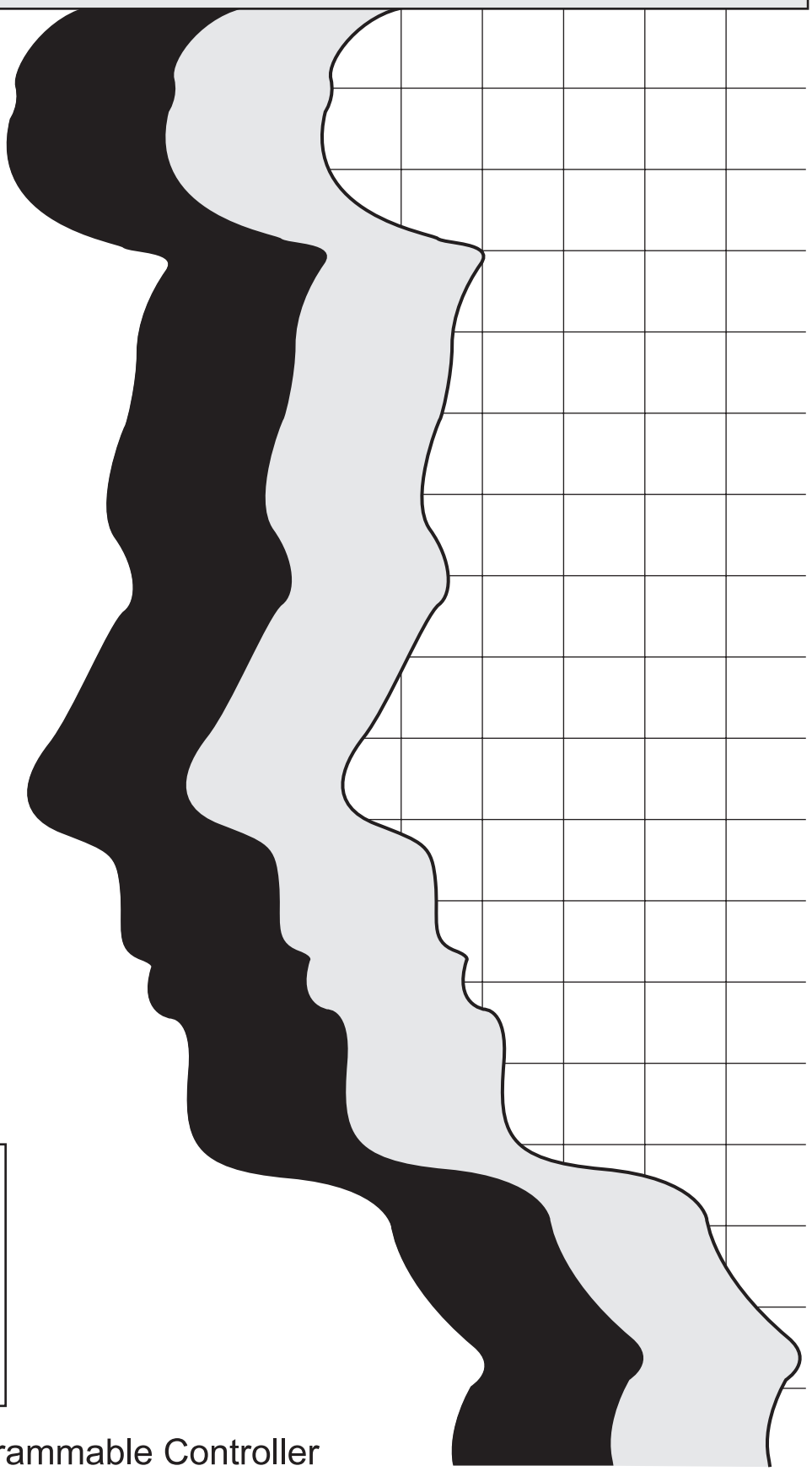
MITSUBISHI

Type A2A(S1)/A3ACPU

User's Manual



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. When disposing of batteries, separate them from other wastes according to the local regulations. (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. (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)66544-A	First edition
Dec., 2003	IB(NA)66544-B	Partial Correction CONTENTS, Related manuals, Chapter 1, Section 1.1, 1.2, 2.1, 2.2, 2.3, 2.4.1, 2.4.2, 2.4.3, Chapter 3, Section 4.1, 4.2, 4.3, 4.5, 4.6.1, 4.6.2, 4.6.4, 4.6.5, 4.8, 4,9, 5.1, 5.2, 5.3, 5.4, 5.5, 6.1, 6.2, 7.4, 7.5, 7.6, 7.8, 8.1, 8.3, 8.4, 8.5, 8.7, 8.7.1, 8.7.2, Chapter 10, Section 10.1, 10.2, 10.3.1 10.3.2, 10.4, Chapter 11, Section 11.2.4, 11.2.6, 11.3, 11.3.2, 11.4.1, 11.4.2, APPENDIX 1, 2, 3, 4.1, 4.2, 4.3, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 6.3, 6.4 Partial Addition SAFETY PRECAUTIONS, Section 4.2, 6.4, 8.8, Chapter 9, APPENDIX 6.4, WARRANTY
Oct., 2006	IB(NA)66544-C	Partial Correction SAFETY PRECAUTIONS, Section 1.1, 2.1, 2.3, Chapter 3, Section 4.2, 4.3, 4.3.1, 4.3.2, 4.4, 4.5, 4.6.1, 4.6.2, 4.6.4, 4.6.5, 4.7, 4.8, 4.9.1, 5.1, 5.1.1, 5.1.2, 5.2.2, 8.7.1, 8.7.2, 9.1.4, 9.2.4, 9.2.6, 11.3.2, APPENDIX 2.1, 2.2, 5.2 Addition Section 6.1, 7.3, 7.4, 4.9.1, 4.9.2 Section No. Change Section 2.2 → Section 2.3, Section 2.3 → Section 2.4, Section 2.4 → Section 2.2, Section 2.4.1 to 2.4.4 → Section 2.2.1 to 2.2.4, Section 5.2 → Section 5.1.1, Section 5.4 → Section 5.2.1, Section 5.3 → Section 5.1.2, Section 6.1 to 6.3 → Section 6.1.1 to 6.1.3, Section 6.4 → Section 6.2, Section 6.5 → Section 6.3, Section 6.6 → Section 6.4, Section 7.4 to 7.6 → Section 7.2.3 to 7.2.4
May., 2007	IB(NA)66544-D	Partial Correction Section 7.2.1, 8.7.1, 8.7.2, 9.1.1, 9.1.3, 9.1.4, 9.2.7, APPENDIX 1
Oct., 2008	IB(NA)66544-E	Partial Correction SAFETY PRECAUTIONS, Chapter 3, Section 4.1, 4.1.5, 4.3.2, 5.1.1, 7.3.1, 9.1.2, 9.2.5 Addition APPENDIX 7, 7.1, 7.2

Japanese Manual Version SH-3501-L

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.

Table of Contents

APPENDIX Appendix - 1 to Appendix - 74

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) 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) Describes how to use the sequence instruction, basic instructions, applied instructions and microcomputer programs. (Sold separately)	IB-66250 (13J741)
AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual (Dedicated Instructions) Describes instructions that have been expanded. (Sold separately)	IB-66251 (13J742)
AnACPU/AnUCPU Programming Manual (AD57 Instructions) Describes dedicated instructions to control the AD57(S1)/AD58 controller module. (Sold separately)	IB-66257 (13J743)
AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual (PID Instructions) Describes dedicated instructions to perform the PID control. (Sold separately)	IB-66258 (13J744)
Building Block Type I/O Module User's Manual 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
・SW□IVD-GPPA Operating Manual
Refer to Section 4.6 for latch clear operation by RESET key switch of the CPU module.

1 OVERVIEW

This manual describes the performances, functions, and handling instructions for A2ACPU(SI), A3ACPU general-purpose programmable logic controllers (hereinafter referred to as A2ACPU, A3ACPU), optical data link modules A2ACPUP21(S1), A3ACPUP21 and coaxial data link modules A2ACPUR21(S1), A3ACPUR21 (hereinafter referred to as AnACPUP21/R21), and the specifications and handling instructions for the memory cassette, power supply module, and base unit.
Each instruction used by the sequence program of the AnACPU is the same as those used by the AnCPU, AnNCPU,and A3HCPU except for those shown below. Refere to Instructions for Different Specifications in Appendix 4.1 for details.

Instructions for different specifications

CHK SEG DI/EI PR PRC CHG SUB FROM TO DFROM DTO	LEDA LEDB LEDC LEDR DXNR Index qualification Subset processing conditions

To execute communications with the AnACPU using the GPP function software package (SW3GP-GPPA, SW3-HGPA) incompatible with the AnACPU, and peripheral devices, set the A3HCPU for both the A2ACPU(SI) and the A3HCPU.

Refer to Appendix 4 when using convertional sequence programs in the AnACPU.

In the text of this manual, peripheral devices are referred to as shown below.

A7PHP, A6PHP: ..... PHP
A7HGP: ..... HGP
A6GPP: ..... GPP
A7PUS, A8UPU, A8PUJ: ..... PU

1.1 Features

The AnACPU module has the following characteristics.

(1) High-speed instruction processing
Processing time in the AnACPU is 9 to 13 times faster than in conventional AnNCPUs. Instruction processing time including file registers and index registers is far faster even when compared to the A3HCPU.

(2) Large capacity for device memory
The AnACPU device capacity is approximately 4 times greater than that of conventional A series PLCs.
Futher, by using the MELSECNET II Data Link System, link relay (B) and link register (W) capacities are 4 times greater, enabling mass data processing.

(3) Enhanced application instructions
To make operation easier, the AnACPU is provided with standard instructions for processing real numbers, character strings, function operations, and for other PID processing, that was processed with utility software packages.
Further, by entering the unit model by parameter I/O assignments for the following special function modules, the AnACPU can use special function module dedicated instructions.
Referto Section 4.3.4.

(4) Structured programs
The AnACPU can use index qualification in all devices including contacts and coils. The AnACPU arranges several circuit blocks which differ in device number only into 1 circuit block, and can simplify the program.
Refer to Section 2.2.4 for structured program details.

(5) Program compatibility
Sequence programs created for the AnCPU, AnNCPU, and A3HCPU can be used with the AnACPU simply by adding corrections for instructions which differ only in certain processing.
Referto Appendix 4 for details of sequence program utilization.

(6) Improved self-diagnosis function
Detailed error codes whose content is segmented when errors occur by self-diagnosis in conventional A series PLCs have been added to the AnACPU, and the causes of errors have become easier to verify.
It is possible to store the occurrence time of the last 16 errors, including the most recent, and error information such as error codes to the internal memory of the CPU. (Battery back up)

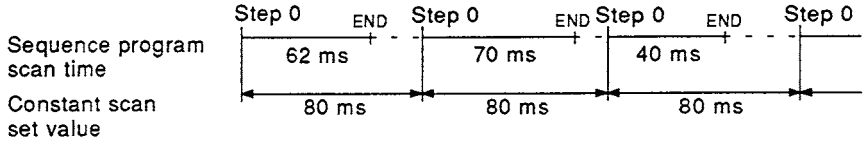
(7) Enhanced debugging function
By using the empty area of an extension file register, sampling trace and status latch can be set while the PLC is operating on line. Sampling trace capacity can be set to a maximum of 16 points for bit devices and 10 points for word devices, and status latch has improved handling such as increasing the execution condition types. RUN patterns of STEP RUN have been increased and functions have been upgraded.

(8) Constant scan function

With the constant scan function, the scan starting period of the sequence program is set to execute the program at the specified intervals.

Normally the instructions to be executed for the program scan time depend on the conditions, or the scan time varies by each scan time depending on whether the interruption program or sub-routine program is executed or not.

The constant scan function allows the program to be executed keeping the control intervals for the external device in relation to the variations of the program scan time constant.



(9) Changeable priority to the LED display of the CPU

By changing the set values of special registers D9038 and D9039 in the A3ACPU, the display order of the following items can be changed.

Refer to ACPU Programming Manual (Fundamertals) for details of the priority to the LED display of the CPU.

Devics No.	LED Display	Content
1	UNIT.VERIFY ERR. FUSE BREAK OFF	I/O module verify error Fuse blown
2	SP.UNIT ERROR LINK PARA. ERROR ORETATION ERROR	Special function module error Link parameter error Operation check error
3	<CHK> ERROR ⬚⬚⬚ (Displays 3-digit failure number)	"CHK" instruction error in operation check errors
4	Corresponding F number (without comments) Displays corresponding F number and comments at 2 s intervals(with comments)	Turns ON annunciator (F0 to 2047) coils
5	Displays character string when executing LED display instruction	Displays ASCII characters, comments, etc., through LED display instructions
6	BATTERY ERROR	Low battery voltage
7	Displays month, date, hour, minutes and seconds of clock data	Turns ON the coil of special relay M9027 and displays clock data.

(10) Automatic refresh of MELSECNET/MINI (S3)
By setting the parameters of MELSECNET/MINI (S3) link information, I/O data storage devices, etc., communication data between remote I/O stations is refreshed.

(11) A maximum of 6 units which can interrupt CPUs such as the AJ71C24 computer link module and the AD51 (S3) intelligent communication module can be installed. However, only 1 unit can interrupt the CPU per execution of END processing.

1.2 Comparison between AnACPU and A3N, A3HCPU

Performance Comparison between AnACPU and A3N, A3HCPU

Item		Type				
		AnACPU			A3NCPU	A3HCPU
		A2ACPU	A2ACPU-S1	A3ACPU		
Control method		Stored program, repeated operation			Stored program, repeated operation	
I/O control mode		Refresh (Instructions to enable partial direct processing are available)			Refresh/direct (selectable)	
Programming language		Language dedicated to sequence control (Realy symbol, logic, symbolic language)			Languages dedicated to sequence control (Realy symbol, logic symbolic language, MELSAP)	
Number of instructions	Sequence instruction	25			26	25
	Basic application instruction	233		235	242	240
	Dedicated instruction	200			---	
Instruction processing time (μ s)	LD	0.2	0.2	0.15	1.0	0.2
	MOV	1.2	1.2	0.9	47	1.2
	MOV Index qualification (V, Z)	1.2	1.2	0.9	100	1.5
Number of I/O points		512	1024	2048	2048	

Performance Comparison between AnACPU and A3N, A3HCPU

Item			Type				
			AnACPU			A3NCPU	A3HCPU
			A2ACPU	A2ACPU-S1	A3ACPU		
Device (points)	Internal relay (M, L, C)		8192 (Each device of M, L, S is set in parameters.)			2048 (Each device of M, L, S is set in parameters.)	
	Link relay (B)		4096			1024	
	Timer (T) (High, low, including retentive)		2048 (Timer type and extension timer set value register are set in paramenters.)			256 (Timer type is set in parameters.)	
	Counter (C) (Normal, including interrupt)		1024 (Counter type and extension counter set value register are set in parameters.)			256 (Counter type is set in parameters.)	
	Data register (D)		6144			1024	
	Link register (W)		4096			1024	
	Annunciator (F)		2048			256	
	File register (R)		8192			8192	
	Accumulator (A)		2			2	
	Index register (V, Z)		14(V, V_1 to V_6, Z, Z_1 to Z_6)*1 (Usable all devices)			2 (Use in certain parts of application instruction)	
	Pointer (P)		256			256	
	Interrupt pointer (P)		32			32	
	Special relay (M)		256			256	
	Special register (D)		256			256	
Structured program		Device number bias	Add constant bias value to each device number of same structured program and execute.			Unavailable	
Number of comments			4032			4032	
Extension comments			3968			---	
Microcomputer mode			Unavailable			Available	
Real number processing, function operation processing, character string processing			Processing by dedicated instruction possible			For character string processing, utility program package is used.	
Special function module support instruction			Dedicated instructions supplied			Utility program package is used.	
Extension file register access instructions			Dedicated instructions supplied			Utility program package is used.	

Performance Comparison between AnACPU and A3N, A3HCPU

Item		Type				
		AnACPU			A3NCPU	A3HCPU
		A2ACPU	A2ACPU-S1	A3ACPU		
Status latch function		• On line range and condition settings • Execution is carried out by instructions or the enabling conditions set by peripheral devices.			Range is set in parameters. Execution is carried out by instructions.	
Sampling trace function		On line range setting (16 points for bit devices, 10 points for word devices)			Range is set in parameters. (8 points for bit devices, 3 points for word devices)	
STEP RUN		• Executed for each instruction • Executed for each circuit block • Executed according to loop count and step interval specification • Executed according to loop count and break point specification • Executed according to device status			• Executed for each instruction • Executed for according to loop count and break point specification	
Offline switch		Unavailable			Available	Unavailable
Watchdog timer (WDT) (ms)		200 (Fixed)			10 to 2000 (Setting allowed)	200 (Fixed)
Allowable momentary power failure period (ms)		20			20	
Program capacity	Main program	Max. 14k steps		Max. 30k steps	Max. 30k steps	
	Subprogram	Absent		Max. 30k steps	Max. 30k steps	
Microcomputer mode		Unavailable			Available	
Remote RUN/PAUSE contact		Available			Available	
Operation mode switching during error occurrence		Available			Available	
Software I/O assignment		Available (Dedicated instructions can be used via special function module model entry) *2			Available	
Entry title entry		Available			Available	
Print title entry		Available			Available	

*1: The value in the AnACPU index register can be rewritten during an interruption program operation.
However, when processing is switched to the main or sub program, the value is rewritten again to the value before the interruption program operation.
(Appendix4.7 gives details.)

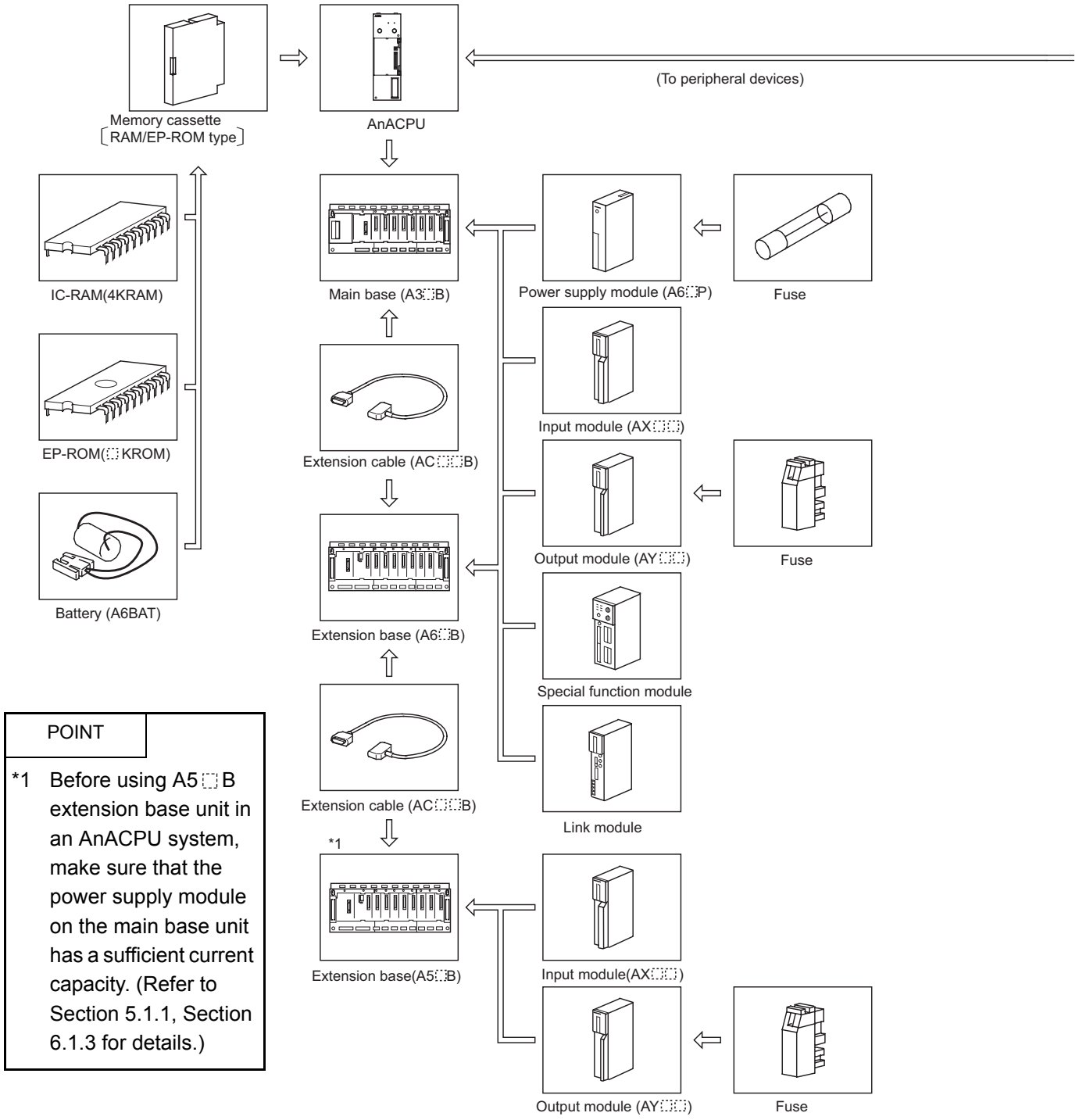
*2: The following unit models are entered as the default. When using these units, the AnACPU can use special function module dedicated instructions without entering the unit models.
AD61(S1), AD59-S1, AJ71C24-S3, AD57, AJ71PT32-S3

2 SYSTEM CONFIGURATION

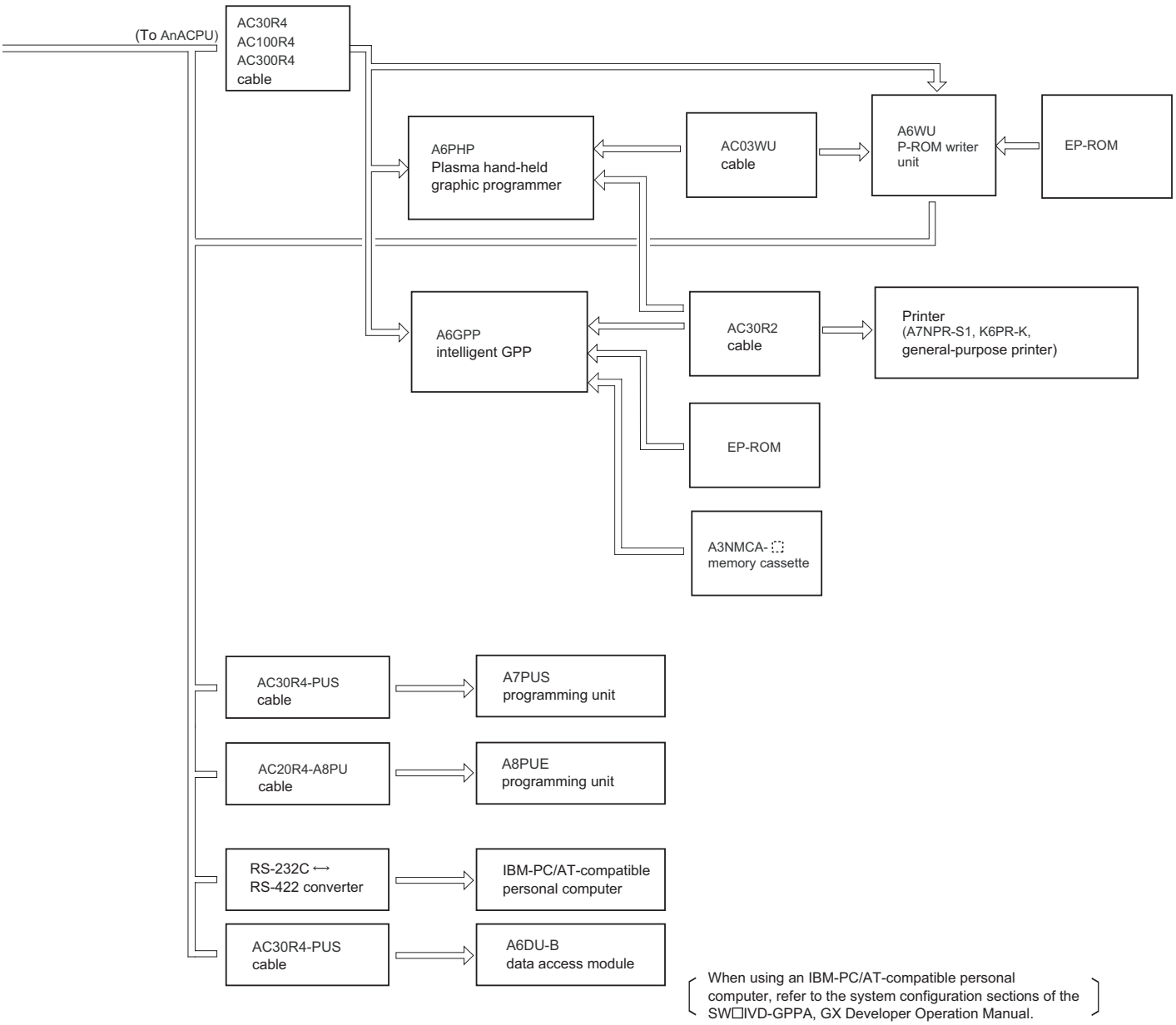
This chapter describes the applicable system configurations controlled by AnACPU, cautions on configuring the system, and the component devices.

2.1 Overall Configuration

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



POINT
*1 Before using A5□B extension base unit in an AnACPU system, make sure that the power supply module on the main base unit has a sufficient current capacity. (Refer to Section 5.1.1, Section 6.1.3 for details.)



When using an IBM-PC/AT-compatible personal computer, refer to the system configuration sections of the SW□IVD-GPPA, GX Developer Operation Manual.

2.2 Precautions When Configuring the System

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

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 AJ71E71N-B2 AJ71C22-S1 AD22-S1 Ad51H-S3 AJ71E71N-B5 AJ71E71N-T AJ71C23-S3 AJ61BT11 (Only when the intelligent mode is used.) GOT-A900 Series (Only when the bus connection is used.)*1 GOT1000 Series (Only when the bus connection is used.)*1	Up to 6 modules in total can be installed.
AI61	Only one module can be installed.
AJ71LP21(G) AJ71LR21 AJ71AR21 AJ71BR11 AJ71AP21(S3) AJ71AT21B	Up to one module in total 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

(3) Peripheral device

The A6PU is unapplicable.

All the other peripheral devices can be used basically.

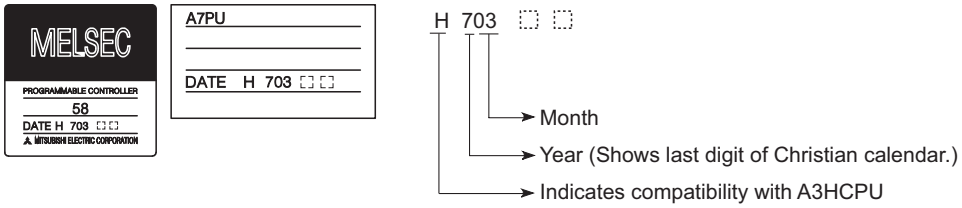
There are following restrictions with the A6WU.

- A6WU ..... Products with "H", which indicates being compatible with A3HCPU, printed in DATE of the rating plate, or products produced at the end of March, 1987 or later.

The A6WU can be used only within the device range of A3HCPU.

REMARK

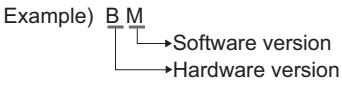
Indication on the rating plate (This example indicates being produced in March, 1987)



(4) Memory cassette model

The A3AMCA-96 is applicable to the A3ACPUs of the following version or later.

- A3ACPU Version BM
- A3ACPUP21 Version BL
- A3ACPUR21 Version AL



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 A2USCPU program and PLC model settings at startup.
When creating a CPU module program, set the PLC type according to the CPU usage modules as follows: Set "A2A" when A2ACPU(P21/R21) or A2ACPU(P21/R21)-S1 is used, and set "A3A" when A3ACPU(P21/R21) is used.
If either of "A2A" and "A3A" are not found in PLC type names, specify "A3H".

Peripheral device	Software package for system start-up	PLC CPU model setting	
		A2A	A3A
IBM-PC/AT-compatible personal computer	SW□IVD-GPPA	A2A	A3A
	GX Developer		
A6PHP	SW4GP-GPPA	A2A	A3A
A6GPP	SW4GP-GPPA	A2A	A3A

(2) Utility package

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

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

* The packages marked with * can execute the same functions using the dedicated instructions.
For details, refer to type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions).

REMARK

The characters generators and canvas, which are necessary for AD57(S1), are created on the peripheral device using the SW□-AD57P.

(3) GPP-BASIC package

The GPP can be started up as a personal computer by using the SW0GHP-BAS GPP-BASIC. However, accessing AnACPU devices from such GPP is not allowed.

2.2.3 Precautions when using conventional system FDs and peripheral devices

When AnACPU is started with the conventional system FD (FDs indicating PLC model of "AnA" or "A3H") or peripheral devices (A7PUS), valid device range is restricted.
A list of usable device ranges for each system FD and peripheral device is shown below, followed by programming methods for devices outside the range

(1) List of usable device range

Item	A3HCPU-compatible Module	
	PLC Model "A3H" at System FD Start-up	A7PUS
Instruction (sequence/basic/ application/dedicated)	All instructions can be used.	
Program capacity	Max. 30k steps can be used each for main and sub programs.	
I/O device points (X/Y)	Max. 2048 points (X/Y0 to X/Y7FF)	
M, L, S relay	M/L/S0 to M/L/S2047 can be used. (M/L/S2048 to M/L/S8191 cannot be used.)	
Link relay (B)	B0 to B3FF can be used. (B400 to B1FFF cannot be used.)	
Timer (T)	T0 to T255 can be used. (T256 to T2047 cannot be used.)	
Counter (C)	C0 to C255 can be used. (C256 to C1023 cannot be used.)	
Data register (D)	D0 to D1023 can be used. (D1024 to D8191 cannot be used.)	
Link register (W)	W0 to W3FF can be used. (W400 to W1FFF cannot be used.)	
Annunciator (F)	F0 to F255 can be used. (F256 to F2047 cannot be used.)	
Index register (V, Z)	V and Z can be used. V1 to V6, Z1 to Z6 cannot be used.	
Comment	Max. 4032 points	–
Expanded comment	–	–
Latch (power failure compensation) range	The device range shown above can be latched.	
I/O assignment	Number of I/O occupied points can be registered.	

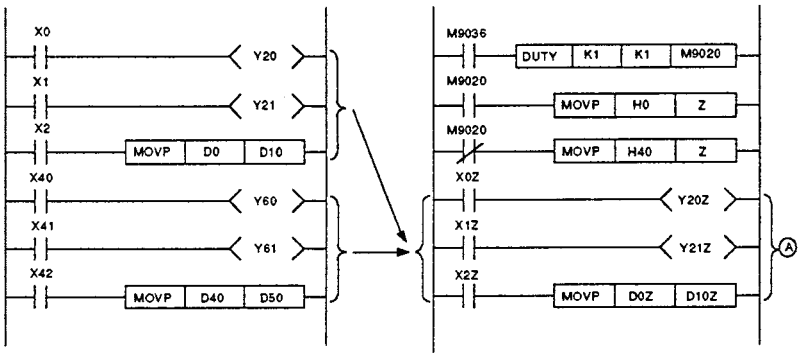
(1) The device range other than listed above is the same as that of AnACPU.

(2) Refer to Operating Manual for peripheral devices to be used for available functions.

2.2.4 Structured programs

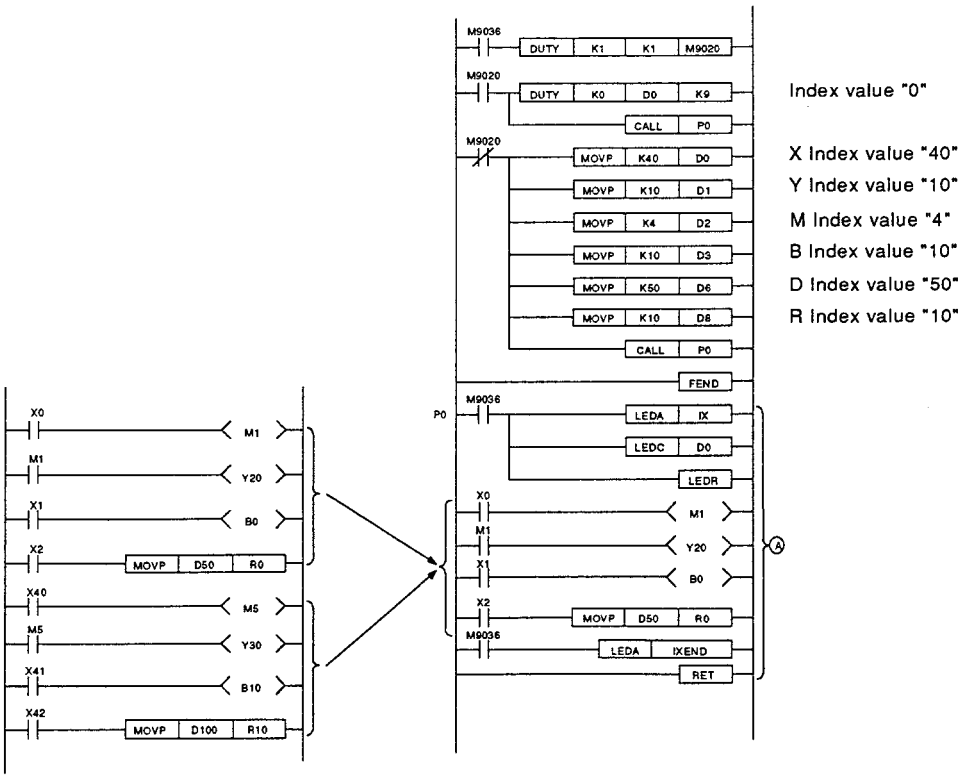
AnACPUs allow indexing to all of the devices including contacts and coils (excluding the following devices) and to the whole ladder, realizing a structured program.
(T/C coil, T/C set value, P/I described individually, 32-bit constant, master control N)

(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 AnACPU 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	A2ACPU	Number of I/O points: 512 points	–	0.4	–	• Memory cassette is prepared separately. • Refer to Section 4.1
	A2ACPU P21			1.0	–	
	A2ACPU R21			1.4	–	
	A2ACPU-S1	Number of I/O points: 1024 points		0.4	–	
	A2ACPUP21 -S1			1.0	–	
	A2ACPUR21 -S 1			1.4	–	
	A3ACPU	Number of I/O points: 2048 points		0.6	–	
	A3ACPU P21			1.1	–	
	A3ACPU R21			1.6	–	
Memory cassette (RAM/ROM type)	A3NMCA-0	Without IC-RAM	–	–	–	• With two memory sockets • IC-RAM or EP-ROM memory can be installed on A3NMCA-0. • Only EP-ROM memory can be installed on A3NMCA-2 to A3NMCA-56 and A3AMCA-96 • Values in parentheses refer to the maximum valid values in the parameter range.
	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)				
	A3AMCA-96	IC-RAM memory with 768k bytes (144k bytes)				

Product Name		Model Name	Description	Number of Occupied Points (points) [I/O Assignment Module Type]	Current Consumption		Remark
					5VDC (A)	24VDC (A)	
Memory	IC-RAM	4KRAM	8k bytes (Max. 3k steps)	–	–	–	
	EP-ROM	4KROM	8k bytes (Max. 3k steps)				
		8KROM	16k bytes (Max. 7k steps)				
		16KROM	32k bytes (Max. 15k steps)				
		32KROM	64k bytes (Max. 31k steps)				
		64KROM	128k bytes (Max. 63k steps)				
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: Short protection function Function that protects the transistors from overcurrents occurring, for example, due to short circuits in external wiring. Overheat protection function 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: Short protection function Function that protects the transistors from overcurrents occurring, for example, due to short circuits in external wiring. Overheat protection function 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) 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 P1: 1 axis P2: 2 axes (Independent, simultaneous 2 axes, linear interpolation, circular interpolation) 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 P1: 1 axis P2: 2 axes (Independent, simultaneous 2 axes, linear interpolation, circular interpolation) 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. Resolution: One resolver revolution = 4096 divisions. 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 Resolution: 4096 divisions × 32 rotations to 409.6 divisions × 320 rotations 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 Resolution: 4096 divisions × 32 rotations to 409.6 divisions × 320 rotations 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 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 Analog output 12 bits, 2 channels	32 (special 32 points)	0.6	0.35	
		A62DA-S1	4 to 20mA/0 to ±10V Analog output, 2 channels				
		A616DAI	4 to 20mA. Resolution: 1/4000 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 Analog output, 16 channels	32 (special 32 points)	0.38	–	15VDC $^{+0.2A}_{-0.17A}$ (A68P) is required.
	Memory card, Centronics interface module	AD59*2	32k byte-memory battery backup Can be connected to printer conforming to Centronics standards	32 (special 32 points)	0.3	–	
		AD59-S1*2			0.32		0.35A when connected to AD59MEF.
	Voice output module	A11VC*2	Messages can be recorded and played back on a maximum of 60 channels. The following recording times can be selected for each channel: 1 second, 2 seconds, 4 seconds, 8 seconds. 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 module 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		

*2 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	For MELSECNET II optical data links	32 (special 32 points)	0.5	–	Maximum one module can be used for one CPU module.
	AJ71AP21-S3	For MELSECNET II optical data link (compatible with GI cable)				
	AJ71AR21	For MELSECNET II coaxial data links	32 (special 32 points)	0.9	–	
	AJ71AT21B	For MELSECNET/B data links	32 (special 32 points)	0.72	–	
	AJ72P25	For MESLECNET optical data link remote I/O station	–	0.23	–	
	AJ72P25-S3	For MESLECNET optical data link remote I/O station (compatible with GI cable)				
	AJ72R25	For MESLECNET coaxial data link remote I/O station	–	2.6	–	
	AJ72T25B	For MELSECNET/B data link remote I/O station	–	0.3	–	

Product Name	Model Name	Description	Number of Occupied Points (points) [I/O Assignment Module Type]	Current Consumption		Remark
				5VDC (A)	24VDC (A)	
Ethernet interface module	AJ71E71N-B2	10BASE2 specification, Transmission speed: 10 Mbps	32 (special 32 points)	0.67	–	Maximum 6 modules can be used for one CPU module.
	AJ71E71N-B5	10BASE5 specification Transmission speed: 10 Mbps		0.55		
	AJ71E71N-T	10BASE5/10BASE2 specification Transmission speed: 10 Mbps		0.55		
	AJ71E71N3-T	10BASE5/10BASE2 specification Transmission speed: 10 Mbps		0.69		
Computer link module	AJ71UC24	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	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	–	
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	–	

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 Total I/O points: 4096 points	32 (special32points)	0.24	–	
PROFIBUS-DP interface module	AJ71PB92D	PROFIBUS-DPmaster module Sendable data Regular service: 32 bytes Extension service: 244 bytes	32 (special32points)	0.54	–	
PROFIBUS-FMSinterface module	AJ71PB96F	PROFIBUS-FMS master/client/server module Total I/O points: 241241 points	32 (special32points)	0.54	–	
MODBUS serial communication module	AJ71UC24-R2	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

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 A61PN	100/200VAC input Output: 5VDC 8A	–	–	–	
		A61PEU					CE-compliant
		A62P	100/200VAC input Output: 5VDC 5A, 24VDC 0.8A				
		A62PEU					CE-compliant
		A63P	24VDC input Output: 5VDC 8A				
	I/O slot mounting position	A66P	100/200VAC input Output: 24VDC 1.2A	16 (empty 16 points)			Power supply for AD70, A616DAV, A616DAI
		A68P	100/200VAC input 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 AnACPU 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 A6TBXY54 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 A6TBY36-E A6TBX54-E A6TBY54-E 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 • SWGP-GPPA ..... GPP function start-up floppy disk for the A series. • SWGP-GPPK ..... GPP function start-up floppy disk for the K series. • SW0-GPPU ..... User floppy disk (2DD). • AC30R4 ..... 3m (9.84 ft.)-long RS-422 cable.	
Intelligent GPP	A6GPP-SET	• A6GPP main unit • SWGP-GPPA ..... GPP function start-up floppy disk for the A series. • SWGP-GPPK ..... GPP function start-up floppy disk for the K series. • SW0-GPPU ..... User floppy disk (2DD). • 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 (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 • AC03R4H ..... 0.3m (0.98 ft.)-long connection cable between A6KB and A6PHP. • A6KB-C ..... Key sheet for the GPP mode of A6KB.	
Optional keyboard for A6GPP	A6KB-SET	• A6KB keyboard • AC03R4L ..... 0.3m (0.98 ft.)-long connection cable between A6KB and A6GPP. • A6KB-C ..... Key sheet for the GPP mode of A6KB.	

Product Name	Model Name	Remark
Printer	K6PR-K 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) 3m (78.74 in) long
Printer paper	K6PR-Y K7PR-Y	Printer paper for K6PR(S1) and K6PR-K.9-inch paper.2000 sheets per unit. 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 3m (118.11 in) long
	AC20R4-A8PU	Connection cable for between the CPU main module and A8PUE 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. • 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) • 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) • Connect to the CPU mopdule with an AC30R4-PUS cable.
RS-422 cable	AC30R4 AC300R4	Connection cable for between the CPU main module and A6WU. 3m/30m (9.84 ft./98.43 ft.) long.
	AC03WU	Connection cable for between the A6PHP main unit and A6WU. 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

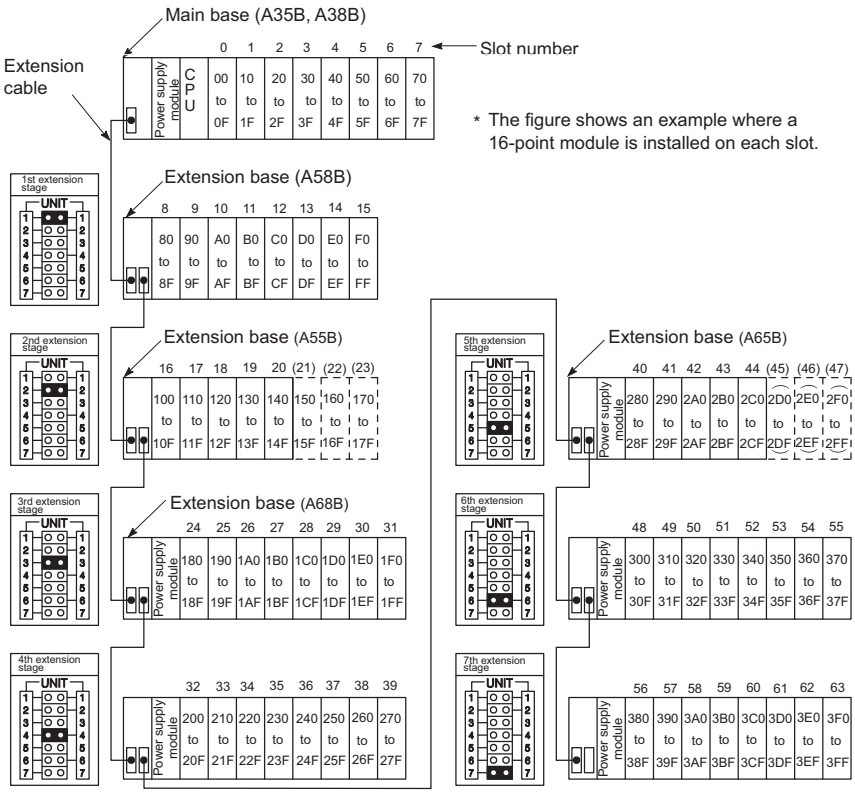
(2) Datalink system ..... A system that controls multiple PLCs and remote I/O modules

(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 datalink 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.

A2A, A3ACPU system

System configuration	
Maximum number of extension stages	A2ACPU : 3rd extension stage, A2ACPU-S1/A3ACPU : 7th extension stage
Maximum number of I/O modules	A2ACPU : 32 modules, A2ACPU-S1/A3ACPU : 64 modules
Maximum number of I/O points	A2ACPU : 512 points, A2ACPU-S1 :1024 points, A3ACPU : 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, AC30B
Restrictions	(1) Extension bases cannot be connected to the main base A32B. (No connector for extension) (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. (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. (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. (3) 16 points are assigned to an empty slot. (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. (5) Items (2) to (4) can be performed by the I/O assignment. 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,
IEC 61131-2
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
(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
		A2ACPU	A2ACPU-S1	A3ACPU	
Control method		Sequence program control method			
I/O control mode		Refresh mode			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)			
Processing speed (sequence instruction)		0.2 to 0.4 μs/step		0.15 to 0.3 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		Capacity of the installed memory cassette (Max. 448k bytes)		Capacity of the installed memory cassette (Max. 768k bytes)	Refer to CHAPTER 7 for details of memory cassette.
Program capacity	Main sequence program	Max. 14k steps		Max. 30k steps	Set in parameters.
	Subsequence program	None		Max. 30k steps	
Number of I/O points		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

Performance specifications (Continued)

Item		Model			Remark
		A2ACPU	A2ACPU-S1	A3ACPU	
Device points	Internal relay [M]	7144 points (M0 to M999, M2048 to M8191)			The range can be changed by parameters.
	Latch relay [L]	1048 points (L1000 to L2047)		Total 8192 points shared by M, L, S	
	Step relay [S]	0 point (None for default)			
	Link relay [B]	4096 points (B0 to BFFF)			
	Timer [T]	2048 points (Default: 256 points) •100ms timer (T0 to T199) .....Setting time: 0.1 to 3276.7s •10ms timer (T200 to T255).....Setting time: 0.01 to 327.67s •100ms retentive timer (none for initial) ...Setting time: 0.1 to 3276.7s •Expansion timer (T256 to T2047) ..... Time set by word device (D, W, R)			The range and number of points for use set by parameters (Refer to Section 4.3.1)
	Counter [C]	1024 points (Default: 256 points) •Normal counter (C0 to C255).....Setting range : 1 to 32767 times •Interrupt counter (none for default) .....C224 to C255 possible depending on setting •Expansion counter (C256 to C1023) .....Count value set by word device (D,W,R)			The range and number of points for use set by parameters (Refer to Section 4.3.1)
	Data register [D]	6144 points (D0 to D6143)			
	Link register [W]	4096 points (W0 to WFFF)			
	Annunciator [F]	2048 points (F0 to F2047)			Fault finding device
	File register [R]	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
	A2ACPU	A2ACPU-S1	A3ACPU	
Comment	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 (watchdog timer fixed to 200ms) 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 (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) (Possible to setup latch ranges for L, B, T, C, D, W)			Range set by parameters.
Remote RUN/PAUSE contacts	Possible to setup one contact poin for each of RUN/PAUSE from X0 to X1FFF.			Set in parameters.
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 4.4.
Interrupt processing	Possible to operate an interrupt program by the interrupt module or constant period interruput signal.			
Data link	MELSECNET(II)			
Clock function	Year, month, day, hour, minute, second, day of the week (automatic detection of the leap year) Accuracy • -2.3 to +4.4s(TYP.+1.8s)/d at 0℃ • -1.1to +4.4s(TYP.+2.2s)/d at 25℃ • -9.6 to +2.7s(TYP.+2.4s)/d at 55℃			
Allowable momentary power failure period	Depending on the power supply modules			Refer to Section 5.1.
5VDC internal current consumption	A2A :0.4A A2AP21(S3) :1.0A A2AR21 :1.4A	A2A-S1 :0.4A A2AP21-S1(S4) :1.0A A2AR21-S1 :1.4A	A3A :0.6A A3AP21(S3) :1.0A A3AR21 :1.6A	Differs according to memory cassette.
Weight	A2A :0.7kg A2AP21(S3) :0.9kg A2AR21 :0.9kg	A2A-S1 :0.7kg A2AP21-S1(S4) :0.9kg A2AR21-S1 :0.9kg	A3A :0.7kg A3AP21(S3) :0.9kg A3AR21 :1.0kg	
External dimensions	250mm (9.84inch) × 79.5mm (5.32inch) × 121mm (4.76inch)			

CAUTION

When the conventional system software packages and peripheral devices are used, the usable device range are limited.
Details are provided in Section 2.2.3.

