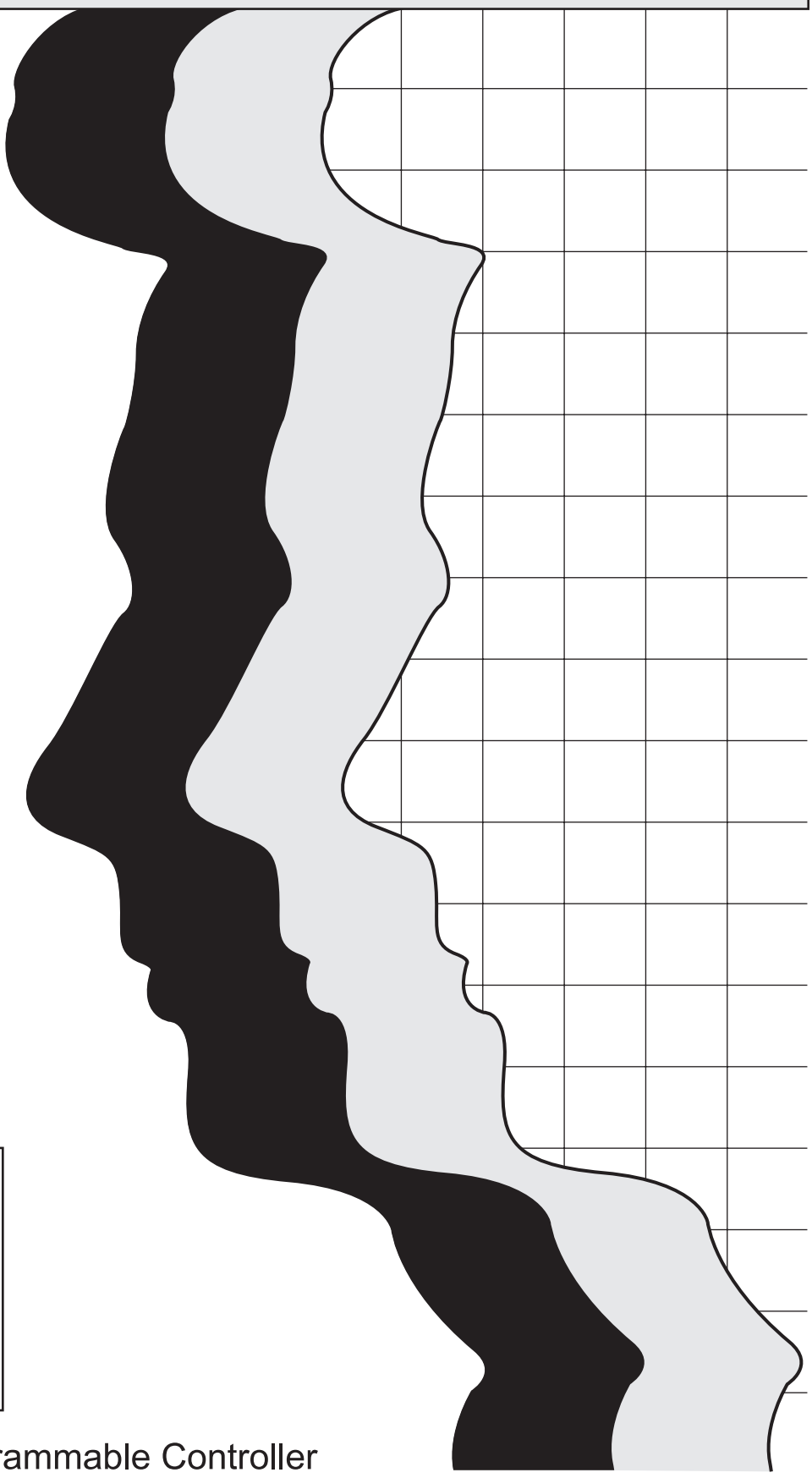
MITSUBISHI

Type A2USCPU(S1)

User's Manual



A

MELSEC

Mitsubishi Programmable Controller

●SAFETY PRECAUTIONS●

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

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

[DESIGN PRECAUTIONS]

⚠ WARNING

- Install a safety circuit external to the PLC that keeps the entire system safe even when there are problems with the external power supply or the PLC main module. Otherwise, trouble could result from erroneous output or malfunction.
  (1) Configure the following circuits outside the PLC: emergency stop circuit, protection circuit, interlocking circuit for opposite operations such as forward and reverse operations, and interlocking circuit for machine damage prevention such as upper/lower limit for positioning.
  (2) When the PLC detects the following problems, it will stop calculation and turn off all output.
    - The power supply module has an over current protection device and over voltage protection device.
    - The PLC CPUs self-diagnostic functions, such as the watchdog timer error, detect problems.

    In addition, all output will be turned on when there are problems that the PLC CPU cannot detect, such as in the I/O controller. Build a failsafe circuit exterior to the PLC that will make sure the equipment operates safely at such times.

    Refer to the Section 8.1 in this manual for example failsafe circuits.
  (3) Output could be left on or off when there is trouble in the output module's relay or transistor. So, build an external monitoring circuit that will monitor any single output that could cause serious trouble.
- If current over the rating or over-current due to a load short-circuit flows for a long term, it may cause smoke or fire. Prepare an external safety circuit, such as a fuse.
- Build a circuit that turns on the external power supply when the PLC main module power supply is turned on. If the external power supply is turned on first, it could result in erroneous output or malfunction.

[DESIGN PRECAUTIONS]

⚠ WARNING

- Build a circuit that turns on the external power supply after the PLC main module power is turned on. If the external power supply is turned on first, it could result in accidents due to erroneous outputs or a malfunction.
- When there are communication faulty with the data link, the communication faulty station will enter the following condition. Build an interlock circuit into the PLC program that will make sure the system operates safely by using the communication state information.
  Not doing so could result in erroneous output or malfunction.
  (1) For the data link data, the data prior to the communication error will be held.
  (2) The MELSECNET (II, /B, /10) remote I/O station will turn all output off.
  (3) The MELSECNET/MINI-S3 remote I/O station will hold the output or turn all output off depending on the E.C. mode setting.
  Refer to manuals for corresponding data link system for how to detect the communication faulty station and the operation status when a communication error occurred.
- When configuring a system, do not leave any slots vacant on the base. Should there be any vacant slots, always use a blank cover (A1SG60) or dummy module (A1SG62).
  If the cover is not attached, the module's internal parts may be dispersed when a short-circuit test is performed or overcurrent/overvoltage is accidentally applied to the external I/O area.

⚠ CAUTION

- Do not bunch the control wires or communication cable with the main circuit or power wires, or install them close to each other.
  They should be installed 100mm (3.94 inch) or more from each other.
  Not doing so could result in noise that would cause malfunction.
- When controlling items like lamp load, heater or solenoid valve using an out put module, large current (approximately ten times greater than that present in normal circumstances) may flow when the output is turned OFF → ON. Take measures such as replacing the module with one having sufficient rated current.
- Time from when the CPU module is powered on or is reset to when it enters in RUN status depends on the system configuration, parameter settings, and program size.
  Design the program so that the entire system will always operate safely, regardless of the time.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the PLC in the environment given in the general specification section of the manual.
  Using the PLC outside the range of the general specifications may result in electric shock, fire, or malfunction or may damage or degrade the product.
- Before mounting the module, securely insert the projection at the bottom of the module into the fixing hole on the base module.
  (The AnS series module must be tightened to the base module at the specified tightening torque.)
  An improperly mounted module may result in malfunction, failure, or falling.
  Excessive screw tightening may cause falling due to the breakage of the screw or module, short-circuit, or malfunction.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Tighten the screw within the range of specified torque.
  If the screws are loose, it may result in fallout, short circuits, or malfunctions.
  Tightening the screws too far may cause damage to the screw and/or the module, resulting in fallout, short circuits, or malfunction.
- When installing extension cables, be sure that the base unit and the module connectors are installed correctly. After installation, check them for looseness. Poor connections could result in erroneous input and erroneous output.
- Correctly connect the memory card installation connector to the memory card. After installation, make sure that the connection is not loose. A poor connection could result in malfunction.
- Do not directly touch the module's conductive parts or electronic components.
  Doing so could cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

⚠ WARNING

- Completely turn off the external power supply when installing or wiring. Not completely turning off all power supply could result in electric shock or damage to the product.
- When turning on the power or operating the module after installation or wiring work, be sure that the module's terminal covers are correctly attached. Not attaching the terminal covers could result in electric shock.

⚠ CAUTION

- Be sure to ground the FG terminals and LG terminals with a special PLC ground of Type 3 or above. Not doing so could result in electric shock or malfunction.
- When wiring in the PLC, check the rated voltage and terminal layout of the wiring, and make sure the wiring is done correctly. Connecting a power supply that differs from the rated voltage or wiring it incorrectly may cause fire or breakdown.
- Do not connect multiple power supply modules in parallel.
  Doing so could cause overheating, fire, or damage to the power supply module.
- Tighten the terminal screws with the specified torque.
  If the terminal screws are loose, it could result in short circuits, fire, or malfunction.
  Tightening the screws too far may cause damage to the screw and/or the module, resulting in fallout, short circuits, or malfunction.
- Take care so that foreign matter such as chips and wiring scraps do not enter the module as it could result in fire, trouble or a malfunction.
- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered.
  For information regarding the crimping and pressure welding tools, refer to the I/O module's user manual. Imperfect connections could result in short circuit, fires, or malfunction.

[STARTING AND MAINTENANCE PRECAUTIONS]

⚠ WARNING

- Do not touch the terminals while power is on. Doing so could cause shock or malfunction.
- Correctly connect the battery connector.
  Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire.
  Mishandling of the battery can cause overheating or cracks which could result in injury and fires.
- Make sure to switch all phases of the external power supply off before cleaning or re-tightening screws. If you do not switch off the external power supply, it will cause electric shock.
  If the screws are loose, it may result in fallout, short circuit, or malfunction. Tightening the screws too far may cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

⚠ CAUTION

- The online operations conducted for the CPU module being operated, connecting the peripheral device (especially, when changing data or operation status), shall be conducted after the manual has been carefully read and a sufficient check of safety has been conducted.
  Operation mistakes could cause damage or problems with of the module.
- Do not disassemble or modify the modules.
  Doing so could cause trouble, erroneous operation, injury, or fire.
- Use any radio communication device such as a cellular phone or a PHS phone more than 25cm (9.85 inch) away from the PLC.
  Not doing so can cause a malfunction.
- Switch all phases of the external power supply off before mounting or removing the module.
  If you do not switch off the external power supply, it will cause failure or malfunction of the module.
- Do not drop or give an impact to the battery installed in the module.
  Otherwise the battery will be broken, possibly causing internal leakage of electrolyte.
  Do not use but dispose of the battery if it has fallen or an impact is given to it.
- Always make sure to touch the grounded metal to discharge the electricity charged in the electricity charged in the body, etc., before touching the module.
  Failure to do say cause a 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 8.)

[TRANSPORTATION PRECAUTIONS]

⚠ CAUTION

- When transporting lithium batteries, make sure to treat them based on the transport regulations.
  (Refer to Appendix 7 for details of the controlled models.)

●CONDITIONS OF USE FOR THE PRODUCT●

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

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

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

REVISIONS

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

Print Date	*Manual Number	Revision
Sept., 1994	IB (NA) 66536-A	First edition
Jan., 1997	IB (NA) 66536-B	Deletion Section 1.3, Chapter 5, APP.3.5, APP.3.6, APP.3.9, APP.3.10 Chapter Change Chp.6 → Chp.5, Chp.7 → Chp.6, Chp.8 → Chp.7, Chp.9 → Chp.8, Chp.10 → Chp.9, Chp.11 → Chp.10, Section 12.1 → APP.2.1, Section12.2 → APP.2.2, Section 12.3 → APP.1, APP.1 → APP.3, APP.2 → APP.4, APP.3 → APP.5, APP.3.7 → APP.5.5, APP.3.8 → APP.5.6 Addition SAFETY PRECAUTIONS, APP.6 Correction Section 1.1, 1.2, 2.1, Chapter 4
Dec., 2002	IB (NA) 66536-C	Equivalent to Japanese version C Addition SAFETY PRECAUTIONS, Section 2.2.3, Section 4.1.1 to 4.1.4, 4.2.4, 4.2.5, Chapter 9, Appendix 6 Partial correction Chapter 1, Section 1.1, 1.2, Section 2.1, 2.2.1, 2.2.2, 2.3, 2.4, Chapter 3, Section 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.6, Section 5.1, 5.1.1, 5.2, Section 6.1.2, 6.1.3, Section 7.1.1, 7.1.2, 7.1.5, Section 8.1, 8.4.1, 8.4.2, 8.7.1, 8.7.2, Section 10.3.2, Appendix 2.1, 2.2, Appendix 4.2 Deletion Section 1.3, Section 4.3.1, Appendix 3.5 to 3.10
Dec., 2003	IB (NA) 66536-D	Addition model A1SY42P Addition Appendix 7, 7.1, 7.2 Partial correction SAFETY PRECAUTIONS, Section 1.2, Section 2.2.1, 2.3, Section 8.4.1, 8.8, Section 9.1.4, Appendix 2.2

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

Print Date	*Manual Number	Revision
Oct., 2008	IB (NA) 66536-E	Partial correction SAFETY PRECAUTIONS, Chapter 3, Section 7.2.1 Addition Appendix 8, 8.1, 8.2
Aug., 2009	IB (NA) 66536-F	Partial correction Section 7.2.3, Chapter 9, Section 10.3.1, 10.3.2
Mar., 2010	IB (NA) 66536-G	Partial correction SAFETY PRECAUTIONS, Section 8.1, 8.7.1, Chapter 10, Section 11.3.2, Appendix 2.1 Addition CONDITIONS OF USE FOR THE PRODUCT

Japanese Manual Version SH-3499-L

CONTENTS

About This Manual

The following table lists manuals regarding this product.

