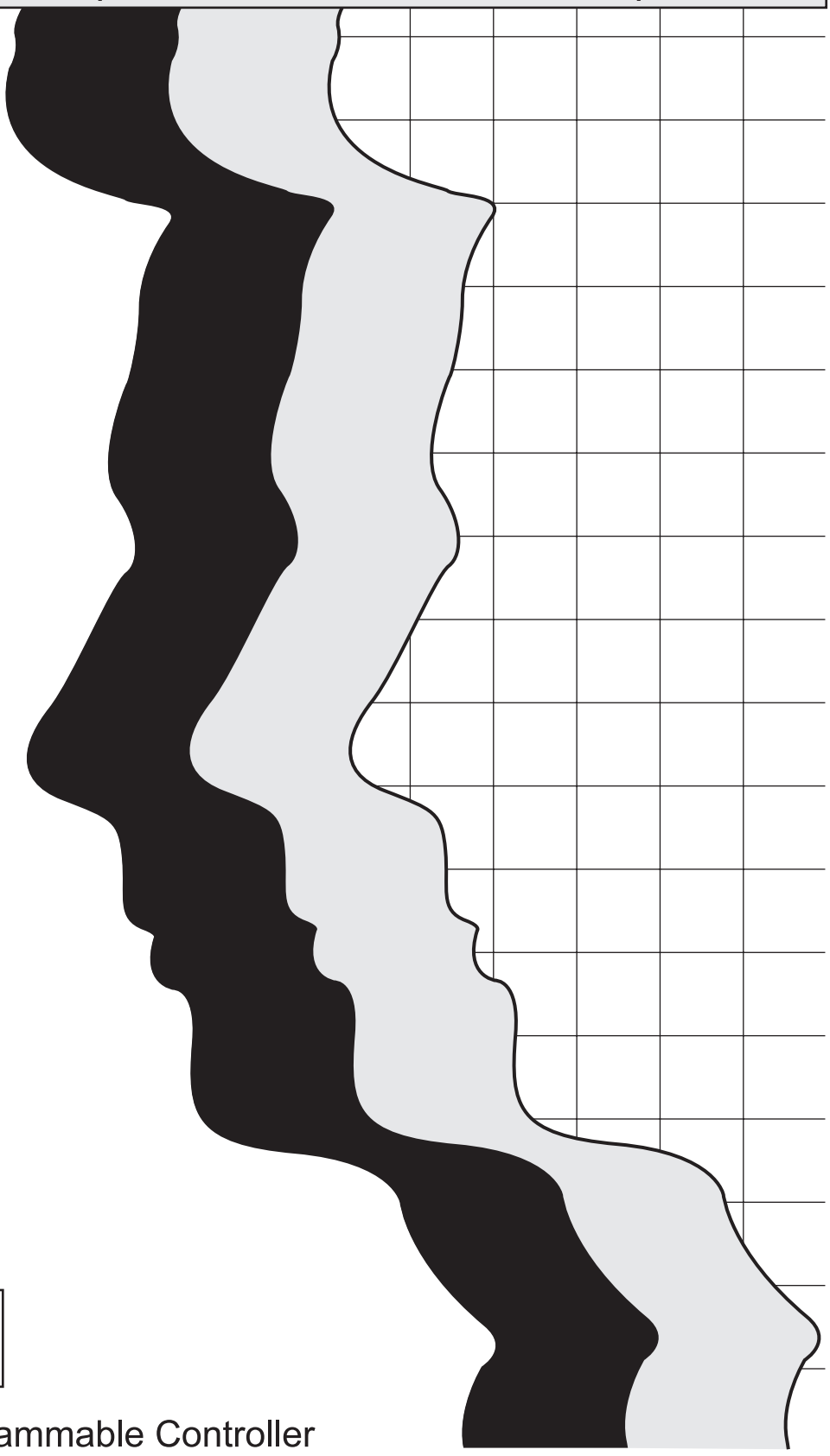
MITSUBISHI

Type A80BDE-A2USH-S1 PLC CPU Board

User's Manual (For SW1DNF-ANU-B)



MELSEC

Mitsubishi Programmable Controller

• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please see the manual for the IBM PC/AT compatible PC.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please store this manual in a safe place and make it accessible when required. Always forward it to the end user.

[DESIGN PRECAUTION]

⚠ DANGER

- Provide a safety circuit externally to the IBM PC/AT compatible PC so that the safety of the overall system is always maintained in case of external power supply failure or IBM PC/AT compatible PC breakdown.
  (1) Provided the following circuits externally to the IBM PC/AT compatible PC, an emergency stop circuit, a protective circuit, an interlocking circuit for opposite operations such as forwarding and reversing, and an interlocking circuit for preventing damage to the machine such as upper and lower limits for positioning.
  (2) The IBM PC/AT compatible PC stops operating and turns off all outputs when one of the following abnormalities is detected:
    • When the overcurrent protective device or the overvoltage protective device of the power supply module is activated.
    • Self-diagnostic function is activated due to an error such as a watchdog timer error in the IBM PC/AT compatible PC

  All outputs may be turned on when there is an abnormality in the I/O control area that cannot be detected by the IBM PC/AT compatible PC. To make the machine operate safely in this situation, provide a failsafe circuit externally to the IBM PC/AT compatible PC or add such a mechanism.
- If overcurrent flows continuously for an extended period of time in the output module due to a rating abnormality or a load short circuit, it may cause smokes or fires. Thus, provide an external safety circuit, such as a fuse.

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[DESIGN PRECAUTION]

⚠ DANGER

- Design the circuit in such a way that the external power supply is turned on after the IBM PC/AT compatible PC is powered on. Turning on the external power supply first may cause accidents due to an erroneous output or a malfunction.
- When a communication error occurs in the data link, the operation status of the communication faulty station will change according to the type of the data link used. Configure an interlocking circuit in a user program using the communication status information so that the safety of the overall system is always maintained.
  Erroneous outputs and malfunctions may lead to accidents.
  (1) The data link retains the data before the communication error.
  (2) All outputs are turned off at the MELSECNET (II, /B, /10) remote I/O stations.
  (3) Either the output is retained or all outputs are turned off at the MELSECNET/MINI-S3 remote I/O stations, depending on the E.C. mode setting.
  For more information about how to check for communication errors and the operation status at the time of a communication error, see the manual for the corresponding data link system.
- When configuring a system, do not leave any slots vacant in the extension base unit. Should there be any vacant slots, always use a blank cover (A1SG60) or a dummy module (A1SG62). If any of the vacant slots are not covered, the module's internal parts may blast when a short circuit test is performed, or overcurrent or overvoltage is accidentally applied to the external I/O area.

⚠ CAUTION

- Mount the CPU board (A80BDE-A2USH-S1) in a panel mount type IBM PC/AT compatible PC with either an FG or LG terminal.
- Install the CPU board mounted IBM PC/AT compatible PC inside the same control box as the programmable controller, and make sure to ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller.
- Do not bundle the control wires or the communication cables together with the main circuit or the power wires, and do not install them close to each other.
  They should be installed at least 100 mm (3.94 in.) away from each other.
  Failure to do so may generate noise, resulting in malfunctions.
- When controlling a lamp load, a heater, solenoid valves, etc. with an output module, a large current (approximately ten times greater than normal) may flow when the output is turned from on to off. Take appropriate measures such as replacing the module with one having sufficient rated current.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the CPU board in an operating environment that meets the general specifications described in the manual.
  Using the CPU board in any other operating environments may cause electric shocks, fires or malfunctions, or may damage or degrade the CPU board.
- Do not directly touch the conducting parts of the CPU board.
  This may cause the CPU board to malfunction or fail.
- Fix the CPU board securely with the installation screws and tighten the installation screws within the specified torque.
  If the screws are loose, it may cause short circuits or malfunctions.
  If the screws are tightened excessively, it may damage the screws and cause short circuits.
- To mount the module, securely insert the module fastening latch at the lower part of the module into the installation hole on the base unit, and tighten the module fixing screws with the specified torque.
  If the module is not mounted properly and fixed with the screws, it may cause the module to malfunction, fail or fall off.
  If the screws are tightened excessively, it may damage the screws and the module, and cause the module to fall off, short-circuit or malfunction.
- Connect the extension cables securely to the connectors of the base unit and the module. After connecting, make sure to check that the cables are not loose.
  If the cables are loose, the poor cable connections may cause erroneous inputs and/or outputs.
- Do not directly touch the conducting parts and electronic parts of the module.
  This may cause the module to malfunction or fail.
- Before handling the CPU board, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunction of the CPU board.

[WIRING PRECAUTIONS]

⚠ DANGER

- Before starting any installation or wiring work, make sure to shut off all phases of the external power supply to the entire system.
  Failure to completely shut off the power supply to the system may result in electric shocks as well as damage or malfunction of the product.
- Before turning on the power or operating the module after installation or wiring work, make sure to install the attached terminal covers to the product.
  Failure to install the terminal covers may result in electric shocks.

[WIRING PRECAUTIONS]

⚠ CAUTION

- Mount the CPU board in a panel mount type IBM PC/AT compatible PC with either an FG or LG terminal.
- Install the CPU board mounted IBM PC/AT compatible PC inside the same control panel as the programmable controller, and make sure to ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller.
  Poor grounding conditions may cause malfunctions due to noise.
- Be careful not to let any foreign matter such as chips and wire burrs get inside the IBM PC/AT compatible PC.
  They may cause fires, as well as breakdowns and malfunctions of the PC.
- Wire correctly to the module upon checking the rated voltage and terminal layout of the product.
  Connecting a power supply having a different rated voltage or incorrect wiring may cause fires or breakdowns.
- Tighten the terminal screws using the specified torque.
  If the terminal screws are loose, it may cause the module to short-circuit, malfunction or fall off.
  If the terminal screws are tightened excessively, it may damage the screws and the module, resulting in short circuits or malfunctions.
- Be careful not to let any foreign matter such as chips and wire burrs get inside the module.
  They may cause fires, as well as breakdowns and malfunctions of the module.
- Make sure to place the communication and power cables to be connected to the CPU board in a duct or fasten them using a cable clamp.
  If the cables are not placed in a duct or fastened with a cable clamp, their positions may become unstable or moved, and they may be pulled inadvertently. This may damage the CPU board and the cables or result in malfunctions because of poor cable contact.
- When disconnecting the communication and power cables from the CPU board, do not pull the cables by hand.
  Loosen the screws in the area connected to the CPU board and then remove the cable.
  If cables are pulled while being connected to the CPU board, it may damage the CPU board or the cables, or result in malfunctions because of poor cable contact.
- Do not connect outputs from multiple power supply modules in parallel.
  This may heat up the power supply modules and may cause fires or breakdowns.
- Perform crimp-contact, pressure-displacement or soldering to properly wire the connectors for external connections using the designated tool.
  For more information about the tools required for crimp-contact or pressure-displacement, refer to the user's manual of the corresponding I/O module.
  If the connection is incomplete, it may cause the module to short-circuit, catch fire or malfunction.

[STARTING AND MAINTENANCE PRECAUTIONS]

⚠ DANGER

- Do not touch the terminals while the power is on.
  Doing so may cause electric shocks or malfunctions.
- Before cleaning the module or re-tightening the terminal screws, make sure to shut off all phases of the external power supply.
  Failure to do so may cause the CPU board to breakdown or malfunction.
  If the screws are loose, it may cause the module to short-circuit, malfunction or fall off.
  If the screws are tightened excessively, it may damage the screws and the CPU board, and cause the CPU board to fall off, short-circuit or malfunction.
- Be sure to connect the battery correctly. Do not charge, disassemble, heat up, short-circuit or solder batteries, or subject them to open fire.
  Improper handling of batteries may cause injuries or fires due to heat generation, explosion and ignition.

⚠ CAUTION

- Never disassemble or modify the CPU board.
  This may cause breakdowns, malfunctions, injuries or fire.
- Before mounting or dismounting the CPU board to/from the IBM PC/AT compatible PC, make sure to shut off all phases of the external power supply.
  Failure to do so may cause the CPU board to breakdown or malfunction.
- Please read this manual thoroughly and confirm the safety before starting online operations (especially, program modifications, forced outputs and operating status modifications).
  Performing incorrect online operations may damage the machinery or result in accidents.
- Never disassemble or modify any of the modules.
  This may cause breakdowns, malfunctions, injuries or fires.
- Before mounting or dismounting the module, make sure to shut off all phases of the external power supply.
  Failure to do so may cause the module to breakdown or malfunction.
- Do not drop or give an impact to the battery installed in the module.
  Otherwise the battery will be broken, possibly causing internal leakage of electrolyte.
  Do not use but dispose of the battery if it has fallen or an impact is given to it.
- Before handling the CPU board, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunction of the CPU board.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- When disposing of this product, treat it as industrial waste.
  When disposing of batteries, separate them from other wastes according to the local regulations. (For details of the Battery Directive in EU countries, refer to Appendix 4.)

REVISIONS

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

Print Date	* Manual Number	Revision
Dec., 2000	IB (NA)-0800174-A	First edition
May, 2004	IB (NA)-0800174-B	Correction SAFETY PRECAUTIONS, Operating Instructions, CONTENTS, Subsection 4.5.1 Addition Operating Instructions, Section 6.1, Section 9.3, Section 11.4, Section 12.2, Subsection 13.13.1, Subsection 13.13.3
Oct., 2004	IB (NA)-0800174-C	Correction Section 5.4, Subsection 6.3.2, Section 6.5, Appendix 3.2
Nov., 2005	IB (NA)-0800174-D	Correction Operating Instructions, Subsection 4.5.1, Subsection 8.1.1, Subsection 8.1.2, Section 8.3, Chapter 9, Section 13.2
Sep., 2008	IB (NA)-0800174-E	Addition SAFETY PRECAUTIONS, Subsection 7.1.1, Appendix 4

Japanese Manual Version IB-0800171-E

(1) When Microsoft® Windows® 2000 Professional Operating System or Microsoft® Windows NT® Workstation Operating System Version 4.0 is used

When Windows 2000 or Windows NT is used, its installation and operation are allowed only with the Administrator privilege.

(2) Caution when Windows® 2000 is used

When Windows® 2000 is used, only Microsoft® Visual Basic® 6.0 and Microsoft® Visual C++® 6.0 can be used as the programming languages.

Neither Microsoft® Visual Basic® 5.0 nor Microsoft® Visual C++® 5.0 can be used.

(3) Multi-processor-compatible personal computers

The communications driver is not compatible with a multi-processor compatible personal computer, so such a computer cannot be used.

(4) Compatibility with Hyper-Threading technology

Hyper-Threading technology is unavailable as the driver does not support it.

Disable the Hyper-Threading technology on the BIOS setting screen of PC and then reinstall the operating system.
(For BIOS setting screen, read the manual of the PC used or confirm with the PC manufacturer.)

(5) Multi-thread communication

Multi-thread communication is not supported.

(6) Installation

Uninstall SW0DNF-ANU-B first, then install SW1DNF-ANU-B.

Since all the data set by each utility will be erased, it is necessary to set them again.

(7) Start menu

After utility software is uninstalled, the program name may still be displayed in the Start menu.

In this case, restart the IBM PC/AT compatible PC.

(8) I/O assignments

The I/O assignments of X/Y0 to BF are fixed.

Any I/O assignments other than these will cause an error.

(9) Installation environment

Make sure to install a CPU board mounted IBM PC/AT compatible PC in the control box together with the extension base.

Failure to do so may cause malfunction due to noise, etc.

(10) Extension base and power supply module

For more information about the extension base and the power supply module, see applicable CPU user's manuals.

(11) Differences between the CPU board and the A2USHCPU-S1

The following is the list of differences between the CPU board and the A2USHCPU-S1:

- Basic base unit
- Power supply module
- Memory size
- Memory protect
- Switches
- Status display
- Programming
- Number of I/O points
- I/O assignments
- CC-Link instruction

For more details, see Section 1.2, "Comparison Between the CPU Board and the A2USHCPU-S1."

(12) Batteries

The power supplied to the IBM PC/AT compatible PC and the extension base unit should be turned on/off at the same time.

The batteries are consumed quickly if the power to the extension base unit is kept on after turning off the power to the IBM PC/AT compatible PC.

(13) About the IBM PC/AT compatible PC to be used.

(a) An IBM PC/AT compatible PCs with an SIS5581/5582 chip set manufactured by SIS may not restart after stopping Windows NT 4.0 without normal shutdown procedures. If this happens, turn off the power to the IBM PC/AT compatible PC and the external power supply and then turn it back on to restart the computer.

(b) This board is incompatible with personal computers that detect the PCI bus data parity errors.
For use of such a PC, set the PCI bus data parity error detection function to OFF. Or, use a PC that does not have the function.
For whether the parity error detection function is provided or not and how to set it off, please contact the PC manufacturer.

INTRODUCTION

Thank you for purchasing the Type A80BDE-A2USH-S1 programmable controller CPU board.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Type A80BDE-A2USH-S1 programmable controller CPU board you have purchased, so as to ensure correct use.
Please forward a copy of this manual to the end user.

CONTENTS

About Manuals

The following manuals are available for this product.

Please order the desired manuals using the chart below.

Related Manuals

Manual name	Manual number (Model code)
I/O Module Type Building Block User's Manual This manual explains the specifications of the building block type I/O module.	IB-66140 (13J643)
AnS Module Type I/O User's Manual This manual explains the specifications of the small-size building block type I/O module.	IB-66541 (13JE81)
Type A1SJH (S8)/A1SH/A2SHCPU (S1) User's Manual This manual explains items concerning the performance, functions and handling of A1SJH (S8), A1SH and A2SHCPU (S1), as well as the specifications and handling of the power supply module, memory cassettes and base unit.	IB-66779 (13JL22)
Type A2USHCPU-S1 User's Manual This manual explains items concerning the performance, functions and handling of A2USHCPU-S1, as well as the specifications and handling of the power supply module, memory cassettes and base unit.	IB-66789 (13JL30)
Type A1N/A2N (S1)/A3NCPU User's Manual This manual explains items concerning the performance, functions and handling of A1N/A2N (S1) and A3NCPU, as well as the specifications and handling of the power supply module, memory cassettes and base unit.	IB-66543 (13JE83)
Type A2A (S1)/A3ACPU User's Manual This manual explains items concerning the performance, functions and handling of A2A (S1) and A3ACPU, as well as the specifications and handling of the power supply module, memory cassettes and base unit.	IB-66544 (13JE84)
Type A2U (S1)/A3U/A4UCPU User's Manual This manual explains items concerning the performance, functions and handling of A2U (S1), A3U and A4UCPU, as well as the specifications and handling of the power supply module, memory cassettes and base unit.	IB-66436 (13JE25)
Q2A (S1)/Q3A/Q4ACPU User's Manual This manual explains items concerning the performance, functions and handling of Q2A (S1), Q3A and Q4ACPU, as well as the specifications and handling of the power supply module, memory card and base unit.	IB-66608 (13J821)
Q2AS (H) CPU (S1) User's Manual This manual explains items concerning the performance, functions and handling of Q2AS (H) CPU (S1), as well as the specifications and handling of the power supply module, memory card and base unit.	SH-3599 (13J858)

How to Use this Manual

"How to Use This Manual" is described by purposes of using the CPU board.

See the following and use this manual.

(1) To learn about the features of the CPU board (Section 1.1)

The features are described in Section 1.1.

(2) To learn about the installation environment of the IBM PC/AT compatible PC (Chapter 3)

The installation of the IBM PC/AT compatible PC is described in Chapter 3.

(3) To learn about the system configuration (Sections 4.1 and 4.2)

The configuration of a system using the CPU board is described in Sections 4.1 and 4.2.

(4) To learn about the concept of I/O assignments

The concept of I/O assignments of the CPU board is described in Section 4.4.

(5) To learn about the operating environment for the CPU board (Section 4.5)

The operating environment for the CPU board is described in Section 4.5.

(6) When installing or uninstalling utility software (Chapter 8)

How to install and uninstall utility software is described in Chapter 8.

(7) To learn about utility software operating procedures (Chapter 9)

The utility software operating procedures are described in Chapter 9.

(8) To learn about accessible devices and ranges (Chapter 10)

The device specifications and the contents of the information stored in the system area are described in Chapter 10.

(9) To learn about how to use the functions (Chapter 11)

How to use the functions is described in Chapter 11.

(10) To learn about error contents (Chapter 12)

The contents of errors are described in Chapter 12.

(11) To learn about the actions to take when the system does not operate (Chapter 13)

The troubleshooting procedures are described in Chapter 13.

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About the Generic Terms and Abbreviations

This manual uses the following generic terms and abbreviations to describe the Type A80BDE-A2USH-S1 programmable controller CPU board, unless otherwise specified.

Generic term/abbreviation		Description of generic term/abbreviation
CPU board		Abbreviation for the Type A80BDE-A2USH-S1 programmable controller CPU board
RS-422/external power supply connecting bracket		Metal fixture for connecting the RS-422 and the external power supply
Windows® 2000		Abbreviation for Microsoft® Windows® 2000 Professional Operating System (English version)
Windows NT®		Abbreviation for Microsoft® Windows NT® Workstation Operating system Version4.0 (English version)
IBM PC/AT compatible PC		Panel mount type IBM PC/AT and compatible personal computers and panel computers (IBM-PC/AT compatible PC without an FG or LG terminal cannot be used.)
GX Developer		Generic product names for SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, SWnD5C-GPPW-EVA
AnNCPU		Generic term for A0J2HCPU, A1SCPU, A1SCPU-S1, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, A1SJHCPU, A1SJHCPU-S8, A1NCPU, A2CCPU, A2CCPUC24, A2CCPUC24-PRF, A2CJCPU, A2CJCPU-S3, A2NCPU, A2NCPU-S1, A2SCPU, A2SCPU-S1, A2SHCPU, A2SHCPU-S1, A3NCPU, and A1FXCPU
AnACPU		Generic term for A2ACPU, A2ACPU-S1, A2ACPUP21/R21, A2ACPUP21/R21-S1, A3ACPUP21/R21, and A3ACPU
AnUCPU		Generic term for A2UCPU, A2UCPU-S1, A2ASCPU-S1, A2ASCPU-S30, A2USHCPU-S1, A3UCPU, and A4UCPU
QnACPU		Generic term for Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU, and Q4ARCPU
ACPU		Generic term for AnNCPU, AnACPU, and AnUCPU
QCPU	A mode	Generic term for Q02CPU-A, Q02HCPU-A and Q06HCPU-A
QCPU	Q mode	Generic term for Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU and Q25HCPU

Product Components

The components of the CPU board are listed below.

Item name	Quantity
Type A80BDE-A2USH-S1 PLC CPU board	1
Type SW1DNF-ANU-B PLC CPU board utility software package	1 (Floppy disks; set of 4)
Type A80BDE-A2USH-S1 PLC CPU Board User's Manual (this manual)	1
Battery for memory backup (A6BAT)	1
RS-422/External power supply connecting bracket	1
Software use agreement	1

1 OVERVIEW

This manual explains the specifications and handling of the Type A80BDE-A2USH-S1 programmable controller CPU board (called the CPU board hereafter) which is mounted on the PCI bus as an optional board for an IBM PC/AT compatible PC (the supported operating systems are Microsoft® Windows ® 2000 Professional Operating System and Microsoft® Windows NT® Operating System Version 4.0). This CPU board enables the IBM PC/AT compatible PC to have programmable controller CPU functionality and enhances the compatibility with the IBM PC/AT compatible PC.

1.1 Features

The following lists the features of the CPU board:

(1) Programmable controller CPU functions equivalent to the A2USHCPU-S1
The CPU board has functions equivalent to the compact programmable controller, A2USHCPU-S1.

(2) Using a PCI bus eliminates troublesome switch settings.
Simply installing the CPU board on the PCI bus automatically executes the initial settings.

(3) Extension base units can be connected with extension cables.
Up to three extension base units can be connected as both the AnS series and A series extension base units.

(4) Most of the I/O modules and special modules can be used
Most of the modules for the AnS series and A series programmable controllers can be used:
- I/O modules
- Analog modules
- Positioning modules, etc.

(5) Buffer memory
The CPU board has 4 k bytes of buffer memory that can be used to communicate data with the programmable controller.
Data can be communicated while interlocking with the programmable controller.

(6) The programmable controller can be accessed from user's application programs.
By using Microsoft® Visual Basic® and Microsoft® Visual C++® , user's application programs for performing remote control of the programmable controller as well as reading from and writing to devices can easily be created.

(7) High-speed communication taking advantage of the bus connection is possible.
Reading 1 point (2 bytes) from the CPU word device can be completed as little as in 0.6 ms. Communication is performed approximately 70 times faster than the computer link's 9600 bps connection.

(8) System down is prevented by external power supply.
By supplying external power to the external power supply terminal, unexpected system down due to power-off of the IBM PC/AT compatible PC can be prevented.

(9) Access through GX Developer and the PCI buss is possible.
Use GX Developer (product after SW3D5C-GPPW-E/SW3D5F-GPPW-E) and direct access to the CPU board can be made through the PCI buss.
This will speed up operations such as monitor operations and uploading and downloading the sequence program.

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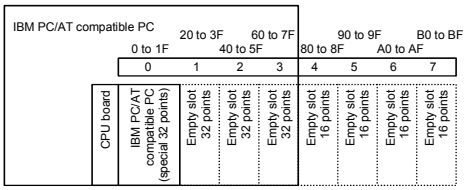
(10) The MELSEC communication support tools can be used.

Monitor application programs can be created using SWnD5F-CSKP-E, SWnD5F-OLEX-E or SWnD5F-XMOP-E, and data can be read or written using Excel spreadsheets.
Use Version SW2 or later when using CSKP, OLEX or XMOP.

1.2 Comparison Between the CPU Board and the A2USHCPU-S1

The following table lists the differences between the CPU board and the A2USHCPU-S1:

Item \ Model name	CPU board (PCI bus corresponding board type)	A2USHCPU-S1 (Building block type)
Basic base unit	Occupied by PCI bus slot on the IBM PC/AT compatible PC	Available (Up to 8 slots can be used)
Extension power supply module	Required	Required (depending on the condition)
Memory size	Fixed to 448 k bytes	Fixed to 256 k bytes
Memory protect	Set in utility software	• Set with the memory protect switch on the A2USHCPU-S1 main module • Can be set with DIP switches of the memory cassette
Switches	• Set in utility software • Reset switch on the printed circuit board	RUN/STOP/RESET/LATCH CLEAR switches
Status display	• IBM PC/AT compatible PC screen • LEDs on the printed circuit board	LED
Programming	Loaded from the GX Developer of the installed IBM PC/AT compatible PC or the GPP Software Package of a peripheral device via RS-422.	Loaded from a peripheral device connected via the RS-422 on the front of the main module.
Number of I/O points	Maximum of 512 points (192 points = X/Y00 to BF are occupied by the system) The I/O numbers that can be used by the user are X/YC0 to 2BF.	Maximum of 1024 points (X/Y00 to 3FF)
I/O assignments	• The I/O assignments of X/Y0 to BF are fixed (cannot be used by the user).  • The I/O assignments of the extension base unit can be set. • Any I/O assignments other than the above will cause an error.	Depends on the configuration of the module to be mounted. (I/O assignments allowed)
CC-Link dedicated instruction	Not available	Available (8 types)

1.3 Combinations of Boards with Existing Software

This section describes the combinations of boards with existing software.
If the operating system (OS) is Windows® 2000, only the CPU board (SW1DNF-AUN-B or later), MELSECNET/H board or CC-Link board (SW4DNF-CCLINK-B or later) can be used (as of December, 2000).

(1) When using the CPU board and other interface boards in the same PC

Board model name	Software package name	Supported OS					
		DOS	NT 3.51	Win 95	Win 98	NT 4.0	Win 2000
Q80BD-J71LP21-25 Q80BD-J71BR11	SW0DNC-MNETH-B	×	×	○	○	○	○
A70BDE-J71QLP23 A70BDE-J71QLP23GE A70BDE-J71QBR13	SW0IVDWT-MNET10P	○	○	×	×	×	×
	SW1IVDWT-MNET10P	○	○	○	×	○ ＊1	×
	SW2DNF-MNET10	○	×	○	○	○	×
	SW3DNF-MNET10	○	×	○	○	○	×
A70BDE-J71QLR23	SW3DNF-MNET10	○	×	○	○	○	×
A80BDE-J61BT13	SW0DNF-CCLINK	×	×	×	×	○ ＊2	×
	SW1DNF-CCLINK	×	×	○	×	○ ＊2	×
	SW2DNF-CCLINK	×	×	○	○	○	×
	SW3DNF-CCLINK	×	×	○	○	○	×
	SW4DNF-CCLINK-B	×	×	○	○	○	○
A80BDE-J61BT11	SW3DNF-CCLINK	×	×	○	○	○	×
	SW4DNF- CCLINK	×	×	○	○	○	○

DOS : MS-DOS 6.2 NT 3.51 : Windows NT® Workstation 3.51 Win 95 : Windows® 95 Win 98 : Windows® 98
NT 4.0 : Windows NT® Workstation 4.0 Win 2000 : Windows® 2000 Professional
○ : Can be operated simultaneously. × : Cannot be operated simultaneously. — : No combination available

indicates an OS that is not supported by the CPU board. It cannot be used on the same PC.

＊1 : The user program EXE file that was generated using MDFUNC32.LIB must be re-linked using the MDFUNC32.LIB that comes with SW1DNF-ANU-B.
＊2 : Update the version of each software if it is used with the CPU board on the same PC.
For details on version update products, contact your nearest Mitsubishi dealer.

(2) When using the CPU board, Communication Support Software Tool and GX Developer in the same PC

Software name	Software package name	Supported OS					
		DOS	NT 3.51	Win 95	Win 98	NT 4.0	Win 2000
Communication Support Software Tool	SW1D5F-CSKP-E	×	×	○	○	△ ∗2	×
	SW2D5F-CSKP-E	×	×	○	○	○	×
	SW2D5F-OLEX-E	×	×	○	○	○	×
	SW2D5F-XMOP-E	×	×	○	○	○	×
	SW3D5F-CSKP-E	×	×	○	○	○	×
	SW3D5F-OLEX-E	×	×	○	○	○	×
	SW3D5F-XMOP-E	×	×	○	○	○	×
	SW0D5C-ACT-E	×	×	○	○	△	×
GX Developer	SW2D5F-GPPW-E/ SW2D5C-GPPW-E	×	×	○	○ ∗1	○ ∗3	×
	SW3D5F-GPPW-E/ SW3D5C-GPPW-E	×	×	○	○	○	×
	SW4D5C-GPPW-E	×	×	○	○	○	×
	SW5D5C-GPPW-E	×	×	○	○	○	×
	SW6D5C-GPPW-E	×	×	○	○	○	×

DOS : MS-DOS 6.2 NT 3.51 : Windows NT® Workstation 3.51 Win 95 : Windows® 95 Win 98 : Windows® 98
NT 4.0 : Windows NT® Workstation 4.0 Win 2000 : Windows® 2000 Professional
○ : Can be operated simultaneously. × : Cannot be operated simultaneously. — : No combination available
△ : Cannot access the CC-Link board, and cannot access other stations via the CPU board.

indicates an OS that is not supported by the CPU board. It cannot be used on the same PC.

∗1 : Supports Windows® 98 from Version 30D or later.
∗2 : Update the version of each software if it is used with the CPU board on the same PC.
For details on version update products, contact your nearest Mitsubishi dealer.
∗3 : Other stations cannot be accessed via the CPU board, and programs cannot be written/read directly to/from the CPU board.
For details on writing/reading the programs to/from the CPU board, see Section 6.6, "Writing/Reading the Programs to/from the CPU Board."

2 EMC DIRECTIVE AND LOW VOLTAGE DIRECTIVE

2.1 Requirements for Compliance to the EMC Directive

The EMC directive, which is one of the European Union directives, is now being enforced. The EMC directive regulates "emission (electromagnetic interference) requiring that devices must not emit strong electromagnetic waves externally," and "immunity (electromagnetic sensitivity) requiring that devices must have the ability to resist external electromagnetic waves."
Sections 2.1.1 through 2.1.6 describe the precautionary items when configuring a machine device incorporating a CPU board in order to conform to the EMC directive. Although we have documented the following based on the requirements and regulations of the EMC directive we have obtained, it does not guarantee the compliance of any of the machine devices that are manufactured based on the description of this material to the EMC directive. The method and final judgment of the compliance of such machine devices to the EMC directive must be determined by individual manufacturers of the machine devices.

2.1.1 EMC directive

The following table lists the regulations related to the EMC directive.
All the test items have been tested while they are mounted on a CE mark conforming IBM PC/AT compatible PC.

Specifications	Test item	Description of test	Standard values
EN50081-2: 1995	EN55011 Radiating noise	Measure electric waves discharged by the product.	30 M to 230 MHz QP: 30 dB μ V/m (30 m (98.43 ft.) measurement) ∗1 230 M to 1000 MHz QP: 37 dB μ V/m (30 m (98.43 ft.) measurement)
	EN55011 Conductive noise	Measure noise discharged by the product to the power line.	150 k to 500 kHz QP: 79 dB, Mean: 66 dB ∗1 500 k to 30 MHz QP: 73 dB, Mean: 60 dB
prEN50082-2: 1991	IEC801-2 Static electricity immunity	Test immunity by applying static electricity to the chassis of the device.	4 kV contact discharge 8 kV aerial discharge
	IEC801-3 Discharged electromagnetic field	Test immunity by discharging an electric field to the product.	10 V/m, 27 to 500 MHz
	IEC801-4 First transient burst noise	Test immunity by applying burst noise to the power line and signal lines.	2 kV
EN50082-2: 1995	EN61000-4-2 Static electricity immunity	Test immunity by applying static electricity to the chassis of the device.	4 kV contact discharge 8 kV aerial discharge
	EN61000-4-4 First transient burst noise	Test immunity by applying burst noise to the power line and signal lines.	2 kV
	ENV50140 Discharged electromagnetic field AM modulation	Test immunity by discharging an electric field to the product.	10 V/m, 80 to 1000 MHz, 80 % AM modulation @1 kHz
	ENV50204 Discharged electromagnetic field Pulse modulation	Test immunity by discharging an electric field to the product.	10 V/m, 900 MHz, pulse modulation 200 Hz, 50% duty
	ENV50141 Conductive noise	Test immunity by inducing an electromagnetic field to the power line and signal lines.	10 Vrms, 0.15 to 80 MHz, 80 % modulation @1 kHz

∗1: QP (Quasi-Peak): Quasi-peak value, Mean: Mean value

2.1.2 Installing the devices in the control box

By installing the devices in the control box, safety can be secured and the noise generated by the IBM PC/AT compatible PC can be isolated inside the control box.

(1) Control box

(a) Use an electrically conductive control box.

(b) When fixing the top and bottom panels of the control box with bolts, mask the coating to provide for surface contact.

(c) To ensure the electric contact between the inside panels of the control box and the control box main body, mask the coating around the installation bolts connecting the inside panels to the control box main body to secure conductivity in the largest surface area possible.

(d) Ground the control box main body using a thick grounding cable so that a low impedance can be secured even at a high frequency.

(e) Make the holes on the control box panels smaller than 10 cm (3.94 in.) in diameter. Electric waves may leak through holes larger than 10 cm (3.94 in.) in diameter.

(2) Layout of the power cable and the grounding cable

The power cable and grounding cable of the IBM PC/AT compatible PC should be laid out as described below:

(a) Allocate a grounding point near the power supply to the IBM PC/AT compatible PC that enables grounding to the control box, and ground the frame ground (FG) terminal of the IBM PC/AT compatible PC using the thickest and shortest cable possible (about 30 cm (11.81 in.) or less in length). Since the FG terminal takes care of grounding the noise generated in the IBM PC/AT compatible PC, it is necessary to ensure the lowest possible impedance. Because the FG terminal is used to allow the noise to escape, its cable actually conducts a great amount of noise. Therefore, the shortest possible cable length should be used to prevent the cable from acting like an antenna.

Note: A long conductive material can become an antenna that emits more effective noise.

(b) Twist the grounding cable coming from the ground point with the power cable. By twisting with the grounding cable, the noise leaking out of the power cable may escape to a wider ground area. However, if a noise filter is attached to the power cable, twisting it with the grounding cable may not be necessary.

2.1.3 Cables

Because the cables that come out of the control box contain high frequency noise components, they act as antenna and radiates noise outside the control box. Thus, always use shielded cables that come out of the control box.
Except for certain models, use of a ferrite core is not required. However, the noise radiated via the cable can be suppressed more effectively if a ferrite core is used.
In addition, using shielded cables is also effective in increasing noise resistance. The signal lines used for the programmable controller inputs/outputs and special modules are designed to ensure a noise resistance level of 2 kV (IEC801-4/EN61000-4-4) if shielded cables are used. If shielded cables are not used, or if shielded cables are used but they are not grounded properly, the noise resistance will drop below 2 kV.

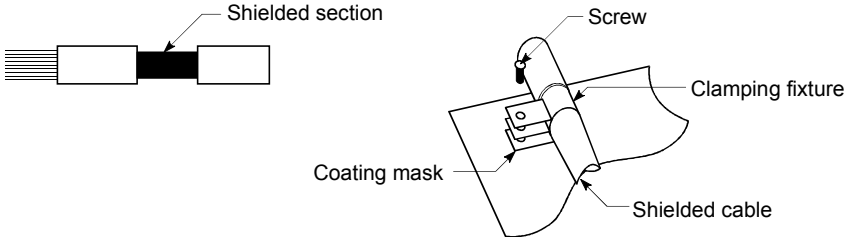
Note: The EN50082-2 specifies the noise resistance of signal lines based on their applications as follows:
Signals related to process control : 2 kV
Signals not related to process control: 1 kV

In the EN50082-2, the meaning of "(signals) related to process control" is not defined. However, considering the original intent of the EMC directive, signal lines that pose possible danger to human bodies or equipment if incorrectly operated can be defined as the "signals related to process control," and thus high noise resistance is required.

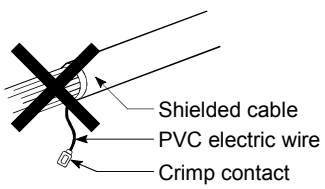
(1) Grounding the shield cables

(a) Perform the shielding processing on a cable to be wired at a location near the exit of the control box. If the grounding point is far from the exit, the portion of the cable after the grounding point will cause electromagnetic induction again and generate high frequency noise.

(b) Shield the cable in such a way that allows the shielded cable to be grounded to a large area of the control box. A clamping fixture as shown below may also be used. When such a fixture is used, however, mask the coating on the inner wall area of the control box where the fixture makes contact.

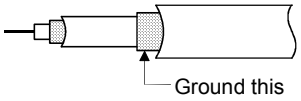


Note: Using the grounding method shown below that solders a PVC electric wire to the shielded section of the shielded cable and then ground at that end will increase frequency impedance; as a result, the effectiveness of the shield will be lost.



(2) MELSECNET (II) and MELSECNET/10 modules

(a) Always use a double-shielded coaxial cable (Mitsubishi Cable: 5C-2V-CCY) for the MELSECNET modules that use coaxial cables such as the A1SJ71AR21 and A1SJ71BR11. By using a double-shielded coaxial cable, noise emitted in a band of 30 MHz or more can be suppressed. Make sure to ground the outer shield. For other precautionary items, see item "(1) Grounding the shielded cables" above.

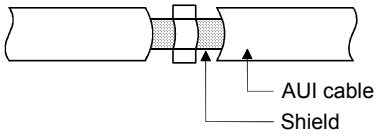


(b) Always install a ferrite core on the double-shielded coaxial cable connected to the MELSECNET module. The ferrite core should be installed on the cable near the exit of the control box. Use of the ZCAT3035 ferrite core manufactured by TDK is recommended.

(3) Ethernet module

The following are precautions that should be observed when using the AUI cable and coaxial cable.

(a) Make sure to ground the AUI cable connected to the 10BASE5 of the A1SJ71E71-B5 and AJ71E71 as well. Since the AUI cable is a shielded cable, remove part of the outer sheath, and then ground the exposed shielded section shown in the figure below using as wide a surface area as possible.



(b) Make sure to use a double-shielded cable for the coaxial cable connected to the 10BASE2 of the A1SJ71E71-B2 and AJ71E71. The precautions in grounding the double-shielded cable is the same as for the MELSECNET module.

(c) For the A1SJ71E71-B2/B5 and AJ71E71, in addition to following the instructions in the items (a) and (b) above, make sure to install a ferrite core for these modules. Use of the ZCAT3035 ferrite core manufactured by TDK is recommended.

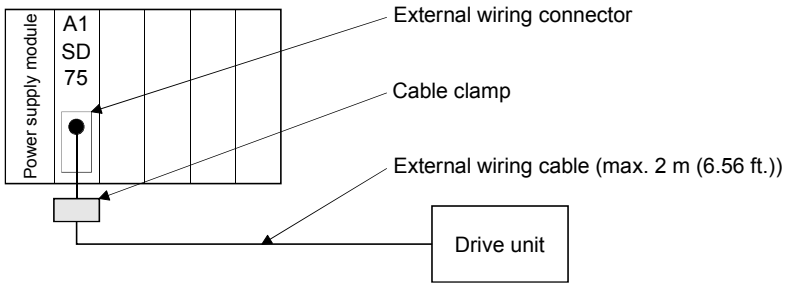
Ethernet is a registered trademark of Xerox Corporation.

(4) Positioning module

The following points out some precautions that should be observed when configuring machine devices using the A1SD75P□-S3 and AD75P□-S3 in order to conform to the EMC directive.

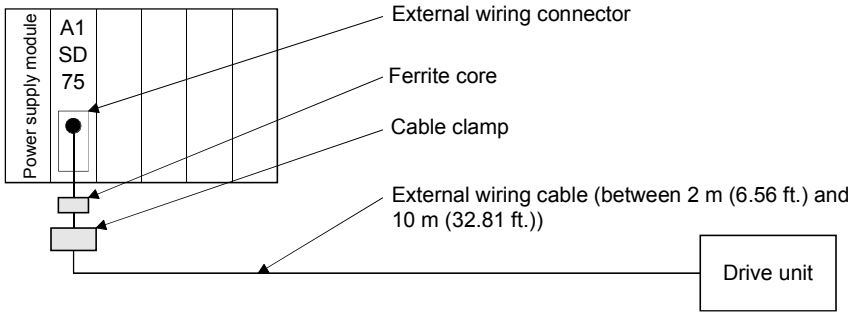
(a) When wiring with a cable of 2 m (6.56 ft.) or smaller

- Ground the shielded section of the external wiring cable with a cable clamp.
  (Ground the shielded section at a location closest to the external wiring connector of the A1SD75 and AD75.)
- Wire the external wiring cable with the drive unit and external devices so that the cable distance can be as short as possible.
- Ground the drive unit in the same control box.



(b) When wiring with a cable of between 2 m (6.56 ft.) and 10 m (32.81 ft.)

- Ground the shielded section of the external wiring cable with a cable clamp.
  (Ground the shielded section at a location closest to the external wiring connector of the A1SD75 and AD75.)
- Install a ferrite core.
- Wire the external wiring cable with the drive unit and external devices so that the cable distance can be as short as possible.

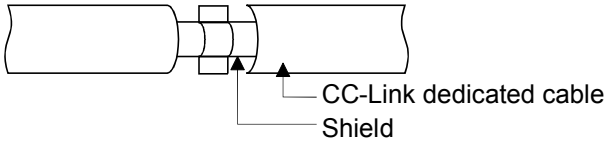


(c) Model name and required quantity of ferrite cores and cable clamps
- Cable clamp
  Model name: AD75CK (manufactured by Mitsubishi Electric Corporation)
- Ferrite core
  Model name: ZCAT3035-1330 (ferrite core manufactured by TDK Corporation)
- Required quantity

Cable length	Required product	Required quantity		
		Single-axis	Double-axis	Triple-axis
2 m (6.56 ft.) or shorter	AD75CK	1	1	1
Between 2 m (6.56 ft.) and 10 m (32.81 ft.)	AD75CK	1	1	1
	ZCAT3035-1330	1	2	3

(5) CC-Link Module

(a) Be sure to ground the cable shield that is connected to the CC-Link module close to the exit of control panel or to any of the CC-Link stations within 30 cm (11.8 in.) from the module or stations.
The CC-Link dedicated cable is a shielded cable. As shown in the illustration below, remove a portion of the outer covering and ground as large a surface area of the exposed shield part as possible.

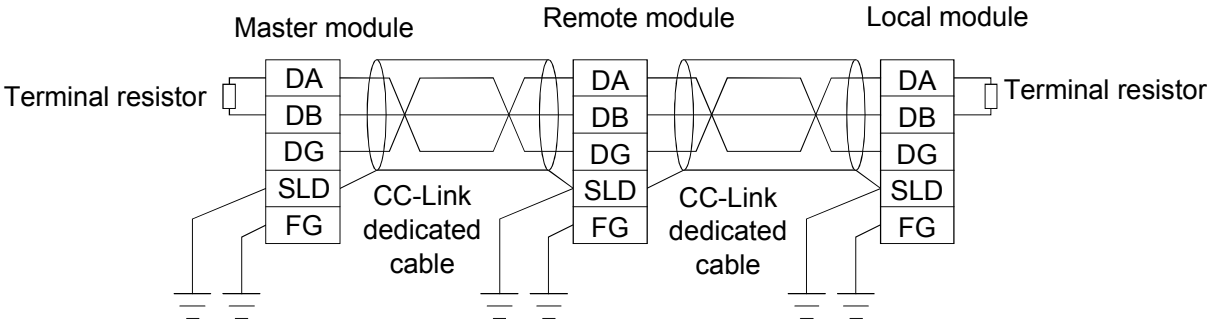


(b) Always use the specified CC-Link dedicated cable.

(c) Do not use a ferrite core for the CC-Link module or CC-Link stations.

(d) The CC-Link module, the CC-Link stations and the FG line inside the control panel should be connected at both the FG terminal and the SLD terminal as shown in the diagram below.

[Simplified diagram]



(6) I/O signal cables and other communication cables

For I/O signal cables and other communication cables (RS232C, RS422, etc.) that come out of the control box, make sure to ground the shielded sections of the cables in the same way as described in item (1) above.

2.1.4 Power supply module

The following table shows the precautions that are applicable to each of the power supply modules. Make sure to observe these precautionary items.

Model name	Precaution
A1S61P, A1S62P	Not used
A1S63P ＊1	Use 24 V DC panel mount power supply modules that conform to the CE standard.
A1S61PEU, A1S62PEU A1S61PN, A1S62PN	None

＊1: For the A1S63P, Version (F) or later, installation of a filter to the power cable is not required. However, make sure to use 24 V DC panel mount power supply modules that conform to the CE standard.

2.1.5 Ferrite core

A ferrite core is effective in reducing noise emitted in a band of 30 MHz to 100 MHz. Except for certain models, the installation of a ferrite core on the cable is not required. However, the installation of a ferrite core is recommended when the shielding effect of the shielded cables coming out of the control box is insufficient. The ZCAT3035 ferrite core manufactured by TDK was used in the tests conducted by Mitsubishi Electric. Install a ferrite core immediately before a cable is taken out of the control box. If the ferrite core is not properly installed, its effect may be lost.

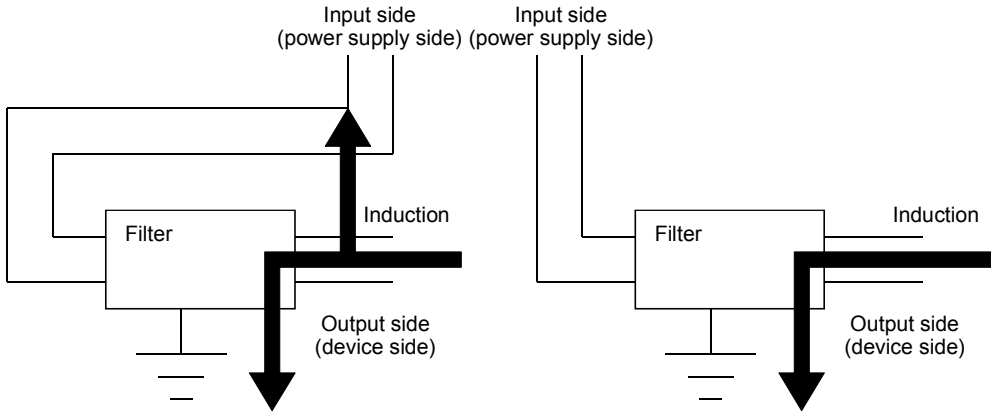
2.1.6 Noise filter (power supply line filter)

A noise filter is a part that gives a considerable effect in preventing conductive noise. Except for certain models, the installation of a noise filter to the power supply line is not required. However, a noise filter can suppress noise effectively if installed (a noise filter is effective for reducing conductive noise emitted in a band below 10 MHz). Use a noise filter (double π type filter) equivalent to the models shown below.

