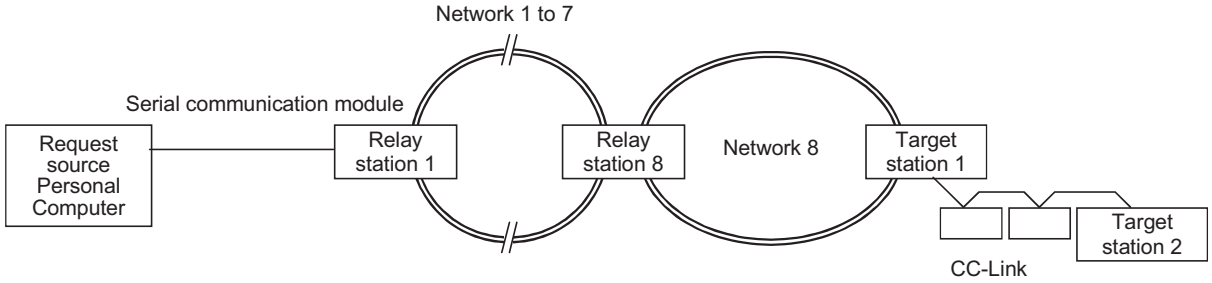
Request Source	Condition 1	Condition 2	Access Range
	Type of relay station	Type of network	
Personal computer	I, II, III or IV	MELSECNET/10 MELSECNET/H	PLC on path up to target station

● **Protocol level 3**



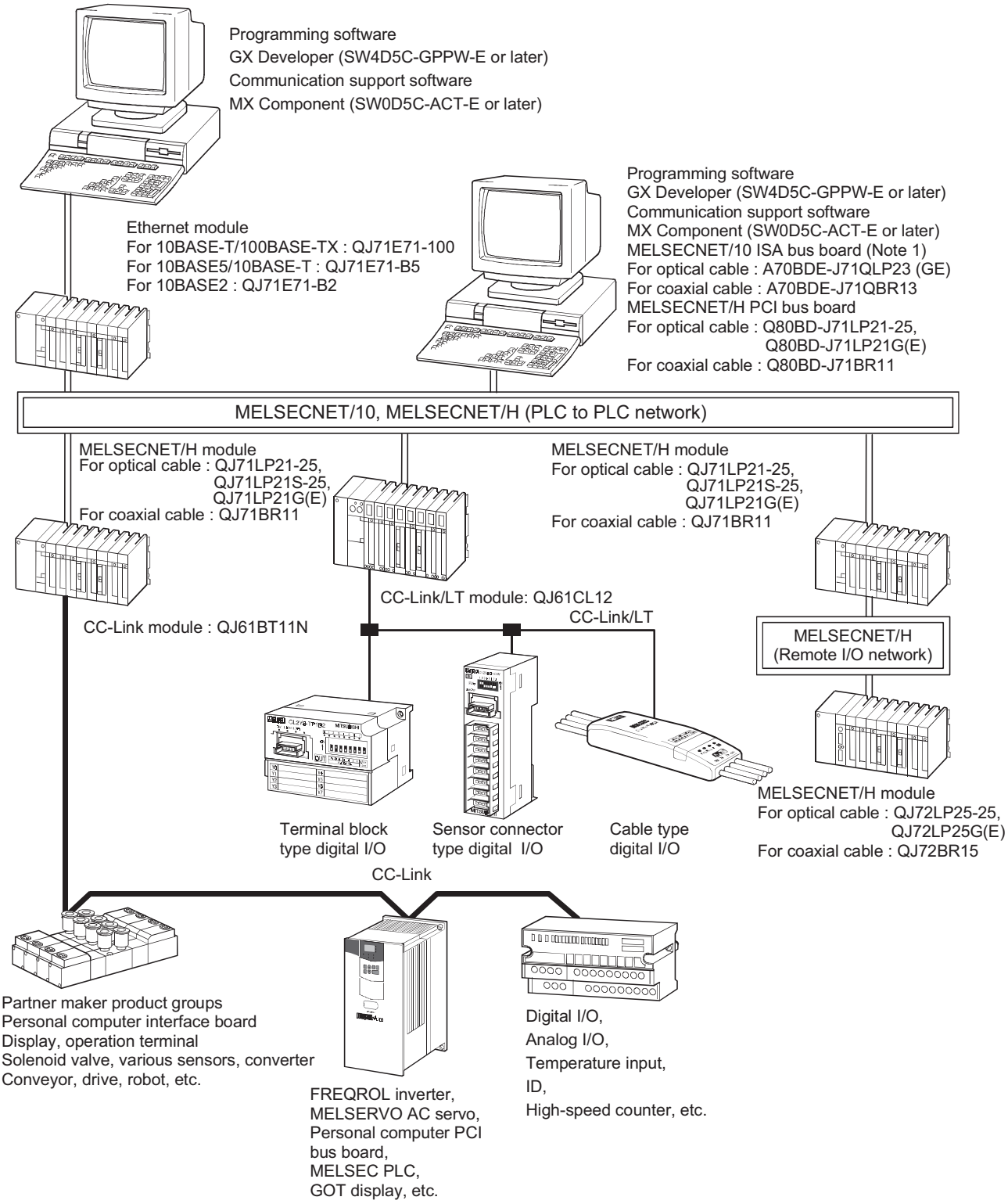
Request Source	Condition 1	Condition 2	Condition 3	Access Range
	Type of relay station	Type of networks 1 to 8	Type of relay stations 2 to 8	
Personal computer	I or II	MELSECNET/10 MELSECNET/H	I, II or III	PLC on path up to target station
	III or IV	-	-	Protocol level 3 is unusable.

● **Protocol level 4**



Request Source	Condition 1	Condition 2	Condition 3	Condition 4	Access Range
	Type of relay station	Type of networks 1 to 8	Type of relay stations 2 to 8	Type of target station 1	
Personal computer	I	MELSECNET/10 MELSECNET/H	I, II or III	I	PLC on path up to target station 2
	I	MELSECNET/10 MELSECNET/H	I, II or III	II or III	PLC on path up to target station 1
	II, III or IV	-	-	-	Protocol level 4 is unusable.

■ Whole network system configuration



*1: Usable in MELSECNET/10 mode.
MELSECNET/H mode is not supported.

2.2 Web server module

2.2.1 QJ71WS96

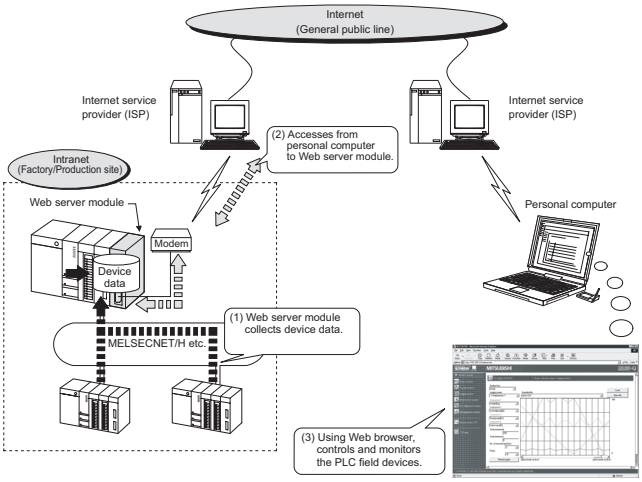
Overview

The Web server module (hereinafter abbreviated to QJ71WS96) incorporates a RS-232 interface that can connect the 100BASE-TX/10BASE-T Ethernet interface or modem. The Web server function enables remote monitoring · data logging · data writing · event notifying via Internet or intranet.

Features

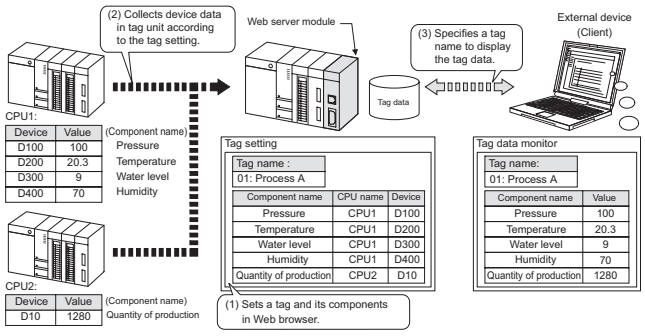
■ Remote monitoring of PLC CPU via Internet

The Web server function allows users to monitor PLC CPUs at a remote location using a commercially available Web browser on a personal computer connected to the Internet/Intranet.



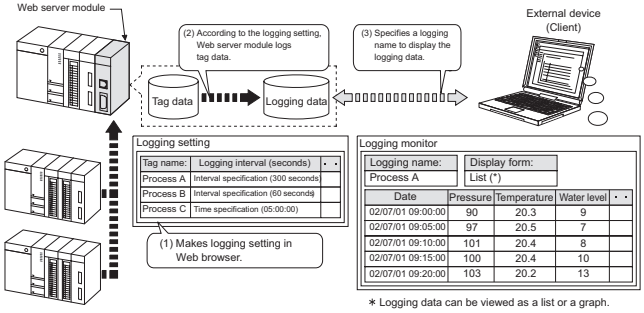
■ Collection/display of tag data (Tag function)

A set of individual PLC CPU's device data on a network is entered as a tag and the Web server module collects those device data in tag unit.
The collected data can be displayed in a Web browser by specifying a tag name.



■ Display of tag data logging/logging result (Logging function)

Tag data can be stored as a CSV file in time series at the user-specified execution timing (by setting timing, start/stop condition).
The stored file can be displayed in a Web browser or downloaded by FTP operation, etc.

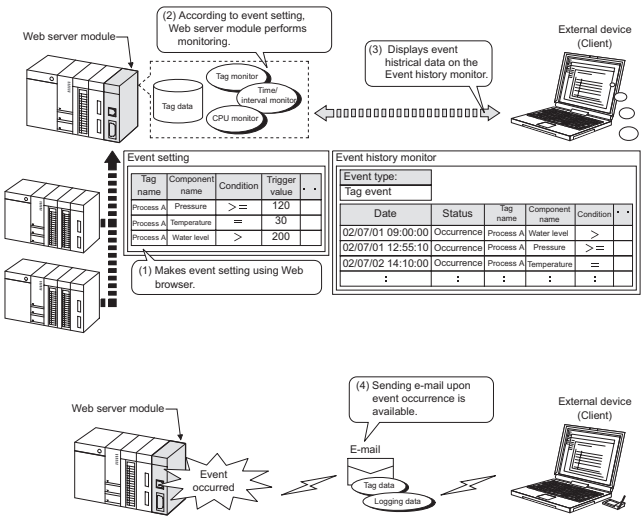


■ Data write from Web browser to PLC CPU

Using the standard screen or user screen, device data or tag data can be written from the Web browser to the PLC CPUs. While data can be written in word unit, ON/OFF data can be used for ON/OFF operation in bit unit.

■ Event monitoring/history display (Event monitor function)

The Web server module can monitor the PLC CPU status (CPU monitor), tag data (tag monitor) and time (time/interval monitor), and store the historical data of occurred events into CSV files.
The stored files can be displayed in a Web browser or downloaded by FTP operation.
The e-mail transmission at event occurrence is also available.



■ Storage of logging data before and after event occurrence (Logging function)

By setting the occurrence of an event as the start/stop condition of logging, logging data before and after event occurrence can be stored.
This enables only necessary data to be stored without the logging data before and after event occurrence being buried in the file.

■ Data transmission/alarm notification by e-mail (E-mail function)

● E-mail transmission by PLC CPU

With the dedicated instruction (WMSEND), a tag data · logging data · user data file can be sent as an attached file of e-mail.

● E-mail transmission by event monitor function

Event setting enables transmission of an event data, tag data or logging data by e-mail when an event occurs.

■ Read/write of file by FTP (FTP function)

●FTP client function

(1) The tag data · logging data · user data file stored in the Web server module can be written to an external device (FTP server).
(2) The user data file stored in the external device (FTP server) can be read to the Web server module.

● FTP server function

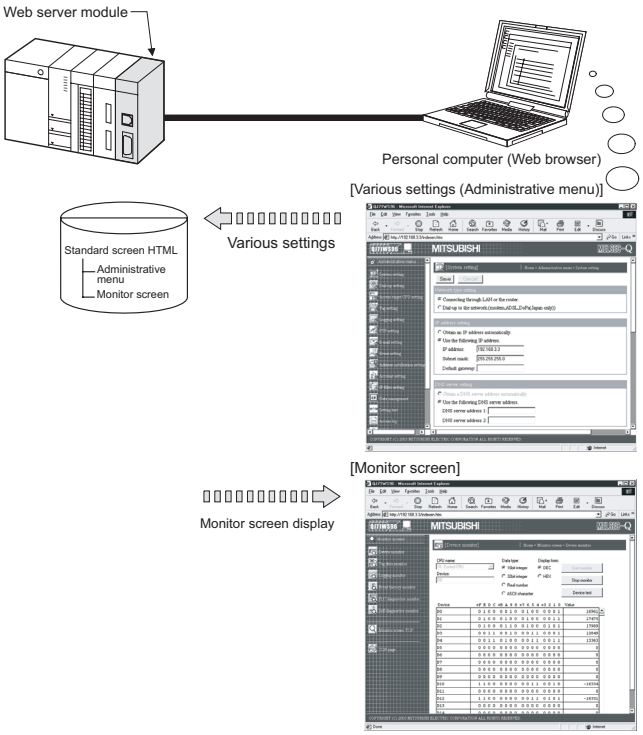
The files stored in the Web server module can be read/written from the external device (FTP server).

■ Read/write of user data file by PLC CPU (Dedicated instructions)

(1) The user data file on the compact flash card mounted on the Web server module can be read to the device data of the PLC CPU.
(2) The device data of the PLC CPU can be written to the user data file of the compact flash card mounted on the Web server module.

■ Easy Web server (Web server module) system configuration by setting in Web browser

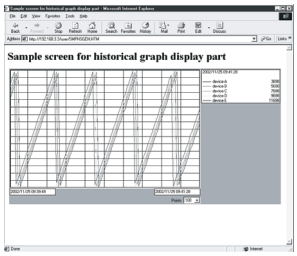
Setting in a Web browser allows easy Web server system configuration.
Moreover, after the Web server module is connected to the network, operations such as monitoring device data are avilable on the standard screen of the Web server module.



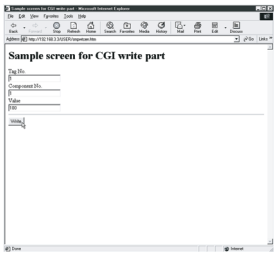
■ Creation of user screens using parts supplied as standard

Creating HTML files using the standard-supplied user parts (applet, SSI, CGI parts) allows the user to make original Web screens.
Also, the user can make original screen on a display of mobile phones by using SSI or CGI parts allows.
This allows the user to easily and remotely check the system status from outside.

[Applet parts]

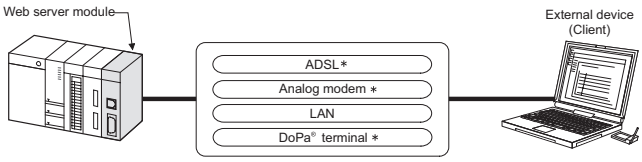


[SSI, CGI parts]



■ Compatibility with a variety of connection methods

(1) A connection method that meets a user's network environment can be selected.



∗ For connection to the Internet, sign-up with the Internet service provider is required in advance.

(2) The Web server module can be connected to an ADSL line via a UPnP-compatible broadband router.
   (a) By merely connecting the Web server module to an ADSL line, it can be connected to the network without taking account of the NAT setting of the router.
   (b) In the environment where a global IP address is dynamically assigned, the Web server module can obtain the global IP address from the router and notify the client of the address.

■ Seamless access beyond network hierarchies

Using the Web server module as a gateway, the statuses of the PLC CPUs connected hierarchically with Ethernet, MELSECNET/H and/or CC-Link can be monitored and those data can be collected.

■ High capacity and backup memory

● Processing of large data volume

Large volume of data that is beyond capability of the PLC CPU can be processed using the standard ROM and Compact FlashTM card.
Saving device data in file format and accessing them from a remote location is available using Web browser or FTP.

● Backup/Restoration of standard ROM data

The data (setting information, logging data, user HTML, etc.) of the standard ROM can be backed up on the Compact FlashTM card. It is also possible to restore the data of the Compact FlashTM card onto the standard ROM.

● Power off without shut-down operation

The file protection battery allows power to be switched on/off any time without troublesome shut-down operation. (When a battery is installed)

■ Prevention of illegal access by user authentication and IP filter functions

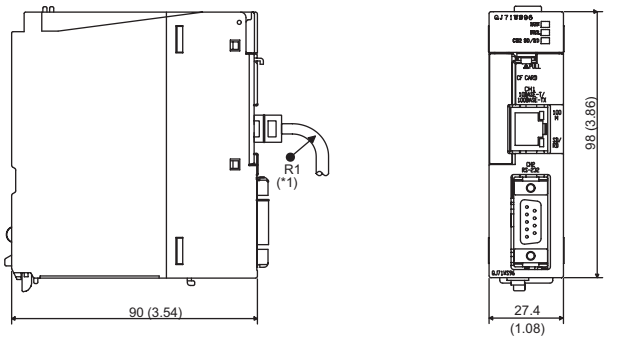
(1) By basic authentication of the user name and password, the Web server module can restrict access of users and setting operations.
   (User authentication function)
(2) The IP address of the access source can be identified to restrict access.
   (IP filter function)

Dedicated instruction list

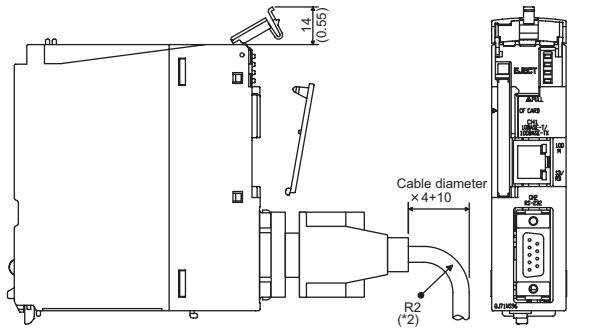
The Web server module dedicated instructions listed in the following table allows to program QJ71WS96.

Application	Instruction	Description
E-mail transmission	WMSEND	Sends e-mail.
FTP	FTPPUT	Transfers (PUT) a file to the FTP server.
	FTPGET	Transfers (GET) a file from the FTP server.
Tag	TAG	Issues a tag collection command. (Triggers a tag collection.)
Logging	LOG	Issues a logging command. (Triggers a logging.)
	LOGDEL	Deletes the saved file of logging data.
User file operation	WFWRITE	Writes the device data of the PLC CPU to the user data file on the compact flash card.
	WFREAD	Reads the user data file on the compact flash card to the device data of the PLC CPU.
	WFDEL	Deletes the user data file on the compact flash card.

External dimensions



Unit: mm (inch)



Unit: mm (inch)

*1: The bending radius near the connectors (reference value: R1) should be four times as long as the cable's outside diameter or more when connecting the twisted pair cable.

*2: The bending radius near the connectors (reference value: R2) should be four times as long as the cable's diameter or more when connecting the RS-232 cable.

Function list

Function		Description
MonitorFunction	Device monitor	Monitors device values.
	Tag data monitor	Monitors tag data.
	Logging monitor	Monitors logging data.
	Event history monitor	Monitors event histories.
	PLC diagnostics monitor	Monitors PLC CPU operation status.
	Self-diagnostics monitor	Monitors Web server module operation status.
Tag function		Stores a set of device data of individual PLC CPUs on a network as a tag, and collects those device data in tag unit. Collected data can be displayed in the Web browser.
Logging function		Stores tag data as a CSV file in time series at the user-specified execution timing (by setting timing, start/stop condition). The stored file can be displayed in the Web browser or downloaded by FTP operation, etc.
Event monitor function		Monitors the PLC CPU status (CPU monitor), tag data (tag monitor) and time (time/interval monitor), and stores the historical data of occurred events into CSV files. The stored files can be can be displayed in the Web browser or downloaded by FTP operation. At event occurrence, e-mail can be sent as necessary.
E-mail function		Used to send e-mail. • E-mail transmission by PLC CPU • E-mail transmission by event monitor function
FTP function		Used to transfer a file between the Web server module and external device. • FTP server function • FTP client function
Access log function		Used to record access from the external device to the Web server module.
Address notification function		Used to notify the external device of the Web server module address.
Data management function		Backs up/restores the standard ROM, formats the compact flash card, and performs CSV export/import.
Diagnostic function		Used to perform self-diagnostics and connection test of the Web server module.
User screen creation function		Creates user-original Web screens using the standard-supplied user parts (applet, SSI, CGI).

Performance specifications

Item			Specifications	
Ethernet transmission specifications CH.1	Interface *1		10BASE-T	100BASE-TX
	Data transmission speed		10Mbps	100Mbps
	Transmission method		Base band	
	Number of cascade connection step		Maximum 4 steps	Maximum 2 steps
	Maximum segment length		100m*2	
	Supported function		Auto negotiation function (automatically recognizes 10BASE-T/100BASE-TX)	
RS-232 transmission specifications CH.2	Interface		Compliance with RS-232 (D-sub 9 pin)	
	Communication method		Full-duplex communication	
	Synchronization method		Start-stop synchronization method	
	Transmission speed		9600,14400,19200,28800,38400,57600,115200bps	
	Transmission distance		Maximum 15m *3	
	Data format	Start bit	1	
		Data bit	8	
		Stop bit	1	
	Parity check		None	
	Transmission control		Flow control (RS/CS control) is available	
Compact FlashTM card	Supply power voltage		3.3V ± 5%	
	Size		TYPE I card	
	Number of mountable cards		1	
Protection degree			IP2X	
Maximum number of writes for Standard ROM (Flash ROM)			Maximum 100,000 times to a same area	
Clock			Obtained from CPU No. 1 (every 60s)	
Battery			Q6BAT(for protecting files)*4	
Online module change			Disable	
Multiple CPU system			Compatible	
Number of occupied I/O points			32 points/1 slot (I/O assignment: intelligent 32 points))	
5V DC internal current consumption			0.65A	
External dimensions			98 (3.86 in.) (H)×27.4 (1.08 in.) (W)× 90 (3.54 in.) (D) mm	
Weight			0.17kg (0.37lb.)	

*1: Web server module recognizes 10BASE-T/100BASE-TX according to the external device.
For connection with the hub that does not have the auto negotiation function, set the hub side to the half-duplex communication mode.

*2: Distance between the hub and node.

*3: Transmission distance may be shorter than the stated distance due to characteristics of the cable.

*4: Battery-less operation is available when shutting down while the PLC is turned off.

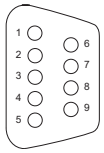
■ Software specifications

Item		Specifications
Web server	Number of simultaneously connectable nodes	5
	HTTP version	1.0
	User area capacity	Standard ROM: Maximum 5MB When Compact FlashTM card is used: Maximum 1GB((Including the home page capacity and logging capacity)
	Parts for creating user screen	Java applet: 14 types, SSI: 1 type, CGI: 3 types (The file included as standard can be used (cannot be created by the user))
Browser	Operation check browser Valid browser	Internet Explorer 5.5/6.0 of Microsoft® Corporation
	Java VM	Microsoft® VM Build number: 3309 or later Sun Microsystems JRE (J2SE) v1.4.1_02 or later
	Mobile phone	imode compatible mobile phone (browsing the user window available (standard window not available))
E-mail	Subject	Maximum 373 words
	Main text	Maximum 960 words
	Attached file	Maximum 256k words (512k bytes)
	Attached file format	MIME Format
	MIME version	1.0
	Attached file Data	CSV or binary format
	Division	Attached file cannot be divided
	Encryption	None
	Compression	None
	Communication with mail server	SMTP (send server) port number = 25
	Operation check mailer	Internet Explorer 5.5/6.0 of Microsoft® Corporation (Outlook® Express 5.5/6.0)
	Others	POP before SMTP compatible
FTP server	Server function	Provided
	Number of simultaneously connectable nodes	10
FTP client	Client function	Provided (PUT, GET)
Security	User authentication	Account number: Maximum 16 (User ID: 1 to 20 characters, password: 8 to 14 characters)
	Access log	Maximum 500
	IP filter	Registration number: Maximum 32
Data collection	Tag	No. of tags: Maximum 64, No. of components: Maximum 4096 (maximum 64 components for each tag)
	Logging	No. of logging: Maximum 64, No. of lines (number of records): Maximum 10000 lines
	Sampling interval	• When "Sampling: Execute at high speed" is selected in tag setting (control CPU only): 100 to 60000ms (total number of device points: Maximum 96) • When "Sampling: Execute" is selected in tag setting:1 to 32767ms (number of components: Maximum 4096)

■ RS-232 connector specifications

The RS-232 connector specifications are shown below.

● RS-232 connector specifications



Pin number	Signal abbreviation	Signal name	Signal transmission direction Web server module ◄► modem
1	CD(DCD)	Receive carrier detection	◄
2	RD(RXD)	Receive data	◄
3	SD(TXD)	Transmission data	►
4	ER(DTR)	Data terminal ready	►
5	SG(GND)	Signal ground	◄
6	DR(DSR)	Data set ready	◄
7	RS(RTS)	Request to send	►
8	CS(CTS)	Transmission enabled	◄
9	CI(RI)	Call indicate	◄

● RS-232 interface connector

The Web server module uses the following RS-232 interface connector.

9 pin D-sub (Female) fixing type
Manufactured by DDK Ltd. 17L-10090-27-D9AC

Use either of the following products as a connector shell for the connection cable on the Web server module side.
• Manufactured by DDK Ltd.
(Contact Tel.No. 03-3494-6611)
Plug, shell type name:17JE-23090-02(D8A)
•3M
(Contact Tel.No. 03-3709-8503)
Plug type: 8209-6009
Shell type: 3702-2209 M2.6
• Tyco Electronics AMP K.K.
(Contact Tel.No. 044-844-8013)
Plug type: 747904-2
Shell type: 747515 or 174469-2
• Connector fitting screw (M2.6)

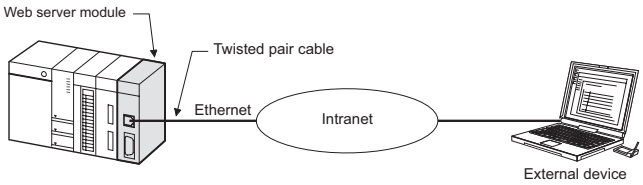
■ RS-232 cable specifications

Use the RS-232-compliant cable of up to 15m.

[Recommended cable]
7/0. 127 □ P HRV-SV... Specify the number of pairs in □ .
(for 13 pairs, specify 7/0. 127 13P HRV-SV.)
(Oki Electric Cable Company, Limited)

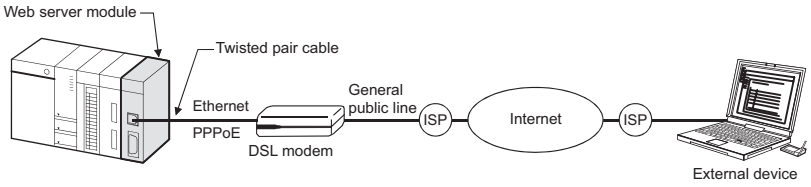
System configuration

■ LAN connection

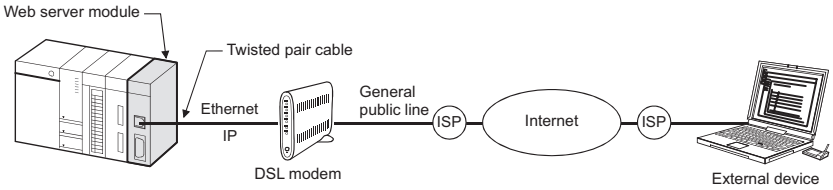


■ Connection via DSL modem

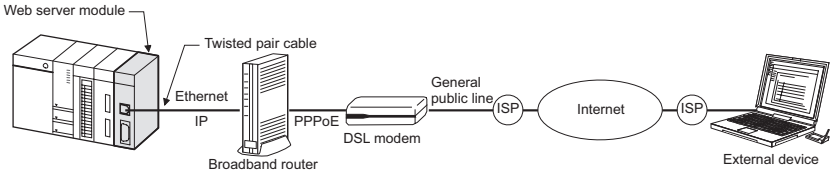
(1) When using bridge type DSL modem



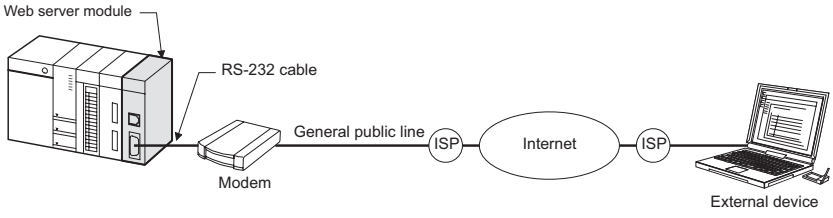
(2) When using router type DSL modem



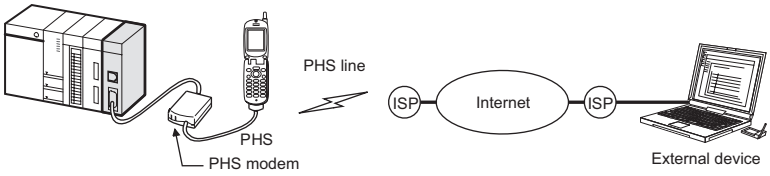
(3) When using bridge type DSL modem + broadband router



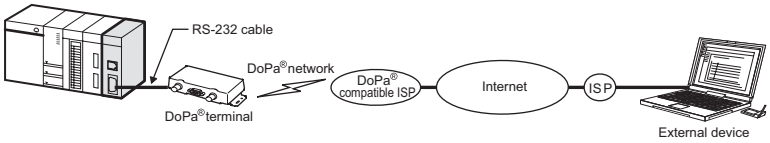
■ Connection via analog modem



■ Connection via PHS modem

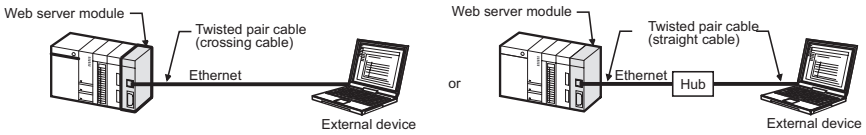


■Connection via DoPa® terminal



Note) DoPa® connection causes slower transmission speed comparing to the other connecting systems. This connection is suitable for the case where alarm notification is frequently transmitted in e-mail.

■ Connection at default, maintenance, and inspection



<QJ71WS96 bundled items>

Item name	Description
Battery	Q6BAT
Manual	Web Server Module User's Manual (Hardware)

<Items for separate purchase>
(When 10BASE-T connected)

Item name	Description
Unshielded twisted pair cable (UTP)	Ethernet standard compliant product Category 3 (4, 5)
Shielded twisted pair cable (STP)	Ethernet standard compliant product Category 3 (4, 5)
Jack	Ethernet standard compliant product RJ45
Hub	Ethernet standard compliant product For 10BASE-T (for 10Mps)
Manual	Web Server Module User's Manual (Detail)

When 100BASE-TX connected

Item name	Description
Unshielded twisted pair cable (UTP)	Ethernet standard compliant product Category 5
Shielded twisted pair cable (STP)	Ethernet standard compliant product Category 5
Jack	Ethernet standard compliant product RJ45
Hub	Ethernet standard compliant product For 100BASE-TX (for 100Mps)
Manual	Web Server Module User's Manual (Detail)

(When RS-232 connected)

Item name	Description
RS-232 cable	Refer to the section of the performance specifications.
Manual	Web Server Module User's Manual (Detail)

■ Applicable systems

<Applicable modules and number of mountable Web server modules>
The following table shows the CPU module compatible with web server module and the number of mountable web server modules.

Applicable module		Number of mountable web server modules	Remarks
CPU module	Q00JCPU	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Mountable for Q mode only*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1

*1: Refer to the contents of system configuration for each CPU system in Chapter 1.

<Compatible software package>
The following table shows the systems where the Web server module will be used and the corresponding software package. It should be noted that GX Developer is not capable of accessing the PLC CPU via the Web server module.

		Software version
		GX Developer
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	

<Compact Flash card>
The Compact FlashTM card applicable to the Web server module is a TYPE I storage card that meets the Compact FlashTM specifications.
One Compact FlashTM card can be set to the Web server module.

<Items for separate purchase>

Type	Description
GT05-MEM-32MC	Compact Flash card 32MB
GT05-MEM-64MC	Compact Flash card 64MB
GT05-MEM-128MC	Compact Flash card 128MB
GT05-MEM-256MC	Compact Flash card 256MB
---	Commercially available Compact Flash card

<Analog modem/PHS modem/ADSL modem/Broadband router/DoPa® terminal>

Item		Specifications
Analog modem/ PHS modem	Web server module side interface	Operable with the interface specifications of the CH2 (RS-232) side on the Web server module *1
	Data communication control command	Compatible with AT command of Hayes
	DR Signal Control	Can turn on only the DR (DSR) signal independently.
ADSL modem	Web server module side interface	Operable with the interface specifications of the CH1 (10BASE-T/100BASE-TX) side of the Web server module *1
	Protocol	PPPoE (PPP over Ethernet) or PPPoA (PPP over ATM)
	Connection form	Bridge type or router type*2
Broadband router	Web server module side interface	Operable with the interface specifications of the CH1 (10BASE-T/100BASE-TX) side of the Web server module *1
	NAT	Should have the NAT (address conversion) function.
	UPnP	Should be compatible with Universal Plug and Play (UPnP). *3
DoPa® terminal	Interface on Web server module side	Compliant with the interface specifications for the CH2 (RS-232) side of the Web server module *1
	Communication system	PDC800MHz, single packet system 9600bps
	DR signal control	Turns on only DR (DSR) signal separately.

*1: For the interface specifications for CH1/CH2 side of the Web server module, refer to the performance specifications.

*2: Use the router type ADSL modem that satisfies the following.

- The modem has the NAT (address conversion) function.
- The modem is compatible with Universal Plug and Play (UPnP).
- When the modem is incompatible with UPnP, it is necessary for the user to make a contract on a static IP address with an Internet service provider and make the NAT setting of the router.

*3: When the broadband router is incompatible with UPnP, it is necessary for the user to make a contract on a static IP address with an Internet service provider and make the NAT setting of the router.

<Internet service provider>

Item	Specifications
Protocol	PPP(Point to Point Protocol)
Authentic method	PAP or CHAP (Operable without authentication)
IP address	Global IP address must be assigned.*1
E-mail (When being set)	SMTP server must be prepared.

*1: When using a UPnP-incompatible router type ADSL modem or broadband router, it is necessary for the user to make a contract on a static IP address with an Internet service provider and make the NAT setting of the router.

Note) For detailed information on connectable devices on which we have performed operation check, visit Mitsubishi Electric FA Network Service on World Wide Web MELFANSweb homepage. (http://www.MitsubishiElectric.co.jp/melfansweb)

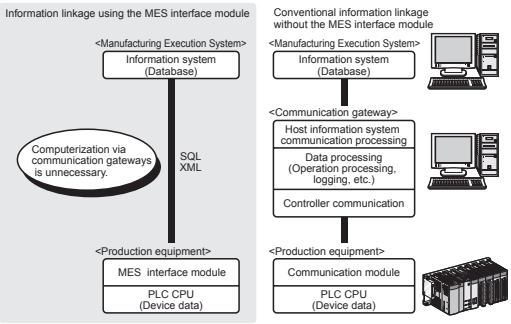
● Technical bulletin No.PLC-D-427

2.3 MES Interface Module

2.3.1 QJ71MES96. MX MES Interface

OVERVIEW

QJ71MES96 MES interface module (hereafter,abbreviated as MES interface module) links the PLC (Production equipment) device data with information system (Manufacturing Execution System) database without communication gateways.

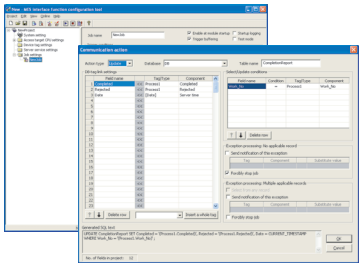


Features

■ Connection with the information system is enabled by simple settings without program

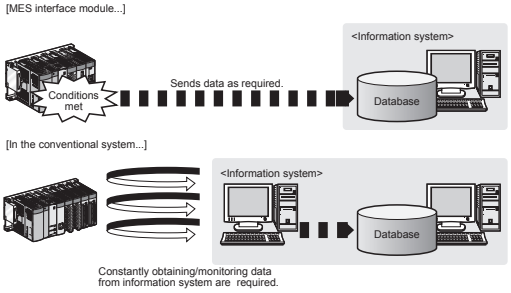
Access to information system databases can be realized simply by making the necessary settings with the setting tool.
There is no need to write programs for accessing databases, so the engineering costs for system construction can be reduced and the work period can be shortened.

[MX MESInterface] - [MES interface function configuration tool]



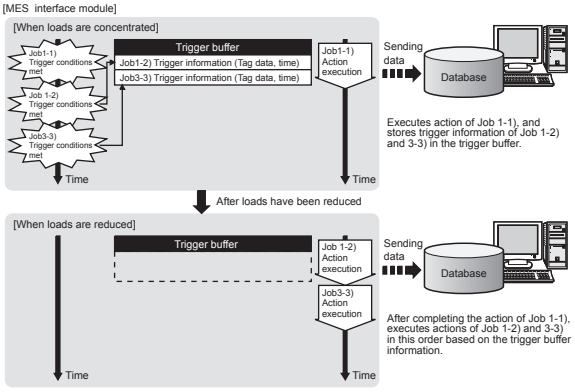
■The information system load can be reduced.

Data can be monitored on the MES interface module side and when the conditions are met, the data can be sent to the information system.
Also, the data can be operated and the results of the operations can be sent to the information system.
This can reduce the information system loads compared to the conventional system of constantly obtaining and monitoring data.



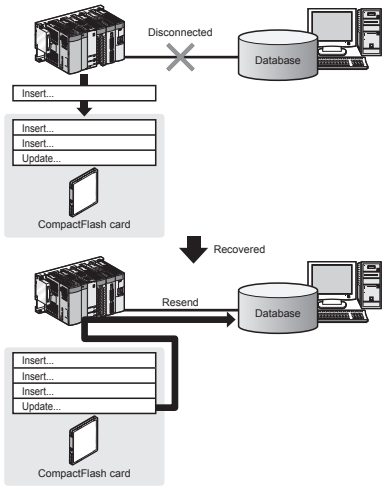
■ Buffering function for reliable data acquisition/ transmission

(a) Even if the frequency of data transmission triggers is high, no trigger will be missed. (Trigger buffering function)
When multiple sets of conditions for data transmission are met in a concentrated manner, their data and trigger times can be buffered in the module's internal memory.
After the loads are reduced, data operations and transmission are executed using the buffered data.



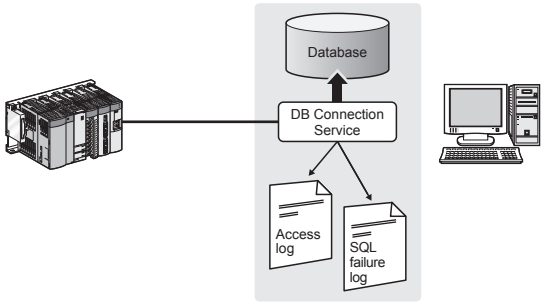
- The numbers 1) to 3) show the order in which trigger conditions of respective jobs are met.
- Job 1 and 3 are assumed to access the same database.

(b) Data to be send to the database are protected even if a communication error occurs. (DB buffering function)
When an error occurs during communications with a database, the SQL texts failed to send can be stored in a CompactFlash card.
After recovery, the buffered SQL texts are automatically sent to the database.
(Manual operation is also possible.)



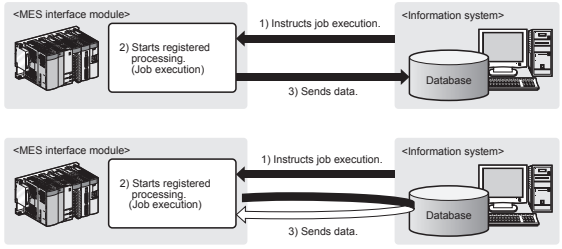
■ Log data are available in the event of an access error

After connection with a database, when there is a communication error, a log of the error contents can be recorded to the database side.
Analyzing the log can protect data and analyze the error.



■ Directions from the information system can be realized.

Processing registered in the MES interface module can be started from information system applications.
This enables to realize production directions from the information system.
Not only can data be sent to a database but it can also be received from a database.
This enables to download data such as production information from information system databases.



■ Supporting diverse databases

When designing a new system, a wide range of database types can be selected.
Even when connecting to the existing system, the system can be transferred without changing the existing database.

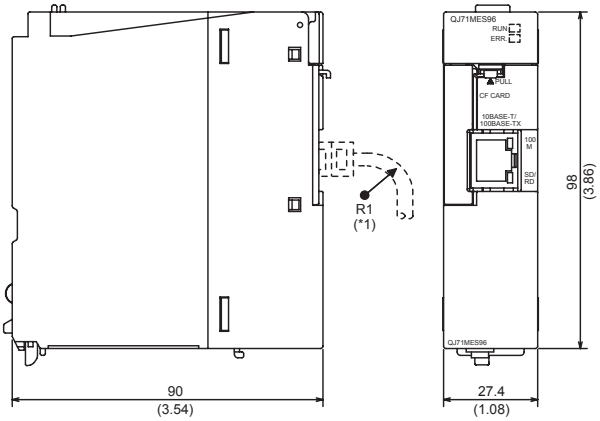
■ Access independent of the database table configuration is possible.

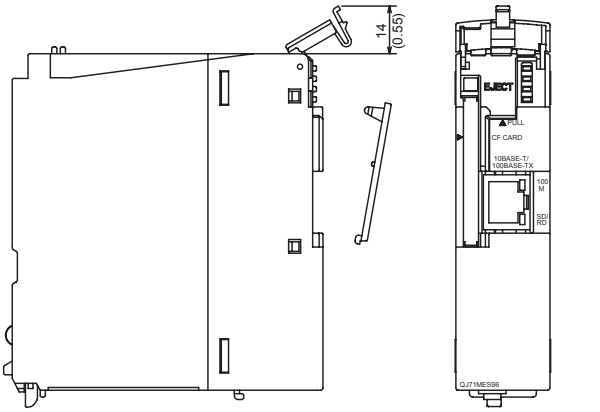
Freely designed database tables can be used for access to databases.
When designing a new system, not only the high flexibility of design, but when connecting to the existing system, the system can be constructed without changing the database tables.

■ Time synchronization using SNTP is also possible.

The clocks for the MES interface module and the PLC CPU can be set through communications with an SNTP server computer.
This enables to synchronize the time for the entire system.

Appearance





Unit: mm (inch)

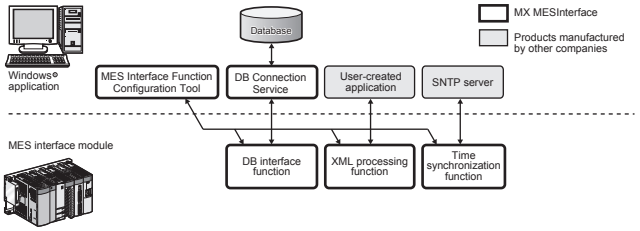
*1: The bending radius near the connector (R1: yardstick) should be at least four times longer than the cable's outside diameter when the twisted pair cable is connected.

System configuration

This section lists the MES interface module functions.

■Function summary

The following explains the function summary of the MES interface module and MX MESInterface.

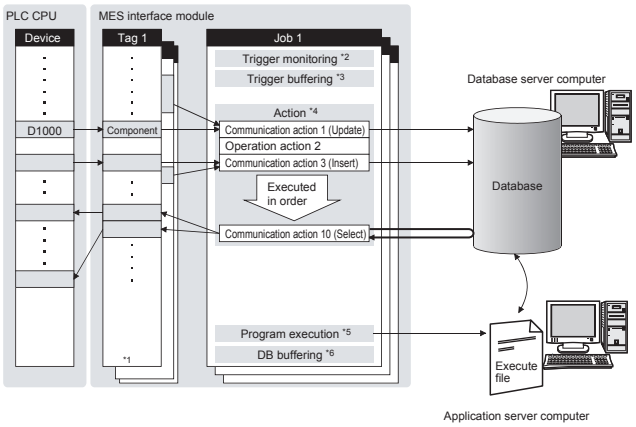


Function List

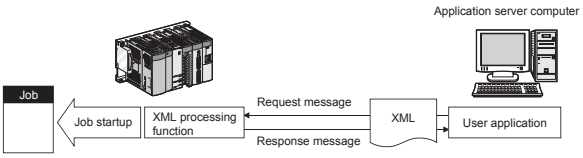
■ MES interface module function list

Function		Description
DB interface function		Executes access to the database in units of jobs.
	Tag function	Collects device data of the PLC CPUs on the network in units of tags. By allocating database fields to tag components, the DB interface function enables the following. • Database value reading/writing • Reading/writing of PLC CPU device data specified with tag components
	Trigger monitoring function	Monitors values such as the time and tag values, and when the trigger condition changes from false to true (when the conditions are met), starts a job.
	Trigger buffering function	When multiple sets of conditions for data transmission are met in a concentrated manner, their data and trigger times are buffered in the module's internal memory so that actions (data operation/transmission) can be executed later using the buffered data. Even if the frequency of data transmission triggers is high, jobs are executed without missing any trigger.
	SQL text transmission (Communication action)	Automatically creates an SQL text and communicates with the database. The following three types of commands can be selected for the SQL text. • SELECT • UPDATE • INSERT
	Arithmetic processing function (Operation action)	Performs operations for tag component values.
	Program execution function	Executes programs in the application server computer before execution of the first action and after execution of the last one in a job.
	DB buffering function	Buffers SQL texts into a CompactFlash card when they cannot be sent due to network disconnection or failure of the database server computer. After recovery, the buffered SQL texts are automatically sent to the database. (Manual operation is also possible.)
XML processing function		Processes execution of requests made by user applications using XML format messages. The XML processing function allows the following instructions for job execution. • One-shot execution of a job • Validating a job (The job is executed when the trigger conditions are met.) • Invalidating a job (The job is not executed even if the trigger conditions are met.)
Time synchronization function		Makes the time of the MES interface module synchronized with the time of the SNTP server computer on the network or a PLC CPU (No.1 CPU in the multiple CPU system).

The operation of the DB interface function



XML Progressing function



*1 Collects tag data.
*2 Activates a job.
*3 Stores data and trigger times temporarily in the module's internal memory when loads are concentrated.
*4 Accesses the database and performs arithmetic processing.
*5 Executes programs.
*6 Temporarily stores SQL texts in a CompactFlash card when a communication error occurs.

■ MES Interface Function Configuration Tool function list

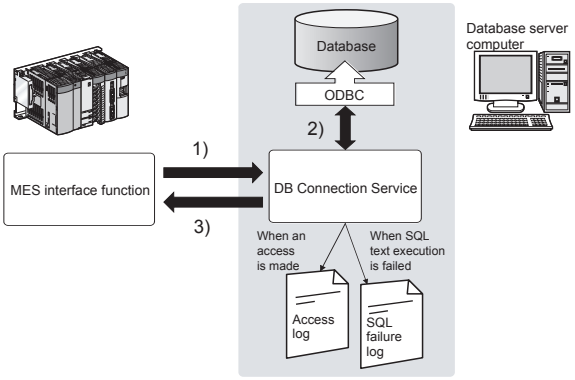
Function		Description
System Setting		Configure the initial settings for the MES interface module.
	Network settings	Configure the settings necessary for connecting the MES interface module to the network.
	Time synchronization setting	Make the time setting for the MES interface module.
	Account setting	Set user authentication accounts used for access to the MES interface module.
	DB buffering setting	Configure the settings for the DB buffering function.
Access Target CPU setting		Set a connection channel to the access target CPU.
Device tag settings		Conigure the settings for the tag function.
	Component setting	Configure the tag component settings.
Server Service setting		Configure the settings for access to a server computer.
Job settings		Configure the settings for the DB interface function.
	Trigger conditions	Configure the settings for startup conditions of the job.
	Trigger buffering	Set whether to utilize the Trigger buffering function or not.
	Communication action	Configure the settings for communications with a database.
	Operation action	Configure the settings for operation of tag component values.
	Program execution	Configure the settings for the program execution function.
	DB buffering	Set whether to utilize the DB buffering function or not.
Online		Perform online operations to the MES interface module connected to the network.
	Communication setting	Set the target MES interface module.
	Write	Write the MES interface function settings (project) to the MES interface module.
	Read	Read the MES interface function settings (project) from the MES interface module.
	Verify	The MES interface function settings in the MES interface module are compared with those in the currently editing project.
	Remote operation	Display or change the operation status of the MES interface module, or format a CompactFlash card.
	Working log	The working log of the MES interface module can be checked.
	One-shot execution of a job	Execute a job as a one-shot task.
Help		The product information of the MES Interface Function Configuration Tool and the Connect to MELFANSweb screen can be displayed.

■ DB Connection Service function list

Function		Description
ODBC connection function		Connects the MES interface module and the ODBC interface for database.
Program execution function		Executes a program on the application server computer upon request from the MES interface module.
IP filter function		Specifies the IP address of the MES interface module that can connect to the DB Connection Service to ensure the security of the server computer.
Log output function	Communication log	Outputs the communication contents between the MES interface module and DB Connection Service to the access log.
	SQL failure log	If data cannot be updated/inserted normally due to no table, etc. at SQL text execution, the error contents are output to the SQL failure log.
DB Connection Service Setting Tool		Software changes the DB Connection Service settings

ODBC connection function

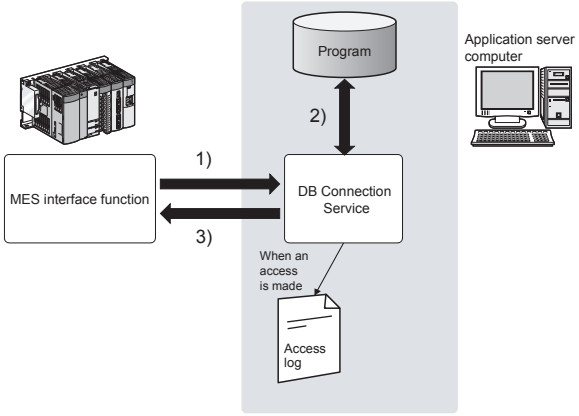
The OBDC connection function connects the MES interface module and the ODBC interface for database.
The following shows operation on the database server computer.



1) Receives SQL text from the MES interface function on the MES interface module.
2) Accesses the database via ODBC interface and executes the SQL text.
3) Sends the SQL text execution results to the MES interface module.

Program execution function

The program execution function executes a program on the application server computer upon request from the MES interface module.
The following shows operation on the application server computer.



1) Receives program execution requests from the MES interface function operating on the MES interface module.
2) Executes programs on the application server computer.
3) Sends the program execution results to the MES interface module.

Performance specifications

■ Transmission and interface specifications

Function		Specifications	
Ethernet	Interface*1	10BASE-T	100BASE-TX
	Data transmission rate	10 Mbps	100 Mbps
	Transmission method	Base band	
	No. of cascaded stages	Maximum 4 stages	Maximum 2 stages
	Max. segment length*2	100 m	
	Supported function	The auto-negotiation function is available. (automatically distinguishes 10BASE-T from 100BASE-TX)	
CompactFlash card	Supply power voltage	3.3V±5 %	
	Supply power capacity	Maximum 150 mA	
	Card size	TYPE I card	
	No. of installable cards	1	
Number of occupied I/O points		32 points/slot (I/O assignment: Intelli. 32 points)	
Clock		The clock data is obtained from a PLC CPU (in multiple CPU system, CPU No.1) or the SNTP server computer.	
5VDC internal current consumption		0.65A	
External dimensions		98 (3.86) (H) × 27.4 (1.08) (W) × 90 (3.54) (D) [mm (inch)]	
Weight		0.16 kg	

*1: The MES interface module distinguishes 10BASE-T from 100BASE-TX depending on the device on other end.
For connection with a hub not having the auto-negotiation function, set the hub side to half-duplex auto communication mode
*2: Distance between a hub and node.

■ Software specifications

Function				Description
DB interface	No. of connected databases			Maximum 32 items/project
	No. of databases that can be connected			7 types® Oracle® 8i Oracle® 9i Oracle ®10g Microsoft® SQL Server 2000 Microsoft® SQL Server 2000 Desktop Engine (MSDE 2000) Microsoft® Access 2000 Microsoft® Access 2003
	Job	Allowable number of settings		Maximum 64 items/project
		Trigger buffering		Maximum 128 times
		Trigger conditions	No. of conditions can be combined	Maximum 2 conditions (Combination can be selected either AND or OR)/job
			Condition type	21 types PeLriod: 1 to 32767 seconds Time: Year, month, day, day of the week, hour, minute Value monitoring[*1]: Compares tag component value and tag component value (6 types). Compares tag component value and constant value (6 types). Module startup Handshake[*1]
		Action	Allowable number of settings	Maximum 10 actions/job
			Type	4 types (Select, update, insert, operation)
			No. of communication action fields	Maximum 8192 fields/project [DB-tag link settings]: Maximum 256 rows/communication action [Select/Update conditions]: Maximum 8 rows/communication action
			No. of operations possible for operation action	(Maximum 20 dyadic operations)/operation action
			Operators for operation action	6 types (Addition, subtraction, multiplication, division, remainder, character string combination)
		Program execution	Allowable number of settings	Maximum 2 programs (One program before execution of initial action + one program after execution of final action)/job
	Device tag		No. of tags	64 tags/project
			No. of components	256 components/tag 4096 components/project
			Data type	5 types (Signed single-precision integer type (16 bits), signed double-precision integer type (32 bits), single-precision floating point type (32 bits), bit type, character string type (1 to 32 characters))
			Statistical processing	6 types (Average, maximum, minimum, moving average[*2], moving maximum[*2], moving minimum[*2])
	DB buffering		Buffering capacity during communication error[*3]	Maximum capacity: CompactFlash card capacity - 32M bytes (16 M bytes to 512 M bytes)
XML processing	Command type			3 types (One-shot execution of a job, enabling the job, disabling the job)
	Request message size			Maximum 128 K bytes
	Reception protocol			HTTP1.0
	User authentication			No. of accounts: 16 User ID: 1 to 20 characters Password: 6 to 14 characters
Working log	Error log capacity			Maximum capacity: 1 M byte • At least 4800 logs can be recorded.
	Event log capacity			Maximum capacity: 2 M bytes • At least 4800 logs can be recorded. (When there is no detailed log) • At least 2 logs can be recorded. (When there is a detailed log)

*1: The monitoring interval is 1 to 600 (in units of 0.1 seconds) or 1 to 32767 (in units of seconds).
*2: [No. of samples] can be set up to 20.
*3: The following shows the method for roughly calculating the buffering duration from the buffering capacity.
Buffering duration = (No. of executable bufferings) / (Execution frequency [times/hour]) [h]
No. of executable bufferings = (Usage capacity) / (SQL text length + Overhead (4 bytes) [cases]
SQL text length = Total field character length + 6 × No. of fields + Total data length + 20 [bytes]

[Calculation example]
Accessing to 256 fields with 1 job and 1 action and performing every 30 seconds when capacity:
64 M bytes, field name: 16 characters, data length: 32 characters
SQL text length = (16 × 256) + 6 × 256 + (32 × 256) = 13844 [bytes]
No. of executable bufferings = (64 × 1024 × 1024) / (13844 + 4) ≒ 4846 [cases]
Buffering duration = 4846 / (60 / 30 × 60) ≒ 40 [h]

■ MX MESInterface Software Configuration

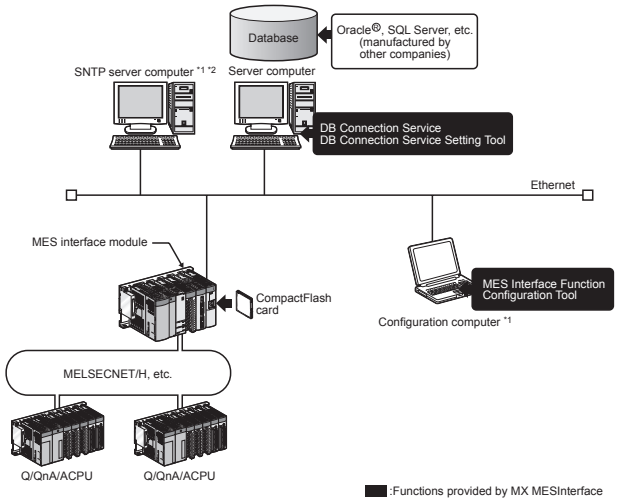
Item	Description
Installer	Installs each execution software (MES Interface Function Configuration Tool, DB Connection Service, and DB Connection Service Setting Tool) in each operating environment.
MES Interface Function Configuration Tool	Operates on a configuration computer and configures various settings required for the MES interface function. In addition to the configuration, the application tool offers features such as the operation status check, working log check, or stop/restart operation.
DB Connection Service	Operates on the server computer and links databases with the MES interface module.
DB Connection Service Setting Tool	Operates on the server computer and changes the settings of the DB Connection Service.

System Configration

This chapter explains the system configuration of the MES interface module.

■ Overall system configuration

This section shows the overall system configuration when using the MES interface module.

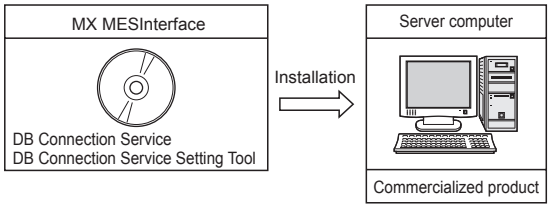


*1 The SNTP server computer and configuration computer can be shared with server computers.
*2 This computer is necessary when using the SNTP server computer time for the MES interface module time.

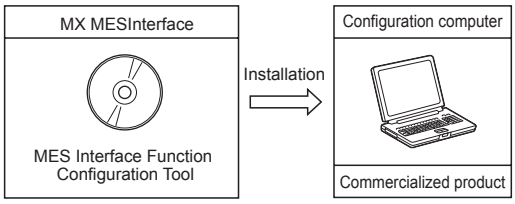
■ System configuration for installation

This section shows system configurations for installing MX MESInterface.

(1) When installing DB Connection Service and DB Connection Service Setting Tool on a server computer



(2) When installing MES Interface Function Configuration Tool on a configuration computer



<QJ71MES96 accessories>

Product	Description
Battery	Q6BAT
Manual	MES Interface Set User's Manual (Hardware)

<Separately obtained products>

Product	Description
SW1DNC-MESIF-J *1	MX MES Interface Version 1
GT05-MEM-128MC *2	CompactFlash Card 128MB
GT05-MEM-256MC *2	CompactFlash Card 256MB

*1: MX MES Interface is required as Information interaction function setting tool, DB connection service and DB connection service setting tool.

*2: MES interface module is used with one Compact Flash card inserted.
For commercially available Compact flash card, refer to the following.
Mitsubishi Electric FA Network Service on World Wide Web
MELFANSweb homepage
(http://www.MitsubishiElectric.co.jp/melfansweb)
Technical bulletin No. PLC-D-427

(When 10BASE-T is connected)

Product	Description
Unshielded twisted pair cable	Ethernet standard compliant product Category 3 (4, 5)
Shielded twisted pair cable (STP cable)	Ethernet standard compliant product Category 3 (4, 5)
Jack	Ethernet standard compliant product RJ45
Hub	Ethernet standard compliant product For 10BASE-T (for 10Mbps)
Manual	MES Interface Module User's Manual (Details)

(When 100BASE-TX connected)

Product	Description
Unshielded twisted pair cable	Ethernet standard compliant product Category 5
Shielded twisted pair cable (STP cable)	Ethernet standard compliant product Category 5
Jack	Ethernet standard compliant product RJ45
Hub	Ethernet standard compliant product For 100BASE-TX (for 100Mbps)
Manual	MES Interface Module User's Manual (Details)

■ Applicable systems

< Applicable system and the number of mountable modules>
The following shows the PLC CPU on which the MES interface module can be mounted and the number of mountable modules.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	
	Q12PHCPU Q25PHCPU		

*1: Refer to the system configuration of each CPU system explained in Chapter 1.

<Applicable software packages >
The following table shows the systems and software packages applicable to the MES interface module.
However, GX Developer cannot access to the PLC CPU via MES interface module.

Item		Software version	
		GX Developer	MX MESInterface
Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.10A or late
	Multiple CPU system	Version 8 or later	
Q02/Q02H/Q06H Q12H/Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
Q12PH/Q25PHCPU	Single CPU system	Version 7.10 or later	
	Multiple CPU system		

Operating environment

■Personal computer for setting

Item		Description
Computer		PC/AT compatible machine on which the following basic software operates.
	CPU	See "Performance required for personal computer and basic software" below.
	Required memory	
Hard disk free space		64MB or more
Disk drive		CD-ROM disk drive
Display		Resolution 1024 × 768 pixels or higher
Basic software		Microsoft® Windows® 2000 Professional Operating System (English version)*1*2 Microsoft® Windows® XP Professional Operating System (English version)*2*3 Microsoft® Windows® XP Home Edition Operating System (English version)*2*3 Microsoft® Windows® 2000 Server Operating System (English version)*1*2 Microsoft® Windows® Server 2003 Operating System (English version)*2*3
Interface		Ethernet, Compact flash card reader/writer

*1: When using Windows® 2000 Server or Windows® 2000 Professional, ServicePack2 or later is required.
*2: Installing MX MESInterface requires the Administrator's authority. Also, logging on to MX MESInterface as a user in Administrator group is recommended.
*3: The following functions cannot be used.
If any of the following functions is used, this product may not operate normally.
- Application startup in Windows® compatibility mode
- User simple switching
- Remote desktop
- Large Fonts (Detailed setting in the Display Properties)

Used basic software and performance required for personal computer

Basic software	Performance Required for Personal Computer	
	CPU	Required memory
Windows®2000 Professional	Intel Pentium®/ Celeron® series CPU 300MHz or more in clock speed	128MB or more
Windows®XP Professional		
Windows®XP Home Edition		
Windows®2000 Server	Intel Pentium®/ Celeron® series CPU 550MHz or more in clock speed	256MB or more
Windows®Server 2003		

■Personal computer for server

Item		Description
Computer		PC/AT-compatible personal computer can operate the following basic software
	CPU	See "Performance required for personal computer and basic software" below.
	Required memory	
Hard disk free space		64MB or more
Disk drive		CD-ROM disk drive
Display		Resolution 1024×768 pixels or higher
Basic software		Microsoft® Windows® 2000 Professional Operating System (English version)*1*2 Microsoft® Windows® XP Professional Operating System (English version)*2*3 Microsoft® Windows® 2000 Server Operating System (English version)*1*2 Microsoft® Windows® Server 2003 Operating System (English version)*2*3
Interface		Ethernet
Required software		When using DB interaction function: Relational database (any of the followings) • Oracle® 8i • Oracle® 9i • Oracle® 10g • Microsoft® SQL Server 2000*4 • Microsoft® SQL Server 2000 Desktop Engine (MSDE 2000)*4 • Microsoft Access 2000*5 *6 • Microsoft Access 2003*5 *6
		When using the time synchronization function: SNTP server (Equipped as a standard to Windows® 2000 Server, Windows® Server 2003)

*1: When using Windows® 2000 Server or Windows® 2000 Professional, ServicePack2 or later isrequired.
*2: Installing MX MESInterface requires the Administrator's authority.
*3: The following functions cannot be used.
If any of the following functions is used, this product may not operate normally.
- Application startup in Windows® compatibility mode
- User simple switching
- Remote desktop
- Large fonts (Details setting of Display properties)

*4: Set the security authentication mode to Mixed Mode.
*5: One communication action can update up to 127 fields.
*6: Do not access a file from multiple MES interface modules at the same time.

Used basic software and performance required for personal computer

Basic software	Performance Required for Personal Computer	
	CPU	Required memory
Windows®2000 Professional	Intel Pentium®/ Celeron® series CPU 300MHz or higher in clock speed	128MB or more
Windows®XP Professional		
Windows®2000 Server	Intel Pentium®/ Celeron® series CPU 550MHz or higher in clock speed	256MB or more
Windows®Server 2003		

(2) Confirming the serial No. with GX Developer
Confirm "Product information list" or "Module detailed information" on GX Developer.

For details, refer to following manual. ☞ Web Server Module User's Manual

[Startup procedure]

- Confirming the serial No. with "Product information list"
  [Diagnostics] → [System monitor] →"Product information list"
- Confirming the serial No. with "Module detailed information"
  [Diagnostics] →[System monitor] →"Module detailed information"

■Personal computer for XML processing application development

Item	Description
Program development environment	Microsoft® Visual Studio® .NET 2003 Sun Microsystems J2SE v1.4.2

2.4 Ethernet Interface Module

2.4.1 QJ71E71-100, QJ71E71-B5, QJ71E71-B2

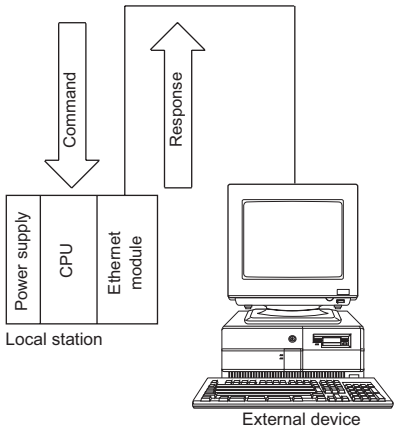
Overview

The Ethernet interface modules, models QJ71E71-100, QJ71E71-B5 and QJ71E71-B2 (hereinafter called the Ethernet module), are interface modules on the PLC side for connecting the Q series PLC with the host system, such as a personal computer and a work station, and between PLCs using the TCP/IP or UDP/IP communication protocol via Ethernet (100BASE-TX, 10BASE-T, 10BASE5, 10BASE2).

Features

■ Data communication using the MELSEC communication protocol

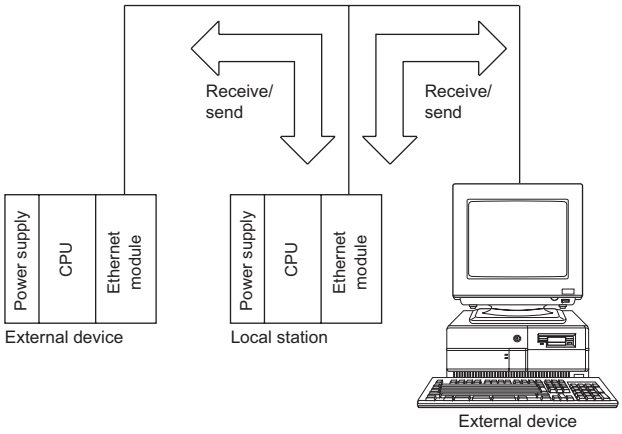
In the "data communication using the MELSEC communication protocol (hereinafter called the MC protocol)", the device data and program files of the PLC can be read from/written to the host system.
This protocol is a passive protocol that communicates data solely according to the requests from the host system. It does not require a sequence program for data communication after a connection is established.
If the host system is a personal computer running one of the basic operation systems below, it is possible to create a communication program for the host system without considering the detailed MC protocol (transmission/reception procedures) using one of the following separately sold communication support tools.



Note)The communication functions using the MC protocol correspond to the communication functions for reading/writing data from/to the PLC CPU that are supported by the A/QnA series Ethernet modules (A1SJ71E71/A1SJ71QE71, etc.).

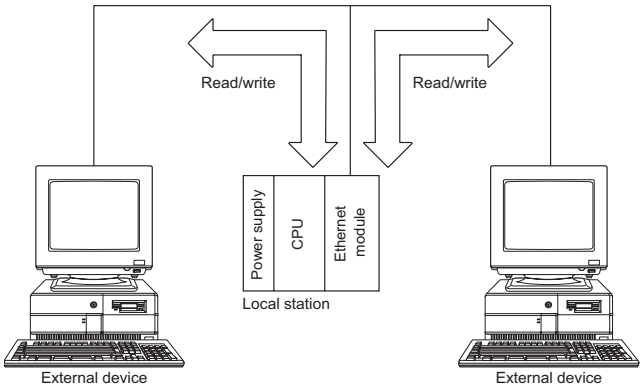
■ Communication using fixed buffers

In the "communication using fixed buffers," a maximum of 1 k words of arbitrary data can be sent or received among PLCs or between the PLC and the host system.
An Ethernet module is provided with 16 fixed buffer data areas of 1 k word storage space, and each is assigned as either a sending or receiving buffer for an arbitrary device.
While the communication using the MC protocol is passive, the communication using fixed buffers is an active protocol. Data can be sent from the PLC side to the host system when errors occur in machine equipment or when some conditions are satisfied. Furthermore, by using the data receiving function in an interrupt program, retrieval of receive data to the PLC CPU may be expedited.



■ Communication using random access buffers

In the "communication using random access buffers," data of larger size (up to 6 k words of data) can be communicated. This protocol can be used when the data size is too large for communication using fixed buffers (up to 1 k words of data).



■ Communication by e-mails

With "sending/receiving e-mail", data can be sent to and received from an external device at a remote location using e-mail via an Internet line.

● Sending/receiving e-mail by the PLC CPU

The following data can be sent/received by using dedicated instructions (MSEND, MRECV).

(1) Sending/receiving data as attached files

Up to 6K words of data can be sent to or received from a personal computer or other Ethernet module as a file attached to e-mail.

(2) Sending data as main text

Up to 960 words of data can be sent to a personal computer or portable terminal as main text of e-mail.

● Sending e-mail by the PLC CPU Monitoring function

By setting up the Ethernet parameters, the notification conditions (PLC CPU status or device value) set by the user can be monitored at constant intervals, and up to 960 words of data can be sent by either of the following methods when the notification conditions are satisfied:

(1) Sending data as an attached file

(2) Sending data as main text

■ Communication by Web function

● PLC monitoring via the Internet using the Web function

The Web function of the Ethernet module is used for the system administrator to monitor Q Series CPUs at a remote location via the Internet, using a commercially available Web browser.

● Access function to the PLC

By using the Web function, the PLC data can be collected or updated, the CPU module operation can be monitored, and the status control of the CPU module can be performed in order to control and monitor the equipment on the PLC side using a Web browser.

● Utilizing the Web server

Access to the PLC using the Web function becomes possible by combining an Ethernet module and a Web server computer.

A system can easily be configured by utilizing a Web server.

(1) Complicated screens can be created.

The user can create multiple HTML files and HTML files of large sizes without being limited by the size of the Ethernet module memory by storing these HTML files in a Web server.

(2) Reducing the load on the Ethernet module

Since access programs for the PLC and control programs for Web browsers are executed in the Web server, the load on the Ethernet module can be minimized when accessing the PLC.

(3) Separating an Ethernet line

By separating the line connecting between the Ethernet module and the Web server, and the line between the Web server and the Web browser, the screen data for the Web browser will not be sent to the line connecting between the Ethernet module and the Web server. Therefore, it is possible to reduce effect on the transmission/reception of data for system control for communication between the Ethernet module and the external device.

■ Connecting GX Developer, GT SoftGOT and GOT

● Simplifying sequence programs using GX Developer

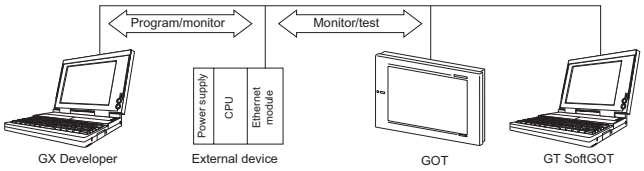
GX Developer supports the parameter setting function to perform the Ethernet module initialization and the open processing with external devices.

By setting up the following parameters with "network parameter settings" of GX Developer, access from the external device to the PLC is enabled. It can also significantly simplify sequence programs used to perform communication by Ethernet modules.

● Programming and monitoring function via the Ethernet

By establishing an Ethernet connection, programming and monitoring of PLCs can be performed using GX Developer, as well as monitoring and testing of PLCs can be performed using GOT or GT SoftGOT.

In either case, remote operations utilizing long-distance connection and high-speed communication of Ethernet become possible.



● Connecting multiple MELSOFT products (GX Developer, GT SoftGOT, and MX Component) or GOTs

This product can be connected with one or more MELSOFT product (GX Developer, GT SoftGOT, and MX Component) or GOT simultaneously via TCP/IP communication or UDP/IP communication. *1

(1) Connection via TCP/IP communication

- The Ethernet module side can connect up to 17 units of MELSOFT product via TCP/IP communication simultaneously by using one dedicated system connection and up to 16 user connections.
- If only one MELSOFT product is to be connected, the following settings using GX Developer are not required. If two or more MELSOFT product are to be connected, the following settings using GX Developer are required since user connections will be used.

(2) Connection via UDP/IP communication *2

By using one dedicated system connection, the Ethernet module side can connect MELSOFT product or GOT via UDP/IP communication.

*1: GT SoftGOT and GOT support UDP/IP communication only.

*2: It is possible to access other stations with the setting of station number ⟷ IP related information (Network No., Station No., and IP address) set by default (Automatic response method), if they are accessed from a MELSOFT product via the Ethernet module using the Communication with MELSECNET/H or MELSECNET/10 relay.

■ Remote password check function

(1) The remote password check function of the Ethernet module prevents improper access to the QCPU by users at a remote location.
The Ethernet module performs a remote password check with respect to data communication from the external device that uses the connection set as a parameter in the QCPU by setting a remote password for the QCPU using GX Developer.

(2) All the remote password checks during data communication from the external device to the local station or other stations are performed for the remote passwords set in the local station QCPU.

(3) When communicating data using the applicable connection for the remote password check, data communication from external device can be performed by the remote password unlocked (canceled) processing after completing open processing.
The user needs to perform the lock processing of the remote password before closing the connection.

■ Redundant system support function

● Backup of Ethernet communication

By mounting the Ethernet modules of function version D or later on the main base units of a redundant system, the Ethernet communication can be backed up.
If a failure or communication error occurs in the Ethernet module, the system can be switched between the control system and standby system to continue the communication of the Ethernet module.

● Issue of system switching request to control system CPU

When the Ethernet module mounted on the main base unit of the control system CPU in the redundant system detects a communication error or disconnection, it can issue a system switching request to the control system CPU.

● Access to redundant system

Communication using MC protocol or data link instruction enables data communication, such as read/write of device data and files, from/to the control system/standby system or system A/system B of the redundant system.

● Connection with OPS

The Ethernet module can communicate with the OPS using the user connection for OPS connection.
Set the user connection for OPS connection in the open setting of GX Developer.

Dedicated instruction list

The following table lists the dedicated instructions that can be used by the Ethernet module.

Application		Instruction name	Description
For opening and closing a connections		OPEN	Opens a connection.
		CLOSE	Closes a connection.
For reinitialization		UINI	Reinitializes the Ethernet module.
For fixed buffer communication		BUFRCV	Reads data received in the fixed buffer
		BUFRCVS	Reads data received in the fixed buffer using an interrupt program. *1
		BUFSND	Sends data to the external device using the fixed buffer.
For reading and clearing error information		ERRCLR	Clears the error (turns off the [COM. ERR] LED, clears the error log).
		ERRRD	Reads error information.
For sending and receiving e-mail		MRECV	Receives e-mail.*1
		MSEND	Sends e-mail.*1
For other station PLC communication (instructions for data link)	For reading/ writing device data	READ	Reads word devices of other stations.
		SREAD	Reads word devices of other stations (with complete device).*2
		WRITE	Writes to word devices of other stations.
		SWRITE	Writes to word devices of other stations (with complete device). *2
		ZNRD	Reads word devices of other stations.
		ZNWR	Writes word devices of other stations.
	For sending/ receiving messages (arbitrary data)	SEND	Sends data to other stations.
		RECV	Reads data received from other stations (for main program).
		RECVS	Reads data received from other stations (for interrupt programs).*1
	Reading/ writing clock data, remote RUN/ STOP	REQ	Runs/stops other stations in remote mode.
			Reads/writes the clock data of other stations.

*1: Basic model QCPUs of function version A is not applicable.
*2: Basic model QCPUs use the instructions as follows.
• SREAD: The same processing as READ instructions.
• SWRITE: The same processing as WRITE instructions.

Program compatibility

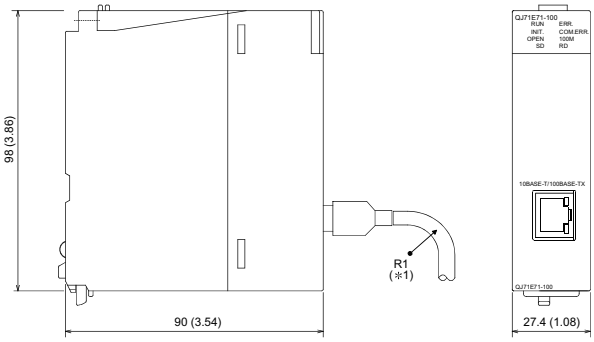
The sequence program of the system which uses the A series/ QnA series Ethernet interface module (e.g. A1SJ71E71N3-T, A1SJ71QE71N3-T, hereafter referred to as "E71") and the program of its host system can be utilized for the system using the QJ71E71.
The compatibility of an E71 program that uses the QJ71E71 for data communications is described below.

	Compatibility with Program for A Series Ethernet Module	Compatibility with Program for QnA Series Ethernet Module
Host system side program *1	Compatible However, only data in PLC is accessible in MC protocol.*7	Compatible*5,*6
PLC side program*1	Incompatible	Compatible*2,*3,*4

*1: In any of the above cases, performance and communication timing are incompatible. Communications is not possible by utilizing the unmodified program. Therefore, always check the program operation when utilizing the program.
*2: The QJ71E71 has no E2PROM. Delete any instances in the program to access the E2PROM.
*3: For the QJ71E71, it is not necessary to set in the program whether communications are possible or not during PLC CPU STOP (GX Developer parameters are used for setting). Delete the sequence program used for this setting.
*4: The LED ON status/switch setting status read from the buffer memory of the QJ71E71 are different from those of the AJ71QE71.
*5: When using the file transfer (FTP server) function, the default value of the FTP login name and FTP password specified on the external device side changes from "AJ71QE71" to "QJ71E71".
*6: For file access in the Q series CPU using MC protocol, create a new program since a new dedicated command will be used.
*7: Access can be made in the same range as that of the conventional A series CPU for read/write communications (MC protocol level 1) of data in the PLC CPU compatible with the conventional A series E71.

Appearance

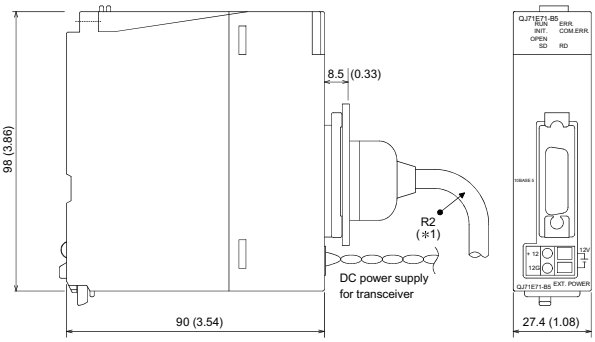
(1) QJ71E71-100



Unit: mm (in.)

*1: When connecting a twisted pair cable, set the bending radius near the connector (reference value: R1) as four times the cable's outside diameter or larger.

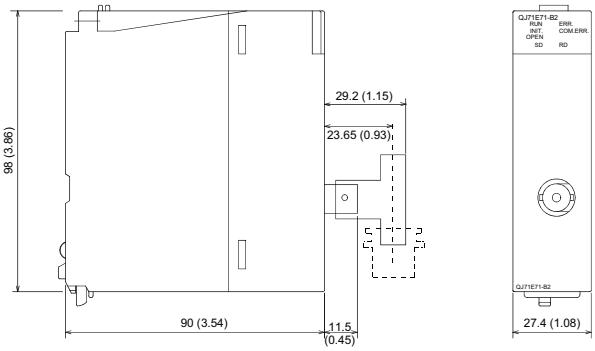
(2) QJ71E71-B5



Unit: mm (in.)

*1: When connecting an AUI cable, set the bending radius near the connector (reference value: R2) as four times the cable's outside diameter or larger.

(3) QJ71E71-B2



Unit: mm (in.)

Function list

Function			Description
Basic function	Communication by MC protocol	4E frame	Reads/writes PLC CPU data from an external device.
		QnA compatible 3E frame	
		A compatible 1E frame	
	Communication by fixed buffer	Procedure exists	Communicates any data between a PLC CPU and external device by using a fixed buffer on an Ethernet module.
		No procedure exists	
	Communication by random access buffer		Reads/writes data in a random access buffer on an Ethernet module from two or more external devices.
	Transmission/reception by e-mail		Sends/receives data by using e-mail. Transmission/reception by PLC CPU Transmission by PLC CPU monitoring function (automatic notification function)
	Communication by data link instruction		Reads/writes data of other station's PLC CPUs via Ethernet by using the data link instruction.
	File transfer (FTP server function)		Reads/writes files by using the FTP command from an external device Communication by Web function.
	Communication using the Web function		Reads/writes PLC CPU data via Internet by using a commercial Web browser.
Application function	MELSECNET/H, MELSECNET/10 relay communication		In a system containing Ethernet and MELSECNET/H or MELSECNET/10, or in a system relaying two or more Ethernets, this function communicates data via these networks.
	Router relay communication (router relay function)		Communicates data via a router or gateway. (The router relay function is not a function enabling Ethernet modules to operate as routers.)
	Alive check for external device (alive check function)		Checks if an external device is in normal operation after connection is established. (open processing)
	Communication by pairing open		Opens a receive and send connection together in a single pair. (for fixed buffer communication)
	Communication by auto-open UDP port		Enables communication after an Ethernet module mounted station is started up. (open and close processing by sequence program not needed)
	Remote password check		Prevents remote users from accessing a QCPU incorrectly.
	Broadcast transmission		Communicates data with all the modules in the system, which includes the Ethernet module, by using UDP/IP. (broadcast transmission)
	Connection to MELSOFT products and GOTs (GX Developer, MX Component, etc.)		Can be connected to MELSOFT products (GX Developer, MX Component, etc.) and GOTs by using TCP/IP or UDP/IP. Simultaneously connecting these products are available.
Check status	Self-loopback test		Checks communication function of Ethernet modules and connection status.
	Hardware test		Checks a RAM and ROM on an Ethernet module.
	Communication error storage		Stores up to 16 sets of error information (error history), each of which contains a sub header of the message, IP address of the external device, etc., when an error occurs.

● **Available functions**

The following table lists available functions when mounting an Ethernet module on CPUs and remote I/O stations.

Function		Basic model QCPU	When mounting on redundant CPU main base module	When mounting on MELSECNET/H remote I/O station
Initial processing	Sequence program	○	○	×
	GX Developer network parameter setting	○	○	○
Open/close processing	Sequence program	○	○	×
	GX Developer network parameter setting	○	○	○
Communication by MC protocol		○	△*4	○*1
Communication by fixed buffer		○	△*4	×
Communication by random access buffer		○	△*4	○
Transmission/reception by e-mail		○*2	△*4	×
Communication by data link instruction		△*3	△*4	× (Relay available)
File transfer (FTP server function)		○	△*4	×
Communication by Web function		○	○	×
MELSECNET/H, MELSECNET/10 relay communication		○	△*4	○
Router relay communication (router relay function)		○	○	○
Alive check for external device (alive check function)		○	○	○
Communication by pairing open		○	○	×
Communication by auto-open UDP port		○	○	○
Broadcast transmission		○	△*4	×
Compatible with QCPU remote password function		○*2	○	○*2
Ethernet parameter setting by GX Developer		○	○	○
Access to QCPU by GX Developer (TCP/IP or UDP/IP)		○	○	○

○:Available △:Available but limited ×:Not available

*1: Perform communication using QnA compatible 3E frame, 4E frame. Available functions are limited.
For details, refer to Ethernet Module User's Manual (Basic).

*2: Available module versions are limited.
For details, refer to the Etheret User's Manual (Basic).

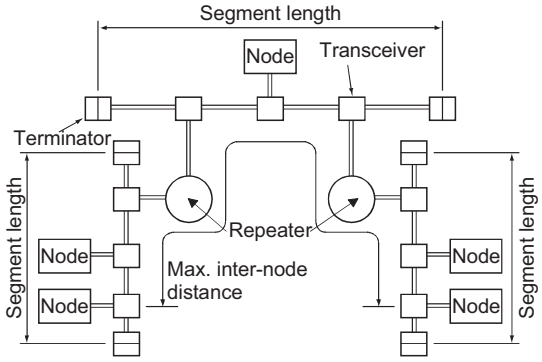
*3: When the target station of the SREAD/SWRITE instruction is the Q00J/Q00/Q01CPU, the read reporting device to the target station set to the argument (D3) is ignored.
Refer to the Ethernet Module User's Manual (Application) for details.

*4: There are the precautions for using the functions on the Q12PRH/Q25PRHCPU.
Refer to the Ethernet Module User's Manual (Basic) for details.

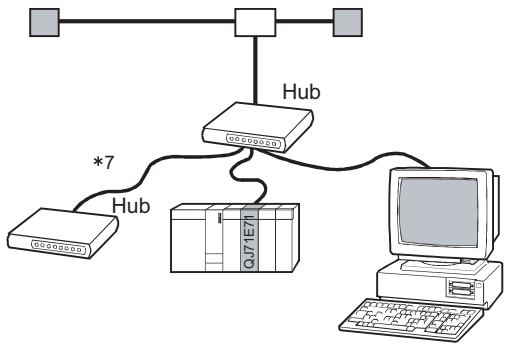
Performance specifications

Item			Specifications			
			QJ71E71-100		QJ71E71-B5	QJ71E71-B2
			100BASE-TX	10BASE-T	10BASE5	10BASE2
Transmission specifications	Data transmission speed (bps)		100Mbps	10Mbps		
	Communication mode		Full-duplex/half-duplex		Half-duplex	
	Transmission method		Base band			
	Max. inter-node distance (m (ft.))		---		2500m	925m
	Max. segment length (m (ft.))		100m*1		500m	185m
	Max. number of nodes / connection		Cascade connection of up to two levels	Cascade connection of up to four levels	100 units/segment	30 units/segment
	Min. node interval (m (ft.))		---		2.5 (8.2)	0.5 (1.64)
Send/receive data storage memory	Max number of simultaneously opened connections		16 connections (connections usable in sequence program)			
	Fixed buffer		1k word × 16 areas			
	Random accessing buffer		6k words × 1 area			
	Electronic mail	attached file	6k words × 1 area*2			
		text	960k words × 1 area*2			
Max. number of data per communication	MC protocol communication		960 words			
	Fixed buffer communication		1k words			
	Random buffer communication		6k words			
	Data send/receive instructions		960 words *3 (RECVS, RECV, READ, SREAD, SEND, WRITE, SWRITE instructions)			
	Data send/receive instructions		230 words	Read from Q/QnACPU :230 words (ZNRD, ZNWR instructions) Read from other than Q/QnACPU: 32 words (ZNRD, ZNWR instructions)s		
Protection degree			IP2X			
Online module change			Disable			
Multiple CPU system			Compatible*4			
Number of I/O signals occupied			32 points (I/O assignment: Intelligent)			
5VDC internal current consumption			0.50A			0.60A*5
12VDC external supply power capacity (transceiver)			---		*6	---
External dimensions			98(H)×27.4(W)×90(D)[mm]			
Weight			0.11kg		0.12kg	0.13kg*5

10BASE5,10BASE2



10BASE-T,100BASE-TX



*1: Length between hub and node.

*2: The following indicates the specifications of the e-mail send/receive function.
The PLC CPU-based e-mail send/receive function and random access buffer-based communication function cannot be used together. Only either of the functions can be used. (The Ethernet module's PLC CPU monitor function-based e-mail send/receive function and random access buffer-based communication function can be used together.)

*3: Supported by the product with the first 5 digits of serial No. "07082" or later. 480 words for the product of serial No. "07082" or before.

*4: Compatible with function version B or later.

*5: The follwings are 5VDC internal current consumption and weight of products of which first 5 digits of serial No. are 05049 or before.
• 5VDC internal current consumption:0.70A
• Weight: 0.14kg

*6: Considering a voltage drop (max. 0.80V) in the module, use the one that satisfies the transceiver and AUI cable specifications.

*7: The cascade connection of hubs is up to four levels for 10BASE-T and up to two levels for 100BASE-TX.
Distinction between 10BASE-T and 100BASE-TX and between full-duplex/half-duplex communication modes is performed with Ethernet module corresponding to the hub.
For connecting to a hub which does not have the automatic negotiation function, set the hub side to half-duplex communication mode.

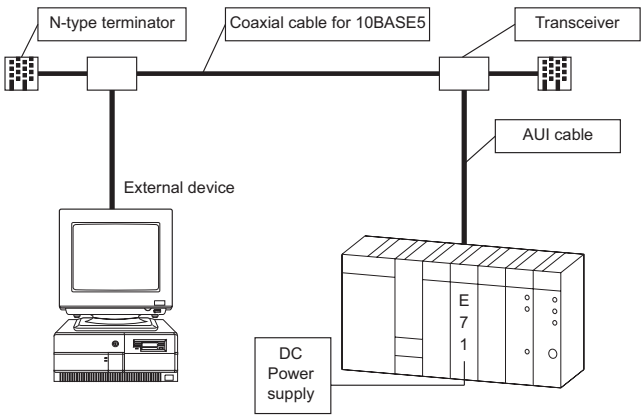
■ E-mail specifications

Item			Specification
Transmission specifications Transmission and reception data	Data size	Attached file	6 k words × 1
		Main text	960 words × 1
	Data transfer method		When sending: Sends either a file as attachment or main text (select one).
			When receiving: Received a file as attachment.
	Subject		Us-ASCII format or ISO-2022-JP (Base64)
	Attached file format		MIME format
	MIME		Version 1.0
	Data of attached file format		Binary/ASCII/CSV can be selected. File name: XXXX.bin (binary), XXXX.asc (ASCII), XXXX.csv (CSV) (CSV:Comma Separated Value)
	Division of attached file		Cannot be divided (only one file can be sent/received) • If any divided files are received, only the first file will be received and the remaining files will be discarded.
	When sending (encode)		Subject :Base64/7bit Main text :7bit Attached file :Base64
	When receiving (decode)		Subject :(Does not decode) Main text :(Cannot be received) Attached file :Base64/7bit/8bit/Quoted Printable • If e-mail is sent from the external device to the PLC side, specify the encoding method (Base64/ 7 bits/8 bits/Quoted Printable) of the attached file.
	Encryption		No
	Compression		No
	Communication with mail server		SMTP (sending server) Port number = 25 POP3 (receiving server) Port number = 110
	Operation check mailer		Microsoft® Corporation Internet Explorer5.0 (Outlook Express 5.5/Outlook Express 5) Netscape® Communications Corporation Netscape® 4.05

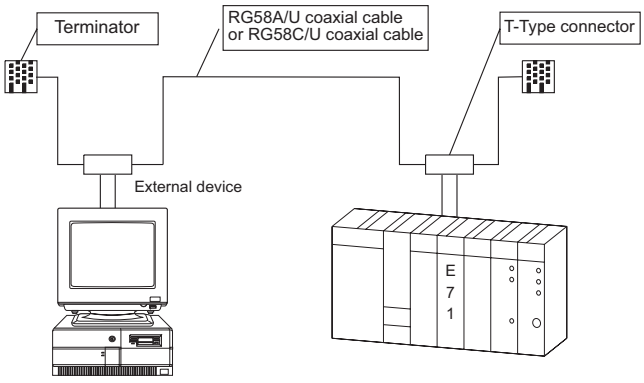
System configuration

The following shows devices necessary for configuring Ethernet system.

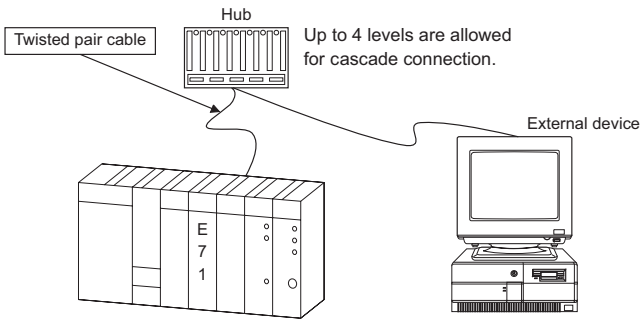
■ 10BASE5:QJ71E71-B5



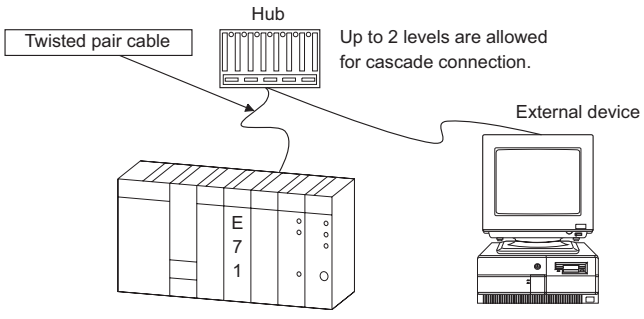
■ 10BASE2:QJ71E71-B2



■ 10BASE-T:QJ71E71-100



■ 100BASE-TX:QJ71E71-100



<QJ71E71-100,QJ71E71-B5,QJ71E71-B2 accessories>

Product	Description
Manual	Ethernet Interface Module User's Manual (Hardware)

<Separately obtained products>
The following equipment must be obtained separately.
(When 10BASE5 is connected)

Product	Description
Transceiver	Ethernet Standard-compliant product. Product where SQETEST (Signal Quality Error Test) or heartbeat will operate.
Coaxial cable	Ethernet Standard-compliant product
AUI cable	Ethernet Standard-compliant product
N type terminator	Ethernet Standard-compliant product
12VDC power supply	Power supply for transceiver

(When 10BASE2 is connected)

Product	Description
Coaxial cable	Ethernet Standard-compliant product. RG58A/U or RG58C/U (50Ω)
BNC type terminator	Ethernet Standard-compliant product (AMP INC. 221629-4 or equivalent)
T type connector	Ethernet Standard-compliant product (Hirose Electric's UG-274/U(1S) or equivalent)

(When 10BASE-T is connected)

Product	Description
Shielded/ unshielded twisted pair cable (STP/UTP cable)	Ethernet standard compliant product (straight cable) Category 3, 4, 5
Jack	Ethernet Standard-compliant product RJ45
Hub	Ethernet Standard-compliant product For 10BASE-T (For 10Mbps)

(When 100BASE-TX connected)

Product	Description
Shielded twisted pair cable (STP cable)	Ethernet standard compatible product (straight cable) Category 5
Jack	Ethernet Standard-compliant product RJ45
Hub	Ethernet Standard-compliant product For 100BASE-TX (For 100Mbps)

Purchase the following manual separately.

Product	Description
Manual	Ethernet Interface Module User's Manual (Basic)
	Ethernet Interface Module User's Manual (Application)
	Ethernet Interface Module User's Manual (Web Function)
	MELSEC Communication Protocol Reference Manual

■ Applicable systems

<Applicable modules and number of modules that can be mounted>
The following table lists the CPU module and network module (for remote I/O station) where the Ethernet module can be mounted and the number of modules that can be mounted.

Applicable module		Number of modules that can be mounted	Remark
CPU module	Q00JCPU Q00CPU Q01CPU	Maximum 1	*1
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 4	Can be mounted only in Q mode. *1
	Q12PHCPU Q25PHCPU	Maximum 4	*1
	Q12PRHCPU Q25PRHCPU	Maximum 4	*1,*4
Network module	QJ72LP25-25 QJ72LP25G QJ72BR15	Maximum 4	MELSECNET/H remote I/O station *2,*3 *2,*3

*1: Refer to the system configuration of each CPU system in Chapter 1.
*2: Refer to the system configuration of MELSECNET/H remote I/O network in Section 2.5.2.
*3: Use the Ethernet module of function version B or later.
*4: Use the Ethernet module of function version D or later.

<Applicable software packages>
(1) Software for PLC
The following table shows the systems and software packages applicable to the Ethernet module.
When using the Ethernet module, GX Developer is required.

		Software version*1
		GX Developer
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	
Q12PRH/ Q25PRHCPU	Redundant system	Version 8.17T or later
When installing to MELSECNET/H remote I/O station		Version 6 or later

*1: Refer to the Ethernet Module User's Manual (Basic) for the GX Developer versions that support the additional functions of the improved Ethernet module.

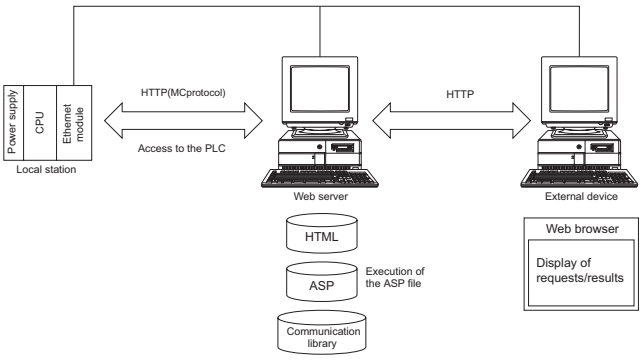
(2) Communication support tool for external devices

Item name	Model	Remark
MX Component	SWnD5C-ACT (-J)	Active X control library. The "n" in the model name is 0 or greater.*2

*2: Depending on the version of MX Component used, different versions of Ethernet modules are supported.
Refer to the manual of MX Component for the details.

<Communication by the Web function>
By setting up the free communication libraries below on the Web server, data communication with a PLC can be performed. Sample screens displayed by a Web browser are available.
•Mitsubishi Electric FA Network Service on World Wide Web (http://www.MitsubishiElectric.co.jp/melfansweb)
A Web server and a Web browser are required to use the Web function.

Basic operating systems	• Microsoft® Windows® 2000 Server Operating System
	• Microsoft® Windows® 2000 Professional Operating System
	• Microsoft® Windows NT® Server Network Operating System Version 4.0
	• Microsoft® Windows NT® Workstation Operating System Version 4.0
	• Microsoft® Windows® 98 Operating System
Web servers	• Microsoft® Internet Information Server 5.0
	• Microsoft® Internet Information Server 4.0
	• Microsoft® Peer Web Services 4.0
	• Microsoft® Personal Web Server 4.0
Web browsers	• Internet Explorer 4.0 or later(Microsoft® Corporation)
	• Netscape® Communicator 4.05 or later (Netscape® Communications Corporation)

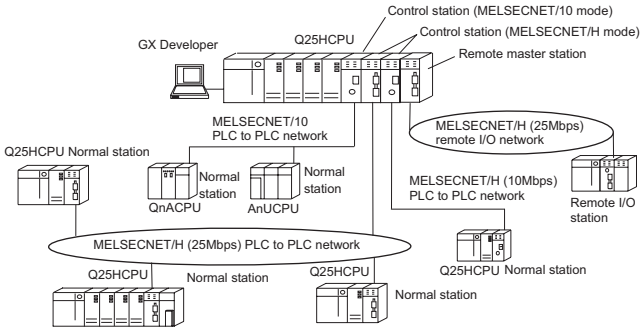


2.5 MELSECNET/H Network Module

2.5.1 MELSECNET/H PLC to PLC Network: QJ71LP21-25, QJ71LP21S-25, QJ71LP21G, QJ71BR11

Overview

For the MELSECNET/H network system, there are two types of network: the PLC to PLC network for communicating between control station and normal station and the remote I/O network for communicating between remote master station and remote I/O station.
The PLC to PLC network system of MELSECNET/H provides more functionality, higher processing speed and more capacity than the conventional PLC to PLC network system of MELSECNET/10 network system (hereinafter known as MESECNET/10.).
In addition, in pursuit of the maximum ease of use of the MELSECNET/10 network system, the FA system can be networked easily by combining with GX Developer.
The MELSECNET/H system supports the MELSECNET/H and MELSECNET/H Extended modes (high functionality and high-speed mode) and the MELSECNET/10 mode (functional and performance compatibility mode) to achieve the network performance improvement and upward compatibility of MELSECNET/10.



Features

The MELSECNET/H is designed to provide higher processing speed, more capacity, and more functionality while maintaining the connectivity with the MELSECNET/10; it is easier to use than ever in combination with GX Developer. Furthermore, the MELSECNET/H has the following features that were not available with the conventional MELSECNET (II) and MELSECNET/B data link systems.

■ Achievement of a high-speed communication system

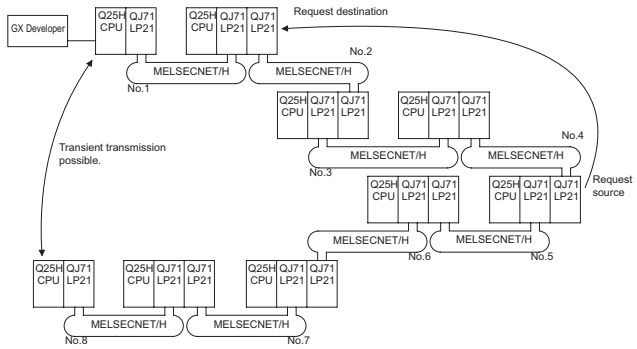
(1) The MELSECNET/H enables high-speed communications with 25Mbps and 10Mbps communication speeds (25Mbps for only the QJ71LP21-25 and QJ71LP21S-25 optical loop system.)
(2) The link scan time has become even faster through the use of processors specifically designed for linking.
(3) Refresh parameter area can be subdivided
by subdividing ranges with refresh parameters, refreshing of the areas not used for the sequence program can be eliminated and the refresh time can be reduced by refreshing only those required.
(4) The optical loop system enables even faster levels of data communication with multiplex transmission.

■ Large-scale and flexible system configuration

(1) The link device has a larger capacity: 16384 points for the link relay (LB) and 16384 points for the link register (LW).
(2) The maximum number of link points per station has been increased.
By selecting the network type, the maximum number of link points per station can be increased.
(a) MELSECNET/H Extended mode *1,*2
By selecting the MELSECNET/H Extended mode as the network type, the maximum number of link points per station can be set up to 35840 bytes in excess of 2000 bytes.
It is not necessary to install multiple network modules for a single CPU module to increase the number of transmission points.
(b) MELSECNET/H mode *2
By selecting the MELSECNET/H mode as the network type, the maximum number of link points per station can be set up to 2000 bytes.
Furthermore, by installing multiple network modules with the same network number for the same CPU module, the link points of "number of modules maximum number of link points per station" can be sent.
(Q02/Q02H/Q06H/Q12H/Q25H/Q12PH/Q25PH/Q12PRH/Q25PRHCPU only)

*1: The MELSECNET/H Extended mode is inapplicable to the Redundant CPU.
*2: The link scan time varies depending on the network type.

(3) The commands for transmitting and receiving data with other stations on the MELSECNET/H network system (SEND, RECV, RECVS, READ, SREAD, WRITE, SWRITE) enable a maximum of 960 words of data to be transmitted and received.
(4) A system can be expanded to contain a maximum of 239 networks.
(5) By using the inter-link data transfer function, data (LB/LW) can be transferred to another network without creating a sequence program. (Q02/Q02H/Q06H/Q12H/Q25H/Q12PH/Q25PH/Q12PRH/Q25PRHCPU only)
(6) By installing multiple network modules, N:N communication (transient transmission) with destination stations on eight network systems that use the PLCs as relay stations can be performed using the routing function.
Transient transmission can be performed using the routing function in a network system configured only with the MELSECNET/Hs as well as a network system that also contains the MELSECNET/10s.



Only the Q02/Q02H/Q06H/Q12H/Q25H/Q12PH/Q25PH/Q12PRH/Q25PRHCPU accepts multiple network modules.

(7) Either of the following systems can be chosen: the optical loop system (maximum total extension of 30 km (98430 ft.)) which has a long station-to-station distance and total distance, and is resistant to noise, or the coaxial bus system (maximum total extension of 500 m (1640.5 ft.) which can easy be wired.

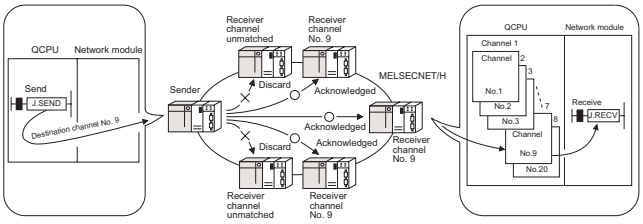
(8) The following functions facilitate network connection:

(a) Any station to be connected in the future can be specified as a reserved station.
Specifying a station not actually connected as a reserved station prevents a communication error.

(b) It is not necessary to connect stations in order of the station No. in the network.

■ Providing various communication services

(1) Transient transmission can be performed by designating a channel number (1 to 64) of the receiving station. This function allows to set (change) the channel numbers arbitrarily with the sequence programs and to perform transmission to multiple stations with the same channel number at one time.

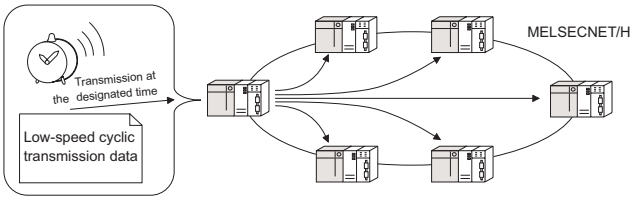


(2) By using the low-speed cyclic transmission function, it is possible to cyclically send data that does not require high-speed transmission in a batch mode, separately from the normal cyclic transmission (LB/LW). High-speed transmission can be achieved by efficiently dividing the data to transmit into data that requires high-speed transmission, which is sent by the normal cyclic transmission, and other data that is sent by low-speed cyclic transmission.
There are three types of transmission method depending on how the transmission is activated.

(a) "Transmission of data for one station in one link scan" (default)

(b) "Periodical cycle interval" which transmits in a set time cycle (h/min/s)

(c) System times" which transmits at the designated time (year/month/day/h/min/s)
(Q02/Q02H/Q06H/Q12H/Q25H/Q12PH/Q25PH/Q12PRH/Q25PRHCPU only)

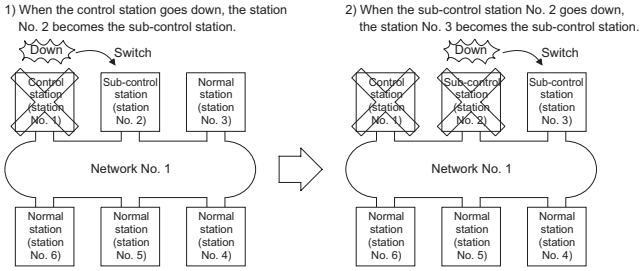


(3) The interrupt sequence program of the host's CPU module can be started up using the event issue function. This function reduces the response time of the system and process real-time data receiving.

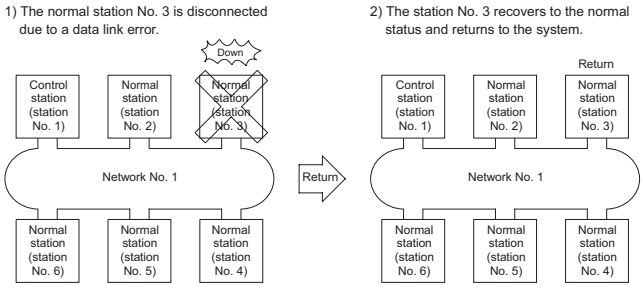
■ Expanded RAS functions

The RAS function stands for Reliability, Availability and Serviceability and refers to the overall easy use of the automated equipment.

(1) By using the control station switch function, if the control station of the network is down, a normal station is substituted for the control station, enabling to continue the network communication. function.

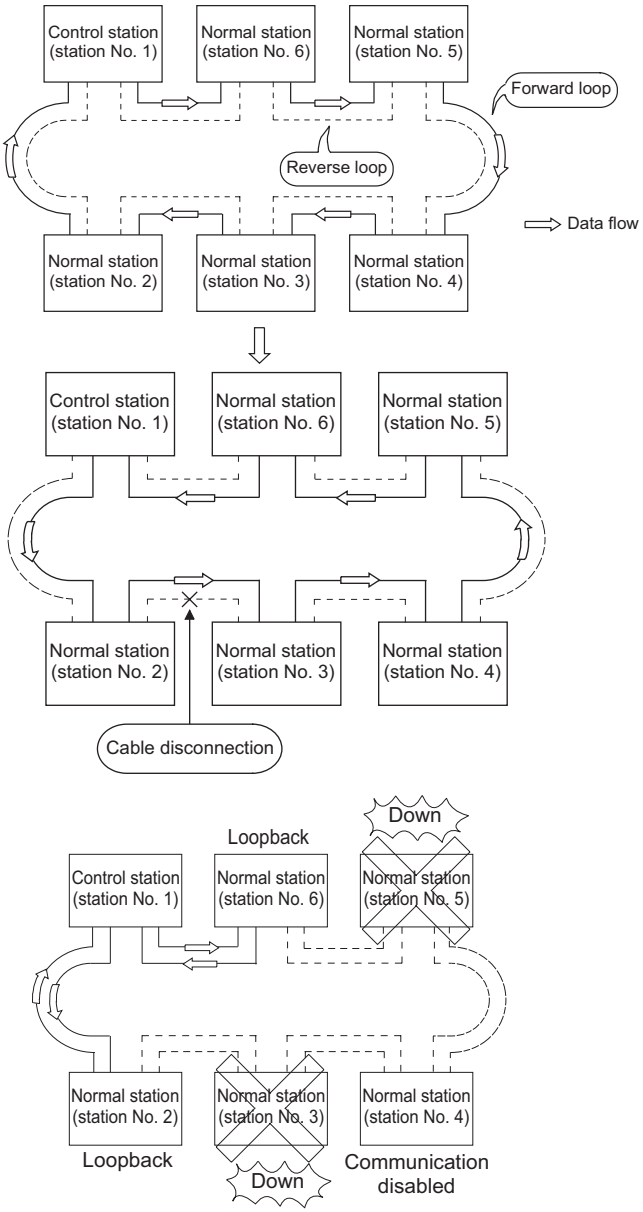


(2) When a faulty station recovers and can resume normal operation, it automatically returns to the network to resume the data communication using the automatic return function.

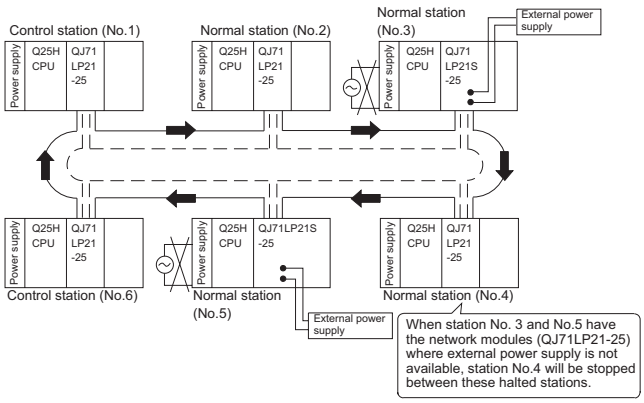


(3) The network stop time can be reduced because a control station that was down can return to the network as a normal station by means of the automatic return control.

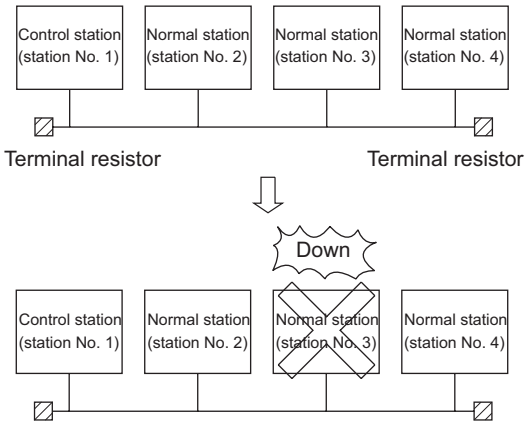
(4) By using the loopback function (the optical loop system), it is possible to continue data transmission among operational stations by disconnecting faulty areas such as a part of the network where there is a cable disconnection, a faulty station, etc.



(5) When two or more stations are faulty and halted in the loop system, stations between these faulty stations can continue the data link.
Because the loop back is prevented, the link scan time will be stabilized.
(The QJ71LP21S-25 is the network module where external power can be supplied.)



(6) By using the station detach function (coaxial bus system), even when some of the connected stations are down due to power off, etc., the normal communication can be continued among other operational stations.



(7) When an error occurs in a normal network due to disconnection, etc. the data link can be continued by switching to link data refresh on the standby network if two network modules, a regular module and a standby module, are installed for each PLC CPU (simple dual-structured network).
(Q02/Q02H/Q06H/Q12H/Q25H/Q12PH/Q25PHCPU only)

(8) The network module can continue the transient transmission even if an error that stops the CPU module while the system is operating occurs.

(9) It is possible to check the time when a transient error occurred.

Note) The following faults make the RAS functions valid.
- Break in cable
- Power-off of slave station
- Network setting error
- Fault detectable by self-diagnostics of CPU module

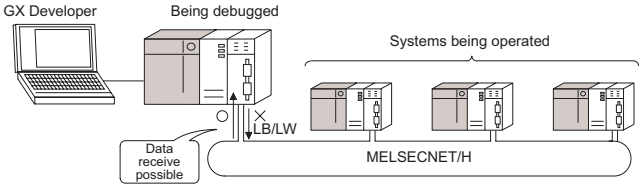
If the network module has become faulty, the RAS functions may not be activated depending on the fault.

■ Enhancement and compatibility of the network functions

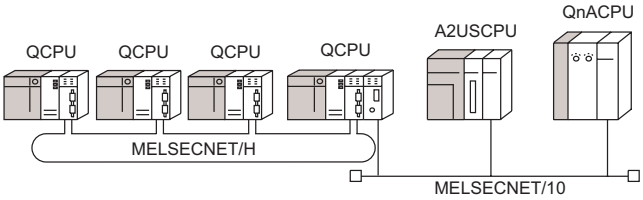
(1) Because of the 32-bit data guarantee, data with double word precision (32 bits) can be guaranteed without an interlock.

(2) Through the block guarantee of cyclic data per station, it is possible to manipulate multiple word data without interlocks.

(3) In the network debug mode, the network functions of user programs can be tested in the online environment without affecting systems being operated.



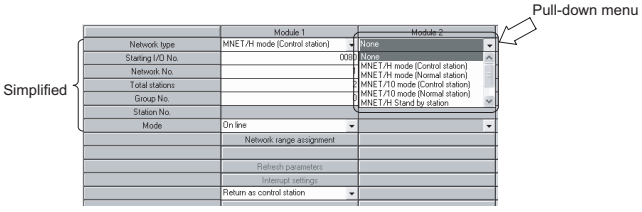
(4) By using the MELSECNET/10 mode (functional compatibility and performance compatibility mode), the MELSECNET/H can be used together with the conventional network modules to easily install a PLC network system.
To use the MELSECNET/H in the MELSECNET/10 mode (functional compatibility and performance compatibility mode), please see the QnA/Q4AR Corresponding MELSECNET/10 Network System Reference Manual.



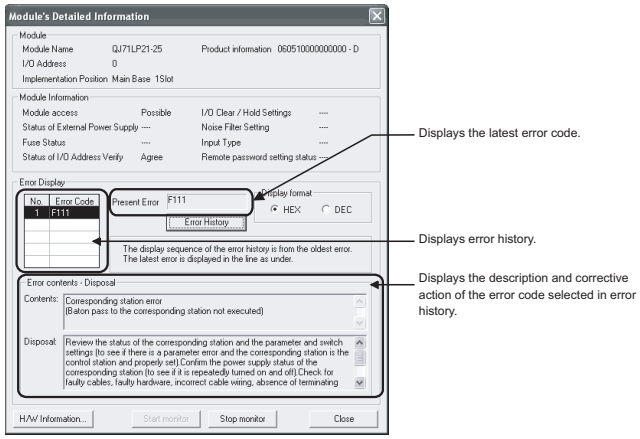
■ Increased ease of network configuration in combination with GX Developer

(1) The network parameters can easily be set by visualising pull-down menus, dialogue boxes, etc.

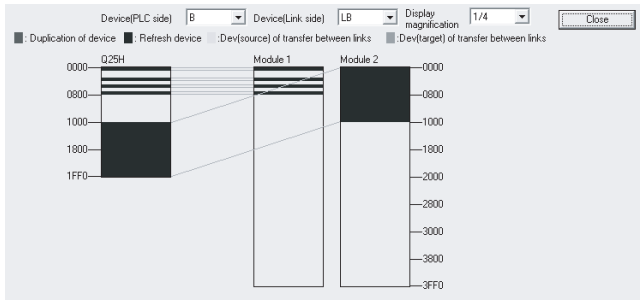
(2) The settings of network Nos., group numbers and operation modes have been simplified so that these values can be designated only through software settings.
(Network parameters)



(3) Troubleshooting process has been simplified through system monitoring.



(4) After assigning the refresh parameters and inter-link data transfer devices to a network system in which multiple network modules are installed, duplicate device settings can easily be checked with [Assignment image diagram].



■ Redundant system construction

● Network modules can be dualized.

A system containing a network module can be dualized (redundant system) by installing another network module and using redundant CPUs.
In case of an error in the control system CPU or a network module, the redundant system including double network modules switches the control system to the standby system, allowing system control and data linking to be continued on the standby system.

● Automatically issuing system switching request to the control system CPU

If failure of a network module mounted to the control system CPU of the redundant system or a data link error is detected, a system switching request will be automatically issued to the CPU.

● Transient transmission to redundant system is available.

By transient transmission using special link instructions or GX Developer, device data can be read from or written to the host system, control/standby system, or system A/B in the redundant system, and remote RUN/STOP can be executed.
When the redundant system is a target station, even if system switching occurs, the target can be followed by specifying the CPU type of the station to control or standby system.

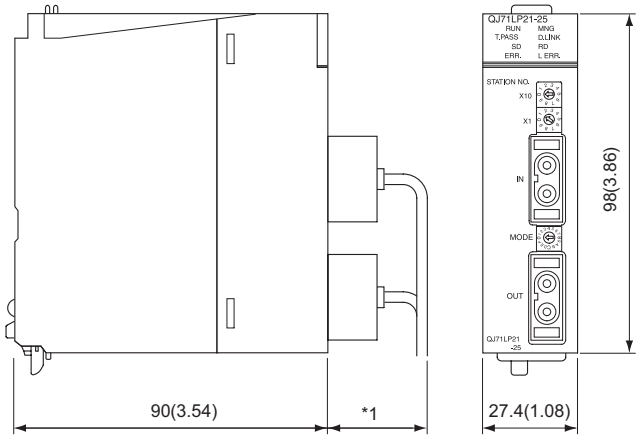
MELSECNET/H dedicated instructions

For the QJ71LP21-25, QJ71LP21G, QJ71LP21GE and QJ71BR11, the MELSECNET/H dedicated instructions listed below can be used to create programs for data transfer other than cyclic communication.

Instruction	Description	Target Station
SEND	Writes data to target station network module	Q mode QnA Q2AS
RECV RECVS	Reads data written by SEND instruction from network module. (RECVS is executed in interrupt program.)	
READ SREAD	Reads data to target station CPU module.	
WRITE SWRITE	Writes data to target station CPU module.	
REQ	Reads data from target station CPU module.	
ZNRD	Performs remote operation for target station CPU.	Q mode QnA Q2AS A mode AnU A2AS
ZNWR	Writes data to target station CPU module.	
RRUN	Remote run of target station CPU module	Q mode
RSTOP	Remote stop of target station CPU module	
RTMRD	Reads clock information from target station CPU module.	
RTMWR	Writes clock information to target station CPU module.	

Appearance

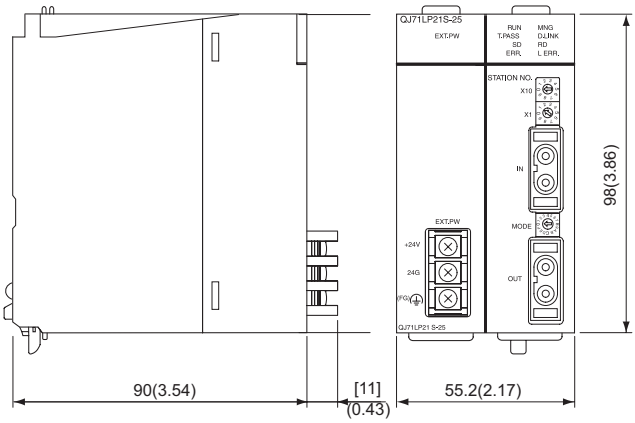
(1) QJ71LP21-25,QJ71LP21G



Unit: mm (inch)

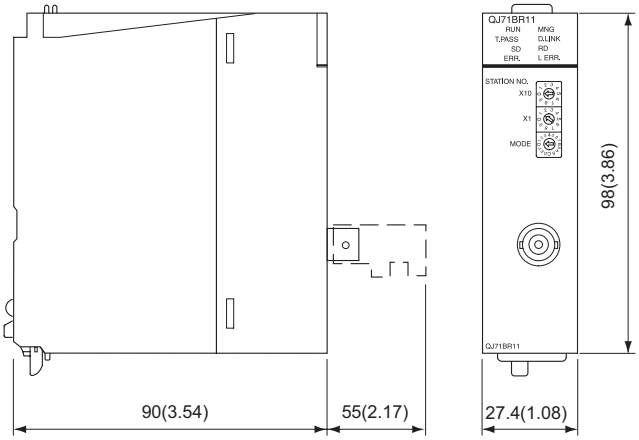
*1: Please contact your nearest Mitsubishi Electric representative for details.

(2) QJ71LP21S-25



Unit: mm (inch)

(3) QJ71BR11



Unit: mm (inch)

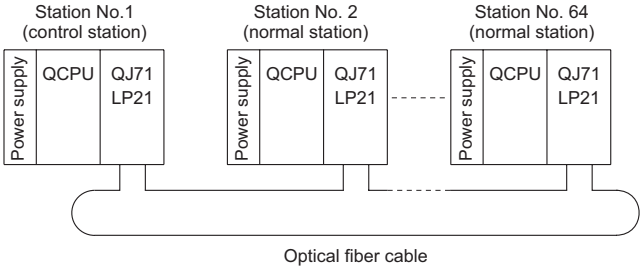
Configurable systems by MELSECNET/H

■ Single network system

A single network system is one system that connects the control station and the normal stations with an optical fiber cable or a coaxial cable.

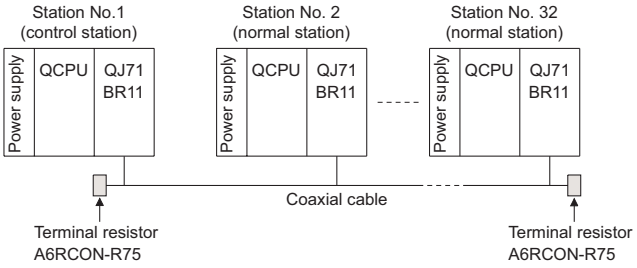
● Optical loop system

In the optical loop system, 1 control station and 63 normal stations (a total of 64 stations) can be connected. Any station number can be assigned as the control station. However, only one station can be set as the control station per system.
In the following sample system, station number 1 has been assigned as the control station.



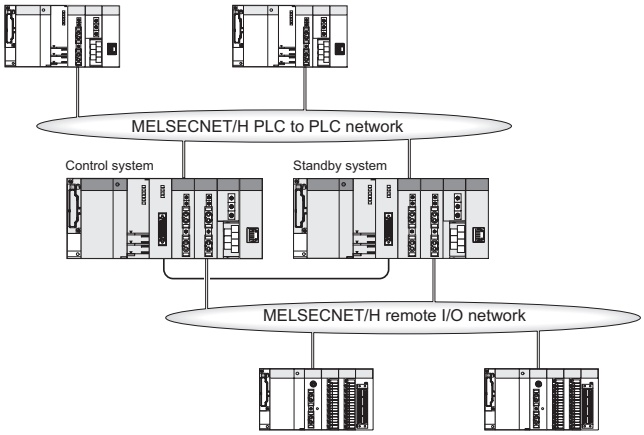
● Coaxial bus system

In the coaxial bus system, 1 control station and 31 normal stations (a total of 32 stations) can be connected. As in the optical loop system, any station number can be assigned as the control station. However, only 1 station can be assigned as the control station per system.



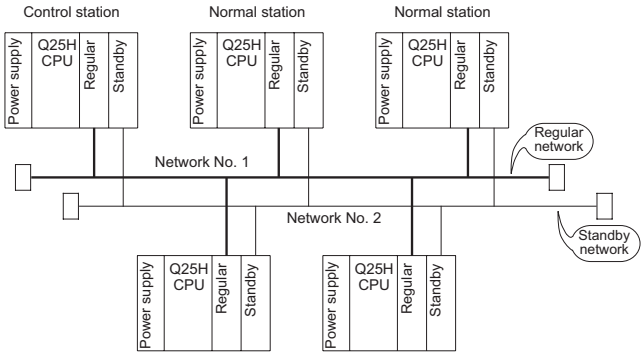
■ Redundant system (Q12PRHCPU and Q25PRHCPU only)

The redundant system refers to a system where a system including a network module is dualized by connecting another network module to another redundant CPU (redundant system). If failure of the control system CPU or a network module occurs, the redundant system switches the control system to the standby system, allowing system control and data linking to be continued on the standby system.



■ Simple dual-structured system (Q02/Q02H/ Q06H/Q12H/Q25H/Q12PH/Q25PHCPU only)

In a simple dual-structured system, "regular" and "standby" network modules are installed in each CPU module, so that if the regular network is down, the data link can still be continued by switching to the standby network through link data refresh.

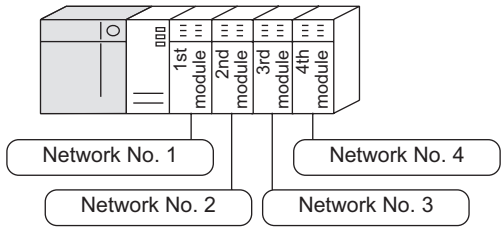


■ Multiple network system (Q02/Q02H/Q06H/ Q12H/Q25H/Q12PH/Q25PH/Q12PRH/ Q25PRHCPU only)

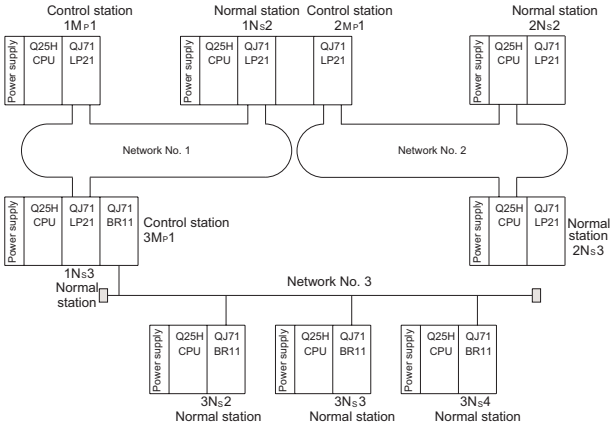
The multiple network system is a network system in which multiple networks are connected via relay stations.

(1) Duplicated setting of a network number is not allowed.
The network number can be freely set within a range from 1 to 239 unless the same number is used two or more times in a system.

(2) A maximum of 4 network modules can be installed per PLC.



The following example shows how three networks can be connected.



Comparison between MELSECNET/H and MELSECNET/10

		MELSECNET/H	MELSECNET/10			Remarks
Host PLC type		Q mode	Q mode	QnA/Q2AS	A mode,AnU/A2US	---
Applicable other station PLC type		Q mode MELSECNET/H board	Q mode, A mode, QnA/Q2AS, A/AnS, A70BD series MELSECNET/10 board			---
1Number of cyclic points per network	LX/LY (1Bit)	0 to 1FFF (8192 points)	0 to 1FFF (8192 points)			---
	LB (1Bit)	0 to 3FFF (16384 points)	0 to 1FFF (8192 points)			---
	LW (1 word)	0 to 3FFF (16384 points)	0 to 1FFF (8192 points)			---
Number of cyclic transmission points per station	Cyclic communications	[MELSECNET/H mode] 2000 bytes [MELSECNET/H extended mode] 35840 bytes	Max. 2000 bytes			Total of LY, LB and LW
	Low-speed cyclic	Max. 2000 bytes	No			
Transmission speed		10Mbps/25Mbps	10Mbps	10Mbps	10Mbps	---
Link scan time		Short	Normal	Normal	Normal	---
Cable	Optical SI/H-PCF/ broad-band H-PCF/ QSI	○	○	○	○	*2
	Optical GI	○	○	○	○	
	Coaxial (3C/5C-2V)	○ (simplex bus)	○ (simplex bus)	○ (simplex bus, duplex loop)		
Max. number of networks		239	239	239	255	---
Max. number of groups		32	9	9	9	---
Dedicated instructions	ZCOM	○	○	○	○	Check the details of the dedicated instructions in the relevant programming manual.
	REQ	○	○	○	×	
	ZNRD,ZNWR	○	○	○	○	
	READ,WRITE, SREAD,SWRITE	○	○	○	×	
	SEND,RECV	○	○	○	×	
	RRUN,RSTOP	○	○	×	×	
	RTMRD,RTMWR	○	○	×	×	
Routing function		*1,*3	*1,*3	*1,*3	*1	---
32-bit data split prevention function		Yes	Yes	No	No	---

*1: Accessible to the PLC on the network located beyond seven relay (gateway) PLCs which connect two MELSECNET/H, MELSECNET/10 or Ethernet networks. Note that the A mode does not have the Ethernet relay function.

*2: Some cables are not compatible with some CPU types. Check details in the corresponding catalog.

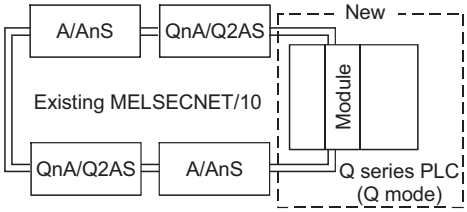
*3: When the MD function is used on the MELSECNET/H or MELSECNET/10 board to access another station, access via Ethernet cannot be made.

Connection with an existing network system

This section describes the compatibility of the Q series PLC (Q mode) for additional connection to an existing MELSECNET network.

Note) The compatibility specifications of the Q series PLC (A mode) with the existing network are different from those of the Q series PLC (Q mode). The Q series PLC (A mode) has the same network capability as that of the AnS and can be connected to all networks available with the AnS.

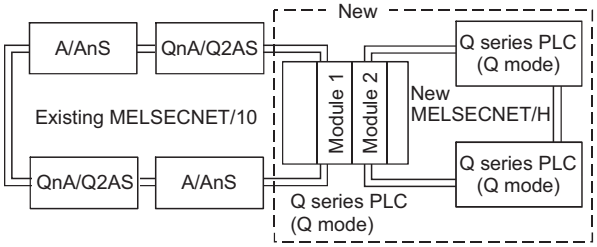
■ Connecting the Q series (Q mode) to the existing MELSECNET/10 (PLC to PLC network)



[Modules required for Q series PLC (Q mode)]
QJ71LP21(S)-25: For optical SI/QSI/H-PCF cable
QJ71LP21G: For optical GI cable
QJ71BR11: For coaxial 75Ω cable
[Instructions]
Use the QJ71LP21(S)-25, QJ71LP21G, QJ71BR11 in the MELSECNET/10 mode.

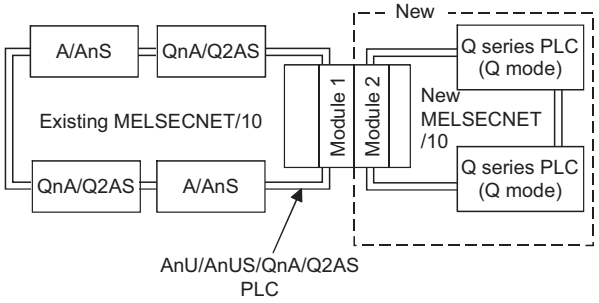
■ Connecting the existing MELSECNET/10 (PLC to PLC network) and new MELSECNET/H network

(Method 1)



[Modules required for relay PLC]
Module 1
QJ71LP21(S)-25: For optical SI/QSI/H-PCF cable
QJ71LP21G: For optical GI cable
QJ71BR11: For coaxial 75Ω cable
Module 2
QJ71LP21(S)-25: For optical SI/QSI/H-PCF cable
QJ71LP21G: For optical GI cable
QJ71BR11: For coaxial 75Ω cable
[Instructions]
Use module 1 in the MELSECNET/10 mode.
Module 2 may also be used in the MELSECNET/H mode.

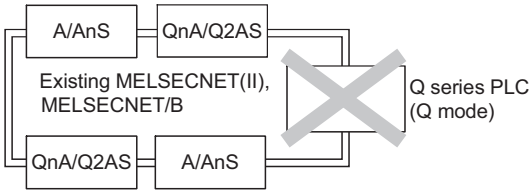
(Method 2)



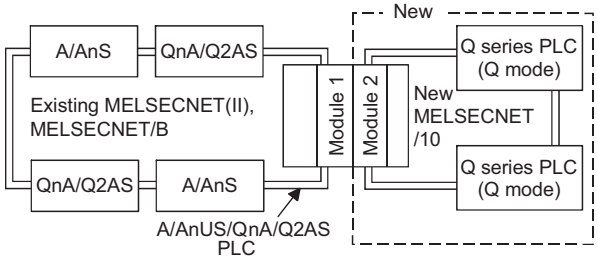
[Modules required for relay PLC]
Module 1 (existing module)
MELSECNET/10 module compatible with A/AnS/QnA/Q2AS
Module 2 (newly added module)
AJ71LP21, A1SJ71LP21, AJ71QLP21(S), A1SJ71QLP21 (S): For optical SI/QSI/H-PCF cable
AJ71LP21G, AJ71QLP21G: For optical GI calbe
AJ71BR11, A1SJ71BR11, AJ71QBR11, A1SJ71QBR11: For coaxial 75Ω cable
[Instructions]
Module 1 is the existing MELSECNET/10 module.
Module 2 is a MELSECNET/10 module for A/AnS/QnA/Q2AS.

■ Connecting the Q series PLC (Q mode) to an existing MELSECNETII or MELSECNET/B network

The Q series PLC (Q mode) cannot be connected to an existing MELSECNET(II) or MELSECNET/B network.



■ Connecting the existing MELSECNET (II) or MELSECNET/B network and new MELSECNET/10 network



[Modules required for relay PLC]
Module 1 (existing module)
MELSECNET (II) or MELSECNET/B module compatible with A/AnS/QnA/Q2AS
Module 2 (newly added module)
AJ71LP21, A1SJ71LP21, AJ71QLP21(S), A1SJ71QLP21 (S): For optical SI/QSI/H-PCF cable
AJ71LP21G, AJ71QLP21G: For optical GI calbe
AJ71BR11, A1SJ71BR11, AJ71QBR11, A1SJ71QBR11: For coaxial 75Ω cable
[Instructions]
Module 1 is the existing MELSECNET (II) or MELSECNET/B module.
Module 2 is an MELSECNET/10 module for A/AnS/QnA/Q2AS

Function list

	Function		Overview
Basic function	Cyclic transmission (Periodical transmission)		Performs communication between stations in the same network using link devices (LB/LW/LX/LY).
	RAS function	Auto return function	Automatically reconnects a station, which was disconnected from the data link due to data link error, to the data link after the station returns to a normal state.
		Management station change function	Keeps a data link established when a management station (a station for which common parameters are set.) is down, by substituting other normal station for a sub-management station.
		Management station return control function	Corrects the error on the management station and reconnects it to the data link as a normal station. This keeps the network working. The network settings provide the selection at return the management station.
		Loopback function (Optical loop system)	The optical loop systems have redundant transmission paths. This feature allows the network to disconnect erroneous stations from the network and continue communication between stations that are capable of data communication. To do this, switching transmission paths between forward loop and reverse loop, and loopback are performed.
		Preventing stations from powered down using external power supply (Optical loop system)	Prevents stations, which are powered down, from cutting power line to a normal station between them by avoiding loopback. This is enabled by directly supplying a power supply (24VDC) from outside to network modules. (QJ71LP21S-25 is the network module which feeds external power supply.)
		Station disconnection function (Coaxial bus system)	The coaxial system keeps the data link established between stations capable of communication when a connected station is turned off.
		Transient transmission available during CPU error	Network modules continue transient transmission even when a CPU module stops due to an error while the system is in operation. For the error description on the erroneous station, GX Developer allows another station to check it.
		Confirming detected time of transient transmission error	Able to confirm "time", "Error detected network No.", and "Error detected station No." when transient transmission ended abnormally.
		Diagnostic function	Checks line status of networks, module settings, etc.
Application function	Direct access of link device		Directly reads and writes link devices (LB,LW,LX,LY,SB,SW) with the sequence program on a network module, regardless of link refresh of a CPU module.
	Cyclic transmission (Periodical transmission)	Inter-data-link transfer function	Simultaneously transfers link data to several networks, which are connected to a single PLC.
		Low-speed cyclic transmission *1,*2	This function is suitable for transmitting data, which does not require fast transmission, to stations by using the cyclic device (LB/LW). The number of transmissions available is one time for a station during one link scan. To transmit from two or more stations simultaneously, it is necessary to take link scan time longer than the number of transmitting stations.
		32-bit data assurance	If a data link contains data type larger than 32 bits (2 words), in some timing of link refreshing, new data and old data may be mixed in 16 bits (1 word). To assure 32-bit data automatically, satisfy the condition and perform the parameter settings.
		Cyclic data block assurance on each station	Handshaking cyclic data allows block assurance on each station (prevent data separation on each station.).
	Transient transmission function		Performs communication only when requested between stations. The request includes the link dedicated instructions, GX Developer, intelligent function modules, etc. By using this function, stations can communicate data with not only stations belonging to the same network but also stations belonging to different networks.
		Routing function	Enables transient transmission to stations belonging to other networks.
		Group function	Categorizes target stations for transient transmission into groups and transmit data at once to all the station in the same group. Up to 32 groups can be made in a single network.
		Message transmitting function using logic channel No.	Allows stations to select massages they received. This is suitable for the case were there are many kinds of information.
	Time setting for stations on a network by GX Developer		GX Developer can set the "clock" on CPU modules on networks. It is available to specify all stations or a group to target stations so as to set the clock on two or more stations at once.
	Startup of interruption sequence program *3		This function uses the interruption setting parameters of the host station, and checks interruption conditions at data receiving from other stations. If the interruption conditions are met, this function allows a network module to request an interruption to a CPU module in order to start the interruption sequence program of its own CPU.
	Multiple transmission function (Optical loop system)		Enables high-speed communication by using duplex transmission path (forward loop and reverse loop) in optical loop systems.

(Continued on next page)

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	Function		Overview
Application function	Simple redundant network*2		By mounting two network modules, one of which is for operation and the other for stand-by, on each CPU module, it is possible to switch to the stand-by network refreshing link data and continues data link, when an error occurred on the operation network due to disconnection, etc. Both kinds of network modules are connected with a data link before an error occurrence.
	Network debug mode*1		Disables transmission of online station. The other stations recognize the online station as a normal station, and only cyclic data transmission is disabled. This function enables debugging with no influence on systems currently in operation when PLCs are extended, etc.
	Cyclic transmission stop/restart and link refresh stop (Network test)		GX Developer's "Network test" enables stopping/restarting cyclic transmission. This is suitable for the case where you do not wish to communicate data with other stations since the system is starting up (debugging).
	Transmission points increase by mounting two or more network modules sharing the same network No.		Up to 8000 bytes (4 modules mounted) of transmission points (up to 2000 bytes for one station) can be obtained by mounting two or more network modules, which have the same network No. on one CPU module.
	Redundant system function	Pairing settings	A single redundant system consists of control system and stand-by system. The pairing settings are necessary to make network modules recognize which stations are making a pair of a control system and stand-by system (which stations consist of the redundant system).
		Redundant settings	Sets an operating mode for network modules connected to B system. Mode selection in this parameter becomes valid, if the mode setting switch of network modules, which is connected to B system, is online (0 or 4).
		System change request function	Automatically issues the system change request to the control system CPU in the redundant system when the data link status, which is indicated by a network module on the control CPU, changes from normal to error (D.LINK LED turns off.).
	Network diagnostic (line monitoring)		Provided by GX Developer and checks the status of MELSECNET/H. At error occurrences, this function finds the erroneous station by using the own station information, other station information and error history monitoring function.

*1: Not available for MELSECNET/10 mode.
*2: Not available for basic model QCPUs.
*3: Not available for basic model QCPUs of function version A.

Performance specifications

Item		Optical loop system			Coaxial bus system
		QJ71LP21-25	QJ71LP21S-25	QJ71LP21G	QJ71BR11
Max. number of link points per network	LX/LY	8192 points (8k bits)			
	LB	MELSECNET/H mode:16384 points (16k bits), MELSECNET/10 mode:8192 points (8k bits)			
	LW	MELSECNET/H mode:16384 points (16k words), MELSECNET/10 mode:8192 points (8k words)			
Max. number of link points per station*5		[MELSECNET/H mode,MELSECNET/10 mode] {(LY+LB)/8+(2×LW)}≦2000 bytes [MELSECNET/H extended mode] {(LY+LB)/8+(2×LW)}≦35840 bytes			
Transient transmission capacity		Max.1920 bytes/frame			
Transmission speed		25Mbps/10Mbps*1 (Change with MODE switchi)		10Mbps	10Mbps
Number of stations connected in one network		64 stations (1: control station, 63: normal station)			32 stations (control station: 1, normal station: 31)
Connection cable		Optical fiber cable (SI/H-PCF/Broad-band H-PCF/QSI)		Optical fiber cable(GI)	Coaxial cable (3C-2V/5C-2V)
Overall distance		30km (98360.67ft.)			3C-2V:300m 5C-2V:500m
Station to station distance	At 25Mbps	SI cable :200m*2 H-PCF cable :400m Broad-band H-PCF cable:1km QSI cable :1km		---	---
	At 10Mbps	SI cable :500m*2 H-PCF cable :1km Broad-band H-PCF cable:1km QSI cable :1km		GI cable:2km	3C-2V:300m 5C-2V:500m *3
Distance extension repeater		---			Up to 2.5km (8196.92ft.) by using repeater modules (A6BR10, A6BR10-DC) (Max. four connection)
Max. number of networks		239 (Total including remote I/O network)			
Max. number of groups		32(9 in MELSECNET/10 mode)			
Transmission path format		Duplex loop type			Simplex bus type
Communication method		Token ring			Token bus
Synchronous method		Frame synchronous			
Encoding method		NRZI code(Non Return to Zero Inverted)			Manchester
Transmission format		HDLC conformance(frame type)			
Error control system		CRC($V^{16}+V^{12}+V^{5}+1$) or retry due to time-over			
Protection degree		IP1XB			
RAS degree		• Loopback function upon abnormal detection and cable breakage (optical loop system only) • Diagnostic function of host link line check • Prevention of system down by switching the control station • Abnormal detection using link special relays and link special registers			
Transient transmission		• N:N communication (monitor, program upload/download, etc.) • Various send/receive instructions from sequence programs • Send function addressed to logical channel number of channel numbers 1 to 8			
Special cyclic transmission function		• Low-speed cyclic transmission function			
Online module change		Disable			
Multiple CPU system		Compatible*4			
Number of I/O points occupied		32 points 1 slot(I/O assignment: Intelligent)	48 points 2 slots(Default I/O assignment: Vacant 16 points+ Intelligent 32 points)	32 points 1 slot(I/O assignment: Intelligent)	
Internal current consumption (5VDC)		0.55A			0.75A
External Power Supply	Voltage	---	DC20.4 to DC31.2V	---	
	Current	---	0.20A	---	
	Suitable cable size	---	0.3 to 1.25mm^2	---	
	Suitable crimp terminal	---	R1.25-3	---	
External dimensions		98(H)×27.4(W)×90(D) mm	98(H)×55.2(W)×90(D) mm	98(H)×27.4(W)×90(D) mm	
Weight		0.11kg	0.20kg	0.11kg	

*1: 25Mbps for the MELSECNET/H mode only.

*2: For old optical fiber cables (A-2P-□), L type differs from H type in the distance between stations. For more information, refer to the reference manual.

*3: There are restrictions on the inter-station cable length depending on the number of connected stations. For more information, refer to the reference manual.

*4: Compatible with function version B or later.

*5: The number of LY points of the stations set in the I/O master station is the sum total of the LY points for output to all stations within the block.

Cyclic communications time

The following calculation expressions are used to find the normal values of cyclic communications time (transmission delay time) in the MELSECNET/H mode. (These are average values only therefore the time taken may become longer than the values given depending on the timing.)

MELSECNET/H mode PLC to PLC network

Transmission delay time T_{D1}

When non-redundant CPU receives

$T_{D1}=S_T+\alpha_T+(LS\times0.5)+(S_R+\alpha_R)\times1.5$[ms]

When redundant CPU receives

$T_{D1}=S_T+\alpha_T+(LS\times0.5)+(S_R+\alpha_R+T_r)\times1.5$[ms]

S_T : Sending side sequence program scan time

S_R : Receiving side sequence program scan time

α_T : Sending side link refresh time

α_R : Receiving side link refresh time

LS : Link scan time

T_r : Tracking transfer time

Max. link refresh time α_T, α_R

$\alpha_T, \alpha_R=KM1+KM2\times\{LB+LX+LY+SB+(LW\times16)+(SW\times16)\}/16+$(number of network modules-1)[ms]

LB : Total number of link relay LB points refreshed by that station

LW : Total number of link register LW points refreshed by that station

LX : Total number of link input LX points refreshed by that station

LY : Total number of link output LY points refreshed by that station

SB : Number of link special relays

SW : Number of link special registers

KM1,KM2:Constants

	Network Module Loaded in Main Base		Network Module Loaded in Extension Base	
	KM1	KM2($X10^{-3}$)	KM1	KM2($X10^{-3}$)
Q00JCPU	1.30	0.67	1.30	1.50
Q00CPU	1.10	0.66	1.10	1.44
Q01CPU	0.90	0.61	0.90	1.42
Q02CPU	0.30	0.48	0.30	1.20
Q02HCPU,Q06HCPU Q12HCPU,Q25HCPU Q12PHCPU,Q25PHCPU Q12PRHCPU,Q25PRHCPU	0.13	0.41	0.13	0.97

More time will be taken if the data refresh destination is a file register on the memory card or inter-data link transfer function is to be performed.

	MELSECNET/H mode PLC to PLC network
Link scan time LS	[MELSECNET/H mode] <Transmission speed:10Mbps> LS=KB+(0.45×total number of stations)+(LB+LY+LW×16)/8×0.001+(T×0.001)+(F×4)[ms] <Transmission speed:25Mbps> LS=KB+(0.40×total number of stations)+(LB+LY+LW×16)/8×0.0004+(T×0.0004)+(F×4)[ms] [MELSECNET/H extended mode] <Transmission speed:10Mbps> LS=KB+(0.45×SP)+(LB+LY+LW×16)/8×0.001+(T×0.001)+(F×4)[ms] <Transmission speed:25Mbps> LS=KB+(0.40×SP)+(LB+LY+LW×16)/8×0.0004+(T×0.0004)+(F×4)[ms] LB : Total number of link relay LB points of all stations on the network*2 LW : Total number of link register LW points of all stations on the network*2 LX : Total number of link input LX of all stations on the network*2 LY : Total number of link output LY points of all stations on the network*2 T : Total number of bytes transient-transmitted during one link scan*3 When transient transmission is made simultaneously from multiple stations during one link scan, this value is the total of data lengths of frames to be transferred. F : Number of returning stations (valid only when faulty stations exist). The number of returning stations indicates the number of stations which will return to network when faulty stations return to normal and reenter data link. KB : Constant

Total number of station	1 to 8	9 to 16	17 to 24	25 to 32	33 to 40	41 to 48	49 to 56	57 to 64
KB	4.0	4.5	4.9	5.3	5.7	6.2	6.6	7.0

$$SP=\sum_{i=1}^{n}\left(\frac{\text{Number of bytes sent by station No. (i)}}{2000}\right)^{*1}$$

n=Total number of stations
Number of bytes sent = {(LY + LB) / 8 + (2 x LW)}

ⓐ shows a calculation example with a setting example of ⓑ

ⓐSetting example

Station number	Transmission byte counts of each station
Station number1	8000bytes
Station number2	7800bytes
Station number3	0byte
Station number4	2000bytes

ⓑCalculation example of SP

$$SP=\frac{8000}{2000}+\frac{7800}{2000}+\frac{0}{2000}+\frac{2000}{2000}$$

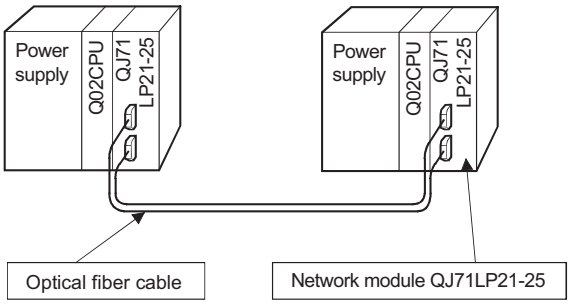
0 is handled as 1.
Number after decimal point is rounded up.

=4 + 4 + 1 + 1
=10

*1: Raised the decimals to a unit."1" in case of "0"
*2: From the beginning to the end of the device assigned with a common parameter (free areas in between are also included in the number of points).
*3: "0" when not used.

System equipment

■ Optical loop system



<QJ71LP21-25/QJ71LP21S-25/QJ71LP21G accessories>

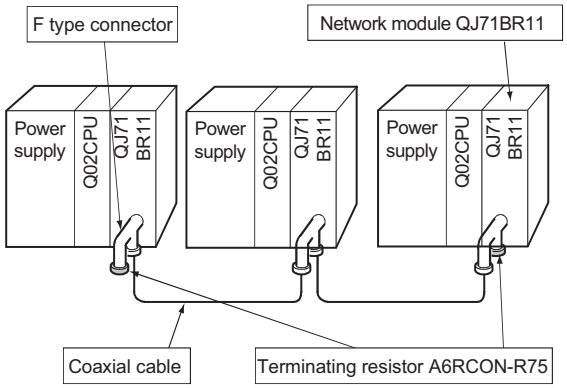
Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)

<Separately obtained products>

The following equipment (manual) must be obtained separately.

Product	Description
Optical cable	SI/H-PCF/broad-band H-PCF/QSI/GI cable
Manual	MELSECNET/H Reference Manual (PLC to PLC network)

■ Coaxial bus system



* Terminating resistors are fitted to stations at both ends.

<QJ71BR11 accessories>

Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)
Connector	F type BNC connector

<Separately obtained products>

The following equipment (manual) must be obtained separately.

Product	Description
Coaxial cable	3C-2V/5C-2V (JISC3501 compliant)
Connector plug	Connector plug for 3C-2V/5C-2V
Terminating resistor	A6RCON-R75 (75Ωterminating resist)
Manual	MELSECNET/H Reference Manual (PLC to PLC network)

■ Applicable Systems

<Applicable CPU modules and the number of mountable network modules>

The table below shows the CPU modules to which a network module can be mounted and the number of mountable network modules.

Applicable module		Number of mountable network modules	Remarks
CPU module	Q00JCPU Q00CPU Q01CPU	One only	*1,*3
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 4	Available only in Q mode. *1,*3
	Q12PHCPU Q25PHCPU	Up to 4	*1
	Q12PRHCPU Q25PRHCPU	Up to 4	*1,*2,*4

*1: Refer to the system configuration for each CPU system in Chapter 1.

*2: Use a network module of function version D or later.

*3: When using the MELSECNET/H Extended mode, use the network module with the first 5 digits of serial No. "06092" or later.

*4: The MELSECNET/H Extended mode cannot be used.

<Compatible software packages>

The systems using network modules and compatible software packages are shown in the table below.

Using a network module requires GX Developer.

(a) When MELSECNET/H mode or MELSECNET/10 mode is used

		Software version
		GX Developer
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	
Q12PRH/ Q25PRHCPU	Redundant system	Version 8.17T or later

(b) When MELSECNET/H Extended mode is used

		Software version
		GX Developer
Q00J/Q00/ Q01CPU	Single CPU system	Version 8.20W or later
	Multiple CPU system	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	
	Multiple CPU system	
Q12PH/ Q25PHCPU	Single CPU system	
	Multiple CPU system	

Applicable cable

■ Optical fiber cable specifications

This section explains the specifications of the optical fiber cables used with the MELSECNET/H optical loop system. Confirm that the cable in use conforms to the details of the optical fiber cable specifications.
The optical fiber cable and connector are specially-designed products. Optical fiber cables complete with connectors are sold my Mitsubishi Electric System Services Corp. (a catalogue on optical cables is available.)
These cables are also used for laying work, and details can be obtained from your nearest Mitsubishi Electric System Services Corp.

Optical fiber cable specifications

Item		SI (Multi-particulate glass)	H-PCF (Plastic-clad)	Broad-band H-PCF (Plastic-clad)	QSI (Quartz glass)	GI (Quartz glass)
Distance between stations	10Mbps	500m	1km	1km	1km	2km
	25Mbps	200m	400m	1km	1km	Must not be used
Transmission loss		12dB/km	6dB/km	5dB/km	5.5dB/km	3dB/km
Core diameter		200 μm	200 μm	200 μm	185 μm	50 μm
Clad diameter		220 μm	250 μm	250 μm	230 μm	125 μm
Primary membrane		250 μm	-	-	250 μm	-
Applicable connector		F06/F08 or equivalent (JIS C5975/5977 conformance)				

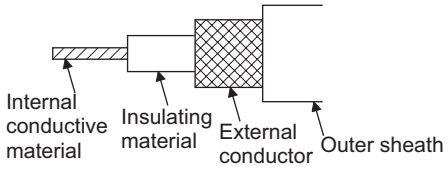
Note 1) When connecting an optical fiber cable, the following restrictions on the bending radius should be observed.
Please confirm bending radius of the cable with the cable used.

Note 2) Maintain the bending radius of the optical fiber cable within the allowable range using a tool for securing the optical fiber cable bending radius.
This tool may be purchased from Mitsubishi Electric System Service, Inc, or your nearest dealer. Please inquire for more information.

■ Coaxial cable specifications

The following table lists the specifications of the coaxial cables used for the coaxial bus system.
The high frequency coaxial cable "3C-2V" or "5C-2V" (conforms to JIS 3501) is used.

Coaxial cable specifications

Item	3C-2V	5C-2V
Structure		
Cable diameter	5.4 mm (0.21 in.)	7.4 mm (0.29 in.)
Minimum allowable bend radius	22 mm (0.87 in.) or more	30 mm (1.18 in.) or more
Internal conductor diameter	0.5 mm (0.02 in.) (annealed copper wire)	0.8 mm (0.03 in.) (annealed copper wire)
Insulating material diameter	3.1 mm (0.12 in.) (polyethylene)	4.9 mm (0.19 in.) (polyethylene)
External conductor diameter	3.8 mm (0.15 in.) (single annealed copper wire mesh)	5.6 mm (0.26 in.) (single annealed copper wire mesh)
Applicable connector plug	3C-2V connector plug (It is recommended to use BNC-P-3-Ni-CAU (manufactured by DDK Ltd.))	5C-2V connector plug (It is recommended to use BNC-P-5-Ni-CAU (manufactured by DDK Ltd.))

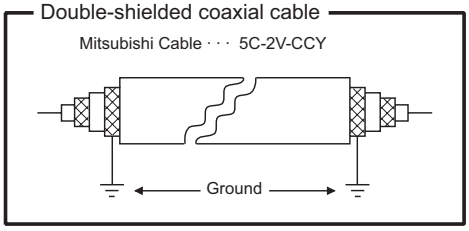
Note 1) Restrictions on the cable length between the stations
1) When connecting between the network modules, the cable lengths indicated in the table below should be used according to the number of stations connected.
A communication error may occur if a cable length other than the lengths indicated in the table is used.

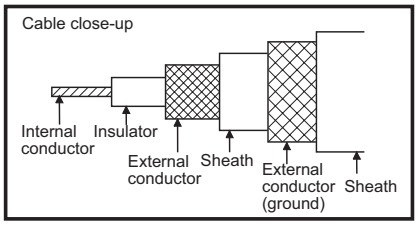
Number of connected stations / Cable length between stations	2 to 9 stations		10 to 33 stations	
Cable type	3C-2V	5C-2V	3C-2V	5C-2V
0 to 1 m (3.28 ft.)	×(cable less than 1m (3.28 ft.) in length cannot be used.)			
1 (3.28 ft.) to 5 m (16.4 ft.)	○	○	○	○
5 (16.4 ft.) to 13 m (42.65 ft.)	○	○	×	×
13 (42.65 ft.) to 17 m (55.78 ft.)	○	○	○	○
17 (55.78 ft.) to 25 m (175.63 ft.)	○	○	×	×
25 (175.63 ft.) to 300 m (98.43 ft.)	○	○	○	○
300 (98.43 ft.) to 500 m (1640.5 ft.)	×	○	×	○

○:Allowed ×:Not allowed

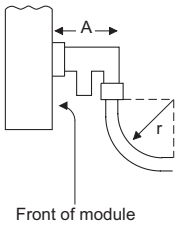
2) If there is a possibility of adding more stations to expand the existing system, the cables should be installed by considering restriction 1) mentioned above in advance.
3) When using a repeater module (models A6BR10 or A6BR10-DC), use the station-to-station cable length for "10 to 33" stations, regardless of the number of stations connected or the number of repeater modules.

Note 2) Cable installation precautions
1) Install the coaxial cables at least 100 mm (3.94 in.) away from other power cables and control cables.
2) Consider to use double-shielded coaxial cables in locations where there is excessive noise.





Note 3) When connecting a coaxial cable, the following restrictions on the bending radius must be observed.

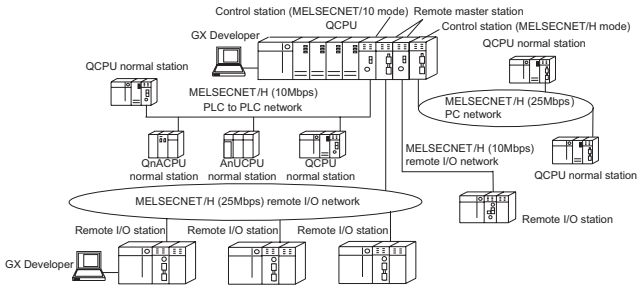


Cable type	Allowable bending radius r [mm (in.)]	Connector A [mm (in.)]
3C-2V	23	55
5C-2V	30	

2.5.2 MELSECNET/H remote I/O network: QJ71LP21-25, QJ71LP21S-25, QJ71LP21G, QJ71BR11, QJ72LP25-25, QJ72LP25G, QJ72BR15

Overview

For the MELSECNET/H network system, there are two types of network: the PLC to PLC network for communicating between control station and normal station and the remote I/O network for communicating between remote master station and remote I/O station.
The MELSECNET/H remote I/O network system (hereafter referred to as MELSECNET/H) has more functionality and capacity than the former network system, MELSECNET/10 network system (hereafter referred to as MELSECNET/10).
As the MELSECNET/H remote I/O network adopts the same module mounting method as the usual one (mounting I/O modules and intelligent function modules onto the main base unit/expansion base unit), each module mounted on the remote I/O stations can be handled in the similar way as the basic one. In addition, the applicability to the MELSECNET/10 remote I/O network has been further enhanced so that the FA system can be easily configured.



Features

The MELSECNET/H remote I/O network has the following features.

■ Achievement of a high-speed communication system

High-speed data sending at a communication rate of 10 Mbps/ 25 Mbps is possible.
(25Mbps is available for only the optical loop type QJ71LP21-25, QJ71LP21S-25 and QJ72LP25-25.)

■ Large-scale and flexible system configuration

(1) The link device has a larger capacity: 16384 points for the link relay (LB), 16384 points for the link register (LW), and 8192 points for the link input (LX)/link output (LY).

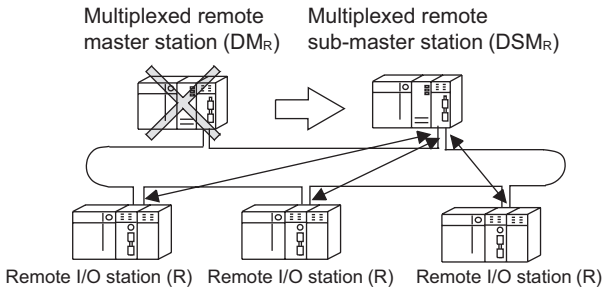
(2) A maximum of 4096 I/O points can be set for each remote I/O station.
The link points between a remote master station and a remote I/O station can be set up to 1600 bytes. The link points of up to 2000 bytes can be set between a master station and a sub-master station on a multiplexed remote I/O network.

(3) Either of the following systems can be chosen: the optical loop system (maximum total extension of 30 km (98430 ft.)) which has a long station-to-station distance and total distance, and is resistant to noise, or the coaxial bus system (maximum total extension of 500 m (1640.5 ft.) which can easy be wired.

(4) It is not necessary to designate reserved stations which are treated as stations to be connected in future or to connect stations in the order of station numbers.
The optical loop system executes a loopback when a station is down.
Because of these functions, connecting networks has become easier than ever.

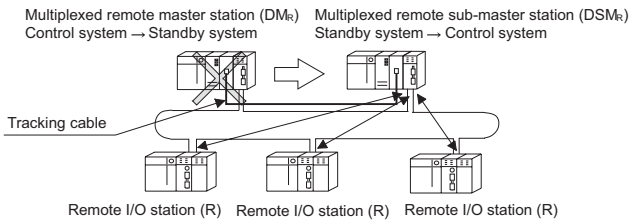
(5) The parameters can be written to remote I/O modules using GX Developer in the same way as to CPU modules.
The parameters of the remote I/O module can be used to change the detailed settings (response time, error output mode) for I/O modules on a remote I/O station, intelligent function module switch settings and I/O allocations, and remote password settings.

(6) Setting up a master station (DMR) and a sub-master station (DSMR) on the multiplexed remote I/O network allows the sub-master station to take over the control of remote I/O stations (R) in case of the master station's failure.(The QnPHCPU should be used for the multiplexed remote master station and sub-master station.)
By making a parameter setting, the multiplexed remote sub-master station can continue the control of the remote I/O stations even if the master station has recovered to normal and rejoined to the system. (Setting for the recovered master station to control the remote I/O stations is also available.)



(7) The redundant system uses the multiplex remote master function to control I/O modules and intelligent function modules. (The QnPRHCPU should be used in the redundant system.) If the multiplexed master station (control system) fails, the multiplex remote master function will switch the master station from "control system" to "standby system". At this time, the multiplexed remote sub-master station is switched from "standby" to "control", continuing the remote I/O control.
The sub-master station (control system) that is controlling the remote I/O stations will keep its control even if the

master station (standby system) has returned to normal status.

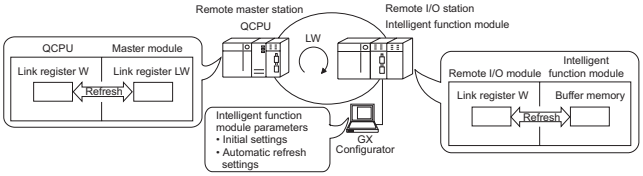


(8) A maximum of 7 extension base units can be connected to the remote I/O module (eight base units including the main base unit), allowing the installation of up to 64 modules. The maximum overall length of extension cables is 13.2m, ensuring a flexible layout of extension base units.

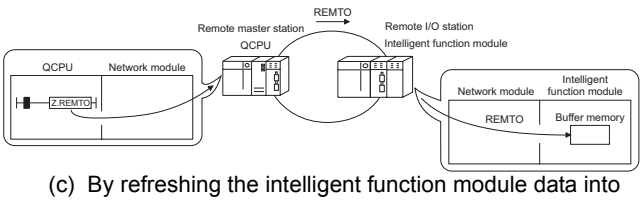
■ Providing versatile communication service

(1) Reading and writing of data for an intelligent function module that has been mounted to a remote I/O station can be easily performed.
There are four methods available for reading and writing.

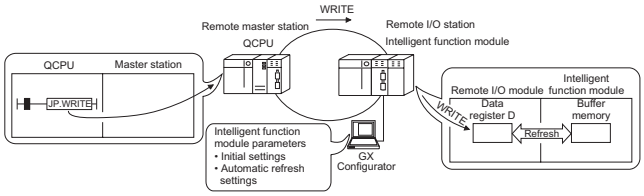
(a) Use GX Configurator to make the initial settings and automatic refresh settings in the intelligent function module parameters, and write them into the remote I/O module in the remote I/O station.
By refreshing the intelligent function module data to the link register W of the remote I/O module in the auto refresh settings, the remote master station can read/write refreshed data by cyclic transmission.



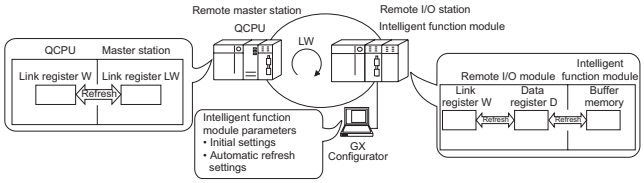
(b) Special link instructions can be used to directly read from or write to the buffer memory of the intelligent module.
- REMFR instruction: Reads data from the buffer memory of the remote I/O station intelligent function module.
- REMTO instruction: Writes data to the buffer memory of the remote I/O station intelligent function module.



(c) By refreshing the intelligent function module data into the remote I/O module's data register D by the automatic refresh setting of the intelligent function module parameters, the remote master station can read/write data from/to the data register D with READ or WRITE instruction.



(d) The automatic refresh setting of the intelligent function parameters enables the intelligent function module data to be refreshed into the remote I/O module's data register D. By refreshing the data register D to the link register W with the parameter of the remote I/O module, the remote master station can read/write the intelligent function module data by cyclic transmission. This method has the advantage that the intelligent function module parameters created for QCPU can be applied to the remote I/O module without making any modifications.

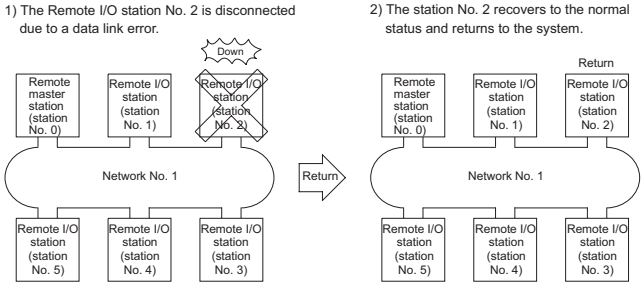


(2) The interrupt sequence program of the host's CPU module can be started up using the event issue function.
This function reduces the response time of the system and enables real-time data reception.

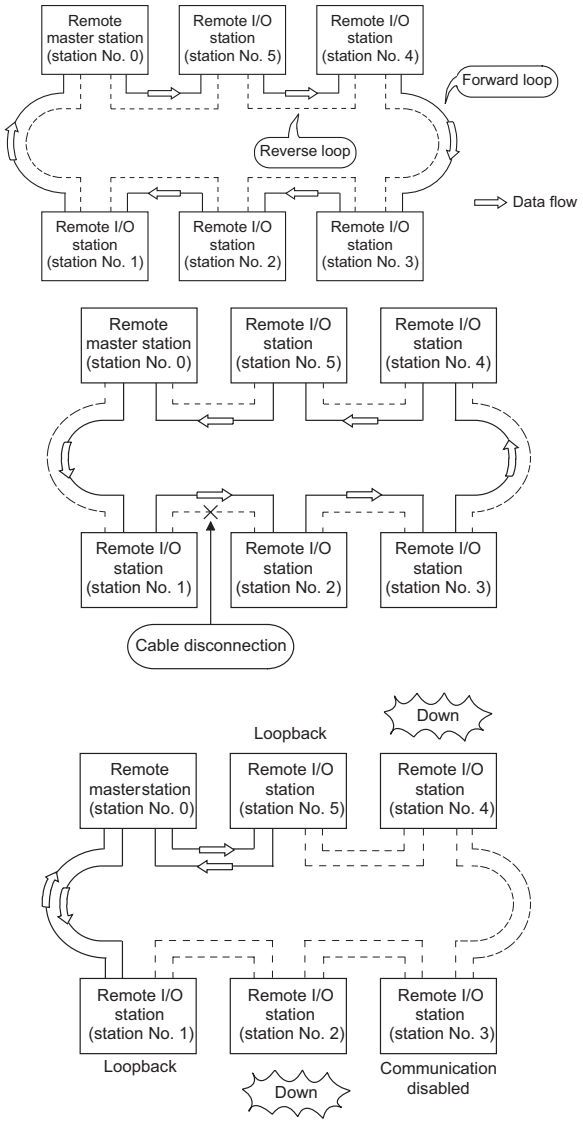
■ Enhanced RAS functions

RAS stands for "Reliability", "Availability" and "Serviceability" and is an automated facility for overall ease of use.

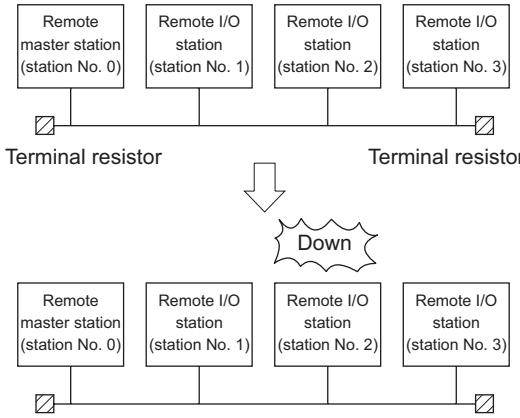
(1) When a faulty station recovers and can resume normal operation, it automatically returns to the network to resume the data communication using the automatic return function.



(2) By using the loopback function (the optical loop system), it is possible to continue data transmission among operational stations by disconnecting faulty areas such as a part of the network where there is a cable disconnection, a faulty station, etc.



(3) By using the station detach function (coaxial bus system), even when some of the connected stations are down due to power off, etc., the normal communication can be continued among other operational stations.



(4) The network module can continue the transient transmission even if an error that stops the CPU module while the system is operating.

(5) It is possible to check the time when a transient error occurred.

(6) By mounting 2 power supply modules on a remote I/O station, either of them can be replaced without powering off the station. (Redundant power supply on remote I/O station) The redundant power supply base unit is required for mounting 2 power supply modules.

(7) When an input module, an output module or an intelligent function module mounted on a remote I/O station fails, the faulty module can be replaced without stopping the system operation. (Online module change)

Online module change is available for Q series I/O modules and function version C or later analog-to-digital and digital-to-analog converter modules, temperature input modules and temperature control modules.

Note) The following faults make the RAS functions valid.
- Break in cable
- Power-off of slave station
- Network setting error
- Fault detectable by self-diagnostics of CPU module

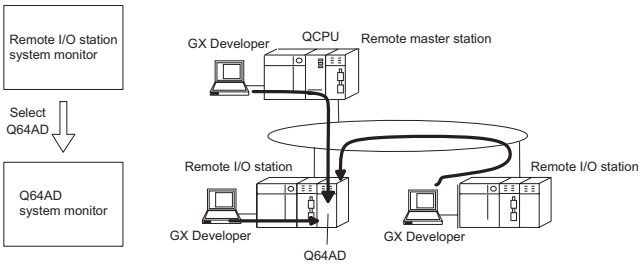
If the network module has become faulty, the RAS functions may not be activated depending on the fault.

■ Control of external connection to remote I/O stations

Setting a remote password for a remote I/O station restricts connections from the outside via an Ethernet interface module, serial communication module or modem interface module. (Remote password)

■ Strengthening network functions

(1) Intelligent function modules mounted to remote I/O stations can be diagnosed using the GX Developer system monitor. Intelligent function modules mounted to remote I/O stations can be diagnosed using the system monitor even if it is done via the network using a GX Developer connected to a remote master station or even if the GX Developer is directly connected to a remote I/O station.



When the network seems to be faulty, it can be diagnosed through GX Developer connected to the remote master station or remote I/O station.

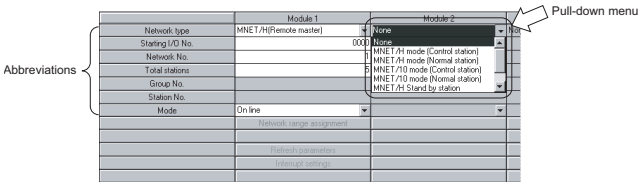
(2) If the GX Developer is connected to a remote I/O station, it will not affect the system operating so user program network function testing can be done online.
It shuts out input (X) from the input module on the remote I/O station and can turn input (X) on or off using the GX Developer test.
This allows testing of the remote master station input program to be performed.
In addition, it shuts of output (Y) form the remote master station and can turn remote I/O station output (Y) on and off using the GX Developer test.
This allows testing of the wires for the output module on the remote I/O station to be performed.

■ Increased ease of network configuration in combination with Q corresponding GX Developer

(1) The network parameters can easily be set by visualising pull-down menus, dialogue boxes, etc.

(2) The settings of network Nos., group numbers and operation modes have been simplified so that these values can be designated only through software settings.

(Network parameters)



MELSECNET/H dedicated instructions

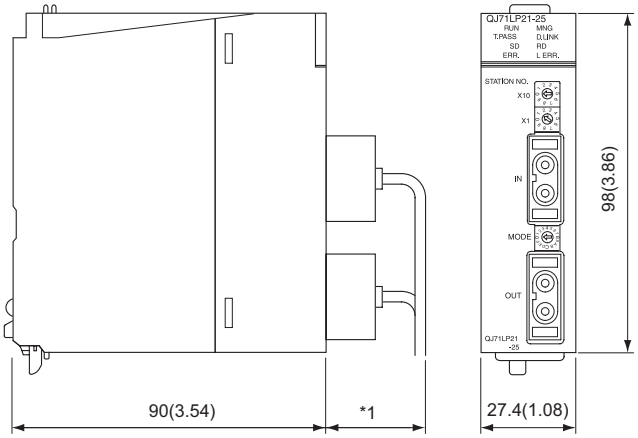
For the QJ71LP21-25, QJ71LP21G, QJ71LP21GE or QJ71BR11 remote master station and QJ72LP25-25, QJ72LP25G, QJ72LP25GE or QJ72BR15 remote I/O stations, the MELSECNET/H dedicated instructions listed below can be used to create programs for data transfer other than the cyclic communication.

Instruction	Description	Target Station
READ	Reads data from the target station CPU module or remote I/O module.	Remote I/O station Multiplexed remote master station Multiplexed remote sub master station
WRITE	Writes data to the target station CPU module or remote I/O module.	
REMFR	Reads data from the buffer memory of the target station intelligent function module.	Remote I/O station
REMTO	Writes data to the buffer memory of the target station intelligent function module.	
SEND	Writes data to the target station network module.	Multiplexed remote master station Multiplexed remote sub master station
RECV RECVS	Reads data written by the SEND instruction from the network module. (RECVS is executed in interrupt program.)	
SREAD	Reads data from the target station CPU module.	
SWRITE	Writes data to the target station CPU module.	
REQ	Performs remote operation for the target station CPU module.	
ZNRD	Reads data from the target station CPU module.	
ZNWR	Writes data to the target station CPU module.	
RRUN	Performs remote RUN of the target station CPU module.	
RSTOP	Performs remote STOP of the target station CPU module.	
RTMRD	Reads clock data from the target station CPU module.	
RTMWR	Writes clock data to the target station CPU module.	

Appearance

■ For remote master station

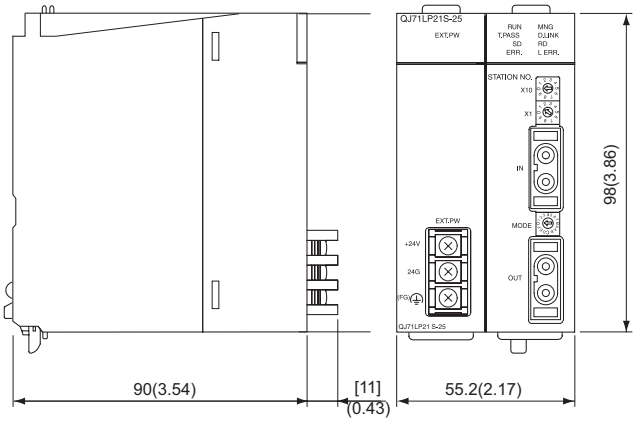
(1) QJ71LP21-25,QJ71LP21G



Unit: mm (inch)

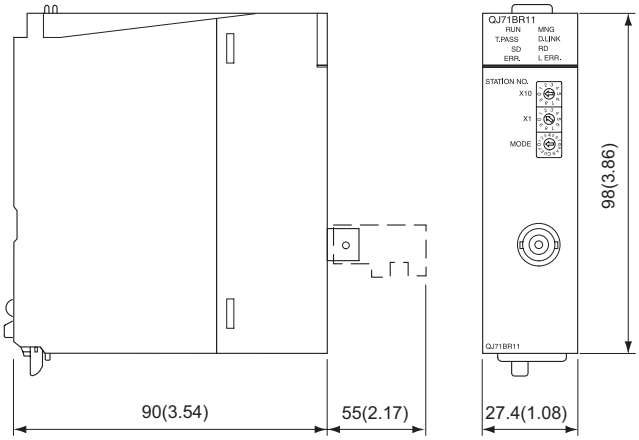
*1: Please contact your nearest Mitsubishi Electric representative for details.

(2) QJ71LP21S-25



Unit: mm (inch)

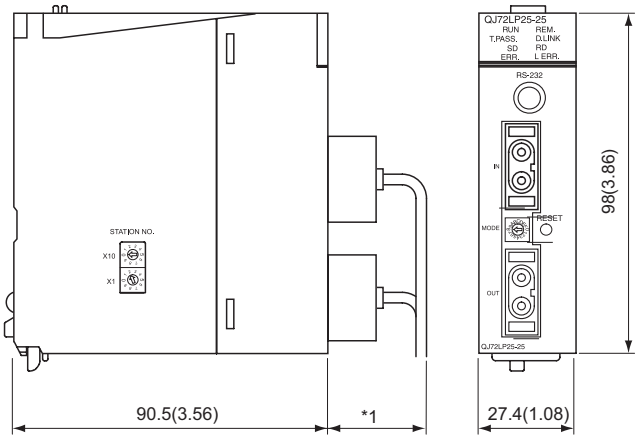
(3) QJ71BR11



Unit: mm (inch)

■ For remote I/O station

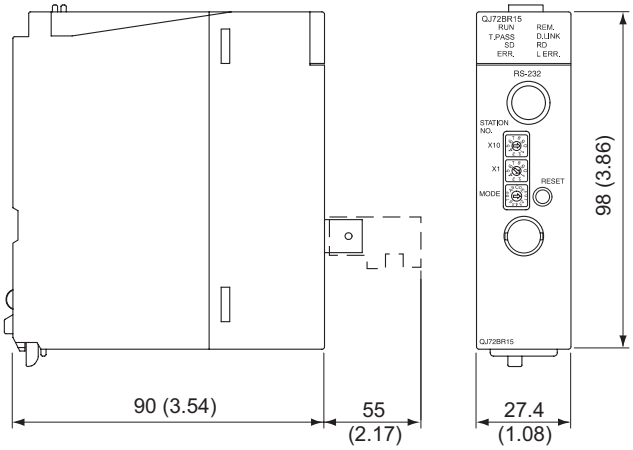
(1) QJ72LP25-25,QJ72LP25G



Unit: mm (inch)

*1: Please contact your nearest Mitsubishi Electric representative for details.

(2) QJ72BR15



Unit: mm (inch)

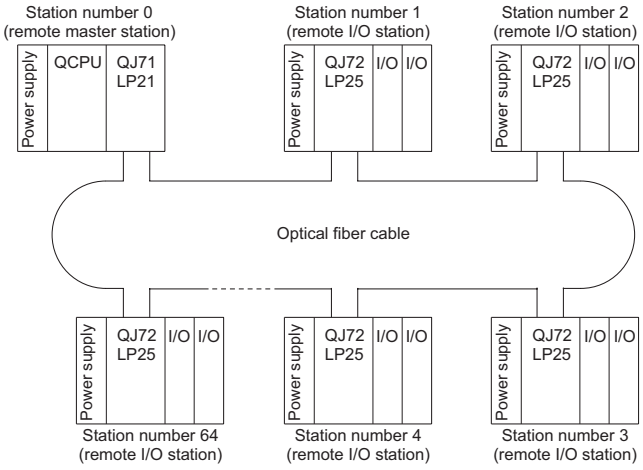
Configurable systems by remote I/O network

■ Single remote I/O networks

● Optical loop system

Up to 64 remote I/O modules can be connected to a remote master station.

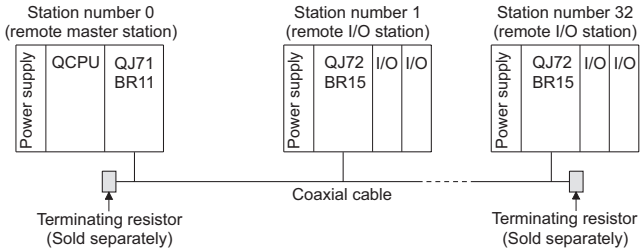
Always set the station number of the remote master station to 0.



● Coaxial cable bus system

Up to 32 remote I/O stations can be connected to a remote master station.

Always set the station number of the remote master station to 0.



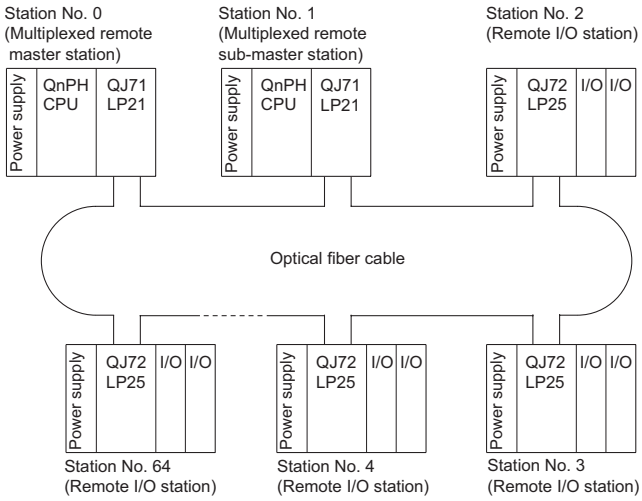
■ Multiple remote I/O network (QnPHCPU Only)

A multiplexed remote I/O network system includes a multiplexed remote master station and a multiplexed remote sub-master station. The multiplexed remote sub-master station takes control of remote I/O stations when the multiplexed remote master station fails.

Always assign station No. 0 to the multiplexed remote master station.

It is allowed to assign any of station number 1 to 64 to the multiplexed remote sub-master station, provided that the number does not overlap with that of remote I/O station.

63 remote I/O stations can be connected in an optical loop system, 31 stations in a coaxial bus system.



■ Multiplexed remote I/O network for redundant system (QnPRHCPU Only)

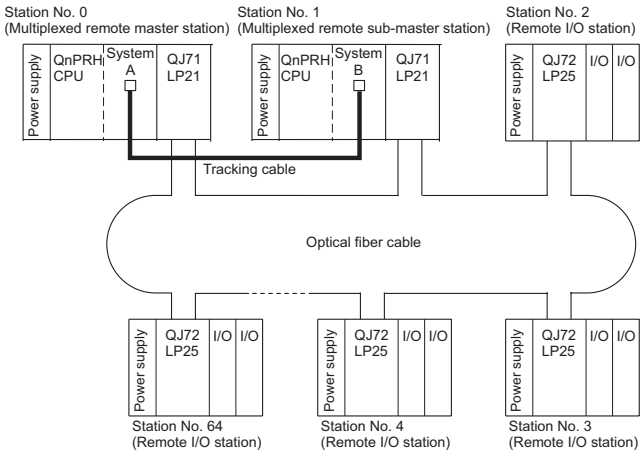
The redundant system including QnPRHCPU utilizes the multiplexed remote I/O network system in order to control I/O modules and intelligent function modules.

In the multiplexed remote I/O network system for the redundant system, the network module on the side of the control QnPRHCPU (started up as a control system) acts as a multiplexed remote master station and controls remote I/O stations, while the network module mounted on the side of the standby QnPRHCPU performs the sub-master operation as a multiplexed remote sub-master station.

When the control system CPU or the multiplexed remote master station goes down, the multiplexed remote sub-master station switches from "standby" to "control" and takes over the control of the remote I/O stations.Make sure to assign No.0 to the network module mounted on the system A, i.e., the system to which the system A connector of tracking cable is connected within the redundant system.

For station No. of the multiplexed remote sub-master station, set any of No. 1 to 64, which should not be overlapped with any of remote I/O stations.

The number of remote I/O stations connectable to a multiplexed remote I/O network for the redundant system is 63 in the optical loop system and 31 in the coaxial bus system.



Comparison between MELSECNET/H and MELSECNET/10 remote I/O networks

			MELSECNET/H	MELSECNET/10	MELSECNET/10	Remarks
Host station PLC type			Q mode	QnA/Q2AS	A mode, AnU/A2US	----
Applicable remote I/O station PLC type			MELSECNET/H remote I/O module	MELSECNET/10 remote I/O module		----
Number of cyclic points per network		LX/LY(1 Bit)	0 to 1FFF (8192 points)	0 to 1FFF (8192 points)		----
		LB(1 Bit)	0 to 3FFF (16384 points)	0 to 1FFF (8192 points)		----
		LW(1 word)	0 to 3FFF (16384 points)	0 to 1FFF (8192 points)		----
Number of cyclic transmission points per station	Remote master station to remote I/O station		Max. 1600 bytes	Max. 1600 bytes		Total of LY, LB and LW
	Remote I/O station to remote master station		Max. 1600 bytes	Max. 1600 bytes		
	Multiplexed remote master to multiplexed remote sub master		Max. 2000 bytes *2	Max. 2000 bytes		
	Multiplexed remote sub master to multiplexed remote master		Max. 2000 bytes *2	Max. 2000 bytes		
Max. number of I/O points per remote I/O station			X+Y≦4096 points	AJ72QLP25/AJ72QBR15:X+Y≦2048 points A1SJ72QLP25/A1SJ72QBR15:X+Y≦1024 points		----
Transmission speed			10Mbps/25Mbps	10Mbps	10Mbps	----
Link scan time			Short	Normal	Normal	----
Cable	Optical SI/H-PCF/broad-band H-PCF/ QSI		○	○	○	*3
	Optical GI		○	○	○	
	Coaxial (3C/5C-2V)		○(simplex bus)	○(simplex bus, duplex loop))		
Max. number of networks			239	239	255	----
Dedicated instructions	ZCOM		○	○	○	Check the details of the dedicated instructions in the relevant programming manual.
	ZNRD,ZNWR		○*2	○	○	
	READ,WRITE		○	○	×	
	SREAD,SWRITE		○	○	×	
	SEND,RECV		○*2	○	×	
	ZNFR,ZNTO		×	○	○	
	REMFR,REMTO		○	×	×	
	REQ		○*2	○	×	
	RECVS		○*2	×	×	
	RRUN,RSTOP		○*2	×	×	
	RTMRD,RTMWR		○*2	×	×	
Routing function			*1	*1	*1	----
Multi-master function			Yes*2	Yes	No	----
Parallel master function			No	Yes	No	----

*1: Accessible to the PLC on the network located beyond seven relay (gateway) PLCs which connect two MELSECNET/H, MELSECNET/10 or Ethernet networks. Note that the A mode does not support relay function to Ethernet.

*2: Dedicated for the process CPU (QnPHCPU) only. Supported by the product with first five digits of serial No. "04012" or later, when the master module is used as the multiplexed remote master station or multiplexed remote sub master station.

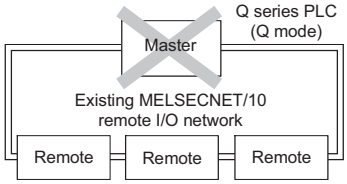
*3: There are cables that are not compatible with some CPU types. Check details in the corresponding catalog.

Connection with an existing network system

The Q series PLC (Q mode) cannot be added to, or replace the existing MELSECNET network.

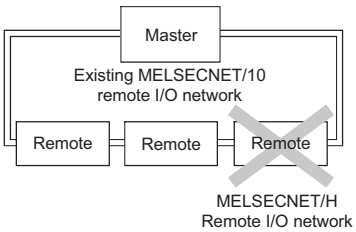
■ Changing the master station of the existing MELSECNET/10 (remote I/O network) for the Q series PLC (Q mode)

The master station of the existing MELSECNET/10 (remote I/O network) cannot be replaced by Q series PLC (Q mode). The Q series PLC (Q mode) is not compatible with the MELSECNET/10 remote I/O network.



■ Connecting the remote I/O module of the MELSECNET/H to the remote I/O station of the existing MELSECNET/10 (remote I/O network)

The remote I/O module of the MELSECNET/H cannot be connected to the existing MELSECNET/10 (remote I/O network).
The remote I/O module of the MELSECNET/H is incompatible with the MELSECNET/10 remote I/O network.



[Existing MELSECNET/10 modules]

Master station	AJ71LP21/A1SJ71LP21/AJ71LP21G/AJ71BR11/A1SJ71BR11:A/AnS series
	AJ71QLP21(S)/AJ71QLP21G/A1SJ71QLP21(S)/AJ71QBR11/A1SJ71QBR11:QnA/Q2AS series
Remote I/O station	AJ72LP25/AJ72LP25G/AJ72BR15:A/AnS series
	AJ72QLP25/A1SJ72QLP25/AJ72QLP25G/AJ72QBR15/A1SJ72QBR15:QnA/Q2AS series

Function list

Function			Overview
Basic function	Cyclic transmission function (Periodical transmission)		Performs periodical data communication between a remote master station and remote I/O stations by using link devices (LX/LY/LB/LW).
	RAS function	Output reset function at communication error	The remote I/O network turns off all outputs of remote I/O stations when an error occurs on the data link or the remote master station CPU module is down. By setting parameters prior to communication errors in a data link or remote I/O station stops, the latest normal data (X, B, W) from the erroneous remote I/O station can be kept.
		Auto return function	Automatically reconnects a station, which was disconnected from the data link due to data link error, to the data link after the station returns to a normal state.
		Loopback function (Optical loop system)	The optical loop systems have redundant transmission paths. This feature allows the network to disconnect erroneous stations from the network and continue communication between stations that are capable of data communication. To do this, switching transmission paths between forward loop and reverse loop, and loopback are performed.
		Station disconnection function (Coaxial bus system)	The coaxial system keeps the data link established between stations capable of communication when a connected station is turned off.
		Transient transmission available during CPU error	Network modules continue transient transmission even when a CPU module stops due to an error while the system is in operation. For the error description on the erroneous station, GX Developer allows another station to check it.
		Confirming detected time of transient transmission error	Able to confirm "time" when transient transmission ended abnormally, "Error detected network No.", and "Error detected station No.".
		Diagnostic function	Checks line status of networks, module settings, etc.
		Redundant power supply compatibility on remote I/O station	Remote I/O stations can have redundant power supply by mounting two power supply modules on the dedicated base unit.
		Online module replacement on remote I/O station	Replaces Q series modules mounted on a remote I/O station main base unit or extension base unit while the remote I/O station is in operation.

	Function	Overview
Application function	Transient transmission function (Non-periodical transmission)	Performs communication only when requested between stations. The request includes the link dedicated instructions, GX Developer, intelligent function modules, etc. By using this function, stations in MELSEC/H can communicate data with not only stations belonging to the same network but also stations belonging to different networks.
	System monitoring of remote I/O station	The remote I/O network enables system monitoring on intelligent function modules that are mounted on a remote I/O station by using GX Developer. This allows easy diagnostic for faults on intelligent function module mounted on a remote I/O station.
	Remote I/O station device test	The remote I/O network allows testing I/O devices of sequence programs without any influence on the currently operating system, by using GX Developer installed on remote I/O stations. To do this, register a target device for the test by selecting "Forced input output registration/cancellation" of the debug in the online menu of GX Developer.
	Multiple transmission function (Optical loop system)	Enables high-speed communication by using duplex transmission path (forward loop and reverse loop) in optical loop systems.
	Number of return stations setting function	Sets the number of communication-erroneous stations available for returning to a link.
	Reserve station function	Prevents stations, which are to be connected (not connected currently but counted in the total number of (slave) stations), from being recognized as a station having a communication error. This function is convenient for making vacant station number.
	Interruption setting	A remote master station uses its own interruption setting parameters, and checks interruption conditions at data receiving from other stations . If the interruption conditions are met, this function allows a master module to request an interruption to a CPU module in order to start the interruption sequence program of the CPU.
	I/O assignment function	Suitable for (1) changing I/O response time of input modules, (2) changing output module's output mode at an error, (3) changing the switch settings of intelligent function modules.
	Cyclic transmission stop/restart and link refresh stop (Network test)	GX Developer's "Network test" enables stopping/restarting cyclic transmission. This is suitable for the case where you do not wish to communicate data with other stations since the system is starting up (debugging).
	Multiple remote master function (for QnPHCPU only)	By setting up a multiple remote master station (DMR) and multiple remote sub master station (DSMR), this function substitutes the multiple sub master station for the multiple master station having an error so as to continue control over remote I/O stations (R).
	The redundant system compatible multiple remote master function (for QnPRHCPU only)	Used in the redundant system for controlling I/O modules and intelligent function modules. With this function, when a multiple remote master station (control) is down, it changes from control to standby. Instead, a multiple remote sub master station (standby) changes from standby to control to take over controlling remote I/O stations.
	Remote password	Prevents remote users from accessing a QCPU incorrectly.
	Network diagnosing (line monitoring)	Provided by GX Developer and checks the status of the remote I/O networks. At error occurrences, this function finds the erroneous station by using the own station information, other station information and error history monitoring function.

