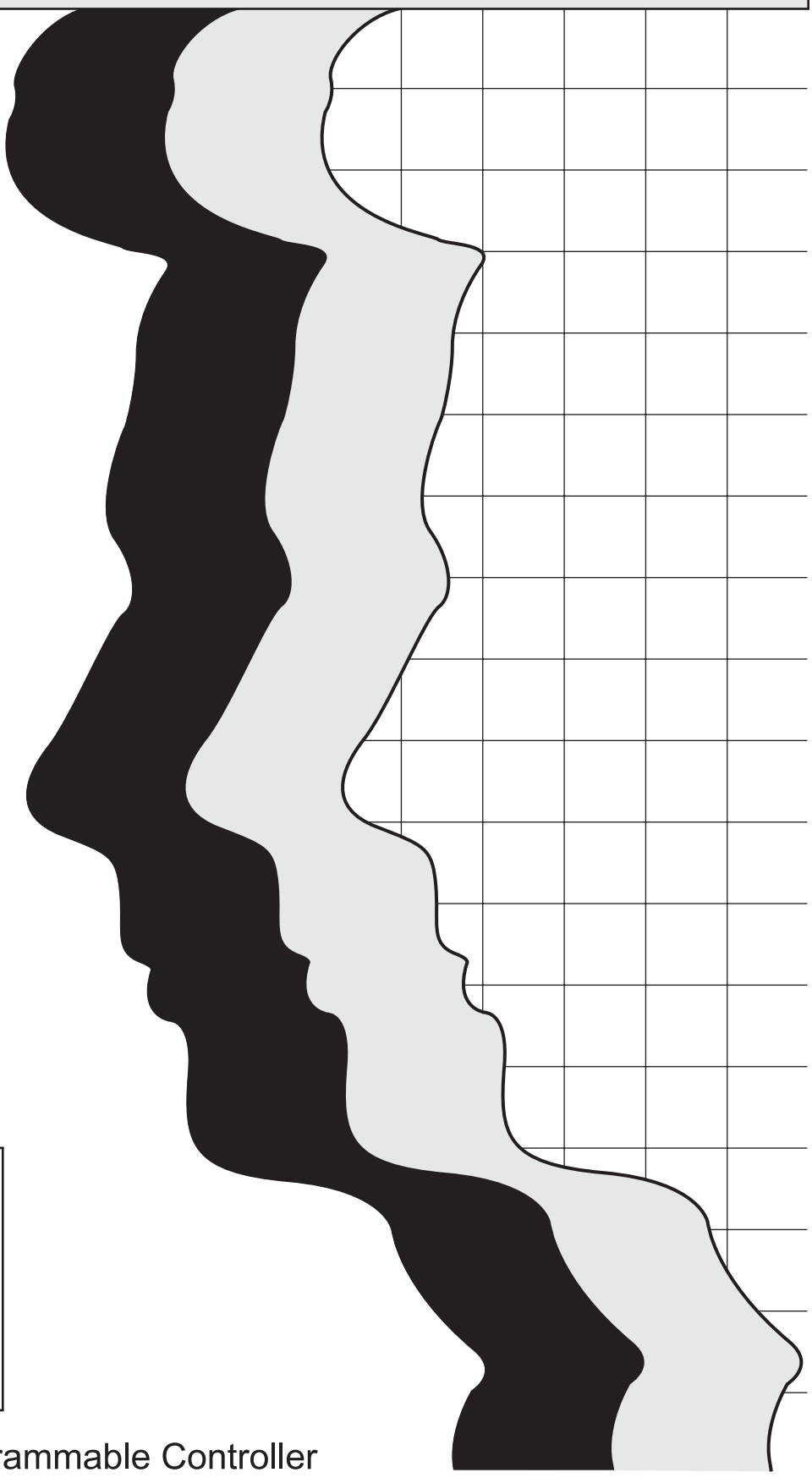
MITSUBISHI

# Type A1N/A2N(S1)/A3NCPU

# User's Manual



A

MELSEC

Mitsubishi Programmable Controller

# ● SAFETY PRECAUTIONS ●

(Be sure to read these instructions before use.)

Before using the product, read this and relevant manuals carefully and handle the product correctly with full attention to safety.
In this manual, ●SAFETY PRECAUTIONS● are classified into 2 levels: "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 minor or moderate injury and/or property damage. |

Under some circumstances, failure to observe the ⚠ CAUTION level instructions may also lead to serious results.
Be sure to observe the instructions of both levels to ensure the safety.

Please keep this manual in a safe place for future reference and also pass this manual on to the end user.

## [DESIGN PRECAUTIONS]

### ⚠ DANGER

● Create a safety circuit outside the PLC to ensure the whole system will operate safely even if an external power failure or a PLC failure occurs.Otherwise, incorrect output or malfunction may cause an accident.

(1) When creating an emergency stop circuit, a protection circuit or an interlock circuit for incompatible actions such as forward/reverse rotation or for damage prevention such as the upper/lower limit setting in positioning, create it outside the PLC.

(2) When the PLC detects the following error conditions, it stops the operation and turn off all the outputs.
- The overcurrent or overvoltage protector of the power supply module is activated.
- The PLC CPU detects an error such as a watchdog timer error by the self-diagnostics function.

In the case of an error undetectable by the PLC CPU, such as an I/O control part error, all the outputs may turn on.In order to make all machines operate safely in such a case, set up a fail-safe circuit or a specific mechanism outside the PLC.For fail safe circuit example, refer to "LOADING AND INSTALLATION" of this manual.

(3) Depending on the failure of the output module's relay or transistor, the output status may remain ON or OFF incorrectly.For output signals that may lead to a serious accident, create an external monitoring circuit.

## [DESIGN PRECAUTIONS]

### ⚠ DANGER

- If load current more than the rating or overcurrent due to a short circuit in the load has flowed in the output module for a long time, it may cause a fire and smoke. Provide an external safety device such as a fuse.

- Design a circuit so that the external power will be supplied after power-up of the PLC.
  Activating the external power supply prior to the PLC may result in an accident due to incorrect output or malfunction.

- For the operation status of each station at a communication error in data link, refer to the respective data link manual.
  Otherwise, incorrect output or malfunction may cause an accident.

- When controlling a running PLC (data modification) by connecting a peripheral device to the CPU module or a PC to a special function module, create an interlock circuit on sequence programs so that the whole system functions safely all the time.
  Also, before performing any other controls (e.g. program modification, operating status change (status control)), read the manual carefully and ensure the safety.
  In these controls, especially the one from an external device to a PLC in a remote location, some PLC side problem may not be resolved immediately due to failure of data communications.
  To prevent this, create an interlock circuit on sequence programs and establish corrective procedures for communication failure between the external device and the PLC CPU.

- When setting up the system, do not allow any empty slot on the base unit.
  If any slot is left empty, be sure to use a blank cover (AG60) or a dummy module (AG62) for it.
  When using the extension base unit, A52B, A55B or A58B, attach the included dustproof cover to the module in slot 0.
  This must be done because some internal parts of the module may be flied during a short circuit test or when an overcurrent or overvoltage is accidentally applied to the external I/O section.

### ⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit or power lines, or bring them close to each other.
  Keep a distance of 100mm (3.94inch) or more between them.
  Failure to do so may cause malfunctions due to noise.

- When an output module is used to control the lamp load, heater, solenoid valve, etc., a large current (ten times larger than the normal one) may flow at the time that the output status changes from OFF to ON. Take some preventive measures such as replacing the output module with the one of a suitable current rating.

## [INSTALLATION PRECAUTIONS]

**⚠ CAUTION**

- Use the PLC under the environment specified in the user's manual.
  Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage.

- When mounting the module, fully insert the module fixing projection into the fixing hole in the base unit.
  Incorrect mounting may cause malfunctions, a failure or a drop of the module.
  In an environment of frequent vibrations, secure the module with the screw.
  Tighten terminal screws within the specified torque range.
  If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
  Tightening the screw excessively may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.

- Connect the extension cable to the connector of the base unit or module.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause incorrect inputs and/or outputs.

- Insert the memory card and fully press it to the memory card connector.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause malfunctions.

- Be sure to shut off all the phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may damage the module.

- Do not directly touch the conductive part or electronic components of the module.
  Doing so may cause malfunctions or a failure of the module.

## [WIRING PRECAUTIONS]

### DANGER

- Be sure to shut off all phases of the external power supply used by the system before wiring.
  Failure to do so may result in an electric shock or damage of the product.

- Before energizing and operating the system after wiring, be sure to attach the terminal cover supplied with the product.
  Failure to do so may cause an electric shock.

### CAUTION

- Ground the FG and LG terminals correctly.
  Failure to do so may cause an electric shock or malfunctions.

- Wire the module correctly after confirming the rated voltage and terminal layout.
  Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.

- Do not connect multiple power supply modules to one module in parallel.
  The power supply modules may be heated, resulting in a fire or failure.

- Press, crimp or properly solder the connector for external connection with the specified tool.
  Incomplete connection may cause a short circuit, fire or malfunctions.

- Tighten terminal screws within the specified torque range.
  If the screw is too loose, it may cause a short circuit, fire or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a short circuit or malfunctions.

- Carefully prevent foreign matter such as dust or wire chips from entering the module.
  Failure to do so may cause a fire, failure or malfunctions.

- Install our PLC in a control panel for use.
  Wire the main power supply to the power supply module installed in a control panel through a distribution terminal block.
  Furthermore, the wiring and replacement of a power supply module have to be performed by a maintenance worker who acquainted with shock protection.
  (For the wiring methods, refer to Section 8.7.)

## [START AND MAINTENANCE PRECAUTIONS]

### ⚠ DANGER

- Do not touch any terminal during power distribution.
  Doing so may cause an electric shock.

- Properly connect batteries.
  Do not charge, disassemble, heat or throw them into the fire and do not make them short-circuited and soldered.
  Incorrect battery handling may cause personal injuries or a fire due to exothermic heat, burst and/or ignition.

- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws or module mounting screws.
  Failure to do so may result in an electric shock.
  If they are too loose, it may cause a short circuit or malfunctions.
  Tightening the screw excessively may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.

## [START AND MAINTENANCE PRECAUTIONS]

### ⚠ CAUTION

- When performing online operations (especially, program modification, forced output or operating status change) by connecting a peripheral device to the running CPU module, read the manual carefully and ensure the safety.
  Incorrect operation will cause mechanical damage or accidents.

- Do not disassemble or modify each of modules.
  Doing so may cause failure, malfunctions, personal injuries and/or a fire.

- When using a wireless communication device such as a mobile phone, keep a distance of 25cm (9.84inch) or more from the PLC in all directions.
  Failure to do so may cause malfunctions.

- Be sure to shut off all the phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may result in failure or malfunctions of the module.

- When replacing the fuse, use a fuse specified by the manufacturer.
  Using the one for the high-rated current or an electric wire may cause a fire.

- Do not drop or apply any impact to the battery.
  Doing so may damage the battery, resulting in electrolyte spillage inside the battery.
  If any impact has been applied, discard the battery and never use it.

- Before handling modules, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunctions of the module.

## [DISPOSAL PRECAUTIONS]

| ⚠ CAUTION |
| --- |
| ● When disposing of the product, treat it as an industrial waste.<br>When disposing of batteries, separate them from other wastes according to the local regulations.<br>(For details of the battery directive in EU member states, refer to Appendix 7.) |

## [TRANSPORTATION PRECAUTIONS]

| ⚠ CAUTION |
| --- |
| ● When transporting lithium batteries, make sure to treat them based on the transportation regulations.<br>(Refer to Appendix 6 for details of the relevant models.) |

Revisions

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

| Print Date | Manual Number | Revision |
|---|---|---|
| Mar., 1995 | IB (NA) 66543-A | First edition |
| Dec., 2003 | IB (NA) 66543-B | Addition<br>SAFETY PRECAUTIONS, Section 8.8, Chapter 9, Section 11.2.7, WARRANTY<br>Partial Correction<br>Section 2.2, 2.3, 2.4.1, 2.4.2, Chapter 3, Section 4.1, 4.3, 4.8, 5.1.1, 5.1.3, 5.2.1, 5.2.2, 6.1.1, Section 6.1.2, 6.1.3, 6.2.1, 7.1.2, 7.2.1, 7.2.2, 7.2.3, Section 7.2.4, 7.2.5, 8.1, 8.4, 8.5, 8.7, 8.7.1, Chapter 10, Section 10.3.1, 10.3.2, 11.1, 11.3.1, 11.4.1, APPENDIX 2, 3, 5.1.2, 5.2.2, 6.4 |
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| | | |

Japanese Manual Version SH-3500-I

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## Introduction

Thank you for purchasing the Mitsubishi programmable logic controller MELSEC-A Series.
Prior to use, please read this manual thoroughly to fully understand the functions.
Please hand in a copy of this manual to the end user.

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About This Manual

The following manuals are related to this product.

Related manuals

| Manual Name | Manual No. (Model Code) |
|---|---|
| ACPU/QCPU-A (A mode) Programming Manual (Fundamentals)<br>Describes programming methods necessary for creating programs, device names, parameters, program types, memory area configuration, and so on. (Sold separately) | IB-66249 (13J740) |
| ACPU/QCPU-A (A mode) Programming Manual (Common Instructions)<br>Describes how to use the sequence instruction, basic instructions, applied instructions and microcomputer programs. (Sold separately) | IB-66250 (13J741) |
| Building Block Type I/O Module User's Manual<br>Describes the specifications of building block type I/O modules. (Sold separately) | IB-66140 (13J643) |

USER PRECAUTIONS

Precautions when using the A series

For a new CPU module, which has never been used before, the memory of the memory cassette and CPU module device data are undefined.
Be sure to clear the memory of the memory cassette (PLC memory all clear) by peripheral devices and perform latch clear by the reset key switch on the CPU module before writing parameters or programs to a CPU module.

Precautions for battery

(1) The operation after a battery is unmounted and the PLC is stored
When resuming operation after removing the battery and storing the PLC, the contents of the memory cassette and CPU module device data may be undefined.
For this reason, be sure to clear the memory of the memory cassette (PLC memory all clear) in the CPU module by peripheral devices and perform latch clear by the reset key switch on the CPU module before starting the operation again.*
After the memory cassette clear and latch clear of the memory cassette, write the memory contents backed up before storing to the CPU module.

(2) The operation after excess of a battery life
When resuming operation after the battery exceeded its guaranteed life, the contents of the memory cassette and CPU module device data may be undefined.
For this reason, be sure to clear the memory of the memory cassette (PLC memory all clear) in the CPU module by peripheral devices and perform latch clear by the reset key switch on the CPU module before starting the operation again.*
After the memory cassette clear and latch clear of the memory cassette, write the memory contents backed up before storing to the CPU module.

| POINT |
| --- |
| Make sure to back up each memory contents before storing the PLC. |

* Refer to the following manuals for details of memory cassette clear (PLC memory all clear) by peripheral devices.
- GX Developer Operating Manual
- A6GPP/A6PHP Operating Manual

Refer to Section 4.6 for latch clear operation by RESET key switch of the CPU module.

# 1 GENERAL DESCRIPTION

This user's manual describes the handling instructions, specifications, and performance of the A1NCPU, A2NCPU(S1), and A3NCPU general-purpose programmable controllers (referred to as A1NCPU, A2NCPU, and A3NCPU in this manual), the A1NCPUP21, A2NCPUP21(S1), and A3NCPUP21 optical data link modules, and the A1NCPUR21, A2NCPUR21(S1), and A3NCPUR21 coaxial data link modules (referred to as AnNCPUP2S/R21 in this manual). In addition, A1NCPU, A2NCPU, A3NCPU and AnNCPU21/R21 are generically abbreviated to AnNCPU in this manual.

In the main text of this manual, the model names of the peripheral devices are abbreviated as follows:

A6PHP: PHP
A6GPP: GPP
A7PU, A7PUS and A8PUE: PU

In addition, the generic term "peripheral device" is used in this manual to refer to all of the above collectively.

## 1.1 Features

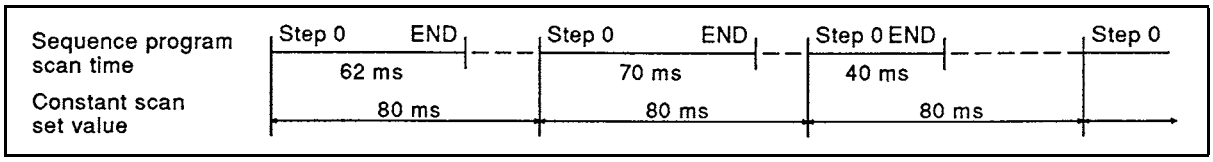
The AnNCPU is provided with the following features that the conventional A1CPU, A2CPU, and A3CPU (hereafter "ACPU") are not.

(1) I/O control mode switching
I/O control may be set in either of the three ways:
(a) Input in direct mode, output in direct mode
(b) Input in I/O image refresh mode, output in direct mode
(c) Input in I/O image refresh mode, output in I/O image refresh mode

Direct mode:
Transfers ON/OFF data every time a corresponding instruction is executed.
Pulse signals can therefore be output to the external device during one scan.

I/O image refresh mode (referred to as "refresh mode"):
Tranfer ON/OFF data after the END instruction is executed.
The program can therefore be executed without its conditions changing during each scan.
Further, the processing speed is higher than in direct mode.

(2) Constant scan function
Executes the sequence program at the specified intervals.
Normally the program scan time depends on the instructions and programs executed.
The constant scan function allows the program to be executed at specified intervals.




(3) Clock function
The real-time clock allows transfer of the year, month, day, hour, minute, second and day of the week.
By switching on special relay M9027, the LED on the CPU front panel indicates the month, day, hour, minute and second.

(4) Online I/O module loading/unloading
Normally, the I/O module elements may be damaged if the module is loaded or unloaded with power on.
In this system any I/O module can be loaded or unloaded with power on.
In addition, I/O module loading/unloading is allowed during PLC CPU operation processing by setting the given data to the special register (D9094) and special relay (M9094).

(5) Compatibility with ACPU programs
Any sequence program written by the ACPU may be used with the AnNCPU with the exception of the following instructions which differ in specifications:

1) CHK
2) SEG
3) EI
4) DI
5) PR
6) CHG

The specifications for these differ.

7) M9050 ....This is not used with the AnNCPU.

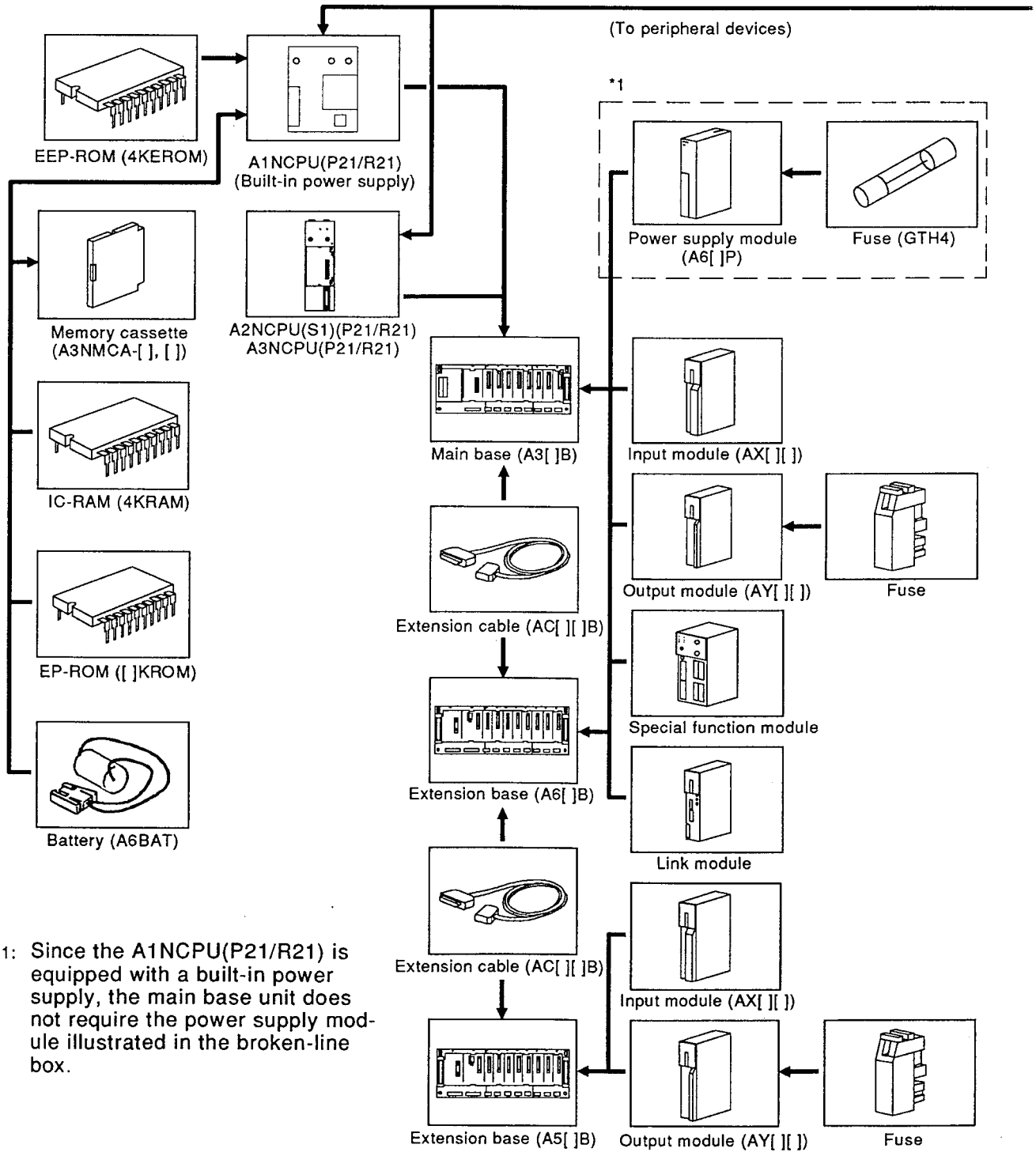
(6) Instruction processing speed
The processing speed of the AnNCPU is 10 to 20% higher than that of the ACPU.

# 2 SYSTEM CONFIGURATION

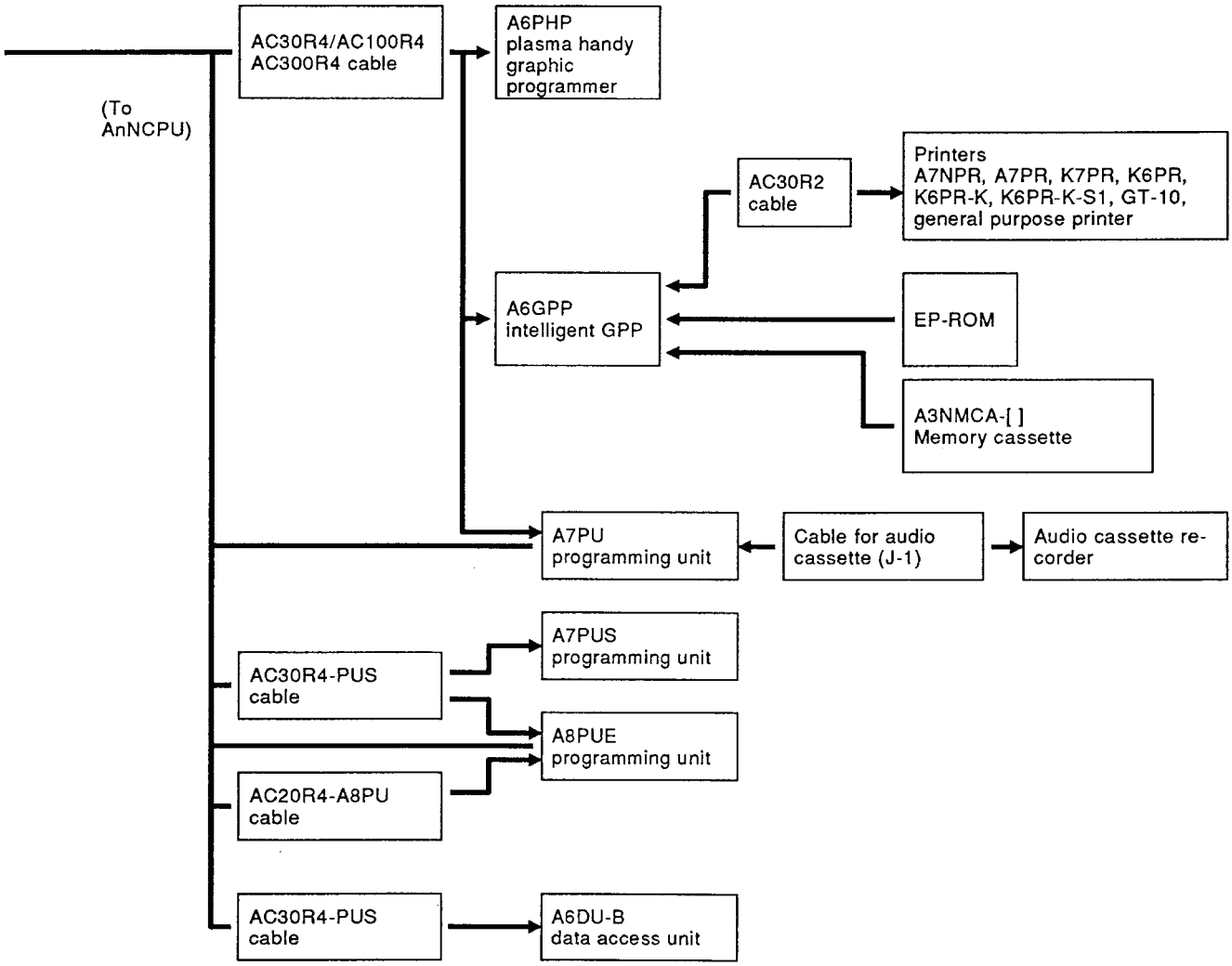
This chapter describes the applicable system configurations controlled by AnNCPU, cautions on configuring the system, and the component devices.

## 2.1 Overall Configuration

The following figure shows configurations of an AnNCPU stand-alone system and a peripheral device.




*1: Since the A1NCPU(P21/R21) is equipped with a built-in power supply, the main base unit does not require the power supply module illustrated in the broken-line box.


(To AnNCPU)
AC30R4/AC100R4 AC300R4 cable
A6PHP plasma handy graphic programmer
AC30R2 cable
Printers A7NPR, A7PR, K7PR, K6PR, K6PR-K, K6PR-K-S1, GT-10, general purpose printer
A6GPP intelligent GPP
EP-ROM
A3NMCA-[ ] Memory cassette
A7PU programming unit
Cable for audio cassette (J-1)
Audio cassette re-corder
A7PUS programming unit
AC30R4-PUS cable
A8PUE programming unit
AC20R4-A8PU cable
AC30R4-PUS cable
A6DU-B data access unit

## 2.2 Precautions When Configuring the System

The following shows the hardware and software packages which can be used for AnNCPU.

### 2.2.1 Hardware

(1) I/O module
All the building block type I/O modules can be used.

(2) Special function module
(a) Installation count of the following modules are limited of the special function modules.

| | |
|---|---|
| AJ71UC24<br>AJ71E71N-B2<br>AJ71C22-S1<br>AD22-S1<br>Ad51H-S3 *1<br>AJ71E71N-B5<br>AJ71E71N-T<br>AJ71C23-S3<br>AJ61BT11 (Only when the intelligent mode is used.)<br>GOT-A900 Series (Only when the bus connection is used.)*1<br>GOT1000 Series (Only when the bus connection is used.)*1 | Up to 2 modules in total can be installed. |
| AI61 | Only one module can be installed. |
| AJ71LP21(G)<br>AJ71BR11<br>AJ71LR21<br>AJ71AP21(S3)<br>AJ71AR21<br>AJ71AT21B | Only one module can be installed. |

*1 Refer to the following manual for applicable GOT models.
- GOT-A900 Series User's Manual (GT Work2 Version2/GT Designer2 Version2 compatible Connection System Manual)
- GOT1000 Series Connection Manual

### 2.2.2 Software package

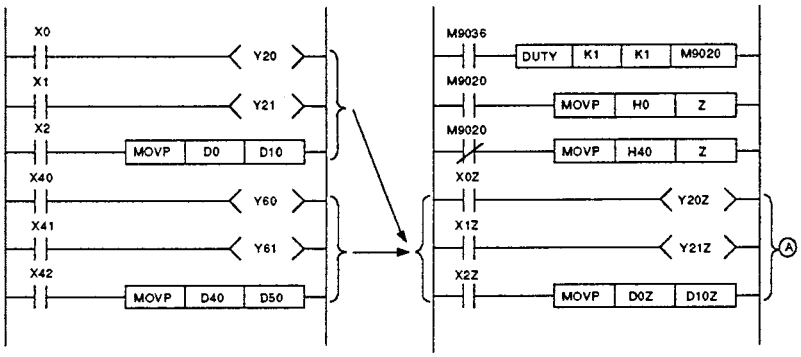
(1) GPP function software packages and model name setting at the start-up
The table below shows the GPP function software packages allowing you to create the CPU module program and PLC model settings at startup.

| Peripheral device | Software package for system start-up | PLC CPU model setting | | |
|---|---|---|---|---|
| | | A1NCPU (P21(-S3)/R21) | A2NCPU (P21(-S3)/R21) A2NCPU (P21/R21)-S1(-S4) | A3NCPU (P21(-S3)/R21) |
| IBM-PC/AT-compatible personal computer | SW□IVD-GPPA | A1(N) | A2(N) | A3(N) |
| | GX Developer | | | |
| A6PHP | SW4GP-GPPA | A1(N) | A2(N) | A3(N) |
| | SW□GP-GPPAU | A1(N) | A2(N) | A3(N) |
| A6GPP | SW4GP-GPPA | A1(N) | A2(N) | A3(N) |
| | SW□GP-GPPAU | A1(N) | A2(N) | A3(N) |

### 2.2.3 Structured programs

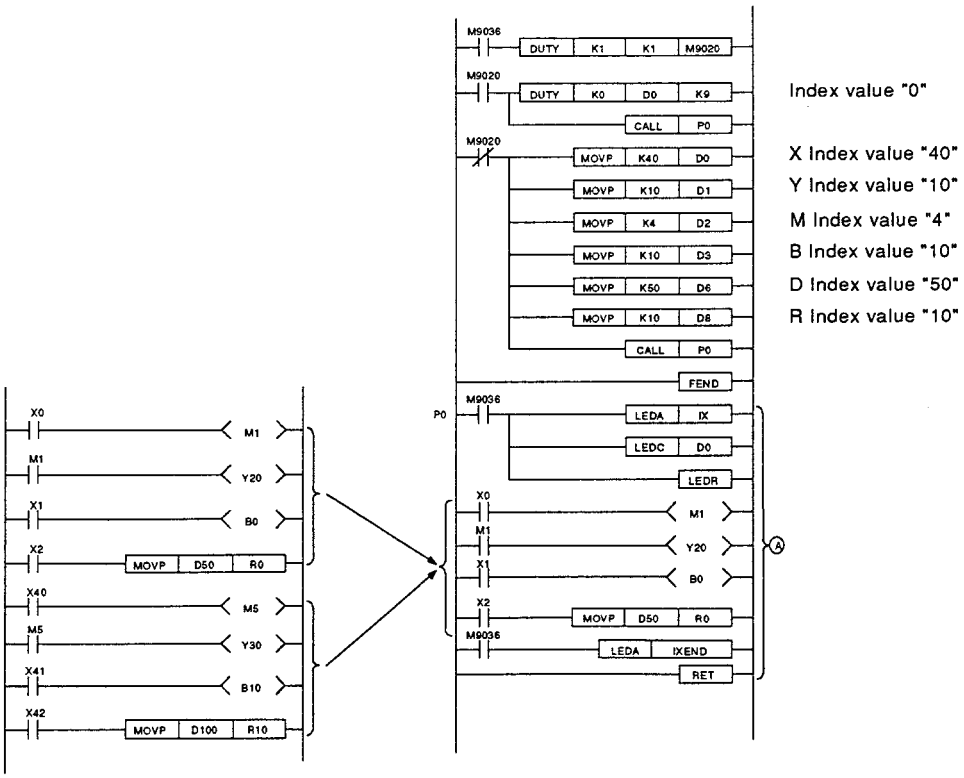
AnNCPUs allow indexing to all of the devices including contacts and coils (excluding the following devices) and to the whole ladder, realizing a structured program.
(T/C coil, T/C set value, P/I described individually, 32-bit constant, master control N)

(1) Structured program with indexing to devices




Indexing is applicable for all the devices including contacts and coils. With this function, several ladder blocks that are different from each other only in device numbers, as shown above, can be integrated into one block.

(2) Structured program with indexing to ladders




| POINT |
|---|

(1) The structured program (the section indicated Ⓐ by A on the example ladder) must be executed periodically during RUN. Note, however, that in the case of the example ladder, the structured program must always be executed alternately by using two types of index values or bias values.

In the example ladder, the DUTY instruction written at the head ladder is used to execute always and alternately.

(2) Do not perform indexing to devices in the ladder that is specified with ladder indexing.

## 2.3 System Equipment List

The following shows the system equipment (modules and peripheral devices) that can be used in an AnUCPU system.

(1) Modules for A

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| CPU module | A1NCPU | Program capacity: 6k steps, I/O points: 256, M, L, S total: 2048, T:256, C: 256, D: 1024 | – | 0.53 | – | Built-in power supply Memory cassette to be arranged separately. |
| | A1NCPUR21 | For coaxial data link (Master, local selectable) | | 1.63 | – | |
| | A1NCPUP21 | For optical data link (Master, local selectable) | | 1.23 | – | |
| | A1NCPUP21-S3 | For optical data link (Master, local selectable) (Compatible with GI cable) | | | | |
| | A2NCPU(S1) | Program capacity: 14k steps, I/O points: A2N: 512, A2N-S1: 1024, T: 256, C: 256, D: 1024, M, L, S: 2048 | – | 0.73 | – | Memory cassette to be arranged separately. |
| | A2NCPUR21 (S1) | For coaxial data link (Master, local selectable) | | 1.78 | | |
| | A2NCPUP21 (S1) | For optical data link (Master, local selectable) | | 1.38 | | |
| | A2NCPUP21-S3 (S4) | For optical data link (Master, local selectable) (Compatible with GI cable) | | | | |
| | A3NCPU | Program capacity: 30k steps, I/O points: 2048, M, L, S total: 2048, T: 256, C: 256, D: 1024 | – | 0.90 | – | Memory cassette to be arranged separately. |
| | A3NCPUR21 | For coaxial data link (Master, local selectable) | | 1.95 | | |
| | A3NCPUP21 | For optical data link (Master, local selectable) | | 1.55 | | |
| | A3NCPUP21-S3 | For optical data link (Master, local selectable) (Compatible with GI cable) | | | | |
| Memory cassette (RAM/ROM type) | A3NMCA-0 | Without IC-RAM | – | – | – | • Necessary when the A2NCPU(S1) or A3NCPU is used.<br>• With two memory sockets<br>• IC-RAM or EP-ROM memory can be installed on A3NMCA-0.<br>• Only EP-ROM memory can be installed on A3NMCA-2 to A3NMCA-56 |
| | A3NMCA-2 | IC-RAM memory with 16k bytes. | | | | |
| | A3NMCA-4 | IC-RAM memory with 32k bytes. | | | | |
| | A3NMCA-8 | IC-RAM memory with 64k bytes. | | | | |
| | A3NMCA-16 | IC-RAM memory with 128k bytes (96k bytes) | | | | |
| | A3NMCA-24 | IC-RAM memory with 192k bytes (144k bytes) | | | | |
| | A3NMCA-40 | IC-RAM memory with 320k bytes (144k bytes) | | | | |
| | A3NMCA-56 | IC-RAM memory with 448k bytes (144k bytes) | | | | |

POINT

(1) The maximum parameter setting range of the memory cassette A3NMCA-16 is 96k bytes. The unused memory area of this memory cassette may be used as extension file registers by using the SW[ ]GHP-UTLPC-FN1.
(2) The maximum parameter setting range of the memory cassettes A3NMCA-24 and 40 is 144k bytes. The unused memory area of these memory cassettes may be unused as extension file registers by using the SW[ ]GHP-UTLPC-FN1.
(3) Any conventional memory cassette A3MCA-[ ](those without N ) may be used.

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Input module | AX10 | 16 points 100VAC input module | 16 (16 inputs) | 0.055 | – | |
| | AX11 | 32 points 100VAC input module | 32 (32 inputs) | 0.11 | – | |
| | AX11EU | 32 points 100VAC input module CE-compliant | 32 (32 inputs) | 0.15 | – | |
| | AX20 | 16 points 200VAC input module | 16 (16 inputs) | 0.055 | – | |
| | AX21 | 32 points 200VAC input module | 32 (32 inputs) | 0.11 | – | |
| | AX21EU | 32 points 200VAC input module CE-compliant | 32 (32 inputs) | 0.15 | – | |
| | AX31 | 32 points 12/24VAC/DC input module | 32 (32 inputs) | 0.11 | – | |
| | AX31-S1 | 32 points 24VDC input module | 32 (32 inputs) | 0.11 | – | |
| | AX40 | 16 points 12/24VDC input module | 16 (16 inputs) | 0.055 | – | |
| | AX41 | 32 points 12/24VDC input module | 32 (32 inputs) | 0.11 | – | |
| | AX41-S1 | 32 points 12/24VDC input module | 32 (32 inputs) | 0.11 | – | |
| | AX42 | 64 points 12/24VDC input module | 64 (64 inputs) | 0.12 | – | |
| | AX50 | 16 points 48VDC sink input module | 16 (16 inputs) | 0.055 | – | |
| | AX50-S1 | 16 points 48VDC sink/source input module | 16 (16 inputs) | 0.055 | – | |
| | AX60 | 16 points 100/110/125VDC sink input module | 16 (16 inputs) | 0.055 | – | |
| | AX60-S1 | 16 points 100/110/125VDC sink/source input module | 16 (16 inputs) | 0.055 | – | |
| | AX70 | 16 points input module for sensor | 16 (16 inputs) | 0.055 | – | |
| | AX71 | 32 points input module for sensor | 32 (32 inputs) | 0.11 | – | |
| | AX80 | 16 points 12/24VDC source input module | 16 (16 inputs) | 0.055 | – | |
| | AX80E | 16 points 12/24VDC source input module | 16 (16 inputs) | 0.055 | – | |
| | AX81 | 32 points 12/24VDC source input module | 32 (32 inputs) | 0.11 | – | |
| | AX81-S1 | 32 points 12/24VDC source input module | 32 (32 inputs) | 0.105 | – | |
| | AX81-S2 | 32 points 48/60VDC source input module | 32 (32 inputs) | 0.11 | – | |
| | AX81-S3 | 32 points 12/24VDC source input module | 32 (32 inputs) | 0.11 | – | |
| | AX81B | 32 points 24VDC sink/source input module | 64 (64 inputs) | 0.125 | – | |
| | AX82 | 64 points 12/24VDC source input module | 64 (64 inputs) | 0.12 | – | |

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Output module | AY10 | 16 points relay contact output module (2A) | 16 (16 outputs) | 0.115 | 0.15 | The short protection and overheat protection functions of the AY40P, AY41P, AY60EP, AY80EP, AY81EP, and AY82EP are described below:<br><br>Short protection function<br><br>Function that protects the transistors from overcurrents occurring, for example, due to short circuits in external wiring.<br><br>Overheat protection function<br><br>Function that protects the transistors from damage due to external temperature rise attributable to external causes. |
| | AY10A | 16 points relay contact output module, for independent contact output | 16 (16 outputs) | 0.115 | 0.15 | |
| | AY11 | 16 points relay contact output module, with surge suppressor | 16 (16 outputs) | 0.115 | 0.15 | |
| | AY11A | 16 points relay contact output module, for independent contact output, with surge suppressor | 16 (16 outputs) | 0.115 | 0.15 | |
| | AY11AEU | 16 points relay contact output module, for independent contact output, with surge suppressor | 16 (16 outputs) | 0.115 | 0.15 | |
| | For AY11E, AY13E | 16 points relay contact output module (fused) | 16 (16 outputs) | 0.115 | 0.15 | |
| | AY11EEU | 16 points relay contact output module (fused) | 16 (16 outputs) | 0.115 | 0.15 | |
| | AY13 | 32 points relay contact output module (2A) | 32 (32 outputs) | 0.23 | 0.29 | |
| | AY13E | 32 points relay contact output module | 32 (32 outputs) | 0.23 | 0.29 | |
| | AY13EU | 32 points relay contact output module (fused) | 32 (32 outputs) | 0.23 | 0.29 | |
| | AY15EU | 24 points relay contact output module (2A) CE-compliant | 32 (32 outputs) | 0.15 | 0.22 | |
| | AY22 | 16 points triac output module (2A, fused) | 16 (16 outputs) | 0.305 | – | |
| | AY23 | 32 points triac output module (0.6A, fused) | 32 (32 outputs) | 0.59 | – | |
| | AY40 | 16 points 12/24VDC transistor output module (0.1A) | 16 (16 outputs) | 0.115 | 0.016 | |
| | AY40A | 16 points 12/24VDC transistor output module, for independent contact output (0.3A) | 16 (16 outputs) | 0.19 | – | |
| | AY41 | 32 points 12/24VDC transistor output module (0.1A) | 32 (32 outputs) | 0.23 | 0.04 | |
| | AY42 | 64 points 12/24VDC transistor output module (0.1A) | 64 (64 outputs) | 0.29 | 0.08 | |
| | AY42-S1 | 64 points 12/24VDC transistor output module (0.1A) | 64 (64 outputs) | 0.29 | 0.08 | |
| | AY42-S3 | 64 points 12/24 VDC transistor output module (fused) | 64 (64 outputs) | 0.29 | 0.08 | |
| | AY42-S4 | 64 points 12/24VDC transistor output module, zener diode with built-in photocoupler | 64 (64 outputs) | 0.50 | – | |

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Output module | For AY50 | 16 points 12/24VDC transistor output module (0.5A, fused) | 16 (16 outputs) | 0.115 | 0.13 | *1: Indicates a source load module. Other modules are sink load modules. |
| | AY51 | 32 points 12/24VDC transistor output module (0.5A) | 32 (32 outputs) | 0.23 | 0.10 | |
| | AY51-S1 | 32 points 12/24VDC transistor output module (0.3A, fused) | 32 (32 outputs) | 0.31 | 0.02 | |
| | AY60 | 16 points 12/24/48VDC transistor output module (2A, fused) | 16 (16 outputs) | 0.115 | 0.13 | |
| | AY60S | 16 points 12/24/48VDC transistor output module (2A) | 16 (16 outputs) | 0.075 | 0.006 | |
| | AY60EP *1 | 16 points 12/24VDC transistor output module (2A), with short protection function and overheat protection function | 16 (16 outputs) | 0.115 | 0.22 | The short protection and overheat protection functions of the AY40P, AY41P, AY60EP, AY80EP, AY81EP, and AY82EP are described below:<br>Short protection function<br>Function that protects the transistors from overcurrents occurring, for example, due to short circuits in external wiring.<br>Overheat protection function<br>Function that protects the transistors from damage due to external temperature rise attributable to external causes. |
| | AY70 | 16 points, CMOS (5/12VDC) output module (16mA) | 16 (16 outputs) | 0.10 | 12VDC 0.11 | |
| | AY71 | 32 points, CMOS (5/12VDC) output module (16mA) | 32 (32 outputs) | 0.20 | 12VDC 0.20 | |
| | AY72 | 64 points, CMOS (5/12VDC) output module (16mA) | 64 (64 outputs) | 0.30 | 12VDC 0.60 | |
| | AY80 *1 | 16 points 12/24/48VDC transistor output module (0.5A, fused) | 16 (16 outputs) | 0.115 | 0.12 | |
| | AY81 *1 | 32 points 12/24VDC transistor output module (0.5A) | 32 (32 outputs) | 0.23 | 0.10 | |
| | AY82EP *1 | 64 points 12/24VDC transistor output module (0.1A), with short protection function and overheat protection function | 64 (64 outputs) | 0.29 | 0.10 | |
| Dynamic input/output combination | A42XY | Input 64 points, output 64 points, dynamic scanning mode | 64 (64 outputs) | 0.11 | 0.235 | Performs I/O processing in 8-point units independently of the CPU module, while scanning. |

| Product Name | | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|---|
| | | | | | 5VDC (A) | 24VDC (A) | |
| Input/output combination module | | AH42 | Input 32 points, output 32 points, 12/24VDC transistor output module (0.1A) | 64 (64 outputs) | 0.245 | 0.04 | The first half 32 points are inputs and the second half 32 points are outputs. |
| Special function module | 1 axis positioning module | AD70 | 1 axis positioning control, speed control and speed-positioning control, analog voltage output for speed-positioning control (0 to ± 10V) | 32 (special 32 points) | 0.3 | – | |
| | | AD70D-S2 | 1 axis, digital output, for MR-SB(K)/SD | 32 (special 32 points) | 0.8 | – | |
| | Positioning module | AD72 | For positioning control analog voltage output for speed-positioning control (0 to ± 10V)<br>2 axes (independent control, simultaneous 2 axes control, linear interpolation control). | 48 (First half: empty 16 points, Second half: special 32 points) | 0.9 | – | |
| | | AD75P1-S3 | For positioning control, pulse output<br>P1: 1 axis<br>P2: 2 axes (Independent, simultaneous 2 axes, linear interpolation, circular interpolation)<br>P3: 3 axes (Independent, simultaneous 3 axes, linear interpolation 2 axes, circular interpolation 2 axes) | 32 (special 32 points) | 0.7 | – | * When differential driver is connected: 0.78 |
| | | AD75P2-S3 | | | 0.7 | | |
| | | AD75P3-S3 | | | 0.7 * | | |
| | | AD75M1 | Digital output for positioning control, for MR-H-B/MR-JB/ MR-J2-B<br>P1: 1 axis<br>P2: 2 axes (Independent, simultaneous 2 axes, linear interpolation, circular interpolation)<br>P3: 3 axes (Independent, simultaneous 3 axes, linear interpolation 2 axes, circular interpolation 2 axes) | 32 (special 32 points) | 0.7 | – | |
| | | AD75M2 | | | | | |
| | | AD75M3 | | | | | |
| | Positioning detection module | A61LS | Absolute detection method.<br>Resolution: One resolver revolution = 4096 divisions.<br>Response speed: within 6ms | 48 (First half: special 32 points, Second half: empty 16 points) | 0.8 | – | |
| | | A62LS-S5 | Absolute detection method, multiple rotation type, linear type<br>Resolution: 4096 divisions × 32 rotations to 409.6 divisions × 320 rotations<br>Response speed: 2ms, 8 channels | 48 (First half: empty 16 points, Second half: special 32 points) | 1.5 | – | The resolution depends on the connected resolver. |
| | | A63LS | Absolute detection method, multiple rotation type<br>Resolution: 4096 divisions × 32 rotations to 409.6 divisions × 320 rotations<br>Response speed: 2ms, 8 channels | 32 (special 32 points) | 0.9 | – | When setting module is connected: 5VDC current consumption: 1.35A |
| | Ultrasonic linear scale module | A64BTL | Measuring range: 0.000 to 3,550,000 mm<br>Resolution: 0.025mm, 4 channels | 32 (special 32 points) | 1.05 | – | |

| Product Name | | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|---|
| | | | | | 5VDC (A) | 24VDC (A) | |
| Special function module | High-speed counter module | AD61 | 24-bit binary, 1/2 phase input, reversible counter, 50 kPPS, 2 channels | 32 (special 32 points) | 0.3 | – | |
| | | AD61S1 | 24-bit binary, 1/2 phase input, reversible counter, 1 phase ⋯ 10kPPS, 2 phases ⋯ 7kPPS, 2 channels | 32 (special 32 points) | 0.3 | – | |
| | A/D converter module | A68AD | 4 to 20mA/0 to ±10V Analog input, 8 channels | 32 (special 32 points) | 0.9 | – | |
| | | A68AD-S2 | | | | | |
| | | A68ADN | 0 to ±20mA/0 to ±10V, Analog input, 8 channels | 32 (special 32 points) | 0.4 | – | |
| | | A616AD | 4 to 20mA/0 to ±10V Analog input, 16 channels Expansion to maximum of 121 channels possible by using A60MX(R) | 32 (special 32 points) | 1.0 | – | |
| | | A60MX | Multiplex module (IC relay) Analog input, 16 channels | 16 (empty 16 points) | 0.65 | – | Used in combination with A616AD or A616TD. |
| | | A60MXR | Multiplex module (mercury relay) Analog input, 16 channels | 16 (empty 16 points) | 0.5 | – | |
| | | A60MXRN | Multiplex module (photo MOS relay) Analog input, 16 channels | 16 (empty 16 points) | 0.35 | – | |
| | Temperature digital converter module | A616TD | For temperature detection by thermocouple (when connected to A60MXT). 0 to ±10V/0 to 20mA (when connected to A60MX(R)) | 32 (special 32 points) | 1.0 | – | |
| | | A60MXT | Multiplex module (mercury relay) Temperature input 15 channels Temperature detection by thermocouple when used in combination with A616TD. | 32 (First half: empty 16 points Second half: empty 16 points) | 0.8 | – | Used in combination with A616TD. |
| | | A60MXTN | Multiplex module (photo MOS relay) Temperature input 15 channels Temperature detection by thermocouple when used in combination with A616TD. | 32 (First half: empty 16 points Second half: empty 16 points) | 0.64 | – | |
| | | A68RD3 | -180 to 600℃ temperature input module (For 3-wire type platinum resistor) | 32 (special 32 points) | 0.94 | – | |
| | | A68RD4 | -180 to 600℃ temperature input module (For 4-wire type platinum resistor) | | 0.75 | – | |

| Product Name | | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|---|
| | | | | | 5VDC (A) | 24VDC (A) | |
| Special function module | D/A converter module | A68DAV | 0 to ±10V, analog output, 8 channels. | 32 (special 32 points) | 0.15 | 0.5 | |
| | | A68DAI-S1 | 0 to 20mA, analog output, 8 channels. | 32 (special 32 points) | 0.15 | 0.4 | |
| | | A62DA | 4 to 20 mA / 0 to ±10V<br>Analog output 12 bits, 2 channels | 32 (special 32 points) | 0.6 | 0.35 | |
| | | A62DA-S1 | 4 to 20mA/0 to ±10V Analog output,<br>2 channels | | | | |
| | | A616DAI | 4 to 20mA. Resolution: 1/4000<br>Analog output, 16 channels | 32 (special 32 points) | 0.3 | – | 15VDC $^{+0.53A}_{-0.125A}$ (A68P) is required. |
| | | A616DAV | 0 to ±10 V/0 to ±5 V. Resolution: 1/4000<br>Analog output, 16 channels | 32 (special 32 points) | 0.38 | – | 15VDC $^{+0.2A}_{-0.17A}$ (A68P) is required. |
| | Memory card, Centronics interface module | AD59*4 | 32k byte-memory battery backup<br>Can be connected to printer conforming to Centronics standards | 32 (special 32 points) | 0.3 | – | |
| | | AD59-S1*4 | | | 0.32 | | 0.35A when connected to AD59MEF. |
| | Voice output module | A11VC*4 | Messages can be recorded and played back on a maximum of 60 channels.<br>The following recording times can be selected for each channel: 1 second, 2 seconds, 4 seconds, 8 seconds.<br>The total recording time is 64 seconds | 16 (special 16 points) | 0.6 | 0.38 | |
| Network module | | AJ71LP21 | For MELSECNET/10 optical loop network (compatible with SI cable) | 32 (special 32 points) | 0.65 | – | Maximum one modules can be used for one CPU module. |
| | | AJ71LP21G | For MELSECNET/10 optical loop network (compatible with GI cable) | | | | |
| | | AJ71BR11 | For MELSECNET/10 coaxial bus network | 32 (special 32 points) | 0.8 | – | |
| | | AJ71LR21 | For MELSECNET/10 coaxial loop network | | 1.2 | | |
| | | AJ72LP25 | For MELSECNET/10 optical loop network remote I/O station (compatible with SI cable) | – | 0.8 | – | |
| | | AJ72LP25G | For MELSECNET/10 optical loop network remote I/O station (compatible with GI cable) | | | | |
| | | AJ72BR15 | For MELSECNET/10 coaxial bus network remote I/O station | – | 0.9 | – | |
| | | AJ72LR25 | For MELSECNET/10 coaxial loop network remote I/O station | | 1.3 | | |

*4 Models to be discontinued

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Data link module | AJ71AP21 *2 | For MELSECNET II optical data links | 32 (special 32 points) | 0.5 | – | Maximum one modules can be used for one CPU module. |
| | AJ71AP21-S3 *2 | For MELSECNET II optical data link (compatible with GI cable) | | | | |
| | AJ71AR21 *2 | For MELSECNET II coaxial data links | 32 (special 32 points) | 0.9 | – | |
| | AJ71AT21B *2 | For MELSECNET/B data links | 32 (special 32 points) | 0.72 | – | |
| | AJ72P25 *2 | For MESLECNET optical data link remote I/O station | – | 0.23 | – | |
| | AJ72P25-S3 *2 | For MESLECNET optical data link remote I/O station (compatible with GI cable) | | | | |
| | AJ72R25 *2 | For MESLECNET coaxial data link remote I/O station | – | 2.6 | – | |
| | AJ72T25B *2 | For MELSECNET/B data link remote I/O station | – | 0.3 | – | |
| Ethernet interface module | AJ71E71N-B2 *2 | 10BASE2 specification, Transmission speed: 10 Mbps | 32 (special 32 points) | 0.67 | – | Maximum two modules can be used for one CPU module. |
| | AJ71E71N-B5 *2 | 10BASE5 specification Transmission speed: 10 Mbps | | 0.55 | | |
| | AJ71E71N-T *2 | 10BASE5/10BASE2 specification Transmission speed: 10 Mbps | | 0.55 | | |
| | AJ71E71N3-T *2 | 10BASE5/10BASE2 specification Transmission speed: 10 Mbps | | 0.69 | | |
| Computer link module | AJ71UC24 *2 | Link module that communicates data with a computer. Transmission speed: 300 bps to 19.2kbps RS-232C, RS-422: one channel each, compatible with RS485 | 32 (special 32 points) | 0.3 | – | |
| Intelligent communication module | AD51H-S3 | AD51H-BASIC, maximum of 8 tasks executes data communication with a PLC or a computer, and monitoring control status. Data communication with a computer can be executed by any format. RS-232C: 2 channels, RS-422, Parallel: one channel each | 48 (First half: empty 16 points Second half: special 32 points) | 1.0 | – | |
| Host controller high-speed link module | AJ71C23-S3 *2 | Link module that sends/receives data at high speed to/from a computer. Transmission speed: 500 kbps RS-422: one channel each | 32 (special 32 points) | 1.5 | – | |
| Multidrop data link module | AJ71C22-S1 | Sends and receives bit data to maximum 8 slave stations to which it is connected in a multidrop system. Used for the master station of a multidrop link. Transmission speed: 38.4 kbps RS-422: one channel each | 32 (special 32 points) | 1.4 | – | |
| | A0J2C25 | Used for a remote I/O station of a multidrop link. | – | – | – | |
| | A0J2C214(S1) | Used for a local station in a multidrop link. (In A0J2CPU and A0J2HCPU systems, A0J2C214 can also be used as the master station in computer links and multidrop data links) | 64 points | 0.3 | – | |

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| CC-Link system master/local module | AJ61BT11 | For CC-Link system master and local stations When used as the master station, the module controls maximum 64 remote I/O stations. When a local station is used, the module occupies 1 or 4 station(s). | 32 (special 32 points) | 0.45 | – | |
| MELSECNET/ MINI-S3 data link module | AJ71PT32-S3 | For MELSECNET/MINI-S3 master stations (max. 64 stations). Performs remote I/O and remote terminal control of a total of 512 I/O points. | I/O dedicated mode 32 (special 32 points) | 0.34 | – | |
| | AJ71T32-S3 | | Expanded mode 48 (special 48 points) | | | |
| B/NET interface module | AJ71B62-S3 | Used for B/NET transmission terminal control. Up to 63 stations can be controlled per module. | 32 (special 32 points) | 0.17 | – | |

*2 Only internal devices within the AnACPU range can be accessed (file registers cannot be accessed).

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Interrupt module | AI61 | Used to designate execution of interrupt programs (16 interrupt inputs). | 32 (special 32 points) | 0.14 | – | Only one module can be used per CPU. |
| | AI61-S1 | Product for changing time to turn ON/OFF A61 | | | | |
| Device Net interface module | AJ71DN91 | Device Net master module<br>Total I/O points: 4096 points | 32 (special32points) | 0.24 | – | |
| PROFIBUS-DP interface module | AJ71PB92D | PROFIBUS-DPmaster module<br>Sendable data Regular service: 32 bytes<br>Extension service: 244 bytes | 32 (special32points) | 0.54 | – | |
| PROFIBUS-FMSinterface module | AJ71PB96F | PROFIBUS-FMS master/client/server module<br>Total I/O points: 241241 points | 32 (special32points) | 0.54 | – | |
| MODBUS serial communication module | AJ71UC24-R2 *2 | MODBUS serial communication module Transmission speed: 300bps to 19200bps | 32 (special32points) | 1.4 | – | |
| PLC easier monitoring module | AS91 | PC easier monitoring module | 16 (16 outputs) | 0.08 | – | With simulation switch 16 points |
| Dummy module | AG62 | Module allows selection of 16, 32, 48, or 64 points. | Setting range [Input Set number of points ] | 0.07 | – | |
| Blank cover | AG60 | Dust-proof cover for unused slot | 16 (empty 16 points) | – | – | CE-compliant |

*2 Only internal devices within the AnACPU range can be accessed (file registers cannot be accessed).

| Product Name | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|
| | | | | 5VDC (A) | 24VDC (A) | |
| Graphic operation terminal | A985GOT | Large-size graphic operation terminal 256 colors, TFT color, 800×600 dots, high intensity | 32 (special 32 points)* | 0.22 * | – | *When bus connected |
| | A975GOT | Large-size graphic operation terminal 256 colors, TFT color, 640×480 dots, high intensity/256 colors, TFT color, 640×480 dots, wide viewing angle | | | | |
| | A970GOT | Large-size graphic operation terminal 16 colors, TFT color, 640×480 dots, high intensity/ 16 colors, TFT color, 640×480 dots, wide viewing angle/8 colors, STN color, 640×480 dots/ 2 colors, STN monochrome, 640×480 dots | | | | |
| | A960GOT | Large-size graphic operation terminal 2 colors, EL, 640×400 dots | | | | |
| | A956GOT | Medium-size graphic operation terminal 8 colors, STN color, 320×240 dots/ STN monochrome, 320×240 dots/ 256 colors, TFT color, 320×240 dots, high intensity | | | | |
| | A956WGOT | Medium-size graphic operation terminal 256 colors, TFT color, 320×240 dots, high intensity | | | | |
| | A953GOT | Medium-size graphic operation terminal 8 colors, STN color, 320×240 dots/ STN monochrome, 320×240 dots/ 256 colors, TFT color, 320×240 dots, high intensity With handheld type | – | – | – | For RS-232C connected only |
| | A951GOT | Medium-size graphic operation terminal 8 colors, STN color, 320×240 dots/ STN monochrome, 320×240 dots/ 256 colors, TFT color, 320×240 dots, high intensity | 32 (special 32 points)* | 0.22 * | – | *When bus connected |
| | A950GOT | Medium-size graphic operation terminal 8 colors, STN color, 320×240 dots/ STN monochrome, 320×240 dots/ 256 colors, TFT color, 320×240 dots, high intensity With handheld type | – | – | – | Dedicated to RS-422 connection |
| | GT1565-VTBA | Large-size graphic operation terminal 8.4" 256 colors, TFT color, 640×480 dots (When installing a multi color display board, 65536 colors can be displayed.) | 32 (special 32 points)* | 0.12 | – | *When bus connected |
| | GT1575-VTBA | Large-size graphic operation terminal 10.4" 256 colors, TFT color, 640×480 dots (When installing a multi color display board, 65536 colors can be displayed.) | | | | |

| Product Name | | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|---|
| | | | | | 5VDC (A) | 24VDC (A) | |
| Power supply module | Power supply slot mounting position | A61P<br>A61PN | 100/200VAC input<br>Output: 5VDC 8A | | – | – | |
| | | A61PEU | | | | | CE-compliant |
| | | A62P | 100/200VAC input<br>Output: 5VDC 5A, 24VDC 0.8A | | | | |
| | | A62PEU | | | | | CE-compliant |
| | | A63P | 24VDC input<br>Output: 5VDC 8A | | | | |
| | I/O slot mounting position | A66P | 100/200VAC input<br>Output: 24VDC 1.2A | 16 (empty 16 points) | | | Power supply for AD70, A616DAV, A616DAI |
| | | A68P | 100/200VAC input<br>Output: +15VDC 1.2A, -15VDC 0.7A | 32 (First half: empty 16 points; Second half: empty 16 points) | | | |
| Base unit | Main base unit | A38B | 8 I/O modules can be installed. | – | – | – | |
| | | A35B | 5 I/O modules can be installed. | | | | |
| | | A32B | 2 I/O modules can be installed. | | | | No connector for extension. |
| | | A32B-S1 | 2 I/O modules can be installed. | | | | With connector for extension. |
| | Extension base unit | A68B | 8 I/O modules can be installed. | – | – | – | The power supply module is required. |
| | | A65B | 5 I/O modules can be installed. | | | | |
| | | A62B | 2 I/O modules can be installed. | | | | |
| | | A58B | 8 I/O modules can be installed. | – | – | – | A61P, A61PN, A62P, A63P, and A65P cannot be mounted. |
| | | A55B | 5 I/O modules can be installed. | | | | |
| | | A52B | 2 I/O modules can be installed. | | | | |
| Extension cable | | AC06B | 600mm (23.62 inch) long | – | – | – | |
| | | AC12B | 1200mm (47.24 inch) long | | | | |
| | | AC30B | 3000 mm (118.11 inch) long | | | | |
| Simulation switch | | A6SW16 | 16 point simulation switch | – | – | – | Installed in an input module. |
| | | A6SW32 | 32 point simulation switch | | | | |
| Battery | | A6BAT | Built-in RAM memory backup | – | – | – | Mounting to AnNCPU module |

| Product Name | | Model Name | Description | Number of Occupied Points (points) [I/O Assignment Module Type] | Current Consumption | | Remark |
|---|---|---|---|---|---|---|---|
| | | | | | 5VDC (A) | 24VDC (A) | |
| Fuse | For AY11E, AY13E | MF51NM8 FGMA250V 8A | Cartridge type, 8A | – | – | – | |
| | For AY22 | HP-70K | Plug type, 7A | | | | |
| | For AY23 | HP-32 | Plug type, 3.2A | | | | |
| | For AY50, AY80 | MP-20 | Plug type, 2A | | | | |
| | For AY60 | MP-32 | Plug type, 3.2A | | | | |
| | For AY60E | MP-50 | Plug type, 5A | | | | |
| | For power supply | GTH4 FGTA250V 4A | Cartridge type, 4A | | | | |
| | For A63P | SM6.3A FGTA250V 6A | Cartridge type, 6.3A | | | | |

| Product Name | Model Name | Description | Applicable Model |
|---|---|---|---|
| Connector/terminal block converter module | A6TBXY36 | For sink type input module and sink type output module (standard type) | AX42(S1), AY42(S1/S3/S4), AH42 |
| | A6TBXY54 | For sink type input module and sink type output module. (2-wire type) | |
| | A6TBX70 | For sink type input module (3 wire type) | AX42(S1), AH42 |
| | A6TBX36-E | For source type input module (standard type) | AX82 |
| | A6TBY36-E | For source type output module (standard type) | AY82EP |
| | A6TBX54-E | For source type input module (2 wire type) | AX82 |
| | A6TBY54-E | For source type input module (2 wire type) | AY82EP |
| | A6TBX70-E | For source type input module (3 wire type) | AX82 |
| Cable for connector/ terminal block converter module | AC05TB | 0.5m (1.64 ft.) long, for sink module | A6TBXY36<br>A6TBXY54<br>A6TBX70 |
| | AC10TB | For 1m (3.28 ft.) sink module | |
| | AC20TB | For 2m (6.56 ft.) sink module | |
| | AC30TB | For 3m (9.84 ft.) sink module | |
| | AC50TB | For 5m (16.40 ft.) sink module | |
| | AC80TB | For 8m (26.24 ft.) sink module (Common current: 0.5A or less) | |
| | AC100TB | For 10m (32.81 ft.) sink module (Common current: 0.5A or less) | |
| | AC05TB-E | 0.5m (1.64 ft.) long, for source module | A6TBX36-E<br>A6TBY36-E<br>A6TBX54-E<br>A6TBY54-E<br>A6TBX70-E |
| | AC10TB-E | For 1m (3.28 ft.) source module | |
| | AC20TB-E | For 2m (6.56 ft.) source module | |
| | AC30TB-E | For 3m (9.84 ft.) source module | |
| | AC50TB-E | For 5m (16.40 ft.) source module | |
| Relay terminal module | A6TE2-16SRN | For sink-type output module | AY42, AY42-S1, AY42-S3, AY42-S4, AH42 |
| Cable for connecting relay terminal module | AC06TE | 0.6m (1.97 ft.) long | A6TE2-16SRN |
| | AC10TE | 1m (3.28 ft.) long | |
| | AC30TE | 3m (9.84 ft.) long | |
| | AC50TE | 5m (16.40 ft.) long | |
| | AC100TE | 10m (32.81 ft.) long | |

REMARK

Toa Electric Industrial CO., LTD. provides I/O cables with connectors, which can connect to 40-pin connector (AX42, AY42, etc.) or 37-pin D-sub connector (AX82, AY82) of I/O modules.

Contact:
TOA ELECTRIC INDUSTRIAL CO., LTD.

(2) Peripheral device

| Product Name | Model Name | Remark | |
|---|---|---|---|
| Plasma handy graphic programmer | A6PHP-SET | • A6PHP main unit<br>• SWGP-GPPA ..... GPP function start-up floppy disk for the A series.<br>• SWGP-GPPK ..... GPP function start-up floppy disk for the K series.<br>• SW0-GPPU ..... User floppy disk (2DD).<br>• AC30R4 ..... 3m (9.84 ft.)-long RS-422 cable. | |
| Intelligent GPP | A6GPP-SET | • A6GPP main unit<br>• SWGP-GPPA ..... GPP function start-up floppy disk for the A series.<br>• SWGP-GPPK ..... GPP function start-up floppy disk for the K series.<br>• SW0-GPPU ..... User floppy disk (2DD).<br>• AC30R4 ..... 3m (9.84 ft.)-long RS-422 cable. | |
| Composite video cable | AC10MD | • Connection cable for the monitor display of the A6GPP screen. 1m (3.28 ft.)long | |
| RS-422 cable | AC30R4 | 3m (9.84 ft.) long | Connection cable for between the CPU main module and A6GPP/A6PHP |
| | AC300R4 | 30m (98.43 ft.) long | |
| User floppy disk | SW0S-USER | 2HD-type | Floppy disk for storing user programs<br>(3.5-inch, pre-formatted) |
| Cleaning floppy disk | SW0-FDC | For A6GPP/A6PHP | Floppy disk for cleaning the floppy disk drive. |
| Optional keyboard for A6PHP | A6KB-SET-H | • A6KB keyboard<br>• AC03R4H ..... 0.3m (0.98 ft.)-long connection cable between A6KB and A6PHP.<br>• A6KB-C ..... Key sheet for the GPP mode of A6KB. | |
| Optional keyboard for A6GPP | A6KB-SET | • A6KB keyboard<br>• AC03R4L ..... 0.3m (0.98 ft.)-long connection cable between A6KB and A6GPP.<br>• A6KB-C ..... Key sheet for the GPP mode of A6KB. | |

| Product Name | Model Name | Remark |
|---|---|---|
| Printer | K6PR-K<br>A7NPR-S1 | • For printing out program circuit diagrams and various lists. |
| RS232C cable | AC30R2 | Connection cable for between A6GPP/A6PHP and printer (K6PR-K, A7NPR-S1, and a general-purpose printer with RS-232C interface)<br>3m (78.74 in) long |
| Printer paper | K6PR-Y<br>K7PR-Y | Printer paper for K6PR(S1) and K6PR-K.9-inch paper.2000 sheets per unit.<br>Printer paper for A7PR and A7NPR.11-inch paper.2000 sheets per unit. |
| Inked ribbon for K6PR(K) | K6PR-R | Replacement inked ribbon for K6PR-K. |
| Programming module | A7PUS | Read/write of the program is performed by connecting to the CPU main module with a RS-422 cable (AC30R4-PUS).(5VDC 0.4A) |
| | A8PUE | Read/write of the program is performed by connecting to the CPU main module or a RS-422 cable (AC30R4-PUS, AC20R4-A8PU).(5VDC 0.4A) |
| RS-422 cable | AC30R4-PUS | Connection cable for between the CPU main module and A7PUS,A8PUE<br>3m (118.11 in) long |
| | AC20R4-A8PU | Connection cable for between the CPU main module and A8PUE<br>2m (78.74 in) long |
| P-ROM writer unit | A6WU | • Used to store programs contained in the CPU main module or the A6PHP to ROM, or to read programs from ROM to the CPU main module.<br>• Connect to the CPU module/A6PHP with an AC30R4/AC03WU cable. |
| Data access module | A6DU-B | • Used for monitoring the devices of the CPU module, changing the setting values/ current values, and displaying the operation status.(5VDC 0.23A)<br>• Connect to the CPU mopdule with an AC30R4-PUS cable. |
| Modem interface module | A6TEL | • An interface module which connects the CPU module and the modem. Using a telephone line, the communication is performed between a remote peripheral device and the CPU module.(5VDC 0.2A)<br>• Connect to the CPU mopdule with an AC30R4-PUS cable. |
| RS-422 cable | AC30R4<br>AC300R4 | Connection cable for between the CPU main module and A6WU.<br>3m/30m (9.84 ft./98.43 ft.) long. |
| | AC03WU | Connection cable for between the A6PHP main unit and A6WU.<br>0.3m (0.98 ft.) long |

## 2.4 System Configuration Overview

There are four system configuration types as follows:

(1) Stand-alone system ..... A system with a main base module only, or with a main base system and an extension base module connected with the extension cable

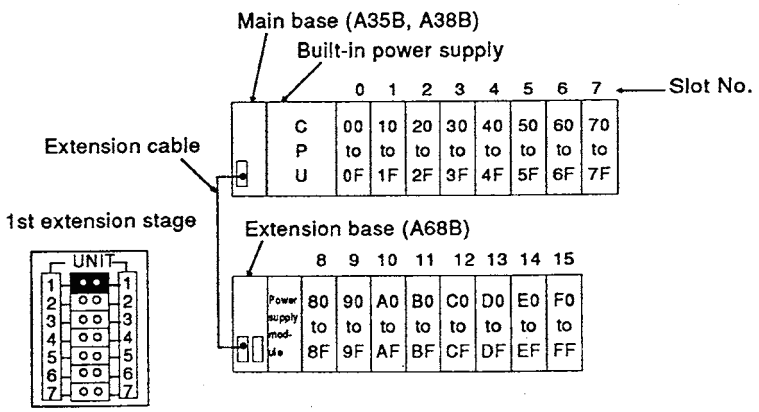
(2) Network system ..... A system that controls multiple PLCs and remote I/O modules

(3) Computer link system ..... A system that communicates between the CPU module and the computer (personal computer, etc.) by using an AJ71UC24 computer link module

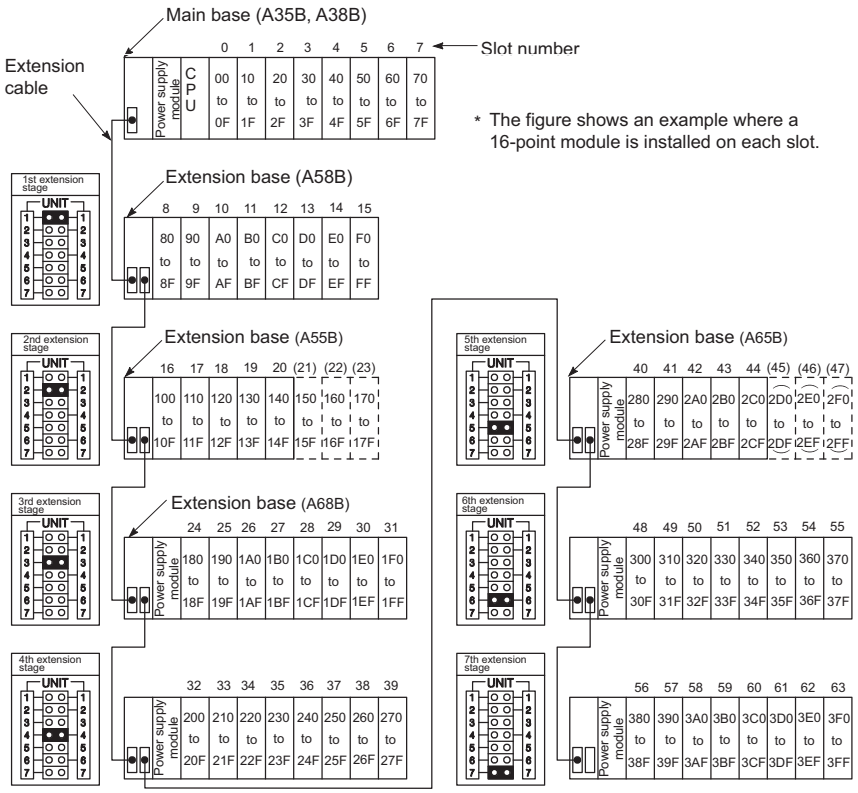
(4) Composite system ..... A system that has a combination of a network system and a computer link system

The details of the system configuration, number of I/O points, I/O number assignment, etc., of a stand-alone system are listed on the following page.

