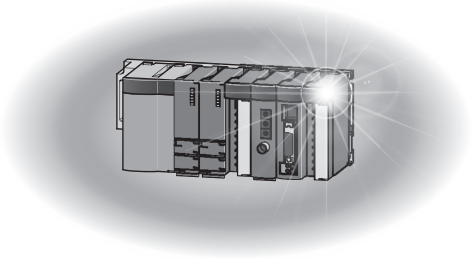
MITSUBISHI ELECTRIC

Programmable Controller

MELSEC Q series

DeviceNet Master-Slave Module User's Manual

-QJ71DN91



DeviceNet™ CONFORMANCE TESTED

• SAFETY PRECAUTIONS •

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual for the CPU module used.
In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠WARNING	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 minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[DESIGN PRECAUTIONS]

⚠WARNING

- If a communications error occurs on a DeviceNet network, faulty nodes will behave as follows:
  (1) The master node (QJ71DN91) holds input data which had been received from slave nodes before the error occurred.
  (2) Whether output signals of a slave node are turned off or held is determined by the slave node's specifications or the parameters set at the master node. When the QJ71DN91 is used as a slave node, it holds data that have been input from the master node before the communication error.

  Utilizing communications states of slave nodes, create an interlock circuit on sequential programs and provide safety mechanism externally so that the system will operate safely.

⚠CAUTION

- Do not install control wires or communication cables together with the main circuit or power wires, or bring them close to each other.
  Keep a distance of 300mm or more between them.
  Failure to do so may cause malfunctions due to noise.

[INSTALLATION PRECAUTIONS]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications contained in the User's Manual of the CPU module used.
  Using it in an environment that does not meet them may result in an electric shock, fire, malfunction, and damage to or deterioration of the product.
- While pressing the installation lever on the lower part of the module, insert the module fixing projection into the hole in the base unit. Then, securely mount the module.
  Incorrect module mounting may cause the module to malfunction, fail or fall off.
  Secure the module with screws especially when it is used in an environment where constant vibrations may occur.
- Tighten the screws within the specified torque range.
  If the screws are loose, it may cause falling, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and /or the module, resulting in falling, short circuits or malfunction.
- Before mounting/dismounting the module, be sure to shut off all phases of the external power supply used by the system. Failure to do so may cause product damage.
- Do not directly touch the conductive area or electric components of the module.
  Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

⚠WARNING

- Before installation or wiring, shut off all phases of the external power supply used in the system.
  Failure to do so may cause an electric shock, damage to the product or malfunction.

⚠CAUTION

- Be careful to prevent foreign matter such as dust or wire chips from entering the module.
  It may cause a fire, failure or malfunction.
- The module has an ingress prevention label on its top to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not peel this label during wiring. Remove it for heat dissipation before system operation.
- Place the communication cables and power cables connected to the module in a duct or clamp them.
  Otherwise, dangling cables may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunctions due to poor cable contact.
- Do not pull the cable part when disconnecting the cable from the module. To disconnect a cable with connector, hold the connector that is plugged into the module. To disconnect a cable without connector, loosen the screws used for fastening.
  Pulling the cable that is still connected to the module may damage the module and/or cable, or cause a malfunction due to poor contact.

A - 2

[STARTUP/MAINTENANCE PRECAUTIONS]

⚠CAUTION
• Do not touch any terminal unless all phases of the external power supply have been shut off. Doing so may cause a malfunction. • Always turn off all phases of the external power supply before cleaning or retightening the terminal screws. Failure to do so may result in a malfunction. • Do not disassemble or remodel the module. Doing so will cause failure, malfunctions, injuries, or a fire. • Before mounting/dismounting the module, be sure to shut off all phases of external power supply used by the system. Failure to do so may cause module failure or malfunctions. • Do not install/remove the module to/from the base unit more than 50 times after the first use of the product. (IEC 61131-2 compliant) Failure to do so may cause malfunction. • Before handling the module, touch a grounded metal object to discharge the static electricity from the human body. Failure to do so may cause a failure or malfunctions of the module.

[DISPOSAL PRECAUTION]

⚠CAUTION
• When disposing of this product, treat it as industrial waste.

• CONDITIONS OF USE FOR THE PRODUCT •

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above restrictions, Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

A - 4

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Dec. 2000	SH (NA)-080143-A	First Printing
Jun. 2001	SH (NA)-080143-B	Addition Section 2.3, 2.4 Delete Section 2.2.1, 2.2.2 Correction SAFETY PRECAUTIONS, About the Generic Terms and Abbreviations, Product Configuration, Section 2.2, 2.4, Section 6.2, 6.2.1, 6.2.2, 6.3.3, 6.5
Feb. 2002	SH (NA)-080143-C	Correction About the Generic Terms and Abbreviations, Section 2.2, Section 6.2.1, 6.2.2
Dec. 2002	SH (NA)-080143-D	Addition Section 2.5 Correction Section 2.2, Section 3.3.2, 3.4.1, Section 6.1, 6.2.1, 6.3.2, 6.4, 6.5, Section 9.2.1, 9.2.2
Feb. 2003	SH (NA)-080143-E	Correction SAFETY PRECAUTIONS, INTRODUCTION, CONTENTS, Section 6.2.2, Section 6.3.3, Section 6.4, Section 6.5
May. 2003	SH (NA)-080143-F	Correction Section 6.3.1
Jun. 2004	SH (NA)-080143-G	Correction Section 2.2, 2.3, Section 3.3.2, Section 4.2.1, Section 6.3.2, 6.5, 6.6, Section 7.3.2, Section 8.1, 8.3, Section 9.3
Feb. 2006	SH (NA)-080143-H	Correction SAFETY PRECAUTIONS, Compliance with the EMC and Low Voltage Directives, Section 1.1, Section 2.1, 2.3, Section 3.2.1, 3.4, 3.5, Section 4.1, 4.2.1, Chapter 5, Chapter 6 (screen change), Section 6.2.2, Section 7.1, 7.2, 7.3.1, 7.4, 7.5.2, 7.7, Section 8.3, Section 9.3, Appendix 3
Mar. 2006	SH (NA)-080143-I	Addition Section 2.5, 3.4.1 Correction Section 3.4.1

A - 5

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Jan. 2008	SH(NA)-080143-J	Correction Generic Terms and Abbreviations, Section 1.1, 2.1 to 2.3, 3.4, Chapter 4, Section 5.1 to 5.4, 5.6, 6.1, 6.2, 6.4, 6.5, Chapter 7 and 8, Section 9.1, 9.2, Appendix 6 Addition Definitions of Terminology, Section 2.4, 3.2, 6.5.1 to 6.5.17, 7.3.1, 7.4.1, 8.2.1, 8.3.1, 9.1.5, 9.2.3, Appendix 2 Deletion Section 2.4 to 2.6, Chapter 5 Section Numbers Changed Section 3.2 -> Chapter 4, Section 3.3.2 -> Sections 3.3.2 and 3.3.3, Section 3.4.2 -> Section 3.4.2 to 3.4.14, Chapter 4 -> Chapter 5, Appendix 2 to 6 -> Appendix 3 to 7
May. 2008	SH(NA)-080143-K	Correction SAFETY PRECAUTIONS, Compliance with the EMC and Low Voltage Directives, Generic Terms and Abbreviations, Section 2.2, 2.3, 5.2.1, 6.2.1, 6.3.3, 6.4, 6.5
Jun. 2011	SH(NA)-080143-L	Addition CONDITIONS OF USE FOR THE PRODUCT, Chapter 9, Section 3.4.15, 3.4.16 Section Numbers Changed Chapter 9 -> Chapter 10 Correction GENERIC TERMS AND ABBREVIATIONS, Section 1.1, 2.2, 2.3, 3.4.1, 3.4.3, 3.5.1, 4.1, 4.3, 6.2.1, 7.1, 7.3, 7.4.2, 7.8, 8.3.2, 10.2.1, Appendix 2
Sep. 2014	SH(NA)-080143-M	Addition Appendix 4, 5 Section Numbers Changed Section 3.5.1 -> Section 3.5.3, Section 3.5.3 -> Section 3.5.1, Appendix 4 to 7 -> Appendix 5 to 8, Appendix 5 to 8 -> Appendix 6 to 9 Correction COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES, GENERIC TERMS AND ABBREVIATIONS, Section 2.1, 2.2, 2.3, 3.4.12, 3.5.3, 4.3, 5.2.1, 6.2.1, 6.2.2, 9.1, 9.2, 9.3, 9.4, 9.5, Appendix 3.5

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Sep. 2018	SH(NA)-080143-N	Correction MANUALS, Chapter 1, Section 2.1, 2.4, 4.6, Chapter 6, Section 6.1, 6.2.2, 6.7, 7.1, 7.8.1, 7.9.1, 9.1, 9.2, 9.4.2, 9.4.3, 9.5 Deletion Section 4.2.3 Section Numbers Changed Appendix 5 to 9 -> Appendix 2 to 6

Japanese Manual Version SH-080125-P

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

© 2000 MITSUBISHI ELECTRIC CORPORATION

INTRODUCTION

Thank you for purchasing the Mitsubishi Electric MELSEC-Q series programmable controller.
Before using the product, please read this manual carefully to understand the functions and performance of the Q series programmable controller to ensure correct use.

CONTENTS

SAFETY PRECAUTIONS ..... A- 1
CONDITIONS OF USE FOR THE PRODUCT ..... A- 4
REVISIONS ..... A- 5
INTRODUCTION ..... A- 8
CONTENTS ..... A- 8
COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES A-11
GENERIC TERMS AND ABBREVIATIONS A-12
DEFINITIONS OF TERMINOLOGY A-13
PACKING LIST A-14

1 OVERVIEW 1- 1 to 1- 3

1.1 Features 1- 1

2 SYSTEM CONFIGURATION 2- 1 to 2- 7

2.1 Overall Configuration 2- 1
2.2 Applicable Systems 2- 3
2.3 How to Check the Function Version and Serial Number 2- 4
2.4 Precautions on System Configuration 2- 6

3 SPECIFICATIONS 3- 1 to 3-50

3.1 Performance Specifications 3- 1
3.1.1 Maximum trunk line distance when using thick and thin cables 3- 2
3.2 Function Lists 3- 3
3.3 I/O Signals for Programmable Controller CPU 3- 4
3.3.1 I/O signal list 3- 4
3.3.2 I/O signals for the master function 3- 5
3.3.3 I/O signals for the slave function 3-13
3.4 Buffer Memory 3-17
3.4.1 Buffer memory list 3-17
3.4.2 Message communication area for master function 3-20
3.4.3 Own node status area for master function 3-25
3.4.4 Node status area for master function 3-28
3.4.5 Master function parameter setting area 3-31
3.4.6 Communication data area for master function 3-36
3.4.7 Link scan time area for master function 3-38
3.4.8 Own node status area for slave function 3-39
3.4.9 Parameter setting area for slave function 3-40
3.4.10 Communication data area for slave function 3-41
3.4.11 Own node information area 3-42

3.4.12 Hardware test area 3-43
3.4.13 Parameter saving area selection area 3-45
3.4.14 Auto communication start setting area 3-45
3.4.15 Operation Setting Area For Bus Off Error 3-46
3.4.16 Data consistency dedicated instruction area 3-47
3.5 Communication Performance 3-48
3.5.1 Link scan time 3-48
3.5.2 Communication cycle time 3-49
3.5.3 Transmission delay 3-50

4 FUNCTIONS 4- 1 to 4-15

4.1 Master Function (I/O Communication Function) 4- 1
4.2 Master Function (Message Communication Function) 4- 9
4.3 Slave Function (I/O Communication Function) 4-12

5 SETUP AND PREPARATION 5- 1 to 5-14

5.1 Pre-operation Procedures 5- 1
5.1.1 When using the master function 5- 1
5.1.2 When using the slave function 5- 2
5.1.3 When using both the master and slave functions 5- 3
5.2 Implementation and Installation 5- 4
5.2.1 Handling precautions 5- 4
5.2.2 Installation environment 5- 4
5.3 Part Names and Settings 5- 5
5.3.1 LED indications 5- 6
5.3.2 Node number switches 5- 7
5.3.3 Mode switch 5- 7
5.4 Hardware Test 5- 8
5.5 Wiring 5- 9
5.6 Communication Test 5-10
5.7 Precautions for Network Power Supply 5-11
5.7.1 Network power supply unit position 5-11
5.7.2 Network power supply unit position and current capacity calculation 5-12

6 FUNCTIONS FOR DeviceNet OF GX Works2 6- 1 to 6- 3

6.1 Functions for DeviceNet of GX Works2 ..... 6- 1
6.2 Handling precautions 6- 2

7 PROGRAMMING FOR EXECUTING THE MASTER FUNCTION 7- 1 to 7-32

7.1 Programming Precautions 7- 1
7.2 System Configuration 7- 4
7.3 Parameters for Master Function 7- 7
7.3.1 Program example using the functions for DeviceNet of GX Works2 7-10
7.3.2 Program example not using the functions for DeviceNet of GX Works2 7-18
7.4 I/O Communication Function 7-22
7.4.1 Program example using the functions for DeviceNet of GX Works2 7-22

7.4.2 Program example not using the functions for DeviceNet of GX Works2 7-24
7.5 Message Communication Function 7-27
7.5.1 Example of reading message communication data 7-27
7.5.2 Example of writing message communication data 7-29
7.6 Obtaining Error Information 7-30
7.7 Allocating Transmit/Receive Data Storage Devices for Future Expansion 7-31

8 PROGRAMMING FOR EXECUTING THE SLAVE FUNCTION 8- 1 to 8-10

8.1 System Configuration 8- 1
8.2 Parameters for Slave Function 8- 1
8.2.1 Program example using the functions for DeviceNet of GX Works2 ..... 8- 3
8.2.2 Program example not using the functions for DeviceNet of GX Works2 ..... 8- 4
8.3 I/O Communication Function 8- 6
8.3.1 Program example using the functions for DeviceNet of GX Works2 ..... 8- 6
8.3.2 Program example not using the functions for DeviceNet of GX Works2 ..... 8- 8
8.4 Obtaining Error Information 8-10

9 DEDICATED INSTRUCTIONS 9- 1 to 9- 6

9.1 Precautions 9- 2
9.2 G.DNTMRD 9- 3
9.3 G.DNTMWR 9- 4
9.4 G.DNTSRD 9- 5
9.5 G.DNTSWR 9- 6

10 TROUBLESHOOTING 10- 1 to 10-18

10.1 Problem Identification 10- 2
10.1.1 Checking the LEDs 10- 2
10.1.2 When unable to communicate with all slave nodes (when using master function) 10- 3
10.1.3 When unable to communicate with a specific slave node (when using master function) 10- 4
10.1.4 When unable to communicate with master node (when using slave function) 10- 5
10.1.5 Troubleshooting for other cases 10- 6
10.2 Error Codes 10- 8
10.2.1 Communication error codes 10- 8
10.2.2 Execution error codes of message communication (for the master function only) 10-13
10.2.3 General DeviceNet error codes of message communication (for the master function only) 10-16
10.3 Checking the QJ71DN91 Status by system monitor in GX Works2 10-17

APPENDIXES App- 1 to App- 6

Appendix 1 External Dimensions ..... App- 1
Appendix 2 How to Use the QJ71DN91 in System of MELSEC iQ-R Series ..... App- 2
Appendix 3 Parameter Setting Sheet (For the Master Function) ..... App- 3
Appendix 4 Parameter Setting Sheet (For the Slave Function) ..... App- 4
Appendix 5 List of Communication Parameters of Slave Nodes from Various Manufactures ..... App- 5
Appendix 6 EDS File of the QJ71DN91 ..... App- 6

INDEX Index- 1 to Index- 2

COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- QCPU User's Manual (Hardware Design, Maintenance and Inspection)
- Safety Guidelines

(This manual is included with the CPU module or base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

No additional measures are necessary for the compliance of this product with the EMC and Low Voltage Directives.

A - 11

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations to explain the QJ71DN91 DeviceNet master/slave module.

Generic term/abbreviation	Description
GX Works2	The product name of the software package for the MELSEC programmable controllers
QCPU	A generic term for the Q00JCPU, Q00UJCPU, Q00CPU, Q00UCPU, Q01CPU, Q01UCPU, Q02CPU, Q02HCPU, Q02PHCPU, Q02UCPU, Q03UDCPU, Q03UDVCPU, Q03UDECPU, Q04UDHCPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06HCPU, Q06PHCPU, Q06UDHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDHCPU, Q10UDEHCPU, Q12HCPU, Q12PHCPU, Q12PRHCPU, Q13UDHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDHCPU, Q20UDEHCPU, Q25HCPU, Q25PHCPU, Q25PRHCPU, Q26UDHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, and Q100UDEHCPU
QJ71DN91	The abbreviation for the QJ71DN91 DeviceNet master/slave module
DNTMRD	The abbreviation for G.DNTMRD
DNTMWR	The abbreviation for G.DNTMWR
DNTSRD	The abbreviation for G.DNTSRD
DNTSWR	The abbreviation for G.DNTSWR

DEFINITIONS OF TERMINOLOGY

Terms used in this manual and their definitions are listed below.

Term	Definition
I/O communication function	Function that allows I/O (input/output) data communications between master and slave nodes.
Message communication function	Function that allows reading or writing of slave node's attribute data in response to a request message. For further details, refer to the DeviceNet common service in the DeviceNet Specifications (Release2.0).
Master node	Device that exchanges I/O data with slave nodes which are configured with the master function parameters.
Slave node	Device that exchanges I/O data with a master node.
Master/slave node	Device that operates as a master and slave node.
Master function parameters	Parameters for setting information such as connection type or I/O points, which are used to exchange I/O data with respective slave nodes when the QJ71DN91 is used as a master node. Configured in sequence programs or the functions for DeviceNet of GX Works2.
Auto configuration	Function that detects slave nodes on the network and automatically creates master function parameters. Two options are available: "All configuration" used for detecting all slave nodes on the network and "Add configuration" used for detecting the slave nodes added to the network. This function can reduce programming steps for master function parameter setting. Executed in sequence programs or the functions for DeviceNet of GX Works2.
Slave function parameters	Parameters provided for changing the number of I/O points for a slave node when the QJ71DN91 is used as a slave node. Configured in sequence programs or the functions for DeviceNet of GX Works2.
Auto communication start setting	Setting by which I/O communications automatically start at power-up. Configured in sequence programs or the functions for DeviceNet of GX Works2.
Buffer memory	Memory inside the QJ71DN91, in which data are temporarily stored. Used for storing parameter settings and I/O data. Parameters are stored on a flash ROM after debugging. I/O data are transferred to devices of a programmable controller CPU by automatic refresh or sequence program.
Flash ROM	Memory inside the QJ71DN91, which stores parameters saved in the following buffer memory areas: • Master Function Parameters (Address: 01D4H to 03CF$_H$) • Slave Function Parameters (Address: 060EH, 060F$_H$) • Auto Communication Start Setting (Address: 0631$_H$) Parameters saved on the flash ROM are automatically loaded to the buffer memory when power is turned on from off or when the CPU module is reset.
Automatic refresh	Automatic data transfer between the buffer memory and devices of a programmable controller CPU. Configured in Auto refresh setting in the functions for DeviceNet of GX Works2.

PACKING LIST

The following are included in the package.

Model	Product name	Quantity
QJ71DN91	QJ71DN91 DeviceNet master/slave module	1
	Terminating resistor 121Ω, 1/4W	2
	Connector	1

A - 14

1 OVERVIEW

This manual provides descriptions such as the specifications and parts names of the QJ71DN91 DeviceNet master/slave module, which is used in combination with a MELSEC-Q series programmable controller CPU.
For the DeviceNet specifications, refer to the DeviceNet Specifications (Release 2.0) Volumes 1 and 2.
DeviceNet is a trademark of ODVA, Inc.

POINT
The QJ71DN91 is assumed to be compatible with most of DeviceNet products on the market. However, the compatibility with products manufactured by other vendors is not guaranteed.

1.1 Features

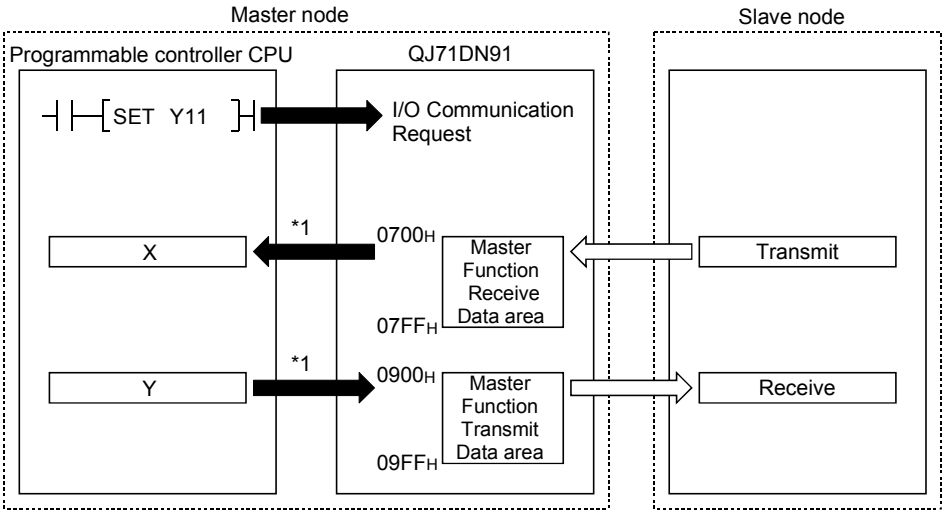
This section explains the features of the QJ71DN91.

(1) Operating as a DeviceNet master node

The QJ71DN91 is compliant with the DeviceNet Specifications (Release2.0) and can operate as a master node.

(a) I/O communication function (Refer to Section 4.1.)

1) The QJ71DN91 can exchange I/O data with slave nodes (max. 63 nodes) using its own buffer memory.
Communications of 512 bytes of inputs (up to 256 bytes per node) and 512 bytes of outputs (up to 256 bytes per node) are available.



*1: Performed by automatic refresh or sequence program.

2) One of the following connection types can be selected for each slave node.
- Polling
- Bit strobe
- Change of state
- Cyclic

1

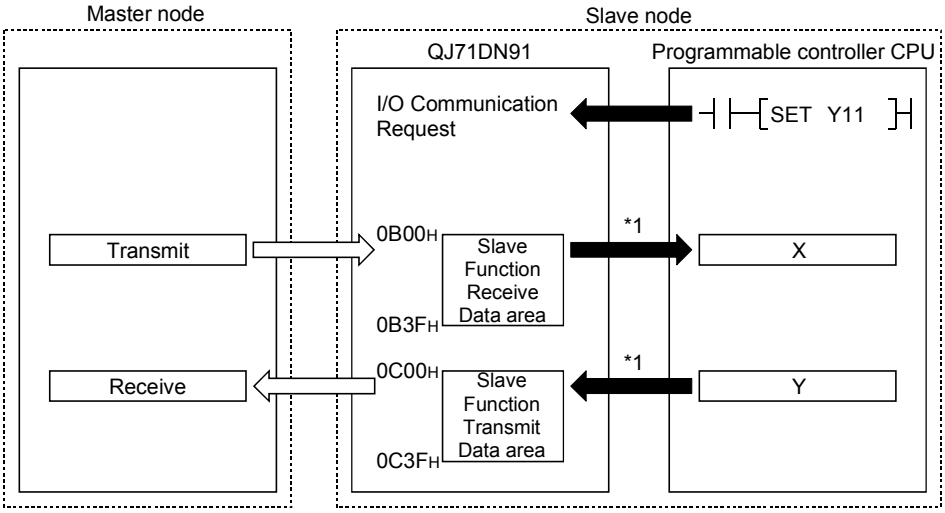
(b) Message communication function (Refer to Section 4.2.)
Using the buffer memory of the QJ71DN91, attribute data can be read from or written to slave nodes.
For details of other message communications, refer to the DeviceNet common service in the DeviceNet Specifications (Release2.0).
At one time, 240 bytes of message data can be transferred.

(c) Creating master function parameters using auto configuration
The QJ71DN91 can detect slave nodes on the network and automatically create master function parameters.
Since programming steps for setting master function parameters are not required, steps for the overall sequence program can be reduced.

(2) Operating as a DeviceNet slave node

The QJ71DN91 is compliant with the DeviceNet Specifications (Release2.0) and can operate as a DeviceNet slave node.

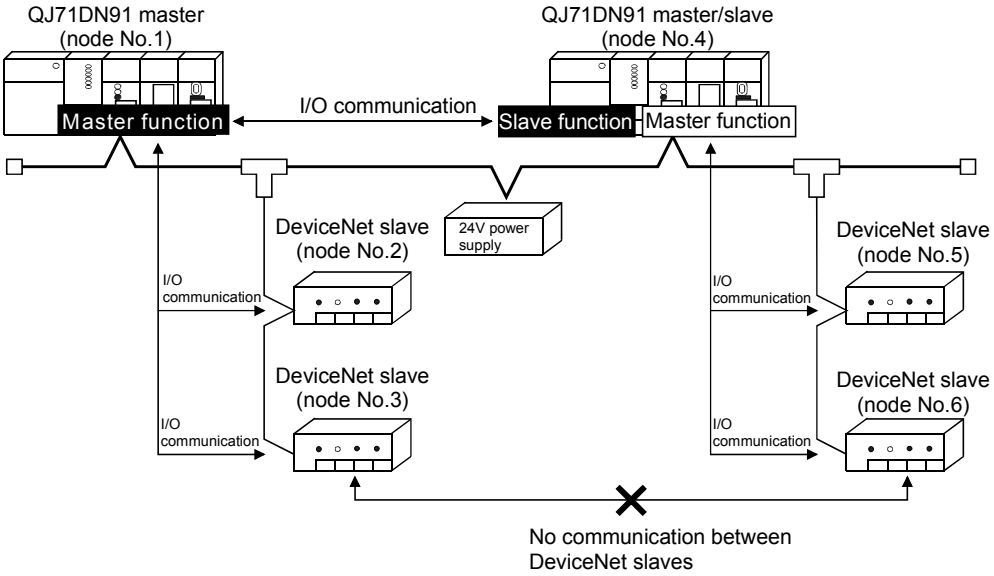
(a) I/O communication function (Refer to Section 4.3.)
1) The QJ71DN91 can exchange I/O data with a master node using its own buffer memory.
It can exchange 128 bytes of inputs and 128 bytes of outputs.
2) The connection type is polling.



*1: Performed by automatic refresh or sequence program.

(3) Operating as a DeviceNet master/slave node

The QJ71DN91can operate as a master and slave node concurrently.



(4) Preventing inconsistency of I/O data

When I/O data is read from/written to the buffer memory of the QJ71DN91, data inconsistency can be avoided using Data consistency dedicated instruction (DNTMRD, DNTMWR, DNTSRD, DNTSWR). (Refer to Chapter 9.)

(5) Easy setting using GX Works2

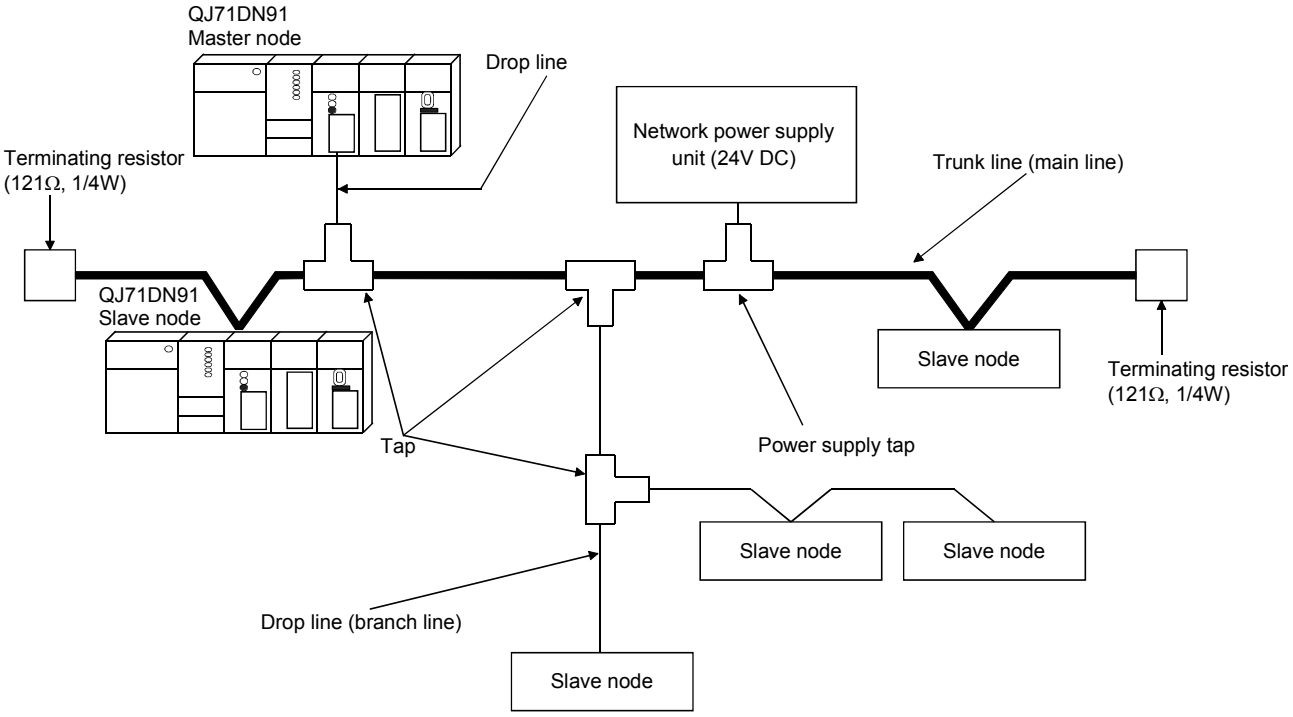
The number of sequence programs can be reduced since settings of the QJ71DN91 can be configured on GX Works2.
Also, GX Works2 simplifies checking of the module settings and operation status.

2 SYSTEM CONFIGURATION

This chapter explains the system configuration of DeviceNet.

2.1 Overall Configuration

The number of modules connectable to a DeviceNet network is 64, including master, slave and master/slave nodes.
The QJ71DN91 can be used as a master node, a slave node or a master/slave node.
The following shows an example of a system configuration:



(1) DeviceNet cables, taps and terminating resistors

DeviceNet cables are used as a trunk line and drop lines.
Each node is connected to the trunk line directly, or connected to a drop line via a tap from the trunk line. Nodes need not be wired in order of node numbers.
Connect terminating resistors at both ends of the trunk line.

(2) Network power supply unit and power supply tap

In addition to power supply for each node, connect a network power supply unit to distribute power to the communication circuit.
Connect a power supply tap to the trunk line, and install a network power supply unit.

POINT
To minimize the affect of noise, keep DeviceNet cables, power cables, and signal lines of I/O modules away from each other.

2 - 1

Remarks

Please inquire to ODVA about the following devices that are required to construct a DeviceNet network.

- Network power supply unit
- Power supply tap
- Tap
- Terminating resistor
- DeviceNet cable

Contact:
ODVA
www.odva.org

2 - 2

2.2 Applicable Systems

This section describes the applicable systems.

(1) Applicable modules and base units, and No. of modules

(a) When mounted with a CPU module

For the CPU modules and base units applicable to the QJ71DN91 and quantities for each CPU modules, refer to the user's manual for the CPU module used.

- The user's manual (Hardware Design, Maintenance and Inspection) for the CPU module used.

Remark

When the module is used with a C Controller module, refer to the user's manual for the C Controller module.

(b) Mounting to a MELSECNET/H remote I/O station

The QJ71DN91 cannot be mounted to any MELSECNET/H remote I/O station.

Mount it to a CPU module on a master node.

(2) Supported software packages

To use the QJ71DN91, GX Works2 Version 1.575Z or later is required.

(3) Remote operation is not allowed from another DeviceNet node

Each DeviceNet node on DeviceNet cannot read/write/monitor the sequence program or data of the programmable controller CPU where the QJ71DN91 is installed.

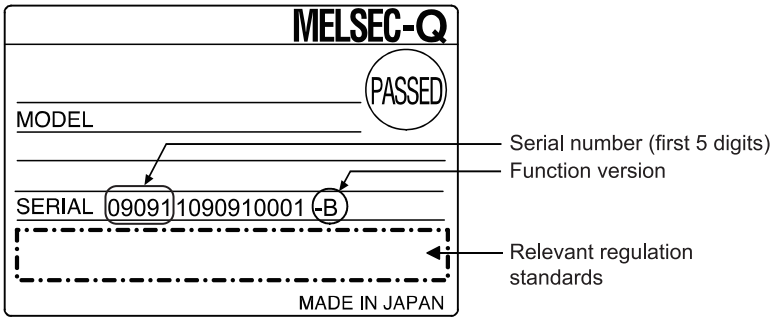
2.3 How to Check the Function Version and Serial Number

This section describes how to check the function version and serial number of the QJ71DN91.

(1) Checking the function version and serial number of the QJ71DN91

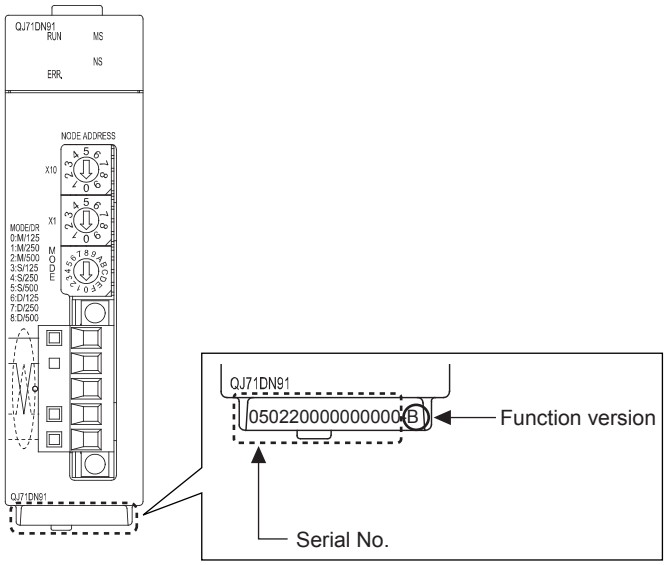
(a) Checking at "the SERIAL field of the rating plate" located on the side of the module

The serial number and function version of the module are shown in the SERIAL field of the rating plate.

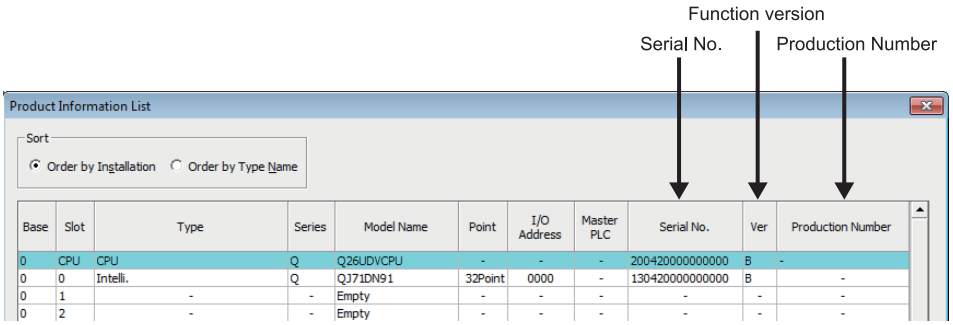


(b) Checking the front of the module

The serial number and function version are also printed on the front of the module (lower part).



(c) Confirming the serial number on the system monitor (Product Information List)



To display the system monitor, select [Diagnostics] → [System Monitor] → Product Inf. List of GX Works2.

1) Product number display
Since the QJ71DN91 does not support the product number display, "-" is displayed.

POINT

The serial No. displayed in the Product Information List of GX Works2 may be different from the one on the rating plate and the front of the module.

- The serial number on the raging plate and the front of the module indicates the management information on the product.
- The serial No. in the Product Information List of GX Works2 indicates the functional information on the product, which is updated when a new function is added.

2.4 Precautions on System Configuration

(1) DeviceNet products manufactured by other vendors

The QJ71DN91 is assumed to be compatible with most of the DeviceNet products on the market. However, the compatibility with products manufactured by other vendors is not guaranteed.

MEMO

2 - 7

3 SPECIFICATIONS

This chapter provides the performance specifications of the QJ71DN91, I/O signals used with a programmable controller CPU, and buffer memory specifications.
For the general specifications for the QJ71DN91, refer to the User's Manual (Hardware) of the CPU module used.

3.1 Performance Specifications

Table 3.1 shows the performance specifications of the QJ71DN91.

Table 3.1 Performance specifications

<table>
<tr><th colspan="5">Item</th><th colspan="6">Specification</th></tr>
<tr><td rowspan="15">Communication specifications</td><td rowspan="7">Master function</td><td colspan="3">Node type</td><td colspan="6">DeviceNet master (Group 2 only client)</td></tr>
<tr><td colspan="3">Node No.</td><td colspan="6">0 to 63</td></tr>
<tr><td rowspan="2">Number of connections</td><td colspan="2">Message connection</td><td colspan="6">63</td></tr>
<tr><td colspan="2">I/O connection</td><td colspan="6">63 (polling, bit strobe, change of state, cyclic)</td></tr>
<tr><td rowspan="4">Communication data size</td><td rowspan="2">I/O communication</td><td>Send</td><td colspan="6">Max. 4096 points (512 bytes), max. 256 bytes per node</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 4096 points (512 bytes), max. 256 bytes per node</td></tr>
<tr><td rowspan="2">Message communication</td><td>Send</td><td colspan="6">Max. 240 bytes</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 240 bytes</td></tr>
<tr><td rowspan="5">Slave function</td><td colspan="3">Node type</td><td colspan="6">DeviceNet slaves (Group 2 server)</td></tr>
<tr><td colspan="3">Node No.</td><td colspan="6">0 to 63</td></tr>
<tr><td>Number of connections</td><td colspan="2">I/O connection</td><td colspan="6">1 (polling)</td></tr>
<tr><td rowspan="2">Communication data size</td><td rowspan="2">I/O communication</td><td>Send</td><td colspan="6">Max. 1024 points (128 bytes)</td></tr>
<tr><td>Receive</td><td colspan="6">Max. 1024 points (128 bytes)</td></tr>
<tr><td colspan="5">Communication speed</td><td colspan="6">Selectable from 125 kbps, 250 kbps and 500kbps.</td></tr>
<tr><td colspan="5" rowspan="5">Maximum cable length *</td><td rowspan="2">Communication speed</td><td colspan="3">Maximum trunk line distance</td><td colspan="2">Drop line length</td></tr>
<tr><td>Thick cables</td><td>Thin cables</td><td>Combination of thick and thin cables</td><td>Maximum</td><td>Total</td></tr>
<tr><td>125 kbaud</td><td>500m</td><td rowspan="3">100m</td><td rowspan="3">See Section 3.1.1</td><td rowspan="3">6m</td><td>156m</td></tr>
<tr><td>250 kbaud</td><td>250m</td><td>78m</td></tr>
<tr><td>500 kbaud</td><td>100m</td><td>39m</td></tr>
<tr><td colspan="5">Current consumption required on the network</td><td colspan="6">0.03 A</td></tr>
<tr><td colspan="6">Number of writes to flash ROM</td><td colspan="6">Max. 100000 times</td></tr>
<tr><td colspan="6">No. of occupied I/O points</td><td colspan="6">32 points (I/O allocation: Intelligent 32 points)</td></tr>
<tr><td colspan="6">5 V DC internal current consumption</td><td colspan="6">0.17 A</td></tr>
<tr><td colspan="6">Weight</td><td colspan="6">0.13kg</td></tr>
</table>

* : The maximum cable length complies with the DeviceNet Specifications (Release 2.0) Volumes 1 and 2.

3.1.1 Maximum trunk line distance when using thick and thin cables

The maximum transmission distance in the case of using thick and thin cables is shown below.

Table 3.2 Maximum trunk line distance when using thick and thin cables

Communication speed	Maximum trunk line distance when using thick and thin cables
125 kbaud	Thick cable length + 5 × Thin cable length < 500m
250 kbaud	Thick cable length +2.5 × Thin cable length < 250m
500 kbaud	Thick cable length + Thin cable length < 100m

3 - 2

3.2 Function Lists

The functions of the QJ71DN91 are listed below.

(1) List of master and slave functions

Table 3.3 List of master and slave functions

Function		Description	Reference section
Master function	I/O communication	The QJ71DN91 master node can exchange I/O data with each slave node (up to 63 nodes), using its own buffer memory. Transfer of 512 input bytes (up to 256 bytes per node) and 512 output bytes (up to 256 bytes per node) is available. The connection type is selectable for each slave node.	4.1
	Message communication	The QJ71DN91 master node can read attribute data from or write them to slave nodes, using its own buffer memory. For further details, refer to the DeviceNet common service in the DeviceNet Specifications (Release2.0). Up to 240 bytes of message data can be transferred at a time.	4.2
Slave function	I/O communication	The QJ71DN91 slave node can exchange I/O data with the master node, using its own buffer memory. Transfer of 128 input bytes and 128 output bytes is available. The connection type is polling method.	4.3

(2) List of configuration functions

Table 3.4 List of configuration functions

Function	Description	Reference section
Saving data to flash ROM	The following parameters in the buffer memory can be stored in the flash ROM inside the QJ71DN91: • Parameters for Master Function (Address: 01D4H to 03CFH) • Parameters for Slave Function (Address: 060EH, 060FH) • Auto Communication Start Setting (Address: 0631H) The parameters saved in the flash ROM are automatically loaded to the buffer memory when power is turned on from off or when the CPU module is reset.	7.3 (3) 8.2 (2)
Auto configuration	This function detects slave nodes on the network, allowing automatic configuration of master function parameters. Two options are available: "All configuration" used for detecting all slave nodes on the network and "Add configuration" used for detecting the slave node(s) added to the network. Programming steps for setting the master function parameters can be reduced.	3.4.5 (2) 7.3 (2)

3.3 I/O Signals for Programmable Controller CPU

This section explains the input/output signals that the QJ71DN91 sends to or receives from a programmable controller CPU.

3.3.1 I/O signal list

The I/O signal assignments shown are based on the case where the start I/O No. of the QJ71DN91 is "0000" (mounted to slot 0 of a main base unit).
Device X denotes an input signal from the QJ71DN91 to the programmable controller CPU.
Device Y denotes an output signal from the programmable controller CPU to the QJ71DN91.
Table 3.5 lists the I/O signals used for the programmable controller CPU.

Table 3.5 I/O signal list

QJ71DN91 → Programmable controller CPU				Programmable controller CPU → QJ71DN91			
Input No.	Signal name	Availability		Output No.	Signal name	Availability	
		Master function	Slave function			Master function	Slave function
X00	Watchdog Timer Error	○	○	Y00	Use prohibited	—	—
X01	I/O Communicating	○	○	Y01			
X02	Message Communication Completion	○	—	Y02			
X03	Error Set Signal for Master Function	○	—	Y03			
X04	Slave Down Signal	○	—	Y04			
X05	Message Communication Error Signal	○	—	Y05			
X06	Saving Parameters to Flash ROM	○	○	Y06			
X07	Parameters Saved to Flash ROM	○	○	Y07			
X08	Error Set Signal for Slave Function	—	○	Y08			
X09	Use prohibited	—	—	Y09			
X0A	H/W Test in Progress	For hardware test		Y0A			
X0B	H/W Test Completion	For hardware test		Y0B			
X0C	H/W Test Error Detection	For hardware test		Y0C			
X0D	Use prohibited	—	—	Y0D			
X0E				Y0E			
X0F	Module Ready	○	○	Y0F			
X10	Use prohibited	—	—	Y10			
X11				Y11	I/O Communication Request	○	○
X12				Y12	Message Communication Request	○	—
X13				Y13	Error Reset Request for Master Function	○	—
X14	Auto-Configuring	○	—	Y14	Use prohibited	—	—
X15	Auto Configuration Completion	○	—	Y15	Auto Configuration Request	○	—
X16	Use prohibited	—	—	Y16	Use prohibited	—	—
X17				Y17	Request for Saving Parameters to Flash ROM	○	○
X18				Y18	Error Reset Request for Slave Function	—	○
X19				Y19	Use prohibited	—	—
X1A				Y1A			
X1B				Y1B			
X1C				Y1C			
X1D				Y1D			
X1E				Y1E			
X1F				Y1F			

IMPORTANT

Do not set any "use-prohibited" signal to on.
Doing so may cause malfunctions of the programmable controller system.

3.3.2 I/O signals for the master function

This section describes the on/off timings and conditions of the I/O signals used for the master function.

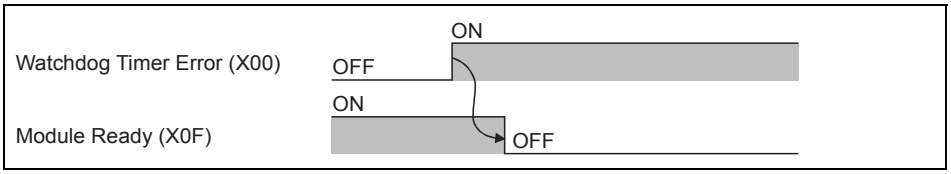
(1) Watchdog Timer Error (X00)

This is set to on when a hardware failure occurs in the QJ71DN91.

OFF: Module normal

ON: Module error

When Watchdog Timer Error (X00) is set to on, Module Ready (X0F) is set to off.



(2) I/O Communicating (X01), I/O Communication Request (Y11)

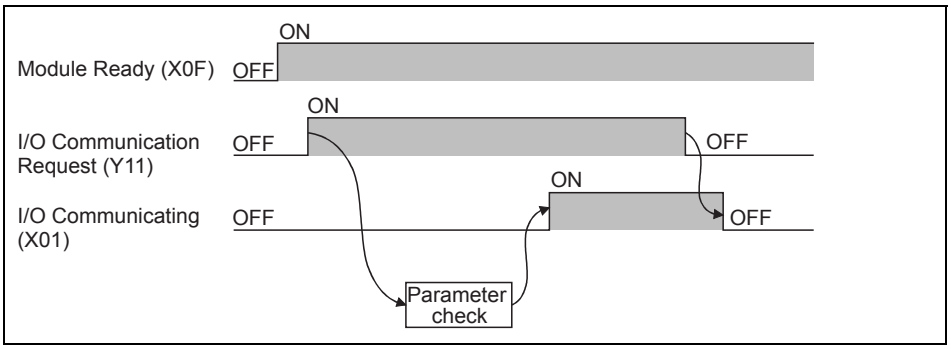
These signals are used to start I/O communications with each slave node.

Execute the signal action while Module Ready (X0F) is on.

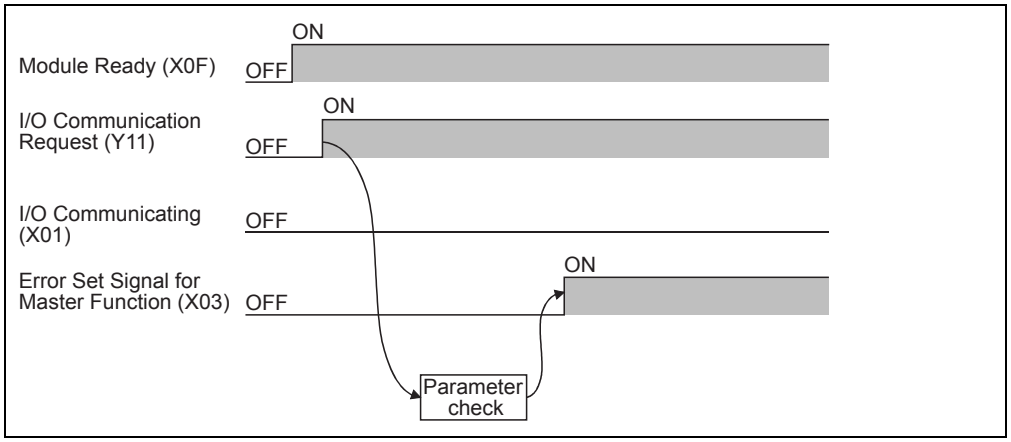
(a) When starting I/O communication by I/O Communication Request (Y11)

- When I/O Communication Request (Y11) is set to on, parameters are checked.
- If the parameter check is completed successfully, I/O communication with each slave node is started and I/O Communicating (X01) is set to on.
- If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) is set to on. At this time, I/O Communicating (X01) is not set to on.
  For details of Error Set Signal for Master Function (X03), refer to Section (4).
- Setting I/O Communication Request (Y11) to off stops I/O communication with each slave node, causing I/O Communicating (X01) to turn off.

When parameter check completed successfully



When parameter check failed



POINT

(1) I/O Communicating (X01) is not set to on even if I/O Communication Request (Y11) is turned on with the following output signals set to on,
- Auto Configuration Request (Y15)
- Request for Saving Parameters to Flash ROM (Y17)

Turn off the output signals, and set I/O Communication Request (Y11) to on from off.