Related Manuals

Manual Name	Manual No. (Model Code)
ACPU 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)
AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual (Dedicated Instructions) Describes instructions that have been expanded for A2USCPU (S1). (Sold separately)	IB-66251 (13J742)
AnACPU/AnUCPU Programming Manual (AD57 Instructions) Describes dedicated instructions for A2USCPU (S1) to control the AD57(S1)/AD58 controller module. (Sold separately)	IB-66257 (13J743)
AnACPU/AnUCPU Programming Manual (PID Instructions) Describes dedicated instructions for A2USCPU (S1) to perform the PID control. (Sold separately)	IB-66258 (13J744)
AnS Module type I/O User's Manual Describes the specification of the compact building block type I/O module. (Sold separately)	IB-66541 (13JE81)

1. GENERAL DESCRIPTION

This manual describes the performance, functions and handling instructions for the A2USCPU and A2USCPU-S1 general purpose programmable controllers (hereafter referred to as A2USCPU), as well as the specifications and handling instructions for the memory cassettes, power supply modules and base units used in connection to the A2USCPU.

The A2USCPU, when compared with existing A1SCPU has improved performance and functions such as increased program capacity and I/O points and increased I/O device points.
Please make the best use of the performance and functions to efficiently use the A2USCPU.

Instructions used in the sequence program of A2USCPU include the following.

- Sequence instructions ..... 25 types
- Basic and application instructions ..... 243 types
- Special purpose instructions..... 204 types

For an instruction list, refer to section 1 in the appendix.

The programming module and software package must be compatible with upgraded A2UCPU, A2UCPU-S1, A3UCPU or A4UCPU (hereafter referred to as AnUCPU).
When old programming modules and software packages are used, the operating range depends on the model of the CPU (PC model) that can be set. Refer to section 2.2.3.

For the various modules available for A2USCPU, refer to the component list in section 2.3.
For the special function modules with which the range of operating devices is limited, refer to section 2.2.1.

1.1 Features

The A2USCPU has the following features when compared with the A1SCPU:

(1) The program capacity and the number of inputs and outputs have been increased.

- Program capacity ..... Max. 14K steps
- Number of inputs ..... 1024 points (when an A2USCPU-S1 is used) and outputs

(2) The A2USCPU supports the MELSECNET/10 network system of high speed and large capacity.
Installing a network module (A1SJ71LP21, A1SJ71LR21, A1SJ71BR11) to an extension base unit and setting network parameters will create a MELSECNET/10 network system.
The A2USCPU is also applicable in the MELSECNET II system.

(3) The I/O device points, link device points and data register points have been increased.

- I/O device (X/Y) ..... 8192 points (X/Y0 to 1FFF)
- Link relay (B) ..... 8192 points (B0 to B1FFF)
- Link register (W)..... 8192 points (W0 to W1FFF)
- Data register (D)..... 8192 points (D0 to 8191)

(4) The A2USCPU incorporates 64-Kbyte and 256-Kbyte RAM memory.
RAM memory of 64 Kbytes (A2USCPU) and 256 Kbytes (A2USCPU-S1) is built in and backed up by battery.
An optional memory cassette (EPROM, EEPROM) can be installed to the A2USCPU.

(5) Data communication requests can be batch-processed.

- By turning ON the M9029 by the sequence program, all data communication requests (from the AD51H-S3, AD57G-S3, AD51FD, AJ71UC24, A1SJ71C24-R2 (PRF/R4) and peripheral devices) received in a scan can be processed by one END processing.
- Batch processing of data communication requests eliminates delays in data communication with each module. (When the M9029 is OFF, the A2USCPU processes only one request to one scan.)

(6) The operation processing speed (sequence instruction) has greatly been increased.
While the processing speed of the A1SCPU operating in the refresh mode is 1.0 μs/step, that of the A2USCPU is substantially improved to 0.2 μs/step.

(7) The A2USCPU can execute AnA/AnUCPU dedicated instructions. It can execute AnA/AnUCPU dedicated instructions, AD57 instructions and PID control instructions.

1.2 Comparison of Performance Specifications Between the A2USCPU and the A1SCPU

The following table makes a comparison of performance specifications between the A2USCPU and the A1SCPU. Other items not included herein are the same as those of the A1SCPU.

Item \ CPU Type		A2USCPU(S1)	A1SCPU
I/O control method		Refresh mode	Refresh mode/Direct mode selective
Processing speed (sequence instruction)(μsec/step)		0.2	Direct: 1.0 to 2.3 Refresh: 1.0
Number of instructions	Sequence instructions	25	26
	Basic and application instructions	243	235
	Dedicated instructions	204	0
Constant scan (msec)		10 to 190	—
Main program capacity		Max. 14K steps	Max. 8K steps
Memory capacity and memory cassette type	Memory capacity (built-in RAM)	64 Kbytes (256 Kbytes)*1	32 Kbytes
	EPROM type memory cassette	A2SMCA-14KP	A1SNMCA-8KP
	EEPROM type memory cassette	A2SNMCA-30KE	A1SNMCA-2KE A1SNMCA-8KE
Number of I/O devices (points)		8192	256
Number of I/O points		512(1024)*1	256
Number of device points	Internal relay (M,L,S) (points)	8192	2048
	Link relay (B) (points)	8192	1024
	Link register (W) (points)	8192	1024
	Data register (D) (points)	8192	1024
	File register (R) (points)	8192	4096
	Annunciator (F) (points)	2048	256
	Timer (T) (points)	2048	256
	Counter (C) (points)	1024	256
	Index register (V,Z) (points)	14	2
Comment (points)		Max. 4032	Max. 1600
Extension comment (points)		Max. 3968	—
Watchdog timer setting		200 (msec) fixed	10 to 200 (ms)
Data link		MELSECNET/10 MELSECNET(II) MELSECNET/B	MELSECNET(II) MELSECNET/B

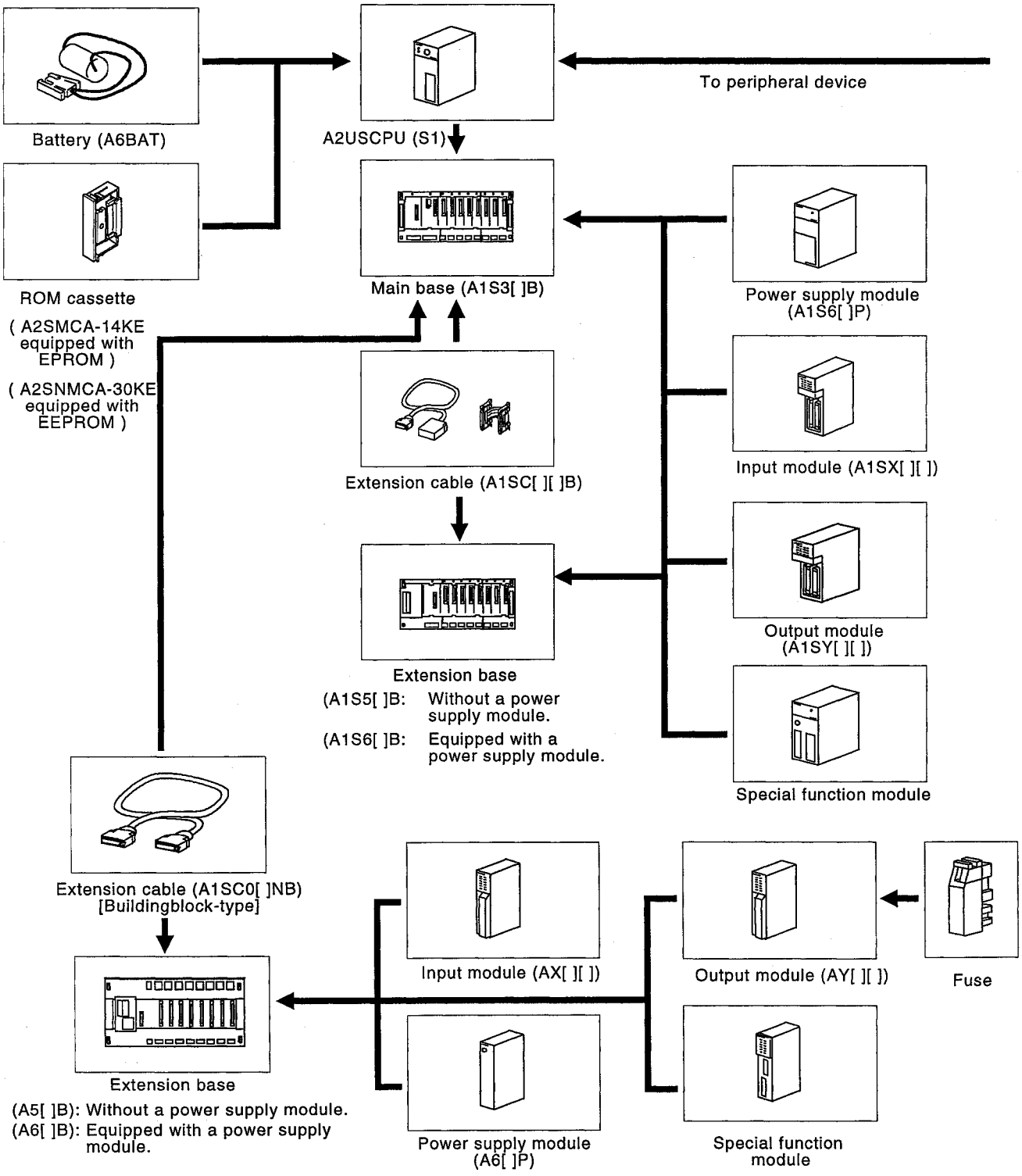
*1 When an A2USCPU-S1 is used.

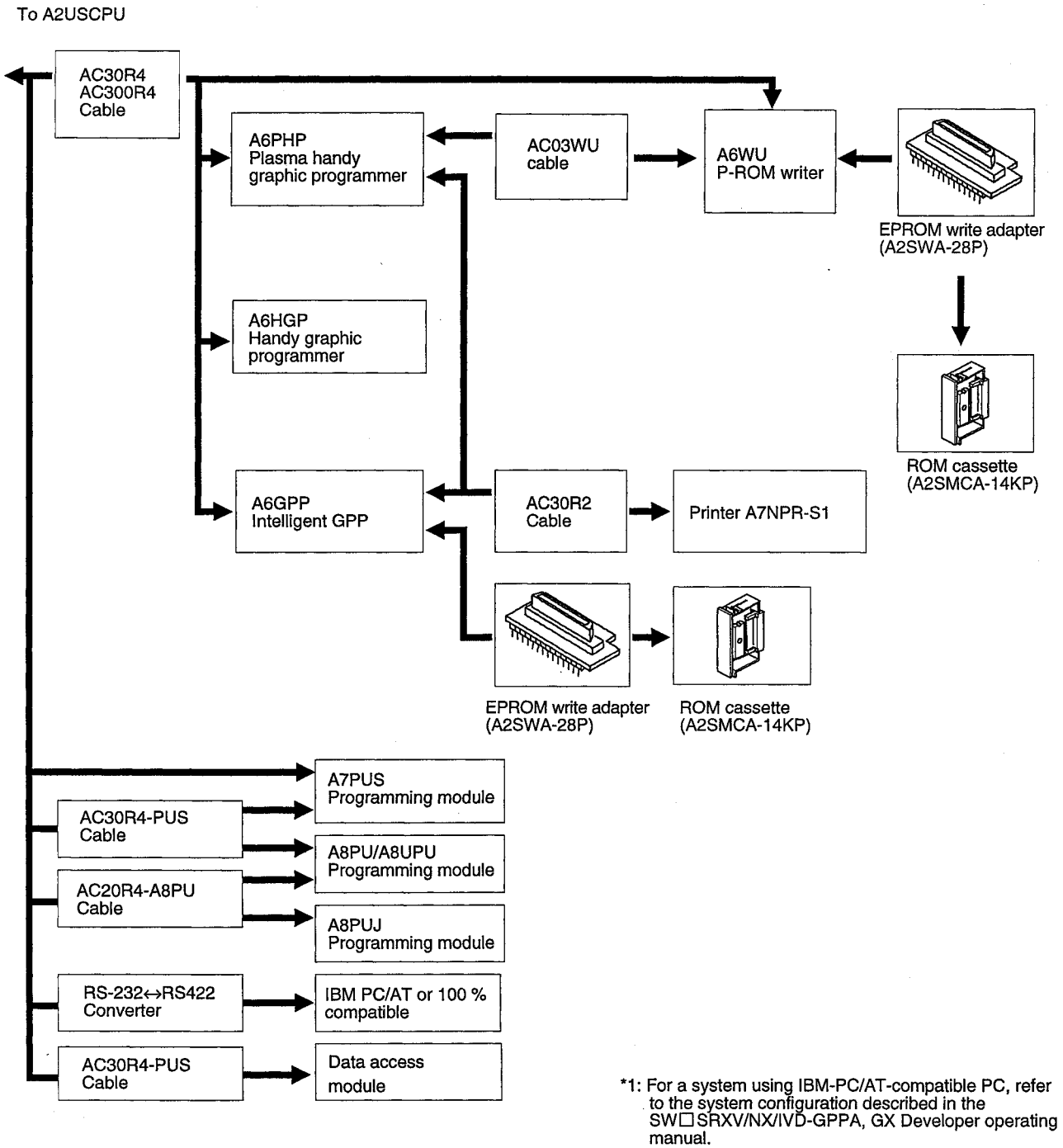
2. SYSTEM CONFIGURATION

This section describes the applicable system configuration, cautions on the system configuration, and component devices of the A2USCPU.

2.1 Overall Configuration

The following figure shows a configuration when the A2USCPU is used independently.





*1: For a system using IBM-PC/AT-compatible PC, refer to the system configuration described in the SW□SRXV/NX/IVD-GPPA, GX Developer operating manual.

2.2 Cautions on System Configurations

Described below are the modules, peripheral devices and software packages compatible with the A2USCPU.