(a) A1NCPU systems

| | |
|---|---|
| System configuration |  |
| Maximum number of extension stages | 1st extension stage |
| Maximum number of I/O modules | 16 modules |
| Maximum number of I/O points | 256 points |
| Main base unit model name | A32B, A32B-S1, A35B, A38B |
| Extension base unit model name | A62B, A65B, A68B, A52B, A55B, A58B |
| Extension cable model name | AC06B, AC12B, AC30 |
| Restrictions | (1) Extension bases cannot be connected to the main base A32B. (No connector for extension)<br>(2) Extension bases A52B, A55B, and A58B are supplied with 5VDC from the power supply module on the main base. Refer to Section 6.1.3 for their applicability before using them.<br>(3) Limit the total length of extension cable to 6.6m (236inch) or shorter. |
| I/O number assignment | (1) I/O numbers for the extension bases are allocated in accordance with the order of the numbers set for the extension base stages, regardless of the order in which the extension cables are connected.<br>(2) Assign I/O numbers as if both main base unit and extension base unit have 8 slots each. Consequently, 16 points are allocated per slot for the parts indicated with dotted lines in the system configuration drawing.<br>(3) 16 points are assigned to an empty slot.<br>(4) Extension stage numbers do not need to be sequential, but any extension stage omitted from the system will occupy 8 (slots) × 16 I/O points.<br>(5) Items (2) to (4) can be performed by the I/O assignment.<br>Refer to the Type ACPU/QCPU-A (A Mode) Programming Manual (Fundamentals) for details. |

(b) A2N, A3N system

| | |
|---|---|
| System configuration |  |
| Maximum number of extension stages | A2NCPU : 3rd extention stage, A2NCPU-S1 : 7th extension stage, A3NCPU : 7th extention stage |
| Maximum number of I/O modules | A2NCPU : 32 modules, A2NCPU-S1 : 64 modules, A3NCPU : 64 modules |
| Maximum number of I/O points | A2NCPU: 512 points, A2NCPU-S1: 1024 points, A3NCPU: 2048 points |
| Main base unit model name | A32B, A32B-S1, A35B, A38B |
| Extension base unit model name | A62B, A65B, A68B, A52B, A55B, A58B |
| Extension cable model name | AC06B, AC12B, AC30 |
| Restrictions | (1) Extension bases cannot be connected to the main base A32B. (No connector for extension)<br>(2) Extension bases A52B, A55B, and A58B are supplied with 5VDC from the power supply module on the main base. Refer to Section 6.1.3 for their applicability before using them.<br>(3) Limit the total length of extension cable to 6.6m (236inch) or shorter. |
| I/O number assignment | (1) I/O numbers for the extension bases are allocated in accordance with the order of the numbers set for the extension base stages, regardless of the order in which the extension cables are connected.<br>(2) Assign I/O numbers as if both main base unit and extension base unit have 8 slots each. Consequently, 16 points are allocated per slot for the parts indicated with dotted lines in the system configuration drawing.<br>(3) 16 points are assigned to an empty slot.<br>(4) Extension stage numbers do not need to be sequential, but any extension stage omitted from the system will occupy 8 (slots) × 16 I/O points.<br>(5) Items (2) to (4) can be performed by the I/O assignment.<br>Refer to the Type ACPU/QCPU-A (A Mode) Programming Manual (Fundamentals) for details. |

# 3 SPECIFICATIONS

The general specification common to various modules is shown.

<table>
<tr><th>Item</th><th colspan="6">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="6">0 to 55℃</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="6">-20 to 75℃</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="6">10 to 90 % RH, No-condensing</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="6">10 to 90 % RH, No-condensing</td></tr>
<tr><td rowspan="5">Vibration resistance</td><td rowspan="5">JIS B 3502,<br>IEC 61131-2<br>Conforms to</td><td></td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td rowspan="2">Under intermittent vibration</td><td>10 to 57Hz</td><td>–</td><td>0.075mm</td><td rowspan="2">10 times each in X, Y, Z directions</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s$^2$</td><td>–</td></tr>
<tr><td rowspan="2">Under continuous vibration</td><td>10 to 57Hz</td><td>–</td><td>00.35mm<br>(0.001in.)</td><td rowspan="2">–</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s$^2$</td><td>–</td></tr>
<tr><td>Shock resistance</td><td colspan="6">Conforming to JIS B 3502, IEC 61131-2 (147m/s$^2$ , 3 times in each of 3 directions XYZ)</td></tr>
<tr><td>Operation ambiance</td><td colspan="6">No corrosive gasses</td></tr>
<tr><td>Operating elevation*3</td><td colspan="6">2000m (6562 ft.) or less</td></tr>
<tr><td>Installation location</td><td colspan="6">Control panel</td></tr>
<tr><td>Overvoltage category*1</td><td colspan="6">II max.</td></tr>
<tr><td>Pollution degree*2</td><td colspan="6">2 max.</td></tr>
<tr><td>Equipment category</td><td colspan="6">Class I</td></tr>
</table>

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

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

*3 Do not use or store the PLC in the environment when the pressure is higher than the atmospheric pressure at sea level.
Otherwise, malfunction may result.
To use the PLC in high-pressure environment, please contact your local Mitsubishi representative.

# 4 CPU MODULE

## 4.1 Performance Specifications

Performance specifications of CPU modules are shown below.

Performance specifications

| Item | | Model | | | | Remark |
|---|---|---|---|---|---|---|
| | | A1NCPU | A2NCPU | A2NCPU-S1 | A3NCPU | |
| Control method | | Sequence program control method | | | | |
| I/O control mode | | Refresh/direct mode selectable | | | | Partial direct I/O are available by the instructions. |
| Programming language | | Language dedicated to sequence control | | | | |
| | | Relay symbol language, logic symbol language, MELSAP-II (SFC)*1 | | | | |
| Processing speed (sequence instruction) | | Direct mode :1.0 to 2.3 μs/step<br>Refresh mode :1.0 μs/step | | | | |
| Constant scanning (Program startup with a specified interval) | | Can be set between 10ms and 190ms in 10ms units. | | | | Set in special register D9020. |
| Memory capacity | | Max. 16k bytes | Capacity of the installed memory cassette (Max. 448k bytes) | | | Refer to CHAPTER 7 for details of memory cassette. |
| Program capacity | Main sequence program | Max. 6k steps | Max. 14k steps | | Max. 30k steps | Set in parameters. |
| | Subsequence program | None | | | Max. 30k steps | |
| Number of I/O points | | 256 points (X/Y0 to X/YFF) | 512 points (X/Y0 to X/Y1FF) | 1024 points (X/Y0 to X/Y3FF) | 2048 points (X/Y0 to X/Y7FF) | The number of points which can be used for access to actual I/O modules |
| Watchdog timer | | 10 to 2000 ms | | | | |

*1: SFC cannot be used for the A1NCPU.

Performance specifications (Continued)

| Item | | Model | | | | Remark |
|---|---|---|---|---|---|---|
| | | A1NCPU | A2NCPU | A2NCPU-S1 | A3NCPU | |
| Device points | Internal relay [M] | 1000 points (M0 to M999) | | | Total 2048 points shared by M, L, S | The range can be changed by parameters. |
| | Latch relay [L] | 1048 points (L1000 to L2047) | | | | |
| | Step relay [S] | 0 point (None for default) | | | | |
| | Link relay [B] | 1024 points (B0 to B3FF) | | | | |
| | Timer [T] | 256 points<br>• 100ms timer (T0 to T199) .....Setting time: 0.1 to 3276.7s<br>• 10ms timer (T200 to T255).....Setting time: 0.01 to 327.67s<br>• 100ms retentive timer (none for initial) ...Setting time: 0.1 to | | | | Set the range by parameters.<br>(Refer to Section 4.3.1) |
| | Counter [C] | 256 points<br>•Normal counter (C0 to C255).....Setting range : 1 to 32767 times<br>▪ Counter for interrupt program .....Setting range : 1 to 32767<br>↳ Counters used in interrupt programs | | | | Set the range by parameters.<br>(Refer to Section 4.3.1) |
| | Data register [D] | 1024 points (D0 to D1023) | | | | |
| | Link register [W] | 1024 points (W0 to W3FF) | | | | |
| | Annunciator [F] | 256 points (F0 to F255) | | | | Fault finding device |
| | File register [R] | None | 4096 points (R0 to R4095) | | 8192 points (R0 to R8191) | Points set by parameters |
| | Accumulator [A] | 2 points (A0, A1) | | | | |
| | Index register [V, Z] | 14 points (V, V1 to V6, Z, Z1 to Z6) | | | | |
| | Pointer [P] | 256 points (P0 to P255) | | | | |
| | Interrupt pointer [I] | 32 points (I0 to I31) | | | | |
| | Special relay [M] | 256 points (M9000 to M9255) | | | | |
| | Special register [D] | 256 points (D9000 to D9255) | | | | |

Performance specifications (Continued)

| Item | Model | | | | Remark |
|---|---|---|---|---|---|
| | A1NCPU | A2NCPU | A2NCPU-S1 | A3NCPU | |
| Comment | 128 points (F0 to 127 : for this use only) | MAX 4032 points (Set with the unit of 64 points) | | | Set in parameters. |
| Expanded comment | MAX 3968 points (Set with the unit of 64 points) | | | | |
| Switch output mode from STOP to RUN | Select "Set the output status at STOP to RUN. (Default)" or "Output after operation exectution." | | | | Set in parameters. |
| Self-diagnostics function | Watchdog error supervision<br>Error detection in the memory, CPU, I/O, battery, etc. | | | | Refer to Section 4.1.4 for details. |
| Operation mode when there is an error | Select STOP or continue | | | | Set in parameters. (refer to Section 4.3.1) |
| Start-up method at RUN | Initial start<br>(upon power supply on/power restoration after power failure, automatic restart by turning the RUN switch of the CPU or ON.) | | | | |
| Latch (power failure compensation) range | L1000 to L2047 (default)<br>(Possible to setup latch ranges for L, B, T, C, D, W) | | | | Range set by parameters. |
| Remote RUN/PAUSE contacts | X0 to XFF | X0 to X1FF | X0 to X3FF | X0 to X7FF | Set in parameters. |
| | Possible to setup one contact poin for each of RUN/PAUSE. | | | | |
| Print title entry | YES (128 characters) | | | | Set in parameters. |
| Keyword registration | YES | | | | Set in parameters. |
| I/O assignment | Possible to register number of occupied I/O points and module model names. | | | | |
| Step operation | Possible to execute or stop sequence program operations. | | | | Refer to Section 4.3. |
| Interrupt processing | Possible to operate an interrupt program by the interrupt module or constant period interruput signal. | | | | |
| Data link | MELSECNET, MELSECNET/B | | | | |
| Clock function | Year, month, day, hour, minute, second, day of the week<br>(automatic detection of the leap year)<br>Accuracy • -3.9 to +0.8s(TYP.-1.1s)/d at 0℃<br>• -1.8to +1.0s(TYP.-0.2s)/d at 25℃<br>• -8.5 to +0.7s(TYP.-4.0s)/d at 55℃ | | | | |
| Allowable momentary power failure period | 20 ms | Depending on the power supply modules | | | Refer to Section 5.1. |
| 5VDC internal current consumption | A1NCPU :0.53A<br>A1NCPUP21 (S3) :1.23A<br>A1NCPUR21 :1.63A | A2NCPU :0.73A<br>A2NCPUP21 (S3) :1.38A<br>A2NCPUR21 :1.78A | A2NCPU-S1:0.73A<br>A2NCPUP21 -S1(S4) :1.38A<br>A2NCPUR21 -S1 :1.78A | A3NCPU :0.90A<br>A3NCPUP21 (S3) :1.55A<br>A3NCPUR21 :1.95A | |
| Weight | A1NCPU :1.45kg<br>A1NCPUP21 (S3) :1.75kg<br>A1NCPUR21 :1.75kg | A2NCPU :0.62kg<br>A2NCPUP21 (S3) :0.92kg<br>A2NCPUR21 :0.92kg | A2NCPU-S1:0.62kg<br>A2NCPUP21 -S1(S4) :0.92kg<br>A2NCPUR21 -S1 :0.92kg | A3NCPU :0.65kg<br>A3NCPUP21 (S3) :0.95kg<br>A3NCPUR21 :0.95kg | |
| External dimensions | 250mm (9.84inch) × 135mm (5.32inch) × 121mm (4.76inch) | 250mm (9.84inch) × 79.5mm (5.32inch) × 121mm (4.76inch) | | | |

### 4.1.1 Overview of operation processing

The following shows an overview of processing which begins with a CPU module power-on to execute the sequence program.
CPU modules processing may be categorized roughly into the following four kinds:

(1) Initial processing
This is a preprocess to execute sequence operations, and is performed only once upon power-on or reset.
(a) Resets the I/O module and initialize it.
(b) Initializes the range of data memory for which latch is not set up (sets the bit device to OFF and the word device to 0).
(c) Allocates I/O address of the I/O module automatically based on the I/O module number or the position of installation on the extension base module.
(d) Executes the self-diagnostics check for the parameter setting and the operation circuit. (Refer to Section 4.1.4)
(e) For the master station of MELSECNET (II)/B, sets the network/link parameter information to the network/data-link module, and commences the network communication/data link.

(2) Refresh processing of I/O module
Executes the refresh processing of I/O module.
(Refer to the ACPU/QCPU-A (A mode) Programming Manual (Fundamentals).)

(3) Operation Processing of Sequence Program
Executes the sequence program from step 0 to the END instruction written in the PLC CPU.

(4) END processing
This is a post-process that finishes one cycle of operation processing of the sequence program and returns the execution of the sequence program to the step 0.
(a) Executes self-diagnostics checks, such as a fuse blown, an I/O module verify, and a low battery.
(Refer to Section 4.1.4)
(b) Updates the current value of the timer, sets the contact ON/OFF, updates the current value of the counter and sets the contact to ON.
(Refer to the ACPU/QCPU-A (A mode) Programming Manual (Fundamentals).)
(c) Executes the data exchange between the PLC CPU and a computer link module(e.g. AJ71UC24, AD51H-S3) when there is a data read or write request from the computer link module.

(d) Executes the refresh processing when there is a refresh request from the link module.

(e) When the trace point setting of sampling trace is set for each scan (after END instruction execution), stores the device status for which it is setup into the sampling trace area. (A2N(S1), A3N only)

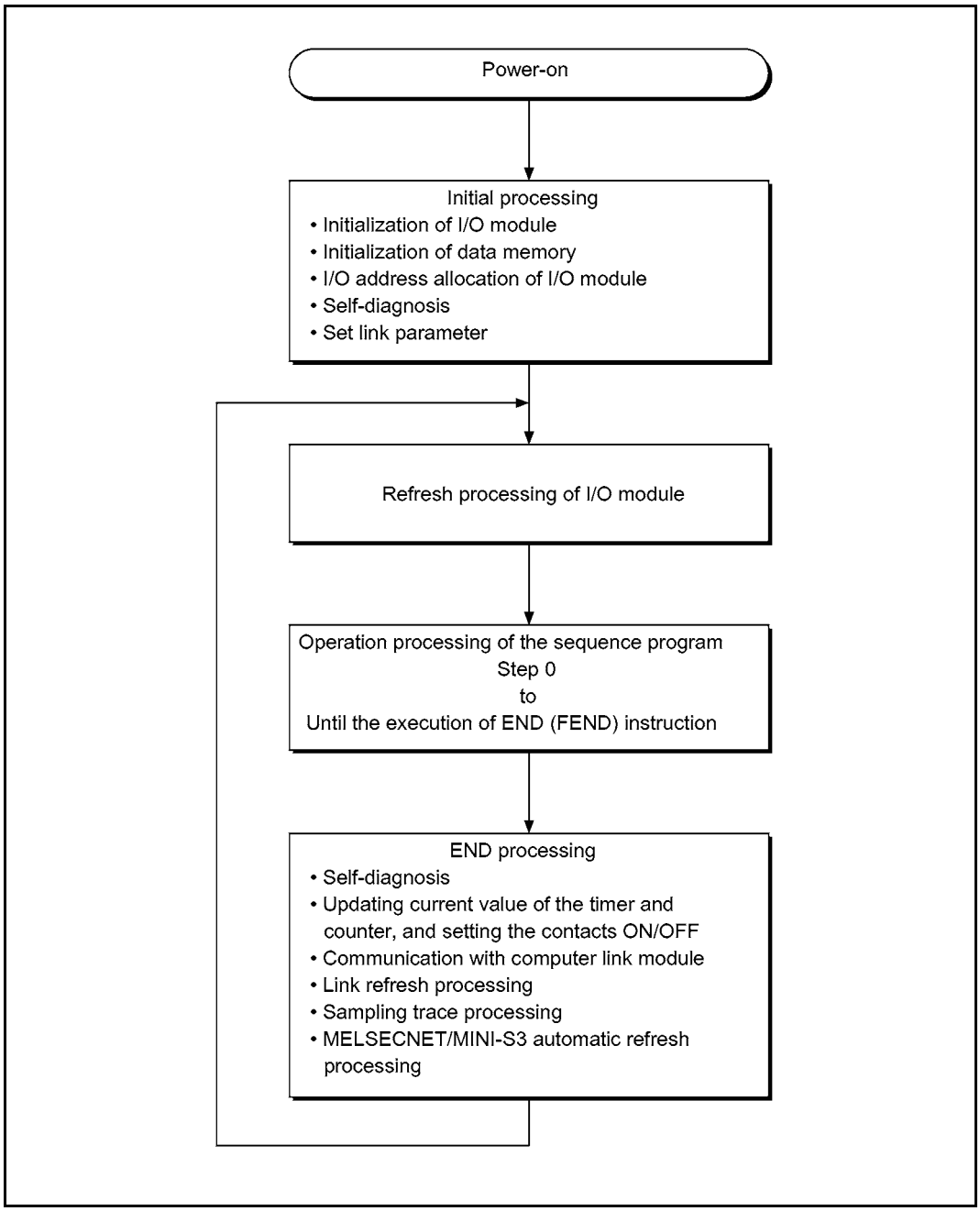



Figure 4.1 CPU module operation processing

POINT

When executing the FROM/TO instruction for the special function module frequently in short scan time, it may cause an operation error in the target special function module.
When executing the FROM/TO instruction, match the processing time and conversion time for the special function module using timer or constant scan function.

### 4.1.2 Operation processing of RUN, STOP, PAUSE, and STEP-RUN

The PLC CPU has four kinds of operation status: RUN status, STOP status, PAUSE status, and step operation (STEP-RUN) status.
Operation processing of PLC CPU in each operation status is explained.

(1) Operation processing in RUN
  (a) RUN status means that the sequence program operation is repeated as step 0 → END (FEND) instruction → 0.

  (b) When entering the RUN status, outputs the stored output status at STOP because of setting the output mode as STOP → RUN in the parameters.

  (c) Processing time from switching STOP → RUN to the start of the sequence program operation is usually two to three seconds, although it may vary depending on the system configuration.

(2) Operation processing in STOP
  (a) STOP status means that the sequence program operation is canceled due to the RUN/STOP key switch, STOP instruction, or the remote STOP. (Refer to Section 4.3)

  (b) When entering the STOP status, stores the output status and sets all output points to OFF. Data memories except for output (Y) are retained.

(3) Operation processing in PAUSE
  (a) PAUSE status means that the sequence program operation is canceled retaining output and data memories. (Refer to Section 4.3)

(4) Step operation (STEP-RUN) operation processing
  (a) Step operation is an operation mode wherein operation processing of a sequence program can be paused/resumed by each instruction from peripheral device(s). (Refer to Section 4.3)

  (b) Since an operation processing is paused while retaining the output and data memories, condition of the execution can be confirmed.

(5) PLC CPU operation processing when RUN/STOP key switch is operated

<table>
<tr><td rowspan="3" colspan="2">RUN/STOP Key Switch Operation</td><td colspan="3">PLC CPU Operation Processing</td><td rowspan="3">Remark</td></tr>
<tr><td rowspan="2">Operation Processing of Sequence Program</td><td rowspan="2">External Output</td><td colspan="2">Data memory</td></tr>
<tr><td colspan="2">(Y,M,L,S,T,C,D)</td></tr>
<tr><td colspan="2">RUN → STOP<br>STEP-RUN → STOP</td><td>Executes up to the END instruction, then stops.</td><td>OS stores the output status, and sets all the output points to OFF.</td><td>Retains the condition immediately prior to entering the STOP status.</td><td>OS stores the output status, and sets all the output points to OFF.</td><td></td></tr>
<tr><td colspan="2">STOP → RUN</td><td>Starts.</td><td>Determines according to the output mode upon STOP → RUN in the parameters.</td><td>Starts operations from the status immediately before STOP.</td><td>Determines according to the output mode upon STOP → RUN in the parameters.</td><td></td></tr>
<tr><td colspan="2">RUN → PAUSE<br>(when M9040 is ON)</td><td>Executes up to the END instruction, then stops.</td><td rowspan="4">Retains the output status.</td><td colspan="2">Retains the condition immediately prior to entering the PAUSE status.</td><td>When M9040 is OFF, the same operation processing is executed as when RUN/STOP key switch is at RUN.</td></tr>
<tr><td rowspan="2">STOP → STEP-RUN<br>PAUSE → STEP-RUN</td><td>Operation stopped from a peripheral device</td><td>Stops operation at a step specified by a periperal device.</td><td colspan="2">Retains the condition immediately prior to stopping operation.</td><td></td></tr>
<tr><td>Operation restarted from a peripheral device</td><td>Restarts from the step that follows the step where operation was stopped.</td><td colspan="2">Restarts operation with the condition immediately prior to stopping operation.</td><td></td></tr>
<tr><td colspan="2">PAUSE → RUN</td><td>Starts.</td><td>Restarts operation with the output condition at PAUSE.</td><td colspan="2">Restarts operation from the status immediately before PAUSE.</td><td></td></tr>
</table>

POINT

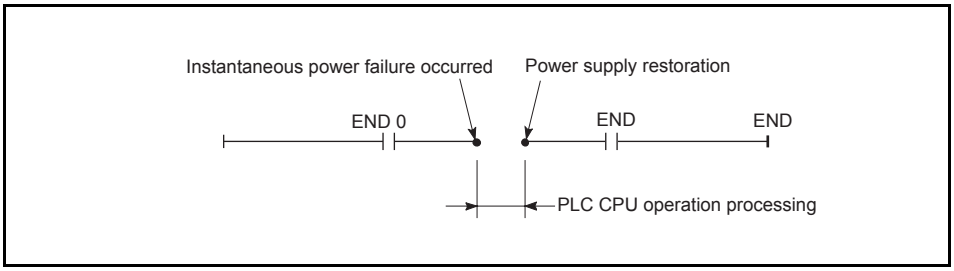
1. In any statuses of RUN, STOP or PAUSE, PLC CPU performs the following:
   - Refresh processing of I/O module when in the refresh mode
   - Data communication with computer link module
   - Link refresh processing

   Thus, even in the STOP or PAUSE status, monitoring or testing I/O with peripheral devices, reading or writing from a computer link module, and communication with other stations by MELSECNET/10, MELSECNET/MINI-S3 are possible.
2. STEP-RUN executes the END processing when executes the END(FEND) instruction during step run.
   For current value update of the timer, the PLC adds 1 by 1 scan on the 10ms timer and adds 1 by 10 scan on the 100ms timer.

### 4.1.3 Operation processing upon instantaneous power failure

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

(1) When an instantaneous power failure shorter than allowable momentary power failure period occurred:
   (a) When an instantaneous power failure occurred, the operation processing is interrupted while the output status is retained.
   (b) When the instantaneous power failure is reset, the operation processing will be continued.
   (c) When an instantaneous power failure occurred and the operation was interrupted, measurement of the watchdog timer (WDT) continues.For instance, when the scan time is 190ms, the watchdog timer setting is 200ms and an instantaneous power failure of 15ms occurs, it causes the watchdog timer error.




Operation processing upon instantaneous power failure

(2) When an instantaneous power failure longer than the allowable momentary power failure period occurred:
   The PLC CPU performs the initial start.
   The operation processing is the same as power-on or reset operation with the reset switch.

### 4.1.4 Self-diagnostics functions

Self-diagnosis is a function that a CPU module diagnoses itself for the presence of any abnormalities.

(1) While turning on the PLC power or when an error occurrs in the PLC RUN, the error is detected and displayed, and the operation is stopped by the self-diagnostics function, which the CPU module performs, to prevent PLC malfunctions and give preventive maintenance.

(2) The CPU module stores the error occurred last to a special register D9008 as an error code, and stores further detailed error code to a special register D9091.

(3) Even with the power-off, the latest error information and 15 errors in the past are stored by battery backup.
With a GPP function software package for the AnUCPU, contents of up to 16 errors can be confirmed from the peripheral devices. For the method of confirming the errors in the past, refer to Self-diagnostics of the GPP Function Software Package Operating Manual.
Reset (All clear) in the past error information can be performed by operating "latch clear" in the CPU module.
The following shows contents of the error information. (The error which occurred last):
   (a) The time and date of error occurrences.....Year, month, day, hour, minute, second (Clock data)
   (b) Error Code.....The content of the special register D9008
   (c) Error step and error module installation address... The content of the special register D9010, D9000

(4) When detecting an error by self-diagnosis, CPU takes action in the following modes:
- Mode wherein the PLC operation is stopped
- Mode wherein the PLC operation is continued

In addition, some errors can be skipped or stopped by setting parameters.

(a) When an operation stop error is detected by the self-diagnosis, the CPU stops the operation at error detection, and sets the all outputs(Y) to OFF.

(b) When an error of operation continued is detected, the only part of the program with the error is not executed while the other part is executed.
Also, in case of module comparison error, the operation is continued using the I/O address prior to the error.

Since error occurrence and error contents are stored in the special relay (M) and special register (D) at error detection, use in the program for preventing any malfunctions of the PLC or mechanical system especially in mode wherein the PLC operation is continued.

The next page shows error descriptions detected by the self-diagnosis.

REMARK

(1) Two modes described in the "CPU Status" and "RUN LED Status" columns in next table indicate that they can be changed by the setting of the peripheral devices.

(2) *1 This is the lit or unlit status of the "ERROR" LED of an A1NCPU or A2NCPU.

(3) *2 In the case of the A3NCPU, error messages are displayed by the LED indicator.
These messages are also displayed as a result of PLC diagnosis conducted using peripheral devices.

(4) *3 In the case of the A3NCPU, the LED indicator displays the following message only when a "CHK" instruction error among the "operation check errors" occurs:

"<CHK>ERROR [ ][ ][ ]"
A three-digit error number appears here.

(5) For how to clear error information stored in special registers, refer to POINT in Appendix 2.2 Special Registers.

Self-diagnostics list

| Diagnostic Item | | Diagnostic Timing | CPU Module Status | Status of "RUN" LED | Error Message | Error Code (D9008) |
|---|---|---|---|---|---|---|
| Memory error | Instruction code check | When each instruction is executed | STOP | Flickering | INSTRCT CODE ERR. | 10 |
| | Parameter setting check | • At power-ON or RESET<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | PARAMETER ERROR | 11 |
| | No END instruction | • When M9056 or M9057 is ON<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | MISSING END INS | 12 |
| | Unable to execute instruction | • CJ SCJ JMP CALL(P) FOR～NEXT<br>When each instruction is executed<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | CAN'T EXECUTE(P) | 13 |
| | Format (CHK instruction) check | • When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | CHK FORMAT ERR. | 14 |
| | Unable to execute instruction | • When interruption occurs<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | CAN'T EXECUTE(I) | 15 |
| | No memory cassettes | • At power-ON or RESET | | | CASSETTE ERROR | 16 |
| CPU error | RAM check | • At power-ON or RESET<br>• When M9084 is ON during STOP | STOP | Flickering | RAM ERROR | 20 |
| | Operation circuit check | • At power-ON or RESET | | | OPE.CIRCUIT ERR. | 21 |
| | Watchdog error supervision | • When END instruction is executed | | | WDT ERROR | 22 |
| | END instruction not executed | • When END instruction is executed | | | END NOT EXECUTE | 24 |
| | Main CPU check | Always | | | MAIN CPU DOWN | 26 |
| I/O error | Module verification *1 (Default: STOP) | When END instruction is executed (However, not checked when M9084 is ON.) | STOP/RUN | Flickering/ ON | UNIT VERIFY ERR. | 31 |
| | Fuse blown *1 (Default: RUN) | When END instruction is executed (However, not checked when M9084 is ON.) | | | FUSE BREAK OFF | 32 |
| Special function module error | Control bus check | When FROM, TO instruction are executed | STOP | Flickering | CONTROL-BUS ERR. | 40 |
| | Special function module error | When FROM, TO instruction are executed | | | SP.UNIT DOWN | 41 |
| | Link module error | • At power-ON or RESET<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | LINK UNIT ERROR | 42 |
| | I/O interrupt error | When interruption occurs | | | I/O INT.ERROR | 43 |
| | Special function module assignment error | • At power-ON or RESET<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | | | SP.UNIT LAY.ERR. | 44 |
| | Special function access error *1 (Default: STOP) | When FROM, TO instruction are executed | STOP/RUN | Flickering/ ON | SP.UNIT ERROR | 46 |
| | Link parameter error | • At power-ON or RESET<br>• When switching from (STOP, PAUSE) to (RUN, STEP→RUN) | Continue | ON | LINK PARA.ERROR | 47 |
| Battery | Low battery | Always<br>(However, not checked when M9084 is ON.) | Continue | ON | BATTERY ERROR | 70 |
| Computation check error *1 (Default: RUN) | | When each instruction is executed | STOP/RUN | Flickering/ ON | OPERATION ERROR*2<br>[<CHK> ERROR□□□] | 50 |

*1 Can be changed by the parameter settings of the peripheral devices.
*2 Displayed as a three-digit trouble code only for errors with the "CHK" instruction.

### 4.1.5 Device list

Device means a general name for such as a contact, coil and timer used on the program operations in a PLC.
The following shows usage ranges and device names of the PLC.
For * in the devices below, they can be used by setting the parameters on each peripheral device. Also, they can be changed the usage ranges assignment.
Set the parameters depending on the usage system and contents of the programs.
For the detailed setting for parameters, refer to Section 4.3.1 "List of parameter setting range".)

Device list

<table>
<tr><th colspan="2" rowspan="2">Device</th><th colspan="4">Range of Usage (points)</th><th rowspan="2">Description of Device</th></tr>
<tr><th>A1NCPU</th><th>A2NCPU</th><th>A2NCPU-S1</th><th>A3NCPU</th></tr>
<tr><td>X</td><td>Input</td><td rowspan="2">X/Y0 to X/YFF (256 points)</td><td rowspan="2">X/Y0 to 1FF (512 points)</td><td rowspan="2">X/Y0 to X/Y3FF (1024 points)</td><td rowspan="2">X/Y0 to X/Y7FF (2048 points)</td><td>Used for the supply PLC commands and data from the external devices such as push buttons, select switches, limit switches and digital switches.</td></tr>
<tr><td>Y</td><td>Output</td><td>Used to the output control results of the program to the external devices such as solenoids, magnetic switches, signal lights and digital display device.</td></tr>
<tr><td rowspan="4">M</td><td>Special Relay</td><td colspan="4">M9000 to M9255 (256 points)</td><td>An auxiliary relay which is used in a PLC set in advance for a special application.</td></tr>
<tr><td>*Internal relay</td><td colspan="2">M0 to M999 (1000 points)</td><td rowspan="3" colspan="2">2048 points as a total of M, L, S</td><td>An auxiliary relay in a PLC which cannot output directly to external devices.</td></tr>
<tr><td>L</td><td>*Latch relay</td><td colspan="2">L1000 to L2047 (1048 points)</td><td>An auxiliary relay in a PLC which cannot output directly to the external devices. Has the power failure compensation function.</td></tr>
<tr><td>S</td><td>*Step relay</td><td colspan="2">Usable when parameter are set (0 points)</td><td>Used in the same manner as the internal relay (M).<br>Used as a relays to indicate the stage number of process stepping program, etc.</td></tr>
<tr><td>B</td><td>Link relay</td><td colspan="4">B0 to B3FF (1024 points)</td><td>An internal relay for data link and it cannot be output to external devices.The range not set by the link parameters can be used as a substitute for a data register.</td></tr>
<tr><td>F</td><td>Annunciator</td><td colspan="4">F0 to F255 (256 points)</td><td>Used for error detection. Error detection programs are created in advance, and if it becomes ON during RUN, the number is stored in a special register D.</td></tr>
<tr><td rowspan="3">T</td><td>*100ms timer</td><td colspan="4">T0 to T199 (200 points)</td><td rowspan="3">Up-timing-timer. There are three kinds: 100ms timer, 10ms timer and 100ms retentive timers.</td></tr>
<tr><td>*10ms timer</td><td colspan="4">T200 to T255 (56 points)</td></tr>
<tr><td>*100ms retentive timer</td><td colspan="4">Usable when parameter are set (0 points)</td></tr>
<tr><td rowspan="2">C</td><td>*Counter</td><td colspan="4">C0 to C255 (256 points)</td><td rowspan="2">Up-timing<br>There are two kinds: an up-timing counter used in PLC programs, an interrupt counter used in counting the number of interrupts.</td></tr>
<tr><td>*Interrupt counter</td><td colspan="4">Usable when parameter are set (0 points)</td></tr>
<tr><td rowspan="2">D</td><td>Data register</td><td colspan="4">D0 to D1023 (1024 points)</td><td>Memory used to store data in a PLC</td></tr>
<tr><td>Special register</td><td colspan="4">D9000 to D9255 (256 points)</td><td>Data memory set up in advance for the special application</td></tr>
</table>

Device list (Continued)

| Device | | Range of Usage (points) | | | | Description of Device |
|---|---|---|---|---|---|---|
| | | A1NCPU | A2NCPU | A2NCPU-S1 | A3NCPU | |
| W | Link register | W0 to W3FF (1024 points) | | | | Register for a data link.<br>The range not set by the link parameters can be used as a substitute for a data register. |
| R | *File register | Usable when parameter are set (0 points) | | | | Used for expanding the data register. User memory area is used for this. |
| A | Accumulator | A0, A1 (2 points) | | | | Data register used to store a operation result of basic and application instructions |
| Z<br>V | Index register | V, Z (2 points) | | | | Used for qualification of devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, P) |
| N | Nesting | N0 to N7 (8 levels) | | | | Indicates nesting structure of a master control. |
| P | Pointer | P0 to P255 (256 points) | | | | Indicates destination of the branch instructions (CJ, SCJ, CALL, JMP). |
| I | Interrupt pointer | I0 to I31 (32 points) | | | | When an interruption is generated, it shows the destination of the interrupt program corresponding to the interruption. |
| K | Decimal constant | K-32768 to K32767 (16-bit instruction)<br>K-2147483648 to K2147483647 (32-bit instruction) | | | | Used to set timer/counter, pointer number, interrupt pointer number, bit device digits, and values for basic and application instructions. |
| H | Hexadecimal | H0 to HFFFF (16-bit instruction)<br>H0 to HFFFFFFFF (32-bit instruction) | | | | Used to the set values for basic and application instructions. |

REMARK

The step relay in the list above can be used in the same manner as the internal relay (M).For the program creation with two kinds of functions in one program, it is usable to divide the step relay (S) and internal relay (M) into a category of such as a function and usage in using.

## 4.2 Performance Spacification of Data Link Modules

Performance specifications regarding data link of AnNCPU21/R21 data link modules are shown below.

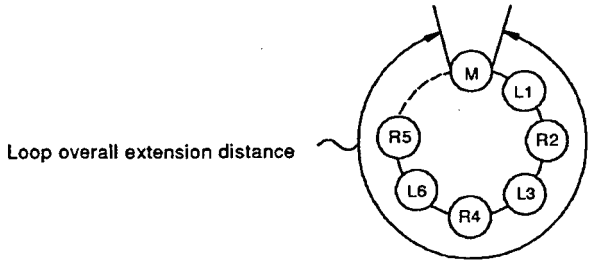
Performance Specifications of Data Link Modules

| | | Optical Data Link | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | A1NCPUP21 | A1NCPUP21-S3 | A2NCPUP21 | A2NCPUP21-S3 | A2NCPUP21-S1 | A2NCPUP21-S4 | A3NCPUP21 | A3NCPUP21-S3 |
| Max. I/O points | | 256 points | | 512 points | | 1024 points | | 2048 points | |
| Max number of link points used per station | Inputs (X) | 256 points (32 bytes) | | 512 points (64 bytes) | | 1024 points (128 bytes) | | 2048 points (256 bytes) | |
| | Outputs (Y) | 256 points (32 bytes) | | 512 points (64 bytes) | | 1024 points (128 bytes) | | 2048 points (256 bytes) | |
| Max. number of link points in a system | Link relays (B) | 1024 points (128 bytes) | | | | | | | |
| | Link registers (W) | 1024 points (2048 bytes) | | | | | | | |
| Max. number of link points per station | | $\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024bytes$ | | | | | | | |
| Allowable momentary power interruption time for the system *1 | | 20 ms or less | | | | | | | |
| Communication speed | | 1.25 MBPS | | | | | | | |
| Communication method | | Half duplex bit serial | | | | | | | |
| Synchronization method | | Frame synchronization | | | | | | | |
| Transmission channel type | | Duplex loop | | | | | | | |
| Loop overall extension distance *2 | | Max. 10 km (between stations:1km) | Max. 10 km (between stations:2km) | Max. 10 km (between stations:1km) | Max. 10 km (between stations:2km) | Max. 10 km (between stations:1km) | Max. 10 km (between stations:2km) | Max. 10 km (between stations:1km) | Max. 10 km (between stations:2km) |
| Number of connected stations | | Maximum of 65 stations/loop (one master station, 64 local/remote I/O stations) | | | | | | | |
| Modulation method | | CMI method | | | | | | | |
| Transmission format | | In accordance with HDLC (Frame method) | | | | | | | |
| Error control method | | CRC (generating polynomial $X^{16}+X^{12}+X^5+1$) and retry at time over | | | | | | | |
| RAS function | | Loopback on detection of fault or cable breakage, and diagnosis functlons such as host station link line check | | | | | | | |
| Connecter | | 2-conductor optical connector plug (CA9003) | 2-conductor optical connector plug (CA9003S) | 2-conductor optical connector plug (CA9003) | 2-conductor optical connector plug (CA9003S) | 2-conductor optical connector plug (CA9003) | 2-conductor optical connector plug (CA9003S) | 2-conductor optical connector plug (CA9003) | 2-conductor optical connector plug (CA9003S) |
| Cable | | SI-200/250 | GI-50/125 | SI-200/250 | GI-50/125 | SI-200/250 | GI-50/125 | SI-200/250 | GI-50/125 |

REMARK

*1 In case of the A63P power supply module, the allowable momentary power failure period is defined as the time from when the primary side of the stabilized power supply for supplying 24VDC to the A63P is turned OFF until when the voltage (secondary side) has dropped from 24VDC to the specified value (15.6VDC) or less. With other power supply modules (A61P, A61PN, A61PEU, A62P, A62PEU, A64P, A65P), the allowable momentary power failure period is 20ms.

*2 The loop overall extension distance is the permissible distance from the send side of a master station to the receive side of the master station via its slave stations in the loop.
The maximum distance is 10 km (6.21 miles) for both optical and coaxial cables.



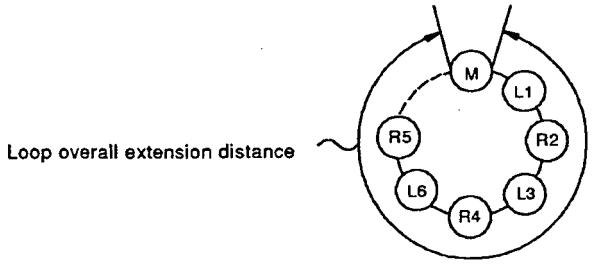
Performance Specifications of Data Link Modules

| | | Coaxial Data Link | | | |
|---|---|---|---|---|---|
| | | A1NCPUR21 | A2NCPUR21 | A2NCPUR21-S1 | A3NCPUR21 |
| Max. I/O points | | 256 points | 512 points | 1024 points | 2048 points |
| Max number of link points used per station | Inputs (X) | 256 points (32 bytes) | 512 points (64 bytes) | 1024 points (128 bytes) | 2048 points (256 bytes) |
| | Outputs (Y) | 256 points (32 bytes) | 512 points (64 bytes) | 1024 points (128 bytes) | 2048 points (256 bytes) |
| Max. number of link points in a system | Link relays (B) | 1024 points (128 bytes) | | | |
| | Link registers (W) | 1024 points (2048 bytes) | | | |
| Max. number of link points per station | | $\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024bytes$ | | | |
| Allowable momentary power interruption time for the system *1 | | 20 ms or less | | | |
| Communication speed | | 1.25 MBPS | | | |
| Communication method | | Half duplex bit serial | | | |
| Synchronization method | | Frame synchronization | | | |
| Transmission channel type | | Duplex loop | | | |
| Loop overall extension distance *2 | | Max. 10 km (between station: 500m) | | | |
| Number of connected stations | | Maximum of 65 stations/loop (one master station, 64 local/remote I/O stations) | | | |
| Modulation method | | CMI method | | | |
| Transmission format | | In accordance with HDLC (Frame method) | | | |
| Error control method | | CRC (generating polynomial $X^{16}+X^{12}+X^5+1$) and retry at time over | | | |
| RAS function | | Loopback on detection of fault or cable breakage, and diagnosis functions such as host station llnk line check | | | |
| Connecter | | BNC-P-5, BNC-P-3-Ni (DDK) or equivalents | | | |
| Cable | | 3C-2V, 5C-2V or equivalents | | | |

REMARK

*1 In case of the A63P power supply module, the allowable momentary power failure period is defined as the time from when the primary side of the stabilized power supply for supplying 24VDC to the A63P is turned OFF until when the voltage (secondary side) has dropped from 24VDC to the specified value (15.6VDC) or less. With other power supply modules (A61P, A61PN, A61PEU, A62P, A62PEU, A64P, A65P), the allowable momentary power failure period is 20ms.

*2 The loop overall extension distance is the permissible distance from the send side of a master station to the receive side of the master station via its slave stations in the loop.
The maximum distance is 10 km (6.21 miles) for both optical and coaxial cables..



## 4.3 Parameter Setting Ranges

Parameter contents of the CPU module and parameter setting ranges are explained below.

### 4.3.1 List of parameter setting range

Parameters are used for allocating the user memory area inside the CPU module, setting various functions and device ranges.
Parameters are usually stored in the first 3k bytes of the user memory area.
In the parameters, the network parameter for MELSECNET/10 is allocated and stored after the main sequence program area.(Refer to Section 4.3.2 for details.)
Parameters can be used with default values set in advance as shown below. These values can be changed within the setting ranges by using the peripheral devices in accordance with the intended use.

List of parameter setting range

<table>
<tr><th colspan="2" rowspan="2">Item</th><th rowspan="2">Default Value</th><th colspan="3">Setting Range</th></tr>
<tr><th>A1NCPU</th><th>A2NCPU(-S1)</th><th>A3NCPU</th></tr>
<tr><td colspan="2" rowspan="2">Main sequence program capacity</td><td rowspan="2">6k steps</td><td>1 to 6k steps</td><td>1 to 14k steps</td><td>1 to 30k steps</td></tr>
<tr><td colspan="3">in 1k step unit</td></tr>
<tr><td colspan="2">Subsequence program capacity</td><td>–</td><td>–</td><td>–</td><td>1 to 30k steps<br>(in 1k step unit)</td></tr>
<tr><td colspan="2" rowspan="2">File register capacity</td><td rowspan="2">–</td><td rowspan="2">–</td><td>1 to 4k points</td><td>1 to 8k points</td></tr>
<tr><td colspan="2">in 1k point unit</td></tr>
<tr><td colspan="2">Comment capacity</td><td>–</td><td>–</td><td colspan="2">0 to 4032 points in 64 point unit</td></tr>
<tr><td colspan="2">Expanded comment capacity</td><td>–</td><td colspan="3">0 to 3968 points (unit: 64 points = 1k byte)</td></tr>
<tr><td rowspan="3">Status latch</td><td>Memory capacity</td><td rowspan="3">–</td><td>–</td><td>0/8 to 16k bytes</td><td>0/8 to 24k bytes</td></tr>
<tr><td>Data memory</td><td>–</td><td colspan="2">No/Yes</td></tr>
<tr><td>File register</td><td>–</td><td>No/Yes (2 to 8k bytes)</td><td>No/Yes (2 to 16k bytes)</td></tr>
<tr><td rowspan="4">Sampling trace</td><td>Memory capacity</td><td rowspan="4">–</td><td rowspan="4">–</td><td colspan="2">0/8k byte(s)</td></tr>
<tr><td>Device setting</td><td colspan="2">Device No.</td></tr>
<tr><td>Execution condition</td><td colspan="2">For each scan<br>For each period</td></tr>
<tr><td>Number of sampling times</td><td colspan="2">0 to 1024 times<br>(in units of 128 times)</td></tr>
<tr><td rowspan="5">Latch range setting</td><td>Link relay (B)</td><td rowspan="5">• Latch: L1000 to L2047 only<br>• None for others</td><td colspan="3">B0 to B3FFF (in 1-point unit)</td></tr>
<tr><td>Timer (T)</td><td colspan="3">T0 to T255 (in 1-point unit)</td></tr>
<tr><td>Counter (C)</td><td colspan="3">C0 to C255 (in 1-point unit)</td></tr>
<tr><td>Data register (D)</td><td colspan="3">D0 to D1023 (in 1-point unit)</td></tr>
<tr><td>Link register (W)</td><td colspan="3">W0 to W3FFF (in 1-point unit)</td></tr>
<tr><td colspan="2">Settings for internal relay (M), latch relay (L), step relay (S)</td><td>M0 to M999<br>L1000 to L2047<br>None for S</td><td colspan="3">M/L/S0 to M/L/S2047<br>(M, L, S are serial numbered.)</td></tr>
<tr><td colspan="2">Watchdog setting</td><td>200ms</td><td colspan="3">10ms to 2000ms (in 10ms unit)</td></tr>
</table>

List of parameter setting range (Continued)

<table>
<tr><th colspan="2" rowspan="2">Item</th><th rowspan="2">Default Value</th><th colspan="3">Setting Range</th></tr>
<tr><th>A1NCPU</th><th>A2NCPU(-S1)</th><th>A3NCPU</th></tr>
<tr><td>Timer settings</td><td>T0 to T255</td><td>T0 to T199 (100ms)<br>T200 to T255(10ms)</td><td colspan="3">• 256 points for 100ms, 10ms, and retentive timers (in 8-point units)<br>• All timers are serial numbered.</td></tr>
<tr><td colspan="2">Counter setting</td><td>No interrupt counter</td><td colspan="3">• 256 points by counters and interrupt counters (in 8-point units)<br>• Counters are serial numbered</td></tr>
<tr><td rowspan="4">I/O number assignment</td><td>Input (X) module</td><td rowspan="4">–</td><td colspan="3" rowspan="4">• 0 to 64 points (in 16-point units) . . . . . Input module/output module<br>special function module/empty slot<br>• Module name registration is possible.</td></tr>
<tr><td>Output (X) module</td></tr>
<tr><td>Special function module</td></tr>
<tr><td>Empty slot</td></tr>
<tr><td colspan="2" rowspan="2">Remote RUN/PAUSE contact setting</td><td rowspan="2">–</td><td>X0 to XFF</td><td>X0 to X1FF<br>(X0 to X3FF)*</td><td>X0 to X7FF</td></tr>
<tr><td colspan="3">• RUN/PAUSE...1 point<br>• Setting of PAUSE contact only is not allowed.</td></tr>
<tr><td rowspan="4">Operation mode when there is an error</td><td>Fuse blown</td><td>Continue</td><td colspan="3" rowspan="4">Stop/Continue</td></tr>
<tr><td>Module comparison error</td><td>Stop</td></tr>
<tr><td>Computation error</td><td>Continue</td></tr>
<tr><td>Special function access error</td><td>Stop</td></tr>
<tr><td colspan="2">Annunciator display mode</td><td>F number display</td><td>–</td><td>–</td><td>Display F number/Display F number and comments alternately<br>(Only alphanumerics can be displayed for comments)</td></tr>
<tr><td colspan="2">Output mode switching at STOP → RUN</td><td>Set the output status at STOP to RUN</td><td colspan="3">Output before STOP/after operation</td></tr>
<tr><td colspan="2">Print title entry</td><td>–</td><td colspan="3">• 128 characters</td></tr>
<tr><td colspan="2">Keyword registration</td><td>–</td><td colspan="3">• Up to 6 characters in hexadecimal (0 to 9, A to F)</td></tr>
<tr><td rowspan="4">Link range settings for MELSECNET</td><td>Number of link stations</td><td rowspan="4">–</td><td colspan="3">• 1 to 64 stations</td></tr>
<tr><td>I/O (X/Y)</td><td>X/Y0 to X/YFF<br>(in 16-point units)</td><td>A2NCPU : X/Y0 to X/Y1FF<br>A2NCPU-S1 : X/Y0 to X/Y3FF<br>(in 16-point units)</td><td>X/Y0 to X/Y7FF<br>(in 16-point units)</td></tr>
<tr><td>Link relay (B)</td><td colspan="3">• B0 to B3FF (in 16-point units)</td></tr>
<tr><td>Link register (W)</td><td colspan="3">• W0 to W3FF (in 1-point units)</td></tr>
</table>

* A2NCPU-S1 used.

### 4.3.2 Memory capacity setting (for main program, file register, comment, etc.)

(1) Calculation of memory capacity
Determine the data types to be stored and the memory capacity with parameters before using the user memory.
Calculate the memory capacity according to Table 4.1.

**Table4.1 Memory capacity**

| Item | | Setting Unit | Memory Capacity (bytes) | Write to ROM | Remark |
|---|---|---|---|---|---|
| Parameter, T/C set value | | – | 4 k bytes (fixed) | Usable | The parameter and T/C set value occupy 4k bytes. |
| Main program | Sequence program | 1k step | (Main sequence program capacity) × 2k bytes | | – |
| | Microcomputer program | 2k bytes | (Main microcomputer program capacity) × 2k bytes | | – |
| Subprogram*1 | Sub sequence program | 1k step | (Sub sequence program capacity) × 2k bytes | Not usable | – |
| | Sub microcomputer program | 2k bytes | (Sub microcomputer program capacity) × k bytes | | |
| Sampling trace *2 | | No/Yes | 0/8k byte(s) | Not usable | – |
| Status latch *2 | Data memory | No/Yes | 0/8k byte(s) | | Memory capacity for status latch in the file register is determined depending on the number of file register points set in the parameter. |
| | File register | No/Yes | (Memory capacity for file registers) k bytes | | |
| File register | | 1k point | (Number of file register points)× 2k bytes | Not usable | – |
| Comment | | 64 points | $\left(\frac{\text{(Comment points)}}{64} + 1\right)$ k bytes | | When the comment capacity is set, the system occupies 1k byte. |

*1.....A3NCPU only
*2.....A2N, A3NCPU only

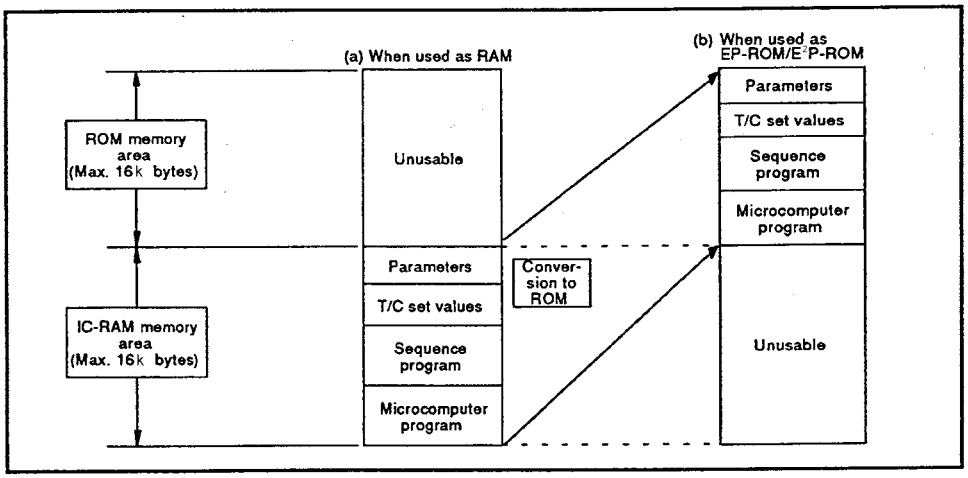
(2) User memory storage order

The various data specified by parameters are stored in memory in the following order.

(a) A1NCPU

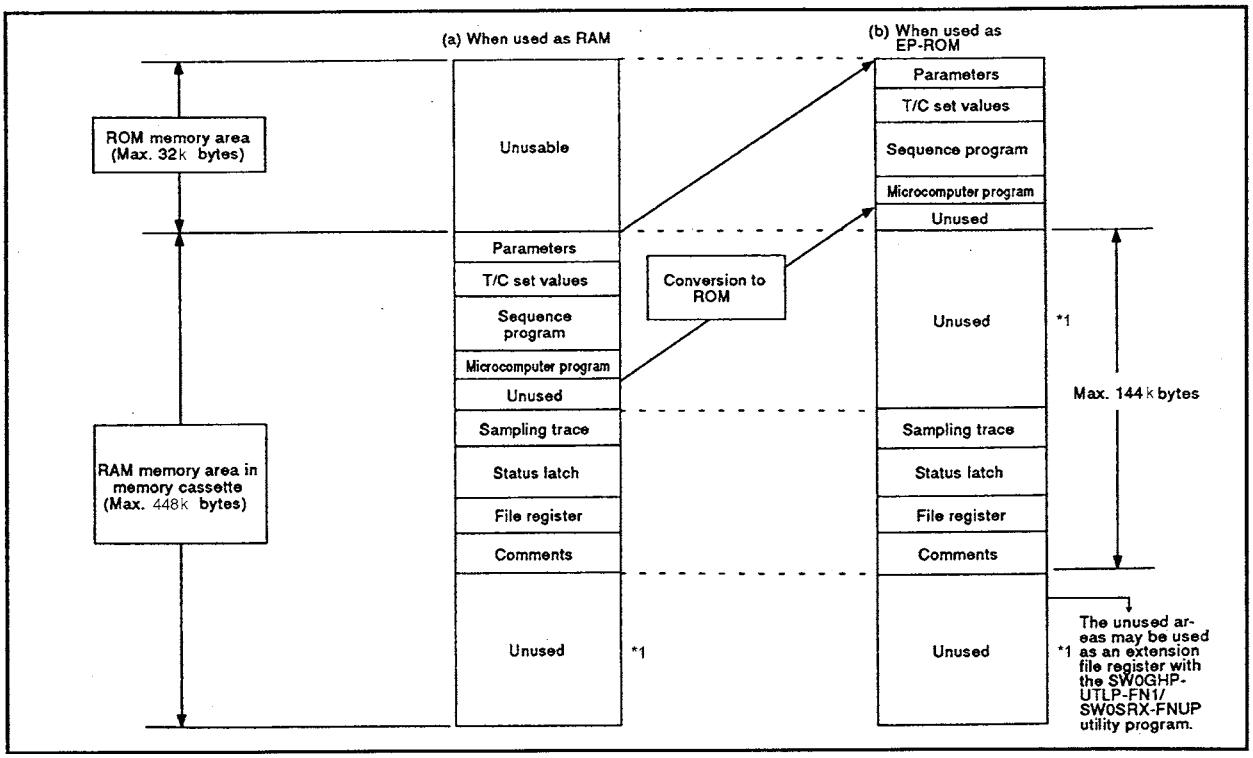
The user memory configuration of the A1NCPU is the same regardless of the type of memory installed (IC-RAM, EP-ROM or $E^2$PROM).

128 points of comments created in F0 to F127 with the GPP function are stored in the internal memory of the A1NCPU.



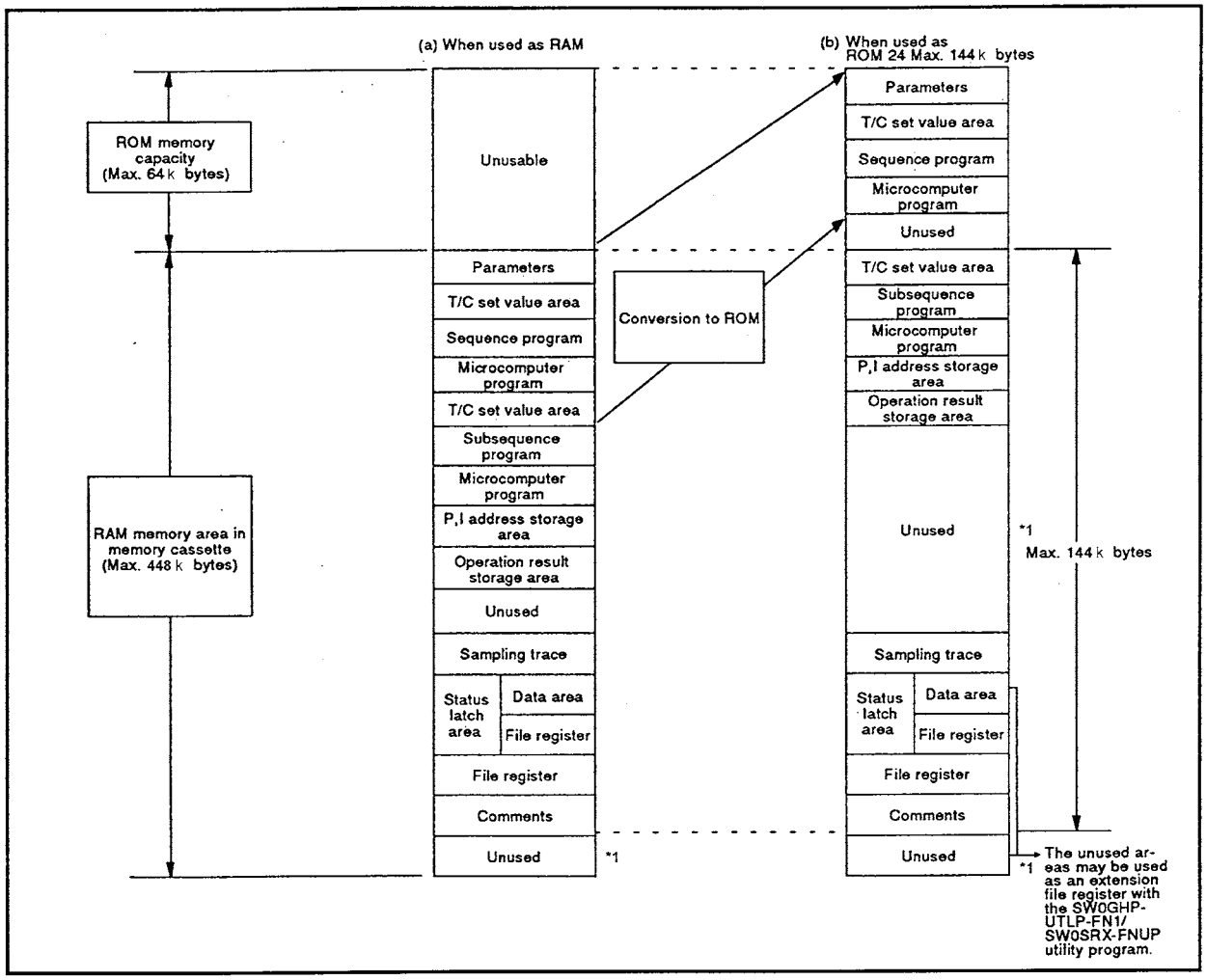

(b) A2NCPU(S1) The user memory configuration of the A2NCPU(S1) varies depending on the memory cassette model.

The SW0GHP-UTLP-FN1/SW0SRX-FNUP utility program allows the area over144 k bytes to be used as an extension file register.




*1: To use an unused area as an extended file registerarea, refer to (3).

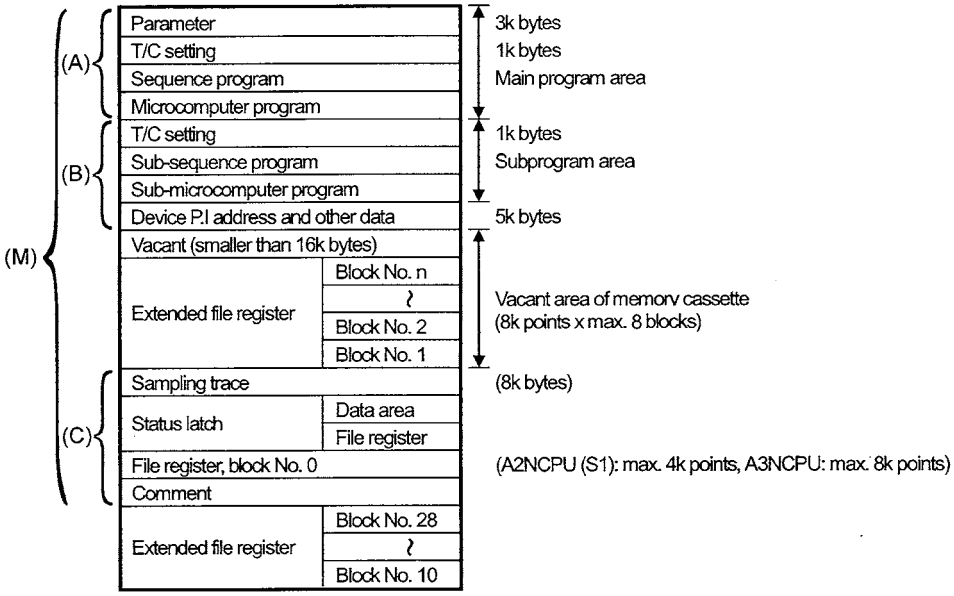
(c) A3NCPU The user memory configuration of the A3NCPU varies depending on the memory cassette model.
The SW0GHP-UTLP-FN1/SW0SRX-FNUP utility program allows the unused area to be used as an extension file register.




*1: To use an unused area as an extended file registerarea, refer to (3).

(3) Allocating a block number to extended file register

(a) Divide a vacant area of the memory cassette into 8k-point blocks and set them as extended file registers. Block numbers 1 to 8 and 10 to 28 are prepared for extended file registers. The block number that can be used is automatically determined according to the target CPU module and memory cassette for block numbers 10 to 28, while the block number that can be used is determined according to the target CPU module, memory cassette, parameter data, and ROM/RAM operation for numbers 1 to 8. The calculation method is described in paragraph (b).




(b) Calculation of available block number of extended file register (block number 1 to 8)

Subtract the parameter data capacity from the capacity of the memory cassette ((M): see Table4.2) to calculate the vacant area of the memory cassette. Divide the vacant area into 8k-point (16k-byte) blocks, and allocate, starting at No. 1.

For RAM operation $\dfrac{(M) - (A) - (B) - (C)\ \text{k bytes}}{16} = n1$

For ROM operation $\dfrac{(M) - (B) - (C)\ \text{k bytes}}{16} = n2$

The integer of n1 or n2 is the number of available blocks.

(Example) Memory cassette A3NMCA16 and following parameter setting method (RAM operation)

Sequence program: 2k bytes

Microcomputer program: 2k bytes

File register: 2k bytes

In addition, 4k bytes are used for parameters and T/C settings.

$$\frac{96 - (4+2+2) - 2}{16} = 5.3$$

Blocks 1 to 5 can be used for extended file registers.

**Table4.2 Available extended file register block No.**

| Model of memory cassette | Memory cassette capacity | (M) | Available block No. (RAM/ROM operation) A2NCPU/A3NCPU |
|---|---|---|---|
| A3NMCA-0 | 16k bytes | 16k bytes | Unavailable |
| A3NMCA-2 | 16k bytes | 16k bytes | Unavailable |
| A3NMCA-4 | 32k bytes | 32k bytes | max. No.1 |
| A3NMCA-8 | 64k bytes | 64k bytes | to max. No.3 |
| A3NMCA-16 | 128k bytes | 96k bytes | to max. No.5, No.10, No.11 |
| A3NMCA-24 | 192k bytes | 144k bytes | to max. No.8, No.10 to No.20 |
| A3NMCA-40 | 320k bytes | 144k bytes | to max. No.8, No.10 to No.20 |
| A3NMCA-56 | 448k bytes | 144k bytes | to max. No.8, No.10 to No.20 |

REMARK

1. "Max. No. n" indicates that you can use up to block number "n" with parameter settings
2. Block No."9" may not be used.

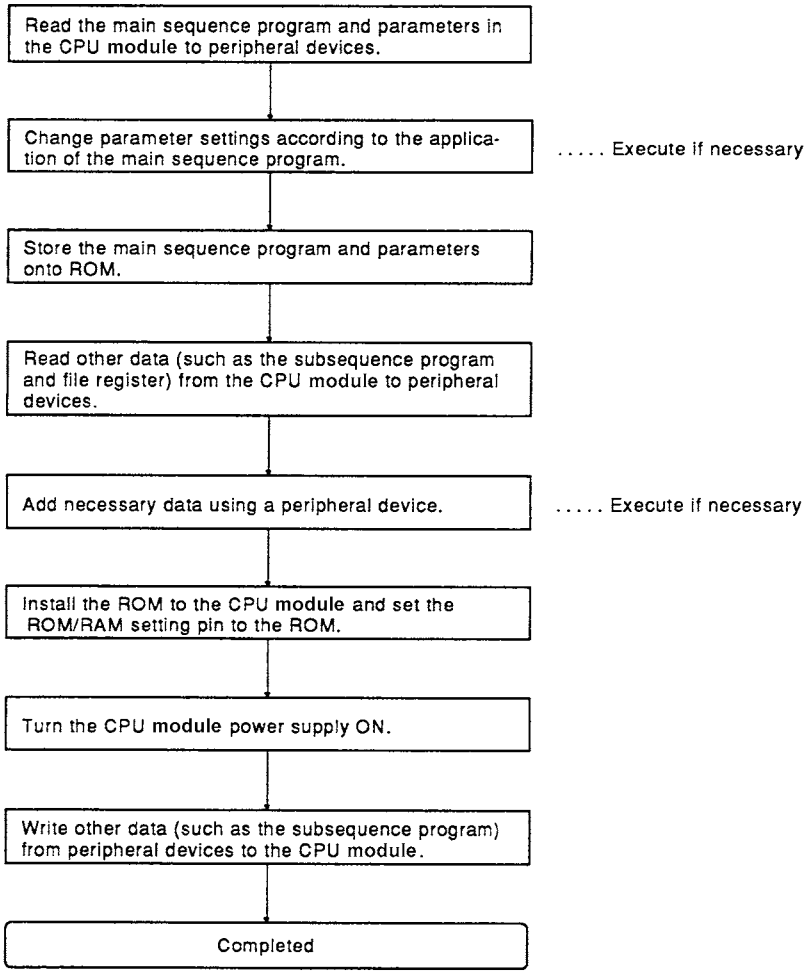
POINT

The CPU module treats A3MCA-12 as A3NMCA-16, and A3MCA-18 and A3NMCA-24/40 as A3NMCA-56. For this reason, no error may be developed even if an unavailable block number is accessed.