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 link parameter information to the 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.

(f) By setting link information, I/O storage device, etc. of the MELSECNET/MINI-S3 to the parameters, auto refresh processing of the master module is performed. (Refer to Section 4.3.5)

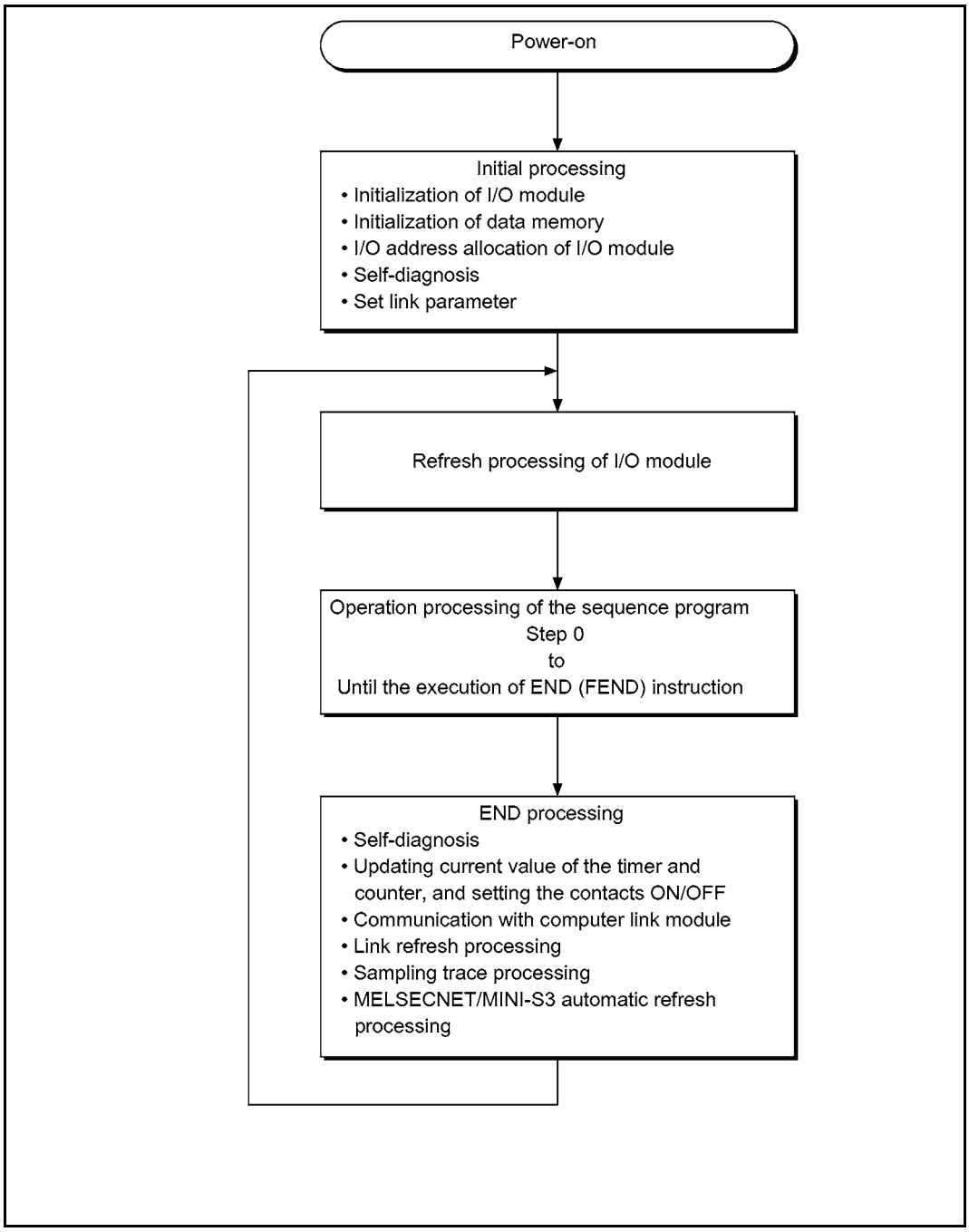


Figure 4.1 CPU module operation processing

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 one 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 4.4)

  (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 4.4)

(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 4.4)

  (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="4">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
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
(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
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

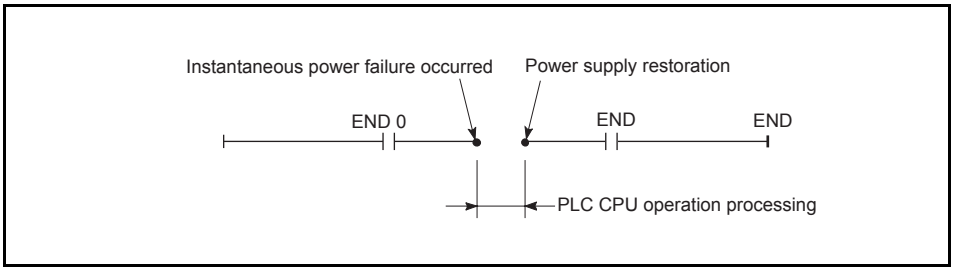
1. In any statuses of RUN, STOP or PAUSE, PLC CPU performs the following:
   - Refresh processing of I/O module
   - Data communication with computer link module
   - Link refresh processing

   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/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 AnACPU, 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) Detailed error code.....The content of the special register D9091
(d) Error step and error module installation address... The content of the special register D9010, D9000, D9002

(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 AnACPU 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) As to the LED indication message, the order of priority of the LED indication can be changed if CPU module is in the operation mode. (Error codes are stored in the special register.)

(2) When the special relay M9084 is ON, checking on fuse blown, I/O verification and the battery are not performed. (Error codes are not stored in the special register.)

(3) The "Error indication of peripheral device" in the table of self-diagnostics functions are messages that is indicated by the PLC diagnosis of peripheral devices.

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 • When switching from (STOP, PAUSE) to (RUN, STEP→RUN)			PARAMETER ERROR	11
	No END instruction	• When M9056 or M9057 is ON • When switching from (STOP, PAUSE) to (RUN, STEP→RUN)			MISSING END INS	12
	Unable to execute instruction	• CJ SCJ JMP CALL(P) FOR～NEXT When each instruction is executed • 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 • 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 • 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 • 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 • 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 • When switching from (STOP, PAUSE) to (RUN, STEP→RUN)	Continue	ON	LINK PARA.ERROR	47
Battery	Low battery	Always (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 [<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

Device		Range of Usage (points)			Description of Device
		A2ACPU	A2ACPU-S1	A3ACPU	
X	Input	X/Y0 to X/Y1FF (512 points)	X/Y0 to 3FF (1024 points)	X/Y0 to X/Y7FF (2048 points)	Used for the supply PLC commands and data from the external devices such as push buttons, select switches, limit switches and digital switches.
Y	Output				Used to the output control results of the program to the external devices such as solenoids, magnetic switches, signal lights and digital display device.
M	Special Relay	M9000 to M9255 (256 points)			An auxiliary relay which is used in a PLC set in advance for a special application.
	*Internal relay	M/L/S0 to M/L/S8191 (8192 points) 8192 points as a total of M, L, S			An auxiliary relay in a PLC which cannot output directly to external devices.
L	*Latch relay				An auxiliary relay in a PLC which cannot output directly to the external devices. Has the power failure compensation function.
S	*Step relay				Used in the same manner as the internal relay (M). Used as a relays to indicate the stage number of process stepping program, etc.
B	Link relay	B0 to BFFF (4096 points)			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.
F	Annunciator	F0 to F2047 (2048 points)			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.
T	*100ms timer	T0 to T2047 (2048 points) (Register for storing setting value(s) is required for T256 or later.)			Up-timing-timer. There are three kinds: 100ms timer, 10ms timer and 100ms retentive timers.
	*10ms timer				
	*100ms retentive timer				
C	*Counter	C0 to C1023 (1024 points)			Up-timing
	*Interrupt counter	(Interrupt counter: fixed C224 to C255 Register for storing setting value(s) is required for C256 or later.)			There are two kinds: an up-timing counter used in PLC programs, an interrupt counter used in counting the number of interrupts.
D	Data register	D0 to D6143 (6144 points)			Memory used to store data in a PLC
	Special register	D9000 to D9255 (256 points)			Data memory set up in advance for the special application

Device list (Continued)

Device		Range of Usage (points)			Description of Device
		A2ACPU	A2ACPU-S1	A3ACPU	
W	Link register	W0 to W1FFF (8192 points)			Register for a data link. The range not set by the link parameters can be used as a substitute for a data register.
R	*File register	R0 to R8191 (8192 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 V	Index register	V,V1 to V6,Z,Z1 to Z6 (14 points)			Used for qualification of devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, 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) 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) 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 Data Link Module Performance Specifications

The following shows data link performance specifications for the AnACPUP21/R21 Data Link Module.

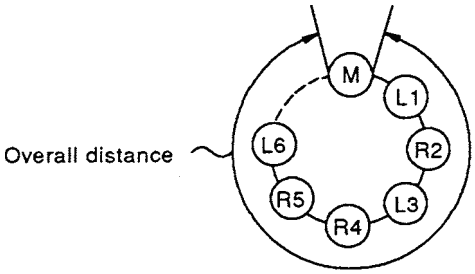
Data Link Module Performance specifications

			For optical data link					
			A2ACPUP21	A2ACPUP21-S3	A2ACPUP21-S1	A2ACPUP21-S4	A3ACPUP21	A3ACPUP21-S3
Max. number of I/O points			512 points		1024 points		2048 points	
Max. number of usable link points per station	Input (X)		512 points(64 bytes)		1024 points(128 bytes)		2048 points(256 bytes)	
	Output (Y)		512 points(64 bytes)		1024 points(128 bytes)		2048 points(256 bytes)	
MELSECNET mode	Max. number of link points in 1 system	B	1024 points (128 bytes)					
		W	1024 points (2048 bytes)					
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes					
MELSECNET II mode	Max. number of link points in 1 system	B	4096 points (512 bytes)					
		W	4096 points (8192 bytes)					
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes $\frac{B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes					
MELSECNET II (compatible)mode	Max. number of link points in 1 system	B	4096 points (512 bytes)					
		W	4096 points (8192 bytes)					
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes $\frac{B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes					
Allowable momentary power failure time			*1 within 20 ms					
Communication speed			1.25 MBPS					
Communication method			Half duplex bit serial method					
Synchronous method			Frame synchronous method					
Transmission path method			Duplex loop method					
Overall loop distance *2			Max.10km (32810 ft) (between stations: 1km (3281 ft))	Max.10km (32810 ft) (between stations: 2km (6562 ft))	Max.10km (32810 ft) (between stations: 1km (3281 ft))	Max.10km (32810 ft) (between stations: 2km (6562 ft))	Max.10km (32810 ft) (between stations: 1km (3281 ft))	Max.10km (32810 ft) (between stations: 2km (6562 ft))
Number of connected stations			Max. 65 units/loop (1 master station, 64 local/remote I/O stations)					
Demodulation method			CMI method					
Transmission format			Conforms to HDLC (frame method)					
Error control system			Rerry due to CRC (generating polynominal $X^{16} + X^{12} + X^5 + 1$) and time over					
RAS function			Loopback function due to error detection and cable breakage, diagnostic function such as host link line					
Connector			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 used			SI-200/250	GI-20/125	SI-200/250	GI-20/125	SI-200/250	GI-20/125

REMARK

*1 The allowable momentary power failure time of the system using the A63P power supply module is the time during which 24 VDC become less than the specified voltage (15.6 VDC) after turning OFF the primary power supply of the stabilized power supply providing 24 VDC to the A63P. When using other power supply modules, (A61P, A61PN, A61PEU, A62P, A62PEU, A64P, A65P), the allowable momentary power failure time is 20 ms.

*2 The overall loop distance is the distance from the sending port of the master station to the receiving port of the master station via slave stations. Both optical and coaxial cables have a max. distance of 10 km (32810 ft).



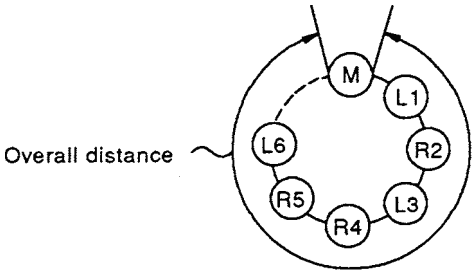
Data Link Module Performance specifications

			For Coaxiall Data Link		
			A2ACPUR21	A2ACPUR21-S1	A3ACPUR21
Max. number of I/O points			512 points	1024 points	2048 points
Max. number of usable link points per station	Input (X)		512 points(64 bytes)	1024 points(128 bytes)	2048 points(256 bytes)
	Output (Y)		512 points(64 bytes)	1024 points(128 bytes)	2048 points(256 bytes)
MELSECNET mode	Max. number of link points in 1 system	B	1024 points (128 bytes)		
		W	1024 points (2048 bytes)		
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes		
MELSECNET II mode	Max. number of link points in 1 system	B	4096 points (512 bytes)		
		W	4096 points (8192 bytes)		
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes $\frac{B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes		
MELSECNET II (compatible)mode	Max. number of link points in 1 system	B	4096 points (512 bytes)		
		W	4096 points (8192 bytes)		
	Max. number of link points in 1 station		$\frac{Y(points) + B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes $\frac{B(points)}{8} + 2 \times W(points) \leqq 1024$ bytes		
Allowable momentary power failure time			*1 within 20 ms		
Communication speed			1.25 MBPS		
Communication method			Half duplex bit serial method		
Synchronous method			Frame synchronous method		
Transmission path method			Duplex loop method		
Overall loop distance			Max. 10 km (32810 ft) (500m (1640.5 ft) station interval)		
Number of connected stations			Max. 65 units/loop (1 master station, 64 local/remote I/O stations)		
Demodulation method			CMI method		
Transmission format			Conforms to HDLC (frame method)		
Error control system			Rerry due to CRC (generating polynominal $X^{16} + X^{12} + X^5 + 1$) and time over		
RAS function			Loopback function due to error detection and cable breakage, diagnostic function such as host link line		
Connector			BNC-P-5, BNC-P-3NI (DDK) equivalent		
Cable used			3C-2V, 5C-2V equivalent		

REMARK

*1 The allowable momentary power failure time of the system using the A63P power supply module is the time during which 24 VDC become less than the specified voltage (15.6 VDC) after turning OFF the primary power supply of the stabilized power supply providing 24 VDC to the A63P. When using other power supply modules, (A61P, A61PN, A61PEU, A62P, A62PEU, A64P, A65P), the allowable momentary power failure time is 20 ms.

*2 The overall loop distance is the distance from the sending port of the master station to the receiving port of the master station via slave stations. Both optical and coaxial cables have a max. distance of 10 km (32810 ft).



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.
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.
Parameters are set with peripheral devices. However, use caution when using a AnACPU Software package not supporting the GPP function and the PU since setting ranges are restricted.

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>A2ACPU</th><th>A2ACPU-S1</th><th>A3ACPU</th></tr>
<tr><td colspan="2">Main sequence program capacity</td><td>6k steps</td><td colspan="2">1 to 14k steps
(1k step = in 2k-byte units)</td><td>1 to 30k steps
(1k step = in 2k-byte units)</td></tr>
<tr><td colspan="2">Subsequence program capacity</td><td>–</td><td colspan="2">–</td><td>1 to 30k steps
(in 1k-step unit)</td></tr>
<tr><td colspan="2">File register capacity</td><td>–</td><td colspan="3">0 to 8k points (1k point = in 2k-byte units)</td></tr>
<tr><td colspan="2">Comment capacity</td><td>–</td><td colspan="3">0 to 4032 points (unit: 64 points = 1k byte)
[When comment capacity is set up, 1k byte is added to the memory area.]</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 colspan="2">Status latch</td><td>–</td><td colspan="3" rowspan="2">No parameter setting
(Performed by setting up extention file registers to store devices and result in each of status latch and sampling trace modes.
(Refer to the Type ACPU/QCPU-A (A Mode)(Fundamentals) Programming Manual.))</td></tr>
<tr><td colspan="2">Sampling trace</td><td>–</td></tr>
<tr><td rowspan="5">Latch range setting</td><td>Link relay (B)</td><td rowspan="5">• Latch: L1000 to L2047 only
• None for others</td><td colspan="3">B0 to BFFF (in 1-point unit)</td></tr>
<tr><td>Timer (T)</td><td colspan="3">T0 to T255 (in 1-point unit)
T256 to T2047 (in 1-point unit)</td></tr>
<tr><td>Counter (C)</td><td colspan="3">C0 to C255 (in 1-point unit)
C256 to C1023 (in 1-point unit)</td></tr>
<tr><td>Data register (D)</td><td colspan="3">D0 to D6143 (in 1-point unit)</td></tr>
<tr><td>Link register (W)</td><td colspan="3">W0 to WFFF (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
M2048 to M8191
L1000 to L2047
None for S</td><td colspan="3">M/L/S0 to M/L/S8191
(M, L, S are serial numbered.)</td></tr>
</table>

List of parameter setting range (Continued)

Item		Default Value	Setting Range		
			A2ACPU	A2ACPU-S1	A3ACPU
Timer settings	T0 to T255	T0 to T199 (100ms) T200 to T255(10ms)	• 256 points for 100ms, 10ms, and retentive timers (in 8-point units) • All timers are serial numbered.		
	T256 to T2047	–	• 1792 points by 100ms, 10ms, and retentive timers (in 16-point unit) • All timers are serial numbered. • Devices set: D, R, W (Setting required when 257 points or more.)		
Counter setting	Interrupt counter setting	–	• Sets whether to use interrupt counter (C224 to C225) or not.		
	Points used	256 points (C0 to C255)	• 0 to 1024 points (in 16 point units) • Devices set: D, R, W (Setting required when 257 points or more.)		
I/O number assignment		–	• 0 to 64 points (in 16-point units).....		Input module/output module special function module/ empty slot
Remote RUN/PAUSE contact setting		–	X0 to X1FF	X0 to X3FF	X0 to X7FF
			RUN/PAUSE...1 point (Setting of PAUSE contact only is not allowed.)		
Operation mode when there is an error	Fuse blown	Continue	Stop/Continue		
	Module comparison error	Stop			
	Computation error	Continue			
	Special function access error	Stop			
Annunciator display mode		F number display	–	–	Display F number/Display F number and comments alternately (Only alphanumerics can be displayed for comments)
Output mode switching at STOP → RUN		Set the output status at STOP to RUN	Output before STOP/after operation		
Print title entry		–	• 128 characters		
Keyword registration		–	• Up to 6 characters in hexadecimal (0 to 9, A to F)		
Link range settings for MELSECNET II	Number of link stations	–	• 0 to 64 station(s)		
	I/O (X/Y)		X/Y0 to X/Y1FF (in 16-point units)	X/Y0 to X/Y3FF (in 16-point units)	X/Y0 to X/Y7FF (in 16-point units)
	Link relay (B)		• B0 to BFFF (in 16-point units)		
	Link register (W)		• W0 to WFFF (in 1-point units)		

List of parameter setting range (Continued)

Item		Default Value	Setting Range		
			A2ACPU	A2ACPU-S1	A3ACPU
Link range setting for MELSECNET/MINI MELSECNET/MINI-S3	Number of supported modules	–	0 to 8 module(s)		
	Head I/O number		0 to 1F0 (in 10H units)	0 to 3F0 (in 10H units)	0 to 7F0 (in 10H units)
	Model name registration		MINI, MINI-S3		
	Transmitted and received data		X, M, L, B, T, C, D, W, R, none (16-point units for bit devices)		
	Number of retries		0 to 32 times		
	FROM/TO response specification		Link priority; CPU priority		
	Faulty station data clear specification		Retain/Clear		
	Faulty station detection		M, L, B, T, C, D, W, R, none (16-point units for bit devices)		
	Error No.		T, C, D, W, R		
	Number of total remote stations		0 to 64 station(s)		
	Sending status setting during communication error		Test message, OFF data, retention (sending data)		

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.

Table 4.1 Memory capacity

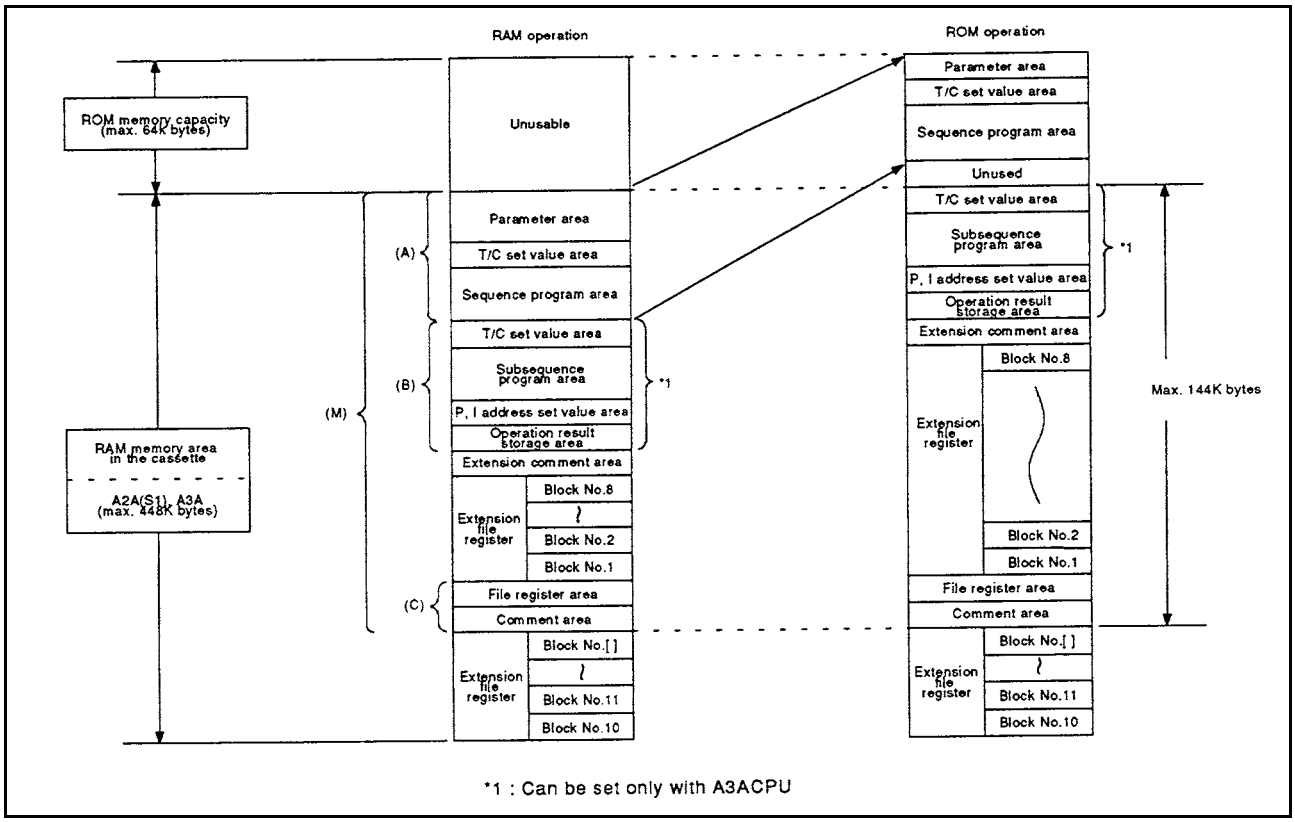
Item		Setting Unit	Memory Capacity (bytes)	Write to ROM	Remark
Parameter, T/C set value		–	4 k bytes (fixed)	Usable	The parameter and T/C set value occupy 4k bytes.
Main program	Sequence program	1k step	(Main sequence program capacity) × 2k bytes		–
	Microcomputer program	2k bytes	(Main microcomputer program)k byte		The microcomputer program area is dedicated to the SFC.
Subprogram*1	T/C set value	–	1k byte (fixed)	Not usable	–
	Sub sequence program	1k step	⎛ Subsequence program capacity ⎞ × 2k bytes		
Subsequence program execution		–	5k bytes (fixed)	Not usable	When subsequence program is set, it occupies 5k bytes for execution area.
Expanded comment		64 points	(Number of extension comments/ 64+1)k bytes		When the expanded comment capacity is set, the system occupies 1k byte.
File register		1k point	(Number of file register points)× 2k bytes		–
Comment		64 points	((Number of comments)/64+1)k bytes		When the comment capacity is set, the system occupies 1k byte.

*1 : A3ACPU only

(2) Strage order in the user memory area

The user memory area differs in capacity according to the used memory cassette.

(a) Using A3NMCA-0 to 56 memory cassette



(b) Caiculation of the number of usable blocks of the extension file register (block No.1 to No.8)

Calculate the empty area by subtracting the capacity for each area set in parameters from the value of (M) in next table. The calculated empty area is divided in units of 8K points (16K bytes), and the block which has been allocated in order from No.1 becomes the usable block.

$$\text{RAM operation: } \frac{(M)-(A)-(B)-(C)\text{k bytes}}{16} = n1 \text{ blocks}$$

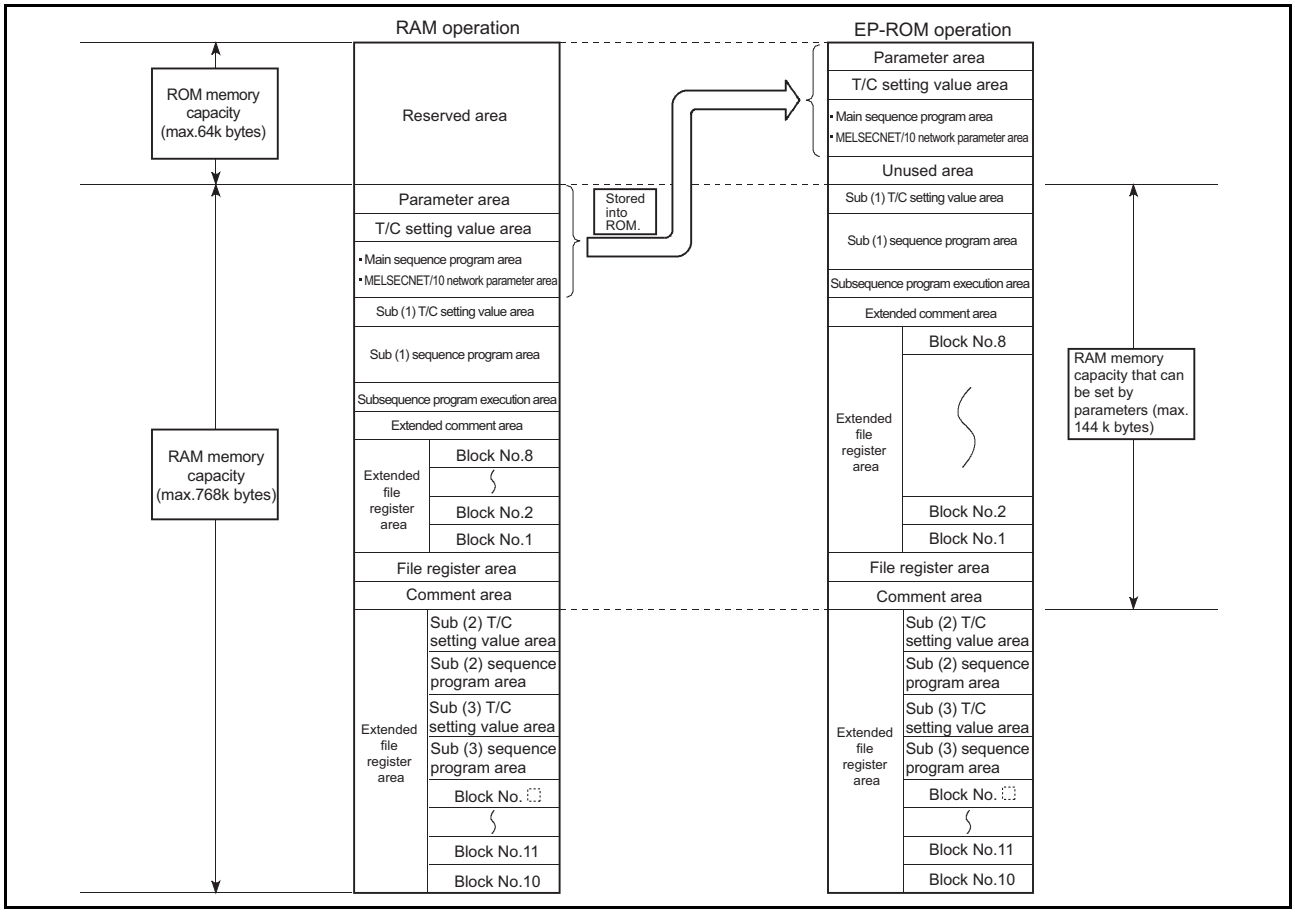
$$\text{ROM operation: } \frac{(M)-(B)-(C)\text{k bytes}}{16} = n2 \text{ blocks}$$

In ROM operation, data in (A) area is stored onto ROM.

The integer values of n1 and n2 become the number of usable blocks in block No.1 to No.8.

The number of usable blocks in block No.10 to No.48 is determined by the memory cassette.

(c) Using A3AMCA-96 memory cassette (can be installed to the A3A*1.)



(d) Calculation of the number of usable blocks in the extended file register (blocks No.1 to No.8)

Calculate the empty area by subtracting the capacity for each area set by parameters from the value of (M) in next table. The calculated empty area is divided in units of 8k points (16 k bytes), and the blocks which have been divided in order starting from No.1 is the usable blocks.

$$\text{RAM operation: } \frac{\text{(M)-(A)-(B)-(C)k bytes}}{16} = \text{n1 blocks}$$

$$\text{ROM operation: } \frac{\text{(M)-(B)-(C)k bytes}}{16} = \text{n2 blocks}$$

In ROM operation, data in (A) area are stored into ROM.

The integer values of n1 and n2 are the number of usable blocks in blocks No.1 to No.8.

Memory area in the memory cassette when parameters are set

Type	Model	RAM Memory Capacity	Allowable RAM Memory Capacity in Parameter Range (M)	*1 Block No. Available for Extension File Register	*2 ROM Memory Capacity
RAM/ EP-ROM type	A3NMCA-0	16k bytes	16k bytes	Unusable	Max. 64k bytes
	A3NMCA-2				
	A3NMCA-4	32k bytes	32k bytes		
	A3NMCA-8	64k bytes	64k bytes	Max. No.1 to No.2	
	A3NMCA-16	128k bytes	96k bytes	Max. No.1 to No.4 No.10 to No.11	
	A3NMCA-24	192k bytes	144k bytes	Max. No.1 to No.8 No.10 to No.12	
	A3NMCA-40	320k bytes		Max. No.1 to No.8 No.10 to No.20	
	A3NMCA-56	448k bytes		Max. No.1 to No.8 No.10 to No.28	
	A3AMCA-96	768k bytes		Max. No.1 to No.8 No.10 to No.48	

*1 Indicates the maximum avalability in the condition that main sequence program of 12k bytes, file register of 16k bytes, and no other areas are assigned.

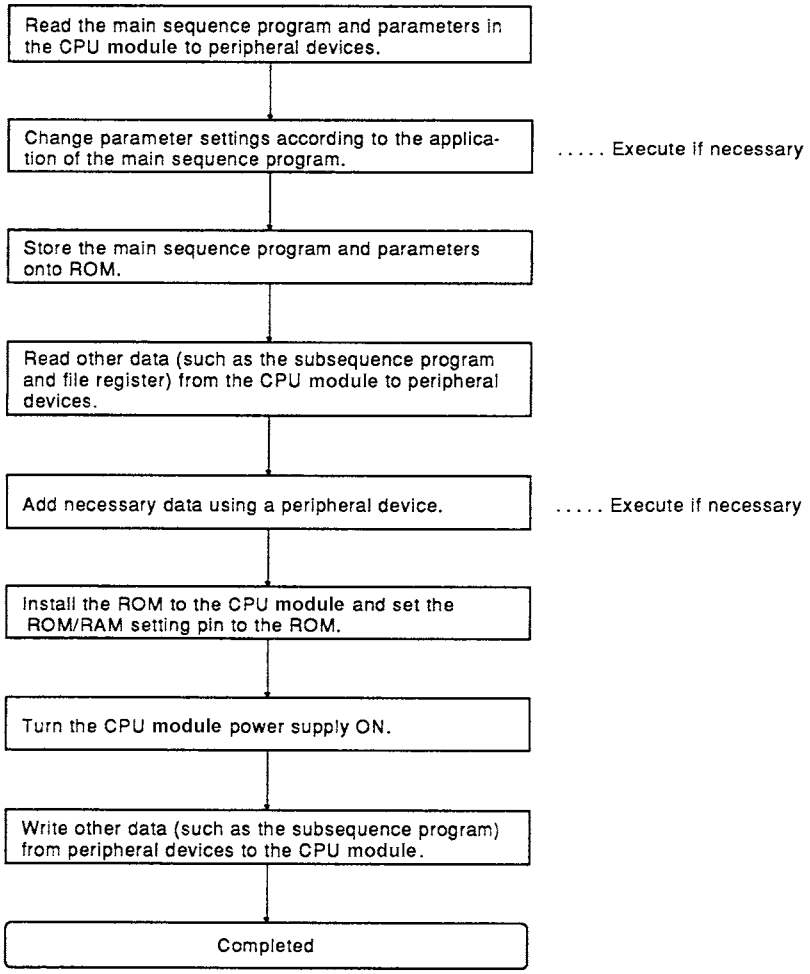
*2 Prepare EP-ROM separately to install to the memory cassette.

POINT

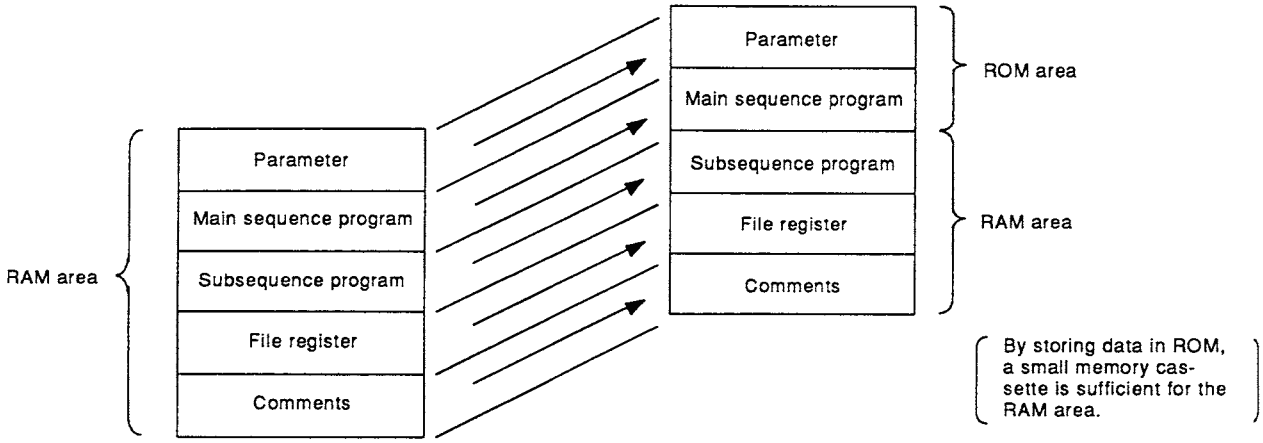
When the capacity (k bytes) of the extension comment set with parameters exceeds the empty area (M) mentioned on the previous page, all extension comments are stored in the extension file registers beginning with block No.10. In this case, the blocks corresponding to the extension comment storage area cannot be used as the extension file registers.

(3) 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)



4.3.3 Setting ranges of timer and counter

(1) Timer setting range

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

Timer points :256 points
100ms timer :T0 to T199
10ms timer :T200 to T255
Retentive timer :None

(b) When timer-use points are set to 257 or more, the default values will be as follows:

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

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

(d) Timer setting values are as follows:

T0 to T255 : constant or word device (D)
T256 to T2047 : word device (D, W, R)
(Allocate a storage device for the set value by setting parameters.)

(2) Counter setting range

(a) Default values of counter setting ranges are as follows:

Counter points :256 points
Normal counter :C0 to C255
Interrupt counter :None

(b) When the counter-use points are set to 257 points or more, the default values will become as follows:

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

(c) A counter which can be setup as an interrupt counter must be in the range C244 to C255 only, and any counters outside the range cannot be set up.
The setup is made with parameters in C224 to C255 by one point for the interrupt counter.
Any counter in the range C224 to C255 which is not set up as an interrupt counter can be used as a normal counter.

The interrupt counters in C224 to C255 are allocated to the interrupt pointers I0 toI31 as shown below, and count the occurrences of interrupts by those of I0 to I31.

Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter	Interrupt pointer	Interrupt counter
I0	C224	I8	C232	I16	C240	I24	C248
I1	C225	I9	C233	I17	C241	I25	C249
I2	C226	I10	C234	I18	C244	I26	C250
I3	C227	I11	C235	I19	C243	I27	C251
I4	C228	I12	C236	I20	C244	I28	C252
I5	C229	I13	C237	I21	C245	I29	C253
I6	C230	I14	C238	I22	C246	I30	C254
I7	C231	I15	C239	I23	C247	I31	C255

(d) The counter-use points can be set arbitrarily by 16 points using the serial numbers.
By setting the counter which points to the number actually used, the counter processing time subsequent to the END instruction can be shortened.

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

POINT

When the timer-use points are set to 257 points or more or the counter-use points are set to 257 points or more, the set value storage devices (D, W, R) specified at the time of timer/counter use point setup are automatically set in the serial numbers.
<Example>
When the timer-use points are set to 512 points and the set value storage device is set to D1000, D equivalent to 256 points (D1000 to D1255) in T256 to T511 becomes the devices for the set values using the continuous numbers.

4.3.4 I/O assignment of special function module

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

Model Name of Special Function Module	Setting for Model Name Registration
AD61	AD61
AD61-S1	AD61S1
AD59	AD59
AD59-S1	AD59S1
AJ71UC24	AJ71UC24
AJ71PT32-S3	PT32S3

4.3.5 MELSECNET/MINI-S3 auto refresh processing

By setting link information, I/O storage device, etc. of the MELSECNET/MINI-S3 to the parameters, the module automatically communicates with the buffer memory area for the batch refresh send/received data of the A1SJ71PT32-S3/AJ71PT32-S3 master module (abbreviated as the master module hereafter).

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

POINT

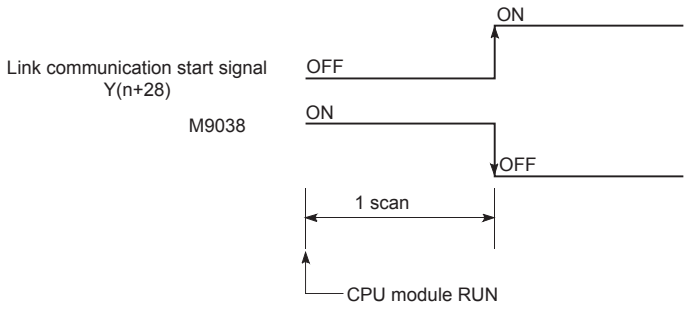
(1) Since up to 8 master modules can be set for auto refresh by the parameter, auto refresh is possible for up to 8 modules.
When 9 or more modules are desired, use the FROM/TO instruction in the sequence program from the 9th module.

(2) Since auto refresh is not possible with send/received data for the separate refresh I/O modules and for the remote terminal units No.1 to No.14, use them by the FROM/TO instructions.
However, the remote terminal units shown below are subject of auto refresh in the limited area:
- AJ35PTF-R2 RS-232C interface module
- AJ35PT-OPB-M1-S3 mount-type tool box
- AJ35PT-OPB-P1-S3 portable type tool box

(3) For the master modules set up for auto refresh, since the CPU module automatically turns ON the link communication start signal Y(n+18) or Y(n+28), it is not necessary to turn it on from the sequence program.

(4) Auto refresh of I/O data is performed by batch after the CPU module executes the END instruction. (Auto refresh processing is performed when the CPU module is in the RUN/PAUSE/STEP-RUN status.)

(5) The master module may perform the processing while the link communication start signal Y(n+28) is OFF depending on the remote terminal units connected.
For instance, if the AJ35PTF-R2 RS-232C interface unit is used without protocol, it is necessary to write parameters to the parameter area (buffer memory address 860 to 929) while the link communication start signal is OFF.
Since the link communication start signal becomes ON after the CPU module enters the RUN status and one scan is performed, write the parameters during the first 1 scan.



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

I/O signal from the master module	Buffer memory address of the master module	Item	Setting Range	Description
–	–	Number of master modules	1 to 8 module(s)	• Sets the total number of use of the master modules.
–	–	Head I/O No.	Number of I/O points of CPU module	• Sets the head I/O number where the master module is installed.
–	–	Model classification of MINI/MINI-S3	• MINI or MINI-S3	• MINI ... In I/O mode (occupies 32 points) • MINI-S3 ... In expansion mode (occupies 48 points)
–	0	Total number of remote I/O stations *2	0 to 64station(s)	• Set only when MINI is set. • In MINI-S3, since the number of master module's initial ROMs becomes valid, the setting is not necessary .(When the setting is executed, ignore it).
–	110 to 141	Storage device for received data	• X • M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	• Sets the devices to store the received/send data for batch refresh. • Specify the head number of the device. • Occupies a part of the device area as the auto refresh area from the head of the device for the number of stations. (When setting the total number of remote I/O stations to 64, occupies 8 points/station × 64 stations = l512 points: bit device.)*2 • Use of X/Y remote I/O range is recommended for devices.
–	10 to 41	Send data storage device	• Y • M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	
–	1	Number of retries	0 to 32 times	• Sets the number of retries upon the communication errors occurrence. • Error is not output when the communication is restored within the number of the retries set.

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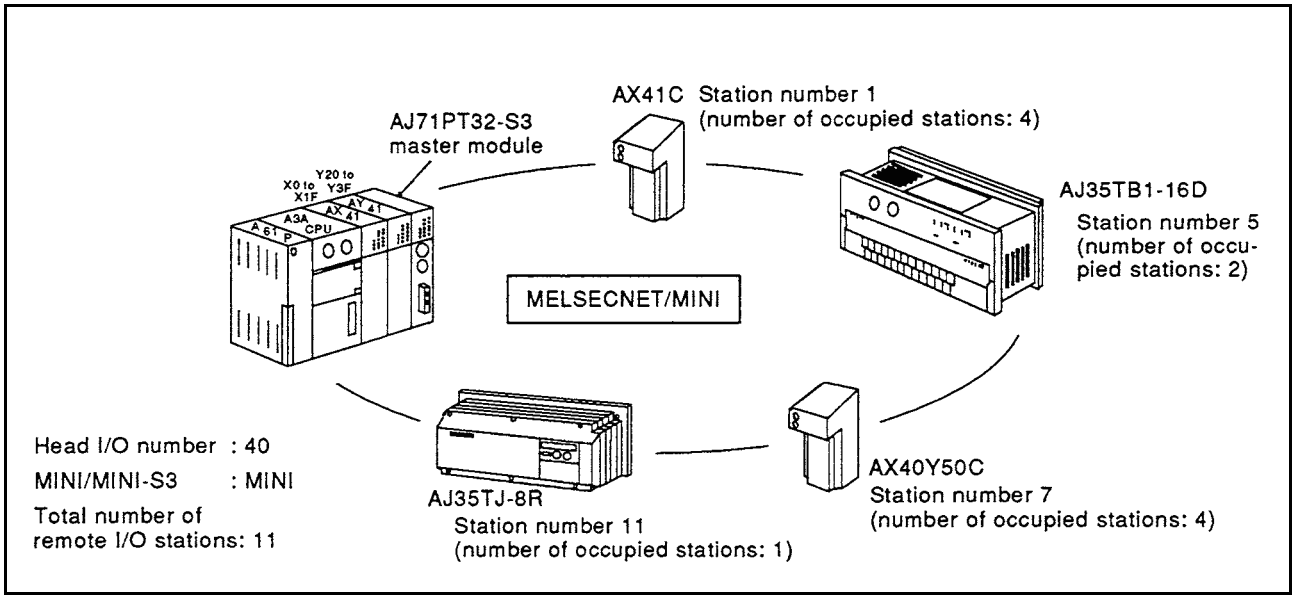
(Continued)

I/O signal from the master module	Buffer memory address of the master module	Item	Setting Range	Description
Y(n+1A)*1	–	FROM/TO response specification	Link priority; CPU priority (Priority selection of access to the master module buffer memory)	(1) Link priority Link access by MINI-S3 has the priority. During the link access, FROM/TO is caused to wait. • Possible to read out the received data refreshed at the same timing. • The maximum wait time (0.3ms + 0.2ms × number of separate refresh stations) for the FROM/TO instruction may be generated. (2) CPU priority ... Access by FROM/TO instruction of CPU has the priority. Even during the link access, it interrupts and accesses. • Depending on the timing, received data in the midst of I/O refresh may be read. • No wait time for FROM/TO instruction.
Y(n+1B)*1	–	Data clear specification for communication faulty station	Retention, clear (received data)	• Retention ... Retains the received data for batch and separate refresh. • Clear ... Sets all points to OFF
–	100 to 103 195	Faulty station detection	M, L, B, T, C, D, W, R, none (Bit device: multiples of 16)	• Sets the head device to store the faulty stations detected data. • MINI ... occupies 4 words; MINI-S3: occupies 5 words.
–	107 196 to 209	Error No.	T, C, D, W, R	• Sets the head device to store the error code at the error occurrence. • MINI ... occupies 1 word; MINI-S3 ... occupies (1+ number of remote terminal units) words.
–	4	Line error check setting (Line error)	• Test message sending • OFF data sending • Immediate data transmission before line errors	• Sets data sending method for verification of faulty area when the line errors occur.

*1 "n" is determined by the installation location of the master modules.
*2 When the total number of remote I/O station is odd, add 1 to the station number to obtain the occupied storage devices.