Model name	FN343-3/01	FN660-6/06	ZHC2203-11
Manufacturer	SCAFFNER	SCHAFFNER	TDK
Rated current	3 A	6 A	3 A
Rated voltage	250 V		

The following are precautions when installing a noise filter:

(1) Do not bundle the wires at the input and output sides of the noise filter. If they are bundled together, noise on the output side that has been removed by the filter will be inducted to the input side wire.



(a) Noise is inducted if the input wire and output wire are bundled together.

(b) Lay the cables in such a way that the input wire and output wire are kept apart.

(2) Ground the grounding terminal of the noise filter to the control box using as short a cable as possible (about 10 cm (3.94 in.)).

2.2 Requirements for Compliance to the Low Voltage Directive

The Low Voltage directive, which is one of the European Union directives, is now being enforced.
The Low Voltage directive requires devices operating with a power supply ranging from 50 to 1000 V AC and 75 to 1500 V DC to ensure certain safety requirements.
Sections 2.2.1 through 2.2.7 describe the precautionary items on the installation and wiring of the MELSEC Series programmable controllers in order to conform to the Low Voltage directive.
Although we have documented the following based on the requirements and regulations of the Low Voltage directive we have obtained, it does not guarantee the compliance of any of the machine devices that are manufactured based on the description of this material to the Low Voltage directive. The method and final judgment of the compliance of such machine devices to the Low Voltage directive must be determined by individual manufacturers of the machine devices.

2.2.1 Standard applicable to the MELSEC-A

The standard applicable to the MELSEC-A: EN61010-1, Safety of Devices Used in Measuring Rooms, Control Rooms or Laboratories

For the modules that operate with a rated voltage of 50 V AC/75 V DC or more, new models that conform to the above standard have been developed.
For the modules that operate with a rated voltage under 50 V AC/75 V DC, the conventional models can be used because they are not subject to the Low Voltage directive.

2.2.2 Precautions in using the MELSEC-A series Programmable Controller

Selecting modules

(1) Power supply module

For a power supply module with a rated input voltage of 100/200 V AC system, select a module with enforced insulation between the internal primary and secondary voltages, because it contains a hazardous voltage (voltage of 42.4 V or more at the peak) internally.
For a power supply module with a rated input of 24 V DC, the conventional models can be used.

(2) I/O module

For an I/O module with a rated I/O voltage of 100/200 V AC system, select a module with enforced insulation between the internal primary and secondary voltages, because it contains a hazardous voltage internally.
For an I/O module with a rated I/O of 24 V DC, the conventional models can be used.

(3) Extension base unit

The conventional models can be used because they only have a 5 V DC circuit internally.

(4) Special module

The conventional models can be used for special modules, including analog modules, network modules and positioning modules, because their rated voltage is 24 V DC or less.

(5) Display

Use an A870GOT CE mark conforming model.

2.2.3 Supply power

The power supply module has the insulation specification of installation category II. Thus, be sure to use installation category II power supply to the programmable controller.
Installation categories indicate the durability levels against surge voltages generated by a thunderbolt. Category I represents the lowest durability, whereas category IV represents the highest durability.

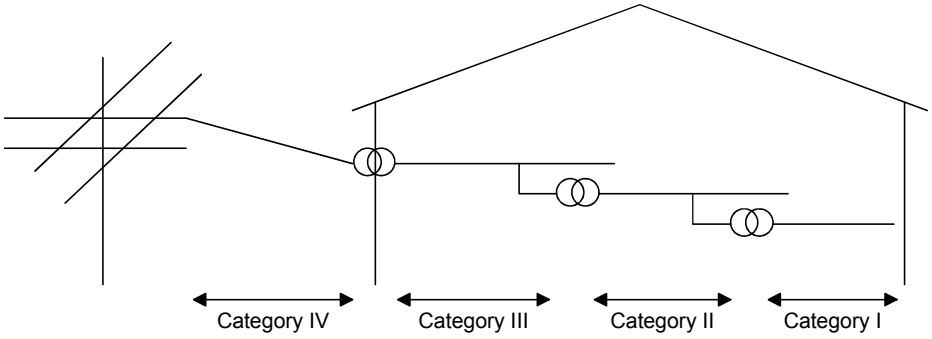


Figure 1: Installation Categories

Category II represents a power supply whose voltage has been reduced by two or more levels with an insulated transformer from the public power distribution.

2.2.4 Control box

Since the programmable controller is an open-type device (device designed to be mounted inside other module), be sure to install it in the control box before use.

(1) Electrical shock protection

In order to protect operators and other workers who may not be familiar with the electric equipment from electrical shocks, the control box must be provided with the following features:

(a) The control box must be equipped with a lock so that only authorized persons who have received appropriate education and have sufficient knowledge about the electric equipment can open the control box.

(b) The control box must be structured so that its power is automatically shut off when the control box door is opened.

(2) Dust-proof and waterproof features

The control box prevents dust and water from entering. If sufficient dust-proof and waterproof functions are not achieved, the insulation withstand voltage will drop, resulting in dielectric breakdown. Since the insulation in Mitsubishi programmable controller is designed to cope with contamination level 2, so it may be used in an environment with contamination level 2 or below.
The following lists four major contamination levels:

Contamination level 1:	An environment where the air is dry and conductive dust does not exist.
Contamination level 2:	An environment where conductive dust does not usually exist, but occasional, temporary conductivity occurs due to accumulated dust. Generally, this is the environment where the insides of the control box temporarily reaches a level equivalent to IP54 in a control room or on the floor of a plant.
Contamination level 3:	An environment where conductive dust exits and conducting condition may occur due to accumulated dust. A temporary environment equivalent to the condition of the floor of a plant.
Contamination level 4:	Continuous conducting condition may occur due to rain, snow, etc. An outdoor environment.

As shown above, the programmable controller can cope with contamination level 2 as long as it is installed in a control box equivalent to IP54.

2.2.5 Mounting the module

The left side of each I/O module of the programmable controller is open. Install I/O modules on the base unit in succession without leaving any vacant slots between any two I/O modules. If there is any vacant slot at the left side of an I/O module with a rating of 100/200 V AC, the circuit board that contains hazardous voltage circuits is exposed. If a slot must be left vacant, be sure to install a blank module (AG60, A1SG60).

2.2.6 Grounding

There are two types of grounding terminals as shown below. Both of the grounding terminals must be used in a grounded condition.

Be sure to ground the protective grounding to secure safety.

Protective grounding  : The purposes of the protective grounding are to secure the safety of the programmable controller and to improve the noise resistance.

Functional grounding  : The purpose of the functional grounding is to improve the noise resistance.

2.2.7 External wiring

(1) 24 V DC external wiring

For special modules that require a 24 V DC I/O module or an external power supply, use a model with enforced insulation of the 24 V DC circuit from the hazardous voltage circuit.

(2) External connection device

When an external device containing a hazardous voltage circuit is connected to the programmable controller, use a model with enforced insulation of the interface circuit section to the programmable controller from the hazardous voltage circuit.

(3) Enforced insulation

Enforced insulation refers to the insulation having the withstand voltages shown in the following table:

Table: Enforced insulation withstand voltage (installation category II, source: IEC664)

Rated voltage of hazardous voltage area	Withstand surge voltage (1.2/50 μ s)
150 V AC or less	2500 V
300 V AC or less	4000 V

3 MOUNTING AND INSTALLATION

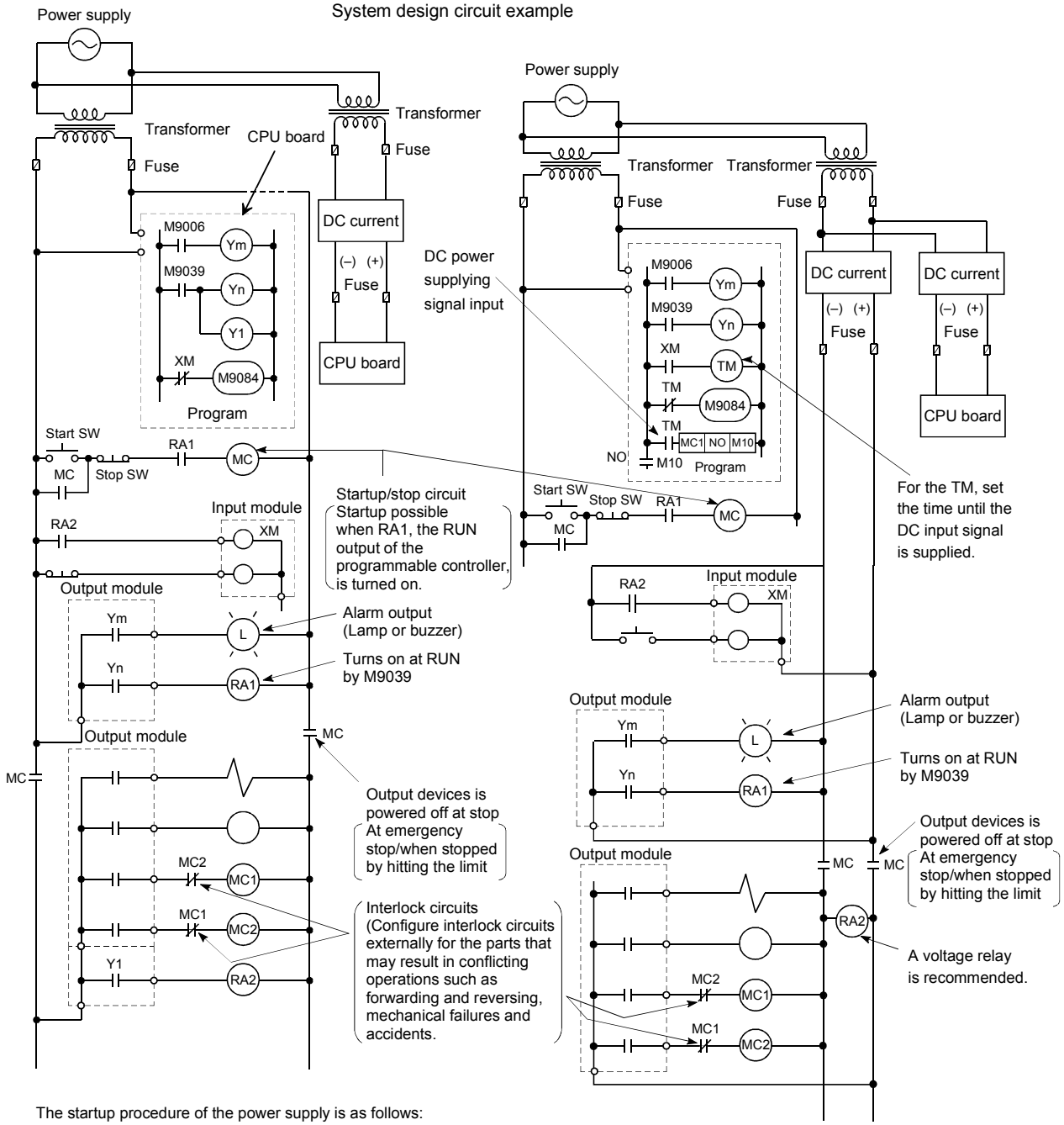
This section explains how to load and install the system as well as the precautions that should be observed in order to increase the reliability and to make full use of the available functions.

3.1 Concept of the Fail-Safe Circuit

When the power to the IBM PC/AT compatible PC, the external power supply or the extension base unit is turned on/off, process outputs may not temporarily be generated normally because of the delay time and the difference at startup between the power supplies for an IBM PC/AT compatible PC and an external power supply and an external power supply (especially DC) for processes.
For example, if the IBM PC/AT compatible PC and the external power supply are powered on after the external power supply for processes is powered on in the DC output module, the DC output module may generate incorrect outputs when the IBM PC/AT compatible PC, the external power supply or the extension base unit is turned on. Thus, it is necessary to configure a circuit in such a way that the IBM PC/AT compatible PC and the external power supply can be powered on first. In addition, if the external power supply is faulty or the IBM PC/AT compatible PC fails, the operation may become abnormal.
In order to prevent these abnormal conditions that may result in erroneous operations of the entire system, as well as make the components (such as emergency stop circuit, protection circuit, and interlock circuit) that may cause machine damages and accidents due to abnormal operations to be fail-safe, it is necessary to configure circuits externally to the IBM PC/AT compatible PC, the external power supply and the extension base units.
An example of system circuit design that meets the above criteria is shown on the next page.

POINT
Some A1S series output modules detect a blown-fuse error when the external power supply is turned off. In the circuit example shown on the next page, the supplying of the external power of the output module takes place after the startup of the CPU board, so a blown-fuse error will be detected. To prevent this, the M9084 is kept on until the external power is supplied so that the blown-fuse check is not performed. (When the M9084 is on, neither I/O module verification check nor battery check is performed.)

System design circuit example



The startup procedure of the power supply is as follows:

In case of AC:

[1] Power "ON" the IBM PC/AT compatible PC and the extension base units.
[2] The CPU board is set to "RUN."
[3] The Start switch is set to "ON."
[4] When the magnetic contactor (MC) turns "ON," output devices are started by a program.

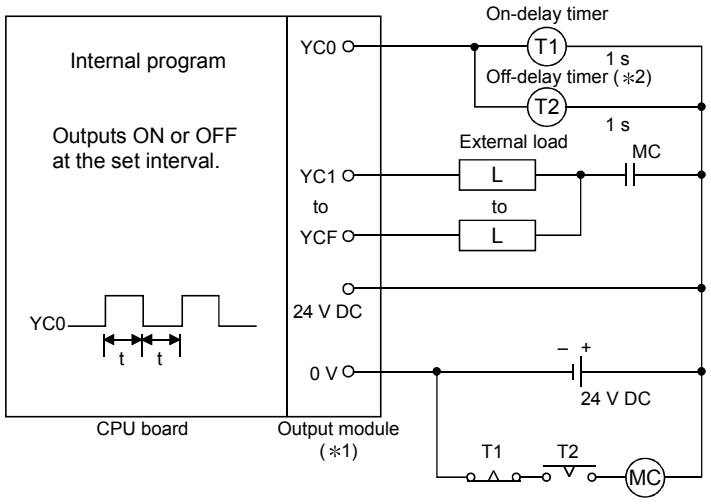
In case of AC/DC:

[1] Power "ON" the IBM PC/AT compatible PC and the extension base units.
[2] The CPU board is set to "RUN."
[3] The Start switch is set to "ON."
[4] The RA2 is set to "ON" when the DC power is supplied.
[5] The timer (TM) is set to "ON" when the DC power is supplied 100%. (The setting value for the TM should be the time from turning "ON" the RA2 to 100 % DC power is supplied. Use a setting value of 0.5 seconds.)
[6] The Start switch is set to "ON."
[7] When the magnetic contactor (MC) turns "ON," output devices are started by a program.
(When a voltage relay is used for the RA2, the timer (TM) is not required in the program.)

3 - 2

3.2 Fail-Safe Measures Against Output Module Failure

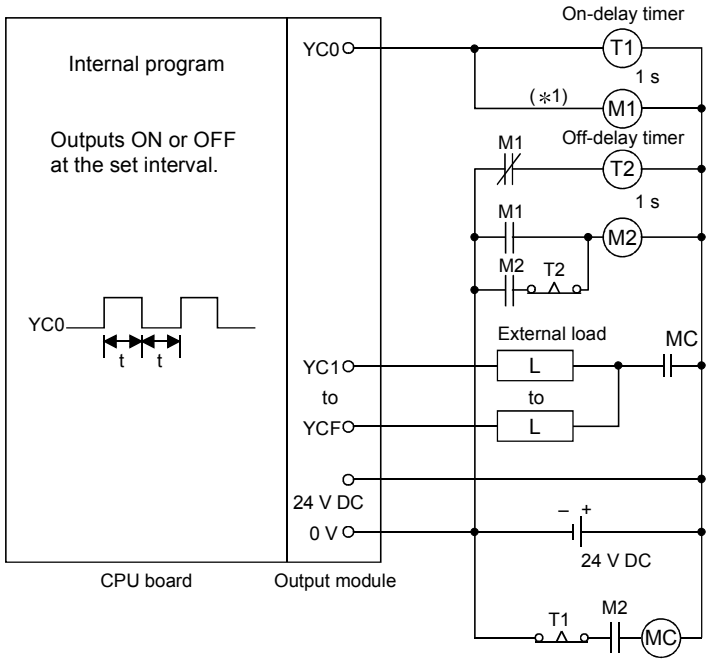
Even if there are abnormalities in the I/O control area, the IBM PC/AT compatible PC may not be able to detect these abnormalities.
In such cases, all points may be turned on or off, or a situation may develop where normal operations and safety of the target controlled device cannot be assured, depending on the condition of the failure.
Although every possible measures are implemented to assure the product quality during manufacturing, a fail-safe circuit should be constructed externally by the user to prevent any mechanical damages or accidents if the programmable controller fails for some reason.
An example of a fail-safe circuit is shown below:



t: Set to approximately two times the program execution time (one scan).

∗1: Since YC0 repeats ON/OFF at t-s intervals, a contactless output module should be used (a transistor is used in the above example).
∗2: If an off-delay timer (especially a miniature timer) is not available, construct a fail-safe circuit using on-delay timers as shown on the next page.

Constructing a fail-safe circuit using on-delay timers only:

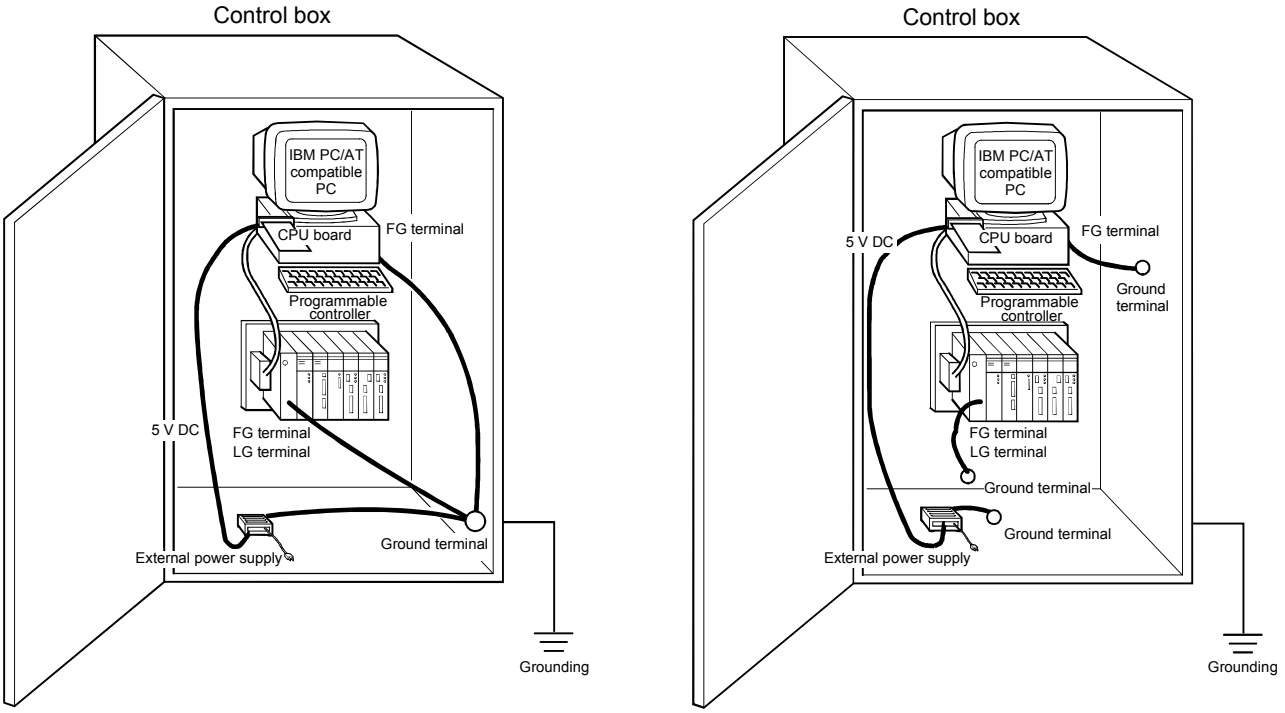


t: Set to approximately two times the program execution time (one scan).

*1: Use a solid-state relay for the M1 relay.

3.3 Installation Environment

Make sure to install the IBM PC/AT compatible PC in which the CPU board is mounted inside the control box together with the extension base units, and ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller. Failure to do so may result in malfunctions due to noise and other factors.



⚠CAUTION

- Mount the CPU board in a panel mount type IBM PC/AT compatible PC with either an FG or LG terminal.
- Install the CPU board mounted IBM PC/AT compatible PC in the same control box as the programmable controller, and make sure to ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller. Otherwise, malfunctions may occur due to noise.
- Use FG and LG cables with a cross-section of $2mm^2$ or more and wire them as short as possible.

3.4 Wiring

This section explains certain issues about wiring that should be implemented when using the system.

DANGER

- Before starting any installation or wiring work, make sure to shut off all phases of the external power supply to the entire system.
  Failure to completely shut off the power supply to the system may result in electric shocks as well as damage to the product.
- Before turning on the power or operating the module after installation or wiring work, make sure to install the attached terminal covers to the product. Failure to install the terminal covers may result in electric shocks.

CAUTION

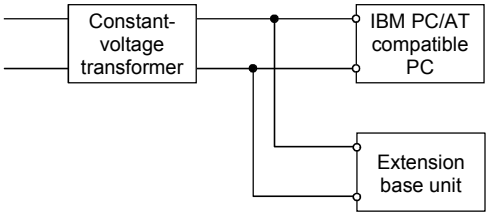
- Wire correctly to the programmable controller upon checking the rated voltage and terminal layout of the product. Connecting a power supply having a different rated voltage or incorrect wiring may result in fires or breakdowns.
- Tighten the terminal screws using the specified torque.
  If the terminal screws are loose, it may cause the module to short-circuit, catch fire or malfunction.
- Be careful not to let any foreign matter such as chips and wire burrs get inside the module.
  They may cause fires, as well as breakdowns and malfunctions of the module.
- Perform crimp-contact, pressure-displacement or soldering to properly wire the connectors for external connections using the designated tool.
  For more information about the tools required for crimp-contact or pressure-displacement, refer to the user's manual of the corresponding I/O module.
  If the connection is incomplete, it may cause the module to short-circuit, catch fire or malfunction.

3.4.1 Wiring precautions

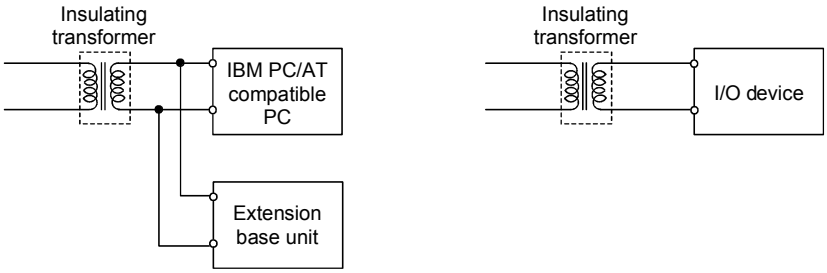
This section explains some precautions that should be observed when wiring power cables, I/O cables and other cables.

(1) Wiring the power supply module

(a) If a voltage variation is larger than the specified value, connect a constant-voltage transformer.



(b) Use a power supply with little noise between cables as well as grounds. When there is much noise, connect an insulating transformer.

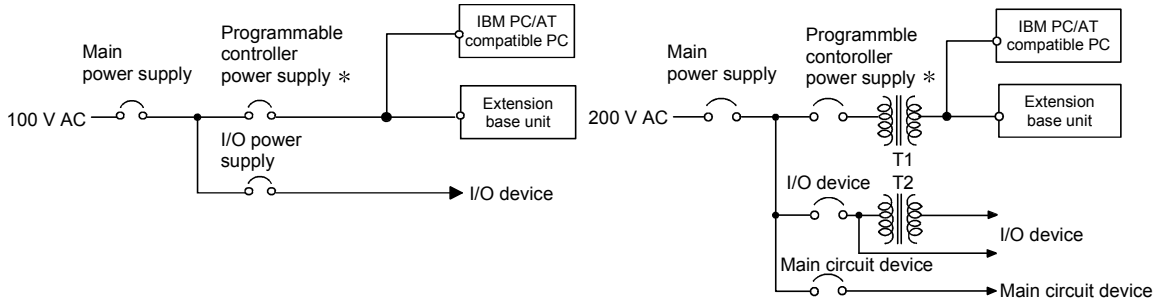


(c) When using a power supply transformer that reduces the voltage from 200 V AC to 100 V AC or an insulating transformer, use one with transformer capacity equal to or greater than the values indicated in the table below.

Power supply module model name	Transformer capacity
A61P (EU)	110 VA × n
A62P (EU)	110 VA × n
A65P	110 VA × n
A66P	95 VA × n
A1S61P	105 VA × n
A1S62P	105 VA × n

n: Indicates the number of power supply modules used.

(d) Wire the programmable controller power supply, the I/O device and the power device in such a way that their systems are separated.



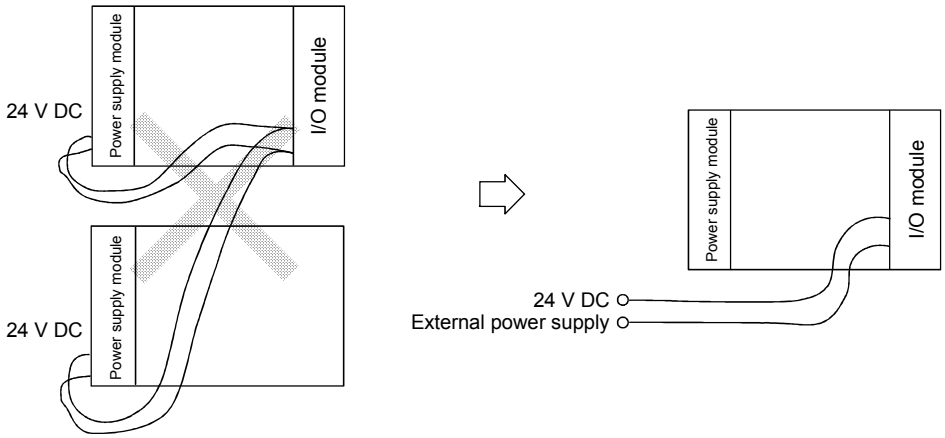
✻ Power on/off both the IBM PC/AT compatible PC and the extension base unit at the same time using the programmable controller power supply without using the power supply switch of the IBM PC/AT compatible PC main body.

REMARK

In the wiring of a power supply to a device in which "an I/O module is replaced in the online state," provide a dedicated switch for each module and device to ensure safety.

(e) Precautions for using 24 V DC outputs of the power supply modules A62P, A65P, A66P and A1S62PN
Do not connect the 24 V DC outputs of multiple power supply modules in parallel to supply power to a single I/O module. Such parallel connection will damage the power supply modules.
If the 24 V DC output capacity of one power supply module is not sufficient, supply extra power from an external 24 V DC power supply.

⚠CAUTION
- Do not connect outputs from multiple power supply modules in parallel. This may overheat the power supply modules and result in fires or breakdowns.

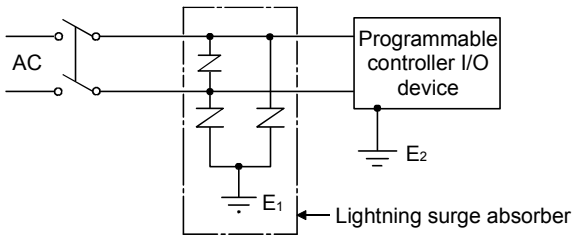


(f) Twist 100 V AC, 200 V AC and 24 V DC wires as densely as possible, and connect the modules as short a distance possible.

(g) To reduce the voltage drop to a minimum, use the thickest 100 V AC, 200 V AC and 24 V DC wires possible (maximum 2mm^2).

(h) Do not bundle 100 V AC or 24 V DC wires with the main circuit (high voltage and large current) wires or I/O signal wires, or place them close to such wires. If possible, keep them 100 mm (3.94 in.) or more apart.

(i) As a countermeasure against power surges due to lightning, connect a lightning surge absorber as shown below.



POINT

(1) Ground the lightning surge absorber (E1) separately from the programmable controller (E2).

(2) Select a type of lightning surge absorber so that when the power supply voltage raises at the maximum, it does not exceed the maximum allowable circuit voltage of the serve absorber.

(2) Wiring the I/O devices

⚠CAUTION

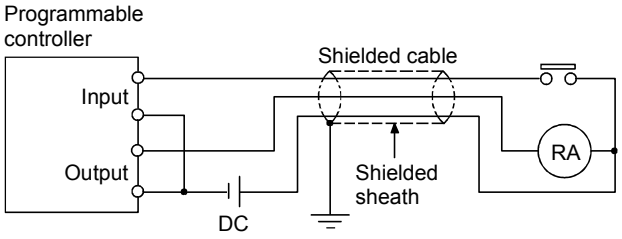
- Do not bundle the control wires or the communication cables together with the main circuit or the power wires, and do not install them close to each other. They should be installed at least 100 mm (3.94 in.) away from each other. Failure to do so may generate noise, resulting in malfunctions.

(a) The suitable wire sizes of wires to be connected to the connectors on a terminal block are 0.75 to 2 mm^2, but for the ease of use, the wire size of 0.75 mm^2 is recommended.

(b) Route the input wires separately from the output wires.

(c) Route the input and output wires at least 100 mm (3.94 in.) away from the high-voltage and large current main circuit wires.

(d) When the input and output wires cannot be separated from the main circuit wires and the power line, use batch-shield cables and ground them at the programmable controller side. However, grounding them on the other side may be required in some cases.



(e) When duct wiring is performed, the duct should be securely grounded.

(f) Separate the 24 V DC input wires from the 100 V AC and 200 V AC wires.

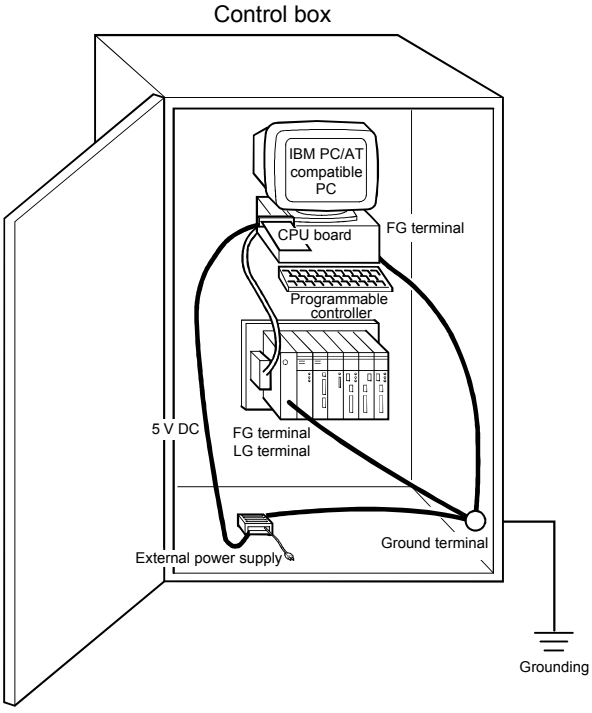
(g) With a long distance wiring of 200 m (656.2 ft.) or longer, leakage current due to line capacity may cause troubles. See the troubleshooting section of the I/O Module User's Manual.

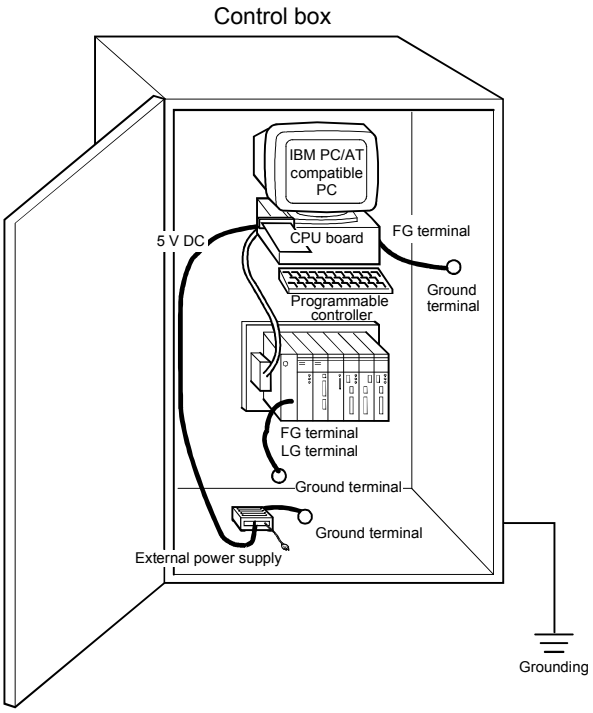
(3) Grounding

DANGER	• Make sure to ground the FG terminals. Failure to do so may cause electric shocks or malfunctions.

The following shows how to ground the IBM PC/AT compatible PC.

(a) Install the IBM PC/AT compatible PC in the same control box that contains the programmable controller system, connect to an FG terminal with the same potential as that of the programmable controller system, and then ground (the ground resistance should be 100 Ω or less.)
Use FG and LG cables with a cross-section of 2mm^2 or greater and wire them as short as possible.





REMARK

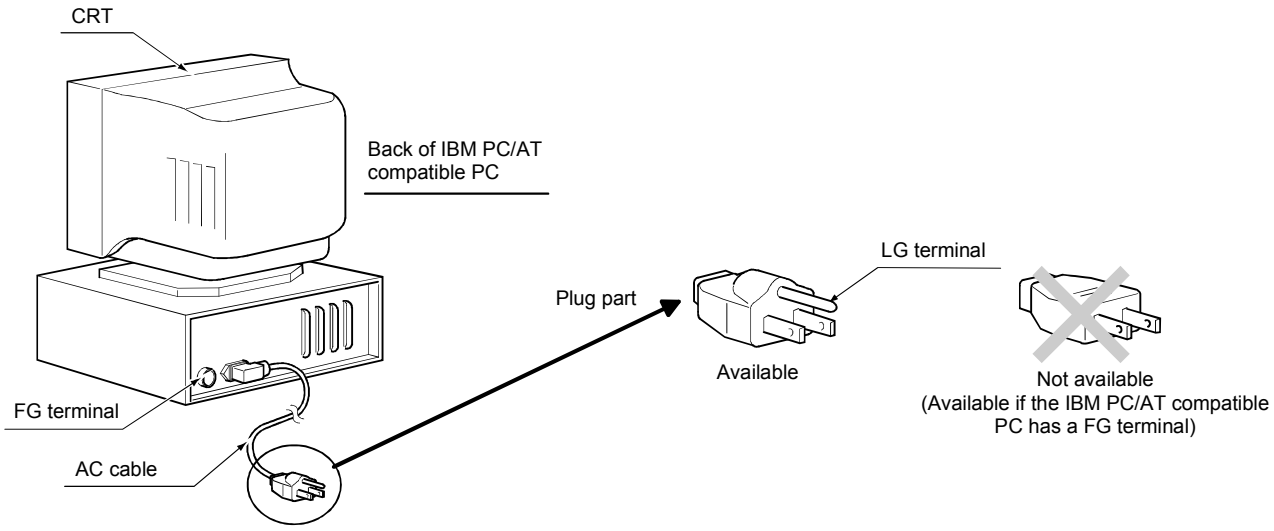
Unlike a system consisting of only a programmable controller, in a system that also uses an IBM PC/AT compatible PC, if the electric potential of the frame ground (FG) is different between the IBM PC/AT compatible PC and the programmable controller, a malfunction may occur because data cannot be transferred normally due to the difference in the electric potentials between them.

(b) The table below shows the availability of the IBM PC/AT compatible PC.

	FG terminal	LG terminal	Availability
IBM PC/AT compatible PC	Yes	Yes	○
	Yes	No	○
	No	Yes	○
	No	No	×

Availability: ○: Available
×: Not available

< IBM PC/AT compatible PC >

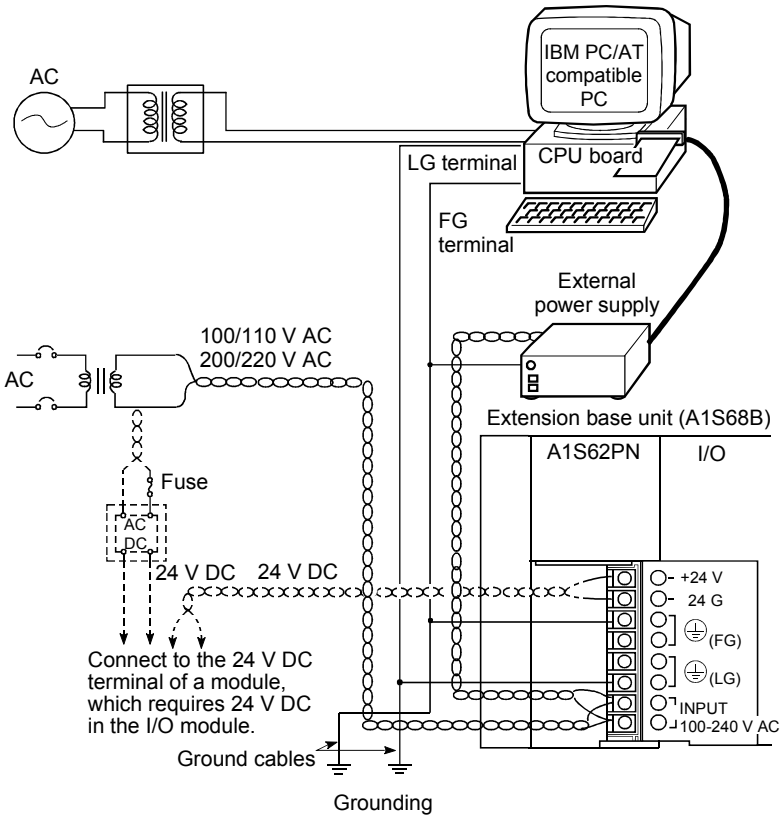


POINT
An IBM PC/AT compatible PC without an FG or LG terminal cannot be used.

3 - 11

3.5 Wiring to the Module Terminals

The following shows some examples of how to wire power cables and ground cables to the extension base unit.



POINT

(1) For the 100/200 V AC and 24 V DC power supply cables, use the thickest wire possible (maximum 2 mm^2). The wires must be twisted from the connecting terminals. Use solderless terminals with an insulation sleeve in order to avoid short circuits when the screws are loosened.

(2) When the LG and FG terminals are connected, make sure to ground them. If they are not grounded, it will be susceptible to noise.
Since the LG terminal has an electric potential of half the input voltage, touching the terminal may result in an electrical shock.

(3) It is recommended to use a noise cut transformer and a line filter externally.

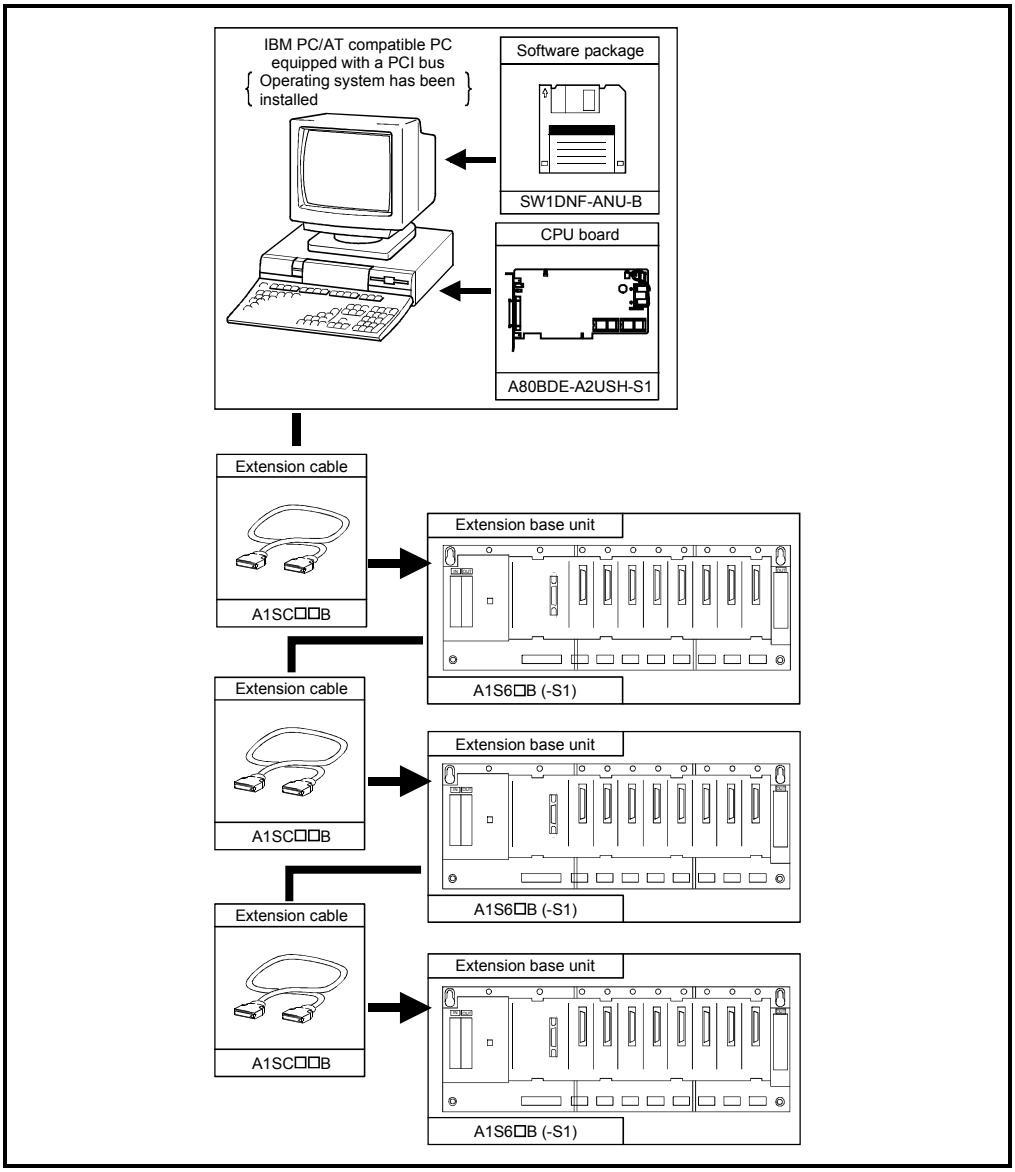
(4) It is recommended to use a ground cable with a cross-section of 2 mm^2 or more for the LG terminal, and wire it as short as possible in order to increase the noise durability of the IBM PC/AT compatible PC.

4 SYSTEM CONFIGURATION

This chapter explains the system configuration when the CPU board is used.

4.1 System Configuration when the AnS Series Modules are Used

The following shows the system configuration when the AnS series modules are used for the extension base units:



POINT

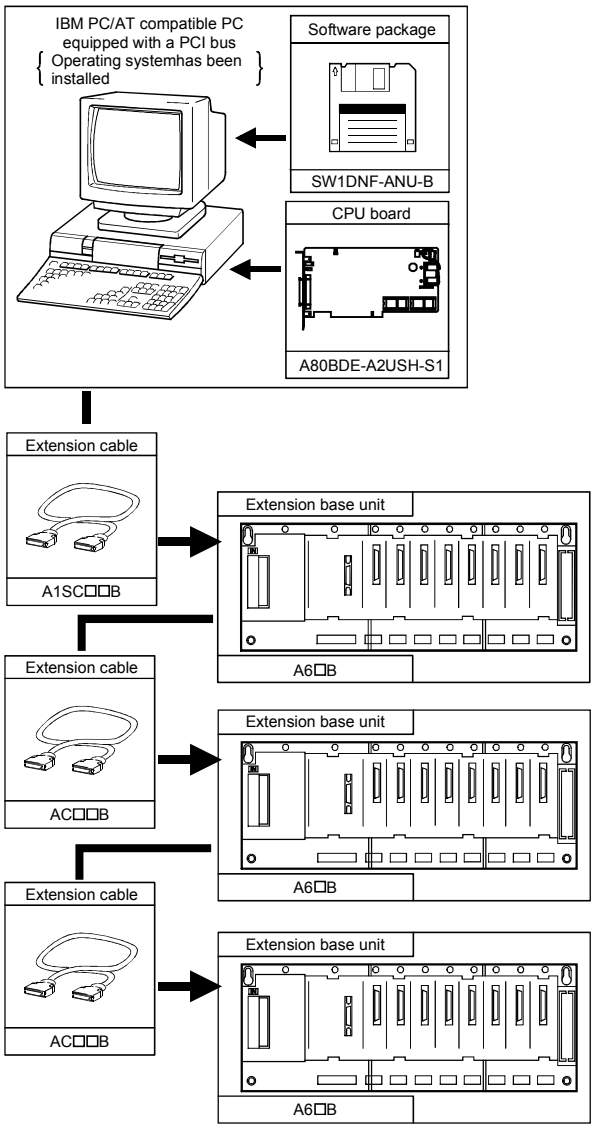
(1) Only one CPU board can be used for one IBM PC/AT compatible PC.

(2) Up to three AnS series extension base units can be connected.
Use the A1S6□B-S1extension base units when connecting two or more extension base units to the CPU board.

(3) The overall distance of the AnS series cable should be 6.0 m (19.69 ft.).

4.2 System Configuration when the A Series Modules are Used

The following shows the system configuration when the A series modules are used for the extension base units:



POINT

(1) Only one CPU board can be used for one IBM PC/AT compatible PC.

(2) Up to three A series extension base units can be connected.

(3) Use A1S series extension cables (A1SC□□NB) to connect between the CPU board and the A series extension base units.
Use A series extension cables (AC□□B) to connect between the A series extension base units.

(4) The overall distance of the A series cable should be 6.6 m (21.65 ft.).

4.3 Precautions in System Configuration

This section explains the hardware and software packages that can be used for the CPU board.

4.3.1 Hardware

(1) I/O modules

All the building block type I/O modules for the A series can be used by installing them in the extension base units of the A6□B.
All the building block type I/O modules for the AnS series can be used by installing them in the extension base units of the A1S6□B.

(2) Special function modules

(a) Special function modules for the A series can be used by installing them in the extension base units of the A6□B.
Special function modules for the AnS series can be used by installing them in the extension base units of the A1S6□B.

(b) The following models of the special function modules have limitations on the number of modules that can be installed.

<table>
<tr><th colspan="3">Module model name</th><th colspan="2">Number of modules that can be installed</th></tr>
<tr><td colspan="3">AD51–S3 ＊1
AD51FD–S3
AJ71C22–S1
AJ71C24 (S3) ＊1
AJ71P41 ＊1
AJ71C21-S1 (BASIC program mode only)
AJ71C23–S3
AJ61BT11 (Intelligent mode only)
A975GOT
A960GOT
A870GOT (Only when the bus connection is used)
A850GOT (Only when the bus connection is used)
A851GOT
A77GOT-S5 (Only when the bus connection is used.) ＊3</td><td colspan="2">AD51H–S3 ＊2
AD57G–S3 ＊2
AJ71UC24
AJ71C24–S6 (S8) ＊2
AJ71E71–S3 ＊2
AD22–S1
A970GOT
A985GOT</td><td colspan="2">A maximum of five modules in total can be installed.</td></tr>
<tr><td colspan="3">A1SJ71UC24–R2 (PRF/R4)
A1SJ71E71–B2–S3 (–B5–S3)
A1SD51S
A1SJ61BT11 (Intelligent mode only)
A1SJ71CMO–S3</td><td colspan="2">A1SD21–S1</td><td colspan="2"></td></tr>
<tr><td colspan="3">AI61 (S1)
A1SI61</td><td colspan="2">Only one module can be installed.</td><td colspan="2"></td></tr>
<tr><td colspan="3">AJ71AP21 ＊2
AJ71AT21B ＊2</td><td colspan="2">AJ71AR21 ＊2</td><td>A maximum of two modules in total can be installed.</td><td rowspan="3">A maximum of four modules in total can be installed.</td></tr>
<tr><td colspan="3">A1SJ71AP21 ＊2
A1SJ71AT21B ＊2</td><td colspan="2">A1SJ71AR21 ＊2</td><td>A maximum of two modules in total can be installed.</td></tr>
<tr><td>AJ71LP21
A1SJ71LP21</td><td>AJ71BR11
A1SJ71BR11</td><td>AJ71LR21
A1SJ71LR21</td><td colspan="2"></td><td>A maximum of four modules in total can be installed.</td></tr>
</table>

＊1: Accessible within the device range of the A3HCPU.
＊2: Accessible within the device range of the A3ACPU.
＊3: The special module monitor function is not available with the A77GOT-S5.