Performance specifications

■ Optical loop system (SI/H-PCF/Broad-band H-PCF/QSI cable)

Item		Remote master station		Remote I/O station
		QJ71LP21-25	QJ71LP21S-25	QJ72LP25-25
Maximum number of links per network	LX/LY	8192 points(8k bits)		
	LB	MELSECNET/H mode: 16384 points (16k bits)		
	LW	MELSECNET/H mode: 16384 points (16kwords)		
Maximum number of links per station		•Remote Master Station → Remote I/O station ((LY+LB)/8+(2×LW))≦1600 bytes*1 • Remote I/O station → Remote Master Station ((LX+LB)/8+(2×LW))≦1600 bytes •Multiplexed remote master station ↔ Multiplexed remote sub-master station ((LX+LB)/8+(2×LW))≦2000 bytes		
Maximum I/O points per remote I/O station		X+Y≦4096 points If the X/Y numbers are duplicate, only one side is taken into consideration.		
Device points per remote I/O station	M	8192 points(8k bits)		
	SM	2048 points(2k bits)		
	D	12288 points(12k words)		
	SD	2048 points(2k words)		
Transient transmission capacity		Max. 1920 bytes/frame		
Communication speed		25Mbps/10Mbps(selected with MODE switch)		
Number of stations per network		65 stations (Remote master stations: 1 Remote I/O stations: 64)*2		
Connection cable		Optical fiber cable (SI/H-PCF/Broad-band H-PCF/QSI)		
Overall distance		30km(98360.67ft.)		
Distance between stations	25Mbps	SI cable :200m*3 H-PCF cable :400m		Broad-band H-PCF cable :1km QSI cable :1km
	10Mbps	SI cable :500m*3 H-PCF cable :1km		Broad-band H-PCF cable :1km QSI cable :1km
Maximum number of networks		239(Total including PLC to PLC network)		
Transmission path format		Double loop		
Communication method		Token ring		
Synchronous method		Frame synchronous		
Encoding method		NRZIcode(Non Return to Zero Inverted)		
Transmission format		HDLC conformance(frame type)		
Error control system		CRC($X^{16}+X^{12}+X^5+1$) and time-out retry		
Protection degree		IP1XB		
RAS functions		•Loopback function upon abnormal detection and cable breakage •Diagnostic function of host link line check •Abnormal detection using link special relays and link special registers •Redundant of remote I/O station power supply •Online module change on remote I/O station		
Application function		•Remote password of remote I/O station		
Transient transmission		•1:1 communication(monitor, program upload/down load, etc.) •Various send/receive instructions from sequence programs		
Online module change		Disable		-*4
Multiple CPU system		Compatible*5		-
Number of I/O points occupied		32 points 1 slot (I/O assignment:Intelligent)	48 points 2 slots (Default I/O assignment: Vacant 16 points + Intelligent 32 points)	- (Installed to the CPU slot of main base)
Internal current consumption (5VDC)		0.55A		0.89A
External Power Supply	Voltage	-	DC20.4 to DC31.2V	-
	Current	-	0.20A	-
	Suitable cable size	-	0.3 to 1.25mm^2	-
	Suitable crimp terminal	-	R1.25-3	-
External dimensions		98(H)×27.4(W)×90(D) mm	98(H)×55.2(W)×90(D) mm	98(H)×27.4(W)×90(D) mm
Weight		0.11kg	0.20kg	0.15kg

*1: The remote master station includes the multiplexed remote master station and multiplexed remote sub-master station.
*2: On a multiplexed remote I/O network, one of 64 remote I/O stations works as a multiplexed remote sub-master station.
*3: The optical fiber cable (A-2P-□) differs in interstation distance between the L and H types. For more information, refer to the reference manual.
*4: If performing online module change on remote station, compartible with remote I/O module of function version D or later.
*5: Compatible with function vrsion B or later.

Optical loop system(GI cable)

Item		Remote master station	Remote I/O station
		QJ71LP21G	QJ72LP25G
Maximum number of links per network	LX/LY	8192 points(8k bits)	
	LB	MELSECNET/H mode:16384 points(16k bits)	
	LW	MELSECNET/H mode:16384 points(16k words)	
Maximum number of links per station		• Remote master station → Remote I/O station((LY+LB)/8+(2×LW))≦1600 bytes*1 • Remote I/O station → Remote master station((LX+LB)/8++(2×LW))≦1600 bytes • Multiplexed remote master station ↔ Multiplexed remote sub-master station((LX+LB)/8+(2×LW))≦2000 bytes	
Maximum I/O points per remote I/O station		X+Y≦4096 points If the X/Y numbers are duplicate, only one side is taken into consideration.	
Device points per remote I/O station	M	8192 points(8k bits)	
	SM	2048 points(2k bits)	
	D	12288 points(12k words)	
	SD	2048 points(2k words)	
Transient transmission capacity		Max. 1920 bytes/frame	
Communication speed		10Mbps	
Number of stations per network		65 stations (Remote master stations: 1 Remote I/O stations: 64)*2	
Connection cable		Optical fiber cable(GI)	
Overall distance		30km	
Distance between stations		2km	
Maximum number of networks		239(Total including PLC to PLC network)	
Transmission path format		Double loop	
Communication method		Token ring	
Synchronous method		Frame synchronous	
Encoding method		NRZI code(Non Return to Zero Inverted)	
Transmission format		HDLC conformance(frame type)	
Error control system		CRC($X^{16}+X^{12}+X^5+1$) and time-out retry	
Protection degeree		IP1XB	
RAS functions		• Loopback function upon abnormal detection and cable breakage • Diagnostic function of host link line check • Abnormal detection using link special relays and link special registers • Redundant of remote I/O station power supply • Online module change on remote I/O station	
Application function		• Remote password of remote I/O station	
Transient transmission		• 1:1 communication(monitor, program upload/down load, etc.) • Various send/receive instructions from sequence programs	
Online module change		Disable	-*3
Multiple CPU system		Compatible*4	-
Number of I/O points occupied		32 points 1 slot (I/O assignment:Intelligent)	-(Installed to the CPU slot of main base)
Internal current consumption (5VDC)		0.55A	0.89A
External dimensions		98(H)×27.4(W)×90(D) mm	
Weight		0.11kg	0.15kg

*1: The remote master station includes the multiplexed remote master station and multiplexed remote sub-master station.
*2: On a multiplexed remote I/O network, one of 64 remote I/O stations works as a multiplexed remote sub-master station.
*3: If performing online module change on remote station, compartible with remote I/O module of function version D or later.
*4: Compatible with function version B or later.

■ Coaxial bus system

Item		Remote master station QJ71BR11	Remote I/O station QJ72BR15
Maximum number of links per network	LX/LY	8192 points(8k bits)	
	LB	MELSECNET/H mode:16384 points(16k bits)	
	LW	MELSECNET/H mode:16384 points(16k words)	
Maximum number of links per station		• Remote master station → Remote I/O station((LY+LB)/8+(2×LW))≦1600 bytes*1 • Remote I/O station → Remote master station((LX+LB)/8+(2×LW))≦1600 bytes • Multiplexed remote master station ↔ Multiplexed remote sub-master station((LX+LB)/8+(2×LW))≦2000 bytes	
Maximum I/O points per remote I/O station		X+Y≦4096 points If the X/Y numbers are duplicate, only one side is taken into consideration.	
Device points per remote I/O station	M	8192 points(8k bits)	
	SM	2048 points(2k bits)	
	D	12288 points(12k words)	
	SD	2048 points(2k words)	
Transient transmission capacity		Max. 1920 bytes/frame	
Communication speed		10Mbps	
Number of stations per network		33 stations (Remote master stations: 1 Remote I/O stations: 32)*2	
Connection cable		Coaxial cable(3C-2V/5C-2V/5C-2V-CCY)	
Overall distance	3C-2V	300m(between stations 300m)*3	
	5C-2V/ 5C-2V-CCY	500m(between stations 500m)*3	
		Up to 2.5km (8196.92ft.) by using repeater modules (A6BR10, A6BR10-DC)(Max. four connection)	
Maximum number of networks		239(Total including PLC to PLC network)	
Transmission path format		Single bus	
Communication method		Token ring	
Synchronous method		Frame synchronous	
Encoding method		Manchester code	
Transmission format		HDLC conformance(frame type)	
Error control system		CRC($X^{16}+X^{12}+X^5+1$) and time-out retry	
Protection degeree		IP1XB	
RAS functions		• Loopback function upon abnormal detection and cable breakage • Diagnostic function of host link line check • Abnormal detection using link special relays and link special registers • Redundant of remote I/O station power supply • Online module change on remote I/O station	
Application function		• Remote password of remote I/O station	
Transient transmission		• 1:1 communication(monitor, program upload/down load, etc.) • Various send/receive instructions from sequence programs	
Online module change		Disable	-*4
Multiple CPU system		Compatible*5	-
Number of I/O points occupied		32 points 1 slot (I/O assignment:Intelligent)	-(Installed to the CPU slot of main base)
Internal current consumption (5VDC)		0.75A	1.10A
External dimensions		98(H)×27.4(W)×90(D) mm	
Weight		0.11kg	0.16kg

*1: The remote master station includes the multiplexed remote master station and multiplexed remote sub-master station.
*2: On a multiplexed remote I/O network, one of 64 remote I/O stations works as a multiplexed remote sub-master station.
*3: There are restrictions on the inter-station cable length depending on the number of connected stations. For more information, refer to the reference manual.
*4: If performing online module change on remote station, compartible with remote I/O module of function version D or later.
*5: Compatible with function vrsion B or later.

Cyclic communications time

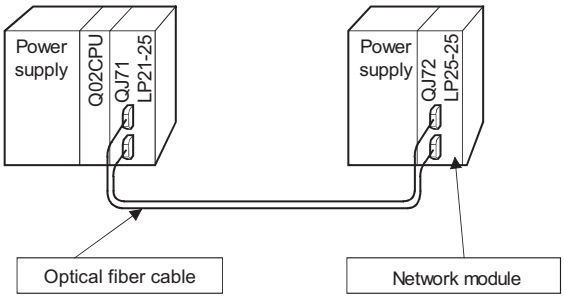
The following calculation expressions are used to find the normal values of cyclic communications time (transmission delay time) in the MELSECNET/H mode. (These are average values only. Therefore, the time taken may become longer than the values given depending on the timing.)

	Remote I/O Network
Transmission delay time of input T_{DX}	[Remote master station sequence scan time (S_m)>link scan time(LS)] $T_{DX}=(S_m+\alpha_m)\times 2+S_m+T_{RIOR}$[ms] [Remote master station sequence scan time (S_m)<link scan time(LS)] $T_{DX}=(S_m+\alpha_m)\times$ round up[LS/$(S_m+\alpha_m)$]$\times 2+S_m+T_{RIOR}$[ms] S_m : Scan time of sequence program of remote master station α_m : Link refresh time of remote master station LS : Link scan time T_{RIOR} : I/O refresh time round up : Operation[LS/$(S_m+\alpha_m)$]result is rounded up to decimal point.
Transmission delay time of output Y T_{DY}	[Remote master station sequence scan time (Sm)>link scan time (LS)] $T_{DY}=(S_m+\alpha_m)+LS+T_{RIOR}$[ms] [Remote master station sequence scan time (Sm)<link scan time (LS)] $T_{DY}=(S_m+\alpha_m)\times$ round up[LS/$(S_m+\alpha_m)$]$+LS+T_{RIOR}$[ms] S_m: : Scan time of sequence program of remote master station α_m: : Link refresh time of remote master station LS: : Link scan time T_{RIOR}: : I/O refresh time round up : Operation [LS/$(Sm+\alpha_m)$]result is rounded up to decimal point.
Input transmission delay time of W T_{DB1}	[Remote master station sequence scan time (Sm)>link scan time (LS)] $T_{DB1}=(S_m+\alpha_m)\times 2+S_m+T_{RBF}$[ms] [Remote master station sequence scan time (Sm)<link scan time (LS)] $T_{DB1}=(S_m+\alpha_m)\times$ round up[LS/ $(Sm+\alpha m)$]$\times 2+Sm+T_{RBF}$[ms] Sm : Scan time of sequence program of remote master station α_m : Link refresh time of remote master station LS : Link scan time T_{RBF} : Refresh time to/from buffer memory of intelligent function module round up : Operation [LS/$(Sm+\alpha_m)$] result is rounded up to decimal point.
Output transmission delay time of W T_{DB2}	[Remote master station sequence scan time (Sm)>link scan time (LS)] $T_{DB2}=(S_m+\alpha_m)+LS+T_{RBF}$[ms] [Remote master station sequence scan time (Sm)<link scan time (LS)] $T_{DB2}=(S_m+\alpha_m)\times$ round up[LS/$(S_m+\alpha_m)$]$+S_m+T_{RBF}$[ms] S_m : Scan time of sequence program of remote master station α_m : Link refresh time of remote master station LS : Link scan time T_{RBF} : Refresh time to/from buffer memory of intelligent function module round up : Operation [LS/$(Sm+\alpha_m)$] result is rounded up to decimal point.
Transmission delay time between multiplexed remote master station and multiplexed remote sub master station T_{D1}	$T_{D1}=S_T+\alpha_T+(LS\times 1)+(S_R\times 2)+\alpha_R$[ms] S_T : Send side scan time S_R : Receive side scan time α_T : Send side link refresh time α_R : Receive side link refresh time LS : Link scan time

<table>
<tr><th></th><th>Remote I/O Network</th></tr>
<tr><td>Link refresh time of remote master station
α_m</td><td>
α_m=KM1+KM2×{LB+LX+LY+SB+(LW×16)+(SW×16)}/16+α_E+(number of network modules-1)[ms]
α_E=KM3×{LB+LX+LY+(LW×16)}/16[ms]
LB : Total number of link relay (LB) points refreshed by that station*1
LW : Total number of link register (LW) points refreshed by that station*1
LX : Total number of link input (LX) points refreshed by that station*1
LY : Total number of link output (LY) points refreshed by that station*1
SB : Number of link special relays (SB)
SW : Number of link special registers (SW)
α_E : On-memory card file register (R, ZR) data transfer time*2
KM1,KM2,KM3:Constants
<table>
<tr><th></th><th colspan="3">Network Module Loaded on Main Base</th><th colspan="3">Network Module Loaded on Extension Base</th></tr>
<tr><th></th><th>KM1</th><th>KM2($X10^{-3}$)</th><th>KM3($X10^{-3}$)</th><th>KM1</th><th>KM2($X10^{-3}$)</th><th>KM3($X10^{-3}$)</th></tr>
<tr><td>Q02CPU</td><td>0.30</td><td>0.48</td><td>0.60</td><td>0.30</td><td>1.20</td><td>1.32</td></tr>
<tr><td>Q02HCPU
Q06HCPU
Q12HCPU
Q25HCPU
Q12PHCPU
Q25PHCPU
Q12PRHCPU
Q25PRHCPU</td><td>0.13</td><td>0.41</td><td>0.53</td><td>0.13</td><td>0.97</td><td>1.09</td></tr>
</table>
Longer time will be taken if the data refresh destination is the file register on the memory card or inter-data link transfer function is to be performed.
</td></tr>
<tr><td>Link refresh time of remote I/O station</td><td>The link refresh time of the remote I/O station does not influence transmission delay time.</td></tr>
<tr><td>Link scan time
LS</td><td>
<At 10Mbps transmission speed>
LS=KB+ (0.45×total number of remote I/O stations)+ {LX+ LY+ LB+ (LW×16)}/8×0.001+ KR
+ {$LY_{M\rightarrow R}$+ $LB_{M\rightarrow R}$+ ($LW_{M\rightarrow R}$×16)}/16×0.0003+ { $LX_{M\rightarrow R}$+ $LB_{M\rightarrow R}$+ ($LW_{M\rightarrow R}$×16)}/16×0.0003+ (T×0.001) [ms]
<At 25Mbps transmission speed>
LS=KB+(0.40×total number of remote I/O stations)+{LX+LY+LB+(LW×16)}/8×0.0004+KR
+{$LY_{M\rightarrow R}$+$LB_{M\rightarrow R}$+($LW_{M\rightarrow R}$×16)}/16×0.0003+{$LX_{M\leftarrow R}$+$LB_{M\leftarrow R}$+($LW_{M\leftarrow R}$×16)}/16×0.0003+(T×0.0004)[ms]
LX : Total number of link input (LX) points used at all stations*1
LY : Total number of link output (LY) points used at all stations*1
LB : Total number of link relay (LB) points used at all stations*1
LW : Total number of link register (LW) points used at all stations*1
$LY_{M\rightarrow R}$: Total number of link output (LY) points used at station in M→R direction*1
$LB_{M\rightarrow R}$: Total number of link relay (LB) points used at station in M→R direction*1
$LW_{M\rightarrow R}$: Total number of link register (LW) points used at station in M→R direction*1
$LX_{M\leftarrow R}$: Total number of link input (LX) points used at station in M←R direction*1
$LB_{M\leftarrow R}$: Total number of link relay (LB) points used at station in M←R direction*1
$LW_{M\leftarrow R}$: Total number of link register (LW) points used at station in M←R direction *1
KB,KR:Constants
<table>
<tr><th>Total number of remote I/O stations</th><th>1 to 8</th><th>9 to 16</th><th>17 to 24</th><th>25 to 32</th><th>33 to 40</th><th>41 to 48</th><th>49 to 56</th><th>57 to 64</th></tr>
<tr><td>KB</td><td>4.0</td><td>4.5</td><td>4.9</td><td>5.3</td><td>5.7</td><td>6.2</td><td>6.6</td><td>7.0</td></tr>
<tr><td>KR</td><td>3.9</td><td>3.1</td><td>2.6</td><td>2.3</td><td>1.7</td><td>1.1</td><td>0.6</td><td>0.0</td></tr>
</table>
T: Max. number of bytes sent by transient transmission during one link scan*2
*1: From the first to the last points of the device allocated in the common parameters. (Any free space is included in the number of points.)
*2: If there are simultaneous transient transmissions from multiple stations during one link scan, it totals the data length of the sending and receiving frames. 0 when not used.
</td></tr>
<tr><td>Refresh time to/from I/O modules
T_{RIOR}</td><td>
T_{RIOR}=(X_K/16×0.0016)+(X_Z/16×0.0024)+ (Y_K/16×0.0014)+ (Y_Z/16×0.0022)[ms]
X_K:Number of input module points mounted on main base unit (multiple of 16)
X_Z:Number of input module points mounted on extension base unit (multiple of 16)
Y_K:Number of output module points mounted on main base unit (multiple of 16)
Y_Z:Number of output module points mounted on extension base unit (multiple of 16)
</td></tr>
<tr><td>Refresh time to/from intelligent function module
T_{RBF}</td><td>
T_{RBF}=(0.45×N_{BF})+47.55[ms]
N_{BF}:Number of buffer memory access words
</td></tr>
</table>

System equipment

■ Optical loop system



<QJ71LP21-25/QJ71LP21S-25/QJ71LP21G accessories>

Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)

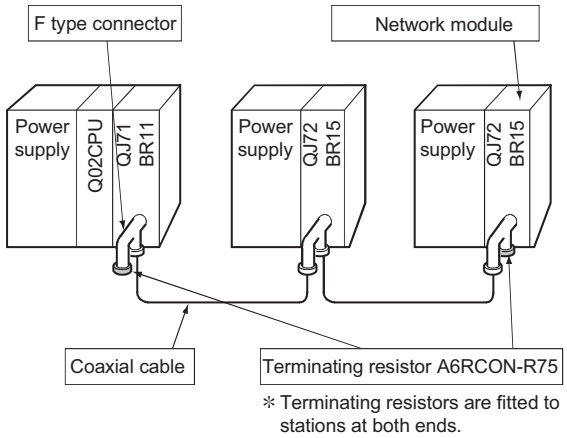
<QJ72LP25-25/QJ72LP25G accessories>

Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)

<Separately obtained products>
The following equipment (manual) must be obtained separately.

Product	Description
Optical cable	SI/H-PCF/Broad-band H-PCF/QSI/GI cable
Manual	MELSECNET/H Reference Manual (Remote I/O network)

■ Coaxial bus system



∗ Terminating resistors are fitted to stations at both ends.

<QJ71BR11 accessories>

Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)
Connector	F type BNC connector

<QJ72BR15 accessories>

Product	Description
Manual	MELSECNET/H Network Module User's Manual (Hardware)
Connector	F type BNC connector

<Separately obtained products>
The following equipment (manual) must be obtained separately.

Product	Description
Coaxial cable	3C-2V/5C-2V(JISC3501-compliant), 5C-2V-CCY
Connector plug	Connector plug for 3C-2V/5C-2V
Terminating resistor	A6RCON-R75 (75 Ω terminating resistor)
Manual	MELSECNET/H Reference Manual (Remote I/O Network)

■ Applicable system

<Precautions when Configuring the System>
Take the following points into consideration when configuring a remote I/O net system.

(1) The following CPU modules and network modules are applicable to the remote master station.

○:Available ×:Not compatible

CPU module	Max. No. of applicable network modules	Function		
		Multiplexed remote I/O network for redundant system	Multiplexed remote I/O network	Remote I/O network
Q12PRHCPU, Q25PRHCPU	4 (including PLC-to-PLC networks)	○	×	×
Q12PHCPU, Q25PHCPU	4 (including PLC-to-PLC networks)	×	○	○
Q02CPU,Q02HCPU,Q06HCPU,Q12HCPU,Q25HCPU *1	4 (including PLC-to-PLC networks)	×	×	○
Q00JCPU,Q00CPU,Q01CPU	Not mountable	×	×	×

*1: Use a CPU module with the first 5 digits of the serial No. "02092" or later.

Network module		Applicable function version	
		Multiplexed remote I/O network for redundant system	Multiplexed remote I/O network*2, or remote I/O network
Master module	QJ71LP21	Function version D or later	Function version B or later*3
	QJ71LP21-25		
	QJ71LP21S-25		
	QJ71LP21G		
	QJ71BR11		
Remote I/O module	QJ72LP25-25		
	QJ72LP25G		
	QJ72BR15		

*2: When using a master module as a multiplexed remote master or sub-master station, the first 5 digits of the serial No. must be "04012" or later.

*3: When using online module change, use a remote I/O module of function version D or later.

(2) The Q-series modules are applicable to remote I/O stations. Note that the following modules have some restrictions.

Module Name	Description
Q3□B,Q3□SB,Q3□RB *3,*4	Base unit for remote I/O modules Max. mountable remote I/O modules:1
Q6□B,Q6□RB,Q5□B *3,*4,*5	Max. mountable stages:7 stages
QA1S6□B,QA6□B	N/A
Q6□P,Q64RP,Q61SP*6	Q64RP is applicable to Q6□RB. Q61SP is applicable to Q3□SB.
QC05B,QC06B,QC12B,QC30B ,QC50B,QC100B	Overall extension cable length: 13.2m or less
QI60,QJ71LP21, QJ71LP21-25, QJ71LP21S-25, QJ71LP21G, QJ71BR11, QJ71WS96	N/A
QJ71E71-100, QJ71E71-B5, QJ71E71-B2, QJ71E71	• Function version B or later is available. • Interrupt pointers, dedicated instructions and e-mail function are not available.
QJ71C24N,QJ71C24N-R2, QJ71C24N-R4, QJ71C24, QJ71C24-R2, QJ71CMO, QD51, QD51-R24, QJ61BT11N, QJ61BT11, QD62, QD62D, QD62E, QD75P1, QD75P2, QD75P4, QD75D1, QD75D2, QD75D4	Interrupt pointers and intelligent-function-module-dedicated instructions are not available.

*3: Total of up to 64 modules can be mounted to a base unit. A-series and QnA-series modules are not usable.

*4: Online module change can be performed for modules mounted on Q3□B,Q3□RB,Q6□B,Q6□RB.Modules mounted on the following base unit cannot be replaced online.
1) Q3□SB
2) Q5□B((Modules mounted on Q3□B cannot be replaced online, while those mounted on Q6□B can be replaced online.)

*5: When using the Q5□B, calculate the operating voltage of the Q5□B and confirm that it is within the specified range.

*6: The ERR contact of the power supply module operates differently depending on the combination of the remote I/O module function version and the base unit. The following table indicates the ERR contact operation of the power supply module.

Base unit	Remote I/O module	
	Function version D or later	Function version C or earlier
Q3□B,Q3□SB	3)	×
Q3□RB	1)	×
Q6□B,Q5□B	×	×
Q6□RB	2)	2)

1): AOutput turns OFF when AC power is not input or power supply module fault or remote I/O module stop error occurs.

2): Output turns OFF when AC power is not input, or power supply module fault occurs.

3): Output turns OFF when AC power is not input or remote I/O module stop error occurs.

×: Output is always OFF.

(3) Note that the number of intelligent function module parameters that may be set (initial setting, automatic refresh setting) is limited on the remote I/O station.
If the number of parameters set exceeds the limited number, the remote I/O module detects the "SP. PARA ERROR (3301)" error. If the error has been detected, read/write the data of the intelligent function modules using the REMFR/REMTO instruction.

<When Using a Multiple CPU System>
Take the following points into consideration when configuring a remote I/O network by utilizing multiple CPU system.
(1) Use the master module of function version B or later.
(2) Set the network parameters to the control CPU controlling the master module.
(3) It is possible to set up to four master modules per control CPU. Note that the maximum number of mountable master modules per multiple CPU system is four.
(4) By connecting to a remote I/O station for access to other stations, GX Developer can access stations in the other network system, whether the relay stations in the multiple CPU system are controlled by the same or different CPUs. Also, GX Developer can access either the control CPU or non-control CPU in the multiple CPU system.

<Compatible software package>
The following table shows the compatibility between systems, which use MELSECNET/H network modules, and the software package.

		Software package
		GX Developer
Q02/Q02H/Q06H/Q12H/Q25HCPU		Version 6 or later
Q12PH/Q25PHCPU		Version 7.10L or later
Q12RPH/Q25RPHCPU		Version 8.17T or later
QJ72LP25-25/ QJ72LP25G/ QJ72BR15	Remote I/O network	Version 6 or later*1
	Multiple remote I/O network	Version 7.10L or later*1
	Redundant system compatible with multiple remote I/O network	Version 8.17T or later

*1: The products with version “8.17T” or later is necessary for replacing modules online on a remote I/O station.

Applicable cable

For the specifications of the optical fiber cables and coaxial cables that are compatible with the MELSECNET/H remote I/O network, refer to Section 2.4.1.
However, when configurating the coaxial bus system of the redundant system compatible multiple remote I/O network, be sure to use the double-shielded coaxial cable (5C-2V-CCY manufactured by Mitsubishi Cable Industries, LTD.).

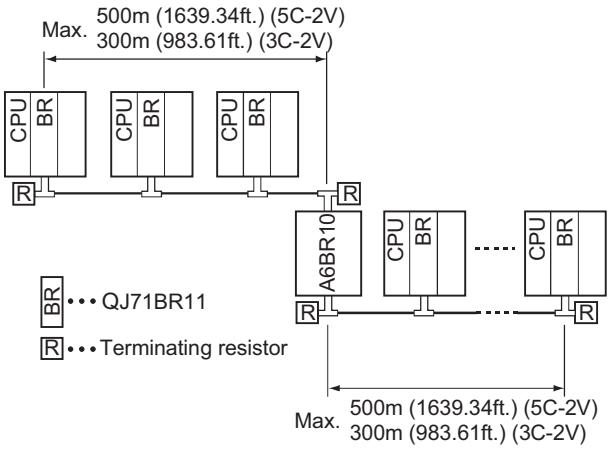
2.5.3 MELSECNET/H coaxial bus repeater: A6BR10, A6BR10-DC

Overview

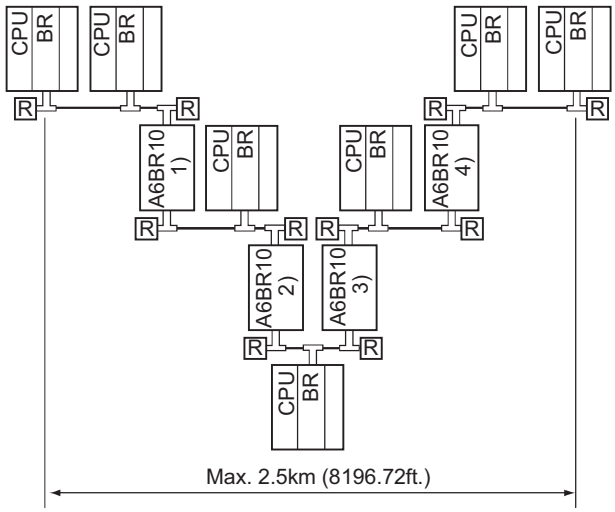
The A6BR10 and A6BR10-DC coaxial bus repeater modules are designed to increase the overall distance in the coaxial bus system of the MELSECNET/10 or MELSECNET/H network system.

Features

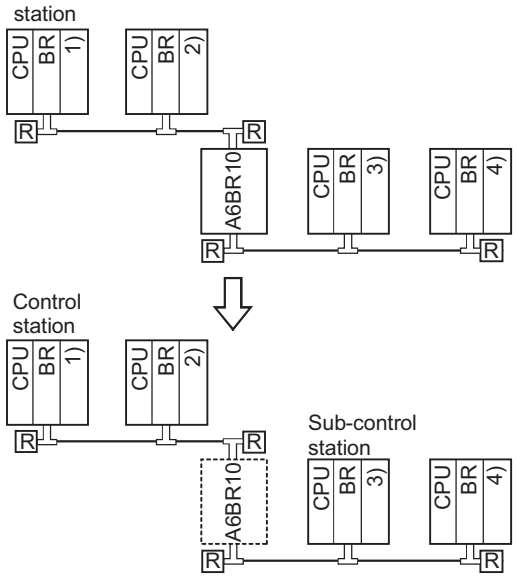
(1) One module can increase the distance by 500m (1639.34ft.) (5C-2V) or 300m (983.61ft.) (3C-2V).



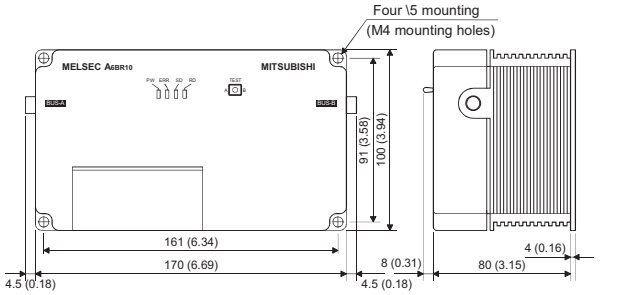
(2) Up to four modules can be used in one network. The overall distance can be increased to 2.5km.



(3) When the A6BR10 develops a fault, the network is broken at the A6BR10, and communication continues in respective networks.
In the following example, data link is made between 1) and 2) and between 3) and 4) when the A6BR10 develops a fault.

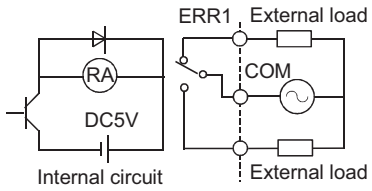


Appearance



Unit:mm (inch)

Performance specifications

Item			A6BR10	A6BR10-DC
Transmission speed			10Mbps	
Number of modules connectable per network			Max. 4 modules	
Extension distance/unit			300m (983.61ft.) (3C-2V),500m (1639.34ft.)(5C-2V)	
Overall distance			300m (983.61ft.)×5=1.5km (4918.03ft.) (3C-2V), 500m (1639.34ft.)×5=2.5km (8196.72ft.)(5C-2V)	
Number of stations connectable			Max. 32 stations	
Input power supply	Voltage		100 to 240VAC (+10%/-15%)	24VDC (+30%/-35%)
	Frequency		50/60Hz±5%	-
	Max. apparent power		21VA	-
	Max. power		-	9W
	Inrush current		40A,within 8ms	17A,within 1ms
	Efficiency		65% or more	65% or more
	Permissible instantaneous power failure time		20ms	10ms
	Current consumption		0.2A	0.6A
Abnormal continuous transmission alarm output			ERR1:On when A6BR10 becomes faulty (power off, error occurrence). ERR2:On when A6BR10 is normal.	
	Isolation method		Non-isolated	
	Rated switching voltage/current		24VDC 2A (resistive load) 240VAC 2A (COSϕ=1)	
	Minimum switching load		5VDC 1mA	
	Maximum switching load		264VAC, 125VDC	
	Response time		OFF to ON:10ms or less ON to OFF: 12ms or less	
	Life	Mechanical	10 million times or more	
		Electrical	Rated switching voltage/current load 100 thousand times or more	
			200VAC 1.5A, 200VAC 1A(COSϕ=0.7) 100 thousand times or more	
			200VAC 1A, 200VAC 0.5A(COSϕ=0.35) 100 thousand times or more	
			24VDC 1A, 100VDC 0.1A 0.1A(L/R=7ms) 100 thousand times or more	
	Surge suppressor		No	
External wiring				
Weight (kg)			0.5kg	

System configuration

<A6BR10, A6BR10-DC accessories>

Product	Description
Manual	A6BR10, A6BR10-DC User's Manual
Connector	T type BNC connector (2 pcs.)

<Separately obtained products>

The following equipment (manual) must be obtained separately.

Product	Description	Remarks
Coaxial cable	3C-2V/5C-2V (JISC3501 conformance)	○
Connector plug	Connector plug for 3C-2V/5C-2V	○
Terminating resistor	A6RCON-R75 (75Ω terminating resistor)	○

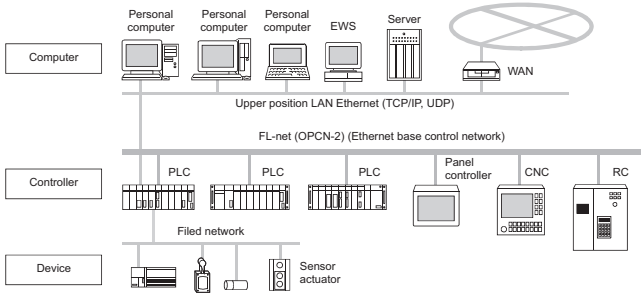
○:Must be obtained, △:Obtained as required

2.6 FL-net (OPCN-2) Interface Module

2.6.1 FL-net (OPCN-2) interface module: QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01

Overview

FL-net (OPCN-2) (the generic term for a network featuring FA link protocol) is standardized by the Japan FA Open Systems Promotion Group (JOP) of the Manufacturing Science and Technology Center, a group affiliated with the Ministry of Economy, Trade and Industry (the former Ministry of International Trade and Industry.)FL-net (OPCN-2) has been civilianized to the Japan Electric Machine Industry Association since April 2000.
The FA link protocol is intended for the FL-net to be used for data exchange between various control modules in manufacture systems such as programmable logic controller (PLC), robot controller (RC) and numerical control module (CNC), and personal computers for control.



Features

■ Features of whole FL-net (OPCN-2) Ver.2.00

● Realization of multi-vendor

A Number of different third party PLCs, controllers such as numerical control module (CNC) and personal computers can be interconnected and realize control and monitoring.

● Conformity with standard

You can use Ethernet network equipment which spread with the progress of Office Automation (transceiver, HUB, cable, and LAN card for personal computer, etc.).

● Higher transmission

Transmission speed will be expected to increase from 10Mps to 100Mps, and 100Mps to 1Gps.

● Large-scale network

Up to 254 devices (nodes) can be connected.
(249 of them for control, the rest of 5 for error diagnosing.)

● Two communication functions for different applications

Both the common memory function based on cyclic transmission and the message communication function based on message transmission are supported.

● Large-capacity common memory

Large capacity of common memory, 8k bits + 8k words.

● High reliability ensured by master-less system

Absence of the master allows each node to participate/leave freely without affecting the communications of the other nodes. It enables every nodes to turn them on/off and maintain freely.

■ Features of the QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01

● Data integrity

In area 2 (word area), double word (32 bit) data identity is ensured.

(The separation prevention *1)

*1: The separation prevention
The separation prevention is the data that has the meaning in a 2-word (32 bits) for current value for the positioning module and it uses the timing of cyclic transmission to prevent the new data and old data from being separated in 1-word units (16 bits).

● Three types of modules available for the cable used

QJ71FL71-T-F01 - Supports 10BASE-T
QJ71FL71-B5-F01 - Supports 10BASE5
QJ71FL71-B2-F01 - Supports 10BASE2

● Supports the PING command response function

When there is a PING command from a corresponding node, the FL-net module responds to the PING command.

● Equipped with self-diagnosis function

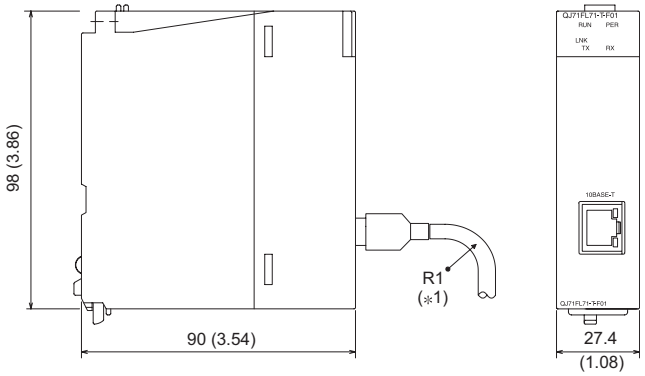
The FL-net module can perform H/W test and self-return test.

POINT

The QJ71FL71-T-F01/QJ71FL71-B5-F01/QJ71FL71-B2-F01 are FL-net modules that can connect to FL-net (OPCN-2) Version 2.00 network.They cannot communicate with the QJ71FL71/QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 (or third party Version 1.00 product) that can be connected to the FL-net (OPCN-2) Version 1.00 network.
However, the sequence programs and network devices for QJ71FL71/QJ71FL71-T/ QJ71FL71-B5/QJ71FL71-B2 are applicable.

Appearance

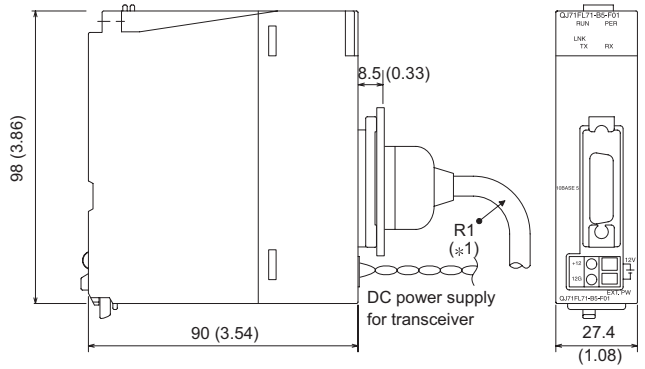
(1) QJ71FL71-T-F01



Unit:mm(inch)

*1: When connecting the twisted pair cable, set the bending radius near the connector (reference value: R1) as four times the cable's outside diameter or larger.

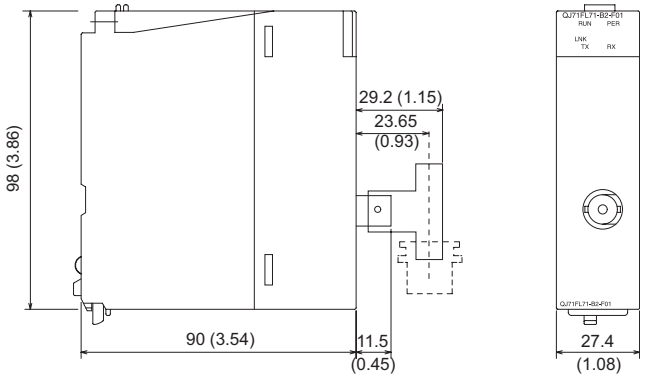
(2) QJ71FL71-B5-F01



Unit:mm(inch)

*1: When connecting the AUI cable, set the bending radius near the connector (reference value: R2) as four times the cable's outside diameter or larger.

(3) QJ71FL71-B2-F01



Unit:mm(inch)

Function list

Function	Description of function
Cyclic transmission	(1) Communication of large data volume The common memory method enables cyclic transmission of data as follows. • Bit data (area 1): 8 k bits (512 words) • Word data (area 2): 8 k words (8192 words) (Transmitting and receiving up to 8. 5 k words/ node cyclic data is possible.) (2) Guaranteed refresh time By setting the permissible time for the refresh cycle, message transmission (transient transmission) control can be performed and the refresh time can be guaranteed.
Message transmission	(1) Transparent message transmission • Message data (up to 1024 bytes) for the message area of a specified node can be sent and received. • Possible to send and receive transaction codes other than those used by the system. (2) Reading and writing of data in word blocks. By using the virtual memory access method, it is possible to read and write the virtual address space data assigned by each manufacturer in word units. (3) Return data response It is possible to return the received data as-is whenever a return command is received. (4) Reading of the parameters It is possible to read the network parameters for each node (such as vendor name, token monitoring time, etc.). (5) Reading and clearing of log data It is possible to read and clear the communication log data held by each node. (6) Reading of device profile It is possible to read the device profile data held by each node.
Self diagnosis function	(1) H/W test mode The GX Developer can be used to set the hardware test mode to perform hardware testing of the FL-net module. (2) Self-loopback test The GX Developer can be used to set the loopback test mode to perform tests of the send/ receive functions of FL-net module and the status of the lines.
PING command response function	It is possible to confirm the IP address of the FL-net module by issuing a PING command to your local station FL-net module from a corresponding device (personal computer, etc.) connected to the FL-net (OPCN-2) network.
Multiple PLC function compatibility	It is possible to control by optional CPU modules, even when multiple card CPU modules are mounted to the same base unit.
Parameter setting by GX Configurator-FL	(1) Parameter settings Parameter settings for common memory allocations, monitoring time and others can be set by GX Configurator-FL. (2) Auto refresh It is possible to perform cyclic data auto refresh.

Performance specifications

Items		Specifications		
		QJ71FL71-T-F01	QJ71FL71-B5-F01	QJ71FL71-B2-F01
		10BASE-T	10BASE5	10BASE2
Transmission specifications	Data transmission speed	10Mbps		
	Transmission method	Base band		
	Electric interface	IEEE802.3 compliance (CSMA/CD compliance)		
	Transmission protocol	UDP/IP FA link protocol		
	Maximum distance between nodes	----	2500m	925m
	Maximum segment length	100m	500m	185m
	Maximum number of nodes in system	254		
	Maximum number of nodes	254 modules/All the hab (12 modules *1)	100 modules/segment	30 modules/segment
	Minimum node interval	-	2.5m	0.5m
	Cyclic data volume	Maximum (8 k bits + 8 k words)/system Maximum (8 k bits + 8 k words)/node		
	Message data volume	Maximum 1024 bytes		
Link data specifications	Common memory area	Area 1 (bit area): 8 k bitsArea 2 (word area): 8 k words		
	Virtual address space and physical memory	----		
	Error log memory area	512 words		
	Status memory area	Bit area: 2 k bits Word area: 2 k words		
	Local node parameter setting area	96 words		
	Other node parameter setting area	2048 words		
	Parameter acquisition area	512 words		
	Device profile memory area	512 words		
	Message area (Transient area)	Maximum 1024 bytes 2 (transmit - receive 1 each)		
Transmission specifications	Message transmission	500 ms or less (1:1 Arrival time of one-way message)		
	Token start time	New participation: Start time = 3000 + (Minimum node number/ 8 remaining) × 4 + 1200ms Underway participation: Participation time = Refresh cycle × 3 + local node number × 4ms		
	Refresh time	(* 2)		
	Transmission delay time	(* 3)		
Protection degree		IP2X		
Online module change		Disabled		
Multiple CPU system		Compatible		
Number of input/output points		32 points 1 slot (I/O allocation: intelligent)		
5VDC internal current consumption		0.50A		0.60A (* 4)
External dimensions		98(H)×27.4(W)×90.5(D) mm		
Weight		0.11kg	0.12kg	0.13kg (* 4)

*1: Up to 12 modules can be connected to a center hub.
Up to 4 connection steps are possible.

*2: The transmission time between the cyclic data area and device area.

(a) Automatic refresh

Refresh time [ms]=KM1+(KM2×total number of transmitted words)+(KM3 × number of parameter setting with automatic refresh setting)
KM1,KM2,KM3:Constant

Item		Constant				
		Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU,Q06HCPU,Q12HCPU,Q12PHCPU,Q25HCPU,Q25PHCPU
KM1	Basic base	0.097	0.082	0.070	0.046	0.013
	Extension base	0.180	0.135	0.103	0.056	0.024
KM2	Basic base	0.00099	0.00091	0.00086	0.00054	0.00046
	Extension base	0.00175	0.00168	0.00164	0.00114	0.00106
KM3	Basic base	0.065	0.063	0.044	0.0105	0.006
	Extension base	0.049	0.053	0.042	0.0095	0.005

(b) During BMOV (FROM/TO)

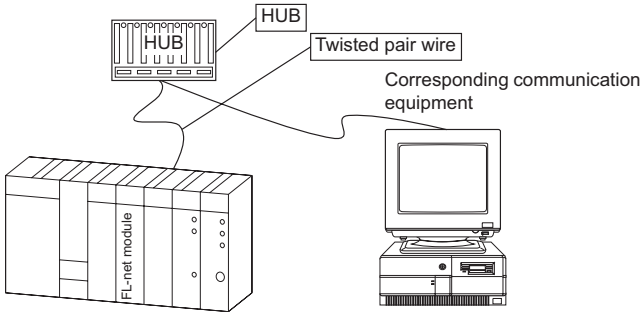
Number of transmission words	Transmission time [ms]				
	Q00JCPU	Q00CPU	Q01CPU	Q02CPU	Q02HCPU,Q06HCPU,Q12HCPU,Q12PHCPU,Q25HCPU,Q25PHCPU
1 point	0.120	0.101	0.0917	0.048	0.025
1000 points	0.734	0.677	0.642	0.489	0.448

*3: The following is the transmission time between cyclic data area and device area.
(a) Minimum transmission delay time [ms] = "SM1" + token hold time + "SM2"
(b) Maximum transmission delay time [ms] = "SM1" + (Refresh cycle × 4) + "SM2"
SM1: Transmit sequence scan (including refresh time)
SM2: Receive sequence scan (including refresh time)

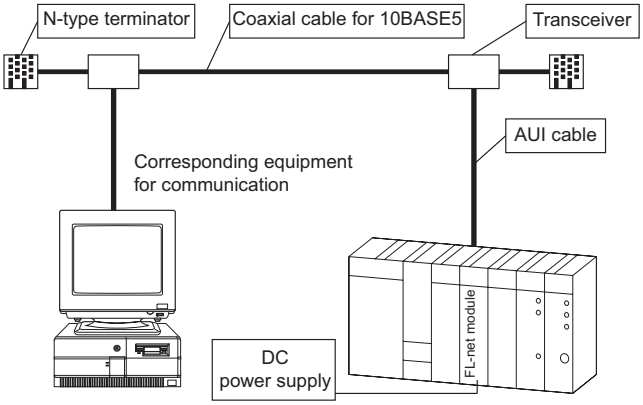
*4: For products having a serial number of "05079" or earlier as its first 5 digits, 5VDC internal current consumption and weight are as follows.
• 5VDC internal current consumption: 0.70A • Weight: 0.14kg

Device configuration

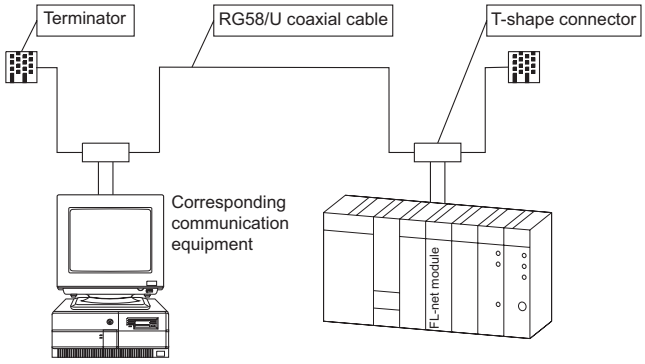
■ 10BASE-T:QJ71FL71-T-F01



■ 10BASE5:QJ71FL71-B5-F01



■ 10BASE2:QJ71FL71-B2-F01



<QJ71FL71-T-F01,QJ71FL71-BS-F01,
QJ71FL71-B2-F01 accessories>

Product	Description
Manual	FL-net (OPCN-2) interface module User's Manual (Hardware)

<Items for separate purchase>
Purchase the following manual separately.
(When 10BASE-T connected)

Product	Description
Shielded/Non-shielded twisted pair cable	Ethernet standard-compliant Category (3, 4, 5)
Jack	Ethernet standard-compliant RJ45
Hub	Ethernet standard-compliant for 10BASE-T(for 10Mbps)
Manual	FL-net (OPCN-2) interface module User's Manual

(When 10BASE-5 connected)

Product	Description
Transceiver	Ethernet standard-compliant. Product where SQETEST (Signal Quality Error TEST) or heartbeat operates.
Coaxial cable	Ethernet standard-compliant
AUI cable	Ethernet standard-compliant
N type terminator	Ethernet standard-compliant
Transceiver power supply	It satisfies specifications of transceiver and AUI cable.
Manual	FL-net (OPCN-2) interface module User's Manual

(When 10BASE-2 connected)

Product	Description
Coaxial cable	Ethernet standard-compliant RG-58A/U or RG58C/U (50Ω)
BNC type terminator	Ethernet standard-compliant (Tyco Electronics AMP K.K. make 221629-4 or equivalent)
T type connector	Ethernet standard-compliant (Hirose Electric make UG-274/U(1S) or equivalent)
Manual	FL-net (OPCN-2) interface module User's Manual

■ Applicable systems

<Applicable modules and number of mountable cards>
PLC station to connect the FL-net module and number of mountable cards are shown.

Applicable modules		Number of mountable cards	Notes
CPU module	Q00JCPU	Maximum 8	(* 1)
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can only be mounted in Q mode (* 1)
	Q12PHCPU Q25PHCPU	Maximum 64	(* 1)
Network remote modules	QJ72LP25-25 QJ72LP25G QJ72BR15	Maximum 64	MELSECNET/H remote I/O station (* 2)

*1: See the system configuration for each CPU system in section 1.
*2: See the system configuration for MELSECNET/H Remote I/O network in section 2.5.2.

<Applicable software package>
The following are the system and the software packages compatible with FL-net module.
The GX Developer is required when using the FL-net module.

		Software Version	
		GX Developer	GX Configurator-FL
Q00J/Q00/Q01CPU	Single PLC system	Version 7 or later	Version 1.10L or later
	Multiple PLC system	Version 8 or later	
Q02/Q02H/Q06H/Q12H/Q25HCPU	Single PLC system	Version 4 or later	SW0D5C-QFLU 00A or later
	Multiple PLC system	Version 6 or later	
Q12PH/Q25PHCPU	Single PLC system	Version 7.10L or later	Version 1.13P or later
	Multiple PLC system		
If installed to MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QFLU 00A or later

2.6.2 FL-net (OPCN-2) interface module settings, monitoring tool : GX Configurator-FL

Overview

GX Configurator-FL is a utility package necessary for the following two settings; the initial settings necessary for using FL-net (OPCN-2) interface modules including QJ71FL71-T-F01, QJ71FL71-B5-F01 and QJ71FL71-B2-F01, and the settings for automatically reading and writing data, which is sent in cyclic transmission, to CPU device memory. To use this utility package, add it in GX Developer.
The initial settings and automatic refresh settings can be configured on the screen, which makes a sequence program shorter and allows easily confirming setting status, operational status, etc.

Intelligent function module utility

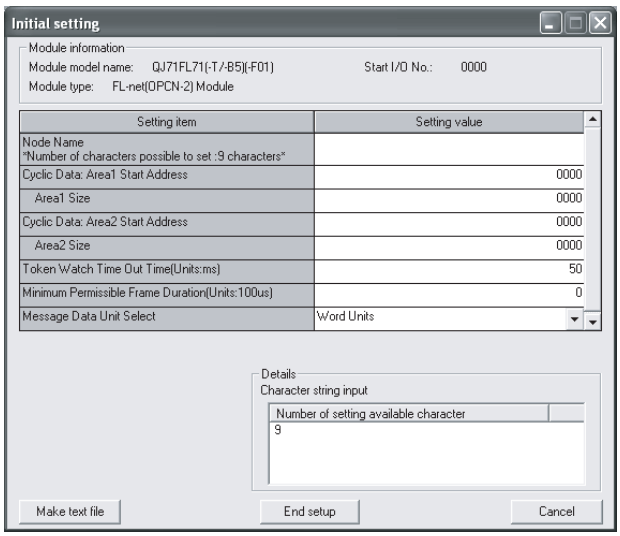
■ Initial setting

It is possible to configure the initial settings for using the FL-net (OPCN-2) interface modules on the screen. The following lists items that require the initial settings.

(1) Node name
(2) Head address of cyclic data area 1
(3) Size of cyclic data area 1
(4) Head address of cyclic data area 2
(5) Size of cyclic data area 2
(6) Token monitoring time-out time
(7) Minimum allowable frame interval

Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to FL-net modules when the PLC CPUs enter RUN state.

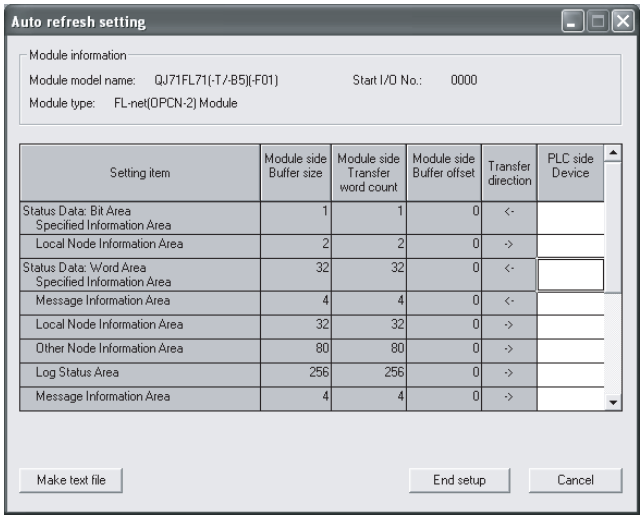
Sample of default value setting screen



■ Auto refresh setting

This setting allows you to configure the status data bit area, status data word area, and cyclic data area in buffer memory on FL-net (OPCN-2) interface modules.
The specified device automatically reads and writes values, which are set for the auto refresh and stored in the buffer memory of the FL-net modules, at END instruction executed.

Sample of auto refresh setting screen



■ Monitor/test

●Monitor/test

Monitors and tests the buffer memory and I/O signals of FL-net (OPCN-2) interface module.

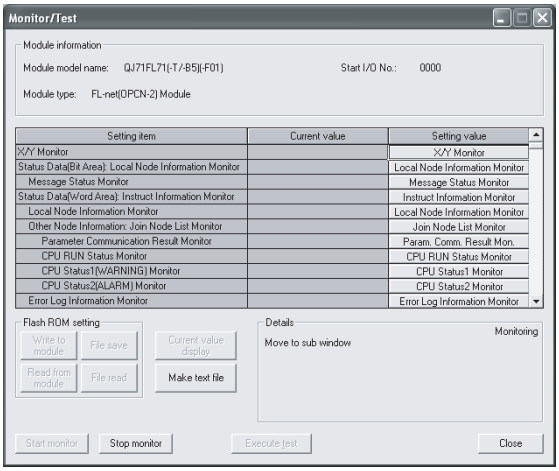
● Status data area

Monitors information of status data area.

● Host/other nodes parameter information

Monitors parameter information of host and other nodes.

Example of Monitor/test screen



About the number of parameters that can be set in GX Configurator-FL

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Installation object of intelligent function module	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings.The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.
The number of parameter settings that can be set for one unit in the GX Configurator-FL is as shown below.

Object Module	Initial setting	Automatic refresh setting
FL-net module	2 (Fixed)	14 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-FL is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later*2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard-disk free space	For installation	65MB or more
	For operation	10MB or more
Display		800 × 600 dot or more resolution *3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-FL in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-FL (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-FL (English version) cannot be used in configuration.

*2: GX Configurator-FL cannot be used as an add-in with GX Developer Version 3 or earlier versions.

*3: Setting fonts Size of Windows® for "Large Fonts" may cause the text to extend off screen. Therefore, choose "Small Fonts".

Used operating system and performance required for personal computer

Operating system		Performance Required for Personal Computer	
		CPU	Required memory
Windows® 95		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

2.7 CC-Link Master Module, Local Module

2.7.1 QJ61BT11N

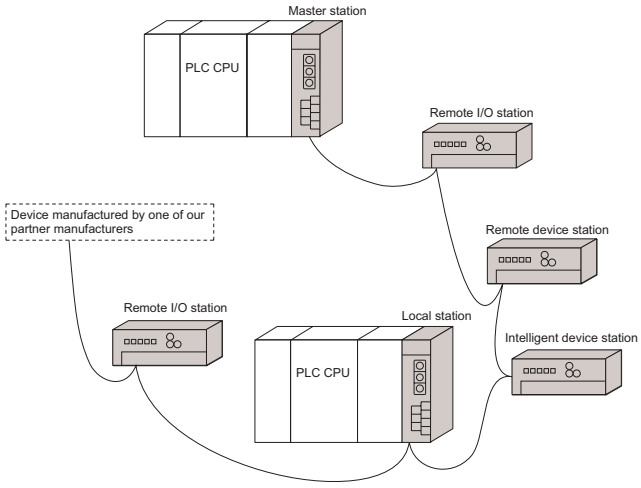
Overview

CC-Link (Control & Communication Link) designed for the integration of both control and communication, is a wire-saving and information network, which has the industry's latest advanced functions and performance capabilities, e.g. real-time capability, decentralized control, communication with intelligent equipment and RAS*1 function. Also, it offers multi-vendor environment compatible with various field equipment manufacturers.
The QJ61BT11 CC-Link modules inherit the features of the MELSEC-A/QnA series and other newly adopted useful functions, such as remote device station initial setting function.
*1: RAS stands for Reliability, Availability, Serviceability.

Features

The CC-Link system connects distributed modules such as an I/O module, an intelligent function module, and a special function module using dedicated cables so that these modules can be controlled by the PLC CPU.

(1) By distributing each module to an equipment device such as a conveyor line and a machine device, the wiring efficiency of the entire system can be accomplished.
(2) On/off information of input/output and numeric data that are handled by modules can easily be sent and received at high-speed.
(3) By connecting multiple PLC CPUs, a simple distributed system can be configured
(4) By connecting various devices made by Mitsubishi's partner manufacturers, the system can provide flexible solutions to meet a wide range of user needs.



Master station ••••••••••• The station that controls the data link system.
Remote I/O station •••••• The remote station that handles bit unit data only.
Remote device station•• The remote station that handles bit unit and word unit data only.
Local station ••••••••••••• The station having a PLC CPU and the ability to communicate with the master and other local stations.
Intelligent device station The station that can perform transient transmission.

■ Cyclic communication system

With CC-Link, the cyclic data areas are assigned to respective remote I/O, remote device, intelligent device stations and local station and are refreshed automatically. Since information from the master station transferred to the remote I/O, remote I/O and remote register data are also transmitted to other local stations. The local stations can also acquire the remote stations operating status.
* Note, however, that when the master station is in the remote network Ver.2 mode or remote net additional mode of QJ61BT11N, and the local station is in the remote network Ver.1 of QJ61BT11N or QJ61BT11/A(1S)J61QBT11/A(1S)J61BT11, communication between local and master stations is basically enabled excluding information of Ver.2 compatible stations.

■ Transient communication

CC-Link provides non-periodical communication in addition to cyclic communication, which is periodical and automatic. Stations that can perform transient communication are master stations, local stations, and intelligent device stations, and the following processing are available.
(1) Uses a PLC to read and write device data in another PLC.
(2) Sends/receives data to/from an intelligent device station by using a master station's PLC.
(3) Reads/writes or monitors programs on other PLC by using GX Developer.
(4) Reads/writes device data in a PLC by using an upper personal computer, etc.

■ Open network

We have partnerships with many Japanese and foreign equipment manufacturers, which makes a wide variety of field equipment connected to CC-Link directly and reduce wiring. We establish an open network where you can use the optimum field equipment trouble-free from many choices.
For the partner maker products, remote I/O stations, remote device stations and intelligent device stations that can be connected to CC-Link, refer to the product catalog published by the CC-Link Partner Association and the Mitsubishi Electric published CC-Link Catalog.
The CC-Link Partner Association is a non-profit organization made up of CC-Link product development partner vender and established to promote CC-Link worldwide.
CC-Link Partner Association home page URL is:
http://www.cc-link.org

■ Selecting a mode according to the system

The CC-Link system has four types of modes according to various systems.
The overview of the modes is described in the following table.

Mode	Connectable	Overview
Remote net Ver. 1 mode	Remote I/O station Remote device station Intelligent device station Local station Standby master station	Mode in which complete compatibility with the conventional module (QJ61BT11) is achieved.Select this mode when the number of cyclic points need not be increased or when the QJ61BT11N is used to replace the conventional module as a maintenance product.
Remote net Ver. 2 mode		Select this mode when increasing the number of cyclic points and configuring a new system.
Remote net additional mode		Select this mode when adding a Ver.2 compatible slave station to the existing system to increase the number of cyclic points.
Remote I/O net mode	Remote I/O station	Select this mode when the system consists of only the master station and remote I/O stations.Since cyclic transmission is made at high speed, the link scan time can be reduced.

■ Cyclic points increase

Selection of the remote net Ver. 2 mode or remote net additional mode allows RX/RY to be increased to up to 8192 points and RWr/RWw to up to 2048 words per network by making expanded cyclic setting (single, double, quadruple, octuple). Also, RX/RY can be increased to up to 224 points and RWr/RWw to up to 32 words per station.
When increasing the number of cyclic points, select one from the following two modes.

•Remote net Ver.2 mode ••••••••Mode suitable for configuring a new system

•Remote net additional mode ••• Mode suitable for adding a Ver. 2 compatible slave station to the existing Ver. 1 system

The number of cyclic points per module can be increased as indicated in the following table.

		Expanded cyclic setting			
		single	double	quadruple	octuple
Occupies 1 station	Remote I/O (RX, RY)	32 points	32 points	64 points	128 points
	Remote register (RWw , RWr)	4 points	8 points	16 points	32 points
Occupies 2 stations	Remote I/O (RX, RY)	64 points	96 oints	192 points	384 points
	Remote register (RWw , RWr)	8 points	16 points	32 points	64 points
Occupies 3 stations	Remote I/O (RX, RY)	96 points	160 points	320 points	640 points
	Remote register (RWw , RWr)	12 points	24 points	48 points	96 points
Occupies 4 stations	Remote I/O (RX, RY)	128 points	224 points	448 points	896 points
	Remote register (RWw , RWr)	16 points	32 points	64 points	128 points

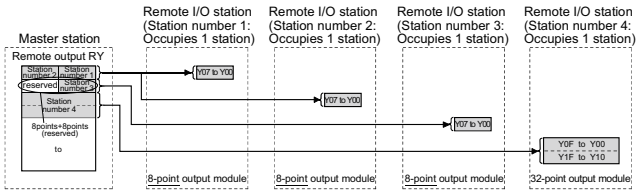
Note1) Cyclic points cannot be extended in remote network Ver.1 mode.
Note2) Cyclic points cannot be extended as remote I/O stations are not compatible with Ver.2.
Note3) To set parameters, use GX Developer versions of 8.03D or later.

■ Points setting of remote I/O station (for remote network Ver.2 mode only)

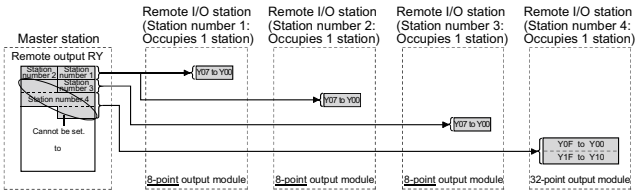
Set the number of I/O points of a remote I/O station.
This setting minimizes CPU device assignment and reduces the reserved points of remote input RX and remote output RY for remote I/O stations.

Note) To set parameters, use GX Developer versions of 8.03D or later.
Parameter settings cannot be performed by the dedicated instruction.

When setting points on a remote I/O stations in Ver.2 mode.



Previous Ver.1 mode.



■ Compatibility with previous models

● Compatibility with master/local modules

The QJ61BT11N achieves complete compatibility with the conventional module (QJ61BT11) in the remote net Ver. 1 mode.
Select the remote net Ver. 1 mode when the number of cyclic points need not be increased or when the QJ61BT11N is used to replace the conventional module as a maintenance product.

●Compatibility with CC-Link dedicated cables

The CC-Link dedicated cables compatible with CC-Link Ver.1.00 and Ver.1.10 can be used in Ver.2 mode.

● Mixing different types of remote I/O stations

Ver.1 compatible slave stations and Ver.2 compatible slave stations can be used together in Ver.2 mode.

■ Parameter setting by GX Developer or the dedicated instruction

There are two parameter setting methods; the parameters can either be set by GX Developer or by using a dedicated instruction.
The following table lists the differences between the two setting methods.

	Program requirement for setting parameters	Automatic refresh	Number of CPUs that can be mounted	Changing the parameter settings while the PLC CPU is running
Parameter setting with GX Developer	Not required	○	8 modules *2, *3	×
Parameter setting with dedicated instruction*1	Required	×	64 modules	○

*1: The parameter of local station cannot be set.
*2: For the basic model QCPU, 2 modules can be mounted.

■ Automatic CC-Link startup

By installing the QJ61BT11N, the CC-Link is started up and all data are refreshed by simply turning on the power, without creating a sequence program. However, when the number of connected modules is less than 64, it is necessary to set the network parameters in order to optimize the link scan time.

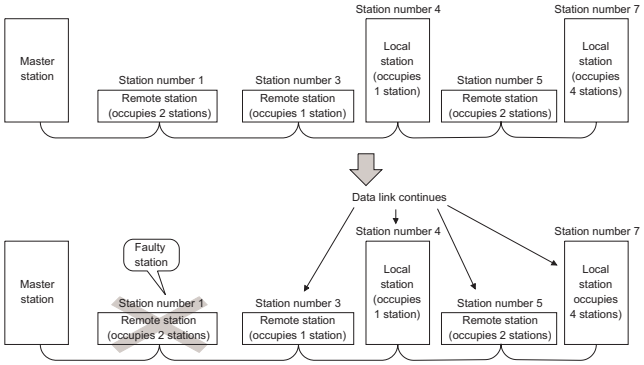
Note1) The automatic CC-Link startup function is available exclusively for a single "QJ61BT11N" with the smallest head I/O No. which is counted from a PLC CPU side.

Note2) Basic model QCPUs and high-performance model QCPU differ in refresh devices.

Note3) High-performance model QCPU is supported by the product with the first 5 digits of serial No. "08032" or later. For the product of serial No. "08032" or before, 4 modules can be mounted.

■ System down prevention (Slave station cut-off function)

Because the system employs the bus connection method, even if a module system fails due to power off, it will not affect the communication with other normal modules.
Also, for a module using a 2-piece terminal block, the module can be replaced during data link. (Replace the module after turning off the module power). However, if the cable is disconnected, data link to all stations are disable.



■ Automatic return function

When a station that has been disconnected from the link due to power off recovers the normal status, it will join the data link automatically.

■ Data link status setting when the master station PLC CPU has an error

The data-link status can be set to either "stop" or "continue" when an error causing the operation to stop such as "SP. UNIT ERROR" occurs in the PLC CPU at the master station. With errors enabling the operation to continue such as "BATTERY ERROR," the data link will continue regardless of the setting.

■ Setting the status of input data from a data link faulty station

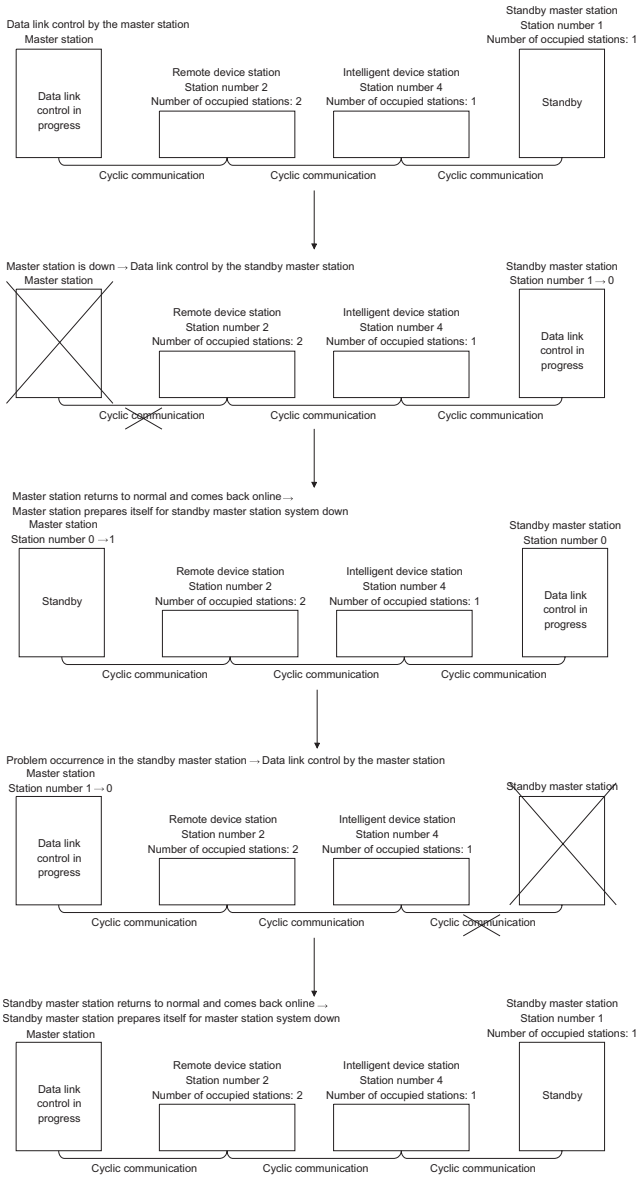
The data entered (received) from a data-link faulty station can be cleared or the previous status immediately before the error can be maintained.

■ Slave station refresh/compulsory clear setting in case of PLC CPU STOP

Set whether output data to the remote, local, intelligent device and standby master stations will be refreshed or compulsorily cleared when the PLC CPU comes to STOP.

■ Standby master function

This function enables the data link to continue working by switching to a standby master station (backup station for the master station) if a malfunction occurs in the master station due to a malfunction of the PLC CPU or power supply.
The master station can return to online even during data link control by the standby master station, and prepares itself for standby master station system down.

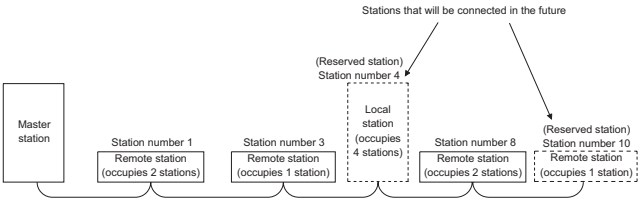


■ Link startup from standby master station is available

The data link can be started by using the standby master station as a master station even when the master station does not exist due to the future addition, etc.

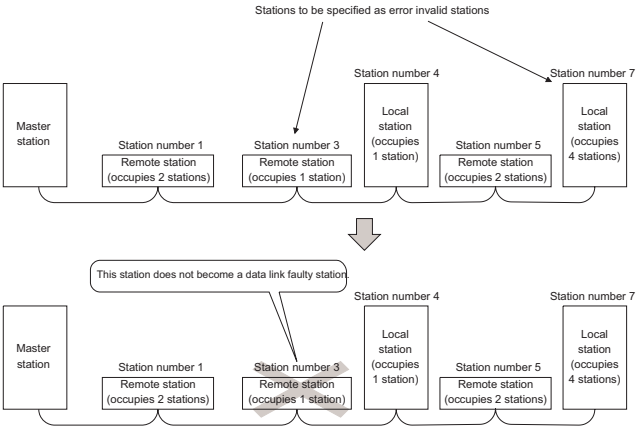
■ Reserved station function

Stations that are not actually connected (stations to be connected in the future) will not be treated as faulty stations if they are specified as reserved stations.
The reserved stations can also be set as 0 points for Ver.2 mode.



■ Error invalid station setting function

By setting the network parameters, the module that is powered off in the system configuration will not be treated as a "data link faulty station" by the master station and local station. However, caution is required since errors are no longer detected.



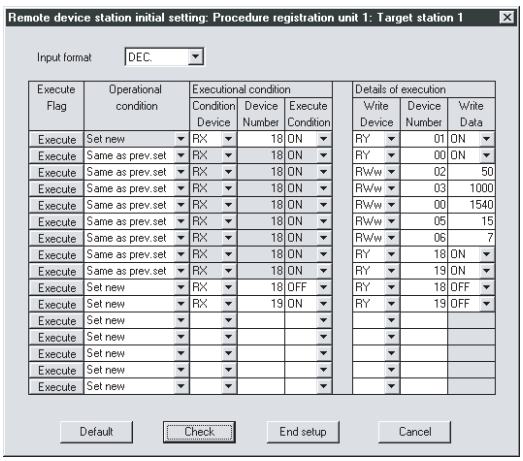
■ High-speed link scan

In a system consisting of only the master and the remote I/O stations, choosing the remote I/O network mode reduces the link scan time.
(At transmission speed of 10Mbps)

Number of Stations	Remote I/O Network Mode	Remote Network Mode(Normal Mode)
16	0.94ms	1.6ms
32	1.61ms	2.3ms
64	2.94ms	3.8ms

■ Remote device station registration function

Using GX Developer, initial setting can be made for a remote device station without creating a sequence program.
The setting example and setting items are shown below.



● Setting items for remote device station registration function

Setting Item	Description
Execution flag	Setting of whether set data is valid or invalid
Operating condition/ procedure execution condition	Set write conditions.
Execution data	Set write devices and write data.

■ Event issuance for the interrupt program

This function issues an event when the conditions set by the GX Developer are established in order to make executed the interrupt program of the PLC CPU.

Note) Not available for basic model QCPUs of function version A.

■Dedicated instruction

The following dedicated instructions are available for QJ61BT11N.

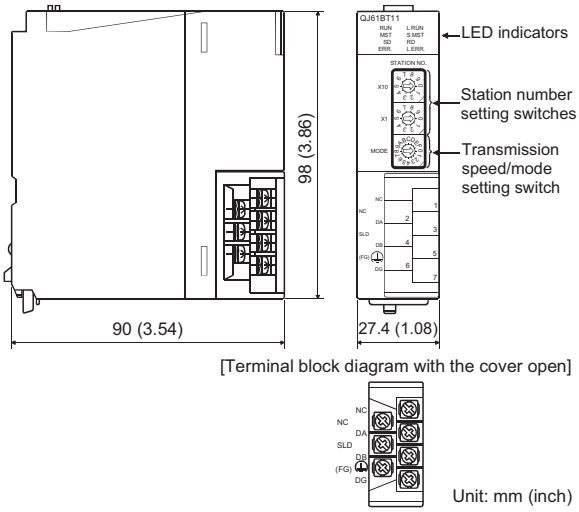
Target station	Instruction	Description
Master station Local station	RIRD	Reads data from the buffer memory or the PLC CPU device of the specified station.
	RIWT	Writes data into the buffer memory or the PLC CPU device of the specified station.
Intelligent device station	RIRD	Reads data from the buffer memory of the specified station.
	RIWT	Writes data into the buffer memory of the specified station.
	RIRCV	Automatically performs handshaking with the specified station and reads data from the buffer memory of that station.
	RISEND	Automatically performs handshaking with the specified station and writes data into the buffer memory of that station.
	RIFR	Reads data in the automatic update buffer of the specified station.
	RITO	Writes data into the automatic update buffer of the specified station.
Master station	RLPASET	Sets the network parameters for the master station and starts up the data link.

Program compatibility

The existing program can be utilized by using A to Q or QnA to Q program conversion of GX Developer.

Note 1: The RLPA network parameter setting instruction and the RRPA automatic refresh parameter setting instruction are not supported. After deleting the RLPA/RRPA instruction, set the parameters using GX Developer or RLPASET instruction.

Appearance



Comparison of Q-Compatible CC-Link and AnS/Q2AS-Compatible CC-Link

		Remote I/O Network Mode			Remote Network Ver.1 Mode			Remote Network Ver.2 Mode	Remarks
PLC type		Q mode	QnA/Q2AS	A mode, AnU/A2US	Q mode	QnA/Q2AS	A mode, AnU/A2US	Q mode	---
CC-Link module type		QJ61BT11N	AJ61QBT11 A1SJ61QBT11	AJ61BT11 A1SJ61BT11	QJ61BT11N	AJ61QBT11 A1SJ61QBT11	AJ61BT11 A1SJ61BT11	QJ61BT11N	---
Connectable remote/ local station		Remote I/O station			Remote I/O station, remote device station, intelligent device station, local station, standby master station				---
Transmission speed		Max. 10Mbps							---
Number of cyclic points per network	RX(1Bit)	0 to 7FF(2048 points)			0 to 7FF(2048 points)			0 to 1FFF (8192 points)	---
	RY(1Bit)	0 to 7FF(2048 points)			0 to 7FF(2048 points)			0 to 1FFF (8192 points)	---
	RWr(1 word)	No			0 to FF(256 points)			0 to 7FF (2048 points)	---
	RWw(1 word)	No			0 to FF(256 points)			0 to 7FF (2048 points)	---
Number of cyclic points per remote station	RX(1Bit)	32 points			32 points			128 points	---
	RY(1Bit)	32 points			32 points			128 points	---
	RWr(1 word)	---			4 points			32 points	---
	RWw(1 word)	---			4 points			32 points	---
Link scan time		Short			Normal				---
CC-Link automatic start function		No			Yes*1	No		Yes*1	---
Standby master function		No			Yes When the master station returns to normal from failure status, it can return to network.	Yes When the master station returns to normal from failure status, it cannot return to network.		Yes When the master station returns to normal from failure status, it can return to network.	---
Remote device station registration function		No			Yes	No		Yes	---
Interrupt program start		Yes	No		Yes	No		Yes	---
Network parameter setting from GX Developer		Yes	Yes	No	Yes	Yes	No	Yes	---
Network parameter setting using dedicated instruction		No	No	No	Yes (RLPASET instruction)	No	Yes*2 (RLPA instruction)	Yes (RLPASET instruction)	---
Dedicated instructions	RLPA	×	×	×	×	×	○*2	×	For details of the dedicated instructions, confirm in the programming manual.related.
	RRPA	×	×	○	×	×	○*2	×	
	CCL,CCLEND	×	×	×	×	○	×	×	
	SPCCLR,SPCBUSY	×	×	×	×	○	×	×	
	RIRD,RIWT	×	×	×	○	○	○*2	○	
	RISEND,RIRCV	×	×	×	○	○	○*2	○	
	RIFR,RITO	×	×	×	○	○	○*2	○	
	RLPASET	×	×	×	○	×	×	○	

*1: The data link can be started by using the standby station as a master station even when the master station does not exist.

*2: For the compatible CPU or CC-Link master/local module, refer to the user's manual and programming manual.

Function list

Item		Outline
Cyclic transmission function		Communicates by link device RX/RY/RWr/RWw among master, remote I/O, remote device, intelligent device and local stations.
Transient transmission function		Communicates specifying other any timing among master, intelligent device and local stations.
Parameter setting using GX Developer		Sets the network parameters and automatic refresh parameters using GX Developer.
Parameter setting using dedicated instructions*5		Sets the network parameters using the RLPASET instructions.
Interrupt program start *3, *5		Starts the network and refreshes all data by merely performing wiring and switch setting, without the need of any parameter setting.
Slave station cut-off function		Disconnects the module that cannot continue the data link because of power off, and continues the data link with only the normal modules.
Automatic return function		When a module cannot continue the data link because of power off, and returns to the normal status, it automatically joins the data link.
Data link status setting when the master station PLC CPU has an error		Sets the data link status when an error that stops the operation occurs at the master station PLC CPU.
Setting the status of input data from a data link faulty station		Sets the status (clear/hold) of the input (receive) data from a station that became data link faulty because of power off.
Slave station refresh/compulsory clear setting in case of PLC CPU STOP*1		Sets whether output data to the slave stations will be refreshed or compulsorily cleared when the PLC CPU comes to STOP.
Standby master function*5		Continues the data link by switching to the standby master station when a problem occurs in the master station.
Remote device station initialization procedure registration function		Performs initial setting of remote device station using GX Developer.
Event issuance for the interrupt program		Issues events when the conditions set by GX Developer are established and causes the PLC CPU to run an interrupt program.
Automatic CC-Link startup*2		Starts the CC-Link automatically by turning the power on.
Remote net mode		Performs communication with all stations (remote station, local station, intelligent device station, and standby master station).
Remote I/O net mode*5		Shortens the link scan time for a system consisting only of the master station and remote I/O stations.
Reserved station function		By assigning modules that will be connected in the future as reserved stations, they will not be treated as data link faulty stations. If any of the connected modules is specified, it cannot perform data link.The reserved stations can also be set as 0 points.
Error invalid station setting function		Prevents modules that may be powered off in the system configuration from being treated as data link faulty stations by setting the network parameters.
Scan synchronous function	Synchronous mode*5	Performs link scan by synchronizing with sequence scan.
	Asynchronous mode	Perform link scan without synchronizing with sequence scan.
Temporary error invalid station setting function		Prevents modules specified by GX Developer from being treated as data link faulty stations temporarily during online operation.
Data link stop/restart		Stops or restarts the data link that is being executed.
Station number overlap checking function		Checks for the overlapping of number of occupied stations and whether or not more than one module having a station number setting of 0 exists in the system.
Multiple PLC system support*4, *5		Allows monitoring and reading/writing programs from/to any CPU in a multiple PLC system mounted with the QJ61BT11N via AJ65BT-G4-S3 or other station CPUs.
Remote I/O station points setting*1		Allows the I/O points of the remote I/O stations to be selected from among 8 points, 16 points and 32 points, reducing the number of reserved points.
Cyclic points increase*1		Allows the number of cyclic points per module to be increased from 128 points for RX/RY and 16 points for RWr/RWw in the Ver. 1 mode to up to 896 points for RX/RY and 128 points for RWr/RWw in the Ver. 2 mode.

*1: When using GX Developer for setting, use versions of "8.03D" or later.
*2: Basic model QCPUs and high-performance model QCPU differ in refresh devices.
*3: Not available for basic model QCPUs of function version A.
*4: Not available for basic model QCPUs.
*5: Not available for use on MELSECNET/H remote I/O stations.

Performance specifications

Item			Specifications				
Control specifications	Maximum link points per one system		Remote network Ver.1 mode	Remote network Ver.2 mode, remote net additional mode			
		Remote I/O (RX, RY)	2048 points	8192 points			
		Remote resister (RWw)*1	256 points	2048 points			
		Remote resister (RWr)*2	256 points	2048 points			
	Link points per one station	Extension cyclic setting	---	1 times setup	2 times setup	4 times setup	8 times setup
		Remote I/O (RX, RY)	32 points (30 points for local stations)	32 points (30 points for local stations)	32 points (30 points for local stations)	64 points (62 points for local stations)	128 points (126 points for local stations)
		Remote resister (RWw)	4 points	4 points	8 points	16 points	32 points
		Remote resister (RWr)	4 points	4 points	8 points	16 points	32 points
	Link points per the number of occupying stations		32 points	32 points	32 points	64 points	128 points
			4 points	4 points	8 points	16 points	32 points
			4 points	4 points	8 points	16 points	32 points
			64 points	64 points	96 points	192 points	384 points
			8 points	8 points	16 points	32 points	64 points
			8 points	8 points	16 points	32 points	64 points
			96 points	96 points	160 points	320 points	640 points
			12 points	12 points	24 points	48 points	96 points
			12 points	12 points	24 points	48 points	96 points
			128 points	128 points	224 points	448 points	896 points
			16 points	16 points	32 points	64 points	128 points
			16 points	16 points	32 points	64 points	128 points
	Transient transmission		Max. 480 words/station				
Communication specifications	Transmission speed		10M/5M/2.5M/625k/156kbps				
	Communication method		Polling system				
	Synchronous method		Flag synchronous system				
	Encoding method		NRZI system				
	Transmission path format		Bus (RS-485)				
	Transmission format		HDLC conformance				
	Error control system		CRC($X^{16}+X^{12}+X^5+1$)				

*1: Master station → Remote device station/Local station/Intelligent device station/Standby master station

*2: Remote device station/Local station/Intelligent device station/Standby master station → Master station

(Continued on next page)

(Continued from preceding page)

Item		Specifications		
Communication specifications	Max. number of connected modules (For master station)	664 modules Note that the following conditions must be satisfied.		
		Remote net Ver. 1 mode		
		Condition 1	{(1×a)+(2×b)+(3×c)+(4×d)}≦64	a: Number of modules occupying 1 station b: Number of modules occupying 2 stations c: Number of modules occupying 3 stations d: Number of modules occupying 4 stations
		Condition 2	{(16×A)+(54×B)+(88×C)}≦2304	A: Number of remote I/O stations≦64 modules B: Number of remote device stations ≦42 modules C: Number of local stations, standby master stations and intelligent device stations ≦26 modules
		Remote net Ver. 2 mode, remote net additional mode		
		Condition 1	{(a+a2+a4+a8) +(b+b2+b4+b8)×2 +(c+c2+c4+c8)×3 +(d+d2+d4+d8)×4}≦64	a: The total number of Ver.1 compatible slave stations that occupy 1 station, and Ver.2 compatible slave stations that occupy 1 station which are set to “Single“. b: The total number of Ver.1 compatible slave stations that occupy 2 stations, and Ver.2 compatible slave stations that occupy 2 stations which are set to “Single“. c: The total number of Ver.1 compatible slave stations that occupy 3 stations, and Ver.2 compatible slave stations that occupy 3 stations which are set to “Single“. d: The total number of Ver.1 compatible slave stations that occupy 4 stations, and Ver.2 compatible slave stations that occupy 4 stations which are set to “Single“. a2: The number of Ver.2 compatible stations that occupy 1 station which are set to “Double“. b2: The number of Ver.2 compatible stations that occupy 2 stations which are set to “Double“. c2: The number of Ver.2 compatible stations that occupy 3 stations which are set to “Double“. d2: The number of Ver.2 compatible stations that occupy 4 stations which are set to “Double“. a4: The number of Ver.2 compatible stations that occupy 1 station which are set to “Quadruple“. b4: The number of Ver.2 compatible stations that occupy 2 stations which are set to “Quadruple“. c4: The number of Ver.2 compatible stations that occupy 3 stations which are set to “Quadruple“. d4: The number of Ver.2 compatible stations that occupy 4 stations which are set to “Quadruple“. a8: The number of Ver.2 compatible stations that occupy 1 station which are set to “Octuple“. b8: The number of Ver.2 compatible stations that occupy 2 stations which are set to “Octuple“. c8: The number of Ver.2 compatible stations that occupy 3 stations which are set to “Octuple“. d8: The number of Ver.2 compatible stations that occupy 4 stations which are set to “Octuple“.
		Condition 2	[{(a×32)+(a2×32)+(a4×64) +(a8×128)}+{(b×64)+(b2×96) +(b4×192)+(b8×384)} +{(c×96)+(c2×160)+(c4×320) +(c8×640)}+{(d×128)+(d2×224) +(d4×448)+(d8×896)}]≦8192	
		Condition 3	[{(a×4)+(a2×8)+(a4×16) +(a8×32)}+{(b×8)+(b2×16) +(b4×32)+(b8×64)}+{(c×12) +(c2×24)+(c4×48)+(c8×96)} +{(d×16)+(d2×32)+(d4×64) +(d8×128)}]≦2048	
		Condition 4	{(16×A)+(54 ×B)+(88×C)}≦2304	A: The number of remote I/O stations ≦64 modules B: The number of remote device stations ≦42 modules C: The number of local, standby master, intelligent device stations ≦26 modules

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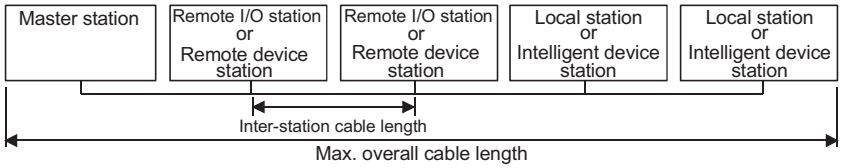
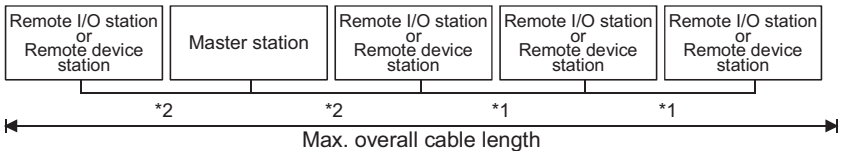
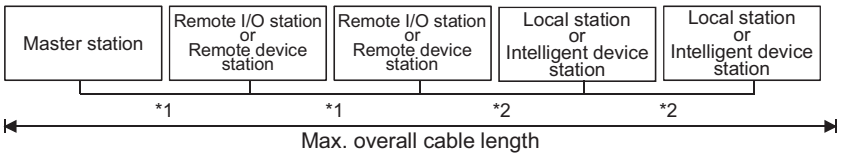
Item			Specifications
Communication specifications	Number of occupying stations (For local station)		1 to 4 station (Switch by parameter setting of GX Developer)
	Max. overall cable length and inter-station cable length (Ver. 1.10)(Note 1)	Same specifications regardless of system configuration	 Ver.1.10 compatible CC-Link dedicated cable (terminating resistor 110 Ω) **Transmission speed** / **Inter-station cable length** / **Max. overall cable length (Note 3)** 156kbps — 20cm or more — 1200m 625kbps — 900m 2.5Mbps — 400m 5Mbps — 160m 10Mbps — 100m
	Max. overall cable length and inter-station cable length (Ver.1.00)	System configuration (1) made up of remote I/O and/or remote device stations only	 * 1 Inter-station cable length between remote I/O or remote device station and remote I/O or remote device station * 2 Inter-station cable length between master station and adjacent station CC-Link dedicated cable (110 Ω terminating resistor used) **Communication speed** / **Inter-station cable length** *1 / **Inter-station cable length** *2 / **Max. overall cable length (Note 3)** 156kbps — 30cm or more — 1m or more — 1200m 625kbps — 30cm or more — 1m or more — 600m 2.5Mbps — 30cm or more — 1m or more — 200m 5Mbps — 30cm to 59cm* — 1m or more — 110m 5Mbps — 60cm or more — 1m or more — 150m 10Mbps — 30cm to 59cm* — 1m or more — 50m 10Mbps — 60cm to 99cm* — 1m or more — 80m 10Mbps — 1m or more — 1m or more — 100m CC-Link dedicated high-performance cable (130 Ω terminating resistor used) **Communication speed** / **Inter-station cable length** *1 / **Inter-station cable length** *2 / **Max. overall cable length (Note 3)** 156kbps — 30cm or more — 1m or more — 1200m 625kbps — 30cm or more — 1m or more — 900m 2.5Mbps — 30cm or more — 1m or more — 400m 5Mbps — 30cm or more — 1m or more — 160m 10Mbps — No. of connected modules: 1 to 32 — 30cm or more — 1m or more — 100m 10Mbps — No. of connected modules: 33 to 48 — 30cm to 39cm* — 1m or more — 80m 10Mbps — No. of connected modules: 33 to 48 — 40cm or more — 1m or more — 100m 10Mbps — No. of connected modules: 49 to 64 — 30cm to 39cm* — 1m or more — 20m 10Mbps — No. of connected modules: 49 to 64 — 40cm to 69cm* — 1m or more — 30m 10Mbps — No. of connected modules: 49 to 64 — 70cm or more — 1m or more — 100m * If wiring is made at even one location within this range of the inter-station cable length between remote I/O or remote device station and remote I/O or remote device station, the max. overall cable length is as indicated above.

<table>
<tr><td rowspan="11">Communication specifications</td><td>Max. overall cable length and inter-station cable length (Ver.1.00)</td><td>System configuration (2) made up of remote I/O, remote device, local, standby master and intelligent device stations</td><td>


* 1 Inter-station cable length between remote I/O or remote device station and remote I/O or remote device station
* 2 Inter-station cable length between master station and adjacent station
CC-Link dedicated cable (110 Ω termination resistor used)
<table>
<tr><th>Communi-cation speed</th><th colspan="2">Inter-station cable length</th><th>Max. overall cable length (Note 3)</th></tr>
<tr><th></th><th>*1</th><th>*2</th><th></th></tr>
<tr><td>156kbps</td><td rowspan="3">30cm or more</td><td rowspan="6">2m or more</td><td>1200m</td></tr>
<tr><td>625kbps</td><td>600m</td></tr>
<tr><td>2.5Mbps</td><td>200m</td></tr>
<tr><td rowspan="2">5Mbps</td><td>30cm to 59cm*</td><td>110m</td></tr>
<tr><td>60cm or more</td><td>150m</td></tr>
<tr><td rowspan="2">10Mbps</td><td>30cm to 59cm*</td><td>50m</td></tr>
<tr><td>60cm to 99cm*</td><td>80m</td></tr>
<tr><td></td><td>1m or more</td><td>100m</td></tr>
</table>
CC-Link dedicated high-performance cable (130 Ω termination resistor used)
<table>
<tr><th>Communi-cation speed</th><th colspan="2">Inter-station cable length</th><th>Max. overall cable length (Note 3)</th></tr>
<tr><th></th><th>*1</th><th>*2</th><th></th></tr>
<tr><td>156kbps</td><td rowspan="3">30cm or more</td><td rowspan="6">2m or more</td><td>1200m</td></tr>
<tr><td>625kbps</td><td>600m</td></tr>
<tr><td>2.5Mbps</td><td>200m</td></tr>
<tr><td rowspan="2">5Mbps</td><td>30cm to 59cm*</td><td>110m</td></tr>
<tr><td>60cm or more</td><td>150m</td></tr>
<tr><td rowspan="2">10Mbps</td><td>70cm to 99cm*</td><td>50m</td></tr>
<tr><td>1m or more</td><td>80m</td></tr>
</table>
* If wiring is made at even one location within this range of the inter-station cable length between remote I/O or remote device station and remote I/O or remote device station, the max. overall cable length is as indicated above.
</td></tr>
<tr><td colspan="2">Connection cable</td><td>CC-Link dedicated cable/CC-Link dedicated high-performance cable/Ver. 1.10-compatible CC-Link dedicated cables (Note 2)</td></tr>
<tr><td rowspan="7">Others</td><td colspan="2">Protection degree</td><td>IP1XB</td></tr>
<tr><td colspan="2">RAS function</td><td>Automatic return function,slave station cut-off function, error detection with link special relay/register</td></tr>
<tr><td colspan="2">Online module change</td><td>Disabled</td></tr>
<tr><td colspan="2">Multiple CPU system</td><td>Compatible</td></tr>
<tr><td colspan="2">Number of occupied I/O points</td><td>32 points 1 slot (I/O assignment: intelligent)</td></tr>
<tr><td colspan="2">Internal current consumption (5VDC)</td><td>0.46A</td></tr>
<tr><td colspan="2">External dimensions</td><td>27.4(W)×98(H)×90(D) mm</td></tr>
<tr><td colspan="2">Weight</td><td>0.12kg</td></tr>
</table>

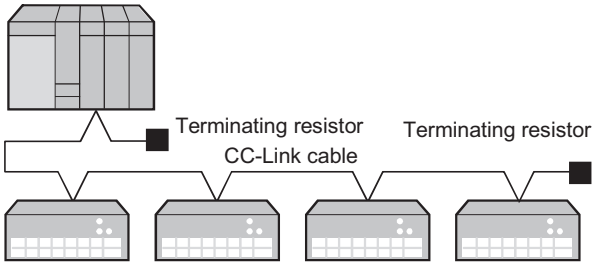
Note 1: The cables with restrictions on the conventional inter-station cable length have been improved and with inter-station cable lengths are 20cm or more uniformly are defined as Ver. 1.10. In contrast, the conventional products are defined as Ver. 1.00.

Note 2: CC-Link dedicated cables/Ver. 1.10-compatible CC-Link dedicated cables and CC-Link dedicated high-performance cables cannot be used together. Set the terminating resistor compatible with the cable type.

Note 3: Using the repeater (T branch) module/optical repeater module/wireless optical repeater module enables extension or T branch.

System configuration

■ QJ61BT11N



<QJ61BT11N Bundled items>

Product name	Description
Terminating resistor	110Ω, 130Ω, two for each
Manual	CC-Link System Master/Local Module User's Manual (Hardware)

<Items for separate purchase>
Purchase the following device (manual) separately.

Product name	Description
CC-Link cable	CC-Link dedicated cable
Manual	CC-Link System Master/Local Module User's Manual (Detail)

■ Applicable System

<Applicable modules and number of CPUs that can be mounted>
The CPU modules and network modules (for remote I/O station) to which the QJ61BT11N can be installed and number of modules that can be installed are listed in the table below.

(1) When performing the parameter setting with the GX Developer

Applicable module		Number of CPUs that can be mounted	Remark
CPU module	Q00JCPU Q00CPU Q01CPU	Maximum 2	*1, *2
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 4	It can be mounted only with the Q mode.*1, *3
	Q12PHCPU Q25PHCPU	Maximum 4	*1,*2
	Q12PRHCPU Q25PRHCPU	Maximum 4	*1,*2,*4
Network module	QJ72LP25-25 QJ72LP25G QJ72BR15	Maximum 4	MELSECNET/H remote I/O station *2

(2) When performing the parameter setting with the dedicated instructions.

Applicable module		Number of CPUs that can be mounted	Remark
CPU module	Q00JCPU Q00CPU Q01CPU	Maximum 2	*1,*2,*5
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	It can be mounted only with the Q mode.*1,*3,*5
	Q12PHCPU Q25PHCPU	Maximum 64	*1,*2,*5

*1: Refer to the system configuration for each CPU system in section 1.
*2: Refer to the system configuration of MELSECNET/H remote I/O network explained in Section 2.5.2.
Not compatible with the remote network additional mode.
Operations are not assured if used in the mode.
*3: To use in the remote network additional mode, select PLC CPUs having a serial No. "05032" or later as its first 5 digits.
Operations are not assured if incompatible CPUs are used.
*4: To use in the redundant system, select QJ61BT11N having a serial No. "06052" or later as its first 5 digits.
Operations are not assured if incompatible QJ61BT11N are used.
*5: When using in the local station, the parameter setting with the dedicated instructions cannot be performed.

<Applicable slave stations>
Both Ver.1 compatible slave stations and Ver.2 compatible slave stations can be used.

<Compatible software package>
(1) Software for PLC
The following shows systems using QJ61BT11N with their compatible software.
GX Developer is necessary to use QJ61BT11N.

		Software version
		GX Developer *1
Q00J/Q00/ Q01CPU	Single CPU system	Version 7or later
	Multiple CPU system	Version 8or later
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4or later
	Multiple CPU system	Version 6or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10Lor later
	Multiple CPU system	
When mounting on MELSECNET/H remote I/O station.		Version 6or later

*1: To use in remote network Ver.2 or remote network additional mode, versions 8.03D or later is necessary.

(2) Parameter setting for remote device, monitor/test support tool

Product name	Type name	Remarks
GX Configurator-CC	SW0D5C-J61P	Remote parameter setting Monitoring/testing remote station RX, RY, RWw, RWr *2

*2: Some functions are not supported by Q series.
For details, refer to the manual of GX Configurator-CC.

CC-Link dedicated cable

Use the CC-Link dedicated cable for the CC-Link system. If a cable other than the CC-Link dedicated cable is used, the performance of the CC-Link system cannot be guaranteed.
If you have any questions regarding the CC-Link dedicated cable, or if you wish to see its specifications, see the CC-Link Partner Association homepage URL:
http://www.cc-link.org/

Note) For details, refer to the CC-Link cable wiring manual issued by CC-Link Partner Association.

2.8 CC-Link/LT Master Module

2.8.1 QJ61CL12

Overview

The CC-Link/LT is a line-saving network system designed for the use inside control boxes or devices, and you will be free from complicated or incorrect wiring.
Wiring among sensors, actuators and controllers can be easily saved and excellent performance such as high-speeded response time can be realized by this.

Features

■ Easy connection/disconnection of communication cable

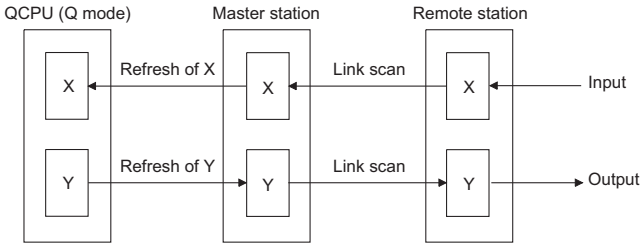
Because a dedicated connector enables simple connection/ disconnection of the communication cables, modules can be easily added and/or replaced.
Using dedicated flat cables, VCTF cables and/or high flexible cables will decrease the wiring steps and save the cost of the cables.

■ No parameter settings

To operate the CC-Link/LT system, no parameters are required to be set.

■ Simplified programming

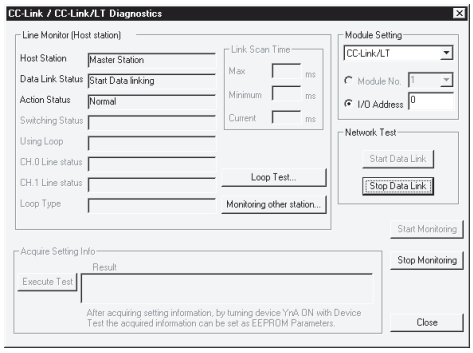
Since link devices of the CC-Link/LT are allocated to X/Y devices of the PLC CPU, you can create programs with X/Y devices only and not have to pay attention to the entire network.



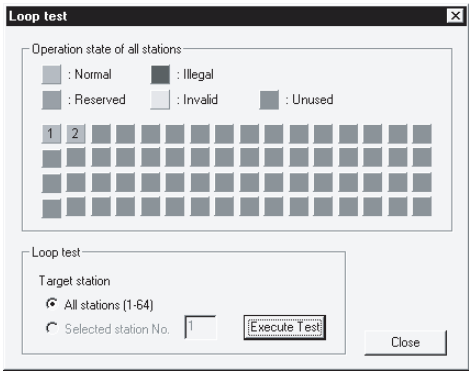
■ CC-Link/LT diagnosis

Operating state of the master station, presence of faulty station and other states can be checked by CC-Link/LT diagnostics of the GX Developer and this enables easy maintenance of the system.

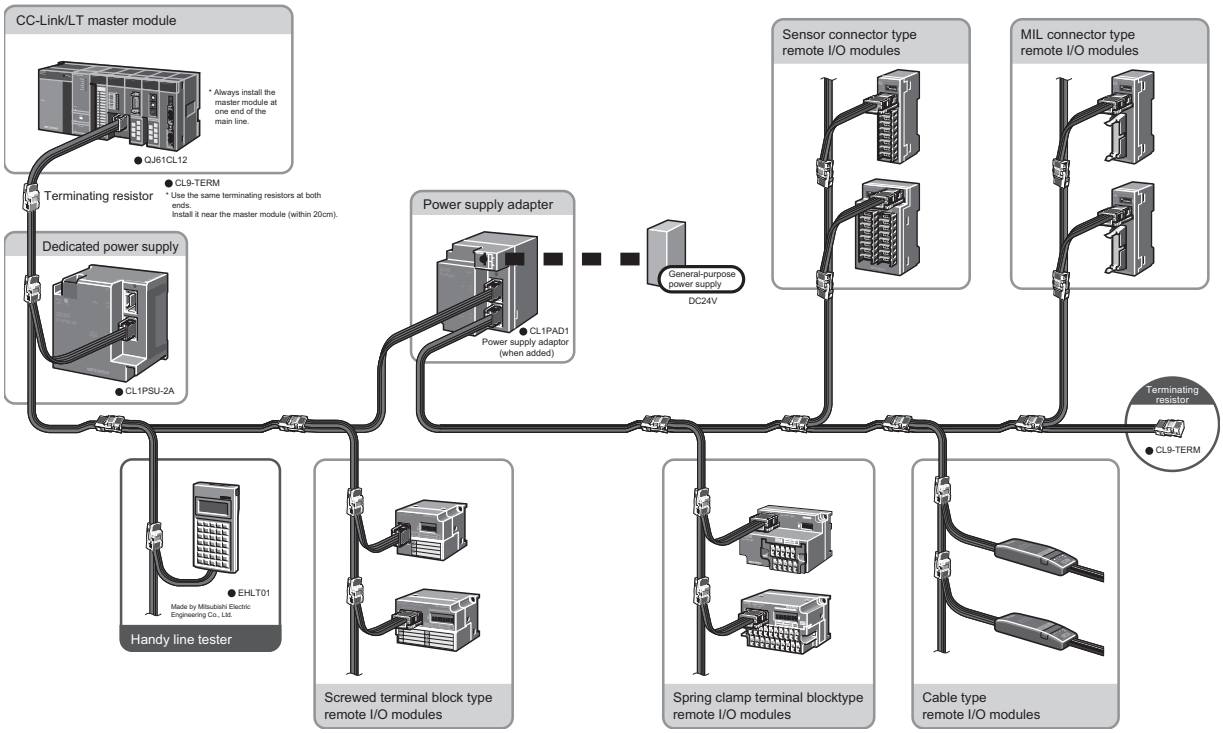
<Line Monitor [Host station] screen>



<Loop test screen>

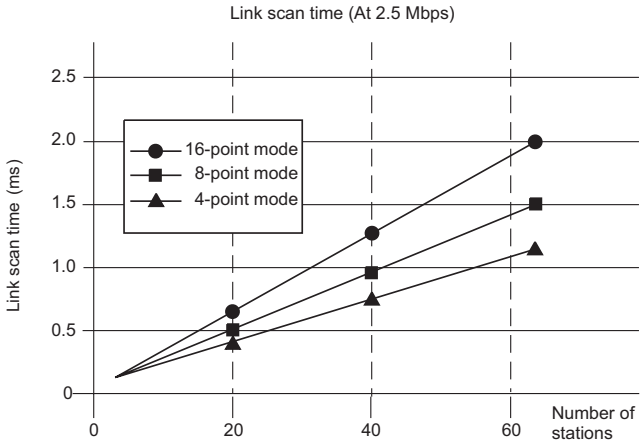


System Configuration Example of Using Dedicated Flat Cables



■ High speed refresh

High speed refreshing of 256 points for 0.5 ms can be achieved. (When 16 modules are connected in 16-point mode at a transmission rate of 2.5 Mbps)



■ Point mode setting

Setting of “occupied points” and “numbers of I/O points” per station allows effective use of the I/O points.

■ Bulk I/O control

The maximum of 2048 points (X: 1024; Y: 1024) can be controlled.

■ Stop/restart of data link

You can stop and restart the module while the data link is being executed.

■Storing data by remote station type

Through the initial communication after powering on or adding a remote station, occupied points, I/O types or other information will be detected and stored in the buffer memory.

■ Transmission speed automatic tracking function (remote station)

The setting of transmission speed in only master module is required. However, the setting in remote station side is not required.

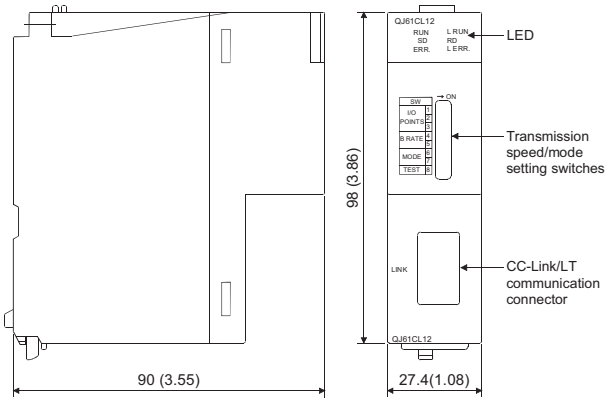
■ Open network

CC-Link/LT is an open network like CC-Link. It improves the freedom of system construction, e.g. enables flexible selection of optimum devices from multi-vendors.
CC-Link Parther Association is a nonprofit organization made up of parther-manufacturers developing CC-Link products, and was established to expand CC-Link throughout the world.
CC-Link Partner Association home page URL:

http://www.cc-link.org

Appearance

■ External dimensions

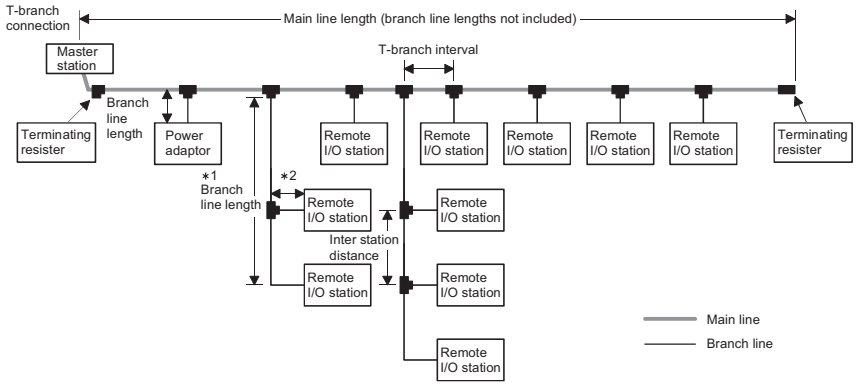


Unit:mm(inch)

Function list

Item	Description
Cyclic communication function	One station has up to 16 points for each of X and Y per one station, and up to 64 stations can be in communication. Free from concern on link devices between a master station and slave stations.
Points mode setting	By setting the number of occupying points and I/O occupying points per station, I/O points can be efficiently assigned.
Transmission speed Automatic tracking function	Setting transmission speed is necessary on master stations only. No need on remote stations.
Refresh range specifying function	By setting the last station number, this function stops refreshing unconnected stations, which leads to shortening scan time.
Slave station disconnecting function	This function prevents stations, which is down due to an error, from having an effect on communication with normal stations. Note, however, disconnection of the main cable disables a data link of all stations.
Auto return function	Stations, which were disconnected from a data link due to data link error, automatically return to the data link after the stations return to a normal state.

Performance specifications

Item				Specifications		
Control specifications	Point mode			4- point mode	8- point mode	16- point mode
	Maximum number of link points (The number of points within [ ] assumes that the same I/O address are used)			256 points [512 points]	512 points [1024 points]	1024 points [2048 points]
	Number of link points per station (The number of points within [ ] assumes that the same I/O address are used)			4 points [8 points]	8 points [16 points]	16 points [32 points]
	Link scan time	When 32 stations are connected	Number of points	128 points	256 points	512 points
			2.5Mbps	0.7ms	0.8ms	1.0ms
			625kbps	2.2ms	2.7ms	3.8ms
			156kbps	8.0ms	10.0ms	14.1ms
		When 64 stations are connected	Number of points	256 points	512 points	1024 points
			2.5Mbps	1.2ms	1.5ms	2.0ms
			625kbps	4.3ms	5.4ms	7.4ms
			156kbps	15.6ms	20.0ms	27.8ms
Communication specifications	Transmission rate			2.5M/625k/156kbps		
	Communication method			BITR system (Broadcastpolling+Interval Timed Response)		
	Transmission path			T- branch system		
	Error control system			CRC		
	Number of connected stations			64 stations		
	Remote station numbers			1 to 64		
	Network Wiring			 *1: The branch line also includes the length marked *2. (Maximum length the branch line and overall branch line length also includes the length marked *2.)		
		Total distance extension	Transmission rate	2.5Mbps	625kbps	125kbps
			Maximum main line length	35m	100m	500m
			Maximum length of the branch line	4m	16m	60m
			Overall branch line length	15m	50m	200m
		Maximum number of stations connected to branch line (per branch)		8 stations		
		Inter station distance		No restrictions		
		T- branch interval		No restrictions		
		Master station connection position		Connected at the end of the main line		
	Connection cable			Dedicated flat cable (0.75mm^2 × 4)		
				VCTF cable (compliant with JIS C 3306)		
				Moving cable (certified by CC-Link Partner Association)		

	Item		Specifications
Others	Protection degree		IP2X
	RAS-oriented functions		Network diagnosis, Internal loopback diagnosis, Station detach function, Automatic return function
	Online module change		Disabled
	Multiplae CPU system		Compatible
	Number of I/ O points occupied		16/32/48/64/128/256/512/1024 point 1 slot (I/ O assignment: intelligent) (I/ O assignment: intelligent)
	5VDC internal current consumption		0.13A
	External power supply (supplied from power supply adaptor)	Voltage	DC20.4 to 28.8V
		Current consumption	0.028A
	External dimensions		98(H)×27.4(W)×90(D) mm
	Weight		0.09kg

Concept of control point (Point mode setting and I/O occupied point setting)

This section describes concept of the point mode setting and I/O occupied point setting, which is required for system configuration.
By the point mode setting, the number of points that the system can control is set to each remote station.
There are 3 kinds of point modes: 4-point, 8-point and 16-point modes. Even in the same number setting of the I/O points occupied, the number of controllable remote stations will vary depending on the point mode setting.

■ Simplified setting

This section describes simple setting by which a point mode and I/O points occupied can be set.
According to the I/O points of the remote station, set the proper points and the mode shown in the following Table.

Remote station I/O points	Setting of I/O points occupied for QJ61CL12	Point mode setting for QJ61CL12
256 or less	16 points	4-point mode
	32 points	
	64 points	
	128 points	
	256 points	
257 to 512 points	512 points	8-point mode
513 to 1024 points	1024 points	16-point mode

■ Advanced setting

This section describes the advanced setting method of the point mode and the I/O points occupied.

(1) Even if the same I/O points occupied is set, the number of controllable remote stations varies depending on which point mode is selected.
The table below shows the relation among the I/O occupied point setting, point mode setting and number of stations that can be connected.

I/O occupied point setting		16 pts.	32 pts.	48 pts.	64 pts.	128 pts.	256 pts.	512 pts.	1024 pts.
Point mode setting	4-point mode	4 stations	8 stations	12 stations	16 stations	32 stations	64 stations	64 stations	64 stations
	8-point mode	2 stations	4 stations	6 stations	8 stations	16 stations	32 stations	64 stations	64 stations
	16-point mode	1 station	2 stations	3 stations	4 stations	8 stations	16 stations	32 stations	64 stations

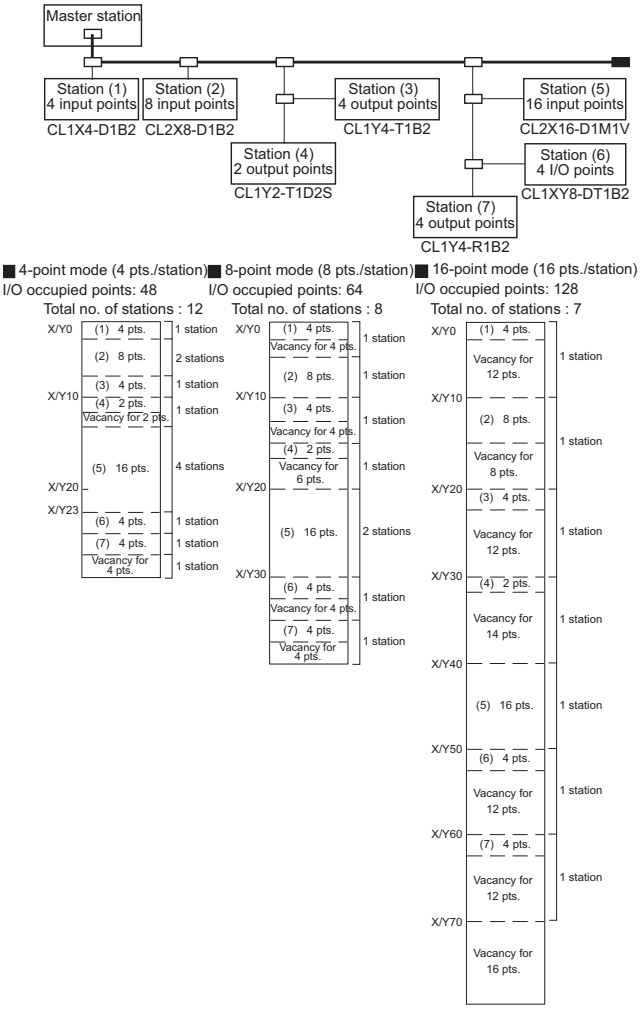
POINT

When the number of I/O points occupied is set exceeding the maximum number of link points in the 4-point or 8-point mode, the excessive I/O points cannot be used.

(2) The number of occupied stations for a remote module varies depending on the point mode.
For a 16-point module, the setting in the 4-pont, 8-point or 16-point mode makes it occupy 4, 2 or 1 station(s) respectively.

(3) The desirable selection of the point mode is depends on the points of the remote module to be used. Generally, setting the point mode in accordance to the points of the module that are used the most in the system can reduce useless points.
A setting example is as follows.

Example) In the system including: 2-point remote station:1, 4-point remote station: 4, 8-point remote station:1, 16-point remote station:1



System configuration

■ Combination of connecting cable to trunk line and drop line

● Mixture of different kinds of cables

(1) Trunk line

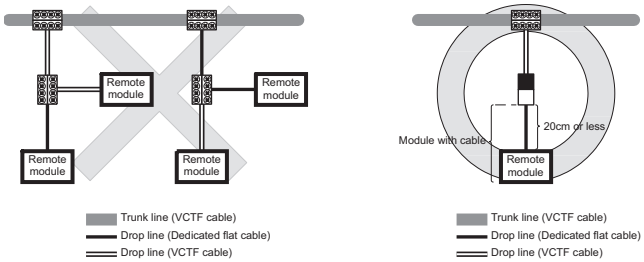
Mixture of different kinds of cables is not allowed.

(2) Drop line

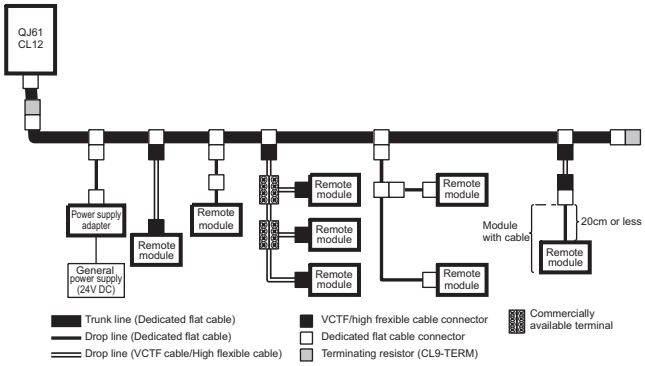
(a) Mixture of different kinds of cables is allowed.

(b) Using more than one kind of cables for the same drop line is not allowed.
When using a module with cable (e.g. CL1Y2-T1D2S), however, dissimilar cables can be connected if the dedicated flat cable of the module is 20cm long or less.

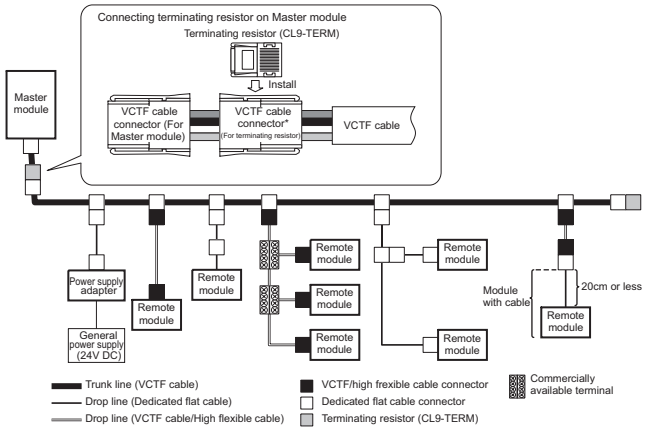
Example)



● System configuration example for using dedicated flat cable as trunk line



● System configuration example for using VCTF cable as trunk line



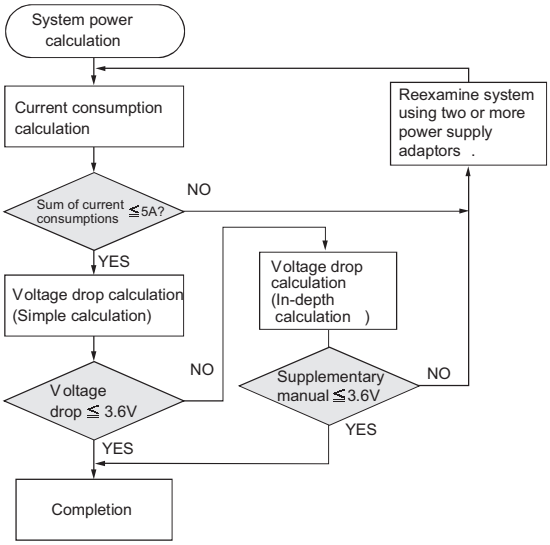
For details of connecting cable combination to trunk line and drop line, refer to Mitsubishi Electric published CC-Link and CC-Link/LT data book.

■ Power supply selection

● Concept of power supply selection

A CC-Link/LT system always requires one or more power supply adaptors.
To construct a system with one power supply adaptor, the following two conditions must be satisfied, otherwise two power supplies or more has to be considered.

1.	Since the current capacity of the power supply adaptor is 5A	Sum of current consumptions ≦ 5A
2.	Since the minimum operating voltage of each unit is 20.4V	Voltage drop ≦ 3.6V(At 24VDC: 24V - 20.4V = 3.6V)



For details of the calculation method for power supply selection, refer to the CC-Link and CC-Link/LT data book published by Mitsubishi Electric Corp.

<QJ61CL12 included products>

Product	Description
Manual	CC-Link/LT Master Module User's Manual (Hardware)

<Items for separate purchase>

The following equipment (manual) must be obtained separately.

Product	Description
Communication connector	CL9-CNF-18: CC-Link/LT dedicated flat cable connector (10 pieces) *1
	CL9-CNR-23: VCTF cable connector (20 pieces), cable insulator external diameter ϕ 2.1 to 2.4*1.
	CL9-CNR-20: Moving cable connector (20 pieces), cable insulator external diameter ϕ 1.8 to 2.1*1.
Sensor connector	ECN-□ (Model name differs depending on connector color, cable diameter, etc.): Sensor connector type dedicated I/O connector (20 pieces)*1
Cable	CL9-FL4-18: CC-Link/LT dedicated flat cable *1
	VCTFcable: cables with the following specifications, which conform to JIS C 3306.

Type	Number of cable cores	Conductor: Nominal cross-sectional area	Conductor: Number of wires/ wire diameter	Conductor: Outer diameter	Insulator thickness	Sheath thickness	Conductor resistance (20°C)
Vinyl cabtire round shaped code	4-core	0.75 mm^2	30/ 0.18 mm	1.1 mm	0.6 mm	1.0 mm	25.1 Ω/km

Cable	Moving cable: Contact CC-Link Partner Association.
Terminating resistor	CL9-TERM: CC-Link/LT dedicated terminating resistor (2 pieces) *1
	CC-Link/LT dedicated flat terminal resistor (2 pieces) *1
Power supply	24VDC power supply (obtained by the user)*2
Power supply adapter	CL1PAD1: CC-Link/LT power supply adapter (5A)*2, *3
Dedicated power supply	CL1PSU-2A:CC-Link/LT power supply*2 Input: AC100/120/200/230/240V 50/60Hz Output: DC24V+10%/-5% 2A
Manual	CC-Link/LT System Master Module User's Manual (Detail)

*1: Manufactured by Mitsubishi Electric System Service Co., Ltd.

*2: At least one power supply adapter (+ power supply) or dedicated power supply is required for the CC-Link/LT system.

*3: Used with the power supply (obtained by the user).

■ Applicable System

<Applicable module and number of available modules >

The following table shows the CPU modules and network modules (for remote I/O stations) applicable to the QJ61CL12 and the maximum numbers of modules that can be installed to each of them.

Applicable module		No. of available modules *1	Remarks
CPU module	Q00JCPU	Up to 16	*2
	Q00CPU Q01CPU	Up to 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 64	Available in Q mode only *2
	Q12PHCPU Q25PHCPU	Up to 64	*2
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Up to 64	MELSECNET/H remote I/O station *3

*1 : The number varies depending on the I/O points of the PLC CPU and the number of occupied I/O points set in QJ61CL12.

*2 : Refer to the description of the system configuration for each CPU system in section 1.

*3 : Refer to the description of the system configuration for MELSECNET/H Remote I/O Network in section 2.5.2.

<Compatible software package>

Software for PLC

The following shows systems using QJ61CL12 with their compatible software.

GX Developer is necessary to use QJ61CL12.

		Software version*1
		GX Developer
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/Q06H/ Q12H/Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	
When mounting on MELSECNET/H remote I/O station		Version 6 or later

*1: Version 7.17T or later is necessary to perform CC-Link/LT diagnostic.

2.9 AS-I Master Module

2.9.1 AS-I Master Module: QJ71AS92

Overview

AS-i, which stands for Actuator-Sensor-Interface, is a network system established by the IEC Standard: IEC 62026-2.
Compliant with AS-Interface Specification Version 2.11 (abbreviated to AS-i Ver. 2.11), the QJ71AS92 can be used as the master module of an AS-i system.

Features

■ Maximum number of connected slaves

As the AS-i master, the QJ71AS92 can control a maximum of 62 slaves by splitting the slave addresses into two groups (A and B).

■ Communication with analog slaves

Provided that one channel is equal to 16 bits, the QJ71AS92 can communicate with AS-i analog input or output slaves of one to four channels.

■ Overall distance

The overall distance is 100m.
Note that the overall distance can be extended to up to 300m by using two repeaters.

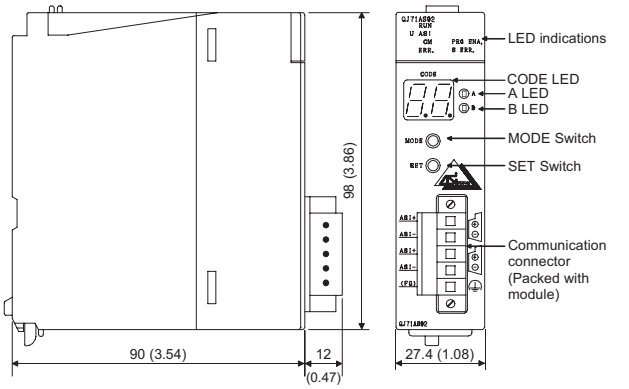
■ Automatic slave address assignment function (Automatic address assignment function)

The QJ71AS92 can automatically assign the same address to the new slave (same type of product), whose slave address is 0, when changing a slave.

■ Easy setting by using utility package (Sold separately)

GX Configurator-AS is available as an utility package (Sold separately).
Although not necessarily required, GX Configurator-AS enables the automatic refresh to be set from within the software, resulting in easy sequence programming, slave address setting, and monitoring of the setting and operation statuses.

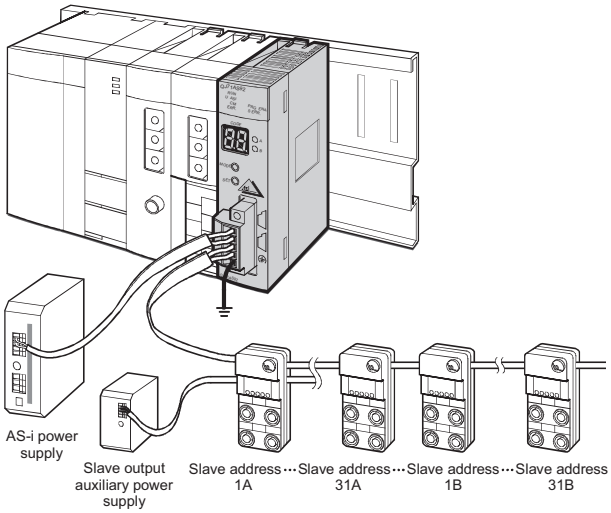
Appearance



Unit:mm(inch)

Function list

Item	Description
AS-i slave communication function	Communicates with AS-i slaves.
Utility-based automatic refresh function	Automatically refreshes the QJ71AS92 I/O data transferred to/from the CPU module's device memory using the utility package (GX Configurator-AS).
Automatic slave address assignment function	Automatically assigns the some address to the new slave (same type of product) whose slave address is 0, when changing a slave.
Parameter setting function	Sets the slave address and QJ71AS92 parameters using the utility package, module's front panel CODE LED and switches or sequence program.



Performance specifications

Item		Specifications
Max. number of AS-i slaves*1		62 (A-slaves: 31, B-slaves: 31)
Max. number of I/O points*2 (1 point = 1 bit)	Input	248 points
	Output	248 points
Maximum number of analog I/O points (1 point = 16 bits)	Input	124 points
	Output	124 points
I/O refresh time		Approx. 5ms (without I/O slave grouping)
		Approx. 10ms (with I/O slave grouping)
		Approx. 35ms (per analog slave channel)
Communication speed		167kbps
Transmission distance		Max. 100m (max. 300m with two repeaters)
Connection type		Bus network type (star, line, tree and ring)
Communication method		APM modulation method (Alternating Pulse Modulation)
Error control method		Parity check
Protection degree		IP2X
Internal memory		EEPROM (for parameter registration), number of writes: 100,000 times
Cable type		AS-i cable used
Online module change		Disabled
Multiple CPU system		Compatible
Number of occupied I/O points		32 points (I/O assignment: intelligent)
5VDC internal current consumption		0.40A
External supply power	Voltage	TYP. DC30.5V (supplied by AS-I power supply)
	Current consumption	46mA (TYP. DC30.5V)
External dimensions		98(H)×27.4(W)×90(D) mm
Weight		0.12kg

*1: This is the max. number of Ver. 2.11-compatible I/O slave stations (can be grouped) configured in the same system. If Ver.2.11-compatible I/O slaves that cannot be grouped, analog slaves, and Ver. 2.04-compatible slaves are used together in the same system, calculate the max. number of slaves using the following expression.

$N_{IO\text{-}A} + N_{IO\text{-}B} + 2 (N_{IO} + N_A) \leqq 62$

$N_{IO\text{-}A}$: Number of Slaves (A-slaves) that are compatible with Ver. 2.11

$N_{IO\text{-}B}$: Number of Slaves (B-slaves) that are compatible with Ver. 2.11

N_{IO}: Number of Slaves that are not compatible with extended addressing

N_A: Number of analog slaves

*2: One slave uses four inputs and four outputs.
One analog slave also uses four inputs and four outputs.

Slave Type	Whether Unit Can Be Grouped or Not
AS-i Ver. 2.11-compatible I/O slave	Please confirm with the manufacturer of the I/O slave unit whether the unit can be grouped.
AS-i Ver. 2.04-compatible I/O slave	N/A
AS-i Ver. 2.11-compatible analog slave	

System configuration

■ AS-i System Connection Methods

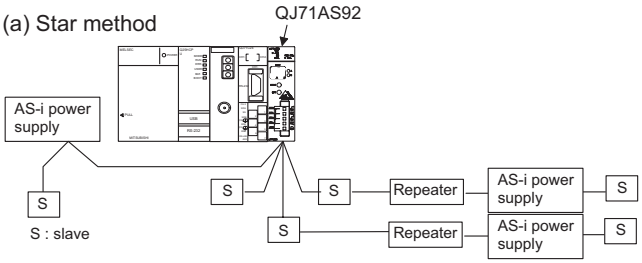
The following methods can be used to connect the AS-i system.

(1) The star method, line method, tree method or ring method can be used to connect the AS-i system.

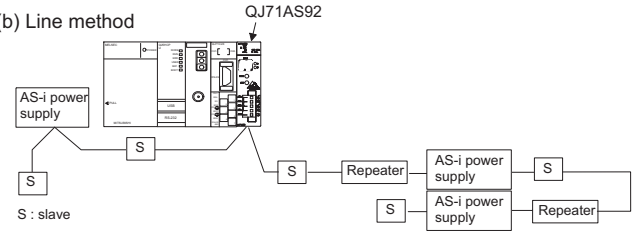
(2) The AS-i system does not require a terminating resistor. The overall distance is 100m when a repeater is not used, and 300m when two repeaters are used.

(3) One AS-i power supply unit is connected to the AS-i system. The power supply can be connected at any place on the AS-i system. When using a repeater, connect an AS-i power supply unit after the repeater is connected.

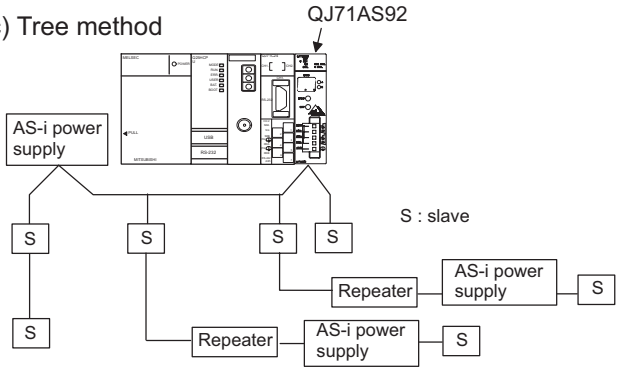
(a) Star method



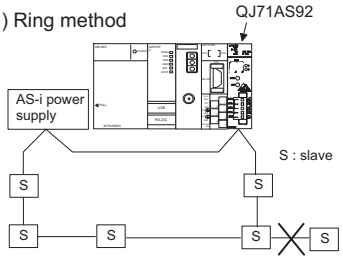
(b) Line method



(c) Tree method



(d) Ring method



(Note)
The system cannot be branched to a tree connection, etc., from the ring connection. Apartial loop cannot be formed. A repeater cannot be used.

<QJ71AS92 included products>

Product	Description
Communication connector	Communication connector for AS-i system
Manual	AS-i Master Module User's Manual (Hardware)

<Separately obtained products>

The following equipment (manual) must be obtained separately.

Product	Description
AS-i power supply	Power supply for AS-i (user-prepared)
AS-i cable	Cable for AS-i (obtained by user)
AS-i slave	Slave station for AS-i
Manual	AS-i Master Module User's Manual (detail)

■ Applicable Systems

<Applicable module and the number of mountable modules>

The followings are the CPU modules in which the QJ71AS92 can be mounted and the number of mountable modules.

Applicable module		No. of available modules	Remarks
CPU module	Q00JCPU	Up to 8	*1
	Q00CPU Q01CPU	Up to 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 64	Available in Q mode only*1
	Q12PHCPU Q25PHCPU	Up to 64	*1

*1: Refer to the description of the system configuration for each CPU system in section 1.

<Compatible software package>

The following shows systems using QJ71AS92 with their compatible software.

GX Developer is necessary to use QJ71AS92.

		Software version	
		GX Developer	GX Configurator-AS
Q00J/Q00/ Q01CPU	Single CPU system	Version 7or later	Version 1.13Por later
	Multiple CPU system	Version 8or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4or later	
	Multiple CPU system	Version 6or later	
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10Lor later	
	Multiple CPU system		

2.9.2 AS-I Master module settings, monitoring tool: GX Configurator-AS

Overview

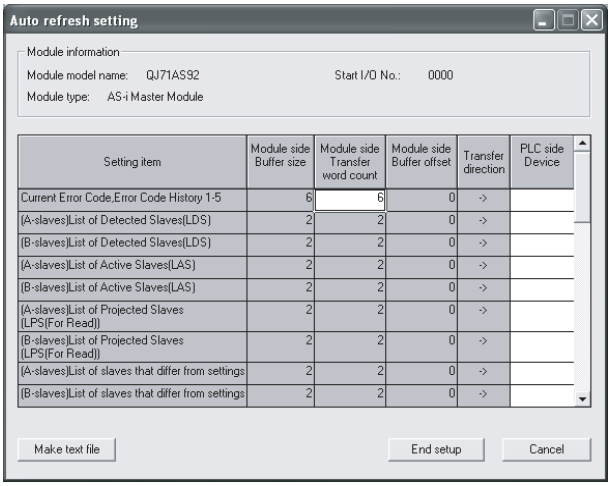
GX Configurator-AS is a utility package for using the AS-i master module QJ71AS92. This package contains the auto refresh setting allowing the module to read and write communication data and CPU device memory automatically, and enables configuration data to be registered and stored in an EEPROM. To use this utility package, add it in GX Developer.
Using GX Configurator-AS, the automatic refresh settings can be configured on the screen, which makes a sequence program shorter and allows easily confirming setting status, operational status, etc.

Intelligent function module utility

■ Auto refresh setting

Sets I/O data from slave stations, slave list, error codes, etc. stored in the buffer memory on the AS-I master module, which is the target of the auto refresh. .
The specified device automatically reads and writes values, which are set for the auto refresh and stored in the buffer memory of the AS-i master modules, at END instruction executed.

Sample of auto refresh setting screen

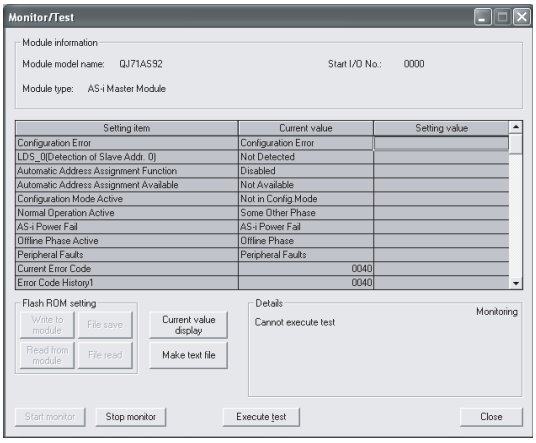


■ Monitor/test

● Monitor/test

Monitors and tests the buffer memory and I/O signals of AS-i master module.

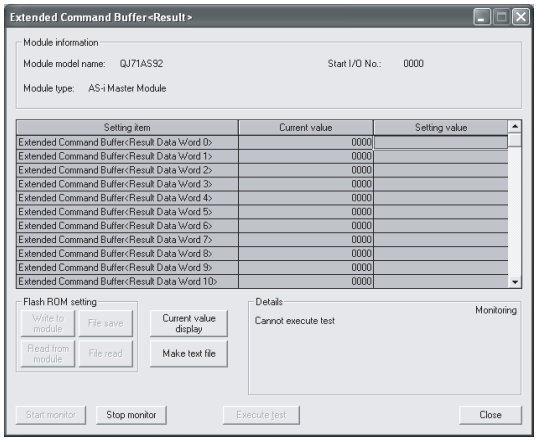
Sample of Monitor/test screen



● Command request/command result

Sets the command buffer<Request (command)> and executes the command in a selecting test to the target slave.
The execution result can be confirmed by checking the command buffer <Result>.

Sample of command request/command result screen

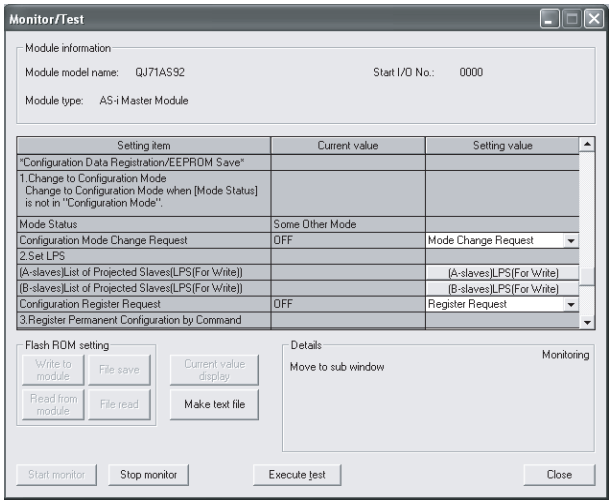


●Configuration registration/EEPROM storage

Registers slave station's configuration data to an AS-i master module.

An AS-i master module registers slave station's configuration data to itself in the configuration mode and uses the registered data to communicate with the slave station in the project operation mode.

Sample of configuration registration/EEPROM storage screen



About the number of parameters that can be set in GX Configurator-AS

The CPU module has a limit on the number of parameters that can be set using GX Configurator for the mounted intelligent function modules.

Intelligent function module installation object	Maximum number of settable parameters	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/ Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256

For example, when multiple intelligent function modules are mounted to the Q25HCPU, set GX Configurator so that the total number of set parameters of all intelligent function modules does not exceed the maximum number of set parameters of the Q25HCPU. Calculate the total number of set parameters separately for initial setting and auto refresh setting.

The number of parameters that can be set per module using GX Configurator-AS is as follows.

Object Module	Initial setting	Auto refresh setting
QJ71AS92	0 (Not used)	30 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-AS is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later *2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	10 MB or more
Display		800×600 dot or more resolution *3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-AS in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-AS (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-AS (English version) cannot be used in configuration.

*2: GX Configurator-AS cannot be used as an add-in with GX Developer Version 3 or earlier versions.

*3: Setting fonts Size of Windows® for "Large Fonts" may cause the text to extend off screen. Therefore, choose "Small Fonts".

Used operating system and performance required for personal computer

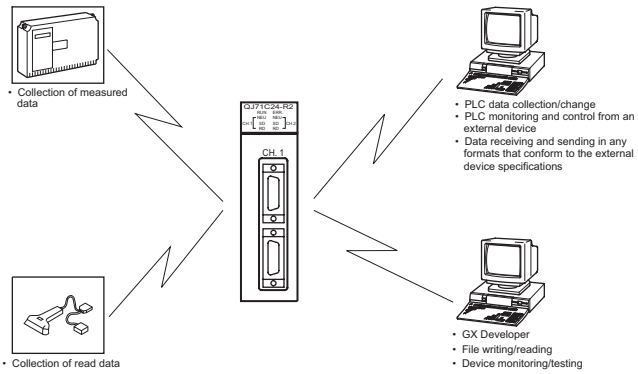
Operating system		Performance Required for Personal Computer	
		CPU	Required memory
Windows® 95		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

2.10 Serial Communication, Modem Interface Module

2.10.1 Serial Communication Module: QJ71C24N, QJ71C24N-R2, QJ71C24N-R4

Overview

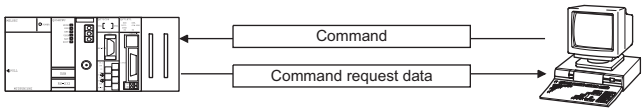
This manual describes the specifications for the QJ71C24N, QJ71C24N-R2, QJ71C24N-R4, serial communication module (hereinafter referred to as "Q series C24").
When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.
The Q series C24 is a module that connects the Q series PLC CPU and an external device using an RS-232 or RS-422/485 line for serial communication, in order to achieve the data communication described below.
By using a modem/terminal adapter, a public line (analog/digital) can be used for data communication with a remote location.



Features

■ Data communication based on the MELSEC communication protocol

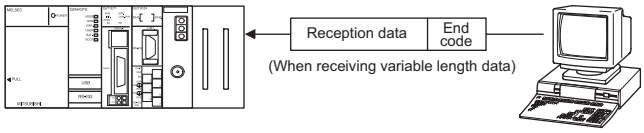
(1) External devices can read/write the PLC device data and sequence programs, and can monitor PLC equipment status.
With the exception of the on-demand function described below, the PLC does not require a sequence program because the PLC sends and receives data based solely on commands from external devices.
(2) Using the on-demand function, data can be sent from the PLC CPU to the external devices in each frame format of the MELSEC communication protocol (hereafter abbreviated to MC protocol.)
(3) Data communication can be performed using a program at the external device side that has been created for communicating data with conventional A/QnA series computer link module/serial communication modules.
(4) If the external device is the PC, it is possible to create a communication program for the external device without considering the detailed MC protocol (transmission/reception procedures) using the MX Component separately sold.



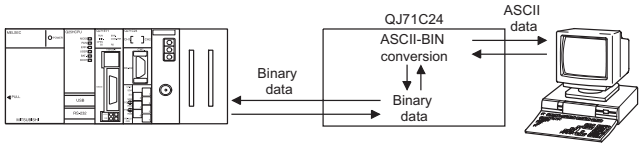
* In the MELSECNET/10 mode, other stations (including the A/QnA series PLC CPUs) can be accessed during data link operation.
* The MC protocol is equivalent to the communication function using a dedicated protocol that is supported by the A/QnA series computer link module/serial communication modules.

■ Data communication using the non procedure protocol

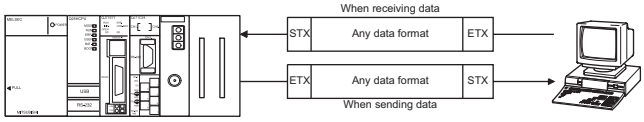
(1) Data can be transferred in any message formats that conform to the specifications of external devices (measuring devices, PCs, etc).
(2) Fixed or variable length messages can be received in accordance with the external device specifications.
1) How to receive the variable length data
The external device sends data by adding at the end of the message the end-code data (CR+LF or any one-byte data) that is set for the Q series C24.
2) How to receive the fixed length data
The external device sends the amount of data equivalent to the size of the end data that is set for the Q series C24.



(3) ASCII code data can be used for communication using the ASCII-BIN conversion function.



(4) It is necessary to create a sequence program for communication control that conforms to the external device.
(5) Communication can be performed using an user frame by registering the fixed format portion of the head and tail sections of a message as an user frame.
1) When sending data, the Q series C24 adds an user frame to any data specified by the user.
2) When receiving data, the Q series C24 transfers any data other than a user frame to the PLC CPU.

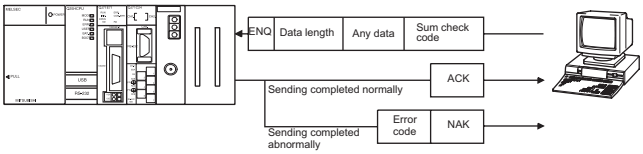


(6) It is possible to clear the current reception data without interrupting the transmission processing by using the dedicated instruction "CSET."

■ Data communication using the bidirectional protocol

(1) In communication between PLC CPUs and communication with an external device for which transmission/receive control programming is allowed, data communication is performed in a sequence of "data transmission and response receipt".

(2) Error check of received data can be performed using the sum-check code, while the occurrence of a reception error at an external device can be checked via an ACK/NAK response.



(3) ASCII code data can be used for communication using the ASCII-BIN conversion function.

■ Monitoring the PLC CPU

(1) The self-station's PLC CPU can be monitored at time intervals set by the user without using a sequence program.

(a) The following monitoring information can be sent/ notified as the result of monitoring the PLC CPU.

1) Transmission of information on devices and the PLC CPU status to be monitored. (It is also possible to send the monitoring information through combined use of the modem function.)

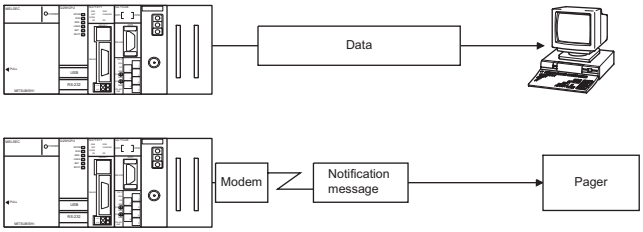
2) Notification of a notification message (string data) registered as the connection data of the modem function, through combined use of the modem function.

(b) The user can select either one of the following timing choices at which to send the PLC CPU monitoring result to the external device.

1) Send/notify every time the PLC CPU is monitored (periodic transmission).

2) Send/notify when the information read from the PLC CPU matches the conditions set by the user (conditional transmission).

(2) The PLC CPU monitoring function can be used in communication using the MC or non procedure protocol.



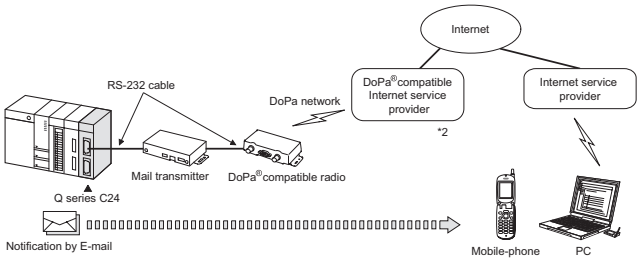
(3) The mail transmitter can notify E-mail via DoPa® network in non procedure protocol.

For details, refer to the manual of FX-232DOPA type mail transmitter.

[Devices used (example)]

Mail transmitter : MELSEC-F series FX-232DOPA type mail transmitter

DoPa® compatible radio : DoPa Mobile Ark 9601D*1



*1: DoPa Mobile Ark 9601D is provided by NTT DoCoMo, Inc. Contact NTT DoCoMo group for how to purchase it.

*2: To use e-mail, it is required to subscribe to an Internet service provider supporting DoPa® network.
Mopera from NTT DoCoMo, Inc. and similar products of it support DoPa® network.

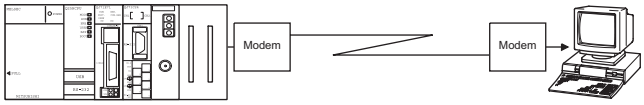
■ Remote communications using the modem function

(1) Data communication can be performed with a remotely located external device.

(2) Modem initialization and line connection/disconnection can be performed.

(3) Data communication can be performed using the MC, non procedure or bidirectional protocol.

(4) Access can be performed from GX Developer to PLC CPU of a remotely located.



■ Initial settings and communication settings without using a sequence program

Various initial settings can be performed using the GX Congifurator-SC.

■ Connecting the GX Developer and the GOT

● Connecting the GX Developer

(1) By connecting a PC installed with a GX Developer to the interface of the Q series C24 at the same time, operations such as programming, monitoring and testing for the PLC CPU can be performed.

(2) By connecting multiple PCs installed with GX Developers to the PLC CPU or Q-series C24 at the same time, operations such as programming and monitoring can be performed simultaneously by multiple operators.
Operating the GX Developers using these simultaneous connections can improve program performance.

(3) Operations can be performed from a GX Developer by setting the communication protocol of the Q series C24 interface to which a PC is connected to "0" with the switch setting using the GX Developer.

● Connecting the GOT

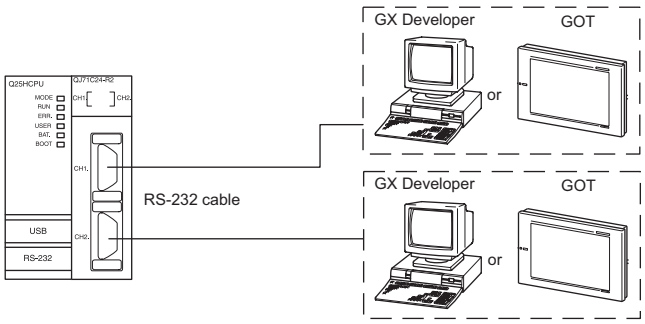
(1) By connecting a GOT (graphic operation terminal) to the interface for the Q series C24 operations such as monitoring the PLC CPU can be performed.

(2) Operations such as monitoring the PLC CPU can be performed by setting the communication protocol of the Q series C24 interface to which a GOT is connected to "0" with the switch setting using a GX Developer.

● **Simultaneous connection of GX Developer and GOT**

(1) It is possible to connect a PC with GX Developer and the GOT to two interfaces of the Q series C24 at the same time. It is thus possible for more than one user to perform programming, monitoring, etc. simultaneously.

(2) When the GOT and the PC with GX Developer are connected at the same time, the two interfaces of the Q series C24 cannot perform an interlock operation.



■ Remote password check function

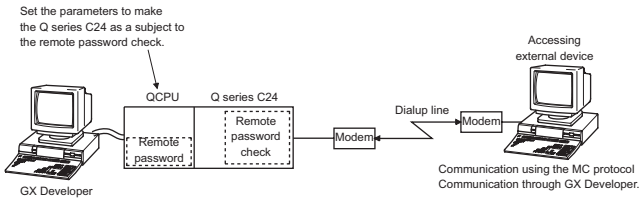
(1) The remote password check function of the Q series C24 prevents users at a remote location to access QCPUs illegally using the modem function of the Q series C24. (The remote password is checked in the following forms of data communication)

1) Communication using the MC protocol
(The remote password check is not carried out in data communication using the non procedure/bidirectional protocols.)

2) Access to the PLC through GX Developer

*: The remote password function is one of the QCPU functions and used for preventing illegal access to the QCPU by other users.
Use GX Developer to set a remote password for the QCPU in order to activate the remote password function of the QCPU.

(2) If the Q series C24 is specified in the parameters of a QCPU as being subject to the remote password check, the remote password can be unlocked (canceled) using either one of the methods below, to allow data communication from the external device. It is necessary to connect a line to the modem first.
The remote password is automatically locked by disconnecting the line to the modem.



Dedicated instruction list

○:Available ×:Not available

Classification	Instruction	Description		Protocol*		
				MC	Non	Bi
For data communication	ONDEMAND	Sends data with the on-demand function		○	×	×
	OUTPUT	Sends designated number of data		×	○	×
	INPUT	Receives data (reads received data)		×	○	×
	BIDOUT	Sends data		×	×	○
	BIDIN	Receives data (reads received data)		×	×	○
	SPBUSY	Reads the status of data sent/received with each dedicated instruction		○	○	○
	CSET	Allows clearing data received up to the present without interrupting the data transmission processing.		×	○	×
	BUFRCVS	Receives data with an interrupt program (reads received data)		×	○	○
	PRR	Sends data with user frames using transmission schedule table		×	○	×
Setting value registration/ reading	PUTE	Stores user frames in flash ROM of the Q series C24 (writing)		○	○	○
	GETE	Reads user frames stored in flash ROM of the Q series C24		○	○	○
PLC CPU monitoring instructions	CSET	Performs PLC CPU monitoring registration	For PLC CPU monitoring function	○	○	×
		Cancels PLC CPU monitoring				
Initial value setting instruction		Sets the unit for the number of communication data (words/bytes) and the data communication area				○
Mode switching	UINI	Changes the mode, transmission specifications and host station No. of the Q series C 24.		○	○	○

* Abbreviations used in the Protocol column
MC : MC protocol
Non : Non procedure protocol
Bi : Bidirectional protocol

Program compatibility

The sequence program or program in external device for A series computer link modules or QnA series serial communication modules (A1SJ71UC24-R2, A1SJ71QC24N) can be used for Q series C24 as it is.
This table shows the compatibility for C24 between Q series C24.

	Compatibility with Programs for A Series Computer Link Modules	Compatibility with Programs for QnA Series Serial Communication Modules
Other-end external device side program*1	Compatible.Note that only data within PLC is accessible in MC protocol.*6	Compatible.*5
PLC side program *1	Incompatible.	Compatible.*2,*3,*4

*1: In any of the above cases, performance capabilities and communication timings are incompatible. Therefore, utilization of programs as they are may not permit communications. When utilizing programs, always confirm their operations.

*2: The following instructions cannot be used with the Q series C24.

Instructions not supported for QJ71C24	READ,SWRITE,SEND,RECV,REQ

*3: QThe QnA series serial communication modules (such as A1SJ71QC24N) contain E^2PROM but the Q series C24 includes flash memory instead of E^2PROM. Namely, if access to E^2PROM can be executed in the conventional program, access to flash memory can be made. Note that communications will stop during writing to flash memory.

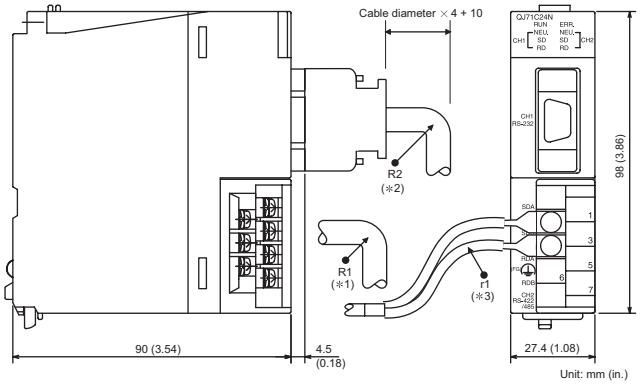
*4: The LED ON states/switch setting read from the buffer memory of the Q series C24 are different from those of the A1SJ71QC24N.

*5: Access to a file in the Q series CPU by the MC protocol uses a new dedicated command and a new program should be created.

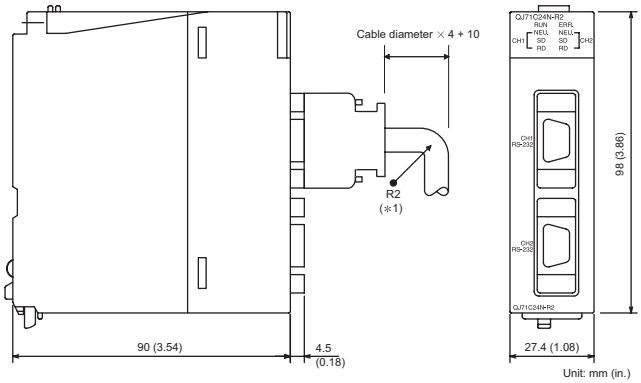
*6: The conventional A series computer link module-compatible dedicated protocol (MC protocol level 1) has an area inaccessible to the internal device memory of the Q mode CPU expanded from the conventional A series CPU.
(Some commands may not be supported.)

Appearance

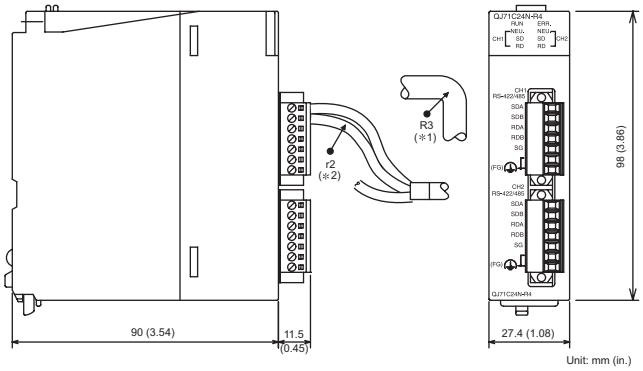
(1) QJ71C24N



(2) QJ71C24N-R2



(3) QJ71C24N-R4



*1: R1 (Bending radius near terminal block) : Cable diameter ×4

*2: R2 (Bending radius near connector : Cable diameter ×4

*3: r1 (Bending radius near solderless terminal : Connectable as long as not bended extremely

*4: R3 (Bending radius near the plug-in socket block: Cable diameter ×4

*5: r2 (Bending radius near the wire connection : Connectable as long as not bended extremely

Function list

Function			
Communication using MC protocol (*1)	Communication with ASCII code	Communication with QnA compatible 2C/3C/4C frame	Formats 1 to 4 exist for each.
		Communication with A compatible 1C frame	
	Communication with binary code	Communication with QnA compatible 4C frame	Format 5
	Read/write of device memory	Batch read/write in bit/word units	
		Monitoring of device memory	
		Batch read/write of multiple blocks	
		Read/write by extension designation	
		Accessing other stations via network system	
	Reading/writing from/to the buffer memory of the Q series C24		
	Reading/writing from/to the buffer memory of intelligent function modules		
	Reading/writing from/to sequence program files		
	Monitoring the PLC CPUs (PLC CPU monitoring function)		
	Status control of the PLC CPUs (remote RUN/STOP, etc.)		
	Turning on/off input signals of the Q series C24 from an external device (global function)		
	Data transmission from a PLC CPU to an external device (on-demand function)		
Communication using nonprocedure protocol (*2)	Data transmission/reception in any format		
	Data transmission/reception using user frames		
	Data reception by interrupt programs		
	Monitoring the PLC CPUs (PLC CPU monitoring function)		
	ASCII data transmission/reception by ASCII-BIN conversion		
	Data transmission/reception by specifying transparent code		
Communication using bidirectional protocol (*1)	Data transmission/reception in any format		
	Data reception by interrupt programs		
	ASCII data transmission/reception by ASCII-BIN conversion		
	Data transmission/reception by specifying transparent code		
Communication via public network, etc. (modem function)	Communication with MC Protocol/non procedure protocol/bidirectional protocol		
	PLC access from GX Developer		
Transmission control	DC code control (including Xon/Xoff control)		
	DTR/DSR (ER/DR) control		
Independent/linked operation of each interface			
Monitoring/testing and protocol FB support function of initial settings and setting values with utility software			
Remote password check			

*1: If the external device is capable of incorporating a program and communicating data using a protocol of the MELSEC PLC, it is possible to access the PLC CPU using the above mentioned MC protocol. Furthermore, it is possible to transfer any data using the bidirectional protocol.

*2: When it is necessary to communicate using the protocol of an external device, such as a measuring instrument or a bar code reader, the above-mentioned non procedure protocol is used for data communication. In that case, the processing of the communication data becomes easier by using the user frame communication function.

Performance specifications

Item			Specifications		
			QJ71C24N	QJ71C24N-R2	QJ71C24N-R4
Interface	CH.1		RS-232-compliance (D-Sub 9P)	RS-232-compliance (D-Sub 9P)	RS-422/485-compliance (2-piece plug-in connector socket block)
	CH.2		RS-422/485-compliance (2-piece terminal block)	RS-232-compliance (D-Sub 9P)	RS-422/485-compliance (2-piece plug-in connector socket block)
Communication system (*1)	Line		Full-duplex/half-duplex communications		
	MC protocols communication		Half-duplex communications		
	Non procedure protocol communication		Full-duplex/full-duplex communications		
	Bidirectional protocol communication		Full-duplex/full-duplex communications		
Synchronization method			Start-stop synchronization method		
Transmission speed			50,300,600,1200,2400,4800,9600,14400,28800,38400,57600,115200,230400bps * Transmission speed 230400 bps is available for only CH1. (Not available for CH2) * Total transmission speed of two interfaces is available up to 230400 bps. * Total transmission speed of two interfaces is available up to 115200 bps when the communication data monitoring function is used.		
Data format	Start bits		1		
	Data bits		7/8		
	Parity bits		1 (vertical parity) or none		
	Stop bits		1/2		
Access cycle	MC protocol communication		Processes one request during installed PLC CPU END processing. * Number of scans that must be processed/number of link scans depends on the contents of the request.		
	Non procedure protocol communication Bidirectional protocol communication		Sends each time a send request is issued. Can receive at any time.		
Error detection	Parity check		All protocols and when ODD/EVEN is selected by parameter.		
	Sum check code		MC protocol/bidirectional protocol selected by parameter. Non procedure protocol selected by user frame.		
Transmission control			DTR/DSR (ER/DR) control: RS-232 Enabled, RS-422/485 Disabled RS/CS control: RS-232 Enabled, RS-422/485 Disabled CD signal control: RS-232 Enabled, RS-422/485 Disabled DC1/DC3 (Xon/Xoff) controlDC2/DC4 control: RS-232 Enabled, RS-422/485 Enabled •DTR/DSR signal control and DC code control are selected by the user.		
Line configuration(Connection) (*2)	RS-232		1:1	1:1	---
	RS-422/485		1:1,1:n,n:1,m:n	---	1:1,1:n,n:1,m:n
Line configuration(Data communication) (*2)	RS-232	MC protocols communication	1:1	1:1	---
		Non procedure protocol communication	1:1	1:1	
		Bidirectional protocols communication	1:1	1:1	
	RS-422/485	MC protocols communication	1:1,1:n,m:n	---	1:1,1:n,m:n
		Non procedure protocol communication	1:1,1:n,n:1		1:1,1:n,n:1
		Bidirectional protocols communication	1:1		1:1
Transmission distance (Overall distance)	RS-232		Maximum 15 m	Maximum 15 m	---
	RS-422/485		Maximum 1200 m (overall distance)	---	Maximum 1200 m (overall distance)
Protection degree			IP2X		
Flash ROM write count			Maximum 100,000 times to the same area		

Item		Specifications		
		QJ71C24N	QJ71C24N-R2	QJ71C24N-R4
Maximum number of data per communication	MC protocols	Maximum 960 words		
	Non procedure protocol	Maximum 6655 words (When using two interfaces simultaneously, each interface cannot communicate 6655 words or more.)		
	Bidirectional protocols			
Online module change		Disabled		
Multiple CPU system		Compatible		
Number of occupied I/O points		32 points per slot (I/O assignment: Intelli: 32 points)		
5V DC internal current consumption		0.31A	0.26A	0.39A
External dimensions		98(H)×27.4(W)×90(D) mm		
Weight		0.20kg		

*1: Set to transfer data with external devices using a full-duplex communication system when the Q series C24 is started. For switching to a half-duplex communication system, refer to the User's Manual (Application).

*2: Indicates possible combinations when connecting the PLC CPU and external devices (external device side: PLC CPU side). The total number of n and m+n is up to 32 stations.

*3: In order to use the Q series C24, it is necessary to set the GX Developer switches.

■ Transmission specifications for Q series C24 when communicating by modem function

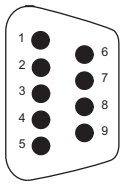
Item		QJ71C24N	QJ71C24N-R2	QJ71C24N-R4
Modem function		Available		Not available
Interface that can use the modem function		RS-232		-
Linked operation between CH1 and CH2 of the Q series C24		Not available		
Communication method		Full duplex communication		
Synchronous method		Asynchronous method		
Transmission speed (Unit: bps)		1200,2400,4800,9600,14400,19200,28800,38400,57600,115200(selectable)		
Data format	Start bit	1		
	Data bit	7 / 8		
	Parity bit	1 (On) / 0 (Off)		
	Stop bit	1 / 2		
Error detection	Parity check	On (odd/even selectable) / Off		
	Sum check code	On / Off		
Transmission control		RS • CS control / not-control (selectable)		
Data communication	No procedure protocol	Available		
	Bidirectional protocol	Available		
	MC protocol	Available		
Line connection (Q series C24: modem)		1:1		

Some specifications for transmission between Q series C24 and modem/TA (host station Q series C24 side) are not explained in the above table. Refer to the previous table for them.

■ RS-232 Interface Specifications

● 1 RS-232 connector specifications

The following shows the specifications of the RS-232 connector that connects the Q series C24 to an external device.



Pin number	Signal abbreviation	Singal name	Singal direction C24 ◄► External device
1	CD	Carrier detect	◄
2	RD(RXD)	Receive data	◄
3	SD(TXD)	Send data	►
4	DTR(ER)	Data terminal ready	►
5	SG	Signal ground	◄►
6	DSR(DR)	Dataset ready	◄
7	RS(RTS)	Request to send	►
8	CS(CTS)	Clear to send	◄
9	RI(CI)	Call Indicate	◄

● RS-232 Interface connector

The Q series C24 uses the following type of RS-232 interface connector.

9-pin D sub (female) screw fixing type

DDK LTD. 17L-10090-27-D9AC

Use one of the following as a connector shell for the connection cable of the Q series C24 side.

DDK LTD. Plug, shell model: 17JE-23090-02 (D8A)

3M

Plug model: 8209-6009Shell model: 3702-2209 M2.6

Tyco Electronics AMP K.K.

Plug model: 747904-2Shell model: 747515 or 174469-2

● RS-232 cable specification

• RUse a 15 m (49.21 ft.), or shorter, cable conforming to the RS-232 standard as the RS-232 cable.

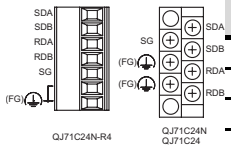
(Recommended cable)

7/0. 127□P HRV-SV : Designates the number of pairs. (For 13 pairs 7/0.127 13P HRV-SV) (Manufactured by Oki Electric Cable Company, LTD.)

■ Interface Specifications

● RS-422/485 terminal block specifications

The following shows the specifications of the RS-422/485 terminal block that connect to an external device.



Signal abbreviation	Signal name	Signal direction C24 ◄► External device
SDA	Send data(+)	►
SDB	Send data(-)	►
RDA	Receive data(+)	◄
RDB	Receive data(-)	◄
SG	Signal ground	◄►
FG	Frame ground	◄►
FG	Frame ground	◄►

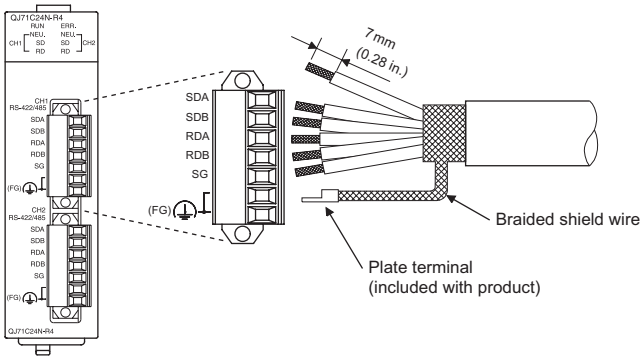
QJ71C24N

(1) The RS-422/485 interface terminal block uses M3 terminal screws.
Use suitable solderless terminals for the terminals.

QJ71C24N-R4

(1) Be sure to strip the outer insulation layer by 7 mm before connecting the cable to the plug-in socket block.

(2) When connecting the braided shield wire inside the RS-422/485 cable, use the plate terminals included with the product. The braided shield wire can be connected without the plate terminal. Four plate terminals are included to connect the FG terminals of both stations.



● RS-422/485 cable specifications

The following shows the RS-422/485 cable specification.

(1) Use a 1200 m (3937 ft.), or shorter, cable that satisfies the following specification for the RS-422/485 cable (cable to connect the Q series C24 terminal block).

(2) Make the total distance within 1200 m (3937 ft.) when two or more device are connected in a 1:n, n:1, or m:n configuration.

(3) The RS-422/485 cable specification is shown below.

Item	Description
Cable type	Shielded cable
Number of pairs	3P
Conductor resistance (20℃)	88.0Ω/km or less
Insulation resistance	10000 MΩ - km or more
Dielectric strength	500 V DC, 1 minute
Electrostatic capacitance (1 kHz)	60nF/km or less on average
Characteristic impedance (100 kHz)	110±10Ω

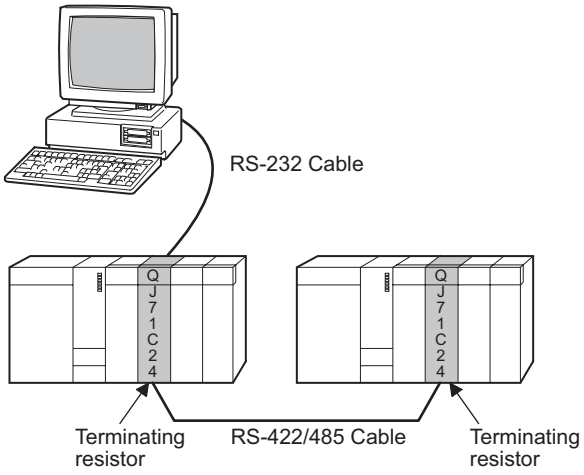
(Recommended cable)

SPEV (SB)-MPC-0.2×3P ..... (MITSUBISHI CABLE INDUSTRIES, Ltd.)

SPEV (SB)-0.2×3P ..... (MITSUBISHI CABLE INDUSTRIES, Ltd.)

- SPEV (SB)-MPC-0.2×3P and SPEV (SB)-0.2×3P have the same electrical characteristics, but purtially different external diameter and internal wire colors.

System equipment



<QJ71C24N included products>

Product	Description
Terminating resistor	110Ω,330Ω 2 of each
Manual	Serial Communication Module User's Manual (Hardware)

<QJ71C24N-R2 included products>

Product	Description
Manual	Serial Communication Module User's Manual (Hardware)

<QJ71C24N-R4 included products>

Product name	Description
Terminating resistor	110Ω,330Ω 4 of each
Bar terminal	4 terminals for connecting braided shield cables
Manual	Serial Communication Module User's Manual (Hardware)

<Separately obtained products>

The following equipment (manuals) must be obtained separately.

Product name	Description
RS-232/422 cable	Refer to the section of the performance specifications.
Manual	Serial Communication Module User's Manual (Basic)
	Serial Communication Module User's Manual (Application)
	MELSEC Communication Protocol Reference Manual
	GX Configurator-SC Version2 Operating Manual (Protocol FB support function)

■ Applicable systems

< Applicable modules and number of modules that can be mounted>

The following table lists the CPU module and network modules (for remote I/O stations) that the Q series C24 can be mounted and the number of modules which can be mounted.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only *1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72LP25G QJ72BR15	Maximum 64	MELSECNET/H Remote I/O station *2

*1: See the description of the system configuration for each CPU system of section 1.

*2: See the description of the system configuration for MELSECNET/H remote I/O network of section 2.5.2.

<Compatible software package>

(1) Software for PLC/setting and monitoring tool

The following shows systems using Q series C24 with their compatible software packages.
GX Developer is necessary to use Q series C24.

		Software version*1	
		GX Developer	GX Configurator-SC
Q00J/Q00/ Q01CPU	Single CPU system	Version 7or later	Version 1.10L or later (SW0D5C-QSCU 40E or earlier is not compatible)
	Multiple CPU system	Version 8or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4or later	SW0D5C-QSCU 00Aor later
	Multiple CPU system	Version 6or later	SW0D5C-QSCU 20Cor later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10Lor later	Version 1.13P or later (SW0D5C-QSCU 40E or earlier is not compatible)
	Multiple CPU system		
When mounting on MELSECNET/H remote I/O station		Version 6or later	SW0D5C-QSCU 30Dor later

*1: For the versions of GX Developer and GX Configurator-SC, which support functions newly added due to Q series C24 enhancement, refer to User's Manual (Basic).

(2) External device communication support tool

Product name	Model name	Remarks
MX Component	SWnD5C-ACT(-J)	ActiveX control library "n" in a model name represents numbers more than 0.*2

*2: Compatible Q series C24 differ depending on the version of MX Component used.
For details, refer to the manual of MX Component.

<Specification and precautions for the connectable modems>

(1) Modem specification

Item			Specification	
			When using the subscriber's telephone line/ office telephone system	When using a manual line connection/ cellular phone
Modem-to-modem communication specification	Connection line		Analog 2-line	
	Initialization		Hayes AT command compatible	
	Telephone line		NTT	
	Communication standard	ITU-T	V.34/V.32bis/V.32/V.22bis/V.22/ V.21/V.fc	
		Bell	212A/103	
	Error correction *1	MNP	Class 4 and 10 compliant	
		ITU-T	V.42 compliant	
	Data compression *1	MNP	Class 5 compliant	
		ITU-T	V.42bis compliant	
	ANS-ORG mode switch		-	Mode switching required
Q series C24-to modem communication specification	Q series C24-side connector (RS-232)		9-pin (female) D sub	
	DR signal control*2		Only the DR (DSR) signal must be able to turn on	
	Other		Compatible with the Q series C24 specification	

*1: They are the functions of the modem itself that become available by issuing the AT commands to the modem. See the modem manual for details.

*2: Modems that turn on the CD signal simultaneously cannot be used.

(2) Precautions for selecting a modem

(a) When using a cellular phone

A modem with the error correction function of MNP class-10 is recommended. However, note that communication may not be established depending on the line condition.

(b) Modem setting

Set the modem on the Q series C24 side as shown below.

Setting item		Setting range
Communication rate		Depends on the modem in use *1
Modem command		Hayes AT command
SI/SO control		None
Communication method		No procedure
Data format	Data bit	Match the Q series C24 *2,*3
	Stop bit	
	Parity bit	

*1: When using different modems, the slower communication rate will be in effect.

*2: Some modems may transmit one character as 10 bits.
Check the modem specifications when setting the Q series C24 transmission specifications.

*3: Some modems may switch the communication rate following the start of data communication.
Since the Q series C24 cannot switch the communication rate, set the modem side so that its communication rate does not switch.
When using a modem whose DR terminal (signal) is set by a switch, set the DR-terminal (modem output) switch level to high.
When using a modem whose DR terminal is set by a software, write the command that turns on the DR terminal into the data for initialization.
Set the "Modem initialization time DR signal valid/invalid designation" to "Invalid" during modem function system settings with GX Configurator-SC.

<Specification and precautions for the connectable TA's (terminal adapters)>

(1) TA specification

Item		Specification
TA-to-TA communication specification	Connection line	ISDN (INS net 64) equivalentHigh-speed digital dedicated line
	Initialization	Hayes AT command compatible
	Communication standard	B-channel line exchange (V.110) D-channel packet exchange
	Electrical condition	V.28 compliant
Q series C24-to-TA communication specification	Circuit definition	V.24 compliant
	Q series C24-side connector (RS-232)	9-pin (female) D sub
	DR signal control*1	Only the DR (DSR) signal must be able to turn on
	Other	Compatible with the Q series C24 specification

*1: TA's that turn on the CD signal simultaneously cannot be used. Use a TA capable of flow control as described in connectable modem specification for the communication between the TA and terminal.
Flow control is a function of the TA itself that becomes available by issuing the AT commands to the TA. See the TA manual for details.

(2) Precautions for selecting a TA

(a) Set the TA on the Q series C24 side as shown below.

Setting item		Setting range
Communication rate		Depends on the TA in use
TA command		Hayes AT command
SI/SO control		None
Communication method		No procedure
Data format	Data bit	Match the Q series C24 *1, *2
	Stop bit	
	Parity bit	

*1: Some TAs may transmit one character as 10 bits.
Check the TA specifications when setting the Q series C24 transmission specifications.

*2: Some TAs may switch the communication rate following the start of data communication. Since the Q series C24 cannot switch the communication rate, set the TA side so that its communication rate does not switch.

(b) When using a TA whose DR terminal (signal) is set by a switch, set the DR-terminal (TA output) switch level to high.
When using a TA whose DR terminal is set by a software, write the command that turns on the DR terminal into the data for initialization.
Set the "Modem initialization time DR signal valid/ invalid designation" to "Invalid" during modem function system settings with GX Configurator-SC.

2.10.2 Modem interface module: QJ71CMO

Overview

The QJ71CMO type modem interface module (hereinafter, abbreviated to Q series CMO) connects external devices to a Q series PLC via public line (using a modular connector) or serial communication line (using a RS-232). This enables MC protocol, non procedure protocol, and bidirectional protocol communication as does the serial communication module (QJ71C24).
Incorporating a modem, the Q series CMOs with a modular connecter interface realizes easy data communication with remote places.
In addition, using the RS-232 side enables communication with thermometers, barcode reader, printer, etc.

- For data communication, both senders and receivers use analog signal. Use analog line accordingly. Digital line is not applicable. For PBX extension, use lines that conform to the electrical specifications for NTT line.

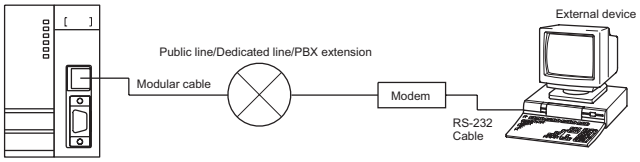
IMPORTANT
This module is exclusively for use in Japan.

Features

■ Communication between remote external device and PLC CPU

(Modem I/F)

(1) Using the built-in modem, this module enables data communication with external devices in remote places via direct connection with one of the following three; public line, dedicated line, PBX extension.



(2) Full-duplex data communication is available.

- Half duplex communication is not possible on CH.1 side.
  To perform half duplex communication on the CH.1 side, configure a procedure in a user program.

(3) For communication from the external device to the PLC CPU, MELSEC communication protocol (hereinafter, abbreviated to MC protocol), non procedure protocol, and bidirectional protocol are available.

(4) For communication from the PLC CPU to the external device, MC protocol (on-demand transmission only), non procedure protocol, and bidirectional protocol are available.

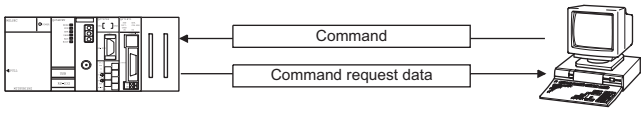
(5) The following standards are conformed by ITU-T as a data transmission system.
  1) V.21 300bit/s Full duplex operation
     Performed by binary modulation in Gaussian Frequency Shift system.
  2) V.22 1200bit/s Full duplex operation
     Performed by frequency division that divides channels.
  3) V.22 2400bit/s Full duplex operation
     Data transmission using the quadrature amplitude modulation is available.
  4) V.32 4800, 9600 bit/s Full duplex operation
     Data transmission using the quadrature amplitude modulation is available.
  5) V.32 bis 7200, 9600, 12000,14400 bit/s Full duplex operation
     Data transmission using trellis coding of the quadrature amplitude modulation is available.
  6) V. 42
     Detects errors on transmission data using CRCs, and automatically corrects it by transmitting data again.
  7) V. 42 bis
     Provides data compression function to improve data through-put.
  8) MNP class 3 to 5
     Provides function to detect and correct error on transmission data along with data compression function.

■ Data communication using MELSEC communication protocol (modem I/F, RS-232 I/F)

(1) Uses an external device to read and write device data, sequence programs, etc. and monitor status of the PLC device.
  Except the following on-demand function, PLCs do not need sequence programs as they transmit and receive all data following instructions of external devices.

(2) Using the on-demand function, PLC CPUs can transmit data to external devices in each frame format of MC protocol.

(3) Data communication via RS-232 interfaces is possible by using external device's program, which was created for communicating with previous A/QnA series computer link modules/serial communication modules.



- MC protocol corresponds to the dedicated protocol supported by A/QnA series modem interface modules, computer link modules, and serial communication modules.

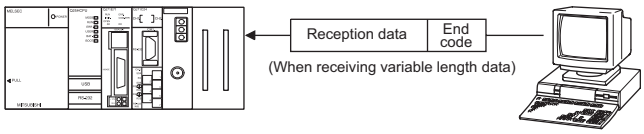
■ Data communication using non procedure protocol (Modem I/F, RS-232 I/F)

(1) Capable of communicating in any transmission format depending on the specification of the external device (Telemetries, personal computers, etc.)

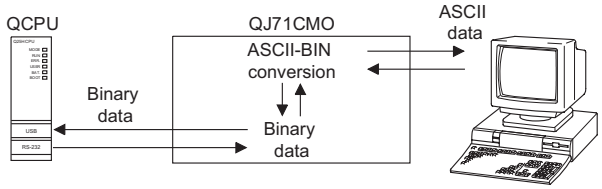
(2) Capable of receiving varying-length and fixed-length messages, depending on the specification of the external device.

1) How to receive varying-length data
Add END code (CR+LF, or any 1 byte data), which is set in the Q series CMO, to the end of messages, and transmit the message from an external device.

2) How to receive fixed-length data
Transmit data, which is END code data set in the Q series COM, from an external device.



(3) The ASCII/binary conversion function allows data communication in ASCII code.

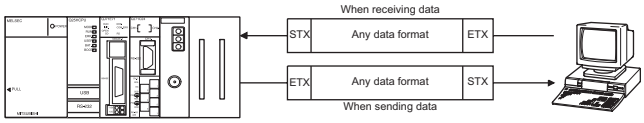


(4) Necessary to create a sequence program for controlling communication, depending on the external device in the communication.

(5) Communication using user-registered frames is available by registering the head and last part of messages, both of which are in fixed format.

1) At transmission, the Q series CMO adds a registered frame to data, which can be specified by the user before transmission.

2) At reception, the Q series CMO passes any data, except the user-registered frames, to the PLC CPU.

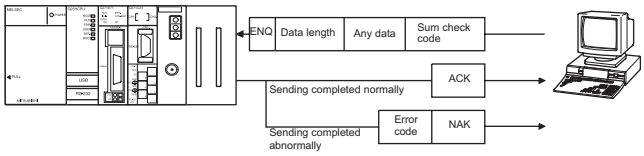


(6) The dedicated instruction "CSET" enables clearing currently receiving data without pausing transmission processing.

■ Data communication using bidirectional protocol (Modem I/F, RS-232 I/F)

(1) If the external device is capable of inter-PLC CPU communication and transmission/reception controlling programs, data communication using a combination of data transmission and response reception is available.

(2) Capable of checking errors on received data using sum check codes, and error occurrences on received data on the external device using ACK/NAK response.



(3) The ASCII/binary conversion function allows data communication in ASCII code.

■ Monitoring a PLC CPU (Modem I/F, RS-232 I/F)

(1) Monitoring the PLC CPU on the host station at a user-desired interval is possible without sequence programs.

(a) As results of monitoring the PLC CPU, the following information is available for transmission/notification.

1) Information on the monitoring target or the PLC CPU status. (Information monitored by modem I/F is also available for transmission.)

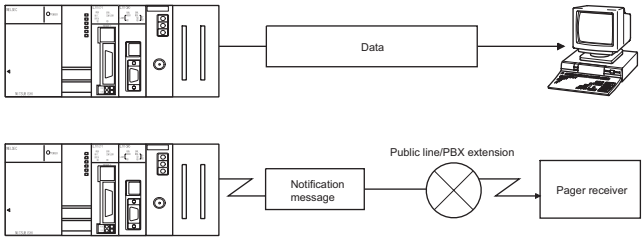
2) The notification message (character strings) registered for modem I/F connection.

(b) The user can select a timing for transmitting the result of PLC CPU monitoring to an external device from the followings.

1) Transmit/notify every time monitoring a PLC CPU. (Constant transmission)

2) Transmit/notify when data read from a PLC CPU meets the condition set by the user. (Conditional transmission)

(2) The PLC CPU monitoring function is available for use in MC protocol and non procedure protocol.



■ Initial setting and communication setting without sequence programs (Modem I/F, RS-232 I/F)

GX Configurator-SC is available for performing the initial settings.
This allows a sequence program to be smaller.

■Connecting GX Developer and GOTs (Modem I/F, RS-232 I/F)

● Connecting GX Developer

(1) The Q series CMO allows a personal computer, which incorporates GX Developer and is in a remote place, to perform remote programming, monitoring, and testing on a PLC CPU via the modem interface on the CMO. *1

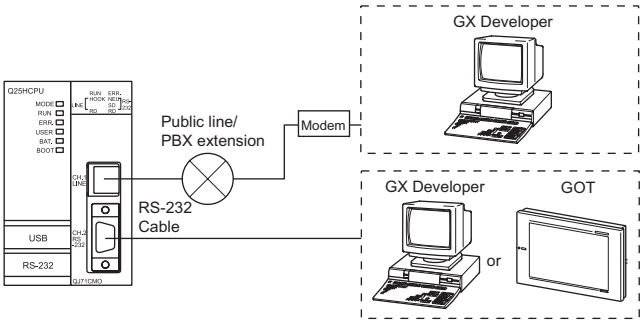
(2) The Q series CMO allows a personal computer, which incorporates GX Developer, to perform programming, monitoring, and testing on a PLC CPU via the RS-232 interface on the CMO. *1

(3) Several users can simultaneously perform programming, monitoring, etc., by connecting their personal computers, each of which incorporates GX Developer, to a PLC CPU or RS-232 interface on the Q series CMO.
Operating GX Developer with this simultaneous connection helps programs work more efficiently.

● Connecting GOTs

(1) Connecting GOTs to a RS-232 interface on the Q series COM allows monitoring, etc. on a PLC CPU.

(2) To perform this PLC CPU monitoring, it is necessary to set "0", in the switch settings of GX Developer, for the communication protocol of the RS-232 interface on the Q series CMO, to which a GOT is to be connected.



*1: The callback function automatically reconnects the Q series CMO to GX Developer (not vise versa) when connecting GX Developer to the Q series CMO.
When GX Developer is accessing to a QCPU, this function allows the GX developer to do so after the callback processing (reconnecting the line toward to the GX Developer) of the Q series CMO completes.
The Q series CMO side will be charged for communication performed after the reconnection made by the Q series CMO using the callback function.
It is possible to specify GX Developers which are allowed to access a QCPU, by selecting GX Developers to give callback permission and register them to the Q series CMO.

■ Remote password check function (Modem I/F)

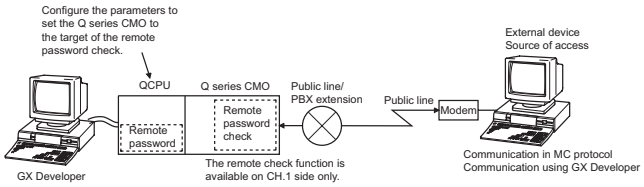
(1) The Q series CMO's remote password check function prevents remote users from accessing incorrectly to a QCPU via the Q series CMO modem interface.
(Data communication checked by the remote password check function)

1) Communication using MC protocol
(The remote password check is not performed in communication using non procedure/bidirectional protocol.)

2) Access to a PLC using GX Developer

* The remote password function is provided by QCPUs and prevents remote users from accessing incorrectry to a QCPU.
The QCPU remote password function can be used by using GX Developer to register a remote password to a QCPU.

(2) When the Q series CMO is specified in the QCPU parameter as a target of the remote password check, data transmission from the external device can be enabled by canceling the remote password after the line to the modem is established.
The remote password is automatically locked after the line to the modem is disconnected.



Dedicated instruction list

○:Available ×:Not available

Type	Instruction	Description		Protocol*		
				MC	Non	Bi
For data communication	ONDEMAND	Transmits data using the on-demand function.		○	×	×
	OUTPUT	Transmits data in the specified size.		×	○	×
	INPUT	Receives data. (Reads received data)		×	○	×
	BIDOUT	Transmits data.		×	×	○
	BIDIN	Receives data. (Reads received data)		×	×	○
	SPBUSY	Reads status of data transmission/reception performed by each dedicated instruction.		○	○	○
	CSET	Clears received data collected so far without pausing data transmission being performed.		×	○	×
	BUFRCVS	Receives data using an interruption program. (Reads received data)		×	○	○
	PRR	Transmits data in user-registered frames by using the transmission schedule table.		×	○	×
Set value registration/read	PUTE	Registers user-registered frames to a flash ROM in the Q series CMO. (Write)		○	○	○
	GETE	Reads registered user-registered frames to a flash ROM in the Q series CMO.		○	○	○
PLC CPU monitoring instruction	CSET	Registers PLC CPU monitoring.	For the PLC CPU monitoring function	○	○	×
		Cancels PLC CPU monitoring.				
Default value setting instruction		Sets the unit (word/byte) of data size and area for transmission/reception.				○

* Protocol column
MC : MC protocol
Non : None procedure protocol
Bi : Bidirectional protocol

Program compatibility

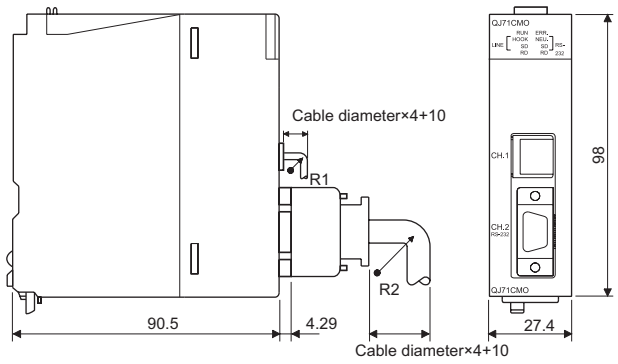
It is possible to use programs of external devices, which are in a system using the A series modem interface modules (hereinafter, abbreviated A series CMO).
The following shows the Q series CMO's program compatibility with the A series CMOs.

	Compatibility with A series CMO programs
External device program *1	Compatible However, only PLC data is accessible in MC protocol.*2
PLC program	Not compatible

*1: Reusing programs directly may not result in success as module's performance and communication timing are incompatible regardless of the above table. Be sure to perform testing operation when reusing programs.

*2: The dedicated protocol (MC protocol level 1), which supports the previous A series computer link modules, does not allow accessing to some area in the internal device memory on Q mode CPUs, which are extended from the pervious A series CPUs. (Some commands are not supported.)

Appearance



Unit:mm

*: R1 (bending radius around the connector): Cable diameter × 4

*: R2 (bending radius around the connector): Cable diameter × 4

Function list

Function				Compatible channel	
				CH1	CH2
Communication using MC protocol *1	Communication using ASCII code	Communication with QnA compatible 2C/3C/4C frame	Each has form 1 to 4.	○	○
		Communication using A compatible 1C frame			
	Communication using binary code	Communication using QnA compatible 4C frame	Form 5		
	Reading/writing device memory	Batch read/write in bit/word format.			
		Monitoring device memory.			
		Batch read/write of two or more blocks.			
		Read/write by extension specification.			
		Accesses to other stations via a network system.			
	Reads/Writes data in the buffer memory of the Q series CMO.				
	Reads/Writes data in the buffer memory of intelligent function modules.				
	Reads/writes sequence programs.				
	Monitors PLC CPUs (PLC CPU monitoring function).				
	Controls status of PLC CPUs (remote RUN/STOP, etc.).				
	Turns on and off input signals for Q series CMOs by using an external device. (global function)				
	Transmits data from a PLC CPU to an external device (on-demand function).				
Communication using non procedure protocol *2	Transmits/receives data in any format.				
	Transmits/receives data using user-registered frames.				
	Receives data using an interruption program.				
	Monitors PLC CPUs (PLC CPU monitoring function).				
	Transmits/receives ASCII data converting between ASCII and binary.				
	Transmits/receives data using permeation code.				
Communication using bidirectional protocol *1	Transmits/receives data in any format.				
	Receives data using an interruption program.				
	Transmits/receives ASCII data converting between ASCII and binary.				
	Transmits/receives data using permeation code.				
Transmission control	DC code control (including Xon/Xoff control)				
	DTR/DSR(ER/DR) control (CH.2 side only)			-	○
Initial setting using GX Configurator-SC, and monitoring/testing of the set value				○	○
Remote password check				○	-
Automatic initialization of modems					
Callback					

*1: External devices, which incorporated the program and is capable of data communication in MELSEC PLC's protocol, can access to a PLC CPU using MC protocol stated above. Also, it is possible to communicate any data using bidirectional protocol.

*2: For data communication using the protocol of the external device such as a measuring instrument or barcode reader, non procedure protocol stated above is available. In such case, the communication functions using the user-registered frame make it easier to process transmission/reception data.

POINT

1. Interfaces on CH.1 and CH.2 of the Q series CMO operate independently.
2. Modems cannot be connected to an interface on CH.2 of the Q series CMO.

Performance specifications

Item		Specifications			
		CH.1		CH.2	
Interface		Modular connector (6 poles)		RS-232-compliance (D-Sub 9P)	
Applicable line *1		Public line, PBX analog extension 2-wire/4-wire analog dedicated line		---	
Communication method		Protocol	Line	Protocol *2	Line *2
	MC protocol communication	Full-duplex communication system ITU-T recommendation V.21,V.22,V.22bis,V.32,V.32bis,V.42,V.42bis, MNP class 3 to 5		Half-duplex communication system	Full/half-duplex communication system
	Non procedure protocol communication			Full/half-duplex communication system	
	Bidirectional protocol communication			Full/half-duplex communication system	
Synchronous type		Non synchronous type		Asynchronous type	
Transmission speed		300,1200,2400,4800,7200,9600,12000,14400bps		50,300,600,1200,2400,4800,9600,14400,19200,28800,38400,57600,115200bps * On CH.1, transmission speed of 57600bps or less is applicable.	
Modulation system		FSK(300bps),PSK(1200bps)QAM(2400/4800/9600)TCM(7200/9600/12000/14400)		---	
Data format *3	Start bit	1			
	Data bit	7/8			
	Parity bit	1(Vertical parity)/None			
	Stop bit1/2	1/2			
NCU format		Automatic mode (AA)		---	
Operation mode		ORIGINATE/ANSWER (auto change) * Setting change while the dedicated line is used.		---	
Transmission level		-15dBm		---	
Reception revel		-43dBm or more		---	
Access cycle	MC protocol communication	Processes data of one request at END processing of the host PLC CPU * The number of scans/link scans necessary for a processing differs depending on the request.			
	Non procedure protocol communication Bidirectional protocol communication	Transmission is executed when requested. Reception is executable anytime.			
Error detection	Parity check	Selects odd/even numbers using parameters when all protocols are targets or some protocols are targets.			
	Sum check code	For MC protocol/bidirectional protocol, select using parameters. For non procedure protocol, select using user-registered frame.			
Transmission control	DTR/DSR(ER/DR) control	---		Enabled	
	RS/CS control	---		Enabled	
	CD signal control	---		Enabled	
	DC1/DC3(Xon/Xoff) control DC2/DC4 control	Enabled		Enabled	
Line configuration *4		1:1			
Transmission distance		---		Maximum 15m (RS-232)	
Protection degree		IP2X			
Flash ROM write count		Maximum 100.000 times to an same area			
Maximum number of data per communication	MC protocol communication	960 words			
	Non procedure protocol communication	Maximum 3839 words (When using two interfaces simultaneously, each interface cannot communicate 3839 words or more.)			
	Bidirectional protocol communication				
Online module change		Disabled			
Multiple CPU system		Compatible			
Number of occupied I/O points		32 points per 1 slot (I/O assignment: intelligent) *5			
5VDC internal current consumption		0.46A			
External dimensions		98(H)×27.4(W)×90.5(D) mm			
Weight		0.20kg			

*1: For data communication, both senders and receivers use analog signal. Use analog line accordingly. Digital line is not applicable.
For PBX extension, use a line that conforms to the electrical specifications for NTT line.
*2: When the Q series CMO is starting up, full duplex communication system is used for the data communicating with external devices.
For changing to half duplex communication system, refer to User's Manual (Application).
*3: When CH.1 is used, there are some combinations of settings unavailable.
*4: The combinations when connecting an external device (remote device) with a PLC CPU are shown. (External device side : PLC CPU side)
*5: To use the Q series CMO, performing the switch setting using GX Developer.

Remark

This module is a terminal equipment that has the Technical Conditions Compliance Approval etc. of Terminal Equipment required by the Telecommunications Business Law.

Certified product name: Modem module QJ71CMO
Certification number : AD01-0189JP

■ Q series CMO connectable lines

Some lines except the following lines may not compatible with Q series CMOs. Perform a connecting test beforehand to check the compatibility.