(2) Setting of the send/received data storage devices is explained using the system example shown below.
<Example> When the device X/Y400 and later are used as the remote I/O stations:



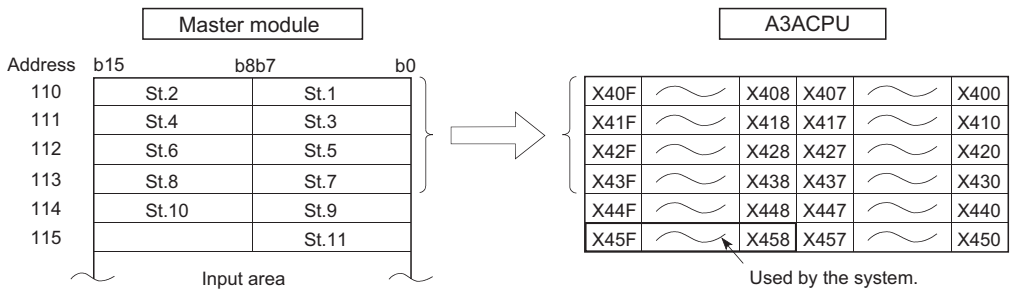
Sample parameter setting of the GPP function software package for the above system configuration is shown below:

Number of modules [1] (0-8)

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

The storage devices for the send/received data for the present system example are as follows:

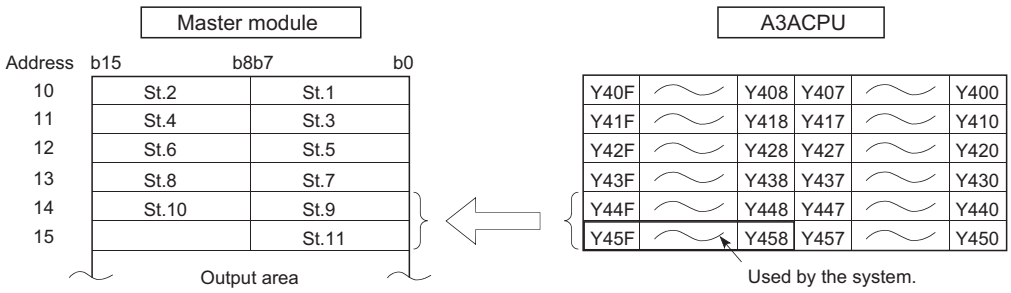
(a) Storage device for received data



1) Set the device number (X400) for b0 of the station 1 as a received data storage device.
2) The received data storage device occupies from X400 to X45F.
For the present system example, since the total number of stations is odd, it is occupied for one extra station.

3) The device numbers of input modules connected are as follows:
Stations 1 to 4 AX41C → X400 to X41F
Stations 5 to 6 AJ35TB-16D → X420 to X42F
Stations 7 to 8 AX40Y50C → X430 to X43F
With respect to X440 to X45F, they are simultaneously refreshed, and set to OFF at any time.
Do not use X440 to X45F in the sequence program.

(b) Send data storage device



1) Set the device number (Y400) for b0 of the station 1 as a send data storage device.
2) The send data storage device occupies from Y400 to Y45F.
For the present system example, since the total number of stations is odd, it is occupied for one extra station.
3) The device numbers of output modules connected are as follows:
Stations 9 to 10 AX40Y50C → Y440 to Y44F
Station 11 AJ35TJ-8R → Y450 to Y457
With respect to Y400 to Y43F and Y458 to Y44F, they are simultaneously refreshed, but are not output.

POINT

(1) Set the send and received data storage devices so that device numbers are not overlapped.
When the received data storage device is set to B0 in the system configuration example, it occupies B0 to B5F as the device range.
Set the send data storage device to B60 or later.
When the send data storage device is set to B60, the device range will be B60 to BBF.

(2) If a bit device is specified as the send/received data storage device, the device number set must be a multiple of 16.

<Example>

X0, X10 ...	X100, ...
M0, M16, ...	M256, ...
B0, B10, ...	B100, ...

(3) Device range used is (8 points) × (Number of stations).
When the number of stations is an odd number, extra 8 points are necessary.

4.4 Function List

Various functions of the CPU module are explained below.

Function (Application)	Description	Overview of Setting and Operation
Constant scan [•Program execution at constant intervals •Simplified positioning]	• Makes the processing time for a single scan in the sequence program constant. • Set the processing time within the range of 10ms to 190ms in 10ms units.	• Write to the special register D9020 by the sequence program.
Latch (power failure compensation) [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. • Latch-enabled devices: L, B, T, C, D, W • 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.
Auto refresh of MELSECNET/ MINI-S3 [Simplification of sequence program]	• Performs I/O auto refresh communication with send/ received data area for the batch refresh of AJ71PT32-S3/ A1SJ71PT32-S3 up to 8 modules. • Auto refresh is executed in a batch after END processing. • I/O devices allocated directly by each module can program without FROM/TO instruction in the sequence program.	• Performed by setting auto refresh parameters of peripheral devices. (Refer to Section 4.3.5)
Remote RUN/STOP [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. • When performed by a peripheral device, perform in the PLC test operation. • When performed via the computer link module, perform using the dedicated commands.
PAUSE [•When stopping operation of CPU module while retaining the output (Y) •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). (When the operation is stopped by STOP, all the outputs (Y) are set to OFF.) • 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. • 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 [Check an operation and failure factor on each device when CPU debugs or a failure condition is met.]	• 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.) • 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. • Using the peripheral devices, monitor the status latch data.

(To the next page)

(Continued)

Function (Application)	Description	Overview of Setting and Operation
Sampling trace [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.) • 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. • Using the peripheral devices, monitor the result of the sampling trace.
Step operation [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. (1) Executes for each instruction. (2) Executes for each ladder block. (3) Executes by step intervals and loop counts. (4) Executes by loop counts and break points. (5) Executes when the device values matches.	• Selects a step operation condition for the peripheral device and executes.
Clock [Program control by clock data/external display of clock data]	• Executes the clock operation installed to the CPU module. • Clock data: year, month, day , hour, minute, second, day of the week • When the clock data read request (M9028) is ON, the clock data are read and stored in D9025 to D9028 by the clock element after the END processing of the sequence operation. • 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. • Writes to the clock element by the sequence program. (Dedicated instructions can be used.)
Online I/O module change [Partial abnormal module replacement]	• Allows removal and installation of I/O modules without any errors while the CPU module is running. (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.
Priority order of LED indication [Changing priority order of indication/canceling indication]	• Changes the display order of or cancels the ERROR LED displays other than the error display by an operation stop and the default display items on the LED display device.	• Writes data as to whether change order/cancel indication to D9038 or D9039 by the sequence program.
Self-diagnostics function [•An abnormal behavior of the CPU module •Preventive maintenance]	• When an error that matches one of the self-diagnostics items is generated at the CPU module power on or during RUN, CPU prevents malfunctions by stopping the CPU module operation and indicating the error. • Stores the error codes corresponding to the self-diagnostics item. • The A3ACPU display error messages on the front face LED indicator.	• There are some self-diagnostics items with which the operation can be continued or stopped by the setting of peripheral device parameters. • Reads the error codes with the peripheral devices and performs troubleshooting. (Refer to Section 4.1.4)

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.

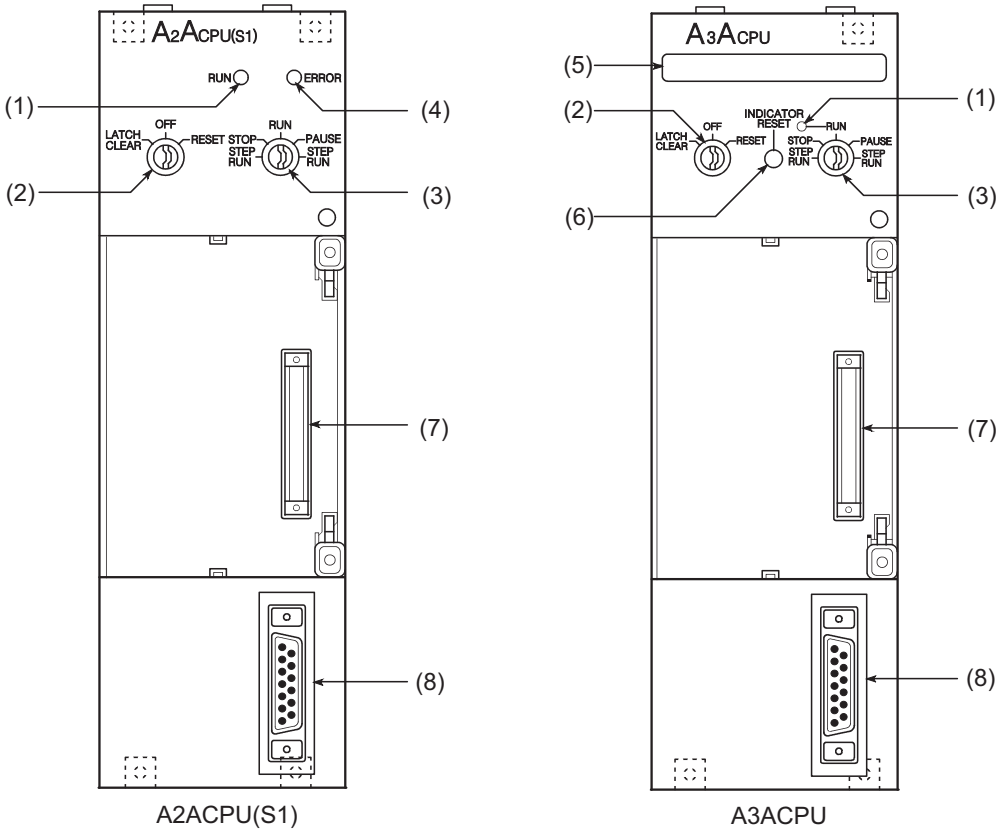
Screw	Tightening torque range
Module mounting screws (M4) (Optional)	78 to 118N·cm
Terminal block screws	98 to 137N·cm

(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 Names

4.6.1 Part names and settings of the AnACPU

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



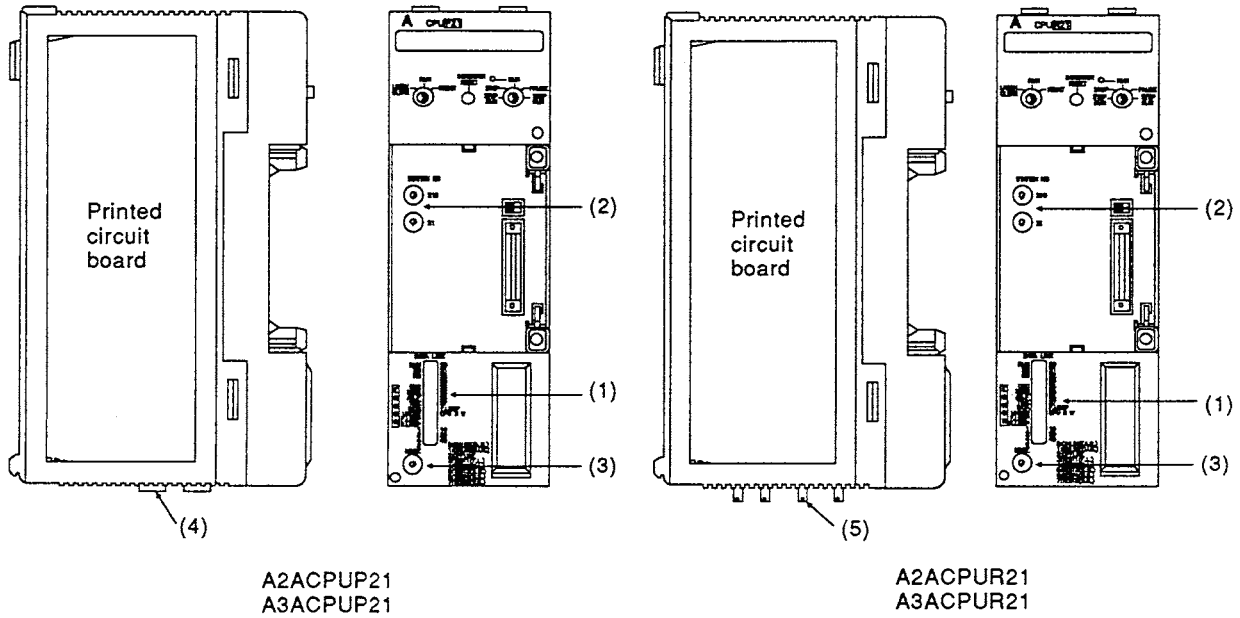
A2ACPU(S1) A3ACPU

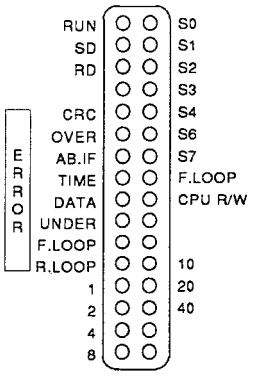
No.	Name	Description
(1)	RUN LED	Indicates the operating status of the CPU module. ON: Operating with the RUN/STOP key switch set to RUN or STEP RUN. OFF: Stopped with the RUN/STOP key switch set to STOP, PAUSE, or STEP RUN. Flickering: An error has been detected by self-diagnostics. (when specified with STOP by parameter setting in the case the parameter setting is made for operation to continue on error occurrences) Flikers approximately two seconds earlier when LATCH CLEAR is executed.
(2)	Reset key switch	RESET: Resets the hardware. Resets and initializes operation when an operation error occurred. LATCH CLEAR: Clears all data in the latch area (to "OFF" or "0") which is set with the parameter setting. Clears set data and results of sampling trace and status latch. (Valid only when the RUN/STOP key switch is set to STOP)
(3)	RUN/STOP key switch	RUN/STOP: Starts/stops sequence program operation. PAUSE: Suspends operation of sequence program with output status retained at the status immediately before the suspension. STEP RUN: Executes sequence program step run.
(4)	ERROR LED (A2ACPU (S1) only)	ON: A WDT error or an internal malfunction diagnositic error has occured due to a hardware failure. Flickering: Annunciator (F) is set.

No.	Name	Description
(5)	LED display (A3ACPU only)	Can display up to 16 characters. Displays comments for errors detected in self-diagnosis, comments or character strings by LED display instructions, clock data by OUT M9027 and SET M9027, or annunciator F number comments by OUT F and SET F instructions.
(6)	LED reset switch (A3ACPU only)	Switch used to clear the current LED display. The next data is displayed, if any.
(7)	Memory cassette installing connector	Connector for connecting a CPU module and memory cassette.
(8)	RS-422 connector	Connector for connecting to a peripheral device. Normally, this is covered.

4.6.2 Part names and settings of the AnACPUP21/R21

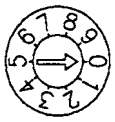
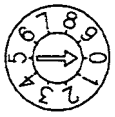
(1) Names and description of parts of the AnACPUP21/R21 data link module.

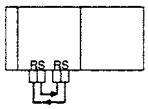


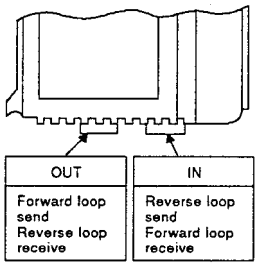
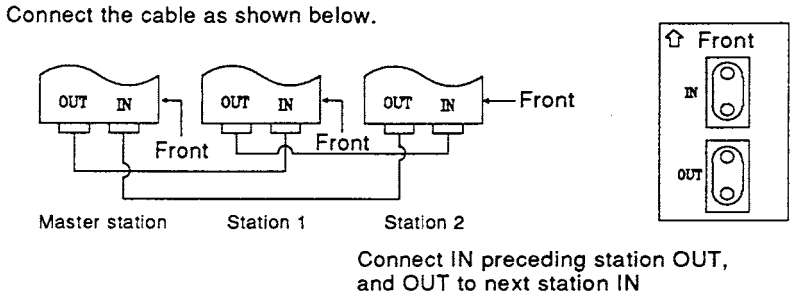
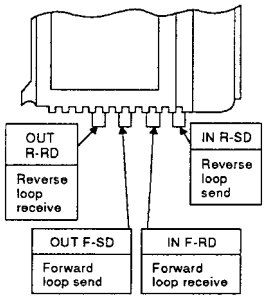
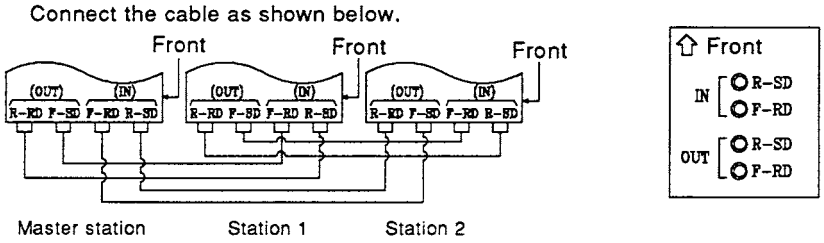
No.	Name	Diagram	Description
(1)	Operation indicator LEDs		Operation, error indicator LEDs

LED	Description	LED	Description
RUN	Lit when data link is normal run.	S0	For factory tests only. (Flickers during normal data link.)
SD	Lit during data sending.	S1	
RD	Lit during data receiving.	S2	
	Not used. (Always off)	S3	
CRC	Lit at CRC error time.	S4	
OVER	Lit at data entry delay error time.	S5	
AB.IF	Lit when all data is 1.	S6	
TIME	Lit at time-out error.	S7	
DATA	Lit to indicate a received data error.	F.LOOP	Lit when receiving data via the forward loop.
UNDER	Lit at sending data error time.	CPU R/W	Lit during communication with programmable controller CPU.
F.LOOP	Lit at forward loop receiving error.		Not used. (Always off)
R.LOOP	Lit at reverse loop receiving error.		Not used. (Always off)
1	Indicates the least significant digit of the station number in BCD.	10	Indicates the most significant digit of the station number in BCD.
2		20	
4		40	
8			Not used. (Always off)

For details of "CRC" to "R.LOOP", refer to the MELSECNET(II) Data Link Reference Manual.

No.	Name	Diagram	Description
(2)	Station number setting switches	STATION NO. X10  X1 	Station number setting switches Set the least significant digit of the station number on the switch marked X1 and the most significant digit on that marked X10 (in the range 01 to 64). The master station should be set to station number "0 0". The local station should be set to station number"01" to "64".

<table>
<tr><th>No.</th><th>Name</th><th>Diagram</th><th>Description</th></tr>
<tr><td>(3)</td><td>Mode select switch</td><td>MODE  </td><td>Mode select 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
• Set the mode select switch to position 2 for independent operation.
• If independent operation is attempted without setting the switch to position 2, the message "LINK PARAMETER ERROR" is displayed.
However, the sequence program is executed normally.</td></tr>
<tr><td>3</td><td>Test mode 1</td><td colspan="2">Forward loop test
• 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
• 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 7</td><td colspan="2">Self-loopback test
• 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.
• The same check is performed for the reverse loop.
 
(1) Test status
• 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.
• Set the "RUN" key switch to STOP. (In case of a remote I/O station, set the master station to STOP.)
• Set the mode select switch to "7" and reset.
(2) Test result
Determine the test result from the LEDs on the front of the link module.
• If the status is normal, the six LEDs, "CRC", "OVER", "AB.IF", "TIME', "DATA", and "UNDER" are flickered in order, starting at the top.
• If an error is detected, one or more of the LEDs remain lit and the test is stopped.
(Example)
When the forward loop is disconnected, the "F LOOP", "R LOOP", 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 to C</td><td>---</td><td colspan="2">Unusable</td></tr>
<tr><td>D to F</td><td>---</td><td colspan="2">Not used</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Diagram</th><th>Description</th></tr>
<tr><td>(4)</td><td>Optical fiber cable connector</td><td> 
</td><td>Optical fiber cable
 
</td></tr>
<tr><td>(5)</td><td>Coaxial cable connector</td><td> 
</td><td>Coaxial cable
 
</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 Between DC external terminals and ground, 500V AC, 1 minute							
Noise durability		Checked by noise simulator of noise voltage 1500Vp-p, noise width 1 μs, and noise frequency 25 to 60Hz				Checked by noise simulator of noise voltage 500Vp-p, noise width 1 μs, and noise frequency 25 to 60Hz	Checked by noise simulator of noise voltage 1500Vp-p, noise width 1 μs, 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 RAV1.25, RAV2-4						R1.25-3, R2-3 RAV1.25-3, RAV2-3	R1.25-4, R2-4 RAV1.25-4, 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 μs, 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

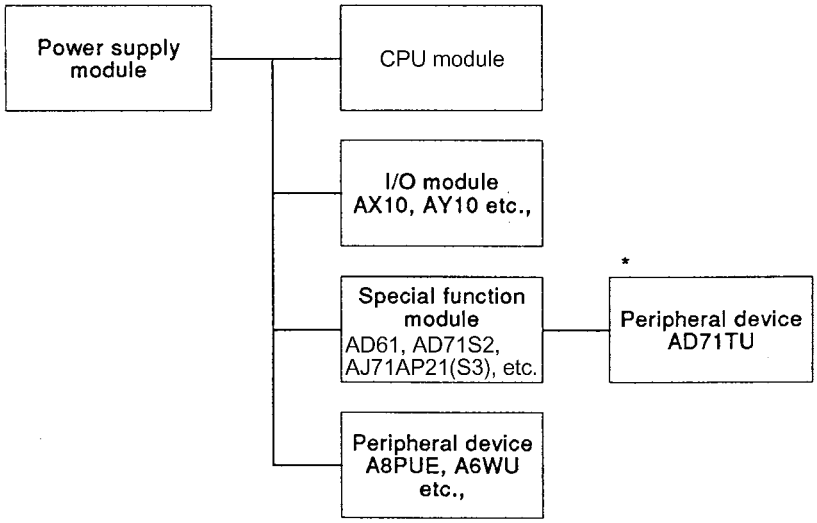
The allowable momentary power failure period of PLC CPUs varies depending on the power supply module used.
In the system using the A63P, it is the time from when the primary side of the stabilized power supply supplying 24VDC to the A63P turns OFF until the voltage (secondary side) has dropped from 24VDC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

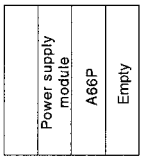
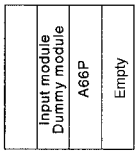
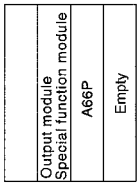
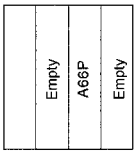
(b) Since power to the A52B, A55B, or A58B is supplied via an extension cable, a voltage drop occurs through the cable.It is necessary to select a power supply module and cables with proper length so that 4.75VDC or more is available on the receiving end.

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	ϕ6 (0.2) × 32 (0.8) mm (inch)	ϕ6 (0.2) × 32 (0.8) mm (inch)	ϕ5.2 (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

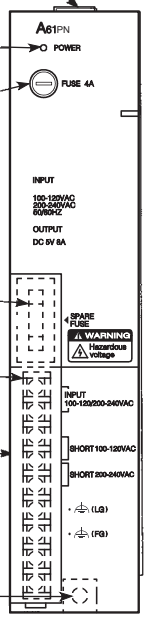
Power fuse, fuse holder
4 A cartridge fuse for AC input power is secured by the fuse holder.

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

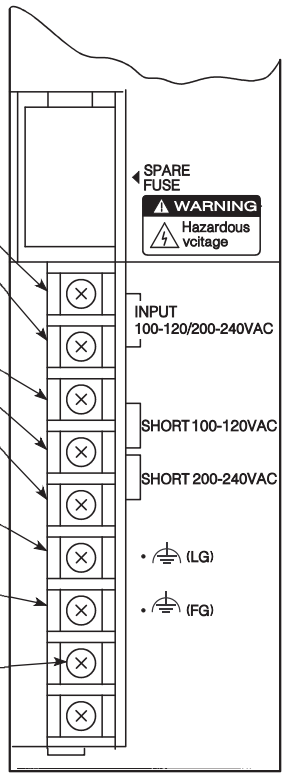
Power input terminals
Power input terminals to which the 100 VAC or 200VAC power is connected

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

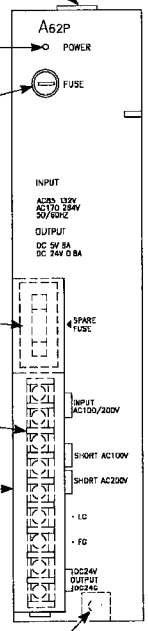
For details, see below. (Located under the terminal cover)

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

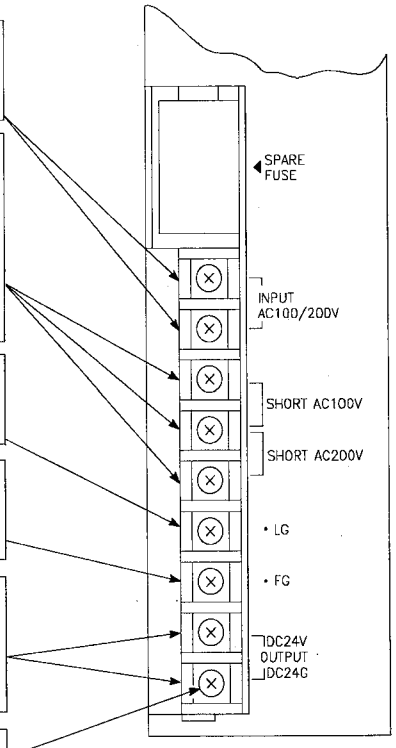
Ground terminal connected to the shielding pattern on the printed-circuit board

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

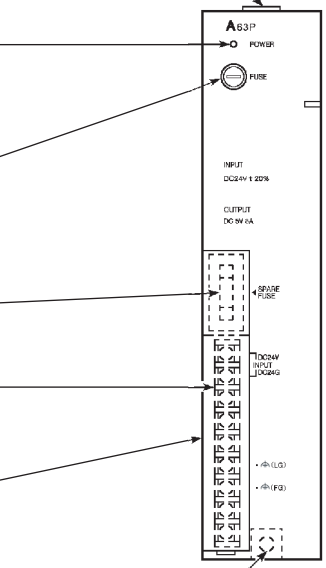
Power fuse, fuse holder
Cartridge fuse for DC input power is fixed by the fuse holder. The rating for the fuses are as follows.
A63P: 6.3 A (SM6.3 A or FGTA250V 6A)
A67P: 4 A (GTH4 or FGTA250V 4V)

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)



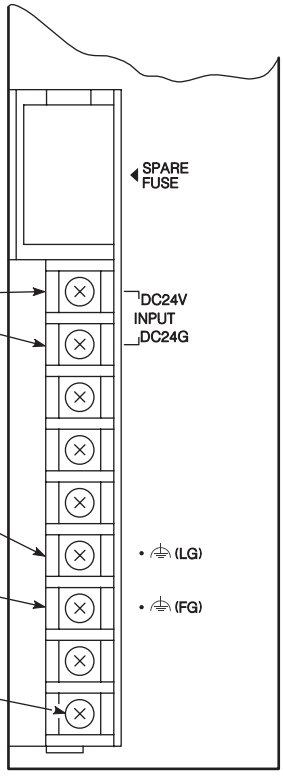
Terminal details

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

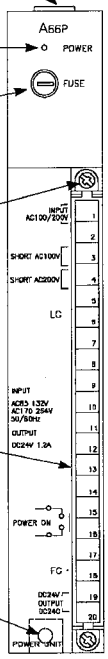
"POWER" LED
LED for indicating 5 VDC power

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.

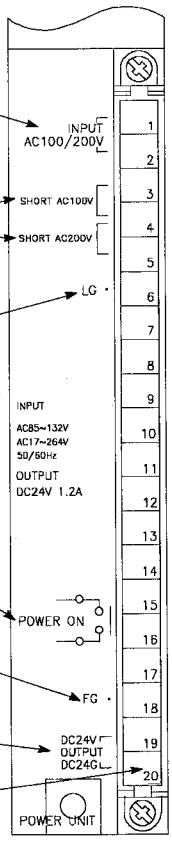
LG terminal
For power filter grounding
Has half the input potential.

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

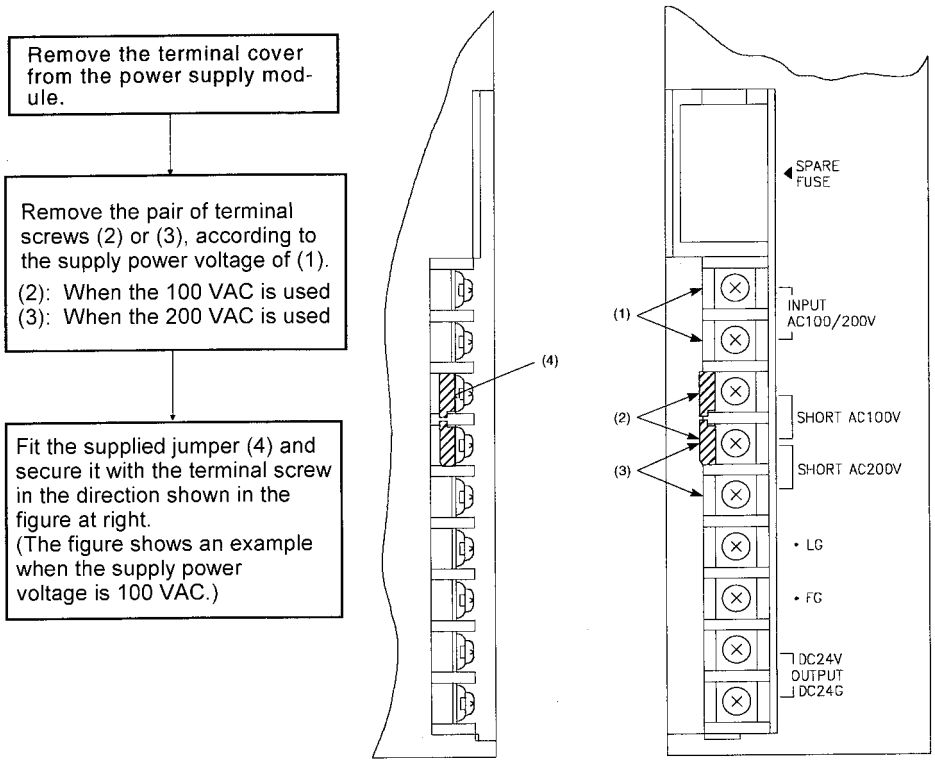
24 VDC, 24 GDC terminals
For supply to an output module which requires 24 V inside the module (Supplied to the module via external wiring)

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	ϕ6 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	ϕ6 bell-shaped holes (for M5 screws)			ϕ6 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 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 AnACPU 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 ▪ 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.

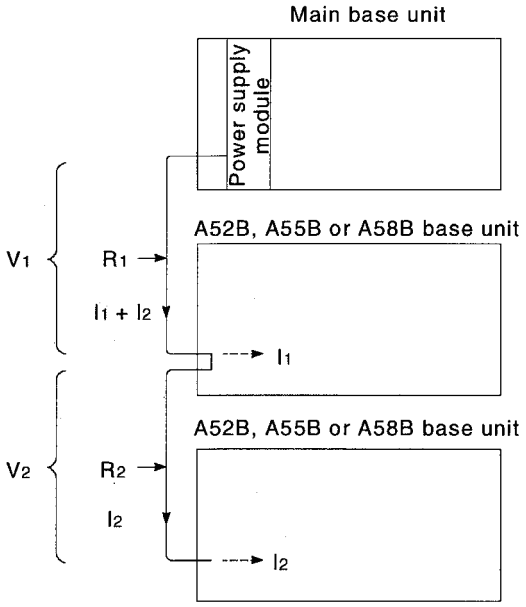
(1) Selection condition
  (a) Voltage of 4.75VDC or more is identified on the receiving end of the base unit.

(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:

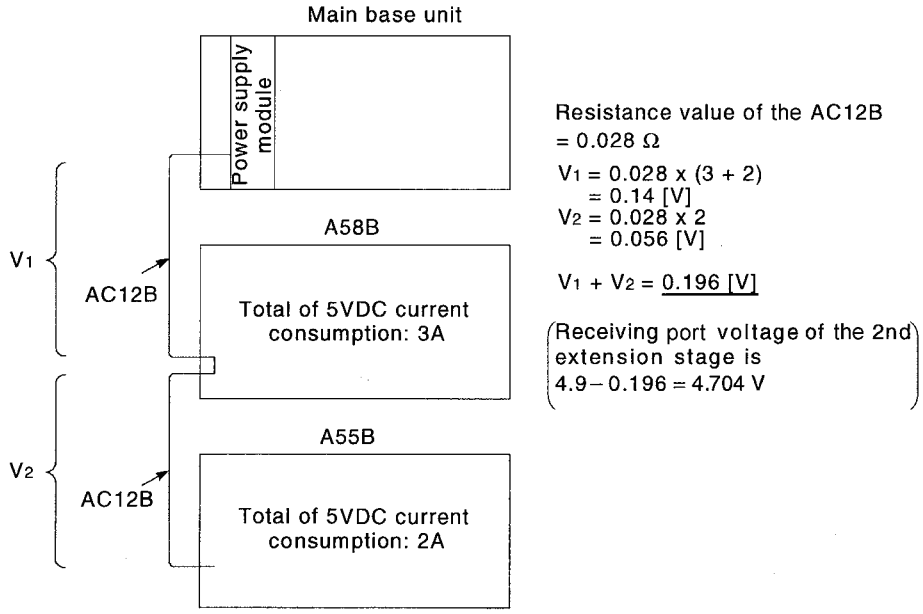
$4.9 - 4.75 \geqq V_1 + V_2$

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

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.

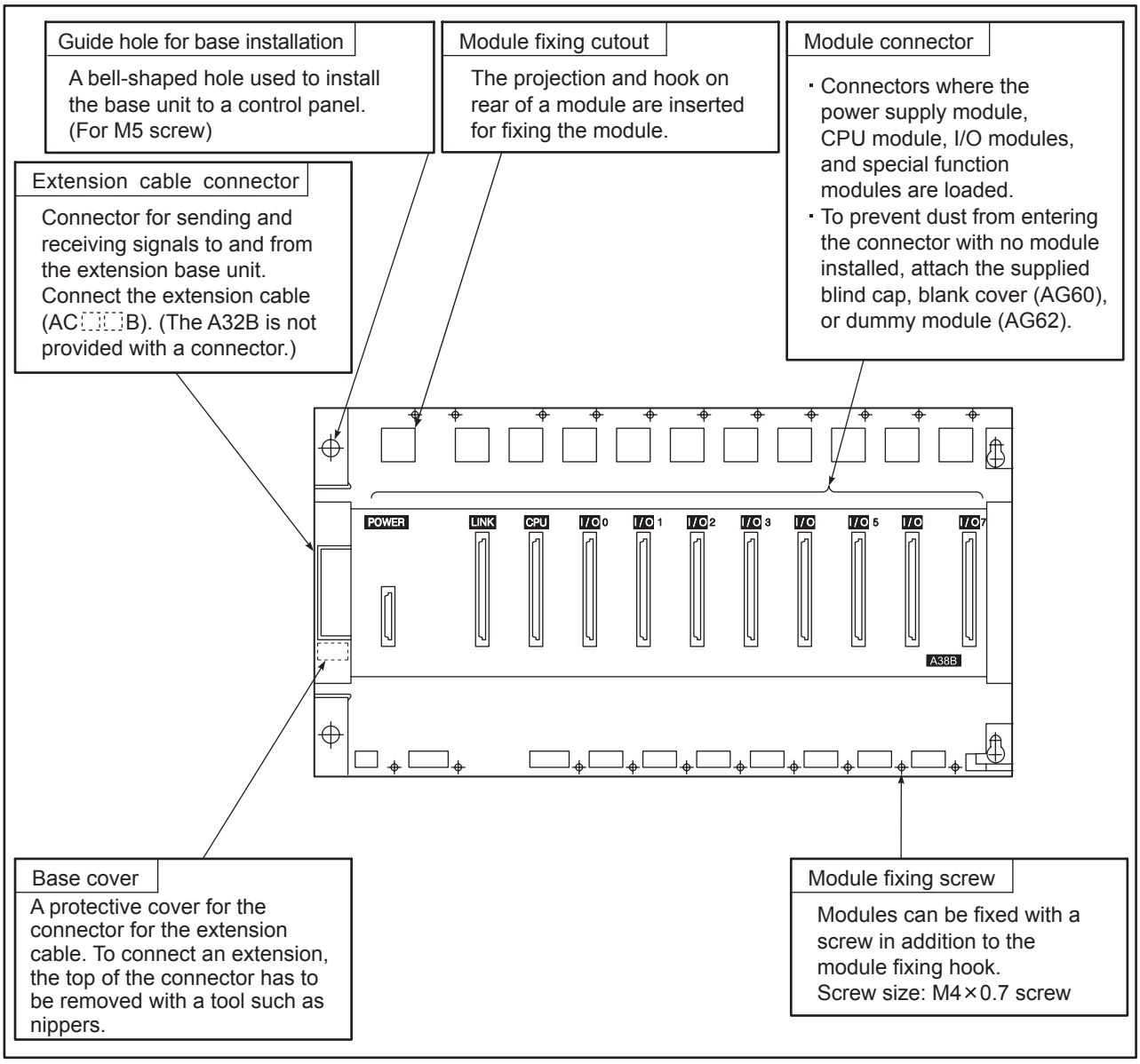
⚠ CAUTION

- 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.

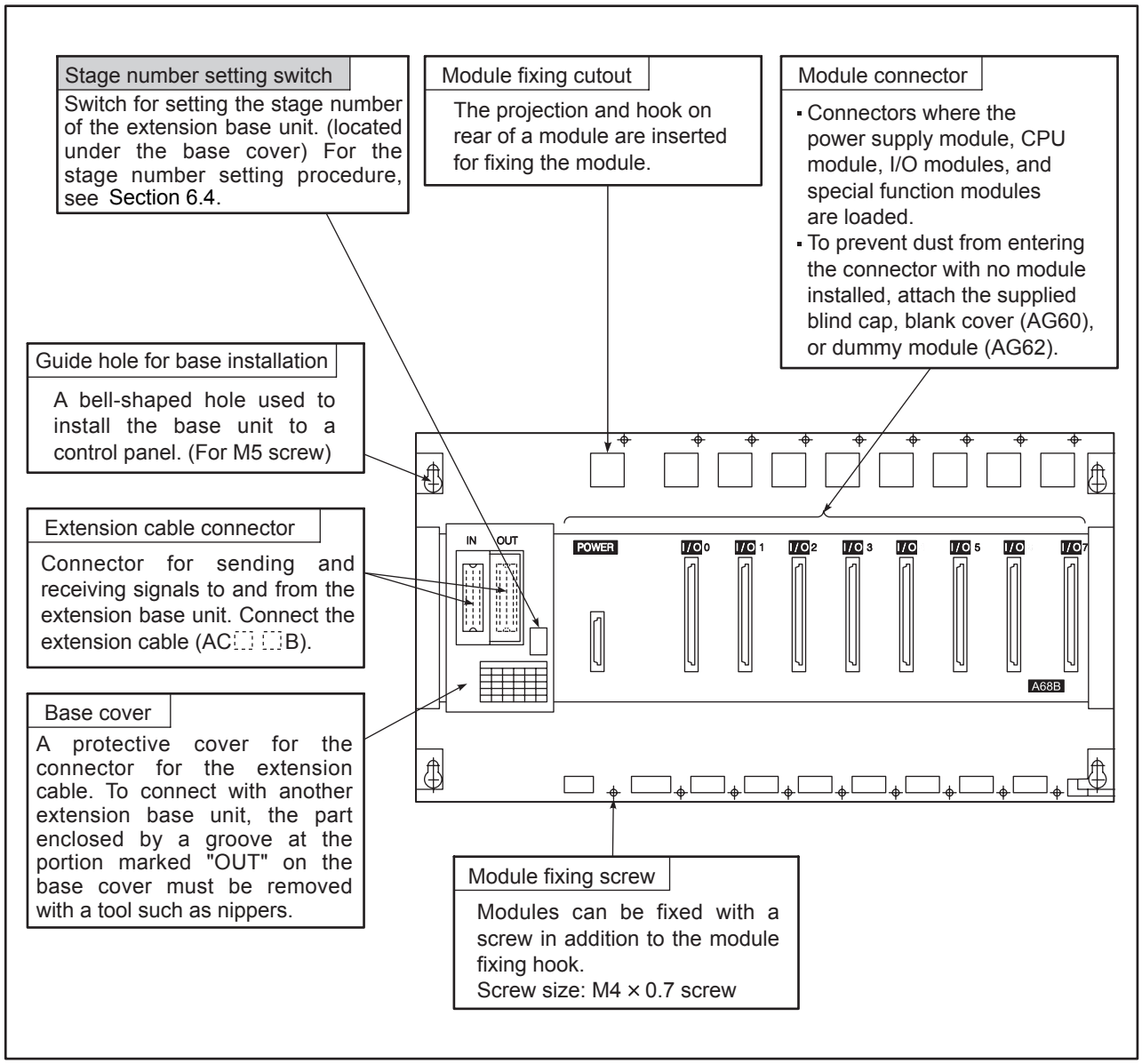
6.3 Part Names

Part names of the base unit are shown here.

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



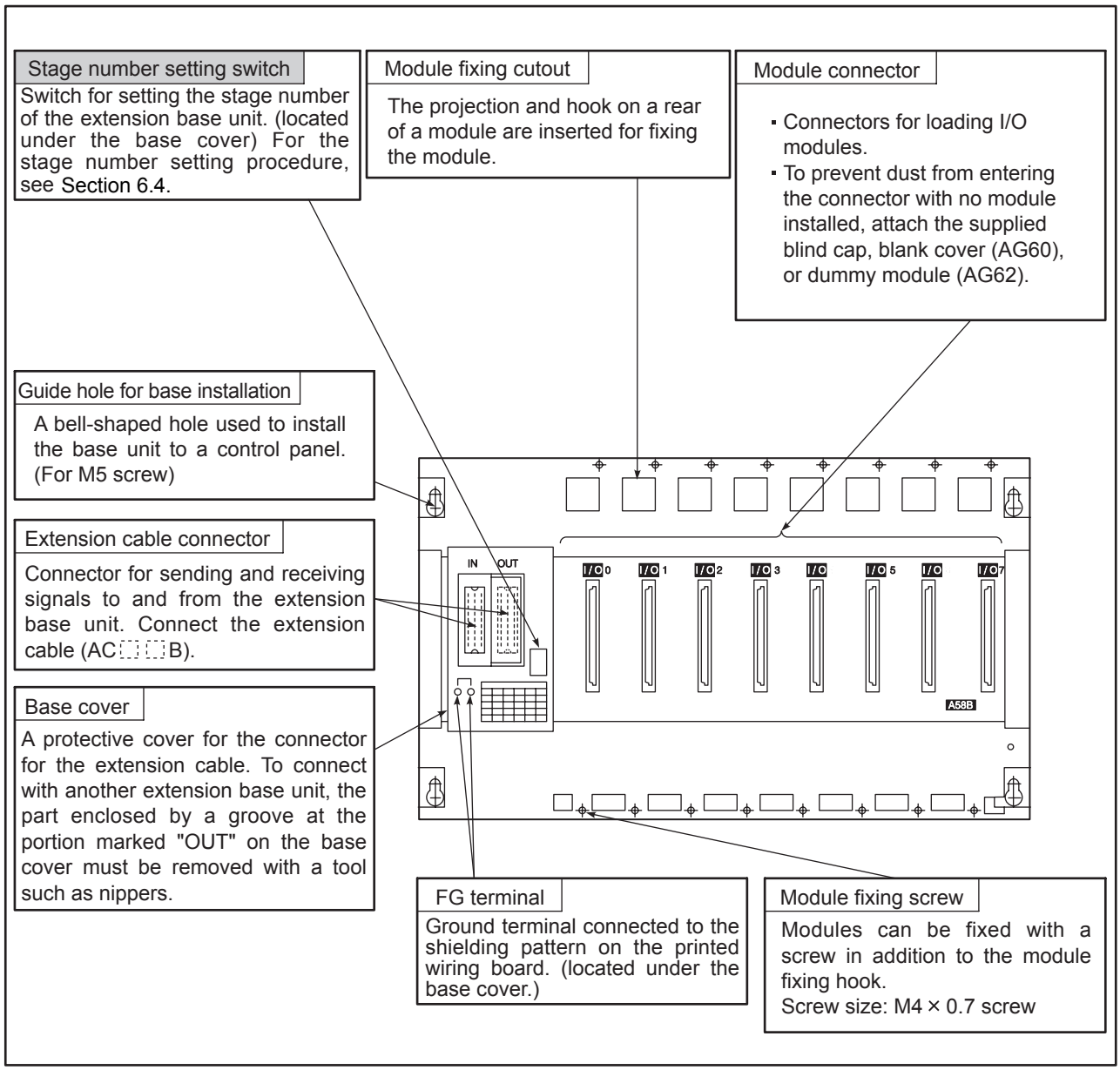
(2) Extension base units (A62B, A65B, A68B)



REMARK

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

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

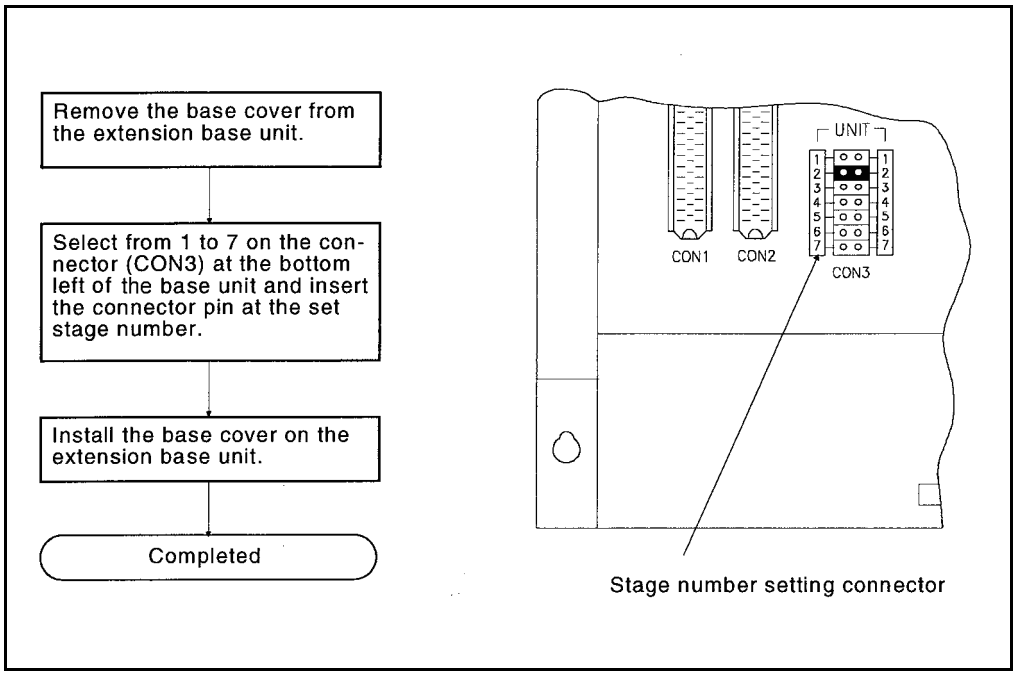


REMARK

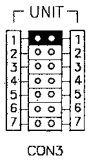
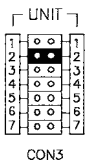
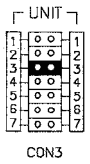
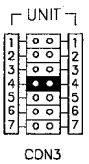
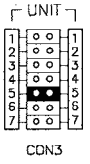
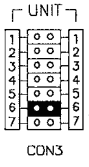
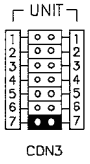
The item indicated by shading must be set before installing the base unit and starting operation.

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 AnACPU.
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 that can be installed on memory cassettes are shown below.