2.2.1 Modules and peripheral devices

(1) I/O module

All A[ ]N and A[ ]A building block type I/O modules are applicable to the A2USCPU by loading them to the A5[ ]B and A6[ ]B extension base units.

(2) Special function module

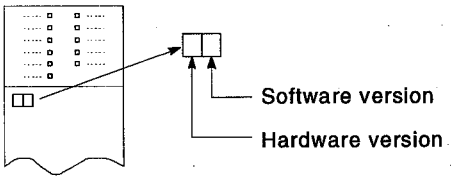
(a) An A[ ]N or A[ ]A special function module can be used by loading it to the A5[ ]B or A6[ ]B extension base unit.

(b) Among the special function modules, the following types must not be loaded in excess of the quantities specified below:

AD51-S3*1 AD51FD-S3 AJ71C22-S1 AJ71C24(S3)*1, AJ71P41*1 AJ71C21-S1 (In BASIC programming mode only) AJ71C23-S3 AJ61BT11 (In intelligent mode only)	AD51H-S3*2 AD57G-S3*2 AJ71UC24 AJ71C24-S6(S8) *2 AJ71E71-S3*2 AD22-S1	Up to 6 modules	
A985GOT (Only when connected with bus) A975GOT (Only when connected with bus) A970GOT (Only when connected with bus) A960GOT (Only when connected with bus) A956WGOT (Only when connected with bus) A956GOT (Only when connected with bus) A951GOT			
A1SJ71UC24-R2(PRF/R4) A1SJ71E71-B2-S3(-B5-S3) A1SD51S A1SD22-S1 A1SD21-S1 A1SJ61BT11 (In intelligent mode only)			
AI61(S1)		1 module only	
A1SI61			
AJ71AP21*2 AJ71AT21B*2	AJ71AR21*2	Up to 2 modules	Up to 4 modules
A1SJ71AP21*2 A1SJ71AT21B*2	A1SJ71AR21*2		
AJ71LP21 A1SJ71LP21 A1SJ71BR11	AJ71BR11 A1SJ71LR21	Up to 4 modules	
AJ71PT32-S3 (In extension mode only) AJ71T32-S3 (In extension mode only) A1SJ71PT32-S3 (In extension mode only) A1SJ71T32-S3 (In extension mode only)		Up to 10 modules	

*1 : Accessible in the device range of A3HCPU
*2 : Accessible in the device range of A2ACPU

(c) When establishing a remote I/O network with a MELSECNET/10 network system, use the "D" or later version of A2USCPU software or the "J" or later version of the software of the AJ71LP21/BR11 or A1SJ71LP21/LR21/BR11 network module.
Example: In case of AJ71LP21/BR11



Front view of module

REMARK

The special function modules below cannot be used with the A2USCPU:

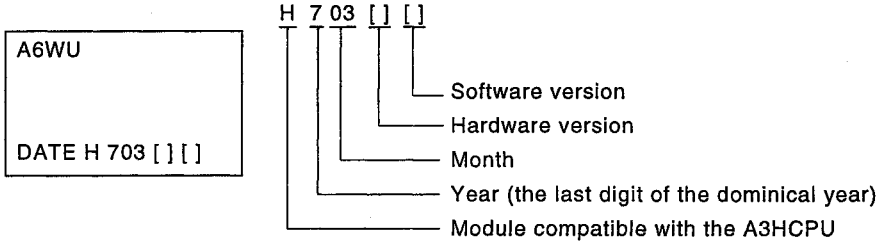
- AJ71C23
- AD57-S2
- AJ71C24 (module manufactured before February 1987)
- AD51 (module manufactured before March 1987)

Check the date of manufacture with the label.

(3) Peripheral device

(a) Use an A6WU P-ROM writer whose software version is "E" or subsequent to it.

<EX.> Module manufactured in March 1987



(b) Directly installing the A6WU P-ROM writer to the A2USCPU by add-on system is not allowed.

(c) Only A7PUS can be installed by add-on system among programming modules (A 7PUS, A8PU, A8UPU and A8PUJ).
Other models (A8PU, A8UPU and A8PUJ) utilize the hand-held system only where connection is made with cables.

(4) Writing to EP-ROM in memory cassette

The optional A2SWA-28P-type memory write adapter is required to write to A2SMCA-14KP-type EP-ROM in memory cassette by using the A6GPP/A6WU ROM writer.
(Conventional A6WA-28P-type is not available.)

(5) Writing to EEP-ROM (A2SNMCA-30KE) during operation

When "Writing during RUN" to EEP-ROM is executed, program transfer is displayed at the peripheral devices and, for approx. 2 seconds after completion of the transfer, the sequence program is stopped to complete "Writing during RUN".
If the operation of controllers may be affected by this stop of the program, stop the CPU to execute the writing, not executing "Writing during RUN".
Note that "Writing during RUN" to EEP-ROM is not executable if the GPP function software package incompatible with AnU series is started with the PC model name setting of "A2A" or "A3H".
If "Writing during RUN" to EEP-ROM has been executed, PLF command existing in modified circuit blocks and subsequent steps will not correctly function. If the execution condition for PLF command is OFF at completion of writing, the PLF command will be executed.

(6) Program writing to EEP-ROM (A2SNMCA-30KE) during operation

(a) To write programs to EEP-ROM by starting the GPP function software package incompatible with AnU series and selecting "A2A" or "A3H" as PC model name, defeat the memory protection set of both the A2USCPU and EEP-ROM memory cassette (A2SNMCA-30KE)

(b) Programs cannot be written from a calculator link module or peripheral devices connected to other station on MELSECNET. Program writing should be executed from the peripheral device connected to RS-422 of A2USCPU.

2.2.2 Software package

(1) GPP function software packages and model name setting at the startup

The table below shows the GPP function software packages allowing you to create an A2USCPU (S1) program and PLC model settings at startup.

When creating an A2USCPU (S1) program, if "A2US (S1)" is not available as a PLC model, set "A2U". If "A2U" is not available, set "A3A". If both "A2U" and "A2A" are not available, set "A3H" .

Peripheral Device	Software package for system startup	PC CPU model setting	Remarks
A6PHP	SW3GP-GPPA	A3H	Write on the ROM is not allowed.
	SW4GP-GPPA	A2A	
	SW□GP-GPPAU	A2U	
A6GPP	SW3-GPPA SW3GP-GPPA	A3H	Write on the ROM is not allowed.
	SW4GP-GPPA	A2A	
	SW□GP-GPPAU	A2U	
IBM PC/AT	SW□IVD-GPPA; □ is 0 to 3	A2U	
	SW□IVD-GPPA; □ is 4 or later	A2US (S1)	
	GX Developer		

POINT

(1) Old software packages other than SW3-GPPA, SW3GP-GPPA, and SW4GP-GPPA cannot be used as the software package for system startup for A6GPP/A6PHP.

(2) When a MELSECNET/10 network system is configured with the A2USCPU (S1), use an AnU/A2US-compatible GPP function software package (which contains "A2U" / "A2US (S1)" in the PC's model name). The network function cannot be set with GPP function software packages not compatible with AnU (no "A2U" / "A2US (S1)" in the PC's model name).

(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

* The packages marked with * can execute the same functions using the dedicated instructions. Refer to AnACPU/AnUCPU Programming Manual (Dedicated Instruction) for details.

- SW□---SIMA
- SW□-UTLP-FD1
- SW□-SAPA

REMARK

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

POINT

(1) Packages which access the A2USCPU by specifying a device in the utility package can specify only in the device range for A2ACPU or A3HCPU equivalent. (Refer to Section 2.2.3.)

(2) Use an AnU-compatible utility package to use the device range for the A2USCPU. (Example: SW1IVD-SAP2, etc.)

2.2.3 Precautions when using GPP function software packages and A8PU peripheral devices which are not compatible with AnU

When the A2USCPU (S1) is started up using a GPP function software package not compatible with AnU, A2US (the PC model name is "A2A" or "A3H") or from an A8PU peripheral device (including A7PUS), the usable device range is limited as follows:

(1) Usable device range

System FD peripheral device / Item	AnACPU-compatible module		A3HCPU-compatible module	
	Modules whose PC model for system FD startup is "A2A"	A8PU	Modules whose PC model for system FD startup is "A3H"	A7PUS
Instruction (sequence/basic/ application/dedicated)	All instructions can be used.			
Program capacity	A maximum of 30k steps can be used for the main program.			
I/O device points (X/Y)	X/Y0 to 3FF can be used. (X/Y400 to 1FFF cannot be used.)		X/Y0 to 7FF can be used. (X/Y800 to 1FFF cannot be used.)	
M, L, S relay	M/L/S0 to 8191 can be used.		M/L/S0 to 2047 can be used. (M/L/S2048 to 8191 cannot be used.)	
Link relay (B)	B0 to BFFF can be used (B1000 to B1FFF cannot be used.)		B0 to B3FF can be used. (B400 to B1FFF cannot be used.)	
Timer (T)	T0 to T2047 can be used.		T0 to T255 can be used. (T256 to T2047 cannot be used.)	
Counter (C)	C0 to C1023 can be used.		C0 to C255 can be used. (C256 to C1023 cannot be used.)	
Data register (D)	D0 to D6143 can be used. (D6144 to D8191 cannot be used.)		D0 to D1023 can be used. (D1024 to D8191 cannot be used.)	
Link register (W)	W0 to WFFF can be used. (W1000 to W1FFF cannot be used.)		W0 to W3FF can be used. (W400 to W1FFF cannot be used.)	
Annunciator (F)	F0 to F2047 can be used.		F0 to F255 can be used. (F256 to F2047 cannot be used.)	
Index register (V, Z)	V, V_1 to V_6, Z, and Z_1 to Z_6 can be used.		V and Z can be used. (V_1 to V_6 and Z_1 to Z_6 cannot be used.)	
Expanded comment	A maximum of 3968 points		Unusable	
Latch (power failure compensation) range	The device range shown above can be latched.		The device range shown above can be latched.	
I/O assignment	Number of I/O occupied points and the module model can be registered.		Number of I/O occupied points can be registered.	

(1) The device range other than listed above is the same as that of A2USCPU.

(2) Refer to the operation manual of each peripheral device for available functions.

2.3 System Equipment

Various components of each module and peripheral device which can be used by the A2USHCPU-S1 are listed.