REMARK

The CPU board cannot use the following special function modules:

- AJ71C23
- AJ71C24 (modules dated before February 1987)
- AD57-S2
- AD51 (modules dated before March 1987)

Check the manufacturing date on the rating plate.

(3) Extension base units that can be used

The following table shows which extension base units are available:

Extension base unit model name	Availability
A1S52B (–S1)	×
A1S55B (–S1)	×
A1S58B (–S1)	×
A1S65B (–S1) ∗1	○
A1S68B (–S1) ∗1	○
A52B	×
A55B	×
A58B	×
A62B	○
A65B	○
A68B	○

○: Available
×: Not available

∗1: Use the A1S65B-S1 or A1S68B-S1 extension base units when connecting two or more extension base units to the CPU board.

4.3.2 Function software

(1) GPP function software and programmable controller CPU model name settings at startup

The following table shows the GPP function software that support program creation for the CPU board and the programmable controller CPU model name settings at startup.

To create a program for the CPU board, set the programmable controller CPU model name to "A3U." If "A3U" is not among the available programmable controller CPU model name selections, set it to "A3A." If neither "A3U" nor "A3A" are among the available selections, then set it to "A3H."

Peripheral device	Software model name for system startup	Programmable controller CPU model name setting	Remarks
A7PHP	SW0RX-GPPA	A3A	—
	SW0SRX-GPPA		
	SW0SRXV-GPPA		
	SW1SRXV-GPPA	A3U	
	SW2SRXV-GPPA		
	SW□IVD-GPPA-E (□ should be 3 or later)	A2USH-S1	
A7HGP	SW□HX-GPPA	A3U	—
A6PHP	SW3GP-GPPA	A3H	Write on ROM is not allowed.
	SW4GP-GPPA	A3A	—
	SW5GP-GPPA		
	SW1GP-GPPAU	A3U	
	SW2GP-GPPAU	A2USH-S1	
A6GPP	SW3-GPPA	A3H	Write on ROM is not allowed.
	SW3GP-GPPA		
	SW4GP-GPPA	A3A	—
	SW5GP-GPPA		
	SW1GP-GPPAU	A3U	
	SW2GP-GPPAU	A2USH-S1	
IBM PC/AT compatible PC	SW1IVD-GPPA	A3U	—
	SW2IVD-GPPA		
	SW□IVD-GPPA (□ should be 3 or later)	A2USH-S1	
	SW□D5C-GPPW-E/SW□D5F-GPPW-E	A2USH-S1	
	MELSEC MEDOC	A3U	
	MELSEC MEDOC plus		

REMARK

GX Developer later than SW3D5C-GPPW-E/SW3D5F-GPPW-E can write or read a program to the CPU board directly.

When writing or reading a program using GX Developer prior to SW2D5C-GPPW-E/SW2D5F-GPPW-E or a peripheral device, connect the peripheral device to the RS-422/external power supply connecting bracket.

For more details, see Section 6.6, "Writing and Reading Programs to/from the CPU Board."

PRECAUTIONS

1. The following errors will be detected when the programmable controller CPU model name in the GPP function software has been set to "A3U":
   1) If a CHG instruction is written, error code 13 and detailed error code 134 will be detected because that instruction cannot be used.
   2) If a subprogram is set, error code 11 and detailed error code 111 will be detected because subprograms cannot be used.
2. When the MELSECNET (II) and MELSECNET/10 parameters are used up to a maximum of 16 k bytes, the program size will be limited to 22 k steps.
   The CPU board uses the same memory area for the sequence programs as that for the MELSECNET (II) and MELSECNET/10 parameters. Thus, the sequence programs can use only the remainder of the maximum 30 k steps minus the memory area used by the MELSECNET (II) and MELSECNET/10 parameters.

POINT

(1) For the system startup function software when the A6GPP/A6PHP are used, old software other than SW3-GPPA, SW3GP-GPPA and SW4GP-GPPA cannot be used.

(2) When configuring a MELSECNET/10 network system with a CPU board, use AnU corresponding GPP function software (which contains "A3U" or "A2USH-S1" in programmable controller CPU model name).
The network functions cannot be set with GPP function software that does not correspond with the AnU (without "A3U" or "A2USH-S1" in programmable controller CPU model name).

(2) Utility software

(a) None of the following utility software for A6GPP/A6PHP can be used:

- SW□-AD57P
- SW□-UTLP-FN0
- SW□-UTLP-FN1
- SW□-UTLP-PID
- SW□-SIMA
- SW□-UTLP-FD1
- SW□-SAPA

* For the utility software marked with ∗, the same functions can be executed using dedicated instructions. For more information, see the AnACPU/AnUCPU Programming Manual (Dedicated Instructions).

REMARK

The character generators and canvas, which are required to use the AD57 (S1) module, are created on a peripheral device using SW□AD57P utility software.

POINT

(1) Utility software, which access the CPU board by designating a device, can only be used in the device range that is equivalent to the A3ACPU or A3HCPU. (See Section 4.3.3.)

(2) To use the device range for the CPU board, use AnU corresponding utility software (example: SW1SRXV-SAP2).

4.3.3 Precautions when using GPP function software that does not correspond with the AnU

When the CPU board is started up using GPP function software that does not correspond with the AnU (programmable controller CPU model name of either "A3A" or "A3H"), the device range that can be used is limited as listed in the table below.

(1) Usable device range list

Item \ System FD peripheral device	AnACPU corresponding device	A3HCPU corresponding device
	Devices whose programmable controller CPU model name for system FD startup is "A3A"	Devices whose programmable controller CPU model name for system FD startup is "A3H"
Instruction (sequence/ basic/application/dedicated)	All instructions can be used.	
Program size	A maximum of 14 k steps can be used for the main program.	
Number of I/O device points (X/Y)	X/Y0 to 7FF can be used. (X/Y800 to 1FFF can be used.)	X/Y0 to 7FF can be used. (X/Y800 to 1FFF cannot be used.)
M, L, S relay	M/L/S0 to 8191 can be used.	M/L/S0 to 2047 can be used.
Link relay (B)	B0 to BFFF can be used. (B1000 to B1FFF cannot be used.)	B0 to B3FF can be used. (B400 to B1FFF cannot be used.)
Timer (T)	T0 to T2047 can be used.	T0 to T255 can be used. (T256 to T2047 cannot be used.)
Counter (C)	C0 to C1023 can be used.	C0 to C255 can be used. (C256 to C1023 cannot be used.)
Data register (D)	D0 to D6143 can be used. (D6144 to D8191 cannot be used.)	D0 to D1023 can be used. (D1024 to D8191 cannot be used.)
Link register (W)	W0 to WFFF can be used. (W1000 to W1FFF cannot be used.)	W0 to W3FF can be used. (W400 to W1FFF cannot be used.)
Annunciator (F)	F0 to F2047 can be used.	F0 to F255 can be used. (F256 to F2047 cannot be used.)
Index register (V, Z)	V, V1 to V6, Z, and Z1 to Z6 can be used.	V and Z can be used. (V1 to V6 and Z1 to Z6 cannot be used.)
Extended comment	A maximum of 3968 points	Not used
Latch (power failure compensation) range	The device range shown above can be latched.	The device range shown above can be latched.
I/O assignments	The number of I/O occupied points and the module model name can be registered.	The number of I/O occupied points can be registered.

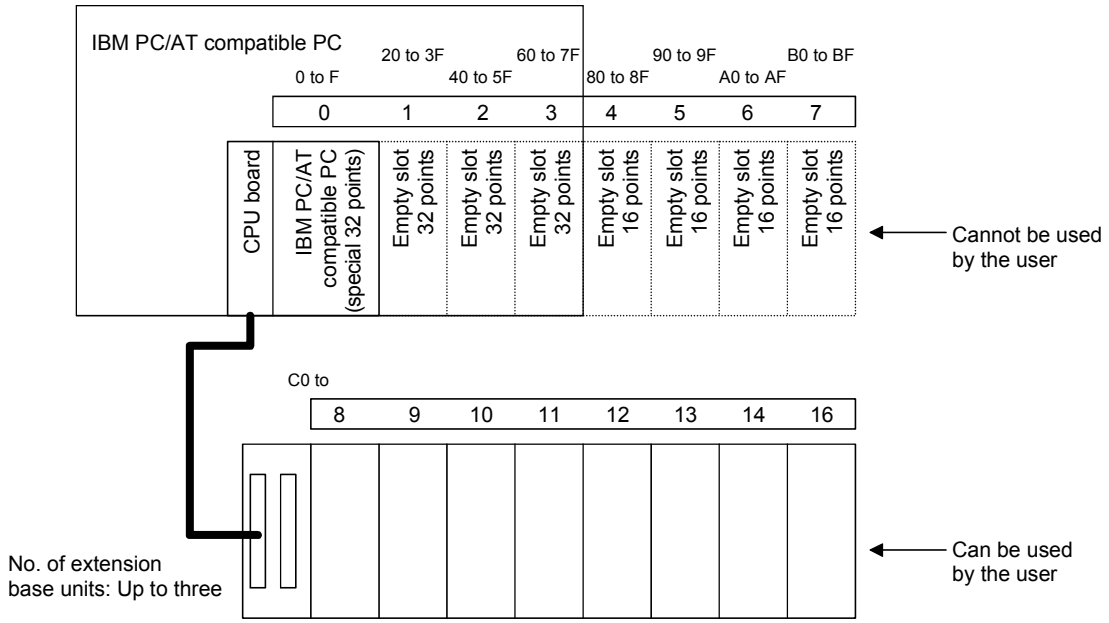
(a) For other than what is listed above, the device ranges are the same as those of the A2USHCPU-S1.

(b) For a list of functions that can be operated from peripheral devices, see the operation manual of each peripheral device.

(c) A8PU type peripheral devices (including A7PU and P7PUS) cannot be used.

4.4 I/O Assignments

The basic scheme of the I/O assignments of the CPU board is shown in the figure below.



POINT
(1) The I/O assignments of X/Y0 to BF are fixed. If other values are set, an error will occur. The I/O assignments for the extension base units can be performed arbitrarily. (2) For details on the errors, see Chapter 12, "Error Codes."

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4.5 Operating Environment and Installation Environment of the IBM PC/AT Compatible PC

The following shows the operating environment and installation environment of the CPU board.

4.5.1 Operating environment of the IBM PC/AT compatible PC

The operating environment of the CPU board is shown below.

Item		Description
IBM PC/AT compatible PC main body		IBM PC/AT compatible PC with Pentium 133 MHz or faster and Operating system to work, having one or more PCI bus slots *1, *2, *3
	PCI bus specification	5 V DC, 32-bit bus Bus clock: 33 MHz
Operating system *4, *5		Either of Microsoft® Windows® 2000 Professional Operating System (English version) *6 or Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) *6, *7
Required memory size		32 MB or more
Hard disk space		6 MB or more
Disk drive (required when installing a driver)		3.5 inch (1.44 MB) floppy disk drive

*1: This product does not work with a multiprocessor IBM-PC/AT-compatible personal computer, as the driver is incompatible.

*2: Hyper-Threading technology is unavailable as the driver does not support it.
Disable the Hyper-Threading technology on the BIOS setting screen of PC and then reinstall the operating system.
(For BIOS setting screen, read the manual of the PC used or confirm with the PC manufacturer.)

*3: This board is incompatible with personal computers that detect the PCI bus data parity errors. For use of such a PC, set the PCI bus data parity error detection function to OFF. Or, use a PC that does not have the function.
For whether the parity error detection function is provided or not and how to set it off, please contact the PC manufacturer.

*4: The CPU board does not support the Standby (Hibernate) mode of the operating system.
The Standby (Hibernate) mode may be preset to some personal computers so that it will be activated by pressing the Power switch or by the UPS (Uninterruptible Power Supply system) setting.
For Windows® 2000 Professional, select [Settings] – [Control Panel] – [Power Options] and disable the standby mode setting.

*5: When exiting the operating system, always shut down the computer.

*6: Installation, uninstallation and usage of utilities are available only by the administrator's authority.

*7: Service Pack3 or higher is required when using Windows NT® Workstation 4.0.

The following development software is required for programming using functions:

OS	Development software (programming language)
Windows® 2000 (English Version)	Microsoft® Visual Basic® 6.0 (English Version) or Microsoft® Visual C++® 6.0 (English Version)
Windows NT® (English Version)	Microsoft® Visual Basic® 5.0 (English Version), Microsoft® Visual Basic® 6.0 (English Version), Microsoft® Visual C++® 5.0 (English Version) or Microsoft® Visual C++® 6.0 (English Version)

REMARK

(1) The external dimensions of the CPU board is not half-size. Depending on the IBM PC/AT compatible PC used, the CPU board cannot be installed.

(2) An IBM PC/AT compatible PC without an FG or LG terminal cannot be used.

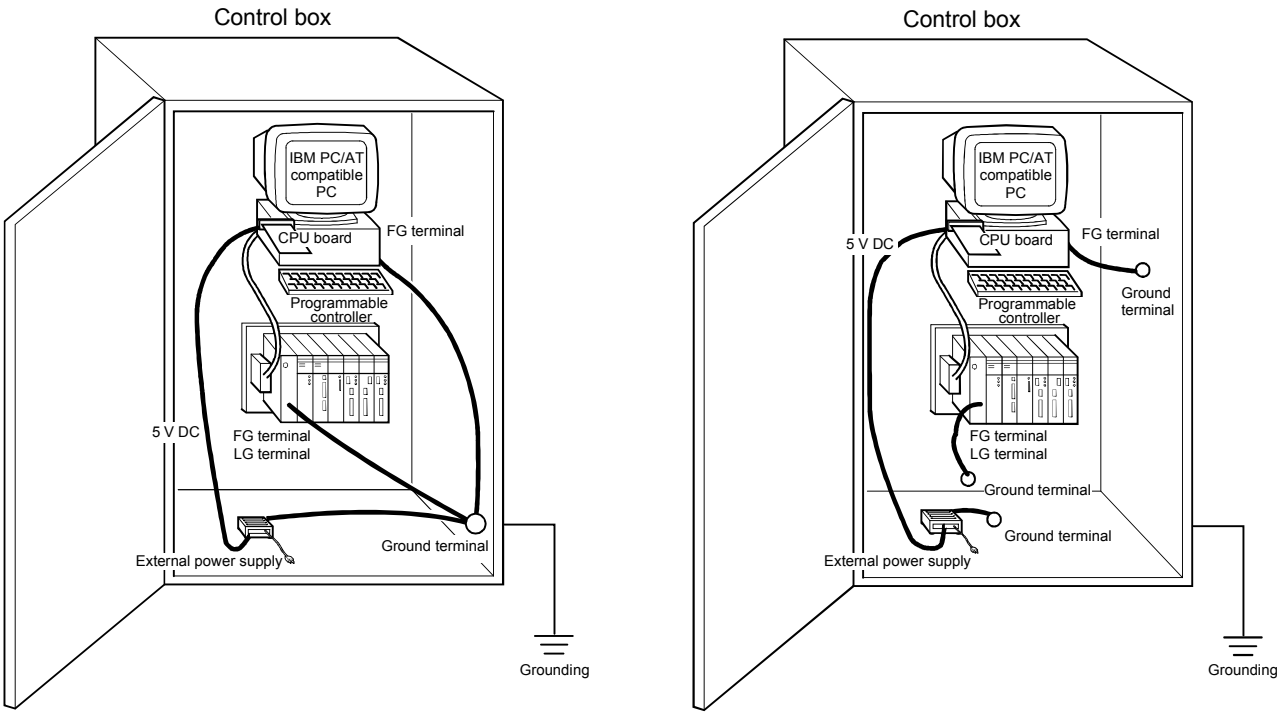
(3) An IBM PC/AT compatible PCs with an SIS5581/5582 chip set manufactured by SIS may not restart after stopping Operating System without normal shutdown procedures. If this happens, turn off the power to the IBM PC/AT compatible PC and the external power supply and then turn it back on to restart the computer.

(4) This product does not comply with large-sized fonts when Windows® 2000 Professional or Windows® XP Professional is used.

(5) User programs created in the English environment work only in the English environment.

4.5.2 Installation environment of the IBM PC/AT compatible PC

Install the IBM PC/AT compatible PC in which the CPU board is mounted inside the control panel together with the extension base units, and ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller. Failure to do so may cause malfunctions due to noise, etc.



⚠CAUTION

- Mount the CPU board in a panel mount type IBM PC/AT compatible PC with either an FG or LG terminal.
- Install the CPU board mounted IBM PC/AT compatible PC inside the same control box as the programmable controller, and make sure to ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller. Poor grounding conditions may cause malfunctions due to noise.
- For FG and LG cables, use cable of at least 2 mm^2 and wire them as short as possible.

5 SPECIFICATIONS

This chapter explains the performance specifications and functions of the CPU board.

5.1 General Specifications

(1) The general specifications of the CPU board are shown below.

Item	Specification					
Operating ambient temperature	0 to 55 °C					
Storage ambient temperature	–20 to 75 °C					
Operating ambient humidity	10 to 90 % RH, no condensation					
Storage ambient humidity	10 to 90 % RH, no condensation					
Vibration resistance	Conforming to JIS B 3501, IEC 61131-2		Frequency	Acceleration	Amplitude	Sweep count
		When there is intermittent vibration	10 to 57 Hz	—	0.075 mm	10 times in each direction, X, Y and Z (80 min)
			57 to 150 Hz	9.8 m/s^2	—	
		When there is continuous vibration	10 to 57 Hz	—	0.035 mm	
			57 to 150 Hz	4.9 m/s^2	—	
Shock resistance	Conforming to JIS B 3501, IEC 61131-2 (147 m/s^2, 3 times each in each direction, X,Y and Z)					
Operating atmosphere	Corrosive gas must not be present.					
Operating height	2000 m (6562 ft.) or less					
Installation area	On the control panel					
Over-voltage category ∗1	II or less					
Contamination level ∗2	2 or less					

∗1: Indicates the distribution area where the device is assumed to be connected, from the public power distribution network to the local machine device.
Category II is applicable to devices to which power is supplied from fixed facility.
The surge resistance voltage of a device with a rating of 300 V is 2500 V.

∗2: This is an index that indicates the occurrence rate of conductive objects in the environment where the device is used.
Contamination level 2 indicates that only non-conductive contamination may occur with a possibility of generating temporary conductivity due to accidental condensation.

(2) The general specifications after installing the CPU board should conform to those of the IBM PC/AT compatible PC.

⚠CAUTION

- Mount the CPU board in a panel mount type IBM PC/AT compatible PC with either an FG or LG terminal.
- Install the CPU board mounted IBM PC/AT compatible PC inside the same control box as the programmable controller, and make sure to ground the FG or LG terminals of both the IBM PC/AT compatible PC and the programmable controller. Poor grounding conditions may cause malfunctions due to noise.
- For FG and LG cables, use cable of at least $2mm^2$ and wire them as short as possible.

5.2 Performance Specifications

The performance specifications of the CPU board are shown below.

Item		Description		Remarks
Corresponding programmable controller CPU type		Equivalent to A2USHCPU-S1		—
Control method		Repeated operation of stored program		—
I/O control method		Refresh method		Partial direct input and output possible by instruction
Programming language		Dedicated language for sequence control (Relay Symbol Language, Logic Symbolic Language, MELSAP-II)		—
Processing speed (sequence instructions) (μs/step)		0.09		—
Number of instructions (types)	Sequence instructions	25		—
	Basic and application instructions	233		—
	Dedicated instructions	204		—
Constant scan (program startup at a constant time interval (ms))		10 to 190 ms (setting possible with 10 ms units)		Set to special register D9020
Memory size		448 k bytes (Load and fix on the circuit board) Equivalent to A3NMCA56		Same as the maximum memory size of A2UCPU-S1
Program size	Main sequence program	Maximum 30 k steps (1 k step = 2 k bytes)		Set with parameters
	Sub sequence program	None		
I/O device points (points)		8192 (X/Y0 to 1FFF)		—
I/O points (points)		Maximum 1024 (192 points = X/Y00 to BF are occupied by the system) I/O points available for the user are C0 to 3FF.		See Section 4.4, "I/O Assignments"
Watch dog timer [WDT] (ms)		200 (fixed)		—
Device points	Internal relay [M] (points)	7144 (M0 to 999, M2048 to 8191)	Total 8192 shared by M, L and S	The range can be changed with parameters
	Latch relay [L] (points)	1048 (L1000 to 2047)		
	Step relay [S] (points)	0 (None for the initial state)		
	Link relay [B] (points)	8192 (B0 to 1FFF)		—
	Timer [T] (points)	2048 (Default: 256 points) 100 ms timer (T0 to 199) : Setting time 0.1 to 3276.7 s 10 ms timer (T200 to 255) : Setting time 0.01 to 327.67 s 100 ms retentive timer (none for initial value) : Setting time 0.1 to 3276.7 s Extension timer (T256 to 2047) : Count value is set by word device (D,W,R)		The range and number of used points are set with parameters
	Counter [C] (points)	1024 (Default: 256 points) Normal counter (C0 to 255) : Setting range 1 to 32767 times Interrupt counter (none for initial value) : A range from C224 to C255 is possible depending on the setting Extension counter (C256 to C1023) : Count value set by word device (D,W,R)		The range and number of used points are set with parameters
	Data register [D] (points)	8192 (D0 to 8191)		—
	Link register [W] (points)	8192 (W0 to 8191)		—
	Annunciator [F] (points)	2048 (F0 to 2047)		Device for failure detection
	File register [R] (points)	8192 (R0 to 8191)		Points are set with parameters

Item		Description	Remarks
Device points	Accumulator [A] (points)	2 (A0, A1)	—
	Index register [V, Z] (points)	14 (V, V1 to 6, Z, Z1 to 6)	—
	Pointer [P] (points)	256 (P0 to 255)	—
	Interrupt pointer [I] (points)	32 (I0 to 31)	—
	Special relay [M] (points)	256 (M9000 to 9255)	—
	Special register [D] (points)	256 (D9000 to 9255)	—
Comment (points)		Maximum 4032 (Set in units of 64 points)	Set with parameters
Extended comment (points)		Maximum 3968 (Set in units of 1 point (range of 100))	
Switch output mode from STOP to RUN		Select to re-input the operation status before stopping (default) or output after execution of operation.	Set with parameters
Self-diagnostic function		Watchdog error monitoring (watchdog timer fixed to 200 ms) Error detection in the memory, CPU, I/O, battery, etc.	—
Operation mode when an error occurred		Select stop or continue.	Set with parameters
Startup method during RUN		Initial start (automatic restart by turning the "RUN" switch of the CPU to on upon power on/power recovery after power failure. The "RUN" switch can be operated by the AnU utility software.)	Set with parameters
Latch (power failure compensation) range		L1000 to L2047 (default) (Possible to set latch ranges for L, B, T, C, D, W)	Range set with parameters
Remote RUN/PAUSE contacts		Possible to set one contact point for each RUN/PAUSE from X0 to X1FFF.	Set with parameters
Print title registration		Yes (128 characters)	Set with parameters
Keyword registration		Yes	—
I/O assignment		Possible to register occupied I/O points and module model names.	—
Clock function		Year, month, day, hour, minute, second, day of the week (automatic judgment of leap years)	—
Step operation		Possible to execute or stop sequence program operations.	—
Interrupt processing		Possible to operate an interrupt program by the interrupt module or constant periodic interrupt signals.	—
Data link		MELSECNET/10, MELSECNET(II), MELSECNET/B, CC-LINK	—
Occupied slot		1 slot (PCI bus)	—
Number of boards that may be installed		1 board/module	Two or more boards cannot be installed on the same IBM PC/AT compatible PC
Allowable period of momentary power failure (ms)		20 ms or less (If the specification of the IBM PC/AT compatible PC is 20 ms or less, use the IBM PC/AT compatible PC specification.)	—
Memory backup function		Total power failure time: guaranteed value minimum 2000 h After turning on the M9006/M9007 Minimum 50 h Battery replacement time: guaranteed value: Minimum 9 min (Can typically last up to 40 min) Battery life: 5 years	—
Connector connecting/disconnecting count		5000 times or more (PCI bus side, cable side)	—
5 V DC internal current consumption		Maximum 2.0 A or less	—
Weight (kg)		0.5	Only the CPU board

5.2.1 Overview of operation processing

This section explains an overview of the operation ranging from startup of the IBM PC/AT compatible PC with the CPU board to the execution of the sequence program. The processing of the CPU board may be categorized roughly into the following four stages:

(1) Initial processing

This is a pre-process to execute sequence operations, and is performed only once upon power on or reset.

(a) The I/O modules are reset and initialized.

(b) The range of data memory for which a latch is not set up is initialized (the bit devices are set to off and the word devices to 0).

(c) I/O addresses of attached I/O modules are automatically allocated based on the I/O module numbers or their installation positions on the extension base unit.

(d) The check items for power on and reset in the list of the CPU board's self-diagnostic items (see Section 5.2.4) are executed.

(e) For the control station of the MELSECNET/10 or the master station of the MELSECNET (II) or MELSECNET/B, the network/link parameter information is set in the network/data link module, and the network communication/data linking is started.

(2) Refresh processing of I/O modules

The refresh processing of I/O modules is executed.
(See the ACPU Programming Manual (Basic).)

(3) Operation processing of a sequence program

The sequence program written in the programmable controller CPU is executed from step 0 to the END instruction.

(4) END processing

This is a post-process to finish one cycle of operation processing of the sequence program and to return the execution of the sequence program to step 0.

(a) Self-diagnostic checks are performed, such as checks for blown fuses, I/O module verification, and low battery (see Section 5.2.4).

(b) The current values of the timers are updated and the contact is set to on/off, after which the current value of the counter is updated and the contact is set to on.
(See the ACPU Programming Manual (Basic).)

(c) Data exchange between the programmable controller CPU and a computer link module is performed when there is a data read or write request from the computer link module. (A1SJ71C24-R2, AJ71C24(S3), AD51(S3), etc.)

(d) The refresh processing is performed when there is a refresh request from the network module or link module.

(e) The condition of the set device is stored to the sampling trace area when the trace point of the sampling trace is set by each scan (after the execution of the END processing).

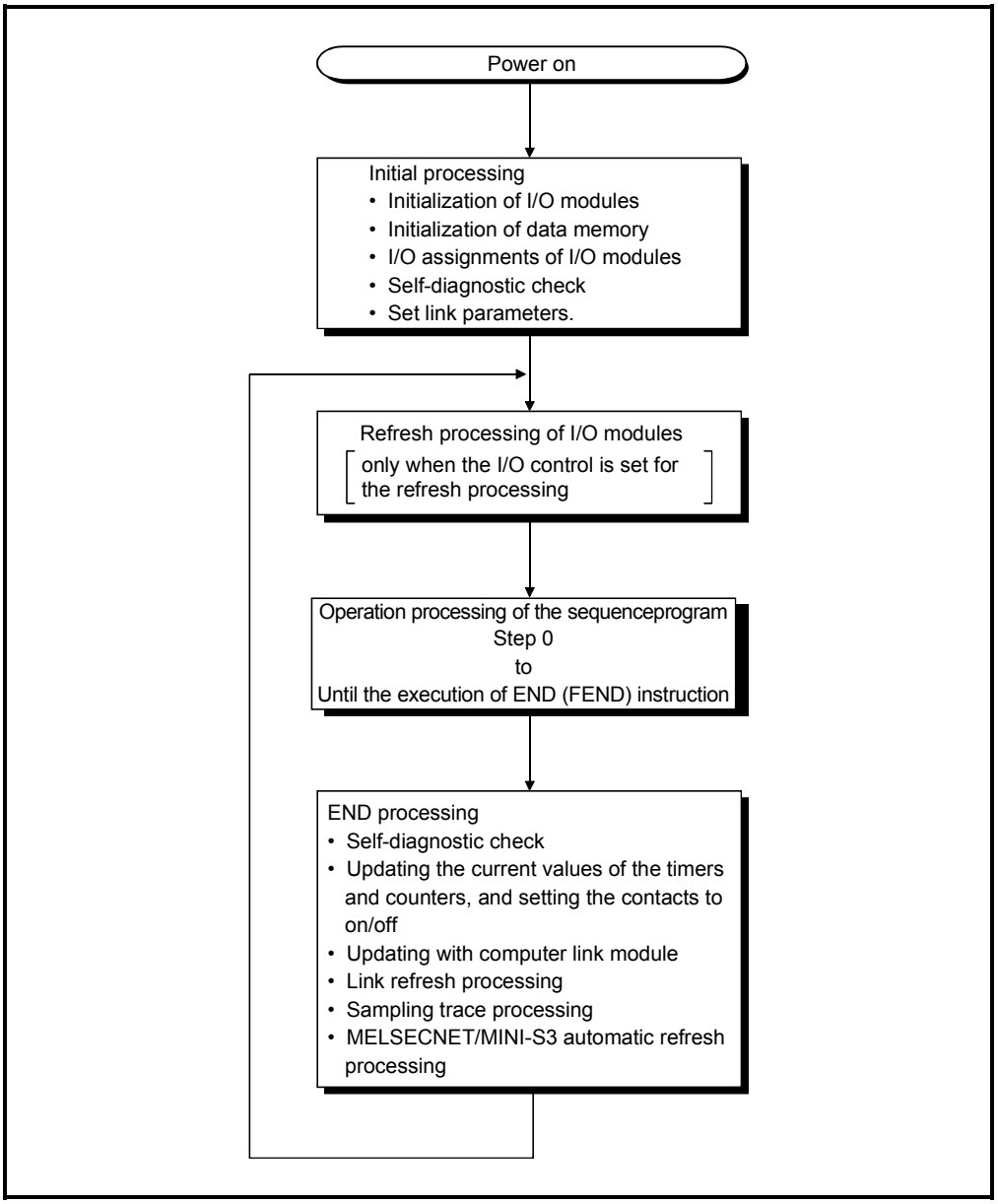


Figure 5.1 Operation flow of the CPU board

5.2.2 Operation processing of RUN, STOP, PAUSE, and STEP RUN

The CPU board has four types of operation states: the RUN state, STOP state, PAUSE state, and step operation (STEP RUN) state.
The following explains the operation processing of the CPU board in each operation state.

(1) RUN state operation processing

(a) The repetition of the sequence program operation in the order from step 0 → END (FEND) instruction → step 0 is called the RUN state.

(b) When entering the RUN state, the output state that was escaped by the STOP instruction is output depending on the output mode setting of parameter upon STOP → RUN.

(c) The processing time from switching from STOP to RUN until the startup of sequence program operation is usually one to three s, but may vary depending on the system configuration.

(2) STOP state operation processing

(a) The termination of operation of the sequence program by the use of the RUN/STOP key switch or the remote STOP instruction is called the STOP state.

(b) When entering the STOP state, it escapes the output state and sets all output points to off. Data memories except for output (Y) are retained.

(3) PAUSE state operation processing

(a) The termination of operation of the sequence program while retaining output and data memory conditions is called the PAUSE state.

(4) Step operation (STEP RUN) operation processing

(a) Step operation is an operation mode wherein operation processing of a sequence program can be paused/continued by each instruction from peripheral device (s).

(b) The conditions of the execution can be confirmed since the operation processing is paused while the output and data memory conditions are retained.

(5) Operation processing of the CPU board when RUN/STOP key switch is operated

CPU board operation processing / RUN/STOP key switch operation	Operation processing of the sequence program	External output	Data memories (Y, M, L, S, T, C, D)	Remarks
RUN → STOP	Executes the program until the END instruction, and then stops.	The OS escapes the output state, and sets all the output points to off.	Maintains the condition just prior to entering the STOP state.	
STOP → RUN	Starts the program.	Determined by the output mode of the parameter upon STOP → RUN.	Starts operations from the condition just prior to entering the STOP state.	

POINT

Regardless of the RUN, STOP or PAUSE state, the CPU board performs the following:
- Refresh processing of I/O modules
- Data communication with computer link modules
- Link refresh processing.

Thus, monitoring or testing I/O with peripheral devices, reading or writing from a computer link module, and communication with other stations by the MELSECNET are possible even in the STOP or PAUSE state.

5.2.3 Operation processing at the time of momentary power failure

The CPU board detects a momentary power failure when the input power voltage supplied to the CPU board becomes lower than the specified range.
When the CPU board detects a momentary power failure, the following operation processing is performed.

(1) If a momentary power failure is detected in the power supply to the IBM PC/AT compatible PC

(a) If external power is supplied to the CPU board
It continues the operation processing.

(b) If external power is not supplied to the CPU board
- It stops the operation processing.
- All points of outputs to the external devices are turned off.

(2) If a momentary power failure is detected in the power supply to the CPU board

(a) If power is supplied to the IBM PC/AT compatible PC
It continues the operation processing.

(b) If power is not supplied to the IBM PC/AT compatible PC
- It stops the operation processing.
- All points of outputs to the external devices are turned off.

(3) If a momentary power failure is detected in the power supply to the extension base unit
- It stops the operation processing. (Stop/run can be changed with parameters.)
- All points of outputs to the external devices are turned off.

5.2.4 Self-diagnostics

Self-diagnostics is a function with which the CPU board diagnoses itself for the presence of any abnormalities.

(1) Upon turning on the power to programmable controller or when an abnormality occurred while the programmable controller is running, the CPU board self-diagnostic processing prevents malfunctions of the programmable controller and performs preventive maintenance by detecting the abnormality, displaying an error display, halting the operation of the CPU board, and so forth.

(2) The CPU board stores the last occurred error to special register D9008 as an error code, and stores the detailed error code to special register D9091 by sub-dividing the contents of the error.

(3) Even with the power-off, the latest error information and the previous 15 errors are stored by battery back-up. With the AnUCPU-supporting system FD, the contents of up to 16 errors can be verified from the peripheral devices.

(4) When the self-diagnostics detects an error, the module will be in one of the following two modes:
- A mode wherein the operation of the programmable controller is paused
- A mode wherein the operation of the programmable controller continues

In addition, there are errors at which the operation can be selected to pause or to continue by the parameter setting.

(a) When a pause-operation mode error is detected by the self-diagnostics, the operation is paused at the time of error detection, and all outputs (Y) are set to off.

(b) When a continue-operation mode error is detected, only the part of the program with the error is not executed while all other parts are executed. Furthermore, in case of an I/O module verification error, the operation is continued using the I/O address prior to the error.

When an error is detected, the error generation and error contents are stored in the special relay (M) and special register (D); use them in the program to prevent any malfunctions of the programmable controller or machine systems especially when the mode is continue-operation.

The error descriptions detected by the self-diagnostics are shown on the next page.

REMARK

1) The priority order of the LED display can be changed with respect to the LED display message if the CPU is in the operation mode. (An error code is stored in the special register.)
2) When special relay M9084 is on, checking for blown fuse, I/O verification and low battery are not performed. (An error code is not stored in the special register.)
3) The "Error display of peripheral devices" in the self-diagnostic functions table lists messages displayed by the PC diagnostics of peripheral devices.

Self-diagnostic functions

Diagnostic item		Diagnostic timing	CPU state	State of "RUN" LED	Error display of peripheral devices	Error code (D9008)
Memory error	Instruction code check	Upon execution of each instruction	Stop	Flicker (Flashing)	INSTRUCT. CODE ERR.	10
	Parameter setting check	• Upon power on and reset • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			PARAMETER ERROR	11
	No END instruction	• When the M9056 or M9057 is ON • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			MISSING END INS.	12
	Unable to execute instruction	• Upon execution of instructions [CJ], [SCJ], [JMP], [CALL (P)], [FOR to NEXT], and [CHG]. • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			CAN'T EXECUTE (P)	13
	Format (CHK instruction) check	Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			CHK FORMATERR.	14
	Unable to execute instruction	• When interruption occurred • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			CAN'T EXECUTE (I)	15
CPU error	RAM check	• Upon power on and reset • When the M9084 is on during STOP	Stop	Flicker (Flashing)	RAM ERROR	20
	Operation circuit check	Upon power on and reset			OPE. CIRCUIT ERR.	21
	Watchdog error monitoring	Upon execution of the END instruction			WDT ERROR	22
	END instruction not executed	Upon execution of the END instruction			END NOT EXECUTE	24
	Main CPU check	Always			MAIN CPU DOWN	26
I/O error	I/O module verification ＊1 (Default: stop)	Upon execution of END instruction (Not checked when M9084 or M9094 is on.)	Stop / Operate	Flicker (Flashing) / ON	UNIT VERIFY ERR.	31
	Fuse blown ＊1 (Default: operate)	Upon execution of END instruction (Not checked when M9084 or M9094 is on.)			FUSE BREAK OFF.	32
Special function module error	Control bus check	Upon execution of the FROM/TO instruction	Stop	Flicker (Flashing)	CONTROL–BUS ERR.	40
	Special function module error	Upon execution of the FROM/TO instruction			SP. UNIT DOWN	41
	Link module error	• Upon power on and reset • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			LINK UNIT ERROR	42
	I/O interrupt error	When interruption occurred			I/O INT. ERROR	43
	Special function module assignment error	• Upon power on and reset • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)			SP UNIT LAY. ERR.	44
	Special function module error ＊1 (Default: stop)	Upon execution of the FROM/TO instructions	Stop / Operate	Flicker (Flashing) / ON	SP. UNIT ERR.	46
	Link parameter error	• Upon power on and reset • Upon switching from (STOP, PAUSE) to (RUN, STEP-RUN)	Operate	ON	LINK PARA. ERROR	47
Battery	Low battery	Always (Not checked when M9084 is on.)	Operate	ON	BATTERY ERROR	70
Operation error ＊1 (Default: operate)		Upon execution of each instruction	Stop / Operate	Flicker (Flashing) / ON	OPERATION ERROR [<CHK> ERROR□□□] ＊2	50

＊1: Can be changed by parameter settings from a peripheral device.

＊2: Displayed as a three-digit failure code only for errors with the "CHK" instruction.

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5.2.5 Device list

The usage range of the CPU board devices is shown below.

Device List

Device		Range of usage (points) CPU board	Description of device
X	Input	X, Y 20 to 3FF (992 points) • External output is possible for C0 to 3FF. • 32 points (0 to 1F) are fixed by the system and not available.	Used to supply programmable controller commands and data from peripheral devices such as push-buttons, select switches, limit switches and digital switches.
Y	Output		Used to output control results of a program to external devices such as solenoids, magnetic switches, signal lights and digital display device.
X	Input	X, Y 20 to 1FFF (8160 points)	• Devices after the I/O points used within the I/O specification range for each CPU board (described above) to a maximum of 8192 points (external output is not allowed) can be used in a program. • Allocated for automatic I/O refreshing of the MELSECNET/MINI-S3 or for remote I/O of the MELSECNET/10.
Y	Output		
M	Special relay	M9000 to 9255 (256 points)	An auxiliary relay used inside the programmable controller set in advance for a special use.
	Internal relay	M/L/S 0 to 8191 (8192 points) 8192 points as a total of M, L, and S	An auxiliary relay inside the programmable controller that cannot output directly to external devices.
L	Latch relay		An auxiliary relay inside the programmable controller that cannot output directly to external devices and has a power failure compensation function.
S	Step relay		Used in the same manner as the internal relay (M). Used as a relay to indicate the stage number of the process stepping program, etc.
B	Link relay	B0 to B1FFF (8192 points)	An internal relay for data link that cannot output to external devices. The range not set with link parameters can be used as the internal relay.
F	Annunciator	F0 to F2047 (2048 points)	For fault detection. A fault detection program is created in advance, and if it is turned on during RUN, the number is stored in the special register D.
T	100 ms timer 10 ms timer 100 ms cumulative timer	T0 to T2047 (2048 points) (Register for storing setting value(s) is required for T256 and later.)	Cumulative timer. There are three kinds: 100 ms timer, 10 ms timer and 100 ms retentive timer.
C	Counter	C0 to C1023 (1024 points)	There are two kinds: the cumulative counter used in programmable controller programs and the interrupt counter which counts number of interrupts.
	Interrupt counter	• Interrupt counters C224 to C255 fixed. • (Register for storing setting value(s) is required for C256 and later.)	
D	Data register	D0 to D8191 (8192 points)	Memory used to store data inside programmable controller.
	Special register	D9000 to D9255 (256 points)	Data memory set in advance for a special use.

Device		Range of usage (points) CPU board	Description of device
W	Link register	W0 to W1FFF (8192 points)	Register for data link. The range not set with link parameters can be used as a substitute for a data register.
R	File register	R0 to R8191 (8192 points)	Used for extending the data register and in the user memory area.
A	Accumulator	A0, A1 (2 points)	Data register used to store an operation result of basic and application instructions.
Z V	Index register	V, V1 to V6, Z, Z1 to Z6 (14 points)	Used for qualification of devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, and P)
N	Nesting	N0 to N7 (8 levels)	Indicates nesting structure of master control.
P	Pointer	P0 to P255 (256 points)	Indicates destination of branch instructions (CJ, SCJ, CALL, and JMP).
I	Interrupt pointer	I0 to I31 (32 points)	When an interrupt is generated, this pointer indicates the destination of the interrupt program corresponding to the interrupt.
K	Decimal constant	K-32768 to 32767 (16-bit instruction) K-2147483648 to 2147483647 (32-bit instruction)	Used to designate setting values of timers/counters, pointer number, interrupt pointer number, bit device digits, and values for basic and application instructions.
H	Hexadecimal constant	H0 to FFFF (16-bit instruction) H0 to FFFFFFFF (32-bit instruction)	Used to designate values for basic and application instructions.

5.3 Parameter Setting Ranges

This section describes the parameter setting ranges and the user memory assignment contents, I/O device assignment method and automatic refresh procedure for the MELSECNET/MINI-S3.

5.3.1 List of parameter setting ranges

Parameters are used for assigning the user memory area inside the memory cassette and for setting various functions and device ranges.
The parameters are usually stored in the first 3 k bytes of the user memory area.
Of these parameters, the network parameters for the MELSECNET/10 are assigned and stored after the main sequence program area. (For more information, see Section 5.3.2.)
As shown in the list below, a default value is set to each parameter. Even though a default value can be used, the parameter values can be changed to a value suitable for a particular application within the setting range by the peripheral device.

Item \ Setting		Default value	Setting range CPU board
Main sequence program size		6 k steps	1 to 30 k steps (1 k steps = 2 k bytes)
File register		—	0 to 8 k points (1 k points = in 2-k byte units)
Extension file register		—	1 block = 16 k bytes (Block setting for from No.1 to No.8, and from No.10 to the end of unused area in the memory) [Automatically set up in the unused area in the memory based on the file register setting.]
Comment size		—	0 to 4032 points (64-point unit = in 1 k byte units) [When the comment size is set, 1 k byte is added to the memory area.]
Extended comment size		—	0 to 3968 points (64-point unit = in 1 k byte units)
Status latch		—	No parameter setting • Stores devices and the result of each mode of status latch and sampling trace. • Performed by setting the extension file register. (See ACPU Programming Manual (Basic).)
Sampling trace		—	
Latch range setting (power failure compensation)	Link relay (B)	• Latch: L1000 to L2047 only. • None for others.	B0 to B1FFF (1-point units)
	Timer (T)		T0 to T255 (1-point units) T256 to T2047 (1-point units)
	Counter (C)		C0 to C255 (1-point units) C256 to C1023 (1-point units)
	Data register (D)		D0 to D8191 (1-point units)
	Link register (W)		W0 to W1FFF (1-point units)
Link range setting for MELSECNET/10	Number of link stations	—	Optical link: maximum 64 stations Coaxial link: maximum 32 stations
	I/O (X/Y)		X/Y0 to X/Y1FFF (unit: 16 points)
	Link relay (B)		B0 to B1FFF
	Link register (W)		W0 to W1FFF
Settings for internal relay (M) latch relay (L) step relay (S)		• M0 to M999 • M2048 to M8191 • L1000 to L2047 • None for S	M/L/S 0 to 8191 (where M, L, and S are consecutive numbers)

Item \ Setting		Default value	Setting range: CPU board
Timer settings	T0 to T255	• T0 to T199 (100 ms) • T200 to T255 (10 ms)	• 256 points by 100 ms, 10 ms, and retentive timers (in 8-point units) • The timers are numbered consecutively.
	T256 to T2047	—	• 1792 points by 100 ms, 10 ms, and retentive timers (in 16-point units) • The timers are numbered consecutively. • Devices set: D, R, W (Setting required in case of 257 points or more.)
Counter setting	Interrupt counter setting	—	Sets whether or not to use interrupt counter (C224 to C225).
	Points used	256 points (C0 to C255)	• 0 to 1024 points (in 16-point units) • Devices set: D, R, W (Setting required in case of 257 points or more.)
I/O number assignment		—	• 0 to 64 points (in 16-point units): Input module/output module/special functional module/empty slot • Module model name can be registered.
Remote RUN/PAUSE contact setting		—	• X0 to X1FFF • RUN/PAUSE: 1 point (Setting of PAUSE contact only is not allowed.)
Operation modes when an error occurred	Fuse blown	Continue	Stop/Continue
	I/O verification error	Stop	
	Operation error	Continue	
	Special functional module check error	Stop	
	END batch processing	None	Yes/No
STOP to RUN display mode		Re-output operation status prior to STOP	Output before STOP/after executing operation
Print title registration		—	• 128 characters
Keyword registration		—	• Up to 6 characters in hexadecimal (0 to 9, A to F)
Link range settings for MELSECNET II	Number of link stations	—	0 to 64 station(s)
	Input/output (X/Y)		X/Y0 to 3FF (16-point units)
	Link relay (B)		B0 to BFFF (16-point units)
	Link register (W)		W0 to WFFF (1-point units)
Link range settings for MELSECNET/MINI, MELSECNET/MINI-S1		—	Number of supported modules : 0 to 8 Start I/O number : 0 to 1FF0 (in 10_H units) Model name registration : MINI, MINI-S3 Send/receive data : X, M, L, B, T, C, D, W, R, none (16-point units for bit devices) Number of retries : 0 to 32 times From/To response setting : Link priority, CPU priority Data clear setting at abnormal station : Retain/ Clear Abnormal station detection : M, L, B, T, C, D, W, R, none (16-point units for bit devices) Error number : T, C, D, W, R Number of total remote stations : 0 to 64 station (s) Send state setting during line error : Test message, off data Retain (send data)

5.3.2 Memory contents settings (for main program, file register, comment and other items)

The CPU board has 448 k bytes of user memory (RAM) as a standard. Data consisting of the parameters, the T/C setting values, the main program, the MELSECNET/10 network parameters, the extended comment, the file register, and the comment are stored in the user memory.

(1) Calculation of memory size

To use the user memory, determine the types of data to be stored and the memory size using. Calculate the memory size according to the following table.

Parameter settings and memory size

Item		Unit of setting	Memory size	Conversion to ROM	Remarks
Parameters, T/C setting values		—	4 k bytes	Allowed	The parameters and T/C setting values occupy 4 k bytes.
Main program	Sequence program	1 k steps	(Main sequence program size) × 2 k bytes		
	Microcomputer program	2 k bytes	(Main microcomputer program size) k bytes		The microcomputer program area is exclusively used by an SFC.
MELSECNET/10 network parameter ✻		—	(Network module) × 4 k bytes		One network module occupies up to 4 k bytes.
Extended comment		64 points	(No. of extended comment points)/64 + 1 k bytes	Not allowed	If the extended comment size is set, 1 k byte is used by the system.
File register		1 k points	(No. of file register points) × 2 k bytes		
Comment		64 points	(No. of comment points)/ 64 + 1 k bytes		If the comment size is set, 1 k byte is used by the system.