Item	Model			
	4KRAM	4KROM	8KROM	16KROM
Memory specification	IC-RAM (Readable and writable)	EP-ROM (Readable)		
Memory Capacity (bytes)	8k bytes	8k bytes	16k bytes	32k bytes
Structure	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).			

7.2 Specifications of the Memory Cassette

7.2.1 RAM/EP-ROM type memory casette

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

Item	Model Name
	A3AMCA-96 *3
RAM memory capacity*1	768k bytes *2 (144k bytes)
Number of ROM installing sockets	Two sockets (for 28-pin)
Installable ROM type (RAM is not installable.)	4KROM 8KROM 16KROM
External dimensions	110mm (5.12 inch) × 79.5mm (2.15 inch) × 33mm (3.69 inch)
Weight	0.14kg

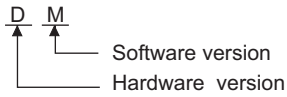
*1 RAM memory is a device that is soldered to the printed-circuit board.

*2 Byte values in parentheses refer to the maximum valid value in the parameter range.

*3 Memory casette A3AMCA-96 is compatible with CPUs of the following versions and later versions.

- A3ACPU Version BM
- A3ACPUP21 Version BL
- A3ACPUR21 Version AL

Example)



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.

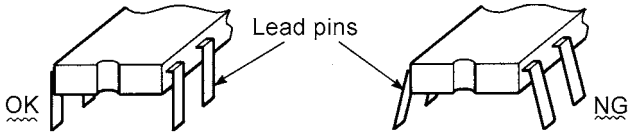
(5) Do not place the memory cassette on a metal object where current is or can be leaked, or materials like wood, plastic, vinyl, fibers, electric wires or paper where static electricity is charged.

(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.



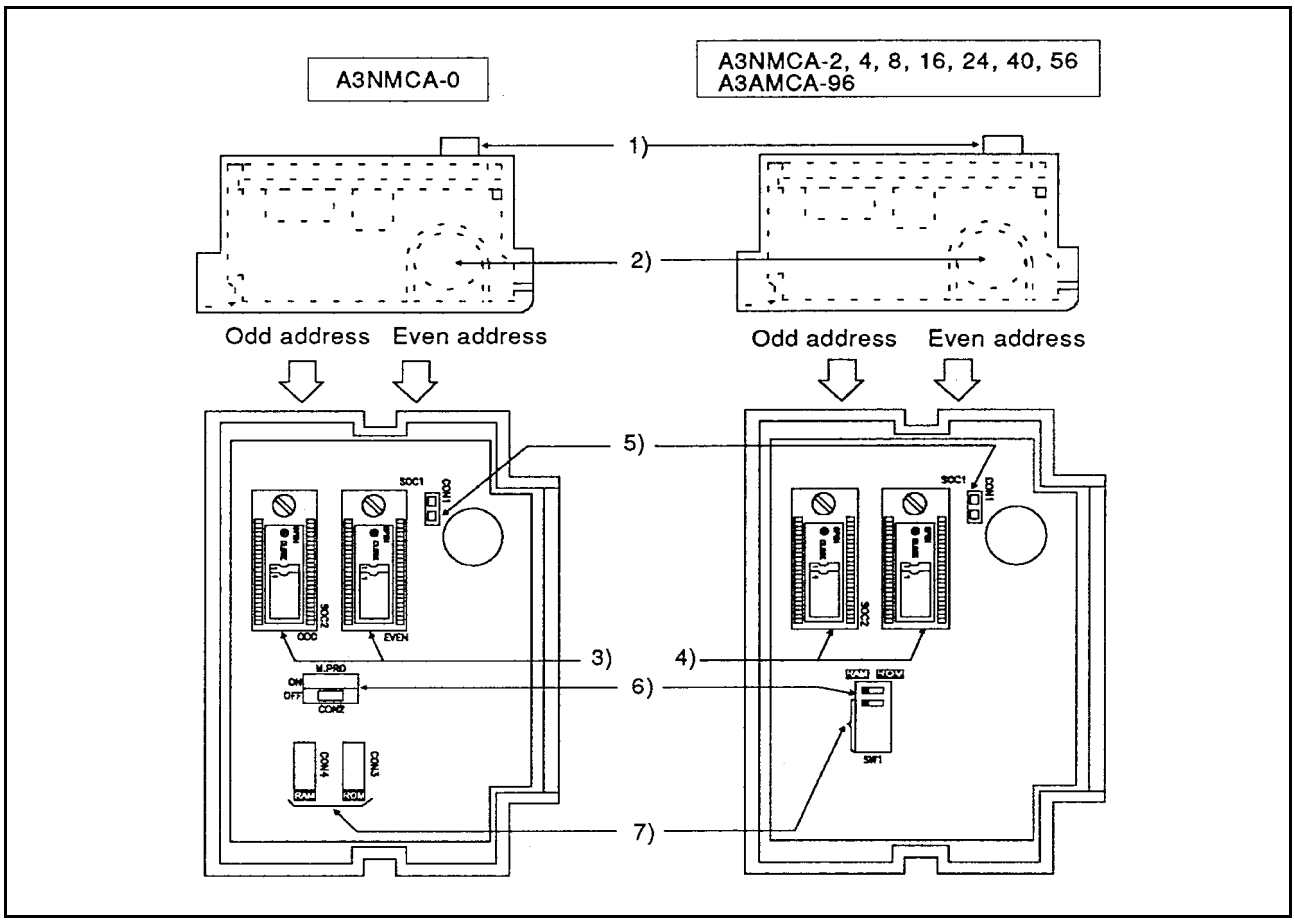
(10) After installing the IC memory into the memory socket, fully turn the locking screw to the position "C" (:CLOSE). (Do not stop anywhere between "O" and "C".)

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. When installing memories, they must be the same model and installed into SOC1 and 2. 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. When installing memories, they must be the same model and installed into SOC1 and 2. 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). (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. (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 RAM and ROM 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.

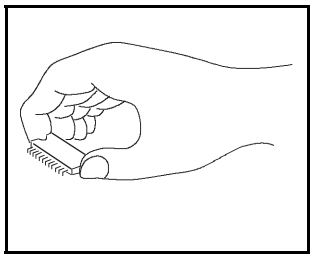


Fig. 7.1
Correct memory holding

(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 along with the concave and the IC-RAM along with the concave or dotted line.

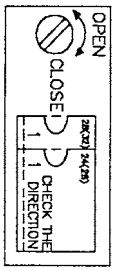
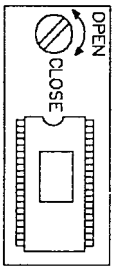
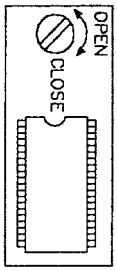
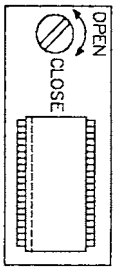
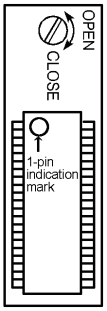
Memory socket	EP-ROM	IC-RAM		
		Concave type	Dotted line type	1-pin indication type
				

Fig. 7.2 Memory installation direction

(3) Setting the memory

Set the RAM and EP-ROM according to the memory used by using pins or switches.

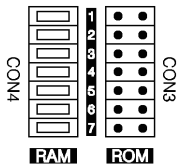
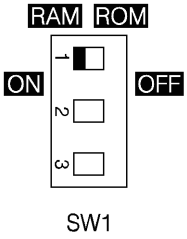
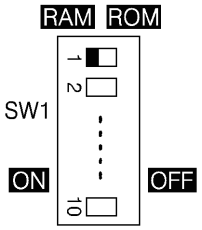
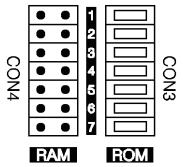
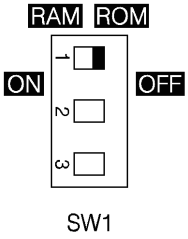
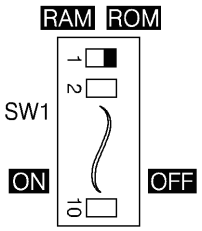
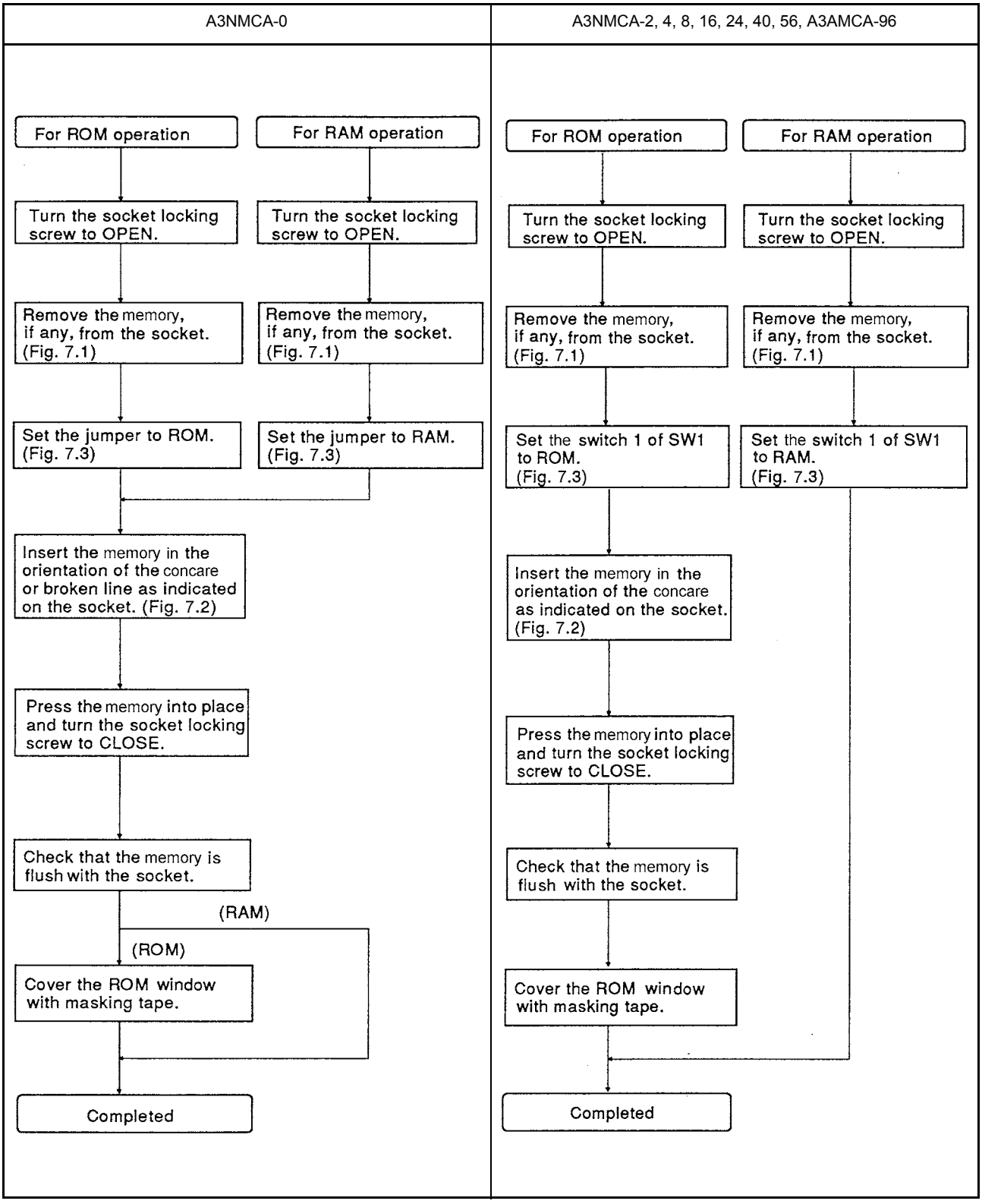
<table>
<tr>
<td rowspan="2">Memory setting</td>
<td>RAM</td>
<td>A3NMCA-0
 
</td>
<td>A3NMCA-2, 4
 
</td>
<td>A3NMCA-8, 16, 24, 40, 56
A3AMCA-96
 
</td>
<td rowspan="2">1) Configure the settings of the RAM or ROM before installing the memory.
2) When using the A3NMCA-0, insert the jumper to CON3 or CON4 to configure the settings.
CON3 ..... ROM setting
CON4 ..... RAM setting
3) When one of the A3NMCA-2 to 56 and A3AMCA-96 is used, switch the 1 of SW1 to the required side to configure the settings.</td>
</tr>
<tr>
<td>EP-ROM</td>
<td> 
</td>
<td> 
</td>
<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.

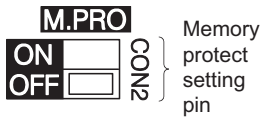
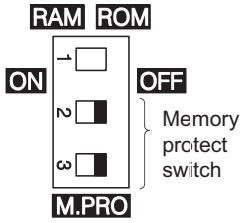
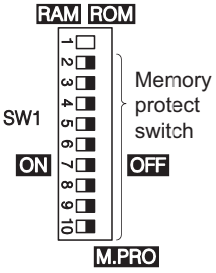
(4) Memory installation procedures

Follow the procedures below to correctly install the memory.



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 A3AMCA-96
		

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 · 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, A3NMCA-96
16k to 32k	3 of SW1 ON	A3NMCA-4, A3NMCA-8, A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56, A3NMCA-96
32k to 48k	4 of SW1 ON	A3NMCA-8, A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56, A3NMCA-96
48k to 64k	5 of SW1 ON	A3NMCA-16, A3NMCA-24, A3NMCA-40, A3NMCA-56, A3NMCA-96
64k to 80k	6 of SW1 ON	A3NMCA-24, A3NMCA-40, A3NMCA-56, A3NMCA-96
80k to 96k	7 of SW1 ON	A3NMCA-40, A3NMCA-56, A3NMCA-96
96k to 112k	8 of SW1 ON	A3NMCA-56, A3NMCA-96
112k to 128k	9 of SW1 ON	A3NMCA-96
128k to 144k		
144k to 192k	10 of SW1 ON	
192k to 320k		
320k to 448k		
448k to 768k		

POINT

(1) When the memory protect is used, refer to the address (step number) of each memory area (sequence 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.
(3) For the details of memory protect setting switches and their ranges, refer to the backside of the memory cassette cover.

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
Lithium content	0.48g
Application	IC-RAM memory backup and power failure compensation
External dimensions	ϕ16mm (0.63inch)×30mm (1.18inch)

REMARK

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

7.3.2 Handling precautions

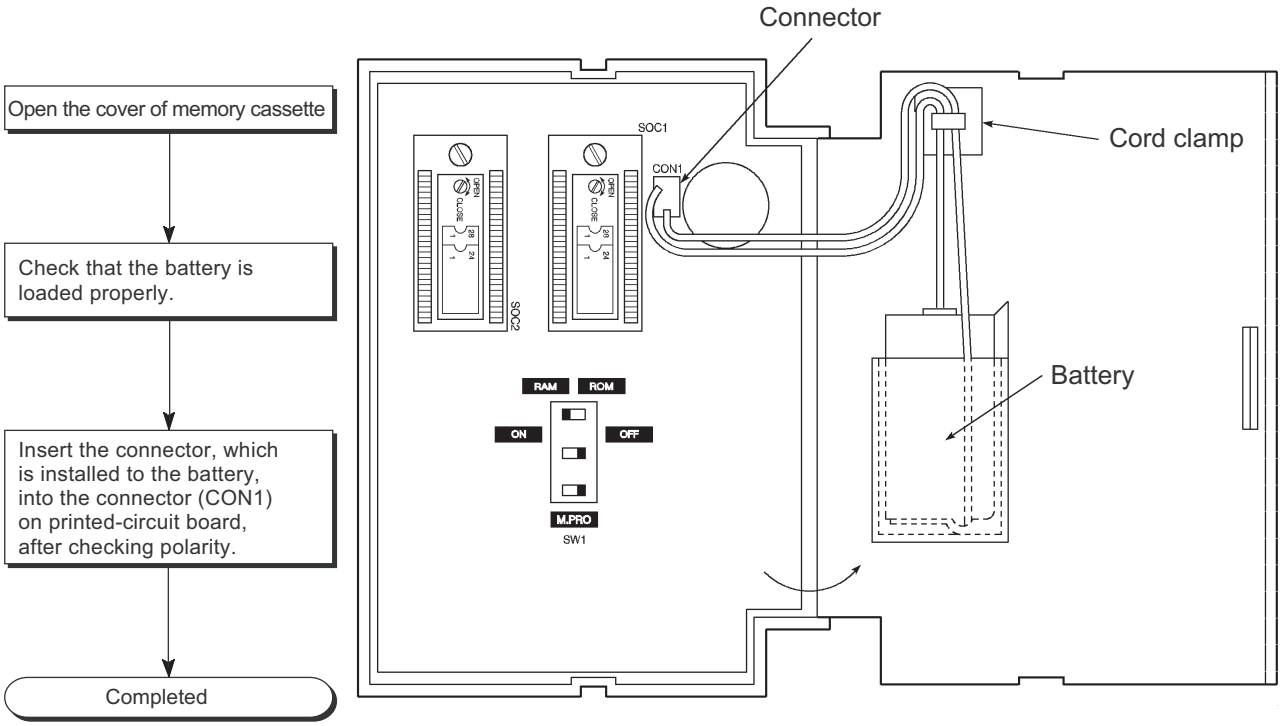
The following describes the battery handling precautions.
(1) Do not short it.
(2) Do not disassemble it.
(3) Do not put it in a fire.
(4) Do not heat it.
(5) Do not solder to the electrodes.

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.

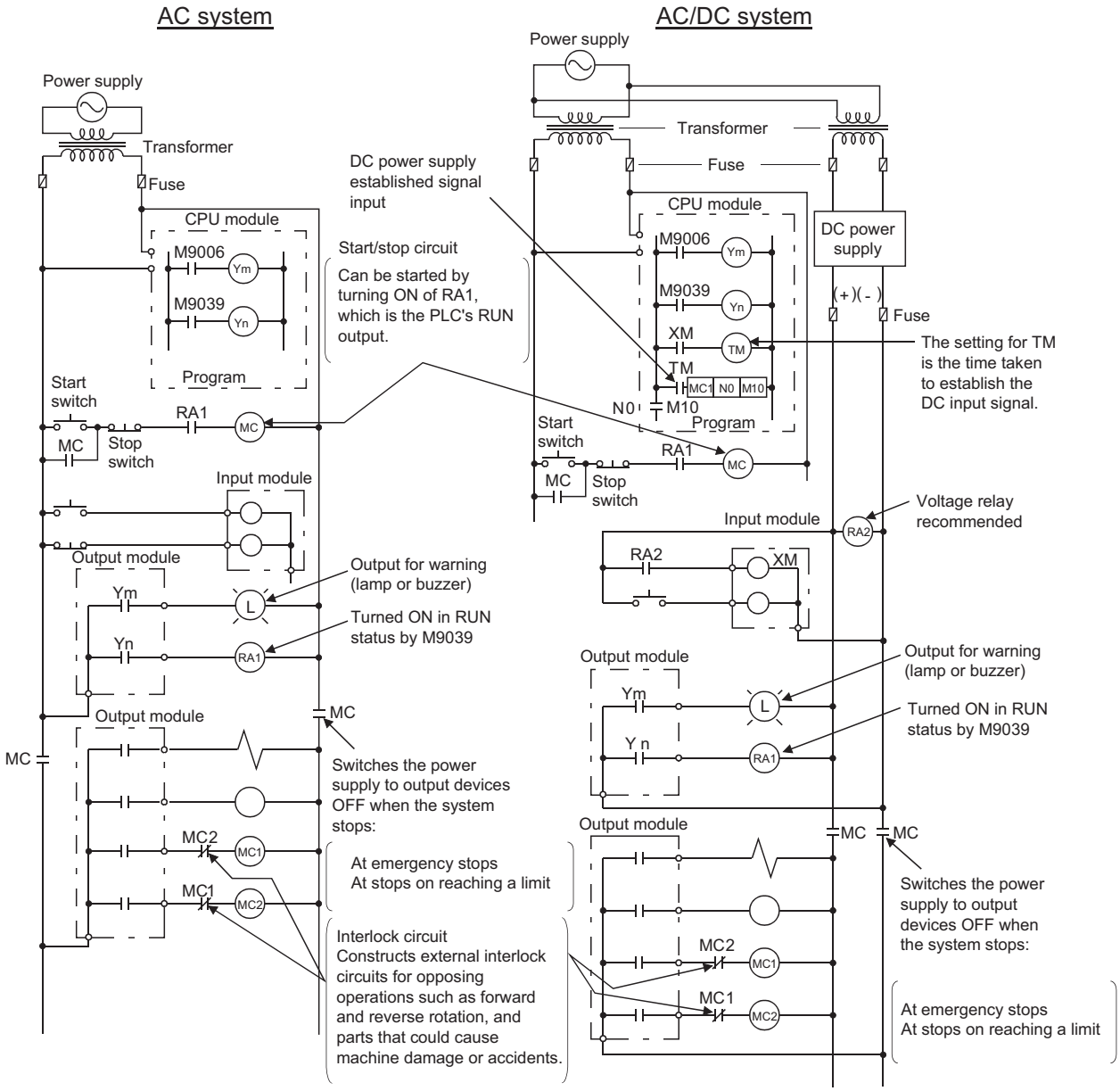
DANGER

- 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

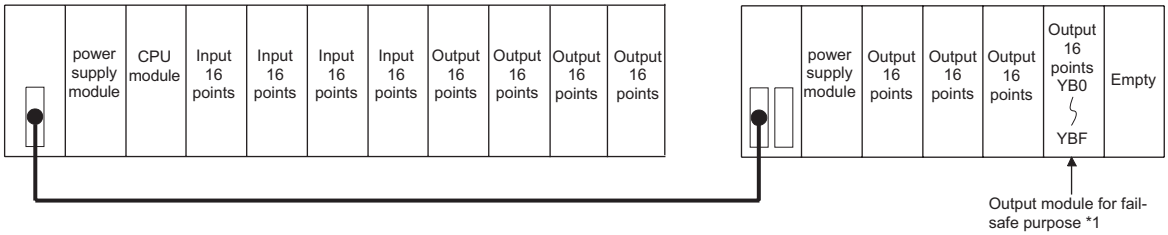
While failure of a CPU module and its memory can be detected by the self-diagnostics function, an error occurred in I/O control area may not be detected by the CPU module.

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.

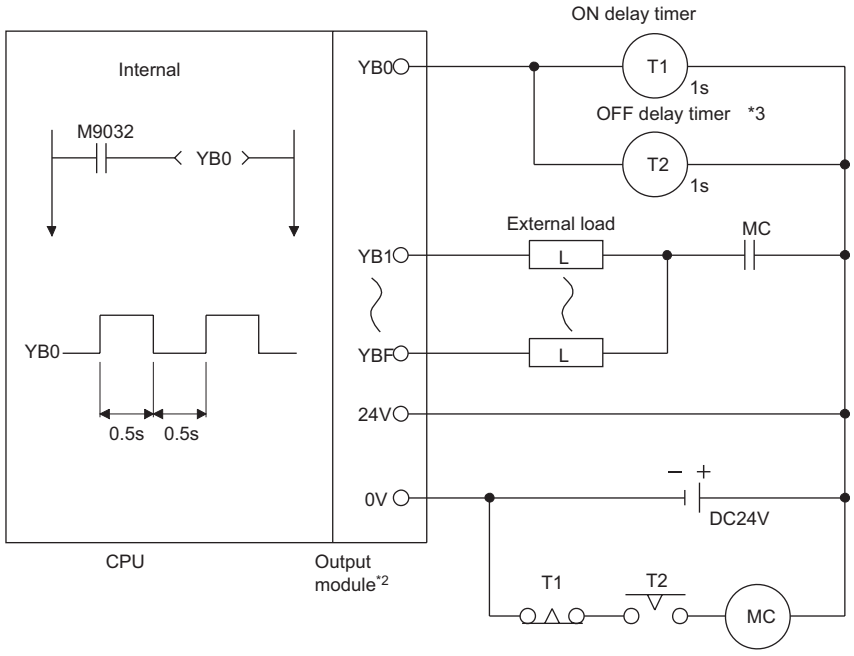
Examples of a system and its fail-safe circuitry are described below:

<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.)

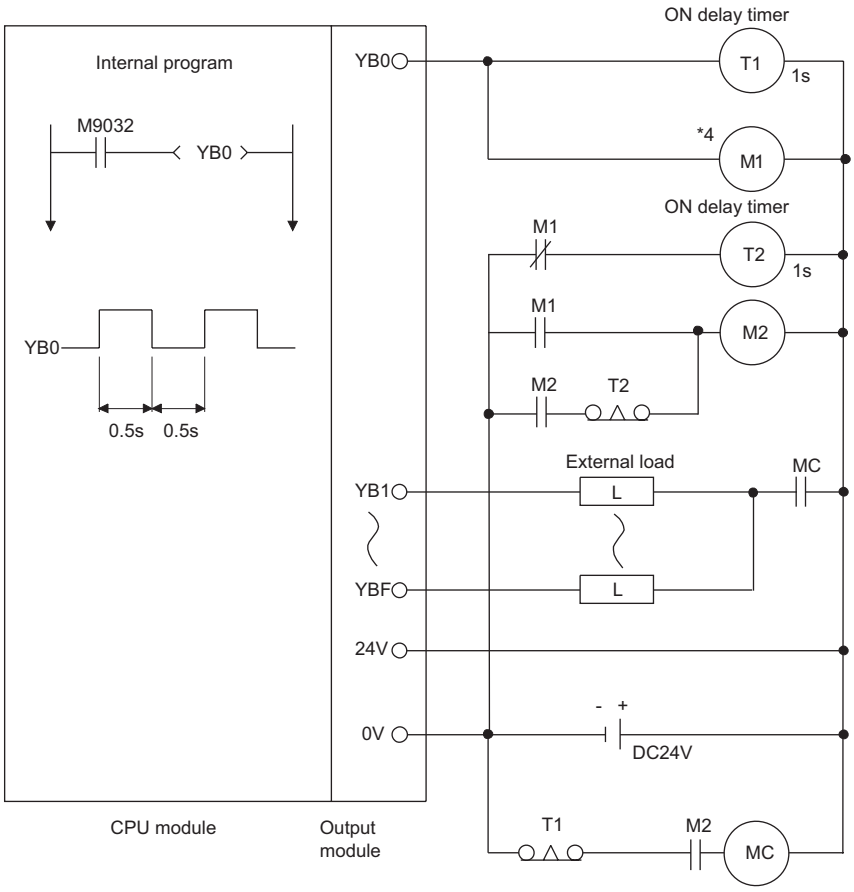
<Example fail safe circuits>



*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.

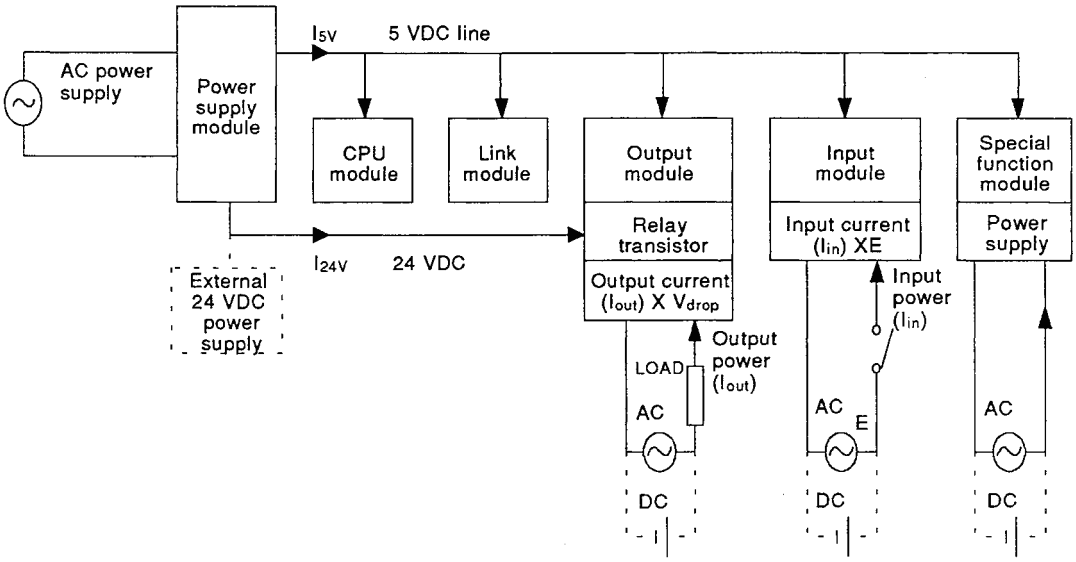
8.3 Calculation Method of Heat Amount Generated by the PLC

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.

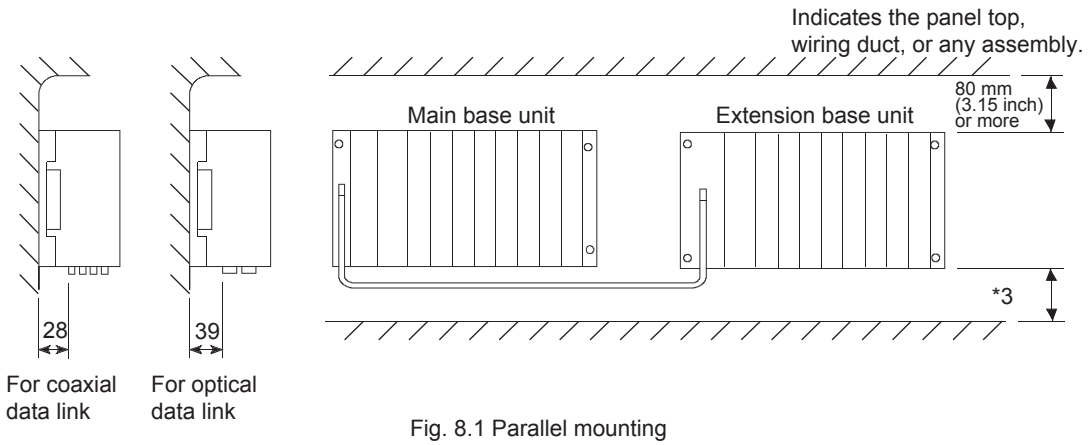
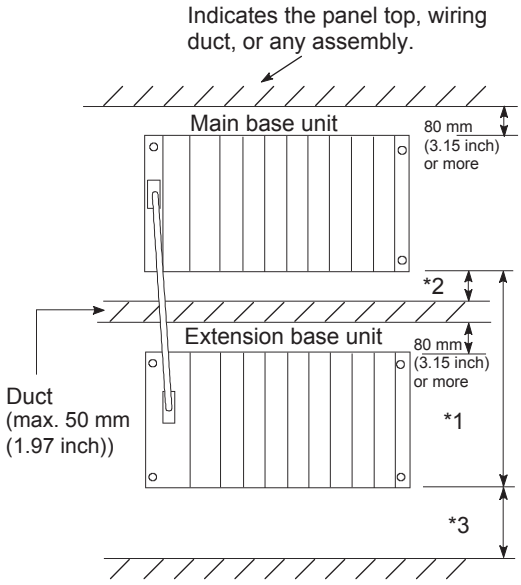


Fig. 8.1 Parallel mounting



*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 ϕ4.5mm (0.18inch) dia. optical fiber cable or coaxial cable is used .....100mm (3.94inch) or more
When ϕ8.5mm (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 ϕ4.5mm (0.18inch) dia. optical fiber cable or coaxial cables used .....100mm (3.94inch) or more
When ϕ8.5mm (0.33inch) dia. optical fiber cable is used .....130mm (5.19inch) or more
} 100mm (3.94inch) or more

Fig. 8.2 Serial mounting

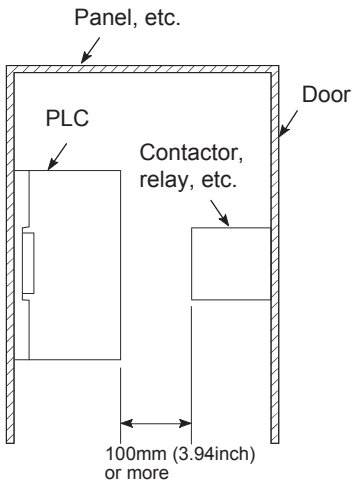


Fig. 8.3 Minimum front clearance with equipment

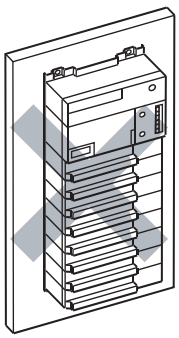


Fig. 8.4 Vertical mounting (Not allowed)

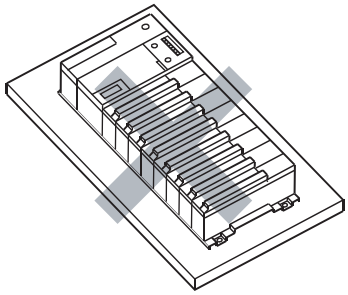


Fig. 8.5 Horizontal mounting (Not allowed)

8.5 Installation and Removal of Modules

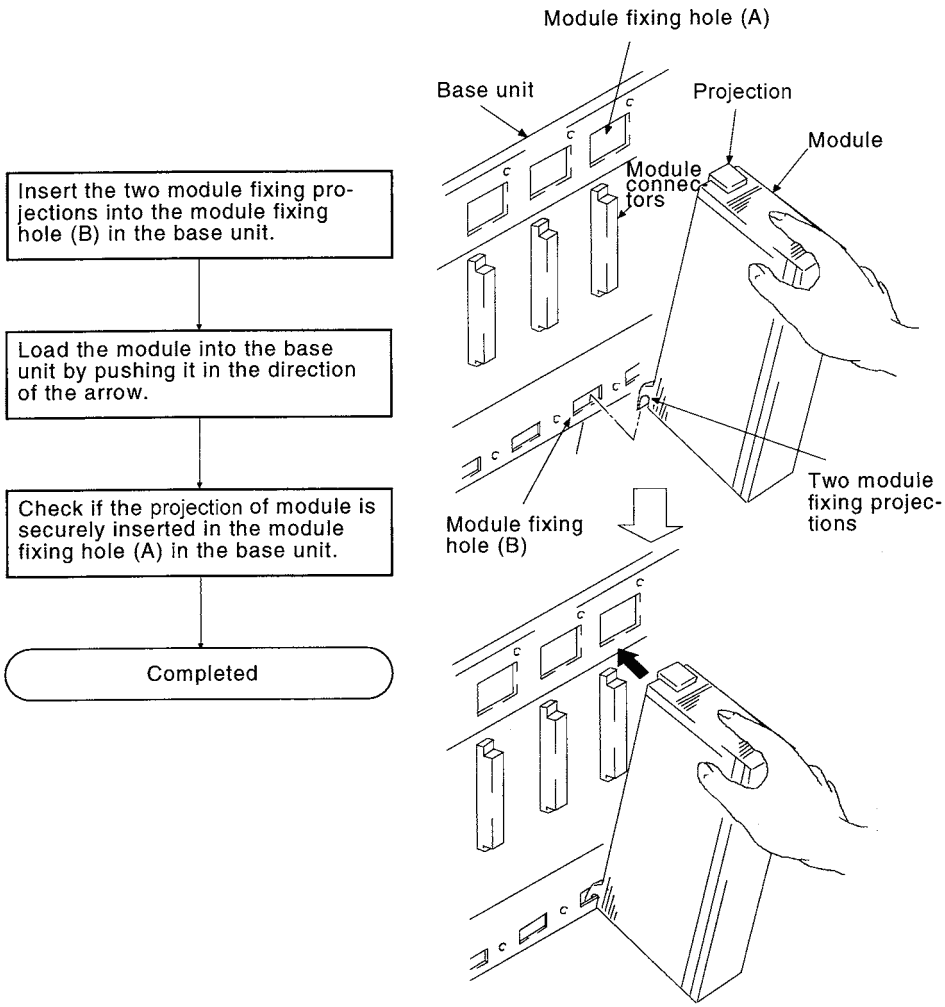
How to install and remove the power supply module, CPU module, I/O module and special function module, etc. to/from the base unit are explained.

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

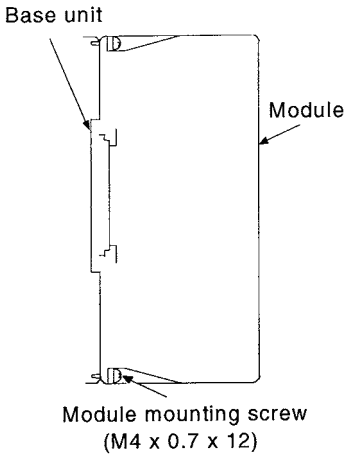
The procedure for mounting a module is described below.



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.

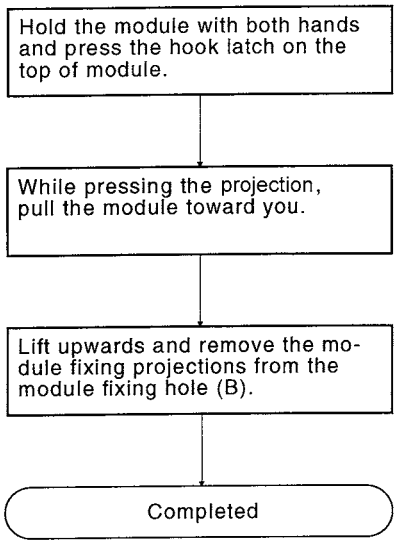


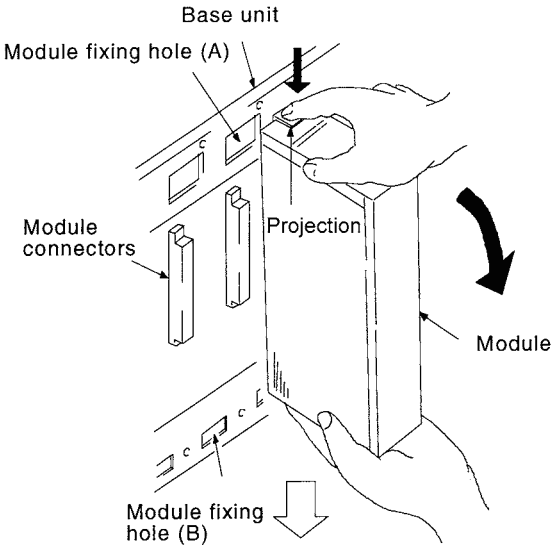
⚠ CAUTION

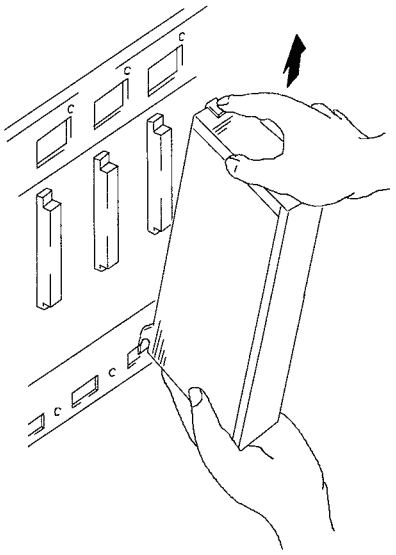
● Insert the module fixing projection into the fixing hole in the base unit to mount the module.
Incorrect loading of the module can cause malfunctions, a failure or a drop of the module.
For use in an environment of frequent vibrations, secure the module with screws.
Tighten the screw within the specified 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.





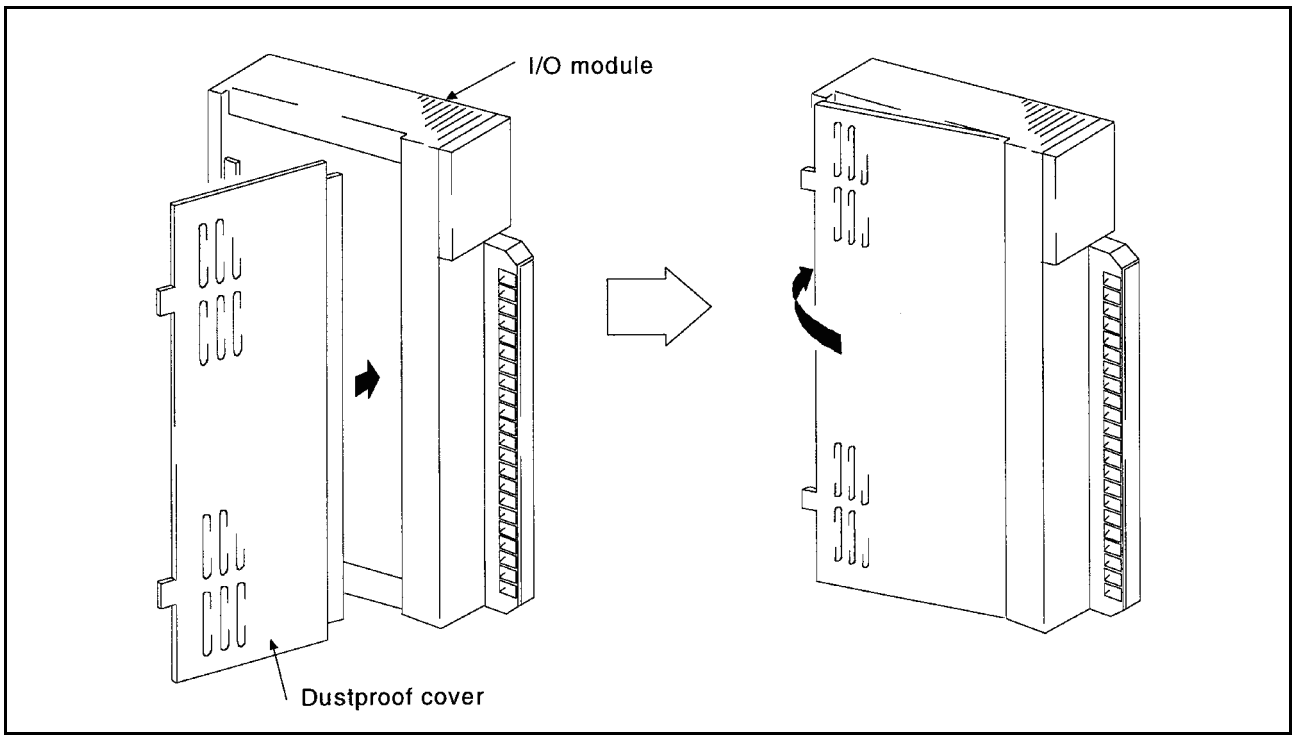


POINT
Always disengage the hook from the module fixing hole (A) and then remove the module fixing projection from the module fixing hole (B). An attempt to remove the module forcibly may damage the hook or module fixing projection.

8.6 Installation and Removal of the Dustproof Cover

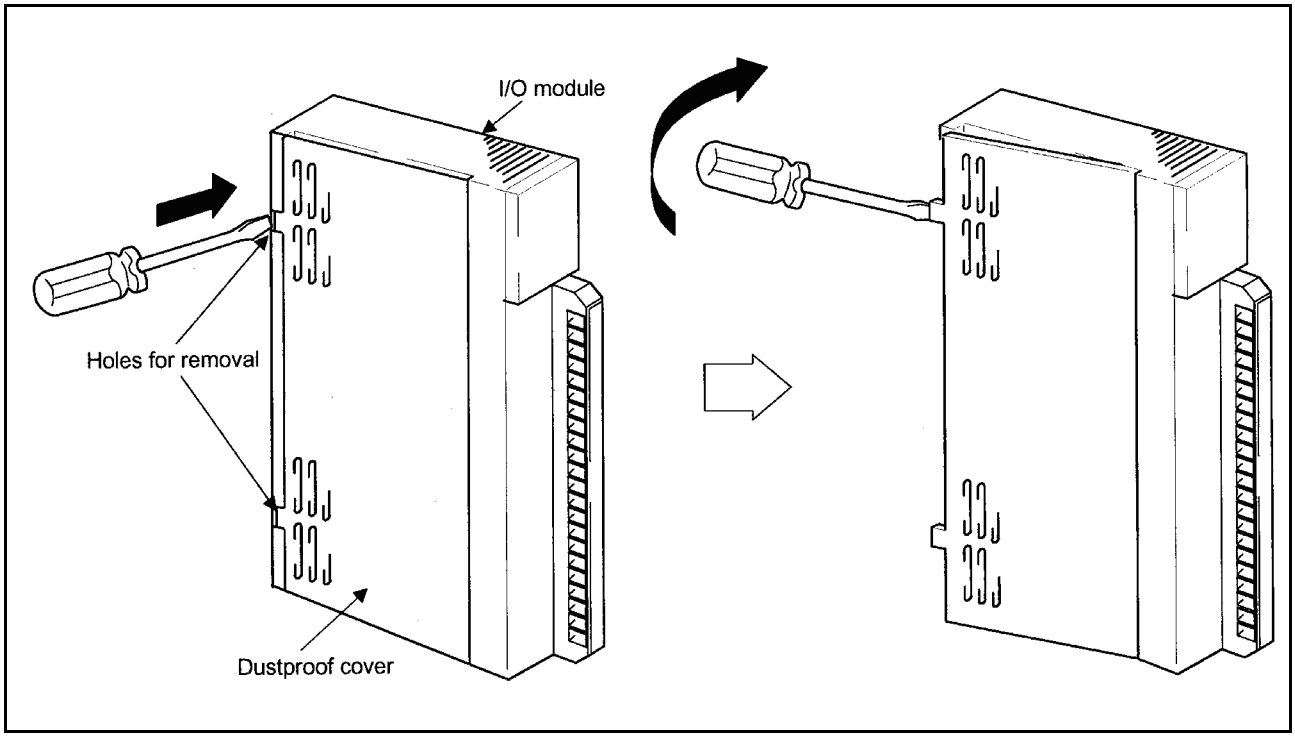
When using the A52B, A55B or A58B, attach the dustproof cover supplied with the extention base unit to the I/O module on the left end. If no dustproof cover is attached, foreign matter will enter the I/O module, causing a failure. Be sure to attach the dustproof cover.
Procedures for installing and removing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

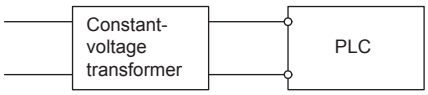
- Be sure to shut off all the phases of the external power supply used by the system before wiring.
  Failure to do so may result in an electric shock or damage of the product.
- Before energizing and operating the system after wiring, be sure to attach the terminal cover supplied with the product.
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

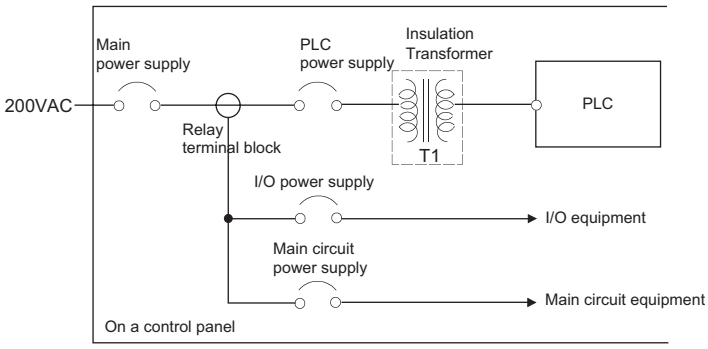
(c) When using a power transformer or an isolating transformer to reduce the voltage from 200VAC to 100VAC, its capacity must be equal to or greater than the corresponding value shown in the following table.