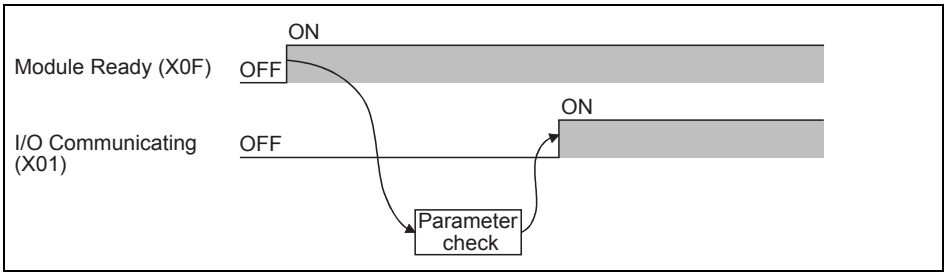
(2) To stop I/O communication, set I/O Communication Request (Y11) and after 200ms or more has elapsed, reset it.

3 - 6

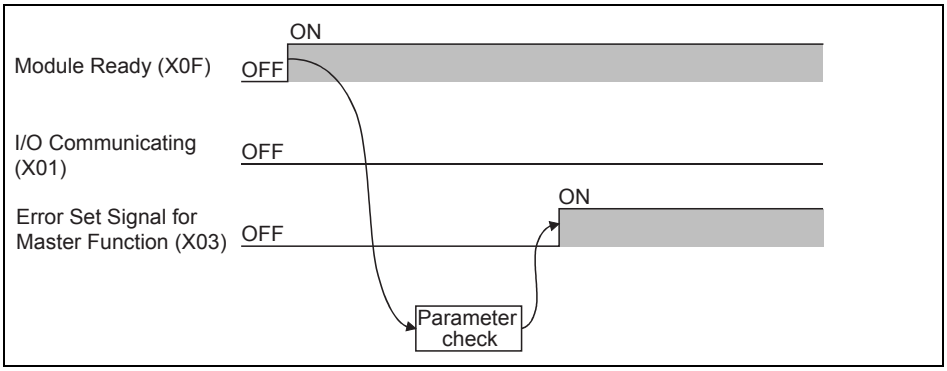
(b) When starting I/O communication automatically at power-up
Set "Start" in Automatic Communication Start Setting (address: 0631H).

- When power is turned on, Module Ready (X0F) is set to on and parameters are checked.
- If the parameter check is completed successfully, I/O communication with each slave node is started and I/O Communicating (X01) is set to on.
- If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) is set to on. At this time, I/O Communicating (X01) is not set to on.
  For details of Error Set Signal for Master Function (X03), refer to Section (4).
- Setting I/O Communication Request (Y11) to on and then off stops I/O communication with each slave node, causing I/O Communicating (X01) to turn off.

When parameter check completed successfully



When parameter check failed



3 - 7

(3) Message Communication Completion (X02), Message Communication Error Signal (X05), Message Communication Request (Y12)

These signals are used for message communication. Execute each signal action when Master Function Communication Status (address: 01B0H) is "OPERATE (C0H)" or "STOP (40H)".

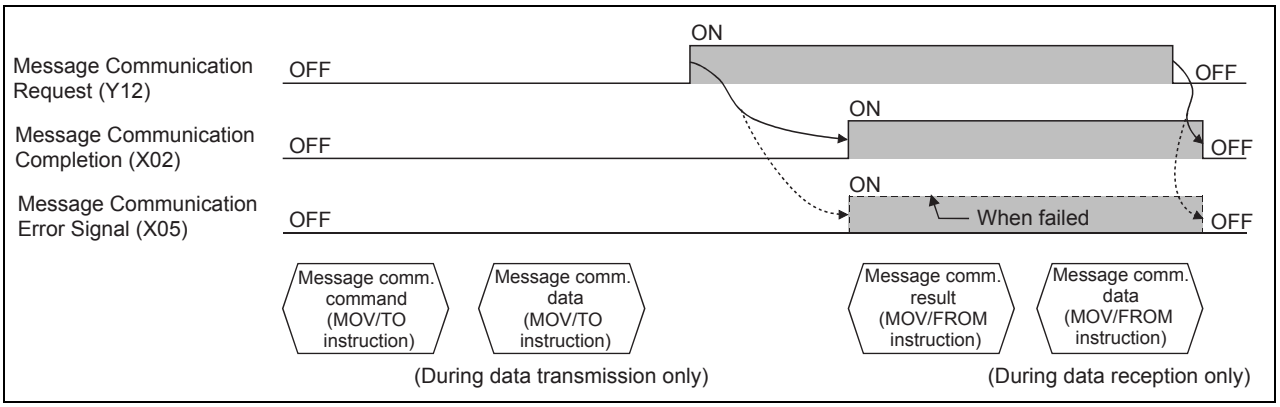
POINT

For message communications, the master function parameters must be set.
If the master function parameters have not been set, a message connection is opened using message group 1.

(a) After setting command data in Message Communication Command (address: 0110H to 011FH), when Message Communication Request (Y12) is set to on, message communication is started.
(Allow an interval of 100ms or more between turn-on actions of Message Communication Request (Y12).)

(b) Upon completion of a message communication, the processing result is stored in Message Communication Result (address: 0120H to 012FH), and Message Communication Completion (X02) is set to on.
When failed, Message Communication Error Signal (X05) is set to on.

(c) Setting Message Communication Request (Y12) to off causes Message Communication Completion (X02) and Message Communication Error Signal (X05) to turn off.

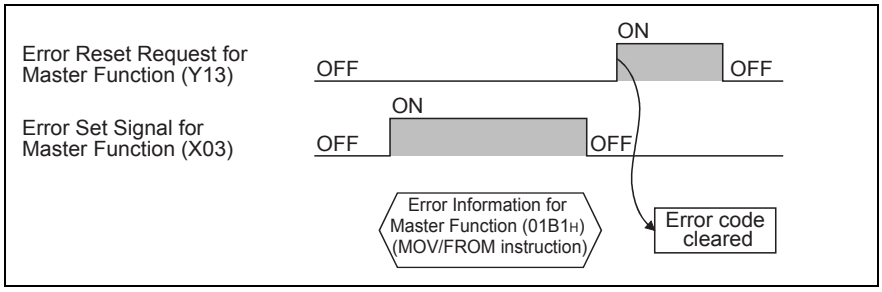


(4) Error Set Signal for Master Function (X03), Error Reset Request for Master Function (Y13)

These signals are used for notification of an error occurred during master function execution and for error code resetting.

(a) When a master function error occurs, the error information is stored in Error Information for Master Function (address: 01B1H), and Error Set Signal for Master Function (X03) is set to on.
When the error is corrected, Error Set Signal for Master Function is set to off. (While I/O communication is stopped, however, it is not set to off.)

(b) After the error is removed, setting Error Reset Request for Master Function (Y13) to on clears the error code in Error Information for Master Function (address: 01B1H).



(5) Slave Down Signal (X04)

This signal indicates whether or not there is a slave node that is in I/O communication stop status (a failed node).

(a) If any one of the slave nodes that are set by parameters is detected as a failed node, this signal is set to on.
OFF: All nodes communicating normally
ON: Faulty node exists

(b) Slave Down Signal (X04) is set to off when communication with the failed node resumes.

POINT
(1) The I/O communication status of each slave node can be confirmed at Node Communication Status (address: 01BCH to 01BFH). (2) Reserved nodes are recognized as failed nodes. To prevent a reserved node from being detected as a failed node, turn on the corresponding bit in Failed Node Detection Setting (address: 01CCH to 01CFH).

(6) Saving Parameters to Flash ROM (X06), Parameters Saved to Flash ROM (X07), Request for Saving Parameters to Flash ROM (Y17)

These signals are used to save the parameters in the buffer memory to the flash ROM. Execute each signal action while I/O Communicating (X01) is off.

(a) When Request for Saving Parameters to Flash ROM (Y17) is set to on, parameters are checked.

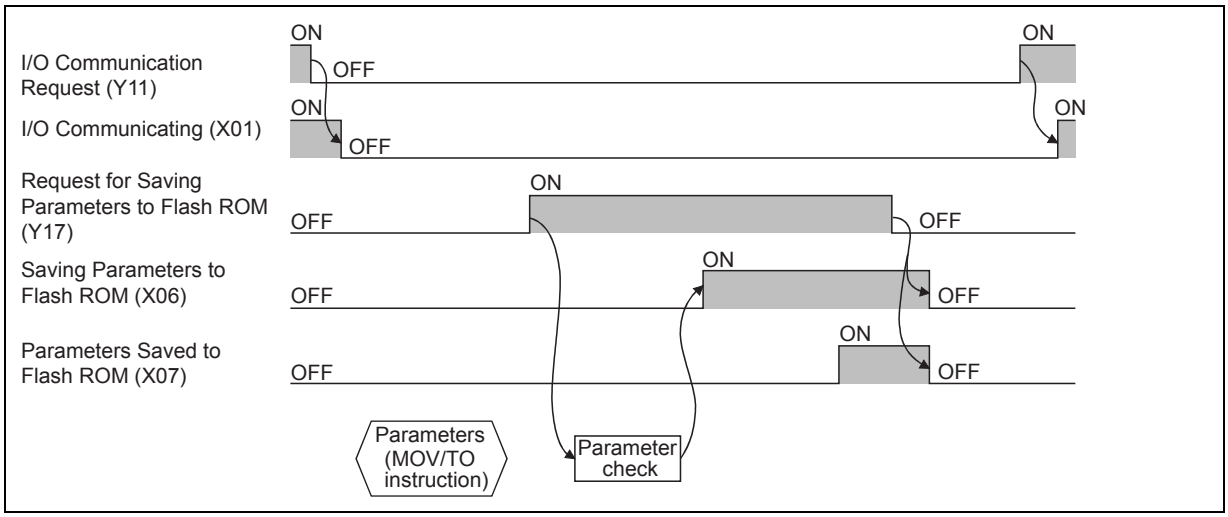
(b) If the parameter check is completed successfully, saving the parameters to the flash ROM is started, and Saving Parameters to Flash ROM (X06) is set to on.

(c) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) or Error Set Signal for Slave Function (X08) is set to on.
For details of Error Set Signal for Master Function (X03), refer to Section (4).
For details of Error Set Signal for Slave Function (X08), refer to Section 3.3.3 (4).

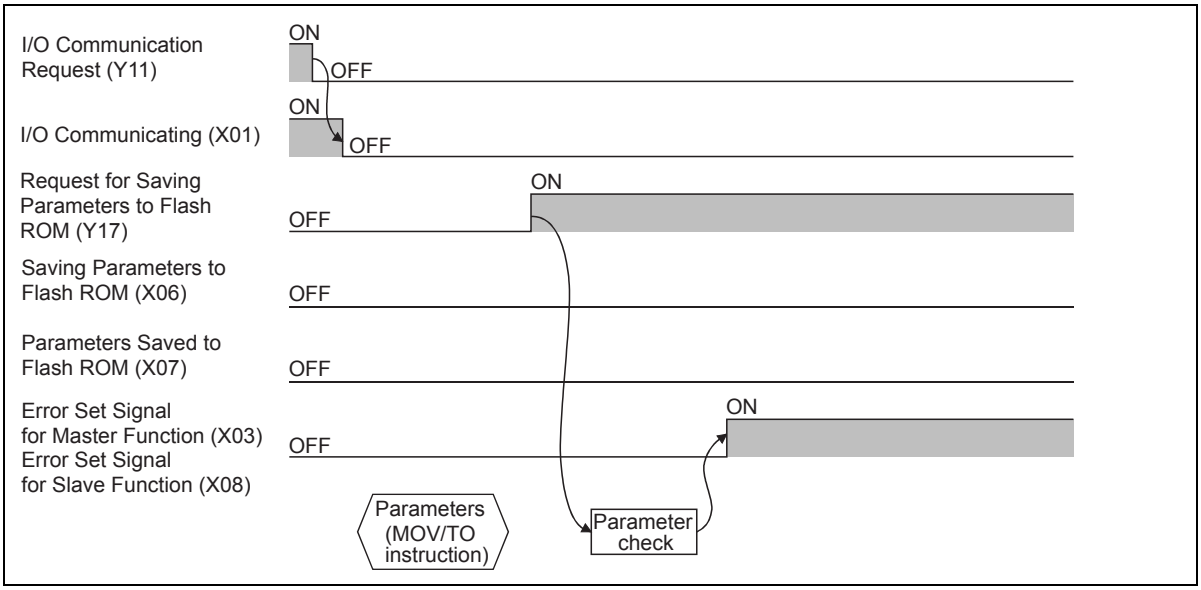
(d) Upon completion of parameter saving to the flash ROM, Parameters Saved to Flash ROM (X07) is set to on.

(e) When Request for Saving Parameters to Flash ROM (Y17) is set to off, Saving Parameters to Flash ROM (X06) and Parameters Saved to Flash ROM (X07) are set to off.

When parameter check completed successfully



When parameter check failed



POINT

(1) Even if Request for Saving Parameters to Flash ROM (Y17) is set to on while I/O Communicating (X01) is on, Parameters Saved to Flash ROM (X07) is not set to on. Set I/O Communication Request (Y11) to on, and after confirming that I/O Communicating (X01) is off, set Request for Saving Parameters to Flash ROM (Y17) to off and then on.

(2) Even if Request for Saving Parameters to Flash ROM (Y17) is set to on while the following output signal is on, Parameters Saved to Flash ROM (X07) is not set to on.
- I/O Communication Request (Y11)
- Auto Configuration Request (Y15)

Set the output signal to off, and then set Request for Saving Parameters to Flash ROM (Y17) to off and then on.

(3) Since there is a restriction on the number of writes to Flash ROM, execute Request for Saving Parameters to Flash ROM (Y17) only when parameters are newly created or changed.

(7) Module Ready (X0F)

This signal indicates whether or not the QJ71DN91 is operable.
When the QJ71DN91 is ready to operate, it is set to on.
When Watchdog Timer Error (X00) turns on, this Module Ready (X0F) is set to off.

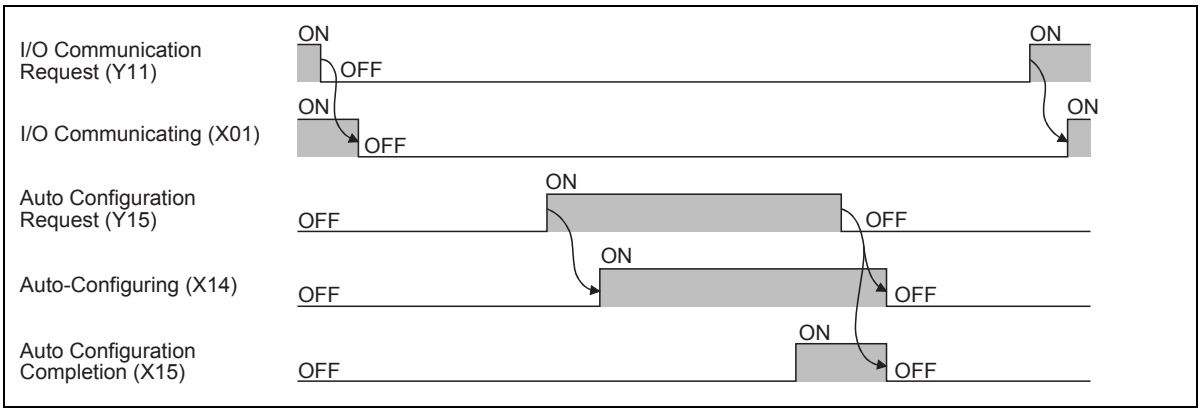
(8) Auto-Configuring (X14), Auto Configuration Completion (X15), Auto Configuration Request (Y15)

These signals are used to configure parameters automatically. Execute them while I/O Communicating (X01) is off.

(a) When Auto Configuration Request (Y15) is set to on, auto configuration starts and Auto-Configuring (X14) is set to on.
Up to approx. 60 seconds are needed for completion of auto configuration.

(b) Upon completion of auto configuration, parameters are stored in Parameters for Master Function (address: 01D4H to 03CFH) and Auto Configuration Completion (X15) is set to on.

(c) When Auto Configuration Request (Y15) is set to off, Auto-Configuring (X14) and Auto Configuration Completion (X15) are set to off.



POINT

Auto Configuration Completion (X15) is not set to on even if Auto Configuration Request (Y15) is set to on while the following output signals are on.

- I/O Communication Request (Y11)
- Request for Saving Parameters to Flash ROM (Y17)

Turn the output signals to off, and set Auto Configuration Request (Y15) to on from off again.

(9) H/W Test in Progress (X0A), H/W Test Completion (X0B), H/W Test Error Detection (X0C)

The hardware test status is indicated.
For the hardware test, refer to Section 5.4.

(a) Turning on the module with the mode set to 9 starts the hardware test, and H/W Test in Progress (X0A) is set to on.

(b) Upon normal completion of the hardware test, H/W Test Completion (X0B) is set to on.

(c) If a failure occurs in the hardware test, H/W Test Error Detection (X0C) is set to on. At this time, H/W Test Completion (X0B) is not set to on.

3.3.3 I/O signals for the slave function

This section describes the on/off timings and conditions of the I/O signals used for the slave function.

(1) Watchdog Timer Error (X00)

Refer to Section 3.3.2 (1).

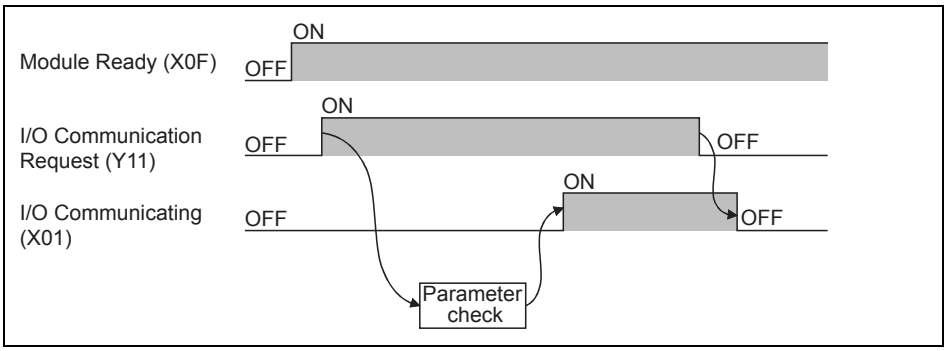
(2) I/O Communicating (X01), I/O Communication Request (Y11)

These are used to start I/O communication with a master node.
Execute these signal actions while Module Ready (X0F) is on.

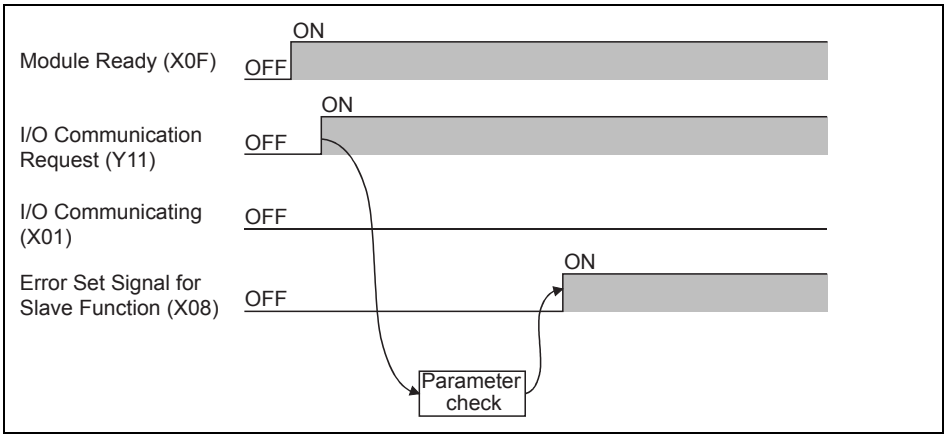
(a) When starting I/O communication by I/O Communication Request (Y11)

- When I/O Communication Request (Y11) is set to on, parameters are checked.
- If the parameter check is completed successfully, I/O communication with the master node is started and I/O Communicating (X01) is set to on. Note that, until receiving an I/O communication request from the master node, the module waits for connection establishment.
- If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Slave Function (X08) is set to on. At this time, I/O Communicating (X01) is not set to on.
  For details of Error Set Signal for Slave Function (X08), refer to Section (4).
- Setting I/O Communication Request (Y11) to off stops I/O communication with the master node, causing I/O Communicating (X01) to turn off.

When parameter check completed successfully



When parameter check failed



POINT

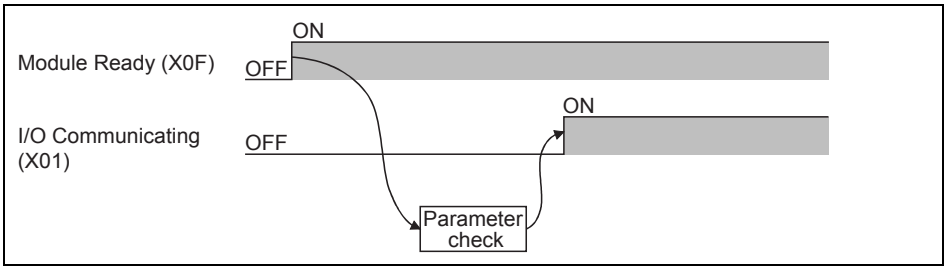
(1) I/O Communicating (X01) is not set to on even if I/O Communication Request (Y11) is turned on with the following output signals set to on,
- Auto Configuration Request (Y15)
- Request for Saving Parameters to Flash ROM (Y17)

Turn off the output signals, and set I/O Communication Request (Y11) to on from off.

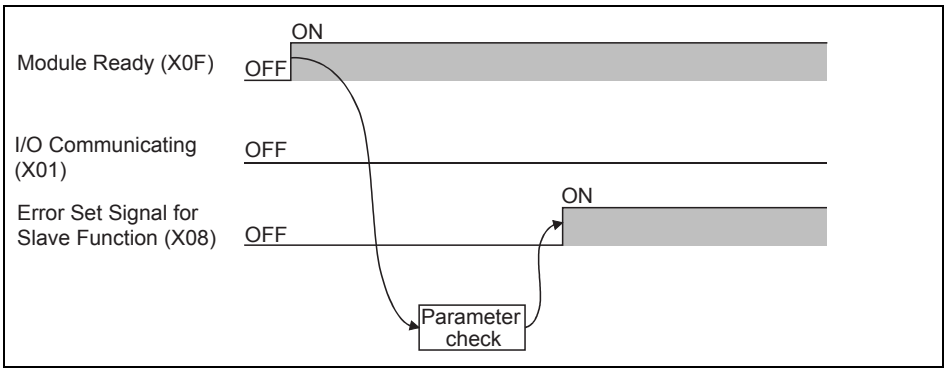
(2) To stop I/O communication, set I/O Communication Request (Y11) and after 200ms or more has elapsed, reset it.

(b) When starting I/O communication automatically at power-up
Set "Start" in Automatic Communication Start Setting (address: 0631H).
- When power is turned on, Module Ready (X0F) is set to on and parameters are checked.
- If the parameter check is completed successfully, I/O communication with the master node is started and I/O Communicating (X01) is set to on. Note that, until receiving an I/O communication request from the master node, the module waits for connection establishment.
- If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Slave Function (X08) is set to on. At this time, I/O Communicating (X01) is not set to on.
For details of Error Set Signal for Slave Function (X08), refer to Section (4).
- Setting I/O Communication Request (Y11) to on and then off stops I/O communication with the master node, causing I/O Communicating (X01) to turn off.

When parameter check completed successfully



When parameter check failed



(3) Saving Parameters to Flash ROM (X06), Parameters Saved to Flash ROM (X07), Request for Saving Parameters to Flash ROM (Y17)

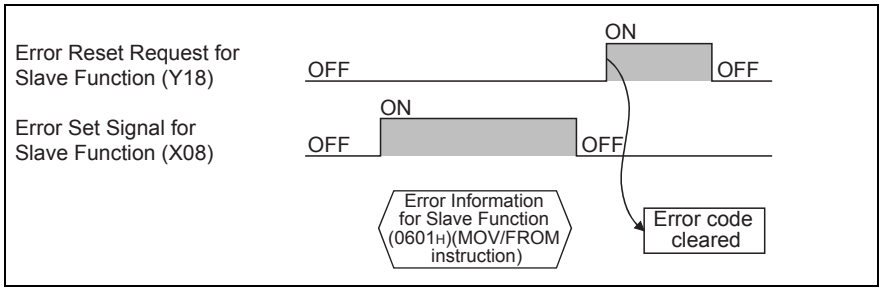
Refer to Section 3.3.2 (6).

(4) Error Set Signal for Slave Function (X08), Error Reset Request for Slave Function (Y18)

These signals are used for notification of an error occurred during slave function execution and for error code resetting.

(a) When a slave function error occurs, the error information is stored in Error Information for Slave Function (address: 0601_H), and Error Set Signal for Slave Function (X08) is set to on.
When the error is corrected, Error Set Signal for Slave Function (X08) is set to off. (While I/O communication is stopped, however, it is not set to off.)

(b) After the error is removed, setting Error Reset Request for Slave Function (Y18) to on clears the error code in Error Information for Slave Function (address: 0601_H).



(5) Module Ready (X0F)

Refer to Section 3.3.2 (7).

3 - 16

3.4 Buffer Memory

This section explains the buffer memory of the QJ71DN91.

3.4.1 Buffer memory list

The buffer memory list is shown in Table 3.6.

Table 3.6 Buffer memory list (1/3)

Address		Item	Description	Availability		Read/Write *1	Reference section
Hex.	Dec.			Master function	Slave function		
0000H to 010FH	0 to 271	Use prohibited	—	—	—	—	—
0110H to 011FH	272 to 287	Message Communication Command	A command for message communication is set.	○	—	R/W	3.4.2
0120H to 012FH	288 to 303	Message Communication Result	Stores result data of message communication.	○	—	R	
0130H to 01A7H	304 to 423	Message Communication Data	Stores transmit and receive data of message communication.	○	—	R/W	
01A8H to 01AFH	424 to 431	Use prohibited	—	—	—	—	—
01B0H	432	Master Function Communication Status	Stores the communication status of the master function.	○	—	R	3.4.3
01B1H	433	Error Information for Master Function	Stores a communication error code of the error occurred.	○	—	R	
01B2H	434	Bus Error Counter	Stores an illegal frame count of the CAN chip (communication chip for DeviceNet) when it exceeds 96.	○	—	R	
01B3H	435	Bus Off Counter	Stores the number of times the QJ71DN91 was placed in the bus off status.	○	—	R	
01B4H to 01B7H	436 to 439	Node Configuration Status	Stores parameter setting status of each slave node.	○	—	R	3.4.4
01B8H to 01BBH	440 to 443	Use prohibited	—	—	—	—	—
01BCH to 01BFH	444 to 447	Node Communication Status	Stores I/O communication status of each slave node.	○	—	R	3.4.4
01C0H to 01C3H	448 to 451	Node Communication Error Status	Stores I/O communication error status of each slave node.	○	—	R	
01C4H to 01C7H	452 to 455	Node Fault Status	Stores communication fault status of each slave node.	○	—	R	
01C8H to 01CBH	456 to 459	Use prohibited	—	—	—	—	—
01CCH to 01CFH	460 to 463	Failed Node Detection Setting	Whether or not to detect any failed node is set.	○	—	R/W	3.4.4
01D0H to 01D3H	464 to 467	Use prohibited	—	—	—	—	—
01D4H to 03CFH	468 to 975	Parameters for Master Function *2	Parameters for master function are set.	○	—	R/W	3.4.5
03D0H to 03EFH	976 to 1007	Use prohibited	—	—	—	—	—
03F0H	1008	Auto Configuration Operation Setting	Operation of auto configuration is set.	○	—	R/W	3.4.5
03F1H to 04FFH	1009 to 1279	Use prohibited	—	—	—	—	—
0500H to 05FBH	1280 to 1531	I/O Address Area for Master Function	Stores the start addresses and sizes (in word units) of Master Function Receive Data (address: 0700H to 07FFH) and Master Function Transmit Data (address: 0900H to 09FFH) for slave nodes.	○	—	R	3.4.6

Table 3.6 Buffer memory list (2/3)

Address		Item	Description	Availability		Read/Write *1	Reference section
Hex.	Dec.			Master function	Slave function		
05FC$_H$	1532	Present Link Scan Time	Stores the current link scan time. (Unit: ms)	○	—	R	3.4.7
05FD$_H$	1533	Minimum Link Scan Time	Stores the minimum link scan time after power-on. (Unit: ms).	○	—	R	
05FE$_H$	1534	Maximum Link Scan Time	Stores the maximum link scan time after power-on. (Unit: ms).	○	—	R	
05FF$_H$	1535	Use prohibited	—	—	—	—	—
0600$_H$	1536	Slave Function Communication Status	Stores the communication status of the slave function.	—	○	R	3.4.8
0601$_H$	1537	Error Information for Slave Function	Stores a communication error code of the error occurred in the slave function.	—	○	R	
0602$_H$ to 060D$_H$	1538 to 1549	Use prohibited	—	—	—	—	—
060E$_H$	1550	Slave Function Receive-Bytes Setting Area	The I/O receive data size (bytes) for the slave function is set.	—	○	R/W	3.4.9
060F$_H$	1551	Slave Function Transmit-Bytes Setting Area	The I/O transmit data size (bytes) for the slave function is set.	—	○	R/W	
0610$_H$ to 061F$_H$	1552 to 1567	Use prohibited	—	—	—	—	—
0620$_H$ to 0624$_H$	1568 to 1572	Model Name	Stores "QJ71DN91" in ASCII code.	○	○	R	3.4.11
0625$_H$	1573	Node No.	Stores the number of the node currently in operation.	○	○	R	
0626$_H$	1574	Mode Switch No.	Stores the mode switch number currently in operation.	○	○	R	
0627$_H$ to 062D$_H$	1575 to 1581	Use prohibited	—	—	—	—	—
062E$_H$	1582	Hardware Test Item Area	Stores the test item number of the hardware test or communication test that is currently being executed.	For hardware test		R	3.4.12
062F$_H$	1583	Hardware Test Result Area	Stores the result of the hardware test or communication test.	For hardware test		R	
0630$_H$	1584	Parameter Area Select Bit	Select the area of the parameters to be saved to a flash ROM.	○	○	R/W	3.4.13
0631$_H$	1585	Auto Communication Start Setting *2	Set whether or not to auto-start I/O communication with parameters saved on the flash ROM at the time of power on from off or CPU reset.	○	○	R/W	3.4.14
0632$_H$	1586	Operation Setting Area for Bus Off Error	Set whether or not to reset the QJ71DN91's CAN chip (communication chip) to restart communications in the event of a bus off error.	○	○	R/W	3.4.15
0633$_H$	1587	Data consistency dedicated instruction setting area	Enable or disable the execution of Data consistency dedicated instruction.	○	○	R/W	3.4.16
0634$_H$	1588	Data consistency dedicated instruction setting status area	Stores whether the execution of Data consistency dedicated instruction is enabled or disabled.	○	○	R	
0635$_H$ to 06FF$_H$	1589 to 1791	Use prohibited	—	—	—	—	—
0700$_H$ to 07FF$_H$	1792 to 2047	Master Function Receive Data	Stores the data received from each slave node.	○	—	R	3.4.6
0800$_H$ to 08FF$_H$	2048 to 2303	Use prohibited	—	—	—	—	—
0900$_H$ to 09FF$_H$	2304 to 2559	Master Function Transmit Data	Data to be sent to each slave node is set.	○	—	R/W	3.4.6
0A00$_H$ to 0AFF$_H$	2560 to 2815	Use prohibited	—	—	—	—	—
0B00$_H$ to 0B3F$_H$	2816 to 2879	Slave Function Receive Data	Stores the data received from the master node.	—	○	R	3.4.10

Table 3.6 Buffer memory list (3/3)

Address		Item	Description	Availability		Read/Write *1	Reference section
Hex.	Dec.			Master function	Slave function		
0B40H to 0BFFH	2880 to 3071	Use prohibited	—	—	—	—	—
0C00H to 0C3FH	3072 to 3135	Slave Function Transmit Data	Data to be sent to the master node is set.	—	○	R/W	3.4.10
0C40H to 7FFFH	3136 to 32767	Use prohibited	—	—	—	—	—

*1: Indicates whether or not data can be read or written from sequence programs.
R: Read only, R/W: Read/Write

*2: Can be saved to a flash ROM.
Parameters in the buffer memory are cleared when power is turned off or when the CPU module is reset, unless they are saved to a flash ROM.

3 - 19

3.4.2 Message communication area for master function

This area is used for the message communication of the master function.
For the execution timing, refer to Section 3.3.2 (3).

(1) Message Communication Command (address: 0110H to 011FH/272 to 287)

Set a command for message communication.

(a) Getting attribute data of a slave node

Table 3.7 Get Attribute

Buffer memory address (Hex.)	Item	Description
0110H	Command No.	0101H=Get Attribute
0111H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID	Low byte: Attribute ID of the object High byte: Always sets to 0.

(b) Setting attribute data into a slave node

Table 3.8 Set Attribute

Buffer memory address (Hex.)	Item	Description
0110H	Command No.	0102H =Set Attribute
0111H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID	Low byte: Attribute ID of the object High byte: Byte length of the attribute data to be set 1 to 240 (1H to F0H)

(c) Reading communication error information of a slave node

Table 3.9 Reading communication error information

Buffer memory address (Hex.)	Item	Description
0110H	Command No.	0001H =Reads Communication Error Information
0111H	Slave node No. (slave MAC ID)	Low byte: Node No. of the slave node (MAC ID) High byte: Always sets to 0.

(d) Resetting

Table 3.10 Reset

Buffer memory address (Hex.)	Item	Description
0110H	Command No.	0201H =Reset
0111H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0112H	Instance ID	Instance ID of the object

(e) Other message communications

Data to be set are shown below.

For details, refer to DeviceNet common service in the DeviceNet Specifications (Release2.0).

Table 3.11 Other message communications

Buffer memory address (Hex.)	Item	Description
0110H	Command No.	FE**H: Refer to DeviceNet Common Service for**.
0111H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0112H	Instance ID	Instance ID of the object
0113H	Attribute ID, data length	Low byte: Attribute ID of the object High byte: Byte length of the attribute data to be set 1 to 240 (1H to F0H)

(2) Message Communication Result (address: 0120H to 012FH/288 to 303)

The result of processing for message communication is stored.

(a) Getting attribute data of a slave node

Table 3.12 Get Attribute

Buffer memory address (Hex.)	Item	Description
0120H	Command No.	0101H =Get Attribute
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code (Refer to Section 10.2.2.)
0122H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID, data length	Low byte: Attribute ID of the object High byte: Byte length of the gotten attribute data 1 to 240 (1H to F0H)

(b) Setting attribute data of a slave node

Table 3.13 Set Attribute

Buffer memory address (Hex.)	Item	Description
0120H	Command No.	0102H =Set Attribute
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code (Refer to Section 10.2.2.)
0122H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID, data length	Low byte: Attribute ID of the object High byte: Byte length of the attribute data (1 to 240)

(c) Reading communication error information of a slave node

Table 3.14 Read communication error information

Buffer memory address (Hex.)	Item	Description
0120H	Command No.	0001H =Read communication error information
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code (Refer to Section 10.2.2.)

(d) Resetting

Table 3.15 Reset

Buffer memory address (Hex.)	Item	Description
0120H	Command No.	0201H =Reset
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code (Refer to Section 10.2.2.)
0122H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0123H	Instance ID	Instance ID of the object

(e) Other message communications

Table 3.16 Other message communications

Buffer memory address (Hex.)	Item	Description
0120H	Command No.	FE**H: Refer to DeviceNet Common Service for**.
0121H	Execution error code	Normal completion: 0000H Failed: Execution error code (Refer to Section 10.2.2.)
0122H	Slave node No. (slave MAC ID), class ID	Low byte: Node No. of the slave node (MAC ID) High byte: Class ID of the object
0123H	Instance ID	Instance ID of the object
0124H	Attribute ID, data length	Low byte: Attribute ID of the object High byte: Byte length of the gotten attribute data 1 to 240 (1H to F0H)

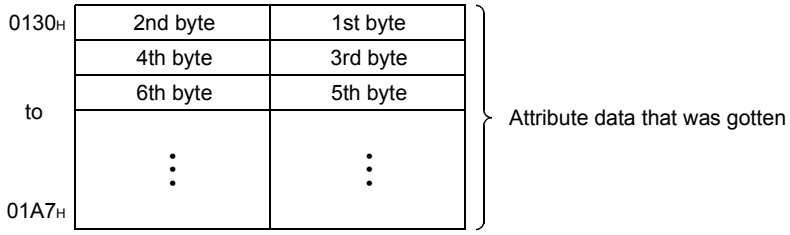
3 - 22

(3) Message Communication Data (address: 0130H to 01A7H /304 to 423)

This area stores data sent/received by message communications.

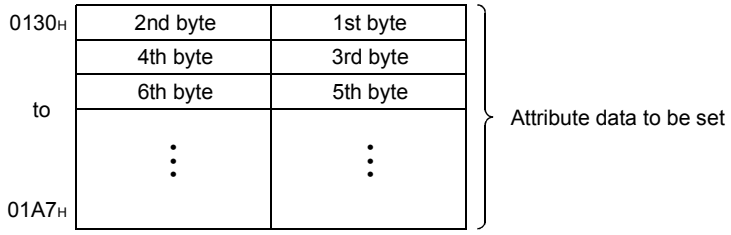
(a) Getting attribute data of a slave node

Attribute data is stored in units of bytes.



(b) Setting attribute data of a slave

Attribute data to be set is configured in units of bytes.



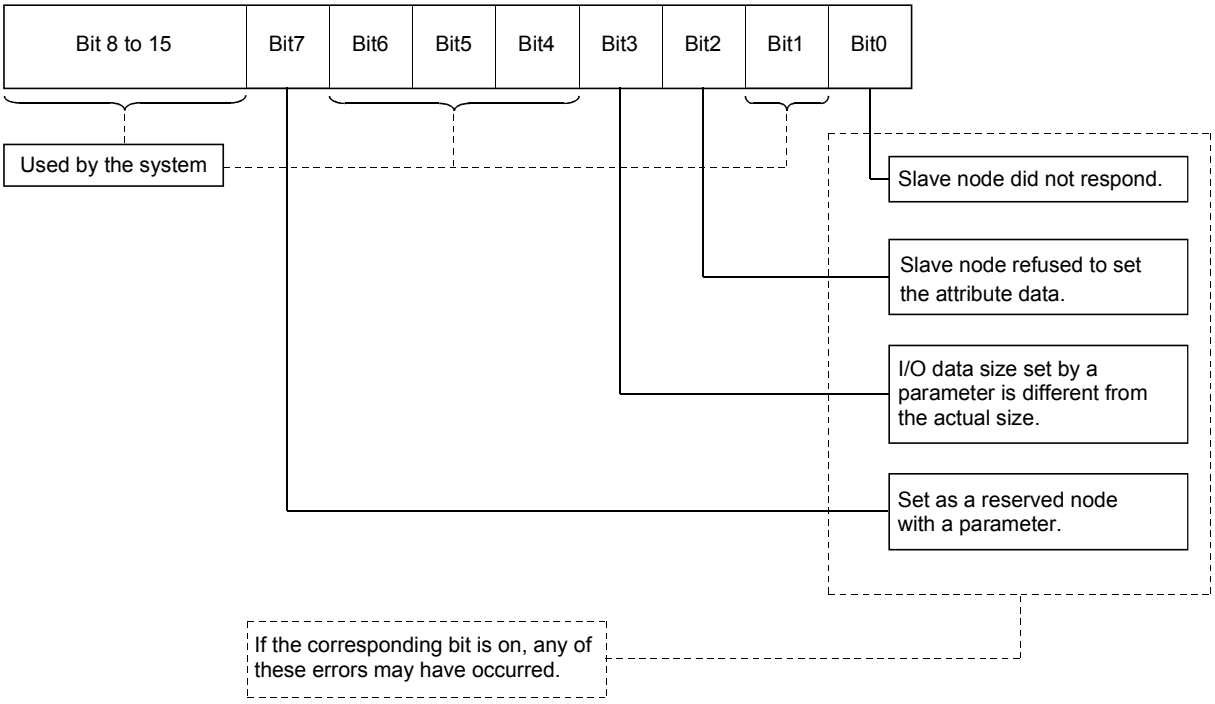
(c) Reading communication error information of a slave node
The communication error information that was read is stored.

Table 3.17 Reading communication error information

Buffer memory address (Hex.)	Item	Description
0130H	Slave status	Stores data showing whether or not the slave node is set with parameters, whether or not it has responded, etc. (See 1).)
0131H	Use prohibited	—
0132H	Communication error	Stores the same error code as in Error Information for Master Function (address 01B1H). (Refer to Section 10.2.1.)
0133H	General DeviceNet error code	Stores a general DeviceNet error code sent from the slave node. Valid only when the communication error code is 35 (0023H). (Refer to Section 10.2.3.) *1
0134H	Additional error code	Stores an additional error code sent from the slave node. *2
0135H	Heartbeat timeout count	Stores the number of times the QJ71DN91 has detected failure of each slave node.

*1: Refer to the manual of each slave node for actual failures and troubleshooting.
*2: Refer to the manual of each slave node for the meaning of each error code.

1) Slave status
The on/off status of each bit notifies of a slave node error as shown below.



(d) Other message communications
For details, refer to DeviceNet Specifications (Release2.0) Volumes 1 and 2.

3.4.3 Own node status area for master function

This area stores the communication status, error information, etc. of the master function.

(1) Master Function Communication Status (address: 01B0H/432)

The communication status of the master function is stored.

(a) High byte

The I/O communication status of the master node is stored.

Table 3.18 Master function I/O communication status

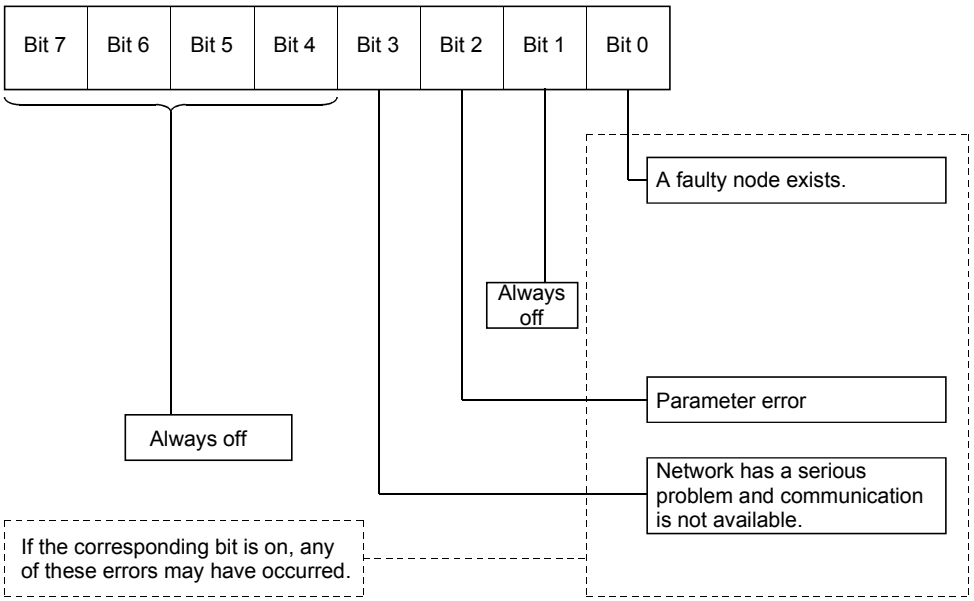
Value	Name	Operation
00H	Offline	Being initialized
40H	Stop	I/O communication stopped
C0H	Operate	I/O communication in progress

1) When "No start" is set for Auto Communication Start Setting (address: 0631H)
   Upon power-up, the status automatically changes from Offline (00H) to Stop (40H).
   When I/O Communication Request (Y11) is set to on, the status changes to Operate (C0H).
2) When "Start" is set for Auto Communication Start Setting (address: 0631H)
   Upon power-up, the status automatically changes from Offline (00H) to Operate (C0H).
3) When a reset message is received through the network
   The status automatically returns to Offline (00H), and then changes to Operate (C0H).

(b) Low byte

The communication status of the network is stored.

Depending on the communication status, each bit turns on/off as shown below.



3 - 26

(2) Error Information for Master Function (address: 01B1H/433)

A code for a communication error occurred in the master function is stored.
For error notification and a clearing method of this area, refer to Section 3.3.2 (4).

(a) High byte
An error code is stored. (Refer to Section 10.2.1.)

(b) Low byte
The number of the node (MAC ID), where an error occurred, is stored.
FEH, FFH (254, 255): Own node (QJ71DN91)
0H to 3FH (0 to 63): Node No. (MAC ID) of the slave node where an error occurred.

POINT
If errors occur at multiple nodes, the error information of the node with the smallest node No. (MAC ID) is stored.

(3) Bus Error Counter (address: 01B2H/434)

The number of times that the illegal frame count of the CAN chip (DeviceNet's communication chip) exceeded 96 is stored.
An increase of this value means that communications are unreliable.

(4) Bus Off Counter (address: 01B3H/435)

The number of times that the QJ71DN91 was placed in the bus off status is stored.
An increase of this value means that communications are unreliable.

3.4.4 Node status area for master function

The operation status of each slave node is stored in this area.

(1) Node Configuration Status (address: 01B4H to 01B7H/436 to 439)

The parameter setting status of each slave node is stored.

- When the corresponding bit is on: Parameters have already been set.
- When the corresponding bit is off: Parameters have not been set.

Table 3.19 Node No. corresponding to each bit in Node Configuration Status

Buffer memory address	Node No. corresponding to each bit				
(Hex.)	Bit 15	Bit 14	…	Bit 1	Bit 0
01B4H	Node 15	Node 14	…	Node 1	Node 0
01B5H	Node 31	Node 30	…	Node 17	Node 16
01B6H	Node 47	Node 46	…	Node 33	Node 32
01B7H	Node 63	Node 62	…	Node 49	Node 48

(a) Bit on timing

When a slave node executes the following, and when the parameter check is completed successfully, the bit corresponding to the slave node turns on.

- Starting I/O communication (Refer to Section 3.2.2 (2).)
- Saving master function parameters to flash ROM (Refer to Section 3.3.2 (6).)

(b) Bit off timing

1) Remove settings of a slave node from master function parameters and execute the following:
   - Starting I/O communication (Refer to Section 3.3.2 (6).)
   - Saving master function parameters to flash ROM (Refer to Section 3.3.2 (6).)

   When the parameter check is completed successfully, the bit corresponding to the slave node turns off.
2) When the master node is powered on from off, or when the CPU module is reset, all bits turn on.

(2) Node Communication Status (address: 01BCH to 01BFH/444 to 447)

The I/O communication status of each slave node is stored.
While I/O Communicating (X01) is off, all bits are off.

- When the corresponding bit is on: Communication in progress
- When the corresponding bit is off: Communication stopped

Table 3.20 Node No. corresponding to each bit in Node Communication Status

Buffer memory address	Node No. corresponding to each bit				
(Hex.)	Bit 15	Bit 14	…	Bit 1	Bit 0
01BCH	Node 15	Node 14	…	Node 1	Node 0
01BDH	Node 31	Node 30	…	Node 17	Node 16
01BEH	Node 47	Node 46	…	Node 33	Node 32
01BFH	Node 63	Node 62	…	Node 49	Node 48

3 - 28

(3) Node Communication Error Status (address: 1C0H to 1C3H/448 to 451)

The I/O communication error status of each slave node is stored.
While I/O Communicating (X01) is off, all bits are off.
Note that no error is detected for the node whose corresponding bit is on in Failed Node Detection Setting (address: 01CCH to 01CFH).

- When the corresponding bit is on: Communication error exists.
- When the corresponding bit is off: No communication error

Table 3.21 Node No. corresponding to each bit in Node Communication Error Status

Buffer memory address	Node No. corresponding to each bit				
(Hex.)	Bit 15	Bit 14	…	Bit 1	Bit 0
01C0H	Node 15	Node 14	…	Node 1	Node 0
01C1H	Node 31	Node 30	…	Node 17	Node 16
01C2H	Node 47	Node 46	…	Node 33	Node 32
01C3H	Node 63	Node 62	…	Node 49	Node 48

POINT

When any of the bits in this area turns on, Slave Down Signal (X04) is set to on.

(4) Node Fault Status (address: 01C4H to 01C7H/452 to 455)

The communication fault status of each slave node is stored.

- When the corresponding bit is on: Fault information exists
- When the corresponding bit is off: No fault information

Reading communication error information of the node in message communication will turn off the corresponding bit. (Refer to Section 4.2 (3).)

Table 3.22 Node No. corresponding to each bit in Node Fault Status

Buffer memory address	Node No. corresponding to each bit				
(Hex.)	Bit 15	Bit 14	…	Bit 1	Bit 0
01C4H	Node 15	Node 14	…	Node 1	Node 0
01C5H	Node 31	Node 30	…	Node 17	Node 16
01C6H	Node 47	Node 46	…	Node 33	Node 32
01C7H	Node 63	Node 62	…	Node 49	Node 48

3 - 29

(5) Failed Node Detection Setting (address: 01CC$_H$ to 01CF$_H$ /460 to 463)

Whether or not to detect a failed node is set in this area.
The setting determines whether or not the off status in Node Communication Status (address: 01BC$_H$ to 01BF$_H$) is reflected to Slave Down Signal (X04).