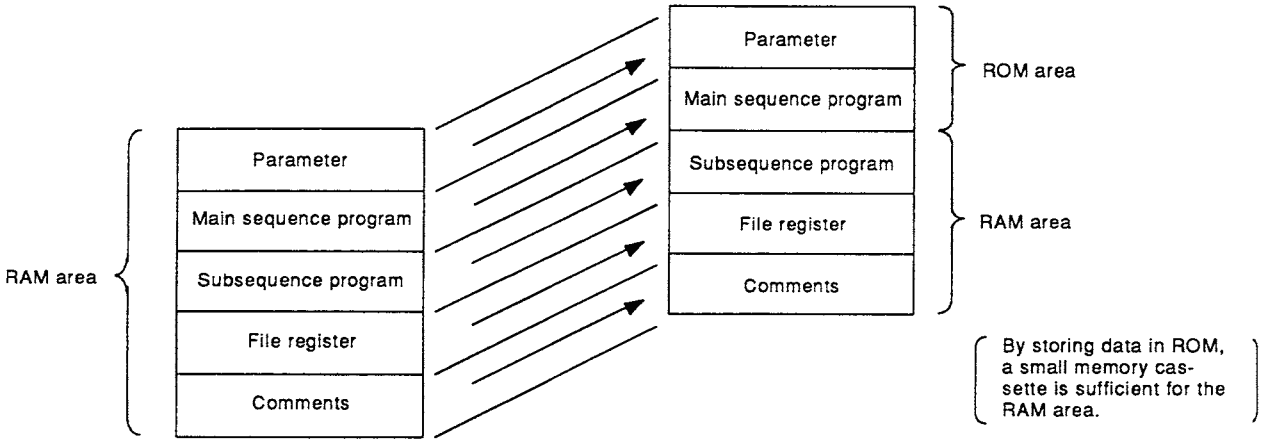
Example:Though no error is caused even if block number 10 or 11 is designated in a system with A3MCA-12, the memory does not exist and reading or writing the block is invalid.

(4) Precautions for ROM operation

When running a CPU module with the main sequence program written to ROM, using subsequence programs does not allow any operation without the procedure below. Use the following procedure to write programs to the memory cassette again. Also, for other data (such as file registers and comments), rewriting to the memory cassette with the following procedure allows more efficient use of memory capacity.




(Example of data movement according to data storage onto ROM)



## 4.4 Function List

Various functions of the CPU module are explained below.

| Function (Application) | Description | Overview of Setting and Operation |
|---|---|---|
| Constant scan<br>[•Program execution at constant intervals<br>•Simplified positioning] | • Makes the processing time for a single scan in the sequence program constant.<br>• Set the processing time within the range of 10ms to 190ms in 10ms units. | • Write to the special register D9020 by the sequence program. |
| Latch (power failure compensation)<br>[Continuous control by data retention on power failure] | • When 20ms or longer power off, CPU reset or power off occur, data contents of the devices for which latches have been set up in advance are retained.<br>• Latch-enabled devices: L, B, T, C, D, W<br>• Latched data are stored in the CPU main module and backed up by batteries of the CPU main module. | • Latch devices and latch ranges are specified by setting of the peripheral device parameters. |
| Remote RUN/STOP<br>[When performing RUN/ STOP control from outside the PLC] | • When a PLC CPU is in RUN (the RUN/STOP key switch is set to RUN), performs the PLC's STOP/RUN from outside the PLC (external input, peripheral devices, computer) with a remote control. | • When performed with the external input (X), the parameter is set with a peripheral device.<br>• When performed by a peripheral device, perform in the PLC test operation.<br>• When performed via the computer link module, perform using the dedicated commands. |
| PAUSE<br>[•When stopping operation of CPU module while retaining the output (Y)<br>•When performing RUN/ PAUSE control from outside the PLC] | • Stops the operation processing of PLC CPU while retaining the ON/OFF of all the outputs (Y).<br>( When the operation is stopped by STOP, all the outputs (Y) are set to OFF. )<br>• When a PLC CPU is in RUN (the RUN/STOP key switch is set to RUN), performs the PLC's STOP/RUN from outside the PLC CPU (external input, peripheral devices, computer) with a remote control. | • Performed by the peripheral devices in the PLC test operation.<br>• When performed with the external input (X), perform the parameter setting with the peripheral device, set the special relay M9040 to ON with the sequence program, then perform. |
| Status latch<br>[Check an operation and failure factor on each device when CPU debugs or a failure condition is met.]<br>(A2NCPU(S1), A3NCPU only) | • The devices, for which status latch is set, are stored to the extension file register of the status latch area in the CPU main module when the status latch conditions are met. (The stored data are cleared by the latch clear operation.)<br>• The criteria for the satisfied condition can be selected from when the SLT instruction is executed by the sequence program or when the device value matches the set condition. | • Using the peripheral devices, set the device to which the status latch is performed and the extension file register where the data are stored.<br>• Using the peripheral devices, monitor the status latch data. |

(To the next page)

(Continued)

| Function (Application) | Description | Overview of Setting and Operation |
|---|---|---|
| Sampling trace<br>[Check the operation status of the set devices in chronological order when CPU debugs or an abnormal behavior are caused.] | • With respect to a device for which the sampling trace is set up, the operating condition of the device is sampled for the number of times specified per scan or per period, and the results are stored in the extension file register for the sampling trace of the CPU main module. (The stored data are cleared by the latch clear operation.)<br>• Sampling trace is performed by the STRA instruction in the sequence program. | • Using the peripheral devices, set the device to which the status latch is performed and the extension file register where the data are stored.<br>• Using the peripheral devices, monitor the result of the sampling trace. |
| Offline switch | • Allows the device (Y, M, L, S, F, B) used with the OUT instruction to be disconnected from the operation processing of the sequence program. | • Using the test function of the peripheral devices, turns the OUT instruction ON or OFF. |
| Step operation<br>[Checks condition of program execution and behavior during debugging for example.] | • Executes operations of the sequence program with one of the conditions (1) to (5) given below, then stops.<br>(1) Executes for each instruction.<br>(2) Executes for each ladder block.<br>(3) Executes by step intervals and loop counts.<br>(4) Executes by loop counts and break points.<br>(5) Executes when the device values matches. | • Selects a step operation condition for the peripheral device and executes. |
| Clock<br>[Program control by clock data/external display of clock data] | • Executes the clock operation installed to the CPU module.<br>• Clock data: year, month, day , hour, minute, second, day of the week<br>• When the clock data read request (M9028) is ON, the clock data are read and stored in D9025 to D9028 by the clock element after the END processing of the sequence operation.<br>• The clock elements are bucked up by a battery of theCPU main module. | • Sets data for D9025 to D9028 by a peripheral device, turns M9025 ON, then write to the clock element.<br>• Writes to the clock element by the sequence program. |
| Online I/O module change<br>[Partial abnormal module replacement] | • Allows removal and installation of I/O modules without any errors while the CPU module is running.<br>(Installation and removal of special modules is not allowed during online) | • Sets the I/O numbers of the module to be replaced in the register D9094 (head number of the replacement I/O number), and turns ON the I/O replacement flag (M9094) by sequence program or peripheral devices. |

## 4.5 Precautions for Handling

⚠ CAUTION

- Use the PLC under the environment specified in the user's manual.
  Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage.
- Insert the module fixing projection into the fixing hole in the base unit to mount the module.
  Incorrect mounting may cause malfunctions, a failure or a drop of the module.
  In an environment of frequent vibrations, secure the module with the screw.
  Tighten terminal screws within the specified torque range.
  If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
  If too tight, it may cause damage to the screws and/or module, resulting in an accidental drop of the module, short circuit or malfunctions.
- Connect the extension cable to the connector of the base unit or module.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause incorrect inputs and/or outputs.
- Insert the memory cassette and fully press it to the memory cassette connector.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause malfunctions.
- Be sure to shut off all the phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may damage the module.
- Do not directly touch the conductive part or electronic components of the module.
  Doing so may cause malfunctions or a failure of the module.

This section explains some notes on handling the CPU module, I/O module, special function module, power supply module, and base unit.

(1) Do not drop or allow any impact to the module case, memory cassette, terminal block connector, and pin connector since they are made of resin.

(2) Do not remove the printed-circuit board from the module case. Otherwise, a malfunction may occur.

(3) Use caution to prevent foreign matter, such as wire chips, from entering the module during wiring.
If any foreign matter has entered the module, remove it.

(4) Tighten the module installation screws and terminal block screws within the tightening torque range specified shown in the table below.

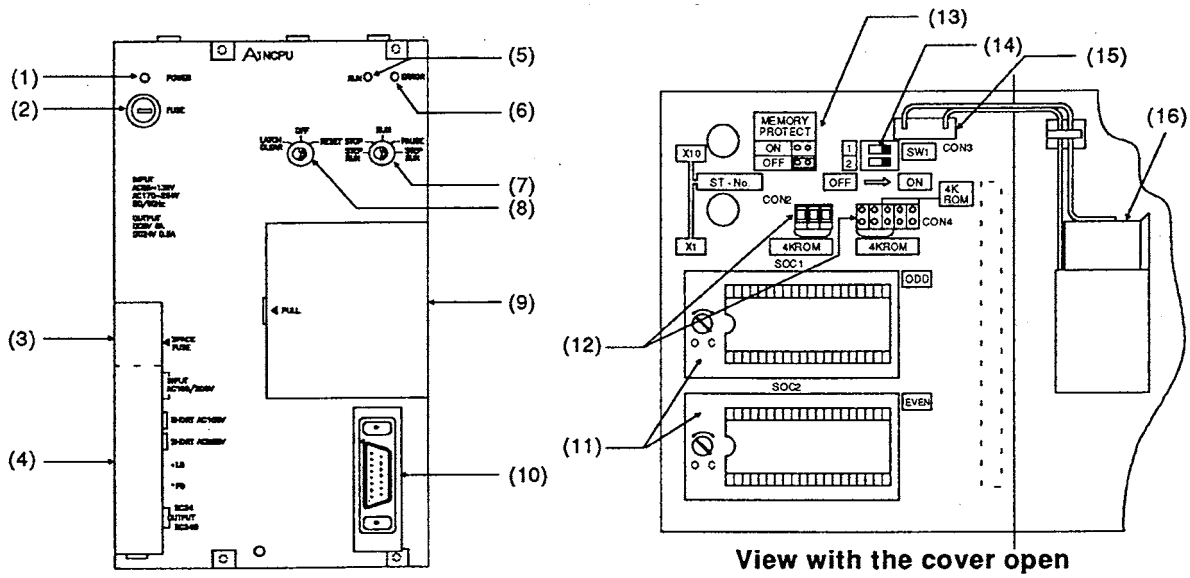
| Screw | Tightening torque range |
|---|---|
| Module mounting screws (M4) (Optional) | 78 to 118N·cm |
| Terminal block screws | 98 to 137N·cm |

(5) When installing the module to the base unit, press the module completely so that its hook is locked into the base. To remove the module, push the hook to unlock, and pull it after confirming it is completely disengaged from the base.

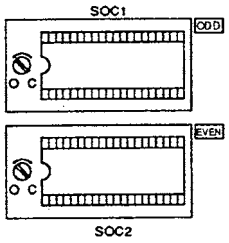
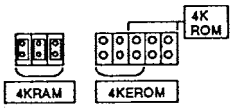
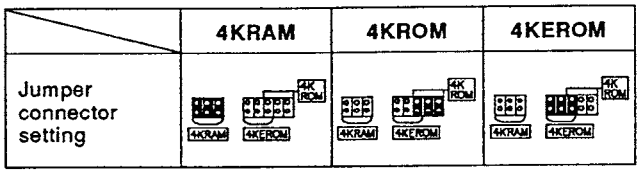
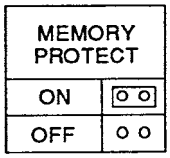
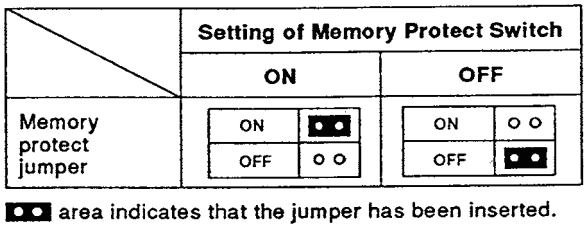
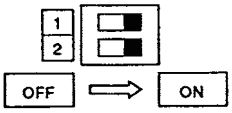
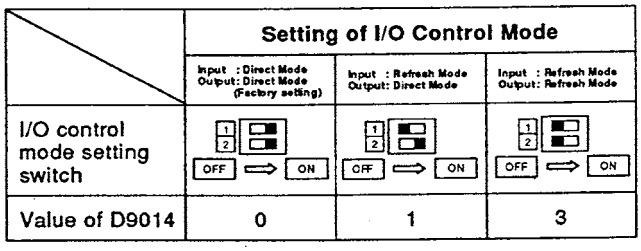
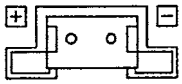
## 4.6 Part Name and Setting

### 4.6.1 Part name and settings of the A1NCPU

The names of A1NCPU module parts and their settings are described here.

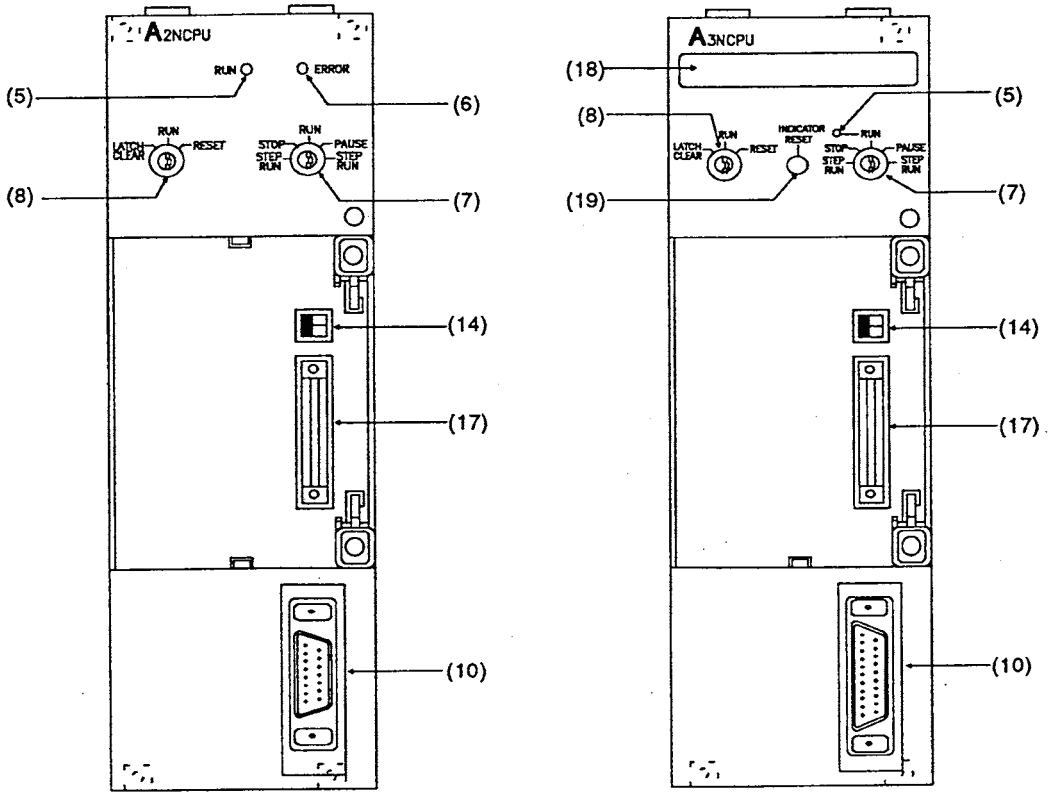



| No. | Name | Description |
|---|---|---|
| (1) | POWER LED | On indicates that the AC power is input and 5/24 VDC outputs are normal. |
| (2) | Fuse holder | Holder for the fuse that protects the AC side. |
| (3) | Spare fuse box | Spare fuses for the power supply are stored on the rear face of the cover. |
| (4) | Power terminal block | Consists of AC input terminals, etc. For further details, see Section 5.2.2 (2). |
| (5) | RUN LED | The "RUN" LED indicates the operating condition of the CPU.<br>ON : When the key switch is turned to RUN or STEP RUN and the sequence program is being executed.<br>OFF : When the key switch is turned to STOP, PAUSE or STEP RUN and the sequence program is not being executed.<br>Flashing : When an error has been detected by the self-diagnosis function (operation will continue if the error detected has been specified in the parameter settings). When the key switch is set to the LATCH CLEAR position, the LED flashes rapidly for about two seconds. |
| (6) | ERROR LED | ON : Indicates that a WDT or internal fault check error has occurred due to a hardware fault.<br>OFF : Indicates that the annunciator (F) has been switched ON by the sequence program. |
| (7) | RUN/STOP key switch | RUN/STOP : Used to start/stop sequence program execution.<br>PAUSE : Sequence program operation stops with the output statuses immediately before the PAUSE condition was established retained.<br>STEP RUN : The sequence program is run step by step or scan by scan. |
| (8) | RESET key switch | RESET : Hardware reset. Used to reset the CPU after an operation error and to initialize operation.<br>LATCH CLEAR : Sets all data in the latch area defined in the parameter settings to "OFF" or "O" (valid only when the RUN/STOP key switch is turned to STOP). |
| (9) | Memory card area | This is the section where the memory card is installed and the memory protect setting is made. (It is provided with a cover.) |
| (10) | RS-422 connector | The connector for peripheral device connection. Fitted with a cover when not in use. |

| No. | Name | Diagram | Description |
|---|---|---|---|
| (11) | Memory sockets |  | I.C. sockets with locking facility for IC-RAM/EP-ROM/E$^2$PROM.<br>(Turn the I.C. locking screw as indicated on the socket with a flat screwdriver.)<br>SOC1 for odd address and SOC2 for even address. |
| (12) | Memory setting jumper |  | Jumpter for selecting IC-RAM (4KRAM), EP-ROM (4KROM), or E$^2$P-ROM (4KEPROM).<br>Short the pins with a jumper to make the selection.<br>  |
| (13) | Memory protect setting |  | Switch ON to protect the contents of the IC-RAM or E$^2$PROM from being accidentally altered by operational error of peripheral devices. Switch OFF to enable writing to the RAM or E$^2$PROM.<br>  |
| (14) | I/O control mode setting switch |  | Select direct or refresh mode with power off.<br>  <br>After the switches have been set, the CPU checks the status of the switches at power on or at reset.<br>Note that if the direct mode is set for input and the refresh mode tor output, the CPU will execute processing in the refresh mode for both input and output.<br>Since a binary code corresponding to the I/O control mode is stored in special resister D9014, the mode can be monitored using a peripheral device. |
| (15) | Battery connector |  | Connect the red battery lead to the positive terminal and the blue lead to the negative. Before shipment, the wires are disconnected to prevent battery consumption. |
| (16) | Battery (A6BAT) | --- | RAM backup and power failure compensation. |

### 4.6.2 Part name and setting of the A2N and A3NCPU

The names of A2N/A3NCPU module parts and their settings are described here.




A2NCPU (S1)

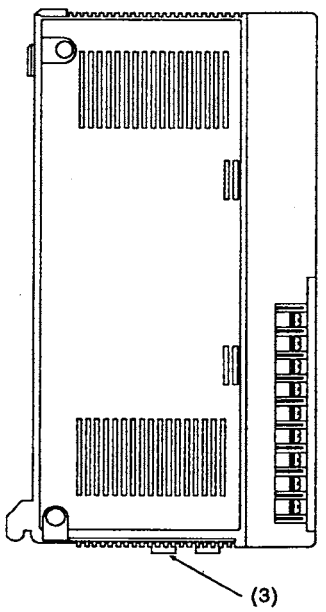
A3NCPU

* (5) to (8), (10), and (14) are same with A1NCPU
See Section 4.9.1.

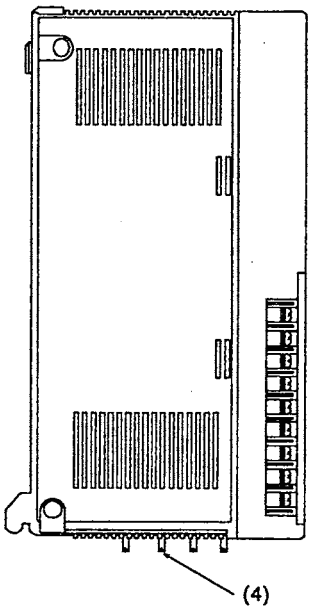
| No. | Name | Description |
|---|---|---|
| (17) | Memory cassette loading connector | Used to connect the memory cassette to the CPU. |
| (18) | LED display | Displays up to 16 aiphanumeric characters.<br>Disptays error comments of self diagnosis, OUT F, SET F. |
| (19) | LED display reset switch | Clears the present LED annunciator message. The next message in the annunciator queue is then displayed where appropriate. |

### 4.6.3 Part name and setting of AnNCPUP21/R21

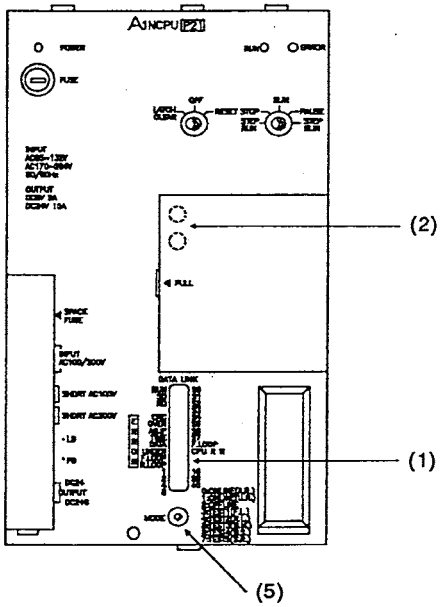
This section gives the names of those parts of the AnNCPUP21/R21 that relate to the data link function.
For the names of other parts, such as the RUN/STOP key switch, refer to Section 4.6.1 and 4.6.2.

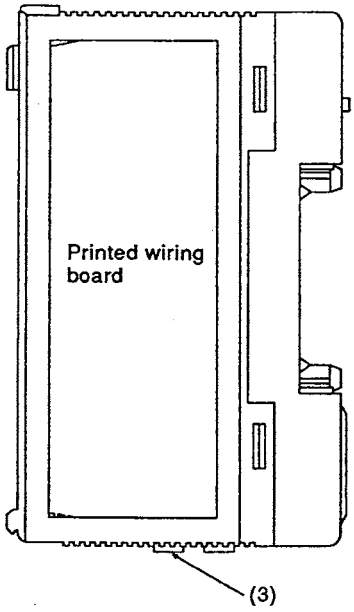



A1NCPUP21

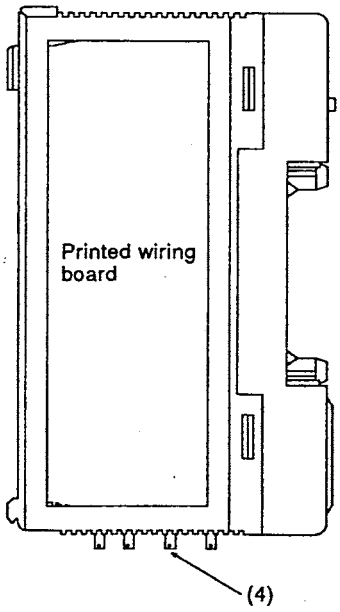



A1NCPUR21

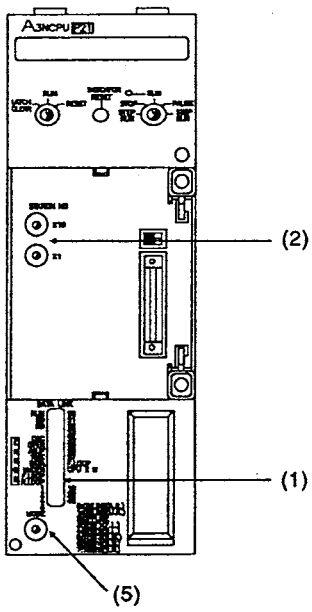


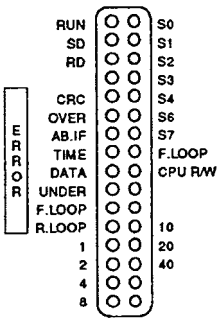



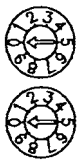
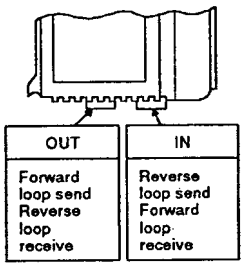
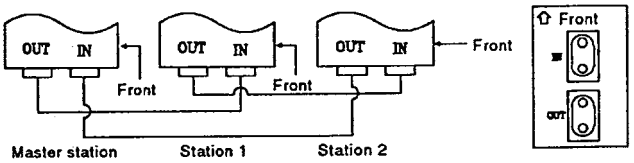
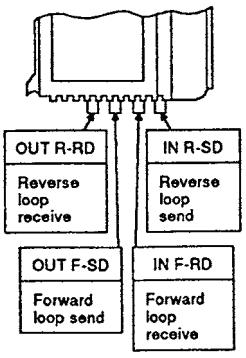
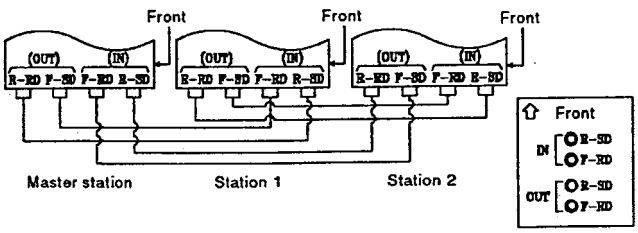

A2NCPUP21
A2ACPUP21-S1
A3NCPUP21

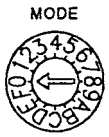
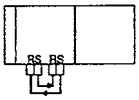



A2NCPUR21
A2NCPUR21-S1
A3NCPUR21



<table>
<tr><th>No.</th><th>Name</th><th>Diagram</th><th>Description</th></tr>
<tr><td>(1)</td><td>Operation indicator LEDs</td><td> 

<table>
<tr><th>LED</th><th>Description</th><th>LED</th><th>Description</th></tr>
<tr><td>RUN</td><td>Lit when data link is normal run.</td><td>S0</td><td rowspan="8">For factory tests only.<br>(Flickers during normal data link.)</td></tr>
<tr><td>SD</td><td>Lit during data sending.</td><td>S1</td></tr>
<tr><td>RD</td><td>Lit during data receiving.</td><td>S2</td></tr>
<tr><td></td><td>Not used. (Always off)</td><td>S3</td></tr>
<tr><td>CRC</td><td>Lit at CRC error time.</td><td>S4</td></tr>
<tr><td>OVER</td><td>Lit at data entry delay error time.</td><td>S5</td></tr>
<tr><td>AB.IF</td><td>Lit when all data is 1.</td><td>S6</td></tr>
<tr><td>TIME</td><td>Lit at time-out error.</td><td>S7</td></tr>
<tr><td>DATA</td><td>Lit to indicate a received data error.</td><td>F.LOOP</td><td>Lit when receiving data via the forward loop.</td></tr>
<tr><td>UNDER</td><td>Lit at sending data error time.</td><td>CPU R/W</td><td>Lit during communication with programmable controller CPU.</td></tr>
<tr><td>F.LOOP</td><td>Lit at forward loop receiving error.</td><td></td><td>Not used. (Always off)</td></tr>
<tr><td>R.LOOP</td><td>Lit at reverse loop receiving error.</td><td></td><td>Not used. (Always off)</td></tr>
<tr><td>1</td><td rowspan="4">Indicates the least significant digit of the station number in BCD.</td><td>10</td><td rowspan="3">Indicates the most significant digit of the station number in BCD.</td></tr>
<tr><td>2</td><td>20</td></tr>
<tr><td>4</td><td>40</td></tr>
<tr><td>8</td><td></td><td>Not used. (Always off)</td></tr>
</table>
For details, see the MELSECNET and MELSECNET/B Data Link Reference Manuals.</td></tr>
<tr><td>(2)</td><td>Station number setting switches</td><td> 
</td><td>• Specifies station numbers from 00 through 64.<br>• The "X10" dial specifies the second digit of the station number.<br>• The "X1" dial specifies the first digit of the station number.<br>• Select "00" to use the AnNCPU as a master station.<br>• Select a number from "01" to "64" to use the AnNCPU as a local station.</td></tr>
<tr><td>(3)</td><td>Optical fiber cable connector</td><td> 
</td><td>Connect cables as shown below.<br> 
<br>IN : Connected to OUT R-RD of the previous station.<br>OUT : Connected to IN of the previous station.</td></tr>
<tr><td>(4)</td><td>Coaxial cable connector</td><td> 
</td><td>Connect cables as shown below.<br> 
<br>IN R-SD : Connected to OUT R-RD of the previous station.<br>IN F-RD : Connected to OUT F-RD of the previous station.<br>OUT F-SD : Connected to In F-RD of the next station.<br>OUT R-SD : Connected to IN R-RD of the previous station.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Diagram</th><th>Description</th></tr>
<tr><td>(5)</td><td>Mode selection switch</td><td> 
</td><td>
The following functions are selectable with the mode selection switch.
<table>
<tr><th>Settlng Number</th><th>Name</th><th colspan="2">Description</th></tr>
<tr><td>0</td><td>Online</td><td colspan="2">Automatic return set during normal operation</td></tr>
<tr><td>1</td><td>Online</td><td colspan="2">Automatic return not set during normal operation</td></tr>
<tr><td>2</td><td>Offline</td><td colspan="2">Disconnected from data link<br>• Set the mode select switch to position 2 for independent operation.<br>• If independent operation is attempted without setting the switch to position 2, the message "LINK PARAMETER ERROR" is displayed.<br>However, the sequence program is executed normally.</td></tr>
<tr><td>3</td><td>Test mode 1</td><td colspan="2">Forward loop test<br>• Mode used to perform a line check on the optical fiber cables or coaxial cables in the data link system forward loop.</td></tr>
<tr><td>4</td><td>Test mode 2</td><td colspan="2">Reverse loop test<br>• Mode used to perform a line check on the optical fiber cables or coaxial cables in the data link system reverse loop when an error occurs.</td></tr>
<tr><td>5</td><td>Test mode 3</td><td>Station-to-station test mode (master station)</td><td rowspan="2">Mode used to check the lines between two stations. Set the station with the lower station number as the master station and the one with the higher station number as the slave station.</td></tr>
<tr><td>6</td><td>Test mode 4</td><td>Station-to-station test mode (slave station)</td></tr>
<tr><td>7</td><td>Test mode 5</td><td colspan="2">Self-loopback test<br>• Used to check the transmission and receiving circuits of the relevant link module. Data is sent from the sending side of the forward loop to the receiving side of the forward loop and must be received within a pre-defined period of time.<br>• The same check is performed for the reverse loop.<br>  <br>(1) Test status<br>• Connect a cabie from the forward loop send port to the forward loop receive port and from the reverse loop send port to the reverse loop receive port.<br>• Set the "RUN" key switch to STOP. (In case of a remote I/O station, set the master station to STOP.)<br>• Set the mode select switch to "7" and reset.<br>(2) Test result<br>Determine the test result from the LEDs on the front of the link module.<br>• If the status is normat, the six LEDs, "CRC", "OVER", "AB.IF", "TIME", "DATA", and "UNDER" are flicker in order, starting at the top.<br>• If an error is detected, one or more of the LEDs remain lit and the test is stopped.<br>(Example)<br>When the forward loop is disconnected, the "FLOOP", "RLOOP", and "DATA" LEDs are lit.</td></tr>
<tr><td>8</td><td>---</td><td colspan="2">Not used</td></tr>
<tr><td>9</td><td>---</td><td colspan="2">Not used</td></tr>
<tr><td>A</td><td>---</td><td colspan="2">Unusable</td></tr>
<tr><td>B</td><td>---</td><td colspan="2">Unusable</td></tr>
<tr><td>C to F</td><td>---</td><td colspan="2">Not used</td></tr>
</table>
</td></tr>
</table>

# 5 POWER SUPPLY MODULE

This section describes the specifications and selection of power supply modules.

## 5.1 Specifications

### (1) Standard power supply module

Power supply module specifications

| Item | | Specifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | A1N | A61P | A61PN | A62P | A63P | A65P | A66P | A67P |
| Slot position | | Slot for mounting CPU module | Power supply module slot | | | | | I/O module | Power supply module slot |
| Input power supply | | 100VAC to 120VAC $^{+10\%}_{-15\%}$ (85VAC to 132VAC) | | | | 24VDC $^{+30\%}_{-35\%}$ (15.6 to 31.2VAC) | 100VAC to 120VAC $^{+10\%}_{-15\%}$ (85VAC to 132VAC) | | 110VDC (85VDC to 140VDC) |
| | | 200VAC to 240VAC $^{+10\%}_{-15\%}$ (170VAC to 264VAC) | | | | | 200VAC to 240VAC $^{+10\%}_{-15\%}$ (170VAC to 264VAC) | | |
| Input frequency | | 50/60Hz ± 5 | | | | – | 50/60Hz ± 5 | | – |
| Input voltage distortion | | Within 5% (See Section 8.8) | | | | – | Within 5% (See Section 8.8) | | – |
| Max. input apparent power | | 110VA | 160VA | | 155VA | 65W | 110VA | 95VA | 65W |
| Inrush current | | 20A, 8ms or less *4 | | | | 100A, 1ms or less | 20A, 8ms or less *4 | | 20A, 8ms or less |
| Rated output current | 5VDC | 5A | 8A | | 5A | 8A | 2A | – | 8A |
| | 24VDC | 0.8A | – | | 0.8A | – | 1.5A | 1.2A | – |
| Overcurrent protection *1 | 5VDC | 5.5A or higher | 8.8A or higher | | 5.5A or higher | 8.5A or higher | 2.2A or higher | – | 8.5A or higher |
| | 24VDC | 1.2A or higher | – | | 1.2A or higher | – | 2.3A or higher | 1.7A or higher | - |
| Overvoltage protection*2 | 5VDC | 5.5 to 6.5V | | | 5.5 to 6.5V | 5.5 to 6.5V | 5.5 to 6.5V | – | 5.5 to 6.5V |
| | 24VDC | – | | | | | | | |
| Efficiency | | 65% or higher | | | | | | | |
| Dielectric withstand voltage | | Between AC external terminals and ground, 1500V AC, 1 minute<br>Between DC external terminals and ground, 500V AC, 1 minute | | | | | | | |
| Noise durability | | Checked by noise simulator of noise voltage 1500Vp-p, noise width 1 $\mu$s, and noise frequency 25 to 60Hz | | | | Checked by noise simulator of noise voltage 500Vp-p, noise width 1 $\mu$s, and noise frequency 25 to 60Hz | Checked by noise simulator of noise voltage 1500Vp-p, noise width 1 $\mu$s, and noise frequency 25 to 60Hz | | |
| Insulation resistance | | Between AC external terminals and ground, 5MΩ or higher by 500V DC insulation resistance tester | | | | | | | |
| Power indicator | | LED indication of power supply | | | | | | | |
| Terminal screw size | | M4 × 0.7 × 6 | | | | | | M3 × 0.5 × 6 | M4 × 0.7 × 6 |

| Item | Specifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A1N | A61P | A61PN | A62P | A63P | A65P | A66P | A67P |
| Applicable wire size | 0.75 to 2mm$^2$ | | | | | | | |
| Applicable solderless terminal | R1.25-4, R2-4<br>RAV1.25, RAV2-4 | | | | | | R1.25-3, R2-3<br>RAV1.25-3,<br>RAV2-3 | R1.25-4, R2-4<br>RAV1.25-4,<br>RAV2-4 |
| Applicable tightening torque | 78 to 118N・cm | | | | | | 39 to 59N・cm | 78 to 118N・cm |
| External dimension | 250(H)mm (9.8inch) × 135(W)mm (5.3inch) × 121(D)mm (4.7inch) | 250(H)mm (9.8inch) × 55(W)mm (2.1inch) × 121(D)mm (4.7inch) | | | | | 250(H)mm (9.8inch) × 37.5(W)mm (2.1inch) × 121(D)mm (4.7inch) | 250(H)mm (9.8inch) × 55(W)mm (2.1inch) × 121(D)mm (4.7inch) |
| Weight | 1.65 kg | 0.98 kg | 0.75 kg | 0.94 kg | 0.8 kg | 0.94 kg | 0.75 kg | 0.8 kg |
| Allowable momentary power failure period *3 | 20ms or less | | | | 1ms or less | 20ms or less | – | 20ms or less (at 100V DC) |

REMARK

1) The number of occupied slots for the A66P is 1.

(2) CE-compliant power supply module

Power supply module specifications

| Item | | Performance specification | |
|---|---|---|---|
| | | A61PEU | A62PEU |
| Slot position | | Power supply module slot | |
| Input power supply | | 100 to 120/200 to 240VAC +10%/-15% | |
| Input frequency | | 50/60Hz±5 | |
| Input voltage distortion | | Within 5% (See Section 8.8) | |
| Max. input apparent power | | 130VA | 155VA |
| Inrush current | | 20A, 8ms or less *4 | |
| Rated output current | 5VDC | 8A | 5A |
| | 24VDC | – | 0.8A |
| Overcurrent protection *1 | 5VDC | 8.8A or higher | 5.5A or higher |
| | 24VDC | – | 1.2A or higher |
| Overvoltage protection*2 | 5VDC | 5.5 to 6.5V | – |
| | 24VDC | – | |
| Efficiency | | 65% or higher | |
| Dielectric withstand voltage | Between primary side and FG | 2830V AC rms/3 cycles (altitude 2000m (6562ft.)) | |
| Noise durability | | Checked by noise simulator of noise voltage IEC801-4, 2kV, 1500Vp-p, noise width 1 $\mu$s, and noise frequency 25 to 60Hz | |
| Power indicator | | LED indication of power supply | |
| Terminal screw size | | M4 × 0.7 × 6 | |
| Applicable wire size | | 0.75 to 2mm$^2$ | |
| Applicable solderless terminal | | RAV1.25-4, RAV2-4 | |
| Applicable tightening torque | | 98 to 137N・cm | |
| External dimension | | 250(H)mm (9.8inch) × 55(W)mm (2.1inch) × 121(D)mm (4.7inch) | |
| Weight | | 0.8 kg | 0.9 kg |
| Allowable momentary power failure period *3 | | 20ms or less | |

POINT

*1 Overcurrent protection

(a) The overcurrent proctector shuts off the 5VDC and/or 24VDC circuit(s) and stops the system if the current exceeding the specified value flows in the circuit(s).
As this results in voltage drop, the power supply module LED turns OFF or is dimly lit.

(b) When this device is activated, eliminate probable causes such as insufficient current capacity or short circuit, and then start the system. When the current has reached the normal value, the system will start from the first.

*2 Overvoltage protection

The overvoltage protector shuts off the 5VDC circuit and stops the system if overvoltage of 5.5 to 6.5V is applied to the circuit.
The power supply module LED turns OFF. When restarting the system, switch the input power OFF, then back ON. The system is started up with an initial start.If the system is not booted and the LED remains off, this means that the power supply module has to be replaced.

*3 Allowable period of momentary power failure

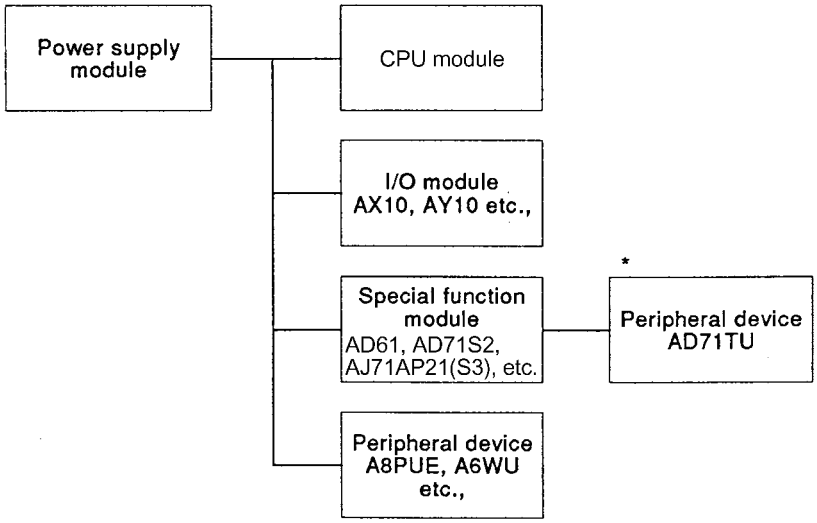
The allowable momentary power failure period of PLC CPUs varies depending on the power supply module used.
In the system using the A63P, it is the time from when the primary side of the stabilized power supply supplying 24VDC to the A63P turns OFF until the voltage (secondary side) has dropped from 24VDC to the specified value (15.6VDC) or less.

*4 Inrush current

If power is reapplied immediately after power OFF (within 5 seconds), an inrush current exceeding the specified value may flow (for 2ms or less). Therefore, before reapplying power, make sure that 5 seconds have elapsed after power off.
When selecting a fuse or breaker for an external circuit, consider the above as well as meltdown and detection characteristics.

### 5.1.1 Power supply module selection

A power supply module is selected based on to the total current consumption of I/O modules, special function modules and peripheral devices to which power is supplied by the power supply module. When an extension base unit, A52B, A55B, or A58B is used, take into consideration that power to the module is supplied by the power supply module on the main base.
For 5VDC current consumption of I/O modules, special function modules and peripheral devices, refer to Section 2.3.
For devices purchased by users, refer to the manual for each device.




* When selecting a power supply module, take account of the current consumption of the peripheral devices connected to special function modules.
For example, when connecting the AD71TU to AD71-S2, the current consumption of the AD71TU should also be taken into consideration.

(1) Selecting a power supply module when using extension base unit(s), A52B, A55B, and/or A58B

When an extension base unit, A52B, A55B, or A58B is used, 5VDC power supply is supplied from the power supply module on the main base unit via an extension cable. Thus, when one of these units is used, pay attantion to the following:

(a) When mounting a power supply module on the main base unit, select a model that can cover 5VDC current consumed by modules mounted on the A52B, A55B, and/or A58B.

Example

If 5VDC current consumption on the main base unit is 5A and 5VDC current consumption on the A55B is 2A, the power supply module to be installed to the main base unit is the A61P (5VDC, 8A).

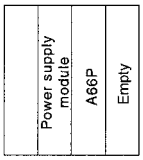
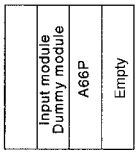
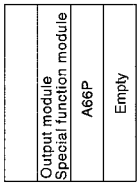
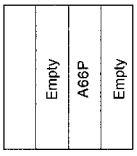
(b) Since power to the A52B, A55B, or A58B is supplied via an extension cable, a voltage drop occurs through the cable.It is necessary to select a power supply module and cables with proper length so that 4.75VDC or more is available on the receiving end.

For details of voltage drop, refer to Section 6.1.3 Application Standards of Extension Base Units.

(2) Handling precautions for the A66P

(a) Use the A66P on the base unit where no module, a dummy module or a blank cover is installed to the rightmost slot or the right adjacent slot.

(b) The A66P output current (24VDC) depends on the left-hand adjacent module as shown below.

| Left Hand Adjacent Module | Power Supply Module | Input Module Dummy Module | Output Module Special Function Module | Empty |
|---|---|---|---|---|
| Configuration |  |  |  |  |
| Max. output current for 24 VDC | 0.5 A | 1.2 A | 1.0 A | 1.5 A |

(3) Precautions for power capacity of power supply

For power supply to the power supply module, select a power supply having enough power capacity. (As a standard, power capacity more than twice of the specification is recommended.)

### 5.1.2 Fuse specifications

This section describes the specifications of fuses used for the power supply modules and output modules.

Fuse specifications

| Item | Model Name | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | GTH4 or FGTA250V 4A | SM6.3A or FGTA250V 6A | MF51NM8 or FGMA250V 8A | GP-32 | HP-32 | HP-70K | MP-20 | MP-32 | MP-50 |
| Application | Power supply module For A61P, A61PN, A61PEU, A62P, A62PEU, A65P, A66P, A67P | Power supply module For A63P | Output module For AY11E AY13E | Output module For AY20EU | Output module For AY23 | Output module For AY22 | Output module For AY50 AY80 | Output module For AY60 | Output module For AY60E |
| Type | Cartridge type | Cartridge type | Cartridge type | Plug type | Plug type | Plug type | Plug type | Plug type | Plug type |
| Rated current | 4A | 6.3A | 8A | 3.2A | 3.2A | 7A | 2A | 3.2A | 5A |
| External dimension | $\phi$6 (0.2) × 32 (0.8) mm (inch) | $\phi$6 (0.2) × 32 (0.8) mm (inch) | $\phi$5.2 (0.2) × 20 (0.8) mm (inch) | 30.3mm (3.3inch) × 8mm (2.1inch) × 20mm (0.1inch) | 30.3mm (3.3inch) × 8mm (2.1inch) × 20mm (0.1inch) | 30.3mm (3.3inch) × 8mm (2.1inch) × 20mm (0.1inch) | 17.2mm (3.3inch) × 5.5mm (2.1inch) × 19mm (0.1inch) | 17.2mm (3.3inch) × 5.5mm (2.1inch) × 19mm (0.1inch) | 17.2mm (3.3inch) × 5.5mm (2.1inch) × 19mm (0.1inch) |

## 5.2 Handling

### 5.2.1 Precautions for Handling

⚠ CAUTION

- Use the PLC under the environment specified in the user's manual.
  Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage.
- Insert the module fixing projection into the fixing hole in the base unit to mount the module.
  Incorrect mounting may cause malfunctions, a failure or a drop of the module.
  In an environment of frequent vibrations, secure the module with the screw.
  Tighten terminal screws within the specified torque range.
  If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
  If too tight, it may cause damage to the screws and/or module, resulting in an accidental drop of the module, short circuit or malfunctions.
- Connect the extension cable to the connector of the base unit or module.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause incorrect inputs and/or outputs.
- Insert the memory cassette and fully press it to the memory cassette connector.
  Check for incomplete connection after installing it.
  Poor electrical contact may cause malfunctions.
- Be sure to shut off all the phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may damage the module.
- Do not directly touch the conductive part or electronic components of the module.
  Doing so may cause malfunctions or a failure of the module.

This section explains some notes on handling the CPU module, I/O module, special function module, power supply module, and base unit.

(1) Do not drop or allow any impact to the module case, memory cassette, terminal block connector, and pin connector since they are made of resin.

(2) Do not remove the printed-circuit board from the module case. Otherwise, a malfunction may occur.

(3) Use caution to prevent foreign matter, such as wire chips, from entering the module during wiring.
If any foreign matter has entered the module, remove it.

(4) Tighten the module installation screws and terminal block screws within the tightening torque range specified shown in the table below.

| Screw | Tightening torque range |
|---|---|
| Module mounting screws (M4) (Optional) | 78 to 118N·cm |
| Terminal block screws | 98 to 137N·cm |

(5) When installing the module to the base unit, press the module completely so that its hook is locked into the base. To remove the module, push the hook to unlock, and pull it after confirming it is completely disengaged from the base.

### 5.2.2 Part Names

Part names of the power supply modules are shown here.

(1) Names and description of parts of the A61P, A61PN and A61PEU modules

**Module fixing hook**
Hook for fixing the module to the base unit

**"POWER" LED**
LED for indicating 5 VDC power

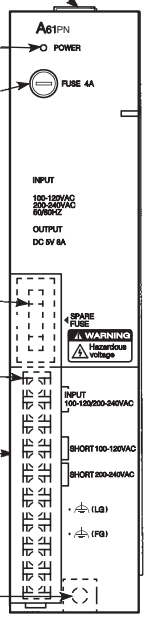
**Power fuse, fuse holder**
4 A cartridge fuse for AC input power is secured by the fuse holder.

**Spare fuse for power supply**
Spare fuse for power supply, mounted on rear side of the terminal cover

**Terminal block**
For details, see below. (Located under the terminal cover)

**Terminal cover**
Cover for protection of terminal block
Remove it during wiring and re-install it after wiring.

**Module fixing screw mounting hole**
Allows the module to be secured with a screw in addition to the module fixing hook. (For M4 screw)




**Terminal details**

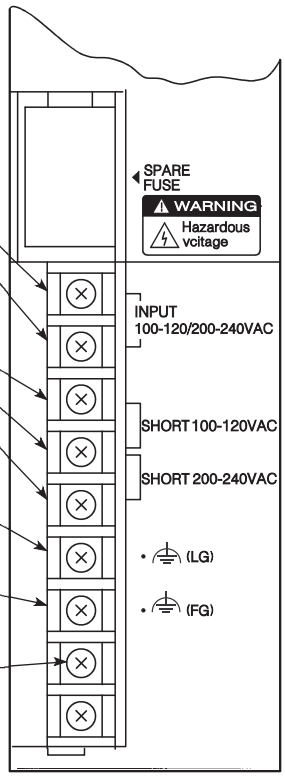
**Power input terminals**
Power input terminals to which the 100 VAC or 200VAC power is connected

**Applied voltage select terminals**
Terminals for selecting applied voltage. Use 100 VAC or 200 VAC as described below. When 100 VAC is input, connect together the "SHORT AC100V" terminals with the jumper provided. When 200VAC is input, connect together the "SHORT AC200V" terminals with the jumper provided.

**LG terminal**
For power filter grounding
Has half the input potential.

**FG terminal**
Ground terminal connected to the shielding pattern on the printed-circuit board

**Terminal screw**
M4 x 0.7 x 6



(2) Names and description of parts of the A62P, A62PEU, and A65P modules

**Module fixing hook**

Hook for fixing the module to the base unit

**"POWER" LED**

LED for indicating 5 VDC power

**Power fuse, fuse holder**

4 A cartridge fuse for AC input power is secured by the fuse holder.

**Spare fuse for power supply**

Spare fuse for power supply, mounted on rear side of the terminal cover

**Terminal block**

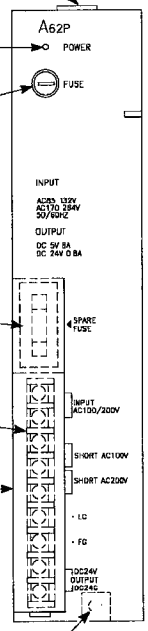
For details, see below. (Located under the terminal cover)

**Terminal cover**

Cover for protection of terminal block
Remove it during wiring and re-install it after wiring.

**Module fixing screw mounting hole**

Allows the module to be secured with a screw in addition to the module fixing hook. (For M4 screw)




**Terminal details**

**Power input terminals**

Power input terminals to which the 100VAC or 200VAC power is connected

**Applied voltage select terminals**

Terminals for selecting applied voltage. Use 100 VAC or 200 VAC as described below. When 100 VAC is input, connect together the "SHORT AC100V" terminals with the jumper provided. When 200 VAC is input, connect together the "SHORT AC200V" terminals with the jumper provided.

**LG terminal**

For power filter grounding
Has half the input potential.

**FG terminal**

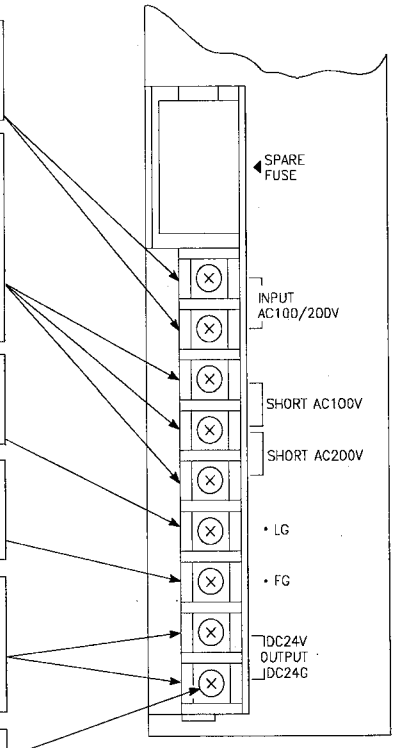
Ground terminal connected to the shielding pattern on the printed-circuit board

**24 VDC, 24 GDC terminals**

For supply to an output module which requires 24V inside the module (Supplied to the module via external wiring)

**Terminal screw**

M4 x 0.7 x 6



(3) Names and description of parts of the A63P and A67P modules

**Module fixing hook**
Hook for fixing the module to the base unit

**"POWER" LED**
LED for indicating 5 VDC power

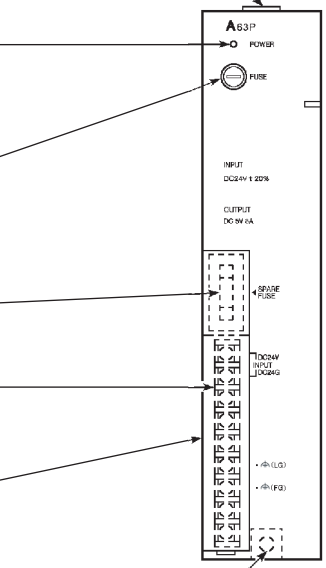
**Power fuse, fuse holder**
Cartridge fuse for DC input power is fixed by the fuse holder. The rating for the fuses are as follows.
A63P: 6.3 A (SM6.3 A or FGTA250V 6A)
A67P: 4 A (GTH4 or FGTA250V 4V)

**Spare fuse for power supply**
Spare fuse for power supply, mounted on rear side of the terminal cover

**Terminal block**
For details, see below. (Located under the terminal cover).

**Terminal cover**
Cover for protection of terminal block
Remove it during wiring and re-install it after wiring.

**Module fixing screw mounting hole**
Allows the module to be secured with a screw in addition to the module fixing hook. (For M4 screw)



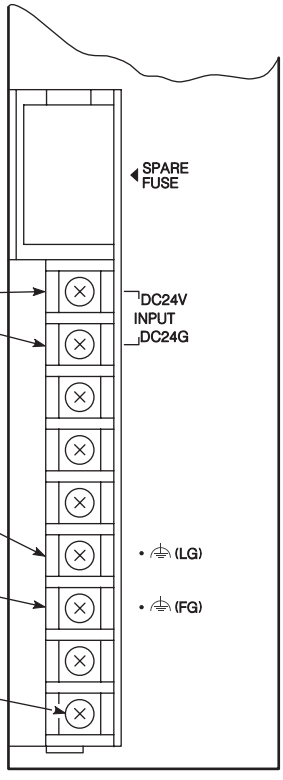

Terminal details

Power input terminal
Power input terminals for A63P: 24VDC, A67P: 100VDC.
Do not connect the + and - sides of 24VDC, 110VDC to the wrong side.
Doing so causes the fuse blown.

LG terminal
For power filter grounding

FG terminal
Ground terminal connected to the shielding pattern on the printed-circuit board

Terminal screw
M4× 0.7× 6



(4) Names and description of parts of the A66P

**Module fixing hook**
Hook for fixing the module to the base unit

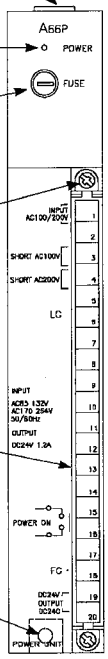
**"POWER" LED**
LED for indicating 5 VDC power

**Power fuse, fuse holder**
4 A cartridge fuse for AC input power is secured by the fuse holder.

**Terminal block fixing screw**
Screw for installing and fixing the terminal block to the module

**Terminal block**
For details, see below. (Located under the terminal cover)

**Module fixing screw mounting hole**
Allows the module to be secured with a screw in addition to the module fixing hook. (For M4 screw)




## Terminal details

**Power input terminals**
Power input terminals to which the 100VAC or 200VAC power is connected

**Applied voltage select terminals**
Terminals for selecting applied voltage. Use 100 VAC or 200 VAC as described below. When 100 VAC is input, connect together the "SHORT AC100V" terminals with the jumper provided. When 200 VAC is input, connect together the "SHORT AC200V" terminals with the jumper provided.

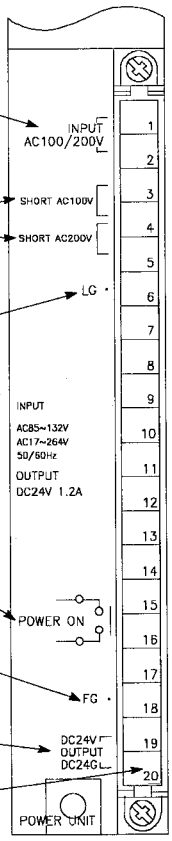
**LG terminal**
For power filter grounding
Has half the input potential.

**Power ON terminal**
Contact terminal which conducts if the 24 VDC output is normal when the power input turns on

**FG terminal**
Ground terminal connected to the shielding pattern on the printed-circuit board

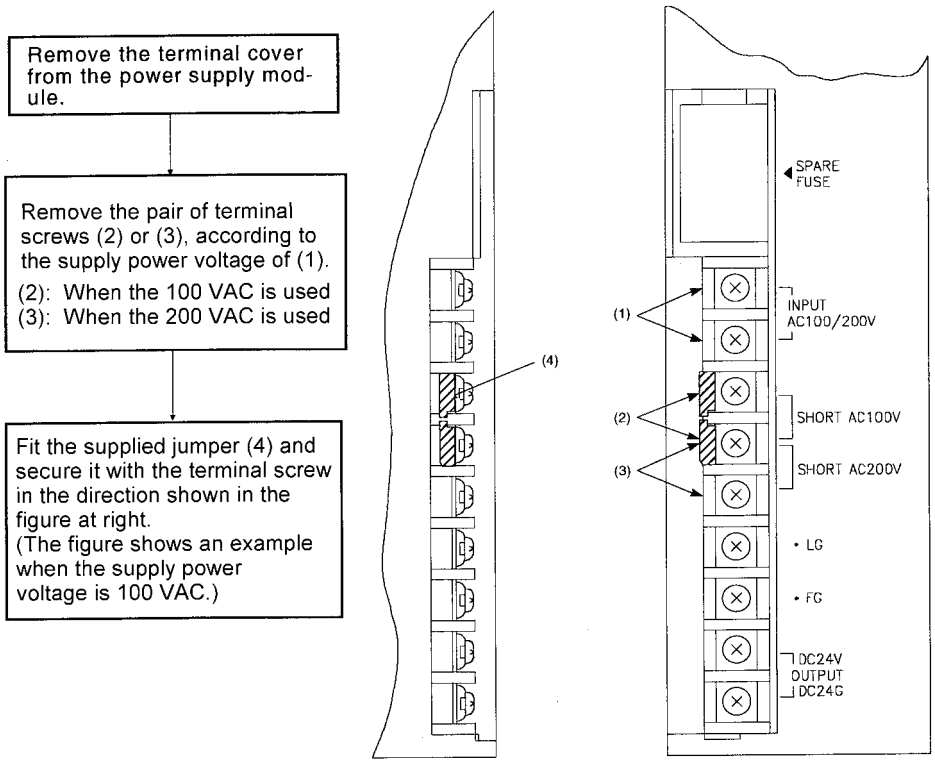
**24 VDC, 24 GDC terminals**
For supply to an output module which requires 24 V inside the module (Supplied to the module via external wiring)

**Terminal screw**
M3 x 0.5 x 6



(5) Setting

On the A61P(EU), A62P(EU), A65P, or A66P power supply module, the input voltage select terminals must be short-circuited by a jumper (accessory). The following explains the setting procedures.




POINT

If the setting differs from the supply power voltage, the following occurs. Be sure to set it correctly.

| | Supply Power Voltage | |
|---|---|---|
| | 100VAC | 200VAC |
| Set to 100VAC (jumper fitted as indicated at (2)) | – | The power supply module is damaged. (The CPU module is not damaged.) |
| Set to 200VAC (jumper fitted as indicated at (3)) | No fault occurs in the module. However, the CPU module does not operate. | – |
| No setting (jumper not fitted) | No fault occurs in the module. However, the CPU module does not operate. | |

# 6 BASE UNIT AND EXTENSION CABLE

This section explains the specifications of the base units (the main and extension base units) and extension cables available for the systems, and the application standards for use of extension base units.

## 6.1 Specifications

### 6.1.1 Base unit specifications

(1) Main base unit specifications

| Item | Model Name | | | |
|---|---|---|---|---|
| | A32B | A32B-S1 | A35B | A38B |
| I/O module installation range | 2 modules can be installed. | | 5 modules can be installed. | 8 modules can be installed. |
| Extension possibility | Not extendable | Extendable | Extendable | Extendable |
| Installation hole size | $\phi$6 bell-shaped holes (for M5 screws) | | | |
| External dimension | 247mm (9.7inch) × 250mm (9.84inch) × 29mm (1.14inch) | 268mm (10.5inch) × 250mm (9.84inch) × 29mm (1.14inch) | 382mm (15.0inch) × 250mm (9.84inch) × 29mm (1.14inch) | 480mm (18.9inch) × 250mm (9.84inch) × 29mm (1.14inch) |
| Weight | 0.96kg | 1.3kg | 1.5kg | 1.9kg |

(2) Extension base unit specifications

| Item | Model Name | | | | | |
|---|---|---|---|---|---|---|
| | A62B | A65B | A68B | A52B | A55B | A58B |
| I/O module installation range | 2 modules can be installed. | 5 modules can be installed. | 8 modules can be installed. | 2 modules can be installed. | 5 modules can be installed. | 8 modules can be installed. |
| Power supply module loading | Power supply module required | | | Not required. (See POINT .) | | |
| Installation hole size | $\phi$6 bell-shaped holes (for M5 screws) | | | $\phi$6 bell-shaped holes (for M5 screws) | | |
| Terminal screw size | – | | | M4 × 0.7 × 6 (FG terminal) | | |
| Applicable wire size | – | | | 0.75 to 2mm$^2$ | | |
| Applicable solderless terminal | – | | | (V)1.25-4, (V)1.25-YS4, (V)2-YS4A<br>Applicable tightening torque: 78 to 118N・cm | | |
| External dimension | 283mm (11.1inch) × 250mm (9.84inch) × 29mm (1.14inch) | 352mm (13.9inch) × 250mm (9.84inch) × 29mm (1.14inch) | 466mm (18.3inch) × 250mm (9.84inch) × 29mm (1.14inch) | 183mm (7.2inch) × 250mm (9.84inch) × 29mm (1.14inch) | 297mm (11.7inch) × 250mm (9.84inch) × 29mm (1.14inch) | 411mm (16.2inch) × 250mm (9.84inch) × 29mm (1.14inch) |
| Weight | 1.1kg | 1.4kg | 1.9kg | 1.0kg | 1.2kg | 1.7kg |
| Accessory | – | | | *1 Dustproof cover (for I/O module): 1 pc. | | |

*1 For the attachment of the dustproof cover, refer to Section 8.6.

POINT

(1) The 5 VDC power of the A52B, A55B, and A58B is supplied from the power supply module mounted on the main base unit.
(2) Before using the A52B, A55B or A58B, refer to Section 5.1.1 "Power supply module selection" and Section 6.1.3 "Application standards of extension base units".

### 6.1.2 Extension cable specifications

The specifications of the extension cables used for the AnNCPU system are shown below:

| Item | Model Name | | |
|---|---|---|---|
| | AC06B | AC12B | AC30B |
| Cable length | 0.6m (2.05ft.) | 1.2m (3.9 ft.) | 3m (9.8 ft.) |
| Resistance value of 5VDC supply line (at 55 ℃ ) | 0.019 Ω | 0.028 Ω | 0.052 Ω |
| Application | ▪ For connection between main base and extension base<br>▪ For connection between extension bases | | |
| Weight | 0.34kg | 0.52kg | 1.06kg |

⚠ CAUTION

● Connect the extension cable to the connector of the base unit or module.
After that, check for incomplete insertion.
Poor electrical contact may cause incorrect inputs and/or outputs.

6.1.3 Application standards of extension base units (A52B, A55B, A58B)

To the A52B, A55B and A58B extension base units, 5VDC is supplied from the power supply module on the main base unit. (Power is not supplied from any power supply module on the A62B, A65B and A68B.)
Therefore, if a voltage drop occurs on an extension cable, the specified voltage may not supplied to the receiving end, resulting in erroneous inputs and outputs.
It is recommended to connect the A52B, A55B and/or A58B after a main base unit to minimize a voltage drop.
Determine applicability of the A52B, A55B and A58B by the following calculation method.

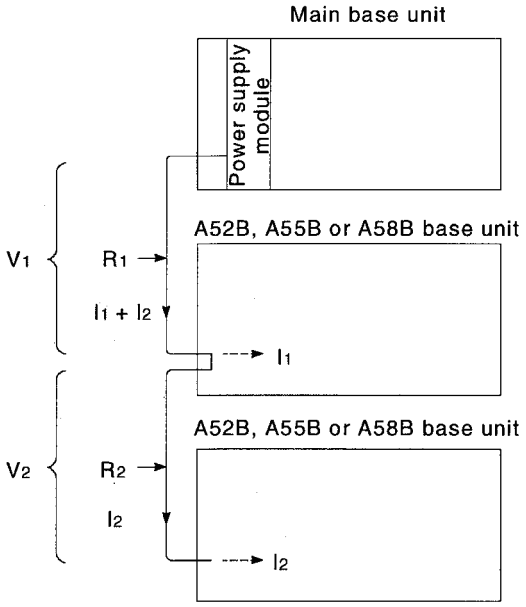
(1) Selection condition
  (a) Voltage of 4.75VDC or more is identified on the receiving end of the base unit.

(2) Calculation of the voltage on the receiving end
  (a) The 5VDC output voltage of the power supply module drops to 4.9V.
  (b) Resistance value of the cable

    AC06B.....0.019 Ω

    AC12B.....0.028 Ω

    AC30B.....0.052 Ω




V1: Voltage drop in the cable between main base unit and extension base unit
V2: Voltage drop in the cable between extension base units
R1: Resistance of the cable between main base unit and extension base unit
R2: Resistance of the cable between extension base units
I1: Current consumption of 5VDC used for the 1st extension stage
I2: Current consumption of 5VDC used for the 2nd extension stage

Voltage drops V1 and V2 are:
$V_1 = R_1 (I_1 + I_2)$
$V_2 = R_2 I_2$

The voltage of the receiving end on the 2nd extension base is:

Voltage on receiving end = $4.9 - (V_1 + V_2) > 4.75$

where the above condition is satisfied by:

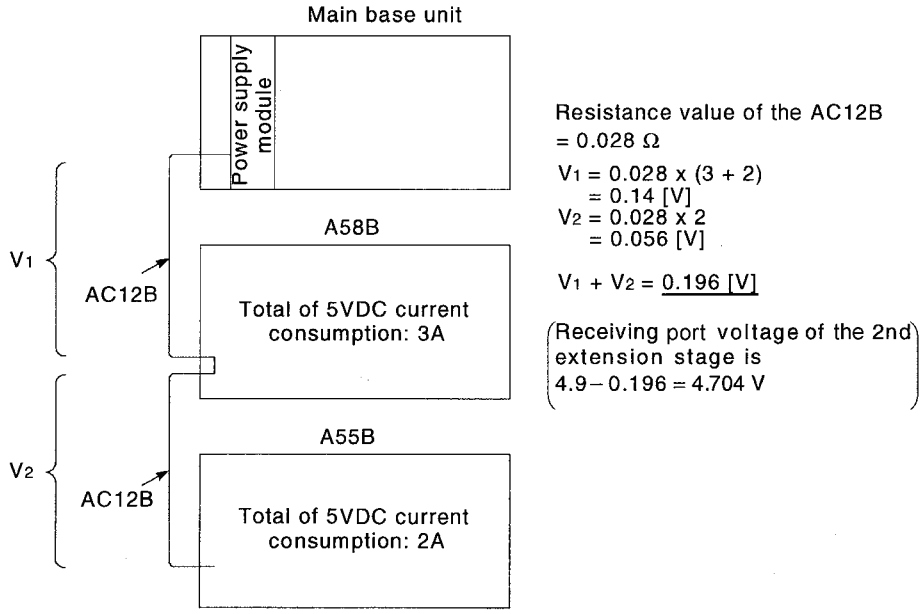
$4.9 - 4.75 \geqq V_1 + V_2$

$0.15 \geqq R_1(I_1 + I_2) + R_2 I_2$

Under the above conditions, the A52B, A55B or A58B can be used as the 2nd extension base.
Therefore, how many A52B, A55B or A58B extension base units can be used and where each of them can be placed is dependant on whether the following condition is satisfied or not.

$0.15 \geqq$ Total voltage drop up to receiving end

(3) Calculation example




Since the voltage drop is higher than 0.15V, the A55B cannot be used as the 2nd extension base under this condition.In this case, the A55B can be used by changing the cable to AC06B (resistance value = 0.019 Ω ).

$V_1$ = 0.019 × (3 + 2)
= 0.095V

$V_2$ = 0.019 × 2
= 0.038V

$V_1 + V_2$ = 0.133V

( Receiving port voltage of 2nd extension base is:
4.9 - 0.133 = 4.767V )

Since the voltage drop is 0.15V or less, the 2nd extension base can be used under this condition.

REMARK

When any of the A62B, A65B, A68B is connected between the main base unit and the A52B, A55B, or A58B, calculate a voltage drop by the following.

- Calculate the total resistive value for the extension cables, which are connected from the main base unit to the A52B, A55B, or A58B via the A62B, A65B, or A68B.
- Calculate a 5VDC consumption current for the A52B, A55B, or A58B, which flows thorough the extension cables.

POINT

When using an I/O module or special function module whose internal current consumption is large, mount it on a main base unit or an extension base unit that requires a power supply module (A62B, A65B, A68B).

## 6.2 Precautions for Handling

The handling precautions to be taken from unpacking to mounting a base unit are described below.

The terminal connectors and pin connectors of the base unit are made of resin. Do not drop them or apply heavy impact to them.