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.



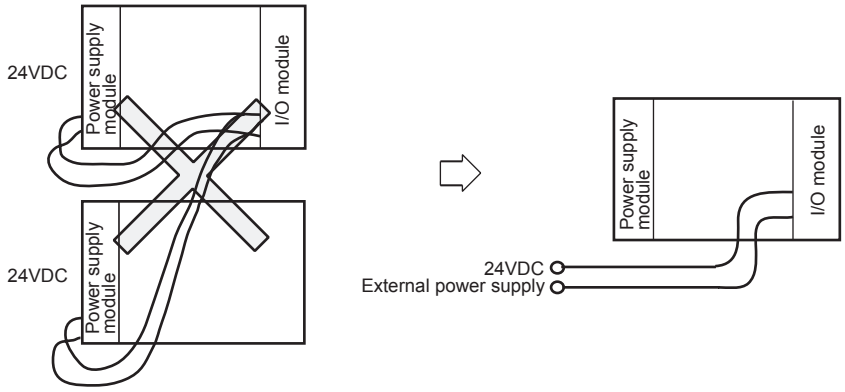
REMARK

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.

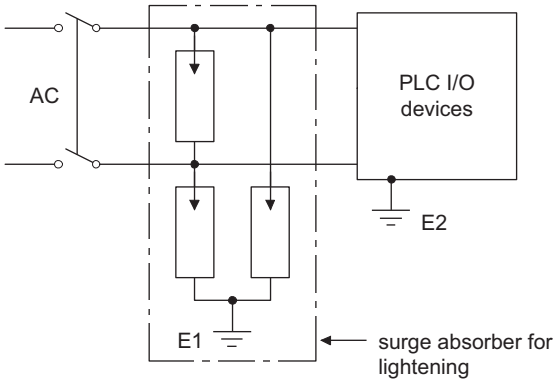
If the 24VDC output capacity from a single power supply module is insufficient, supply it from the external 24VDC power supply.



(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.

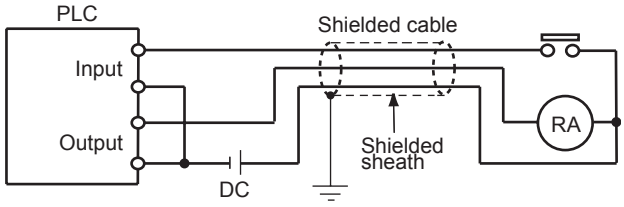


POINT
(1) Ground the lightning surge absorber (E1) and the PLC (E2) separately from each other. (2) Select a lightning surge absorber whose voltage does not exceed the maximum allowable circuit voltage even when line voltage reaches the maximum.

(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. Keep a distance of 100mm (3.9inch) or more between them. 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.

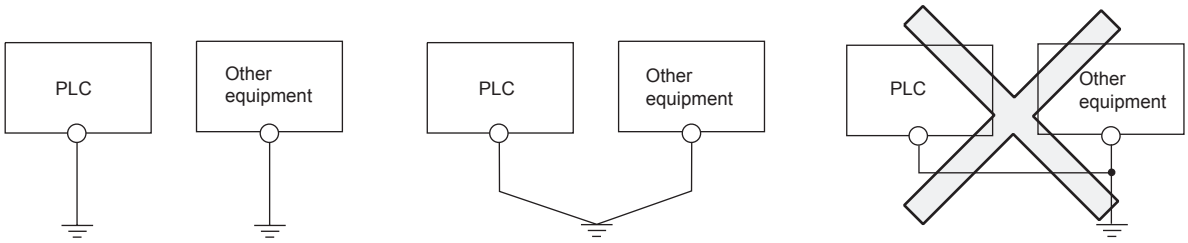


(e) When ducts are used for wiring, securely ground them.
(f) Separate the 24VDC input cables from the 100VAC and 200VAC cables.
(g) In a long distance wiring of 200m (656.2ft.) or longer, leak current due to capacitance may cause failure.
(h) As protective measures against lightning surges, separate 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. 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.

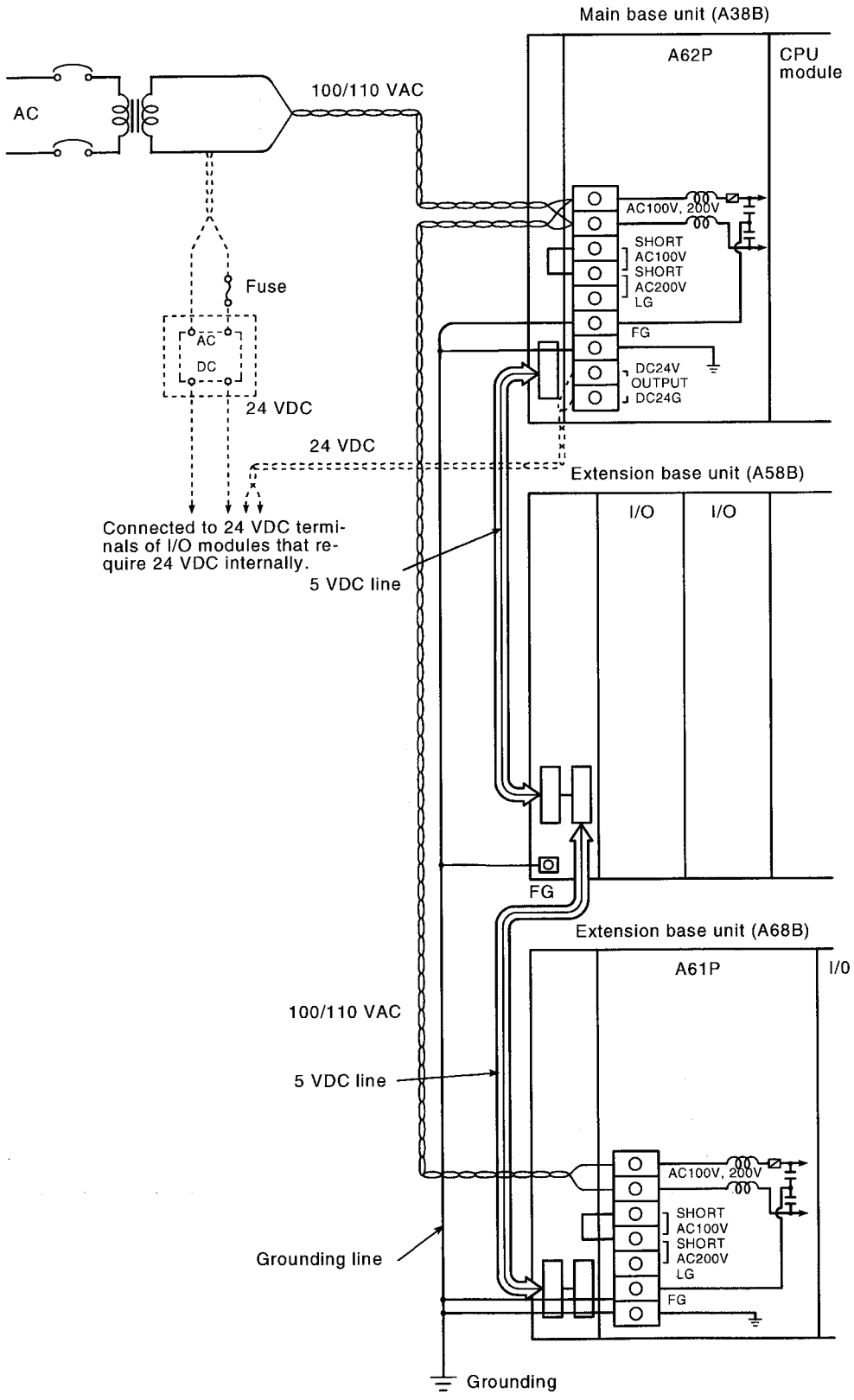


(1) Independent grounding ... Best (2) Joint grounding ... Good (3) Joint grounding ... Not allowed

(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.

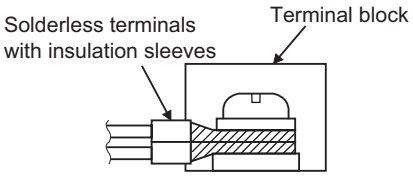
8.7.2 Wiring to module terminals

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 μ /m (30m measurement) *1 230M-1000MHz QP: 30dB μ /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 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 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 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.

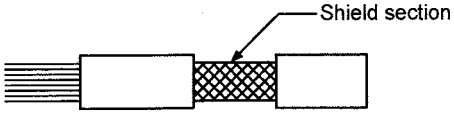
(1) Control panel
  (a) Use a conductive control panel.
  (b) When fixing the top or base plate with bolts, mask the fixing area when painting so that an electrical contact can be made.
  (c) To ensure an electrical contact with the control panel, mask the bolt areas of the inner plates when painting 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.

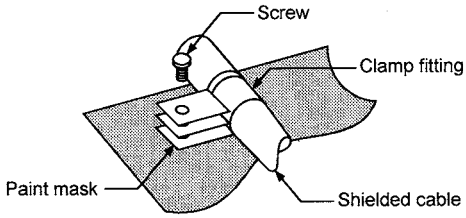
(2) Connection of power cable and ground wires
Handle the power cables and ground wires as described below.
  (a) Provide a grounding point near the power supply module. Ground the power supply module's LG and FG terminals (LG : Line Ground, FG : Frame Ground) with the thickest and shortest wire possible. (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.

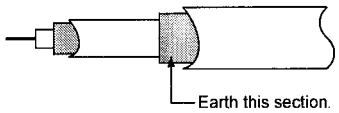
(1) Grounding of shielded cables
   (a) Shielding must be done close to the control panel. Otherwise, electromagnetic induction from the cable after the grounding point will generate high frequency noise.
   (b) Partly remove the outer sheath of the shielded cable so that it can be contacted with the 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.



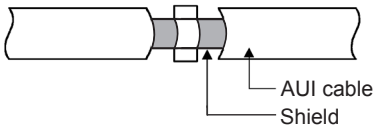
Refer to (1) for the grounding of the shield.

(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

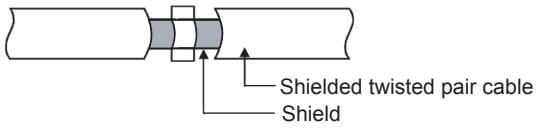
Precautions to be followed when AUI cables[*1], twisted pair cables and coaxial cables are used are described below.

(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.

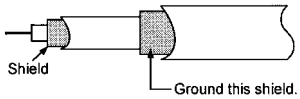
(b) Use shielded twisted pair cables as the twisted pair cables[*1] connected to the 10BASE-T connectors. Partly strip the outer sheath of the shielded twisted pair cable, and ground the exposed shield section to the widest possible area as shown below.



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.

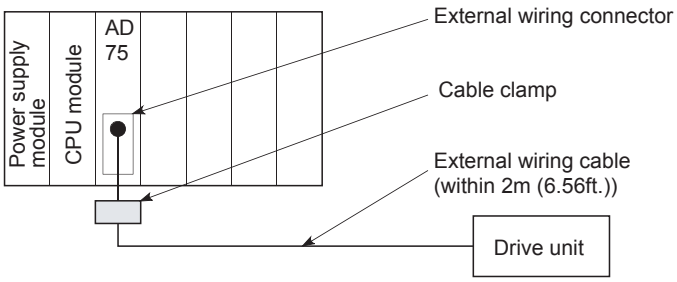
*2 Make sure to attach a ferrite core to the cable.
As a ferrite core, ZCAT2035 manufactured by TDK is recommended.

Ethernet is the registered trademark of XEROX, Co.,LTD

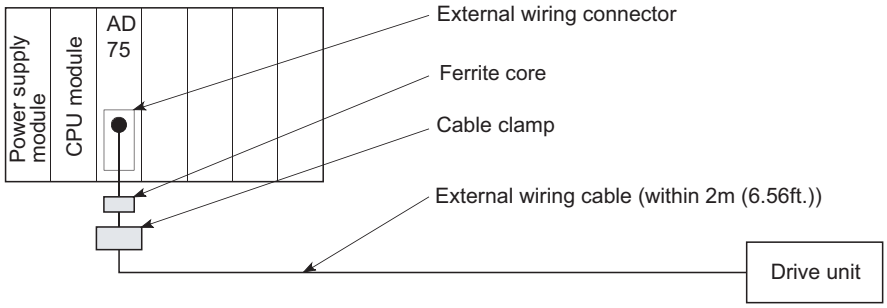
(4) I/O signal cables and other communication cables
Always ground the I/O signal lines (including common line) and other communication cables (RS-232-C, RS-422, etc.) in the same manner as described in (1) if they are brought out of the control panel.

(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.



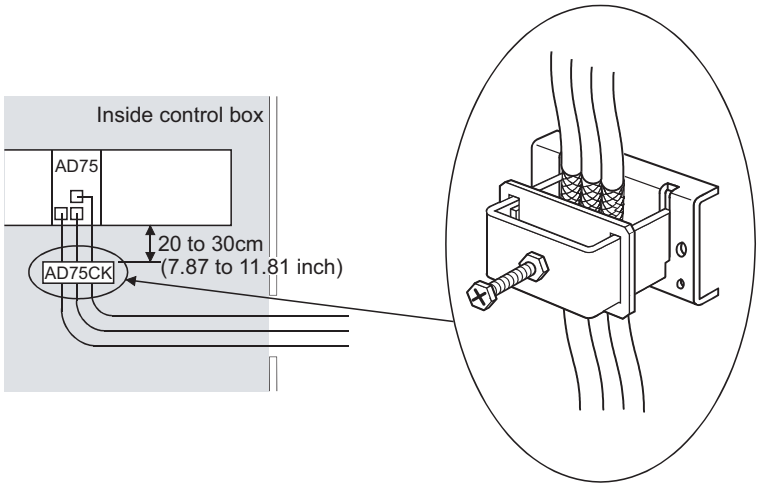
(b) When connecting a cable longer than 2m (6.56ft.), but not exceeding 10m (32.81ft.)
- Ground the shield section of the external wiring cable with a cable clamp. (Ground the shield at the closest location to the AD75 external wiring connector.)
- Install a ferrite core.
- Connect the external wiring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

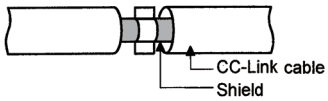
Cable length	Optional part	Required quantity		
		1 axis	2 axes	3 axes
Within 2m (6.56ft.)	AD75CK	1	1	1
2m (6.56ft.) to 10m (32.81ft.)	AD75CK	1	1	1
	ZCAT3035-1330	1	2	3

(d) Cable clamp position



(6) CC-Link module

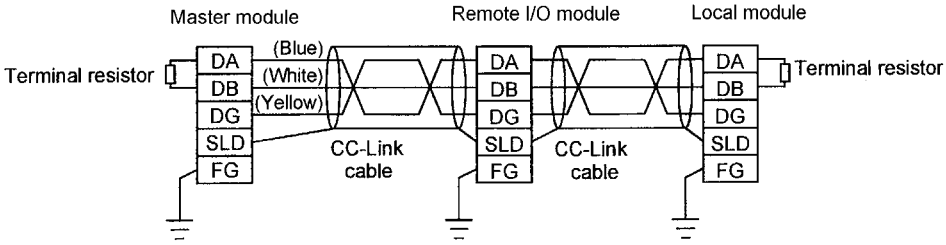
(a) Be sure to ground the shield of the cable that is connected to a CC-Link module close to the exit of the control panel or to any of CC-Link stations within 30cm (11.81inch) from the module or stations.
The CC-Link dedicated cables are shielded cables.As shown in the illustration below, remove a part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

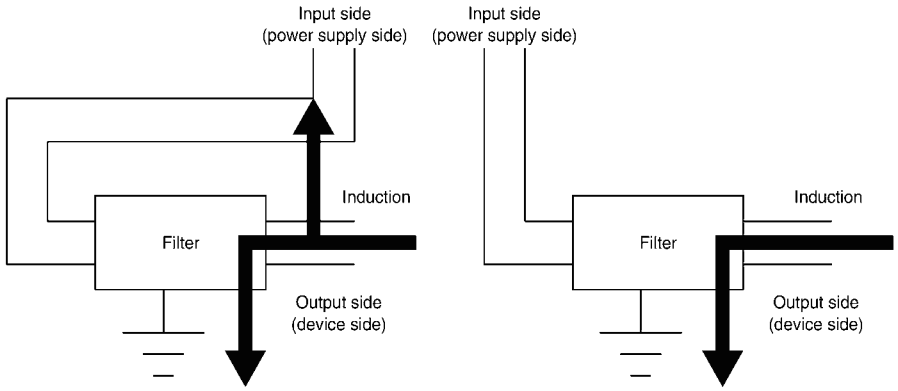
9.1.6 Noise filter (power supply line filter)

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 (doubleπ 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.

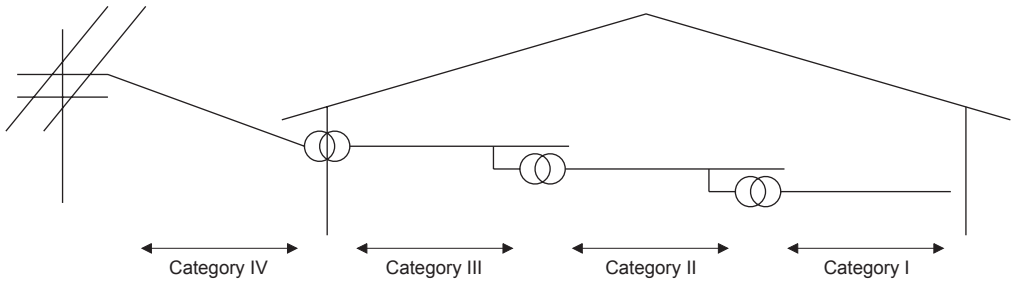


Fig.9.1 Installation category

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.
> 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
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
A3AMCA-96	1860	9495	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.

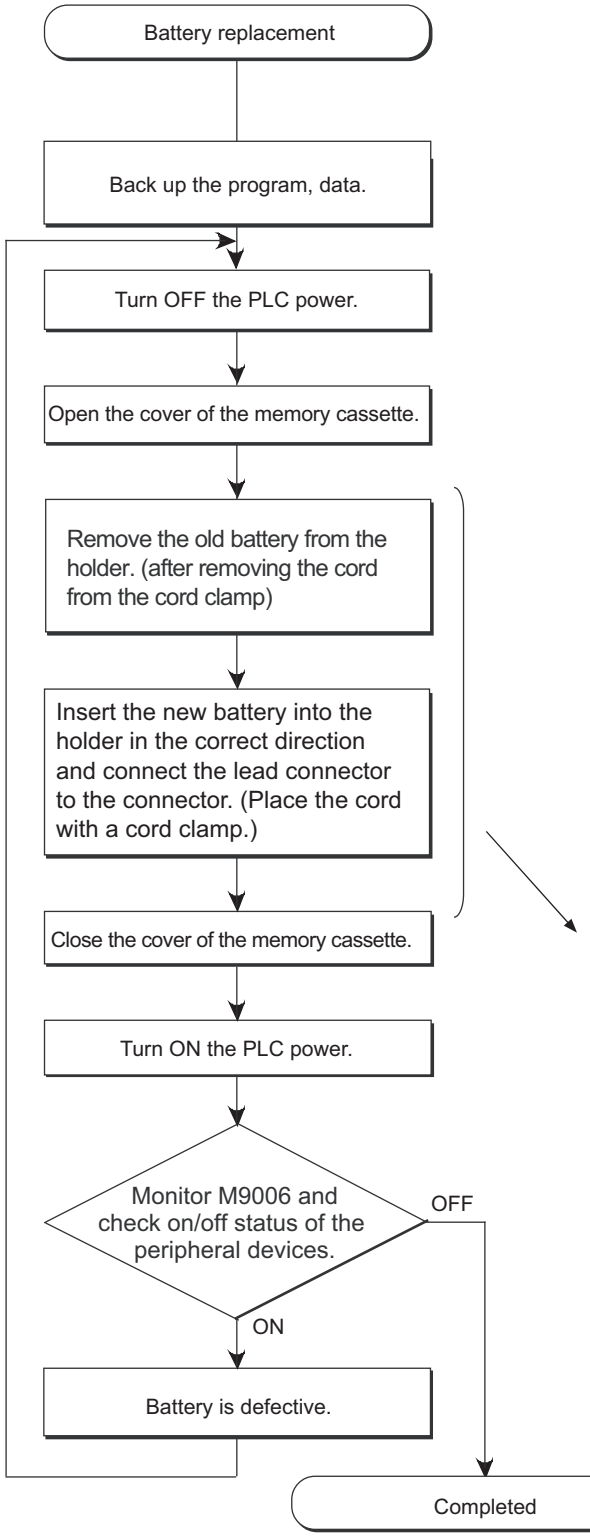
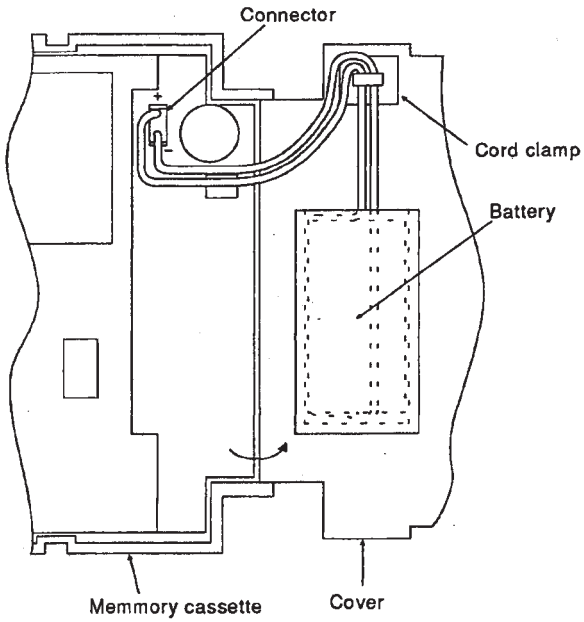


Table 10.4 Period backed up by the capacitor

Memory Cassette Model Name	Period Backed up by the Capacitor [min]	
	Guaranteed Value (MIN)	Actual Value (TYP)
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
A3AMCA-96	3	15



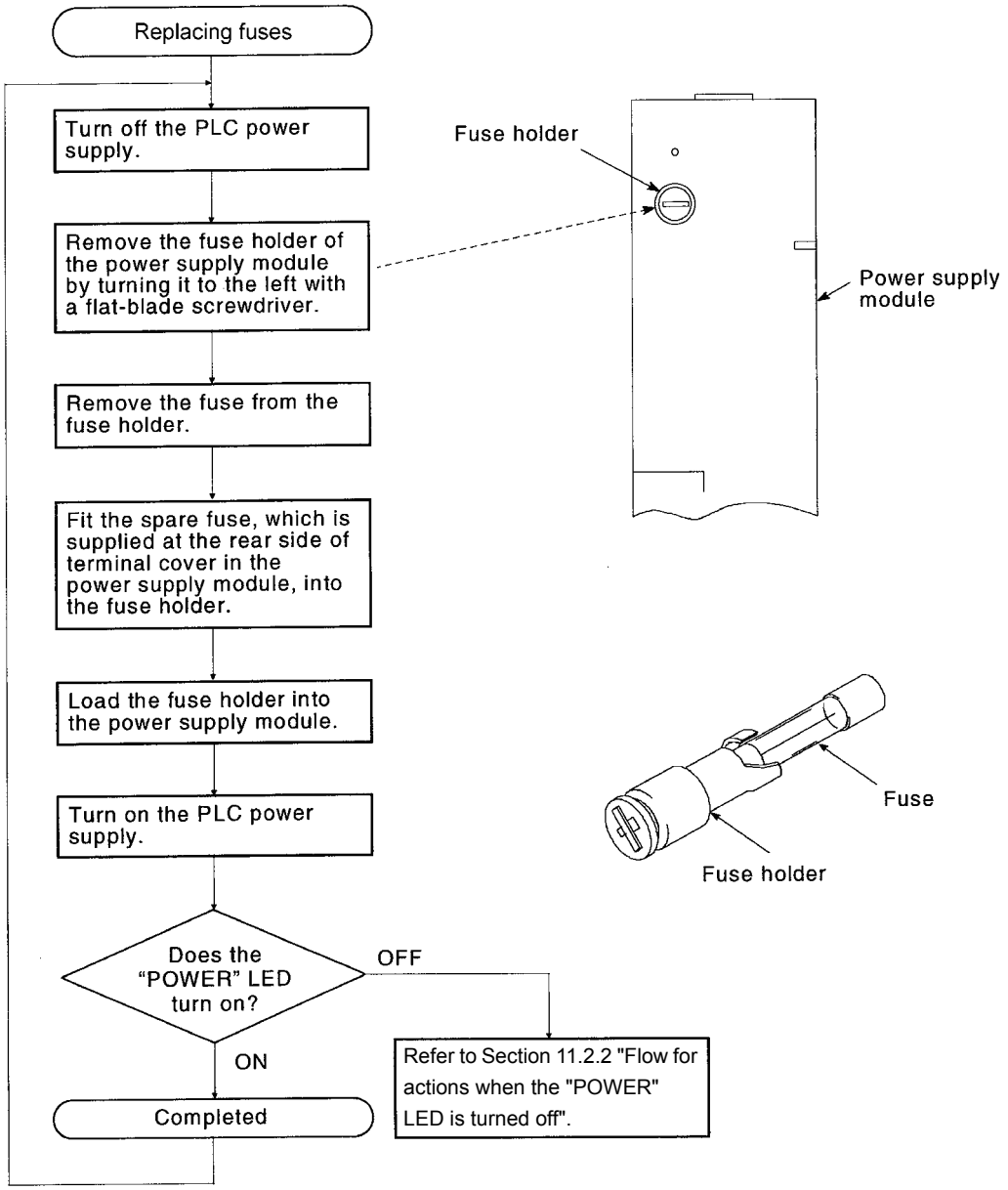
10.4 Fuse Replacement

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.

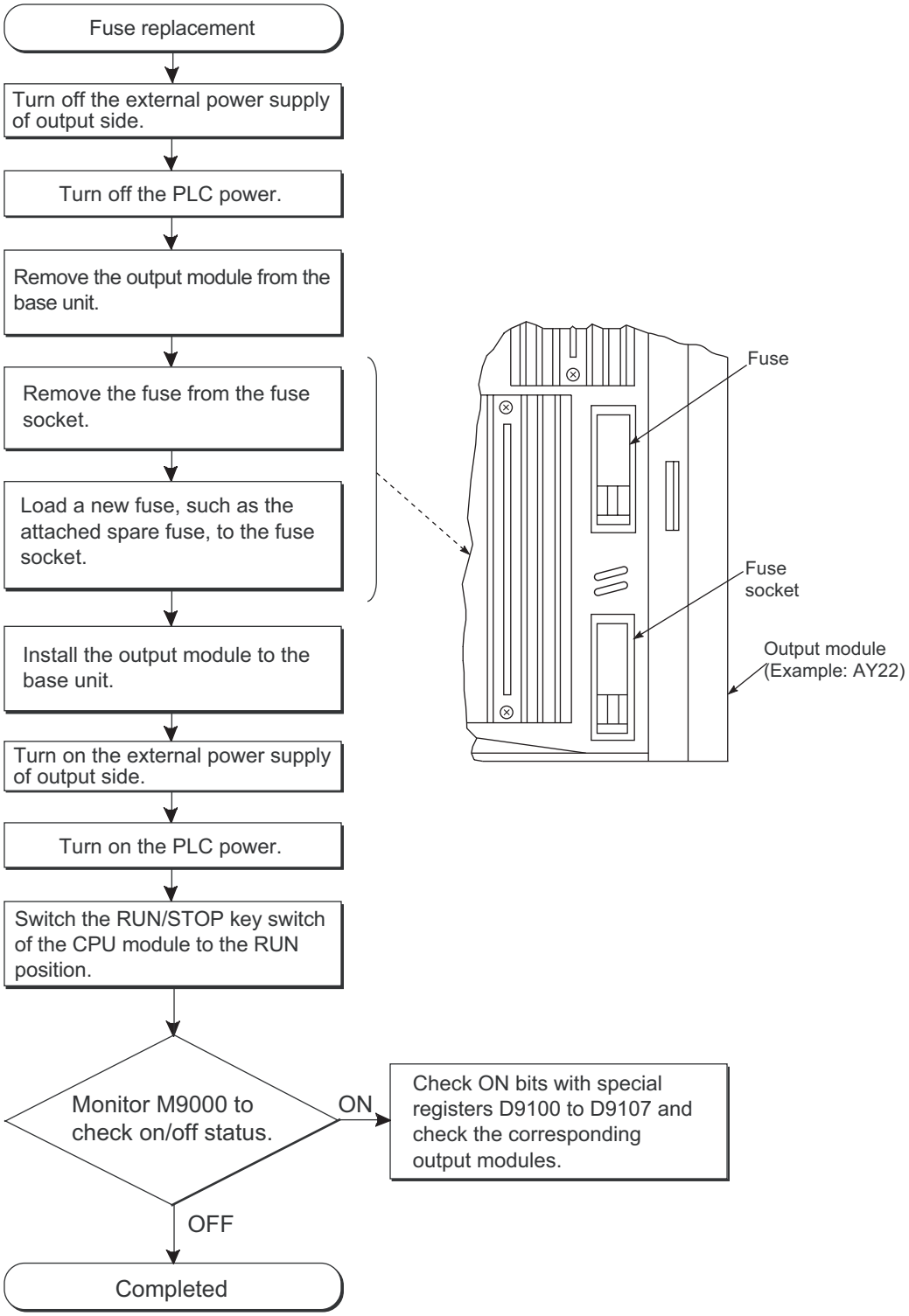
> ⚠ CAUTION
> ● When replacing the fuse, use a fuse specified by the manufacturer.
> Using the one for the high-rated current or an electric wire may cause a fire.

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.

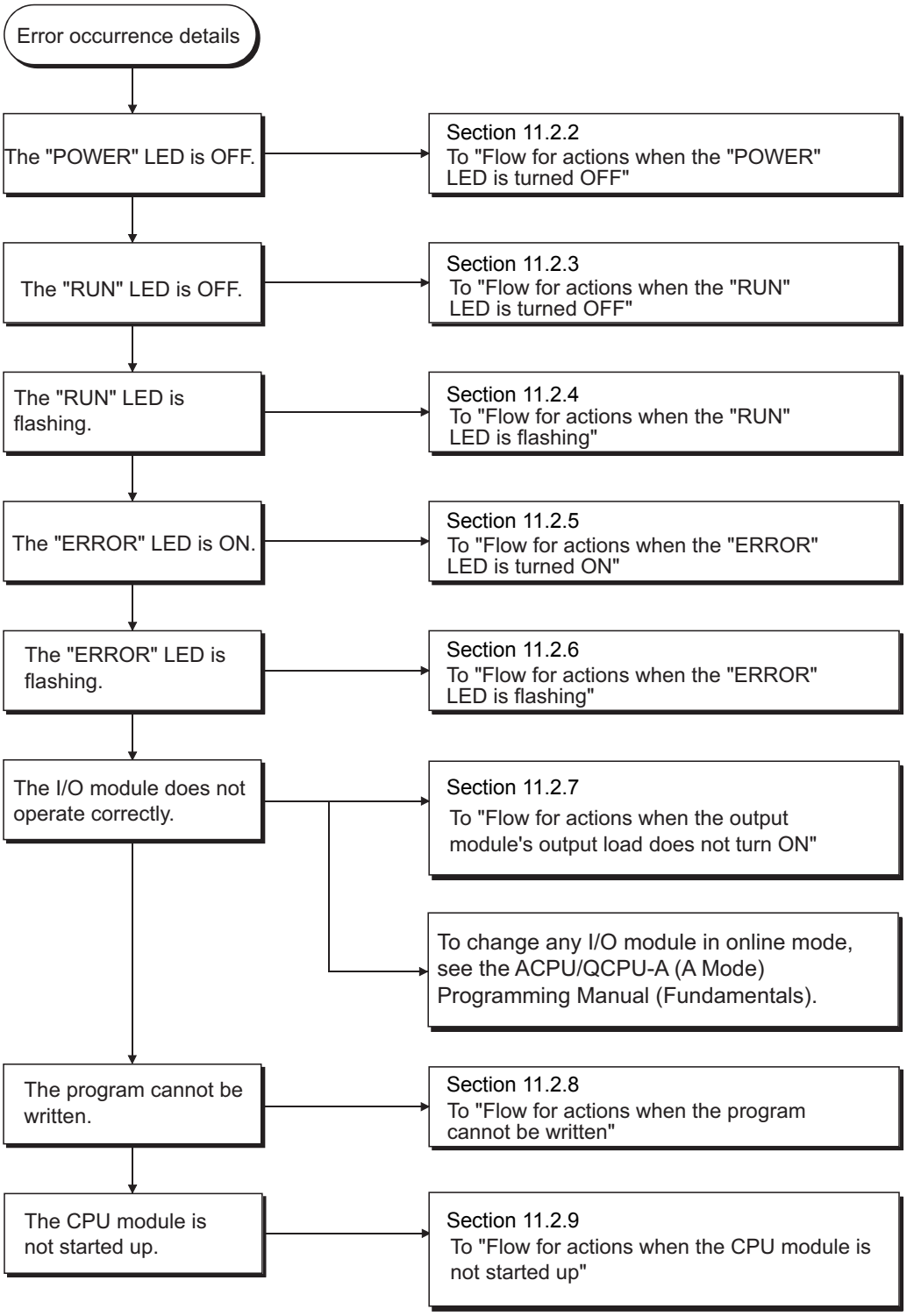
(3) Narrow down the range.
By performing the (1) and (2) above, assume the faulty area in the following:
(a) PLC or external devices?
(b) I/O module or others?
(c) Sequence program?

11.2 Troubleshooting

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

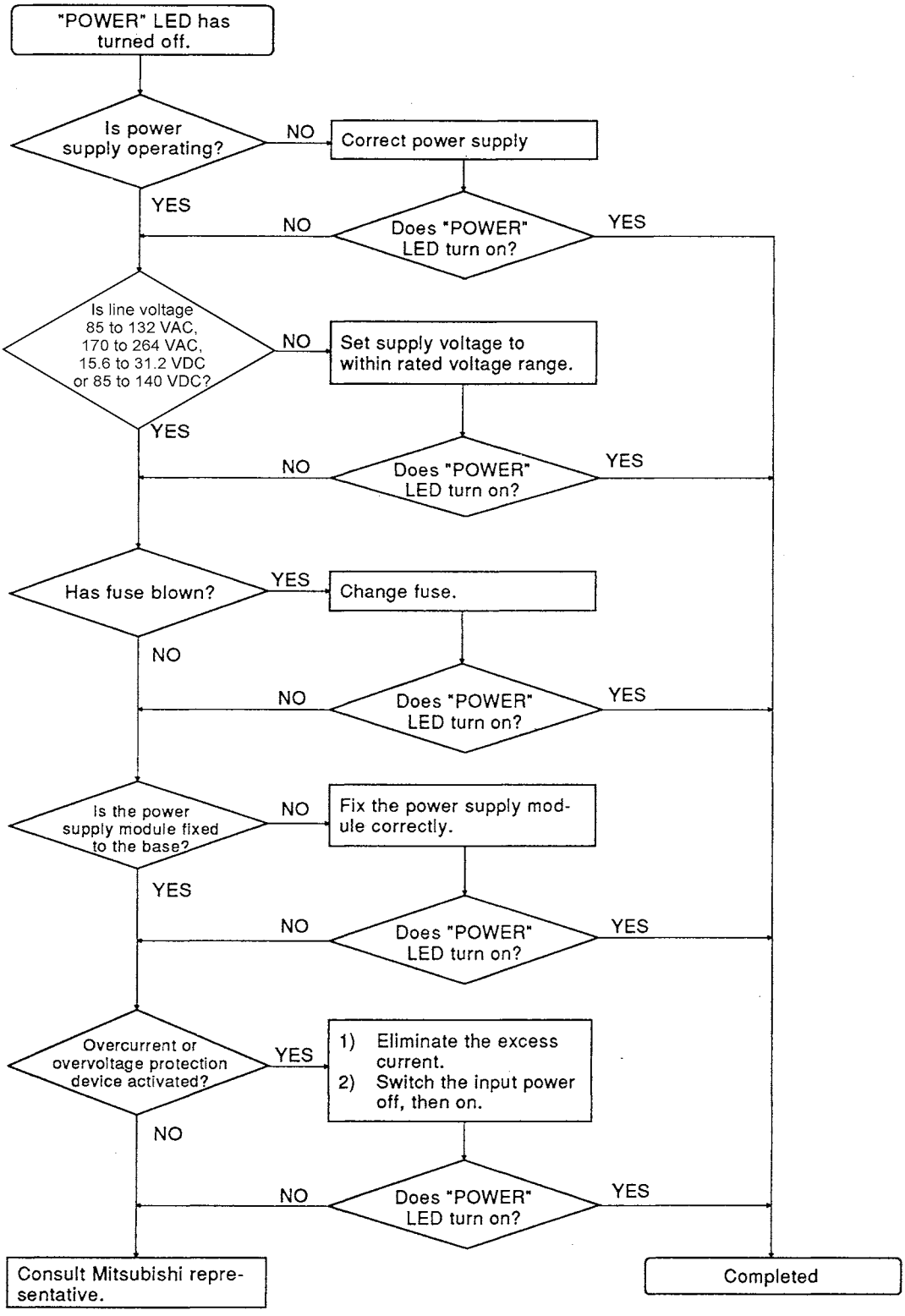
11.2.1 Troubleshooting flowchart

The error definitions are described by events.



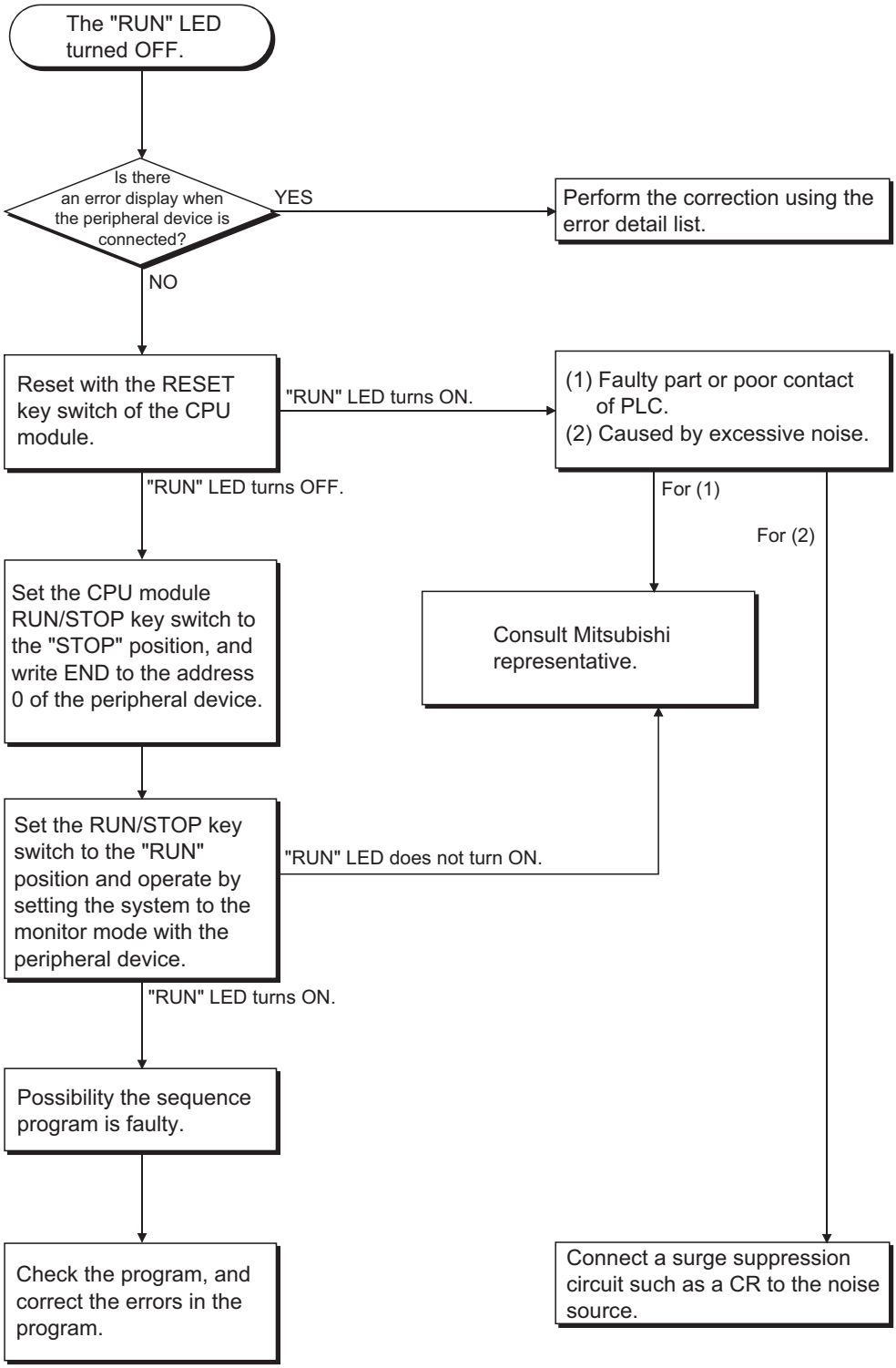
11.2.2 Flow for actions when the "POWER" LED is turned OFF

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



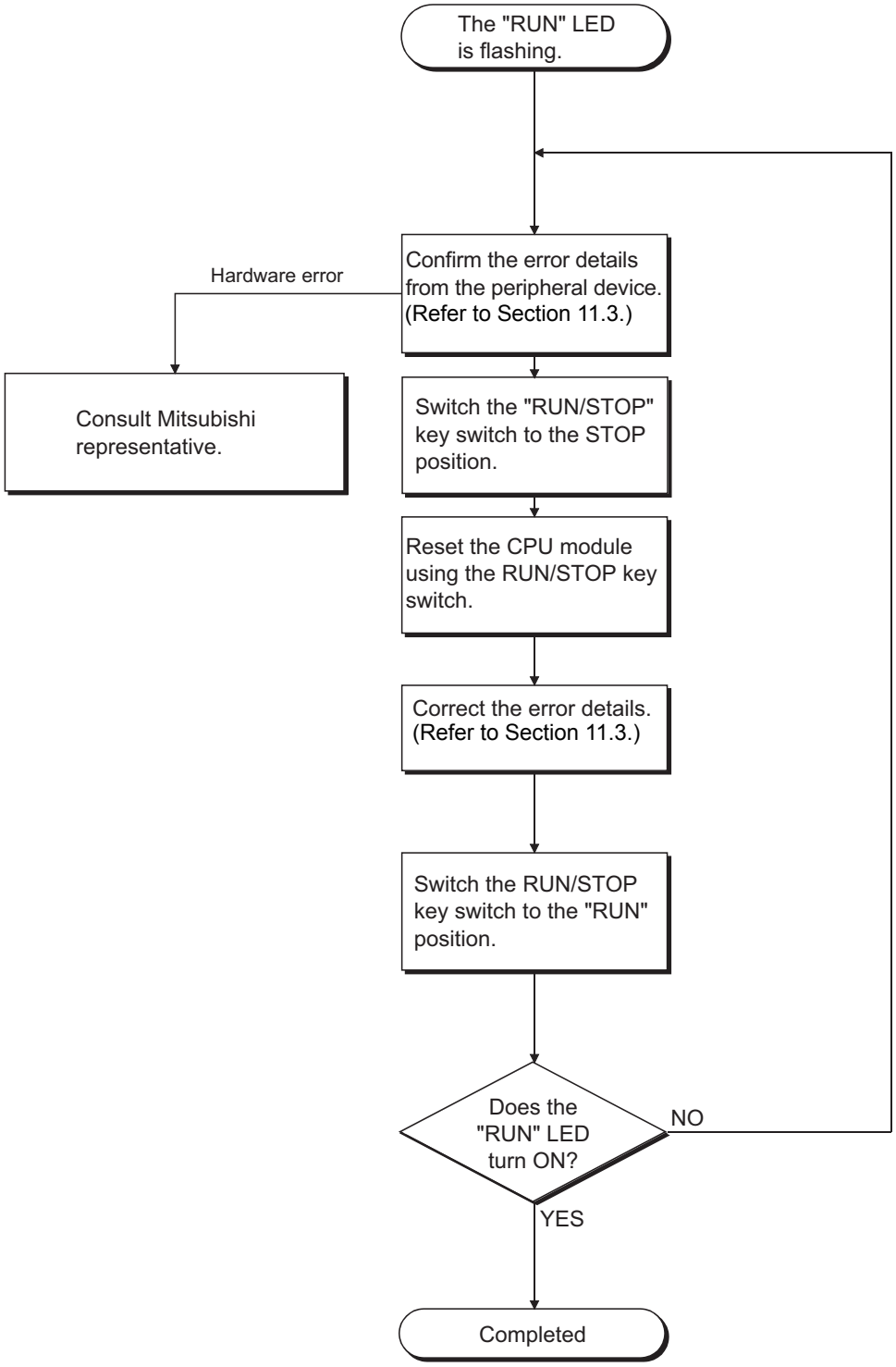
11.2.3 Flow for actions when the "RUN" LED is turned OFF

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



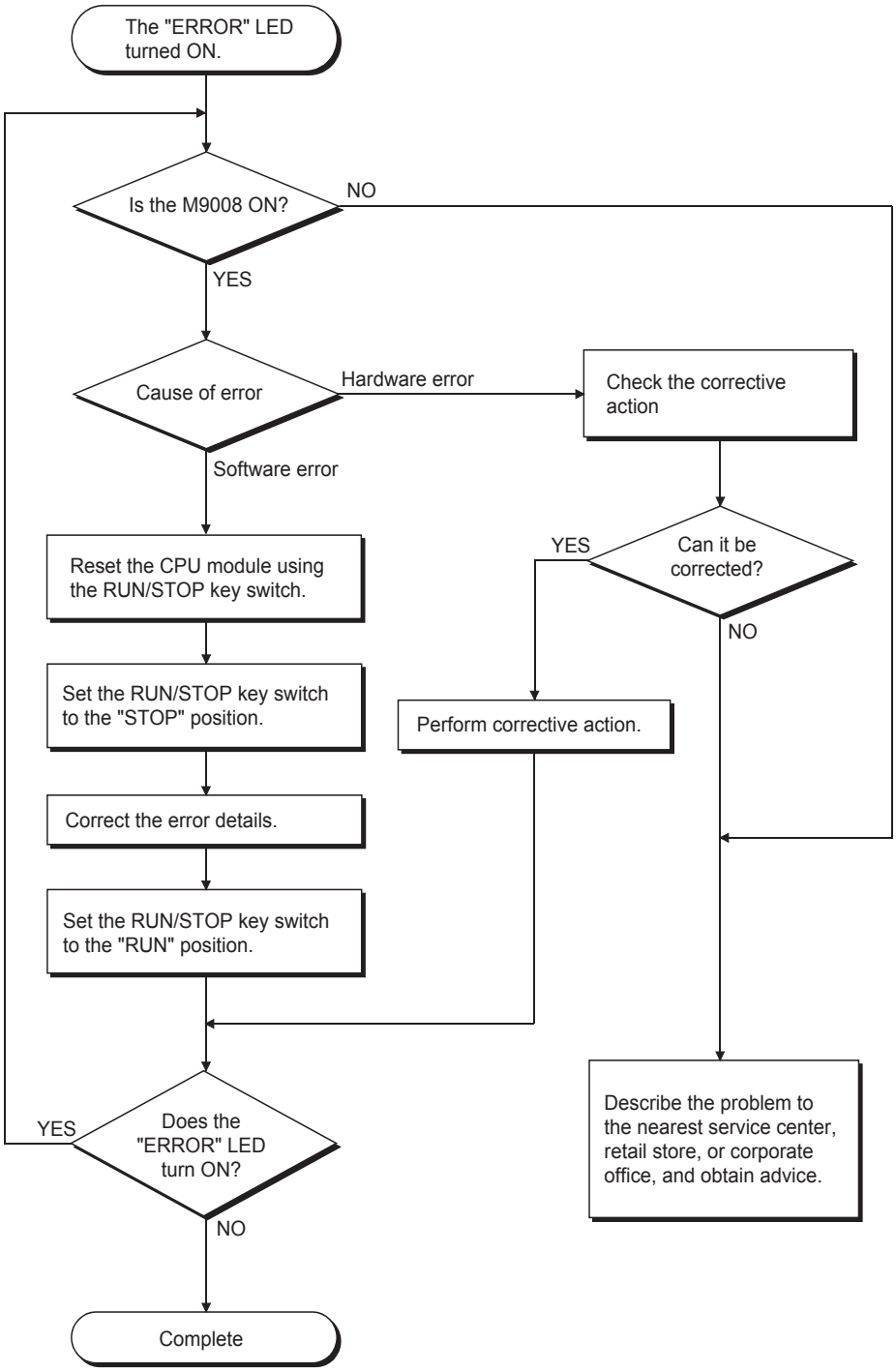
11.2.4 Flow for actions when the "RUN" LED is flashing

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 A3ACPU 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.