(1) Modules dedicated to AnS

Item	Model	Description		Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
					5VDC (A)	24VDC (A)	
CPU module	A2USCPU	512 real I/O points, 256k bytes memory capacity		—	0.32	—	Built-in RAM memory
	A2USCPU-S1	1024 real I/O points, 256k bytes memory capacity					
Power supply module	A1S61PN	5VDC, 5A	100/200VAC input	—	—	—	Installed in the power supply slot of the basic base module and expansion base module.
	A1S62PN	5VDC, 3A/24VDC, 0.6A					
	A1S63P	5VDC, 5A	24VDC input				
Input module	A1SX10	16-point 100 to 120 VAC input module		16 [16 input points]	0.05	—	
	A1SX10EU	16-point 100 to 120 VAC input module		16 [16 input points]	0.05	—	
	A1SX20	16-point 200 to 240 VAC input module		16 [16 input points]	0.05	—	
	A1SX20EU	16-point 200 to 240 VAC input module		16 [16 input points]	0.05	—	
	A1SX30	16-point 12/24VDC, 12/24VAC input module		16 [16 input points]	0.05	—	
	A1SX40	16-point 12/24VDC input module		16 [16 input points]	0.05	—	
	A1SX40-S1	16-point 24VDC input module		16 [16 input points]	0.05	—	
	A1SX40-S2	16-point 24VDC input module		16 [16 input points]	0.05	—	
	A1SX41	32-point 12/24VDC input module		32 [32 input points]	0.08	—	
	A1SX41-S1	32-point 24VDC input module		32 [32 input points]	0.12	—	
	A1SX41-S2	32-point 24VDC input module		32 [32 input points]	0.08	—	
	A1SX42	64-point 12/24VDC input module		64 [64 input points]	0.09	—	
	A1SX42-S1	64-point 24VDC input module		64 [64 input points]	0.16	—	
	A1SX42-S2	64-point 24VDC input module		64 [64 input points]	0.09	—	
	A1SX71	32-point 5/12/24VDC input module		32 [32 input points]	0.075	—	
	A1SX80	16-point 12/24VDC sink/source input module		16 [16 input points]	0.05	—	
	A1SX80-S1	16-point 24VDC sink/source input module		16 [16 input points]	0.05	—	
	A1SX80-S2	16-point 24VDC sink/source input module		16 [16 input points]	0.05	—	
	A1SX81	32-point 12/24VDC sink/source input module		32 [32 input points]	0.08	—	
	A1SX81-S2	32-point 24VDC sink/source input module		32 [32 input points]	0.08	—	
	A1SX82-S1	64-point 24VDC sink/source input module		64 [64 input points]	0.16	—	
Output module	A1SY10	16-point relay contact output module (2A)		16 [16 output points]	0.12	0.09	
	A1SY10EU	16-point relay contact output module (2A)		16 [16 output points]	0.12	0.09	
	A1SY14EU	12-point relay contact output module (2A)		16 [16 output points]	0.12	0.10	
	A1SY18A	8-point relay contact output module (2A) for independent contacts		16 [16 output points]	0.24	0.075	
	A1SY18AEU	8-point relay contact output module (2A) for independent contacts		16 [16 output points]	0.24	0.075	
	A1SY22	16-point Triac output module (0.6A)		16 [16 output points]	0.27	(220VAC) 0.002	
	A1SY28EU	8-point Triac output module (0.6A)		16 [16 output points]	0.27	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
Output module	A1SY28A	8-point Triac output module (1A) All points independent	16 [16 output points]	0.13	—	
	A1SY40	16-point 12/24VDC transistor output module(0.1A) sink type	16 [16 output points]	0.27	0.008	
	A1SY41	32-point 12/24VDC transistor output module(0.1A) sink type	32 [32 output points]	0.50	0.016	
	A1SY42	64-point 12/24VDC transistor output module(0.1A) sink type	64 [64 output points]	0.93	0.008	
	A1SY42P	64-point 12/24VDC transistor output module(0.1A) sink type	64 [64 output points]	0.17	0.014	
	A1SY50	16-point 12/24VDC transistor output module(0.5A) sink type	16 [16 output points]	0.12	0.06	
	A1SY60	16-point 24VDC transistor output module(2A) sink type	16 [16 output points]	0.12	0.015	
	A1SY60E	16-point 5/12/24VDC transistor output module(2A) source type	16 [16 output points]	0.20	0.01	
	A1SY68A	8-point 5/12/24/48VDC transistor output module (2A) sink/source type All points independent	16 [16 output points]	0.11	—	
	A1SY71	32-point 5/12VDC transistor output module(0.016A) sink type	32 [32 output points]	0.40	0.15	
	A1SY80	16-point 12/24VDC transistor output module(0.8A) source type	16 [16 output points]	0.12	0.02	
	A1SY81	32-point 12/24VDC transistor output module(0.1A) source type	32 [32 output points]	0.50	0.016	
	A1SY82	64-point 12/24VDC transistor output module(0.1A) source type	64 [64 output points]	0.93	0.008	
I/O hybrid module	A1SH42	32-point 12/24VDC input module 32-point 12/24VDC transistor output module(0.1A) sink type	32 [32 output points]	0.50	0.008	
	A1SH42-S1	32-point 24VDC input module 32-point 24VDC transistor output module(0.1A) sink type	32 [32 output points]	0.50	0.008	
	A1SX48Y18	8-point 24VDC input module 8-point relay contact output module (2A)	16 [16 output points]	0.085	0.045	
	A1SX48Y58	8-point 24VDC input module 8-point 12/24VDC transistor output module (0.5A)	16 [16 output points]	0.06	0.06	
Dynamic input module	A1S42X	16/32/48/64 points 12/24VDC dynamic input module	Specified number of points [Input specified number of points]	0.08	—	
Dynamic output module	A1S42Y	16/32/48/64 points 12/24VDC dynamic output module	Specified number of points [Output specified number of points]	0.10	0.008	
Blank cover	A1SG60	Dust-proof cover for unused slot	16 [Empty]	—	—	
Dummy module	A1SG62	16-point, 32-point, 48-point, or 64-point selectable module	Specified number of points [Input specified number of points]	—	—	
Pulse catch module	A1SP60	16-point input module for short ON-time pulse input (pulse with a minimum of 0.5ms)	16 [16 output points]	0.055	—	
Analog timer module	A1ST60	8-point analog timer module whose timer setting value can be changed for different volumes (0.1 to 1.0s, 1 to 10s, 10 to 60s, 60 to 600s)	16 [16 output points]	0.055	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
Interrupt module	A1SI61	Interrupt module for specifying the interrupt program (16-point interrupt input)	32 [32 special points]	0.057	—	
High-speed counter module	A1SD61	32-bit signed binary 50kBPS, 1 channel	32 [32 special points]	0.35	—	
	A1SD62	24-bit signed binary, 2 channels 100kPPS, DC input Transistor output (sink type)	32 [32 special points]	0.1	—	
	A1SD62D	24-bit signed binary, 2 channels 200kPPS, difference input Transistor output (sink type)	32 [32 special points]	0.25	—	
	A1SD62D-S1	24-bit signed binary, 2 channels 200kPPS, difference input Transistor output (sink type)	32 [32 special points]	0.27	—	
	A1SD62E	24-bit signed binary, 2 channels 100kPPS, DC input Transistor output (source type)	32 [32 special points]	0.1	—	
A/D converter module	A1S64AD	4 to 20mA/0 to 10V 4 analog channels	32 [32 special points]	0.4	—	
	A1S68AD	4 to 20mA/0 to 10V 8 analog channels	32 [32 special points]	0.4	—	
Temperature/ digital converter module	A1S62RD3N	For Pt100 (3-wire type) connection 2 channels of temperature input	32 [32 special points]	0.49	—	
	A1S62RD4N	For Pt100 (4-wire type) connection 2 channels of temperature input	32 [32 special points]	0.39	—	
	A1S68TD	Thermocouple input, 8 channels	32 [32 special points]	0.32	—	
D/A converter module	A1S62DA	4 to 20mA/0 to 10V 2 analog output channels	32 [32 special points]	0.8	—	
	A1S68DAV	-10 to 10V input Analog output, 8 channels	32 [32 special points]	0.65	—	
	A1S68DAI	4 to 20mA input Analog output, 8 channels	32 [32 special points]	0.85	—	
Analog I/O module	A1S63ADA	Analog input, 2 channels, simple loop control is allowed. Analog output, 1 channel	32 [32 special points]	0.8	—	
	A1S66ADA	Analog input, 4 channels, simple loop control is allowed. Analog output, 2 channels	32 [32 special points]	0.21	0.16	
Temperature control module	A1S64TCTT-S1	Thermocouple input - transistor input, 4 channels	32 [32 special points]	0.33	—	
	A1S64TCTTBW-S1	Thermocouple input - transistor input, 4 channels With disconnection detection function	32 [32 special points]	0.42	—	
	A1S64TCRT-S1	Platinum resistance temperature sensor input - transistor input, 4 channels	32 [32 special points]	0.33	—	
	A1S64TCRTBW-S1	Platinum resistance temperature sensor input - transistor input, 4 channels With disconnection detection function	32 [32 special points]	0.42	—	
	A1S62TCTT-S2	Thermocouple input - transistor output (overheat cooling), 2 channels	32 [32 special points]	0.19	—	
	A1S62TCTTBW-S2	Thermocouple input - transistor output (overheat cooling), 2 channels With disconnection detection function	32 [32 special points]	0.28	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
Temperature control module	A1S62TCRT-S2	Platinum resistance temperature sensor input - transistor output (heat cooling), 2 channels	32 [32 special points]	0.19	—	
	A1S62TCRTBW-S2	Platinum resistance temperature sensor input - transistor output (heat cooling), 2 channels With disconnection detection function	32 [32 special points]	0.28	—	
	A1S64TCTRT	Transistor output, thermocouple input, or platinum RTD input [For standard control] 4 channels/module PID control: ON/OFF pulse or 2 positioning control [For heating-cooling control] 2 channels/module PID control: ON/OFF pulse	32 [32 special points]	0.33 (0.19)*	—	*:When the temperature conversion function of unused channels are not used in the heating-cooling control
	A1S64TCTRTBW	Transistor output, thermocouple input, or platinum RTD input [For standard control] 4channels/module PID control: ON/OFF pulse or 2 positioning control [For heating-cooling control] 2 channels/module PID control: ON/OFF pulse, wire breakage detection function	32 [32 special points]	0.39 (0.25)*	—	
Computer link module	A1SJ71UC24-R2	Computer link function RS-232C, 1 channel	32 [32 special points]	0.1	—	
	A1SJ71UC24-PRF	Computer link function, printer function RS-232C, 1 channel	32 [32 special points]	0.1	—	
	A1SJ71UC24-R4	Computer link function, multidrop link function RS-422/RS-485, 1 channel	32 [32 special points]	0.1	—	
Ethernet interface module	A1SJ71E71N-B2	10 Base 2 (for Cheapernet)	32 [32 special points]	0.64	—	Only AnACPU-equivalent device range accessible File register and program read/write disabled.
	A1SJ71E71N-B5T	10 Base 5 (for Ethernet), 10 Base T	32 [32 special points]	0.42	—	
Intelligent communication module	A1SD51S	BASIC (interpreter/compiler) RS-232C, 2 channels RS-422/485, 1 channel	32 [32 special points]	0.4	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
Positioning module	A1SD70	Analog voltage output (0 to ±10V) for 1-axis positioning control, speed control, and speed-positioning control.	48 [First half: 16 empty points] [Second half: 32 special points]	0.3	—	
	A1SD71-S2	For positioning control, speed control, and speed-positioning control. Pulse train output, 2-axis (independent, 2-axis simultaneous, linear interpolation		0.8	—	
	A1SD71-S7	For positioning control, setting for manual pulse output speed can be changed. Pulse train output, 2-axis (independent, 2-axis simultaneous, linear interpolation)		0.8	—	
	A1SD75P1-S3	For positioning control, pulse output, 1-axis	32 [32 special points]	0.7	—	
	A1SD75P2-S3	For positioning control, pulse output, 2-axis (independent, 2-axis simultaneous, linear interpolation, circular interpolation)	32 [32 special points]	0.7	—	
	A1SD75P3-S3	For positioning control, pulse output, 3-axis (independent, 3-axis simultaneous, 2-axis linear interpolation, 2-axis circular interpolation)	32 [32 special points]	0.7 *	—	* When differential driver is connected : 0.78
	A1SD75M1	For positioning control, digital output, for MR-H-B/MR-J-B/MR-J2-B, 1-axis SSCNET	32 [32 special points]	0.7	—	
	A1SD75M2	For positioning control, digital output, for MR-H-B/MR-J-B/MR-J2-B, 2-axis SSCNET (independent, 2-axis simultaneous, linear interpolation, circular interpolation)	32 [32 special points]	0.7	—	
	A1SD75M3	For positioning control, digital output, for MR-H-B/MR-J-B/MR-J2-B, 3-axis SSCNET (independent, 3-axis simultaneous, 2-axis linear interpolation, 2-axis circular interpolation)	32 [32 special points]	0.7	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
ID interface module	A1SD35ID1	ID interface module One reader/writer module can be connected.	32 [32 special points]	0.25	0.17	
	A1SD35ID2	ID interface module Two reader/writer modules can be connected.	32 [32 special points]	0.25	0.33	
MELSECNET(II) data link module	A1SJ71AP21	For the master and local stations of MELSECNET(II) data link system (for the optical fiber cable)	32 [32 special points]	0.33	—	Access is allowed within the device range of the A3ACPU.
	A1SJ71AP21-S3	For the master and local stations of MELSECNET(II) data link system (for the GI-type optical fiber cable)	32 [32 special points]	0.33	—	
	A1SJ71AR21	For the master and local stations of MELSECNET(II) data link system (for the coaxial cable)	32 [32 special points]	0.8	—	
MELSECNET/B data link module	A1SJ71AT21B	For the master and local stations of MELSECNET/B data link system	32 [32 special points]	0.66	—	
	A1SJ72T25B	For the remote I/O station of MELSECNET/B data link system	—	0.3	—	
B/NET data link module	A1SJ71B62-S3	Master module for B/NET	32 [32 special points]	0.08	—	
MELSECNET/10 data link module	A1SJ71LP21	For the control, master, and normal stations of the MELSECNET/10 data link module system (For the dual loop SI-type optical fiber cable)	32 [32 special points]	0.65	—	Accessible only within MELSECNET (II) range
	A1SJ71BR11	For the control, master, and normal stations of the MELSECNET/10 data link module system (For the single bus coaxial cable)	32 [32 special points]	0.80	—	
	A1SJ71LR21	For the control, master, and normal stations of the MELSECNET/10 data link module system (For the single bus coaxial cable) (For the coaxial cable dual loop)	32 [32 special points]	1.14	—	
CC-Link system master module	A1SJ61BT11	For the master and local stations of the CC-Link data link system(For the twisted pair shield cable only.)	32 [32 special points]	0.40	—	
MELSECNET /MINI-S3 master module	A1SJ71PT32-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 [32 special points] Expanded mode 48 [48 special points]	0.35	—	
	A1SJ71T32-S3	MELSECNET/MINI-S3 master station Performs remote I/O and remote terminal control of a maximum 64 stations and a total of 512 I/O points.(For the twisted pair cable only.)	I/O dedicated mode 32 [32 special points] Expanded mode 48 [48 special points]	0.30	—	
MELSECNET-I/O LINK master module	A1SJ51T64	MELSECNET-I/O LINK master station. Controls I/O LINK remote I/O module of a maximum of 64 stations and a total of 128 I/O points.	64 [64 output points]	0.115	0.09	
S-LINK interface module	A1SJ71SL92N	Master module for S-LINK I/O total 128 points	32 [32 special points]	0.20	—	
JEMANET (JPCN-1) interface module	A1SJ71J92-S3	JEMANET (JPCN-1) master module	32 [32 special points]	0.40	—	
	A1SJ72J95	JEMANET (JPCN-1) slave module	32 [32 special points]	0.40	—	
DeviceNet interface module	A1SJ71DN91	Master module for DeviceNet I/O total 4096 points	32 [32 special points]	0.24	—	

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
PROFIBUS-DP slave module	A1SJPB93D	Slave module for PROFIBUS-DP I/O data total 192 words	32 [32 special points]	0.36	—	
AS-I interface module	A1SJ71AS92	Master module for AS-I I/O total 496 points	32 [32 special points]	0.15	—	
Modem interface module	A1SJ71CMO-S3	Modem interface module	32 [32 special points]	0.26	—	
Paging interface module	A1SD21-S1	Paging interface module	32 [32 special points]	0.14	—	
Position detection module	A1S62LS	Absolute position detection module	32 [32 special points]	0.55	—	
PC easier monitoring module	A1SS91	PC easier monitoring module	32 [32 special points]	0.08	—	
Memory card interface module	A1SD59J-S2	Memory card interface module	32 [32 special points]	0.05	—	
Simulation module	A6SIM-X64Y64	An I/O simulation unit used connected to the base module. Debugging can be executed without connecting the I/O module to the base module. Use an expansion cable of the AnS series between the basic base module of the AnS series and the A6SIM-X64Y64.	64 [64 input points] 64 [64 output points]	TYP. 0.3 (when all points "ON".)	—	
Graphic operation terminal	A985GOT	Large-size graphic operation terminal 256 colors, TFT color, 800 × 600 dots, high intensity	32 [32 special points] *	0.22 *	—	* When bus-connected
	A975GOT	Large-size graphic operation terminal 256 colors, TFT color, 640 × 480 dots, high intensity	32 [32 special points] *	0.22 *	—	
	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	32 [32 special points] *	0.22 *	—	
	A960GOT	Large-size graphic operation terminal 2 colors, EL, 640 × 400 dots	32 [32 special points] *	0.22 *	—	
	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	32 [32 special points] *	0.22 *	—	
	A956WGOT	Medium-size graphic operation terminal 256 colors, TFT color, 480 × 234 dots	32 [32 special points] *	0.22 *	—	
	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	—	—	—	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	32 [32 special 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	—	—	—	For RS-422 connected only