● Public line

NTT general line. The line needs to be analog line as well as line for both transmission and reception.
Connecting digital line is not possible.
For selection signal system, both tone dial (PB) and pulse dial (DP) system are applicable.

●PBX extension

PBX analog line (single line). The line needs to be for both transmission and reception.
Monitor signal (reversal of polarity at receiver response) is not necessary for operation.
Connecting with digital line is not possible.
For selection signal system, both tone dial (PB) and pulse dial (DP) system are applicable.
Note, however, that some types of PBX extensions differ from NTT line in electrical specifications (current, voltage, etc.) Connecting such lines with this product may cause malfunction. To avoid this, make sure that the specification of the line to be used corresponds with those of NTT line.

● Dedicated line

1) 2-wire analog dedicated line
   The line needs to be 2-wire analog dedicated line having the bandwidth of 300Hz to 3400Hz.
2) 4-wire analog dedicated line
   The line needs to be 4-wire analog dedicated line having the bandwidth of 300Hz to 3400Hz.
   Four wires (2 wires for transmission, the other 2 for reception) are used.
3) Digital dedicated line
   Connecting digital dedicated line is not possible.

(1) Call-waiting line is not applicable as data distortion may occur due to the calling tone of interruption and line is to be automatically disconnected.
(2) To prevent receiving interruption call during communication, do not connect to extension phones.
(3) If the switchboard beeps at specified time to prevent long time calling, it may cause data to be distorted.
   It is recommended to perform response transmission between devices, which notifies that data reception was normally completed or not, and retransmit data if it was found abnormal.
(4) This module is exclusively for use in Japan due to international diversity on telephone lines.
   Using this module abroad is not possible.

■ Modems connectable with external devices

Modems connectable with external devices in remote places must conform to the Q series CMO performance specifications or higher specifications.
When using the dedicated line, make sure that the modem on the external device is compatible with the dedicated line.
However, some types of external devices cannot establish connection. Perform connecting test beforehand to check the compatibility.

■ Communication system

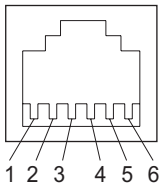
The type of communication using modem interfaces is full duplex.
Connecting with devices for half duplex communication is not applicable.

■ Modem interface (LINE) specifications

● Modular connector specifications

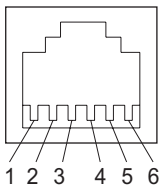
The following shows the specifications for modular connector to be used for public line/dedicated line/PBX extension.

(1) 2-wire system



Pin No.	Signal symbol	Signal symbol	Signal direction CMO ◀▶ Line
1,2	-	No used	-
3	L1	Public line, 2-wire analog dedicated line, PBX analog extension	→
4	L2	Public line, 2-wire analog dedicated line, PBX analog extension	→
5,6	-	No used	-

(2) 4-wire system



Pin No.	Signal symbol	Signal symbol	Signal direction CMO ◀▶ Line
1	R1	4-wire analog dedicated line reception	←
2	-	No used	-
3	T1	4-wire analog dedicated line transmission	→
4	T2	4-wire analog dedicated line transmission	→
5	-	No used	-
6	R2	4-wire analog dedicated line reception	←

● Modular cable specification

Use the following recommended modular cable.
(Recommended cable) EFTC2-001-7 (manufactured by Oki Electric Cable Co.,Ltd.) equivalent products.

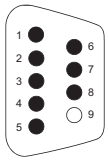
Remark

Contact the professional engineers to establish 4-wire analog dedicated line.

■RS-232 interface specifications

●RS-232 connector specifications

The following shows the specifications for RS-232 connectors for external devices.



Pin No.	Signal abbreviation	Signal name	Signal direction C24 ◀▶ External device
1	CD	Receive carrier detection	←
2	RD(RXD)	Receive data	←
3	SD(TXD)	Transmission data	→
4	DTR(ER)	Data terminal ready	→
5	SG	Signal ground	◀▶
6	DSR(DR)	Data setting ready	←
7	RS(RTS)	Transmission request	→
8	CS(CTS)	Transmission possible	←
9	RI(CI)	Call indication (connection not necessary)	←

●RS-232 interface connector

The following models are used for Q series CMO interface connector.

9-pin D sub (female) mounting type
Manufactured by DDK Ltd.
17L-10090-27-D9AC

Use one of the following as a connector shell for the connection cable of the Q series CMO side.

DDK Ltd.
(Contact Tel.No. 03-3494-6611)
Plug, shell model name:17JE-23090-02(D8A)

Sumitomo 3M Limited.
(Contact Tel.No. 03-3709-8503)
Plug model :8209-6009
Shell module :3702-2209 M2.6

•Tyco Electronics AMP KK.
(Contact Tel.No. 044-844-8013)
Plug model :747904-2
Shell module :747515 or 174469-2

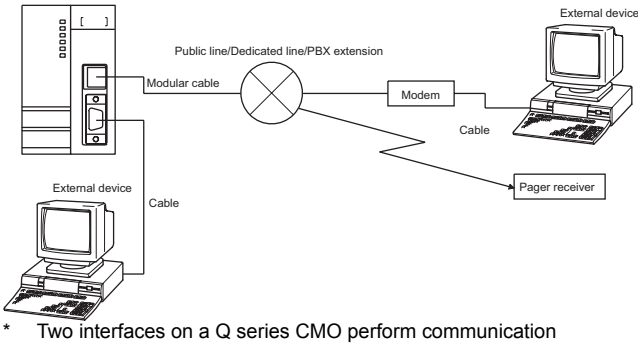
●RS-232 cable specifications

• Use cables that conform to RS-232 standard and keep them within 15m when using them.

(Recommended cable)

7/0.127 ☐ P HRV-SV ••• ☐ :Specifies the number of pairs
(For example, 13 pairs will be expressed as 7/0.127 13P HRV-SV)
(Oki Electric Cable Co.,Ltd)

System configuration



* Two interfaces on a Q series CMO perform communication independently from the other. (Independent operation)

<QJ71CMO included products>

Product name	Description
Manual	Modem Interface Module User's Manual (Hardware)

<Separately obtained products >
The following equipment (manuals) must be obtained separately.

Product name	Description
Modular cable	Refer to the section of the performance specifications.
RS-232 cable Refer to the section of the performance specifications.	Refer to the section of the performance specifications.
Manual	Modem Interface Module User's Manual (Detail)
	Modem Interface Module User's Manual (Application)
	MELSEC Communication Protocol Reference Manual
	GX Configurator-SC Version2 Operating Manual (Protocol FB Support Function)

■Applicable system

<Applicable system and the number of mountable modules>
The following shows the CPU modules and network modules (for remote I/O stations) on which the Q series CMOs can be mounted and the number of mountable modules.

Applicable module		No. of available modules	Remarks
CPU module	Q00JCPU	Up to 8	*1
	Q00CPU Q01CPU	Up to 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 64	Available in Q mode only *1
	Q12PHCPU Q25PHCPU	Up to 64	*1
Network module	QJ72LP25-25 QJ72LP25G QJ72BR15	Up to 64	MELSECNET/H remote I/O station *2 *3

*1: Refer to the system configuration of each CPU system explained in Section 1.
*2: Refer to the system configuration of MELSEC/H remote I/O network explained in Section 2.5.2.
*3: Use the network modules of function version D or later.

<Compatible software package>

(1) Software for PLC/setting and monitoring tool

The following shows systems using Q series CMO together with their compatible software packages.

GX Developer is necessary to use Q series CMO.

		Software version	
		GX Developer	GX Configurator-SC
Q00J/Q00/ Q01CPU	Single CPU system	Version 7or later	Version 1.10L or later (SW0D5C-QSCU 40E or earlier is not compatible.)
	Multiple CPU system	Version 8or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 7or later	Version 1.10Lor later *1
	Multiple CPU system		
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10Lor later	Version 1.13P or later (SW0D5C-QSCU 40E or earlier is not compatible.)
	Multiple CPU system		

*1: It is recommended to use GX Configurator-SC of version1.10L or later when using the Q series CMOs.
Note that it is possible to use GX Configurator-SC of the versions earlier than the above with limitation.

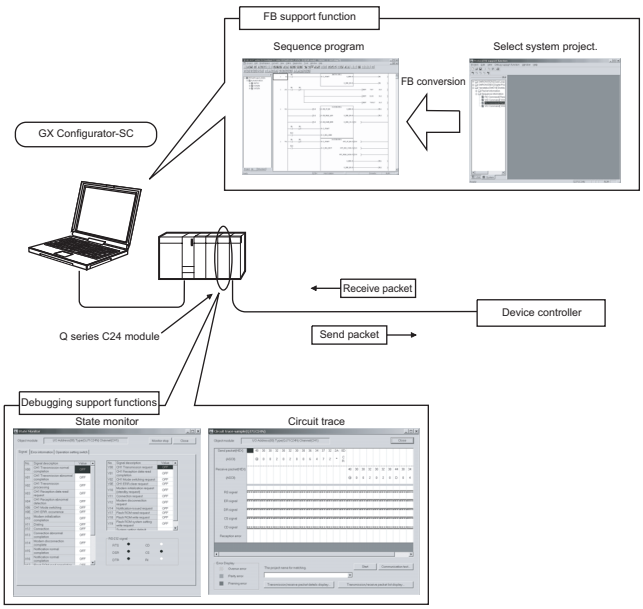
(2) External device communication support tool

Product name	Model name	Remarks
MX Component	SWnD5C-ACT(-J)	• ActiveX control library • "n" in a model name represents numbers more than 3.

2.10.3 Serial communication module settings, monitoring tool: GX Configurator-SC

Overview

GX Configurator-SC Version 2 (hereafter abbreviated to GX Configurator-SC) is the software added into GX Developer for use.
The GX Configurator-SC is a tool that supports the production of necessary PLC programs with initial setting, monitoring and testing, and data communication processing of the serial communication module, modem interface module (hereafter abbreviated to Q series C24 module).
The GX Configurator-SC is composed of an intelligent function utility and protocol FB support function.



● Intelligent function module utility (utility package)

The utility package facilitates the initial settings and monitoring of the Q series C24 by using dedicated screens without having to consider the I/O signals or buffer memory.
The utility package can also be used together with the GX Simulator.

● Protocol FB support function

The protocol FB support function automatically generates the FB (function block) for communication that supports data communication processing and traces the network that monitors the data transmitted/received on the communication network.
Conventionally, to perform the communication processing of the serial communication module/modem interface module with a device controller, a wide variety of complicated sequence programs, e.g. device-specific message format creation and data communication, had to be created by the user in the nonprocedural protocol.
On this software, user-created communication control programs are available as function blocks (hereafter abbreviated to FBs). The user can create a communication control program easily by making use of these FBs.
Also, since the communication debugging functions necessary for system startup are provided, operations from communication control program creation to system startup-time debugging can be performed with this software.

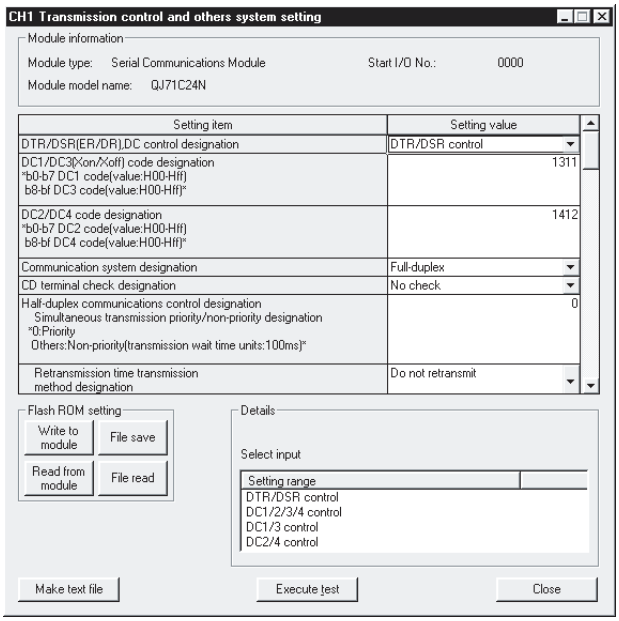
Intelligent function module utility

■System settings

When using the Q series C24 module's functions, the system settings, which need to be set in the buffer memory, can be configured on the screen and stored in the flash ROM.
The followings are items that can be set in the system settings.

(1) Transmission control and other system settings (MC protocol, non procedure, bidirectional)
(2) MC protocol system settings
(3) Non procedure system settings
(4) Bidirectional system settings
(5) PLC CPU monitoring system settings (MC protocol, non procedure, bidirectional)
(6) Transmission user-registered frame number specifying system settings (non procedure)

Sample of transmission control and other system settings screen

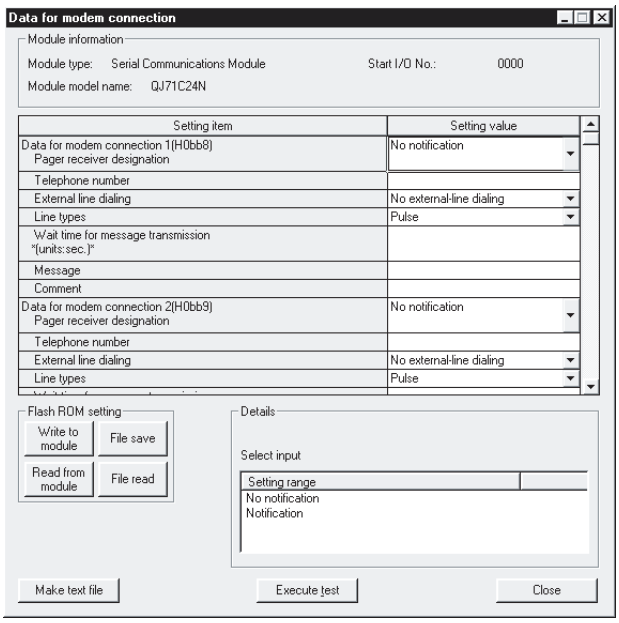


■ Flash ROM registration

The setting information for connecting a modem and system setting information stored in the buffer memory can be registered in the flash ROM of the Q series C24 module. The followings are items that can be registered.

(1) User-registered frame (MC protocol, non procedure)
(2) Modem initialization data (MC protocol, non procedure, bidirectional)
(3) Modem connection data (MC protocol, non procedure, bidirectional)
(4) Modem function system settings (MC protocol, non procedure, bidirectional)
(5) System settings

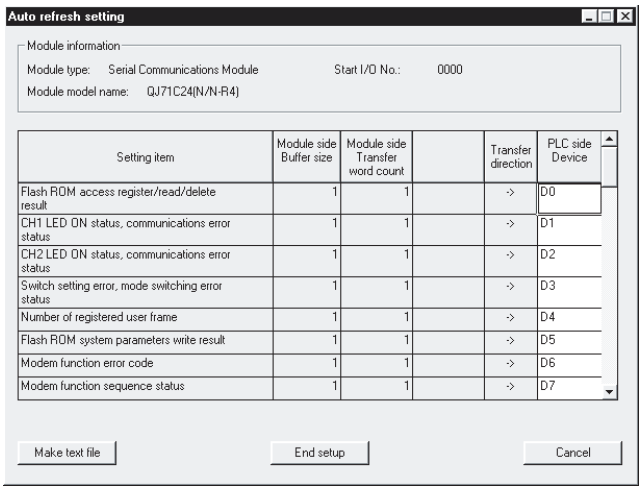
Sample of modem connecting data screen



■ Auto refresh setting

This setting allows specifying the error and the status information, which are in the buffer memory of the Q series C24 module to be automatically refreshed.
The specified device automatically reads values, which are set for the auto refresh and stored in the buffer memory of the Q series 24C modules, at END instruction executed.

Sample of auto refresh setting screen



■Monitor/test

●X/Y Monitoring/testing

This monitors/tests I/O signals of the Q series C24 modules.

●Modem function monitoring/testing

This monitors/tests operating status and set values of the modem functions.

● Transmission control and other monitoring/testing

This monitors status of RS-232 signals and set values for data communication.

●MC protocol monitoring

This monitors status and set values of data communication in MC protocol.

●Non procedure monitoring/testing

This monitors status and set values of data transmission/ reception in non procedure protocol.

●Bidirectional monitoring

This monitors status and set values of data transmission/ reception in bidirectional protocol.

●PLC CPU monitoring function monitoring

This monitors operating status and set values of the PLC CPU monitoring function.

●Transmission user-registered frame number specifying monitoring

This monitors the set value of output frame number, which is for data transmission using the user-registered frame and non procedure protocol.

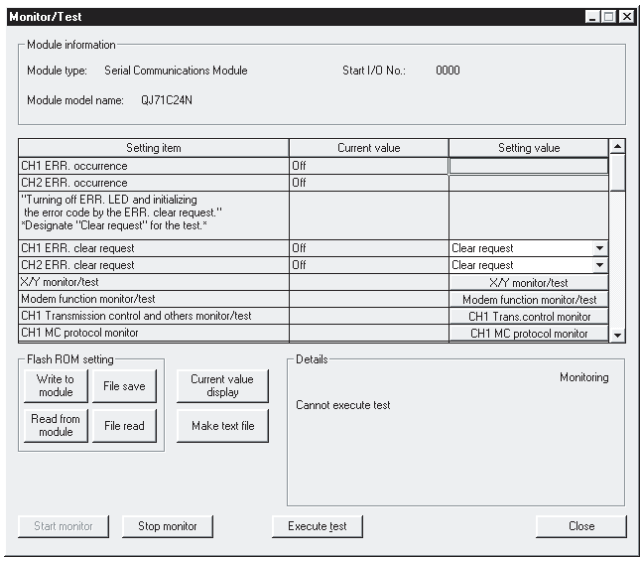
● Other monitoring

This monitors results of accesses to a flash ROM, status of data communication on each interface, results of the intelligent function module switch settings with GX Developer, etc.

●ERR LED off

It is possible to turn off displayed LED, and to initialize communication error information and error codes without resetting the PLC CPU or turning the power off.

Sample of Monitor/test screen



■ Non procedure protocol received data clearing

It is possible to use GX Configurator-SC to clear received data in non procedure protocol communication without resetting the PLC CPU or turning the power off.

About the number of parameters that can be set in GX Configurator-SC

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/ Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

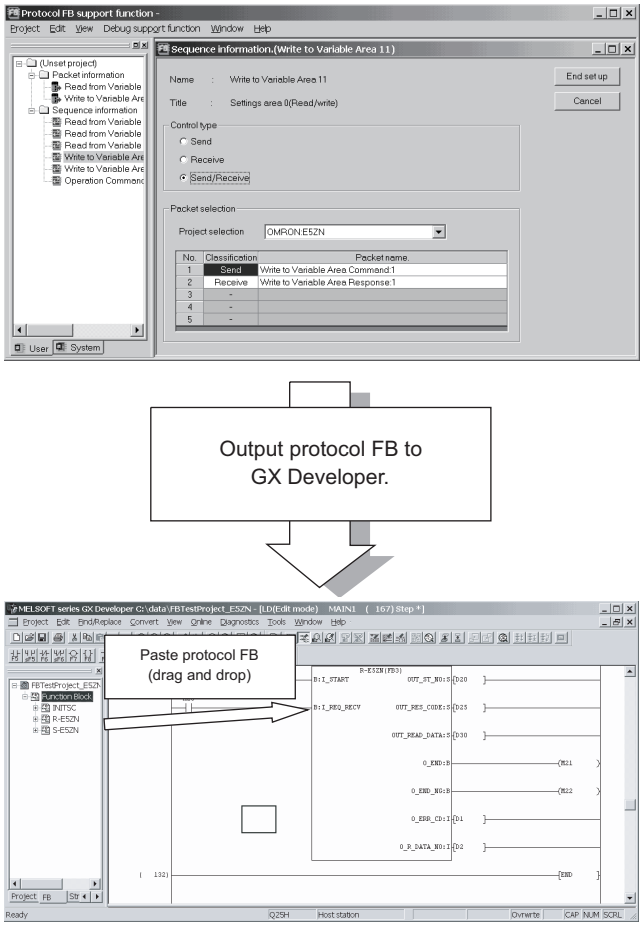
For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings. The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.
The number of parameter settings that can be set for one module in the GX Configurator-SC is as shown below.

Object Module	Initial setting	Automatic refresh setting
QJ71C24N	0(not used)	46(Maximum number of settings)
QJ71C24N-R2	0(not used)	47(Maximum number of settings)
QJ71C24N-R4	0(not used)	46(Maximum number of settings)
QJ71CMO	0(not used)	47(Maximum number of settings)

Protocol FB support function

■ Automatic creation of communication control program (function blocks)

Reduced work for creating sequence for communication control.
Since data for various device controllers are available, the user merely needs to perform FB conversion to create a communication control function block (hereafter abbreviated to a protocol FB).



● No requirement of packet construction specific to device controller

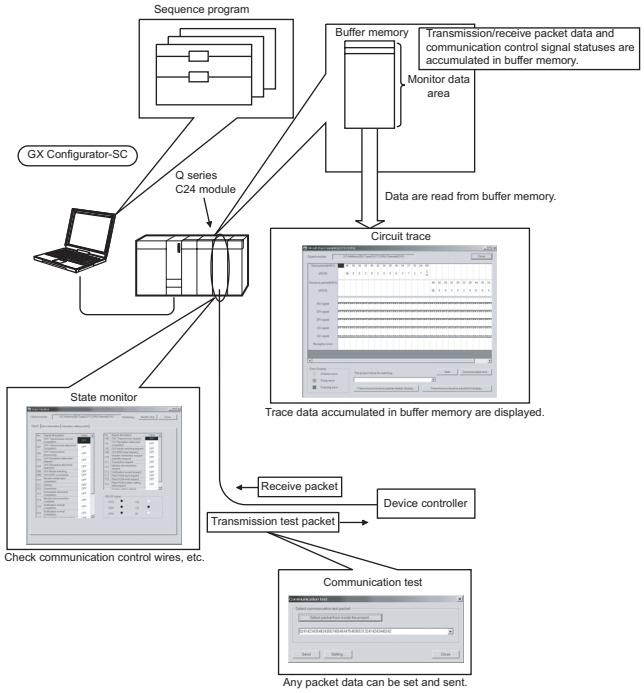
The protocol FB support function has preset data for various data controllers. The user merely needs to select the device controller and its processing items to create a protocol FB automatically without considering dedicated instruction.

● Desired setting of data communication procedure

When constructing any packet originally, setting can be made easily for each device controller.

■ Communication debugging support

Reduced debugging work for system startup.
The debugging functions required for system startup for communication of the Q series C24 module with the device controller are available. Packet data on the line can be confirmed without any other tool being used.
The following outlines the debugging support functions.



● Circuit trace

The transmission/receive packet data and communication signal wire condition between the Q series C24 module and device controller can be traced.

(1) Transmission/receive packet details display

The transmission/receive packet data obtained by circuit trace are displayed in detail on the basis of the packet information.

(2) Transmission/receive packet list display

The transmission/receive packet data obtained by circuit trace are displayed separately in lists on a packet-by-packet basis.

● Communication test

Test transmission (any/setting data) can be made from the Q series C24 module to the device controller.
By starting the circuit trace and the following state monitor simultaneously, the packet communication data on the line can be confirmed.

● State monitor

The error status, communication signal line condition, etc. of the Q series C24 module can be monitored.

Protocol FB support function list

● Protocol FB support function

Function	Function outline
Module setting	**M**ake the initial setting of the module used with the protocol FB support function.Used at the time of protocol FB conversion.
Packet construction information setting	Set the packet construction elements (message format) of the device controller.
Packet data information setting	Set detailed data to the construction elements of the packet construction information to set the data for actual communication.
Sequence information setting	Set the communication processing control type (send, receive, communication) and the packet data that matches that type to set the information for creation of a protocol FB.
Sequence FB conversion	Convert the specified sequence information into a protocol FB.The created protocol FB is inserted into the <<FB>> tab of GX Developer.

● Debugging support functions

Function	Function outline
Circuit trace	Traces the transmission/receive packet data and communication signal wire condition. Transmission/ receive packet details display • The packet information is collated with the transmission/receive data obtained by circuit trace and the details of each packet are displayed. • Transmission/receive packet list displayThe obtained transmission/receive packet data are displayed separately in lists on a packet-by-packet basis.
	• Save/read of trace data Saves/reads the data obtained by circuit trace.
Communication test	Performs a communication test on any packet data from the Q series C24 module to the device controller.
State monitor	Monitors the error status, communication signal wire, etc. of the Q series C24 module.

Applicable modules and function ranges

Applicable module	Protocol FB support function	Debugging Support Function		
		Circuit trace	Communication test	State monitor
QJ71C24/-R2	○	×	×	○
QJ71C24N/-R2/-R4	○	○	○	○
QJ71CMO*1	○	×	×	○

*1: CH.1 is for modem functions, therefore not applicable.

Operating environment

This chapter explains the operating environment of the personal computer that uses GX Configurator-SC.

Item		Peripheral device
Installation (add-in) destination *1		Add into GX Developer Version 8 (English version) or later *2
Computer		Personal computer on which Windows® operates.
	CPU	Refer to "Used operating system and performance required for personal computer" in the following table.
	Required memory	
Hard disk free space	For installation	65MB or more
	For operation	20MB or more
Display		Resolution 800×600 dots or more. *3
Operating systems		Microsoft® Windows® 95 Operating System(English version) Microsoft® Windows® 98 Operating System(English version) Microsoft® Windows® Millennium Edition Operating System(English version) Microsoft® Windows NT® Workstation Operating System Version 4.0(English version) Microsoft® Windows® 2000 Professional Operating System(English version) Microsoft® Windows® XP Professional Operating System(English version) Microsoft® Windows® XP Home Edition Operating System(English version)

*1: Install GX Configurator-SC into GX Developer Version 8 or later of the same language.
GX Developer (Japanese version) and GX Configurator-SC (English version) or GX Developer (English version) and GX Configurator-SC (Japanese version) cannot be used together.

*2: The protocol FB support function cannot be used if it is added into GX Developer Version 7 or earlier.

*3: Large fonts are not supported when Windows® XP Professional or Windows® XP Home Edition is used.

Used operating system and performance required for personal computer

Operating System		Required performance for personal computers	
		CPU	Required capacity
Windows® 95(Service Pack 1 or later)		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0(Service Pack 3 or later)		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatible mode" and "easy switching by user" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

2.11 Intelligent Communication Module

2.11.1 Intelligent communication module: QD51, QD51-R24

Overview

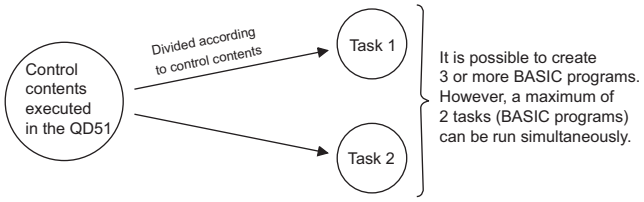
The intelligent communication module (hereafter abbreviated to QD51 (-R24)) is a module which operates by BASIC programs created by the user.
The BASIC version that can be used by the QD51 (-R24) is AD51H-BASIC, which is capable of multitasking processing of up to 2 tasks.

Besides the various calculations that can be carried out by a BASIC program created by the user,
•Data can be sent to and received from an external devices.
•Data can be sent to and received from the PLC CPU.

Features

■ It is possible to run up to two BASIC programs (tasks) simultaneously

Since multitask processing is possible, it is possible to create BASIC programs where the control contents executed by the QD51 (-R24) are divided into processing modules.
The necessary task is started in accordance with the control contents and the system can be controlled while carrying on data communications and synchronizing execution between each task.

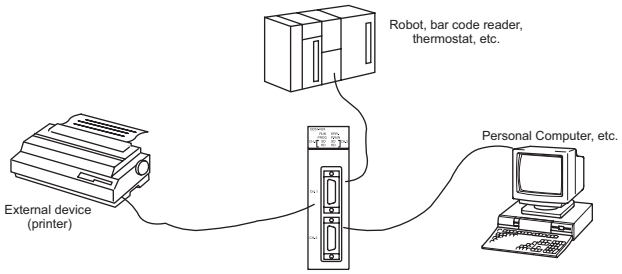


■ Data communications with external devices is possible

<Data communications with external devices>
Non procedure data communications can be carried out with external devices connected to the RS-232 and RS-422/485 interfaces.

<Data communications with a console or terminal>
Data can be displayed in a console or terminal connected to the RS-232 and RS-422/485 interfaces and data can be input from the console or terminal.

<Printout on a Printer>
Data can be printed out on a printer connected to the RS-232 interface.



■ Data communications with the PLC are possible

Data can be sent to and received from a PLC CPU or the MELSECNET/H PLC CPU with the QD51 (-R24) installed in it.
The types of data which can be sent to and received from a PLC CPU are shown below.
(1) Device writing and reading in the PLC CPU (Max. 960 words/time)
(2) Writing to and reading from the buffer memory in the special function module (Max. 960 words/time).
(3) Remote RUN/STOP of the PLC CPU.
(4) Interrupts to the PLC CPU.

■ File control is possible

Using the console's FD or HD (hard disk), sequential files and random files can be handled.
However, it is necessary that the console should be connected at all times.

<Sequential Files>
These are files in which data can be read and written sequentially and which enable efficient use of memory.
They are used mainly for operating instruction data files and results files, etc.

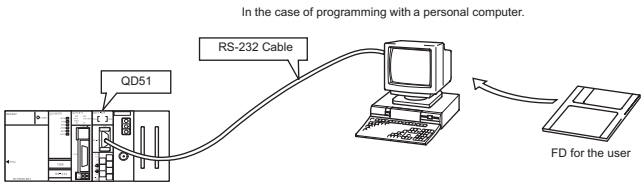
<Random Files>
These are files where reading starts from the necessary portion only and only the necessary portion is written.
This type of file is appropriate for large volume inventory files, instruction data for operator interfaces, master files, etc.
When reading or writing is done one time, the maximum data size is 256 bytes.

■ Offline programming with a text editor is possible

A BASIC program can be created offline using a text editor, and the BASIC program can then be registered.
In offline programming, the edited program cannot be run.

■ Online Programming is possible

By connecting the QD51 (-R24) to a personal computer and carrying out settings at a console, a BASIC program can be edited and debugged.



■ Multitask debugging is possible

By connecting the QD51 (-R24) to a personal computer and carrying out settings at a debuggy, multitask process can be performed during debugging.
Multitask debugging is performed by inputting the Debug command from the debugger. By executing the Debug command, the following can be done.

- The BASIC program for the specified task No. area can be run and terminated.
- The variable values specified in the BASIC program for the specified task No. area can be read and written.
- Data can be read from and written to the QD51 (-R24)'s internal memory.
- Common events and message port use status displays, etc. can be shared between BASIC programs.

■ Both interpreter BASIC and compiled BASIC can be used

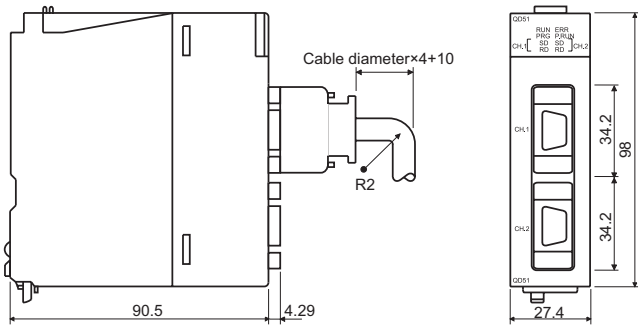
By compiling a BASIC program created in interpreter BASIC with the BASIC compiler, the BASIC processing speed can be markedly increased.

Interpreter BASIC : BASIC in an execution format where the QD51 (-R24) converts the program to machine language during execution.

Compiled BASIC : BASIC in the format where the program is compiled (the commands are converted to machine language) at the stage when the program is completed and the QD51 (-R24) runs it in machine language directly.

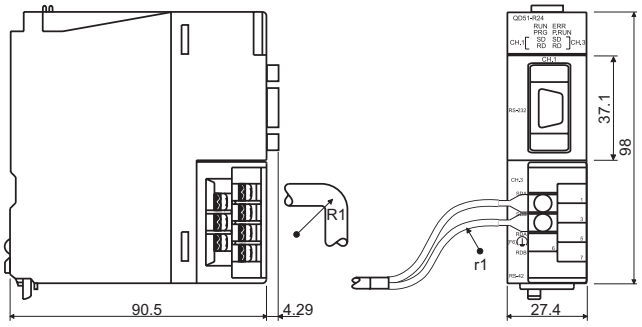
Appearance

(1) QD51



Unit:mm

(2) QD51-R24



Unit:mm

* R1 (Bending radius near the terminal block): Cable diameter × 4

* R2 (Bending radius near the connector): Cable diameter × 4

* r1 (Bending radius near the solderless terminals):
Connectable to the degree with no excessive bending of the cable

List of exclusive commands

Exclusive Command	Function Outline
YCHECK	Checks the rise of the start signal (Y19) and shortens the start time of a BASIC program.

Function list

Item		Function Outline
Functions by BASIC programs	Sub-CPU Function	Complex numerical calculations and function calculations which would lengthen the PLC CPU' s scan time can be calculated by a BASIC program. • Collection, analysis and correction of measurement data • Function calculations such as Sin, Log and square roots, etc.
	Monitor Display Function	This displays the operating status (production conditions, running status, breakdown contents, etc.) in a console or terminal connected to the QD51 (-R24).
	Key Input Function	This carries out input of production schedules, production quantity, operations, setting data, etc. from the keyboard of a console or terminal connected to the QD51 (-R24).
	Printer Function	This prints out production plans, results, daily reports, breakdown contents, planning data, inspection results, test results charts, etc with a printer connected to the QD51 (-R24).
	Data Input Function	This enables input of data from a bar code reader or magnetic card reader, etc. that is connected to the QD51 (-R24). (Since sending and receiving can be done in a free format through a BASIC program, it is possible for the QD51 (-R24) to match the protocols of the external device.) • Input of production lot No., product name, quantity, etc. • Collection of measured values, test data.
	External Device Connection Function	This connects with a computer, etc. to the RS-232C or RS-422/485 interface of the QD51 (-R24) and sends and receives data through a BASIC program.
	Clock Function	This writes and reads PLC CPU clock data (year, month, day, hour, minute, second, day of week) for PLC CPU's with the clock function.
Online Programming Function		This creates executes and corrects BASIC programs through system commands by connecting a console to the QD51 (-R24). It also records programs run by system commands in Flash ROM and reads them.
Multitask Debugging Function		This carries out debugging while running BASIC programs by multitasking, by connecting a console and debugger to the QD51 (-R24).

Performance specifications

Item		Specifications	
		QD51	QD51-R24
Programming language		AD51H-BASIC((interpreter, compile)	
Number of tasks		2	
Task Start conditions		•Start when power is turned on. •Start by an interrupt from the sequencer CPU. (Not possible when compiled BASIC is used.) •Start by a start request from another task.	
Internal Memory	Program	Max. 64 kbytes (Task 1 capacity + Task 2 capacity ≦ 64 kbytes)	
	Common Memory	8 kbytes	
	Buffer Memory	6 kbytes	
	Expansion Relay (EM)	1024 points	
	Expansion Register (ED)	1024 points	
General-purpose I/O (from/to PLC CPU)		Input 27 points, output 23 points	
Memory protection		Unavailable	
Interface	CH.1	RS-232 compliant (D-Sub9P)	RS-232 compliant (D-Sub9P)
	CH.2	RS-232 compliant (D-Sub9P)	---
	CH.3	---	RS-422/485 compliant (two-piece terminal block)
Communication system		Full-duplex	
Synchronization system		Synchronous	
Transmission speed bps		300,600,1200,2400,4800,9600,14400,19200,28800,38400bps *Usable when the total transmission speed of two channels is within 38400bps.	
Data Format	Start Bit	1	
	Data Bits	7 or 8	
	Parity Bit	Even, Odd, None	
	Stop Bit	1 or 2	
Transmission Control	DTR/DSR (ER/DR) Control	RS-232 only can be used, RS-422/485 cannot be used.	
	RS/CS Control		
	CD Signal Control	None	
	DC1/DC3 (Xon/Xoff Control)	Both RS-232 and RS422/485 can be used.	
	DC2/DC4 Control	None	
Clock Function		None	
Power Failure Maintenance		None	
User Program ROM Storage		The program area only can be stored in Flash ROM.	
Console		DOS/V personal computer or PC-9800 series personal computer	
Multitask Debugging		Possible (when the debugger is used)	
Line Configuration *1	RS-232	1:1	
	RS-422/485	---	1:1,1:n,n:1,m:n
Transmission Distance (Total Length Distance)	RS-232	Max. 15 m	
	RS-422/485	---	Max. 1200 m (Total Length Distance)
Progection degree		IP2X	
Number of times in an Input/Output Share		Maximum 100,000 times for the same area	
Online module change		Disabled	
Multiple CPU system		Compatible *3	
Number of occupied I/O points		32 points 1 slot (I/O divided: intelligent)*2	
Internal current consumption (5VDC)		0.26A	0.31A
External dimensions		98(H) × 27.4(W) × 90.5(D) mm	
Weight		0.20kg	

*1: This shows the combination when the external device and PLC CPU are connected. (External Device Side: PLC CPU Side) The total n, m + n becomes a maximum of 32.

*2: To use the QD51(-R24), switch settings must be made by GX Developer. Refer to Section 5.6 for the switch settings of GX Developer.

*3: The system is compatible with the function version B or later.

■ QD51 (-R24) Internal Memory

The following memory can be used by the user in the QD51 (-R24).

● Memory where programs for execution can be stored

- Program Area
  This is memory where BASIC programs which run the QD51 (-R24) are stored.
  The program area can execute a maximum of two tasks and it has a maximum capacity of 64 k bytes.

● Memory for communications with the PLC CPU

- Buffer memory

● Memory for communications with a task

- Common memory

● Memory for reading/writing ON/OFF data.

- Expansion register (ED) : 1024 points (ED0 to ED1023)
- Special register (ED9000) : 128 points (ED9000 to ED9127)
- Expansion relay (EM) : 1024 points (EM0 to EM1023)
- Special relay (EM9000) : 128 points (EM9000 to EM9127)

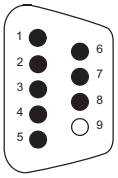
Caution

Internal memory is not backed up by a battery.If the QD51 (-R24)'s power is turned off, the BASIC program written to it and the data in the buffer memory, etc. are erased.Be sure to save the BASIC programs you create in flash ROM before turning the power off. Also, store the contents of buffer memory, etc. in a device that is latched by the PLC or save them to files.

■ RS-232 Interface Specifications

● RS-232 connector specifications

The connector specifications for the RS-232 used to connect with the opposite device are shown below.



Pin No.	Signal Abbrviation	Signal Name	Signal Direction QR51 (-R24) ◄► Opposite e Device
1	CD	Receive Carrier Detect	←
2	RD(RXD)	Receive Data	←
3	SD(TXD)	Transmit Data	→
4	DTR(ER)	Data Terminal Ready	→
5	SG	Signal Ground	◄►
6	DSR(DR)	Data Set Ready	←
7	RS(RTS)	Request to Send	→
8	CS(CTS)	Clear to Send	←
9	---	---	---

● RS-232 interface connector

The QD51(-R24) uses the following type of RS-232 interface connector.

9-pin D sub (female) screw fixing type

17L-10090-27-D9AC Manufactured by DDK Ltd.

Use one of the following as a connector shell for the connection cable of the QD51(-R24) side.

DDK Ltd.

Plug, shell model: 17JE-23090-02 (D8A)

3M

Plug model: 8209-6009 Shell model: 3702-2209 M2.6

Tyco Electronics AMP K.K.

Plug model: 747904-2 Shell model: 747515 or 174469-2

● RS-232 cable specifications

• For the RS-232 cable, use a cable which complies with the RS-232 standard and which has a length of 15 m or less.

(Recommended cable)

7/0.127□P HRV-SV • • • :

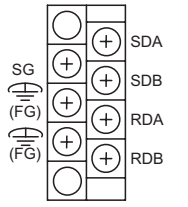
Specifies a logarithm (In the case of 13 pairs, 7/0.127 13P HRV-SV)

(Made by Oki Electric Wire Co. Ltd.)

■ RS-422/485 Interface Specifications

● RS-422/485 terminal block specifications

This shows the RS-422/485 terminal block specifications for connecting with the opposite device.



Signal Abbreviation	Signal Name	Signal Direction QR51 (-R24) ◄► Opposite Device
SDA	Send Data(+)	→
SDB	Send Data(-)	→
RDA	Receive Data(+)	←
RDB	Receive Data(-)	←
SG	Signal Ground	◄►
FG	Frame Ground	◄►
FG	Frame Ground	◄►

The M3 screw is used for the terminal block of RS-422/485 interface.

Use the solderless terminal applicable to the terminal.

● RS-422/485 cable specifications

This shows the RS-422/485 cable specifications.

(1) For the RS-422/485 cable (cable which connects to the QD51 (-R24) terminal block), use a cable which satisfies the following specifications, with a length of 1200 m or less.

(2) Also, when connecting multiple devices at 1:n, n:1, or m:n, keep the total cable length within 1200 m.

(3) The RS-422/485 cable specifications are shown below.

Item	Content
Cable Type	Shielded Cable
Logarism	3P
Conductor Resistance (20℃)	88.0 Ω/km or less
Insulation Resistance	10,000 MΩ - km or greater
Voltage Resistance	500 V DC 1 minute
Electrostatic Capacity (1 KHz)	Average 60 nF/km or less
Characteristic Impedance (100 KHz)	110±10Ω

(Recommended Cables)

SPEV(SB)-MPC-0.2×3P .....(Made by Mitsubishi Electric Wire Co. Ltd.)

SPEV(SB)-0.2×3P.....(Made by Mitsubishi Electric Wire Co. Ltd.)

* The electrical characteristics of the recommended cables SPEV (SB) -MPC 0.2×3P and SPEV (SB) -0.2×3P are equivalent, but they differ somewhat in their external dimensions and internal wire colors.

System configuration

<QD51 included products>

Product	Description
Manual	Intelligent Communication Modules User's Manual (Hardware)

<QD51-R24 included products>

Product	Description
Terminating resistor	110Ω,330Ω,2 of. each
Manual	Intelligent Communication Modules User's Manual (Hardware)

<Separately obtained products>
The following equipment (manuals) must be obtained separately.

Product name	Description
RS-232/422 cable	Refer to the section of the performance specifications.
Manual	Intelligent Communication Module User's Manual (Detail)
	AD51H-BASIC Programming Manual (Command)
	AD51H-BASIC Programming Manual (Command and Compile)

■ Application Systems

<Applicable modules and number of modules that can be mounted>
The following table lists the CPU module and network modules (for remote I/O stations) that the QD51(-R24) can be mounted and the number of modules which can be mounted.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only *1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72LP25G QJ72BR15	Maximum 64	MELSECNET/H Remote I/O station *2

*1: See the description of the system configuration for each CPU system of section 1.
*2: See the description of the system configuration for MELSECNET/H remote I/O network of section 2.5.2.

<Applicable software package>
The following shows the system for using QD51(-R24) and corresponding to the software package.
When using the QD51(-R24), The AD51H-BASIC software package and the GX Developer is required.

(1) Console/debugger software package

Product Name	Model	Remarks
AD51H-BASIC Software Package	SW1IVD-AD51HP	For Personal Computers

(2) PLC software package (Essential)

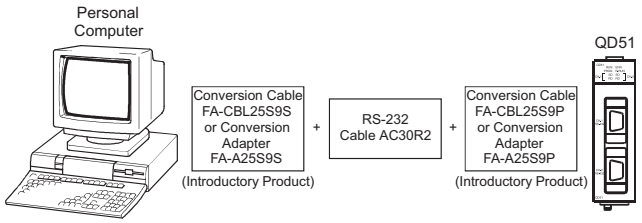
		Software packages
		GX Developer
Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later
	Multiple CPU system	Version 8 or later
Q02/Q02H/Q06H/Q12H/Q25HCPU	Single CPU system	Version 4 or later
	Multiple CPU system	Version 6 or later
Q12PH/Q25PHCPU	Single CPU system	Version 7.10L or later
	Multiple CPU system	
When mounting on MELSECNET/H remote I/O station		Version 6 or later

(3) Commercially available compilation software package (necessary only during compilation)
(a) When using a Personal Computer
Purchase the product Borland C++ Suite.
The Turbo Assembler is included in the Borland C++ Suite.

Product Name	Model Name	Remarks
Turbo Assembler	Turbo Assembler Ver5.0	IBM PC/AT English Version

Borland Corporation
Shinjyuku First West Bldg.
1-23-7 Nishishinjyuku, Shinjyuku-Ku, Tokyo
160-0023
Tel. 03-5323-3071

<Connection Cable for the Console/Debugger>
(1) When using a Personal Computer
(a) Connection Cables
Combine cables to make connections.



Caution
Two conversion adapters (FA-A25S9P) cannot be installed on the QD51.

[Inquiries for Introductory Products]

Conversion Cable : FA-CBL25S9S,FA-CBL25S9P

Conversion Adapter : FA-A25S9S,FA-A25S9P

Mitsubishi Electric Engineering Co.,Ltd.

(b) Cable Wiring

This shows wires for cables made by users.

This Module Side		Cable Connection and Signal Direction (Example of Full Duplex Communications Connection)	Console Side
Signal Name	Pin No.		Signal Name
CD	1		CD
RD(RXD)	2		RD(RXD)
SD(TXD)	3		SD(TXD)
DTR(ER)	4		DTR(ER)
SG	5		SG
DSR(DR)	6		DSR(DR)
RS(RTS)	7		RS(RTS)
CS(CTS)	8		CS(CTS)
---	9		---

Caution

The pin arrangement on the console side may differ depending on the personal computer used.
If the user makes the cables, please do so after confirming the personal computer's interface specifications.

2.11.2 AD51H-BASIC package: SW1IVD-AD51HP

Overview

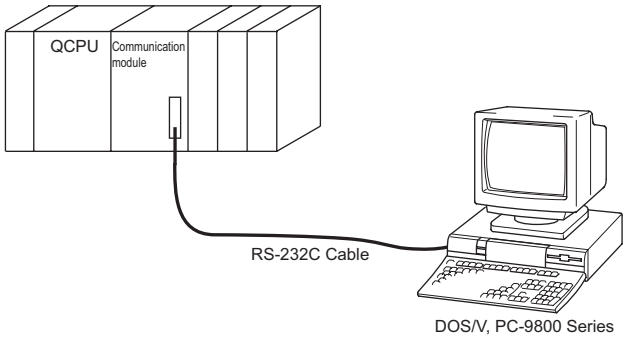
This manual explains the procedures for operating the SW1IVD-AD51HP type AD51H-BASIC Package, which is used to create, revise and debug BASIC programs for the AD51H-S3/A1SD51S/QD51(-R24) intelligent communication (hereinafter referred to as communication module).
This software package can register with the hard disk of the following PC and use.

•DOS/V PC (SW1IVD-AD51HP)

Features

■ Online programming, execution and debugging of BASIC programs

By connecting a DOS/V PC to the communication module, it can be used to create, revise, execute and debug BASIC programs in online.
The program can also be stored on FD or HD.



■ Operation of files on FD, HD

The following procedures can be operated on BASIC program files stored on FD or HD.

- Display of names of stored files (directory)
- Deletion of stored files.
- Copying and verifying of files between FD and HD.

List of functions

The functions that can be executed with the software package are presented below.

● Programming

Online programming

● File maintenance

Directory display of HD, FD and memory cards(Cautions)
Deletion of files and system names from HD, FD and memory cards(Cautions)
Copying of files on HD, FD and memory cards(Cautions)
Verification of files on HD, FD and memory cards(Cautions)
Memory card formatting(Cautions)
Memory card back up(Cautions)
ROM conversion of BASIC program for execution(Cautions)
Display of contents of execution environment settings

● Date and time settings

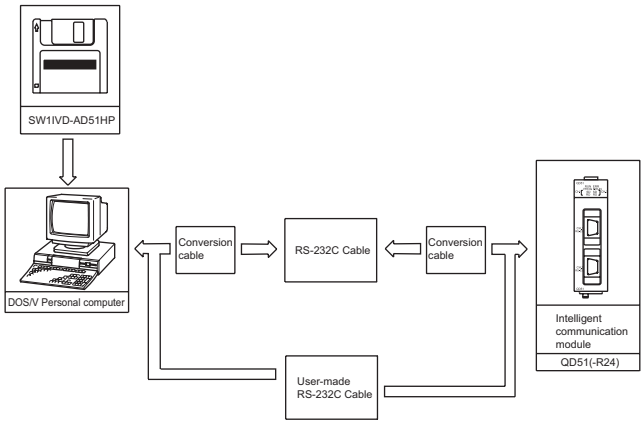
Setting of clock data for PLC CPU

Cautions

(1) The following operations cannot be executed on the A1SD51S/QD51(-R24) intelligent communication module.
•Access to memory card
•ROM conversion of execution program
(2) In the case of ROM conversion, a separate SW□-ROMA ROM Function Software Package is required.

System configuration

■ System configuration using the QD51 (-R24)



For conversion cables, RS-232C cables, user-made RS-232C cables, refer to Section 2.11.1.

Operating environment

● Operating environment of DOS/V PC

Item	Description
OS	IBM DOS Version J5.02/V IBM DOS Version J6.1/V MS-DOS Version 5.0/V MS-DOS Version 6.2/V Windows3.1(operated using DOS compatibility BOX.) Windows® 95(operated using DOS compatibility BOX. Full-screen display is not available.) Windows® 98(operated using DOS compatibility BOX. Full-screen display is not available.) Windows® 2000 Professional(operated using DOS compatibility BOX.) Windows® XP Professional(operated using DOS compatibility BOX.) Windows® XP Home Edition(operated using DOS compatibility BOX.)
Required memory	DOS:640k bytes or more (free space 360k bytes or more) Windows:Environment where Windows operates
Free hard disk space	1MB or more
Disk drive	3.5 inch (1.44MB) floppy disk drive
Communication interface	DOS,Windows3.1:COM1 Windows95,Windows98,Windows2000,WindowsXP:COM1 to 9

POINT

In case of DOS, Windows 3.1, Windows 95 or Windows 98, ANSY.SYS must be registered as CONFIG.SYS file to display screens.

2.12 MELSECNET/MINI-S3

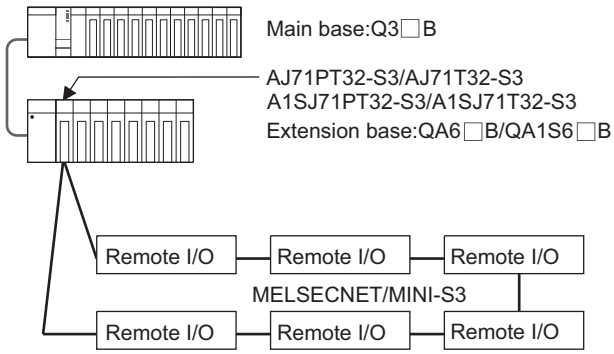
2.12.1 AJ71PT32-S3, AJ71T32-S3, A1SJ71PT32-S3, A1SJ71T32-S3

Overview

The MELSECNET/MINI-S3 is a wire-saving remote I/O network using plastic fiber or twisted pair cables. The A2C series I/O and special modules, FX series PLC, partner maker solenoid valves and others can be connected to MELSECNET/MINI-S3 as remote modules.
The AJ71PT32-S3/A1SJ71PT32-S3 and AJ71T32-S3/A1SJ71T32-S3 are usable with the High Performance model QCPU only.

Features

■ System configuration



The MELSECNET/MINI-S3 master module can be mounted on QA6□B/QA1S6□B.

■ Connectable remote modules

All conventional MELSECNET/MINI-S3 and A2C series remote I/O modules that are connectable to MELSECNET/MINI-S3 are supported for connection. For full information on the usable modules, refer to the MELSEC-A/QnA catalog.

■ Twisted pair cable specifications

Item	Specifications
Cable type	Shielded twisted pair cable
Number of pairs	2P or more
Conductor resistance	88.0Ω/km max. @20℃
Capacitance	Average 60nF/km max. @1kHz
Characteristic impedance	110±10Ω

■ Optical cable specifications

Item	Specifications
Type	Plastic fiber cable
Transmission loss	260dB/km max.
Fiber OD	1000μm
Connector	1-core connector
Permissible flexing radius	25mm

Optical fiber cables are available from Mitsubishi Electric System & Service co, Ltd.

■ Restrictions on use with Q mode

The following MELSECNET/MINI-S3 dedicated instructions compatible with the A/QnA cannot be used with the Q mode. Programming must be performed using the FROM/TO instructions etc.

Unusable instructions	INPUT, PRN, PR, MINI, MINIERR, SPBUSY, SPCLR

The Q mode CPU does not have the MELSECNET/MINI-S3 automatic refresh function.

Performance specifications

		AJ71PT32-S3/A1SJ71PT32-S3	AJ71T32-S3/A1SJ71T32-S3
Compatible cable		Optical cable	Twisted pair cable
Number of mountable master modules		No restriction	
For every master module	Max. number of link stations	64 stations *1	
	Number of I/O points	512 points	
I/O refresh time		3.2 to 18ms (when 64 stations are connected) *2	
Transmission speed		1.5Mbps	
Max. inter-station distance		1 to 50m *3	1 to 100m *4
Number of I/O points occupied		I/O dedicated mode: 32 points, extension mode: 48 points (I/O assignment: intelligent)	
5VDC internal current consumption		0.35A	0.30A
Weight		0.60kg	

*1: The max. number of link stations indicates the total number of occupied stations assigned to remote modules is up to 64. However, the max. number of connectable remote terminal modules (number of occupied stations: 4) is 14.
*2: The I/O refresh time depends on the number of remote module stations connected, their type, and the operating mode of the master module.
*3: Communications may not be made if the inter-station distance of the optical cable is less than 1m (3.28ft.). When the 2VTPE-1 cable (Manufactured by Mitsubishi Cable Industries, Ltd.) is used, the max. inter-station distance is 35m (114.75ft.).
*4: The max. inter-station distance depends on the twisted pair cable diameter used. It is 50m (163.93ft.) for cables of 0.2mm^2 to 0.5mm^2, and 100m (327.87ft.) for cables of 0.5mm^2 or more.

The production of the AJ71PT32-S3/AJ71T32-S3 is discontinued after September 30, 2006. Also, please note that the production of the A1SJ71PT32-S3 remote module is discontinued after September 30, 2008.

2.13 MELSEC-I/OLINK

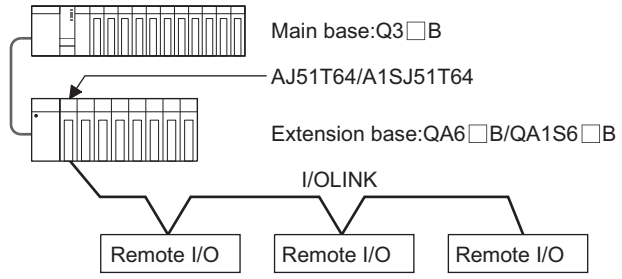
2.13.1 AJ51T64, A1SJ51T64

Overview

The MELSEC-I/OLINK is a simple, wire-saving remote I/O network that does not need network parameter setting and can be programmed as if you are using ordinary I/O modules.
It can control 64 points of input or output (up to 128 points when 8- or 16-point composite modules are used) per network. This network uses a multidrop bus wiring system and also supports T branch connection. In addition, it does not require any terminations.
The AJ51T64, A1SJ51T64 is applicable to the High Performance model QCPU only.

Features

■ System configuration



The AJ51T64 can be mounted with QA6□B, and the A1SJ51T64 with QA1S6□B.

■ Connectable remote I/O

All conventional remote I/O modules that are connectable to MELSEC-I/OLINK are supported for connection.
For full information on the usable modules, refer to the MELSEC-A/QnA catalog.

■ Twisted pair cable specifications

Item	Specifications	
Cable type	Shielded twisted pair cable	Cabtyre cable
Wire diameter, number of pairs	0.75mm^2 × 1P	0.75mm^2 × 2C
Conductor resistance	29Ω/km max. @20℃	
Capacitance	75nF/km max. @1kHz	-
Characteristic impedance	100Ω	-
Insulation resistance	500MΩ or more	
Withstand voltage	AC500V 1 minute or longer	
OD	ϕ8.5mm max.	ϕ9mm max.

■ Restrictions on use with Q mode

No restrictions.

Performance specifications

Item		Specifications	
		AJ51T64	A1SJ51T64
Max. number of I/O points		128 points (when I/O composite remote modules are used)	
I/O refresh time		Approx. 5.4ms	
Applicable communication cable		Twisted pair cable or cabtyre cable 0.75mm^2 or more	
Transmission speed		38.4kbps	
Synchronous system		For frame synchronization and bit synchronization	
Error control		Parity check	
Transmission path form		Bus system (T branch possible, terminating resistors not needed)	
Transmission distance		Overall 200m (Overall 665.74feet)	
Number of I/O points occupied		64 points (I/O assignment: intelligent)	
External power supply	rated voltage	DC24V (+15%/-10%) (for transmission path)	
	current consumption	TYP. 90mA	
Internal current consumption (5VDC)		0.115A	
Weight		0.35kg	0.30kg

The production of the AJ51T64 is discontinued after September 30, 2006. Also, please note that the production of the A1SJ51T64 is discontinued after October 31, 2007.

2.14 OPCN-1 open PLC-to-PLC network

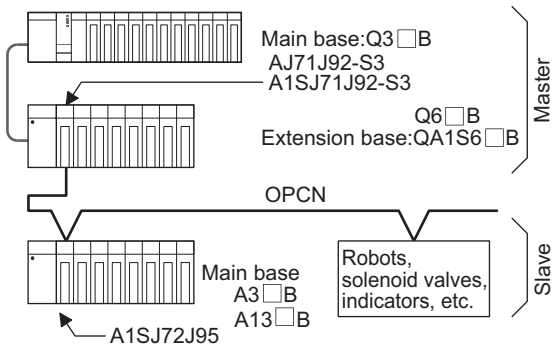
2.14.1 AJ71J92-S3, A1SJ71J92-S3, A1SJ72J95

Overview

The OPCN-1 is an open PLC network standardized by the Japan Electrical Manufacturers' Association and can control OPCN-1-compatible slave stations, such as remote I/O, solenoid valves, robots and indicators, from the master PLC.
The AJ71J92-S3/A1SJ71J92-S3 is usable with the High Performance model QCPU only.

Features

■ System configuration



The AJ71J92-S3 can be mounted with QA6□B., and the A1SJ71J92-S3 with QA1S6□B.
The A1SJ72J95 with A1S3□B.

■ Modules connectable to slave stations

The A1SJ72J95 slave station module can be loaded in the CPU slot of the A1S3□B to control the AnS series I/O modules (A1SX□ □, A1SY□ □).
A large-size series/the AnS series special, network and I/O composite modules cannot be loaded.

■ Twisted pair cable specifications

Item	Specifications
Cable type	Shielded twisted pair cable
Number of pairs	2P or more
Conductor resistance	88.0Ω/km max. @20℃
Capacitance	Average 60nF/km max. @1kHz
Characteristic impedance	110±10Ω

■ Restrictions on use with Q mode

When device memory data in the master PLC are accessed by slave stations by the GET-PUT service, the accessible ranges are limited as indicated below.

Device Type		Range
X		0 - 7FF
Y		0 - 7FF
M/L/S		0 - 8191
B		0 - FFF
T	Contact	0 - 2047
	Coil	0 - 2047
	Current value	0 - 2047
	Set value	0 - 2047
C	Contact	0 - 1023
	Coil	0 - 1023
	Current value	0 - 1023
	Set value	0 - 1023
D		0 - 6143
W		0 - FFF
F		0 - 2047

Performance specifications

Item	Specifications		
	AJ71J92-S3	A1SJ71J92-S3	A1SJ72J95
OPCN-1 -compliant class	TYPE-M52I(master station)		TYPE-S52I(slave station)
Transmission speed	125k/250k/500k/1M bps		
Communication system/encoding system/ electrical characteristic/transmission path format	Half duplex synchronous communication/NRZI system/EIA RS-485/bus format		
Overall distance	Depends on transmission speed. 125kbps:1000m, 250kbps:800m, 500kbps:480m, 1Mbps:240m		
Number of stations connectable	---		Up to 31 slave stations to one master station
Transmission right control	Polling/selecting		
Service type	Initial setting I/O Reset Data write Data read	Broadcasting Message write Message read GET PUT	Initial setting I/O Reset
Number of link points	When assigning points normally in an I/O area. When specified as 2048 points: Input + output ≦ 2048 points When specified as 16384 points: Input + output ≦ 16384 points When assigning points closely in an I/O area. When specified as 2048 points: Input + output ≦ 4096 points When specified as 16384 points: Input + output ≦ 32768 points		Input ≦ 1024 points output ≦ 1024 points Input + output ≦ 2048 points
Number of I/O points occupied	32 points (I/O assignment: special 32 points)		---
Internal current consumption (5VDC)	0.50A	0.40A	0.40A
Weight	0.40kg	0.31kg	0.43kg

Please note that the production of the AJ71J92-S3 is discontinued after September 30, 2006.

2.15 S-LINK

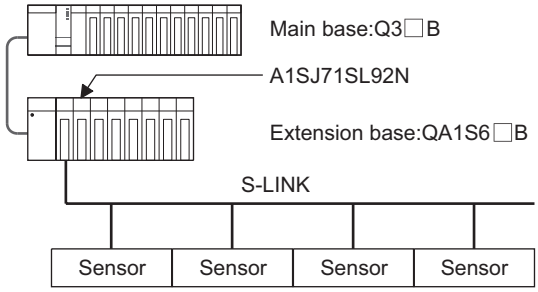
2.15.1 A1SJ71SL92

Overview

The A1SJ71SL92N is a master module connected to SUNX's S-LINK equipment to control it. S-LINK can control 128 points per master module and be used as a wire-saving network.
The A1SJ71SL92N is usable with the High Performance model QCPU only.

Features

■ System configuration



The A1SJ71SL92N can be mounted on QA1S6□B.

■ Connectable remote modules

The S-LINK equipment of SUNX Ltd. can be connected.

■ Restrictions on use with Q mode

None.

Performance specifications

Item		Specifications
Transmission system		Interactive time-sharing multiplex transmission system
Synchronization system		Bit synchronization system, frame synchronization system
Transmission protocol		S-LINK protocol
Transmission speed		28.5kbps
Transmission distance		Signal trunk: Max. overall distance 200m (655.74feet) (400m (1311.48feet)when booster is used)
Connection system		T-branch multidrop connection/ multidrop connection[+24V･0V･D･G (with short protection across D-G)]
Number of branches		10 branches max.
Number of control I/O points		128 points
External power supply for S-LINK system	24VDC ±10% / permissible ripple p-p±10% or less	24VDC ±10% /permissible ripple p-p±10% or less
	Across D-G: 1.60A, across +24-0V: 5.00A	Across D-G: 1.60A, across +24-0V: 5.00A
Number of I/O occupied points		32 points (I/O assignment: intelligent)
Internal current consumption (5VDC)		0.20A
Weight		0.27kg

Chapter 3

MODULE

3.1 I/O Module

3.1.1 Overview of I/O Modules

Overview

The Q series I/O modules are compatible with the high-function, high-performance Q series CPU module (Q mode only) bus. They are also designed for Q series size and are compact and power-saving in consideration of the environment.

Features

■ Ultra compact

A building block type I/O module measures 98mm (3.86 inch) in height by 27.4mm (1.08 inch) in width by 90mm (3.55 inch) in depth.

Note 1: The Q series I/O modules are designed to be used with Q3□SB, Q3□B, Q3□RB, Q5□B, Q6□B or Q6□RB. They cannot be used with QA1S3□B, QA1S6□B or QA65B. They cannot be used in A-mode, either.

■ Multi-functional

(1) The DC input modules have a user variable input response time.
The response time can be selected from among 1, 5, 10, 20 and 70ms: 1ms for fast response or 70ms for high-reliability response (in consideration of noise margin, etc.).
Using the QX40-S1, QX41-S1 or QX42-S1 high-speed input module allows you to select the input response time from among 0.1, 0.2, 0.4, 0.6 and 1ms.

(2) The lineup of the DC transistor output modules have a short-circuit protection function, which prevents transistors from being damaged by a short circuit, etc.

■ Wiring capability improvement

The relay output modules do not require external power supply.

■ Maintainability improvement

(1) The modules can be mounted/removed with a single motion (screwing not needed).
* Screwing may be needed under some operating conditions.

(2) If a CPU error occurs, output hold/clear setting can be done per output module.

(3) The mounted module configuration can be confirmed on the programming software screen making it very useful for maintenance.

■ Online module change

The module below that becomes faulty during control can be changed for the module of the same type without the system being stopped.

Module Type	Restrictions
Input module	No restrictions
Output module	
I/O mixed module	

Note 1: The interrupt module cannot be changed online.

Note 2: For the condition of online module change, refer to CPU system in Chapter 1 and Online module change of MELSECNET/H remote I/O net in Section 2.5.2.

■ Energy-saving

5VDC reduced current consumption for transistor output modules.

Type	Input current
QY81P	Approx. 95mA
A1SY81EP	Approx. 500mA

■ Safety

The 100/200VAC rated modules are enhanced in insulation between the external hazardous voltage and internal circuit.

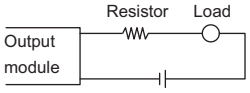
■ Compatibility

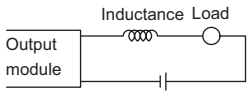
Since the connector shape and pin layout of the 32- and 64-point modules are the same as those of the A/AnS series, the connector terminal block conversion modules of the A/AnS series and the connectors wired for the AnS series I/O modules can be used.

Selecting instructions

(1) If an output module drives an inductive load, it must be switched ON for 1 second or longer and switched OFF for 1 second or longer.

(2) If a counter or timer which has a DC-DC converter as a load is used with an output module, using an average current to choose an output module can cause a fault due to periodic rush currents when it is turned ON or during operation.
To reduce the influence of rush currents for use of the above load, connect a resistor or an inductance to the load in series or use a module whose maximum load current is larger.

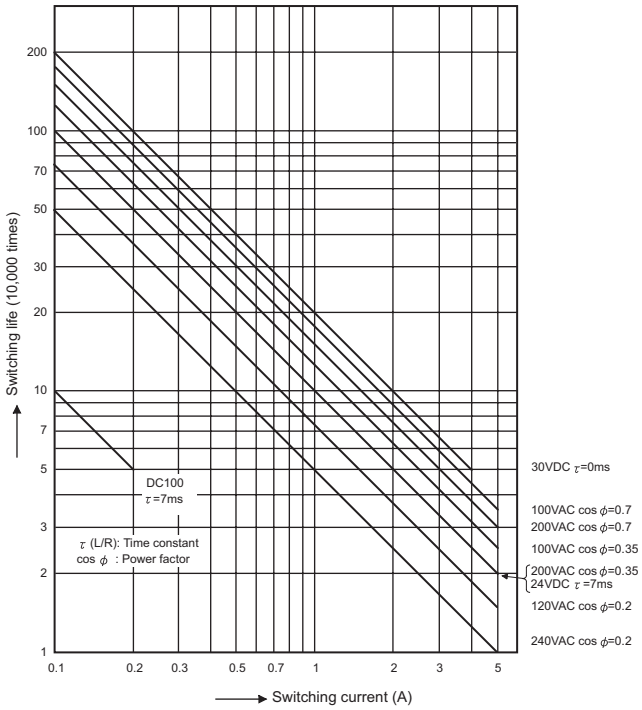




(3) Fuses installed in output modules cannot be replaced. They are designed to protect external wiring if the module outputs are shorted.
Therefore, output modules may not be protected from a short circuit.
If an output module becomes faulty due to any cause other than a short circuit, its fuse may not function.

(4) The number of signals, which can be turned ON simultaneously in an input module, varies according to the input voltage and ambient temperature.
Refer to the corresponding input module specifications.

(5) The following chart shows the service life of a relay output module.
Applicable module: QY10, QY18A



POINT

(1) When using the module for the application in which the relay contact is frequently switched, the relay life span should be considered. Therefore, it is recommended to use a triac output module or transistor output.

(2) The relay life curve shows the value based on actual use, which is not guaranteed. Therefore, make sure to allow for a margin of error.
The relay life span differs according to the specifications as follows:
Rated switching voltage, current load100 thousand operations
200V AC 1.5A, 240V AC 1A (COS ϕ =0.7)100 thousand operations
200V AC 0.4A, 240V AC 0.3A (COS ϕ =0.7)300 thousand operations
200V AC 1A, 240V AC 0.5A (COS ϕ =0.35)100 thousand operations
200V AC 0.3A, 240V AC 0.15A (COS ϕ =0.35)300 thousand operations
24V DC 1A, 100V DC 0.1A (L/R=7ms)100 thousand operations
24V DC 0.3A, 100V DC 0.03A (L/R=7ms)300 thousand operations

(3) Relay life is substantially affected by the load type and inrush current characteristics.
The inrush current may cause the contact welding.
Therefore, consideration should be given to it as well as constant current.
(a) Inductive load
When the inductive load such as electromagnetic contactor or solenoid is shut off, high counter-electromotive force is generated between the contacting materials to produce an arc discharge. Consideration should be made especially when the power factor is low, as it may decrease the life period.
In addition, make sure to consider the contact melting, as the inrush current equivalent to 5 to 15 times of constant current flows when the module is powered on.
(b) Lamp load
Make sure to consider the contact melting, as the inrush current equivalent to 10 to 15 times of constant current flows in the lamp circuit.
(c) Capacitive load
Make sure to consider the contact melting when a device such as condenser is used in a load circuit, as the inrush current equivalent to 20 to 40 times of constant current may flow in the circuit.
Also, pay full attention to the wire capacity if long length of wire is routed.

(6) Insulation-sleeved crimping terminals cannot be used with the terminal block.
It is recommended to cover the wire connections of the crimping terminals with mark or insulation tubes.

(7) Use wires of 0.3 to 0.75mm^2 core and 2.8mm (0.11in.) OD max. to connect to the terminal block.
When using wires of 0.75mm or more core, please consider the use of spring cramp terminal block (Q6TE-18S).

(8) Do not use I/O modules under pressure higher than the atmospheric pressure of 0m (0ft.) altitude. Doing so can cause a malfunction.
When using I/O modules under pressure, please consult your sales representative.

(9) Tighten the module fixing and terminal block screws to the torques in the following ranges.

Screw location	Tightening torque range
Module fixing screw (M3 × 12 screw)	36 to 48 N•cm
I/O module terminal block screw (M3 screw)	42 to 58 N•cm
I/O module terminal block mounting screw (M3 screw)	66 to 89 N•cm

(10) The overload protection function and overheat protection function of the following modules will be explained below.
(a) QY40P, QY41P, QY42P, QH42P

Function	Description
Common (Overload and overheat protection functions)	• If an overcurrent keeps flowing due to overload, heat is generated to activate the overheat protective function. • Each protection function is designed to protect the internal elements of the module, not the external equipment.
Overload protection function	• The overload protection function is activated in 1 point increments in terms of 1A to 3A/point. • The overload protection function returns operation to normal when the load becomes a rated load.
Overheat protection function	• The overheat protection function is activated in 1 point increments. • The overheat protection function automatically returns operation to normal when heat reduces.

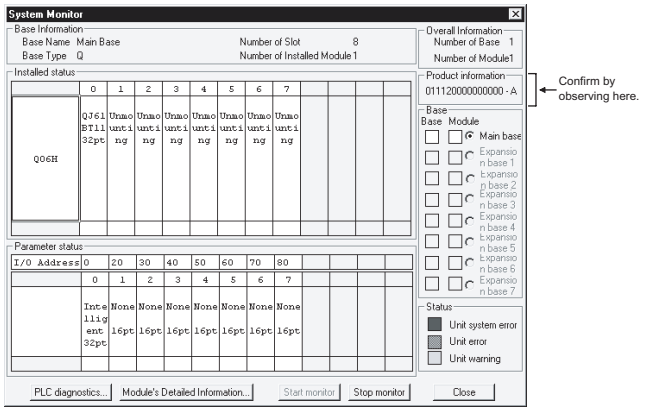
(b) QY81P

Function	Description
Common (Overload and overheat protection functions)	• If an overcurrent keeps flowing due to overload, heat is generated to activate the overheat protection function. • Each protective function is designed to protect the internal elements of the module, not the external equipment.
Overload protective function	• The overload protective function is activated in 1 point increments in terms of 1A to 3A/point. • The overload protective function returns operation to normal when the load becomes a rated load.
Overheat protective function	• The overheat protective function is activated in 2 point increments. (It is activated in 2 point increments of Y0/Y1, Y2/Y3, ..., and when overheat protection is activated, that of 2 points is activated simultaneously. If an overheat condition persists, heat transferred may activate the other overheat protective function.) • If an output turns ON at the activation of the overheat protection function, the actual output voltage oscillates between 0V and load voltage. At the load voltage of 24V, the average voltage during oscillation is approx. 7V. No oscillation is encountered when the output is OFF at the activation of the overheat protection function. To ensure that the output is turned OFF at the activation of the overheat protective function, use an external load which switches OFF at 7V or more. • The overheat protection function automatically returns operation to normal when heat reduces.

(11) Input modules may import noise or the like as an input depending on the pulse width of a signal.
The pulse width differs according to the parameter-set response time, whose value is listed on the table below.
The operating environment should be fully considered when making the response time setting.

Response time setting (ms)	Minimum value of pulse width that may be imported (ms)
1	0.3
5	3
10	6
20	12
70	45

(12) When confirming the product information on the CPU PLC, observe the system monitor in the DIAGNOSIS menu of the GX Developer.



(13) When using the QH42P or QX48Y57, configure it with the following devices.

Part name	Detail
CPU PLC	Product of product information [011120000000000-A] or later
GX Developer	SW5D5C-GPPW or later

The CPU PLCs other than those listed above cannot be used.
When the SW4D5C-GPPW or before is used, the response time cannot be set (fixed at 10ms).
Set “OUTPUT” for the I/O allocation.

(14) Instructions for use of QY22
It is recommended to fit a fuse to each external terminal in order to prevent the external device and module from being burnt if a load short-circuit occurs.
The fuse recommended for fitting is the one conforming to IEC60127 Sheet 1.
The following fuses have been confirmed by Mitsubishi to operate properly.

Fuse Model	216 02.5	216 002
Rated current	2.5A	2A
Manufacturer	Littelfuse, Inc	

(15) Caution points when using QY68A

Installing a fuse to the external terminal is recommended to prevent the external devices and modules from burning out in case of a load short.

A rated voltage 3A fast type fuse is recommended.

Fuses confirmed for operation by this company are listed below.

Fuse Model	216 3.15	312 003
Rated current	3.15A	3A
Manufacturer	Littelfuse, Inc	

(16) Possible constructions for QI60 compatible time settings

When setting response times for QI60, use the constructions listed below.

If using other constructions, response times can not be set. (Fixed at 0.2 ms)

Product name	Contents
PLC CPU	Product information "021120000000000-B" or later
GX Developer	SW6D5C-GPPW or later

(17) Caution when connecting to uninterruptible power supply system (UPS)

For an uninterruptible power supply system (UPS), use a line-interactive method of which power supply distortion is below 5%. Do not use UPS of standby power supply.

Input derating

(Temperature-Dependent Input ON Ratio Restriction)

Some input module models may require their input specifications to be derated. This restriction is provided to prevent a failure due to excessive heat generated in the input section, and is influenced by the ambient temperature, input voltage, number of input ON points, and input ON time.
The derating diagrams are provided for the modules that require derating for the input specifications.

System configuration

<Separately obtained products>
The following manual must be obtained separately.

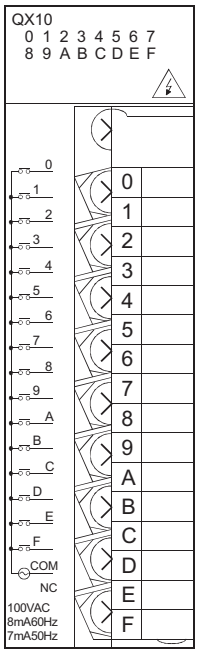
Product	Description
Manual	I/O Module Type Building Block User's Manual

3.1.2 Input Module

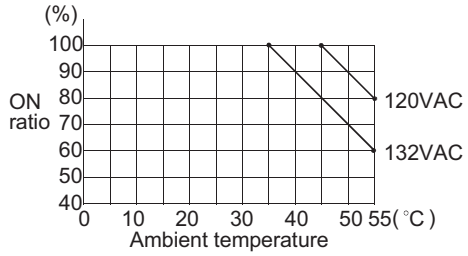
■ QX10 AC input module

Specifications \ Type		AC input module QX10
Number of input points		16 points
Isolation method		Photocoupler
Rated input voltage, frequency		100-120VAC (+10/-15%) 50/60Hz (±3Hz) (distortion factor within 5%)
Rated input current		Approx. 8mA (100VAC, 60Hz), approx. 7mA (100VAC, 50Hz)
Input derating		Refer to the derating chart.
Inrush current		Max. 200mA within 1ms (at 132VAC)
ON voltage/ON current		80VAC or higher/5mA or higher (50Hz, 60Hz)
OFF voltage/OFF current		30VAC or lower/1.7mA or lower (50Hz, 60Hz)
Input impedance		Approx. 12kΩ (60Hz), approx. 15kΩ (50Hz)
Response time	OFF → ON	15ms or less (100VAC 50Hz, 60Hz)
	ON → OFF	20ms or less (100VAC 50Hz, 60Hz)
Dielectric withstand voltage		1780VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP1X
Common terminal arrangement		16 points/common (common terminal: TB17)
Operation indicator		ON indication (LED)
External connections		18-point terminal block (M3×6 screws)
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)
Online module change		Possible
Multiple CPU system		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: Input)
5VDC internal current consumption		0.05A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.17kg

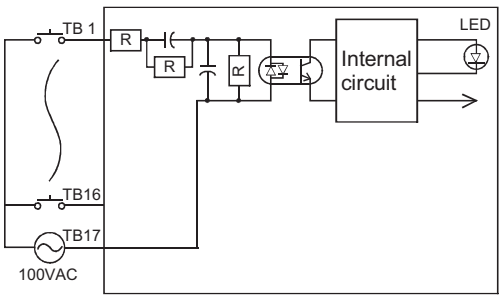
Appearance



Derating chart



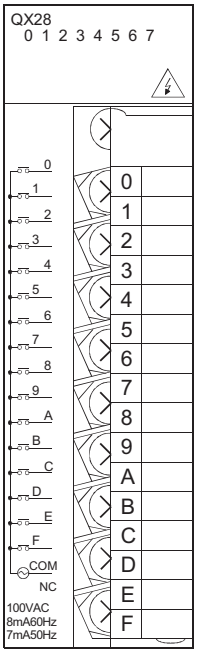
External connections



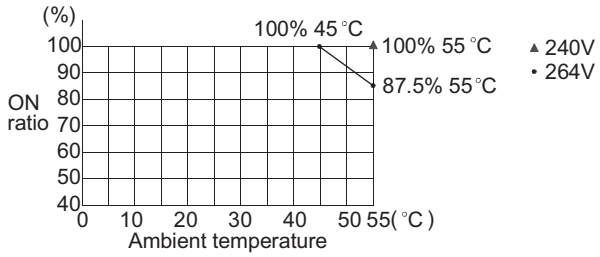
Terminal block number	Signal name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	X08
TB10	X09
TB11	X0A
TB12	X0B
TB13	X0C
TB14	X0D
TB15	X0E
TB16	X0F
TB17	COM
TB18	Vacant

■ QX28 AC input module

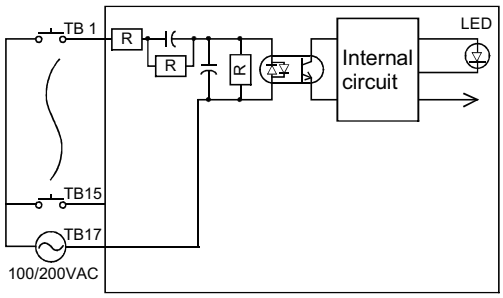
Specifications \ Type		AC input module QX28	Appearance
Number of input points		8 points	
Isolation method		Photocoupler	
Rated input voltage, frequency		100-240VAC (+10/-15%) 50/60Hz (±3Hz) (distortion factor within 5%)	
Rated input current		Approx. 17mA (200VAC, 60Hz), approx. 14mA (200VAC, 50Hz) Approx. 8mA (100VAC, 60Hz), approx. 7mA (100VAC, 50Hz)	
Input derating		Refer to the derating chart.	
Inrush current		Max. 500mA within 1ms (at 264VAC)	
ON voltage/ON current		80VAC or higher/5mA or higher (50Hz, 60Hz)	
OFF voltage/OFF current		30VAC or lower/1.7mA or lower (50Hz, 60Hz)	
Input impedance		Approx. 12kΩ (60Hz), approx. 15kΩ (50Hz)	
Response time	OFF → ON	10ms or less (100VAC 50Hz, 60Hz)	
	ON → OFF	20ms or less (100VAC 50Hz, 60Hz)	
Dielectric withstand voltage		2830VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP1X	
Common terminal arrangement		8 points/common (common terminal: TB17)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3 6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU system		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Input)	
5VDC internal current consumption		0.05A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.20kg	



Derating chart



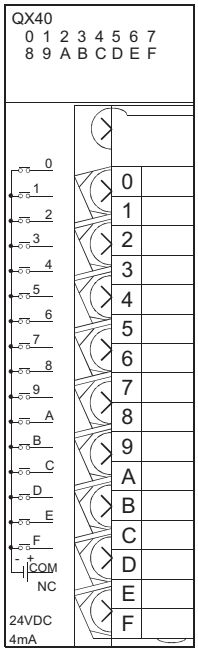
External connections

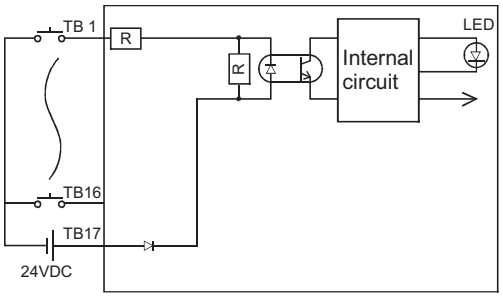


Terminal block number	Signal name
TB1	X00
TB2	Vacant
TB3	X01
TB4	Vacant
TB5	X02
TB6	Vacant
TB7	X03
TB8	Vacant
TB9	X04
TB10	Vacant
TB11	X05
TB12	Vacant
TB13	X06
TB14	Vacant
TB15	X07
TB16	Vacant
TB17	COM
TB18	Vacant

■ QX40 DC input module (Positive common type)

Specifications \ Type		DC input module (Positive common type) QX40	Appearance
Number of input points		16 points	
Isolation method		Photocoupler	
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 4mA	
Input derating		No	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		11V or lower/1.7mA or lower	
Input impedance		Approx. 5.6kΩ	
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting) Initial setting is 10ms.	
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting) Initial setting is 10ms.	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB17)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU system		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Input)	
5VDC internal current consumption		0.05A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.16kg	

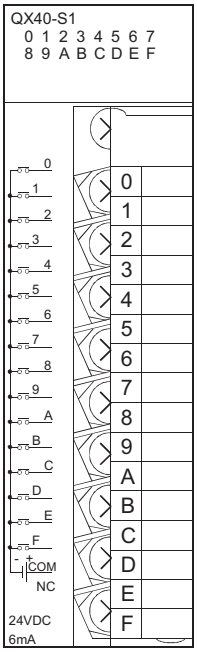


External connections	Terminal block number	Signal name
	TB1	X00
	TB2	X01
	TB3	X02
	TB4	X03
	TB5	X04
	TB6	X05
	TB7	X06
	TB8	X07
	TB9	X08
	TB10	X09
	TB11	X0A
	TB12	X0B
	TB13	X0C
	TB14	X0D
	TB15	X0E
	TB16	X0F
	TB17	COM
	TB18	Vacant

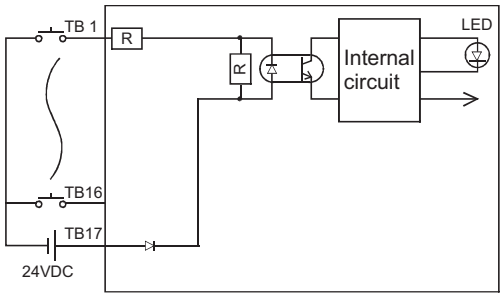
*: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

■ QX40-S1 DC input module (Positive common type)

Specifications \ Type			DC input module (Positive common type) QX40-S1					Appearance
Number of input points			16 points					
Isolation method			Photocoupler					
Rated input voltage			24VDC (+20/-15%, ripple ratio within 5%)					
Rated input current			Approx. 6mA					
Input derating			No					
ON voltage/ON current			19V or higher/4.0mA or higher					
OFF voltage/OFF current			11V or lower/1.7mA or lower					
Input impedance			Approx. 3.9kΩ					
Response time	Set value *		0.1	0.2	0.4	0.6	1	
	OFF → ON	TYP.	0.05ms	0.15ms	0.30ms	0.55ms	1.05ms	
		MAX.	0.10ms	0.20ms	0.40ms	0.60ms	1.20ms	
	ON → OFF	TYP.	0.15ms	0.20ms	0.35ms	0.60ms	1.10ms	
		MAX.	0.20ms	0.30ms	0.50ms	0.70ms	1.30ms	
Dielectric withstand voltage			560VAC rms/3 cycles (altitude 2000m (6557.38ft.))					
Insulation resistance			10MΩ or more by insulation resistance tester					
Noise immunity			By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency First transient noise IEC61000-4-4: 1kV					
Protection degree			IP2X					
Common terminal arrangement			16 points/common (common terminal: TB17)					
Operation indicator			ON indication (LED)					
External connections			18-point terminal block (M3×6 screws)					
Applicable wire size			0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)					
Applicable crimping terminal			R1.25-3 (sleeved crimping terminals cannot be used.)					
Online module change			Possible					
Multiple CPU system			Compatible					
Number of occupied I/O points			16 points/slot (I/O assignment: High-speed input)					
5VDC internal current consumption			0.06A (TYP. all points ON)					
External dimensions			98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)					
Weight			0.20kg					



External connections



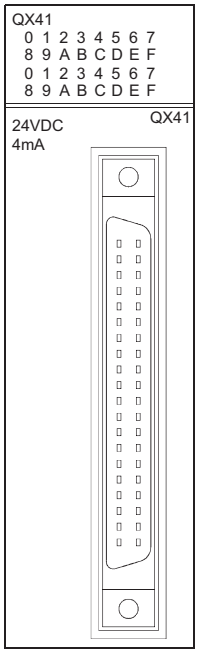
Terminal block number	Signal name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	X08
TB10	X09
TB11	X0A
TB12	X0B
TB13	X0C
TB14	X0D
TB15	X0E
TB16	X0F
TB17	COM
TB18	Vacant

*: CPU parameter setting. (Initial setting is 0.2ms)
Response time can be changed on SW5D5C-GPPW or later.
For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

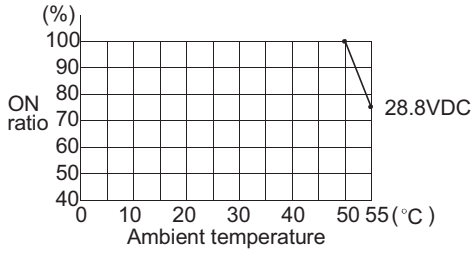
■ QX41 DC input module (Positive common type)

Specifications \ Type		DC input module (Positive common type) QX41
Number of input points		32 points
Isolation method		Photocoupler
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)
Rated input current		Approx. 4mA
Input derating		Refer to the derating chart.
ON voltage/ON current		19V or higher/3mA or higher
OFF voltage/OFF current		11V or lower/1.7mA or lower
Input impedance		Approx. 5.6kΩ
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: B01, B02)
Operation indicator		ON indication (LED)
External connections		40-pin connector
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*2
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4
Applicable connector/terminal block conversion module		A6TBXY36,A6TBXY54,A6TBX70
Online module change		Possible
Multiple CPU system		Compatible
Number of occupied I/O points		32 points/slot (I/O assignment: Input)
5VDC internal current consumption		0.075A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.15kg

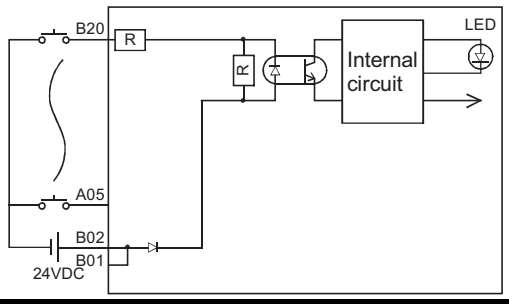
Appearance



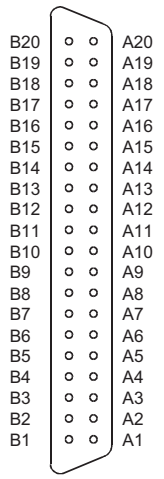
Derating chart



External connections



Pin-outs



Module front view

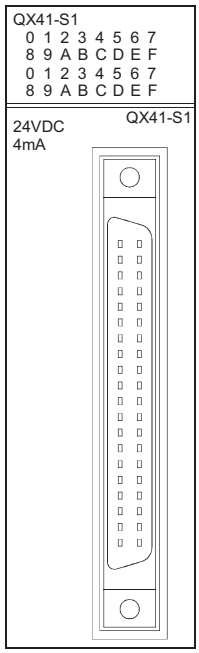
Pin No.	Signal No.	Pin No.	Signal No.
B20	X00	A20	X10
B19	X01	A19	X11
B18	X02	A18	X12
B17	X03	A17	X13
B16	X04	A16	X14
B15	X05	A15	X15
B14	X06	A14	X16
B13	X07	A13	X17
B12	X08	A12	X18
B11	X09	A11	X19
B10	X0A	A10	X1A
B09	X0B	A09	X1B
B08	X0C	A08	X1C
B07	X0D	A07	X1D
B06	X0E	A06	X1E
B05	X0F	A05	X1F
B04	Vacant	A04	Vacant
B03	Vacant	A03	Vacant
B02	COM	A02	Vacant
B01	COM	A01	Vacant

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

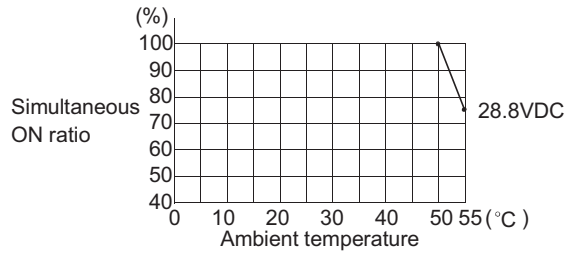
*2: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QX41-S1 DC input module (Positive common type)

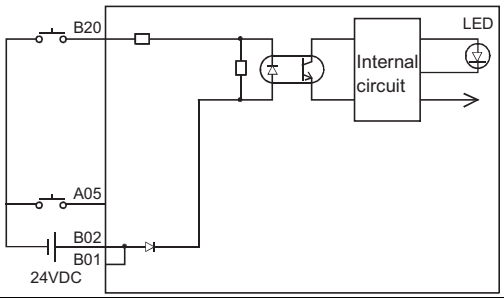
Specifications \ Type			DC input module (Positive common type) QX41-S1					Appearance
Number of input points			32 points					
Isolation method			Photocoupler					
Rated input voltage			24VDC (+20/-15%, ripple ratio within 5%)					
Rated input current			Approx. 4mA					
Input derating			Refer to the derating chart.					
ON voltage/ON current			19V or higher/3mA or higher					
OFF voltage/OFF current			9.5V or lower/1.5mA or lower					
Input impedance			Approx. 5.6kΩ					
Response time	Set value *1		0.1ms	0.2ms	0.4ms	0.6ms	1ms	
	OFF → ON	TYP.	0.05ms	0.15ms	0.30ms	0.55ms	1.05ms	
		MAX.	0.12ms	0.20ms	0.40ms	0.60ms	1.20ms	
	ON → OFF	TYP.	0.15ms	0.20ms	0.35ms	0.60ms	1.10ms	
		MAX.	0.20ms	0.30ms	0.50ms	0.70ms	1.30ms	
Dielectric withstand voltage			560VAC rms/3 cycles (altitude 2000m (6557.38ft.))					
Insulation resistance			10MΩ or more by insulation resistance tester					
Noise immunity			By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency					
			First transient noise IEC61000-4-4: 1kV					
Protection degree			IP2X					
Common terminal arrangement			32 points/common (common terminal: B01, B02)					
Operation indicator			ON indication (LED)					
External connections			40-pin connector					
Applicable wire size			0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*2					
External wiring connector (Sold separately)			A6CON1, A6CON2, A6CON3, A6CON4					
Applicable connector/terminal block conversion module			A6TBXY36, A6TBXY54, A6TBX70					
Online module change			Possible					
Multiple CPU system			Compatible					
Number of occupied I/O points			32 points/slot (I/O assignment: High-speed input)					
5VDC internal current consumption			0.075A (TYP. all points ON)					
External dimensions			98 (3.86)(H)×27.4 (1.08)(W) 90×(3.54)(D) mm(inch)					
Weight			0.15kg					



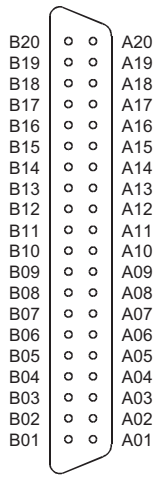
Derating chart



External connections



Pin-outs



Module front view

Pin No.	Signal No.	Pin No.	Signal No.
B20	X00	A20	X10
B19	X01	A19	X11
B18	X02	A18	X12
B17	X03	A17	X13
B16	X04	A16	X14
B15	X05	A15	X15
B14	X06	A14	X16
B13	X07	A13	X17
B12	X08	A12	X18
B11	X09	A11	X19
B10	X0A	A10	X1A
B09	X0B	A09	X1B
B08	X0C	A08	X1C
B07	X0D	A07	X1D
B06	X0E	A06	X1E
B05	X0F	A05	X1F
B04	Vacant	A04	Vacant
B03	Vacant	A03	Vacant
B02	COM	A02	Vacant
B01	COM	A01	Vacant

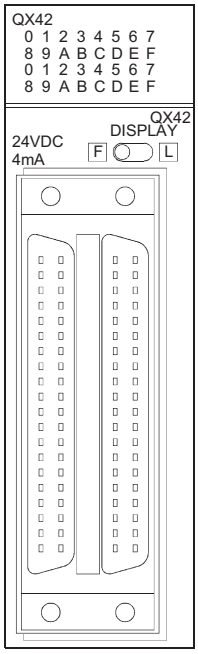
*1: CPU parameter setting. (Initial setting is 0.2ms)
Response time can be changed on SW5D5C-GPPW or later.
For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

*2: When using A6CON2 or A6CON3, refer to Section 3.8.1.

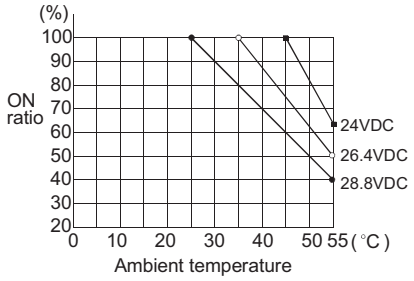
■ QX42 DC input module (Positive common type)

Specifications \ Type		DC input module (Positive common type) QX42
Number of input points		64 points
Isolation method		Photocoupler
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)
Rated input current		Approx. 4mA
Input derating		Refer to the derating chart.
ON voltage/ON current		19V or higher/3mA or higher
OFF voltage/OFF current		11V or lower/1.7mA or lower
Input impedance		Approx. 5.6kΩ
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)
Operation indicator		ON indication (LED), 32 point switch-over using switch
External connections		40-pin connector
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*4
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4
Applicable connector/terminal block conversion module		A6TBXY36,A6TBXY54,A6TBX70
Online module change		Possible
Multiple CPU system		Compatible
Number of occupied I/O points		64 points/slot (I/O assignment: Input)
5VDC internal current consumption		0.09A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.18kg

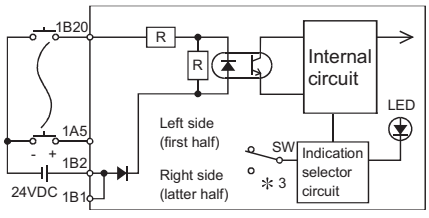
Appearance



Derating chart

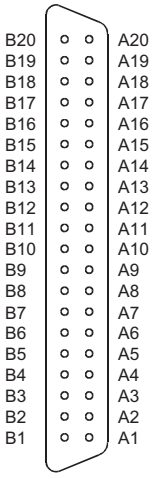


External connections



The above diagram shows the first half of 32 points (F).
The latter half of 32 points (L) are similar.

Pin-outs



Module front view

Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B09	X0B	1A09	X1B	2B09	X2B	2A09	X3B
1B08	X0C	1A08	X1C	2B08	X2C	2A08	X3C
1B07	X0D	1A07	X1D	2B07	X2D	2A07	X3D
1B06	X0E	1A06	X1E	2B06	X2E	2A06	X3E
1B05	X0F	1A05	X1F	2B05	X2F	2A05	X3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	COM1	1A02	Vacant	2B02	COM2	2A02	Vacant
1B01	COM1	1A01	Vacant	2B01	COM2	2A01	Vacant

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

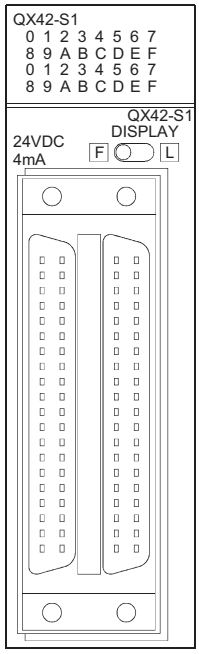
*2: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.

*3: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (X20 to X3F) LED indications.

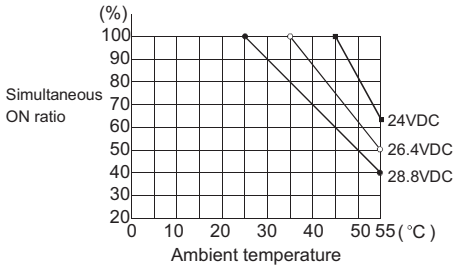
*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QX42-S1 DC input module (Positive common type)

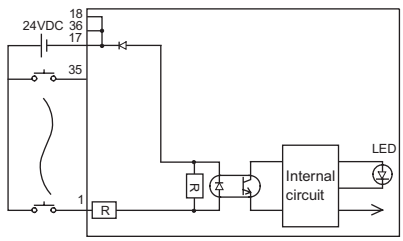
Specifications \ Type			DC input module (Positive common type) QX42-S1					Appearance
Number of input points			64 points					
Isolation method			Photocoupler					
Rated input voltage			24VDC (+20/-15%, ripple ratio within 5%)					
Rated input current			Approx. 4mA					
Input derating			Refer to the derating chart.					
ON voltage/ON current			19V or higher/3mA or higher					
OFF voltage/OFF current			9.5V or lower/1.5mA or lower					
Input impedance			Approx. 5.6kΩ					
Response time	Set value *3		0.1ms	0.2ms	0.4ms	0.6ms	1ms	
	OFF → ON	TYP.	0.05ms	0.15ms	0.30ms	0.55ms	1.05ms	
		MAX.	0.12ms	0.20ms	0.40ms	0.60ms	1.20ms	
	ON → OFF	TYP.	0.15ms	0.20ms	0.35ms	0.60ms	1.10ms	
		MAX.	0.20ms	0.30ms	0.50ms	0.70ms	1.30ms	
Dielectric withstand voltage			560VAC rms/33 cycles (altitude 2000m (6557.38ft.))					
Insulation resistance			10MΩ or more by insulation resistance tester					
Noise immunity			By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency					
			First transient noise IEC61000-4-4: 1kV					
Protection degree			IP2X					
Common terminal arrangement			32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)					
Operation indicator			ON indication (LED), 32 point switch-over using switch					
External connections			40-pin connector					
Applicable wire size			0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*4					
External wiring connector (Sold separately)			A6CON1, A6CON2, A6CON3, A6CON4					
Applicable connector/terminal block conversion module			A6TBXY36, A6TBXY54, A6TBX70					
Online module change			Possible					
Multiple CPU system			Compatible					
Number of occupied I/O points			64 points/slot (I/O assignment: High-speed input)					
5VDC internal current consumption			0.09A (TYP. all points ON)					
External dimensions			98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)					
Weight			0.18kg					



Derating chart

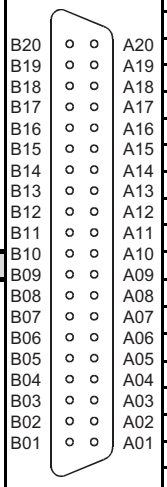


External connections



The above diagram shows the first half of 32 points (F).
The latter half of 32 points (L) are similar.

Pin-outs



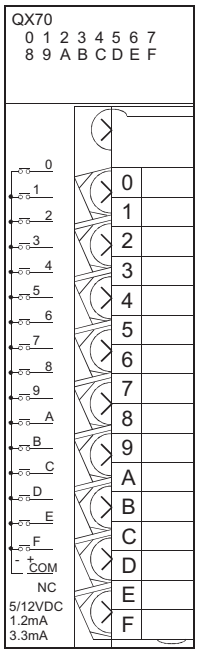
Module front view

Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B09	X0B	1A09	X1B	2B09	X2B	2A09	X3B
1B08	X0C	1A08	X1C	2B08	X2C	2A08	X3C
1B07	X0D	1A07	X1D	2B07	X2D	2A07	X3D
1B06	X0E	1A06	X1E	2B06	X2E	2A06	X3E
1B05	X0F	1A05	X1F	2B05	X2F	2A05	X3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	COM1	1A02	Vacant	2B02	COM2	2A02	Vacant
1B01	COM1	1A01	Vacant	2B01	COM2	2A01	Vacant

*1: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.
*2: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (X20 to X3F) LED indications.
*3: CPU parameter setting. (Initial setting is 0.2ms)
Response time can be changed on SW5D5C-GPPW or later.
For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.
*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

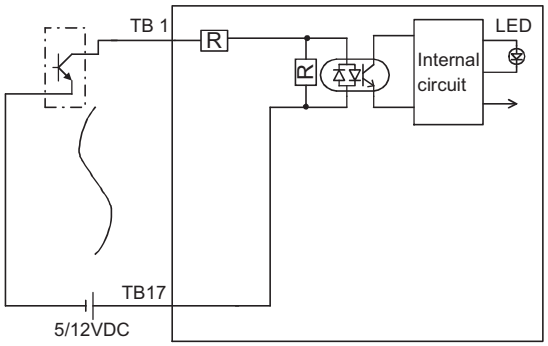
■ QX70 DC input module (Positive common/Negative common shared type)

Specifications \ Type		DC input module (Positive common/Negative common shared type) QX70		Appearance
Number of input points		16 points		
Insulation method		Photocoupler		
Rated input voltage		5VDC (+20/-15%, ripple ratio within 5%)	12VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 1.2mA	Approx. 3.3mA	
Input derating		No		
ON voltage/ON current		3.5V or higher/1mA or higher		
OFF voltage/OFF current		1V or lower/0.1mA or lower		
Input resistance		Approx. 3.3kΩ		
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)* Initial setting is 10ms.		
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)* Initial setting is 10ms.		
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38 ff.))		
Insulation resistance		10MΩ or more by insulation resistance tester		
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency		
		First transient noise IEC61000-4-4: 0.25kV		
Protection degree		IP2X		
Common terminal arrangement		16 points/common (common terminal: TB17)		
Operation indicator		ON indication (LED)		
External connections		18-point terminal block (M3×6 screw)		
Applicable wire size		Core cable: 0.3 to 0.75mm^2 (Outside diameter: 2.8mm or smaller)		
Applicable crimping terminal		R1.25-3 (Terminals with sleeve cannot be used)		
Online module change		Possible		
Multiple CPU system		Compatible		
Number of occupied I/O points		16 points/slot (I/O assignment: High-speed input)		
5VDC internal current consumption		0.055A (TYP. all points ON)		
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)		
Weight		0.14kg		

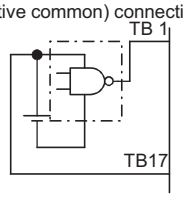


External connections

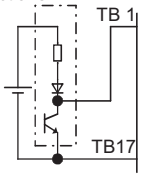
For open collector (positive common) connection



For TTL, LS-TTL, CMOS buffer (positive common) connections



For sensor (negative common) connections

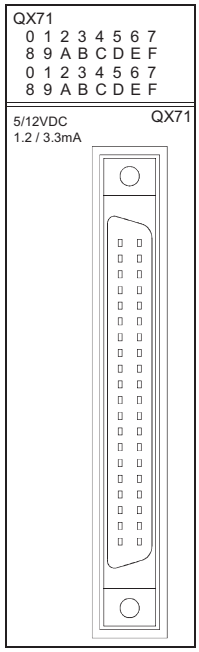


Terminal block No.	Signal name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	X08
TB10	X09
TB11	X0A
TB12	X0B
TB13	X0C
TB14	X0D
TB15	X0E
TB16	X0F
TB17	COM
TB18	Vacant

*: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

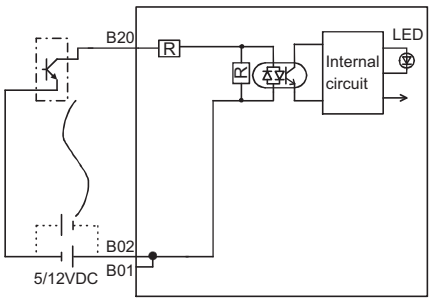
■ QX71 DC input module (Positive common/Negative common shared type)

Specifications \ Type		DC input module (Positive common/Negative common shared type) QX71		Appearance
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		5VDC (+20/-15%, ripple ratio within 5%)	12VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 1.2mA	Approx. 3.3mA	
Input derating		No		
ON voltage/ON current		3.5V or higher/1mA or higher		
OFF voltage/OFF current		1V or lower/0.1mA or lower		
Input resistance		Approx. 3.3kΩ		
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.		
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.		
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (65573.38 ff.))		
Insulation resistance		10MΩ or more by insulation resistance tester		
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency		
		First transient noise IEC61000-4-4: 0.25kV		
Protection degree		IP2X		
Common terminal arrangement		32 points/common (common terminal: B01, B02)		
Operation indicator		ON indication (LED)		
External connections		40-pin connector		
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4) *2		
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4		
Online module change		Possible		
Multiple CPU system		Compatible		
Number of occupied I/O points		32 points/slot (I/O assignment: Input)		
5VDC internal current consumption		0.07A (TYP. all points ON)		
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)		
Weight		0.12kg		

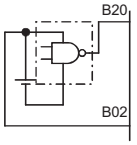


External connections

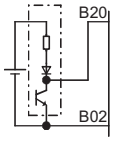
For open collector (positive common) connection



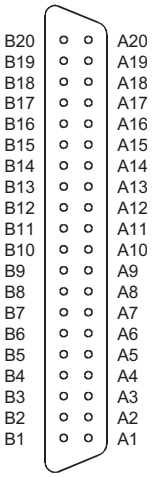
For TTL, LS-TTL, CMOS buffer (positive common) connections



For sensor (negative common) connections



Pin-outs



Module front view

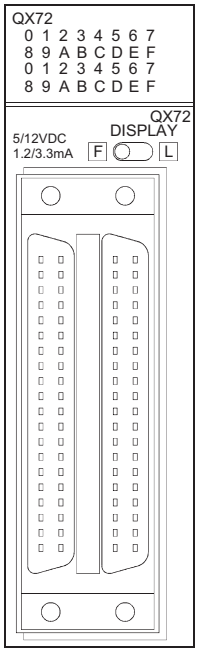
Pin No.	Signal No.	Pin No.	Signal No.
B20	X00	A20	X10
B19	X01	A19	X11
B18	X02	A18	X12
B17	X03	A17	X13
B16	X04	A16	X14
B15	X05	A15	X15
B14	X06	A14	X16
B13	X07	A13	X17
B12	X08	A12	X18
B11	X09	A11	X19
B10	X0A	A10	X1A
B09	X0B	A09	X1B
B08	X0C	A08	X1C
B07	X0D	A07	X1D
B06	X0E	A06	X1E
B05	X0F	A05	X1F
B04	Vacant	A04	Vacant
B03	Vacant	A03	Vacant
B02	COM	A02	Vacant
B01	COM	A01	Vacant

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

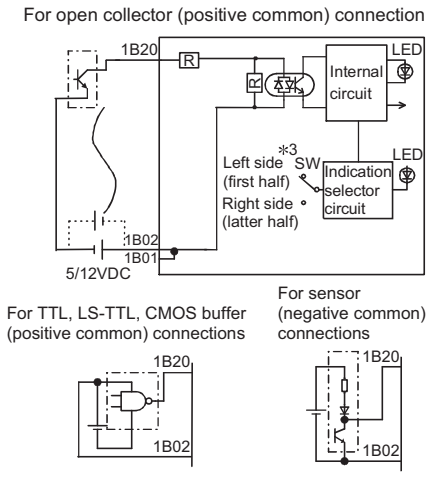
*2: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QX72 DC input module (Positive common/Negative common shared type)

Specifications \ Type		DC input module (Positive common/Negative common shared type) QX72		Appearance
Number of input points		64 points		
Insulation method		Photocoupler		
Rated input voltage		5VDC (+20/-15%, ripple ratio within 5%)	12VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 1.2mA	Approx. 3.3mA	
Input derating		No		
ON voltage/ON current		3.5V or higher/1mA or higher		
OFF voltage/OFF current		1V or lower/0.1mA or lower		
Input resistance		Approx. 3.3kΩ		
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.		
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.		
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38 ff.))		
Insulation resistance		10MΩ or more by insulation resistance tester		
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency		
		First transient noise IEC61000-4-4: 0.25kV		
Protection degree		IP2X		
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)		
Operation indicator		ON indication (LED), 32point switch-over using switch		
External connections		40-pin connector		
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*4		
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4		
Online module change		Possible		
Multiple CPU system		Compatible		
Number of occupied I/O points		64 points/slot (I/O assignment: Input)		
5VDC internal current consumption		0.085A (TYP. all points ON)		
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)		
Weight		0.13kg		

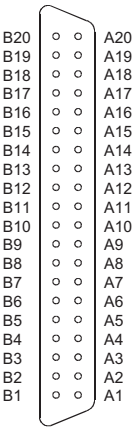


External connections



The above diagram shows the first half of 32 points (F).
The latter half of 32 points (L) are similar.

Pin-outs



Module front view

Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B09	X0B	1A09	X1B	2B09	X2B	2A09	X3B
1B08	X0C	1A08	X1C	2B08	X2C	2A08	X3C
1B07	X0D	1A07	X1D	2B07	X2D	2A07	X3D
1B06	X0E	1A06	X1E	2B06	X2E	2A06	X3E
1B05	X0F	1A05	X1F	2B05	X2F	2A05	X3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	COM1	1A02	Vacant	2B02	COM2	2A02	Vacant
1B01	COM1	1A01	Vacant	2B01	COM2	2A01	Vacant

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

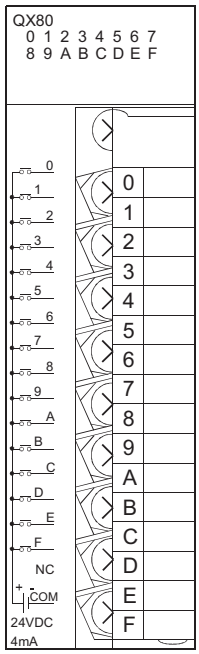
*2: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.

*3: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (X20 to X3F) LED indications.

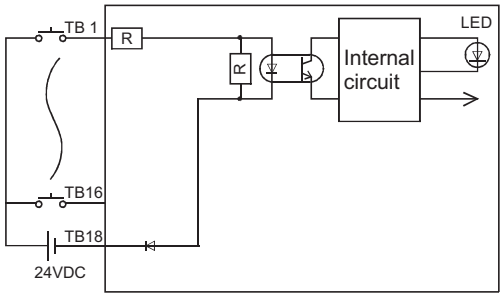
*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QX80 DC input module (Negative common type)

Specifications \ Type		DC input module (Negative common type) QX80	Appearance
Number of input points		16 points	
Isolation method		Photocoupler	
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 4mA	
Input derating		No	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		11V or lower/1.7mA or lower	
Input impedance		Approx. 5.6kΩ	
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)* Initial setting is 10ms.	
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)* Initial setting is 10ms.	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB18)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU system		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Input)	
5VDC internal current consumption		0.05A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.16kg	



External connections



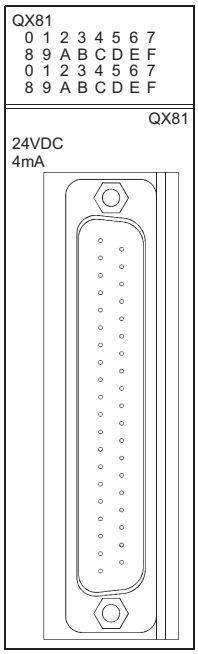
Terminal block number	Signal name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	X08
TB10	X09
TB11	X0A
TB12	X0B
TB13	X0C
TB14	X0D
TB15	X0E
TB16	X0F
TB17	Vacant
TB18	COM

*: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

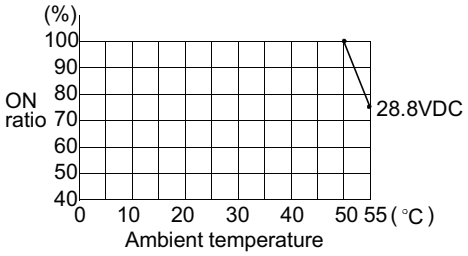
■ QX81 DC input module (Negative common type)

Specifications \ Type		DC input module (Negative common type) QX81
Number of input points		32 points
Isolation method		Photocoupler
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)
Rated input current		Approx. 4mA
Input derating		Refer to the derating chart.
ON voltage/ON current		19V or higher/3mA or higher
OFF voltage/OFF current		11V or lower/1.7mA or lower
Input impedance		Approx. 5.6kΩ
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting) *1 Initial setting is 10ms.
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting) *1 Initial setting is 10ms.
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: 17, 18, 36)
Operation indicator		ON indication (LED)
External connections		37-pin D-sub connector
Applicable wire size		0.3mm^2 (For A6CON1E)*2
External wiring connector (Sold separately)		A6CON1E, A6CON2E, A6CON3E
Applicable connector/terminal block conversion module		A6TBX36-E,A6TBX54-E,A6TBX70-E
Online module change		Possible
Multiple CPU system		Compatible
Number of occupied I/O points		32 points/slot (I/O assignment: Input)
5VDC internal current consumption		0.075A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.16kg

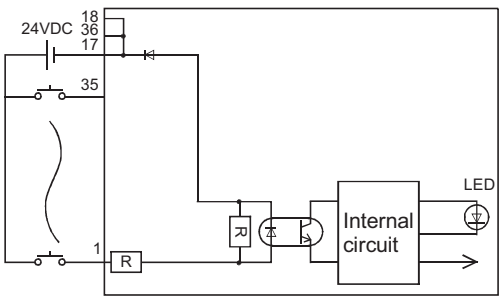
Appearance



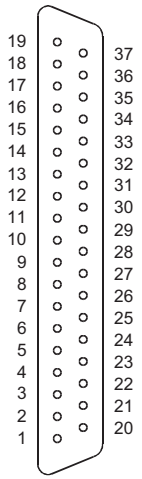
Derating chart



External connections



Pin-outs



Module front view

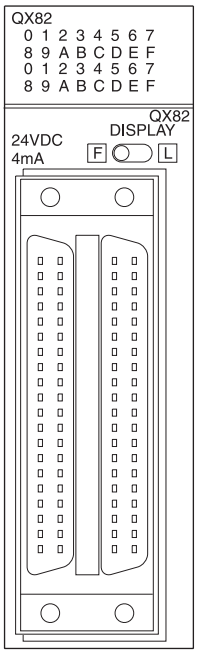
Pin No.	Signal No.	Pin No.	Signal No.
1	X00	9	X10
20	X01	28	X11
2	X02	10	X12
21	X03	29	X13
3	X04	11	X14
22	X05	30	X15
4	X06	12	X16
23	X07	31	X17
5	X08	13	X18
24	X09	32	X19
6	X0A	14	X1A
25	X0B	33	X1B
7	X0C	15	X1C
26	X0D	34	X1D
8	X0E	16	X1E
27	X0F	35	X1F
17	COM	37	Vacant
36	COM	19	Vacant
18	COM		

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

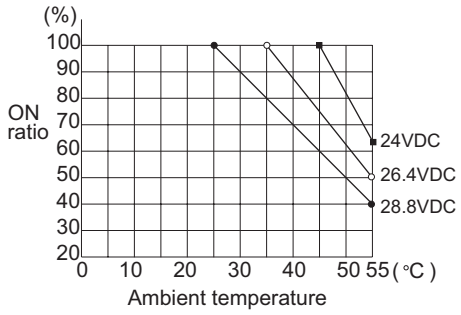
*2: When using A6CON2E or A6CON3E, refer to Section 3.8.1.

■ QX82 DC input module (Negative common type)

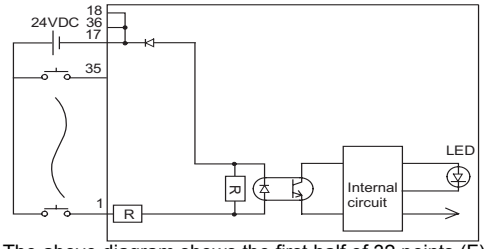
Specifications \ Type		DC input module (Negative common type) QX82	Appearance
Number of input points		64 points	
Isolation method		Photocoupler	
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 4mA	
Input derating		Refer to the derating chart.	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		11V or lower/1.7mA or lower	
Input impedance		Approx. 5.6kΩ	
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.	
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms.	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1 s noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)	
Operation indicator		ON indication (LED), 32 point switch-over using switch	
External connections		40-pin connector	
Applicable wire size		0.3mm^2 (For A6CON1 or A6CON4) 4	
External wiring connector (optional)		A6CON1, A6CON2, A6CON3, A6CON4	
Applicable connector/terminal block conversion module		----	
Online module convert		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		64 points/slot (I/O allocation input)	
5VDC internal current consumption		90mA (TYP. all points ON)	
External dimensions		98(H)×27.4(W)×90(D)mm	
Weight		0.18kg	



Derating chart

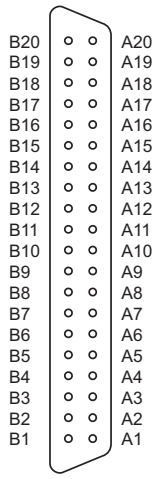


Signal No.



The above diagram shows the first half of 32 points (F).
The latter half of 32 points (L) are similar.

Pin-outs



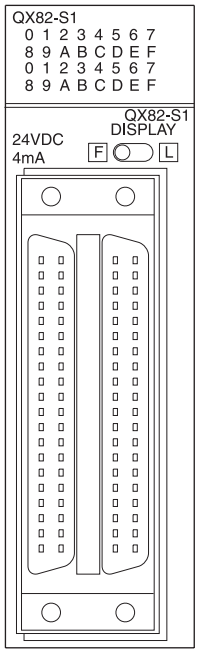
Module front view

Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B09	X0B	1A09	X1B	2B09	X2B	2A09	X3B
1B08	X0C	1A08	X1C	2B08	X2C	2A08	X3C
1B07	X0D	1A07	X1D	2B07	X2D	2A07	X3D
1B06	X0E	1A06	X1E	2B06	X2E	2A06	X3E
1B05	X0F	1A05	X1F	2B05	X2F	2A05	X3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	COM1	1A02	Vacant	2B02	COM2	2A02	Vacant
1B01	COM1	1A01	Vacant	2B01	COM2	2A01	Vacant

*1: For the setting method, refer to the I/O Module Type Building Block Use's Manual.
*2: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.
*3: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (X20 to X3F) LED indications.
*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QX82-S1 DC input module (Negative common type)

Specifications \ Type			DC input module (Negative common type) QX82-S1					Appearance
Number of input points			64 points					
Isolation method			Photocoupler					
Rated input voltage			24VDC (+20/-15%, ripple ratio within 5%)					
Rated input current			Approx.4mA					
Input derating			Refer to the derating chart.					
ON voltage/ON current			19V or higher/3.0mA or higher					
OFF voltage/OFF current			9.5V or lower/1.5mA or lower					
Input impedance			Approx. 5.6kΩ					
Response time	Set value*1		0.1	0.2	0.4	0.6	1	
	OFF → ON	TYP.	0.05ms	0.15ms	0.30ms	0.55ms	1.05ms	
		MAX.	0.12ms	0.20ms	0.40ms	0.60ms	1.20ms	
	ON → OFF	TYP.	0.15ms	0.20ms	0.35ms	0.60ms	1.10ms	
		MAX.	0.20ms	0.30ms	0.50ms	0.70ms	1.30ms	
Dielectric withstand voltage			560VAC rms/3 cycles (altitude 2000m (6557.38ft.))					
Insulation resistance			10MΩ or more by insulation resistance tester					
Noise immunity			By noise simulator of 500Vp-p noise voltage, 1 s noise width and 25 to 60Hz noise frequency					
			First transient noise IEC61000-4-4: 1kV					
Protection degree			IP2X					
Common terminal arrangement			32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)					
Operation indicator			ON indication (LED), 32 points switch-over using switch					
External connections			40-pin connector					
Applicable wire size			0.3mm^2 (For A6CON1 or A6CON4) *4					
External wiring connector (optional)			A6CON1, A6CON2, A6CON3, A6CON4					
Applicable connector/terminal block conversion module			----					
Online module convert			Possible					
Multiple CPU System			Compatible					
Number of occupied I/O points			64 points/slot (I/O allocation HS. input module)					
5VDC internal current consumption			90mA (TYP. all points ON)					
External dimensions			98(H)×27.4(W)×90(D)mm					
Weight			0.18kg					



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*1: CPU parameter setting. (Initial setting is 0.2ms)
Response time can be changed on SW5D5C-GPPW or later.
For the setting method, refer to the I/O Module Type Building Block User's Manual.

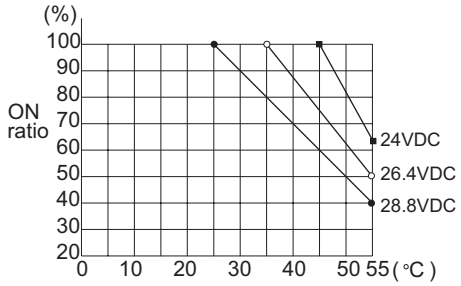
*2: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.

*3: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (X20 to X3F) LED indications.

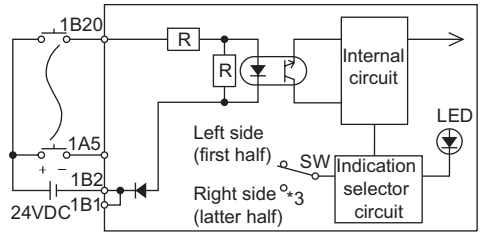
*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

(Continued)

Derating chart

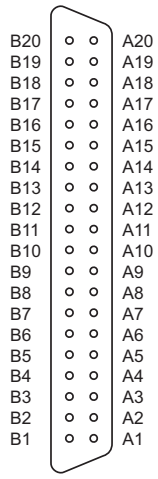


External connections



The above diagram shows the first half of 32 points (F).
The latter half of 32 points (L) are similar.

Pin-outs



Module front view

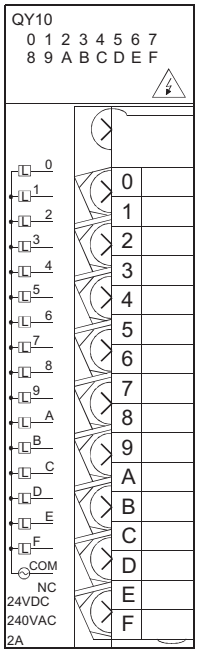
Pin No	Signal No.	Pin No	Signal No.	Pin No	Signal No.	Pin No	Signal No.
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B09	X0B	1A09	X1B	2B09	X2B	2A09	X3B
1B08	X0C	1A08	X1C	2B08	X2C	2A08	X3C
1B07	X0D	1A07	X1D	2B07	X2D	2A07	X3D
1B06	X0E	1A06	X1E	2B06	X2E	2A06	X3E
1B05	X0F	1A05	X1F	2B05	X2F	2A05	X3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	COM1	1A02	Vacant	2B02	COM2	2A02	Vacant
1B01	COM1	1A01	Vacant	2B01	COM2	2A01	Vacant

3.1.3 Output module

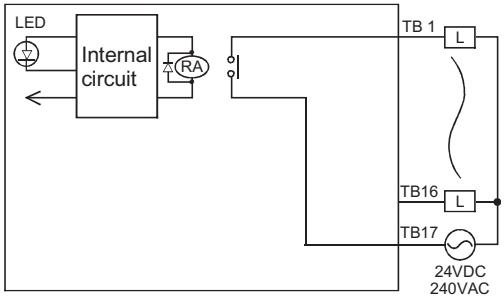
■ QY10 Contact Output Module

Specifications \ Type		Contact output module QY10
Number of output points		16 points
Isolation method		Relay
Rated switching voltage, current		24VDC 2A (resistive load) 240VAC 2A (cosϕ=1)/point, 8A/common
Minimum switching load		5VDC 1mA
Maximum switching load		264VAC 125VDC
Response time	OFF → ON	10ms or less
	ON → OFF	12ms or less
Life	Mechanical	20 million times or more
	Electrical	Rated switching voltage/current load More than 100 thousand times or more
		200VAC 1.5A, 240VAC 1A (COSϕ=0.7) 100 thousand times or more 200VAC 0.4A, 240VAC 0.3A (COSϕ=0.7) 300 thousand times or more
		200VAC 1A, 240VAC 0.5A (COSϕ=0.35) 100 thousand times or more 200VAC 0.3A, 240VAC 0.15A (COSϕ=0.35) 300 thousand times or more
		24VDC 1A, 100VDC 0.1A (L/R=7ms) 100 thousand times or more 24VDC 0.3A, 100VDC 0.03A (L/R=7ms) 300 thousand times or more
Maximum switching frequency		3600 times/hour
Surge suppressor		No
Fuse		No
Dielectric withstand voltage		2830VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP1X
Common terminal arrangement		16 points/common (common terminal: TB17)
Operation indicator		ON indication (LED)
External connections		18-point terminal block (M3×6 screws)
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.43A(TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.22kg

Appearance



External connections

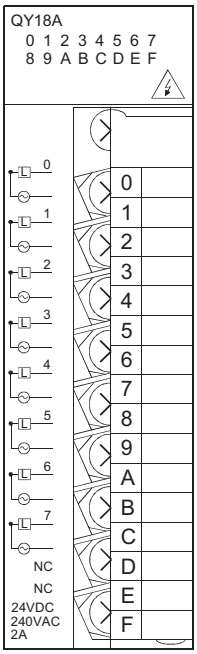


Terminal block number	Signal name
TB1	Y00
TB2	Y01
TB3	Y02
TB4	Y03
TB5	Y04
TB6	Y05
TB7	Y06
TB8	Y07
TB9	Y08
TB10	Y09
TB11	Y0A
TB12	Y0B
TB13	Y0C
TB14	Y0D
TB15	Y0E
TB16	Y0F
TB17	COM
TB18	Vacant

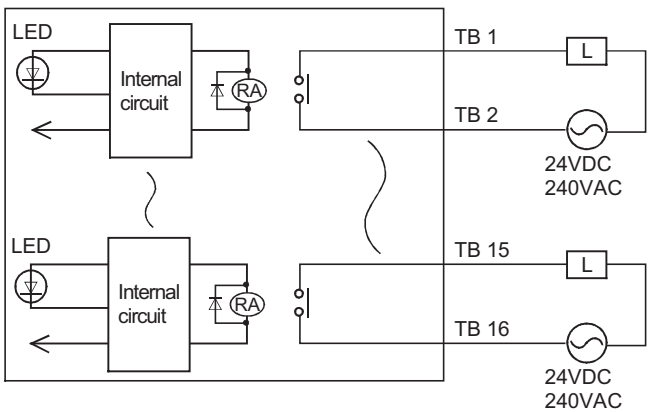
■ QY18A Contact Output Module (All Independent)

Specifications \ Type		Contact output module (All points independent) QY18A
Number of output points		8 points
Isolation method		Relay
Rated switching voltage/current		24VDC 2A (resistive load) 240VAC 2A (cos ϕ =1) point
Minimum switching load		5VDC 1mA
Maximum switching load		264VAC 125VDC
Response time	OFF → ON	10ms or less
	ON → OFF	12ms or less
Life	Mechanical	20 million cycles or more
	Electrical	Rated switching voltage/current load 100 thousand cycles or more
		200VAC 1.5A, 240VAC 1A (COS ϕ =0.7) 100 thousand cycles or more
		200VAC 0.4A, 240VAC 0.3A (COS ϕ =0.7) 300 thousand cycles or more
		200VAC 1A, 240VAC 0.5A (COS ϕ =0.35) 100 thousand cycles or more
		200VAC 0.3A, 240VAC 0.15A (COS ϕ =0.35) 300 thousand cycles or more
		24VDC 1A, 100VDC 0.1A (L/R=7ms) 100 thousand cycles or more 24VDC 0.3A, 100VDC 0.03A (L/R=7ms) 300 thousand cycles or more
Maximum switching frequency		3600 cycles/hour
Surge suppressor		No
Fuse		No
Dielectric withstand voltage		2830VAC rms/3 cycles (altitude 2000m (6557.38ft))
Insulation resistance		10M Ω or more by insulation resistance tester
Noise immunity		By noise simulator of 1500Vp-p noise voltage, 1 μ s noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP1X
Common terminal arrangement		All points Independent
Operation indicator		ON indication (LED)
External connections		18-point terminal block (M3×6 screws)
Applicable wire size		Core cable: 0.3 to 0.75mm^2 (Outside diameter 2.8mm or smaller)
Applicable crimping terminal		R1.25-3 (Sleeved climping terminals cannot be used)
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.24A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.22kg

Appearance



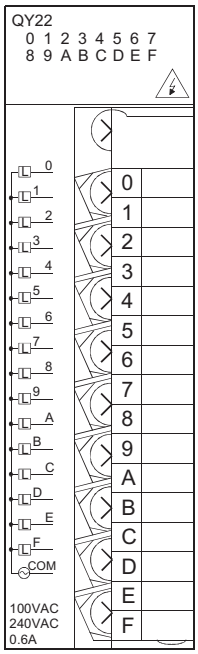
External connections



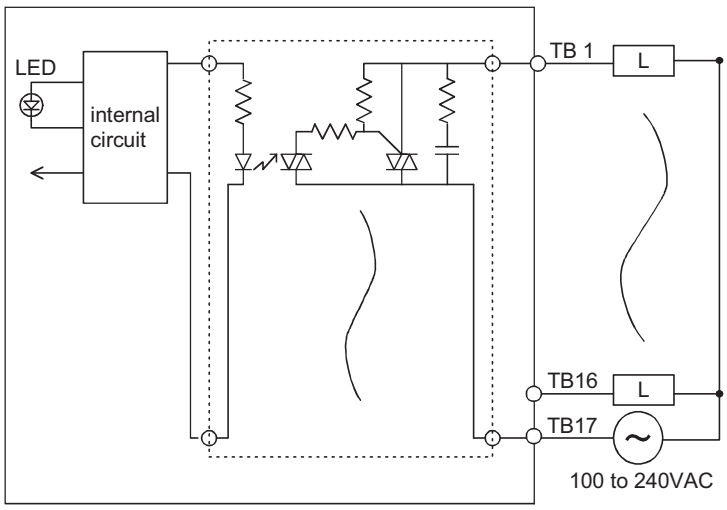
Terminal block No.	Signal name
TB1	Y00
TB2	
TB3	Y01
TB4	
TB5	Y02
TB6	
TB7	Y03
TB8	
TB9	Y04
TB10	
TB11	Y05
TB12	
TB13	Y06
TB14	
TB15	Y07
TB16	
TB17	Vacant
TB18	Vacant

■ QY22 TRIAC Output Module

Specifications \ Type		TRIAC output module QY22	Appearance
Number of output points		16 points	
Isolation method		Photocoupler	
Rated load voltage		100-240VDC (+10/-15%)	
Maximum load current		0.6A/point, 4.8A/common	
Minimum load voltage/current		24VAC 100mA, 100VAC 25mA, 240VAC 25mA	
Maximum inrush current		20A/cycle or less	
Leakage current at OFF		3mA or lower (for 240V, 60Hz), 1.5mA or lower (for 120V, 60Hz)	
Maximum voltage drop at ON		1.5V or lower	
Response time	OFF → ON	1ms or less	
	ON → OFF	1ms + 0.5cycle or less (rated load, resistance load)	
Surge suppressor		CR absorber	
Fuse		Non (Attaching a fuse to external wiring is recommended)	
Dielectric withstand voltage		2830VAC rms/3 cycles (altitude 2000m (6557.38 ft))	
Insulation resistance		10MΩ or higher by insulation resistance meter	
Noise immunity		By noise simulator of 1.5kVp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP1X	
Common terminal arrangement		16 points/common (common terminal: TB17)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		Core cable: 0.3 to 0.75mm^2 (Outside diameter: 2.8mm or smaller)	
Applicable crimping terminal		R1.25-3 (Terminals with sleeve cannot be used)	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Output)	
5VDC internal current consumption		0.25A (Max. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×112.3 (4.42)(D) mm(inch)	
Weight		0.40kg	



External connections

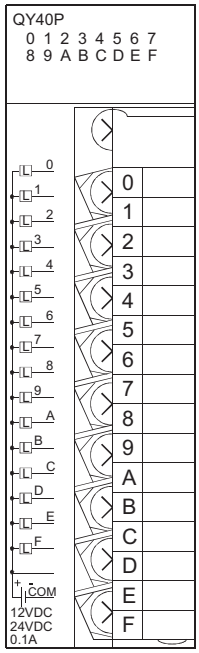


Terminal block number	Signal name
TB1	Y00
TB2	Y01
TB3	Y02
TB4	Y03
TB5	Y04
TB6	Y05
TB7	Y06
TB8	Y07
TB9	Y08
TB10	Y09
TB11	Y0A
TB12	Y0B
TB13	Y0C
TB14	Y0D
TB15	Y0E
TB16	Y0F
TB17	COM
TB18	Vacant

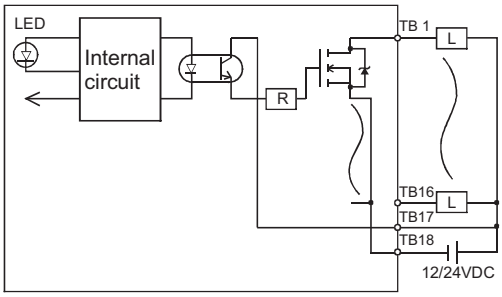
*1: Wire the module with care so that the wiring does not interfere with the left-side module.

■ QY40P Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY40P	Appearance
Number of output points		16 points	
Isolation method		Photocoupler	
Rated load voltage		12-24VDC (+20/-15%)	
Maximum load current		0.1A/point, 1.6A/common	
Maximum inrush current		0.7A, 10ms or less	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF → ON	1ms or less	
	ON → OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		No	
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)	
	Current	0.01A (at 24VDC) (Max. all points ON)	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB18)	
Protection function		Yes (overload protection, overheat protection) •Overheat protection is activated in increments of 1 point. •Overload protection is activated in increments of 1 point.	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Output)	
5VDC internal current consumption		0.065A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.16kg	



External connections

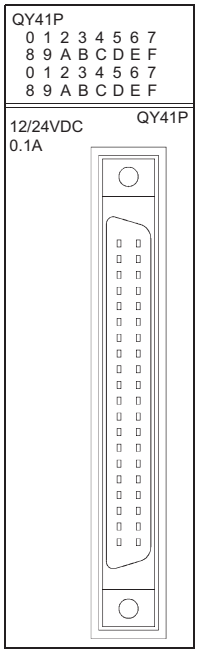


Terminal block number	Signal name
TB1	Y00
TB2	Y01
TB3	Y02
TB4	Y03
TB5	Y04
TB6	Y05
TB7	Y06
TB8	Y07
TB9	Y08
TB10	Y09
TB11	Y0A
TB12	Y0B
TB13	Y0C
TB14	Y0D
TB15	Y0E
TB16	Y0F
TB17	12/24VDC
TB18	COM

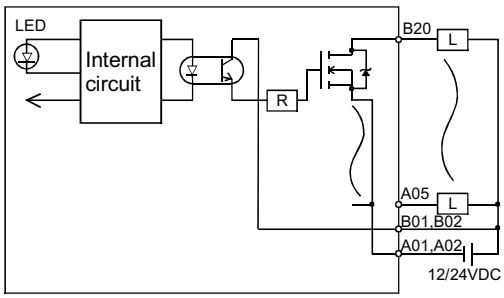
■ QY41P Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY41P
Number of output points		32 points
Isolation method		Photocoupler
Rated load voltage		12-24VDC (+20/-15%)
Maximum load current		0.1A/point, 2A/common
Maximum inrush current		0.7A, 10ms or less
Leakage current at OFF		0.1mA or less
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A
Response time	OFF → ON	1ms or less
	ON → OFF	1ms or less (rated load, resistive load)
Surge suppressor		Zener diode
Fuse		No
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)
	Current	0.02A (at 24VDC)
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: A01, A02)
Protection function		Yes (overload protection, overheat protection) •Overload protection is activated in increments of 1 point. •Overheat protection is activated in increments of 1 point.
Operation indicator		ON indication (LED)
External connections		40-pin connector
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4
Applicable connector/terminal block conversion module		A6TBXY36,A6TBXY54
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		32 points (I/O assignment: Output)
5VDC internal current consumption		0.105A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.15kg

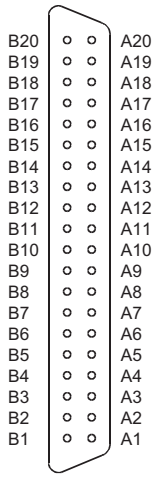
Appearance



External connections



Pin-outs



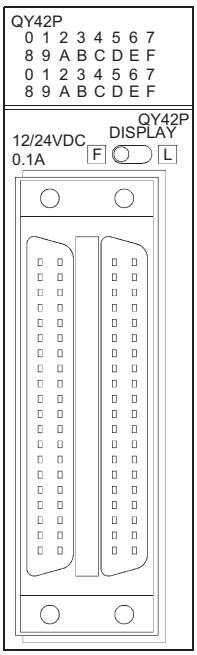
Module front view

Pin No.	Signal No.	Pin No.	Signal No.
B20	Y00	A20	Y10
B19	Y01	A19	Y11
B18	Y02	A18	Y12
B17	Y03	A17	Y13
B16	Y04	A16	Y14
B15	Y05	A15	Y15
B14	Y06	A14	Y16
B13	Y07	A13	Y17
B12	Y08	A12	Y18
B11	Y09	A11	Y19
B10	Y0A	A10	Y1A
B09	Y0B	A09	Y1B
B08	Y0C	A08	Y1C
B07	Y0D	A07	Y1D
B06	Y0E	A06	Y1E
B05	Y0F	A05	Y1F
B04	Vacant	A04	Vacant
B03	Vacant	A03	Vacant
B02	12/24VDC	A02	COM
B01	12/24VDC	A01	COM

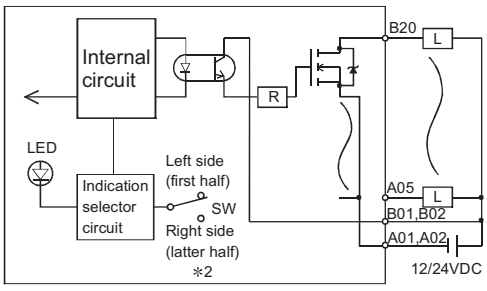
*: When using A6CON2 or A6CON3, refer to Section 3.8.1.

■ QY42P Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY42P	Appearance
Number of output points		64 points	
Isolation method		Photocoupler	
Rated load voltage		12-24VDC (+20/-15%)	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		0.7A, 10ms or less	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF → ON	1ms or less	
	ON → OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		No	
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)	
	Current	0.02A (at 24VDC)/common	
Dielectric withstand voltage		A560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		32 points/common (common terminal: 1A01, 1A02, 2A01, 2A02)	
Protection function		Yes (overload protection, overheat protection) •Overload protection is activated in increments of 1 point. •Overheat protection is activated in increments of 1 point.	
Operation indicator		ON indication (LED), 32 point switch-over using switch *2	
External connections		40-pin connector	
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*3	
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4	
Applicable connector/terminal block conversion module		A6TBXY36,A6TBXY54	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		64 points/slot (I/O assignment: Output)	
5VDC internal current consumption		0.15A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.17kg	

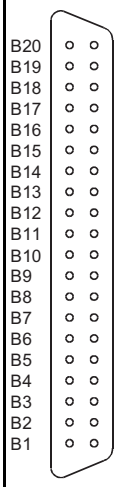


External connections



The above diagram shows the first half of 32 points (F). The latter half of 32 points (L) are similar.

Pin-outs



Module front view

Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
1B20	Y00	1A20	Y10	2B20	Y20	2A20	Y30
1B19	Y01	1A19	Y11	2B19	Y21	2A19	Y31
1B18	Y02	1A18	Y12	2B18	Y22	2A18	Y32
1B17	Y03	1A17	Y13	2B17	Y23	2A17	Y33
1B16	Y04	1A16	Y14	2B16	Y24	2A16	Y34
1B15	Y05	1A15	Y15	2B15	Y25	2A15	Y35
1B14	Y06	1A14	Y16	2B14	Y26	2A14	Y36
1B13	Y07	1A13	Y17	2B13	Y27	2A13	Y37
1B12	Y08	1A12	Y18	2B12	Y28	2A12	Y38
1B11	Y09	1A11	Y19	2B11	Y29	2A11	Y39
1B10	Y0A	1A10	Y1A	2B10	Y2A	2A10	Y3A
1B09	Y0B	1A09	Y1B	2B09	Y2B	2A09	Y3B
1B08	Y0C	1A08	Y1C	2B08	Y2C	2A08	Y3C
1B07	Y0D	1A07	Y1D	2B07	Y2D	2A07	Y3D
1B06	Y0E	1A06	Y1E	2B06	Y2E	2A06	Y3E
1B05	Y0F	1A05	Y1F	2B05	Y2F	2A05	Y3F
1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
1B02	12/24 VDC	1A02	COM1	2B02	12/24 VDC	2A02	COM2
1B01	12/24 VDC	1A01	COM1	2B01	12/24 VDC	2A01	COM2

*1: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.

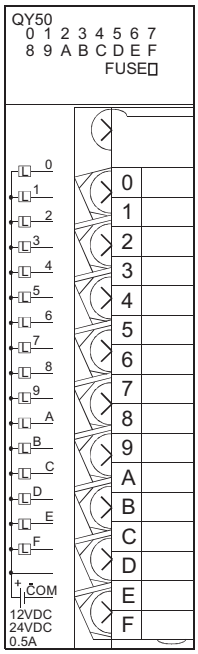
*2: Selection of left-hand (F) side provides the first half (Y00 to Y1F) LED indications, and selection of right-hand (L) side provides the latter half (Y20 to Y3F) LED indications.

*3: When using A6CON2 or A6CON3, refer to Section 3.8.1.

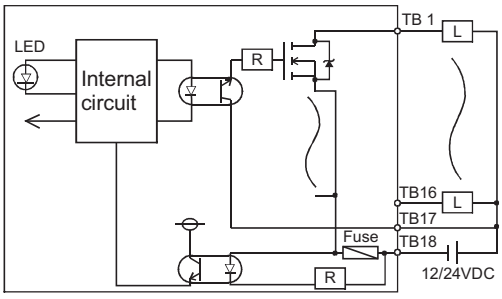
■ QY50 Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY50
Number of output points		16 points
Isolation method		Photocoupler
Rated load voltage		12-24VDC (+20/-15%)
Maximum load current		0.5A/point, 4A/common
Maximum inrush current		4A, 10ms or less
Leakage current at OFF		0.1mA or less
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A
Response time	OFF → ON	1ms or less
	ON → OFF	1ms or less (rated load, resistive load)
Surge suppressor		Zener diode
Fuse		6.7A (unchangeable) (fuse blow capacity: 50A)
Fuse blow indication		Yes (When fuse blows, LED indicates it and signal is output to CPU) *1
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)
	Current	0.02A (at 24VDC)
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		16 points/common (common terminal: TB18)
Operation indicator		ON indication (LED)
External connections		18-point terminal block (M3×6 screws)
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.08A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.17kg

Appearance



External connections

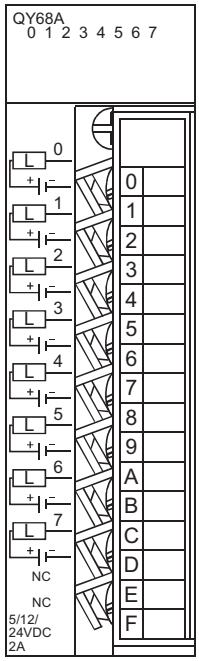


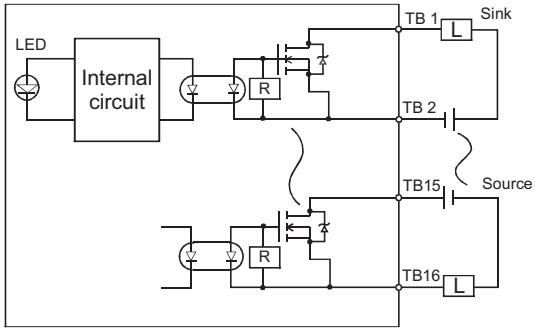
Terminal block number	Signal name
TB1	Y00
TB2	Y01
TB3	Y02
TB4	Y03
TB5	Y04
TB6	Y05
TB7	Y06
TB8	Y07
TB9	Y08
TB10	Y09
TB11	Y0A
TB12	Y0B
TB13	Y0C
TB14	Y0D
TB15	Y0E
TB16	Y0F
TB17	12/24VDC
TB18	COM

*1: When external supply power is off, fuse blown is not detected.

■ QY68A Transistor Output Module (All Points Independent, Sink/Source Type)

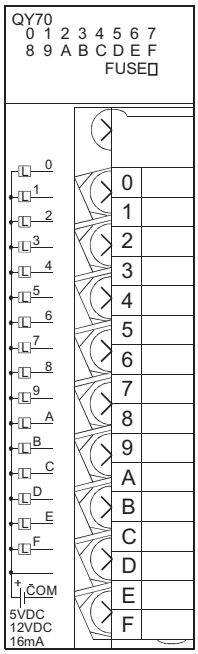
Specifications \ Type		Transistor output module (All points independent, sink/Source type) QY68A	Appearance
Number of output points		8 points	
Isolation method		Photocoupler	
Rated load voltage		5-24VDC (+20/-10%)	
Maximum load current		2A/point, 8A/unit	
Maximum inrush current		8A, 10ms or less	
Leakage current at OFF		0.1mA or less	
Maximum voltage drop at ON		0.3VDC (MAX.) 2A	
Response time	OFF → ON	3ms or less	
	ON → OFF	10ms or less (resistive load)	
Surge suppressor		Zener diode	
Fuse		No (Attaching a fuse to external wiring is recommended. Refer to the Precautions in Section 3.1.1.)	
External supply power		Unnecessary	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		All points Independent	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: Output)	
5VDC internal current consumption		0.11A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.14kg	

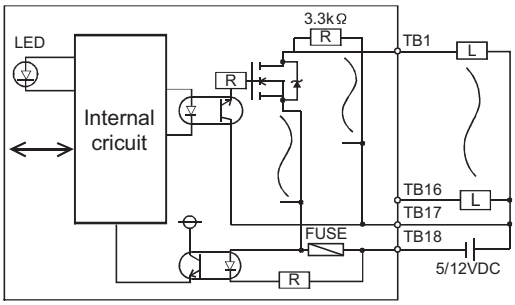


External connections	Terminal block number	Signal name
	TB1	Y00
	TB2	
	TB3	Y01
	TB4	
	TB5	Y02
	TB6	
	TB7	Y03
	TB8	
	TB9	Y04
	TB10	
	TB11	Y05
	TB12	
	TB13	Y06
	TB14	
	TB15	Y07
	TB16	
	TB17	Vacant
	TB18	Vacant

■ QY70 Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY70	Appearance
Number of output points		16 points	
Isolation method		Photocoupler	
Rated load voltage		5-12VDC (+25/-10%)	
Maximum load current		16mA/point, 256mA/common	
Maximum inrush current		40mA, 10ms or less	
Output voltage at OFF		VOH: 3.5VDC (VCC=5VDC, IOH=0.4mA)	
Maximum voltage drop at ON		VOL: 0.3VDC	
Response time	OFF → ON	0.5ms or less	
	ON → OFF	0.5ms or less (resistive load)	
Surge suppressor		No	
Fuse		1.6A (unchangeable) (fuse blow capacity: 50A)	
Fuse blow indication		Yes (When fuse blows, LED indicates it and signal is output to CPU)*1	
External supply power	Voltage	5/12VDC (+20/-10%) (ripple ratio within 5%)	
	Current	0.09A (at 24VDC) (Max. all points ON)	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	
		First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		16 points/common (common terminal: TB18)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screws)	
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		16 points (I/O assignment: Output)	
5VDC internal current consumption		0.095A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.14kg	



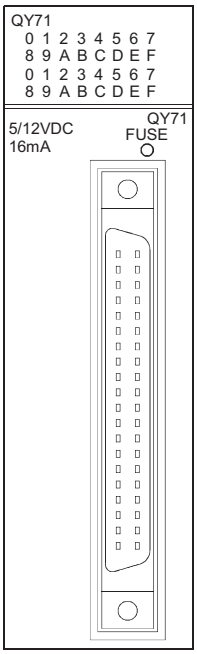
External connections	Terminal block number	Signal name
	TB1	Y00
	TB2	Y01
	TB3	Y02
	TB4	Y03
	TB5	Y04
	TB6	Y05
	TB7	Y06
	TB8	Y07
	TB9	Y08
	TB10	Y09
	TB11	Y0A
	TB12	Y0B
	TB13	Y0C
	TB14	Y0D
	TB15	Y0E
	TB16	Y0F
	TB17	5/12VDC
	TB18	COM

*1: When external supply power is off, fuse blown is not detected.

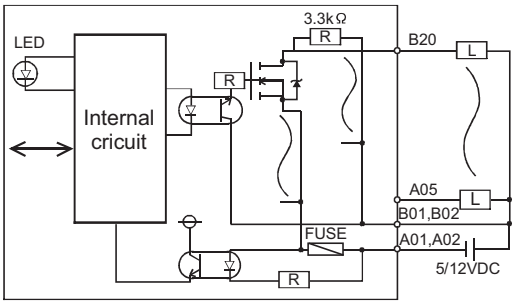
■ QY71 Transistor Output Module (Sink Type)

Specifications \ Type		Transistor output module (Sink type) QY71
Number of output points		32 points
Isolation method		Photocoupler
Rated load voltage		5-12VDC (+25/-10%)
Maximum load current		16mA/point, 512mA/common
Maximum inrush current		40mA, 10ms or less
Output voltage at OFF		VOH: 3.5VDC (VCC=5VDC, IOH=0.4mA)
Maximum voltage drop at ON		VOL: 0.3VDC
Response time	OFF → ON	0.5ms or less
	ON → OFF	0.5ms or less (resistive load)
Surge suppressor		No
Fuse		1.6A (unchangeable) (fuse blow capacity: 50A)
Fuse blow indication		Yes (When fuse blows, LED indicates it and signal is output to CPU)*1
External supply power	Voltage	5/12VDC (+25/-10%) (ripple ratio within 5%)
	Current	0.17A (at 12VDC) (MAX. all points ON)
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: A01, A02)
Operation indicator		ON indication (LED)
External connections		40-pin connector
Applicable wire size		0.3mm^2(AWG#22) or less (for A6CON1, A6CON4) *2
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		32 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.15A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.14kg

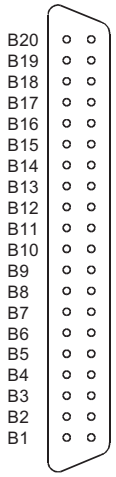
Appearance



External connections



Pin-outs



Module front view

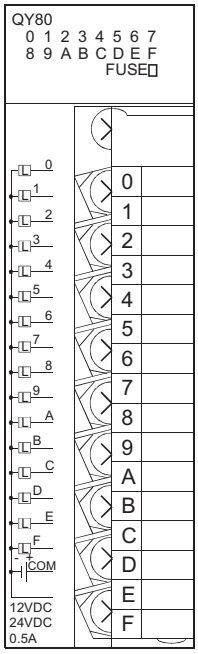
Pin No.	Signal No.	Pin No.	Signal No.
B20	Y00	A20	Y10
B19	Y01	A19	Y11
B18	Y02	A18	Y12
B17	Y03	A17	Y13
B16	Y04	A16	Y14
B15	Y05	A15	Y15
B14	Y06	A14	Y16
B13	Y07	A13	Y17
B12	Y08	A12	Y18
B11	Y09	A11	Y19
B10	Y0A	A10	Y1A
B09	Y0B	A09	Y1B
B08	Y0C	A08	Y1C
B07	Y0D	A07	Y1D
B06	Y0E	A06	Y1E
B05	Y0F	A05	Y1F
B04	Vacant	A04	Vacant
B03	Vacant	A03	Vacant
B02	5/12VDC	A02	COM
B01	5/12VDC	A01	COM

*1: When external supply power is off, fuse blown is not detected.
*2: When using A6CON2 or A6CON3, refer to Section 3.8.1.

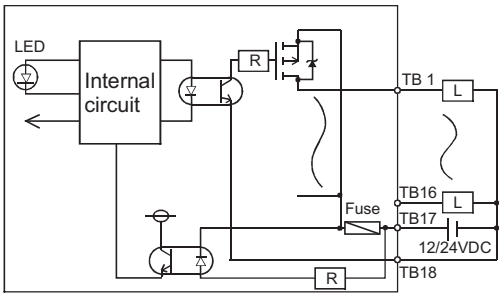
■ QY80 Transistor Output Module (Source Type)

Specifications \ Type		Transistor output module (Source type) QY80
Number of output points		16 points
Isolation method		Photocoupler
Rated load voltage		12-24VDC (+20/-15%)
Maximum load current		0.5A/point, 4A/common
Maximum inrush current		4A, 10ms or less
Leakage current at OFF		0.1mA or less
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A
Response time	OFF → ON	1ms or less
	ON → OFF	1ms or less (rated load, resistive load)
Surge suppressor		Zener diode
Fuse		6.7A (unchangeable) (fuse blow capacity: 50A)
Fuse blow indication		Yes (When fuse blows, LED indicates it and signal is output to CPU) *1
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)
	Current	0.02A (at 24VDC)
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		16 points/common (common terminal: TB17)
Operation indicator		ON indication (LED)
External connections		18-point terminal block (M3×6 screws)
Applicable wire size		0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used.)
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.08A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.17kg

Appearance



External connections



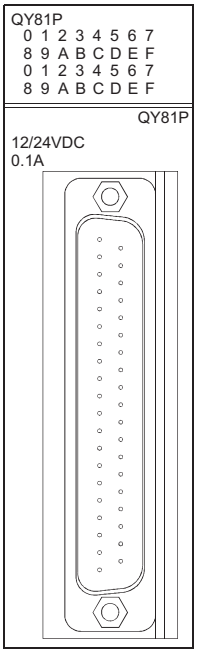
Terminal block number	Signal name
TB1	Y00
TB2	Y01
TB3	Y02
TB4	Y03
TB5	Y04
TB6	Y05
TB7	Y06
TB8	Y07
TB9	Y08
TB10	Y09
TB11	Y0A
TB12	Y0B
TB13	Y0C
TB14	Y0D
TB15	Y0E
TB16	Y0F
TB17	COM
TB18	OV

*1: When external supply power is off, fuse blown is not detected.

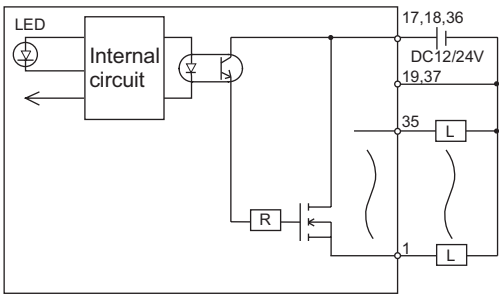
■ QY81P Transistor Output Module (Source Type)

Specifications \ Type		Transistor output module (Source type) QY81P
Number of output points		32 points
Isolation method		Photocoupler
Rated load voltage		12-24VDC (+20/-15%)
Maximum load current		0.1A/point, 2A/common
Maximum inrush current		0.7A, 10ms or less
Leakage current at OFF		0.1mA or less
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A
Response time	OFF → ON	1ms or less
	ON → OFF	1ms or less (rated load, resistive load)
Surge suppressor		Zener diode
Fuse		No
External supply power	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)
	Current	0.04A (at 24VDC)
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: 17, 18, 36)
Protection function		Yes (overload protection, overheat protection) •Overload protection is activated in increments of 1 point. •Overheat protection is activated in increments of 1 point.
Operation indicator		ON indication (LED)
External connections		37-pin D-sub connector
Applicable wire size		0.3mm^2 (For A6CON1E) *
External wiring connector (Sold separately)		A6CON1E, A6CON2E, A6CON3E
Applicable connector/terminal block conversion module		A6TBY36-E,A6TBY54-E
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		32 points/slot (I/O assignment: Output)
5VDC internal current consumption		0.095A (TYP. all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.15kg

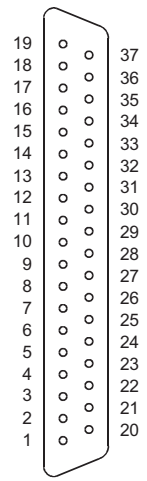
Appearance



External connections



Pin-outs



Module front view

Pin No.	Signal No.	Pin No.	Signal No.
1	Y00	9	Y10
20	Y01	28	Y11
2	Y02	10	Y12
21	Y03	29	Y13
3	Y04	11	Y14
22	Y05	30	Y15
4	Y06	12	Y16
23	Y07	31	Y17
5	Y08	13	Y18
24	Y09	32	Y19
6	Y0A	14	Y1A
25	Y0B	33	Y1B
7	Y0C	15	Y1C
26	Y0D	34	Y1D
8	Y0E	16	Y1E
27	Y0F	35	Y1F
17	COM	37	OV
36	COM	19	OV
18	COM		

*: When using A6CON2E or A6CON3E, refer to Section 3.8.1.

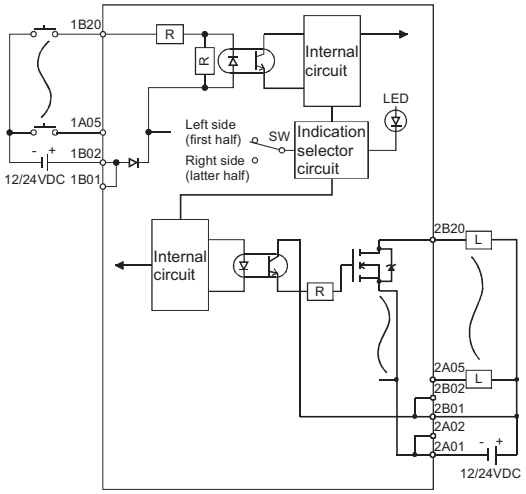
3.1.4 I/O Composite Module

■ QH42P I/O Module

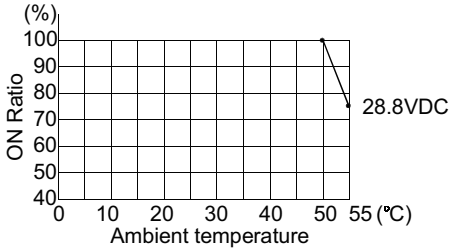
(1) DC Input Specification (Positive Common Type)

Specifications \ Type		QH42P I/O module (Input specification)
Number of input points		32 points
Insulation method		Photocoupler
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)
Rated input current		Approx. 4mA
Input derating		See the derating chart.
ON voltage/ON current		19V or higher/3mA or higher
OFF voltage/OFF current		11V or lower/1.7mA or lower
Input resistance		Approx. 5.6kΩ
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6557.38 ft.))
Insulation resistance		10MΩ or more by insulation resistance tester
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency
		First transient noise IEC61000-4-4: 1kV
Protection degree		IP2X
Common terminal arrangement		32 points/common (common terminal: 1B01, 1B02)
Operation indicator		ON indication (LED), 32point switch-over using switch*2
External connections		40-pin connector
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4)*4
External wiring connector (Sold separately)		A6CON1, A6CON2, A6CON3, A6CON4
Mixed connector/terminal block conversion module		A6TBXY36,A6TBXY54,A6TBX70
Online module change		Possible
Multiple CPU System		Compatible
Number of occupied I/O points		32 points/slot (I/O assignment: I/O mixed)
5VDC internal current consumption		0.13A (TYP, all points ON)
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)
Weight		0.20kg

External connections



Derating chart



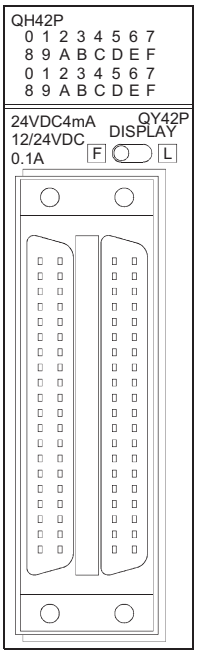
*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

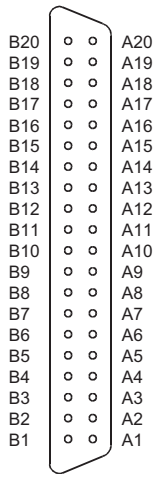
*2: Selection of left-hand (F) side provides the first half (X00 to X1F) LED indications, and selection of right-hand (L) side provides the latter half (Y20 to Y3F) LED indications.

*3: Use this module in the following makeup.
- Use the CPU module of product information "011120000000000-A" or later. Any other CPU module cannot be used.
- Use GX Developer Version 5 (SW5D5C-GPPW) or later.
- When GX Developer Version 4 (SW4D5C-GPPW) or earlier is used, the response time cannot be set. (Fixed to 10ms) Set the I/O allocation as "output".

*4: When using A6CON2 or A6CON3, refer to Section 3.8.1.

(2) Transistor Output Specification (Sink Type)

Specifications \ Type		QH42P I/O module (Output specification)	Appearance
Number of output points		32 points	
Insulation method		Photocoupler	
Rated load voltage		12-24VDC (+20/-15%)	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		0.7A/10ms or less	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF → ON	1ms or less	
	ON → OFF	1ms or less (rated load, resistance load)	
Surge suppressor		Zener diode	
Fuse		No	
External power supply	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)	
	Current	0.015A (at 24VDC)/common (Max. all points ON)	
Common terminal arrangement		32 points/common (common terminal: 2A01, 2A02)	
Protection function		Provided (overload, overheat protection) •Overload protection is activated in increments of 1 point. •Overheat protection is activated in increments of 1 point.	

Pin-outs	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
	1B20	X00	1A20	X10	2B20	Y00	2A20	Y10
	1B19	X01	1A19	X11	2B19	Y01	2A19	Y11
	1B18	X02	1A18	X12	2B18	Y02	2A18	Y12
	1B17	X03	1A17	X13	2B17	Y03	2A17	Y13
	1B16	X04	1A16	X14	2B16	Y04	2A16	Y14
	1B15	X05	1A15	X15	2B15	Y05	2A15	Y15
	1B14	X06	1A14	X16	2B14	Y06	2A14	Y16
	1B13	X07	1A13	X17	2B13	Y07	2A13	Y17
	1B12	X08	1A12	X18	2B12	Y08	2A12	Y18
	1B11	X09	1A11	X19	2B11	Y09	2A11	Y19
	1B10	X0A	1A10	X1A	2B10	Y0A	2A10	Y1A
	1B09	X0B	1A09	X1B	2B09	Y0B	2A09	Y1B
	1B08	X0C	1A08	X1C	2B08	Y0C	2A08	Y1C
	1B07	X0D	1A07	X1D	2B07	Y0D	2A07	Y1D
	1B06	X0E	1A06	X1E	2B06	Y0E	2A06	Y1E
	1B05	X0F	1A05	X1F	2B05	Y0F	2A05	Y1F
	1B04	Vacant	1A04	Vacant	2B04	Vacant	2A04	Vacant
	1B03	Vacant	1A03	Vacant	2B03	Vacant	2A03	Vacant
	1B02	COM1	1A02	Vacant	2B02	12/24VDC	2A02	COM2
	1B01	COM1	1A01	Vacant	2B01	12/24VDC	2A01	COM2

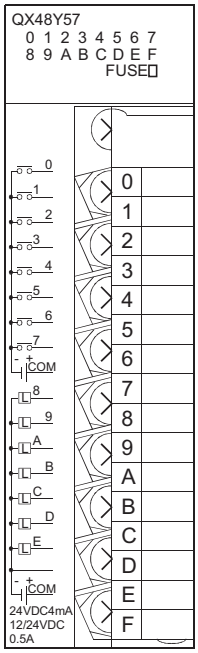
Module front view

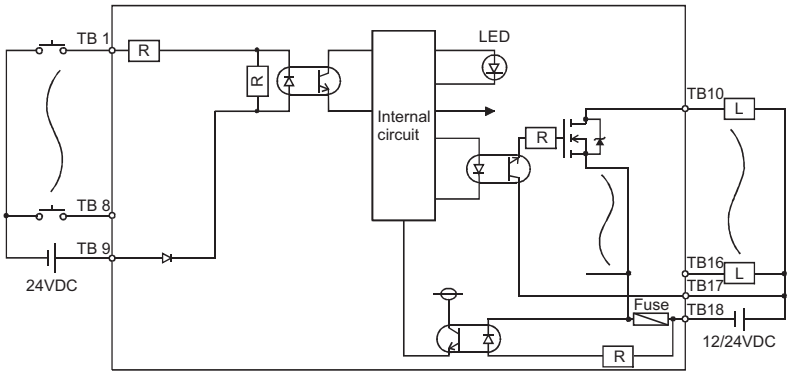
*1: Pin number of 1□□□ indicates that of the left-hand side connector, and pin number of 2□□□ indicates that of the right-hand side connector.

■ QX48Y57 I/O Module

(1) DC Input Specification (Positive Common Type)

Specifications \ Type		QX48Y57 I/O module (Input specification)	Appearance
Number of input points		8 points	
Insulation method		Photocoupler	
Rated input voltage		24VDC (+20/-15%, ripple ratio within 5%)	
Rated input current		Approx. 4mA	
Input derating		No	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		11V or lower/1.7mA or lower	
Input resistance		Approx. 5.6kΩ	
Response time	OFF → ON	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms	
	ON → OFF	1ms/5ms/10ms/20ms/70ms or less (CPU parameter setting)*1 Initial setting is 10ms	
Dielectric withstand voltage		560VAC rms/3 cycles (altitude 2000m (6657.38ft.))	
Insulation resistance		10MΩ or more by insulation resistance tester	
Noise immunity		By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency First transient noise IEC61000-4-4: 1kV	
Protection degree		IP2X	
Common terminal arrangement		8 points/common (common terminal: TB9)	
Operation indicator		ON indication (LED)	
External connections		18-point terminal block (M3×6 screw)	
Applicable wire size		Core cable: 0.3 to 0.75mm^2 (Outside diameter: 2.8mm or smaller)	
Applicable crimping terminal		R1.25-3 (sleeved crimping terminals cannot be used)	
Online module change		Possible	
Multiple CPU System		Compatible	
Number of occupied I/O points		16 points/slot (I/O assignment: I/O mixed)	
5VDC internal current consumption		0.08A (TYP. all points ON)	
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight		0.20kg	



External connections	Terminal block No.	Signal name
	TB1	X00
	TB2	X01
	TB3	X02
	TB4	X03
	TB5	X04
	TB6	X05
	TB7	X06
	TB8	X07
	TB9	COM1
	TB10	Y08
	TB11	Y09
	TB12	Y0A
	TB13	Y0B
	TB14	Y0C
	TB15	Y0D
	TB16	Y0E
	TB17	12/24VDC
	TB18	COM2

*1: For the setting method, refer to the Building Block I/O Module User's Manual.
Note that OFF → ON and ON → OFF response times cannot be set separately.

*2: Use this module in the following makeup.
• Use the CPU module of product information "011120000000000-A" or later. Any other CPU module cannot be used.
• Use GX Developer Version 5 (SW5D5C-GPPW) or later.
• When GX Developer Version 4 (SW4D5C-GPPW) or earlier is used, the response time cannot be set.
(Fixed to 10ms) Set the I/O allocation as "output".

(2) Transistor Output Specifications (Sink Type)

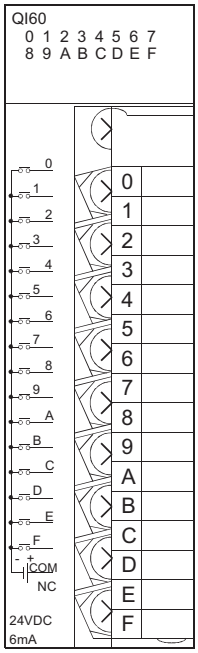
Specifications \ Type		QX48Y57 I/O module (Output specification)
Number of output points		7 points
Insulation method		Photocoupler
Rated load voltage		12-24VDC (+20/-15%)
Maximum load current		0.5A/point, 2A/common
Maximum inrush current		4A/10ms or less
Leakage current at OFF		0.1mA or lower
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A
Response time	OFF → ON	1ms or less
	ON → OFF	1ms or less (rated load, resistance load)
Surge suppressor		Zener diode
Fuse		4A (Not replaceable) (Fuse breakage capacity: 50A)
Fuse blow indication		Provided (When fuse blows, LED lights and a signal is output to CPU) *3
External power supply	Voltage	12-24VDC (+20/-15%) (ripple ratio within 5%)
	Current	0.01A (at 24VDC)
Common terminal arrangement		7 points/common (common terminal: TB18)

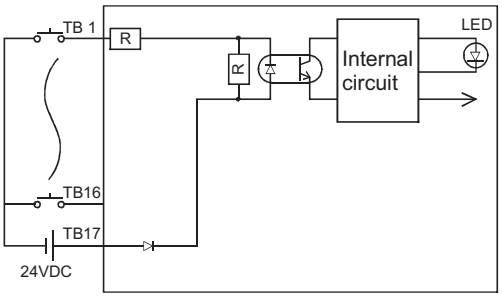
*3: When external supply power is off, fuse blown is not detected.

3.1.5 Interruption module: QI60

■ QI60 Interrupt Module

Specifications \ Type			Interrupt module				
			QI60				Appearance
Number of input points			16 points				
Isolation method			Photocoupler				
Rated input voltage			24VDC (+20/-15%, ripple ratio within 5%)				
Rated input current			Approx. 6mA				
Input derating			No				
ON voltage/ON current			19V or higher/4.0mA or higher				
OFF voltage/OFF current			11V or lower/1.7mA or lower				
Input impedance			Approx. 3.9kΩ				
Response time	Set value *2		0.1	0.2	0.4	0.6	1
	OFF → ON	TYP.	0.05ms	0.15ms	0.30ms	0.55ms	1.05ms
		MAX.	0.10ms	0.20ms	0.40ms	0.60ms	1.20ms
	ON → OFF	TYP.	0.15ms	0.20ms	0.35ms	0.60ms	1.10ms
		MAX.	0.20ms	0.30ms	0.50ms	0.70ms	1.30ms
Dielectric withstand voltage			560VAC rms/3 cycles (altitude 2000m (6557.38ft.))				
Insulation resistance			10MΩ or more by insulation resistance tester				
Noise immunity			By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency				
			First transient noise IEC61000-4-4: 1kV				
Protection degree			IP2X				
Common terminal arrangement			16 points/common (common terminal: TB17)				
Interrupt processing condition			Set by setting the CPU parameter switch. *3				
Operation indicator			ON indication (LED)				
External connections			18-point terminal block (M3×6 screws)				
Applicable wire size			0.3 to 0.75mm^2 core (2.8mm (0.11in.) OD max.)				
Applicable crimping terminal			R1.25-3 (sleeved crimping terminals cannot be used.)				
Online module change			Possible				
Multiple CPU System			Compatible				
Number of occupied I/O points			16 points/slot (I/O assignment: Interrupt) *4				
5VDC internal current consumption			0.06A (TYP. all points ON)				
External dimensions			98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)				
Weight			0.20kg				

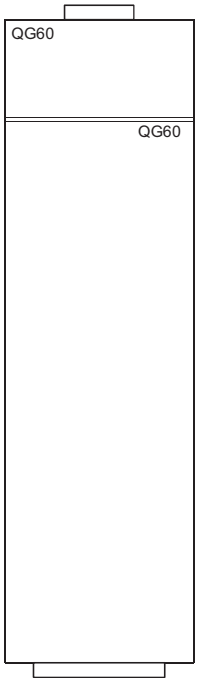


External connections	Terminal block number	Signal name
	TB1	X00
	TB2	X01
	TB3	X02
	TB4	X03
	TB5	X04
	TB6	X05
	TB7	X06
	TB8	X07
	TB9	X08
	TB10	X09
	TB11	X0A
	TB12	X0B
	TB13	X0C
	TB14	X0D
	TB15	X0E
	TB16	X0F
	TB17	COM
	TB18	Vacant

*1: For information of the main module, refer to the QCPU (Q-mode) User's Manual (Function Explanation/Program Basics Version).
*2: CPU parameter setting. (Initial setting is 0.2ms) For the setting method, refer to the Building Block I/O Module User's Manual.
When setting the response time, use the following configuration.
In other than the following configuration, the response time cannot be set. (Fixed at 0.2ms)
• The CPU module is the one of product information "021120000000000-B" or later.
• GX Developer is GX Developer Version 6 (SW6D5C-GPPW) or later.
*3: For the setting method, refer to the Building Block I/O Module User's Manual.
*4: When setting I/O assignment with GX Developer Version 5 (SW5D5C-GPPW) or earlier, select "16-point intelligent module".

3.1.6 Blank cover module: QG60

■ QG60 Blank cover module

Type / Specifications	Blank cover module	
	QG60	Appearance
Application	Used for protection against dust on the slot not mounted with the I/O module (especially an empty slot between modules).	
Number of occupied I/O points	16 points/slot (default I/O assignment: Intelligent: Vacant 16 points)	
External dimensions	98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)	
Weight	0.07Kg	
----	----	

*: Mount the blank cover module with the connector cover of the base unit fitted.

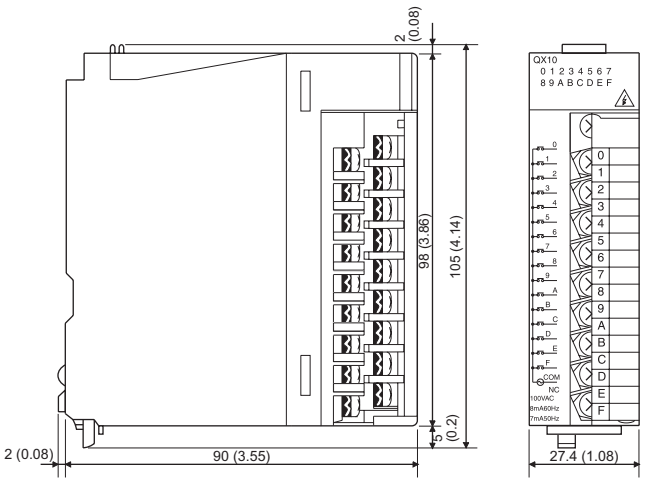
3.1.7 External dimensions

External dimensions

■ **I/O module, blank cover module**

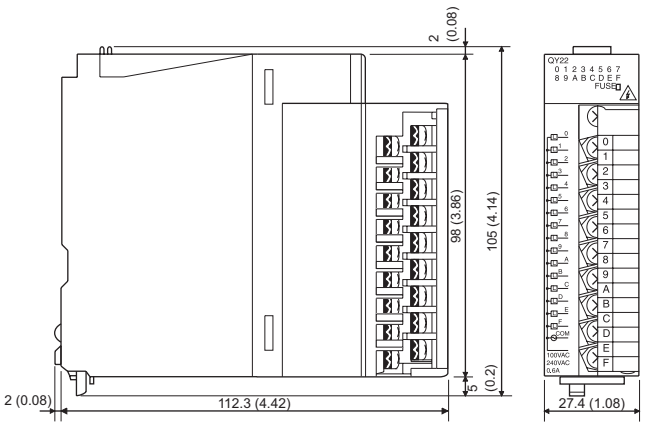
● **Terminal block connector type**

(1) Other than QY22



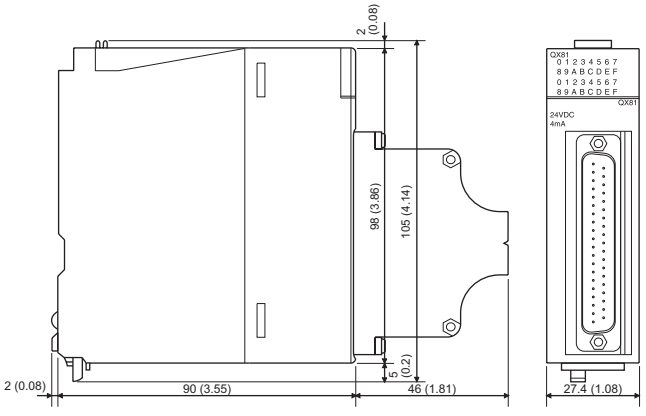
Unit:mm(inch)

(2) QY22 TRIAC output module



Unit:mm(inch)

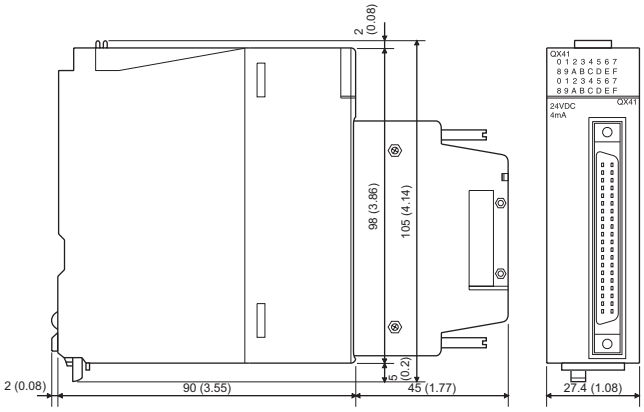
● **37-pin D-sub connector type 32-point I/O module**



Unit:mm(inch)

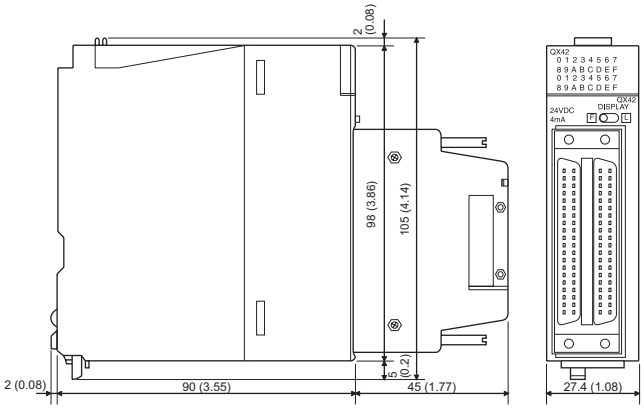
● **40-pin connector type**

(1) 32-point I/O module



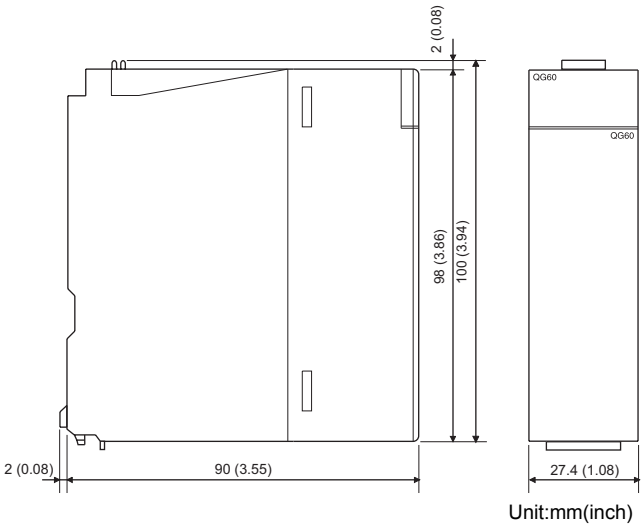
Unit:mm(inch)

(2) 64-point I/O module



Unit:mm(inch)

● **Blank cover module**



Unit:mm(inch)

3.2 Analog module

3.2.1 A/D conversion module: Q64AD, Q68ADV, Q68ADI

Overview

The analog signals of external voltages or currents are converted into digital values and imported into the CPU module. Then the analog data, e.g. voltage, pressure, temperature, current and speed, from external devices such as sensors can be processed by the CPU module.

Features

■ Model selection according to applications

1) Q64AD ••••••••••4 channels, voltage or (current) input
2) Q68ADV ••••••••8 channels, voltage input
3) Q68ADI •••••••••8 channels, current input

■ Fast conversion processing

Conversion speed is as high as 80 s/channel.
Also, the temperature drift compensation is achieved in the processing time of all-channel conversion + 160μs.

■ High accuracy

Conversion accuracy is as high as ±0.1% (operating ambient temperature 25±5℃).

■ Resolution mode switching

According to your application, you can change the resolution mode. These are 1/4000, 1/12000, and 1/16000 as the digital value resolution.

■ Input range switch(s)

Input range[*1] switch(s) can be set easily from GX

*1: The input range indicates the offset/gain setting type. The popular offset/gain setting types are set in default, and the user can modify to requirement.

■ Online module change

The module can be changed without the system being stopped. Also, by using the dedicated instruction (G.OGLOAD, G.OGSTOR) or writing to the buffer and turning on the corresponding Y signal, this enables reading of A/D converter module (changed online) offset/gain settings to the QCPU, and transfer of offset/gain settings to another A/D converter module mounted on a different slot position. (Only between the modules of the same model.)

■ Offset/gain setting

GX Configurator-AD, dedicated instruction (G.OFFGAN) or mode switching setting allows easy switching of the offset/gain setting mode.

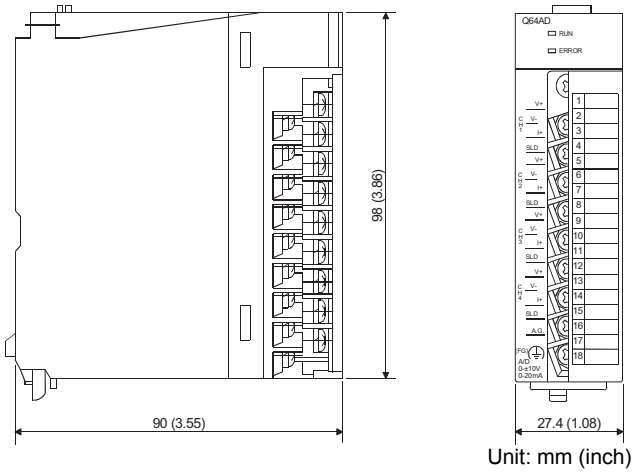
■ Easy settings using the utility package

A utility package is sold separately (GX Configurator-AD).
The utility package is not a required item, however, it is useful for on-screen setting of the intelligent function module parameters (initial setting/auto refresh setting). In addition, FB[*2] can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

*2: FB is the function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

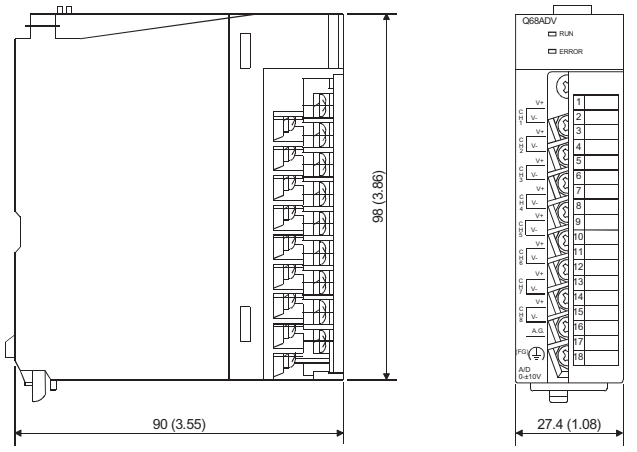
Appearance

(1) Q64AD



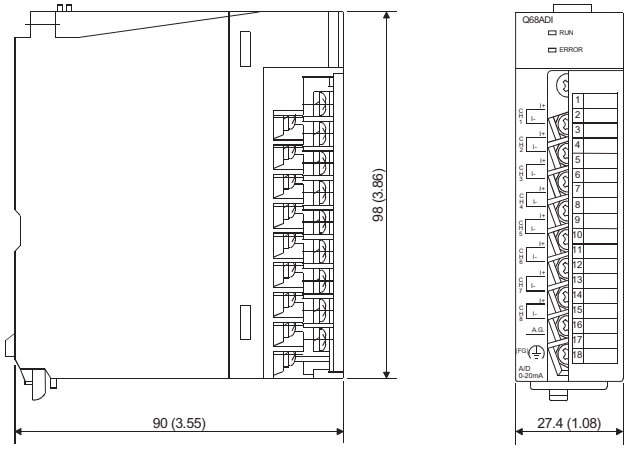
Unit: mm (inch)

(2) Q68ADV



Unit: mm (inch)

(3) Q68ADI



Unit: mm (inch)

Functions

Item	Function
A/D conversion enable/disable setting	(1) Specifies whether to enable or disable the A/D conversion for each channel. (2) By disabling the conversion for the channels that are not used, the sampling time can be shortened.
A/D conversion method	(1) Sampling processing The A/D conversion for analog input values is performed successively for each channel, and the digital output value is output after each conversion. (2) Averaging processing For each channel, A/D conversion values are averaged for the set number of times or set amount of time, and the average value is output as a digital value.
Maximum and minimum values hold function	The maximum and minimum values of the digital output values are retained in the module.
Temperature drift compensation function	(1) Errors arising from changes in the ambient temperature of the module are automatically compensated to improve the accuracy of conversion. (2) The temperature drift compensation function can be performed at (A/D conversion time for all channels) + 160 μs.
Resolution mode	(1) The resolution mode can be switched according to the application, and digital-value resolution settings of 1/4000, 1/12000 or 1/16000 can be selected. (2) The resolution mode setting is applicable to all channels. (3) See Performance Specifications for the digital output values and maximum resolution in normal resolution mode and high resolution mode.
Online module change	Module can be changed without the system being stopped.

Performance specifications

Item \ Model name			Q64AD	Q68ADV	Q68ADI
Analog input points			4 points (4 channels)	8 points (8 channels)	8 points (8 channels)
Analog input	Voltage		-10 to 10 V DC (Input resistance value 1MΩ)		---
	Current		0 to 20 mA DC (input resistance value 250Ω)	---	0 to 20 mA DC (input resistance value 250Ω)
Digital output			16-bit signed binary (normal resolution mode: -4096 to 4095, high resolution mode: -12288 to 12287, -16384 to 16383)		
I/O characteristics, Maximum resolution	Analog input range		Normal resolution mode: Digital output value	Normal resolution mode: Maximum resolution	High resolution mode: Digital output value / Maximum resolution
	Voltage	0 to 10V	0 to 4000	2.5mV	0 to 16000 / 0.625mV
		0 to 5V		1.25mV	0 to 12000 / 0.416mV
		1 to 5V		1.0mV	0.333mV
		-10 to 10V	-4000 to 4000	2.5mV	-16000 to 16000 / 0.625mV
		Users range setting		0.375mV	-12000 to 12000 / 0.333mV
	Current	0 to 20mA	0 to 4000	5μA	0 to 12000 / 1.66μA
		4 to 20mA		4μA	-12000 to 12000 / 1.33μA
		Users range setting	-4000 to 4000	1.37μA	1.33μA

Accuracy (Accuracy in respect to maximum digital output value)	Analog input range		Normal resolution mode: Ambient temperature 0 to 55℃: With temperature drift correction	Normal resolution mode: Ambient temperature 0 to 55℃: Without temperature drift correction	Normal resolution mode: Ambient temperature 25 ±5℃	High resolution mode: Ambient temperature 0 to 55℃: With temperature drift correction	High resolution mode: Ambient temperature 0 to 55℃: Without temperature drift correction	High resolution mode: Ambient temperature 25 ±5℃
	Voltage	0 to 10V	±0.3% (±12digit*)	±0.4% (±16digit*)	±0.1% (±4digit*)	±0.3% (±48digit*)	±0.4% (±64digit*)	±0.1% (±16digit*)
		-10 to 10V						
		0 to 5V				±0.3% (±36digit*)	±0.4% (±48digit*)	±0.1% (±12digit*)
		1 to 5V						
		Users range setting						
	Current	0 to 20mA						
		4 to 20mA						
		Users range setting						
	*Digit indicates a digital value.							

Conversion speed	80 μs/channel (When there is temperature drift, the time calculated by adding 160 μs will be used regardless of the number of channels used.)		
Absolute maximum input	Voltage : ±15V Current : ±30mA		
Insulation method	Between the I/O terminal and PLC power supply : Photocoupler insulation Between channels : Non-insulated		
Dielectric withstand voltage	Between the I/O terminal and PLC power supply: 500VAC for 1 minute		
Insulation resistance	Between the I/O terminal and PLC power supply: 500VDC 20MΩ or more		
Protection degree	IP2X		
E^2PROME write count	Max. 100 thousand times		
Connection terminals	18-point terminal block		
Applicable wire size	0.3 to 0.75 mm^2		
Applicable crimping terminal	R1.25-3 (sleeved crimping terminals cannot be used)		
Online module change	Possible (Note 1)*1		
Multiple CPU system	Compatible*2		
Number of occupied I/O points	16 points (I/O assignment: intelligent)		
5VDC Internal current consumption	0.63A	0.64A	0.64A
External dimensions	98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)		
Weight	0.18kg	0.19kg	0.19kg

*1: The products of function version C or later are compatible.
*2: The products of function version B or later are compatible.

■ I/O conversion characteristic

The I/O conversion characteristic represents the angle formed by a straight line connecting the "offset value" and "gain value" when the analog signals (voltage or current input) from outside the PLC are converted to digital values.

Offset value

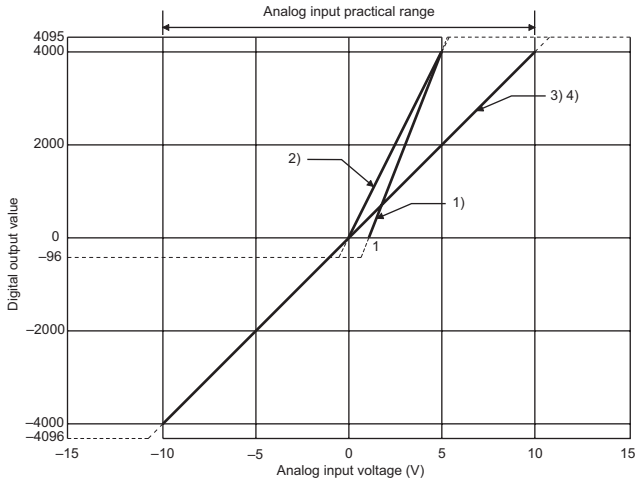
The offset value denotes the analog input value (voltage or current) that makes the digital output value 0.

Gain value

The gain value denotes the analog input value (voltage or current) that makes the digital output value:
4000 (in normal resolution mode)
12000 (when 0 to 5 V, 1 to 5 V, 4 to 20 mA, 0 to 20 mA or the user range setting is selected in high resolution mode).
16000 (when -10 to 10 V or 0 to 10 V is selected in high resolution mode).