✻: The area used by the network parameters of the MELSECNET/10 changes depending on the contents set. The network parameter area size should be secured in 2 k byte units based on the total size of the settings. The memory size of each network parameter is as follows:

Item	Memory size (bytes)
Internal data	30
Routing parameters	390
Inter-link data transfer parameters	246
Common parameters	2164/module ✻1
Refresh parameters	92/module
Station specific parameters	1490/module

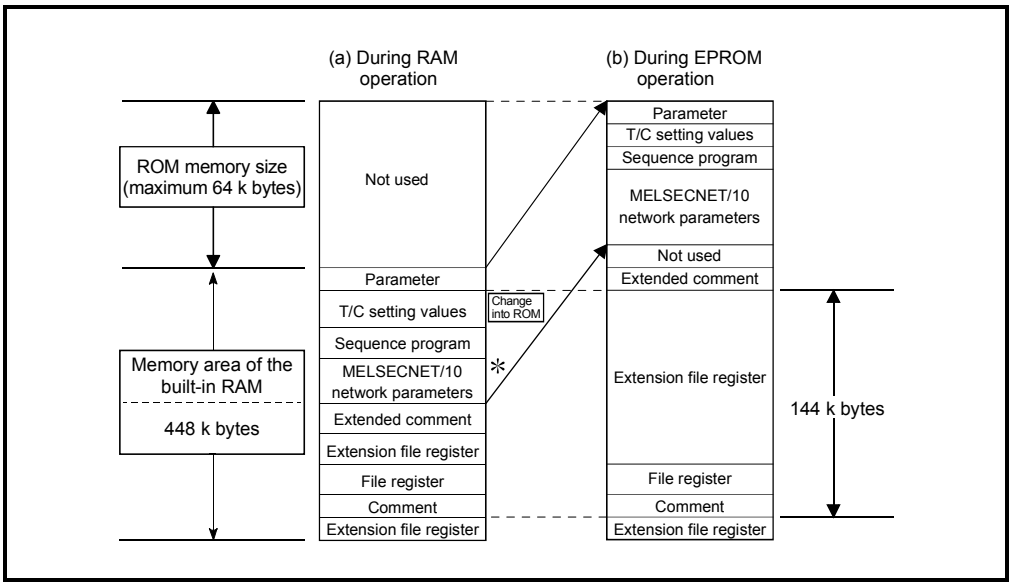
✻1: The memory size will be 2722 bytes for the remote master station.

The network parameter size for the MELSECNET/10 is determined from the total memory size calculated from above.

Total size of each setting	Network parameter setting size
30 to 2048 bytes	2 k bytes
2049 to 4096 bytes	4 k bytes
4097 to 6144 bytes	6 k bytes
6145 to 8192 bytes	8 k bytes
8193 to 10240 bytes	10 k bytes
10241 to 12288 bytes	12 k bytes
12289 to 14336 bytes	14 k bytes
14337 to 16384 bytes	16 k bytes

(2) Order of storage in the user memory

Various data set with parameters are stored in the order shown below:



* If a MELSECNET(II) data link system is configured using the AnU corresponding GPP function, 2 k bytes (equivalent to 1 k step) are occupied as the link parameter area.

POINT
Note that the sequence program can use only up to 22 k steps when maximum 16 k bytes are used for the MELSECNET/10 network parameters. The memory area for the sequence program for the CPU board is the same as that of the MELSECNET/10. Therefore, only the remainder after subtracting the memory area used by the MELSECNET/10 network parameters from maximum 30 k steps can be used as a memory area for the sequence program.

5.3.3 Setting ranges of the timers and the counters

The following explains the setting ranges for the timers and counters.

(1) Timer setting ranges

(a) The default values of the timer setting ranges are as follows:

No. of timer points	: 256 points
100 ms timer	: T0 to T199
10 ms timer	: T200 to T255
Retentive timer	: None

(b) If the number of timer-use points is set to 257 or more, the default values will be as follows:

100 ms timer	: T0 to T199
10 ms timer	: T200 to T255
100 ms timer	: T256 to T2047

(c) The timer type can be arbitrarily set using contiguous numbers, with the T0 to T255 in 8-point units, and the T256 to T2047 in 16-point units. By setting the number of timer points that will actually be used, the timer processing time subsequent to the END instruction may be shortened.

(d) The timer setting values are as follows:

T0 to T255	: Constant or word device (D)
T256 to T2047	: Word device (D, W, R)

(Assign a setting value storage device for the values set with parameters.)

(2) Counter setting ranges

(a) The default values of the counter setting ranges are as follows:

No. of counter points	: 256 points
Normal counter	: C0 to C255
Interrupt counter	: None

(b) If the number of counter-use points is set to 256 points or more, the default values will be as follows:

Normal counter	: C0 to C255
Normal counter	: C256 to C1024

(c) Only counters ranging from C244 to C255 can be set as interrupt counters, and any other counters outside this range cannot be set.
Set a counter from the C224 to C255 as an interrupt counter in 1-point units with parameters. Any counters from the C224 to C255 which are not set as interrupt counters can be used as normal counters.

The interrupt counters from the C224 to C255 are assigned to interrupt pointers I0 to I31 as shown below, and count the occurrences of interrupts in the I0 to I31.

Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter
I0	C224	I8	C232	—	—	I24	C248
I1	C225	I9	C233	I17	C241	I25	C249
I2	C226	I10	C234	I18	C242	I26	C250
I3	C227	I11	C235	I19	C243	I27	C251
I4	C228	I12	C236	I20	C244	I28	C252
I5	C229	I13	C237	I21	C245	I29	C253
I6	C230	I14	C238	I22	C246	I30	C254
I7	C231	I15	C239	I23	C247	I31	C255

(d) Counter-use points can be set arbitrarily in 16-point units using contiguous numbers. By setting the points that will actually be used, the counter processing time subsequent to the END instruction may be shortened.

(e) The counter set values are as follows:
C0 to C255 : Constant or word device (D)
C256 to C1023 : Word device (D, W, R)
(Assign a storage device for the value set by the setting parameters.)

POINT

If the number of timer-use points is set to 257 points or more or the number of counter-use points is set to 256 points or more, the setting value storage devices (D, W, R), designated at the time of timer/counter use point setup, are automatically set using contiguous numbers.
<Example>
If the number of timer-use points is set to 512 points and the setting value storage device is set to the D1000, D devices (D1000 to D1255) equivalent to 256 points in the T256 to T511 will be device for the setting value.

5.3.4 I/O devices

The CPU board has I/O device points of 8,192 (X/Y0 to 1FFF) for each of inputs (X) and outputs (Y). Both actual I/O devices and remote I/O devices are included in this I/O range.

(1) Actual I/O devices

This represents the device range where I/O modules and special functional modules can be installed and controlled in the basic base unit/expansion base unit.

CPU board · · · 512 points (0 to 1F are occupied by the system.
20 to BF can be used as substitutes for internal relays.
C0 to 34F can be output to external devices as actual I/O.)

(2) Remote I/O devices

The remote I/O devices, after the actual I/O devices, can be used for the following items:

(a) Assignment of remote I/O stations in the MELSECNET(II) data link system.

(b) Assignment of remote I/O stations in the MELSECNET/10 network system.

(c) Assignment of the send/receive data storage devices in the MELSECNET MINI-S3's automatic refresh setting.

(d) As substitute for internal relays.

5.3.5 I/O assignments of special functional modules

By registering the model names of the following special functional modules for I/O assignments with a peripheral device, dedicated instructions for special functional modules can be used.

Model name of special functional module	Setting during module name registration
AD61	AD61
AD61-S1	AD61S1
AD59	AD59
AD59-S1	AD59S1
AJ71C24	AJ71C24
AJ71C24-S3	AJ71C24S3
AJ71C24-S6	AJ71C24S6
AJ71C24-S8	AJ71C24S8
AJ71UC24	AJ71UC24
AJ71C21	AJ71C21
AJ71C21-S1	AJ71C21S1
AJ71PT32-S3	PT32S3
AD57	AD57
AD57-S1	AD57S1
AD58	AD58
A1SJ71UC24-R2	A1SJ71UC24
A1SJ71UC24-R4	
A1SJ71UC24-PRF	
A1SJ71PT32-S3	A1SPT32S3

5.3.6 Automatic refreshing of the MELSECNET/MINI (S3)

By setting the link information, the I/O storage devices and other devices of the MELSECNET/MINI (S3) with parameters, the module automatically communicates with the buffer memory area of the batch refresh send/receive data of the A1SJ71PT32-S3/AJ71PT32-S3 master module (called the master module hereafter).

Sequence programs can be created using the I/O devices allocated to send/receive by automatic refresh settings. (The FROM/TO instructions are not required.)

POINT

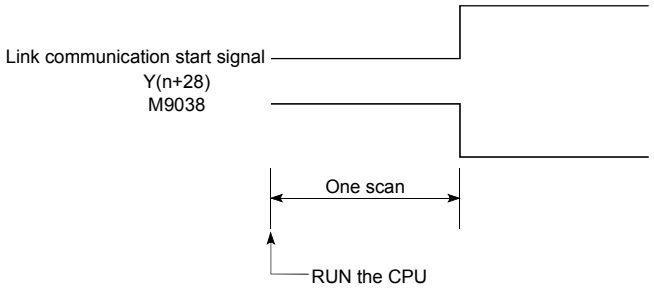
(1) Since up to eight master modules can be set for automatic refreshing with parameters, automatic refreshing is possible for up to eight modules. If nine or more modules are desired, use the FROM/TO instructions in the sequence program from the 9th module.

(2) Since automatic refreshing is not possible with send/receive data for split refresh I/O modules and for remote terminal modules numbers 1 to 14, the FROM/TO instructions should be used for these modules.
However, part of the remote terminal modules shown below are subject to automatic refreshing:
- AJ35PTF-R2 type RS-232C interface module
- AJ35PT-OPB-M1-S3 type mount-type tool box
- AJ35PT-OPB-P1-S3 type portable type tool box

(3) For the master modules designated for automatic refreshing, the CPU automatically turns on the link communication start signal Y(n+18) or Y(n+28), so it is not necessary to turn it on from the sequence program.

(4) Automatic refreshing of I/O data is performed in batches after the CPU executes the END instruction. (Automatic refresh processing is performed when the CPU is in the RUN/PAUSE/STEP RUN state).

(5) The master module may perform the processing while the link communication start signal Y(n+28) is off depending on the remote terminal module connected. For instance, if the AJ35PTF-R2 type RS-232C interface module is used with non procedure, it is necessary to write parameters to the parameter area (buffer memory address 860 to 929) while the link communication start signal is off. The link communication start signal is turned on after the CPU enters the RUN state and one scan is performed; write the parameters during the first scan.



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(1) The parameter setting items, setting ranges and contents of automatic refreshing, as well as the buffer memory address of the master module which is used for exchanging data with the CPU board are shown below. Set the parameters for the number of A1SJ71PT32-S3/AJ71PT32-S3 master modules used.

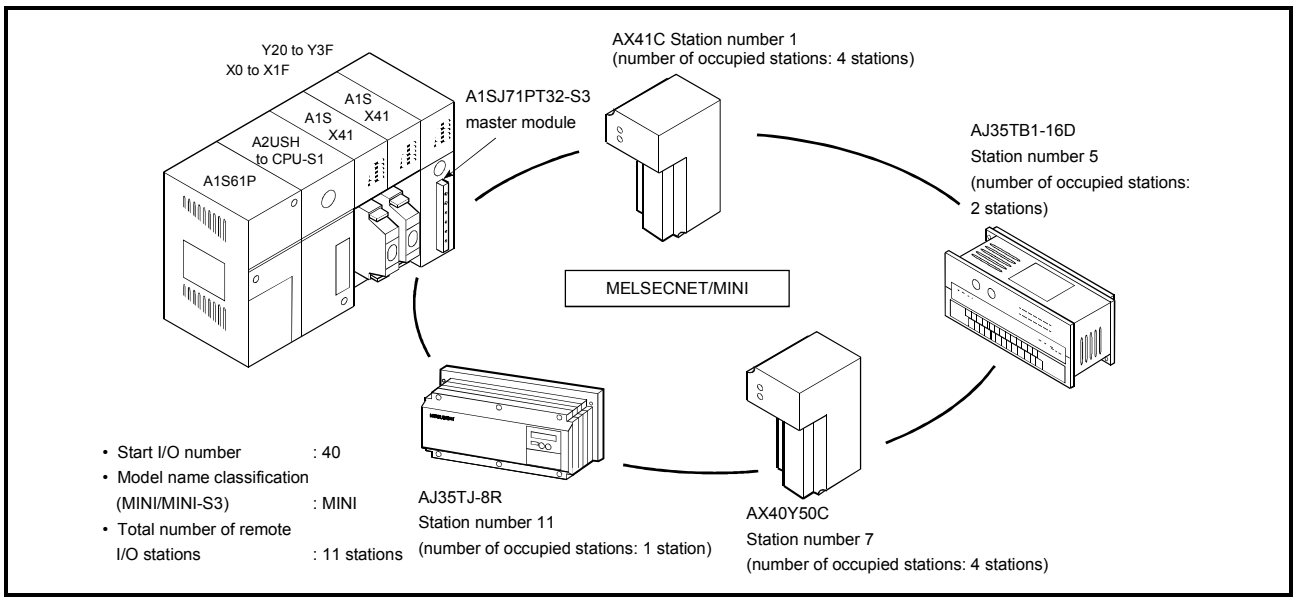
I/O signal from the master module	Buffer memory address of the master module	Item	Setting range	Description
—	—	Number of master modules	1 to 8 module (s)	• Sets the total number of master modules to be used.
—	—	Start I/O No.	I/O points of CPU	• Sets the start I/O No. where the master module is installed.
—	—	Model name classification of MINI/MINI-S3	MINI or MINI-S3	• MINI: In I/O dedicated mode (occupies 32 points) • MINI-S3: In extension mode (occupies 48 points)
—	0	Total number of remote I/O stations	0 to 64 station (s)	• Set only when MINI is set. • In MINI-S3, the setting is not necessary because the number of master modules' initial ROMs becomes valid. (If set, the setting is ignored).
—	110 to 141	Receive data storage device	• X • M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	• Sets the devices that will store receive/send data for batch refresh. • Designate the head number of the device. • The devices occupy points for the number of stations from the head of the device as the automatic refresh area (8 points/station × 64 stations = 512 points: Bit device) ＊2 • It is recommended to use X/Y remote I/O range for the devices.
—	10 to 41	Send data storage device	• Y • M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	
—	1	Number of retries	0 to 32 times	• Sets the number of retries when a communication error occurs. • An error is not output if communication is restored within the number of retries set.
Y (n+1A) ＊1	—	FROM/TO response designation	Link priority, CPU priority (Selection of priority access to the master module buffer memory)	(1) Link priority: Link access by MINI-S3 has the priority. The FROM/TO instruction waits during the link access. • Possible to read out the receive data refreshed at the same timing. • The FROM/TO instruction has to wait a maximum of {0.3ms+0.2ms × number of split refresh stations}. (2) CPU priority: Access with the FROM/TO instruction of the CPU has priority. It interrupts and accesses even during link access. • Depending on the timing, data received in the midst of I/O refreshing may be read. • No wait time for the FROM/TO instruction.
Y (n+1B) ＊1	—	Data clear designation for communication abnormal station	Retain, clear (receive data)	• Retain: Retains the received data for batch refreshing and split refreshing. • Clear: Sets all points to off
—	100 to 103 195	Abnormal station detection	M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	• Sets the head device that will store the abnormal station detection data. • MINI: Occupies 4 words; MINI-S3: Occupies 5 words.
—	107 196 to 209	Error number	T, C, D, W, R	• Sets the head device that will store the error code at the occurrence of an error. • MINI: Occupies 1 word; MINI-S3: Occupies (1+ number of remote terminal modules) words
—	4	Line error check constant (Line error)	• Test message sending • Off data sending • Data sending just before line error	• Sets data sending method for verification of error location in the occurrence of a line error.

＊1: "n" is determined by the installation location of the master module.

＊2: When the total number of remote I/O stations is an odd number, each storage device is occupied for one additional station.

(2) The following system example explains the setting of the send/receive data storage device.

<Example> Devices X/Y400 and later are used as remote I/O stations:



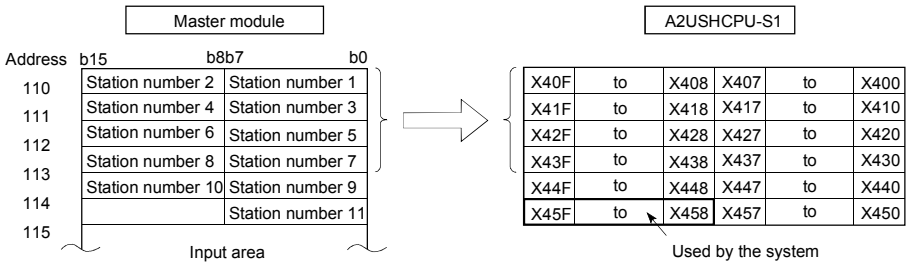
A sample parameter setting with the GPP function software for the above system configuration is shown below:

Number of modules [1] (0-8)

I/O No.	0040
Model name	MINI
Number of stations	11
Receive	X0400
Send	Y0400
Retries	5
Response	CPU
Data clear	Clear
Detection	
Error No.	
Abnormal	Retain

The storage devices for send/receive data for the example system shown above are set as follows:

(a) Storage device for receive data



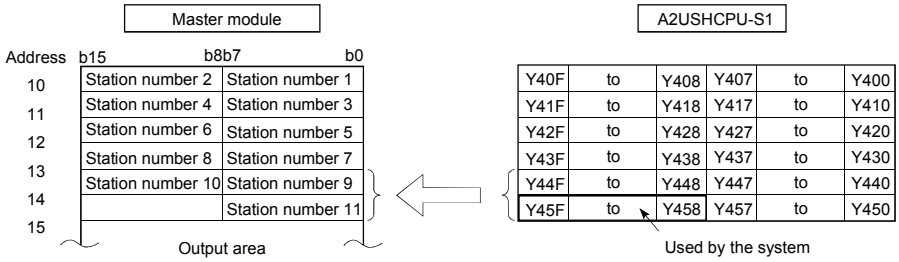
1) Set the device number (X400) for b0 of station number 1 as a receive data storage device
2) The receive data storage device occupies from X400 to X45F.
In the above example, the total number of stations is an odd number, so one additional station is used.

3) The device numbers of the connected I/O modules are as follows.

Station numbers 1 to 4 AX41C ⟶ X400 to X41F
Station numbers 5 to 6 AJ35TB-16D ⟶ X420 to X42F
Station numbers 7 to 8 AX40Y50C ⟶ X430 to X43F

X440 to X45F are also simultaneously refreshed, and always set to off.
Do not use X440 to X45F in the sequence program.

(b) Storage device for send data



1) Set the device number (Y400) equivalent to b0 of station number 1 as a send data storage device.
2) The send data storage device occupies from Y400 to Y45F.
In the above example, the total number of stations is an odd number, so one additional station is used.
3) The device numbers of the connected output modules are as follows.

Station number 9 to 10 AX40Y50C ⟶ Y400 to Y44F
Station number 11 AJ35TJ-8R ⟶ Y450 to Y457

Y400 to Y43F and Y458 to Y44F are also simultaneously refreshed, but are not output.

POINT

(1) Set the send and receive data storage devices so that the device numbers are not duplicated.
If the receive data storage device is set to B0 in the system configuration in the example, B0 to B5F are occupied as a device range.
Set the send data storage device to B60 or higher. If the send data storage device is set to B60, the device range will be B60 to BBF.

(2) If a bit device is designated as the send/receive data storage device, make sure to set a device number that is a multiple of 16.
<Example> X0, X10, •••• X100, ••••
M0, M16, •••• M256, ••••
B0, B10, •••• B100, ••••

(3) The device range used is (8 points) × (number of stations). If the number of stations is an odd number, extra eight points are required.

5.4 External Power Supply Specifications

This section shows the external power supply specifications and wiring.

(1) Power supply specifications

Item	Specification
Output voltage	5.0 VDC ± 5 %
Maximum output current	2.0 A (make sure to consider derating due to operating temperature.)

*: Please use an external power supply compliant with UL1310 Class 2.

(2) Wiring

(a) Plug

Use the plug with the following model name that is connected to the external power supply connector.

Item	Description
Manufacturer	AMP
Model number	172166-1
Number of poles	3
Material	94 V-0 grade nylon

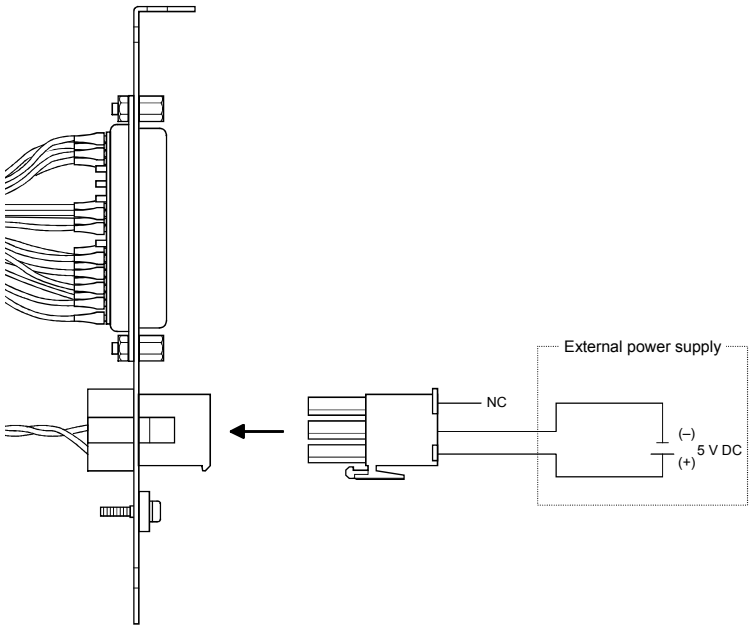
(b) Pins

Use the pins with the following model names that are to be inserted into the plug.

Item \ Model number	Terminal (pin)			
	Linked	Single	Linked	Single
	170359-4	170363-4	170360-4	170364-4
Manufacturer	AMP			
Insulation covering external diameter (mm)	1.2 to 1.8		1.5 to 2.4 (Max. 3.4)	
Applicable wire size (mm^2)	0.12 to 0.35		0.3 to 0.89 0.3 to 0.35 × 2 wires	

(c) Wiring diagram

Wire the external power supply as shown in the figure below and connect it to the external power supply connector of the RS-422/external power supply connecting bracket.



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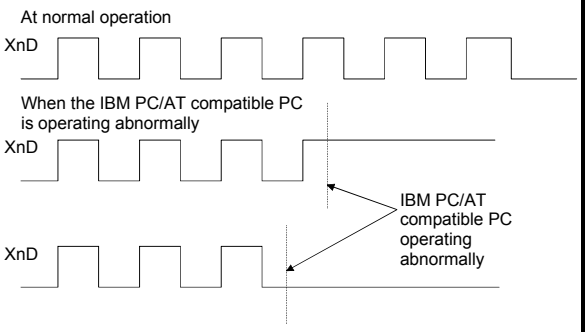
5.5 I/O Signals

This section explains the I/O signals.

(1) Input signals (IBM PC/AT compatible PC → programmable controller CPU)

There are 16 points of input signals, Xn0 to XnF.

Input signal	Signal name	Description
Xn0 to XnA	—	Not used
XnB	PC ready signal	• Turns on when the IBM PC/AT compatible PC is ready after powering on or resetting. • Turns off if the IBM PC/AT compatible PC cannot continue the operation due to an error.
XnC	—	Not used
XnD	Driver start signal	• Used to check that the IBM PC/AT compatible PC is not operating abnormally. • Repeats turning on/off at a fixed interval (400 ms) while the driver is operating. 
XnE, XnF	—	Not used

(2) Output signals (programmable controller CPU → IBM PC/AT compatible PC)

There are 16 points of output signals, Y (n+1) 0 to Y (n+1) F.

Output signal	Signal name	Description
Y (n+1) 0 to Y (n+1) F	—	Not used

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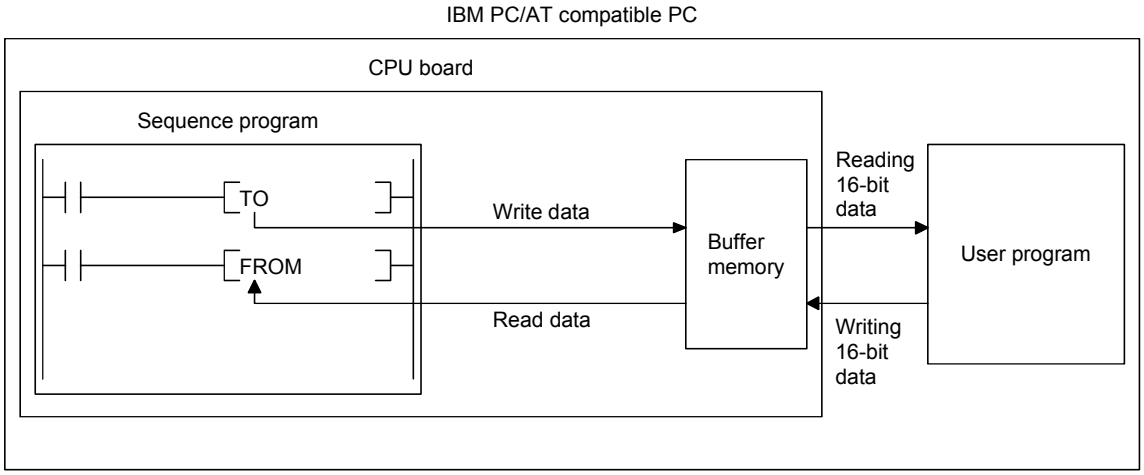
5.6 Buffer Memory

16-bit data communication between the IBM PC/AT compatible PC and the CPU board is performed by reading/writing data from/to the CPU board's buffer memory using a user program or a sequence program.



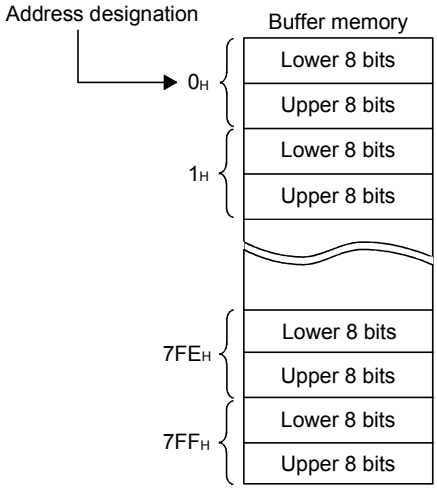
(1) From CPU board to IBM PC/AT compatible PC

Reads the 16-bit data that has been written into the CPU board's buffer memory with the CPU board's sequence program (with the TO instruction), using the communication function (device type 50, local station buffer memory) of the user program.

(2) From IBM PC/AT compatible PC to CPU board

Reads the 16-bit data that has been written into the CPU board's buffer memory with the communication function (device type, local station buffer memory) of the user program, using the CPU board's sequence program (with the FROM instruction).

(3) The buffer memory of the CPU board is 2 k words (4 k bytes).
Addresses are designated from both the CPU board side and the IBM PC/AT compatible PC side in 1-word unit and 0_H to $7FF_H$ in hexadecimal.

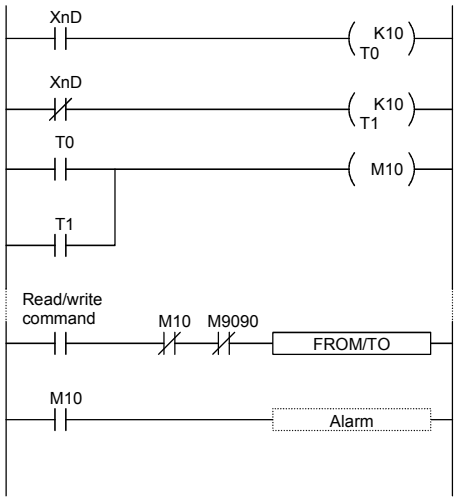


REMARK

For details about the communication functions, see MELSEC Communication Function HELP of the software.

POINT

Interlock the sequence program as shown below when writing/reading data from the CPU board to the buffer memory.



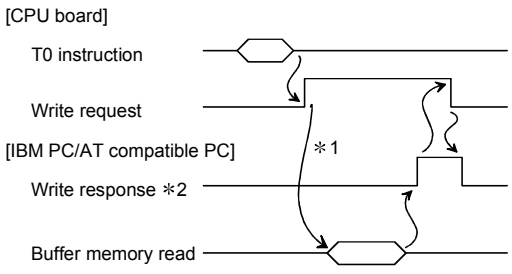
(1) Set a value of 1000 ms or more for the T0 and T1.

(2) When the IBM PC/AT compatible PC is powered off, the M9090 is turned on and the FROM/TO instruction is not executed.

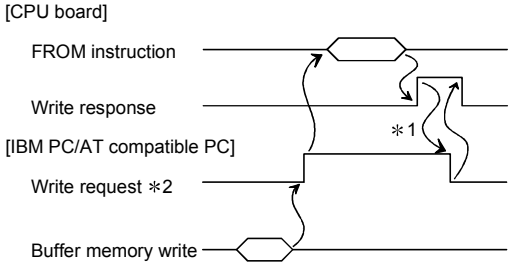
(3) If the IBM PC/AT compatible PC malfunctions, the M10 turns on after the setting time of both the T0 and T1 and the FROM/TO instruction is not executed.

(4) When sending/receiving data between the IBM PC/AT compatible PC and the CPU board's sequence program via the buffer memory, make sure that the data is transmitted by handshaking (example: use device D0 as a write request and a write response flag).

CPU board → IBM PC/AT compatible PC



IBM PC/AT compatible PC → CPU board



*1: Use mdReceive/mdRandR in order to get a write request and a write response from the IBM PC/AT compatible PC.
*2: Use mdDevSet (flag on)/mdDevRst (flag off) or mdSend/mdRandW in order to set a write response and a write request from the IBM PC/AT compatible PC.

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5.7 Function List

The following table lists various functions of the CPU board.

Function [application]	Description	Outline of setting and operation
Constant scan [• Program execution at constant intervals • Simplified positioning]	• Makes the processing time for a single scan in the sequence program constant. • Set the processing time within the range of 10 ms to 190 ms in 10 ms units.	• Write to the special register D9020 by the sequence program.
Latch (power failure compensation) [Continuous control by data retention at power failure]	• At power failures of 20 ms or longer/CPU reset/power off, data contents are retained for the devices for which latches have been set up in advance. • Latch-enabled devices: L, B, T, C, D, W • Latched data are backed up by the batteries.	• Latch devices and latch range are performed by the settings of the peripheral device parameters.
Automatic refresh of MELSECNET/MINI-S3 [Simplification of sequence program]	• Performs I/O automatic refresh communication with send/receive data area for the batch refresh of up to eight AJ71PT32-S3/ A1SJ71PT32-S3 modules. • Automatic refreshing is executed in batches after the END processing. • The FROM/TO instructions for I/O in the sequence program are not required. Programming is possible with I/O devices which are directly allocated.	• Perform by setting the automatic refresh parameters of a peripheral device. (see Section 5.3.6)
Remote RUN/STOP [When performing RUN/ STOP control from outside the programmable controller]	• When the programmable controller CPU is in the RUN state (the key switch is set to RUN), this function directs the programmable controller to RUN/STOP from outside the programmable controller (external input, peripheral devices, computer) with a remote operation.	• When performed by the external input (X), set the parameters with a peripheral device. • When performed from a peripheral device, do so in the PLC test mode. • When performed via a computer link module, use the dedicated commands.
PAUSE [• When stopping operation of CPU while retaining the output (Y) • When performing RUN/ PAUSE control from outside the programmable controller]	• Stops the calculation processing of the PLC CPU while retaining the on/off status of all the outputs (Y). [When the operation is stopped by STOP, all the outputs (Y) are set to off.] • When the programmable controller CPU is in the RUN state (the key switch is set to RUN), this function directs the programmable controller to PAUSE/RUN from outside the programmable controller (external input, peripheral devices) with a remote operation.	• Performed with a peripheral device in the PLC test mode. • When performed by the external input (X), set the parameter with a peripheral device, turn on the special relay M9040 by the sequence program.
Status latch [Performs operation check and failure factor check on each device when debugging or a failure condition is enabled.]	• When the status latch conditions are met with respect to devices for which status latches are set up, the data contents of the devices are stored in the extension file register for the status latch area in the memory cassette. (stored data are cleared by the latch clear operation). • It is possible to select the time when the conditions are enabled from when the sequence program executes the SLT instruction or when the device value matches the set condition.	• Set the device to which the status latch is performed and the extension file register where the data will be stored using a peripheral device. • Monitor the status latch data using a peripheral device.

Function [application]	Description	Outline of setting and operation
Sampling trace [Performs chronological checking on the operation status of set devices when debugging or an abnormal operation is detected.]	• The operating conditions of the device for which the sampling trace is set up, is sampled for the number of times set per scan or per period, and the results are stored in the extension file register for sampling trace in the memory cassette. (The data stored are cleared by the latch clear operation.) • The sampling trace is performed by executing the STRA instruction in the sequence program.	• Set the device to which sampling trace is performed and trace point and the extension file register where the number of times and the data will be stored using a peripheral device. • Monitor the result of the sampling trace using a peripheral device.
Step operation [Checks conditions of program execution and operation during debugging, etc.]	• Executes operations of the sequence program under one of the conditions (1) through (5) below, and then stops: (1) Executes for each instruction. (2) Executes for each circuit block. (3) Executes using the step interval time and the number of loops. (4) Executes using the number of loops and break points. (5) Executes when the device values match.	• Selects and sets a stepping operation condition for the peripheral device and executes.
Clock ＊1 [Program control by clock data/external display of clock data]	• Executes built-in clock operation for the CPU module. • Clock data: Year, month, day, hour, minute, second, day of the week • When the clock data read request (M9028) is on, the clock data are read out and stored in the D9025 to D9028 by the clock after the END processing of the sequence operation. • The clock element is backed up by the battery of the memory cassette.	• Sets data for the D9025 to D9028 with a peripheral device, turns on the M9025, and then writes to the clock element. • Writes to the clock element by the sequence program. (Dedicated instructions may be used.)
Priority order of LED display [Changing priority order of display/ canceling display]	• Changes the display order or cancels the error LED displays excluding the error displays that stop an operation, or the items displayed on the LED display device by default.	• Writes change order/non-display data to the D9038 or D9039 by the sequence program.
Self-diagnostic function [• Abnormal detection of CPU operation • Preventive maintenance]	• When an error that matches one of the self-diagnostic items is generated at the CPU power on or during RUN, it prevents malfunctions by stopping the CPU operation and displaying the error. • Stores the error codes corresponding to the self-diagnostic item.	• For some self-diagnostic items, an operation can be continued or stopped by the setting parameters of the peripheral device. • Reads out an error code with a peripheral device and performs troubleshooting.

＊1: Regarding the countermeasures for year 2000 (Y2K) problem
Year 2000 is a leap year, thus there is a day following February 28th which is February 29th.
With this CPU board, the clock element built in the CPU module automatically corrects the date, so resetting the date in the clock by the user is not required.
To read the clock data from the programmable controller CPU to use it for sequence control, the year data contains only the last two digits of Gregorian calendar year. Thus, depending on the application of the data, correction of the year data by the sequence program may be required.
Year 1999 → "99"
Year 2000 → "00"
If the CPU decides the year using only the last two digits of the year data using the magnitude comparison instruction alone, year 2000 and succeeding years will be judged to be earlier than year 1999.

6 COMPONENT NAMES AND SETTINGS

This chapter explains some precautions that should be observed when handling the CPU board, the procedure for mounting it on the IBM PC/AT compatible PC, the names and settings of the components, and the mounting of the RS-422/external power supply connecting bracket.

6.1 Handling Precautions

This section explains some precautions that should be observed when handling the CPU board:

DANGER

- Do not touch the terminals and the connectors while the power to the module is on. Doing so may cause electric shocks or malfunctions.

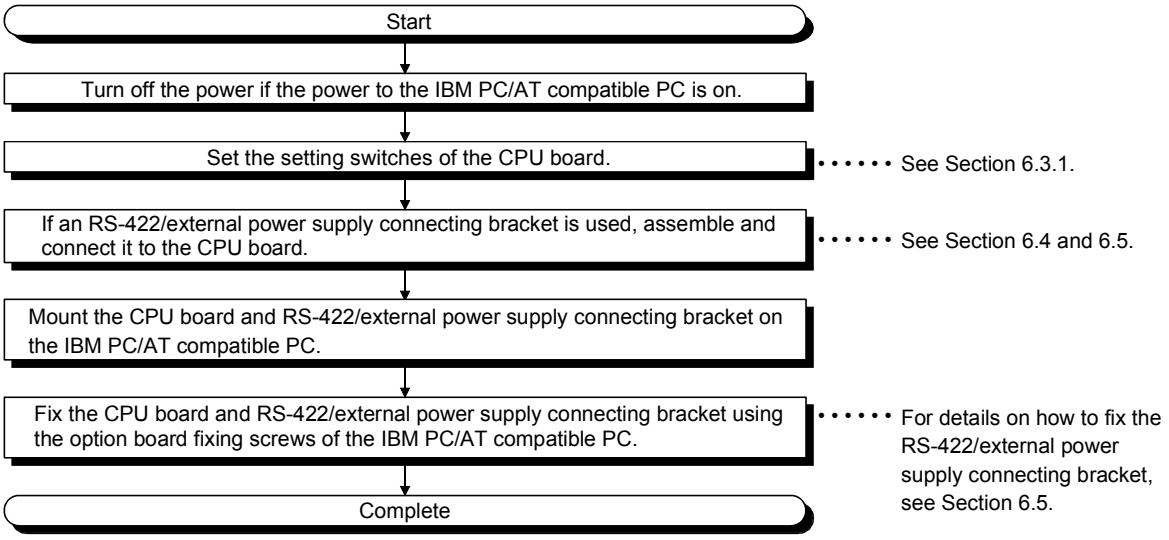
CAUTION

- Fix the CPU board securely with the mounting screws and tighten the mounting screws within the specified torque.
  If the screws are loose, it may cause malfunctions.
  If the screws are tightened excessively, it may damage the screws and module and cause malfunctions.
- Do not directly touch the conducting part of the CPU board.
  It may damage the CPU board or cause malfunctions.
- Before handling the CPU board, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunction of the CPU board.
- While handling the CPU board, make sure to keep it free of static electricity.
  Static electric charges may damage the CPU board or cause malfunctions.
- Be careful not to let any foreign objects such as wire chips get inside the IBM PC/AT compatible PC.
  They may cause fire, breakdowns or malfunctions.
- Never disassemble or modify the CPU board.
  This may cause breakdowns, malfunctions, injuries or fire.
- Before mounting or dismounting the CPU board to/from the IBM PC/AT compatible PC, make sure to shut off all phases of the external power supply.
  Failure to do so may damage or cause the IBM PC/AT compatible PC to malfunction.
- When disposing of this product, treat it as an industrial waste.
- Do not drop the CPU board or subject it to any excessive shock.
  This may damage or cause the CPU board to malfunction.

6 - 1

6.2 How to Mount the CPU Board on the IBM PC/AT Compatible PC

This section explains the procedure for mounting the CPU board on the IBM PC/AT compatible PC.



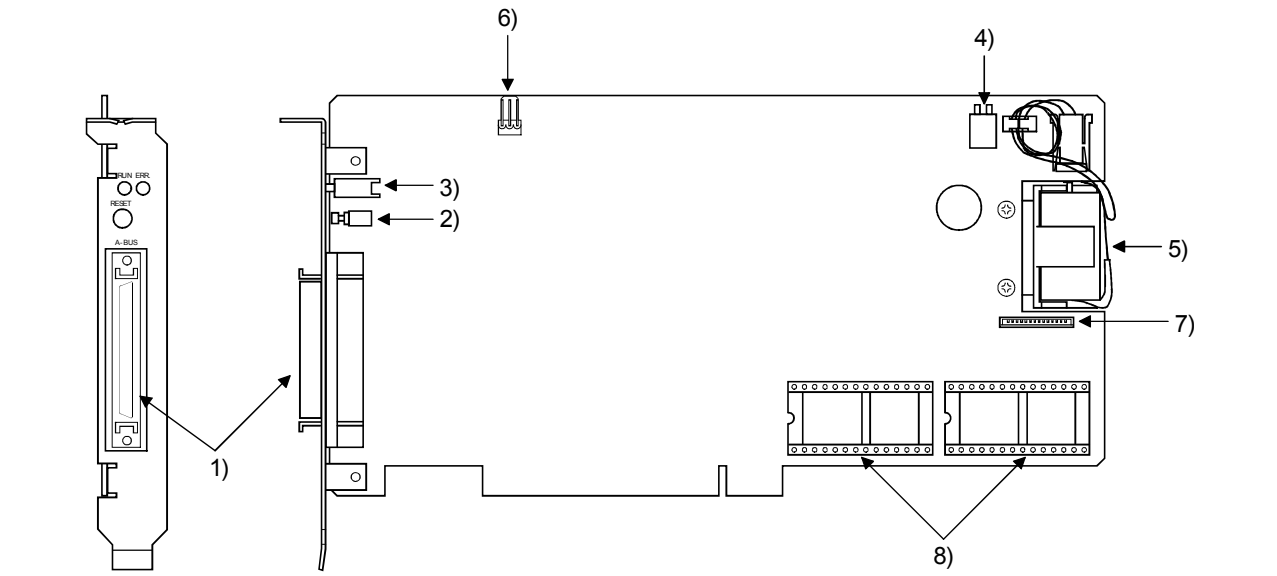
6 - 2

6.3 Component Names and Settings

This section explains the names and settings of the components of the CPU board and the RS-422/external power supply connecting bracket that is connected to the CPU board.

6.3.1 CPU board

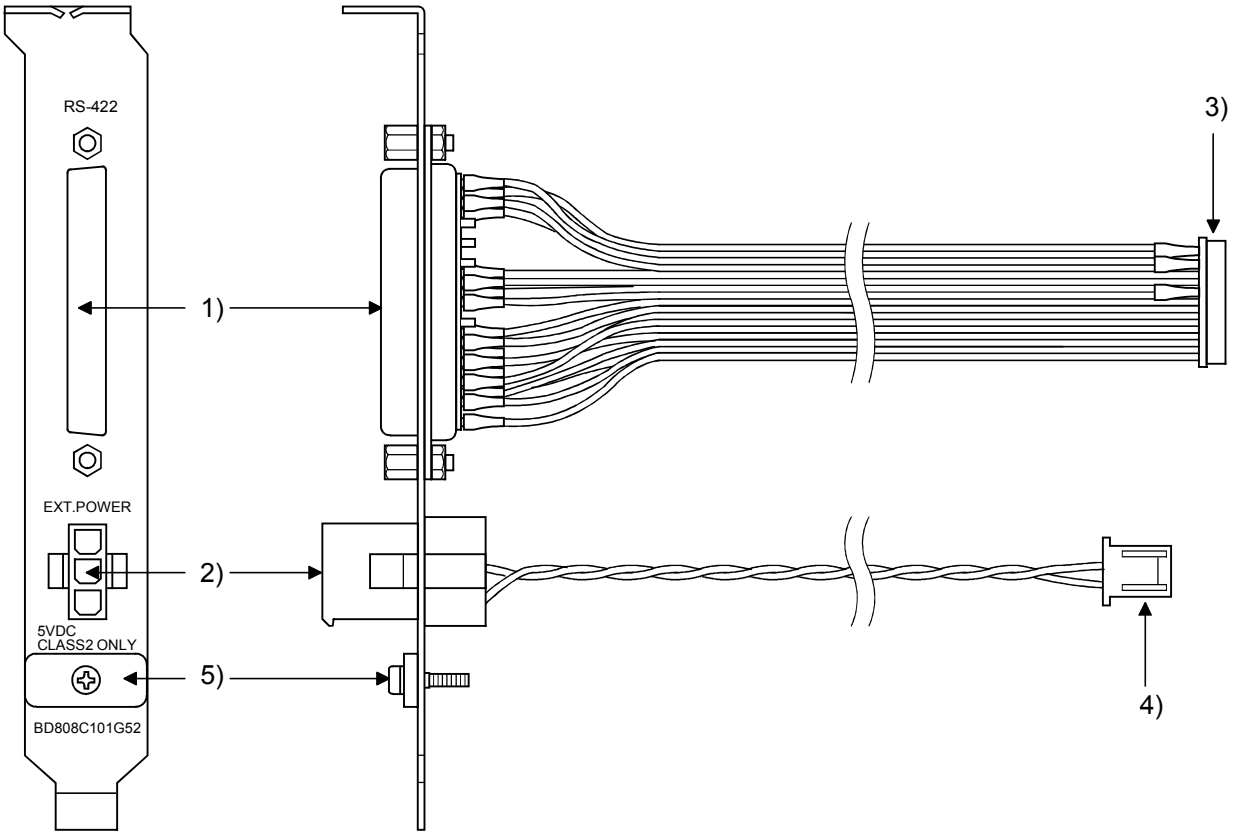
The names and settings of the components of the CPU board are listed below.



Number	Name	Description
1)	A bus extension cable connector	Connector for the extension cable (A1SC□NB/A1SC□B) which is used to connect to the extension base unit.
2)	Reset switch	Switch for resetting the CPU board
3)	Operation LED display	**Board status** / **Description** RUN: Light on : During execution of the sequence program. Light off : 1. When the CPU operation key is in the stop position. 2. When there is remote stop. 3. When there is remote pause. Light blinking : When the self diagnosis function has detected an error that will stop the processing of the sequence program. ERROR: Light on : The self diagnosis function has detected an error. Light blinking : The annunciator (F) in the sequence program has been set to on. Light off : 1. Normal 2. A fault has been detected by CHK instruction. 3. Pressed "INDICATOR RESET" button after the error.
4)	Setting switches	**Setting item** / **Setting description** Extension base unit switching: Sets the type of the extension base unit connected to the CPU board. On: A series extension base unit Off: AnS series extension base unit (factory setting) Error detection temperature switching: Sets the reference temperature at which a temperature error is detected. On: 57 °C Off: 47 °C (factory setting)
5)	Battery for memory backup	Battery for backing up programs, device/data registers in the latch range and parameters in case of instantaneous power failure
6)	External power supply connector	Connector for the external power supply cable
7)	Connector for RS-422 cable	Connector for the RS-422 cable
8)	Memory socket for ROM	• A socket for mounting ROM on the CPU board • For details on how to mount the ROM (4KROM, 8KROM, 16KROM) that can be mounted on the CPU board, see Section 7.2, "ROM."

6.3.2 RS-422/extenal power supply connecting bracket

The names and settings of the components of the RS-422/external power supply connecting bracket are listed below.



Number	Name	Description
1)	RS-422 connector	Connector for the RS-422 cable.
2)	External power supply connector	Connector for the external power supply cable. ＊1
3)	RS-422 cable	• Cable for connecting the RS-422 connector of the RS-422/external power supply connecting bracket to the connector of the CPU board. • For details on the connection method, see Section 6.5, "Mounting the RS-422/External Power Supply Connecting Bracket."
4)	External power supply cable	• Cable for connecting the external power supply connector of the RS-422/external power supply connecting bracket to the connector of the CPU board. • For details on the connecting method, see Section 6.5, "Mounting the RS-422/External Power Supply Connecting Bracket."
5)	Screw fixture	Metal fixture for fixing the RS-422/external power supply connecting bracket to the IBM PC/AT compatible PC.

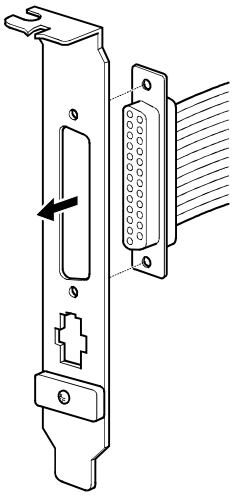
＊1: For details on the specifications and wiring of the external power supply, see Section 5.4, "External Power Supply Specifications."

6.4 Assembling the RS-422/External Power Supply Connecting Bracket

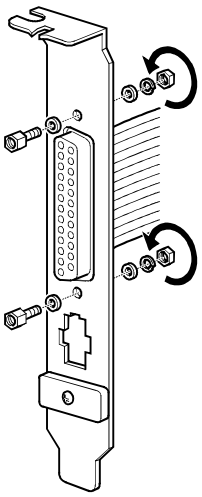
The following explains the assembling procedure of the RS-422/external power supply connecting bracket.