Item	Model	Description	Number of occupied points (points) [I/O allocation module type]	Current consumption		Remark
				5VDC (A)	24VDC (A)	
Basic base unit	A1S32B	2 I/O module can be installed.	—	—	—	Extension connector on the right and left side each.
	A1S33B	3 I/O module can be installed.				
	A1S35B	5 I/O module can be installed.				
	A1S38B	8 I/O module can be installed.				
Extension base unit	A1S52B	2 I/O module can be installed.	—	—	—	The power supply module cannot be installed. (Power is supplied from the basic base module.)
	A1S55B	5 I/O module can be installed.				
	A1S58B	8 I/O module can be installed.				
	A1S65B	5 I/O module can be installed.	—	—	—	The power supply module is required.
	A1S68B	8 I/O module can be installed.				
Extension cable	A1SC01B	55mm (2.17 in.) long flat cable	—	—	—	For extension towards right.
	A1SC03B	330mm (13 in.) long	—	—	—	Connection cable for the extension base module.
	A1SC07B	700mm (27.56 in.) long				
	A1SC12B	1200mm (47.24 in.) long				
	A1SC30B	3000mm (118.11 in.) long				
	A1SC60B	6000mm (236.22 in.)long				
	A1SC05NB	450mm (17.72 in.)long	—	—	—	Cable for the A□N, A□A extension base module.
	A1SC07NB	700mm (27.56 in.) long				
	A1SC30NB	3000mm (118.11 in.) long				
	A1SC50NB	5000mm (196.86 in.) long				

Item		Model	Contents	Applicable models
Memory cassette	EPROM	A2SMCA-14KP	With a 14k-step EPROM (direct connection)	A2SWA-28P is required
	E^2PROM	A2SNMCA-30KE	With a 30k-step E^2PROM (direct connection)	Direct writing to and reading from a peripheral device is feasible.
Memory write adapter		A2SWA-28P	Adapter for the memory cassette attachment connector/28-pin EPROM	Used for the ROM writing of A2SMCA-I4KP
Battery		A6BAT	IC-RAM memory backup	Installed in the A2USHCPU-S1 main module
Connector/terminal block converter unit		A6TBXY36	For the sink-type input module and sink-type output module. (standard type)	A1SX41(S1/S2), A1SX42(S1/S2), A1SY41, A1SY42, A1SY42P, A1SY82, A1SH42(S1)
		A6TBXY54	For the sink-type input module and sink-type output module. (2-wire type)	
		A6TBX70	For the sink-type input module. (3-wire type)	A1SX41(S1/S2), A1SX42(S1/S2), A1SH42(S1)
		A6TBX36-E	For the source-type input module. (standard type)	A1SX81(S2), A1SX71, A1SX82-S1
		A6TBY36-E	For the source-type output module. (standard type)	A1SY81, A1SY82
		A6TBX54-E	For the source-type input module. (2-wire type)	A1SX81(S2), A1SX71, A1SX82-S1
		A6TBY54-E	For the source-type output module. (2-wire type)	A1SY81, A1SY82
		A6TBX70-E	For the source-type input module. (3-wire type)	A1SX81(S2), A1SX71, A1SX82-S1
Cable for the connector/terminal block converter unit		AC05TB	0.5m (1.64 ft.) for the source module	A6TBXY36 A6TBXY54 A6TBX70
		AC10TB	1m (3.28 ft.) for the source module	
		AC20TB	2m (6.56 ft.) for the source module	
		AC30TB	3m (9.84 ft.) for the source module	
		AC50TB	5m (16.40 ft.) for the source module	
		AC80TB	8m for the sink module	
		AC100TB	10m for the sink module	
		AC05TB-E	0.5m (1.64 ft.) for the source module	A6TBX36-E A6TBY36-E A6TBX54-E A6TBY54-E A6TBX70-E
		AC10TB-E	1m (3.28 ft.) for the source module	
		AC20TB-E	2m (6.56 ft.) for the source module	
		AC30TB-E	3m (9.84 ft.) for the source module	
		AC50TB-E	5m (16.40 ft.) for the source module	
Relay terminal unit		A6TE2-16SRN	For the sink-type output module	A1SY41, A1SY42, A1SH42(S1)
Cable for connecting the relay terminal unit		AC06TE	0.5m (1.64 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	
Terminal block cover for the A1S I/O module and the special module		A1STEC-S	Slim-type terminal block cover for the A1S I/O module and the special module (terminal block type).	All terminal block connector type modules
Insulation displacement terminal block adapter		A1S-TA32	Insulation displacement terminal block adapter for 32 points 0.5mm^2 (AWG20)	A1SX41(S1/S2), A1SX71, A1SY41, A1SY71
		A1S-TA32-3	Insulation displacement terminal block adapter for 32 points 0.3mm^2 (AWG22)	
		A1S-TA32-7	Insulation displacement terminal block adapter for 32 points 0.75mm^2 (AWG18)	
Terminal block adapter		A1S-TB32	For 32 points, conversion into Europe type terminal block	A1SX41(S1/S2), A1SX71, A1SY41, A1SY71
40-pin connector		A6CON1	Soldering type, straight out	Sink type (40p FCN)
		A6CON2	Solderless type, straight out	
		A6CON3	Press-fit type, flat cable	
		A6CON4	Soldering type, straight/diagonal out	
37-pin D-sub connector		A6CON1E	Soldering type, straight out	Source type (37p D-sub)
		A6CON2E	Solderless type, straight out	
		A6CON3E	Press-fit type, flat cable	

(2) Peripheral devices

Item	Model	Remark	
Plasma hand-held graphic programmer	A6PHP-SET	• A6PHP main module • SW□GP-GPPA.....GPP function startup floppy disk for the A series. • SW□GP-GPPK.....GPP function startup 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 module • SW□GP-GPPA.....GPP function startup floppy disk for the A series. • SW□GP-GPPK.....GPP function startup 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	SW0-GPPU	2DD-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-CKey sheet for the GPP mode of A6KB.	
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 (9.84 ft.) 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.	
Inked ribbon for A7NPR-S1	A7NPR-R	Replacement inked ribbon for A7NPR-S1.	
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)	
	A8PU A8UPU	Read/write of the program is performed by connecting to the CPU main module with a RS-422 cable (AC30R4-PUS, AC20R4-A8PU). (5VDC 0.4A)	

Item	Model	Remark
RS-422 cable	AC30R4-PUS	Connection cable for between the CPU main module and A7PUS, A8PU, A8UPU. 3m (9.84 ft.) long
	AC20R4-A8PU	Connection cable for between the CPU main module and A8PU, A8UPU. 2m (6.56 ft.) long
P-ROM write module	A6WU	• Used to write the program in the CPU/A6PHP main module to a ROM, or to read out the program in the ROM for the CPU main module. • Connect to the CPU/A6PHP with an AC30R4/AC03WU cable.
Data access module	A6DU-B	• Used for monitoring the CPU devices, changing the setting values/ current values, and displaying the operation status. (5VDC 0.23A) • Connect to the CPU with an AC30R4-PUS cable.
Modem interface module	A6TEL	• An interface module which connects the PC CPU and the modem. Using a telephone line, the communication is performed between a remote peripheral device and the CPU. (5VDC 0.2A) • Connect to the CPU 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 module 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 basic base module only, or with a basic base system and an extension base module connected with the expansion cable.

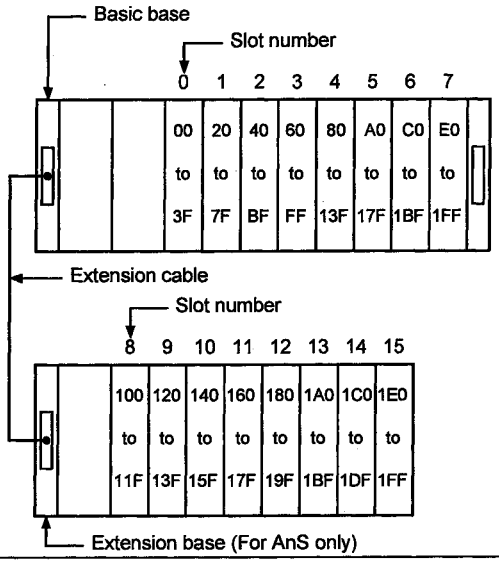
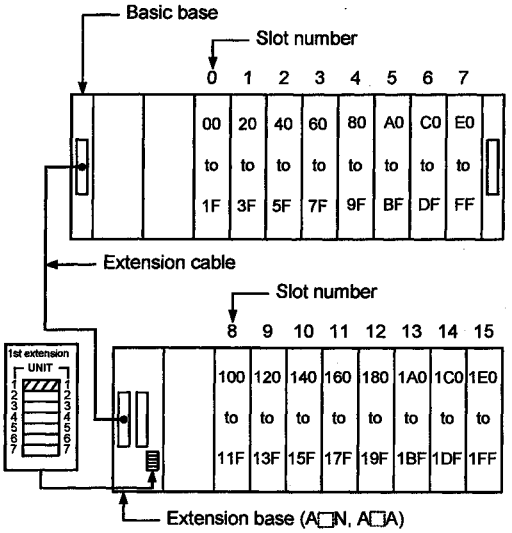
(2)- **Network system** ..... A system for controlling multiple PCs and remote I/O modules.

(3)- **Computer link system** ..... A system for data exchange between the A2USCPU (S1) and the computer (personal computer, etc.) by using an A1SJ71UC24 computer link module.

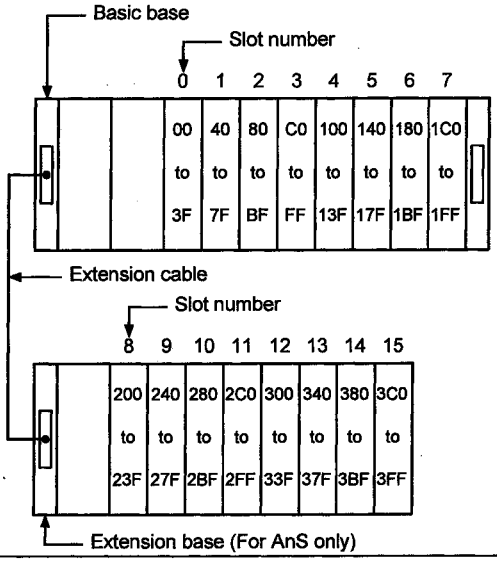
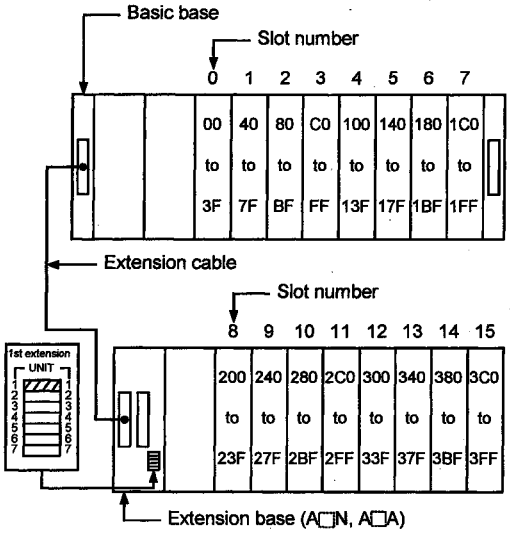
(4)- **Composite system** ..... A system which has a combination of a network system and a computer link system.

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

(1) A2USCPU-system

<table>
<tr><td>System configuration</td><td>[When the A1S dedicated extension base is used]
An example when a 32-point module is installed to each slot is shown.
 
</td><td>[When the A□N or A□A extension base is used]
An example when a 32-point module is installed to each slot is shown.
 
</td></tr>
<tr><td>Maximum number of extension</td><td colspan="2">1 extension unit</td><td>1 extension unit</td></tr>
<tr><td>Maximum number of I/O modules</td><td colspan="3">16 modules</td></tr>
<tr><td>Maximum number of I/O points</td><td colspan="3">512 points</td></tr>
<tr><td>Basic base unit model</td><td colspan="3">A1S32B, A1S33B, A1S35B, A1S38B</td></tr>
<tr><td>Extension base unit model</td><td colspan="2">A1S65B, A1S68B, A1S52B, A1S55B, A1S58B</td><td>A62B, A65B, A68B, A52B, A55B, A58B</td></tr>
<tr><td>Extension cable model</td><td colspan="2">A1SC03B, A1SC07B, A1SC12B, A1SC30B,
A1SC01B (right-side installation), A1SC60B</td><td>A1SC05NB. A1SC07NB
A1SC30NB, A1SC50NB</td></tr>
<tr><td>Notes</td><td colspan="3">(1) Only one extension base module can be used. (The second extension module cannot be used.)
(2) When the extension base A1S52B, A1S55B, A1S58B, A55B or A58B is used, the 5VDC power is supplied from the power supply module of the basic base module. Before use, refer to Section 6.1.3 and examine if it can be used.
(3) Limit the length of extension cable to 6m or shorter.
(4) If an extension cable is used, do not tie it with the main circuit cables, which has high voltage, large current, or install them close to each other.</td></tr>
<tr><td>Assignment of the I/O numbers
(When I/O is not assigned)</td><td colspan="3">(1) Assign I/O numbers to the basic base unit first, then to the extension base unit.
(2) Assign I/O numbers as if both basic base unit and extension base unit have 8 slots each. When the A1S32B/A1S33B/A1S35B for 2/3/5 slots are used as the basic base unit, add 6/5/3 slots (96 points/48 points) and assign the extension base unit I/O numbers.
(3) 16 points are assigned to an empty slot.
(4) When an extension base unit for A□N or A□A is used, be sure to set to a single extension level. If it is set to the number of skipped unit, 16 points/slot are assigned to all of "skipped unit x 8 slots", and thus it does not work.
(5) Items (2) to (4) can be changed by the I/O assignment. Refer to the ACPU Programming Manual (Fundamentals) for details.</td></tr>
</table>

(2) A2USCPU-S1 system

<table>
<tr><td>System configuration</td><td>[When the A1S dedicated extension base is used]
An example when a 64-point module is installed to each slot is shown.
 