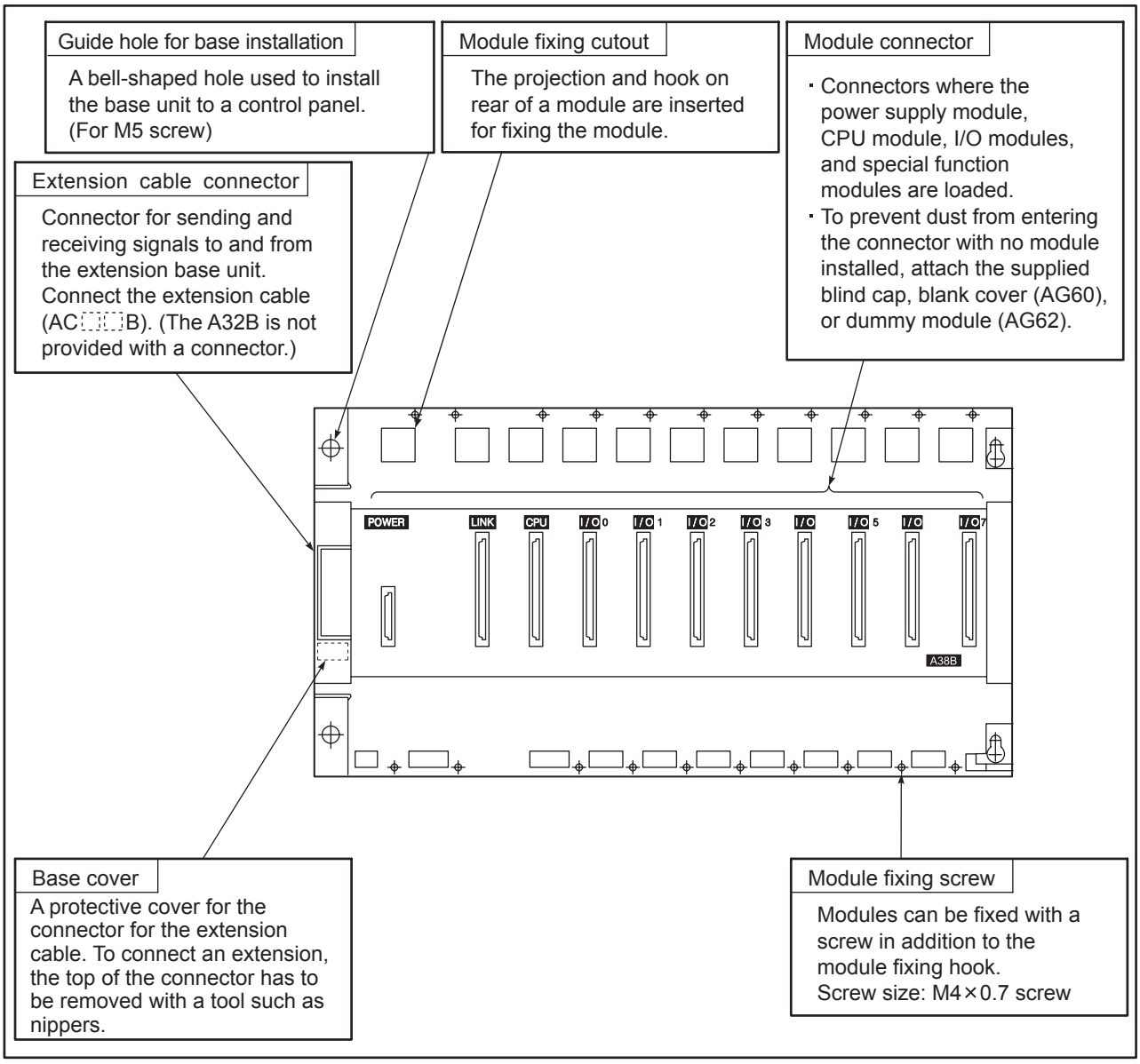
⚠ CAUTION

- Do not remove the printed-circuit board from the base unit.
  Doing so may cause failure, malfunctions, personal injuries and/or a fire.
- Use caution to prevent foreign matter, such as dust or wire chips, from entering the base unit during wiring.
  Failure to do so may cause a failure, malfunction or fire.

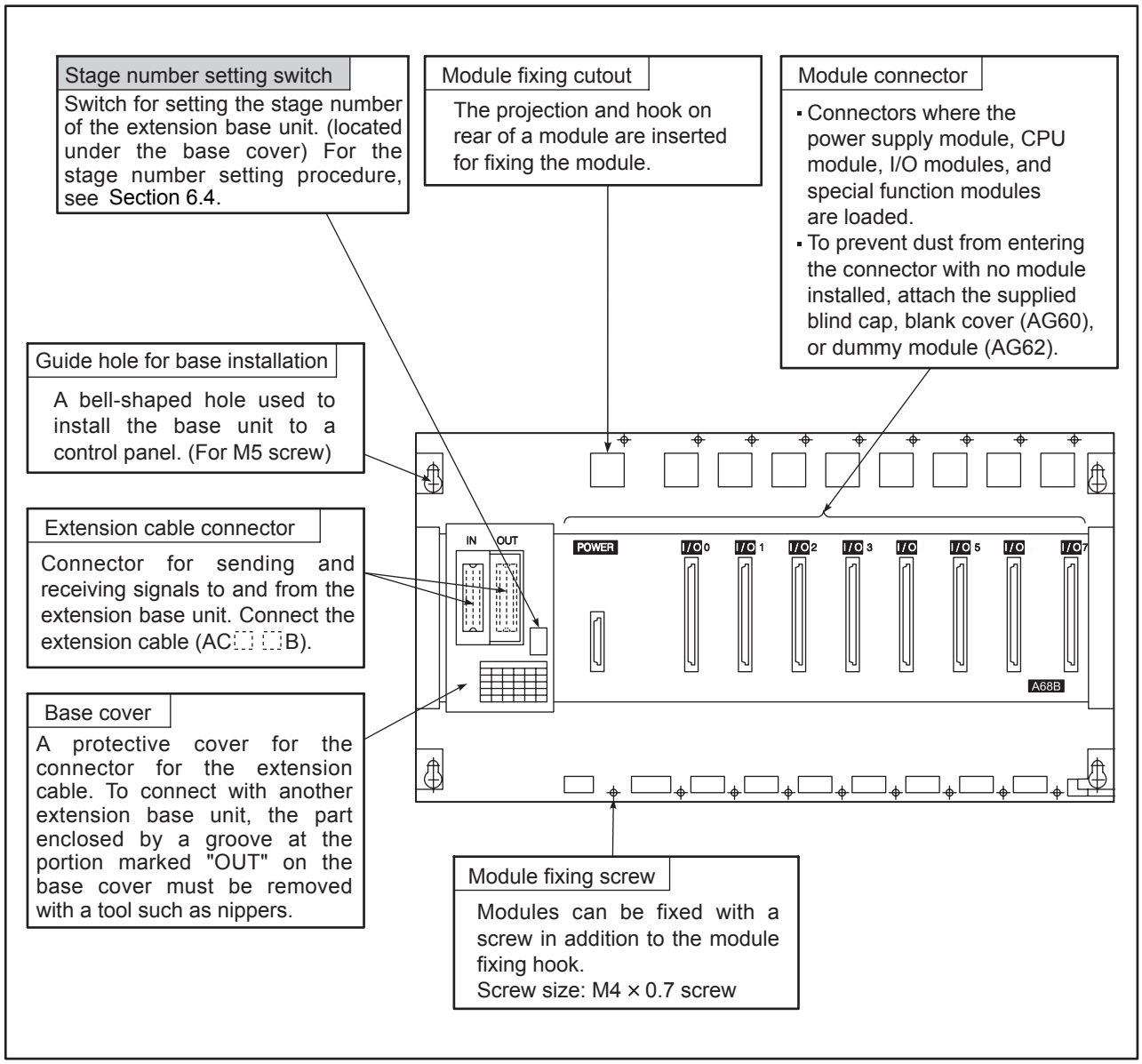
## 6.3 Part Names

Part names of the base unit are shown here.

(1) Main base units (A32B, A35B, A38B)



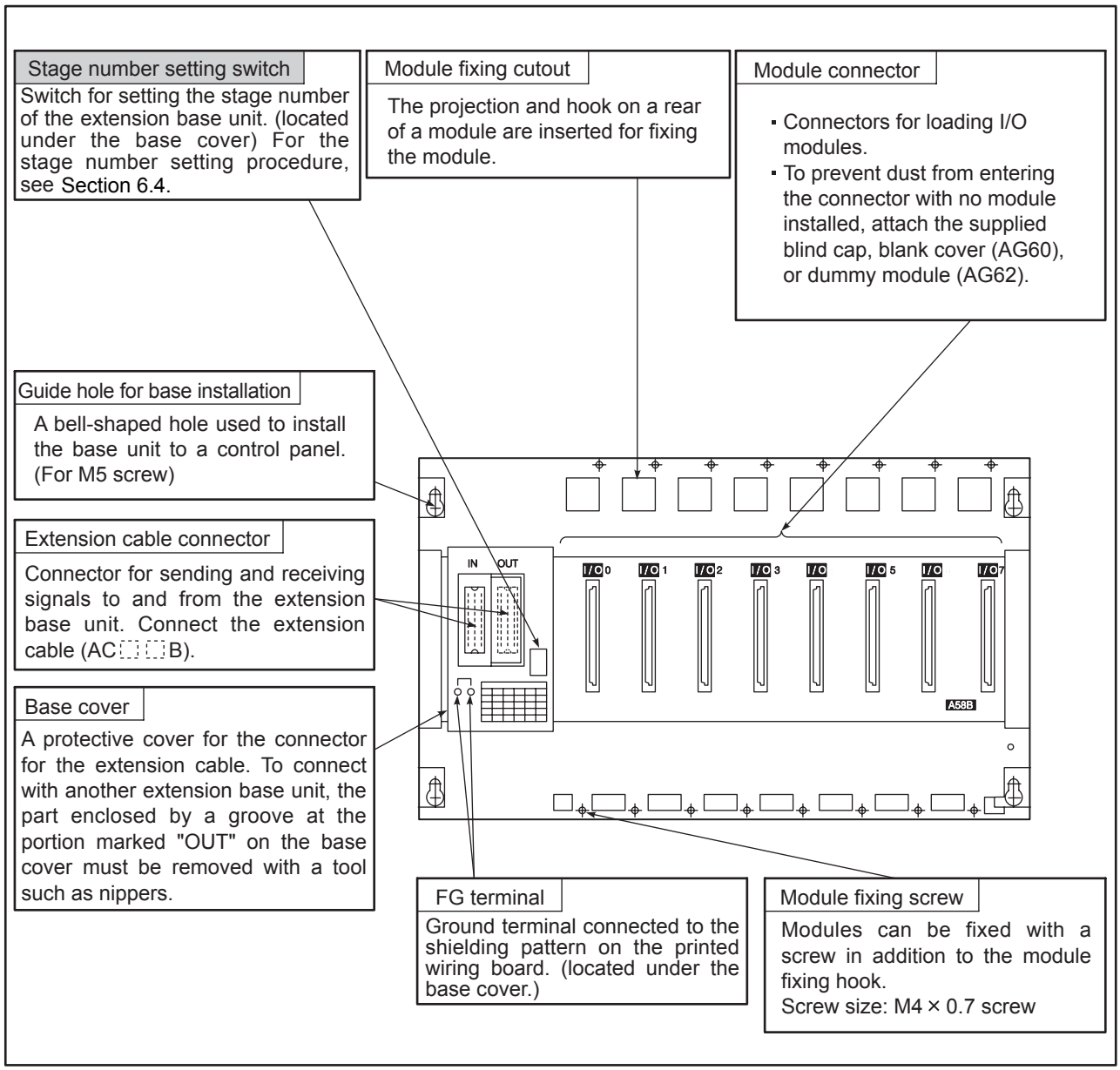
(2) Extension base units (A62B, A65B, A68B)




REMARK

The item indicated by shading must be set before installing the base unit and starting operation.

(3) Extension base units (A52B, A55B, A58B)

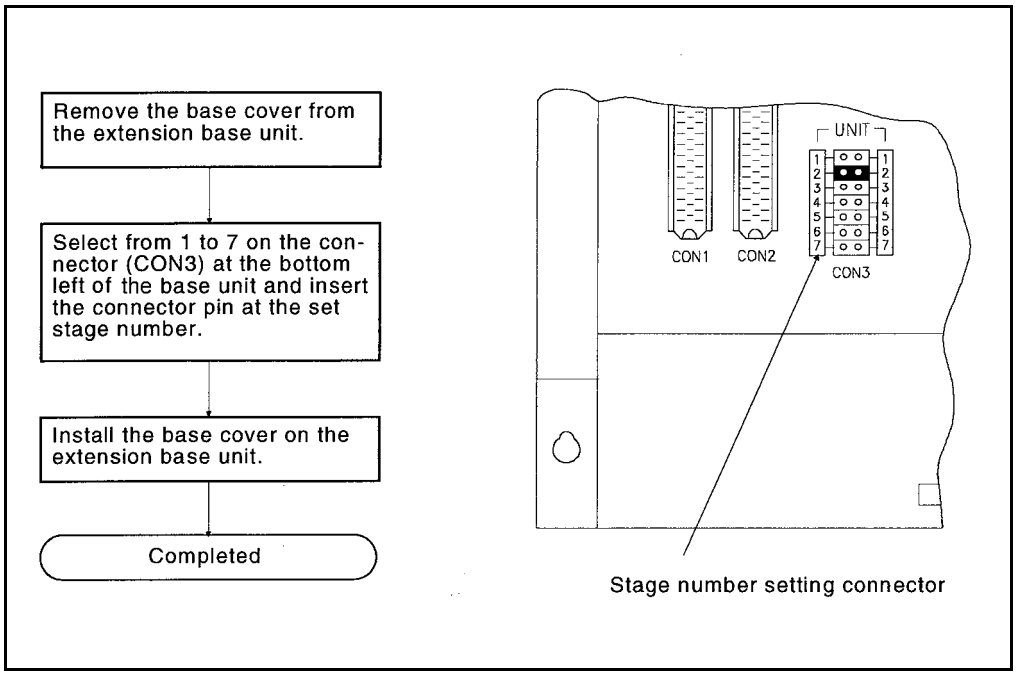



REMARK

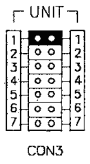
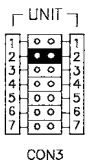
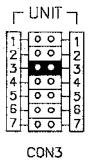
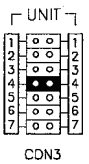
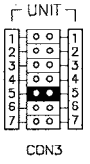
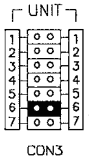
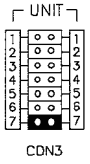
The item indicated by shading must be set before installing the base unit and starting operation.

## 6.4 Setting of Extension Stage Numbers

This section explains how to set the extension stage number for each of the extension base units used.




Extension Base Unit Stage Number Setting

| | Extension Stage Number Setting | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1st Stage | 2nd Stage | 3rd Stage | 4th Stage | 5th Stage | 6th Stage | 7th Stage |
| Setting of the stage number setting connector |  |  |  |  |  |  |  |



**POINT**

With the stage number setting connector (CON3), select one of the 1st to 7th that matches the extension stage number. Multiple settings for the same stage, duplicate stage setting, or no setting is not allowed because it may result in erroneous inputs and/or outputs.

# 7 MEMORY, MEMORY CASSETTE, AND BATTERY

This chapter explains the specifications, handling, and setting of the memory, memory cassette, and battery that are applicable for the AnNCPU.
Refer to Section 4.3.2 for the items and capacity that can be stored to a memory cassette.

## 7.1 Memory Specification

The specifications of the ROM/RAM memories and $E^2$PROM memory that can be installed on memory cassettes are shown below.

| Item | Model | | | | |
|---|---|---|---|---|---|
| | 4KRAM | 4KROM | 8KROM | 16KROM | 4KEROM*1 |
| Memory specification | IC-RAM (Readable and writable) | EP-ROM (Readable) | | | $E^2$PROM*2 (Read and write possible) |
| Memory Capacity (bytes) | 8k bytes | 8k bytes | 16k bytes | 32k bytes | 8k bytes |
| Structure | 28-pin IC package | 28-pin IC package | 28-pin IC package | 28-pin IC package | 28-pin IC package |
| Others | Two memories with the same model name must be installed into the memory installing sockets (two provided). | | | | |

*1: Do not execute operation with the 4KEROM ($E^2$PROM) installed at the ROM socket of an A6GPP/A6WU. This will damage the 4KEROM.

*2: It is not possible to write to the $E^2$PROM while the CPU is in the RUN mode. Attempting to do so will cause an error.

See Sections 4.3.1 and 4.3.2 for the items and size of parameter data that can be set in the memory card and the memory cassettes by using peripheral devices.

## 7.2 Specifications of the Memory Cassette

### 7.2.1 RAM/EP-ROM type memory casette

The specifications of the AnNCPU-compatible memory cassette are shown below.

| Item | Model Name | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A3NMCA-0 | A3NMCA-2 | A3NMCA-4 | A3NMCA-8 | A3NMCA-16 | A3NMCA-24 | A3NMCA-40 | A3NMCA-56 |
| RAM memory capacity*1 | None | 16k bytes | 32k bytes | 64k bytes | 128k bytes *2 (96k bytes) | 192k bytes *2 (144k bytes) | 320k bytes *2 (144k bytes) | 448k bytes *2 (144k bytes) |
| Number of ROM installing sockets | Two sockets (for 28-pin) | | | | | | | |
| Installable ROM type | 4KROM, 8KROM, 16KROM | | | | | | | |
| Installable RAM type | 4KRAM | Not installable. | | | | | | |
| External dimensions | 110mm (5.12inch) × 79.5mm (2.15inch) × 33mm (3.69inch) | | | | | | | |
| Weight | 0.13kg | 0.13kg | 0.13kg | 0.13kg | 0.13kg | 0.13kg | 0.15kg | 0.15kg |

*1 RAM memory is a device that is soldered to the printed-circuit board.
*2 The capacity in the parentheses indicates the maximum parameter setting range.
The areas exceeding the maximum values can be made available as extension file registers by using the SW[ ]GHP-UTLP-FN1 software.

### 7.2.2 Handling precautions

This section explains the specifications of the memory cassette, the handling precautions and the installation and removal procedures.

> ⚠ CAUTION
> ● Insert the memory cassette and fully press it into the memory cassette connector. After that, check for incomplete insertion.
> Poor electrical contact may cause malfunctions.

(1) Since the memory cassette and pin connector are made of resin, do not drop them or apply heavy impact to them.

(2) Do not remove the printed-circuit board of memory cassette from the case.Doing so could give damage to the module.

(3) Use caution to prevent foreign matter, such as wire chips, falling from the top of a module during wiring.
If it does get inside the module, remove it immediately.

(4) When installing the memory cassette into the CPU module, fully press it to the connector.

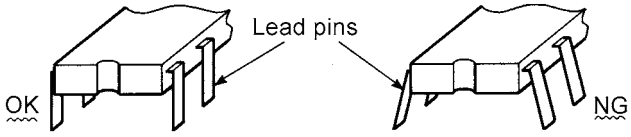
(5) Do not place the memory cassette on a metal object where current is or can be leaked, or materials like wood, plastic, vinyl, fibers, electric wires or paper where static electricity is charged.

(6) Do not touch and bend the lead of the memory. This may damage the memory.

(7) Make sure to install the memory as indicated on the socket.
Installing it in the reverse way damages the memory.

(8) Do not touch the CPU connector of the memory cassette. Doing so may cause poor contact.

(9) If the lead pins of the IC memory are leaning towards the outside, make them straight so that they are in parallel with each other. After the modification, install the IC memory into the memory socket.



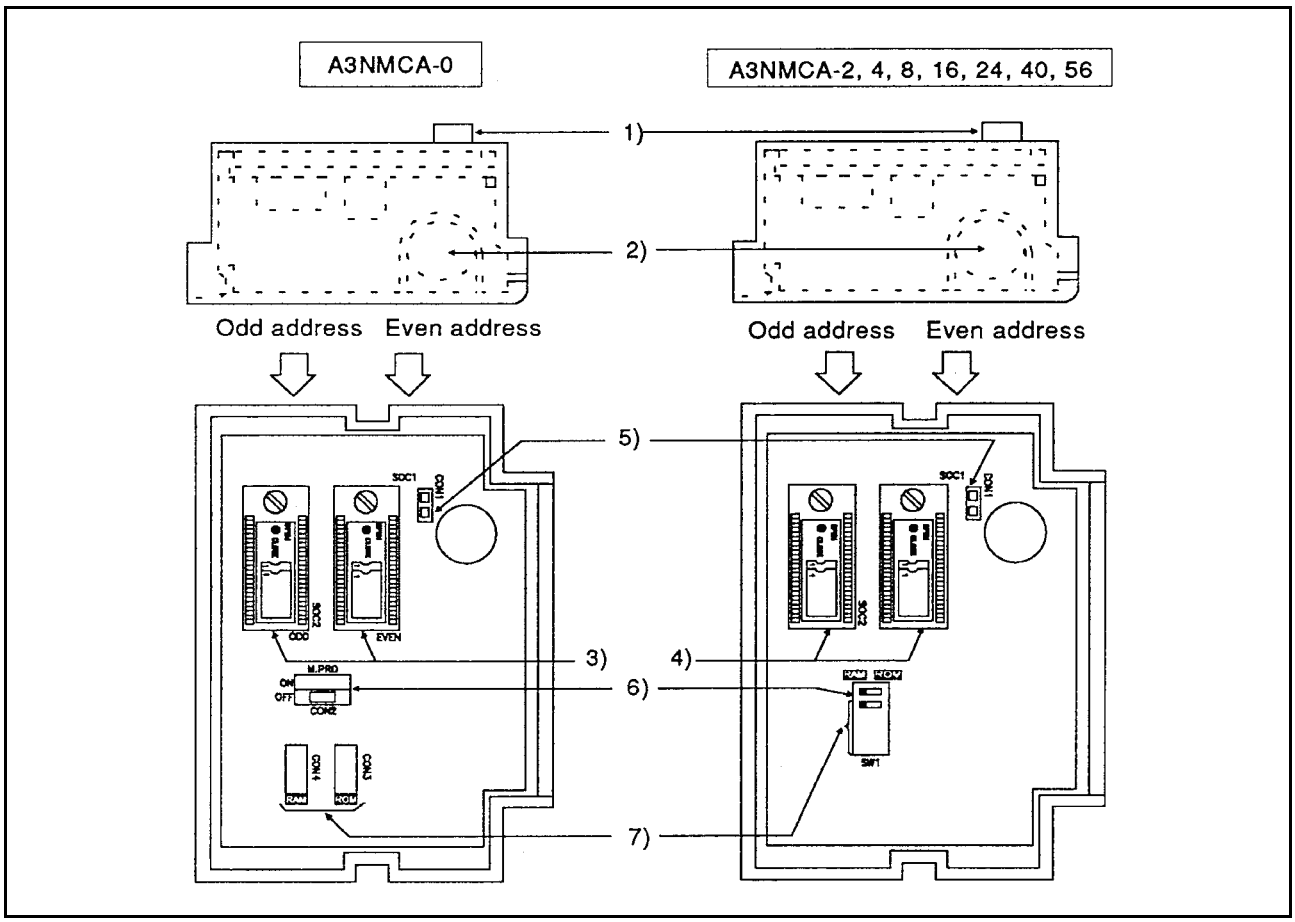

(10) After installing the IC memory into the memory socket, fully turn the locking screw to the position "C" (:CLOSE). (Do not stop anywhere between "O" and "C".)

IMPORTANT

Before installing the memory cassette to or removing it from the CPU module, make sure that the power supply is OFF. Installing or removing the memory cassette with power ON destroys its memory.

### 7.2.3 Part names of a memory cassette

The part names of a memory cassette are shown below.




| No. | Name | Description | Remark |
|---|---|---|---|
| 1) | CPU module connector | A connector for connecting the memory cassette to a CPU module. | |
| 2) | Battery (A6BAT) | Backup battery for the IC-RAM memory and the power failure compensation function. | |
| 3) | Memory socket for RAM/ROM | A socket for installing the IC-RAM or EP-ROM memory.<br>When installing memories, they must be the same model and installed into SOC1 and 2.<br>When installing EP-ROMs, install the one with even number addresses into SOC1. (EVEN) and install the one with odd number addresses into SOC2. (ODD). | * |
| 4) | ROM memory socket | A socket for installing the EP-ROM memory.<br>When installing memories, they must be the same model and installed into SOC1 and 2.<br>When installing memories, install the one with even number addresses into SOC1. (EVEN) and install the one with odd number addresses into SOC2. (ODD). | * |
| 5) | Connector for battery lead wire connection | The battery lead wire must be connected to the connector (CON1).<br>(To prevent battery drain, the battery lead wire is disconnected from the connector before shipment.) | * |
| 6) | Memory setting switch | A switch for switching memory between RAM and ROM. | * |
| 7) | Memory protect switch | Sets the protected data range in the IC-RAM memory.<br>(Enabling the protect function prevents the memory from being overwritten.) | * |

* Must be set before writing a program and starting operation.

### 7.2.4 Setting and installing memory

Procedures for setting and installing the IC-RAM, EP-ROM and $E^2$PROM provided inside the memory cassette are explained below.

(1) How to hold the memory
Hold the memory as shown on the diagram for correct installation. Touching the lead area on the memory with hands may cause static electricity to be generated, resulting in damage to the memory. It may also cause the pins to be bent, resulting in poor contact.

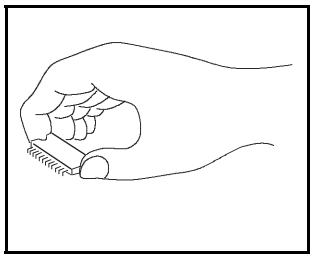


Fig. 7.1
Correct memory holding

(2) Installation direction of the memory
Make sure the correct direction before installing the memory. Installing the memory in the wrong direction causes the memory to be damaged at power-on.
The installation direction is indicated on the memory socket. Referring to this indication, install the EP-ROM and $E^2$PROM along with the concave and the IC-RAM along with the concave or dotted line.

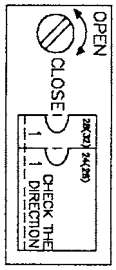
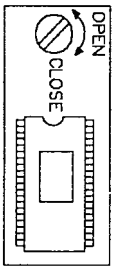
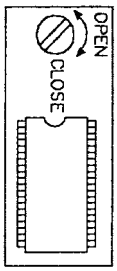
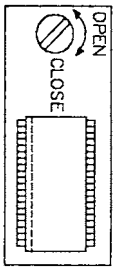
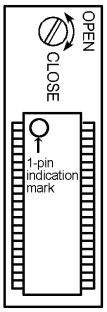
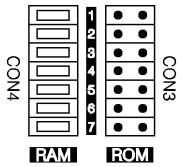
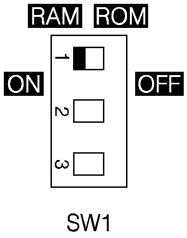
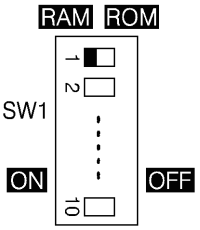
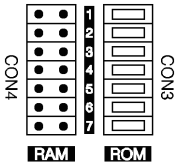
| Memory socket | EP-ROM<br>$E^2$PROM | IC-RAM | | |
|---|---|---|---|---|
| | | Concave type | Dotted line type | 1-pin indication type |
|  |  |  |  |  |

Fig. 7.2 Memory installation direction

(3) Setting the memory

Set the RAM and EP-ROM/E$^2$PROM according to the memory used by using pins or switches.

<table>
<tr>
<td rowspan="2">Memory setting</td>
<td>RAM</td>
<td>A3NMCA-0<br> 
</td>
<td>A3NMCA-2, 4<br> 
</td>
<td>A3NMCA-8, 16, 24, 40, 56<br> 
</td>
<td rowspan="2">1) Configure the settings of the RAM or ROM before installing the memory.<br>2) When using the A3NMCA-0, insert the jumper to CON3 or CON4 to configure the settings.<br>CON3 ..... ROM setting<br>CON4 ..... RAM setting<br>3) When one of the A3NMCA-2 to 56 is used, switch the 1 of SW1 to the required side to configure the settings.</td>
</tr>
<tr>
<td>EP-ROM/ E$^2$PROM</td>
<td> 
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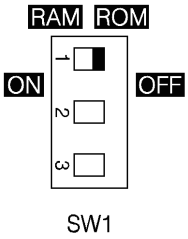
<td> 
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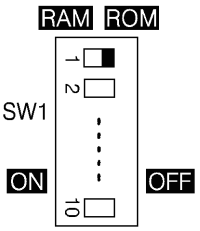
<td> 
</td>
</tr>
</table>

Fig. 7.3 Setting the memory

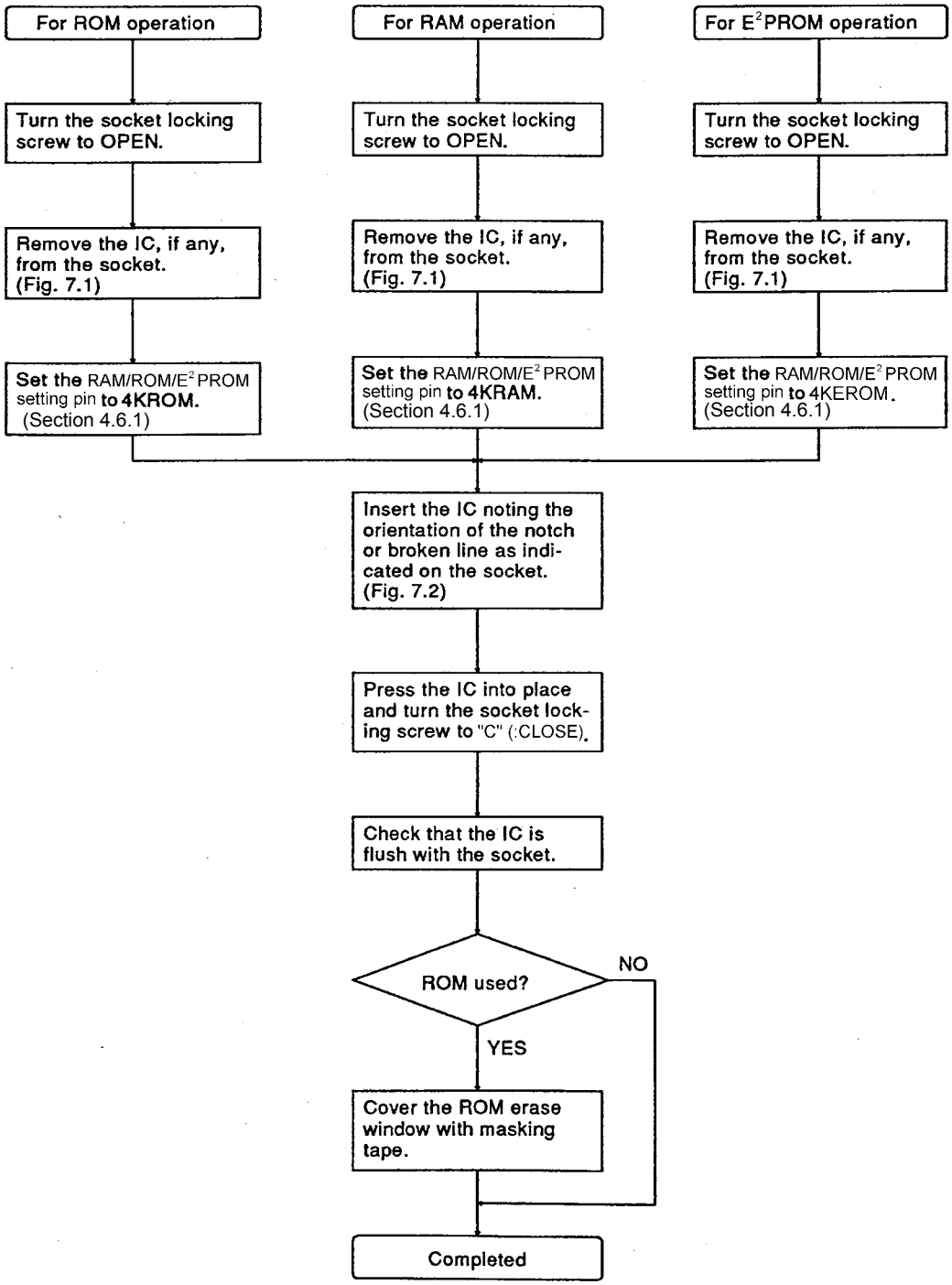
⚠ CAUTION

- Insert the memory cassette and fully press it to the memory cassette connector. After that, check for incomplete insertion. Poor electrical contact may cause malfunctions.

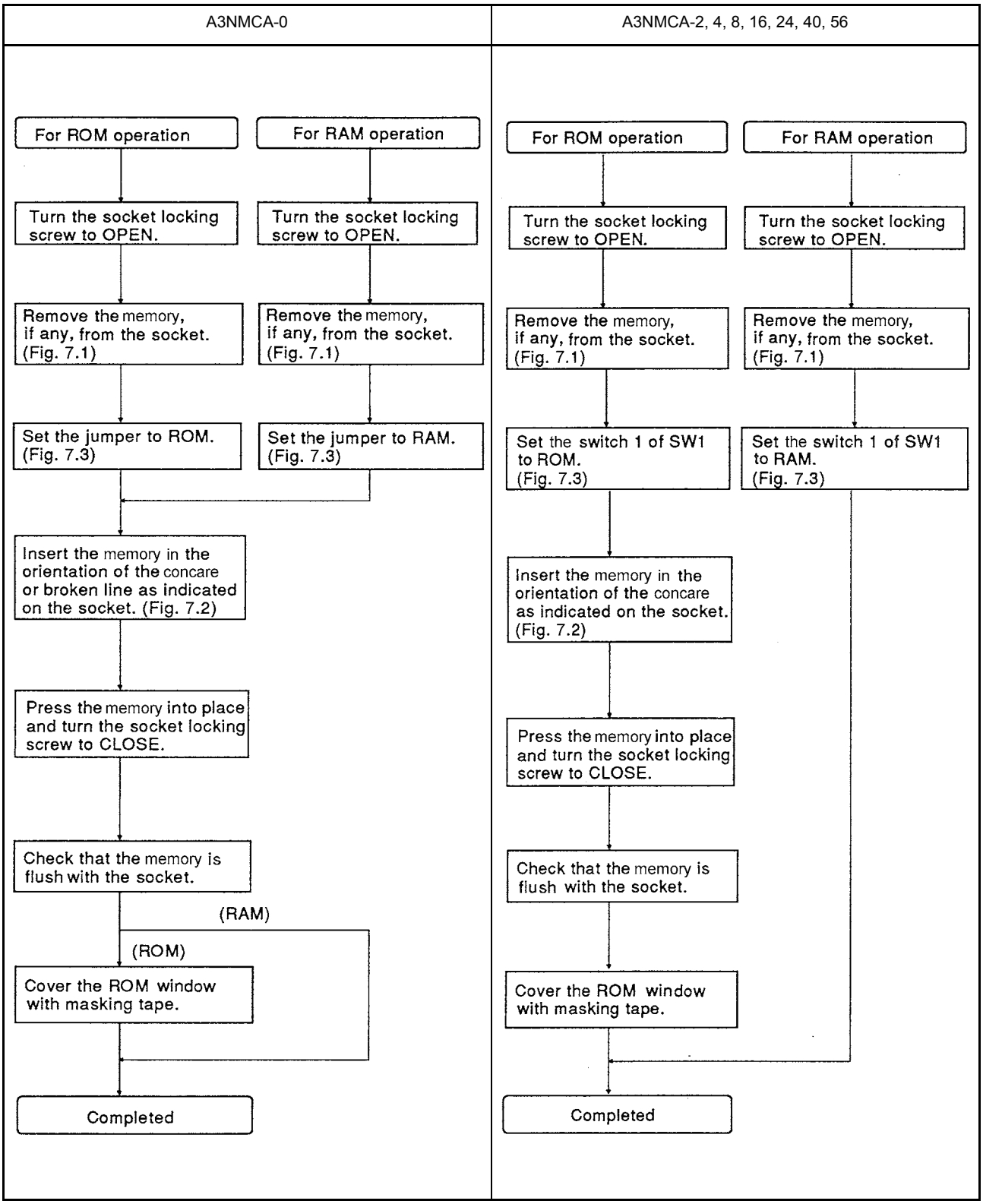
(4) Memory installation procedures

Follow the procedures below to correctly install the memory.

(a) IC loading procedure to memory card (A1NCPU)

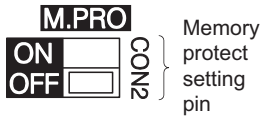
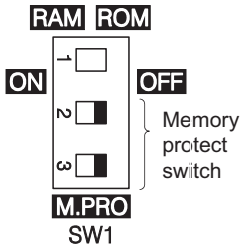
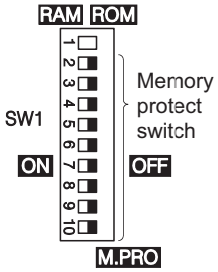


(b) Procedure for installing the memory to the memory cassette



### 7.2.5 Settings for memory protect switch

Memory protect switch is to prevent data in a memory cassette from being overwritten and deleted by an erroneous operation from peripheral devices.
It is used to prevent overwriting and deletion of a program after the program is created.
To modify the memory cassette, cancel the memory write protect (OFF).
Memory protection range differs depending on the model of memory cassettes as shown below.

| A3NMCA-0 | A3NMCA-2, 4 | A3NMCA-8, 16, 24, 40, 56 |
|---|---|---|
|  |  |  |

Memory protection range depends on each switch is as follows.

| Memory Protect Range (byte number) | Setting Switch | Applicable Memory Cassette |
|---|---|---|
| 0 to 16k | · A3NMCA-0 jumper set to ON of CON2<br>· A3NMCA-2 to 56 and 2 of SW1 ON | A3NMCA-0, A3AMCA-2, A3NMCA-4, A3NMCA-8, A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56 |
| 16k to 32k | 3 of SW1 ON | A3NMCA-4, A3NMCA-8, A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56 |
| 32k to 48k | 4 of SW1 ON | A3NMCA-8, A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56 |
| 48k to 64k | 5 of SW1 ON | A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56 |
| 64k to 80k | 6 of SW1 ON | A3NMCA-24, A3NMCA-40, A3NMCA-56 |
| 80k to 96k | 7 of SW1 ON | A3NMCA-40, A3NMCA-56 |
| 96k to 112k | 8 of SW1 ON | A3NMCA-40, A3NMCA-56 |
| 112k to 128k | 9 of SW1 ON | A3NMCA-56 |
| 128k to 144k | | |
| 144k to 192k | 10 of SW1 ON | |
| 192k to 320k | | |
| 320k to 448k | | |

POINT

(1) When the memory protect is used, refer to the address (step number) of each memory area (sequence program, microcomputer program subsequence program, comment, sampling trace, status latch, and file register) to set the protection.

(2) When sampling trace or status latch is executed, do not apply the memory protect to the data storage area. If the protection is applied, the execution results cannot be stored in the memory.

## 7.3 Battery

This section explains the specifications, handling precautions and installation procedures of the battery.

> **DANGER**
> ● Properly connect batteries. Do not charge, disassemble, heat or throw them into the fire and do not make them short-circuited and soldered.
> Incorrect battery handling may cause personal injuries or a fire due to exothermic heat, burst and/or ignition.

### 7.3.1 Specifications

The specifications of the battery used for power failure compensation are shown in Table 7.4.

Table7.4 Battery specifications

| Item | | A6BAT |
|---|---|---|
| Classification | | Thionyl chloride lithium battery |
| Initial voltage | | 3.6VDC |
| Battery warranty period | | 5 years |
| Total power failure backup time | A1NCPU | Min. : 7200 hours |
| | A2N, A3N CPU | Depends on memory cassette types as indicated below<br>A3NMCA-0 : Min. 10800 hours<br>A3NMCA-40 : Min.1400hours |
| Lithium content | | 0.48g |
| Application | | IC-RAM memory backup and power failure compensation |
| External dimensions | | $\phi$16mm (0.63inch)×30mm (1.18inch) |

REMARK

For the battery directive in EU member states, refer to Appendix7.

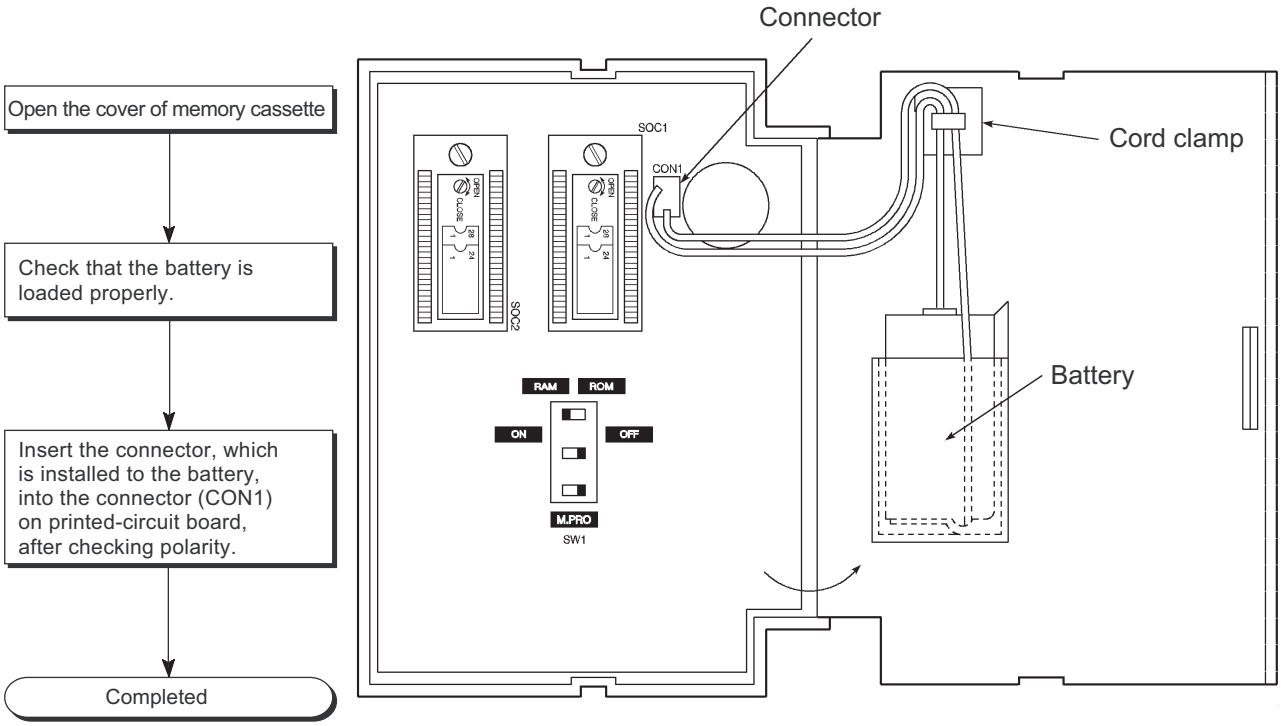
### 7.3.2 Handling precautions

The following describes the battery handling precautions.
(1) Do not short it.
(2) Do not disassemble it.
(3) Do not put it in a fire.
(4) Do not heat it.
(5) Do not solder to the electrodes.

### 7.3.3 Battery installation

Since the battery connector is shipped with disconnected, connect the connector according to the procedure indicated below for using the RAM memory or the power failure compensation function.

> **DANGER**
>
> ● Properly connect batteries.
> Do not charge, disassemble, heat or throw them into the fire and do not make them short-circuited and soldered.
> Incorrect battery handling may cause personal injuries or a fire due to exothermic heat, burst and/or ignition.




REMARK

The battery connector is removed to prevent battery consumption during distribution and storage. Connect the connector when using them.

# 8 LOADING AND INSTALLATION

This chapter describes the loading and installation procedures and precautions to obtain the maximum system reliability and performance.

## 8.1 Fail Safe Circuit Concept

When the PLC is powered ON or OFF, improper outputs may be generated temporarily depending on the delay time and start-up time differences between the PLC power supply and the external power supply for the control target (especially, DC).
For example, if the external power supply for a DC output module is powered ON and then the PLC is powered ON, the DC output module may generate incorrect outputs temporarily upon the PLC power-ON. To prevent this, it is required to build a circuit by which the PLC is powered on first.
Also, an external power failure or PLC failure may lead to erroneous operation.
In order to eliminate the possibility of an system error and to ensure fail-safe operation, create a circuit (emergency stop circuit, protection circuit, interlock circuit, etc.) outside the PLC for the parts whose faulty operation could cause mechanical damage and/or accidents.
A system design circuit example based on the above is provided later.

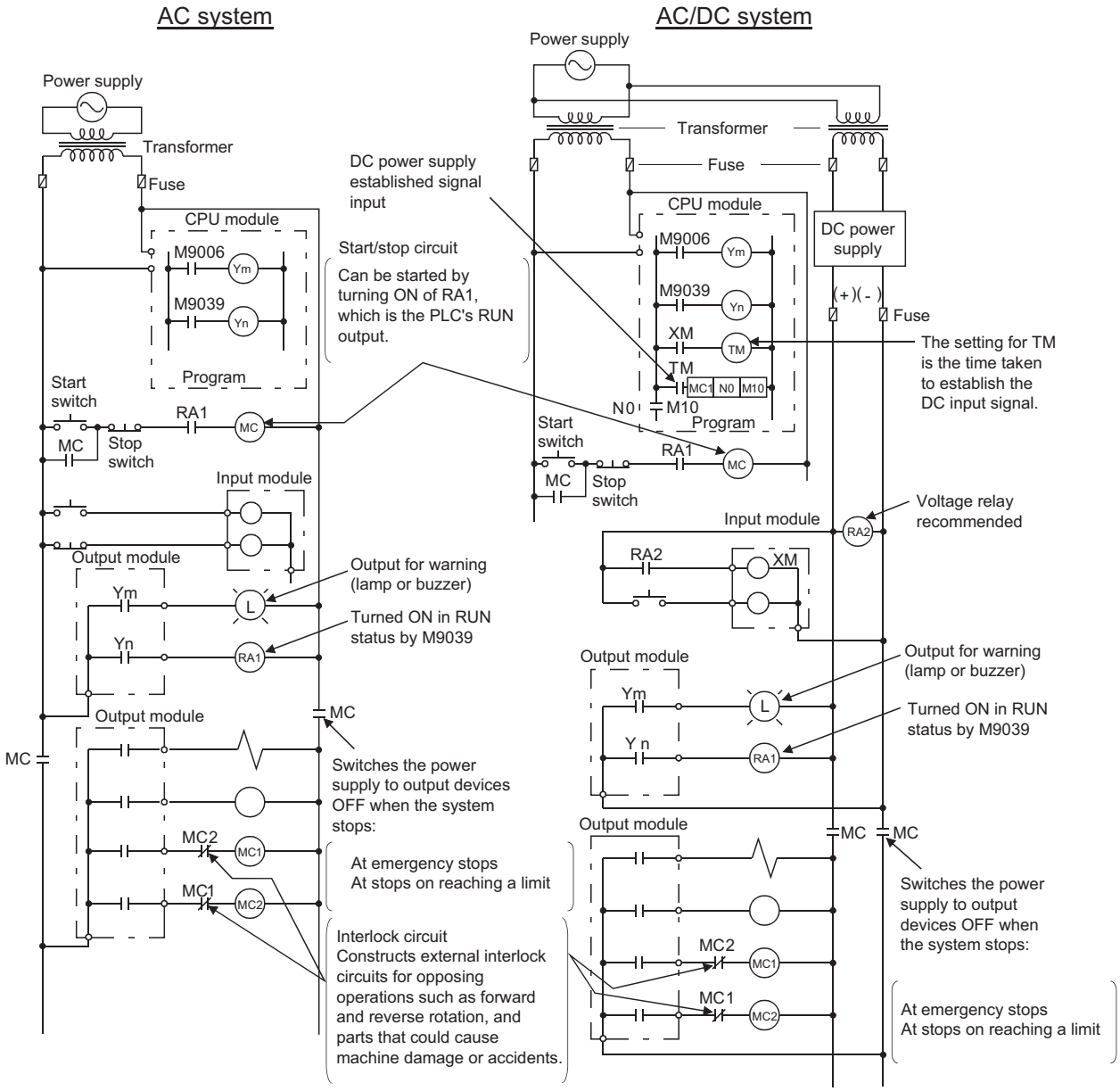
DANGER

- Create a safety circuit outside the PLC to ensure the whole system will operate safely even if an external power failure or a PLC failure occurs.
  Otherwise, incorrect output or malfunction may cause an accident.
  (1) For an emergency stop circuit, protection circuit and interlock circuit that is designed for incompatible actions such as forward/reverse rotation or for damage prevention such as the upper/lower limit setting in positioning, any of them must be created outside the PLC.
  (2) When the PLC detects the following error conditions, it stops the operation and turn off all the outputs.
  •The overcurrent protection device or overvoltage protection device of the power supply module is activated.
  •The PLC CPU detects an error such as a watchdog timer error by the self-diagnostics function.
  In the case of an error of a part such as an I/O control part that cannot be detected by the PLC CPU, all the outputs may turn on. In order to make all machines operate safely in such a case, set up a fail-safe circuit or a specific mechanism outside the PLC.
  (3) Depending on the failure of the output module's relay or transistor, the output status may remain ON or OFF incorrectly. For output signals that may lead to a serious accident, create an external monitoring circuit.
- If load current more than the rating or overcurrent due to a short circuit in the load has flowed in the output module for a long time, it may cause a fire and smoke. Provide an external safety device such as a fuse.
- Design a circuit so that the external power will be supplied after power-up of the PLC.Activating the external power supply prior to the PLC may result in an accident due to incorrect output or malfunction.
- For the operation status of each station at a communication error in data link, refer to the respective data link manual.
  Otherwise, incorrect output or malfunction may cause an accident.
- When controlling a running PLC (data modification) by connecting a peripheral device to the CPU module or a PC to a special function module, create an interlock circuit on sequence programs so that the whole system functions safely all the time. Also, before performing any other controls (e.g. program modification, operating status change (status control)), read the manual carefully and ensure the safety. In these controls, especially the one from an external device to a PLC in a remote location, some PLC side problem may not be resolved immediately due to failure of data communications.
  To prevent this, create an interlock circuit on sequence programs and establish corrective procedures for communication failure between the external device and the PLC CPU.
- When setting up the system, do not allow any empty slot on the base unit. If any slot is left empty, be sure to use a blank cover (AG60) or a dummy module (AG62) for it. When using the extension base unit, A52B, A55B or A58B, attach the included dust-proof cover to the module in slot 0. Otherwise, internal parts of the module may be flied in the short circuit test or when an overcurrent or overvoltage is accidentally applied to the external I/O section.

⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit or power lines, or bring them close to each other.
  Keep a distance of 100mm (3.94inch) or more between them.
  Failure to do so may cause malfunctions due to noise.
- When an output module is used to control the lamp load, heater, solenoid valve, etc., a large current (ten times larger than the normal one) may flow at the time that the output status changes from OFF to ON. Take some preventive measures such as replacing the output module with the one of a suitable current rating.

(1) System design circuit example




The procedures used to switch on the power supply are indicated below.

AC system

1) Switch the power supply ON.
2) Set the CPU module to RUN.
3) Switch the start switch ON.
4) The output devices are driven in accordance with the program when the magnetic contactor (MC) comes ON.

AC/DC system

1) Switch the power supply ON.
2) Set the CPU module to RUN.
3) Switch RA2 ON when the DC power supply starts.
4) Set the timer (TM) to "ON" upon 100% establishment of DC power supply.
   (The set value for TM shall be the period from turning "ON" RA2 to 100% establishment of DC power supply. Set 0.5 seconds for it.)
5) Switch the start switch ON.
6) The output devices are driven in accordance with the program when the magnetic contactor (MC) comes ON.
   (When a voltage relay is used for RA2, the timer in the program (TM) is not necessary.)

(2) Fail-safe measures for PLC failure

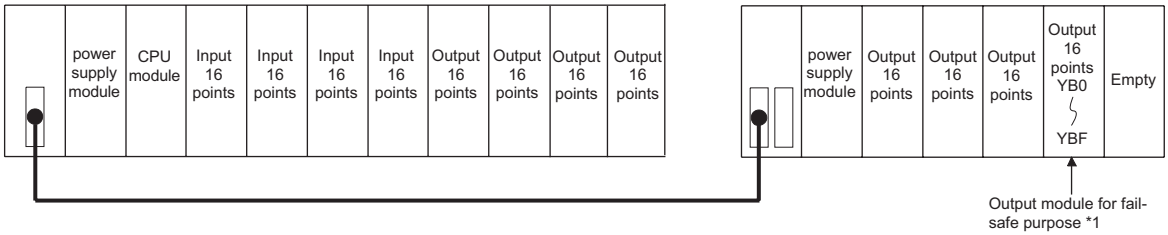
While failure of a CPU module and its memory can be detected by the self-diagnostics function, an error occurred in I/O control area may not be detected by the CPU module.

In such a case, depending on the condition of the failure, all device points could turn ON or OFF resulting in a situation where normal operations of the control target and safety cannot be ensured.

Though Mitsubishi PLCs are manufactured under strict quality control, create a fail-safe circuit outside the PLC to prevent mechanical damage and accidents in the case of a PLC failure occurred due to any cause.

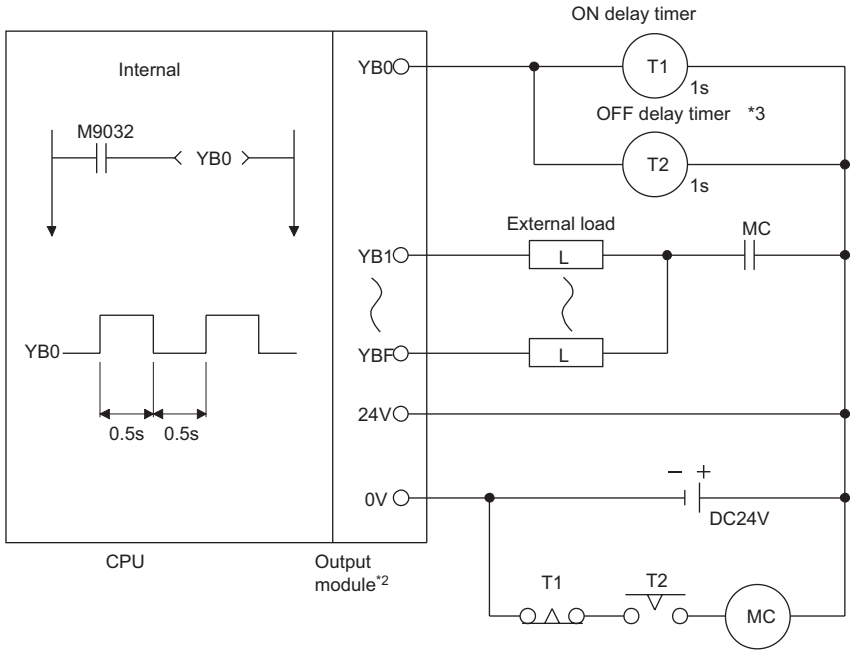
Examples of a system and its fail-safe circuitry are described below:

<System example>




*1 The output module for fail safe purpose should be mounted on the last slot of the system. (YB0 to YBF in the above system.)

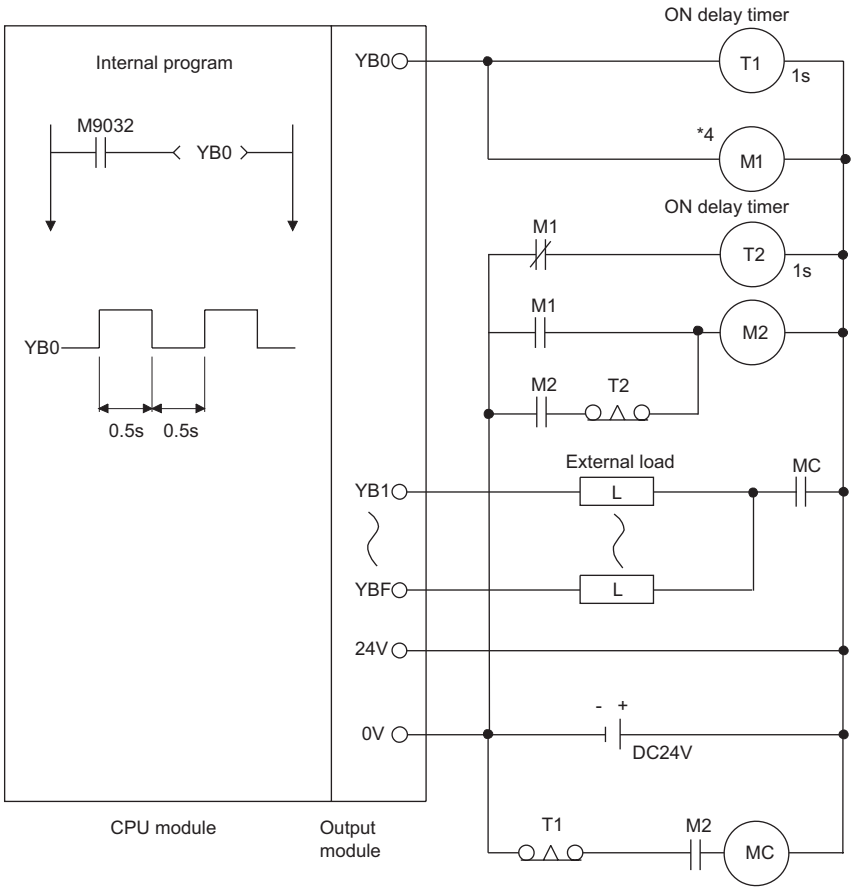
<Example fail safe circuits>




*2 Since YB0 turns ON and OFF alternatively at 0.5 second intervals, use a contactless output module (a transistor is used in the above example).

*3 If an off delay timer (especially miniature timer) is not available, construct a fail safe circuit by using an on delay timer shown on the next page.

When constructing a fail safe circuit by using on delay timers only




*4 Use a solid state relay for the M1 relay.

## 8.2 Installation Environment

Avoid the following environment when you install the sequence system:

(1) A location in which the ambient temperature falls outside the range of 0 to 55 degrees Celsius.

(2) A location in which the ambient humidity falls outside the range of 10 to 90%RH.

(3) Location in which condensation may occur due to drastic changes in temperature.

(4) A location in which corrosive gas or flammable gas exists.

(5) A location in which a lot of conductive powdery substance such as dust and iron filing, oil mist, salt, or organic solvent exists.

(6) A location exposed to direct sunlight.

(7) A location in which strong electric fields or magnetic fields form.

(8) Vibrations and shocks are transmitted directly to the system.

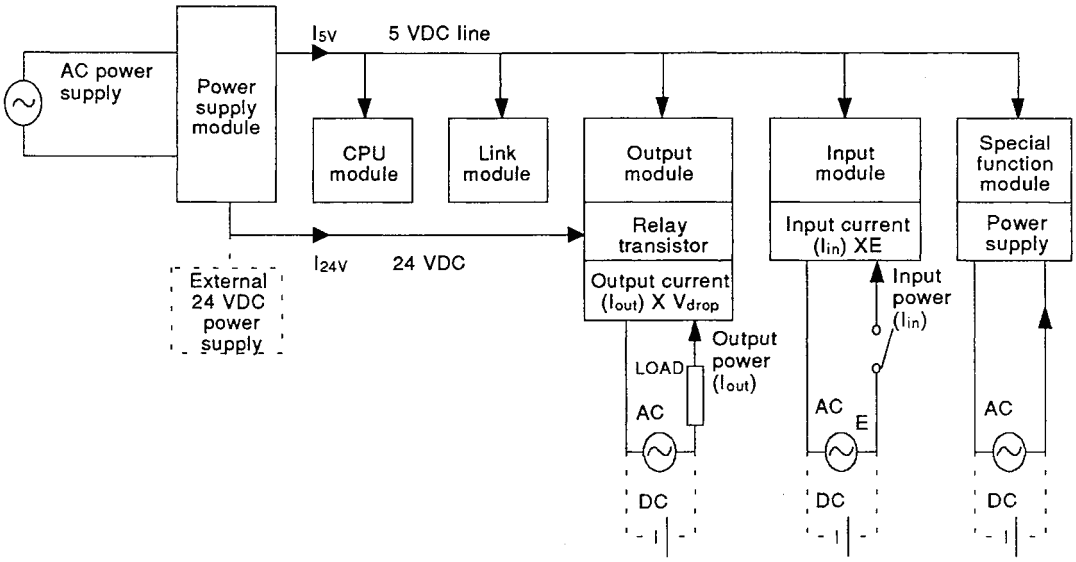
## 8.3 Calculation Method of Heat Amount Generated by the PLC

The operating ambient temperature in the panel where the PLC is stored must be kept 55°C or less. For heat dissipation design of the panel, it is necessary to know the average power consumption (heat generation) of the devices and machinery stored inside. In this section, a method to obtain the average power consumption of the PLC system is explained.

Calculate the temperature rise inside the panel from the power consumption.

Average power consumption

The power consuming parts of the PLC may be roughly classified into the following blocks:




(1) Power consumption by power supply module

The power conversion efficiency of the power supply module is about 70%, and 30% is consumed as heat generated, thus, 3/7 of the output power is the power consumption. Therefore, the calculation formula is:

$$Wpw = \frac{3}{7}\left\{(I_{5V} \times 5)+(I_{15V} \times 15)+(I_{24V} \times 24)\right\}(W)$$

$I_{5V}$ : Current consumption of 5VDC logic circuit of each module

$I_{15V}$ : Current consumption of 15VDC external power supply part of special function module

$I_{24V}$ : Average current consumption of 24VDC power supply for output module's internal consumption
(Current consumption equivalent to the points simultaneously ON)

..... Not applicable to a system where 24VDC is supplied externally and a power module which does not have a 24VDC output is used.

(2) Total power consumption of each module at 5VDC logic part

Power of the 5VDC output circuit of the power supply module is the power consumption of each module.

$W_{5V} = I_{5V} \times 5$ (W)

(3) Total 24VDC average power consumption of the output module (power consumption equivalent to the points simultaneously ON)
Average power of the 24VDC output circuit of the power supply module is the total power consumption of each module.

$W_{24V} = I_{24V} \times 24$ (W)

(4) Total 24VDC average power consumption of the output module
(power consumption equivalent to the points simultaneously ON)

$W_{OUT} = I_{OUT} \times Vdrop \times$ Output points $\times$ Simultaneous ON ratio (W)

$I_{OUT}$ :Output current (current actually used) (A)
Vdrop :Voltage dropped across each output module (V)

(5) Average power consumption of the input modules at the input part (power consumption equivalent to the points simultaneously ON)

$W_{IN} = I_{IN} \times E \times$ Input points $\times$ Simultaneous ON (W)

$I_{IN}$ :Input current (effective value for AC) (A)
E :Input voltage (actual operating voltage) (V)

(6) Power consumption of the external power supply part of the special function module is:

$W_S = I_{+15V} \times 15 + I_{-15V} \times 15 + I_{24V} \times 24$ (W)
The total of the power consumption values obtained for each block is power consumption of the entire PLC system.

$W = Wpw + W_{5V} + W_{24V} + W_{OUT} + W_{IN} + W_S$ (W)

Calculate the amount of heat generation and temperature increase inside the panel from the total power consumption (W).

Simplified calculation formula to obtain temperature increase inside panel is shown next:

$$T = \frac{W}{UA} [°C]$$

W : Power consumption of the PLC system as a whole (the value obtained above)
A : Inside surface area of the panel [$m^2$]
U : When the temperature inside panel is kept constant by a fan, etc. ..... 6
When the air inside panel is not circulated ..... 4

| POINT |
|---|
| If the temperature inside the panel exceeds the specified range, it is recommended to install a heat exchanger to the panel to lower the inside temperature. If an ordinary ventilation fan is used, it sucks dust together with the outside air and it may affect the performance of the PLC. |

## 8.4 Installing the Base Units

Precautions concerning installation of the main base unit and extension base unit are described next.

### 8.4.1 Precautions when installing PLC

Precautions concerning the installation of PLC to the panel, etc. are explained below.

(1) To improve the ventilation and to facilitate the exchange of the module, provide at least 80mm (1.18inch) of distance between the top part of the module and any structure or part.

(2) Do not install vertically or horizontally, because of concerns with ventilation.

(3) If there are any protrusions, dents or distortion on the installation surface of the base unit, an excessive force is applied to the printed-circuit board and causes problems, so, install to a flat surface.

(4) Avoid sharing the same panel with any source of vibration such as a large-sized electromagnetic contactor or no-fuse breaker, and install it to a separate panel or away from such devices.

(5) Provide wiring ducts as necessary.
However, when the clearance from the top or bottom of the PLC is less than described in Fig. 8.1 and Fig. 8.2, pay attention to the following:
   (a) When installing a duct over the PLC, the height of the duct must be 50mm (1.97inch) or less to allow sufficient air flow.
   Place the PLC in the proper position so that the user can press the hook on the top of the module.
   Module replacement is not possible if the hook cannot be pressed.
   (b) When placing a duct under the PLC, take into account the use of optical fiber cables or coaxial cables as well as the minimum bending radius of the cables.

(6) If any device is placed in front of the PLC (when the PLC is installed on the back of the door), a distance of at least 100mm (3.94inch) must be provided to avoid the influence of radiated noise and heat.
Also, keep at least 50mm (1.97inch) distance from the base unit to any device placed on right or left or the unit.

### 8.4.2 Attachment

Installation location of the main base unit and the extension base unit is shown below.

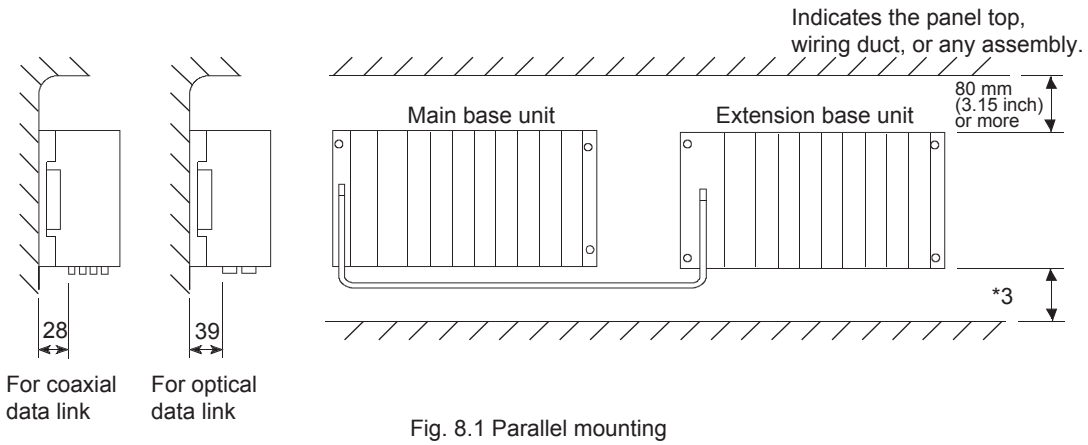
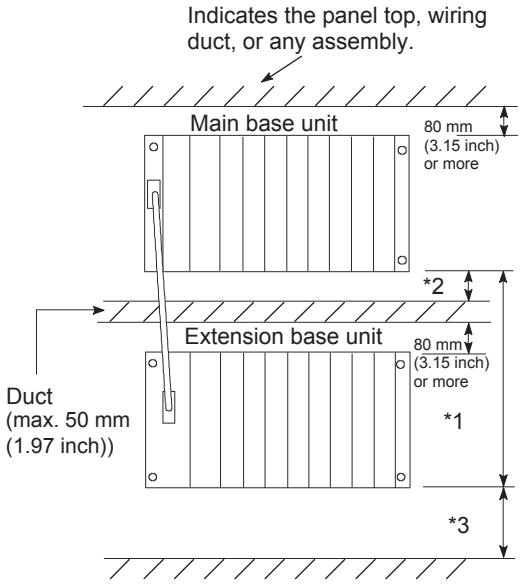



Fig. 8.1 Parallel mounting




*1: .....Depends on the length of the extension cable as indicated below.
For Type AC06B cable ..... 450mm (17.72inch) or less
For Type AC12B cable ..... 1050mm (41.34inch) or less
For Type AC30B cable ..... 2850mm (112.21inch) or less

*2: .....When no link module is used ..... 50mm (1.97inch) or more
When $\phi$4.5mm (0.18inch) dia. optical fiber cable or coaxial cable is used .....100mm (3.94inch) or more
When $\phi$8.5mm (0.33inch) dia. optical fiber cable is used .....130mm (5.19inch) or more
} 100mm (3.94inch) or more

*3: ..... When the link unit is not used.....50mm (1.97inch) or more
When $\phi$4.5mm (0.18inch) dia. optical fiber cable or coaxial cables used .....100mm (3.94inch) or more
When $\phi$8.5mm (0.33inch) dia. optical fiber cable is used .....130mm (5.19inch) or more
} 100mm (3.94inch) or more

Fig. 8.2 Serial mounting

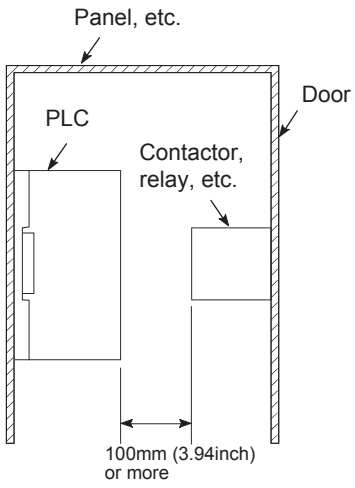



Fig. 8.3 Minimum front clearance with equipment

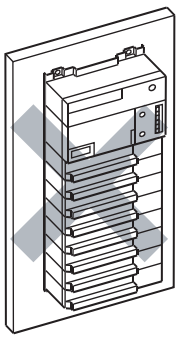


Fig. 8.4 Vertical mounting (Not allowed)

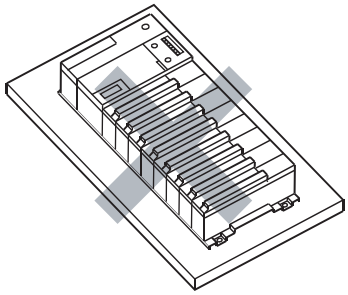


Fig. 8.5 Horizontal mounting (Not allowed)

## 8.5 Installation and Removal of Modules

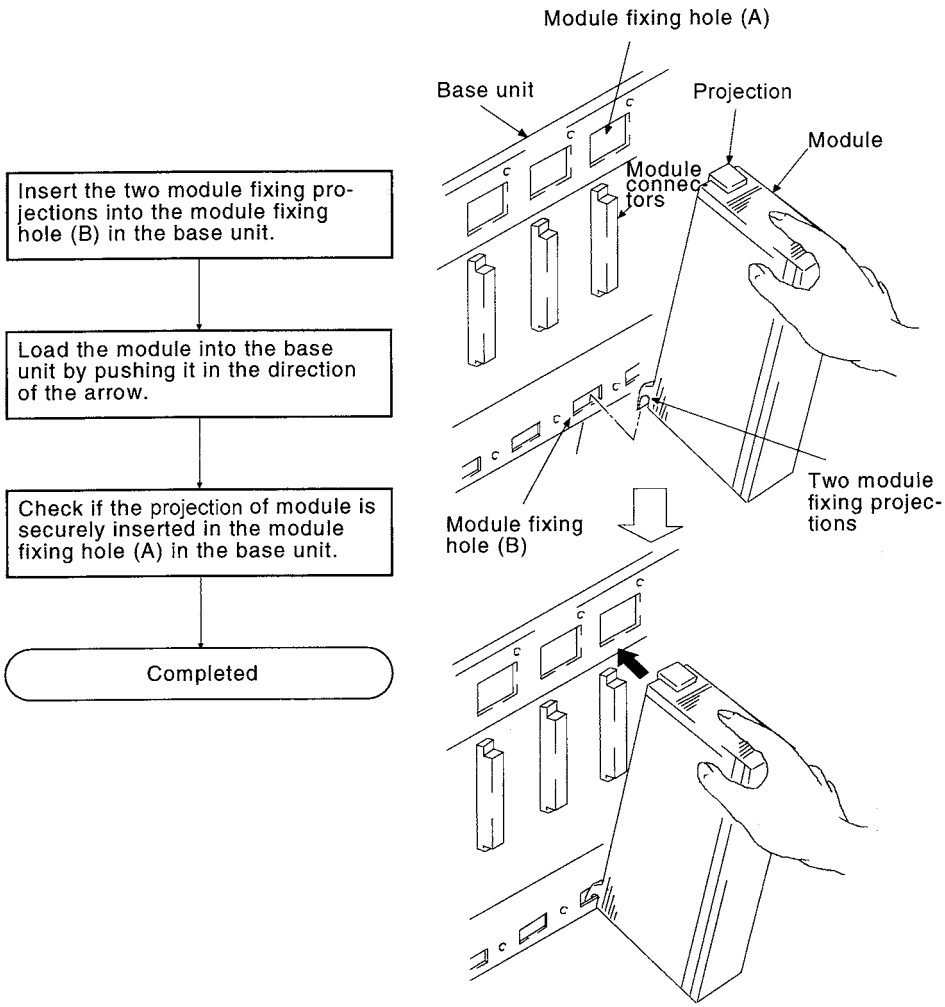
How to install and remove the power supply module, CPU module, I/O module and special function module, etc. to/from the base unit are explained.