- When the corresponding bit is on: Slave Down Signal (X04) is not set to on even if the slave node went down.
- When the corresponding bit is off: Slave Down Signal (X04) is set to on if the slave node went down.

Table 3.23 Node No. corresponding to each bit in Failed Node Detection Setting

Buffer memory address	Node No. corresponding to each bit				
(Hex.)	Bit 15	Bit 14	…	Bit 1	Bit 0
01CC$_H$	Node 15	Node 14	…	Node 1	Node 0
01CD$_H$	Node 31	Node 30	…	Node 17	Node 16
01CE$_H$	Node 47	Node 46	…	Node 33	Node 32
01CF$_H$	Node 63	Node 62	…	Node 49	Node 48

POINT

For a node that is set as a reserved node with a master function parameter, turn on the corresponding bit of Failed Node Detection Setting. If it remains off, it is recognized as a failed node even if it is just a reserved node.

3.4.5 Master function parameter setting area

Parameters for master function are set in this area.
To exchange I/O data with each slave node (up to 63 nodes), information such as connection types and I/O points is set.

(1) Parameters for Master Function (address: 01D4H to 03CFH/468 to 975)

Master function parameters are set in this area.
For use of auto configuration, refer to Section 7.3 (2).
For saving parameters to a flash ROM, refer to Section 7.3 (3).

Table 3.24 Master function parameters

Buffer memory address (Hex.)	Item		Description
01D4H to 01D6H	Use prohibited		—
01D7H	Constant scan		Specified to keep link scan time constant. (Setting range: 0 to 65535ms (FFFFH))*1
01D8H	1st slave node	Node No. and message group	Low byte: Node No. (MAC ID) of the 1st slave node 00H to 3FH (0 to 63) High byte: 01H → Node that supports UCMM and uses any of message groups 3, 2, and 1. 03H → Node that supports UCMM and uses message group 1 04H → Node that does not support UCMM (Group 2 only server) 80H → Reserved node
01D9H		Connection type	Select a connection type for I/O communication. 0001H = Polling 0002H = Bit strobe 0004H = Change of state 0008H = Cyclic
01DAH		Number of byte modules	Low byte: Number of input byte modules High byte: Number of output byte modules (set in hexadecimal) Eight bit modules (8 points) are counted as one byte module.
01DBH		Number of word modules	Low byte: Number of input word modules High byte: Number of output word modules (set in hexadecimal)
01DCH		Number of double-word modules	Low byte: Number of input double-word modules High byte: Number of output double-word modules (set in hexadecimal)
01DDH		Expected packet rate	Set an expected packet rate for the slave node. Setting varies depending on the connection type. For details, refer to Table 3.25. (Setting range: 0 to 65535ms (FFFFH))*1 0000H: 200ms (Default) Other than 0000H: Set value – 1 (ms)

Buffer memory address (Hex.)	Item		Description
01DEH	1st slave node	Watchdog timeout action	Set an action for watchdog timeout of the slave node. 0000H: Equivalent to the following Timeout (Default) 0001H: Timeout The connection is placed in timeout status. Not recovered until an operator stops the communication and then resumes it. 0002H: Auto Delete The connection is automatically deleted. At this time the communication stops once, and then resumes automatically. The output is cleared once. 0003H: Auto Reset The communication continues while the connection is maintained. The output is not cleared.
01DFH		Production inhibit time	Set a production inhibit time. Setting varies depending on the connection type. For details, refer to Table 3.25. (Setting range: 0 to 65535ms (FFFFH))*1 0000H: 10ms (Default) Other than 0000H: Set value –1 (ms)
01E0H to 03CFH	Settings for 2nd to 63rd slave nodes		Same as those for 1st slave node

*1: When setting a value of 32768 or more, set it in hexadecimal.

POINT

When changing master function parameters, set default values for the areas after the changed area.

(Example) When changing the number of slave nodes that perform I/O communication, set default values in the areas for the 5th and 6th slave nodes.

Table 3.25 Details of the expected packet rate and production inhibit time

	Expected packet rate	Production inhibit time
Polling	(1) Set a communication watchdog timer value for the slave node. When the communication between the master node and the slave node stops for the duration represented by "set value × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Set a minimum transmit interval of the slave node, which is the minimum time during which the slave node can prepare transmit data. The master node transmits a polling request to the slave node when this time or longer has elapsed.*1
	(2) When the specified expected packet rate value is not equal to 1 (not equal to 0ms), the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the set value = 1, i.e., when the expected packet rate = 0ms, the watchdog timer monitoring function is disabled.	(3) When the set value = 1, i.e. when the production inhibit time = 0ms, the master node transmits a polling request to the slave node at intervals of the module scan.
Bit strobe*2	(1) Set a communication watchdog timer value for the slave node. When the communication between the master node and the slave node stops for the duration represented by "set value × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Set a minimum transmit interval of the slave node, which is the minimum time during which the slave can prepare transmit data. The master node transmits a bit strobe request to the slave node when this time or longer has elapsed.*1
	(2) When the specified expected packet rate value is not equal to 1 (not equal to 0ms), the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the set value = 1, i.e., when the expected packet rate = 0ms, the watchdog timer monitoring function is disabled.	(3) When the set value = 1, i.e., when the expected packet rate = 0ms, the watchdog timer monitoring function is disabled.
Change of state	(1) Set a communication watchdog timer value for the slave node. When the communication between the master node and the slave node stops for the duration represented by "set value × 4," the slave node executes the operation specified by the Watchdog Timeout Action.	(1) Set a minimum time during which the slave node can receive data. The master node transmits output data to the slave node at this time intervals. (The master node also transmits data to the slave node when output data changes.)*1
	(2) When the specified expected packet rate value is not equal to 1 (not equal to 0ms), the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) When the set value = 1, i.e., when the expected packet rate = 0ms, the watchdog timer monitoring function is disabled.	(3) When the set value = 1, i.e., when the expected packet rate = 0ms, the watchdog timer monitoring function is disabled.
Cyclic	(1) Specify an interval of data transmissions from the slave node to the master node.	(1) Specify an interval of data transmissions from the master node to the slave node.*1
	(2) When the specified expected packet rate value is not equal to 1 (not equal to 0ms), the expected packet rate must be equal to or greater than the production inhibit time.	
	(3) Setting of the set value = 1, i.e., the expected packet rate = 0ms is inhibited.	(3) Setting of the set value = 1, i.e., the production inhibit time = 0ms is inhibited.

*1: If the setting of the production inhibit time is shorter than the scan time of the module, the master node transmits data to the slave node at the intervals of the module's scan.

*2: The setting of the production inhibit time must be the same in all bit strobe connections.

(2) Auto Configuration Operation Setting (address: 03F0H/1008)

The operation of auto configuration is set in this area.
For the execution timing, refer to Section 7.3 (2).

(a) Setting details

1) High byte
Set an auto configuration type.
00H: All configuration (Default)
01H: Add configuration

2) Low byte
Set the maximum detection node No.
00H to 3FH (0 to 63) (Default: 3FH)

(b) Operation of auto configuration

1) When "All configuration" is set:
- Clears all of Parameters for Master Function (address: 01D4H to 03CFH). (Except the Constant scan area)
- Detects all of the slave nodes within a range from node 0 to the maximum detection node on the network.
- Stores parameters of the detected slave nodes into the "Parameters for Master Function" area (address: 01D4H to 03CFH).

2) When "Add configuration" is set:
- Detects all of the slave nodes within a range from node 0 to the maximum detection node on the network, except for slave nodes that have been already set to the master node.
- Stores parameters of the detected slave nodes into the area after the preset area in Parameters for Master Function (address: 01D4H to 03CFH).
Note that the area after the parameter storing area is not cleared.

(c) Contents of Parameters for Master Function set by auto configuration
An execution of auto configuration reads parameters of each slave node and writes them to Parameters for Master Function (address: 01D4H to 03CFH). Set values can be changed in sequence programs or the functions for DeviceNet of GX Works2.

Table 3.26 Auto configuration settings

Buffer memory address (Hex.)	Item		Description
01D8H	1st slave node	Node No. and message group	Low byte: Node No. (MAC ID) of the 1st slave node 00H to 3FH (0 to 63) High byte: 01H → Node that supports UCMM and uses any of message groups 3, 2, and 1. 03H → Node that supports UCMM and uses message group 1 04H → Node that does not support UCMM (Group 2 only server)
01D9H		Connection type	Connection type for I/O communication. 0001H = Polling 0002H = Bit strobe 0004H = Change of state 0008H = Cyclic
01DAH		Number of byte modules	Low byte: Number of input byte modules High byte: Number of output byte modules (set in hexadecimal) Eight bit modules (8 points) are counted as one byte module.
01DBH		Number of word modules	Low byte: Number of input word modules High byte: Number of output word modules (set in hexadecimal)
01DCH		Number of double-word modules	Low byte: Number of input double-word modules High byte: Number of output double-word modules (set in hexadecimal)
01DDH		Expected packet rate	Default value is stored. (0000H: 200ms)
01DEH		Watchdog timeout action	Default value is stored. (0000H: Timeout)
01DFH		Production inhibit time	Default value is stored. (0000H: 10ms)
01E0H to 03CFH	Settings for 2nd to 63rd slave nodes		Same as those for 1st slave node

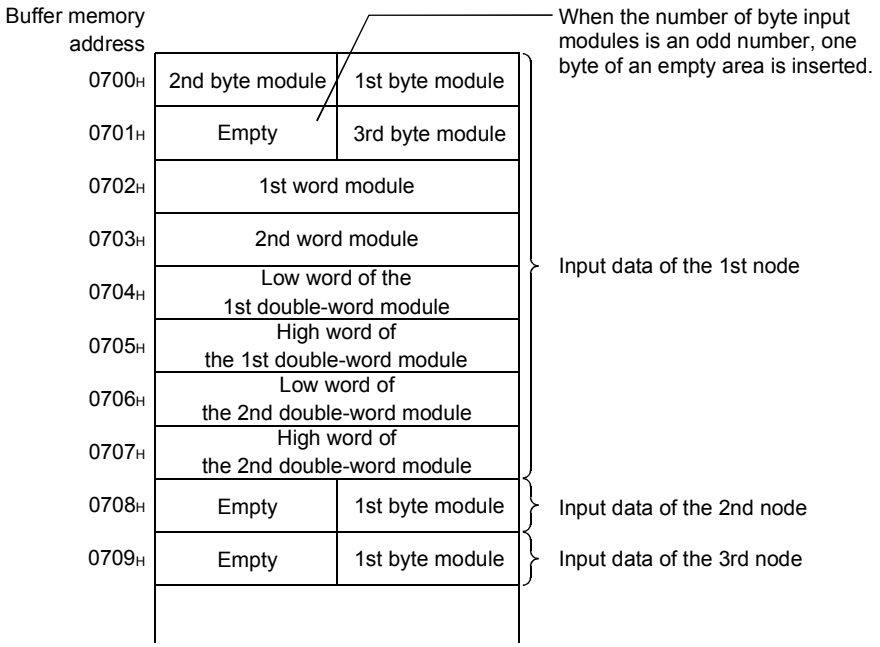
3.4.6 Communication data area for master function

Communication data for the master function are stored in this area.

(1) Master Function Receive Data (address: 0700H to 07FFH/1792 to 2047)

Data received from each slave node are stored.
Data are aligned on word boundaries of slave nodes and stored as shown below.
For double-word data, the low word is stored first and then the high word.
When the number of byte input modules is an odd number, one byte of an empty area is inserted.
Bit input modules are treated in the same way as byte input modules.
The following is an example.
<Example>

1st node - Number of byte input modules = 3
Number of word input modules = 2
Number of double-word input modules = 2
2nd node - Number of byte input modules = 1
3rd node - Number of byte input modules = 1



Word input module: Numeric data represented by 9 to 16 bits
Double-word input module: Numeric data represented by 17 to 32 bits
Byte input module: On/off data, or numeric data represented by 1 to 8 bits

(2) Master Function Transmit Data (address: 0900H to 09FFH/2304 to 2559)

Data to be sent to each slave node are set in this area.

Data are aligned on word boundaries of slave nodes and stored as shown below.

For double-word data, the low word is stored first and then the high word.

When the number of byte input modules is an odd number, one byte of an empty area is inserted.

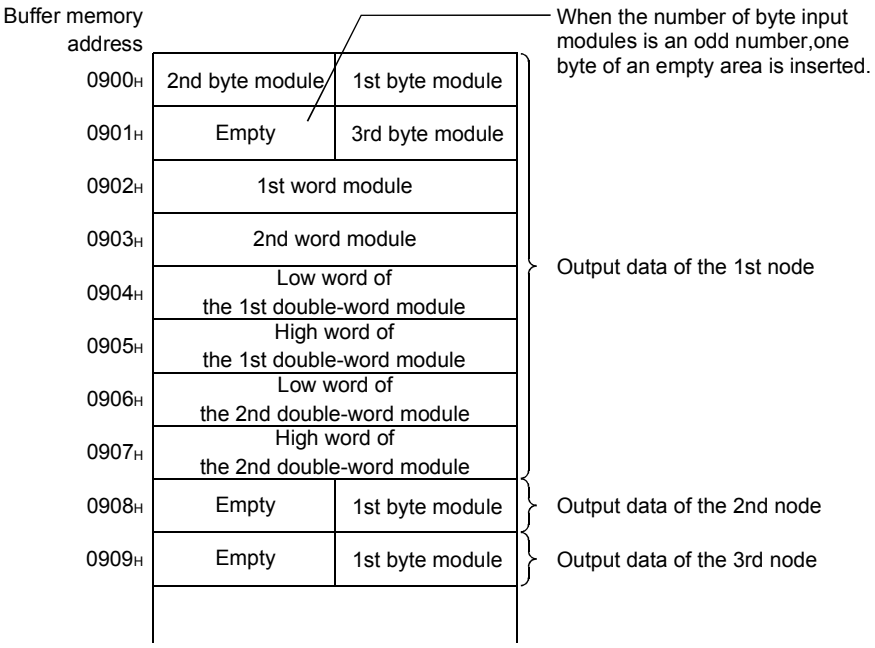
The following is an example.

<Example>

1st node - Number of byte output modules = 3
Number of word output modules = 2
Number of double-word output modules = 2

2nd node - Number of byte output modules = 1

3rd node - Number of byte output modules = 1



3 - 37

(3) I/O Address Area for Master Function (address: 0500H to 05FBH /1280 to 1531)

This area stores the start addresses and sizes (number of words) of Master Function Receive Data (address: 0700H to 07FFH/1792 to 2047) and Master Function Transmit Data (address: 0900H to 09FFH/2304 to 2559) for each node. This area can be used to check the start address of each node.

0500H	Input data start address of 1st slave node
0501H	Input data size of 1st slave node (No. of words)
0502H	Output data start address of 1st slave node
0503H	Output data size of 1st slave node (No. of words)
0504H	Input data start address of 2nd slave node
	▪ ▪ ▪
5FBH	Output data size of 63rd slave node (No. of words)

3.4.7 Link scan time area for master function

Link scan time values are stored in this area.

(1) Present Link Scan Time (address: 05FCH /1532)

The present link scan time is stored. (Unit: ms)

(2) Minimum Link Scan Time (address 05FDH/1533)

The minimum link scan time after power-on is stored. (Unit: ms)

(3) Maximum Link Scan Time (address 05FEH/1534)

The maximum link scan time after power-on is stored. (Unit: ms)

3.4.8 Own node status area for slave function

This area stores the communication status, error information, etc. of the slave function.

(1) Slave Function Communication Status (address: 0600H/1536)

The I/O communication status of the slave function is stored.

Table 3.27 Slave function communication status

Value	Name	Operation
0000H	Offline	Initialization in progress, bus-off, or network power off
0040H	Stop	I/O communication stopped
0080H	Ready	Waiting to establish a connection from the master node
00C0H	Operate	I/O communication in progress

(a) When "No start" is set for Auto Communication Start Setting (address: 0631H)
Upon power-up, the status automatically changes from Offline (0000H) to Stop (0040H).
When I/O Communication Request (Y11) is set to on, the status changes to Operate (00C0H).
Note that, until receiving an I/O communication request from the master node, the module is placed in Ready status (0080H).

(b) When "Start" is set for Auto Communication Start Setting (address: 0631H)
Upon power-up, the status automatically changes from Offline (0000H) to Operate (00C0H).
Note that, until receiving an I/O communication request from the master node, the module is placed in Stop status (0040H).

(c) When a reset message is received through the network
The status automatically returns to Offline (0000H), and then changes to Operate (00C0H).

(2) Error Information for Slave Function (address: 0601H/1537)

A code for a communication error occurred in the slave function is stored.
For error notification and a clearing method of this area, refer to Section 3.3.3 (4).

(a) High byte
An error code is stored. (Refer to Section 10.2.1.)

(b) Low byte
The number of the node (MAC ID), where an error occurred, is stored.
FEH, FFH (254, 255): Own node (QJ71DN91)
0H to 3FH (0 to 63): Node No. (MAC ID) of the node where an error occurred.

3.4.9 Parameter setting area for slave function

Parameters for the slave function are set in this area.

(1) Slave Function Receive-Bytes Setting Area (address: 060EH/1550)/Slave Function Transmit-Bytes Setting Area (address: 060FH/1551)

Input/output points for the slave function are set.

For saving parameters to a flash ROM, refer to Section 8.2 (2).

Table 3.28 Slave function parameters

Buffer memory address (Hex.)	Item	Description
060EH	Slave function receive-bytes (input size) setting area	Set a size of I/O data that can be received for the slave function. (Setting range: 0 to 128 bytes, Default: 8 bytes)
060FH	Slave function transmit-bytes (output size) setting area	Set a size of I/O data that can be sent for the slave function. (Setting range: 0 to 128 bytes, Default: 8 bytes)

3.4.10 Communication data area for slave function

Communication data for the slave function are stored in this area.

(1) Slave Function Receive Data (address: 0B00H to 0B3FH/2816 to 2879)

Data received from the master node are stored.
The data size that is set in Slave Function Receive-Bytes Setting Area (address: 060EH) is valid.

0B00H	2nd byte	1st byte
0B01H	4th byte	3rd byte
0B02H	6th byte	5th byte
	⋮	⋮

(2) Slave Function Transmit Data (address: 0C00H to 0C3FH /3072 to 3135)

Data to be sent to the master node are set in this area.
I/O data of the size, which is set in Slave Function Transmit-Bytes Setting Area (address: 060FH), are sent.

0C00H	2nd byte	1st byte
0C01H	4th byte	3rd byte
0C02H	6th byte	5th byte
	⋮	⋮

POINT

When the QJ71DN91 is used as a master node, set an even number of byte modules. If an odd number is set and when word modules and double-word modules are set at the same time, these word and double-word data cannot be sent or received normally.

3.4.11 Own node information area

Information of the own node (QJ71DN91) is stored in this area.

(1) Model Name (address: 0620H to 0624H/1568 to 1572)

"QJ71DN91" is stored in ASCII code format.

0620H	"J"	"Q"
0621H	"1"	"7"
0622H	"N"	"D"
0623H	"1"	"9"
0624H	"0"	"0"

(2) Node No. (address: 0625H/1573)

The node No. of the currently operating node is stored.

00H to 3FH (Stored in binary format)

(3) Mode Switch No. (address: 0626H/1574)

The mode switch No. of the currently active mode is stored.

3 - 42

3.4.12 Hardware test area

This area is used for hardware test and communication test.
For the hardware test, refer to Section 5.4.
For the communication test, refer to Section 5.6.

(1) Hardware Test Item Area (address: 062E$_H$/1582)

The test item No. of the hardware or communication test being executed is stored.

Table 3.29 Hardware test items

Test item No.	Meaning	Description
0000$_H$	Before test	Hardware test not yet started.
0001$_H$	ROM check	Testing if ROM is normal.
0002$_H$	RAM check	Testing if RAM is normal.
0003$_H$	Microcomputer check	Testing if microcomputer is normal.
0004$_H$	CAN controller check	Testing if CAN controller is normal.
FFFF$_H$	Test completion	Hardware test was executed and completed normally.

Table 3.30 Communication test items

Test item No.	Meaning	Description
0000$_H$	Before test	Communication test not yet started.
0001$_H$	Node No. duplication check	Checking if any other node has the same node No. as the own node.
0002$_H$	Communication check	Checking if communication with one or more nodes on the network is available.
FFFF$_H$	Test completion	Communication test was executed and completed normally.

(2) Hardware Test Result Area (address: 062FH/1583)

The hardware or communication test result is stored.

Table 3.31 Hardware test results

Error code	Error	Action
0000H	No error	Hardware test completed normally.
60AAH	RAM error	A hardware failure has occurred. Please consult your local Mitsubishi representative.
61AAH	ROM error	
62AAH	CAN controller check error	
63AAH	Network power supply error	Verify that power is supplied to the network.
70AAH	Microcomputer error	A hardware failure has occurred. Please consult your local Mitsubishi representative.
71AAH		
72AAH		
73AAH		
74AAH		

Table 3.32 Communication test results

Error code	Error	Detail	Action
0001H	Node No. duplication error	Any other node on the network has the same node No. as the own node.	• Assign unique node numbers to all nodes on the network.
0002H	Bus off error	A bus off occurred during the test.	• Set the same communication speed value to all nodes on the network. • Check the overall network for disconnection of terminating resistors, DeviceNet cable length, etc.
0003H	Network power supply error	The network power supply is off.	• Turn on the network power supply.
0004H 0005H	Communication error	Data could not be sent or received correctly.	• Connect one or more nodes to the network. • Set the same communication speed value to all nodes on the network. • Check the overall network for disconnection of terminating resistors, DeviceNet cable length, etc.
0006H	No error	Communication test was completed normally.	—

3.4.13 Parameter saving area selection area

This area is used to save parameters in the buffer memory to a flash ROM.
For the execution timing, refer to Section 7.3 (3) and 8.2 (2).

(1) Parameter Area Select Bit (address: 0630H/1584)

Select an area of the parameters that are to be saved to a flash ROM.
When clearing the parameters on the flash ROM, set 8000H. In this case, parameters in the buffer memory are not cleared.
Default values vary depending on the operation mode. Refer to Table 3.33.

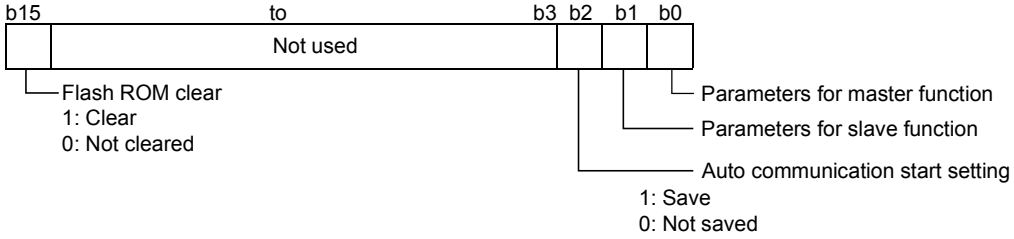


Table 3.33 Default values for Parameter Area Select Bit

Mode	Default value
0 to 2 (master function only)	0005H
3 to 5 (slave function only)	0006H
6 to 8 (master and slave functions)	0007H

3.4.14 Auto communication start setting area

The auto communication start setting is set in this area.

(1) Auto Communication Start Setting (address: 0631H/1585)

Set whether or not to automatically start I/O communication using the parameters saved on the flash ROM when power is turned on from off or when the CPU module is reset.
For saving parameters to flash ROM, refer to Section 7.3 (3) and 8.2 (2).

0: Not start I/O communication automatically. (default)
1: Start I/O communication automatically.
* : I/O communication does not start automatically when any value other than 0 and 1 is set.

3 - 45

3.4.15 Operation Setting Area for Bus Off Error

This area is used to set whether or not to reset the CAN chip (communication chip) of the QJ71DN91 to resume the communication if a bus off error occurs.

(1) Operation Setting Area for Bus Off Error (address: 0632H/1586)

Set whether or not to reset the QJ71DN91's CAN chip (communication chip) to resume the communication if a bus off error occurs.
Setting "1" in this area enables communication resumption without resetting the CPU module.
Configure this setting before starting I/O communication (before setting I/O Communication Request (Y11) to on).
If "1" is set in this area after a bus off error occurs, the CAN chip is not reset.
0: Stop communication without resetting the CAN chip (default)
1: Resume communication by resetting the CAN chip
*: When any value other than 0 and 1 is set, the CAN chip is not reset.

(a) Confirming a bus off error
A bus off error can be confirmed by a LED and relevant values in the buffer memory.
1) LED
The NS LED on the QJ71DN91 turns on red.
2) Buffer memory
How many times the error occurred is stored in Bus Error Counter (address: 01B2H) and Bus Off Counter (address: 01B3H).

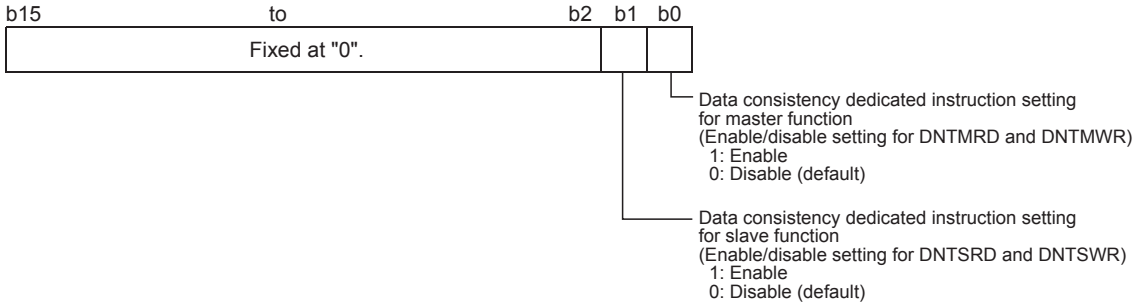
(b) After resetting the CAN chip
When the CAN chip is reset, the LED indication and buffer memory values are changed as follows:
1) LED
When the CAN chip is reset, the NS LED status on the QJ71DN91 changes as follows: turning on (red) → OFF → flashing (green) → remaining on (green).
2) Buffer memory
Values in Bus Error Counter (address: 01B2H) and Bus Off Counter (address: 01B3H) are not cleared even if the CAN chip is reset.

3.4.16 Data consistency dedicated instruction area

This area is used to execute Data consistency dedicated instruction.
For details of Data consistency dedicated instruction, refer to Chapter 9.

(1) Data consistency dedicated instruction setting area (address: 0633H/1587)

Enable or disable Data consistency dedicated instruction.
To execute Data consistency dedicated instruction, set "Enable".
Set this area before turning on I/O Communication Request (Y11).



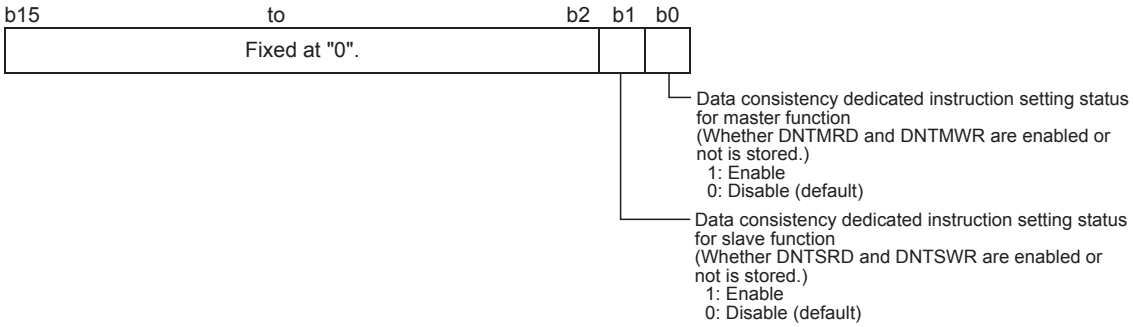
(a) Precautions

1) Using the master function
When using the master function, disable "Data consistency dedicated instruction setting for slave function".
If "Enable" is set and I/O communication is started, an error occurs.
Check the error code in Error Information for Master Function (address: 01B1H) and take corrective actions. (Refer to Section 10.2.1.)

2) Using the slave function
When using the slave function, disable "Data consistency dedicated instruction setting for master function".
If "Enable" is set and I/O communication is started, an error occurs.
Check the error code in Error Information for Slave Function (address: 0601H) and take corrective actions. (Refer to Section 10.2.1.)

(2) Data consistency dedicated instruction setting status area (address: 0634H/1588)

This area stores the setting status of Data consistency dedicated instruction.



3.5 Communication Performance

3.5.1 Link scan time

The link scan time represents a time during which the QJ71DN91 waits for responses from all nodes after sending a polling request or bit-strobe requests.
The following shows the link scan time calculation formulas.

$$LS = \Sigma (TIn + TOn + 0.097) + 0.222 \times BR + 1.0 \text{ [ms]}$$

LS: Link scan time [ms]
TIn: Transmission time for data received from the n-th slave. [ms] (Refer to (1) below.)
TOn: Transmission time for data sent to the n-th slave. [ms] (Refer to (2) below.)
Σ: Indicates that the values in the parentheses "( )" must be added up for all of the slave nodes. (Except for reserved nodes)
BR: Coefficient corresponding to the baud rate
500kbaud = 1, 250kbaud = 2, 125kbaud = 4

(1) How to calculate TIn

(a) When the length of the data received from the n-th slave is 8 bytes or less

$$TIn = BT + BTa \times \text{Receive data length (bytes) [ms]}$$

BT, BTa: Coefficient corresponding to the baud rate (See *1.)

(b) When the length of the data received from the n-th slave is 9 bytes or more

$$TIn = (BT + BTa \times 8 + 0.190) \times a + \{BT + BTa \times (b + 1) + 0.450\} \text{ [ms]}$$

BT, BTa: Coefficient corresponding to the baud rate (See *1.)
a: Result obtained by dividing the receive data length by 7 (Truncate the fractional part.)
b: Remainder obtained by dividing the receive data length by 7

(2) How to calculate TOn

(a) When the length of the data sent to the n-th slave is 8 bytes or less

$$TOn = BT + BTa \times \text{Transmit data length (bytes) [ms]}$$

BT, BTa: Coefficient corresponding to the baud rate (See *1.)

(b) When the length of the data sent to the n-th slave is 9 bytes or more

$$TOn = (BT + BTa \times 8 + 0.130) \times c + \{BT + BTa \times (d + 1) + 1.2\} \text{ [ms]}$$

BT, BTa: Coefficient corresponding to the baud rate (See *1.)
c: Result obtained by dividing the transmit data length by 7 (Truncate the fractional part.)
d: Remainder obtained by dividing the transmit data length by 7

*1 The following shows the coefficients corresponding to the baud rates.

	125kbaud	250kbaud	500kbaud
BT	0.376	0.188	0.094
BTa	0.064	0.032	0.016

3.5.2 Communication cycle time

The communication cycle time is an interval from the time a polling or bit strobe request is sent to a slave node until another request is sent to the same node.
The calculation formulas for the communication cycle time of each slave node are shown below.

(1) LS<PIT: LC = LS + PIT [ms]
(2) LS≧PIT: LC = LS [ms]

LC: Communication cycle time [ms]
LS: Link scan time [ms] (Refer to Section 3.5.1.)
PIT: Production inhibit time [ms] (Refer to Section 3.4.5.)

3.5.3 Transmission delay

Transmission delay time depends on the use of Data consistency dedicated instruction.
The following notations are used in the calculation formulas (1) and (2).

ST : Sequence scan time [ms]
LS : Link scan time [ms] (Refer to Section 3.5.1.)
PIT : Production inhibit time [ms] (Refer to Section 3.4.5.)
LC : Communication cycle time [ms]
LS < PIT: LC = LS + PIT [ms]
LS ≥ PIT: LC = LS [ms]

(1) When Data consistency dedicated instruction is not used

The following table lists transmission delay time when I/O data is read/written using auto refresh or MOV/FROM/TO instruction.

(a) Transmission delay of send data

Item	Transmission delay time
Maximum value	LC × 2 + ST [ms]
Normal value	LC + ST × 0.5 [ms]

(b) Transmission delay of receive data

Item	Condition	Transmission delay time
Maximum value	Reading the receive data using MOV or FROM/TO instruction	LC × 2 [ms]
	Using auto refresh	LC × 2 + ST [ms]
Normal value	Reading the receive data using MOV or FROM/TO instruction	LC [ms]
	Using auto refresh	LC + ST×0.5 [ms]

(2) When Data consistency dedicated instruction is used

The following table lists transmission delay time when I/O data is read/written using Data consistency dedicated instruction.

(a) Transmission delay of send data (using DNTMWR or DNTSWR)

Item	Condition	Transmission delay time
Maximum value	ST × 2 ≦ LC	LC × 3 [ms]
	ST × 2 > LC	ST × 2 + LC × 2 [ms]
	LC < ST	ST × 4 [ms]
Normal value	—	ST + LC [ms]

(b) Transmission delay of receive data (using DNTMRD or DNTSRD)

Item	Condition	Transmission delay time
Maximum value	ST × 2 ≦ LC	ST + LC [ms]
	ST ≦ LC < ST × 2	ST + LC × 2 [ms]
	LC < ST	ST × 3 [ms]
Normal value	—	ST + LC [ms]

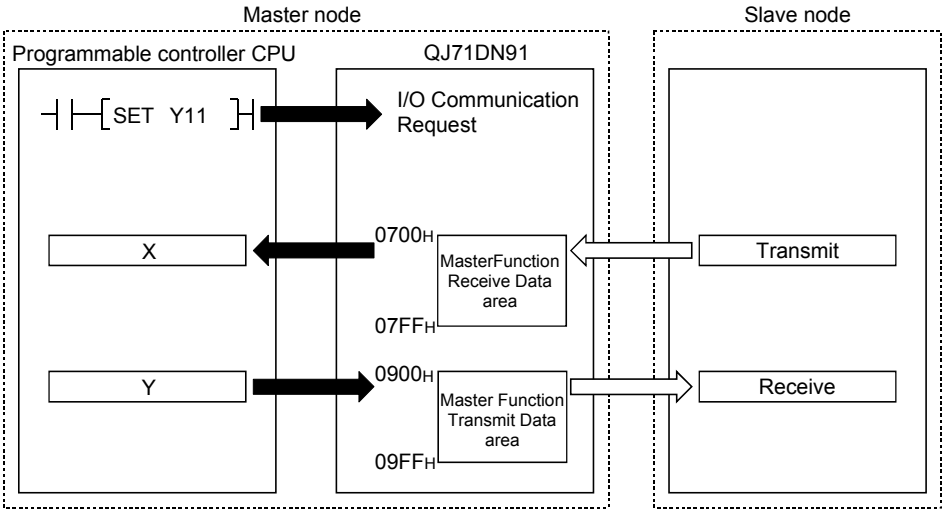
3 - 50

4 FUNCTIONS

This chapter explains the functions of the QJ71DN91.

4.1 Master Function (I/O Communication Function)

This function allows I/O data communication with respective slave nodes (up to 63 nodes), using the buffer memory of the QJ71DN91.
Communications of 512 bytes of inputs (up to 256 bytes per node) and 512 bytes of outputs (up to 256 bytes per node) are available.



(1) Setting for I/O communication with each slave node

(a) Set the information such as connection types or I/O points in Parameters for Master Function (address: 01D4H to 03CFH) to exchange I/O data with each slave node.

(b) Parameters for the master function are set in the functions for DeviceNet of GX Works2 or sequence programs. (Refer to Section 7.3.)

(2) Reading/writing I/O data

(a) I/O data are stored in the following buffer memory areas.

Buffer memory address (Hex.)	Item	Description	Reference section
0700H to 07FFH	Master function receive data	Data received from each slave node are stored.	3.4.6
0900H to 09FFH	Master function transmit data	Data to be sent to each slave node are set.	

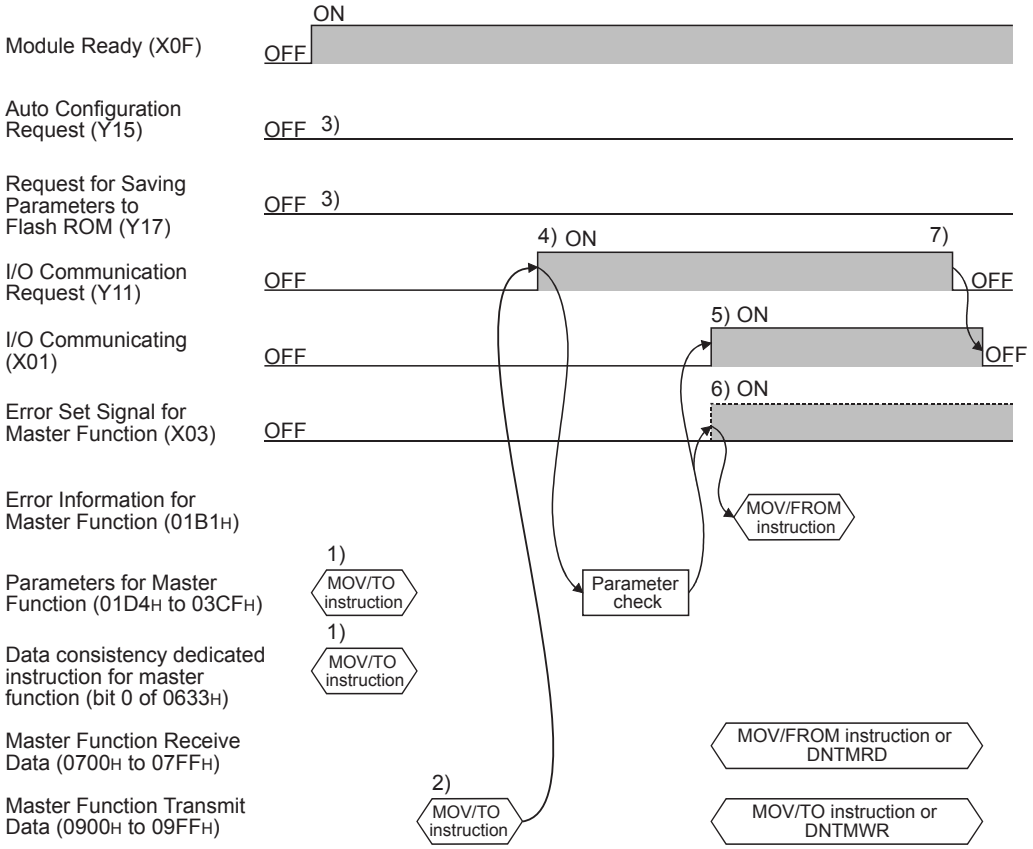
(b) Data transfer between the buffer memory and programmable controller CPU devices

Transfer method	Description	Data consistency	Reference section
Auto refresh	Configure the auto refresh settings in the functions for DeviceNet of GX Works2.	Not ensured	7.4.1
MOV or FROM/TO instruction	Configure the settings in sequence programs.	Not ensured	7.4.2
Data consistency dedicated instruction (DNTMRD, DNTMWR)		Ensured	

(3) Operation flow

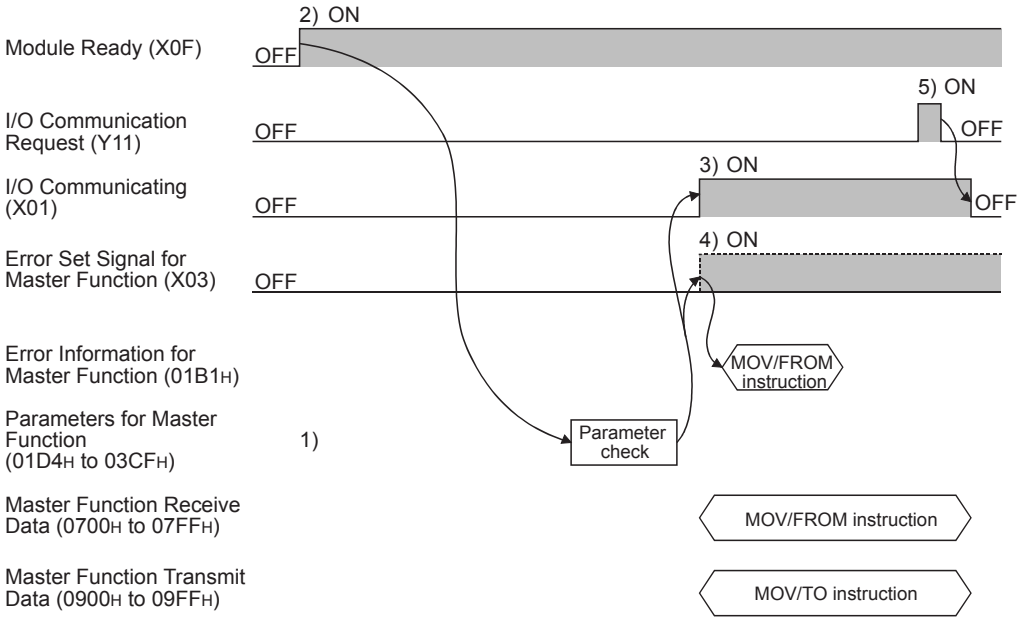
This section explains how I/O communication is performed with each slave node.

(a) When starting I/O communication by I/O Communication Request (Y11)



1) Set the following:
   - Set parameters in Parameters for Master Function (address: 01D4H to 03CFH).
   - Set whether to enable or disable Data consistency dedicated instruction in Data consistency dedicated instruction setting for master function (address: bit 0 of 0633H).
2) Set initial values of on/off information for each slave node in Master Function Transmit Data (address: 0900H to 09FFH).
3) Set Auto Configuration Request (Y15) and Request for Saving Parameters to Flash ROM (Y17) to off.
4) When I/O Communication Request (Y11) is set to on, the parameters are checked.
5) When the parameter check is succeeded, I/O communication with each slave node is started and I/O Communicating (X01) is set to on.
   - The status of input from each slave node is stored in Master Function Receive Data (address: 0700H to 07FFH).
   - The on/off information to be sent to each slave node is set in Master Function Transmit Data (address: 0900H to 09FFH).
6) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) is set to on. At this time, I/O Communicating (X01) is not set to on.
   Check the error code in Error Information for Master Function (address: 01B1H), and take corrective actions.
7) Setting I/O Communication Request (Y11) to off stops I/O communication with each slave node, causing I/O Communicating (X01) to turn off.

(b) When starting I/O communication automatically at power-up
Set "Start" in Automatic Communication Start Setting (address: 0631H).



1) Save the following parameters to the flash ROM in advance.
   - Parameters for Master Function (address: 01D4H to 03CFH)
   - Auto Communication Start Setting (address: 0631H)
2) When the power is turned on, parameters saved in the flash ROM is loaded into the buffer memory automatically.
   Module Ready (X0F) is set to on, and the parameters are checked.
3) When the parameter check is succeeded, I/O communication with each slave node is started and I/O Communicating (X01) is set to on.
   - The status of input from each slave node is stored in Master Function Receive Data (address: 0700H to 07FFH).
   - The on/off information to each slave node is set in Master Function Transmit Data (address: 0900H to 09FFH).
4) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) is set to on. At this time, I/O Communicating (X01) is not set to on.
   Check the error code in Error Information for Master Function (address: 01B1H), and take corrective actions.
5) Setting I/O Communication Request (Y11) to on and then off stops I/O communication with each slave node, causing I/O Communicating (X01) to turn off.

(4) Overview of each connection type

One of the connection types shown below can be selected for each slave node.
For available connection types, refer to the manual for each slave node.

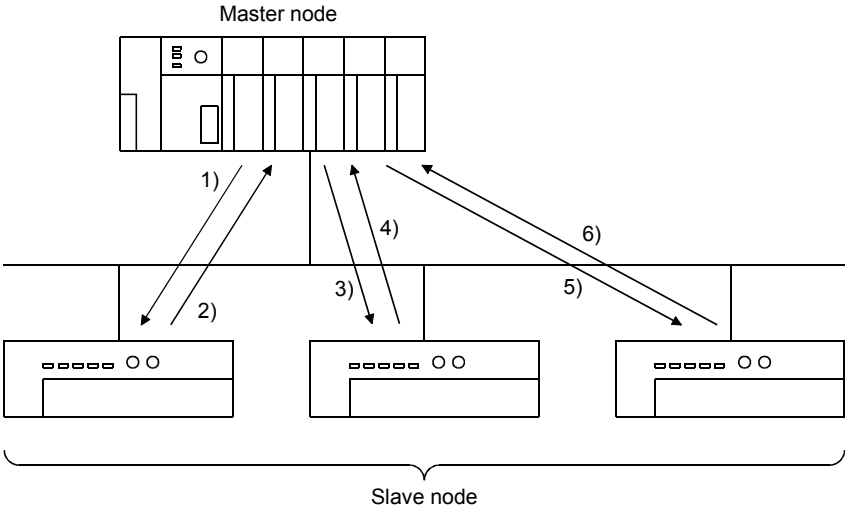
- Polling
- Bit strobe
- Change of state
- Cyclic

I/O communications of respective connection types are explained below.

(a) Polling

Polling is a communication method by which the following steps 1) to 6) are repeated to slave nodes.

1) The master node sends output data.
2) Step 1) triggers input data transmission from the slave node.
3) The master node sends output data.
4) Step 3) triggers input data transmission from the slave node.
5) The master node sends output data.
6) Step 5) triggers input data transmission from the slave node.

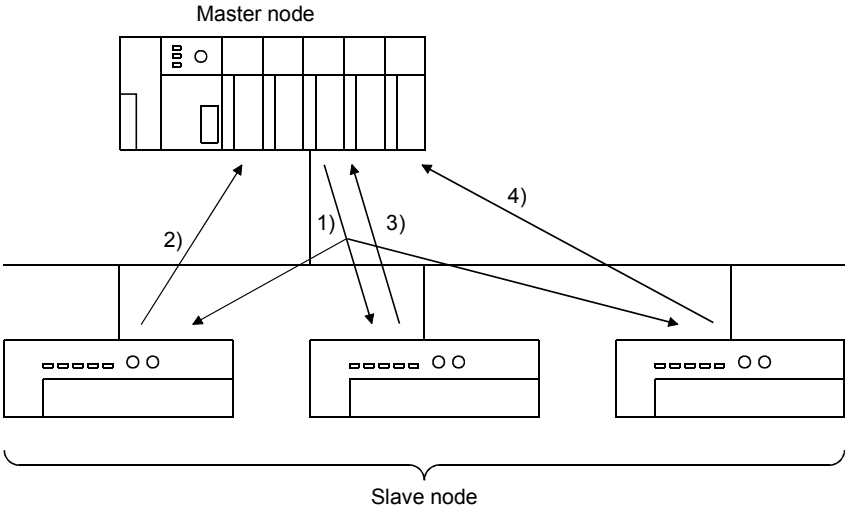


4 - 5

(b) Bit strobe

Bit strobe is a communication method by which the following steps 1) to 4) are repeated to each slave node.

1) Up to one bit of output information is simultaneously sent to respective slave nodes.
2) Step 1) triggers input data transmission from the slave node.
3) Step 1) triggers input data transmission from the slave node.
4) Step 1) triggers input data transmission from the slave node.



4 - 6

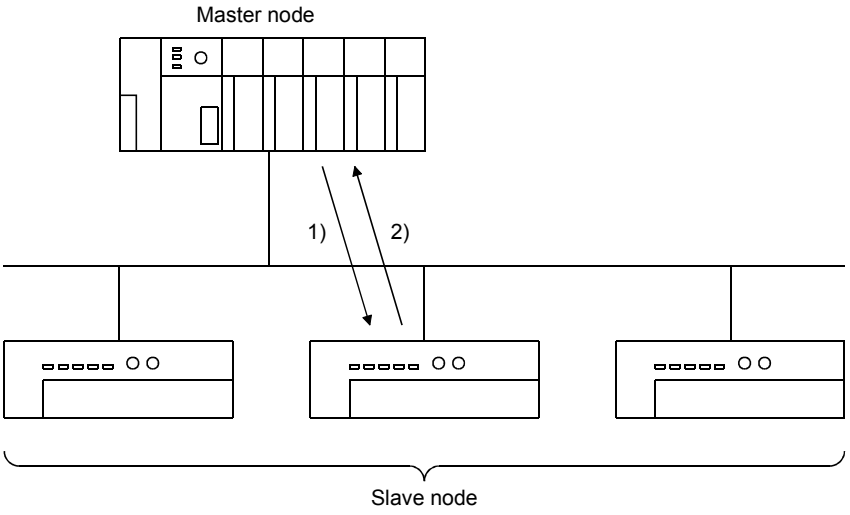
(c) Change of state

Change of state is a communication method by which the following steps 1) and 2) are performed to each slave node by changes in I/O data.

No data transmission is performed unless any change is made in I/O data,

1) When output data of the master node changes, the master node sends the data to the slave node.
2) When input data of the slave node changes, the slave node sends the data to the master node.

The change-of-state communication does not have a concept of communication cycle.