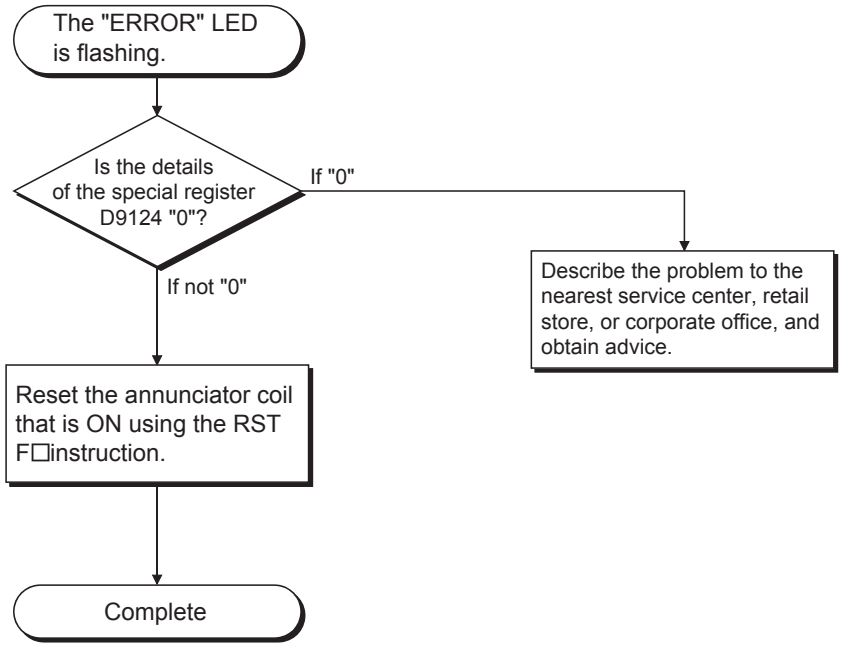
11.2.5 Flow for actions when the "ERROR" LED is turned ON

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



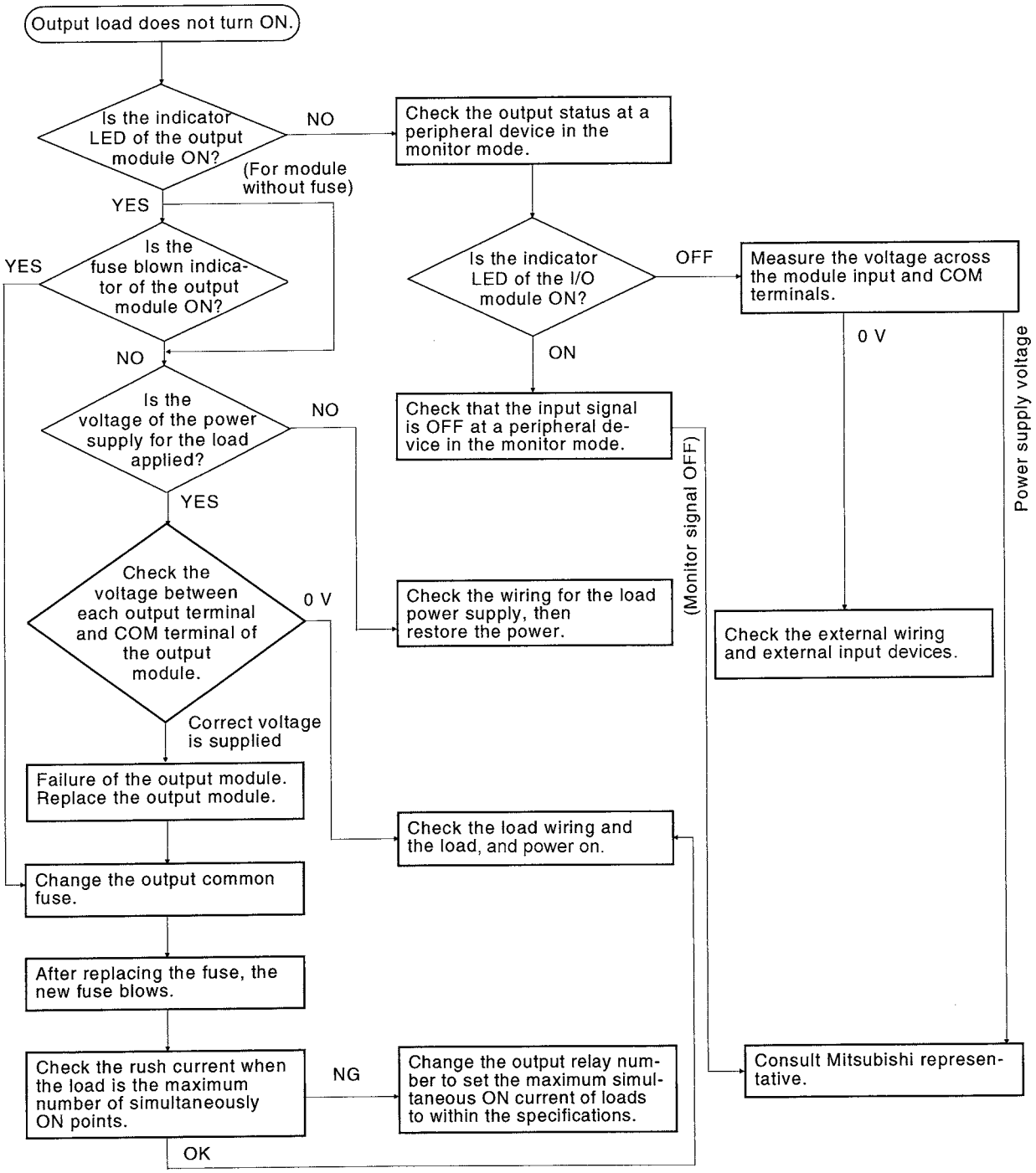
11.2.6 Flow for actions when the "ERROR" LED is flashing

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

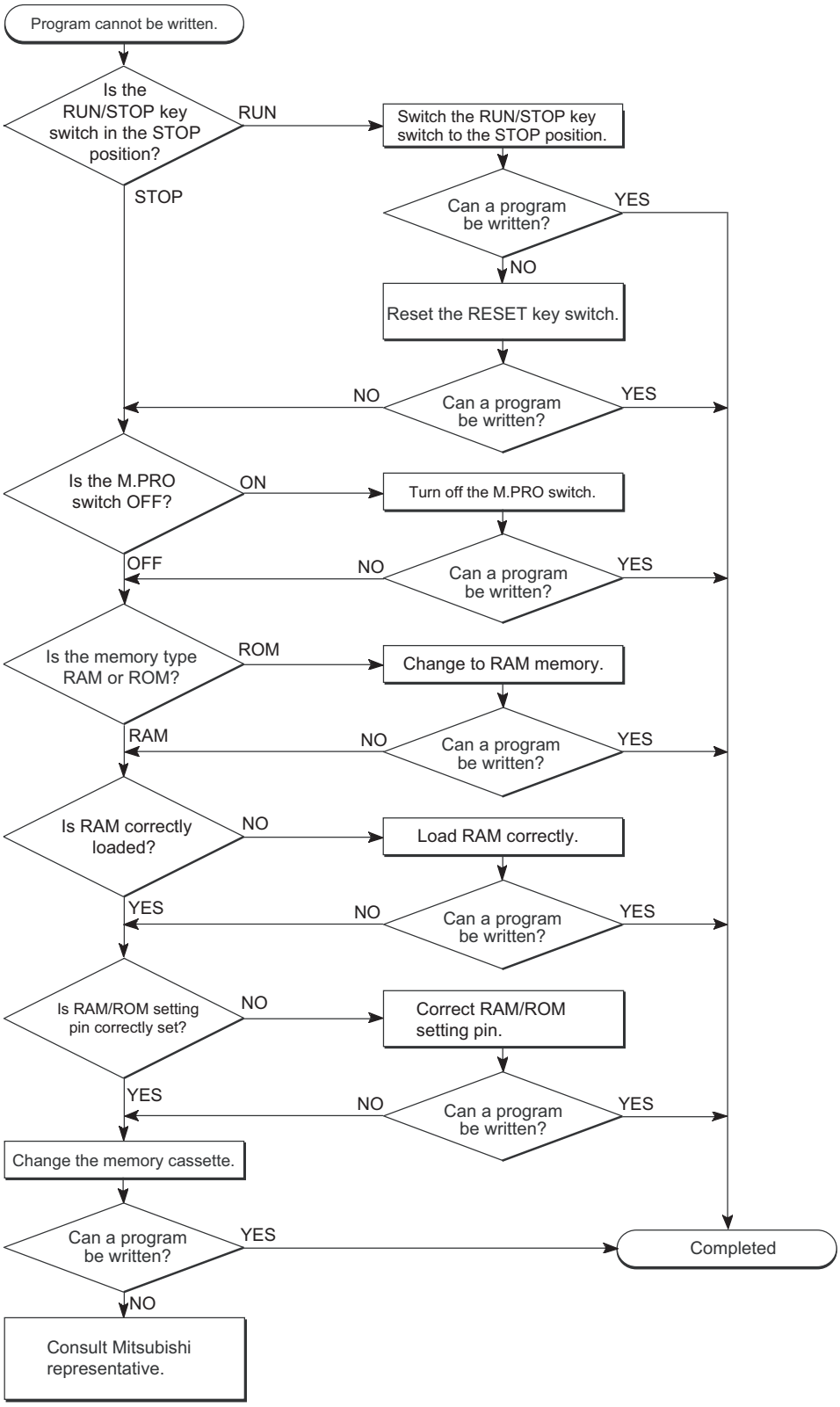
The flow when the output load of the output module is not turned ON during operation is described.



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.

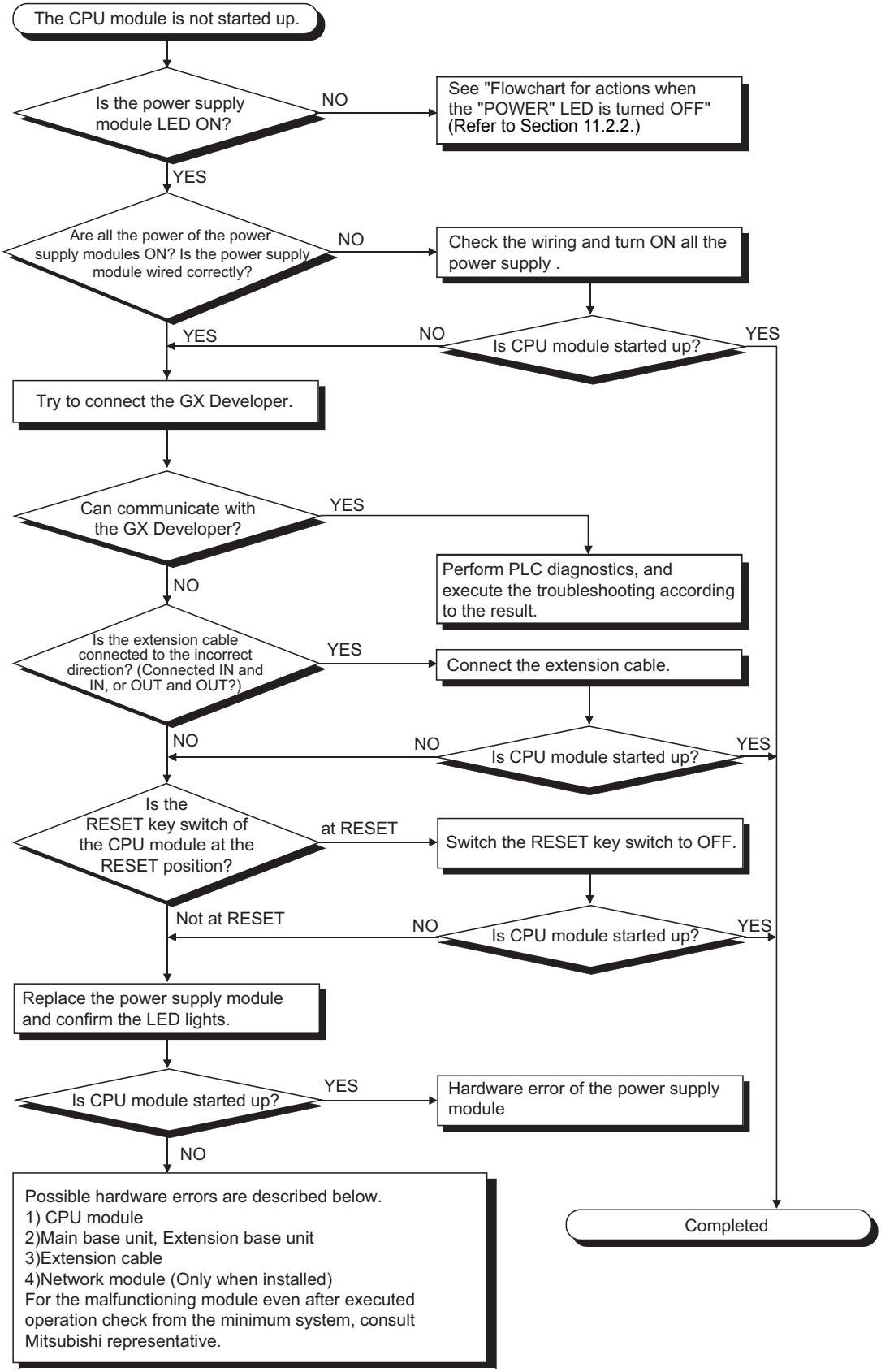
11.2.8 Flow for actions when the program cannot be written

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, D9091 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 AnACPU and A3A Board

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

Error code: D9008
Detailed error code: D9091
Error step: D9010 and D9011

Table 11.1 Error Code List for AnACPU and A3A Board

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"INSTRCT CODE ERR" (Checked when STOP → RUN or at execution of instruction.)	10	101	STOP	Instruction codes which the CPU cannot decode are included in the program.	(1) Read the error step using a peripheral device and correct the program of the step. (2) Check the ROM if it contains instruction codes which cannot be decoded. If it does, replace it with a correct ROM.
		102		Index qualification is specified for a 32-bit constant.	Read the error step using a peripheral device and correct the program of the step.
		103		Device specified by a dedicated instruction is not correct.	
		104		An dedicated instruction has incorrect program structure.	
		105		An dedicated instruction has incorrect command name.	
		106		Index qualification using Z or V is included in the program between LEDA/BIX and LEDA/BIXEND.	
		107		(1) Index qualification is specified for the device numbers and set values in the OUT instruction of timers and counters. (2) Index qualification is specified at the label number of the pointer (P) provided to the head of destination of the CJ, SCJ, CALL, CALLP, JMP, LEDA/B, FCALL and LEDA/B, BREAK instructions or at the label number of the interrupt pointer (I) provided to the head of an interrupt program.	
		108		Errors other than 101 to 107 mentioned above.	

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"PARAMETER ERROR" (Checked at power on and at STOP/PAUSE → RUN.)	11	111	STOP	Capacity settings of the main and sub programs, microcomputer program, file register comments, status latch, sampling trace and extension file registers are not within the usable range of the CPU.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory.
		112		Total of the set capacity of the main and sub programs, file register comments, status latch, sampling trace and extension file registers exceeds capacity of the memory cassette.	
		113		Latch range set by parameters or setting of M, L or S is incorrect.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory
		114		Sum check error	
		115		Either of settings of the remote RUN/PAUSE contact point by parameters, operation mode at occurrence of error, annunciator indication mode, or STOP → RUN indication mode is incorrect.	
		116		The MNET-MINI automatic refresh setting by parameters is incorrect.	
		117		Timer setting by parameters is incorrect.	
		118		Counter setting by parameters is incorrect.	
"MISSING END INS" (Checked at STOP → RUN.)	12	121	STOP	The END (FEND) instruction is not given in the main program.	Write the END instruction at the end of the main program.
		122		The END (FEND) instruction is not given in the sub program if the sub program is set by parameters.	Write the END instruction at the end of the sub program.

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CAN'T EXECUTE (P)" (Checked at execution of instruction.)	13	131	STOP	The same device number is used at two or more steps for the pointers (P) and interrupt pointers (I) used as labels to be specified at the head of jump destination.	Eliminate the same pointer numbers provided at the head of jump destination.
		132		Label of the pointer (P) specified in the CJ, SCJ, CALL, CALLP, JMP, LEDA/BFCALL or LEDA/BBREAK instruction is not provided before the END instruction.	Read the error step using a peripheral device, check contents and insert a jump destination pointer (P).
		133		(1) The RET instruction was included in the program and executed though the CALL instruction was not given. (2) The NEXT LEDA/BBREAK instructions were included in the program and executed though the FOR instruction was not given. (3) Nesting level of the CALL, CALLP and FOR instructions is 6 levels or deeper, and the 6th level was executed. (4) There is no RET or NEXT instruction at execution of the CALL or FOR instruction.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of nesting levels of the CALL, CALLP and FOR instructions to 5 or less.
		134		The CHG instruction was included in the program and executed though no sub program was provided.	Read the error step using a peripheral device and delete the CHG instruction circuit block.
		135		(1) LEDA/BIX and LEDA/BIXEND instructions are not paired. (2) There are 33 or more sets of LEDA/BIX and LEDA/BIXEND instructions.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of sets of LEDA/BIX and LEDA/BIXEND instructions to 32 or less.

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/PAUSE → RUN.)	14	141	STOP	Instructions (including NOP) other than LDX, LDIX, ANDX and ANIX are included in the CHK instruction circuit block.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
		142		Multiple CHK instructions are given.	
		143		The number of contact points in the CHK instruction circuit block exceeds 150.	
		144		The LEDA CHK instructions are not paired with the LEDA CHKEND instructions, or 2 or more pairs of them are given.	
		145		Format of the block shown below, which is provided before the CHK instruction circuit block, is not as specified. P254 ─┤├─── CJ P□ ─┤	
		146		Device number of D1 in the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.	
		147		Index qualification is used in the check pattern circuit.	
		148		(1) Multiple check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are given. (2) There are 7 or more check condition circuits in the LEDA CHK - LEDA CHKEND instructions. (3) The check condition circuits in the LEDA CHK - LEDA CHKEND instructions are written without using X and Y contact instructions or compare instructions. (4) The check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are written with 257 or more steps.	
"CAN'T EXECUTE (I)" (Checked at occurrence of interrupt.)	15	151	STOP	The IRET instruction was given outside of the interrupt program and was executed.	Read the error step using a peripheral device and delete the IRET instruction.
		152		There is no IRET instruction in the interrupt program.	Check the interrupt program if the IRET instruction is given in it. Write the IRET instruction if it is not given.
		153		Though an interrupt module is used, no interrupt pointer (I) which corresponds to the module is given in the program. Upon occurrence of error, the problem pointer (I) number is stored at D9011.	Monitor special register D9011 using a peripheral device, and check if the interrupt program that corresponds to the stored data is provided or if two or more interrupt pointers (I) of the same number are given. Make necessary corrections.

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CASSETTE ERROR"	16	—	STOP	Memory cassette is not loaded.	Turn off the PC power and load the memory cassette.
"RAM ERROR" (Checked at power on.)	20	201	STOP	The sequence program storage RAM in the CPU module caused an error.	Since this is CPU hardware error, consult Mitsubishi representative.
		202		The work area RAM in the CPU module caused an error.	
		203		The device memory in the CPU module caused an error.	
		204		The address RAM in the CPU module caused an error.	
"OPE CIRCUIT ERROR" (Check during execution of END process)	21	211	STOP	The operation circuit for index qualification in the CPU does not work correctly.	
		212		Hardware (logic) in the CPU does not operate correctly.	
		213		The operation circuit for sequential processing in the CPU does not operate correctly.	
		214		The operation circuit for indexing in the END process check of the CPU does not function correctly.	
		215		Hardware inside the CPU does not function in the END process check of the CPU.	
"WDT ERROR" (Checked at execution of END processing.)	22	—	STOP	Scan time is longer than the WDT time. (1) Scan time of the user's program has been extended due to certain conditions. 2) Scan time has been extended due to momentary power failure occurred during scanning.	(1) Calculate and check the scan time of user program and reduce the scan time using the CJ instruction or the like. (2) Monitor contents of special register D9005 using a peripheral device. If the contents are other than 0, power supply voltage may not be stable. Check power supply and reduce variation in voltage.
"END NOT EXECUTE" (Checked at execution of the END instruction.)	24	241	STOP	Whole program of specified program capacity was executed without executing the END instructions. (1) When the END instruction was to be executed, the instruction was read as other instruction code due to noise. (2) The END instruction changed to other instruction code due to unknown cause.	(1) Reset and run the CPU again. If the same error recurs, Since this is CPU hardware error, consult Mitsubishi representative.
"MAIN CPU DOWN"	26	—	STOP	The main CPU is malfunctioning or faulty.	Since this is CPU hardware error, consult Mitsubishi representative

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"UNIT VERIFY ERR" (Checked continuously.)	31	—	Stop or Continue (set by parameter)	Current I/O module information is different from that recognized when the power was turned on. (1) The I/O module (including special function modules) connection became loose or the module was disconnected during operation, or wrong module was connected.	Read detailed error code using a peripheral device and check or replace the module which corresponds to the data (I/O head number). Or, monitor special registers D9116 to D9123 using a peripheral device and check or replace the modules if corresponding data bit is "1".
"FUSE BREAK OFF" (Checked continuously.)	32	—	Stop or Continue (set by parameter)	There is an output module of which fuse is blown.	(1) Check the FUSE BLOWN indicator LED on the output module and replace the fuse. (2) Read detailed error code using a peripheral device and replace the fuse of the output module which corresponds to the data (I/O head number). Or, monitor special registers D9100 to D9107 using a peripheral device and replace the fuse of the output module of which corresponding data bit is "1".
"CONTROL-BUS ERR"	40	401	STOP	Due to the error of the control bus which connects to special function modules, the FROM/TO instruction cannot be executed.	Since it is a hardware error of special function module, CPU module or base module, replace and check defective module(s). Consult Mitsubishi representative for defective modules.
		402		If parameter I/O assignment is being executed, special function modules are not accessible at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"SP.UNIT DOWN"	41	411	STOP	Though an access was made to a special function module at execution of the FROM/TO instruction, no response is received.	Since it is hardware error of the special function module to which an access was made, consult Mitsubishi representative.
		412		If parameter I/O assignment is being executed, no response is received from a special function module at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"LINK UNIT ERROR"	42	—	STOP	(1) Either data link module is loaded to the master station. (2) There are 2 link modules which are set to the master station (station 0).	(1) Remove data link module from the master station. (2) Reduce the number of master stations to 1. Reduce the link modules to 1 when the 3-tier system is not used.
"I/O INT. ERROR"	43	—	STOP	Though the interrupt module is not loaded, an interrupt occurred.	Since it is hardware error of a module, replace and check a defective module. For defective modules, consult Mitsubishi representative.
"SP.UNIT LAY.ERR."	44	441	STOP	A special function module is assigned as an I/O module, or vice versa, in the I/O assignment using parameters from the peripheral device.	Execute I/O assignment again using parameters from the peripheral device according to the loading status of special function modules.
		442		There are 9 or more special function modules (except the interrupt module) which can execute interruption to the CPU module loaded.	Reduce the special function modules (except the interrupt module) which can execute interrupt start to 8 or less.
		443		There are 2 or more data link modules loaded.	Reduce the data link modules to 1 or less.
		444		There are 7 or more modules such as a computer link module loaded to one CPU module.	Reduce the computer link modules to 6 or less.
		445		There are 2 or more interrupt modules loaded.	Reduce the interrupt modules to 1 or less.
		446		Modules assigned by parameters for MNT/MINI automatic refresh from the peripheral device do not conform with the types of station modules actually linked.	Perform again module assignment for MNT/MINI automatic refresh with parameters according to actually linked station modules.
		447		The number of modules of I/O assignment registration (number of loaded modules) per one CPU module for the special function modules which can use dedicated instructions is larger than the specified limit. (Total of the number of computers shown below is larger than 1344.) (AD59 × 5) (AD57(S1)/AD58 × 8) (AJ71C24(S3/S6/S8) × 10) (AJ7IUC24 × 10) (AJ71C21(S1) (S2) × 29) + ((AJ71PT32(S3) in extension mode × 125) Total > 1344	Reduce the number of loaded special function modules.

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"SP.UNIT ERROR" (Checked at execution of the FROM/TO instruction or the dedicated instructions for special function modules.)	46	461	Stop or Continue (set by parameter)	Module specified by the FROM / TO instruction is not a special function module.	Read the error step using a peripheral device and check and correct contents of the FROM / TO instruction of the step.
		462		Module specified by the dedicated instruction for special function module is not a special function module or not a corresponding special function module.	Read the error step using a peripheral device and check and correct contents of the dedicated instruction for special function modules of the step.
"LINK PARA. ERROR"	47	—	Continue	(1) Data written to the parameter areas of the link of which range was set by parameters using a peripheral device does not conform with the data of link parameters read by the CPU. Or, link parameters are not written. (2) Total number of local stations is set at 0.	(1) Write in parameters again and check. (2) Check setting of station numbers. (3) If the same error indication is given again, it is hardware failure. Consult Mitsubishi representative.
"OPERATION ERROR" (Checked at execution of instruction.)	50	501	Stop or Continue (set by parameter)	(1) When file registers (R) are used, operation is executed outside of specified ranges of device numbers and block numbers of file registers (R). (2) File registers are used in the program without setting capacity of file registers.	Read the error step using a peripheral device and check and correct program of the step.
		502		Combination of the devices specified by instruction is incorrect.	
		503		Stored data or constant of specified device is not in the usable range.	
		504		Set number of data to be handled is out of the usable range.	
		505		(1) Station number specified by the LEDA/BLRDP LEDA/BLWTP , LRDP , LWTP instructions is not a local station. (2) Head I/O number specified by the LEDA/BRFRP LEDA/BRTOP , RFRP , RTOP instructions is not of a remote station.	
		506		Head I/O number specified by the LEDA/BRFRP LEDA/BRTOP , RFRP , RTOP instructions is not of a special function module.	
		507		(1) When the AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed to either of them. (2) When an AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed in divided mode to another AD57(S1) or AD58.	Read the error step using a peripheral device and provide interlock with special relay M9066 or modify program structure so that, when the AD57(S1) or AD58 is executing instructions in divided processing mode, other instructions may not be executed to either of them or to another AD57(S1) or AD58 in divided mode.

Table 11.1 Error Code List for AnACPU and A3A Board (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"OPERATION ERROR" (Checked at execution of instruction.)	50	509	STOP	(1) An instruction which cannot be executed by remote terminal modules connected to the MNET/ MINI-S3 was executed to the modules. (2) When the PRC instruction was executed to a remote terminal, the communication request registration areas overflowed. 3) The PIDCONT instruction was executed without executing the PIDINIT instruction. The PID57 instruction was executed without executing the PIDINIT or PIDCONT instruction.	(1) Read the error step using a peripheral device and correct the program, meeting loaded conditions of remote terminal modules. (2) Provide interlock using M9081 (communication request registration areas BUSY signal) or D9081 (number of vacant areas in the communication request registration areas) when the PRC instruction is executed to a remote terminal. (3) Execute the PIDCONT instruction after execution of the PIDINIT instruction. Execute the PID57 instruction after execution of the PIDINIT and PIDCONT instructions.
"MAIN CPU DOWN"	60	—	STOP	(1) The CPU malfunctioned due to noise. (2) Hardware failure.	(1) Take proper countermeasures for noise. (2) Hardware failure.
		602		(1) Failure in the power module, CPU module, main base unit or expansion cable is detected.	(1) Replace the power module, CPU module, main base unit or expansion cable.
"BATTERY ERROR" (Checked at power on.)	70	—	Continue	(1) Battery voltage has lowered below specified level. (2) Battery lead connector is not connected.	(1) Replace battery. (2) If a RAM memory or power failure compensation function is used, connect the lead connector.

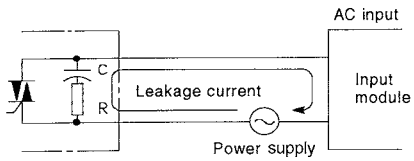
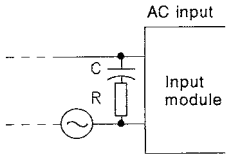
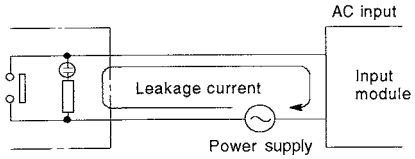
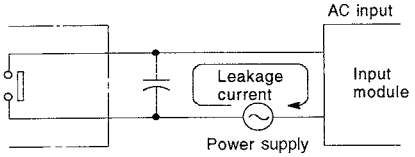
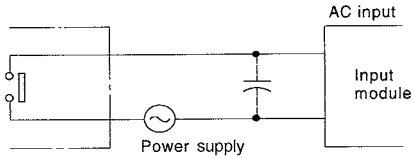
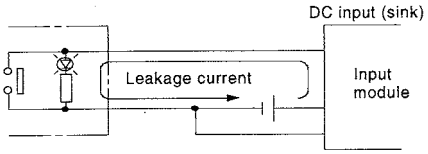
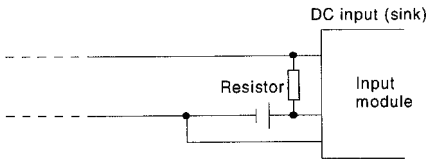
11.4 Fault Examples with I/O Modules

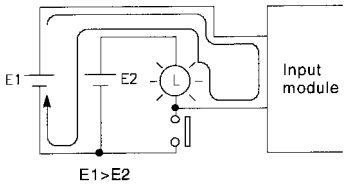
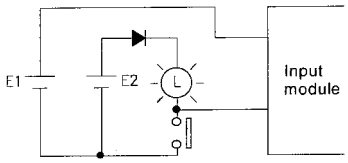
Examples of faults concerning I/O circuits and the corrective actions are explained.

11.4.1 Faults with the input circuit and the corrective actions

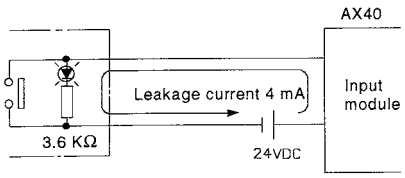
Examples of faults concerning input circuit and the corrective actions are explained.

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.) 	• Connect an appropriate resistance so that voltage between the terminals of the input module is lower than the OFF voltage.  For CR constant, 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 	• Same as the example 1. • 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. 	• Same as the example 1. • However, leakage current does not occur when a power supply is on the side of input device as shown below. 
Example 4	Input signal does not turn OFF.	• Driven by a switch with LED indication 	• 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.  * 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. 	• Use only one power supply. • Connect a diode for a sneak path.(Figure below). 

Calculation example for Example 4

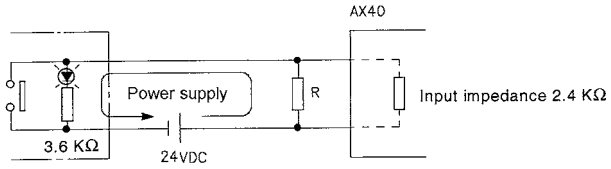


If a switch with LED indication is connected to the AX40 and leak current of 4mA is generated

• 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

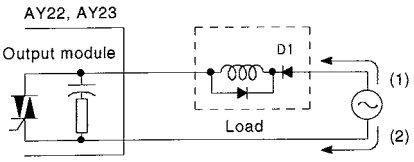
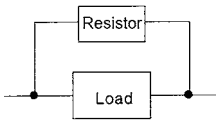
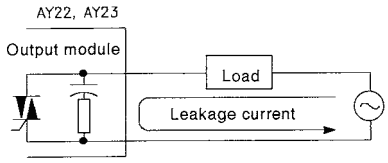
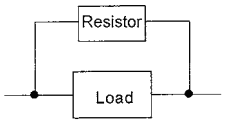
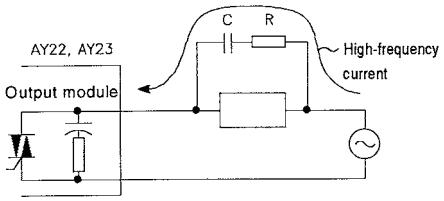
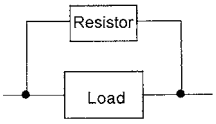
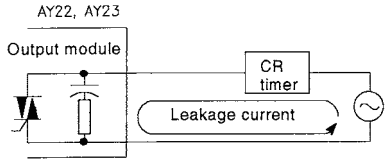
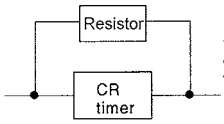
W = (26.4[V])^2/2[kΩ] = 0.348[W]

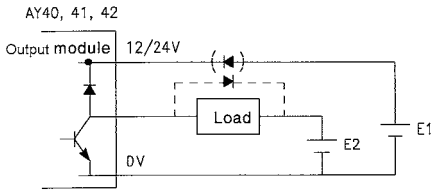
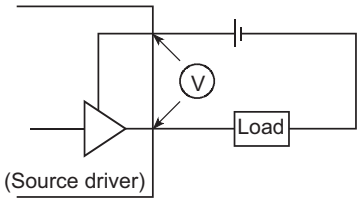
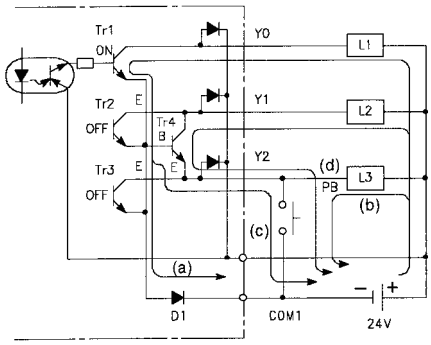
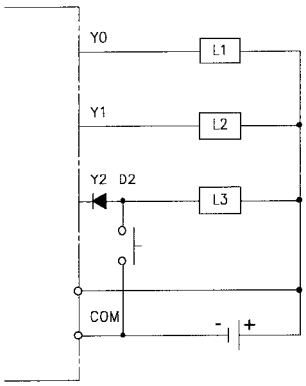
• Because the resistance is selected so that the power capacity is three to five times the actual power consumption, 1.5 to 2 [W] should be selected.From the above, the resistor to be connected across the terminal in question and COM is 2[kΩ] 1.5 to 2[W].

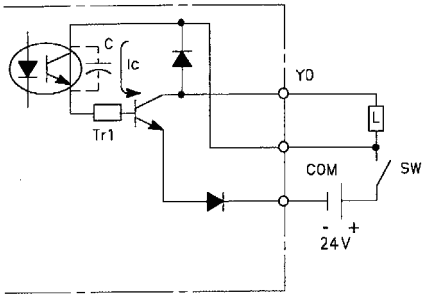
11.4.2 Faults in the output circuit

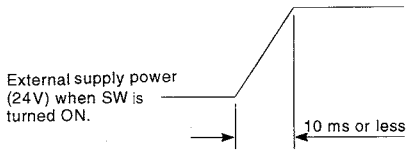
Faults concerning output circuits and the corrective actions are explained.

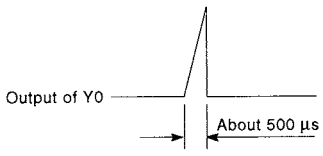
Faults in the output circuit

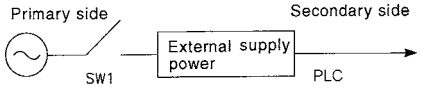
	Situation	Cause	Countermeasure
Example 1	An excessive voltage is applied to the load when output is off. (Triac output)	• When the load is subjected to half wave rectification inside (Solenoids have these types.)  • When the polarity of the power supply is (1), C is charged, and when the polarity is (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. (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.) 
Example 2	Load does not turn OFF. (Triac output)	• Leakage current caused by built-in noise supression 	• Connect a resistor to the both ends of the load. (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.) 
Example 3	Load turns OFF with a delay. (Triac output)	• Leakage current due to surge suppressor for the load. 	• Disconnect the surge suppressor from across the loads, leaving only the resistance. (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.)  Guide to resistive value: At 100VAC: 5 to 10 KΩ, 5 to 3 W At 200VAC: 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. (In some timers, internal circuit may be half wave rectification type, so the caution as to the example 1 is necessary here.) (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.)  Calculate the resistance constant in accordance with the load.

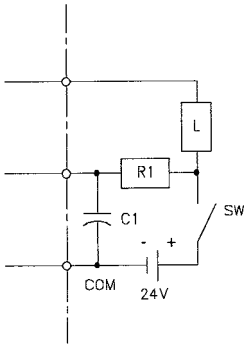
	Situation	Cause	Countermeasure
Example 5	Load does not turn OFF. (Transistor output with clamp diode)	• Sneak path due to the use of two power supplies.  • Sneak path occurs when E1 < E2.	• Use only one power supply. • Connect a diode for a sneak path. (When the load is a relay or similar device, a reverse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

<table>
<tr><th></th><th>Situation</th><th>Cause</th><th>Countermeasure</th></tr>
<tr>
<td>Example 8</td>
<td>The load is momentarily turned ON when the external supply power is started up.
(Transistor output)</td>
<td>Incorrect output due to the floating capacitance (C) between the collector and emitter of the photocoupler
(This does not affect normal loads, but in case of highly sensitive loads (such as solid state relays), incorrect outputs may occur.)
Photocoupler
 

(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.
(2) Current Ic flows to the base of transistor Tr1 in the next stage, and output Y0 turns ON for about 500 μs.
 

</td>
<td>(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.
 

(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).
 

R1: Several tens of ohme
Power capacity ≧ (External supply power current)^{2} *1
× Resistive value × (3 to 5)*2
C1: Several hundreds of μF, 50 mV
*1 For the current consumption of the external supply power, refer to the manual attached to the module to be used.
*2 Select the resistance for power capacity in the range of between 3 and 5 times higher than the actual power consumption.
Example:
R1=40 Ω , C1=300μF
Calculate the time constant as follows:
C1 × R1 = 300 × 10^{-6} × 40
= 12 × 10^{-3}S
= 12ms</td>
</tr>
</table>

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
• AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions)	IB-66251
• AnACPU/AnUCPU Programming Manual (AD57 Instructions)	IB-66257
• AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (PID Control Instructions)	IB-66258

(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

(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	LED, LEDC
Display reset	LEDR

(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		SLT, SLTR
Sampling trace		STRA, STRAR
Carry flag set/reset	1 bit	STC, CLC
Timing clock	1 bit	DUTY

(4) Dedicated instructions

(a) Direct processing instructions

Direct output	DOUT
Direct set	DSET
Direct reset	DRST

(b) Structured program instructions

Circuit indexing	IX, IXEND
Repeat forced termination	BREAK
Subroutine call	FCALL
Error check circuit pattern change	CHK, CHKEND

(c) Data operation instructions

32-bit data search	DSER
16-bit upper/lower byte swap	SWAP
Data separation	DIS
Data association	UNI
Bit test	TEST, DTEST

(d) I/O operation instructions

Flip-flop control	FF
Numeral key input from keyboard	KEY

(e) Real value processing instructions (BCD format processing)

BCD 4-digit square root	BSQR
BCD 8-digit square root	BDSQR
SIN (sine) operation	BSIN
COS (cosine) operation	BCOS
TAN (tangent) operation	BTAN
SIN^{-1}(arcsine) operation	BASIN
COS^{-1} (arccosine) operation	BACOS
TAN^{-1} (arctangent) operation	BATAN

(f) Real value processing instructions (Floating point format real value processing)

Real number → 16/32-bit BIN conversion	INT, DINT
16/32-bit BIN → real number conversion	FLOAT, DFLOAT
Addition	ADD
Subtraction	SUB
Multiplication	MUL
Division	DIV
Degree → radian conversion	RAD
Radian → degree conversion	DEG
SIN (sine) operation	BSIN
COS (cosine) operation	BCOS
TAN (tangent) operation	BTAN
SIN^{-1}(arcsine) operation	BASIN
COS^{-1} (arccosine) operation	BACOS
TAN^{-1} (arctangent) operation	BATAN
Square root	SQR
Exponential	EXP
Logarithm	LOG

(g) Text string processing instructions

16/32-bit BIN → hexadecimal ASCII conversion	BINDA, DBINDA
16/32-bit BIN → hexadecimal ASCII conversion	BINHA, DBINHA
16/32-bit BCD → decimal ASCII conversion	BCDDA, DBCDDA
Hexadecimal ASCII → 10/32-bit BIN conversion	DABIN, DDABIN
Hexadecimal ASCII → 16/32-bit BIN conversion	HABIN, DHABIN
Decimal ASCII → 16/32-bit BCD conversion	DABCD, DDABCD
Device comment data read	COMRD
Text string length detection	LEN
16/32-bit BIN → decimal character string conversion	STR, DSTR
Decimal character string → 16/32-bit BIN conversion	VAL, DVAL
Hexadecimal data → ASCII conversion	ASC
ASCII → hexadecimal data conversion	HEX
Text string transfer	SMOV
Character string association	SADD
Character string comparison	SCMP
Separation in byte units	WTOB
Byte-unit data association	BTOW

(h) Data control instructions

Upper/lower limit control	LIMIT, DLIMIT
Dead zone control	BAND, DBAND
Zone control	ZONE, DZONE

(i) Clock instructions

Clock data read	DATERD
Clock data write	DATEWR

(j) Extension file register instructions

Extension file register block number conversion	RSET
Block transfer between extension file registers	BMOVR
Block exchange between extension file registers	BXCHR
Direct read of extension file register in 1 word unit	ZRRD
Direct read of extension file register in 1 byte unit	ZRRDB
Direct write of extension file register in 1 word unit	ZRWR
Direct write of extension file register in 1 byte unit	ZRWRB

(k) Data link instructions

*1: New instructions set for exclusive use with AnACPU

Local station word device read	LRDP
Local station word device write	LWTP
Data read from remote I/O station special function module	RFRP
Data write from remote I/O station special function module	RTOP

(l) AD61(S1) high-speed counter module control instructions
(The AD61 dedicated instructions cannot be executed on the A1SD61.)

Preset value data setting	PVWR1, PVWR2
Set data write for larger/smaller/matched judgement	SVWR1, SVWR2
Present value read from CH1/CH2	PVRD1, PVRD2

(m) AJ71C24(S8)/AJ71UC24 computer link module control instructions

Data send	Characters up to the 00H code	PR
	Intended number of characters	PRN
Data receive		INPUT
Communication status read		SPBUSY
Communication processing forced interruption		SPCLR

(n) AJ71C21(S1) terminal interface module control instructions

Data output to RS-232C (data up to the 00H code)	PR2
Data output to RS-422 (data up to the 00H code)	PR4
Data output to RS-232C (for intended number of points)	PRN2
Data output to RS-422 (for intended number of points)	PRN4
Data read input from RS-232C	INPUT2
Data input from RS-422	INPUT4
Data read from RAM memory	GET
Data write to RAM memory	PUT
Communication status read	SPBUSY
Communication processing forced interruption	SPCLR

(o) MELSECNET/MINI-S3 master module control instructions

Key input from operation box	INPUT
Data send/receive for specified number of bytes to/ from AJ35PTF-R2	PR, PRN, INPUT
Data read/write for MINI standard protocol module	MINI
Error reset for remote terminal module	MINIERR
Communication status read	SPBUSY
Communication status forced interruption	SPCLR

(p) PID operation instructions

Control data setting	PIDINIT
PID operation	PIDCONT
PID operation result monitoring for AD57(S1)	PID57

(q) AD59(S1) memory card/centronics interface module control instructions

Output to printer	Characters up to the 00H code	PR
	Intended number of characters	PRN
Data read to memory card		GET
Data write to memory card		PUT

(r) AD57(S1) control instructions

Display mode setting instruction		CMODE
Screen display control instructions	Canvas screen display	CPS1
	VRAM display address change	CPS2
	Canvas data transfer	CMOV
	Screen clear	CLS
	VRAM clear	CLV
	Scroll up/down	CSCRU, CSCRD
Cursor control instructions	Cursor display	CON1, CON2
	Cursor erase	COFF
	Cursor position setting	LOCATE
Display condition setting instructions	Forward/reverse rotation of characters to be displayed	CNOR, CREV
	Forward/reverse rotation of characters	CRDSP, CRDSPV
	Character color specification	COLOR
	Character color change	CCDSP, CCDSPV

(Continued to next page)

Specified character display instructions	ASCII character display	PR, PRN
	ASCII character write	PRV, PRNV
	Character display	EPR, EPRN
	Character write	EPRV, EPRNV
	Continuous display of same character	CR1, CR2, CC1, CC2
Fixed character display instructions	- (minus) display	CINMP
	- (hyphen) display	CINHP
	. (period, decimal point) display	CINPT
	Numeric character display	CIN0 to CIN9
	Alphanumeric character display	CINA to CINZ
	Space display	CINSP
Specified column clear instruction		CINCLR
Conversion instructions for displayed character string into ASCII code		INPUT
VRAM data control instructions	Data read	GET
	Data write	PUT
Display status read instruction		STAT

(s) CC-Link dedicated instructions

Network parameter setting	RLPA
Automatic refresh parameter setting	RRPA
Read from the auto refresh buffer memory of the intelligent device station	RIFR
Write to the auto refresh buffer memory of the intelligent device station	RITO
Read from the buffer memory of the intelligent device station	RIRD
Write to the buffer memory of the intelligent device station	RIWT
Write to the buffer memory of the intelligent device station (with handshake)	RISEND
Read from the buffer memory of the intelligent device station (with handshake)	RIRCV

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 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 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 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 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 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 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 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 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 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 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 ON: Carry on	• Carry flag used in application instruction.	○	Usable with all types of CPUs.