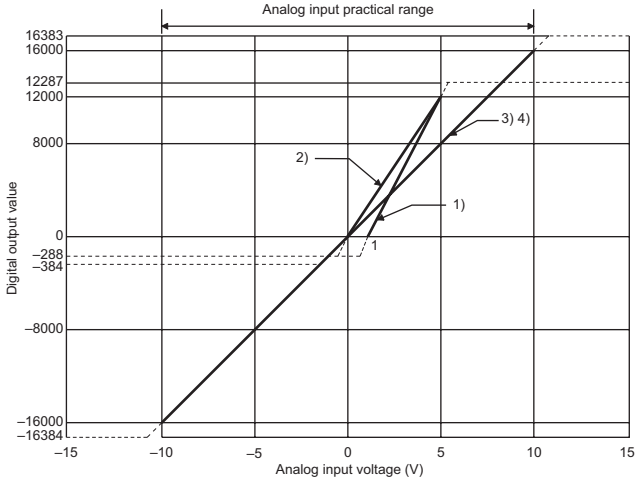
● Input characteristic

(1) Voltage input characteristic in normal resolution mode



Number	Analog input range setting	Offset value	Gain value	Digital output value *2	Maximum resolution
1)	1 to 5V	1V	5V	0 to 4000	1.0mV
2)	0 to 5V	0V	5V		1.25mV
3)	-10 to 10V	0V	10V	-4000 to 4000	2.5mV
4)	0 to 10V	0V	10V	0 to 4000	2.5mV
-	User range setting	*1	*1	-4000 to 4000	0.375mV

(2) Voltage input characteristic in high resolution mode



Number	Analog input range setting	Offset value	Gain value	Digital output value *2	Maximum resolution
1)	1 to 5V	1V	5V	0 to 12000	0.333mV
2)	0 to 5V	0V	5V		0.416mV
3)	-10 to 10V	0V	10V	-16000 to 16000	0.625mV
4)	0 to 10V	0V	10V	0 to 16000	0.625mV
-	User range setting	*1	*1	-12000 to 12000	0.333mV

POINT

1. Set within the analog input range and digital output range for each input range. If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of current input characteristic.)
2. Do not input an analog input voltage of more than ±15 V. The input elements may be damaged.
3. Set the offset/gain values for the user setting range*1 within a range in which the following conditions are satisfied.
   { (Gain value) - (Offset value) } > A

   <Value of A>

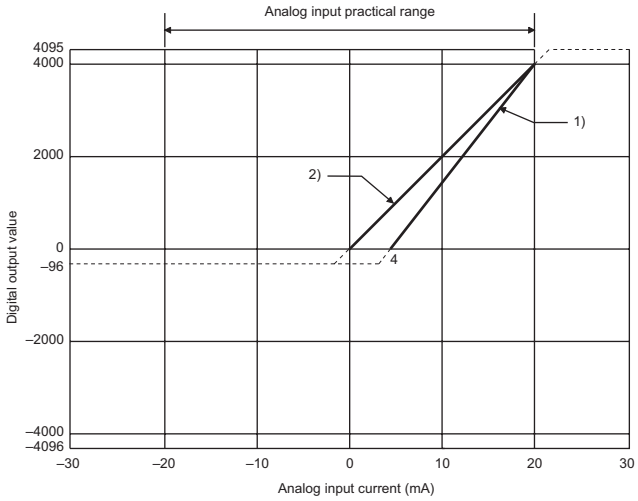
Normal resolution mode	High resolution mode
1.5V	4.0V

4. When an analog value that exceeds the range for the digital output value*2 is entered, the digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Normal resolution mode		High resolution mode	
	Minimum	Maximum	Minimum	Maximum
1 to 5V	-96	4095	-288	12287
0 to 5V				
-10 to 10V	-4096		-16384	16383
0 to 10V	-96		-384	
User range setting	-4096		-12288	12287

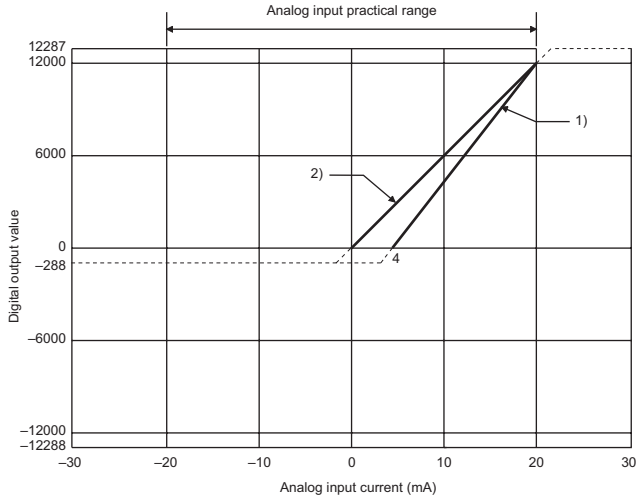
● **Current input characteristic**

(1) Current input characteristic in normal resolution mode



Number	Analog input range setting	Offset value	Gain value	Digital output value *2	Maximum resolution
1)	4 to 20mA	4mA	20mA	0 to 4000	4 μA
2)	0 to 20mA	0mA	20mA		5 μA
-	User range setting	*1	*1	-4000 to 4000	1.37 μA

(2) Current input characteristic in high resolution mode



Number	Analog input range setting	Offset value	Gain value	Digital output value *2	Maximum resolution
1)	4 to 20mA	4mA	20mA	0 to 12000	1.66 μA
2)	0 to 20mA	0mA	20mA		1.33 μA
-	User range setting	*1	*1	-12000 to 12000	1.33 μA

POINT

1. Set within the analog input range and digital output range for each input range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of voltge input characteristic.)
2. Do not input an analog input current of more than ±30 mA. The input elements may be damaged.
3. Set the offset/gain values for the user setting range*2 within a range in which the following conditions are satisfied.
   { (Gain value) - (Offset value) } > A

   <Value of A>

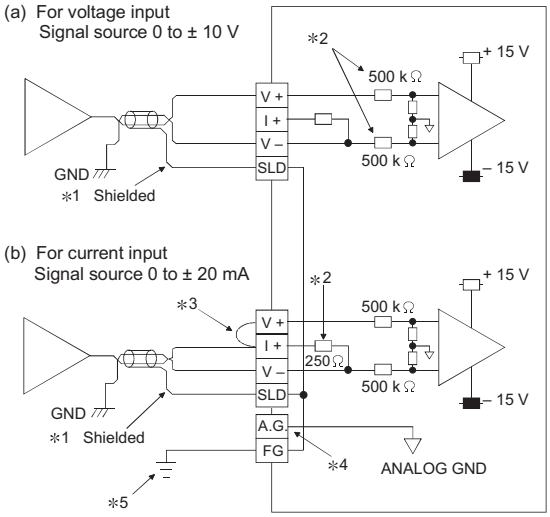
Normal resolution mode	High resolution mode
5.5mA	16.0mA

4. When an analog value that exceeds the range of the digital output value*2 is entered, the digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Normal resolution mode		High resolution mode	
	Minimum	Maximum	Minimum	Maximum
4 to 20mA	-96	4095	-288	12287
0 to 20mA				
User range setting	-4096		-12288	12287

External wiring

(1) Q64AD



*1 Use a twisted two core shielded wire for the power wire.

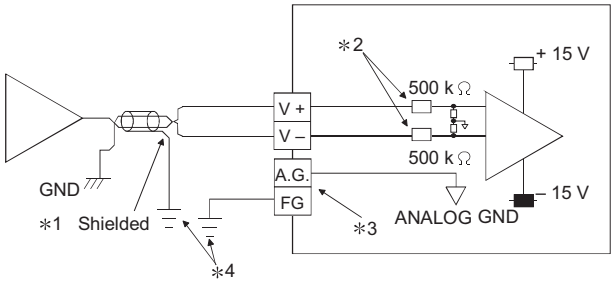
*2 Shows input resistance of Q64AD.

*3 If using as current input, connect to (V +) and (I +) terminals.

*4 "A.G." terminal does not normally require wiring. However, it can be used as a GND terminal for compatible equipment under the following conditions.
(1) When there is a difference in polarity between "A.G" and "GND for compatible equipment".
(2) As an alternative for 0 V input when only the + side is open on a ± wire.

*5 Always use a ground. In addition, ground the FB of the power supply module.

(2) Q68ADV



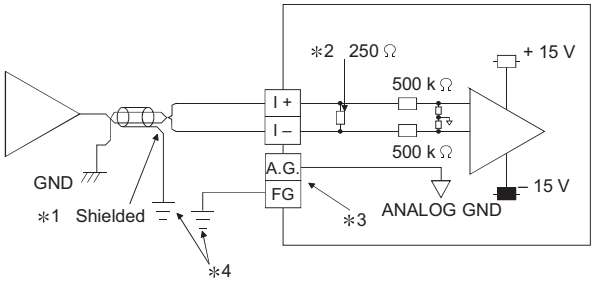
∗1 Use a twisted two core shielded wire for the power wire.

∗2 Shows input resistance of Q68ADV.

∗3 "A.G." terminal does not normally require wiring.
However, it can be used as a GND terminal for compatible equipment under the following conditions.
(1) When there is a difference in polarity between "A.G" and "GND for compatible equipment".
(2) As an alternative for 0 V input when only the + side is open on a ± wire.

∗4 Always use a ground. In addition, ground the FB of the power supply module.

(3) Q68ADI



∗1 Use a twisted two core shielded wire for the power wire.

∗2 Shows input resistance of Q68ADI.

∗3 "A.G." terminal does not normally require wiring.
However, it can be used as a GND terminal for compatible equipment under the following conditions.
(1) When there is a difference in polarity between "A.G" and "GND for compatible equipment".

∗4 Always use a ground. In addition, ground the FB of the power supply module.

Terminal number	Signal name					
	Q64AD		Q68ADV		Q68ADI	
1	CH1	V+	CH1	V+	CH1	I+
2		V-		V-		I-
3		I+	CH2	V+	CH2	I+
4		SLD		V-		I-
5	CH2	V+	CH3	V+	CH3	I+
6		V-		V-		I-
7		I+	CH4	V+	CH4	I+
8		SLD		V-		I-
9	CH3	V+	CH5	V+	CH5	I+
10		V-		V-		I-
11		I+	CH6	V+	CH6	I+
12		SLD		V-		I-
13	CH4	V+	CH7	V+	CH7	I+
14		V-		V-		I-
15		I+	CH8	V+	CH8	I+
16		SLD		V-		I-
17	A.G.(ANALOG GND)					
18	FG					

System configuration

<Q64AD, Q68ADV, Q68ADI accessories>

Product	Description
Manual	Q64AD, Q68ADV, Q68ADI A/D Converter Module User's Manual (Hardware)

<Separately obtained products>

The following manual must be obtained separately.

Product	Description
Manual	A/D Converter Module User's Manual

■ Applicable systems

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the A/D converter module can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system explained in Section 1.

*2: Refer to the system configuration of MELSEC/H remote I/O network explained in Section 2.5.2.

<Compatible software packages>

The following shows systems using A/D converter module with their compatible software packages.

GX Developer is necessary when using the A/D converter module.

		Software version	
		GX Developer	GX Configurator-AD
Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later (SW0D5C-QADU 40E or earlier is not compatible)
	Multiple CPU system	Version 8 or later	
Q02/Q02H/Q06H/Q12H/Q25HCPU	Single CPU system	Version 4 or later	SW0D5C-QADU 00A or later
	Multiple CPU system	Version 6 or later	SW0D5C-QADU 20C or later
Q12PH/Q25PHCPU	Single CPU system	Version 7. 10L or later	Version 1.13P or later (SW0D5C-QADU 40E or earlier is not compatible)
	Multiple CPU system		
When mounting on MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QADU 30D or later

3.2.2 Channel isolated high resolution A/D converter module, channel isolated high resolution distributor module: Q64AD-GH, Q62AD-DGH

Overview

These particular A/D converter modules have realized channel isolation, high accuracy, high resolution, warning output function, input signal error detection function, and online module change.
When used with the process CPU, these modules can support process control.

Features

■ Channel isolated

The channels are isolated.
With the Q62AD-DGH, there is also isolation between the external power supply and channels.

■ High resolution

The resolution is as high as 32-bit signed binary (16 bit signed binary for data). (17 bits for when -10V to +10V range is selected)

■ Power supply for 2-wire transmitter (Q62AD-DGH only)

As the Q62AD-DGH provides its own, it does not require a separate power supply for the 2-wire transmitter.
Also, the Q62AD-DGH supply power can be switched ON/OFF channel-by-channel from the A/D conversion enable/disable setting.

■ Module short-circuit protection (Q62AD-DGH only)

If an excessive current flows into the module due to a wiring short circuit, the built-in short-circuit protection circuit limits the current to within 25 to 35mA, protecting the module.

■ Verify analog input by dedicated check terminal (Q62AD-DGH only)

When verifying the output current for the 2-wire transmitter, calculating the value obtained from the measured voltage via the check terminal eliminates the need to removing the wires.

■ High accuracy

The reference accuracy*1 is as high as ±0.05% and the temperature coefficient*2 is as high as ±71.4ppm/℃.

*1: Accuracy of offset/gain setting at ambient temperature

*2: Accuracy per temperature change of 1℃
Example) Accuracy when the temperature varies from 25℃ to 30℃
0.05% (reference accuracy) + 0.00714%/℃ (temperature coefficient) × 5℃ (temperature variation difference) = 0.0857%

■ Changing the input range

The input range*3 can easily be set from GX Developer.

*3: Input range refers to the type of offset/gain settings. The most frequently used range is set as the default but the user can also set the offset/gain.

■ A/D conversion method

The following are the five A/D conversion methods.

● **Sampling processing**

The A/D conversion for analog input values is performed successively for each channel, and the digital output value is output after each conversion.

● **Averaging processing**

(1) Time averaging
A/D conversion is averaged in terms of time for each channel and a digital average value is output.

(2) Count averaging
A/D conversion is averaged in terms of count for each channel and a digital average value is output.

(3) Move averaging
The specified number of digital output values measured per sampling time are averaged.

● **Primary delay filter**

The digital output value is smoothed out according to the preset time constant.

■ Input signal error detection function

The voltage/current outside the setting range is detected.

■ Warning output

These are the following two warning outputs.

● **Process alarm**

A warning is output when the digital output value falls outside the setting range.

● **Rate alarm**

A warning is output when the digital output value rate of change falls outside the preset range.

■ Online module change

The module can be changed without the system being stopped.
Also, by using the dedicated instruction (G.OGLOAD, G.OGSTOR) or writing to the buffer and turning on the corresponding Y signal, this enables reading of A/D converter module (changed online) offset/gain settings to the QCPU, and transfer of offset/gain settings to another A/D converter module mounted on a different slot position. (Only between the modules of the same model)

■ Offset/gain setting

GX Configurator-AD, dedicated instruction (G.OFFGAN) or mode switching setting allows easy switching of the offset/gain setting mode.

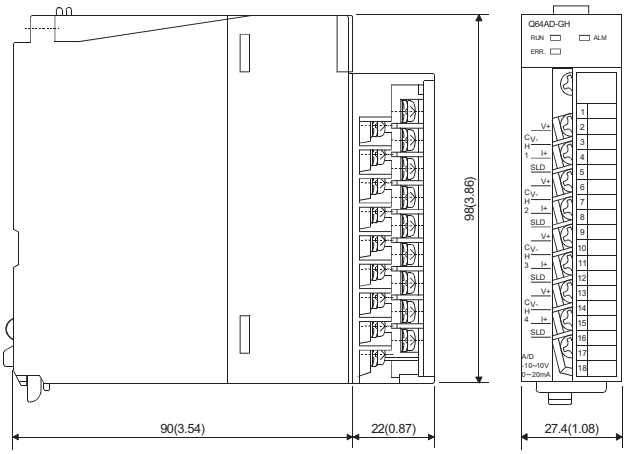
■ Easy settings using the utility package

A utility package is sold separately (GX Configurator-AD).
The utility package is not a required item, however, it is useful for on-screen setting of the intelligent function module parameters (initial setting/auto refresh setting). In addition, FB*4 can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

*4: FB is the function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

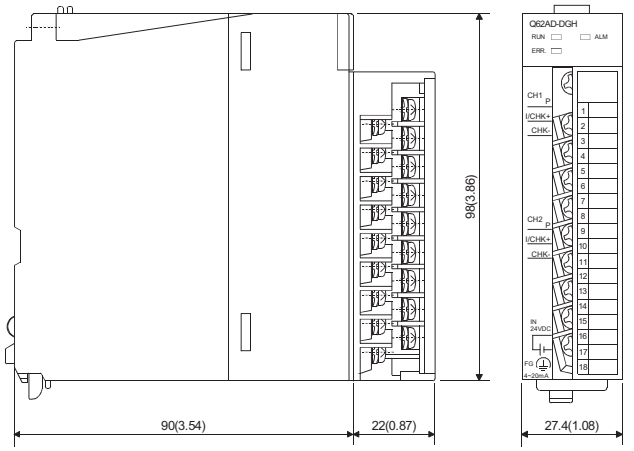
Appearance

(1) Q64AD-GH



Unit:mm(inch)

(2) Q62AD-DGH



Unit:mm(inch)

Functions

Item	Function
A/D conversion enable/disable setting	(1) Specifies whether to enable or disable the A/D conversion for each channel. (2) The conversion speed is 10ms regardless of how many channels are enabled for conversion.
A/D conversion method	(1) Sampling processing The A/D conversion for analog input values is performed successively for each channel, and the digital output value is output after each conversion. (2) Averaging processing (a) Time averaging A/D conversion is averaged in terms of time for each channel and a digital average value is output. (b) Count averaging A/D conversion is averaged in terms of count for each channel and a digital average value is output. (c) Move averaging The specified number of digital output values measured per sampling time are averaged. (3) Primary delay filter The digital output value is smoothed out according to the preset time constant.
Maximum and minimum values hold function	The digital output maximum and minimum values are retained in the module.
Input signal error detection function	The voltage/current value outside the set range is detected.
Warning output function	(1) Process alarm A warning is output if a digital output value falls outside the setting range. (2) Rate alarm A warning is output when the digital output value rate of change falls outside the preset range.
A/D conversion starting time setting function (Q62AD-DGH only)	Setting the A/D conversion starting time allows A/D conversion to be started at the point when the output of the 2-wire transmitter stabilizes.
Supply power ON/OFF function (Q62AD-DGH only)	(1) The power supply to the 2-wire transmitter can be switched ON/OFF for each channel separately. (2) Power is supplied to the channel set for "Conversion enable" from the A/D conversion enable/disable setting (buffer memory address 0: Un\G0).
Online module change	The module can be changed without the system being stopped.

Performance specifications

(1) Q64AD-GH

Item \ Model name			Q64AD-GH				
Number of analog input points			4 points (4 channels)				
Analog input	Voltage		-10 to 10VDC (Input resistance 1 MΩ)				
	Current		0 to 20mADC (Input resistance 250Ω)				
Digital output			16-bit signed binary (-32768 to 32767) 32-bit signed binary (-65536 to 65535)				
I/O characteristics, maximum resolution	Analog input range		Maximum resolution		Digital output value (32-bit)	Digital output value (16-bit)	
			32-bit	16-bit			
	Voltage	0 to 10V	156.3μV	312.6μV	0 to 64000	0 to 32000	
		0 to 5V	78.2μV	156.4μV			
		1 to 5V	62.5μV	125.0μV			
		Users input range (Uni-polar)	47.4μV	94.8μV			
		-10 to 10V	156.3μV	312.6μV	-64000 to 64000	-32000 to 32000	
		Users input range (Uni-polar)	47.4μV	94.8μV			
	Current	0 to 20mA	312.5nA	625.0nA	0 to 64000	0 to 32000	
		4 to 20mA	250.0nA	500.0nA			
		Users input range (Uni-polar)	151.6nA	303.2nA			
Accuracy (Accuracy relative to full-scale of digital output)	Reference accuracy *1		±0.05% Digital output value (32-bit) : ±32digit *2 Digital output value (16-bit) : ±16digit *2				
	Temperature coefficient *3		±71.4ppm/℃ (0.00714%/℃)				
Common mode characteristic			Common mode voltage Input-Common ground (input voltage 0V): 1780VAC				
			Common mode voltage rejection ratio (VCM < 1780V): 60Hz 105dB, 50Hz 107dB				
Conversion speed			10ms/4 channels				
Absolute maximum input			Voltage: ±15V Current: ±30mA				
Isolation specifications	Specific isolated area		Isolation method		Dielectric withstand voltage	Insulation resistance	
	Between I/O terminal and PLC power supply		Photocoupler isolation		1780VAC rms/3 cycles (elevation 2000m)	500VDC 10MΩ or more	
	Between analog input channels		Transformer isolation				
Protection degree			IP2X				
Maximum number of writes for E^2PROM			100,000				
Connected terminal			18 points terminal block				
Applicable wire size			0.3 to 0.75mm^2				
Applicable solderless terminals			R1.25-3 (Solderless terminals with sleeves are not applicable)				
Online module change			Possible				
Multiple CPU system			Compatible				
Number of occupied I/O points			16 points/slot (I/O assignment: intelligent)				
5VDC Internal current consumption			0.89A				
External dimensions			98 (3.86)(H)×27.4 (1.08)(W)×112 (4.41)(D) mm(inch)				
Weight			0.20kg				

*1: Accuracy of offset/gain setting at ambient temperature

*2: "digit" indicates a digital output value.

*3: Accuracy per temperature change of 1℃

Example) Accuracy when temperature changes from 25 to 30℃

0.05% (reference accuracy) + 0.00714 %/℃ (temperature coefficient) × 5℃ (temperature change difference) = 0.0857%

(2) Q62AD-DGH

Item			Model name: Q62AD-DGH				
Connecting with 2-wire transmitter	Input specification	Number of analog input points	2 points (2 channels)				
		Analog input	4 to 20mADC *4(Input resistance 250Ω)				
	Supply power specification	Supply voltage	26±2VDC				
		Maximum supply current	24mADC				
		Short-circuit protection	Available Limit current: 25 to 35mA				
	Check terminals		Available				
Digital output			16-bit signed binary (-768 to 32767) 32-bit signed binary (-1536 to 65535)				
I/O characteristics, Maximum resolution			Analog input range	Maximum resolution		Digital output value (32-bit)	Digital output value (16-bit)
				32-bit	16-bit		
			4 to 20mA	250.0nA	500.0nA	0 to 64000	0 to 32000
			Users range setting	151.6nA	303.2nA		
Accuracy (Accuracy relative to full-scale of digital output)		Reference accuracy *1	±0.05% Digital output value (32-bit): ±32digit *2 Digital output value (16-bit): ±16digit *2				
		Temperature coefficient *3	±71.4ppm/℃ (0.00714 %/℃)				
Conversion speed			10ms/2 channels				
Isolation specifications			Specific isolated area	Isolation method	Dielectric withstand voltage		Insulation resistance
			Between I/O terminal and PLC power supply	Photocoupler isolation	1780VAC rms/3 cycles (elevation 2000m)		500VDC 10MΩ or more
			Between analog input channels	Transformer isolation			
			Between external supply power and analog input	Transformer isolation			
Protection degree			IP2X				
Maximum number of writes for E^2PROM			100,000				
Connected terminal			18 points terminal block				
Applicable wire size			0.3 to 0.75mm^2				
Applicable solderless terminals			R1.25-3 (Solderless terminals with sleeves are not applicable)				
Online module change			Possible				
Multiple CPU system			Compatible				
Number of occupied I/O points			16 points/slot (I/O assignment: intelligent)				
5VDC Internal current consumption			0.33A				
External supply power			24VDC +20%, -15%				
			Ripple, spike within 500mVp-p				
			Inrush current : 5.5A, within 200μs				
			0.19A				
External dimensions			98 (3.86)(H)×27.4 (1.08)(W)×112 (4.41)(D) mm(inch)				
Weight			0.19kg				

*1: Accuracy of offset/gain setting at ambient temperature
The module must be powered up (energized) for 30 minutes prior to operation in order to achieve full accuracy.

*2: "digit" indicates a digital output value.

*3: Accuracy per temperature change of 1℃
Example) Accuracy when temperature changes from 25 to 30℃
0.05% (reference accuracy) + 0.00714 %/℃ (temperature coefficient) × 5℃ (temperature change difference) = 0.0857%

*4: User range setting is 2 to 24mA.

■ I/O conversion characteristic

The I/O conversion characteristic represents the angle formed by a straight line connecting the "offset value" and "gain value" when the analog signals (voltage or current input) from outside the PLC are converted to digital values.

Offset value

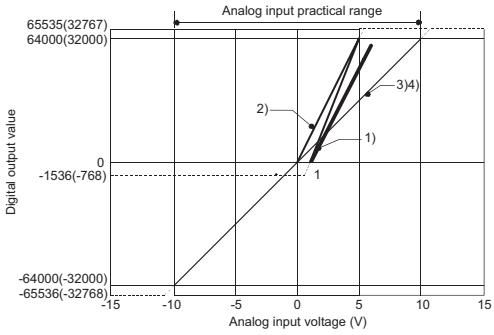
The offset value denotes the analog input value (voltage or current) that makes the digital output value 0.

Gain value

The gain value denotes the analog input value (voltage or current) that makes the digital output value.
32000 (16 bits)
64000 (32 bits)

● Input characteristics of Q64AD-GH

(1) Voltage input characteristic



The value within parentheses indicates the digital output value (16 bits).

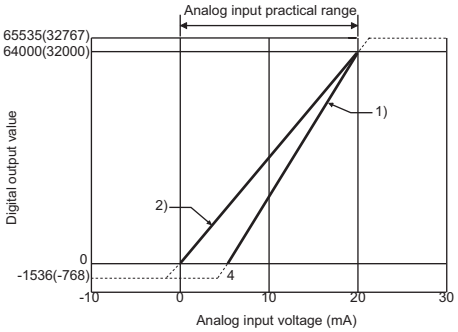
Number	Analog input range setting	Offset value	Gain value	Digital output value (32 bits) *2	Digital output value (16 bits) *2	Maximum resolution	
						32 bits	16 bits
1)	1 to 5V	1V	5V	0 to 64000	0 to 32000	62.5 μV	125.0 μV
2)	0 to 5V	0V	5V			78.2 μV	156.4 μV
3)	-10 to 10V	0V	10V	-64000 to 64000	-32000 to 32000	156.3 μV	312.6 μV
4)	0 to 10V	0V	10V	0 to 64000	0 to 32000		
-	User range setting (Uni-polar)	*1	*1			47.4 μV	94.8 μV
-	User range setting (Bi-polar)	*1	*1	-64000 to 64000	-32000 to 32000		

POINT

1. Set within the analog input range and digital output range for each input range. If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid use in the dotted area of voltage input characteristic.)
2. Do not input an analog input voltage of more than ±15 V. The input elements may be damaged.
3. Set the offset/gain values for the user setting range*1 within a range in which the following conditions are satisfied.
   (a) Offset value, gain value setting range: -10V to 10V
   (b) { (gain value) - (offset value) } > 3.030V
4. When an analog value that exceeds the range for the digital output value*2 is entered, the digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Digital output value (32 bits)		Digital output value (16 bits)	
	Minimum	Maximum	Minimum	Maximum
1 to 5V	-1536	65535	-768	32767
0 to 5V				
-10 to 10V	-65536		-32768	
0 to 10V	-1536		-768	
User range setting (Uni-polar)				
User range setting (Bi-polar)	-65536		-32768	

(2) Current input characteristic



The value within parentheses indicates the digital output value (16 bits).

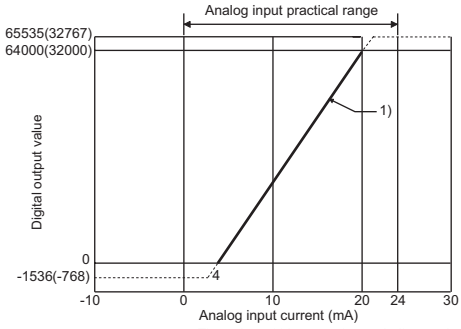
Number	Analog input range setting	Offset value	Gain value	Digital output value (32 bits) *2	Digital output value (16 bits) *2	Maximum resolution	
						32 bits	16 bits
1)	4 to 20mA	4mA	20 mA	0 to 64000	0 to 32000	250.0 nA	500.0 nA
2)	0 to 20mA	0mA	20 mA			312.5 nA	625.0 nA
-	User range setting (Uni-polar)	*1	*1			151.6 nA	303.2 nA

POINT

1. Set within the analog input range and digital output range for each input range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid use in the dotted area of voltage input characteristic.)
2. Do not input an analog input current of more than ±30 mA. The input elements may be damaged.
3. Set the offset/gain values for the user setting range*1 within a range in which the following conditions are satisfied.
   (a) Gain value ≦ 20mA, offset value ≧ 0mA
   (b) { (gain value) - (offset value) } > 9.70mA
4. When an analog value that exceeds the range of the digital output value*2 is entered, the digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Digital output value (32 bits)		Digital output value (16 bits)	
	Minimum	Maximum	Minimum	Maximum
4 to 20mA	-1536	65535	-768	32767
0 to 20mA				
User range setting (Uni-polar)				

● Input characteristic of Q62AD-DGH



The value within parentheses indicates the digital output value (16 bits).

Number	Analog input range setting	Offset value	Gain value	Digital output value (32 bits) *2	Digital output value (16 bits) *2	Maximum resolution	
						32 bits	16 bits
1)	4 to 20mA	4mA	20 mA	0 to 64000	0 to 32000	250.0 nA	500.0 nA
-	User range setting	*1	*1			151.6 nA	303.2 nA

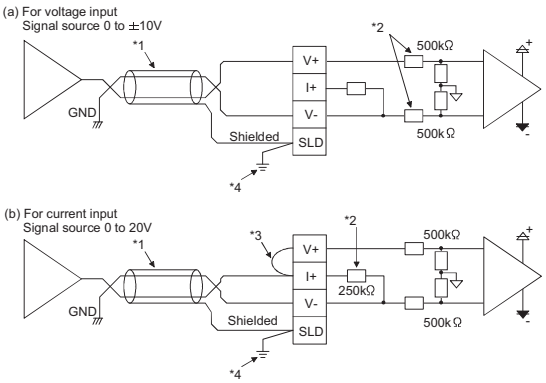
POINT

1. Set within the analog input range and digital output range for each input range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid use in the dotted area of input characteristic.)
2. Set the offset/gain values for the user setting range*1 within a range in which the following conditions are satisfied.
   (a) Gain value ≦ 24mA, offset value ≧ 2mA
   (b) { (gain value) - (offset value) } > 9.70mA
3. When an analog value that exceeds the range of the digital output value*2 is entered, the digital output value will be fixed at the maximum or minimum value.

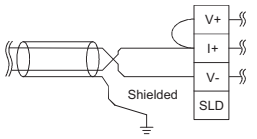
Analog input range setting	Digital output value (32 bits)		Digital output value (16 bits)	
	Minimum	Maximum	Minimum	Maximum
4 to 20mA	-1536	65535	-768	32767
User range setting				

External wiring

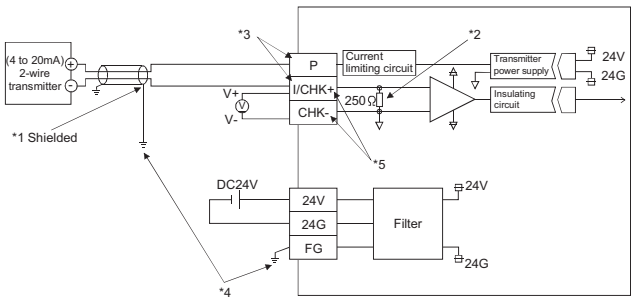
(1) Q64AD-GH



*1 Use a 2-core twisted shielded wire for the power wire.
*2 Shows input resistance.
*3 For current input, be sure to connect to (V+) and (I+) terminals.
*4 Be sure to ground the shield wire of each channel.
The SLD terminal can be used when grounding, however it has not been wired inside the board.
Ground it as shown in the diagram shown above or below.
In addition, ground the FG of the power supply module.



(2) Q62AD-DGH



*1 Use a 2-core twisted shielded wire for the power wire.
*2 Shows input resistance.
*3 To connect with the 2-wire transmitter, be sure to connect to P and I/CHK+.
*4 Always use a ground. In addition, ground the FG of the power supply module.
*5 The check terminals (I/CHK+, CHK-) are used to check the amount of input in mA in relation to the 2-wire transmitter output.
This can be checked since analog inputs of 4 to 20mA are converted to analog outputs of 1 to 5V.
The relationship of this conversion can be expressed by the following formula:

$$\text{Analog output (V)} = \frac{\text{Analog input (mA)}}{1000} \times 250\,\Omega$$

Terminal number	Signal name			
	Q64AD-GH		Q62AD-DGH *	
1	Empty		CH1	P
2	Empty			I/CHK+
3	CH1	V+		CHK-
4		V-	Empty	
5		I+	Empty	
6		SLD	Empty	
7	CH2	V+	Empty	
8		V-	Empty	
9		I+	CH2	P
10		SLD		I/CHK+
11	CH3	V+		CHK-
12		V-	Empty	
13		I+	Empty	
14		SLD	Empty	
15	CH4	V+	Empty	
16		V-	24V	
17		I+	24G	
18		SLD	FG	

* P : Power supply for 2-wire transmitter
I/CHK+ : 2-wire transmitter current input/check (+) terminal
CHK- : Check (-) terminal

System configuration

<Q64AD-GH accessories>

Product	Description
Manual	Q64AD-GH Channel Isolated High Resolution Analog-Digital Converter Module User's Manual (Hardware)

<Q62AD-DGH accessories>

Product	Description
Manual	Q62AD-DGH Channel Isolated High Resolution Analog-Digital Converter Module User's Manual (with Singnal Conditioning Function)

<Separately obtained product>

Product	Description
Manual	Channel Isolated High Resolution A/D Converter Module Channel Isolated High Resolution A/D Converter Module User's Manual (with Singnal Conditioning Function)

■ Applicable systems

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the A/D converter module can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only (*1)
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station (*2)

*1: Refer to the system configuration of each CPU system explained in Section 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O network explained in Section 2.5.2.

<Compatible software packages>

(1) Q64AD-GH compatible software package. The following table shows the compatibility between the systems using the Q64AD-GH with the software packages.

GX Developer is necessary when using a Q64AD-GH module.

		Software version	
		GX Developer	GX Configurator-AD *1
If mounted with Q00J/ Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.13Q or later
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
If mounted with Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	

*1: When using OMC refresh data, use Version 1.16S or later.

(2) Q62AD-DGH compatible software packages

The following table shows the compatibility between the systems using the Q62AD-DGH with the software packages. GX Developer is necessary when using a Q62AD-DGH module.

		Software version	
		GX Developer	GX Configurator-AD
If mounted with Q00J/ Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1.14Q or later
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
If mounted in the Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	

■ Cautions for power supply from Q61P-A1/A2 to Q64AD-GH

When using the Q61P-A1/A2 and Q64AD-GH in combination, it is required to use them within the range in Table below.

This requirement applies to the case where the Q64AD-GH satisfies any of the following conditions.

- The first six digits of serial number are "050914" or earlier.
- The first five digits of "Product information" number are "05081" or earlier.

If it satisfies the above conditions but does not meet the ones outlined in Table below, carry out the following:

- Replace the power supply module with the Q64P.
- Mount the Q64AD-GH to another base unit.

No. of Q64AD-GH modules	Conditions	Available power supply	
		Q61P-A1/A2	Q64P
3 or less	Total current consumption of all modules on the same base is 5.0A or less.	○	○
	Total current consumption of all modules on the same base exceeds 5.0A.	×	○
4	Module other than the Q64AD-GH is not mounted on the same base.	○	○
	Module other than the Q64AD-GH is mounted on the same base.	×	○
5 or more	----	×	○

*: If the modules are used outside the condition range given in Table below, the "POWER" LED of the power supply module may flicker and the PLC CPU system may not start.

Remark

When the Q64AD-GH satisfies any of the following conditions, the above precaution does not apply.

The first six digits of serial number are "051217" or later.

The first five digits of "Product information" number are "05082" or later.

3.2.3 A/D converter module settings, monitoring tool: GX Configurator-AD

Overview

GX Configurator-AD is a utility package to make an initial setting, which is necessary to use A/D converter modules such as Q64AD, Q68ADV, Q68ADI, Q64AD-GH, and Q62AD-DGH, and also to make a setting to automatically read out A/D converted data into a CPU device memory. It is used as an add-in for GX Developer.

Using GX Configurator-AD, the intelligent function module parameters (initial setting / auto refresh setting) can be configured on the screen. In addition, FB* can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

*: FB is function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

Intelligent function module utility

■ Initial setting

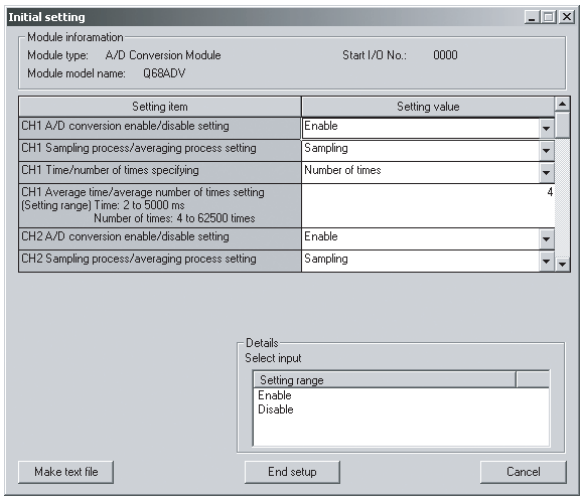
It is possible to configure the initial settings for using the A/D converter modules on the screen. The following lists main items* which require the initial settings.

(1) A/D conversion enable/disable setting
(2) Sampling/Average processing setting
(3) Time averaging • Count averaging specifying
(4) Average time • Average count setting

Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to A/D converter modules when the PLC CPUs enter RUN state.

*: Items which can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of initial setting screen



■ Auto refresh setting

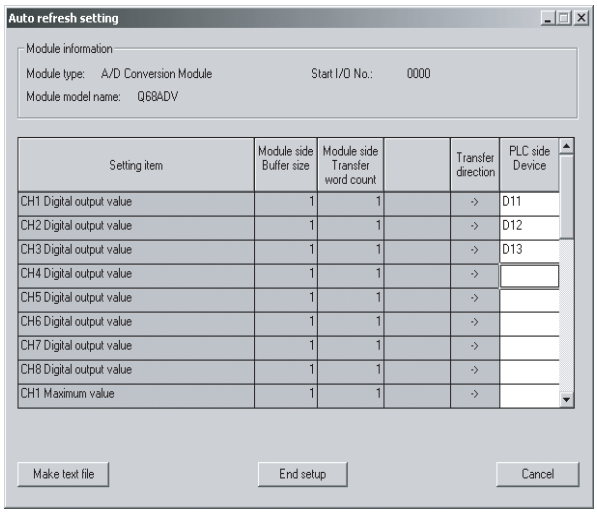
This sets the buffer memory of A/D converter module, which is the target of the auto refresh. The following shows the main items* which are the target of the auto refresh.

(1) Digital output value
(2) Maximum/Minimum
(3) Error code

The specified device automatically reads values, which are set for the auto refresh and stored in the buffer memory of the A/D converter modules, at END instruction executed.

* The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of auto refresh setting screen

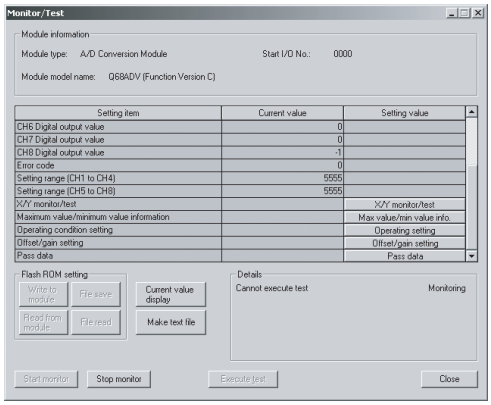


■ Monitor/test

● Monitor/test

This monitors/tests the buffer memories or I/O signals of the A/D converter modules.

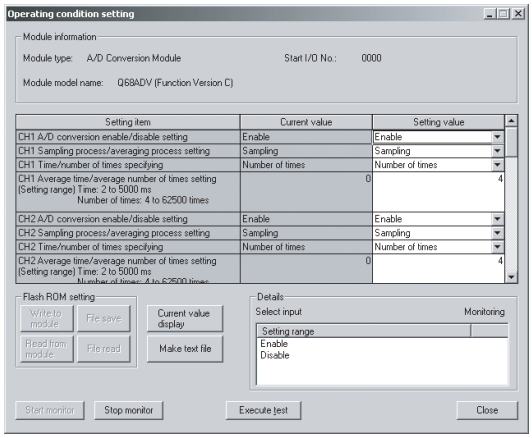
Sample of Monitor/test screen



● Operating condition setting

This changes the A/D conversion enable/disable setting during the operation.

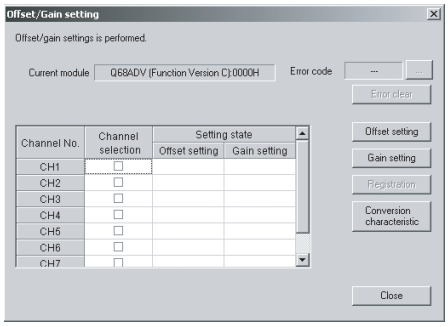
Sample of operating condition setting screen

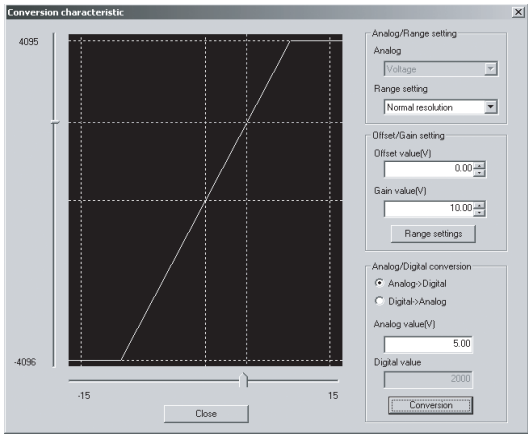


● Offset/gain setting

When users set the arbitrary value at the offset/gain setting (analog input range setting is set to user range setting), the offset/gain setting is easily made viewing the screen.

Sample of offset/gain setting screen

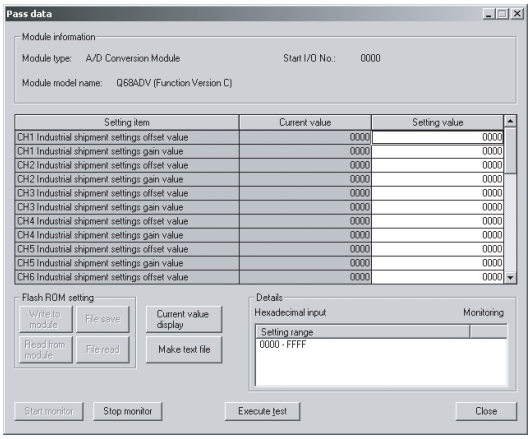




● OMC refresh data

This monitors/sets the OMC refresh data (factory-set offset/gain values, and user range-set offset/gain values).

Sample of OMC refresh data screen



■ FB conversion

FB is generated automatically from the intelligent function module parameters (initial setting/auto refresh).

About the number of parameters that can be set in GX Configurator-AD

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/ Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings. The total number of parameter settings is calculated separately for the initial setting and for the auto refresh setting. The number of parameter settings that can be set for one module in the GX Configurator-AD is as shown below.

Object Module	Initial setting	Automatic refresh setting
Q64AD	2 (Fixed)	13 (Maximum number of settings)
Q68ADV/ADI	2 (Fixed)	25 (Maximum number of settings)
Q64AD-GH	4 (Fixed)	27 (Maximum number of settings)
Q62AD-DGH	8 (Fixed)	15 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-AD is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later*2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	20 MB or more
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® NTR Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-AD in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-AD (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-AD (English version) cannot be used in configuration.

*2: GX Configurator-AD cannot be used as an add-in with GX Developer Version 3 or earlier versions.
In addition, GX Developer Version 8 or later is necessary to use the FB conversion function.

Used operating system and performance required for personal computer

Operating system	Performance Required for Personal Computer	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP Professional	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition	Pentium® 300MHz or more	128MB or more

POINT

New functions of Windows® XP

When Microsoft® Windows® XP Professional Operating System or Microsoft® Windows® XP Home Edition Operating System is used, the following new functions cannot be used.
If any of the following new functions is used, this product may not operate normally.

- Start of application in Windows® compatible mode
- Fast user switching
- Remote desktop
- Large fonts (Details setting of Display properties)

3.2.4 D/A conversion module: Q62DAN, Q64DAN, Q68DAVN, Q68DAIN, Q62DA, Q64DA, Q68DAV, Q68DAI

Overview

Digital data from CPU module are converted into analog signals and output to an external device. By converting the CPU module-processed data into analog data, information can be sent to equipment which handles analog data, e.g. an inverter.

Features

■ Available models

1) Q62DAN, Q62DA ••••• 2 channels: Voltage or current output can be selected for each channel.
2) Q64DAN, Q64DA ••••• 4 channels: Voltage or current output can be selected for each channel.
3) Q68DAVN, Q68DAV•• 8 channels: All of which are voltage output.
4) Q68DAIN, Q68DAI ••• 8 channels: All of which are current output.

■ Improved safety and noise resistance (For Q62DAN, Q64DAN, Q68DAVN and Q68DAIN only)

Insulation between the external power supply and analog output channels improves safety and noise resistance.

■ High-speed conversion processing

80 μs/channel conversion processing speed

■ High degree of accuracy

The conversion accuracy is ±0.1% (When the ambient temperature is 25 ±5℃).

■ Changing the resolution mode

The resolution mode can be changed according to the application, and digital-value resolution settings of 1/4000, 1/12000 or 1/16000 can be selected.

■ Changing the output range

The output range*1 can easily be changed using GX Developer.

*1: The output range refers to the type of offset/gain settings. The most frequently used range is set as the default but the user can also specify their own offset/gain settings.

■ Synchronous output function

This function sets a constant time (120 μs) until the analog value is output after the digital value is written from the PLC CPU. Highly accurate analog control can be achieved by combining this function with a constant scan execution type program for the PLC CPU or the constant scan function*2.

*2: The constant scan function executes the sequence program within a fixed time interval.

■ Analog output HOLD/CLEAR function

This function is set to either retain or clear the analog output value when an error that causes the CPU to stop occurs.

■ Online module change

The module can be changed without the system being stopped.

Also, by using the dedicated instruction (G.OGLOAD, G.OGSTOR) or writing to the buffer and turning on the corresponding Y signal, this enables reading of D/A converter module (changed online) offset/gain settings to the QCPU, and transfer of offset/gain settings to another D/A converter module mounted on a different slot position. (Only between the modules of the same model.)

■ Offset/gain setting

GX Configurator-DA, dedicated instruction (G.OFFGAN) or mode switching setting allows easy switching of the offset/gain setting mode.

■ Easy settings using the utility package

A utility package is sold separately (GX Configurator-DA).
The utility package is not a required item, however, it is useful for on-screen setting of the intelligent function module parameters (initial setting/auto refresh setting). In addition, FB *3 can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

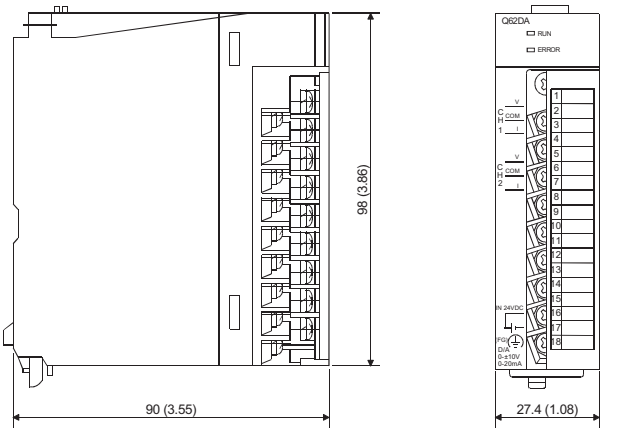
*3: FB is the function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.
For the details of FB, refer to "GX Developer Version 8 Operating Manual (Function Block)".

Appearance

(1) Q62DAN

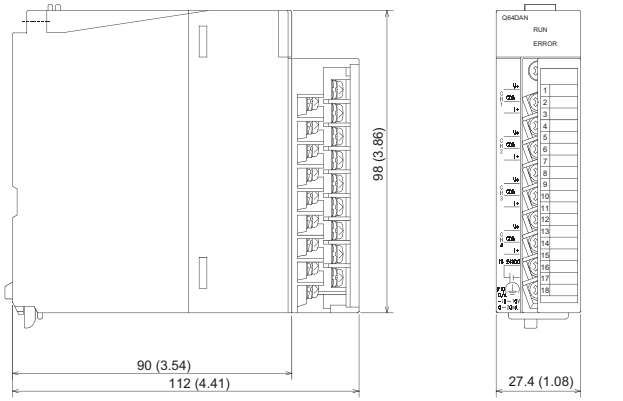
Unit:mm(inch)

(2) Q62DA



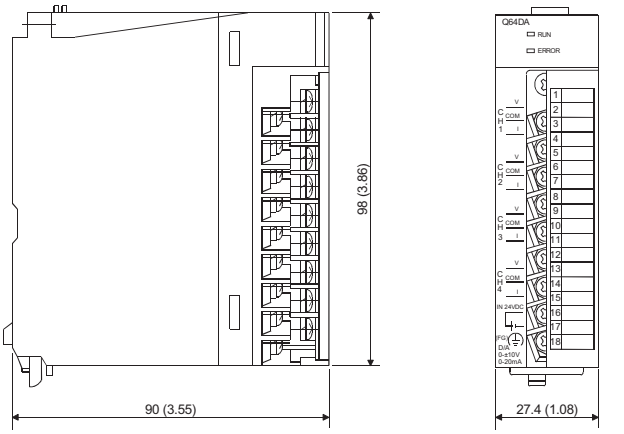
Unit:mm(inch)

(3) Q64DAN



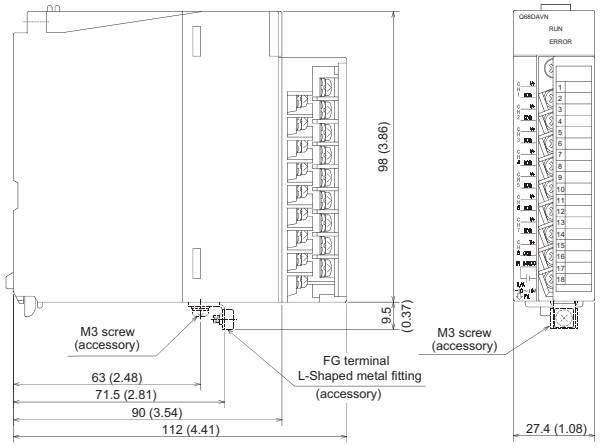
Unit:mm(inch)

(4) Q64DA



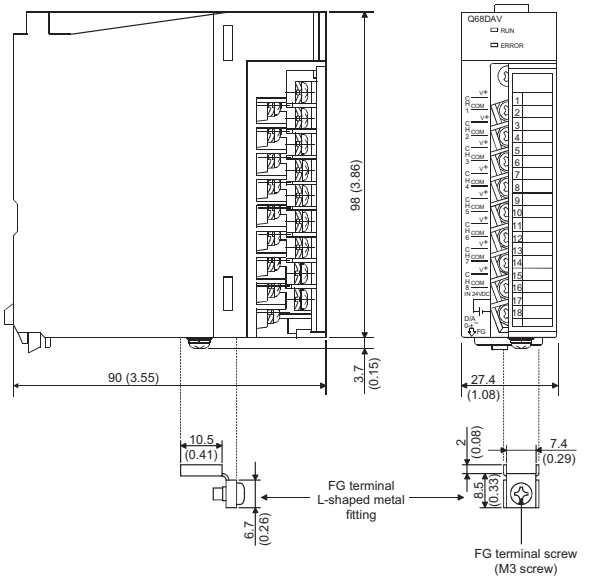
Unit:mm(inch)

(5) Q68DAVN



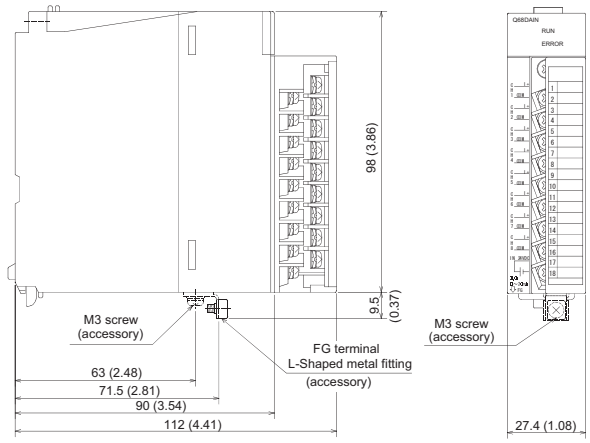
Unit:mm(inch)

(6) Q68DAV



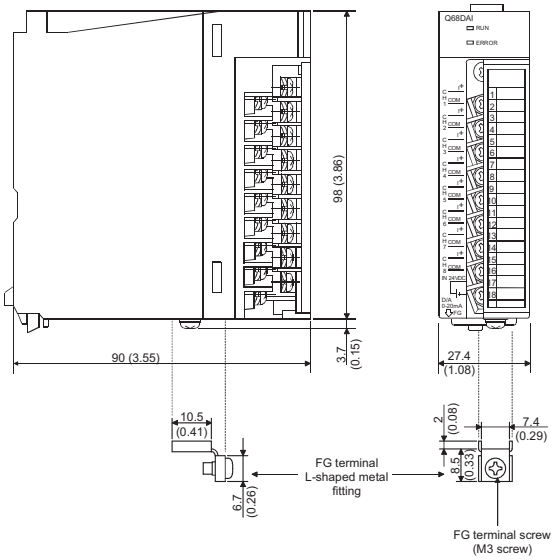
Unit:mm(inch)

(7) Q68DAIN



Unit:mm(inch)

(8) Q68DAI



Unit:mm(inch)

Functions

Item	Function
D/A conversion enable/disable function	(1) Specifies whether to enable or disable the D/A conversion for each channel. (2) By disabling the D/A conversion for the channels that are not used, the conversion speed can be shortened.
D/A output enable/disable function	(1) Specifies whether to output the D/A converted value or the offset value for each channel. (2) The conversion speed stays constant regardless of the D/A output is enabled or disabled.
Synchronous output function	An analog output synchronized with the PLC CPU can be obtained.
Analog output HOLD/CLEAR function	The output analog value can be retained when the PLC CPU module is stopped or when an error occurs.
Analog output test during PLC CPU STOP	When the CH. ☐ output enable/disable flag is forced ON during PLC CPU STOP, the D/A converted analog value is output.
Resolution mode	(1) The resolution mode can be changed according to the application, and the resolution setting range is selectable from 1/4000, 1/12000, and 1/16000. (2) The resolution mode setting is applicable to all channels. (3) See Performance Specifications for the digital input values and maximum resolution in normal resolution mode and high resolution mode.
Online module change	Module can be changed without the system being stopped.

Performance specifications

Item \ Model name		Q62DAN	Q64DAN	Q68DAVN	Q68DAIN
Number of analog output points		2 points (2 channels)	4 points (4 channels)	8 points (8 channels)	
Digital input		16-bit signed binary (normal resolution mode: -4096 to 4095, high resolution mode: -12288 to 12287, -16384 to 16383)			
Analog output	Voltage	-10 to 10 V DC (External load resistance value: 1 kΩ to 1MΩ)			---
	Current	0 to 20 mA DC (External load resistance value: 0Ω to 600Ω)		---	0 to 20 mA DC (External load resistance value: 0Ω to 600Ω)

I/O characteristics, Maximum resolution

Analog output range		Normal resolution mode: Digital input value	Normal resolution mode: Maximum resolution	High resolution mode: Digital input value	High resolution mode: Maximum resolution
Voltage	0 to 5V	0 to 4000	1.25mV	0 to 12000	0.416mV
	1 to 5V		1.0mV		0.333mV
	-10 to 10V	-4000 to 4000	2.5mV	-16000 to 16000	0.625mV
	User range setting		0.75mV	-12000 to 12000	0.333mV
Current	0 to 20mA	0 to 4000	5μA	0 to 12000	1.66μA
	4 to 20mA		4μA		1.33μA
	User range setting	-4000 to 4000	1.5μA	-12000 to 12000	0.83μA

Accuracy (Accuracy in respect to maximum analog output value)	Ambient temperature 25 ± 5℃	Within ±0.1 % (Voltage: ±10 mV, Current: ±20μA)			
	Ambient temperature 0 to 55℃	Within ±0.3 % (Voltage: ±30 mV, Current: ±60 μA)			
Conversion speed		80μs/channel			
Absolute maximum output	Voltage	±12V			---
	Current	21mA		---	21mA
Output short circuit protection		Available			
Insulation method		Between the I/O terminal and PLC power supply: Photocoupler insulation Between output channels: No insulation Between external supply power and analog output: Transformer isolation			
Dielectric withstand voltage		Between the I/O terminal and PLC power supply: 500VAC for 1 minute Between external supply power and analog output :500VAC for 1 minute			
Insulation resistance		Between the I/O terminal and PLC power supply: 500VDC 20MΩ or more Between external supply power and analog output :500VDC 20MΩ or more			
Protection degree		IP2X			
E^2PROM write count		Max. 100 thousand times			
Connected terminals		18-points terminal block			
Applicable wire size		0.3 to 0.75 mm^2			
Applicable solderless terminal		R 1.25-3 (A solderless terminal with sleeve cannot be used)		FG terminal : R1.25-3, 1.25-YS3, RAV1.25-3, V1.25-YS3A Other than FG terminal: R1.25-3 (A solderless terminal with sleeve cannot be used)	
Online module change		Possoble[*1]			
Multiple CPU system		Compatible[*2]			
Number of occupied I/O points		16 points/slot (I/O assignment: intelligent 16 points)			
5 V DC Internal current consumption		0.33A	0.34A	0.39A	0.38A
External supply power		DC24V +20%, -15%			
		Ripple, spike 500 mV p-p or less			
		Inrush current: 2.5 A, within 250μs	Inrush current: 2.5 A, within 260μs	Inrush current: 2.5 A, within 230μs	Inrush current: 2.5 A, within 230μs
		0.15A	0.24A	0.20A	0.27A
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×112 (3.54)(D) mm(inch)			
Weight		0.19kg	0.20kg	0.20kg	

Performance specifications

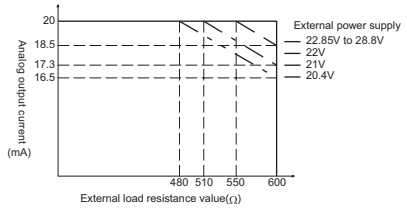
Item \ Model name		Q62DA	Q64DA	Q68DAV	Q68DAI
Number of analog output points		2 points (2 channels)	4 points (4 channels)	8 points (8 channels)	
Digital input		16-bit signed binary (normal resolution mode: -4096 to 4095, high resolution mode: -12288 to 12287, -16384 to 16383)			
Analog output	Voltage	-10 to 10 V DC (External load resistance value: 1 kΩ to 1MΩ)			---
	Current	0 to 20 mA DC (External load resistance value:Refer to *3)		---	0 to 20 mA DC (External load resistance value:Refer to *3)

I/O characteristics, Maximum resolution

Analog output range		Normal resolution mode		High resolution mode	
		Digital input value	Maximum resolution	Digital input value	Maximum resolution
Voltage	0 to 5V	0 to 4000	1.25mV	0 to 12000	0.416mV
	1 to 5V		1.0mV		0.333mV
	-10 to 10V	-4000 to 4000	2.5mV	-16000 to 16000	0.625mV
	User range setting		0.75mV	-12000 to 12000	0.333mV
Current	0 to 20mA	0 to 4000	5μA	0 to 12000	1.66μA
	4 to 20mA		4μA		1.33μA
	User range setting	-4000 to 4000	1.5μA	-12000 to 12000	0.83μA

Accuracy (Accuracy in respect to maximum analog output value)	Ambient temperature 25 ± 5℃	Within ±0.1 % (Voltage: ±10 mV, Current: ±20μA)			
	Ambient temperature 0 to 55℃	Within ±0.3 % (Voltage: ±30 mV, Current: ±60 μA)			
Conversion speed		80μs/channel			
Absolute maximum output	Voltage	±12V			---
	Current	21mA		---	21mA
Output short circuit protection		Available			
Insulation method		Between the I/O terminal and PLC power supply: Photocoupler insulation Between output channels: No insulation Between external supply power and analog output: No insulation			
Dielectric withstand voltage		Between the I/O terminal and PLC power supply: 500VAC for 1 minute			
Insulation resistance		Between the I/O terminal and PLC power supply: 500VDC 20MΩ or more			
Protection degree		IP2X			
E^2PROM write count		Max. 100 thousand times			
Connected terminals		18-points terminal block			
Applicable wire size		0.3 to 0.75 mm^2			
Applicable solderless terminal		R 1.25-3 (A solderless terminal with sleeve cannot be used)		FG terminal : R1.25-3, 1.25-YS3, RAV1.25-3, V1.25-YS3A Other than FG terminal: R1.25-3 (A solderless terminal with sleeve cannot be used)	
Online module change		Possoble*2			
Multiple CPU system		Compatible*3			
Number of occupied I/O points		16 points/slot (I/O assignment: intelligent 16 points)			
5 V DC Internal current consumption		0.33A	0.34A	0.39A	0.38A
External supply power		DC24V +20%, -15%			
		Ripple, spike 500 mV p-p or less			
		Inrush current: 1.9 A, within 300μs	Inrush current: 3.1 A, within 300μs	Inrush current: 3.3 A, within 70μs	Inrush current: 3.1 A, within 75μs
		0.12A	0.18A	0.19A	0.28A
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)			
Weight		0.19kg		0.18kg	

*1: Products with function version C or later are compatible.
*2: Products with function version B or later are compatible.
*3: When the voltage of the external power supply is less than 22.85V DC, the analog output current and the external load resistance value are as follows.



■ I/O conversion characteristics

I/O conversion characteristics are used for converting the digital value written from the PLC CPU to an analog output value (voltage or current output), and represented by inclined straight lines when offset and gain values are included.

Offset value

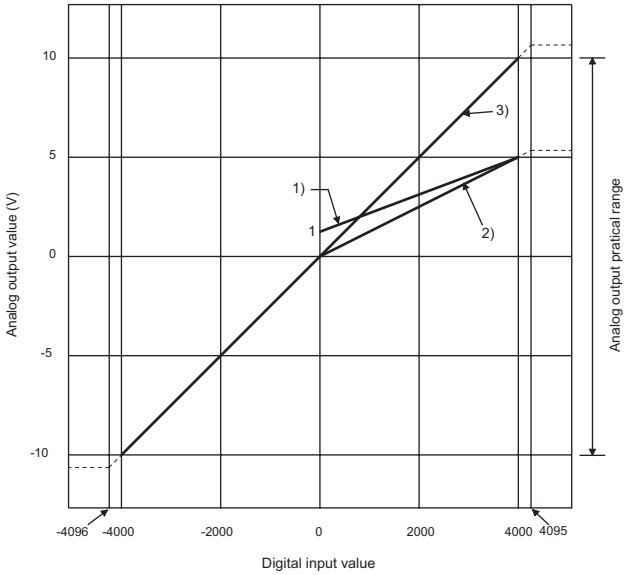
The offset value becomes the analog output value (voltage or current) when the digital input value set from the PLC CPU is 0.

Gain value

The gain value denotes the analog output value (voltage or current) when the digital input value set from the PLC CPU is 4000 (in normal resolution mode),
12000 (when 1 to 5V, 0 to 5V, 4 to 20 mA, 0 to 20 mA or the user range setting is selected in high resolution mode),
16000 (when -10 to 10V is selected in high resolution mode).

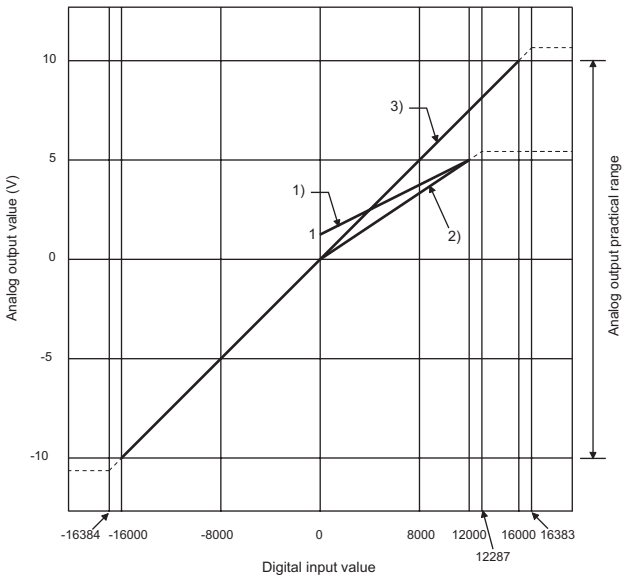
● Voltage output characteristic

(1) Voltage output characteristic in normal resolution mode



Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	1 to 5 V	1V	5V	0 to 4000	1.0mV
2)	0 to 5 V	0V	5V		1.25mV
3)	-10 to 10 V	0V	10V	-4000 to 4000	2.5mV
-	User range setting	*1	*1	-4000 to 4000	0.75mV

(2) Voltage output characteristic in high resolution mode



Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	1 to 5 V	1V	5V	0 to 12000	0.333mV
2)	0 to 5 V	0V	5V		0.416mV
3)	-10 to 10 V	0V	10V	-16000 to 16000	0.625mV
-	User range setting	*1	*1	-12000 to 12000	0.333mV

POINT

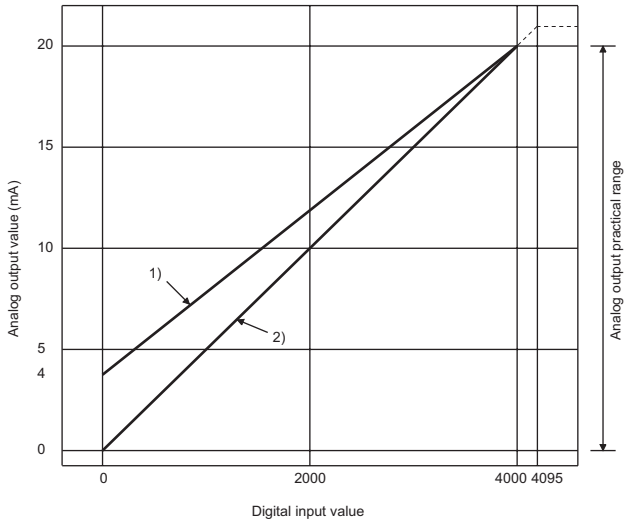
1. Set within the digital input range and analog output range for each output range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of voltage output characteristic.)
2. Set the offset/gain values for the user setting range *1 within a range in which the following conditions are satisfied.
   (a) Setting range is from -10 to 10 V.
   (b) { (Gain value) - (Offset value) } > A

<Value of A>

Normal resolution mode	High resolution mode
3.0V	4.0V

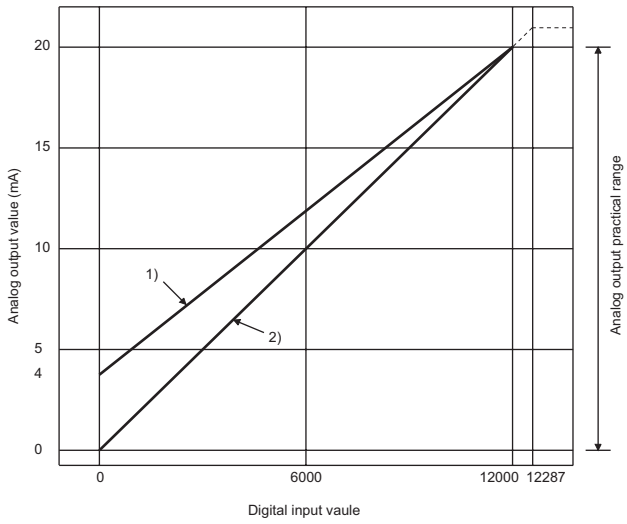
● **Current output characteristic**

(1) Current output characteristic in normal resolution mode



Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	4 to 20 mA	4mA	20mA	0 to 4000	4 μA
2)	0 to 20 mA	0mA	20mA		5 μA
-	User range setting	*1	*1	-4000 to 4000	1.5 μA

(2) Current output characteristic in high resolution mode



Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	4 to 20 mA	4mA	20mA	0 to 12000	1.66 μA
2)	0 to 20 mA	0mA	20mA		1.33 μA
-	User range setting	*1	*1	-12000 to 12000	0.83 μA

POINT

1. Set within the digital input range and analog output range for each output range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of current output characteristic.)
2. Set the offset/gain values for the user setting range *1 within a range in which the following conditions are satisfied.
   (a) Setting range is from 0 to 20 mA
   (b) { (Gain value) - (Offset value) } > A
   <Value of A>

Normal resolution mode	High resolution mode
6.0mA	10.0mA

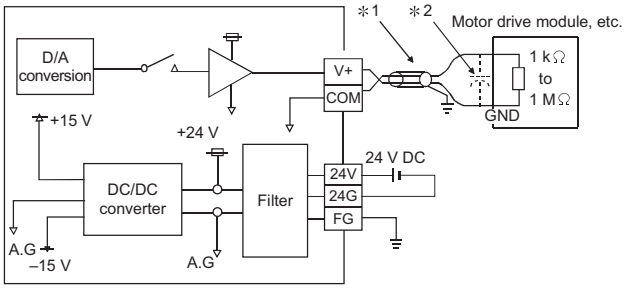
■ Conversion speed

The conversion speed is "80μs × the number of conversion enabled channels".
By setting the unused channels to D/A conversion disabled in buffer memory address 0 (Un\G0), the conversion speed can be increased.

External wiring

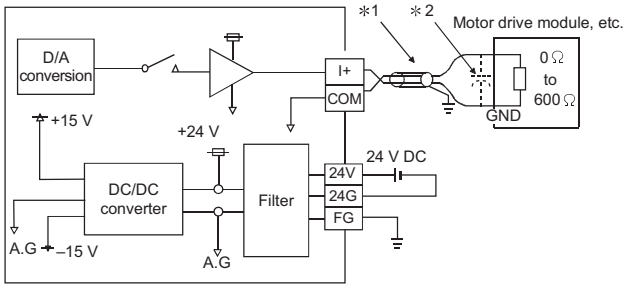
(1) For Q62DAN, Q62DA, Q64DAN and Q64DA

(a) For voltage output



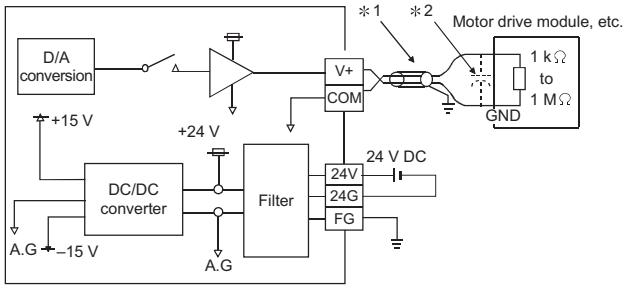
*1 Use a twisted two core shielded wire for the power wire.
*2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 m F25V capacitor between the V+/I+ terminal and COM.

(b) For current output



*1 Use a twisted two core shielded wire for the power wire.
*2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 m F25V capacitor between the V+/I+ terminal and COM.

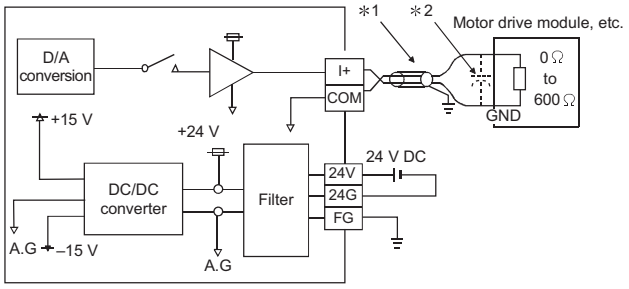
(2) For Q68DAVN and Q68DAV



*1 Use a twisted two core shielded wire for the power wire.

*2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 m F25V capacitor between the V+/I+ terminal and COM.

(3) For Q68DAIN and Q68DAI



*1 Use a twisted two core shielded wire for the power wire.

*2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 m F25V capacitor between the V+/I+ terminal and COM.

Terminal number	Signal name							
	Q62DAN, Q62DA		Q64DAN, Q64DA		Q68DAVN, Q68DAV		Q68DAIN, Q68DAI	
1	CH1	V+	CH1	V+	CH1	V+	CH1	I+
2		COM		COM		COM		COM
3		I+		I+	CH2	V+	CH2	I+
4	Vacant		Vacant			COM		COM
5	CH2	V+	CH2	V+	CH3	V+	CH3	I+
6		COM		COM		COM		COM
7		I+		I+	CH4	V+	CH4	I+
8	Vacant		Vacant			COM		COM
9	Vacant		CH3	V+	CH5	V+	CH5	I+
10	Vacant			COM		COM		COM
11	Vacant			I+	CH6	V+	CH6	I+
12	Vacant		Vacant			COM		COM
13	Vacant		CH4	V+	CH7	V+	CH7	I+
14	Vacant			COM		COM		COM
15	Vacant			I+	CH8	V+	CH8	I+
16	24V					COM		COM
17	24G				24V			
18	FG				24G			

System configuration

<Q62DAN, Q62DA, Q64DAN, Q64DA, Q68DAVN, Q68DAV, Q68DAIN, Q68DAI accessories>

Product	Description
Manual	Q62DAN, Q62DA, Q64DAN, Q64DA, Q68DAVN, Q68DAV, Q68DAIN, Q68DAI Digital-Analog Converter Module User's Manual (Hardware)

<Separately obtained products>

The following manual must be obtained separately.

Product	Description
Manual	Q62DAN, Q62DA, Q64DAN, Q64DA, Q68DAVN, Q68DAV, Q68DAIN, Q68DAI Digital-Analog Converter Module User's manual

■ Applicable systems

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the D/A converter module can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only*1
	Q12HPCPU Q25HPCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the User's Manual (Function Explanation, Program Fundamentals) of the CPU module used.

*2: Refer to Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network).

<Compatible software package>

The following shows systems using D/A converter module with their compatible software.

GX Developer is necessary to use D/A converter module.

		Software version	
		GX Developer	GX Configurator-DA *1 *2
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1. 10L or later (SW0D5C-QDAU 60G or earlier is not compatible)
	Multiple CPU system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	SW0D5C-QDAU 00A or later
	Multiple CPU system	Version 6 or later	SW0D5C-QDAU 20C or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7. 10L or later	Version 1.13P or later (SW0D5C-QDAU 60G or earlier is not compatible)
	Multiple CPU system		
When mounting on MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QDAU 30D or later

*1: Refer to the User's Manual of D/A converter module for the combinations of the D/A converter module functions and the GX Configuration-DA software versions.
When Q68DAVN, Q68DAIN, Q68DAV or Q68DAI is used, use SW0D5C-GDAV 60G or later.

*2: Model name selection of Q62DAN, Q64DAN, Q68DAVN and Q68DAIN can be made with GX Configurator-DA Version 2.03D or later.
To use the software packages earlier than version 2.03D, select a model name without "N" for each model.

3.2.5 Channel isolated D/A conversion module: Q62DA-FG

Overview

This D/A converter module has realized channel isolation, high accuracy, output monitor function, warning output function, disconnection detection function, and online module change. When used with the process CPU, this module can support process control.

Features

■ Channel isolated

Isolated between the channels, and also between the external power supply and channels.

■ High accuracy

The reference accuracy*1 is as high as ±0.1% and the temperature coefficient*2 is as high as ±80ppm/℃.

*1: Accuracy of offset/gain setting at ambient temperature.

*2: Accuracy per temperature change of 1℃
Example) Accuracy when the ambient temperature varies from 25℃ to 30℃
0.1% (reference accuracy) + 0.008%/℃ (temperature coefficient) × 5℃ (temperature variation difference) = 0.14%

■ Changing the output range

The output range *3 can be easily set from GX Developer.

*3: The output range refers to the type of offset/gain settings. The most frequently used range is set as the default but the user can also set the offset/gain.

■ Analog output hold/clear function

This function is used to set whether the analog output value will be held or cleared when the CPU module is stopped or when an error that causes the CPU to stop occurs.

■ Output monitor function

The analog output value output by D/A conversion is reconverted into a digital value within the Q62DA-FG and the result is stored into the buffer memory as an output monitor value.

■ Warning output function

A warning is output if a digital input value falls outside the setting range.

■ Rate control function

The increment and decrement of the analog output value per conversion cycle can be restricted.

■ Disconnection detection function

Monitors the output value to detect a disconnection when analog output range is 4 to 20mA, or the user-defined range is 1.

■ Online module change

The module can be changed without the system being stopped. Also, by using the dedicated instruction (G.OGLOAD, G.OGSTOR) or writing to the buffer and turning on the corresponding Y signal, this enables reading of Q62DA-FG converter module (changed online) offset/gain settings to the QCPU, and transfer of offset/gain settings to another Q62DA-FG converter module mounted on a different slot position. (Only between the modules of the same model.)

■ Offset/gain setting

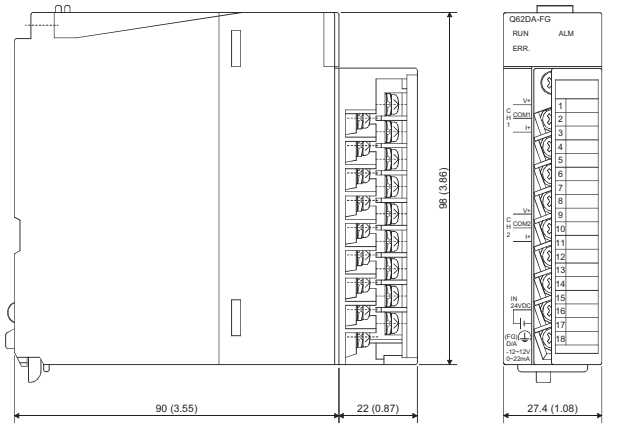
GX Configurator-DA, dedicated instruction (G.OFFGAN) or mode switching setting allows easy switching of the offset/gain setting mode.

■ Easy settings using the utility package

A utility package is sold separately (GX Configurator-DA). The utility package is not a required item, however, it is useful for on-screen setting of the intelligent function module parameters (initial setting/auto refresh setting). In addition, FB *4 can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

*4: FB is the function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

Appearance



Unit:mm(inch)

Functions

Item	Function
D/A conversion enable/disable function	(1) Specifies whether to enable or disable the D/A conversion for each channel. (2) The conversion speed is 10ms regardless of the number of channels that are enabled for conversion.
D/A output enable/disable function	(1) Specifies whether to output the D/A converted value or the offset value for each channel. (2) The conversion speed is 10ms constant independently of whether the output is enabled or disabled.
Analog output HOLD/CLEAR function	The output analog value can be retained when the PLC CPU module is stopped or when an error occurs.

Item	Function
Analog output test during PLC CPU STOP	When the CH□ output enable/disable flag is forced ON during PLC CPU STOP, the D/A converted analog value is output.
Output monitor function	The analog output value output by D/A conversion is reconverted into a digital value within the Q62DA-FG and the result is stored into the buffer memory as an output monitor value.
Warning output function	A warning is output if a digital input value falls outside the setting range.
Rate control function	The increment and decrement of the analog output value per conversion cycle can be restricted.
Disconnection detection function	Monitors the output value to detect a disconnection when analog output range is 4 to 20mA, or the user-defined range is 1.
Online module change	The module can be changed without the system being stopped.

Performance specifications

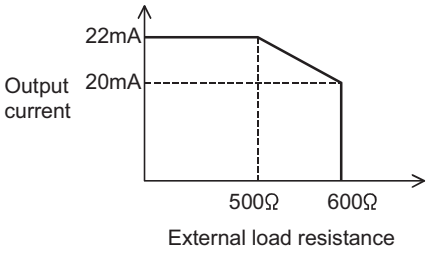
Item \ Type			Q62DA-FG			
Number of analog outputs			2 points (2 channels)			
Digital input			16-bit signed binary (-12288 to 12287, -16384 to 16383)			
Analog output	Voltage		-12 to 12VDC (External load resistance: 1kΩ to 1MΩ)			
	Current		0 to 20mADC (External load resistance: 0Ω to 600Ω) 0 to 22mADC (External load resistance please refer to Note 3)			
I/ O characteristics maximum resolution			Analog output range		Digital input value	Maximum resolution
		Voltage	0 to 5V		0 to 12000	0.416mV
			1 to 5V			0.333mV
			-10 to 10V		-16000 to 16000	0.625mV
			User range setting 2		-12000 to 12000	0.366mV
			User range setting 3			0.183mV
		Current	0 to 20mA		0 to 12000	1.66μA
			4 to 20mA			1.33μA
			User range setting 1		-12000 to 12000	0.671μA
Accuracy (Accuracy relative to maximum analog output value)	Reference accuracy *1		Within ±0.1% (Voltage: ±10mV, Current: ±20μA)			
	Temperature coefficient *2		±80ppm/℃ (0.008%/℃)			
Conversion speed			10ms/2 channels			
Absolute maximum output			Voltage	±13V		
			Current	23mA		
Output monitor	Resolution		12bit			
	Reference accuracy *1		±0.2%			
	Temperature coefficient *2		±160ppm/℃(0.016%/℃)			
Output short-circuit protection			Available			
Isolation specifications			Specific isolated area	Isolation method	Dielectric withstand voltage	Insulation resistance
			Between the I/O terminal and PLC power supply	Photocoupler isolation	1780VAC rms/3 cycles (elevation 2000m)	500VDC 10MΩ or more
			Between analog output channels	Transformer isolation		
			Between external supply power and analog output cannel	Transformer isolation		
Protection degree			IP2X			
Maximum number of writes for E^2PROM			MAX 100 thousand times			
Connected terminal			18 points terminal block			

Item \ Type	Q62DA-FG
Applicable wire size	0.3 to 0.75mm^2
Applicable solderless terminals	R 1.25-3 (Solderless terminals with sleeves are not applicable)
Online module change	Possible
Multiple CPU system	Compatible
Number of occupied I/O points	16 points/slot (I/O assignment: intelligent)
5 VDC Internal current consumption	0.37A
External supply power	24VDC +20%, -15%
	Ripple, spike within 500 mV p-p
	Inrush current: 5.2A, within 300 μ s
	0.3A
External dimensions	98 (3.86)(H)×27.4 (1.08)(W)×112 (4.41)(D) mm(inch)
Weight	0.20kg

*1: Accuracy of offset/gain setting at ambient temperature
The module must be powered up (energized) for 30 minutes prior to operation in order to achieve full accuracy.

*2: Accuracy per temperature change of 1℃
Example: Accuracy when temperature changes from 25 to 30℃
0.1% (Reference accuracy) + 0.008%/℃ (temperature coefficient) × 5℃ (temperature change difference) = 0.14%

*3: The following shows the external load resistance value when output current is 20mA or more.



■ I/O conversion characteristics

I/O conversion characteristics are used for converting the digital value written from the PLC CPU to an analog output value (voltage or current output), and represented by inclined straight lines when offset and gain values are included.

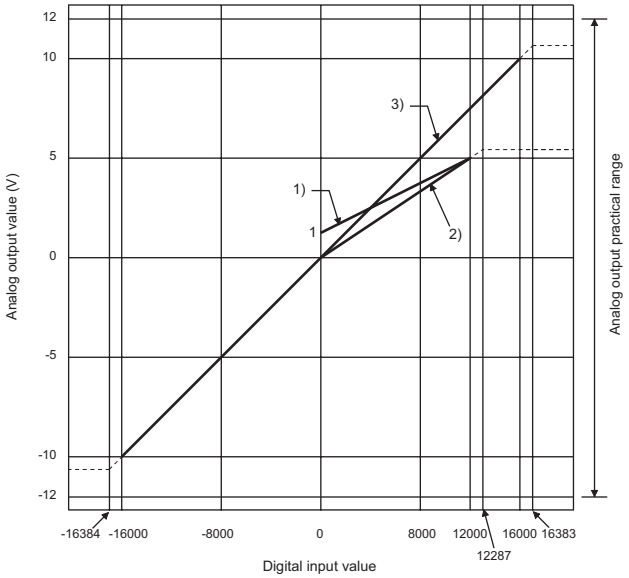
Offset value

The offset value becomes the analog output value (voltage or current) when the digital input value set from the PLC CPU is 0.

Gain value

The gain value denotes the analog output value (voltage or current) when the digital input value set from the PLC CPU is 12000 (when 1 to 5V, 0 to 5V, 4 to 20 mA, 0 to 20 mA or the user range setting1 to 3 is selected),
16000 (when -10 to 10V is selected).

● Voltage output characteristic

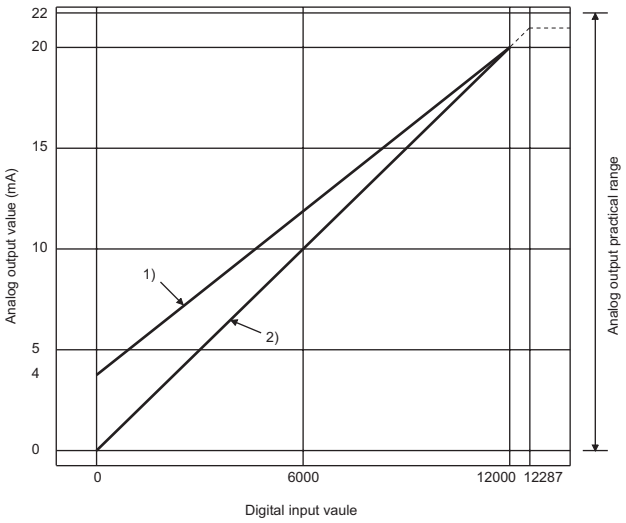


Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	1 to 5V	1V	5V	0 to 12000	0.333 mV
2)	0 to 5V	0V	5V		0.416 mV
3)	-10 to 0V	0V	10V	-16000 to 16000	0.625 mV
-	User range setting2	*1	*1	-12000 to 12000	0.366 mV
-	User range setting3	*2	*2		0.183 mV

POINT

1. Set within the digital input range and analog output range for each output range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of voltage output characteristic.)
2. Set the offset/gain values for the user range setting2 *1 within a range in which the following conditions are satisfied.
   (a) Setting range is from -12 to 12 V.
   (b) { (Gain value) - (Offset value) } > 4.5A
3. Set the offset/gain values for the user range setting3 *2 within a range in which the following conditions are satisfied.
   (a) Setting range is from 0.5 to 6 V.
   (b) { (Gain value) - (Offset value) } > 3A

● Current output characteristic



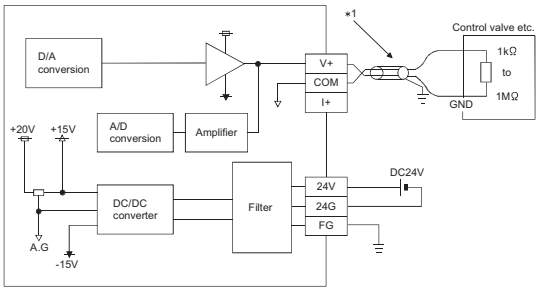
Number	Output value range setting	Offset value	Gain value	Digital input value	Maximum resolution
1)	4 to 20 mA	4mA	20mA	0 to 12000	1.33 μA
2)	0 to 20 mA	0mA	20mA		1.66 μA
-	User range setting1	*1	*1	-12000 to 12000	0.671 μA

POINT

1. Set within the digital input range and analog output range for each output range.
   If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area of current output characteristic.)
2. Set the offset/gain values for the user range setting1 *1 within a range in which the following conditions are satisfied.
   (a) Setting range is from 0 to 22 mA.
   (b) { (Gain value) - (Offset value) } > 10mA

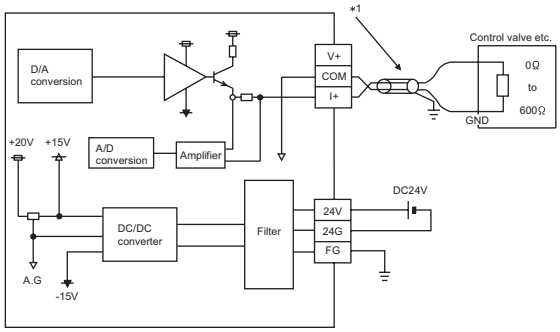
External wiring

● For voltage output



*1 Use a twisted two core shielded wire for the power wire.

● For current output



*1 Use a twisted two core shielded wire for the power wire.

Terminal number	Signal name	
1	CH1	V+
2		COM1
3		I+
4	Vacant	
5	Vacant	
6	Vacant	
7	Vacant	
8	Vacant	
9	CH2	V+
10		COM2
11		I+
12	Vacant	
13	Vacant	
14	Vacant	
15	Vacant	
16	24V	
17	24G	
18	FG	

System configuration

<Q62DA-FG accessories>

Product	Description
Manual	Q62DA-FG Channel Isolated Digital-Analog Converter Module User's Manual (Hardware)

<Separately obtained products>

The following manual must be obtained separately.

Product	Description
Manual	Q62DA-FG Channel Isolated Digital-Analog Converter Module User's Manual

■ Applicable systems

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the Q62DA-FG can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Compatible software packages>

Compatibility between systems which use Q62DA-FG module and software packages are as shown below.

GX Developer is necessary when using a Q62DA-FG.

		Software version	
		GX Developer	GX Configurator-DA
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1.14Q or later
	Multiple CPU system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	

3.2.6 D/A conversion module setting, monitoring tool: GX Configurator-DA

Overview

GX Configurator-DA is a utility package to make an initial setting, which is necessary to use D/A converter modules such as Q62DA, Q64DA, Q68DAV, Q68DAI, and Q62DA-FG, and also to make a setting to automatically read out D/A converted data into a CPU device memory. It is used as an add-in for GX Developer.

Using GX Configurator-DA, the intelligent function module parameters (initial setting/auto refresh setting) can be configured on the screen. In addition, FB* can be generated automatically from the intelligent function module parameters that have been set up and used in a sequence program.

*: FB is function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program. This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

Intelligent function module utility

■ Initial setting

It is possible to configure the initial settings for using the D/A converter modules on the screen. The following shows the main items* which require the initial settings.

(1) D/A conversion enable/disable setting

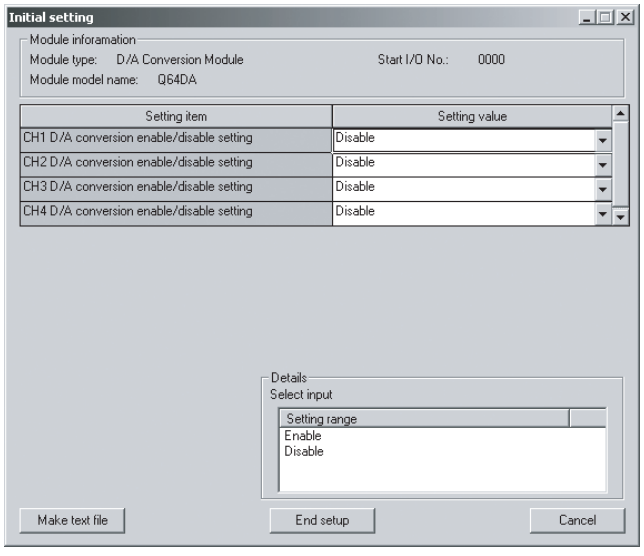
(2) Disconnection detection setting (Q62DA-FG only)

(3) Alarm output setting (Q62DA-FG only)

Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to D/A converter modules when the PLC CPUs enter RUN state.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of initial setting screen



■ Auto refresh setting

This sets the buffer memory of D/A converter module, which is the target of the auto refresh. The following shows the main items* which are the target of the auto refresh.

(1) Digital value

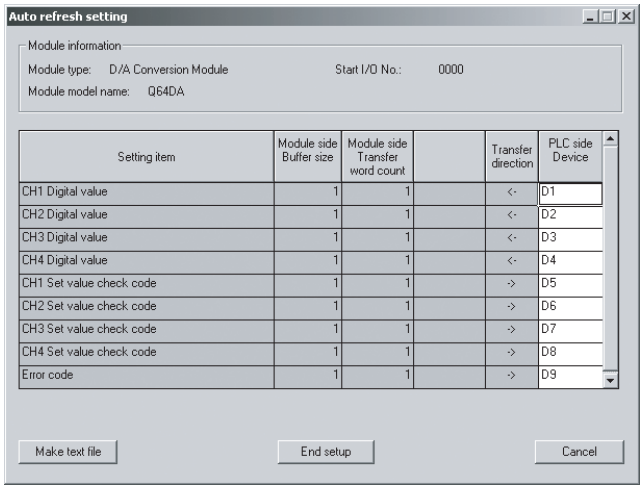
(2) Set value check code

(3) Error code

The specified device automatically reads values, which are set for the auto refresh and stored in the buffer memory of the D/A converter modules, at END instruction executed.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of auto refresh setting screen

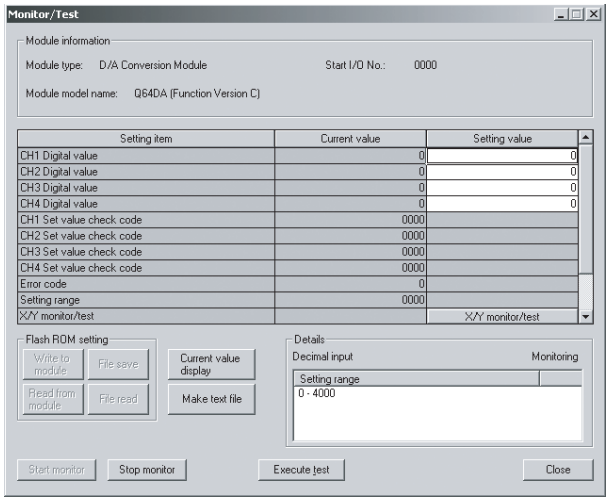


■ Monitor/test

● Monitor/test

This monitors/tests the buffer memories or I/O signals of the D/A converter modules.

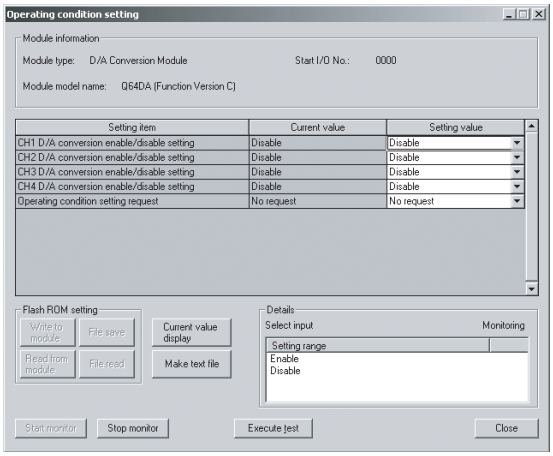
Sample of Monitor/test screen



● Operating condition setting

This changes the D/A conversion enable/disable setting during the operation.

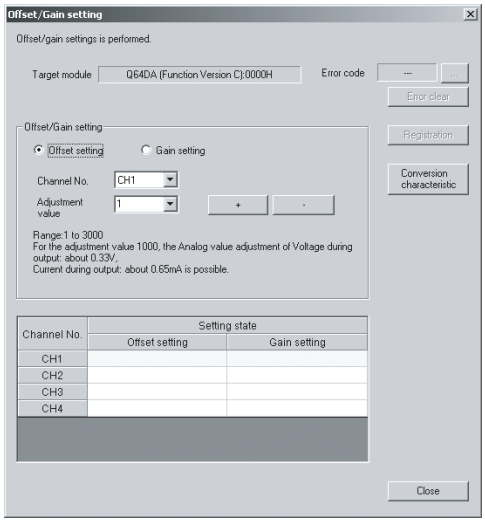
Sample of operating condition setting screen

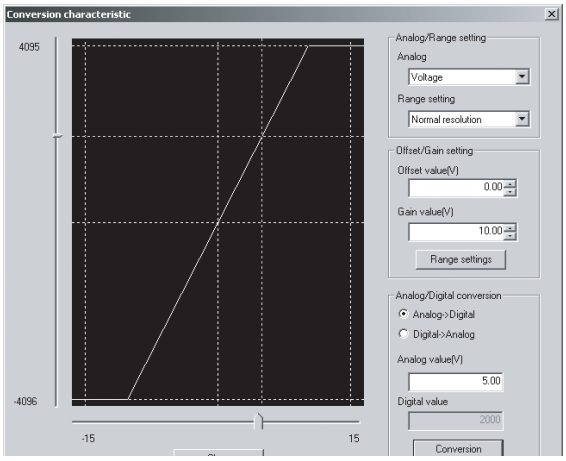


● Offset/gain setting

When users set the arbitrary value at the offset/gain setting (analog output range setting is set to user range setting), the offset/gain setting is easily made with viewing the screen.

Sample of offset/gain setting screen

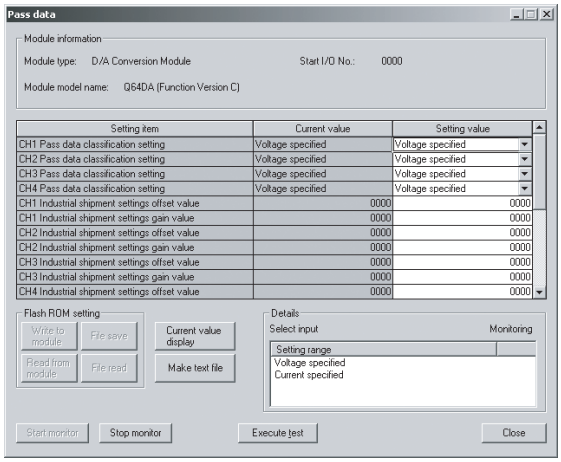




● OMC refresh data

This monitors/sets the OMC refresh data (OMC refresh data type setting, factory-set offset/gain values, and user range-set offset/gain values).

Sample of OMC refresh data screen



■ FB conversion

FB is generated automatically from the intelligent function module parameters (initial setting/auto refresh).

About the number of parameters that can be set in GX Configurator-DA

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/ Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings. The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.

The number of parameter settings that can be set for one module in the GX Configurator-DA is as shown below.

Object module	Initial setting	Automatic refresh setting
Q62DA	1 (Fixed)	5 (Maximum number of settings)
Q64DA	1 (Fixed)	9 (Maximum number of settings)
Q68DAV/Q68DAI	1 (Fixed)	17 (Maximum number of settings)
Q62DA-FG	4 (Fixed)	9 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-DA is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later*2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	20 MB or more
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-DA in GX Developer Version 4 or higher in the same language.
*2: GX Configurator-DA cannot be used as an add-in with GX Developer Version 3 or earlier versions.
In addition, GX Developer Version 8 or later is necessary to use the FB conversion function.

Used operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP Professional	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition	Pentium® 300MHz or more	128MB or more

POINT

New functions of Windows® XP

When Microsoft® Windows® XP Professional Operating System or Microsoft® Windows® XP Home Edition Operating System is used, the following new functions cannot be used.
If any of the following new functions is used, this product may not operate normally.

- Start of application in Windows® compatible mode
- Fast user switching
- Remote desktop
- Large fonts (Details setting of Display properties)

3.3 Temperature input module

3.3.1 Thermocouple input module, channel isolated thermocouple/micro voltage input module: Q64TD, Q64TDV-GH

Overview

The Q64TD is a module designed to convert thermocouple input values externally from the PLC into 16-bit signed binary temperature measurement values and into 16-bit signed binary scaling values (ratios).
The Q64TDV-GH has the function to convert micro voltage signals into 16-bit signed binary data, in addition to the temperature measurement function of the Q64TD.

Features

■ Channels isolated

Both the Q64TD and Q64TDV-GH are isolated between channels.

■ Four temperature measurement input channels in one module

One Q64TD module can measure temperatures using four channels.
It can also convert the detected temperature measurement values into scaling values (ratios (%)).

■ Four Micro voltage input channels on one module (Q64TDV-GH only)

One Q64TDV-GH module convert micro voltage input using four channels.
It can also convert the detected micro voltage conversion values into scaling values (ratio values (%)).

■ Setting of conversion enable/disable

The conversion enable/disable setting for each channel can be done. Disabling unused channels for conversion reduces the sampling time.
It also prevents unnecessary disconnection detection of unused channels.

■ Compatible with thermocouples conforming to JIS Standards

You can use eight different thermocouples (K, E, J, T, B, R, S, N) conforming to the JIS Standards. You can also select the thermocouple type for each channel using GX Developer.

■ Disconnection detection

The disconnection of a thermocouple, compensation conductor or micro voltage input line can be detected on each channel.

■ Selection of sampling processing/time averaging processing/count averaging processing

As a conversion processing method, you can choose sampling processing, time averaging processing or count averaging processing on each channel.

■ Pt100 temperature-measuring resistor for cold junction temperature compensation

The connected Pt100 temperature-measuring resistor provides cold junction temperature compensation automatically.

■ Setting of Pt100 cold junction temperature compensation enable/disable

Disabling cold junction temperature compensation with Pt100 temperature-measuring resistor enables cold junction temperature compensation to be made externally from the module.
If the ±1℃ cold junction temperature compensation accuracy of the Pt100 temperature-measuring resistor cannot be ignored, use of an external precision ice bath improves the cold junction temperature compensation accuracy.

■ Error compensation by offset/gain value setting

Error compensation can be made by setting offset and gain values on each channel. The offset and gain values, can be selected from user settings or factory settings.

■ Warning output

If the temperature detected is outside the preset measurement range, a warning is output on each channel.

■ Online module change

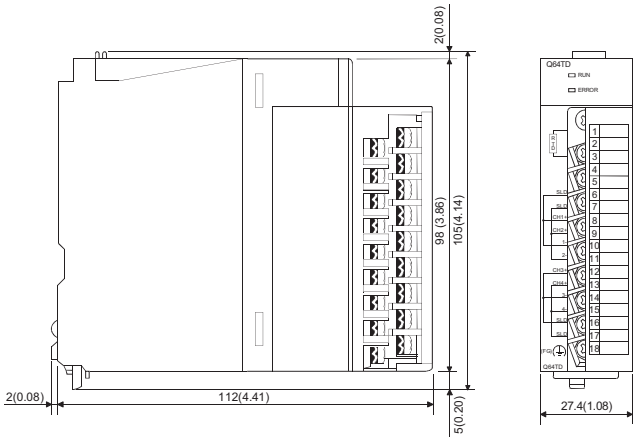
The module can be changed without the system being stopped. Also, by using the dedicated instruction (G.OGLOAD, G.OGSTOR) or writing to the buffer memory and turning on the corresponding Y signal, this enables reading of Q64TD and Q64TDV-GH module (changed online) offset/gain settings to the QCPU, and transfer of offset/gain settings to another Q64TD Q64TDV-GH module mounted on a different slot position. (Only between the modules of the same model.)

■ Utility package for ease of setting

The GX Configurator-TI utility package is sold separately.
The utility package is not a required item. However, it can be used to set initial settings and auto refresh settings on screen, reduce sequence programs, and check settings and operating status quickly.

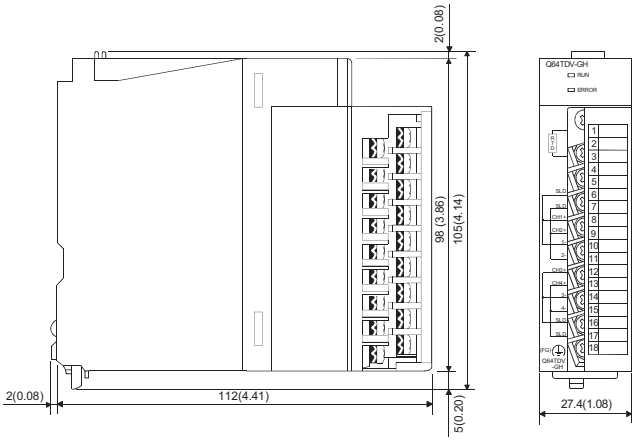
Appearance

(1) Q64TD



Unit:mm(inch)

(2) Q64TDV-GH



Unit:mm(inch)

Functions

Item	Function
Temperature conversion function	This function allows temperature data to be imported by connecting a thermocouple. Temperature data is converted into 16-bit signed binary (-2700 to 18200) and stored into buffer memory.
Micro voltage conversion function (Q64TDV-GH only)	This function converts a -100mV to +100mV micro voltage into a 16-bit signed binary (-25000 to 25000) and stores it into the buffer memory.
Conversion enable/disable function	This function specifies whether temperature/micro voltage conversion is enabled or disabled on each channel. Setting temperature/micro voltage conversion enable/disable reduces the processing time of unused channels. In addition, it prevents unnecessary disconnection detection of unused channels.
Disconnection detection function	This function detects the disconnection of the connected thermocouple/micro voltage signal cable on each channel.
Input type selection function	This function sets the input type per channel.
Warning output function	This function outputs a warning if a temperature/micro voltage falls outside the user-set temperature/micro voltage input range.
Temperature conversion system (Q64TD)	(1) Sampling processing A temperature input value is converted into a temperature successively on each channel and a digital output value is output after every conversion. (2) Averaging processing A temperature conversion value is averaged in terms of count or time on each channel and a digital average value is output.
Temperature/micro voltage conversion system (Q64TDV-GH only)	(1) Sampling processing A temperature/micro voltage input value is converted successively on each channel and a digital output value is output after every conversion. (2) Averaging processing A temperature input value/micro voltage conversion value is averaged in terms of count or time on each channel and a digital average value is output.
Conversion setting for disconnection detection*1	For values to be stored in the CH□ measured temperature value/micro voltage conversion value in the case of disconnection detection, any of "Value immediately before disconnection", "Up scale (each range's upper limit value +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" can be selected.
Scaling function	This function converts a temperature measurement value/micro voltage conversion value into a preset range ratio (%) and imports it into buffer memory.
Pt100 cold junction temperature compensation enable/disable function	This function specifies whether cold junction temperature compensation is enabled or disabled when the Pt100 is connected to the terminals. This function is used when high accuracy measurement is required when the cold junction temperature compensation accuracy (1) of the Pt100 cannot be ignored as an error. Disabling the cold junction temperature compensation of the Pt100 and providing a precision ice bath externally can improve the cold junction temperature compensation accuracy.
Offset/gain setting function	This function compensates for the error of a temperature measurement value or changes the conversion characteristic of a micro voltage conversion value.
Online module change	The module can be changed without the system being stopped.

*1: Supported by the products whose first 5 digits of product information are "07072" or later.

Specifications of Q64TD

(1)Performance specifications

Item \ Type		Q64TD
Number of channels		4 channels
Output	Temperature conversion value	16-bit, signed binary (-2700 to 18200: Value to the first decimal place × 10 times)
	Scaling value	16-bit, signed binary
Standard with which thermocouple conforms		JIS C1602-1995
Usable thermocouples and measured temperature range accuracies		Refer to the table of usable thermocouples and measured temperature range accuracies.
Cold junction temperature compensation accuracy		±1.0℃
Accuracy		As per calculation expression marked*1
Resolution		B,R,S,N: 0.3℃ K, E, J, T: 0.1℃
Conversion speed		40ms/channel *2
Number of analog input points		4 channels + Pt100 connection channel/module
Isolation specifications		Across thermocouple input and earth: Transformer insulation Across thermocouple input channels: Transformer insulation Across cold junction temperature compensation input (Pt100) and earth: No insulation
Dielectric withstand voltage		1780VrmsAC/3 cycles (altitude 2000m)
Insulation resistance		Across thermocouple input and earth: 500VDC 100MΩ or more using insulation resistance tester Across thermocouple input channels: 500VDC 10MΩ or more using insulation resistance tester
Wire break detection		Yes (Each channel independent)*3
Protection degree		IP2X
E^2PROM write count		Max. 100 thousand times
Connection terminals		18-point terminal block
Applicable wire size		0.3 to 0.75mm^2
Applicable crimping terminals		1.25-3 R1.25-3(Sleeved crimping terminals are unusable)
Online module change		Possible*4
Multiple CPU system		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: intelligent)
5VDC Internal current consumption		0.50A
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×112 (4.41)(D) mm(inch)
Weight		0.25kg

*1: Calculate the accuracy using the following method.
(Accuracy) = (conversion accuracy) + (temperature characteristic)×(operating ambient temperature variation) + (cold junction temperature compensation accuracy)
An operating ambient temperature variation indicates a deviation of the operating ambient temperature from the 25±5 range.
Example: When the thermocouple used is B, the operating ambient temperature is 35℃, and the measured temperature is 1000℃, the accuracy is: (±25 5℃) + (±0.4℃)×(5℃) + (±1) =±5.5℃

*2: The conversion speed is a period from when a temperature is input and converted into a corresponding digital value until the value is stored into the buffer memory. When two or more channels are used, the conversion speed is "40ms × number of channels enabled for conversion ".

*3: When the first 5 digits of product information are "07071" or earlier, at wire break detection, the temperature conversion value just before the wire break occurs is held.
When the first 5 digits of product information are "07072" or later, select any of "Value immediately before disconnection", "Up scale (each range's upper limit +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" for output in the case of disconnection detection.

*4: Corresponding to the function version C or later.

(2) Usable thermocouples and measured temperature range accuracies

Usable thermocouple type	Measured temperature range *1	Conversion accuracy (At operating ambient temperature 25±5℃)	Temperature characteristic (Per operating ambient temperature variation of 1℃)	Max. temperature error at ambient temperature 55℃
B	0 to 600℃	--- *3	--- *3	--- *3
	600 to 800℃ *2	±3.0℃	±0.4℃	±13.0℃
	800 to 1700℃ *2	±2.5℃		±12.5℃
	1700 to 1820℃	--- *3	--- *3	--- *3
R	-50 to 0℃	--- *3	--- *3	--- *3
	0 to 300℃ *2	±2.5℃	±0.4℃	±12.5℃
	300 to 1600℃ *2	±2.0℃	±0.3℃	±9.5℃
	1600 to 1760℃	--- *3	--- *3	--- *3
S	-50 to 0℃	--- *3	--- *3	--- *3
	0 to 300℃ *2	±2.5℃	±0.4℃	±12.5℃
	300 to 1600℃ *2	±2.0℃	±0.3℃	±9.5℃
	1600 to 1760℃	--- *3	--- *3	--- *3
K	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	Larger value of ±0.5℃ or ±0.5% of measured temperature	Larger value of ±0.06℃ or ±0.2% of measured temperature	±11.0℃
	0 to 1200℃ *2	Larger value of ±0.5℃ or ±0.25% of measured temperature	Larger value of ±0.06℃ or ±0.02% of measured temperature	±9.0℃
	1200 to 1370℃	--- *3	--- *3	--- *3
E	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	Larger value of ±0.5℃ or ±0.5% of measured temperature	Larger value of ±0.06℃ or ±0.15% of measured temperature	±8.5℃
	0 to 900℃ *2	Larger value of ±0.5℃ or ±0.25% of measured temperature	Larger value of ±0.06℃ or ±0.02% of measured temperature	±6.75℃
	900 to 1000℃	--- *3	--- *3	--- *3
J	-210 to -40℃	--- *3	--- *3	--- *3
	-40 to 750℃ *2	Larger value of ±0.5℃ or ±0.25% of measured temperature	Larger value of ±0.06℃ or ±0.02% of measured temperature	±5.625℃
	750 to 1200℃	--- *3	--- *3	--- *3
T	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	Larger value of ±0.5℃ or ±0.5% of measured temperature	Larger value of ±0.06℃ or ±0.1% of measured temperature	±6.0℃
	0 to 350℃ *2	Larger value of ±0.5℃ or ±0.25% of measured temperature	Larger value of ±0.06℃ or ±0.02% of measured temperature	±2.625℃
	350 to 400℃	--- *3	--- *3	--- *3
N	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	Larger value of ±0.5℃ or ±0.5% of measured temperature	Larger value of ±0.06℃ or ±0.2% of measured temperature	±11.0℃
	0 to 1250℃ *2	Larger value of ±0.5℃ or ±0.25% of measured temperature	Larger value of ±0.06℃ or ±0.02% of measured temperature	±9.375℃
	1250 to 1300℃	--- *3	--- *3	--- *3

*1: If a value entered from the thermocouple is outside the measured temperature range given in the table, it is handled as the maximum/minimum value of the measured temperature range.

*2: The accuracy only in the temperature ranges of Class 1 to 3 (shaded areas) in JIS C1602-1995 apply.

*3: Temperature measurement can be made, but accuracy is not guaranteed.

Specifications of Q64TDV-GH

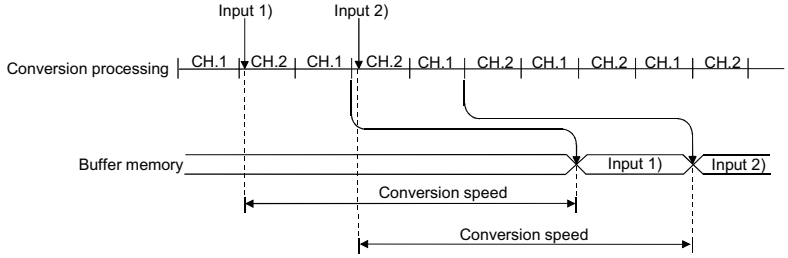
(1) Performance specifications

Item \ Type		Q64TDV-GH
Number of channels		4 channels
Output	Temperature conversion value	16-bit, signed binary (-2700 to 18200: Value to the first decimal place × 10 times)
	Micro voltage conversion value	16-bit signed binary (-25000 to 25000)
	Scaling value	16-bit, signed binary
Standard with which thermocouple conforms		JIS C1602-1995
Usable thermocouples and measured temperature range accuracies		Refer to the table of usable thermocouples and measured temperature range accuracies.
Cold junction temperature compensation accuracy		±1.0℃
Thermocouple input accuracy		As per calculation expression marked*1
Micro voltage input range		-100mV to +100mV (input resistance 2MΩ or more)
Micro voltage input accuracy		Refer to the table of micro voltage input accuracies.
Resolution	Thermocouple input	B:0.7℃, R,S:0.8℃, K,T:0.3℃, E:0.2℃, J:0.1℃, N:0.4℃
	Micro voltage input	4μV
Sampling time		20ms/channel*2
Conversion speed		Sampling time×3 *3
Number of analog input points		4 channels + Pt100 connection channel/module
Absolute maximum input		±5V
Insulation system		Between thermocouple input/micro voltage input and earth :Transformer insulation Between thermocouple input/micro voltage input channels:Transformer insulation Between cold junction temperature compensation input (Pt100) and earth:No insulation
Dielectric withstand voltage		1780VACrms/3 cycles (altitude 2000m)
Isolation resistance		Between thermocouple input/micro voltage input and earth:500VDC 100M or more using insulation resistance tester Between thermocouple input/micro voltage input channels:500VDC 10M or more using insulation resistance tester
Disconnection detection		Yes (Each channel independent) *4
Protection degree		IP2X
E^2PROM write count		Max. 100 thousand times
Connection terminals		18-point terminal block
Applicable wire size		0.3 to 0.75mm^2
Applicable crimping terminals		1.25-3 R1.25-3(Sleeved crimping terminals are unusable)
Online module change		Possible
Multiple CPU system		Compatible
Number of occupied I/O points		16 points/slot (I/O assignment: intelligent)
5VDC Internal current consumption		0.50A
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)×112 (4.41)(D) mm(inch)
Weight		0.25kg

*1: Calculate the accuracy using the following method.
(Accuracy) = (conversion accuracy) + (temperature characteristic) × (operating ambient temperature variation) + (cold junction temperature compensation accuracy)
An operating ambient temperature variation indicates a deviation of the operating ambient temperature from the 25±5℃ range.
Example: When the thermocouple used is B, the operating ambient temperature is 35℃, and the measured temperature is 1000℃, the accuracy is: (±3.5℃) + (±0.4℃) × (5℃) + (±1℃) =±6.5℃

*2: The time taken until a thermocouple input value/micro voltage input value is converted into a temperature measurement value/micro voltage conversion value.

*3: The time taken from a thermocouple input value/micro voltage input value is converted into a temperature measurement value/micro voltage conversion value to the resultant value is stored into the buffer memory.
The conversion speed is a delay time that occurs during sampling processing. It is independent of averaging processing.
Example: When two channels are enabled for conversion (Conversion speed) = (sampling period)× 3
= (20ms × 2 channels) × 3
= 120ms



*4: When the first 5 digits of product information are "07071" or earlier, at wire break detection, the temperature measurement value/micro voltage conversion value right before wire break occurrence is held.
When the first 5 digits of product information are "07072" or later, select any of "Value immediately before disconnection", "Up scale (each range's upper limit +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" for output in the case of disconnection detection.

(2) Usable thermocouples and measured temperature range accuracies

Usable Thermocouple Type	Measured Temperature Range *1	Conversion Accuracy (At operating ambient temperature 5±5℃)	Temperature Characteristic (Per operating ambient temperature variation of 1℃)	Max. Temperature Error at Ambient Temperature 55℃
B	0 to 600℃	--- *3	--- *3	--- *3
	600 to 800℃ *2	±4.0℃	±0.4℃	±14.0℃
	800 to 1700℃ *2	±3.5℃		±13.5℃
	1700 to 1820℃	--- *3	--- *3	--- *3
R	-50 to 0℃	--- *3	--- *3	--- *3
	0 to 300℃ *2	±4.0℃	±0.4℃	±14.0℃
	300 to 600℃ *2	±3.5℃		±13.5℃
	1600 to 1760℃	--- *3	--- *3	--- *3
S	-50 to 0℃	--- *3	--- *3	--- *3
	0 to 300℃ *2	±4.0℃	±0.4℃	±14.0℃
	300 to 600℃ *2	±3.5℃		±13.5℃
	1600 to 1760℃	--- *3	--- *3	--- *3
K	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	±2.0℃	±0.25℃	±8.25℃
	0 to 200℃ *2	±1.5℃		±7.75℃
	200 to 1200℃ *2	±2.0℃		±8.25℃
	1200 to 1370℃	--- *3	--- *3	--- *3
E	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 200℃ *2	±1.5℃	±0.15℃	±5.25℃
	200 to 900℃ *2	±2.0℃		±5.75℃
	900 to 1000℃	--- *3	--- *3	--- *3
J	-210 to -40℃	--- *3	--- *3	--- *3
	-40 to 200℃ *2	±1.5℃	±0.15℃	±5.25℃
	200 to 750℃ *2	±2.0℃		±5.75℃
	750 to 1200℃	--- *3	--- *3	--- *3
T	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	±2.0℃	±0.1℃	±4.5℃
	0 to 350℃ *2	±1.5℃		±4.0℃
	350 to 400℃	--- *3	--- *3	--- *3
N	-270 to -200℃	--- *3	--- *3	--- *3
	-200 to 0℃ *2	±2.5℃	±0.25℃	±8.75℃
	0 to 200℃ *2	±2.0℃		±8.25℃
	200 to 1250℃ *2	±2.5℃		±8.75℃
	1250 to 1300℃	--- *3	--- *3	--- *3

*1: If a value entered from the thermocouple is outside the measured temperature range given in the table, it is handled as the maximum/minimum value of the measured temperature range.

*2: The accuracy only in the temperature ranges of Class 1 to 3 (shaded areas) in JIS C1602-1995 apply.

*3: Temperature measurement can be made, but accuracy is not guaranteed.

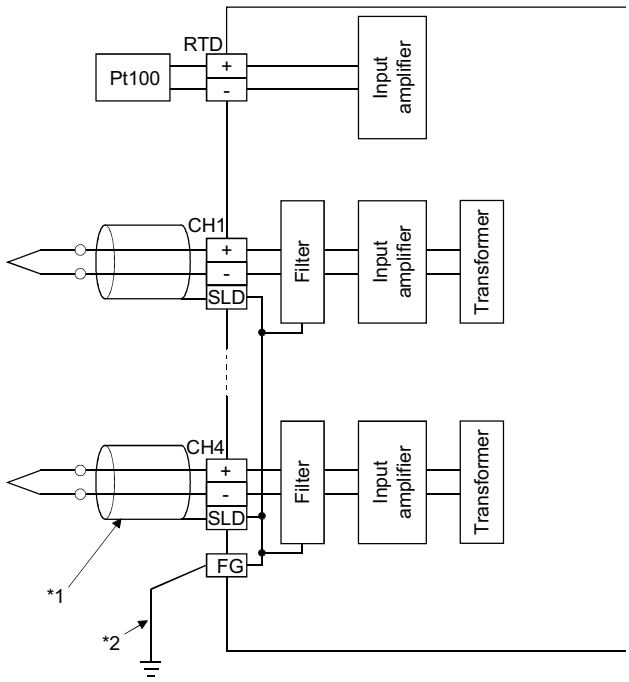
(3) Micro voltage input range and accuracy

The micro voltage input range and accuracy is shown below.

Input type	Measurable voltage range	Conversion accuracy	
		(At 25±5℃ operating ambient temperature)	(Between 0 and 55℃ operating ambient temperature)
Micro voltage input	-100 to 100mV	±0.2mV	±0.8mV

External wiring

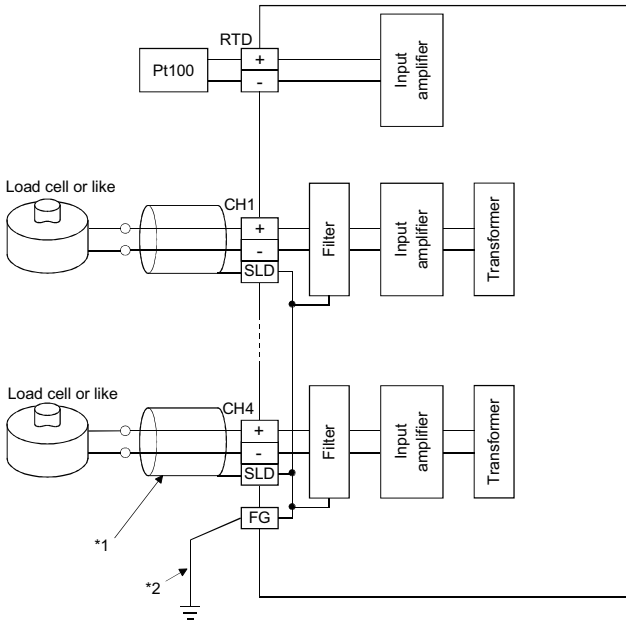
● **Thermocouple**



*1: As cables, always use shielded compensation conductors. Also, wire the shielded cables as short as possible.

*2: Always connect to the earth terminal of the control box.

● **Micro voltage signal**



*1: As cables, always use shielded conductors. Also, wire the shielded cables as short as possible.

*2: Always connect to the earth terminal of the control box.

Terminal number	Signal name
	Q64TD/Q64TDV-GH
1	RTD+
2	Vacant
3	RTD-
4	Vacant
5	Vacant
6	CH1 SLD
7	CH2 SLD
8	CH1+
9	CH2+
10	CH1-
11	CH2-
12	CH3+
13	CH4+
14	CH3-
15	CH4-
16	CH3 SLD
17	CH4 SLD
18	FG

Equipment

<Q64TD,Q64TDV-GH accessories>

Product	Description
Manual	Thermocouple Input Module, Channel Isolated Thermocouple/Micro Voltage Input Module User's Manual (Hardware)

<Separately obtained products>

The following manual must be obtained separately.

Product	Description
Manual	Thermocouple Input Module, Channel Isolated Thermocouple/Micro Voltage Input Module User's Manual

■ Applicable systems

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the Q64TD/Q64TDV-GH can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Compatible software packages>

(1) Q64TD-compatible software packages

Compatible between systems which use Q64TD and software packages are as shown below.

GX Developer is necessary when using a Q64TD.

		Software Version	
		GX Developer	GX Configurator-TI*1*3
If mounted with Q00J/ Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	Version 1.00A or later
	Multiple CPU system	Version 6 or later	
If mounted with Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	Version 1.13P or later
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	Version 1.00A or later

*1: The product of Version 1.14Q or earlier is not compatible with "normal mode - offset/gain setting mode switching" and "OMC refresh data". Use the product of Version 1.15R or later.

*3: The product of Version 1.20W or earlier is not compatible with "Conversion setting for disconnection detection function". Use the product of Version 1.21X or later.

(2) Q64TDV-GH-compatible software packages

Compatibility between systems which use Q64TDV-GH and software packages are as shown below.

GX Developer is necessary when using a Q64TDV-GH.

		Software Version	
		GX Developer	GX Configurator-TI*2*3
If mounted with Q00J/ Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.13P or later
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
If mounted with Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	

*2: The product of Version 1.14Q or earlier is not compatible with "OMC refresh data". Use the product of Version 1.15R or later.

*3: The product of Version 1.20W or earlier is not compatible with "Conversion setting for disconnection detection function". Use the product of Version 1.21X or later.

3.3.2 RTD input module, Channel isolated RTD input module: Q64RD, Q64RD-G

Overview

The Q64RD is a module for connection of 3-wire or 4-wire type platinum RTDs (2-wire application is available if terminals are short-circuited.) and converts temperature data [℃] input from Pt100 or JPt100 platinum RTD (hereinafter referred to as Pt100 or JPt100) to:

- 16-bit signed binary data (stored as a value rounded off to 1 decimal place × 10)
- 32-bit signed binary data (stored as a value rounded off to 3 decimal places × 1000)

and scaling values (ratios (%)).

The Q64RD-G is a module for connection of 3-wire or 4-wire type RTDs (2-wire application is available if terminals are short-circuited.) and converts temperature data [℃] input from Pt100, JPt100 or nickel RTD Ni100Ω (hereinafter referred to as Ni100Ω) to:

- 16-bit signed binary data (stored as a value rounded off to 1 decimal place × 10)
- 32-bit signed binary data (stored as a value rounded off to 3 decimal places × 1000)

and scaling values (ratios (%)).

Features

■ Channel isolation (Q64RD-G)

The Q64RD-G is a channel-isolated module.

■ Four-channel temperature measurement by one module

The Q64RD and Q64RD-G are capable of measuring temperatures of 4 channels per module. Detected temperature values can be converted into scaling values (ratios (%)).

■ Conversion enable/disable setting

You can make a conversion enable/disable setting for each channel. Disabling unused channels for conversion reduces sampling time.
It also prevents unnecessary disconnection detection on unused channels.

■ Standard-compliant RTD is usable

(1) Platinum RTD compliant with JIS (Japanese Industrial Standards) is usable (Q64RD)
Two types of JIS-compliant platinum RTDs (Pt100 and JPt100) can be used.
The types can be selected for each channel on GX Developer.

(2) Platinum RTD compliant with JIS or Nickel RTD compliant with DIN is usable (Q64RD-G)
In addition to the above 2 types of JIS-compliant platinum RTDs, DIN-compliant nickel RTDs can be used.
The types of RTD can be selected for each channel on GX Developer.

■ Connection of 3-wire or 4-wire RTD is available for each channel

For each channel, 3-wire or 4-wire RTD can be connected. By making the terminals short-circuited, 2-wire RTD can be used.

■ Disconnection detection

The disconnection of a platinum RTD or cable can be detected on each channel.

■ Optimal processing selection is available

A desired conversion method can be selected for each channel.

■ Optimal range selection is available

(1) Ranges of -20 to 120℃, -180 to 600℃ and -200 to 850℃ can be selected (Q64RD)
When Pt100 or JPt100 is used, a desired range can be selected for each channel.

(2) Ranges of 0 to 200℃, -20 to 120℃, -180 to 600℃, -200 to 850℃, -60 to 180℃ can be selected (Q64RD-G)
When a platinum RTD, Pt100 or JPt100 is used, a range of 0 to 200℃, -20 to 120℃, -180 to 600℃ or -200 to 850℃ can be selected for each channel.
When a nickel RTD, Ni100Ω is used, a range of -60 to 180℃ can be selected for each channel.

■ Error compensation by offset/gain value setting

Error compensation can be made by setting offset and gain values on each channel.
As the offset and gain values, you can make selection from user settings and factory settings.

■ Warning output

If the temperature detected is outside the preset measurement range, an warning can be output on each channel.

■ Online module change

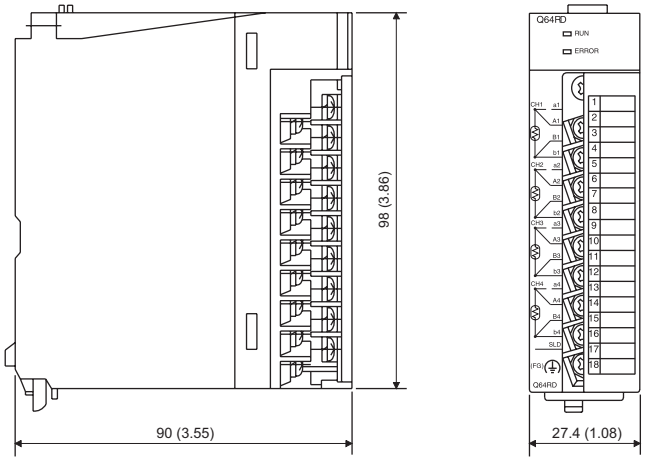
The module can be changed without the system being stopped. Also, by using the dedicated instructions (G.OGLOAD, G.OGSTOR) or writing to the buffer memory and turning on the corresponding Y signal, the offset/gain values can be re-set to the Q64RD/Q64RD-G replaced online and they can be transferred to the other Q64RD/Q64RD-G mounted in another slot. (Between the same models only)

■ Easy setting by utility package

The utility package, GX Configurator-TI is available separately. This utility package is not necessarily for use. However, using this makes the initial setting and auto refresh setting easy on screen, reduces sequence programs and enables easy setting and operation check.

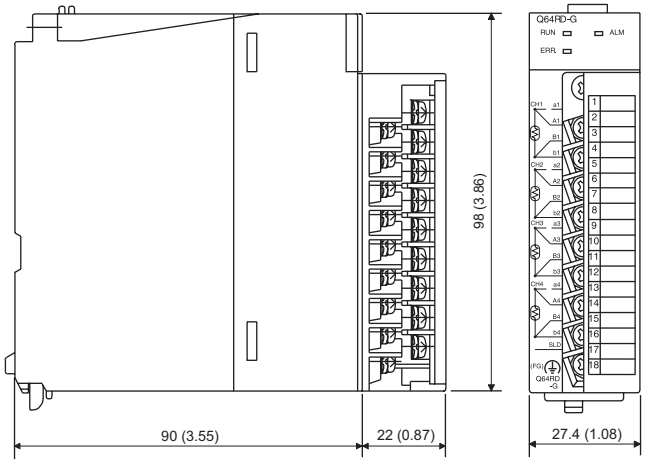
External dimensions

(1) Q64RD



Unit:mm(inch)

(2) Q64RD-G



Unit:mm(inch)

Function list

Item	Description
Temperature conversion function	This function allows temperature data to be imported by connecting a temperature-measuring resistor. Temperature data are 16-bit signed binary (-2000 to 8500), 32-bit signed binary (-200000 to 850000) and stored into buffer memory.
Conversion enable/disable function	This function specifies whether temperature conversion is enabled or disabled on each channel. Setting temperature conversion enable/disable reduces the processing time of unused channels. In addition, it prevents unnecessary disconnection detection of unused channels.
Disconnection detection function	This function detects the disconnection of the connected temperature-measuring resistor on each channel.
Range changing function	This function changes the measured temperature range.
Temperature-measuring resistor selection function	This function sets the type of the temperature-measuring resistor per channel.
Warning output function	This function outputs a warning if a temperature falls outside the user-set temperature range.
Temperature conversion system	(1) Sampling processing Values input by each channel are successively converted into temperature values and output as digital values. (2) Averaging processing (a) Time averaging Temperature values converted by each channel are averaged in terms of time and the average is output as a digital value. (b) Count averaging Temperature values converted by each channel are averaged in terms of count and the average is output as a digital value. (c) Moving average*1 Digital output values sampled at specified number of times are averaged. (3) Primary delay filter*1 By a preset time constant, digital output values are smoothed.
Conversion setting for disconnection detection*2	For values to be stored in the CH□ measured temperature value in the case of disconnection detection, any of "Value immediately before disconnection", "Up scale (each range's upper limit value +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" can be selected.
Scaling function	This function can convert a temperature conversion value into a preset range ratio (%) and import it into buffer memory.
Offset/gain setting function	This function compensates for an error of a temperature conversion value.
Online module change	A module change is made without the system being stopped.

*1: Supported by the Q64RD-G and the Q64RD whose first 5 digits of product information are "07072" or later.

*2: Supported by the product whose first 5 digits of product information are "07072" or later.

Performance specifications

(1) Performance specifications

Specifications of Q64RD

Item \ Type		Q64RD
Number of channels		4 channels
Output	Temperature conversion value	16-bit, signed binary data (-2000 to 8500: Value to the first decimal place × 10 times) 32-bit, signed binary data (-200000 to 850000: Value to the third decimal place × 1000 times)
	Scaling value	16-bit, signed binary
Usable platinum RTD		Pt100(JIS C1604-1997,IEC 751 1983), JPt100(JIS C1604-1981)
Measured temperature range	Pt100	-200 to 850℃
	JPt100	-180 to 600℃
Range changing	Pt100	-20 to 120℃/-200 to 850℃
	JPt100	-20 to 120℃/-180 to 600℃
Accuracy *1	Ambient temperature 0 to 55℃	±0.25% (Accuracy relative to maximum value)
	Ambient temperature 25±5℃	±0.08% (Accuracy relative to maximum value)
Resolution		0.025℃
Conversion speed		40ms/channel *2
Number of analog input points		4 channels/module
Temperature detecting output current		1mA

Isolation

Specific isolated area	Isolation method	Dielectric withstand voltage	Isolation resistance
Between platinum temperature-measuring resistor input and PLC power supply	Photocoupler isolation	1780VrmsAC/ 3 cycles (Altitude 2000m)	10MΩ or more using 500VDC isolation resistance tester
Between platinum temperature-measuring resistor input channels	No isolation	-	

Wire break detection	Yes (Each channel independent) *3
Protection degree	IP2X
E^2PROM write count	Max. 100 thousand times
Connected terminal	18 points Terminal block
Applicable wire size	0.3 to 0.75mm^2
Applicable crimping terminals	1.25-3 R1.25-3 (Sleeved crimping terminals are unusable)
Cables between Q64RD and platinum RTD	Total resistance value is 2Ω or less. (Refor to Specifications for RTD connection in (2))
Online module change	Possible*4
Multiple CPU system	Compatible
I/O occupied points	16 points/slot (I/O assignment: Intelligent)
Internal current consumption (5VDC)	0.60A
External dimensions	98(H)×27.4(W)×90(D)mm
Weight	0.17kg

*1: The selection ranges and accuracies have the following relationships.

Ambient \ Selection	Pt100 and JPt100 : -20 to 120℃	Pt100 : -200 to 850℃	JPt100:-180 to 600℃
0 to 55℃	±0.3℃	±2.125℃	±1.5℃
25±5℃	±0.096℃	±0.68℃	±0.48℃

*2: The conversion speed is a period from when a temperature is input and converted into a corresponding digital value until the value is stored into the buffer memory.
When two or more channels are used, the conversion speed is "40ms × number of conversion enabled channels".

*3: When the first 5 digits of product information are "07071" or earlier, at wire break detection, the temperature conversion value right before wire break occurrence is held.
When the first 5 digits of product information are "07072" or later, select any of "Value immediately before disconnection", "Up scale (each range's upper limit +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" for output in the case of disconnection detection.

*4: Corresponding to the function version C or later.

Specifications of Q64RD-G

Item \ Type			Q64RD-G
Number of channels			4 channels
Output	Measured temperature value		16-bit, signed binary data (-2000 to 8500: Value to the first decimal place × 10 times) 32-bit, signed binary data (-200000 to 850000: Value to the third decimal place × 1000 times)
	Scaling value		16-bit, signed binary data
Usable RTD			Pt100(JIS C1604-1997,IEC 751 1983), JPt100(JIS C1604-1981), Ni100Ω(DIN43760 1987)
Measured temperature range	Pt100		-200 to 850℃
	JPt100		-180 to 600℃
	Ni100Ω		-60 to 180℃
Range changing	Pt100		-20 to 120℃/0 to 200℃/-200 to 850℃
	JPt100		-20 to 120℃/0 to 200℃/-180 to 600℃
	Ni100Ω		---
Accuracy *1 (Accuracy relative to maximum value of selection range)	Reference accuracy *2		Within ±0.04%
	Temperature coefficient *3	Pt100/JPt100 (-20 to 120℃)	±70ppm/℃(±0.0070%/℃)
		Pt100/JPt100 (0 to 200℃)	±65ppm/℃(±0.0065%/℃)
		Pt100/JPt100 (-200 to 850℃)	±50ppm/℃(±0.0050%/℃)
		Ni100Ω (-60 to 180℃)	±70ppm/℃(±0.0070%/℃)
Resolution			0.025℃
Conversion speed			40ms/channel *2
Number of analog input points			4 channels/module
Temperature detecting output current			1mA

Isolation

Specific isolated area	Isolation method	Dielectric withstand voltage	Isolation resistance
Between temperature-measuring resistor input and PLC power supply	Photocoupler isolation	1780VACrms/3 cycles (Altitude 2000m)	10M or more using 500VDC isolation resistance tester
Between temperature-measuring resistor input channels	Transformer isolation		

Wire break detection	Yes (Each channel independent) *3
Protection degree	IP2X
E^2PROM write count	Max. 100000 times
Connected terminal	18 points Terminal block
Applicable wire size	0.3 to 0.75mm^2
Applicable crimping terminals	1.25-3 R1.25-3 (Sleeved crimping terminals are not usable.)
Cables between Q64RD-G and platinum RTD	Total resistance value is 2Ω or less. (Refor to Specifications for RTD connection in (2))
Online module change	Possible*4
Multiple CPU system	Compatible
I/O occupied points	16 points/slot (I/O assignment: Intelligent)
Internal current consumption (5V DC)	0.62A
External dimensions	98(H)×27.4(W)×112(D)mm
Weight	0.20kg

*1: The selection ranges and accuracies have the following relationships.

Selection / Ambient temperature	Pt100 and JPt100: -20 to 120℃	Pt100: -200 to 850℃	JPt100: -180 to 600℃
0 to 55℃	±0.300℃	±1.615℃	±1.140℃
25±5℃	±0.090℃	0.553℃	±0.390℃

*2: Accuracy in ambient temperature and conductor resistance when the offset/gain setting is set.

*3: Accuracy per 1-degree temperature change
Example) Accuracy for the case of changing from 25 to 30
0.04% (Reference accuracy) + 0.0070%/ (Temperature coefficient) × 5 (Temperature difference) = 0.075%

*4: The conversion speed is a period from when a temperature is input and converted into a corresponding digital value until the value is stored into the buffer memory.
When two or more channels are used, the conversion speed is "40ms × number of conversion enabled channels".

*5: When the first 5 digits of product information are "07071" or earlier, at wire break detection, the temperature conversion value right before wire break occurrence is held.
When the first 5 digits of product information are "07072" or later, select any of "Value immediately before disconnection", "Up scale (each range's upper limit +5%)", "Down scale (each range's lower limit value +5%)" or "Given value" for output in the case of disconnection detection.

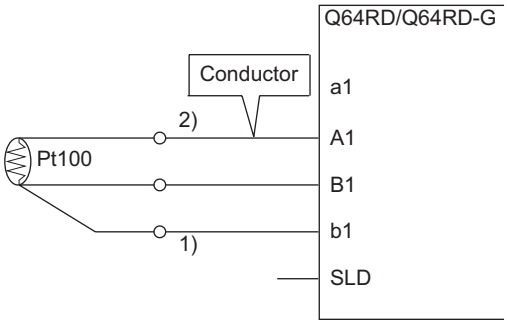
(2) Specifications for RTD Connection

This section explains the specifications for connection of the Q64RD/Q64RD-G and platinum temperature-measuring resistors.

(a) For 3-wire type

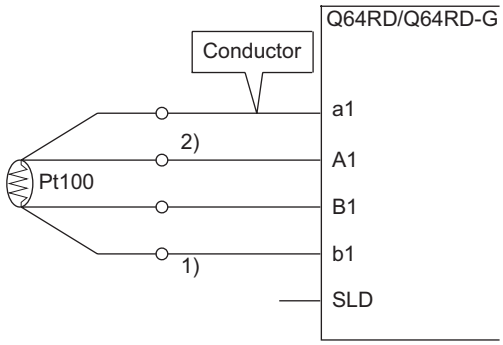
The conductor resistance value should satisfy the condition of 1) + 2)≦2kΩmax.

In addition, the difference of the conductor resistance value between 1) and 2) should be 10Ωmax.



(b) For 4-wire type

The conductor resistance value should satisfy the condition of 1) + 2)≦2kΩmax.



POINT

Conductor resistance values may be an error factor in the temperature measurement.

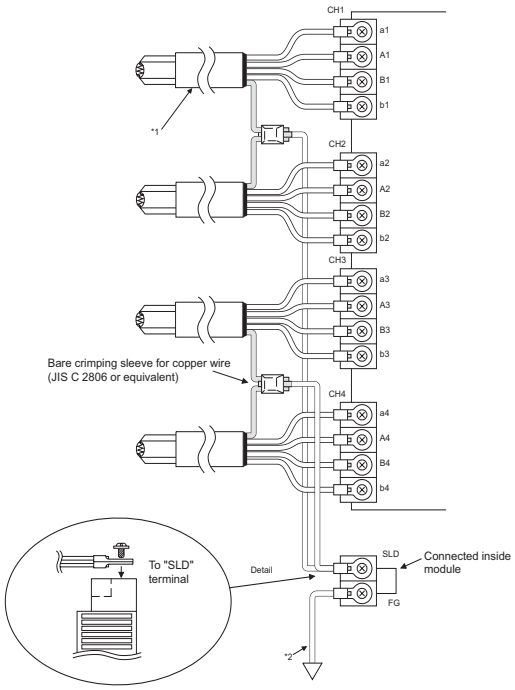
The error arisen between the Q64RD/Q64RD-G and the temperature-measuring resistor (between the conductor resistance value 1) + 2) and measured temperature value) is Max. 0.007℃/2Ω(Q64RD) or Max. 0.003℃/2Ω(Q64RD-G).

This error can be corrected by the offset/gain setting.

When making offset/gain adjustment, set the conductor resistance value actually used.

External wiring

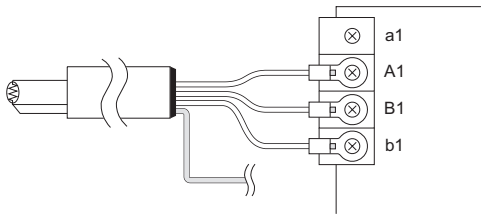
■ For 4-wire type



*1: Use shielded cable and make the wiring length as short as possible.

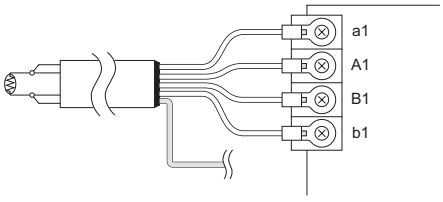
*2: Ground it to the ground terminal on the control panel.

■ For 3-wire type

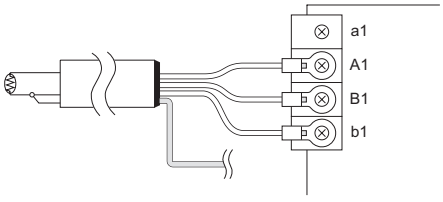


■ For 2-wire type

When 4 conductor type is selected in switch 3 of intelligent function module switch setting



When 3 conductor type is selected in switch 3 of intelligent function module switch setting



■ External I/O terminals

Terminal number	Signal name	
1	CH1	a1
2		A1
3		B1
4		b1
5	CH2	a2
6		A2
7		B2
8		b2
9	CH3	a3
10		A3
11		B3
12		b3
13	CH4	a4
14		A4
15		B4
16		b4
17	SLD	
18	FG	

System configuration

<Q64RD, Q64RD-G accessories>

Product	Description
Manual	RTD Input Module, Channel Isolated RTD Input Module User's Manual (Hardware)

<Separately obtained products>

The following manual must be obtained separately.

Product	Description
Manual	RTD Input Module, Channel Isolated RTD Input Module User's Manual

■ Applicable Systems

<Applicable module and number of modules>

The following are the CPU module and network module (for remote I/O stations) for which the Q64RD/Q64RD-G can be installed and the number of modules that can be installed.

Applicable module		Number of modules	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Compatible software packages>

(1) Software packages for Q64RD

The following shows relation between the systems using the Q64RD and applicable software packages.
The GX Developer is necessary when using a Q64RD.

		Software version	
		GX Developer	GX Configurator-TI*1 *2
Q00J/Q00/ Q01CPU	Single PLC system	Version 7 or later	Version 1.10L or later
	Multiple PLC system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single PLC system	Version 4 or later	Version 1.00A or later
	Multiple PLC system	Version 6 or later	
Q12PH/ Q25PHCPU	Single PLC system	Version 7.10L or later	Version 1.13P or later
	Multiple PLC system		
If installed in a MELSECNET/H remote I/O station		Version 6 or later	Version 1.00A or later

*1: The product of Version 1.14Q or earlier is not compatible with "normal mode - offset/gain setting mode switching" and "OMC refresh data". Use the product of Version 1.15R or later.

*2: The product of Version 1.20W or earlier is not compatible with "Moving average", "Primary delay filter", and "Conversion setting for disconnection detection function".
Use the product of Version 1.21X or later.

(2) Software packages for Q64RD-G

The following shows relation between the systems using the Q64RD-G and applicable software packages.
The GX Developer is necessary when using a Q64RD-G.

		Software version	
		GX Developer	GX Configurator-TI*3
Q00J/Q00/ Q01CPU	Single PLC system	Version 7 or later	Version 1.17T or later
	Multiple PLC system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single PLC system	Version 4 or later	
	Multiple PLC system	Version 6 or later	
Q12PH/ Q25PHCPU	Single PLC system	Version 7.10L or later	
	Multiple PLC system		
If installed in a MELSECNET/H remote I/O station		Version 6 or later	

*3: The product of Version 1.20W or earlier is not compatible with "Conversion setting for disconnection detection function".
Use the product of Version 1.21X or later.

3.3.3 Temperature input module settings, monitoring tool: GX Configurator-TI

Overview

GX Configurator-TI is a utility package to make a setting to automatically read out data such as initial temperature measurement value into a CPU device memory, which is necessary to use temperature input module such as Q64TD, Q64TDV-GH, Q64RD, and Q64RD-G. It is used as an add-in with GX Developer.
The initial settings and automatic refresh settings can be configured on the screen, which makes a sequence program shorter and allows easily confirming setting status, operational status, etc.

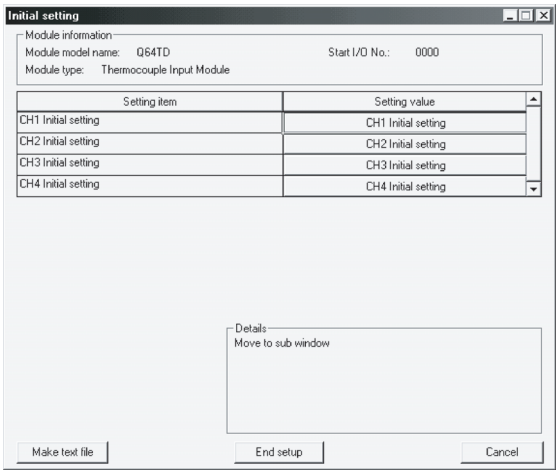
Intelligent function module utility

■ Initial setting

It is possible to configure the initial settings for using the temperature input modules on the screen. The following shows the main items* which require the initial settings.
(1) Conversion enable/disable setting
(2) Sampling/Average processing setting
(3) Time averaging/Count averaging specification
(4) Average time/Average count setting
(5) Alarm output enable/disable setting
(6) Setting range
Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to temperature input modules when the PLC CPUs enter RUN state.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of initial setting screen

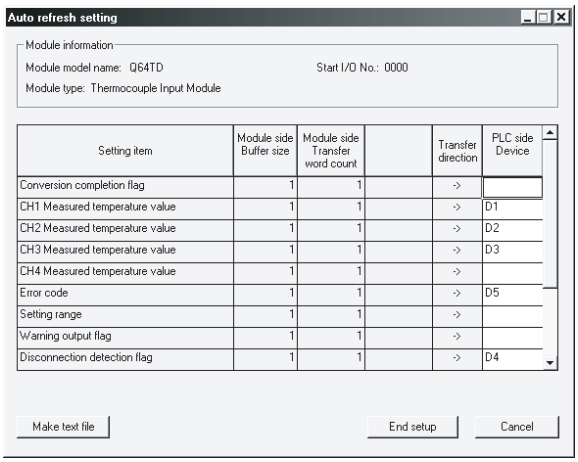


■ Auto refresh setting

This sets the buffer memory of temperature input module, which is the target of the auto refresh. The following shows the main items* which are the target of the auto refresh.
(1) Conversion completion flag
(2) Temperature measurement value
(3) Error code
(4) Alarm output flag
(5) Disconnection detection flag
The specified device automatically reads and writes values, which are set for the auto refresh and stored in the buffer memory of the temperature input modules, at END instruction executed.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of auto refresh setting screen

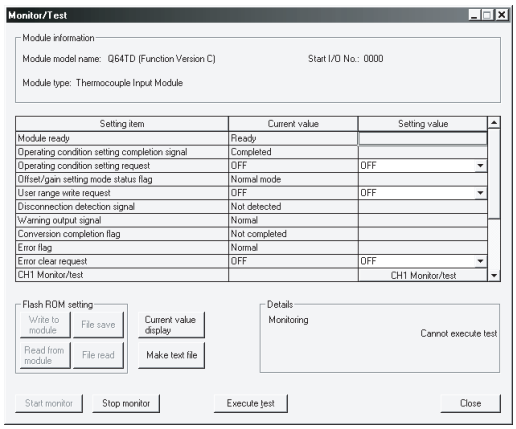


■ Monitor/test

● Monitor/test

This monitors/tests the buffer memory of the temperature input module.

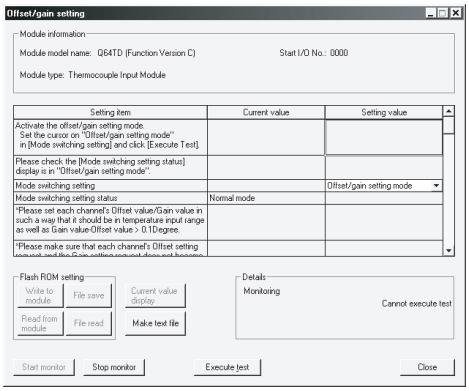
Sample of Monitor/test screen



● Offset/gain setting

When users set the arbitrary value at the offset/gain setting (analog input range setting is set to user range setting), the offset/gain setting is easily made with viewing the screen.

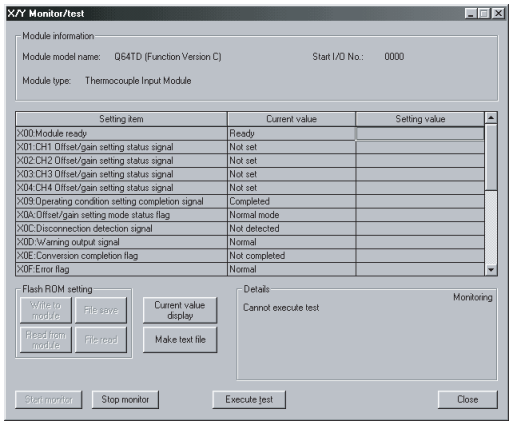
Sample of offset/gain setting screen



● X•Y monitor/test

This monitors/tests the I/O signals of the temperature input module.

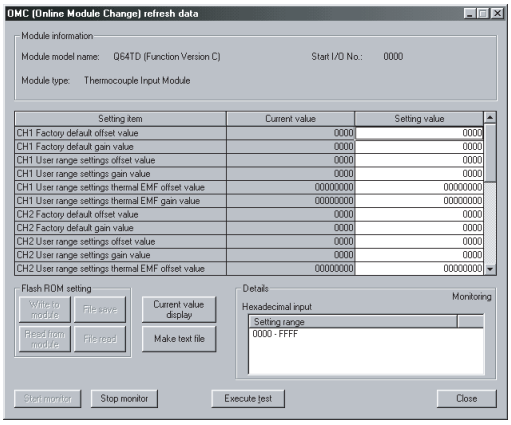
Sample of X•Y monitor/test screen



● OMC refresh data

This monitors/sets the OMC refresh data (factory-set offset/gain values, and user range-set offset/gain values).

Sample of OMC refresh data screen



About the number of parameters that can be set in GX Configurator-TI

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/ Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings. The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.

The number of parameter settings that can be set for one module in the GX Configurator-TI is as shown below.

Object module	Initial setting	Automatic refresh setting
Q64TD	6 (Fixed)	13 (Maximum number of settings)
Q64TDV-GH	6 (Fixed)	13 (Maximum number of settings)
Q64RD	5 (Fixed)	17 (Maximum number of settings)
Q64RD-G	4 (Fixed)	18 (Maximum number of settings)

Operating environment

This section explains operating environment of the personal computer where the GX Configurator- TI is used.

Item		Peripheral devices
Installation (Add-in) destination*1		Add-in to GX Developer Version 4 (English version) or later*2.
Computer main unit		Personal computer on which PC-9800® series*3 and Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	10 MB or more
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-TI in GX Developer Version 4 or later in the same language.

*2: GX Configurator- TI cannot be used as an add-in with GX Developer Version 3 or earlier versions.

*3: PC-9800® series (excluding PC98-NX®) are not compatible with Windows® Me, Windows® 2000 Professional, Windows® XP Professional and Windows® XP Home Edition.

Used operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP Professional (Service Pack 1 or later)	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition (Service Pack 1 or later)	Pentium® 300MHz or more	128MB or more

POINT

New functions of Windows® XP

When Microsoft® Windows® XP Professional Operating system or Microsoft® Windows® XP Home Edition Operating system is used, the following new functions cannot be used.

If any of the following new functions is used, this product may not operate normally.

- Start of application in Windows® compatible mode
- Fast user switching
- Remote desktop
- Large fonts (Details setting of Display properties)

3.4 Temperature control module / Loop control module

3.4.1 Temperature control module: Q64TCTT, Q64TCTTBW, Q64TCRT, Q64TCRTBW

Overview

(1) What are Q64TCTT and Q64TCRT?

(a) The Q64TCTT and Q64TCRT are modules designed to convert input values from external temperature sensors into 16-bit signed BIN (binary) data. It also includes a PID function to attain target temperatures, and provides transistor outputs for temperature control.

(b) The Q64TCTT and Q64TCRT have an auto tuning function that automatically sets the proportional band (P), integral time (I) and derivative time (D) for PID operations.

(c) The Q64TCTT accepts K, J, T, B, S, E, R, N, U, L, PL II and W5Re/W26Re type thermocouples. The Q64TCRT accepts Pt100 and JPt100 type platinum temperature-measuring resistors.

(2) What are Q64TCTTBW and Q64TCRTBW?

The Q64TCTTBW and Q64TCRTBW are Q64TCTT and Q64TCRT-based modules that include an additional function that detects heater wire disconnection using inputs from external current sensors.

Item	Q64TCTT	Q64TCTTBW	Q64TCRT	Q64TCRTBW
Input sensor type	Thermocouple	Thermocouple	Platinum temperature-measuring resistor	Platinum temperature-measuring resistor
Heater disconnection detection function	No	Yes	No	Yes

Features

■ Optimum temperature adjustment control (PID control)

(1) The Q64TC provides temperature adjustment control automatically by merely setting the PID constants (proportional band (P), integral time (I), derivative time (D)) and temperature set value (set value: SV) necessary for PID operations.
Therefore, no special instructions are needed to perform PID control.

(2) Using the auto tuning function enables the PID constants to be set automatically by the Q64TC.
Hence, you can use the equipment without considering difficult PID operation expressions to find the PID constants.

■ Four loops on 1 module

The module provides a maximum of four simultaneous loops for temperature adjustment control.

■ RFB limiter function

The RFB (Reset Feed Back) limiter suppresses overshooting which is liable to occur at startup or when the temperature set value (SV) is increased.

■ Sensor compensation function

By setting a sensor compensation value, the sensor compensation function eliminates the difference between a temperature process value (PV) and the actual temperature.

■ Connection of thermocouples compatible with JIS, IEC, NBS, ASTM and DIN Standards

(1) The Q64TCTT(BW) accepts the following thermocouples compatible with the JIS, IEC, NBS, ASTM and DIN Standards.
- JIS Standards : R, K, J, S, B, E, T
- IEC Standards : R, K, J, S, B, E, T, N
- NBS Standards : PL II
- ASTM Standards: W5re, W23re
- DIN Standards : U, L

(2) The Q64TCTT(BW) allows you to set the temperature measurement ranges that meet the operating temperatures of the above thermocouples.

■ Connection of Pt100 and JPt100 platinum temperature-measuring resistors

The Q64TCRT(BW) allows you to set the temperature measurement ranges which meet the operating temperatures of the Pt100 and JPt100.

■ Choice of fine temperature measurement units and various control temperature ranges

The temperature measurement unit of each loop can be set to 1℃ or 0.1℃ in Centigrade or to 1°F or 0.1°F in Fahrenheit, enabling you to choose the appropriate resolution for control. Also, the controllable temperature range can be selected from 0.0 to 400.0℃ (when K type thermocouple is used), 0.0 to 3000.0℃ (when R type thermocouple is used) and others, enabling you to make adequate setting for the object to be controlled.

■ E^2PROM for backing up set values

The set values in buffer memory can be stored into E^2PROM for data backup.
Using the test function of GX Developer to write data directly to the buffer memory, what is required in a sequence program is "LD**" + "OUT Yn1" at the minimum.

■ Disconnection detection

The Q64TCTTBW and Q64TCRTBW can detect the disconnection of a heater.

■ Online module change

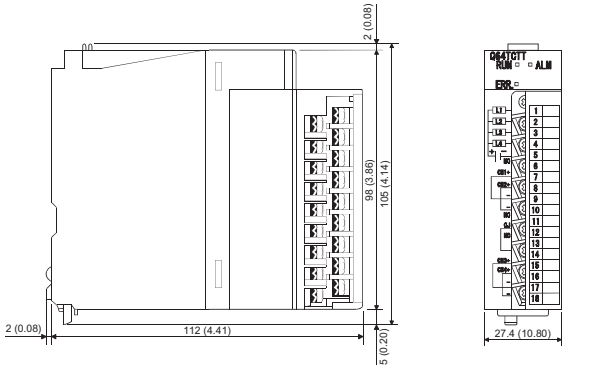
The module can be changed without the system being stopped.

■ Utility package for ease of setting

The GX Configurator-TC utility package is sold separately. Though you are not required to use the utility package, it allows initial and automatic refresh settings to be made on the screen, reducing sequence programs and also enabling you to check the setting and operating states and execute auto tuning easily.

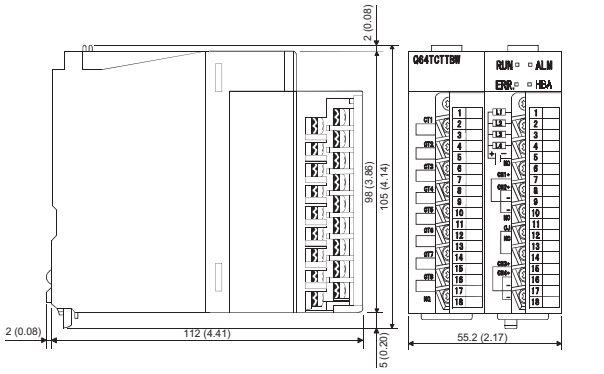
Appearance

(1) Q64TCTT



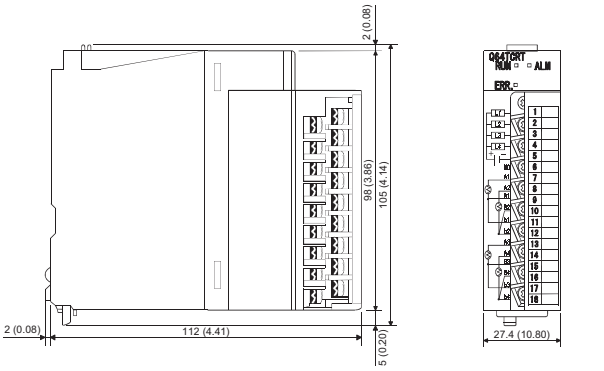
Unit:mm(inch)

(2) Q64TCTTBW



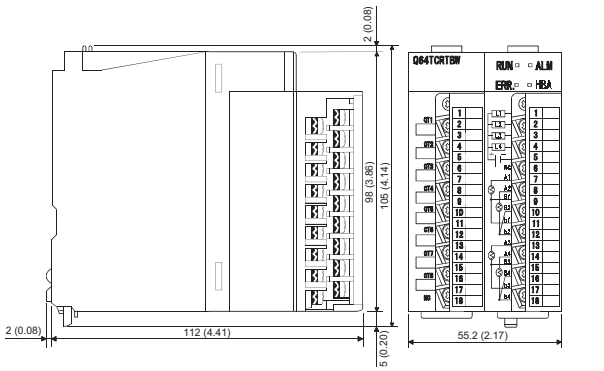
Unit:mm(inch)

(3) Q64TCRT



Unit:mm(inch)

(4) Q64TCRTBW



Unit:mm(inch)

Functions

Item	Function
Auto-tuning function	The temperature control module automatically sets the optimal PID constants.
Forward action/ reverse action selection function	Either heat control (reverse action) or cooling control (forward action) can be selected.
RFB limiter function	Limits the manipulation value overshoot that frequently occurs when the set value (SV) is changed or control target is changed.
Sensor compensation function	Reduces the difference between the measured value and actual temperature to zero when these two are different due to measurement conditions, etc.
Unused channel setting	Disables the PID operation for channels that do not perform temperature adjustment therefore alarm error will not activate.
PID control forced stop	Stops the PID operation for channels that is performing temperature adjustment.
Heater disconnection detection function	Measures the current that flows in the heater main circuit and detects disconnection when Q64TCTTBW or the Q64TCRTBW is used.
Current error detection function when output is off	When the Q64TCTTBW or the Q64TCRTBW is used, this function measures the current in the heater's main circuit while the transistor's output is off, and checks if there is a current error when output is off.
Loop disconnection detection function	A function to detect errors in the control system (control loop) caused by a load (heater) disconnection, abnormal operation from external device (such as magnet relay), or a thermocouple disconnection.
Data storage in E^2PROM	By backing up the buffer memory contents to E^2PROM, the amount of sequence program is reduced.
Alert alarm	Monitors the process value (PV) and alerts the user.
Control output setting for CPU stop error occurrence	This function continues/stops temperature adjustment control output at CPU stop error occurrence.
Q64TC control status	The Q64TC can be controlled by the output signal of Q64TC and the settings in the buffer memory.
Online module change	A module change is made without the system being stopped.

Performance specifications

Item \ Type			Q64TCTT	Q64TCRT	Q64TCTTBW	Q64TCRTBW
Control output			Transistor output			
Number of temperature input points			4 channels/module			
Usable thermocouples/platinum temperature-measuring resistors			Refer to the "usable temperature sensor type, measured temperature range and data resolution".			
Accuracy *1	Reference accuracy	Ambient temperature: 25℃±5℃	Full-scale × (±0.3%)			
		Ambient temperature: 0℃ to 55℃	Full-scale × (±0.7%)			
	Cold junction temperature compensation accuracy (ambient temperature: 0℃ to 55℃)	Temperature measured value: -100℃ or more	Within ±1.0℃	---	Within ±1.0℃	---
		Temperature measured value: -150℃ to -100℃	Within ±2.0℃		Within ±2.0℃	
		Temperature measured value: -200℃ to -150℃	Within ±3.0℃		Within ±3.0℃	
Sampling period			0.5s/4 channels (constant independently of the number of channels used)			
Control output period			1 to 100s			
Input impedance			1MΩ			
Input filter			0 to 100s (0: Input filter off)			
Sensor compensation value setting			-50.00 to 50.00%			
Operation at sensor input disconnection			Upscale processing			
Temperature control system			PID ON/OFF pulse or 2-position control			
PID constant range		PID constant setting	Setting can be made by auto tuning			
		Proportional band (P)	0.0 to 1000.0% (0: 2-position control)			
		Integral time (I)	1 to 3600s			
		Derivative time (D)	0 to 3600s (set 0 for PI control.)			
Set value setting range			Within temperature range set to the used thermocouple/platinum temperature-measuring resistor			
Dead band setting range			0.1 to 10.0%			
Transistor output		Output signal	ON/OFF pulse			
		Rated load voltage	10 to 30VDC			
		Max. load current	0.1A/point, 0.4A/common			
		Max. inrush current	0.4A 10ms			
		Leakage current at OFF	0.1mA or less			
		Max. voltage drop at ON	1.0VDC (TYP) 0.1A 2.5VDC (MAX) 0.1A			
		Response time	OFF ON: 2ms or less, ON OFF: 2ms or less			
Insulation method			Between input and grounding: Transformer insulation Between input and channel: Transformer insulation			
Dielectric strength			Between input and grounding: 500VAC for 1 minute Between input and channel: 500VAC for 1 minute			
Insulation resistance			Between input and grounding: 500VDC 20MΩ or more Between input and channel: 500VDC 20MΩ or more			
Heater disconnection detection specifications		Current sensor *2	---		The following current sensors of URD, Ltd. • CTL-12-S36-8(0.0 to 100.0A) • CTL-6-P-H(0.00 to 20.00A)	
		Input accuracy			Input range width x (±1.0%)	
		Number of alert delays			3 to 255	
Protection degree			IP2X			
E^2PROM write count			Max. 100 thousand times			
Connection terminal			18-point terminal block		Two 18-point terminal blocks	
Applicable wire size			0.3 to 0.75mm^2			
Applicable crimping terminal			R1.25-3,1.25-YS3,RAV1.25-3,V1.25-YS3A			
External module change			Possible*5			
Multiple CPU system			Compatible*6			
Number of occupied I/O points *3			16 points/slot (I/O assignment: 16 intelligent points)		32 points/2 slots (Default I/O assignment : 16 free points + 16 intelligent points)	
5V DC Internal current consumption			0.55A		0.60A	
External dimensions			27.4(1.08)(W)×98(3.86)(H)×112(4.41)(D) (mm(inch))		55.2(2.17)(W)×98(3.86)(H)×112(4.41)(D) (mm(inch))	
Weight			0.20kg		0.30kg	

*1: Calculate the accuracy using the following method.
(Accuracy) = (reference accuracy) + (cold junction temperature compensation accuracy)
Example: When the input range setting "38", the operating ambient temperature is 35℃, and the measured temperature is 300℃, the accuracy is:
{400.0-(-200.0)} (full-scale)×(±0.007)(±0.7%)+(±1.0℃)(cold junction temperature compensation accuracy) = ±5.2℃

*2: Only the current sensors manufactured by URD, Ltd. may be used. Refer to <Current sensors> on page 3-101 for more information. Also this product needs to be obtained separately.

*3: When the Q64TCTTBW or Q64TCRTBW is used, the device numbers of the I/O signals increase to 16 I/O points depending on how many free points the left-hand side slots have.
Hence, as I/O signals are given as indicated below in this manual, read them according to the module used.
Example) When a signal is given as Yn1
When Q64TCTT or Q64TCRT is used: Y1 When Q64TCTTBW or Q64TCRTBW is used: Y11

*4: For the noise immunity, dielectric withstand voltage, insulation resistance and others of the PLC system which uses this module, refer to the power supply module specifications given in the user's manual of the CPU module used.

*5: Corresponding to the function version C or later.

*6: Corresponding to the function version B or later.

■ Usable temperature sensor types, measurement temperature ranges and data resolutions

(1) For use of Q64TCTT and Q64TCTTBW

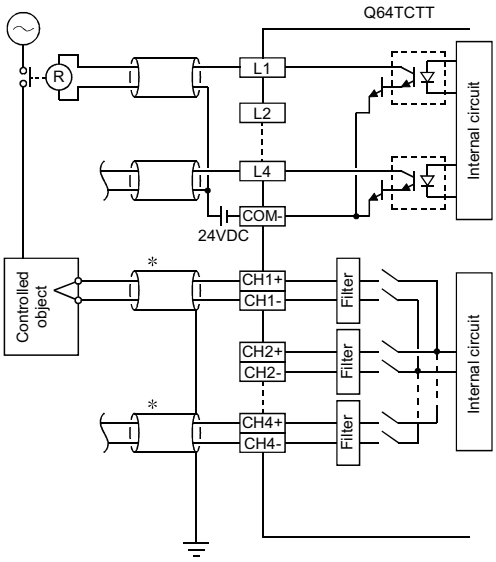
Thermocouple Type	℃		℉	
	Measurement temperature range	Data resolution	Measurement temperature range	Data resolution
R	0 to 1700	1	0 to 3000	1
K	0 to 500 0 to 800 0 to 1300	1	0 to 1000 0 to 2400	1
	-200.0 to 400.0 0.0 to 400.0 0.0 to 500.0 0.0 to 800.0	0.1	0.0 to 1000.0	0.1
J	0 to 500 0 to 800 0 to 1200	1	0 to 1000 0 to 1600 0 to 2100	1
	0.0 to 400.0 0.0 to 500.0 0.0 to 800.0	0.1	0.0 to 1000.0	0.1
T	-200 to 400 -200 to 200 0 to 200 0 to 400	1	0 to 700 -300 to 400	1
	-200.0 to 400.0 0.0 to 400.0	0.1	0.0 to 700.0	0.1
S	0 to 1700	1	0 to 3000	1
B	0 to 1800	1	0 to 3000	1
E	0 to 400 0 to 1000	1	0 to 1800	1
	0.0 to 700.0	0.1	---	---
N	0 to 1300	1	0 to 2300	1
U	0 to 400 -200 to 200	1	0 to 700 -300 to 400	1
	0.0 to 600.0	0.1	---	---
L	0 to 400 0 to 900	1	0 to 800 0 to 1600	1
	0.0 to 400.0 0.0 to 900.0	0.1	---	---
PLII	0 to 1200	1	0 to 2300	1
W5Re/W26Re	0 to 2300	1	0 to 3000	1

(2) For use of Q64TCRT and Q64TCRTBW

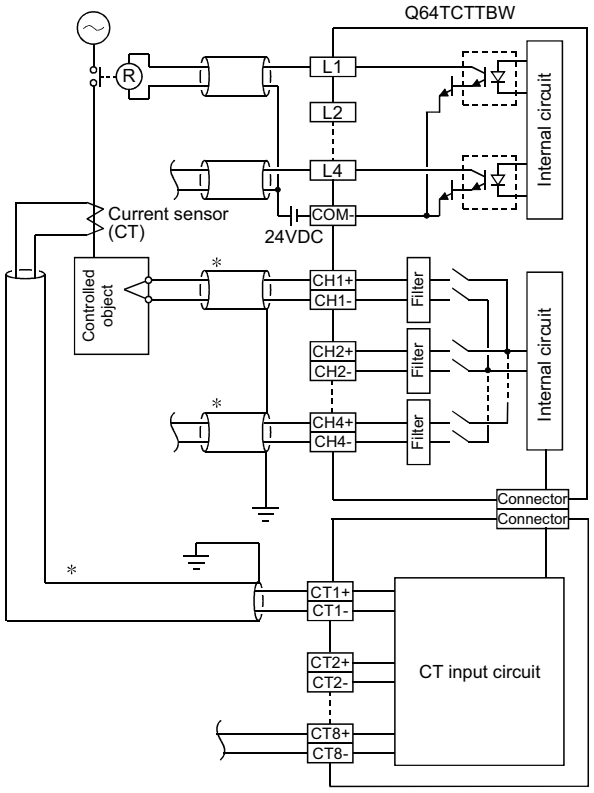
Platinum Temperature-Measuring Resistor	℃		℉	
	Measurement temperature range	Data resolution	Measurement temperature range	Data resolution
Pt100	-200.0 to 600.0 -200.0 to 200.0	0.1	-300 to 1100	1
			-300.0 to 300.0	0.1
JPt100	-200.0 to 500.0 -200.0 to 200.0	0.1	-300 to 900	1
			-300.0 to 300.0	0.1

External wiring

(1) For use of Q64TCTT

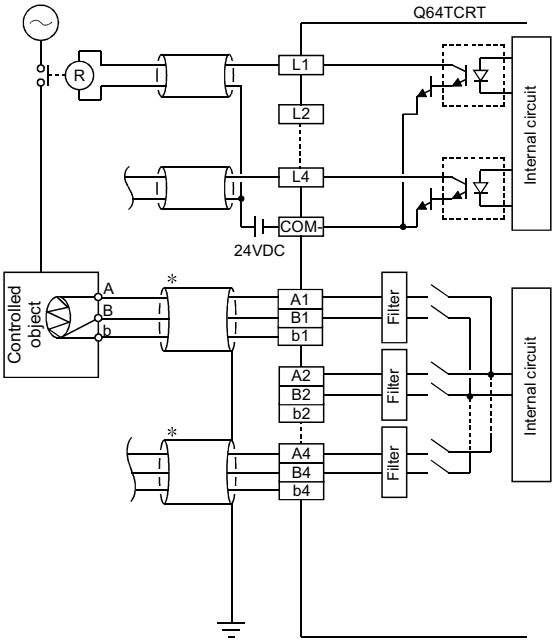


(2) For use of Q64TCTTBW

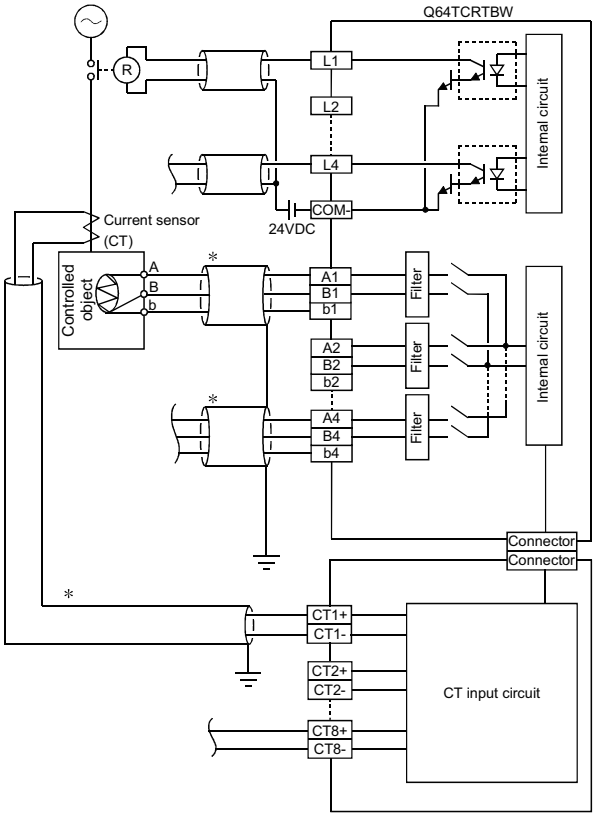


*: Always use shielded cables.

(3) For use of Q64TCRT



(4) For use of Q64TCRTBW



Q64TCTT, Q64TCTTBW external I/O terminals

Terminal number	Signal name		
	Q64TCTT	Q64TCTTBW	
1	L1	Unused	L1
2	L2	CT1+	L2
3	L3	CT1-	L3
4	L4	CT2+	L4
5	COM-	CT2-	COM-
6	Unused	CT3+	Unused
7	CH1+	CT3-	CH1+
8	CH2+	CT4+	CH2+
9	CH1-	CT4-	CH1-
10	CH2-	CT5+	CH2-
11	Unused	CT5-	Unused
12	CJ	CT6+	CJ
13	Unused	CT6-	Unused
14	CJ	CT7+	CJ
15	CH3+	CH7-	CH3+
16	CH4+	CH8+	CH4+
17	CH3-	CH8-	CH3-
18	CH4-	Unused	CH4-

Q64TCRT, Q64TCRTBW external I/O terminals

Terminal number	Signal name		
	Q64TCRT	Q64TCRTBW	
1	L1	Unused	L1
2	L2	CT1+	L2
3	L3	CT1-	L3
4	L4	CT2+	L4
5	COM-	CT2-	COM-
6	Unused	CT3+	Unused
7	A1	CT3-	A1
8	A2	CT4+	A2
9	B1	CT4-	B1
10	B2	CT5+	B2
11	b1	CT5-	b1
12	b2	CT6+	b2
13	A3	CT6-	A3
14	A4	CT7+	A4
15	B3	CH7-	B3
16	B4	CH8+	B4
17	b3	CH8-	b3
18	b4	Unused	b4

Equipment

<Q64TCTT, Q64TCTTBW accessories>

Product	Description
Manual	Q64TCTT/Q64TCTTBW Temperature Control Module User's Manual (Hardware)

<Q64TCRT, Q64TCRTBW accessories>

Product	Description
Manual	Q64TCRT/Q64TCRTBW Temperature Control Module User's Manual (Hardware)

<Separately obtainable products>

Product	Description
Manual	Temperature control module user's manual

■ Applicable Systems

<Applicable modules and numbers of Q64TC modules that may be mounted>

The following table indicates the CPU modules and network modules (for remote I/O stations) which accept the Q64TC, and the number of Q64TC modules that can be mounted.

Applicable module		Number of modules that can be installed		Remarks
		Q64TCTT/ Q64TCRT	Q64TCTTBW/ Q64TCRTBW	
CPU module	Q00JCPU	Maximum 16	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	Maximum 12	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Maximum 32	Can be installed in Q mode only *1
	Q12PHCPU Q25PHCPU	Maximum 64	Maximum 32	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	Maximum 32	MELSECNET/H Remote I/O stations *2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O network in Section 2.5.2.

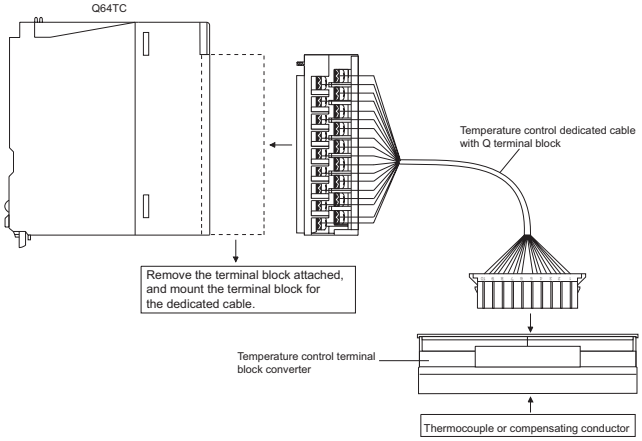
<Compatible software packages>
Correspondence between systems which use Q64TC and software packages are as shown below.
The GX Developer is necessary when using a Q64TC.

		Software Version	
		GX Developer	GX Configurator-TC
If mounted with Q00J/ Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later (cannot be used with the SW0D5C-QTCU40-E or earlier versions).
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/Q06H/ Q12H/ Q25HCPU	Single CPU system	Version 4 or later	SW0D5C-QTCU-E 00A or later
	Multiple CPU system	Version 6 or later	
If mounted with Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	Version 1.13P or later (cannot be used with the SW0D5C-QTCU-E 40D or earlier versions).
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QTCU-E 10B or later

<Current sensors>
Only the following current sensors manufactured by URD, Ltd. are usable with the Q64TCTTBW and Q64TCRTBW.

• CTL-12-S36-8(0.0 to 100.0A)
• CTL-6-P(-H)(0.0 to 20.00A)

<Cautions for system configuration>
Q64TC measures temperature at the terminal block. Therefore, depending on the system configuration, (especially when two or more Q64TC are connected consecutively or when Q64TC is connected next to a power module or a CPU module), measured temperature error can be bigger for the uneven temperature distribution resulting from the heat generated by each module.
In this case, the following terminal block converter module and the dedicated cable can prevent the error resulting from heat.



The following shows the dedicated cable and the terminal block converter module.

Product name	Model name	Manufacturer
Dedicated cable for temperature adjustment with Q terminal block	FA-CBLQ64TC** (**: cable length)	Mitsubishi Electric Engineering Co., Ltd.
Terminal block converter module for temperature adjustment	FA-TB20TC	

Contact our branch offices listed below for the inquiry and order of the dedicated cable and terminal block converter module.

3.4.2 Loop control module : Q62HLC

General Description

■ What are Q62HLC

(1) The Q62HLC is the intelligent function module for the continuous proportional control.
The Q62HLC converts analog inputs from various external sensors (temperature, humidity, pressure, and flow rate, etc.) into measured values (with 16-bit signed binary), performs PID operations to attain target set values, and outputs the calculated manipulated values to external operation device with current output.

(2) The Q62HLC has the following five control functions.
- Normal mode (Normal control mode)
- Program control (Program control mode)
- Cascade mode
- Manual control (Manual control mode 1)
- Manual control (Manual control mode 2)

(3) The Q62HLC have an auto tuning function which automatically sets the proportional band (P), integral time (I) and derivative time (D) for PID operations.

(4) The Q62HLC accepts K, J, T, B, S, E, R, N, PLII and W5Re/W26Re type thermocouples and the sensors compatible with various input ranges of micro voltage, voltage and current.

Features

■ High speed continuous proportional control (PID control)

The Q62HLC is the intelligent function module that performs the continuous proportional control.
The specifications of the Q62HLC are the high speed 25ms sampling cycle, the high accurate and high resolution analog input (thermocouple, micro voltage, voltage and current), and the current output.
This will enable the Q62HLC to support the target controls with high speed response such as the rising and falling temperature control, pressure control and flow rate control with high speed.

■ Optimum temperature adjustment control (PID control)

(1) The Q62HLC exercises PID control automatically by merely setting the PID constants (proportional band (P), integral time (I), derivative time (D)) (set value: (SV) necessary for PID operations.
Therefore, no special instructions are needed to perform PID control.

(2) The Q62HLC can select a control function from several control functions.
(a) Normal mode (Normal control mode)
: controls the control target using the manipulated values calculated in PID operations as the control output.
(b) Program control (Program control mode)
: changes the set values automatically and performs the control, following the set program pattern. The calculated operational rate in PID operations is used for the control output.
(c) Cascade control
: performs the control using the channel 1 as master and the channel 2 as slave.
(d) Manual control (Manual control mode 1)
: controls the control target using the numerical values(-5.0 to 105.0%) written in the manual output setting as the control output.
(e) Manual control (Manual control mode 2)
: controls the control target using the numerical values (0 to 4000) written in the manual output setting as the control output. Mode for simplified analog I/O function.

(3) Using the auto tuning function at normal control mode, enables the PID constants to be set automatically by the Q62HLC.
Hence, you can use the equipment without being conscious of cumbersome PID operation expressions to find the PID constants.

■ Connection of thermocouples compatible with JIS, IEC, NBS and ASTM Standards

(1) The Q62HLC accepts the following thermocouples compatible with the JIS, IEC, NBS and ASTM Standards. (Refer to Section 3.2.1)
- JIS Standards : R, K, J, S, B, E, T
- IEC Standards: R, K, J, S, B, E, T, N
- NBS Standards : PL II
- ASTM Standards: W5Re, W26Re

(2) The Q64TCTT(BW) allows you to set the temperature measurement ranges which meet the operating temperatures of the above thermocouples.

■ Connection of sensors compatible with various input ranges of micro voltage, voltage and current

With the input sensor for micro voltage, voltage and current, the measuring of the analog input is available within the following ranges.
- Micro voltage : 0 to 10mV, 0 to 100 mV, -10 to 10 mV, -100 to 100 mV
- Voltage : 0 to 1V, 1 to 5V, 0 to 5V, 0 to 10V, -1 to 1V, -5 to 5 V, -10 to 10V
- Current : 4 to 20mA, 0 to 20mA

■ RFB limiter function

The RFB (Reset Feed Back) limiter suppresses overshooting which is liable to occur at a startup or when the set values (SV) is increased.

■ Sensor compensation function

By setting a sensor compensation value, the sensor compensation function eliminates a difference between measured values (PV) and actual temperature, humidity, pressure, flow rate or others, if any.

■ Program control function

By merely setting the program pattern, the function performs the control automatically changing the set values (SV) or PID constants (proportional band (P), integral time (I), derivative time (D)) by the hour.

■ **Cascade control function**

The cascade control can perform the control using the channel 1 as master and the channel 2 as slave.

■ **Scaling function**

The result scaling the measured value (PV) can be automatically stored in the buffer memory.

■ **Simplified analog I/O function**

Monitoring the measured value and setting the manipulated value manually can use the Q62HLC as simplified thermocouple/micro voltage input module, analogdigital conversion module and digital-analog conversion.

■ **Auto tuning mode setting function**

Setting AT (auto tuning) differential gap and AT additional lag can set the auto tuning mode according to a control target to be used.

■ **Online module change function**

The Q62HLC can be changed without stopping the system.

■ **FeRAM for backing up set values**

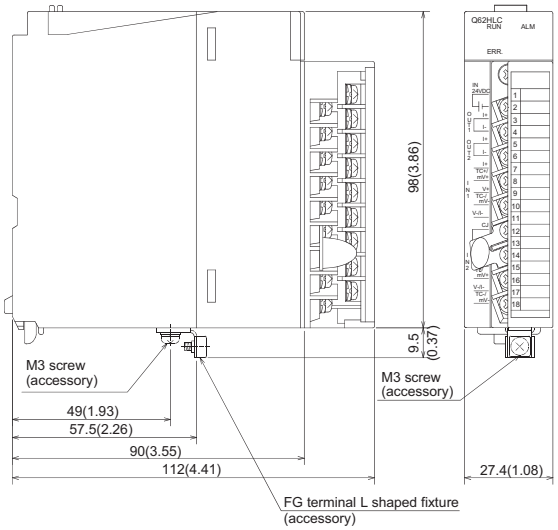
The set values in buffer memory can be stored into FeRAM for data backup.

Using the test function of GX Developer to write data directly to the buffer memory, what is required in a sequence program is "LD** " + "OUT Yn1" at the minimum.

■ **Utility package for ease of setting**

The optional utility package (GX Configurator-TC) is available. Though you are not required to use the utility package, it allows initial and automatic refresh settings to be made on the screen, reducing sequence programs and also enabling you to check the setting and operating states and execute auto tuning easily.

Appearance



Unit:mm(inch)

Function

Item	Deseription
Auto-tuning function	The loop control module automatically sets the optimal PID constants.
Auto-tuning mode setting function	Sets the auto-tuning mode according to the control target to use by setting AT (auto tuning) differential gap and AT additional lag.
Forward action/reverse action selection function	Heat control (reverse action) or cooling control (forward action) can be selected and controlled.
RFB limiter function	Limit the manipulation value overshoot which frequently occurs when the set value (SV) is changed or control target is changed.
Sensor compensation function	Compensates a difference between measured values and actual temperature, humidity, pressure, flux or others, if any, according to the measured status, etc.
Unused channel setting function	Sets the PID operation for channels that do not controll to "not execute."
PID control forced stop function	Stops the PID operation for channels that is performing temperature adjustment.
Loop disconnection detection function	A function to detect errors in the control system (control loop) caused by a load (heater) disconnection, abnormal external operation device (such as magnet relay), or a Input Sensor disconnection.
Data storage in FeRAM function	By backing up the buffer memory contents to FeRAM, the load of sequence program can be reduced.
Alert function	Monitors the process value (PV) and alerts the user.
Control output setting for CPU stop error occurrence function	This function continues/stops control output at CPU stop error occurrence.
Program control function	Performs the control changing the set value, following the time schedule
Cascade control function	Performs the control using the channel 1 as master and the channel 2 as slave.
Scaling function	Scales the set value and stores it in the buffer memory.
Simplified analog I/O input function	Uses the Q62HLC as simplified thermocouple/micro voltage input module analog-digital converter module, digital-analog converter module by monitoring the set value and manually setting the manipulated value.
Online module change function	A module change is made without the system being stopped.
Control function of Q62HLC	Controls the Q62HLC by the output signal of Q62HLC and the settings in the buffer memory.

Performance specification

Item			Specifications			
Analog I/O points			2 channels/module			
Specification for analog				Specification for analog output		
Input points			2points (2 channels)	Output points		2points(2 channels)
Analog input			Refer to "Usable input sensor types and measurement range, data resolution"	Digital input		16-bit signed binary
Digital output			16-bit signed binary	Analog output		Current
Applicable thermocouple			K,J,T,S,R,N,E,B, PLII,W5Re/w26Re	----		----
I/O characteristics			Refer to "Usable input sensor types and measurement range, data resolution"	Output characteristics		Digital input value: 0 to 1000 (When using simplified analog output:0 to 4000) Output range : 4 to 20mA
Maximum resolution				Maximum resolution		4μA
Accuracy	Indicated accuracy	Ambient temperature 23℃ ±2℃	Refer to Indication accuracy	Output accuracy	Ambient temperature 23℃ ±2℃	Full-scale ×(±0.2%)
		Ambient temperature 0℃ to 55℃			Ambient temperature 0℃ to 55℃	Full-scale ×(±0.4%)
	Cold junction temperature compensation accuracy	Ambient temperature 23℃ ±2℃	±0.5℃	----		----
		Ambient temperature 0℃ to 55℃	±1.0℃	----		----
Conversion speed			25ms/2 channels (Stable regardless of the number of used channels)	Conversion speed		25ms/2 channels (Stable regardless of the number of used channels)
Sampling period			25ms/2 channels (Stable regardless of the number of used channels)	----		----
Absolute maximum output			Micro voltage: ±12V Voltage: ±15V Current input: ±30mA	Allowable load resistance		Less than 600Ω
Input impedance			Thermocouple, micro voltage, voltage:1MΩ Current:250Ω	Output impedance		5MΩ
Normal mode rejection ratio			More than 60dB (50/60Hz)	----		----
Common mode rejection ratio			More than 120dB (50/60Hz)	----		----
Input filter (Primary delay digital filter)			0.0 to 100.0 (0: input filter OFF)	----		----
Sensor compensation value setting			Thermocouple: -500.0 to 500.0 Micro voltage, voltage, current: -50.00 to 50.00%	----		----
Operation at input wire breakage			Refer to "Operation at input disconnection"	----		----

(Continued on next page)

*1 Calculate the accuracy in the following method.
(Accuracy) = (indication accuracy) + (cold junction temperature compensation accuracy)
Example) Accuracy at the input range setting of "2", operating ambient temperature of 35℃ and temperature measurement value of 300℃
{400.0 - (-200.0)} [Full-scale] (±0.007) [±0.7%] + (±1.0℃) [Cold junction temperature compensation accuracy] = ±5.2℃

(Continued)

Item		Specifications
Control method		Auto tuning setting available
PID constant range	PID constant setting	Auto tuning setting available
	Proportional band (P)	Thermocouple: 0.1 to Full-scale ℃ Micro voltage, voltage, current: 0.1 to 1000.0%
	Integral time (I)	0.0 to 3276.7s
	Derivative time (D)	0.0 to 3276.7s
Set value setting range		Thermocouple: Input range of the thermocouple to be used Micro voltage, voltage, current: Set input range
Dead band setting range		Thermocouple: 0.0 to 100.0 ℃ Micro voltage, voltage, current: 0.00 to 10.00%
Time accuracy		±0.2%
Noise immunity		*2
Insulation		Insulation part: Between input and earth / Between input channels Insulation method: Transformer insulation / Transformer insulation Dielectric withstand voltage: 500VAC for 1min. Insulation resistance: 500VDC 20MΩ or more
Level of protection		IP2X
FeRAM read/write count		Max. 10^{10} times
Connection terminal		18-point terminal block
Applicable wire size		0.3 to 0.75mm^2
Applicable crimping terminal		R1.25-3, RAV1.25-3
Online module change		Possible
Multiple CPU system		Compatible
I/O occupied points		16 points/slot (I/O assignment: Intelligent 16 points)
External supply power		24 VDC +20%, -15%
		Ripple, spike within 500mV$_{P-P}$
		Inrush current: 0.2A, within 4ms
		0.07A
DC5V Internal current consumption		0.27A
Outline dimention		27.4 (W) × 98(H) × 112(D)mm
Weight		0.25kg

*2: For the noise immunity, dielectric withstand voltage, insulation resistance and others of the PLC system which uses this module, refer to the power supply module specifications used.

■ Usable input sensor types and measurement range, data resolution list

Input		Input range	Digital value	Resolution
Thermocouple	K	-200 to 1372℃	-2000 to 13720	0.1℃
	J	-200 to 1200℃	-2000 to 12000	
	T	-200 to 400℃	-2000 to 4000	
	S	-50 to 1768℃	-500 to 17680	
	R	-50 to 1768℃	-500 to 176800	
	N	0 to 1300℃	0 to 1300	
	E	-200 to 1000℃	-2000 to 10000	
	B	0 to 1800℃	0 to 18000	
	PLII	0 to 1390℃	0 to 13900	
	W5Re/W26Re	0 to 2300℃	0 to 23000	
Micro voltage		0 to 10mV	0 to 20000	0.5μV
		0 to 100mV		5μV
		-10 to 10mV	-10000 to 10000	1μV
		-100 to 100mA		10μV
Voltage		0 to 1V	0 to 20000	0.05mV
		1 to 5V		0.2mV
		0 to 5V		0.25mV
		0 to 10V		0.5mV
		-1 to 1V	-10000 to 10000	0.1mV
		-5 to 5V		0.5mV
		-10 to 10V		1mV
Current		4 to 20mA	0 to 20000	0.8μA
		0 to 20mA		1μA

■ Indication accuracy

(1) At ambient temperature 23±2℃

Item		Error	
Thermocouple	K,J,T,E,PLII	Less than -100℃	±1.0℃
		-100 to less than 500℃	±0.5℃
		500 or more	±(Indication value × (0.1%)+1 digit)
	S,R,N,W5Re/W26Re	-50 to less than 1000℃	±1.0℃
		1000℃ or more	±(Indication value × (0.1%)+1 digit)
	B	Less than 400℃	±70.0℃
		400 to less than 1000℃	±1.0℃
		1000℃ or more	±(Indicated value × (0.1%)+1 digit)
Micro voltage		Full-scale × (±0.1%)	
Voltage			
Current			

(2) At ambient temperature 0 to 55℃

Item		Error	
Thermocouple	K,J,T,E,PLII	Less than -100℃	±2.0℃
		-100 to less than 500℃	±1.0℃
		500 or more	±(Indication value × (0.2%)+1 digit)
	S,R,N,W5Re/W26Re	-50 to less than 1000℃	±2.0℃
		1000℃ or more	±(Indication value × (0.2%)+1 digit)
	B	Less than 400℃	±140.0℃
		400 to less than 1000℃	±2.0℃
		1000℃ or more	±(Indicated value × (0.2%)+1 digit)
Micro voltage		Full-scale × (±0.2%)	
Voltage			
Current			

■ Operation at input disconnection

Input	Input range	Operation
Thermocouple Micro voltage	All	Up scale *1
Voltage	1 to 5V	Down scale *2
	0 to 1V,-1 to 1V,0 to 5V,-5 to 5V, 0 to 10V,-10 to 10V	Value near 0V is displayed. *3
Current	4 to 20mA	Down scale
	0 to 20mA	Value near 0mA is displayed. *3

*1: "Input range upper limit + (Full-scale × 5%)" is displayed.

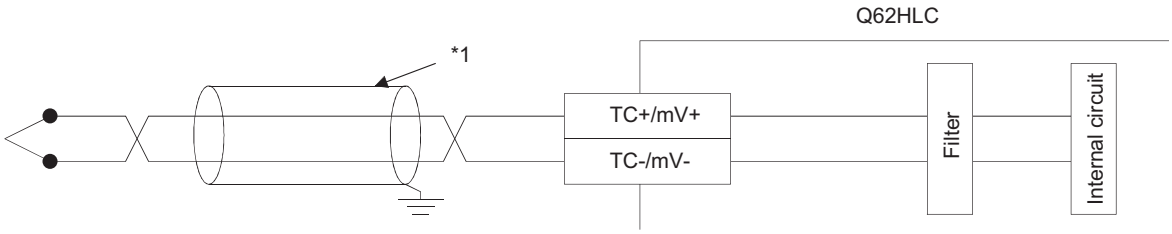
*2: "Input range lower limit - (Full-scale × 5%)" is displayed.

*3: In this case, no alert will occur at the channel without connecting a sensor, since themeasured value is within the input range.