(d) Cyclic

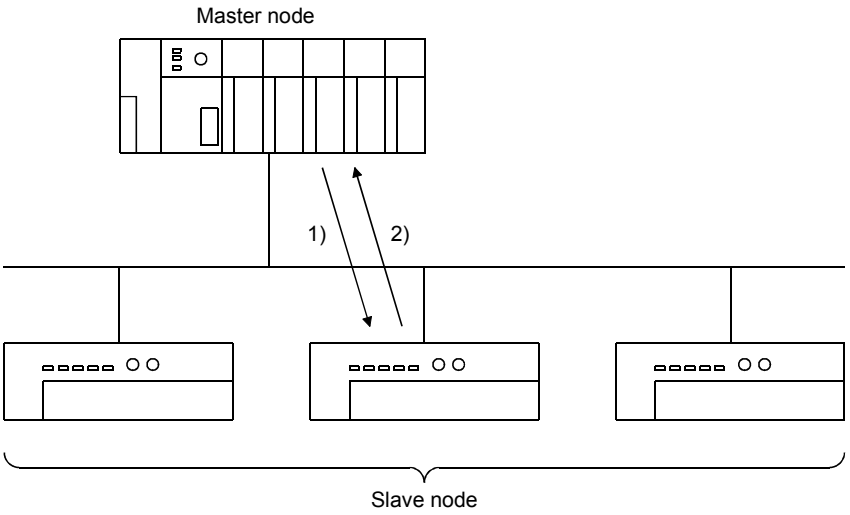
Cyclic is a communication method by which the following steps 1) and 2) are repeated to each slave node at fixed intervals.

1) Data of the master node are sent to the slave node.
2) Data of the slave node are sent to the master node.

The cycle of cyclic transmission can be specified for each slave node. Specify it to the following parameter items:

Cycle of transmission from master node: Production inhibit time
Cycle of transmission from slave node: Expected packet rate

The cyclic communication does not have a concept of communication cycle.



4.2 Master Function (Message Communication Function)

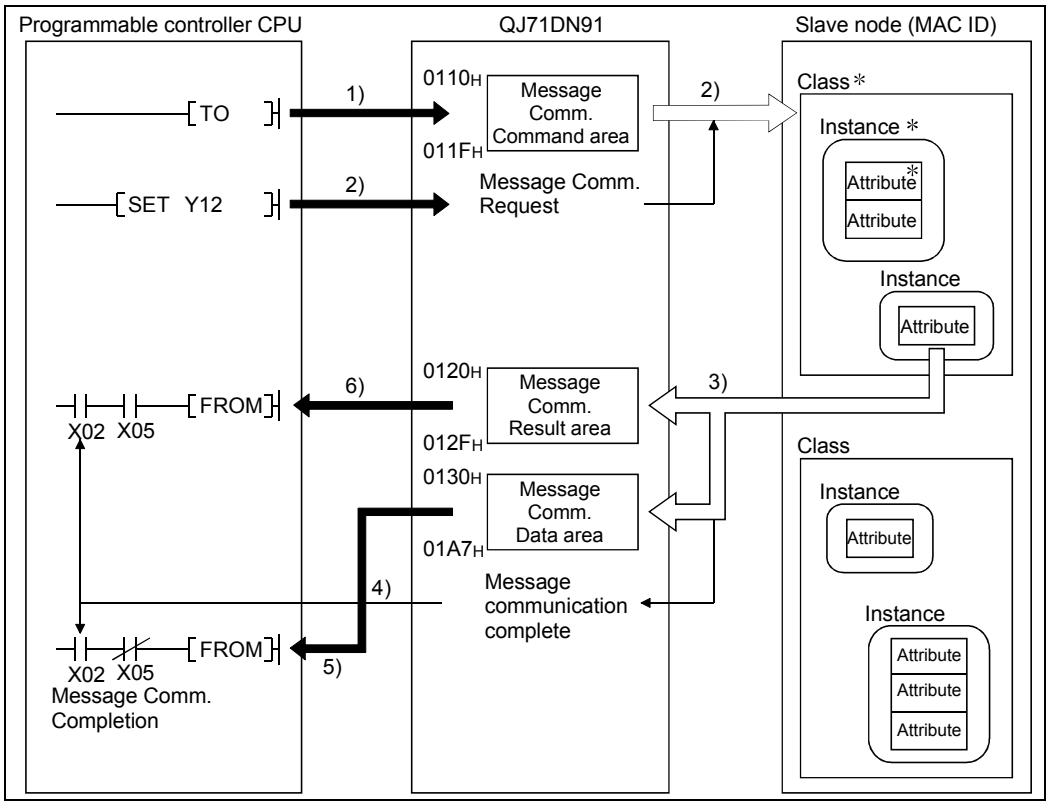
The QJ71DN91 can read or write attribute data of slave nodes using its own buffer memory.

For details of other message communications, refer to DeviceNet Common Service in DeviceNet Specifications (Release 2.0).

At one time, 240 bytes of message data can be transferred.

For the execution timing, refer to Section 3.3.2 (3).

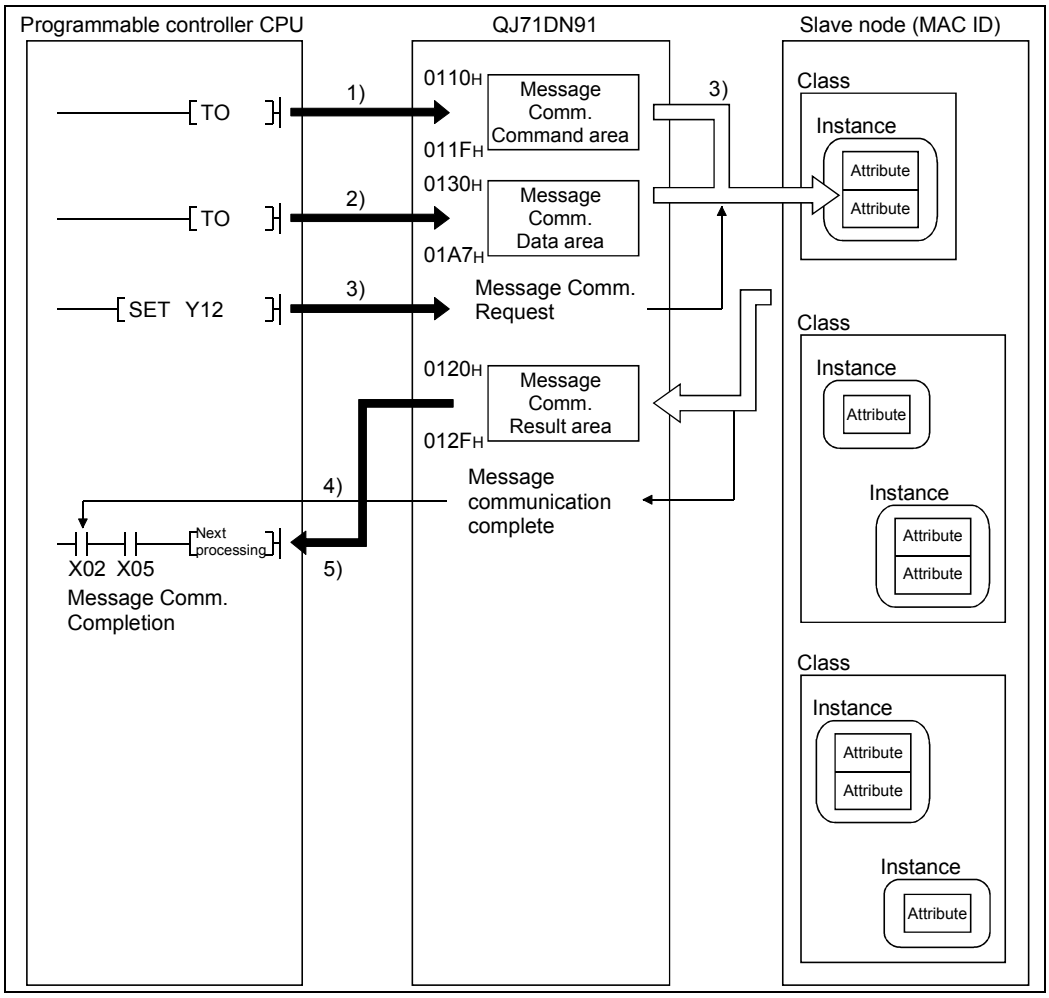
(1) Get Attribute



*: In DeviceNet, the areas used for reading and writing by communication are specified by the numbers such as class ID, instance ID, and attribute ID. For details, refer to the manual of each slave node.

1) Set command data in Message Communication Command (address: 0110H to 011FH).
2) Set Message Communication Request (Y12) to on to read out attribute data from the slave that is specified in the command data.
3) The attribute data of the slave node are stored in Message Communication Data (address: 0130H to 01A7H).
4) Upon completion of reading, the processing result is stored in Message Communication Result (address: 0120H to 012FH), and Message Communication Completion (X02) is set to on.
5) The slave node's attribute data stored in Message Communication Data (address: 0130H to 01A7H) are read out to the programmable controller CPU.
6) If failed, Message Communication Error Signal (X05) is set to on. Read data in Message Communication Result (address: 0120H to 012FH) to identify the cause of the error.

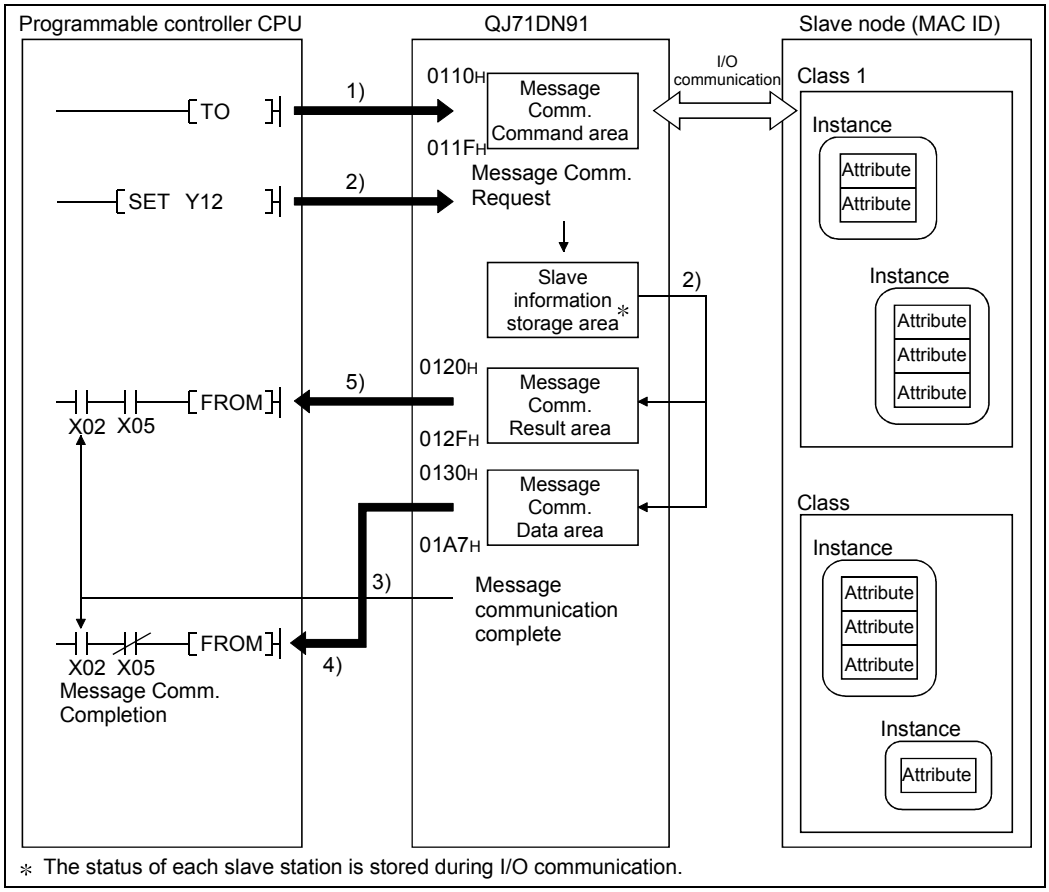
(2) Set Attribute



1) Set command data in Message Communication Command (address: 0110H to 011FH).
2) Set attribute data in Message Communication Data (address: 0130H to 01A7H).
3) Set Message Communication Request (Y12) to on to write the attribute to the slave node that is specified in the command data.
4) Upon completion of writing, the processing result is stored in Message Communication Result (address: 0120H to 012FH), and Message Communication Completion (X02) is set to on.
5) If failed, Message Communication Error Signal (X05) is set to on. Read data in Message Communication Result (address: 0120H to 012FH) to identify the cause of the error.

4 - 10

(3) Reading communication error information



1) Set command data in Message Communication Command (address: 0110H to 011FH).
2) When Message Communication Request (Y12) is set to on, the communication error information of the relevant slave node, which has been accumulated in the QJ71DN91, is stored in Message Communication Data (address: 0130H to 01A7H).
3) Upon completion of reading, the processing result is stored in Message Communication Result (address: 0120H to 012FH), and Message Communication Completion (X02) is set to on.
4) The slave node's communication error information stored in Message Communication Data (address: 0130H to 01A7H) is read out to the programmable controller CPU.
5) If failed, Message Communication Error Signal (X05) is set to on. Read data in Message Communication Result (address: 0120H to 012FH) to identify the cause of the error.

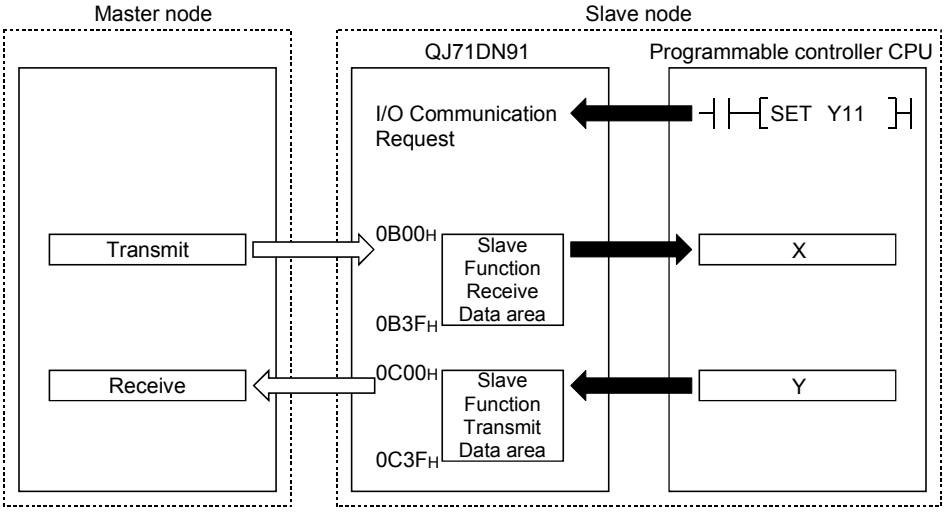
4 - 11

4.3 Slave Function (I/O Communication Function)

This function allows I/O data communication with the master node, using the buffer memory of the QJ71DN91.

Communications of 128 input bytes and 128 output bytes are available.

The polling method is used as the connection type.



(1) Setting for I/O communication with the master node

(a) Set the number of I/O points in Parameters for Slave Function (address: 060EH, 060FH) to exchange I/O data with the master node.
This setting is not needed if the default values (8 bytes for each) are used.

(b) Parameters for slave function are set in the functions for DeviceNet of GX Works2 or sequence programs. (Refer to Section 8.2.)

(2) Reading/writing I/O data

(a) I/O data are stored in the following buffer memory areas.

Buffer memory address (Hex.)	Item	Description	Reference section
0B00H to 0B3FH	Slave function receive data	Data received from the master node are stored.	3.4.10
0C00H to 0C3FH	Slave function transmit data	Data to be sent to the master node are set.	

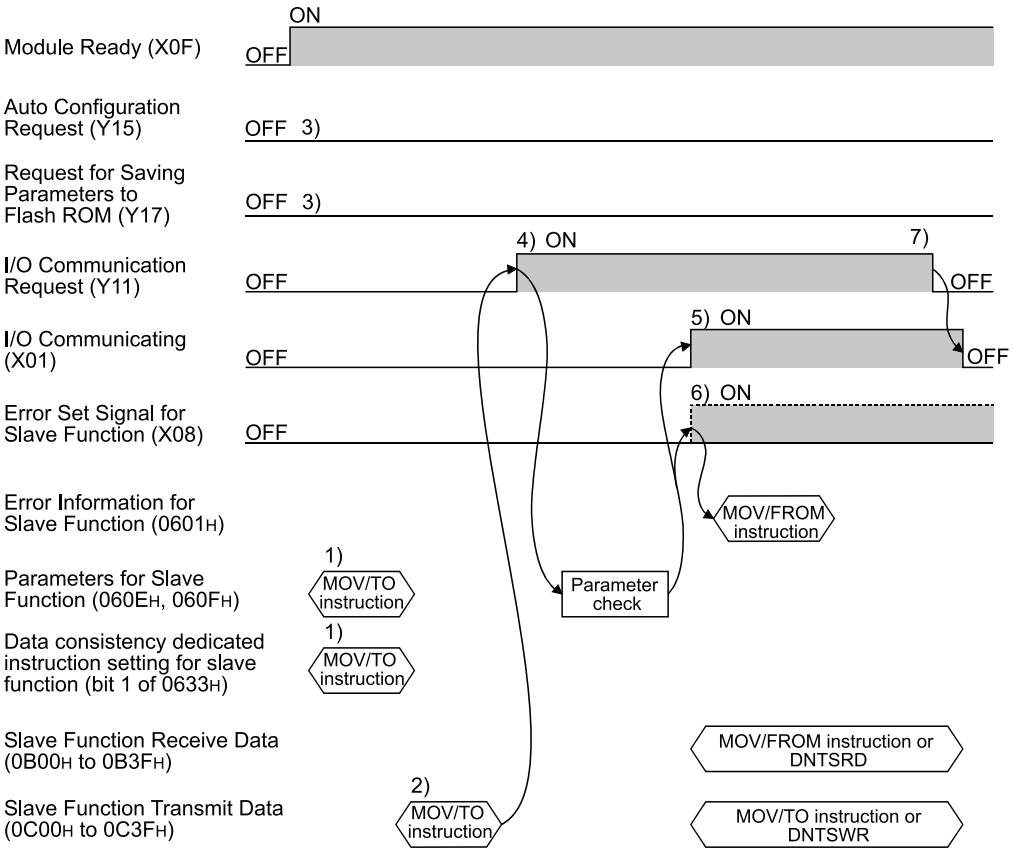
(b) Data transfer between the buffer memory and programmable controller CPU devices

Transfer method	Description	Availability of data consistency	Reference section
Auto refresh	Configure the auto refresh settings in the functions for DeviceNet of GX Works2.	Unavailable	8.3.1
MOV or FROM/TO instruction	Configure the settings in sequence programs.	Unavailable	8.3.2
Data consistency dedicated instruction (DNTSRD, DNTSWR)		Available	

(3) Operation flow

This section explains how I/O communication is performed with the master node.

(a) When starting I/O communication by I/O Communication Request (Y11)

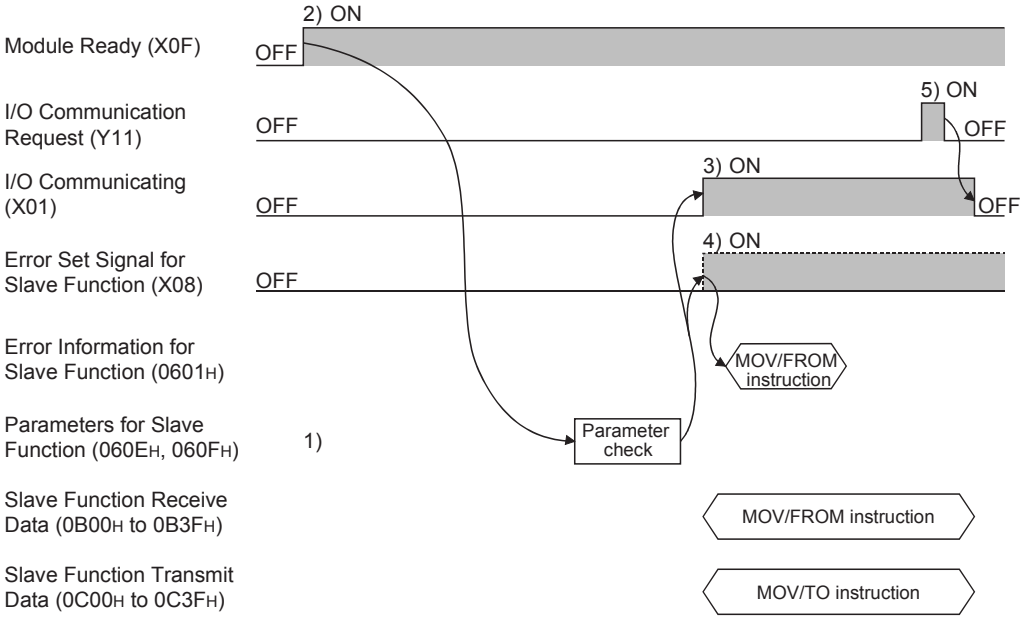


1) Set the following:
   - Set parameters in Parameters for Slave Function (address: 060EH, 060FH).
   - Set whether to enable or disable Data consistency dedicated instruction in Data consistency dedicated instruction setting for slave function (address: bit 1 of 0633H).
2) In Slave Function Transmit Data (address: 0C00H to 0C3FH), set initial values of on/off information to be sent to the master node.
3) Set Auto Configuration Request (Y15) and Request for Saving Parameters to Flash ROM (Y17) to off.
4) When I/O Communication Request (Y11) is set to on, the parameters are checked.
5) When the parameter check is succeeded, I/O communication with the master node is started and I/O Communicating (X01) is set to on. Note that, until receiving an I/O communication request from the master node, the module waits for connection establishment.
   - Data sent from the master node are stored in Slave Function Receive Data (address: 0B00H to 0B3FH).
   - The on/off information to be sent to the master node is set in Slave Function Transmit Data (address: 0C00H to 0C3FH).

6) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Slave Function (X08) is set to on. At this time, I/O Communicating (X01) is not set to on.
Check the error code in Error Information for Slave Function (address: 0601H), and take corrective actions.

7) Setting I/O Communication Request (Y11) to off stops I/O communication with the master node, causing I/O Communicating (X01) to turn off.

(b) When starting I/O communication automatically at power-up
Set "Start" in Automatic Communication Start Setting (address: 0631H).



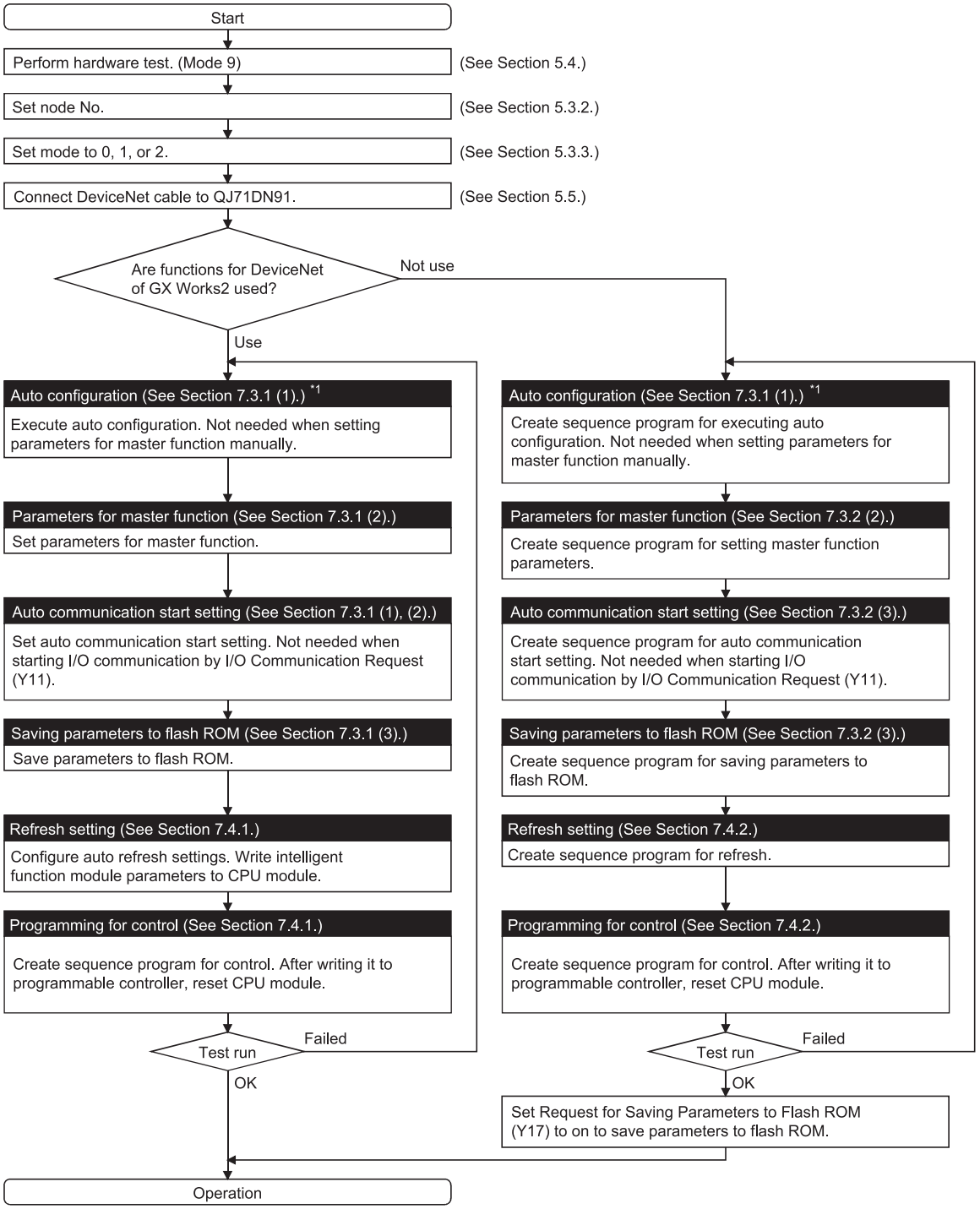
1) Save the following parameters to the flash ROM in advance.
   - Parameters for Slave Function (address: 060EH, 060FH)
   - Auto Communication Start Setting (address: 0631H)
2) When the power is turned on, parameters saved in the flash ROM is loaded into the buffer memory automatically.
   Module Ready (X0F) is set to on, and the parameters are checked.
3) When the parameter check is succeeded, I/O communication with the master node is started and I/O Communicating (X01) is set to on.
   Note that, until receiving an I/O communication request from the master node, the module waits for connection establishment.
   - Data sent from the master node are stored in Slave Function Receive Data (address: 0B00H to 0B3FH).
   - The on/off information to be sent to the master node is set in Slave Function Transmit Data (address: 0C00H to 0C3FH).
4) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Slave Function (X08) is set to on. At this time, I/O Communicating (X01) is not set to on.
   Check the error code in Error Information for Slave Function (address: 0601H), and take corrective actions.
5) Setting I/O Communication Request (Y11) to on and then off stops I/O communication with the master node, causing I/O Communicating (X01) to turn off.

5 SETUP AND PREPARATION

This chapter describes the procedures to be followed before starting the system that includes the QJ71DN91.

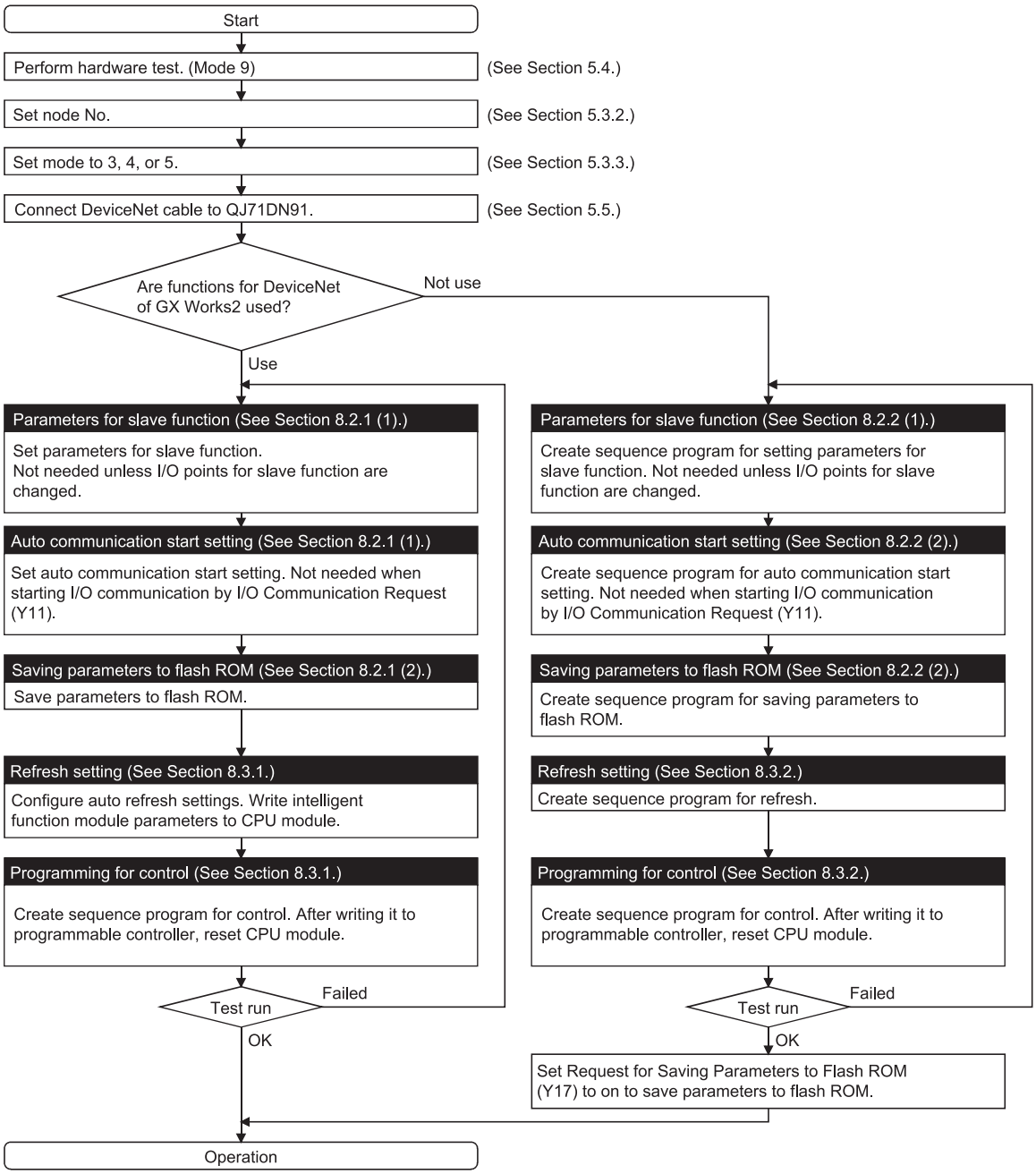
5.1 Pre-operation Procedures

5.1.1 When using the master function



*1: Check that power supplies to slave nodes and network are on and the wiring is correct.

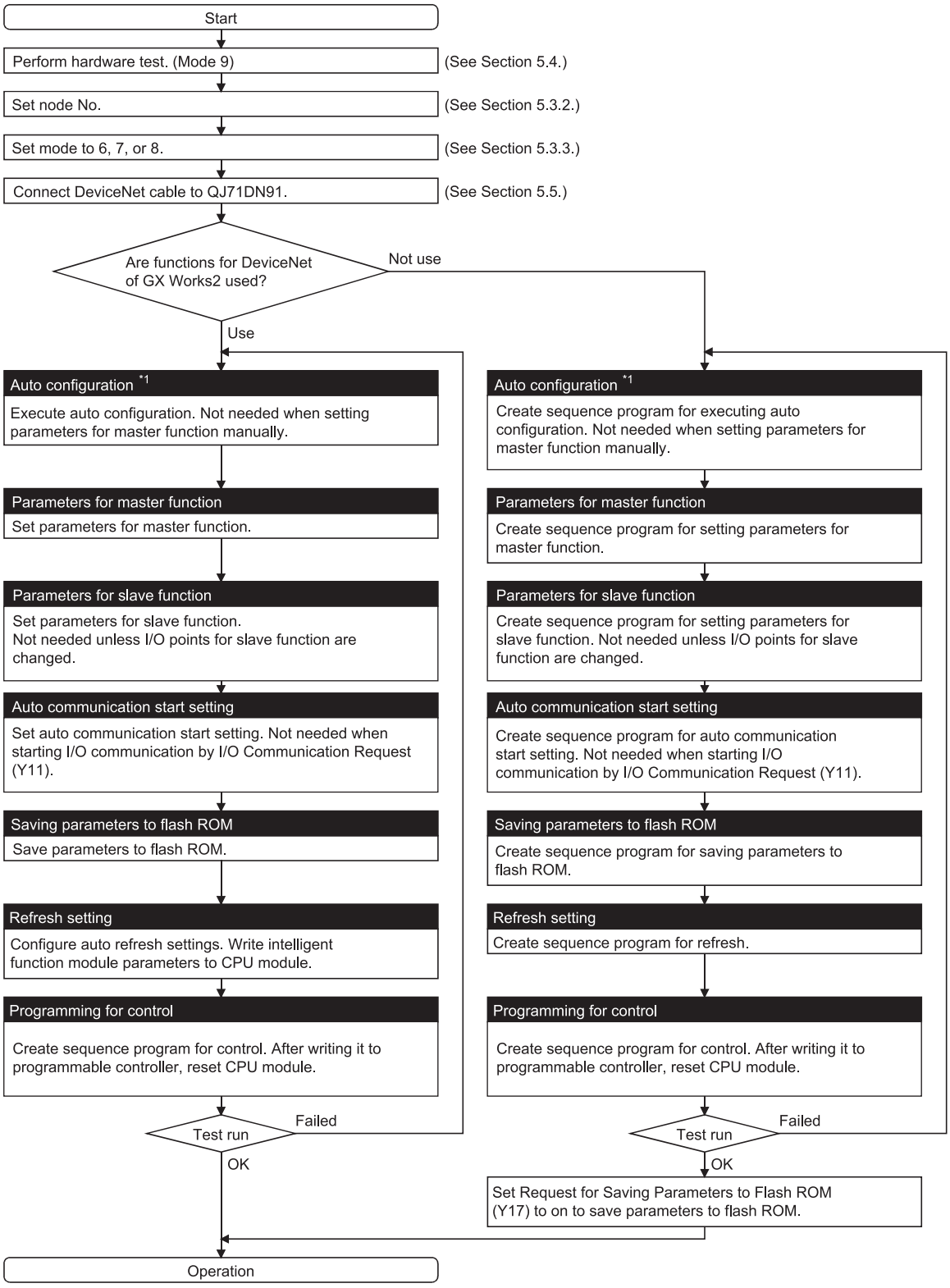
5.1.2 When using the slave function



5 - 2

5.1.3 When using both the master and slave functions

Refer to Chapter 7 for programming for the master function, and Chapter 8 for programming for the slave function.



*1: Check that power supplies to slave nodes and network are on and the wiring is correct.

5.2 Implementation and Installation

This section describes handling precautions to be taken from unpacking to mounting the QJ71DN91.
For more details, refer to the User's Manual of your programmable controller CPU.

5.2.1 Handling precautions

(1) Do not drop the module casing or connector, or do not subject it to strong impact.

(2) Do not remove the printed-circuit board of the module from its case.
Doing so may cause a failure.

(3) Be careful to prevent foreign matter such as wire chips from entering the module.
It may cause a fire, failure or malfunction.

(4) The module has an ingress prevention label on its top to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not peel this label during wiring. Remove it for heat dissipation before system operation.

(5) Tighten the screws such as module fixing screws within the following ranges.

Screw location	Tightening torque range
Module fixing screw (usually not required) (M3 screw)*1	0.36 to 0.48 N•m
DeviceNet connector screw (M2.5 screw)	0.20 to 0.30 N• m
DeviceNet connector wiring screw	0.608 to 0.823 N• m

*1: The module can be easily fixed onto the base unit using the hook at the top of the module.
However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration.

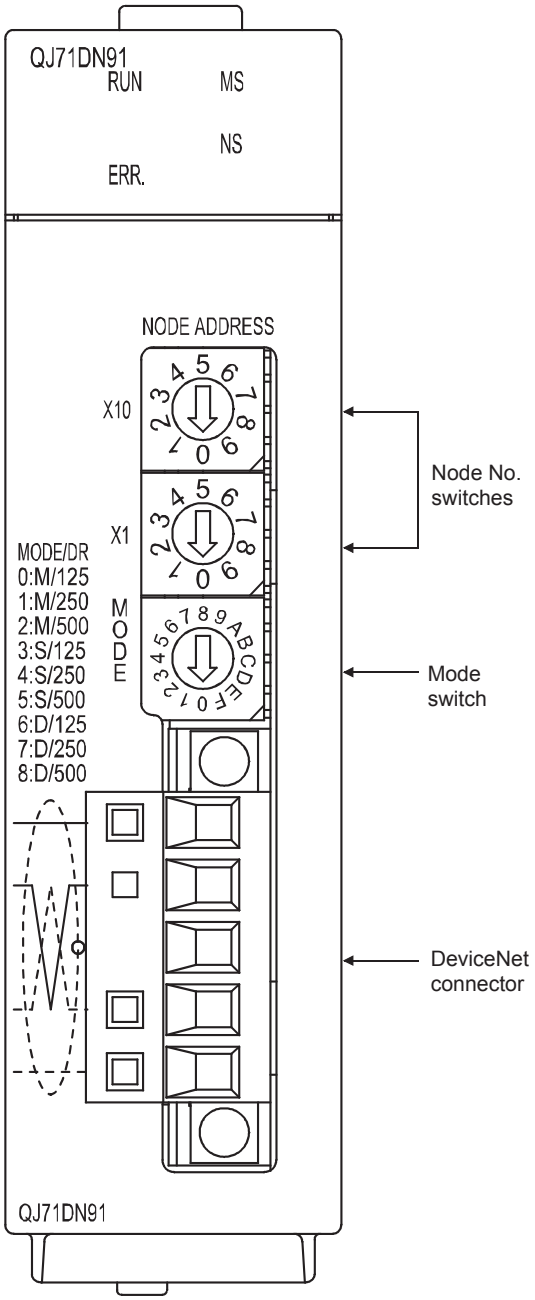
(6) Be sure to insert the module fixing projection into the hole in the base unit. Then, securely mount the module.
Incorrect module mounting may cause the module to malfunction, fail or fall off.

5.2.2 Installation environment

For more details on the installation environment, refer to the User's Manual of your programmable controller CPU.

5.3 Part Names and Settings

This section describes the part names, LED indications, and respective switch settings of the QJ71DN91.



5.3.1 LED indications

The following explains the names of the LEDs on the QJ71DN91 and their indications in mode 0 to 8.

For the LED indications in mode 9 to C, refer to Section 5.4 Hardware Test or 5.6 Communication Test.

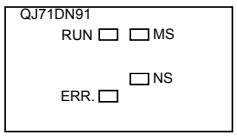


Table 5.1 LED names and indications

LED name	Color	LED status
RUN	Green	ON: Operating normally
		OFF: Watchdog timer error
ERR.	Red	ON: Node No. setting error
		Flashing: Node number switch or mode switch was changed during module operation.
MS	Green	ON: Communication is available.
		Flashing: Parameter error
NS	Green	ON: Communication in progress
		Flashing: Waiting for communication (waiting for I/O communication request from programmable controller CPU, or waiting for communication start of the target module)
	Red	ON: Node No. duplication or bus off error (communication line error)
		Flashing: <In master function mode> A node that does not respond exists. <In slave function mode> Communication with the master node is interrupted.
	Green/Red	OFF: Power to the network is not being supplied.

5.3.2 Node number switches

The following explains the node number switches of the QJ71DN91

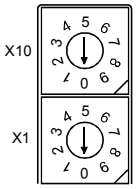


Table 5.2 Node number switches

Name	Description
Node number switch	Used to set the node No. of the module. (Factory default: 0) Do not change the node No. during module operation since it is recognized when the module is powered on or reset. If changed, the ERR. LED will flash. Setting range: 0 to 63 (The Err. LED will flash if any other than these is set.) * The node No. must be unique.

POINT

(1) If the module is used as both a master and slave node, the same node No. is applied to the master and slave functions.

(2) Since lower numbers have priority over higher numbers, set a lower number to a master node.

5.3.3 Mode switch

The following explains the mode switch of the QJ71DN91.

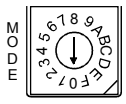


Table 5.3 Mode switch

Name	Setting	Function	Description
Mode switch	0	Master function	Operates as a master node, at communication speed of 125k baud (factory default).
	1		Operates as a master node, at communication speed of 250k baud.
	2		Operates as a master node, at communication speed of 500k baud.
	3	Slave function	Operates as a slave node, at communication speed of 125k baud.
	4		Operates as a slave node, at communication speed of 250k baud.
	5		Operates as a slave node, at communication speed of 500k baud.
	6	Master and slave functions *	Operates as a master and slave node, at communication speed of 125k baud.
	7		Operates as a master and slave node, at communication speed of 250k baud.
	8		Operates as a master and slave node, at communication speed of 500k baud.
	9	Hardware test	Performs the ROM/RAM check and self-loopback test.
	A	Communication test	Performs the transmit/receive test, at communication speed of 125k baud.
	B		Performs the transmit/receive test, at communication speed of 250k baud.
	C		Performs the transmit/receive test, at communication speed of 500k baud.
	D to F	Use prohibited	-

* Select a mode between 6 and 8 when using both the master and slave functions.

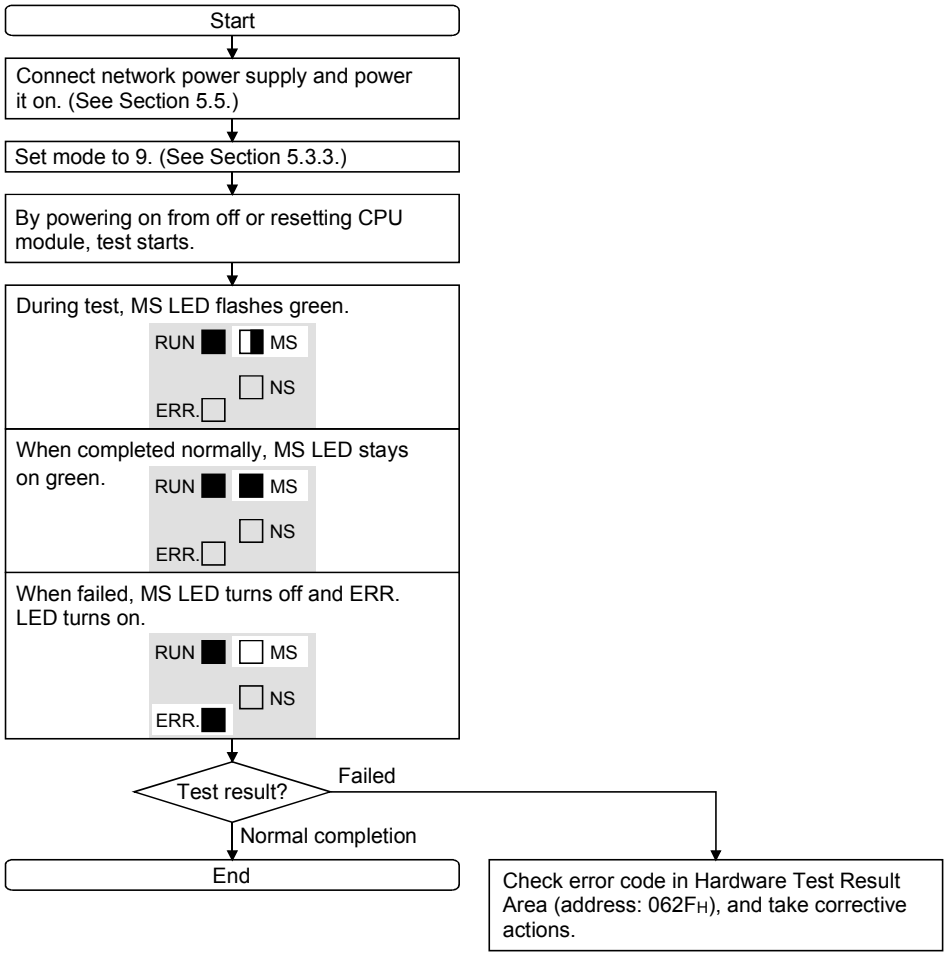
5.4 Hardware Test

The hardware test checks whether or not the module operates normally in stand-alone condition. It performs ROM check, RAM check, self-loopback test, etc.

Be sure to perform the hardware test before building a system.

For the test related to DeviceNet communications, refer to Section 5.6 Communication Test and perform it after wiring.

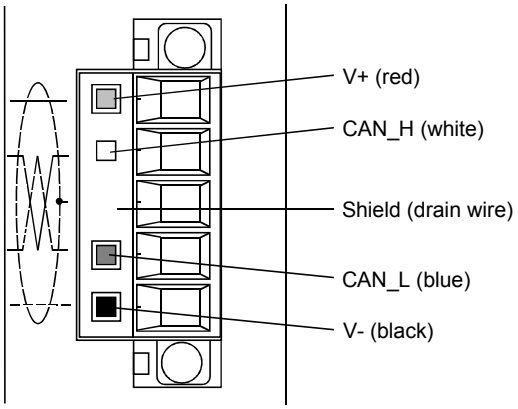
Execute the hardware test in the following sequence:



5.5 Wiring

(1) Connecting a DeviceNet cable

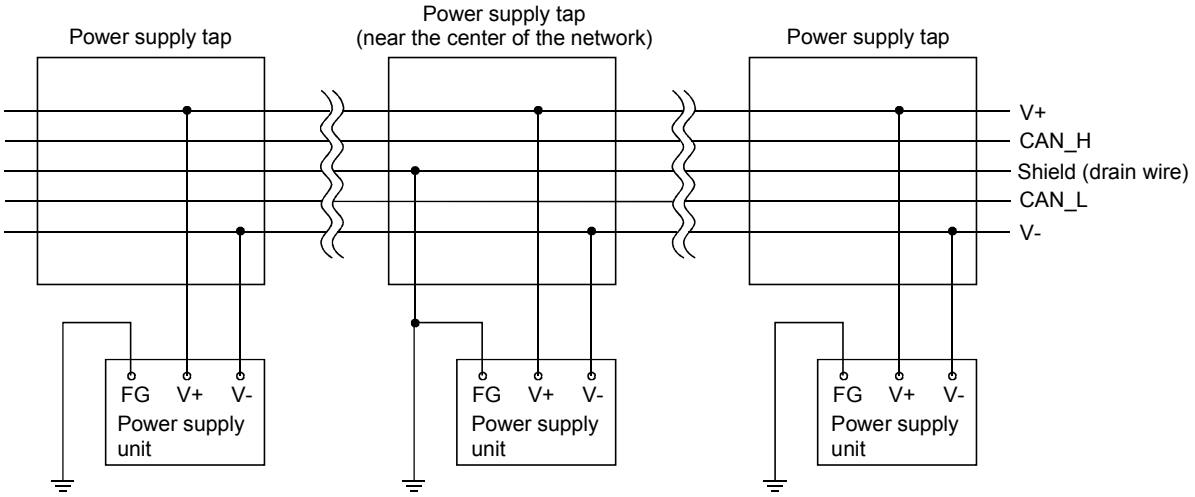
The following explains how to connect a DeviceNet cable to the QJ71DN91.



The figure above shows the QJ71DN91's DeviceNet connector.
Stickers in the colors of respective wires are put on the connector.
Connect the DeviceNet cable correctly so that the colors of the wires will match those of the stickers.