(1) Connecting the RS-422 connector

1) Insert the RS-422 connector to the RS-422/external power supply connecting bracket.



2) Insert the washers as shown in the figure below, and tighten the nuts to fix the RS-422 connector.

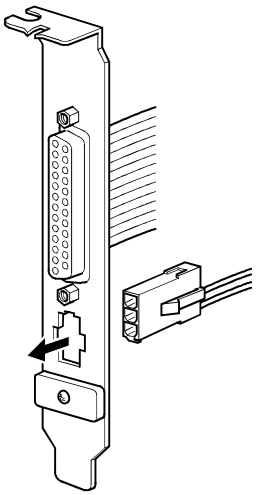


CAUTION

Make sure to tighten the nuts securely to fix the RS-422 connector in place.

(2) Connecting the external power supply connector

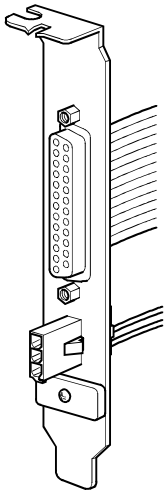
Insert the external power supply connector into the RS-422/external power supply connecting bracket.



CAUTION

Insert the external power supply connect all the way to the back so that it is fixed in place by the latches.

(3) Finished assembly

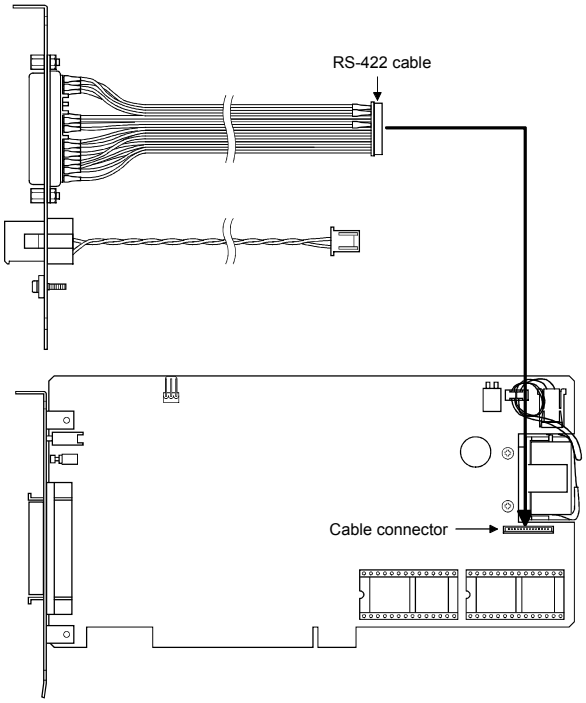


6.5 Mounting the RS-422/External Power Supply Connecting Bracket

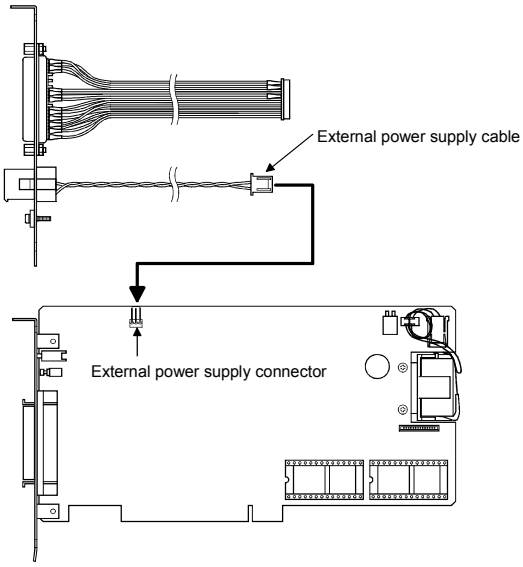
The following explains the procedures for mounting the RS-422/external power supply connecting bracket.

(1) Procedure for connecting the RS-422/external power supply connecting bracket and the CPU board

1) Connect the RS-422 cable of the RS-422/external power supply connecting bracket to the cable connector of the CPU board.

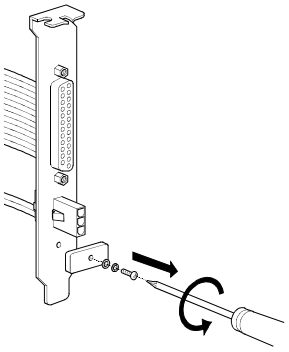


2) Connect the external power supply cable of the RS-422/external power supply connecting bracket to the external power supply connector of the CPU board.



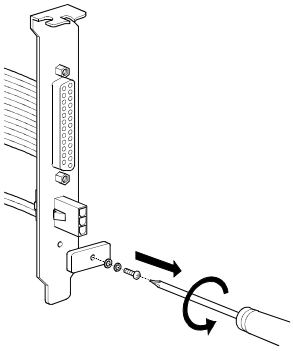
(2) Procedure for mounting the RS-422/external power supply connecting bracket on the IBM PC/AT compatible PC

1) When mounting the RS-422/power supply connecting bracket on an IBM PC/AT compatible PC with a PCI bus slot that is structured to fix the bottom part of the RS-422/external power supply connecting bracket, remove the screw fixture before mounting the power supply connecting bracket on the IBM PC/AT compatible PC as shown in the figure below.



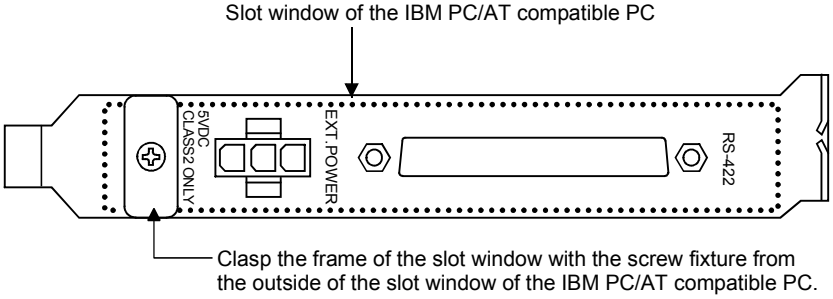
2) When mounting the RS-422/external power supply connecting bracket on an IBM PC/AT compatible PC with a PCI bus slot that is not structured to fix the bottom part of the RS-422/external power supply connecting bracket, mount it on the IBM PC/AT compatible PC according to the procedure below.

(a) Remove the screw fixture from the RS-422/external power supply connecting bracket.



(b) Mount the RS-422/external power supply connecting bracket on the IBM PC/AT compatible PC.

(c) Fix the RS-422/external power supply connecting bracket to the IBM PC/AT compatible PC using the screw fixture.

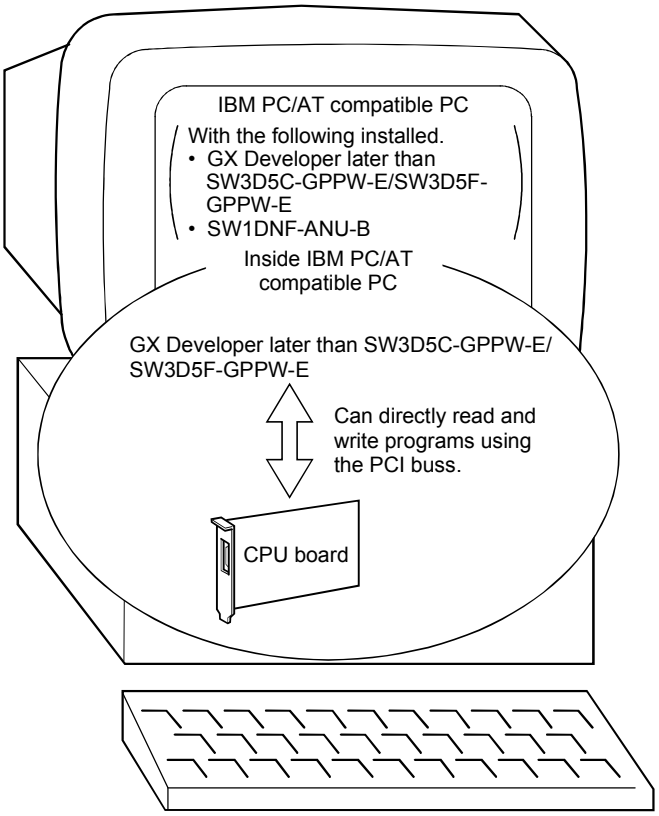


6.6 Writing and Reading Programs to/from the CPU Board

The following shows how to write and read programs to/from the CPU board.

(1) GX Developer→ CPU board

If GX Developer later than SW3D5C-GPPW-E/SW3D5F-GPPW-E and SW1DNF-ANU-B have been installed in an IBM PC/AT compatible PC with a CPU board mounted, it is possible to directly read and write programs from and to the CPU through the PCI buss. For details, see the GX Developer manual.



POINT

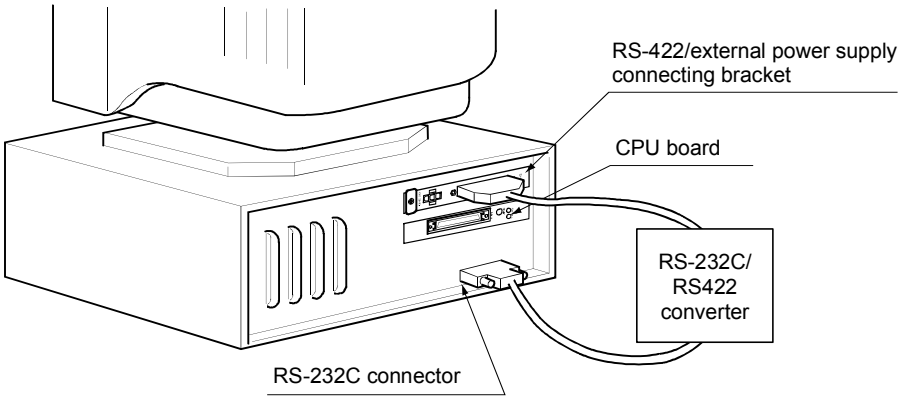
If a stop error occurs when the CPU board is in the CPU mode, reset the CPU board. (Press the RESET button in the AnU utility or press the reset switch of the CPU board.) Then access the CPU board using GX Developer.

CAUTION

On GX Developer prior to SW2D5C-GPPW-E/SW2D5F-GPPW-E, use methods (2) and (3) for writing and reading programs.

(2) From the IBM PC/AT compatible PC to the CPU board

When the GPP function utility software is installed on the IBM PC/AT compatible PC with the CPU board mounted, connect the RS-422/external power supply connecting bracket and the IBM PC/AT compatible PC in order to perform reading and writing.



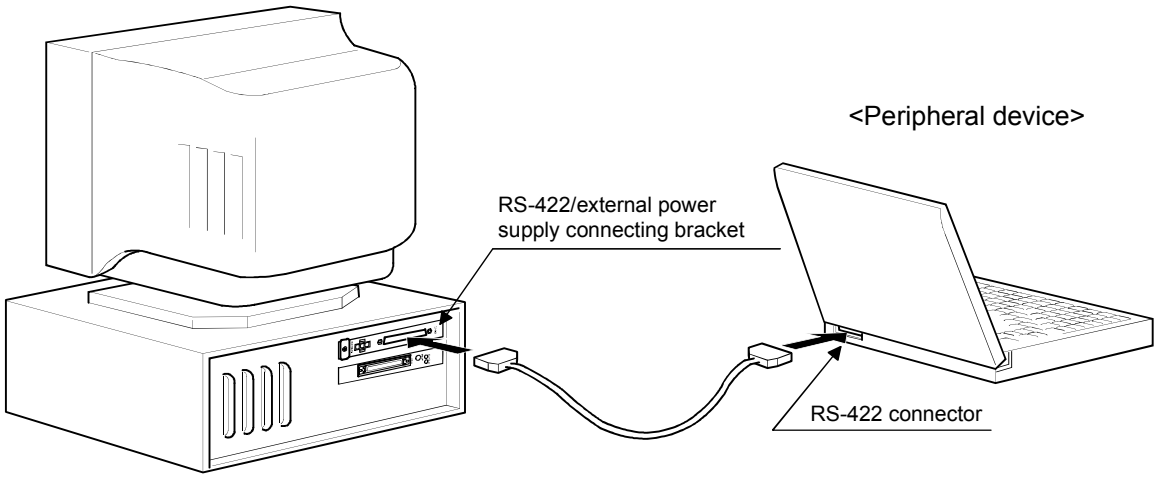
CAUTION

Use a converter that has own power supply when selecting an RS-232C/RS-422 converter.
If a converter that does not have own power supply is used, CPU board malfunction may occur when the RS-422 connector is unplugged and plugged when the power is on.

(3) From the peripheral device to the CPU board

Connect the RS-422/external power supply connecting bracket and the peripheral device in order to perform writing/reading.

<IBM PC/AT compatible PC>



7 BATTERY AND ROM

This chapter explains the specifications of the battery and ROM, the handling precautions, and the mounting method.

7.1 Battery

This section explains the specifications and handling precautions of the battery.

7.1.1 Specifications

The table below lists the specifications of the battery used for the power failure compensation function.

Item \ Model name	A6BAT
Nominal value	3.6 V DC
Battery guarantee period	5 years (When the power supplies to the IBM PC/AT compatible PC and the extension base unit are turned on/off at the same time.)
Application	IC-RAM memory backup and power failure compensation function
External dimensions (mm)	ϕ16 $\times$ 30

POINT

(1) Turn on/off the power supplied to the IBM PC/AT compatible PC and the extension base unit at the same time.
The battery will be consumed quickly if the extension base unit is kept powered on after turning off the power to the IBM PC/AT compatible PC.

(2) For the Battery Directive in EU counties, refer to Appendix 4.

7.1.2 Handling precautions

This section explains some precautions that should be observed while handling the battery.

(1) Do not short-circuit the battery.

(2) Do not disassemble the battery

(3) Do not place the battery in open fire.

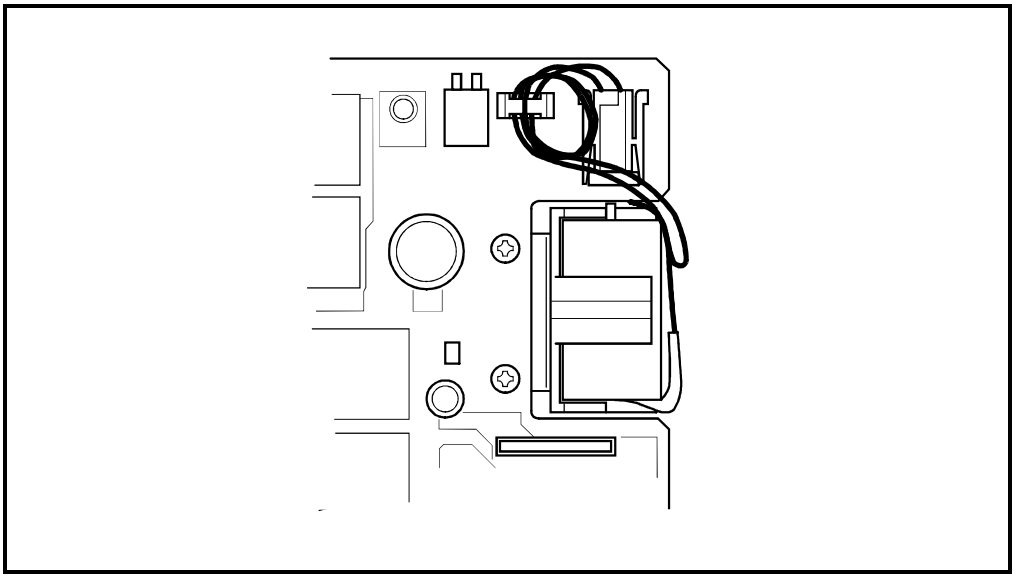
(4) Do not heat the battery.

(5) Do not solder the electrodes of the battery.

7.1.3 Mounting the battery

The connector of the battery has been removed in order to prevent battery consumption during distribution and storage.
If the CPU board is used for one of the following listed below, connect the lead connector of the battery to the battery connector of the CPU board.

- When sequence programs in the user program area of the CPU board are used.
- When the power failure compensation function is used.



7 - 2

7.2 ROM

This section explains the specifications, handling precautions and settings of the ROM that can be mounted on the CPU board.

7.2.1 Specifications

The table below lists the specifications of the ROM that can be mounted on the CPU board.

Item \ Model name	4KROM	8KROM	16KROM
ROM specifications	EPROM (reading enabled)		
Memory size	8 k bytes	16 k bytes	32 k bytes
Structure	28-pin IC package		
Others	It is necessary to mount two ROMs of the same type on the two ROM memory sockets.		

7.2.2 ROM handling precautions

This section explains some precautions that should be observed from unpacking to mounting of the ROM.

(1) Since the pin connector is made of resin, do not drop it or subject it to strong impacts.

(2) Be careful not to let foreign objects such as wire chips enter when mounting the ROM. If any foreign object enters into the CPU board, remove it immediately.

(3) Do not place the ROM on the metals that have or may have a leakage of current, or the wood, plastic, vinyl, fiber, wire, paper and other items that may be charged with static electricity.

(4) Do not touch or bend the lead section of the ROM.
Doing so may damage the ROM.

(5) Make sure to mount the ROM so that it matches with the marking on the socket.
If mounted in reverse, the ROM may be damaged.

⚠CAUTION

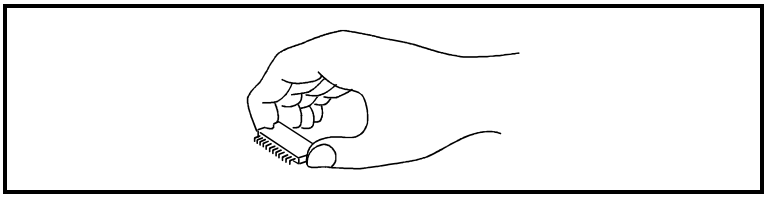
- Securely mount the ROM by pressing it onto the ROM memory socket. After mounting, make sure to check that the ROM is not loose.
  If the ROM is loose, the poor connection will cause malfunctions.
- Be sure to turn off the power before mounting or removing the ROM on/from the CPU board or the GPP.
  If mounted or removed when the power is on, the memory contents of the ROM will be corrupted.

7.2.3 Mounting and setting the ROM

This section explains the mounting procedure and the setting method of the ROM.

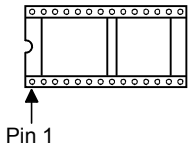
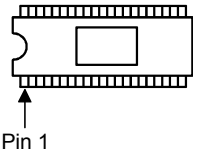
(1) How to hold the ROM

Touching the lead section of the ROM by hand may cause memory to corrupt due to static electricity, or the pins to bend, resulting in poor connection. Hold the ROM with two fingers as shown in the figure below and mount it properly.



(2) Mounting direction of the ROM

If the ROM is mounted in a wrong direction, memory will be corrupted when powered on. Make sure to mount the ROM in the correct direction.
The mounting direction is marked on the ROM memory socket; mount the EPROM by matching the direction of the concave or dashed line.

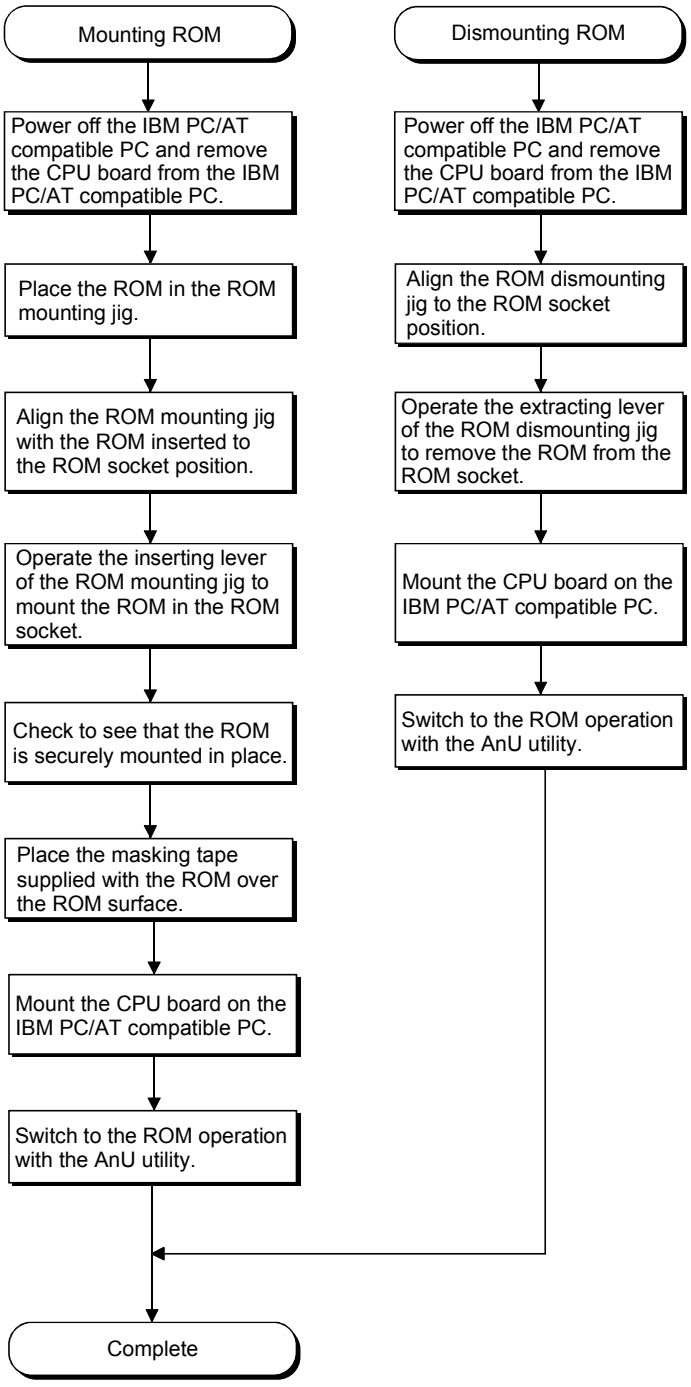
Memory socket for ROM	EPROM
	

(3) ROM/RAM operation settings

For details on changing the ROM/RAM operation mode of the CPU board, see Section 9.2.3, "Memory protect screen operation."

(4) Mounting and dismounting procedures of the ROM

The following shows the mounting and dismounting procedures of the ROM.
Make sure to follow these procedures when mounting or dismounting the ROM.



⚠CAUTION

- Securely mount the ROM by pressing it onto the ROM memory socket. After mounting, make sure to check that the ROM is not loose.
- If the ROM is loose, the poor connection will cause malfunctions.

8 INSTALLING AND UNINSTALLING THE SOFTWARE PACKAGE

This chapter describes how to install and uninstall the software package.

8.1 Installing the Software Package

This section describes how to install the software package.

8.1.1 Installing the driver

The following explains how to install the driver for the CPU board when Microsoft® Windows® 2000 Professional Operating System is used.

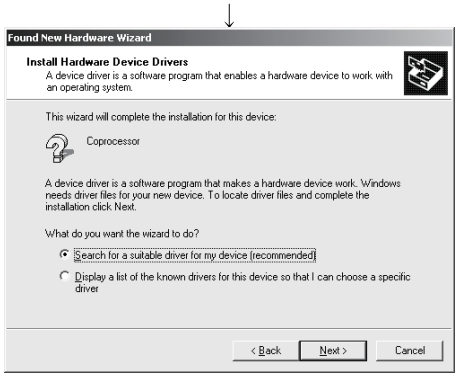
POINT

(1) When Microsoft® Windows NT® Workstation Operating System Version 4.0 is used, the installation of the CPU board driver is not required.
(2) Logon as a user who has administrator authority.
(3) Disassociate all applications registered in the startup procedure, then execute installation after restarting Windows® .
(4) Make sure to close other applications running on Windows® (including resident software such as antivirus software) before installation.

1. Install the CPU board in the PC, then turn on the power to the PC to start Windows® 2000.

2. When the screen shown at the left is displayed, click the Next> button.

↓



3. When the screen shown at the left is displayed, select "Search for a suitable driver for my device [recommended]," then click the Next> button.

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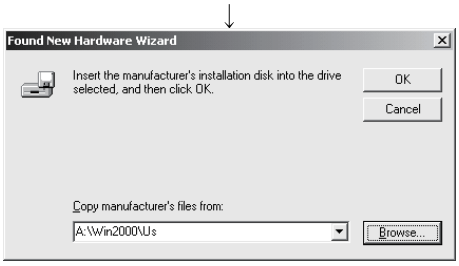
4. When the screen shown at the left is displayed, select "Specify a location" and click the Next> button.

↓

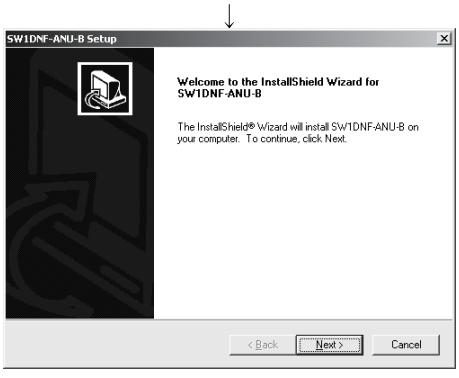


5. When the screen shown at the left is displayed, enter "A:\Win2000\Us" for "Copy manufacturer's files from." Insert Disk 4 into the floppy disk drive, then click the OK button.

↓

6. When the screen shown at the left is displayed, click the Next> button.

↓



7. The installation is complete when the screen shown at the left is displayed.
Click the Finish button.

↓

(Complete)

8

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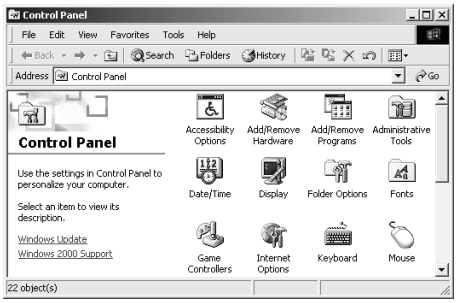
8.1.2 Installing the SW1DNF-ANU-B

The following explains how to install the SW1DNF-ANU-B.
The explanation below uses the screens of Microsoft® Windows® 2000. Therefore, they may be slightly different from the screens of Microsoft® Windows NT® .

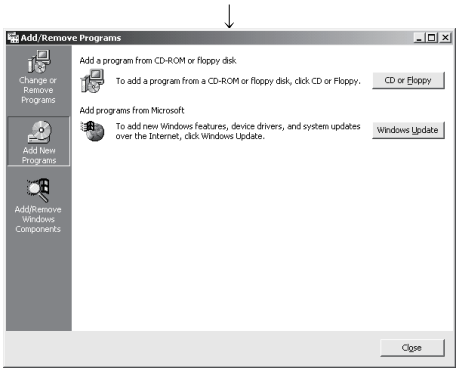
POINT

(1) Logon as a user who has administrator authority.
(2) Disassociate all applications registered in the startup procedure, then execute installation after restarting Windows® .
(3) Make sure to close other applications running on Windows® (including resident software such as antivirus software) before installation.
(4) Be sure to uninstall SW0DNF-ANU-B first, then install SW1DNF-ANU-B.
Since all the data set by each utility will be erased, it is necessary to set them again.
(5) To install SW1DNF-ANU-B, use "Add/Remove Programs" in "Control Panel."
As an alternative method, you can execute "Setup.exe".
Double-click "Setup.exe" in Disk 1, then start the installation from item [6.] below.

1. Turn on the power to the PC and start Windows® .



↓



2. Open [Start] - [Settings] - [Control Panel].

3. Open "Add/Remove Programs" and select "Add New Program."
When the screen shown at the left is displayed, click the CD or Floppy button.

REMARK

When Windows NT® is used, open "Add/Remove Programs" and click the Install... button.

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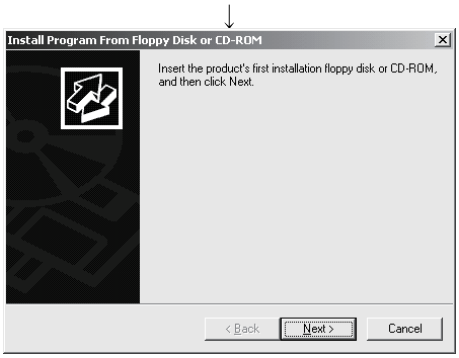
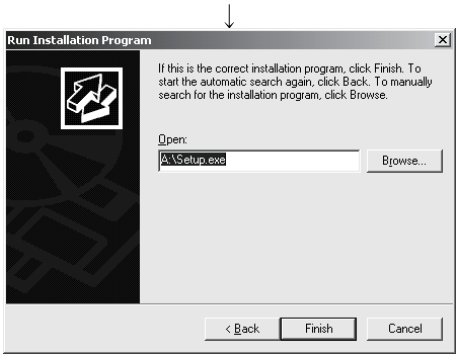


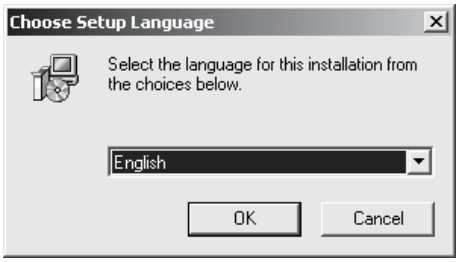
4. When the screen shown at the left is displayed, insert Disk 1 into the floppy disk drive and click the [Next>] button.

↓



5. When the screen shown at the left is displayed, "Setup.exe" has been found. Click the [Finish] button and start the installation.
If "Setup.exe" was not found, click the [Browse...] button and change to the location where "Setup.exe" exists.

↓

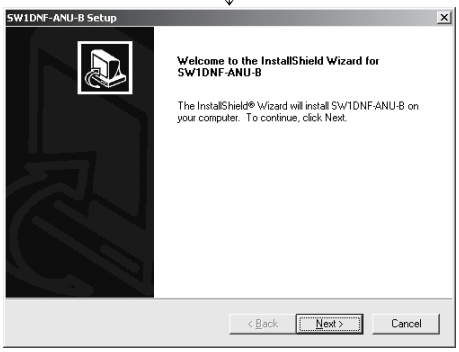


6. When the screen shown at the left is displayed, select "English" and click the [OK] button.

REMARK

Do not select Japanese.
When selecting Japanese, the message in the following dialog box will not be displayed correctly.

↓



7. When the screen shown at the left is displayed, click the [Next>] button.

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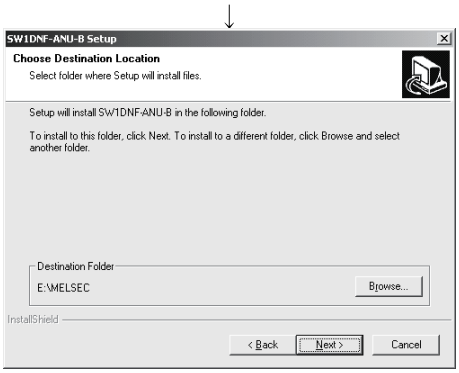
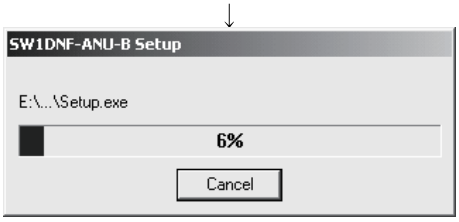


8. Specify the installation destination folder.
   The default installation destination folder of SW1DNF-ANU-B is "C:\MELSEC."
   To accept the default, click the Next> button.
   To change the installation destination folder, click the Browse... button.

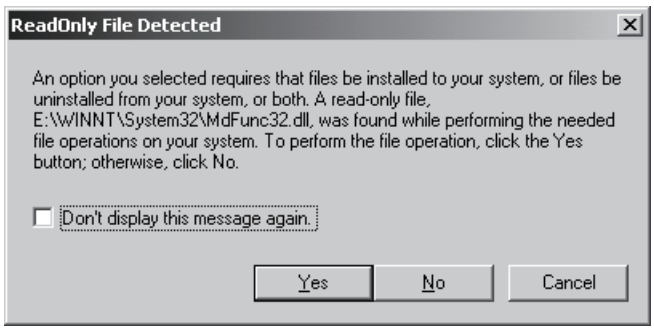
↓



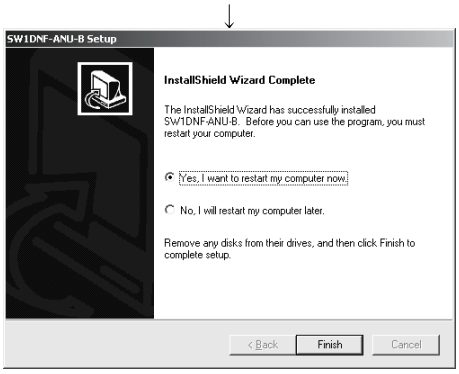
9. The installation will start. Switch floppy disks in the order, as instructed on the screen.

REMARK

If the following screen is displayed during installation, click the Yes button and continue with the installation.



↓



10. The installation is complete when the screen shown at the left is displayed.
    To restart, verify that "Yes, I want to restart my computer now" is checked, then click the Finish button.
    To restart later, check "No, I will restart my computer later," then click the Finish button.

↓

(Complete)

POINT

(1) If the installation failed to complete and it is possible to uninstall the software package, execute the uninstall procedure.
(2) To reinstall the software package, uninstall it first, restart the PC, and then reinstall.

8.2 Icons to be Registered

When the software package is installed, the following icons are registered in [Start] - [Programs] - [MELSEC].

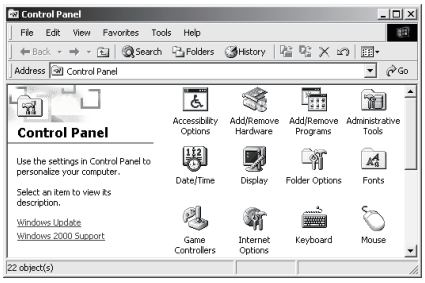
Icon	Utility name	Description
	AnU utility	Starts the AnU utility.
	MELSEC Communication Function HELP	Starts up HELP for the communication functions.

8.3 Uninstalling the Software Package

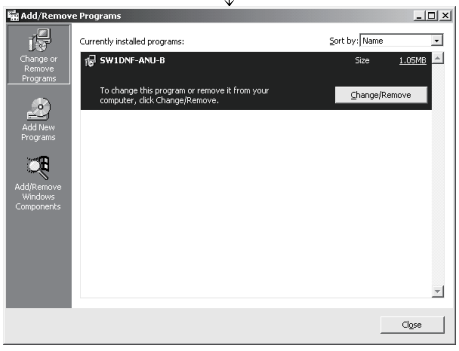
The following explains how to uninstall the software package.

POINT

(1) Logon as a user who has administrator authority.
(2) Disassociate all applications registered in the startup procedure, then execute uninstallation after restarting Windows® .
(3) Make sure to close other applications running on Windows® (including resident software such as antivirus software) before uninstallation.
(4) Always uninstall from Control Panel.
Do not directly start the installed "UnInstaller.exe."
(5) To reinstall the software package, uninstall it first, restart the PC, and then reinstall.



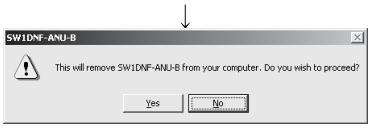
1. Open [Start] - [Settings] - [Control Panel].



2. Open "Add/Remove Programs" and select "Change or remove programs."
Select SW1DNF-ANU-B and click the Change/Remove button.

REMARK

When Windows NT® is used, select SW1DNF-ANU-B and click the Add/Remove... button.



3. When the screen shown at the left is displayed, click the Yes button to begin uninstalling the software package.

4. After the uninstall procedure of the software package is complete, click the OK button.

(Complete)

9 OPERATION OF UTILITIES

The following explains the operating method and procedure in each utility.

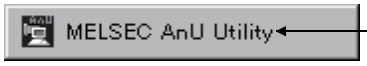
9.1 Shared Operation of Utilities

The following explains the shared operations in each utility.

POINT
Logon as a user who has administrator authority.

9.1.1 Starting a utility

The utility menu is located inside the [Start] - [Program] - [MELSEC] menu. Click the menu shown below to start.

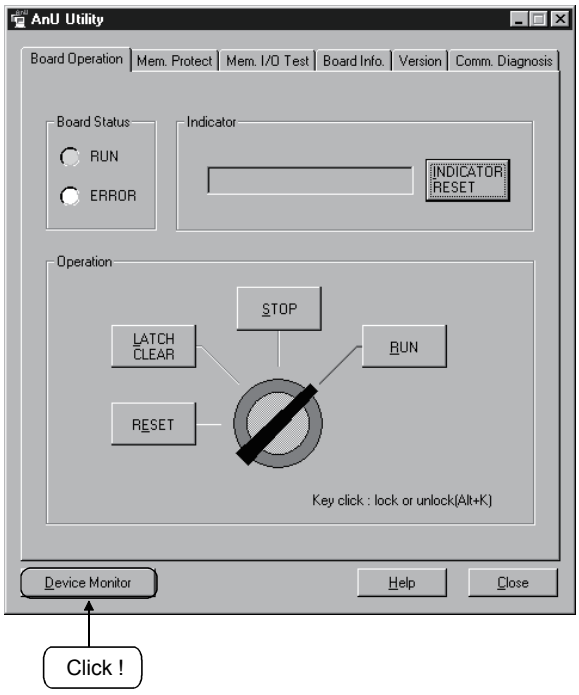


*1: If the CPU board is generating a stop error, it may take approximately 30 seconds for the AnU utility to start.

9.1.2 Starting the device monitor utility

The following explains the method for starting a device monitor utility from an AnU utility.

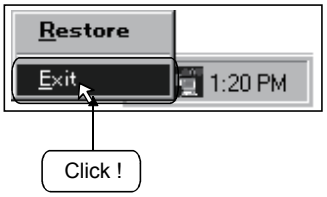
Click [Device Monitor] button shown on the AnU utility screen to start the device monitor utility.



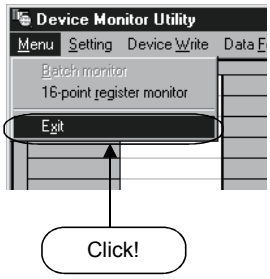
9.1.3 Ending a utility

The following explains the method for ending a utility.

(1) Perform the operation shown below to end the AnU utility.
Right click the AnU utility icon on the desk bar and select "Exit."



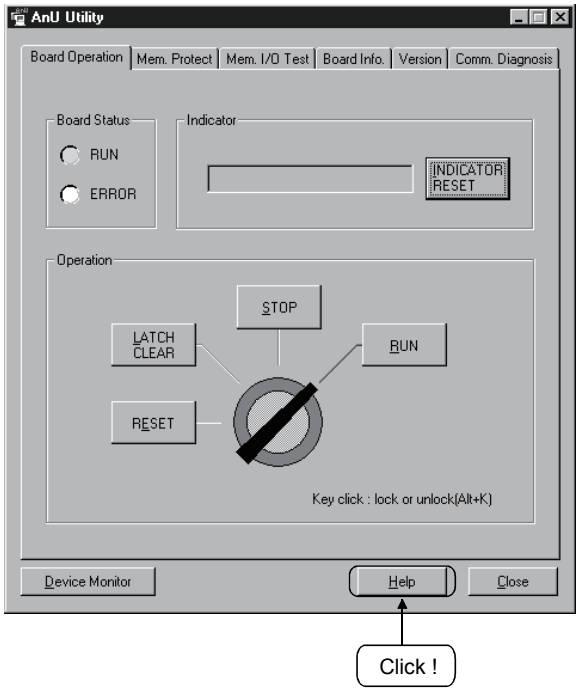
(2) On the menu bar, click [Menu] - [Exit] to end a device monitor utility. When the dialog box appears, click Yes button to end the device monitor utility.



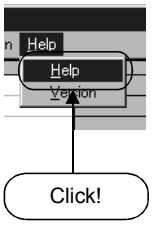
9.1.4 Displaying the help screen

The following explains how to display the help screen for a utility.

(1) Click the Help button in the lower right corner of the utility screen to display the AnU utility help screen.



(2) On the menu bar, click [Help] - [Help] to display the device monitor utility help screen.

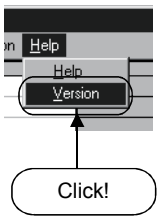


9.1.5 Confirming the version

The following explains the method for confirming the version of the utility.

(1) Click the "Version" tab to confirm the version of the AnU utility.

(2) On the menu bar, click [Help] - [Version] to confirm the device monitor utility version.

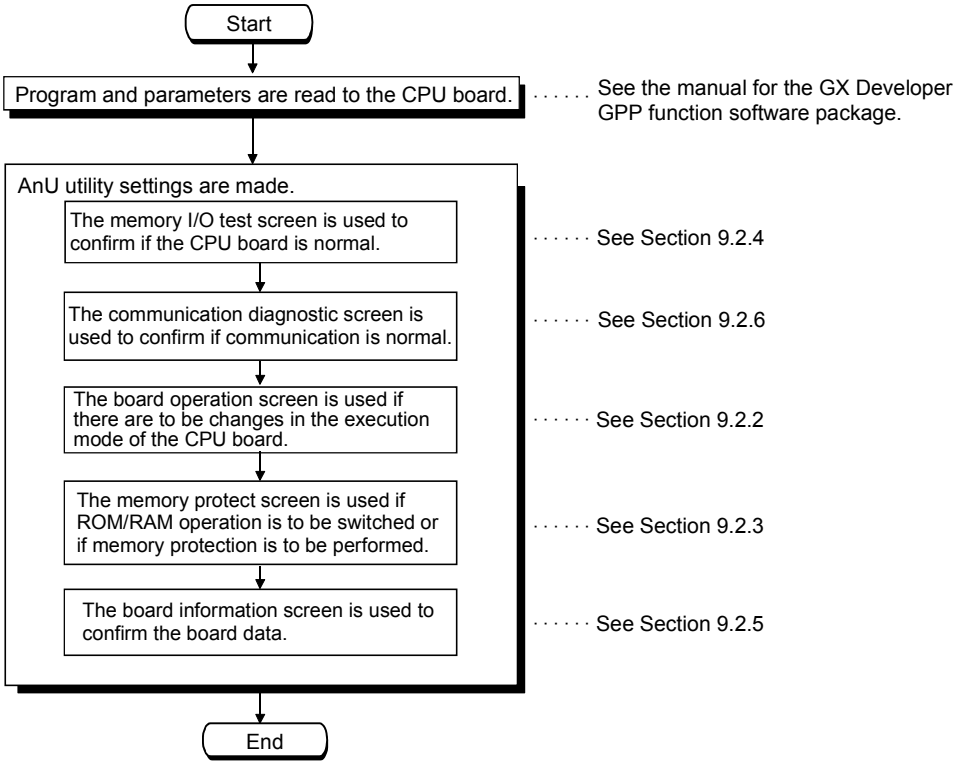


9.2 AnU Utility

The following explains the operation of the AnU utility.

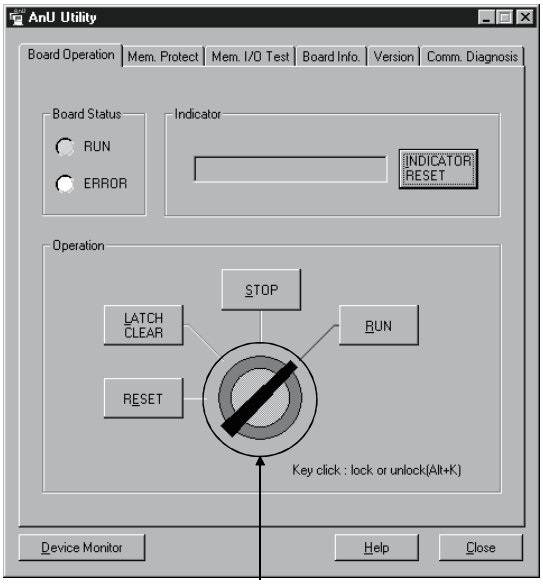
9.2.1 Operating procedure

The following explains the operating procedure of the AnU utility.



9.2.2 Board Operation screen operation

This is used to change the execution mode of the CPU board and clear error messages.

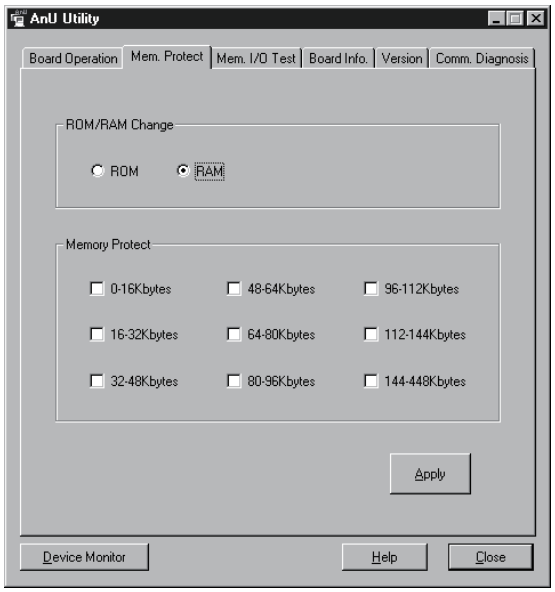


Item	Description
Board status	This displays the operating mode of the CPU board. **Board status / Description** **RUN** Light on: During execution of the sequence program. Light off: 1. When the CPU operation key is in the stop position. 2. When there is remote stop. 3. When there is remote pause. Light blinking: When the self diagnosis function has detected an error that will stop the processing of the sequence program. **ERROR** Light on: The self diagnosis function has detected an error. Light blinking: The annunciator (F) in the sequence program has been set to on. Light off: 1. Normal 2. A fault has been detected by CHK instruction. 3. Pressed "INDICATOR RESET" button after the error.
Indicator	Up to 16 characters can be displayed. Displays include: error comments created by the self diagnosis function, comments or characters by LED display commands, clock data by OUT M9027 and SET M9027, and the display of annunciator F number comments by OUT F and SET F.
INDICATOR RESET button	Clears the indicator and turns off the ERROR LED of "Board status" and if there is the next data, it is then displayed.
1) (CPU operation key)	Each click switches between lock and unlock. (Short-cut key: "Alt" + "K") Note that when lock has been selected, the operation of the CPU board cannot be switched when any of the follow buttons are clicked "STOP," "LATCH CLEAR" or "RESET." <LOCKED> <UNLOCKED> Click !

Item	Description
RUN button	When the CPU operation key is set to unlock, click this key to execute the sequence program.
STOP button	When the CPU operation key is set to unlock, click this key to stop the sequence program.
LATCH CLEAR button	When the CPU operation key is set to unlock, click this button to clear the device and the self diagnosis error data (the latest error data and the past 15 error data). When the operation has been completed, the message "DATA CLEAR OK!" will be displayed in the error message column.
RESET button	When the CPU operation key is set to unlock, click this button to reset the CPU board. Once a calculation error has been reset, initialization of the calculation will be performed.
Close button	Creates an icon for the AnU utility and displays it in the task tray. Double click the icon in the task tray to redisplay the dialog box.

9.2.3 Memory Protect screen operation

This is used for switching between ROM and RAM operation and setting the range of memory protect.



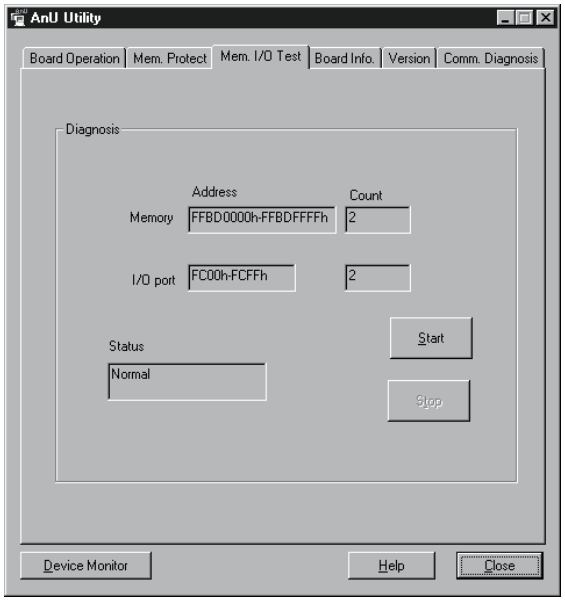
Item	Description
ROM/RAM Change	This switches the operating mode of the CPU board. ROM: Operates using the ROM mounted on the CPU board. If ROM operation is to be performed, the data must be written to the ROM beforehand by a ROM writer. RAM: Operates using the RAM of the CPU board.
Memory Protect	This sets the memory protect selected during the "ROM/RAM Change" operation. Memory protect selection is made by placing a checkmark in the box for the setting range. Memory protect is a setting that prevents that data in memory from accidentally being overwritten by peripheral device.
Apply button	The current settings are registered.