</td><td colspan="2">[When the A□N or A□A extension base is used]
An example when a 64-point module is installed to each slot is shown.
 
</td></tr>
<tr><td>Maximum number of extension</td><td>1 extension unit</td><td colspan="2">1 extension unit</td></tr>
<tr><td>Maximum number of I/O modules</td><td colspan="3">16 modules</td></tr>
<tr><td>Maximum number of I/O points</td><td colspan="3">1024 points</td></tr>
<tr><td>Basic base unit model</td><td colspan="3">A1S32B, A1S33B, A1S35B, A1S38B</td></tr>
<tr><td>Extension base unit model</td><td>A1S65B, A1S68B, A1S52B, A1S55B, A1S58B</td><td colspan="2">A62B, A65B, A68B, A52B, A55B, A58B</td></tr>
<tr><td>Extension cable model</td><td>A1SC03B, A1SC07B, A1SC12B, A1SC30B,
A1SC01B (right-side installation), A1SC60B</td><td colspan="2">A1SC05NB. A1SC07NB
A1SC30NB, A1SC50NB</td></tr>
<tr><td>Notes</td><td colspan="3">(1) Only one extension base module can be used. (The second extension module cannot be used.)
(2) When the extension base A1S52B, A1S55B, A1S58B, A55B or A58B is used, the 5VDC power is supplied from the power supply module of the basic base module. Before use, refer to Section 6.1.3 and examine if it can be used.
(3) Limit the length of extension cable to 6m or shorter.
(4) If an extension cable is used, do not tie it with the main circuit cables, which has high voltage, large current, or install them close to each other.</td></tr>
<tr><td>Assignment of the I/O numbers
(When I/O is not assigned)</td><td colspan="3">(1) Assign I/O numbers to the basic base unit first, then to the extension base unit.
(2) Assign I/O numbers as if both basic base unit and extension base unit have 8 slots each. When the A1S32B/A1S33B/A1S35B for 2/3/5 slots are used as the basic base unit, add 6/5/3 slots (96 points/48 points) and assign the extension base unit I/O numbers.
(3) 16 points are assigned to an empty slot.
(4) When an extension base unit for A□N or A□A is used, be sure to set to a single extension level. If it is set to the number of skipped unit, 16 points/slot are assigned to all of "skipped unit x 8 slots", and thus it does not work.
(5) Items (2) to (4) can be changed by the I/O assignment. Refer to the ACPU Programming Manual (Fundamentals) for details.</td></tr>
</table>

3. GENERAL SPECIFICATION

The general specification common to various modules is shown.

Table 3.1 General specification

<table>
<tr><th>Item</th><th colspan="5">Specification</th></tr>
<tr><td>Operation ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">-20 to 75°C</td></tr>
<tr><td>Operation ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td rowspan="8">Vibration durability</td><td rowspan="8">Conforms to the JIS B 3502 and IEC 61131-2</td><td colspan="4">When there is intermittent vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.075mm (0.003 in.)</td><td rowspan="2">10 times each in X, Y, and Z directions</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>—</td></tr>
<tr><td colspan="4">When there is continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.035mm (0.001 in.)</td><td rowspan="2">—</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>—</td></tr>
<tr><td>Shock durability</td><td colspan="5">Conforms to the JIS B 3502 and IEC 61131-2 (147 m/s^2), 3 times each in 3 directions)</td></tr>
<tr><td>Operation ambiance</td><td colspan="5">No corrosive gas</td></tr>
<tr><td>Operation height *3</td><td colspan="5">2000m(6562 ft.) or less</td></tr>
<tr><td>Installation area</td><td colspan="5">On the control panel</td></tr>
<tr><td>Over-voltage category *1</td><td colspan="5">II or less</td></tr>
<tr><td>Pollution level *2</td><td colspan="5">2 or less</td></tr>
</table>

*1 Indicates the location the device is connected, from the public cable network to the device structure wiring area.
Category II applies to the devices to which the power is supplied from a fixed equipment.
Surge withstand voltage for devices with up to 300V of rated voltage is 2500V.

*2 This is an index which indicates the degree of conductive object generation in the environment where the device is used. Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensation must be expected occasionally.

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

4. CPU MODULE

4.1 CPU Module Performance Specifications

This section explains the performance specifications and devices of the A2USCPU.

Table 4.1 Performance Specifications

Item		Performance		Remarks
		A2USCPU	A2USCPU-S1	
Control system		Stored program, repeated operation		
I/O control method		Refresh method		Instructions to enable partial direct I/O are available.
Programming language		Language dedicated to sequence control		
		Combined use of relay symbol type, logic symbolic language and MELSAP-II(SFC)		
Processing speed (Sequence instruction) (μ sec/step)		0.2		
Instruction (types)	Sequence instruction	25		
	Basic, application instruction	243		
	Dedicated instruction	204		
Constant scan (program start at specified intervals)		Can be set between 10 msec and 190 msec in 10 msec increments		Set in special register D9020.
Memory capacity		64 kbytes (built-in RAM)	256 kbytes (built-in RAM)	A2SMCA-14KP/14KE (64 kbytes) can be installed.
Program capacity	Main sequence program	Max. 14K steps		Set in parameters.
	Sub-sequence program	Absent		
I/O device points		8192 points (X/Y0 to 1FFF)		The number of points usable in the program
I/O points		512 points (X/Y0 to 1FF)	1024 points (X/Y0 to 3FF)	The number of points which can be used for accessibility to I/O modules
Device points	Internal relay (M)	7144 points (M0 to M999, M2048 to M8191)	Total of 8192 points shared by M, L, and S	Range of each device can be changed in parameters.
	Latch relay (L)	1048 points (L1000 to L2047)		
	Step relay (S)	0 point (None in the initial state)		
	Link relay (B)	8192 points (B0 to B1FFF)		
	Timer (T)	2048 points (defaults to 256 points) • 100 msec timer (T0 to T199) ..... Setting range 0.1 to 3276.7 sec • 10 msec timer (T200 to T255) ..... Setting range 0.01 to 327.67 sec • 100 msec retentive timer ..... Setting range 0.1 to 3276.7 sec (None in the initial state) • Extension timer ..... Set range with word devices (T256 to T2047) (D, W, R)		Set number of points used and range in parameters. (Refer to Section 4.2.1.)
	Counter (C)	1024 points (defaults to 256 points) • Normal counter (C0 to C255) ..... Count range 1 to 32767 times • Interrupt counter ..... Can be set within the range of C224 (None in the initial state) ..... to C255 depending on the setting • Extension counter ..... Set range with word devices (C256 to C1023) (D, W, R)		Set number of points used and range in parameters. (Refer to Section 4.2.1.)
	Data register (D)	8192 points (D0 to D8191)		
	Link register (W)	8192 points (W0 to W1FFF)		
	Annunciator (F)	2048 points (F0 to F2047)		Device for fault detection
	File register (R)	8192 (R0 to R8191)		Set number of points in parameters.

Table 4.1 Performance Specifications (Continued)

Item		Performance		Remarks
		A2USCPU	A2USCPU-S1	
Device points	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)		
Comment		Max. 4032 points (Set in units of 64 points)		Set in parameters.
Extension comment		Max. 3968 points (Set in units of 64 points)		
Output mode switching at STOP → RUN		Selection of re-output of operation state before STOP (default)/output after operation execution		Set in parameters.
Self-diagnostic functions		Watchdog timer (watchdog timer 200 msec fixed) Memory error detection, CPU error detection, I/O error detection, battery error detection, etc.		Refer to Section 4.1.4 for details.
Operation mode at error occurrence		Stop or continue selectable		Set in parameters. (Refer to Section 4.2.1.)
Starting method at RUN		Initial start (Automatic restart when "RUN" switch is moved to ON position at power-on, at power restoration after power failure)		
Latch (power failure compensation) range		Defaults to L1000 to L2047 (Latch range can be set for L, B, T, C, D and W relays.)		Set range in parameters.
Remote RUN/PAUSE contact		One RUN contact and one PAUSE contact can be set within the range from X0 to X1FFF		Set in parameters.
Print title entry		Available (128 characters)		Set in parameters.
Entry code		Available		Set in parameters.
I/O allocation		Number of occupied I/O points and unit model can be entered.		
Step RUN		Can execute or stop sequence program operation.		Refer to Section 4.3.
Interrupt processing		Interrupt program can be run in response to a signal from an interrupt unit or by a constant-cycle interrupt signal.		
Data link		MELSECNET/10, MELSECNET(II), MELSECNET/B		
Allowable momentary power failure time		Depends on used power supply module		Refer to Section 5.1.
5 VDC internal power consumption (A)		0.32		
Weight kg (lb)		0.41 (0.9)		
External dimensions mm (in)		130 x 54.5 x 93.6 (5.12 x 2.15 x 3.69)		

CAUTION

When the existing system software package and peripheral devices are used, the applicable device range is limited. Refer to Section 2.2.3 for details.

4.1.1 Overview of operation processing

An overview of processing subsequent to starting power supply for A2USCPU (S1) to execution of the sequence program is explained.
A2USCPU (S1)'s 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 check items for power-on and reset among the PC CPU's self-diagnosis items (Refer to 4.1.4).

(e) For the control station of the MELSECNET/10 or the master station of MELSECNET (II)/B, sets the network/link parameter information to the network/data-link module, and commences the network communication/data link.

(2) Refresh processing of I/O module

Executes the refresh processing of I/O module. (Refer to the ACPU Programming Manual (Fundamentals).)

(3) Operation processing of a sequence program

Executes a sequence program from step 0 to the END instruction written in the PC CPU.

(4) END processing

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

(a) Performs self-diagnosis checks, such as fuse blown, I/O module verification, and 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 Programming Manual (Fundamentals).)

(c) Performs data exchange between PC CPU and computer link module when there is a data read or write request from a computer link module. (A1SJ71UC24-R2, AJ71C24(S3), AD51(S3), etc.)

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

(e) When the trace point setting of sampling trace is by each scan (after the execution of END instruction), stores the condition of the device for which it is setup into the sampling trace area.

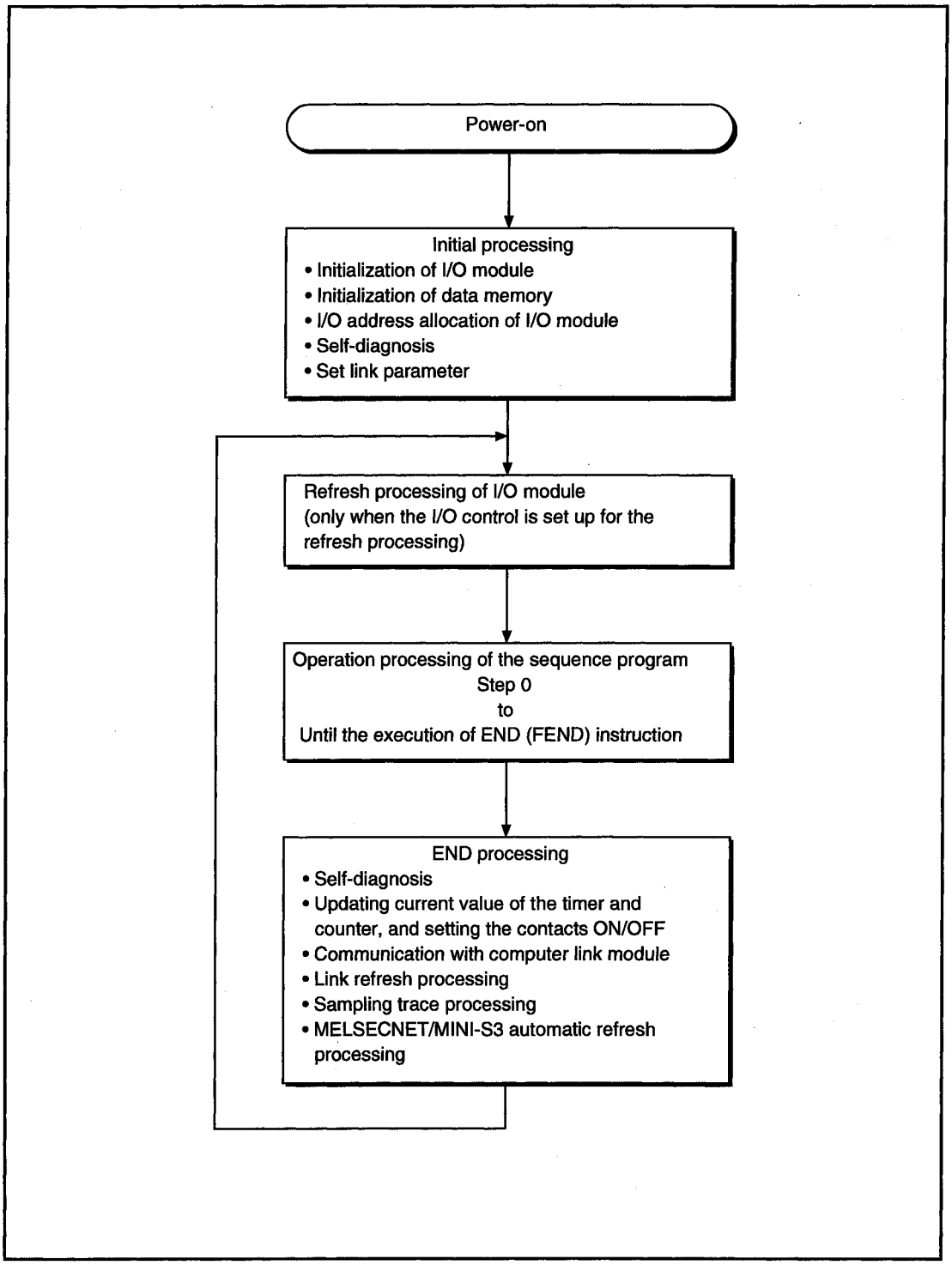


Figure 4.1 A2USCPU (S1) operation processing

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

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

(1) RUN state operation processing

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

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

(c) Processing time from switching from STOP to RUN until the startup of sequence program is usually one to three seconds, yet it may vary depending on the system configuration.