**DANGER**

- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may damage the module.
- Before energizing and operating the system after installation or wiring, be sure to attach the terminal cover supplied with the product.
  Failure to do so may cause an electric shock.

(1) Installing a module

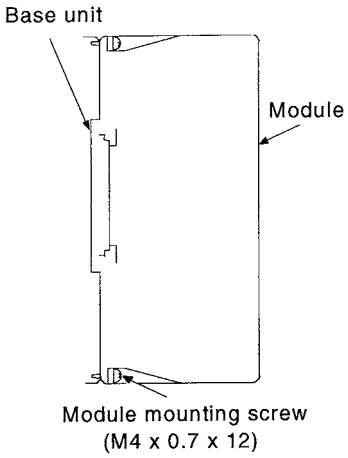
The procedure for mounting a module is described below.



POINT

(1) When fixing a module, make sure to do so by inserting the module fixing projection into the module fixing hole (B). Failure to do so will bend the pins of module connector or damage the module.

(2) For use in an environment with particularly large vibrations and/or shocks, fix the module to the base with screws. The applicable screw size is M4(0.16)×0.7(0.03)×12mm (0.47inch). See the figure on the right.

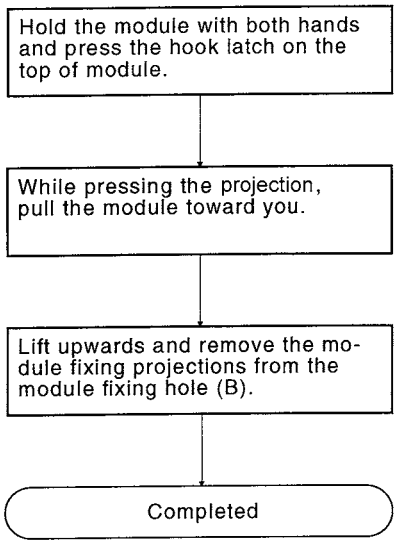


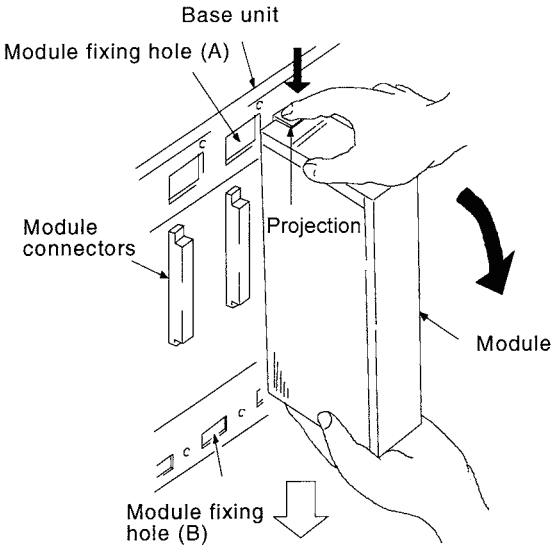

⚠ CAUTION

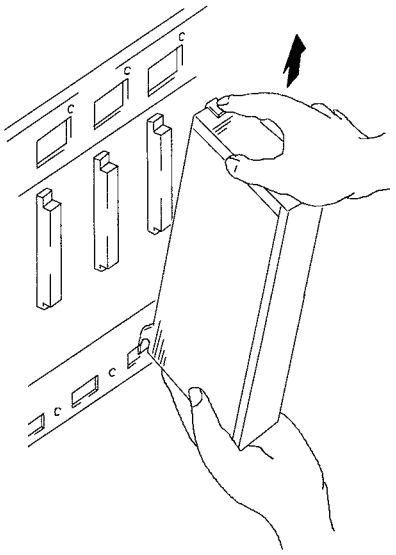
● Insert the module fixing projection into the fixing hole in the base unit to mount the module.
Incorrect loading of the module can cause malfunctions, a failure or a drop of the module.
For use in an environment of frequent vibrations, secure the module with screws.
Tighten the screw within the specified torque range.
If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
Tightening the screw excessively may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.

(2) Removing a module

Removal procedure of the above module is explained below.



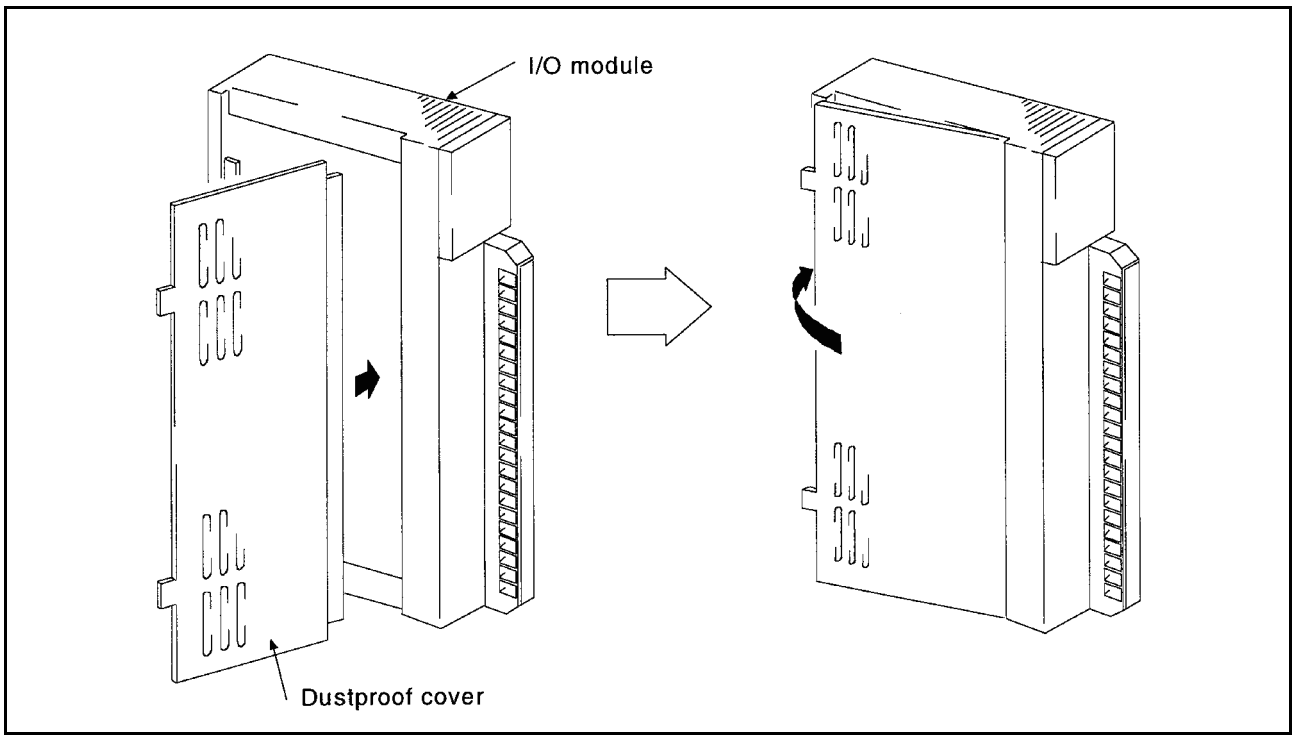



| POINT |
|---|
| Always disengage the hook from the module fixing hole (A) and then remove the module fixing projection from the module fixing hole (B). An attempt to remove the module forcibly may damage the hook or module fixing projection. |

## 8.6 Installation and Removal of the Dustproof Cover

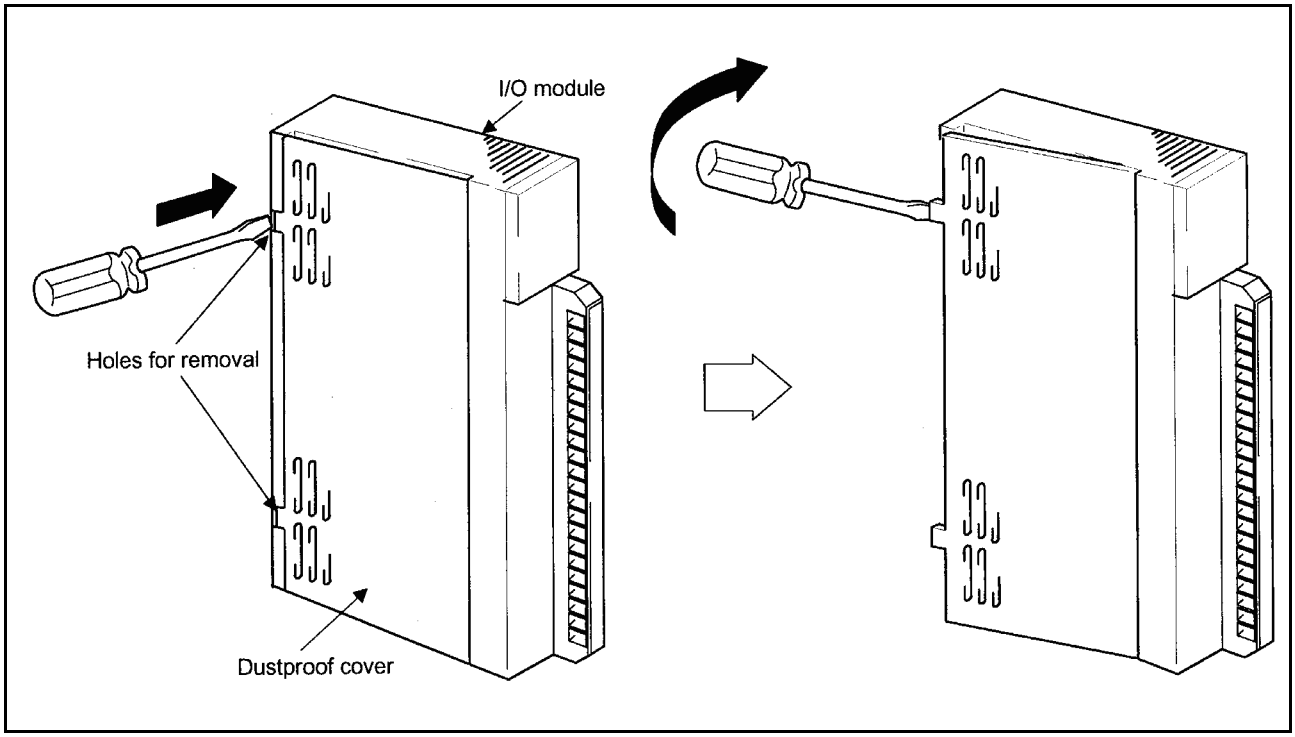
When using the A52B, A55B or A58B, attach the dustproof cover supplied with the extention base unit to the I/O module on the left end. If no dustproof cover is attached, foreign matter will enter the I/O module, causing a failure. Be sure to attach the dustproof cover.
Procedures for installing and removing the dustproof cover are described below.

(1) Attachment




Insert the dustproof cover into the terminal-side groove of the I/O module first as shown in the figure, and then push the dustproof cover.

(2) Removal




To remove the dustproof cover from the I/O module, insert the tip of a flat-head screwdriver into the hole as shown in the figure, then pry the tab of the cover out from the hole using the screwdriver.

## 8.7 Wiring

This section describes details of the wiring that used in systems.

### 8.7.1 Wiring the power supply

Instructions for wiring of power cables or I/O cables are given in this section.

**DANGER**

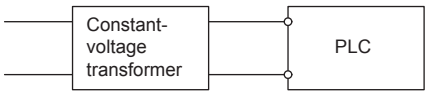
- Be sure to shut off all the phases of the external power supply used by the system before wiring.
  Failure to do so may result in an electric shock or damage of the product.
- Before energizing and operating the system after wiring, be sure to attach the terminal cover supplied with the product.
  Failure to do so may cause an electric shock.

**CAUTION**

- Ground the FG and LG terminals correctly.
  Failure to do so may cause an electric shock or malfunctions.
- Wire the module correctly after confirming the rated voltage and terminal layout.
  Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.
- Do not connect multiple power supply modules to one module in parallel.
  The power supply modules may be heated, resulting in a fire or failure.
- Press, crimp or properly solder the connector for external connection with the specified tool.
  Incomplete connection may cause a short circuit, fire or malfunctions.
- Tighten terminal screws within the specified torque range.
  If the screw is too loose, it may cause a short circuit, fire or malfunctions
  If too tight, it may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.
- Carefully prevent foreign matter such as dust or wire chips from entering the module.
  Failure to do so may cause a fire, failure or malfunctions.
- Install our PLC in a control panel for use.
  Wire the main power supply to the power supply module installed in a control panel through a distribution terminal block.
  Furthermore, the wiring and replacement of a power supply module have to be performed by a maintenance worker who acquainted with shock protection.
  (For the wiring methods, refer to Section 8.7.)

(1) Wiring the power supply

(a) When voltage fluctuates outside the specified value range, connect a constant-voltage transformer.




(b) Use a power supply which generates minimal noise between wires and between the PLC and ground.
If excessive noise is generated, connect an isolating transformer.

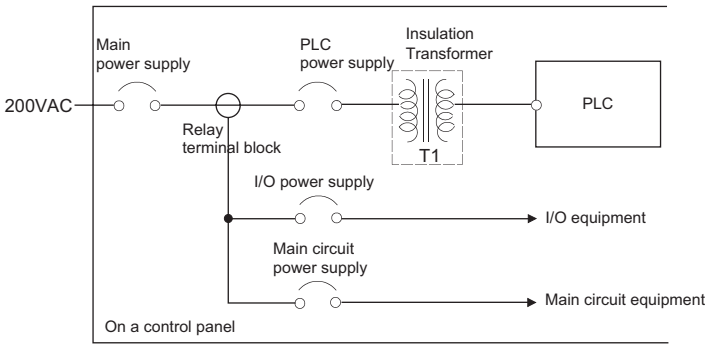
(c) When using a power transformer or an isolating transformer to reduce the voltage from 200VAC to 100VAC, its capacity must be equal to or greater than the corresponding value shown in the following table.

| Power Supply Module | Transformer Capacity |
|---|---|
| A61P, A61PN | 160VA × n |
| A61PEU | 130VA × n |
| A62P, A62PEU | 155VA × n |
| A65P | 110VA × n |
| A66P | 95VA × n |

n: Stands for the number of power supply modules.

(d) Separate the PLC's power supply line from the lines for I/O devices and power devices as shown below.
When there is much noise, connect an isolating transformer.

(e) Taking rated current or inrush current into consideration when wiring the power supply, be sure to connect a breaker or an external fuse that have proper blown and detection.
When using a single PLC, a 10A breaker or an external fuse are recommended for wiring protection.



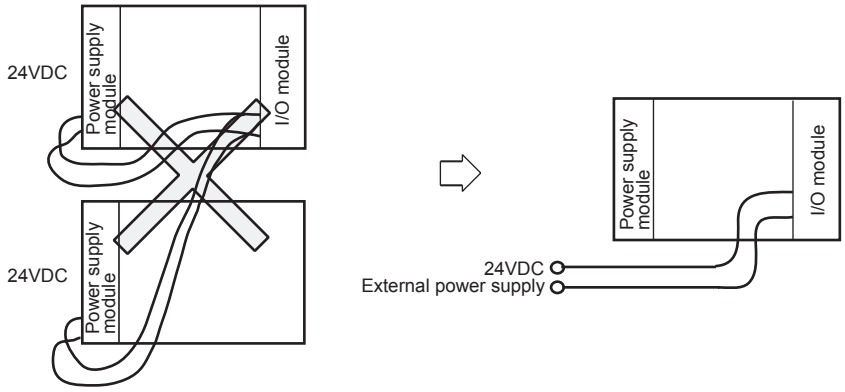

REMARK

As a safety measure, provide a switch for turning on/off the power to each module and equipment to allow "online I/O module replacement".

(f) Precautions for using 24VDC output of the A62P, A62PEU, A65P or A66P power supply module

| CAUTION | ● Do not connect multiple power supply modules to one module in parallel. The power supply modules may be heated, resulting in a fire or failure. |
|---|---|

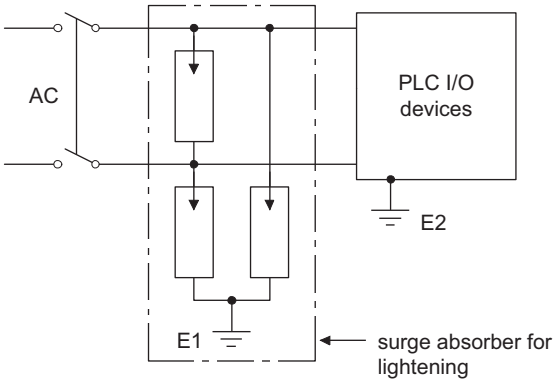
If the 24VDC output capacity from a single power supply module is insufficient, supply it from the external 24VDC power supply.




(g) Twist the 100VAC, 200VAC or 24VDC wires as tightly as possible, and use the minimum length to make connection between modules.
Also, use a thick wire (max. 2 $mm^2$ (0.0031$in.^2$)) to minimize voltage drop.

(h) Do not install 100VAC and 24VDC wires together with main circuit wires (high voltage and large current) or I/O signal lines (including common line). Provide a distance of 100mm (3.94inch) or more between them if possible.

(i) As a measure against lightning surges, connect a lightning surge absorber as shown below.

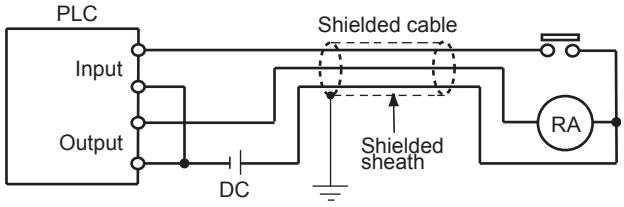



| POINT |
|---|
| (1) Ground the lightning surge absorber (E1) and the PLC (E2) separately from each other.<br>(2) Select a lightning surge absorber whose voltage does not exceed the maximum allowable circuit voltage even when line voltage reaches the maximum. |

(2) Wiring I/O equipment

| CAUTION | ● Do not install the control lines or communication cables together with the main circuit or power lines, or bring them close to each other.<br>Keep a distance of 100mm (3.9inch) or more between them.<br>Failure to do so may cause malfunctions due to noise. |
|---|---|

(a) The applicable wire size for a terminal block connector is 0.75 to 2mm$^2$. It is recommended to use wire of 0.75mm$^2$ for easy use.
(b) Run the input line and output line away from each other.
(c) Separate the I/O signal lines (including common line) at least 100mm (3.94inch) away from the main circuit line carrying high voltage and large current.
(d) If it is not possible, use a batch shielding cable and ground it on the PLC side. However, ground it on the opposite side in some cases.

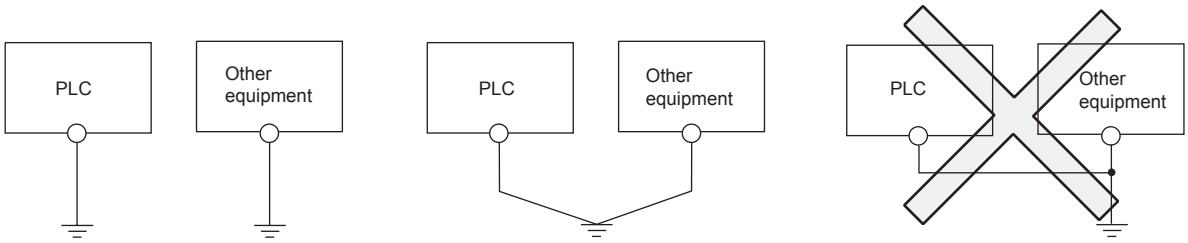



(e) When ducts are used for wiring, securely ground them.
(f) Separate the 24VDC input cables from the 100VAC and 200VAC cables.
(g) In a long distance wiring of 200m (656.2ft.) or longer, leak current due to capacitance may cause failure.
(h) As protective measures against lightning surges, separate the AC wiring from the DC wiring and connect a lightning surge absorber as shown in (1) (i). Failure to do so increases the risk of I/O equipment failure due to lightning.

(3) Grounding

| CAUTION | ● Ground the FG and LG terminals correctly.<br>Failure to do so may cause an electric shock or malfunctions. |
|---|---|

(a) Carry out the independent grounding if possible.
(b) If the independent grounding is impossible, carry out the shared grounding (2) as shown below.

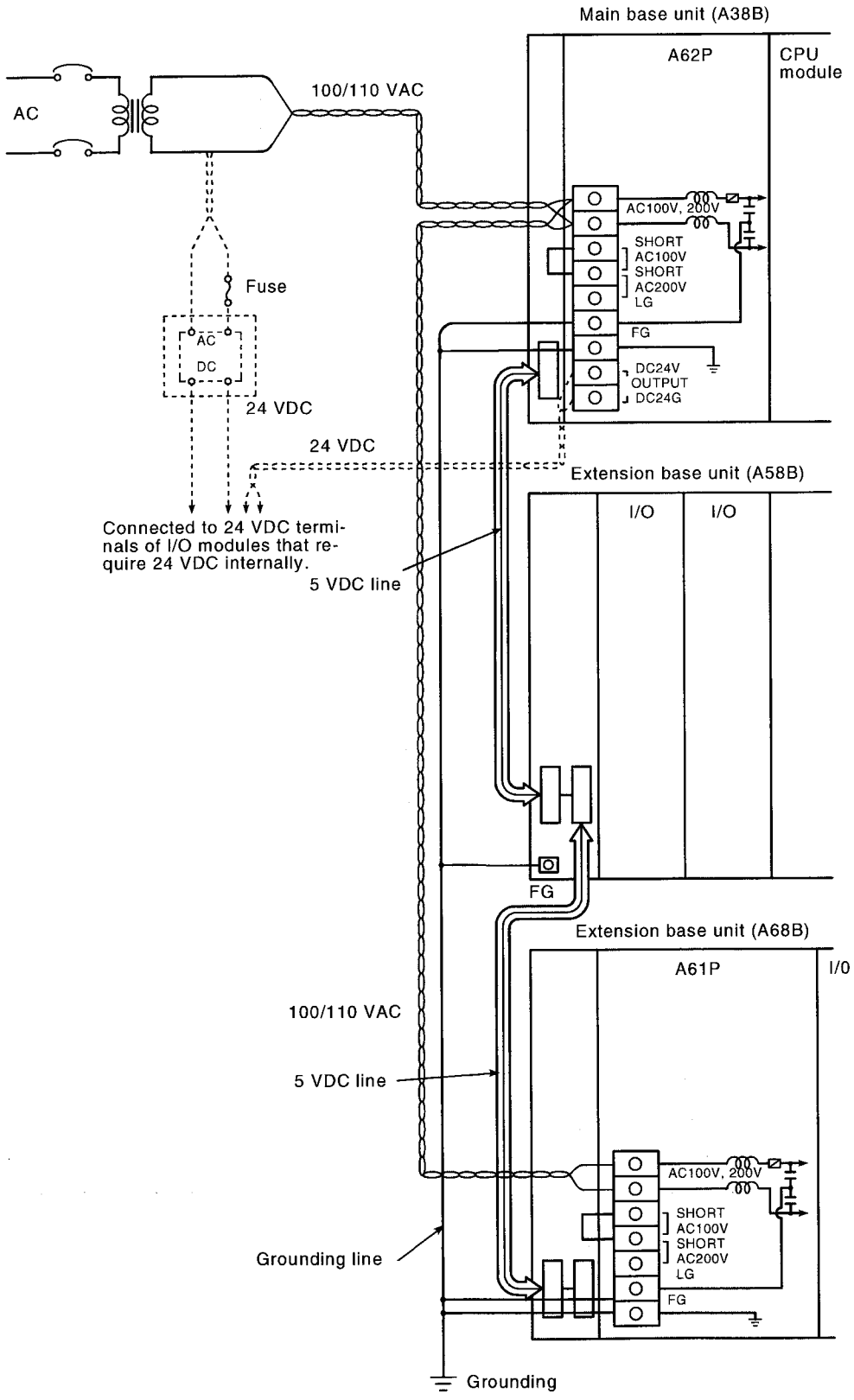



(1) Independent grounding ... Best (2) Joint grounding ... Good (3) Joint grounding ... Not allowed

(c) Use the cable of 2mm$^2$ (0.0031in.$^2$) or more for grounding.
Set the grounding point closer to the PLC to make the grounding cable short as possible.
(d) If any malfunction occurs due to grounding, disconnect either or both of the LG and FG terminals of the base unit from the ground.

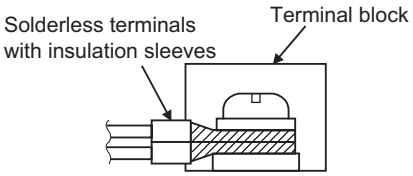
### 8.7.2 Wiring to module terminals

This section provides an example for wiring power cables and ground wires to the main and extension bases.



POINT

(1) Use the thickest possible (max. 2 $mm^2$ (14 AWG)) wires for the 100/200 VAC and 24 VDC power cables. Be sure to twist these wires starting at the connection terminals. For wiring a terminal block, be sure to use a solderless terminal. To prevent short-circuit due to loosening screws, use the solderless terminals with insulation sleeves of 0.8 mm (0.03 inch) or less thick.
The number of the solderless terminals to be connected for one terminal block are limited to 2.




(2) When connection is made between the LG and FG terminals, be sure to ground the wire.
When it is not grounded with LG and FG terminals connected, it will be susceptible to noises.
Note that each LG terminal has half the potential of the input voltage, you might get an electric shock if you touch it.

## 8.8 Precautions when Connecting the Uninterruptible Power Supply (UPS)

Connect the PLC system to the uninterruptible power supply (UPS), while paying attention to the followings.

Use the on-line UPS or line interactive UPS (voltage distortion of 5% or less.)
Alternatively, use the off-line system UPS, i.e., FREQUPS-F series with serial number P or later (manufactured by Mitsubishi Electric). Example: FW-F10-03.K/0.5K
Do not use the off-line system UPS other than above.

# 9 EMC AND LOW VOLTAGE DIRECTIVES

The products sold in the European countries have been required by law to comply with the EMC Directive of the EU Directives since 1996.
The manufacturers must confirm by self-declaration that their products meet the requirements of these directives, and put the CE mark on the products.

## 9.1 Requirements for Compliance with EMC Directives

The EMC Directives specifies emission and immunity criteria and requires the products to meet both of them, i.e., not to emit excessive electromagnetic interference (emission): to be immune to electromagnetic interference outside (immunity). Guidelines for complying the machinery including MELSEC-A series PLC with the EMC Directives are provided in Section 9.1.1 to Section 9.1.6 below.
The guidelines are created based on the requirements of the regulations and relevant standards, however, they do not guarantee that the machinery constructed according to them will comply with the Directives. Therefore, manufacturers must finally determine how to make it comply and how it is compliant with the EMC Directives.

### 9.1.1 EMC standards

Standards related to the EMC directives are described below.

| Specifications | Test Item | Test Description | Standard Values |
|---|---|---|---|
| EN61000-6-4 (2001) | EN55011*2 Radiated noise | Measure the emission released by the product. | 30M-230MHz QP: 30dB $\mu$ /m (30m measurement) *1<br>230M-1000MHz QP: 30dB $\mu$ /m (30m measurement) *1 |
| | EN55011*2 Conduction noise | Measure the emission released by the product to the power line. | 150k-500kHz QP: 79 dB, Mean: 66 dB*1<br>500k-30MHz QP: 73 dB, Mean : 60 dB *1 |
| EN61131-2/A12 (2000) | EN61000-4-2*2 Static electricity immunity | Immunity test by applying static electricity to the module enclosure. | 4kV contact discharge<br>8kV air discharge |
| | EN61000-4-4*2 First transient burst noise | Immunity test by applying burst noise to the power line and signal line. | 2kV power line<br>1kV signal line |
| | EN61000-4-12*2 Damped oscillatory wave | Immunity test in which damped oscillatory waves are applied to power cables. | 1kV |
| | EN61000-4-3*2 Radiated electromagnetic field | Immunity test in which electric fields are applied to the product. | 10V/m, 26-1000MHz |
| EN61000-6-2 (2001) | EN61000-4-6*2 Conduction noise | Immunity test in which electromagnetic fields are induced to power cables and signal line. | 10V, 0.15-80MHz |

*1 QP: Quasi-peak value, Mean: Average value

*2 The PLC is an open type device (device installed to another device) and must be installed in a conductive control panel.The tests for the corresponding items were performed while the PLC was installed inside the control panel.

### 9.1.2 Installation inside the control panel

The PLC is open equipment and must be installed within a control panel for use.* This is effective not only for ensuring safety but also for shielding electromagnetic noise generated from the PLC.

* Each network remote station also needs to be installed inside the control panel. However, waterproof type remote stations can be installed outside the control panel.

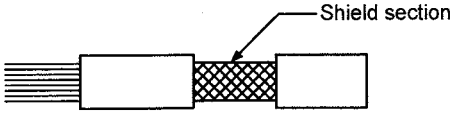
(1) Control panel
  (a) Use a conductive control panel.
  (b) When fixing the top or base plate with bolts, mask the fixing area when painting so that an electrical contact can be made.
  (c) To ensure an electrical contact with the control panel, mask the bolt areas of the inner plates when painting to allow conductivity over the widest possible area.
  (d) Ground the control panel with a thick wire so that a low impedance can be ensured even at high frequencies.
  (e) Holes made in the control panel must be 10cm (3.94inch) diameter or less. If the diameter is more than 10cm (3.94inch), radio waves can be leaked.

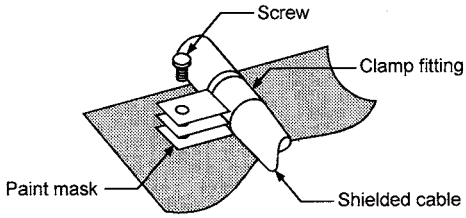
(2) Connection of power cable and ground wires
Handle the power cables and ground wires as described below.
  (a) Provide a grounding point near the power supply module. Ground the power supply module's LG and FG terminals (LG : Line Ground, FG : Frame Ground) with the thickest and shortest wire possible. (The wire length must be 30cm (11.18inch) or shorter.) As the LG and FG terminals release the noise generated in the PLC to the ground, the lowest possible impedance must be ensured. The ground wires also need to be short as they are used to release noise. Because the wire itself carries large noise, short wiring prevents it from acting as an antenna.
  (b) Twist the ground wire led from the grounding point with the power cable. By doing this, noise from the power cable can be released to the ground. If a filter is attached to the power cable, however, this twisting may not be needed.
  (c) Power cable of the external power supply terminal
  Wire the power cable connected to the external power supply terminal of the analog module within 10m (32.81 ft.).

### 9.1.3 Cables

The cables running from the control panel contain a high frequency noise component, and outside the control panel, they release noise acting as antennas. Always use shielded cables when cables connected to I/O modules and/or special modules are to be brought out from the control panel.
Attaching ferrite cores is not required except some CPU types, however, using ferrite cores can restrain noise emanated via cables.
Using shielded cables also increase noise resistance. The signal lines (including common line) of the PLC, which are connected to I/O modules and/or special modules, have noise resistance compliant with EN61131-2/A12(2000) in the condition that shielded cables are to be used. If shielded cables are not used, or if grounding of shielded cables is not correct, the noise resistance will be less than the specified value.

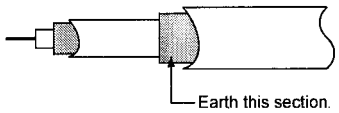
(1) Grounding of shielded cables
   (a) Shielding must be done close to the control panel. Otherwise, electromagnetic induction from the cable after the grounding point will generate high frequency noise.
   (b) Partly remove the outer sheath of the shielded cable so that it can be contacted with the widest possible area of the control panel. A clamp may also be used as shown in the figure below. In this case, cover the control panel's inner surface which will come in contact with the clamp when painting.



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

(a) Use double-shielded coaxial cables (MITSUBISHI CABLE INDUSTRIES, LTD.: 5C-2V-CCY) for the MELSECNET modules (such as AJ71AR21, AJ71BR11) which uses coaxial cables. Radiated noise in the range of 30 MHz or higher can be suppressed by using double-shielded coaxial cables.Ground the double-shielded coaxial cable by connecting its outer shield to the ground.



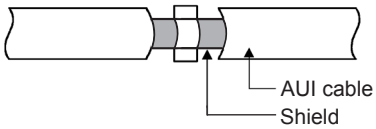

Refer to (1) for the grounding of the shield.

(b) Always attach a ferrite core to the double-shielded coaxial cable connected to the MELSECNET module. In addition, position the ferrite core on each cable near the outlet of the control panel.The ZCAT3035 ferrite core (TDK) is recommended.

(3) Ethernet module

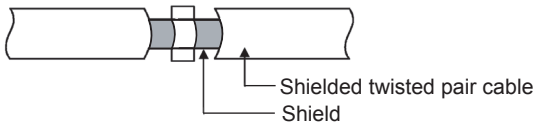
Precautions to be followed when AUI cables[*1], twisted pair cables and coaxial cables are used are described below.

(a) Be sure to ground the AUI cables[*1] connected to the 10BASE5 connectors. Because the AUI cable is of the shielded type, as shown in the figure below, partly remove the outer sheath, and ground the exposed shield section to the widest possible surface.




Refer to (1) for the grounding of the shield.

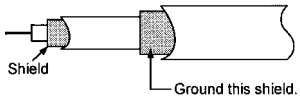
(b) Use shielded twisted pair cables as the twisted pair cables[*1] connected to the 10BASE-T connectors. Partly strip the outer sheath of the shielded twisted pair cable, and ground the exposed shield section to the widest possible area as shown below.




Refer to (1) for the grounding of the shield.

*1 Make sure to attach a ferrite core to the cable.
As a ferrite core, the ZCAT2035 manufactured by TDK is recommended.

(c) Always use double-shielded coaxial cables as the coaxial cables[*2] connected to the 10BASE2 connectors.Ground the double-shielded coaxial cable by connecting its outer shield to the ground.




Refer to (1) for the grounding of the shield.

*2 Make sure to attach a ferrite core to the cable.
As a ferrite core, ZCAT2035 manufactured by TDK is recommended.

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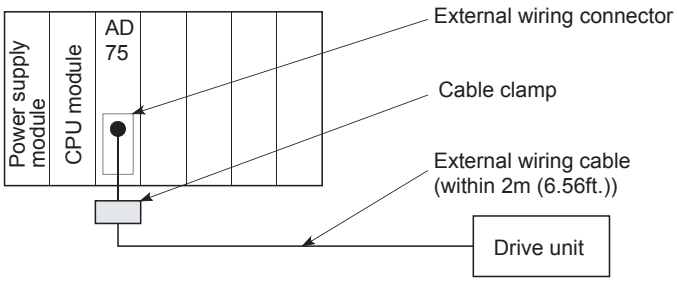
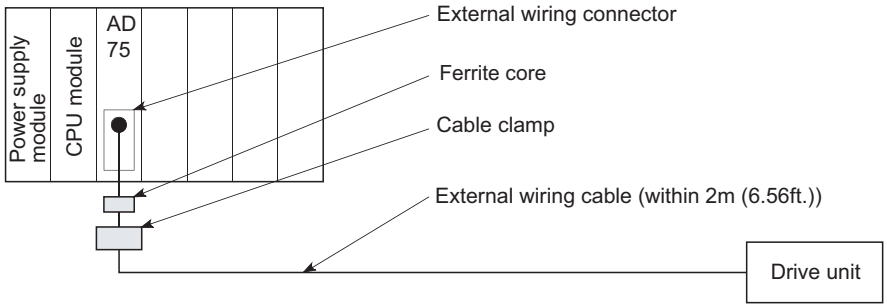
(4) I/O signal cables and other communication cables
Always ground the I/O signal lines (including common line) and other communication cables (RS-232-C, RS-422, etc.) in the same manner as described in (1) if they are brought out of the control panel.

(5) Positioning modules
Precautions for configuring machinery compliant with the EMC Directives using the AD75P□-S3 are described below.

(a) When using a cable of 2m (6.56ft.) or less
- Ground the shield section of the external wiring cable with a cable clamp. (Ground the shield at the closest location to the AD75 external wiring connector.)
- Connect the external wiring cable to a drive unit or an external device in the shortest distance.
- Install the drive unit in the same panel.



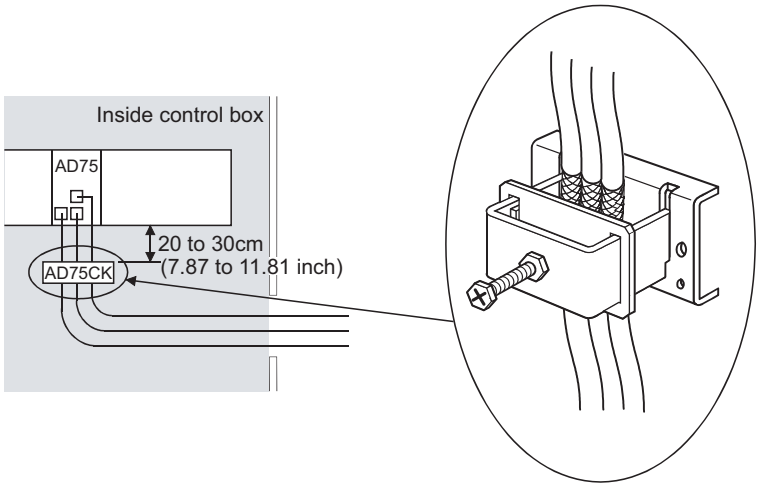
(b) When connecting a cable longer than 2m (6.56ft.), but not exceeding 10m (32.81ft.)
- Ground the shield section of the external wiring cable with a cable clamp. (Ground the shield at the closest location to the AD75 external wiring connector.)
- Install a ferrite core.
- Connect the external wiring cable to a drive unit or an external device in the shortest distance.




(c) Models and required quantities of the ferrite core and cable clamp
- Cable clamp
  Model: AD75CK (Manufactured by Mitsubishi Electric)
- Ferrite core
  Model: ZCAT3035-1330 (TDK ferrite core)
  Contact: TDK Corporation
- Required quantity

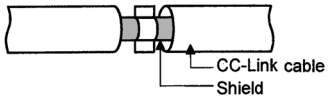
| Cable length | Optional part | Required quantity | | |
|---|---|---|---|---|
| | | 1 axis | 2 axes | 3 axes |
| Within 2m (6.56ft.) | AD75CK | 1 | 1 | 1 |
| 2m (6.56ft.) to 10m (32.81ft.) | AD75CK | 1 | 1 | 1 |
| | ZCAT3035-1330 | 1 | 2 | 3 |

(d) Cable clamp position




(6) CC-Link module

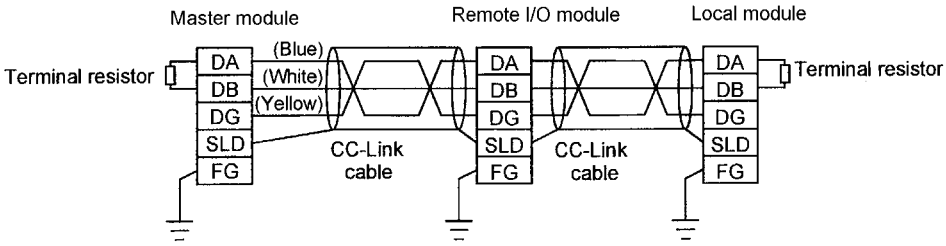
(a) Be sure to ground the shield of the cable that is connected to a CC-Link module close to the exit of the control panel or to any of CC-Link stations within 30cm (11.81inch) from the module or stations.
The CC-Link dedicated cables are shielded cables.As shown in the illustration below, remove a part of the outer sheath and ground it to the widest possible area.




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

(c) Connect the CC-Link module and each CC-Link station to the FG line inside the control panel with the FG terminals as shown below.

[Simplified diagram]




(d) Power line connecting to the external power supply terminal (compliant with I/O power port of CE standard) should be 30m (98.43 ft.) or less.
Power line connecting to module power supply terminal (compliant with main power port of CE standard) should be 10m (32.81 ft.) or less.

(e) A power line connecting to the analog input of the following modules should be 30cm or less.
- AJ65BT-64RD3
- AJ65BT-64RD4
- AJ65BT-68TD

### 9.1.4 Power supply module

The precautions required for each power supply module are described below.Always observe the items noted as precautions.

| Model Name | Precautions |
|---|---|
| A61P, A62P | N/A |
| A63P | Use a CE-compliant 24VDC power supply in the control panel. |
| A61PN, A61PEU, A62PEU, A1NCPU (Power supply part) | Make sure to short and ground the LG and FG terminals. |

### 9.1.5 Ferrite core

Use of ferrite cores is effective in reducing conduction noise in the band of about 10MHz and radiated noise of 30 to 100MHz.
It is recommended to attach ferrite cores when the shield of the shielded cable coming out of control panel does not work effectively, or when emission of the conduction noise from the power supply line has to be suppressed.[*1] The ferrite cores used in our tests are TDK's ZCAT3035.
It should be noted that the ferrite cores should be fitted to the cables in the position immediately before they are pulled out of the enclosure.If the fitting position is improper, the ferrite will not produce any effect.

*1 To comply with CE(EN61131-2/A12), make sure to attach 2 or more ferrite cores to the power supply line.
The position should be as close to the power supply module as possible.
- Ferrite core

  Model: ZCAT2235-1030A (TDK ferrite core)

  Contact: TDK Corporation

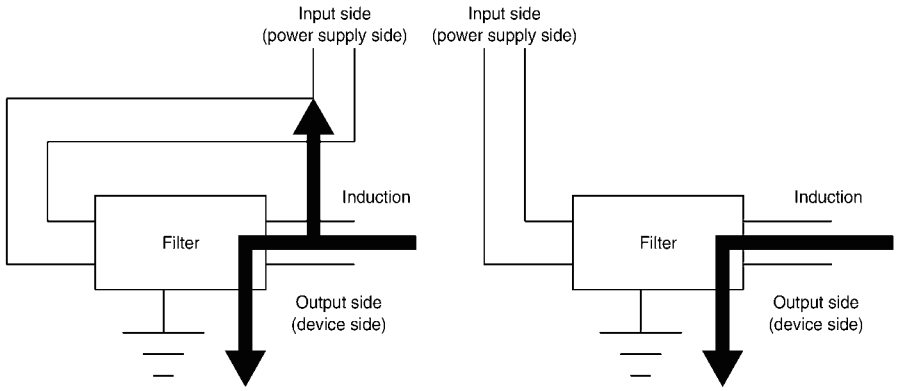
### 9.1.6 Noise filter (power supply line filter)

A noise filter is effective for suppressing conduction noise. It is not required to attach a noise filter to the power supply line except for the A61PEU, A62PEU, and A63P, however, attaching it can suppress more noise. (The noise filter has the effect on reducing conduction noise of 10MHz or less.) Use any of the following noise filters (double$\pi$ type filters) or equivalent.

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

The precautions required when installing a noise filter are described below.

(1) Do not bundle the wires on the input side and output side of the noise filter.When bundled, the output side noise will be induced into the input side wires from which noise has been filtered out.




(a) The noise will be induced when the input and output wires are installed together.

(b) Separate the input wires from the output wires.

(2) Ground the noise filter ground terminal to the control panel with the shortest wire possible (approx. 10cm (3.94inch)).

## 9.2 Requirements for Compliance with Low Voltage Directives

The Low Voltage Directives apply to the electrical equipment operating from 50 to 1000VAC or 75 to 1500VDC; the manufacturer must ensure the safety of the equipment. Section 9.2.1 to Section 9.2.7 provide precautions on installation and wiring of the MELSEC-A series PLC to conform to The Low Voltage Directives.
The descriptions are made based on the requirements and standards of the latest regulation. However, they do not guarantee that any machinery produced according to the contents of this manual is compliant with the above directives. Therefore, manufacturers must finally determine how to make it comply it and how it is compliant with the low voltage directives.

### 9.2.1 Standard applied for MELSEC-A series PLC

The standard applied for MELSEC-A series PLC is EN61010-1: Safety of devices used in measurement, control, or laboratories.

For the modules which operate with the rated voltage of 50 VAC/75 VDC or above, we have developed new models that conform to the above standard.
For the modules which operate with the rated voltage less than 50 VAC or 75 VDC, conventional models can be used, because the low voltage directives do not apply to them.

### 9.2.2 Precautions when using the MELSEC-A series PLC

Module selection

(1) Power supply module
Since a power supply module with the rated input voltage of 100/200VAC has a potentially hazardous voltage area (42.4V or more at the peak), select a model in which reinforced insulation is provided between the primary and secondary sides.
For those of 24VDC rated input, conventional models can be used.

(2) I/O module
Since an I/O module with the rated input voltage of 100/200VAC has a potentially hazardous voltage area, select a model in which reinforced insulation is provided between the primary and secondary sides.
For those of 24VDC rated input, conventional models can be used.

(3) CPU module, memory cassette, base unit
Conventional models can be used for these modules, because they only have a 5VDC circuit inside.

(4) Special function module
Conventional models can be used for the special function modules including analog modules, network modules, and positioning modules, because their rated voltage is 24VDC or lower.

(5) Display
Use the CE-marked product.

### 9.2.3 Power supply

The insulation specification of the power supply module was designed assuming installation category II. Be sure to use the installation category II power supply to the PLC. The installation category indicates the durability level against surge voltage generated by a thunderbolt. Category I has the lowest durability; and category IV has the highest durability.

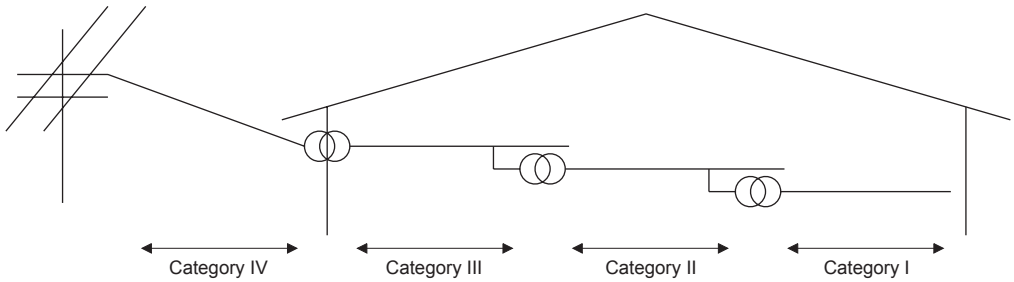



Fig.9.1 Installation category

Category II indicates a power supply whose voltage has been reduced by two or more levels of isolating transformers from the public power distribution.

### 9.2.4 Control panel

Because the PLC is an open type device (a device designed to be stored within another device), be sure to use it inside the control panel.*

* Also, each network remote station needs to be installed inside the control panel.However, the waterproof type remote station can be installed outside the control panel.

(1) Shock protection

To prevent personnel such as operators who are not familiar with electricity from electric shocks, the control panel must be handled as follows:

(a) Lock the control panel so that only the qualified personnel can open it.

(b) Provide a mechanism so that opening the control panel will automatically stop the power supply.

(c) For electric shock protection, use IP20 or greater control panel.

(2) Dustproof and waterproof features

The control panel also has the dustproof and waterproof functions.Insufficient dustproof and waterproof features lower the insulation withstand voltage, resulting in insulation destruction.As our PLCs are designed assuming the pollution level 2, use them in an environment of pollustion level 2 or lower.

Pollution level 1: An environment where the air is dry and conductive dust does not exist.

Pollution level 2: An environment where conductive dust does not usually exist, however, temporary conductivity may occasionally occur due to accumulated dust. Generally, this is the level for the inside of the IP54-equivalent control panel in a control room or on a shop floor.

Pollution level 3: An environment where conductive dust exits and conductivity may be generated due to accumulated dust. An environment for a typical factory floor.

Pollution level 4: Continuous conductivity may occur due to rain, snow, etc. An outdoor environment.

As shown above, the PLC can meet pollution level 2 when stored in a control panel equivalent to IP54.

9.2.5 Module installation

(1) Installing modules contiguously
The left side face of each A series I/O module is open. When installing I/O modules to the base, do not allow any empty slots between modules. If a slot to the left of a 100/200VAC module is left empty, the circuit board containing the hazardous voltage circuit is exposed. When a slot needs to be left empty, be sure to mount the blank cover (AG60).
When using the A5□B expansion base with no power supply, attach the included cover to the side of the leftmost module.

9.2.6 Grounding

There are two kinds of ground terminals as shown below.Either ground terminal must be used grounded.
Be sure to perform protective grounding to ensure the safety.

Protective grounding ⏚ : Ensures the safety of the PLC and improves the noise resistance.

Functional grounding ⏚ : Improves the noise resistance.

9.2.7 External wiring

(1) Module power supply and external power supply
For the remote module which requires 24VDC as module power supply, the 5/12/24/48VDC I/O module, and the special function module which requires the external power supply, use the 5/12/24/48VDC circuit which is doubly insulated from the hazardous voltage circuit or use the power supply whose insulation is reinforced.

(2) External devices
When a device with a hazardous voltage circuit is externally connected to the PLC, use a model whose circuit section of the interface to the PLC is intensively insulated from the hazardous voltage circuit.

(3) Reinforced insulation
Reinforced insulation refers to the insulation with the dielectric withstand voltage shown in Table 1.

Reinforced Insulation Withstand Voltage (Installation Category II, source : IEC664)

| Rated voltage of hazardous voltage area | Surge withstand voltage (1.2/50μs) |
|---|---|
| 150VAC or less | 2500V |
| 300VAC or less | 4000V |

# 10 MAINTENANCE AND INSPECTION

**DANGER**

- Do not touch any terminal during power distribution.
  Doing so may cause an electric shock.
- Properly connect batteries.
  Do not charge, disassemble, heat or throw them into the fire and do not make them short-circuited and soldered. Incorrect battery handling may cause personal injuries or a fire due to exothermic heat, burst and/or ignition.
- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws or module mounting screws.
  Failure to do so may result in an electric shock.
  If they are too loose, it may cause a short circuit or malfunctions.
  Tightening the screw excessively may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.

**CAUTION**

- When performing online operations (especially, program modification, forced output or operating status change) by connecting a peripheral device to the running CPU module, read the manual carefully and ensure the safety.
  Incorrect operation will cause mechanical damage or accidents.
- Do not disassemble or modify each of modules.
  Doing so may cause failure, malfunctions, personal injuries and/or a fire.
- When using a wireless communication device such as a mobile phone, keep a distance of 25cm (9.84inch) or more from the PLC in all directions.
  Failure to do so may cause malfunctions.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may result in failure or malfunctions of the module.
- Do not drop or apply any impact to the battery.
  Doing so may damage the battery, resulting in electrolyte spillage inside the battery.
  If any impact has been applied, discard the battery and never use it.
- Before handling modules, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunctions of the module.

In order to use the PLC always in good condition, conducting daily and periodical maintenance/inspection on the following items are strongly recommended.

## 10.1 Daily Inspection

Dairy inspection items recommended are shown in Table 10.1.

Table 10.1 Dairy inspection

| Item | Check item | | Content of inspection | Judgement | Action |
|---|---|---|---|---|---|
| 1 | Installation condition of the base unit | | Confirm if installation screws are not loose or cover is not detached. | It is installed securely. | Retighten the screw. |
| 2 | Installation condition of the I/O modules | | Check if the module is not disengaged and if the hook is securely engaged. | The hook should be securely engaged and the module should be positively mounted. | Securely engage the hook. |
| 3 | Connection condition | | Loosening of terminal screw | No loosening. | Retighten the terminal screw. |
| | | | Proximity of solderless terminals. | There is an appropriate distance. | Correct the distance. |
| | | | Connector areas of extension cable | No loosening at connectors. | Retighten the connector fixing screw. |
| 4 | LEDs on the main module | "POWER" LED | Confirm it is ON. | The LED is ON. (Faulty if it is OFF.) | Refer to Section 11.2.2. |
| | | "RUN" LED | Confirm it is ON in the "RUN" state. | The LED is ON. (Faulty if it is OFF or flickering.) | Refer to Section 11.2.3, Section 11.2.4. |
| | | "ERROR" LED | Confirm it is ON when an error occurs. | OFF (ON when an error occurs.) | Refer to Section 11.2.5, Section 11.2.6. |
| | | Input LED | Confirm if it correctly turns on and off. | The LED is ON when input is ON, and OFF when input is OFF. (Faulty other than the above.) | Refer to Section 11.4.1. |
| | | Output LED | Confirm if it correctly turns on and off. | The LED is ON when output is ON, and OFF when output is OFF. (Faulty other than the above.) | Refer to Section 11.4.2. |

REMARK

To replace I/O modules while the PLC is RUN, use the sequence program or peripheral devices to specify the module to be replaced and turn ON the I/O replacement flag (M9094). Refer to the ACPU/QCPU-A (A Mode) Programming Manual (Fundamentals) for details.

## 10.2 Periodic Inspection

Inspection on items shown below should be conducted once or twice every six months to a year.Conduct the inspection when the equipment is moved or modified, or wiring is changed.

Table 10.2 Periodic inspection

| Item | Check Item | | Content of Inspection | Judgement | Action |
|---|---|---|---|---|---|
| 1 | Ambient environment | Ambient temperature | Measure with temperature and humidity gauge. Measure presence of corrosive gasses. | 0 to 55℃ | When used in a panel, temperature inside the panel is the ambient temperature. |
| | | Ambient humidity | | 10 to 90%RH | |
| | | Atmosphere | | There is no corrosive gas present. | |
| 2 | Line voltage check | | Measure voltage between 100/200VAC terminals. | 85 to 132VAC | Change the power supply. |
| | | | | 170 to 264VAC | |
| | | | | 15.6 to 31.2VDC | |
| | | | | 85 to 140VDC | |
| 3 | Installation condition | Loosening, backlash | Test by moving the module. | Must be installed solidly. | Retighten the screw. For CPU, I/O, or power supply module, if loosened, secure it with screws. |
| | | Adhesion of dirt or foreign matters | Visual inspection | No adhesion. | Remove and clean. |
| 4 | Connection condition | Loosening of terminal screw | Retighten with a screwdriver. | No loosening. | Retighten. |
| | | Proximity of solderless terminals | Visual inspection | There is an appropriate distance. | Correct the distance. |
| | | Loosening of connector | Visual inspection | No loosening. | Retighten the connector fixing screw. |
| 5 | Battery | | Confirm M9006 or M9007 is OFF with a peripheral device in the monitoring mode. | (Preventive maintenance) | Even when there is no low-battery display, replace if specified life is exceeded. |
| 6 | Fuse | | Check if the fuse is blown. | (Preventive maintenance) | Even if a fuse has not blown, the element may have deteriorated due to inrush current, and the fuse should therefore be changed at regular intervals. |

## 10.3 Battery Replacement

| | |
|---|---|
| DANGER | ● Properly connect batteries.Do not charge, disassemble, heat or throw them into the fire and do not make them short-circuited and soldered.<br>Incorrect battery handling may cause personal injuries or a fire due to exothermic heat, burst and/or ignition. |

M9006 or M9007 is turned ON when voltage of the battery for backing up programs and power failure compensation function drops. Even though programs and contents of power failure compensation function are not erased immediately when these special relays become ON, the contents could be erased if the ON-status of the special relay fails to be recognized.
Replace the battery while the total period of power failure is less than shown in Table 10.3 from when the M9006 or M9007 is turned ON.
Yardstick for battery life and the specifics of replacement are explained below.

### 10.3.1 Battery life

The battery life is shown in Table 10.3.

Table10.3 Battery life

| Memory Cassette Model Name | Battery life (total power failure time) [Hr] | | |
|---|---|---|---|
| | Guaranteed value (MIN) | Actual value (TYP) | After M9006 or M9007 turns ON |
| A1NCPU | 7200 | 18000 | 168 |
| A3NMCA-0 | 10800 | 27000 | 168 |
| A3NMCA-2 | 7200 | 18000 | 168 |
| A3NMCA-4 | 5400 | 13000 | 168 |
| A3NMCA-8 | 3600 | 9000 | 168 |
| A3NMCA-16 | 2150 | 5400 | 168 |
| A3NMCA-24 | 1950 | 4900 | 168 |
| A3NMCA-40 | 1400 | 3500 | 168 |
| A3NMCA-56 | 450 | 1125 | 168 |

* Actual value indicates a rough average value and guaranteed value indicates the minimum value.

Yardsticks for preventive maintenance are as follows:
[1] Replace in 4 to 5 years even when the total power failure time is less than the guaranteed value shown in the table above.
[2] Replace when the total power failure time exceeds the guaranteed value shown in the table above and the M9006 is ON.

POINT

(1) Replace batteries regularly so that the battery use hours (total power failure time) do not exceed the guaranteed values.
(2) When the battery hours (total power failure time) exceed the guaranteed value, perform ROM operation to protect a program in case that the battery dies at PLC power supply OFF, or back up a program and data within specified time as shown in the table 10.3 after M9006 (battery low) is ON.
(3) When a PLC power supply is ON or CPU module reset is cancelled, a CPU module reviews the status of data below, and initializes all the data if detecting an error.
- Breakdown history
- Latch data (latch relay (L), latch setting range device set in a parameter)
- Sampling trace data
- Status latch data
- Special relay M9102 (SFC program continue start)

### 10.3.2 Battery replacement procedure

Replace the battery according to the following procedure when life of the battery is over. Even when the battery is removed memory is backed up by the capacitor for a while. However, if replacement takes longer than the guaranteed value shown in Table 10.4, the content of the memory may be erased, so replace the battery quickly.

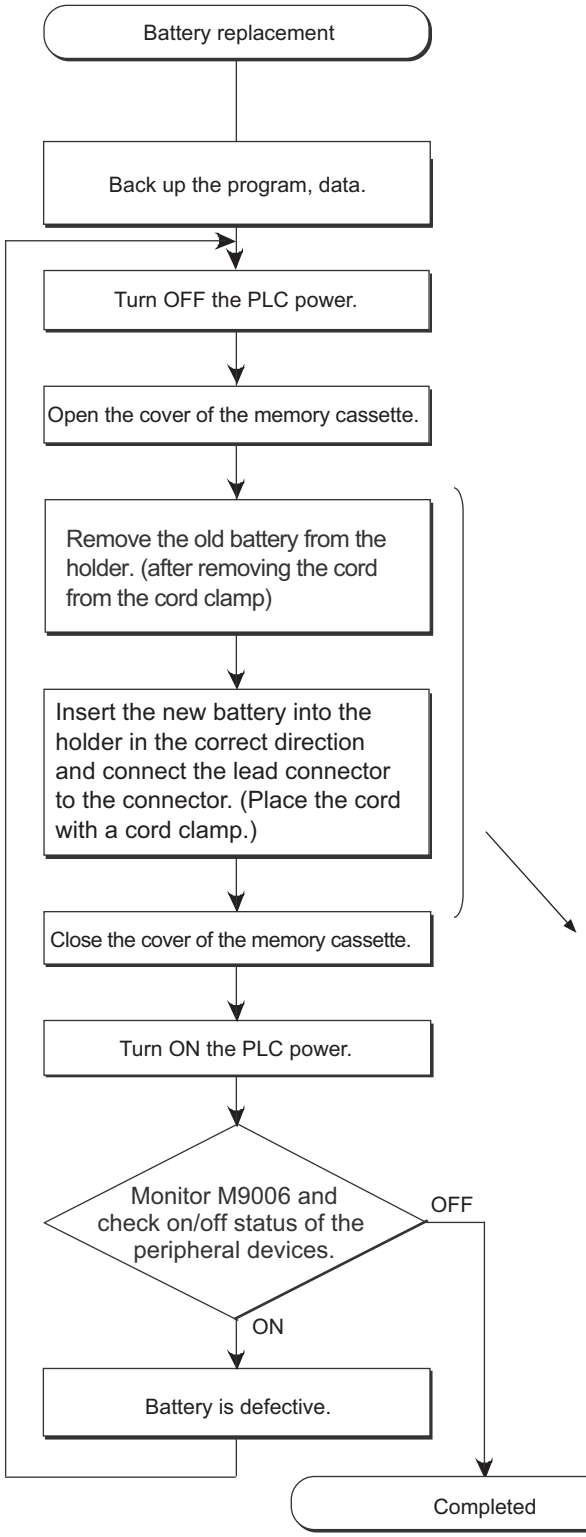
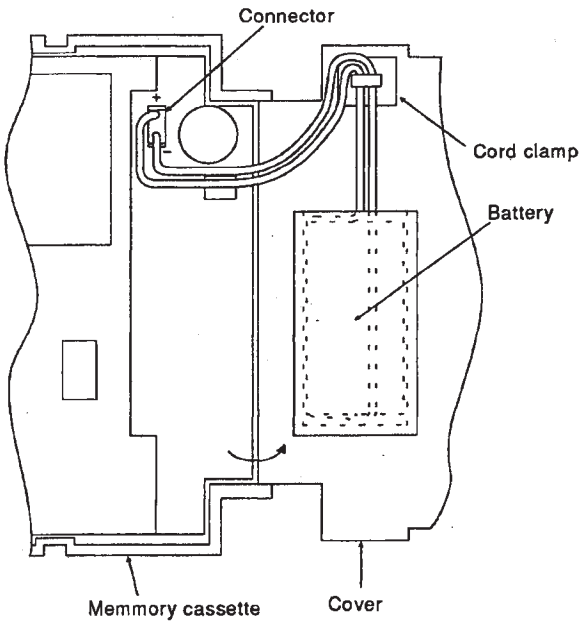



Table 10.4 Period backed up by the capacitor

| Memory Cassette Model Name | Period Backed up by the Capacitor [min] | |
|---|---|---|
| | Guaranteed Value (MIN) | Actual Value (TYP) |
| A1NCPU | 12 | 30 |
| A3NMCA-0 | 18 | 45 |
| A3NMCA-2 | 12 | 30 |
| A3NMCA-4 | 9 | 20 |
| A3NMCA-8 | 6 | 15 |
| A3NMCA-16 | 4 | 10 |
| A3NMCA-24 | 3 | 8 |
| A3NMCA-40 | 2 | 5 |
| A3NMCA-56 | 1 | 3 |



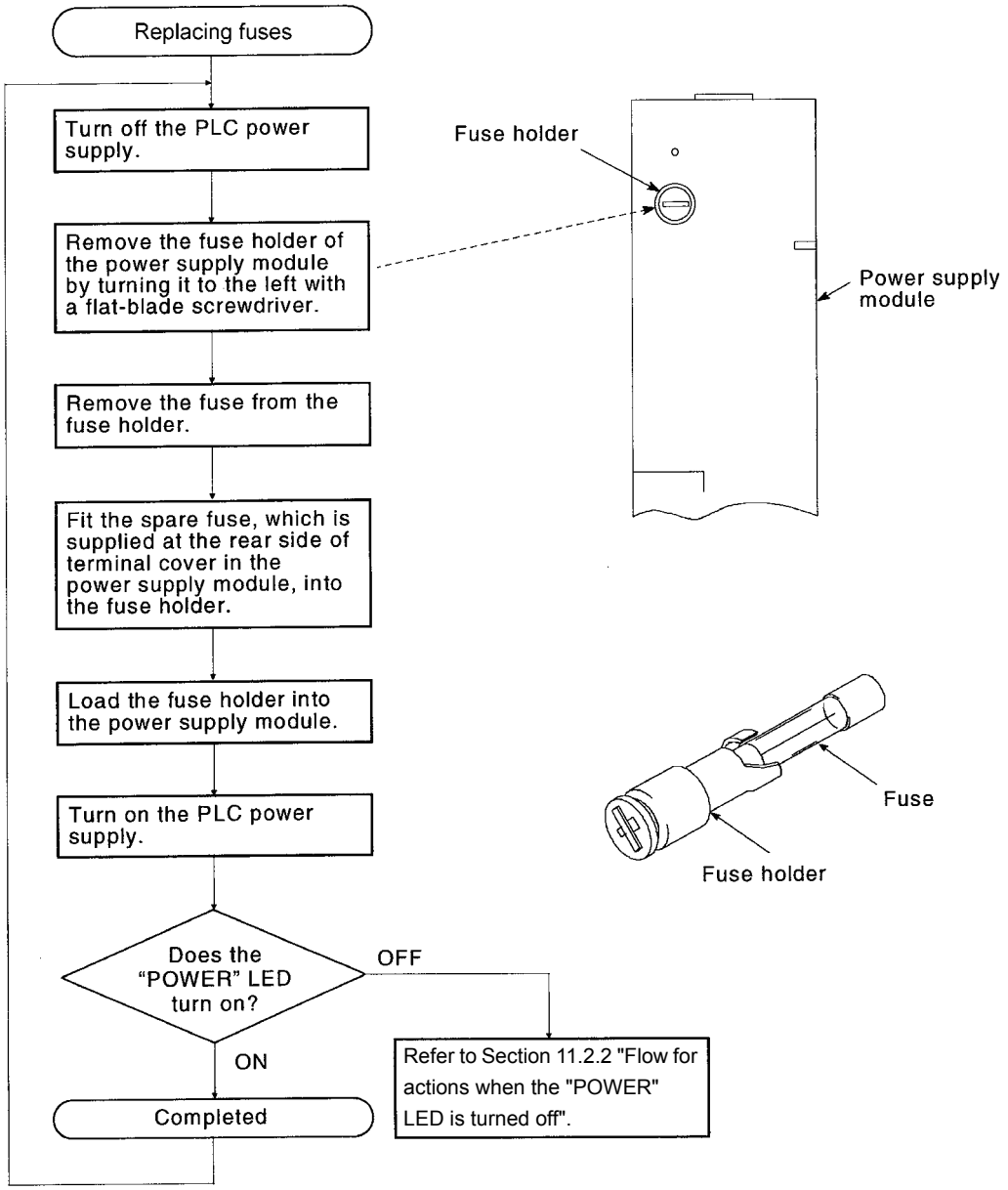
## 10.4 Fuse Replacement

Even if a fuse has not blown, the element may have deteriorated due to inrush current, and the fuse should therefore be changed at regular intervals.

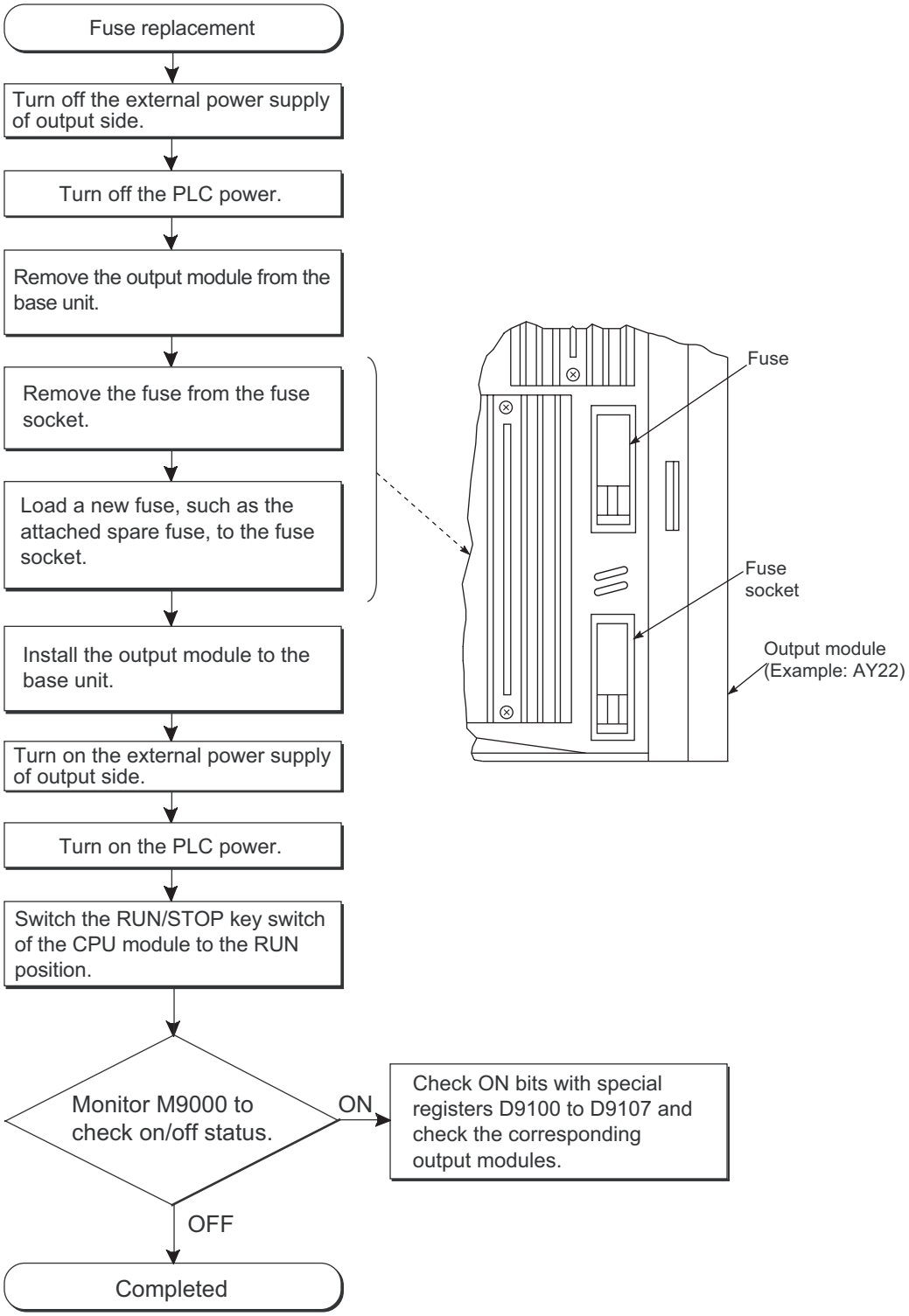
> ⚠ CAUTION
> ● When replacing the fuse, use a fuse specified by the manufacturer.
> Using the one for the high-rated current or an electric wire may cause a fire.

### 10.4.1 Replacement of the fuse for a power supply module

The procedure for replacing the fuse is as follows.



### 10.4.2 Replacement of the fuse for an output module



# 11 TROUBLESHOOTING

The description, cause investigation, and corrective actions of each error which may occur during system usage are described.