POINT

Data cannot be changed by peripheral device during ROM operation. To change ROM data, the ROM module must be removed from the CPU board and a ROM writer used to make the changes.

9.2.4 Memory I/O Test screen operation

This is used to diagnose the dual-port memory on the CPU board and the I/O port.



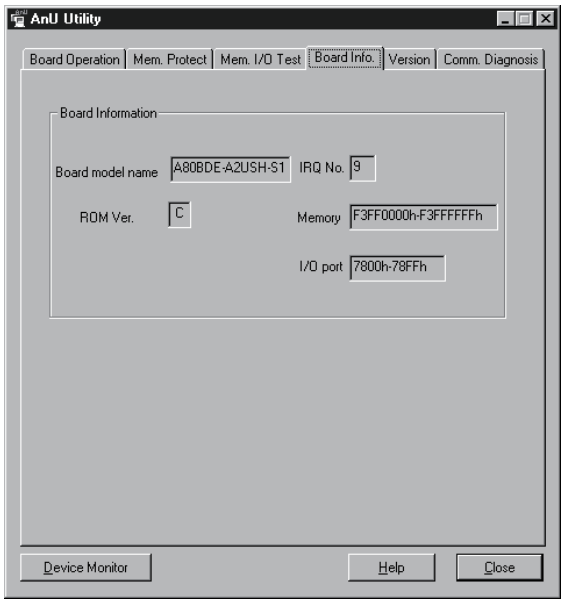
Item	Description
Memory	Address: Displays the address for the dual-port memory on the CPU board and the I/O port to be diagnosed. Count: Displays how may times the diagnosis is to be performed.
I/O port	
Status	Displays the mode currently being executed and the error status.
Start button	Starts memory and I/O port diagnosis.
Stop button	Stops memory and I/O port diagnosis.

POINT

(1) Always remove any external cables before starting the diagnosis function.
(2) Always click the "Stop" button to stop the diagnosis function before changing screens during the diagnosis.

9.2.5 Board Information screen operation

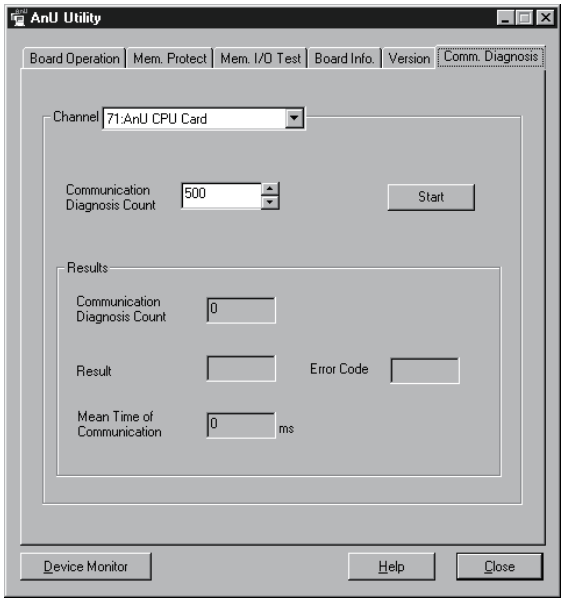
This displays information about the hardware that has been set in the CPU board.



Item	Description
Board model name	Displays the model name of the CPU board that has been connected.
ROM Ver.	Displays the ROM version of the CPU board.
IRQ No.	Displays the IRQ number of the CPU board being used.
Memory	Displays the dual-port memory range occupied by the CPU board.
I/O port	Displays the I/O port range occupied by the CPU board.

9.2.6 Communication Diagnosis screen operation

This communicates with the CPU board and diagnosis whether the communication is normal or abnormal.



Item	Description
Channel	Sets the channel to be used. (71 fixed)
Communication Diagnosis Count	Sets the number of communication diagnosis cycles to be performed.
Results	Displays the results of the communication diagnosis. Communication diagnosis count: Displays the number of communication diagnosis cycles performed. Results: Displays the results of the communication diagnosis. Mean Time of Communication: Displays the average time required for the communication. Error code: Displays the resulting diagnosis error code. (See Chapter 12 "Error Codes" for a description of the error codes.)
Start button (Stop button)	Executes the communication diagnosis function. This button turns into the Stop button during running diagnostics and stops the diagnosis.

9.3 Device Monitor Utility

The following explains how to set and operate the device monitor utility.

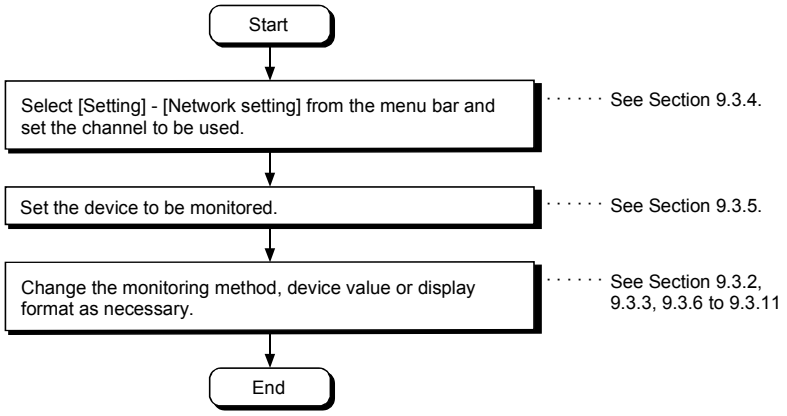
POINT

- In the device monitor utility, SB (Link special relay) and SW (Link special register) are indicated as SM and SD, respectively.
- The current network status is displayed as follows:
  (1) When the host (current board) is specified…Network No.:0, Station No.: 255
  (2) When other station is specified……Network No.: *1, Station No.: *1

*1: "Network No." and "Station No." preset in the network setting are displayed.

9.3.1 Operation procedure

The following explains how to operate the device monitor utility.



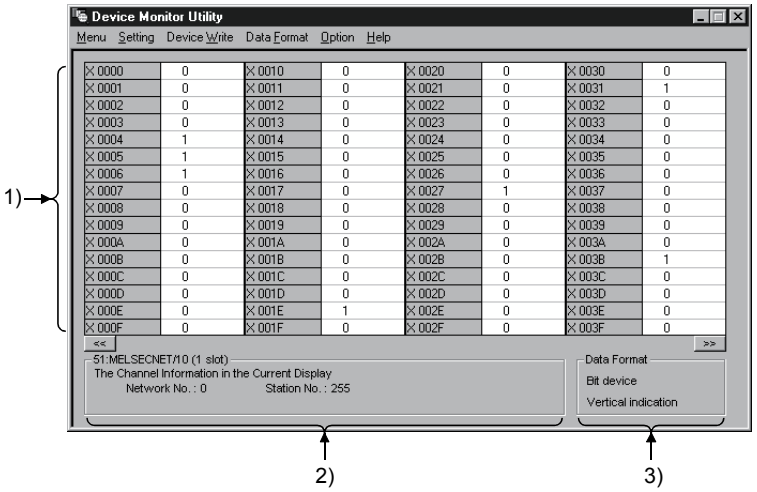
9.3.2 Setting as batch monitoring

Monitors only one device that has been designated.

(1) Selecting the menu

Select [Menu] - [Batch monitoring] from the menu bar.
(Selectable for 16-point entry monitor only.)

(2) Display screen



Item	Description
1) Device information	Displays the current device status. See Section 9.3.9 on how to change the display form.
2) Network status	Displays the network status currently set. See Section 9.3.4 on how to set the network.
3) Data format	Shows the display form and device types being displayed (word device and bit device). See Section 9.3.5 on how to change the device type. And, see Section 9.3.9 on how to change the display form.

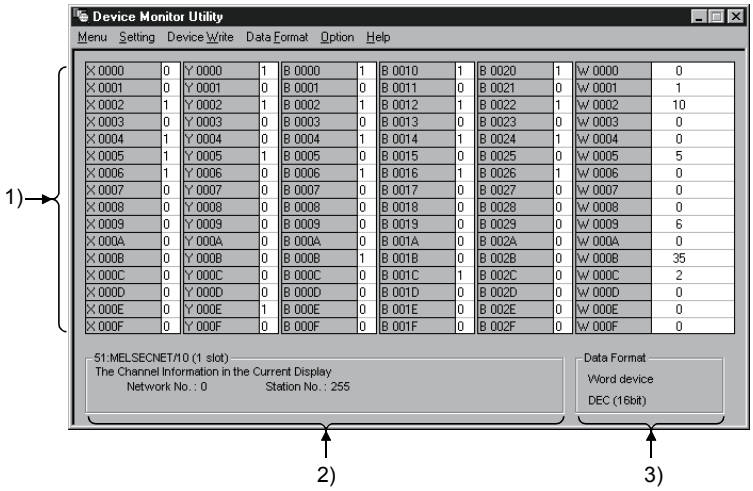
9.3.3 Setting as 16 point entry monitor

Monitors up to five bit devices and one word device simultaneously.

(1) Selecting the menu

Select [Menu] - [16 point entry monitor] from the menu bar.
(Selectable at batch monitoring only.)

(2) Display screen



Item	Description
1) Device information	Displays the current device status. See Section 9.3.9 on how to change the display form.
2) Network status	Displays the network status currently set. See Section 9.3.4 on how to set the network.
3) Data format	Shows a display form and device types being displayed (word device and bit device). See Section 9.3.5 on how to change the device type. And, see Section 9.3.9 on how to change the display form.

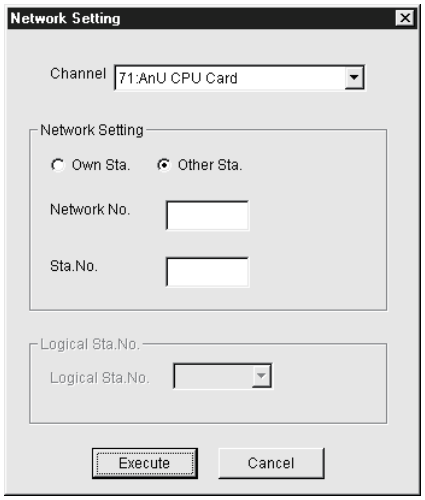
9.3.4 Setting the monitoring destination

Sets the network to be used for device monitoring.
Set the destination when starting the device monitor utility.

(1) Selecting the menu

Select [Setting] - [Network Setting] from the menu bar.

(2) Dialog box



Item	Description
Channel	Set the channel to be used.
Network Setting	Set the host and other stations along with network number and station number.
Logical Sta. No.	Set the logical station number.

9.3.5 Setting the device to be monitored

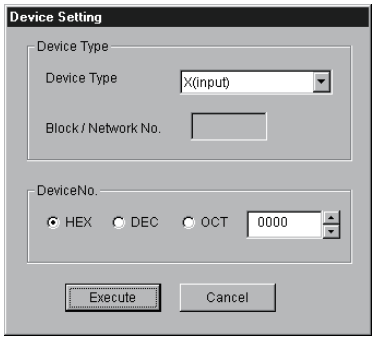
Set the device to be monitored.

(1) Selecting the menu

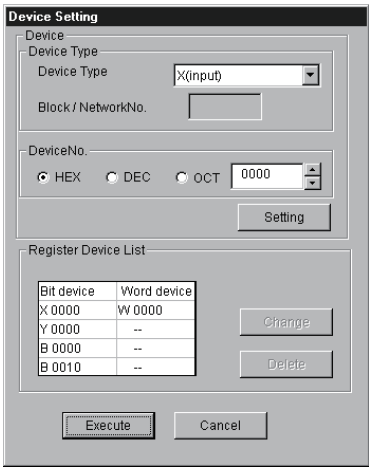
Select [Setting] - [Device setting] from the menu bar.

(2) Dialog box

For batch monitoring



For 16-point entry monitor



Item	Description
Device type	Set the type, block number, and network number for the device to be monitored.
Device No.	Set the head number of the device to be monitored. (HEX: Hexadecimal, DEC: Decimal, OCT: Octal)
Register Device List	Displays a list of the devices entered.
Setting button	Enters the item set in Device type and Device number, then adds it to List of devices entered.
Change button	Select the device to be changed and click this button to change the entered data.
Delete button	Select the device to be deleted and click this button to delete it from List of devices entered.

POINT

The only devices that may be monitored using the 16-point entry monitor are those that have random access capability. If a device that is not capable of random-access is specified, a device type error (-3) will occur.
See Chapter 10, "ACCESSIBLE DEVICES AND RANGES" to determine whether or not a device has random-access capability.

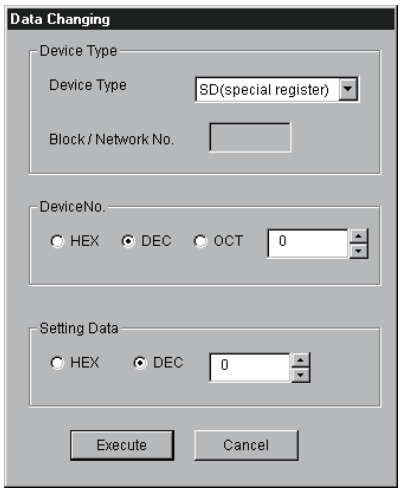
9.3.6 Changing word device values

Changes the specified word device data.

(1) Selecting the menu

Select [Device write] - [Data changing] from the menu bar.

(2) Dialog box



Item	Description
Device type	Set the type, block number, and network number for the device for which data is to be changed.
Device No.	Set the number of the device for which data is to be changed. (HEX: Hexadecimal, DEC: Decimal, OCT: Octal)
Setting data	Set the data to be changed. (HEX: Hexadecimal, DEC: Decimal)

DANGER

- Configure an interlock circuit in the sequence program so that the entire system works safely at all times for data change control to the programmable controller in operation.
  Also, determine corrective actions for an event of data communication error between the PC and programmable controller CPU in use.

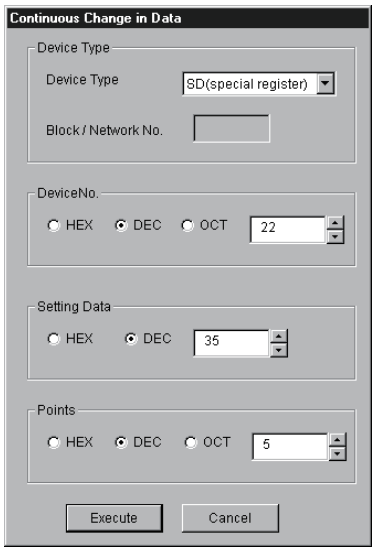
9.3.7 Changing word device values continuously

Change the specified word device data for the number of specified points being set.

(1) Selecting the menu

Select [Device write] - [Continuous Change in Data] from the menu bar.

(2) Dialog box



Item	Description
Device type	Set the type, block number, and network number of the device for which data is to be changed.
Device No.	Set the head address of the device number to change data. (HEX: Hexadecimal, DEC: Decimal, OCT: Octal)
Setting data	Set the data to be continuously changed. (HEX: Hexadecimal, DEC: Decimal)
Points	Set the number of points to perform continuos change of data. (HEX: Hexadecimal, DEC: Decimal, OCT: Octal)

DANGER

- Configure an interlock circuit in the sequence program so that the entire system works safely at all times for data change control to the programmable controller in operation.
  Also, determine corrective actions for an event of data communication error between the PC and programmable controller CPU in use.

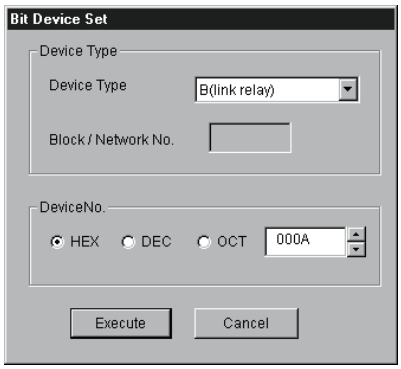
9.3.8 Tuning on/off a bit device

Turns on/off the specified bit device.

(1) Selecting the menu

Select [Device write] - [Bit device set (reset)] from the menu bar.

(2) Dialog box



Item	Description
Device type	Sets the type, block number, and network number of the bit device to be turned on/off.
Device No.	Sets the number of the bit device to be turned on/off. (HEX: Hexadecimal, DEC: Decimal, OCT: Octal)

DANGER

- Configure an interlock circuit in the sequence program so that the entire system works safely at all times for data change control to the programmable controller in operation.
  Also, determine corrective actions for an event of data communication error between the PC and programmable controller CPU in use.

9.3.9 Switching the display form

Switches the device monitoring display to the selected form.
The batch monitoring and 16-point entry monitor have different sets of selectable menus, respectively.

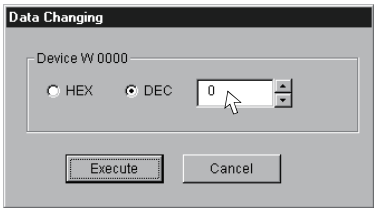
(1) Selecting the menu

Select [Display switch] - [Word (bit) device] from the menu bar.

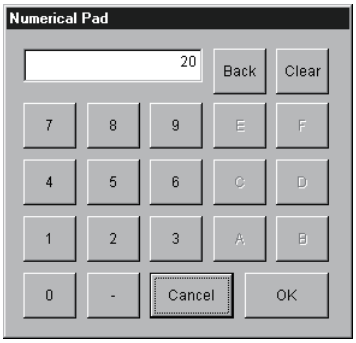
9.3.10 Numeric value input pad

A numeric value input pad is available for setting device values and other numeric parameters. To display the numeric value input pad, select [Options] - [Numerical pad] from the menu bar.

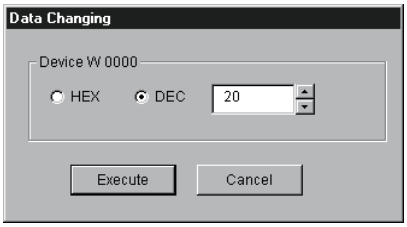
1. Click inside the numeric value input field.



2. The numeric value input pad is displayed. Use the buttons to enter a desired value, and then click the OK button.



3. The value is entered in the system.



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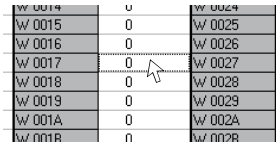
9.3.11 Other operations

Double-clicking the device number on the screen while monitoring changes data in word device and turns on/off the bit device.

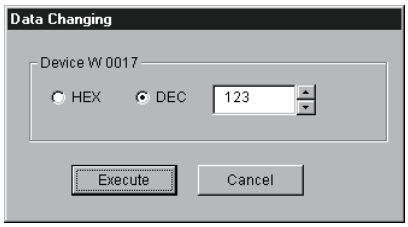
(1) Word device

The following explains how to change the word device.
(Only when the display form is 16 bit.)

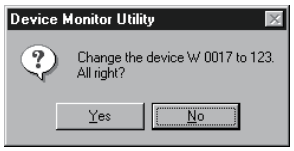
1. Double-click the number of the word device to be changed.



2. As the following dialog box is displayed, set a desired value.
   Click the [Execute] button.



3. Select [Yes] in the dialog box shown below if the change is acceptable.
   Select [No] to cancel the operation.



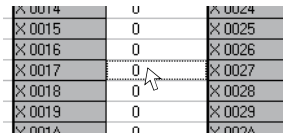
DANGER

- Configure an interlock circuit in the sequence program so that the entire system works safely at all times for data change control to the programmable controller in operation.
  Also, determine corrective actions for an event of data communication error between the PC and programmable controller CPU in use.

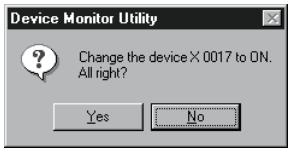
(2) Bit device

The following explains how to turn on/off the bit device.
However, this operation is available only when the display orientation is "Portrait."

1. Double-click the number of the bit device to be changed.



2. Select [Yes] in the dialog box shown below if the change is acceptable.
   Select [No] to cancel.



DANGER

- Configure an interlock circuit in the sequence program so that the entire system works safely at all times for data change control to the programmable controller in operation.
  Also, determine corrective actions for an event of data communication error between the PC and programmable controller CPU in use.

10 ACCESSIBLE DEVICES AND RANGES

This chapter explains the devices and ranges that can be accessed during CPU board communication.

10.1 Accessible Devices

The following shows the devices that can be accessed during CPU board communication.

10.1.1 Devices of the local station (IBM PC/AT compatible PC (CPU board))

For a list of the devices that can be accessed by the local station (IBM PC/AT compatible PC (CPU board)), see the column for the A2USH-S1 in the table shown in Section 10.1.2, "Devices of other stations."

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10.1.2 Devises of other stations

Device		Access destination							
		A1N	A0J2H A1S (-S1) A1SC24-R2 A1SH A1SJ (-S3) A1SJH (-S8) A2C A2CJ (-S3) A2CC24 (-PRF) A2N (-S1) A2S (-S1) A2SH (-S1) A1FX	A2A (-S1) A2U (-S1) A2AS (-S1/-S30) A2USH-S1 Q02 (H)-A Q06H-A	A3N A3A A3U	A4U	Q2A (-S1) Q3A Q4A Q4AR Q2AS (-S1) Q2ASH (-S1) *1	Q02 (H) Q06H Q12H Q25H	FX_0 FX_{0S} FX_{0N} FX_1 FX_2 FX_{2C} FX_{2N} FX_{2NC}
X	Batch	○	○	○	○	○	○	×	×
	Random								
Y	Batch	○	○	○	○	○	○	×	×
	Random								
L	Batch	○	○	○	○	○	○ *2	×	×
	Random								
M	Batch	○	○	○	○	○	○	×	×
	Random								
Special M (SM), SB	Batch	○	○	○	○	○	○	×	×
	Random								
F	Batch	○	○	○	○	○	○	×	×
	Random								
T (contact)	Batch	○	○	○	○	○	○	×	×
	Random								
T (coil)	Batch	○	○	○	○	○	○	×	×
	Random								
C (contact)	Batch	○	○	○	○	○	○	×	×
	Random								
C (coil)	Batch	○	○	○	○	○	○	×	×
	Random								
T (current value)	Batch	○	○	○	○	○	○	×	×
	Random								
C (current value)	Batch	○	○	○	○	○	○	×	×
	Random								
D	Batch	○	○	○	○	○	○	×	×
	Random								
Special D (SD), SW	Batch	○	○	○	○	○	○	×	×
	Random								
T (setting value main)	Batch	○	○	○	○	○	×	×	×
	Random	×	×	×	×	×			
T (setting value sub 1)	Batch	×	×	×	○	○	×	×	×
	Random				×	×			
T (setting value sub 2)	Batch	×	×	×	×	○	×	×	×
	Random					×			
T (setting value sub 3)	Batch	×	×	×	×	○	×	×	×
	Random					×			

*1: When accessing other station's QnACPU, access it as an AnACPU.

*2: Device M is accessed. (Device L of the QnACPU cannot be accessed.)

Device		Access destination							
		A1N	A0J2H A1S (-S1) A1SC24-R2 A1SH A1SJ (-S3) A1SJH (-S8) A2C A2CJ (-S3) A2CC24 (-PRF) A2N (-S1) A2S (-S1) A2SH (-S1) A1FX	A2A (-S1) A2U (-S1) A2AS (-S1/-S30) A2USH-S1 Q02 (H)-A Q06H-A	A3N A3A A3U	A4U	Q2A (-S1) Q3A Q4A Q4AR Q2AS (-S1) Q2ASH (-S1) *1	Q02 (H) Q06H Q12H Q25H	FX_0 FX_{0S} FX_{0N} FX_1 FX_2 FX_{2C} FX_{2N} FX_{2NC}
C (setting value main)	Batch	○	○	○	○	○	×	×	×
	Random	×	×	×	×	×			
C (setting value sub 1)	Batch	×	×	×	○	○	×	×	×
	Random				×	×			
C (setting value sub 2)	Batch	×	×	×	×	○	×	×	×
	Random					×			
C (setting value sub 3)	Batch	×	×	×	×	○	×	×	×
	Random					×			
A	Batch	○	○	○	○	○	○	×	×
	Random								
Z	Batch	○	○	○	○	○	○	×	×
	Random								
V (index register)	Batch	○	○	○	○	○	○	×	×
	Random								
R (file register)	Batch	×	○	○	○	○	×	×	×
	Random								
ER (extension file register)	Batch	×	○	○	○	○	×	×	×
	Random								
B	Batch	○	○	○	○	○	○	×	×
	Random								
W	Batch	○	○	○	○	○	○	×	×
	Random								
QnA link special relay (on QnACPU)	Batch	×	×	×	×	×	×	×	×
	Random								
Retentive timer (contact)	Batch	×	×	×	×	×	×	×	×
	Random								
Reentive timer (coil)	Batch	×	×	×	×	×	×	×	×
	Random								
QnA link special register (on QnACPU)	Batch	×	×	×	×	×	×	×	×
	Random								
QnA edge relay (on QnACPU)	Batch	×	×	×	×	×	×	×	×
	Random								
Local station random access buffer	Batch	×	×	×	×	×	×	×	×
	Random								
Retentive timer (current value)	Batch	×	×	×	×	×	×	×	×
	Random								
Local station link register (for send)	Batch	×	×	×	×	×	×	×	×
	Random								
Local station link register (for receive)	Batch	×	×	×	×	×	×	×	×
	Random								

*1: When accessing other station's QnACPU, access it as an AnACPU.

Device		Access destination							
		A1N	A0J2H A1S (-S1) A1SC24-R2 A1SH A1SJ (-S3) A1SJH (-S8) A2C A2CJ (-S3) A2CC24 (-PRF) A2N (-S1) A2S (-S1) A2SH (-S1) A1FX	A2A (-S1) A2U (-S1) A2AS (-S1/-S30) A2USH-S1 Q02 (H)-A Q06H-A	A3N A3A A3U	A4U	Q2A (-S1) Q3A Q4A Q4AR Q2AS (-S1) Q2ASH (-S1) *1	Q02 (H) Q06H Q12H Q25H	FX_0 FX_{0S} FX_{0N} FX_1 FX_2 FX_{2C} FX_{2N} FX_{2NC}
S device of FXCPU	Batch	×	×	×	×	×	×	×	×
	Random								
Local station buffer memory	Batch	×	×	○ *3	×	×	×	×	×
	Random			×					
Arrival confirmation for the QnA SEND function	Batch	×	×	×	×	×	×	×	×
	Random								
No arrival confirmation for the QnA SEND function	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link input	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link output	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link relay	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link register	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link special relay (network module side)	Batch	×	×	×	×	×	×	×	×
	Random								
Direct link special register (network module side)	Batch	×	×	×	×	×	×	×	×
	Random								
Special direct buffer register	Batch	×	×	×	×	×	×	×	×
	Random								
Other station buffer memory	Batch	×	×	×	×	×	×	×	×
	Random								
Other station random access buffer	Batch	×	×	×	×	×	×	×	×
	Random								
Other station RX	Batch	×	×	×	×	×	×	×	×
	Random								
Other station RY	Batch	×	×	×	×	×	×	×	×
	Random								
Other station link register	Batch	×	×	×	×	×	×	×	×
	Random								
Other station SB	Batch	×	×	×	×	×	×	×	×
	Random								
Other station SW	Batch	×	×	×	×	×	×	×	×
	Random								

*1: When accessing other station's QnACPU, access it as an AnACPU.

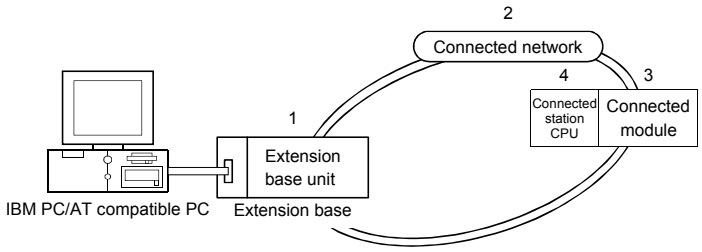
*3: Only the CPU board (local station) can be accessed.

10.2 Accessible Ranges

The following shows the ranges that can be accessed during CPU board communication.

(1) When the MELSECNET (II) is connected

(a) Configuration



(b) Access allowed/not allowed table

The following table shows whether or not access is allowed.
The local board can be accessed.
In the connected station CPU column, symbol ○ indicates that access is allowed and symbol × indicates that access is not allowed.

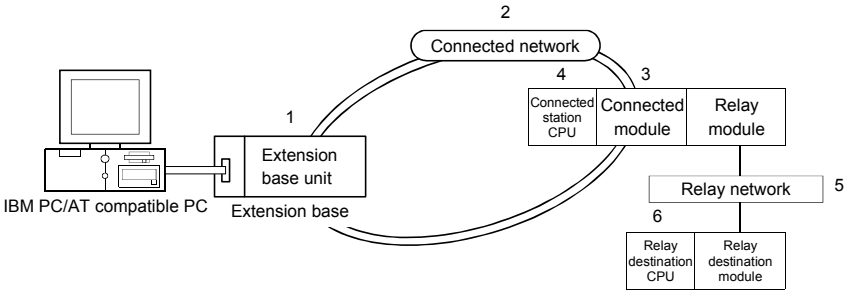
1. Extension base unit	Connected station					
	2. Connected network	3. Connected module	4. Connected station CPU			
			QCPU		QnACPU	ACPU
			Q mode	A mode		
AJ71AP21 AJ71AR21 AJ71AT21B A1SJ71AP21 A1SJ71AR21 A1SJ71AT21B	MELSECNET (II)	AJ71AP21 AJ71AR21 AJ71AT21B A1SJ71AP21 A1SJ71AR21 A1SJ71AT21B	×	○	○	○

○ : Access is allowed, × : Access is not allowed

POINT
When accessing the QnACPU, the device range is equivalent to that of the AnACPU.

(2) When the MELSECNET/10 is connected

(a) Configuration



(b) Access allowed/not allowed table

The following table shows whether or not access is allowed.
The local board and the connecting station CPU can be accessed.
In the relay destination CPU column, symbol ○ indicates that access is allowed and symbol × indicates that access is not allowed.

1. Extension base unit	Connected station			5. Relay network	6. Relay destination CPU			
	2. Connected network	3. Connected module	4. Connected station CPU		QCPU		QnACPU	ACPU
					Q mode	A mode		
AJ71LP21 AJ71BR11 AJ71LR21 A1SJ71LP21 A1SJ71BR11 A1SJ71LR21	MELSECNET/10	AJ71QLP21 AJ71QBR11 AJ71QLR21 A1SJ71QLP21 A1SJ71QBR11 A1SJ71QLR21	QnACPU	MELSECNET/H	×	×	×	×
				MELSECNET/10	×	○	○	○
				MELSECNET (II)	×	×	×	×
				Ethernet	×	×	×	×
				Computer link	×	×	×	×
				CC-Link	×	×	×	×
		AJ71LP21 AJ71BR11 AJ71LR21 A1SJ71LP21 A1SJ71BR11 A1SJ71LR21	QCPU (A mode), ACPU	MELSECNET/H	×	×	×	×
				MELSECNET/10	×	○	○	○
				MELSECNET (II)	×	×	×	×
				Ethernet	×	×	×	×
				Computer link	×	×	×	×
				CC-Link	×	×	×	×

○ : Access is allowed, × : Access is not allowed

POINT

When accessing a QnACPU, the device range is equivalent to that of the AnACPU.

11 MELSEC DATA LINK LIBRARY

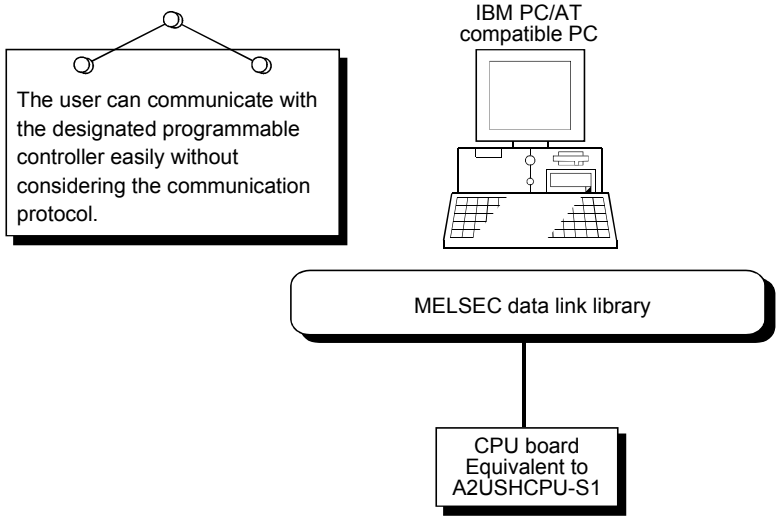
This chapter explains an overview of the functions offered by the MELSEC data link library.

REMARK

This manual uses the screens of Microsoft® Windows NT® Workstation Operating System Version 4.0. Therefore, they may be slightly different from the screens of Microsoft® Windows® 2000 Professional Operating System.

11.1 Overview of the MELSEC Data Link Library

The functions of the MELSEC data link library are used to create user programs for communicating with the programmable controller CPU. Using these functions, the user can perform communication without considering the hardware type and communication protocol of the opposite side.
The user can communicate with the designated programmable controller easily without considering the communication protocol.



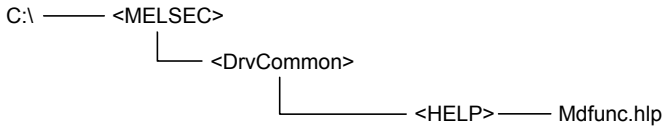
11.2 List of the Functions of the MELSEC Data Link Library

The following table lists the functions of the MELSEC data link library that are provided with the utility software.

Function name	Function
mdOpen	Opens a communication line.
mdClose	Closes a communication line.
mdSend	Writes data to a device in batch mode.
mdReceive	Reads data from a device in batch mode.
mdRandW	Writes data to a device in random mode.
mdRandR	Reads data from a device in random mode.
mdDevSet	Sets a bit device.
mdDevRst	Resets a bit device.
mdTypeRead	Reads the programmable controller CPU type.
mdControl	Remote RUN/STOP/PAUSE
mdInit	Refreshes the programmable controller device addresses.
mdBdRst	Resets local board.
mdBdLedRead	Reads the LED information of local board.
mdBdSwRead	Reads the switch status of local board.
mdBdVerRead	Reads the version information of local board.

POINT

For more information about the functions, see the HELP for the MELSEC data link functions in the utility software.
The HELP for the MELSEC data link functions is stored in the following directory (when the utility software is installed by designating the default installation destination folder):



11.3 Settings for Using Functions

This section describes the setting operation in order to use functions.

POINT
If Windows® 2000 is used, Microsoft® Visual Basic® 5.0 and Microsoft® Visual C++® 5.0 cannot be used. Please use Microsoft® Visual Basic® 6.0 and Microsoft® Visual C++® 6.0.

11.3.1 When using Visual Basic® 5.0 and Visual Basic® 6.0

The following describes the setting operation when using Visual Basic® 5.0 and Visual Basic® 6.0.

1. Start Visual Basic® 5.0 or Visual Basic® 6.0 and select [Project] - [Add standard module] menu.
2. Select the "Existing files" tab and select "MDFUNC.BAS."
   "MDFUNC.BAS" has been saved in the following directory during installation:
   <User-specified folder> - <COMMON> - <INCLUDE>

11.3.2 When using Visual C++® 5.0 and Visual C++® 6.0

The following describes the setting operation when using Visual C++® 5.0 and Visual C++® 6.0.

(1) When setting an include file

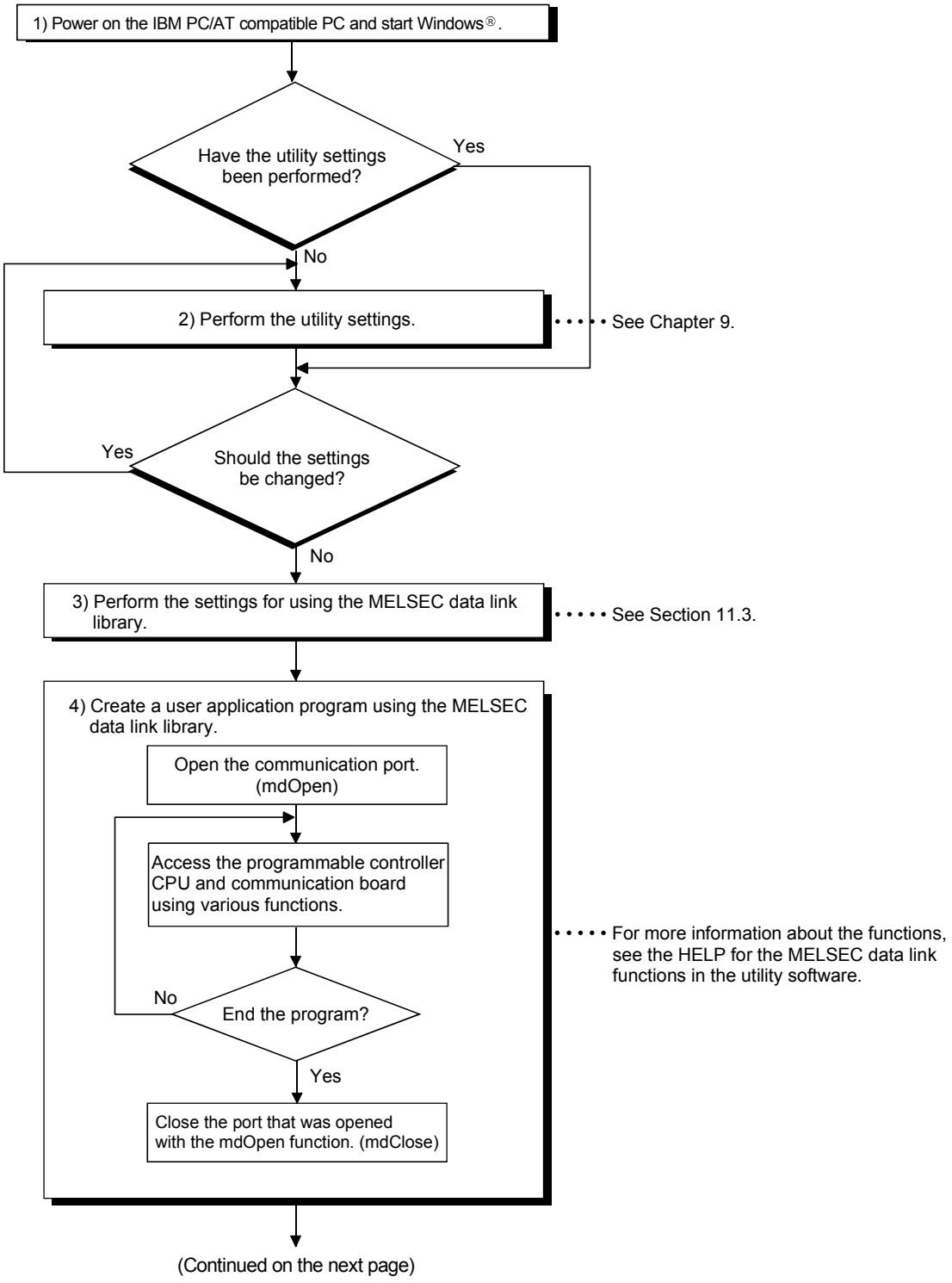
1. Start Visual C++® 5.0 or Visual C++® 6.0 and select [Tool] - [Option] menu.
2. Select the "Directory" tab and set the directory type to "Include files."
3. Double-click the item to set and reference the include file.
   MDFUNC.H has been saved in the following directory during installation:
   <User-specified folder> - <COMMON> - <INCLUDE>
4. Add "#include<mdfunc.h>" at the beginning of your program.

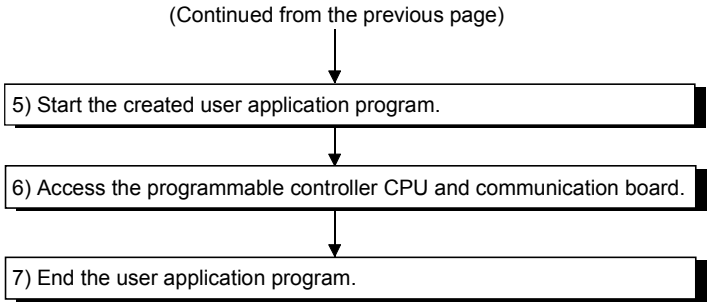
(2) When setting a library file

1. Start Visual C++® 5.0 or Visual C++® 6.0 and select [Tool] - [Option] menu.
2. Select the "Directory" tab and set the directory type to "Library files" in the same manner as in (1).
3. Open the workspace to create and select [Project] - [Set] menu.
4. Select the "Link" tab, set "General" as the category, then type "mdfunc32.lib" in the object/library module field.

11.4 Programming Procedure

The following shows the programming procedure using the MELSEC data link library.
In this explanation, it is assumed that the utility software has already been installed.





POINT

(1) Perform the open and close processing of the communication line (mdOpen/mdClose) only once at the beginning and end of the program. Repeating the open and close processing for each communication will degrade the communication performance.

(2) When accessing the programmable controller CPU and communication board again using the created user application program, the access can only be performed with the operations in steps 5) to 7) in the above flowchart.

(3) When accessing multiple remote stations simultaneously from the same PC using the MNETH utility, Device Monitor utility, user application program or Mitsubishi's software package (such as MX Links), limit the number of stations to be accessed to eight or less.
If nine or more remote stations are accessed simultaneously, communication performance may deteriorate.

11.5 Channel

The following channel can be used for the MELSEC data link library:

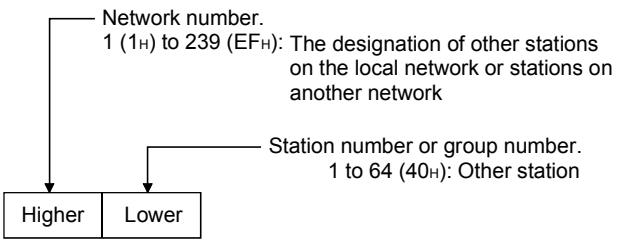
No.	Channel name	Description
71	AnU CPU card	Used when communication is performed via the CPU board.

11.6 Station Number Designation

The following lists the station numbers that are designated by functions:

Communication	Station number designation method
CPU board	Local station: 255 (0xFF) Other station: MELSECNET (II) 0 to 64 (0x40) MELSECNET/10 ＊1

＊1



11.7 Device Types

Either the code number or the device name can be designated as the device type for the functions.

Device type		Device name designation	Device
Code designation			
Decimal	Hexadecimal		
1	1H	DevX	X
2	2H	DevY	Y
3	3H	DevL	L
4	4H	DevM	M
5	5H	DevSM	Special M (SM), SB (link special B for MELSECNET/H, MELSECNET/10 and CC-Link)
6	6H	DevF	F
7	7H	DevTT	T (contact)
8	8H	DevTC	T (coil)
9	9H	DevCT	C (contact)
10	AH	DevCC	C (coil)
11	BH	DevTN	T (current value)
12	CH	DevCN	C (current value)
13	DH	DevD	D
14	EH	DevSD	Special D (SD), SW (link special W for MELSECNET/H, MELSECNET/10 and CC-Link)
15	FH	DevTM	T (setting value main)
16	10H	DevTS	T (setting value sub 1)
16002	3E82H	Dev TS2	T (setting value sub 2)
16003	3E83H	Dev TS3	T (setting value sub 3)
17	11H	DevCM	C (setting value main)
18	12H	DevCS	C (setting value sub 1)
18002	4652H	DevCS2	C (setting value sub 2)
18003	4653H	DevCS3	C (setting value sub 3)
19	13H	DevA	A
20	14H	DevZ	Z
21	15H	DevV	V (index register)
22	16H	DevR	R (file register)
22001 to 22256	55F1H to 56F0H	DevER1 to DevER256	ER (extension file register)
23	17H	DevB	B
24	18H	DevW	W
50	32H	DevSPB	Local station buffer memory ＊1

＊1: The dedicated device for accessing the buffer memory of the CPU board (local station).

12 ERROR CODES

12.1 Errors During Sequence Program Execution

When an error occurs while the programmable controller or the CPU board is running, the error message is displayed, or the error code, detailed error code and erroneous step are stored to the special registers, D9008, D9091 and D9010, respectively, with the self-diagnostic function.
This section explains the details of errors and corrective actions.

12.1.1 Reading error codes

When an error occurs, the error code can be read from a peripheral device (GX Developer, etc.).
For more information about operating procedures, see the operating manuals of the corresponding peripheral device.

POINT
When an error occurs in the CPU board that changes the CPU board status to "Stop," access the CPU board from a peripheral device after resetting the CPU board (press the "RESET" button in AnU utility or the Reset switch on the CPU board). If the error message is deleted from the AnU utility's indicator display area by either of the above operations, see the error code in the error history of the peripheral device.

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12.1.2 Error code list

The following error code list explains the error messages, the error codes, the detailed error codes, the detailed description and causes of errors, and the corrective actions to take.

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"INSTRCT CODE ERR." (Checked during STOP → RUN or execution of an instruction)	10	101	Program contains instructions codes that cannot be comprehended by the CPU.	(1) Read the erroneous step into a peripheral device and correct the program in that step. (2) Check to see if ROM contains incomprehensible instruction codes; if so, replace it with ROM containing the correct codes.
		102	Index qualification is made to a 32-bit constant.	Read the erroneous step into a peripheral device and correct the program in that step.
		103	The device designated with the dedicated instruction is not correct.	
		104	The program structure of the dedicated instruction is incorrect.	
		105	The command name of the dedicated instruction is incorrect.	
		106	The program in [LEDA/B][IX] to [LEDA/B][IXEND] contains indices qualified with Z and V.	
		107	(1) An index qualification is made to the device number and setting value with the OUT instruction of the timer or counter. (2) An index qualification is made to the label number of the pointer (P) attached to the beginning of the skip number destination of the [CJ] [SCJ] [CALL] [CALLP] [JMP] [LEDA/B][FCALL] or [LEDA/B][BREAK] instruction, or the label number of the interrupt pointer (I) attached to the beginning of the interrupt program.	
		108	Error(s) other than 101 to 107 mentioned above.	

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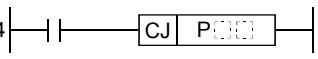
Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"PARAMETER ERROR" (Checked during power on or STOP/PAUSE → RUN)	11	111	(1) Settings for the sizes of the main program, microcomputer program, file register comment, status latch, sampling trace and extension file register are not in the usable ranges of CPU. (2) The size is not set to that of the subprogram. (3) The I/O assignments of the basic base unit of the CPU board are incorrect.	Read the parameters in the CPU memory and rewrite them after checking the contents and making necessary corrections.
		112	Sum of the sizes set for the main program, file register comment, status latch, sampling trace, and extension file register exceeds the size of the cassette.	
		113	Latch range setting with a parameter or settings for M, L, S are incorrect.	
		114	Check sum error	
		115	One of the parameter settings for the following is not correct: Remote RUN/PAUSE contact, operation mode during error output, annunciator display mode, or STOP → RUN display mode.	
		116	Parameter setting for MNET-MINI automatic refresh is not correct.	
		117	Parameter setting for the timer is not correct.	
		118	Parameter setting for the counter is not correct.	
"MISSING END INS" (Checked during STOP → RUN)	12	121	There is no END (FEND) instruction in the main program.	Write END at the end of the main program.
"CAN'T EXECUTE (P)" (Checked at execution of an instruction)	13	131	Duplicate device number is used for the pointer (P) that is used as a label attached to the beginning of the skip destination and the interrupt pointer (I).	Correct the numbers so the numbers do not duplicate by eliminating the same pointer number attached to the skip destination starting number. Read the erroneous step into a peripheral device, check the content and insert the skip destination pointer (P).
		132	The label for the pointer (P) designated with the instructions CJ SCJ CALL CALLP JMP LEDA/B FCALL or LEDA/B BREAK is not found before the END instruction.	
		133	(1) Even though there was no CALL instruction, the RET instruction in the program was executed. (2) Even though there was no FOR instruction, the NEXT or LEDA/B BREAK instruction was executed. (3) CALL, CALLP or FOR instructions are nested more than 6 levels and the 6th nesting was executed. (4) There is no RET or NEXT at execution of CALL or FOR.	(1) Read the erroneous step into the peripheral device, check the content and correct the program in that step. (2) Make the nesting of the CALL, CALLP or FOR instructions to be 5 levels or less.
		134	There was no subprogram, but the CHG instruction in the main program was executed.	Read the erroneous step into a peripheral device, check the content and correct the program in that step.