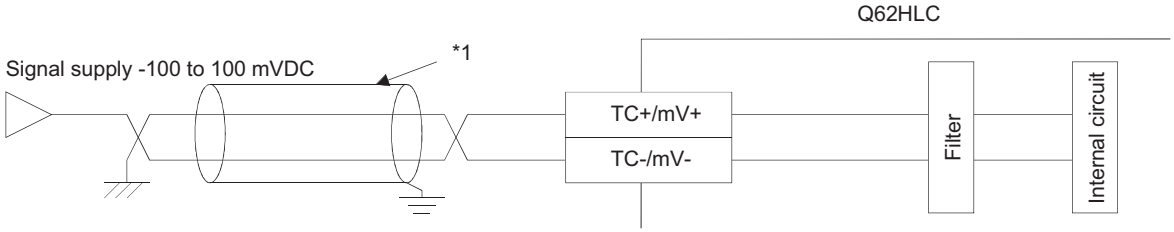
External wiring

(1) Input

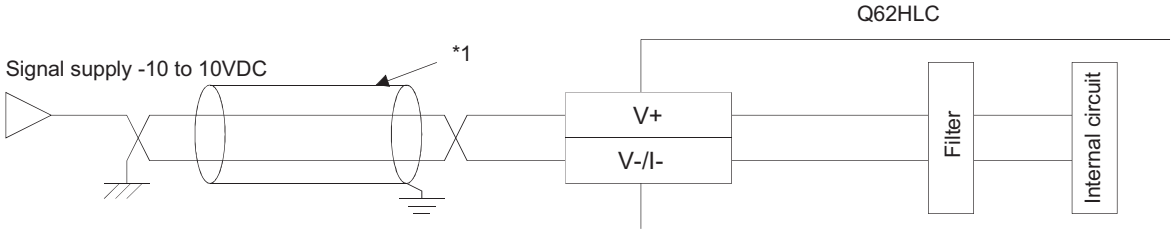
(a) Thermocouple input



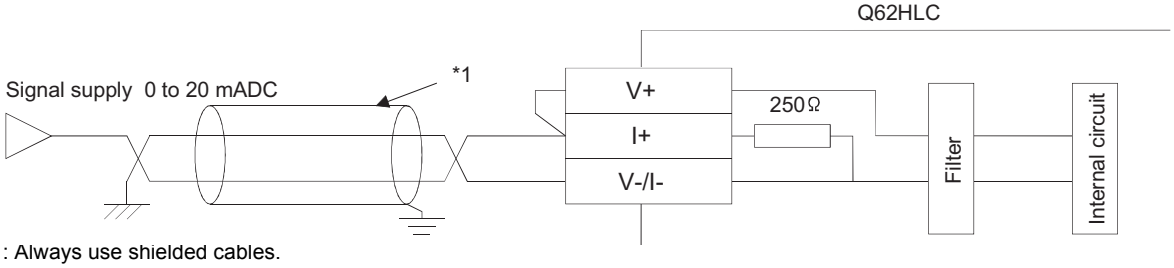
(b) Micro voltage input



(c) Current input

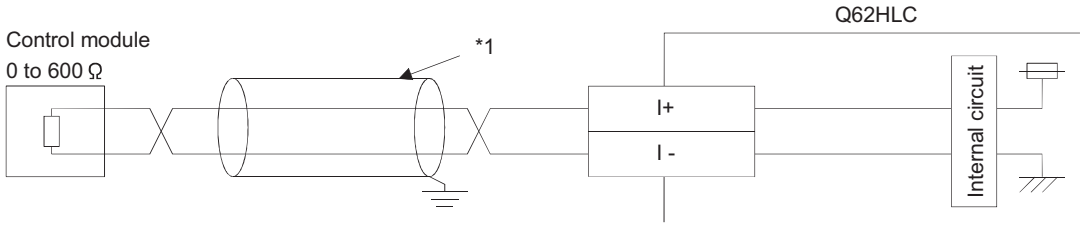


(d) Current input

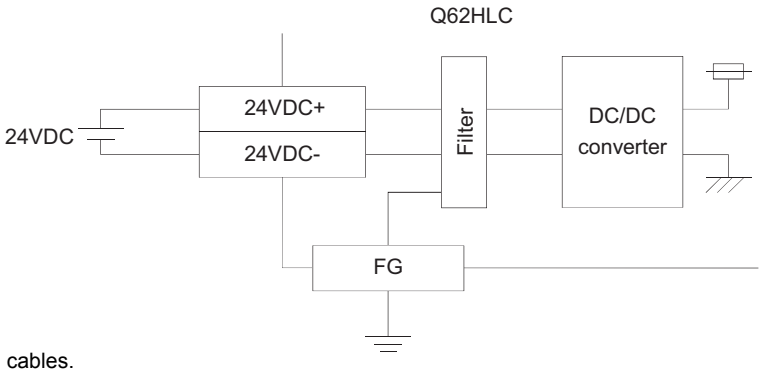


*1 : Always use shielded cables.

(2) Output



(3) External power supply



*1 : Always use shielded cables.

<Terminal number and signal name>

Terminal number	Signal name		Description	
1	24VDC+		24VDC+external power supply for current output	
2	24VDC-		24VDC- external power supply for current output	
3	OUT1	I +	CH1	Current output+
4		I -		Current output-
5	OUT2	I +	CH2	Current output+
6		I -		Current output-
7	IN1	I +	CH1	Current input+
8		TC+/mV+		Thermocouple/micro voltage input+
9		V+		Voltage input+
10		TC-/mV-		Thermocouple/micro voltage input-
11		V-/I-		Voltage/current input-
12	CJ		Cold junction temperature compensation resistor	
13	IN2	I +	CH2	Current input+
14	CJ		Cold junction temperature compensation resistor	
15	IN2	V+	CH2	V+ Voltage input+
16		TC+/mV+		Thermocouple/micro voltage input+
17		V-/I-		Voltage/current input-
18		TC-/mV-		Thermocouple/micro voltage input-

■System configuration

<Q62HLC accessories>

Product	Description
Manual	Loop Control Module User's Manual (Hardware)

<Separately obtained product>

Product	Description
Manual	Loop Control Module User's Manual

■ Applicable system

<Applicable modules and numbers of Q62HLC modules that may be mounted>

The following table indicates the CPU modules and network modules (for remote I/O stations) which accept the Q62HLC, and the number of Q62HLC modules that can be mounted.

Applicable module		Number of modules that can be installed Remarks	Remarks
CPU module	Q00JCPU	Maximum 16	(*1)
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only (*1)
	Q12PHCPU Q25PHCPU	Maximum 64	(*1)
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G QJ71LP25GE	Maximum 64	MELSECNET/H Remote I/O station (*2)

*1 Refer to details of the system configuration in each CPU system of Chapter 1.

*2 Refer to Section 2.5.2 MELSECNET/H (details of the system configuration in the remote I/O network).

<Software packages supported>
Correspondence between systems which use Q62HLC and software packages are as shown below.
The GX Developer is necessary when using a Q62HLC.

		Software Version	
		GX Developer	GX Configurator-TC
Q00J/ Q00/ Q01CPU	Single PLC system	Version 7 or later	Version 1.20W or later
	Multiple PLC system	Version 8 or later	
Q02/ Q02H/ Q06H/ Q12H/ Q25HCPU	Single PLC system	Version 4 or later	
	Multiple PLC system	Version 6 or later	
Q12PH/ Q25PHCPU	Single PLC system	Version 7.10L or later	
	Multiple PLC system		
If installed in a MELSECNET/H remote I/O station		Version 6 or later	

3.4.3 Temperature control module, Loop control module setting, monitoring tool:GX Configurator-TC

Overview

GX Configurator-TC is a temperature control module.
GX Configurator-TC is a utility package to make an initial setting necessary to use Q64TCTT(BW), Q64TCRT(BW) and loop control module Q62HLC and also make a setting to automatically read out and write in the data such as temperature measurement values, manipulation volumes, and target values. It is used as an add-in with GX Developer.
The initial settings and automatic refresh settings can be configured on the screen, which makes a sequence program shorter and allows easily confirming setting status and doing auto tuning.

Intelligent function module utility

■ Initial setting

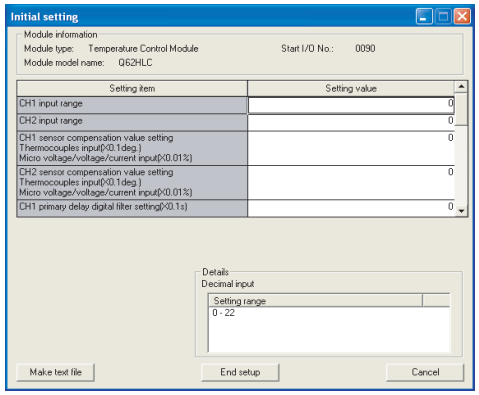
It is possible to configure the initial settings for using the temperature adjustment modules and loop control module on the screen. The following shows the main items* which require the initial settings.

(1) Input range
(2) Control parameter setting
(3) Alarm function setting
(4) CT setting (Q64TCTTBW, Q64TCRTBW only)
(5) Auto tuning setting (Q62HLC only)
(6) Program control setting (Q62HLC only)
(7) Cascade control setting (Q62HLC only)
(8) Other settings

Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to temperature control modules and loop control module when the PLC CPUs enter RUN state.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of initial setting screen



■ Auto refresh setting

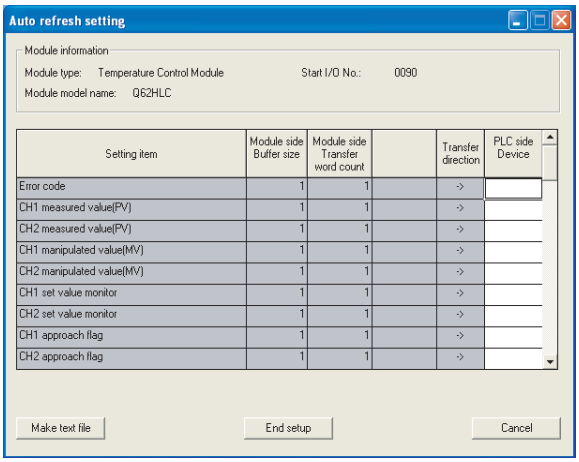
This sets the buffer memory of temperature control module and loop control module, which is the target of the auto refresh. The following shows the main items* which are the target of the auto refresh.

(1) Write data error code
(2) Temperature measurement value (PV)
(3) Manipulation volume (MV)
(4) Target value (SV)
(5) Transistor output flag (Q64TCTT(BW), Q64TCRT(BW) only)
(6) Alarm occurrence description
(7) Alarm setting value
(8) Heater disconnection alarm setting (Q64TCTTBW, Q64TCRTBW only)
(9) Heater electric current measurement value (Q64TCTTBW, Q64TCRTBW only)
(10) Proportional band (P) setting (Q62HLC only)
(11) Integral time (I) setting (Q62HLC only)
(12) Derivative time (D) setting (Q62HLC only)

The specified value, which are set for the auto refresh and stored in the buffer memory of the temperature control modules and loop control module, is automatically read at END instruction.

*: The items that can be set may vary depending on the module. For details, refer to the manual of each module.

Sample of auto refresh setting screen

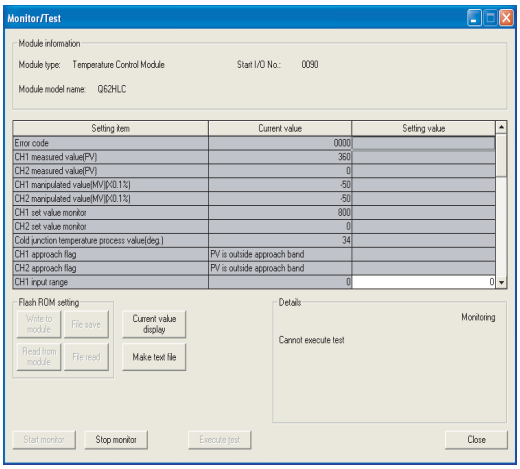


■ Monitor/test

● Monitor/test

This monitors/tests the buffer memory and I/O signals of the temperature control module and loop control module.

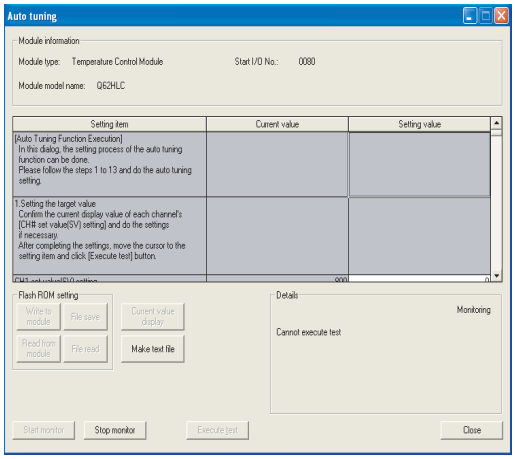
Sample of Monitor/test screen



● Auto tuning

Auto tuning function is available for temperature control module.

Sample of auto tuning screen



About the number of parameters that can be set in GX Configurator-TC

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Automatic refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/ Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings.The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.

The number of parameter settings that can be set for one module in the GX Configurator-TC is as shown below.

Object module	Initial setting	Automatic refresh setting
Q64TCTT,Q64TCRT	21 (Fixed)	61 (Maximum number of settings)
Q64TCTTBW Q64TCRTBW	21 (Fixed)	73 (Maximum number of settings)
Q62HLC	22 (Fixed)	52 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-TC is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later *2
Computer main unit		Personala computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	10 MB or more
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-TC in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-TC (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-TC (English version) cannot be used in configuration.

*2: GX Configurator-TC cannot be used as an add-in with GX Developer Version 3 or earlier versions.

Used operating system and performance required for personal computer

Operating system	Performance Required for Personal Computer	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows NT® 2000 Professional	Pentium® 133MHzor more	64MBor more
Windows® XP Professional (Service Pack 1 or later)	Pentium® 300MHzor more	128MBor more
Windows® XP Home Edition (Service Pack 1 or later)	Pentium® 300MHzor more	128MBor more

POINT

New functions of Windows ® XP

When Microsoft ® Windows ® XP Professional Operating System or Microsoft ® Windows ® XP Home Edition Operating System is used, the following new functions cannot be used.

If any of the following new functions is used, this product may not operate normally.

- Start of application in Windows® compatible mode
- Fast user switching
- Remote desktop
- Big fonts (Details setting of Display properties)

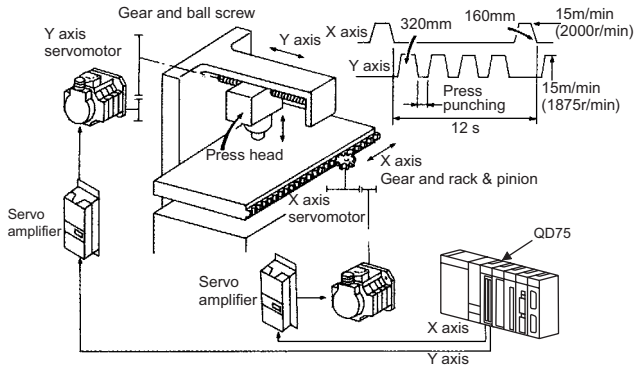
3.5 Positioning module

3.5.1 Overview of positioning control

Purpose and applications of positioning control

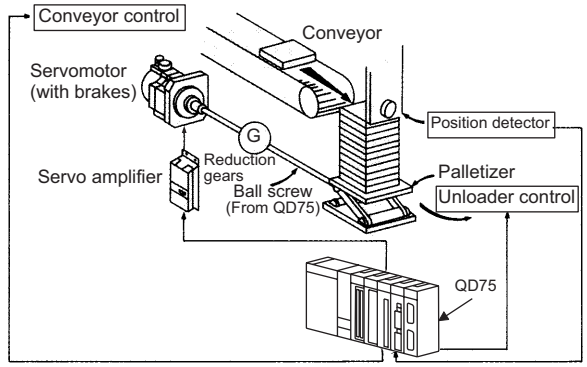
"Positioning" refers to moving a movable body, such as a workpiece or tool (hereinafter, generically called "workpiece") at a designated speed, and accurately stopping it at the target position. The main application examples are shown below.

■Punch press (X, Y feed positioning)



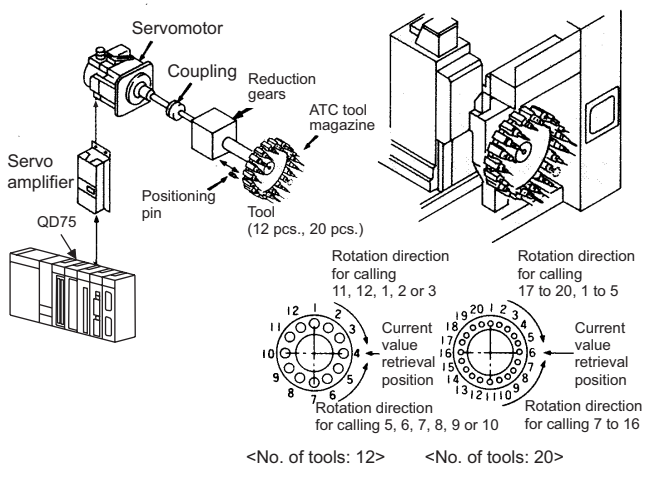
- To punch insulation material or leather, etc., as the same shape at a high yield, positioning is carried out with the X axis and Y axis servos.
- After positioning the table with the X axis servo, the press head is positioned with the Y axis servo, and is then punched with the press.
- When the material type or shape changes, the press head die is changed, and the positioning pattern is changed.

■Palletizer



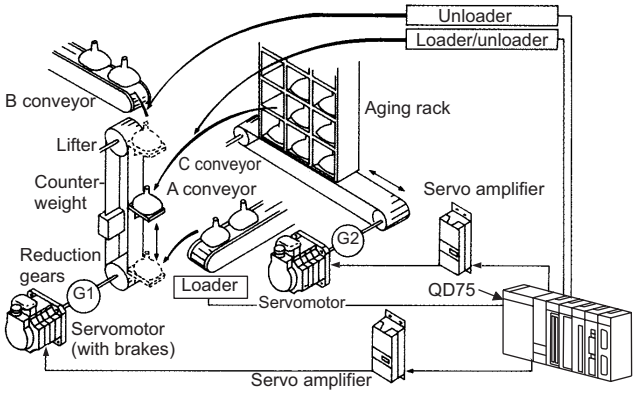
- Using the servo for one axis, the palletizer is positioned at a high accuracy.
- The amount to lower the palletizer according to the material thickness is saved.

■Compact machining center (ATC magazine positioning)



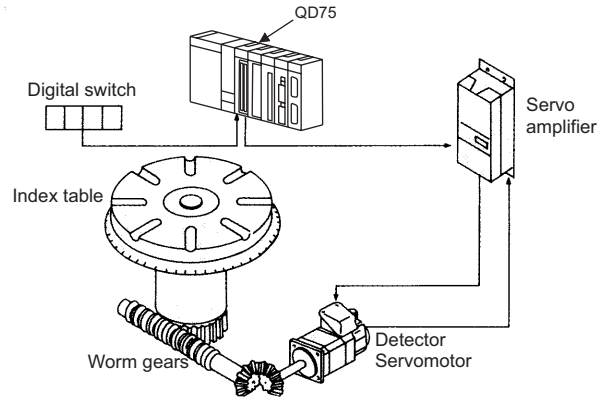
- The ATC tool magazine for a compact machining center is positioned.
- The relation of the magazine's current value and target value is calculated, and positioning is carried out with forward run or reverse run to achieve the shortest access time.

■Lifter (Storage of Braun tubes onto aging rack)



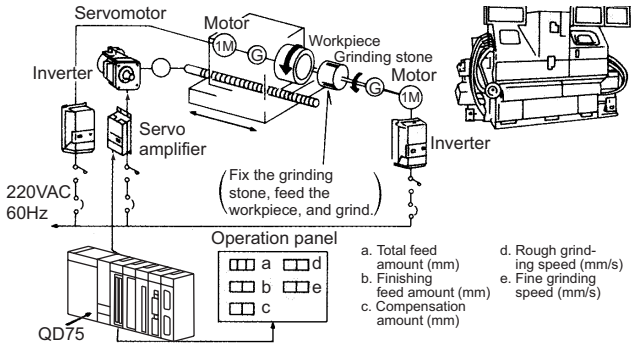
- During the aging process of braun tubes, storage onto the rack is carried out by positioning with the AC servo.
- The up/down positioning of the lifter is carried out with the 1-axis servo, and the horizontal position of the aging rack is positioned with the 2-axis servo.

■Index table (High-accuracy indexing of angle)



- The index table is positioned at a high accuracy using the 1-axis servo.

■Inner surface grinder



- The grinding of the workpiece's inner surface is controlled with the servo and inverter.
- The rotation of the workpiece is controlled with the 1-axis inverter, and the rotation of the grinding stone is controlled with the 2-axis inverter. The workpiece is fed and ground with the 3-axis servo.

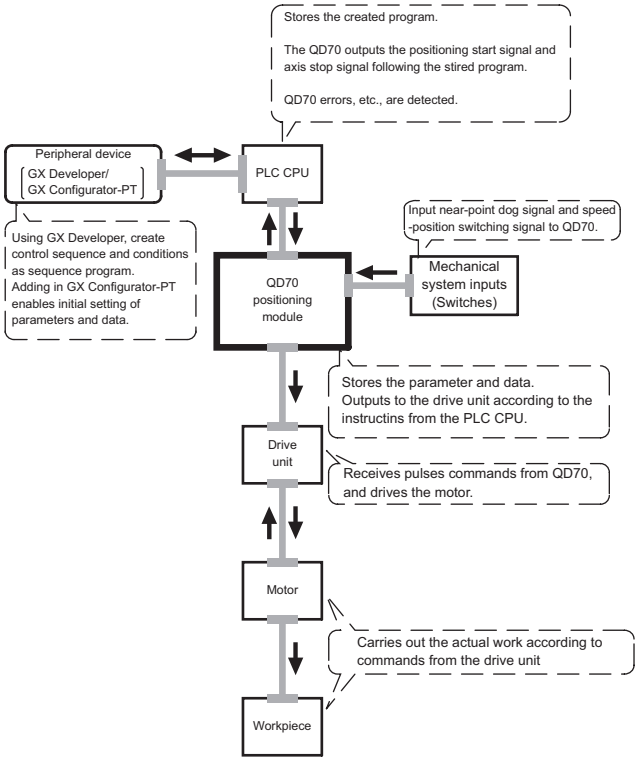
Mechanism of positioning control

<QD70P/D>

Positioning control using the QD70P/D is exercised using "pulse signals". (The QD70P/D is a module that outputs pulses.)

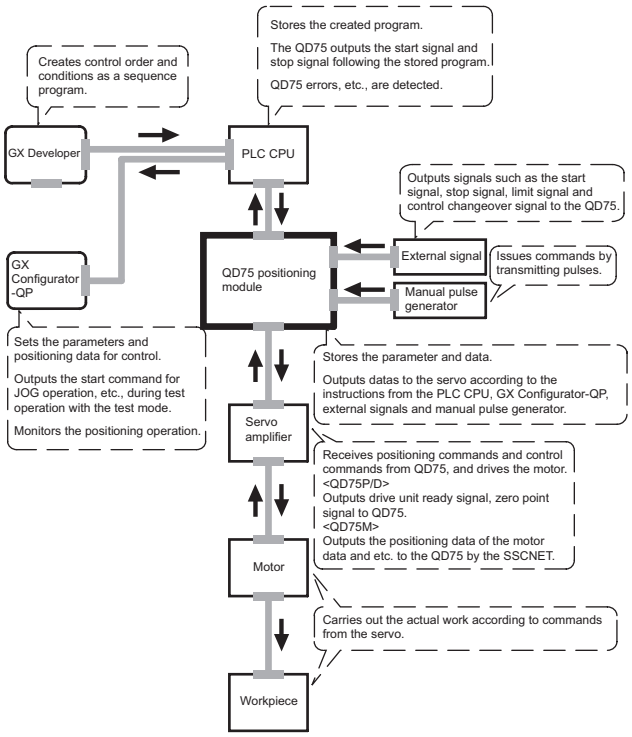
In a positioning control system using the QD70P/D, a variety of software and external devices are used to play their roles as shown below.

The QD70P/D imports various signals, parameters and data, and exercises control with the PLC CPU to realize complex positioning control.



<QD75>

In the positioning system using the QD75, various software and devices are used for the following roles. The QD75 realizes complicated positioning control when it reads in various signals, parameters and data and is controlled with the PLC CPU.



* For QD75M1, 2 and 4, use SW2D5C-QD75P or later of the GX Configurator.

Principle of operation of position control and speed control

■ Position control

The total No. of pulses required to move the designated distance is obtained in the following manner.

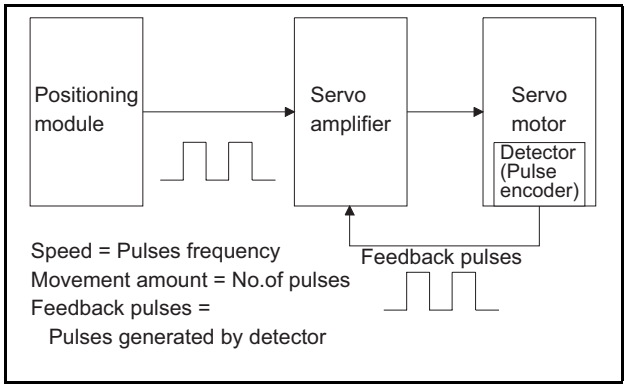
$$\left[\begin{array}{l}\text{Total No. of pulses}\\ \text{required to move}\\ \text{designated distance}\end{array}\right] = \left[\frac{\text{Designated distance}}{\text{Movement amount of machine (load) side when motor rotates once}}\right] \times \left[\begin{array}{l}\text{No. of pulses}\\ \text{required for motor to}\\ \text{rotate once}\end{array}\right]$$

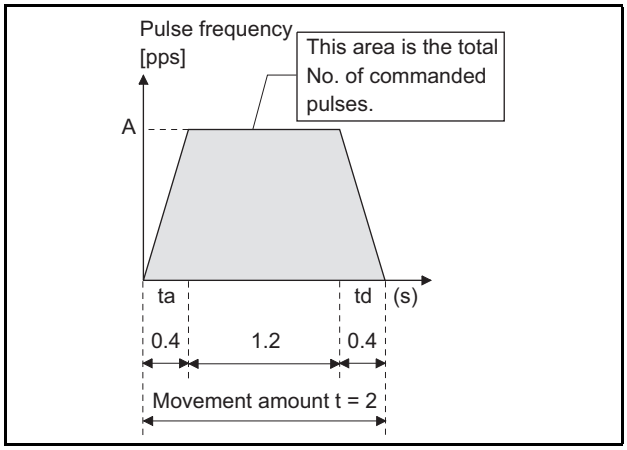
* The number of pulses required for the motor to rotate once is the "encoder resolution" described in the motor catalog specification list.

When this total No. of pulses is issued from the QD75 to the servo amplifier, control to move the designated distance can be executed.
The machine side movement amount when one pulse is issued to the servo amplifier is called the "movement amount per pulse". This value is the minimum value for the workpiece to move, and is also the electrical positioning precision.

■ Speed control

The "Total No. of pulses" mentioned above is invariably required for controlling the distance. For positioning or speed control, the speed must be controlled as well.
The "speed" is determined by the "frequency of pulses" sent from the QD75 to the drive unit.





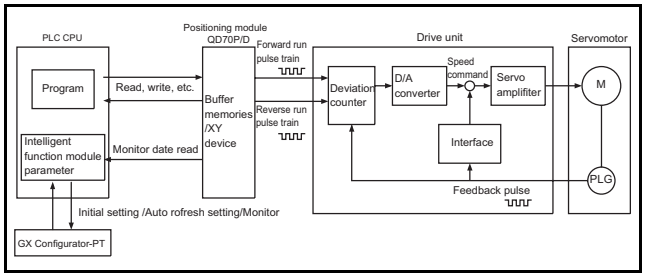
POINT

The QD75 and QD70P/D control the position with the "total No. of pulses", and the speed with the "pulse frequency".

Outline design of positioning control system

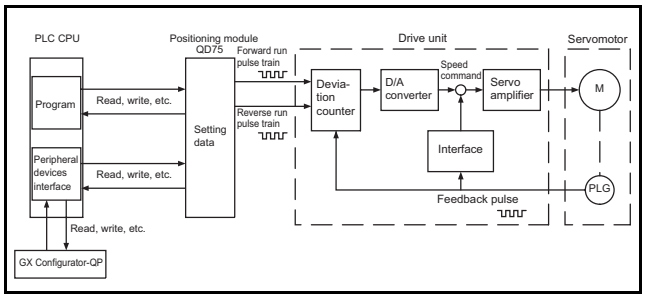
The outline of the positioning control system operation and design, using the QD70P/D and QD75P/D, is shown below.

■ Positioning control system using QD70P/D



Outline of the operation of positioning control system using QD70P/D

■ Positioning system using QD75P/D



Outline of the operation of positioning system using QD75P/D

● Positioning operation by the QD70P/D and QD75P/D

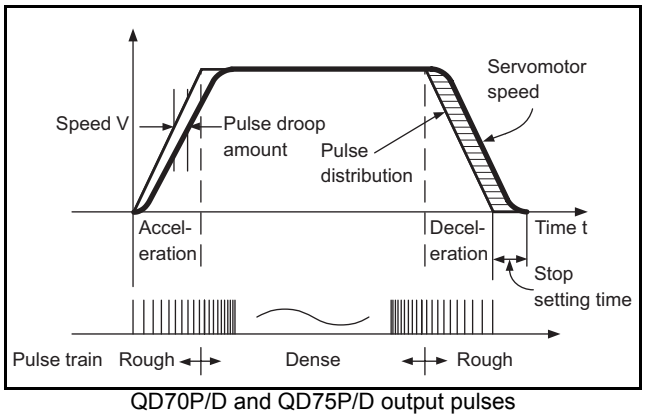
(1) The QD70P/D and QD75P/D output is a pulse train.
The pulse train output by the QD70P/D and QD75P/D is counted by and stored in the deviation counter in the drive unit.
The D/A converter outputs an analog DC current proportionate to the count maintained by the deviation counter (called "pulse droop"). The analog DC current serves as the servomotor speed control signal.

(2) The servomotor rotation is controlled by the speed control signal from the drive unit.
As the servomotor rotates, the pulse encoder (PLG) attached to the servomotor generates feedback pulses, the frequency of which is proportionate to the rotation speed.
The feedback pulses are fed back to the drive unit and decrements the pulse droop, the pulse count maintained by the deviation counter.
The motor keeps on rotating as the pulse droop is maintained at a certain level.

(3) When the QD70P/D and QD75P/D terminate the output of a pulse train, the servomotor decelerates as the pulse droop decreases and stops when the count drops to zero. Thus, the servomotor rotation speed is proportionate to the pulse frequency, while the overall motor rotation angle is proportionate to the total number of pulses output by the QD70P/D.
Therefore, when a movement amount per pulse is given, the overall movement amount can be determined by the number of pulses in the pulse train.
The pulse frequency, on the other hand, determines the servomotor rotation speed (feed speed).

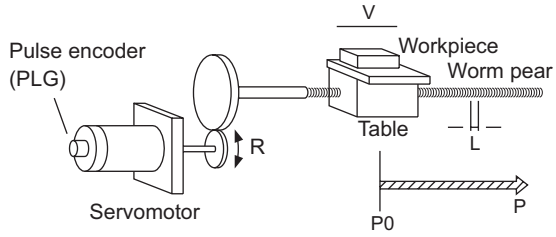
● Pulse train output from the QD70P/D and QD75P/D

(1) As shown in below, the pulse frequency increases as the servomotor accelerates. The pulses are sparse when the servomotor starts and more frequent when the servomotor speed comes close to the target speed.
(2) The pulse frequency stabilizes when the motor speed equals the target speed.
(3) The QD70P/D and QD75P/D decrease the pulse frequency (sparser pulses) to decelerate the servomotor before it finally stops the output.
There will be a little difference in timing between the decrease in the pulse frequency and the actual deceleration and stopping of the servomotor.
This difference, called "the stop settling time", is required for gaining a stopping accuracy.



QD70P/D and QD75P/D output pulses

■ Movement amount and speed in a system using worm gears



A:Movement amount per pulse (mm/pulse)
Vs:Command pulse frequency (pulse/s)
n:Pulse encoder resolution (pulse/rev)
L:Worm gear lead (mm/rev)
R:Deceleration ratio
V:Movable section speed (mm/s)
N:Motor speed (r/min)
K:Position loop gain (1/s)
ε :Deviation counter droop pulse amount
PO:OP (pulse)
P :Address (pulse)

System using worm gears

In the system shown in above, the movement amount per pulse, command pulse frequency, and the deviation counter droop pulser amount are determined as follows:

● Movement amount per pulse

The movement amount per pulse is determined by the worm gear lead, deceleration ratio, and the pulse encoder resolution.
The movement amount, therefore, is given as follows:
(Number of pulses output) × (Movement amount per pulse).

$$A = \frac{L}{R \times n} \text{ [mm/pulse]}$$

● Command pulse frequency

The command pulse frequency is determined by the speed of the moving part and movement amount per pulse.

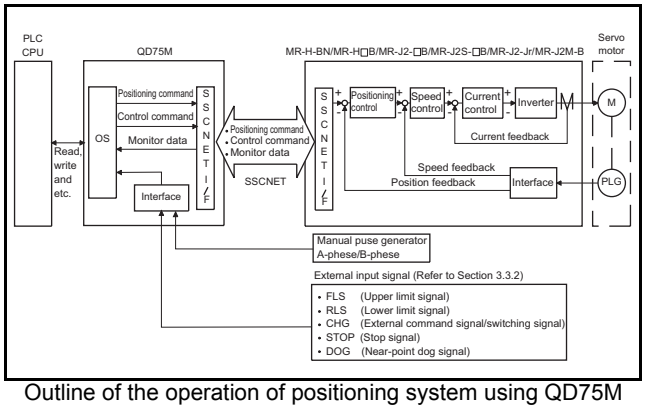
$$Vs = \frac{V}{A} \text{ [pulse/s]}$$

● Deviation counter droop pulser amount

The deviation counter droop pulser amount is determined by the command pulse frequency and position loop gain.

$$\varepsilon = \frac{Vs}{K} \text{ [pulse]}$$

■ Positioning system using QD75M



Outline of the operation of positioning system using QD75M

Positioning control operation by QD75M

(1) QD75M can be connected to servo amplifiers by SSCNET (Servo System Controller Network).

(2) By connecting to MELSERVO (Mitsubishi servo amplifier: MR-H-BN, MR-H-BN4, MR-J2-B, MR-J2S-B, MR-J2-Jr, MR-J2M-B) with SSCNET cable, cables can be saved.

(3) By connecting to the absolute position-corresponding servo amplifier, the absolute position system can be compatible.

3.5.2 QD70P/D positioning module: QD70P4,QD70P8, QD70D4,QD70D8

Overview

The QD70P4, QD70P8, QD70D4 and QD70D8 (hereafter referred generically to as the "QD70P/D") are positioning modules used in a multi-axis system that does not need complicated control.
However, please note they are not compatible in I/O signals, functions and others with the MELSEC-A series A1SD70 positioning modules.
AD70 positioning module is not compatible with QD70P/D positioning module as the type is analog output.)

Features

■ Two different output systems

Two different output systems, open collector and differential driver systems, are available as command signals to a stepping motor or servo amplifier.
QD70P4, QD70P8: Open collector system
QD70D4, QD70D8: Differential driver system

■ Selection of 4- and 8-axis products

4- and 8-axis models are available in terms of the number of axes per module.
QD70P4, QD70D4: 4 axes
QD70P8, QD70D8: 8 axes
Also, since there are no restrictions on the number of modules mounted, multiple modules can be mounted and used if more than 8 control axes are required.

■ About positioning control functions

(1) The QD70P/D has a number of functions required for a positioning control system, such as positioning control to any position and equal-speed control.
  (a) You can set up to 10 pieces of positioning data, which include positioning address, control method, operation pattern and the like, per axis.
  These positioning data are used to exercise positioning control axis-by-axis.
  (b) Axis-by-axis positioning control allows linear control (up to 8 axes can be controlled simultaneously).
  This control can perform positioning termination with one piece of positioning data or exercise continuous positioning control by continuous execution of multiple pieces of positioning data.

(2) As the control method, any of position control, speed-position switching control and current value changing may be specified in each positioning data.

(3) You can change the target position or speed during positioning control using the target position change function or target speed change function. (QD70D4 and QD70D8 only)

(4) OPR control is given additional features.
  (a) Six different methods are provided for "machine OPR control": near-point dog method (one method), stopper (three methods) and count (two methods).
  (b) OPR retry function facilitates the machine OPR control from an arbitrary position. (QD70D4 and QD70D8 only)

(5) Two acceleration/deceleration control methods are provided: trapezoidal acceleration/deceleration and S-pattern acceleration/deceleration. (The S-pattern acceleration/deceleration control is for QD70D4 and QD70D8 only.)

(6) You can change the I/O signal logic according to the specifications of the external device.
  This allows the input signals to be used with either of "normally open" and "normally closed" contacts, and the output signals to be used according to the specifications of the drive unit.
  Because of the acceleration/deceleration with precise speed change, it is suitable for the motor control.

■ Fast start processing

Speeding up the processing at a position control start allows the start processing time of one axis to be 0.1ms.
At a simultaneous start of multiple axes (the positioning start signals are turned ON at the same time within one scan), there are no starting delays between the axes.

■ Faster pulse output and allowance of longer distance to drive unit

The QD70D4 and QD70D8 with a differential driver incorporate the improvements in speed and distance.
- QD70P4/QD70D8: 4Mpulse/s, 10m max.
- QD70P4/QD70P8: 200Kpulse/s, 2m max.

■ Ease of maintenance

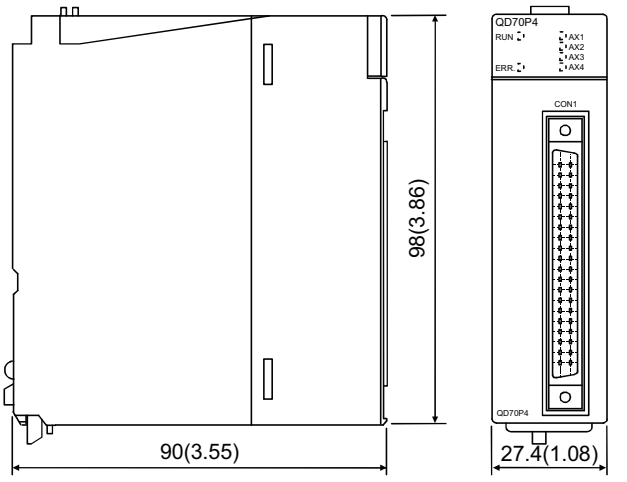
In the QD70P/D, error definitions have been subdivided to improve maintenance performance.

■ Ease of utility package settings

The optionally available utility package (GX Configurator-PT) allows initial setting and auto refresh setting to be made on the screen, reducing sequence programs and facilitating the confirmation of the setting status and operating status.

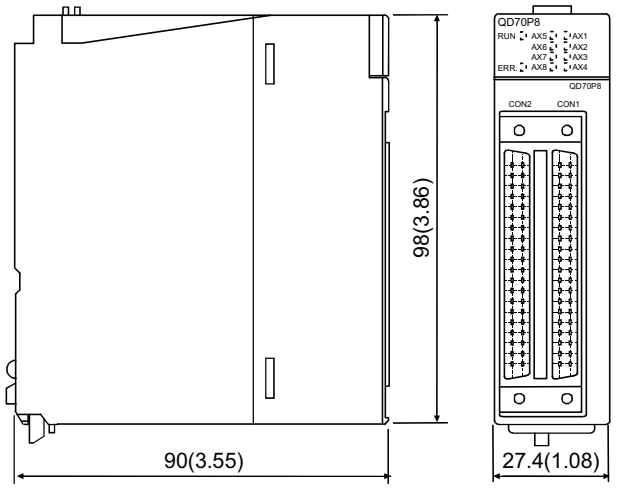
Appearance

(1) QD70P4



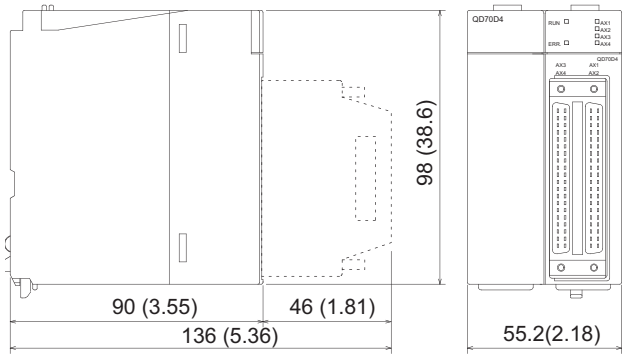
Unit:mm(inch)

(2) QD70P8



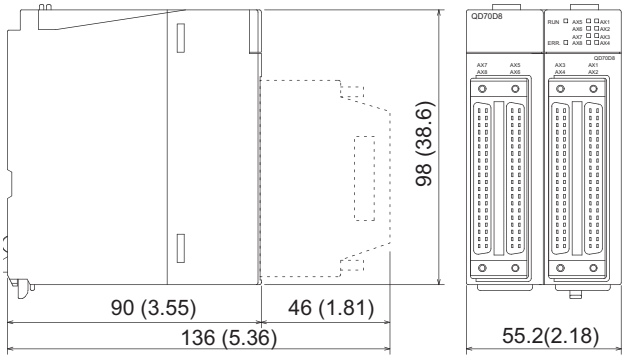
Unit:mm(inch)

(3) QD70D4



Unit:mm(inch)

(4) QD70D8



Unit:mm(inch)

List of functions

Function name		Description
OPR control	Machine OPR control	Mechanically establishes the positioning control start point using a near-point dog or stopper.
	Fast OPR control	Positions a target to the OP address (Current feed value) stored in the QD70 using machine OPR control.
	OPR retry function	Allows the machine OPR from an arbitrary position. The machine OPR is automatically performed even if the workpiece goes past the OP. (QD70D4 and QD70D8 only)
Positioning control	Position control (1-axis linear control)	Positions a target using a linear path to the address set in the positioning data or to the position designated with the movement amount.
	Speed-position switching control	First, carries out speed control, and then carries out position control (positioning control with designated movement amount) by turning the "speed-position switching signal" ON.
	Current value changing	Changes the Current feed value to the address set in the positioning data.
JOG operation		Outputs a pulse to drive unit while the JOG start signal is ON.
Sub function	Speed limit function	If the command speed exceeds "Speed limit value" during control, this function limits the commanded speed to within the "Speed limit value" setting range.
	Speed change function	This function changes the speed at any point during control. The function is enabled during position control whose operation status is "Positioning complete", during speed control of speed-position switching control or during JOG operation.
	Software stroke limit function	If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command.
	Target position change function	This function changes the positioning address or movement amount at any point during control. The function is enabled during position control whose operation status is "Positioning complete". (QD70D4 and QD70D8 only)
	Acceleration/deceleration processing function	This function adjusts the acceleration/deceleration processing of control.
	Restart function	This function resumes positioning control during a stop of the axis from where it had stopped.
Common function	External I/O signal logic switching function	This function changes the external I/O signal logic to match the externally connected device. It can be changed by making the intelligent function module switch setting.
	External I/O signal monitor function	This function monitors the external I/O signal states using GX Developer.

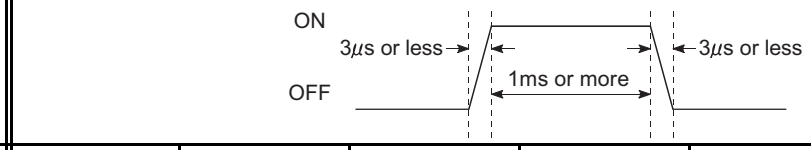
Performance specifications

Item \ Model		QD70P4			QD70D4		
		QD70P8			QD70D8		
No. of control axes		4 axes / 8 axes			4 axes / 8 axes		
Interpolation function		No					
Control method		PTP (Point To Point) control, path control (linear only), speed-position switching control					
Control unit		pulse					
Positioning data*1		10 pieces of data (positioning data No. 1 to 10)/axis (can be set using GX Configurator-PT or sequence program)					
Peripheral device/utility package		GX Configurator-PT (option)					
Data backup		No					
Positioning control	Positioning control method	PTP control: Incremental system/absolute system Speed-position switching control: Incremental system Path control: Incremental system/absolute system					
	Positioning control range	[Absolute system] -2147483648 to 2147483647pulse [Incremental system] -2147483648 to 2147483647pulse [Speed-position switching control] 0 to 2147483647pulse					
	Speed command	0 to 200000pulse/s			0 to 4000000pulse/s		
	Acceleration/ deceleration processing	Trapezoidal acceleration/deceleration			Trapezoidal acceleration/deceleration, S-pattern acceleration/deceleration*3		
	Acceleration/ deceleration time	0 to 32767ms					
Starting time *2		Position control	1-axis start	0.1ms	Position control	1-axis start	0.1ms
			4-axes simultaneous start	0.2ms		4-axes simultaneous start	0.2ms
			8-axes simultaneous start	0.4ms		8-axes simultaneous start	0.4ms
Protection degree		IP2X					
External wiring connection system		40-pin connector (The pin layout differs between QD70P and QD70D.)					
Applicable wire size		0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4), AWG#24 (for A6CON2)			0.3mm^2 (for A6CON1, A6CON4), AWG#24 (for A6CON2)		
External device connection connector (option)		A6CON1, A6CON2, A6CON4					
Pulse output method		Open collector output			Differential output		
Max. output pulse		200kpps			4Mbps		
Max. connection distance between QD70P/D and drive unit		2m			10m		
Online module change		Not possible					
Multiple CPU system		Compatible					
Number of occupied I/O points		32 points/slot (I/O assignment: Intelligent)			48 points/2 slots (I/O assignment: 16 free points + 32 intelligent points)*4		
5VDC Internal current consumption		0.55A	0.74A		1.16A	2.16A	
External supply power	Voltage	24VDC (+20%/-15%) (Within ripple ratio 5%)			---	---	
	Current consumption	0.065A	0.12A				
External dimensions		98 (3.86)(H)×27.4 (1.08)(W)× 90 (3.54)(D) mm(inch)			98 (3.86)(H)×55.2 (2.18)(W)× 90 (3.54)(D) mm(inch)		
Weight		0.15kg	0.17kg		0.17kg	0.23kg	

*1: Positioning data can be started from only No. 1. (Cannot be started from any of No. 2 to No. 10.)
*2: A delay may occur depending on the operating conditions and starting conditions (control method, bias speed, ACC/DEC time, etc.) of the other axes.
*3: When the operation pattern is the continuous positioning control or continuous path control, the S-pattern acceleration/deceleration cannot be used.
*4: Setting of 32 points (0 for empty + 32 for intelligent) is also available by GX Developer's I/O assignment setting.

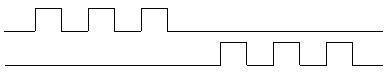
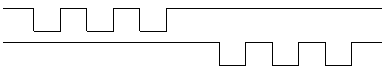
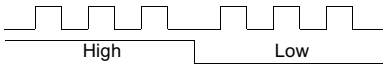
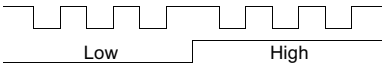
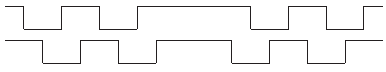
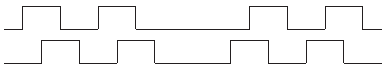
External I/O specifications

■ Input specifications

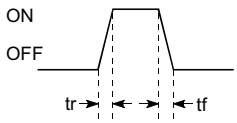
Signal name		Rated input voltage/current	Working voltage range	ON voltage/ current	OFF voltage/ current	Input resistance	Response time
Zero signal (PG0)	For QD70P□	5VDC/18mA	4.5 to 5.5VDC	2.7VDC or more/ 5.5mA or more	1.0VDC or less/ 0.5mA or less	Approx. 270Ω	0.1ms or less
	For QD70D□	5VDC/13mA	4.75 to 5.5VDC	3.5VDC or more/ 6mA or more	1.0VDC or less/ 0.5mA or less	Approx. 390Ω	0.1ms or less
							
Near-point dog signal (DOG) Speed-position switching signal (CHG)		24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/3mA or more	7VDC or less/ 0.9mA or less	Approx. 6.8kΩ	1ms or less

■ Output specifications

Signal name	Rated load voltage	Working load voltage range	Max. load current/rush current	Max. voltage drop at ON	Leakage current at OFF	Response time
Pulse output F (PULSE F(+/-)) (CW/PULSE/A phase*) Pulse output R (PULSE R(+/-)) (CCW/SIGN/B phase*)	Differential driver equivalent to Am26c31 (For QD70D□) • Set the "pulse output mode" and "pulse output logic selection" in "intelligent function module switch setting". (Refor to Section 5.6) • The following are the relationships between pulse outputs depending on the "pulse output mode" and "pulse output logic selection".					
	For QD70P□, the table next page shows the rising/falling edge time and duty ratio.					
	5 to 24VDC	4.75 to 30VDC	50mA/1 point/ 200mA 10ms or less	0.5VDC (TYP)	0.1mA or less	---
Deviation counter clear (CLEAR)	5 to 24VDC	4.75 to 30VDC	0.1A/1 point/0.4A 10ms or less	1VDC (TYP) 2.5VDC (MAX)	0.1mA or less	2ms or less (resistance load)

Pulse output mode	Pulse output logic selection			
	Positive logic		Negative logic	
	Forward run	Reverse run	Forward run	Reverse run
CW CCW				
PULSE SIGN				
Aϕ* Bϕ*				

*: QD70D4, QD70D8 only



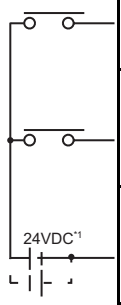
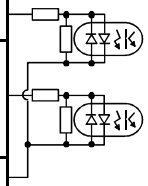
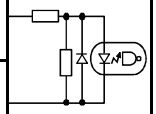
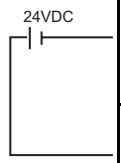
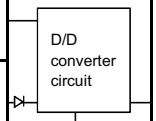
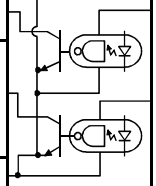
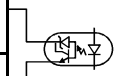
Pulse rising in QD70P□/falling edge time (Unit for "tr" and "tf": μs, unit for "Duty": %)... When ambient temperature is room temperature.

Load voltage (V)		26.4					
Cable length (m)		1			2		
Load current (mA)	Pulse speed (kpps)	tr (Rising edge)	tf (Falling edge)	Duty	tr (Rising edge)	tf (Falling edge)	Duty
2	200	1.902	0.3178	28.20	2.129	0.2724	28.09
	100	2.869	0.3388	38.44	3.691	0.3549	40.12
	10	3.710	0.3616	50.22	5.187	0.3613	49.63
5	200	1.776	0.3036	35.45	1.763	0.3395	36.48
	100	2.134	0.3285	43.90	2.394	0.3445	41.11
	10	2.357	0.3982	50.88	3.105	0.3899	50.50
10	200	1.336	0.3174	40.92	1.429	0.3228	40.44
	100	1.644	0.3814	48.05	1.812	0.3793	46.40
	10	2.028	0.4197	51.31	1.996	0.4200	51.22
20	200	1.236	0.3807	45.64	1.269	0.3949	45.14
	100	1.772	0.4453	49.90	1.734	0.4660	49.73
	10	1.957	0.4776	51.63	1.727	0.4749	51.55
50	200	1.122	0.6809	51.78	1.019	0.6684	51.42
	100	1.359	0.7407	53.09	1.544	0.7897	52.90
	10	1.750	0.9833	52.05	1.819	0.9130	52.03

Load voltage (V)		4.75					
Cable length (m)		1			2		
Load current (mA)	Pulse speed (kpps)	tr (Rising edge)	tf (Falling edge)	Duty	tr (Rising edge)	tf (Falling edge)	Duty
2	200	0.8352	0.2093	45.21	1.484	0.1924	36.94
	100	1.880	0.2679	44.44	1.848	0.2536	45.03
	10	1.942	0.2765	51.03	2.039	0.2873	51.13
5	200	1.220	0.1726	39.35	1.191	0.2345	41.56
	100	1.422	0.2652	48.15	1.589	0.2631	47.89
	10	1.705	0.2893	51.35	1.604	0.3116	51.40
10	200	0.8736	0.2739	46.99	1.167	0.2519	44.97
	100	1.041	0.3075	49.87	1.371	0.3028	50.02
	10	1.576	0.3295	51.49	1.672	0.3212	51.41
20	200	1.021	0.3479	49.65	0.7345	0.3452	48.94
	100	1.277	0.3671	51.67	1.222	0.3780	52.12
	10	1.473	0.4207	51.84	1.287	0.3999	51.73
50	200	0.8312	0.6302	55.37	0.7978	0.5752	55.34
	100	0.9714	0.6290	55.38	1.025	0.6218	55.64
	10	0.9884	0.7037	52.09	1.105	0.6799	52.05

External I/O terminals

■ QD70P4, QD70P8

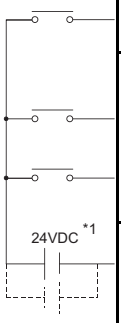
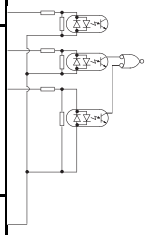
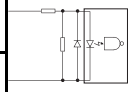
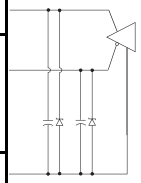
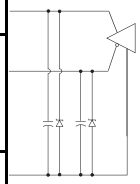
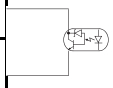
I/O class	External wiring	Signal name		Internal circuit	Wiring
Input		Near-point dog signal	DOG		△
		Speed-position switching signal	CHG		△
		Common	COM		△
		Zero signal	PGO		△
		Zero signal common	PGO COM		
		External power input (0V)	24G*2		○
		External power input (24VDC)	+24V *2		
Output		Pulse output F (CW/ PULSE)	PULSE F		○
		Pulse output R (CCW/ SIGN)	PULSE R		
		Pulse output common	PULSE COM		
		Deviation counter clear	CLEAR		△
		Deviation counter clear common	CLEAR COM		

Wiring: ○ :wiring required, △ :wiring as required

*1: Either polarity can be connected to the common (COM1-2)

*2: CON1 side only

■ QD70D4, QD70D8

I/O class	External wiring	Signal name		Internal circuit	Wiring
Input		Near-point dog signal	DOG		△
		Speed-position switching signal/Retry switch signal*3	CHG/ RTRY		△
		Common input common*2	COM		
		Zero signal	PGO		△
		Zero signal common	PGO COM		
Output		Pulse output F+	PULSE F+		○
		Pulse output F-	PULSE F-		
		Pulse output F common	PULSE F COM		
		Pulse output R+	PULSE R+		
		Pulse output R-	PULSE R-		
		Pulse output R common	PULSE R COM		
		Deviation counter clear	CLEAR		△
		Deviation counter clear common	CLEAR COM		

Wiring: ○ :wiring required, △ :wiring as required

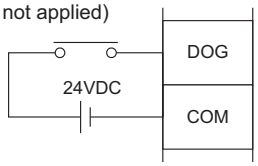
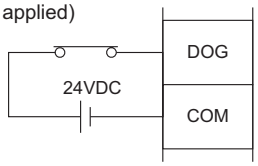
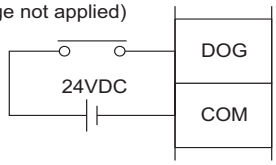
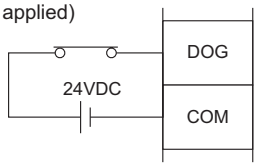
*1: Either polarity can be connected to the input common (COM).

*2: The common input commons (COM) for axes 1 to 4 and axes 5 to 8 are internally connected.

*3: For the speed-position switching signal/retry s witch signal (CHG/ RTRY), both CHG and RTRY switches can be wired. However, both switches must not be simultaneously turned on.

● **Input signal ON/OFF status**

The input signal ON/OFF status is defied by the external wiring and logic setting.
This is explained below with the example of near-point dog signal (DOG).
(The other input signals also perform the same operations as the near-point dog signal (DOG).)

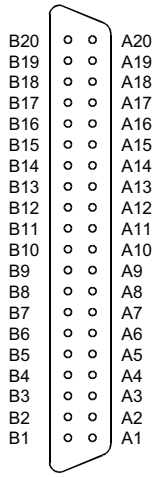
Logic setting*	External wiring	ON/OFF status of near-point dog signal (DOG) as seen from QD70P/D
Negative logic (Initial value)	(Voltage not applied) 	OFF
	(Voltage applied) 	ON
Positive logic (Voltage not applied)	(Voltage not applied) 	ON
	(Voltage applied) 	OFF

*: Set the logic setting using "Switch setting for intelligent function module".

● **Logic setting and internal circuit**

In the QD70P/D, the case where the internal circuit (photocoupler) is OFF in the negative logic setting is defined as "input signal OFF".
Reversely, the case where the internal circuit (photocoupler) is OFF in the positive logic setting is defined as "input signal ON".
<Photocoupler ON/OFF status>
When voltage is not applied: Photocoupler OFF
When voltage is applied: Photocoupler ON

■ Pin assignment and signal name (QD70P4, QD70P8)

Pin-Outs	CON2 (for Axes 5 to 8)				CON1 (for Axes 1 to 4)			
	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
	B20	PG06 COM*1	A20	PG08 COM*1	B20	PG02 COM*1	A20	PG04 COM*1
	B19	PG06	A19	PG08	B19	PG02	A19	PG04
	B18	PG05 COM*1	A18	PG07 COM*1	B18	PG01 COM*1	A18	PG03 COM*1
	B17	PG05	A17	PG07	B17	PG01	A17	PG03
	B16	CLEAR6 COM	A16	CLEAR8 COM	B16	CLEAR2 COM	A16	CLEAR4 COM
	B15	CLEAR6	A15	CLEAR8	B15	CLEAR2	A15	CLEAR4
	B14	CLEAR5 COM	A14	CLEAR7 COM	B14	CLEAR1 COM	A14	CLEAR3 COM
	B13	CLEAR5	A13	CLEAR7	B13	CLEAR1	A13	CLEAR3
	B12	CHG6	A12	CHG8	B12	CHG2	A12	CHG4
	B11	CHG5	A11	CHG7	B11	CHG1	A11	CHG3
	B10	DOG6	A10	DOG8	B10	DOG2	A10	DOG4
	B9	DOG5	A9	DOG7	B9	DOG1	A9	DOG3
	B8	COM 5-6*3	A8	COM 7-8*3	B8	COM 1-2*3	A8	COM 3-4*3
	B7	PULSE F6	A7	PULSE F8	B7	PULSE F2	A7	PULSE F4
	B6	PULSE COM6	A6	PULSE COM8	B6	PULSE COM2	A6	PULSE COM4
	B5	PULSE R6	A5	PULSE R8	B5	PULSE R2	A5	PULSE R4
	B4	PULSE F5	A4	PULSE F7	B4	PULSE F1	A4	PULSE F3
	B3	PULSE COM5	A3	PULSE COM7	B3	PULSE COM1	A3	PULSE COM3
	B2	PULSE R5	A2	PULSE R7	B2	PULSE R1	A2	PULSE R3
	B1	Vacant	A1	Vacant	B1	+24V*5	A1	24G*5

Module front view

*1: Common for PG0□. (Any of Axis No. 1 to 8 enters □.)

*2: Common for CLEAR□. (Any of Axis No. 1 to 8 enters □.)

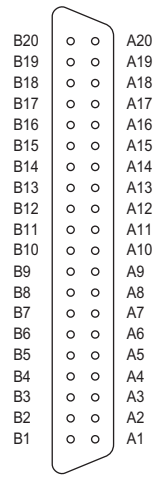
*3: Common for DOG□, CHG□. (Any of Axis No. 1 to 8 enters □.)

*4: Common for PULSE F□, PULSE R□. (Any of Axis No. 1 to 8 enters □.)

*5: To output command pulses, always connect an external power supply (24VDC). (When outputting the command pulses of Axes 5 to 8, also connect to A1 and B1 of connector CON1 for Axes 1 to 4.)

■ Pin assignment and signal name (QD70D4, QD70D8)

Pin-Outs	AX1		AX2		AX3		AX4	
	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
	A20	PULSE R1 COM	B20	PULSE R2 COM	A20	PULSE R3 COM	B20	PULSE R4 COM
	A19	PULSE F1 COM	B19	PULSE F2 COM	A19	PULSE F3 COM	B19	PULSE F4 COM
	A18	PULSE R1-	B18	PULSE R2-	A18	PULSE R3-	B18	PULSE R4-
	A17	PULSE R1+	B17	PULSE R2+	A17	PULSE R3+	B17	PULSE R4+
	A16	PULSE F1-	B16	PULSE F2-	A16	PULSE F3-	B16	PULSE F4-
	A15	PULSE F1+	B15	PULSE F2+	A15	PULSE F3+	B15	PULSE F4+
	A14	CLEAR1 COM	B14	CLEAR2 COM	A14	CLEAR3 COM	B14	CLEAR4 COM
	A13	CLEAR1	B13	CLEAR2	A13	CLEAR3	B13	CLEAR4
	A12	NC	B12	NC	A12	NC	B12	NC
	A11	NC	B11	NC	A11	NC	B11	NC
	A10	PG01 COM	B10	PG02 COM	A10	PG03 COM	B10	PG04 COM
	A9	PG01	B9	PG02	A9	PG03	B9	PG04
	A8	NC	B8	NC	A8	NC	B8	NC
	A7	COM1 to 4	B7	COM1 to 4	A7	COM1 to 4	B7	COM1 to 4
	A6	COM1 to 4	B6	COM1 to 4	A6	COM1 to 4	B6	COM1 to 4
	A5	CHG1/RTRY1	B5	CHG2/RTRY2	A5	CHG3/RTRY3	B5	CHG4/RTRY4
	A4	NC	B4	NC	A4	NC	B4	NC
	A3	DOG1	B3	DOG2	A3	DOG3	B3	DOG4
	A2	CHG1/RTRY1	B2	CHG2/RTRY2	A2	CHG3/RTRY3	B2	CHG4/RTRY4
	A1	NC	B1	NC	A1	NC	B1	NC



Module front view

	AX5		AX6		AX7		AX8	
	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.	Pin No.	Signal No.
	A20	PULSE R5 COM	B20	PULSE R6 COM	A20	PULSE R7 COM	B20	PULSE R8 COM
	A19	PULSE F5 COM	B19	PULSE F6 COM	A19	PULSE F7 COM	B19	PULSE F8 COM
	A18	PULSE R5-	B18	PULSE R6-	A18	PULSE R7-	B18	PULSE R8-
	A17	PULSE R5+	B17	PULSE R6+	A17	PULSE R7+	B17	PULSE R8+
	A16	PULSE F5-	B16	PULSE F6-	A16	PULSE F7-	B16	PULSE F8-
	A15	PULSE F5+	B15	PULSE F6+	A15	PULSE F7+	B15	PULSE F8+
	A14	CLEAR5 COM	B14	CLEAR6 COM	A14	CLEAR7 COM	B14	CLEAR8 COM
	A13	CLEAR5	B13	CLEAR6	A13	CLEAR7	B13	CLEAR8
	A12	NC	B12	NC	A12	NC	B12	NC
	A11	NC	B11	NC	A11	NC	B11	NC
	A10	PG05 COM	B10	PG06 COM	A10	PG07 COM	B10	PG08 COM
	A9	PG05	B9	PG06	A9	PG07	B9	PG08
	A8	NC	B8	NC	A8	NC	B8	NC
	A7	COM5 to 8	B7	COM5 to 8	A7	COM5 to 8	B7	COM5 to 8
	A6	COM5 to 8	B6	COM5 to 8	A6	COM5 to 8	B6	COM5 to 8
	A5	CHG5/RTRY5	B5	CHG6/RTRY6	A5	CHG7/RTRY7	B5	CHG8/RTRY8
	A4	NC	B4	NC	A4	NC	B4	NC
	A3	DOG5	B3	DOG6	A3	DOG7	B3	DOG8
	A2	CHG5/RTRY5	B2	CHG6/RTRY6	A2	CHG7/RTRY7	B2	CHG8/RTRY8
	A1	NC	B1	NC	A1	NC	B1	NC

System configuration

<Accessories>

Product	Description
Manual	Type QD70P/D Positioning Module User's Manual (Hardware)

<Separately obtained products>

Product	Description
Manual	Type QD70P/D Positioning Module User's Manual Type QD70D Positioning Module User's Manual
Connector*1	External device connector A6CON1, A6CON2, A6CON4
External device connection cable*1	Cables connecting QD70P/D to drive unit and device input signal. Cables, whose external wiring connector (A6CON1, A6CON2, A6CON4) are modified by wiring for particular servo amplifiers and stepping motors, are also available. Refer to Section 6.1 FA supplies.

*1: The external device connector and cable are not packed with the product. Always obtain them separately.

■ Applicable system

<Applicable module and the number of modules that can be installed>

The following are the CPU module and network module (for remote I/O stations) in which the QD70P/D can be installed and the number of modules that can be installed.

Applicable module		Number of modules that can be installed		Remarks
		QD70P□	QD70D□	
CPU module	Q00JCPU	Maximum 8	Maximum 4	*1
	Q00CPU Q01CPU	Maximum 24	Maximum 12	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Maximum 32	Can be installed in Q mode only *1
	Q12PHCPU Q25PHCPU	Maximum 64	Maximum 32	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	Maximum 32	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Software packages supported>

Compatible between systems which use a QD70P/D and software packages are as shown below.

GX Developer is necessary when using a QD70P/D.

		Software version		
		GX Developer	GX Configurator-PT	
			QD70P□	QD70D□
If mounted with Q00J/Q00/Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later	Version 1.20W or later
	Multiple CPU system	Version 8 or later		
If mounted with Q02/Q02H/Q06H/Q12H/Q25HCPU	Single CPU system	Version 4 or later	Version 1.00A or later	
	Multiple CPU system	Version 6 or later		
If mounted with Q12PH/Q25PHCPU	Single CPU system	Version 7.10L or later	Version 1.13P or later	
	Multiple CPU system			
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	Version 1.00A or later	

3.5.3 QD70P/D positioning module setting, monitoring tool: GX Configurator-PT

Overview

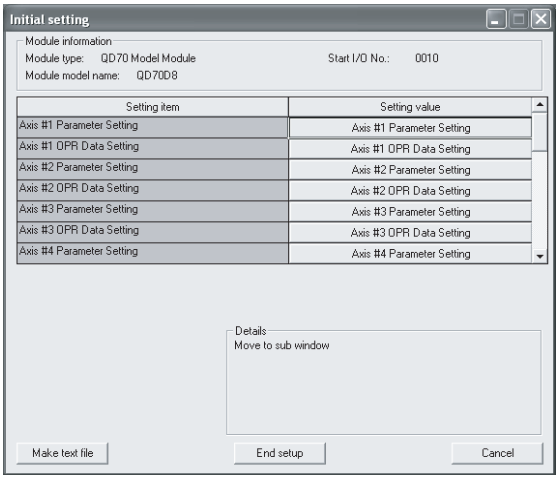
GX Configurator-PT is a utility package to make a setting to automatically read out initial setting data, which is necessary to use a type QD70 positioning module and positioning data into a CPU device memory. It is used as an add-in for GX Developer. By GX Configurator-PT, the initial settings and automatic refresh settings can be configured on the screen, which makes a sequence program shorter and allows easily confirming setting status, operational status, etc.

Intelligent function module utility

■ Initial setting

It is possible to configure on the screen the initial setting that is needed to use the QD70P/D positioning module. The following lists items that require the initial settings.
(1) Parameter
(2) OPR data
(3) Positioning data
Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to positioning modules when the PLC CPUs enter RUN state.

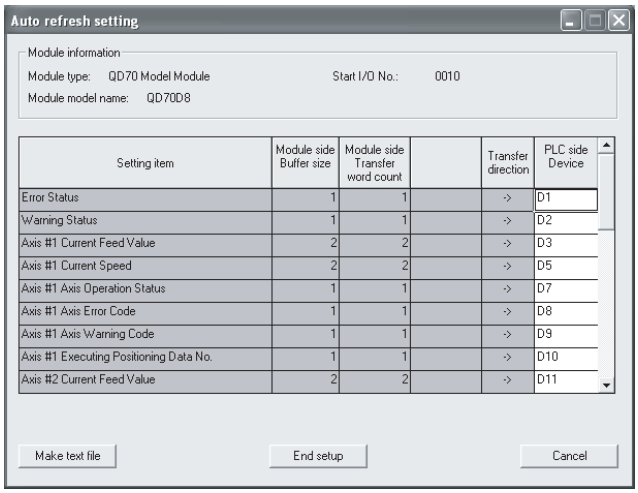
Sample of initial setting screen



■ Auto refresh setting

This sets the buffer memory of the QD70P/D positioning module, which is the target of the auto refresh. The followings are items that can be auto refresh targets.
(1) Error status
(2) Warning status
(3) Current feed value
(4) Current speed
(5) Axis operation status
(6) Axis error code
(7) Axis warning code
(8) Executing positioning data No.
The specified device automatically reads and writes values, which are set for the auto refresh and stored in the buffer memory of the positioning modules, at END instruction executed.

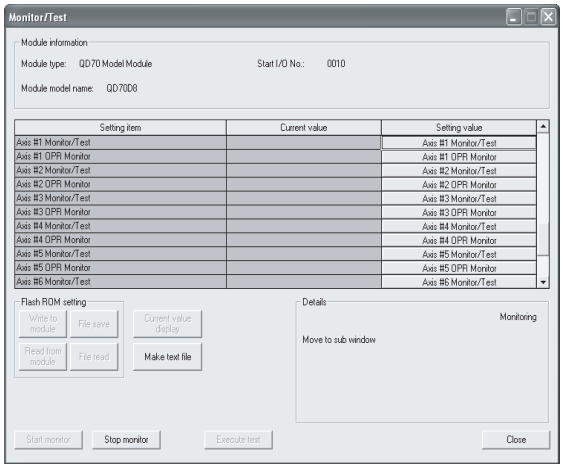
Sample of auto refresh setting screen



■ Monitor/test

This monitors/tests the buffer memory and I/O signals of the QD70P/D positioning module.
(1) Axis monitor/test
(2) OPR monitor
(3) X/Y monitor

Sample of Monitor/test screen



About the number of parameters that can be set in GX Configurator-PT

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings. The total number of parameter settings is calculated separately for the initial setting and for the auto refresh setting.
The number of parameter settings that can be set for one module in the GX Configurator-PT is as shown below.

Object Module	Initial setting	Auto refresh setting
QD70P4/D4	12 (Fixed)	26 (Maximum number of settings)
QD70P8/D8	24 (Fixed)	50 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-PT is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later*2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65MB or more
	For operation	10MB or more
Display		800 × 600 dot or more resolution*3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-PT in GX Developer Version 4 or higher in the same language.
*2: GX Configurator-PT cannot be used as an add-in with GX Developer Version 3 or earlier versions.

Used operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP Professional	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition	Pentium® 300MHz or more	128MB or more

POINT

New functions of Windows® XP

When Microsoft® Windows® XP Professional Operating System or Microsoft® Windows® XP Home Edition Operating System is used, the following newfunctions cannot be used.

If any of the following new functions is used, this product may not operate normally.

- Start of application in Windows® compatible mode
- Fast user switching
- Remote desktop
- Large fonts (Details setting of Display properties)

3.5.4 QD75P/QD75D positioning module: QD75P1, QD75P2, QD75P4, QD75D1, QD75D2, QD75D4

Overview

The QD75P1, QD75P2, QD75P4, QD75D1, QD75D2 and QD75D4 (hereafter referred to as the "QD75") are modules used with stepping motors or servo amplifiers to execute machine position or speed control.

Features

■ Two different output systems

Two different output systems, open collector and differential driver systems, are available as command signals to a stepping motor or servo amplifier.
QD75P1, QD75P2, QD75P4 : Open collector system
QD75D1, QD75D2, QD75D4 : Differential driver system

■ Assortment of 1-, 2- and 4-axis products

1-, 2- and 4-axis models are available in terms of the number of axes per module.
QD75P1, QD75D1: 1 axis
QD75P2, QD75D2: 2 axes
QD75P4, QD75D4: 4 axes
Also, since there are no restrictions on the number of mountable modules, multiple modules can be mounted and used if more than four control axes are needed.

■ Wide variety of positioning control functions

(1) A wide variety of positioning control functions essential to any positioning system are supported: positioning to an arbitrary position, fixed-feed control, equal-speed control, and so on.
  (a) Up to 600 positioning data items, including such information as positioning addresses, control systems, and operation patterns, can be prepared for each axis. Using the prepared positioning data, the positioning control is performed independently for each axis. (In addition, such controls as interpolation involving two to four axes and simultaneous startup of multiple axes are possible.)
  (b) Independent control of each axis can be achieved in linear control mode (executable simultaneously four axes).
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
  (c) Coordinated control over multiple axes can take the form of either the linear interpolation through the speed or position control of two to four axes or the circular interpolation involving two axes.
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
(2) For each positioning data, the user can specify any of the following control systems: position control, speed control, speed-position switching control, position-speed switching control, and so on.
(3) Continuous positioning control using multiple positioning data can be executed in accordance with the operation patterns the user assigned to the positioning data. Continuous positioning control can be executed over multiple blocks, where each block consists of multiple positioning data.
(4) OPR control is given additional features.
  (a) Six different machine OPR methods are provided: near point dog method (one method), stopper methods (three methods), and count methods (two methods).
  (b) OPR retry function facilitates the machine OPR control from an arbitrary position.
  (The machine OP a premier reference position for positioning control. The machine is set to the machine OP through one of the machine OPR methods mentioned in a) above.)
(5) Two acceleration/deceleration control methods are provided: automatic trapezoidal acceleration/deceleration and S-pattern acceleration/deceleration.
  (The S-pattern acceleration/deceleration control is disabled if stepping motors are used.)

■ Quick startup

A positioning operation starts up quickly taking as little as 6 ms to 7 ms.
When operation using simultaneous start function or interpolation operation is executed, the axes start without delay.

(Example) Axis 1 and Axis 3 are started by the simultaneous start function:
No delay in between Axis 1 and Axis and 3 start
Axis 2 and Axis 4 are started by the interpolation operation:
No delay in Axis 2 and Axis 4 start

■ Faster pulse output and allowance of longer distance to drive unit

The modules with a differential driver (QD75D1, QD75D2, and QD75D4) incorporate the improvements in pulse output speed and maximum distance to the drive unit.
• QD75D1/QD75D2/QD75D4: 1 Mpulse/s, 10 m max.
• QD75P1/QD75P2/QD75P4 : 200 kpulse/s, 2 m max.

■ Easy maintenance

Each QD75 positioning module incorporates the following improvements in maintainability:
(1) Data such as the positioning data and parameters can be stored on a flash ROM inside the QD75, eliminating the need of a battery for retaining data.
(2) Error messages are classified in more detail to facilitate the initial troubleshooting procedure.
(3) The module retains 16 error messages and 16 warning messages recently output, offering more complete error and warning histories.

■ Support of intelligent function module dedicated instructions

Dedicated instructions such as the absolute position restoration instruction, positioning start instruction, and teaching instruction are provided.
The use of such dedicated instruction simplifies sequence programs.

■ Setups, monitoring, and testing through GX Configurator-QP

Using GX Configurator-QP, the user can control the QD75 parameters and positioning data without considering the buffer memory addresses.
Moreover, GX Configurator-QP has a test function which allows the user to check the wiring before creating a sequence program for positioning control, or test operation the QD75 using created parameters and positioning data for checking their integrity.
The control monitor function of GX Configurator-QP allows the user to debug programs efficiently.

■ Restrictions with a system using a stepping motor

Note the following restrictions applicable to a system that uses a stepping motor:

(1) The S-pattern acceleration/deceleration is disabled because it requires a servomotor for the controlled axis.
(2) The circular interpolation control is disabled because it requires a servomotor for each of the two controlled axes.

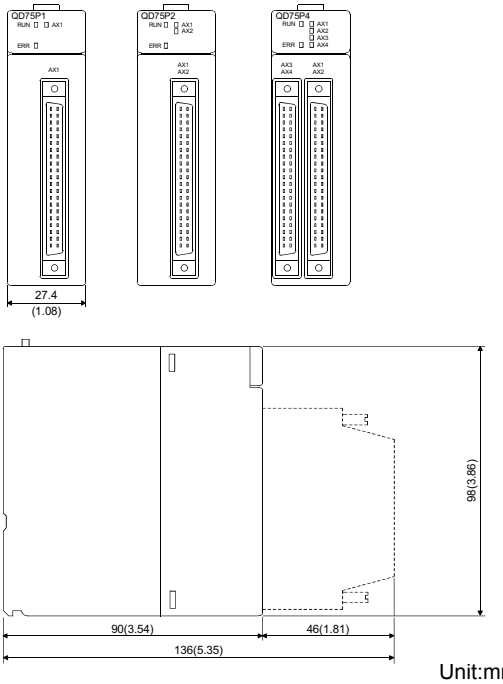
QD75 Dedicated instructions

The following QD75 dedicated instructions can be used to create sequence programs for the QD75.

Instruction name	Instruction specifications
ABRST1,ABRST2, ABRST3,ABRST4	This function restores the absolute position of the designated axis of the QD75.
PSTRT1,PSTRT2, PSTRT3,PSTRT4	This function starts the positioning control of the designated axis of the QD75.
TEACH1,TEACH2, TEACH3,TEACH4	This function carries out teaching the designated axis of the QD75.
PFWRT	This function writes the buffer memory parameters, positioning data and block start data to the flash ROM.
PINIT	This function initializes the buffer memory and flash ROM setting data to the factory-set data (initial values).

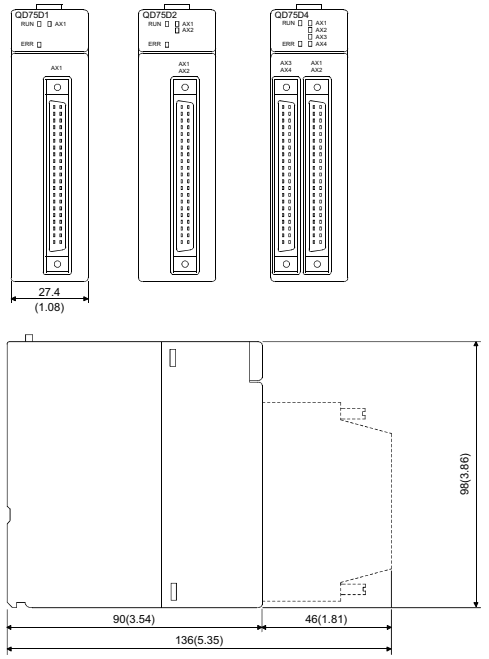
Appearance

(1) QD75P1/QD75P2/QD75P4



Unit:mm(inch)

(2) QD75D1/QD75D2/QD75D4



Unit:mm(inch)

Functions

■ Main functions

● OPR control

"OPR control" is a function that establishes the start point for carrying out positioning control, and carries out positioning toward the start point. This is used to return a workpiece, located at a position other than the OP when the power is turned ON or after positioning stop, to the OP. The "OPR control" is preregistered in the QD75 as the "Positioning start data No. 9001 (Machine OPR)", and "Positioning start data No. 9002 (Fast OPR).

● Major positioning control

This control is carried out using the "Positioning data" stored in the QD75. Positioning control, such as position control and speed control, is executed by setting the required items in this "positioning data" and starting that positioning data. An "operation pattern" can be set in this "positioning data", and with this whether to carry out control with continuous positioning data (ex.: positioning data No. 1, No. 2, No. 3, ...) can be set.

● High-level positioning control

This control executes the "positioning data" stored in the QD75 using the "block start data". The following types of applied positioning control can be carried out.

- Random blocks, handling several continuing positioning data items as "blocks", can be executed in the designated order.
- "Condition judgment" can be added to position control and speed control.
- The operation of the designated positioning data No. that is set for multiple axes can be started simultaneously. (Pulses are output simultaneously to multiple servos.)
- The designated positioning data can be executed repeatedly, etc.,

● Manual control

By inputting a signal into the QD75 from an external source, the QD75 will output a random pulse train and carry out control. Use this manual control to move the workpiece to a random position (JOG operation), and to finely adjust the positioning (inching operation, manual pulse generator operation), etc.

Main functions		Details
OPR control	Machine OPR control	Mechanically establishes the positioning start point using a near-point dog or stopper. (Positioning start No. 9001)
	Fast OPR control	Positions a target to the OP address (Machine feed value) stored in the QD75 using machine OPR. (Positioning start No. 9002)

Main functions			Details
Major positioning control	Position control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Positions a target using a linear path to the address set in the positioning data or to the position designated with the movement amount.
		Fixed-feed control (1-axis fixed-feed control) (2-axis fixed-feed control) (3-axis fixed-feed control) (4-axis fixed-feed control)	Positions a target by the movement amount designated with the amount set in the positioning data. (With fixed-feed control, the "Current feed value" is set to "0" when the control is started. With 2-, 3-, or 4-axis fixed-feed control, the fixed-feed is fed along a linear path obtained by interpolation.)
		2-axis circular interpolation control	Positions a target using an arc path to the address set in the positioning data, or to the position designated with the movement amount, sub point or center point.
	Speed control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Continuously outputs the pulses corresponding to the command speed set in the positioning data.
	Speed-position switching control		First, carries out speed control, and then carries out position control (positioning with designated address or movement amount) by turning the "speed-position switching signal" ON.
	Position-speed switching control		First, carries out position control, and then carries out speed control (continuous output of the pulses corresponding to the designated command speed) by turning the "position-speed switching signal" ON.
	Other control	Current value changing	Changes the Current feed value to the address set in the positioning data. The following two methods can be used. (The machine feed value cannot be changed.) •Current value changing using positioning data • Current value changing using current value changing start No. (No. 9003)
		NOP instruction	No execution control system. When NOP instruction is set, this instruction is not executed and the operation of the next data is started.
		JUMP instruction	Unconditionally or conditionally jumps to designated positioning data No.
		LOOP	Carries out loop control with repeated LOOP to LEND.
		LEND	Returns to the beginning of the loop control with repeated LOOP to LEND.

Main functions		Details
High-level positioning control	Block start (Normal start)	With one start, executes the positioning data in a random block with the set order.
	Condition start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, that "block start data" is ignored, and the next point's "block start data" is executed.
	Wait start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, stops the control until the condition is established. (Waits.)
	Simultaneous start	Simultaneously executes the positioning data having the No. for the axis designated with the "condition data". (Outputs pulses at the same timing.)
	Repeated start (FOR loop)	Repeats the program from the block start data set with the "FOR loop" to the block start data set in "NEXT" for the designated No. of times.
	Repeated start (FOR condition)	Repeats the program from the block start data set with the "FOR condition" to the block start data set in "NEXT" until the conditions set in the "condition data" are established.
	Multiple axes simultaneous start control	Starts the operation of multiple axes simultaneously according to the pulse output level. (Positioning start No. 9004, same as the "simultaneous start" above)
Manual control	JOG operation	Outputs a pulse to drive unit while the JOG start signal is ON.
	Inching operation	Outputs pulses corresponding to minute movement amount by manual operation to drive unit. (Performs fine adjustment with the JOG start signal.)
	Manual pulse generator operation	Outputs pulses commanded with the manual pulse generator to drive unit. (Carry out fine adjustment, etc., at the pulse level.)

With the "major positioning control" ("high-level positioning control"), whether or not to continuously execute the positioning data can be set with the "operation pattern". Outlines of the "operation patterns" are given below.

Operation pattern	Details
Independent positioning control (Positioning complete)	When "independent positioning control" is set for the operation pattern of the started positioning data, only the designated positioning data will be executed, and then the positioning will end.
Continuous positioning control	When "continuous positioning control" is set for the operation pattern of the started positioning data, after the designated positioning data is executed, the program will stop once, and then the next following positioning data will be executed.
Continuous path control	When "continuous path control" is set for the operation pattern of the started positioning data, the designated positioning data will be executed, and then without decelerating, the next following positioning data will be executed.

■ Sub functions

When executing the main functions, compensates and limits and adds function.

Sub function		Details
Functions characteristic to machine OPR	OPR retry function	This function retries the machine OPR with the upper/lower limit switches during machine OPR. This allows machine OPR to be carried out even if the axis is not returned to before the near-point dog with JOG operation, etc.
	OP shift function	After returning to the machine OP, this function compensates the position by the designated distance from the machine OP position and sets that position as the OP address.
Functions that compensate control	Backlash compensation function	This function compensates the mechanical backlash. Feed pulses equivalent to the set backlash amount are output each time the movement direction changes.
	Electronic gear function	By setting the movement amount per pulse, this function can freely change the machine movement amount per commanded pulse. When the movement amount per pulse is set, a flexible positioning system that matches the machine system can be structured.
	Near pass function *1	This function suppresses the machine vibration when the speed changes during continuous path control in the interpolation control.
Functions that limit control	Speed limit function	If the command speed exceeds "Speed limit value" during control, this function limits the commanded speed to within the "Speed limit value" setting range.
	Torque limit function *2	If the torque generated by the servomotor exceeds " Torque limit setting value" during control, this function limits the generated torque to within the "Torque limit setting value" setting range.
	Software stroke limit function	If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command.
Functions that limit control	Hardware stroke limit function	This function carries out deceleration stop with the limit switch connected to the QD75 external device connector.
Functions that change control details	Speed change function	This function changes the speed during positioning. Set the new speed in the speed change buffer memory (New speed value), and change the speed with the Speed change request.
	Override function	This function changes the speed within a percentage of 1 to 300% during positioning. This is executed using "Positioning operation speed override".
	Acceleration/ deceleration time change function	This function changes the acceleration/ deceleration time during speed change.
	Torque change function	This function changes the "torque limit value" during control.
Absolute position restoration function *3		This function restores the absolute position of designated axis.

Sub function		Details
Other functions	Step function	This function temporarily stops the operation to confirm the positioning operation during debugging, etc. The operation can be stopped at each "automatic deceleration" or "positioning data".
	Skip function	This function stops (decelerates to a stop) the positioning being executed when the skip signal is input, and carries out the next positioning.
	M code output function	This function issues a command for a sub work (clamp or drill stop, tool change, etc.) corresponding to the M code No. (0 to 65535) that can be set for each positioning data.
	Teaching function	This function stores the address positioned with manual control into the positioning address having the designated positioning data No.
	Target position change function	This function changes the target position during positioning. Position and speed can be changed simultaneously.
	Command in-position function	At each automatic deceleration, this function calculates the remaining distance for the QD75 to reach the positioning stop position. When the value is less than the set value, the "command in-position flag" is set to "1". When using another auxiliary work before ending the control, use this function as a trigger for the sub work.
	Acceleration/ deceleration process function	This function adjusts the control acceleration/deceleration.
	Continuous operation interrupt function	This function interrupts continuous operation. When this request is accepted, the operation stops when the execution of the current positioning data is completed.
	Pre-reading start function	This function shortens the virtual start time.
	Deceleration start flag function *4	Function that turns ON the flag when the constant speed status or acceleration status switches to the deceleration status during position control, whose operation pattern is "Positioning complete", to make the stop timing known.
	Stop command processing for deceleration stop function *5	Function that selects a deceleration curve when a stop cause occurs during deceleration stop processing to speed 0.

*1: The near pass function is featured as standard and is valid only for position control. It cannot be set to be invalid with parameters.
*2: Using "Torque limit function" requires a "D/A conversion module" and a "drive unit capable of torque limit command with analog voltage".
*3: Using "Absolute position restoration function" requires a "16-point input module", a "16-point output module", and a "drive unit that can construct absolute position detection system".
*4: First five digits of serial No. can be used in "03042" or later.
*5: First five digits of serial No. can be used in "05072" or later.

■ Common functions

Common control using the QD75 for "parameter initialization" or "backup of execution data" can be carried out.

Common functions	Details
Parameter initialization function	This function returns the "parameters" stored in the QD75 buffer memory and flash ROM to the default values. The following two methods can be used. 1) Method using sequence program 2) Method using GX Configurator-QP
Execution data backup function	This functions stores the "setting data", currently being executed, into the flash ROM. The following two methods can be used. 1) Method using sequence program 2) Method using GX Configurator-QP
External I/O signal logic switching function	This function switches I/O signal logic according to externally connected devices. This function enables the use of the system that does not use b (N.C.)-contact signals, such as Drive unit READY or Upper/lower limit signal, by setting parameters to positive logic.
External I/O signal monitor function	This function monitors the external I/O signal monitor information in the module's detailed information which can be displayed on the system monitor of GX Developer*6.

*6: Usable on GX Developer (SW6D5C-GPPW-E or later).

■ Combination of QD75 main functions and sub functions

Main functions			Sub functions: Combination with operation pattern *1	Machine OPR retry functions: OPR retry function	Machine OPR retry functions: OP shift function	Functions that compensate control: Backlash compensation function	Functions that compensate control: Electronic gear function	Functions that compensate control: Near pass function	
OPR control	Machine OPR control		×	○	○	○	○		
	Fast OPR control		×	×	×	○	○		
Major positioning control	Position control	1-axis linear control	○	×	×	○	○		
		2-, 3-, or 4-axis linear interpolation control	○	×	×	○	○		
		1-axis fixed-feed control	△ (Continuous path control cannot be set)	×	×	○	○		
		2-, 3-, or 4-axis fixed-feed control (interpolation)	△ (Continuous path control cannot be set)	×	×	○	○		
		2-axis circular interpolation control	○	×	×	○	○		
	Speed control (1- to 4-axis)		△ (Only independent positioning control can be set)	×	×	○	○	*2	
	Speed-position switching control		△ (Continuous path control cannot be set)	×	×	○	○		
	Position-speed switching control		△ (Only independent positioning control can be set)						
	Other control	Current value change	△ (Continuous path control cannot be set)	×	×	×	×		
		NOP instruction	×						
		JUMP instruction	×	×	×	×	×		
		LOOP to LEND							
Manual control	JOG operation, inching operation		×	×	×	○	○		
	Manual pulse generator operation		×	×	×	○	○		

◎:Always combine, ○:Combination possible, △:Combination limited, ×:Combination not possible

*1: The operation pattern is one of the "positioning data" setting items.

*2: The near pass function is featured as standard and is valid only for setting continuous path control for position control.

*3: Invalid during creep speed.

*4: Invalid during continuous path control.

*5: Inching operation does not perform acceleration/deceleration processing.

*6: Valid for the reference axis only.

*7: Valid for only the case where a deceleration start is made during position control.

*8: Disabled for a start of positioning start No. 9003.

	Functions that limit control				Functions that change control details				Other functions									
	Speed limit function	Torque limit function	S/W stroke limit function	H/W stroke limit function	Speed change function	Override function	Acceleration/ deceleration time change function	Torque change function	Step function	Skip function	M code output function	Teaching function	Target position change function	Command in-position function	Acceleration/deceleration process function	Pre-reading start function	Deceleration start flag function	Stop command processing for deceleration stop function
	○	○	×	◎	△ *3	△ *3	×	○	×	×	×	×	×	×	○	×	×	○
	○	○	×	◎	○	○	×	○	×	×	×	×	×	×	○	×	×	○
	○	○	○	◎	○	○	○	○	○	○	○	×	△ *4	○	○	○	○	○
	○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	△ *6	○
	○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	○	○
	○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	△ *6	○
	○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	×	○
	○	○	○	◎	○	○	○	○	×	×	○	×	×	×	○	○	×	○
	○	○	○	◎	○	○	○	○	○	×	○	×	×	○	○	○	△ *7	○
	×	×	×	◎	×	×	×	×	○ ×	×	△ *8 ×	×	×	×	×	×	×	×
	×	×	×	◎	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	○	○	○	◎	○	○	×	○	×	×	×	○	×	×	△ *5	×	×	×
	×	○	○	◎	×	×	×	○	×	×	×	○	×	×	×	×	×	×

Performance specifications

Item \ Model	QD75P1 *1 QD75D1	QD75P2 *1 QD75D2	QD75P4 *1 QD75D4
No. of control axes	1 axis	2 axes	4 axes
Interpolation function	No	2-axis linear interpolation 2-axis circular interpolation	2-, 3-, or 4-axis linear interpolation 2-axis circular interpolation
Control system	PTP (Point To Point) control, path control (both linear and arc can be set), speed control, speed-position switching control, position-speed switching control		
Control unit	mm, inch, degree, pulse		
Positioning data	600 data (positioning data Nos. 1 to 600)/axis (Can be set with peripheral device or sequence program.)		
Backup	Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup).		
Positioning — Positioning system	PTP control : Incremental system/absolute system Speed-position switching control : Incremental system/absolute system *2 Position-speed switching control : Incremental system Path control : Incremental system/absolute system		
Positioning — Positioning range	In absolute system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • 0 to 359.99999(degree) • -2147483648 to 2147483647(pulse) In incremental system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • -21474.83648 to 21474.83647(degree) • -2147483648 to 2147483647(pulse) In speed-position switching control (INC mode) / position-speed switching control • 0 to 214748364.7(μm) • 0 to 21474.83647(inch) • 0 to 21474.83647(degree) • 0 to 2147483647(pulse) In speed-position switching control (ABS mode) • 0 to 359.99999(degree)		
Positioning — Speed command	0.01 to 20000000.00(mm/min) 0.001 to 2000000.000(inch/min) 0.001 to 2000000.000(degree/min) 1 to 1000000(pulse/s)		
Positioning — Acceleration/deceleration process	Automatic trapezoidal acceleration/deceleration, S-pattern acceleration/deceleration		
Positioning — Acceleration/deceleration time	1 to 8388608 (ms) Four patterns can be set for each of acceleration time and deceleration time		
Positioning — Sudden stop deceleration time	1 to 8388608 (ms)		
Starting time (ms)*3	1-axis linear control	6	Factors in starting time extension The following times will be added to the starting time in the described conditions: • S-pattern acceleration/deceleration is selected :0.5 • Other axis is in operation :1.5 • During continuous positioning control :0.2 • During continuous path control :1.0
	1-axis speed control	6	
	2-axis linear interpolation control (Composite speed)	7	
	2-axis linear interpolation control (Reference axis speed)	7	
	2-axis circular interpolation control	7	
	2-axis speed control	6	
	3-axis linear interpolation control (Composite speed)	7	
	3-axis linear interpolation control (Reference axis speed)	7	
	3-axis speed control	6	
	4-axis linear interpolation control	7	
	4-axis speed control	7	
Protection degree	IP2X		
Flash ROM write count	Max. 100000 times		
External wiring connection system	40-pin connector		
Applicable wire size	0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4), AWG #24 (for A6CON2)		

(Continued on next page)

(Continued from preceding page)

Item \ Model	QD75P1 *1 QD75D1	QD75P2 *1 QD75D2	QD75P4 *1 QD75D4
Applicable connector for external device (Sold separately)	A6CON1, A6CON2, A6CON4		
Max. output pulse	QD75P1,QD75P2,QD75P4:200kpps QD75D1,QD75D2,QD75D4:1Mpps		
Max. connection distance between servos	QD75P1,QD75P2,QD75P4:2m QD75D1,QD75D2,QD75D4:10m		
Online module change	Disabled		
Multiple CPU system	Compatible*4		
Number of occupied I/O points	32 points/slot (I/O assignment: intelligent)		
5VDC Internal current consumption	QD75P1:0.40A QD75D1:0.52A	QD75P2:0.46A QD75D2:0.56A	QD75P4:0.58A QD75D4:0.82A
External dimensions	98×(3.86)(H)×27.4 (1.08)(W)×90 (3.54)(D) mm(inch)		
Weight	0.15kg	0.15kg	0.16kg

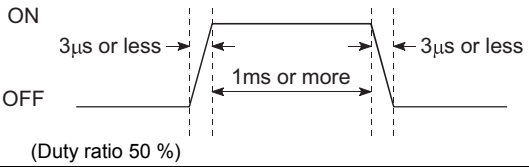
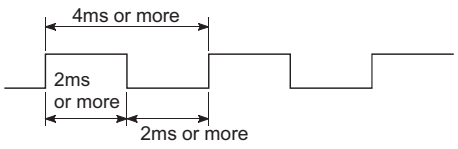
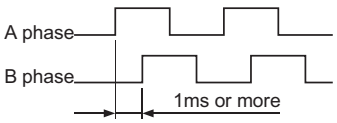
*1: QD75P□ represents the open-collector output system, and QD75D□ represents the differential driver output system.
*2: In speed-position switching control (ABS mode), the control unit available is "degree" only.
*3: Using the "Pre-reading start function", the virtual start time can be shortened.
*4: Corresponding to the function version B or later.

■ Differential driver common terminal specifications (QD75D1, QD75D2, QD75D4 only)

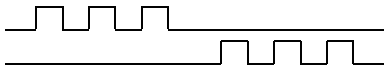
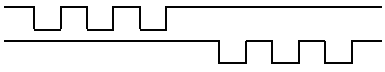
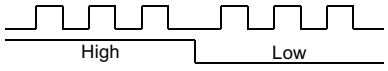
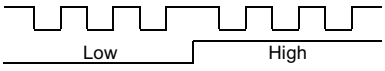
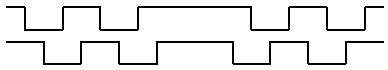
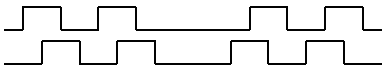
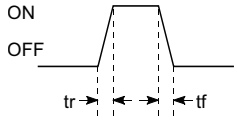
Applicable wire size	12AWG
Rated multiple-wire connection size	Solid wire: 0.2 to 0.8mm^2×2 pcs.
	Twisted wire: 0.2 to 0.8mm^2×2 pcs.
Screw tightening torque	50N•cm

External I/O specifications

■ Input specifications

Signal name	Rated input voltage/current	Working voltage range	ON voltage/ current	OFF voltage/ current	Input resistance	Response time
Drive unit READY (READY) Stop signal (STOP) Upper limit signal (FLS) Lower limit signal (RLS)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.7mA or less	Approx. 4.7kΩ	4ms or less
Zero signal (PG05/PG024)	5VDC/5mA	4.5 to 6.1VDC	2VDC or more/ 2mA or more	0.5VDC or less/ 0.5mA or less	Approx. 0.3kΩ	1ms or less
	24VDC/5mA	12 to 26.4VDC	10VDC or more/ 3mA or more	3VDC or less/ 0.2mA or less	Approx. 4.7kΩ	1ms or less
	 (Duty ratio 50 %)					
Zero signal differential input	Differential receiver equivalent to Am26LS32 (ON/OFF level ON: 1.8V or more, OFF: 0.6V or less)					
Manual pulse generator A phase (PULSE R A) Manual pulse generator B phase (PULSE R B)	5VDC/5mA	4.5 to 6.1VDC	2.5VDC or more/ 2mA or more	1VDC or less/ 0.1mA or less	Approx. 1.5kΩ	1ms or less
	1) Pulse width  2) Phase differential  When the A phase leads the B phase, the positioning address (current value) increases.					
Near-point dog signal (DOG) External command signal (CHG)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.7mA or less	Approx. 4.3kΩ	1ms or less

■ Output specifications

<table>
<tr><th>Signal name</th><th>Rated load voltage</th><th>Working load voltage range</th><th>Max. load current/rush current</th><th>Max. voltage drop at ON</th><th>Leakage current at OFF</th><th>Response time</th></tr>
<tr><td>Pulse output (CW/PULSE/A phase)
Pulse sign (CCW/SIGN/B phase)</td><td colspan="6">Differential driver equivalent to Am26C31 (For QD75D□)
• The types of CW/CCW, PULSE/SIGN and A phase/B phase are selected with the parameters (Pr.5 Pulse output mode) of the QD75 and drive unit.
• The relation of the pulse output with the " Pr.5 Pulse output mode" and " Pr.23 Output signal logic selection" is shown below:
<table>
<tr><th rowspan="3">Pr.5
Pulse output mode</th><th colspan="4">Pr.23 Output signal logic selection (bit 0)</th></tr>
<tr><th colspan="2">Positive logic</th><th colspan="2">Negative logic</th></tr>
<tr><th>Forward run</th><th>Reverse run</th><th>Forward run</th><th>Reverse run</th></tr>
<tr><td>CW
CCW</td><td colspan="2">  </td><td colspan="2">  </td></tr>
<tr><td>PULSE
SIGN</td><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
<tr><td>Aϕ
Bϕ</td><td colspan="2">  </td><td colspan="2">  </td></tr>
</table>
The table below shows the rising/falling edge time and duty ratio when the QD75P□ is used.
 
</td></tr>
<tr><td>5 to 24VDC</td><td>4.75 to 30VDC</td><td>50mA/1 point/ 200mA 10ms or less</td><td>0.5VDC (TYP)</td><td>0.1mA or less</td><td>---</td></tr>
<tr><td>Deviation counter clear (CLEAR)</td><td>5 to 24VDC</td><td>4.75 to 30VDC</td><td>0.1A/1 point/0.4A 10ms or less</td><td>1VDC (TYP)
2.5VDC (MAX)</td><td>0.1mA or less</td><td>2ms or less (resistance load)</td></tr>
</table>

Pulse rise/fall time on QD75P□ (unit tr, tf: μs Duty: %) ... When ambient temperature is normal temperature

Load voltage(V)		26.4						4.75					
Cable length (m (feet))		1			2			1			2		
Load current (mA)	Pulse speed (kpps)	tr (Rise)	tf (Fall)	Duty	tr (Rise)	tf (Fall)	Duty	tr (Rise)	tf (Fall)	Duty	tr (Rise)	tf (Fall)	Duty
2	200	2.33	0.08	6.6	2.20	0.08	14.6	0.57	0.07	44.8	0.95	0.07	39.0
	100	2.42	0.09	34.7	4.44	0.10	12.6	0.57	0.07	47.5	1.01	0.08	45.3
	10	2.44	0.09	48.7	4.52	0.10	47.7	0.60	0.07	49.7	1.04	0.08	49.5
5	200	1.00	0.09	39.8	1.77	0.11	24.5	0.32	0.07	48.4	0.45	0.08	45.8
	100	1.01	0.09	45.3	1.76	0.10	40.3	0.31	0.07	49.2	0.45	0.08	48.7
	10	1.00	0.10	49.6	1.72	0.10	49.2	0.33	0.08	49.9	0.49	0.08	49.8
20	200	0.27	0.10	50.1	0.44	0.11	48.0	0.15	0.08	50.7	0.15	0.08	51.3
	100	0.29	0.10	49.8	0.48	0.11	49.1	0.15	0.08	50.4	0.18	0.08	50.4
	10	0.30	0.10	49.9	0.48	0.12	49.9	0.17	0.08	50.1	0.18	0.08	49.9
50	200	0.19	0.11	50.5	0.24	0.12	50.6	0.15	0.10	51.8	0.14	0.11	51.7
	100	0.19	0.11	50.4	0.24	0.12	50.4	0.14	0.10	50.7	0.15	0.10	50.8
	10	0.18	0.12	50.0	0.22	0.13	50.1	0.14	0.10	50.1	0.15	0.12	50.1

The time for H/L width of differential output waveform with the QD75D□. (Cable length: 2m, Ambient temperature: normal temperature)

Pulse speed	H width	L width
1Mpps	410ns	456ns
500kpps	936ns	1μs

External I/O Terminals

■ Input terminals(QD75P1, QD75P2, QD75P4, QD75D1, QD75D2, QD75D4)

External wiring	Signal name		Internal circuit	Wiring *1
When upper limit switch is not used	Near-point dog signal	DOG		△
	Upper limit LS signal	FLS		○
When lower limit switch is not used	Lower limit LS signal	RLS		○
	Stop signal	STOP		△
	External command signal	CHG		△
24VDC *2	Common	COM		○
5V, A, 5VDC, B, 0V, Manual pulse generator (MR-HDP01)	Manual pulse generator A phase	PULSER A+		△
		PULSER A-		
	Manual pulse generator B phase	PULSER B+		
		PULSER B-		
	Drive unit READY	READY		○
	Drive unit READY common	RDY COM		○
	Zero signal	PG024		△
		PG05		
	Zero signal common	PG0 COM		

*1: The symbols in Need for wiring column indicate the following meanings:

○: Wiring is necessary for positioning.

△: Wiring is necessary depending on the situation.

*2: Either polarity can be connected to the common (COM).

● Input signal ON/OFF status

The input signal ON/OFF status is defined by the external wiring and logic setting.

This is explained below with the example of near-point dog signal (DOG).

(The other input signals also perform the same operations as the near-point dog signal (DOG).)

Logic setting *3,*4	External wiring*4	ON/OFF status of near-point dog signal (DOG) as seen from QD75
Negative logic (Initial value)	(Voltage not applied) 24VDC, DOG, COM	OFF
	(Voltage applied) 24VDC, DOG, COM	ON
Positive logic	(Voltage not applied) 24VDC, DOG, COM	ON
	(Voltage applied) 24VDC, DOG, COM	OFF

*3: Set the logic setting using "Input signal logic selection".

*4: When using the upper limit signal (FLS) or lower limit signal (RLS), always wire it as a "b" (normally closed) contact in the negative logic setting. The signal will turn OFF to stop positioning.

● About logic setting and internal circuit

In the QD75, the case where the internal circuit (photocoupler) is OFF in the negative logic setting is defined as "input signal OFF".

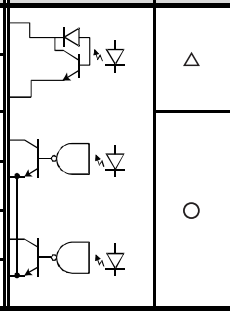
Reversely, the case where the internal circuit (photocoupler) is OFF in the positive logic setting is defined as "input signal ON".

<Photocoupler ON/OFF status>

When voltage is not applied: Photocoupler OFF

When voltage is applied: Photocoupler ON

■ Output terminals(QD75P1, QD75P2, QD75P4)

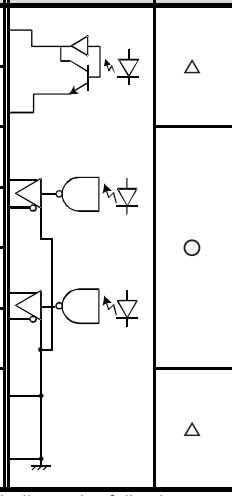
Signal name		Internal circuit	Wiring *1
Deviation counter clear	CLEAR		△
Deviation counter clear common	CLEAR COM		
CW/A-phase/pulse	PULSE F		○
	PULSE COM		
CCW/B-phase/sign	PULSE R		
	PULSE COM		

*1: The symbols in Need for wiring column indicate the following meanings:

○: Wiring is necessary for positioning.

△: Wiring is necessary depending on the situation.

■ Output terminals (QD75D1, QD75D2, QD75D4)

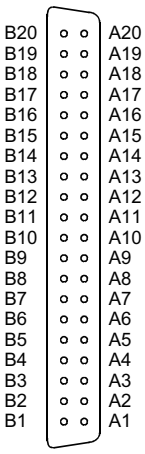
Signal name		Internal circuit	Wiring *1
Deviation counter clear	CLEAR		△
Deviation counter clear common	CLEAR COM		
CW/A-phase/pulse	PULSE F+		○
	PULSE F-		
CCW/B-phase/sign	PULSE R+		
	PULSE R-		
Differential driver common terminal	SG*2		△

*1: The symbols in Need for wiring column indicate the following meanings:

○: Wiring is necessary for positioning.

△: Wiring is necessary depending on the situation.

*2: A terminal block at the bottom of the module.

Pin layout	Axis 4(AX4)		Axis 3(AX3)		Axis 2(AX2)		Axis 1(AX1)	
	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
	2B20	Vacant	2A20	Vacant	1B20	PULSER B-	1A20	PULSER B+
	2B19	Vacant	2A19	Vacant	1B19	PULSER A-	1A19	PULSER A+
	2B18*3	PULSE COM PULSE R-	2A18*3	PULSE COM PULSE R-	1B18*3	PULSE COM PULSE R-	1A18*3	PULSE COM PULSE R-
	2B17*3	PULSE R PULSE R+	2A17*3	PULSE R PULSE R+	1B17*3	PULSE R PULSE R+	1A17*3	PULSE R PULSE R+
	2B16*3	PULSE COM PULSE F-	2A16*3	PULSE COM PULSE F-	1B16*3	PULSE COM PULSE F-	1A16*3	PULSE COM PULSE F-
	2B15*3	PULSE F PULSE F+	2A15*3	PULSE F PULSE F+	1B15*3	PULSE F PULSE F+	1A15*3	PULSE F PULSE F+
	2B14	CLRCOM	2A14	CLRCOM	1B14	CLRCOM	1A14	CLRCOM
	2B13	CLEAR	2A13	CLEAR	1B13	CLEAR	1A13	CLEAR
	2B12	RDYCOM	2A12	RDYCOM	1B12	RDYCOM	1A12	RDYCOM
	2B11	READY	2A11	READY	1B11	READY	1A11	READY
	2B10	PGOCOM	2A10	PGOCOM	1B10	PGOCOM	1A10	PGOCOM
	2B9	PGO5	2A9	PGO5	1B9	PGO5	1A9	PGO5
	2B8	PGO24	2A8	PGO24	1B8	PGO24	1A8	PGO24
	2B7	COM	2A7	COM	1B7	COM	1A7	COM
	2B6	COM	2A6	COM	1B6	COM	1A6	COM
	2B5	CHG	2A5	CHG	1B5	CHG	1A5	CHG
Front view of the module	2B4	STOP	2A4	STOP	1B4	STOP	1A4	STOP
	2B3	DOG	2A3	DOG	1B3	DOG	1A3	DOG
	2B2	RLS	2A2	RLS	1B2	RLS	1A2	RLS
	2B1	FLS	2A1	FLS	1B1	FLS	1A1	FLS

*1: Pin No. "1□□□" indicates the pin No. for the right connector. Pin No. "2□□□" indicates the pin No. for the left connector.

*2: When a 1-axis module is used, pin Nos. 1B1 to 1B18 are "vacant".

*3: The upper line indicates the signal name for the QD75P1/QD75P2/QD75P4, and the lower line indicates the signal name for the QD75D1/QD75D2/QD75D4.

System configuration

<Accessories>

Product	Description
Manual	Type QD75P/QD75D Positioning Module User's Manual (Hardware)
Differential driver common terminal	1

<Separately obtained products>

Product	Description
Manual	Type QD75P/QD75D Positioning Module User's Manual
Connector	External wiring connector A6CON1, A6CON2, A6CON4*1
Manual pulse generator	Recommended product: MR-HDP01 (Manufactured by Mitsubishi Electric Corp.)
connection cable	Cables connecting QD75 to drive unit, manual pulse generator, and device input signal. Cables having external wiring connectors (A6CON1, A6CON2, A6CON4) with wiring for specific servo amplifiers and stepping motors are also available. Refer to the FA goods in Section 6.1.

*1: As the external wiring connector is not packed with the module, always obtain it separately.

■ Applicable system

<Applicable modules and the number of installable modules>
The following table indicates the CPU modules and network modules (for remote I/O station) usable with the QD75 and the number of installable modules.

Applicable modules		Number of installable modules	Remarks
CPU module	Q00JCPU	Max. 8	*1
	Q00CPU Q01CPU	Max. 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Max. 64	Installable in the Q mode only*1
	Q12PHCPU Q25PHCPU	Max. 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Max. 64	MELSECNET/H remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net work in Section 2.5.2.

<Supported software packages>
The following table lists the compatibility between the systems using the QD75 and the software packages. GX Developer is required for use of the QD75.

		Software version	
		GX Developer	GX Configurator-QP
If mounted with Q00J/ Q00/Q01CPU	Single CPU system	Version 7 or more	Version 2.10L or more
	Multiple CPU system	Version 8 or more	
If mounted with Q02/ Q02H/Q06H/ Q12H/ Q25HCPU	Single CPU system	Version 4 or more	Version 2.00A or more
	Multiple CPU system	Version 6 or more	
If mounted with Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or more	Version 2.13P or more
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or more	Version 2.00A or more

3.5.5 QD75M positioning module: QD75M1, QD75M2, QD75M4

Overview

The QD75M1, QD75M2 and QD75M4 (hereafter referred generically to as the "QD75M") are modules used with SSCNET-compatible servo amplifiers to execute machine position or speed control.

Features

■ Assortment of 1-, 2- and 4-axis products

1-, 2- and 4-axis models are available in terms of the number of axes per module.
QD75M1: 1 axis, QD75M2: 2 axes, QD75M4: 4 axes
Also, since there are no restrictions on the number of loadable modules, multiple modules can be loaded and used if more than four control axes are needed.

■ Wide variety of positioning control functions

(1) A wide variety of positioning control functions essential to any positioning system are supported: positioning to an arbitrary position, fixed-feed control, equal-speed control, and so on.
  (a) Up to 600 positioning data items, including such information as positioning addresses, control systems, and operation patterns, can be prepared for each axis. Using the prepared positioning data, the positioning control is performed independently for each axis. (In addition, such controls as interpolation involving two to four axes and simultaneous startup of multiple axes are possible.)
  (b) Independent control of each axis can be achieved in linear control mode (executable simultaneously four axes).
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
  (c) Coordinated control over multiple axes can take the form of either the linear interpolation through the speed or position control of two to four axes or the circular interpolation involving two axes.
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
(2) For each positioning data, the user can specify any of the following control systems: position control, speed control, speed-position switching control, position-speed switching control, and so on.
(3) Continuous positioning control using multiple positioning data can be executed in accordance with the operation patterns the user assigned to the positioning data.Continuous positioning control can be executed over multiple blocks, where each block consists of multiple positioning data.
(4) OPR control is given additional features.
  Four different machine OPR methods are provided: the near point dog method, two count methods, and the data set method.
(5) Two acceleration/deceleration control methods are provided: automatic trapezoidal acceleration/deceleration and S-pattern acceleration/ deceleration.

■ Quick startup

A positioning operation starts up quickly taking as little as 6 ms to 7 ms.
When operation using simultaneous start function or interpolation operation is executed, the axes start without delay.

(Example)	Axis 1 and Axis 3 are started by the simultaneous start function	: No delay in Axis 1 and Axis 3 start
	Axis 2 and Axis 4 are started by the interpolation operation	: No delay in Axis 2 and Axis 4 start

■ SSCNET makes the connection to the servo amplifier possible

(1) The QD75 can be directly connected to the servo amplifier using the MELSERVO (Mitsubishi's servo amplifier: MR-H-BN, MR-H-BN4, MR-J2-B, MR-J2S-B, MR-J2-Jr, MR-J2M-B) and SSCNET.
(2) Because the SSCNET cable is used to connect the QD75M and the servo amplifier, or servo amplifiers, saving wiring can be realized. The cable between the QD75M and servo amplifier or servo amplifiers can be extended up to 30m.
(3) The servo parameters can be set on the QD75M side to write or read them to/from the servo amplifier using the SSCNET.
(4) The actual current value and error description contained in the servo can be checked by the buffer memory of the QD75M.

■ Easy application to the absolute position system

(1) The absolute position-corresponding servo amplifier is connected to have an application to the absolute position system.
(2) Once the OP have been established, the OPR operation can also be made unnecessary when the power is supplied.
(3) With the absolute position system, the data set method OPR is used to establish the OP.
(4) When the setting unit is "degree", the absolute position system with unlimited length feed can be configured.

■ Control can be realized with the mechanical system input

The external inputs, such as external start, stop, and speed-position switching is used to perform the positioning control without using the PLC program.

■ Easy maintenance

Each QD75M positioning module incorporates the following improvements in maintainability:

(1) Data such as the positioning data and parameters can be stored on a flash ROM inside the QD75M, eliminating the need of a battery for retaining data.

(2) Error messages are classified in more detail to facilitate the initial troubleshooting procedure.

(3) The module retains 16 error messages and 16 warning messages recently output, offering more complete error and warning histories.

■ Support of intelligent function module dedicated instructions

Dedicated instructions such as the positioning start instruction, and teaching instruction are provided.
The use of such dedicated instruction simplifies PLC programs.

■ Setups, monitoring, and testing through GX Configurator-QP

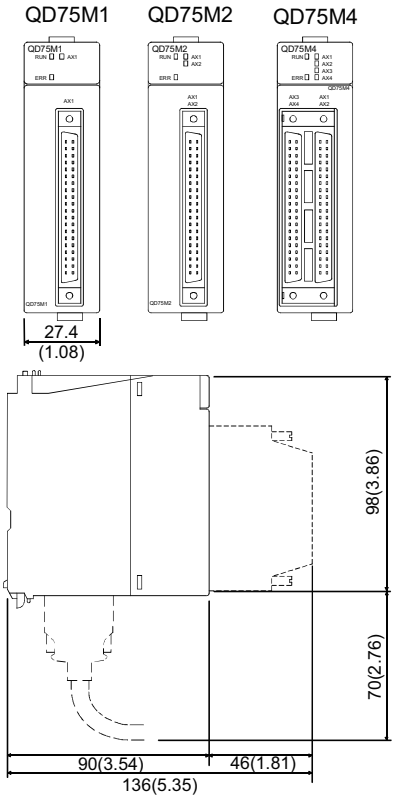
Using GX Configurator-QP, the user can control the QD75M parameters and positioning data without considering the buffer memory addresses.
Moreover, GX Configurator-QP has a test function which allows the user to check the wiring before creating a PLC program for positioning control, or test operation the QD75M using created parameters and positioning data for checking their integrity.
The control monitor function of GX Configurator-QP allows the user to debug programs efficiently.

QD75M dedicated instructions

The following QD75M dedicated instructions can be used to create sequence programs for the QD75M.

instruction name	instruction specifications
PSTRT1,PSTRT2, PSTRT3,PSTRT4	This function starts the positioning control of the designated axis of the QD75M.
TEACH1,TEACH2, TEACH3,TEACH4	This function carries out teaching the designated axis of the QD75M.
PFWRT	This function writes the buffer memory parameters, positioning data and block start data to the flash ROM.
PINIT	This function initializes the buffer memory and flash ROM setting data to the factory-set data (initial values).

Appearance



Unit:mm(inch)

To give allowance for SSCNET cable wiring, leave a 70mm or more (2.76 inch) clearance under the QD75M.

List of functions

■ Main functions

● OPR control

"OPR control" is a function that establishes the start point for carrying out positioning control, and carries out positioning toward that start point. This is used to return a workpiece, located at a position other than the OP when the power is turned ON or after positioning stop, to the OP. The "OPR control" is preregistered in the QD75M as the "Positioning start data No. 9001 (Machine OPR)", and "Positioning start data No. 9002 (Fast OPR).

● Major positioning control

This control is carried out using the "Positioning data" stored in the QD75M. Positioning control, such as position control and speed control, is executed by setting the required items in this "positioning data" and starting that positioning data. An "operation pattern" can be set in this "positioning data", and with this whether to carry out control with continuous positioning data (ex.: positioning data No. 1, No. 2, No. 3, ...) can be set.

● High-level positioning control

This control executes the "positioning data" stored in the QD75M using the "block start data". The following types of applied positioning control can be carried out.

- Random blocks, handling several continuing positioning data items as "blocks", can be executed in the designated order.
- "Condition judgment" can be added to position control and speed control.
- The operation of the designated positioning data No. that is set for multiple axes can be started simultaneously. (Commands are output simultaneously to multiple servos.)
- The designated positioning data can be executed repeatedly, etc.,

● Manual control

"Manual control" refers to control in which positioning data is not used, and a positioning operation is carried out in response to signal input from an external device. Use this manual control to move the workpiece to a random position (JOG operation), and to finely adjust the positioning (inching operation, manual pulse generator operation), etc.

Main functions			Details
OPR control	Machine OPR control		Mechanically establishes the positioning start point using a near-point dog or stopper. (Positioning start No. 9001)
	Fast OPR control		Positions a target to the OP address (Machine feed value) stored in the QD75M using machine OPR. (Positioning start No. 9002)
Major positioning control	Position control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Positions a target using a linear path to the address set in the positioning data or to the position designated with the movement amount.
		Fixed-feed control (1-axis fixed-feed control) (2-axis fixed-feed control) (3-axis fixed-feed control) (4-axis fixed-feed control)	Positions a target by the movement amount designated with the amount set in the positioning data. (With fixed-feed control, the"Current feed value" is set to "0" when the control is started. With 2-, 3-, or 4-axis fixed-feed control, the fixed-feed is fed along a linear path obtained by interpolation.)
		2-axis circular interpolation control	Positions a target using an arc path to the address set in the positioning data, or to the position designated with the movement amount, sub point or center point.
	Speed control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Continuously outputs the command corresponding to the command speed set in the positioning data.
	Speed-position switching control		First, carries out speed control, and then carries out position control (positioning with designated address or movement amount) by turning the "speed-position switching signal" ON.
	Position-speed switching control		First, carries out position control, and then carries out speed control (continuous output of the command corresponding to the designated command speed) by turning the "position-speed switching signal" ON.
	Other control	Current value change	Changes the Current feed value to the address set in the positioning data. The following two methods can be used. (The machine feed value cannot be changed.) • Current value change using positioning data • Current value change using current value changing start No. (No. 9003)
		NOP instruction	No execution control system. When NOP instruction is set, this instruction is not executed and the operation of the next data is started.
		JUMP instruction	Unconditionally or conditionally jumps to the designated positioning data No.
		LOOP	Carries out loop control with repeated LOOP to LEND.
		LEND	Returns to the biginning of the loop control with repeated LOOP to LEND.

Main functions		Details
High-level positioning control	Block start (Normal start)	With one start, executes the positioning data in a random block with the set order.
	Condition start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, that "block start data" is ignored, and the next point's "block start data" is executed.
	Wait start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, stops the control until the condition is established. (Waits.)
	Simultaneous start	Simultaneously executes the positioning data having the No. for the axis designated with the "condition data". (Outputs commands at the same timing.)
	Repeated start (FOR loop)	Repeats the program from the block start data set with the "FOR loop" to the block start data set in "NEXT" for the designated No. of times.
	Repeated start (FOR condition)	Repeats the program from the block start data set with the "FOR condition" to the block start data set in "NEXT" until the conditions set in the "condition data" are established.
	Multiple axes simultaneous start control	Starts the operation of multiple axes simultaneously according to the command output level. (Positioning start No. 9004, same as the "simultaneous start" above)
Manual control	JOG operation	Outputs a command to servo amplifier while the JOG start signal is ON.
	Inching operation	Outputs pulses corresponding to minute movement amount by manual operation to servo amplifier. (Performs fine adjustment with the JOG start signal.)
	Manual pulse generator operation	Outputs pulses commanded with the manual pulse generator to servo amplifier. (Carry out fine adjustment, etc., at the command level.)

With the "major positioning control" ("high-level positioning control"), whether or not to continuously execute the positioning data can be set with the "operation pattern". Outlines of the "operation patterns" are given below.

Operation pattern	Details
Independent positioning control (positioning complete)	When "independent positioning control" is set for the operation pattern of the started positioning data, only the designated positioning data will be executed, and then the positioning will end.
Continuous positioning control	When "continuous positioning control" is set for the operation pattern of the started positioning data, after the designated positioning data is executed, the program will stop once, and then the next following positioning data will be executed.
Continuous path control	When "continuous path control" is set for the operation pattern of the started positioning data, the designated positioning data will be executed, and then without decelerating, the next following positioning data will be executed.

■ Sub functions

When executing the main functions, control and adds functions compensates and limits.

Sub function		Details
Functions characteristic to machine OPR	OPR retry function	This function retries the machine OPR with the upper/lower limit switches during OPR. This allows machine OPR to be carried out even if the axis is not returned to before the near-point dog with JOG operation, etc.
	OP shift function	After returning to the machine OP, this function compensates the position by the designated distance from the machine OP position and sets that position as the OP address.
Functions that compensate control	Backlash compensation function	This function compensates the mechanical backlash. Feed pulses equivalent to the set backlash amount are output each time the movement direction changes.
	Electronic gear function	By setting the movement amount per pulse, this function can freely change the machine movement amount per commanded pulse. When the movement amount per pulse is set, a flexible positioning system that matches the machine system can be structured.
	Near pass function *1	This function suppresses the machine vibration when the speed changes during continuous path control in the interpolation control.
Functions that limit control	Speed limit function	If the command speed exceeds "Speed limit value" during control, this function limits the commanded speed to within the "Speed limit value" setting range.
	Torque limit function	If the torque generated by the servomotor exceeds "Torque limit setting value" during control, this function limits the generated torque to within the "Torque limit setting value" setting range.
	Software stroke limit function	If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command.
	Hardware stroke limit function	This function carries out deceleration stop with the limit switch connected to the QD75M external device connector.
Functions that change control details	Speed change function	This function changes the speed during positioning. Set the new speed in the speed change buffer memory (New speed value), and change the speed with the Speed change request.
	Override function	This function changes the speed within a percentage of 1 to 300% during positioning. This is executed using "Positioning operation speed override".
	Acceleration/ deceleration time change function	This function changes the acceleration/ deceleration time during speed change.
	Torque change function	This function changes the "torque limit value" during control.

*1: The near pass function is featured as standard and is valid only for position control. It cannot be set to be invalid with parameters.

Sub function		Details
Absolute position system		This function restores the absolute position.
Other functions	Step function	This function temporarily stops the operation to confirm the positioning operation during debugging, etc. The operation can be stopped at each "automatic deceleration" or "positioning data".
	Skip function	This function stops (decelerates to a stop) the positioning being executed when the skip signal is input, and carries out the next positioning.
	M code output function	This function issues a command for a sub work (clamp or drill stop, tool change, etc.) corresponding to the M code No. (0 to 65535) that can be set for each positioning data.
	Teaching function	This function stores the address positioned with manual control into the positioning address having the designated positioning data No.***.
	Target position change function	This function changes the target position during positioning. Position and speed can be changed simultaneously.
	Command in-position function	At each automatic deceleration, this function calculates the remaining distance for the QD75M to reach the positioning stop position. When the value is less than the set value, the "command in-position flag" is set to "1". When using another auxiliary work before ending the control, use this function as a trigger for the sub work.
	Acceleration/ deceleration process function	This function adjusts the control acceleration/deceleration.
	Continuous operation interrupt function	This function interrupts continuous operation. When this request is accepted, the operation stops when the execution of the current positioning data is completed.
	Pre-reading start function	This function shortens the virtual start time.
	Deceleration start flag function	Function that turns ON the flag when the constant speed status or acceleration status switches to the deceleration status during position control, whose operation pattern is "Positioning complete", to make the stop timing known.
	Stop command processing for deceleration stop function	Function that selects a deceleration curve when a stop cause occurs during deceleration stop processing to speed 0.
	Follow up function	This function monitors the motor rotation amount with the servo turned OFF, and reflects it on the current feed value.

*2: Usable with the module whose first five digits of SERIAL No. are "05022" or later.

*3: Usable with the module whose first five digits of SERIAL No. are "05032" or later.

■ Common functions

Common control using the QD75M for "parameter initialization" or "backup of execution data" can be carried out.

Common functions	Details
Parameter initialization function	This function returns the "parameters" stored in the QD75M buffer memory and flash ROM to the default values. The following two methods can be used. 1) Method using PLC program 2) Method using GX Configurator-QP
Execution data backup function	This functions stores the "setting data", currently being executed, into the flash ROM. The following two methods can be used. 1) Method using PLC program 2) Method using GX Configurator-QP
External I/O signal logic switching function	This function switches I/O signal logic according to externally connected devices. This function enables the use of the system that does not use b (N.C.)-contact signals, such as Upper/lower limit signal, by setting parameters to positive logic.
External I/O signal monitor function	This function monitors the external I/O signal monitor information in the module's detailed information which can be displayed on the system monitor of GX Developer*1.

*1: Usable on GX Developer (SW6D5C-GPPW-E or later).

■ Combination of QD75M main functions and sub functions

Main functions \ Sub functions			Combination with operation pattern.*1	Functions characteristic to machine OPR: OPR retry function	Functions characteristic to machine OPR: OP shift function	Functions that compensate control: Backlash compensation function	Functions that compensate control: Electronic gear function	Functions that compensate control: Near pass function	Functions that limit control: Speed limit function	Functions that limit control: Torque limit function	Functions that limit control: Software stroke limit function	Functions that limit control: Hardware stroke limit function	Functions that change control details: Speed change function	Functions that change control details: Override function	Functions that change control details: Acceleration/ deceleration time change function	Functions that change control details: Torque change function	Other functions: Step function	Other functions: Skip function	Other functions: M code output function	Other functions: Teaching function	Other functions: Target position change function	Other functions: Command in-position function	Other functions: Acceleration/deceleration process function	Other functions: Pre-reading start function	Other functions: Deceleration start flag function	Other functions: Stop command processing for deceleration stop function
OPR control	Machine OPR control		×	○	○	○	○	*2	○	○	×	◎	*3 △	*3 △	×	○	×	×	×	×	×	×	○	×	×	○
	Fast OPR control		×	×	×	○	○		○	○	×	◎	○	○	×	○	×	×	×	×	×	×	○	×	×	○
Major positioning control	Position control	1-axis linear control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	*4 △	○	○	○	○	○
		2-, 3-, or 4-axis linear interpolation control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	*6 △	○
		1-axis fixed-feed control	△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	○	○
		2-, 3-, or 4-axis fixed-feed control (interpolation)	△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	*6 △	○
		2-axis circular interpolation control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	×	○
	Speed control (1- to 4-axis)		△ (Only independent positioning control can be set)	×	×	○	○		○	○	○	◎	○	○	○	○	×	×	○	×	×	×	○	○	×	○
	Speed-position switching control		△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	×	○	×	×	○	○	○	*7 △	○
	Position-speed switching control		△ (Only independent positioning control can be set)																						
	Other control	Current value changing	△ (Continuous path control cannot be set)	×	×	×	×		×	×	×	◎	×	×	×	×	○	×	*8 △	×	×	×	×	×	×	×
		NOP instruction	×														×		×							
		JUMP instruction	×	×	×	×	×		×	×	×	◎	×	×	×	×	×	×	×	×	×	×	×	×	×	×
		LOOP to LEND																								
Manual control	JOG operation, inching operation		×	×	×	○	○		○	○	○	◎	○	○	×	○	×	×	×	○	×	×	*5 △	×	×	×
	Manual pulse generator operation		×	×	×	○	○		×	○	○	◎	×	×	×	○	×	×	×	○	×	×	×	×	×	×

◎: Always combine, ○: Combination possible, △: Combination limited, ×: Combination not possible

*1: The operation pattern is one of the "positioning data" setting items.

*2: The near pass function is featured as standard and is valid only for setting continuous path control for position control.

*3: Invalid during creep speed.

*4: Invalid during continuous path control.

*5: Inching operation does not perform acceleration/deceleration processing.

*6: Valid for the reference axis only.

*7: Valid for only the case where a deceleration start is made during position control.

*8: Disabled for a start of positioning start No. 9003.

Performance specifications

Item \ Model		QD75M1	QD75M2	QD75M4
No. of control axes		1 axis	2 axes	4 axes
Interpolation function		No	2-axis linear interpolation 2-axis circular interpolation	2-, 3-, or 4-axis linear interpolation 2-axis circular interpolation
Control system		PTP (Point To Point) control, path control (both linear and arc can be set), speed control, speed-position switching control, position-speed switching control		
Control unit		mm, inch, degree, PLS		
Positioning data		600 data (positioning data Nos. 1 to 600)/axis (Can be set with peripheral device or sequence program.)		
Backup		Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)		
Positioning	Positioning system	PTP control:Incremental system/absolute system Speed-position switching control: Incremental system/absolute system*1 Position-speed switching control: Incremental system Path control:Incremental system/absolute system		
	Positioning range	In absolute system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • 0 to 359.99999(degree) •-2147483648 to 2147483647(PLS) In incremental system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • -21474.83648 to 21474.83647(degree) • -2147483648 to 2147483647(PLS) In speed-position switching control (INC mode) / position-speed switching control • 0 to 214748364.7(μm) • 0 to 21474.83647(inch) • 0 to 21474.83647(degree) • 0 to 2147483647(PLS) In speed-position switching control (ABS mode)*1 • 0 to 359.99999(degree)		
	Speed command	0.01 to 20000000.00(mm/min) 0.001 to 2000000.000(inch/min) 0.001 to 2000000.000(degree/min) 1 to 10000000(PLS/s)		
	Acceleration/ deceleration process	Automatic trapezoidal acceleration/deceleration, S-pattern acceleration/deceleration		
	Acceleration/ deceleration time	1 to 8388608(ms) Four patterns can be set for each of acceleration time and deceleration time.		
	Sudden stop deceleration time	1 to 8388608(ms)		

Starting time (ms) *2		
1-axis linear control	6	Factors in starting time extension The following times will be added to the starting time in the described conditions: • S-pattern acceleration/ deceleration is selected :0.5 • Other axis is in operation :1.5 • During continuous positioning control :0.2 • During continuous path control :1.0
1-axis speed control	6	
2-axis linear interpolation control (Composite speed)	7	
2-axis linear interpolation control (Reference axis speed)	7	
2-axis circular interpolation control	7	
2-axis speed control	6	
3-axis linear interpolation control (Composite speed)	7	
3-axis linear interpolation control (Reference axis speed)	7	
3-axis speed control	6	
4-axis linear interpolation control	7	
4-axis speed control	7	

(Continues to next page)

*1: In speed-position switching control (ABS mode), the control unit available is "degree" only.
*2: Using the "Pre-reading start function", the virtual start time can be shortened.

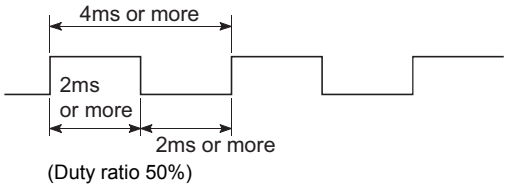
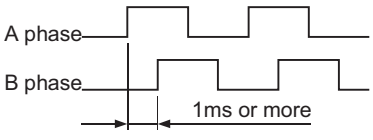
(Continued from previous page)

Item \ Model	QD75M1	QD75M2	QD75M4
Protection degree	---		
Flash ROM write count	Max. 100000 times		
External wiring connection system	40-pin connector		
Applicable wire size	0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4), AWG #24 to 28 (for A6CON2) AWG #28 (Twisted wire)/ AWG #30 (Solid wire) (for A6CON3)		
Applicable connector for external device (sold separately)	A6CON1, A6CON2, A6CON3, A6CON4		
SSCNET cable	MR-J2HBUS□M: • Connection between QD75M□ and MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B • Connection between MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B and MR-J2-B/MRJ2S-B/ MR-J2-Jr/MR-J2M-B (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-J2CN1: connector set (sold separately)		
	MR-J2HBUS□M-A: • Connection between QD75M□/MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B and MR-H-BN/ MR-H-BN4 (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-J2CN1-A: connector set (sold separately)		
	MR-HBUS□M: • Connection between MR-H-BN/MR-H-BN4 and MR-H-BN/MR-H-BN4 (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-HBCNS: connector set (sold separately)		
SSCNET cable over all length (m)	30m		
Online module change	Disabled		
Multiple CPU system	Compatible		
No. of occupied I/O points (points)	32points/slot (I/O assignment: Intelligent)		
Internal current consumption (5VDC)	0.40A		
Outline dimensions (mm(inch))	98 (3.86)(H) × 27.4 (1.08)(W)× 90 (3.54)(D) mm		
Weight (kg)	0.15kg	0.15kg	0.16kg

*3: Provide a 70mm or more clearance under the QD75M to give room for wiring the SCNET cable.

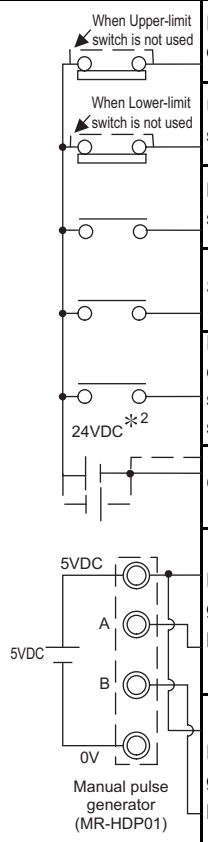
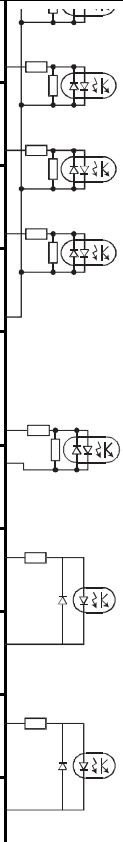
External I/O specifications

■ Input specifications

Signal name	Rated input voltage/current	Working voltage range	ON voltage/ current	OFF voltage/ current	Input resistance	Response time
Upper limit signal (FLS) Lower limit signal (RLS) Stop signal (STOP)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.0mA or less	Approx. 6.8kΩ	4ms or less
Manual pulse generator A phase (PULSER A) Manual pulse generator B phase (PULSER B)	5VDC/5mA	4.5 to 6.1VDC	2.5VDC or more/ 1mA or more	1VDC or less/ 0.1mA or less	Approx. 1.2kΩ	1ms or less
	1) Pulse width  (Duty ratio 50%) 2) Phase difference  When the A phase leads the B phase, the positioning address (current value) increases.					
Near-point dog signal (DOG) External command signal (CHG)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.0mA or less	Approx. 6.8kΩ	1ms or less

External I/O terminals

■ Input terminals

External wiring	Signal name		Internal circuit	Wiring *1
	Near-point dog signal	DOG		△
	Upper limit LS signal	FLS		○
	Lower limit LS signal	RLS		○
	Stop signal	STOP		△
	External command signal/switching signal	CHG		△
	Common	COM		○
	Manual pulse generator A phase	PULSER A+		△
		PULSER A-		
	Manual pulse generator B phase	PULSER B+		
		PULSER B-		

*1: The symbols in Need for wiring column indicate the following meanings:

○:Wiring is necessary for positioning.

△:Wiring is necessary depending on the situation.

*2: Either polarity can be connected to the common (COM).

Pin layout	Axis4 (AX4)		Axis3 (AX3)		Axis2 (AX2)		Axis1 (AX1)	
	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
Front view of the module	2B20	Vacant	2A20	Vacant	1B20	PULSER B-	1A20	PULSER B+
	2B19	Vacant	2A19	Vacant	1B19	PULSER A-	1A19	PULSER A+
	2B18	Vacant	2A18	Vacant	1B18	Vacant	1A18	Vacant
	2B17	Vacant	2A17	Vacant	1B17	Vacant	1A17	Vacant
	2B16	Vacant	2A16	Vacant	1B16	Vacant	1A16	Vacant
	2B15	Vacant	2A15	Vacant	1B15	Vacant	1A15	Vacant
	2B14	Vacant	2A14	Vacant	1B14	Vacant	1A14	Vacant
	2B13	Vacant	2A13	Vacant	1B13	Vacant	1A13	Vacant
	2B12	Vacant	2A12	Vacant	1B12	Vacant	1A12	Vacant
	2B11	Vacant	2A11	Vacant	1B11	Vacant	1A11	Vacant
	2B10	Vacant	2A10	Vacant	1B10	Vacant	1A10	Vacant
	2B9	Vacant	2A9	Vacant	1B9	Vacant	1A9	Vacant
	2B8	Vacant	2A8	Vacant	1B8	Vacant	1A8	Vacant
	2B7	COM	2A7	COM	1B7	COM	1A7	COM
	2B6	COM	2A6	COM	1B6	COM	1A6	COM
	2B5	CHG	2A5	CHG	1B5	CHG	1A5	CHG
	2B4	STOP	2A4	STOP	1B4	STOP	1A4	STOP
	2B3	DOG	2A3	DOG	1B3	DOG	1A3	DOG
	2B2	RLS	2A2	RLS	1B2	RLS	1A2	RLS
	2B1	FLS	2A1	FLS	1B1	FLS	1A1	FLS

*1: Pin No. "1□□□" indicates the pin No. for the right connector. Pin No. "2□□□" indicates the pin No. for the left connector.

*2: When a 1-axis module is used, pin Nos. 1B1 to 1B18 are "Vacant".

*3: For 1- and 2-axis modules do not have the AX3 and AX4 connectors on the left side.

System configuration

<Accessories>

Product	Description
Manual	Type QD75M Positioning Module User's Manual (Hardware)

<Separately obtained products>

Product	Description	
Manual	Type QD75M Positioning Module User's Manual (Details)	
Connector	External wiring connector A6CON1, A6CON2, A6CON3, A6CON4	
Manual pulse generator	Recommended product: MR-HDP01 (Manufactured by Mitsubishi Electric, Corp.)	
SSCNET Cable	MR-J2HBUS □M	• Connection between QD75M□ and MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B • Connection between MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B and MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-J2CN1: Connector set (sold separately)
	MR-J2HBUS □M-A	• Connection between QD75M□/MR-J2-B/MR-J2S-B/MR-J2-Jr/MR-J2M-B and MR-H-BN/MR-H-BN4 (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-J2CN1-A: Connector set (sold separately)
	MR-HBUS □M	• For connection of MR-H-BN/MR-H-BN4 and MR-H-BN/MR-H-BN4 (cable length 0.5m (1.64ft.), 1m (3.28ft.), 5m (16.4ft.)) • MR-HBCNS: Connector set (sold separately)
External device connection cable	Cables connecting QD75M to external devices	
Compatible servo amplifier	MR-H□-BN, MR-J2S-□B, MR-J2-□B, MR-J2-Jr, MR-J2M-B	

Note) The external wiring connector and SSCNET cable are not packed with the product. Therefore, they need to be obtained separately.

Applicable system

<Applicable modules and the number of installable modules>
The following table indicates the CPU modules and network modules (for remote I/O station) usable with the QD75M and the number of installable modules.

Applicable modules		Number of installable modules	Remarks
CPU module	Q00JCPU	Max. 8	*1
	Q00CPU Q01CPU	Max. 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Max. 64	Installable in the Q mode only*1
	Q12PHCPU Q25PHCPU	Max. 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Max. 64	MELSECNET/H remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.
*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Supported software packages>
The following table lists the compatibility between the systems using the QD75M and the software packages. GX Developer is required for use of the QD75M.

		Software version	
		GX Developer	GX Configurator-QP
Q00J/Q00/Q01CPU	Single PLC system	Version 7 or more	Version 2.10L or more
	Multiple PLC system	Version 8 or more	
Q02/Q02H/Q06H/Q12H/Q25HCPU	Single PLC system	Version 4 or more	Version 2.00A or more
	Multiple PLC system	Version 6 or more	
Q12PH/Q25PHCPU	Single PLC system	Version 7.10L or more	Version 2.13P or more
	Multiple PLC system		
For use on MELSECNET/H remote I/O station		Version 6 or more	Version 2.00A or more

3.5.6 QD75MH positioning module: QD75MH1, QD75MH2, QD75MH4

Overview

The QD75MH1, QD75MH2 and QD75MH4 (hereafter referred generically to as the "QD75MH") are modules used with SSCNETIII-compatible servo amplifiers to execute machine position or speed control.

Features

■ Assortment of 1-, 2- and 4-axis products

1-, 2- and 4-axis models are available in terms of the number of axes per module.
QD75MH1: 1 axis, QD75MH2: 2 axes, QD75MH4: 4 axes
Also, since there are no restrictions on the number of loadable modules, multiple modules can be loaded and used if more than four control axes are needed.

■ Wide variety of positioning control functions

(1) A wide variety of positioning control functions essential to any positioning system are supported: positioning to an arbitrary position, fixed-feed control, equal-speed control, and so on.
  (a) Up to 600 positioning data items, including such information as positioning addresses, control systems, and operation patterns, can be prepared for each axis. Using the prepared positioning data, the positioning control is performed independently for each axis. (In addition, such controls as interpolation involving two to four axes and simultaneous startup of multiple axes are possible.)
  (b) Independent control of each axis can be achieved in linear control mode (executable simultaneously four axes).
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
  (c) Coordinated control over multiple axes can take the form of either the linear interpolation through the speed or position control of two to four axes or the circular interpolation involving two axes.
  Such control can either be the independent positioning control using a single positioning data or the continuous positioning control enabled by the continuous processing of multiple positioning data.
(2) For each positioning data, the user can specify any of the following control systems: position control, speed control, speed-position switching control, position-speed switching control, and so on.
(3) Continuous positioning control using multiple positioning data can be executed in accordance with the operation patterns the user assigned to the positioning data.Continuous positioning control can be executed over multiple blocks, where each block consists of multiple positioning data.
(4) OPR control is given additional features.
  Four different machine OPR methods are provided: the near point dog method, two count methods, and the data set method.
(5) Two acceleration/deceleration control methods are provided: automatic trapezoidal acceleration/deceleration and S-pattern acceleration/ deceleration.

■ Quick startup

A positioning operation starts up quickly taking as little as 3.5 ms to 4 ms.
When operation using simultaneous start function or interpolation operation is executed, the axes start without delay.

(Example)	Axis 1 and Axis 3 are started by the simultaneous start function	: No delay in Axis 1 and Axis 3 start
	Axis 2 and Axis 4 are started by the interpolation operation	: No delay in Axis 2 and Axis 4 start

■ SSCNETIII makes the connection to the servo amplifier possible

(1) The QD75 can be directly connected to the servo amplifier using the MELSERVO (Mitsubishi's servo amplifier: MR-J3-B) and SSCNETIII.
(2) Because the SSCNETIII cable is used to connect the QD75MH and the servo amplifier, or servo amplifiers, saving wiring can be realized. The cable between the QD75MH and servo amplifier or servo amplifiers can be extended up to 50m (164.04ft.).
(3) By the use of SSCNETIII cable (Optical communication), influence of electromagnetic noise and others from servo amplifier, etc. are reduced.
(4) The servo parameters can be set on the QD75MH side to write or read them to/from the servo amplifier using the SSCNETIII.
(5) The actual current value and error description contained in the servo can be checked by the buffer memory of the QD75MH.

■ Easy application to the absolute position system

(1) The absolute position-corresponding servo amplifier is connected to have an application to the absolute position system.
(2) Once the OP have been established, the OPR operation can also be made unnecessary when the power is supplied.
(3) With the absolute position system, the data set method OPR is used to establish the OP.
(4) When the setting unit is "degree", the absolute position system with unlimited length feed can be configured.

■ Control can be realized with the mechanical system input

The external inputs, such as external start, stop, and speed-position switching is used to perform the positioning control without using the PLC program.

■ Easy maintenance

Each QD75MH positioning module incorporates the following improvements in maintainability:

(1) Data such as the positioning data and parameters can be stored on a flash ROM inside the QD75MH, eliminating the need of a battery for retaining data.

(2) Error messages are classified in more detail to facilitate the initial troubleshooting procedure.

(3) The module retains 16 error messages and 16 warning messages recently output, offering more complete error and warning histories.

■ Support of intelligent function module dedicated instructions

Dedicated instructions such as the positioning start instruction, and teaching instruction are provided.
The use of such dedicated instruction simplifies PLC programs.

■ Setups, monitoring, and testing through GX Configurator-QP

Using GX Configurator-QP, the user can control the QD75MH parameters and positioning data without considering the buffer memory addresses.
Moreover, GX Configurator-QP has a test function which allows the user to check the wiring before creating a PLC program for positioning control, or test operation the QD75MH using created parameters and positioning data for checking their integrity.
The control monitor function of GX Configurator-QP allows the user to debug programs efficiently.

■ Addition of forced stop function

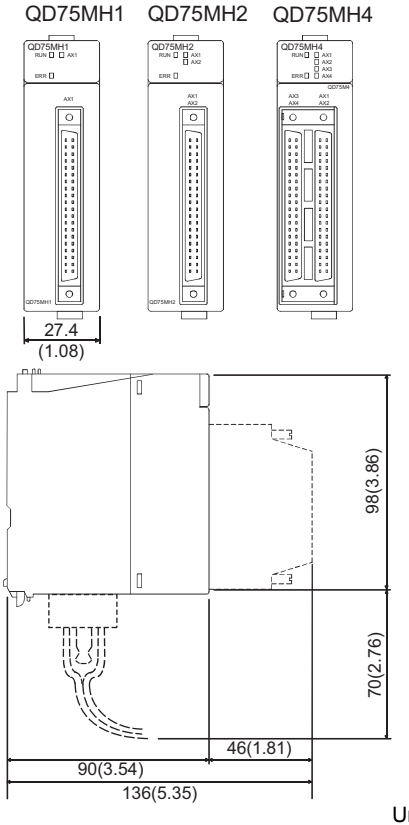
As forced stop input signal to the connector for external equipment connection is added, batch forced stop is available for all axes of servo amplifier.
Selection for whether using "Forced stop input signal" or not can be made with parameter.

QD75MH dedicated instructions

The following QD75MH dedicated instructions can be used to create sequence programs for the QD75MH.

instruction name	instruction specifications
PSTRT1,PSTRT2, PSTRT3,PSTRT4	This function starts the positioning control of the designated axis of the QD75MH.
TEACH1,TEACH2, TEACH3,TEACH4	This function carries out teaching the designated axis of the QD75MH.
PFWRT	This function writes the buffer memory parameters, positioning data and block start data to the flash ROM.
PINIT	This function initializes the buffer memory and flash ROM setting data to the factory-set data (initial values).

Appearance



Unit:mm(inch)

To give allowance for SSCNETIII cable wiring, leave a 70mm or more (2.76 inch) clearance under the QD75MH.

List of functions

■ Main functions

● OPR control

"OPR control" is a function that establishes the start point for carrying out positioning control, and carries out positioning toward that start point. This is used to return a workpiece, located at a position other than the OP when the power is turned ON or after positioning stop, to the OP. The "OPR control" is preregistered in the QD75MH as the "Positioning start data No. 9001 (Machine OPR)", and "Positioning start data No. 9002 (Fast OPR).

● Major positioning control

This control is carried out using the "Positioning data" stored in the QD75MH. Positioning control, such as position control and speed control, is executed by setting the required items in this "positioning data" and starting that positioning data. An "operation pattern" can be set in this "positioning data", and with this whether to carry out control with continuous positioning data (ex.: positioning data No. 1, No. 2, No. 3, ...) can be set.

● High-level positioning control

This control executes the "positioning data" stored in the QD75MH using the "block start data". The following types of applied positioning control can be carried out.

- Random blocks, handling several continuing positioning data items as "blocks", can be executed in the designated order.
- "Condition judgment" can be added to position control and speed control.
- The operation of the designated positioning data No. that is set for multiple axes can be started simultaneously. (Commands are output simultaneously to multiple servos.)
- The designated positioning data can be executed repeatedly, etc.,

● Manual control

"Manual control" refers to control in which positioning data is not used, and a positioning operation is carried out in response to signal input from an external device. Use this manual control to move the workpiece to a random position (JOG operation), and to finely adjust the positioning (inching operation, manual pulse generator operation), etc.

Main functions			Details
OPR control	Machine OPR control		Mechanically establishes the positioning start point using a near-point dog or stopper. (Positioning start No. 9001)
	Fast OPR control		Positions a target to the OP address (Machine feed value) stored in the QD75MH using machine OPR. (Positioning start No. 9002)
Major positioning control	Position control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Positions a target using a linear path to the address set in the positioning data or to the position designated with the movement amount.
		Fixed-feed control (1-axis fixed-feed control) (2-axis fixed-feed control) (3-axis fixed-feed control) (4-axis fixed-feed control)	Positions a target by the movement amount designated with the amount set in the positioning data. (With fixed-feed control, the"Current feed value" is set to "0" when the control is started. With 2-, 3-, or 4-axis fixed-feed control, the fixed-feed is fed along a linear path obtained by interpolation.)
		2-axis circular interpolation control	Positions a target using an arc path to the address set in the positioning data, or to the position designated with the movement amount, sub point or center point.
	Speed control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (4-axis linear interpolation control)	Continuously outputs the command corresponding to the command speed set in the positioning data.
	Speed-position switching control		First, carries out speed control, and then carries out position control (positioning with designated address or movement amount) by turning the "speed-position switching signal" ON.
	Position-speed switching control		First, carries out position control, and then carries out speed control (continuous output of the command corresponding to the designated command speed) by turning the "position-speed switching signal" ON.
	Other control	Current value change	Changes the Current feed value to the address set in the positioning data. The following two methods can be used. (The machine feed value cannot be changed.) • Current value change using positioning data • Current value change using current value changing start No. (No. 9003)
		NOP instruction	No execution control system. When NOP instruction is set, this instruction is not executed and the operation of the next data is started.
		JUMP instruction	Unconditionally or conditionally jumps to the designated positioning data No.
		LOOP	Carries out loop control with repeated LOOP to LEND.
		LEND	Returns to the biginning of the loop control with repeated LOOP to LEND.

(Continued on next page)

(Continued)

	Main functions	Details
High-level positioning control	Block start (Normal start)	With one start, executes the positioning data in a random block with the set order.
	Condition start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, that "block start data" is ignored, and the next point's "block start data" is executed.
	Wait start	Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data". When the condition is established, the "block start data" is executed. When not established, stops the control until the condition is established. (Waits.)
	Simultaneous start	Simultaneously executes the positioning data having the No. for the axis designated with the "condition data". (Outputs commands at the same timing.)
	Repeated start (FOR loop)	Repeats the program from the block start data set with the "FOR loop" to the block start data set in "NEXT" for the designated No. of times.
	Repeated start (FOR condition)	Repeats the program from the block start data set with the "FOR condition" to the block start data set in "NEXT" until the conditions set in the "condition data" are established.
	Multiple axes simultaneous start control	Starts the operation of multiple axes simultaneously according to the command output level. (Positioning start No. 9004, same as the "simultaneous start" above)
Manual control	JOG operation	Outputs a command to servo amplifier while the JOG start signal is ON.
	Inching operation	Outputs commands corresponding to minute movement amount by manual operation to servo amplifier. (Performs fine adjustment with the JOG start signal.)
	Manual pulse generator operation	Outputs pulses commanded with the manual pulse generator to servo amplifier. (Carry out fine adjustment, etc., at the command level.)

With the "major positioning control" ("high-level positioning control"), whether or not to continuously execute the positioning data can be set with the "operation pattern". Outlines of the "operation patterns" are given below.

Operation pattern	Details
Independent positioning control (positioning complete)	When "independent positioning control" is set for the operation pattern of the started positioning data, only the designated positioning data will be executed, and then the positioning will end.
Continuous positioning control	When "continuous positioning control" is set for the operation pattern of the started positioning data, after the designated positioning data is executed, the program will stop once, and then the next following positioning data will be executed.
Continuous path control	When "continuous path control" is set for the operation pattern of the started positioning data, the designated positioning data will be executed, and then without decelerating, the next following positioning data will be executed.

■ Sub functions

When executing the main functions, control and adds functions compensates and limits.

Sub function		Details
Functions characteristic to machine OPR	OPR retry function	This function retries the machine OPR with the upper/lower limit switches during OPR. This allows machine OPR to be carried out even if the axis is not returned to before the near-point dog with JOG operation, etc.
	OP shift function	After returning to the machine OP, this function compensates the position by the designated distance from the machine OP position and sets that position as the OP address.
Functions that compensate control	Backlash compensation function	This function compensates the mechanical backlash. Feed pulses equivalent to the set backlash amount are output each time the movement direction changes.
	Electronic gear function	By setting the movement amount per pulse, this function can freely change the machine movement amount per commanded pulse. When the movement amount per pulse is set, a flexible positioning system that matches the machine system can be structured.
	Near pass function *1	This function suppresses the machine vibration when the speed changes during continuous path control in the interpolation control.
Functions that limit control	Speed limit function	If the command speed exceeds "Speed limit value" during control, this function limits the commanded speed to within the "Speed limit value" setting range.
	Torque limit function	If the torque generated by the servomotor exceeds "Torque limit setting value" during control, this function limits the generated torque to within the "Torque limit setting value" setting range.
	Software stroke limit function	If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command.
	Hardware stroke limit function	This function carries out deceleration stop with the limit switch connected to the QD75MH external device connector.
	Forced stop function	This function is stopped the all axis of the servo amplifier when the forced stop input signal of the QD75MH external connector is turned ON.
Functions that change control details	Speed change function	This function changes the speed during positioning. Set the new speed in the speed change buffer memory (New speed value), and change the speed with the Speed change request.
	Override function	This function changes the speed within a percentage of 1 to 300% during positioning. This is executed using "Positioning operation speed override".
	Acceleration/ deceleration time change function	This function changes the acceleration/ deceleration time during speed change.
	Torque change function	This function changes the "torque limit value" during control.
Absolute position system		This function restores the absolute position.
Other functions	Step function	This function temporarily stops the operation to confirm the positioning operation during debugging, etc. The operation can be stopped at each "automatic deceleration" or "positioning data".
	Skip function	This function stops (decelerates to a stop) the positioning being executed when the skip signal is input, and carries out the next positioning.
	M code output function	This function issues a command for a sub work (clamp or drill stop, tool change, etc.) corresponding to the M code No. (0 to 65535) that can be set for each positioning data.
	Teaching function	This function stores the address positioned with manual control into the positioning address having the designated positioning data No.***.
	Target position change function	This function changes the target position during positioning. Position and speed can be changed simultaneously.
	Command in-position function	At each automatic deceleration, this function calculates the remaining distance for the QD75MH to reach the positioning stop position. When the value is less than the set value, the "command in-position flag" is set to "1". When using another auxiliary work before ending the control, use this function as a trigger for the sub work.
	Acceleration/ deceleration process function	This function adjusts the control acceleration/deceleration.
	Continuous operation interrupt function	This function interrupts continuous operation. When this request is accepted, the operation stops when the execution of the current positioning data is completed.
	Pre-reading start function	This function shortens the virtual start time.

*1: The near pass function is featured as standard and is valid only for position control. It cannot be set to be invalid with parameters.

(Continued on next page)

(Continued)

Sub function		Details
Other functions	Deceleration start flag function	Function that turns ON the flag when the constant speed status or acceleration status switches to the deceleration status during position control, whose operation pattern is "Positioning complete", to make the stop timing known.
	Stop command processing for deceleration stop function	Function that selects a deceleration curve when a stop cause occurs during deceleration stop processing to speed 0.
	Follow up function	This function monitors the motor rotation amount with the servo turned OFF, and reflects it on the current feed value.
	Speed control 10 x multiplier setting for degree axis function	This function is executed the positioning control by the 10 x speed of the command speed and the speed limit value when the setting unit is "degree".
	Operation setting for incompletion of OPR function	This function is provided to select whether positioning control is operated or not, when OPR request flag is ON.

■ Common functions

Common control using the QD75MH for "parameter initialization" or "backup of execution data" can be carried out.

Common functions	Details
Parameter initialization function	This function returns the "parameters" stored in the QD75MH buffer memory and flash ROM to the default values. The following two methods can be used. 1) Method using PLC program 2) Method using GX Configurator-QP
Execution data backup function	This functions stores the "setting data", currently being executed, into the flash ROM. The following two methods can be used. 1) Method using PLC program 2) Method using GX Configurator-QP
External signal selection function	This functions is selected either of external device connector of QD75MH or external input signal of servo amplifier whether connect the upper/lower limit signal and the Near-point dog signal.
External I/O signal logic switching function	This function switches I/O signal logic according to externally connected devices. This function enables the use of the system that does not use b (N.C.)-contact signals, such as Upper/lower limit signal, by setting parameters to positive logic.

*1: Usable on GX Developer (SW6D5C-GPPW or later).

■ Combination of QD75 main functions and sub functions

Main functions \ Sub functions			Combination with operation pattern.*1	OPR retry function	OP shift function	Backlash compensation function	Electronic gear function	Near pass function	Speed limit function	Torque limit function	Software stroke limit function	Hardware stroke limit function	Speed change function	Override function	Acceleration/ deceleration time change function	Torque change function	Step function	Skip function	M code output function	Teaching function	Target position change function	Command in-position function	Acceleration/deceleration process function	Pre-reading start function	Deceleration start flag function	Stop command processing for deceleration stop function	Speed control 10 x multiplier setting for degree axis function	Operation setting for incompletion of OPR function
				Functions characteristic to machine OPR		Functions that compensate control			Functions that limit control				Functions that change control details				Other functions											
OPR control	Machine OPR control		×	○	○	○	○		○	○	×	◎	*3 △	*3 △	×	○	×	×	×	×	×	×	○	×	×	○	○	×
	Fast OPR control		×	×	×	○	○		○	○	×	◎	○	○	×	○	×	×	×	×	×	×	○	×	×	○	○	×
Major positioning control	Position control	1-axis linear control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	*4 △	○	○	○	○	○	○	○
		2-, 3-, or 4-axis linear interpolation control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	*6 △	○	○	○
		1-axis fixed-feed control	△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	○	○	○	○
		2-, 3-, or 4-axis fixed-feed control (interpolation)	△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	*6 △	○	○	○
		2-axis circular interpolation control	○	×	×	○	○		○	○	○	◎	○	○	○	○	○	○	○	×	×	○	○	○	×	○	×	○
	Speed control (1- to 4-axis)		△ (Only independent positioning control can be set)	×	×	○	○	*2	○	○	○	◎	○	○	○	○	×	×	○	×	×	×	○	○	×	○	○	○
	Speed-position switching control		△ (Continuous path control cannot be set)	×	×	○	○		○	○	○	◎	○	○	○	○	○	×	○	×	×	○	○	○	*7 △	○	○	○
	Position-speed switching control		△ (Only independent positioning control can be set)																								
	Other control	Current value changing	△ (Continuous path control cannot be set)	×	×	×	×		×	×	×	◎	×	×	×	×	○	×	*8 △	×	×	×	×	×	×	×	×	*10 △
		NOP instruction	×														×		×									×
		JUMP instruction	×	×	×	×	×		×	×	×	◎	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
		LOOP to LEND																										
Manual control	JOG operation, inching operation		×	×	×	○	○		○	○	○	◎	○	○	×	○	×	×	×	○	×	×	*5 △	×	×	×	○	×
	Manual pulse generator operation		×	×	×	○	○		×	○	○	◎	×	×	×	○	×	×	×	○	×	×	×	×	×	×	*9 △	×

◎: Always combine, ○: Combination possible, △: Combination limited, ×: Combination not possible

*1: The operation pattern is one of the "positioning data" setting items.
*2: The near pass function is featured as standard and is valid only for setting continuous path control for position control.
*3: Invalid during creep speed.
*4: Invalid during continuous path control.
*5: Inching operation does not perform acceleration/deceleration processing.
*6: Valid for the reference axis only.
*7: Valid for only the case where a deceleration start is made during position control.
*8: Disabled for a start of positioning start No. 9003.
*9: Valid for "Feedrate" and "Axis feedrate".
*10: Valid for a start of positioning start No.9003, but invalid for a start of positioning data (No. 1 to 600).

Performance specifications

Item \ Model		QD75MH1	QD75MH2	QD75MH4
No. of control axes		1 axis	2 axes	4 axes
Interpolation function		No	2-axis linear interpolation 2-axis circular interpolation	2-, 3-, or 4-axis linear interpolation 2-axis circular interpolation
Control system		PTP (Point To Point) control, path control (both linear and arc can be set), speed control, speed-position switching control, position-speed switching control		
Control unit		mm, inch, degree, PLS		
Positioning data		600 data (positioning data Nos. 1 to 600)/axis (Can be set with peripheral device or sequence program.)		
Backup		Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)		
Positioning	Positioning system	PTP control:Incremental system/absolute system Speed-position switching control: Incremental system/absolute system[*1] Position-speed switching control: Incremental system Path control:Incremental system/absolute system		
	Positioning range	In absolute system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • 0 to 359.99999(degree) •-2147483648 to 2147483647(PLS) In incremental system • -214748364.8 to 214748364.7(μm) • -21474.83648 to 21474.83647(inch) • -21474.83648 to 21474.83647(degree) • -2147483648 to 2147483647(PLS) In speed-position switching control (INC mode) / position-speed switching control • 0 to 214748364.7(μm) • 0 to 21474.83647(inch) • 0 to 21474.83647(degree) • 0 to 2147483647(PLS) In speed-position switching control (ABS mode)[*1] • 0 to 359.99999(degree)		
	Speed command	0.01 to 20000000.00(mm/min) 0.001 to 2000000.000(inch/min) 0.001 to 2000000.000(degree/min)[*3] 1 to 50000000(PLS/s)		
	Acceleration/ deceleration process	Automatic trapezoidal acceleration/deceleration, S-pattern acceleration/deceleration		
	Acceleration/ deceleration time	1 to 8388608(ms) Four patterns can be set for each of acceleration time and deceleration time.		
	Sudden stop deceleration time	1 to 8388608(ms)		
Starting time (ms) [*2]		1-axis linear control	3.5	Factors in starting time extension The following times will be added to the starting time in the described conditions: • S-pattern acceleration/ deceleration is selected :0.5 • Other axis is in operation :1.5 • During continuous positioning control :0.2 • During continuous path control :1.0
		1-axis speed control	3.5	
		2-axis linear interpolation control (Composite speed)	4.0	
		2-axis linear interpolation control (Reference axis speed)	4.0	
		2-axis circular interpolation control	4.0	
		2-axis speed control	3.5	
		3-axis linear interpolation control (Composite speed)	4.0	
		3-axis linear interpolation control (Reference axis speed)	4.0	
		3-axis speed control	3.5	
		4-axis linear interpolation control	4.0	
		4-axis speed control	4.0	

(Continues to next page)

*1: In speed-position switching control (ABS mode), the control unit available is "degree" only.
*2: Using the "Pre-reading start function", the virtual start time can be shortened.
*3: When "Speed control 10 x multiplier setting for degree axis function" is valid, this will be the setting range 0.01 to 20000000.00 (degree/min).

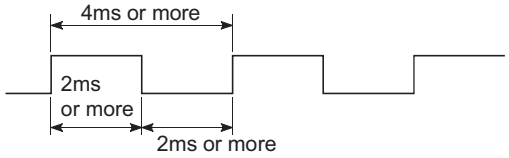
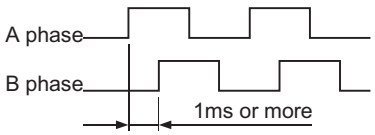
(Continued from previous page)

Item \ Model	QD75MH1		QD75MH2	QD75MH4
Protection degree	---			
Flash ROM write count	Max. 100000 times			
External wiring connection system	40-pin connector			
Applicable wire size	0.3mm^2 (AWG#22) or less (for A6CON1, A6CON4), AWG #24 to 28 (for A6CON2) AWG #28 (Twisted wire)/ AWG #30 (Solid wire) (for A6CON3)			
Applicable connector for external device (sold separately)	A6CON1, A6CON2, A6CON3, A6CON4			
SSCNETIII cable *4	MR-J3BUS□M *4	• Connection between QD75MH and MR-J3- □B. • Connection between MR-J3-□B and MR-J3- □B. • Standard code for inside panel. • 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3.28ft.), 3m(9.84ft.)		
	MR-J3BUS□M-A *4	• Connection between QD75MH and MR-J3-□B. • Connection between MR-J3- □B and MR-J3- □B. • Standard code for outside panel. • 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.)		
	MR-J3BUS□M-B *4	• Connection between QD75MH and MR-J3- □B. • Connection between MR-J3- □B and MR-J3- □B. • Long distance cable. • 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.)		
SSCNETIII cable over all length	800m			
Online module change	Disabled			
Multiple CPU system	Compatible			
No. of occupied I/O points	32points/slot (I/O assignment: Intelligent)			
Internal current consumption (5VDC)	0.60A			
Outline dimensions	98 (3.86)(H) × 27.4 (1.08)(W)× 90 (3.54)(D) mm(inch)			
Weight	0.15kg		0.15kg	0.16kg

*4: Provide a 70mm or more clearance under the QD75MH to give room for wiring the SCNET cable.

External I/O specifications

■ Input specifications

Signal name	Rated input voltage/current	Working voltage range	ON voltage/ current	OFF voltage/ current	Input resistance	Response time
Forced stop input signal (EMI) Upper limit signal (FLS) Lower limit signal (RLS) Stop signal (STOP)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.0mA or less	Approx. 6.8kΩ	4ms or less
Manual pulse generator A phase (PULSER A) Manual pulse generator B phase (PULSER B)	5VDC/5mA	4.5 to 6.1VDC	2.5VDC or more/ 1mA or more	1VDC or less/ 0.1mA or less	Approx. 1.2kΩ	1ms or less
	1) Pulse width  (Duty ratio 50%) 2) Phase difference  When the A phase leads the B phase, the positioning address (current value) increases.					
Near-point dog signal (DOG) External command signal (CHG)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/ 3.5mA or more	7VDC or less/ 1.0mA or less	Approx. 6.8kΩ	1ms or less

External I/O terminals

■ Input terminals

External wiring	Signal name		Internal circuit	Wiring *1
When Upper-limit switch is not used	Near-point dog signal *4	DOG		
	Upper limit LS signal *4	FLS		
When Lower-limit switch is not used	Lower limit LS signal *4	RLS		
	Stop signal	STOP		
	External command signal/switching signal	CHG		
DC24V *2	Common	COM		
	Forced stop input signal	EMI		△
		EMI.COM		
5VDC, A, B, 0V, Manual pulse generator (MR-HDP01)	Manual pulse generator A phase	PULSER A+		
		PULSER A-		
	Manual pulse generator B phase	PULSER B+		
		PULSER B-		
	Manual pulse generator power supply (+5VDC) *3, *5	P5	5VDC	
	Manual pulse generator power supply (GND) *5	SG		
	–	–		–

*1: The symbols in Need for wiring column indicate the following meanings:

○:Wiring is necessary for positioning.

△:Wiring is necessary depending on the situation.

*2: Either polarity can be connected to the common (COM).

*3: If using separately-placed power supply as manual pulse generator power supply, do not connect power supply 5V(P5) on QD75MH side. Use separately-placed power supply as 5V stabilized power supply. Using power supply of different voltage between P5 and SG could lead to faults.

*4: When using external input signal of servo amplifier, set "1" with "External signal selection".

*5: Do not use P5 and SG for other than manual pulse generator power supply.

Pin layout	Axis 4(AX4)		Axis 3(AX3)		Axis 2(AX2)		Axis 1(AX1)	
	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
	2B20	Vacant	2A20	Vacant	1B20	PULSER B-	1A20	PULSER B+
	2B19	Vacant	2A19	Vacant	1B19	PULSER A-	1A19	PULSER A+
B20 A20	2B18	Vacant	2A18	Vacant	1B18	Vacant	1A18	Vacant
B19 A19	2B17	Vacant	2A17	Vacant	1B17	Vacant	1A17	Vacant
B18 A18	2B16	Vacant	2A16	Vacant	1B16	Vacant	1A16	Vacant
B17 A17	2B15	Vacant	2A15	Vacant	1B15	P5	1A15	P5
B16 A16	2B14	Vacant	2A14	Vacant	1B14	SG	1A14	SG
B15 A15	2B13	Vacant	2A13	Vacant	1B13	Vacant	1A13	Vacant
B14 A14	2B12	Vacant	2A12	Vacant	1B12	Vacant	1A12	Vacant
B13 A13	2B11	Vacant	2A11	Vacant	1B11	Vacant	1A11	Vacant
B12 A12	2B10	Vacant	2A10	Vacant	1B10	Vacant	1A10	Vacant
B11 A11	2B9	Vacant	2A9	Vacant	1B9	Vacant	1A9	Vacant
B10 A10	2B8	Vacant	2A8	Vacant	1B8	EMI. COM	1A8	EMI
B9 A9	2B7	COM	2A7	COM	1B7	COM	1A7	COM
B8 A8	2B6	COM	2A6	COM	1B6	COM	1A6	COM
B7 A7	2B5	CHG	2A5	CHG	1B5	CHG	1A5	CHG
B6 A6	2B4	STOP	2A4	STOP	1B4	STOP	1A4	STOP
B5 A5	2B3	DOG	2A3	DOG	1B3	DOG	1A3	DOG
B4 A4	2B2	RLS	2A2	RLS	1B2	RLS	1A2	RLS
B3 A3	2B1	FLS	2A1	FLS	1B1	FLS	1A1	FLS
B2 A2								
B1 A1								

Front view of the module

*1: Pin No. "1□□□" indicates the pin No. for the right connector. Pin No. "2□□□" indicates the pin No. for the left connector.

*2: When a 1-axis module is used, pin Nos. 1B1 to 1B7 are "Vacant".

*3: For 1- and 2-axis modules do not have the AX3 and AX4 connectors on the left side.

System configuration

<Accessories>

Product	Description
Manual	Type QD75MH Positioning Module User's Manual (Hardware)

<Separately obtained products>

Product	Description	
Manual	Type QD75MH Positioning Module User's Manual (Details)	
Connector	External wiring connector A6CON1, A6CON2, A6CON3, A6CON4	
Manual pulse generator	Recommended product: MR-HDP01 (Manufactured by Mitsubishi Electric, Corp.)	
SSCNETIII Cable	MR-J3BUS□M	• Connection between QD75MH and MR-J3-□B. • Connection between MR-J3-□B and MR-J3-□B. • Standard code for inside panel. • 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3.28ft.), 3m(9.84ft.)
	MR-J3BUS□M-A	• Connection between QD75MH and MR-J3-□B. • Connection between MR-J3-□B and MR-J3-□B. • Standard code for outside panel. • 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.)
	MR-J3BUS□M-B	• Connection between QD75MH and MR-J3-□B. • Connection between MR-J3-□B and MR-J3-□B. • Long distance cable. • 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.)
External device connection cable	Cables connecting QD75MH to external devices	
Compatible servo amplifier	MR-J3-□B	

Note) The external wiring connector and SSCNETIII cable are not packed with the product. Therefore, they need to be obtained separately.

Applicable system

<Applicable modules and the number of installable modules>
The following table indicates the CPU modules and network modules (for remote I/O station) usable with the QD75MH and the number of installable modules.

Applicable modules		Number of installable modules	Remarks
CPU module	Q00JCPU	Max. 8	*1
	Q00CPU Q01CPU	Max. 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Max. 64	Installable in the Q mode only*1
	Q12PHCPU Q25PHCPU	Max. 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Max. 64	MELSECNET/H remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.
*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Supported software packages>
The following table lists the compatibility between the systems using the QD75MH and the software packages. GX Developer is required for use of the QD75MH.

		Software version	
		GX Developer	GX Configurator-QP
Q00J/Q00/Q01CPU	Single PLC system	Version 7 or more	Version 2.20W or more
	Multiple PLC system	Version 8 or more	
Q02/Q02H/Q06H/Q12H/Q25HCPU	Single PLC system	Version 4 or more	
	Multiple PLC system	Version 6 or more	
Q12PH/Q25PHCPU	Single PLC system	Version 7.10L or more	
	Multiple PLC system		
For use on MELSECNET/H remote I/O station		Version 6 or more	

3.5.7 QD75 positioning module setting, monitoring tool: GX Configurator-QP

Overview

This manual describes the functions and operating procedures of GX Configurator-QP.
GX Configurator-QP can perform the following functions via the QCPU, Q corresponding serial communication module or Q corresponding MELSECNET/H network remote I/O module.

- Setting of positioning data and parameters
- Simulation using positioning data
- Read/write of data from/to positioning module
- Monitoring of positioning control status
- Test operation of positioning control
- Auto refresh setting between QCPU devices and QD75 buffer memory

GX Configurator-QP can be used with any of the following positioning modules.

Positioning type	Type
Open collector output type	QD75P1,QD75P2,QD75P4
Differential driver output type	QD75D1,QD75D2,QD75D4
SSCNET connection type	QD75M1,QD75M2,QD75M4
SSCNETIII type	QD75MH1,QD75MH2,QD75MH4

GX Configurator-QP can access the QD75 via any of the following modules.

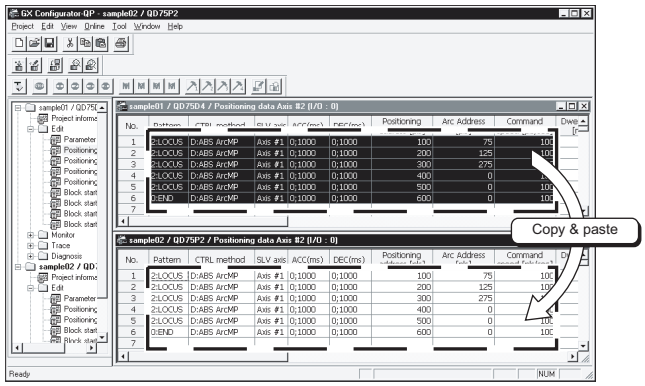
Module type	Type
QCPU	Q00JCPU,Q00CPU,Q01CPU, Q02CPU,Q02HCPU,Q06HCPU, Q12HCPU,Q25HCPU, Q12PHCPU,Q25PHCPU
Q corresponding serial communication module	QJ71C24(N),QJ71C24(N)-R2
Q corresponding MELSECNET/H network remote I/O module*	QJ72LP25-25,QJ72BR15, QJ72LP25G

*: Only when connecting to the remote I/O module directry.

Features

■ Concurrent editing of multiple projects

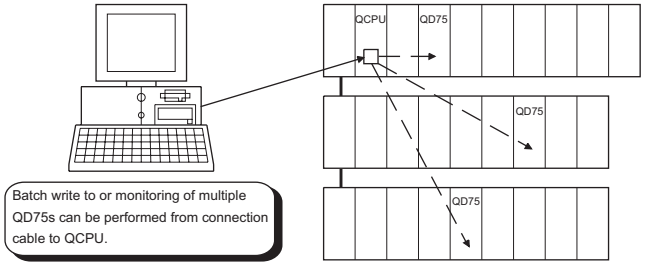
Capable of opening multiple projects simultaneously, this software allows you to easily edit the positioning data and block start data to be utilized by copying and pasting.



■ Efficient debugging of multi-modules

Since GX Configurator-QP access to the QD75 is made via the QCPU, Q corresponding serial communication module or Q corresponding MELSECNET/H network remote I/O module*, a direct connection cable to the QD75 on the main/ extension base unit is not needed.
Also, because the QD75 to be connected to is set per project, batch write to or monitoring of multi-modules can be performed. When using multiple QD75s, you can reduce the software start waiting time and physical work time, increasing debugging efficiency.

*: Only when connecting to the remote I/O module directry.

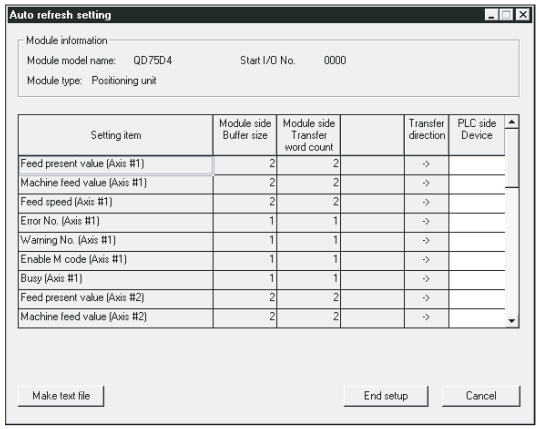


■ Simplified sequence program by auto refresh setting

Auto refresh setting is made to automatically read the following values stored in QD75 buffer memory to the QCPU devices.

- Feed present value
- Machine feed value
- Feed speed
- Error No.
- Warning No.
- Enable M code

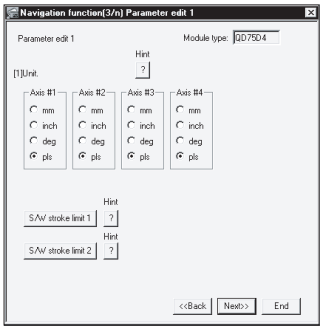
Auto refresh setting reduces the number of FROM instructions used to read the buffer memory storage values, facilitating creation and debugging of sequence programs.



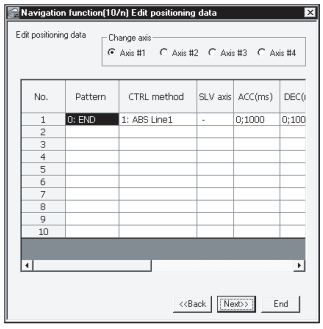
■ Ease of operation with navigation function

GX Configurator-QP has a navigation function which can perform operations from data setting, write to the QD75, monitoring, test to data storage in a sequential order.
As basic settings and debugging can be performed in orderly sequence, you can understand operations necessary for this software and positioning control.

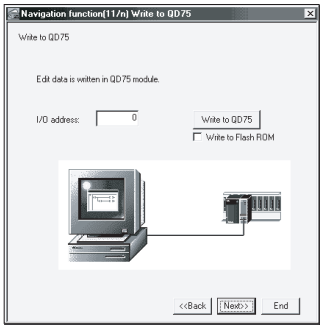
Parameter setting



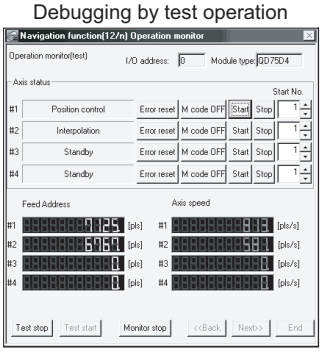
Positioning data setting



Write to QD75



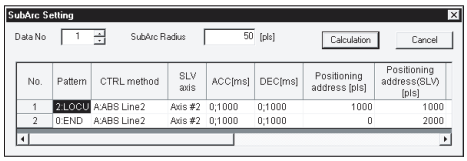
Debugging by test operation



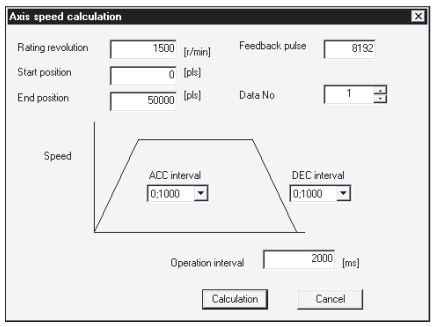
■ Setting of optimum positioning data without complicated calculation

Positioning data can be set by sub arc setting and automatic axis speed setting.
Sub arc setting generates from the specified two linear interpolation control data the circular interpolation control data in which the angle between two linear paths is converted into a circular arc (curve) path.
Sub axis speed setting calculates the axis speed (command speed) from the operation time, travel, acceleration/ deceleration time and motor specifications.

[Sub arc]



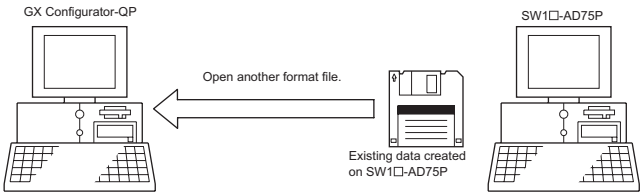
[Speed of axis setting]



These functions allow the optimum positioning data to be set without complicated calculation and advance measurement.

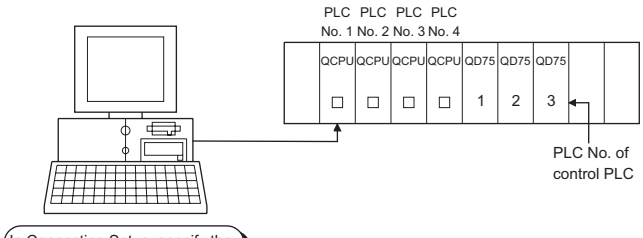
■ Ease of migration from AD75

You can read and use the data created on A series SW1RX/ IVD/NX-AD75P and GX Configurator-AP.
Valuable data is not wasted and can be utilized for QD75.



■ Compatible with multiple PLC system

On GX Configurator-QP, setting the control PLC type and PLC No. of the QD75 to communicate with in Connection Setup allows communication to be made with any QD75.



(Example)
Connection Setup for communication with the QD75 under control of PLC No. 1
PLC type: Type of PLC No. 1, Multiple PLC setting: PLC No. 1

Function list

Function			Description	QD75 Used	
				QD75P/ QD75D	QD75M/ QD75MH
Edit	Parameter setting		Sets the basic parameters #1, basic parameters #2, extended parameters #1, extended parameters #2, OPR basic parameters and OPR extended parameters.	○	○
	Servo parameter setting		Sets the servo basic parameters, servo regulation parameters and servo extended parameters.	×	○
	Positioning data setting		Sets the positioning data, such as pattern, control method, accel/decel time and address, on an axis basis.	○	○
		M code comment setting	Sets comments to the M codes assigned to the positioning data on an axis basis.	○	○
		Sub arc	Automatically generates positioning data to ensure smooth movement on the intersection of consecutive two-axis linear interpolations by circular interpolation.	○	○
		Automatic axis speed setting	Automatically calculates the axis speed in the constant-speed part by setting the time taken from a positioning start until the target position is reached.	○	×
	Block start data setting		Sets the starting mode, etc. of the positioning data specified for points on an axis basis.	○	○
		Condition data setting	Sets the data which is used as a special start condition in the block start data on an axis basis.	○	○
	Simulation		Simulates axis operation from the setting positioning data. Wave form data is displayed for single axis control. Locus data is displayed for two axis interpolation control.	○	○
Monitor	Positioning monitor		Enters the monitor mode from the positioning data edit window and monitors the positioning data during operation.	○	○
	Block start monitor		Enters the monitor mode from the block start data edit window and monitors the block start data during operation.	○	○
	Operation monitor		Monitors the operating states, such as feed present values, axis feed speeds, axis statuses and executed positioning data numbers, of all axes.	○	○
		History monitor	Monitors the error, warning, start history of all axes.	○	○
		Signal monitor	Monitors the X/Y devices, external signals or status signals of all axes.	○	○
		Operation monitor	Monitors the control states, QD75 parameter settings or others of all axes.	○	○
		Servo monitor	Monitors the states of the servo amplifiers and servo motors on all axes.	×	○
	Sampling monitor	Signal	Monitors the specified signals while simultaneously sampling them.	○	○
		Buffer memory	Monitors the specified buffer memory data while simultaneously sampling them.	○	○
	System monitor		Shows the system configuration of the host and the I/O address and model (type) of the specified QD75.	○	○
Test	Cableless mode		Tests the QD75P, QD75D alone without wiring between the servo amplifier and motor.	○	×
	Positioning data test edit		Writes the setting parameters, positioning data and block start data in the test mode.	○	○
	Operation test	Positioning start	Specifies the positioning data number and block start data point number and performs test operation.	○	○
		Present value change	Performs the change test of the feed present value.	○	○
		Speed change	Performs a speed change test on the axis on which a positioning start test is being done.	○	○
		OPR	Performs an original point return test.	○	○
		JOG operation	Performs a JOG operation test.	○	○
		Inching operation	Moves the axis over the specified distance per operation.	○	○
		MPG operation	Performs test operation using a manual pulse generator.	○	○
Diagnosis	Checking connect		Displays signals from external devices. Also tests initial operation by JOG operation.	○	×
Trace	Waveform display		Traces the speed command for a given time and displays the waveform data relative to the time axis.	○	×
	Locus display		Traces the position command or real value for a given time and displays the track data of the axes.	○	×
Extended	Auto refresh setting		Assigns the QD75 buffer memory and QCPU devices for auto refresh between QD75 and QCPU.	○	○
	Navigation		Performs operations from parameter and positioning data settings to simple test operation and set data storage in accordance with navigation.	○	×

Operating environment

The operating environment of GX Configurator-QP is indicated below.

Item		Description
Peripheral device	Personal computer	Personal computer on which Windows® operates.
	PC CPU module	Personal computer on which Windows MELSEC-Q series compatible PC CPU module (CONTEC CO., LTD. make)
Computer main unit		Refer to the following table "Used operating system and performance required for personal computer".
	CPU	
	Required memory	
Hard disk free space		65MB or more
Disk drive		CD-ROM disk drive
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: PC-9800® series (except PC98-NX®)is not compatible with Windows® Me, Windows® 2000 Professional, Windows® XP Professional, or Windows® XP Home Edition.

*2: When Windows® XP Professional or Windows® XP Home Edition is used, Large Fonts are not supported.

Used operating system and performance required for personal computer

Operating system		Performance required for personal computer	
		CPU	Required memory
Windows® 95 (Service Pack 1 or more)		Pentium® 133MHz or more	64MB or more
Windows® 98		Pentium® 133MHz or more	64MB or more
Windows® Me		Pentium® 150MHz or more	64MB or more
Windows NT® Workstation 4.0 (Service Pack 3 or more)		Pentium® 133MHz or more	64MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

Connection with QD75

When set data is downloaded to the QD75 or the operating status is monitored, GX Configurator-QP is not directly connected to the QD75. Since GX Configurator-QP and QD75 make data communications via the Q mode CPU module, the personal computer installed with GX Configurator-QP is connected to the Q mode CPU module by RS-232 or USB.

■ About the connection cables

● Connection to QCPU or Q corresponding MELSECNET/H network remote I/O module by QC30R2

When the baudrate is set to 115.2/57.6kbps, communication cannot be made unless the peripheral device used is compatible with the communication speed of 115.2/57.6kbps. If a communication error occurs, reduce the baudrate setting and restart communication.

● Connection to QCPU by USB cable

- Usable when the USB driver has been installed with any of the following operating systems used.
  Microsoft® Windows® 98 Operating System
  Microsoft® Windows® Millennium Edition Operating System
  Microsoft® Windows® 2000 Professional Operating System
  Microsoft® Windows® XP Professional Operating System
  Microsoft® Windows® XP Home Edition Operating System
- Use of the USB cable allows only PLC CPU to be connected.
- The following cables have been tested by Mitsubishi.

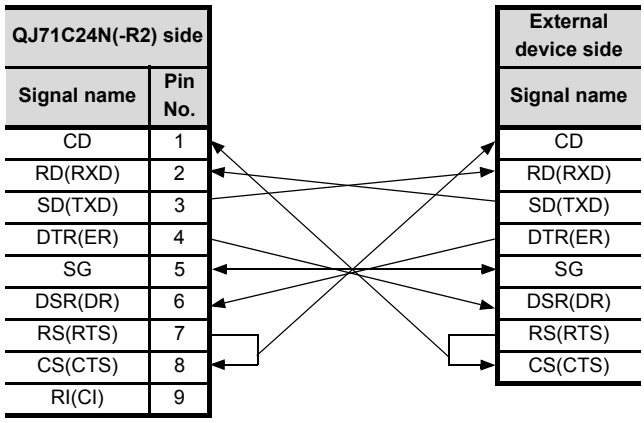
Model name	Manufacturer
USB2-30	ELECOM CO., LTD.
AU2-30	ARVEL CORP

● Connection to Q corresponding serial communication module

The specifications of the RS-232 cable connector are indicated below.

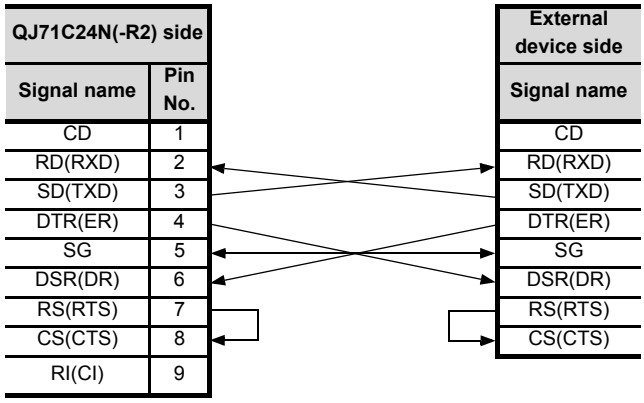
Pin number	Signal code	Signal name	Signal direction Q corresponding serial communication module external device
1	CD	Receive carrier detection	←
2	RD(RXD)	Receive data	←
3	SD(TXD)	Send data	→
4	DTR(ER)	Data terminal ready	→
5	SG	Send ground	↔
6	DSR(DR)	Data set ready	←
7	RS(RTS)	Request to send	→
8	CS(CTS)	Clear to send	←
9	RI(CI)	Call indication	←

- Connection example which can turn ON/OFF CD signal (No. 1 pin)



QJ71C24N(-R2) side		External device side
Signal name	Pin No.	Signal name
CD	1	CD
RD(RXD)	2	RD(RXD)
SD(TXD)	3	SD(TXD)
DTR(ER)	4	DTR(ER)
SG	5	SG
DSR(DR)	6	DSR(DR)
RS(RTS)	7	RS(RTS)
CS(CTS)	8	CS(CTS)
RI(CI)	9	

- Connection example which cannot turn ON/OFF CD signal (No. 1 pin)
  Connection example for exercising DC code control or DTR/DSR control



QJ71C24N(-R2) side		External device side
Signal name	Pin No.	Signal name
CD	1	CD
RD(RXD)	2	RD(RXD)
SD(TXD)	3	SD(TXD)
DTR(ER)	4	DTR(ER)
SG	5	SG
DSR(DR)	6	DSR(DR)
RS(RTS)	7	RS(RTS)
CS(CTS)	8	CS(CTS)
RI(CI)	9	

Separately obtained product

Product	Description
Manual	GX Configurator-QP Operating Manual
Connection cable	Depends on the purpose of connection to QD75.

Note: The PDF format data of the same contents as those of the above manual are included in the CD-ROM of GX Configurator-QP.

3.6 Counter Module

3.6.1 High-speed counter module: QD62, QD62E, QD62D

Overview

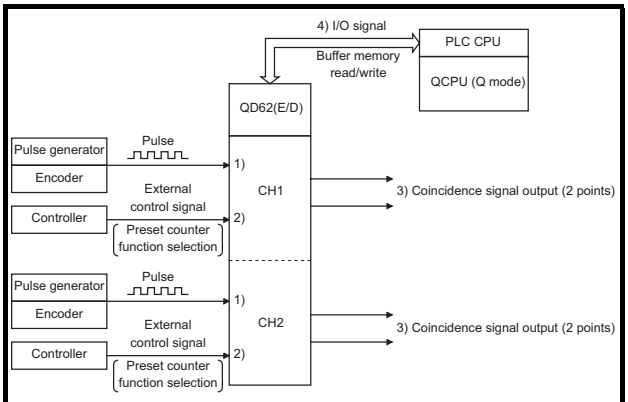
The QD62, QD62E and QD62D are high-speed counter modules designed to count high-speed pulse values. They can be used with external encoders to execute control such as positioning. These three modules differ as indicated below and are selected according to your applications.

Item	QD62	QD62E	QD62D
I/O type	DC input sinking output	DC input sourcing output	Differential input sinking output
Maximum counting speed	200kPPS		500kPPS
Number of channels	2 channels		

The QD62(E/D) modules have the following input methods for 1 phase/2 phase pulse input:

- Phase 1 pulse input multiple of 1
- Phase 1 pulse input multiple of 2
- CW/CCW
- Phase 2 pulse input multiple of 1
- Phase 2 pulse input multiple of 2
- Phase 2 pulse input multiple of 4

An overview of QD62 (E/D) operation is shown in the figure below.



1) Counts the pulses to be input to the QD62 (E/D).
2) Preset or counter function can be selected with an external control signal.
3) The present count value and the coincidence output point setting value can be compared to output a coincidence signal.
4) Using the sequence program, the I/O signal and buffer memory status of the QD62 (E/D) can be verified. Also, count start/stop, preset, and counter function can be selected.

Features

■ Counting can be performed in a wide range (The count value can be expressed within the range between -2147483648 and 2147483647)

The count values are stored as 2-channel 32-bit signed binary codes.

■ The maximum counting speed can be changed

The maximum speed of the QD62D can be changed by selecting from among 500 k, 200 k, 100 k and 10 k, while that of the QD62 and QD62E can be selected from among 200k, 100k and 10k. This allows an error-free count even with gradual rise/fall pulses.

■ Pulse input can be selected

The pulse input can be selected from 1 phase multiple of 1, 1 phase multiple of 2, 2 phase multiple of 1, 2 phase multiple of 2, 2 phase multiple of 4, CW and CCW.

■ Counter format can be selected

Either one of the following counter formats can be selected.

● Linear counter format

A count from -2147483648 to 2147483647 is possible and if the count exceeds the range, an overflow will be detected.

● Ring counter format

Counting is performed repeatedly between the ring counter maximum value and minimum value.

■ Coincidence output is possible

Any channel coincidence output point can be preset to compare with the present counter value to output the ON/OFF signal output, or to start an interrupt program.

■ Selection can be made from four counter functions

One of the following four functions can be selected.

● Latch counter function

This function latches the present value of the counter when the signal was input.

● Sampling counter function

This function counts the pulses that were input within the preset time period from the signal input.

● Periodic pulse counter function

This function stores the present and previous values of the counter at each preset time interval while the signal is being input.

● Disable count function

This function inputs a signal while executing the count enable command to stop pulse counting.

■ The preset function/counter selection function can be executed using an external control signal.

By applying voltage to the preset terminal/function start terminal of an external terminal, preset function/counter function selection can be executed.

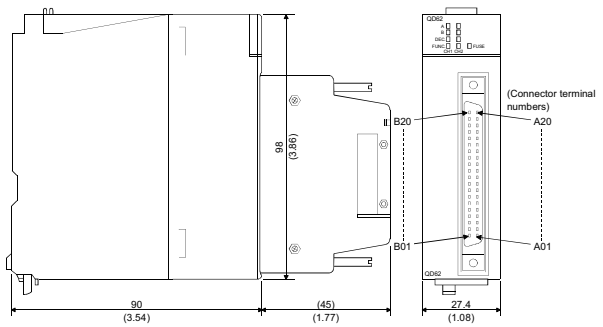
■ Easy settings using the utility package

A utility package is sold separately (GX Configurator-CT). The utility package is not a required item. However, it can be used to set initial settings and automatic refresh settings on screen, reduce sequence programs, and check settings and operating status.