## 11.1 Fundamentals of Troubleshooting

Besides using obviously highly-reliable devices to increase system reliability, it is an important point to quickly start up the system again when an error occurs.
In order to quickly start up the system, find the cause of the problem and resolve it. There are the following three basic points to be aware of when performing troubleshooting.

(1) Visual confirmation
Confirm the following points:
(a) Machine operation (stop status and operation status)
(b) Power supply ON/OFF
(c) I/O equipment status
(d) Wiring status (I/O wires and cable)
(e) Display status of each display indicator (POWER LED, RUN LED, ERROR LED, I/O LED, etc.)
(f) Status of each setting switch (extension base, latch, etc.)

After confirming (a) to (f), connect a peripheral device and observe the operation status of the PLC and program contents.

(2) Error confirmation
Observe how the error changes by performing the following operations:
(a) Set the RUN/STOP key switch to "STOP."
(b) Reset using the RESET key switch.
(c) Turn ON/OFF the power supply.

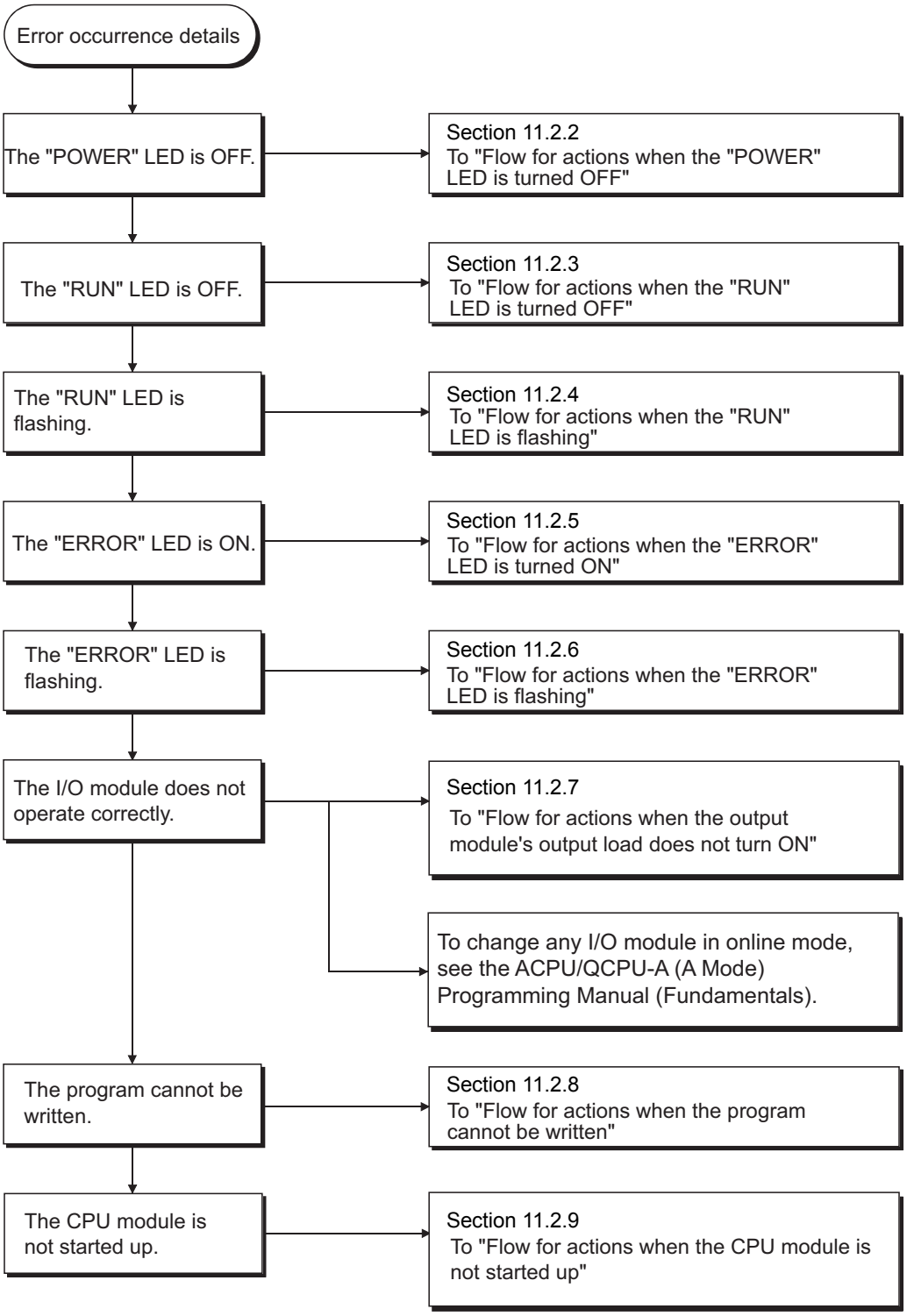
(3) Narrow down the range.
By performing the (1) and (2) above, assume the faulty area in the following:
(a) PLC or external devices?
(b) I/O module or others?
(c) Sequence program?

## 11.2 Troubleshooting

The error definition investigation method, error definition corresponding to the error code, and corrective actions are described.

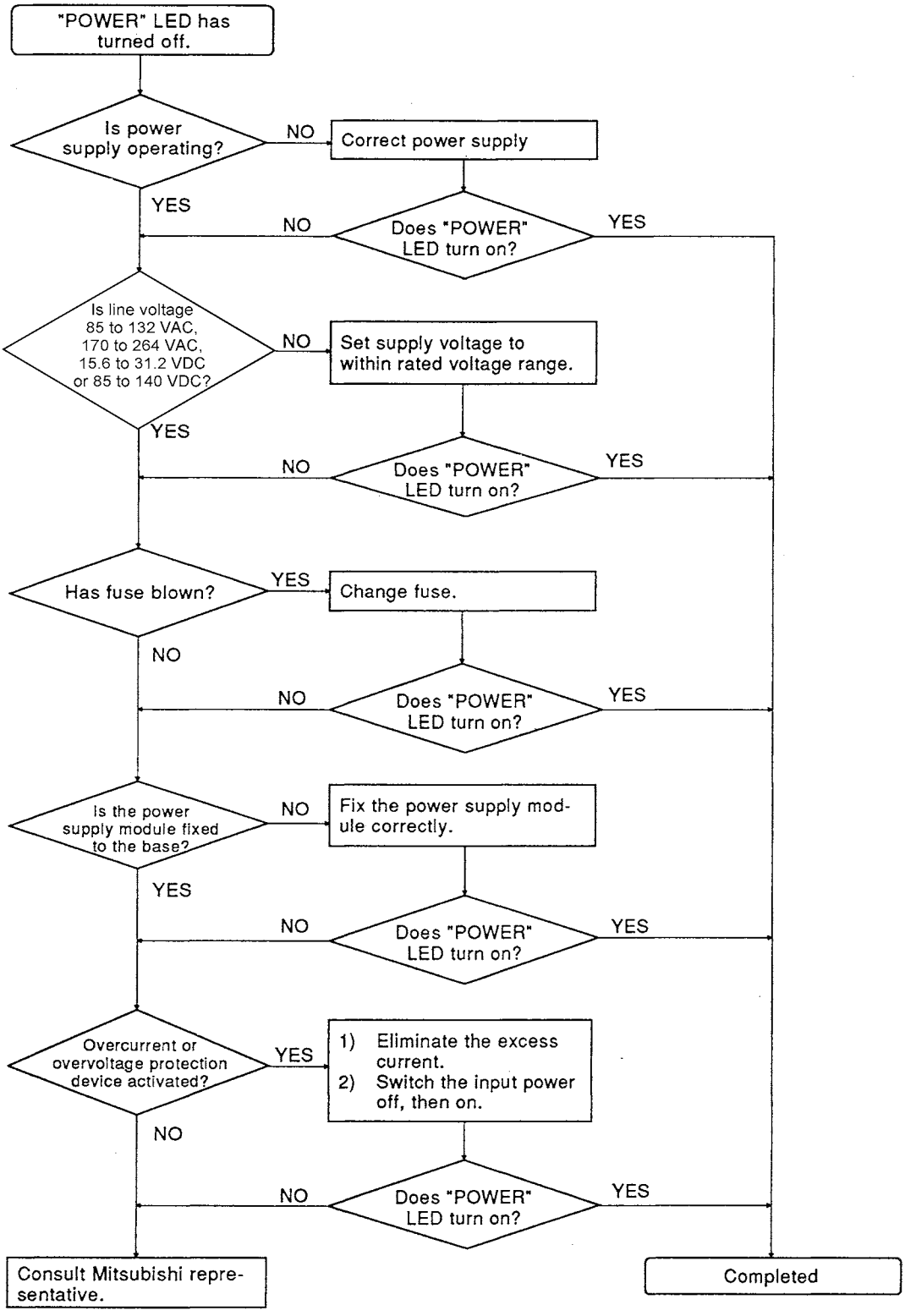
### 11.2.1 Troubleshooting flowchart

The error definitions are described by events.



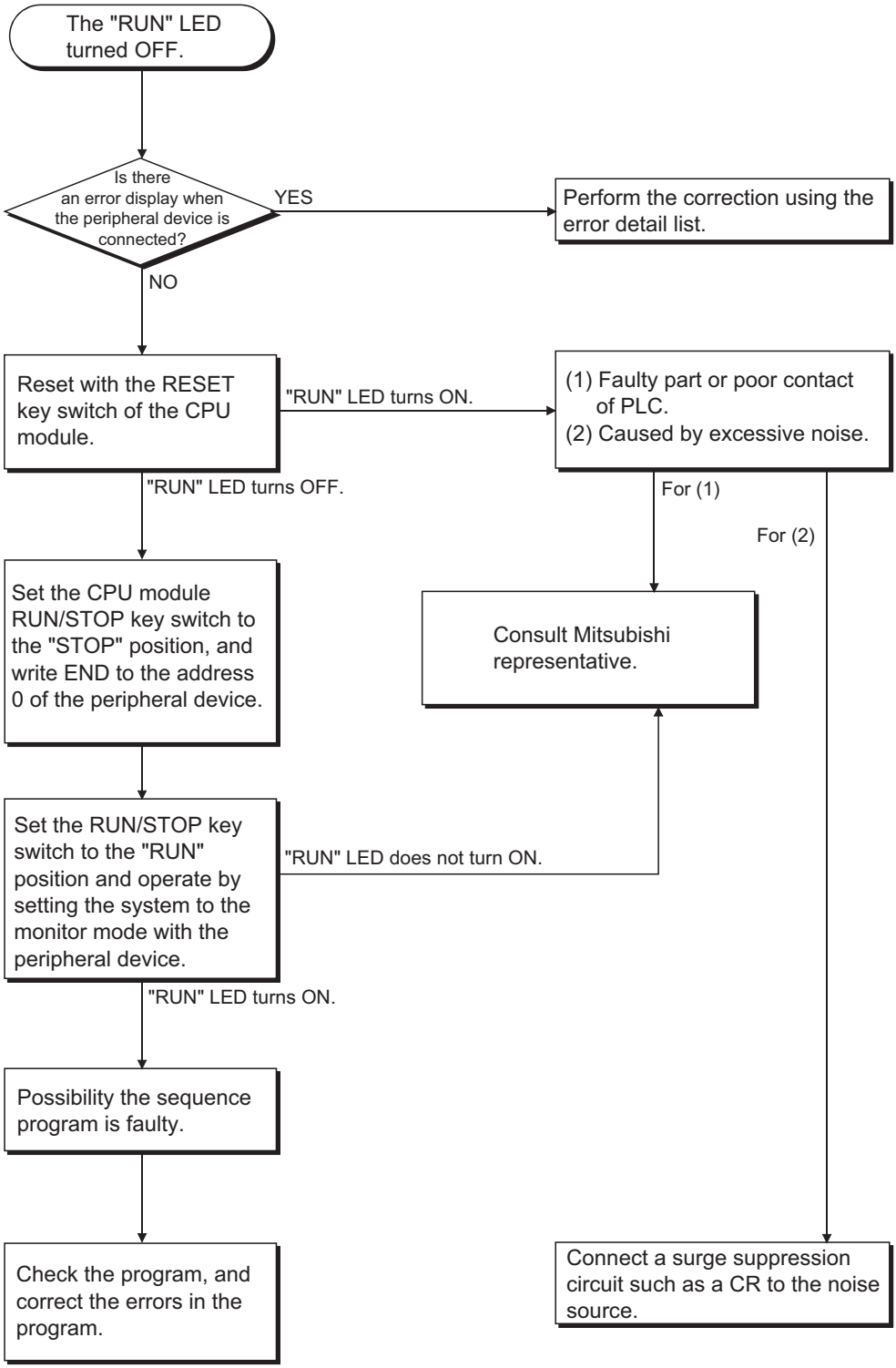
### 11.2.2 Flow for actions when the "POWER" LED is turned OFF

The flow when the PLC power is ON or when the "POWER" LED of the power supply module is ON during operation is described.



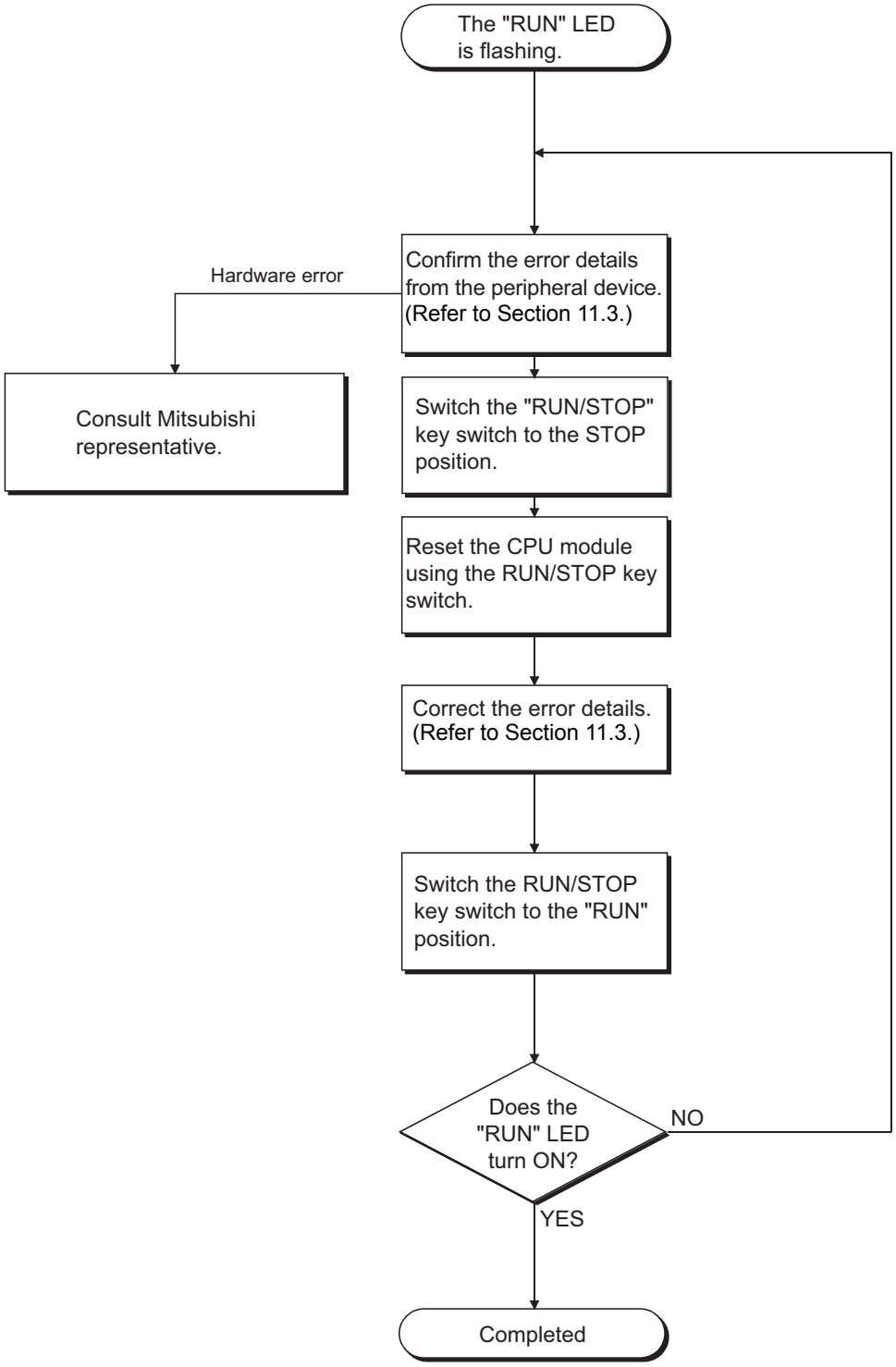
### 11.2.3 Flow for actions when the "RUN" LED is turned OFF

The corrective action when the "RUN" LED turns OFF during operation is described.



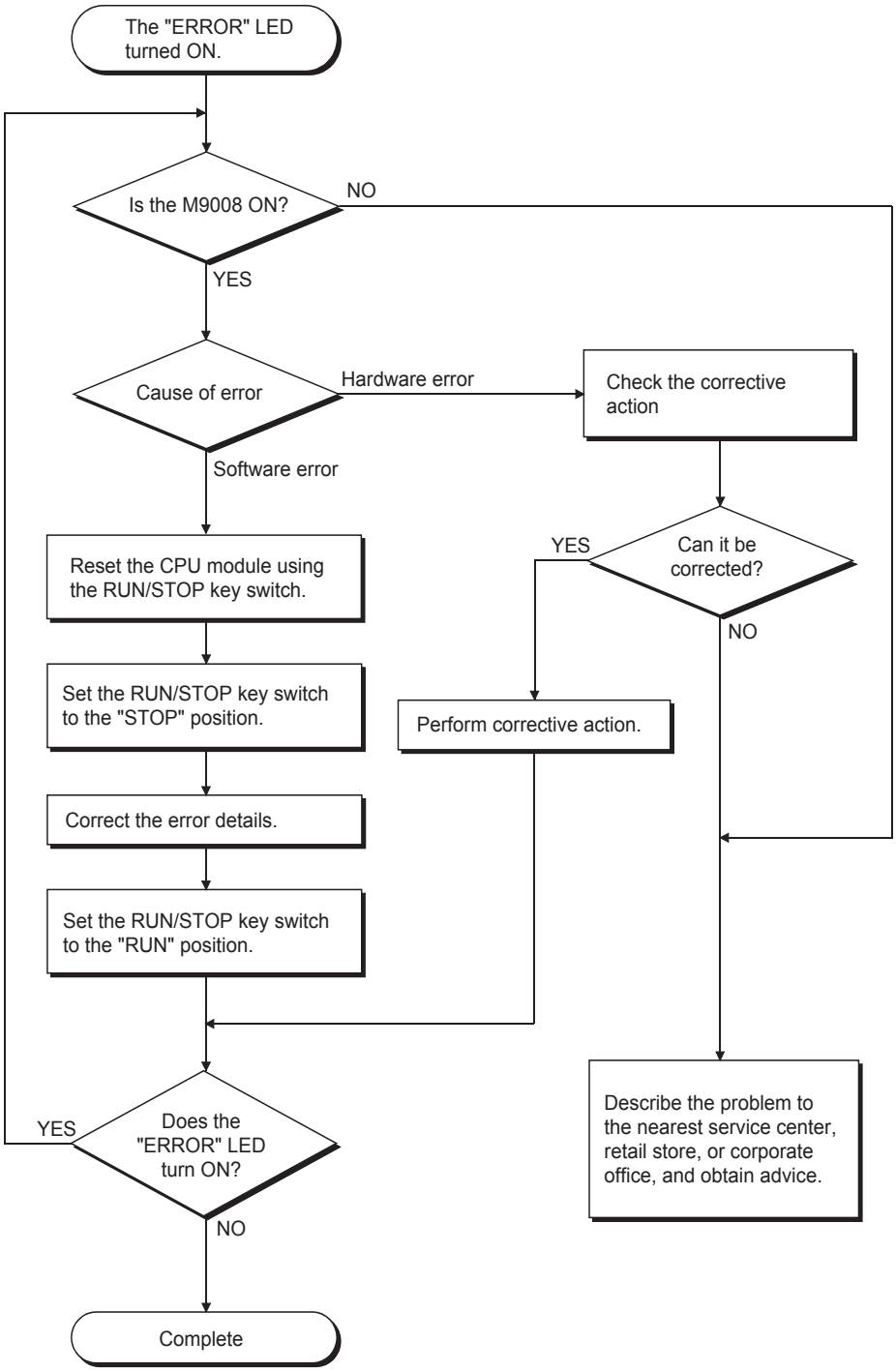
### 11.2.4 Flow for actions when the "RUN" LED is flashing

The corrective action when the "RUN" LED is flashing during power on, start of the operation, or during operation is described.
Note, however, that the A3NCPU show error messages in the front face of the LED display. Refer to Section 11.3 Error Code List to know the meanings and countermeasures of the error messages.



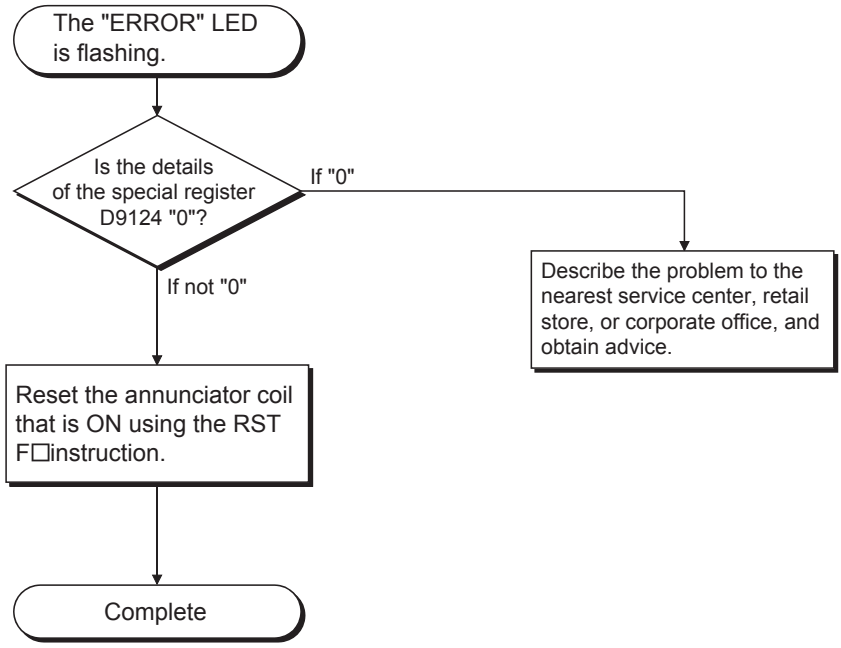
### 11.2.5 Flow for actions when the "ERROR" LED is turned ON

The flow when the "ERROR" LED turns ON during operation is described.



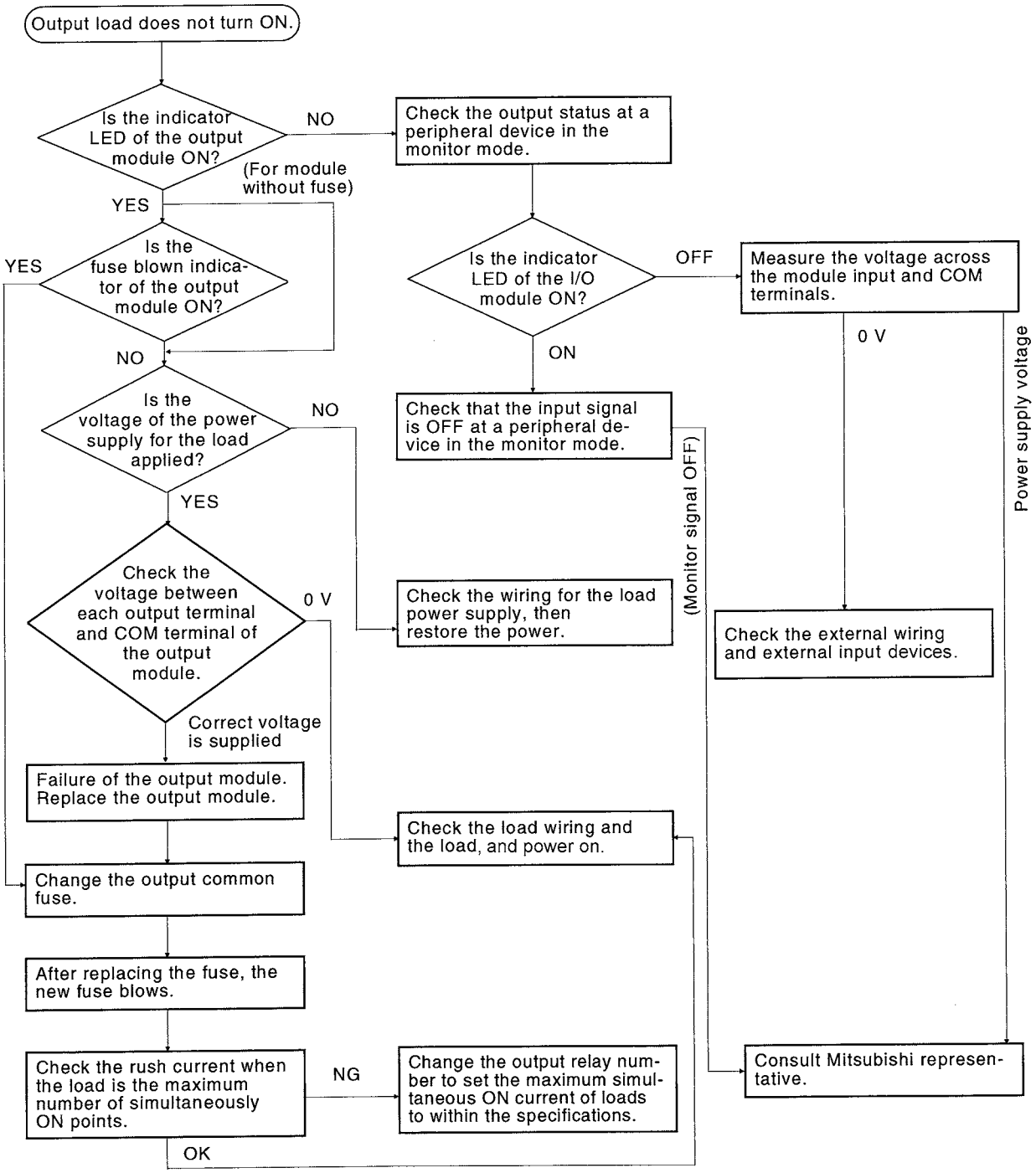
### 11.2.6 Flow for actions when the "ERROR" LED is flashing

The flow when the "ERROR" LED turns ON during operation is described.



11.2.7 Flow for actions when the output module's output load does not turn ON

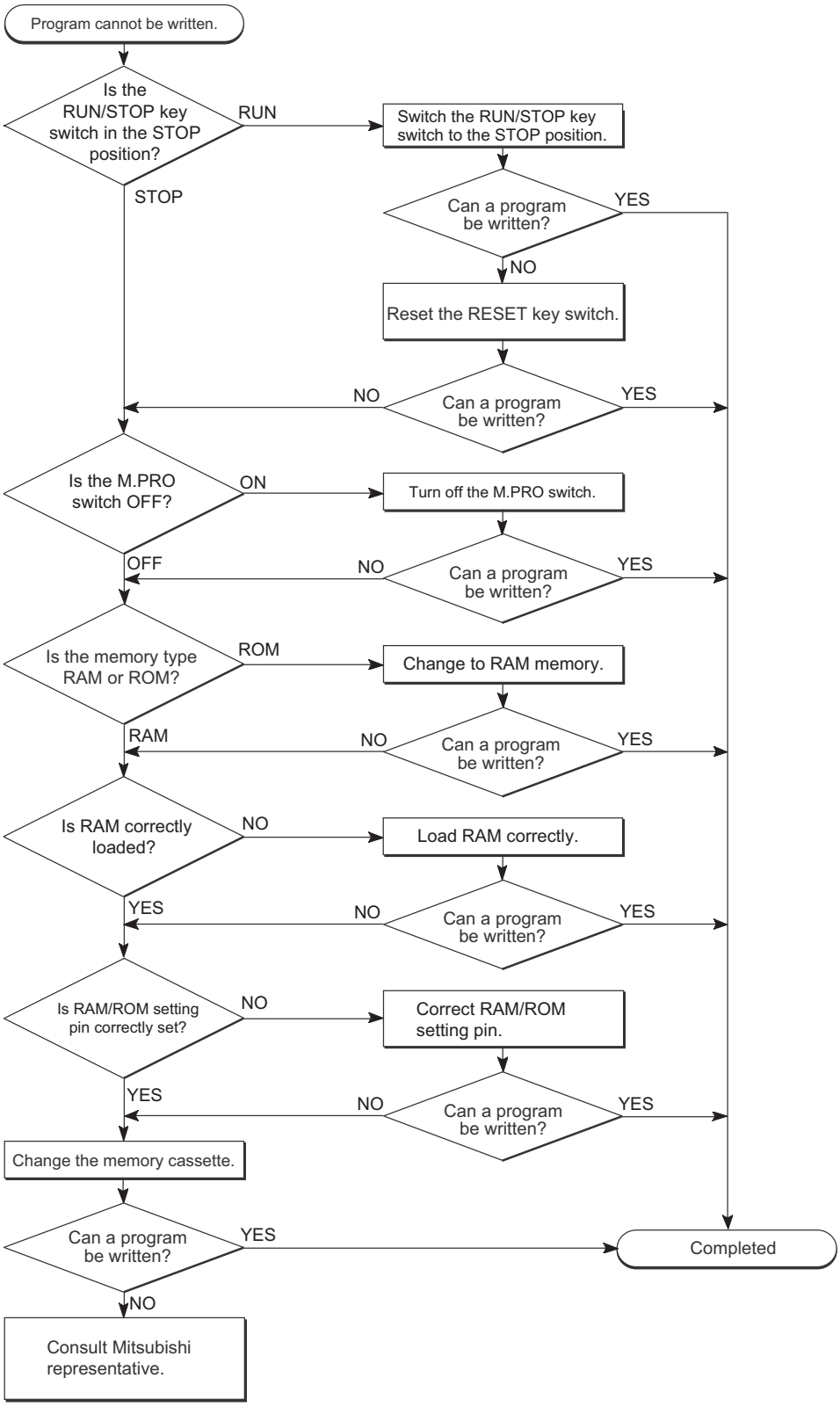
The flow when the output load of the output module is not turned ON during operation is described.




| POINT |
|---|
| For problems when the input signal does not turn off or ourput load does not turn off, perform troubleshooting by referring to the fault examples for the I/O modules in Section 11.4. |

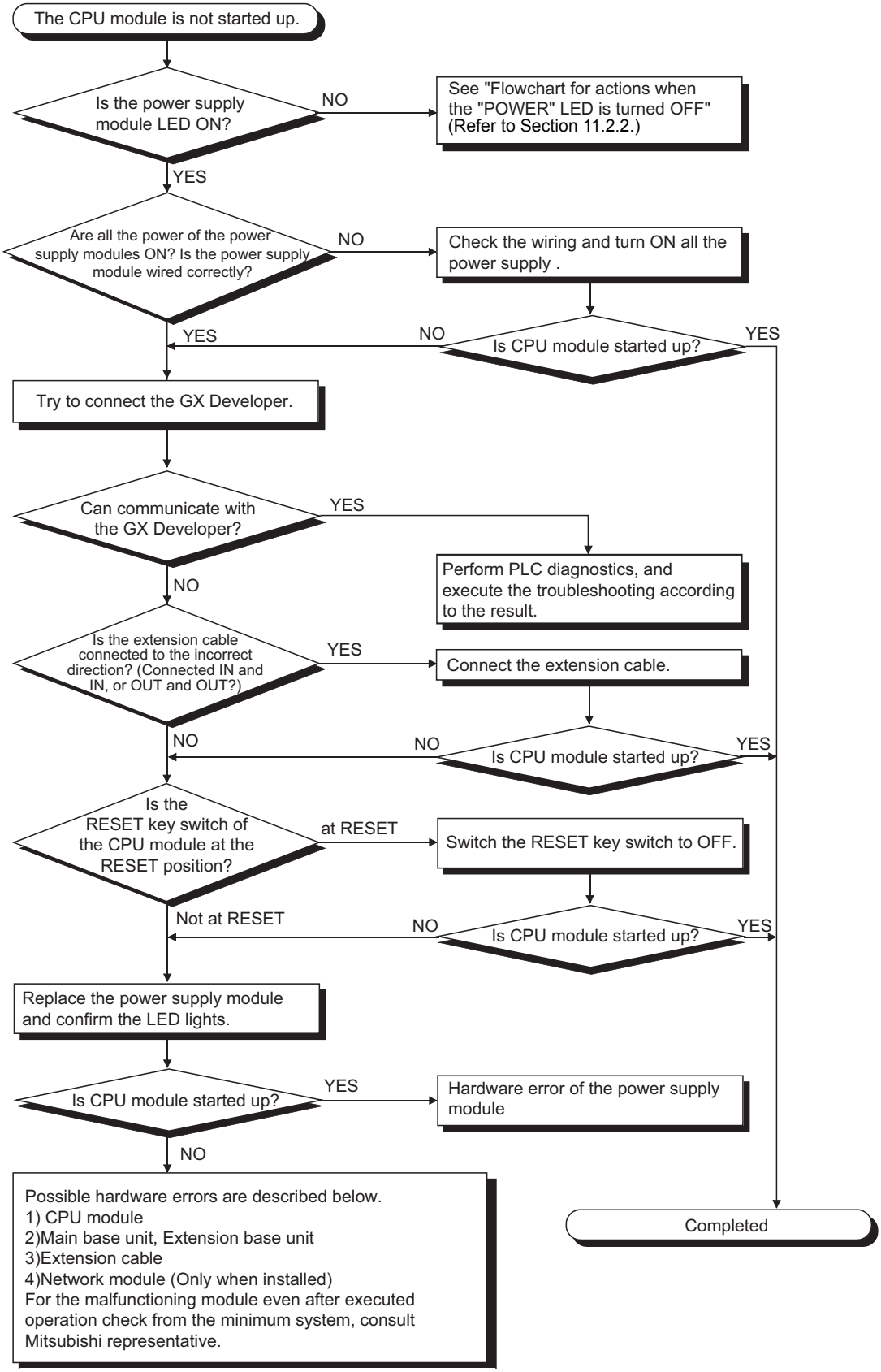
### 11.2.8 Flow for actions when the program cannot be written

The flowchart when the program and other data cannot be written to the CPU module is described.



### 11.2.9 Flow for actions when the CPU module is not started up

The following shows the flow when the CPU module is not started up.



# MEMO

## 11.3 Error Code List

When an error occurs while the PLC is running or during RUN, error is displayed, or error code, detailed error code and error step are stored to special registers, D9008 and D9010, respectively, by the self-diagnostics function. Error definitions and corrective actions are shown below.

### 11.3.1 Procedure to read an error code

When an error occurs, the error code can be read with a peripheral device.
Refer to the Operating Manuals of the peripheral device for operation method.

### 11.3.2 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board

The following table shows the error messages, description and cause of error and corrective actions. Error codes and error steps are stored in the following special registers.

Error code: D9008

Error step: D9010 and D9011

**Table 11.1 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board**

| Error Message | Error Code (D9008) | CPU States | Error and Cause | Corrective Action |
|---|---|---|---|---|
| "INSTRCT. CODE ERR" (Checked at the execution of instruction) | 10 | Stop | Instruction code, which cannot be decoded by CPU, is included in the program.<br>(1) EP-ROM or memory cassette, which cannot be decoded, has been loaded.<br>(2) Since the memory contents have changed for some reason, instruction code, which cannot be decoded, has been included. | (1) Read the error step by use of a peripheral equipment and correct the program at that step.<br>(2) In the case of EP-ROM or memory cassette, rewrite the contents or replace with an EP-ROM or memory cassette which stores correct contents. |
| "PARAMETER ERROR" (Checked at power-on, STOP → RUN, and PAUSE → RUN) | 11 | Stop | (1) Capacity larger than the memory capacity of CPU module has been set with the peripheral equipment and then write to CPU module has been performed.<br>(2) The contents of parameters of CPU memory have changed due to noise or the improper loading of memory.<br>(3) RAM is not loaded to the A1 or A1NCPU. | (1) Check the memory capacity of CPU with the memory capacity set by peripheral equipment and re-set incorrect area.<br>(2) Check the loading of CPU memory and load it correctly. Read the parameter contents of CPU memory, check and correct the contents, and write them to CPU again.<br>(3) Install the RAM and write parameter contents from a peripheral device. |
| "MISSING END INS." (Checked at STOP → RUN) | 12 | Stop | (1) There is no END ( FEND ) instruction in the program.<br>(2) When subprogram has been set by the parameter, there is no END instruction in the subprogram. | Write END instruction at the end of program. |

**Table 11.1 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board (Continue)**

| Error Message | Error Code (D9008) | CPU States | Error and Cause | Corrective Action |
|---|---|---|---|---|
| "CAN'T EXECUTE(P)" (Checked at the execution of instruction) | 13 | Stop | (1) There is no jump destination or multiple destinations specified by the CJ, SCJ, CALL, CALLP, or JMP instruction.<br>(2) There is a CHG instruction and no setting of subprogram.<br>(3) Although there is no CALL instruction, the RET instruction exists in the program and has been executed.<br>(4) The CJ, SCJ, CALL, CALLP, or JMP instruction has been executed with its jump destination located below the END instruction.<br>(5) The number of the FOR instructions is different from that of the NEXT instructions.<br>(6) A JMP instruction is given within a FOR to NEXT loop causing the processing to exit the loop.<br>(7) Processing exited subroutine by the JMP instruction before execution of the RET instruction.<br>(8) Processing jumped into a step in a FOR to NEXT loop or into a subroutine by the JMP instruction.<br>(9) The STOP instruction is given in an interrupt program, a subroutine program or in a FOR to NEXT loop. | Read the error step by use of peripheral equipment and correct the program at that step.<br>(Insert a jump destination or reduce multiple destinations to one.) |
| "CHK FORMAT ERR" (Checked at STOP/PAUSE → RUN) | 14 | Stop | (1) Instructions (including NOP) except LD X□, LDI X□, AND X□ and ANI X□ are included in the CHK instruction circuit block.<br>(2) Multiple CHK instructions are given.<br>(3) The number of contact points in the CHK instruction circuit block exceeds 150.<br>(4) There is no ⊣⊢ CJ P□ ⊣ circuit block before the CHK instruction circuit block.<br>(5) The device number of D1 of the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.<br>(6) Pointer P254 is not given to the head of the CHK instruction circuit block.<br>P254 ⊣⊢⊢⊢ CHK D1 D2 ⊣ | Check the program in the CHK instruction circuit block according to items (1) to (6) in the left column. Correct problem using the peripheral and perform operation again. |
| "CAN'T EXECUTE (I)" (Checked at the occurrence of interruption) | 15 | Stop | (1) Although the interrupt module is used, there is no number of interrupt pointer I, which corresponds to that module, in the program or there are multiple numbers.<br>(2) No IRET instruction has been entered in the interrupt program.<br>(3) There is IRET instruction in other than the interrupt program. | (1) Check for the presence of interrupt program which corresponds to the interrupt unit, create the interrupt program, and reduce the same numbers of I.<br>(2) Check if there is IRET instruction in the interrupt program and enter the IRET instruction.<br>(3) Check if there is IRET instruction in other than the interrupt program and delete the IRET instruction. |

**Table 11.1 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board (Continue)**

| Error Message | Error Code (D9008) | CPU States | Error and Cause | Corrective Action |
|---|---|---|---|---|
| "CASSETTE ERROR" (Checked at power-on) An, AnN only | 16 | Stop | The memory cassette is not loaded. | Turn off the power, insert the memory cassette and turn on the power again. |
| "ROM ERR" | 17 | Stop | Parameters and/or sequence programs are not correctly written to the mounted memory cassette. | (1) Correctly write parameters and/or sequence programs to the memory cassette.<br>(2) Remove the memory cassettes that contain no parameters or sequence programs. |
| | | | Parameters stored in the memory cassette have exceeded the limit of available program capacity.<br>Ex.) Default parameters (program capacity: 6k steps) are written to A1NMCA-2KE. | (1) Adjust the program capacity for parameters to the memory cassette used.<br>(2) Use the memory cassette of which memory capacity is larger than the program capacity for parameters. |
| "RAM ERROR" (Checked at power-on) | 20 | Stop | The CPU has checked if write and read operations can be performed properly to the data memory area of CPU, and as a result, either or both has not been performed. | Since this CPU hardware error, consult Mitsubishi representative. |
| "OPE. CIRCUIT ERR" (Checked at power-on) | 21 | Stop | The operation circuit, which performs the sequence processing in the CPU, does not operate properly. | |
| "WDT ERROR" (Checked at the execution of END processing) | 22 | Stop | Scan time exceeds watch dog error monitor time.<br>(1) Scan time of user program has been exceeded for some conditions.<br>(2) Scan time has lengthened due to instantaneous power failure which occurred during scan. | (1) Calculate and check the scan time of user program and reduce the scan time using the CJ instruction or the like.<br>(2) Monitor the content of special register D9005 by use of peripheral equipment. When the content is other than 0, line voltage is insufficient. When the content is other than 0, the power voltage is unstable. |
| "SUB-CPU ERROR" (Checked continuously) | 23 (During run) 26 (At power-on) | Stop | Sub-CPU is out of control or defective. | Since this CPU hardware error, consult Mitsubishi representative. |
| "END NOT EXECUTE" (Checked at the execution of END instruction) | 24 | Stop | (1) When the END instruction was to be executed, the instruction was read as other instruction code due to noise or the like.<br>(2) The END instruction has changed to another instruction code for some reason. | Perform reset and run.<br>If the same error is displayed again, it is the CPU hardware error, consult Mitsubishi representative. |
| "WDT ERROR" (Checked continuously) | 25 | Stop | The CPU is executing an endless loop. | Since the program is in an endless lop due to the JMP and CJ instructions, check the program. |
| "MAIN CPU DOWN" (Checked continuously) | 26 | Stop | Main-CPU is out of control or defective. (Sub-CPU checked it.) | Since this is a CPU hardware error, consult Mitsubishi representative. |

**Table 11.1 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board (Continue)**

| Error Message | Error Code (D9008) | CPU States | Error and Cause | Corrective Action |
|---|---|---|---|---|
| "UNIT VERIFY ERR. " (Checked continuously) | 31 | Stop or Continue (set by parameter) | I/O module data are different from those at power-on.<br>The I/O module (including the special function module) is incorrectly loaded or has been removed, or a different unit has been loaded. | (1) Among special registers D9116 to D9123, the bit corresponding to the module of verify error is "1". Therefore, use peripheral equipment to monitor the registers and check for the module with “1” and make replacement.<br>(2) When the present unit arrangement is OK, perform reset with the reset switch. |
| "FUSE BREAK OFF" (Checked continuously) | 32 | Stop or Continue (set by parameter) | (1) A fuse is blown in an output modul.<br>(2) The external output supply for output load is not turned off or not connected. | (1) Check the fuse blown indicator LED of output module and change the fuse of module of which LED is on.<br>(2) Among special registers D9100 to D9107, the bit corresponding to the unit of fuse break is "1" Replace the fuse of a corresponding module. Monitor and check it.<br>(3) Check if the external power supply for output load is turned on or off. |
| "CONTROL-BUS ERR. " (Checked at the execution of FROM and TO instructions) | 40 | Stop | The FROM and TO instructions can-not be executed.<br>Error of control bus with special function module. | Since this is a hardware error of a special function module, CPU module, or base unit, replace the module and check the defective module, consult Mitsubishi representative. |
| "SP. UNIT DOWN" (Checked at the execution of FROM and TO instructions.) | 41 | Stop | When the FROM or TO instruction is executed, access has been made to the special function module but the answer is not given.<br>The accessed special function module is defective. | Since this is an accessed special function module error, consult Mitsubishi representative. |
| "LINK UNIT ERROR" | 42 | Stop | The data link module is loaded in the master station. | Remove the data link module from the master station. After correction, reset and start from the initialization. |
| "I/O INT. ERROR" | 43 | Stop | Although the interrupt module is not loaded, interruption has occurred. | Since this is a hardware error of a specific module, replace the module and check the defective module, consult Mitsubishi representative. |
| "SP. UNIT LAY. ERROR." | 44 | Stop | (1) Three or more computer link units are loaded with respect to one CPU module. (A1SCPU24-R2 is also counted as one unit.)<br>(2) Two or more data link modules are loaded.<br>(3) Two or more interrupt units are loaded.<br>(4) A special function module is assigned in place of an I/O module, or vice versa, at I/O assignment of parameters on peripheral devices.<br>(5) The input/output modules or special function modules are loaded at the input/output numbers exceeding the number of input/output points, or GOT is connected via bus line. | (1) Reduce the computer link modules to two or less.<br>(2) Reduce the data link modules to one or less.<br>(3) Reduce the interrupt module to one.<br>(4) Re-set the I/O assignment of parameter setting by use of peripheral devices according to the actually loaded special function module.<br>(5) Review the input/output numbers, and remove the modules at the input/output numbers beyond the number of input/output points or GOT. |

**Table 11.1 Error Code List for the An, AnN, A3H, A3M, A3V, A0J2H, AnS, A2C, A73, A52G, A1FX and A3N board (Continue)**

| Error Message | Error Code (D9008) | CPU States | Error and Cause | Corrective Action |
|---|---|---|---|---|
| "SP. UNIT ERROR" (Checked at the execution of FROM and TO instructions) | 46 | Stop or Continue (set by parameter) | Access (execution of FROM to TO instruction) has been made to a location where there is not special function unit. | Read the error step by use of peripheral equipment, and check and correct the content of FROM or TO instruction at that step. |
| "LINK PARA. ERROR" | 47 | Continue | (1) If a data link CPU is used to set a master station (station number "00") : The contents written to the parameter area of link by setting the link range in the parameter setting of peripheral devices are different from the link parameter contents for some reason. Or, link parameters are not written.<br>(2) The setting of the total number of slave stations is 0. | (1) Write parameters again and make check.<br>(2) Check setting of station numbers.<br>(3) When the error is displayed again, it is hardware error. Therefore, consult Mitsubishi representative. |
| "OPERATION ERROR" (Checked during execution of instruction) | 50 | Continue | (1) The result of BCD conversion has exceeded the specified range (9999 or 99999999).<br>(2) Operation impossible because specified device range has been exceeded.<br>(3) File registers used in program without capacity setting.<br>(4) Operation error occurred during execution of the RTOP, RFRP, LWTP or LRDP instruction. | Read the error step using peripheral devices and check the program at the error step, and correct it. (Check the specified device range, BCD conversion, or the like.) |
| "MAIN CPU DOWN" (Interrupt fault) AnNCPU only | 60 | Stop | (1) INT instruction processed in microcomputer program area.<br>(2) CPU malfunction due to noise.<br>(3) Hardware error of CPU module. | (1) Because the INT instruction cannot be used in the microcomputer program, remove it.<br>(2) Take measures against noises.<br>(3) Consult Mitsubishi representative. |
| "BATTERY ERROR" (Checked at power-on) | 70 | Continue | (1) The battery voltage has dropped to below the specified value.<br>(2) The lead connector of the battery is not connected. | (1) Replace battery.<br>(2) Connect the lead connector if RAM memory or power failure compensation function is used. |

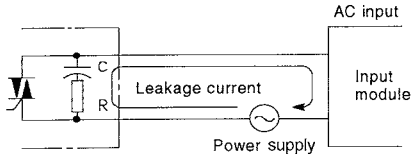
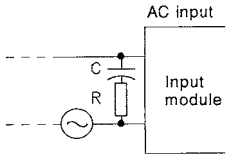
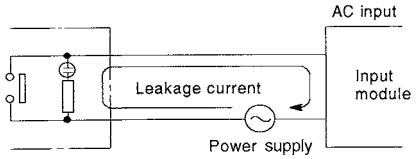
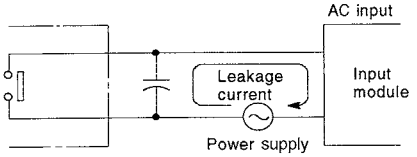
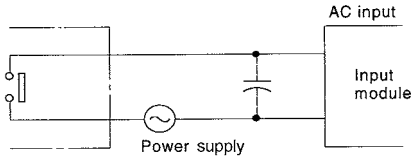
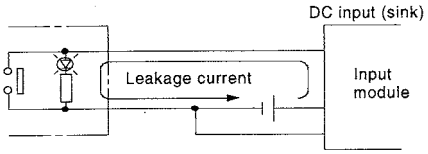
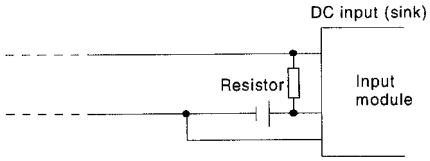
## 11.4 Fault Examples with I/O Modules

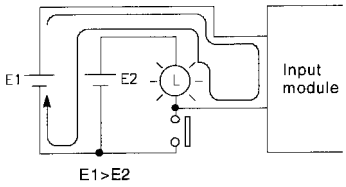
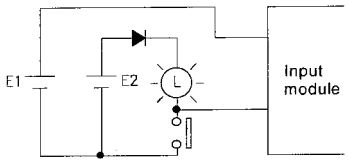
Examples of faults concerning I/O circuits and the corrective actions are explained.

### 11.4.1 Faults with the input circuit and the corrective actions

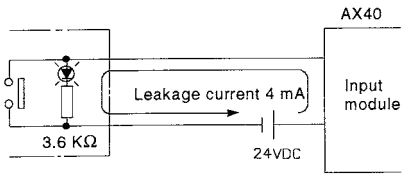
Examples of faults concerning input circuit and the corrective actions are explained.

Faults with the input circuit and the corrective actions

| | Situation | Cause | Countermeasure |
|---|---|---|---|
| Example 1 | Input signal does not turn OFF. | • Leak current from input switch (driven by a contactless switch, etc.)<br>  | • Connect an appropriate resistance so that voltage between the terminals of the input module is lower than the OFF voltage.<br>  <br>For CR constant,<br>0.1 to 0.47μF + 47 to 120Ω (1/2W) is recommended. |
| Example 2 | Input signal does not turn OFF. | • Driven by a limit switch with a neon lamp<br>  | • Same as the example 1.<br>• Or, provide a totally independent display circuit separately. |
| Example 3 | Input signal does not turn OFF. | • Line capacity C of the leak current twisted pair cable due to line capacity of the wiring cable is about 100PF/m.<br>  | • Same as the example 1.<br>• However, leakage current does not occur when a power supply is on the side of input device as shown below.<br>  |
| Example 4 | Input signal does not turn OFF. | • Driven by a switch with LED indication<br>  | • Connect an appropriate resistance so that voltage between the terminal of the input module and the common is lower than the OFF voltage as shown below.<br>  <br>* An example of calculation of resistor to be connected is provided on the following page. |

| | Situation | Cause | Countermeasure |
|---|---|---|---|
| Example 5 | Input signal does not turn OFF. | • Sneak path due to the use of two power supplies.<br>  | • Use only one power supply.<br>• Connect a diode for a sneak path.(Figure below).<br>  |

Calculation example for Example 4

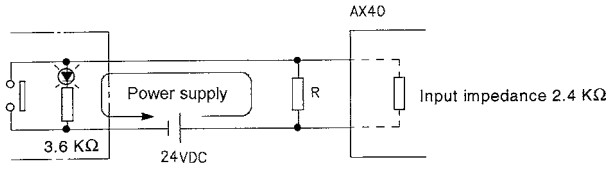



If a switch with LED indication is connected to the AX40 and leak current of 4mA is generated

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

$V_{TB}$ = 4[mA] × 2.4[kΩ] = 9.6[V] (Ignore the voltage drop caused by the LED.)

Because the condition for the OFF voltage ( 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 between the terminals must be reduced to within 6[V]. The current for reducing the voltage between the terminals to within 6 [V] is:

(24 - 6[V]) / 3.6[kΩ] = 5mA

Therefore, resistor R for flowing current I of 5[mA] has to 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] / 2.5mA ＞ R

2.4[kΩ] ＞ R

Suppose that the resistance R is 2[kΩ].

The power capacity W of the resistor when the switch turned on is:

W = (Applied voltage)$^2$/R

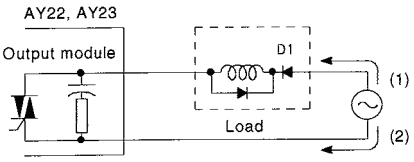
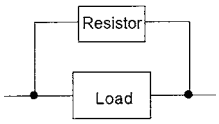
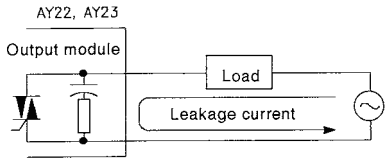
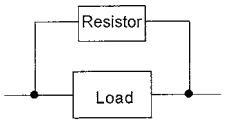
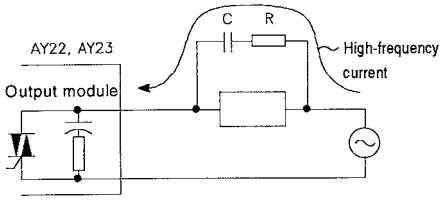
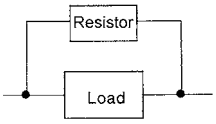
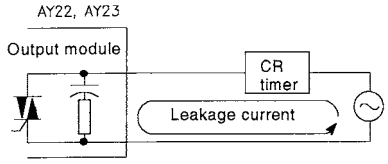
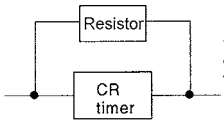
W = (26.4[V])$^2$/2[kΩ] = 0.348[W]

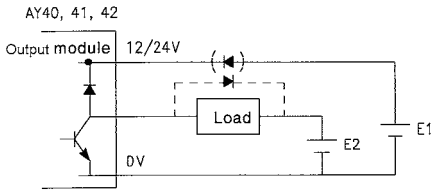
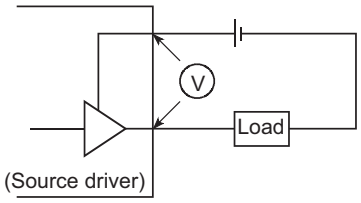
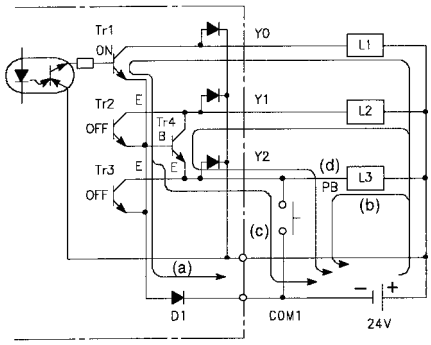
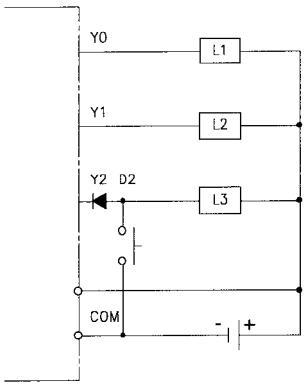
• Because the resistance is selected so that the power capacity is three to five times the actual power consumption, 1.5 to 2 [W] should be selected.From the above, the resistor to be connected across the terminal in question and COM is 2[kΩ] 1.5 to 2[W].

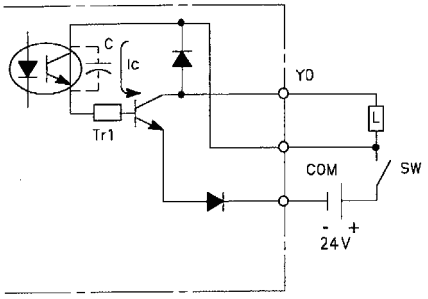
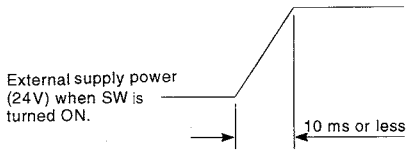
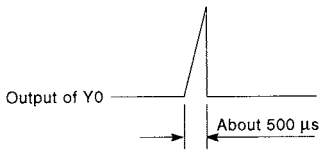
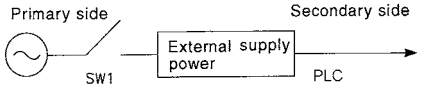
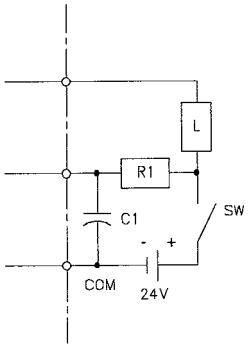
### 11.4.2 Faults in the output circuit

Faults concerning output circuits and the corrective actions are explained.

Faults in the output circuit

| | Situation | Cause | Countermeasure |
|---|---|---|---|
| Example 1 | An excessive voltage is applied to the load when output is off. (Triac output) | • When the load is subjected to half wave rectification inside (Solenoids have these types.)<br>  <br>• When the polarity of the power supply is (1), C is charged, and when the polarity is (2), the voltage charged in C + voltage of the power supply are applied to the both ends of D1.The maximum value of the voltage is about 2.2E. | • Connect a resistor at several tens Ω to several hundred of kΩ to the both ends of the load.<br>( With this kind of usage, there is no problem with the output element, but the diode built-in to the load may deteriorate and burn-out. )<br>  |
| Example 2 | Load does not turn OFF. (Triac output) | • Leakage current caused by built-in noise supression<br>  | • Connect a resistor to the both ends of the load.<br>( When the wiring distance from the output module to the load is long, be aware of the risk of a leak current due to line capacity. )<br>  |
| Example 3 | Load turns OFF with a delay. (Triac output) | • Leakage current due to surge suppressor for the load.<br>  | • Disconnect the surge suppressor from across the loads, leaving only the resistance.<br>( When the wiring distance from the output module to the load is long, be aware of the risk of a leak current due to line capacity. )<br>  <br>Guide to resistive value:<br>At 100VAC:<br>5 to 10 KΩ, 5 to 3 W<br>At 200VAC:<br>10 to 20 KΩ, 15 to 10 W |
| Example 4 | When load is CR type timer, the time limit fluctuates. (Triac output) |  | • Connect a resistance between the CR timer terminals.<br>( In some timers, internal circuit may be half wave rectification type, so the caution as to the example 1 is necessary here. )<br>( When the wiring distance from the output module to the load is long, be aware of the risk of a leak current due to line capacity. )<br>  <br>Calculate the resistance constant in accordance with the load. |

| | Situation | Cause | Countermeasure |
|---|---|---|---|
| Example 5 | Load does not turn OFF.<br>( Transistor output with clamp diode ) | • Sneak path due to the use of two power supplies.<br>  <br>• Sneak path occurs when E1 < E2. | • Use only one power supply.<br>• Connect a diode for a sneak path.<br>( When the load is a relay or similar device, a reverse voltage absorbing diode must be connected to it. )<br>(Shown by dotted line in the figure at left) |
| Example 6 | Load does not operate normally.<br>(Due to external short)<br>AY60EP<br>AY80EP<br>AY81EP<br>AY82EP | Occurred due to an external load failure or incorrect connection. For what to check, refer to the Countermeasure column. | • Check the operation of external load<br>• Check voltage between the terminals below when output (Y) is turned ON.<br>3V or higher voltage may short external loads. Check the external loads and wiring when applying such voltages.<br>  |
| Example 7 | When an external switch is connected in parallel between the output and common, the voltage between Y1 and COM1 drops to between 0 and 24V even though the output Y1 which is not connected to the external switch is OFF.<br>Especially when the load L2 is relatively small, (Load current of several mA only) such as LED lamps and photocouplers, the outputs drop.<br>AY40<br>AY41<br>AY42 | Incorrect output by parasitic transistor (Tr4)<br>  <br>Y2 can turn the load L3 on either from a PC or PB. When PB is ON, Y0 is ON with a PC, and Y1 is OFF:<br>(1) L1(current (a)) and L3 (current (b)) turn ON.<br>(2) A potential difference to COM1occurs in the emitter E of Tr1 to Tr3 since diode D1 is connected between COM1 and the emitter.<br>(3) The transistors AY40 to 42, etc., are accompanied by a parasitic transistor (Tr4).<br>(4) The potential difference described in (2) above is supplied between the base (B) of Tr4 and emitter (E), which causes the base current (c) to flow.(Tr4 turns ON).<br>(5) The current in (4) causes the collector current (d) to flow, and voltage Y1 drops to between 0 and 24V. |  <br>As shown above, connect diode D2 of $I_F$ = 1A class to output Y2 which is connected to an external switch.<br>However, check the operation voltage of L3 as the amount of voltage drop of Y2 at power ON increases for 0.6 to 1V. |

| | Situation | Cause | Countermeasure |
|---|---|---|---|
| Example 8 | The load is momentarily turned ON when the external supply power is started up. (Transistor output) | Incorrect output due to the floating capacitance (C) between the collector and emitter of the photocoupler<br>( This does not affect normal loads, but in case of highly sensitive loads (such as solid state relays ), incorrect outputs may occur. )<br>Photocoupler<br>  <br>(1) If the external supply power is suddenly started up, current Ic flows due to the floating capacitance (C) between the collector and emitter of the photocoupler.<br>(2) Current Ic flows to the base of transistor Tr1 in the next stage, and output Y0 turns ON for about 500 $\mu$s.<br>  <br>  | (1) After checking the external supply power takes at least 10ms to start up when turned it ON/ OFF, set the switch SW1 at the primary side of the external supply power.<br>  <br>(2) If setting the switch at the secondary side of the external supply power is required, connect a capacitor and resistor so that the start-up of the power is slowly performed (Longer than 10ms).<br>  <br>R1: Several tens of ohme<br>Power capacity ≧ (External supply power current)$^{2}$ *1<br>× Resistive value × (3 to 5)*2<br>C1: Several hundreds of $\mu$F, 50 mV<br>*1 For the current consumption of the external supply power, refer to the manual attached to the module to be used.<br>*2 Select the resistance for power capacity in the range of between 3 and 5 times higher than the actual power consumption.<br>Example:<br>R1=40 Ω , C1=300$\mu$F<br>Calculate the time constant as follows:<br>C1 × R1 = 300 × $10^{-6}$ × 40<br>= 12 × $10^{-3}$S<br>= 12ms |

# APPENDIX

## Appendix1 INSTRUCTION LIST

The instruction list to be used with a PLC is shown.
Refer to the following Programming Manuals for the details of the instructions.

| | |
|---|---|
| • ACPU/QCPU-A (A Mode) Programming Manual (Fundamentals) | IB-66249 |
| • ACPU Programming Manual (Common Instructions) | IB-66250 |

(1) Sequence instructions

(a) Contact instruction

| | |
|---|---|
| Contact | LD, LDI, AND, ANI, OR, ORI |

(b) Association command

| | |
|---|---|
| Association | ANB, ORB, MPS, MRD, MPP |

(c) Output instruction

| | |
|---|---|
| Output | OUT, SET, RST, PLS, PLF |

(d) Shift instructions

| | |
|---|---|
| Shift | SFT, SFTP |

(e) Master control instruction

| | |
|---|---|
| Master control | MC, MCR |

(f) End instruction

| | |
|---|---|
| Program end | FEND, END |

(g) Other instructions

| | |
|---|---|
| STOP | STOP |
| No operation | NOP |
| Page break (Page break operation for printer output) | NOPLF |

(2) Basic instructions

(a) Comparison instructions

| | | |
|---|---|---|
| = | 16 bit | LD, AND, OR |
| | 32 bit | LDD, ANDD, ORD |
| < > | 16 bit | LD<>, AND<>, OR<> |
| | 32 bit | LDD<>, ANDD<>, ORD<> |
| > | 16 bit | LD>, AND>, OR> |
| | 32 bit | LDD>, ANDD>, ORD> |
| ≦ | 16 bit | LD<=, AND<=, OR<= |
| | 32 bit | LDD<=, ANDD<=, ORD<= |
| < | 16 bit | LD<, AND<, OR< |
| | 32 bit | LDD<, ANDD<, ORD< |
| ≧ | 16 bit | LD>=, AND>=, OR>= |
| | 32 bit | LDD>=, ANDD>=, ORD>= |

(b) BIN arithmetic operation instructions

| | | |
|---|---|---|
| + Addition | 16 bit | Two types each for +, +P |
| | 32 bit | Two types each for D+, D+P |
| - Subtraction | 16 bit | Two types each for -, -P |
| | 32 bit | Two types each for D, D-P |
| * Multiplication | 16 bit | *, * P |
| | 32 bit | D *, D *P |
| / Division | 16 bit | /, /P |
| | 32 bit | D/, D/P |
| +1 Addition | 16 bit | INC, INCP |
| | 32 bit | DINC, DINCP |
| -1 Subtraction | 16 bit | DEC, DECP |
| | 32 bit | DDEC, DDECP |

(c) BCD arithmetic operation instructions

| | | |
|---|---|---|
| + Addition | BCD 4-digit | Two types each for B+, B+P |
| | BCD 8-digit | Two types each for DB+, DB+P |
| - Subtraction | BCD 4-digit | Two types each for B-, B-P |
| | BCD 8-digit | Two types each for DB-, DB-P |
| * Multiplication | BCD 4-digit | B *, B * P |
| | BCD 8-digit | DB *, DB *P |
| / Division | BCD 4-digit | B/, B/P |
| | BCD 8-digit | DB/, DB/P |

(d) BCD-BIN conversion instructions

| | | |
|---|---|---|
| BIN → BCD | 16 bit | BCD, BCDP |
| | 32 bit | DBCD, DBCDP |
| BCD → BIN | 16 bit | BIN, BINP |
| | 32 bit | DBIN, DBINP |

(e) Data transfer instructions

| | | |
|---|---|---|
| Transfer | 16 bit | MOV, MOVP |
| | 32 bit | DMOV, DMOVP |
| Exchange | 16 bit | XCH, XCHP |
| | 32 bit | DXCH, DXCHP |
| Negation transfer | 16 bit | CML, CMLP |
| | 32 bit | DCML, DCMLP |
| Batch transfer | 16 bit | BMOV, BMOVP |
| Same data batch transfer | 16 bit | FMOV, FMOVP |

(f) Program branch instructions

| | |
|---|---|
| Jump | CJ, SCJ, JMP |
| Subroutine call | CALL, CALLP, RET |
| Interrupt program enable/disable | EI, DI, IRET |

(g) Program switching instructions

| | |
|---|---|
| Switch (between main and sub) | CHG |

(Remarks): To switch amoung the main program, subprogram 1, 2 and 3 that are dedicated for the A4UCPU, refer to the dedicated instruction.

(h) Refresh instructions

| | |
|---|---|
| Link refresh | COM |
| Partial refresh | SEG |

(3) Application instructions

(a) Logical operation instructions

| | | |
|---|---|---|
| Logical product | 16 bit | Two types each for WAND, WANDP |
| | 32 bit | DAND, DANDP |
| Logical sum | 16 bit | Two types each for WOR, WORP |
| | 32 bit | DOR, DORP |
| Exclusive logical sum | 16 bit | Two types each for WXOR, WXORP |
| | 32 bit | DXOR, DXORP |
| Not exclusive logical sum | 16 bit | Two types each for WXNR, WXNRP |
| | 32 bit | DXNR, DXNRP |
| Complements of 2 (sign highlights) | 16 bit | NEG, NEGP |

(b) Rotation instructions

| | | |
|---|---|---|
| Right rotation | 16 bit | ROR, RORP, RCR, RCRP |
| | 32 bit | DROR, DRORP, DRCR, DRCRP |
| Left rotation | 16 bit | ROL, ROLP, RCL, RCLP |
| | 32 bit | DROL, DROLP, DRCL, DRCLP |

(c) Shift instructions

| | | |
|---|---|---|
| Right shift | 16 bit | SFR, SFRP, BSFR, BSFRP |
| | Device unit | DSFR, DSFRP |
| Left shift | 16 bit | SFL, SFLP, BSFL, BSFLP |
| | Device unit | DSFL, DSFLP |

(d) Data processing instructions

| | | |
|---|---|---|
| Data search | 16 bit | SER, SERP |
| Bit check | 16 bit | SUM, SUMP |
| | 32 bit | DSUM, DSUMP |
| Decode | $2^n$-bit | DECO, DECOP |
| | 16 bit | SEG |
| Encode | $2^n$-bit | ENCO, ENCOP |
| Bit set | 16 bit | BSET, BSETP |
| Bit reset | 16 bit | BRST, BRSTP |
| Separation | 16 bit | DIS, DISP |
| Association | 16 bit | UNI, UNIP |

(e) FIFO instructions

| | | |
|---|---|---|
| Write | 16 bit | FIFW, FIFWP |
| Read | 16 bit | FIFR, FIFRP |

(f) ASCII instructions

| | |
|---|---|
| ASCII conversion | ASC |
| ASCII print | PR (two types), PRC |

(g) Buffer memory access instructions

| | | |
|---|---|---|
| Data read | 1 word | FROM, FROMP |
| | 2 word | DFRO, DFROP |
| Data write | 1 word | TO, TOP |
| | 2 word | DTO, DTOP |

(h) FOR to NEXT instruction

| | |
|---|---|
| Repeat | FOR, NEXT |

(i) Display instructions

| | |
|---|---|
| Display*1 | LED, LEDC |
| Display reset | LEDR |

(REMARK): Instruction marked *1 can be used with the A3NCPU.

(j) Data link module instructions

| | | |
|---|---|---|
| Data read | 1 word | LRDP, RFRP |
| Data write | 1 word | LWTP, RTOP |

(k) Other instructions

| | | |
|---|---|---|
| WDT reset | | WDT, WDTP |
| Error check | | CHK |
| Status latch*2 | | SLT, SLTR |
| Sampling trace*2 | | STRA, STRAR |
| Carry flag set/reset | 1 bit | STC, CLC |
| Timing clock | 1 bit | DUTY |

(REMARK): Instruction marked *2 can be used with the A1NCPU.

# Appendix 2 LISTS OF SPECIAL RELAYS AND SPECIAL REGISTERS

## Appendix 2.1 List of Special Relays

The special relays are the internal relays that have specific applications in the sequencer. Therefore, do not turn the special register ON/OFF on the program. (Except for the ones marked by *1 or *2 in the table.)