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"CAN'T EXECUTE (P)" (Checked at execution of an instruction)	13	135	(1) The LEDA/B IX to LEDA/B IXEND instructions are not paired. (2) There are 33 or more pairs of the LEDA/B IX to LEDA/B IXEND instructions.	(1) Read the erroneous step into a peripheral device, check the content and correct that step in the program. (2) Reduce the number of pairs of the LEDA/B IX to LEDA/B IXEND instructions to 32 or less.
"CHK FORMAT ERR." (Checked during STOP/PAUSE → RUN)	14	141	There is an instruction other than LDX, LDIX, ANDX and ANIX (including NOP) on the CHK instruction circuit block.	Check and correct the program concerning the CHK instruction using the content of detailed error code as a reference.
		142	Two or more CHK instructions are present.	
		143	The number of contacts on the CHK instruction circuit block exceeds 150.	
		144	The LEDA CHK and LEDA CHK and instructions are not paired, or two or more of them are present.	
		145	The format of the following block, which is present before the CHK instruction circuit block, is incorrect. 	
		146	The device (number) of D1 for CHK D1, D2 instructions and the device (number) of the contact before the CJP instruction are not the same.	
		147	An index qualification is made to an area in the check pattern circuit.	
		148	(1) There are two or more check pattern circuits for the LEDA CHK to LEDA CHKEND instructions. (2) There are seven or more check condition circuits between LEDA CHK to LEDA CHKEND. (3) The check condition circuits between LEDA CHK to LEDA CHKEND are structured with instructions other than contact instructions for X and Y or comparison instructions.	
"CAN'T EXECUTE (I)" (Checked when interrupt occurs)	15	151	The IRET instruction was found outside the interrupt program and then executed.	Read the erroneous step into a peripheral device, and delete that IRET instruction.
		152	The IRET instruction is not written in the interrupt program.	Check whether the IRET instruction is present in the interrupt program, and if not, write the IRET instruction.
		153	An interrupt module is used without interrupt pointer (I) in the program corresponding to the module. When an error occurs, the pointer (I) number is stored in the D9011.	Monitor the special register D9011 with a peripheral device, and check the presence of an interrupt program corresponding to the value stored or check for a duplicate interrupt pointer (I) number, and then correct.

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"RAM ERROR" (Checked at power on)	20	201	Error in sequence program storage RAM inside the CPU	Since it is a CPU hardware failure, consult with the dealer regarding the problem.
		202	RAM error in the work memory area inside the CPU	
		203	Device memory error inside the CPU	
		204	Address RAM error inside the CPU	
"OPE. CIRCUIT ERR." (Checked at power on)	21	211	Arithmetic circuit in the CPU which performs index qualification is not operating normally.	Since it is a CPU hardware failure, consult with the dealer regarding the problem.
		212	Hardware (logic) inside the CPU is not operated normally.	
		213	Arithmetic circuit in the CPU which performs sequence processing is not operating normally.	
"WDT ERROR" (Checked at execution of END processing)	22	—	Scan time exceeded the watchdog error monitoring time. (1) Scan time for the user program exceeded depending on the conditions. (2) A momentary power failure occurred during scanning and the scan time was extended.	(1) Calculate and confirm the scan time for the user program, and shorten the scan time with the CJ instruction, etc.
"END NOT EXECUTE" (Checked at execution of END processing)	24	241	Instead of executing the END instruction, all programs equivalent to the program size were executed. (1) During END instruction execution, another instruction code was read due to noise, etc. (2) The END instruction has been changed to a code for other instruction for some reason.	(1) Reset, then RUN again. If the same error is displayed again, it is a CPU hardware failure. Consult with the dealer regarding the problem.
"MAIN CPU DOWN"	26	—	Main CPU is malfunctioning or broke down.	Since it is a CPU hardware failure, consult with the dealer regarding the problem.
"UNIT VERIFY ERR." (Always checked)	31	—	The I/O module information is different from that at the time of power on. (1) An I/O module (including the special function module) was about to be dismounted or dismounted during operation, or a wrong module was installed. (2) The END instruction has been changed to a code for other instruction for some reason.	Read the detailed error information into a peripheral device, and check or replace the module corresponding to the value (start I/O number). Or, monitor special registers D9116 to D9123 with the peripheral device, and check or replace the corresponding module whose data bit is "1."

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"FUSE BREAK OFF" (Always checked)	32	—	(1) There is an output module with a blown fuse. (2) The external power supply for output load is turned off or not connected.	(1) Check the ERR LED of the output modules and replace the module where the LED is lit. (2) A blown fuse module can also be checked with a peripheral device. The bits corresponding to the modules whose fuse is blown are set to "1" in special registers D9100 to D9107; thus, they can be monitored to replace fuse. (3) Check the on/off status of the external power supply for output load.
"CONTROL-BUS ERR."	40	401	The FROM/TO instructions cannot be executed due to control bus failure with a special function module.	Since it is a hardware failure of either the CPU board, the special function module, or the base unit, the module should be replaced and check the defective module. Consult with the dealer regarding the problem of the defective module.
		402	When I/O assignments of parameters are being performed, the special function module cannot be accessed during the initial communication. When an error occurs, the start I/O number (higher 2 digits of the 3-digit representation) of the special function module that was subject to the error is stored in the D9011.	
		403	A PCI bus error occurred.	
"SP. UNIT DOWN"	41	411	During FROM/TO instruction execution, special function module was accessed but the module was not responding.	Since it is a hardware failure of the special function module accessed, consult with the dealer regarding the problem.
		422	When I/O assignments of parameters are being performed, the special function module does not respond during the initial communication. When an error occurs, the start I/O number (higher 2 digits of the 3-digit representation) of the special function module that was subject to the error is stored in the D9011.	
"LINK UNIT ERROR"	42	—	Both of the A1SJ71AP21/R21, A1SJ71AT21B, AJ71AP21/R21 and AJ71AP21B are set as master stations.	Set one of the A1SJ71AP21/R21, A1SJ71AT21B, AJ71AP21/R21 and AJ71AP21B as a master station and the other as a local station.
"I/O INT. ERROR"	43	—	Interrupt occurred even though no interrupt module was installed.	Since it is a hardware failure of one of the modules, replace the module and check the defective module. Consult with the dealer regarding the problem of the defective module.

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"SP. UNIT LAY. ERR."	44	441	During parameter setting by a peripheral device, I/O assignment of a special function module was made at a location for an I/O module, or vice versa.	Perform I/O assignment parameter setting with the peripheral device again according to the actual installation location of the special function module.
		442	Eleven or more of special function module cards (excluding AI61(S1)) which can activate interrupts to the CPU boards are installed.	Reduce the number of special function module cards which can activate interrupts (excluding AI61(S1)) to 10 or less.
		443	Three or more of A1SJ71AP21/R21, A1SJ71AT21B, AJ71AP21/R21, or AJ71AT21B cards are installed.	Reduce A1SJ71AP21/R21, A1SJ71AT21B, AJ71AP21/R21, or AJ71AT21B cards to two or less.
		444	Seven or more of computer link module cards are installed in one CPU board.	Reduce the number of computer link module cards to six or less.
		445	Two or more AI61(S1)/A1SI61 cards are installed.	Reduce to only one AI61/A1SI61 card.
		446	The model name of the module allocated for MNET/MINI automatic refresh and that of the module for the station number actually being linked do not match during parameter setting using a peripheral device.	Perform the MNET/MINI automatic refresh module assignment parameter setting with the peripheral devise again for according to the module for the station number actually being linked.
		447	The number of special function modules, which can use dedicated instructions, has been assigned to I/Os exceeding the maximum per CPU board. (Total number of modules for each computer is 1344 or more, as shown below) Number of AD59 installed × 5) Number of AD57 (S1)/AD58 installed × 8) Number of A1SJ71UC24-R2 (PRF/R4) installed × 10) Number of AJ71C24 (S3/S6/S8) installed × 10) Number of AJ71UC24 installed × 10) Number of AJ71C21 (S1) installed × 29) Number of A1SJ71PT32-S3, AJ71PT32 (S3) installed × 125) Total > 1344	Reduce the number of special function modules installed.
		448	(1) Five or more of AJ71LP21, AJ71BR11, AJ71LR21 cards are installed. (2) Five or more of A1SJ71AP21/R21, A1SJ71AT21B, AJ71AP21/R21, AJ71AT21B, AJ71LP21, AJ71BR11 or AJ71LR21 cards are installed in total.	(1) Reduce to 4 cards or less. (2) Reduce to 4 cards or less in total.
"SP. UNIT ERROR" (Checked during execution of the FROM/TO instruction or dedicated instruction for special function module)	46	461	A location designated with the FROM/TO instruction is not a special function module.	Read the erroneous step into a peripheral device, and correct the content of the FROM/TO instruction in that step.
		462	A location designated with a dedicated instruction for special function module is not a special function module, or any of the applicable special function modules.	Read the erroneous step into a peripheral device, and correct the content of dedicated instruction for the special function module in that step.

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"LINK PARA. ERROR"	47	— (MELSECNET II)	(1) Link range was designated with parameter setting of a peripheral device but the content loaded to the parameter area of the link and the content of the link parameter read by the CPU are different for some reason, or link parameter has not been loaded. (2) Total number of slave stations is set to 0.	(1) Write and check the parameter again. (2) Check the station number setting. (3) If the error is displayed again, it is a hardware failure. Consult with the dealer regarding the problem.
		470	MELSECNET/10 network refresh parameter error	
		471	MELSECNET/10 data inter-link transfer parameter error	
		472	MELSECNET/10 routing parameter error	
		473	MELSECNET/10 network parameter error on the first card	
		474	MELSECNET/10 network parameter error on the second card	
		475	MELSECNET/10 network parameter error on the third card	
		476	MELSECNET/10 network parameter error on the fourth card	
"OPERATION ERROR" (Checked at execution of an instruction)	50	501	(1) When a file register (R) was used, the device number and block number of the file register exceeded the designated ranges, and were then computed. (2) A file register was used in the program without setting the size of the file register.	Read the erroneous step into a peripheral device and correct the program in that step.
		502	Combination of devices designated with an instruction is incorrect.	
		503	The storage data or constants of a device to be designated are not within the usable range.	
		504	The setting usage count of data to be processed has exceeded the allowable range.	
		505	(1) The station number designated with the LEDA/B LRDP, LEDA/B LWTP LRDP or LWTP instruction is not a local station. (2) The start I/O number designated with the LEDA/B RFRP, LEDA/B RTOP RFRP or RTOP instruction is not a remote station.	
		506	The start I/O number designated with LEDA/B RFRP, LEDA/B RTOP RFRP or RTOP instruction is not a special function module.	

Error code list

Error message	Error code (D9008)	Detailed error code (D9091)	Details and cause of error	Corrective action
"OPERATION ERROR" (Checked at execution of an instruction)	50	507	(1) While the AD57(S1) or AD58 was executing an instruction with split processing, other instruction was executed for the same module. (2) While the AD57(S1) or AD58 was executing an instruction with split processing, other instruction was executed for other AD57(S1) or AD58 module with split processing.	Read the erroneous step into a peripheral device. While executing an instruction to the AD57(S1) or AD58 with split processing, do not let the module execute other instruction. Or, to prevent executing an instruction by split processing to other the AD57(S1) or AD58, interlock with the special relay M9066 or modify the program configuration to correct the problem.
		509	(1) An instruction that could not be used was executed to a remote terminal module which was actually connected to the MNET/MINI-S3. (2) While 32 instructions registered to the memory area were waiting to be processed, another PRC instruction was executed. Thus, the mail box (execution wait memory area) overflowed. (3) The PIDCONT instruction was executed without executing PIDINIT. PID57 was executed without executing the PIDINIT and PIDCONT instructions.	(1) Read the erroneous step into a peripheral device, and modify the program according to the actual installed conditions of the remote terminal module. (2) Correct it using the special register D9081 (the number of empty mail boxes) or the special relay M9081 (mail box busy signal) so that it does not execute the PRC instruction when the mail box (memory area for waiting for execution) has no free area. (3) Execute the next instruction after completing the execution of each instruction.
"MAIN CPU DOWN"	60	—	(1) The CPU op erated abnormally due to noise, etc. (2) Hardware failure	(1) Implement a counteraction to noise. (2) Replace the CPU.
"BATTERY ERROR" (Checked at power on)	70	—	(1) Battery voltage dropped below the designated value. (2) Battery lead connector is not installed.	(1) Replace the battery. (2) When built-in RAM memory or the power failure compensation function is used, install a lead connector.

12.2 Errors that may Occur when Executing Functions

When an error occurs during the execution of a function, an error code that is returned will be used as a return value.
The following table lists the return values, the error contents and corrective actions to take:

Return value (HEX)	Error content	Corrective action
0	Normal end	-
1	Driver not started. The driver has not been started. The interrupt number and I/O address are duplicated with those for other board.	Correct the error occurred during driver startup. Check the board setting.
2	Board response error A timeout has occurred while waiting for a response to the corrective action.	Review the operation status of the access station(s) and loading conditions of the board(s). Retry with the application program.
65 (41)	Channel error An unregistered channel number was designated.	Check the channel number.
66 (42)	OPEN error The designated channel has already been opened.	Open only once.
67 (43)	CLOSE error The designated channel has already been closed.	Close only once.
68 (44)	PATH error A path other than the opened line was set.	Set to the number when the path was opened.
69 (45)	Processing code error An unsupported processing code was issued.	Use the supported processing code.
70 (46)	Station designation error The designated station is incorrect. A process that should have been requested to other station was requested to the local station. Or, the station number corresponds to the local station (0xFF) but the network No. is not 0.	Correct the designation of the station number in the application program.
71 (47)	Receive data error (during RECV request) Data has not been received.	Wait until data is received.
72 (48)	Waiting for mode setting Mode setting has not been performed.	Perform mode setting.
73 (49)	Mode error Processing was requested to other station when the mode setting was not online.	Set the mode to online. Or, cancel the request.
	Interrupt number error The interrupt number is duplicated with that for other board.	Check the board setting.
	I/O address error The I/O address is duplicated with that for other board.	
77 (4D)	Memory error Sufficient memory could not be secured.	End all other application programs that are currently running. Check if the system is operating normally. Restart the system. Increase the minimum working set area of the PC. *1
78 (4E)	Timeout error during mode setting Mode setting was attempted but failed due to timeout.	Restart after checking that the dual-port memory is not duplicated with other board. Hardware failure.
80 (50)	Mapping of shared memory address failed.	Check if the shared address is duplicated with that of other INTERFACE board.
85 (55)	Channel number error (during RECV request) A channel number error.	Check the channel number used during the RECV request.
100 (64)	Local station board being accessed, or requesting to SEND An access request was issued to the local station board while the local station board is being accessed.	Retry.

Return value (HEX)	Error content	Corrective action
101 (65)	Routing parameter error The routing parameter is not set.	Correct the routing parameters.
102 (66)	Data sending error Data sending has failed.	Retry. Check if the system is operating normally.
103 (67)	Data receiving error Data receiving has failed.	Restart the system.
128 (80)	Number of bytes read error The number of bytes to be read was out of range.	Set the number of bytes to be read within the range.
129 (81)	Device type error The designated device type is invalid.	Check the device type.
130 (82)	Device number error The designated device number is out of range. When a bit device is designated, the device number is not a multiple of 8 for ACPU or 16 or QnACPU.	Check the device number.
131 (83)	Device points error The designated number of points was out of device range. When a bit device is designated, the device point is not a multiple of 8 for ACPU or 16 for QnACPU.	Check the size.
132 (84)	Number of bytes written error The number of bytes to be written was out of range.	Set the number of bytes to be written within the range.
133 (85)	Link parameter error The link parameter is broken down. The total number of slave stations is 0. The link parameter's fixed pattern is broken. The link parameter's sum check is broken.	Reset the link parameter.
135 (87)	Remote RUN/STOP/PAUSE designation error Setting values other than 0 to 2 were designated for the remote RUN/STOP/PAUSE.	Reset the setting value to 0 to 2.
136 (88)	Random written designation error. A designated value other than 0 to 2 was designated for the random written.	Reset the setting value to 0 to 2.
137 (89)	Processing cancel The next processing was requested before the previous processing was completed.	Request the processing again after the previous processing is completed.
210 (D2)	Disallowed during RUN The sequence P shift processing was requested during RUN.	Request after setting the CPU to STOP.
212 (D4)	Processing cancel A new processing was requested during the processing.	Request again.
215 (D7)	Receive data length error The length of receive data or byte length is out of range.	Retry. Check the cable.
	Request data buffer length exceeded The length of request data exceeded the request data area.	Set the smaller size for the request data.
216 (D8)	Protocol error The communication procedure is abnormal. The requested code does not exist.	Check the cable.
217 (D9)	Address error The address is out of the access range.	Check the request data.
219 (DB)	Write error Unable to write.	
224 (E0)	PC number error The request destination station does not exist.	Check the station number.
225 (E1)	Processing mode error A processing code that could not be processed by the request destination ACPU was set. (It is checked by the request destination ACPU.)	Review the request destination ACPU and processing code.

Return value (HEX)	Error content	Corrective action
226 (E2)	Special module error The designated special module is not a module that can be processed.	Correct the Y number.
227 (E3)	Other data error Incorrect data was found in the address, head step or shift value of the request data.	Correct the request data.
228 (E4)	Link designation error A processing code that could not be processed by the request destination station was set. (It is checked by the request destination link module.)	Check the request destination station number and processing code.
232 (E8)	Remote error The keyword did not match during the remote RUN/STOP/PAUSE request.	Search for the request source that executed the remote STOP/PAUSE to the request destination ACPU.
233 (E9)	Link time-over The request destination disconnected the link while processing.	Return the link.
234 (EA)	Special module BUSY Either the receive buffer was full at the request destination during sending of general data, or data receiving was not ready.	Review the hardware of the special module.
236 (EC)	Request destination BUSY Either the receive buffer was full at the request destination during sending of general data, or data receiving was not ready.	Execute the request when the request destination can receive data.
240 (F0)	Link error A request was issued to a disconnected link station.	Return the link.
241 (F1)	Special module bus error Processing was not ready for the designated special module.	Review the hardware of the special module.
242 (F2)	Special module time-over No response was made from the designated special module.	Review the hardware of the special module.
	No response was made from the MELSECNET (II) board.	Review the hardware of the MELSECNET (II) board.
1280 (500)	Local station board memory access error	Check the switch setting on the local station board and move the memory address to the area that is not affected by other board. Change the memory access setting to 16 bits if it is set to 8 bits.
1281 (501)	Unable to access I/O port	Check the setting for the I/O port address. Perform a board self-loopback test and check the hardware.
16384 to 20479 (4000 to 4FFF)	Errors detected by the access target CPU.	Refer to the user's manual of the access target CPU module.
16432 (4030)	The designated device type does not exist.	Check the designated device type.
16433 (4031)	The designated device number is out of range.	Check the designated device number.
16448 (4040)	The module does not exist.	Do not issue a request that generated an error for the designated special module.
16449 (4041)	The number of device points is out of range.	Check the head address and number of access points, and access within the existing range.
16450 (4042)	Corresponding module error	Check if the designated module is operating normally.
16451 (4043)	The module does not exist at the designated location.	Check the start I/O number of the designated module.
28672 to 32767 (7000 to 7FFF)	Errors detected by intelligent function modules such as the serial communication module.	Refer to the user's manual of the access target intelligent function module.

Return value (HEX)	Error content	Corrective action
–1 (FFFF)	Bus error The designated bus is invalid.	Check the bus that was returned by the mdOpen function.
–2 (FFFE)	Device number error The designated device number is out of range. When a bit device is designated, the device number is not a multiple of 8.	Check the head device number for the designated device.
–3 (FFFD)	Device type error The designated device type is invalid.	Check if the device type used is in the device list.
–4 (FFFC)	CPU error Check an invalid station was designated.	Check the status of the communication station. Check the designated station number.
–5 (FFFB)	Size error The device number and size exceeded the device range. Access was attempted using an odd byte count. The device number and size exceeded the range for the same block.	Check the designated device size. Check the device number and size.
–6 (FFFA)	Number of block error The number of blocks designated in dev [0] for device random read/write is out of range.	Check the number of blocks designated in dev[0].
–8 (FFF8)	Channel number error The channel number designated in the mdOpen function is invalid.	Check the designated channel number.
–11 (FFF5)	Insufficient buffer area The read area size of the read data storage array variable is too small.	Check the read size and read data storage destination size.
–12 (FFF4)	Block error The designated block No. of the extension file register is invalid.	Check the block No. (device type) of the extension file register.
–13 (FFF3)	Write protect error The designated block number of the extension file register is duplicated with the write protect area of the memory cassette.	Check the block No. (device type) of the extension file register. Check the write protect DIP switch of the accessed memory cassette.
–14 (FFF2)	Memory cassette error No memory cassette is loaded to the accessed CPU, or an incorrect memory cassette is loaded.	Check the accessed memory cassette.
–15 (FFF1)	Read area length error The read area size of the read data storage array variable is too small.	Check the read size and read data storage destination size.
–16 (FFF0)	Station number/network No. error The station number/network No. is out of range.	Check the designated station number/network No.
–17 (FFEF)	All-station/group No. designation error A function that does not support all-station designation/group No. designation was designated.	Check if all-station designation/group No. designation is enabled for the function.
–18 (FFEE)	Remote direction error An undesignated code was designated.	Check the designated code.
–19 (FFED)	SEND/RECV channel No. error The channel No. designated with the SEND/RECV function is out of range.	Check the designated channel No.
–21 (FFEB)	Error in gethostbyname ( ) An error occurred in the function, gethostbyname ( ).	Check if the designated host name exists in the HOSTS file.
–24 (FFE8)	Time-out error in select ( ) A timeout error occurred in the function, select ( ).	Check if MGW server service has been started on the server machine. Check if normal Ethernet communication can be performed with the server machine.

Return value (HEX)	Error content	Corrective action
–25 (FFE7)	Error in sendto ( ) An error occurred in the function, sendto ( ).	Check if normal Ethernet communication can be performed with the server machine.
–26 (FFE6)	Error in recvfrom ( ) An error occurred in the function, recvfrom ( ).	
–28 (FFE4)	Error response receiving An error response was received.	
–29 (FFE3)	Receive data length exceeded Too much data was received.	
–30 (FFE2)	Sequence No. error The received sequence No. is abnormal.	
–31 (FFE1)	DLL error An attempt to load a DLL, which is necessary to execute the function, has failed.	Set up the package again.
–32 (FFE0)	Other task/thread is occupying the resource and the resource is not released within 30 s.	Retry. There may be a problem of insufficient memory. End other application (s) that is currently running. Check if the system is operating normally. Restart the system.
–33 (FFDF)	Incorrect access destination error The setting for the communication destination is incorrect.	Check if the communication destination is correctly set by the utility. Check if the communication destination is incorrect (not supported.)
–34 (FFDE)	Registry error An attempt to open the registry has failed.	Check if the communication destination is correctly set by the utility. Set up the package again.
–35 (FFDD)	Registry read error An attempt to read from the registry has failed.	
–36 (FFDC)	Registry write error An attempt to write to the registry has failed.	
–37 (FFDB)	Communication initialization setting error An attempt to perform initial setting for communication has failed.	Retry. There may be a problem of insufficient memory. End other application(s) that is currently running. Check if the system is operating normally. Restart the system.
–38 (FFDA)	Ethernet communication setting error An attempt to set for Ethernet communication has failed.	Retry. Check if the communication destination is correctly set by the utility. There may be a problem of insufficient memory. End other application (s) that is currently running. Check if the system is operating normally. Restart the system.
–39 (FFD9)	COM communication setting error An attempt to set for COM communication has failed.	
–41 (FFD7)	COM control error Control cannot be performed properly during COM communication.	Retry. Check if the system is operating normally. Restart the system.
–42 (FFD6)	Close error Communication cannot be closed.	
–43 (FFD5)	ROM operation error The TC setting value was written to the CPU during ROM operation.	Change the TC setting value during RAM operation.
–44 (FFD4)	LLT communication setting error An attempt to set for LLT communication has failed.	Retry. Check if the communication destination is correctly set by the utility. There may be a problem of insufficient memory. End other application(s) that is currently running. Check if the system is operating normally. Restart the system.
–45 (FFD3)	Ethernet control error Control cannot be performed properly during Ethernet communication.	Retry. Check if the system is operating normally. Restart the system.

Return value (HEX)	Error content	Corrective action
–50 (FFCE)	Open path maximum value exceeded The number of open paths exceeds the maximum value (32).	Close several paths.
–51 (FFCD)	Exclusive control error An error occurred in the exclusive control.	Retry. Check if the system is operating normally.
–4096 to –257 (F000 to FEFF)	Errors detected in the MELSECNET/H, MELSECNET/10 network system.	MELSECNET/10 network system Refer to the MELSECNET/H, MELSECNET/10 network system reference manual.
–2174 (F782)	Request destination station number designation error The designated station number for the processing request destination is designating the local station.	Review the request destination station number.
–16384 to –12289 (C000 to CFFF)	Errors detected by the Ethernet interface module	Refer to the user's manual of the Ethernet interface module.
–20480 to –16385 (B000 to BFFF)	Errors detected in the CC-Link system.	Refer to the CC-Link system master/local module user's manual. * Refer to the QJ61BT11N User's Manual for whether the cyclic data can be transmitted to/from stations compatible with CC-Link Ver.2.
–24957 (9E83)	Device points error The number of points set for the request destination station is out of device range. When a bit device is designated, the device number is not a multiple of 8. (It is checked by the request destination link module.)	Check the size.
–24958 (9E82)	Device number error The device number designated for the request destination station is out of range. When a bit device is designated, the device number is not a multiple of 8. (It is checked by the request destination link module.)	Check the device No.
–24959 (9E81)	Device type error The device type designated for the request destination station is invalid. (It is checked by the request destination link module.)	Check the device type.
–25056 (9E20)	Processing code error A processing code that cannot be processed by the request destination station was set. (It is checked by the request destination link module.)	Check the request destination station number and processing code.
–26334 (9922)	Board reset error Other process has executed a board reset using the same channel while other station is being accessed.	Retry.
–26336 (9200)	Request error for other loop Routing to other loop was performed.	Change the routing request destination to AnUCPU or QnACPU.
–28150 (920A)	Data link disconnecting error	A local station link device was accessed while the data link is being disconnected.
–98156 (9204)	Dual-port memory handshake error	Remove other optional board.
–28158 (9202)	WDT error	Reset the board. Restart the IBM PC/AT compatible PC.

∗1: Procedures and sample program for increasing the minimum working set area of the PC

The following provides measures for increasing the minimum working set area of the PC when an error of error code 77 occurs due to MD function execution, and its sample program.
The PC board driver runs using the minimum working set area in the memory area reserved in the application program. Some application program may use a large area of the minimum working set area. In such a case, when the minimum working set area for the PC board driver cannot be reserved, an error code 77 is returned.
If this situation occurs, increase the minimum working set area in the application program before executing the MD function. (See the following sample program.)
The minimum working set area of 200KB is reserved at startup of the personal computer.

Sample program

This section gives a processing overview for setting a greater size to the minimum working set and provides sample programs.

(a) Processing overview of sample program

1) Obtain the application program ID by the GetCurrentProcessID function.
2) Using the ID obtained in step 1), obtain the application program handle by the OpenProcess function.
3) The current minimum and maximum working set sizes can be obtained by executing the GetProcessWorkingSetSize function.
4) Set a size greater than the minimum working set obtained in step 3) and execute the SetProcessWorkingSetSize.
5) Release the application program handle by the CloseHandle function.

(b) Sample program: When setting by VB

(Example of min. working set size 1MB and max. working set size 3MB)

```
Dim id As Long          'Application program ID variable
Dim ph As Long          'Application program handle variable
Dim wkmin As Long       'Minimum working set variable
Dim wkmax As Long       'Maximum working set variable

'Obtain the application program ID
id = GetCurrentProcessID()
'Open the application program handle
'PROCESS_SET_QUOTA = 256,PROCESS_QUERY_INFORMATION = 1024
ph = OpenProcess(256 + 1024,False,id)
'Obtain the maximum working set size and minimum working set size of the application program
bret = GetProcessWorkingSetSize(ph,wkmin,wkmax)
'Set the minimum working set size to 1MB
wkmin = 1 * 1024 * 1024
'Set the maximum working set size to 3MB
wkmax = 3 * 1024 * 1024
'Change the maximum working set size and minimum working set size of the application program
bret = SetProcessWorkingSetSize(ph,wkmin,wkmax)
'Close the application program handle
bret = CloseHandle(ph)
```

The set sizes shown here are reference sizes. Adjust the sizes in accordance with your system.

(c) Sample program: When setting by VC
(Example of min. working set size 1MB and max. working set size 3MB)

```
#define ERROR   -1
short ChangeWorkingSetSize()
{
    DWORD    dwProcessId;                /*Application program ID variable*/
    HANDLE   hProcess;                   /*Application program handle variable*/
    DWORD    dwMinimumWorkingSetSize;    /*Minimum working set variable*/
    DWORD    dwMaximumWorkingSetSize;    /*Maximum working set variable*/

    /*Obtain the application program ID*/
    dwProcessId = GetCurrentProcessId();

    /*Open the application program handle*/
    hProcess =
    OpenProcess(PROCESS_SET_QUOTA+PROCESS_QUERY_INFORMATION,FALSE,dwProcessId);
    if(hProcess == NULL){
            /*Error end*/
            return(ERROR);
    }

    /*Obtain the maximum working set size and minimum working set size of the application program */
    if(GetProcessWorkingSetSize(hProcess,&dwMinimumWorkingSetSize,&dwMaximumWorkingSetSize)==0){
            /*Error end*/
            CloseHandle(hProcess);
            return(ERROR);
    }

    /*Set the minimum working set size to 1MB*/
    dwMinimumWorkingSetSize = 1 * 1024 * 1024;
    /*Set the maximum working set size to 3MB*/
    dwMaximumWorkingSetSize = 3 * 1024 * 1024;

    /*Change the maximum working set size and minimum working set size of the application program */
    if(SetProcessWorkingSetSize(hProcess,dwMinimumWorkingSetSize,dwMaximumWorkingSetSize)==0){
            /*Error end*/
            CloseHandle(hProcess);
            return(ERROR);
    }

    /*Close the application program handle*/
    CloseHandle(hProcess);

    /*Normal return*/
    return(0);
```

The set sizes shown here are reference sizes. Adjust the sizes according to your system.

12.3 Error Codes Returned by the Driver

The following table lists the event IDs, the error contents that are written in Event Viewer, and the corrective actions to take for driver startup errors.

Event ID (HEX)	Error content	Corrective action
256 (100)	The driver could not be executed because an error occurred during driver startup.	Reinstall the driver package. If the error still occurs, reinstall operating system.
257 (101)	The CPU board was not detected.	Check the installation status of the CPU board.
258 (102)	No response was made from hardware.	Replace the CPU board.
259 (103)	The number of boards detected exceeded the maximum number of boards that can be loaded.	Remove excessive boards.
260 (104)	The board conflicts with another device due to error in the MEM, INT, station number, DIP switches or other settings.	Check for duplicate settings with another optional board.
261 (105)	An attempt to create a device object has failed.	Increase the system memory size.
262 (106)	An attempt to link a device name has failed.	Reinstall operating system.
263 (107)	An attempt to secure dual-port memory has failed.	Change the memory address setting.
264 (108)	An attempt to perform interrupt registration has failed.	Change the INT number setting.
265 (109)	An error occurred when reading I/O.	Replace the CPU board.
266 (10A)	An error occurred when reading I/O.	
267 (10B)	An error occurred during memory transfer.	Start with the operating system reinstallation.
268 (10C)	An error occurred during receive processing. (The request packet is illegal.)	Check the program of the IBM PC/AT compatible PC and the programmable controller that requests the processing to the IBM PC/AT compatible PC.
270 (10E)	An error occurred during interrupt processing.	Start with the operating system reinstallation.
271 (10F)	An error occurred during UNLOAD processing.	
272 (110)	An error occurred during StartIO processing.	
273 (111)	An error occurred in a critical section.	
275 (113)	An error occurred during IoCompletion processing.	
276 (114)	An error occurred during DPC processing.	
277 (115)	An error occurred when opening the registry database.	
278 (116)	An error occurred when reading from the registry database.	
279 (117)	An error occurred when writing to the registry database.	1) This error occurs when the CPU board driver is installed first. Install SW1DNF-ANU-B, then restart the PC to confirm that this error does not occur. 2) Increase the system memory and disk capacities.

Event ID (HEX)	Error content	Corrective action
280 (118)	A request that could not be processed was received from another station. (A request for which a response request cannot be processed was received.)	Check the program of the IBM PC/AT compatible PC and the programmable controller that requests the processing to the IBM PC/AT compatible PC.
282 (11A)	The mapping of the I/O port has failed.	The I/O port is duplicated with another resource. Remove the other option board.
283 (11B)	The shared memory area of the CPU board is duplicated with other hardware.	Remove the other optional board.
284 (11C)	IRQ of the CPU board is duplicated with other hardware.	Remove the other optional board.
286 (11E)	Failed to secure enough memory area to start the driver.	Increase the system memory.
291 (123)	The mapping of the shared memory area has failed.	Remove the other optional board.
293 (125)	An attempt to perform interrupt registration has failed.	Remove the other optional board.
294 (126)	The I/O port of the CPU board is duplicated with other hardware.	Remove the other optional board.

13 TROUBLESHOOTING

This chapter describes the troubleshooting procedures when troubles occur using the system. How to check for error causes and what kinds of corrective actions to take are presented.

13.1 Checklist for Troubleshooting

Occurrences of troubles should be kept to a minimum in order to operate the system effectively. However, if a trouble occurs, it is important to identify the causes as quickly as possible to correct the error.
The following lists three types of basic items that need to be checked when performing troubleshooting:

(1) Visual check

Check the following items:

1) Operating conditions of external devices (stop or running status)
2) On/off status of the power supply
3) Status of I/O devices
4) Wiring status (cable and I/O lines)
5) LED display status (POWER LED, RUN LED, ERROR LED, I/O LED, etc.)
6) Status of various setting switches (extension base units, power failure compensation, etc.)
7) Confirmation of suitability of the IBM PC/AT compatible PC in a given operating environment
   After checking items 1) through 7), connect the external devices and check the operation of the user programs.

(2) Confirming abnormalities

Check for any abnormalities by performing the following operations:

1) Change the input conditions to see if the correct changes can be read by the test programs.
2) Repeat on/off of outputs to see if the status of the external devices changes accordingly.

(3) Narrowing down the range of trouble

Based on the check items (1) and (2) above, narrow down the range of trouble to one of the following:

1) IBM PC/AT compatible PC side or external device side
2) IBM PC/AT compatible PC main body or CPU board
3) I/O module or other modules
4) Cables
5) User programs
6) Sequence programs

13.2 Troubleshooting Flow by the Problem Occurrence Case

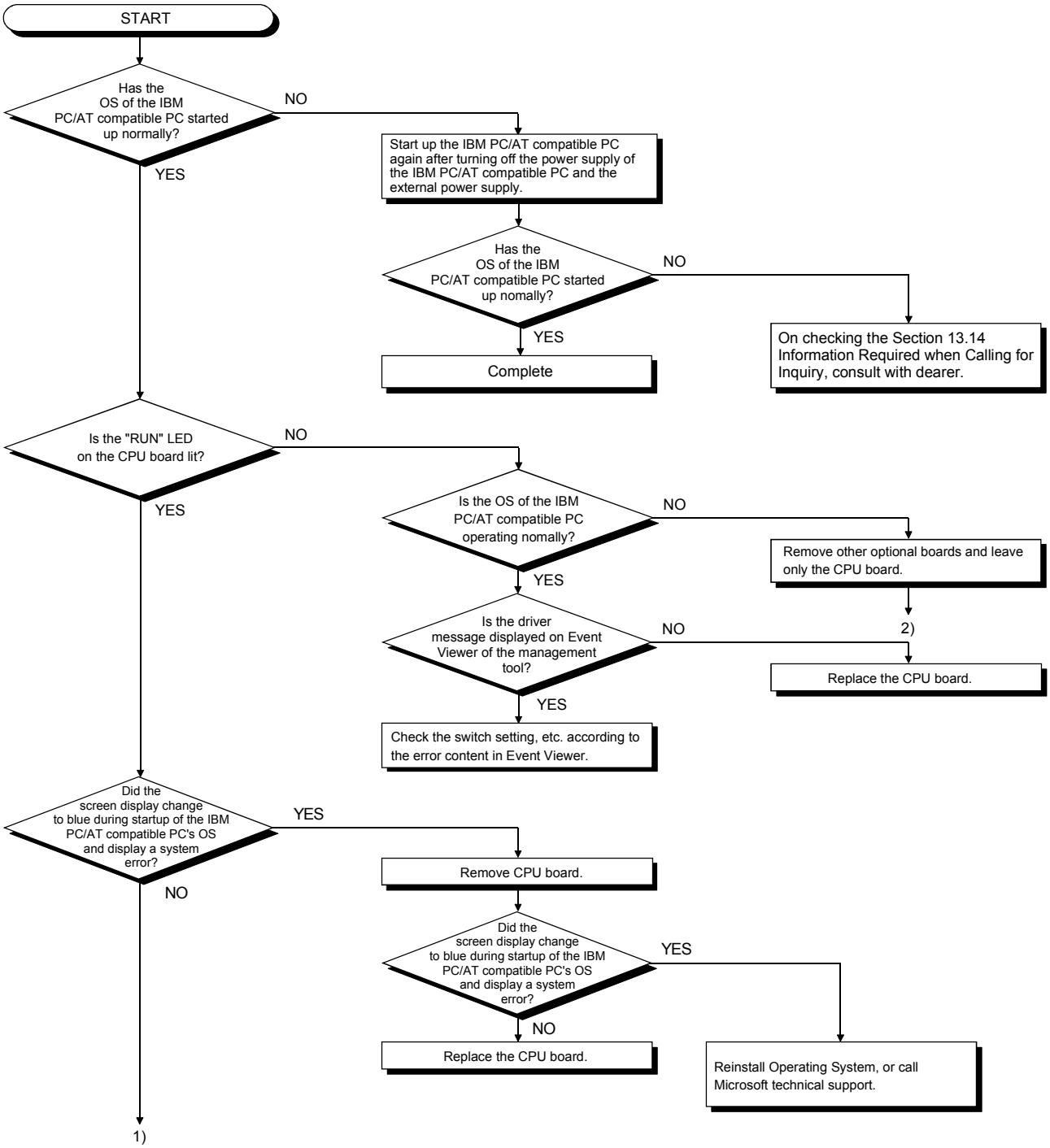
When a problem occurs, determine how to check for the cause from Table 13.1 below.

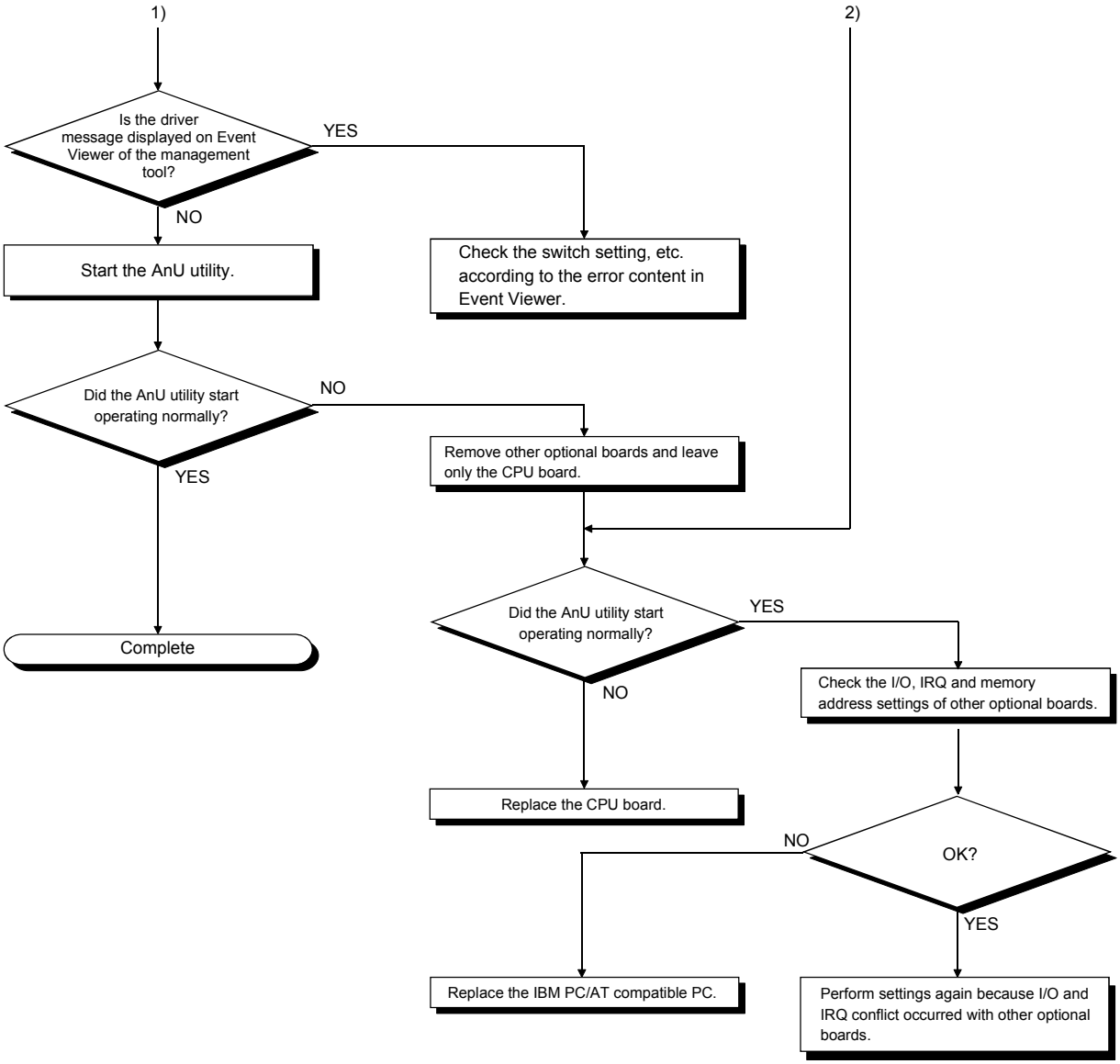
Table 13.1 Troubleshooting flow by the problem occurrence case

No.	Error detail	Cause determination method/Action
1	Not operating normally when the CPU board was booted.	See Section 13.3, "Flowchart for Actions When the Board and the IBM PC/AT Compatible PC were not Operating Normally."
2	The "RUN" LED is turned off.	See Section 13.5, "Flowchart for Actions When the "RUN" LED Turned Off."
3	The "RUN" LED is flashing.	See Section 13.6, "Flowchart for Actions When the "RUN" LED is Flashing."
4	The "ERROR" LED is turned on.	See Section 13.7, "Flowchart for Actions When the "ERROR" LED Turned On."
5	The "ERROR" LED is flashing.	See Section 13.8, "Flowchart for Actions When the "ERROR" LED is Flashing."
6	The "POWER" LED of the power supply module on the extension base unit is turned off.	See Section 13.9, "Flowchart for Actions When the "POWER" LED Turned Off."
7	The I/O module was not operating normally.	See Section 13.10, "Flowchart for Actions When the Output Module's Output Load does not Turn On."
8	The program cannot be written.	See Section 13.11, "Flowchart for Actions When Programs Cannot be Written."
9	The display of the AnU utility extends outside the CRT screen area.	See Section 13.12, "Flowchart for Actions When the Display of the AnU Utility Extends Outside the CRT Screen Area."
10	Uninstallation is not executed normally. 1) Although the message "SW□DNF-ANU-B has been successfully uninstalled from your machine" is displayed on the screen, the uninstallation is not complete.	Logon as a user with administrator authority and execute the uninstallation. (See POINT in Section 8.3)
11	An error message is displayed in utility. 1) "The AnU utility failed to load the H/W" is displayed. 2) "The AnU utility failed to set the value" is displayed.	Logon as a user with administrator authority and execute utility (See POINT in Chapter 9) or reinstall the operating system.

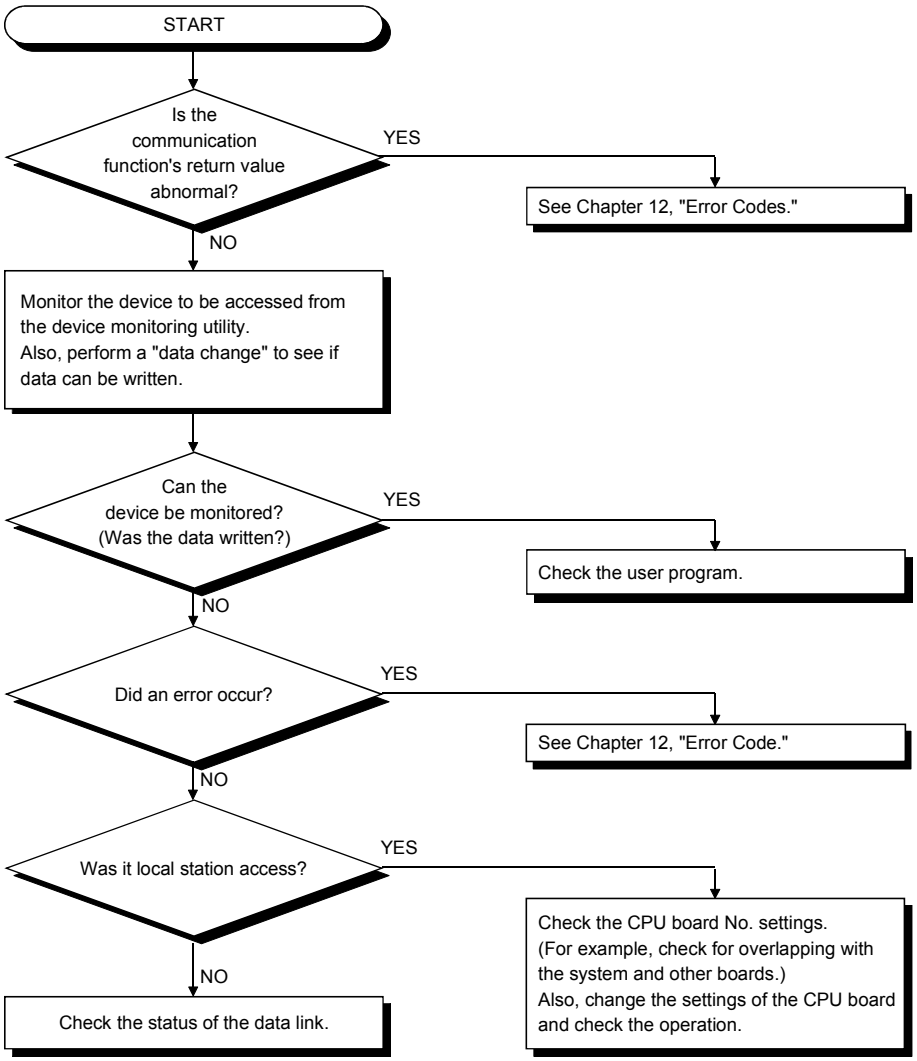
13.3 Flowchart when the Board and the IBM PC/AT Compatible PC were not Operating

The following shows a flowchart for checking with the IBM PC/AT compatible PC when they were not operating normally at the CPU board booting.