(2) STOP state operation processing

(a) The termination of operation of the sequence program by the use of RUN/STOP key switch or the remote STOP is called the STOP state. (Refer to Section 4.3.)

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

(3) PAUSE state operation processing

(a) The termination of operation of sequence program while retaining output and data memories is called the PAUSE state. (Refer to Section 4.3.)

(4) Step operation (STEP RUN) operation processing

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

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

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

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

POINT

Whether in the RUN, STOP or PAUSE state, PC CPU is performing the following:

- Refresh processing of I/O module
- Data communication with computer link module
- Link refresh processing.

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

4.1.3 Operation processing upon momentary power failure

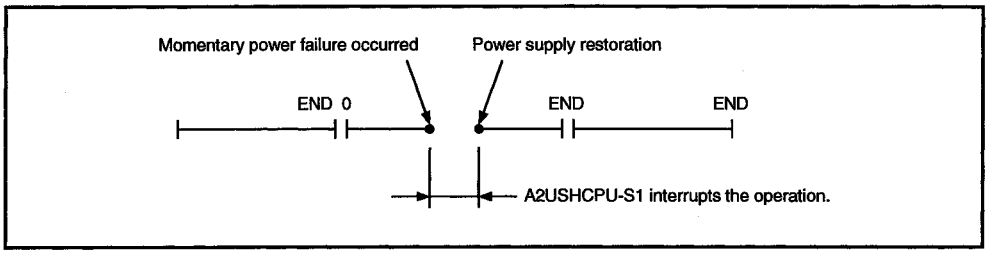
The PC CPU detects a momentary power failure when input power voltage supplied to the power supply module becomes lower than the specified range.
When the PC CPU detects a momentary power failure, following operation processing is performed.

(1) When a momentary power failure shorter than allowable period of momentary power failure occurred:

(a) When a momentary power failure occurred, operation processing is interrupted while the output state is retained.

(b) When the momentary power failure is reset, operation processing will be continued.

(c) When a momentary power failure occurred and the operation was interrupted, measurement of the watchdog timer (WDT) continues. For instance, when the scan time is 190ms and a momentary power failure of 15ms occurs, it causes the watchdog timer error (200ms).



Operation processing upon momentary power failure

(2) When a momentary power failure longer than the allowable period of momentary power failure occurred:

The PC CPU performs the initial start. The operation processing is the same as power-on or reset operation with the reset switch.

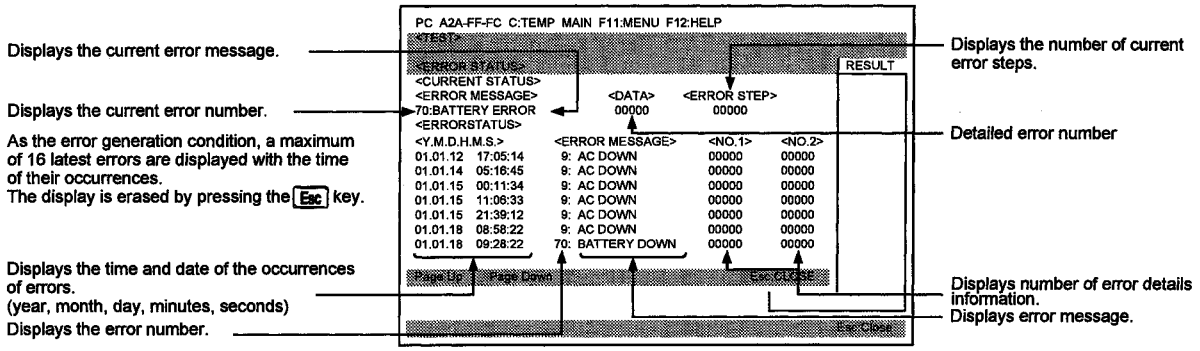
4.1.4 Self-diagnosis

Self-diagnosis is a function with which A2USCPU (S1) diagnoses itself for the presence of any abnormalities.

(1) Upon turning on the power supply to PC or when an abnormality occurred while the PC is running, the A2USCPU (S1)'s self-diagnosis processing prevents malfunctions of the PC and performs preventive maintenance by detecting the abnormality, displaying an error display, halting the operation of A2USCPU (S1), and so on.

(2) A2USCPU (S1) 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 back-up. With the AnUCPU-supporting system FD, contents of up to 16 errors can be confirmed from the peripheral devices. Display example with SW□IVD-GPPA is shown below:



(4) When the self-diagnosis detects an error, the module will be in one of the two modes below:

- Mode wherein operation of the PC is stopped
- Mode wherein operation of the PC continues

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

(a) When a stop-operation mode error is detected by the self-diagnosis, the operation is stopped at the time of detection of the error, and sets the all outputs(Y) to OFF.

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

When an error is detected, error generation and error contents are stored in the special relay (M) and special register (D), so that in case of the continue-operation mode, the program can use the information to prevent any malfunctions of the PC or devices.

Error descriptions detected by the self-diagnosis are shown in the next page.

REMARK

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

Self-diagnostic functions

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

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

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

4.1.5 Device list

The device operating range of the A2USCPU is shown below.

Table 4.3 Device List

Device		Application Range (Number of points)		Explanation
		A2USCPU	A2USCPU-S1	
X	Input	X, Y 0 to 1FF (512 points)	X, Y 0 to 3FF (1024 points)	rovides PC command and data from external devices, e.g., pushbutton, select switch, limit switch, and digital switch.
Y	Output			Provides program control result to external devices, e.g., solenoid, magnetic switch, signal light, and digital display.
X	Input	X, Y 0 to 1FFF (8192 points)		• Up to 8192 points after the I/O points used within the I/O range (mentioned above) assigned for each A2USCPU can be used in a program. (external output impossible) • These points are assigned for the I/O automatic refersh of MELSECNET/MINI-S3 or for the remote I/O points of MELSECNET/10.
Y	Output			
M	Special relay	M9000 to 9255 (256 points)		Predefined auxiliary relay for special purpose and for use in the PC.
	Internal relay	M/L/S 0 to 8191 (8192 points) Number of Ms + Ls + Ss = 8192 points		Auxiliary relay in the PC which cannot be output directly.
L	Latch relay			Auxiliary relay in the PC which cannot be output directly. Backed up during power failure.
S	Step relay			Used in the same manner as an internal relay (M), e.g. as a relay indicating the stage number of a step-by-step process operation program.
B	Link relay	B0 to B1FFF (8192 points)		Internal relay for data link which cannot be output. May be used as an internal relay if not set for link initial data.
F	Annunciator	F0 to F2047 (2048 points)		Used to detect a fault. When switched on during RUN by a fault detection program, stores a corresponding number in special register D.
T	100 msec timer	T0 to T2047 (2048 points) (After T256, set value storage registers required)		Up timers available in 100 msec, 10 msec and 100 msec retentive types.
	10 msec timer			
	100 msec retentive timer			
C	Counter	C0 to C1023 (1024 points) (Interrupt counter C224 to C255 fixed. After C256, set value storage registers required)		Up counters available in normal and interrupt types.
	Interrupt counter			

Table 4.3 Device List (Continued)

Device		Application Range (Number of points)		Explanation
		A2USCPU	A2USCPU-S1	
D	Data register	D0 to D8191 (8192 points)		Memory for storing PC data.
	Special register	D9000 to D9255 (256 points)		Predefined data memory for special purpose.
W	Link register	W0 to W1FFF (8192 points)		Data register for use with data link.
R	File register	R0 to R8191 (8192 points)		Extends data register using user memory area.
A	Accumulator	A0, A1 (2 points)		Data register for storing the operation results of basic and application instructions.
Z V	Index register	V, V_1 to V_6, Z, Z_1 to Z_6 (14 points)		Used to modify devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, P).
N	Nesting	N0 to N7 (8 levels)		Indicates the nesting of master controls.
P	Pointer	P0 to P255 (256 points)		Indicates the destination of the branch instruction (CJ, SCJ, CALL, JMP).
I	Pointer for interruption	I0 to I31 (32 points)		Indicates the destination of an interrupt program corresponding to the interrupt factor which has occurred.
K	Decimal constant	K-32768 to 32767 (16-bit instruction) K-2147483648 to 2147483647 (32-bit instruction)		Used to specify the timer/counter set value, pointer number, interrupt pointer number, the number of bit device digits, and basic and application instruction values.
H	Hexadecimal constant	H0 to FFFF (16-bit instruction) Ho to FFFFFFFF (32-bit instruction)		Used to specify the basic and application instruction values.

4.2 Parameter Setting Range

Parameter setting ranges, user memory allocation contents, I/O device allocation method and automatic refresh of MELSECNET/MINI-S3 are explained in this section.

4.2.1 Parameter setting range list

Parameter setting involves specifying various PLC functions and device ranges as well as allocating the user memory in the memory cassette.

The set data is stored in the parameter memory area (the first 3 Kbytes of the user memory area).

The network parameters for MELSECNET/10 are allocated and saved in the area next to the main sequence program area. (Refer to section 4.2.2.)

As given in the table below, default values can be used as they are set with parameter data. Setting ranges shown here can be changed by the peripheral device according to their purpose.

Table 4.4 Parameter Setting Range List

Item \ Setting		Default Value	Type	
			A2USCPU	A2USCPU-S1
Main sequence program capacity		6K steps	1 to 14K steps (1K step = in units of 2 Kbytes)	
File register		———	0 to 8K points (1K point = in units of 2 Kbytes)	
Extension file register		———	1 block = 16 Kbytes (Block setting for block Nos. 1 to 8 and 10 to vacant memory area) [Automatically set to vacant memory area by file register setting.]	
Comment capacity		———	0 to 4032 points (in units of 64 points = in units of 1 Kbyte) [1 Kbyte memory area is added by setting a comment capacity.]	
Extension comment capacity		———	0 to 3968 points (in units of 64 points = in units of 1 Kbyte)	
Status latch		———	Parameter setting is not provided.	
Sampling trace		———	(Set the device and the resultant destination extension file register by the status latch and sampling trace modes. Refer to ACPU Programming Manual (Fundamentals).)	
Setting of latch (power failure compensation) range	Link relay (B)	• Only for L1000 to L2047 • Absent for others.	B0 to B1FFF (in units of 1 point)	
	Timer (T)		T0 to T255 (in units of 1 point) T256 to T2047 (in units of 1 point)	
	Counter (C)		C0 to C255 (in units of 1 point) C256 to C1023 (in units of 1 point)	
	Data register (D)		D0 to D8191 (in units of 1 point)	
	Link register (W)		W0 to W1FFF (in units of 1 point)	
Setting of the MELSECNET/10 link range	Number of link stations	———	Optical link: Max. 64 stations Coaxial link: Max. 32 stations	
	I/O (X/Y)		X/Y0 to X/Y1FFF (in units of 16 points)	
	Link relay (B)		B0 to B1FFF (in units of 16 points)	
	Link register (W)		W0 to W1FFF (in units of 1 point)	

Table 4.4 Parameter Setting Range List (Continued)

Item \ Setting		Default Value	Type	
			A2USCPU	A2USCPU-S1
Setting of internal relay (M), latch relay (L), step relay (S)		M0 to M999 M2048 to M8191 L1000 to L2047 Absent for S	M/L/S 0 to 8191 (M, L, S are serial numbers)	
Setting of timer	T0 to T255	100 ms: T0 to T199 10 ms: T200 to T255	• 256 points of 100 ms, 10 ms, and retentive timers (in units of 8 points) • Timers have serial numbers.	
	T256 to T2047	———	• 1792 points of 100 ms, 10 ms, and retentive timers (in units of 16 points) • Timers have serial numbers. • Setting devices ... D, R, W (Set values for the points exceeding 256 points)	
Setting of counter	Interrupt counter setting	———	• Set whether or not an interrupt counter (C224 to C255) is allocated for every point of the interrupt pointer.	
	Number of used points	256 points (C0 to C255)	• 0 to 1024 points (in units of 16 points) • Setting devices ... D, R, W (Set values for the points exceeding 256 points)	
I/O number allocation		———	• 0 to 64 points (in units of 16 points) ..... Input module/output module Special function module/vacant slot • Module type can be entered.	
Setting of remote RUN/PAUSE contact		———	• X0 to X1FFF (1 point for each of run and pause contacts.) • Setting of only pause contact cannot be performed.	
Operation mode at the time of error	Fuse blown	Continuation	Stop/continuation	
	I/O verify error	Stop		
	Operation error	Continuation		
	Special function unit check error	Stop		
General data processing method END batch processing		Not featured	Featured/not featured	
STOP → RUN display mode		Operation status prior to stop is re-output	Output before stop or after operation execution	
Print title entry		———	• 128 characters	
Keyword entry		———	• Max. 6 digits in hexadecimal (0 to 9, A to F)	
MELSEC NET II link range setting	Number of link stations	———	• 0 to 64 stations	
	Input/output (X/Y)		X/Y0 to 1FF (in units of 16 points)	X/Y0 to 3FF (in units of 16 points)
	Link relay (B)		• B0 to BFFF (in units of 16 points)	
	Link register (W)		• W0 to WFFF (in units of 1 point)	

Table 4.4 Parameter Setting Range List (Continued)

Item \ Setting	Default Value	Type	
		A2USCPU	A2USCPU-S1
MELSECNET/MINI, MELSECNET/MINI-S3 link range setting	———	Number of support units: 0 to 8 units	
		Head I/O number: 0 to 1FF0 (in units of 10^H)	
		Name entry: MINI, MINI-S3	
		Send/receive data: X, M, L, B, T, C, D, W, R, Ab-sent (bit devices in units of 16 points)	
		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, Absent (bit devices in units of 16 points)	
		Error number: T, C, D, W, R	
		Total number of remote stations: 0 to 64 stations	
		Send status setting at line error: Test message, OFF data, retention (send data)	

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

A2USHCPU-S1 has 256k bytes of user memory (RAM) as a standard. Parameters, T/C set value main program, MELSECNET/10 network parameters, expansion comment, file register, and comment data are stored in the user memory.