Table App2.1 Special Relay List (Continue)

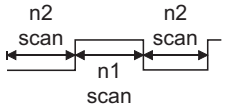
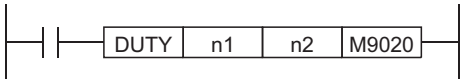
Number	Name	Description	Details	Applicable CPU	
M9016	Data memory clear flag	OFF: No processing ON: Output clear	• Clears the data memory including the latch range (other than special relays and special registers) in remote run mode from computer, etc. when M9016 is on.	○	Usable with all types of CPUs.
M9017	Data memory clear flag	OFF:No processing 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 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. • When power is turned on or reset is per-formed, the clock starts with off. • Set the intervals of on/off by DUTY instruction. 	○	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 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 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 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 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 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. • The data communication request batch process can be turned on or off during operation. • 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)

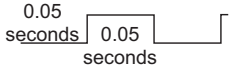
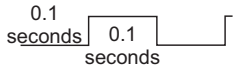
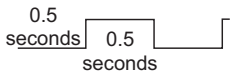
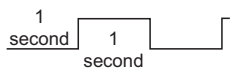
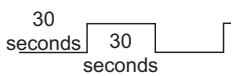
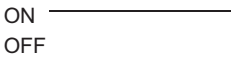
Number	Name	Description	Details	Applicable CPU	
M9030	0.1 second clock		• 0.1 second, 0.2 second, 1 second, 2 second, and 1 minute clocks are generated. • Not turned on and off per scan but turned on and off even during scan if corresponding time has elapsed. • Starts with off when power is turned on 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. • 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 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 ON: During pause			
M9042	Stop status contact	OFF:Not during stop 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 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 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.) When switched from OFF to ON: STRA instruction When switched from ON to OFF: STRAR instruction The value stored in D9044 is used as the condition for the sampling trace. At scanning, at time → Time (10 msec unit)	△	Unusable with A1 and A1N.
M9045	Watchdog timer (WDT) reset	OFF:WDT not reset 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 ON: During trace	• Switched on during sampling trace.	△	Unusable with A1 and A1N.
M9047	Sampling trace preparation	OFF: Sampling trace stop 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. 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. 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. ON: 16 characters are output.	• When M9049 is off, up to NUL (00_H) code are output. • 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 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 ON: Disable	• Switched on to disable the CHG instruction. • 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 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 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 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 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 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 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 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.) • Turned off when communication with all re-mote terminal modules is restored to normal with automatic online return enabled. • Remains on when automatic online return is disabled. • Not turned on or off when communication is suspended at error detection.	—	Usable with A2C and A52G
M9061	Communication error	OFF: Normal ON: Error	• Turned on when communication with a remote terminal module or an I/O module is faulty. • Communication error occurs due to the following reasons. • Initial data error • Cable breakage • Power off for remote terminal modules or I/O modules • Turned off when communication is restored to normal with automatic online return enabled • 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 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 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 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.) • Turned off when communication with all I/O modules is restored to normal with automatic online return enabled. • Remains on when automatic online return is disabled. • 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 ON: Line check	• Turned on when line check with I/O modules and remote terminal modules is performed. • 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. ON: Outputs are retained.	• Sets whether all outputs are turned off or retained at communication error. OFF: All outputs are turned off at communication error. 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 ON: Reading time reduction ON	• Turn on to reduce the search time of A8UPU/ A8PUJ. (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 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 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 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 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 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 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 ON: Successfully completed writing to ROM	• Turned on when writing to the built-in ROM is successfully completed. (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. 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 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 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 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
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:
Setting value > Accumulation time:
Turns M9077 ON and clears the accumulation time.
Setting value < Accumulation time:
Turns M9077 from ON to OFF and clears the accumulation time. When M9077 is already OFF, clears the accumulation time.
* When 1 to 255 is designated at D9077, M9077 is turned ON at the first scan.
* 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
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
ON: Data error</td><td>• Turned on when the positioning data of the servo program designated by the DSFRP instruction has an error.
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
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.
OFF: Number of remaining instructions executable simultaneously: 1 to 10
ON: Number of remaining instructions executable simultaneously: 0
By assigning M9080 as execution condition, the number of instructions above executed simultaneously at one scan can be limited to 10 or less.
*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 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 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. • 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 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): • Fuse blown • I/O unit verify error • Battery error	△	Unusable with An, A2C and A3V.
M9086	BASIC program RUN flag	OFF: A3M-BASIC stop 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 ON: A3M-BASIC disable	• Specifies enable/disable of A3M-BASIC execution when the A3MCPU is in PAUSE state. OFF: A3M-BASIC is executed. ON: A3M-BASIC is not executed.	—	Dedicated to A3M.
M9090	Power supply problem status on the PC side	OFF: Normal 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. It stays on even after the status becomes normal.	—	Dedicated to A2USH board
*1 M9091	Operation error detail flag	OFF: No error 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 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 ON: Power off	• Turns on when the external power being supplied to the CPU board is shut off. It stays on even after the status becomes normal.	—	Dedicated to A2USH board
M9092	Duplex power supply overheat error	OFF: Normal ON: Overheat	• Turned on when overheat of a duplex power supply module is detected.	—	Dedicated to A3V.
M9093	Duplex power supply error	OFF: Normal 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 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.) • 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. • 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 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 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 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 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 ON: Error	• Turned on when a self-check error occurred on the A3VTU.	—	Dedicated to A3V.
M9100	SFC program registration	OFF: No SFC program 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 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 ON: Continuous start	• Selects the starting step when the SFC program is restarted using M9101. ON: Started with the step of the block being executed when the program stopped. OFF: All execution conditions when the SFC program stopped are cleared, and the program is started with the initial step of block 0. • Once turned on, the program is latched in the system and remains on even if the power is turned off. 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 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. ON: Consecutive transfer is executed. 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 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 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 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. 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 ON: Trace enable	• Selects sampling trace execution enable/disable. ON: Sampling trace execution is enabled. 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 ON: Coil output on	• Selects the operation output when block stop is executed. ON: Retains the ON/OFF status of the coil being used by using operation output of the step being executed at block stop. 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 M9198	Fuse blow, I/O verify error display switching	M9197 / M9198 / I/O numbers to be displayed: OFF / OFF / X/Y0 to 7F0 ON / OFF / X/Y800 to FF0 OFF / ON / X/Y1000 to 17F0 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 ON: Data recovery ON	• When sampling trace / status latch is executed, the setting data stored in the CPU module is recovered to enable restart. • 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)

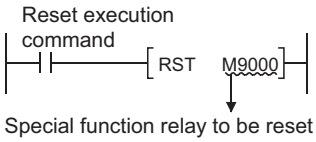
*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

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.
(Cleared when all contents of D9100 to D9107 are reset to 0.)
• Fuse blow check is executed also to the output modules of remote I/O stations.</td><td>△</td><td>Unusable with A0J2H.
(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.
(Cleared when all contents of D9116 to D9123 are reset to 0.)
• I/O module verify check is executed also to the modules of remote I/O terminals.</td><td>△</td><td>Unusable with A0J2H.
(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).
• 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)

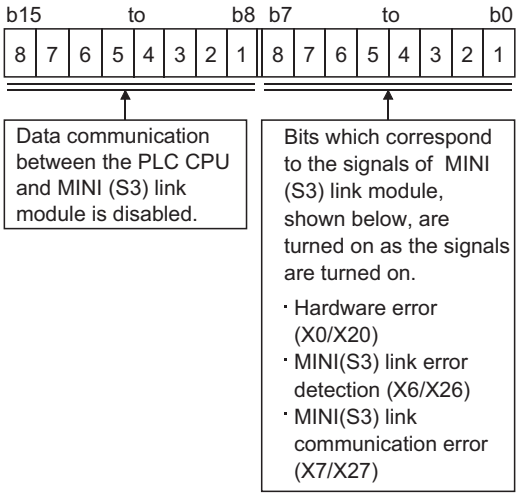
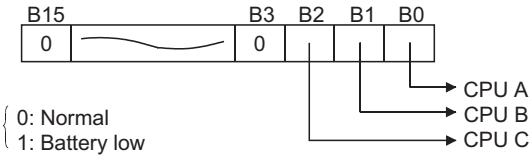
Number	Name	Description	Details	Applicable CPU	
D9003	SUM instruction detection bits	The number of bits detected by SUM instruction detection.	• The number of bits detected by execution of the SUM instruction are stored. in BIN code and updated every execution thereafter.	—	Dedicated to A0J2H.
*1 D9004	MINI link master module error	Error detection status	• Error status of the MINI (S3) link detected on loaded MINI (S3) link module is stored. 	—	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. 	—	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. • 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. • 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)

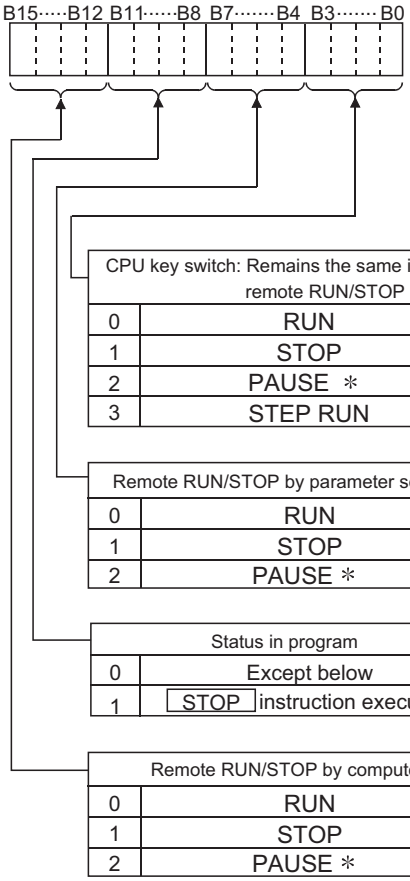
Number	Name	Description	Details	Applicable CPU	
D9010	Error step	Step number at which operation error has occurred	• When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in BIN code. Thereafter, each time operation 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: 0. Both input and output in direct mode 1. Input in refresh mode, output in direct mode 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.  * 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 1: RAM 2: E^2PROM	• 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) 1: Main program (RAM) 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) 1: Main program (RAM) 2: Subprogram 1 (RAM) 3: Subprogram 2 (RAM) 4: Subprogram 3 (RAM) 5: Subprogram 1 (ROM) 6: Subprogram 2 (ROM) 7: Subprogram 3 (ROM) 8: Main program (E^2PROM) 9: Subprogram 1 (E^2PROM) A: Subprogram 2 (E^2PROM) B: Subprogram 3 (E^2PROM)	• 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. 0: No setting 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. • 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)

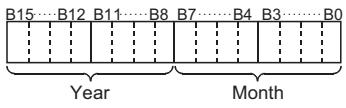
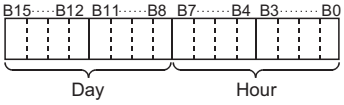
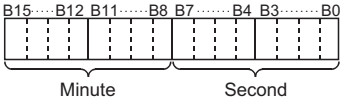
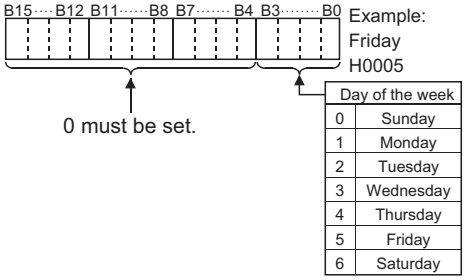
Number	Name	Description	Details	Applicable CPU	
*2 D9025	Clock data	Clock data (Year, month)	• Stores the year (2 lower digits) and month in BCD.  Example: 1987,July H8707	△	Unusable with An, A3H, A3M, A3V, A2C and A0J2H.
*2 D9026	Clock data	Clock data (Day, hour)	• Stores the day and hour in BCD.  Example: 31th,10 o'clock H3110	△	
*2 D9027	Clock data	Clock data (Minute, second)	• Stores the Minute and second in BCD.  Example: 35 minutes, 48 seconds H3548	△	
*2 D9028	Clock data	Clock data (, day of the week)	• Stores the day of the week in BCD.  Example: Friday H0005	△	Unusable with An, A3H, A3M, A3V, A2C and A0J2H.

Table App2.2 Special Register List (Continue)

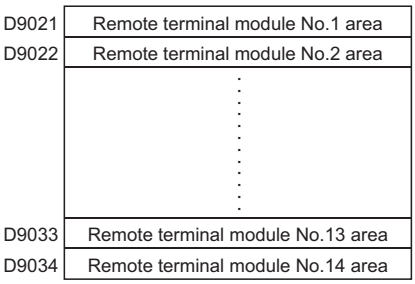
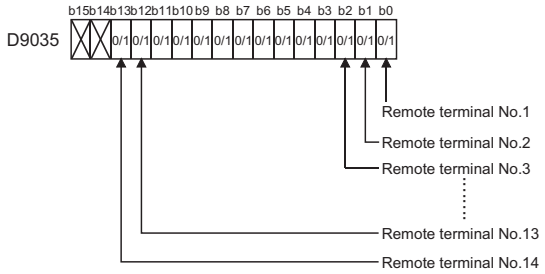
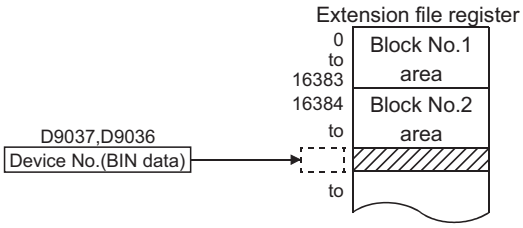
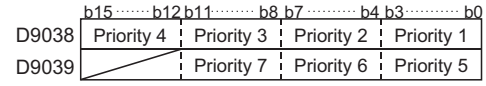
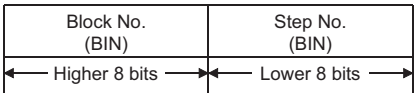
Number	Name	Description	Details	Applicable CPU	
D9021 D9022 D9023 D9024 D9025 D9026 D9027 D9028 D9029 D9030 D9031 D9032 D9033 D9034	Remote terminal parameter setting	1 to 61	• Sets the head station number of remote terminal modules connected to A2C and A52G. Setting is not necessarily in the order of station numbers. A2CCPUC24:1 to 57 Other CPUs:1 to 61 • Data configuration 	—	Usable with A2C and A52G.
D9035	Attribute of remote terminal module	0: MINI standard protocol 1: No protocol	• Sets attribute of each remote terminal module connected to A2C and A52G with 0 or 1 at each bit. 0: Conforms to the MINI standard protocol or remote terminal unit. 1: No-protocol mode of AJ35PTF-R2 • Data configuration 		
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 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. Use consecutive numbers beginning with R0 of block No. 1 to designate device numbers. 	—	Usable with AnA, A2AS, AnU and QCPU-A (A Mode).
D9038 D9039	LED indication priority	Priority 1 to 4 Priority 5 to 7	• Sets priority of ERROR LEDs which illuminate (or flicker) to indicate errors with error code numbers. • Configuration of the priority setting areas is as shown below.  • 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 . At scanning ... 0 At time..... Time (10 ms unit) 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. • 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. 0: No error 80: SFC program parameter error 81: SFC code error 82: Number of steps of simultaneous execution exceeded 83: Block start error 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. 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.
Stores "0" when errors 80, 81 and 82 occurred.
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.
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.
• Stores the step number in a binary value if status latch is executed in a main sequence program.
• Stores the block number and the step number if status latch is executed in a SFC program.
 
</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.
Example: Stores "41H" for version A.
Note)The software version of the internal system may be different from the version marked on the housing.
*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
1: Initial data error
2: Line error</td><td>• Stores error code when M9061 is turned on (communication with I/O modules or remote terminal modules fails).
• 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.
• 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)

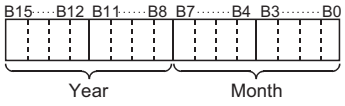
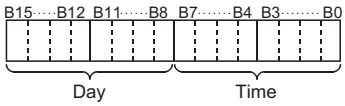
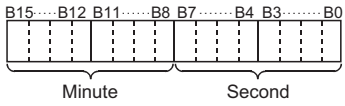
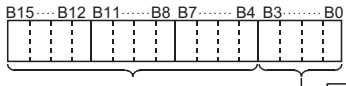
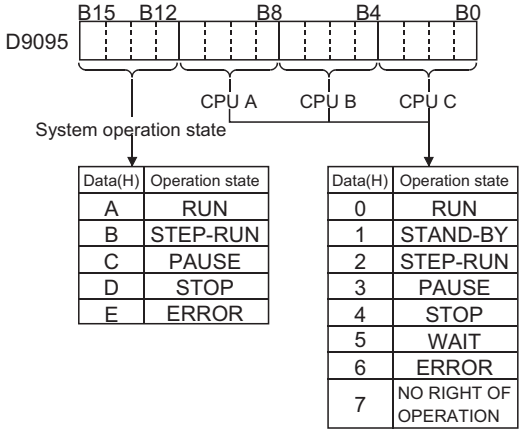
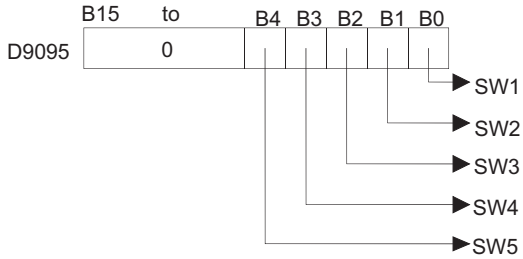
Number	Name	Description	Details	Applicable CPU	
D9068	Abnormal base module	Stores the bit pattern of the abnormal base module	Stores the bit pattern of the base module in abnormal condition. When basic base module is abnormal: Bit 0 turns ON. When 1st expansion base module is abnormal: Bit 1 turns ON. When 2nd expansion base module is abnormal: Bit 2 turns ON. : : 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.  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.  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.  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. 0: Writing enabled F1H: During RAM operation F2H: Writing to built-in ROM disabled F3H: Failed to erase F4H: Failed to write FEH: Checking erasing 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.  These digits are always set to 0. 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. Statuses of DIP switch 3 and M9073 0: SW3 is OFF, M9073 is OFF/ON 1: SW3 is ON, M9073 is OFF 2: SW3 is ON, M9073 is ON	—	Dedicated to QCPU-A (A Mode)

Table App2.2 Special Register List (Continue)

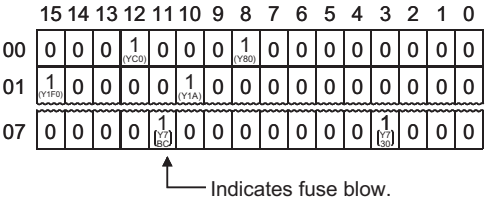
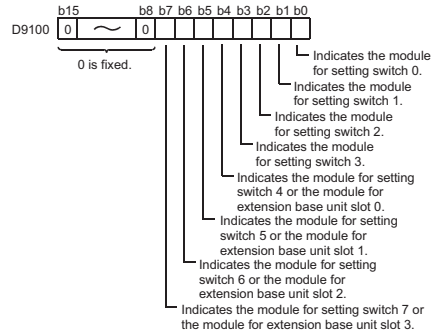
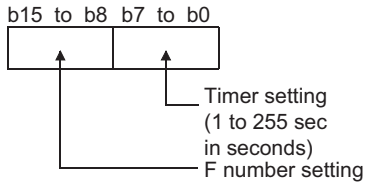
<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9077</td><td>Sequence accumulation time measurement</td><td>Accumulation time setting</td><td>• Stores the accumulation time used by M9077.
Setting range: 1 to 255ms (Default: 5ms)
* 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.
(With QCUP-A or AnUCPU)
Number of remaining instructions being executable = 10 – Number of instructions executed simultaneously
(With AnSHCPU)
Number of remaining instructions being executable = 64 – Number of instructions executed simultaneously
*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.
• Setting range: 1 s to 65535 s (1 to 65535)
• Setting unit: 1 s
• 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.  Data(H) / Operation state: A RUN; B STEP-RUN; C PAUSE; D STOP; E ERROR 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. 0:ON 1:OFF 	—	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. • 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. • 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. • 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 *1 D9101 *1 D9102 *1 D9103 *1 D9104 *1 D9105 *1 D9106 *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.)  • Fuse blow check is executed also to the output module of remote I/O station. (If normal status is restored, clear is not performed. Therefore, it is required to perform clear by user program.) (For the AnU, A2US(H) and QCPU-A (A mode)) • Data clear of D9100 to D9107 is executed by turning off M9000 (fuse blown). (For the CPU other than the AnU, A2US(H) and QCPU-A (A mode)) • Data clear of D9100 to D9107 is executed by turning off D9100 to D9107 (fuse blown).	○	Usable with all types of CPUs 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. 	—	Dedicated to A0J2H.
*2 D9108 *2 D9109 *2 D9110 *2 D9111 *2 D9112 *2 D9113 *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.  (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)

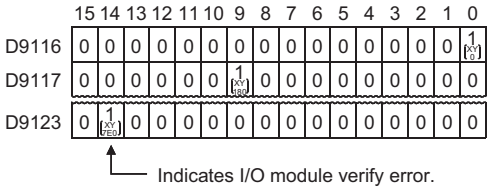
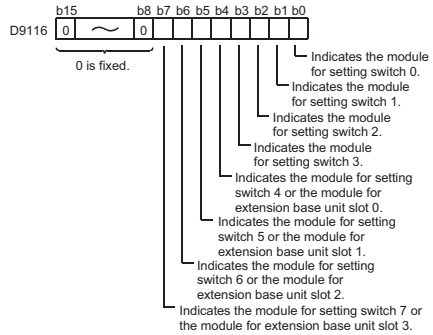
Number	Name	Description	Details	Applicable CPU	
*1 D9116 *1 D9117 *1 D9118 *1 D9119 *1 D9120 *1 D9121 *1 D9122 *1 D9123	I/O module verify error	Bit pattern in units of 16 points of verify error units	• When I/O modules, of which data are different from those entered at power-on, have been detected, the 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.)  • I/O module verify check is executed also to remote I/O station modules. (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 (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. 	—	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.) • 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
D9126
D9127
D9128
D9129
D9130
D9131
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.
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.
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.
When there are 8 annunciator detections, the 9th one is not stored into D9125 to 9132 even if detected.
<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
D9134
D9135
D9136
D9137
D9138
D9139
D9140</td><td>Remote terminal card information</td><td>00: No I/O module or remote terminal module or initial communication impossible
01: Input module or remote terminal module
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.
• Information of I/O modules and remote terminal modules is for input, output and remote terminal module identification and expressed as 2-bit data.
00: No I/O module or remote terminal module or initial communication is impossible.
01: Input module or remote terminal module
10: Output module
• Data configuration
<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)

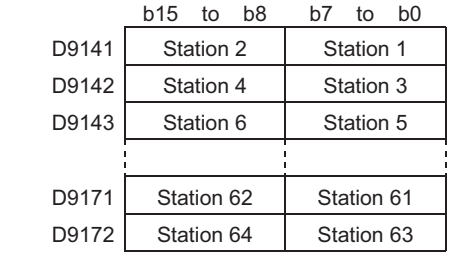
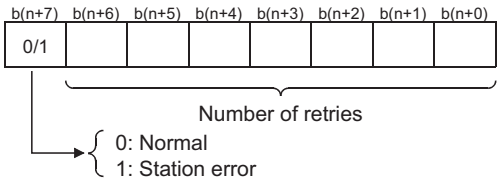
Number	Name	Description	Details	Applicable CPU	
D9141 D9142 D9143 D9144 D9145 D9146 D9147 D9148 D9149 D9150 D9151 D9152 D9153 D9154 D9155 D9156 D9157 D9158 D9159 D9160 D9161 D9162 D9163 D9164 D9165 D9166 D9167 D9168 D9169 D9170 D9171 D9172	Number of times of retry execution	Number of retries	• Stores the number of retries executed to I/O modules or remote terminal modules which caused communication error. (Retry processing is executed the number of times set at D9174.) • Data becomes 0 when communication is restored to normal. • Station number setting of I/O modules and remote terminal modules is as shown below.  • Retry counter uses 8 bits for one station.  * "n" is determined by station number of I/O module or remote terminal module. Odd number stations: b0 to b7 (n = 0) 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
1: Automatic online return disabled
2: Transmission stop at online error
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.
• Communication with normal stations is continued.
• 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.
• Communication with normal stations is continued.
• 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.
• 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.
• Set for 5 times at power on.
• Set range: 0 to 32
• 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).
• 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
D9181
D9182
D9183
D9184
D9185
D9186
D9187
D9188
D9189
D9190
D9191
D9192
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.
• The error code storage areas for each remote terminal module are as shown below.
D9180 Remote terminal module No.1
D9181 Remote terminal module No.2
D9182 Remote terminal module No.3
⋮
D9192 Remote terminal module No.13
D9193 Remote terminal module No.14
Remote terminal module numbers from 1 to 14 are set with D9020 to D9034.
• Error code is cleared in the following cases.
• When the RUN key switch is moved from STOP to RUN.
(D9180 to D9183 are all cleared.)
• 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)

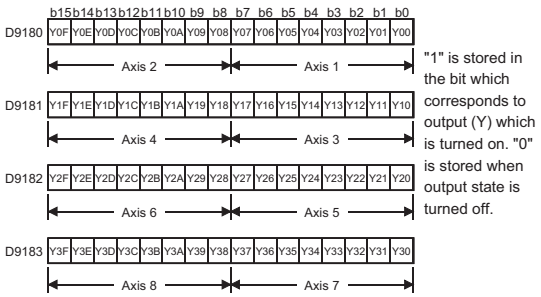
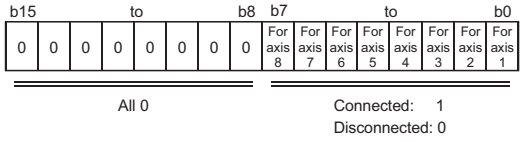
Number	Name	Description	Details		
D9180	Limit switch output state torage areas for axes 1 and 2	Bit pattern of limit switch function output state	• Stores output state of limit switch function.  "1" is stored in the bit which corresponds to output (Y) which is turned on. "0" is stored when output state 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. 0 : Normal 1 : A73CPU hardware error 2 : PCPU error 10: A70AF error 11: A70AF error 12: A70MDF error 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. 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. 	—	Dedicated to A73.

Table App2.2 Special Register List (Continue)

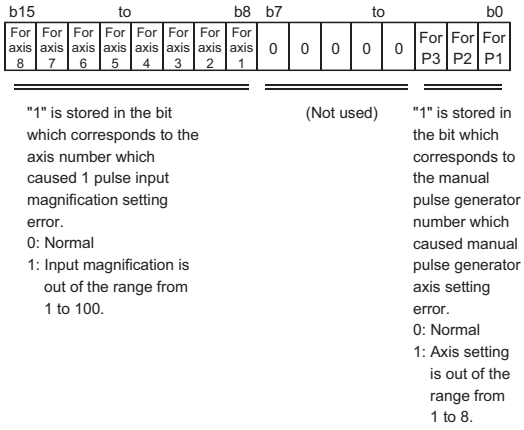
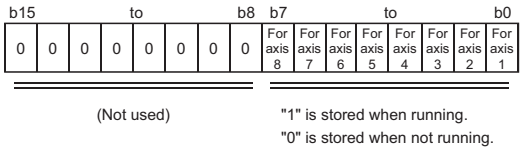
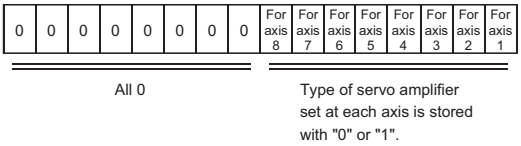
Number	Name	Description	Details		
D9187	Manual pulse generator axis setting error	Manual pulse generator axis setting error code	• Stores error code when the manual pulse generator axis setting error flag (M9077) is turned on in the bit each corresponds to each axis number. 	—	Dedicated to A73.
D9188	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. 	—	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. 0: MR-SB/MR-SD/MR-SB-K is connected or not connected. 1: General-purpose servo amplifier is connected. 	—	Dedicated to A73.

Table App2.2 Special Register List (Continue)

Number	Name	Description	Details		
D9196 D9197 D9198 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). (Bit which corresponds to a faulty station is set when normal communication cannot be restored after executing the number of retries set at D9174.) • If automatic online return is enabled, bit which corresponds to a faulty station is reset (0) when the station is restored to normal. • 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

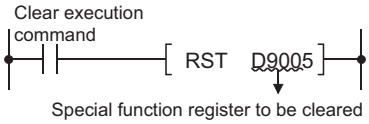
1: Error
0: Normal

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 PRECAUTIONS FOR REPLACING THE EXISTING SYSTEM WITH AnACPU SYSTEM

Appendix3.1 Power Supply Module

Power supply modules used with the existing CPU modules shown below can be used.

Existing CPU module	A3HCPU, AnNCPU, AnCPU

CAUTION
Current consumption at 5VDC differs depending on the CPU module. Check the current consumption of the system. (Refer to Section 5.1)

Appendix3.2 Memory Cassette

Memory cassettes used with the existing CPU modules shown below can be used.

Existing CPU module	A3HCPU, AnNCPU, AnCPU

CAUTION
Compatible memory cassettes are models described in Section 7.2, in addition to A3MCA-0, 2, 4, 6, 8, 12, and 18, which are AnCPU-compatible.

Appendix3.3 Special Function Module

Applicability of special function modules is shown below in accorance with each existing CPU module type.

Item	Existing CPU module		
	A3HCPU	AnNCPU	AnCPU
Applicable module	All modules are applicable except for the one(s) specified as nonapplicable module(s).	All modules are applicable except for the one(s) specified as nonapplicable module(s).	All modules are applicable except for the one(s) specified as nonapplicable module(s).
Nonapplicable module	AJ71C23	• AJ71C23 • AJ71C24 (products manufactured in February 1987 or earlier) • AD51 (products manufactured in March 1987 or earlier)	

Appendix3.4 Peripheral Device

The following peripheral devices and the GPP function software packages can be used with an AnACPU:

- A6GPPE/A6PHP SW3GP-GPPAEE
- A6HGPE.....SW3-HGP0
- A7LMS.....SW0S-GPPA
- A6WU .....Must be compatible with A3H.
- A7PU .....Must be compatible with A3H.

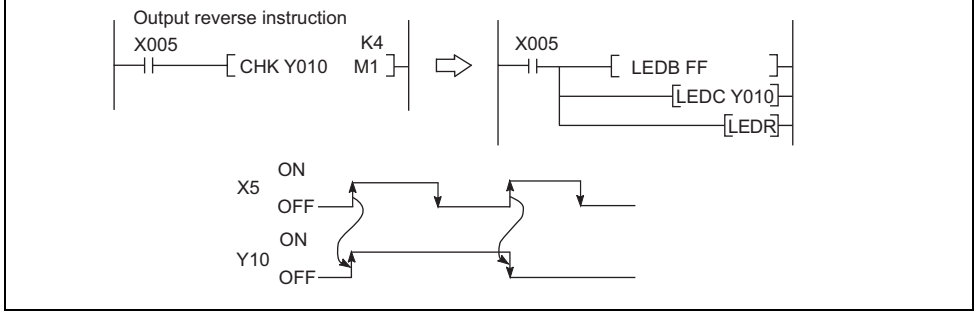
The peripheral devices and the GPP function software packages above are compatible with existing CPUs such as A3H, AnN, and AnCPU. These can be used with an AnACPU unless expanded functions and devices are used.
All dedicated instructions except those for special function modules can be programmed.

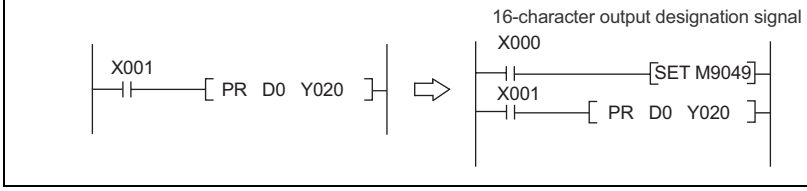
Appendix4 PRECAUTIONS FOR UTILIZING THE EXISTING SEQUENCE PROGRAMS FOR AnACPU

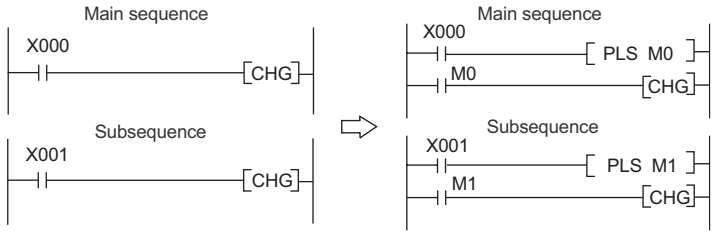
This chapter describes precautions for utilizing programs that were created for the AnACPU, A3HCPU, AnNCPU, or AnCPU for AnACPU.

Appendix4.1 Instructions with Different Specifications

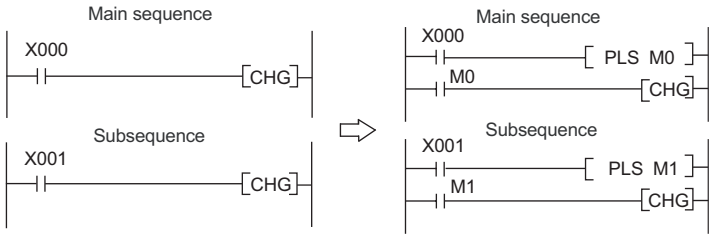
This section explains whether the sequence program must be modified when the instructions with different specifications are used.

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Instruction</th><th colspan="3">Existing CPU Module</th></tr>
<tr><th>A3HCPU</th><th>AnNCPU</th><th>AnCPU</th></tr>
<tr><td>1</td><td>Indexing</td><td colspan="3">Modification not required (The indexing specified by the existing CPU can be utilized without any modification.)</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">CHK instruction</td><td>Modification not required</td><td>1) In direct mode:
Modification not required
2) In refresh mode:
Modification required
(Refer to (1) below.)</td><td>Modification not required</td></tr>
<tr><td colspan="3">(1) AnNCPU
 
</td></tr>
</table>

<table>
<tr><td rowspan="2">No.</td><td rowspan="2">Instruction</td><td colspan="3">Existing CPU Module</td></tr>
<tr><td>A3HCPU</td><td>AnNCPU</td><td>AnCPU</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">PR instruction</td><td>Modification not required</td><td>Modification not required</td><td>Modification required
(Refer to (1) below.)</td></tr>
<tr><td colspan="3">(1) AnCPU
 
</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">DI/EI instruction</td><td>Modification not required</td><td>1) With special relay M9053 OFF: Modification not required
2) With special relay M9053 ON: Modification required, utilization not possible (Refer to (1) below.)</td><td>Modification not required</td></tr>
<tr><td colspan="3">(1) AnNCPU
• When M9053 is turned ON, link refresh enable/disable (EI, DI) can be executed.
• As the AnACPU performs link refresh in the END processing, enabling/disabling of link refresh during the sequence program execution is not allowed. Therefore, modify the sequence program.</td></tr>
</table>

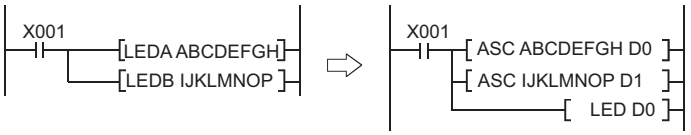
<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Instruction</th><th colspan="3">Existing CPU Module</th></tr>
<tr><th>A3HCPU</th><th>AnNCPU</th><th>AnCPU</th></tr>
<tr><td rowspan="2">5</td><td rowspan="2">CHG instruction</td><td>Modification not required</td><td>Modification not required
(Refer to (1) below.)</td><td>Modification required
(Refer to (2) below.)</td></tr>
<tr><td colspan="3">(1) AnNCPU
 

The AnACPU always performs the CHG instruction as long as the contacts X0 and X1, which are the execution conditions, are ON.
The AnNCPU executes the CHG instruction only when the execution condition contacts X0 and X1 switch from OFF to ON. To do this with the AnACPU, use the PLS instruction so that inputs to X0 and X1 will be performed by pulses.

(2) AnCPU
(a) With special relay M9050 ON
 

The AnACPU always performs the CHG instruction as long as the contacts X0 and X1, which are the execution conditions, are ON.
With the special relay M9050 ON, the AnCPU executes the CHG instruction only when the execution condition contacts X0 and X1 switch from OFF to ON. To do this with the AnACPU, use the PLS instruction so that inputs to X0 and X1 will be performed by pulses.

(b) With special relay M9050 OFF
When the special relay M9050 is OFF, the AnCPU performs the CHG instruction in the same manner as the AnACPU does. (i.e. always performs the instruction as long as the execution condition contacts X0 and X1are ON.)
When the special relay M9050 is OFF, no modification is required for CHG instructions. Note, however, that the AnACPU and AnCPU (with M9050 OFF) differ in the execution status of the PLS instructions and □P instructions.</td></tr>
</table>

No.	Instruction	Existing CPU Module		
		A3HCPU	AnNCPU	AnCPU
6	LEDA/LEDB instruction	Modification not required (Refer to (1) below.) (1) A3H/AnN/AnCPU 		
7	LEDC instruction	Modification not required		
8	LEDR instruction	Modification not required		
9	SEG instruction	Modification not required		
10	SUB, SUBP instruction	Modification not allowed ... (Utilization not allowed) • As the AnACPU is not designed to store microcomputer programs, SUB instructions for microcomputer program call cannot be used. • To use in the AnACPU, all the data processed in the microcomputer program area has to be changed into those of the dedicated instrutions.		
11	PRC instruction	Modification not required		
12	DXNR instruction	Modification not required		
13	FROM/TO instruction	Modification not required		
14	DFR0/DT0 instruction	Modification not required		
15	All dedicated instructions	–		

Appendix4.2 Special Relays and Special Registers with Different Specifications

Special relays and special registers shown below are not used for AnACPU.
Although no error occurs even if the following special relays and special registers in the original program remain in the newly created program (they will be ignored), it is recommended to delete them from the program.

Existing CPU module	A3HCPU	AnNCPU	AnCPU	Description
M9010	–	○	○	Turns ON when an operation error occurs and OFF when the error is removed.
M9050	–	–	○	A special relay that switches the ON/OFF status of devices at the CHG instruction execution to the reserved memory area.
M9053	–	○	–	A special relay that selects the EI instruction to be used as the link refresh enable instruction or the interrupt enable instruction, or the DI instruction to be used as the link refresh disable instruction or the interrupt disable instruction.

The sysmol ○ indicates the device may be used in the corresponding existing CPU module.

Appendix4.3 Parameter Setting

The parameters set in the existing CPU module can be utilized without any modifications if none of them meets the following conditions.

Setting Item	Description
Microcomputer program capacity	The microcomputer program area of the AnACPU is dedicated for the SFC. "PARAMETER ERROR" occurs if a utility package for the microcomputer program is stored in the microcomputer program area of the existing CPU module.
Module model name registration by I/O assignment (By the system FD compatible with AnACPU)	When the AD57 module or AD57-S1 module is used in the existing system, the utility package of the SW-AD57P is stored in the microcomputer program area. The utility package mentioned above cannot be stored in the AnACPU since it does not have a microcomputer program area. To realize the utility package functions, dedicated instructions for special function modules are provided for the AnACPU. To use the dedicated instructions of the AnACPU, model names of modules must be registered by I/O assignment of the parameters in advance. Conclusion: When an AD57 or AD57-S1 exists, be sure to register the model name of the module by system FD compatible with the AnACPU.

The processing of the following items is different from the parameter setting of the existing CPU module.

Existing CPU module	A3HCPU	AnNCPU	AnCPU
Watchdog timer setting	The set time is ignored, and 200ms is applied.		
I/O control setting	The set control mode is ignored, and I/O refresh mode is applied.	–	–
Interrupt counter setting	The same processing as the interrupt counter of the A3H is applied. (For counting the number of interrupts occurred)	The same processing as the interrupt counter of the AnN is applied. (For counter ladders in interrupt programs)	The same processing as the interrupt counter of the An is applied. (For counter ladders in interrupt programs)

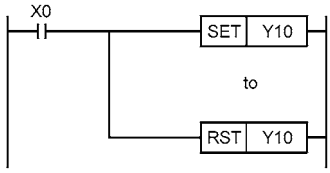
Appendix4.4 I/O Control Mode

The I/O control mode of the AnACPU is the refresh mode (partial direct I/O depending on the instruction), and is different from that of the An, AnN, or A3HCPU. Therefore pay attention to the input timing of the input (X) and the output timing of the output (Y).
The I/O control mode of each CPU module is shown below.

Model	Control Mode	Setting Method
AnCPU	I/O direct mode	Not usable
AnNCPU	The control modes for inputs and outputs are set to direct mode and refresh mode, respectively. (Input direct mode and output refresh mode cannot be set.)	The switch on the AnNCPU main module is used.
A3HCPU	The control modes for inputs and outputs are set to direct mode and refresh mode, respectively.	Set in parameters.

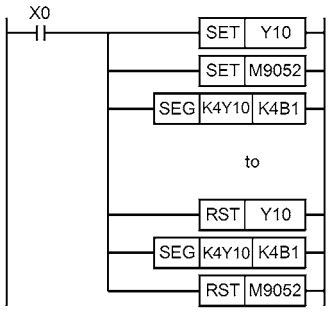
(1) Pulse processing program by the SET/RST instruction
To make the AnACPU execute the pulse output used in the direct method with the SET/RST instruction in the conventional CPUs, create the program as follows:

AnCPU, AnN and A3HCPU in direct mode

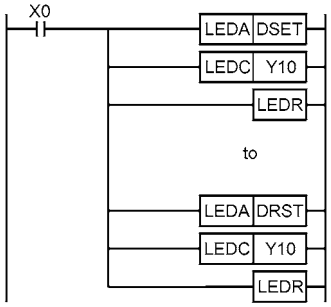


(a) When the ACPU common instructions are used:

AnACPU



(b) When the AnACPU dedicated instructions are used:



POINT

When a special function module such as the AD61(S1) high-speed counter module is used, use the above program if outputting the pulse signals to the module is required.

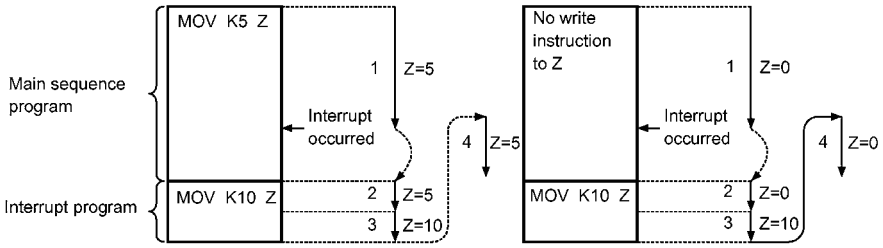
Appendix4.5 Microcomputer Program

Since the microcomputer mode is not supported by the AnACPU, the utility software packages and user-created microcomputer programs used for the A3H, AnN, and AnCPU are not applicable.
When the utility software packages or the microcomputer programs above are used, delete all of the SUB instructions (microcomputer program call) used for executing them from the sequence program.
When the following utility packages are used, modify the program using the AnACPU dedicated instructions.

1) SW□-AD57P .....Type AnACPU/AnUCPU Programming Manual
   (Usable for creating the canvas and character generators.) (AD57 Instructions) IB-66257
2) SW □-UTLP-FNO .....Type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual
   (Dedicated Instructions) IB-66251
3) SW □-UTLP-PID .....Type AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual
   (PID Control Instructions) IB-66258
4) SW□-SIMA
5) SW□-UTLP-FD1 } Unusable
6) SW□-SAPA

Appendix4.6 Index Register Processing

An index register of the AnACPU is rewritten with the value prior to the interrupt program execution when the processing is switched to the main program or sebsequence program even when the value was updated in an interrupt program.



To pass a value written to the index register in an interrupt program to the main sequence program or subsequence programs, store the value to a data register before passing.

Appendix4.7 Data Link Processing

(1) Using the AnACPU on a MELSECNET (II) system

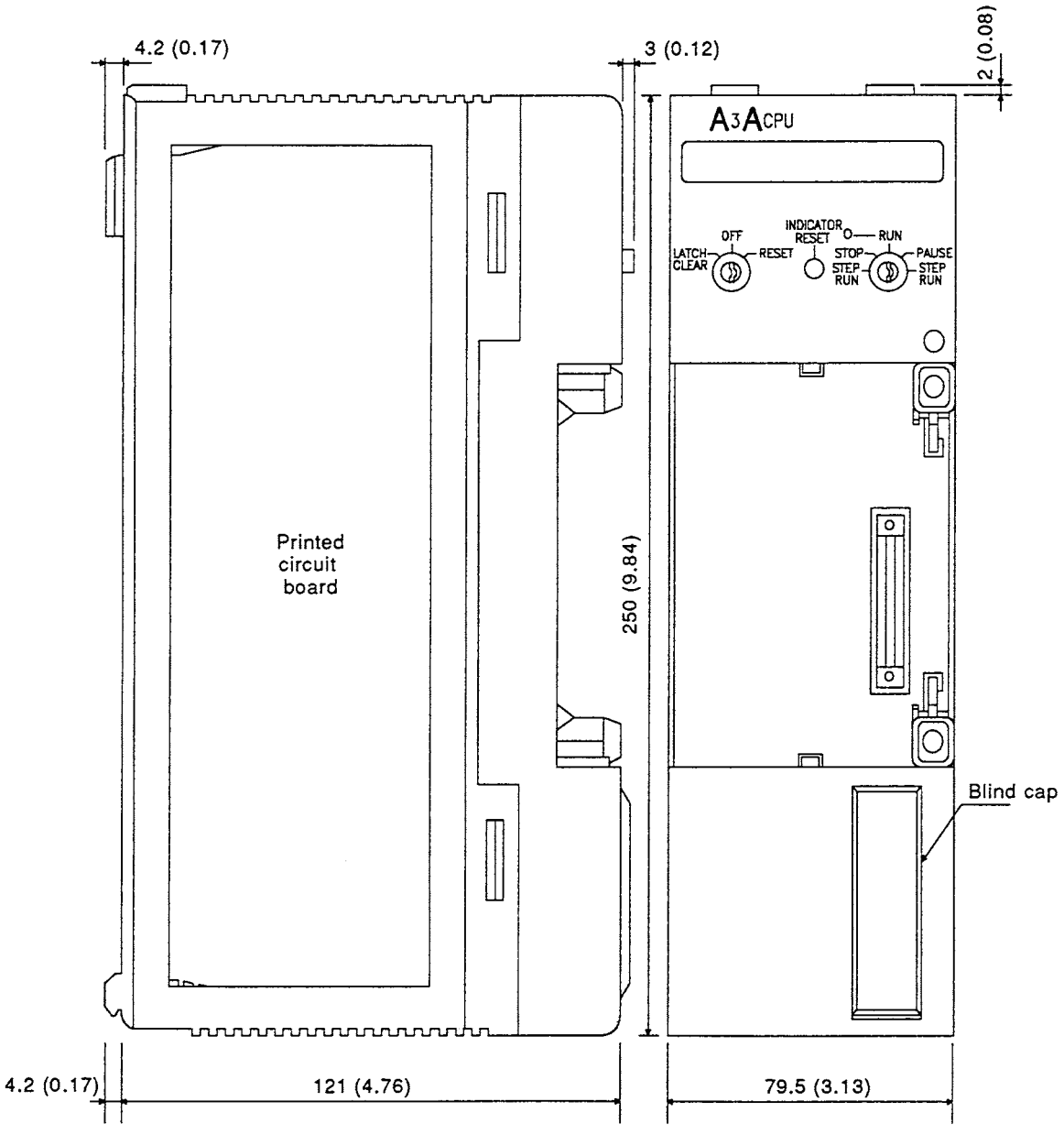
- The link refresh timing of each CPU module differs. If this difference affects program execution, the program must be modified accordingly.
- Actions that must be taken when utilizing programs of an existing CPU module are shown below.