■ A blown fuse in the external output section can be detected.

A blown fuse in the external output section can be detected; it is notified by the input signal X and the LED display on the module.

Appearance



A value in parentheses shows the reference measurement when the A6CON1 is installed.

Unit: mm (inch)

Function

Name		Description
Linear counter function		Counts in the range of -2147483648 to 2147483647, and detects overflow when the range is exceeded.
Ring counter function		Repeatedly counts in the range between upper and lower limit of ring counter.
Coincidence output function		Presets a channel, which can be any, as a coincidence output point to compare it with the current counter value, and then outputs the ON/ OFF signal.
	Coincidence detection interruption function	Outputs an interruption signal to a PLC CPU when the coincidence is detected, and starts an interruption program.*1
Preset function		Changes the current value of the counter to any value. Preset can be executed using a sequence program or external preset input.
Counter selection function	Disable count function	Stops counting while enabling the counter function selection start command.
	Latch counter function	Stores the current value of the counter in the buffer memory when the counter function selection start command signal was input.
	Sampling counter function	Counts the pulses that were input within the preset sampling period, and stores the result in the buffer memory when the counter function selection start command was input.
	Periodic pulse counter function	While the counter function selection start command signal is being input, stores the current value in the buffer memory in the cycle previously set .

A function in the above table can be used along with the other functions. Note, however, it is neither possible to select both of the liner counter and ring counter function or select more than one function from the counter selection functions.

*1: Not available for Basic Model QCPUs of function version A.

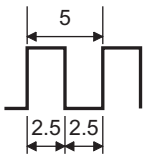
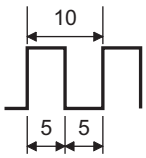
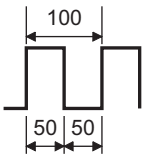
Performance specification

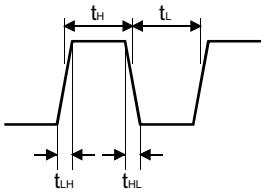
Item		QD62	QD62E	QD62D
Counting speed switch setting		200k(100k to 200kPPS) 100k(10k to 100kPPS) 10k(10kPPS or less)		500k(200k to 500kPPS) 200k(100k to 200kPPS) 100k(10k to 100kPPS) 10k(10kPPS or less)
Number of channels		2 channels		
Count input signal	Phase	1-phase multiply by 1/1-phase multiply by 2/2-phase multiply by 1/2-phase multiply by 2/2-phase multiply by 4/ CW/CCW		
	Signal level (ϕA, ϕB)	5/12/24VDC 2 to 5mA (plus or minus common)		EIA Standard RS-422-A Differential type line driver[*1] level
Counter	Counting speed	Refer to the another table		
	Counting range	Binary with 32-bit code (-2147483648 to 2147483647)		
	Type	UP/DOWN preset counter + ring counter function		
	Minimum count pulse width (μs) (Duty ratio 50%)	Refer to the another table		
Coincidence output	Comparison range	Binary with 32-bit code		
	Comparison result	Set value < Count value Set value = Count value Set value > Count value		
External input	Preset	5/12/24VDC 2 to 5mA (Plus or minus common)		5/12/24VDC 2 to 5mA[*2]
	Function start			
External output (coincidence output)	Number of points	2 points/channel	2 points/channel	2 points/channel
	Output rating	Transistor (sink type) output 12/24VDC 0.5A/1 point 2A/1 common	Transistor (source type) output 12/24VDC 0.1A/1 point 0.4A/1 common	Transistor (sink type) output 12/24VDC 0.5A/1 point 2A/1 common
	Fuse	Available		
	Fuse blow indication	Available (LED is displayed and a signal is output to a CPU when fuse is blown)[*3]		
Protection degree		IP2X		
External wiring connection		40-pin connectors		
Applicable wire size		0.3mm^2 (AWG#22) or shorter (A6CON1, A6CON4)[*4]		
External wire applicable connector (sold separately)		A6CON1, A6CON2, A6CON3, A6CON4		
Applicable connector/terminal block converter module		A6TBXY36		
Online module change		Not avialable		
Multiple CPU system		Compatible		
Number of occupied I/O points		16 points per 1 slot (I/O assignment: intelligent)		
5VDC internal current consumption		0.30A	0.33A	0.38A
External dimensions		27.4(W)×98(H)×90(D) mm		
Weight		0.11kg		0.12kg

*1: Product equivalent with Am26LS31 manufactured by Texas Instrument Japan, Ltd..
*2: Differential type line drivers conforming to EIA Standard RS-422-A are also applicable.
*3: Fuse blow is not detected with an external power supply disconnected.
*4: For using A6CON2 and A6CON3, refer to Section 3.8.1.

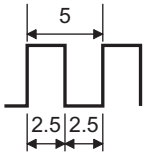
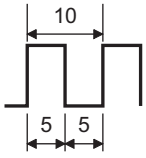
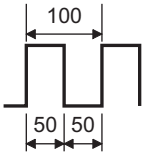
Separate list

<QD62>

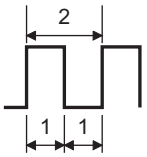
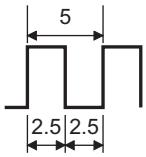
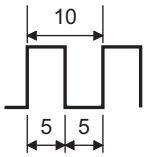
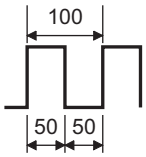
Counting speed switch setting	200kPPS	100kPPS	10kPPS
Rise/fall time	Both phases 1 and 2		
t=1.25μs or less	200kPPS	100kPPS	10kPPS
t=2.5μs or less	100kPPS	100kPPS	10kPPS
t=25μs or less	-	10kPPS	10kPPS
t=500μs	-	-	500PPS
Minimum count pulse width (μs) (Duty ratio 50 %)	 (Min. phase differential for 2-phase input: 1.25 μs)	 (Min. phase differential for 2-phase input: 2.5 μs)	 (Min. phase differential for 2-phase input: 25 μs)



<QD62E>

Counting speed switch setting	200kPPS	100kPPS	10kPPS
Rise/fall time	Both phases 1 and 2		
t=1.25μs or less	200kPPS	100kPPS	10kPPS
t=2.5μs or less	100kPPS	100kPPS	10kPPS
t=25μs or less	-	10kPPS	10kPPS
t=500μs	-	-	500PPS
Minimum count pulse width (μs) (Duty ratio 50 %)	 (Min. phase differential for 2-phase input: 1.25 μs)	 (Min. phase differential for 2-phase input: 2.5μs)	 (Min. phase differential for 2-phase input: 25μs)

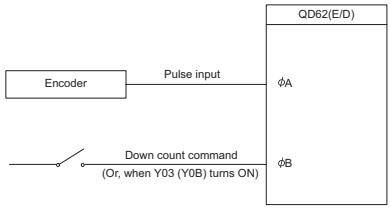
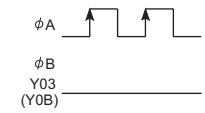
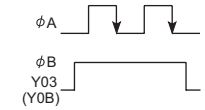
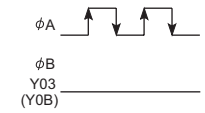
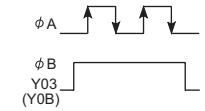
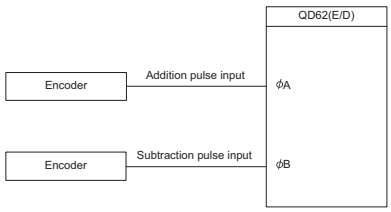
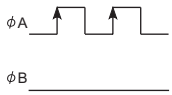
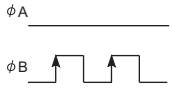
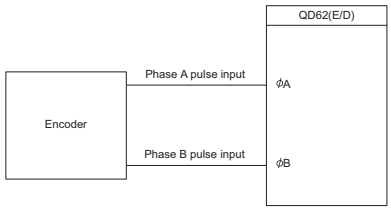
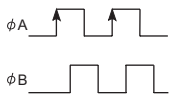
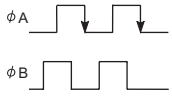
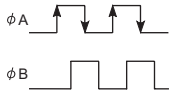
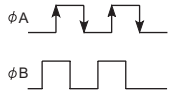
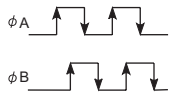
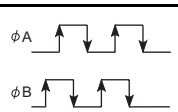
<QD62D>

Counting speed switch setting	500kPPS	200kPPS	100kPPS	10kPPS
Rise/fall time	Both phases 1 and 2			
t=0.5μs or less	500kPPS	200kPPS	100kPPS	10kPPS
t=1.25μs or less	200kPPS	200kPPS	100kPPS	10kPPS
t=2.5μs or less	-	100kPPS	100kPPS	10kPPS
t=25μs or less	-	-	10kPPS	10kPPS
t=500μs	-	-	-	500PPS
Minimum count pulse width (μs) (Duty ratio 50 %)	 (Min. phase differential for 2-phase input: 0.5 μs)	 (Min. phase differential for 2-phase input: 1.25 μs)	 (Min. phase differential for 2-phase input: 2.5 μs)	 (Min. phase differential for 2-phase input: 25 μs)

Note: Inputting a waveform of long rise/fall time may cause false input. Enter a waveform within permissible rise/fall time.

Types of pulse input methods

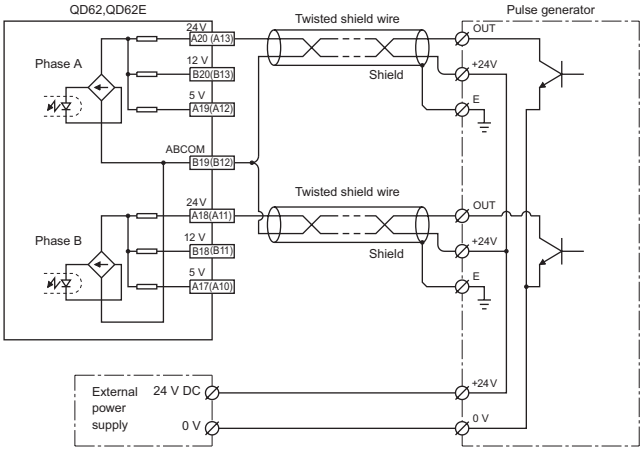
Six types of the pulse input methods are available. These include 1 phase multiple of 1, 1 phase multiple of 2, CW/CCW pulse input, 2 phase multiple of 1, 2 phase multiple of 2, and 2 phase multiple of 4. The following table shows the pulse input methods and count timings.

Pulse input method		Count timing		
Phase 1 pulse input For phase 1 pulse input, either a multiple of 1 or multiple of 2 count method can be selected. The relationship between the phase A pulse input and the down count command is shown below. 	1-phase multiple of 1	For addition count		Count at ϕA rise (↑) ϕB, Y03 (Y0B) are OFF.
		For subtraction count		Count at ϕA fall (↓) ϕB, Y03 (Y0B) are ON.
	1-phase multiple of 2	For addition count		Count at ϕA rise (↑) and fall (↓) ϕB, Y03(Y0B) are OFF.
		For subtraction count		Count at ϕA rise (↑) and fall (↓) ϕB, Y03(Y0B) are ON.
CW/CCW pulse input For CW/CCW pulse input, the up count is performed when there is a phase A pulse input, and the down count is performed when there is a phase B pulse input. The relationship between the phase A pulse input and phase B pulse input is shown below. 	CW/CCW	For addition count		Count at ϕA rise (↑) ϕB is OFF.
		For subtraction count		ϕA is OFF. Count at ϕB rise (↑)
Phase 2 pulse input For phase 2 pulse input, either a multiple of 1, multiple of 2, or multiple of 4 count method can be selected. The phase difference between the phase A pulse and phase B pulse determines whether the up count or down count is performed. The relationship between the phase A pulse input and phase B pulse input is shown below. 	2-phase multiple of 1	For addition count		Count at ϕA rise (↑) when ϕB is OFF.
		For subtraction count		Count at ϕA fall (↓) when ϕB is OFF.
	2-phase multiple of 2	For addition count		Count at ϕA rise (↑) when ϕB is OFF. Count at ϕA fall (↓) when ϕB is ON.
		For subtraction count		Count at ϕA rise (↑) when ϕB is ON. Count at ϕA fall (↓) when ϕB is OFF.
	2-phase multiple of 4	For addition count		Count at ϕA rise (↑) when ϕB is OFF. Count at ϕA fall (↓) when ϕB is ON. Count at ϕB rise (↑) when ϕA is ON. Count at ϕB fall (↓) when ϕA is OFF.
		For subtraction count		Count at ϕA rise (↑) when ϕB is ON. Count at ϕA fall (↓) when ϕB is OFF. Count at ϕB rise (↑) when ϕA is OFF. Count at ϕB fall (↓) when ϕA is ON.

External wiring

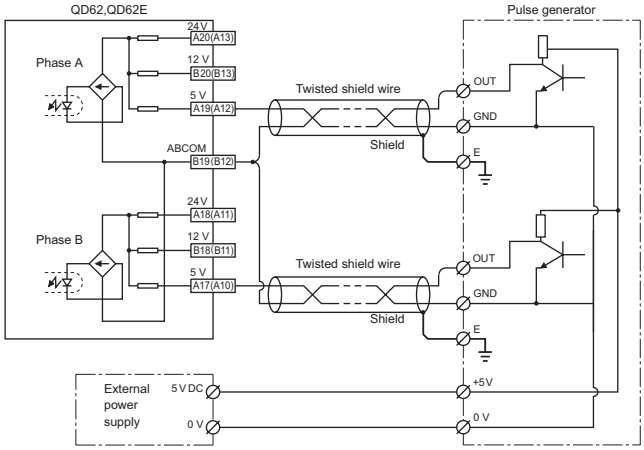
■ Wiring example of a module and a pulse generator

● Wiring example with an open collector output type pulse generator (24 V DC)



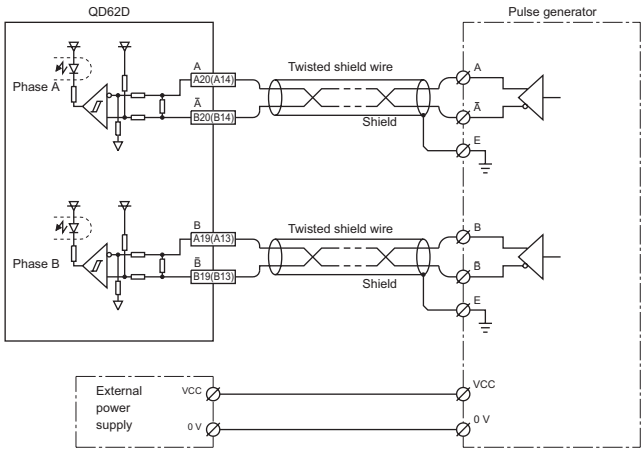
The number inside the ( ) indicates the terminal number for channel 2.

● Wiring example with a voltage output type pulse generator (5 V DC)



The number inside the ( ) indicates the terminal number for channel 2.

● Wiring example with a driver (equivalent to Am26LS31) pulse generator

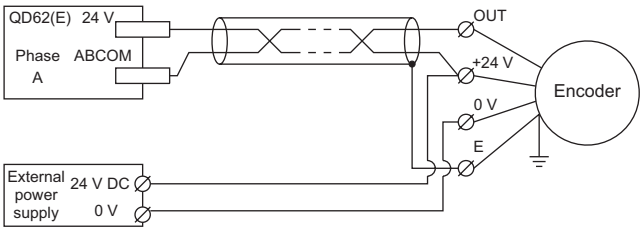


The number inside the ( ) indicates the terminal number for channel 2.

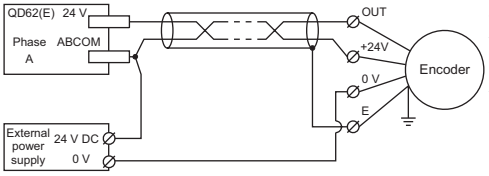
POINT

When wiring the QD62, QD62E, and the encoder, separate the power supply cable and signal cable. The following diagram shows an example.

[Wiring example]



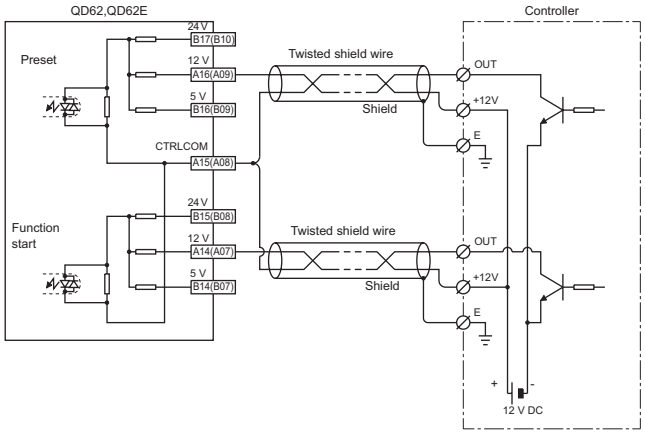
[Incorrect wiring example]

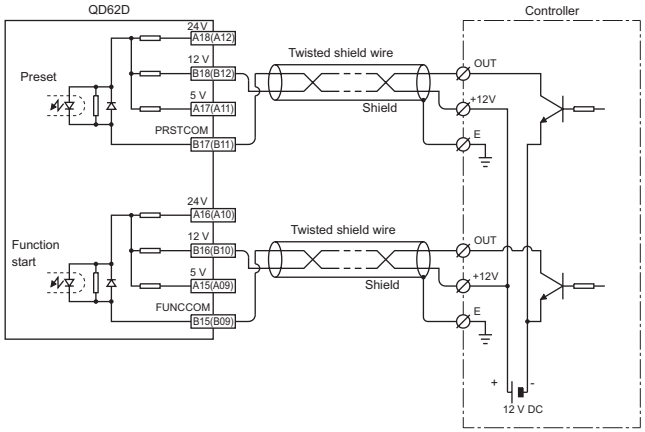


The current flows through the twisted pair cables in the same direction, so there is no cancelling effect. This makes it more prone to electrom agnetic induction.

■ Wiring example of a controller and an external input terminal

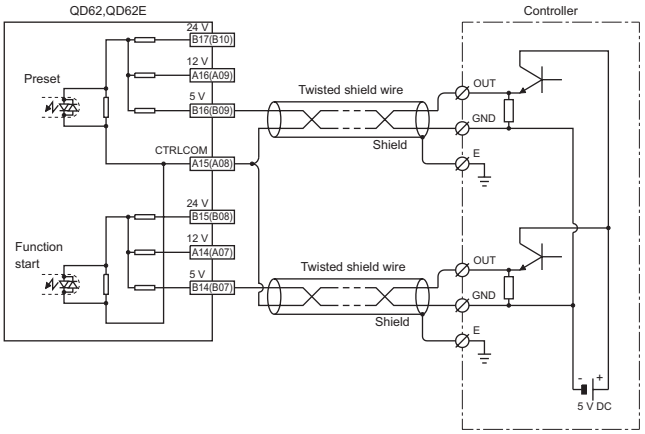
● When the controller (sink loading type) is 12 V DC

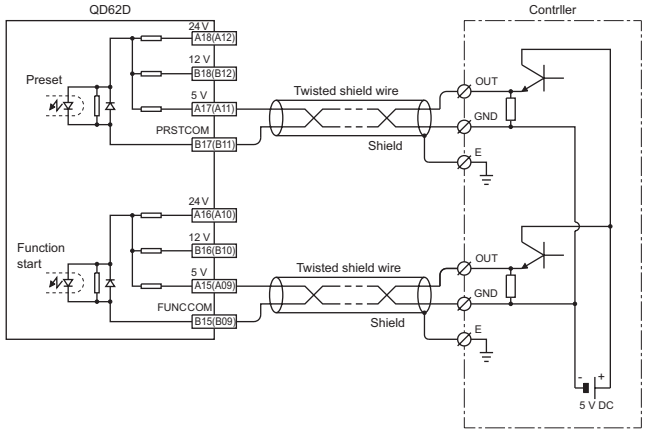




The number inside the ( ) indicates the terminal number for channel 2.

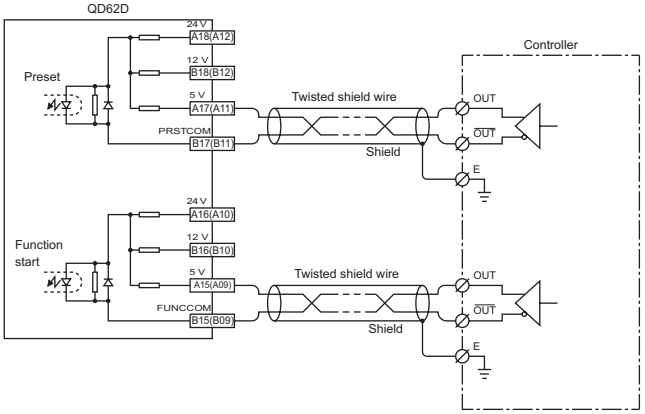
● When the controller (source loading type) is 5 V DC





The number inside the ( ) indicates the terminal number for channel 2.

● When the controller is a line driver

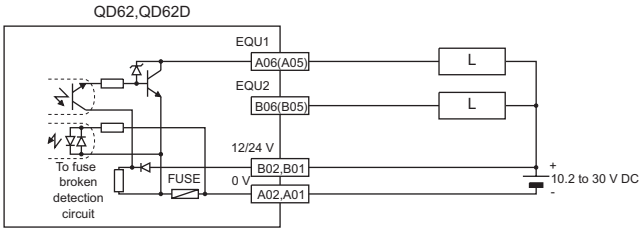


The number inside the ( ) indicates the terminal number for channel 2.

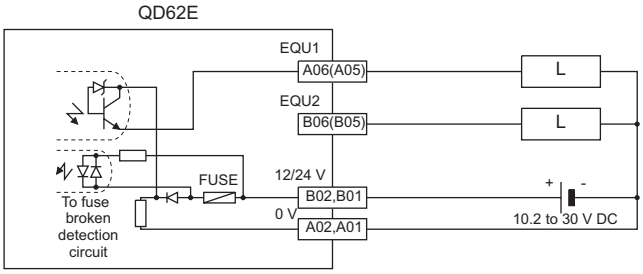
■ Wiring example with an external output

When the coincidence output (EQU terminal) is used, an external power supply of 10.2 to 30 V DC will be required for operation of the internal photocopier. A wiring example is shown below.

● For QD62, QD62D (Sink output type)



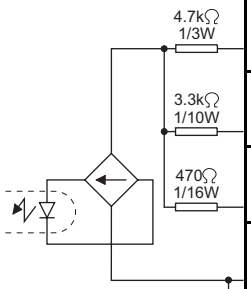
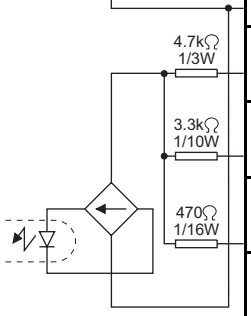
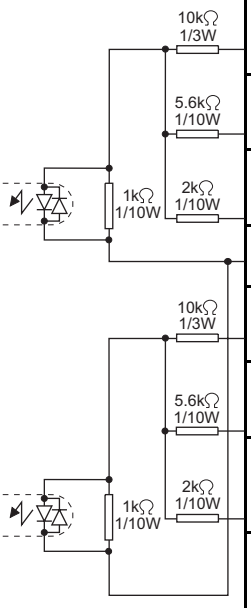
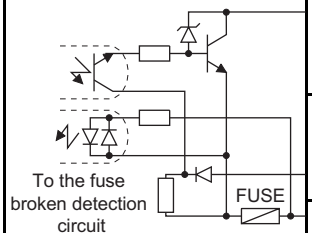
● For QD62E (Source output type)



The number inside the ( ) indicates the terminal number for channel 2.

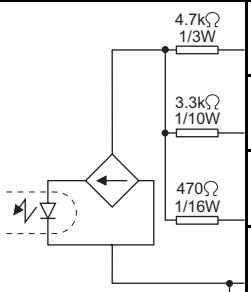
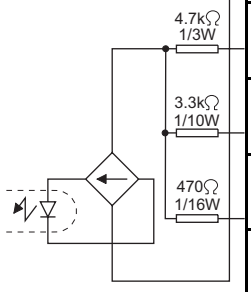
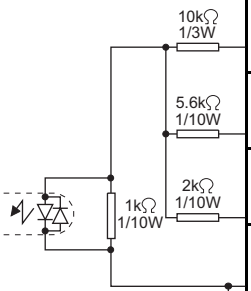
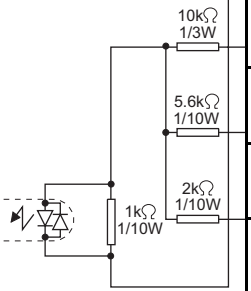
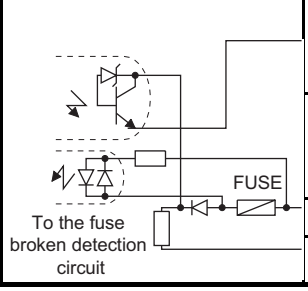
■ External I/O terminal

● QD62 (DC input sinking output type)

I/O classification	Internal circuit	Terminal number*1 CH1	Terminal number*1 CH2	Signal name 1	Operation	Input voltage (guaranteed value)	Operating current (guaranteed value)
Input		A20	A13	Phase A pulse input 24 V 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		B20	B13	Phase A pulse input 12 V 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		A19	A12	Phase A pulse input 5 V 5V	When ON	4.5 to 5.5V	2 to 5mA
					When OFF	2V or less	0.1mA or less
		B19	B12	ABCOM	-		
		A18	A11	Phase B pulse input 24 V 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		B18	B11	Phase B pulse input 12 V 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		A17	A10	Phase B pulse input 5 V 5V	When ON	4.5 to 5.5V	2 to 5mA
					When OFF	2V or less	0.1mA or less
		-	-	-	-		
		B17	B10	Preset input 24 V 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		A16	A09	Preset input 12 V 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		B16	B09	Preset input 5 V 5V	When ON	4.5 to 5.5V	2 to 5mA
					When OFF	2V or less	0.1mA or less
		A15	A08	CTRLCOM	Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
		B15	B08	Function start input 24 V 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		A14	A07	Function start input 12 V 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		B14	B07	Function start input 5 V 5V	When ON	4.5 to 5.5V	2 to 5mA
					When OFF	2V or less	0.1mA or less
		-	-	-	Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
Output		A06	A05	EQU1 (Coincidence output point No. 1)	Operating voltage Maximum load current Maximum voltage drop when ON Response time OFF → ON ON → OFF	10.2 to 30 V 0.5 A/point, 2 A/1 common 1.5 V 0.1 ms or less 0.1 ms or less (rated load, resistive load)	
		B06	B05	EQU2 (Coincidence output point No. 2)			
		B02,B01		12/24V	Input voltage Current consumption	10.2 to 30 V 8 mA (TYP 24 V DC)	
		A02,A01		0V			

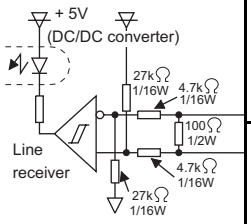
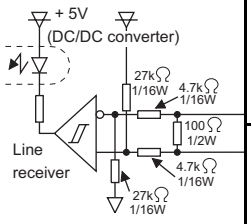
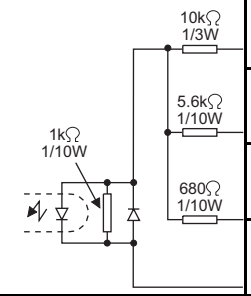
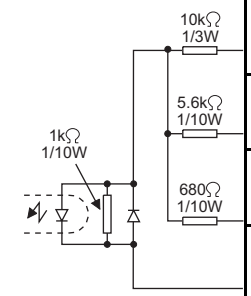
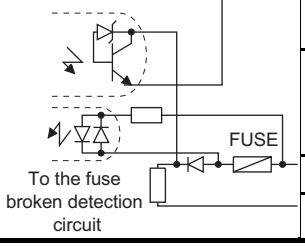
*1: Terminal numbers A03, A04, B03 and B04 are not used.

● **QD62E (DC input sourcing output type)**

I/O classification	Internal circuit	Terminal number*1 CH1	Terminal number*1 CH2	Signal name		Operation	Input voltage (guaranteed value)	Operating current (guaranteed value)
Input		A20	A13	Phase A pulse input	24V	When ON	21.6 to 26.4V	2 to 5mA
						When OFF	5V or less	0.1mA or less
		B20	B13	Phase A pulse input	12V	When ON	10.8 to 13.2V	2 to 5mA
						When OFF	4V or less	0.1mA or less
		A19	A12	Phase A pulse input	5V	When ON	4.5 to 5.5V	2 to 5mA
						When OFF	2V or less	0.1mA or less
		B19	B12	ABCOM		-		
		A18	A11	Phase B pulse input	24V	When ON	21.6 to 26.4V	2 to 5mA
						When OFF	5V or less	0.1mA or less
		B18	B11	Phase B pulse input	12V	When ON	10.8 to 13.2V	2 to 5mA
						When OFF	4V or less	0.1mA or less
		A17	A10	Phase B pulse input	5V	When ON	4.5 to 5.5V	2 to 5mA
						When OFF	2V or less	0.1mA or less
		-	-	-		-		
		B17	B10	Preset input	24V	When ON	21.6 to 26.4V	2 to 5mA
						When OFF	5V or less	0.1mA or less
		A16	A09	Preset input	12V	When ON	10.8 to 13.2V	2 to 5mA
						When OFF	4V or less	0.1mA or less
		B16	B09	Preset input	5V	When ON	4.5 to 5.5V	2 to 5mA
						When OFF	2V or less	0.1mA or less
		A15	A08	CTRLCOM		Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
		B15	B08	Function start input	24V	When ON	21.6 to 26.4V	2 to 5mA
						When OFF	5V or less	0.1mA or less
		A14	A07	Function start input	12V	When ON	10.8 to 13.2V	2 to 5mA
						When OFF	4V or less	0.1mA or less
		B14	B07	Function start input	5V	When ON	4.5 to 5.5V	2 to 5mA
						When OFF	2V or less	0.1mA or less
		-	-	-		Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
Output		A06	A05	EQU1 (Coincidence output point No. 1)		Operating voltage 10.2 to 30 V Maximum load current 0.1A/point, 0.4A/1 common Maximum voltage drop when ON 1.5 V Response time OFF → ON 0.3 ms or less ON → OFF 0.3 ms or less (rated load, resistive load)		
		B06	B05	EQU2 (Coincidence output point No. 2)				
		B02,B01		12/24V		Input voltage 10.2 to 30 V Current consumption 8 mA (TYP 24 V DC)		
		A02,A01		0V				

*1: Terminal numbers A03, A04, B03 and B04 are not used.

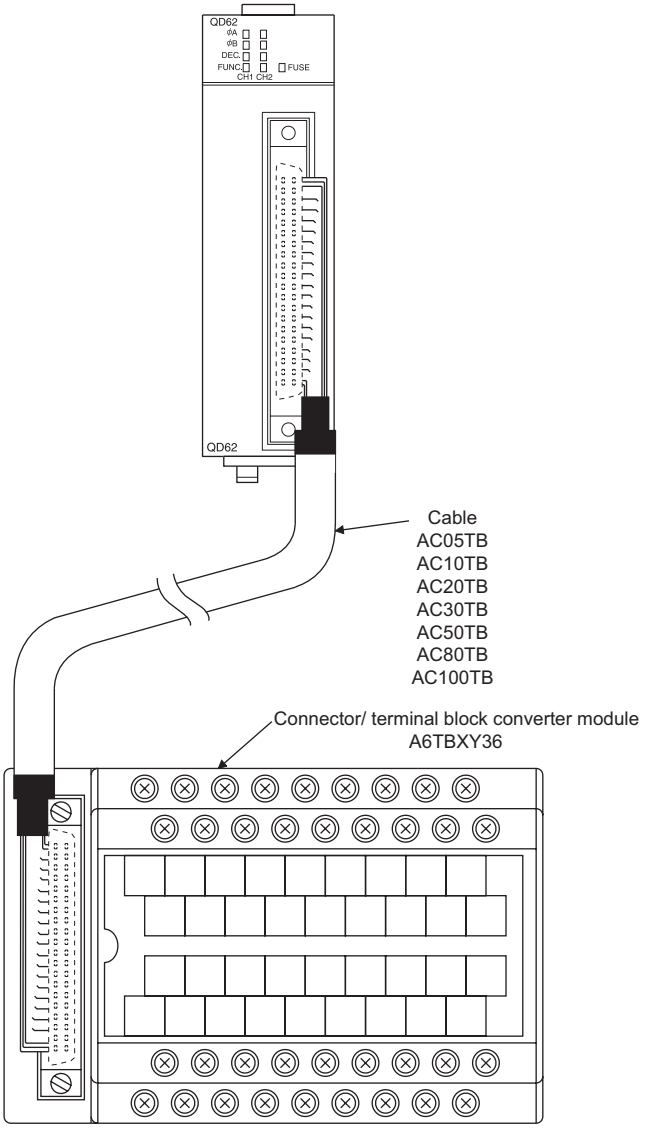
● **QD62D (Differential input sinking output type)**

I/O classification	Internal circuit	Terminal number*1 CH1	Terminal number*1 CH2	Signal name	Operation	Input voltage (guaranteed value)	Operating current (guaranteed value)
Input		A20	A14	Phase A pulse input	Line driver level (Am26LS31 [manufactured by Texas Instruments] or equivalent) that conforms to RS-422-A in EIA standard V_{hys} Hysteresis (VT+ - VT-) 60 mV V_{IH}(E) "H" level enable input voltage: 2 V or higher V_{IL}(E) "L" level enable input voltage: 0.8 V or lower * A current type line driver cannot be used.		
		B20	B14	Phase $\overline{A}$ pulse input			
		A19	A13	Phase B pulse input			
		B19	B13	Phase $\overline{B}$ pulse input			
		A18	A12	Preset input 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		B18	B12	Preset input 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		A17	A11	Preset input 5V	When ON	2.5 to 5.5V	2 to 5mA
					When OFF	1V or less	0.1mA or less
		B17	B11	PRSTCOM	Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
		A16	A10	Function start input 24V	When ON	21.6 to 26.4V	2 to 5mA
					When OFF	5V or less	0.1mA or less
		B16	B10	Function start input 12V	When ON	10.8 to 13.2V	2 to 5mA
					When OFF	4V or less	0.1mA or less
		A15	A09	Function start input 5V	When ON	2.5 to 5.5V	2 to 5mA
					When OFF	1V or less	0.1mA or less
		B15	B09	FUNCCOM	Response time	OFF → ON 0.5ms or less	ON → OFF 1ms or less
Output		A06	A05	EQU1 (Coincidence output point No. 1)	Operating voltage 10.2 to 30 V Maximum load current 0.5 A/point, 2 A/1 common Maximum voltage drop when ON 1.5 V Response time OFF → ON 0.1 ms or less ON → OFF 0.1 ms or less (rated load, resistive load)		
		B06	B05	EQU2 (Coincidence output point No. 2)			
		B02,B01		12/24V	Input voltage 10.2 to 30 V Current consumption 8 mA (TYP 24 V DC)		
		A02,A01		0V			

*1: Terminal numbers A08, A07, A03, A04, B08, B07, B04 and B03 are not used.

■ Using the connector/terminal block converter module

(1) The figure below shows the wiring when a connector/ terminal block converter module and a cable are used in the QD62 (E/D).



(2) The following table lists the signal names and the corresponding connector side terminal numbers and terminal block side terminal symbols, when a connector/ terminal block converter module is used in the QD62(E/D).

For the QD62 and QD62E

Signal name			Connector side terminal number	Terminal block side terminal symbol
CH1	Phase A pulse input	24 V	A20	10
	Phase A pulse input	12 V	B20	0
	Phase A pulse input	5 V	A19	11
	ABCOM		B19	1
	Phase B pulse input	24 V	A18	12
	Phase B pulse input	12 V	B18	2
	Phase B pulse input	5 V	A17	13
	Preset input	24 V	B17	3
	Preset input	12 V	A16	14
	Preset input	5 V	B16	4
	CTRLCOM		A15	15
	Function start input	24 V	B15	5
	Function start input	12 V	A14	16
	Function start input	5 V	B14	6
	EQU1 (Coincidence output point No. 1)		A06	1E
	EQU2 (Coincidence output point No. 2)		B06	E
CH2	Phase A pulse input	24 V	A13	17
	Phase A pulse input	12 V	B13	7
	Phase A pulse input	5 V	A12	18
	ABCOM		B12	8
	Phase B pulse input	24 V	A11	19
	Phase B pulse input	12 V	B11	9
	Phase B pulse input	5 V	A10	1A
	Preset input	24 V	B10	A
	Preset input	12 V	A09	1B
	Preset input	5 V	B09	B
	CTRLCOM		A08	1C
	Function start input	24 V	B08	C
	Function start input	12 V	A07	1D
	Function start input	5 V	B07	D
	EQU1 (Coincidence output point No. 1)		A05	1F
	EQU2 (Coincidence output point No. 2)		B05	F
12/24V			B02 B01	24V
0V			A02 A01	0V

For the QD62D

Signal name			Connector side terminal number	Terminal block side terminal symbol
CH1	Phase A pulse input	(+)	A20	10
	Phase A pulse input	(-)	B20	0
	Phase B pulse input	(+)	A19	11
	Phase B pulse input	(-)	B19	1
	Preset input	24 V	A18	12
	Preset input	12 V	B18	2
	Preset input	5 V	A17	13
	PRSTCOM		B17	3
	Function start input	24 V	A16	14
	Function start input	12 V	B16	4
	Function start input	5 V	A15	15
	FUNCCOM		B15	5
	EQU1 (Coincidence output point No. 1)		A06	1E
	EQU2 (Coincidence output point No. 2)		B06	E
CH2	Phase A pulse input	(+)	A14	16
	Phase A pulse input	(-)	B14	6
	Phase B pulse input	(+)	A13	17
	Phase B pulse input	(-)	B13	7
	Preset input	24 V	A12	18
	Preset input	12 V	B12	8
	Preset input	5 V	A11	19
	PRSTCOM		B11	9
	Function start input	24 V	A10	1A
	Function start input	12 V	B10	A
	Function start input	5 V	A09	1B
	FUNCCOM		B09	B
	EQU1 (Coincidence output point No. 1)		A05	1F
	EQU2 (Coincidence output point No. 2)		B05	F
12/24V			B02 B01	24V
0V			A02 A01	0V

Remark

If a connector/terminal block converter module is used in the QD62D, the terminals on the terminal block side with symbols, C, D, 1C and 1D are not used.

■Encoders that can be Connected

The encoders that can be connected to the QD62(E/D) are described below.

● Encoders that can be connected to the QD62 and QD62E

- Open collector output type encoders
- CMOS level voltage output type encoders
  (Verify that the encoder output voltage meets the specifications for the QD62 and QD62E.)

● Encoders that can be connected to the QD62D

- Line driver output type encoders
  (Verify that the encoder output voltage meets the specifications for the QD62D.)

POINT

The following encoders cannot be used with the QD62(E/D).

- TTL level voltage output type encoders

System configuration

<QD62, QD62E, QD62D accessories>

Product	Description
Manual	QD62, QD62E, QD62D High-speed Counter Module User's Manual (Hardware)

<Separately obtained products>

Product	Description
Manual	QD62, QD62E, QD62D, GX Configurator-CT (SW0D5C-QCTU-E) User's Manual
Connector	External wiring connector*1 A6CON1, A6CON2, A6CON3, A6CON4

*1: As the external wiring connector is not packed with the module, always obtain it separately.

Applicable system

<Applicable CPU and number of modules that can be mounted>

The CPU module and network module (for remote I/O station) that can have the QD62 (E/D) and the number of modules that can be mounted are listed below.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 16	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only.*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Software packages supported>
Correspondence between systems which use QD62 (E/D) and software packages are as shown below.
The GX Developer is necessary when using a QD62 (E/D).

		Software version	
		GX Developer	GX Configurator-CT
Q00J/Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1.10L or later(cannot be used with the SW0D5C-QCTU-E 50F or earlier versions)
	Multiple CPU system	Version 8 or later	
Q02/Q02H/ Q06H/Q12H/ Q25HCPU	Single CPU system	Version 4 or later	SW0D5C-QCTU-E 00A or later
	Multiple CPU system	Version 6 or later	SW0D5C-QCTU-E 50F or later
Q12PH/ Q25PHCPU	Single CPU system	Version 7.10L or later	Version 1.13L or later(cannot be used with the SW0D5C-QCTU-E 50F or earlier versions)
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	SW0D5C-QCTU-E 50F or later

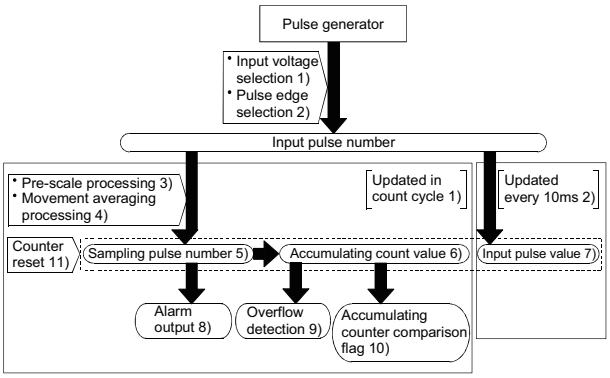
3.6.2 Channel isolated pulse input module: QD60P8-G

Overview

The QD60P8-G counts the input pulse number (speed, rotation number, instant flux or similar) and measures the quantity, the length, accumulating flux, etc. The input pulse value is updated every 10ms. The QD60P8-G updates the accumulating count value and the pulse number after moving averaging processing or similar (sampling pulse number) at intervals of the count cycle setting value.
Using with a process CPU makes QD60P8-G applicable to process control.

Features

■ Wide range of functions



● Pulse input voltage

A single module accepts the pulse inputs of 5VDC/12 to 24VDC.

● Pulse edge selection

It is allowed to select the rise or fall of the input pulses to be counted.

● Pre-scale function

The input pulse number is multiplied by any value to convert the pulse number.

● Moving averaging function

The values of the sampling pulse number are averaged by the specified number of times to calculate the average value.

● Sampling pulse number indication

The value obtained by performing pre-scale conversion on the pulse number entered in the count cycle set to the count cycle setting value is displayed. If the input pulse number is not uniform, moving averaging processing can be performed to average the input pulse number.
The count range is 0 to 32767.

● Accumulating count value indication

The accumulating value of the sampling pulse number is displayed in the set count cycle. The count range is 0 to 99999999, and you can select whether to use the accumulating counter as the linear counter or ring counter.

● Input pulse value indication

The pulse number actually input is displayed every 10ms. Since the input pulse number is displayed every 10ms, the module can be used as a counter. (The input pulse value is updated every 10ms. Note this when using the module as a counter.)
The count range is 0 to 2147483647.

● Alarm output

It is allowed to set four setting values, i.e. upper/upper limit value, upper/lower limit value, lower/upper limit value and lower/lower limit value, for the sampling pulse number to output alarms.

● Accumulating counter overflow detection

If the accumulating count value overflows (exceeds 99999999) in the linear counter mode, the accumulating counter overflow detection flag turns ON to indicate that an overflow error has occurred.

● Accumulating counter comparison output

If the accumulating count value reaches or exceeds the comparison output setting value, the accumulating counter comparison flag turns ON.

● Counter reset

The sampling pulse number, accumulating count value and input pulse value can be reset at any timing.

■ Counting speed range of the input pulse can be changed.

By changing the input filter, the input pulse speed is available within the range 0 to 20kpps.

■ 8 channels of pulse inputs in one module

One module has 8 channels of pulse inputs allowing configuration of a low cost system.

■ Channel isolated

The channels are isolated from each other. (Dielectric withstand voltage: 1780VAC for 1 minute)

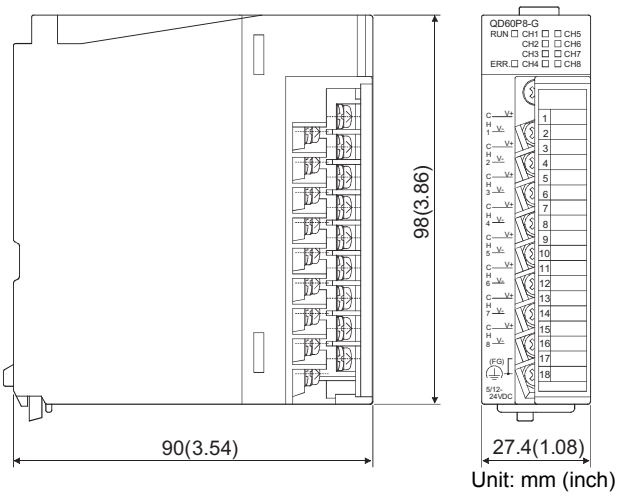
■ Online module change

The module can be changed without the system being stopped.

■ Easy setting by utility package

The GX Configurator-CT Utility package is sold separately.
The utility package enables the initial setting and auto refresh setting to be made on the screen, reducing the sequence programs as well as resulting in easy monitoring of the setting and operating status.

Appearance



Unit: mm (inch)

Functions

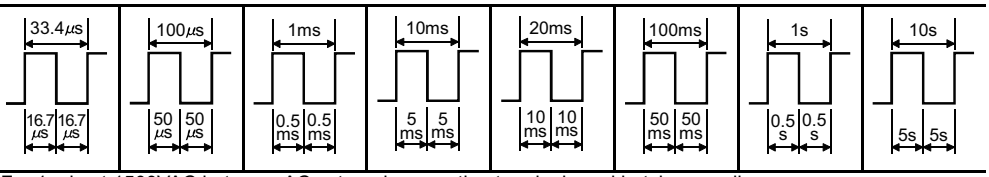
The following table indicates the QD60P8-G functions.

Name		Details
Accumulating counter	Linear counter function	This function counts from 0 to 99999999 and detects an overflow when the count range is exceeded.
	Ring counter function	This function repeats counting between 0 and 99999999.
	Comparison output function	This function turns ON the accumulating counter comparison flag when the accumulating count value reaches or exceeds the comparison output setting value. (The accumulating counter comparison flag turns OFF by setting the comparison signal reset flag.)
Sampling counter	Count cycle change function	This function changes the count cycle of the sampling pulse number or accumulating count value.
	Movement averaging function	This function performs movement averaging processing by the specified number of times if there are variations in the sampling pulse number.
	Pre-scale function	This function converts the input pulse number into the unit pulse number when its weight per pulse is a fraction.
	Alarm output function	This function sets the upper/upper limit value, upper/lower limit value, lower/upper limit value and lower/lower limit value for the sampling pulse number converted by the pre-scale function to output alarms.
Counter reset function		This function resets the sampling pulse number, accumulating count value or input pulse value. A reset can be made during any time.
Pulse edge selection function		This function selects whether the rising edge or falling edge of the input pulse will be used for counting. (This setting can be made for each channel using the intelligent function module switch.)
Count enable function		This function starts input pulse count operation when the count enable signal is turned ON.
Online module change function		The module can be changed without the system being stopped. (The message of GX Developer shows a method for online module change.)
Utility function		This function uses the utility package (GX Configurator-CT) to perform initial setting, auto refresh setting, reset setting or similar from within the software without using sequence programs.

POINT

The above functions can be used in combination. However, the linear counter function and ring counter function cannot be used together. Please select either of them.

Performance specifications

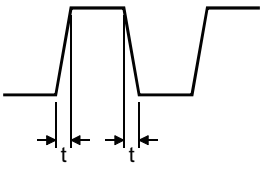
Item \ Model name		QD60P8-G							
Counting speed switch settings*1		30kpps	10kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
Number of channels		8 channels							
Count input signal	Phase	1-phase input							
	Signal level	5VDC/12 to 24VDC							
Input derating		Refer to the derating chart (Below)							
Counter	Counting speed (Max.) *2	30kpps	10kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
	Counting range	Sampling pulse number : 16-bits binary values (0 to 32767) Accumulating count value: 32-bits binary values (0 to 99999999) Input pulse value) : 32-bits binary values (0 to 2147483647)							
	Count type	Linear counter method, ring counter method							
	Minimum count pulse width (Duty ratio 50%)								
Dielectric withstand voltage		For 1 min at 1500VAC between AC external connecting terminals and batch grounding For 1 min at 500VAC between DC external connecting terminals and batch grounding For 1 min at 1780VAC between channels							
Insulation resistance		5MΩor more at 500VDC between AC external connecting terminals and general grounding							
Protection degree		IP2X							
Connected terminal		18 points terminal block							
Applicable wire size		0.3 to 0.75mm^2							
Applicable solderless terminals		R1.25-3 (Solderless terminals with sleeves cannot be used.)							
Online module change		Possible							
Multiple CPU system		Compatible							
Number of occupied I/O points		32 points/slot (I/O assignment: intelligent)							
5VDC Internal current consumption		0.58A							
External dimensions		27.4 (1.08) (W) × 98 (3.86) (H) × 90 (3.54) (D) mm (in.)							
Weight		0.17kg							

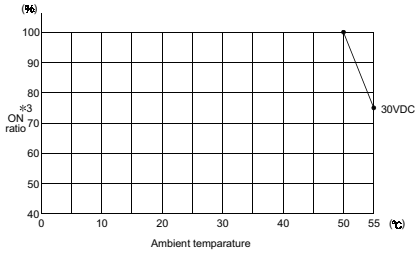
*1: To change the counting speed, use the intelligent function module switch settings.

*2: The counting speed is affected by the rise/fall time of pulses. The countable counting speeds are indicated in the table below. Note that counting the pulses of long rise/fall time may result in incorrect values.

<Rise/Fall time and the corresponding counting speed switch settings>

Rise/Fall Time	Counting speed switch settings							
	30kpps	10kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
t = 8.4μs or less	30kpps	10kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
t = 25μs or less	10kpps	10kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
t = 250μs or less	-	1kpps	1kpps	100pps	50pps	10pps	1pps	0.1pps
t = 2.5ms or less	-	-	100pps	100pps	50pps	10pps	1pps	0.1pps
t = 5ms or less	-	-	-	50pps	50pps	10pps	1pps	0.1pps
t = 25ms or less	-	-	-	-	10pps	10pps	1pps	0.1pps
t = 250ms or less	-	-	-	-	-	1pps	1pps	0.1pps
t = 2.5s or less	-	-	-	-	-	-	0.1pps	0.1pps
t = 5s	-	-	-	-	-	-	-	0.05pps





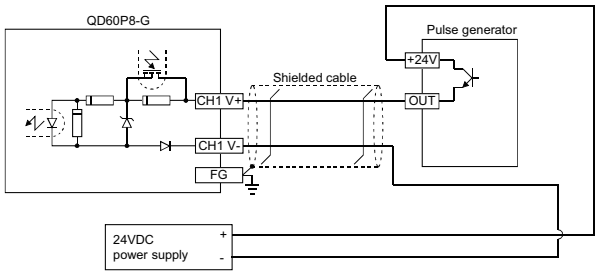
*3: "ON" indicates the status where voltage is applied to the pulse input terminals.

External wiring

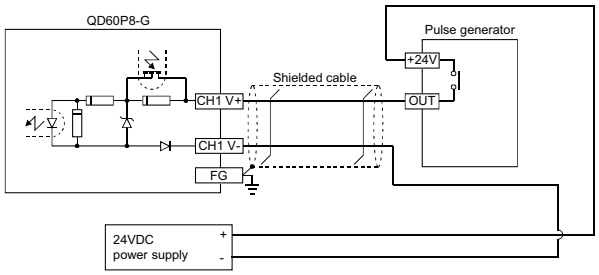
This section shows an example of wiring the QD60P8-G and pulse generator.
In the wiring example, only CH1 is wired. Also, in this example, the voltage of the external power supply is 24VDC as the electrical specifications of the pulse generator.

■ Wiring example with a sink logic type pulse generator

● For transistor output

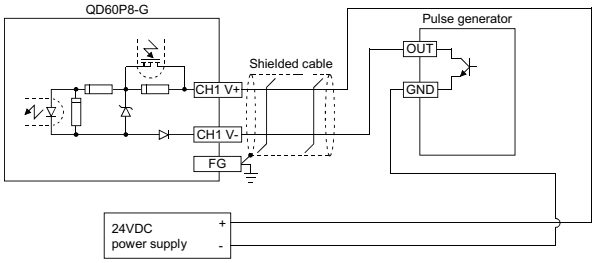


● For contact output

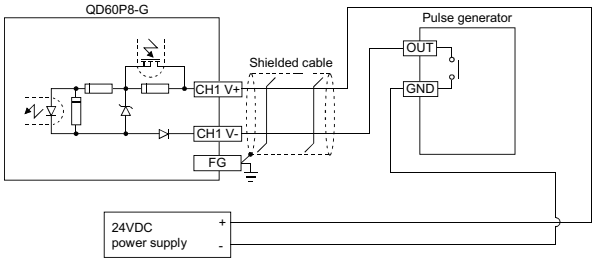


■ Wiring example with a source logic type pulse generator

● For transistor output

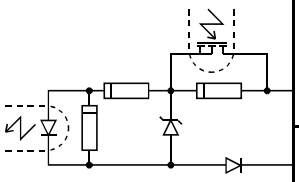


● For contact output



■ External I/O terminal

The internal circuit of the QD60P8-G for connection to external devices is shown in the following schematic diagram.

Input/ Output	Internal circuit	Terminal number	Signal name	Operation		Input voltage (guaranteed value)	Operating current (guaranteed value)
Input		1, 3, 5, 7, 9, 11, 13, 15	CH1 to 8 V+	At ON	5VDC*	3.5V to 5.5V	4mA or more
					12 to 24VDC*	10.2 to 30V	4mA or more
		2, 4, 6, 8, 10, 12, 14, 16	CH1 to 8 V-	At OFF	5VDC*	1.0V or less	0.5mA or less
					12 to 24VDC*	2.0V or less	0.5mA or less
-	-	17, 18	FG	-		-	-

*: Use the intelligent function module switch to change between 5VDC and 12 to 24VDC.

Signal layout of each channel

Terminal number		Signal name
CH1	1	CH1 V+
	2	CH1 V-
CH2	3	CH2 V+
	4	CH2 V-
CH3	5	CH3 V+
	6	CH3 V-
CH4	7	CH4 V+
	8	CH4 V-
CH5	9	CH5 V+
	10	CH5 V-
CH6	11	CH6 V+
	12	CH6 V-
CH7	13	CH7 V+
	14	CH7 V-
CH8	15	CH8 V+
	16	CH8 V-

System configuration

<QD60P8-G accessories>

Product	Description
Manual	QD60P8-G User's Manual (Hardware)

<Separately obtained products>

Product	Description
Manual	QD60P8-G User's Manual

■ Applicable system

<Applicable modules and numbers of QD60P8-G modules that may be mounted>

The following table indicates the CPU modules and network modules (for remote I/O stations) which accept the QD60P8-G, and the number of QD60P8-G modules that can be mounted.

Applicable module		Number of modules that can be installed	Remarks
CPU module	Q00JCPU	Maximum 8	*1
	Q00CPU Q01CPU	Maximum 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Maximum 64	Can be installed in Q mode only.*1
	Q12PHCPU Q25PHCPU	Maximum 64	*1
Network module	QJ72LP25-25 QJ72BR15 QJ72LP25G	Maximum 64	MELSECNET/H Remote I/O station*2

*1: Refer to the system configuration of each CPU system in Chapter 1.

*2: Refer to the system configuration of MELSECNET/H remote I/O net in Section 2.5.2.

<Software packages supported>

Compatibility between systems which use QD60P8-G and software packages are as shown below.

GX Developer is necessary when using a QD60P8-G.

		Software version	
		GX Developer	GX Configurator-CT
If mounted with Q00J/ Q00/ Q01CPU	Single CPU system	Version 7 or later	Version 1.14Q or later
	Multiple CPU system	Version 8 or later	
If mounted with Q02/ Q02H/Q06H/ Q12H/ Q25HCPU	Single CPU system	Version 4 or later	
	Multiple CPU system	Version 6 or later	
If mounted with Q12PHCPU/ Q25PHCPU	Single CPU system	Version 7.10L or later	
	Multiple CPU system		
If mounted in a MELSECNET/H remote I/O station		Version 6 or later	

3.6.3 Counter module settings, monitoring tool: GX Configurator-CT

Overview

GX Configurator-CT is a utility package to make an initial setting, which is necessary to use the high-speed counter module QD62 (E/D) and channel Isolated pulse module QD60P8-G, and also to make a setting to automatically read out data, which was input using pulse, into CPU device memory. It is used as an add-in for GX Developer.
The initial settings and automatic refresh settings can be configured on the screen. This reduces a sequence program and allows easily confirming setting status, operational status, etc.

Intelligent function module utility

■ Initial settings

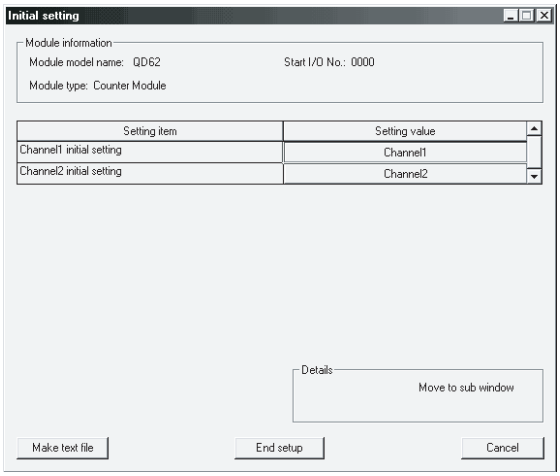
It is possible to configure on the screen the initial settings for using the counter modules. The following lists items* which require the initial settings.

(1) Preset value (for QD62(D/E) only)
(2) Coincidence output point setting (for QD62(D/E) only)
(3) Counter function selection setting (for QD62(D/E) only)
(4) Sampling/cycle time setting (for QD62(D/E) only)
(5) Comparison output selection (for QD60P8-G only)
(6) Movement averaging processing selection (for QD60P8-G only)
(7) Pre-scale function selection (for QD60P8-G only)
(8) Alarm output selection (for QD60P8-G only)
(9) Count cycle change function selection (for QD60P8-G only)

Data set as default is to be stored in the parameters of PLC CPUs, and automatically written to the counter module when the PLC CPUs enter RUN state.

*: Settable items may vary depending on the module. For details, refer to the user's manual of each module.

Sample of default value setting screen



■ Auto refresh setting

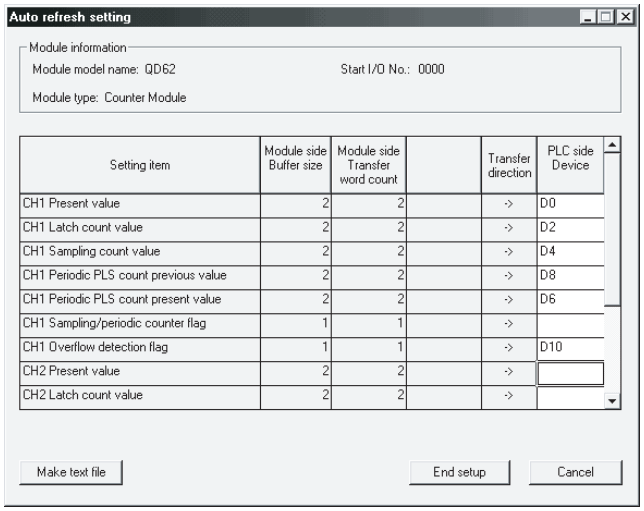
Sets the buffer memory of counter module, which is the target of the auto refresh. The following lists the main items* which are the targets of the auto refresh.

(1) Present value (for QD62(D/E) only)
(2) Latch count value (for QD62(D/E) only)
(3) Sampling count value
(4) Comparison output selection (for QD60P8-G only)
(5) Movement averaging processing selection (for QD60P8-G only)
(6) Pre-scale function selection (for QD60P8-G only)
(7) Accumulating count value (for QD60P8-G only)
(8) Input pulse value (for QD60P8-G only)
(9) Error code (for QD60P8-G only)
(10) Alarm output selection (for QD60P8-G only)

The specified device automatically reads and writes values, which were set for the auto refresh and stored in the buffer memory of the counter modules, at the END instruction executed.

*: Settable items may vary depending on the module. For details, refer to the user's manual of each module.

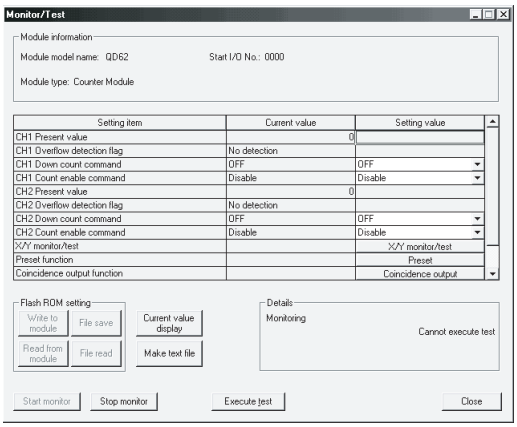
Sample of auto refresh setting screen



■ Monitor/test

Monitors/tests the buffer memory and I/O signals of the counter module.

Sample of Monitor/test screen



About the number of parameters that can be set in GX Configurator-CT

The number of parameters that can be set by the GX Configurator for an intelligent function module installed in the CPU module and in a remote I/O station of the MELSECNET/H network system is limited.

Intelligent function module installation object	Maximum number of parameter settings	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q12PH/Q25PHCPU	512	256
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed in a remote I/O station, set the GX Configurator so that the number of parameter settings of all the intelligent function modules does not exceed the maximum number of parameter settings.The total number of parameter settings is calculated separately for the initial setting and for the automatic refresh setting.
The number of parameter settings that can be set for one module in the GX Configurator-CT is as shown below.

Object module	Initial setting	Auto refresh setting
QD62/QD62E/QD62D	8 (Fixed)	14 (Maximum number of settings)
QD60P8-G	24 (Fixed)	8 (Maximum number of settings)

Operating environment

The operating environment of the personal computer where the GX Configurator-CT is used is explained.

Item		Peripheral devices
Installation (Add-in) destination *1		Add-in to GX Developer Version 4 (English version) or later*2
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space	For installation	65 MB or more
	For operation	10 MB or more
Display		800×600 dot or more resolution *3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: Install the GX Configurator-CT in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-CT (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-CT (English version) cannot be used in configuration.

*2: GX Configurator-CT cannot be used as an add-in with GX Developer Version 3 or earlier versions.

*3: Setting fonts Size of Windows® for "Large Fonts" may cause the text to extend off screen. Therefore, choose "Small Fonts".

Used operating system and performance required for personal computer

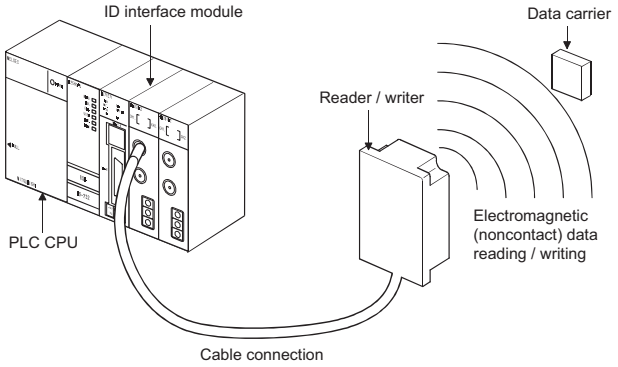
Operating system		Performance required for personal computer	
		CPU	Required memory
Windows® 95		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

3.7 Other Intelligent Function Modules

3.7.1 ID interface module: QD35ID1, QD35ID2

Overview

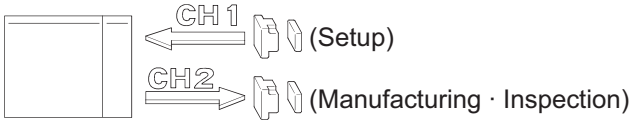
ID interface module is equipped with one or two connection channel of reader/writer and it writes/reads data from/to data carrier and works as an interface with a PLC CPU.



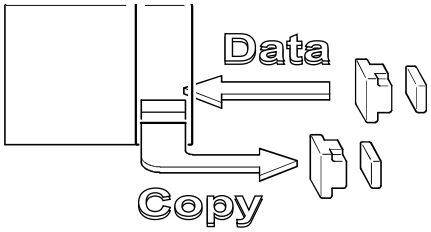
Features

(1) Easy programming
It is easy to read/write data from/to data carrier via an ID interface module by using the dedicated instructions.
By using dedicated instruction, short programs shorter than conventional FROM/TO instructions can be created.

(2) Reader/writer operates independently on ID interface modules which have two channels.
Each channel on QD35ID2 can communicate with data carrier using different instructions.

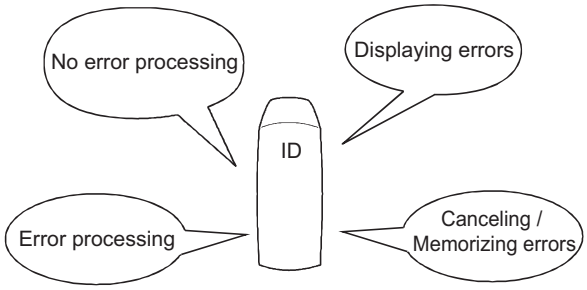


(3) Data copy between data carriers can be executed by the data copy instruction.
Data copy between data carries without using a PLC CPU is possible.

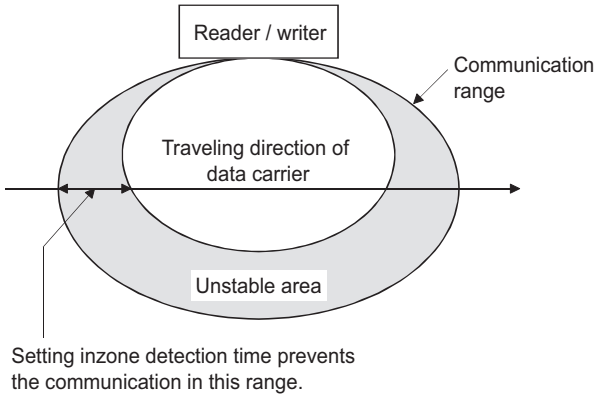


(4) Batch communication of 160 words assures simultaneity of data.
One FROM/TO instruction can communicate up to 160 words collectively.
This function allows communicating with a data carrier with data simultaneity assured.

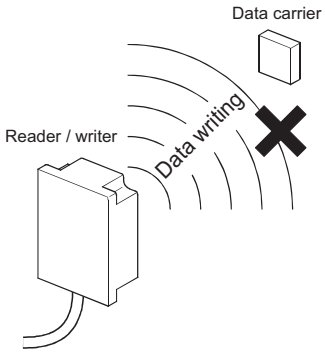
(5) A wide variety of error processing realizes advanced sequence control.
A sequence program enables confirming error LED display status, canceling errors, confirming the latest four error codes occurred, setting retry counts at communication error occurrence, etc. .



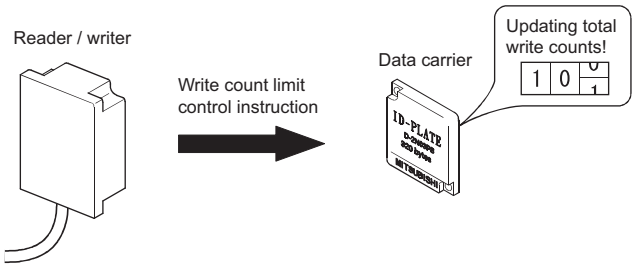
(6) Inzone detection is possible.
The inzone function prevents interference of communication, by confirming a data carrier entered in the communication range at first and continuing to detect its existence while it is in the communication range, .



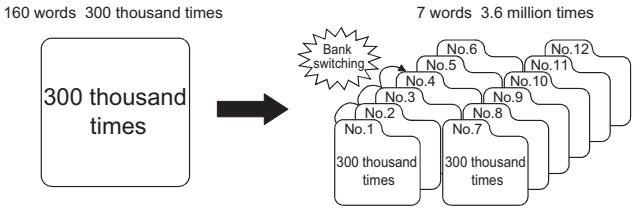
(7) Write protect function prevents incorrect writing.
This function keeps important data, such as product type and model, from being deleted by inadvertent writing.



(8) Controlling write counts is available.
The write counts control function allows easily controlling data carrier's write count limit easily.



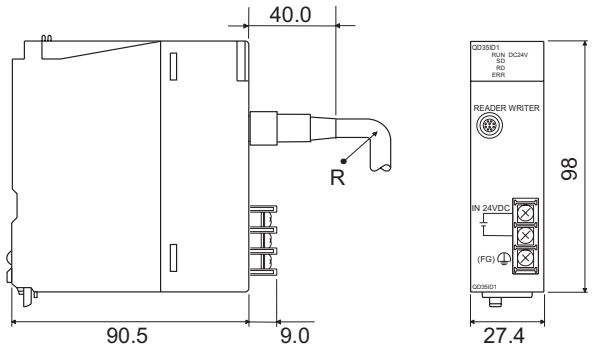
(9) Switching banks can extend a life span of data carrier.
The banks switch function can increase write counts of data carrier (300.000 times) up to 3.600.000 times.



Appearance

(1) QD35ID1/QD35ID2

The following shows QD35ID1.QD35ID2 has the same external dimensions
(There are two connectors to connect with reader/writer.)

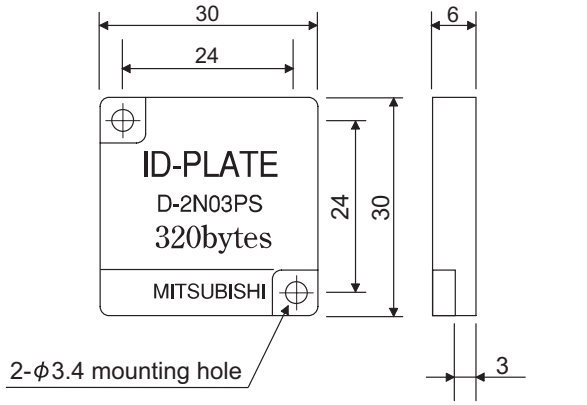


R(bending radius of cable) : 40 mm or longer

Unit: mm

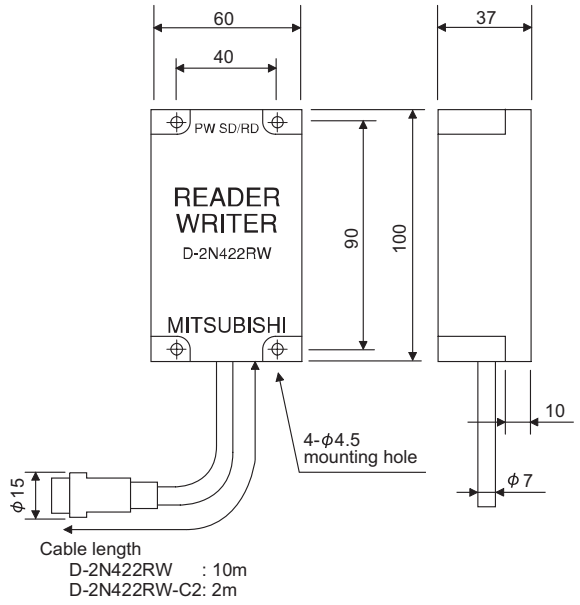
(2) D-2N03PS/D-2N03PM

The following shows D-2N03PS. D-2N03PM has the same external dimensions.



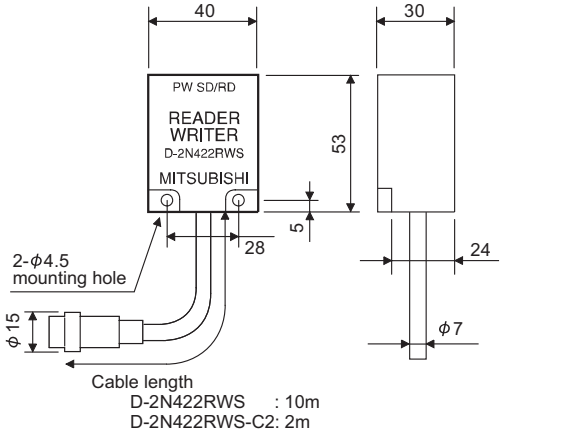
Unit: mm

(3) D-2N422RW(-C2)



Unit: mm

(4) D-2N422RWS(-C2)



Unit: mm

Function

The following shows the functions provided by an ID interface module.

Function	Instruction and command	Description
Initial setting	Initial setting	Configures the initial setting of ID interface module.
Read	Read	Reads data from data carrier.
	Continuous read	Continues reading until data carries enters in the communication range of reader/writer, and reads data from the data carrier after it enters the communication range.
	Comparison read	Reads data from data carrier and compares them.
	Continuous comparison read	Continues reading until data carries enters in the communication range of reader/writer, and reads data from the data carrier to compare them after it enters the communication range.
Write	Write	Writes data in data carrier.
	Continuous write	Continues writing until data carries enters in the communication range of reader/writer, and writes data to the data carrier after it enters the communication range.
	Comparison write	Writes data in data carrier and compares them.
	Continuous comparison write	Continues writing until data carries enters in the communication range of reader/writer, and writes data to the data carrier to compare them after it enters the communication range.
	Batch write	Collectively writes the specified data in the specified area of data carrier.
Verification	Comparison	Compares data in ID interface module with data in data carrier.
Copy	Data copy	Copies data in data carrier between CH.1 and CH.2.
Erase	Clear	Clears all data in data carrier by switching to "0".
Life control	Count write	Writes data in data carrier and updates write counts.
	Continuous count write	Continues writing until data carries enters in the communication range of reader/writer, and writes data to the data carrier to update the data counts after it enters the communication range.
	Write counts batch update	Adds arbitrary write counts value.
Write protect	Write protect information read	Reads write protect information set in data carrier.
	Write protect information write	Writes write protect information in data carrier.
Memory setting	Life extension bank switching	Sets the memory type (number of banks) in data carrier.
Command	Continuous instruction stop	Forcibly stops the continuous instruction.
	Error cancel	Executes error cancel processing (turning off error LED, resetting error detection signal, clearing error code storage area in buffer memory).

Performance specifications

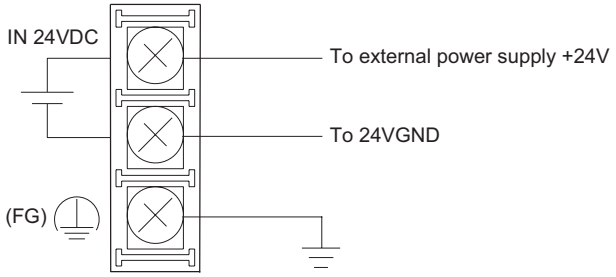
Item \ Model name		QD35ID1	QD35ID2
Connectable reader/writer		D-2N422RW(-C2), D-2N422RWS(-C2)	
Number of connectable readers/writers		1 module	2 modules
Connectable cable		D-NS422CAB10(10m), D-NS422CAB20(20m) D-NS422CAB40(40m), D-NS422CAB100(100m) Up to two cables are available for combined connection (maximum connection interval 200 m)	
Applicable data carrier		D-2N03PS, D-2N03PM	
Communication time *1		Read (20 words) : 65 ms, Write (20 words) : 120 ms	
Response time *2		Read (20 words) : 97 ms, Write (20 words) : 130 ms	
Online module change		Not available	
Multiple CPU system		Compatible	
Number of occupied I/O points		32 points per 1 slot (I/O assignment: intelligent)	
5VDC internal current consumption		0.40A	0.42A
External power supply	Voltage	24VDC	
	Current consumption	0.17A	0.33A
External dimensions		98(H)×27.4(W)×90.5(H)mm	
Weight		0.13kg	0.14kg

*1: Communication time between data carrier and reader/writer
*2: Time needed for an ID instruction to complete on the program
(Time needed for an ID interface module to output a processing instruction, complete the processing, and return it to CPU.)

Wiring

■ Wiring of power supply terminal

Wiring of a power supply terminal should be executed as the diagram below.

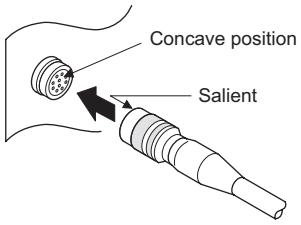


■ Connection/disconnection method of reader/writer and cable

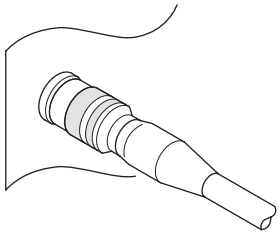
Connection/disconnection of reader/writer and cable should be executed as the diagram below.

● Connecting

1. Align the salient of the plug with concave position and insert the plug.

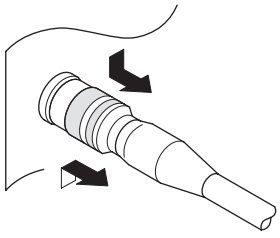


2. Push the plug certainly until it is locked (it clicks).

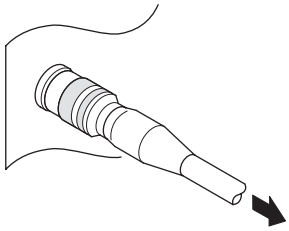


Disconnecting

1. Pull the lock release working part of the plug in the direction indicated by the arrow to unlock it.



2. Hold the plug and pull it in the direction indicated by the arrow.



System configuration

<QD35ID1, QD35ID2 accessories>

Product name	Description
Manual	QD35ID1, QD35ID2 ID Interface Module User's Manual (Hardware)

<Separately obtained products>

Product name	Description
Manual	QD35ID1, QD35ID2 ID Interface Module User's Manual
Reader/writer	D-2N422RW (Standard, cable length 32.79 ft.) D-2N422RW-C2 (Standard, cable length 6.56 ft) D-2N422RWS (Small, cable length 32.79 ft) D-2N422RWS-C2 (Small, cable length 6.56 ft)
Cable (For connecting an ID interface module with reader/writer)	D-NS422CAB10(32.79 ft.) D-NS422CAB20(65.58 ft.) D-NS422CAB40(131.16 ft.) D-NS422CAB100(327.9 ft.) Up to two cables are available for combined connection. (maximum connection distance 655.8 ft.)
Data carrier	D-2N03PS (non-metal mount, plate, memory capacity 320 bytes) D-2N03PM (non-metal mount, plate, memory capacity 320 bytes)

■ Applicable system

<Applicable system and the number of mountable modules>
The following table shows the number of mountable QD35ID1s/QD35ID2s on each CPU module. QD35ID1s/QD35ID2s cannot be mounted on remote I/O stations.

Applicable module		No. of mountable modules	Remarks
CPU module	Q00JCPU	Up to 8	*1
	Q00CPU Q01CPU	Up to 24	
	Q02CPU Q02HCPU Q06HCPU Q12HCPU Q25HCPU	Up to 64	Mountable in the Q mode only.*1

*1: Refer to the system configuration of each CPU system explained in Chapter 1.

■ Model selection

● Model selection of ID interface module and ID controller

(1) When quantity of data for read/write is large, use the bus connection ID interface module (QD35ID□).
(2) When quantity of data for read/write is small (several bytes) or there are many readers/writers, use the CC-Link ID interface module AJ65BT-D35ID2.
(3) When the host controller has a RS-232C communication port, use the RS-232C ID Controller D-2N232IF2.

● **Model selection depending on static communication and mobile communication**

Cautions for using mobile communication

(1) When using the RS-232C ID controller (D-2N232IF2) and CC-Link ID interface module (AJ65BT-D35ID2), do not execute continuous communication using data carrier and two or more instructions.
(If executing communication continuously two or more times, (ex: AW execution after AR execution), data carrier may pass the communication range before the second communication is executed, as the host controller takes long to process data (program execution time of PC and scan time of CC-Link).

(2) To execute continuous communication using mobile communication, use the QD35ID□.

● **Model selection depending on communication time**

The CC-Link ID interface module AJ65BT-D35ID2 takes long to process large data. Use the QD35ID□ if the data has large quantity.

3.8 I/O Module Accessories

3.8.1 Connector, connector terminal block conversion module

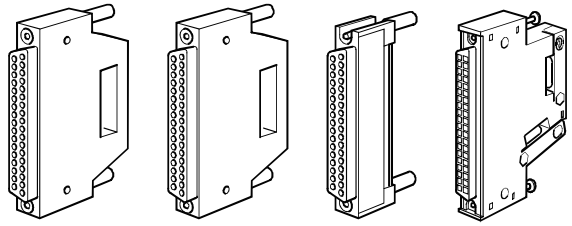
External wiring connectors for I/O modules

■ Overview

Mounted onto a connector type I/O module and used for wiring an external device. These connectors are classified into six different types according to the actual connectors and I/O module types used.

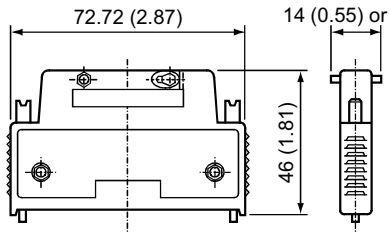
■ Appearance

A6CON1, A6CON2, A6CON3, A6CON4



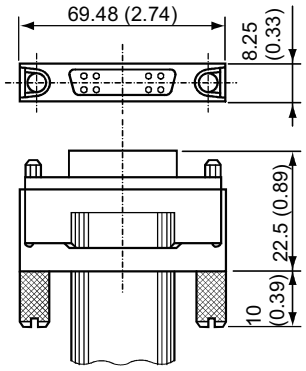
■ External dimensions

A6CON1/A6CON2



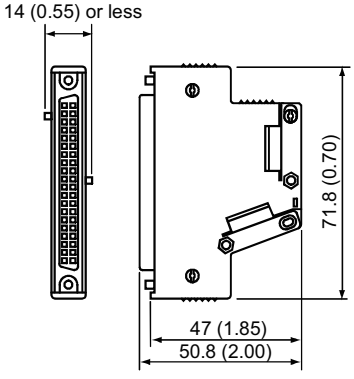
Unit: mm (inch)

A6CON3



Unit: mm (inch)

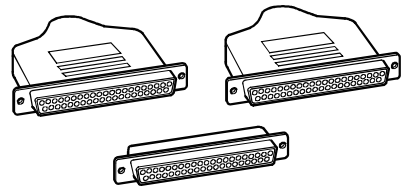
A6CON4



Unit: mm (inch)

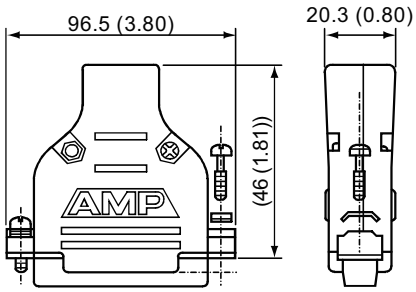
■ Appearance

A6CON1E, A6CON2E, A6CON3E



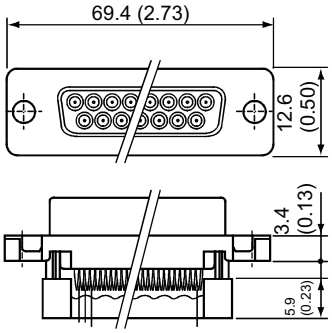
■ External dimensions

A6CON1E/A6CON2E



Unit: mm (inch)

A6CON3E



Unit: mm (inch)

■ Model list

Type	A6CON1, A6CON4	A6CON2	A6CON3
Connector type	Soldering type	Pressure-bonding type	Pressure-welding type
Applicable module	Positive common (sink) type input module, sink type output module		
Applicable wire size	0.3mm^2 (AWG#22) or less	AWG#24 to 28	AWG#28, (twisted wire), AWG#30 (single wire)

- Pressure-bonding tool for A6CON2E:
  Manufactured by Fujitsu component LTD.
  FCN-363T-T005/H
- Pressure-welding tool for A6CON3E:
  Manufactured by Fujitsu component LTD.
  FCN-367T-T012/H(Locator plate)
  FCN-707T-T001/H(Cable cutter)
  FCN-707T-T101/H(Hand press)
- Contact for pressure-bonding, pressure-welding
  Fujitsu component LTD.

Type	A6CON1E	A6CON2E	A6CON3E
Connector type	Soldering type	Pressure-bonding type	Pressure-welding type
Applicable module	Negative common (source) type input module, source type output module		
Applicable wire size	0.3mm^2 (AWG#22)	AWG#20 to 24	AWG#28, (twisted wire), AWG#30 (single wire)

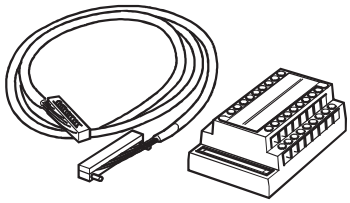
- Pressure-bonding tool for A6CON2E:
  Manufactured by Tyco Electronics AMP K.K.
  90312-1
- Pressure-welding for A6CON3E:
  Manufactured by Tyco Electronics AMP K.K.
  768349-1(die set)
  768338-1(die set)
  91220-1(cable cutter)
  91085-2(manual mini press)
- Contact for Pressure-bonding, pressure-welding tool
  Tyco Electronics AMP K.K.

Connector/Terminal block converter modules, cables

■ Overview

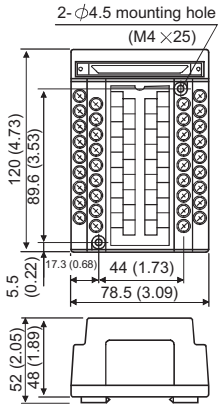
The connector/terminal block converter module is designed to convert the connector of the connector type I/O module into a terminal block to make external wiring easier.
Simply plug one end of the dedicated cable to the connector of an I/O module, and plug the opposite side of the cable to the connector/terminal block module. Then use the connector/terminal block converter module for external wiring.

■ Appearance



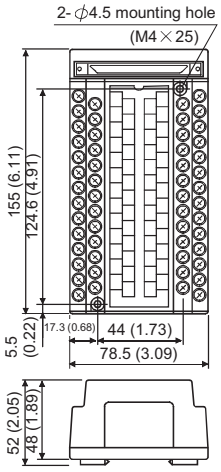
■ External dimensions

A6TB□36□



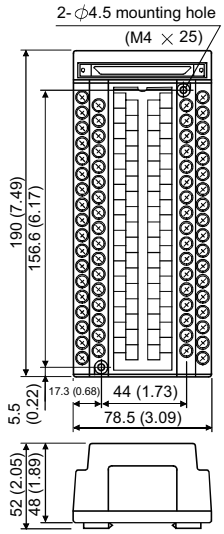
Unit: mm (inch)

A6TB□54□



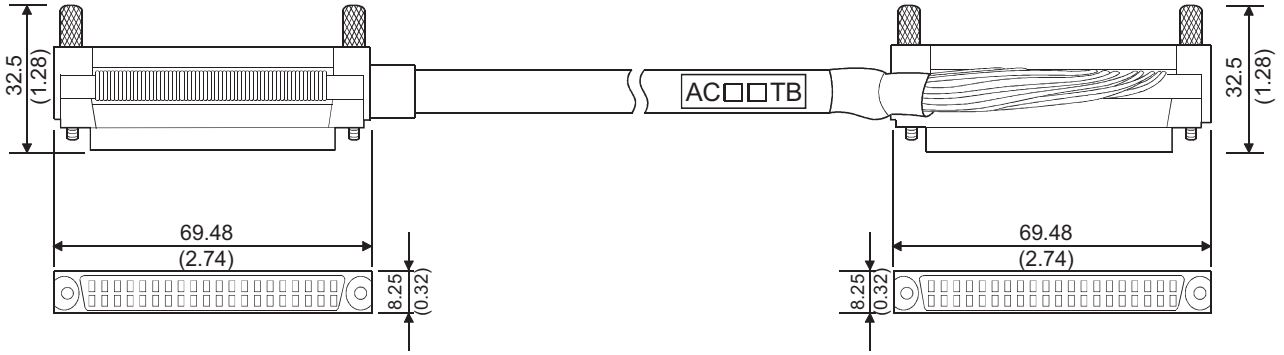
Unit: mm (inch)

A6TBX70



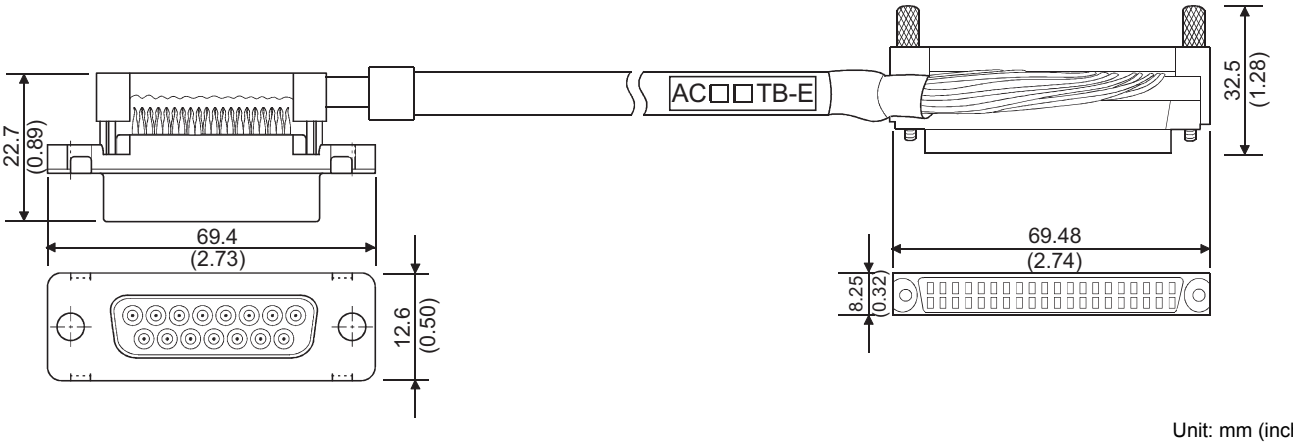
Unit: mm (inch)

AC□□TB



Unit: mm (inch)

AC□□TB-E



Unit: mm (inch)

■ Model list

● Connector/terminal block converter modules

Type	Description	Weight (kg)	Applicable model
A6TBXY36	Positive common type input module Sink type output modules. (Standard type)	0.4	Q series : QX41, QX41-S1, QX42, QX42-S1, QY41P, QY42P, QH42P AnS series : A1SX41, A1SX41-S1, A1SX41-S2, A1SX42, A1SX42-S1, A1SX42-S2, A1SX82, A1SX82-S1, A1SY41, A1SY42P, A1SY82, A1SH42, A1SH42-S1 A series : AX42, AX42-S1, AY42, AY42-S1, AY42-S2, AY42-S3, AY42-S4, AH42 CC-Link : AJ65SBTCF1-32D, AJ65SBTCF1-32T, AJ65BT1-32D, AJ65BCT1-32T MELSECNET-MINI : AJ35TC1-32D, AJ35TC1-32T
A6TBXY54	Positive common type input module Sink type output modules. (2-wire type)	0.5	
A6TBX70	Positive common type input modules. (3-wire type)	0.6	Q series : QX41, QX41-S1, QX42, QX42-S1, QH42P AnS series : A1SX41, A1SX41-S1, A1SX41-S2, A1SX42, A1SX42-S1, A1SX42-S2, A1SX82, A1SX82-S1, A1SH42, A1SH42-S1 A series : AX42, AX42-S1, AH42 CC-Link : AJ65SBTCF1-32D, AJ65SBC1-32D MELSECNET-MINI : AJ35TC1-32D
A6TBX36-E	Source type input modules. (Standard type)	0.4	Q series : QX81 AnS series : A1SX81, A1SX81-S1, A1SX81-S2 A series : AX82
A6TBX54-E	Negative common type input modules. (2-wire type)	0.4	
A6TBX70-E	Negative common type input modules. (3-wire type)	0.5	
A6TBY36-E	Source type output modules. (Standard type)	0.5	Q series : QY81P AnS series : A1SY81 A series : AY82EP
A6TBY54-E	Source type output modules. (2-wire type)	0.6	

POINT

1. The number of connectable I/O points is 32 for all connector/terminal block convertor modules.
   Two connector/terminal block convertor modules and two cables for connector/terminal block convertor modules are required for 64-point I/O modules.
2. Though the A1SX81(S1/S2) is used either as a sink or source type, use the A6TBX36-E, A6TBX54-E or A6TBX70-E. The A6TBXY36, A6TBXY54 or A6TBX70 cannot be used.
3. Though the A1SX82-S1 is used either as a sink or source type, the A6TBXY36/XY54/X70 may be used only when the A1SX82-S1 is used as a sink type.
   When it is used as a source type, the A6TBXY36/XY54/X70 cannot be used.
4. Though the A1SY82 is a source type output module, use theA6TBXY36 or A6TBXY54. The A6TBXY36-E or A6TBXY54-E cannot be used.
5. In the A series, the plus common input module is separately labeled as a sink type input module, and the minus common input module is separately labeled as a source type input module.
6. When using the A6TBXY70 as a mixed input/output module, use at the input side.
7. Tighten the module terminal screws to the following torque.
   Supply line connecting terminal screw (M3.5 screw): Tightening torque 78.4N•cm

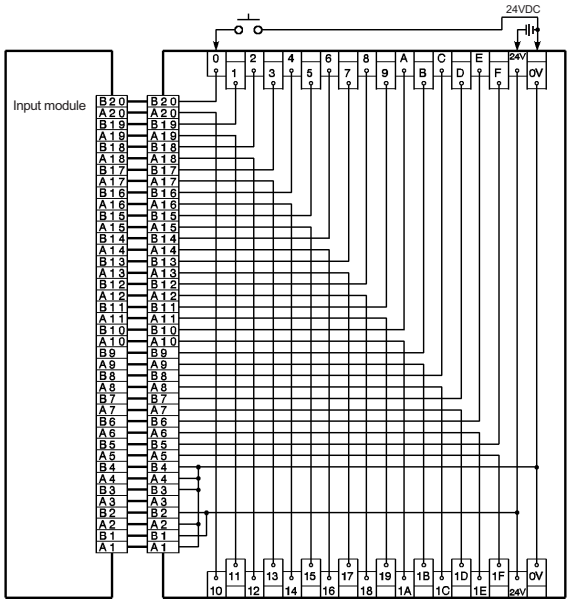
● Cables

Type	Description	Weight (kg)	Applicable model
AC05TB	0.5m (1.64ft.) for sink type modules	0.17	A6TBXY36 A6TBXY54 A6TBX70
AC10TB	1m (3.28ft.) for sink type modules	0.23	
AC20TB	2m (6.56ft.) for sink type modules	0.37	
AC30TB	3m (9.84ft.) for sink type modules	0.51	
AC50TB	5m (16.39ft.) for sink type modules	0.76	
AC80TB	8m (26.23ft.) for sink type modules (common current not exceeding 0.5 A)	1.2	
AC100TB	10m (32.79ft.) for sink type modules (common current not exceeding 0.5 A)	1.5	
AC05TB-E	0.5m (1.64ft.) for source type modules	0.17	A6TBX36-E A6TBY36-E A6TBX54-E A6TBY54-E A6TBX70-E
AC10TB-E	1m (3.28ft.) for source type modules	0.23	
AC20TB-E	2m (6.56ft.) for source type modules	0.37	
AC30TB-E	3m (9.84ft.) for source type modules	0.51	
AC50TB-E	5m (16.39ft.) for source type modules	0.76	

■ Connector/terminal block converter module connection diagrams

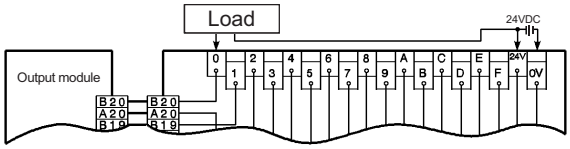
● A6TBXY36

<When connecting an input module>

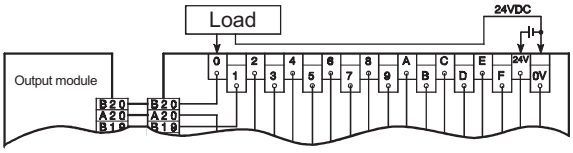


<When connecting an output module>

(a) Sink type

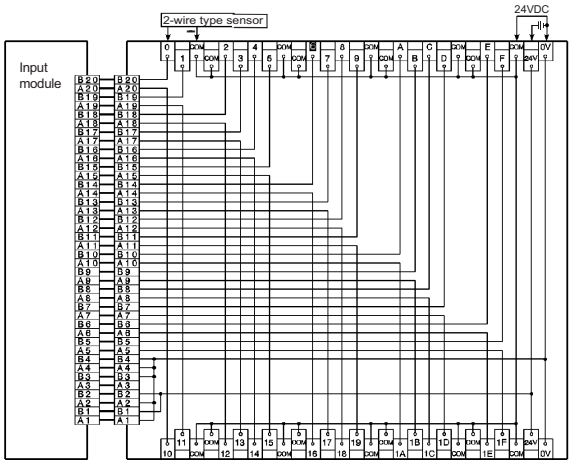


(b) Source type



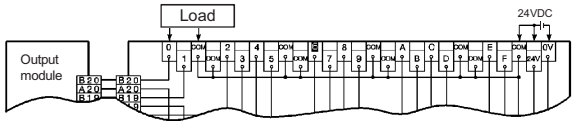
● A6TBXY54

<When connecting an input module>

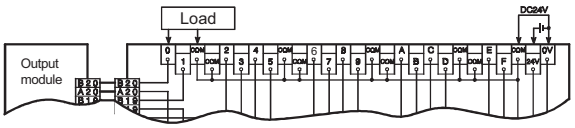


<When connecting an output module>

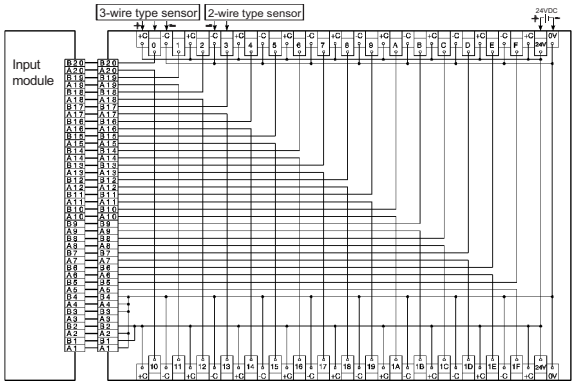
(a) Sink type



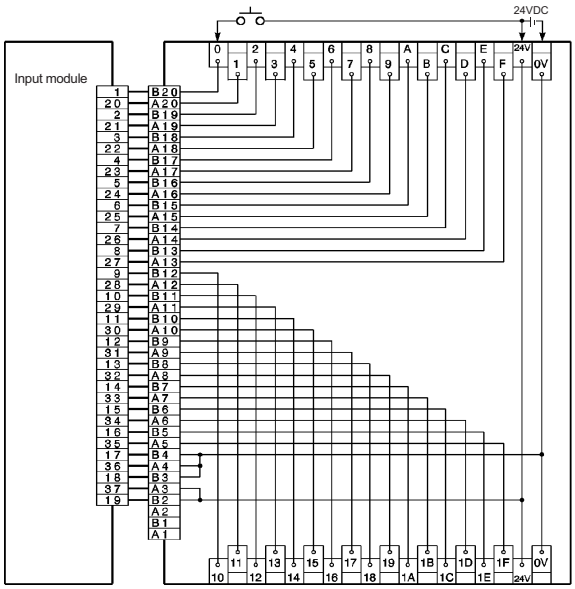
(b) Source type



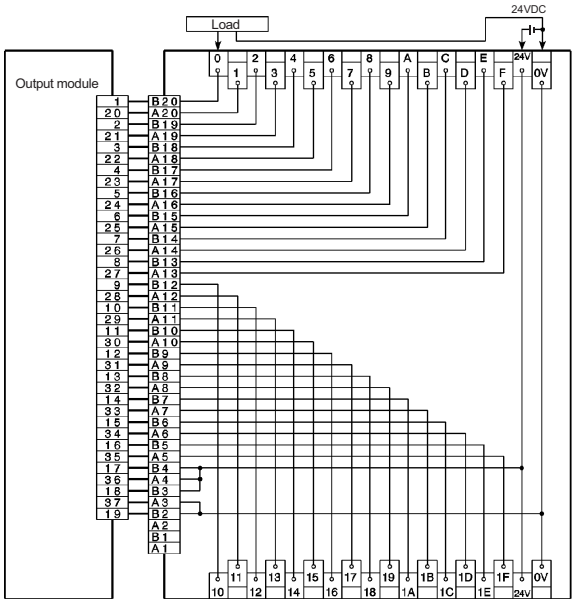
● A6TBX70



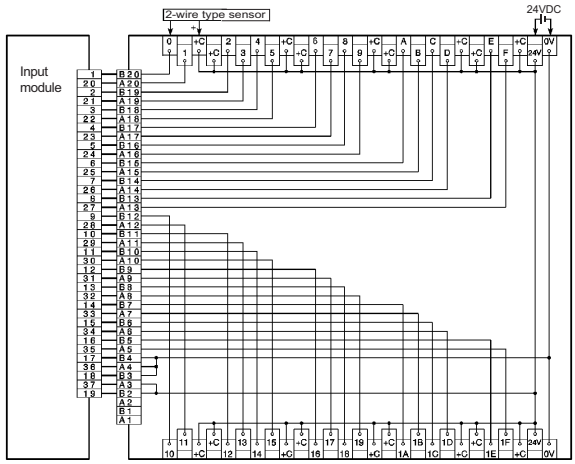
● **A6TBX36-E**



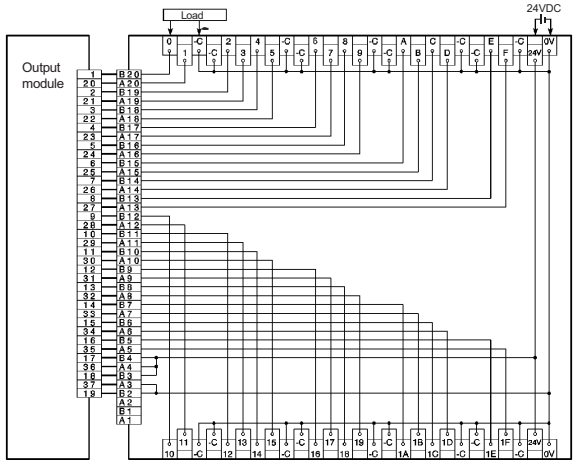
● **A6TBY36-E**



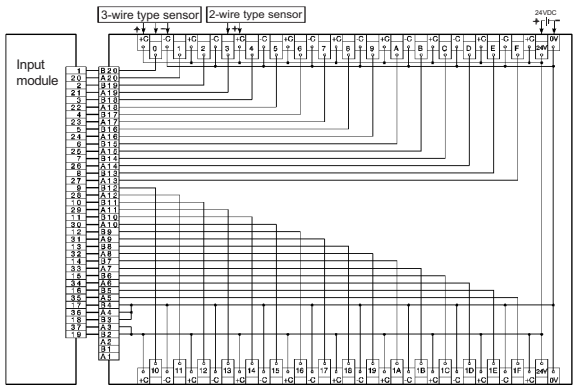
● **A6TBX54-E**



● **A6TBY54-E**



● **A6TBX70-E**



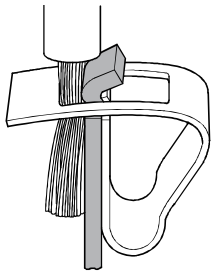
3.8.2 Spring cramp terminal block: Q6TE-18S

Spring clamp terminal block

■ Overview

The Spring Clamp Terminal Block Q6TE-18S is attachable to a Q-Series terminal block-type I/O module or an intelligent function module.
Since the Q6TE-18S uses a spring clamp, it does not require tightening of terminal screws, which greatly reduces the number of wiring steps.

The spring clamp terminal block prevents poor contact and wire loosening due to vibration by securing the wire conductor with the constant spring force of the metal fixture inside it. This offers high constant reliability.



■ Features

● Reduction of wiring steps

It requires only two steps. (wire stripping and wire insertion).

● High reliability

The spring force of the metal fixture firmly secures the wire. This prevents loosening of the wire due to varying manual installation, or wire damage and momentary disconnection due to vibration.

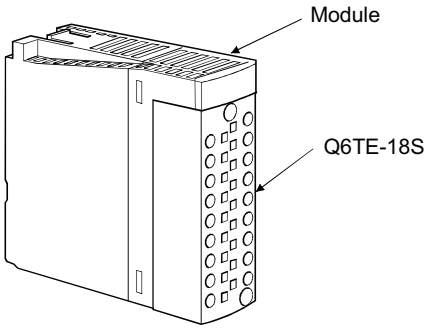
● Less maintenance work required

The Q6TE does not use screws to secure the wire. Therefore no retightening is required, eliminating the risk of screws being loosened due to vibration.

■ Specifications

Item	Specifications
Applicable wire size	0.3 to 1.5 mm^2 (AWG22 to 16)
Wire strip length	8 to 11mm
Mounting screw tightening torque range	66 to 89N•cm
Weight	0.07kg

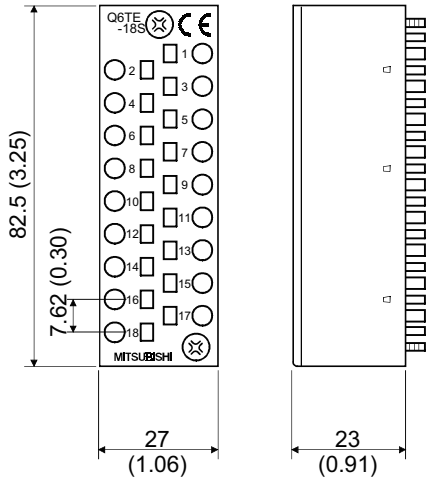
■ Appearance



Q6TE-18S mounted to module

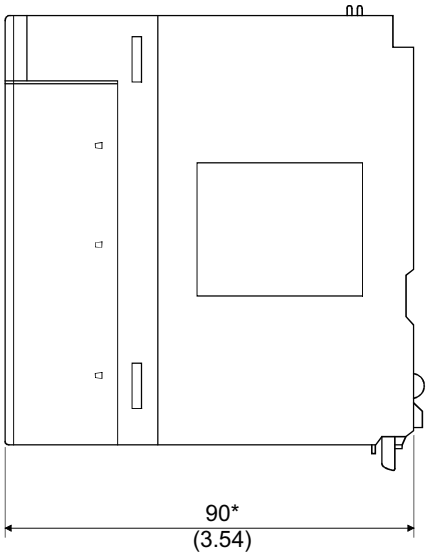
■ External dimensions

Q6TE-18S



Unit:mm(inch)

Installed on module (Example:QX10)



* The depth of the module installed with a Q6TE-18S is equivalent to the factory dimensions for that module.

Unit:mm(inch)

■ Compatible models

The Q6TE-18S should be attached to the Q Series 16-point terminal block type I/O module or intelligent function module.
The following models are compatible with the Q6TE-18S.

Model type	Model name					
I/O module	QX10	QX28	QX40	QX40-S1	QX70	QX80
	QY10	QY18A	QY22	QY40P	QY50	QY68A
	QY70	QY80	QX48Y57	QI60		
Intelligent function module	Q62DA	Q64DA	Q68DAV	Q68DAI		
	Q64AD	Q68ADV	Q68ADI			
	Q64TCRT	Q64TCRTBW	Q64RD			

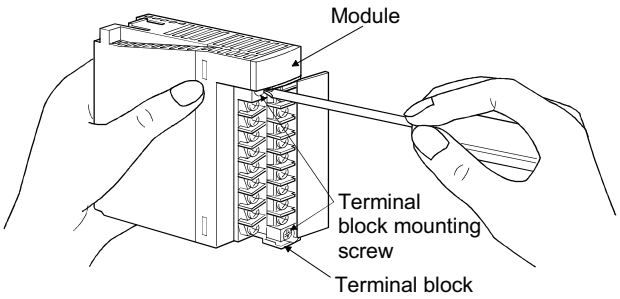
POINT

The terminal numbers of the Q6TE-18S are equivalent to those of the compatible modules.
Refer to the User's Manual of the module for information on the signal names corresponding to the terminal numbers, when connecting with an external device.

■ How to use

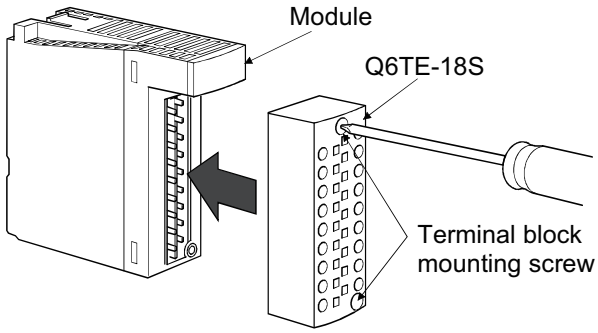
● Removal of terminal block

Unscrew the two terminal block mounting screws situated at the top and bottom of the terminal block.



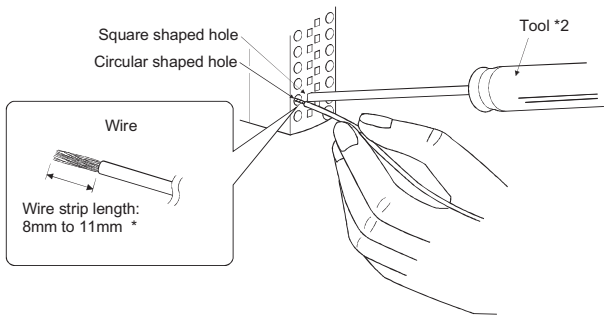
● Installation of Q6TE-18S

Attach the Q6TE-18S to the module and tighten the terminal block mounting screws within the specified torque range.



● Cable Installation

Insert the tool into the square shaped hole, which corresponds to the terminal you wish to use.
While the tool is inside the hole, insert the wire into the circular shaped hole (as shown below).
Remove the tool from the square shaped hole, taking care not to remove the wire.
After the wire has been clamped, gently pull the wire to confirm that it is secure.



*1 If the wire strip length is too long, this will expose the bare wire, which increases the risk of electric shock or short circuit.
If the wire strip length is too short, this will result in the wire not being securely attached.

*2 When mounting/removing the cable, make sure to use the dedicated tool, i.e., a tool dedicated to spring clamp terminal block, and insert the tool vertically into the hole.
If a general slotted screwdriver is used instead of the dedicated tool, or the tool is not vertically inserted, the spring clamp terminal part or terminal block resin part might be broken.

● Cable removal

Insert the tool into the corresponding square shaped hole until it stops, which releases the clamp.
And gently pull the wire out of the hall completely.

■ List of products

Product name	Model name	Applicable wire size	Contact
Spring cramp Tool for terminal block	KD-5339	---	Mitsubishi Electric System&Service Co., Ltd
Bar mould crimp-type terminal *2	TE0.5	0.5mm^2	Nichifu Terminal Industry Co., Ltd
	TE0.75	0.75mm^2	
	TE1	0.9 to 1.0mm^2	
	TE1.5	1.25 to 1.5mm^2	
Bar mould crimp-type terminal tool	NH77	---	

*2 Needed to insert the wire, which had treatment on its terminal, to the spring cramp terminal block and to insert two or more wires to one terminal.

3.8.3 Crimp-terminal block adapter, dedicated tool: Q6TA32, Q6TA32-TOL

IDC terminal block adaptor

■ Overview

The Q6TA32 IDC (Insulation Displacement Connector) terminal block adaptor is attachable to the Q Series 32-point I/O module (40-pin connector type).
Using the Q6TA32 eliminates the need for stripping the wire, soldering and crimping terminals, resulting in reduced number of wiring steps.

■ Features

● Increased efficiency of wiring work

No need for stripping the wire(s). Also, soldering and crimping terminals are no longer required, resulting in reduced number of steps for wiring when using the Q6TA32.

● Less maintenance work required

The Q6TA32 does not use terminal screws to secure the wire. Therefore no retightening is required, reducing the number of steps for maintenance.

● Less space required for wiring

The wiring can be done even while modules are mounted, which allows you to run the wires according to the space available without using excessive wires or making the wiring duct crowded.

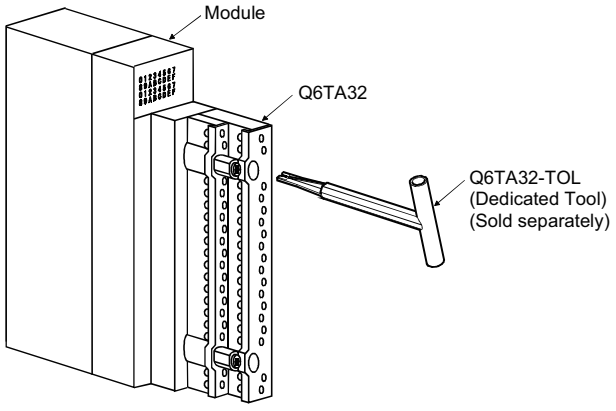
● No need for an extra relay terminal block

As wire termination i.e. soldering is no longer required, wires can be directly connected between I/O module and devices outside the control panel without the need for extra relay terminal blocks.

● Checking the wiring

On the Q6TA32 cover a range of tester lead inlets are included that allows the wiring to be checked, whereas with the older connector type adapters it could not be checked.

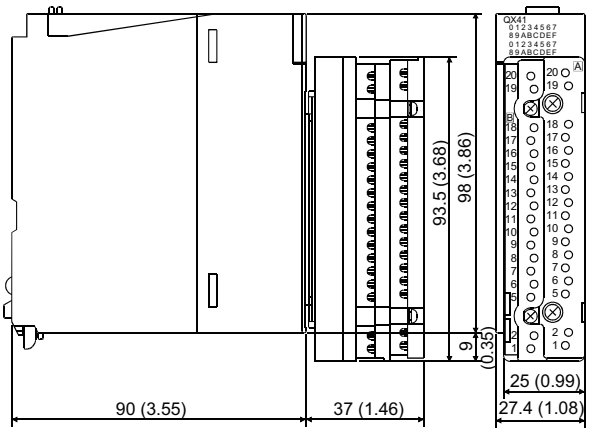
● Appearance



Q6TA32 mounted to module

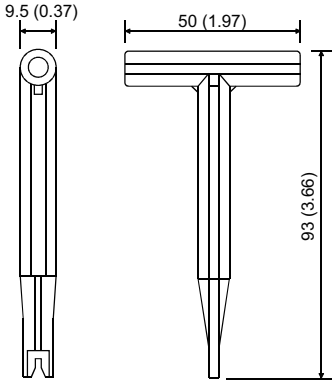
■ External dimensions

Q6TA32(when mounted to I/O module)



Unit:mm(inch)

Q6TA32-TOL

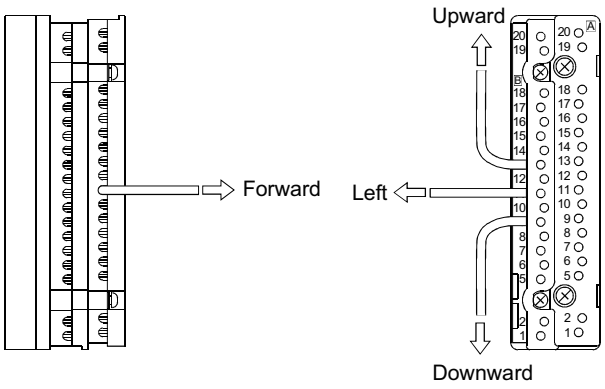


Unit:mm(inch)

■ Specifications

Item		Specifications
Applicable model		QX41, QX41-S1, QX71, QY41P, QY71
Applicable wire *2		Polyvinyl insulation wire (twisted wire) Nominal 0.5 mm^2 (AWG20) Maximum outer sheath diameter: 1.9 mm (0.07 inch)
Number of connectable wire		1
Tensile strength of wire *1	To the left	35N
	Forward	22N
	Upward or downward	60N
Number of wire insertion/ disconnection times		30
Max. allowable voltage		250VAC
Max. allowable current		3ADC
Contact resistance		100mΩ
Weight		0.08kg

*1 Direction of tensile strength of wire

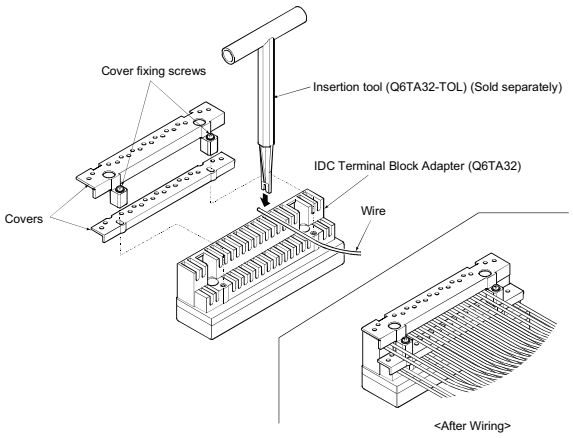


*2 Recommended cable list

Manufacturer	Conductor			Vinyl isolation	
	Size (AWG)	Structure (pcs./ mm)	Outside diameter (mm)	Average thickness (mm)	Outer insulation layer diameter (mm)
Showa Electric Wire & Cable Co., Ltd.	20	21/ 0.18	0.95	0.39	1.80
Sumitomo Wiring Systems, Ltd.	20	21/ 0.16	0.95	0.41	1.77
Fujikura Ltd.	20	7/ 0.32	0.95	0.41	1.78

The "UL STYLE 1007, CSA TYPE TR-64" type cable is recommended.

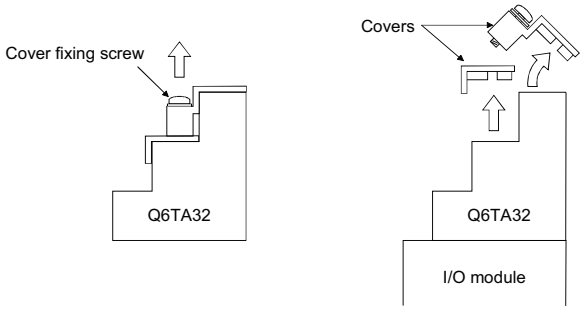
■ Schematic wiring diagram



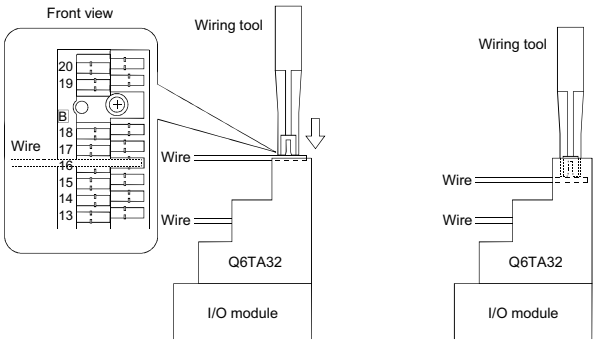
■ Wiring procedure

● Wire connection

(1) Install the Q6TA32 to the I/O module using the IDC terminal block fixing screws provided. Loosen the cover fixing screws and remove the covers.

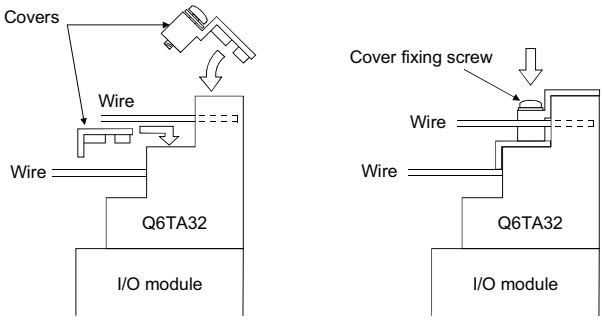


(2) Insert the wire along the guide inside the Q6TA32 and then push it in gently with your finger to temporarily hold it. Push it completely using the specific insertion tool.

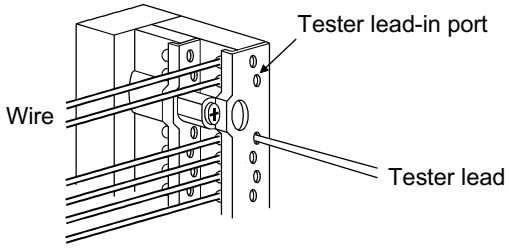


When wiring Line A (right side), check the numbers of Line B (left side) to confirm the correct terminal number to be wired.

(3) Install the covers to the Q6TA32 and tighten the cover fixing screws.



(4) Using a continuity tester, check the wiring.



3.8.4 Relay terminal module, connection cable: A6TE2-16SRN, AC□□TE

Relay terminal module

■ Overview

The Relay Terminal Module A6TE2-16SRN is used in place of a joint terminal block and in-panel relay. It reduces wiring work processes for the programmable controller, joint terminal block and in-panel relay.

■ Features

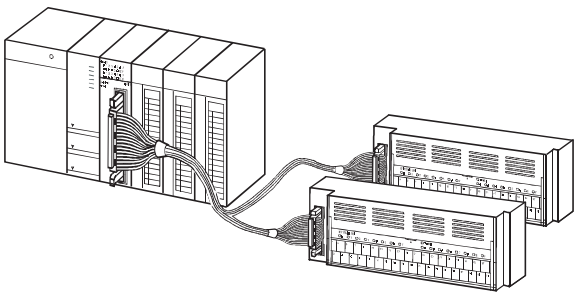
(1) The A6TE2-16SRN can be used in combination with sink type output modules having the following connectors (only Fujitsu component Limited 40-pin connector).

Classification	Applicable Models
Q series	QY41P, QY42P, QH42P
AnS series	A1SY41, A1SY42, A1SY42P, A1SH42, A1SH42-S1
A series	AY42, AY42-S1, AY42-S2, AY42-S3, AY42-S4, AH42
CC-Link	AJ65SBTCF1-32T, AJ65BTC1-32T
MELSECNET-MINI	AJ35TC1-32T

(2) One cable (separate arrangement; see Figure 4.2) and two relay terminal modules can share 32 points (one connector).
(3) By using the dedicated cable, it is possible to install the relay terminal module in a position of maximum 10 m (32.8 feet).
(4) There are five types of dedicated cables, each having different cable length.
(5) Because it is a socket-type relay, each relay can be replaced individually as necessary.
- The relay has a structure that allows secure installation and prevents drop-offs due to vibration, etc.
- It is supplied with a relay removal tool.

(6) Because it can be replaced by a relay output, it can be used either for AC or DC with larger current capacity.
(7) Self-up screws are adopted so that the terminal screws do not fall off.
(8) Wiring works have been simplified by the indication on the symbol sheet of the relay terminal module.
(9) Only a DIN rail can be installed.
(10) 2-wire load can be connected.

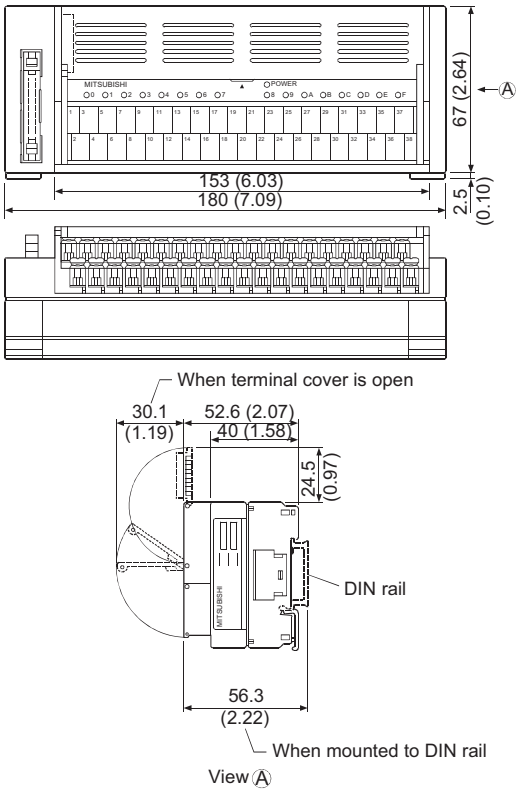
■ Appearance



A6TE2-16SRN

■ External dimensions

A6TE2-16SRN



Unit:mm(inch)

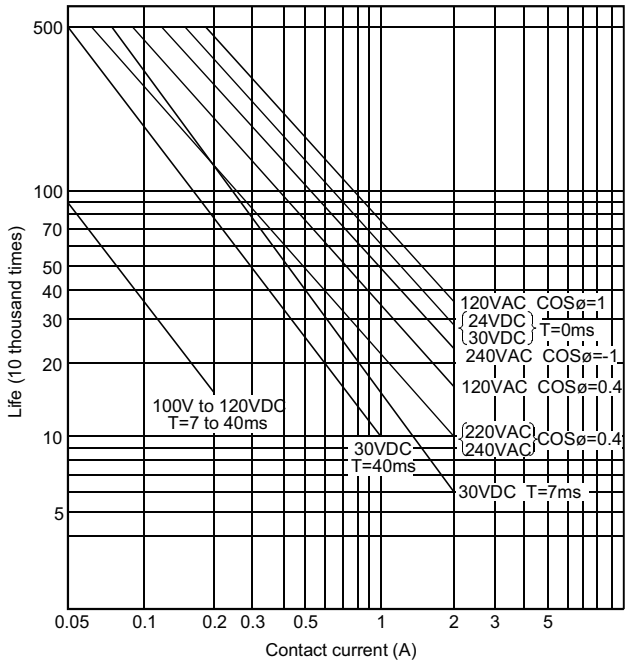
■ Specifications

Item		Specifications
Number of output		16 points
Isolation method		Relay insulation
Rated switching voltage/ current		24VDC 2A (resistive load) per point, 8A per common 240VAC 2A (COS ϕ =1) per point
Minimum switching load		5VDC 1mA
Maximum switching load		AC264V DC125V
Response time	OFF→ON	10ms or below (excluding delay of the PC output module)
	ON→OFF	12ms or below (excluding delay of the PC output module)
Life	Mechanical	Over 20 million times
	Electrical *1	Rated switching voltage/current load: Over 100 thousand times
		200VAC 1.5A, 240VAC 1A(COS ϕ =0.7) Over 100 thousand times
		200VAC 1A, 240VAC 0.5A(COS ϕ =0.35): Over 100 thousand times
		24VDC 1A, 100VDC 0.1A(L/R=7ms): Over 100 thousand times
Maximum switching frequency *2		3,600 times per hour
Noise suppression		No
Fuse		No
Common wiring system		8 points 1 common (common terminals: TB19, TB21)
Operation indication		ON display (LED)
External wiring system		38-point terminal block connector (M3 screw)
Applicable wire size		0.75 to 1.25 mm^2, max. 2 wires per point (Applicable tightening torque 60 to 100N•cm)
Applicable solderless terminal		1.25-3 1.25-MS3 1.25-B3A 1.25-C3A V1.25-3 V1.25-MS3 V1.25-B3A max. 2 wires per point
Applicable DIN rail		TH35-7.5Fe, TH35-7.5AI
Accessory item		Relay removal tool (RV9Z-T01)
External supply power	Voltage	24VDC±10% ripple voltage, 4VP-P or less
	Current	350mA (TYP. 24VDC, all points OFF)
5VDC Internal current consumption		-
Weight		0.35kg
Relays for replacement		RV3T-3G24 (made by Izumi Electric, Inc. user arranged item) Izumi Electric, Inc.
Remark		24VDC, connector (40-pin, made by Fujitsu) For a sink tank type output, use 2-wire terminal block.

*1 See the electrical life curve of a relay on upper right for details.
*2 For the maximum switching frequency when load L is driver, set ON for 1 second or longer and OFF for 1 second or longer.

■ Relay life

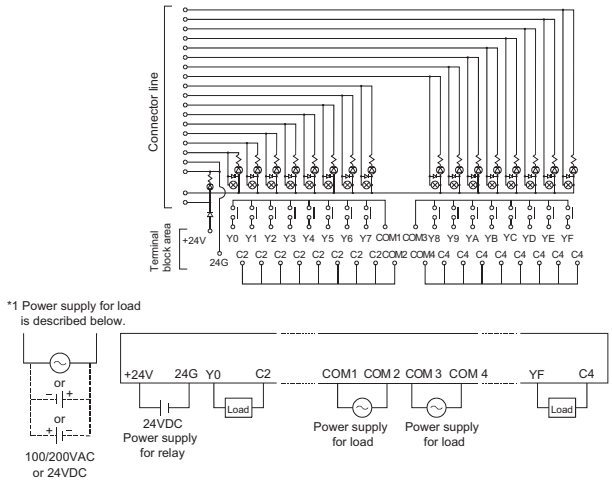
The following chart shows the life of the relay RV3T-3G24 for the relay terminal module A6TE2-16SRN.



Electrical Life Curve of a Relay

■ Wiring

Be sure to use the relay terminal module connection cable and install the wiring in accordance with the wiring diagram.

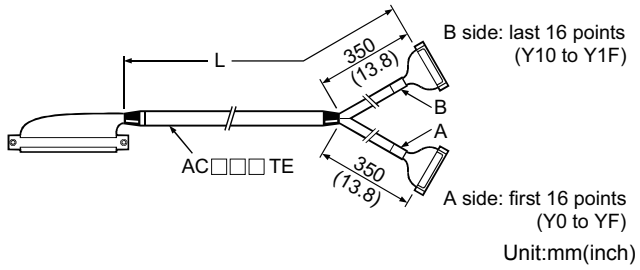


Wiring Diagram

■ Connection cable

The following shows the connection cables that can be used for wiring of A6TE2-16SRN.

Type	Cable length L
AC06TE	0.6m (2ft)
AC10TE	1m (3.2ft)
AC30TE	3m (9.8ft)
AC50TE	5m (16.4ft)
AC100TE	10m (32.8ft)

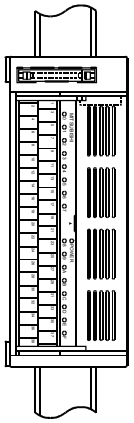


Unit:mm(inch)

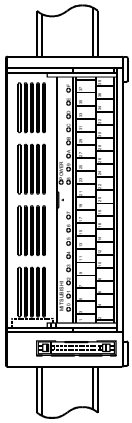
Connection Cable

■ Installation orientation

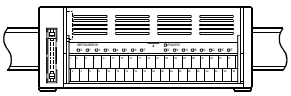
The installation direction is as shown below.



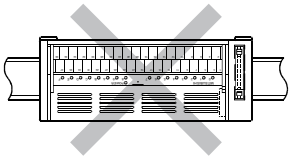
(a)Vertical orientation: Correct



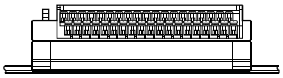
(b)Vertical orientation: Correct



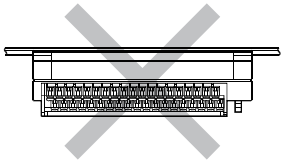
(c)Vertical orientation: Correct



(d)Vertical orientation: Incorrect



(e)Horizontal orientation: Correct



(f)Horizontal orientation: Incorrect

Installation Orientation (Horizontal view)

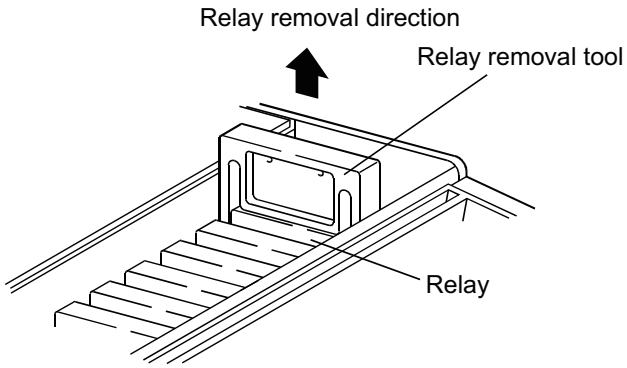
POINT

Confirm that the relay is securely installed before turning on the power supply for the first time after shipment.

■ Replacing the Relay

The relay is replaced in the following procedure.

(1) Open the top cover of the module.
(2) Pull out the red relay removal tool at the left hand side.
(3) Insert the relay removal tool into the top of the relay and then pull out the relay.



Relay Removal Procedure

(4) Mount the new relay starting from the upper most part of the relay, whilst paying attention to the orientation of the relay.
(5) After confirming that the relay is firmly connected and the lead is not bent, turn on the power supply.

MEMO

Chapter 4

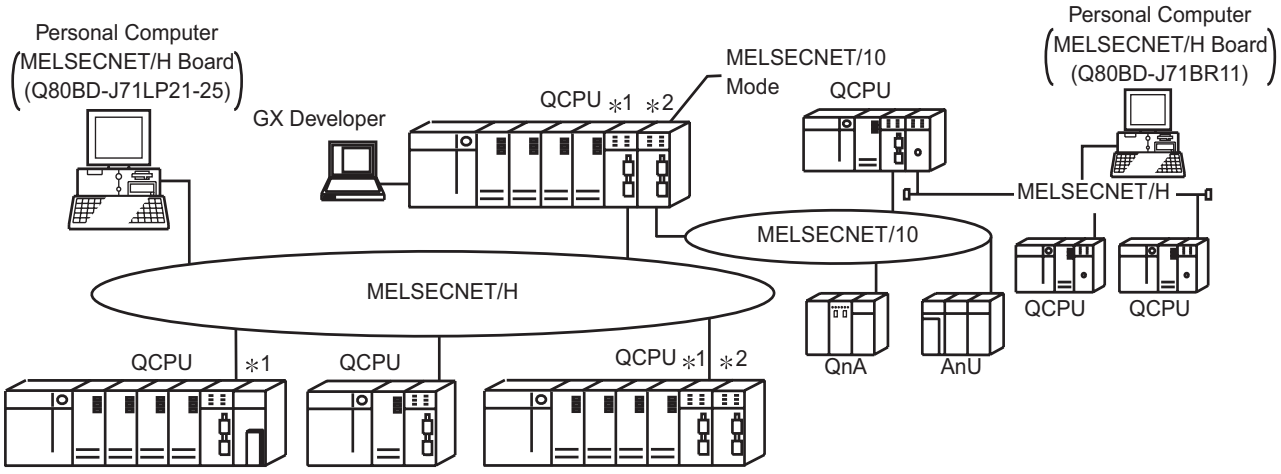
PC NETWORK BOARD

4.1 MELSECNET/H Boards

4.1.1 Q80BD-J71LP21-25,Q80BD-J71LP21S-25,Q80BD-J71LP21G, Q80BD-J71BR11

Overview

The MELSECNET/H is a network system which is used to connect multiple sequencer modules and personal computers, and is equipped with functions and performance realized in the MELSECNET/10 for general control of a production line.
In the MELSECNET/H, there is a network system which includes an optical loop system (communication rates: 10 Mbps, 25 Mbps) and a coaxial bus system (communications rate: 10 Mbps), enabling large volume communications at high speeds.
Also, in order to improve the performance of the MELSECNET/10 network and achieve upward compatibility, MELSECNET/H supports the MELSECNET/ H and MELSECNET/H Extended modes (high performance, high speed mode) and the MELSECNET/10 Mode (function compatible and performance compatible mode).



∗1: The multiple CPU system compatible network module is for function version B and subsequent products.
∗2: In the multiple CPU system, a network module that becomes a relay station is the same as the control PLC.

POINT

(1) For the MELSECNET/H, please select the QCPU (Q Mode) and Q compatible network modules.
(2) If the QnACPU or ACPU are included in the same network, select the MELSECNET/10 mode which is compatible with the MELSECNET/10.
(3) All of network modules and MELSECNET/H boards within the same network must be set to the same mode (network type) .

Features

■A personal computer can be incorporated into MELSECNET/H.

By mounting the MELSECNET/H board in a personal computer, the personal computer can be used as a MELSECNET/H or MELSECNET/10 control station or normal station.

Board model name	Supported network	
	Mode	
Q80BD-J71LP21-25 Q80BD-J71LP21S-25	MELSECNET/H Mode, MELSECNET/H Extended Mode	MELSECNET/H (10 Mbps / 25 Mbps) Optical Loop System
	MELSECNET/10 Mode	MELSECNET/10 Optical Loop System
Q80BD-J71BR11	MELSECNET/H Mode, MELSECNET/H Extended Mode	MELSECNET/H (10 Mbps) Coaxial Bus System
	MELSECNET/10 Mode	MELSECNET/10 Coaxial Bus System

Board model name	Supported network	
	Mode	
Q80BD-J71LP21G Q80BD-J71LP21GE	MELSECNET/H Mode, MELSECNET/H Extended Mode	MELSECNET/H (10 Mbps) Optical Loop System
	MELSECNET/10 Mode	MELSECNET/10 Optical Loop System

■Through the use of the PCI bus, it is not necessary to carry out troublesome switch settings.

The system can be used simply by installing the MELSECNET/ H board in the personal computer, then installing the software. The channel No., station No. and other settings can be carried out easily in the MNETH Utility.

■Compatibility with the previous MELSECNET/10 board's operations is maintained.

●Upward compatibility of user applications

The MELSECNET/H board is the same as the previous MELSECNET/10 board when it comes to the maximum number of boards that can be installed in a personal computer (No. of MELSECNET/10 boards and MELSECNET/H boards combined) and the channel No., etc. so you can continue to use your existing MELSECNET/10 boards.

●Compatible with the GX Developer and MX Component.

It is possible to access the PLC CPU using the GX Developer and MX Component from a personal computer where the MELSECNET/H board is installed.

■Compatible with QCPU (Q Mode) multiple CPU systems.

By using logical station No. station designations in the MNETH utility, it is possible to communicate with each CPU (Q Mode) in a multiple CPU system.

■Compatible with redundant CPU systems.*1

Only by specifying whether the destination is a control or standby station using the user-created application (MD functions), access is simply made without considering the current operating system state of the redundant CPU system.

*1: Supported by the function version D or later (attached driver package SW0DNC-MNETH- B[90K] or later).

■Compatible with MELSECNET/H Extended mode*2

The MELSECNET/H Extended mode is the extended MELECNET/H mode, which is extended in the maximum number of link points per station.
With this mode, the maximum number of link points per station can be set to 2000 bytes or more, i.e., up to 35840 bytes.
This mode is suitable for the system that needs many number of link points per station.
However, inapplicable to the redundant CPU system.

*2: Use the MELSECNET/H board ROM Version 2X or later and SWODNC-MNETH-B Version 11M or later.

■External power supply allows continuous network communication even during power-off of personal computer. (Function of the Q80BD-J71LP21S-25*3)

Since power is supplied externally, the Q80BD-J71LP21S-25 can continue network communication (baton passing) even if a personal computer is powered off and data link cannot be performed.
Therefore, a normally operating station connected between other stations with power-off computers will not be disconnected from the data link.
Another advantage is that the link scan time is stabilized since loopback can be also prevented.

*3: Use the SW0DNC-MNETH-B Version 12N or later.

■Drivers are provided for compatibility with each OS.

Each type of driver is provided, so it is easy to build a system that is compatible with the user environment.

Compatible OS	Microsoft® Windows® 95 Operating System (English Version)
	Microsoft® Windows® 98 Operating System (English Version)
	Microsoft® Windows NT® Workstation Operating System Version 4.0 (English Version)
	Microsoft® Windows® 2000 Professional Operating System (English Version)
	Microsoft® Windows® XP Professional Operating System (English Version)

■User programming functions are provided.

Through Microsoft® Visual Basic® and Microsoft® Visual C++® compatible functions, it is possible to carry out remote control of a PLC CPU or read and write to devices, and user applications can be created easily.

Function list

Name	Description
Data communications	Cyclic transmission function (Low speed cyclic transmission), transient transmission function, direct access of link devices, multiple transmission function (Optical loop system).
RAS function	Loopback function (master station transition function, master station return control function), automatic return function, loop monitoring function, self-diagnosis function, etc.

Performance Specifications

Item		Specifications			
		Q80BD-J71LP21-25	Q80BD-J71LP21S-25	Q80BD-J71LP21G	Q80BD-J71LP21GE
Maximum links in 1 network	LX/LY	8192 Points			
	LB	16384 Points (When in the MELSECNET/10 Mode[*1]: 8192 Points)			
	LW	16384 Points (When in the MELSECNET/10 Mode[*1] : 8192 Points)			
Maximum links in 1 station		• MELSECNET/H mode, MELSECNET/10 mode[*1] {(LY + LB) / 8 + (2 × LW)} ≦ 2000 bytes • MELSECNET/H Extended mode[*1] {(LY + LB) / 8 + (2 × LW)} ≦ 35840 bytes			
Communications rate [*1]		25Mbps/10Mbps		10Mbps	
Number of stations Connected to 1 network		64 Stations (Control station: 1; Normal station: 63)			
Connection cable		Optical fiber cable			
Total extension cable length		30km (98430 ft.)			
Between stations length[*2]	25Mbps	SI optical cable : 200m (656.2 ft.) H-PCF optical cable : 400m (1312.4 ft.) Broad-band H-PCF optical cable : 1km (3281 ft.) QSI optical cable : 1km (3281 ft.)		----	----
	10Mbps	SI optical cable : 500m (1640.5 ft.) H-PCF optical cable : 1km (3281 ft.) Broad-band H-PCF optical cable : 1km (3281 ft.) QSI optical cable : 1km (3281 ft.)		GI optical cable : 2km (6562 ft.)	62.5 GI optical cable : 2km (6562 ft.)
Maximum networks		239			
Maximum number of groups		32 (When in the MELSECNET/10 Mode: 9)			
Transmission channel format		Duplex loop			
Communications system		Token ring system			
Synchronization system		Frame synchronization system			
Encoding system		NRZI encoding (Non return to Zero inverted)			
Transfer format		HDLC Standard (Frame format)			
Error control system		CRC ($X^{16} + X^{12} + X^5 + 1$) and retry by overtime.			
RAS function		• Loop back function (optical loop system only) by abnormal detection and cable disconnection. • System down prevention through control station. • Error detection by the link special relay and link special register. etc.			
Transient transmission		N: N communications			
Special cyclic transmission		Low speed cyclic transmission			
Number of boards that can be installed		Maximum 4 boards [*2]			
Installation slot		PCI bus slot (Half size)			
Exclusive slots		1 slot	2 slot	1 slot	
External power supply	Voltage	----	20.4 to 31.2 V DC	----	
	Current	----	0.16 A	----	
	Connector	----	Connector set (Accessory)	----	
	Suitable cable size	----	0.50 to 1.25 mm^2 [AWG20-16]	----	
5 V DC Internal current consumption		0.46A	0.46A	0.45A	
Weight		0.10kg	0.20 kg	0.11kg	

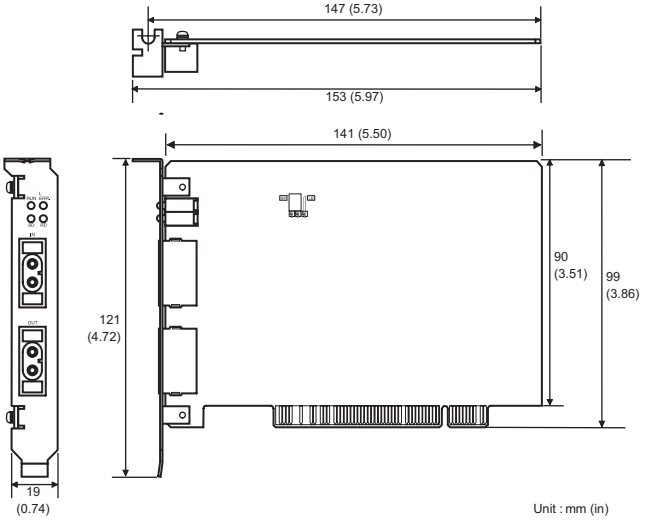
Item		Specifications
		Q80BD-J71BR11
Maximum links in 1 network	LX/LY	8192 Points
	LB	16384 Points (When in the MELSECNET/10 Mode[*1]: 8192 Points)
	LW	16384 Points (When in the MELSECNET/10 Mode[*1] : 8192 Points)
Maximum links in 1 station		• MELSECNET/H mode, MELSECNET/10 mode[*1] {(LY + LB) / 8 + (2 × LW)} ≦ 2000 bytes • MELSECNET/H Extended mode[*1] {(LY + LB) / 8 + (2 × LW)} ≦ 35840 bytes
Communications rate [*1]		10Mbps
Number of stations Connected to 1 network		32 Stations (Control station: 1; normal station: 31)
Connection cable		Optical fiber cable / Coaxial cable
Total extension cable length in 1 network		Cable name: 3C-2V — Total extension cable length: 300 m (Between stations: 300 m); Cable name: 5C-2V — Total extension cable length: 500 m (Between stations: 500 m) Can be extended to 2.5 km (8202.5 ft.) using a repeater unit (A6BR10, A6BR10-DC).
Maximum networks		239
Maximum number of groups		32 (When in the MELSECNET/10 Mode: 9)
Transmission channel format		Single Bus
Communications system		Token bus system
Synchronization system		Frame synchronization system
Encoding system		NRZI encoding (Non return to Zero inverted) / Manchester encoding
Transfer format		HDLC Standard (Frame format)
Error control system		CRC ($X^{16} + X^{12} + X^5 + 1$) and retry by overtime.
RAS function		•Loop back function (optical loop system only) by abnormal detection and cable disconnection. •System down prevention through control station. •Error detection by the link special relay and link special register. etc.
Transient transmission		N: N communications
Special cyclic transmission		Low speed cyclic transmission
Number of boards that can be installed		Maximum 4 boards[*2]
Installation slot		PCI bus slot (Half size)
Exclusive slots		1 slot
5 V DC Internal current consumption		0.67 A
Weight		0.11kg

*1: MELSECNET/H board communications rate and mode settings are performed using the MNETH Utility.

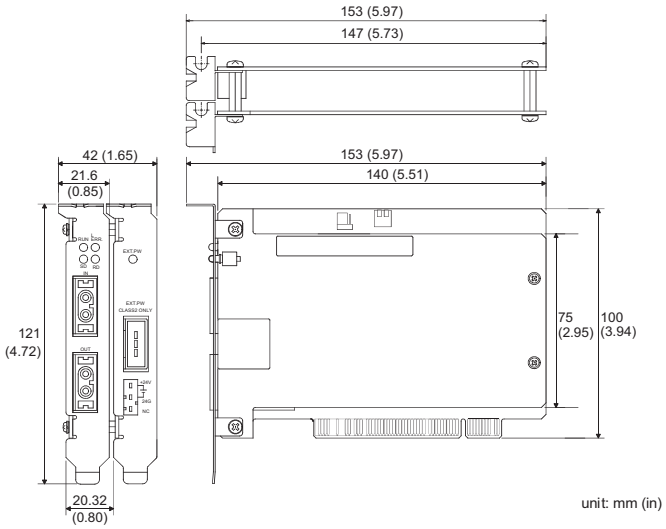
*2: The number of boards that can be installed is the combined number of MELSECNET/H boards and MELSECNET/10 boards.
When using the Q80BD-J71LP21-25, Q80BD-J71LP21S-25 at a communication speed of 25 Mbps, installing multiple boards with the same network No. is not allowed.
(Doing so may result in failures of all stations at OS startup, shutdown or board resetting.)

External dimensions

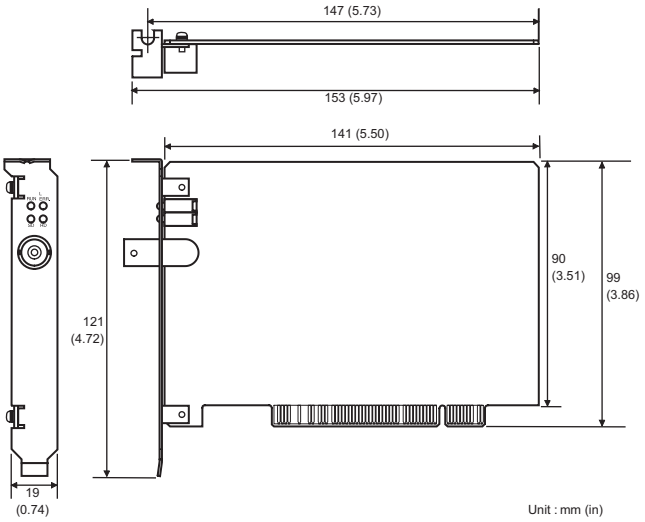
(1) Q80BD-J71LP21-25, Q80BD-J71LP21G



(2) Q80BD-J71LP21S-25

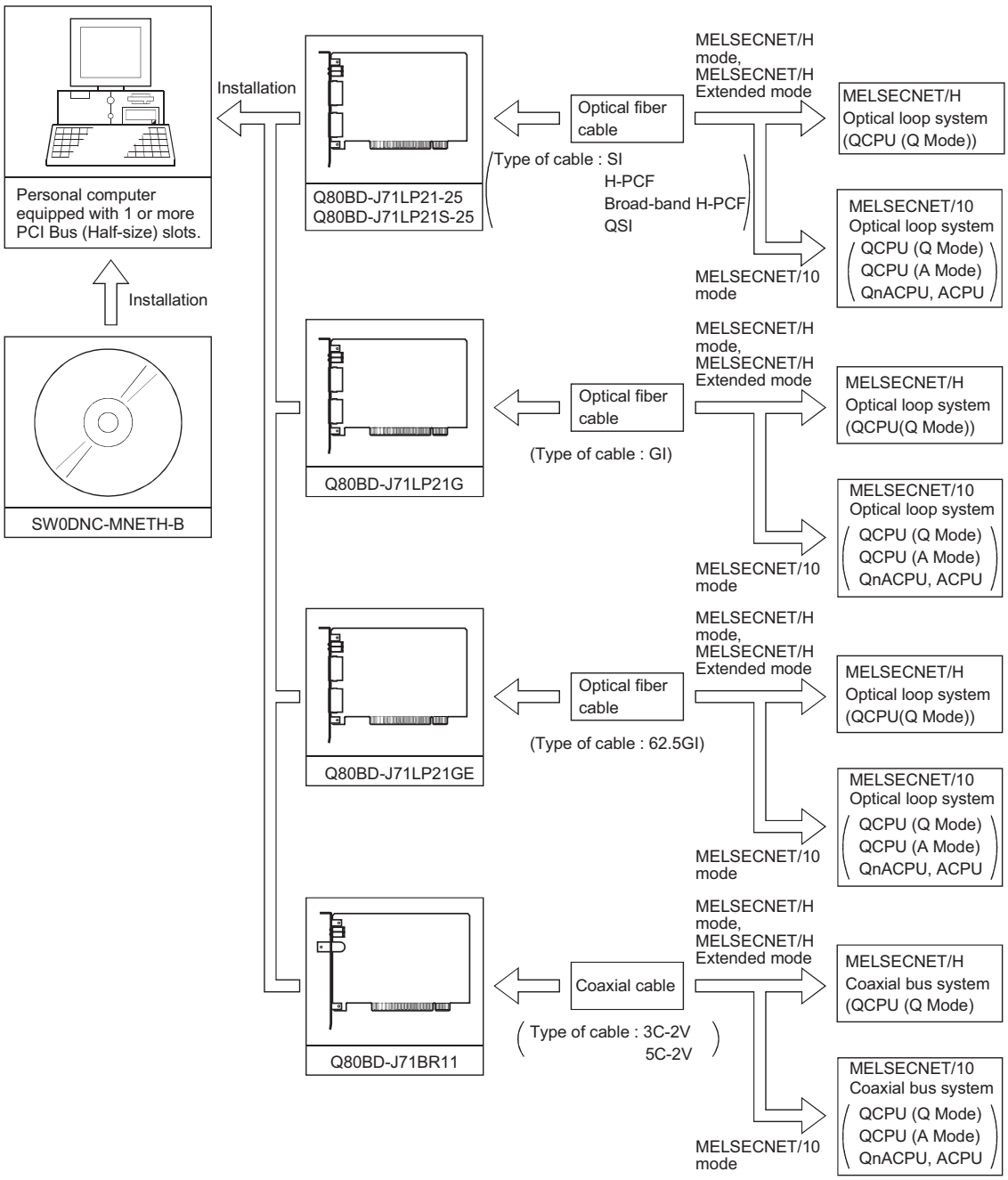


(3) Q80BD-J71BR11



System configuration

The system configuration when the MELSECNET/H board is mounted to a personal computer is shown below.



Operating environment

Item		Description
Personal computer	CPU Required memory	Personal computer (including FC98-NX®) with one or more PCI bus slots, which meets the specifications in "Applicable operating system and the corresponding required PC performance" shown on the following table *1, *2, *3.
	PCI bus specifications	5V DC, 32-bit bus, Basic clock: 33MHz
Operating system *4, *5, *6		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) *7, *8 Microsoft® Windows® 2000 Professional Operating System (English version) *7 Microsoft® Windows® XP Professional Operating System (English version) *7
Display		Resolution: 800 × 600 dot or higher (Recommended: 1024 × 768 dot) *9
Available hard disk space		20MB or more
Disk drive		CD-ROM disk drive
Programming language *10, *11		Microsoft® Visual Basic® 5.0 (English version) Microsoft® Visual Basic® 6.0 (English version) Microsoft® Visual Basic® .NET 2003 (English version) Microsoft® Visual C++® 5.0 (English version) Microsoft® Visual C++® 6.0 (English version) Microsoft® Visual C++® .NET 2003 (English version)

*1: This product does not work with a multiprocessor IBM-PC/AT-compatible personal computer, as the driver is incompatible.

*2: This board can be used in IBM PC/AT compatible PCs which conform to the PCI standard.
Using a PC not compliant with the PCI standard may result in a problem due to bad electrical contact, erroneous operation or other reason.

*3: For the Q80BD-J71LP21S-25, 2 slots are required for one PCI bus.

*4: The MELSECNET/H board does not support the Standby (Hibernate) mode of the operating system.
The Standby (Hibernate) mode may be preset tosome personal computers so that it will be activated by pressing the Power switch or by the UPS (Uninterruptible Power Supply system) setting.
For Windows ® 2000 Professional, select [Settings] - [Control Panel] - [Power Options] and disable the Standby mode setting.

*5: When exiting the operating system, always shut down the computer.

*6: The hyper-threading technology is supported by Windows ® XP Professional only.
When using this function, make sure to use the SW0DNC-MNETH-B version 11M or later.
When using the personal computer that includes the hyper-threading technology and Windows ® 95, Windows ® 98, Windows NT® Workstation 4.0 or Windows ® 2000 Professional, make sure to disable the function in the BIOS settings of the personal computer.

*7: Installation, uninstallation and usage of utilities are available only by the administrator's authority.

*8: Service Pack3 or higher is required when using Windows NT® Workstation 4.0.

*9: This product does not comply with large-sized fonts when Windows ® 2000 Professional or Windows® XP Professional is used.

*10: User programs created in the English environment work only in the English environment.

*11: When the operating system is Windows® 2000 Professional or Windows® XP Professional, use the following programming software.
(Visual Basic® 5.0 or Visual C++® 5.0 is not usable.)
- Visual Basic® 6.0, Visual Basic® .NET 2003
- Visual C++® 6.0, Visual C++® .NET 2003

Applicable operating system and the corresponding required PC performance

Operating system	Description	
	CPU	Required memory
Windows® 95	Pentium® 133MHz or higher	32MB or more
Windows® 98	Pentium® 133MHz or higher	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or higher	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or higher	64MB or more
Windows® XP Professional	Pentium® 300MHz or higher	128MB or more

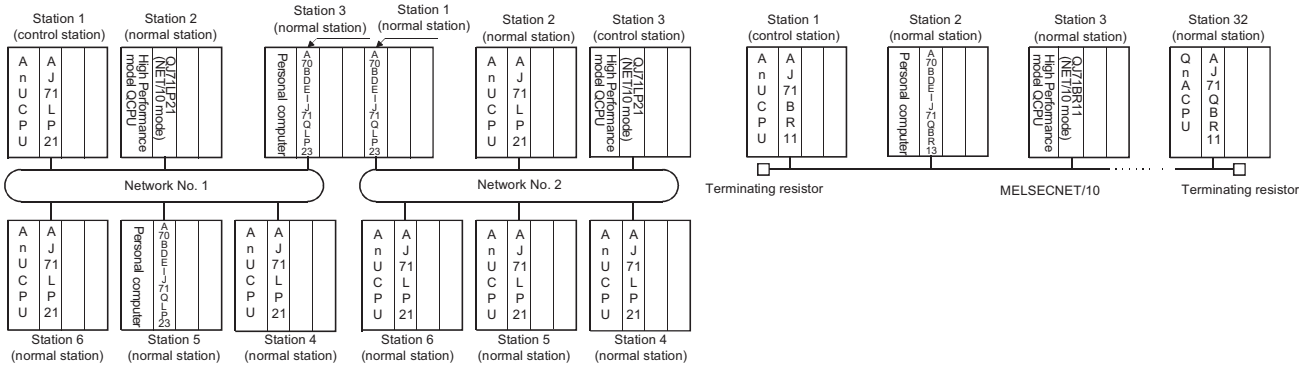
Bundled items

Product	Description
Software	SW0DNC-MNETH-B software (CD-ROM)
Connector set	For external power supply cable (attached to Q80BD-J71LP21S-25 only)
F-type connector	F connector × 1 pc. (attached to Q80BD-J71BR11 only)
Manual	MELSECNET/H Interface Board User's Manual (Hardware)

4.2 MELSECNET/10 Boards

4.2.1 A70BD-J71QLP23,A70BD-J71QLP23G,A70BD-J71QBR13,A70BD-J71QLR23

Overview



Multi-level system **Coaxial bus system**

By being mounted on a personal computer as an option board, these boards allow the PC to be connected *3 to the MELSECNET/10 *1 network.

The following shows MELSECNET/10 boards compatible with personal computers *2.

Board model name	Compatible network
A70BD-J71QLP23	MELSECNET/10 (Optical loop system)
A70BD-J71QLP23G	MELSECNET/10 (Optical loop system)
A70BD-J71QBR13	MELSECNET/10 (Coaxial bus system)
A70BD-J71QLR23	MELSECNET/10 (Coaxial loop system)

*1: Not compatible with the MELSECNET/H mode.
*2: FC98-NX is included.
*3: Not capable of accessing to Basic Model QCPUs, Process QCPUs, and Redundant CPUs.

Features

■A personal computer can be incorporated into MELSECNET/H.

You can install the MELSECNET/10 board into a personal computer to use the personal computer as a normal station on the MELSECNET/10 network.

■Test and monitor information related to data link are displayed on the CRT screen.

Operation becomes easy since the data-link testing and monitoring statuses are displayed on the CRT screen of personal computer.

■The board has two communication functions: cyclic communication and transient communication.

The board has two communication functions: cyclic communication in which data is refreshed in accordance with the network parameters set in the control station; transient communication enables to access PC to PLC at optional timing programmed on PC. In transient communication, Normal station PCs can communicate with the PLC on a control station and normal station via data communication (Q/QnA dedicated instruction), device reading and writing, and so on.

■Various functions are available to accommodate user programming.

Various functions that can be used with Visual C++ and Visual Basic are provided, making it possible to easily create user programs to perform remote control for the PLC CPU as well as reading from and writing to devices.

■Availability of drivers according to various operating systems

You can configure a system according to your PCs operating environment with the various drivers provided.

Compatible OS	Microsoft® Windows® 95 (English version)
	Microsoft® Windows® 98 (English version)
	Microsoft® Windows NT® Workstation 4.0 (English version)
	Microsoft® MS-DOS® 6.2/V *1 (English version)
	Microsoft® Windows® 3.1 (English version)

*1: The driver for MS-DOS®, Windows® 3.1 cannot access the HighPerformance model QCPU system.
*2: Not usable with A70BD-J71QLR23.

Function list

Name	Description
Data communications	Cyclic communication function, transient communication function, multiple transmission function (for duplex loop system)
RAS function	Loopback function, automatic return function, loop monitoring function, self-diagnosis function

Performance specifications

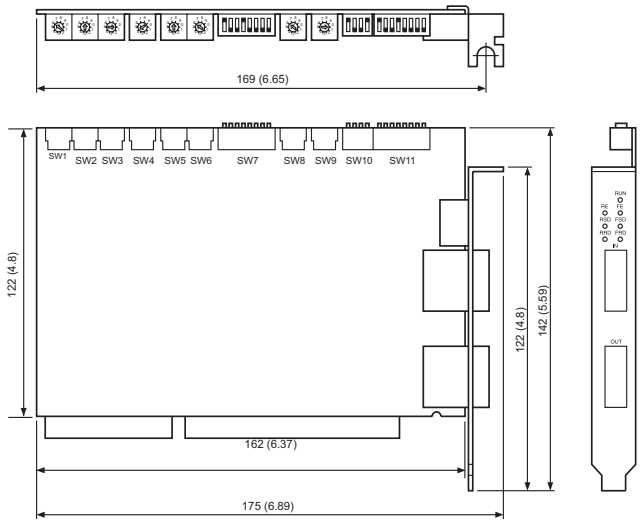
Item		Specifications			
		Optical loop system		Coaxial loop system	Coaxial bus system
		A70BD-J71QLP23	A70BD-J71QLP23G	A70BD-J71QLR23	A70BD-J71QBR13
Maximum number of link points per network	LX/LY	8192 points			
	LB	8192 points			
	LW	8192 points			
Maximum number of link points per link		LW × 2 + (LB + LY) / 8 ≦ 2000 bytes			
Connection cable		Optical (SI, H-PCF, broad-band H-PCF, QSI)	Optical (GI)	Coaxial (3C-2V, 5C-2V)	
Transmission speed		10MBPS (equivalent to 20MBPS in multiple transmission)		10MBPS	
Communication system		Token ring system		Token bus system	
Transmission path format		Duplex loop		Simplex bus	
Stations connected in one network *1		64 stations (control station: 1, normal stations: 63)		32 stations (control station: 1, normal station: 3.1)	
Control station/normal station		Normal station (does not operate as control station)			
Other network specifications		Other specifications conform to network between PCs of those of MELSECNET/10.			
Number of loadable boards		ISA bus slot (MELSECNET/10 board for personal computer)			
Loading slot		Max. 4 (Total number of MELSECNET/H boards and MELSECNET/10 boards)			
Number of occupied slots		1 slot/board			
5VDC internal current consumption		0.53A	0.52A	1.3A	0.74A
Weight		0.17kg	0.19kg	0.17kg	0.19kg

*1: Not capable of accessing to Basic Model QCPUs, Process CPUs, and Redundant CPUs.

*2: The MELSECNET/10 boards on PC do not provide the inter-loop transfer function or routing function.

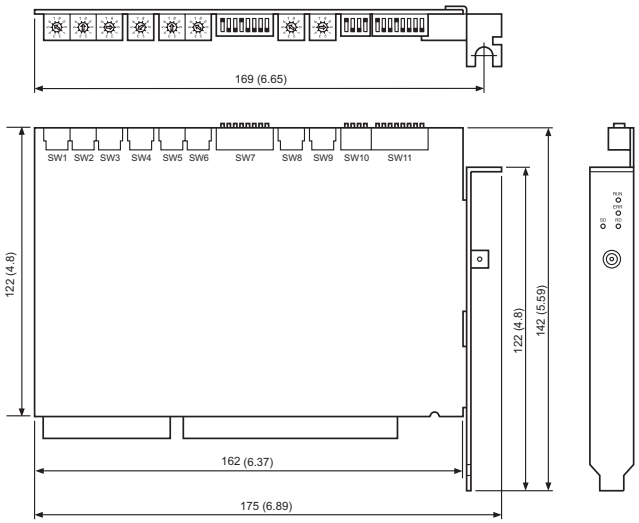
External dimensions

(1) A70BD-J71QLP23, A70BD-J71QLP23G



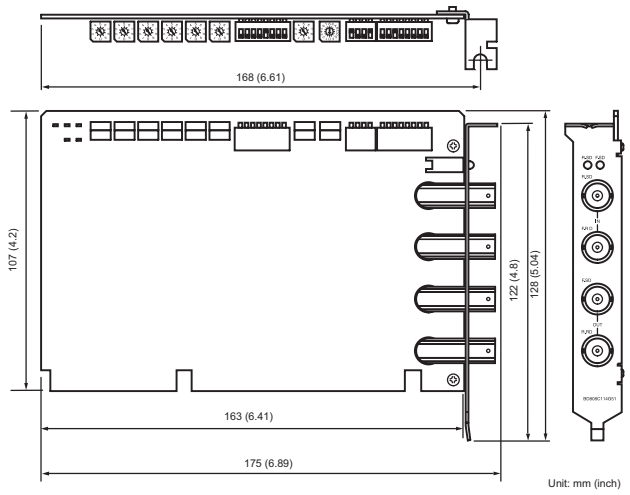
Unit: mm (inch)

(2) A70BD-J71QBR13



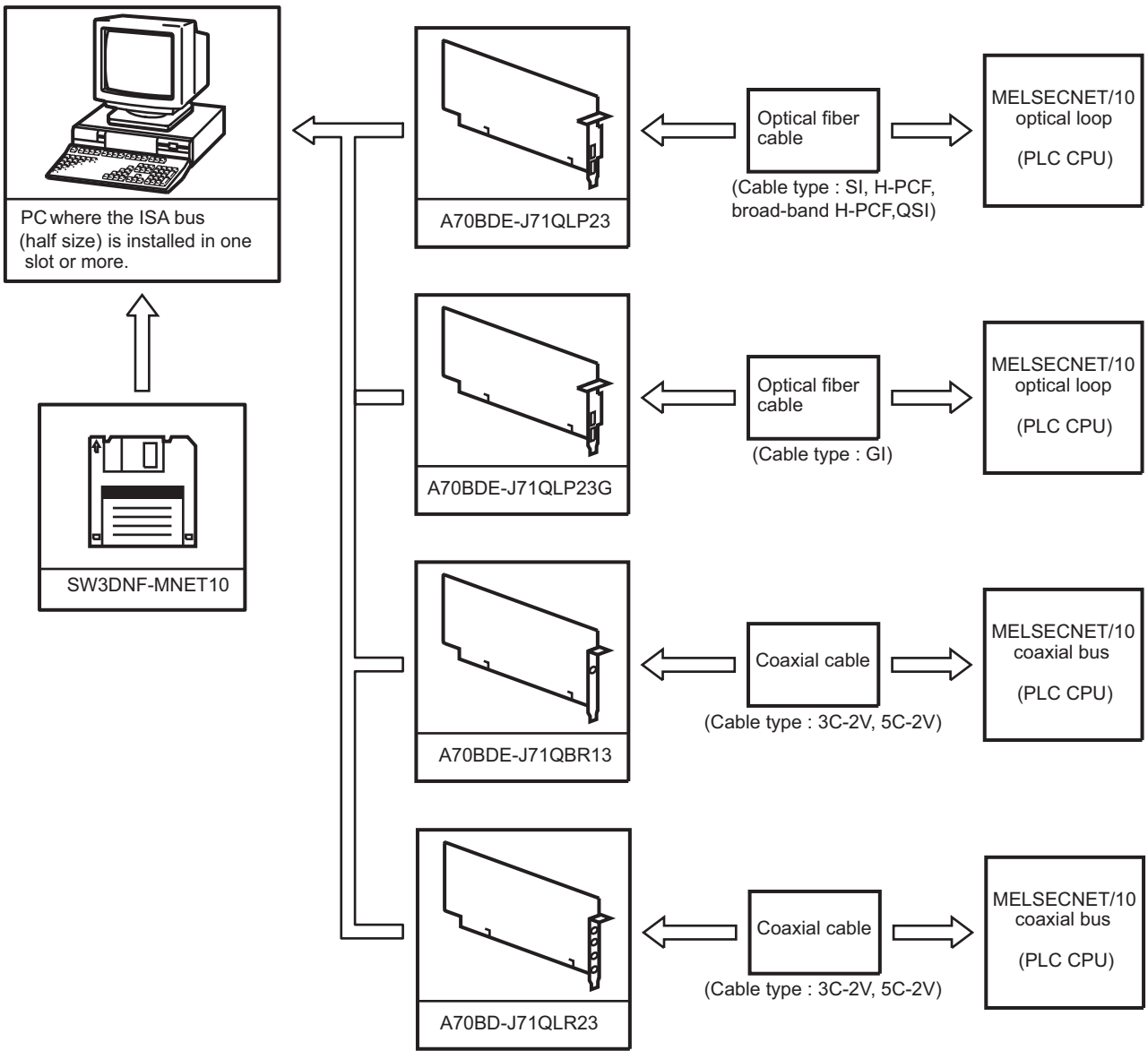
Unit: mm (inch)

(3) A70BD-J71QLR23



System configuration

The following illustration shows the system configuration when an MELSECNET/10 board is installed in an IBM PC/AT compatible PC.



Operating environment

Item		Description
PC		PC installed Pentium 133MHz or higher and a built-in ISA bus slot (half size)*1
Operating system *2, *3		Windows 95 (English version), Windows 98 (English version), Windows NT Workstation 4.0 (English version)*4, MS-DOS Ver. 6.2 (English version), Windows 3.1 (English version)*4, *5
Programming*6 language	MS-DOSVer6.2/V	Visual C++ Ver1.5J (English version)
	Windows 3.1	Visual C++ Ver1.51J (English version)
	Windows 95	Visual Basic Ver4.0 (English version), Visual Basic Ver5.0 (English version)
	Windows 98	Visual Basic Ver6.0 (English version), Visual C++ Ver4.2 (English version)
	Windows NT 4.0	Visual C++ Ver5.0 (English version), Visual C++ Ver6.0 (English version)
Required memory size		32 MB or more
Hard disk free space		9 MB or more
Disk drive (required when installing the driver)		3.5 inch (1.44 MB) floppy disk drive

*1: This product does not work with a multiprocessor personal computer, as the driver is incompatible.
*2: The I/F board does not support the Standby (Hibernate) mode of the operating system.
The Standby (Hibernate) mode may be preset to some personal computers so that it will be activated by pressing the Power switch or by the UPS (Uninterruptible Power Supply system) setting.
*3: When exiting the operating system, always shut down the computer.
*4: Installation and usage of utilities are available only by the administrator's authority.
*5: A70BD-J71QLR23 is not compatible with Windows 3.1 (English version).
*6: User programs written in English language environment can be used in English environment only.

Accessories

Product	Description
Software	SWnDNF-MNET10 software (driver)
Connector	BNC F connector × 1 pc. (attached to A70BD-J71QBR13 only)
Manual	MELSECNET/10 Interface Board User's Manual

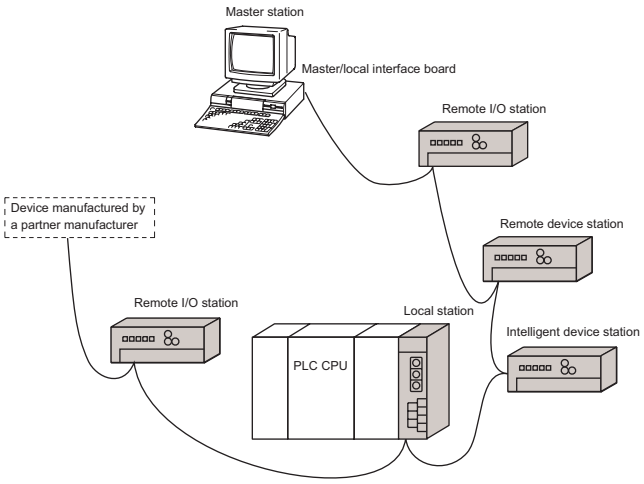
4.3 CC-Link Boards

4.3.1 Q80BD-J61BT11N

Overview

The term CC-Link is the abbreviation for Control & Communication Link.
The CC-Link system connects distributed modules such as an I/O module and a special functional module using CC-Link dedicated cables so that these modules can be controlled by the PLC CPU.

(1) By distributing each module to facility equipment such as a conveyor line and a machine device, the entire system can be connected in the most efficient manner.
(2) The on/off information of input/output and numeric data handled by modules can easily be sent and received at high speed.
(3) A simple distributed system can be configured by connecting multiple PCs and PLC CPUs.
(4) By connecting various devices made by Mitsubishi's partner manufacturers, the system that can provide flexible solutions to meet a wide range of user needs may be configured.



The CC-Link board can be installed into a PCI bus slot as an optional board of a personal computer to connect the to the CC-Link system.
Two kinds of CC-Link boards are available.
Q80BDE-J61BT11N (hereinafter referred to as CC-Link Ver.2 board) supports both master function and local function of CC-Link.

Features

■PC can be incorporated into the CC-Link system.

PC can be incorporated into the CC-Link system.
Installing CC-Link Ver.2 board into a PC allows the PC to be used as a master station, standby master station, or local station compatible with CC-Link Ver.2.

■Programs in the CC-Link Ver.1 board can also be used in the CCLink Ver.2 board.

Programs in the CC-Link Ver.1 board can also be used in the CC-Link Ver.2 board
Programs developed for A80BD-J61BT11 and A80BD-J61BT13 (hereinafter referred to as CC-Link Ver.1 board) can be used for the CC-Link Ver.2 board.

■Parameters set for the CC-Link Ver.1 board can also be used for the CC-Link Ver.2 board.

Parameters set for the CC-Link Ver.1 board can be reused for the CC-Link Ver.2 board.

■Using the PCI bus eliminates troublesome switch settings.

Simply installing the CC-Link board on the PCI bus automatically executes the initial settings.

■Parameters can easily be set.

The parameters necessary for the operation of the CC-Link system can easily be set with a CC-Link Ver.2 utility program; thus, programming is simplified.

■Test and monitoring information related to the CC-Link system can be displayed.

The test and monitoring states in the CC-Link system can be easily displayed on a PC.

■Support for QCPUs (Q mode) of a multiple CPU system

By specifying the station number of the logical station number via the CC-Link Ver.2 utility, communication with each QCPU (Q mode) of a multiple CPU system can be performed.

■It provides the functions that support user programming.

It is possible to perform the remote control of remote I/O stations, remote device stations, intelligent device stations, and local stations, as well as reading and writing of devices using the functions that support Microsoft® Visual C++® , Microsoft® Visual Basic®,Microsoft® Visual Basic® .NET 2003 and Microsoft® Visual C++® .NET 2003. Thus, user program can easily be created.

Example: Control of the input signal X and output signal Y of a remote I/O station
Analogue voltage output control of a remote device station (analogue module)
Communication control of an intelligent device station (RS-232C module)

■It provides the drivers for various operating systems.

Various drivers are provided for easy system configuration according to the user environment.

Supported OS
Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)
Microsoft® Windows® 2000 Professional Operating System (English version)
Microsoft® Windows® XP Professional Operating System (English version)
Microsoft ® Windows ® XP Home Edition Operating System (English version)

Function list

Name	Description
Data communications	Cyclic communication function, transient communication function
RAS function	Offline test function, automatic return function, slave station disconnecting function, self-diagnostic function

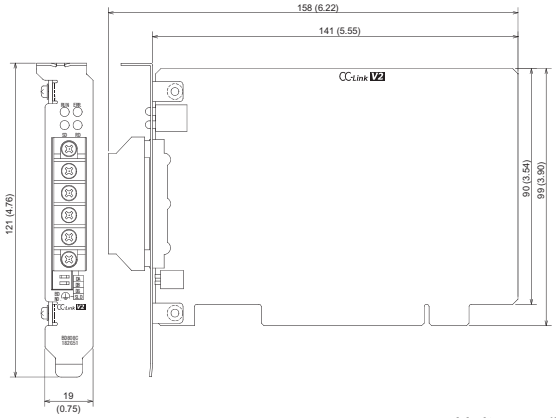
Performance specifications

Item	Specifications
Type	Q80BD-J61BT11N
Transmission speed	Can be selected from among 156kbps, 625kbps, 2.5Mbps, 5Mbps and 10Mbps.
Connection cable	CC-Link dedicated cable/ CC-Link dedicated high performance cable/Ver. 1.10 corresponding CC-Link dedicated cable*1
Communication method	Broadcast Polling method
Max. transmission distance	Max. 1.2km (3934.43feet) (depending on transmission speed).
Number of occupied stations (For local station)	In remote net ver.1 mode: 1 or 4 station(s) (Can be changed by the utility parameter setting.) In remote net ver.2 mode, remote net additional mode: 1 to 4 station(s) (Can be changed by the utility parameter setting.)
Number of loadable boards	Max. 4*2
Loading slot	PCI bus slot (half size)
Occupied slots	1 slot
DC5V Internal current consumption	0.56A
Weight	0.11kg

*1: The CC-Link dedicated cable and CC-Link dedicated high performance cable cannot be used together.
*2: Using the CC-Link Ver.2 board and the CC-Link Ver.1 board in the same computer is not allowed.

External dimensions

(1) Q80BD-J61BT11N



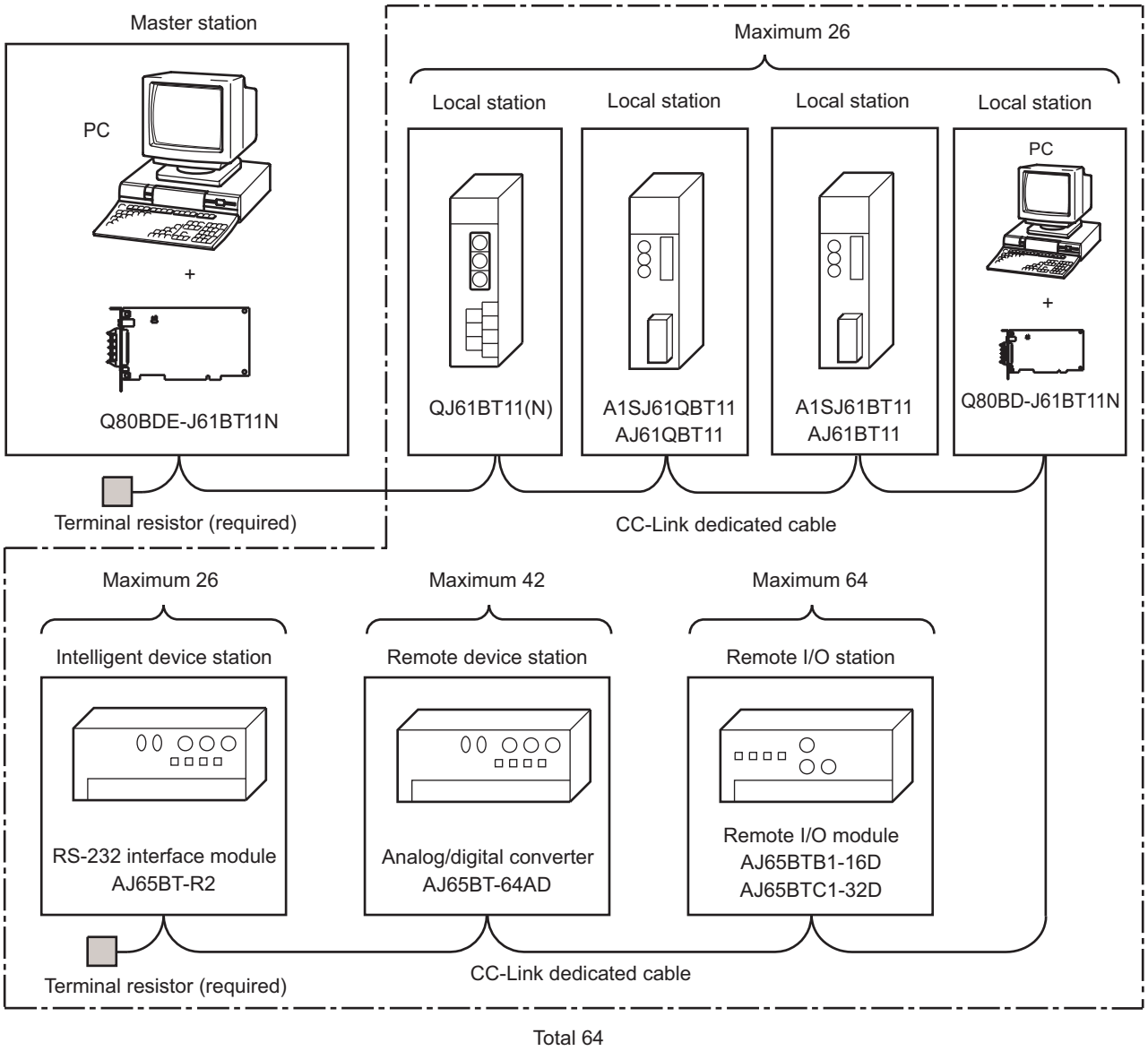
Unit: mm (inch)

System configuration

A total of 64 remote I/O stations, remote device stations, local stations, standby master stations, and intelligent device stations can be connected to a single master station.
However, the following conditions must be satisfied:

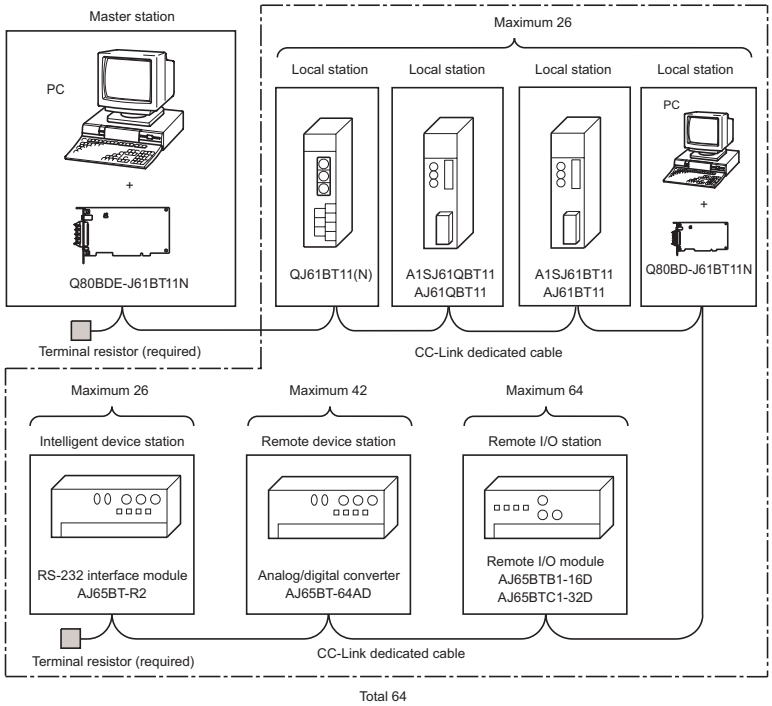
(1) Remote net ver.1 mode

Condition 1	{(1×a) + (2×b) +(3×c) + (4×d)} ≦ 64	a: Number of modules occupying 1 station b: Number of modules occupying 2 stations c: Number of modules occupying 3 stations d: Number of modules occupying 4 stations	
Condition 2	{(16×A) {(54×B) {(88×C)} ≦ 2304	A: Number of remote I/O stations B: Number of remote device stations C: Number of local stations, standby master stations and intelligent device stations	≦ 64 ≦ 42 ≦ 26



(2) Remote net ver.2 mode, remote net additional mode

Condition 1	{(a+a2+a4+a8) +(b+b2+b4+b8)×2 +(c+c2+c4+c8)×3 +(d+d2+d4+d8)×4} ≦ 64	a: The total number of ver.1 compatible slave stations that occupy 1 station, and ver.2 compatible slave stations that occupy 1 station which are set to "Single".Number of modules occupying 2 stations b: The total number of ver.1 compatible slave stations that occupy 2 stations, and ver.2 compatible slave stations that occupy 2 stations which are set to"Single".Number of modules occupying 4 stations c: The total number of ver.1 compatible slave stations that occupy 3 stations, and ver.2 compatible slave stations that occupy 3 stations which are set to"Single ". d: The total number of ver.1 compatible slave stations that occupy 4 stations, and ver.2 compatible slave stations that occupy 4 stations which are set to "Single ".
Condition 2	[{(a×32+(a2×32)+(a4×64)+(a8×128)} + {(b×64)+(b2×96)+(b4×192)+(b8×384)} + {(c×12)+(c2×160)+(c4×320)+(c8×640)} +{(d×128)+(d2×224)+(d4×448)+(d8×896)}] ≦8192	a2: The number of ver.2 compatible stations that occupy 1 station which are set to "Double". b2: The number of ver.2 compatible stations that occupy 2 stations which are set to "Double". c2: The number of ver.2 compatible stations that occupy 3 stations which are set to "Double". d2: The number of ver.2 compatible stations that occupy 4 stations which are set to "Double". a4: The number of ver.2 compatible stations that occupy 1 station which are set to "Quadruple". b4: The number of ver.2 compatible stations that occupy 2 stations which are set to "Quadruple". c4: The number of ver.2 compatible stations that occupy 3 stations which are set to "Quadruple". d4: The number of ver.2 compatible stations that occupy 4 stations which are set to "Quadruple".
Condition 3	[{(a×4)+(a2×8)+(a4×16)+(a8×32)} +{(b×8)+(b2×16)+(b4×32)+(b8×64)} +{(c×12)+(c2×24)+(c4×48)+(c8×96)} +{(d×16)+(d2×32)+(d4×64)+(d8×128)}] ≦ 2048	a8: The number of ver.2 compatible stations that occupy 1 station which are set to "Octuple". b8: The number of ver.2 compatible stations that occupy 2 stations which are set to "Octuple". c8: The number of ver.2 compatible stations that occupy 3 stations which are set to "Octuple". d8: The number of ver.2 compatible stations that occupy 4 stations which are set to "Octuple".
Condition 4	{(16×A)+(54×B)+(88×C)}] ≦ 2034	A: Number of remote I/O stations ≦64 B: Number of remote device stations ≦42 C Number of local stations, standby master stations and intelligent device stations ≦26



Operating environment

Item		Description
Personal computer	CPU / Required memory	IBM-PC/AT-compatible personal computer with one or more PCI bus slots, satisfying the specifications described below in "Applicable operating system and the corresponding required PC performance"*1, *2
	PCI bus specifications	5V DC, 32-bit bus, Basic clock: 33MHz
Operating system*3, *4		Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)*5, *6 Microsoft® Windows® 2000 Professional Operating System (English version)*5 Microsoft® Windows® XP Professional Operating System (English version)*5 Microsoft ® Windows ® XP Home Edition Operating System (English version)*5
Display		Resolution: 800 × 600 dot or higher (Recommended: 1024 × 768 dot)*7
Available hard disk space		20MB or more
Disk drive (required when installing the driver)		CD-ROM disk drive
Programming language*8, *9		Microsoft® Visual Basic® 5.0 (English version), Microsoft® Visual Basic® 6.0 (English version), Microsoft® Visual C++® 5.0 (English version), Microsoft® Visual C++® 6.0 (English version), Microsoft ® Visual Basic ® .NET 2003 (English version), Microsoft ® Visual C++® .NET 2003 (English version)

*1: This product does not work with a multiprocessor IBM-PC/AT-compatible personal computer, as the driver is incompatible.

*2: This board can be used in PC which conform to the PCI standard.
Using a PC not compliant with the PCI standard may result in a problem due to bad electrical contact, erroneous operation or other reason.

*3: This board does not support the Standby (Hibernate) mode of the operating system.
The Standby (Hibernate) mode may be preset to some personal computers so that it will be activated by pressing the Power switch or by the UPS (Uninterruptible Power Supply system) setting.
For Windows® 2000 Professional, Windows ® XP Professional and Windows ® XP Home Edition, select [Settings]-[Control Panel]-[Power-Options] and choose "Never" in the System standby.

*4: When exiting the operating system, always shut down the computer.

*5: Installation, uninstallation and usage of utilities are available only by the administrator's authority.

*6: Service Pack3 or higher is required when using Windows NT® Workstation 4.0.

*7: This product does not comply with large-sized fonts when Windows ® 2000 Professional, Windows ® XP Professional or Windows ® XP Home Edition is used.

*8: User programs created in the English environment work only in the English environment.

*9: When the OS is Windows® 2000 Professional, Windows ® XP Professional or Windows ® XP Home Edition, Visual Basic ® 5.0 and Visual C++® 5.0 are not available.
When using Windows NT® Workstation 4.0, Microsoft® Visual Basic® .NET 2003 and Microsoft ® Visual C++® .NET 2003 are not available.

Applicable operating system and the corresponding required PC performance

Operating system	Description	
	CPU	Required memory
Windows NT® Workstation 4.0	Pentium® 133MHz or higher	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or higher	64MB or more
Windows® XP Professional	Pentium® 300MHz or higher	128MB or mores
Windows® XP Home Edition	Pentium® 300MHz or higher	128MB or mores

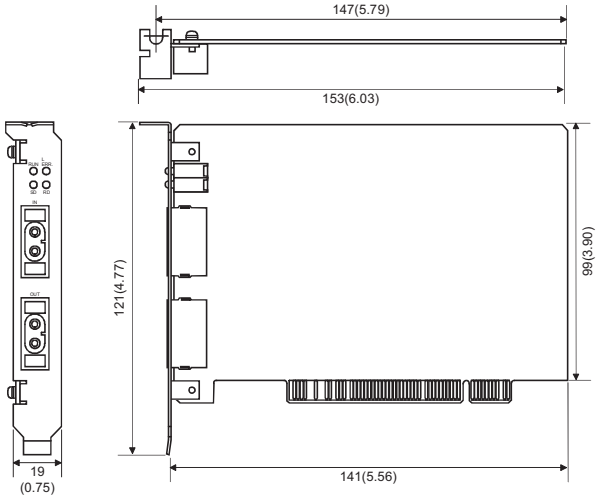
Bundled items

Product name	Description
Software	SWnDNC-CCBD-2 type CC-Link software package (CD-ROM)
Manual	CC-Link Interface Board User's Manual (Hardware)
Terminating resistor	110Ω1/2W(brown-brown-brown), 130Ω1/2W(brown-orange-brown), two for each

4.4 External Dimensions

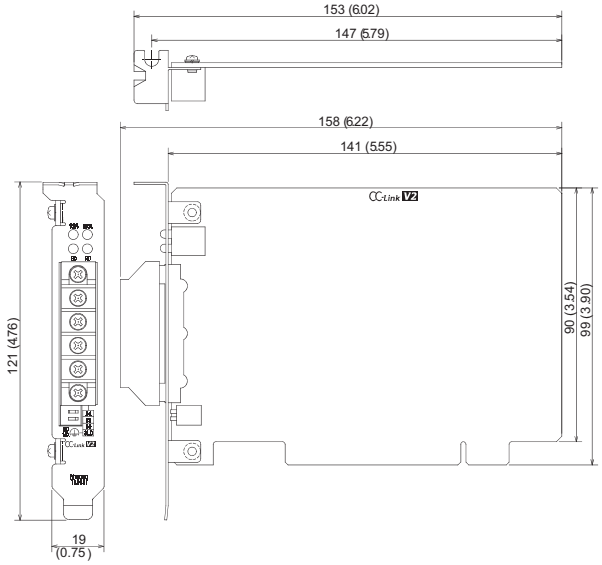
■Q80BD-J71LP21-25, Q80BD-J71LP21G, Q80BD-J71BR11

(1) Q80BD-J71LP21-25, Q80BD-J71LP21G



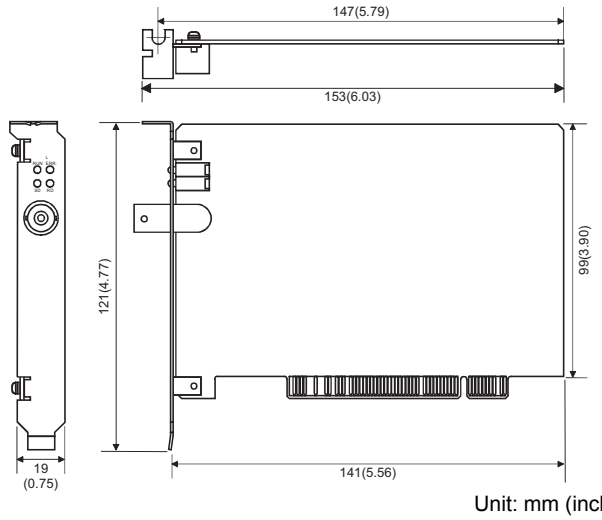
Unit: mm (inch)

(2) Q80BD-J71LP21S-25



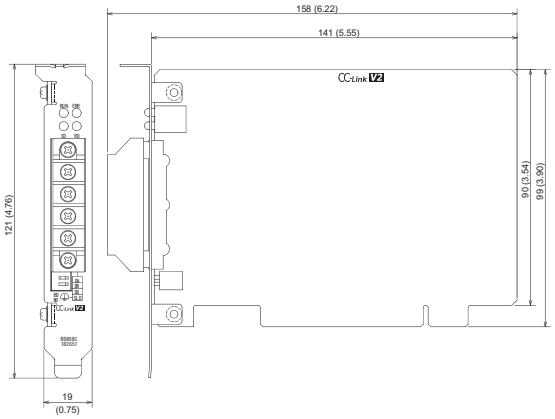
Unit: mm (inch)

(3) Q80BD-J71BR11



Unit: mm (inch)

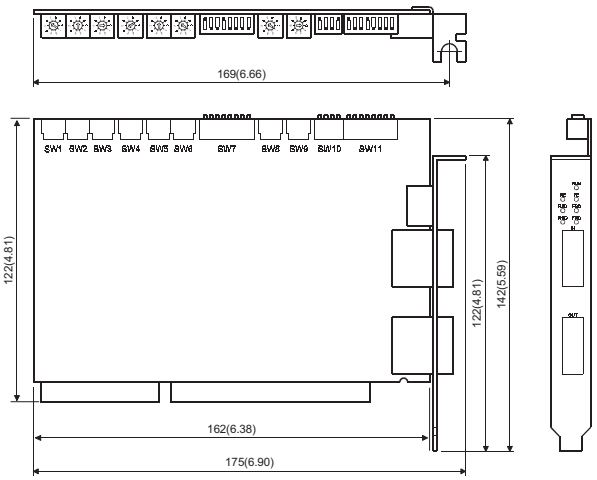
■Q80BD-J61BT11N



Unit: mm (inch)

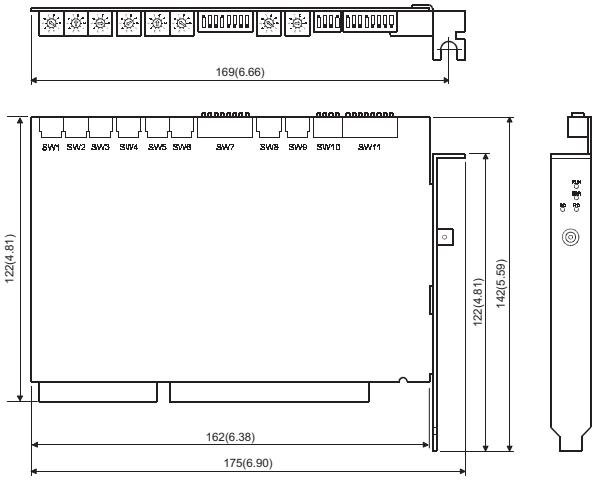
■A70BD-J71QLP23, A70BD-J71QLP23G, A70BD-J71QBR13, A70BD-J71QLR23

(1) A70BD-J71QLP23, A70BD-J71QLP23G



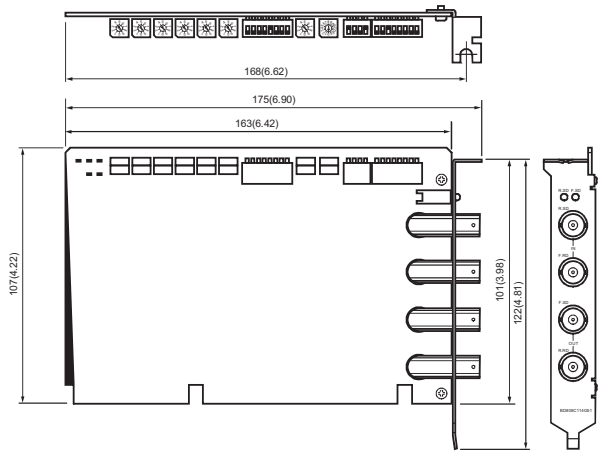
Unit: mm (inch)

(2) A70BD-J71QBR13



Unit: mm (inch)

(3) A70BD-J71QLR23



Unit: mm (inch)

MEMO

Chapter 5

INTEGRATED FA SOFTWARE MELSOFT

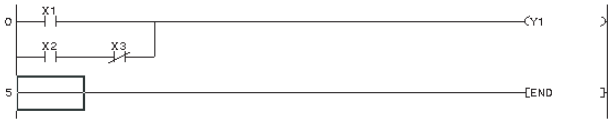
5.1 GX Series

5.1.1 MELSEC PLC programming software: GX Developer

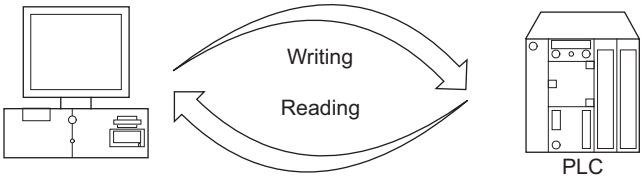
Outline

This section explains GX Developer (unless otherwise specified, the product name represented GX Developer will hereafter be its English version 8).
GX Developer is a software package having the following functions.