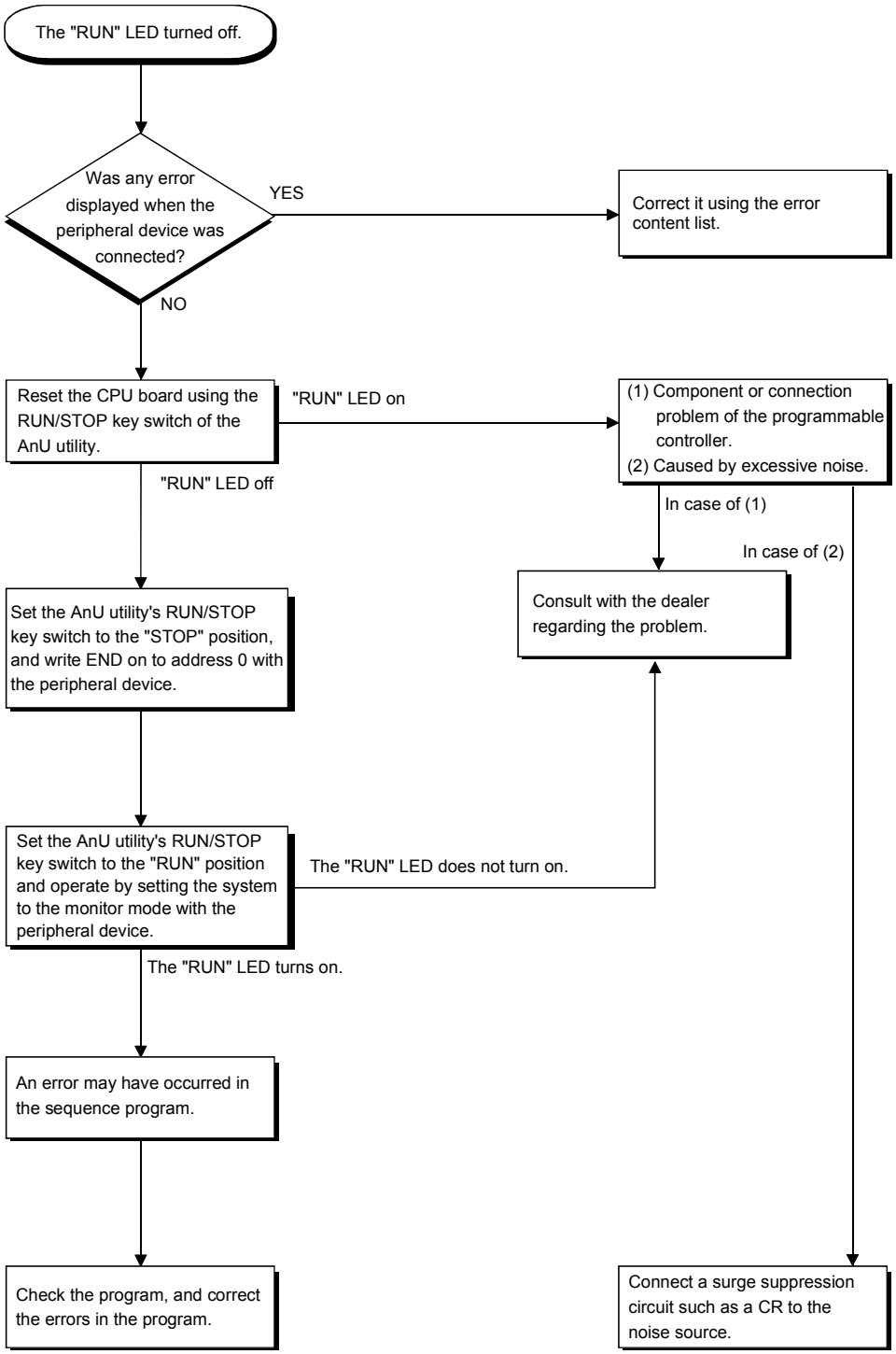

1)
2)
Is the driver message displayed on Event Viewer of the management tool?
YES
NO
Start the AnU utility.
Check the switch setting, etc. according to the error content in Event Viewer.
Did the AnU utility start operating normally?
NO
YES
Remove other optional boards and leave only the CPU board.
Complete
Did the AnU utility start operating normally?
YES
NO
Check the I/O, IRQ and memory address settings of other optional boards.
Replace the CPU board.
NO
OK?
YES
Replace the IBM PC/AT compatible PC.
Perform settings again because I/O and IRQ conflict occurred with other optional boards.

13.4 Flowchart for Actions when Devices could not be Read with the Communication Function



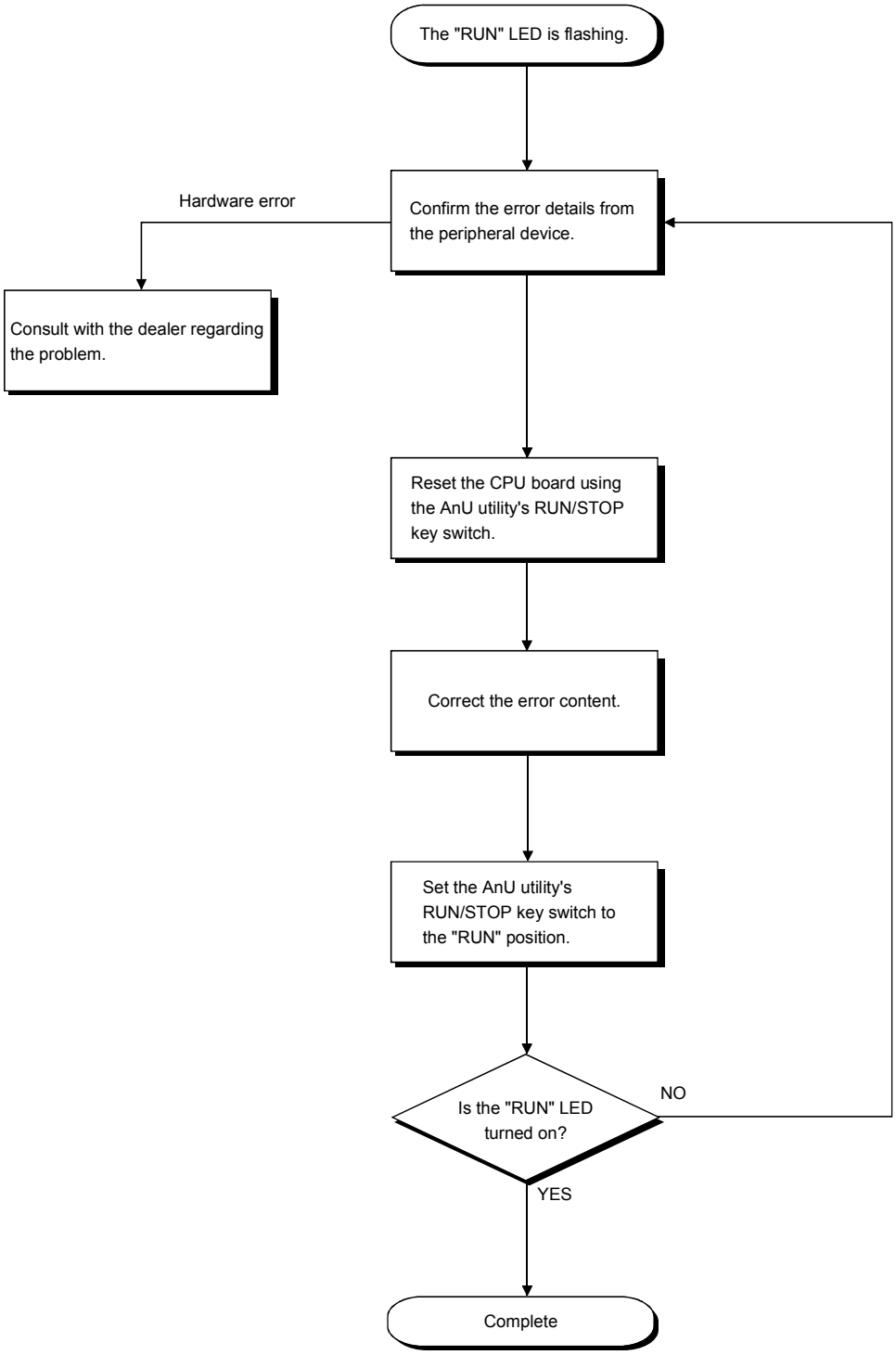
13.5 Flowchart for Actions when the "RUN" LED Turned off

The following flowchart explains the actions to take when the "RUN" LED turned off during an operation.



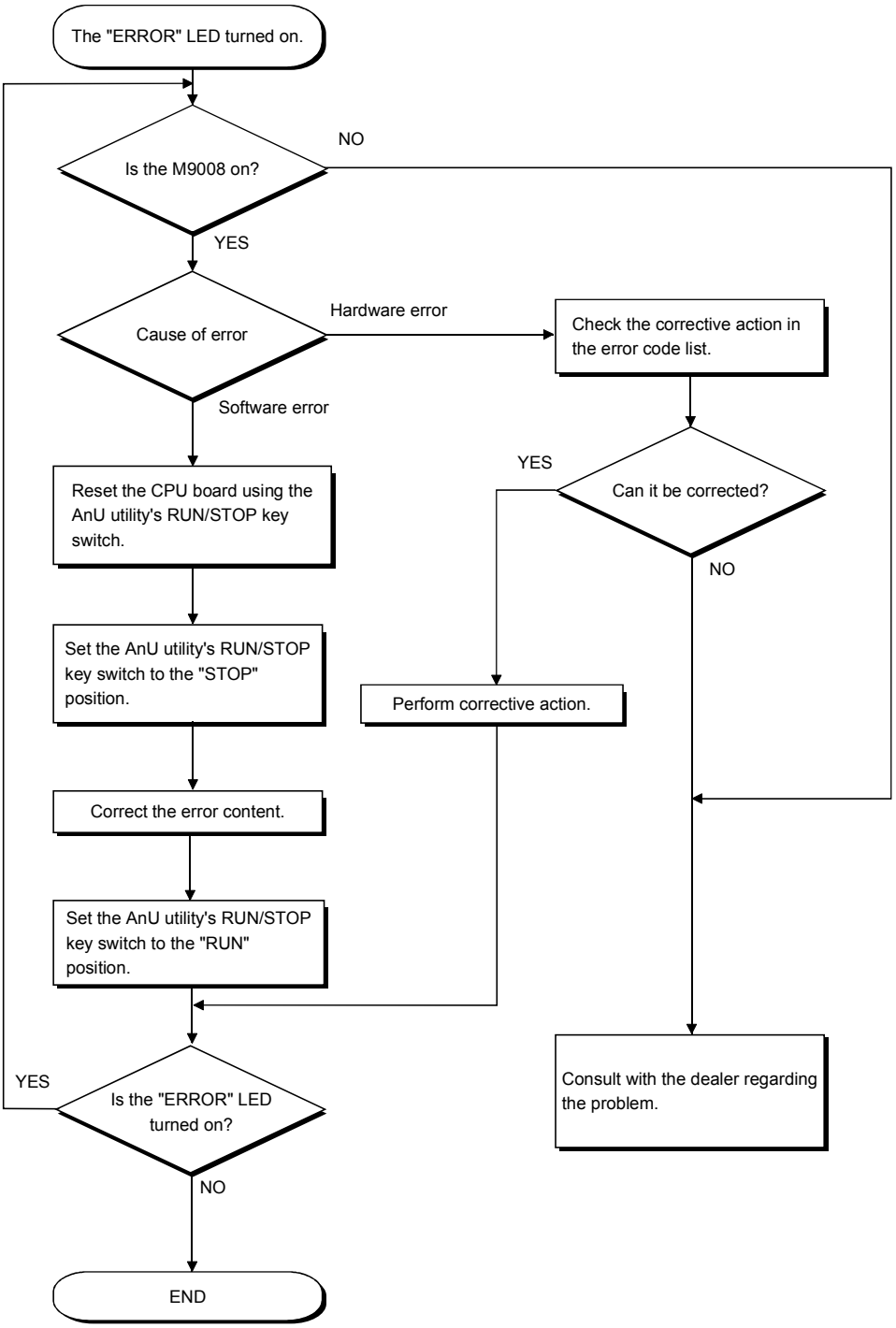
13.6 Flowchart for Actions when the "RUN" LED is Flashing

The following flowchart explains the corrective actions when the "RUN" LED is flashing when turning on the power, starting an operation, or during an operation.



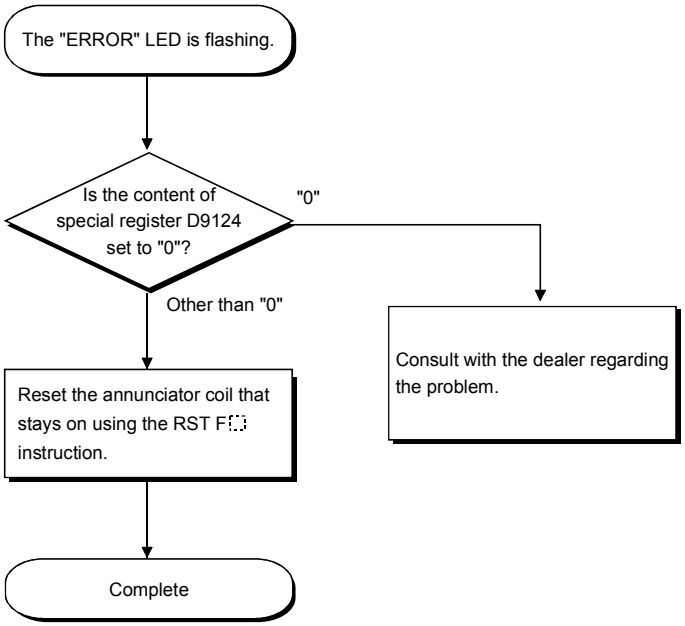
13.7 Flowchart for Actions when the "ERROR" LED Turned on

The following flowchart explains the actions to take when the "ERROR" LED turned on during an operation.



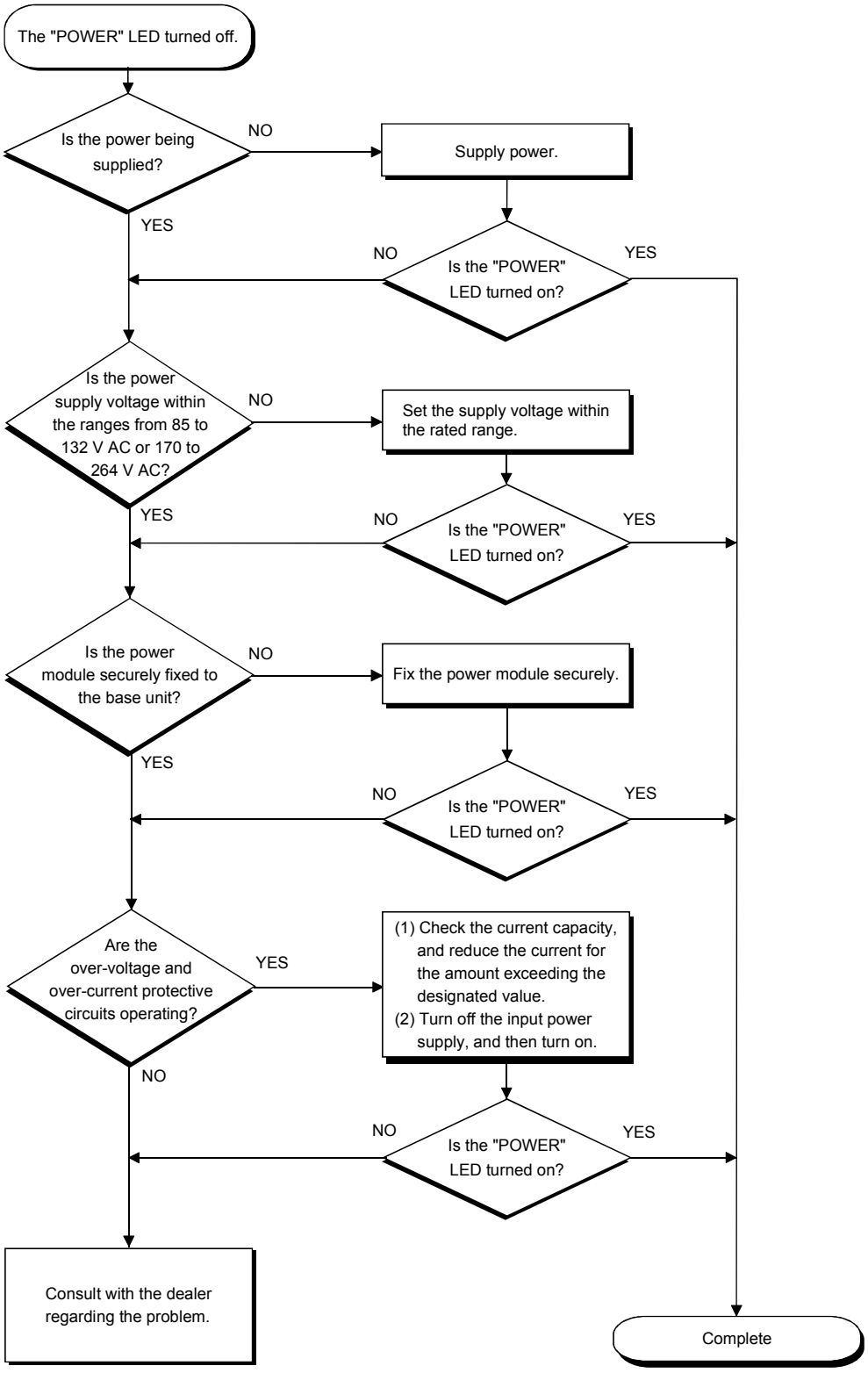
13.8 Flowchart for Actions when the "ERROR" LED is Flashing

The following flowchart explains the actions to take when the "ERROR" LED is flashing during a operation.



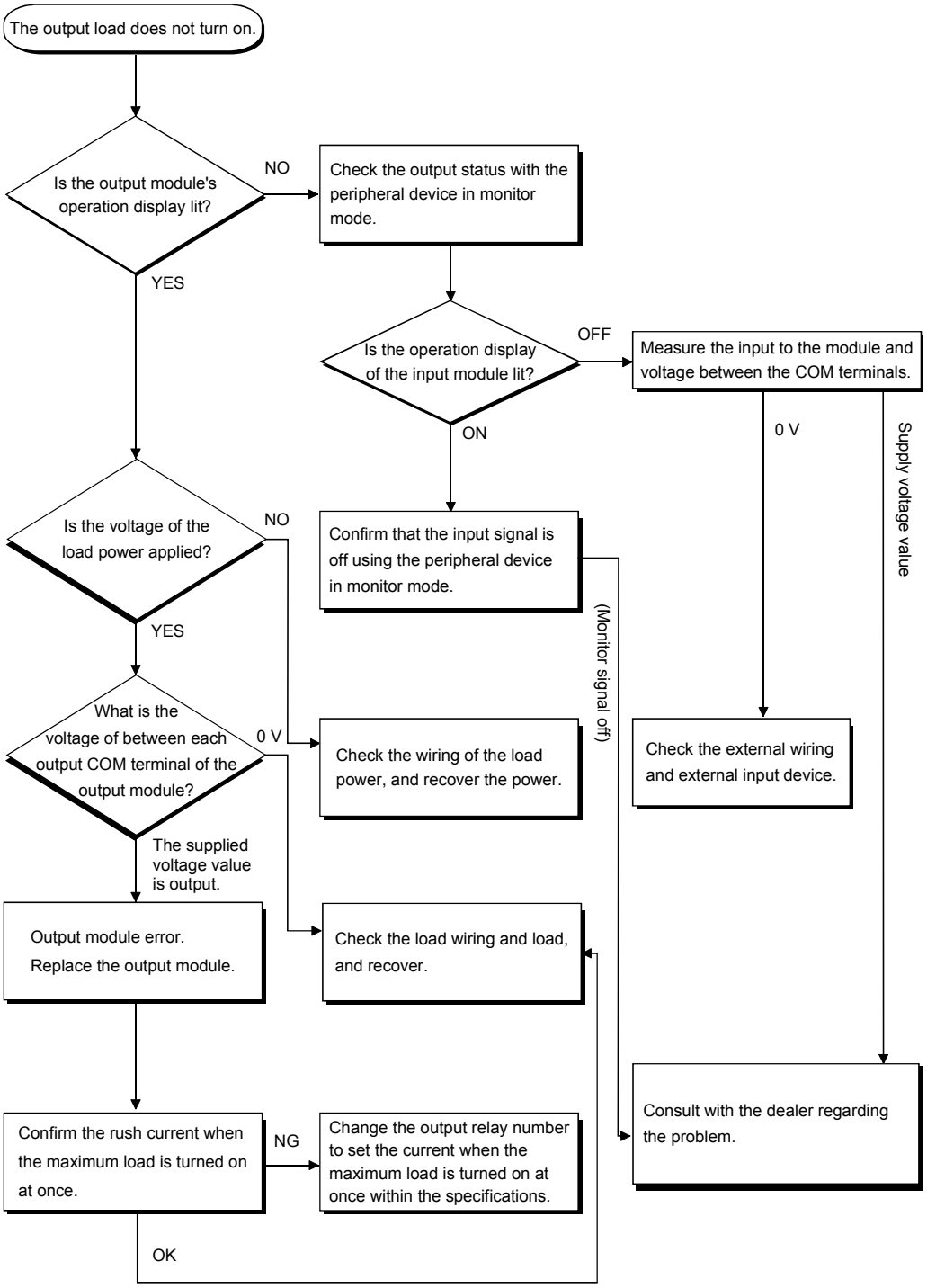
13.9 Flowchart for Actions when the "POWER" LED Turned off

The following flowchart explains the actions to take when the "POWER" LED turned off at power on or during an operation.



13.10 Flowchart for Actions when the Output Module's Output Load does not Turn on

The following flowchart explains the actions to take when the output load of the output module does not turn on during an operation.

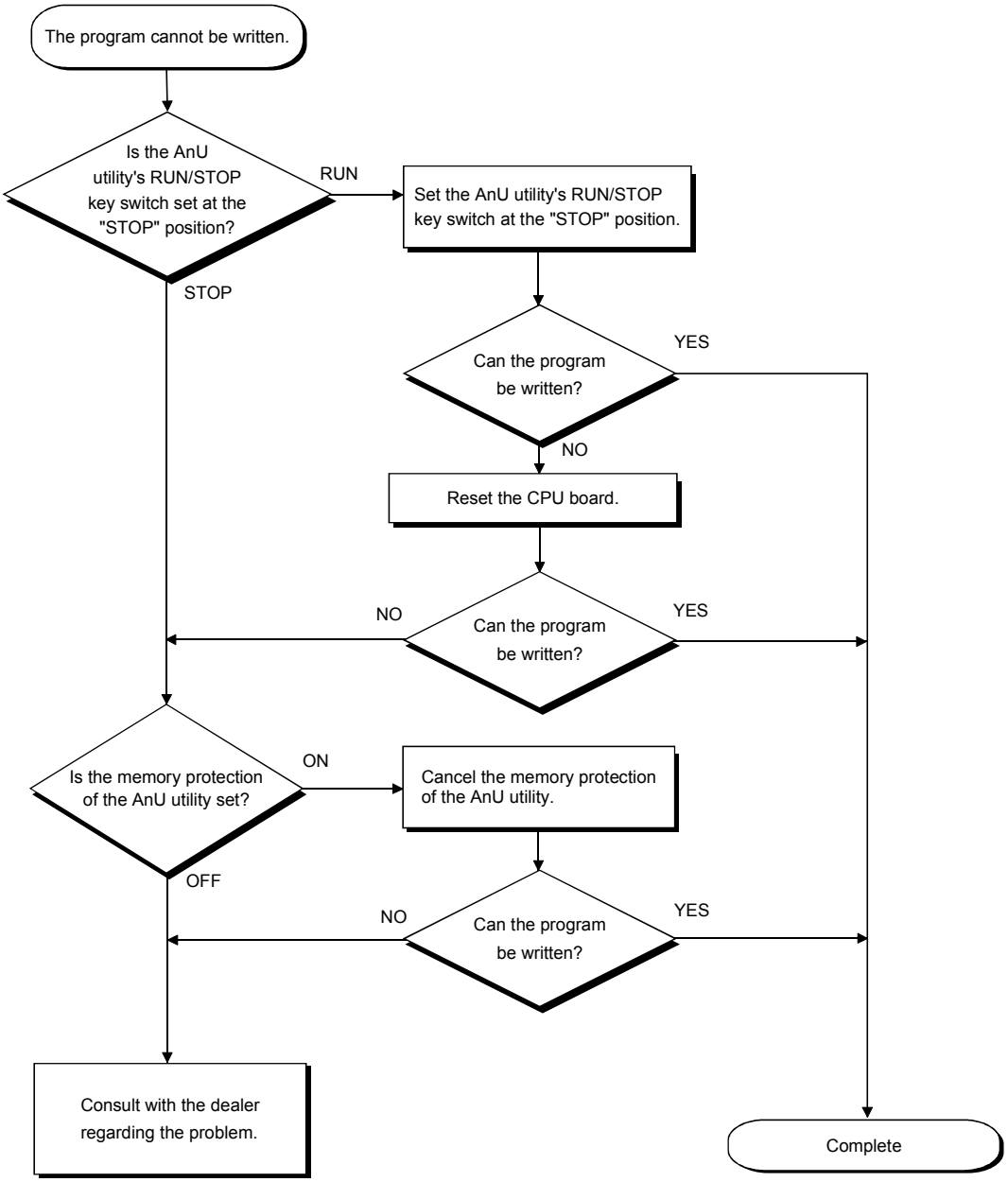


POINT

In case of problems where the input signal does not turn off and the load does not turn off, perform the troubleshooting by seeing Section 13.13, "Examples and Countermeasures of I/O Module Troubles."

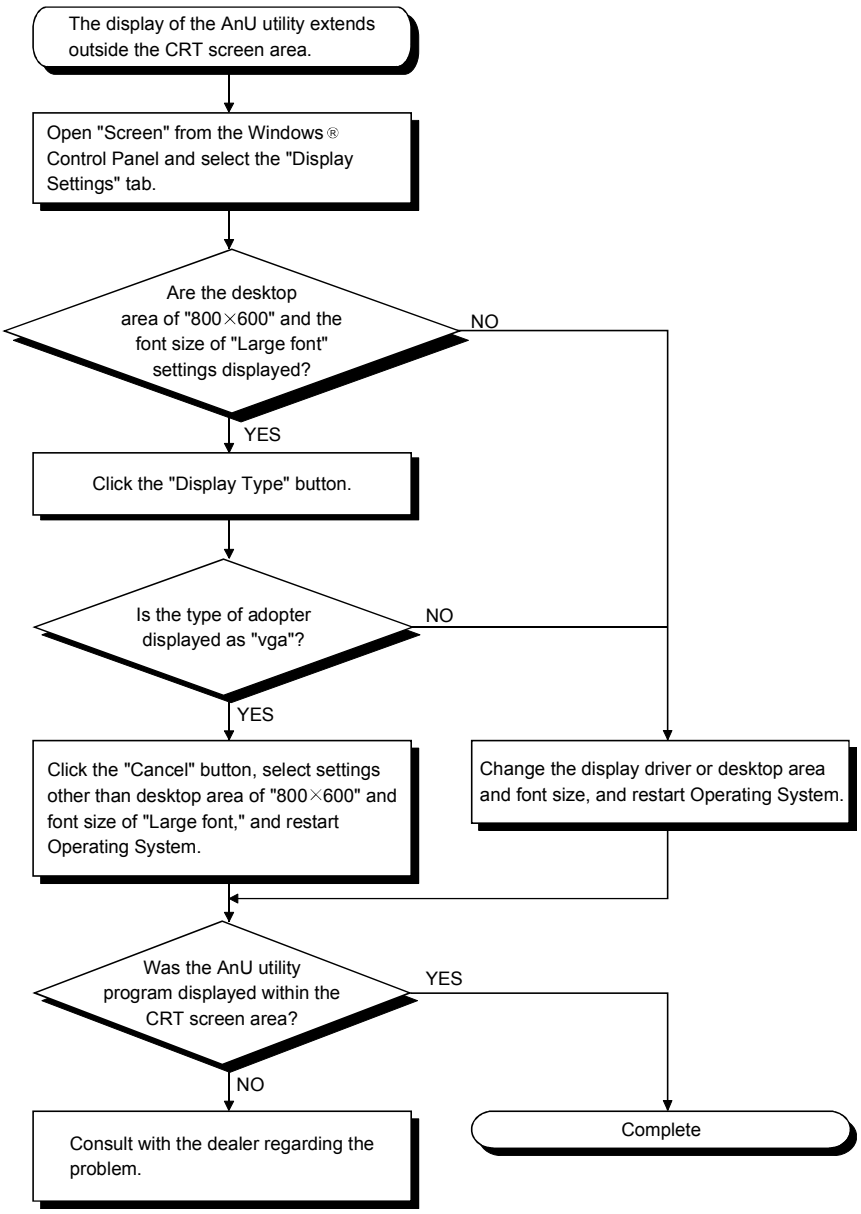
13.11 Flowchart for Actions when Programs cannot be Written

The following explains the actions to take when an attempt to load a program to the CPU has failed.



13.12 Flowchart for Actions when the Display of the AnU Utility Extends Outside the CRT Screen Area

The following explains the actions to take when the display of the AnU utility extends outside the CRT screen area at AnU utility program startup.



13.13 Examples and Countermeasures of I/O Module Problem

This section explains examples of problem concerning I/O circuits and their countermeasures.

13.13.1 Problems in the input circuits and countermeasures

The following shows some examples of problems concerning the input circuits and their countermeasures.

Table 13.2 Problems in the input circuits and countermeasures

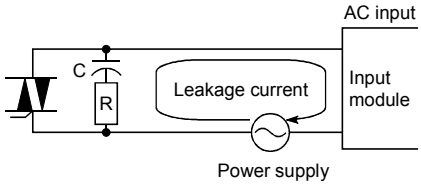
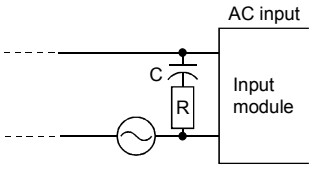
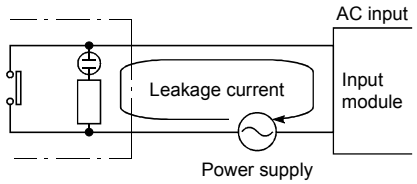
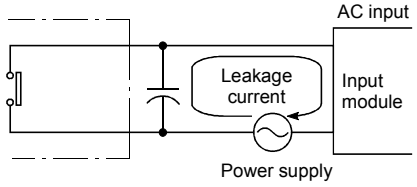
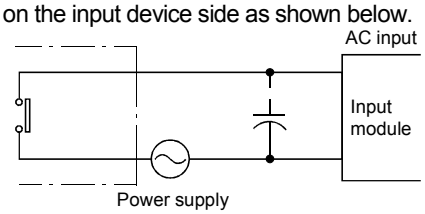
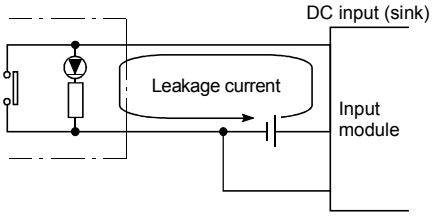
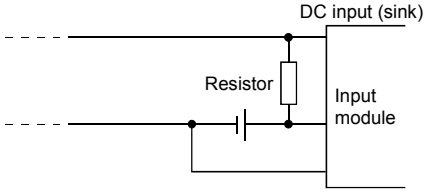
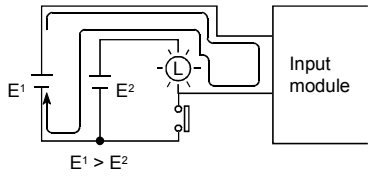
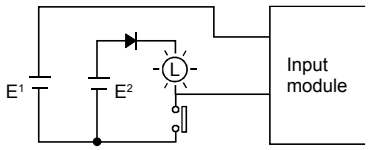
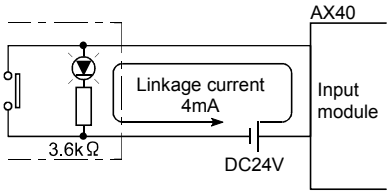
	Situation	Cause	Countermeasure
Ex. 1	Input signal does not turn off.	• Leakage current from input switch (driven by a contactless switch, etc.) 	• Connect an appropriate resistor so that voltage between the terminals of the input module is lower than the OFF voltage value.  For OR constant, 0.1 to 0.47 μ F + 47 to 120 Ω (1/2 W) is recommended.
Ex. 2	Input signal does not turn off.	• Driven by a limit switch with a neon lamp 	• Same as Example 1. • Or, provide a display circuit independent from the existing circuit.
Ex. 3	Input signal does not turn off.	• Leakage current due to line capacity of the wiring cable Line capacity C of the twisted pair cable is about C = 100/PFm. 	• Same as Example 1. • However, it does not occur when a power supply is on the input device side as shown below. 
Ex. 4	Input signal does not turn off.	• Driven by a switch with LED display 	• Connect an appropriate resistor so that voltage between the terminal of the input module and the common is higher than the OFF voltage as shown below.  *: An example of calculation of resistance to be connected is provided on the following page.

Table 13.2 Problems on input circuits and countermeasures

	Situation	Cause	Countermeasure
Ex. 5	Input signal does not turn off.	• Revolving path due to the use of two power supplies. 	• Use only one power supply. • Connect a diode to prevent the revolving path. 

<Example 4s Calculation Example>



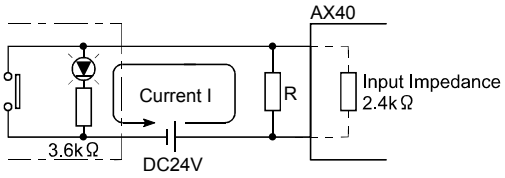
If a switch with an LED display is connected to AX40 and a leak current of 4 mA is observed

• Voltage V_{TB} across the terminal and common base is:

$V_{TB} = 4\ [mA] \times 2.4[k\Omega] = 9.6\ [V]$

(Ignore the voltage drop caused by the LED.)

Because the condition for the OFF voltage ($\leq$ 6 [V]) is not satisfied, the input does not turn off. To correct this, connect a resistor as shown below.



• Calculation of resistance of connected resistor R

The voltage of AX40 across the terminals must be reduced to within 6 [V]. The current for reducing the voltage across the terminals to within 6 [V] is:

(24−6 [V]÷3.6 [kΩ] = 5mA)

Therefore resistor R for flowing current I of 5 [mA] must be connected.

• Resistance of the connected resistor R is obtained in the following equations.

6 [V] ÷ R > 5−2.5 [mA] ← 6 [V] ÷ Input impedance 2.4 [kΩ]

6 [V] ÷ 2.5 [mA] > R

2.4 [kΩ] > R

Suppose that the resistance R is 2 [kΩ]

The power capacity W of the resistor during activation of the switch is:

$W = (\text{Applied voltage})^2/R$

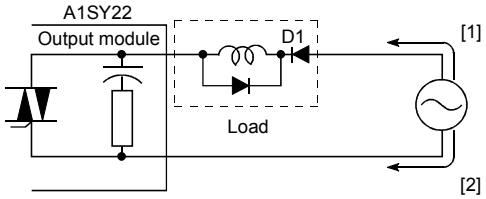
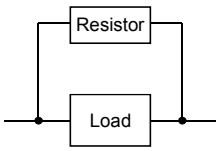
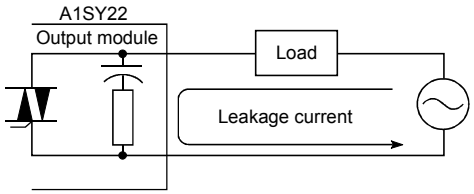
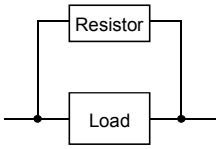
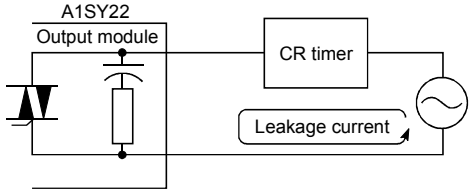
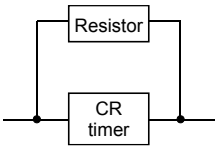
$W = (26.4\ [V])^2/2\ [k\Omega] = 0.348\ [W]$

• Because the resistance is selected so that the power capacity is three to five times the actual power consumption, 1.0 to 1.7 [W] should be selected.
From the above, the resitor to be connected across the terminal in question and COM is 2 [kΩ] 1 to 2 [W].

13.13.2 Problems in the output circuits and countermeasures

The following explains some examples of troubles concerning the output circuits and their countermeasures.

Table 13.3 Problems in the output circuits and countermeasures

	Situation	Cause	Countermeasure
Ex. 1	An excessive voltage is applied to the load when output is off.	• When the load is subjected to half wave rectification inside the circuit. (Some solenoids are of these types).  • When the polarity of the power supply is [1], C is charged, and when the polarity is [2], the voltage charged in C plus voltage of the power supply are applied to both ends of D1. The maximum voltage value is about 2.2E.	• Connect a resistor of several tens to several hundreds of k Ω to both ends of the load. (If used in this manner, it will not affect the output elements, but the diode that is built in the load may deteriorate and burn out.) 
Ex. 2	Load does not turn off (Triac output)	• Leakage current caused by built-in surge killer 	• Connect a resistor to both ends of the load (When the wiring distance from the output card to the load is long, be aware of the risk of leakage current due to line capacity.) 
Ex. 3	When a load is a CR type timer, the time limit fluctuates (Triac output).		• Start the relay first, and then start the CR-type timer at that contact. (Depending on the timer, the internal circuit may be of half-wave rectification type. Thus, note the caution in Example 1.)  Calculate the constant of the resistance based on the load.

13.13.3 Precautions for installing other optional board

Executing user applications (including the device monitor utility) for each board simultaneously under the following condition may cause an error.
When an error occurs in the user application, take the action shown below.

<Condition>

A personal computer into which the CPU board and other optional board are installed and where the resources were allocated automatically by Plug-and-Play is used.

<Action>

(1) Change the positions where the CPU board and other optional board are installed.
(2) In the BIOS setup, exchange the IRQs between the CPU board and other optional board or change their IRQs.

13.14 Information Required when Calling for Inquiry

The following information is required when contacting the dealer with any inquiry regarding any faulty CPU board.

(1) Description of problem (be specific)
Example) The system does not boot during startup processing after turning on the power, displaying the "board Not response" message.

(2) PC manufacturer, IBM PC/AT compatible PC name/model name

(3) Main memory size, hard disk capacity, and CPU model name

(4) Operating system name: Microsoft® Windows® 2000 Professional Operating System Microsoft® Windows NT® Workstation Operating System Version 4.0.

(5) Loading slot position, number of boards installed

(6) Use of optional boards made by other manufacturers

(7) If other manufacturer's optional boards are installed, please provide the following information for each board.
- Board model name
- Board manufacturer's name
- Memory address (head address and occupying size)
- I/O address (head address and occupying size)
- IRQ number and DMA number

(8) Whether or not the problem was verified using another IBM PC/AT compatible PC

(9) Switch settings

(10) Details of the error description of the CPU board driver that is entered in Event Viewer

APPENDIX

Appendix 1 Special Relays and Special Registers

This section explains the information about the special relays and special registers that can be used with the CPU board.

(1) Special relays

Number	Name	Description	Details
M9090	Power supply problem status on the IBM PC/AT compatible PC side	OFF: Normal ON : Power off	• Turns on if the power to the IBM PC/AT compatible PC side is shut off when the external power supply is connected to the CPU board. It stays on even after the status becomes normal.
M9092	External power supply problem status	OFF: Normal ON : Power off	• Turns on when the external power being supplied to the CPU board is shut off. It stays on even after the status becomes normal.

For special relays from the M9000 to M9199, see the CPU User's Manual, and for the M9200 or later model versions, see the Network System Reference Manual.

(2) Special registers

For special registers from the D9000 to D9200, see the CPU User's Manual, and for the D9200 or later model versions, see the Network System Reference Manual.

App - 1

Appendix 2 Instruction Processing Time

This section explains the instruction processing time of the CPU board.

(1) Sequence instructions

Instruction	Device	Condition	Instruction processing time (μs)
OUT	F	During execution	60.90
SET			61.17
RST			67.09

For details on the sequence instruction processing time other than the above, see the A2USHCPU-S1 User's Manual.

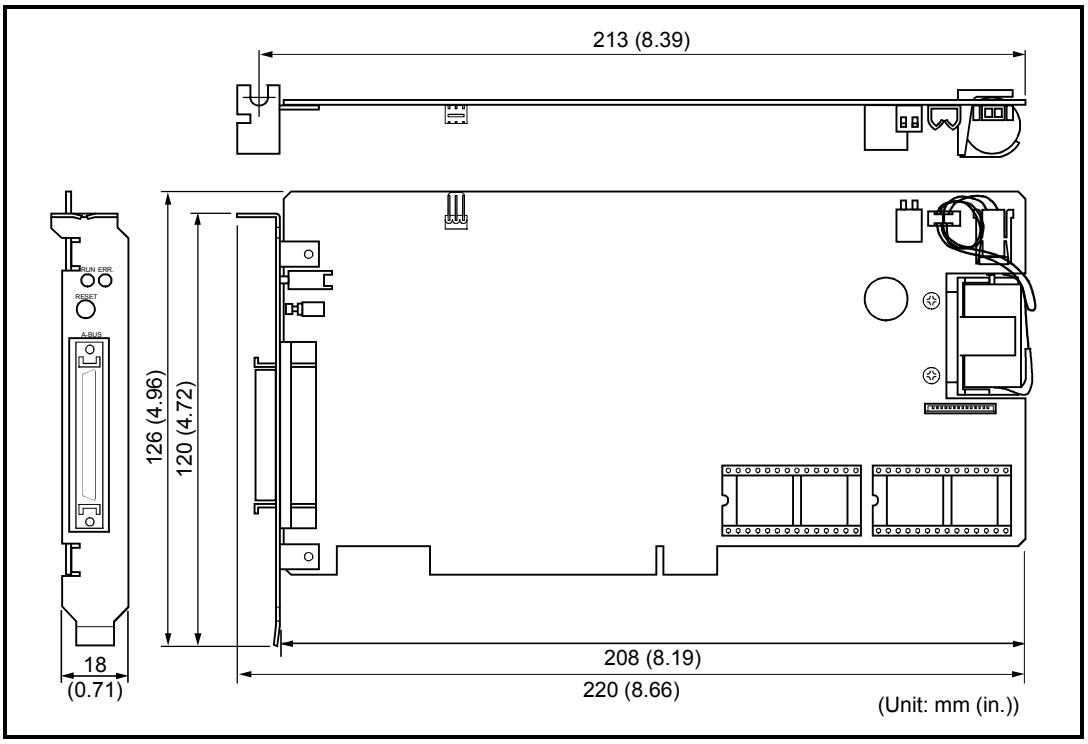
(2) Basic instructions

Instruction	Condition	Instruction processing time (μs)
ORD=	True	4.53
	False	3.45
ORD<>	True	4.53
	False	3.45
ORD>	True	4.53
	False	3.45
ORD>=	True	4.53
	False	3.45
ORD<	True	4.53
	False	3.45
ORD<=	True	4.53
	False	3.45

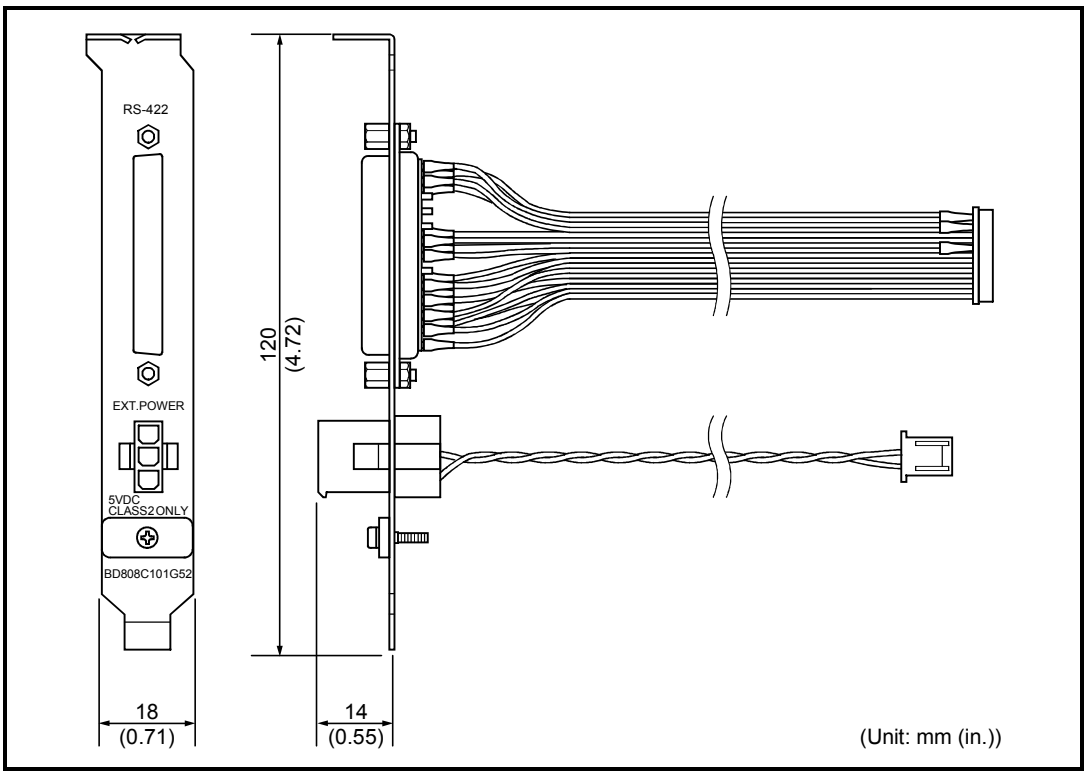
For details on the basic instruction processing time other than the above, see the A2USHCPU-S1 User's Manual.

Appendix 3 External Dimension Diagrams

Appendix 3.1 A80BDE-A2USH-S1



Appendix 3.2 RS-422/External power supply connecting bracket



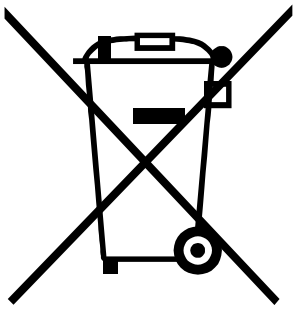
Appendix 4 Handling of Batteries and Devices with Built-in Batteries in EU Member States

This section describes the precautions for disposing of waste batteries in EU member states and exporting batteries and/or devices with built-in batteries to EU member states.

Appendix 4.1 Disposal precautions

In EU member states, there is a separate collection system for waste batteries. Dispose of batteries properly at the local community waste collection/recycling center.

The following symbol is printed on the batteries and packaging of batteries and devices with built-in batteries used for Mitsubishi programmable controllers.



Note: This symbol is for EU member states only.
The symbol is specified in the EU Battery Directive (2006/66/EC) Article 20 “Information for end users” and Annex II.

The symbol indicates that batteries need to be disposed of separately from other wastes.

Appendix 4.2 Exportation precautions

The new EU Battery Directive (2006/66/EC) requires the follwoing when marketing or exporting batteries and/or devices with built-in batteries to EU member states.

- To print the symbol on batteries, devices, or their packaging
- To explain the symbol in the manuals of the products

(1) Labelling

To market of export batteries and/or devices with built-in batteries, which have no symbol, to EU member states on September 26, 2008 or later, print the symbol shown on the previous page on the batteries, devices, or their packaging.

(2) Explaining the symbol in the manuals

To export devices incorporating Mitsubishi programmable controller to EU member states on September 26, 2008 or later, provide the latest manuals that include the explanation of the symbol.

If no Mitsubishi manuals or any old manuals without the explanation of the symbol are provided, separately attach an explanatory note regarding the symbol to each manual of the devices.

POINT
The requirement apply to batteries and/or devices with built-in batteries manufactured before the enforcement date of the new EU Battery Directive (2006/66/EC).

App - 5

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
(2) The Mitsubishi programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable logic controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable logic controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

IB (NA)-0800174-E

Type A80BDE-A2USH-S1 PLC CPU Board

User's Manual (For SW1DNF-ANU-B)

MODEL	SW1DNF-ANU-B-U-E
MODEL CODE	13JR27
IB(NA)-0800174-E(0809)MEE	

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