(2) Grounding the network

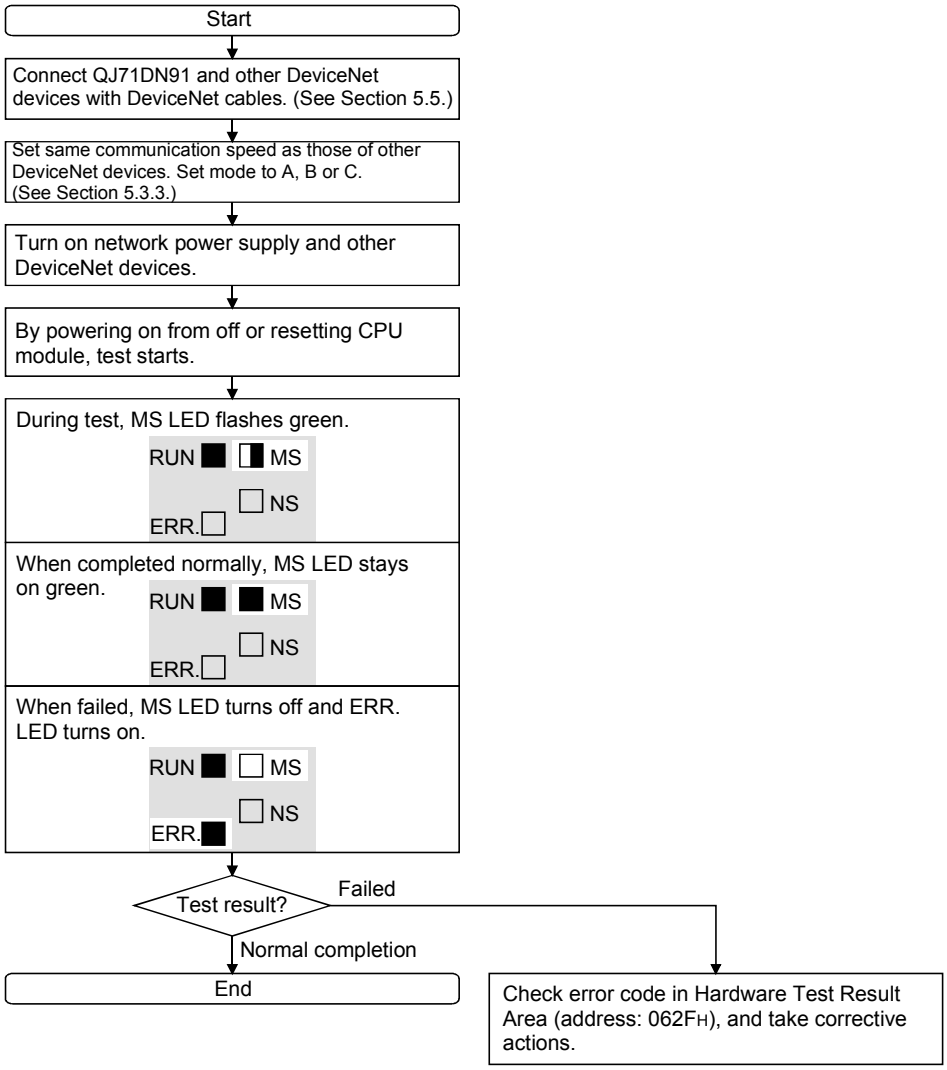
The DeviceNet network should be grounded at a single point, near the center of the network.
Connect the cable shield (drain wire) to the ground terminal of the power supply unit, and ground it to the protective ground conductor.
If multiple power supply units exist on the network, ground only the power supply unit near the center of the network, and do not ground others.
Also, in such a case, use power supply taps.



5.6 Communication Test

The transmission and reception tests are performed after connecting the QJ71DN91 and other DeviceNet devices with DeviceNet cables.
There is no restriction on the node No. setting of the communication target.

Execute the test in the following sequence:



5.7 Precautions for Network Power Supply

This section describes the precautions for network power supply.

5.7.1 Network power supply unit position

Follow the procedure below to determine the position to install the network power supply unit.

1) Calculate the current consumption of each node on the network.
2) Measure the total length of the network.
3) Referring to Tables 5.4 and 5.5, find a maximum current value corresponding to the network length and the cable type used.
4) If the current value calculated at step 1) is less than the one obtained at step 3), any of the positions described on the next page can be used.
5) If the current value calculated at step 1) exceeds the one obtained at step 3), install the network power supply unit near the center of the network referring to the next page, and check if power can be supplied to all nodes.
6) As a result of step 5), if power cannot be supplied to all nodes, increase the number of network power supply units.

Table 5.4 Maximum current capable of being supplied to master/slave nodes, for each length of the network using thick cables

Network length (m)	0	25	50	100	150	200	250	300	350	400	450	500
Maximum current (A)	8.00	8.00	5.42	2.93	2.01	1.53	1.23	1.03	0.89	0.78	0.69	0.63

Table 5.5 Maximum current capable of being supplied to master/slave nodes, for each length of the network using thin cables

Network length (m)	0	10	20	30	40	50	60	70	80	90	100
Maximum current (A)	3.00	3.00	3.00	2.06	1.57	1.26	1.06	0.91	0.80	0.71	0.64

POINT

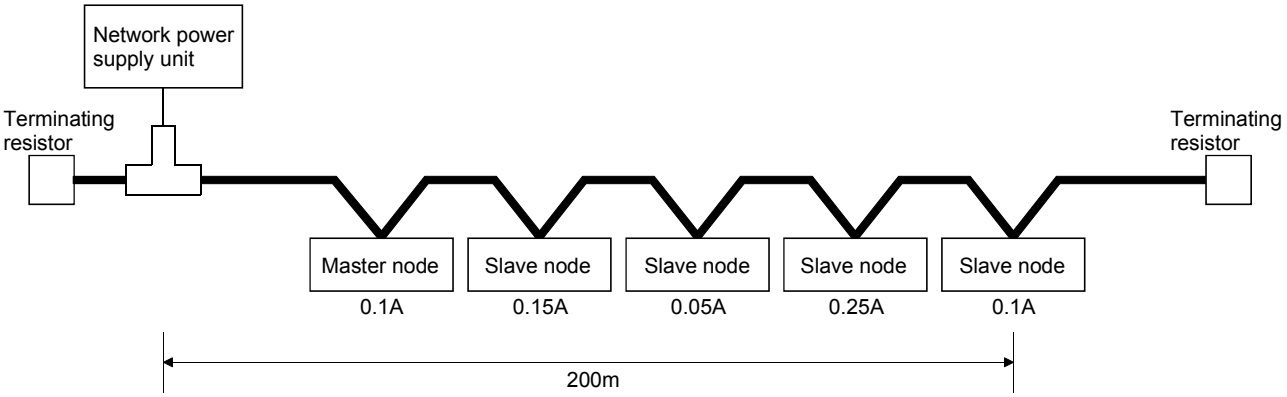
Use a network power supply unit of which the current capacity is more than the required total current consumption.
If the current capacity is insufficient, use of multiple power supplies is possible. However, use power supply taps in such a case.

5.7.2 Network power supply unit position and current capacity calculation

This section describes where to install the network power supply unit and how to calculate the current capacity.

(1) Connecting the network power supply unit to one end of the network

When the network is 200m long in total and uses thick cables, the current capacity can be calculated as shown below.



Total power supply distance = 200m

Total current capacity = 0.1A + 0.15 + 0.05A + 0.25A + 0.1A = 0.65A

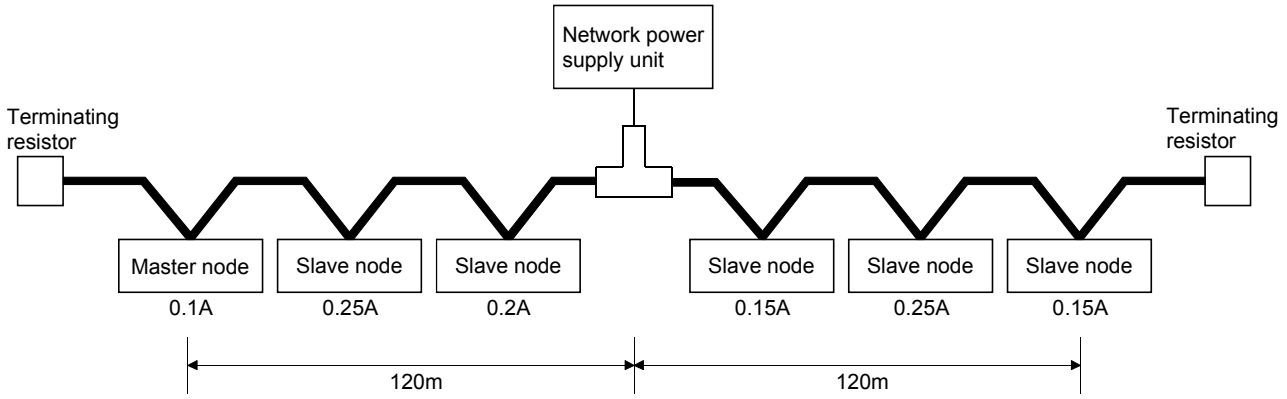
Max. current capacity available for total thick cable length of 200m (See Table 5.4.) = 1.53A

Therefore, this configuration allows power supply to all nodes.

(2) Connecting the network power supply unit to the center of the network

When the network uses thick cables, the current capacity can be calculated as shown below.

In this case, the network power supply unit can supply twice the current compared to when it is connected to the end of the network.



Power supply distance on the left side = Power supply distance on the right side = 120m

Total current capacity of the left side = 0.1A + 0.25A + 0.2A = 0.55A

Total current capacity of the right side = 0.15A + 0.25A + 0.15A = 0.55A

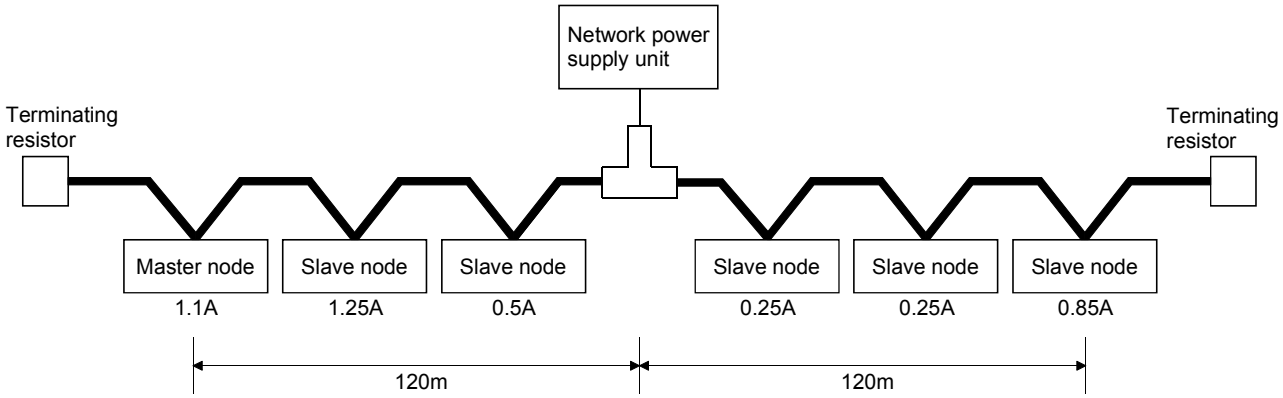
Max. current capacity available for thick cable length of 120m (See Table 5.4.) = approx. 2.56A

(Straight-line approximation between 100m and 150m)

Therefore, this configuration allows power supply to all nodes.

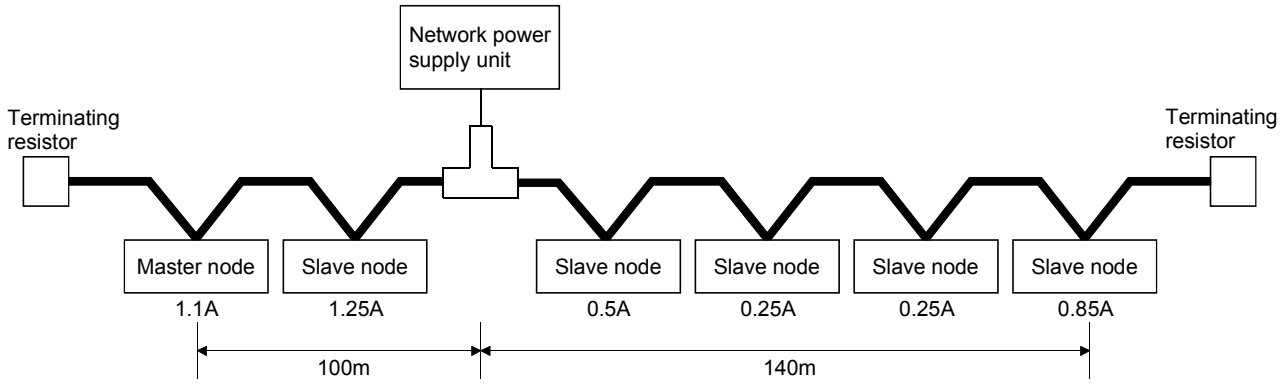
(3) When the network power supply current capacity is insufficient

In the case where the network power supply unit is connected to the following network that uses thick cables:



Power supply distance on the left side = Power supply distance on the right side = 120m
Total current capacity of the left side = 1.1A + 1.25A + 0.5A = 2.85A
Total current capacity of the right side = 0.25A + 0.25A + 0.85A = 1.35A
Max. current capacity available for thick cable length of 120m (See Table 5.4.) = approx. 2.56A
(Straight-line approximation between 100m and 150m)

In this configuration, the current capacity on the left side is insufficient.
In this case, move the network power supply unit in the direction of insufficient current capacity (to the left in the figure above).

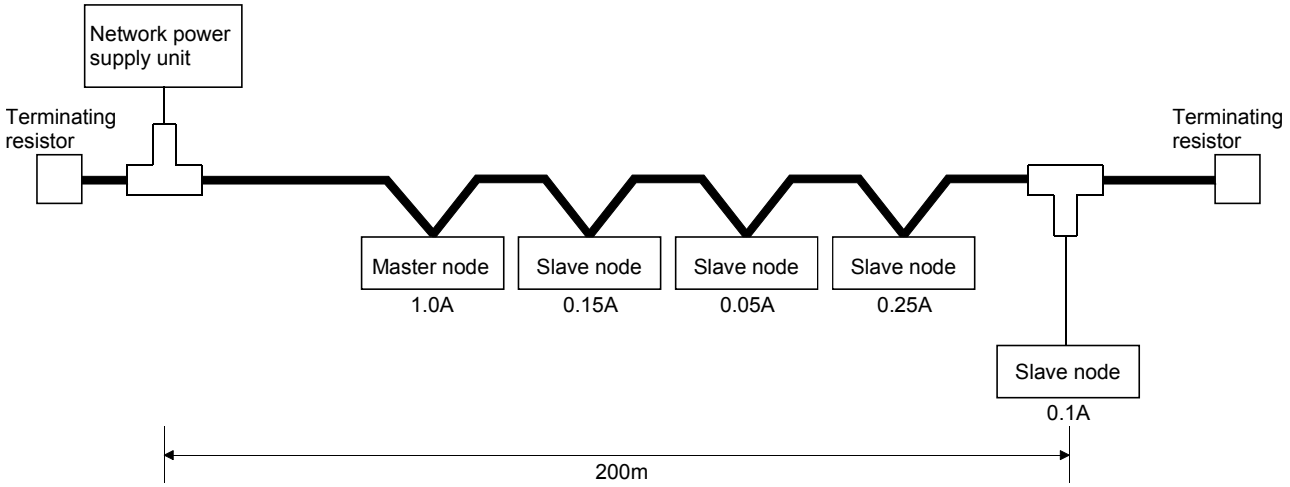


Total power supply distance on the left side = 100m
Total power supply distance on the right side = 140m
Total current capacity of the left side = 1.1A + 1.25A = 2.35A
Total current capacity of the left side = 0.5A + 0.25A + 0.25A + 0.85A = 1.85A
Max. current capacity available for thick cable length of 100m (See Table 5.4.) = approx. 2.93A
Max. current capacity available for thick cable length of 140m (See Table 5.4.) = approx. 2.19A
(Straight-line approximation between 100m and 150m)

As a result of shifting the network power supply unit, it is able to supply power to all nodes.

(4) When using both trunk and drop lines

The current capacity is calculated as shown below when the network power supply unit is connected to a network that has a 200m-long trunk line of thick cables and a 6m-long drop line of a thin cable.



Total thick-cable length = 200m
Total drop-line length = 6m
Total current capacity = 0.5A + 0.15A + 0.05A + 0.25A + 0.1A = 1.05A
Max. current capacity available for thick cable length of 200m (See Table 5.4.) = 1.53A
Max. current capacity available for thin cable length of 6m (See Table 5.6.) = 0.75A
Total current consumed by devices connected to drop line = 0.1A

Therefore, this configuration allows power supply to all nodes.

Table 5.6 Maximum current capacity for each drop line length

Drop line length (m)	0.30	0.90	1.50	2.25	3.00	4.50	6.00
Max. current (A)	3.00	3.00	3.00	2.00	1.50	1.00	0.75

6 FUNCTIONS FOR DeviceNet OF GX Works2

6.1 Functions for DeviceNet of GX Works2

Table 6.1 lists the functions for DeviceNet of GX Works2.

Table 6.1 Setting list of functions for DeviceNet of GX Works2

Function	Description
Parameter (Main)	Set basic settings, parameters for the master function, parameters for the slave function, and parameters for the master/slave common function.
Parameter (Slave_Node_Information)	Set the station numbers of slave station, message groups, connection type, the number of I/O byte module and the number of I/O word module.
Auto refresh	(1) The QJ71DN91's buffer memory is configured for automatic refresh. (2) Values set for auto refresh and stored in the QJ71DN91's buffer memory are automatically read out when the END instruction is executed in the programmable controller CPU.
Monitoring/test	The buffer memory and I/O signals of the QJ71DN91 are monitored or tested. Auto configuration and parameter backup are also available.
Flash ROM Operation	The data can be saved to the flash ROM and cleared in offline.

For the operation of the functions for DeviceNet of GX Works2, refer to the following.
GX Works2 Version 1 Operating Manual (Intelligent Function Module)

6 - 1

6.2 Handling precautions

(1) Number of parameters that can be set in GX Works2

When multiple intelligent function modules are mounted, the number of parameter settings must not exceed the following limit.

When intelligent function modules are installed to:	Maximum number of parameter settings	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q02PH/Q06PH/Q12PH/Q25PHCPU	512	256
Q00UJ/Q00U/Q01UCPU	512	256
Q02UCPU	2048	1024
Q03UD/Q04UDH/Q06UDH/Q10UDH/ Q13UDH/Q20UDH/Q26UDH/Q03UDE/ Q04UDEH/Q06UDEH/Q10UDEH/ Q13UDEH/Q20UDEH/Q26UDEHCPU	4096	2048
CPU modules other than listed above	Not available	Not available

For example, if multiple intelligent function modules are installed to the Q25HCPU, configure the settings in GX Works2 so that the number of parameter settings for all the intelligent function modules does not exceed the limit of the Q25HCPU. Calculate the total number of parameter settings separately for the initial setting and for the auto refresh setting.
The number of parameters that can be set for one module in the intelligent function module (QJ71DN91) is as shown below.

Target module	Initial setting	Auto refresh setting
QJ71DN91	0 (Not used)	18 (Max.)

Example) Counting the number of parameter settings in Auto refresh setting

(2) Writing parameters via the network

The QJ71DN91 does not support writing of parameters via the network.

MEMO

6 - 3

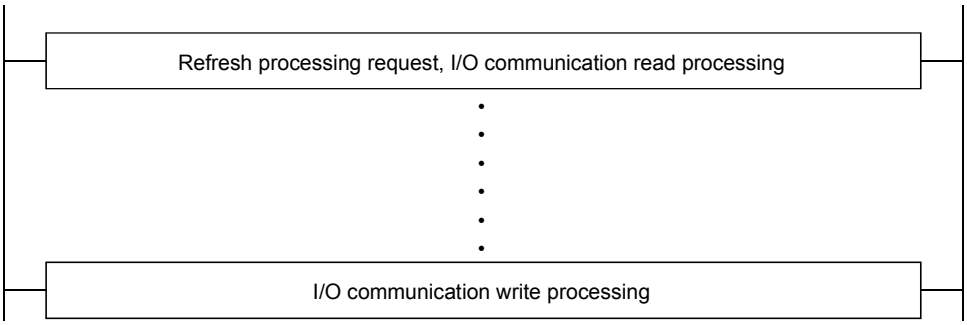
7 PROGRAMMING FOR EXECUTING THE MASTER FUNCTION

This chapter explains programming for executing the master function.
When applying the program examples introduced in this chapter to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

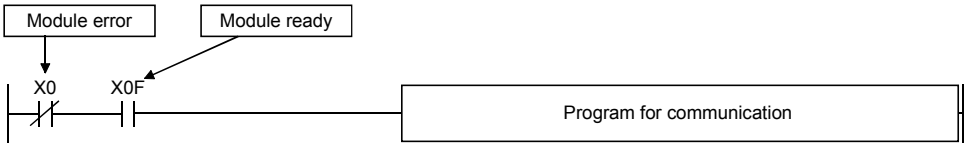
7.1 Programming Precautions

When creating programs, pay attention to the following:

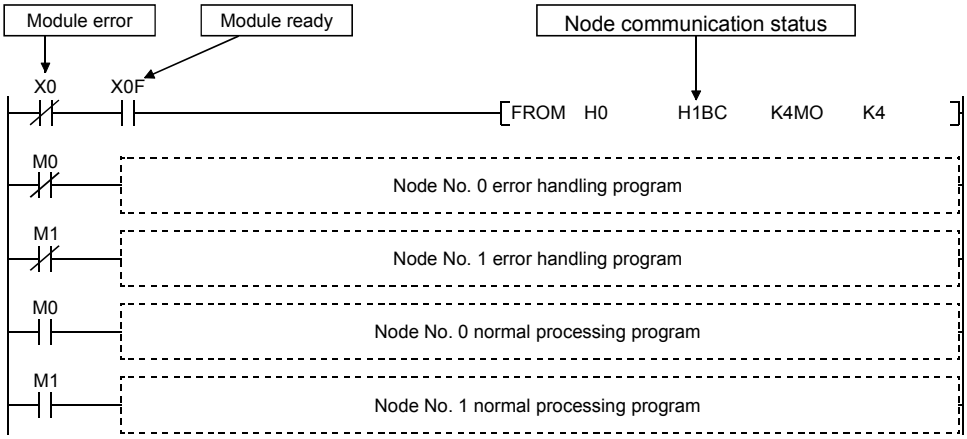
(1) To perform I/O communication with a slave node, perform the following:
- Place the I/O communication read processing program at the beginning of the sequence program.
- Place the I/O communication write processing program at the end of the sequence program.



(2) Reading receive data and writing transmit data must be performed when there is no error in the module and the module is in the ready status.



(3) Create a program that detects the communication status of each node and performs interlock. Also, create an error handling program.

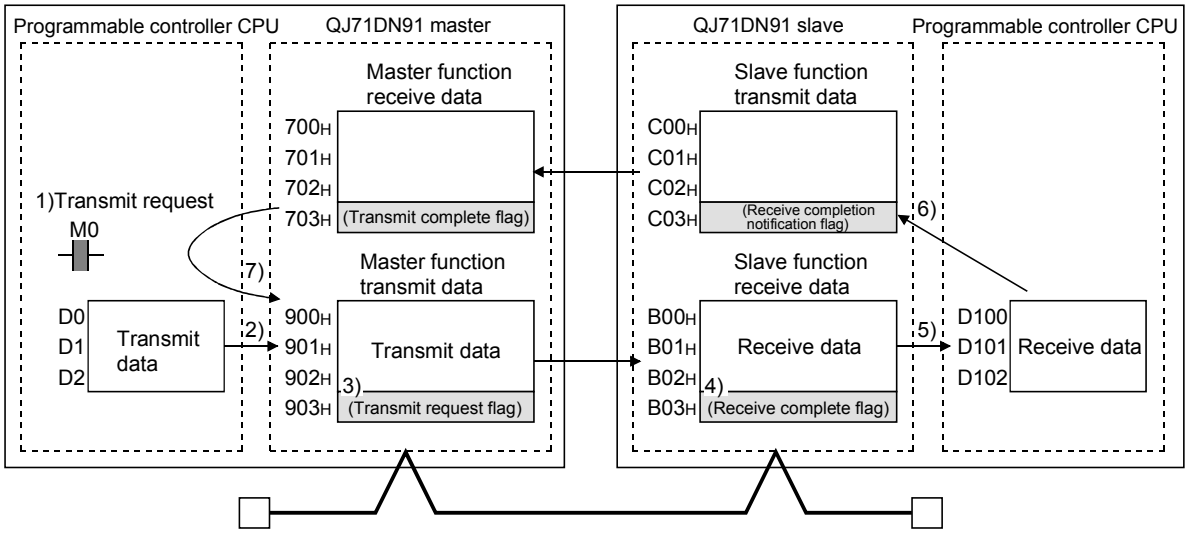


7

(4) When data of multiple words is sent from/received in the buffer memory of the QJ71DN91, data inconsistency may occur.
When sending/receiving data of multiple words, use Data consistency dedicated instruction (DNTMRD, DNTMWR, DNTSRD, DNTSWR).

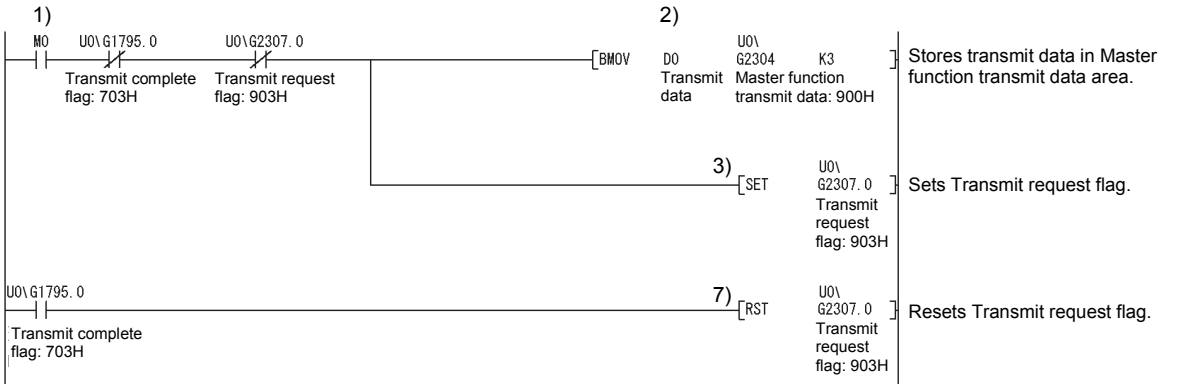
REMARK

With MOV or FROM/TO instruction, data inconsistency can be avoided by checking data transfer.
The following shows an example in which data transfer is checked by providing a handshake area at the end of send/receive data.

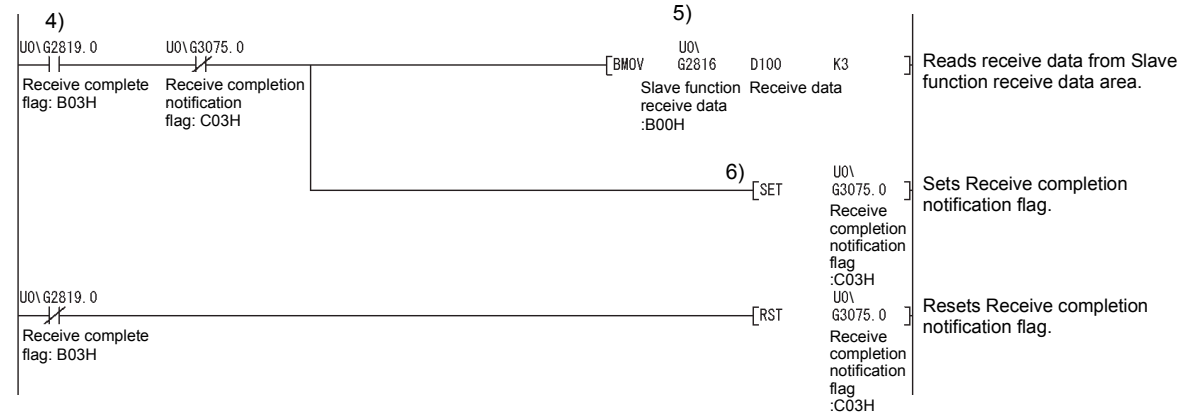


7

Transmitting node (QJ71DN91 master)



Receiving node (QJ71DN91 slave)

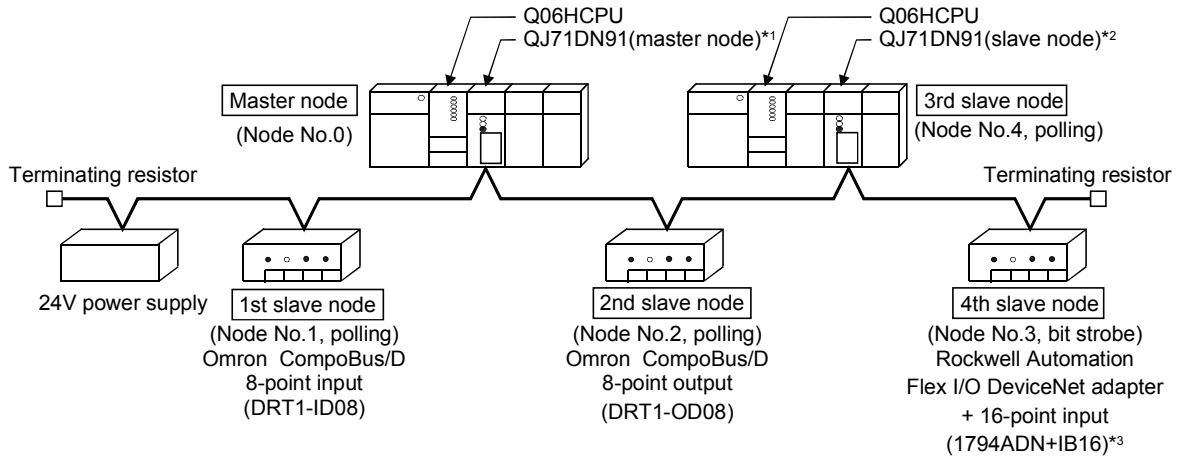


1) Transmission command turns on.
2) Data in D0 to D2 are stored in the transmit data area (address: 900H to 902H).
3) Upon completion of storing the transmit data, the transmit request flag (address: 903H) turns on.
4) The master function transmit data are sent through I/O communication, and the receive complete flag (address: B03H) turns on.
5) Data in the receive data area (address: B00H to B02H) are stored in D100 to D102.
6) Upon completion of storing the data into D100 to D102, the receive completion notification flag (address: C03H) turns on.
7) When data are received on the receiving node, the transmit request flag (address: 903H) turns off.

7.2 System Configuration

The explanation of the programs in this chapter is based on the following system.

(1) System configuration



*1: The QJ71DN91 (master node) is installed to slot 0 of the base unit, with the start I/O No. set to "0000H".

*2: The QJ71DN91 (slave node) is installed to slot 1 of the base unit, with the start I/O No. set to "0020H".

*3: Rockwell Automation's Flex I/O DeviceNet adapter has input data of two bytes for its status. It also has 2-byte input data and 2-byte output data.

(2) Settings

(a) Settings of the master node (QJ71DN91 (master node))

For communication with the 1st to 4th slave nodes, set the information such as connection type and I/O points as the parameters for master function. (Refer to Section 7.3.)

Item	Setting
Node number (Node number switches)	0 (00)
Communication speed (Mode switch)	125kbaud (Mode 0)
Receive data	X100 to X16F
Transmit data	Y100 to Y14F

(b) Settings of the slave nodes

For the setting of node No. and communication speed, refer to the manual for each slave node.

1) 1st slave node

(Omron's CompoBus/D, 8-point input (DRT1-ID08))

Item	Setting
Node No.	Node No.1
Communication speed	125kbaud
Connection type	Polling
I/O points	8 input points

2) 2nd slave node

(Omron's CompoBus/D, 8-point output (DRT1-OD08))

Item	Setting
Node No.	Node No.2
Communication speed	125kbaud
Connection type	Polling
I/O points	8 output points

3) 3rd slave node (QJ71DN91(slave node))

Item	Setting
Node number (Node number switches)	Node No.4 (04)
Communication speed (Mode switch)	125kbaud (Mode 3)
Connection type	Polling
Slave function receive-bytes (input points)	8 bytes
Slave function transmit-bytes (output points)	8 bytes

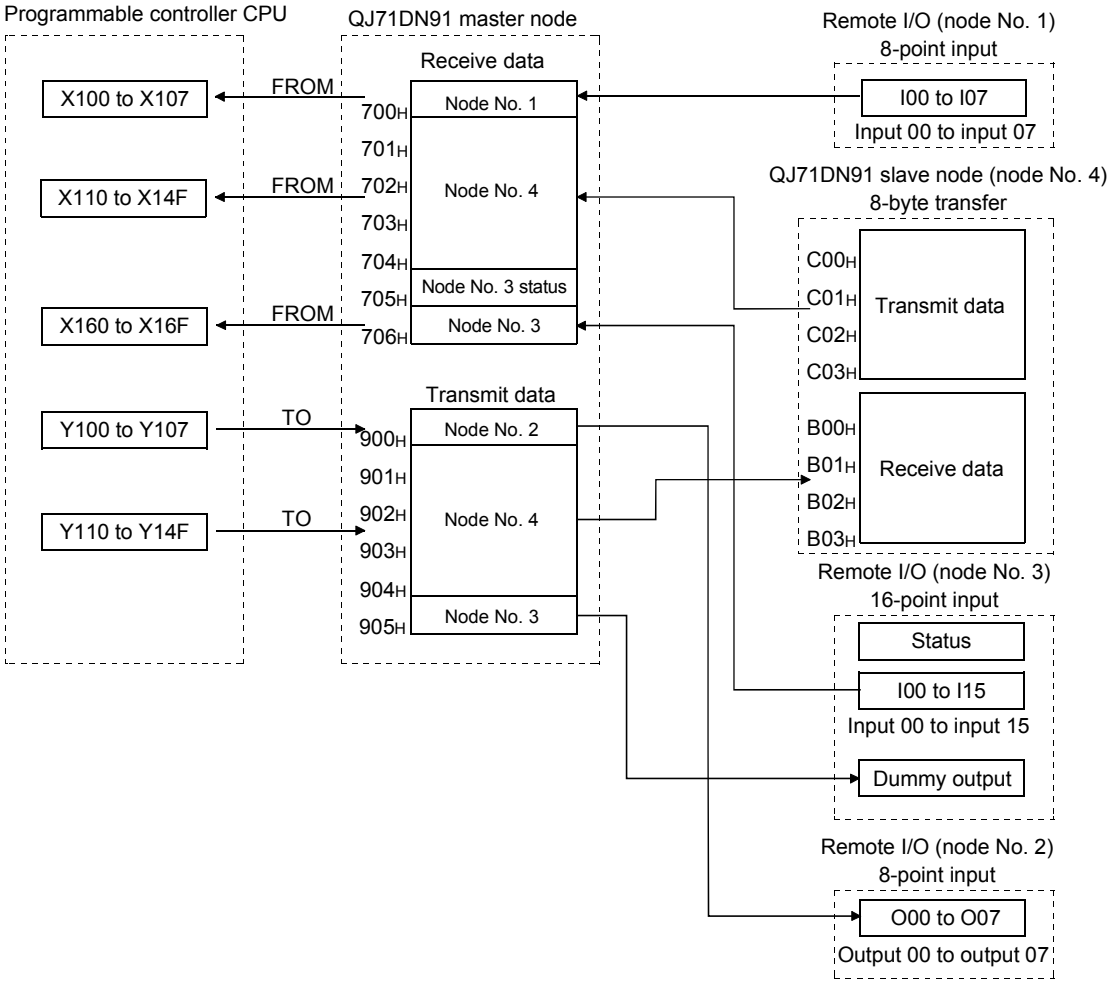
4) 4th slave node

(Rockwell Automation's Flex I/O DeviceNet adapter + 16-point input (1794ADN + IB16))

Item	Setting
Node No.	Node No.3
Communication speed	125kbaud
Connection type	Bit strobe
I/O points	16 input points

(3) Communications

The following shows the relation among the programmable controller CPU, master node's buffer memory, and a slave node.



7.3 Parameters for Master Function

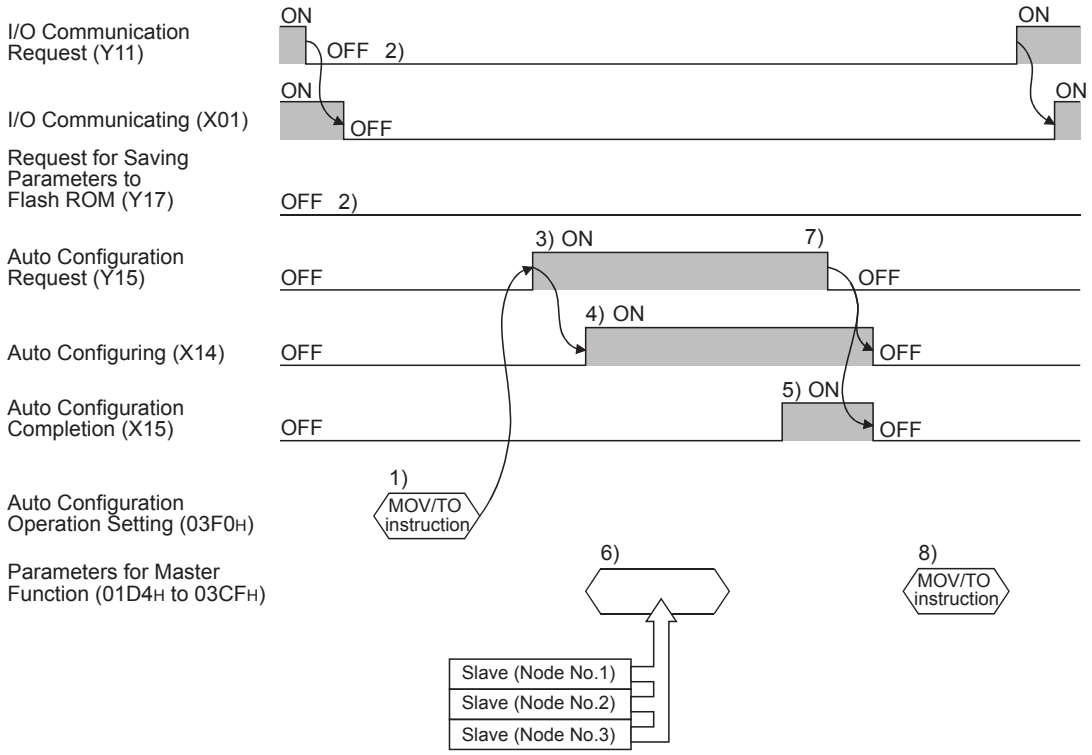
(1) Setting items

The following table lists the parameters for master function, which are set in a program example.
For details of the parameters for master function, refer to Section 3.4.5.
For setting by auto configuration, refer to (2) in this section.
For saving parameters to the flash ROM, refer to (3) in this section.

Buffer memory address (Hex.)	Item		Set value
01D7H	Constant scan		0000H (0ms)
01D8H	1st slave node	Node No. and message group	0401H (Node No.1, group 2 only server)
01D9H		Connection type	0001H (Polling)
01DAH		Number of byte modules	0001H (Input 1, Output 0)
01DBH		Number of word modules	0000H (Input 0, Output 0)
01DCH		Number of double-word modules	0000H (Input 0, Output 0)
01DDH		Expected packet rate	0000H (200ms)
01DEH		Watchdog timeout action	0000H (Timeout)
01DFH		Production inhibit time	0000H (10ms)
01E0H	2nd slave node	Node No. and message group	0402H (Node No.2, group 2 only server)
01E1H		Connection type	0001H (Polling)
01E2H		Number of byte modules	0100H (Input 0, Output 1)
01E3H		Number of word modules	0000H (Input 0, Output 0)
01E4H		Number of double-word modules	0000H (Input 0, Output 0)
01E5H		Expected packet rate	0000H (200ms)
01E6H		Watchdog timeout action	0000H (Timeout)
01E7H		Production inhibit time	0000H (10ms)
01E8H	3rd slave node	Node No. and message group	0104H (Node No.4, message group 3)
01E9H		Connection type	0001H (Polling)
01EAH		Number of byte modules	0808H (Input 8, Output 8)
01EBH		Number of word modules	0000H (Input 0, Output 0)
01ECH		Number of double-word modules	0000H (Input 0, Output 0)
01EDH		Expected packet rate	501 (500ms)
01EEH		Watchdog timeout action	0002H (Auto delete)
01EFH		Production inhibit time	21 (20ms)
01F0H	4th slave node	Node No. and message group	0103H (Node No.3, message group 3)
01F1H		Connection type	0002H (Bit strobe)
01F2H		Number of byte modules	0204H (Input 4, Output 2)
01F3H		Number of word modules	0000H (Input 0, Output 0)
01F4H		Number of double-word modules	0000H (Input 0, Output 0)
01F5H		Expected packet rate	0000H (200ms)
01F6H		Watchdog timeout action	0000H (Timeout)
01F7H		Production inhibit time	0000H (10ms)

(2) Operation flow of auto configuration

The following explains the operation flow in the case of using auto configuration.
When using the utility package, refer to Section 7.3.1 (1).
When not using the utility package, refer to Section 7.3.2 (1).



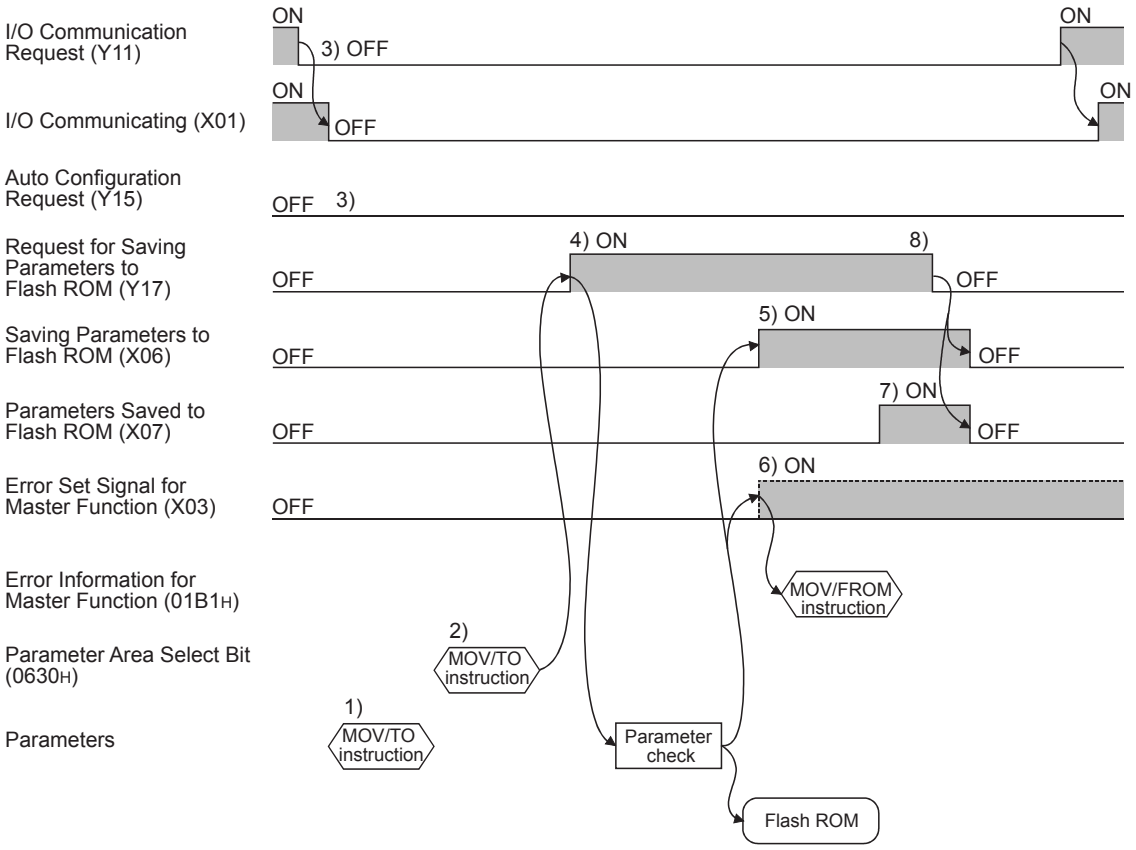
1) Set a type of auto configuration and the maximum detection node No. in Auto Configuration Operation Setting (address: 03F0H).
(Example) When the auto configuration type is "All configuration" and the maximum detection node No. is 4, set 0004H.
2) Set I/O Communication Request (Y11) and Request for Saving Parameters to Flash ROM (Y17) to off.
3) Set Auto Configuration Request (Y15) to on.
4) Auto configuration is started, and Auto-Configuring (X14) is set to on. Up to approx. 60 seconds are needed for completion of auto configuration.
5) Upon completion of auto configuration, Auto Configuration Completion (X15) is set to on.
6) Parameters saved in each slave node are loaded and stored in Parameters for Master Function (address: 01D4H to 03CFH). The parameter settings loaded from the slave nodes are stored in order of node No.
7) When Auto Configuration Request (Y15) is set to off, Auto-Configuring (X14) and Auto Configuration Completion (X15) are set to off.
8) Check Parameters for Master Function (address: 01D4H to 03CFH). Confirm that the settings such as node No., connection type, I/O points are correct. Correct values if any incorrect setting is identified.

(3) Operation flow of parameter saving to flash ROM

The following explains the operation flow in the case of saving parameters to the flash ROM.

When using the functions for DeviceNet of GX Works2, refer to Section 7.3.1 (3).

When not using the functions for DeviceNet of GX Works2, refer to Section 7.3.2 (3).



1) Set parameters in the following buffer memory areas:
   - Parameters for Master Function (address: 01D4H to 03CFH)
   - Auto Communication Start Setting (address: 0631H)
2) Specify a parameter saving area in Parameter Area Select Bit (address: 0630H).
3) Set I/O Communication Request (Y11) and Auto Configuration Request (Y15) to off.
4) When Request for Saving Parameters to Flash ROM (Y17) is set to on, parameters are checked.
5) If the parameter check is completed successfully, saving the parameters to the flash ROM is started, and Saving Parameters to Flash ROM (X06) is set to on.
6) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Master Function (X03) is set to on.
   Check the error code in Error Information for Master Function (address: 01B1H), and take corrective actions.
7) Upon completion of parameter saving to the flash ROM, Parameters Saved to Flash ROM (X07) is set to on.
8) When Request for Saving Parameters to Flash ROM (Y17) is set to off, Saving Parameters to Flash ROM (X06) and Parameters Saved to Flash ROM (X07) are set to off.

7.3.1 Program example using the functions for DeviceNet of GX Works2

(1) When using auto configuration

Execute the auto configuration on the [Parameter Setting] and [Information/Status] screen of the intelligent function module monitor (QJ71DN91).

For information on how to display the intelligent function module monitor (QJ71DN91), refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)

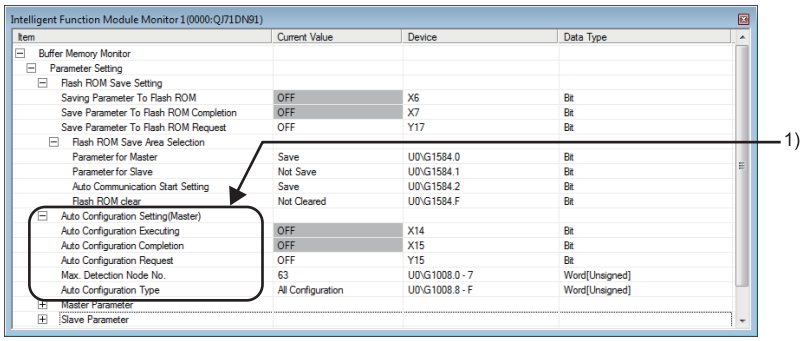
POINT

(1) Pre-determine the slave node settings (e.g. connection type) before executing auto configuration.

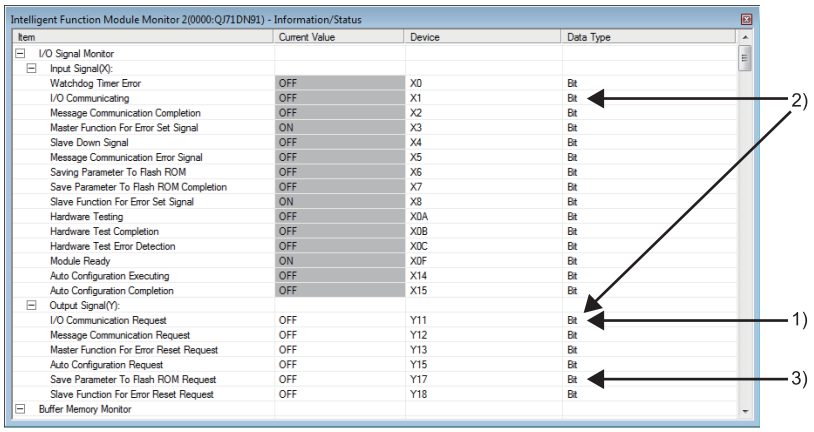
(2) Check that the power of the slave nodes and the network is on and the wiring is correct.

(a) The setting items for auto configuration are shown below.

The setting items for auto configuration are shown on [Parameter Setting] screen of the intelligent function module monitor (QJ71DN91).

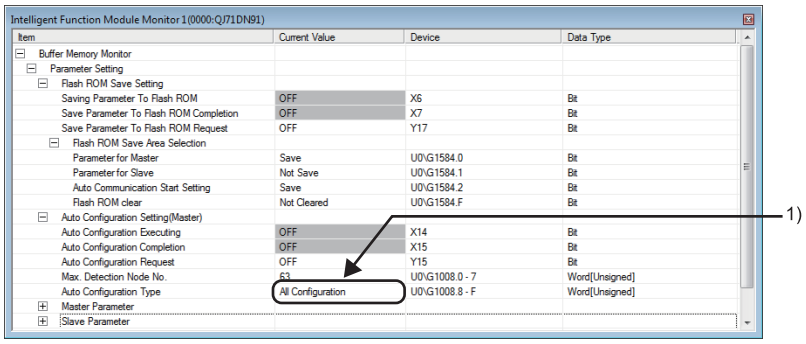


(b) Turn off I/O communication request.
The I/O communication request will be displayed on [Information/Status] screen of the intelligent function module monitor (QJ71DN91).
Follow the setting instructions



1) When the current value for [I/O Communication Request] is "ON", set "OFF" to it.
2) When the current value for [I/O Communicating] is "ON", set "ON" to [I/O Communication Request].
3) When the current value for [Save Parameter To Flash ROM Request] is "ON", set "OFF" to it.