■ Program creation



■ Writing and reading to/from PLC



■ Monitoring (example: device batch monitoring)

The circuit monitor, device batch monitor, and device registration monitor can be used for monitoring.

Device	+F E D C	+B A 9 8	+7 6 5 4	+3 2 1 0	
D01	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0
D02	0 0 0 0	0 0 0 0	0 0 1 0	0 1 0 1	37
D03	0 0 0 0	0 0 0 0	1 0 0 1	0 0 0 0	144

■ Debugging

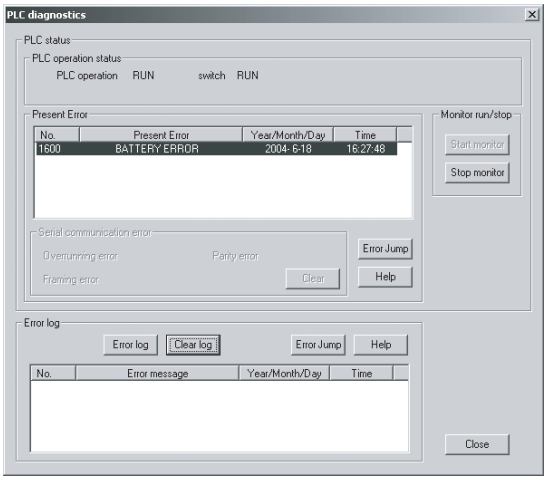
The created sequence program is written into PLC to test that the written sequence program operates normally.

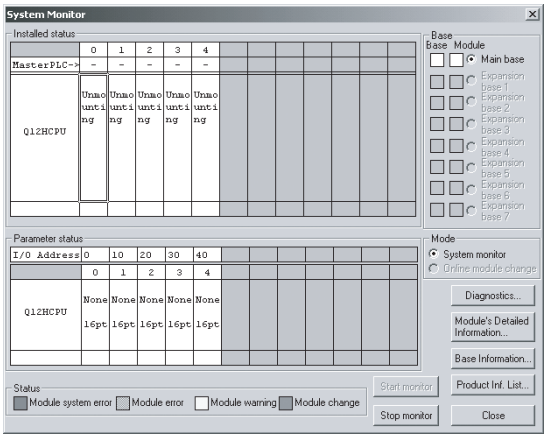
In addition, newly developed GX Simulator*1 (unless otherwise specified, the product name represented GX Simulator will hereafter be its English version 6) can be used to debug the program on a single personal computer.

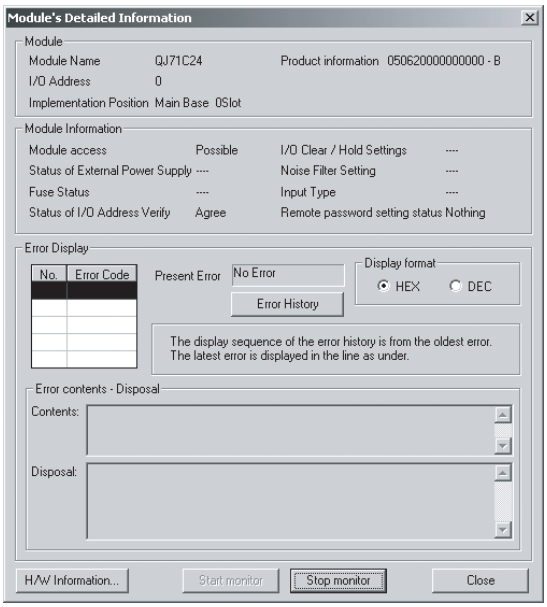
*1: GX Simulator is sold separately.

■ Diagnosing PLC

The current error status, error status or error log can be displayed to shorten the time required for error recovery. Also, system monitoring (QCPU (Q mode) only) provides in-depth information on the special functions. Therefore, if an error occurs, recovery work can be done in much shorter time.







Features

■ Common software

GX Developer can create the data of the Q series, QnA series, A series (including the motion controller (SCPU)) and FX series, with their setting operations common. When the A series and QnA series are selected, data can be converted into a SW□-GPPA type GPP function software (hereafter abbreviated to GPPA. Note that this does not apply to the A6GPP/A6PHP-compatible software) and SW□-GPPQ type GPP function software (hereafter abbreviated to GPPQ) format file and you can edit data on GPPA or GPPQ.
When the FX series is selected, data can be converted into a DOS version programming software (hereafter abbreviated to FXGP(DOS)) or SW0PC-FXGP/WIN programming software (hereafter abbreviated to FXGP(WIN)) format file and you can edit data on FXGP(DOS) or FXGP(WIN).

■ Advantages of Windows® are utilized for dramatic improvements in operability

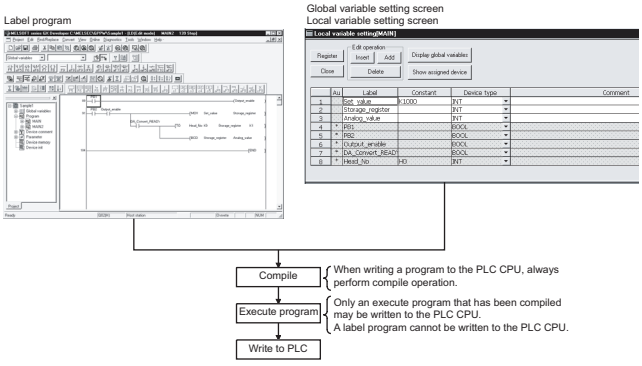
Comment data created on Excel, Word or the like can be copied or pasted for data diversion.

■ Standardized programs

●Label programming

By using label programming to create sequence programs, you can create standard programs with labels without considering device numbers.
The programs created by label programming can be compiled for use as an actual program.
Label programming enables more efficient designing.

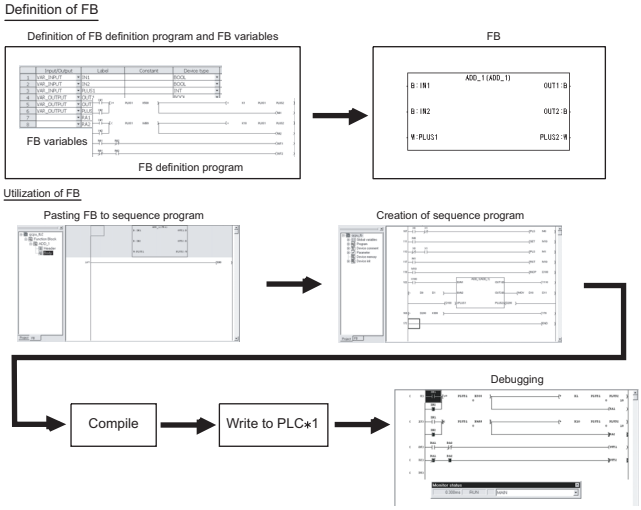
- General programs created with the label programming allow device assignment to be changed according to the device configuration, therefore can be easily used in another program.
- By using labels, programs can be created even when device configuration is not defined.
- When device configuration is defined, programs for execution can be easily created simply by associating the labels with actual devices.
- The user can simply specify the label assignment method in order to have the compiler automatically assign device numbers.
- Placing label names on monitor/debug programs is possible. This realizes more efficient debugging.



● Function block (hereafter abbreviated to the FB)

The FB is a function developed to improve the efficiency of developing sequence programs. The ladder blocks of a sequence program that are used repeatedly for sequence program development are converted into components to facilitate sequence program development. Also, the conversion of ladder blocks into components prevents sequence program inputting mistakes when they are utilized for other sequence programs.

Programming procedure using FB



*1: GX Developer writes the compiled sequence program to the PLC CPU. Hence, the FB cannot be displayed if read from PLC is performed to read the sequence program from the PLC CPU. Carefully store the sequence program that is not yet compiled since it is needed to correct the FB.

The FB has the following features.

(1) Conversion of program into component
Displaying a standard program as a single block improves the reuse and readability of the program, facilitating editing and debugging. This ensures ease of configuring a large-scale program.

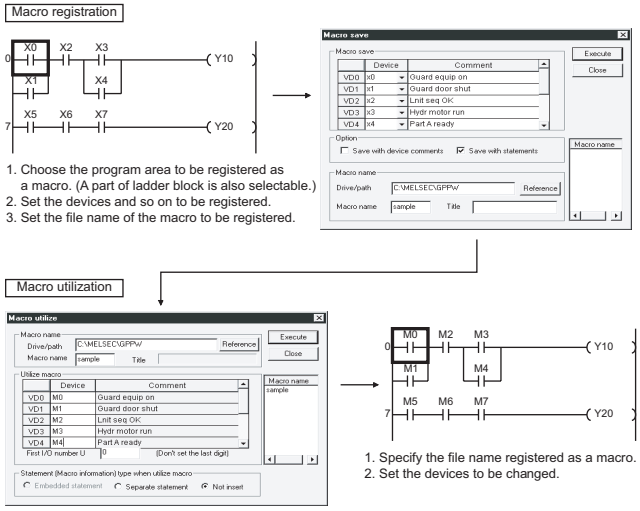
(2) Uniform program quality
Reusing the components of a standard program provides uniform program quality, which is independent of the technological level of a program developer. It also prevents programming mistakes during utilization.

(3) Editing function of high operability
The FB can be utilized easily in a sequence program by drag and drop operation.

(4) Selecting programming language suitable for the application
Ladder program and structured text (ST) program are available for creating FBs.

● Macros

By naming any ladder patterns (macro names) and registering them to a file (macro registration), merely entering simple instructions allows the registered ladder patterns to be read and the devices to be changed for data diversion.



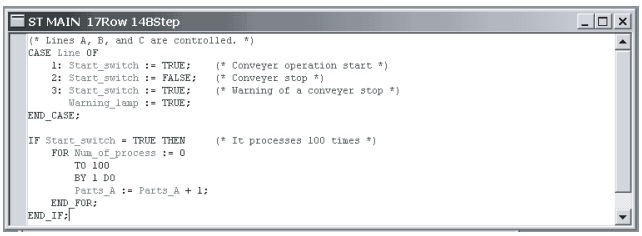
■ Wide range of programming languages

GX Developer is compatible with various programming languages such as relay symbol language, logic symbolic language, MELSAP3(SFC), MELSAP-L and function block. Furthermore, structured text (hereafter abbreviated to ST language) has been newly added to the above compatible languages.

Features of ST language

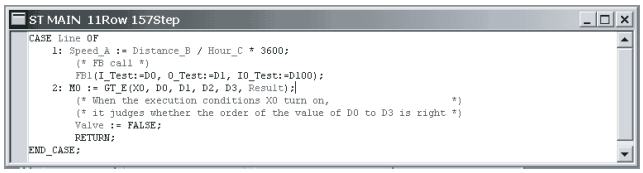
● High-level programming equivalent to advanced computer language such as C language

ST language can be used to describe the conditional statements for selection branch and iterative statements for the control based on repetition syntaxes as advanced computer language such as C language, which enables user-friendly programs to be created.



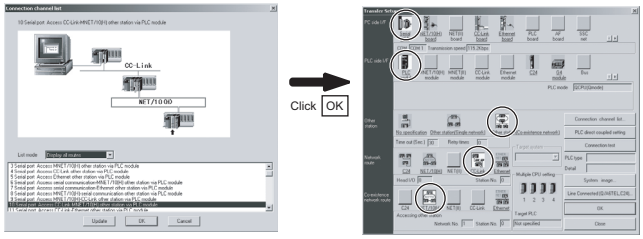
● Easy description of operation processing

With ST language, operation processing that is too complicated to describe in list or ladder form, can be described easily and clearly. ST language is suitable for the case requires high quality of program visibility such as complicated arithmetic operation or comparison operation.



■ Ease of setting access to another station

As the connection target can be specified graphically, you can set access to another station easily if a complicated system has been configured.



■ Connection with PLC CPU in any of various methods

(1) Via serial port
(2) Via USB
(3) Via MELSECNET/(II) board
(4) Via MELSECNET/10(H) board
(5) Via CC-Link board
(6) Via Ethernet board
(7) Via CPU board
(8) Via AF board

■ Fully useful debugging functions

(1) Use of the GX Simulator ensures much easier debugging.
  (a) There is no need to make connection with the PLC CPU.
  (b) There is no need to create a pseudo sequence program (debugging program).
(2) Help function contains the explanations of CPU errors and special relays/special registers. It is useful when an error has occurred online or when you want to know the contents of the special relays/special registers during programming.
(3) If an error occurs during data creation, the corresponding message is displayed to indicate the cause of that error, substantially reducing data creation time.

Operating environment

Item		Contents
Peripheral device	Personal computer	Personal computer on which PC-9800 series *1 or Windows® operates.
	PC CPU module	MELSEC-Q Series-compatible PC CPU module (CONTEC CO., Ltd.)
Personal computer main body		See "Applicable operating system and the corresponding required PC performance" shown below.
	CPU	
	Required memory	
Available hard disk space		150MB or more
Disk drive		CD-ROM disk drive
Display		Resolution800x600 pixels or higher*2
Communication interface		RS-232 port: Needed when communicating with the PLC CPU. USB port: Can be used when communicating with the QCPU (Q mode). (Excludes the Q00J/Q00/Q01/Q02CPU and remote I/O modules.)
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

*1: PC-9800R series (excluding PC98-NXR) is not compatible with Windows® Me, Windows® 2000 Professional, Windows® XP Professional, or Windows XP Home Edition.

*2: Large-sized fonts are not supported when Windows® XP Professional or Windows® XP Home Edition is used.

Applicable operating system and the corresponding required PC performance.

Item		Required PC Performance	
		CPU *3	Required Memory*4
Windows® 95 (Service Pack 1 or higher)		Pentium® 133MHz or higher	32MB or more
Windows® 98		Pentium® 133MHz or higher	32MB or more
Windows® Me		Pentium® 150MHz or higher	32MB or more
Windows NT® Workstation 4.0 (Service Pack 3 or higher)		Pentium® 133MHz or higher	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or higher	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported	Pentium® 300MHz or higher	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or higher	128MB or more

*3: Pentium® 300MHz or higher is recommended when creating label programs.

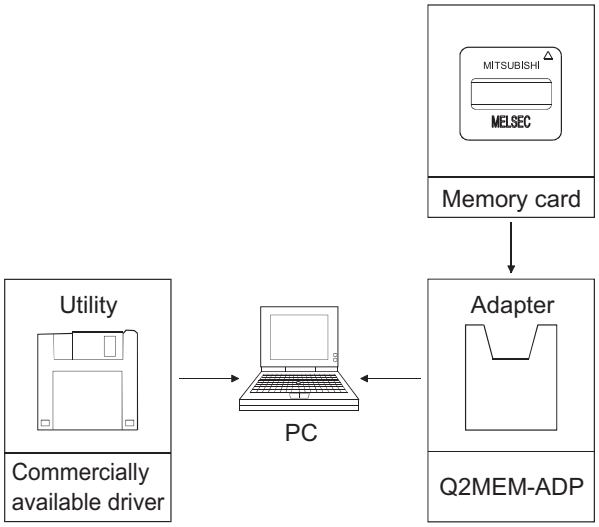
*4: 64MB or more is recommended when creating label programs.

The following table indicates the operating environment for use of the ST language programming function.

Item		Description
Operating system		Microsoft® Windows® 98 2nd Edition or later Microsoft® Windows® NT4.0 Workstation Service Pack 3 or later Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows® XP (Home edition, Professional edition)
CPU		Pentium® II 450MHz or more
Screen		800 × 600 dots or more, small fonts only
For installation		
	Required memory capacity	64MB or more
	Required disk capacity	130MB or more
For operation		
	Required memory capacity	64MB or more
	Required disk capacity	100MB or more

When using memory cards on PCs

The following shows the system configuration when a memory card is inserted into a card slot on a PC.



■ IC memory card/disk image data overview

● Memory card/PC combination list

		Windows® 95/98	Windows® Me/2000	Windows NT® 4.0*2
IC file data	SRAM card *1, *4, *6	Available (-)	×	Available (CardUT-NT)
	ATA card *5	Available (-)	Available (-)	Available (CardUT-NT)
	Flash card	×	×	×
Disk image data	SRAM card *1	Available (CardUT-97)	×	Available (CardUT-NT)
	ATA card	×	×	×
	Flash card	Available (CardUT-97) *3	×	Available (CardUT-NT)

( ) indicates utility used.

*1: Set the driver to CONFIG.SYS to use a SRAM card. (For details, refer to Help on Windows®)
Windows® automatically recognizes ATA cards.
If it did not recognize, select [Control panel] and then [System] to configure the settings.
If a driver for SRAM cards is set to CONFIG.SYS, remove it.

*2: Perform the following operation after installing the PC card driver, which comes with CardUT-NT.
(For details, refer to the Manual of CardUTNT.)
Insert an IC memory card to the PC card slot.
Select [Control Panel] and then [Device] in Windows®.
Set PCDISK to automatic action, and then click Start .
When CardWare does not recognize the IC memory card
Select the [Cards] menu in CardWare, execute [SetupCard], and then execute [Slotpower on].
To remove an IC memory card from the PC card slot, select the [Cards] menu in CardWare and execute [Slotpower off].

*3: Select [Control panel] and then [System].
Select the system manager memory card and then "Hardware profile disabled".
If a driver for SRAM cards is set to CONFIG.SYS, remove it.
(For details, contact ADTEK System Science Co.,Ltd.)

*4: Some PCs and OSes do not support operation concerning SRAM cards. In this case, execute each operation as a disk image data.

*5: When it takes time to reads/writes data in an ATA card from GX Developer on Windows® 95, change the driver to "SunDisk" (SunDisk ATA FlashDisk) using the Hardware controller ([Start] → [Control Panel] → [Hardware]).

*6: When reading/writing data in a regular IC memory card cannot be performed, execute each operation as a disk image.

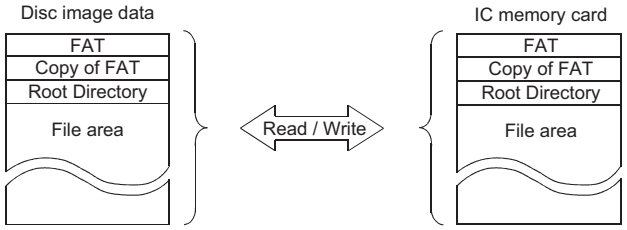
● About installation to PC card slot

The memory card for Q series requires an adapter for installing to the PC card slot.

	Manufactured by Mitsubishi Electric Corp. (Model name)
PC card adapter	Q2MEM-ADP

■ About flash ROM write (Disk image data)

As the flash ROM does not accept writing in data unit (program, device comment, etc), create a disk image data to write in a flash ROM.



For reading/writing from GX Developer using a IC memory card, refer to the GX Developer Operating Manual.

Remark

For drivers and utilities, contact ADTEK System Science Co., Ltd.

■ IC memory card (GX Developer ↔ IC memory card)

Install an IC memory card to the PC card slot of PC and execute reading/writing of data.

For Windows® 95 or Windows® 98, use the driver comes with the OS.

For Windows® Me or Windows® 2000, only ATA card is available.

For Windows NT® Workstation 4.0, commercially available drivers are required.

● About reading/writing IC memory card

IC Memory Card	Function	
	Read	Write
SRAM card	○*1	○*1
ATA card	○	○
Flash card	×	×

*1: SRAM cards are not available on Windows® Me and Windows® 2000.

● About formatting of IC memory card

To format the IC memory card, choose [Online]→ [Format PLC memory] on GX Developer.

IC Memory Card	Memory Card Name on Setting Screen
SRAM card	Memory card (RAM)
ATA card	Memory card (ROM)

POINT

Make sure to use the following method to format the ATA card.:Choose [Online] → [Format PLC memory] on GX Developer.(If a method other than above, e.g., Windows® format function is used to format the ATA card, the card may not work when inserted to PLC CPU.)

● About PLC user data

For read/write of PC user data from/to the IC memory card, GX Developer cannot directly access the IC memory card.

Use Explorer on Windows® or the like.

■ IC memory card (GX Developer ↔ Disk image data)

The disk images are used to perform reading/writing of data in a Flash card (on Q series) and Flash card (on QnA series).
For reading/writing disk image data, a driver available commercially is required.

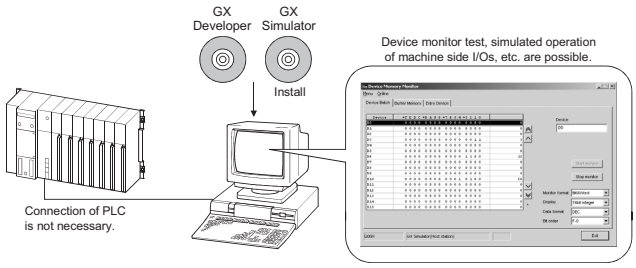
● About reading/writing with IC memory card (Disk image data)

IC Memory Card	Function	
	Read	Write
SRAM card	○	○
ATA card	×	×
Flash card	○	○

5.1.2 MELSEC PLC simulation software: GX Simulator

Overview

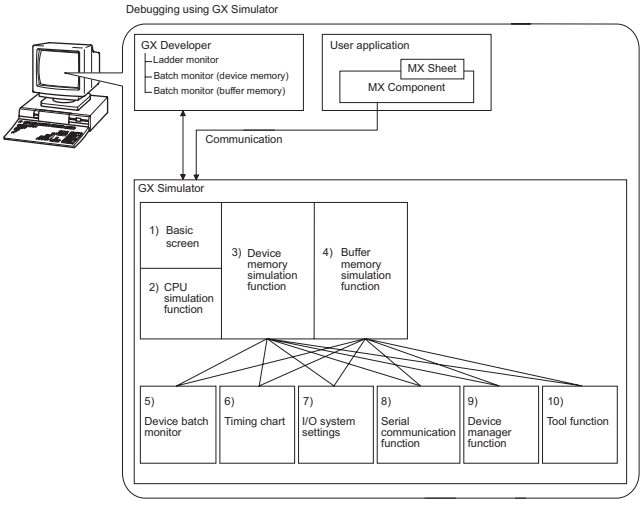
GX Simulator Version 7 (hereafter abbreviated to GX Simulator) is a software package which runs under Microsoft® Windows® Operating System.
As the GX Simulator allow sequence programs to be developed and debugged on a single computer, checking a modified program is quick and easy.
The offline debugging functions include the device monitor test of own/other stations and simulated operation of external device I/Os.



Features

■ Can be utilized as a single program debugging tool

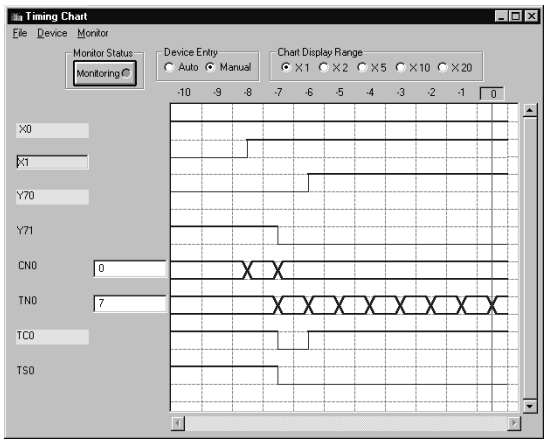
Using the PLC for debugging in the conventional method required not only the PLC but also I/O and special function modules, external device, etc. to be prepared as needed.
When using the GX Simulator, you can perform debugging on a single personal computer because I/O System Settings for external device simulation and the simulation function for special function module buffer memory are available in addition to the simulation function for PLC.
Also, because of no connection to actual equipment, you can proceed with debugging safely if an abnormal output should occur due to a program creation error.



1)•••• Key switch, indicator display function.
2)•••• Function that simulates CPU operation.
3)•••• Function that simulates CPU device memory.
4)•••• Function that simulates the buffer memory area of a special function module.
5)•••• Function that monitors a batch of device memory values.
6)•••• Function that displays device memory changes in a chart form.
7)•••• Function that simulates I/O operation of external device.
8)•••• Function that simulates communication with an external device.
9)•••• Function that checks the operation of the user application using the MELSOFT product.
10)•••Function that saves/reads device memory or buffer memory data to/from a file.

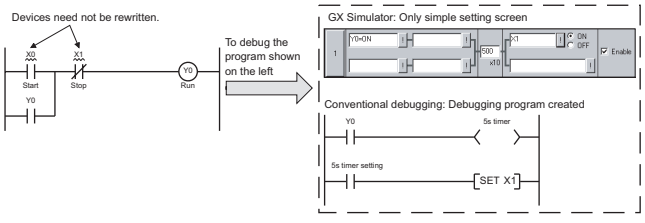
■ Monitoring of device memory (monitor test function)

You can monitor the states of the virtual CPU device memory and the buffer memory.
Like the device batch monitor and buffer memory batch monitor functions of GX Developer, you can not only monitor the ON/OFF states and values of devices but also perform forced ON/OFF and change current values.
This function also allows you to display the ON/OFF states and values in a timing chart format to grasp time series operation.



■ Simulation of external device operation (I/O system setting function)

By setting the combination of bit device ON/OFF condition and word device value interactively in the I/O system settings of GX Simulator, an external input generated in response to a PLC output can be provided exactly.



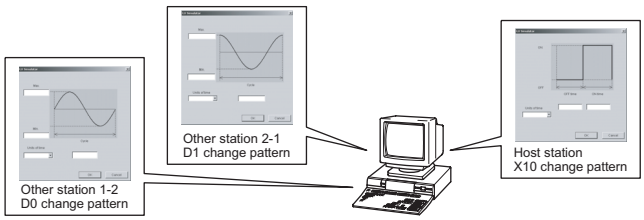
■ Support for offline debugging of user application (Device Manager function)

The operation of the user application using the MELSOFT product (e.g. MX Component) can be checked easily without use of the actual PLC.

● Checking the read operation of the host station/other station devices

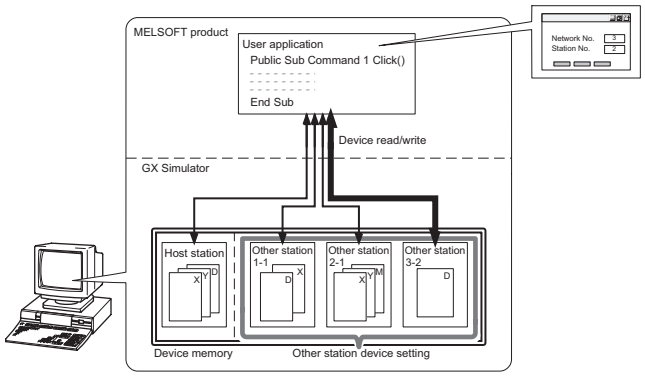
Without creation of a program that will change device values for debugging, the operation of the user application can be checked on the basis of the device values that change with patterns.
Also, read operation from the host station/other station devices can be checked without changing the user application.

(Device change pattern setting screen)



● Checking the written device values

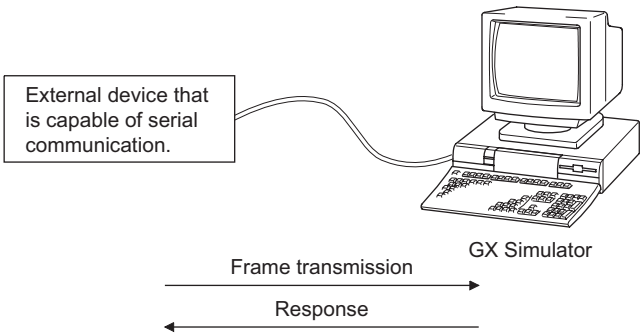
Whether the values written from the user application to the host station/other station devices are within the user-assumed ranges or not can be checked.
This enables check for user application creation or setting mistakes.



■ Checking of message format of frame sent by external device (Serial communication function)

This function allows you to easily check whether the frame (A-compatible 1C frame, QnA-compatible 3C/4C frame) used for access from an external device to the PLC CPU via a serial communication module (computer link module) is in a correct message format or not.
Since this function also enables devices to be accessed, you can check/change device contents easily on an external device.

Conventionally, the serial communication module (computer link module) was actually connected with the external device to check operation. Using this function, however, you can easily check the message format and device contents between GX Simulator and external device.



■ Saving/reading of device/buffer memory data (tool function)

You can save the data of the device memory in the virtual CPU or the buffer memory of the special function module temporarily, and when resuming debugging, you can read and use the saved data.

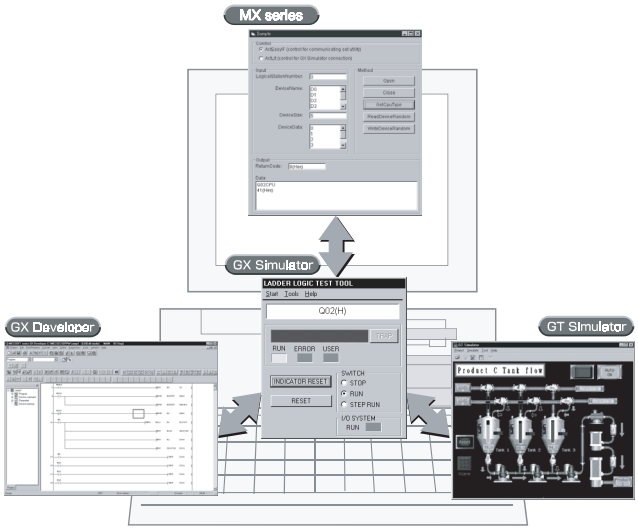
■ Coordination with other MELSOFT series

● MX Series

Testing applications can be done without using other equipment apart from PC where simulation software is installed. This is because GX Simulator is used as a virtual PLC in the user application development to read/write PLC data.

● GT Series

GX Simulator and GT Simulator 2 display changes in device value by simulation.
The device value changing function of GX Simulator allows you to change a device value forcibly to confirm a change displayed on the screen.
This enables all operations, from screen drawing without a sequence program to the debugging of the screen drawing with a sequence program, on a desktop.



Function

The functions supported by the GX Simulator are shown below.
The functions supported by the GX Simulator include functions executed from the GX Simulator menu and executed from the GX Developer menu.
The functions executed from the GX Developer menu can be used only when GX Simulator is used together.

Functions Supported by GX Simulator

Function		Description
Functions executed from the GX Developer menu	Ladder monitor Device monitor	• Monitors the processing status of the GX Simulator
	Device test	• Forcibly write device values to the GX Simulator during monitoring.
	Write to PLC	• Writes parameter file and program file to GX Simulator.
	PLC diagnosing	• Checks the GX Simulator status and errors.
	Skip execution	• Skips program execution in the range between two designated steps. (Do not perform the processes)
	Partial execution	• Executes the part of the program in a designated step or pointer range.
	Step execution	• Executes the sequence program one step at a time.
	Remote operation	• Operates the GX Simulator execution status.
	Program list monitor	• Monitors the program execution status and number of executions as a table, starts and stops the program execution in the table.
	Online change	• Writes a program while a simulating CPU is in RUN status (Writes at ladder or ST conversion).
Functions executed from the GX Simulator menu	I/O system settings	• Simulates the operation of external devices by simple settings.
	Serial communication function	• Checks the operation of the frame that is sent from the external device to the serial communication module (computer link module).
	Monitor test	• Conducts testing by monitoring the device memory status. • Displaying the ON/OFF chart of the devices. • Forcing the devices ON/OFF, and changing present values.
	Device manager function	• Function that allows the user application operation to be checked by setting the external input-assumed device value change patterns and write-enabled device ranges. • Function that allows access from the user application using the MELSOFT product to the other station devices.
	Tools	• Reads and saves device memory/buffer memory data and makes option setting.
	Function equivalent to WDT	• Issues a WDT error if a sequence program is written in such a way that it runs an infinite loop.
	Error detail display function	• Displays detailed error information at occurrence of an error.
	Unsupported instruction list display function	• Lists the instructions which are not supported by the GX Simulator if they are included in a sequence program.

Operating environment

Item		Description
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Hard disk free space		70MB or more*1
Disk drive		CD-ROM disk drive
Display		800×600 dot or more resolution*2
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)

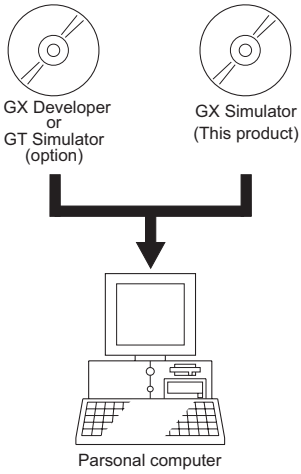
*1: 1MB is required to use a file register.
Make sure that the required space is secured within the drive in which this product has been installed, before using file register.

*2: When Windows® XP Professional or Windows® XP Home Edition is used, Large Fonts are not supported.

Used operating system and performance required for personal computer

Operating System		Performance Required for Personal Computer	
		CPU	Required Memory
Windows® 95		Pentium® 133MHz or more	64MB or more
Windows® 98		Pentium® 133MHz or more	64MB or more
Windows® Me		Pentium® 150MHz or more	64MB or more
Windows NT® Workstation 4.0 (Service Pack 3 or more)		Pentium® 133MHz or more	64MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

Combination with MELSOFT products



The following describes combinations between GX Simulator Version 7 and MELSOFT product versions.

(1) GX Simulator Version 7 operates on any version of GX Developer.

(2) To use the function added to GX Simulator Version 7 (Device Manager function), use the MELSOFT product compatible with GX Simulator Version 7.

5.1.3 Maintenance tool: GX Explorer

Overview

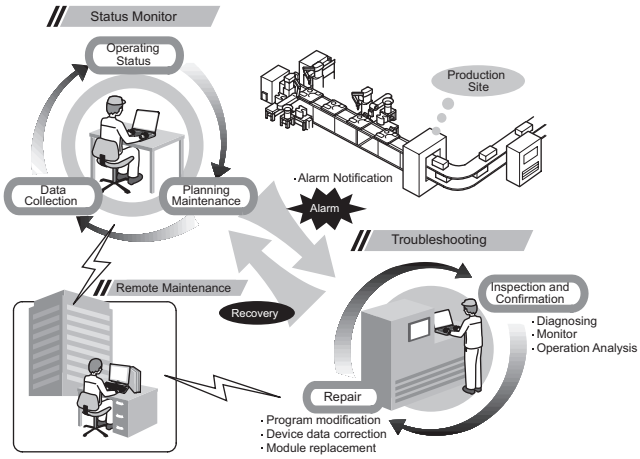
GX Explorer Version 2 (hereafter abbreviated to GX Explorer) is the maintenance software package that includes functions required for PLC system maintenance.

Wide rage of maintenance functions

GX Explorer (need to be connected to the target PLC system) always monitors the operating status of PLC system at the production site and executes alarm notification when an error occurs.
Furthermore, it includes following functions which facilitate troubleshooting error investigation and recovery functions, diagnosing, monitor, operation analysis and program change (write to PLC).

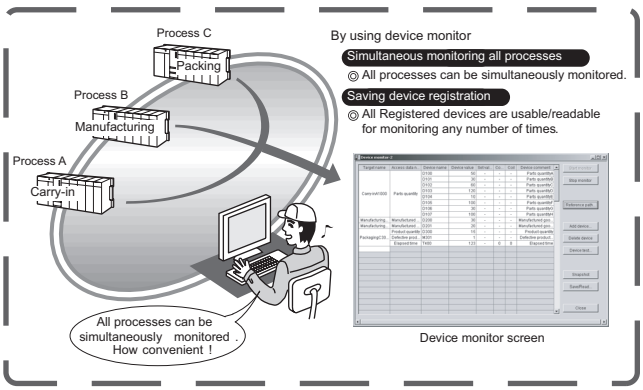
Various connection routes

GX Explorer is compatible with various networks and can connect to the PLC system at the production site through various connection routes. When making a connection via the Internet, the remote production site can be maintained as the same as on-site maintenance.
(When connecting this software package via the Internet, use a personal computer/Web server module (QJ71WS96) in which GX RemoteService-I Version 2 is installed as a server.)

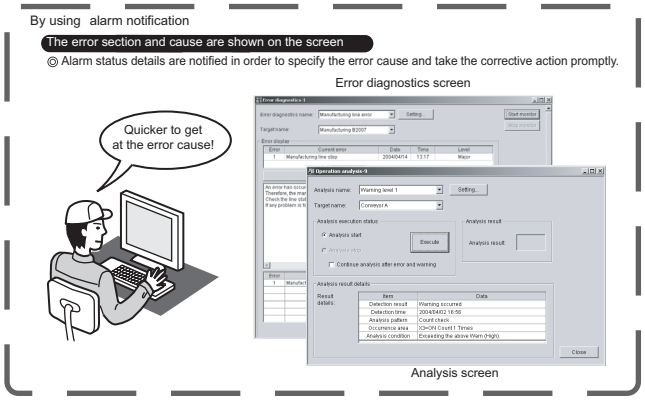


Features

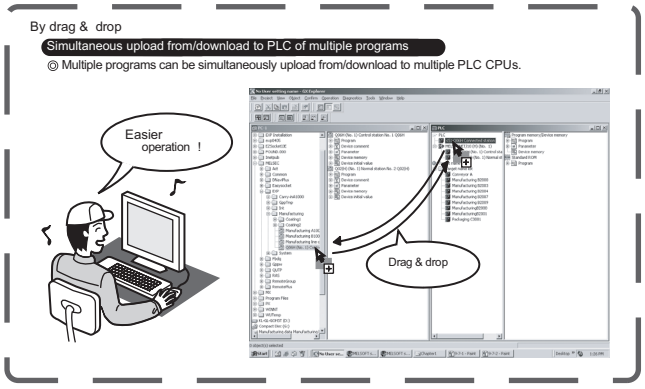
■ Device monitor easier to see -Simultaneous monitor of multiple PLC CPUs -



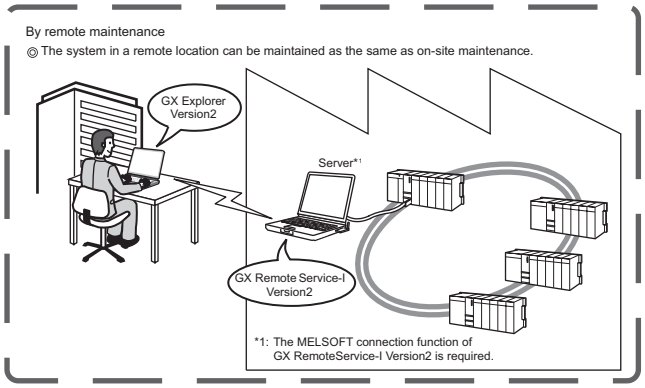
■ Diagnosing function that notifies of error occurrence -Alarm status detailed display-



■ Convenient project management -Upload from PLC/ Download to PLC-



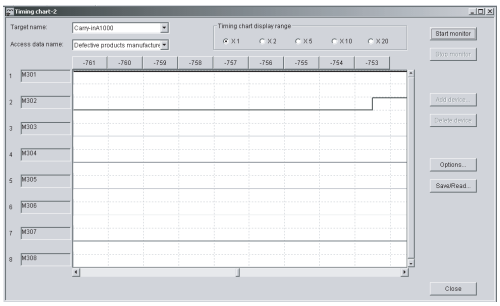
■ Maintenance of remote location -Access to PLC CPU via the Internet or Intranet-



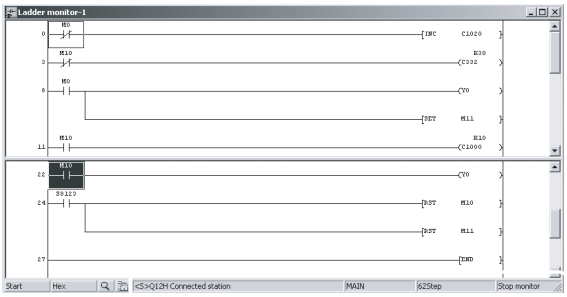
■ Program operation can be visually confirmed

Use of timing chart/ladder monitor enables the bit device status (ON/OFF) and change of word device value can be virtually confirmed.

[Timing Chart]



[Ladder monitor split display]
Several points of the same program can be monitored by separating the screen or using other windows.



■ Program backup and restore

The target data can be easily backed up or restored by drag & drop operation.

■ File transfer by FTP

File transfer can be made between personal computers by FTP via the Intranet.

■ Other convenient functions
-Free customization-

GX Explorer can be freely customized for user-friendly operating environment.

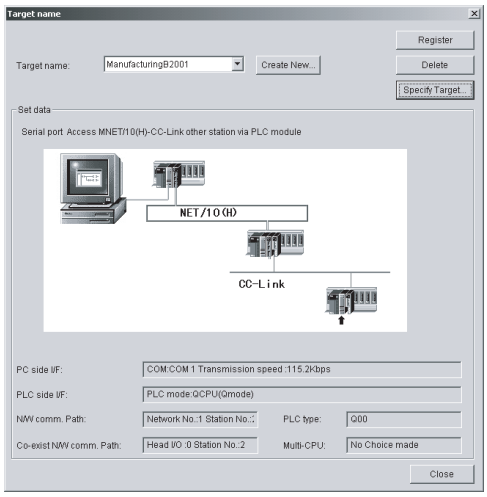
● Easy menu

Frequently-used functions can be easily selected without the necessity to find them from the menu bar, as they can be displayed on "Easy menu" dialog box.

● Target name

Target PLC CPU and the connection route can be saved as any name. By specifying the PLC CPU name, the target PLC CPU can be easily changed.

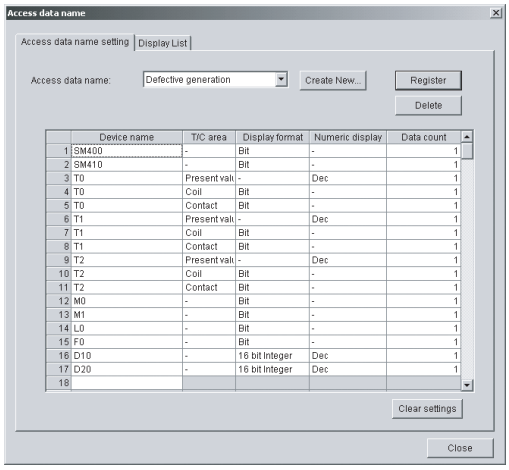
[Connection Target Name]



● Access data name

Devices to be monitored can be grouped and saved as any name. This setting is applicable for the "Device monitor" and "Timing chart" settings.

[Access data name]



● User setting name

Operating environment settings can be saved as any name according to various applications.
Read out the saved operating environment by specifying the corresponding name.

■ Various applicable devices

Extension file register, buffer memory*1 of all PLC CPU types can be directly seen.

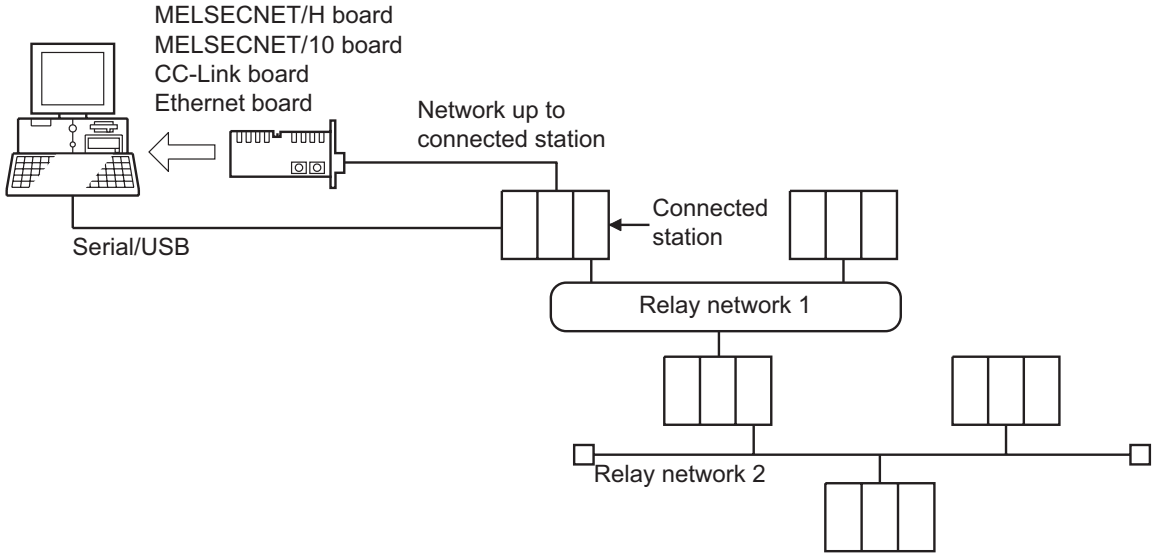
*1 For the details of extended file register and buffer memory available for GX Explorer, refer to GX Explorer Operating Manual.

■ Network Configuration Analysis Specification

Make the settings in order that the network configuration to the target station will be analyzed.
At target setup, set the connection path information to the target PLC CPU.

● Network configuration information display/operation range

This section explains the network configuration information display/operation range and relevant precautions.
The following shows the display/operation range of up to the connected station/relay network 1/relay network 2given in (1) to (3).



(1) When the connected station is the QCPU (Q mode)

PC Side I/F in Target Setup	Network UP to Connected Station	Relay Network 1	Relay Network 2	Display and Operation of Network Configuration Information		
				QCPU (Q mode)	QnACPU	ACPU QCPU (A mode)
Serial/USB	-	MELSECNET/H*1 MELSECNET/10*1	-	○	○	○
	-	MELSECNET/H*1 MELSECNET/10*1	CC-Link*2	○	○	○
	-	CC-Link*2	-	○	○	○
	-	CC-Link*2	MELSECNET/H*1 MELSECNET/10*1	-	-	-
MELSECNET/H board MELSECNET/10 board	MELSECNET/H*1 MELSECNET/10*1	-	-	○	○	○
	MELSECNET/H*1 MELSECNET/10*1	CC-Link*2	-	-	-	-
CC-Link board	CC-Link*2	-	-	○	○	○
	CC-Link*2	MELSECNET/H*1 MELSECNET/10*1	-	-	-	-
Ethernet board	Ethernet	MELSECNET/H*1 MELSECNET/10*1	-	○	○	○
	Ethernet	MELSECNET/H*1 MELSECNET/10*1	CC-Link*2	○	○	○
	Ethernet	CC-Link*2	-	○	○	○
	Ethernet	CC-Link*2	MELSECNET/H*1 MELSECNET/10*1	-	-	-

*1: Up to 7 relay stations and 8 networks can be displayed/operated when the routing parameters have been set.Only the network of the connection can be displayed/operated when the routing parameters have not been set.Up to 1 gate and 2 networks can be displayed/operated when the connection station is a remote I/O station.

*2: When the connection station and relayed station are the QCPU master stations.

○ : Display/operation enabled
-: Display/operation disabled

(2) When the connection station is the QnACPU

PC Side I/F in Target Setup	Network UP to Connection Station	Relay Network 1	Relay Network 2	Display and Operation of Network Configuration Information		
				QCPU (Q mode)	QnACPU	ACPU QCPU (A mode)
Serial	-	MELSECNET/H*1 MELSECNET/10*1	-	*	○	-
MELSECNET/H board MELSECNET/10 board	MELSECNET/H*1 MELSECNET/10*1	-	-	*	○	-
CC-Link board	CC-Link	-	-	*	-*2	-
	CC-Link	MELSECNET/H*1 MELSECNET/10*1	-	-	-	-
Ethernet board	Ethernet	MELSECNET/H*1 MELSECNET/10*1	-	*	○	-

*1: Up to 7 relay stations and 8 networks are permitted when the routing parameters have been set. Only the network of the connection station is permitted when the routing parameters have not been set.

*2: Display/operation enabled for the connection station only.

○ : Display/operation enabled
- : Display/operation disabled
* : Disable enabled, operation inhibited

(3) When the connection station is the ACPU or QCPU (A mode)

PC Side I/F in Target Setup	Network UP to Connection Station	Relay Network 1	Relay Network 2	Display and Operation of Network Configuration Information		
				QCPU (Q mode)	QnACPU	ACPU QCPU (A mode)
Serial	-	MELSECNET/H*1 MELSECNET/10*1	-	-	-	○
MELSECNET/H board MELSECNET/10 board	MELSECNET/H*1 MELSECNET/10*1	-	-	-	-	○
	MELSECNET/H*1 MELSECNET/10*1	MELSECNET/H*1 MELSECNET/10*1	-	-	-	○

*1: Up to 7 relay stations and 8 networks are permitted when the routing parameters have been set. Only the network of the connection station is permitted when the routing parameters have not been set.

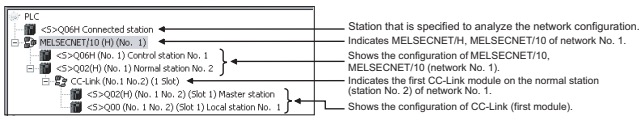
○ : Display/operation enabled
- : Display/operation disabled

POINT

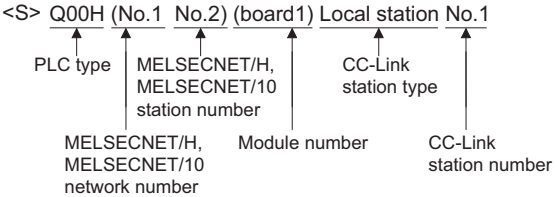
- Setting the MELSECNET/H, MELSECNET/10 (including Ethernet) routing parameters enables the other station PLC to be accessed within the range of the network system specifications.
- In the case of FXCPU, only the connected station can be analyzed.
  Note that "FX0S" is displayed as "FX0N" in GX Explorer.
- The information of network configuration saved using older version cannot be read due to version incompatibility.
- The display range of network configuration information differs with the range that can be specified as the target name. By setting as target name, the PLC CPU outside the display range of network configuration information can be selected in the target name filed of each function and then operated.

● Network configuration

Select [Window] - [Open PLC side window] form the menu bar to display the PLC side window.
After a dialog box appears to confirm if the network configuration information will be updated, display the PLC network configuration.
The PLC configuration field shows the connection station and the station names connected to MELSECNET/10(H) and CC-Link in a tree structure.

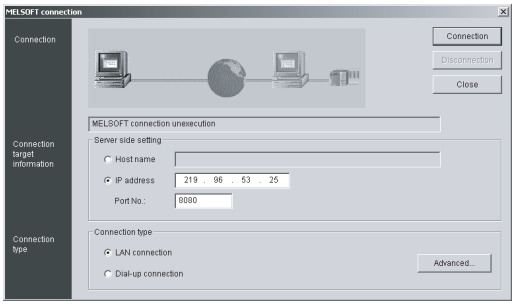


The station names are displayed as indicated below.
(Example) For CC-Link on the MELSECNET/H, MELSECNET/10 station, the PLC type, the MELSECNET/H, MELSECNET/10 network number and station number of the station loaded with the master station, the station type of CC-Link and the station number of CC-Link are displayed.



■ MELSOFT connection

MELSOFT connection (Internet/Intranet connection) is for maintaining the system in a remote location. For details of MELSOFT connection, refer to GX RemoteService-I of section 5.1.4.



Main functions

The following explains functions for "Monitor", "Investigation/ Confirmation" and "Recovery", and other useful functions.

Monitor ••••••••••••••••••••••••••• Always monitors system status using alarm notification, error diagnosing or other functions

Investigation/Confirmation•••• Investigates/Confirms system status using diagnosing, monitor, analysis or similar functions.

Recovery••••••••••••••••••••••••• Performs program change (write to PLC), device data change and others.

■ Useful functions for monitoring

Function		Description
Monitor	Alarm notification	Notifies of error occurrence and the analysis, diagnosing results by e-mail.
	Error diagnosing	Displays the error of the target PLC CPU based on the error condition defined by the user.
	PLC diagnosing	Executes the diagnostics of the target PLC CPU.
	Analysis	Executes the analysis of the target PLC CPU operation (order check, count check, failure (normal/ faulty) check, high/low limit value check) and displays the analysis results.

■ Useful functions for investigation/confirmation

Function		Description
Investigation /Confirmation	PLC status monitor	Displays the PLC CPU operation status and program list.
	Device monitor	Simultaneously monitors devices for multiple PLC CPUs.
	Timing chart	Displays the timing chart of the specified device.
	Trace	Executes sampling trace for the specified device.
	Ladder monitor	Investigates the ON/OFF cause for ladder monitor and device.
	PLC diagnosing	Diagnoses the target PLC CPU.
	Network diagnosing	Diagnoses MELSECNET/H, CC-Link, Ethernet or other networks.
	System monitor	Display the system configuration, each module error status and history.
	Alarm notification	Notifies of error occurrence and the analysis, diagnostics results by e-mail.
	Error diagnosing	Displays the error of the target PLC CPU based on the error condition defined by the user.
	Analysis	Executes the analysis of the target PLC CPU operation (order check, count check, failure (normal/faulty) check, high/low limit value check) and displays the analysis results.
	Device test	Tests the specified device. (Simultaneous test of all specified devices.)

■ Useful functions for recovery

Function		Description
Recovery	Upload from PLC/ Download to PLC	Reads/Writes project data (Maintenance)
	FTP site	Reads project data via the FTP site
	Replacing module online (Hot swapping)	Replaces a module without stopping the system when the module is faulty.

■ Other useful functions

Function		Description
File operation	Import/Export	Imports/Exports access data name, operation analysis, Error diagnostics name or other data.
Project operation	FTP site	Reads from/Writes to files through the FTP site connection.
	PLC batch operation	Multiple project data can be simultaneously uploaded from/ downloaded to multiple PLC CPUs. This function is available by relating target PLCs and projects by name in advance.
	Relating a target name and a project	Relates target PLCs and projects by name. This setting is useful for "PLC batch operation".
	Backup	Backs up data of specified projects.
	Restore	Restores backed up projects.
	Backup arrangement	Deletes the project specified from the backed up projects.
Connection target specifications	Network configuration analysis specification	Specify the analysis target, i.e., network that includes the connection target station.
	Connection target name	Saves the PLC CPU to be accessed and the path as name.
	Access data name	Groups devices to save the group as any name.
	MELSOFT connection	Internet/Intranet settings.
Tool	Easy menu	Registers frequently-used functions to execute them by using one button.
	Option	Changes the settings for project display, network configuration information and online change.
	Security setting	Settings for illegal access prevention
	Operation log	Collects and saves the operation history including start of this product to operation termination.
	Auto-start setting	Settings for auto start of this product or specified functions at the start of personal computer.

Operating environment

Item		Description	
Computer		200MHz or more (recommended) Pentium® personal computer on which Windows® operates *1	
Required memory		64MB or more recommended (128MB or more is recommended to Windows XP).	
Free hard disk area	For installation	130MB or more	
	For operation	100MB or more	
Disk drive		CD-ROM disk drive	
Display resolution		1024×768 dots or more (XGA or more)	
Operating System		Microsoft® Windows® 98 Microsoft® Windows® Me Microsoft® Windows NT® Workstation 4.0 *2 Microsoft® Windows® 2000 Professional *2 Microsoft® Windows® XP Professional *2 Microsoft® Windows® XP Home Edition *2	
Required software (Required only when combined with GX RemoteService-I Version2.)	For personal computer CPU	Web server	Personal Web Server version4 or later Internet Information Server version5 or later Peer Web Services verision4 or later
		Web browser	Internet Explorer5.5 or later Netscape4.5 or later
		Mailer	Not specified
	For Web server module	Java execution environment (JavaVM)	Microsoft JavaVM of Build No. 3309 or later
		Web browser	Internet Explorer5.5 Internet Explorer6.0
		Mailer	Not specified

*1: PC-9800® series is not applicable.

*2: Administrator privilege is required to install GX Explorer into the following operating systems, Windows NT® Workstation4.0, Windows® 2000 Professional, Windows® XP Professional and Windows® XP Home Edition. In addition, Administrator privilege is required to use GX Explorer in Windows® XP Professional and Windows® XP Home Edition.

5.1.4 Remote access tool: RemoteService-I

Overview

GX RemoteService-I Version2 (called GX RemoteService-I in this Chapter) is the software package (needed to be installed in the server) that makes a connection between the PLC CPU at the site and the client (personal computer or mobile phone) in a remote location via the Internet (or Intranet).

GX RemoteService-I includes the Web function and MELSOFT connection function, which can realize the excellent remote maintenance of PLC CPU.

•Web function

Notifies of the PLC CPU device status by sending an e-mail to a mobile phone or personal computer.
Also, enables the PLC CPU device status or relevant comments to be checked from Web browser of a mobile phone or personal computer.

•MELSOFT connection function

Connects to the PLC CPU from the software package[*1] in the client (personal computer) via the Internet (or Intranet).
Also, enables the PLC CPU, which is in a remote location from the client (personal computer), to be maintained using the software package[*2].

*1: GX Explorer Version2, etc.
*2: For usable functions, refer to the operating manual of the software package used.

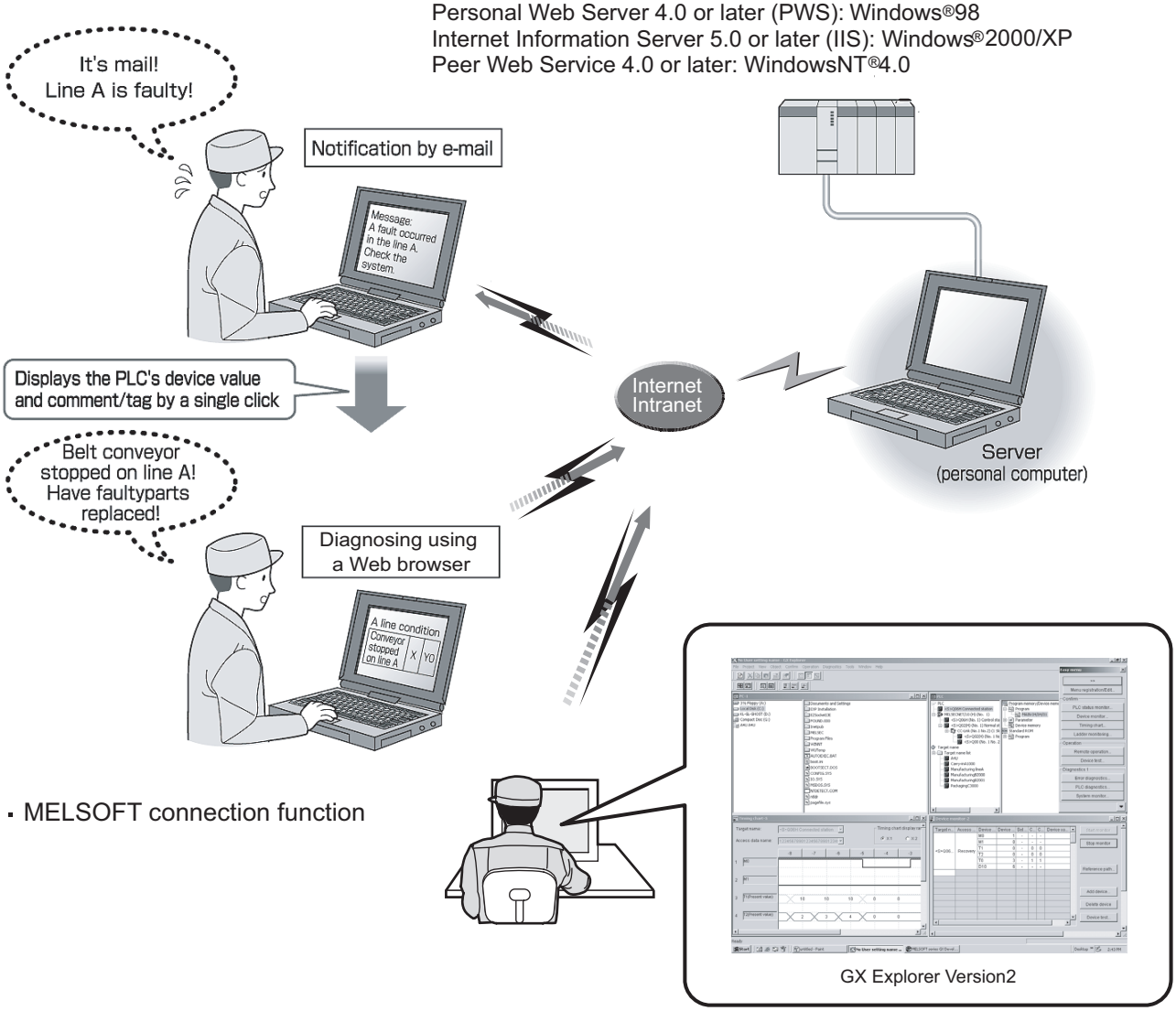
- Web function

▶Applications needed to be installed in the server (personal computer)

- GX RemoteService-I Version2 (this product)
- Web browser (supplied by Microsoft®)
  Internet Explorer6.0 or later

▶Applications needed to be installed in the server (personal computer) for use of the Web function

- Web server software (supplied by Microsoft®)
  Personal Web Server 4.0 or later (PWS): Windows®98
  Internet Information Server 5.0 or later (IIS): Windows®2000/XP
  Peer Web Service 4.0 or later: WindowsNT®4.0



- MELSOFT connection function

Features

■ PLC CPU can be monitored/diagnosed via the Internet or Intranet

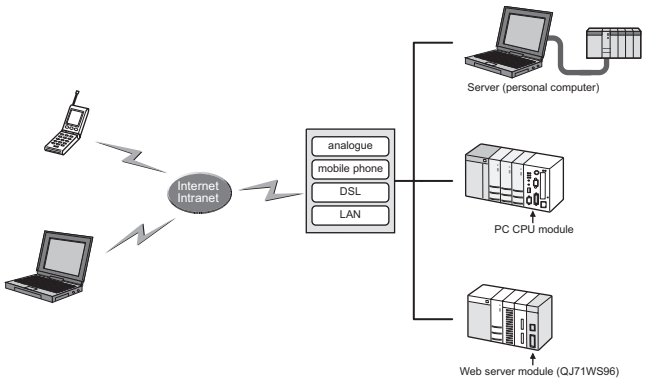
You can see the status of PLC CPU on i-mode compatible mobile phone or personal computer. Especially, the mobile phone diagnoses PLC CPU easily as it can be used regardless of time and place.
Furthermore, setting trigger condition enables to send e-mail manually or automatically.

■ This system can be introduced without any modification to the existing system

No dedicated special modules are required to use this product. In addition, you need not change the parameter values since this product does not require I/O points.

■ Wide range of operating environments (Compatible with Internet and Intranet)

A Windows-based personal computer, PC CPU module and Web server module are applicable for the operating environment of the server. Also, the following networks, Internet and Intranet are applicable. In addition, the connection methods are selectable from analogue, mobile phone, DSL and LAN. With this wide range of operating environments, the system can be constructed according the needs, and GX RemoteService-I can be introduced into the existing system easily.

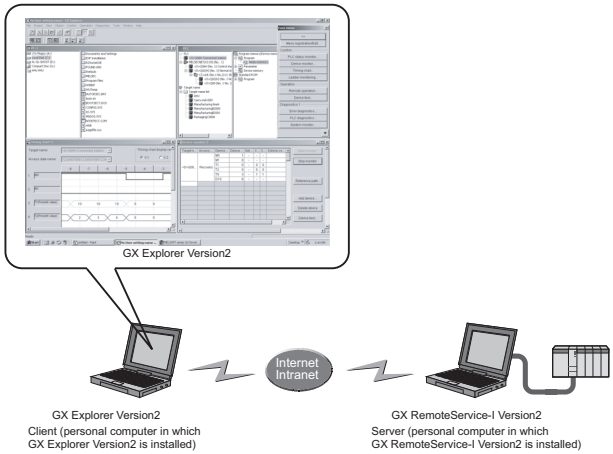


For Internet connection, a contract with ISP (Internet Service Provider) is required.

■ Remote maintenance by MELSOFT connection function

Installing GX RemoteService-I into the server enables remote maintenance of the PLC CPU from the client (personal computer in which MELSOFT connection-compatible software package[*1] is installed) via the Internet or intranet.

*1: GX Explorer Version2, etc.



■ Illegal access prevention by security function

When a client connects to the server, the user authentication function checks the user name and password in order to prevent an illegal access to the server.

■ Compatible with all CPU series[*2]

Access can be made to all CPU series and all CPU types supported by GX Developer.

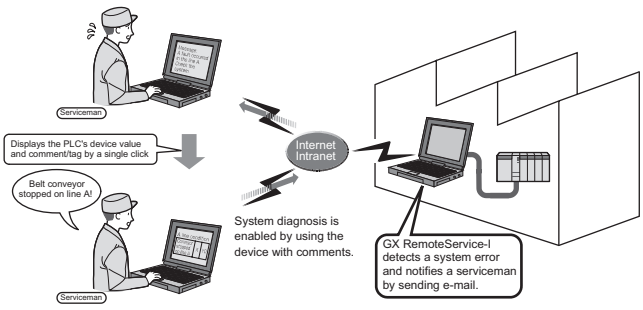
*2 Some of the discontinued models are incompatible. For the details, refer to GX RemoteService-I Operating Manual.

■ About Automatic Operation and Manual Operation

GX RemoteService-I allows you to select the automatic or manual operation mode.
The features of the automatic and manual operation modes are explained below. Refer to it when configuring a system.

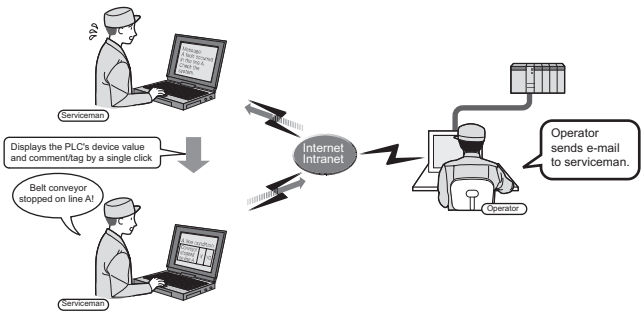
● When the server (personal computer) is always connected to the system for monitoring (automatic operation mode)

GX RemoteService-I always monitors the PLC CPU devices. When an error occurs in the system, GX RemoteService-I sends an e-mail to the personal computer, i.e., notifies of the system error.
(The condition for triggering the transmission of e-mail that notifies the personal computer of a system fault is to be set to the server (personal computer).)
Hence, a serviceman can be notified of an error definition within a short time after occurrence of a fault.



● When an operator judges a fault and contacts a serviceman (manual operation mode)

If a fault has occurred in the system, an operator can make judgment to notify a serviceman of the faulty condition.
The serviceman can diagnose the actual system from a remote location to run more in-depth diagnosing.



Function list

The following provides lists of setting items for the server (personal computer) and for i-mode phone compatible mobile.

■ Server (Personal computer) function list

The following table lists the functions to be set on the server (personal computer).

Function name	Description	Necessity of Setting/ Operation	
		For Web Function	For MELSOFT Connection
Operating mode	Sets the automatic or manual operation mode.	○	×
Starts AUTO drive	Starts the continuous monitoring of devices in the automatic operation mode.	△	×
Dial-up execution	Makes dial-up connection to connect with the Internet.	○	×
URL copy	Copies the URL of the server (personal computer).	-	-
Send e-mail	Sends e-mail created with GX RemoteService-I.	○	×
Product information	Displays the version and others of the product.	-	-
Security setting	Makes settings related to the security for server access.	○	△
E-mail setting	Makes settings related to e-mail (mail server, account name, etc.). Also creates a message for manual operation.	○	×
Network setting	Sets the connection type, HTTP port number for MELSOFT connection and HTTP port number for Web facility.	○	○
PLC type selection	Selects the PLC type of the PLC CPU to be monitored on i-mode phone compatible mobile.	○	×
Transfer setup	Selects the path of the PLC CPU to be monitored on i-mode phone compatible mobile.	○	×
Device range setting	Makes settings related to the device to be monitored on i-mode phone compatible mobile.	○	×
Tag setting	Makes setting for handling the read devices as tags.	○	×
Auto drive setting	Sets the device to be monitored continuously in the automatic operation mode.	○	×
Device display style setting	Changes the display format of the screen displayed on i-mode phone compatible mobile.	○	×

○: Necessary
×: Unnecessary
△: Might be necessary
-: Irrelevant

■ Personal computer side function list

● Monitor functions

The following table lists the functions to be set with i-mode phone compatible mobile.

Function		Description
Tag display		Performs one-shot monitoring of the tag set on the server (personal computer) side.
Transfer setup		Sets the PLC series, PC side I/F, PLC side I/F and other station.
Device display	Device range setting	Sets the device to be monitored.
	Device comment search	Makes a device comment search.
	Word (Dec)	Displays devices in a word multi-point decimal format.
	Word (Hex)	Displays devices in a word multi-point hexadecimal format.
	Bit	Displays devices in a bit multi-point format.
	Comment Dec	Displays devices in a commented decimal format.
	Comment Hex	Displays devices in a commented hexadecimal format.
	Comment Bin	Displays devices in a commented binary format.

● Functions to cut off server (personal computer) line from i-mode phone compatible mobile

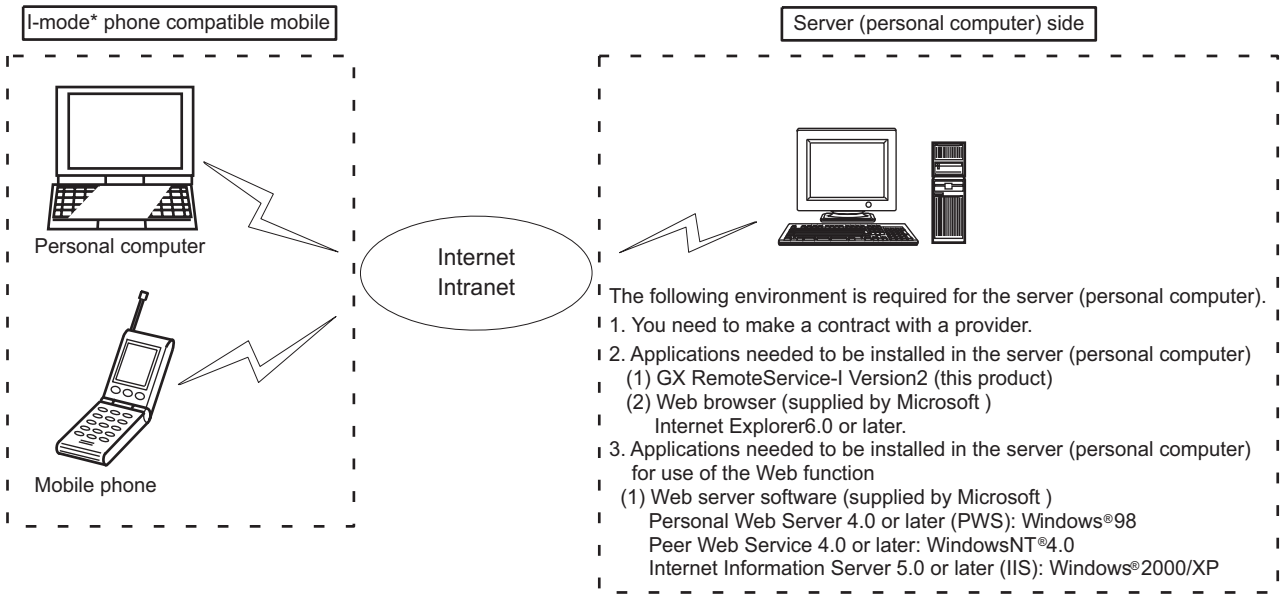
The following table lists the functions that disconnect the server (personal computer) line from i-mode phone compatible mobile.

Function	Description
Server Side Circuit Settings Time to disconnect the circuit	Sets the server (personal computer) line disconnection timer.
Server side dial-up disconnect execution	Disconnects the server (personal computer) line.

Device list for server (personal computer) side

This section explains the system configuration that uses GX RemoteService-I.

Refer to GX RemoteService-I Operating Manual for the system device lists of the server (personal computer) side and i-mode* phone compatible mobile.



*: This product can be used only in Japan.

Connection method	Devices used	Automatic acquisition of IP address of the server	Supplemental remarks concerning IP address of the server
Analog	Server ↔ Analog modem	Enabled	---
	Server ↔ Broadband router ↔ Analog modem	Partly enabled	Only routers compatible with UpnP can acquire IP address automatically. These routers support both of changeable IP addresses and fixed IP addresses. Routers not compatible with UPnP supports only fixed IP addresses.
	Server ↔ Dial-up router	Partly enabled	
Mobile-phone/ PHS*	Server mobile-phone/PHS modem + Mobile-phone/PHS	Enabled	---
DoPa*	Server ↔ DoPa terminal	Enabled	---
DSL	Server ↔ Bridge type DSL modem	Enabled	---
	Server ↔ Broadband router ↔ Bridge type DSL modem	Partly enabled	Only routers compatible with UpnP can acquire IP address automatically. These routers support both of changeable IP addresses and fixed IP addresses. Routers not compatible with UPnP supports only fixed IP addresses.
	Server ↔ Router type DSL modem	Partly enabled	---
LAN	Server ↔ LAN cable (Twisted pair)	Enabled	---

*: This product can be used only in Japan.

■ Connection devices configuration

● The following explains the devices to be used to connect a server that includes GX RemoteService-I to network.

Connection method	Devices used	Connection type	REMARK
Analogue line	Analogue modem • Hayes AT-command compatible product • Turns DR(DSR) signal ON independently • Meets the QJ71WS96 RS-232 transmission specifications	Dial-up connection	RS-232C connection (RS-232C standard compliant product)
Mobile phone line PHS line	Mobile phone modem PHS modem	Dial-up connection	RS-232C connection (RS-232C standard compliant product) PCMCIA card connection USB connection
DoPa*	DoPa terminal • Terminals compatible with the communication method PDC800MHz or single packet method 9600bp. • Terminals capable of turning only DR(DSR) signal ON. • Terminals satisfying the RS-232 transmission specifications of QJ71WS96.	Dial-up connection	RS-232C connection (RS-232C standard compliant product)
DSL	DSL modem • Compatible with the following communication method: PPPoA (RFC2364 standard) or PPPoE (RFC2516 standard). • Communication with the following communication standard: G.992.1/G992.2 and AnnexA. (For compatible provider, refer to the next page.)	Continuous connection	LAN cable (twisted pair) connection IEEE802.3, 10BASE-T/100BASE-TX standard compliant product • For 10Mbps UTP cable (category 5), STP cable (category 5) • For 100Mbps UTP cable (category 3 or higher), STP cable (category 3 or higher)
LAN	LAN cable (twisted pair)	LAN connection	

*: This product can be used only in Japan.

● About covenant with provider

Be careful for the following items on making a covenant with provider, depending on the communication method.
The following shows the support scope of optical communication for the provider which provides optical communication.

(a) Provider
Only providers compatible with the PPPoE (RFC2516 standard) are supported.

(b) Line terminal equipment
Only recommended line terminal equipments provided by each compatible provider are supported.

The following shows the scope of DSL support for the provider which provides DSL communication.

(a) Provider
Only providers compatible with the PPPoA (RFC2364 standard) and PPPoE (RFC2516 standard) are supported.

(b) DSL modem
Only DSL modems compliant with the G.992.1/G992.2 AnnexA Standard are supported.

Operating environment

■ Server (personal computer)

A contract with a provider is required for use of server.

● The following shows the operating environment for personal computer.

Item		Description	
Computer main unit		Pentium® 200MHz or higher (recommended) IBM-PC/AT-compatible personal computer installed with applicable Windows®. However, a Pentium 300MHz processor or higher is recommended when using Windows® XP Professional.	
Required memory		64 MB or more, However, 128 MB or more when using Windows® XP Professional.	
Hard disk area	For installation	100 MB or more	
	For operation	100 MB or more	
Disk drive		CD-ROM disk drive	
Display		Resolution: 1024×768 pixels or higher (XGA or higher)	
Operating system*1		Web function-compatible	Microsoft® Windows® 98 Microsoft® Windows® 98 Second Edition Microsoft® WindowsNT® Workstation 4.0*2 Microsoft® Windows® 2000 Professional*2 Microsoft® Windows® XP Professional*2
		MELSOFT connection function-compatible	Microsoft® WindowsNT® Workstation 4.0*2 Microsoft® Windows® 2000 Professional*2 Microsoft® Windows® XP Professional*2
Web browser		Microsoft® Internet Explorer 6.0 or later	

*1: This product does not work with Windows® Me and Windows® XP HomeEdition, as the Web server is incompatible.

*2: Administrator privilege is required to install GX RemoteService-I into the following operating systems, WindowsNT® Workstation4.0, Windows® 2000 Professional and Windows® XP Professional. In addition, Administrator privilege is required to use GX RemoteService-I in Windows® XP Professional.

● The following shows the operating environment for PC CPU module.

Item		Description
Module		PPC CPU686 (MS)
Hard disk area	For installation	100 MB or more
	For operation	100 MB or more
Disk drive		CD-ROM disk drive (PPC-CDD-01)
Display		Resolution: 1024×768 pixels or higher (XGA or higher)
Operating system		Microsoft® WindowsNT® Workstation 4.0 Microsoft® Windows® 2000 Professional Microsoft® Windows® XP Professional
Web browser		Microsoft® Internet Explorer 6.0 or later

● **The following shows the operating environment for Web server module.**

Item	Description
Module	QJ71WS96
Compact flash card	64MB or more

Install GX RemoteService-I Version2 into a compact flash card, and then set it to the Web server module.
Note that a compact flash card is compatible with the Web server module with the first five digits of the serial number "05112" or later.

IMPORTANT

A Web server software must be installed to use the Web function. Make sure that the Web server software is compatible with the operating system (OS) before installation.
The following shows the applicable Web server software.

Operating system (OS)	Compatible software
Microsoft® Windows® 98	Personal Web Server Version 4.0 or later
Microsoft® WindowsNT® Workstation 4.0	Peer Web Service Version 4.0 or later
Microsoft® Windows® 2000 Professional Microsoft® Windows® XP Professional	Internet Information Server Version 5.0 or later

- Web server software other than above is inapplicable.
- Windows® 98, Windows® 2000 and Windows® XP must be set up at the time of installation.
- Set up WindowsNT® 4.0 when installing Service Pack 3 or later and Option Pack. (WindowsNT® 4.0 Service Pack 3 or later and Option Pack are available by downloading them from the Microsoft® Corporation home page or by CD-ROM sending service.)
- Refer to the help function of Windows® for the installation method and others of the server software.

■ I-mode compatible mobile phone

The necessary environment is as follows.

Used Device	Description
When using a mobile phone.*	I-mode compatible mobile phone (Manufactured by NTT DoCoMo, Inc.) Ezweb compatible mobile phone
When using a personal computer.	Personal computer where the Web browser has been installed (Microsoft® Corporation's Internet Explorer 5.5 or later or Netscape Communication Corporation's Netscape Communicator 4.5 or later)

*: This product can be used only in Japan.

5.1.5 Excel/Text • CSV format data converter: GX Converter

Overview

GX Converter Version1 (hereafter abbreviated to, GX Converter) is a software package which enables to convert the text/CSV format data to the instruction list/device comment/device memory, which are available to be used on GX Developer, and to convert the instruction list/device comment/device memory to the text/CSV format data.

Features

■ Conversion can be processed as a GX Developer function.

Conversion can be performed without closing the GX Developer because it is an add-on function for the GX Developer.

■ Data can be converted by file.

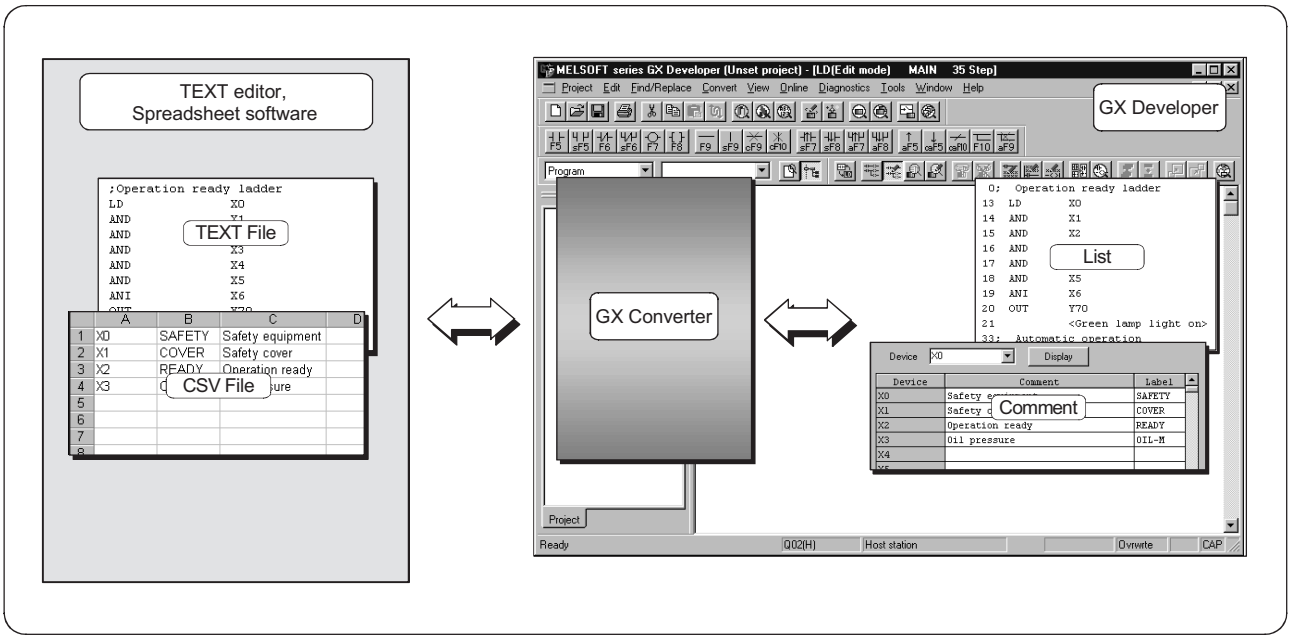
Conversions can be performed between commercial software (TEXT, CSV format data) and the GX Developer (List or Device comments) at the file level.
(There is no need for copying and pasting.)

■ Sequence programs can be created using commercial software.

When a program created using the TEXT,CSV format is converted to a List via GX Converter, it may be used as an actual sequence program.

■ Data can be created in any file format.

When creating a List or Device Comments using the TEXT,CSV format, the file format can be created freely.



Operating environment

Item		Description
Install (Add-in) destination *1, *2		Add-in to GX Developer Version 3 (SW3D5C-GPPW-E or later).
Computer main unit		Personal computer on which Windows® operates.
	CPU	Refer to the following table "Used operating system and performance required for personal computer".
	Required memory	
Free space	For installation	25MB or more
	For operation (Virtual memory) *3	10MB or more
Disk Drive		CD-ROM disk drive
Display		800 × 600 dot or more resolution
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version)
Microsoft® Word (When using add-in software for Word) *5, *7		Word 95, Word 97, Word 98, Word 2000*6, *8, Word 2002*8
Microsoft® Excel (When using add-in software for Word) *5		Excel 95, Excel 97, Excel 2000 *8, Excel 2002*8

*1: GX Converter cannot be installed into GX Developer (SW0D5-GPPW-E, SW1D5-GPPW-E, SW2D5-GPPW-E). GX Converter becomes unusable if the version (SW0D5-GPPW-E, SW1D5-GPPW-E, SW2D5-GPPW-E) of GX Developer (SW2D5C-GPPW-E or earlier) is reinstalled in the environment where GX Converter has already been installed into GX Developer (SW3D5C-GPPW-E or later).

*2: Install GX Converter into the software package of the same language.
GX Converter (English version) cannot be installed into GX Developer of other than the English version.

*3: Free space of at least twice the size of the TEXT, CSV format file that will be read is required in the Windows® temporary drive.

*4: When using Windows® XP Professional and Windows® XP Home Edition, large-sized fonts are not available.

*5: Word and Excel of Office 95, Office 97, Office 2000 and Office XP are included.

*6: When using Word 2000 on Windows® 95, garbage characters may occur.

*7: To use with add-in of other products, make sure to register the add-in of this software package at start-up.

*8: When "Office 2000 English User Interface Pack" or "Office XP English User Interface Pack" is used, GX Converter is not supported.

Applicable system software and the corresponding required personal computer performance

Operating System		Performance Required for Personal Computer	
		CPU	Required memory
Windows® 95		Pentium® 133MHz or more	32MB or more
Windows® 98		Pentium® 133MHz or more	32MB or more
Windows® Me		Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0		Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional		Pentium® 133MHz or more	64MB or more
Windows® XP Professional	"XP compatibility mode" and "Fast User Switching" are not supported.	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition		Pentium® 300MHz or more	128MB or more

5.2 PX Series

5.2.1 PX Developer overview

Overview

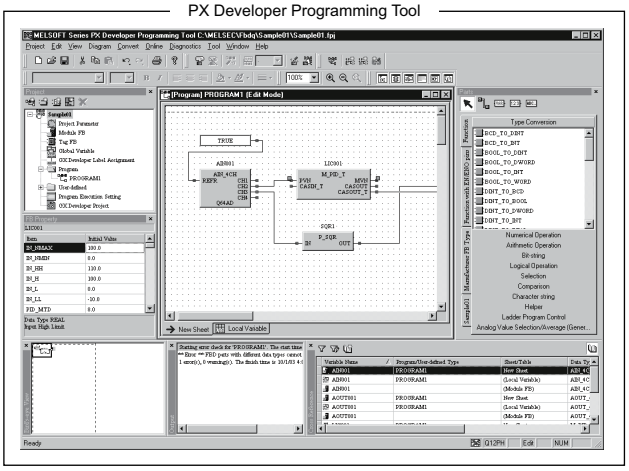
PX Developer is a software package which supports users to process DDC on CPU module.
PX Developer consists of programming tool and monitor tool.
The programming work is done in FBD language. DDC processing monitor is done with tag data.

FBD: Function Block Diagram
DDC: Direct Digital Control

(1) Programming tool

The tool can be used for programming with FBD language (FBD program editing function), converting program edited by FBD into ladder program (compile function), as well as for monitoring and debugging.

PX Developer Programming Tool



GX Developer is required to run the PX Developer programming tool.
Note that the combination of GX Developer and PX Developer varies with the CPU module connected as shown below.

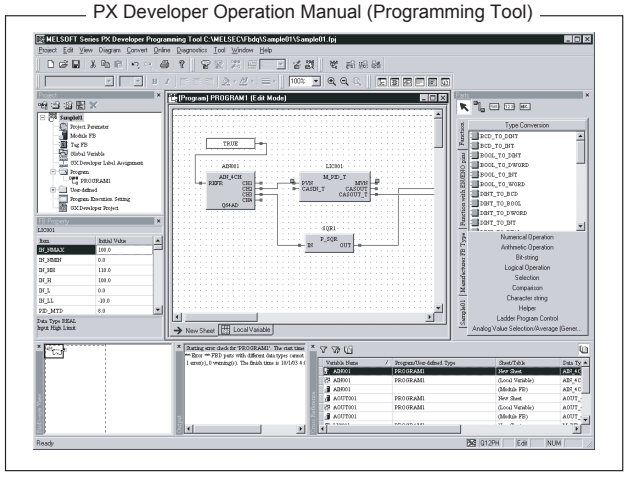
Connected CPU	GX Developer	PX Developer
Process CPU	Version 7.20W or later	Version 1.02C or later
Redundant CPU	Version 8.17T or later	Version 1.05F or later

The programming tool has the following modes:
•Edit mode
•Monitor mode

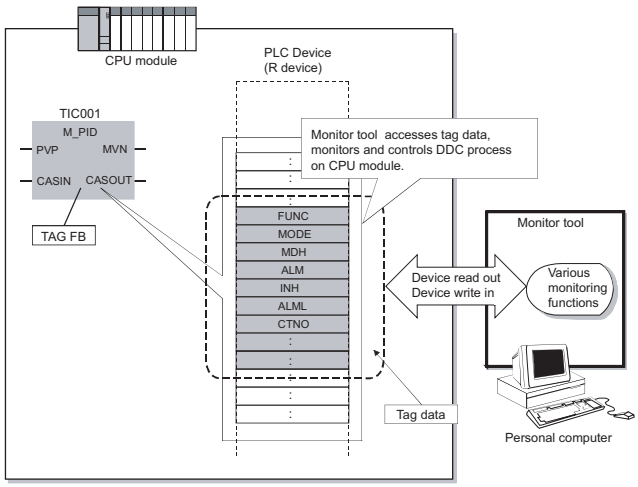
(2) Monitor tool

The monitor tool can be used to monitor and control DDC processing that is being executed on CPU module (DDC monitor function).

PX Developer Operation Manual (Programming Tool)



The monitor tool monitors and controls DDC processing executed in the way of tag FB with the programming tool. Inside Tag FB, there is a data area called tag data. This tag data is arranged on the PLC device. When a program with this tag FB is executed, the tag data can show the logical status of DDC processing at any time. Meanwhile, the monitor tool controls DDC processing logic itself through parameters in this tag data. Monitor tool communicates with CPU module monitoring and controlling this tag data. The contents of tag data read can be displayed on various kinds of monitor screens. And numerical values can be written to the tag data through users' operation.



The monitoring status with the insertion of tag data

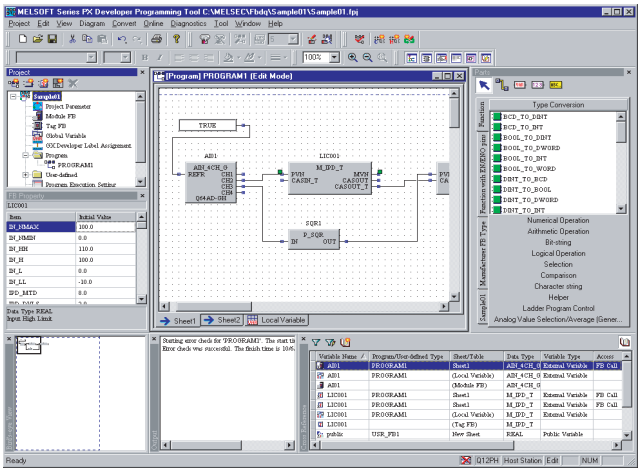
Besides, monitor tool offers ActiveX control. This control can get optional values inside tag data. As a result, users can make optional user-created screens (user monitor screens) with Microsoft® Visual Basic® Version 6.0.
User-created screens made with ActiveX control are easy to be opened by pressing buttons on the monitor tool.

5.2.2 PX Developer programming tool

Features

■ Easy programming only by arranging and connecting FB

It is very complex and troublesome to describe DDC processing in the ladder program, but it is possible to make a visually understandable program by the programming tool with FBD language compatible with the IEC61131-3 International Standard. Thus the time and cost of programming can be saved, and the starting period of process control system can be shortened.



■ Cooperation with ladder program

In a batch processing system that integrates sequence and loop control, a ladder program for the sequence control can coexist with a FBD program that can simply describe the loop control in a single CPU module.

■ Shorten DDC processing time by supplying tag FB

The users are provided with an applicable loop processing FB (tag FB) integrating CPU module dedicated commands for process control and tag data, so as to shorten the DDC processing time.

■ Shorten the man-hours for program access by providing FB for modules access processing

It is unnecessary to make a ladder program for input/output access because FB (module FB) has provided for the access of Q series I/O modules and analog modules in CPU module.

■ Automatically assign device No. (Physical address)

FBD program can be created without considering PLC device. Moreover, the troublesome device assignment task can be saved through automatic assignment of PLC devices in FBD program.

■ Easily confirm the influence on other processings when modifying FBD program

As the programming tool provides "Cross reference function" that displays a list of variables used in FBD programs, the users can easily confirm the influence on other processing by tracing the relevant variables in the list, when modifying FBD programs. Furthermore, it includes the filter display function that displays a list of the variables used in specific programs. These features help to reduce the man-hours for FBD program modification.

■ Application to redundant CPU

Programs can be created for the redundant system including redundant CPUs.
By changing the PLC type, projects for process CPU module can be used as redundant CPU programs.

Function

■ Manage program elements through project

Manage programs (created by programming tools), parameters and user-defined FB parts are managed collectvely through project to realize administration of program data.

■ Programming with FBD language

By FBD language, which is compatible with IEC61131-3 standard, users can create program through simple operations as configuring parts and establishing direct connection.
Additionally, users can also change input pin number (some are function part).
FBD parts can be reconfigured, thus it is possible to edit which FBD part shall be displayed in front.

■ Cross reference function

A list that shows where variables are declared and used by the programming tool.
As it includes the sort and filter (narrow search display) functions, which are helpful to trace the relevant variables, the users can easily confirm the variables that will be affected by program modification.

■ FBD program convert function (compile)

FBD programs made by programming tools can be converted into executable codes in a CPU module (ladder program or PLC parameter).
Additionally, if online change compile is executed, online change will be executed after compile. Before conversion, error check will be performed automatically.

■ Online function

Through online connection between programming tool and CPU module, not only can users monitor the status of created programs, local variables, I/O value of tag FB and global variables in real time, but also change the current value of the variable during processing. Additionally, as for tag FB, the faceplate can be displayed for monitoring the monitor value.

■ Upload/Download of FBD program

The symbolic data of FBD program can be stored in PLC CPU. Since a project can be restored from a symbolic data by uploading from PLC, the editing can be done on a personal computer on which the project is not saved.

■ Diagnoing function

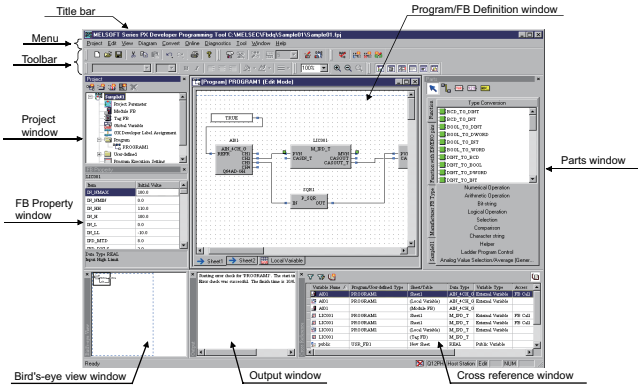
Diagnose the created FBD programs. When an error is found in the program, the error position can be displayed on the screen and the related details can also be displayed when you double-click the displayed error. (It can be displayed only when the contents containing information about the editing or setting screen of FBD sheet is selected.)
Additionally, it can diagnose created programs as well as CPU module. It makes recovery work facilitate as the current error status and error history can be displayed.

■ Upload function

This function allows a project to be reproduced on any personal computer even if the project data is not saved at the personal computer. (The data required to reproduce the project must first be downloaded to the PLC CPU.)

Screen configuration

(1) Screen configuration of the programming tool main window



Relevant contents of the items above-mentioned are described in the following table.

Items	Contents
Title bar	Display currently opened project path etc.
Menu	Display workable functions list of the programming tool.
Toolbar	Frequent operations (save, copy, paste, etc.) can be executed by clicking the buttons on it instead of opening the menu.
Project window	The window used for opening various setting windows, program/FB definition window etc.
FB Property window	The window used for setting initial value of public variable of FB parts. (Refer to section 7.5)
Bird's-eye view window	Display active programs/the bird's-eye view of FBD sheet in the FB definition window.
Output window	The window for displaying messages when executing error check or compile.
Cross reference window	The window for displaying the where variables are declared and used by the programming tool.
Parts window	The window for list display of parts pasted in FBD sheet of the Program/FB definition window.
Program/FB definition window	The window for editing programs and displaying the local variable sheet in FBD sheet.

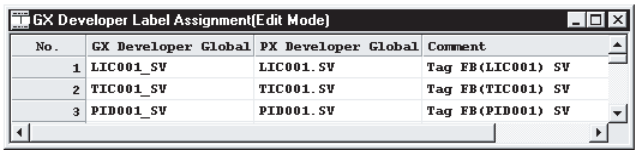
Relation with GX Developer

When GX Developer project is started in PX Developer project, the user can create ladder program or make various parameter setting with programming tool.
The relation of FBD program in a PX Developer project with the ladder program compiled by the user is as follows.

● About ladder programming

(1) Ladder program (called user-created ladder hereafter) in GX Developer can be used to describe the processing that is difficult to be described in a FBD program (such as interlock processing).

(2) Through GX Developer label assignment setting in programming tool, the global variable in a FBD program can be used as GX Developer's global label. This allows the user to program with the variables of FBD programs on a user ladder without paying attention to devices.


GX Developer Label Assignment(Edit Mode)

No.	GX Developer Global	PX Developer Global	Comment
1	LIC001_SV	LIC001.SV	Tag FB(LIC001) SV
2	TIC001_SV	TIC001.SV	Tag FB(TIC001) SV
3	PID001_SV	PID001.SV	Tag FB(PID001) SV

● Download to PLC

Please use PLC download function of programming tool when downloading user-created ladder or setting parameters compiled in GX Developer.

● GX Developer/PX Developer version

GX Developer is required to use the PX Developer programming tool.
Note that the GX Developer version and the applicable PX Developer version vary with the PLC CPU connected as shown below.

Connected CPU	GX Developer	PX Developer
Process CPU	Version 7.20W or later	Version 1.02C or later
Redundant CPU	Version 8.17T or later	Version 1.05F or later

Operating environment (PX Developer programing tool)

Items		Contents
Computer		PC/AT compatible machine where Microsoft® Windows® Operating System runs.
	CPU	Refer to the table below "Applicable system software and the corresponding required personal computer performance".
	Required memory	
Hard disk free space		When installing : Hard disk 100MB or more When operating: Free space of virtual memory 100MB or more
Disk drive		CD-ROM disk drive
Display		Resolution: 800×600 pixels (256 colors) or more *5
Network Interface		One of the following is required <Serial USB connection> • Serial port • USB port < Network route > • Ethernet board • MELSECNET/10 interface board *1 • MELSECNET/H interface board • CC-Link board *4
Pointing Device		Double-button mouse or the compatible pointing device
System Software *6		• Microsoft® Windows® 98 Operating System (English Version) *2 • Microsoft® Windows® Millennium Edition Operating System (English Version) • Microsoft® Windows NT® Workstation 4.0 Operating System (English Version) Service Pack 3 or later *3 • Microsoft® Windows® 2000 Professional Operating System (English Version) • Microsoft® Windows® XP Professional Operating System (English Version) Service Pack1 or later • Microsoft® Windows® XP Home Edition Operating System (English Version) Service Pack1 or later
Required Software & Program Package		GX Developer Version 7 (SW7D5C-GPPW Version 7.20W) or later. However, GX Developer Version 8 (SW8D5C-GPPW Version 8.03D or later) is required to upload/download symbolic data from/to PLC, and Version 8.17T or later for a redundant CPU.

*1: Inapplicable when connecting to the redundant CPU, as the MELSECNET/10 interface board driver is incompatible.

*2: Windows® 98 Second Edition Operating System is included.

*3: USB cannot be used with Microsoft® Windows NT® Workstation 4.0 Operating System. If used, a communication error will occur.

*4: CC-Link Ver.1 and Ver.2 boards cannot be used together with the same PC.

*5: Resolution 1024×768 pixels or more is required to display an illustration for FB property page.
Note that the Big fonts function cannot be used.

*6: Installing the latest version of Microsoft® Internet Explorer and the Service Pack is recommended.

Applicable system software and the corresponding personal computer performance

System Software	Required Personal Computer Performance	
	CPU*7	Required memory
Windows® 98 (including Windows® 98 Second Edition Operating System)	Pentium 133MHz or more *8	64MB or more
Windows® Me	Pentium 150MHz or more *8	64MB or more
Windows NT® Workstation 4.0 Operating System (Service Pack 3 or later)	Pentium 133MHz or more *8	64MB or more
Windows® 2000 Professional	Pentium 133MHz or more *8	64MB or more
Windows® XP Professional (Service Pack 1 or later)	Pentium 300MHz or more	128MB or more
Windows® XP Home Edition (Service Pack 1 or later)	Pentium 300MHz or more	128MB or more

*7: Cannot be used in the multi processor environment.

*8: Pentium® 300MHz or more is recommended.

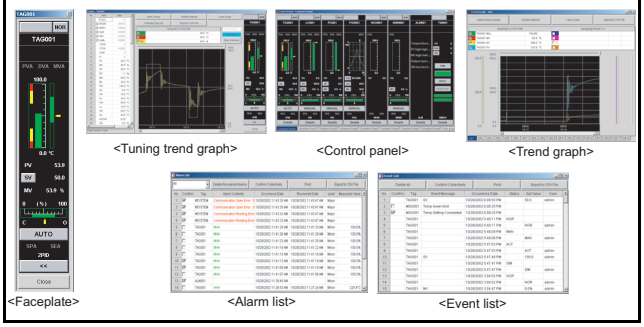
5.2.3 PX Developer monitor tool

Features

■ Shorten configuration time of process control system with tag monitoring control function

Various standard functions are installed inside the monitor tool for tag monitoring control, which are necessary for the start adjustment of process control system. Communication processing does not need to be programmed, because monitoring work can be done by easily setting tags made by PX Developer programming tool.

[Standard monitor function installed inside PX Developer monitor tool]



■ Various connection methods with CPU

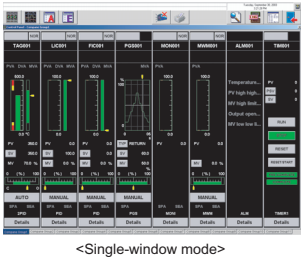
The monitor tool can monitor and operate up to 8 CPU modules via MELSECNET/10(H) or Ethernet network.
The serial/USB and connection by CC-Link are allowed for adjusting the CPU.
[Communication route of PLC transfer setup that can be set in the monitor tool]

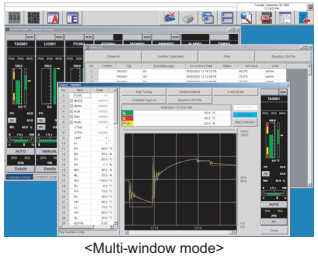
Communication route	Adjustment	Application
Serial/USB	○	×
MELSECNET/10	○	○
MELSECNET/H	○	○
Ethernet	○	○
CC-Link	○	×

○ : usable
× : unusable

■ Operation environment with single/multiple windows adapted to different purposes

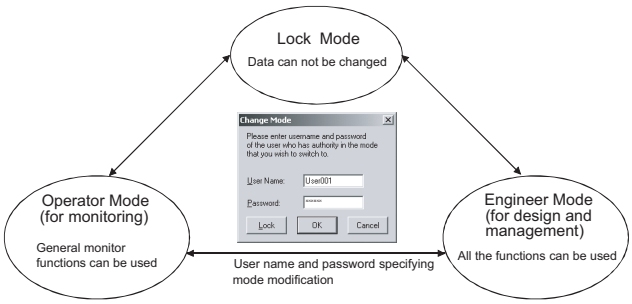
According to different purposes, single-window mode and multi-window mode can be selected. The former can always display only one screen in maximal size. The latter can display several screens at the same time, furthermore, the window's size and its arrangement can be changed freely through easy setting.





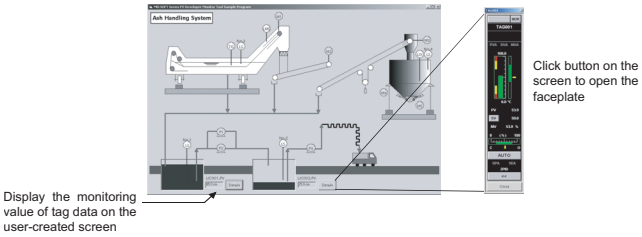
■ Mis-operation by persons not concerned can be avoided by managing user names and passwords

In monitor tool, operators without registering user names and passwords (without right) cannot change numerical values and setting by changing modes. Therefore, the mode just needs to be set to lock status. Even without operators, mis-operation by persons not concerned can be avoided.



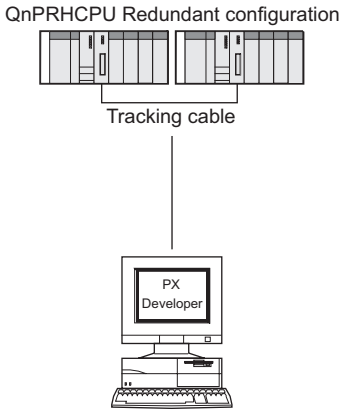
■ Support user-created screen made by Microsoft® Visual Basic®

Monitor tool provides ActiveX control to get tag data value. To use this control on the graphs made by Microsoft® Visual Basic® the tag data can be monitored.



■ Application to redundant CPU

Monitoring and control can be performed by redundant system including redundant CPUs.
When the system is switched, the monitoring/control target is automatically changed.

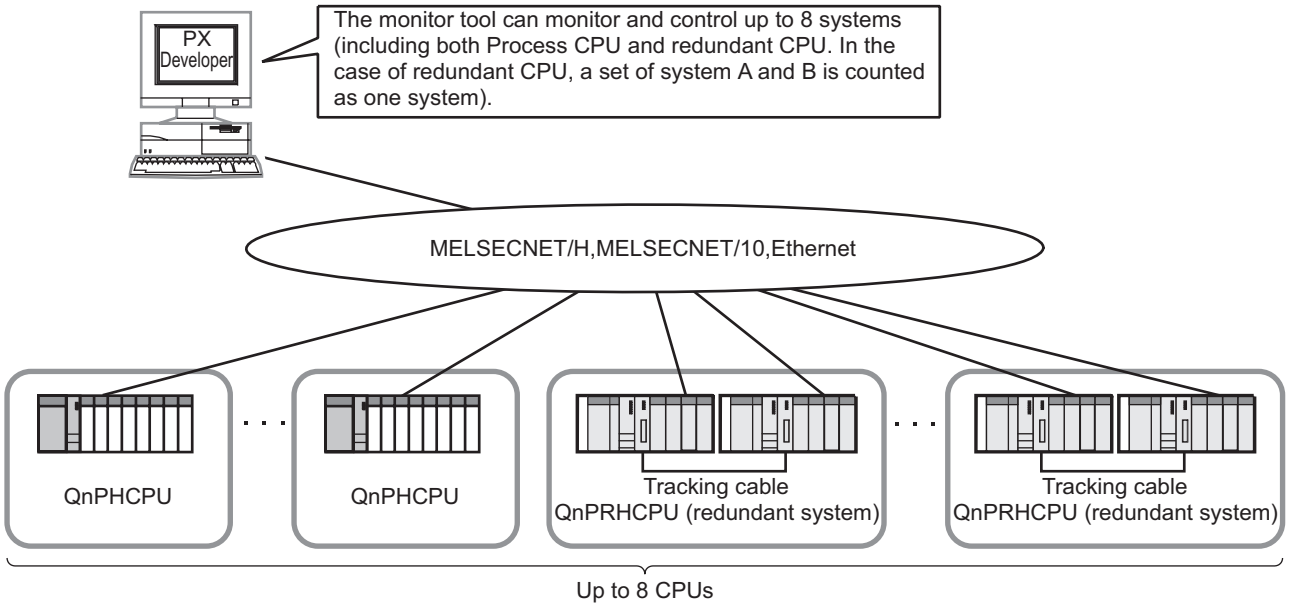


■ Monitoring is enabled by the monitor tool only

The personal computer in which GX Developer has not been installed can be monitored by the PX Developer Version 1.05F or later only monitor tool using.

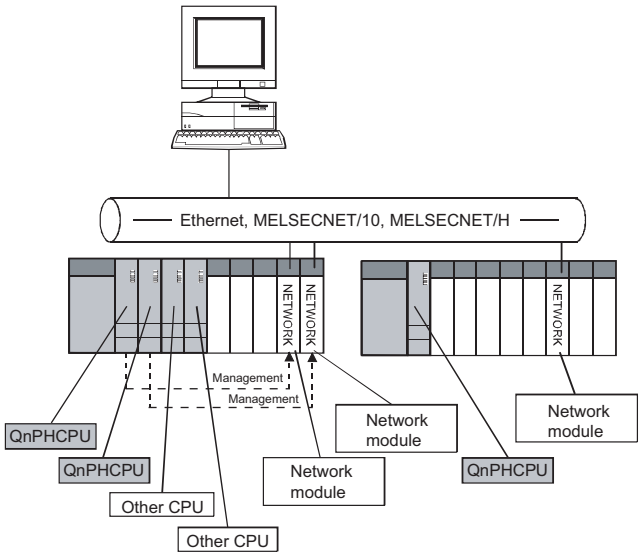
■ Maximum monitor system configuration with Monitor Tool

Only CPU modules within the same network as the network board of personal computer can be set as connection target.
Note that PX Developer cannot monitor the multi-tier network using relay stations.



The multiple CPU system including Process CPU can be monitored when the following conditions are satisfied.

- A network module is controlled by each Process CPU.
- The whole network includes up to 8 CPUs, including Process CPU of multiple CPU system and CPU module of single CPU system. (In the following diagram, 3 QnPHCPUs are counted.)

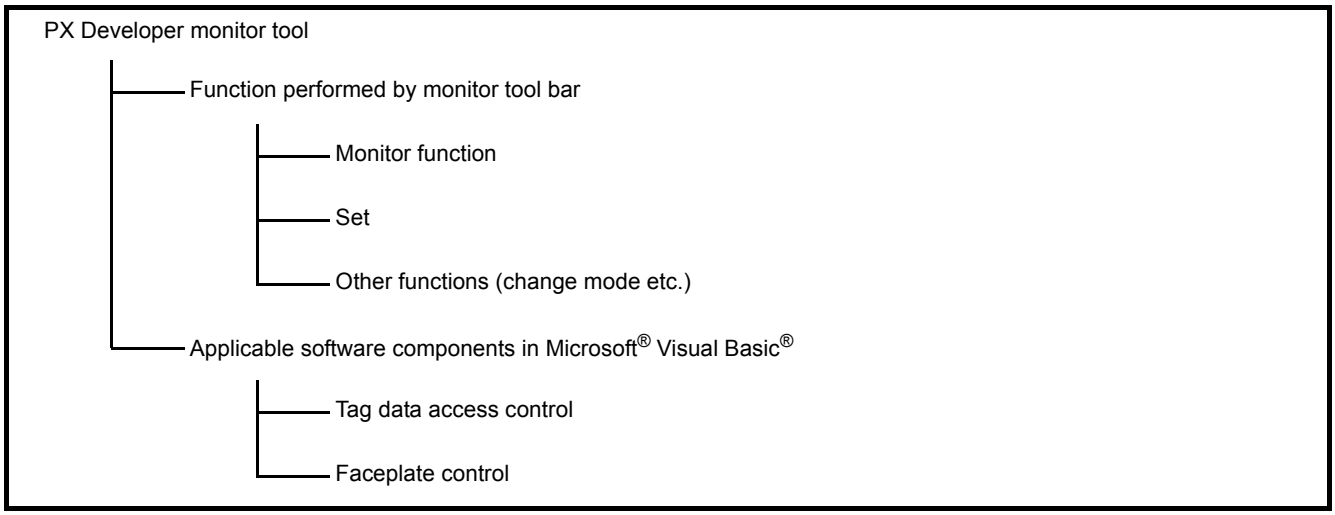


<System configuration with multiple CPU system>

* The redundant system does not support the multiple CPU system.

Function

The functions of PX Developer monitor tool are as follows.

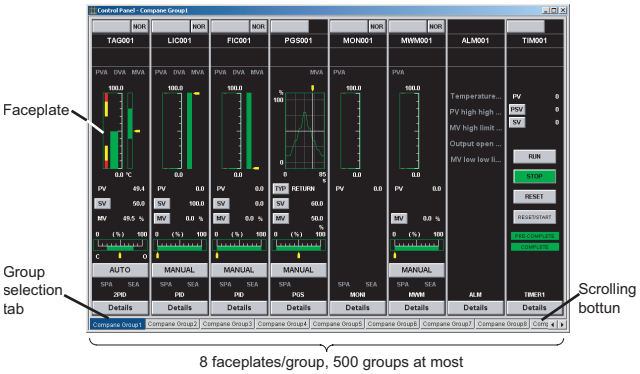


■ The primary functions performed by monitor tool bar

Function		Contents	Setting Window
Monitor function	Control panel	A faceplate that can maximum parallel display 8 simulating process control	Control panel setting
	Trend graph	A time sequence change chart that displays tag data item value.	Trend setting
	Alarm list	A list that maximum displays 2000 alarm records	Alarm setting
	Event list	A list that maximum displays 2000 event records	Event setting
	User-graphic	Applied program pointed by start which can display the user-created screen by user.	User-graphic setting
	Pop-up faceplate	A faceplate that can display simulating process control by using pop-up window.	---
	Pop-up tuning	A faceplate that can display a tuning pop-up window (faceplate + tuning trend graph + tag monitor).	---
Buzzer stop		Stop alarm buzzer.	Option setting
Print screen		Hardcopy of whole screen in the print display.	Option setting
Screen Align		Overlap the diagrams in display or redisplay after vertical arrangement.	---
Find		Find tag, Control panel, and Trend graph. Display pop-up faceplate after finding tag.	Control panel setting, trend setting.
Change Mode		Determining function limit according to the authority of user. (Mode divided into: lock mode, operator mode and engineer mode)	User setting
Setting		Set up work conditions of each function.	---
Display communication condition		Confirm the collection period for each type of communication between monitor tool and CPU module.	Monitor target project setting
Automatic CSV file export		Save trend, alarm and event data in CSV files automatically as histories.	Trend setting Option setting
Exit		Stop monitor, exit monitor tool.	---

■ Control panel

Implement grouping administration to the screen called faceplate with the simulating adjusting meter, and every group is displayed in a parallel way.
On the faceplate, the current PID control status can be monitored with histogram and be executed ON/OFF control.



At most 500 groups can be registered.
Maximum 8 (the number of tags) faceplates can be displayed in one group.
On the control panel, total 500×8 = 4000 tags can be registered at most.

● Faceplate display

Every piece of assigned tag information is displayed on the faceplate.
In control panel, the tag faceplates of the chosen groups are displayed together on one graphic screen.
The group, number and tag allocation of the faceplate can be set with control panel setting.

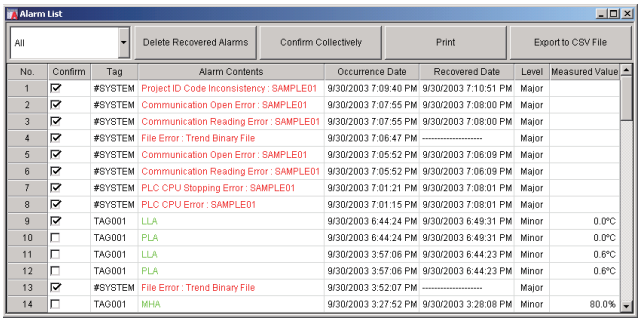
■ Trend graph

Display the time series process of the tag data item value with curve graph. The curve graph is managed in groups, and every group is displayed respectively.

Maximum 125 groups can be registered.
Maximum 8(tag data item number) trend graphs can be displayed in one group.
At most total 125×8 = 1000 tag items.
In the 1 second or 10 seconds sampling period, collectable tag data item number is 100 at most.

■ Alarm list

Display the list of alarm record.



No.	Confirm	Tag	Alarm Contents	Occurrence Date	Recovered Date	Level	Measured Value
1	☑	#SYSTEM	Project ID Code Inconsistency : SAMPLE01	9/30/2003 7:09:40 PM	9/30/2003 7:10:51 PM	Major	
2	☑	#SYSTEM	Communication Open Error : SAMPLE01	9/30/2003 7:07:55 PM	9/30/2003 7:08:00 PM	Major	
3	☑	#SYSTEM	Communication Reading Error : SAMPLE01	9/30/2003 7:07:55 PM	9/30/2003 7:08:00 PM	Major	
4	☑	#SYSTEM	File Error : Trend Binary File	9/30/2003 7:06:47 PM	----------	Major	
5	☑	#SYSTEM	Communication Open Error : SAMPLE01	9/30/2003 7:05:52 PM	9/30/2003 7:06:09 PM	Major	
6	☑	#SYSTEM	Communication Reading Error : SAMPLE01	9/30/2003 7:05:52 PM	9/30/2003 7:06:09 PM	Major	
7	☑	#SYSTEM	PLC CPU Stopping Error : SAMPLE01	9/30/2003 7:01:21 PM	9/30/2003 7:08:01 PM	Major	
8	☑	#SYSTEM	PLC CPU Error : SAMPLE01	9/30/2003 7:01:15 PM	9/30/2003 7:08:01 PM	Major	
9	☑	TAG001	LLA	9/30/2003 6:44:24 PM	9/30/2003 6:49:31 PM	Minor	0.0℃
10	☐	TAG001	PLA	9/30/2003 6:44:24 PM	9/30/2003 6:49:31 PM	Minor	0.0℃
11	☐	TAG001	LLA	9/30/2003 3:57:06 PM	9/30/2003 6:44:23 PM	Minor	0.6℃
12	☐	TAG001	PLA	9/30/2003 3:57:06 PM	9/30/2003 6:44:23 PM	Minor	0.6℃
13	☑	#SYSTEM	File Error : Trend Binary File	9/30/2003 3:52:07 PM	----------	Major	
14	☐	TAG001	MHA	9/30/2003 3:27:52 PM	9/30/2003 3:28:08 PM	Minor	80.0%

Maximum 2000 alarm records are displayed.

■ Mode administration

● Mode overview

When using the monitor tools, the users need to be pre-registered, and their passwords and authority should be defined. (Engineer or Operator)
When the monitor tool starts, it is in the lock mode and all the operation of configuration and change value are restricted.
When operating, the user designates user name and password, as well as changing the mode. After the change, the mode can be operated within the authority (engineer or operator) corresponding to the pre-registered user names.
Before the operator leaves, if the lock mode is set, the mis-operation by irrelevant persons can be avoided.

● Mode types

Among the monitoring tools, 3 kinds of modes can be set for every user.

Mode name	Description	Corresponding user's authority
Engineer Mode	For all functions	Engineer
Operator Mode	For mode with general monitor function	Operator
Lock Mode	The setting and tag data can not be changed	(No designated user)

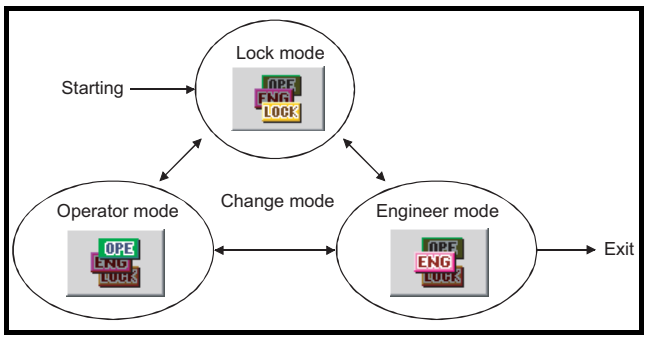
● User authorities

Some available functions will be limited according to the modes.

Function	Description	Lock	Operator	Engineer
Setting	Set the operation conditions of all functions	No	No	Ok
Exit	Exit monitor tools to stop monitoring	No	No	Ok
Lockout tag/ setting/ removing	Forbid the operation on the faceplate/ cancel the forbiddance	No	Partly ok Only the operators' grade tag can be changed	Ok All the lockout tags can be changed

● Mode Transition

At the starting time, the lock mode is used.
The closing monitor tool can be realized only in the engineer mode.



■ Software component enable to be used on Microsoft® Visual Basic®

The monitor tool offer ActiveX control which is used for accessing the tag data easily so that the user can uses Microsoft® Visual Basic® to create the user-graphic screen (user monitor screen).
The application program (in EXE form) of the user-created screen (user monitor screen) can be started by pressing the button which is assigned beforehand the same operation as displaying other monitor windows.

● Tag Data Access Control

Tag data access control is the ActiveX control that acquires or sets tag data value. For format such as appearance please refer to the command button control provided by Visual Basic®.
Users can freely arrange tag data access control button on user-created screen. Click the button to display pop-up faceplate screen of tags. With tag data access control, users can separately specify tag data item and acquire/set its value.

● Faceplate Control

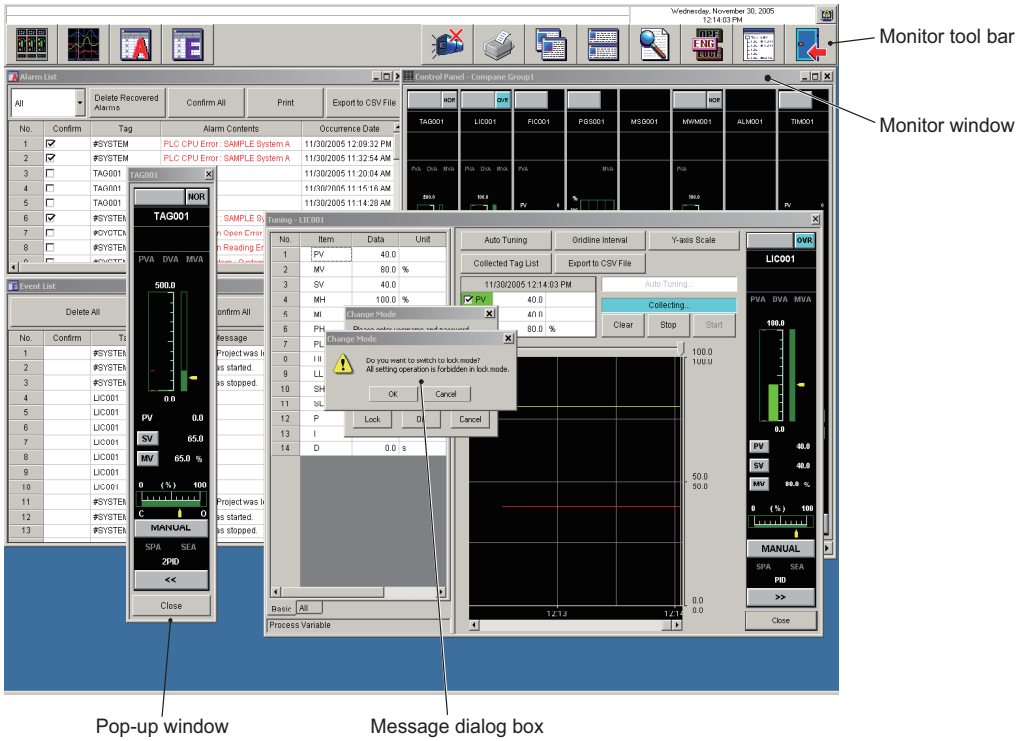
Faceplate control is the ActiveX control that displays faceplate on user-created screen.
The external appearance and function are as same as that of monitor tool faceplate.

Screen configuration

The screens displayed by monitor tools can be approximately classified as follows.

Screen		Feature	Maximum number
Monitor toolbar		Menus to select primary functions. They are always on the top of the screen and will not be cascaded by other windows.	1
Monitor Window	Multi-window mode	Normal windows with variable sizes, possible to be maximized and minimized.	4
	Single window mode	Windows displayed in maximum size, unable to be displayed simultaneously within a plurality of windows.	1
Pop-up window		Usually displayed in front of other windows, with variable sizes, maximization and minimization unallowable.	2
Message, dialog box		Used for display of users' confirmations and settings, fixed window-size.	---

The number of screens that can be displayed is subject to the type of the screen.
Besides monitor toolbars, 4 monitor windows and 2 pop-up windows can be displayed simultaneously under the multi-window mode.



Operating environment (PX Developer monitor tool)

Item		Content	
Computer		PC/AT compatible where Microsoft® Windows® Operating System runs	
	CPU	Refer to the table below, "Applicable operating system and the corresponding required personal computer performance".	
	Required memory		
Hard disk free space		When installing : Hard disk 100MB or more When operating: Free space of virtual memory 100MB or more	
Disk drive		CD-ROM disk drive	
Display		Resolution: 800×600 pixels (256 colors) or more	
Network interface		One of the following is required • Ethernet board • MELSECNET/10 interface board *1 • MELSECNET/H interface board Serial, USB, CC-Link board *3 can only be used for adjustment.	
Pointing devices		2-button mode mouse or the compatible pointing device	
Operating system*2		• Microsoft® Windows NT® Workstation Operating System Version 4.0 (English Version) Service Pack 3 or later *4 • Microsoft® Windows® 2000 Professional Operating System (English Version) • Microsoft® Windows® XP Professional Operating System (English Version) Service Pack 1 or later • Microsoft® Windows® XP Home Edition Operating System (English Version) Service Pack 1 or later	
Required software package		PX Developer Version 1.04E or earlier	GX Developer Version 7 (SW7D5C-GPPW Version 7.20W or later)*5
		PX Developer Version 1.05F or later	None
Programming language			

Programming language	Development software
Visual Basic	Microsoft® Visual Basic® 6.0 Microsoft® Visual Basic® .NET2002 Microsoft® Visual Basic® .NET2003

*1: The connection to the redundant CPU cannot be made via the MELSECNET/10 interface board since the MELSECNET/10 interface board driver is incompatible.

*2: Monitor tool cannot be installed on Microsoft® Windows® 98 Operating System and Microsoft® Windows® Millennium Edition Operating System.

*3: CC-Link Ver.1 and Ver.2 boards cannot be used together on the same personal computer.

*4: USB is inapplicable for Microsoft® Windows NT® Workstation 4.0 Operating System, as it will cause a communication error.

*5: GX Developer must be installed because the communication library in GX Developer is used for communication between monitor tool and QnPHCPU.

Applicable operating system and the corresponding required personal computer performance

Operating System	Required Personal Computer Performance	
	CPU*6	Required memory
Windows NT® Workstation 4.0 (Service Pack 3 or later)	Pentium® 133MHz or more (Pentium® 300MHz or more recommended)	64MB or more
Windows® 2000 Professional	Pentium® 133MHz or more (Pentium® 300MHz or more recommended)	64MB or more
Windows® XP Professional (Service Pack 1 or later)	Pentium® 300MHz or more	128MB or more
Windows® XP Home Edition (Service Pack 1 or later)	Pentium® 300MHz or more	128MB or more

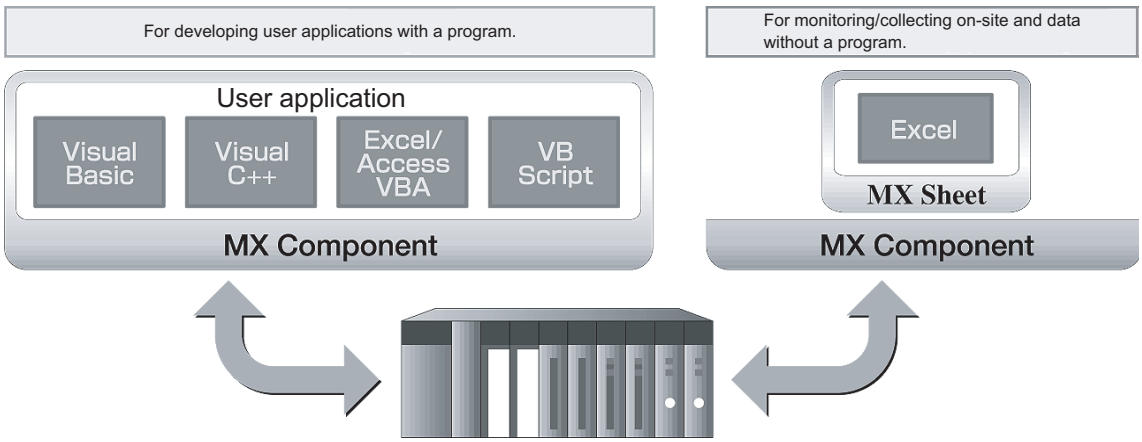
*6: Cannot be used in the multi processor environment.

5.3 MX Series

5.3.1 Overview

Overview

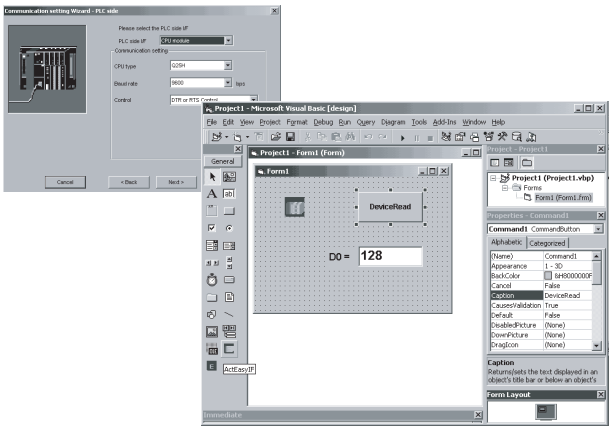
The MX series enables simple system configuration without having to consider complicated protocols for Ethernet communication, serial communication, etc.
The MX series has a wide lineup of software, from collecting onsite data using Excel without any programming, to abilities for designing sophisticated user applications.



Increased efficiency for developing user applications

■ MX Component

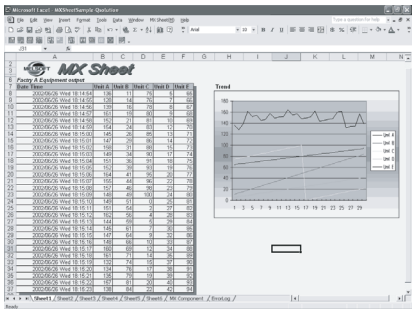
Since MX Component smoothes out differences in protocol between communication paths, it can achieve communication between the PLC and personal computer in the same method. This substantially improves efficiency for system development.



Data collection without programming

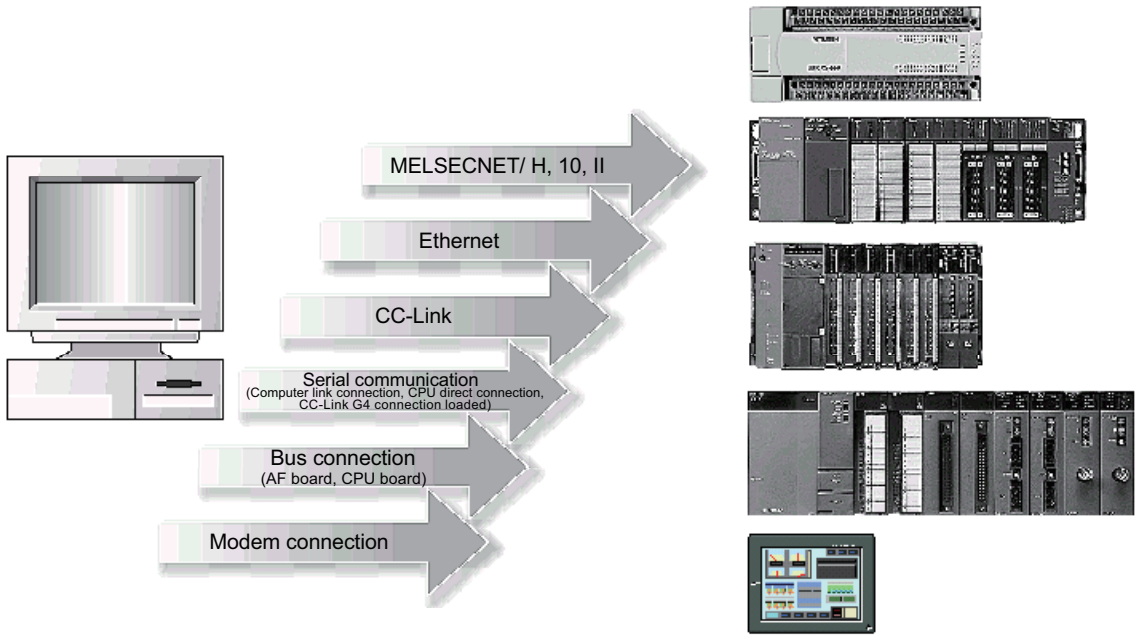
■ MX Sheet

By simply setting using Microsoft Excel , you can realize the monitoring/logging of field PLC data without programming.



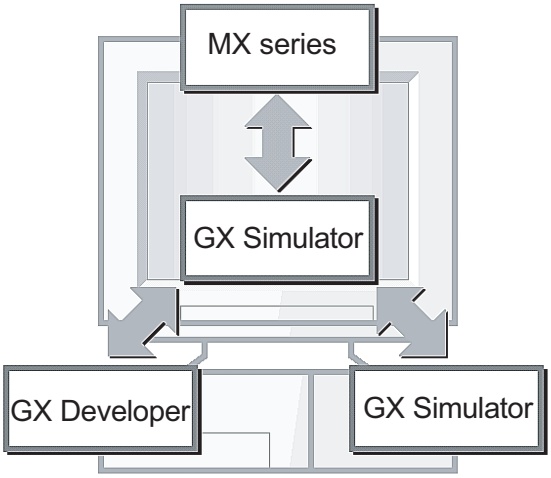
Wide choice of communication paths

The MX series supports a wide selection of communication paths between the personal computer and PLC, therefore realizing easy system design that meets the customer's requirements.



Powerful debugging environment

In combination with GX Developer, GX Simulator and GT Simulator, the MX series can perform system simulation and debugging by a single personal computer without actual devices. This remarkably improves system development efficiency.



Development environment

■ MX Component

Refer to MX Component of section 5.3.2.

■ MX Sheet

Refer to MX Sheet of section 5.3.3.

5.3.2 Active X communication support tool: MX Component

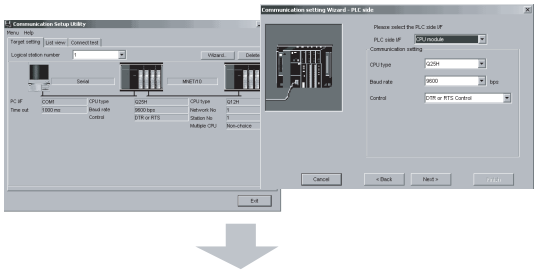
Overview

MX Component is an Active X control library that supports all communication paths, from the personal computer to the PLC, and enables communication via simple processing without being aware of the different protocols used by various communications.
MX Component provides efficient development of applications by reducing the man-hour needed for designing a communication program. This feature is ideal when fast system implementation/maintenance for onsite applications is required.
MX Component also enables the development of a wide variety of applications by supporting various languages, such as Visual C++®, Visual Basic®, VBA/VBScript for Microsoft Access® and Excel®.

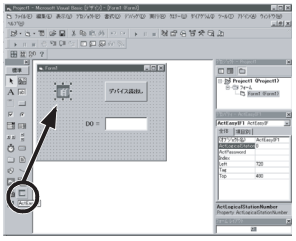
■ Simple programming

How to use MX Component (Program example for reading PLC device values in Visual Basic®)

(1) Set the communication path as instructed by the Wizard.
(Options for setting the program without using the Wizard are also available.)

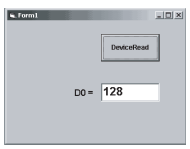


(2) Paste the MX Component control icon into the form, and set the communication path number set in (1) as the property for that control.



(3) Describe the program for reading the device.

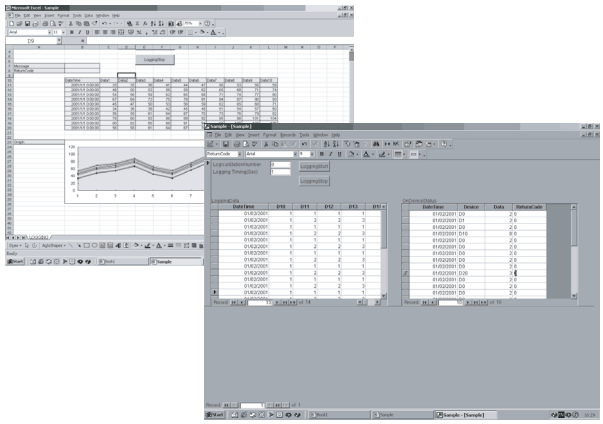
```
Command1                    Click
Private Sub Command1_Click()

 ret = ActEasyIF1.GetDevice("D0", lpData(0))
 Label1.Caption = lpData(0)

End Sub
```



Completed!

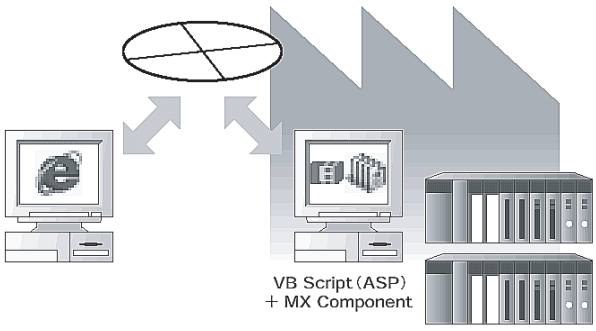
■ Versatile application design using VBA

Using VBA for Microsoft Excel® /Access®, applications that require PLC data collection, production instructions/results and display of alarm history can be created easily.



■ Remote monitoring/operation via Internet/ intranet

Simple access to the Web Page written in VB Script (ASP function) via the Internet/intranet from IE (Internet Explorer) or imode compatible mobile phone provides remote monitoring/ operation of the PLC system situated at the application location.



■ Compatibility with QCPU redundant system

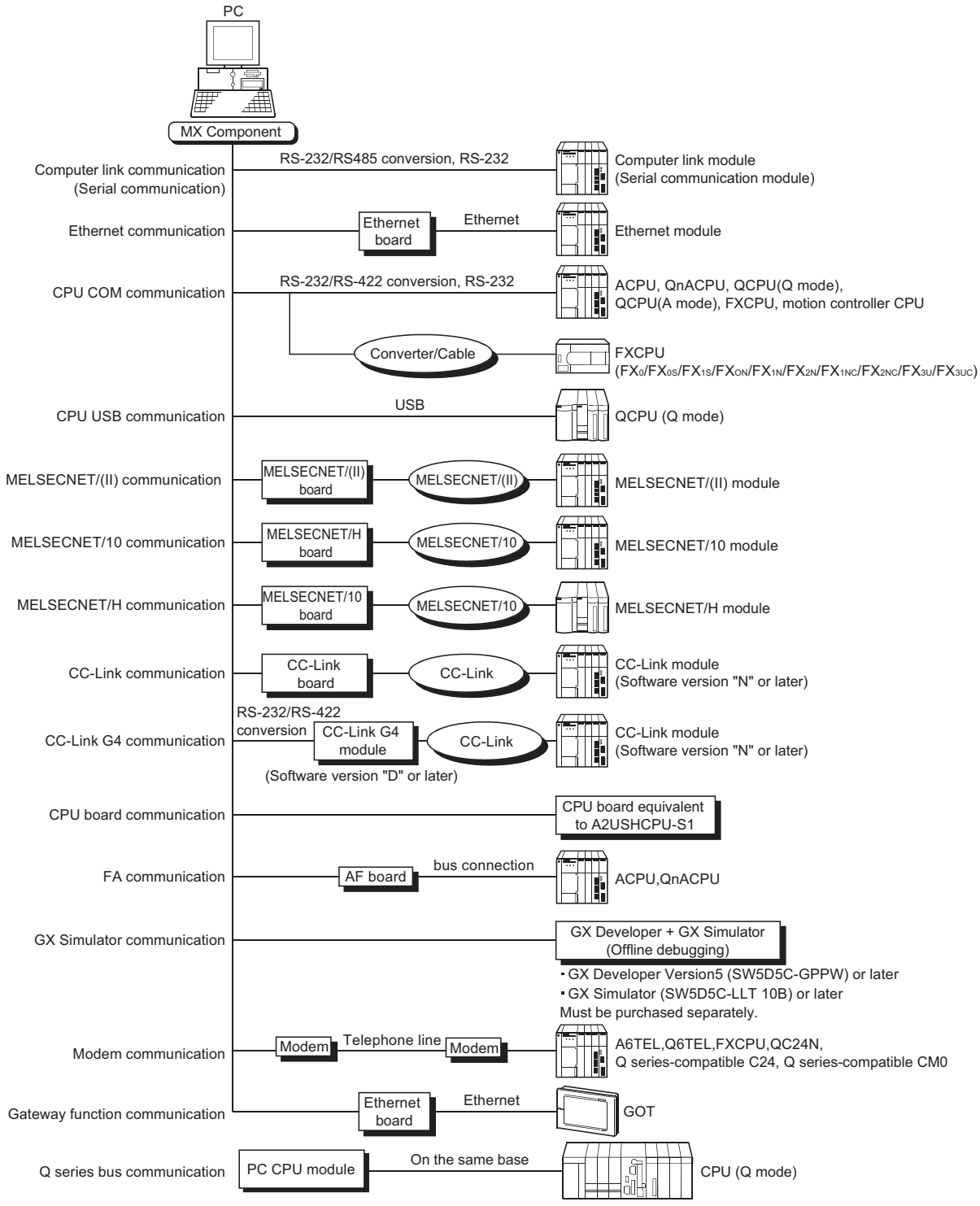
[Simple communication system]
• The communication setting for the redundant system is only specifying "control system". When the control system goes down, the communication target change processing by a program is not required.

[Existing software can be utilized]
• The existing user applications created by MX Component are available for the redundant system only with a change of communication settings.

Features

■ Wide range of communication paths for PLC are supported

A wide range of communication paths to the PLC are supported, enabling design of a system according to the users requirements.



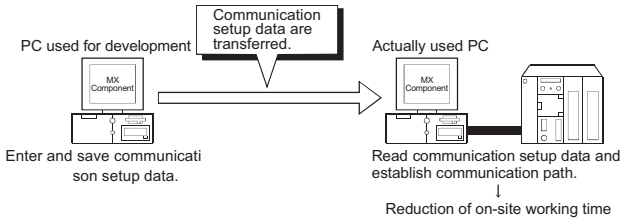
■ Substantial improvement in user's development efficiency

MX Component includes a communication setup wizard utility. By simply following/interacting with the instructions within the wizard utility, the user can setup the communication path for accessing to the PLC CPU easily. Once the communication settings have been made, just the logical station number of the PLC stored in the communication setup utility needs to be specified, to gain access to the PLC CPU.

■ Save and read of communication settings

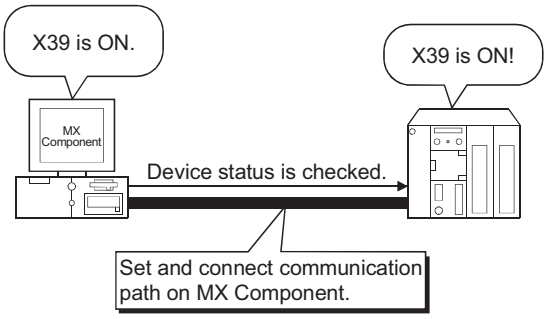
MX Component includes the function to save and read the communication settings that were previously set in the communication setup utility. The set data can be easily utilized from PC to PC, i.e. Transfer from PC used for development of the system to the PC actually used for the application.

Note: MX Component needs to be installed in both the PCs mentioned in the above example.



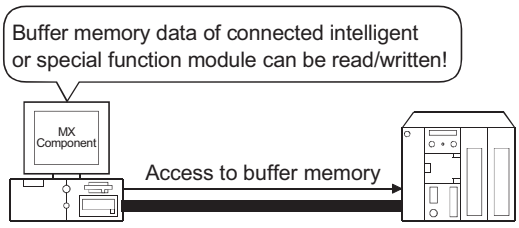
■ Device monitor function

Utilizing the PLC monitor utility enables you to monitor the status of the specified device and change its data.



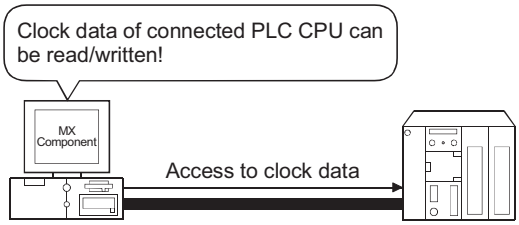
■ Access to special function module buffer memory

Access can be made to not only the PLC CPU devices but also the intelligent function or special function module buffer memory area.



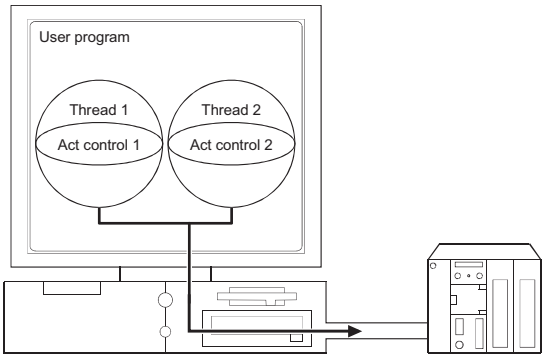
■ Read/write of PLC CPU clock data

You can read and write the clock data of the PLC CPU, which is connected to the IBM-PC/AT compatible PC.



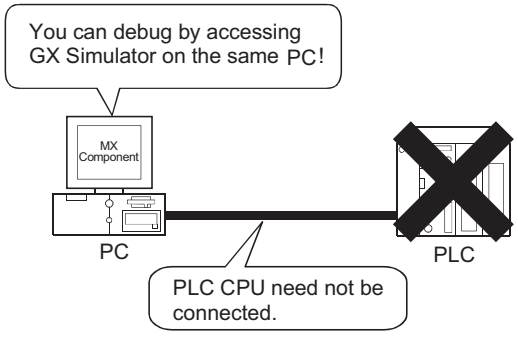
■ Multi-thread communication

Access to the same communication path can be made from multiple threads at the same time.



■ GX Simulator for offline debugging

By using together GX Developer and GX Simulator, you can perform debugging on a single PC without having to connect a PLC.



POINT

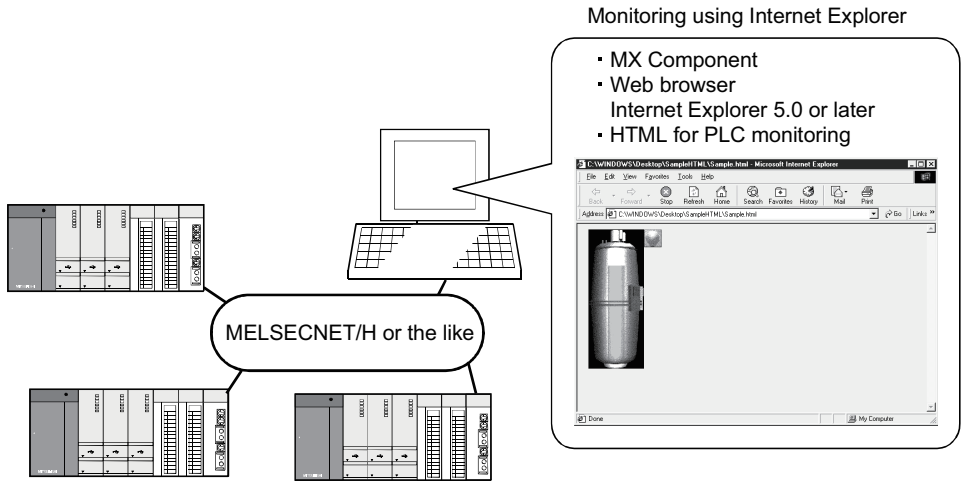
GX Developer and GX SImulator are required to use the GX Simulator.

■ A wide variety of programming languages supported

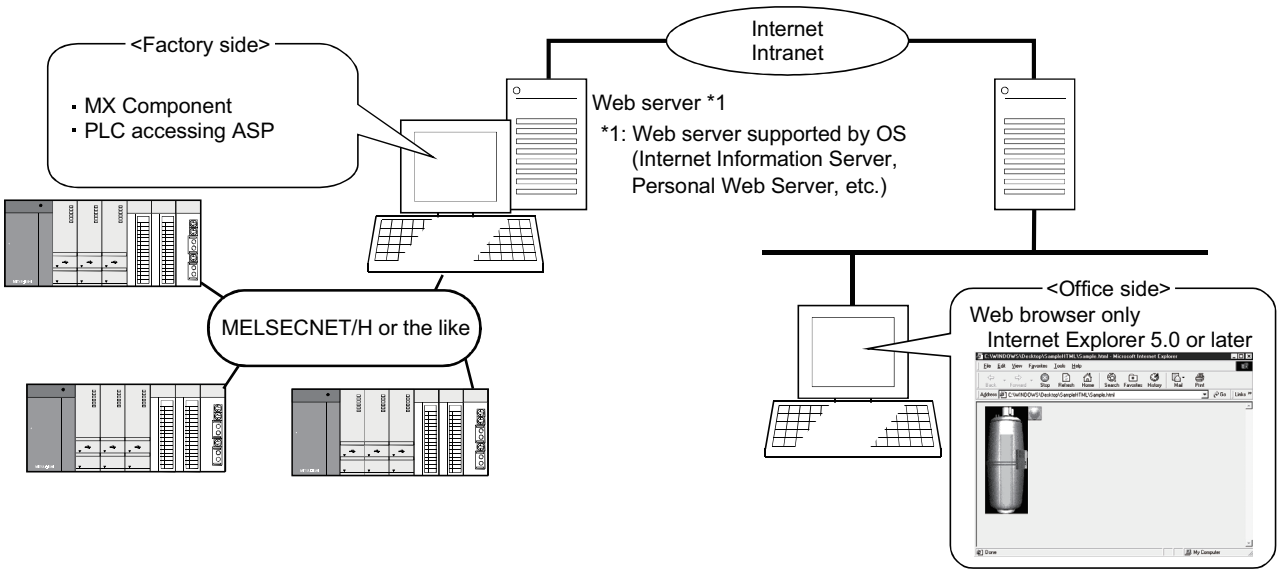
MX Component supports VB Script and VBA as well as Visual Basic® and Visual C++®.

● Creating a monitoring page using VB Script

1) A page used for monitoring can be created in HTML format.
By using a text editor, you can create a graphical home page for monitoring (HTML format).
You need not purchase Visual Basic®, Visual C++® or similar.



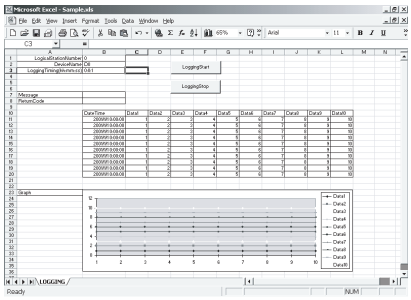
2) Using ASP function for monitoring via Internet/intranet
The status of the PLC devices or time of when a fault occurs can be accessed remotely just by entering the remote location URL of application side (Monitors using MX Component) on Microsoft Internet Explorer. This aspect is achieved by using the VBScript ASP function when creating the application side Web pages.



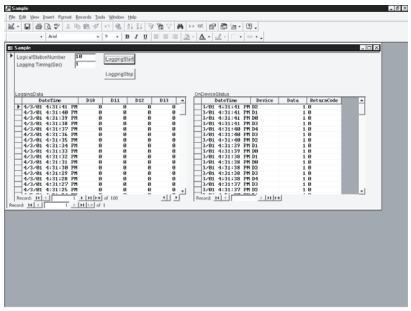
● VBA-driven data collection and monitoring function

Programming with VBA allows Microsoft Excel® or Access® functions to be utilized, to create an application for providing a real-time graph display. You can log the PLC device data and collect/save the device data in real time.

<Excel>



<Access>

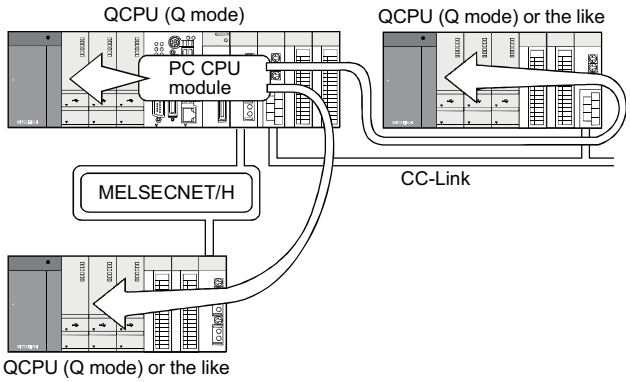


■ Compatibility with QCPU (Q mode) multi-CPU system

Setting the communication setting utility or ACT control properties enables access to the multi-CPU system.

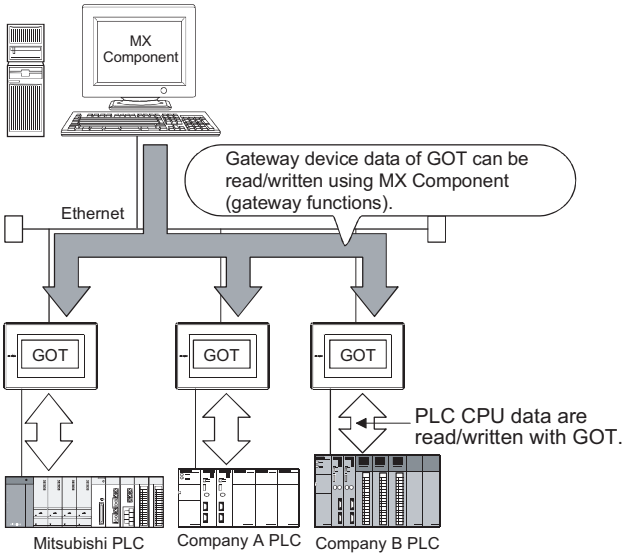
■ Operability on PC CPU module

Q series bus communication from the PC CPU module enables access to the QCPU (Q mode) on the same base.
Using the MELSECNET/H communication control or CC-Link communication control enables access to other stations via the MELSECNET/H module or CC-Link module controlled by the PC CPU module.



■ Access to GOT gateway devices

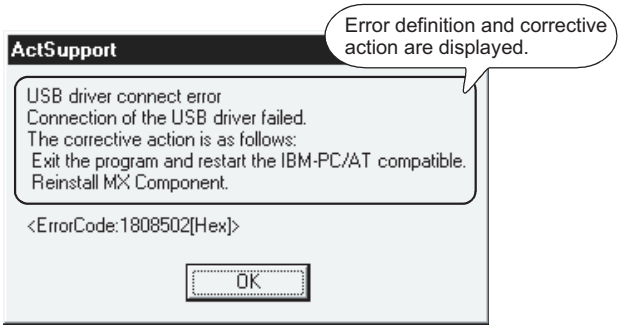
The MX Component gateway communication function enables to read/write the GOT gateway device data.
Reading/writing the gateway device data of the GOT can read/write the device data of the PLC CPU monitored by the GOT.



■ Reduce search time for defining errors

The ActSupport control for the troubleshooting function is supported.
The error definition and corrective action are displayed within the user application by only specifying the error code.
This eliminates the need to referring to the programming manual in order to find the definition or corrective action of the error, if an error occurs in the ACT control.

<Example of displaying error definition in message box>



Compatible OS list

The following table shows the Operating Systems compatible with the various MX Component communication paths.
(For details, refer to the MX Component Operating Manual.)

Item	OS					
	Windows® 95	Windows® 98	Windows® Me	Windows NT® Workstation Version4.0	Windows® 2000 Professional	Windows® XP Professional/ Home Edition
Computer link communication	○	○	○	○	○	○
Ethernet communication	○	○	○	○	○	○
CPU COM communication	○	○	○	○	○	○
CPU USB communication	×	○	○	×	○	○
MELSECNET(II)communication	○	○	×	○	×	×
MELSECNET/10 communication	○	○	×	○	×	×
MELSECNET/ H communication	○	○	×	○	○	×
CC-Link communication	○ *1	○ *1	×	○	○	○ *2
CC-Link G4 communication	○	○	○	○	○	○
CPU board communication	×	×	×	○	○	×
AF communication	×	×	×	○	×	×
Q series bus communication(PC CPU)	×	×	×	○	○	×
GX Simulator communication	○	○	○	○	○	○
Modem communication	○	○	○	○	○	○
Gateway function communication	○	○	○	○	○	○

○:Applicable ×:N/A

*1: Compatible only when A80BD-J61BT13 is used.
*2: Compatible only when Q80BD-J61BT11N is used.

POINT

(1) The following communications through the COM port might cause a memory leak.
Continuous communication is prohibited in Windows95.
- Computer link communication
- CPU COM communication
- CC-Link G4 communication
- Modem communication

(2) The following communication on PC98-NX is not possible.
- MELSECNET(II) communication
- MELSECNET/10 communication
- MELSECNET/H communication
- CC-Link communication
- CPU board communication
- AF communication

(3) When using GX Simulator communication, use the following GX Developer and GX Simulator versions.

OS	GX Developer Version	GX Simulator Version
Windows® 95, 98, NT® 4.0	Version5(SW5D5C-GPPW) or later	SW5D5C-LLT 10B or later
Windows® 2000, Me	Version7(SW7D5C-GPPW) or later	Version6(SW6D5C-LLT) or later
Windows® XP	Version8(SW8D5C-GPPW) or later	Version6(SW6D5C-LLT)13P or later

(4) The VB Script ASP function is not supported for Windows® Me or XP Home Edition.

Connection configuration list

The following table lists the connection configuration and required interface devices.
(For details on connection with conventional devices and precautions, refer to the MX Component Operating Manual.)

Connection System	Personal Computer Side Interface	PLC /GOT Type*1	PLC /GOT Side Interface	Cable Type	Remarks
Computer link	Personal computer COM port	Basic model QCPUs/High Performance model QCPU/ Process CPU/Redundant CPU	QJ71C24N, QJ71C24N-R2, QJ71C24N-R4	RS-232/422 cable	-
		QnA	AJ71QC24N, AJ71QC24N-R2, AJ71QC24N-R4		
		Q2AS(H)	A1SJ71QC24N1, A1SJ71QC24N1-R2		
		QCPU(A mode) /AnSH/A2US(H)	A1SJ71UC24-R2, A1SJ71UC24-R4, A1SJ71UC24-PRF		
		AnN/AnA/AnU	AJ71UC24		
		FX	FX_{0N}-485ADP, FX_{2NC}-485ADP, FX_{3U}-485ADP, FX_{1N}-485-BD, FX_{2N}-485-BD, FX_{3U}-485-BD		
Ethernet	General-purpose Windows®-compatible Ethernet board/card	Basic model QCPU/High Performance model QCPU/ Process CPU/Redundant CPU	QJ71E71-100	100BASE-TX	-
			QJ71E71-B2, QJ71E71-B5	10BASE-2/5/T	
		QnA	AJ71QE71N-B2, AJ71QE71N-B5, AJ71QE71N3-T		
		Q2AS(H)	A1SJ71QE71N-B2, A1SJ71QE71N-B5, A1SJ71QE71N3-T		
		QCPU(A mode) AnSH, A2US(H)	A1SJ71E71N-B2, A1SJ71E71N-B5, A1SJ71E71N3-T		
		AnN, AnA, AnU	AJ71E71N-B2, AJ71E71N-B5, AJ71E71N3-T		
MELSECNET/H	Q80BD-J71LP21-25 Q80BD-J71LP21S-25 Q80BD-J71LP21G Q80BD-J71BR11	Basic model QCPU/High Performance model QCPU/ Process CPU/Redundant CPU	QJ71LP21(S)-25, QJ71LP21G, QJ71BR11	Fiber-optic cable, coaxial cable	-
		QnA	AJ71QLP21(S), AJ71QLP21G, AJ71QBR11		Connectable in the MELSECNET /10 mode.
		Q2AS(H)	A1SJ71QLP21(S), A1SJ71QBR11, A1SJ71QLR21		
		QCPU(A mode) AnSH, A2US(H)	A1SJ71LP21, A1SJ71BR11		
		AnN/AnA/AnU	AJ71LP21, AJ71LP21G, AJ71BR11, AJ71LR21		
MELSECNET/10	A70BD-J71QLP23 A70BD-J71QLP23G A70BD-J71QBR13 A70BD-J71QLR23	Basic model QCPU/High Performance model QCPU/ Process CPU/Redundant CPU	QJ71LP21(S)-25, QJ71LP21, QJ71LP21G, QJ71BR11	Fiber-optic cable, coaxial cable	Incompatible with MELSECNET/H mode
		QnA	AJ71QLP21(S), AJ71QLP21G, AJ71QBR11		
		Q2AS(H)	A1SJ71QLP21(S), A1SJ71QBR11, A1SJ71QLR21		
		QCPU(A mode) AnSH, A2US(H)	A1SJ71LP21, A1SJ71BR11		
		AnN/AnA/AnU	AJ71LP21, AJ71LP21G, AJ71BR11, AJ71LR21		

(Continued on next page)

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Connection System	Personal Computer Side Interface	PLC /GOT Type*1	PLC /GOT Side Interface	Cable Type	Remarks
CC-Link	Q80BD-J61BT11N	Basic model QCPU/High Performance model QCPU/Process CPU /Redundant CPU	QJ61BT11N	CC-Link dedicated cable	-
		QnA	AJ61QBT11		
		Q2AS(H)	A1SJ61QBT11		
		QCPU(A mode) /AnSH/A2US(H)	A1SJ61BT11		
		AnN/AnA/AnU	AJ61BT11		
CC-Link G4	Personal computer COM port	QCPU(A mode) /QnA/Q2AS(H) /AnN/AnA/AnU/AnSH /A2US(H)	AJ65BT-G4(-S3) via CC-Link	RS-232/422 conversion cable	-
CPU COM	Personal computer COM port	Basic model QCPU/High Performance model QCPU/ Process CPU /Redundant CPU /QCPU(A mode)	CPU module RS-232	RS-232 cable	-
		QnA/Q2AS(H)/AnN/AnA /AnU/ AnSH/A2US(H)	CPU module RS-422	RS-232/422 conversion cable	-
		FX	CPU module RS-422		
	Personal computer USB port	FX	CPU module RS-422	USB/RS-422 conversion cable	-
CPU USB	Personal computer USB port	High Performance model QCPU/Process CPU /Redundant CPU	CPU module USB	USB cable	Q02CPU is incompatible.
MELSECNET (II)	A70BD-J71AP23	QnA/AnN/AnA/AnU	AJ71AP21 and CPU internal MELSECNET interface	Optical fiber cable	Connection to QCPU (Q mode) is not possible.
		QCPU(A mode) /Q2AS(H)/AnSH/A2US(H)	A1SJ71AP21		
PLC bus	A70BD-AF	QnA/Q2AS(H)/AnN/AnA/ AnU/AnSH/A2US(H)	Bus	Extension cable	-
PLC board for personal computer		A80BD-A2USH-S1	-	-	-
Simulation		GX Simulator	-	-	-
Q series bus communication		Basic model QCPU/High Performance model QCPU/ Process CPU	Q series bus	-	The PC CPU module *2 can access QCPU in the same multi PLC system
Modem	Modem	Basic model QCPU/High Performance model QCPU/Process CPU	QJ71CMO, QJ71C24N, QJ71C24N-R2	RS232 cable between PLC side interface and modem	With the exception of the QJ71CMO, a modem is also required on the PLC side.
		QnA	AJ71QC24N, AJ71QC24N-R2, Q6TEL		
		Q2AS(H)	A1SJ71QC24N1, A1SJ71QC24N1-R2, Q6TEL		
		QCPU(A mode)/ AnSH/A2US(H)/ AnN/AnA/AnU	A6TEL, Q6TEL		
		FX	RS-232 communication device *3		
Gateway	General-purpose Windows®-compatible Ethernet board/card	A900GOT	A9GT-J71E71-T	10BASE-T	-

*1: "AnU" includes motion controller "A173UH(S1), A273UH(S3)". "AnSH" includes motion controller "A171SH/A172SH".
*2: MELSEC-Q series is compatible with PC CPU module (manufactured by CONTEC CO., LTD.)
*3: Refer to the FX series manual for the RS-232 communication device.

Operating environment

The following table summarizes the recommended operating environment for MX Component.

Item		Description	
Personal computer	PC	Pentium® 133MHz or higher *1 PC (PC98-NX is included) installed with applicable Windows® *2	
	PC CPU module	MELSEC-Q series corresponding PC CPU module (CONTEC CO., LTD. make)	
Operating System		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)*3 Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version)*4 Microsoft® Windows® XP Home Edition Operating System (English version)*4	
Required memory		32MB or more *5	
Hard disk free space		100MB or more	
Disk drive		CD-ROM disk drive	
Display		800×600 dot or more resolution	
Programming language*6		Programming language	Development software
		Visual Basic®	Microsoft® Visual Basic® 6.0 (English version) Microsoft® Visual Basic® .NET 2003 (English version)
		Visual C++®	Microsoft® Visual C++® 6.0 (English version) Microsoft® Visual C++® .NET 2003 (English version)
		VB Script*7, *8	Text editor and commercially available HTML tool
		VBA	Microsoft® Excel 2000 (English version) Microsoft® Excel 2002 (English version) Microsoft® Excel 2003 (English version) Microsoft® Access 2000 (English version) Microsoft® Access 2002 (English version) Microsoft® Access 2003 (English version)

*1: Pentium® 150MHz or higher is recommended when using Windows® Me, and Pentium® 300MHz or higher when using Windows® XP Professional or Windows® XP Home Edition.

*2: This product does not work with a multiprocessor personal computer, because the driver is not compatible with it.

*3: Service Pack 3 or higher is required when using Windows NT® Workstation 4.0.

*4: MX Component does not work in XP compatibility mode.

*5: 64MB or more is recommended when using Windows® 2000 Professional, or 128MB or more when using Windows® XP Professional or Windows® XP Home Edition.

*6: User programs created in the English environment work in the English environment only.

*7: Internet Explorer (version 5.00.2919.6307 or later) is required for VBScript.

*8: ASP function is not available when using Windows® Me or Windows® XP Home Edition.

Precautions for used OS and personal computer

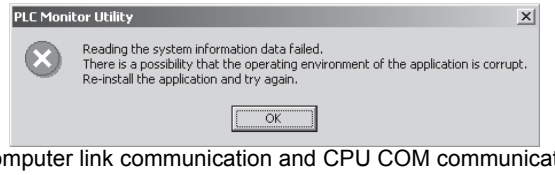
(1) When using Microsoft® Windows NT® Workstation Operating System Version 4.0, Microsoft® Windows® 2000 Professional Operating System, Microsoft® Windows® XP Professional Operating System and Microsoft® Windows® XP Home Edition
Note that the following restrictions apply when a user without Administrator's authority operates MX Component.

(a) Communication Setup Utility
- The logical station number cannot be created, changed or deleted.
- Target settings cannot be imported.
- This utility cannot be started up if the communication settings have been made using MX Component earlier than Version3.00A.*1

(b) PLC Monitor Utility
- This utility cannot be started up if the communication settings have been made using MX Component earlier than Version3.00A.*1
- Device registration cannot be performed on "Entry Device" tab.

(c) Communication board
- Various settings cannot be made on the MELSECNET/H, MELSECNET/10, MELSECNET(II), CC-Link, AF and CPU board utilities.

*1: If the following error message appears, start up and close the utility once as a user witsh Administrator's authority.
This operation enables a user without Administrator's authority to start up the utility.



(2) About Ethernet communication, computer link communication and CPU COM communication on Microsoft® Windows® 95 Operating System
(a) Making Ethernet communication using TCP/IP and UDP/IP on Windows® 95 of the version older than OSR2 will cause a memory leak. When performing continuous operation on Windows® 95, use Window® 95 OSR2 or later.
(b) On Windows® 95, communication using the COM port, e.g. computer link communication or CPU COM communication, will cause a memory leak.
Therefore, do not perform continuous operation.

(3) Precautions for use of Microsoft® Windows® Millennium Edition Operating System
It is not recommended to use MX Component with the "system restoring function" made invalid by the operating system.
If the free space of the system drive becomes less than 200MB, the "system restoring function" is made invalid by the operating system.
When using Windows® Me, reserve a 200MB or more free space for the system drive.

(4) About the resume and other functions of personal computer
A communications error may occur if communications are made with the PLC CPU after setting the resume function, suspend setting, power-saving function and/or standby mode of the personal computer.

Therefore, do not set the above functions when making communications with the PLC CPU.

Usable PLC CPUs

The usable PLC CPUs are given below.

	PLC CPU Types
ACPU	A0J2HCPU, A1SCPU, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJHCPU, A1NCPU, A2CCPU, A2CCPUC24, A2CCPUC24-PRF, A2CJCPU, A2NCPU, A2NCPU-S1, A2SCPU, A2SHCPU, A3NCPU, A1FXCPU, A2ACPU, A2ACPU-S1, A2ACPUP21/R21, A2ACPUP21/R21-S1, A3ACPU, A3ACPUP21/R21, A2UCPU, A2UCPU-S1, A2USCPU, A2USCPU-S1, A2USHCPU-S1, A3UCPU, A4UCPU
QnACPU	Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU, Q4ARCPU
QCPU(A mode)	Q02CPU-A, Q02HCPU-A, Q06HCPU-A
QCPU(Q mode)	Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q12PHCPU, Q12PRHCPU, Q25PHCPU, Q25PRHCPU
FXCPU	FX0CPU, FX0SCPU, FX0NCPU, FX1CPU, FX1NCPU, FX1NCCPU, FX1SCPU, FX2CPU, FX2CCPU, FX2NCPU, FX2NCCPU, FX3UCPU, FX3UCCPU
Motion controller CPU	A171SHCPU, A172SHCPU, A173UHCPU, A173UHCPU-S1, A273UHCPU, A273UHCPU-S3

Accessible CPU device ranges

Refer to the MX Component Operating Manual for accessible devices.

5.3.3 Excel communication support tool: MX Sheet

Overview

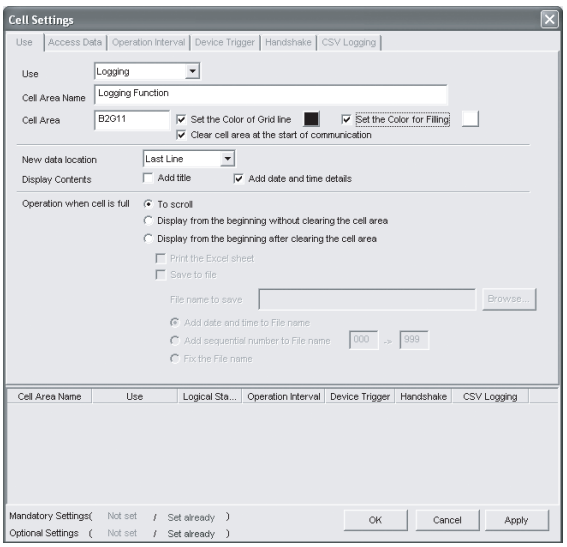
MX Sheet is a communication support software package that allows device data collection, etc. by simple, program-less setting using Excel.

Features

■ Program-less and easy setting

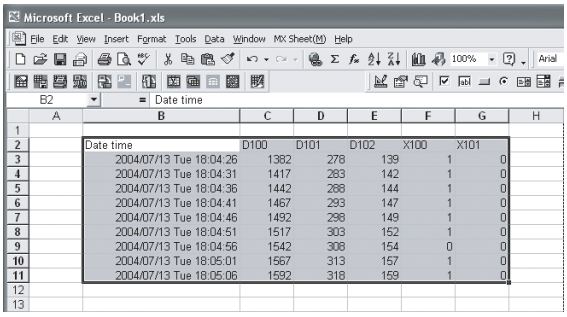
PLC device data can be collected/written by making simple setting without programming.

MX Sheet



Making simple setting

Excel



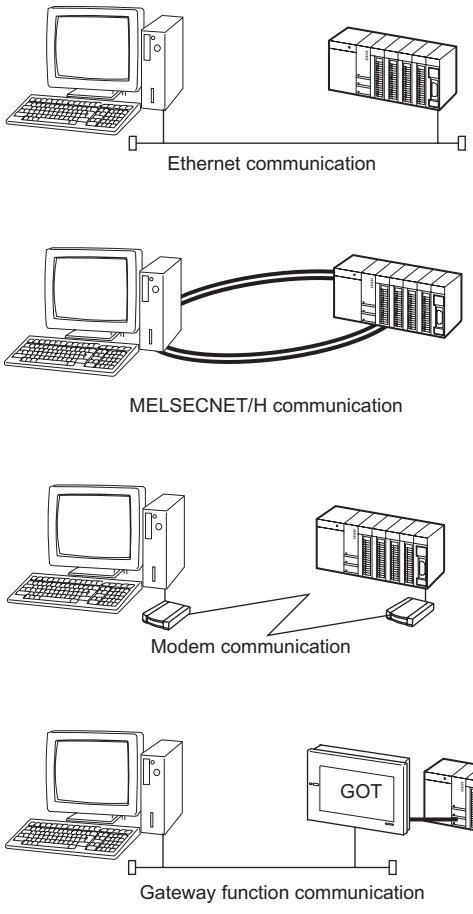
	A	B	C	D	E	F	G	H
1								
2		Date time	D100	D101	D102	X100	X101	
3		2004/07/13 Tue 18:04:26	1382	278	139	1	0	
4		2004/07/13 Tue 18:04:31	1417	283	142	1	0	
5		2004/07/13 Tue 18:04:36	1442	288	144	1	0	
6		2004/07/13 Tue 18:04:41	1467	293	147	1	0	
7		2004/07/13 Tue 18:04:46	1492	298	149	1	0	
8		2004/07/13 Tue 18:04:51	1517	303	152	1	0	
9		2004/07/13 Tue 18:04:56	1542	308	154	0	0	
10		2004/07/13 Tue 18:05:01	1567	313	157	1	0	
11		2004/07/13 Tue 18:05:06	1592	318	159	1	0	
12								
13								

PLC device data are displayed on Excel sheet.

■ Collection/write of device data using a wide range of communication paths

MX Sheet uses MX Component for communication between the PLC and personal computer.
Using a variety of communication paths supported by MX Component, system configuration that meets user's requirement can be achieved.

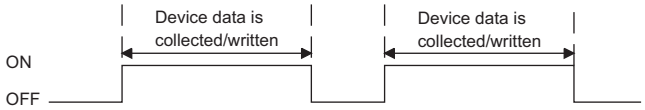
<Examples of communication using MX Component>



■ Each function can be controlled by device condition

The condition of device data collection/write can be set to PLC devices.
The execution of any MX Sheet function can be controlled from the PLC side.

<When device data is collected/written while bit device is on>

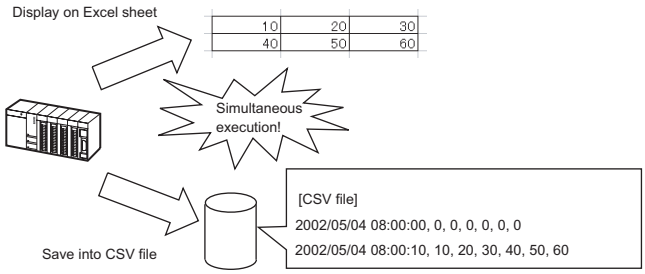


Corresponding functions

- Logging
- Write
- Comment display
- Automatic print
- Monitor
- Alarm summary
- Automatic save

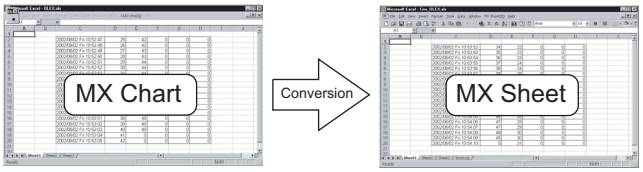
■ Data logging using CSV file

Using the logging or monitor function, device data can be displayed on Excel sheet, and simultaneously, collected data can be saved into a CSV file.
Long-term data collection is enabled by a single CSV file.



■ Compatibility with MX Chart

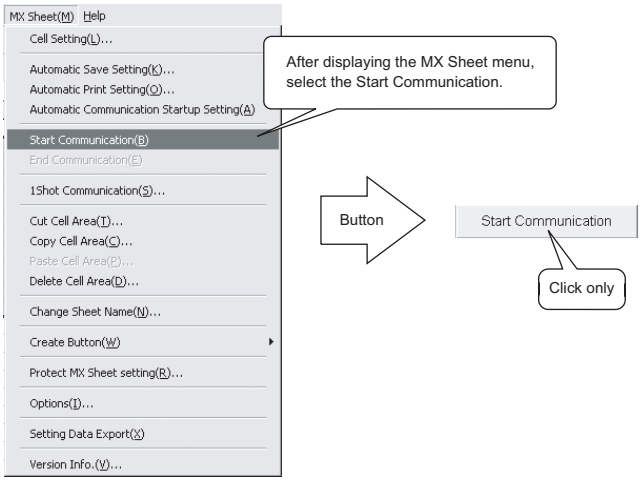
MX Sheet can convert the set data of MX Chart into those of MX Sheet.
The communication settings of MX Links and various settings of MX Chart can be converted into the logical station numbers of MX Component and cell settings of MX Sheet respectively to utilize old assets efficiently.



■ Improvement of operability by buttons

By creating buttons, the Start Communication, End Communication, and 1 Shot Communication functions can be executed by merely clicking the corresponding buttons.
Operability is improved as compared to the execution of the functions from the menu.

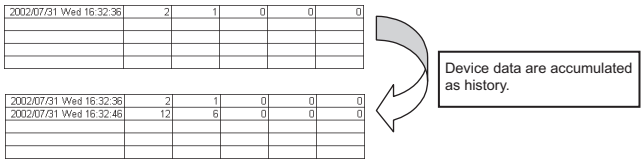
(Example) Start Communication



Functions

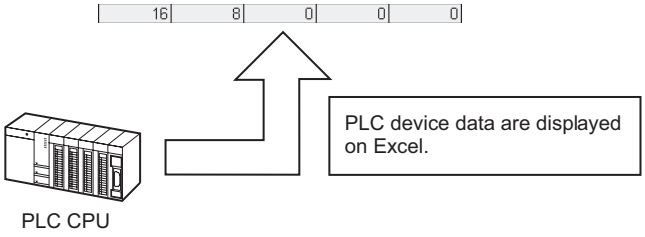
■ Logging function

This function accumulates the device data collected from the PLC as a history in the cell area selected on an Excel sheet.



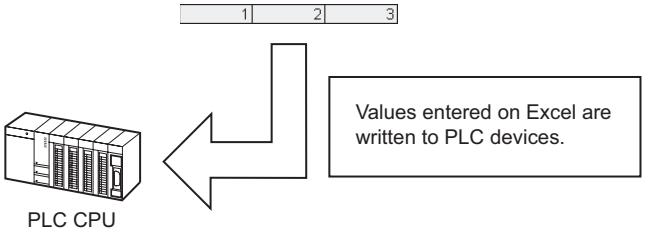
■ Monitor function

This function displays the device data collected from the PLC in selected cell area on an Excel sheet.



■ Write function

This function writes the values entered on an Excel sheet to PLC devices.

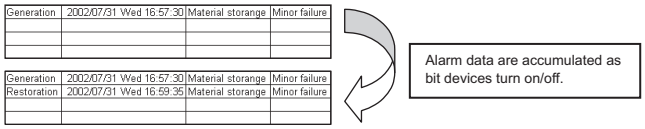


■ Alarm summary

The alarm summary function converts the ON/OFF information into the corresponding alarm comment character strings and accumulates them on an Excel sheet as an alarm history.
The followings are available by specifying in advance when the alarm history reaches the last line.

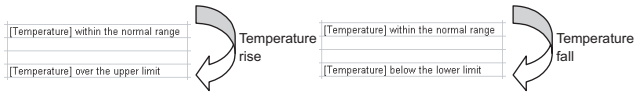
•Scrolling
•Printing Excel sheet
•Saving Excel book

The line operation ratio and other conditions can be checked easily by accumulating the alarm data history.



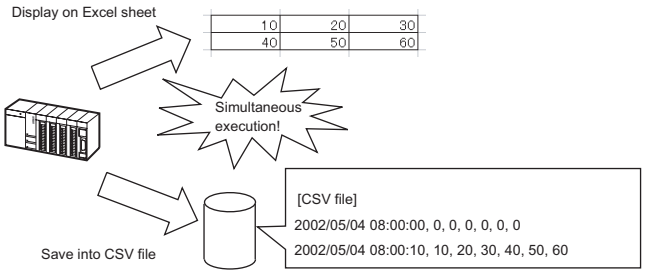
■ Comment display

The comment display function converts a bit device value or word device value into the corresponding comment character strings and displays them on an Excel sheet. (A comment is displayed according to the change of device value.)
In the following example, the upper and lower limit values are set for a device so that the corresponding warning message will appear when the device value falls outside the range.



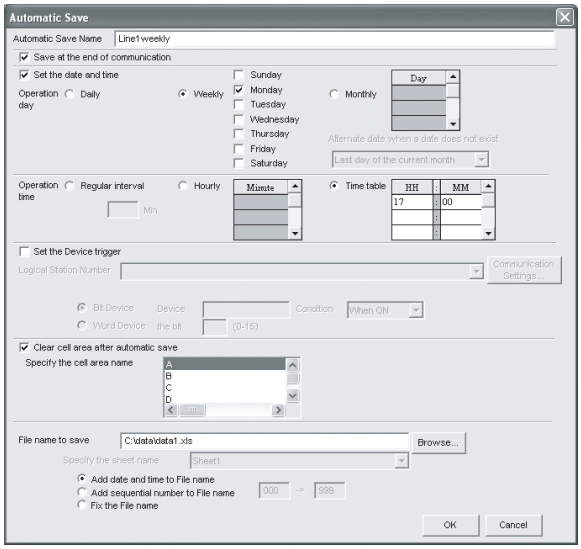
■ CSV logging

The CSV logging function simultaneously displays device data on an Excel sheet using the logging or monitor function, and saves collected data as a CSV file.
Using a single CSV file enables long-term data collection file.



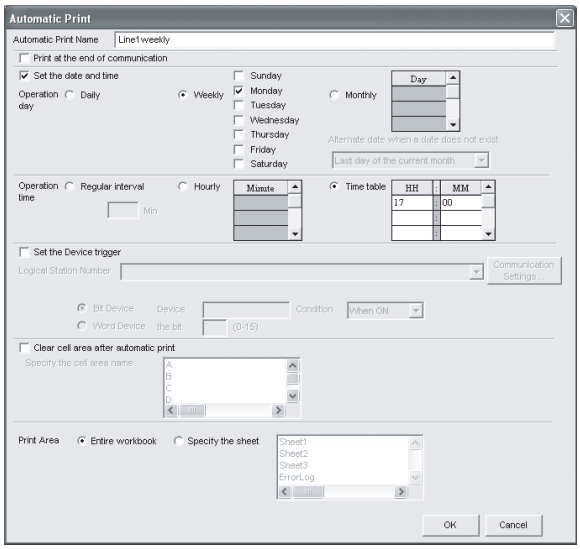
■ Automatic save function

This function saves the Excel book automatically, when the specified device is triggered at the specified time.



■ Automatic print function

This function prints the Excel book or specified Excel sheets automatically, when the specified device is triggered at the specified time.

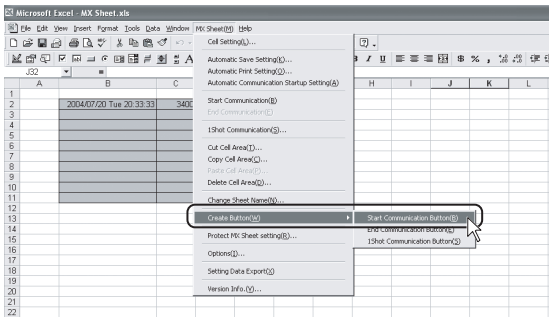


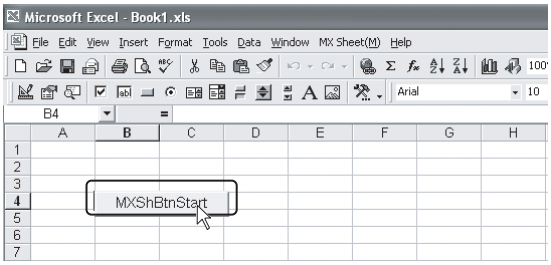
■ Automatic Communication Startup Setting

Automatic Communication Startup Setting automatically starts communication with the PLC when the Excel book where MX Sheet settings have been made is started.
This setting eliminates the need of selecting [Start Communication] from the MX Sheet menu.

■ Create button function

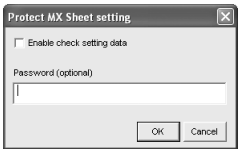
This function executes each of the Start Communication, End Communication and 1 Shot Communication functions by merely clicking the corresponding button created from Create Button.





■Security function

Protects the MX Sheet setting by a password. This function is effective to disable changing of the MX Sheet settings once set.



■ Data conversion function

The data conversion function converts the communication settings of MX Links (SW3D5F-CSKP-E) and various settings of MX Chart (SW3D5F-OLEX-E) into the logical station number of MX Component and cell settings of MX Sheet respectively. This function ensures efficient utilization of the conventional assets.

● Function list

The following table lists the data conversion functions.

Function	Description
Conversion of MX Links data	This function converts automatically the communication settings made using the utilities of MX Links into the communication settings (logical station numbers) of MX Component.
Conversion of MX Chart data	This function converts automatically the set data of MX Chart into the cell settings of MX Sheet.

For details, refer to MX Sheet Operating Manual.

● System configuration

The following table indicates the system configuration that executes the data conversion function.

Item	Compatible Version
Personal computer	Personal computer where any of the following OSs operates and MX Links and MX Chart have been installed *1 Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® NT Workstation Operating System Version 4.0 (English version)
MX Links	SW3D5F-CSKP Version 10B or later
MX Chart	SW3D5F-OLEX Version 00A or later
Conversion source Excel book	Excel book created using Excel 97 (English version) or Excel 2000 (English version) *2

*1: The utilities of MX Links must have been set for communication.
*2: MX Chart must have been set to the Excel book for data conversion.

Remark

The following OSs and conversion source Excel book do not support the data conversion function.

Item	Compatible Version
OS	Microsoft® Windows® 95 Operating System(English version) Microsoft® Windows® Millennium Edition Operating System(English version) Microsoft® Windows® 2000 Professional Operating System(English version) Microsoft® Windows® XP Professional Operating System(English version) Microsoft® Windows® XP Home Edition Operating System(English version)
Conversion source Excel book	Excel 95(English version)

■ Function list

Function Name	Description	Available Device Points	Available Cells
Logging	Accumulates device data collected from PLC in cell range selected on Excel as history.	256 points *1,*2	256 columns×65536 rows
Monitor	Displays device data collected from PLC in cell range selected on Excel.	2000 points *1,*3	2000
Write	Writes values entered on Excel to PLC devices.	2000 points *1,*3	2000
Alarm summary	Converts ON/OFF data of bit devices into alarm comment character strings that are set separately and accumulates them on Excel sheet as alarm history.	2000 points *2,*4	6 columns×65536 rows
Comment display	Converts bit or word device values into comment character strings that are set separately and displays them on Excel sheet.	1 points *5	1
Device trigger	Collects/Writes device data when set device conditions set for collection/write are met.	-	
Handshake	Sets handshake with PLC for secure device data collection/write.	-	
CSV logging	Displays device data on Excel sheet with logging or monitor function, and simultaneously saves collected data as a CSV file.	-	
Automatic save	Automatically saves Excel book	-	
Automatic print	Automatically prints Excel book.	-	
Automatic communication startup	Automatically starts communication with PLC when Excel book is started.	-	
Communication start	This function starts communication with the PLC.	-	
Communication end	This function ends communication with the PLC.	-	
1 shot communication	Executes functions set in the selected cell range at any desired timing.	-	
Create button	This function creates buttons to facilitate Start Communication, End Communication, and 1 Shot Communication operations.	-	
Protect/Unprotect MS Sheet setting	This function sets/cancels the password for protecting the MX Sheet setting.	-	
Options	This function sets the output format of the error log sheet.	-	
Setting data export	Outputs MX Sheet settings in CSV file format.	-	
Data conversion	Converts communication settings of MX Links (SW3D5F-CSKPE) and various settings of MX Chart (SW3D5F-OLEXE) into logical station numbers of MX Component and cell settings of MX Sheet respectively.	-	

*1: This number of device points refers to the case where word device data are collected/written in 16 bit integer.
The number of device points that can be set changes depending on the device data type, etc.
*2: One Excel file (one Excel book) accepts 100 - cell - area setting.
*3: One Excel file (one Excel book) accepts 1000 - cell - area setting
*4: Only bit devices can be set.
*5: One Excel file (one Excel book) accepts 500 - cell - area setting.

Operating environment

Item		Description
Computer	PC	Pentium® 200MHz or higher *1 PC (PC98-NX is included) installed with applicable Windows® *2
	PC CPU module	MELSEC-Q series compatible PC CPU module (CONTEC CO., LTD.)
Required memory		64MB or more*5
Hard disk free space		100MB or more
Disk drive		CD-ROM disk drive
Display		1024×768 dot or higher resolution
System Software		Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)*3 Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version)*4 Microsoft® Windows® XP Home Edition Operating System (English version)*4
Required Software	Excel*6	Microsoft® Excel 2000 (English version) or Microsoft® Excel 2002 (English version) or Microsoft® Excel 2003 (English version)
	MX Component	MX Component Version 3.01B or later

*1: A Pentium® 300MHz processor or higher is recommended when using Windows® XP Professional and Windows® XP Home Edition.
*2: This product does not work with a multiprocessor personal computer, because the driver is not compatible with it.
*3: Service Pack 3 or more is needed when using Windows NT® Workstation 4.0.
*4: MX Sheet cannot be used in the XP compatibility mode.
*5: 128MB or more is recommended when using Windows® XP Professional and Windows® XP Home Edition.
*6: Excel sheets created in the English environment can be used in the English environment only. They cannot be used in other environment.

Precautions on OS and personal computer

(1) When using of Microsoft® Windows NT® Workstation Operating System Version 4.0, Microsoft® Windows® 2000 Professional Operating System, Microsoft® Windows® XP Professional Operating System and Microsoft® Windows® XP Home Edition

To make/change Communication Settings, a user who has an administrator authority must log on.
The administrator authority is also required to execute the data conversion function.
If the user account that does not have the administrator authority is used to execute the data conversion function, MX Links/MX Chart data cannot be converted.

(2) Coexistence of different Excel versions

When different versions of Excel exist in a single personal computer, MX Sheet will not operate normally. For example, Excel 2000 and Excel 2002 cannot coexist.

(3) Resume function, etc. of personal computer

If any of the following has been set to the personal computer where MX Sheet is installed, a communication error will occur during communication with the PLC.
Do not set the following functions on the personal computer.
•Resume function
•Suspend function
•Power saving function
•Standby mode

Precautions on use of VBA

(1) Incorporation of VBA program

When incorporating a user-created VBA program into the Excel sheet where MX Sheet has been set, check the operation of the VBA program first and then perform MX Sheet programming for the Excel sheet.

(2) VBA program creation

MX Sheet utilizes OLE Automation for communication.
Do not perform the following on VBA programs.
1) Do not execute the DoEvents method in a For-Next loop.
2) FileFilter is ignored in the GetSaveAsFileName method.
3) Do not execute the Reset method in the Excel menu.

Precautions on use of other MELSOFT products

(1) MX Component version

MX Component Version 3.01B or later is required to use MX Sheet.
If MX Component Version 3.00A or earlier is used, MX Sheet does not operate normally.

(2) Logical station number

Before deleting the logical station number from the Communication Setup Utility of MX Component, check that the logical station number to be deleted is not used in MX Sheet.
If the logical station number used in MX Sheet is deleted, MX Sheet does not operate normally.

(3) Coexistence with MX Chart

MX Sheet and MX Chart cannot be installed in a single personal computer to make communication simultaneously.

(4) Modem communication

When communication via modem is to be made by MX Sheet, MX Sheet, GX Developer and other applications (e.g. user applications utilizing MX Component) cannot perform communication simultaneously.
If simultaneous communication is attempted using MX Sheet, GX Developer and other applications, a fault such as a communication error, telephone line disconnection will occur.
When making communication via modem using MX Sheet, check that GX Developer and other applications do not use modems.

Accessible CPUs

The accessible CPUs in MX Sheet are the same as those in MX Component Version 3.
For details, refer to the MX Component Version 3 Operating Manual of section 5.3.2.

Accessible device ranges

The accessible device ranges in MX Sheet are the same as those in MX Component Version 3, with the exception of the following item.
For details, refer to the MX Component Version 3 Operating Manual of section 5.3.2.

Note) Device extension representation
MX Sheet does not allow access to any device by word designation for bit device (e.g. K4X0, K8M0) and bit designation for word device (e.g. D0.0,W.01).*1

*1: When using MX Sheet Version1.06 G or later, device setting by bit designated for word device (e.g. D0.0) is only possible of the setting on <<Access Data >>tab.

Comparison between MX Sheet and MX Chart

The following table indicates comparison between MX Sheet and MX Chart.

Item		MX Sheet	MX Chart
Logging function	Number of device points	256 points *1	256 points
	Number of logging lines	65536 lines	2000 lines
	Number of cell areas that can be set	100/1 Excel book	
	Communication interval	0.1s to 3600s, time designation	0.1s to 3600s, time designation
	Save, print when cell is full	Available	N/A
	Number of CSV logging save points	256 points	N/A
	Number of CSV logging save lines	9999999 lines	N/A
Monitor function	Number of device points	2000 points *1	1000 points
	Number of cell areas that can be set	1000/1 Excel book	
	Communication interval	0.1s to 3600s, time designation	0.5s to 3600s, time designation
	Number of CSV logging save points	1000 points	N/A
	Number of CSV logging save lines	9999999 lines	N/A
Write function	Number of device points	2000 points *1	1000 points
	Number of cell areas that can be set	1000/1 Excel book	
	Communication interval	0.1s to 3600s, time designation	0.5s to 3600s, time designation
Alarm summary function	Number of device points	2000 points	300 points
	Number of history lines	65536 lines	300 lines
	Number of cell areas that can be set	100/1 Excel book	
	Communication interval	0.1s to 3600s	0.5s to 3600s
Comment display function	Number of device points	1 point	
	Number of comments	1000 comments	
	Maximum number of registered points	500/1 Excel book	
	Communication interval	0.1s to 3600s, time designation	0.5s to 3600s, time designation
Automatic save/ automatic print function	Time designation	Available	
	Device trigger designation	Available	N/A
	Automatic save format	Excel file, HTML file, CSV file	Excel file
1 shot communication	For logging function	Available	
	For monitor function	Available	
	For write function	Available	
	For alarm summary function	N/A	
	For comment function	Available	N/A
Macro	Read function	N/A	Available (OLEXRead function)
	Write function	N/A	Available (OLEXWrite function)

*1: This number of device points applies to the case word device data is collected/written in 16 bit integer.

MEMO

Chapter 6

PARTNERSHIP PRODUCTS

6.1 Partnership products

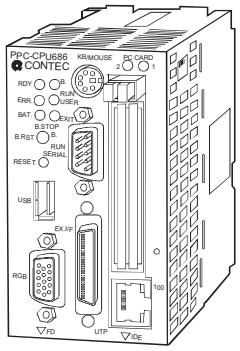
PC CPU modules

This PC CPU module is mountable on the Q series PLC base (2 slots occupied) to provide PC/AT compatible functions.