**Table App2.1 Special Relay List**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *1 M9000 | Fuse blown | OFF:Normal<br>ON: Fuse blown unit | • Turned on when there is one or more output units of which fuse has been blown or external power supply has been turned off (only for small type). Remains on if normal status is restored. Output modules of remote I/O stations are also checked fore fuse condition. | ○ | Usable with all types of CPUs (Only remote I/O station information is valid for A2C.) |
| *2 M9002 | I/O unit verify error | OFF:Normal<br>ON: Error | • Turned on if the status of I/O module is different from entered status when power is turned on. Remains on if normal status is restored. I/O module verification is done also to remote I/O station modules. (Reset is enabled only when special registers D9116 to D9123 are reset.) | ○ | Usable with all types of CPUs (Only remote I/O station information is valid for A2C.) |
| M9004 | MINI link master module error | OFF:Normal<br>ON: Error | • Turned on when the MINI (S3) link error is detected on even one of the MINI (S3) link modules being loaded. Remains on if normal status is restored. | — | Dedicated to AnA, A2AS, AnU and QCPU-A (A Mode). |
| *1 M9005 | AC DOWN detection | OFF:AC power good<br>ON: AC power DOWN | • Turned on when an momentary power failure of 20 msec or less occurred. Reset when POWER switch is moved from OFF to ON position. | ○ | Usable with all types of CPUs. |
| M9006 | Battery low | OFF:Normal<br>ON: Battery low | • Turned on when battery voltage reduces to less than specified. Turned off when battery voltage becomes normal. | ○ | Usable with all types of CPUs. |
| *1 M9007 | Battery low latch | OFF:Normal<br>ON: Battery low | • Turned on when battery voltage reduces to less than specified. Remains on if battery voltage becomes normal | ○ | Usable with all types of CPUs. |
| *1 M9008 | Self-diagnostic error | OFF:No error<br>ON: Error | • Turned on when error is found as a result of self-diagnosis. | ○ | Usable with all types of CPUs. |
| M9009 | Annunciator detection | OFF:No detection<br>ON: Detected | • Turned on when OUT F of SET F instruction is executed. Switched off when D9124 data is zeroed. | ○ | Usable with all types of CPUs. |
| M9010 | Operation error flag | OFF:No error<br>ON: Error | • Turned on when operation error occurs during execution of application instruction. Turned off when error is eliminated. | △ | Unusable with A3H, A3M, AnA, A2AS, A3A board, AnU and QCPU-A (A Mode). |
| *1 M9011 | Operation error flag | OFF:No error<br>ON: Error | • Turned on when operation error occurs during execution of application instruction. Remains on if normal status is restored. | ○ | Usable with all types of CPUs. |
| M9012 | Carry flag | OFF:Carry off<br>ON: Carry on | • Carry flag used in application instruction. | ○ | Usable with all types of CPUs. |

**Table App2.1 Special Relay List (Continue)**

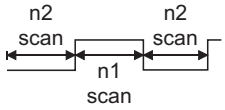
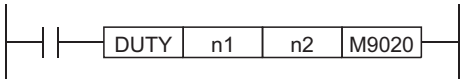
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9016 | Data memory clear flag | OFF: No processing<br>ON: Output clear | • Clears the data memory including the latch range (other than special relays and special registers) in remote run mode from computer, etc. when M9016 is on. | ○ | Usable with all types of CPUs. |
| M9017 | Data memory clear flag | OFF:No processing<br>ON: Output clear | • Clears the unlatched data memory (other than special relays and special registers) in remote run mode from computer, etc. when M9017 is on. | ○ | Usable with all types of CPUs. |
| *2 M9018 | Data link monitor switching | OFF:F link<br>ON: R link | • Specifies the lines to be monitored for link monitoring. | — | Dedicated to A3V. |
| M9020 | User timing clock No. 0 |  | • Relay that repeats on/off at intervals of predetermined scan.<br>• When power is turned on or reset is per-formed, the clock starts with off.<br>• Set the intervals of on/off by DUTY instruction.<br>  | ○ | Usable with all types of CPUs. |
| M9021 | User timing clock No. 1 | | | | |
| M9022 | User timing clock No. 2 | | | | |
| M9023 | User timing clock No. 3 | | | | |
| M9024 | User timing clock No. 4 | | | | |
| *2 M9025 | Clock data set request | OFF:No processing<br>ON: Set requested | • Writes clock data from D9025-D9028 to the clock element after the END instruction is executed during the scan in which M9025 has changed from off to on. | △ | Unusable with An, A3H, A3M, A3V, A2C and A0J2H. |
| M9026 | Clock data error | OFF:No error<br>ON: Error | • Switched on by clock data (D9025 to D9028) error and switched off without an error. | △ | Unusable with An, A3H, A3M, A3V, A2C and A0J2H. |
| M9027 | Clock data display | OFF:No processing<br>ON: Display | • Clock data such as month, day, hour, minute and minute are indicated on the CPU front LED display. | △ | Usable with A3N, A3A, A3U, A4U, A73 and A3N board. |
| *2 M9028 | Clock data read request | OFF:No processing<br>ON: Read request | • Reads clock data to D9025-D9028 in BCD when M9028 is on. | △ | Unusable with An, A3H, A3M, A3V, A2C and A0J2H. |
| *2 M9029 | Data communication request batch process | OFF:No batch process<br>ON: Batch process | • Turn M9029 on in the sequence program to process all data communication requests, which have been received in the entire scan, during END process of the scan.<br>• The data communication request batch process can be turned on or off during operation.<br>• OFF in default state (Each data communication request is processed at the END process in the order of reception.) | △ | Usable with AnU and A2US(H). |

**Table App2.1 Special Relay List (Continue)**

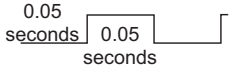
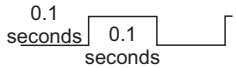
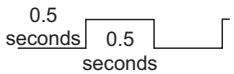
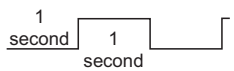
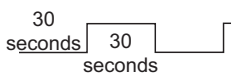
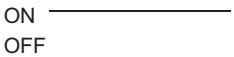
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9030 | 0.1 second clock |  | • 0.1 second, 0.2 second, 1 second, 2 second, and 1 minute clocks are generated.<br>• Not turned on and off per scan but turned on and off even during scan if corresponding time has elapsed.<br>• Starts with off when power is turned on or reset is performed. | △ | Unusable with A3V. |
| M9031 | 0.2 second clock |  | | | |
| M9032 | 1 second clock |  | | | |
| M9033 | 2 second clock |  | | | |
| M9034 | 1 minute clock |  | | | |
| M9036 | Normally ON |  | • Used as dummy contacts of initialization and application instruction in sequence program.<br>• M9036 and M9037 are turned on and off without regard to position of key switch on CPU front. M9038 and M9039 are under the same condition as RUN status except when the key switch is at STOP position, and turned off and on. Switched off if the key switch is in STOP position. M9038 is on for one scan only and M9039 is off for one scan only if the key switch is not in STOP position. | ○ | Usable with all types of CPU |
| M9037 | Normally OFF | | | | |
| M9038 | On only for 1 scan after run | | | | |
| M9039 | RUN flag (off only for 1 scan after run) | | | | |
| M9040 | PAUSE enable coil | OFF:PAUSE disabled<br>ON: PAUSE enabled | • When RUN key switch is at PAUSE position or remote pause contact has turned on and if M9040 is on, PAUSE mode is set and M9041 is turned on. | ○ | Usable with all types of CPU |
| M9041 | PAUSE status contact | OFF:Not during pause<br>ON: During pause | | | |
| M9042 | Stop status contact | OFF:Not during stop<br>ON: During stop | • Switched on when the RUN key switch is in STOP position. | ○ | Usable with all types of CPU |
| M9043 | Sampling trace completion | OFF:During sampling trace<br>ON: Sampling trace completion | • Turned on upon completion of sampling trace performed the number of times preset by parameter after STRA instruction is executed. Reset when STRAR instruction is executed. | △ | Unusable with A1 and A1N. |
| M9044 | Sampling trace | OFF → ON: STRA Same as execution<br>ON → OFF: STRAR Same as execution | • Turning on/off M9044 can execute STRA / STRAR instruction. (M9044 is forcibly turned on/off by a peripheral device.)<br>When switched from OFF to ON: STRA instruction<br>When switched from ON to OFF: STRAR instruction<br>The value stored in D9044 is used as the condition for the sampling trace.<br>At scanning, at time → Time (10 msec unit) | △ | Unusable with A1 and A1N. |
| M9045 | Watchdog timer (WDT) reset | OFF:WDT not reset<br>ON: WDT reset | • Turn on M9045 to reset the WDT upon execution of a ZCOM instruction or data communication request batch process. (Use this function for scan times exceeding 200 ms.) | △ | Unusable with A1 and A1N. |

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9046 | Sampling trace | OFF: Except during trace<br>ON: During trace | • Switched on during sampling trace. | △ | Unusable with A1 and A1N. |
| M9047 | Sampling trace preparation | OFF: Sampling trace stop<br>ON: Sampling trace start | • Turn on M9047 to execute sampling trace. Sampling trace is interrupted if M9047 is turned off. | △ | Unusable with A1 and A1N. |
| *2 M9048 | RUN LED flicker flag | ON: Flickers at annunciator on.<br>OFF: No flicker at annunciator on. | • Sets whether the RUN LED flickers or not when the annunciator relay F⬚ is turned on when the A0J2H is used. | — | Usable with A0J2H. |
| M9048 | Memory card battery voltage detection | OFF: Low voltage is not detected.<br>ON: Low voltage is detected. | • Turned ON when the drop in the battery voltage for the memory card is detected. (Automatically turned OFF when the voltage recovers to normal.) | — | Dedicated to QCPU-A (A Mode) |
| M9049 | Switching the number of output characters | OFF: Up to NUL code are output.<br>ON: 16 characters are output. | • When M9049 is off, up to NUL ($00_H$) code are output.<br>• When M9049 is on, ASCII codes of 16 characters are output. | △ | Unusable with An, A3V, A2C and A52G |
| *2 M9050 | Operation result storage memory change contact (for CHG instruction) | OFF: Not changed<br>ON: Changed | • Switched on to exchange the operation result storage memory data and the save area data. | — | Dedicated to A3 |
| M9051 | CHG instruction execution disable | OFF: Enable<br>ON: Disable | • Switched on to disable the CHG instruction.<br>• Switched on when program transfer is requested and automatically switched off when transfer is complete. | — | Usable with A3, A3N, A3H, A3M, A3V, A3A, A3U, A4U, A73 and A3N board |
| *2 M9052 | SEG instruction switching | OFF: 7SEG display<br>ON: Partial refresh | • Switched on to execute the SEG instruction as a partial refresh instruction. Switched off to execute the SEG instruction as a 7SEG display instruction. | △ | Unusable with An, A3H, A3M, A3V, AnA, AnU, A3V and A3A board |
| *2 M9053 | EI / DI instruction switching | OFF: Sequence interrupt control<br>ON: Link interrupt control | • Switched on to execute the link refresh enable, disable (EI, DI) instructions. | △ | Unusable with An, A3V and A3N board |
| M9054 | STEP RUN flag | OFF: Other than step run<br>ON: During step run | • Switched on when the RUN key switch is in STEP RUN position. | △ | Unusable with An, AnS, AnSH, A1FX, A2C, A0J2H, and A52G |
| M9055 | Status latch complete flag | OFF: Not complete<br>ON: Complete | • Turned on when status latch is completed. Turned off by reset instruction. | △ | Unusable with A1 and A1N. |
| M9056 | Main program P, I set request | OFF: Other than P, I set request<br>ON: P, I set request | • Provides P, I set request after transfer of the other program (for example subprogram when main program is being run) is complete during run. Automatically switched off when P, I setting is complete. | — | Usable with A3, A3N, A3H, A3M, A3V, A3A, A73, A3U, A4U and A3N board |
| M9057 | Subprogram 1 P, I set request | OFF: Except during P, I set request<br>ON: During P, I set request | | | |
| M9060 | Subprogram 2 P, I set request | | | — | Dedicated to A4U |
| M9061 | Subprogram 3 P, I set request | | | | |

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9060 | Remote terminal error | OFF: Normal<br>ON: Error | • Turned on when one of remote terminal modules has become a faulty station. (Communication error is detected when normal communication is not restored after the number of retries set at D9174.)<br>• Turned off when communication with all re-mote terminal modules is restored to normal with automatic online return enabled.<br>• Remains on when automatic online return is disabled.<br>• Not turned on or off when communication is suspended at error detection. | — | Usable with A2C and A52G |
| M9061 | Communication error | OFF: Normal<br>ON: Error | • Turned on when communication with a remote terminal module or an I/O module is faulty.<br>• Communication error occurs due to the following reasons.<br>• Initial data error<br>• Cable breakage<br>• Power off for remote terminal modules or I/O modules<br>• Turned off when communication is restored to normal with automatic online return enabled<br>• Remains on when communication is suspended at error detection with automatic online return disabled. | — | Usable with A2C and A52G |
| M9065 | Divided transfer status | OFF: Other than divided processing<br>ON: Divided processing | • Turned on when canvas screen transfer to AD57 (S1)/AD58 is done by divided processing, and turned off at completion of divided processing. | — | Usable with AnA, and AnU. |
| *2 M9066 | Transfer processing switching | OFF: Batch transfer<br>ON: Divided transfer | • Turned on when canvas screen transfer to AD57 (S1)/AD58 is done by divided processing. | — | Usable with AnA, and AnU. |
| M9067 | I/O module error detection | OFF: Normal<br>ON: Error | • Turned on when one of I/O modules has become a faulty station. ( Communication error is detected when normal communication is not restored after the number of retries set at D9174.)<br>• Turned off when communication with all I/O modules is restored to normal with automatic online return enabled.<br>• Remains on when automatic online return is disabled.<br>• Not turned on or off when communication is suspended at error detection. | — | Usable with A2C and A52G. |
| M9068 | Test mode | OFF: Automatic online return enabled Automatic online return disabled Communication suspended at online error<br>ON: Line check | • Turned on when line check with I/O modules and remote terminal modules is performed.<br>• Turned off when communication with I/O modules and remote terminal modules is per-formed. | — | Usable with A2C and A52G. |
| M9069 | Output at line error | OFF: All outputs are turned off.<br>ON: Outputs are retained. | • Sets whether all outputs are turned off or retained at communication error.<br>OFF: All outputs are turned off at communication error.<br>ON: Outputs before communication error are retained. | — | Usable with A2C and A52G. |

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *2 M9070 | Time required for search of A8UPU/A8PUJ | OFF: Reading time reduction OFF<br>ON: Reading time reduction ON | • Turn on to reduce the search time of A8UPU/ A8PUJ.<br>(In this case, the scan time of the CPU module extends by 10%.) | △ | Usable with AnU and A2US(H). |
| *1 M9073 | WDT error flag | OFF: No WDT error<br>ON: WDT error | • Turns on when WDT error is detected by the self-check of the PCPU. | — | Dedicated to A73. |
| M9073 | Clock data set request | OFF: No processing<br>ON: Set request is made | • The clock data registered in D9073 to D9076 is written to the clock device after the execution of the END instruction of the scan in which the state of M9073 changes from OFF to ON. | — | Dedicated to A2CCPUC24 (-PRF) |
| M9073 | Setting of writing to flash ROM | OFF: Disables writing to ROM<br>ON: Enables writing to ROM | • Turned on to enable writing to the flash ROM. (DIP switch 3 should be set to ON.) | — | Dedicated to QCPU-A (A Mode) |
| M9074 | PCPU ready complete flag | OFF: PCPU ready incomplete<br>ON: PCPU ready complete | • Set if the motor is not running when it is checked at PC ready (M2000) on. Turned off when M2000 is turned off. | — | Dedicated to A73. |
| M9074 | Clock data error | OFF: No error<br>ON: Error occurred | • This goes ON when a clock data (D9073 to D9076) error occurs. This remains OFF when there is no error. | — | Dedicated to A2CCPUC24 (-PRF) |
| M9074 | Request for writing to flash ROM | OFF → ON: Starts writing to ROM | • When turned from OFF to ON, writing to the built-in ROM is started. | — | Dedicated to QCPU-A (A Mode) |
| M9075 | Test mode flag | OFF: Other than test mode<br>ON: Test mode | • Turned ON when a test mode request is made from a peripheral device. Reset when test mode is finished. | — | Dedicated to A73. |
| M9075 | Successful completion of writing to built-in ROM | OFF: Failed writing to ROM<br>ON: Successfully completed writing to ROM | • Turned on when writing to the built-in ROM is successfully completed.<br>(This status is stored in D9075.) | — | Dedicated to QCPU-A (A Mode) |
| M9076 | External emergency stop input flag | OFF: External emergency stop input is on.<br>ON: External emergency stop input is off. | • Turned off when the external emergency stop input connected to the EMG terminal of A70SF is turned on. Turned on when the external emergency stop input is turned off. | — | Dedicated to A73. |
| M9076 | Clock data read request | OFF: No procesing<br>ON: Read request is made | • When M9076 is ON, clock data is read out to D9073 to D9076 in BCD values. | — | Dedicated to A2CCPUC24 (-PRF) |
| M9076 | Status of writing to built-in ROM | OFF: Writing to ROM disabled<br>ON: Writing to ROM enabled | • Turns ON when writing to built-in ROM is enabled. (Turns ON when DIP switch and M9073 are ON.) | — | Dedicated to QCPU-A (A Mode) |
| M9077 | Manual pulse generator axis setting error flag | OFF: All axes normal<br>ON: Error axis detected | • Turned on when there is an error in the contents of manual pulse generator axis setting. Turned off if all axes are normal when the manual pulse generator enable flag is turned on. | — | Dedicated to A73. |

**Table App2.1 Special Relay List (Continue)**

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>M9077</td><td>Sequence accumulation time measurement</td><td>OFF: Time not elapsed<br>ON: Time elapsed</td><td>• Compares the setting value at D9077 with the time elapsed from the start of measurement (accumulation time) at every scan. Then, performs the following operations:<br>Setting value > Accumulation time:<br>Turns M9077 ON and clears the accumulation time.<br>Setting value < Accumulation time:<br>Turns M9077 from ON to OFF and clears the accumulation time. When M9077 is already OFF, clears the accumulation time.<br>* When 1 to 255 is designated at D9077, M9077 is turned ON at the first scan.<br>* When the value other than 1 to 255 is designated at D9077, the value in D9077 is reset to 0 and M9077 is always turned OFF.</td><td>—</td><td>Dedicated to QCPU-A (A Mode)</td></tr>
<tr><td>M9078</td><td>Test mode request error flag</td><td>OFF: No error<br>ON: Error</td><td>• Turned on when test mode is not available though a test mode request was made from a peripheral device. Turned off if test mode becomes available by making another test mode request.</td><td>—</td><td>Dedicated to A73.</td></tr>
<tr><td>M9079</td><td>Servo program setting error flag</td><td>OFF: No data error<br>ON: Data error</td><td>• Turned on when the positioning data of the servo program designated by the DSFRP instruction has an error.<br>Turned off when the data has no error after the DSFRP instruction is executed again.</td><td>—</td><td>Dedicated to A73.</td></tr>
<tr><td>M9080</td><td>BUSY flag for execution of CC-Link dedicated instruction</td><td>OFF: Number of remaining instructions executable simultaneously: 1 to 10<br>ON: Number of remaining instructions executable simultaneously: 0</td><td>Turned ON/OFF according to the number of remaining instructions ( RIRD / RIWT / RISEND / RIRCV ) being executable simultaneously at one scan.<br>OFF: Number of remaining instructions executable simultaneously: 1 to 10<br>ON: Number of remaining instructions executable simultaneously: 0<br>By assigning M9080 as execution condition, the number of instructions above executed simultaneously at one scan can be limited to 10 or less.<br>*4: This function is available with the CPU of the following S/W versions or later.
<table>
<tr><th>CPU Type Name</th><th>Software Version</th></tr>
<tr><td>Q02CPU-A, Q02HCPU-A, Q06HCPU-A</td><td rowspan="2">Available with all versions</td></tr>
<tr><td>A1SJHCPU, A1SHCPU, A2SHCPU</td></tr>
<tr><td>A2UCPU(S1), A3UCPU, A4UCPU</td><td>S/W version Q (Manufactured in July, 1999)</td></tr>
<tr><td>A2USCPU(S1)</td><td>S/W version E (Manufactured in July, 1999)</td></tr>
<tr><td>A2USHCPU-S1</td><td>S/W version L (Manufactured in July, 1999)</td></tr>
</table></td><td>△</td><td>Can be used only with AnU, A2US, or AnSH, QCPU-A (A Mode) *4</td></tr>
</table>

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9081 | Registration area busy signal for communication request | OFF: Communication request to remote terminal modules enabled<br>ON: Communication request to remote terminal modules disabled | • Indication of communication enable/disable to remote terminal modules connected to the MINI (S3) link module, A2C or A52G. | — | Usable with AnA, AnA, AnU, A2AS, QCPU-A (A Mode) A2C and A52G. |
| M9082 | Final station number disagreement | OFF: Final station number agreement<br>ON: Final station number disagreement | • Turned on when the final station number of the remote terminal modules and remote I/O modules connected to the A2C or A52G disagrees with the total number of stations set in the initial setting.<br>• Turned off when the final station number agrees with the total number of stations at STOP → RUN | — | Dedicated to A2C and A52G. |
| *2 M9084 | Error check | OFF: Checks enabled<br>ON: Checks disabled | • Specify whether the following errors are to be checked or not after the END instruction is executed (to set END instruction processing time):<br>• Fuse blown<br>• I/O unit verify error<br>• Battery error | △ | Unusable with An, A2C and A3V. |
| M9086 | BASIC program RUN flag | OFF: A3M-BASIC stop<br>ON: A3M-BASIC run | • Turned on when the A3M-BASIC is in RUN state, and turned off when it is in STOP state. | — | Dedicated to A3M |
| M9087 | BASIC program PAUSE flag | OFF: A3M-BASIC RUN enable<br>ON: A3M-BASIC disable | • Specifies enable/disable of A3M-BASIC execution when the A3MCPU is in PAUSE state.<br>OFF: A3M-BASIC is executed.<br>ON: A3M-BASIC is not executed. | — | Dedicated to A3M. |
| M9090 | Power supply problem status on the PC side | OFF: Normal<br>ON: Power off | • Turns on if the power to the PC side is shut off when the external power supply is connected to the CPU board.<br>It stays on even after the status becomes normal. | — | Dedicated to A2USH board |
| *1 M9091 | Operation error detail flag | OFF: No error<br>ON: Error | • Turned on when an operation error detail factor is stored at D9091, and remains ON after normal state is restored. | — | Usable with AnA, A2AS, AnU and QCPU-A (A Mode). |
| *1 M9091 | Microcomputer subroutine call error flag | OFF: No error<br>ON: Error | • Turned on when an error occurred at execution of the microcomputer program package, and remains ON after normal state is restored. | — | Unusable with AnA, A2AS, AnU and QCPU-A (A Mode). |
| M9092 | External power supply problem status | OFF: Normal<br>ON: Power off | • Turns on when the external power being supplied to the CPU board is shut off.<br>It stays on even after the status becomes normal. | — | Dedicated to A2USH board |
| M9092 | Duplex power supply overheat error | OFF: Normal<br>ON: Overheat | • Turned on when overheat of a duplex power supply module is detected. | — | Dedicated to A3V. |
| M9093 | Duplex power supply error | OFF: Normal<br>ON: Failure or AC power supply down | • Turned on when a duplex power supply module caused failure or the AC power supply is cut down. | — | Dedicated to A3V. |

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *2 *3 M9094 | I/O change flag | OFF: Changed<br>ON: Not changed | • After the head address of the required I/O module is set to D9094, switching M9094 on allows the I/O module to be changed in online mode. (One module is only allowed to be changed by one setting.)<br>• To be switched on in the program or peripheral device test mode to change the module during CPU RUN. To be switched on in peripheral device test mode to change the module during CPU STOP.<br>• RUN/STOP mode must not be changed until I/O module change is complete. | — | Usable with An, AnN, AnA, AnU. |
| M9095 | Duplex operation verify error | OFF: Normal<br>ON: Duplex operation verify error | • During duplex operation of the operating CPU with a stand-by CPU, verification is performed by the both to each other. Turned on when a verify error occurred. | — | Dedicated to A3V. |
| M9096 | A3VCPU A selfcheck error | OFF: No error<br>ON: Error | • Turn on when a self-check error occurred on the A3VCPU A mounted next to the A3VTU. | — | Dedicated to A3V. |
| M9097 | A3VCPU B selfcheck error | OFF: No error<br>ON: Error | • Turn on when a self-check error occurred on the A3VCPU B mounted next to the A3VCPU A. | — | Dedicated to A3V. |
| M9098 | A3VCPU C selfcheck error | OFF: No error<br>ON: Error | • Turn on when a self-check error occurred on the A3VCPU C mounted next to the A3VCPU B. | — | Dedicated to A3V. |
| M9099 | A3VTU selfcheck error | OFF: No error<br>ON: Error | • Turned on when a self-check error occurred on the A3VTU. | — | Dedicated to A3V. |
| M9100 | SFC program registration | OFF: No SFC program<br>ON: SFC program registered | • Turned on if the SFC program is registered, and turned off if it is not. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| *2 M9101 | SFC program start/stop | OFF: SFC program stop<br>ON: SFC program start | • Should be turned on by the program if the SFC program is to be started. If turned off, operation output of the execution step is turned off and the SFC program is stopped. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| *2 M9102 | SFC program starting status | OFF: Initial start<br>ON: Continuous start | • Selects the starting step when the SFC program is restarted using M9101.<br>ON: Started with the step of the block being executed when the program stopped.<br>OFF: All execution conditions when the SFC program stopped are cleared, and the program is started with the initial step of block 0.<br>• Once turned on, the program is latched in the system and remains on even if the power is turned off.<br>Should be turned off by the sequence program when turning on the power, or when starting with the initial step of block 0. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9103 *2 | Consecutive step transfer enable/disable | OFF: Consecutive step transfer disable<br>ON: Consecutive step transfer enable | • Selects consecutive or step-by-step transfer of steps of which transfer conditions are established when all of the transfer conditions of consecutive steps are established.<br>ON: Consecutive transfer is executed.<br>OFF: One step per one scan is transferred. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9104 | Consecutive transfer prevention flag | OFF: Transfer complete<br>ON: Transfer incomplete | • Turned on when consecutive transfer is not executed with consecutive transfer enabled. Turned off when transfer of one step is completed. Consecutive transfer of a step can be prevented by writing an AND condition to corresponding M9104. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9108 *2 | Step transfer monitoring timer start (corresponds to D9108) | OFF: Monitoring timer reset<br>ON: Monitoring timer reset start | • Turned on when the step transfer monitoring timer is started. Turned off when the monitoring timer is reset. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9109 *2 | Step transfer monitoring timer start (corresponds to D9109) | | | | |
| M9110 *2 | Step transfer monitoring timer start (corresponds to D9110) | | | | |
| M9111 *2 | Step transfer monitoring timer start (corresponds to D9111) | | | | |
| M9112 *2 | Step transfer monitoring timer start (corresponds to D9112) | | | | |
| M9113 *2 | Step transfer monitoring timer start (corresponds to D9113) | | | | |
| M9114 *2 | Step transfer monitoring timer start (corresponds to D9114) | | | | |

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.1 Special Relay List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| M9180 | Active step sampling trace complete flag | OFF: Trace start<br>ON: Trace complete | • Turned on when sampling trace of all specified blocks is completed. Turned off when sampling trace is started. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9181 | Active step sampling trace execution flag | OFF: Trace not executed.<br>ON: Trace being executed. | • Turned on when sampling trace is being executed. Turned off when sampling trace is completed or suspended. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9182 *2 | Active step sampling trace enable | OFF: Trace disable/ suspend<br>ON: Trace enable | • Selects sampling trace execution enable/disable.<br>ON: Sampling trace execution is enabled.<br>OFF: Sampling trace execution is disabled. If turned off during sampling trace execution, trace is suspended. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9196 *2 | Operation output at block stop | OFF: Coil output off<br>ON: Coil output on | • Selects the operation output when block stop is executed.<br>ON: Retains the ON/OFF status of the coil being used by using operation output of the step being executed at block stop.<br>OFF: All coil outputs are turned off. (Operation output by the SET instruction is retained regardless of the ON/OFF status of M9196.) | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| M9197<br>M9198 | Fuse blow, I/O verify error display switching | M9197 / M9198 / I/O numbers to be displayed:<br>OFF / OFF / X/Y0 to 7F0<br>ON / OFF / X/Y800 to FF0<br>OFF / ON / X/Y1000 to 17F0<br>ON / ON / X/Y1800 to 1FF0 | • Switches I/O numbers in the fuse blow module storage registers (D9100 to D9107) and I/O module verify error storage registers (D9116 to D9123) according to the combination of ON/OFF of the M9197 and M9198. | — | Usable with AnU, A2AS and QCPU-A (A Mode) |
| M9199 | Data recovery of online sampling trace / status latch | OFF: Data recovery OFF<br>ON: Data recovery ON | • When sampling trace / status latch is executed, the setting data stored in the CPU module is recovered to enable restart.<br>• Turn on M9199 to execute again. (There is no need to write data with the peripheral device.) | — | Usable with AnU, A2AS and QCPU-A (A Mode) |

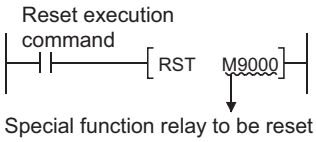
*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

POINTS

(1) Contents of the M special relays are all cleared by power off, latch clear or reset with the reset key switch. When the RUN/STOP key switch is set in the STOP position, the contents are retained.

(2) The above relays with numbers marked *1 remain "on" if normal status is restored. Therefore, to turn them "off", use the following method:

(a) Method by use program
Insert the circuit shown at right into the user program and turn on the reset execution command contact to clear the special relay M.




(b) Use the test function of the peripheral device to reset forcibly.
For the operation procedure, refer to the manuals for peripheral devices.

(c) By moving the RESET key switch on the CPU front to the RESET position, the special relays are turned off.

(3) Special relays marked *2 above are switched on/off in the sequence program.

(4) Special relays marked *3 above are switched on/off in test mode of the peripheral equipment.

(5) Turn OFF the following special relays after resetting the related special resisters. Unless the related special registers are reset, the special relays will be turned ON again even if they are turned reset. (Except for the AnU, A2US(H), and QCPU-A (A mode).)

| Special Relay | Related Special Resister |
|---|---|
| M9000 | D9100 to D9107 |
| M9001 | D9116 to D9123 |

## Appendix 2.2 Special Registers

Special registers are data registers of which applications have been determined inside the PC. Therefore, do not write data to the special registers in the program (except the ones with numbers marked 2 in the table).

**Table App2.2 Special Register List**

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9000</td><td>Fuse blow</td><td>Fuse blow module number</td><td>• When fuse blown modules are detected, the lowest number of detected units is stored in hexadecimal. (Example: When fuses of Y50 to 6F output modules have blown, "50" is stored in hexadecimal) To monitor the number by peripheral devices, perform monitor operation given in hexadecimal.<br>(Cleared when all contents of D9100 to D9107 are reset to 0.)<br>• Fuse blow check is executed also to the output modules of remote I/O stations.</td><td>△</td><td>Unusable with A0J2H.<br>( Only remote I/O station information is valid for A2C. )</td></tr>
<tr><td>D9001</td><td>Fuse blow</td><td>Fuse blow module number</td><td>• Stores the module numbers corresponding to setting switch numbers or base slot numbers when fuse blow occurred.
<table>
<tr><th colspan="2">I/O Module for A0J2</th><th colspan="2">Extension Base Unit</th></tr>
<tr><th>Setting Switch</th><th>Stored Data</th><th>Base Unit Slot No.</th><th>Stored Data</th></tr>
<tr><td>0</td><td>1</td><td>0</td><td>5</td></tr>
<tr><td>1</td><td>2</td><td>1</td><td>6</td></tr>
<tr><td>2</td><td>3</td><td>2</td><td>7</td></tr>
<tr><td>3</td><td>4</td><td>3</td><td>8</td></tr>
<tr><td>4</td><td>5</td><td></td><td></td></tr>
<tr><td>5</td><td>6</td><td></td><td></td></tr>
<tr><td>6</td><td>7</td><td></td><td></td></tr>
<tr><td>7</td><td>8</td><td></td><td></td></tr>
</table>
• In case of remote I/O station, (module I/O number/10H) + 1 is stored.</td><td>—</td><td>Dedicated to A0J2H.</td></tr>
<tr><td rowspan="2">D9002</td><td rowspan="2">I/O module verify error</td><td rowspan="2">I/O module verify error unit number</td><td>• If an I/O module whose data is different from the entered data when the power is turned on is detected, the head I/O number of the detected module is stored in hexadecimal. When the situation is detected in multiple modules, the lowest number among the module will be stored. (Storing method is the same as that of D9000.) To monitor the number by peripheral devices, perform monitor operation given in hexadecimal.<br>(Cleared when all contents of D9116 to D9123 are reset to 0.)<br>• I/O module verify check is executed also to the modules of remote I/O terminals.</td><td>△</td><td>Unusable with A0J2H.<br>( Only remote I/O station information is valid for A2C. )</td></tr>
<tr><td>• If an I/O module, of which data is different from data entered, is detected when the power in turned on, the I/O number corresponding to the setting switch No. or base unit No. is stored.(Storing method is the same as that of D9001).<br>• In case of remote I/O station, (module I/O number/10H) + 1 is stored.</td><td>—</td><td>Dedicated to A0J2H.</td></tr>
</table>

**Table App2.2 Special Register List (Continue)**

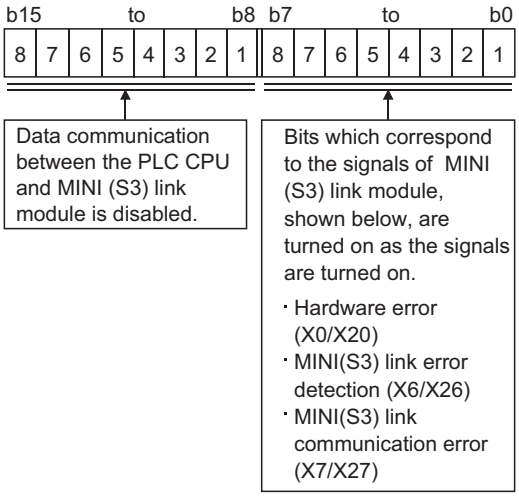
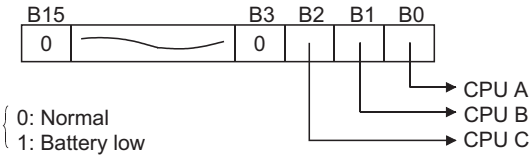
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9003 | SUM instruction detection bits | The number of bits detected by SUM instruction detection. | • The number of bits detected by execution of the SUM instruction are stored. in BIN code and updated every execution thereafter. | — | Dedicated to A0J2H. |
| *1 D9004 | MINI link master module error | Error detection status | • Error status of the MINI (S3) link detected on loaded MINI (S3) link module is stored.<br>  | — | Usable with AnA, A2AS, AnA board and AnU. |
| *1 D9005 | AC DOWN counter | AC DOWN count | • 1 is added each time input voltage becomes 85% or less of rating while the CPU unit is performing operation, and the value is stored in BIN code. | ○ | Usable with all types of CPUs. |
| D9006 | Battery low | Indicates the CPU module of which battery voltage is low. | • Bits which correspond to CPU of which battery is low are turned on in D9006, as shown below.<br>  | — | Dedicated to A3V. |
| *1 D9008 | Shelf-diagnostic error | Self-diagnostic error number | • When error is found as a result of self-diagnosis, error number is stored in BIN code. | ○ | Usable with all types of CPUs. |
| D9009 | Annunciator detection | F number at which external failure has occurred | • When one of F0 to 255 is turned on by OUT F or SET F , the F number, which has been detected earliest among the F numbers which have turned on, is stored in BIN code.<br>• D9009 can be cleared by RST F or LEDR instruction. If another F number has been detected, the clearing of D9009 causes the next number to be stored in D9009. | △ | Unusable with A3, A3N, A3A, A73 and A3N board. |
| | | | • When one of F0 to 255 is turned on by OUT F or SET F , the F number, which has been detected earliest among the F numbers which have turned on, is stored in BIN code.<br>• D9009 can be cleared by executing RST F or LEDR instruction or moving INDICATOR RESET switch on CPU front to ON position. If another F number has been detected, the clearing of D9009 causes the nest number to be stored in D9009. | — | Usable with A3, A3N, A3A, A73 and A3N board. |

**Table App2.2 Special Register List (Continue)**

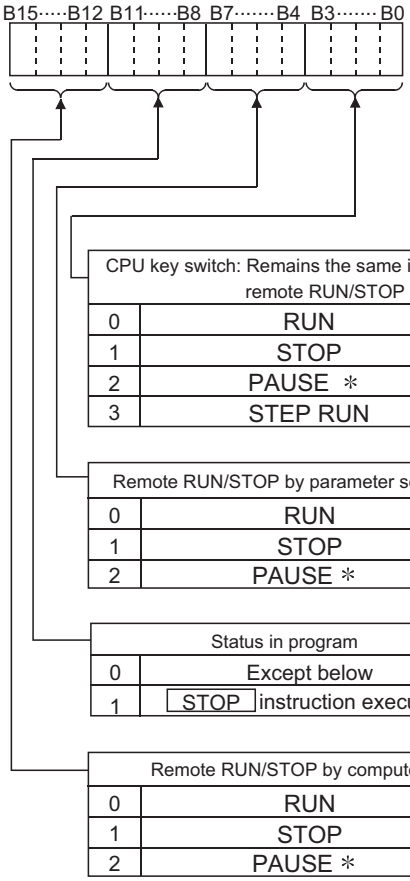
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9010 | Error step | Step number at which operation error has occurred | • When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in BIN code. Thereafter, each time operation error occurs, the contents of D9010 are renewed. | △ | Unusable with A3H and A3M. |
| D9011 *1 | Error step | Step number at which operation error has occurred | • When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in BIN code. Since storage into D9011 is made when M9011 changes from off to on, the contents of D9010 cannot be renewed unless M9011 is cleared by user program. | ○ | Usable with all types of CPUs. |
| D9014 | I/O control mode | I/O control mode number | • The I/O control mode set is returned in any of the following numbers:<br>0. Both input and output in direct mode<br>1. Input in refresh mode, output in direct mode<br>3. Both input and output in refresh mode | △ | Unusable with An, A3H and A3M. |
| D9015 | CPU operating states | Operating states of CPU | • The operation states of CPU as shown below are stored in D9015.<br>  <br><br>* When the CPU is in RUN mode and M9040 is off, the CPU remains in RUN mode if changed to PAUSE mode. | ○ | Usable with all types of CPUs. |

**Table App2.2 Special Register List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9016 | ROM/RAM setting | 0: ROM<br>1: RAM<br>2: $E^2$PROM | • Indicates the setting of memory select chip. One value of 0 to 2 is stored in BIN code. | — | Usable with A1 and A1N. |
| | Program number | 0: Main program (ROM)<br>1: Main program (RAM)<br>2: Subprogram (RAM) | • Indicates which sequence program is run presently. One value of 0 to 2 is stored in BIN code. ("2" is not stored when AnS, AnSH, A1FX, A0J2H, A2C, A2, A2N, A2A, A2AS and A2U is used.) | △ | Unusable with A1 and A1N |
| | | 0: Main program (ROM)<br>1: Main program (RAM)<br>2: Subprogram 1 (RAM)<br>3: Subprogram 2 (RAM)<br>4: Subprogram 3 (RAM)<br>5: Subprogram 1 (ROM)<br>6: Subprogram 2 (ROM)<br>7: Subprogram 3 (ROM)<br>8: Main program ($E^2$PROM)<br>9: Subprogram 1 ($E^2$PROM)<br>A: Subprogram 2 ($E^2$PROM)<br>B: Subprogram 3 ($E^2$PROM) | • Indicates which sequence program is run presently. One value of 0 to B is stored in BIN code. | — | Dedicated to AnU. |
| D9017 | Scan time | Minimum scan time (per 10 ms) | • If scan time is smaller than the content of D9017, the value is newly stored at each END. Namely, the minimum value of scan time is stored into D9017 in BIN code. | ○ | Usable with all types of CPUs. |
| D9018 | Scan time | Scan time (per 10 ms) | • Scan time is stored in BIN code at each END and always rewritten. | ○ | Usable with all types of CPUs. |
| D9019 | Scan time | Maximum scan time (per 10 ms) | • If scan time is larger than the content of D9019, the value is newly stored at each END. Namely, the maximum value of scan time is stored into D9019 in BIN code. | ○ | Usable with all types of CPUs. |
| D9020 *2 | Constant scan | Constant scan time (Set by user in 10 ms increments) | • Sets the interval between consecutive user program starts in multiples of 10 ms.<br>0: No setting<br>1 to 200: Set. Program is executed at intervals of (set value) × 10 ms. | △ | Unusable with An. |
| D9021 | Scan time | Scan time (1 ms unit) | • Scan time is stored and updated in BIN code after every END. | — | Usable with AnA, A2AS, AnU, AnA board and QCPU-A (A Mode). |
| D9022 | 1 second counter | Counts 1 every second. | • When the PC CPU starts running, it starts counting 1 every second.<br>• It starts counting up from 0 to 32767, then down to -32768 and then again up to 0. Counting repeats this routine. | — | |

**Table App2.2 Special Register List (Continue)**

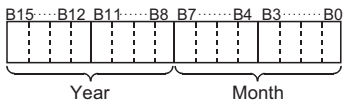
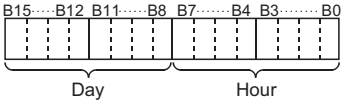
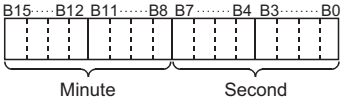
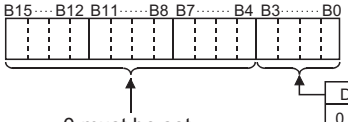
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *2 D9025 | Clock data | Clock data (Year, month) | • Stores the year (2 lower digits) and month in BCD.<br>  <br>Example: 1987,July H8707 | △ | Unusable with An, A3H, A3M, A3V, A2C and A0J2H. |
| *2 D9026 | Clock data | Clock data (Day, hour) | • Stores the day and hour in BCD.<br>  <br>Example: 31th,10 o'clock H3110 | △ | |
| *2 D9027 | Clock data | Clock data (Minute, second) | • Stores the Minute and second in BCD.<br>  <br>Example: 35 minutes, 48 seconds H3548 | △ | |
| *2 D9028 | Clock data | Clock data ( , day of the week) | • Stores the day of the week in BCD.<br>  <br>Example: Friday H0005<br>Day of the week: 0 Sunday; 1 Monday; 2 Tuesday; 3 Wednesday; 4 Thursday; 5 Friday; 6 Saturday | △ | Unusable with An, A3H, A3M, A3V, A2C and A0J2H. |

**Table App2.2 Special Register List (Continue)**

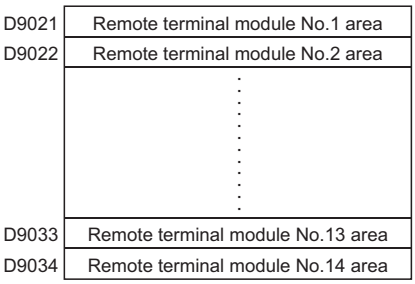
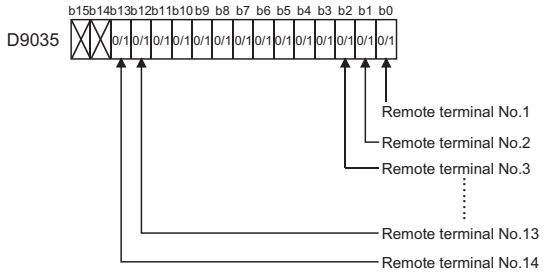
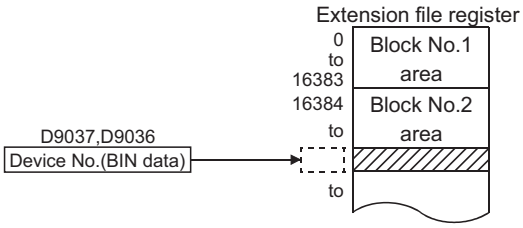
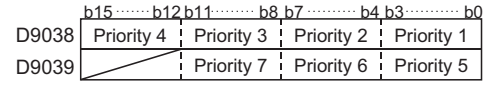
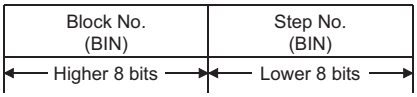
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9021<br>D9022<br>D9023<br>D9024<br>D9025<br>D9026<br>D9027<br>D9028<br>D9029<br>D9030<br>D9031<br>D9032<br>D9033<br>D9034 | Remote terminal parameter setting | 1 to 61 | • Sets the head station number of remote terminal modules connected to A2C and A52G. Setting is not necessarily in the order of station numbers.<br>A2CCPUC24:1 to 57<br>Other CPUs:1 to 61<br>• Data configuration<br>  | — | Usable with A2C and A52G. |
| D9035 | Attribute of remote terminal module | 0: MINI standard protocol<br>1: No protocol | • Sets attribute of each remote terminal module connected to A2C and A52G with 0 or 1 at each bit.<br>0: Conforms to the MINI standard protocol or remote terminal unit.<br>1: No-protocol mode of AJ35PTF-R2<br>• Data configuration<br>  | | |
| D9035 | Extension file register | Use block No. | • Stores the block No. of the extension file register being used in BCD code. | — | Usable with AnA, A2AS, AnU and QCPU-A (A Mode). |
| D9036 | Total number of stations | 1 to 64 | • Sets the total number of stations (1 to 64) of I/O modules and remote terminal modules which are connected to an A2C or A52G. | — | Usable with A2C and A52G. |

**Table App2.2 Special Register List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9036<br>D9037 | For designation extension file register device numbers | The devise number used for getting direct access to each device for extension file register | • Designate the device number for the extension file register for direct read and write in 2 words at D9036 and D9037 in BIN data.<br>Use consecutive numbers beginning with R0 of block No. 1 to designate device numbers.<br>  | — | Usable with AnA, A2AS, AnU and QCPU-A (A Mode). |
| D9038<br>D9039 | LED indication priority | Priority 1 to 4<br>Priority 5 to 7 | • Sets priority of ERROR LEDs which illuminate (or flicker) to indicate errors with error code numbers.<br>• Configuration of the priority setting areas is as shown below.<br>  <br>• For details, refer to the applicable CPUs User's Manual and the ACPU (Fundamentals) Programming manual. | — | Usable with A2C, AnS, AnSH, A1FX, A0J2H, A52G AnA, A2AS, AnU and QCPU-A (A Mode). |
| D9044 | Sampling trace | Step or time during sampling trace | • The value stored in D9044 is used as the condition of the sampling trace when M9044 is turned on or off with the peripheral device to start sampling trace STRA or STRAR .<br>At scanning ... 0<br>At time..... Time (10 ms unit)<br>Stores the value in BIN code for D9044. | △ | Usable with A1 and A1N |
| D9049 | SFC program execution work area | Expansion file register block number to be used as the work area for the execution of a SFC program. | • Stores the block number of the expansion file register which is used as the work area for the execution of a SFC program in a binary value.<br>• Stores "0" if an empty area of 16K bytes or smaller, which cannot be expansion file register No. 1, is used or if M9100 is OFF. | — | Usable with AnN*, AnA*, AnU, A2AS, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |
| D9050 | SFC program error code | Code number of error occurred in the SFC program | • Stores code numbers of errors occurred in the SFC program in BIN code.<br>0: No error<br>80: SFC program parameter error<br>81: SFC code error<br>82: Number of steps of simultaneous execution exceeded<br>83: Block start error<br>84: SFC program operation error | | |
| D9051 | Error block | Block number in which an error occurred. | • Stores the block number in which an error occurred in the SFC program in BIN code.<br>In the case of error 83 the starting block number is stored. | — | |

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.2 Special Register List (Continue)**

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9052</td><td>Error step</td><td>Step number in which an error occurred.</td><td>• Stores the step number in which error 84 occurred in the SFC program in BIN code.<br>Stores "0" when errors 80, 81 and 82 occurred.<br>Stored the block starting step number when error 83 occurred.</td><td>—</td><td rowspan="3">Usable with AnN*, AnA*, AnU, A2S, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G.</td></tr>
<tr><td>D9053</td><td>Error transfer</td><td>Transfer condition number in which an error occurred.</td><td>• Stores the transfer condition number in which error 84 occurred in the SFC program in BIN code.<br>Stored "0" when errors 80, 81, 82 and 83 occurred.</td><td>—</td></tr>
<tr><td>D9054</td><td>Error sequence step</td><td>Sequence step number in which an error occurred.</td><td>• Stores the sequence step number of transfer condition and operation output in which error 84 occurred in the SFC program in BIN code.</td><td>—</td></tr>
<tr><td>D9055</td><td>Status latch execution step number</td><td>Status latch execution step number</td><td>• Stores the step number when status latch is executed.<br>• Stores the step number in a binary value if status latch is executed in a main sequence program.<br>• Stores the block number and the step number if status latch is executed in a SFC program.<br> 
</td><td>—</td><td>Usable with AnA, A2AS, AnA bpard, AnU and QCPU-A (A Mode).</td></tr>
<tr><td>D9060</td><td>Software version</td><td>Software version of internal system</td><td>Stores the software version of the CPU module's internal system in ASCII codes.<br>Example: Stores "41H" for version A.<br>Note)The software version of the internal system may be different from the version marked on the housing.<br>*5: This function is available with the CPU of the following S/W versions or later.
<table>
<tr><th>CPU Type Name</th><th>Software Version</th></tr>
<tr><td>A2ACPU (P21/R21), A2ACPU-S1 (P21/R21)</td><td>S/W version W (Manufactured in July, 1998)</td></tr>
<tr><td>A3ACPU (P21/R21)</td><td>S/W version X (Manufactured in July, 1998)</td></tr>
<tr><td>A2UCPU (S1), A3UCPU, A4UCPU</td><td>S/W version H (Manufactured in July, 1998)</td></tr>
<tr><td>A1SJHCPU, A1SHCPU, A2SHCPU</td><td>S/W version H (Manufactured in May, 1998)</td></tr>
<tr><td>A2USCPU (S1)</td><td>S/W version Y (Manufactured in July, 1998)</td></tr>
<tr><td>A2USHCPU-S1</td><td>S/W version E (Manufactured in July, 1998)</td></tr>
</table></td><td>△</td><td>Can be used only with AnU, A2US, or AnSH. *5</td></tr>
<tr><td>D9061</td><td>Communication error code</td><td>0: Normal<br>1: Initial data error<br>2: Line error</td><td>• Stores error code when M9061 is turned on (communication with I/O modules or remote terminal modules fails).<br>• 1 .....Total number of stations of I/O modules or remote terminal modules or number of retries is not normal. Initial program contains an error.<br>• 2 .....Cable breakage or power supply of I/O modules or remote terminal modules is turned off.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
</table>

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.2 Special Register List (Continue)**

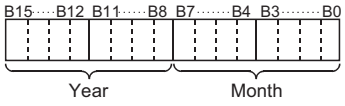
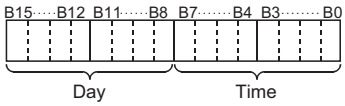
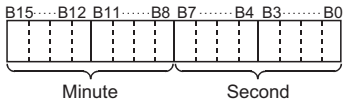
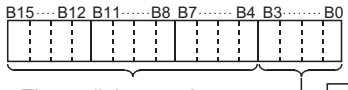
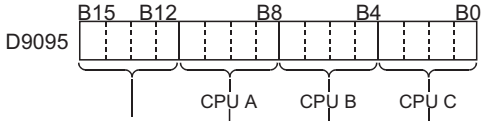
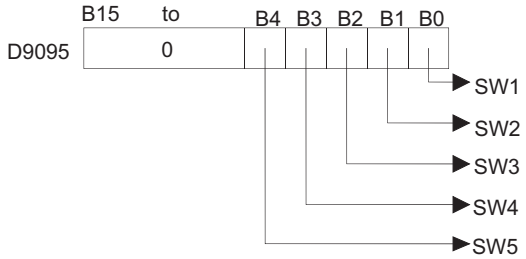
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9068 | Abnormal base module | Stores the bit pattern of the abnormal base module | Stores the bit pattern of the base module in abnormal condition.<br>When basic base module is abnormal: Bit 0 turns ON.<br>When 1st expansion base module is abnormal: Bit 1 turns ON.<br>When 2nd expansion base module is abnormal: Bit 2 turns ON.<br>:<br>:<br>When 7th expansion base module is abnormal: Bit 7 turns ON. | — | Dedicated to QCPU-A (A Mode) |
| D9072 | PC communication check | Data check by AJ71C24 | • In the loopback test mode of individual AJ71C24, the AJ71C24 automatically executes data write/read and communication check. | ○ | Usable with all types of CPUs. |
| D9073 | Clock data | Clock data (year, month) | • Two digits showing the year (XX of 19XX) and month are stored to D9073 in BCD codes, as shown below.<br>  <br>Example: 1987,July H8707 | — | Dedicated to A2CCPUC24 (-PRF) |
| D9074 | Clock data | Clock data (day, time) | • Two digits showing the day and time are stored to D9074 in BCD codes, as shown below.<br>  <br>Example: 31th,10 o'clock H3110 | | |
| D9075 | Clock data | Clock data (minute, second) | • Two digits showing the minute and second are stored to D9075 in BCD codes, as shown below.<br>  <br>Example: 35 minutes, 48 seconds H3548 | | Dedicated to A2CCPUC24 (-PRF) |
| D9075 | Result of writing to built-in ROM | Stores the status of writing to the built-in ROM | Stores the status of writing to the built-in ROM.<br>0: Writing enabled<br>F1H: During RAM operation<br>F2H: Writing to built-in ROM disabled<br>F3H: Failed to erase<br>F4H: Failed to write<br>FEH: Checking erasing<br>FFH: During writing | — | Dedicated to QCPU-A (A Mode) |
| D9076 | Clock data | Clock data (day of the week) | • Two day of the week is stored to D9076 in BCD codes, as shown below.<br>  <br>These digits are always set to 0.<br>Day of the week: 0 Sunday, 1 Monday, 2 Tuesday, 3 Wednesday, 4 Thursday, 5 Friday, 6 Saturday | — | Dedicated to A2CCPUC24 (-PRF) |
| D9076 | Status of writing to built-in ROM | Stores the status of writing (enabled/disabled) to the built-in ROM | Stores the status of writing (enabled/disabled) to the built-in ROM.<br>Statuses of DIP switch 3 and M9073<br>0: SW3 is OFF, M9073 is OFF/ON<br>1: SW3 is ON, M9073 is OFF<br>2: SW3 is ON, M9073 is ON | — | Dedicated to QCPU-A (A Mode) |

**Table App2.2 Special Register List (Continue)**

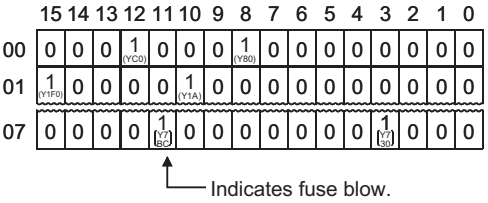
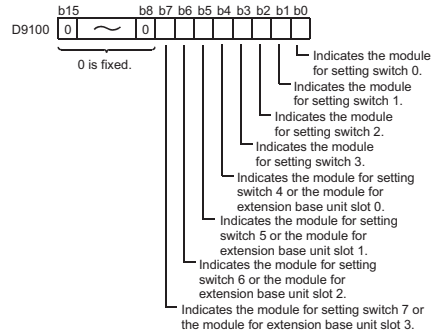
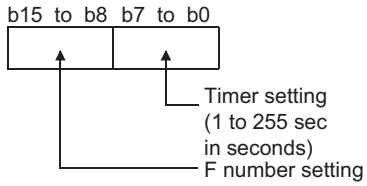
<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9077</td><td>Sequence accumulation time measurement</td><td>Accumulation time setting</td><td>• Stores the accumulation time used by M9077.<br>Setting range: 1 to 255ms (Default: 5ms)<br>* When the value other than 1 to 255 ms is designated, the value in D9077 is reset to 0.</td><td>—</td><td>Dedicated to QCPU-A (A Mode)</td></tr>
<tr><td>D9080</td><td>Number of executable CC-Link dedicated instructions</td><td>Stores the number of remaining CC-Link dedicated instructions being executable</td><td>Stores the number of remaining instructions ( RIRD / RIWT / RISEND / RIRCV ) being executable simultaneously at one scan.<br>(With QCUP-A or AnUCPU)<br>Number of remaining instructions being executable = 10 – Number of instructions executed simultaneously<br>(With AnSHCPU)<br>Number of remaining instructions being executable = 64 – Number of instructions executed simultaneously<br>*6: This function is available with the CPU of the following S/W versions or later.
<table>
<tr><th>CPU Type Name</th><th>Software Version</th></tr>
<tr><td>Q02CPU-A, Q02HCPU-A, Q06HCPU-A</td><td rowspan="2">Available with all versions</td></tr>
<tr><td>A1SJHCPU, A1SHCPU, A2SHCPU</td></tr>
<tr><td>A2UCPU (S1), A3UCPU, A4UCPU</td><td>S/W version Q (Manufactured in July, 1999)</td></tr>
<tr><td>A2USCPU (S1)</td><td>S/W version E (Manufactured in July, 1999)</td></tr>
<tr><td>A2USHCPU-S1</td><td>S/W version L (Manufactured in July, 1999)</td></tr>
</table></td><td>△</td><td>Can be used only with AnU, A2US, QCPU-A (A Mode) or AnSH *6</td></tr>
<tr><td>D9081</td><td>Number of vacant registration areas for communication requests</td><td>0 to 32</td><td>• Stores the number of vacant registration areas for communication requests executed to remote terminal modules connected to MINI (S3) link module, A2C and A52G.</td><td>—</td><td>Usable with AnA, A2AS, QCPU-A (A Mode), AnU, A2C and A52G.</td></tr>
<tr><td>D9082</td><td>Final connected station number</td><td>Final connected station number</td><td>• Stores the final station number of remote I/O modules and remote terminal modules connected to A2C and A52G.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
<tr><td>D9085</td><td>Time check time</td><td>1 s to 65535 s</td><td>• Sets the time check time of the data link instructions ( ZNRD , ZNWR ) for the MELSECNET/10.<br>• Setting range: 1 s to 65535 s (1 to 65535)<br>• Setting unit: 1 s<br>• Default value: 10 s (If 0 has been set, default 10 s is applied)</td><td>—</td><td>Usable with AnU and A2AS, QCPU-A (A Mode)</td></tr>
<tr><td>D9090</td><td>Microcomputer subroutine input data area head device number</td><td>Depends on the micro-computer program package to be used.</td><td>• For details, refer to the manual of each microcomputer program package.</td><td>△</td><td>Unusable with AnA, A2AS, QCPU-A (A Mode) and AnU.</td></tr>
<tr><td rowspan="2">D9091</td><td>Instruction error</td><td>Instruction error detail number</td><td>• Stores the detail code of cause of an instruction error.</td><td>—</td><td>Usable with AnA, A2AS, QCPU-A (A Mode),AnA board and AnU.</td></tr>
<tr><td>Microcomputer subroutine call error code</td><td>Depends on the micro-computer program package to be used.</td><td>• For details, refer to the manual of each microcomputer program package.</td><td>△</td><td>Unusable with AnA, A2AS, QCPU-A (A Mode),AnA board and AnU.</td></tr>
</table>

**Table App2.2 Special Register List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9091 | SFC program detail error number | Detail error number of the error which occurred in a SFC program | • Stores the detail error number of the error occurred in a SFC program in a binary value. | — | Usable with AnN*, AnA*, AnU, A2US(H), A2C, AOJ2H, QCPU-A (A Mode), AnS, AnSH, A1FX. |
| *2 *3 D9094 | Changed I/O module head address | Changed I/O module head address | • Stores upper 2 digits of the head I/O address of I/O modules to be loaded or unloaded during online mode in BIN code. Example) Input module X2F0 → H2F | — | Unusable with AnN, A3V, AnA, A73, AnU. |
| D9095 | Operation state of the A3VTS system and A3VCPU | Stores operation with 4 hexadecimal digits. | • Monitors operation state of the A3VTS system and the A3VCPU.<br>  <br>Data(H) / Operation state: A RUN; B STEP-RUN; C PAUSE; D STOP; E ERROR<br>Data(H) / Operation state: 0 RUN; 1 STAND-BY; 2 STEP-RUN; 3 PAUSE; 4 STOP; 5 WAIT; 6 ERROR; 7 NO RIGHT OF OPERATION | — | Dedicated to A3V. |
| | Dip switch information | Dip switch information | • Dip switch information of CPU module is stored as follows.<br>0:ON<br>1:OFF<br>  | — | Usable wtih QCPU-A (A mode) only. |
| D9096 | A3VCPU A Self-check error | Self-check error code | • Error code of self-check error on CPU A is stored in BIN code.<br>• Cleared when D9008 of CPU A is cleared. | — | Dedicated to A3V. |
| D9097 | A3VCPU B Self-check error | Self-check error code | • Error code of self-check error on CPU B is stored in BIN code.<br>• Cleared when D9008 of CPU B is cleared. | — | Dedicated to A3V. |
| D9098 | A3VCPU C Self-check error | Self-check error code | • Error code of self-check error on CPU C is stored in BIN code.<br>• Cleared when D9008 of CPU C is cleared. | — | Dedicated to A3V. |
| D9099 | A3VTU Self-check error | Self-check error code | • Error code of self-check error on A3VTU is stored in BIN code. | — | Dedicated to A3V. |

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.2 Special Register List (Continue)**

| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *1 D9100<br>*1 D9101<br>*1 D9102<br>*1 D9103<br>*1 D9104<br>*1 D9105<br>*1 D9106<br>*1 D9107 | Fuse blown module | Bit pattern in units of 16 points of fuse blow modules | • Output module numbers (in units of 16 points), of which fuses have blown, are entered in bit pattern. (Preset output unit numbers when parameter setting has been performed.)<br>  <br>• Fuse blow check is executed also to the output module of remote I/O station.<br>(If normal status is restored, clear is not performed. Therefore, it is required to perform clear by user program.)<br>(For the AnU, A2US(H) and QCPU-A (A mode))<br>• Data clear of D9100 to D9107 is executed by turning off M9000 (fuse blown).<br>(For the CPU other than the AnU, A2US(H) and QCPU-A (A mode))<br>• Data clear of D9100 to D9107 is executed by turning off D9100 to D9107 (fuse blown). | ○ | Usable with all types of CPUs<br>Only remote I/O station information is valid for A2C. |
| *1 D9100 | Fuse blow module | Fuse blow module bit pattern | • Stores the output module number of the fuses have blown in the bit pattern.<br>  | — | Dedicated to A0J2H. |
| *2 D9108<br>*2 D9109<br>*2 D9110<br>*2 D9111<br>*2 D9112<br>*2 D9113<br>*2 D9114 | Step transfer monitoring timer setting | Timer setting value and the F number at time out | • Sets value for the step transfer monitoring timer and the number of F which turns on when the monitoring timer timed out.<br>  <br>(By turning on any of M9108 to M9114, the monitoring timer starts. If the transfer condition following a step which corresponds to the timer is not established within set time, set annunciator (F) is tuned on. | — | Usable with AnN , AnA, AnU, A2AS, AnA board, QCPU-A (A Mode), A2C, A0J2H, AnS, AnSH, A1FX and A52G. |

*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

**Table App2.2 Special Register List (Continue)**

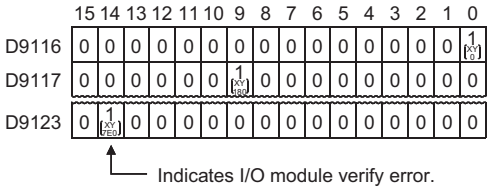
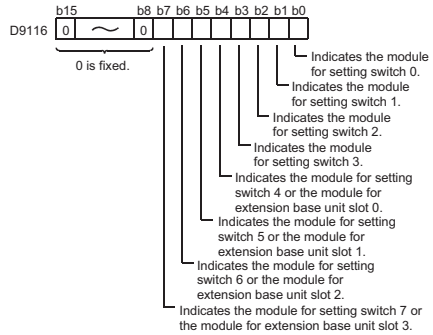
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| *1 D9116<br>*1 D9117<br>*1 D9118<br>*1 D9119<br>*1 D9120<br>*1 D9121<br>*1 D9122<br>*1 D9123 | I/O module verify error | Bit pattern in units of 16 points of verify error units | • When I/O modules, of which data are different from those entered at power-on, have been detected, the I/O unit numbers (in units of 16 points) are entered in bit pattern. (Preset I/O unit numbers when parameter setting has been performed.)<br>  <br>• I/O module verify check is executed also to remote I/O station modules.<br>(If normal status is restored, clear is not performed. Therefore, it is required to perform clear by user program.) | ○ | Usable with all types of CPUs<br>( Only remote I/O station information is valid for A2C. ) |
| *1 D9116 | I/O module verification error | Bit pattern of verification error module | • When an I/O module different from the I/O module data registered during power-on is detected, this register indicates the bit pattern of the I/O module number.<br>  | — | Dedicated to A0J2H. |
| D9124 | Annunciator detection quantity | Annunciator detection quantity | • When one of F0 to 255 (F0 to 2047 for AnA and AnU) is turned on by SET F 1 is added to the contents of D9124. When RST F or LEDR instruction is executed, 1 is subtracted from the contents of D9124. (If the INDICATOR RESET switch is provided to the CPU, pressing the switch can execute the same processing.)<br>• Quantity, which has been turned on by SET F is stored into D9124 in BIN code. The quantity turned on with SET F is stored up to "8." | ○ | Usable with all types of CPUs. |

**Table App2.2 Special Register List (Continue)**

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9125<br>D9126<br>D9127<br>D9128<br>D9129<br>D9130<br>D9131<br>D9132</td><td>Annunciator detection number</td><td>Annunciator detection number</td><td>• When one of F0 to 255 (F0 to 2047 for AnA and AnU) is turned on by SET F, F number, which has turned on, is entered into D9125 to D9132 in due order in BIN code.<br>F number, which has been turned off by RST F, is erased from D9125 to D9132, and the contents of data registers succeeding the data register, where the erased F number was stored, are shifted to the preceding data registers.<br>By executing LEDR instruction, the contents of D9125 to D9132 are shifted upward by one. (With a CPU equipped with an INDICATOR RESET switch, the same process occurs when the switch is pressed.<br>When there are 8 annunciator detections, the 9th one is not stored into D9125 to 9132 even if detected.<br>
<table>
<tr><th></th><th>SET F50</th><th>SET F25</th><th>SET F99</th><th>RST F25</th><th>SET F15</th><th>SET F70</th><th>SET F65</th><th>SET F38</th><th>SET F110</th><th>SET F151</th><th>SET F210</th><th>LEDR</th><th></th></tr>
<tr><td>D9009</td><td>0</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>99</td></tr>
<tr><td>D9124</td><td>0</td><td>1</td><td>2</td><td>3</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>8</td><td>8</td></tr>
<tr><td>D9125</td><td>0</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>99</td></tr>
<tr><td>D9126</td><td>0</td><td>0</td><td>25</td><td>25</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>15</td></tr>
<tr><td>D9127</td><td>0</td><td>0</td><td>0</td><td>99</td><td>0</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>70</td></tr>
<tr><td>D9128</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>70</td><td>70</td><td>70</td><td>70</td><td>70</td><td>70</td><td>65</td></tr>
<tr><td>D9129</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>65</td><td>65</td><td>65</td><td>65</td><td>65</td><td>38</td></tr>
<tr><td>D9130</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>38</td><td>38</td><td>38</td><td>38</td><td>110</td></tr>
<tr><td>D9131</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>110</td><td>110</td><td>110</td><td>151</td></tr>
<tr><td>D9132</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>151</td><td>151</td><td>210</td></tr>
</table></td><td>○</td><td>Usable with all types of CPUs</td></tr>
<tr><td>D9133<br>D9134<br>D9135<br>D9136<br>D9137<br>D9138<br>D9139<br>D9140</td><td>Remote terminal card information</td><td>00: No I/O module or remote terminal module or initial communication impossible<br>01: Input module or remote terminal module<br>10: Output module</td><td>• Stores information of I/O modules and remote terminal modules connected to the A2C and A52G corresponding to station number.<br>• Information of I/O modules and remote terminal modules is for input, output and remote terminal module identification and expressed as 2-bit data.<br>00: No I/O module or remote terminal module or initial communication is impossible.<br>01: Input module or remote terminal module<br>10: Output module<br>• Data configuration<br>
<table>
<tr><th></th><th>b15 b14</th><th>b13 b12</th><th>b11 b10</th><th>b9 b8</th><th>b7 b6</th><th>b5 b4</th><th>b3 b2</th><th>b1 b0</th></tr>
<tr><td>D9133</td><td>Station 8</td><td>Station 7</td><td>Station 6</td><td>Station 5</td><td>Station 4</td><td>Station 3</td><td>Station 2</td><td>Station 1</td></tr>
<tr><td></td><td>Station 16</td><td>Station 15</td><td>Station 14</td><td>Station 13</td><td>Station 12</td><td>Station 11</td><td>Station 10</td><td>Station 9</td></tr>
<tr><td></td><td>Station</td><td>Station</td><td>Station</td><td>Station</td><td>Station 20</td><td>Station 19</td><td>Station 18</td><td>Station</td></tr>
<tr><td></td><td>Station 56</td><td>Station 55</td><td>Station 54</td><td>Station 53</td><td>Station 52</td><td>Station 51</td><td>Station 50</td><td>Station 49</td></tr>
<tr><td>D9140</td><td>Station 64</td><td>Station 63</td><td>Station 62</td><td>Station 61</td><td>Station 60</td><td>Station 59</td><td>Station 58</td><td>Station 57</td></tr>
</table></td><td></td><td>Usable with A2C and A52G</td></tr>
</table>

**Table App2.2 Special Register List (Continue)**

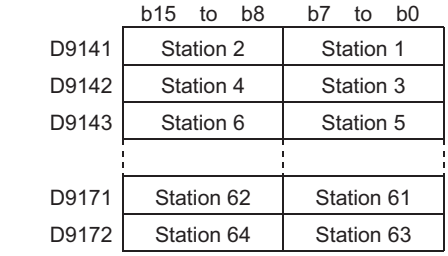
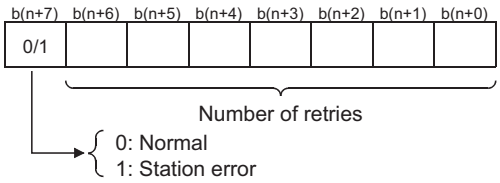
| Number | Name | Description | Details | Applicable CPU | |
|---|---|---|---|---|---|
| D9141<br>D9142<br>D9143<br>D9144<br>D9145<br>D9146<br>D9147<br>D9148<br>D9149<br>D9150<br>D9151<br>D9152<br>D9153<br>D9154<br>D9155<br>D9156<br>D9157<br>D9158<br>D9159<br>D9160<br>D9161<br>D9162<br>D9163<br>D9164<br>D9165<br>D9166<br>D9167<br>D9168<br>D9169<br>D9170<br>D9171<br>D9172 | Number of times of retry execution | Number of retries | • Stores the number of retries executed to I/O modules or remote terminal modules which caused communication error.<br>(Retry processing is executed the number of times set at D9174.)<br>• Data becomes 0 when communication is restored to normal.<br>• Station number setting of I/O modules and remote terminal modules is as shown below.<br>  <br><br>• Retry counter uses 8 bits for one station.<br>  <br><br>* "n" is determined by station number of I/O module or remote terminal module.<br>Odd number stations: b0 to b7 (n = 0)<br>Even number stations: b8 to b15 (n = 8) | — | Usable with A2C and A52G. |

**Table App2.2 Special Register List (Continue)**

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th colspan="3">Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td rowspan="5">D9173</td><td rowspan="5">Mode setting</td><td rowspan="5">0: Automatic online return enabled<br>1: Automatic online return disabled<br>2: Transmission stop at online error<br>3: Line check</td><td colspan="3">Mode setting</td><td rowspan="5">—</td><td rowspan="5">Usable with A2C and A52G.</td></tr>
<tr><td>0</td><td>Auto-matic online return enabled</td><td>• When an I/O module or a remote terminal module caused communication error, the station is placed offline.<br>• Communication with normal stations is continued.<br>• The station recovering from a communication error automatically resumes communication.</td></tr>
<tr><td>1</td><td>Auto-matic online return disabled</td><td>• When an I/O module or a remote terminal module caused communication error, the station is placed offline.<br>• Communication with normal stations is continued.<br>• Though a faulty station returned to normal, communication is not restored unless the station module is restarted.</td></tr>
<tr><td>2</td><td>Trans-mission stop at online error</td><td>• When an I/O module or a remote terminal module caused communication error, communication with all stations is stopped.<br>• Though a faulty station returned to normal, communication is not restored unless the station module is restarted.</td></tr>
<tr><td>3</td><td>Line check</td><td>• Checks hardware and connecting cables of I/O modules and remote terminal modules.</td></tr>
<tr><td>D9174</td><td>Setting of the number of retries</td><td>Number of retries</td><td colspan="3">• Sets the number of retries executed to I/O modules and remote terminal modules which caused communication error.<br>• Set for 5 times at power on.<br>• Set range: 0 to 32<br>• If communication with an I/O module or a remote terminal module is not restored to normal after set number of retries, such module is regarded as a faulty station.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
<tr><td>D9175</td><td>Line error retry counter</td><td>Number of retries</td><td colspan="3">• Stores the number of retries executed at line error (time out).<br>• Data becomes 0 when line is restored to normal and communication with I/O modules and remote terminal modules is resumed.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
<tr><td>D9180<br>D9181<br>D9182<br>D9183<br>D9184<br>D9185<br>D9186<br>D9187<br>D9188<br>D9189<br>D9190<br>D9191<br>D9192<br>D9193</td><td>Remote terminal module error number</td><td>Remote terminal number</td><td colspan="3">• Stores error code of a faulty remote terminal module when M9060 is turned on.<br>• The error code storage areas for each remote terminal module are as shown below.<br>D9180 Remote terminal module No.1<br>D9181 Remote terminal module No.2<br>D9182 Remote terminal module No.3<br>⋮<br>D9192 Remote terminal module No.13<br>D9193 Remote terminal module No.14<br>Remote terminal module numbers from 1 to 14 are set with D9020 to D9034.<br>• Error code is cleared in the following cases.<br>• When the RUN key switch is moved from STOP to RUN.<br>(D9180 to D9183 are all cleared.)<br>• When Yn4 of each remote terminal is set from OFF to ON.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
</table>

**Table App2.2 Special Register List (Continue)**

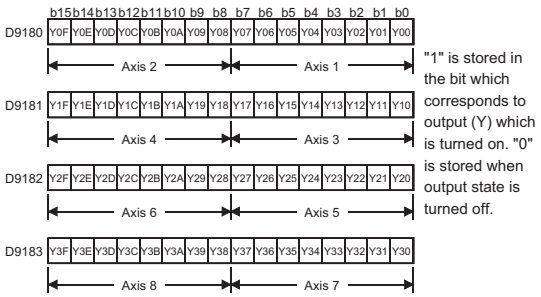
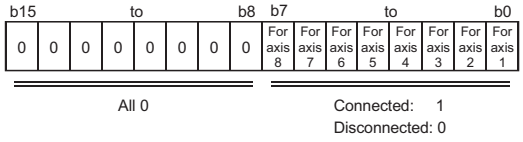
| Number | Name | Description | Details | | |
|---|---|---|---|---|---|
| D9180 | Limit switch output state torage areas for axes 1 and 2 | Bit pattern of limit switch function output state | • Stores output state of limit switch function.<br>  <br><br>"1" is stored in the bit which corresponds to output (Y) which is turned on. "0" is stored when output state is turned off. | — | Dedicated to A73. |
| D9181 | Limit switch output state storage areas for axes 3 and 4 | | | — | Dedicated to A73. |
| D9182 | Limit switch output state storage areas for axes 5 and 6 | | | — | Dedicated to A73. |
| D9183 | Limit switch output state storage areas for axes 7 and 8 | | | — | Dedicated to A73. |
| D9184 | Cause of PCPU error | PCPU error code | • Stores error codes occurred at the PCPU in BIN code.<br>0 : Normal<br>1 : A73CPU hardware error<br>2 : PCPU error<br>10: A70AF error<br>11: A70AF error<br>12: A70MDF error<br>13: AY42 error | — | Dedicated to A73. |
| D9185 | Servo amplifier connection data | Bit pattern of servo amplifier connection state | • Servo amplifier connection state is checked and the result is stored in the bit which corresponds to each axis number.<br>Connection state is continuously checked. Axes which changed from disconnected state to connected state are regarded as connected. But, axes which changed from connected state to disconnected state are still regarded as connected.<br>  <br> | — | Dedicated to A73. |

**Table App2.2 Special Register List (Continue)**

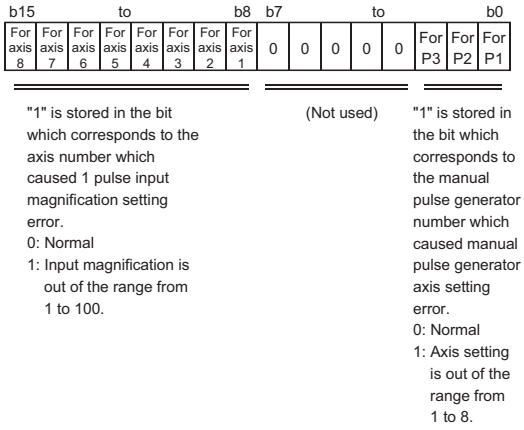
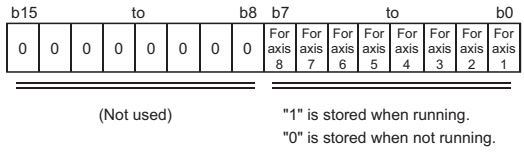
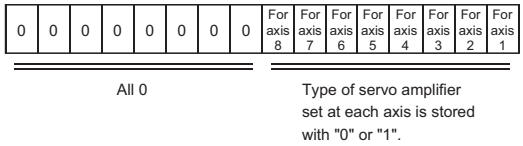
| Number | Name | Description | Details | | |
|---|---|---|---|---|---|
| D9187 | Manual pulse generator axis setting error | Manual pulse generator axis setting error code | • Stores error code when the manual pulse generator axis setting error flag (M9077) is turned on in the bit each corresponds to each axis number.<br>  | — | Dedicated to A73. |
| D9188 | Starting axis number at test mode request error | Starting axis number | • Stores axis number in the bit which corresponds to the axis which was running when a test mode request was given and test mode request error occurred.<br>  | — | Dedicated to A73. |
| D9189 | Error program number | Error program number | • Stores error servo program number (0 to 4095) when the servo program setting error flag (M9079) is turned on. | — | Dedicated to A73. |
| D9190 | Data setting error | Data setting error number | • Stores error code which corresponds to the error setting item when the servo program setting error flag (M9079) is turned on. | — | Dedicated to A73. |
| D9191 | Servo amplifier type | Bit pattern of the axis connected to a general-purpose servo amplifier | • Stores type of connected servo amplifier in the bit which corresponds to each axis number.<br>0: MR-SB/MR-SD/MR-SB-K is connected or not connected.<br>1: General-purpose servo amplifier is connected.<br>  | — | Dedicated to A73. |

**Table App2.2 Special Register List (Continue)**

| Number | Name | Description | Details | | |
|---|---|---|---|---|---|
| D9196<br>D9197<br>D9198<br>D9199 | Faulty station detection | Bit pattern of the faulty station | • Bit which corresponds to faulty I/O module or remote terminal module is set (1).<br>(Bit which corresponds to a faulty station is set when normal communication cannot be restored after executing the number of retries set at D9174.)<br>• If automatic online return is enabled, bit which corresponds to a faulty station is reset (0) when the station is restored to normal.<br>• Data configuration | — | Usable with A2C and A52G. |

| Address | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D9196 | Stasion 16 | Stasion 15 | Stasion 14 | Stasion 13 | Stasion 12 | Stasion 11 | Stasion 10 | Stasion 9 | Stasion 8 | Stasion 7 | Stasion 6 | Stasion 5 | Stasion 4 | Stasion 3 | Stasion 2 | Stasion 1 |
| D9197 | Stasion 32 | Stasion 31 | Stasion 30 | Stasion 29 | Stasion 28 | Stasion 27 | Stasion 26 | Stasion 25 | Stasion 24 | Stasion 23 | Stasion 22 | Stasion 21 | Stasion 20 | Stasion 19 | Stasion 18 | Stasion 17 |
| D9198 | Stasion 48 | Stasion 47 | Stasion 46 | Stasion 45 | Stasion 44 | Stasion 43 | Stasion 42 | Stasion 41 | Stasion 40 | Stasion 39 | Stasion 38 | Stasion 37 | Stasion 36 | Stasion 35 | Stasion 34 | Stasion 33 |
| D9199 | Stasion 64 | Stasion 63 | Stasion 62 | Stasion 61 | Stasion 60 | Stasion 59 | Stasion 58 | Stasion 57 | Stasion 56 | Stasion 55 | Stasion 54 | Stasion 53 | Stasion 52 | Stasion 51 | Stasion 50 | Stasion 49 |

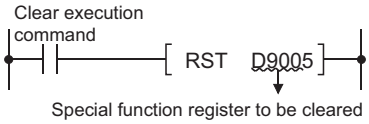
1: Error
0: Normal

## POINTS

(1) Special registers are cleared when the PC is switched off or the RESET switch is set to LATCH CLEAR or RESET. Data remains unchanged when the RUN/STOP key switch is set to STOP.