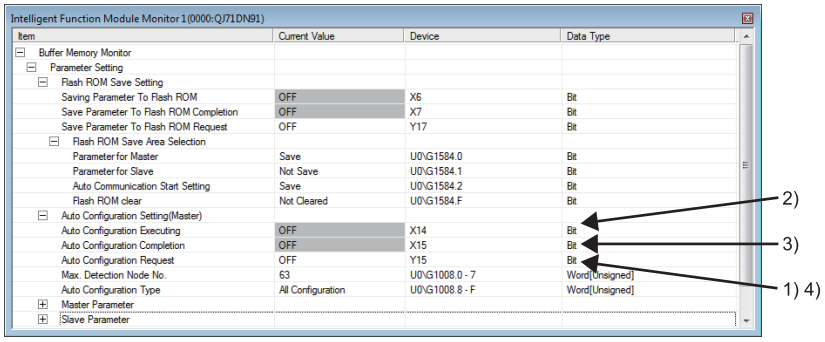
(c) Set the maximum detection node No. and auto configuration type.
To specify the maximum detection node No. and auto configuration type, set [Parameter Setting] for the intelligent function module monitor (QJ71DN91).



1) Set the auto configuration type. (Refer to Section 3.4.5.)
To specify all configuration, set "All Configuration" to "Auto Configuration Type".

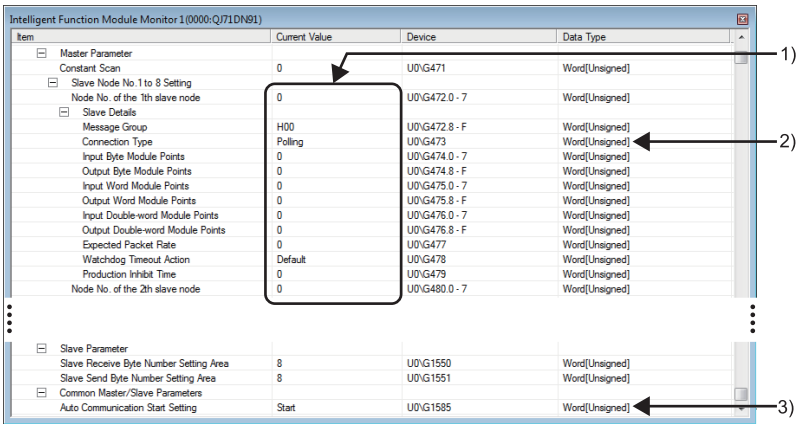
7 - 12

(d) Execute auto configuration.
Execute auto configuration on the [Parameter Setting] screen of intelligent function module monitor (QJ71DN91).



1) Set "ON" to [Auto Configuration Request].
2) Auto configuration is started, and "ON" is displayed for [Auto Configuration Executing].
3) Upon completion of auto configuration, "ON" is displayed for [Auto Configuration Completion].
4) After completing the auto configuration, set "OFF" to [Auto Configuration Request].

(e) Confirm the parameters configured automatically.
Check the auto configuration result is displayed on [Parameter Setting] screen of the intelligent function module monitor (QJ71DN91).



1) Check the parameters for master function.
Check that the settings such as node No., connection type, and I/O points are correct. (For the setting details, refer to Section 7.3 (1).)
2) Correct values if any incorrect setting is identified.
Repeat this if more than one value must be corrected.
3) To start I/O communication automatically at power-up, set "Start" to [Auto Communication Start Setting].

POINT

(1) Slave node settings detected by auto configuration are stored in order of node No.
(2) When changing parameters for master function, set default values in the areas after the parameter-set areas.
(Example) When changing the number of slave nodes that can perform I/O communication from 6 to 4, set default values in the areas for 5th and 6th slave nodes.

(f) Save parameters to a flash ROM. (Refer to (3) in this section.)

7 - 14

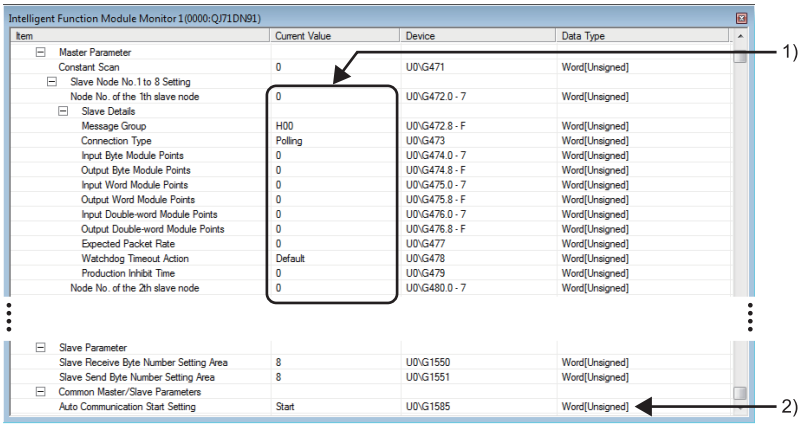
(2) When setting parameters manually

(a) Set the parameters for master function.

Display [Intelligent Function Module Monitor (QJ71DN91) Parameter Setting].

For information on how to display the [Intelligent Function Module Monitor (QJ71DN91) Parameter Setting] screen, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)



1) Set parameters for 1st to 4th slave nodes. (For the setting details, refer to Section 7.3 (1).)
Repeat this if more than one parameter must be set.

2) To start I/O communication automatically at power-up, set "Start" to "Auto Communication Start Setting".

(b) Save parameters to a flash ROM (Refer to (3) in this section.)

POINT

When changing parameters for master function, set default values in the areas after the parameter-set areas.

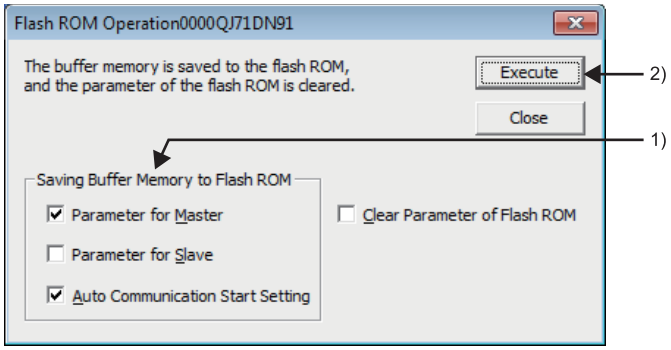
(Example) When changing the number of slave nodes that can perform I/O communication from 6 to 4, set default values in the areas for 5th and 6th slave nodes.

(3) When saving the parameters to a flash ROM

Select "Flash ROM Operation" under "Tool" after the configuration screen of DeviceNet is displayed, [Flash ROM Operation] screen will be displayed.

POINT

Save the parameters in the buffer memory to a flash ROM. Otherwise, they are cleared when the power is turned off or the CPU module is reset.



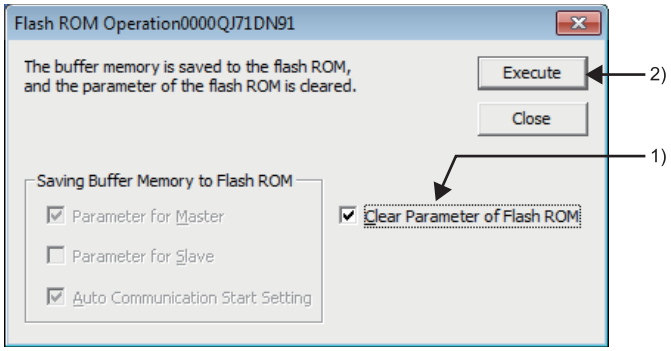
1) Set the parameters that are to be saved to a flash ROM in the buffer memory.
2) Click the Execute button.

POINT

Since the number of writes to flash ROM is limited, save the parameters to a flash ROM only when creating or changing parameters.

(4) When clearing parameters from the flash ROM

Select "Flash ROM Operation" under "Tool" after the configuration screen of DeviceNet is displayed, [Flash ROM Operation] screen will be displayed.



1) Select "Clear Parameter of Flash ROM".
2) Click Execute button.

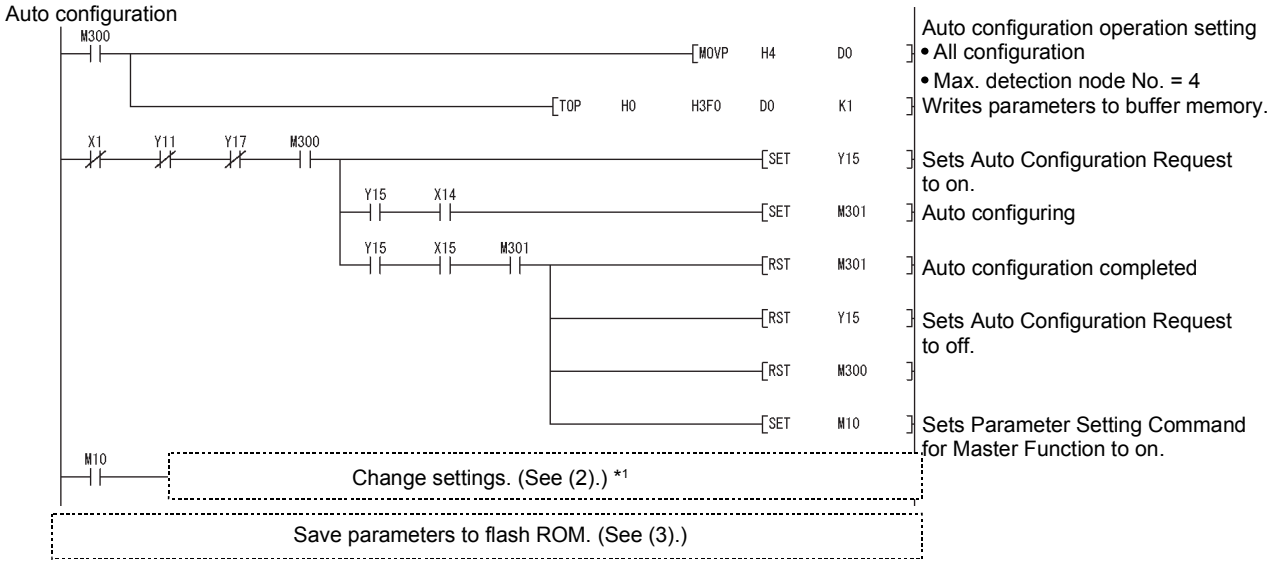
7.3.2 Program example not using the functions for DeviceNet of GX Works2

(1) When using auto configuration

(a) Device list

Device	Description	Reference section
M10	Parameter Setting Command for Master Function	—
M300	Auto Configuration Command	
M301	Auto-Configuration Flag	
X01	I/O Communicating	3.3.2 (8)
X14	Auto-Configuring	
X15	Auto Configuration Completion	
Y11	I/O Communication Request	
Y15	Auto Configuration Request	
Y17	Request for Saving Parameters to Flash ROM	
D0	Auto Configuration Operation Setting	3.4.5

(b) Program example



*1: Check that the settings such as node No., connection type, and I/O points are correct.
Correct values if any incorrect setting is identified. (For the setting details, refer to Section 7.3 (1).)

POINT

(1) Pre-determine the slave node settings (e.g. connection type) before executing auto configuration.

(2) Check that the power of the slave nodes and the network is on and the wiring is correct.

(3) Slave node settings detected by auto configuration are stored in order of node No.

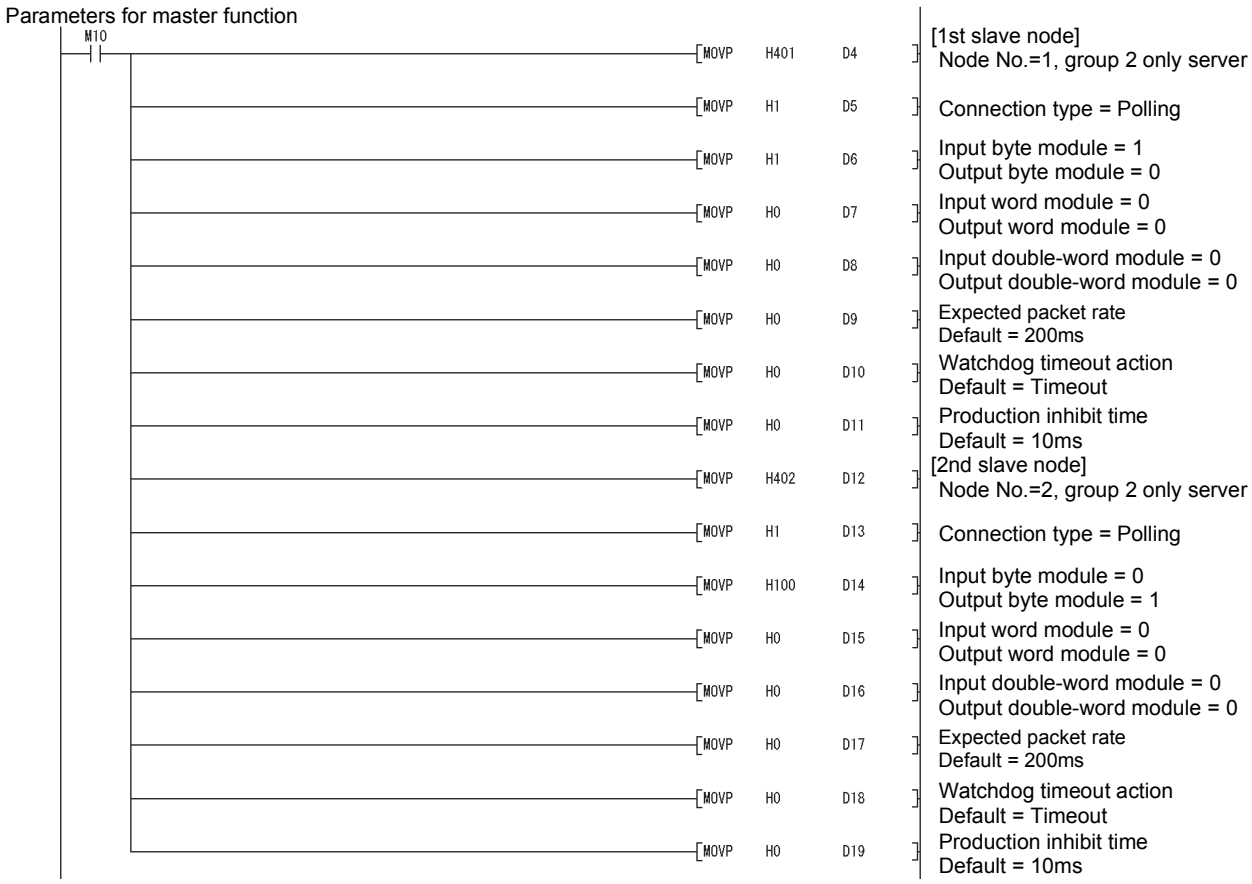
(4) When changing parameters for master function, set default values in the areas after the parameter-set areas.
(Example) When changing the number of slave nodes that can perform I/O communication from 6 to 4, set default values in the areas for 5th and 6th slave nodes.

(2) When setting parameters manually

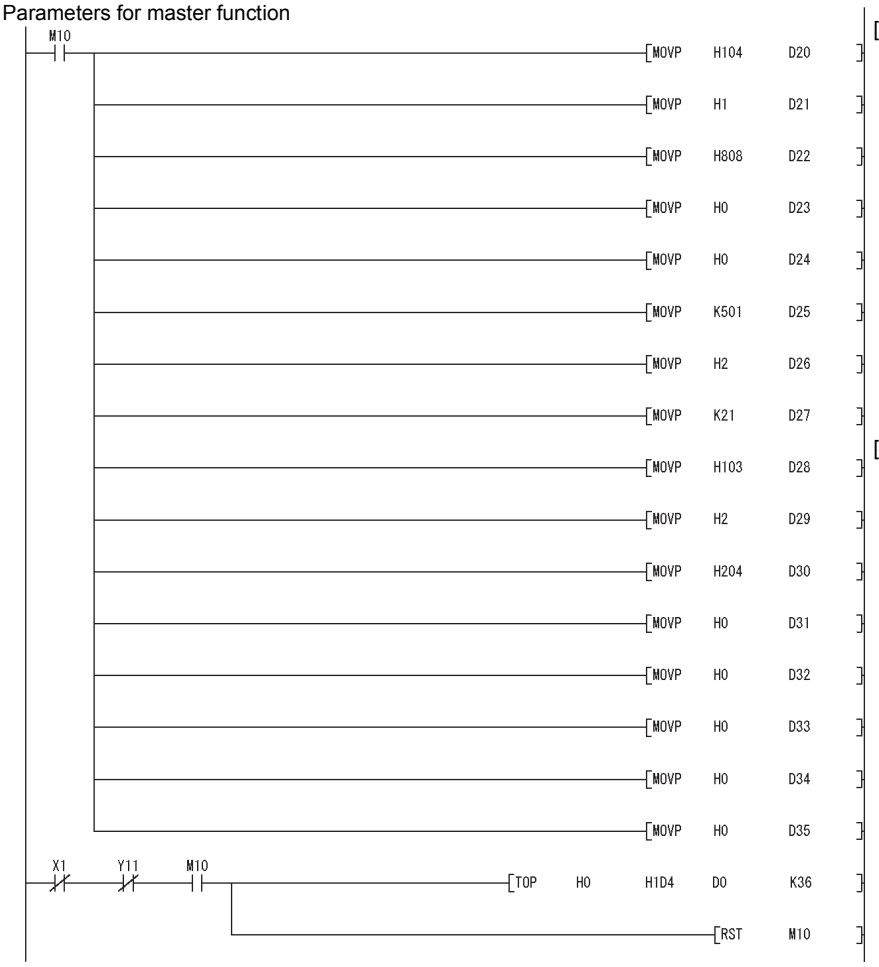
(a) Device list

Device	Description	Reference section
M10	Parameter Setting Command for Master Function	—
X01	I/O Communicating	
Y11	I/O Communication Request	
D4 to D35	Parameters for Master Function (for 1st to 4th slave nodes)	3.4.5

(b) Program example



Parameters for master function



Save parameters to flash ROM. (See (3).)

POINT

When changing parameters for master function, set default values in the areas after the parameter-set areas.

(Example) When changing the number of slave nodes that can perform I/O communication from 6 to 4, set default values in the areas for 5th and 6th slave nodes.

(3) When saving parameters to a flash ROM

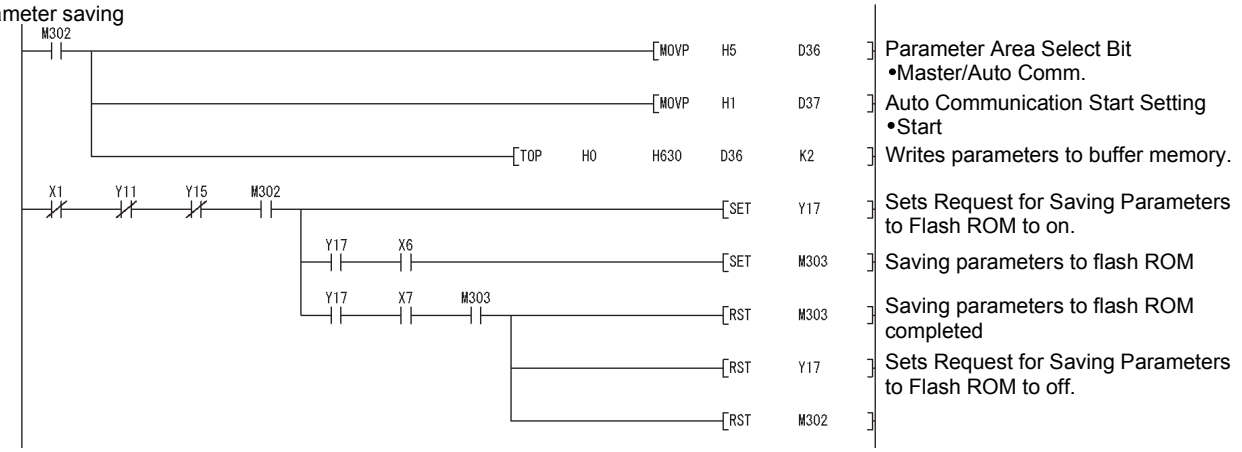
(a) Device list

Device	Description	Reference section
M302	Parameter Saving Command	—
M303	Saving Parameters to Flash ROM Flag	
X01	I/O Communicating	3.3.2 (6)
X06	Saving Parameters to Flash ROM	
X07	Parameters Saved to Flash ROM	
Y11	I/O Communication Request	
Y15	Auto Configuration Request	
Y17	Request for Saving Parameters to Flash ROM	
D36	Parameter Area Select Bit	3.4.13
D37	Auto Communication Start Setting	3.4.14

(b) Program example

Setting parameters for master function
- Using auto configuration (See (1).)
- Setting manually (See (2).)

Parameter saving



POINT

(1) Save the parameters in the buffer memory to a flash ROM. Otherwise, they are cleared when the power is turned off or the CPU module is reset.

(2) Since the number of writes to flash ROM is limited, use Request for Saving Parameters to Flash ROM (Y17) only when creating or changing parameters.

7.4 I/O Communication Function

7.4.1 Program example using the functions for DeviceNet of GX Works2

(1) Device list

Device	Description		Reference section
M11	I/O Communication Start Command		—
M96 to M111*1	Node Communication Status		3.4.4
X100 to X10F*1	Master Function Receive Data	1st slave node: Node No.1	3.4.6
X110 to X14F*1		3rd slave node: Node No.4	
X150 to X16F*1		4th slave node: Node No.3	
Y11	I/O Communication Request		3.3.2 (2)
Y100 to Y10F*1	Master Function Transmit Data	2nd slave node: Node No.2	3.4.6
Y110 to Y14F*1		3rd slave node: Node No.4	

*1: Devices used in the auto refresh function included the functions for DeviceNet of GX Works2.

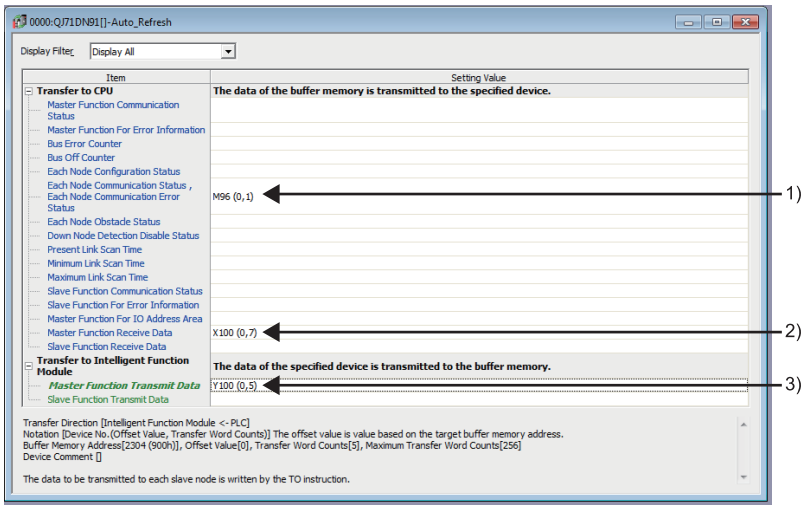
(2) Operation in the functions for DeviceNet of GX Works2

(a) Auto refresh setting (Refer to Section 6.4.)

1) Node Communication Status, Node Communication Error Status ……..M96 to M111

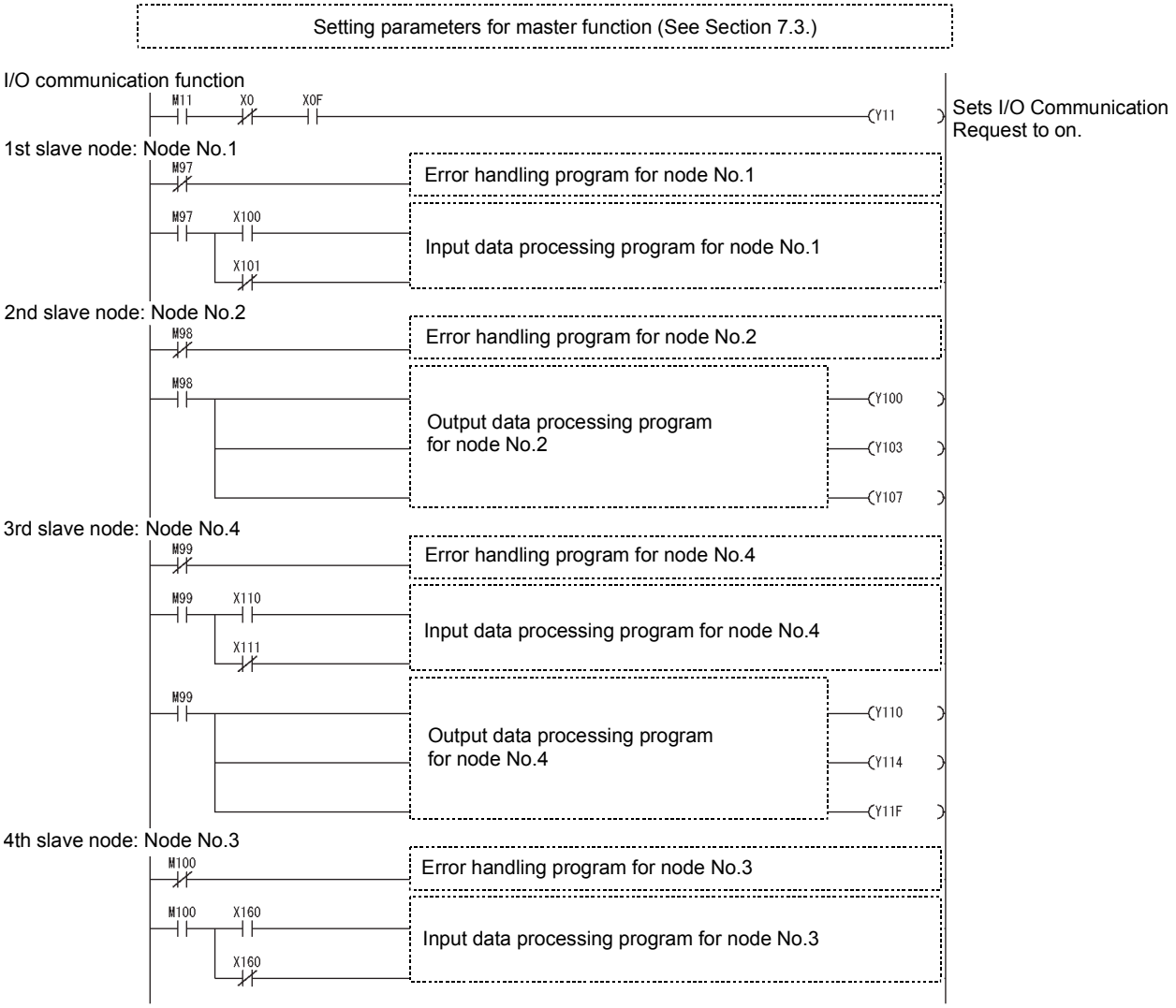
2) Master Function Receive Data……..X100 to X16F

3) Master Function Transmit Data……Y100 to Y14F



(b) Writing intelligent function module parameters (Refer to Section 6.3.3.)
Write parameters of the intelligent function modules (auto refresh settings) to the CPU module.
Perform this operation from the screen for selecting a target intelligent function module.

(3) Program example



POINT
To ensure consistency of transmit/receive data of multiple words, take a measure such as providing a handshake area at the end of transmit/receive data to check the data transfer. For the program example, refer to Section 7.1 (4).

7.4.2 Program example not using the functions for DeviceNet of GX Works2

(1) Device list

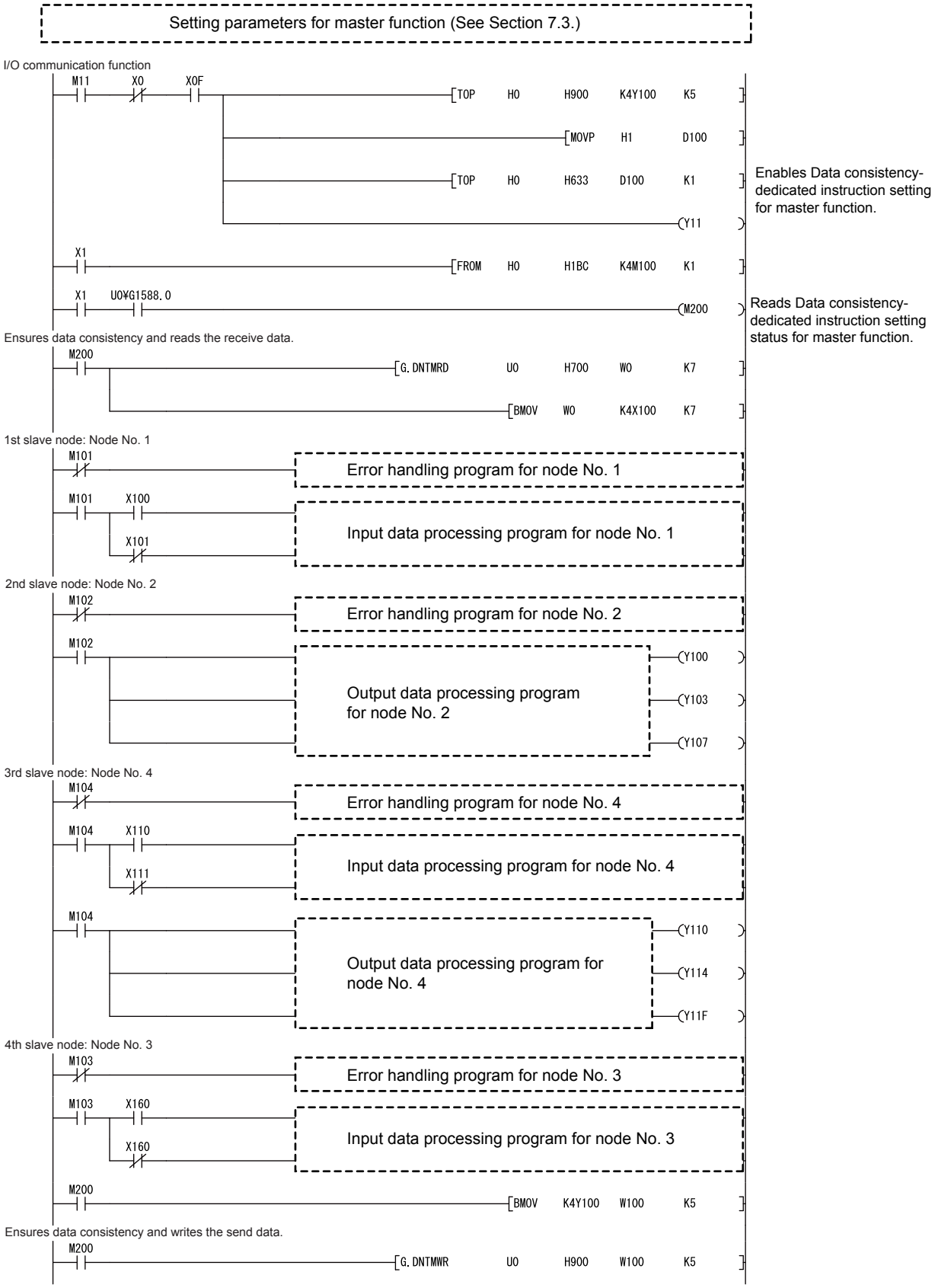
Device	Description		Reference section
M11	I/O Communication Command		—
M100 to M115	Node Communication Status		3.4.4
M200*1	Data consistency dedicated instruction setting status for master function		3.4.16
D100*1	Data consistency dedicated instruction setting for master function		
X01	I/O Communicating		3.3.2 (2)
X100 to X107	Master Function Receive Data	1st slave node: Node No.1	3.4.6
X110 to X14F		3rd slave node: Node No.4	
X160 to X16F		4th slave node: Node No.3	
Y11	I/O Communication Request		3.3.2 (2)
Y100 to Y107	Master Function Transmit Data	2nd slave node: Node No.2	3.4.6
Y110 to Y14F		3rd slave node: Node No.4	

*1: Use these devices when executing Data consistency dedicated instruction (DNTMRD, DNTMWR).

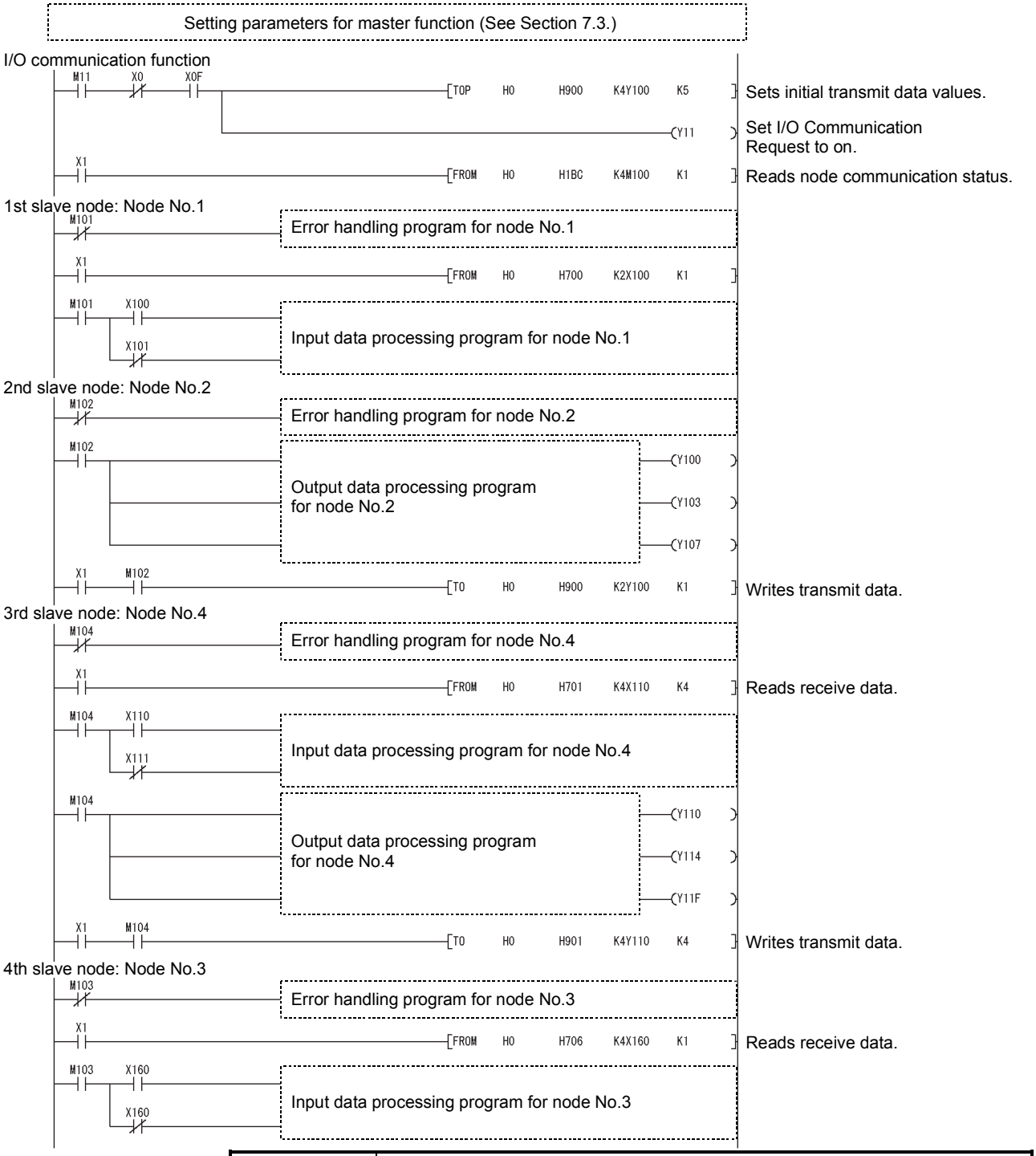
7 - 24

(2) Program example

(a) When Data consistency dedicated instruction (DNTMRD, DNTMWR) is used



(b) When the FROM/TO instruction is used



POINT

To ensure consistency of transmit/receive data of multiple words, take a measure such as providing a handshake area at the end of transmit/receive data to check the data transfer.
For the program example, refer to Section 7.1 (4).

7.5 Message Communication Function

This section explains an example of a sequence program created for message communication.

7.5.1 Example of reading message communication data

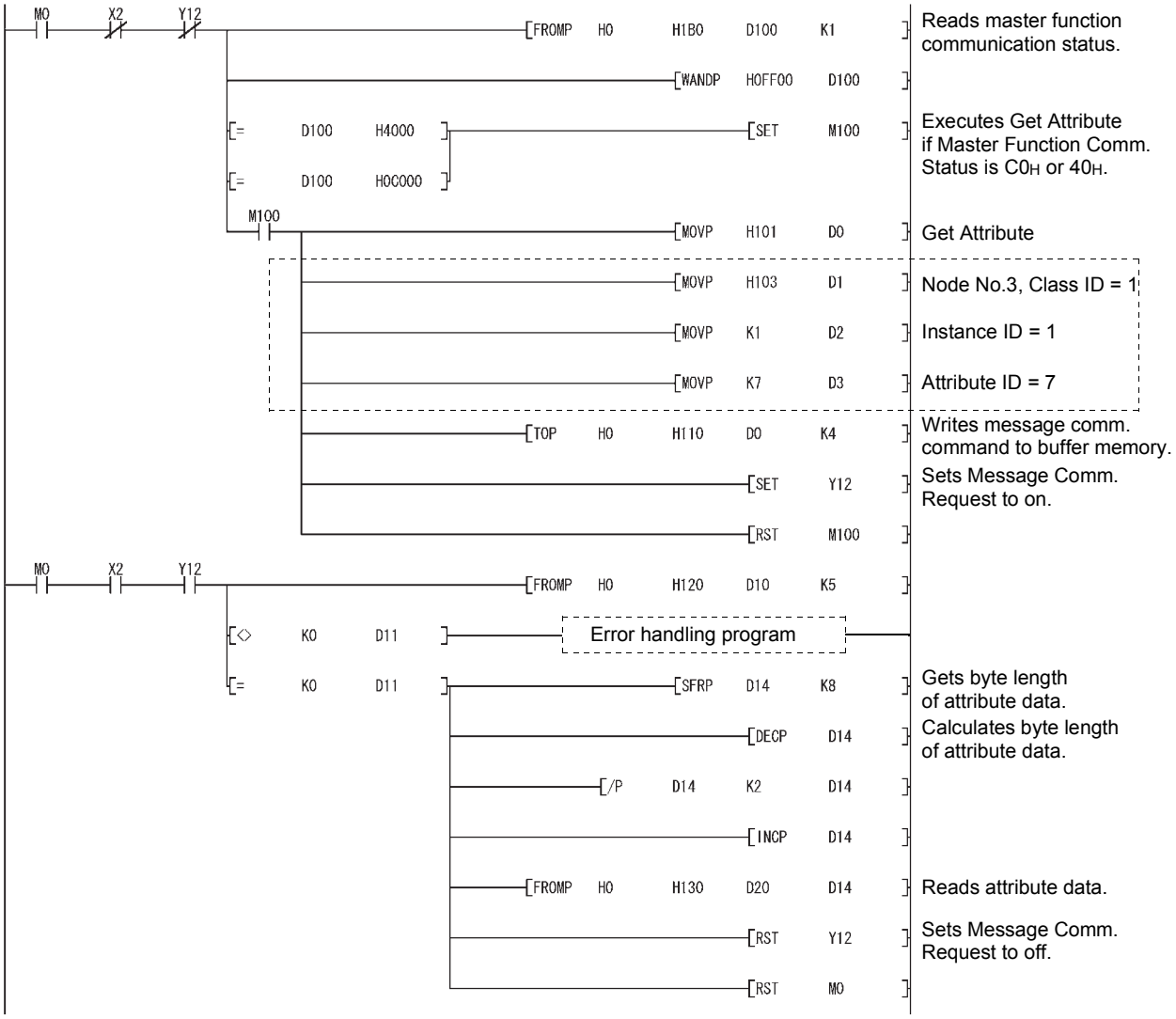
An example program in this section performs Get Attribute to node No.3.
For the area enclosed with a dotted line, refer to the manual for the relevant slave node since the class ID, instance ID, and attribute ID are different depending on the actual area and the slave node.

(1) Device list

Device	Description	Reference section
M0	Get Attribute Command	—
M100	Get Attribute Execute Flag	
X02	Message Communication Completion	3.3.2 (3)
Y12	Message Communication Request	
D0 to D3	Message Communication Command	3.4.2
D10 to D14	Message Communication Result	
D20 to D28	Message Communication Data	
D100	Master Function Communication Status	3.4.3

7 - 27

(2) Program example



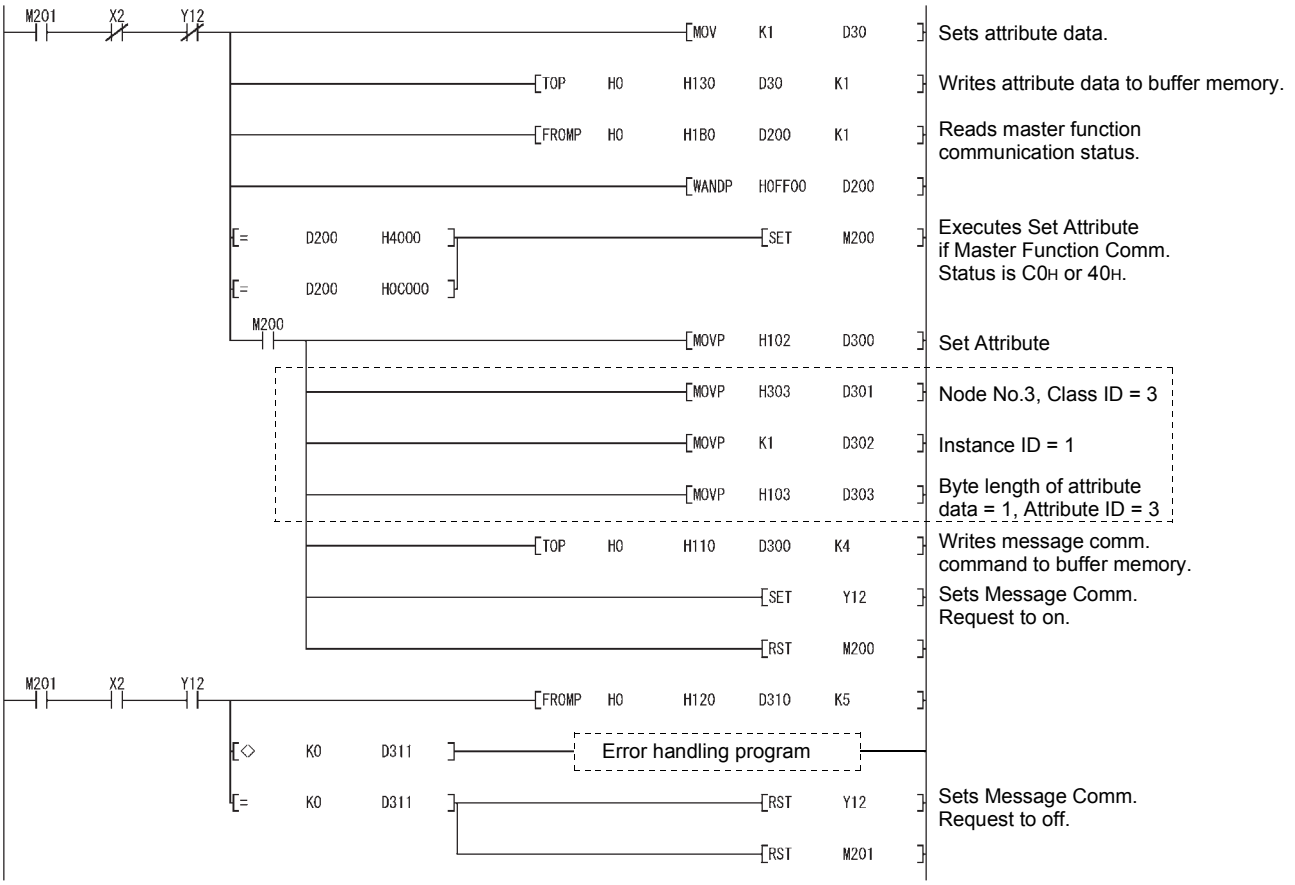
7.5.2 Example of writing message communication data

An example program in this section performs Set Attribute to node No.3.
For the area enclosed with a dotted line, refer to the manual for the relevant slave node since the class ID, instance ID, and attribute ID are different depending on the actual area and the slave node.

(1) Device list

Device	Description	Reference section
M200	Set Attribute Execute Flag	—
M201	Set Attribute Command	
X02	Message Communication Completion	3.3.2 (3)
Y12	Message Communication Request	
D30	Message Communication Data	3.4.2
D300 to D303	Message Communication Command	
D310 to D314	Message Communication Result	
D200	Master Function Communication Status	3.4.3

(2) Program example



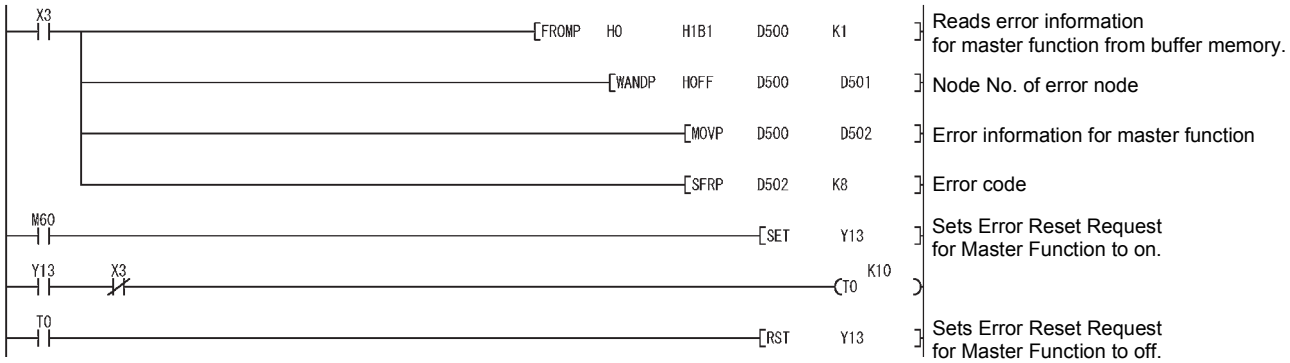
7.6 Obtaining Error Information

This section explains an example of a sequence program that obtains the error information for the master function.