■ Features

(1) The module realizes personal computer functions on a PLC base, therefore downsizing the device/control box.
(2) Environmental resistance and noise resistance are on Factory Automation levels. The use of an ATA flash card and silicon disk drive has resolved the problems of HDD life and vibration resistance. Therefore, the industrial personal computer or personal computer can be replaced worry-free.
(3) The PLC CPU can execute the Sequence control system, and the PC CPU can execute the information processing side, therefore achieving integration of control and information processing, configuring an optimum system.
(4) The introduction of MX Component, GT Soft GOT, Windows® compatible commercially available software and user application software allows configuration of a highly flexible system.
(5) The built-in Ethernet communication port helps you configure a system that utilizes the Internet/intranet technology such as E-mail and Web access.
(6) A PC card available on the market can be used for flexible system expansion.
(7) The built-in USB port allows you to connect a commercially available USB device easily.
(8) Using the bus interface driver software enables access to almost all I/O and intelligent function modules from a Microsoft Visual C++® application program. (However, some modules may have restrictions.)
(9) The PC CPU module can operate in a multiple CPU configuration with PLC CPU and motion CPU, and as a stand-alone personal computer.
(10) Due to no built-in fans, the module has improved in maintenance performance. Therefore, the module can be used in a clean room environment, without having to worry about air circulated dust particles contaminating the production line.

■ Appearance



■ Specifications

Type		PPC-CPU686(MS)-128
MPU		Mobile Celeron Processor_LP 400MHz
Memory		128MB
Video memory		2MB
I/F	USB	2 channels (1 channel as extension connector)
	Serial	2 channels (D-SUB 9P) (1 channel as extension connector)
	Parallel	1 channel (extension connector)
	PS2 mouse/ keyboard	Mini DIN 6P Can be used simultaneously by conversion cable.
	LAN	100BASE-TX/10BASE-T
	Display	Analog RGB H-Dsub 15P
	FDD	26P half connector (for connection to FDD manufactured by Contec Ltd)
	PC card	PCMCIA, CardBus Type I, II × 2 or Type III × 1
Silicon disk module		Separate module (PCC-SDD(MS)-32/64/128/192/ 320/500/1000) 1 slot occupied
Hard disk module		Separate module (PCC-HDD(MS)) 1 slot occupied
OS		Windows® NT4.0, Windows® 2000, Windows® NT4.0Embedded

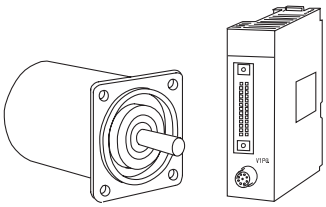
Absocoder position detection module

The Absocoder position detection module is mountable on the Q series PLC base.

■ Features

(1) Limit switches or dogs for position detection are not needed so that the users can be free from the troubles of replacements or adjustments.
(2) For position detection, absolute-method Absocoders (manufactured by NSD Corp.) are used.
(3) Absocoders used as a position detecting sensor is highly durable even in bad conditions such as vibrations, shocks, heat, water, oil, dusts, etc.

■ Appearance



■ Specifications

Type	VS-Q62
Number of position detection axis	1
Position detection method	Absolute position detection by Absocoder
Resolution	4096 divisions × 32 turns to 409.6 divisions × 320 turns (When using a multi turn type)
Sampling time	0.2ms
Additional function	Current value setting function

Interface module for ID system

The ID controller, BIS C-488-00, is a control module, which is directly mounted on the base of Q series PLCs, for reading/ writing the data of ID tags by the PLC commands.

■ Features

(1) This module allows the connection of two ID heads and the concurrent processing of two channels.
(2) This module also allows the use of all ID tags of BIS C series.

Balluff ID systems/BIS series are ID systems for FA to read/ write data by an electromagnetic coupling type.
ID tags are sufficiently supplied in their sizes and memory capacities.
(Memory capacities: 510 bytes to 8k bytes)

■ Specifications

Type	BIS C-488-00
Power voltage	24VDC ± 10%
Current consumption	0.8A
I/O occupied points	32 points
Connectable number of ID head	Up to 2
Connection method of ID head	Terminal block

GP-IB Module

The GP-IB module is mounted on the Q series PLC base to communicate with measuring devices through GP-IB line.

■ Features

(1) The maximum text length that can be communicated at one time for send /receive combined is as large as 63422 bytes.

(2) This module has a master/slave function.
When the master function is selected, the module operates as a system controller and can send address, universal and other commands. When the slave function is selected, the module communicates data under the command of the system controller.

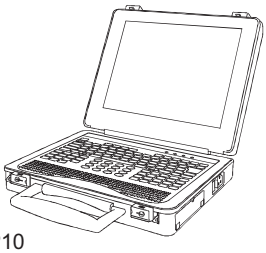
■ Specifications

Type	EQGPIB
Number of connectable units	Max. 15 units (including this module)
Connection cable length	Between module and device, between devices: Within 2m (Within a total of 20m in a single system)
Max. text length	63422 bytes for send and receive combined
Data transfer speed	Transfer speed of the slowest device among the connected devices
Access from program	Intelligent function module direct device (or FROM/TO instruction) and I/O instruction
Number of I/O occupied points	16 points per slot

PLC peripheral devices

● Peripheral device designed for on-site

The EHGP10 handy graphic programmer is a peripheral device designed for on-site applications for the MELSEC-QCPU as well as the QnA and A PLC CPUs. It also has environment resistance, and can be operated easily with the touch panel.



EHGP10
handy graphic programmer

● PocketLadder

The EPGP-type easy maintenance tool, PocketLadder, operates with commercially available PocketPCs*1 and is compatible with the MELSEC-QCPU as well as the QnA and A PLC CPUs. It can read/write PLCs, monitor circuits, devices, and systems, search contact coils, diagnose PLCs and networks, which enables a temporary diagnosis to be conducted easily on the spot.

*1: PocketPC must be purchased separately.

PocketLadder

● Programming module

The EPU01 programming module is compatible with the MELSEC-QCPU as well as the QnA and A PLC CPUs, and can edit programs in the CPU, test devices, and monitor devices. (For the QCPU, this programming module is usable with the high-performance model only.)

FA goods

For the Q series PLCs, plenty of convenient goods are available for extending the applicability of PLCs.

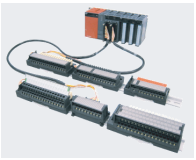
■FA goods lineup

● Converter module

Terminal block converter modules that make an easier connection from various controllers (PLCs) to an external circuit.

- A terminal block converter module that enables monitoring the operation of each I/O point (up to 32 points)
- A screwless terminal block converter module that allows saving spaces for no need of tightening screws during terminal block wiring.
- A single-touch connector converter module that enables the insulation displacement connection without uncovering electric wires.
- A terminal block converter module that enables separate disposition by 8 or 16 points.
- A terminal block converter module that is small, inexpensive, and easy to wire with captive screws.
- A terminal block converter module and cable that can be used for the DC and AC power supply.
- A thermocouple input terminal block converter module that enables the temperature measurement without being affected by heat.

● Interface terminal module



Interface terminal modules that have a wide lineup such as relay, triac, transistor, etc. that allows the appropriate selection for the system.

- The A connection and C connection relay output module, relay insulation input module, and connector terminal block converter module are available.
- 1-wire system, 2-wire system, and independent common type, are available for various outputs.
- Modules (relay, triac, and transistor) can be replaced by 1 point (socket type).
- For the relay type, inexpensive socketless modules are available.
- Independent common modules allow the mixture of relay, triac, and transistor.
- A puller for module replacement is equipped for the storage in a module (socket type).

● Peripheral cables for PLCs

Peripheral cables that enable the connection between the MELSEC modules and a personal computer.

- The optical cables connect the MELSEC modules and peripheral devices (personal computers), monitors, etc.
- They are noise-tolerant and enable a long distance communication (maximum length: 800m) (when using a glass fiber cable)
- A direct communication is possible between different types (RS-232 ↔ RS-422)
- Inexpensive plastic fiber cables, and light and strong glass fiber cables are available.
- Various inexpensive metal cables, which enables the connection between the MELSEC modules and a personal computer, are also available.

● PLC positioning cable

MELSEC positioning cable compliant with servo amplifiers of various manufacturers.

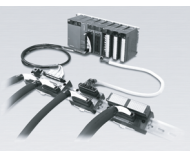
- They are compliant with the major servo amplifiers of various manufacturers.
- The shield cable provides the noise-tolerant communication.
- They are less expensive than the ones created by users, and there are no worries about miswirings.
- Separate type of cables are also available.

● CC-Link goods

CC-Link supplies supporting the configuration of the CC-Link system in its cost and convenience.

- Various cables for CC-Link are available.
- The cables each of which end has been processed are available.
- Simple-type T branch modules for CC-Link and general-purpose water-proof T branch modules (waterproof: IP67)
- Out-of-panel drawers for CC-Link cable, various single-touch waterproof connectors, and cables with connecters, which enable relaying, are available.

● Relay terminal module



Using the out-of-panel cable via the relay terminal module allows easy wiring from the MELSEC-Q, AnS, or A PLC CPU in the control panel, or from any device, to the outside of the control panel.

- 40P connector type relay terminal module that enables an easy relay of the I/O signals from the MELSEC 32-point connecter type DC I/O module in the control panel to the outside of the control panel using two 20-core out-of-panel cables.
- 20P connector type relay terminal module that enables an easy relay of the I/O signals from the MELSEC 16-point terminal block I/O(AC/DC) to the outside of the control panel using one 20-core out-of-panel cable.
- 20P terminal block type relay terminal module that enables an easy relay of the various 20-point signals from the control panel to the outside of the control panel using one 20-core out-of-panel cable.
- Five types of 20-core out-of-panel cables and external cable connecters that allows the setting to prevent insertion errors.

■ **Product list**

Class	Product	Type	Outline
CPU module-compatible communication module, intelligent module compatible	Connection cable	FA-CBLQC***R2	RS-232C cable for connection of personal computer and CPU (Mini-DIN 6P male)-(D-Sub 9P female) (3, 5, 15m)
		FA-CBL30USB	USB cable for connection of personal computer and CPU (3m)
		FA-CBL25P6P***	RS-232C cable for connection of personal computer, display or the like and CPU (Mini-DIN 6P male)-(D-Sub 25P male) (3, 5, 14m)
		FA-CBL9S9P***	RS-232C cable for connection of personal computer and intelligent module (D-Sub 9P male)-(D-Sub 9P female) (3, 5, 15m)
	Optical converter	FA-OPT232**	Optical converter for connection of RS-232 device
	Conversion cable	FA-CBL25S***	Conversion cable for connection of optical converter (0.2m)
	Conversion adaptor	FA-A25S***	Conversion adaptor for connection of optical converter
	Fiber-optic cable	FA-FB****M	Fiber-optic cable for connection of optical converter (within enclosure, indoors, portable, outdoors)
	Screwless terminal block conversion module	FA-TE(W)32XY	Screwless terminal block type 32-point module for DC
DC: Input, output module (connector type) compatible	Quick connector type distributed module	FA-CB**XY*	Quick connector type 8- or 16-point distributed module for DC
	Connector/terminal block conversion module	FA-TB**XY*	Terminal block type 8- or 16-point distributed module or 32-point terminal block module for DC
	Connection cable	FA-CBL***FMV	Cable for connection of input or output module and quick connector type distributed module or connector/terminal block conversion module
		FA-CBL***DMF	
		FA-(F)CBL***MMH	Cable for connection of quick connector type distributed modules or terminal block type distributed modules
AC/DC: Input, output module (terminal block type) compatible	PLC/terminal block conversion module	FA-TB161AC**	Terminal block conversion module for AC/DC, 16 points/common, 1- or 2-wire type
	Connection cable	FA-CBL**TD	Cable for connection of input or output module and PLC/terminal block conversion module
DC: Input, Output module (connector type) compatible	Interface terminal module	FA-TH16*****	Relay, triac or transistor output terminal module (16 points)
	Connection cable	FA-CBL***FM2V	Cable for connection of interface terminal module, 40 cores
		FA-CBL***MMH20	Cable for connection of interface terminal module, 42 cores
Positioning module compatible	Connection cable	FA-CBLQ75*****	Cable for connection of positioning module and servo amplifier (for QD75)
		FA-CBLQ70*****	Cable for connection of positioning module and servo amplifier (for QD70)
Thermocouple input module compatible	Converter module	FA-TB20TD	Terminal block module for Q64TD
	Connection cable	FA-CBLQ64TD**	Cable for connection of Q64TD terminal block module
Thermocouple adjustment module compatible	Conveiter module	FA-TB20TC	Terminal block modulefor Q64TCTT(BW)
	Connection module	FA-CBLQ64TC	Cable for connection of Q64TCTT(BW) terminal block module
AC/DC: I/O module (terminal block type) compatible	Relay terminal module	FA-CC**P	Connector type, terminal block type relay terminal module
		FA-CTB20P	
	Out-of-panel connection cable	FA-CBL***EX****	Cable for connection of relay terminal module wiring to the outside of the panel

APPENDIX

APPENDIX

APPENDIX1 Safety Precations

SAFETY PRECAUTIONS (Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

DANGER
Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

CAUTION
Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the CAUTION level may lead to a serious consequence according to the circumstances.
Always follow the instructions of both levels because they are important to personal safety.

■ Design Precautions

DANGER

● Install a safety circuit external to the PLC that keeps the entire system safe even when there are problems with the external power supply or the PLC module. Otherwise, trouble could result from erroneous output or erroneous operation.

(1) Outside the PLC, construct interlock circuits to prevent mechanical damage, emergency stop, protective circuits, positioning upper and lower limits switches and interlocking forward/reverse operations.

(2) When the PLC detects the following problems, it will stop calculation and turn off all output in the case of (a).
In the case of (b), it will hold or turn off all output according to the parameter setting.
Note that the AnS series module will turn off the output in either of cases (a) and (b).

	Q series module	AnS series module
(a) The power supply module has over current protection equipment and over voltage protection equipment.	Output OFF	Output OFF
(b) The CPU module self-diagnosis functions, such as the watchdog timer error, detect problems.	Hold or turn off all output according to the parameter setting.	Output OFF

In addition, all output will be turned on when there are problems that the PLC CPU cannot detect, such as in the I/O controller. Build a fail safe circuit exterior to the PLC that will make sure the equipment operates safely at such times.
Refer to "LOADING AND INSTALLATION" in this manual for examples of fail safe circuits.

⚠DANGER

(3) Output could be left on or off when there is trouble in the outputs module relay or transistor. So build an external monitoring circuit that will monitor any single outputs that could cause serious trouble.

● When overcurrent which exceeds the rating or caused by short-circuited load flows in the output module for a long time, it may cause smoke or fire. To prevent this, configure an external safety circuit, such as a fuse.

● Build a circuit that turns on the external power supply when the PLC main module power is turned on.
If the external power supply is turned on first, it could result in erroneous output or erroneous operation.

● When there are communication problems with the data link, refer to the corresponding data link manual for the operating status of each station.
Not doing so could result in erroneous output or erroneous operation.

● When connecting a peripheral device to the CPU module or connecting a personal computer or the like to the intelligent function module / special function module to exercise control (data change) on the running PLC, configure up an interlock circuit in the sequence program to ensure that the whole system will always operate safely.
Also before exercising other control (program change, operating status change (status control)) on the running PLC, read the manual carefully and fully confirm safety.
Especially for the above control on the remote PLC from an external device, an immediate action may not be taken for PLC trouble due to a data communication fault.
In addition to configuring up the interlock circuit in the sequence program, corrective and other actions to be taken as a system for the occurrence of a data communication fault should be predetermined between the external device and PLC CPU.

⚠CAUTION

● Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
They should be installed 100 mm (3.94 inch) or more from each other.
Not doing so could result in noise that would cause erroneous operation.

● When controlling items like lamp load, heater or solenoid valve using an output module, large current (approximately ten times greater than that present in normal circumstances) may flow when the output is turned OFF to ON.
Take measures such as replacing the module with one having sufficient rated current.

■ **Installation Precautions**

⚠CAUTION

● Use the PLC in an environment that meets the general specifications contained in this manual.
Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.

● While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
Incorrect loading of the module can cause a malfunction, failure or drop.
When using the PLC in the environment of much vibration, tighten the module with a screw.
Tighten the screw in the specified torque range.
Undertightening can cause a drop, short circuit or malfunction.
Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

● When installing extension cables, be sure that the base unit and the extension module connectors are installed correctly.
After installation, check them for looseness.
Poor connections could cause an input or output failure.

● Securely load the memory card into the memory card loading connector.
After installation, check for lifting.
Poor connections could cause an operation fault.

● Completely turn off the externally supplied power used in the system before mounting or removing the module. Not doing so could result in damage to the product.Note that the module can be changed online (while power is on) in the system that uses the CPU module compatible with online module change or on the MELSECNET/H remote I/O station.
Note that there are restrictions on the modules that can be changed online(while power is on), and each module has its predetermined changing procedure.
For details, refer to this manual and the online module change section in the manual of the module compatible with online module change.

● Do not directly touch the module's conductive parts or electronic components.
Touching the conductive parts could cause an operation failure or give damage to the module.

■ **Wiring Precautions**

⚠CAUTION

- Completely turn off the externally supplied power used in the system when installing or placing wiring.
  Not completely turning off all power could result in electric shock or damage to the product.

- When turning on the power supply or operating the module after installation or wiring work, be sure that the module's terminal covers are correctly attached.
  Not attaching the terminal cover could result in electric shock.

- Be sure to ground the FG terminals and LG terminals to the protective ground conductor.
  Not doing so could result in electric shock or erroneous operation.

- When wiring in the PLC, be sure that it is done correctly by checking the product's rated voltage and the terminal layout.
  Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.

- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered.
  Imperfect connections could result in short circuit, fires, or erroneous operation.

- Tighten the terminal screws with the specified torque.
  If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation.
  Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

- Be sure there are no foreign substances such as sawdust or wiring debris inside the module.
  Such debris could cause fires, damage, or erroneous operation.

- The module has an ingress prevention label on its top to prevent foreign matter, such as wire offcuts, from entering the module during wiring.
  Do not peel this label during wiring.
  Before starting system operation, be sure to peel this label because of heat dissipation.

■ **Startup and Maintenance precautions**

⚠DANGER

- Do not touch the terminals while power is on.
  Doing so could cause shock or erroneous operation.

- Correctly connect the battery.
  Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery.
  Mishandling of battery can cause overheating or cracks which could result in injury and fires.

- Switch off all phases of the externally supplied power used in the system when cleaning the module or retightening the terminal or module mounting screws.
  Not doing so could result in electric shock.
  Undertightening of terminal screws can cause a short circuit or malfunction.
  Overtightening of screws can cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

⚠CAUTION
● The online operations conducted for the CPU module being operated, connecting the peripheral device (especially, when changing data operation status or forced output), shall be conducted after the manual has been carefully read and a sufficient check of safety has been conducted. Operation mistakes could cause damage or problems with the module.
● Do not disassemble or modify the modules. Doing so could cause trouble, erroneous operation, injury, or fire.
● Use any radio communication device such as a cellular phone or a PHS phone more than 25cm (9.85 inch) away in all directions of the PLC. Not doing so can cause a malfunction.
● Completely turn off the externally supplied power used in the system before mounting or removing the module. Not doing so could result in damage to the product or a malfunction. Note that the module can be changed online (while power is on) in the system that uses the CPU module compatible with online module change or on the MELSECNET/H remote I/O station. Note that there are restrictions on the modules that can be changed online (while power is on) , and each module has its predetermined changing procedure. For details, refer to this manual and the online module change section in the manual of the module compatible with online module change.
● Do not mount/remove the module onto/from base unit more than 50 times (IEC61131-2-compliant), after the first use of the product.Failure to do so may cause the module to malfunction due to poor contact of connector.
● Do not drop or give an impact to the battery mounted to the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or given an impact, dispose of it without using.
● Before touching the module, always touch grounded metal, etc. to discharge static electricity from human body, etc. Not doing so can cause the module to fail or malfunction.

■ **Disposal Precautions**

⚠CAUTION
● When disposing of this product, treat it as industrial waste.

■ **Transportation Precautions**

⚠CAUTION
● When transporting lithium batteries, make sure to treat them based on the transport regulations. (Refer to Appendix 7 for details of the controlled models.)

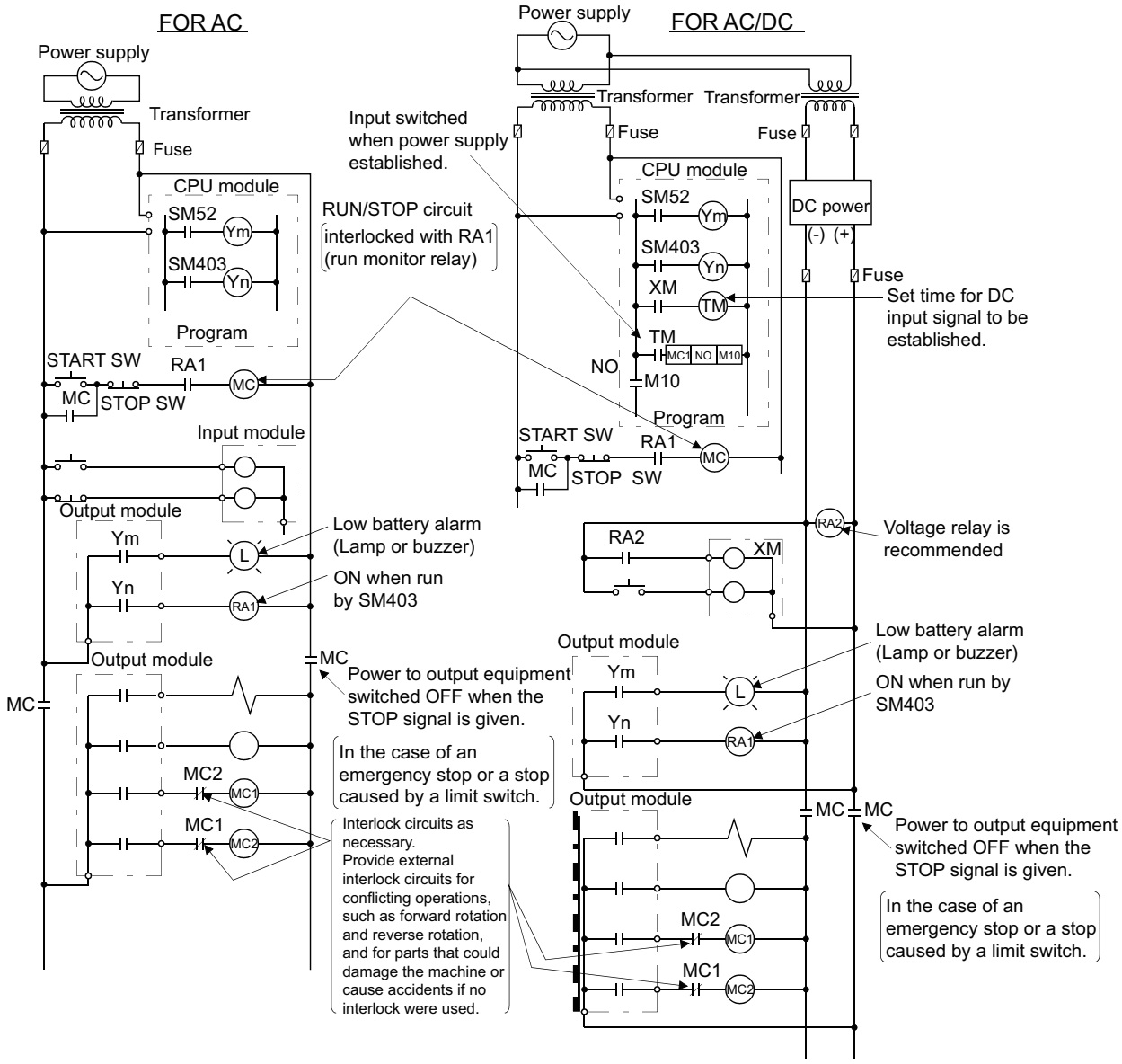
APPENDIX2 Mounting and Installation

In order to increase the reliability of the system and exploit the maximum performance of its functions, this section describes the methods and precautions for the mounting and installation of the system.

Concept of fail safe circuit

When the PLC is powered on and off, normal control output may not be done momentarily due to a delay or a start-up time difference between the PLC power supply and the external power supply (DC in particular) for the control target.
For example, if the external power supply for the controlled object is switched on in a DC output module and then the PLC power supply is switched on, the DC output module may provide false output instantaneously at power-on of the PLC. Therefore, it is necessary to make up a circuit that can switch on the PLC power supply first.
Also, an abnormal operation may be performed if an external power supply fault or PLC failure takes place.
To prevent any of these abnormal operations from leading to the abnormal operation of the whole system and in a fail-safe viewpoint, areas which can result in machine breakdown and accidents due to abnormal operations (e.g. emergency stop, protective and interlock circuits) should be constructed outside the PLC.
The following diagram gives examples of system designing in the above viewpoint.

■ System design circuit example (when not using $\overline{\text{ERR}}$ terminal of power supply module, or using Q00JCPU)



The power-ON procedure is as follows:

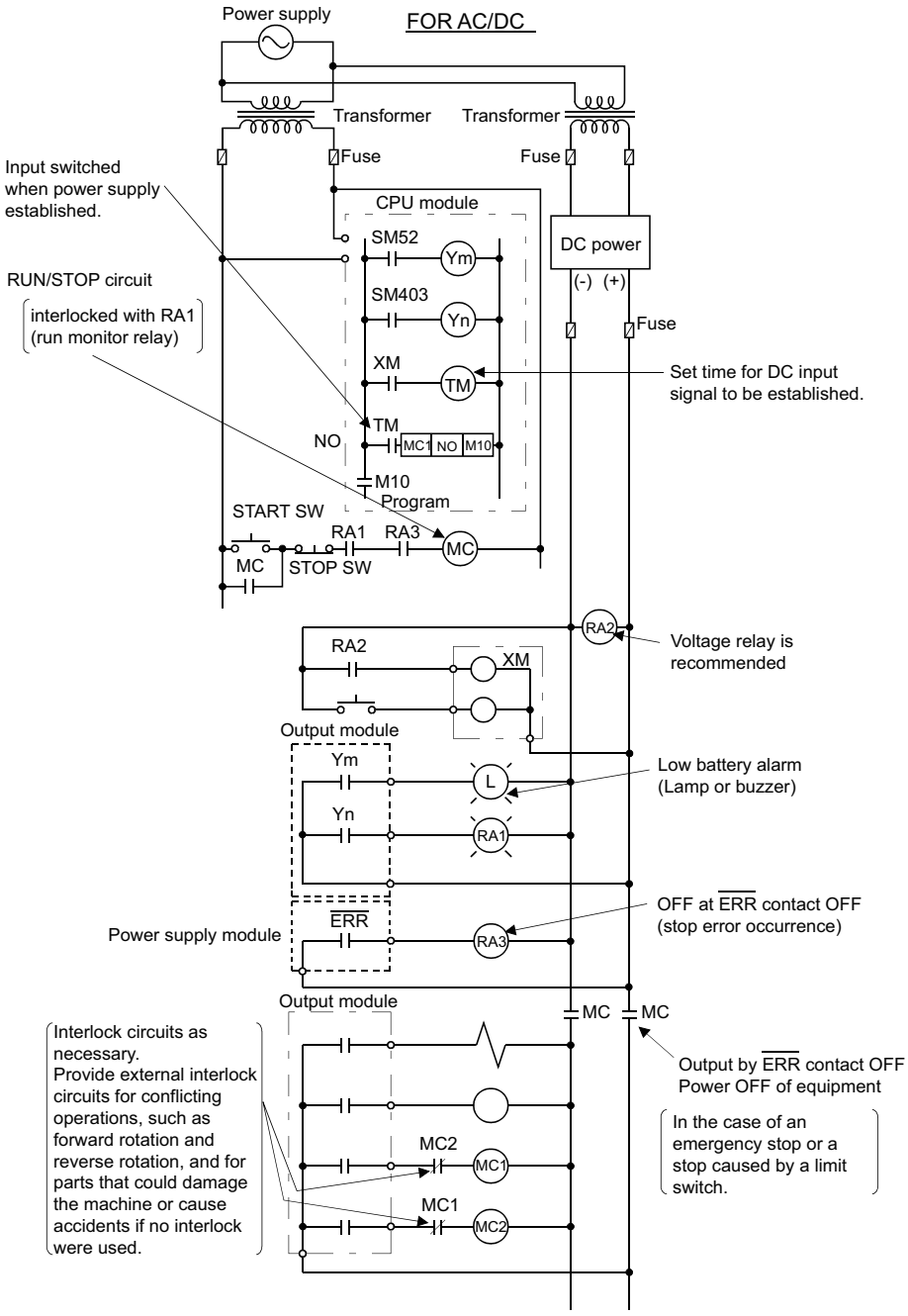
For AC

1) Switch power ON.
2) Set CPU to RUN.
3) Turn ON the start switch.
4) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program.

For AC/DC

1) Switch power ON.
2) Set CPU to RUN.
3) When DC power is established, RA2 goes ON.
4) Timer (TM) times out after the DC power reaches 100%. (The TM set value should be the period of time from when RA2 goes ON to the establishment of 100% DC voltage. Set this value to approximately 0.5 seconds.)
5) Turn ON the start switch.
6) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

■ System design circuit example (when using $\overline{\text{ERR}}$ terminal of power supply module)



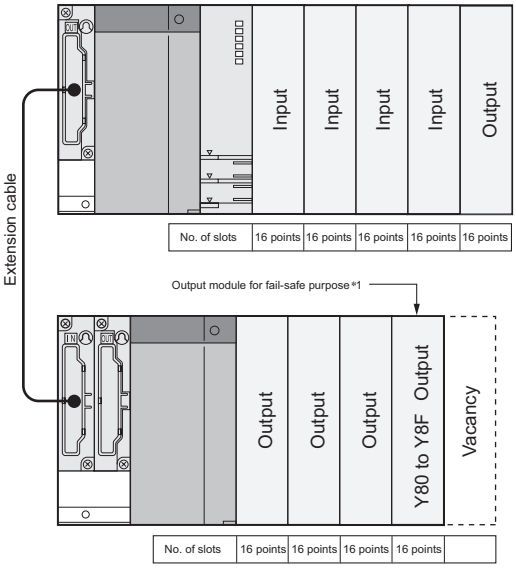
The power-ON procedure is as follows:

For AC/DC

1) Switch power ON.
2) Set CPU to RUN.
3) When DC power is established, RA2 goes ON.
4) Timer (TM) times out after the DC power reaches 100%. (The TM set value should be the period of time from when RA2 goes ON to the establishment of 100% DC voltage. Set this value to approximately 0.5s.)
5) Turn ON the start switch.
6) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

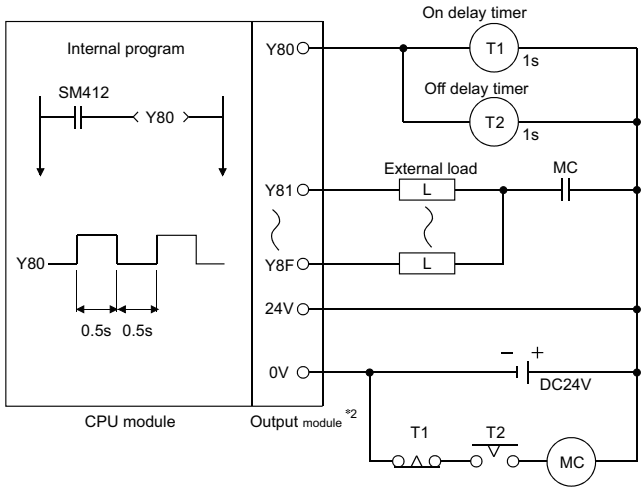
■ Fail-safe measures against failure of the PLC

Failure of a CPU module or memory can be detected by the self-diagnosis function. However, failure of I/O control area may not be detected by the CPU module.
In such cases, all I/O points turn ON or OFF depending on a condition of problem, and normal operating conditions and operating safety cannot sometimes be maintained.
Though Mitsubishi PLCs are manufactured under strict quality control, they may cause failure or abnormal operations due to unspecific reasons. To prevent the abnormal operation of the whole system, machine breakdown, and accidents, fail-safe circuitry against failure of the PLC must be constructed outside the PLC.
The followings are a system example and its fail-safe circuit example.



*1: The output module for fail-safe purpose should be loaded in the last slot of the system.
(Y80 to Y8F in the above system.)

System example



*2: Y80 repeats turning ON and then OFF at 0.5s intervals.
Use a no-contact output module (transistor in the example shown above).

Fail-safe circuit example

Calculating heat generation of PLC

The ambient temperature inside the panel storing the PLC must be suppressed to an ambient temperature of 55°C or less, which is specified for the PLC.
For the design of a heat releasing panel, it is necessary to know the average power consumption (heating value) of the devices and instruments stored inside.
Here the method of obtaining the average power consumption of the PLC system is described.
From the power consumption, calculate a rise in ambient temperature inside the panel.

How to calculate average power consumption

The power consuming parts of the PLC are roughly classified into six blocks as shown below.

(1) Power consumption of power supply module

The power conversion efficiency of the power supply module is approx. 70 %, while 30 % of the output power is consumed as heat. As a result, 3/7 of the output power is the power consumption.
Therefore the calculation formula is as follows.

$$W_{PW} = \frac{3}{7} \times (I_{5V} \times 5)\ (W)$$

I_{5V}: Current consumption of logic 5 VDC circuit of each module

POINT

In a redundant power supply system configuration, the same calculation method is applied.
(When 2 redundant power supply modules (Q64RP) are placed in parallel, they run sharing the load current half-and-half.)

(2) Total power consumption for 5VDC logic circuits of all modules (including CPU module)

The power consumption of the 5 VDC output circuit section of the power supply module is the power consumption of each module (including the current consumption of the base unit).

$W_{5V} = I_5 \times V_5$ (W)

*: For the power consumption of the motion CPU and PC CPU module, refer to the instruction manuals of the corresponding modules.

(3) A total of 24 VDC average power consumption of the output module (power consumption for simultaneous ON points)

The average power of the external 24 VDC power is the total power consumption of each module.

$W_{24V} = I_{24V} \times 24$ (W)

(4) Average power consumption due to voltage drop in the output section of the output module (Power consumption for simultaneous ON points)

$W_{OUT} = I_{OUT} \times V_{drop} \times$ Number of outputs $\times$ Simultaneous ON rate (W)

I_{OUT} : Output current (Current in actual use) (A)
V_{drop}: Voltage drop in each output module (V)

(5) Average power consumption of the input section of the input module (Power consumption for simultaneous ON points)

$W_{IN} = I_{IN} \times E \times$ Number of input points $\times$ Simultaneous ON rate (W)

I_{IN}: Input current (Effective value for AC) (A)
E : Input voltage (Voltage in actual use) (V)

(6) Power consumption of the power supply section of the intelligent function module

$W_S = I_{5V} \times 5 + I_{24V} \times 24 + I_{100V} \times 100$ (W)

The total of the power consumption values calculated for each block becomes the power consumption of the overall sequencer system.

$W = W_{PW}+W_{5V}+W_{24V}+W_{OUT}+W_{IN}+W_S$ (W)

From this overall power consumption (W), calculate the heating value and a rise in ambient temperature inside the panel.
The outline of the calculation formula for a rise in ambient temperature inside the panel is shown below.

$$T = \frac{W}{UA}(^{\circ}C)$$

W: Power consumption of overall sequencer system (value obtained above)

A: Surface area inside the panel (m^2)

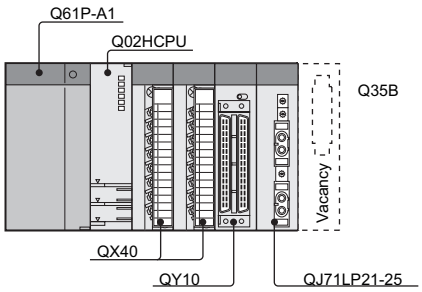
U: When the ambient temperature inside the panel is uniformed by a fan••6
When air inside the panel is not circulated••••••••••••4

POINT

If the temperature inside the panel has exceeded the specified range, it is recommended to install a heat exchanger to the panel to lower the temperature.
If a normal ventilating fan is used, dust will be sucked into the PLC together with the external air, and it may affect the performance of the PLC.

(7) Example of calculation of average power consumption

(a) System configuration



(b) 5 VDC current consumption of each module

Q02HCPU : 0.64(A)
QX40 : 0.05(A)
QY10 : 0.43(A)
QJ71LP21-25: 0.55(A)
Q35B : 0.074(A)

(c) Power consumption of power supply module
W_{PW} = 3/7×(0.64 + 0.05 + 0.05 + 0.43 + 0.55 + 0.074)×5 = 3.84(W)

(d) Total power consumption for 5 VDC logic circuits of all module
W_{5V} = (0.64 + 0.05 + 0.05 + 0.43 + 0.55 + 0.074)×5 = 8.97(W)

(e) Total 24 VDC average power consumption of the output module
W_{24V} = 0(W)

(f) Average power consumption due to voltage drop in the output section of the output module
W_{OUT} = 0(W)

(g) Average power consumption of the input section of the input module
W_{IN} = 0.004×24×32×1 = 3.07(W)

(h) Power consumption of the power supply section of the intelligent function module
W_S = 0(W)

(i) Power consumption of overall system
W = 3.84 + 8.97 + 0 + 0 + 3.07 + 0 = 15.88(W)

POINT

The value of the heat generated in a redundant system configuration (when the redundant CPU is used) is the sum of the two values for the control and standby systems, each of which is calculated by the same method as that for the single system.

Module installation

Precaution on installation

This section gives instructions for handling the CPU, I/O, intelligent function and power supply modules, base units and so on.

- Module enclosure, terminal block connectors and pin connectors are made of resin; do not drop them or subject them to strong impact.
- Do not remove modules' printed circuit boards from the enclosure in order to avoid changes in operation.
- Tighten the module fixing screws and terminal block screws within the tightening torque range specified shown in the following table.

Table.1 Tightening torque range

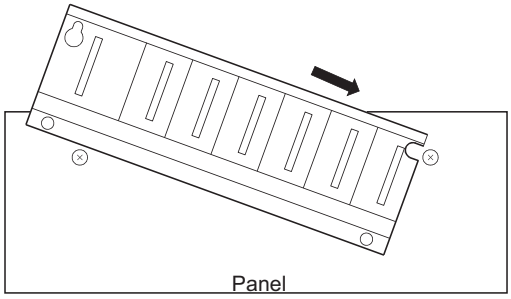
Location of Screw	Tightening Torque Range
Module fixing screw (M3×12 screw)	0.36 to 0.48N•m
I/O module terminal block screw (M3 screw)	0.42 to 0.58N•m
I/O module terminal block fixing screw (M3.5 screw)	0.66 to 0.89N•m
Power supply module terminal screw (M3.5 screw)	0.66 to 0.89N•m

- Be sure to install a power supply module in the power supply installation slot of Q3□B, Q3□SB, Q3□RB, Q6□B, Q6□RB, or QA1S6□B.
  Even if the power supply module is not installed, when the I/O modules and intelligent function module installed on the base units are of light load type, the modules may be operated.
  In this case, because a voltage becomes unstable, we cannot guarantee the operation.
- When using an extension cable or a tracking cable, keep it away from the main circuit cable (high voltage and large current).
  Keep a distance of 100mm or more from the main circuit.

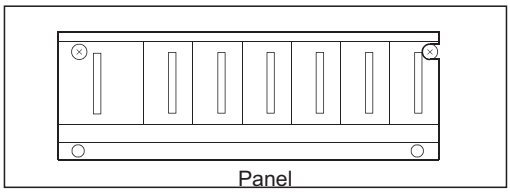
Install a main base unit or a Q00JCPU (by screwing) in the following procedure.

(1) Fit the two base unit top mounting screws into the enclosure.

(2) Place the right-hand side notch of the base unit onto the right-hand side screw.



(3) Place the left-hand side pear-shaped hole onto the left-hand side screw.



(4) Fit the mounting screws into the holes at the bottom of the base unit, and then retighten the 4 mounting screws.

Note 1: Install the main base unit and Q00JCPU to a panel, with no module loaded in the right-end slot.
Remove the base unit after unloading the module from the right-end slot.

Note 2: The mounting screws that included with the slim type main base unit differ from those included with other types of the base unit.
When ordering mounting screws for the slim type main base unit, specify "cross recessed head bind screw M4 x 12 (black)."

Note the following points when mounting a DIN rail.
Mounting a DIN rail needs special adaptors (sold separately), which are to be user-prepared.

(a) Applicable adaptor types

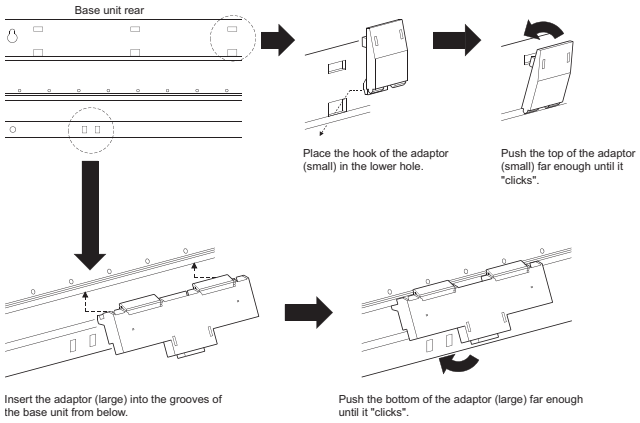
For Q38B,Q312B,Q68B,Q612B, Q38RB,Q68RB :Q6DIN1
For Q35B,Q65B,Q00JCPU :Q6DIN2
For Q33B,Q52B,Q55B,Q63B,Q32SB, Q33SB,Q35SB :Q6DIN3

Table.2 Parts included with DIN rail mounting adaptors included parts

DIN rail mounting adaptors	Quantity of included parts				
	Adaptor (Large)	Adaptor (small)	Mounting screw (M5 × 10)	Square washer	Stopper
Q6DIN1	2	4	3	3	2
Q6DIN2	2	3	2	2	2
Q6DIN3	1	2	2	2	2

(b) Adaptor installation method

The way to install the adaptors for mounting a DIN rail to the base unit is given in the following diagram.

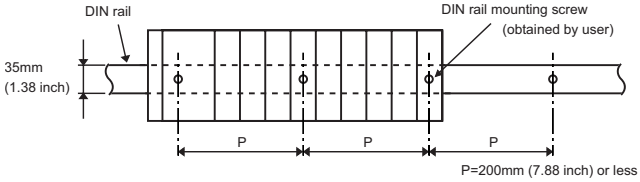


(c) Applicable DIN rail types (IEC 60715)

TH35-7.5Fe
TH35-7.5Al
TH35-15Fe

(d) DIN rail mounting screw intervals

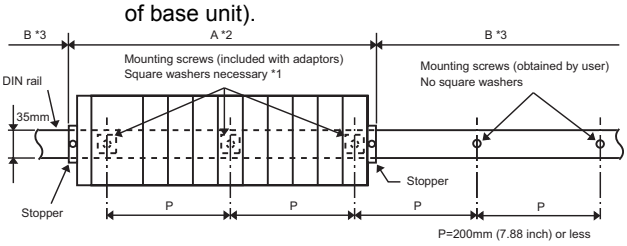
When using either the TH35-7.5Fe or TH35-7.5Al DIN rail, rail mounting screws should be inserted in 200 mm (7.88 inch) interrals or less in order to ensure that the rail has sufficient strength.



When installing the DIN rail in a large vibration and/or shock prone environment, insert the mounting screws in 200mm intervals or less by the following method show below.

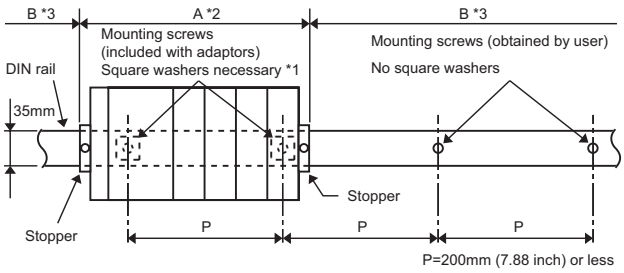
<For Q38B, Q312B, Q68B, Q38RB or Q68RB type>

Screw the DIN rail in three places using the mounting screws and square washers included with the DIN rail mounting adaptors (hereafter abbreviated to the adaptors) in 'Position A' (bottom of base unit).

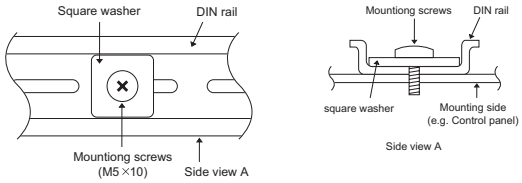


<For Q35B, Q65B, Q00JCPU, Q33B, Q52B, Q55B, Q63B, Q32SB, Q33SB or Q35SB type>

Screw the DIN rail in two places using the mounting screws and square washers included with the adaptors in 'Position A' (bottom of base unit).



*1:

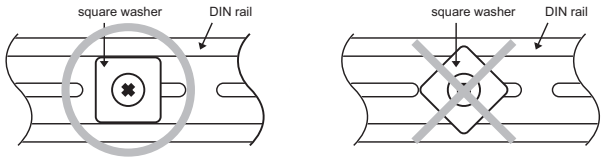


*2: Screw the DIN rail to a control panel using the mounting screws and square washers included with the adaptors in 'Position A' (bottom of base unit).

*3: Screw the DIN rail with mounting screws (obtained by user) in 'Position B' (Where the base unit is not installed). In this method the supplied mounting screws and square washeres are not used.

POINT

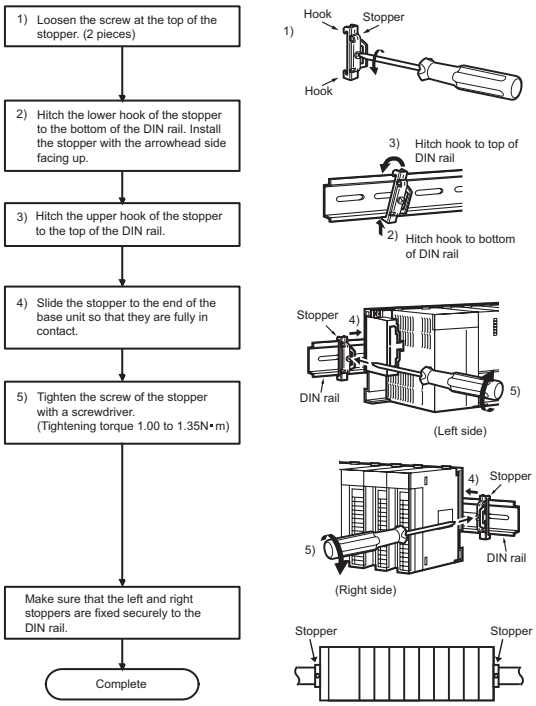
1. Use only one washer for each mounting screw. Use only the square washers supplied with the adaptors.
   If two or more washers are used together for one mounting screw, the screw may interfere with the base unit.
2. Make sure to align the square washer sides with the DIN rail.



3. Use the DIN rail that is compatible with M5 size screws.

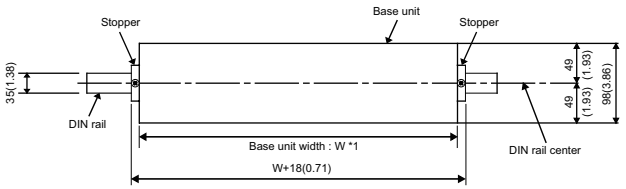
(e) Stopper mounting

When using the DIN rail in a large vibration and/or shock prone environment, install the base unit using the stoppers supplied with the DIN rail mounting adaptors indicated in (a).



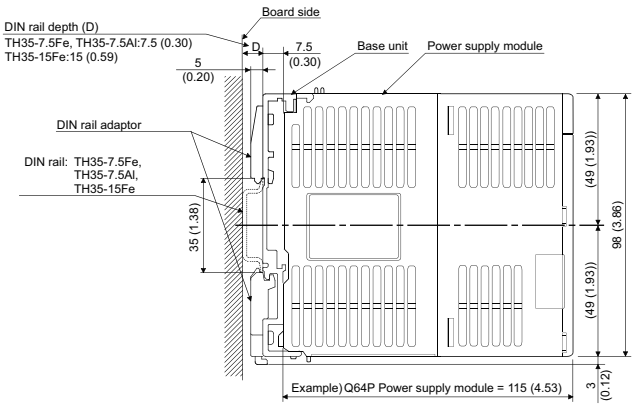
POINT

When stoppers are used, the dimension of stoppers need to be considered in the unit installation dimensions. Refer to Section 1.8 for the base unit dimensions (W).



Unit: mm (inch)

(f) Dimensions when DIN rail is attached (Side view)



Unit: mm (inch)

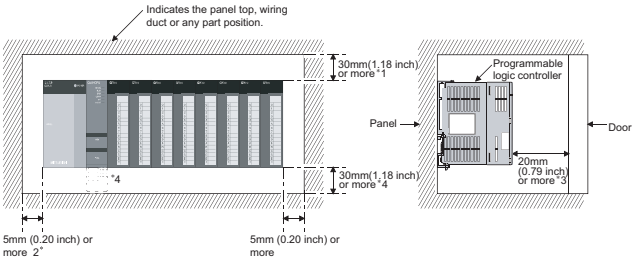
Instructions for mounting the base unit

When mounting the PLC to a panel or similar, fully consider its operability, maintainability and environmental resistance.

(1) Module mounting position

Keep the clearances shown in the following diagram between the top/bottom faces of the module and other structures or parts to ensure good ventilation and facilitate module replacement.

(a) In case of main base unit or extension base unit



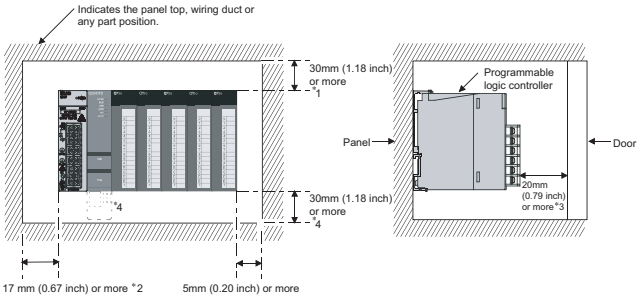
*1: For wiring duct with 50mm (1.97 inch) or less height. 40mm (1.58 inch) or more for other cases.

*2: 20mm (0.79 inch) or more when the adjacent module is not removed and the extension cable is connected.

*3: 80mm (3.15 inch) or more for the connector type. 140mm or more for installing a tracking cable when using a redundant CPU.

*4: 45mm (1.77 inch) or more when the Q7BAT is mounted.

(b) In case of slim type main base unit



*1: For wiring duct with 50 (1.97 inch) mm or less height. 40mm (1.58 inch) or more for other cases.

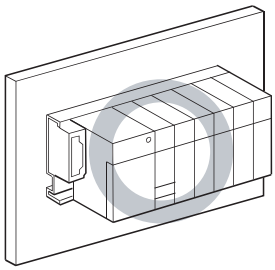
*2: The cable of the power supply module of the slim type main base unit protrudes out of the left end of the module. Install the module while reserving 17mm (0.67 inch) or more wiring space. If the cable sheath is susceptible to damage caused by a structural object or part on the left side of the module, take a protective measure with spiral tube or a similar insulator.

*3: 80mm (3.15 inch) or more for the connector type.

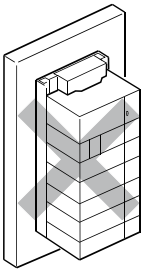
*4: 45mm (1.77 inch) or more when the Q7BAT is mounted.

(2) Module mounting orientation

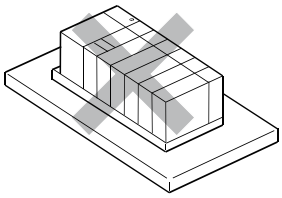
• Install the PLC in the orientation in the following diagram to ensure good ventilation for heat release.



• Do not mount it in either of the orientations shown in the following diagram.



Lengthwise installation



Horizontal installation

(3) Installation surface

Mount the base unit on a flat surface. If the mounting surface is not even, this may strain the printed circuit boards and cause malfunctions.

(4) Installation of unit in an area where the other devices are installed

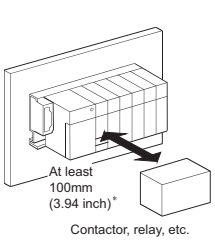
Avoid mounting base unit in proximity to vibration sources such as large magnetic contractors and no-fuse circuit breakers; mount these on a separate panel or at a distance.

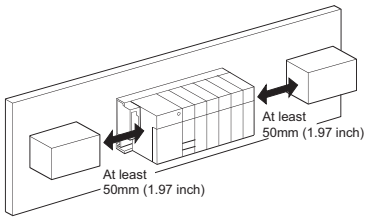
(5) Distances from the other devices

In order to avoid the effects of radiated noise and heat, provide the clearances indicated below between the PLC and devices that generate noise or heat (contactors and relays).

• Required clearance in front of PLC
  at least 100 mm (3.94 inch)*

• Required clearance on the right and left of PLC
  at least 50 mm (1.97 inch)





*: When using a redundant CPU, keep a distance of 100mm or more between the PLC and the tracking cable

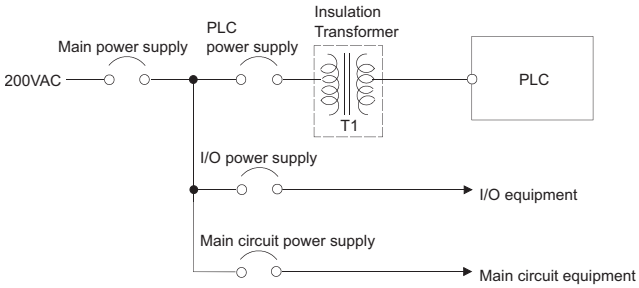
Wiring

■ The precautions on the wiring

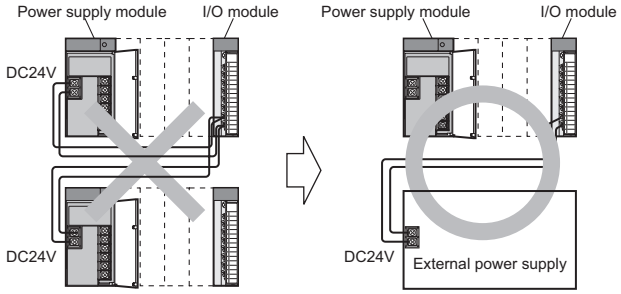
The precautions on the connection of the power cables are described below.

(1) Power supply wiring

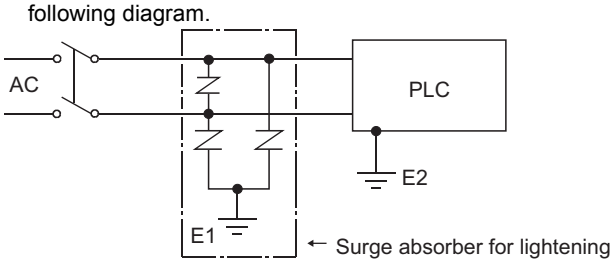
- Separate the PLC's power supply line from the lines for I/O devices and power devices as shown below.
  When there is much noise, connect an insulation transformer.



- Do not connect the 24VDC outputs of two or more power supply modules in parallel to supply power to one I/O module. Parallel connection will damage the power supply modules.



- 100VAC, 200VAC and 24VDC wires should be twisted as dense as possible.
  Connect the modules with the shortest distance.
  Also, to reduce the voltage drop to the minimum, use the thickest wires possible (maximum 2mm^2).
- Do not bundle the 100VAC and 24VDC wires with, or run them close to, the main circuit (high voltage, large current) and I/O signal lines. Reserve a distance of at least 100 mm from adjacent wires.
- As a countermeasure to power surge due to lightening, connect a surge absorber for lightening as shown in the following diagram.

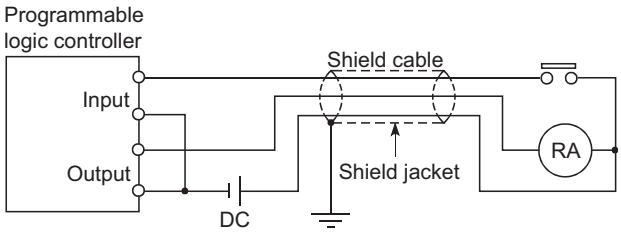


POINT

1. Separate the ground of the surge absorber for lightening (E1) from that of the PLC (E2).
2. Select a surge absorber for lightening whose power supply voltage does no exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

(2) Wiring of I/O equipment

- Insulation-sleeved solderless terminals cannot be used with the terminal block.
  It is recommended to cover the wire connections of the solderless terminals with mark or insulation tubes.
- The wires used for connection to the terminal block should be 0.3 to 0.75mm^2 in core and 2.8mm (0.11 inch) max. in outside diameter.
- Run the input and output lines away from each other.
- When the wiring cannot be run away from the main circuit and power lines, use a batch-shielded cable and ground it on the PLC side.
  In some cases, ground it in the opposite side.

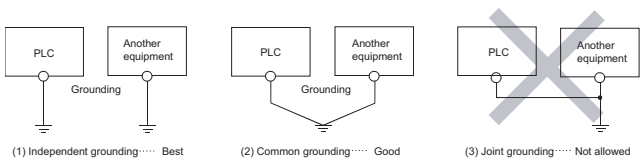


- Where wiring runs through piping, ground the piping without fail.
- Run the 24VDC input line away from the 100VAC and 200VAC lines.
- Wiring of 200m (686.67 ft.) or longer distance will give rise to leakage currents due to the line capacity, resulting in a fault.
- To prevent an electric shock or operating module malfunction, provide the external power supply of the module to be changed online with means that can turn the power supply off individually, e.g. a switch.

(3) Grounding

For grounding, perform the following:

- Use a dedicated grounding wire as far as possible.
  (Grounding resistance of 100Ω or less.)
- When a dedicated grounding cannot be performed, use (2) Common Grounding shown below.

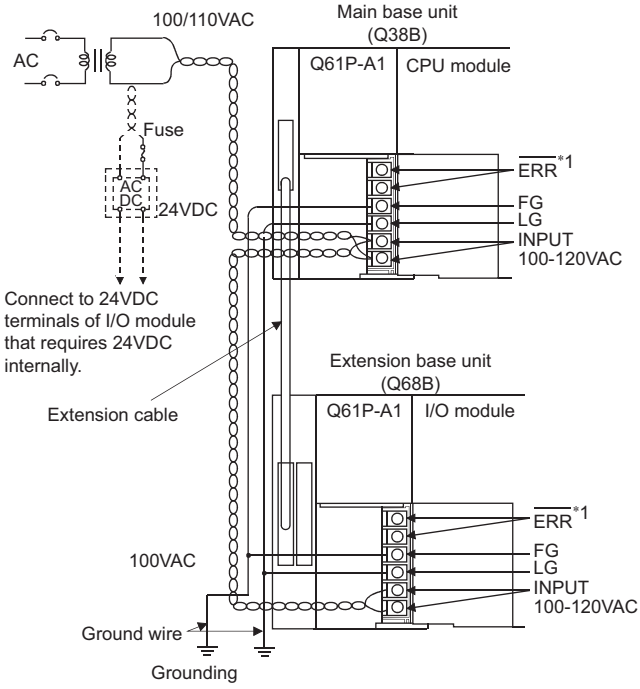


- For grounding a cable, use the cable of 2 mm^2 or more. Position the ground-contact point as closely to the sequencer as possible, and reduce the length of the grounding cable as much as possible.

■ Connecting to the power supply module

The following diagram shows the wiring example of power lines, grounding lines, etc. to the main and extension base units.

(1) Singular power supply system

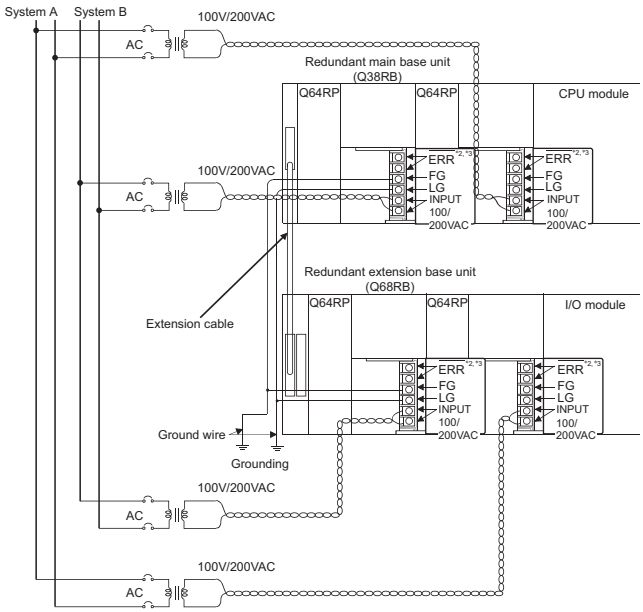


*1: The $\overline{\text{ERR}}$ terminal turns ON/OFF as described below.
<When the power supply module is mounted on the main base unit>
The terminal turns OFF (opens) when the AC power is not input, a CPU module stop error (including a reset) occurs, or the fuse of the power supply module is blown.
<When the power supply module is mounted on the extension base unit>
The terminal is always OFF (open).

POINT

1. Use the thickest possible (max. 2 mm^2 (14 AWG)) wires for the 100/200 VAC and 24 VDC power cables. Be sure to twist these wires starting at the connection terminals. To prevent a short-circuit should any screws loosen, use solderless terminals with insulation sleeves.
2. When the LG terminals and FG terminals are connected, be sure to ground the wires. Do not connect the LG terminals and FG terminals to anything other than ground. If LG terminals and FG terminals are connected without grounding the wires, the PLC may be susceptible to noise. In addition, since the LG terminals have a half of the input voltage, the operator may receive an electric shock when touching terminal parts.
3. No system error can be detected by the $\overline{\text{ERR}}$ terminal of an extension base unit. (The $\overline{\text{ERR}}$ terminal is always set off.)

(2) Redundant power supply system



*2: The $\overline{\text{ERR}}$ terminal turns ON/OFF as described below.
<When the redundant power supply module is mounted on the redundant main base unit>
The terminal turns OFF (opens) when the AC power is not input, a CPU module stop error (including a reset) occurs, the redundant power supply module fails, or the fuse of the redundant power supply module is blown.
<When the redundant power supply module is mounted on the redundant extension base unit>
The terminal turns OFF (opens) when the redundant power supply module fails, Ac power is not input, or the fuse of the redundant power supply module is blown.

*3: When input power is supplied to the redundant power supply module mounted on the redundant main base unit and the redundant power supply module mounted on the redundant extension base unit simultaneously, the ON (short) timing of the $\overline{\text{ERR}}$ terminal on the redundant main base unit is later than that of the $\overline{\text{ERR}}$ terminal on the redundant extension base unit by the initial processing time of the CPU module.

POINT

1. Use the thickest possible (max. 2mm^2) power cable of 100/200VAC and 24VDC and be sure to twist it starting at the connection terminals.
To prevent short-circuit due to loosen screws, use solderless terminals with insulation sleeves.
2. Supply power to two redundant power supply modules (Q64RP) individually (redundant power supply system).
3. When two redundant power supply modules are placed in parallel and operated as a redundant power supply system, it is recommended to use one of them as an AC power input and connect an uninterruptible power supply to the other.
4. When the LG and FG terminals are connected, be sure to ground the wires.
Otherwise, the PLC may be susceptible to noise.
Since the LG terminal has a half of the input voltage, touching this termial may result in an electric shock.

APPENDIX3 Maintenance and Inspection

APPENDIX3.1 Daily inspection

In order that you can use the PLC in normal and optimal condition at all times, this section describes those items that must be maintained or inspected daily or at regular intervals.

The items that must be inspected daily are listed in the following table.

Daily inspection

Item	Inspection Item		Inspection	Judgment Criteria	Remedy
1	Installation of base unit		Check that fixing screws are not loose and the cover is not dislocated.	The screws and cover must be installed securely.	Retighten the screws.
2	Installation of I/O module		Check that module is not dislocated and the unit fixing hook is engaged securely.	The module fixing hook must be engaged and installed securely.	Securely engaged the unit fixing hook.
3	Connecting conditions		Check for loose terminal screws.	Screws should not be loose.	Retighten the terminal screws.
			Check for distance between solderless terminals.	The proper clearance should be provided between Solderless terminals.	Correct.
			Check the connector part of the cable.	Connections should no be loose.	Retighten the connector fixing screws.
4	Module indication LED	Power supply module "POWER" LED*1	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF or ON (red)).	Refer to Troubleshooting in Section 12.2 of QCPU User's Manual (Maintenance and Inspection)
		CPU module "RUN" LED	Check that the LED is ON in RUN status.	The LED must be ON. (Abnormal if the LED is OFF.)	
		CPU module "ERR." LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flickering.)	
		CPU module "BAT." LED*2	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON.)	
		input module Input LED	Check that the LED turns ON and OFF.	The LED must be ON when the input power is turned ON. The LED must be extinguished when the input power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	
		output module Output LED	Check that the LED turns ON and OFF.	The LED turns ON when the output power is turned ON. The LED must be extinguished when the output power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	

*1: For the Q00JCPU, check the "POWER" LED on the CPU module side.
*2: The basic model QCPU does not have the "BAT." LED.

APPENDIX3.2 Periodic inspection

The items that must be inspected one or two times every 6 months to 1 year are listed below.

When the equipment is moved or modified, or layout of the wiring is changed, also perform this inspection.

Periodic Inspection

Item	Inspection Item		Inspection	Judgment Criteria	Remedy
1	Ambient environment	Ambient temperature	Measure with a thermometer and a hygrometer. Measure corrosive gas.	0 to 55°C	When the sequencer is used in the board, the ambient temperature in the board becomes the ambient temperature.
		Ambient humidity		5 to 95 %RH *1	
		Atmosphere		Corrosive gas must not be present.	
2	Line voltage check		Measure a voltage across the terminals of 100/200VAC and 24VDC.	85 to 132VAC	Change the power supply.
				170 to 264VAC	
				15.6 to 31.2VDC	
3	Installation	Looseness, rattling	Move the module to check for looseness and rattling.	The module must be installed fixedly.	Retighten the screws. If the CPU, I/O, or power supply module is loose, fix it with screws.
		Adhesion of dirt and foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.
4	Connection	Looseness of terminal screws	Try to further tighten screws with a screwdriver.	Screws must not be loose.	Retighten the terminal screws.
		Proximity of solderless terminals to each other	Check visually.	Solderless terminals must be positioned at proper intervals.	Correct.
		Looseness of connectors	Check visually.	Connectors must not be loose.	Retighten the connector fixing screws.
5	Battery		Check on the monitor mode of the GX Developer that SM51 or SM52 is turned OFF.	(Preventive maintenance)	Even if the lowering of a battery capacity is not shown, replace the battery with a new one if a specified service life of the battery is exceeded.

*1: When AnS Series Module is included in the system, the judgement criteria will be from 10 to 90 % RH.

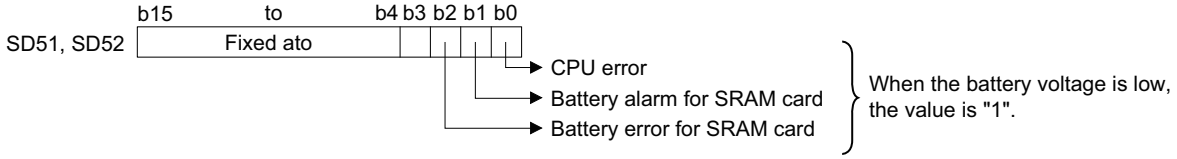
APPENDIX3.3 Lives of batteries

The batteries installed in the CPU module and SRAM card are used for data retention during the power failure of the program memory and latch device. Special relays SM51 and SM52 turn on due to the decrease of battery voltage. Even if the special relays turn on, the program and retained data are not erased immediately.
After relay SM51 turns on, replace the battery quickly within the data retention time for power failure (3 minutes).

POINT

SM51 turns on when the battery voltage falls below the specified value, and remains ON even after the voltage is recovered to the normal value.
SM52 turns on when the battery voltage falls below the specified value, and turns OFF when the voltage is recovered to the normal value.
After SM51 and/or SM52 turns on, replace the battery quickly.

SM51 and SM52 turn on when the battery voltage of the CPU module or SRAM card is lowered.
To identify the specific battery of the memory of which voltage is lowered, check the contents of the special resisters SD51 and SD52.



POINT

The following table shows the cases for memory retention by the CPU module battery and the SRAM card battery.
The important points are:
1) The CPU module battery cannot retain the SRAM card memory.
2) The SRAM card battery cannot retain the CPU module memory.

Cases for memory retention by the CPU module battery and the SRAM card battery.

Power supply Module	Battery of CPU Module	SRAM card battery	Memory of CPU Module	Memory of SRAM Card
ON	Connected	Installed	○	○
		Not installed	○	○
	Not connected	Installed	○	○
		Not installed	○	○
OFF	Connected	Installed	○	○
		Not installed	○	×
	Not connected	Installed	×	○
		Not installed	×	×

○: Retained, ×: Not retained

■ Battery lives of CPU modules

(1) Battery (Q6BAT) lives of basic model QCPUs

CPU Module Type	Power-on Time Ratio *1	Battery lives		
		Guaranteed value (70℃)*2	Actual service value(Reference value)*3 (40℃)	After SM52 ON (Backup time after alarm*4)
Q00JCPU	0%	26,000hr 2.96 years	43,800hr 5.00 years	710hr 30 days
	30%	37,142hr 4.23 years	43,800hr 5.00 years	710hr 30 days
	50%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
	70%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
	100%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
Q00CPU	0%	26,000hr 2.96 years	43,800hr 5.00 years	710hr 30 days
	30%	37,142hr 4.23 years	43,800hr 5.00 years	710hr 30 days
	50%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
	70%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
	100%	43,800hr 5.00 years	43,800hr 5.00 years	710hr 30 days
Q01CPU	0%	5,600hr 0.63 years	25,175hr 2.87 years	420hr 18 days
	30%	8,000hr 0.91 years	35,964hr 4.10 years	420hr 18 days
	50%	11,200hr 1.27 years	43,800hr 5.00 years	420hr 18 days
	70%	18,666hr 2.13 years	43,800hr 5.00 years	420hr 18 days
	100%	43,800hr 5.00 years	43,800hr 5.00 years	420hr 18 days

* 1: The power-on time ratio indicates the ratio of PLC power-on time to one day (24 hours).
(When the total power-on time is 12 hours and the total power-off time is 12 hours, the power-on time ratio is 50%.)

* 2: The guaranteed battery service life; equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25 to 75℃(operating ambient temperature of 0 to 55).

* 3: The actual battery service life; equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 40℃. This value is intended for reference only, as it varies with characteristics of the memory.

* 4: In the following status, the backup time after power OFF is 3 minutes.
- The battery connector is disconnected.
- The lead wire of the battery is broken.

POINT

1. Do not use the battery exceeding its guaranteed life.
2. If it is expected that the battery may be used exceeding its guaranteed life, take the following measures: operate the system by ROM so that the program can be protected even if the battery runs out while the PLC is powered OFF, or back up programs and data in advance after SM52 turns on (within the backup time after alarm occurrence).
3. The life of Q6BAT is 5 years when not connected to a CPU module.
4. When the battery-low special relay SM52 turns on, immediately change the battery.
If an alarm has not yet occurred, it is recommended to replace the battery periodically according to the conditions of use.
5. The battery (Q7BAT, Q8BAT) is not available for the basic model QCPU.

(2) Battery (Q6BAT, Q7BAT and Q8BAT) lives of high performance model QCPU, process CPU, and redundant CPU

CPU Module Type	Power-on Time Ratio *1	Battery life *5					
		Q6BAT			Q7BAT		
		Guaranteed value *2 (70℃)	(40℃)	After SM52 ON (Backup time after alarm *4)	Guaranteed value *2 (70℃)	(40℃)	After SM52 ON (Backup time after alarm *4)
Q02CPU	0%	30,000 hrs 3.42 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
	30%	42,857 hrs 4.89 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
	50%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
	70%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
Q02HCPU Q06HCPU	0%	2,341 hrs 0.26 years	18,364 hrs 2.09 years	120 hrs 5 days	5,000 hrs 0.57 years	43,800 hrs 5.00 years	240 hrs 10 days
	30%	3,344 hrs 0.38 years	26,234 hrs 2.99 years	120 hrs 5 days	7,142 hrs 0.81 years	43,800 hrs 5.00 years	240 hrs 10 days
	50%	4,682 hrs 0.53 years	36,728 hrs 4.19 years	120 hrs 5 days	10,000 hrs 1.14 years	43,800 hrs 5.00 years	240 hrs 10 days
	70%	7,803 hrs 0.89 years	43,800 hrs 5.00 years	120 hrs 5 days	16,666 hrs 1.90 years	43,800 hrs 5.00 years	240 hrs 10 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
Q12HCPU Q25HCPU Q12PHCPU Q25PHCPU Q12PRHCPU Q25PRHCPU	0%	1,260 hrs 0.14 years	7,755 hrs 0.88 years	48 hrs 2 days	2,900 hrs 0.33 years	21,107 hrs 2.40 years	96 hrs 4 days
	30%	1,800 hrs 0.20 years	11,079 hrs 1.26 years	48 hrs 2 days	4,142 hrs 0.47 years	30,153 hrs 3.44 years	96 hrs 4 days
	50%	2,520 hrs 0.28 years	15,510 hrs 1.77 years	48 hrs 2 days	5,800 hrs 0.66 years	42,214 hrs 4.81 years	96 hrs 4 days
	70%	4,200 hrs 0.47 years	25,850 hrs 2.95 years	48 hrs 2 days	9,666 hrs 1.10 years	43,800 hrs 5.00 years	96 hrs 4 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	48 hrs 2 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	96 hrs 4 days

The power-on time ratio indicates the ratio of PLC power-on time to one day (24 hours).
(When the total power-on time is 12 hours and the total power-off time is 12 hours, the power-on time ratio is 50%.)

CPU Module Type	Power-on Time Ratio *1	Battery life *5		
		Q8BAT		
		Guaranteed value *2 (70℃)	Actual service value (Reference value) *3 (40℃)	After SM52 ON (Backup time after alarm *4)
Q02CPU	0%	43,800 hr 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
	30%	43,800 hr 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
	50%	43,800 hr 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
	70%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
Q02HCPU Q06HCPU	0%	20,498 hr 2.34 years	43,800 hr 5.00 years	240 hr 10 days
	30%	29,959 hr 3.42 years	43,800 hr 5.00 years	240 hr 10 days
	50%	41,785 hr 4.77 years	43,800 hr 5.00 years	240 hr 10 days
	70%	43,800 hr 5.00 years	43,800 hr 5.00 years	240 hr 10 days
	100%	43,800 hr 5.00 years	43,800 hrs 5.00 years	240 hr 10 days
Q12HCPU Q25HCPU Q12PHCPU Q25PHCPU Q12PRHCPU Q25PRHCPU	0%	11,038 hr 1.26 years	29,609 hr 3.38 years	96 hr 4 days
	30%	16,200 hr 1.80 years	42,311 hr 4.83 years	96 hr 4 days
	50%	22,075 hr 2.52 years	43,800 hrs 5.00 years	96 hr 4 days
	70%	37,055 hr 4.23 years	43,800 hrs 5.00 years	96 hr 4 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	96 hr 4 days

* 1: The power-on time ratio indicates the ratio of PLC power-on time to one day (24 hours).
(When the total power-on time is 12 hours and the total power-off time is 12 hours, the power-on time ratio is 50%.)

* 2: The guaranteed battery service life; equivalent to the total power failure time that is calculated based on the characteristics value of the memory (SRAM) supplied by the manufacturer and under the storage ambient temperature range of -25 to 75℃ operating ambient temperature of 0 to 55℃).

* 3: The actual battery service life; equivalent to the total power failure time that is calculated based on the measured value and under the storage ambient temperature of 40℃ . This value is intended for reference only, as it varies with characteristics of the memory.

* 4: In the following status, the backup time after power OFF is 3 minutes.
• The battery connector is disconnected.
• The lead wire of the battery is broken.

* 5: For the high performance model QCPU, these values are applicable when the first 5 digits of the serial number of the CPU module is "05011" or higher.
For the battery life of the CPU module with a serial number of the first 5 digits "05010" or less,refer to Appendix 4.3.

POINT

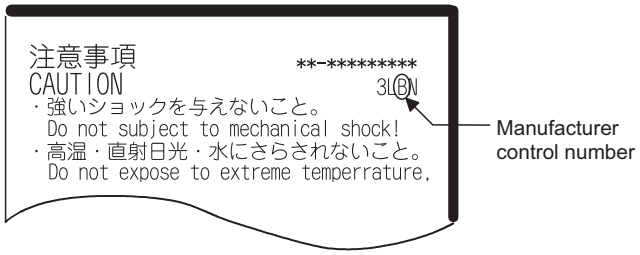
1. Do not use the battery exceeding its guaranteed life.
2. If it is expected that the battery may be used exceeding its guaranteed life, take the following measures: operate the system by ROM so that the program can be protected even if the battery runs out while the PLC is powered OFF, or back up programs and data in advance after SM52 turns on (within the backup time for after alarm occurrence).
3. When the battery (Q6BAT, Q7BAT and Q8BAT) is not connected to the CPU module, its service life is five years.
4. When the battery-low special relay SM52 turns on, immediately change the battery.
However, if the alarm has not yet occurred, it is recommended to change the battery periodically according to the operating condition.

■ SRAM card battery life

SRAM card	Power-on Time Ratio *1	Battery lives *3		
		Guaranteed value (MIN)	Actual operation value use (TYP) *4	After SM52 ON (Backup time after alarm)
Q2MEM-1MBS Manufacturing control number "□□A" *2	0%	690hrs 0.07years	6,336hrs 0.72years	8hrs
	100%	11,784hrs 1.34years	13,872hrs 1.58years	8hrs
Q2MEM-1MBS Manufacturing control number "□□B" *2 or "□□B□" *2 ↑ On and after B	0%	2,400hrs 0.27years	23,660hrs 2.7years	20hrs
	30%	2,880hrs 0.32years	31,540hrs 3.6years	20hrs
	50%	4,320hrs 0.49years	39,420hrs 4.5years	20hrs
	70%	6,480hrs 0.73years	43,800hrs 5.0years	20hrs
	100%	43,800hrs 5.0years	43,800hrs 5.0years	50hrs
Q2MEM-2MBS	0%	2,400hrs 0.27years	23,660hrs 2.7years	20hrs
	30%	2,880hrs 0.32years	31,540hrs 3.6years	20hrs
	50%	4,320hrs 0.49years	39,420hrs 4.5years	20hrs
	70%	6,480hrs 0.73years	43,800hrs 5.0years	20hrs
	100%	43,800hrs 5.0years	43,800hrs 5.0years	50hrs

*1: The power-on time ratio indicates the ratio of PLC power-on time to one day (24 hours).
(When the total power-on and power-off times are 12 hours for each, the power-on time ratio is 50%).

*2: The manufacturing control number (the third digit from the leftmost) is written on the label on the back of the SRAM card (as shown in the following diagram).



Label on the back of SRAM card

*3: Indicates the battery life when the SRAM card is installed in the high performance model QCPU whose first 5 digits of the serial number are "04012" or higher.
For the battery life for those of "04011" or lower, refer to Appendix 4.3.

*4: The actual operation value represents the actual performance, however, this value may vary depending on ambient temperatures.

POINT

1. Do not use the battery exceeding its guaranteed life.
2. If it is expected that the battery may be used exceeding its guaranteed life, take the following measures: operate the system by ROM so that the program can be protected even if the battery runs out while the PLC is powered OFF, or back up programs and data in advance after SM52 turns on (within the backup time after alarm occurrence).
3. Note that the SRAM card battery is consumed even while the PLC is powered ON with the CPU module battery connected.
4. When the special relay showing battery low, SM52 turns on, immediately change the battery.
Even if an alarm has not yet occurred, it is recommended to replace the battery periodically according to the conditions of use.
5. The SRAM card is not available for the basic model QCPU.

APPENDIX4 Comparisons

APPENDIX4.1 Enhanced functions of basic model QCPUs

Q series CPU module is updated to add functions and change the specifications.
The functions and specifications that can be used by the CPU module change depending on the function version.

(1) Specification comparison

Specifications		Function Version of CPU Module	
		Function Version A	Function Version B
		First 5 digits of Serial No is "04121" or earlier	First 5 digits of Serial No is "04122" or later
Standard RAM capacity	Q00JCPU	×	
	Q00CPU	64k bytes	128k bytes
	Q01CPU	64k bytes	128k bytes
CPU shared memory	Q00JCPU	×	
	Q00CPU	×	○
	Q01CPU	×	○

○: Usable/compatible, ×: Unusable/incompatible

(2) Function comparison

New Function*1	Function Version of CPU Module	
	Function Version A	Function Version B
	First 5 digits of Serial No is "04121" or earlier	First 5 digits of Serial No is "04122" or later
MELSAP3	×	○
Function block	×	○
Structured text (ST) language	×	○
PID operation function*2	×	○
Real number operation*2	×	○
Intelligent function module event interrup	×	○
Device initial value automatic setting function	×	○
Remote password setting function	×	○
E-mail parameter	×	○
Write during RUN using pointer	×	○
Increased file register R capacity *3	×	○
Multiple CPU System compatibility	×	○ *2
Multiple-block write during RUN	×	○

○: Usable/compatible, ×: Unusable/incompatible

*1: For details of functions, refer to QCPU User's Manual (Function Explanation, Program Fundamentals).
*2: When the CPU instruction installed by GX Developer Version 8 is read by GX Developer of Version 7 or earlier, it is processed as an "instruction code error" by GX Developer.
*3: Unsupported by the Q00JCPU.

(3) Usability of additional functions by GX Developer version

Additional Functions	GX Developer Version	
	Version 7 or earlier	Version 8.00A
MELSAP3	×	○
Function block	×	○
Structured text (ST) language	×	○
PID operation function	×	○
Real number operation function	×	○
Intelligent function module event interrupt	×	○
Device initial value automatic setting function	×	○
Remote password setting function	×	○
Electronic mail parameter	×	○
Write during RUN using pointer	×	○
Increased file register R capacity	----	----
Multiple PLC system compatibility	×	○
Multi-block write during RUN	×	○

○: Usable/compatible, ×: Unusable, ----: Function irrelevant to GX Developer

APPENDIX4.2 Enhanced functions of high-performance model QCPU

The high-performance Q series CPU module is updated to add functions and change the specifications.
The functions and specifications that can be used by the CPU module change depending on the function version.

(1) Specification comparison

Specifications		First 5 digits of Serial No. of CPU Module				
		Function Version A		Function Version B		
		02091 or earlier	02092 or later	02112 or later	03051 or later	04012 or later
Standard RAM capacity	Q02CPU	64kbyte				
	Q02HCPU	64kbyte				128kbyte
	Q06HCPU	64kbyte				128kbyte
	Q12HCPU	64kbyte	256kbyte			
	Q25HCPU	64kbyte	256kbyte			
CPU shared memory		×	×	○	○	○
Extended life battery SRAM card *1		×	×	×	×	○
Compatibility with 2Mbyte SRAM card		×	×	×	×	○

○: Usable/compatible, ×: Unusable/incompatible

*1: Refer to Appendix3.3 for details of the SRAM card battery life.

(2) Function comparison

Added Function	First 5 digits of Serial No. of CPU Module						
	Function Version A		Function Version B				
	02091 or earlier	02092 or later	02112 or later	03051 or later	04012 or later	04122 or later	05032or later
Automatic write to standard ROM *2	×	○	○	○	○	○	○
Enforced ON/OFF for external I/O *2	×	○	○	○	○	○	○
Remote password setting*2	×	○	○	○	○	○	○
Compatibility with MELSECNET/H remote I/O network *2	×	○	○	○	○	○	○
Interrupt module (QI60) compatibility*2	×	○	○	○	○	○	○
Programming module compatibility	×	○	○	○	○	○	○
Compatibility with the multiple CPU system*2	×	×	○	○	○	○	○
Installation of PC CPU module into the multiple CPU system *2	×	×	×	○	○	○	○
High speed interrupt *2	×	×	×	×	○	○	○
Compatibility with index modification for module designation of dedicated instruction*2	×	×	×	×	○	○	○
Selection of refresh item for COM instruction*2	×	×	×	×	○	○	○
SFC program online batch change*2	×	×	×	×	×	○	○
File memory capacity change*2	×	×	×	×	×	○	○
CC-Link remote network additional mode*2	×	×	×	×	×	×	○
Incomplete derivative PID operation function*6	×	×	×	×	×	×	○
Floating-point comparison instruction speedup*2	×	×	×	×	×	×	○

○: Usable/compatible, ×: Unusable/incompatible

*2: Refer to the following QCPU User's Manual (Function Explanation, Program Fundamentals) for details of the functions.

(3) Added functions and the corresponding GX Developer versions

Added Function	GX Developer Version					
	SW4D5C-GPPW-E SW5D5C-GPPW-E	GX Developer				
		Version 6	Version 7	Version 7.10L	Version 8	Version 8.03D or later
Automatic write to standard ROM	×	○	○	○	○	○
Enforced ON/OFF for external I/O	×	○	○	○	○	○
Remote password setting	×	○	○	○	○	○
Compatibility with MELSECNET/H remote I/O network	×	○	○	○	○	○
Interrupt module (QI60) compatibility	×	×	○	○	○	○
Programming module compatibility	----	----	----	----	----	----
Compatibility with the multiple CPU system	×	○	○	○	○	○
Installation of PC CPU module into the multiple CPU system	×	×	○	○	○	○
High speed interrupt	×	×	×	○	○	○
Compatibility with index modification for module designation of dedicated instruction	----	----	----	----	----	----
Selection of refresh item for COM instruction	----	----	----	----	----	----
SFC program online batch change	×	×	×	×	○	○
File memory capacity change	×	×	×	×	○	○
CC-Link remote network additional mode	×	×	×	×	×	○
Incomplete derivative PID operation function	×	×	×	×	×	○
Floating-point comparison instruction speedup	----	----	----	----	----	----

○: Usable/compatible, ×: Unusable, ----: Function irrelevant to GX Developer

APPENDIX4.3 When using previous high-performance model QCPUs

(1) Q6BAT/Q7BAT battery life when QCPU used has serial No. whose first 5 digits are "05010" or earlier

CPU module model name	Power-on time ratio	Battery lives					
		Q6BAT			Q7BAT		
		Guaranteed value (70℃)	Actual operation value (40℃)	After SM52 ON (Backup time after alarm)	Guaranteed value (70℃)	Actual operation value (40℃)	After SM52 ON (Backup time after alarm)
Q02CPU	0%	5,433 hrs 0.62 years	13,120 hrs 1.49 years	120 hrs 5 days	13,000 hrs 1.48 years	31,000 hrs 3.53 years	240 hrs 10 days
	30%	7,761 hrs 0.88 years	18,742 hrs 2.13 years	120 hrs 5 days	18,571 hrs 2.11 years	43,800 hrs 5.00 years	240 hrs 10 days
	50%	10,866 hrs 1.24 years	26,240 hrs 2.99 years	120 hrs 5 days	26,000 hrs 2.96 years	43,800 hrs 5.00 years	240 hrs 10 days
	70%	18,110 hrs 2.06 years	43,733 hrs 4.99 years	120 hrs 5 days	43,333 hrs 4.94 years	43,800 hrs 5.00 years	240 hrs 10 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
Q02HCPU Q06HCPU	0%	2,341 hrs 0.26 years	6,435 hrs 0.73 years	120 hrs 5 days	5,000 hrs 0.57 years	14,000 hrs 1.59 years	240 hrs 10 days
	30%	3,344 hrs 0.38 years	9,192 hrs 1.04 years	120 hrs 5 days	7,142 hrs 0.81 years	20,000 hrs 2.28 years	240 hrs 10 days
	50%	4,682 hrs 0.53 years	12,870 hrs 1.46 years	120 hrs 5 days	10,000 hrs 1.14 years	28,000 hrs 3.19 years	240 hrs 10 days
	70%	7,803 hrs 0.89 years	21,450 hrs 2.44 years	120 hrs 5 days	16,666 hrs 1.90 years	43,800 hrs 5.00 years	240 hrs 10 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	120 hrs 5 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	240 hrs 10 days
Q12HCPU Q25HCPU	0%	1,260 hrs 0.14 years	4,228 hrs 0.48 years	48 hrs 2 days	2,900 hrs 0.33 years	9,700 hrs 1.10 years	96 hrs 4 days
	30%	1,800 hrs 0.20 years	6,040 hrs 0.68 years	48 hrs 2 days	4,142 hrs 0.47 years	13,857 hrs 1.58 years	96 hrs 4 days
	50%	2,520 hrs 0.28 years	8,456 hrs 0.96 years	48 hrs 2 days	5,800 hrs 0.66 years	19,400 hrs 2.21 years	96 hrs 4 days
	70%	4,200 hrs 0.47 years	14,093 hrs 1.60 years	48 hrs 2 days	9,666 hrs 1.10 years	32,333 hrs 3.69 years	96 hrs 4 days
	100%	43,800 hrs 5.00 years	43,800 hrs 5.00 years	48 hrs 2 days	43,800 hrs 5.00 years	43,800 hrs 5.00 years	96 hrs 4 days

(2) SRAM card battery life when QCPU used has serial No. whose first 5 digits are "04011" or earlier

SRAM card	Power-on time ratio	Battery lives		
		Guaranteed value (MIN)	Actual operation value (TYP)	After SM52 ON (Backup time after alarm)
Q2MEM-1MBS Q2MEM-2MBS	0%	690 hrs 0.07 years	6,336 hrs 0.72 years	8 hrs
	100%	11,784 hrs 1.34 years	13,872 hrs 1.58 years	8 hrs

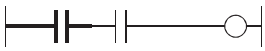
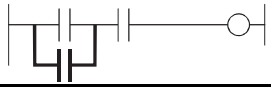
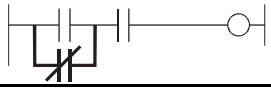
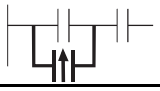
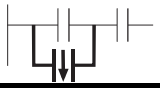
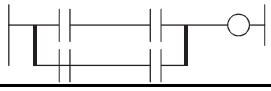
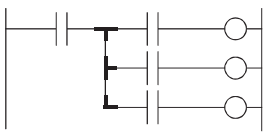
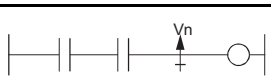
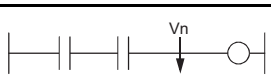
(3) Number of file register points according to first 5 digits of serial No.

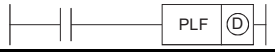
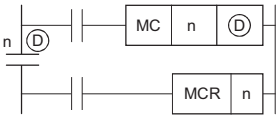
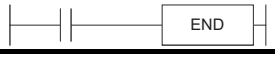
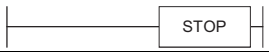
CPU module model name		Number of file register points
Q02CPU		32k points
Q02HCPU Q06HCPU	First 5 digits of serial No. are "04011" or earlier	32k points
	First 5 digits of serial No. are "04012" or later	64k points
Q12HCPU Q25HCPU	First 5 digits of serial No. are "02091" or earlier	32k points
	First 5 digits of serial No. are "02092" or later	128k points

APPENDIX5 List of Instructions

APPENDIX5.1 MELSEC-Q series instructions

39 User-friendly, practical sequence instructions

Instruction Symbol (Designation)	Function	Drawing Indication	PLC CPU		Process CPU	Redundant CPU
			Basic model QCPU	High Performance model QCPU		
Contact instructions						
LD Load	Starts N.O. contact logic operation		○	○	○	○
LDI Load inverse	Starts N.C. contact logic operation		○	○	○	○
AND And	N.O. contact series connection		○	○	○	○
ANI And inverse	N.C. contact series connection		○	○	○	○
OR Or	N.O. contact parallel connection		○	○	○	○
ORI Or inverse	N.C. contact parallel connection		○	○	○	○
LDP Load pulse	Starts leading edge pulse operation		○	○	○	○
LDF Load pulse F	Starts trailing edge pulse operation		○	○	○	○
ANDP And pulse	Leading edge pulse series connection		○	○	○	○
ANDF And pulse F	Trailing edge pulse series connection		○	○	○	○
ORP Or pulse	Leading edge pulse parallel connection		○	○	○	○
ORF Or pulse F	Trailing edge pulse parallel connection		○	○	○	○
Connection instructions						
ANB And block	Ladder block series connection		○	○	○	○
ORB Or block	Ladder block parallel connection		○	○	○	○
MPS Memory Push	Storage of operation result		○	○	○	○
MRD Memory Read	Storage of operation result		○	○	○	○
MPP Memory Pop	Reset and reading of operation result		○	○	○	○
INV Inverse	Inversion of operation result		○	○	○	○
MEP Edge pulse	Conversion of operation result to leading edge pulse		○	○	○	○
MEF Edge pulse F	Conversion of operation result to trailing edge pulse		○	○	○	○
EGP Edge relay pulse	Conversion of operation result to leading edge pulse (Stored		○	○	○	○
EGF Edge relay pulse F	Conversion of operation result to trailing edge pulse (Stored		○	○	○	○

Instruction Symbol (Designation)	Function	Drawing Indication	PLC CPU		Process CPU	Redundant CPU
			Basic model QCPU	High Performance model QCPU		
Output instructions						
OUT Out	Device output		○	○	○	○
SET Set	Set device		○	○	○	○
RST Reset	Reset device		○	○	○	○
PLS Pulse Rising	Leading edge output		○	○	○	○
PLF Pulse Falling	Trailing edge output		○	○	○	○
FF Flip-flop	Reversal of bit device output		○	○	○	○
DELTA Delta	Pulse output (every scan)		○	○	○	○
DELTAP Delta P	Pulse output (one scan only)		○	○	○	○
Shift instructions						
SFT Shift	1-bit shift of bit device		○	○	○	○
SFTP Shift P	1-bit shift of bit device (Pulse ON/OFF)		○	○	○	○
Master control instructions						
MC Master control	Master control set		○	○	○	○
MCR Master control reset	Master control reset		○	○	○	○
Program end instructions						
FEND F end	Termination of main routine program		○	○	○	○
END End	Termination of sequence program		○	○	○	○
Miscellaneous instructions						
STOP Stop	Sequence program stop (All outputs OFF)		○	○	○	○
NOP NOP	No operation	NOP	○	○	○	○
NOPLF NOP LF	Page feed of printer output	NOPLF	○	○	○	○
PAGE Page	Page changing of printer output	PAGE	○	○	○	○

Basic instructions for increasing programming efficiency

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Comparison operation instructions					
BIN 16 bit data comparisons	=, <>, >, >=, <, <=	○	○	○	○
BIN 32 bit data comparisons	D=, D<>, D>, D>=, D<, D<=	○	○	○	○
Floating-decimal point data comparison	E=, E<>, E>, E>=, E<, E<=	○*1	○	○	○
Character string data comparisons	$=, $<>, $>, $>=, $<, $<=	×	○	○	○
Block data comparisons	BKCMP	○	○	○	○
Arithmetic operation instructions					
BIN 16 bit data addition and subtraction operations	+(P), -(P)	○	○	○	○
BIN 32 bit data addition and subtraction operations	D+(P), D-(P)	○	○	○	○
BIN 16 bit data multiplication and division operations	*(P), /(P)	○	○	○	○
BIN 32 bit data multiplication and division operations	D*(P), D/(P)	○	○	○	○
BCD 4-digit data addition and subtraction operations	B+(P), B-(P)	○	○	○	○
BCD 8-digit data addition and subtraction operations	DB+(P), DB-(P)	○	○	○	○
BCD 4-digit data multiplication and division operations	B*(P), B/(P)	○	○	○	○
BCD 8-digit data multiplication and division operations	DB*(P), DB/(P)	○	○	○	○
Floating decimal point data addition and subtraction operations	E+(P), E-(P)	○*1	○	○	○
Floating decimal point data multiplication and division	E*(P), E/(P)	○*1	○	○	○
BIN block bit data addition and subtraction operations operations	BK+(P), BK-(P)	○	○	○	○
Addition of character string data	$+(P)	×	○	○	○
BIN 16 bit data +1, -1	INC(P), DEC(P)	○	○	○	○
BIN 32 bit data +1, -1	DINC(P), DDEC(P)	×	○	○	○
Data conversion instructions					
Conversion of BIN 16/32-bit data into BCD 4/8-digit data	BCD(P), DBCD(P)	○	○	○	○
Conversion of BCD 4/8-digit data into BIN 16/32-bit data	BIN(P), DBIN(P)	○	○	○	○
Conversion of BIN 16/32-bit data into floating-point data	FLT(P), DFLT(P)	○*1	○	○	○
Conversion of floating-point data into BIN 16/32-bit data	INT(P), DINT(P)	○*1	○	○	○
Conversion of BIN 16-bit data into BIN 32-bit data	DBL(P)	○	○	○	○
Conversion of BIN 32-bit data into BIN 16-bit data	WORD(P)	○	○	○	○
Conversion of BIN 16/32-bit data into gray code	GRY(P), DGRY(P)	○	○	○	○
Conversion of gray code into BIN 16/32-bit data	GBIN(P), DGBIN(P)	○	○	○	○
2's complement of BIN 16/32-bit data	NEG(P), DNEG(P)	○	○	○	○
Sign inversion of floating-point data	ENEG(P)	○*1	○	○	○
Block conversion of BIN data into BCD data	BKBCD(P)	○	○	○	○
Block conversion of BCD data into BIN data	BKBIN(P)	○	○	○	○
Data transfer instructions					
16/32-bit data transfer	MOV(P), DMOV(P)	○	○	○	○
Floating-decimal point data transfer	EMOV(P)	○*1	○	○	○
Character string data transfer	$MOV(P)	○	○	○	○
16/32-bit data negative transfer	CML(P), DCML(P)	○	○	○	○
Block data transfer	BMOV(P)	○	○	○	○
Same data block transfer	FMOV(P)	○	○	○	○
16/32-bit data exchange	XCH(P), DXCH(P)	○	○	○	○
Block data exchange	BXCH(P)	○	○	○	○
Upper/lower byte exchange	SWAP(P)	○	○	○	○

*1: Supported by products with a serial No. having "04122" or later in its first 5 digits.

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Program branch instructions					
Pointer branch	CJ, SCJ, JMP	○	○	○	○
Jump to END	GOEND	○	○	○	○
Program execution control instructions					
Interrupt enable/disable	DI, EI	○	○	○	○
Interrupt program mask	IMASK	○	○	○	○
Return from interrupt program	IRET	○	○	○	○
I/O refresh instructions					
I/O refresh instructions	RFS(P)	○	○	○	○
Miscellaneous instructions					
Up, down counters	UDCNT1, UDCNT2	×	○	○	×
Teaching timer	TTMR	×	○	○	×
Special function timer	STMR	×	○	○	×
Random access control of rotary table in nearest path	ROTC	×	○	○	×
Ramp signal	RAMP	×	○	○	×
Pulse density measurement	SPD	×	○	○	×
Cyclic pulse output	PLSY	×	○	○	×
Pulse width modulation	PWM	×	○	○	×
Matrix input	MTR	×	○	○	×

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Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Logical operation instructions					
16/32-bit data logical product	WAND(P), DAND(P)	○	○	○	○
16/32-bit data logical add	WOR(P), DOR(P)	○	○	○	○
16/32-bit data exclusive logical add	WXOR(P), DXOR(P)	○	○	○	○
16/32-bit data negative exclusive logical add	WXNR(P), DXNR(P)	○	○	○	○
Block data logical product	BKAND(P)	○	○	○	○
Block data logical add	BKOR(P)	○	○	○	○
Block data exclusive logical add	BKXOR(P)	○	○	○	○
Block data negative exclusive logical add (match)	BKXNR(P)	○	○	○	○
Rotation instructions					
Right rotation of 16-bit data	ROR(P), RCR(P)	○	○	○	○
Left rotation of 16-bit data	ROL(P), RCL(P)	○	○	○	○
Right rotation of 32-bit data	DROR(P), DRCR(P)	○	○	○	○
Left rotation of 32-bit data	DROL(P), DRCL(P)	○	○	○	○
Shift instructions					
n-bit right shift/left shift of 16-bit data	SFR(P), SFL(P)	○	○	○	○
1-bit right shift/left shift of n-bit data	BSFR(P), BSFL(P)	○	○	○	○
1-word right shift/left shift of n-word data	DSFR(P), DSFL(P)	○	○	○	○
Bit processing instructions					
Bit set/reset of word device	BSET(P), BRST(P)	○	○	○	○
Bit test	TEST(P), DTEST(P)	○	○	○	○
Bit device batch reset	BKRST(P)	○	○	○	○

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Data processing instructions					
16/32-bit data search	SER(P), DSER(P)	○	○	○	○
16/32-bit data check	SUM(P), DSUM(P)	○	○	○	○
8 to 256 bit decode, 256 to 8 bit encode	DECO(P), ENCO(P)	○	○	○	○
7 segment decode	SEG(P)	○	○	○	○
4-bit dissociation/association of 16-bit data	DIS(P), UNI(P)	○	○	○	○
Any-bit dissociation/association of 16-bit data	NDIS(P), NUNI(P)	○	○	○	○
Byte unit dissociation, association	WTOB(P), BTOW(P)	○	○	○	○
16/32-bit data maximum value search	MAX(P), DMAX(P)	○	○	○	○
16/32-bit data minimum value search	MIN(P), DMIN(P)	○	○	○	○
16/32-bit data sort	SORT, DSORT	○	○	○	○
16/32-bit data total value calculation	WSUM, DWSUM	○	○	○	○
Structure creation instructions					
FOR to NEXT (repeat)	FOR, NEXT	○	○	○	○
FOR to NEXT forced end	BREAK(P)	○	○	○	○
Subroutine call, return	CALL(P), RET	○	○	○	○
Output OFF subroutine call	FCALL(P)	○	○	○	○
Inter-program subroutine call	ECALL(P)	○	○	○	○
Inter-program output OFF subroutine call	EFCALL(P)	○	○	○	○
Subroutine program call	XCALL	○*1	○	○	○
Refresh	COM	○*6	○*6	○	×
Index qualification of whole ladder	IX, IXEND	○	○	○	○
Index qualification value designation of whole ladder	IXDEV, IXSET	○	○	○	○
Table operation instructions					
Table data write	FIFW(P)	○	○	○	○
First-in data (oldest data) read from table	FIFR(P)	○	○	○	○
Last-in data (newest data) read from table	FPOP(P)	○	○	○	○
Table data insert, delete	FINS(P), FDEL(P)	○	○	○	○
Buffer memory access instructions					
1-word/2-word data read from buffer memory	FROM(P), DFRO(P)	○	○	○	○
1-word/2-word data write to buffer memory	TO(P), DTO(P)	○	○	○	○
Display instructions					
ASCII code print	PR, PRC	×	○	○	×
Error display, annunciator reset	LED(C)	×	○	○	○
Debugging and failure diagnosis instructions					
Specific format fault check, check start	CHK, CHKST	×	○	○	○
Fault check pattern change	CHKCIR, CHKEND	×	○	○	○

*1: Supported by products with a serial No. having "04122" or later in its first 5 digits.

*6: For basci model QCPUs with a serial No."04122" or later, and high-performance model QCPUs and Redundant CPUs with a serial No."04012" or later, the COM instruction is the selection refresh instruction (COM)of the QCPU instruction.

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Character string processing instructions					
Conversion of BIN 16/32-bit data into decimal 5/10-digit ASCIIdata	BINDA(P), DBINDA(P)	×	○	○	○
Conversion of BIN 16/32-bit data into hexadecimal 4/8-digit ASCII data	BINHA(P), DBINHA(P)	×	○	○	○
Conversion of BCD 4/8-digit data into decimal 4/8-digit ASCII data	BCDDA(P), DBCDDA(P)	×	○	○	○
Conversion of decimal 5/10-digit ASCII data into BIN 16/32-bit data	DABIN(P), DDABIN(P)	×	○	○	○
Conversion of hexadecimal 4/8-digit ASCII data into BIN 16/32-bit data	HABIN(P), DHABIN(P)	×	○	○	○
Conversion of decimal 4/8-digit ASCII data into BCD 4/8-bit data	DABCD(P), DDABCD(P)	×	○	○	○
Device comment data read	COMRD(P)	×	○	○	○
Character string length detection	LEN(P)	×	○	○	○
Conversion of BIN 16/32-bit data into character string data	STR(P), DSTR(P)	○*1	○	○	○
Conversion of character string data into BIN 16/32-bit data	VAL(P), DVAL(P)	○*1	○	○	○
Conversion of floating-point data into character string data	ESTR(P)	○*1	○	○	○
Conversion of character string data into floating-point data	EVAL(P)	○*1	○	○	○
Conversion of hexadecimal BIN data into ASCII data	ASC(P)	×	○	○	○
Conversion of ASCII data into hexadecimal BIN data	HEX(P)	×	○	○	○
Fetch of right, left-hand side data in character string	RIGHT(P), LEFT(P)	×	○	○	○
Fetch, replacement of any data in character string	MIDR(P), MIDW(P)	×	○	○	○
Character string search	INSTR(P)	×	○	○	○
Analysis of floating-point data into BCD data	EMOD(P)	×	○	○	○
Analysis of BCD data into floating-point data	EREXP(P)	×	○	○	○
Special function instructions					
SIN operation of floating-point data	SIN(P)	○*1	○	○	○
COS operation of floating-point data	COS(P)	○*1	○	○	○
TAN operation of floating-point data	TAN(P)	○*1	○	○	○
SIN-1 operation of floating-point data	ASIN(P)	×	○	○	○
COS-1 operation of floating-point data	ACOS(P)	×	○	○	○
TAN-1 operation of floating-point data	ATAN(P)	×	○	○	○
Conversion of angle data of floating-point data into radian data	RAD(P)	○*1	○	○	○
Conversion of radian data of floating-point data into angle data	DEG(P)	○*1	○	○	○
Square root operation of floating-point data	SQR(P)	○*1	○	○	○
Exponent operation of floating-point data	EXP(P)	○*1	○	○	○
Natural logarithm operation of floating-point data	LOG(P)	○*1	○	○	○
Floating-point data random number generation	RND(P), SRND(P)	○*1	○	○	○
BCD type SIN operation	BSIN(P)	×	○	○	○
BCD type COS operation	BCOS(P)	×	○	○	○
BCD type TAN operation	BTAN(P)	×	○	○	○
BCD type SIN-1 operation	BASIN(P)	×	○	○	○
BCD type COS-1 operation	BACOS(P)	×	○	○	○
BCD type TAN-1 operation	BATAN(P)	×	○	○	○
BCD 4-digit/8-digit square root operation	BSQR(P), BDSQR(P)	×	○	○	○

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Data control instructions					
16/32 bit upper and lower limit controls	LIMIT(P), DLIMIT(P)	○	○	○	○
16/32 bit dead band controls	BAND(P), DBAND(P)	○	○	○	○
16/32 bit zone controls	ZONE(P), DZONE(P)	○	○	○	○
Replacement instructions					
File register block No. changing	RSET(P)	○*3	○	○	○
Setting of file register file	QDRSET(P)	×	○	○	○
Setting of comment file	QCDSET(P)	×	○	○	○

*1: Supported by products with a serial No. having "04122" or later in its first 5 digits.
*3: Q00JCPUs cannot be used.

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Clock instructions					
Read clock data	DATERD(P)	○	○	○	○
Write clock data	DATEWR(P)	○	○	○	○
Clock data addition/subtraction	DATE+(P), DATE-(P)	○	○	○	○
Clock data format conversion	SECOND(P), HOUR(P)	○	○	○	○
For program control instructions					
Program stand by	PSTOP(P)	×	○	○	○
Program output OFF stand by	POFF(P)	×	○	○	○
Program scan execution registration	PSCAN(P)	×	○	○	○
Program low-speed execution registration	PLOW(P)	×	○	○	×
Program execution status check	PCHK	×	○	○	○
Miscellaneous instructions					
WDT reset	WDT(P)	○	○	○	○
Timing pulse generation	DUTY	○	○	○	○
Time check instruction	TIM CHK	○*1	○	○	○
File resister 1 byte read	ZRRDB(P)	○*3	○	○	○
File resister 1 byte write	ZRWRB(P)	○*3	○	○	○
Indirect address setting	ADRSET(P)	○	○	○	○
Numeric key input from keyboard	KEY	×	○	○	×
Index register batch save, batch return	ZPUSH(P), ZPOP(P)	○	○	○	○
Link refresh	COM	○	○	○	○
Network refresh	S(P).ZCOM	○	○	○	○
Routing parameter read, registration	S(P).RTRDAD, S(P).RTWRITE	×	○	○	○
QCPU instructions					
Module information read	UNIRD	○	○	○	○
Trace	TRACE, TRACER	×	○	○	○
Binary data write, read	S.FWRITE, S.FREAD	×	○	○	○
Program load, unload	PLOAD, PUNLOAD, PSWAP	×	○	○	×
High-speed file register transfer	RBMOV	×	○	○	○
Write to shared memory on host module CPU	S(P).TO	○*4	○*5	○	×
Write to shared memory on host module CPU	TO(P)	○*4	×	×	×
Read from shared memory on another module CPU	FROM(P)	○*4	○*5	○	×
Selection refresh instruction	COM	○*6, *7	○*6, *7	×	○

Function	Instruction Symbols	PLC CPU		Process CPU	Redundant CPU
		Basic model QCPU	High Performance model QCPU		
Redundant CPU instructions					
System change instructions	SP.CONTSW	×	×	×	○
PID control instructions (Exact derivative)					
PID control data setting	PIDINIT	○*1	○	×	×
PID control	PIDCONT	○*1	○	×	×
Specified loop operation stop	PIDSTOP	○*1	○	×	×
Specified loop operation start	PIDRUN	○*1	○	×	×
Specified loop parameter change	PIDPRMW	○*1	○	×	×
PID control instructions (Inexact Exact derivative)					
PID control data setting	S(P).PIDINIT	○*1	○*2	×	×
PID control	S(P).PIDCONT	○*1	○*2	×	×
Stop operation for specified loop No.	S(P).PIDSTOP	○*1	○*2	×	×
Start operation for specified loop No.	S(P).PIDRUN	○*1	○*2	×	×
Change parameters for specified loop No.	S(P).PIDPRMW	○*1	○*2	×	×

*1: Supported by products with a serial No. having "04122" or later in its first 5 digits.
*2: Supported by products with a serial No. having "05032" or later in its first 5 digits.
*3: Q00JCPU cannot be used.
*4: Supported by Q00/01CPUs with a serial No. having "04122" or later in its first 5 digits.
*5: Supported by products with function version B or later.
*6: For basic model QCPUs with a serial No."04122" or later and high-performance model QCPUs with a serial No."04012" or later, the COM instruction is the selection refresh instruction (COM) in the QCPU instructions.
*7: For basic model QCPUs with a serial No."04121" or earlier and high-performance model QCPUs with a serial No."04011" or earlier, the COM instruction is the refresh instruction (COM) in the application instructions.

APPENDIX5.2 Process control instructions (Process CPU, Redundant CPU)

Process instructions for process control

Function	Instruction Symbol
I/O control instructions	
Analog Input Processing	S.IN
Output Processing with Mode Switching1	S.OUT1
Output Processing with Mode Switching2	S.OUT2
Manual Output	S.MOUT
Time Rate	S.DUTY
Batch Counter	S.BC
Pulse Integration	S.PSUM
Control operation instructions	
Basic PID	S.PID
2-degree-of-freedom PID	S.2PID
Position Type PID	S.PIDP
Sample PI	S.SPI
I-PD Control	S.IPD
Blend PI Control	S.BPI
Rate	S.R
High/Low Limit alarm	S.PHPL
Lead/lag	S.LLAG
Integration	S.I
Derivative	S.D
Dead Time	S.DED
High Selector	S.HS
Low Selector	S.LS
Intermediate Value Selection	S.MID
Average Value	S.AVE
High/Low Limiter	S.LIMT
Rate of change Limiter 1	S.VLMT1
Rate of change Limiter 2	S.VLMT2
2-position ON/OFF	S.ONF2
3-position ON/OFF	S.ONF3
Dead Band	S.DBDN
Program Setting Device	S.PGS
Loop Selector	S.SEL
Bump-less Transfer	S.BUMP
Analog Memory	S.AMR
Compensation operation instructions	
Polygon	S.FG
Inverted Polygon	S.IFG
Standard Filter	S.FLT
Integration	S.SUM
Temperature/Pressure Compensation	S.TPC
Engineering Value Conversion	S.ENG
Engineering Value Reverse Conversion	S.IENG
Arithmetic operation instructions	
Addition	S.ADD
Subtraction	S.SUB
Multiplication	S.MUL
Division	S.DIV
Extraction	S.SQR
Absolute Value	S.ABS
Comparison operation instructions	
Comparison (S.>)	S.>
Comparison (S.<)	S.<
Comparison (S.=)	S.=
Comparison (S.>=)	S.>=
Comparison (S.<=)	S.<=
Auto tuning	
Auto Tuning Instruction	S.AT1

General functions

Function	Function name
Type conversion function	
INT type → REAL type	INT_TO_REAL(_E)
INT type → DINT type	INT_TO_DINT(_E)
INT type → BCD type	INT_TO_BCD(_E)
INT type → WORD type	INT_TO_WORD(_E)
INT type → DWORD type	INT_TO_DWORD(_E)
INT type → BOOL type	INT_TO_BOOL(_E)
DINT type → REAL type	DINT_TO_REAL(_E)
DINT type → INT type	DINT_TO_INT(_E)
DINT type → BCD type	DINT_TO_BCD(_E)
DINT type → WORD type	DINT_TO_WORD(_E)
DINT type → DWORD type	DINT_TO_DWORD(_E)
DINT type → BOOL type	DINT_TO_BOOL(_E)
REAL type → INT type	REAL_TO_INT(_E)
REAL type → DINT type	REAL_TO_DINT(_E)
BCD type → INT type	BCD_TO_INT(_E)
BCD type → DINT type	BCD_TO_DINT(_E)
WORD type → INT type	WORD_TO_INT(_E)
WORD type → DINT type	WORD_TO_DINT(_E)
WORD type → DWORD type	WORD_TO_DWORD(_E)
WORD type → BOOL type	WORD_TO_BOOL(_E)
DWORD type → INT type	DWORD_TO_INT(_E)
DWORD type → DINT type	DWORD_TO_DINT(_E)
DWORD type → WORD type	DWORD_TO_WORD(_E)
DWORD type → BOOL type	DWORD_TO_BOOL(_E)
INT type → STRING type	INT_TO_STRING(_E)
DINT type → STRING type	DINT_TO_STRING(_E)
REAL type → STRING type (index number format)	REAL_TO_STRING(_E)
REAL type → STRING type(decimal point format)	REAL_TO_STRING_EX (_E)
STRING type → INT type	STRING_TO_INT(_E)
STRING type → DINT type	STRING_TO_DINT(_E)
STRING type → REAL type	STRING_TO_REAL(_E)
BOOL type → INT type	BOOL_TO_INT(_E)
BOOL type → DINT type	BOOL_TO_DINT(_E)
BOOL type → WORD type	BOOL_TO_WORD(_E)
BOOL type → DWORD type	BOOL_TO_DWORD(_E)
Unary function	
Absolute figure	ABS(_E)
Square root	SQRT(_E)
Natural logarithm(e)	LN(_E)
Common logarithm(10)	LOG(_E)
Index number	EXP(_E)
SIN(sine)function	SIN(_E)
COS(cosine)function	COS(_E)
TAN(tangent)function	TAN(_E)
SIN^{-1}(arcsine)function	ASIN(_E)
COS^{-1}(arccosine)function	ACOS(_E)
TAN^{-1}(arctangent)function	ATAN(_E)
Arithmetic operation function	
Addition	ADD(_E)
Multiplication	MUL(_E)
Subtraction	SUB(_E)
Division	DIV(_E)
Remainder	MOD(_E)

Function	Function name
Bit string shift function	
Shift to left	SHL(_E)
Shift to right	SHR(_E)
Rotate to right	ROR(_E)
Rotate to left	ROL(_E)
Logic operation function	
Logical multiplication	AND(_E)
Logical addition	OR(_E)
Logical addition exclusive	XOR(_E)
Negation	NOT(_E)
Selection function	
2 inputs 1 selection	SEL(_E)
Maximum value	MAX(_E)
Minimum value	MIN(_E)
Upper and lower limit restriction	LIMIT(_E)
Multiplexer	MUX(_E)
Comparison function	
>Comparison	>(_E)
≧ Comparison	>=(_E)
=Comparison	=(_E)
≦ Comparison	<=(_E)
<Comparison	<(_E)
≠ Comparison	<>(_E)
Character string function	
Calculate character string length	LEN(_E)
Output specified character string from left end	LEFT(_E)
Output specified character string from right end	RIGHT(_E)
Output specified character string from specified position	MID(_E)
Connect character string	CONCAT(_E)
Insert character string	INSERT(_E)
Delete character string	DELETE(_E)
Replace character string	REPLACE(_E)
Find character string	FIND(_E)
Compensation function	
Unbind WORD type data to 16 BOOL type data.	UNBIND(_E)
Bind 16 BOOL type data into WORD or DWORD type data (lower WORD).	BIND(_E)
Bind 2 WORD type data into 1 DWORD type data.	MAKE_DWORD(_E)
Output upper D WORD type data	HI_WORD(_E)
Output lower D WORD type data	LO_WORD(_E)
Input pin connection status acquisition	IS_CONNECTED(_E)_
Ladder program control function	
Call ladder subroutine (Argument is DINT type)	CALL_DINT(_E)
Call ladder subroutine (Argument is REAL type)	CALL_REAL(_E)
Make specified ladder file enter standby → Enters scan execution status	PSCAN(_E)
Scan specified ladder file in current scanning → Enters standby state	PSTOP(_E)
Scan specified ladder file in next scanning → Enters standby state	POFF(_E)
Set specified ladder file to low speed execution type	PLOW(_E)

General FB

Function	FB name
Flip-flop FB	
SR type flip-flop	SR
RS type lip-flop	RS
Latch (BOOL type)	LATCH_BOOL
Latch (REAL type)	LATCH_REAL
Latch (WORD type)	LATCH_WORD
Latch (DWORD type)	LATCH_DWORD
Edge detection FB	
Rising edge detection	R_TRIG
Falling edge detection	F_TRIG
Rising/falling edge detection	EDGE_CHECK
Counter FB	
Counter up	CTU
Counter down	CTD
Counter up/down	CTUD
Timer FB	
Pulse timer (High-speed timer type)	TP_HIGH
Pulse timer (Low-speed timer type)	TP_LOW
On-delay timer (High-speed timer type)	TON_HIGH
On-delay timer (Low-speed timer type)	TON_LOW
Off-delay timer (High-speed timer type)	TOF_HIGH
Off-delay timer (Low-speed timer type)	TOF_LOW
Communication control FB	
Send to another station PLC CPU	SEND
Receive from another PLC CPU	RECV

Process function

Function	Function name
Analog value selection/Average function	
High selector	P_HS(_E)
Low selector	P_LS(_E)
Medium value selection	P_MID(_E)
Average value	P_AVE(_E)
Absolute value	P_ABS(_E)

Process FB

General-purpose process FB

Function	FB name
Correcting operation FB	
Polygonal line	P_FG
Inverse polygonal line	P_IFG
Standard filter (moving average)	P_FLT
Engineering value conversion	P_ENG
Engineering value inverse conversion	P_IENG
Temperature pressure correction	P_TPC
Sum	P_SUM
Arithmetic operation FB	
Addition (with coefficient)	P_ADD
Subtract (with coefficien)	P_SUB
Multiplication (with coefficien)	P_MUL
Division (with coefficien)	P_DIV
Square root extraction (with coefficien)	P_SQR
Comparison operation FB	
>Comparison (with setting value)	P_>
<Comparison (with setting value)	P_<
=Comparison (with setting value)	P_=
≧Comparison (with setting value)	P_>=
≦Comparison (with setting value)	P_<=
Control operation FB	
Progress delay	P_LLAG
Integration	P_I
Derivation	P_D
Wasted time compensation	P_DED
Upper/lower limit limiter	P_LIMT
Changing rate limiter 1	P_VLMT1
Changing rate limiter 2	P_VLMT2
Dead band	P_DBND
Bumpless transfer	P_BUMP
Analog memory	P_AMR

Tag access FB

Function	FB name
I/O control FB	
Analog input	P_IN
Output with mode changing 1(Input addition available)	P_OUT1
Output with mode changing 2(Input addition not available	P_OUT2
Output with mode changing 3(input addition and compensation available)	P_OUT3_
Manual output	P_MOUT
Time proportional output	P_DUTY
Pulse sum	P_PSUM
Batch counter	P_BC
Loop control operation FB	
Ratio control (Tracking for upper loop available)	P_R_T
Ratio control (Tracking for upper loop not available)	P_R
Speed type basic PID control (Tracking for upper loop available)	P_PID_T
Speed type basic PID control (Tracking for upper loop not available)	P_PID
Position type basic PID control (Tracking for upper loop available, tracking for lower loop not available)	P_PIDP_T
Position type basic PID control (Tracking for upper loop not available, tracking for lower loop not available)	P_PIDP
Position type basic PID control (Tracking for upper loop available, tracking for lower loop available)	P_PIDP_EX_T_
Position type basic PID control (Tracking for upper loop not available, tracking for lower loop available)	P_PIDP_EX_
Sample PI control (Tracking for upper loop available)	P_SPI_T
Sample PI control (Tracking for upper loop not available)	P_SPI
Measured value proportional derivative proactive PID(I-PD) control (Tracking for upper loop available)	P_IPD_T
Measured value proportional derivative proactive PID(I-PD) control (Tracking for upper loop not available)	P_IPD
Blend PI control (Tracking for upper loop available)	P_BPI_T
Blend PI control (Tracking for upper loop not available)	P_BPI
2-degree of freedom PID control (Tracking for upper loop available)	P_2PID_T
2-degree of freedom PID control (Tracking for upper loop not available)	P_2PID
2-degree of freedom high function PID control (Tracking for upper loop available)	P_2PIDH_T_
2-degree of freedom high function PID control (Tracking for upper loop not available)	P_2PIDH_
Upper/lower limit alarm check	P_PHPL
2-position ON/OFF (Tracking for upper loop available)	P_ONF2_T
2-position ON/OFF (Tracking for upper loop not available)	P_ONF2

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Function	FB name
3-position ON/OFF (Tracking for upper loop available)	P_ONF3_T
3-position ON/OFFF (Tracking for upper loop not available)	P_ONF3
Program setter	P_PGS
Loop selector (Tracking for upper loop not available)	P_SEL
Loop selector (Tracking for upper loop available)	P_SEL_T1
Loop selector (Tracking for upper loop available)	P_SEL_T2
Tag special FB	
Control mode changing	P_MCHG

Tag FB

Function	FB name
Loop tag FB	
Speed type basic PID control (Tracking for upper loop available)	M_PID_T
Speed type basic PID control (Tracking for upper loop not available)	M_PID
Speed type basic PID control DUTY output (Tracking for upper loop available)	M_PID_DUTY_T
Speed type basic PID control DUTY output (Tracking for upper loop not available)	M_PID_DUTY
Position type basic PID control (Tracking for upper loop available, tracking for lower loop not available)	M_PIDP_T
Position type basic PID control (Tracking for upper loop not available, tracking for lower loop not available)	M_PIDP
Position type basic PID control (Tracking for upper loop available, tracking for lower loop available)	M_PIDP_EX_T_
Position type basic PID control (Tracking for upper loop not available, tracking for lower loop available)	M_PIDP_EX_
Sample PI control (Tracking for upper loop available)	M_SPI_T
Sample PI control (Tracking for upper loop not available)	M_SPI
Measured value proportional derivative proactive PID(I-PD) control (Tracking for upper loop available)	M_IPD_T
Measured value proportional derivative proactive PID(I-PD) control (Tracking for upper loop not available)	M_IPD
Blend PI control (Tracking for upper loop available)	M_BPI_T
Blend PI control (Tracking for upper loop not available)	M_BPI
2-degree of freedom PID control (Tracking for upper loop available)	M_2PID_T
2-degree of freedom PID control (Tracking for upper loop not available)	M_2PID
2-degree of freedom PID control DUTY output (Tracking for upper loop available)	M_2PID_DUTY_T
2-degree of freedom PID control DUTY output (Tracking for upper loop not available)	M_2PID_DUTY
2-degree of freedom high function PID control (Tracking for upper loop available)	M_2PIDH_T
2-degree of freedom high function PID control (Tracking for upper loop not available)	M_2PIDH
Ratio control (Tracking for upper loop available)	M_R_T
Ratio control (Tracking for upper loop not available)	M_R
2-position ON/OFF (Tracking for upper loop available)	M_ONF2_T
2-position ON/OFF (Tracking for upper loop not available)	M_ONF2
3-position ON/OFF (Tracking for upper loop available)	M_ONF3_T
3-position ON/OFF (Tracking for upper loop not available)	M_ONF3
Monitor	M_MONI
Manual output with monitor	M_MWM
Batch flow acquire	M_BC
Pulse sum	M_PSUM
Loop selector (Tracking for upper loop not available)	M_SEL
Loop selector (Tracking for upper loop available)	M_SEL_T1
Loop selector (Tracking for upper loop available)	M_SEL_T2
Manual output	M_MOUT
Program setter	M_PGS
Status tag FB	
Motor not reversible(2 input, 2 output)	M_NREV
Motor reversible(2 input, 3 output)	M_REV
ON/OFF operation(2 input, 2 output)	M_MVAL1
ON/OFF operation(2 input, 3 output)	M_MVAL2
Timer 1 (Timer stops by COMPLETE)	M_TIMER1
Timer 2 (Timer does not stop by COMPLETE)	M_TIMER2
Counter 1 (Counter stops by COMPLETE)	M_COUNTER1
Counter 2 (Counter does not stop by COMPLETE)	M_COUNTER2
Alarm tag FB	
Alarm	M_ALARM
Message tag FB	
Message	M_MESSAGE

Module FB

Function	FB name
Analog module FB	
4-channel analog input	AIN_4CH
8-channel analog input	AIN_8CH
Inter-channel insulated 2-channel distributor	AIN_2CH_DG
Inter-channel insulated 4-channel analog input	AIN_4CH_G
2-channel analog output	AOUT_2CH
4-channel analog output	AOUT_4CH
8-channel analog output	AOUT_8CH
Inter-channel insulated 2-channel analog output	AOUT_2CH_G
Temperature input module FB	
4-channel temerature input	TC_4CH
Inter-channel insulated 4-channel temperature/nano-voltage input	TCV_4CH_G

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Function	FB name
4-channel temperature input	RTD_4CH
Counter module FB	
High-speed counter	HIC_2CH
Inter-channel insulated pulse input	PIN_8CH_G
Digital I/O module FB	
8-point digital input	DIN_8PT
16-point digital input	DIN_16PT
32-point digital input	DIN_32PT
64-point digital input	DIN_64PT
8-point digital output	DOUT_8PT
16-point digital output	DOUT_16PT
32-point digital output	DOUT_32PT
64-point digital output	DOUT_64PT
Digital I/O of 32-point input and 32-point output	DINOUT_64PT
Digital I/O of 8-point input and 7-point output	DINOUT_15PT
CC-Link module FB	
CC-Link slave station occupying 1 station	CCLINK_1(*)
CC-Link slave station occupying 2 stations	CCLINK_2(*)
CC-Link slave station occupying 3 stations	CCLINK_3(*)
CC-Link slave station occupying 4 stations	CCLINK_4(*)

*: Not compatible with CC-Link Version2.

APPENDIX6 Precautions for re-using an existing system

APPENDIX6.1 Reuse AnSHCPU data on basic model QCPUs

No.	Item	Sub Item	Instructions for Basic Model QCPU	What to Be Done by Customer
1	Performance	I/O control system	Switching between the refresh system and direct system cannot be done. (Fixed to the refresh system)	When direct access is necessary, use direct access inputs (DX) and direct access outputs (DY).
2		Number of instructions	Note some instructions are unusable.	Refer to the instruction list in APPENDIX 5.1 and correct the program. (Note *1)
3		Standard RAM capacity	The Q00JCPU cannot use the file register (R) (standard RAM).	Use within the range of the standard device memory that has been increased.
4		Processing time	Higher speed. (The scan time and other processing times become shorter.)	Check the program timing.
5		Device	Handling of the accumulator (A) and index register (V) is different.	Use the conversion function of GX Developer. Note that partial program correction may be needed. (Note *2)
6	System connection	Power supply, base	The AnS series power supplies and bases cannot be used.	Use the Q series power supplies and bases.
7		System configuration	The AnS series modules cannot be used.	Use the Q series modules.
8			Modules loaded are restricted to one Ethernet and two CC-Link modules.	The High Performance model QCPU accepts up to 4 Ethernet and 64 CC-Link modules (Note 4).
9		Tool connection	The AnS series tools (Note *3) cannot be used.	Use GX Developer (version 7 or later) compatible with the Basic model QCPU.
10			MX Links, MX Monitor and MX Chart cannot be used.	Use MX Component. (The personal computer side application program must be corrected.)
11			The AnS series programming unit (A8UPU/A8PUJ/A7PUS) cannot be used.	The High Performance model QCPU can be used with the Q series compatible programming unit (EPU01). (Note 5)
12			The Q00JCPU does not allow the bus extension module (A9GT-QCNB) of the GOT to be connected to the main base.	When an extension base is connected, the bus extension module can be loaded on the extension base.
13	Hardware handling	LED	The status conditions of the LEDs differ from those of the AnS series.	Check the status conditions of the LEDs in the Basic Model QCPU User's Manual.
14			The LED display priorities cannot be set.	If a LED display is not provided, choose the error check-free setting or use the error cancel function to turn it off. The High Performance model QCPU allows setting of the LED display priorities.
15		Key switch	The operation of the key switch differs from that of the AnS series. (Without latch clear key, resetting operation changed.)	Perform latch clear by the remote operation of GX Developer. To reset, move the RUN/STOP/RESET switch to the RESET position for several seconds. (The ERR. LED flickers on completion of reset.)

Note 1: The conversion function of GX Developer replaces unusable instructions with SM999.
After conversion using GX Developer, searching for SM999 allows you to confirm the instructions that could not be converted.

Note 2: The accumulators (A) and index registers (V, Z) in the AnSH are converted by the conversion function of GX Developer as follows.
A0→ SD718
A1 → SD719
Z → Z0
V → Z7
Note that the way handling 32bits index registers is different in AnSH and QCPU.
While the AnSH represents the lower 16 bits with Z and the upper 16 bits with V, the Basic model QCPU represents the lower 16 bits with Zn and the upper 16 bits with Z(n+1).
Example
- Execution result when the following are described in an AnSHCPU program
  DMOV K100000 Z → Lower 16 bits are stored into Z and upper 16 bits into V.
- When the above program is executed after it has been converted into the one for Basic model QCPU
  DMOV K100000 Z0 → Lower 16 bits are stored into Z0 and upper 16 bits into Z1.

Note 3: A6GPP/A6PHP/A6HGP (SW□GP-GPPA/GPPAU)
A7PHP/A7HGP (SW□SRXV-GPPA)
DOS/V personal computer (SW□IVD-GPPA)

Note 4: Up to 64 modules are made usable by dedicated instructions. (Network parameter setting can be made for up to four modules per CPU.)

Note 5: The EPU01 is a product of Mitsubishi Engineering Co., Ltd. For details, refer to Section 6.1 Partnership Products in Chapter 6.

No.	Item	Sub Item	Instructions for Basic Model QCPU	What to Be Done by Customer
16	Hardware handling	Memory cassette	The AnS series momory cassette can not be used.	Use the built-in memory. (Program memory, standard RAM, standard ROM) (Note 6)
17		Battery	The AnS series battery (A6BAT) can not be used.	Use the Q series battery (Q6BAT).
18		Memory protect switch	Can not be used.	Password registration enables access restriction in file units. The High Performance model QCPU can provide memory protection by switch setting.
19	Program handling	Language/ instruction	A microcomputer program is incompatible.	Do not use it.
20			Timers and counters operate differently. (Sequential processing) (Note 7)	Considering the timing, modify the program as required.
21			The AnS series special module dedicated instructions can not be used. In addition, the buffer memory addresses are incompatible.	Correct the program so that it will be the one for Q series intelligent function module. (Note 8)
22			The special relays and the special registers have been changed.	The conversion function of GX Developer converts the special relays/special registers for AnSH (M9000 and later/D9000 and later) into the special relays/special registers for Basic model QCPU (SM/SD). However, since those incompatible are replaced by SM999/SD999, modify the program as required.
23			Some error codes have been changed.	Modify the program as required.
24		ROM handling	It cannot be separated as a ROM cassette. (The ROM cassette storing a program cannot be loaded into another CPU to perform ROM operation.)	Using GX Developer, write the program to the standard ROM built in the CPU.
25	Network handling	MELSECNET (II)	Connection cannot be made to the MELSECNET(II).	Use MELSECNET/H or CC-Link.
26	Debugging function	Sampling trace	Sampling trace is unusable.	Perform it using offline simulation of GX Simulator.
27		Status latch	Status latch is unusable.	-
28		Offline switch	Offline switch is unusable.	-

Note 6: Q00/Q01CPU have standard RAM.

Note 7: There are the following differences in timer/counter present value update processing and contact ON/OFF processing timings.
AnSH: Processed at execution of the END instruction.
Basic model QCPU: Processed at execution of the OUT T /OUT C instruction. (Sequential processing)

Note 8: Making use of GX Configurator allows communication with the intelligent function module to be made by simple setting.
For details of GX Configurator, refer to the relevant section of the corresponding intelligent function module.

APPENDIX6.2 Reuse A2US(H)CPU data on basic model QCPUs

No.	No.	Sub Item	Instructions for Basic Model QCPU	What to Be Done by Customer
1	Performance	I/O points	The number of I/O points that can be controlled on the base decreases. (Q00J: 256 points, Q00/Q01: 1024 points)	Use the I/O points within the corresponding Basic model QCPU range. Configuring a remote I/O (CC-Link) system enables use of a total of 2048 I/O points.
2			X and Y points are not enough to refresh all points of 64 stations on CC-Link.	Make parameter setting to refresh devices M, etc.
3		Program capacity	The program capacity may sometimes reduce.	The number of program steps decreases when an A2AS/A2USH CPU program is converted into a Basic mode QCPU program by the conversion function of GX Developer. (Note 1) To check whether there is enough program capacity or not after conversion, convert a program actually to check whether it is converted correctly or not. (Note 2) The program capacity is insufficient if the program has not been converted to the end. In that case, use the large-capacity High Performance model QCPU.
4		Number of instructions	There are unusable instructions.	Refer to the instruction list in APPENDIX 5.1 and correct the program. (Note 3)
5		Processing time	The scan time and other processing times vary.	While simultaneously checking the processing timing, correct the program as required.
6		Program memory capacity	The built-in program capacity reduces.	Adjust the comment file and other capacities that are stored into the program memory.
7		Standard RAM capacity	The Q00JCPU cannot use the file registers (R) (standard RAM).	Use within the range of the standard device memory that has been increased.
8		Device	18kW or more of the device memory is unusable.	Use it within the range of the Basic model QCPU range. For the Q00/Q01CPU, examine the use of the file registers (R).
9			Since devices B and W reduce, all LB and LW of the MELSECNET/H may sometimes be unusable.	Perform device assignment to increase the number of B and W points or allocate them to the file registers. (Note 4)
10			There are only up to 10 points of index registers.	Use the index registers within the Basic model QCPU range. The High Performance model QCPU allows use of 16 points of index registers.
11			Handling of the accumulators (A) and index registers (V) is different.	Use the conversion function of GX Developer. Note that partial program correction may be needed. (Note 5)

Note 1: A Basic model QCPU requires only half program steps as A2US/A2USHCPU.

Note 2: (1) When making program conversion, always backup the program.
The program will be deleted midway if the program capacity was insufficient as a result of program conversion.
If you save the program in that status, it cannot be reconverted into the original program.
(2) Note that whether a program has been converted to the end or not cannot be judged by the presence/absence of the END instruction.
If the program has been deleted midway due to insufficient program capacity, the END instruction is added to the program after conversion.
(The END instruction may not be added when the program is deleted midway in the ladder block, for example.)

Note 3: The conversion function of GX Developer replaces unusable instructions with SM999.
After conversion using GX Developer, searching for SM999 allows you to confirm the instructions that could not be converted.

Note 4: File registers can be used with the Q00/Q01CPU.

Note 5: The accumulators (A) and index registers (V, Z) used with the A2US/A2USH are converted by the conversion function of GX Developer as follows.

A0 → SD718

A1 → SD719

Z → Z0 (Z1 to Z6 remain unconverted)

V → Z7

V1 to V2 → Z8 to Z9

V3 to V6 → SD999 (10 points of index registers, Z0 to Z9, can be handled by the Basic model QCPU.)
Note that when index registers are handled as 32 bits, they are handled differently as described below.
While the A2US(H) represents the lower 16 bits with Zn and the upper 16 bits with Vn, the Basic model QCPU represents the lower 16 bits with Zn and the upper 16 bits with Z(n+1).
Example

- Execution result when the following are described in an A2US/A2USH CPU program
  DMOV K100000 Z1 → Lower 16 bits are stored into Z1 and upper 16 bits into V1.
  DMOV K200000 Z2 → Lower 16 bits are stored into Z2 and upper 16 bits into V2.
- When the above program is executed after it has been converted into the one for Basic model QCPU
  DMOV K100000 Z1 → Lower 16 bits are stored into Z1 and upper 16 bits into Z2.
  DMOV K200000 Z2 → Lower 16 bits are stored into Z2 and upper 16 bits into Z3.

*In this case, 32-bit data are not stored normally since Z2 is overwritten.

No.	Item	Sub Item	Instructions for Basic Model QCPU	What to Be Done by Customer
12	System connection	Power supply, base	The AnS series power supplies and bases can not be used here.	Use the Q series power supplies and bases.
13		System configuration	The AnS series modules are unusable.	Use the Q series modules.
14			An MELSECNET/H remote I/O system cannot be achieved.	Use CC-Link instead. An MELSECNET/H remote I/O system can be configured by the High Performance model QCPU.
15			Modules loaded are restricted to one MELSECNET/H, one Ethernet and two CC-Link modules.	The High Performance model QCPU accepts up to 4 MELSECNET/H modules, 4 Ethernet and 64 CC-Link modules (Note 6).
16		Tool connection	The AnS series tools (Note 7) can not be used here.	Use GX Developer (version 7 or later) compatible with the Basic model QCPU.
17			MX Links, MX Monitor and MX Chart are unusable.	Use MX Component. (The personal computer side application program must be corrected.)
18			The AnS series programming unit (A8PUJ/A8PUE/A7PUS) can not be used here.	The High Performance model QCPU can be used with the Q series compatible programming unit (EPU01). (Note 8)
19			The Q00JCPU does not allow the bus extension connector box (A9GT-QCNB) of the GOT to be connected to the main base.	When an extension base is connected, the bus extension connector box can be loaded on the extension base.
20	Hardware handling	LED	The on/flickering conditions of the LEDs differ from those of the AnS series.	Check the on/flickering conditions of the LEDs in the Basic Model QCPU User's Manual.
21			The LED display priorities cannot be set.	If a LED display is not provided, choose the error check-free setting or use the error cancel function to turn it off. The High Performance model QCPU allows setting of the LED display priorities.
22		Key switch	The operation of the key switch differs from that of the AnS series. (Without latch clear key, resetting operation changed.)	Perform latch clear by the remote operation of GX Developer. To reset, move the RUN/STOP/RESET switch to the RESET position for several seconds. (The ERR. LED flickers on completion of reset.)
23		Memory cassette	The AnS series memory cassette is unusable.	Use the built-in memory. (Program memory, standard RAM, standard ROM) (Note 9)
24		Battery	The AnS series battery (A6BAT) is unusable.	Use the Q series battery (Q6BAT).
25		Memory protect switch	The memory protect switch cannot provide protection.	Password registration enables access restriction in file units. The High Performance model QCPU can provide memory protection by switch setting.

Note 6: You can use dedicated instructions on up to 64 modules. (Network parameter setting can be made for up to four modules per CPU.)

Note 7: A6GPP/A6PHP/A6HGP (SW□GP-GPPA/GPPAU)

A7PHP/A7HGP (SW□SRXV-GPPA)

DOS/V personal computer (SW□IVD-GPPA)

Note 8: The EPU01 is a product of Mitsubishi Engineering Co., Ltd.
For details, refer to Section 6.1 Partnership Products in Chapter 6.

Note 9: The standard RAM can be used with the Q00/Q01CPU.

No.	Item	Sub Item	Instructions for Basic Model QCPU	What to Be Done by Customer
26	Program handling	Language/ instruction	Timers and counters operate differently. (Sequential processing) (Note 10)	Considering the timing, modify the program as required.
27			The AnS series special module dedicated instructions are unusable. In addition, the buffer memory addresses are incompatible.	Correct the program so that it will be the one for Q series intelligent function module. (Note 11)
28			The special relays/special registers have been changed.	The conversion function of GX Developer converts the special relays/special registers for A2US/A2USH (M9000 and later/D9000 and later) into the special relays/special registers for Basic model QCPU (SM/SD). However, since those incompatible are replaced by SM999/SD999, modify the program as required.
29			Some error codes have been changed.	Modify the program as required.
30		ROM handling	It cannot be separated as a ROM cassette. (The ROM cassette storing a program cannot be loaded into another CPU to perform ROM operation.)	Using GX Developer, write the program to the standard ROM built in the CPU.
31	Network handling	Ethernet	The method of access from a personal computer to another station of the MELSECNET/10 via Ethernet differs. (Ethernet has network numbers/station numbers.)	By setting the "modules valid for other station access" of the network parameters, you can access the device memory without changing the personal computer side program. (Some devices are inaccessible.) (Note 12) When making other than access to the device memory, correct the personal computer side program since the protocol must be changed. For details, refer to the Q-Compatible MELSEC Communication Protocol Reference Manual. (Note 13)
32		MELSECNET (II)	Connection cannot be made to the MELSECNET (II).	Use MELSECNET/H or CC-Link.
33		MELSECNET/ H	The station-specific parameters cannot be set.	Change the refresh parameter setting or use the link direct device (J□\□).
34			Only up to eight routing parameters are usable.	Use them within the permissible range.
35	Debugging function	Sampling trace	Sampling trace is unusable.	Perform it using offline simulation of GX Simulator.
36		Status latch	Status latch is unusable.	---
37		Step run	Step run cannot be done.	Perform it using offline simulation of GX Simulator.
38		Offline switch	Offline switch is unusable.	---

Note 10: There are the following differences in timer/counter present value update processing and contact ON/OFF processing timings.
A2AS/A2USH: Processed at execution of the END instruction.
Basic model QCPU: Processed at execution of the OUT T□/OUT C□ instruction. (Sequential processing)

Note 11: Exploitation of GX Configurator allows communication with the intelligent function module to be made by simple setting.
For details of GX Configurator, refer to the relevant section of the corresponding intelligent function module.

Note 12: The file register (R), special relay (SM), special register (SD) and index register (Z) are impossible to be accessed.
The same goes for the device memories added to the QnA/Q series so, you must change the communication protocol to achieve.
Refer to the Q-Compatible MELSEC Communication Protocol Reference Manual and correct the personal computer side program.

Note 13: MX Component ensures ease of developing a personal computer side PLC communication program.
Refer to Chapter 5, Section 5.3.2 for details of MX Component.

APPENDIX7 Precautions for Transporting Batteries

When transporting lithium batteries, make sure to treat them based on the transport regulations.

(1) Controlled models

The batteries for the Q Series CPU module (including memory cards) are classified as shown in the following table.

Models subject to transportation regulations

Product name	Model	Product supply status	Classification for transportation
Q series battery	Q7BAT	Lithium battery	Dangerous goods
Q series battery	Q7BAT-SET	Lithium battery with holder	
Q series battery	Q6BAT	Lithium battery	Non-dangerous goods
Q series memory card battery	Q2MEM-BAT	Lithium coin battery	
Q series memory card	Q2MEM-1MBS Q2MEM-2MBS	Packed with lithium coin battery (Q2MEM-BAT)	

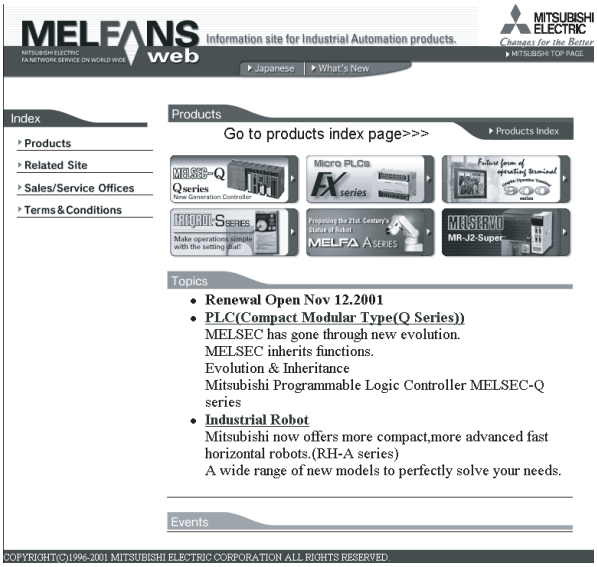
(2) Transport guidelines

Comply with IATA Dangerous Goods Regulations, IMDG code and the local transport regulations when transporting products after unpacking or repacking, while Mitsubishi ships products with packages to comply with the transport regulations.

For the detail contact the transporters.

APPENDIX8 MELFANSweb

■ MELFANSweb: Information retrieval and communication on the Internet



● Product lineup

Introduces the outlines of our products per series.
Provides detailed information on individual products such as specifications, functions, features, wiring examples and outline dimensional drawings.

● New products

Introduces products released recently or to be released soon.

● Standard-compliant products

Lists products that comply with various international standards. I.e. explosion-proof and ship-borne, and with foreign standards, such as UL and EN.

● Manual list

Offers such information as the latest versions of the product related manuals and whether manuals are packed with the products or not.

● Event information

Introduces training schools, exhibits and technological seminars held for our products.

● Topics

Notice of system expansion plans, etc. from MELFANSweb. View this periodically.

● Update history

Information on recently added and changed items, etc. Use especially when you want to view only new information.

● In-site search

Equipped with an engine that searches for information in MELFANSweb.
Note 1:FA Land search is not included.

● Related sights

Links page for related sights useful for Factory Equipment users and the "global network".

● Inquiry contact

Introduces the overseas business locations (such as sales branches), service locations, and the models handled by these locations.

■ FA land communication

Obtaining a membership ID (membership number) allows you to search more detailed information.
Membership ID is available on the Internet.

● Online manual

Provides online manuals of FA products.
The dedicated software, which is newly developed, and the manual downloading function allows you to find several manuals at once by using keywords and have them listed on the display all together. This is available offline.

● Downloading

Provides sample programs of PLCs and GOTs, demoware, and external drawing data of three-phase motors, PLCs, AC servos.

● Q & A

Provides answers to common questions. Find your answer using keywords along with AND/OR. This is a 24 hours*2 (information desk) technical consulting service provides you with answers from our technical personnel.

*2: This service may be unavailable temporally due to maintenance.

● Technical library

Useful references are collected such as application examples, skillful methods for use, etc. This library supports you to work efficiently.
The contents are now being developed.

APPENDIX9 Global Market/Service Network

Sales office

North America

USA	Mitsubishi Electric Automation, Inc.	500 Corporate Woods Parkway Vernon Hills, IL 60061, USA	Tel: 1-847-478-2100 Fax: 1-847-478-2396
	California-South Office	5665 Plaza Drive Cypress, CA 90630, USA	Tel: 1-714-220-2500 Fax: 1-714-229-3897
	Georgia Office	2810 Premiere Parkway, Suite 400 Duluth, GA 30097, USA	Tel: 1-678-258-4500 Fax: 1-678-258-4504
	Ohio-South Office	7566 Paragon Road Centerville, OH 45459, USA	Tel: 1-937-291-4600 Fax: 1-937-291-4606
	New Jersey Office	Vantage Court South, 200 Cottontail Lane, Somerset, NJ 08873, USA	Tel: 1-732-560-4500 Fax: 1-732-560-4535
Canada	Canada-Ontario Office	4299 14th Avenue Markham, Ontario L3R 0J2, CANADA	Tel: 1-905-475-7728 Fax: 1-905-475-7935

Central & South America

Brazil	MELCO-TEC Rep.Com.e Assessoria Tecnica Ltda.	Rua Correia Dias,184, Edificio Paraiso Trade Center-8 ander Paraiso, Sao Paulo, SP Brasil CEP : 04104-000	Tel: 55 -11- 5908-8331 Fax: 55-11-5574-5296
Chile	Rhona S.A.	Variante Agua Santa 4211 Vina Del Mar, Chile	Tel: 56-32-320-600 Fax: 56-32-320-618
Mexico	Mexico-Texas Office	1000 Nolen Drive, Suite 200 Grapevine, TX 76051, USA	Tel: 1-817-416-9767 Fax: 1-817-416-5000

Europe

UK	Mitsubishi Electric Europe B.V. UK. Branch	Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel: 44-1707-276100 Fax: 44-1707-278695
Ireland	Mitsubishi Electric Europe B.V. Irish Branch	Westgate Business Park, Ballymount, Dublin 24, Ireland	Tel: 353-14505007 Fax: 353-14602069
Germany	Mitsubishi Electric Europe B.V. German Branch	Gothaer Strasse 8 D-40880 Ratingen, GERMANY	Tel: 49-2102-486-0 Fax: 49-2102-486-7170
	Mitsubishi Electric Europe B.V. German Branch North West	Revierstrasse 5, D-44379 Dortmund	Tel: 49-231-967041-0 Fax: 49-231-967041-41
	Mitsubishi Electric Europe B.V. German Branch South West	Kurze Strasse 40, D-70794 Filderstadt-Bonlanden	Tel: 49-711-770598-0 Fax: 49-711-770598-79
	Mitsubishi Electric Europe B.V. German Branch South East	Am Soeldnermoos 8, D-85399 Hallbergmoos	Tel: 49-811-99874-0 Fax: 49-811-99874-10
France	MITSUBISHI ELECTRIC EUROPE B.V. French Branch	25, Boulevard des Bouvets F-92741 Nanterre Cedex, France	Tel: 33-1-5568-5568 Fax: 33-1-5568-5685
Italy	MITSUBISHI ELECTRIC EUROPE B.V. Italian Branch	Centro Dir. Colleoni, Pal. Perseo-Ingr.2 Via Paracelo 12, I-20041 Agrate Brianza (Milano), Italy	Tel: 39-039-60531 Fax: 39-039-6053312
Spain/Portugal	MITSUBISHI ELECTRIC EUROPE B.V. Spanish Branch	Carretera de Rubi 76-80, E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel: 34-93-565-3131 Fax: 34-93-589-2948
Netherlands	Getronics Nederland B.V.	Donauweg 2B, NL-1043 AJ Amsterdam, the Netherlands	Tel: 31-205876700 Fax: 31-205876839
Denmark	Louis Poulsen Industri & Automation	Geminivej 32, DK-2670 Greve, Denmark	Tel: 45-43-959595 Fax: 45-43-959591
Belgium	N.V. Getronics Belgium S.A.	Pontbeeklaan 43, B-1731 Asee-Zelik, Belgium	Tel: 32-2-4671751 Fax: 32-2-4671745
Sweden	Beijer Electronics AB	Krangatan 4A, SE-20124 Malmoe, Sweden	Tel: 46-40-358600 Fax: 46-40-358602
Finland	Beijer Electronics OY (PLC, SV)	Ansatie 6A, FI-1740 Vantaa, Finland	Tel: 358-9-88677500 Fax: 358-9-88677555
	UTU POWEL OY (INV)	Hevoshaankatu 3, FI-28101 Pori, Finland	Tel: 358-2-5508800 Fax: 358-2-5508841
Norway	Beijer Electronics A/S	Teglverksveien 1, N-3002 Drammen, Norway	Tel: 47-32-243000 Fax: 47-32-848577
Switzerland	ECONOTEC AG	Hinterdorfstrasse 12, CH-8309 Nuerensdorf, Switzerland	Tel: 41-1-8384811 Fax: 41-1-8384812
Austria	GEVA Electronik-Handels GmbH.	Wiener Str. 89, A-2500 Baden, Austria	Tel: 43-2252-855520 Fax: 43-2252-48860
Czech	Autocont Control Systems S.R.O.	Nemocnicni 12, CZ-70200 Ostrava 2, Czech Republic	Tel: 420-59-6152111 Fax: 420-59-6152562
Slovenia	INEA D.O.O.	Stegne 11, SI-1230, Ljubljana, Slovenia	Tel: 386-1-513-8100 Fax: 386-1-513-8170
Poland	MPL Technology SP. Z.O.O.	UL. Sliczna 36, PL-31-444 Krakow, Poland	Tel: 48-12-6322885 Fax: 48-12-6324782
Turkey	GENERAL TEKNIK SISTEMLER LTD. STI	Darulaceze Caddesi Famas Is Merkezi/A, Block No.43 KAT. 2, TR-80270 Okmeydani-Istanbul, Turkey	Tel: 90-212-320-1640 Fax: 90-212-320-1649

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Russia	MITSUBISHI ELECTRIC EUROPE, B.V. -Russian Branch	Kosmodamianskaya nab., 52, building 5, RUS-113054 Moscow	Tel: 7-95-721-2070 Fax: 7-95-721-2071
	Avtomatika Sever Ltd. (PLC, INV, SV)	LVA Tolstogo Str. 7, Off. 311, RU-197376 St. Petersburg, Russia	Tel: 7-812-1183238 Fax: 7-812-1183239
	Consys (PC, INV, SV)	Promyshlennaya St. 42, RU-198099 St. Petersburg, Russia	Tel: 7-812-325-36-53 Fax: 7-812-325-36-53
	ICOS Industrial Computer Systems ZAO (PC, INV, SV)	Ryazanskij Prospekt, 8A, Office 100, RU-109428 Moscow, Russia	Tel: 7-095-2320207 Fax: 7-095-2320327
	NPP "Uralelektra" (PLC only)	Sverdlova 11A, RU-620027 Ekaterinburg	Tel: 7-34-32-53-27-45 Fax: 7-34-32-53-24-61
	Stc Drive Technique (PC, INV, SV)	Poslannikov Per. 9, Str 1, RU-107005 Moscow	Tel: 7-095-790-7210 Fax: 7-095-790-7212
Bulgaria	TELECON CO.	4, A. Ljapchev Blvd. BG-1756 Sofia	Tel: 359-2-9744058 Fax: 359-2-9744061
Estonia	UTU ELEKTROTEHNIKA AS	Parnu mnt. 160i, EE-11317 Tallinn	Tel: 372-6-517280 Fax: 372-6-517288
Rumania	Sirius Trading & Services srl	Str. Biharia Nr.67-77, RO-013981 Bucuresti 1, Rumania	Tel: 40-21-201-1146 Fax: 40-21-201-1148
Greece	UTECO A.B.E.E.	5, Mavrogenous Str., GR-18542 Piraeus, Greece	Tel: 30-210-4210050 Fax: 30-210-4212033
Israel	SHERF Motion Techn. LTD (INV, SV)	Rehov Hamerkava 19, IL-58851 Holon	Tel: 972-3-5595462 Fax: 972-3-5560182
	TEXEL Electronics Ltd. (PLC)	2 Ha'umanut P.O. Box 6272, IL-42160 Netanya	Tel: 972-9-8630891 Fax: 972-9-8852430
	ILAN & GAVISH Automation Service LTD (PLC)	24 Shenkar St., Kiryat-Arie IL-49001 Petah-Tiqva	Tel: 972-3-9221824 Fax: 972-3-9240761
Ukraine	CSC Automation	15, M. Raskova St., Floor 10, Office 1010, UKR-02002 Kiev, Ukraine	Tel: 380-44-2388316 Fax: 380-44-2388317
Belarus	Tehnikon.	Oktjabrskaya 16/5, AP 704, BY-220030 MINSK, Belarus	Tel: 375-17-2104626 Fax: 375-17-2104626
Serbia-Montenegro	Craft	Branka Krsmanovica 43 V, YU-18000 Nis	Tel: 381-018531226 Fax: 381-018531226

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South Africa	Circuit Breaker Industries Ltd.	Private Bag 2016, Isando 1600, Tripswitch Drive, Elandsfontein Gauteng, South Africa	Tel: 27-11-928-2000 Fax: 27-11-392-2354

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Taiwan	Setsuyo Enterprise Co., Ltd.	6F., NO.105 Wu-Kung 3rd.RD, Wu-Ku Hsiang Taipei Hsine, Taiwan	Tel: 886-2-2299-2499 Fax: 886-2-2299-2509
Singapore	Mitsubishi Electric Asia Pte, Ltd,	307 Alexandra Road #05-01/02, Mitsubishi Electric Building, Singapore 159943	Tel: 65-6470-2460 Fax: 65-6476-7439
	Pumas Automation & Robotics Pte, Ltd.	1001 JALAN BUKIT MERAH # 06-01 TO #06-10 SINGAPORE 159455	Tel: 65-6278-3289 Fax: 65-6278-8372
Malaysia	Flexible Automation System Sdn, Bhd. Head Office	60 Jalan USJ10/1B 47620 Uep Subang Jaya Selangor DARUL EHSAN Malaysia [Kuala Lunpur]	Tel: 60-3-5633-1280 Fax: 60-3-5633-6613
Viet Nam	SA GIANG TECHNO CO., LTD.	47-79 Hoang Sa St., Dist. 1, Hochiminh City, Vietnum	Tel: 84-8-9103633 Fax: 84-8-9102593
Thailand	F.A. Tech Co., Ltd.	896/19,20,21,22 S.V.City Building, Office Tower1, Floor 12,14 Rama áV Rd., Bangpongpang, Yannawa, Bangkok 10120, Thailand	Tel: 66-2-682-6522Â`31 Fax: 66-2-682-6020
	Oriental Electric Industry Co., Ltd.	Bang-Chan Industrial Estate No.111, Moo 4, Serithai Rd T. Kannayao, A. Bangkok, 10230, Thailand	Tel: 66-2-517-1326 Fax: 66-2-517-1328

Asia

Indonesia	P.T. Autoteknindo SUMBER MAKMUR	Murara Karang Selatan Block A/Utara No.1 Kav. No.11 , Kawasan Industri/Pergudangan Jakarta-Utara 14440, P.O. Box 5045 Jakarta, Indonesia	Tel: 62-21-6630833 Fax: 62-21-6630832
India	Messung Systems Pvt.Ltd.	Electronic Sadan NO:III Unit No.15 M.I.D.C. BHOSARI, PUNE-411026, India	Tel: 91-20-2712-3130,8927 Fax: 91-20-2712-8108
Philippines	Edison Electric Integrated, Inc	24th Fl. Galleria Corporate Center Edsa Cr. Ortigas Avenue. Quezon City Metro Manila, Philippines	Tel: 63-2-634-8691 to 95 Fax: 63-2-634-5899
	Flexible Automation System Coporation	Unit 411. Alabang Corporate Center Km 25. West Service Road, South Super Highway Alabang Muntinlupa Metro Manila, Philippines	Tel: 63-2-807-2416 Fax: 63-2-807-2417

Oceania

Australia	Mitsubishi Electric Australia Pty. Ltd.	348 Victoria Road, Rydalmere, N.S.W 2116, Australia	Tel: 61-2-9684-7777 Fax: 61-2-9684-7245
New Zealand	Black Diamond Technologies Limited	1 Parliament Street Lower Hutt, Wellington, New Zealand	Tel: 64-4-560-9100 Fax: 64-4-560-9100

Global FA Center

North America FA Center	Mitsubishi Electric Automation, Inc.	500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA	Tel: 1-847-478-2100 Fax: 1-847-478-2396
Europe FA Center	Mitsubishi Electric Europe B.V. German Branch	Gothaer Strasse 8. D-40880 Ratingen, GERMANY	Tel: 49-2102-486-0 Fax: 49-2102-486-7170
UK FA Center	Mitsubishi Electric Europe B.V. U.K. Branch	Travellers Lane, Hatfield, Herfordshire, AL10 8XB, U.K.	Tel: 44-1707-276100 Fax: 44-1707-278695
Korea FA Center	MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.	2F 660-11, Deungchon-Dong, Kangseo-ku, Seoul 157-030, Korea	Tel: 82-2-3660-9607 Fax: 82-2-3663-0475
Shanghai FA Center	Mitsubishi Electric Automation (Shanghai) Ltd Beijing Office	Unit 917-918, 9/F Office Tower 1, Hendenson Center, 18 Jianguomennei Avenue, Dongcheng District, Beijing China 100005	Tel: 86-10-6518-8330 Fax: 86-10-6518-2530
Shanghai FA Center	Mitsubishi Electric Automation (Shanghai) Ltd	4/F Zhi Fu Plazz, No.80 Xin Chang Road, Shanghai, China 200003	Tel: 86-21-6121-2460 Fax: 86-21-6121-2424
Tianjin FA Center	Mitsubishi Electric Automation (Shanghai) Ltd Tianjin Office	B-2 801/802 Youyi Building, No. 50 Youyi Road, Hexi District, Tianjin 300061	Tel: 86-22-2813-1015 Fax: 86-22-2813-1017
Hong Kong FA Center	Mitsubishi Electric Automation Ltd	10th Floor, Manulife Tower, 169 Electric Road, North Point, Hong Kong	Tel: 852-2887-8870 Fax: 852-2887-7984
Taipei FA Center	Setsuyo Enterprise Co., Ltd.	6F., NO.105 Wu-Kung 3rd.RD, Wu-Ku Hsiang Taipei Hsine,Taiwan, R.O.C.	Tel: 886-2-2299-2499 Fax: 886-2-2299-2509
Asean FA Center	Mitsubishi Electric Asia Pte, Ltd.	307 ALEXANDRA ROAD #05-01/02 MITSUBISHI ELECTRIC BUILDING SINGAPORE 159943	Tel: 65-6470-2480 Fax: 65-6476-7439

In FA centers, we offer the technical advice about our products and meet your demands concerned with repairs, field services and training.

APPENDIX10 Warranty

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
(2) The Mitsubishi programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable logic controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable logic controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

APPENDIX11 Model List

APPENDIX11.1

* Always refer to the "Q series data book" for information on usable modules and restrictions, etc., before starting use.
* Refer to MELFANSweb or contact your nearest sales office for the latest information on the MELSOFT versions and compatible OS.

Usable with basic model
Usable with high-performance model
Usable with process CPU
Usable with redundant CPU
Usable with MELSECNET/H remote I/O
GMP GMP validation compliant

CPU, base, power supply

Product		Type	Outline
CPU	Basic Model	Q00JCPU	No. of input/output points: 256 points No. of input/output device points: 2048 points Program capacity: 8k steps Basic instruction processing speed (LD instruction): 0.20μs Program memory capacity: 58kbyte 5 slots 100 to 240VAC input/5VDC 3A output power supply
		Q00CPU	No. of input/output points: 1024 points No. of input/output device points: 2048 points Program capacity: 8k steps Basic instruction processing speed (LD instruction): 0.16μs Program memory capacity: 94kbyte
		Q01CPU	No. of input/output points: 1024 points No. of input/output device points: 2048 points Program capacity: 14k steps Basic instruction processing speed (LD instruction): 0.10μs Program memory capacity: 94kbyte
	High Performance Model	Q02CPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 28k steps Basic instruction processing speed (LD instruction): 0.079μs Program memory capacity: 112kbyte
		Q02HCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 28k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 112kbyte
		Q06HCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 60k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 240kbyte
		Q12HCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 124k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 496kbyte
		Q25HCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 252k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 1008kbyte
	Process CPU	Q12PHCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 124k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 496kbyte
		Q25PHCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 252k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 1008kbyte
	Redundant CPU	Q12PRHCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 124k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 496kbyte
		Q25PRHCPU	No. of input/output points: 4096 points No. of input/output device points: 8192 points Program capacity: 252k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 1008kbyte
	Motion CPU	Q172CPUN	For 8-axis control
		Q172CPUN-T	For 8-axis control, teaching module supported
		Q172HCPU	For 8-axis control, SSCNET III connection
		Q172HCPU-T	For 8-axis control, SSCNET III connection, teaching module supported
		Q173CPUN	For 32-axis control
		Q173CPUN-T	For 32-axis control, teaching module supported
		Q173HCPU	For 32-axis control, SSCNET III connection
		Q173HCPU-T	For 32-axis control, SSCNET III connection, teaching module supported
	Battery	Q6BAT	Replacement battery
		Q7BAT	Large capacity battery
		Q7BAT-SET	Large capacity battery with holder
		Q8BAT	Replacement large-capacity battery module Without cable
		Q8BAT-SET	Large capacity battery module With cable
	Memory card	Q2MEM-1MBS	SRAM memory card Capacity: 1Mbyte
		Q2MEM-2MBS	SRAM memory card Capacity: 2Mbyte
		Q2MEM-2MBF	Linear Flash memory card Capacity: 2Mbyte
		Q2MEM-4MBF	Linear Flash memory card Capacity: 4Mbyte
		Q2MEM-8MBA	ATA card Capacity: 8Mbyte
		Q2MEM-16MBA	ATA card Capacity: 16Mbyte
		Q2MEM-32MBA	ATA card Capacity: 32Mbyte
	Memory card adaptor	Q2MEM-ADP	Adaptor for Q2MEM memory card's standard PCMCIA slot
	SRAM card battery	Q2MEM-BAT	Replacement battery for Q2MEM-1MBS/ Q2MEM-2MBS
	Connection cable	QC30R2	RS-232 cable for connection of personal computer and CPU, 3m (mini-DIN 6P)-(Dsub 9P)
	Tracking cable	QC10TR	1m cable for tracking
		QC30TR	3m cable for tracking
	Cable disconnection prevention holder	Q6HLD-R2	Holder for prevention of RS-232 cable disconnection
Base	Main base	Q33B	3 slots power supply module, mountable for Q series modules
		Q35B	5 slots power supply module, mountable for Q series modules
		Q38B	8 slots power supply module, mountable for Q series modules
		Q312B	12 slots power supply module, mountable for Q series modules
	Slim type main base	Q32SB	2 slots slime type power supply module, mountable for Q series modules
		Q33SB	3 slots slime type power supply module, mountable for Q series modules
		Q35SB	5 slots slime type power supply module, mountable for Q series modules

CPU, base, power supply

Product		Type	Outline
Base	Extension base	Q63B	3 slots power supply module, mountable for Q series modules
		Q65B	5 slots power supply module, mountable for Q series modules
	Main base for power supply redundant system	Q38RB	8 slots two power supply modules for power supply redundant system, mountable for Q series modules
	Extension base	Q68B	8 slots power supply module, mountable for Q series modules
		Q612B	12 slots power supply module, mountable for Q series modules
		Q52B	2 slots power supply module, mountable for Q series modules
		Q55B	5 slots power supply module, mountable for Q series modules
		QA1S65B (* 1)	5 slots power supply module, mountable for AnS series modules
		QA1S68B (* 1)	8 slots power supply module, mountable for AnS series modules
		QA65B (* 1)	5 slots power supply module, mountable for A series modules
	Extension base power supply redundant system	Q68RB	8 slots two power supply modules for power supply redundant system, mountable for Q series modules
	Extension cable	QC05B	0.45m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
		QC06B	0.6m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
		QC12B	1.2m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
		QC30B	3m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
		QC50B	5m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
		QC100B	10m cable for Q52B, Q55B, Q63B, Q65B, Q68B, Q612B, Q38RB, Q68RB
	Adaptor	Q6DIN1	DIN rail mounting adaptor for Q38B, Q312B, Q68B, Q612B, Q38RB, Q68RB
		Q6DIN2	DIN rail mounting adaptor for Q35B, Q65B, Q00JCPU
		Q6DIN3	DIN rail mounting adaptor for Q32SB, Q33SB, Q35SB, Q33B, Q52B, Q55B, Q63B
	Blank cover	QG60	Blank cover for I/O slot
Power supply		Q61P-A1	Input voltage range: 100-120VAC Output voltage: 5VDC Output current: 6A
		Q61P-A2	Input voltage range: 200-240VAC Output voltage: 5VDC Output current: 6A
		Q62P	Input voltage range: 100 to 240VAC Output voltage: 5/24VDC Output current: 3/0.6A
		Q63P	Input voltage range: 24VDC Output voltage: 5VDC Output current: 6A
		Q64P	Input voltage range: 100 to 120VAC/200 to 240VAC Output voltage: 5VDC Output current: 8.5A
Slim type power supply		Q61SP	Input voltage range: 100 to 240VAC Output voltage: 5VDC Output current: 2A Slim type power supply
Power supply for power supply redundant system		Q63RP	Input voltage range: 24VDC Output voltage: 5VDC Output current: 8.5A
		Q64RP	Input voltage range: 100 to 120VAC/200 to 240VAC Output voltage: 5VDC Output current: 8.5A

Input/output module

Input	AC	QX10	16 points 100 to 120VAC 8mA (100VAC, 60Hz)/7mA (100VAC, 50Hz) response time: 20ms 16 points/common 18-point terminal block
		QX28	8 points 100 to 240VAC 17mA (200VAC, 60Hz)/14mA (200VAC, 50Hz)/8mA (100VAC, 60Hz) / 7mA (100VAC, 50Hz) response time: 20ms 8 points/common 18-point terminal block
	DC (Positive common) (* 2)	QX40	16 points 24VDC 4mA response time: 1/5/10/20/70ms 16 points/common Positive common 18-point terminal block
		QX40-S1	16 points 24VDC 6mA response time: 0.1/0.2/0.4/0.6/1ms 16 points/common Positive common 18-point terminal block
		QX41 (* 3)	32 points 24VDC 4mA response time: 1/5/10/20/70ms 32 points/common Positive common 40-pin connector
		QX41-S1 (* 3)	32 points 24VDC 4mA response time: 0.1/0.2/0.4/0.6/1ms 32 points/common Positive common 40-pin connector
		QX42 (* 3)	64 points 24VDC 4mA response time: 1/5/10/20/70ms 32 points/common Positive common 40-pin connector
		QX42-S1 (* 3)	64 points 24VDC 4mA response time: 0.1/0.2/0.4/0.6/1ms 32 points/common Positive common 40-pin connector
	DC sensor (* 2)	QX70	16 points 5/12VDC 1.2mA (5VDC)/3.3mA (12VDC) response time: 1/5/10/20/70ms 16 points/common positive common/negative common combination use 18-point terminal block
		QX71 (* 3)	32 points 5/12VDC 1.2mA (5VDC)/3.3mA (12VDC) response time: 1/5/10/20/70ms 32 points/common positive common/negative common combination use 40-pin connector
		QX72 (* 3)	64 points 5/12VDC 1.2mA (5VDC)/3.3mA (12VDC) response time: 1/5/10/20/70ms 32 points/common positive common/negative common combination use 40-pin connector

Input/output module

Input	DC (Negative common) (* 2)	QX80	16 points 24VDC 4mA response time: 1/5/10/20/70ms 16 points/common negative common 18-point terminal block
		QX81 (* 4)	32 points 24VDC 4mA response time: 1/5/10/20/70ms 32 points/common negative common 37-pin D-sub connector
		QX82 (* 3)	64 points 24VDC 4mA response time: 1/5/10/20/70ms 32 points/common negative common 40-pin connector
		QX82-S1 (* 3)	64 points 24VDC 4mA response time: 0.1/0.2/0.4/0.6/1ms 32 points/common negative common 40-pin connector
Output	Relay	QY10	16 points 24VDC/240VAC 2A/point 8A/common response time: 12ms 16 points/common 18-point terminal block
		QY18A	8 points 24VDC/240VAC 2A/point response time: 12ms 18-point terminal block all points independent Relay
	Triac	QY22	16 points 100 to 240VAC 0.6A/points 4.8A/common Minimum load voltage Current: 24VAC 100mA/100/240VAC 25mA Leakage at OFF: 1.5mA (120VAC) / 3mA (240VAC) response time: 1ms + 0.5Hz 16 points/common 18-point terminal block with surge suppressor
	Transistor (Sink)	QY40P	16 points 12 to 24VDC 0.1A/points 1.6A/common Leakage at OFF: 0.1mA response time: 1ms 16 points/common sink type 18-point terminal block with thermal protection, short-circuit protection and surge suppressor
		QY41P (* 3)	32 points 12 to 24VDC 0.1A/points 2A/common Leakage at OFF: 0.1mA response time: 1ms 32 points/common sink type 40-pin connector with thermal protection, short-circuit protection and surge suppressor
		QY42P (* 3)	64 points 12 to 24VDC 0.1A/points 2A/common Leakage at OFF: 0.1mA response time: 1ms 32 points/common sink type 40-pin connector with thermal protection, short-circuit protection and surge suppressor
		QY50	16 points 12 to 24VDC 0.5A/points 4A/common Leakage at OFF: 0.1mA response time: 1ms 16 points/common sink type 18-point terminal block with thermal protection, surge suppressor and fuse
	Transistor (Independent)	QY68A	8 points 5 to 24VDC 2A/points 8A/module Leakage at OFF: 0.1mA response time: 10ms sink/source combination type 18-point terminal block with surge suppressor all points independent
	TTL CMOS	QY70	16 points 5 to 12VDC 16mA/points 256mA/common response time: 0.5ms 16 points/common sink type 18-point terminal block with fuse
		QY71 (* 3)	32 points 5 to 12VDC 16mA/points 512mA/common response time: 0.5ms 32 points/common sink type 40-pin connector with fuse
	Transistor (Source)	QY80	16 points 12 to 24VDC 0.5A/points 4A/common Leakage at OFF: 0.1mA response time: 1ms 16 points/common source type 18-point terminal block with surge suppressor and fuse
		QY81P (* 4)	32 points 12 to 24VDC 0.1A/points 2A/common Leakage at OFF: 0.1mA response time: 1ms 32 points/common source type 37-pin D-sub connector with thermal protection, short-circuit protection and surge suppressor
Input/output	DC input/ transistor output	QH42P (* 3)	Input 32 points 24VDC 4mA response time: 1/5/10/20/70ms Positive common output 32 points 12 to 24VDC 0.1A/points 2A/common Leakage at OFF: 0.1mA response time: 1ms sink type 40-pin connector with thermal protection, short-circuit protection and surge suppressor
		QX48Y57	Input 8 points 24VDC 4mA response time: 1/5/10/20/70ms Positive common output 7 points 12 to 24VDC 0.5A/points 2A/common Leakage at OFF: 0.1mA response time: 1ms 7 points/common sink type 18-point terminal block with surge suppressor and fuse
Interrupt module		QI60	16 points 24VDC 4mA response time: 0.1/0.2/0.4/0.6/1ms 16 points/common 18-point terminal block
Connector		A6CON1	Soldering 32-point connector (40-pin connector)
		A6CON2	Solderless terminal connection 32-point connector (40-pin connector)
		A6CON3	Flat cable pressure-displacement 32-point connector (40-pin connector)
		A6CON4	Soldering 32-point connector (40-pin connector, bidirectional cable mountable)
		A6CON1E	Soldering 32-point connector (37-pin D-sub connector)
		A6CON2E	Solderless terminal connection 32-point connector (37-pin D-sub connector)
		A6CON3E	Flat cable pressure-displacement 32-point connector (37-pin D-sub connector)
Spring clamp terminal block		Q6TE-18S	For 16-point I/O, 0.3 to 1.5mm^2 (AWG22 to 16)
Terminal block adaptor		Q6TA32	For 32-point I/O, 0.5mm^2 (AWG20)
		Q6TA32-TOL	Tool exclusively used for Q6TA32
Connector/terminal block conversion module		A6TBX36-E	For negative common input module (standard type)
		A6TBX54-E	For negative common input module (2-wire type)
		A6TBX70	For positive common input module (3-wire type)
		A6TBX70-E	For negative common input module (3-wire type)
		A6TBY36-E	For source type output module (standard type)
		A6TBY54-E	For source type output module (2-wire type)
		A6TBYX36	For positive common input module, sink type output module (standard type)
		A6TBYX54	For positive common input module, sink type output module (2-wire type)
Connector/ terminal block conversion module	Cable	AC05TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 0.5m
		AC10TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 1m
		AC20TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 2m
		AC30TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 3m
		AC50TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 5m
		AC80TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 8m *Common power supply 0.5A or less
		AC100TB	For A6TBXY36/A6TBXY54/A6TBX70 (positive common, for sink type) 10m *Common power supply 0.5A or less
		AC05TB-E	For A6TBX-E/A6TBY36-E/A6TBX54-E/A6TBY54-E/A6TBX70-E (negative common, for source type) 0.5m
		AC10TB-E	For A6TBX-E/A6TBY36-E/A6TBX54-E/A6TBY54-E/A6TBX70-E (negative common, for source type) 1m

Input/output module

Product		Type	Outline
Connector/ terminal block conversion module	Cable	AC20TB-E	For A6TBX-E/A6TBY36-E/A6TBX54-E/A6TBY54-E/A6TBX70-E (negative common, for source type) 2m
		AC30TB-E	For A6TBX-E/A6TBY36-E/A6TBX54-E/A6TBY54-E/A6TBX70-E (negative common, for source type) 3m
		AC50TB-E	For A6TBX-E/A6TBY36-E/A6TBX54-E/A6TBY54-E/A6TBX70-E (negative common, for source type) 5m
Relay terminal module		A6TE2-16SRN	For 40-pin connector 24VDC transistor output module (sink type)
Relay terminal module Cable	Cable	AC06TE	0.6m for A6TE2-16SRN
		AC10TE	1m for A6TE2-16SRN
		AC30TE	3m for A6TE2-16SRN
		AC50TE	5m for A6TE2-16SRN
		AC100TE	10m for A6TE2-16SRN

Analog input/output module

Analog input Note 1	Voltage input	Q68ADV GMP	8 channels Input: -10 to 10VDC Output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000 Conversion speed: 80μs/channel 18-point terminal block
	Current input	Q62AD-DGH	2 channels Input: 4 to 20mADC Output (resolution): 0 to 32000, 0 to 64000 Conversion speed: 10ms/2channel 18-point terminal block channel isolated, power supply to 2-wire transmitter
		Q68ADI GMP	8 channels Input: 0 to 20mADC Output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000 Conversion speed: 80μs/channel 18-point terminal block
	Voltage/ current input	Q64AD GMP	4 channels Input: -10 to 10VDC, 0 to 20mADC Output (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, 0 to 16000, -16000 to 16000 Conversion speed: 80μs/channel 18-point terminal block
		Q64AD-GH GMP	4 channels Input: -10 to 10VDC, 0 to 20mADC Output (resolution): 0 to 32000, -32000 to 32000, 0 to 64000, -64000 to 64000 Conversion speed: 10ms/4channel 18-point terminal block channel isolated
Analog output Note 1	Voltage output	Q68DAVN	8 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC Conversion speed: 80μs/channel 18-point terminal block Isolated transformer between power supply and output.
		Q68DAV GMP	8 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC Conversion speed: 80μs/channel 18-point terminal block
	Current output	Q68DAIN	8 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000 Output: 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block Isolated transformer between power supply and output.
		Q68DAI GMP	8 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000 Output: 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block
	Voltage/ current output	Q62DAN GMP	2 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC, 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block Isolated transformer between power supply and output.
		Q62DA GMP	2 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC, 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block
		Q62DA-FG GMP	2 channels Input (resolution): 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -12 to 12VDC, 0 to 22mADC Conversion speed: 10ms/2channel 18-point terminal block channel isolated
		Q64DAN GMP	4 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC, 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block Isolated transformer between power supply and output.
		Q64DA GMP	4 channels Input (resolution): 0 to 4000, -4000 to 4000, 0 to 12000, -12000 to 12000, -16000 to 16000 Output: -10 to 10VDC, 0 to 20mADC Conversion speed: 80μs/channel 18-point terminal block
Temperature input Note 1	Temperature-measuring resistor	Q64RD GMP	4 channels Platinum temperature-measuring resistor (Pt100 (JIS C 1604-1997, IEC 751 1983), JPt100 (JIS C1604-1981)) conversion speed: 40ms/channel 18-point terminal block
		Q64RD-G GMP	4 channels Platinum temperature-measuring resistor (Pt100 (JIS C1604-1997, IEC 751 1983), JPt100 (JIS C1604-1981), Ni100W (DIN43760 1987)) Conversion speed: 40ms/channel 18-point terminal block channel isolated
	Thermocouple	Q64TD GMP	4 channels thermocouple (JIS C1602-1995) conversion speed: 40ms/channel 18-point terminal block
		Q64TDV-GH	4 channels thermocouple (JIS C1602-1995) micro voltage (-100mV to 100mV) conversion speed: (sampling cycle x 3)/channel 18-point terminal block
Temperature control Note 1	Platinum temperature-measuring resistor	Q64TCRT GMP	4 channels Platinum temperature-measuring resistor (Pt100, JPt100) No heater wire break detection sampling cycle: 0.5s/4 channels 18-point terminal block
		Q64TCRTBW GMP	4 channels Platinum temperature-measuring resistor (Pt100, JPt100) heater wire break detection sampling cycle: 0.5s/4 channel 18-point terminal block x 2
	Thermocouple	Q64TCTT GMP	4 channels thermocouple (K, J, T, B, S, E, R, N, U, L, PLII, W5Re/W26Re) No heater wire break detection sampling cycle: 0.5s/4 channel 18-point terminal block
		Q64TCTTBW GMP	4 channels thermocouple (K, J, T, B, S, E, R, N, U, L, PLII, W5Re/W26Re) Heater wire break detection Sampling cycle: 0.5s/4 channel 18-point terminal block x 2
	Loop control module	Q62HLC	Loop control module 2CH thermocouple 5 PID control modes Output: 4-20mA

: Dedicated instructions for the interrupt pointer and intelligent function module cannot be used.
Note 1

Pulse input/output and positioning module

Product		Type	Outline
Channel-isolated pulse input		QD60P8-G	8 channels 30kpps/10kpps/1kpps/100pps/50pps/10pps/1pps/0.1pps count input signal: 5/12 to 24VDC
High-speed counter (* 3) Note 1		QD62	2 channels 200/100/10kpps count input signal: 5/12/24VDC external input: 5/12/24VDC match output: transistor (sink) 12/24VDC, 0.5A/point, 2A/1common 40-pin connector
		QD62D	2 channels 500/200/100/10kpps count input signal: EIA Standards RS-422A (Differential line driver) external input: 5/12/24VDC match output: transistor (sink) 12/24VDC, 0.5A/point, 2A/1common 40-pin connector
		QD62E	2 channels 200/100/10kpps count input signal: 5/12/24VDC external input: 5/12/24VDC match output: transistor (source) 12/24VDC, 0.1A/point, 0.4A/common 40-pin connector
Positioning	Open collector output (* 5)	QD75P1 Note 1	1-axis control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 200kpps 40-pin connector
		QD75P2 Note 1	2-axis 2-axis linear interpolation, 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 200kpps 40-pin connector
		QD75P4 Note 1	4-axis 2-axis, 3-axis, 4-axis linear interpolation 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 200kpps 40-pin connector
		QD70P4	4-axis control unit: pulse No. of positioning data items: 10 data items/axis max. output pulse: 200kpps 40-pin connector
		QD70P8	8-axis control unit: pulse No. of positioning data items: 10 data items/axis max. output pulse: 200kpps 40-pin connector
	Differential output (* 5) Note 1	QD75D1	1-axis control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 1Mpps 40-pin connector
		QD75D2	2-axis 2-axis linear interpolation, 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 1Mpps 40-pin connector
		QD75D4	4-axis 2-axis, 3-axis, 4-axis linear interpolation 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis max. output pulse: 1Mpps 40-pin connector
		QD70D4 COMING SOON	4-axis control unit: pulse No. of positioning data items: 10 data items/axis max. output pulse: 4Mpps 40-pin connector Differential output
		QD70D8 COMING SOON	8-axis control unit: pulse No. of positioning data items: 10 data items/axis max. output pulse: 4Mpps 40-pin connector Differential output
	SSCNET connection (* 3) Note 1	QD75M1	1-axis control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector
		QD75MH1 NEW	1-axis control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector SSCNET III connection
		QD75M2	2-axis 2-axis linear interpolation, 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector
		QD75MH2 NEW	2-axis 2-axis linear interpolation, 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector SSCNET III connection
		QD75M4	4-axis 2-axis, 3-axis, 4-axis linear interpolation 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector
		QD75MH4 NEW	4-axis 2-axis, 3-axis, 4-axis linear interpolation 2-axis circular interpolation control unit: mm, inch, degree, pulse No. of positioning data items: 600 data items/axis 40-pin connector SSCNET III connection

Note 1 : Dedicated instructions for the interrupt pointer and intelligent function module cannot be used.

Information module

Ethernet		QJ71E71-100	10BASE-T/100BASE-TX
		QJ71E71-B2	10BASE2
		QJ71E71-B5	10BASE5
MES Interface		QJ71MES96	10BASE-T/100BASE-TX
	Compact flash card	GT05-MEM-128MC	Flash ROM 128MB
		GT05-MEM-256MC	Flash ROM 256MB
Web Server		QJ71WS96	10BASE-T/100BASE-TX 1 channel, RS-232 1 channel. Web server
	Compact flash card	GT05-MEM-32MC	Flash ROM 32MB
		GT05-MEM-64MC	Flash ROM 64MB
		GT05-MEM-128MC	Flash ROM 128MB
		GT05-MEM-256MC	Flash ROM 256MB
Serial communication		QJ71C24N	RS-232 1 channel RS-422/485 1 channel Transmission speed: 230.4kbps total for two channels GX Configurator-SC Version 2 compatible
		QJ71C24N-R2	RS-232 2 channel Transmission speed: 230.4kbps total for two channels GX Configurator-SC Version 2 compatible
		QJ71C24N-R4	RS-422/485 2 channels Transmission speed: 230.4kbps total for two channels GX Configurator-SC Version 2 compatible
Modem Interface		GJ71CMO (*6)	Modular connector 1 channel, RS-232 1 channel
Intelligent communication		QD51 Note 1	Basic program execution module RS-232 2 channels
		QD51-R24 Note 1	Basic program execution module RS-232 1 channel RS-422/485 1 channel
		SW□ IVD-AD51HP (* 7)	QD51H software package (shared between AD51H-S3/A1SD51HS)

Control network module

MELSEC NET/H	SI/QSI optical cable	QJ71LP21-25	SI, QSI, H-PCF, broadband H-PCF optical cable duplex loop PLC-to-PLC network (control station/normal station)/ remote I/O network (remote master station)
		QJ71LP21S-25	SI, QSI, H-PCF, broadband H-PCF optical cable duplex loop PLC-to-PLC network (control station/normal station)/ remote I/O network (remote master station) external power supply function
		QJ72LP25-25	SI, QSI, H-PCF, broadband H-PCF optical cable duplex loop Remote I/O network (remote I/O station)
	GI-50/125 optical cable	QJ71LP21G	GI-50/125 optical cable duplex loop PLC-to-PLC network (control station/normal station)/ remote I/O network (remote master station)
		QJ72LP25G	GI-50/125 optical cable duplex loop Remote I/O network (remote I/O station)
	GI-62.5/125 optical cable	QJ71LP21GE	GI-62.5/125 optical cable duplex loop PLC-to-PLC network (control station/normal station)/ remote I/O network (remote master station)
		QJ72LP25GE	GI-62.5/125 optical cable duplex loop Remote I/O network (remote I/O station)
	Coaxial cable	QJ71BR11	3C-2V/5C-2V coaxial cable simplex bus PLC-to-PLC network (control station/normal station)/ remote I/O network (remote master station)
		QJ72BR15	3C-2V/5C-2V coaxial cable simplex bus Remote I/O network (remote I/O station)
CC-Link Note 1		QJ61BT11N	Master station/local station combined use, CC-Link Ver. 2 compatible
CC-Link/LT		QJ61CL12	Master station
FL-net (OPCN-2)	Ver. 2.00 specifications	QJ71FL71-T-F01	10BASE-T
		QJ71FL71-B2-F01	10BASE2
		QJ71FL71-B5-F01	10BASE5
AS-i		QJ71AS92	Master station, AS-i standard version 2.11 compatible

Note 1 : Dedicated instructions for the interrupt pointer and intelligent function module cannot be used.

Note 2 : Dedicated instructions for the interrupt pointer and intelligent function module, and the e-mail function cannot be used.

A mode CPU, base

Product		Type	Outline
CPU		Q02CPU-A	For A mode No. of input points: 4096 points No. of input/output device points: 8192 points Program capacity: 28k steps Basic instruction processing speed (LD instruction): 0.079μs Program memory capacity: 144kbyte
		Q02HCPU-A	For A mode No. of input points: 4096 points No. of input/output device points: 8192 points Program capacity: 28k steps Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 144kbyte
		Q06HCPU-A	For A mode No. of input points: 4096 points No. of input/output device points: 8192 points Program capacity: 30k steps (main) 30k steps (sub) Basic instruction processing speed (LD instruction): 0.034μs Program memory capacity: 144kbyte
Base	Main base	QA1S33B	3 slots, power supply module mountable, for AnS series modules
		QA1S35B	5 slots, power supply module mountable, for AnS series modules
		QA1S38B	8 slots, power supply module mountable, for AnS series modules
	Extension base	QA1S65B	5 slots, power supply module mountable, for AnS series modules
		QA1S68B	8 slots, power supply module mountable, for AnS series modules

MELSOFT GX Series

GX Developer	SW□D5C-GPPW-E	MELSEC PLC programming software
	SW□D5C-GPPW-EV	MELSEC PLC programming software (Upgrade)
GX Simulator	SW□D5C-LLT-E	MELSEC PLC simulation software
	SW□D5C-LLT-EV	MELSEC PLC simulation software (Upgrade)
GX Explorer	SW□D5C-EXP-E	Maintenance tool
	SW□D5C-EXP-EV	Maintenance tool (Upgrade)
GX Converter	SW□D5C-CNVW-E	Excel®/text data converter
GX Configurator-AD (* 7)	SW□D5C-QADU-E	MELSEC-Q dedicated analog to digital module setting/monitoring tool
GX Configurator-DA (* 7)	SW□D5C-QDAU-E	MELSEC-Q dedicated digital to analog module setting/monitoring tool
GX Configurator-SC (* 7)	SW□D5C-QSCU-E	MELSEC-Q dedicated serial communication module setting/monitoring tool
GX Configurator-CT (* 7)	SW□D5C-QCTU-E	MELSEC-Q dedicated counter module setting/monitoring tool
GX Configurator-TC (* 7)	SW□D5C-QTCU-E	MELSEC-Q dedicated temperature control module setting/monitoring tool
GX Configurator-TI (* 7)	SW□D5C-QTIU-E	MELSEC-Q dedicated temperature input module setting/monitoring tool
GX Configurator-FL (* 7)	SW□D5C-QFLU-E	MELSEC-Q dedicated FL-net module setting/monitoring tool
GX Configurator-PT (* 7)	SW□D5C-QPTU-E	MELSEC-Q dedicated QD70P positioning module setting/monitoring tool
GX Configurator-AS (* 7)	SW□D5C-QASU-E	MELSEC-Q dedicated AS-i master module setting/monitoring tool
GX Configurator-QP (* 7)	SW□D5C-QD75P-E	MELSEC-Q dedicated QD75P/D/M positioning module setting/monitoring tool
GX Configurator-CC (* 7)	SW□D5C-J61P-E	CC-Link module setting/monitoring tool
GX RemoteService-I	SW□D5C-RAS-E	Remote access tool
	SW□D5C-RAS-EV	Remote access tool (Upgrade)
GX Works	SW□D5C-QSET-E	A set of seven products, GX Developer, GX Simulator, GX Explorer, GX Configurator-AD, DA, SC, CT
	SW□D5C-GPPLLT-E	A set of three products, GX Developer, GX Simulator, GX Explorer

MELSOFT PX Series

PX Developer (* 7)	SW□D5C-FBDQ-E	FBD Software package for process control
PX Works	SW□D5C-FBDGPP-E	A set of six products, PX Developer, GX Developer, GX Configurator-AD, DA, CT, and TI

MELSOFT MX Series

MX MES Interface	SW1DNC-MESIF-J	Information interaction support tool for MES interface modules
MX Component	SW□D5C-ACT-E	Active X library for communication
MX Sheet	SW□D5C-SHEET-E	Excel®communication support tool
MX Works	SW□D5C-SHEETSET-E	A set of two products, MX Component, MX Sheet

MELSOFT MT Series

MT Developer	SW□RNC-GSVPROE	Integral startup support software for Q Motion
	SW□RNC-GSVSETE	Integral startup support software for Q Motion + A30CD-PCF SSC I/F card + Q170CDCBL3M cable

MELSOFT MR Series

MR Configurator (* 9)	MRZJW3-SETUP221	Servo setup software for personal computer

PC I/F Board

MELSEC NET/H (10)	SI/QSI optical cable	Q80BD-J71LP21-25	PCI bus Japanese/English OS compatible SI/QSI optical cable duplex loop PLC-to-PLC network (control station, normal station)
		Q80BD-J71LP21S-25	PCI bus Japanese/English OS compatible SI/QSI optical cable duplex loop PLC-to-PLC network (control station, ordinary station) With external power supply function
	GI optical cable	Q80BD-J71LP21G	PCI bus Japanese/English OS compatible GI-62.5/125 optical cable duplex loop PLC-to-PLC network (control station, ordinary station)
	Coaxial cable	Q80BD-J71BR11	PCI bus Japanese/English OS compatible GI-62.5/125 optical cable duplex loop PLC-to-PLC network (control station, ordinary station)
CC-Link		A80BDE-J61BT11	PCI bus Japanese/English OS compatible Shared by master station and local station CC-Link Ver.2 compatible

* 1) Compatible only with high-performance module
* 2) "Positive common" refers to using the sensor with the positive DC power connected to the common terminal. "Negative common" refers to using the sensor with the negative DC power connected to the common terminal.
* 3) The connector is not enclosed. Prepare the A6CON1, A6CON2, A6CON3 or A6CON4 connector.
* 4) No connector is provided. Please acquire the A6CON1E/A6CON2E/A6CON3E separately.
* 5) No connector is provided. Please acquire the A6CON1/A6CON2/A6CON3 separately.
* 6) Runs at the Windows command prompt.
* 7) Not compatible with the A mode.

REVISIONS

The DATA Book number is given on the bottom left of the back cover.

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***., 2006	L(NA)-08029E-B	Completely reviewed and revised.

Japanese Manual Version L(NA)-08023-E

MEMO

Mitsubishi Programmable Logic Controller

Precautions for Choosing the Products

This catalog explains the typical features and functions of the Q series PLCs and does not provide restrictions and other information on usage and module combinations. When choosing the products, always check the detailed specifications, restrictions, etc. of the products in the Q series data book. When using the products, always read the user's manuals of the products.
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⚠ For safe use

- To use the products given in this catalog properly, always read the "manuals" before starting to use them.
- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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