Data Link Method	Existing CPU Module		
	A3HCPU	AnNCPU	AnCPU
Used on master station	Modification not required (Executed after END processing)	• Modification not required when the program scan time is greater than the link scan time (Executed after END processing) • Modification not required when the DI instruction (link interrupt disable) is being executed with M9053 ON (Executed after END processing) • Modification is required when the program scan time is less than the link scan time since link refresh is performed during program execution.	• Modification not required when the program scan time is greater than the link scan time (Executed after END processing) • Modification is required when the program scan time is less than the link scan time since link refresh is performed during program execution.
Used on local station	Modification not required (Executed after END processing)	• The same action as when used on the master station	• Modification is required since link refresh is performed during program execution.

Appendix5 EXTERNAL DIMENSIONS

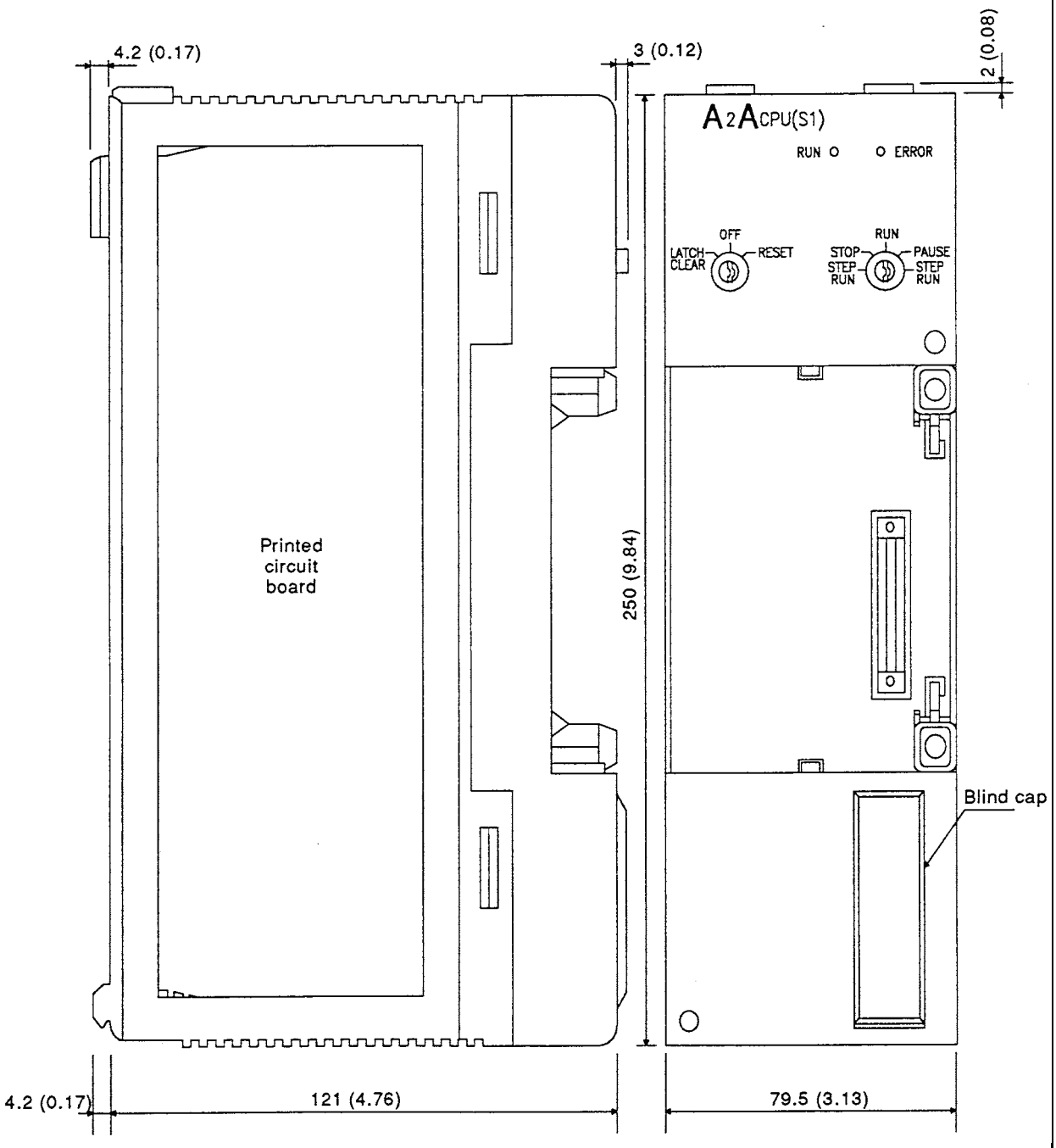
Appendix5.1 CPU Module

(1) A3ACPU module

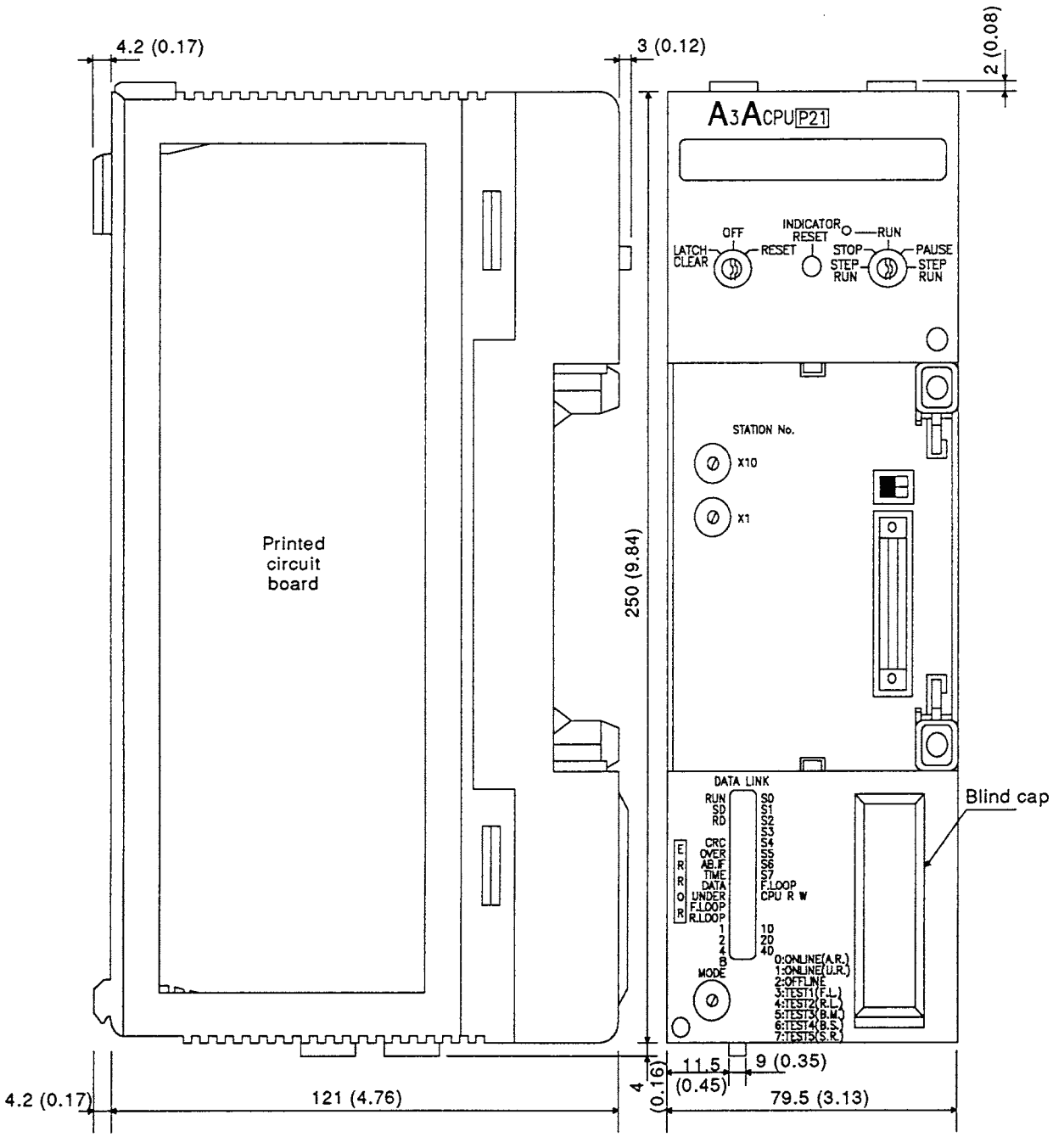


Unit: mm (inch)

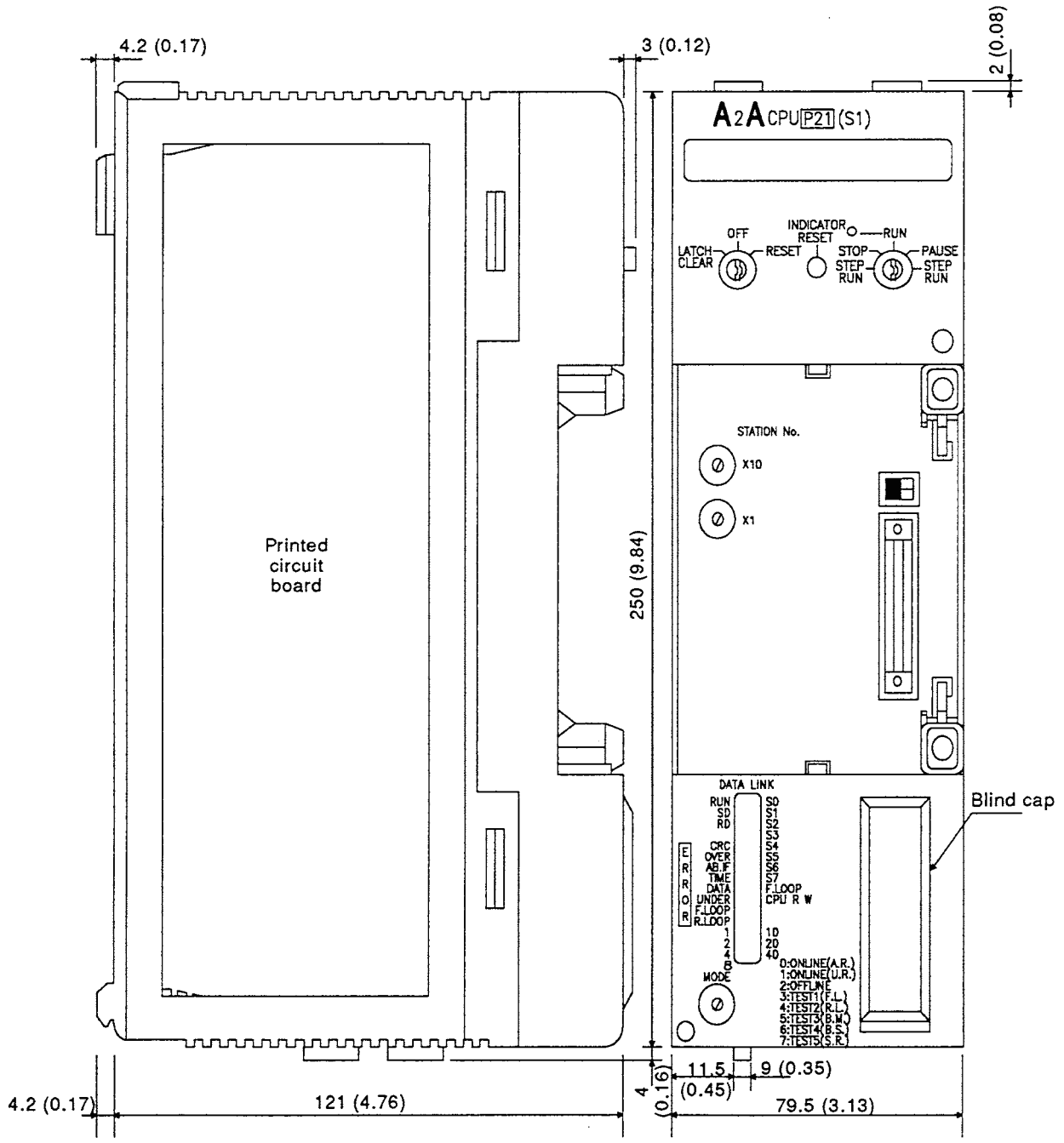
(2) A2ACPU, A2ACPU-S1 module



(3) A3ACPUP21 optical data link module

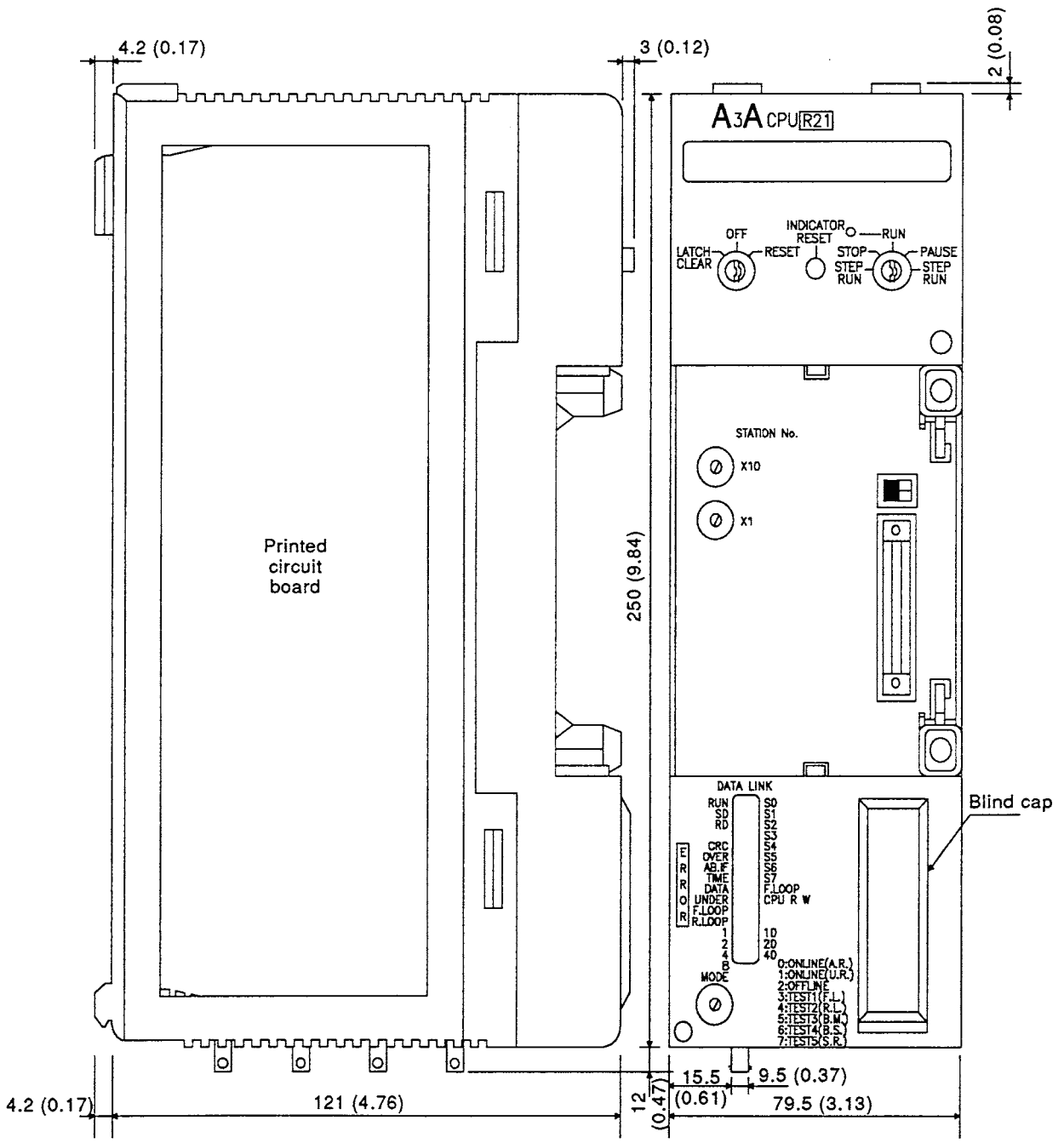


(4) A2ACPU21, A2ACPUP21-S1 optical data link module



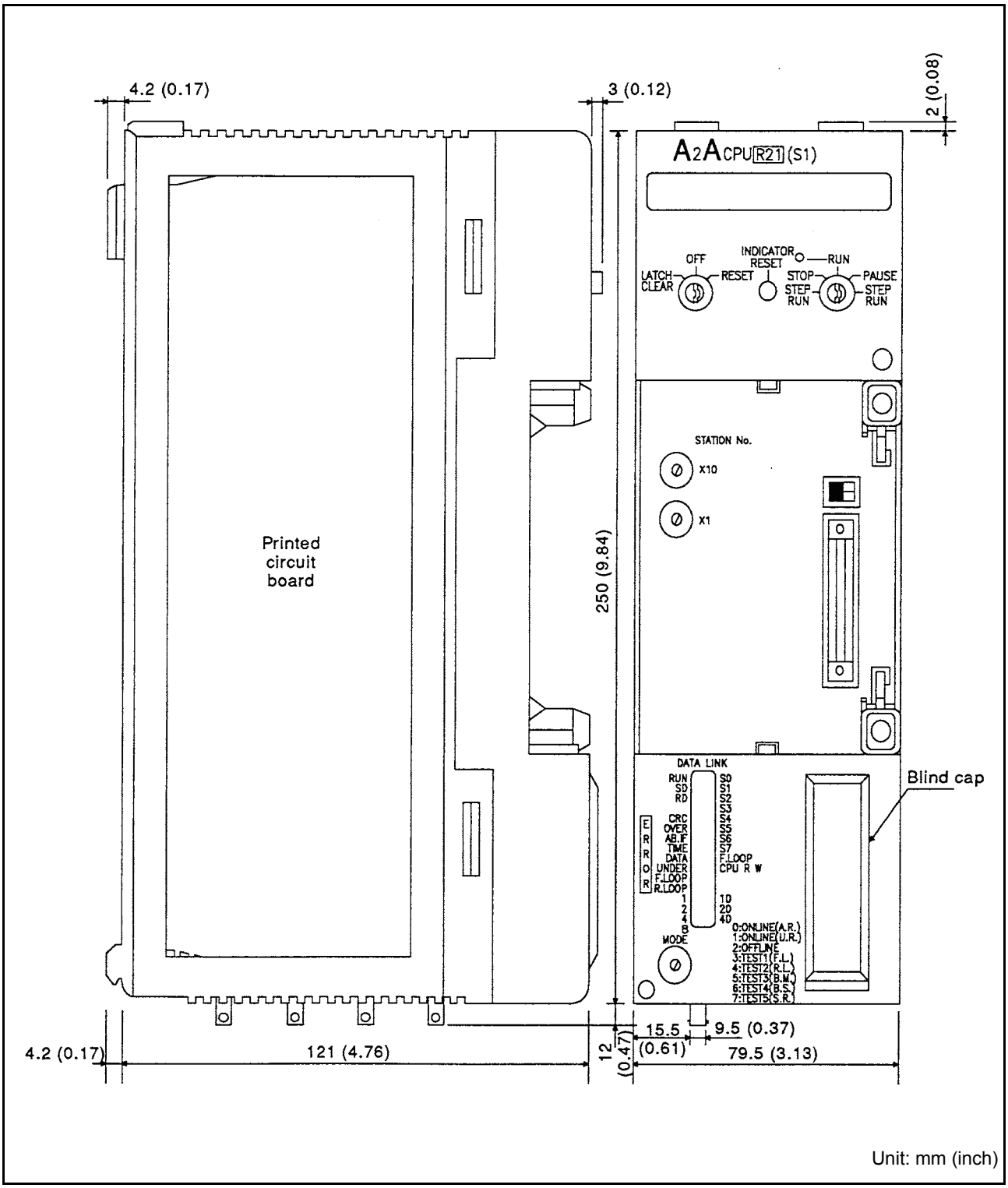
Unit: mm (inch)

(5) A3ACPUR21 coaxial data link module



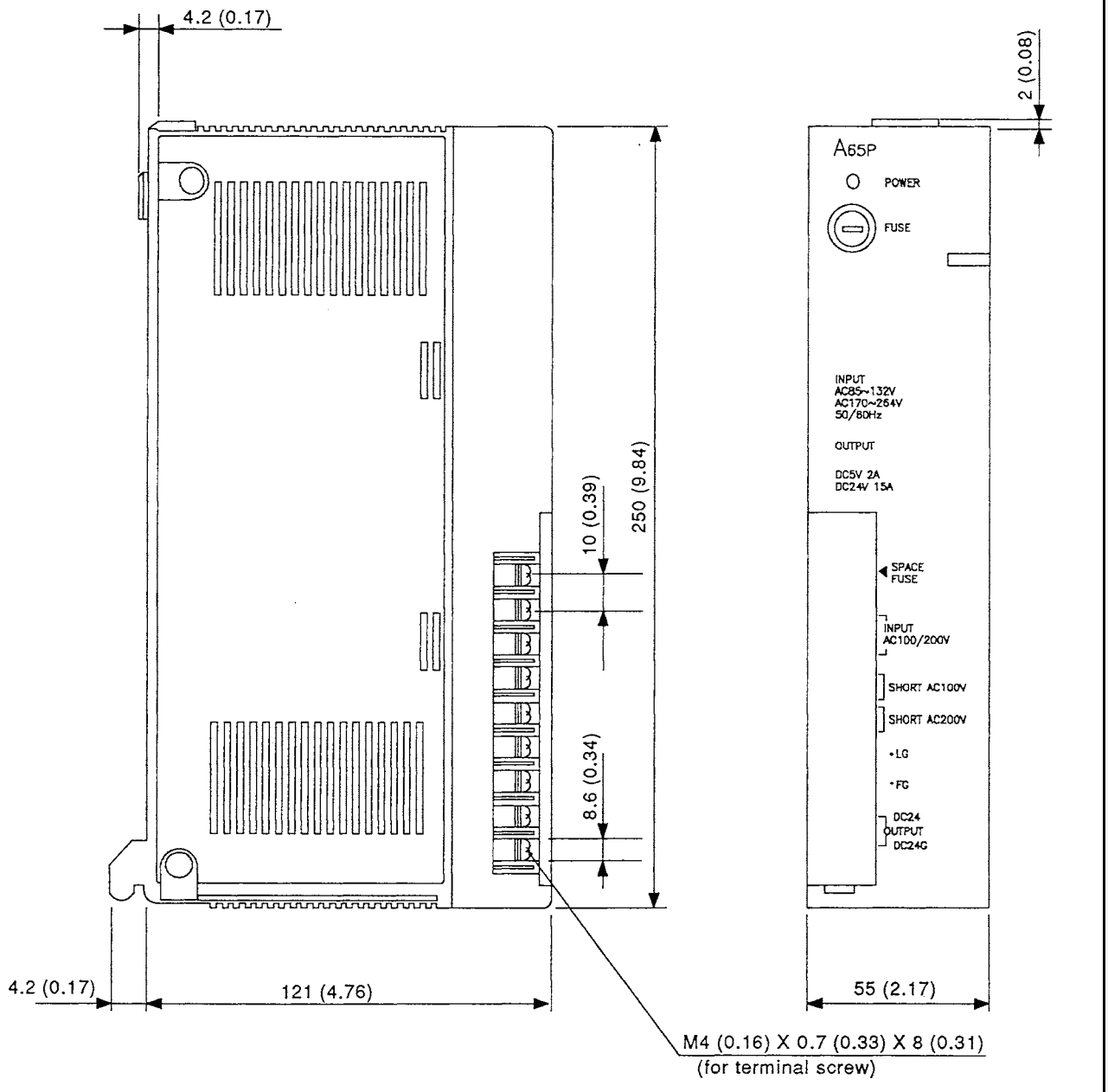
Unit: mm (inch)

(6) A2ACPUR21, A2ACPUR21-S1 coaxial data link module

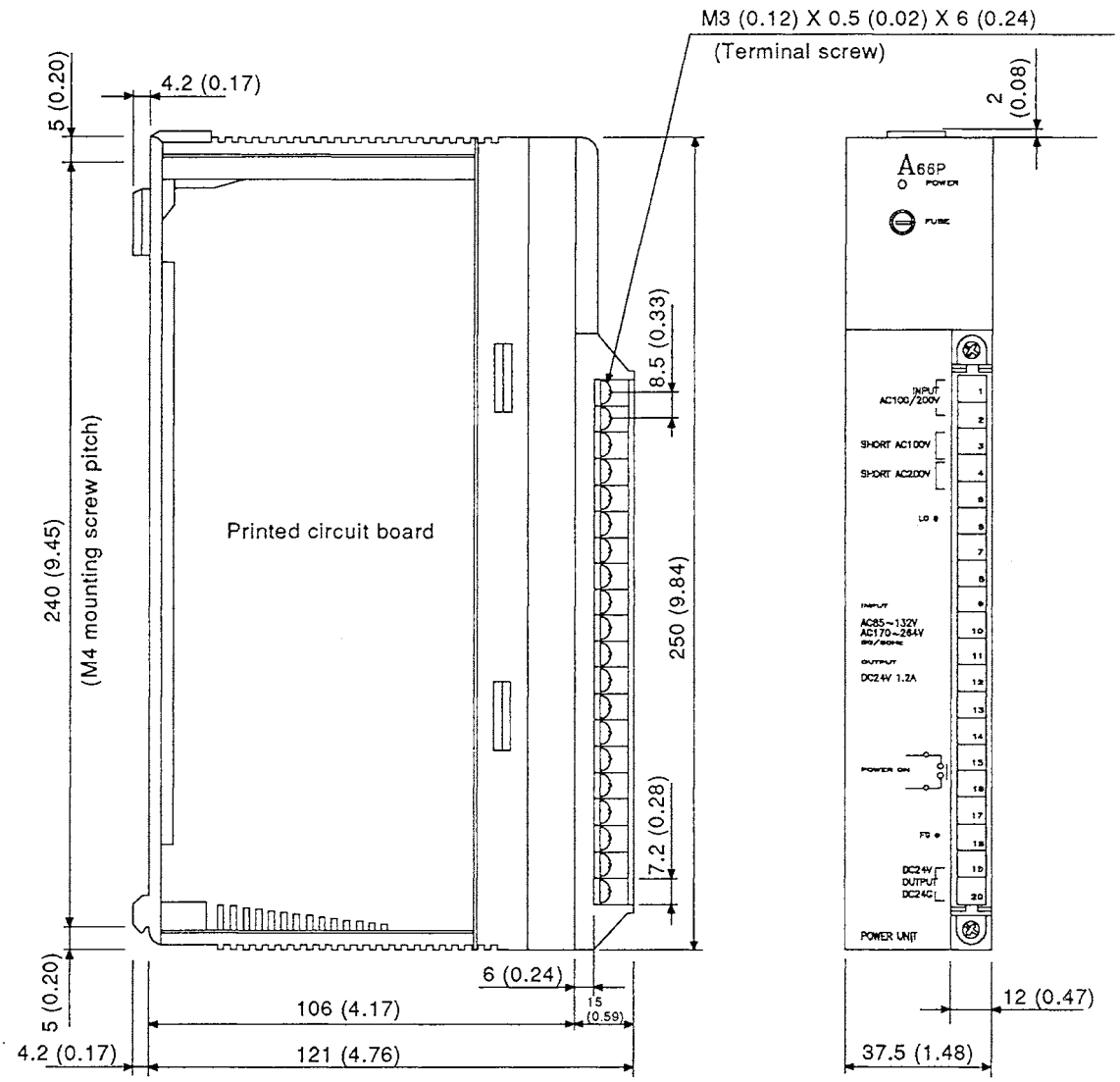


Appendix5.2 Power Supply Module

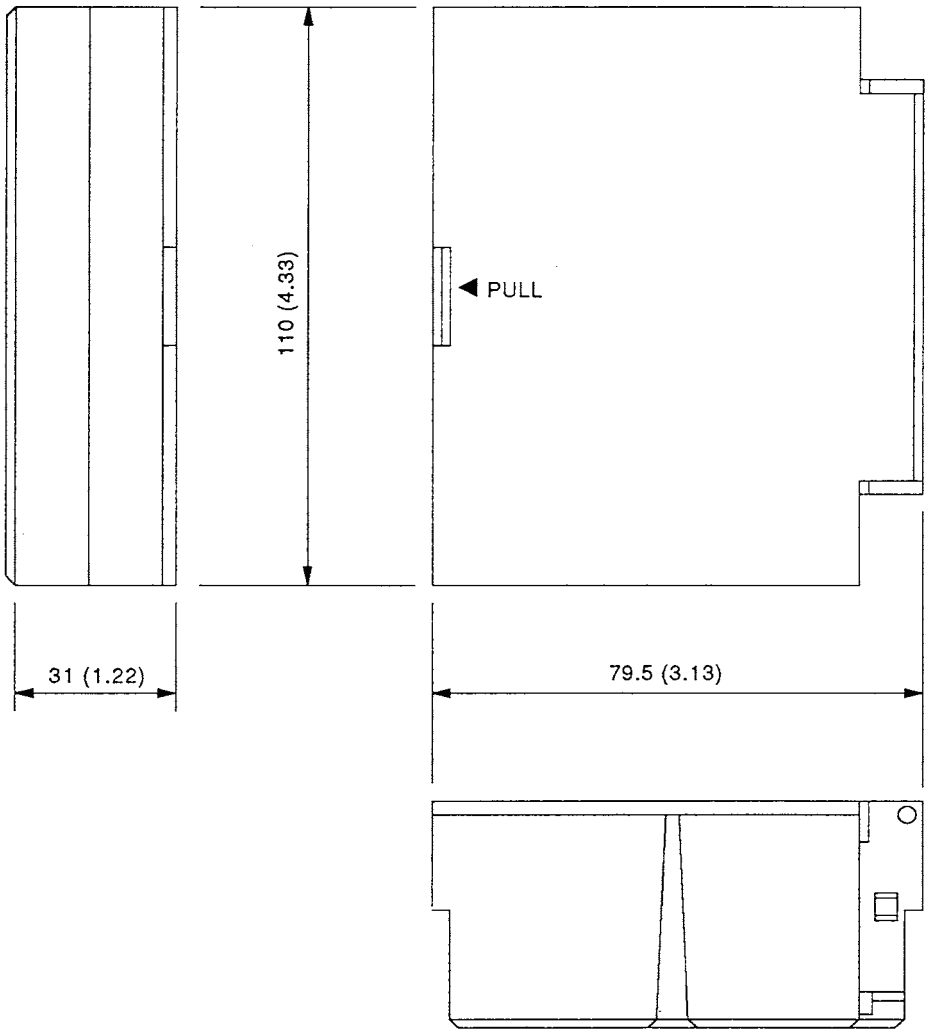
(1) A61P, A61PN, A61PEU, A62P, A62PEU, A63P, A65P, A67P power supply module



(2) A66P power supply module



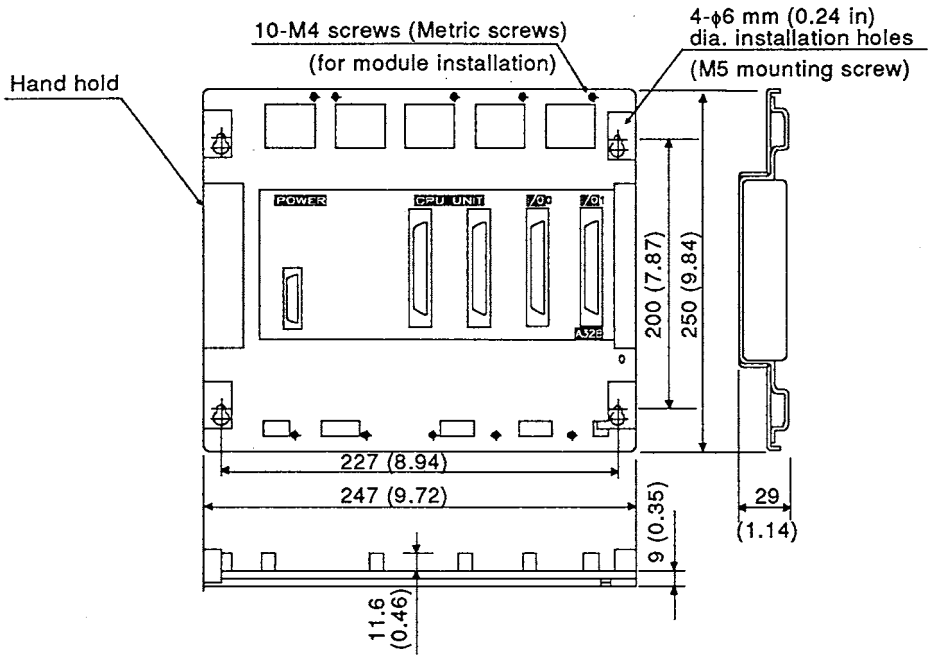
Appendix5.3 Memory Cassette (A3NMCA-□, A3AMCA-96)



Unit: mm (inch)

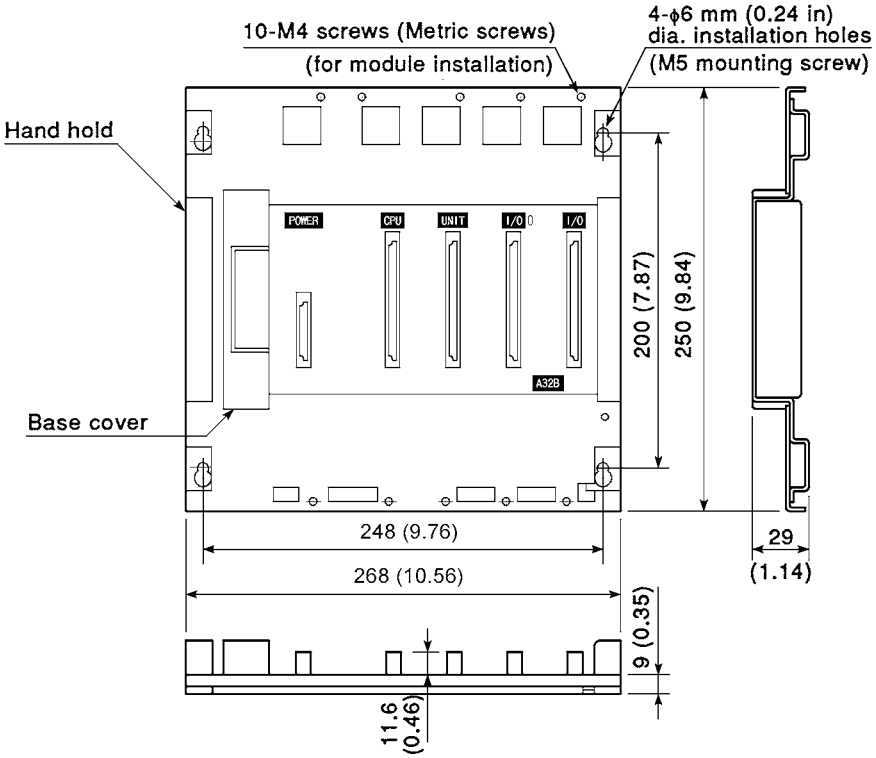
Appendix5.4 Main Base Unit

(1) A32B base unit



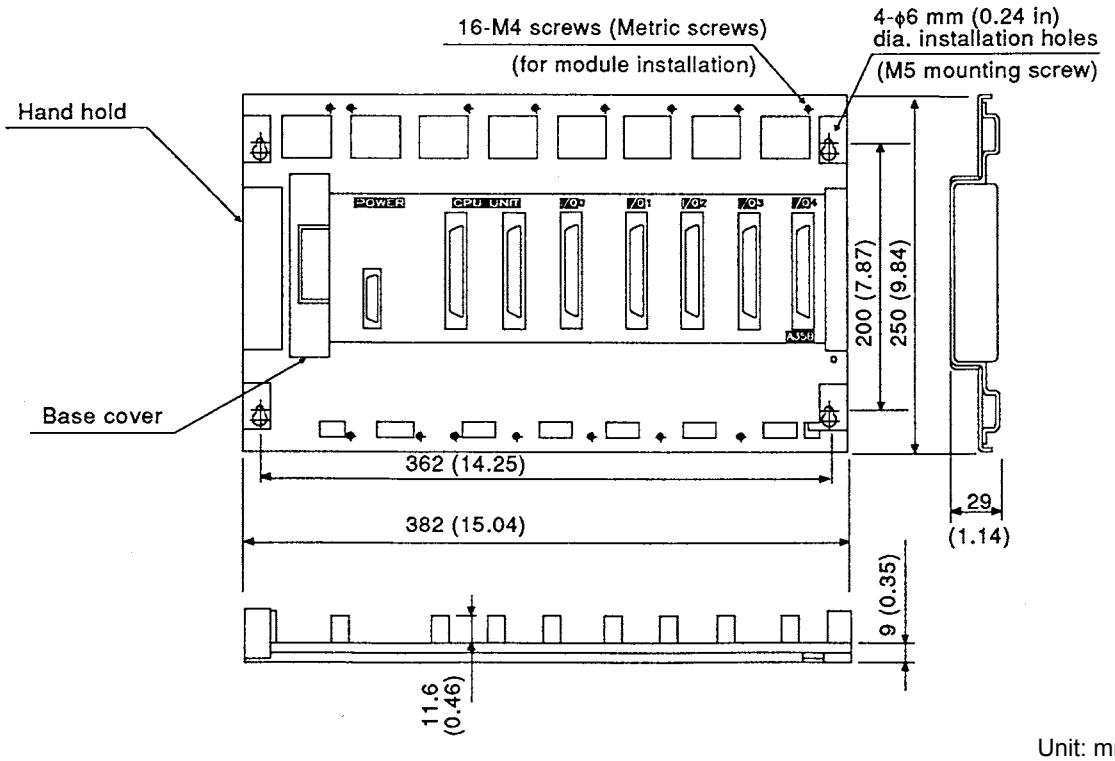
Unit: mm (inch)

(2) A32B-S1 base unit



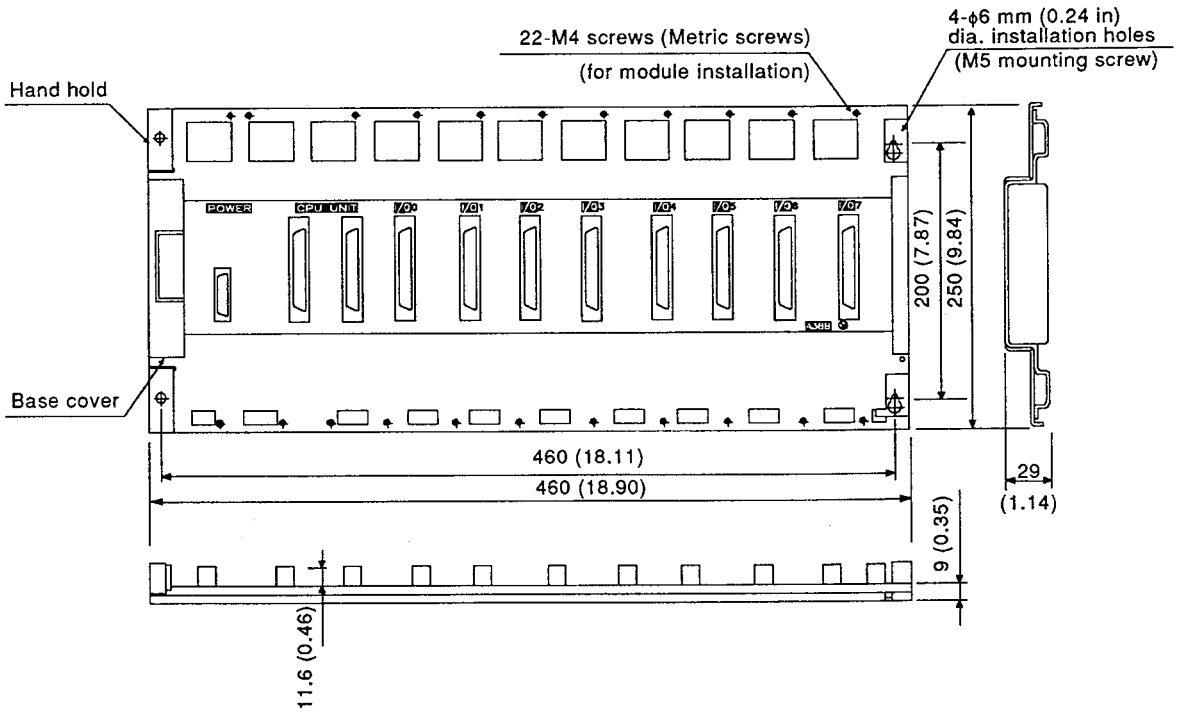
Unit: mm (inch)

(3) A35B base unit



Unit: mm (inch)

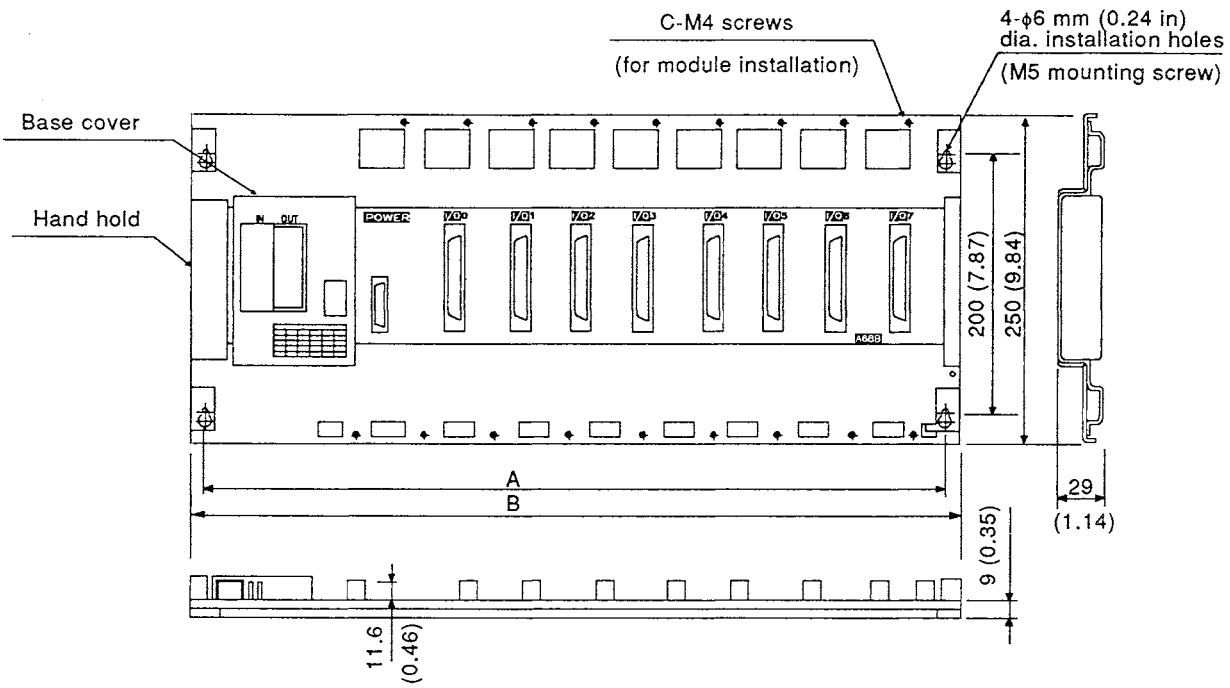
(4) A38B base unit



Unit: mm (inch)

Appendix5.5 Extension Base Unit

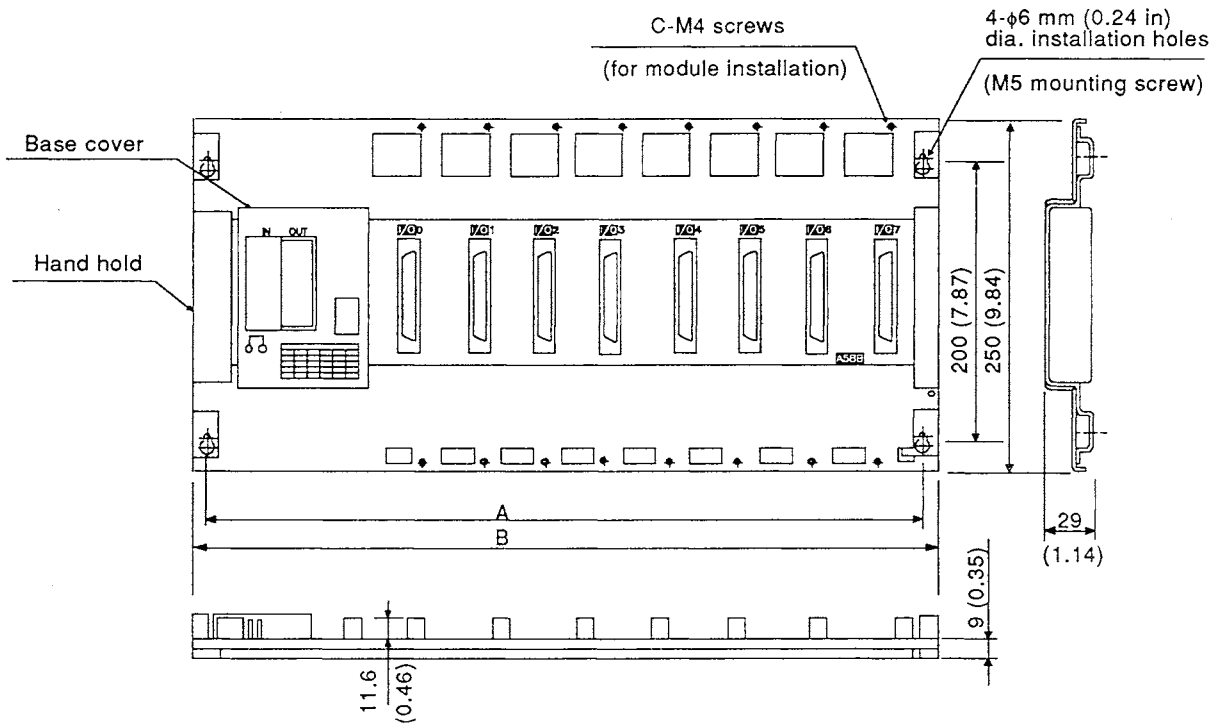
(1) A62B, A65B, A68B base unit



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).

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 A2A(S1)/A3ACPU

User's Manual

MODEL	A2A/A3ACPU-U-E
MODEL CODE	13JE84
IB(NA)-66544-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