(1) Device list

Device	Description	Reference section
M60	Error Reset Command	—
X03	Error Set Signal for Master Function	3.3.2 (4)
Y13	Error Reset Request for Master Function	
D500	Error Information for Master Function	3.4.3
D501	Node No. of Error Node	
D502	Error Code	

(2) Program example

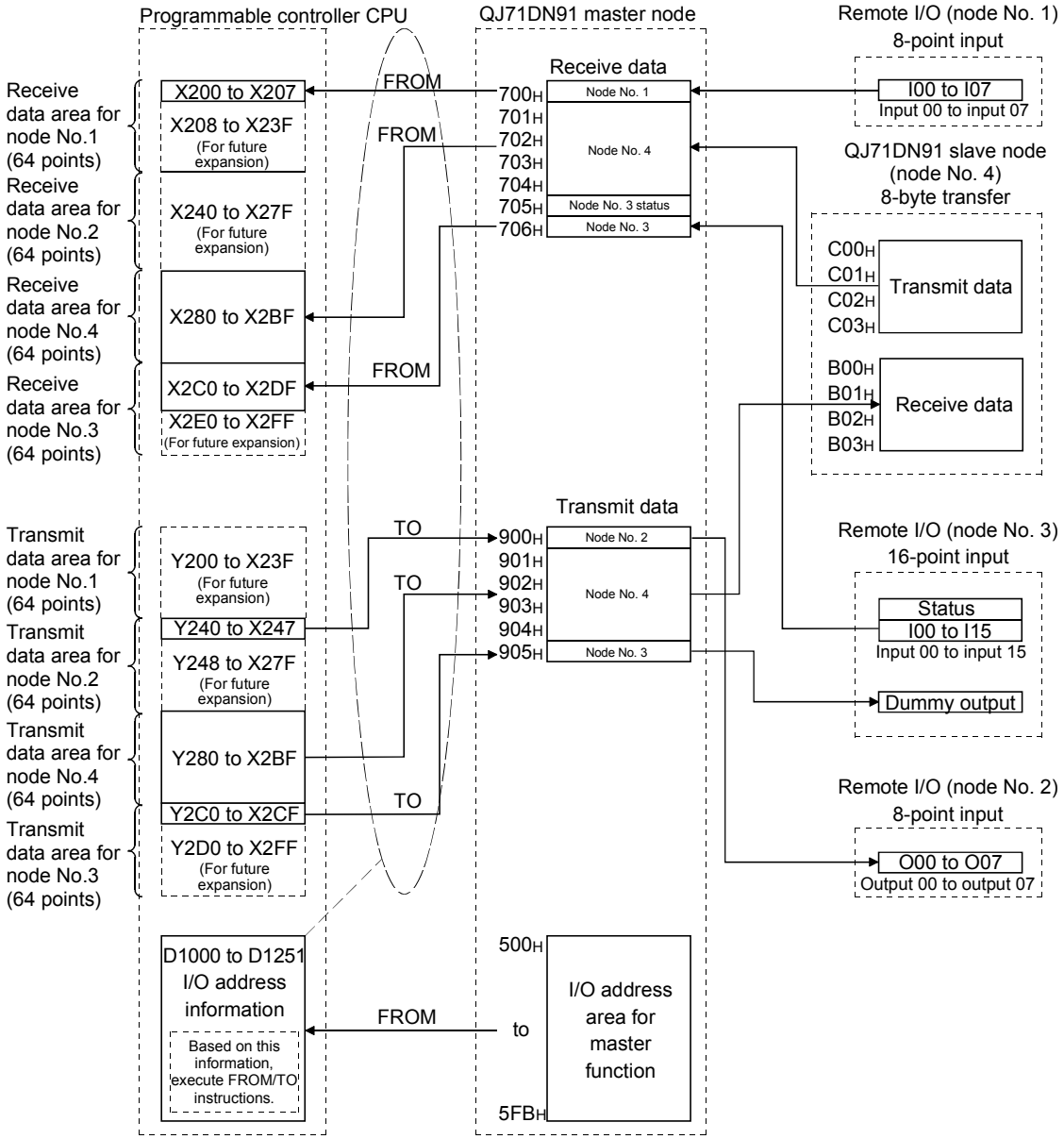


7.7 Allocating Transmit/Receive Data Storage Devices for Future Expansion

If transmit/receive data of each slave node may change depending on the system, reserve the data storage devices for each slave node in advance.
Using the information in I/O Address Area for Master Function (address: 0500H to 05FBH) and executing the FROM or TO instruction will eliminate the need for modifying the sequence program even if the transmit/receive data length is changed.

The figure below shows an example in which the transmit/receive data storage devices of each node are allocated in units of 64 points, in the same system configuration described in Section 7.2.
In this example, the devices are allocated as follows: 64 points from X200 for storing receive data of node No.1, 64 points from X240 for storing receive data of node No.2, and so on.

The information in I/O Address Area for Master Function (address: 0500H to 05FBH) is stored in D1000 to D1251, and the FROM or TO instruction is executed using the start buffer memory address of this information and the data length.

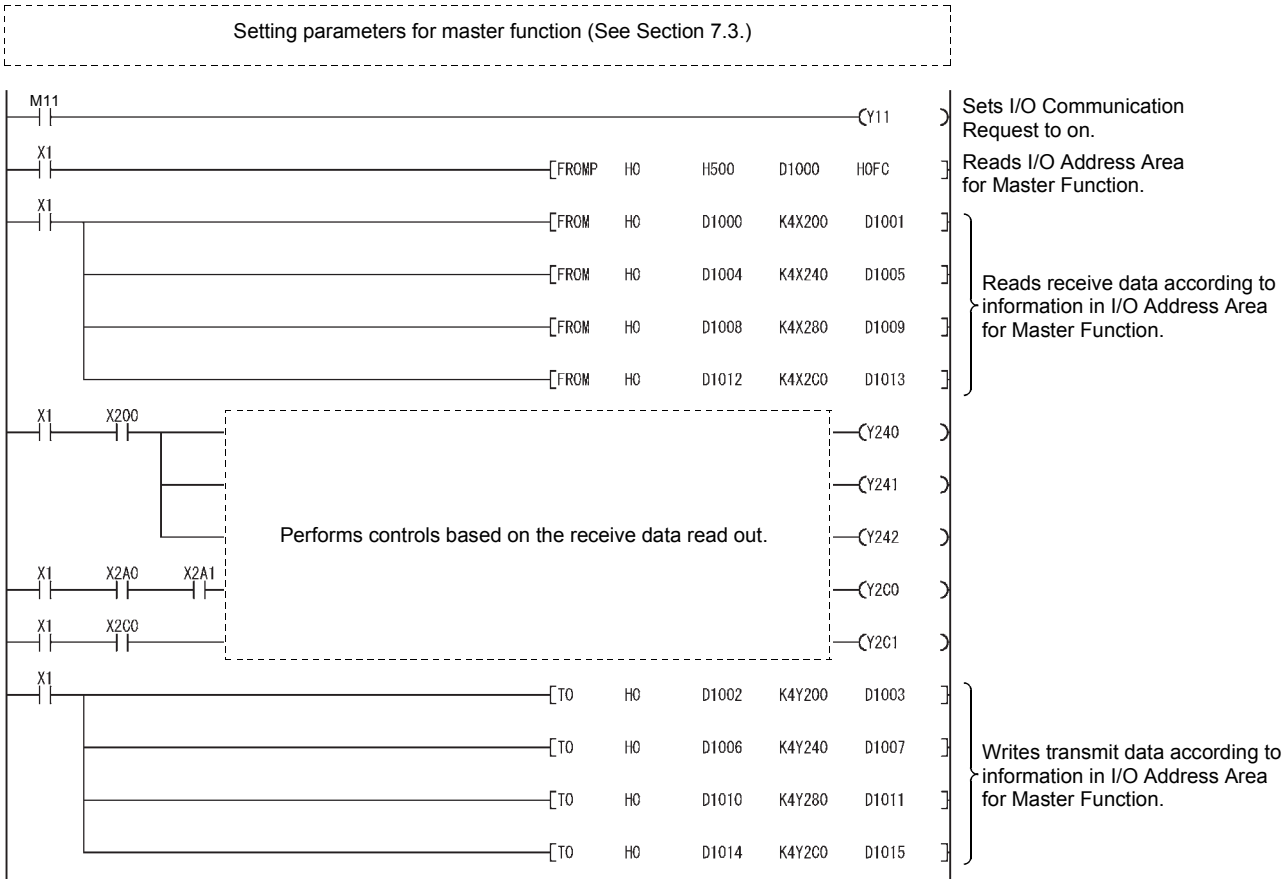


The following explains a sequence program example for this case.

(1) Device list

Device	Description		Reference section
M11	I/O Communication Start Command		—
X01	I/O Communicating		3.3.2 (2)
X200 to X23F	Master Function Receive Data	1st slave node: Node No.1	3.4.6
X240 to X27F		2nd slave node: Node No.2	
X280 to X2BF		3rd slave node: Node No.4	
X2C0 to X2FF		4th slave node: Node No.3	
Y11	I/O Communication Request		3.3.2 (2)
Y200 to Y23F	Master Function Transmit Data	1st slave node: Node No.1	3.4.6
Y240 to Y27F		2nd slave node: Node No.2	
Y280 to Y2BF		3rd slave node: Node No.4	
Y2C0 to Y2FF		4th slave node: Node No.3	
D1000 to D1251	I/O Address Area for Master Function		

(2) Program example



7 - 32

8 PROGRAMMING FOR EXECUTING THE SLAVE FUNCTION

This chapter explains programming for executing the slave function.
When applying the program examples introduced in this chapter to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

8.1 System Configuration

The explanation of the programs in this chapter is based on the system shown in Section 7.2.
Note that the transmit/receive data of the QJ71DN91 (slave node) are assigned to the following devices.

Item	Device
Receive data	X200 to X23F
Transmit data	Y200 to Y23F

8.2 Parameters for Slave Function

POINT

To change I/O points for slave function, parameters for slave function must be set.
However, for the I/O points of the QJ71DN91 (slave node) shown in Chapter 7, parameters for slave function need not be set because default values are used.

(1) Settings

The following table shows the slave function parameters that are to be set in the program example.
For details of the slave function parameters, refer to Section 3.4.9.
For saving parameters to a flash ROM, refer to (2) in this section.

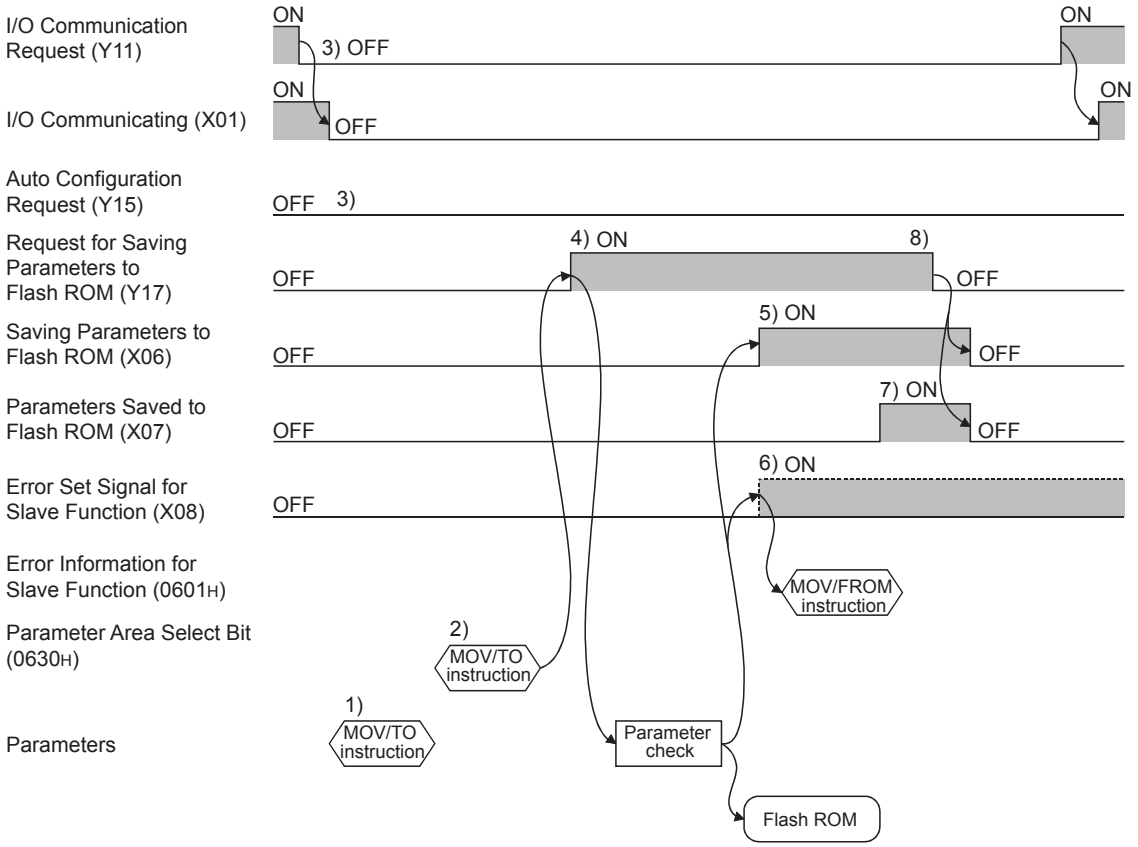
Buffer memory address (Hex.)	Item	Set value
060EH	Slave Function Receive-Bytes (Input Size) Setting Area	K16 (16 bytes)
060FH	Slave Function Transmit-Bytes (Output Size) Setting Area	K16 (16 bytes)

(2) Operation flow of parameter saving to flash ROM

The following explains the operation flow in the case of saving parameters to the flash ROM.

When using the utility package, refer to Section 8.2.1 (2).

When not using the utility package, refer to Section 8.2.2 (2).



1) Set parameters in the following buffer memory areas:
   • Parameters for Slave Function (address : 060EH, 060FH)
   • Auto Communication Start Setting (address : 0631H)
2) Specify a parameter saving area in Parameter Area Select Bit (address: 0630H).
3) Set I/O Communication Request (Y11) and Auto Configuration Request (Y15) to off.
4) When Request for Saving Parameters to Flash ROM (Y17) is set to on, parameters are checked.
5) If the parameter check is completed successfully, saving the parameters to the flash ROM is started, and Saving Parameters to Flash ROM (X06) is set to on.
6) If the parameter check has failed, the ERR. LED lights up and Error Set Signal for Slave Function (X08) is set to on.
   Check the error code in Error Information for Slave Function (address: 0601H), and take corrective actions.
7) Upon completion of parameter saving to the flash ROM, Parameters Saved to Flash ROM (X07) is set to on.
8) When Request for Saving Parameters to Flash ROM (Y17) is set to off, Saving Parameters to Flash ROM (X06) and Parameters Saved to Flash ROM (X07) are set to off.

8.2.1 Program example using the functions for DeviceNet of GX Works2

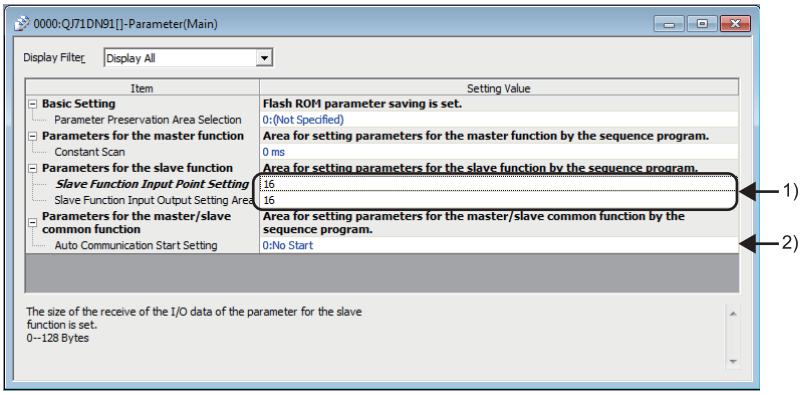
(1) Setting example

(a) Setting the parameters for slave function.

Set the parameters for slave in the basic settings of the functions for DeviceNet of GX Works2.

For information on how to display the basic settings, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)



1) Enter "16" for "Slave Function Input Sizes Setting Area" and "Slave Function Output Sizes Setting Area".
2) To start I/O communication automatically at power-up, set "Start" for "Auto Communication Start Setting".

(b) Write intelligent function module parameters to CPU module. (See Section 7.3.1 (2).)

For information on how to write parameters to CPU module, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)

(c) Save parameters to a flash ROM (See Section 7.3.1 (3).)

POINT

Save the parameters in the buffer memory to a flash ROM. Otherwise, they are cleared when the power is turned off or the CPU module is reset.
Since the number of writes to flash ROM is limited, use Request for Saving Parameters to Flash ROM (Y17) only when creating or changing parameters.

(2) When clearing parameters from the flash ROM

Refer to Section 7.3.1 (4).

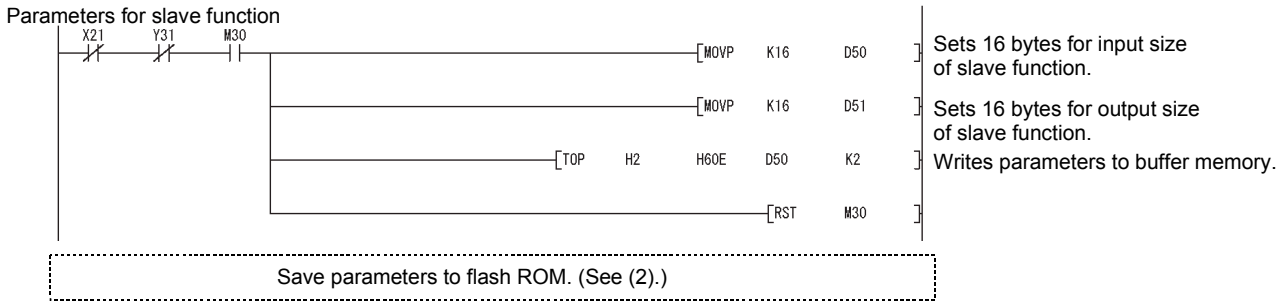
8.2.2 Program example not using the functions for DeviceNet of GX Works2

(1) Setting example

(a) Device list

Device	Description	Reference section
M30	Parameter Setting Command for Slave Function	—
X21	I/O Communicating	
Y31	I/O Communication Request	
D50	Slave Function Receive-Bytes (Input Sizes) Setting Area	3.4.9
D51	Slave Function Transmit-Bytes (Output Sizes) Setting Area	

(b) Program example

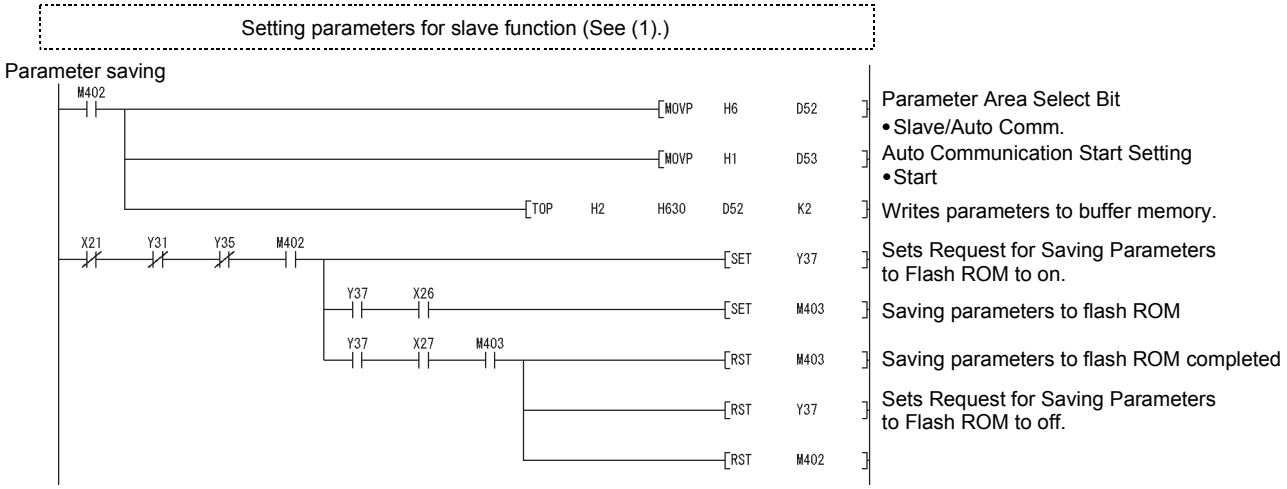


(2) When saving parameters to a flash ROM

(a) Device list

Device	Description	Reference section
M402	Parameter Saving Command	—
M403	Saving Parameters to Flash ROM Flag	
X21	I/O Communicating	3.3.2 (6)
X26	Saving Parameters to Flash ROM	
X27	Parameters Saved to Flash ROM	
Y31	I/O Communication Request	
Y35	Auto Configuration Request	
Y37	Request for Saving Parameters to Flash ROM	
D52	Parameter Area Select Bit	3.4.13
D53	Auto Communication Start Setting	3.4.14

(b) Program example



POINT

(1) Save the parameters in the buffer memory to a flash ROM. Otherwise, they are cleared when the power is turned off or the CPU module is reset.

(2) Since the number of writes to flash ROM is limited, use Request for Saving Parameters to Flash ROM (Y17) only when creating or changing parameters.

8.3 I/O Communication Function

8.3.1 Program example using the functions for DeviceNet of GX Works2

(1) Device list

Device	Description	Reference section
M31	I/O Communication Start Command	—
X21	I/O Communicating	3.3.3 (2)
X200 to X23F*1	Slave Function Receive Data	3.4.10
Y31	I/O Communication Request	3.3.3 (2)
Y200 to Y23F*1	Slave Function Transmit Data	3.4.10

*1: Devices used in the auto refresh function included the functions for DeviceNet of GX Works2.

(2) Operation in the functions for DeviceNet of GX Works2

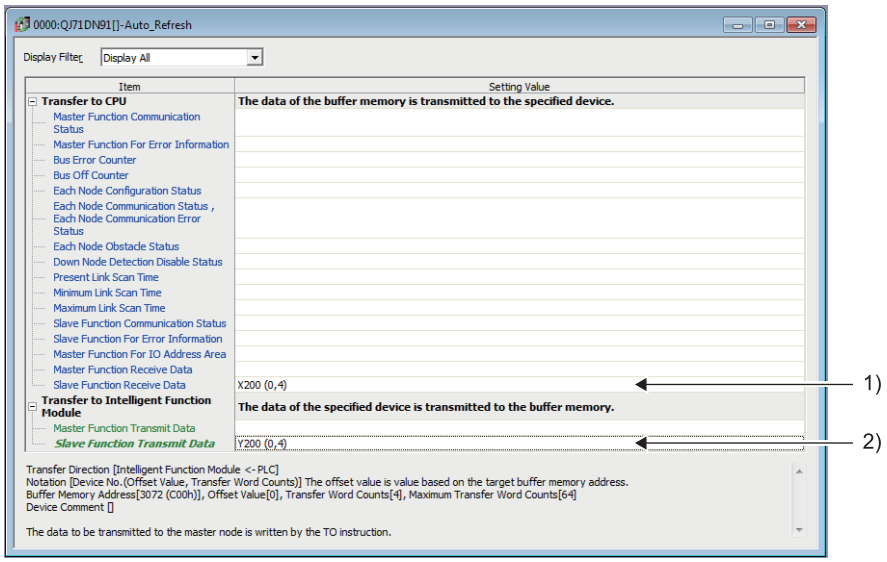
(a) Auto refresh setting

For the setting of auto refresh setting, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)

1) Slave Function Receive Data……X200 to X23F

2) Slave Function Transmit Data……...Y200 to Y23F



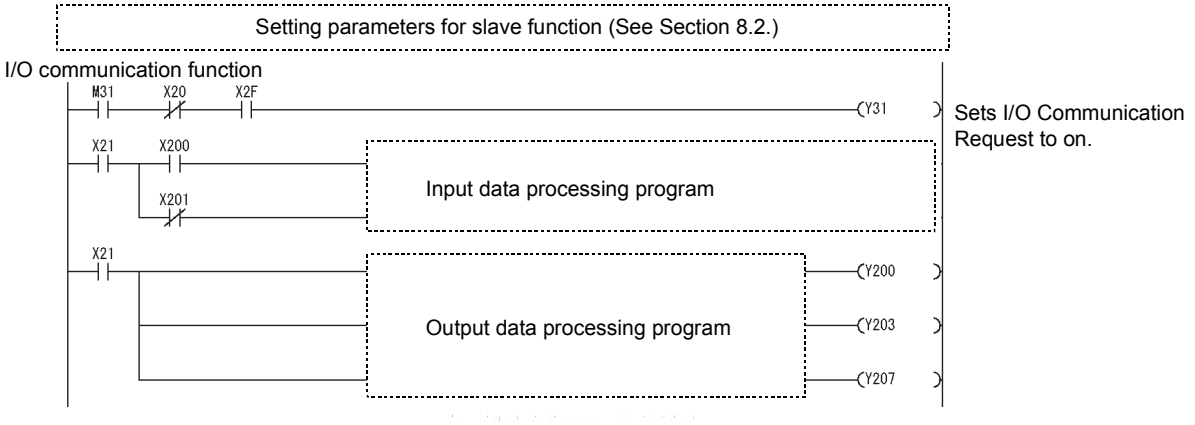
(b) Writing intelligent function module parameters

Write parameters of the intelligent function modules (auto refresh settings) to the CPU module.

For information on how to write parameters to the CPU module, refer to the following.

GX Works2 Version 1 Operating Manual (Intelligent Function Module)

(3) Program example



POINT
To ensure consistency of transmit/receive data of multiple words, take a measure such as providing a handshake area at the end of transmit/receive data to check the data transfer. For the program example, refer to Section 7.1 (4).

8.3.2 Program example not using the functions for DeviceNet of GX Works2

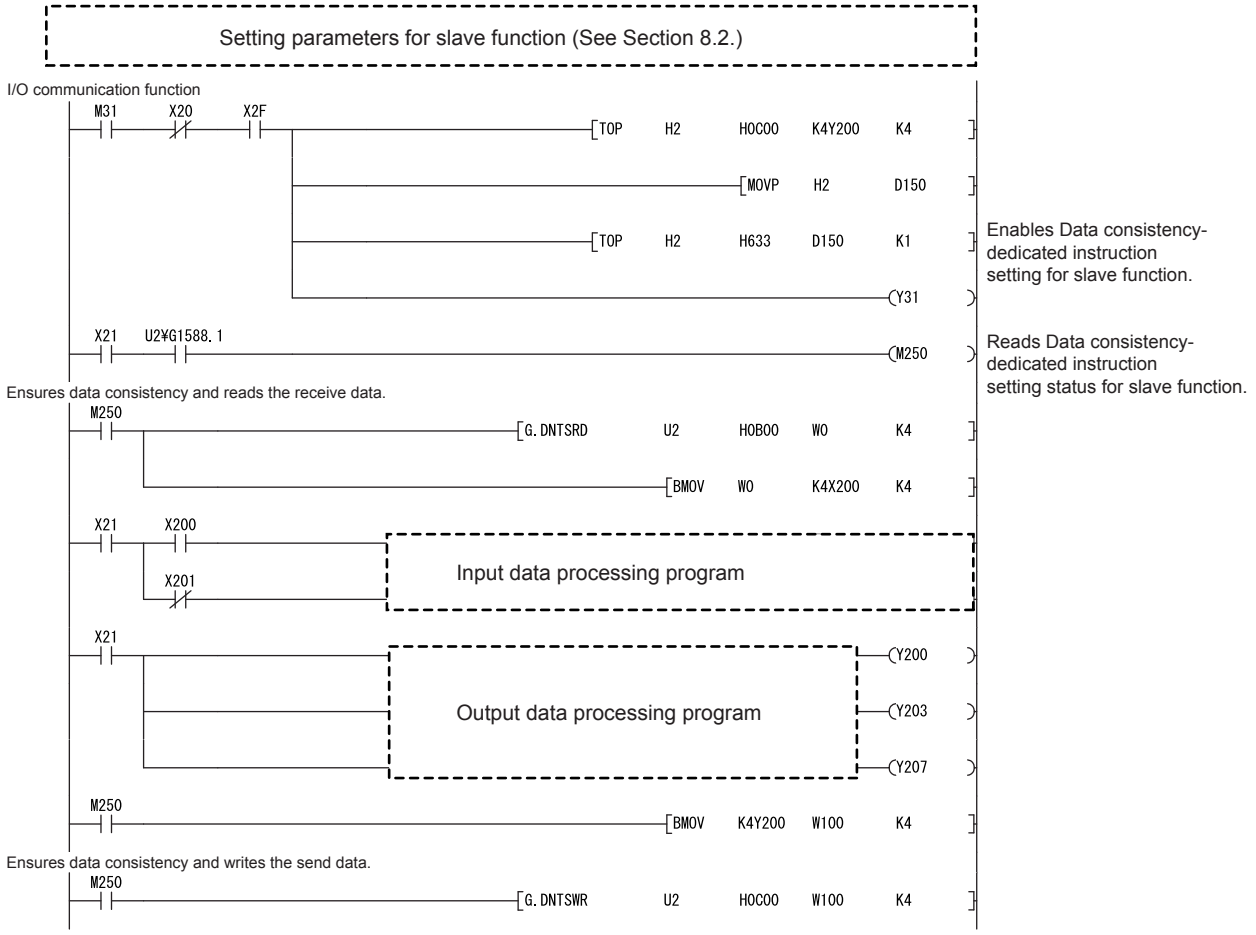
(1) Device list

Device	Description	Reference section
M31	I/O Communication Start Command	—
M250*1	Data consistency dedicated instruction setting status for slave function	3.4.16
D150*1	Data consistency dedicated instruction setting for slave function	
X21	I/O Communicating	3.3.3 (2)
X200 to X23F	Slave Function Receive Data	3.4.10
Y31	I/O Communication Request	3.3.3 (2)
Y200 to Y23F	Slave Function Transmit Data	3.4.10

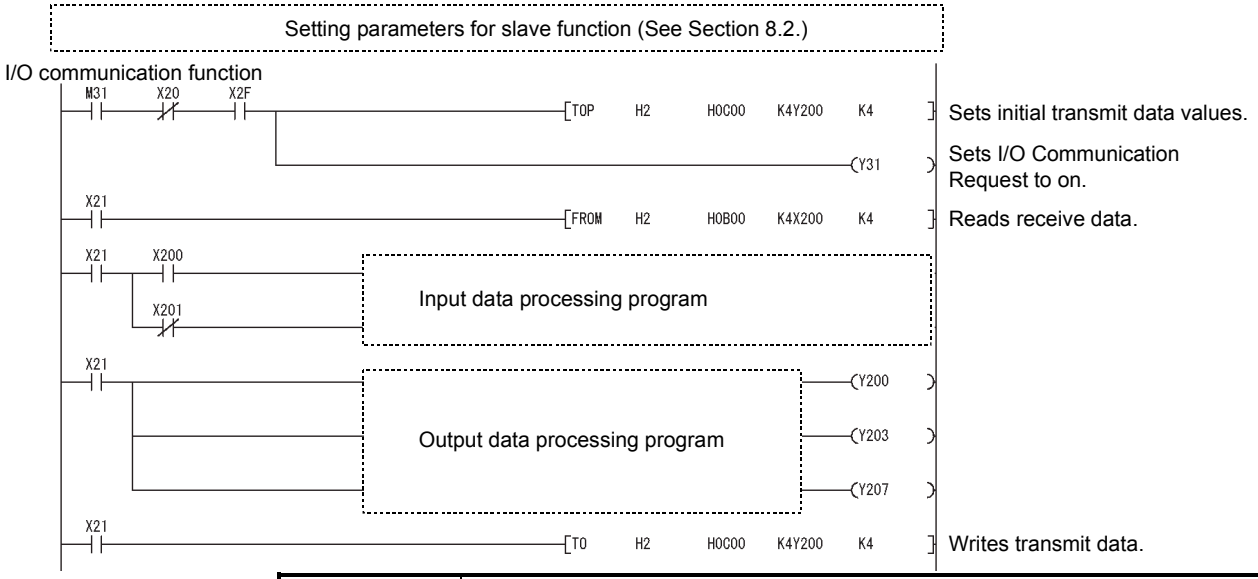
*1: Use these devices when executing Data consistency dedicated instruction (DNTSRD, DNTSWR).

(2) Program example

(a) When Data consistency dedicated instruction (DNTSRD, DNTSWR) is used



(b) When the FROM/TO instruction is used



POINT

To ensure consistency of transmit/receive data of multiple words, take a measure such as providing a handshake area at the end of transmit/receive data to check the data transfer.
For the program example, refer to Section 7.1 (4).

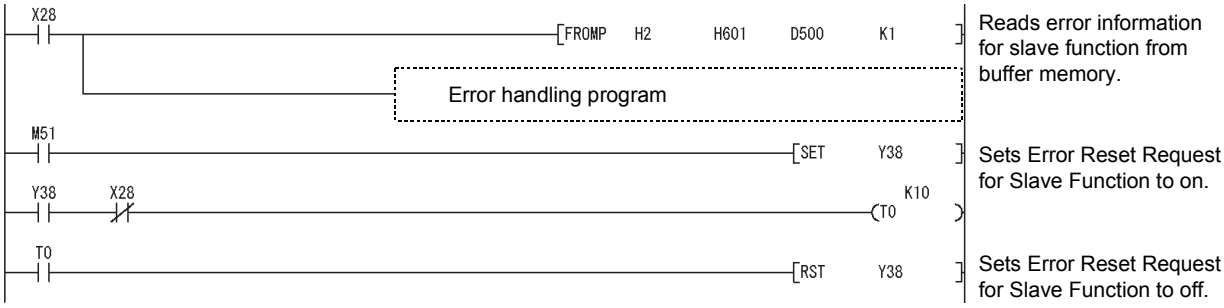
8.4 Obtaining Error Information

This section explains an example of a sequence program that obtains the error information for the slave function.

(1) Device list

Device	Description	Reference section
M51	Error Reset Command	—
X28	Error Set Signal for Slave Function	3.3.3 (4)
Y38	Error Reset Request for Slave Function	
D500	Error Information for Slave Function	3.4.8

(2) Program example



9 DEDICATED INSTRUCTIONS

Dedicated instructions enable easy programming to use the functions of an intelligent function module.
This chapter explains dedicated instructions available for the QJ71DN91.

(1) List of dedicated instructions

Dedicated instructions available for the QJ71DN91 are shown below.

Dedicated instruction	Function overview	Reference section
DNTMRD	This instruction ensures data consistency when the CPU module reads data from the master function receive data area of the specified module.	9.2
DNTMWR	This instruction ensures data consistency when the CPU module writes data to the master function transmit data area of the specified module.	9.3
DNTSRD	This instruction ensures data consistency when the CPU module reads data from the slave function receive data area of the specified module.	9.4
DNTSWR	This instruction ensures data consistency when the CPU module writes data to the slave function transmit data area of the specified module.	9.5

(2) Available devices

Devices available for the dedicated instructions are listed below.

Internal device		File register	Constant *1
Bit	Word		
—	T, ST, C, D ,W	R, ZR	K, H, $

*1: The available devices are described in the Constant rows in each section.

9 - 1

9.1 Precautions

(1) Before executing Data consistency dedicated instruction

Before executing Data consistency dedicated instruction, check the following items.

(a) Compatible module versions

Use the modules with the following serial numbers.

- The QCPU with the first five digits of the serial number is "02092" or later

(b) Setting of Data consistency dedicated instruction setting area

Enable the corresponding bit of Data consistency dedicated instruction setting area (address: 0633H). (Refer to Section 3.4.16.)

POINT

When the corresponding bit of Data consistency dedicated instruction setting area (address: 0633H) is disabled, Data consistency dedicated instruction cannot be executed, and no error occurs.

(c) Data transfer between devices while Data consistency dedicated instruction is executed

When using Data consistency dedicated instruction, do not use the following methods for data transfer between devices.

Doing so may result in data inconsistency.

- Auto refresh
- MOV instruction
- FROM/TO instruction

(2) Transmission delay time when Data consistency dedicated instruction is used

When Data consistency dedicated instruction is used, transmission delay time becomes longer. (Refer to Section 3.5.3.)

(3) Execution timing of Data consistency dedicated instruction

After enabling the corresponding bit of Data consistency dedicated instruction setting area (address: 0633H), execute Data consistency dedicated instruction once per sequence scan.

(4) Operation when Data consistency dedicated instruction is not executed

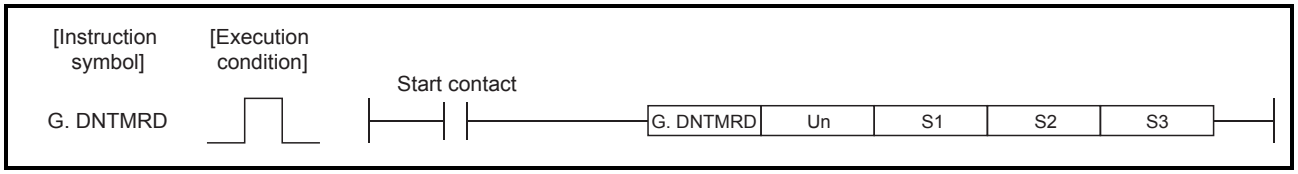
After enabling the corresponding bit of Data consistency dedicated instruction setting area (address: 0633H), if the dedicated instruction is not executed in three sequence scans, an error occurs.

- When using the master function
  Error Set Signal for Master Function (X03) turns ON and the error code is stored in Error Information for Master Function (address: 01B1H).
- When using the slave function
  Error Set Signal for Slave Function (X08) turns ON and the error code is stored in Error Information for Slave Function (address: 0601H).

9.2 G.DNTMRD

This instruction ensures data consistency when the CPU module reads data from the master function receive data area of the specified module.

Setting data	Available device									
	Internal device (system, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
S1	—	○		—			—	○	—	—
S2	—	○		—			—	—	—	—
S3	—	○		—			—	○	—	—



Setting data

Setting data	Description	Setting range	Set by	Data type
Un	Module start I/O number of the QJ71DN91 (first two digits of three-digit I/O number)	0 to FE$_H$	User	16-bit binary
S1	Start address of the data to be read	0700$_H$ to 07F$_H$		
S2	Start device number which stores the read data	—	System	Device name
S3	Number of read data	0 to 100$_H$	User	16-bit binary

Function

This instruction ensures data consistency when the CPU module reads data from the master function receive data area of the specified module.

Error

OPERATION ERROR occurs in the following cases:

- When the name of dedicated instruction is not set correctly
- When a value which is out of setting range is set in setting data

Program example

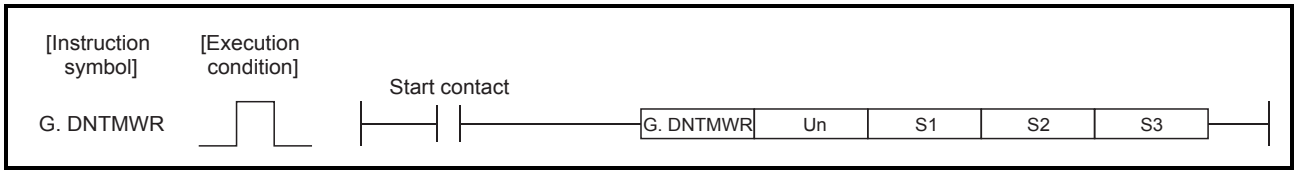
This program reads 4-point data from the Master Function Receive Data (address: 0700$_H$ ~) area of the QJ71DN91 to D0 - D3 by turning on the following I/O signal and buffer memory area.
(In this example, the QJ71DN91 is mounted on the slot 0 of the base unit with "0000$_H$" set to start I/O No.)

- I/O Communicating (X01)
- Data consistency dedicated instruction setting status for master function (address: bit 0 of 0634$_H$)

9.3 G.DNTMWR

This instruction ensures data consistency when the CPU module writes data to the master function transmit data area of the specified module.

Setting data	Available device									
	Internal device (system, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
S1	—	○		—			—	○	—	—
S2	—	○		—			—	—	—	—
S3	—	○		—			—	○	—	—



Setting data

Setting data	Description	Setting range	Set by	Data type
Un	Module start I/O number of the QJ71DN91 (first two digits of three-digit I/O number)	0 to FE$_H$	User	16-bit binary
S1	Start address for writing data	0900$_H$ to 09FF$_H$		
S2	Start number of device which stores write data	—	System	Device name
S3	Number of write data	0 to 100$_H$	User	16-bit binary

Function

This instruction ensures data consistency when the CPU module writes data to the master function transmit data area of the specified module.

Error

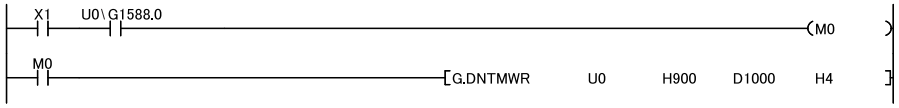
OPERATION ERROR occurs in the following cases:

- When the name of dedicated instruction is not set correctly
- When a value which is out of setting range is set in setting data

Program example

This program writes 4-point data in D1000 to D1003 to the Master Function Transmit Data (address: 0900$_H$ to 09FF$_H$) area of the QJ71DN91 by turning on the following I/O signal and buffer memory area.
(In this example, the QJ71DN91 is mounted on the slot 0 of the base unit with "0000$_H$" set to start I/O No.)

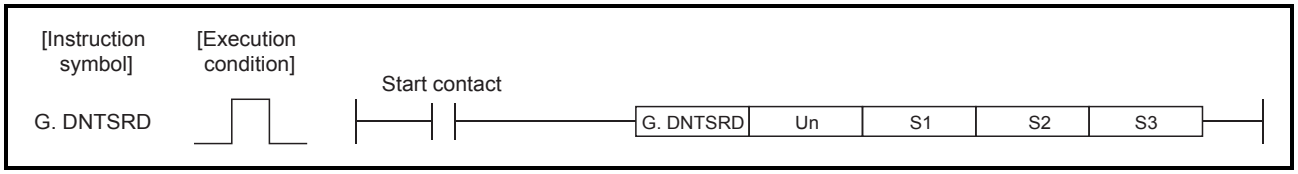
- I/O Communicating (X01)
- Data consistency dedicated instruction setting status for master function (address: bit 0 of 0634$_H$)



9.4 G.DNTSRD

This instruction ensures data consistency when the CPU module reads data from the slave function receive data area of the specified module.

Setting data	Available device									
	Internal device (system, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
S1	—	○		—			—	○	—	—
S2	—	○		—			—	—	—	—
S3	—	○		—			—	○	—	—



Setting data

Setting data	Description	Setting range	Set by	Data type
Un	Module start I/O number of the QJ71DN91 (first two digits of three-digit I/O number)	0 to FE$_H$	User	16-bit binary
S1	Start address of the data to be read	0B00$_H$ to 0B3F$_H$		
S2	Start device number which stores the read data	—	System	Device name
S3	Number of read data	0 to 40$_H$	User	16-bit binary

Function

This instruction ensures data consistency when the CPU module reads data from the slave function receive data area of the specified module.

Error

OPERATION ERROR occurs in the following cases:

- When the name of dedicated instruction is not set correctly
- When a value which is out of setting range is set in setting data

Program example

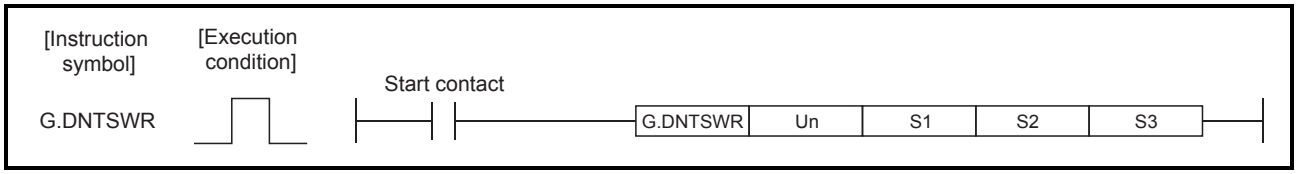
This program reads 4-point data from the Slave Function Receive Data (address: 0B00$_H$ ~) area of the QJ71DN91 to D0 - D3 by turning on the following I/O signal and buffer memory area.
(In this example, the QJ71DN91 is mounted on the slot 0 of the base unit with "0000$_H$" set to start I/O No.)

- I/O Communicating (X01)
- Data consistency dedicated instruction setting status for slave function (address: bit 1 of 0634$_H$)

9.5 G.DNTSWR

This instruction ensures data consistency when the CPU module writes data to the slave function transmit data area of the specified module.

Setting data	Available device									
	Internal device (system, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Zn	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
S1	—	○		—			—	○	—	—
S2	—	○		—			—	—	—	—
S3	—	○		—			—	○	—	—



Setting data

Setting data	Description	Setting range	Set by	Data type
Un	Module start I/O number of the QJ71DN91 (first two digits of three-digit I/O number)	0 to FE$_H$	User	16-bit binary
S1	Start address for writing data	0C00$_H$ to 0C3F$_H$		
S2	Start number of device which stores write data	—	System	Device name
S3	Number of write data	0 to 40$_H$	User	16-bit binary

Function

This instruction ensures data consistency when the CPU module writes data to the slave function transmit data area of the specified module.

Error

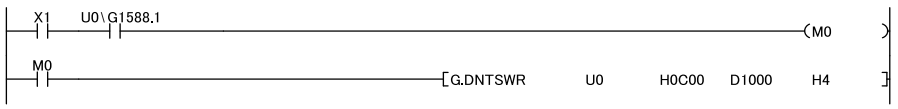
OPERATION ERROR occurs in the following cases:

- When the name of dedicated instruction is not set correctly
- When a value which is out of setting range is set in setting data

Program example

This program writes 4-point data in D1000 to D1003 to the Slave Function Transmit Data (address: 0C00$_H$ to 0C3F$_H$) area of the QJ71DN91 by turning on the following I/O signal and buffer memory area.
(In this example, the QJ71DN91 is mounted on the slot 0 of the base unit with "0000$_H$" set to start I/O No.)

- I/O Communicating (X01)
- Data consistency dedicated instruction setting status for slave function (address: bit 1 of 0634$_H$)



10 TROUBLESHOOTING

This chapter describes the errors that may occur while using the QJ71DN91 as well as their troubleshooting procedures.
This chapter contains the following information:

Section 10.1 Problem Identification
Troubleshooting procedures are shown according to symptoms.

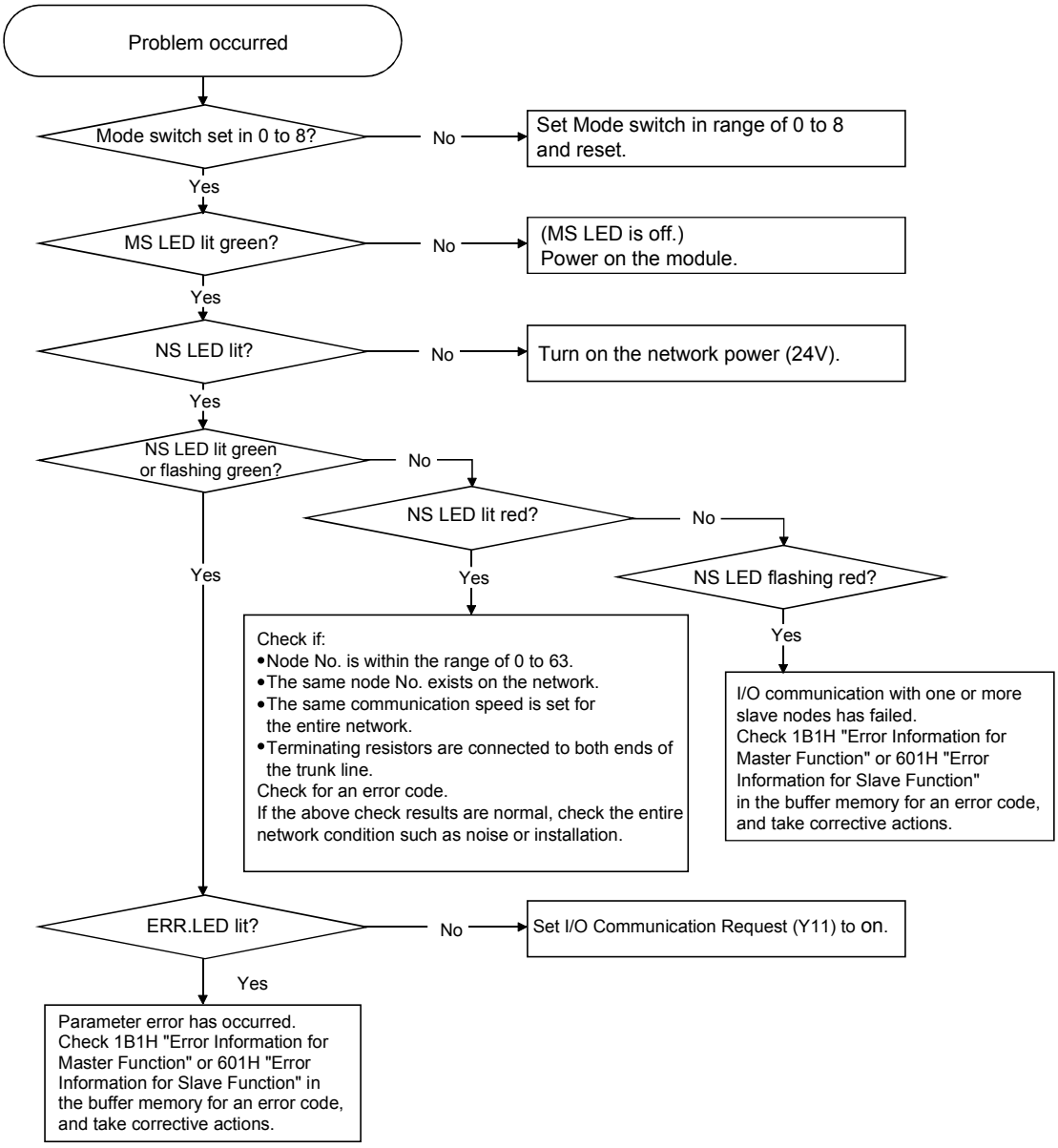
Section 10.2 Error Codes
Troubleshooting procedures are shown according to error codes.