(2) The above special registers marked *1 above are latched and their data will remain unchanged after normal status is restored. For this reason, use one of the following methods to clear the registers.

(a) Method by user program
Insert the circuit shown at right into the program and turn on the clear execution command contact to clear the contents of register.




(b) Method by peripheral equipment
Set the register to "0" by changing the present value by the test function of peripheral equipment or set to "0" by forced reset. For the operation procedure, refer to the Instruction Manual for peripheral equipment.

(c) By moving the RESET key switch at the CPU front to the RESET position, the special register is set to "0".

(3) Data is written to special registers marked *2 above in the sequence program.

(4) Data is written to special registers marked *3 above in test mode of the peripheral equipment.

## Appendix3 INSTRUCTION DIFFERENCES FROM THOSE OF ACPU

The instructions for the AnNCPU are the same as those for the ACPU except for the ones shown in the table.
Other instructions are as described in the ACPU/QCPU-A (A mode) Programming Manual (Common Instructions).

Instructions Different from Those of ACPU

| | Instruction | Description |
|---|---|---|
| 1 | CHK instruction | Function depends on the I/O control mode.<br>(1) Acts as a "fault check instruction" in direct mode (input = direct mode).<br>(2) Acts as an "F/F instruction" in refresh mode (input = refresh mode). Reverses the output status of the spacefied bit device when the input condition is swiched on. |
| 2 | SEG instruction | Function depends on the status of special relay M9052.<br>(1) Acts as a "partial refresh instruction" when M9052 is on.<br>(2) Acts as a "7-segment display data decode instruction" when M9052 is off. |
| 3 | EI instruction | Function depends on the status of special relay M9053.<br>(1) Acts as a "link interrupt enable instruction" when M9053 is on.<br>(2) Acts as a "sequence interrupt enable instruction" when M9053 is off. |
| 4 | DI instruction | Function depends on the status of special relay M9053.<br>(1) Acts as a "link interrupt disable instruction" when M9053 is on.<br>(2) Acts as a "sequence interrupt disable instruction" when M9053 is off. |
| 5 | PR instruction | Function depends on the ON/OFF state of special relay M9049.<br>(1) 16 characters are output when M9049 is on. An error is flagged if more than 16 characters are specified.<br>(2) The characters up to code NULL (00H) are output when M9049 is off.<br>An error is flagged if NULL (00H) is not specified. |
| 6 | CHG instruction | The signal flow data is independent of the status of special relay M9050. |

# Appendix4 NOTES ON COMPATIBILITY WITH EXISTING SYSTEMS

Note the following points regarding the hardware and software compatibility between the AnNCPU and ACPU.

## Appendix4.1 Notes on Use of the ACPU Instead of the AnNCPU

### Appendix4.1.1 CPU modules

This section describes the compatibility and incompatibility between the ACPU and AnNCPU.

(1) Compatibility
There is compatibility in size, mounting dimensions, basic programming, etc.

(2) Current consumption of the CPU module
The AnNCPU consumes less current than the ACPU and the power supply module that supplies power to the main base unit or extension base unit will have more than sufficient current capacity.

(3) For differences ininstructions, see Appendix 3, "INSTRUCTION DIFFERENCES FROM THOSE OF ACPU"

(4) For notes on use of the ACPU sequence programs with the AnNCPU, see Appendix4.2.

(5) The new features of the AnNCPU are as follows:
(a) Instruction processing speed approximately 20% higher than the ACPU.
(b) I/O control mode switching (between direct and refresh) (See Section 4.6.3 for details.)
(c) Constant scan function (See the ACPU/QCPU-A (A mode) Programming Manual (Fundamentals) for details.)
(d) Clock function

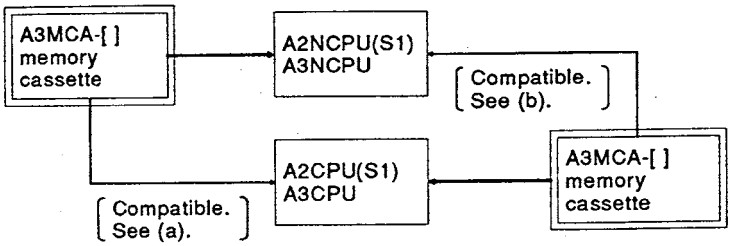
### Appendix4.1.2 Memory cassettes

This section describes the compatibility and the incompatibility between the A3NMCA-0, 2, 4, 8, 16, 24, 40 and 56 the conventional A3MCA-0, 2, 4, 8, 12 and 18.

(1) Compatibility
There is compatibility in size, mounting dimensions, ROM loading, etc.

(2) Compatibility between the memory cassette and CPU
(a) When using the A3MCA-[ ] in the A2N, A3NCPU
The A3MCA-0 to -18 may be used to their full memory capacities.

(b) Restrictions on use of A3NMCA-[ ] in the A2, A3CPU
A3NMCA-0 through 8 can be used up to the full capacity. If A3NMCA-16/24 is used, there are the following limitations. A3NMCA-40/56 cannot be used.
- A3NMCA-16 is recognized as A3MCA-12 having a memory capacity of 96k bytes.
- A3NMCA-24 is recognized as A3MCA-18 having a memory capacity of 144k bytes.




## Appendix4.2 Notes on Use of the ACPU Sequence Programs with the AnNCPU

Programs written for an ACPU may be used in an AnNCPU. However, thereare slight differences with regard to the following:

(1) I/O control mode switching

(2) Pulse conversion processing using SET/RST instructions

(3) Data link processing

(4) Special relays and registers

(5) PR instruction

(6) CHK instruction

(7) SEG instruction

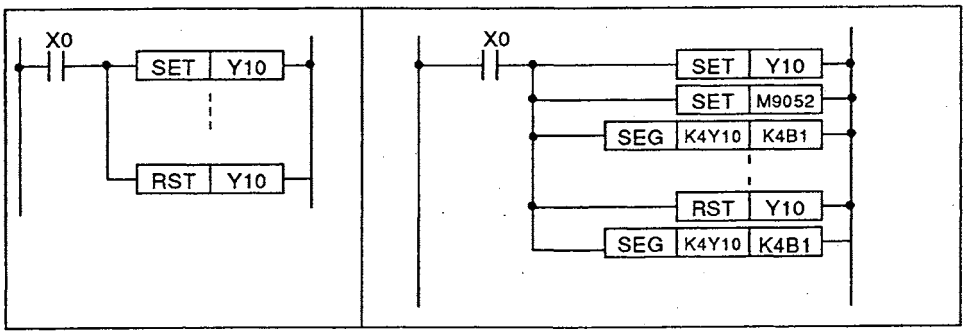
For details of the above items (1) to (7), see Sections 4.2.1 to 4.2.7 of the APPENDICES.

### Appendix4.2.1 I/O control mode switching

The AnNCPU allows input (X) and output (Y) control to be switched to director refresh mode.
Processing is the same as in the ACPU if the direct mode is selected for both input and output.
Input and output timings are different if the refresh mode is selected.
For further details, see the ACPU/QCPU-A (A mode) (Fundamentals) Programming Manual.

Appendix4.2.2 Pulse conversion processing using SET/RST instructions

The partial refresh instruction must be used as shown below to output pulse signals using SET/RST instructions with the AnNCPU output (Y) in therefresh mode.
For details of the instructions, see the ACPU/QCPU-A (A mode) Programming Manual (Common Instructions).




ACPU or direct mode　　Refresh mode

| POINT |
|---|
| Note that it is necessary to output pulse signals to the AD61 when using the AD61(S1) high speed counter. |

Appendix4.2.3 Data link processing

The link refresh timing can be changed by switching on special relay M9053 and using the EI/DI instructions.
For special relays and registers, see Appendix 2.1 and Appendix 2.2.

Appendix4.2.4 Special relays

The following special relays is not used in the AnNCPU.

(1) M9050 ..[CHG] instruction execution flag.

Appendix4.2.5 PR instruction

The specifications are different as follows:

| | AnNCPU | ACPU |
|---|---|---|
| Number of characters | M9049 OFF: Characters up to NULL(00H) output.<br>M9049 ON :16 characters output. | 16 characters output. |

For details, see Appendix 3.

### Appendix4.2.6 CHK instruction

The specifications are difterent as follows:

| | AnNCPU | ACPU |
|---|---|---|
| Function | When I/O control is in direct mode;<br>Acts as a special format fault check instruction.<br>When I/O control is in refresh mode;<br>Acts as a bit device output reverse instruction in refresh mode. | Acts as a special format fault check instruction. |

For further details, see the ACPU/QCPU-A (A mode) Programming Manual (Common Instructions).

### Appendix4.2.7 SEG instruction

The specifications are different as follows:

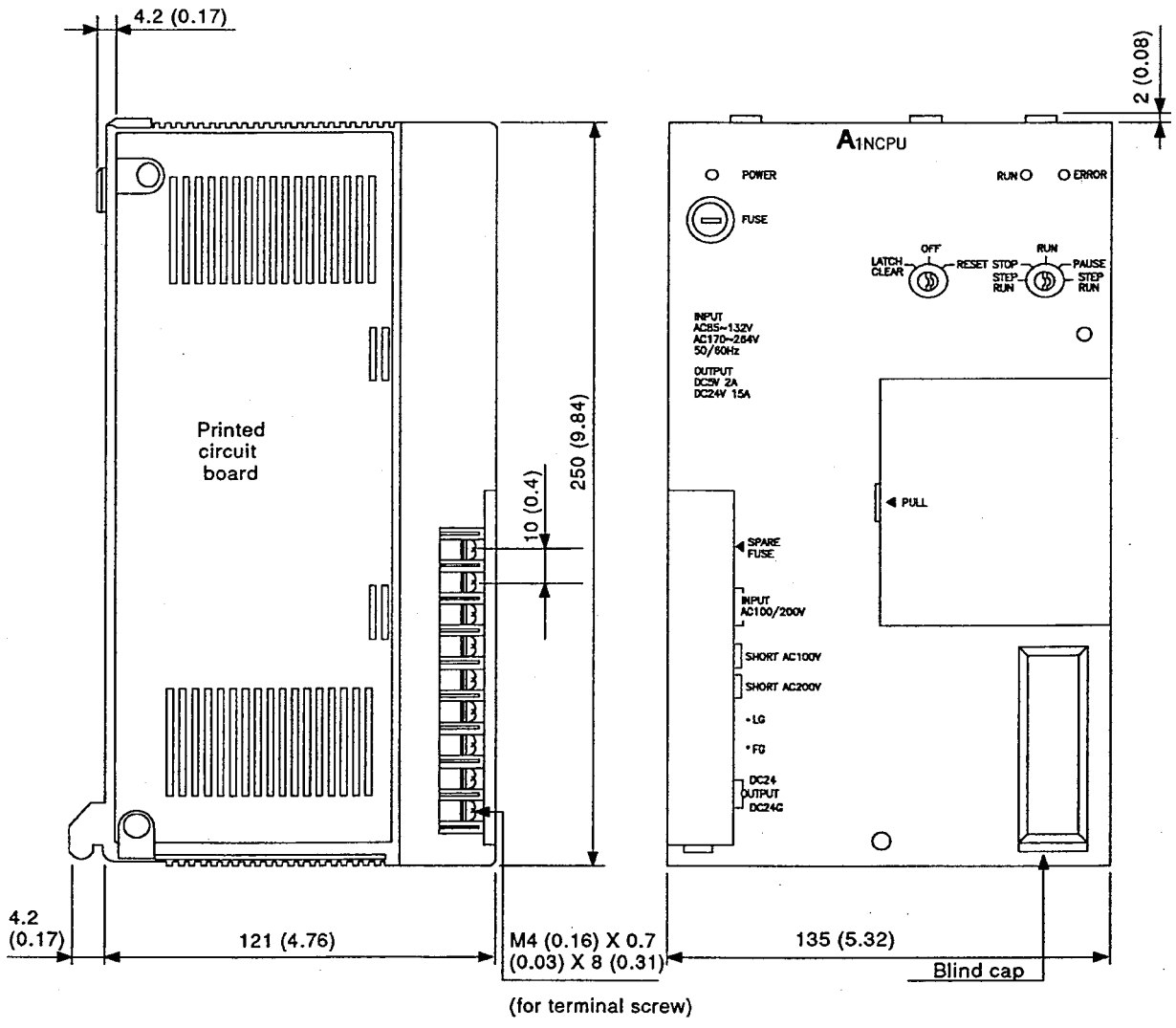
| | AnNCPU | ACPU |
|---|---|---|
| Function | Acts as a 7-segment decode instruction when M9052 is off. Acts as a partial refresh instruction when M9052 is on. | Acts as a 7-segment decode instruction. |

For further details, see the ACPU/QCPU-A (A mode) Programming Manual (Common Instructions).

# Appendix5 EXTERNAL DIMENSIONS

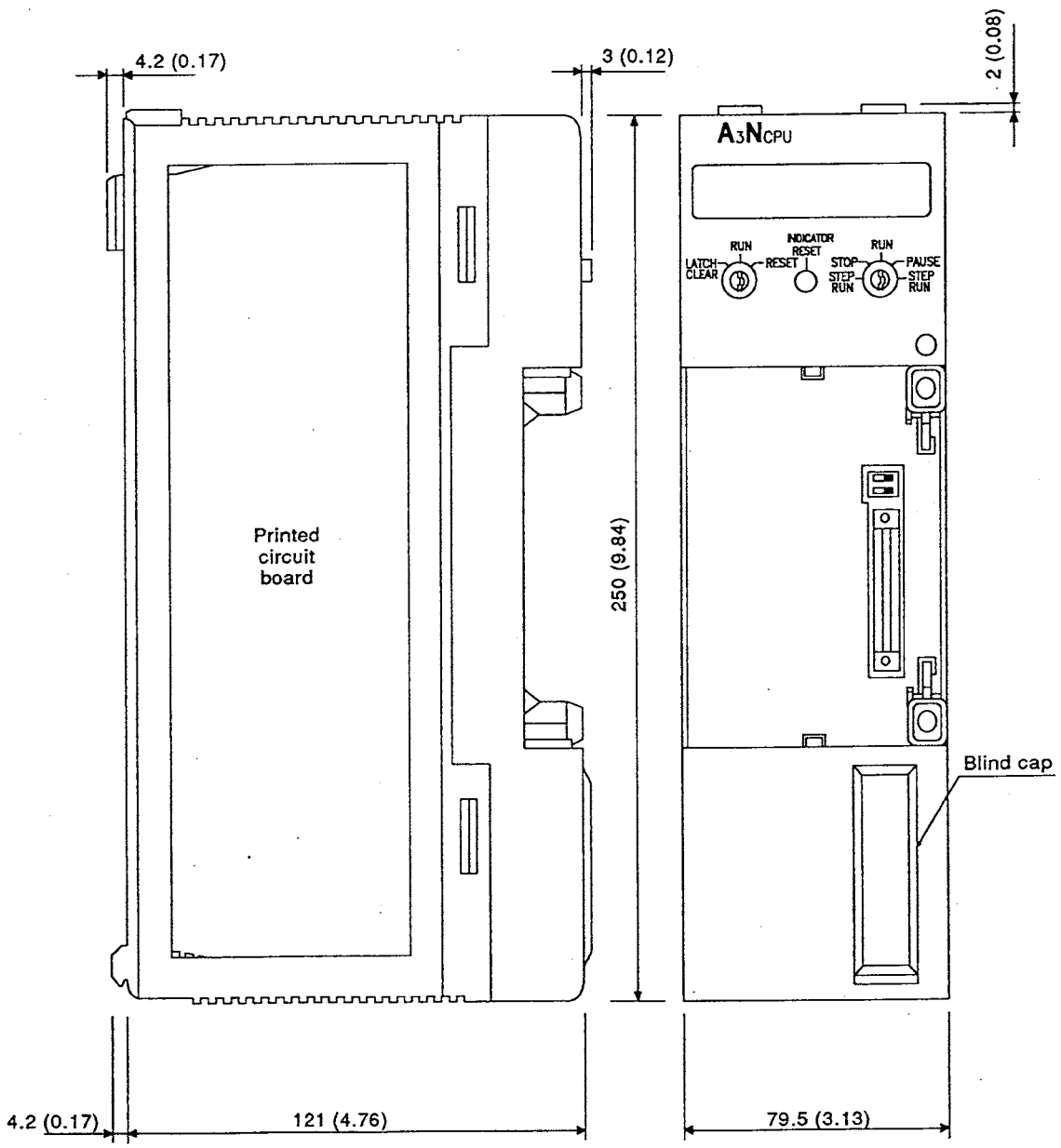
## Appendix5.1 CPU Module

### (1) A1NCPU modules



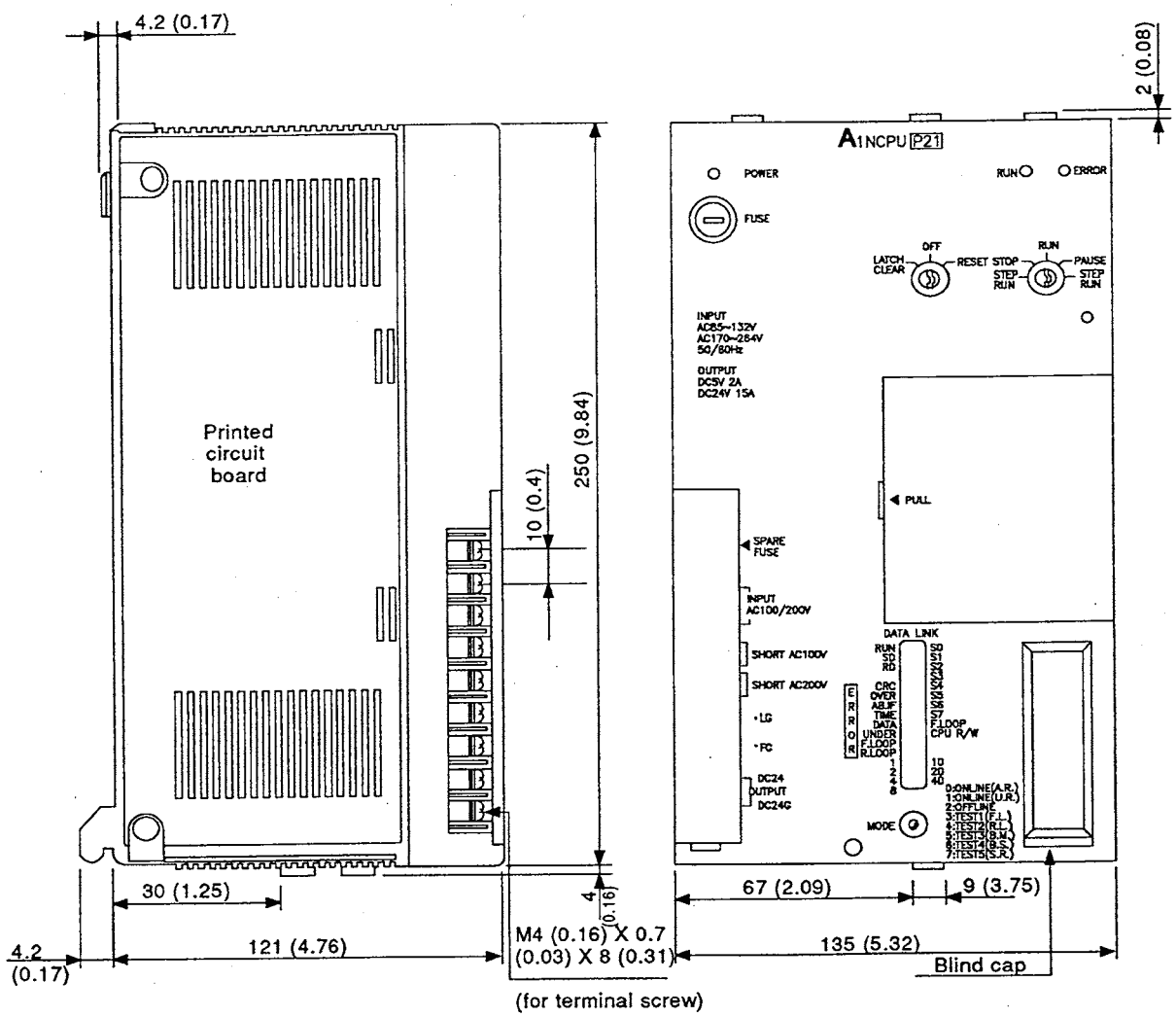

Unit: mm (inch)

(2) A2NCPU, A2NCPU-S1, A3NCPU module



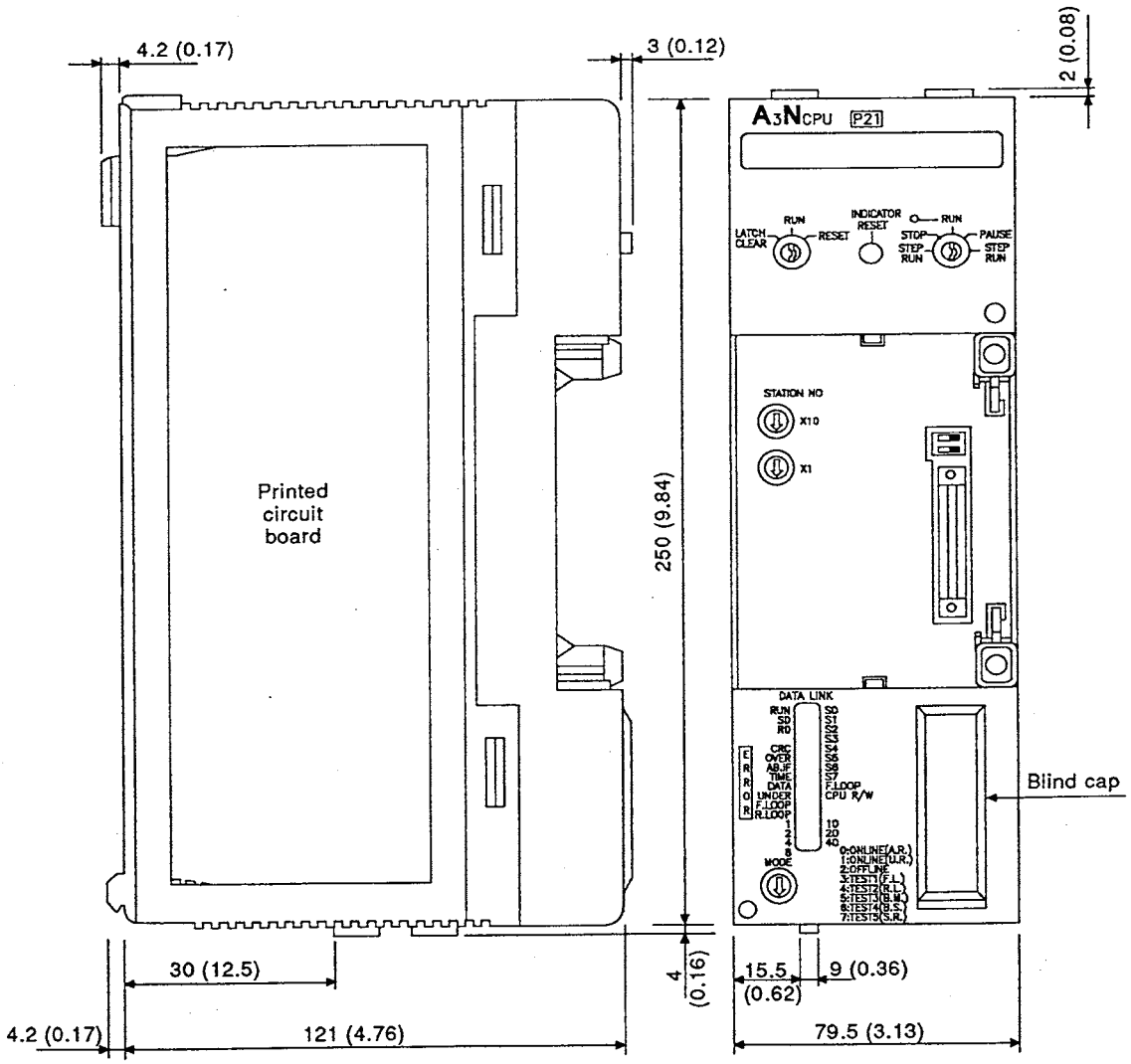

Unit: mm (inch)

(3) A1NCPUP21 Optical data link module



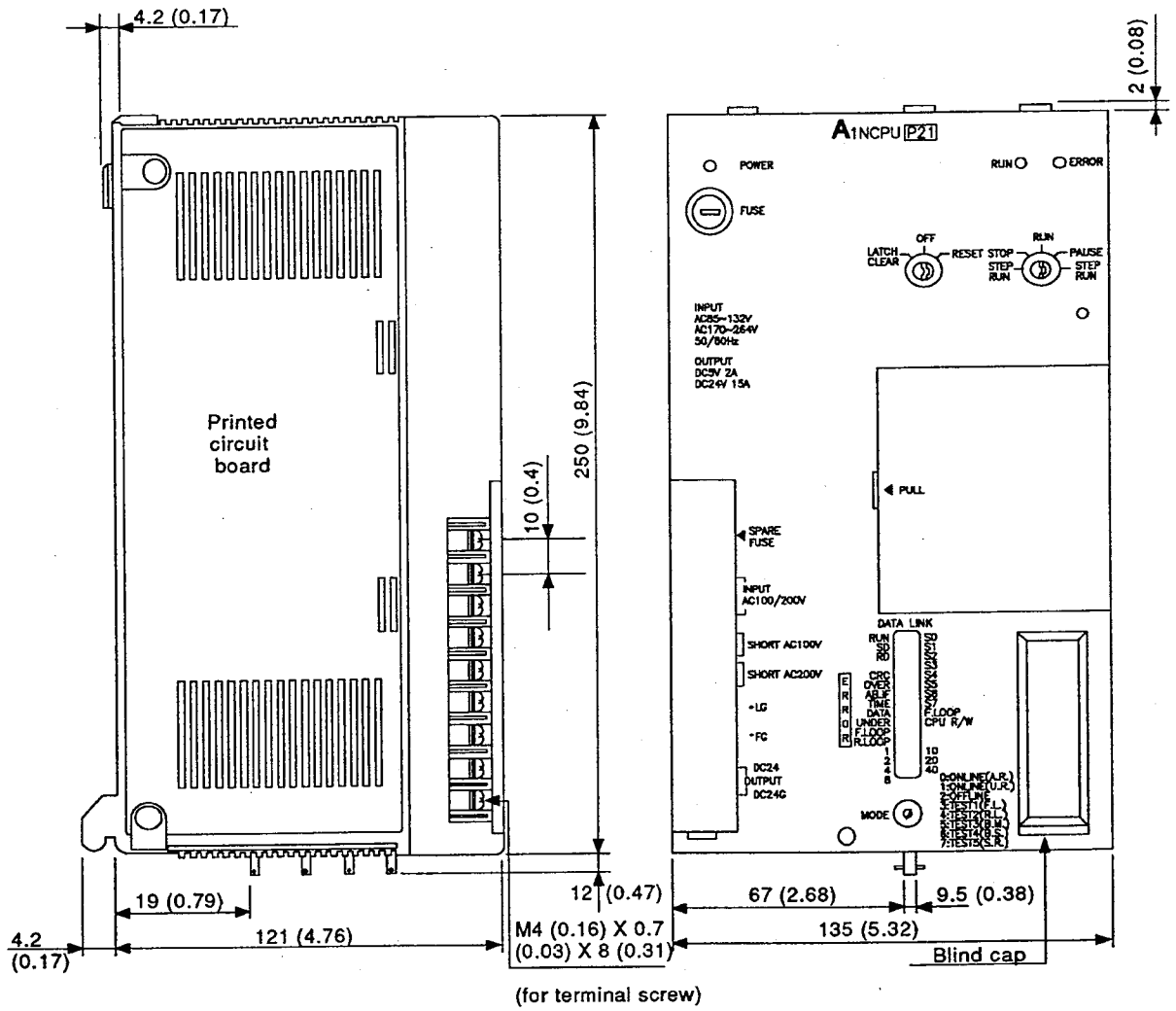

Unit: mm (inch)

(4) A2NCPUP21, A2NCPUP21-S1, A3NCPUP21 Optical data link module



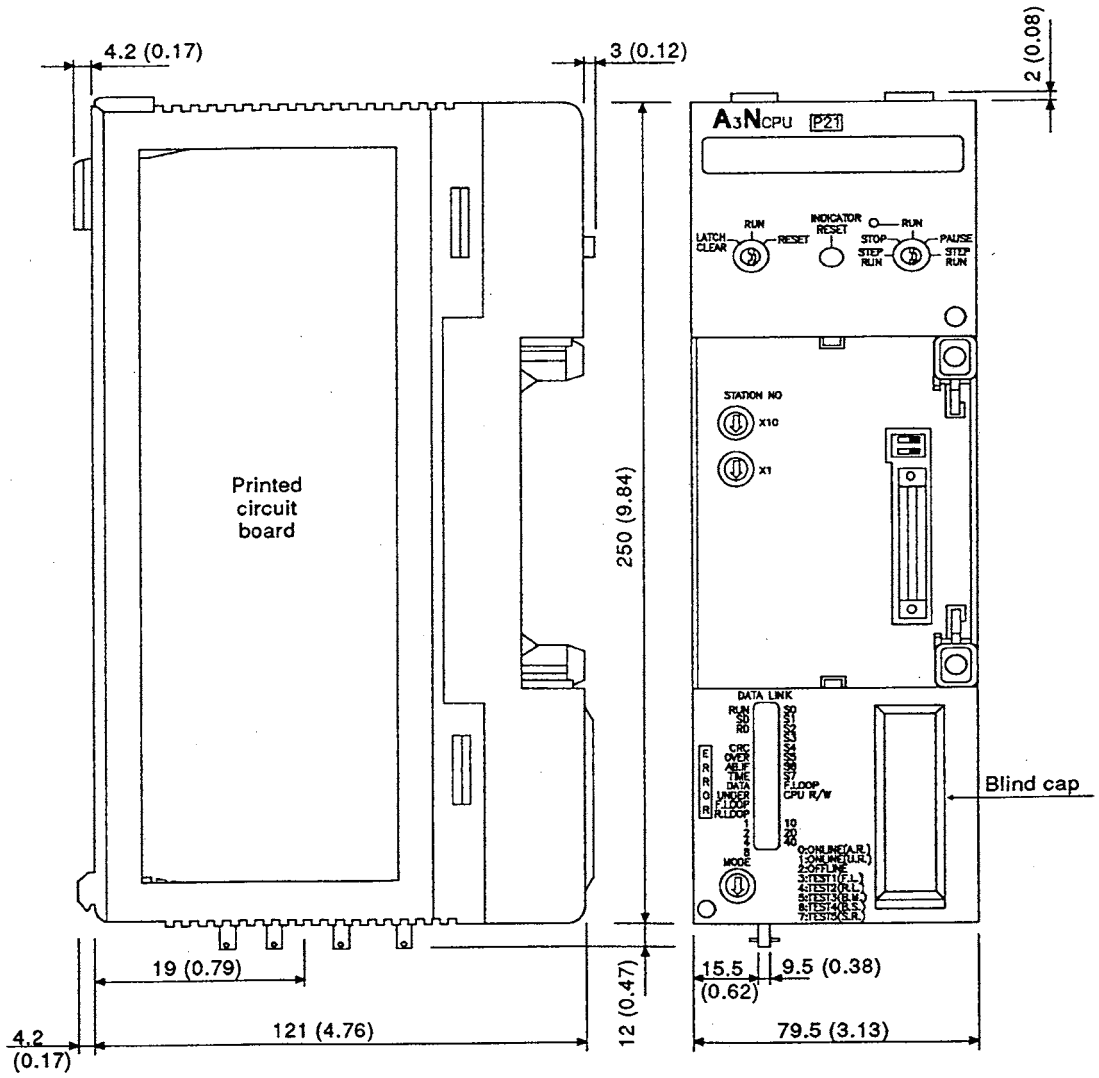

Unit: mm (inch)

(5) A1NCPUR21 coaxial data link module




Unit: mm (inch)

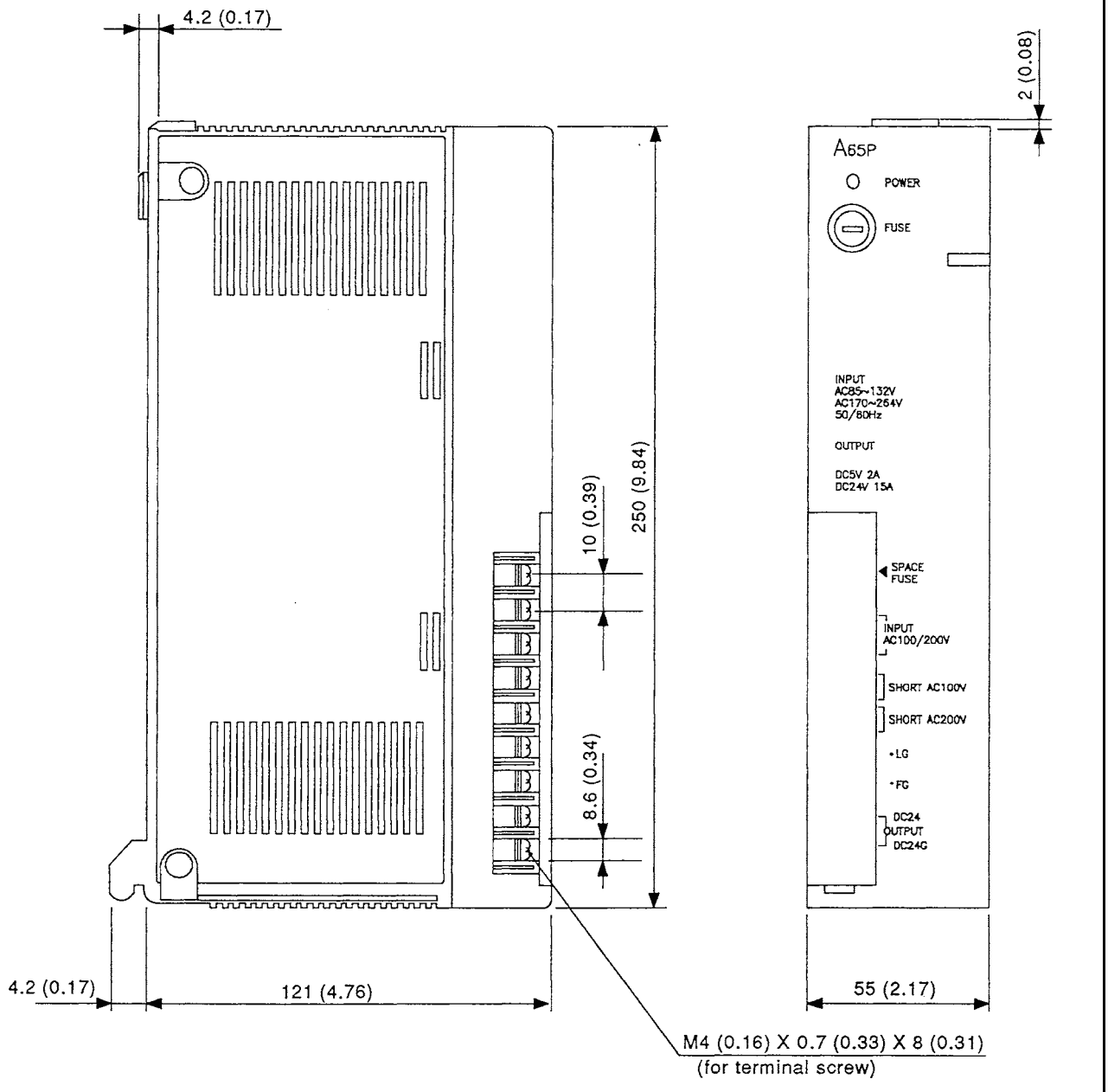
(6) A2NCPUR21, A2NCPUR21-S1, A3NCPUR21 coaxial data link module




Unit: mm (inch)

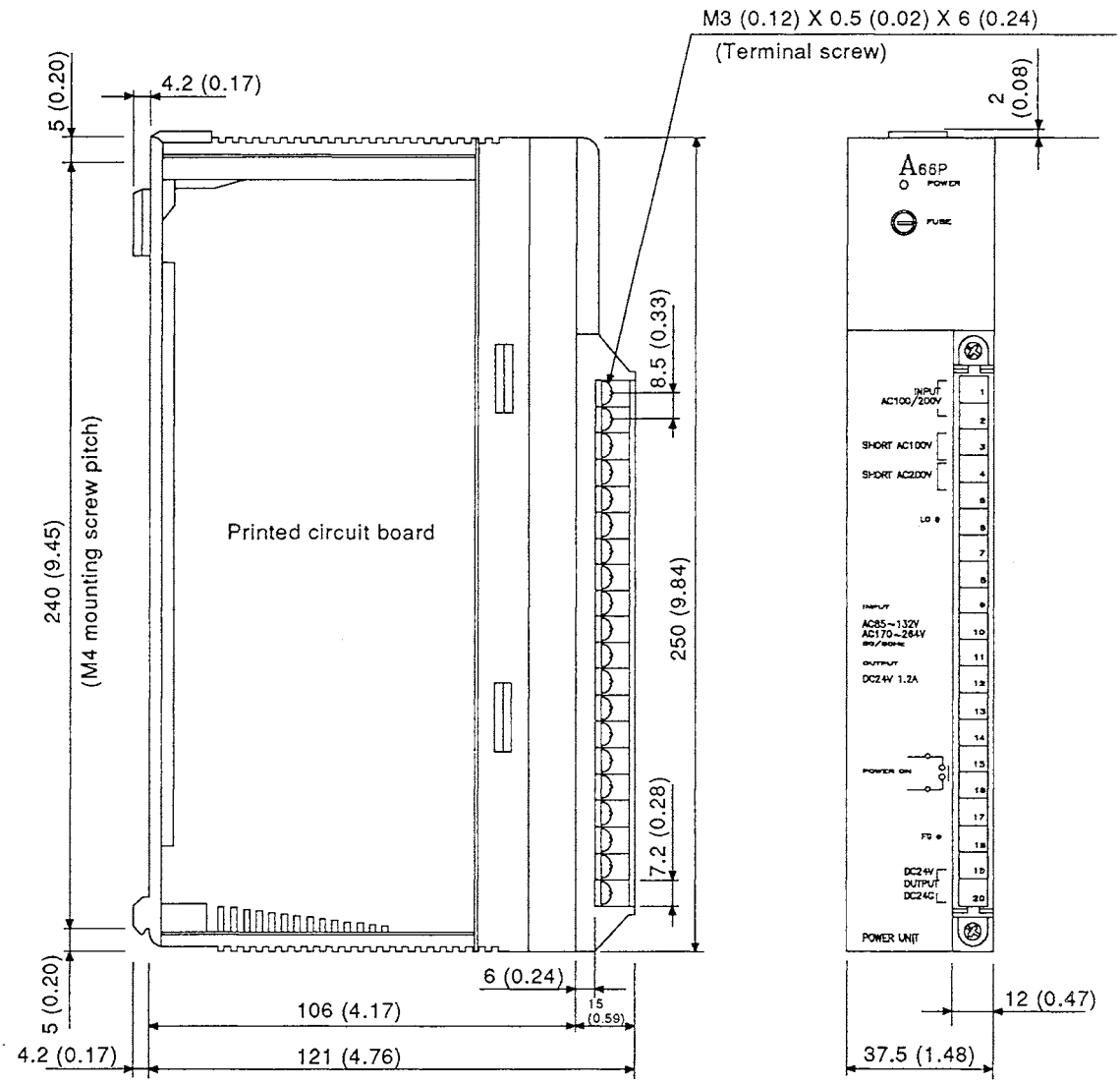
Appendix5.2 Power Supply Module

(1) A61P, A61PN, A61PEU, A62P, A62PEU, A63P, A65P, A67P power supply module

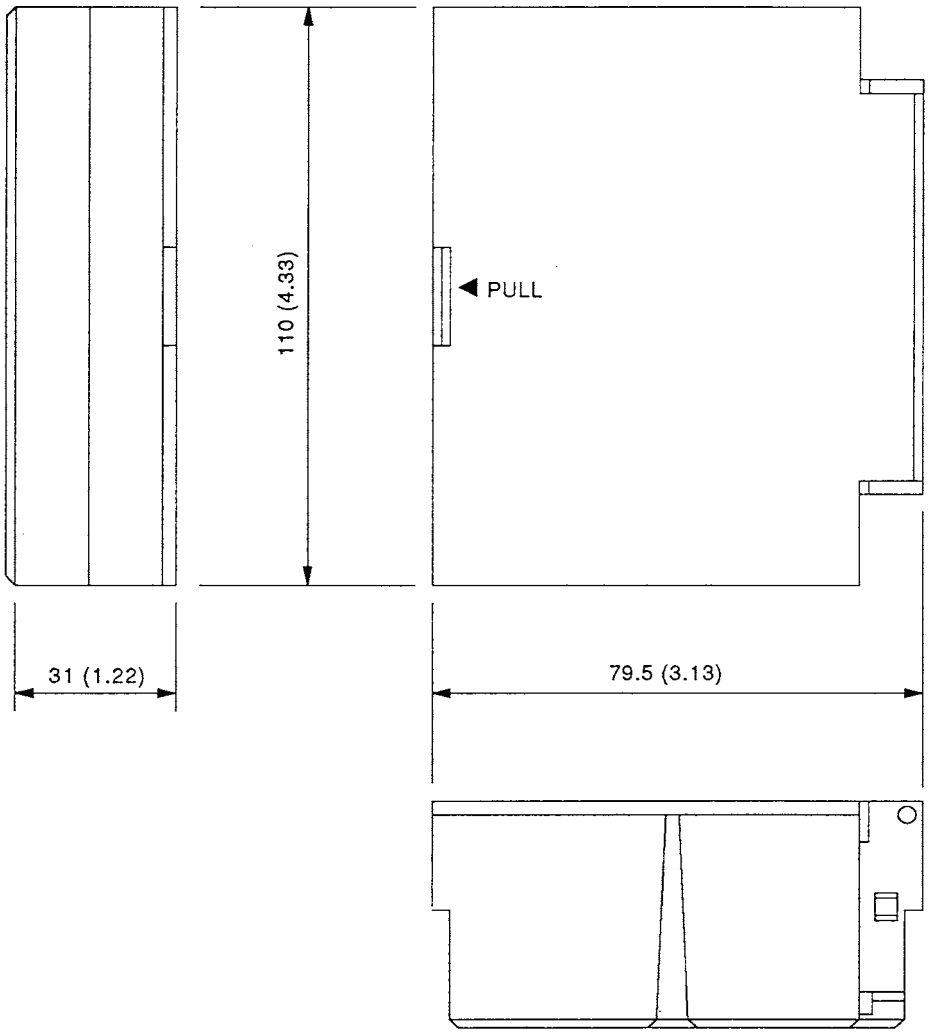



Unit: mm (inch)

(2) A66P power supply module



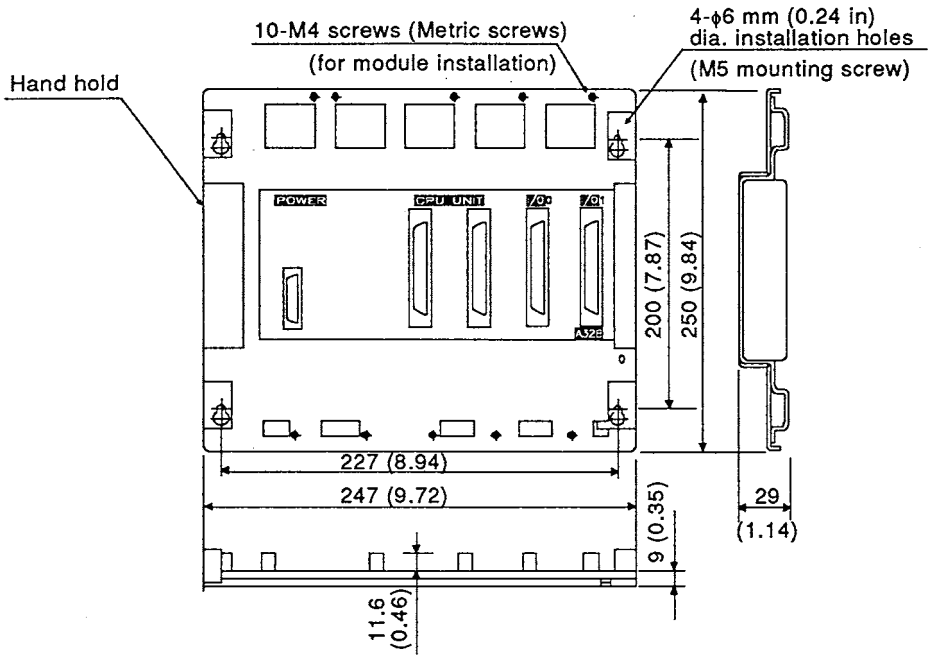
Appendix5.3 Memory Cassette (A3NMCA-□)




Unit: mm (inch)

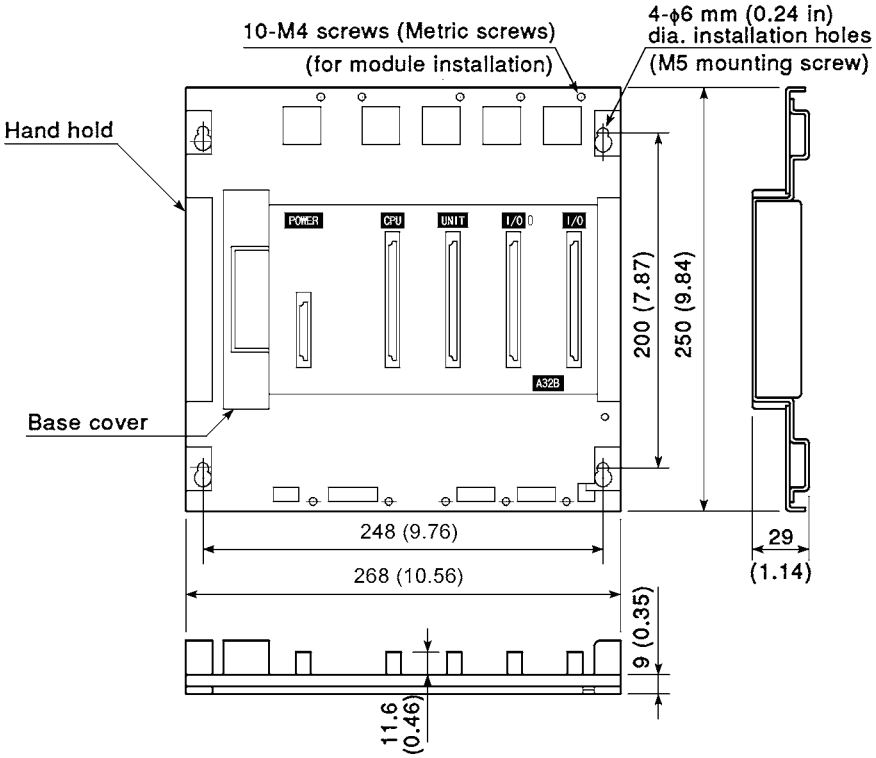
Appendix5.4 Main Base Unit

(1) A32B base unit



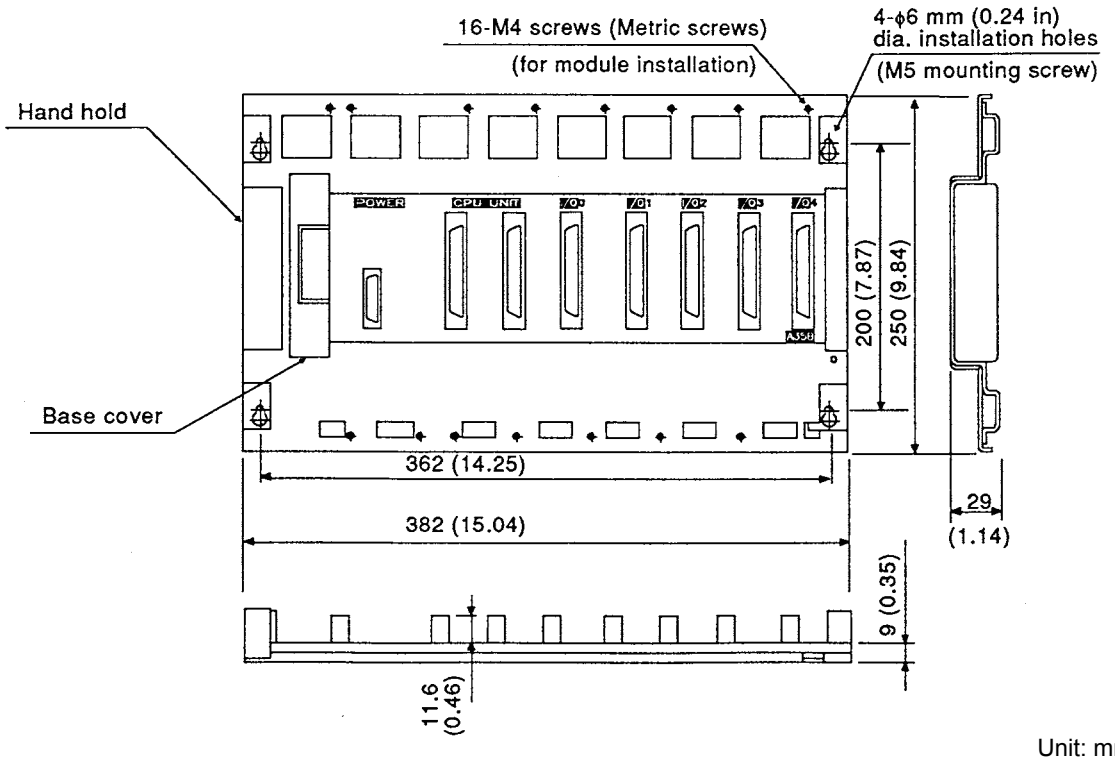

Unit: mm (inch)

(2) A32B-S1 base unit



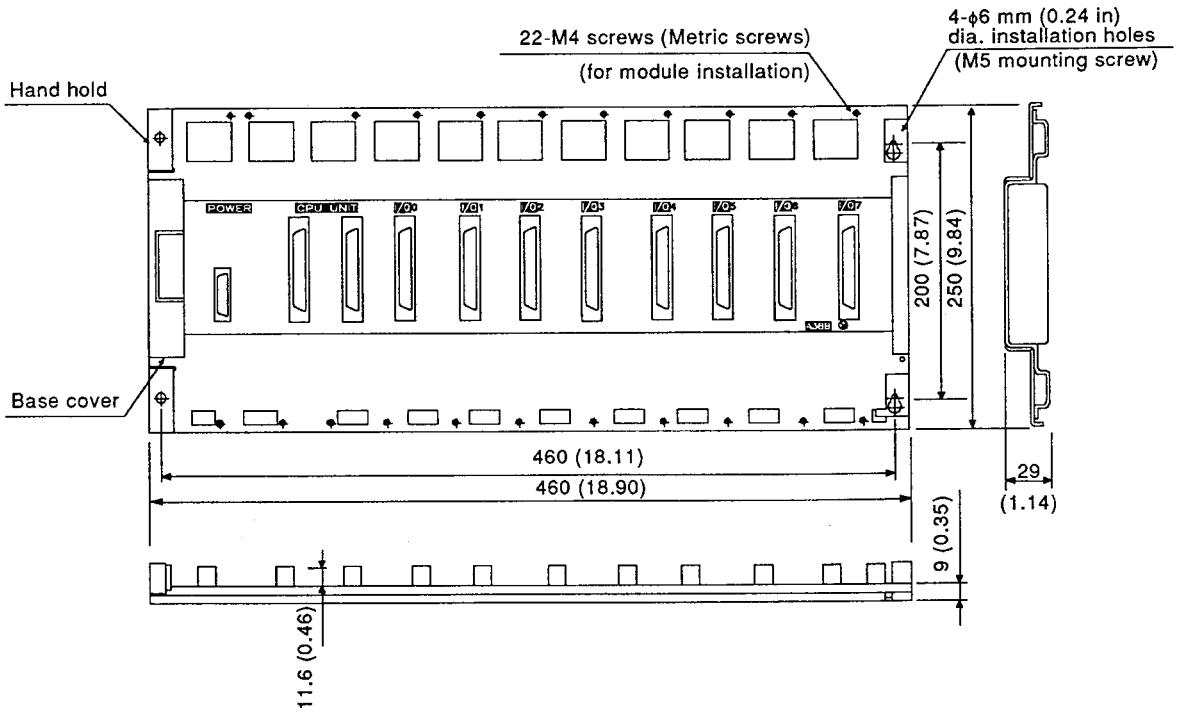

Unit: mm (inch)

(3) A35B base unit




Unit: mm (inch)

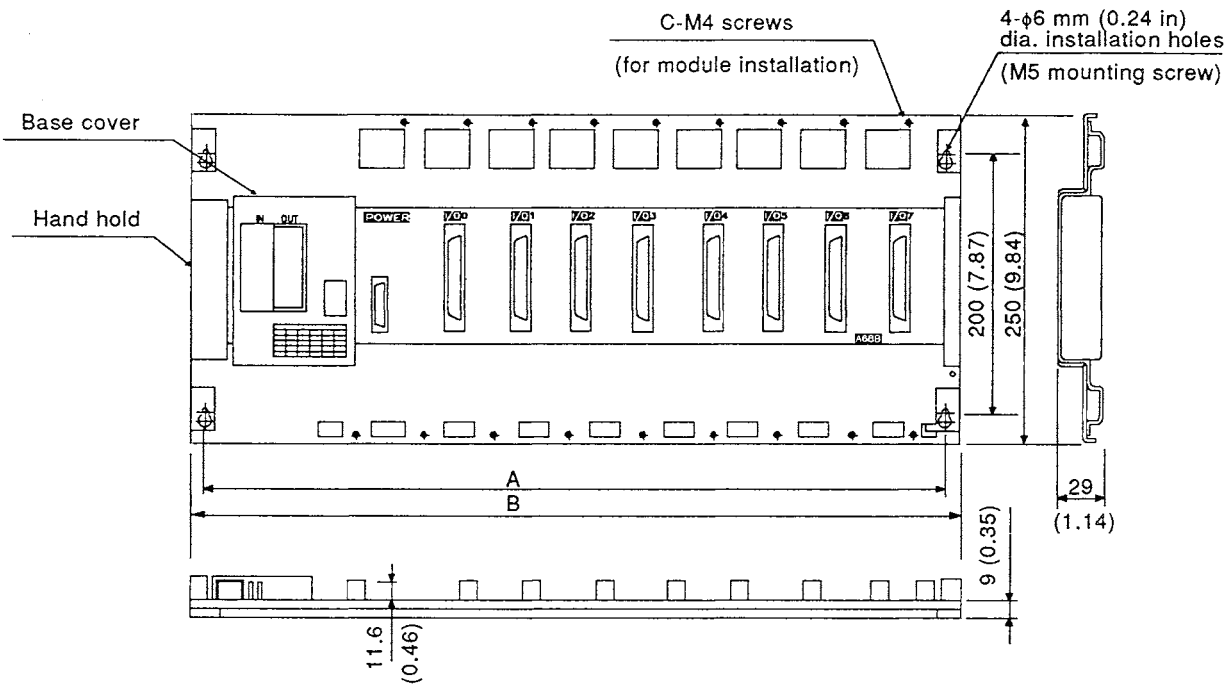
(4) A38B base unit




Unit: mm (inch)

Appendix5.5 Extension Base Unit

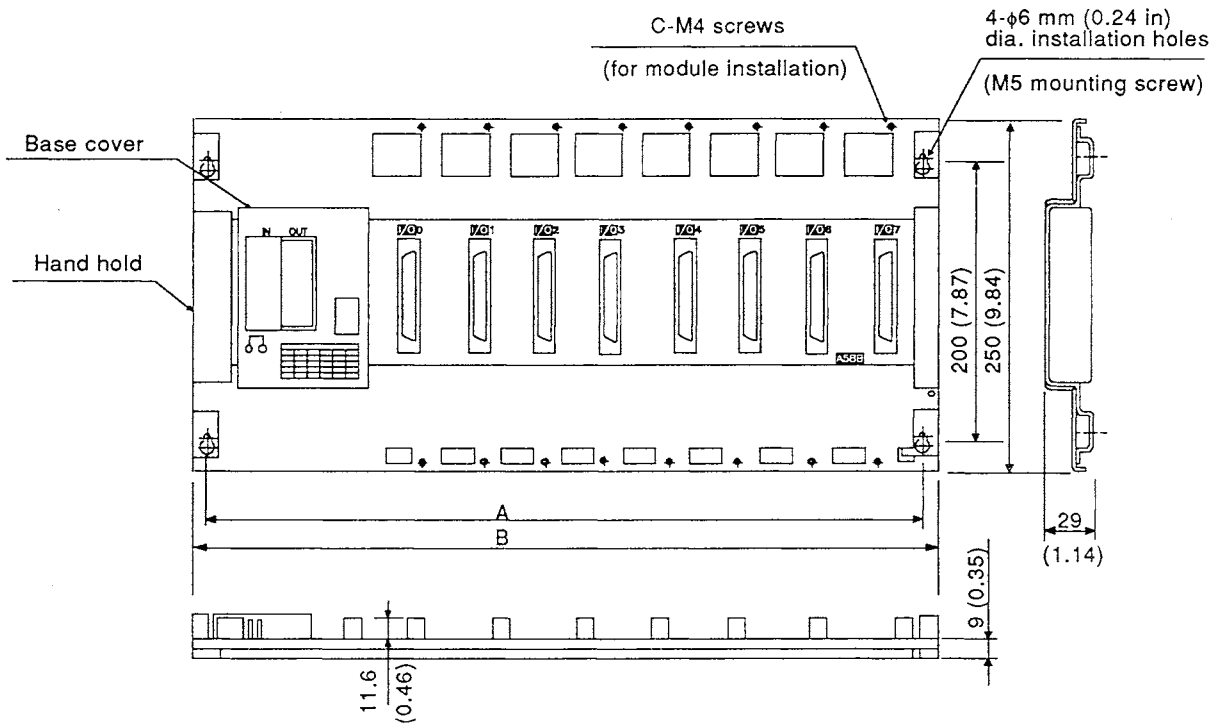
(1) A62B, A65B, A68B base unit




Unit: mm (inch)

| Model Name | Variable Dimensions (mm) [inch] | | | Number of Slots |
|---|---|---|---|---|
| | A | B | C | |
| A62B | 218 [8.58] | 238 [9.37] | 6 [0.24] | 2 (slots 0, 1) |
| A65B | 332 [13.07] | 352 [13.86] | 12 [0.47] | 5 (slots 0 to 4) |
| A68B | 446 [17.6] | 466 [18.35] | 18 [0.71] | 8 (slots 0 to 7) |

(2) A52B, A55B, A58B base units




Unit: mm (inch)

| Model Name | Variable Dimensions (mm) [inch] | | | Number of Slots |
|---|---|---|---|---|
| | A | B | C | |
| A52B | 163 [6.42] | 183 [7.2] | 4 [0.16] | 2 (slots 0, 1) |
| A55B | 277 [10.9] | 297 [11.69] | 10 [0.39] | 5 (slots 0 to 4) |
| A58B | 391 [15.4] | 411 [16.18] | 16 [0.63] | 8 (slots 0 to 7) |

# Appendix6 TRANSPORTATION PRECAUTIONS

When transporting lithium batteries, make sure to handle them based on the transportation regulations.

## Appendix6.1 Relevant Models

The batteries used for CPU modules are classified as follows:

| Product Name | | Description | Handling Category |
|---|---|---|---|
| A series battery | A6BAT | Lithium battery | Non-dangerous goods |

## Appendix6.2 Transportation Guidelines

Products are packed properly in compliance with the transportation regulations prior to shipment. When repacking any of the unpacked products to transport it to another location, make sure to observe the IATA Dangerous Goods Regulations, IMDG Code and other local transportation regulations.
For details, please consult your transportation company.

## Appendix7 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.

### Appendix7.1 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 new 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.

## Appendix7.2 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 or 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 requirements apply to batteries and/or devices with built-in batteries manufactured before the enforcement date of the new EU Battery Directive (2006/66/EC). |

# MEMO

# 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.

# Type A1N/A2N(S1)/A3NCPU

# User's Manual

| | |
|---|---|
| MODEL | A1/2/3NCPU-U-E |
| MODEL CODE | 13JE83 |
| IB(NA)-66543-E(0810)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

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

Specifications subject to change without notice.