10 - 1

10.1 Problem Identification

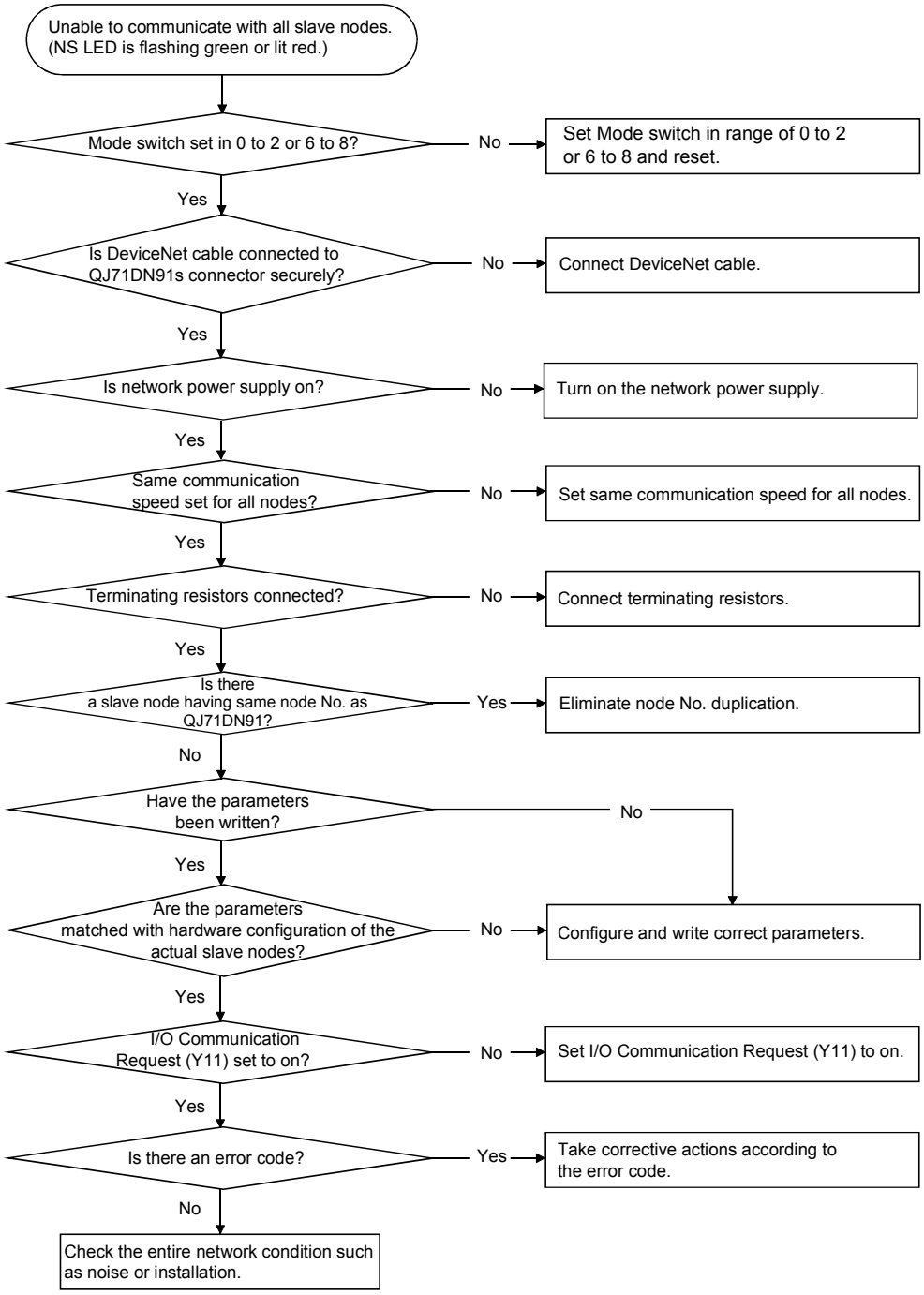
This section explains checking procedures and actions to be taken when a problem occurs.

10.1.1 Checking the LEDs

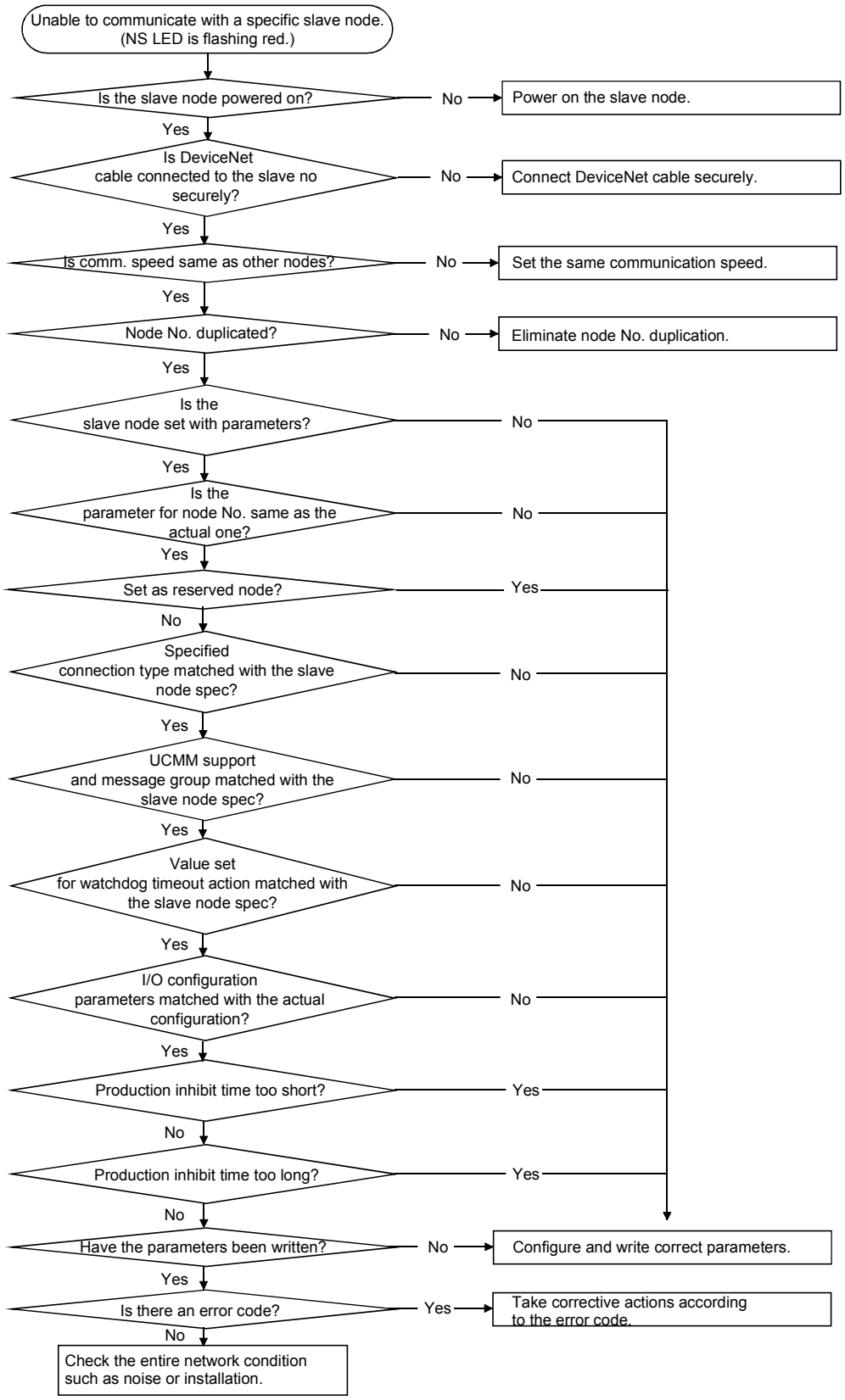


10 - 2

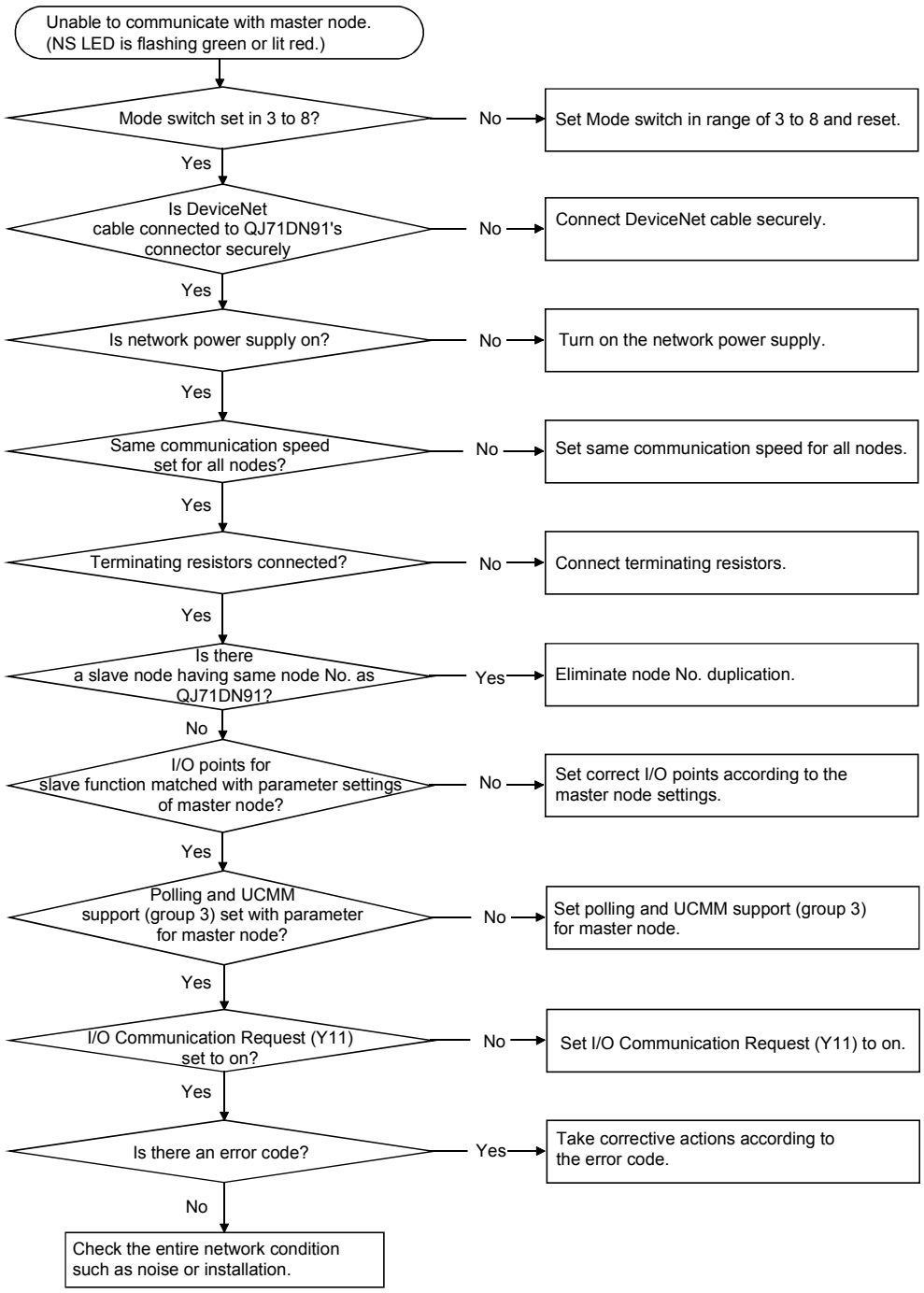
10.1.2 When unable to communicate with all slave nodes (when using master function)



10.1.3 When unable to communicate with a specific slave node (when using master function)



10.1.4 When unable to communicate with master node (when using slave function)



10.1.5 Troubleshooting for other cases

Symptom	Check	Action
Auto configuration is not executed.	Are the following output signals on? • I/O Communication Request (Y11) • Request for Saving Parameters to Flash ROM (Y17)	Set the output signals to off, and then set Auto Configuration Request (Y15) to off and on again.
	• Is "Start" set in Auto Communication Start Setting (address: 0631H)? (I/O Communicating is on?)	• Set "Not start" in Auto Communication Start Setting (address: 0631H), and save the parameters to a flash ROM. • Setting I/O Communication Request (Y11) to on and then off will stop I/O communication, and thereby I/O Communicating (X01) is set to off.
Unable to obtain expected parameters by auto configuration.	• Are the slave nodes powered on? • Is the network powered on? • Is the wiring correct?	Check that the slave nodes and network are powered up and the wiring is correct.
	• If the target slave node is the QJ71DN91, check if "Start" is set in Auto Communication Start Setting (address: 0631H) or if I/O Communication Request (Y11) is on.	When the auto communication start setting is not set up for the target slave node (QJ71DN91), set I/O Communication Request (Y11) to off and then on.
	• Are the slave nodes set in order of node No?	The slave node settings detected by auto configuration are stored in order of node No. Correct values in Parameters for Master Function (address: 01D4H to 03CFH).
	• Are the connection types and I/O points correct?	Referring to the manual for each slave node, check available connection types and I/O points. Correct values in Parameters for Master Function (address: 01D4H to 03CFH).
Parameter saving/clearing is not started.	Are the following output signals on? • I/O Communication Request (Y11) • Auto Configuration Request (Y15)	Set the output signals to off, and then set Request for Saving Parameters to Flash ROM (Y17) to off and on again.
	• Is "Start" set in Auto Communication Start Setting (address: 0631H)? (I/O Communicating is on?)	• Set "Not start" in Auto Communication Start Setting (address: 0631H), and save the parameters to a flash ROM. • Setting I/O Communication Request (Y11) to on and then off will stop I/O communication, and thereby I/O Communicating (X01) is set to off.
Parameters are not saved.	• If the parameter saving area correct?	Check Parameter Area Select Bit (address: 0630H), and set Request for Saving Parameters to Flash ROM (Y17) to off and then on again.

Symptom	Check	Action
After power-up, I/O communication starts automatically.	• Is "Start" set in Auto Communication Start Setting (address: 0631H)? (I/O Communicating is on?)	• Set "Not start" in Auto Communication Start Setting (address: 0631H), and save the parameters to a flash ROM. • Setting I/O Communication Request (Y11) to on and then off will stop I/O communication, and thereby I/O Communicating (X01) is set to off.

10.2 Error Codes

This section describes error codes and respective corrective actions.

10.2.1 Communication error codes

A communication error code is stored in the high byte of Error Information for Master Function (address: 01B1H) or Error Information for Slave Function (address: 0601H). Read it when Error Set Signal for Master Function (X03) or Error Set Signal for Slave Function (X08) is set to on, and check the error details.
Communication error codes can be checked in system monitor of GX Works2. (Refer to Section 10.3.)

(1) When the error-detected node No. (low byte of error information) is FFH

Error code (Hex.)	Detected in:	Description	Action	Detectability	
				Master function	Slave function
36H	QJ71DN91	The node No. (MAC ID) value is out of range. The mode switch value is out of range.	• Set the node No. within the range of 0 to 63. • Set the mode switch to any other than D to F.	○	○
39H	QJ71DN91	The node No. (MAC ID) is duplicated on the network.	• Set a unique node No.	○	○
E0H	QJ71DN91	Power is not supplied to the network.	• Supply power to the network (24VDC).	○	○
E1H	QJ71DN91	Other modules cannot be identified on the network.	• Connect other modules to the network.	○	○
F0H	QJ71DN91	The node number switches or mode switch has been changed during operation.	• Restore the setting of the node number switches or mode switch.	○	○

(2) When the error-detected node No. (low byte of error information) is FE$_H$

Error code (Hex.)	Detected in:	Description	Action	Detectability	
				Master function	Slave function
02$_H$	QJ71DN91	Zero (0) is set for both the input and output points of a slave node.	• Set the input and output points according to the slave node specifications.	○	×
03$_H$	QJ71DN91	The low byte of the slave node No. in the buffer memory is out of range.	• Set it within the range of 0 to 63.	○	×
04$_H$	QJ71DN91	The high byte of the slave node No. in the buffer memory is out of range.	• Set it within the range of 01$_H$ to 04$_H$, or to 80$_H$.	○	×
05$_H$	QJ71DN91	The connection type in the buffer memory is out of range.	• Set 0001$_H$, 0002$_H$, 0004$_H$, or 0008$_H$.	○	×
06$_H$	QJ71DN91	The same node No. has already been set for a slave node in the buffer memory.	• Set unique node numbers for all nodes.	○	×
07$_H$	QJ71DN91	No slave node has been set.	• Set at least one slave node.	○	×
08$_H$	QJ71DN91	The total input data length of all slave nodes is too long.	• Reduce it to 512 bytes or less.	○	×
09$_H$	QJ71DN91	The total output data length of all slave nodes is too long.	• Reduce it to 512 bytes or less.	○	×
0A$_H$	QJ71DN91	The parameter value for the watchdog timeout action is invalid.	• Set 0000$_H$, 0001$_H$, 0002$_H$, or 0003$_H$.	○	×
0B$_H$	QJ71DN91	The expected packet rate value in the buffer memory is smaller than the production inhibit time value.	• Change the setting so that the expected packet rate value is greater than or equal to the production inhibit time value.	○	×
0C$_H$	QJ71DN91	Flash ROM checksum error (Parameters for Master Function area)	• Save the parameters again. • Do not turn off the power or reset while saving the parameters.	○	○
0D$_H$	QJ71DN91	Flash ROM checksum error (Parameters for Slave Function area)	• Save the parameters again. • Do not turn off the power or reset while saving the parameters.	○	○
0E$_H$	QJ71DN91	Flash ROM checksum error (Auto Communication Start Setting area)	• Save the parameters again. • Do not turn off the power or reset while saving the parameters.	○	○
0F$_H$	QJ71DN91	Flash ROM all clear error	• Clear all parameters again. • Do not turn off the power or reset while clearing the parameters.	○	○
10$_H$	QJ71DN91	The number of input points per slave node exceeds 256 bytes.	• Correct the number of input points per slave node to 256 bytes or less.	○	×
11$_H$	QJ71DN91	The number of output points per slave node exceeds 256 bytes.	• Correct the number of output points per slave node to 256 bytes or less.	○	×
15$_H$	QJ71DN91	The production inhibit time value was set to 0ms (set value 1) in cyclic.	• Set the production inhibit time value to a value other than 0ms.	○	×
16$_H$	QJ71DN91	All slave nodes are set as reserved nodes by parameters.	• Set the parameters according to the slave nodes connected to the network.	○	×
20$_H$	QJ71DN91	DNTMRD was not executed for three sequence scans although "Data consistency dedicated instruction setting for master function" is enabled.	• Correct the sequence program so that DNTMRD is executed in every scan. • When not using Data consistency dedicated instruction, disable "Data consistency dedicated instruction setting for master function", then turn on I/O Communication Request (Y11).	○	×

Error code (Hex.)	Detected in:	Description	Action	Detectability	
				Master function	Slave function
21H	QJ71DN91	DNTMWR was not executed for three sequence scans although "Data consistency dedicated instruction setting for master function" is enabled.	• Correct the sequence program so that DNTMWR is executed in every scan. • When not using Data consistency dedicated instruction, disable "Data consistency dedicated instruction setting for master function", then turn on I/O Communication Request (Y11).	○	×
22H	QJ71DN91	DNTSRD was not executed for three sequence scans although "Data consistency dedicated instruction setting for slave function" is enabled.	• Correct the sequence program so that DNTSRD is executed in every scan. • When not using Data consistency dedicated instruction, disable "Data consistency dedicated instruction setting for slave function", then turn on I/O Communication Request (Y11).	×	○
23H	QJ71DN91	DNTSWR was not executed for three sequence scans although "Data consistency dedicated instruction setting for slave function" is enabled.	• Correct the sequence program so that DNTSWR is executed in every scan. • When not using Data consistency dedicated instruction, disable "Data consistency dedicated instruction setting for slave function", then turn on I/O Communication Request (Y11).	×	○
24H	QJ71DN91	The master function is used but "Data consistency dedicated instruction setting for slave function" was enabled and I/O communication was started.	• Disable "Data consistency dedicated instruction setting for slave function", then turn on I/O Communication Request (Y11).	○	×
25H	QJ71DN91	The slave function is used but "Data consistency dedicated instruction setting for master function" was enabled and I/O communication was started.	• Disable "Data consistency dedicated instruction setting for master function", then turn on I/O Communication Request (Y11).	×	○
80H	QJ71DN91	The number of slave function receive bytes is out of range.	• Set it within the range of 0 to 128 bytes.	×	○
81H	QJ71DN91	The number of slave function transmit bytes is out of range.	• Set it within the range of 0 to 128 bytes.	×	○
82H	QJ71DN91	Both of the slave function transmit and receive bytes are set to 0.	• Set either of the transmit or receive bytes to any other than 0.	×	○
A0H	QJ71DN91	When using both the master and slave functions, the number of I/O points is set to 0 for both of them.	• Set I/O points of slave nodes in Parameters for Master Function. • Set transmit/receive bytes in Parameters for Slave Function. (Either of master or slave function values must be set.)	○	○

(3) When the error-detected node No. (low byte of error information) is other than FF_H and FE_H

Error code (Hex.)	Detected in:	Description	Action	Detectability	
				Master function	Slave function
01_H	QJ71DN91	A network problem was detected after communication was started.	• Check that the cables are connected correctly.	○	○
$1E_H$	QJ71DN91	The slave node did not respond.	• Check the entire network and slave node states for MAC ID and baud rate setting, a failed slave node, or disconnection of a terminating resistor.	○	×
20_H	Slave node	A slave node responded with a non-prescribed error.	• Read the communication error information, and take an appropriate action according to the error information.	○	×
23_H	Slave node	A slave node responded with an error when establishing a connection.	• Read the communication error information, and take an appropriate action according to the error information.	○	×
24_H	QJ71DN91	The input data size set with a parameter is different from the size for the actual slave node.	• Check the slave node manual and set the correct input data size.	○	×
25_H	QJ71DN91	The output data size set with a parameter is different from the size for the actual slave node.	• Check the slave node manual and set the correct output data size.	○	×
26_H	QJ71DN91	Response data of the function that is not supported by the QJ71DN91 was received.	• Check the slave node manual, and prevent any data of the function not supported by the QJ71DN91 from being sent from the slave node. • Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	×
27_H	Slave node	The connection is already in the specified mode.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	×
28_H	QJ71DN91	Unexpected invalid data was received when the connection was established.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	×
29_H	Slave node	Connection has already been established with that slave node.	• Wait for a while, and reset the slave node if the connection cannot be established.	○	×
$2A_H$	QJ71DN91	The data length of a polling response is different from the length of the data that was read from the slave node when a connection was established.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	×
$2B_H$	QJ71DN91	When a polling response was divided into several data units, the first data unit was received twice.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	○
$2C_H$	QJ71DN91	When a polling response was divided into several data blocks, data of an unexpected number was received.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	○
$2D_H$	QJ71DN91	When a polling response was divided into several data blocks, the second data block or later was received before the first one.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.	○	○

Error code (Hex.)	Detected in:	Description	Action	Detectability	
				Master function	Slave function
$3B_H$	QJ71DN91	Two or more identical node numbers (MAC IDs) were detected in parameters.	• The same node No. is set for two or more slave nodes. Correct the duplicated parameter settings. • A slave node having the same node No. as that of this node exists in the parameters.	○	×
47_H	QJ71DN91	Incorrect connection type was specified.	• Check if the connection type value is correct. • Read the communication error information, and take appropriate actions.	○	×
80_H	QJ71DN91	The polling connection in the slave function has timed out.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor. • Check the master node status.	×	○
81_H	QJ71DN91	A connection other than for explicit messages and polling was allocated.	• Do not allocate any I/O connection other than for polling.	×	○
82_H	QJ71DN91	The number of bytes received by polling is greater than the max. number of receive points.	• Set the master node's I/O points that match the settings of the QJ71DN91.	×	○

10 - 12

10.2.2 Execution error codes of message communication (for the master function only)

An execution error code is stored in Message Communication Result (address: 0121H). Read it when Message Communication Completion signal (X02) is set to on, and check the error details.

(1) When reading communication error information

Error code (Dec.)	Detected in:	Description	Action
161	QJ71DN91	The specified slave node No. is other than 0 to 63.	• Specify a slave node No. within the range of 0 to 63.

(2) When getting/setting attribute, or resetting

Error code (Dec.)	Detected in:	Description	Action
2	Slave node	Resources required for the object to execute a requested service could not be used.	• Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
8	Slave node	The requested service was not installed, or it was not defined for this object class/instance.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
9	Slave node	Invalid attribute data were detected.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
11	Slave node	The object is already placed in the mode/status that is requested by the service.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Verify the current status by reading the attribute. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
12	Slave node	The object cannot execute the requested service in the current mode/status.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Verify the current status by reading the attribute. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
14	Slave node	A request to change an attribute whose change is inhibited was received.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
15	Slave node	Permission/privilege check failed.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.

Error code (Dec.)	Detected in:	Description	Action
16	Slave node	The requested service cannot be executed in the current device status.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
17	QJ71DN91	Slave node did not respond.	• Check the entire network and slave node states for any fault such as slave node failure, or disconnection of a terminating resistor.
19	Slave node	Sufficient data was not provided to execute the specified operation.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • In the case of set attribute, verify that the specified data is sufficient and the data length is correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
20	Slave node	The specified attribute is not supported.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
21	Slave node	The service provided excessive data.	• Reduce the data returned from the slave node to 240 bytes or less.
22	Slave node	The specified object does not exist in the slave node.	• Check whether or not the specified MAC ID, class ID, instance ID and attribute ID are correct. • Referring to the slave node manual, check the condition under which the slave node notifies this error, and take an appropriate action.
50	QJ71DN91	The response data format is invalid.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.
55	QJ71DN91	The specified slave node No. is other than 0 to 63.	• Specify a node No. in the range of 0 to 63.
57	QJ71DN91	The divided data were received in incorrect order.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.
257	QJ71DN91	The data length set in the buffer memory is 241 or more.	• Set the data length to 240 bytes or less.
258	QJ71DN91	An invalid value was set as a command No. in the Message Communication Command area of the buffer memory.	• Set 0001_H, 0101_H, 0102_H, 0201_H, or FE**$_H$ as a command No.
300	QJ71DN91	The own node is set offline.	• Set Y11 to on to set the own node online.
301	QJ71DN91	An error occurred during data queuing.	• Perform a hardware test to check for hardware failure.
302	QJ71DN91	A timeout occurred while waiting for a response.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.
303	QJ71DN91	An invalid response was obtained.	• Check the entire network and slave node states for any fault such as disconnection of a terminating resistor.
304	QJ71DN91	The specified node No. is currently set for a reserved node.	• Set a node No. that is not being used for a reserved node.
305	QJ71DN91	The message was sent to the own node.	• Send messages to address any other than the own node.

Error code (Dec.)	Detected in:	Description	Action
306	QJ71DN91	Failed to open a message connection.	• Check whether the parameter value for the message group is set correctly or not.
317	Slave node	The response data length is too long.	• Verify that the transmit message can be responded by the slave node.

10.2.3 General DeviceNet error codes of message communication (for the master function only)

A general DeviceNet error code is stored in Message Communication Data (address: 0133H).
Read it when Message Communication Completion signal (X02) is set to on, and check the error details. (Valid when Communication error code is 35 (0023H).)

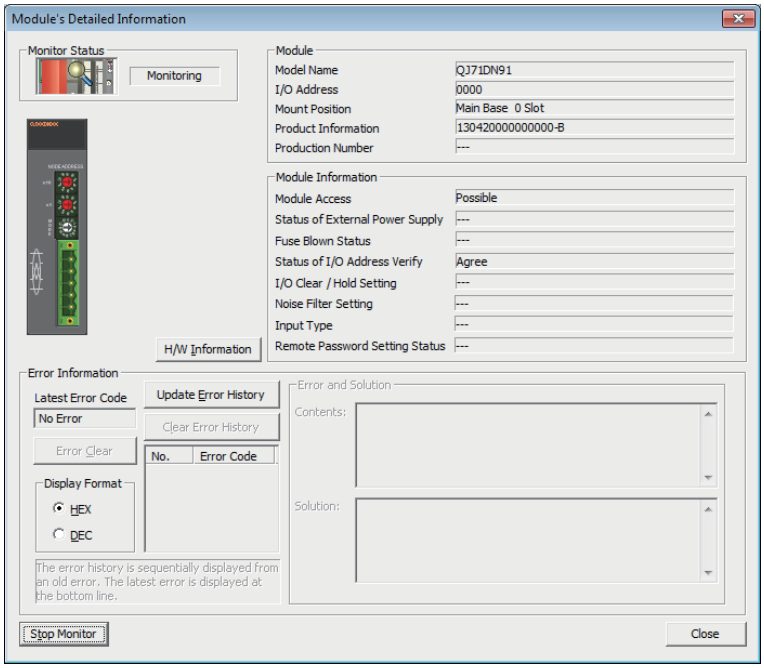
Error code		Error name	Description
Hex.	Dec.		
0000H to 0001H	0 to 1	Reserved	Reserved by DeviceNet.
0002H	2	Resource unavailable	The requested service could not be executed because there was no space in the required resource.
0003H to 0007H	3 to 7	Reserved	Reserved by DeviceNet.
0008H	8	Service not supported	The requested service is not supported. Or, the requested service is not defined by the specified object class/instance.
0009H	9	Invalid attribute value	The requested service had an error in the attribute data.
000AH	10	Reserved	Reserved by DeviceNet.
000BH	11	Already in requested mode/state	The specified object has already been changed into the requested mode/status.
000CH	12	Object state conflict	The specified object was not in the state that could execute the requested service.
000DH	13	Reserved	Reserved by DeviceNet.
000EH	14	Attribute not settable	The requested setup service specified an unchangeable attribute.
000FH	15	Privilege violation	The service requester did not have the access privilege.
0010H	16	Device state conflict	The specified device was not in the state that could execute the requested service.
0011H	17	Reply data too large	The response data length exceeded the data length that can be processed.
0012H	18	Reserved	Reserved by DeviceNet.
0013H	19	Not enough data	The requested service did not provide sufficient data to execute processing.
0014H	20	Attribute not supported	The requested service specified an undefined attribute.
0015H	21	Too much data	The requested service includes invalid data.
0016H	22	Object does not exist	The requested service specified an unimplemented object.
0017H	23	Reserved	Reserved by DeviceNet.
0018H	24	No stored attribute data	The attribute data of this object had not been saved before this service was requested.
0019H	25	Store operation failure	The attribute data of this object was not saved due to an error that occurred during the save operation.
001AH to 001EH	26 to 30	Reserved	Reserved by DeviceNet.
001FH	31	Vendor specific error	A vender-specific error occurred. A specific error occurred is indicated in the "Additional error code" area (0134H) of the error response. This error code can be used only when the error codes shown in this table and object class definitions do not apply to the corresponding error.
0020H	32	Invalid parameter	The requested service had a parameter error. This code can be used only when the parameter satisfies neither the requirements of the DeviceNet specifications nor the requirements defined by application object specifications.
0021H to 0027H	33 to 39	Future extensions	Reserved by DeviceNet.
0028H	40	Invalid Member ID	An unimplemented class/instance/attribute was specified for the member ID of the requested service.
0029H	41	Member not settable	The requested setup service specified an unchangeable member.
002AH to 00CFH	42 to 207	Reserved	Reserved by DeviceNet.
00D0H to 00FFH	208 to 255	Reserved for Object Class and service errors	This error code range is used to indicate errors specific to the object class. The code in this range can be used only when any error code in this table does not correctly explain the error that occurred. Using the "Additional error code" area (0134H), the "General DeviceNet error code" area (0133H) can be explained in detail.

10.3 Checking the QJ71DN91 Status by system monitor in GX Works2

Error codes and LED status can be checked by selecting the detailed information of the QJ71DN91 from system monitor of GX Works2.

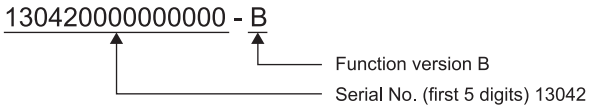
(a) Operation procedure

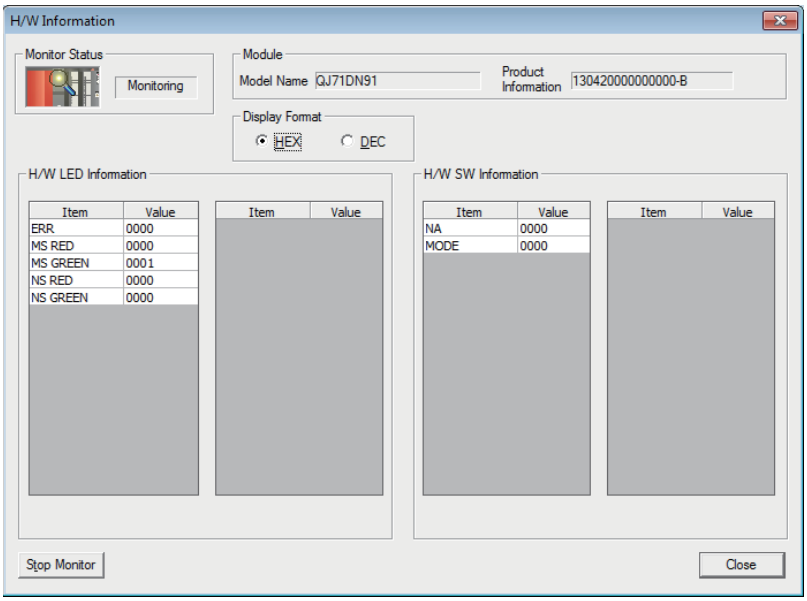
Select "Diagnostics" – "System monitor", choose a module, and then "Module's Detailed Information" – "H/W Information."



(b) Product information

The serial number and function version are displayed as shown below.





(c) H/W LED Information

The LED status of the QJ71DN91 is displayed. (0: OFF, 1: ON)

ERR:	Indicates the "ERR" LED status.
MS RED:	Indicates the "MS (red)" LED status.
MS GREEN:	Indicates the "MS (green)" LED status.
NS RED:	Indicates the "NS (red)" LED status.
NS GREEN:	Indicates the "NS (green)" LED status.

(d) H/W SW Information

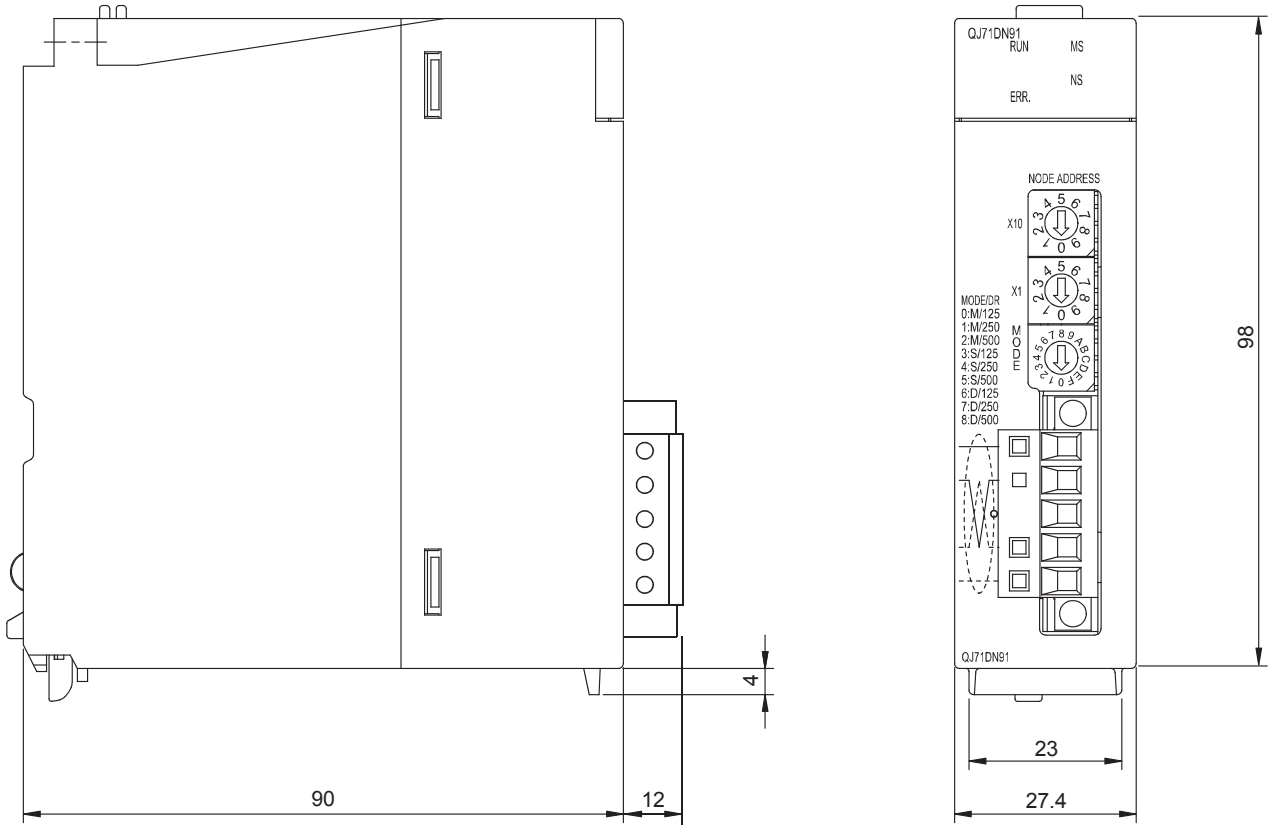
The switch setting status of the QJ71DN91 is displayed.

NA:	Displays the node No. setting status.
MODE:	Displays the mode switch status.

APPENDIXES

Appendix 1 External Dimensions

The external dimensions of the QJ71DN91 are shown below.



(Unit: mm)

App - 1

Appendix 2 How to Use the QJ71DN91 in System of MELSEC iQ-R Series

By using RQ extension base unit, the QJ71DN91 can be used in the system of MELSEC iQ-R series.
For details, refer to the MELSEC iQ-R Module Configuration Manual.

(1) Precautions

(a) The mode switch can be set in range of 0 to 8.

(b) If the mode switch is set to the range other than 0 to 8 or the node number switch is set to the range other than 0 to 63, an error (2241H: Parameter error (module)) occurs in the CPU module of MELSEC iQ-R series.

(c) Set parameters in a sequence program because the following cannot be set in GX Works3.

- Master function parameters (Refer to Section 7.3.2 (1) (2).)
- Slave function parameters (Refer to Section 8.2.2 (1).)
- Save Parameters to Flash ROM (Refer to Section 7.3.2 (3), 8.2.2 (2).)

(2) Refresh processing time

When the QJ71DN91 is used for MELSEC iQ-R series, the refresh processing time for when "Target" is a refresh data register (RD) is as follows.

RQ extension base unit		Q extension base unit	
Refresh read time	Refresh write time	Refresh read time	Refresh write time
265.14μs	155.06μs	599.57μs	327.80μs

For the refresh processing time for when "Target" is a specified device, refer to the MELSEC iQ-R CPU Module User's Manual (Application).

Appendix 3 Parameter Setting Sheet (For the Master Function)

Buffer memory address (Hex.)	Item	Description	Set value
01D7H	Constant scan	Specify a value to make the link scan time constant. (Setting range: 0 to 65535ms (FFFFH))	

[□ th slave node]

Buffer memory address (Hex.)	Item	Description	Set value
01D8H + (□ - 1) × 8	Node No. and message group	Low byte: Node No. of □ th slave node (MAC ID) 00H to 3FH (0 to 63) High byte: 01H → Node that supports UCMM and uses any of message groups 3, 2, and 1. 03H → Node that supports UCMM and uses message group 1 04H → Node that does not support UCMM (Group 2 only server) 80H → Reserved node	
01D9H + (□ - 1) × 8	Connection type	Select a connection type for I/O communication. 0001H = Polling 0002H = Bit strobe 0004H = Change of state 0008H = Cyclic	
01DAH + (□ - 1) × 8	Number of byte modules	Low byte: Number of input byte modules High byte: Number of output byte modules (set in hexadecimal) Eight bit modules (8 points) are counted as one byte module.	
01DBH + (□ - 1) × 8	Number of word modules	Low byte: Number of input word modules High byte: Number of output word modules (set in hexadecimal)	
01DCH + (□ - 1) × 8	Number of double-word modules	Low byte: Number of input double-word modules High byte: Number of output double-word modules (set in hexadecimal)	
01DDH + (□ - 1) × 8	Expected packet rate	Set an expected packet rate for the slave node. (Setting range: 0 to 65535ms (FFFFH)) 0000H: 200ms (Default) Other than 0000H: Set value – 1 (ms)	
01DEH + (□- 1) × 8	Watchdog timeout action	Set an action for watchdog timeout of the slave node. 0000H: Equivalent to the following Timeout (Default) 0001H: Timeout 0002H: Auto Delete 0003H: Auto Reset	
01DFH + (□ - 1) × 8	Production inhibit time	Set a production inhibit time. (Setting range: 0 to 65535ms (FFFFH)) 0000H: 10ms (Default) Other than 0000H: Set value –1 (ms)	

When setting parameters, use a copy of this sheet.

Appendix 4 Parameter Setting Sheet (For the Slave Function)

Buffer memory address (Hex.)	Item	Description	Set value
060E$_H$	Slave function receive-bytes (input size) setting area	Set a size of I/O data that can be received for the slave function. (Setting range: 0 to 128 bytes, Default: 8 bytes)	
060F$_H$	Slave function transmit-bytes (output size) setting area	Set a size of I/O data that can be sent for the slave function. (Setting range: 0 to 128 bytes, Default: 8 bytes)	

Appendix 5 List of Communication Parameters of Slave Nodes from Various Manufactures

The following table lists an example of parameter setting for communicating with slave nodes from various manufacturers. For more details on the parameter settings, please contact each manufacturer.

Name of manufacturer	Model	Name	Set value (values in parentheses are for the case of setting with sequence programs)									Remarks	
			Connection type	No. of byte modules		No. of word modules		No. of double-word modules		Expected Packet Rate	Watch-dog Timeout Action	Production Inhibit Time	UCMM	Message group
				Output	Input	Output	Input	Output	Input					
Mitsubishi Electric Corporation	QJ71DN91	DeviceNet master/slave module	Polling (H1)	00H to 80H	00H to 80H	00H	00H	00H	00H	200ms (K201)	Timeout (H1)	10ms (H0)	Yes	3
	FR-A5ND	A500 Series inverter DeviceNet option	Polling (H1)	04H	04H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	Yes	3
Rockwell Automation Japan Co., Ltd.	1794ADN	Flex I/O DeviceNet adapter	Polling (H1)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	Yes	3
			Bit strobe (H2)							1000ms (K1001)		10ms (K11)		
			Change-of-state (H4)							0ms (H0)		0ms (H0)		
			Cyclic (H8)							30ms (K31)		25ms (K26)		
	1794-IB16	Flex I/O input module	—	02H	02H	00H	00H	00H	00H	—	—	—	—	—
	1794-OB16	Flex I/O output module	—	02H	02H	00H	00H	00H	00H	—	—	—	—	—
Omron Corporation	DRT1-ID08	CompoBus/D 8-point input	Polling (H1)/ bit strobe (H2)	00H	01H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-ID16	CompoBus/D 16-point input	Polling (H1)/ bit strobe (H2)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-OD08	CompoBus/D 8-point output	Polling (H1)	01H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-OD16	CompoBus/D 16-point output	Polling (H1)	02H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-AD04	CompoBus/D 4-point analog input	Polling (H1)/ bit strobe (H2)	00H	00H	00H	04H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	DRT1-DA02	CompoBus/D 2-point analog output	Polling (H1)	00H	00H	02H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
IDEC (Izumi) Corporation	SX5D-SBN16S	DeviceNet 16-point digital input	Polling (H1)	00H	02H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	SX5D-SBT16K	DeviceNet 16-point digital output	Polling (H1)	02H	00H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—
	SX5D-SBM16K	DeviceNet 8-point digital input/8-point digital output	Polling (H1)	01H	01H	00H	00H	00H	00H	1000ms (K1001)	Timeout (H1)	10ms (K11)	No	—

Appendix 6 EDS File of the QJ71DN91

The following shows the EDS file of the QJ71DN91.

```
$ Mitsubishi Master/Slave EDS file

$ File Description Section
[File]
   DescText="QJ71DN91 EDS file";
   CreateDate=08-28-2000;                    $ created
   CreateTime=12:00:00;
   ModDate=08-28-2000;                       $ last change
   ModTime=12:00:00;
   Revision=1.1;                             $ Revision of EDS

$ Device Description Section
[Device]
   VendCode=0xA1;
   VendName="MITSUBISHI ELECTRIC CORPORATION";
   ProdType=0x0C;                             $ Communication Adapter Device
   ProdTypeStr="Communication Adapter";       $ Communication Adapter Device
   ProdCode=4;
   MajRev=1;
   MinRev=1;
   ProdName="QJ71DN91";
   Catalog="";

$ I/O Characteristics Section
[IO_Info]
   Default=0x0001;                           $ Poll Only
   PollInfo=0x0001,
      1,                                     $ Default Input = Input1
      1;                                     $ Default Output = Output1

  $ Input Connections
   Input1=                                   $ Input(Producing)
      8,                                     $ 8 byte
      0,                                     $ 0 bits are significant
      0x0001,                                $ Poll Only Connection
      "Input Data",                          $ Name
      6,                                     $ Path Size
      "20 04 24 64 30 03",                   $ Assembly Object Instance 100
      "Data";                                $ Help
  $ Output Connections
   Output1=                                  $ Output(Consuming)
      8,                                     $ 8 byte
      0,                                     $ 0 bits are significant
      0x0001,                                $ Poll Only Connection
      "Output Data",                         $ Name
      6,                                     $ Path Size
      "20 04 24 65 30 03",                   $ Assembly Object Instance 101
      "Data";                                $ Help

[ParamClass]
   MaxInst=0;
   Descriptor=0x00;
   CfgAssembly=0;
```

INDEX

[A]
Add configuration 3-34
All configuration 3-34
Auto-configuring (X14) 3-12
Auto configuration A-13
Auto configuration completion (X15) 3-12
Auto communication start setting 3-45
Auto configuration operation setting 3-34
Auto configuration request (Y15) 3-12

[B]
Bit strobe 4-6
Buffer memory list 3-17
Bus error counter 3-27
Bus off counter 3-27

[C]
Change of state 4-7
Checking the LEDs 10-2
Communication error codes 10-8
Communication test 5-10
Cyclic 4-8

[D]
DNTMRD 9-3
DNTMWR 9-4
DNTSRD 9-5
DNTSWR 9-6

[E]
Error codes 10-8
Error information for master function 3-27
Error information for slave function 3-39
Error reset request for master function (Y13) 3-9
Error reset request for slave function (Y18) 3-16
Error set signal for master function (X03) 3-9
Error set signal for slave function (X08) 3-16
Execution error codes of message communication 10-13
Expected packet rate 3-33
External dimensions App-1

[F]
Failed node detection setting 3-30
Function version 2-4,10-17

[G]
General DeviceNet error codes 10-16

[H]
Hardware test 5-8
Hardware test item area 3-43
Hardware test result area 3-44
H/W test completion (X0B) 3-12
H/W test error detection (X0C) 3-12
H/W test in progress (X0A) 3-12

[I]
I/O address area for master function 3-38
I/O communicating (X01) 3-5, 3-13
I/O communication request (Y11) 3-5, 3-13
I/O signal list 3-4

[L]
LED indications 5-6
Link scan time 3-48
List of communication parameters of slave nodes from various manufacturers App-5

[M]
Master function (I/O communication function) 4-1
Master function communication status 3-25
Master function receive data 3-36
Master function transmit data 3-37
Maximum link scan time 3-38
Message communication command 3-20
Message communication completion (X02) 3-8
Message communication data 3-23
Message communication error signal (X05) 3-8
Message communication function 4-9, 7-32
Message communication request (Y12) 3-8
Message communication result 3-21
Minimum link scan time 3-38
Mode switch 5-7
Mode switch No. 3-42
Model name 3-42
Module ready (X0F) 3-11

Index - 1

[N]
Node communication error status..... 3-29
Node communication status 3-28
Node configuration status 3-28
Node fault status 3-29
Node No. 3-42
Node number switches 5-7

[O]
Obtaining error information (master function) 7-30
Obtaining error information (slave function) 8-10
ODVA..... 2-2
Operation setting area for bus off error 3-46

[P]
Parameters saved to flash ROM (X07) 3-10
Parameter saving area selection area..... 3-45
Parameters for master function 3-31, 7-9
Parameters for slave function 3-40, 8-1
Performance specifications..... 3-1
Polling 4-5
Precautions for network power supply 5-11
Present link scan time..... 3-38
Production inhibit time..... 3-33
Programming precautions..... 7-1

[R]
Request for saving parameters to flash ROM (Y17) 3-10

[S]
Saving parameters to flash ROM (X06) 3-10
Slave function (I/O communication function) 4-12, 8-9
Slave function communication status 3-39
Slave function receive data..... 3-41
Slave function receive-bytes setting area..... 3-40
Slave function transmit data..... 3-41
Slave function transmit-bytes setting area ... 3-40
System configuration..... 2-1

[T]
Transmission delay 3-50

[W]
Watchdog timer error (X00) 3-5
When unable to communicate with all slave nodes 10-3
When unable to communicate with a specific slave node.....10-4
When unable to communicate with master node 10-5
Wiring 5-9

Index - 2

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 to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) 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.

Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
DeviceNet is a trademark of ODVA, Inc.
The company names, system names and product names mentioned in this manual are either registered trademarks or trademarks of their respective companies.
In some cases, trademark symbols such as '™' or '®' are not specified in this manual.

SH(NA)-080143-N

SH(NA)-080143-N(1809)MEE
MODEL: QJ71DN91-U-S-E
MODEL CODE: 13JR32

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.