(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 Parameter setting and memory capacity

Item		Setting unit	Memory capacity	Change into a ROM	Remark
Parameter, T/C set value		—	4k bytes (fixed)	Yes	The parameter and T/C set value occupy 4k bytes.
Main program	Sequence program	1k step	[Main sequence program capacity] × 2k bytes		
	Microcomputer program	2k bytes	[Main microcomputer program capacity] k bytes		The microcomputer program area is dedicated to SFC.
MELSECNET/10 network parameter		—	(Network module) × 4k bytes		One network module occupies up to a maximum of 4k bytes.
Expansion comment		64 points	[(Extension comment points) / 64 + 1] k byte	No	If the expansion comment capacity is set, the system occupies 1k byte.
File register		1k point	(File register points) × 2k bytes		
Comment		64 points	[(Comment points) / 64 + 1] k byte		If the comment capacity is set, the system occupies 1k byte.

*(1) The capacity for network parameters of MELSECNET/10 changes depending on the contents set. The area for the network parameters shall be secured in 2k byte units based on the total of capacity for each setting. The memory capacity of each network parameter is as follows:

Item	Memory capacity (bytes)
Internal data	30
Routing parameter	390
Transfer parameter between data links	246
Common parameter	2164/module *1
Refresh parameter	92/module
Station specific parameter	1490/module

*1 It is 2722 bytes in case of a remote master station.

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

Total of the capacity	Capacity for network parameter setting
30 to 2048 bytes	2k bytes
2049 to 4096 bytes	4k bytes
4097 to 6144 bytes	6k bytes
6145 to 8192 bytes	8k bytes
8193 to 10240 bytes	10k bytes
10241 to 12288 bytes	12k bytes
12289 to 14336 bytes	14k bytes
14337 to 16384 bytes	16k bytes

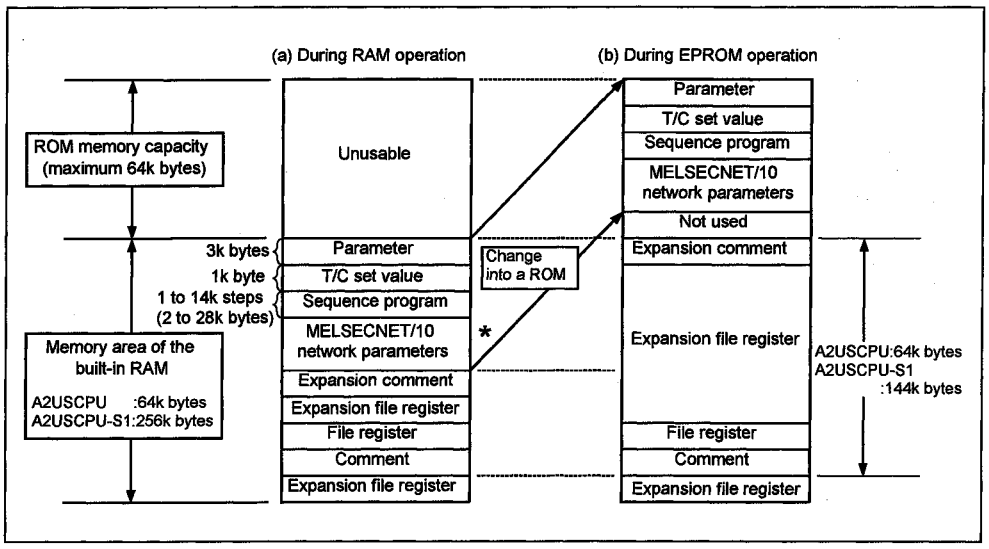
(2) If the MELSECNET(II) data link system is configured using a GPP function software package for the A2USH CPU, two-kilo bytes (for kilo steps) are occupied as a link parameter area.

(2) Storing order in the user memory

Each data set by the parameters are stored in the order shown below:

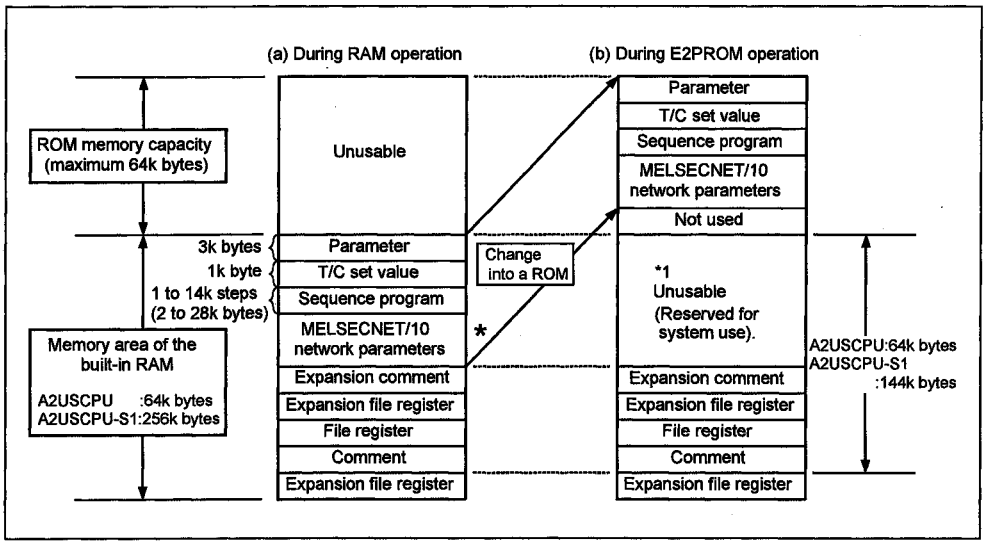
(a) When the main program is made into EPROM

By making the main program into EPROM, the expansion file register can be enlarged.



(b) Making the main program to E^2PROM

Even when the main program is made into E^2PROM, the system uses the same built-in RAM area (area*1 in figure below) as during RAM operation, so the expansion file register cannot be enlarged.



* When MELSECNET(II) data link system is constructed using the GPP function software package which is compatible to AnU, 2k bytes (equivalent to 1k step) are occupied for link parameter area.

POINT

Note that the sequence program can use only up to 22k steps when the maximum 16k bytes are used for the MELSECNET/10 network parameters.

The memory area for the sequence program for A2USHCPU-S1 is the same as that for MELSECNET/10. Therefore, the remainder of subtracting the memory area used by MELSECNET/10 network parameters from the maximum 30k steps can be used for the memory area for the sequence program.

(c) Storage addresses of user memory

The addresses of the data stored into the RAM memory can be found as described below. When making memory protect setting, confirm the data storage addresses so that the storage destinations of the data to be rewritten are not protected.

1) During RAM operation

Item			Memory capacity	Head addresses where data will be stored into RAM memory		Remark
				A2USCPU-S1	A2USCPU	
Parameter, T/C set value			4k bytes	0k	0k	
Main program	Sequence program		(a) *1	4k	4k	
	Microcomputer program		(b) *1	4k + (a)	4k + (a)	
MELSECNET/10 network parameter			(c) *1	4k + (a) + (b)	4k + (a) + (b)	
Not used area			—	4k + (a) + (b) + (c)	4k + (a) + (b) + (c)	
Expansion file register *3	Block No.8		16k bytes	16k − (d) − (e)	—	Number of expansion file registers: n is determined by the memory capacity that remains after storage of the parameters, T/C set values, main programs, MELSECNET/10 network parameters, file registers and comments. (Remaining memory capacity) / 16 = n
	Block No.7	*2	16k bytes	32k − (d) − (e)	—	
	Block No.6		16k bytes	48k − (d) − (e)	—	
	Block No.5		16k bytes	64k − (d) − (e)	—	
	Block No.4		16k bytes	80k − (d) − (e)	—	
	Block No.3		16k bytes	96k − (d) − (e)	16k − (d) − (e)	
	Block No.2		16k bytes	112k − (d) − (e)	32k − (d) − (e)	
	Block No.1		16k bytes	128k − (d) − (e)	48k − (d) − (e)	
File register			(d) *1	144k − (d) − (e)	64k − (d) − (e)	
Comment			(e) *1	144k − (e)	64k − (e)	
Expansion file register *3	Block No.16		16k bytes	144k	—	
	Block No.15		16k bytes	160k	—	
	Block No.14		16k bytes	176k	—	
	Block No.13		16k bytes	192k	—	
	Block No.12		16k bytes	208k	—	
	Block No.11	*2	16k bytes	224k	—	
	Block No.10		16k bytes	240k	—	

*1: Can be confirmed in the memory capacity setting of the parameter setting on GX Developer.

*2: The expansion comments are stored into the expansion file register area.

1) If the expansion file register capacity cannot be taken up in the expansion file register block No. 1 to 8 area, data are stored into the expansion file register block No. 10 to 16 area.

2) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 1 to 8 area, the area is used in order of block Nos. 8, 7, 6, 5, 4, 3, 2 and 1.
When the A2USCPU is used and data are stored into the expansion file register block No. 1 to 3 area, the area is used in order of block Nos. 3, 2 and 1.

3) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 10 to 16 area, the area is used in order of block Nos. 10, 11, 12 and 13.

*3: Sampling trace data and status latch data are stored into the expansion file register area.
Determine the storage block Nos. in the parameter setting of GX Developer.

2) During EPROM operation

Item			Memory capacity	Head addresses where data will be stored into RAM memory		Remark
				A2USCPU-S1	A2USCPU	
Parameter, T/C set value			—	(Stored into EPROM)	(Stored into EPROM)	
Main program	Sequence program		—	(Stored into EPROM)	(Stored into EPROM)	
	Microcomputer program		—	(Stored into EPROM)	(Stored into EPROM)	
MELSECNET/10 network parameter			—	(Stored into EPROM)	(Stored into EPROM)	
Not used area			—	0k	0k	
Expansion file register *3	Block No.8		16k bytes	16k − (d) − (e)	—	Number of expansion file registers: n is determined by the memory capacity that remains after storage of the parameters, T/C set values, main programs, MELSECNET/10 network parameters, file registers and comments. (Remaining memory capacity) / 16 = n
	Block No.7	*2	16k bytes	32k − (d) − (e)	—	
	Block No.6		16k bytes	48k − (d) − (e)	—	
	Block No.5		16k bytes	64k − (d) − (e)	—	
	Block No.4		16k bytes	80k − (d) − (e)	—	
	Block No.3		16k bytes	96k − (d) − (e)	16k − (d) − (e)	
	Block No.2		16k bytes	112k − (d) − (e)	32k − (d) − (e)	
	Block No.1		16k bytes	128k − (d) − (e)	48k − (d) − (e)	
File register			(d) *1	144k − (d) − (e)	64k − (d) − (e)	
Comment			(e) *1	144k − (e)	64k − (e)	
Expansion file register *3	Block No.16		16k bytes	144k	—	
	Block No.15		16k bytes	160k	—	
	Block No.14		16k bytes	176k	—	
	Block No.13		16k bytes	192k	—	
	Block No.12		16k bytes	208k	—	
	Block No.11	*2	16k bytes	224k	—	
	Block No.10		16k bytes	240k	—	

*1: Can be confirmed in the memory capacity setting of the parameter setting on GX Developer.

*2: The expansion comments are stored into the expansion file register area.

1) If the expansion file register capacity cannot be taken up in the expansion file register block No. 1 to 8 area, data are stored into the expansion file register block No. 10 to 16 area.

2) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 1 to 8 area, the area is used in order of block Nos. 8, 7, 6, 5, 4, 3, 2 and 1.
When the A2USCPU is used and data are stored into the expansion file register block No. 1 to 3 area, the area is used in order of block Nos. 3, 2 and 1.

3) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 10 to 16 area, the area is used in order of block Nos. 10, 11, 12 and 13.

*3: Sampling trace data and status latch data are stored into the expansion file register area.
Determine the storage block Nos. in the parameter setting of GX Developer.

3) During E^2PROM operation

Item			Memory capacity	Head addresses where data will be stored into RAM memory		Remark
				A2USCPU-S1	A2USCPU	
Parameter, T/C set value			4k bytes	(Stored into E^2PROM)	(Stored into E^2PROM)	Reserved for system use.
Main program	Sequence program		(a) *1	(Stored into E^2PROM)	(Stored into E^2PROM)	
	Microcomputer program		(b) *1	(Stored into E^2PROM)	(Stored into E^2PROM)	
MELSECNET/10 network parameter			(c) *1	(Stored into E^2PROM)	(Stored into E^2PROM)	
Expansion comment *2			(d) *1	4k + (a) + (b) + (c)	4k + (a) + (b) + (c)	
Not used area			—	4k + (a) + (b) + (c) + (d)	4k + (a) + (b) + (c) + (d)	
Expansion file register *3	Block No.8		16k bytes	16k − (d) − (e)	—	Number of expansion file registers: n is determined by the memory capacity that remains after storage of the parameters, T/C set values, main programs, MELSECNET/10 network parameters, file registers and comments. (Remaining memory capacity) / 16 = n
	Block No.7	*2	16k bytes	32k − (d) − (e)	—	
	Block No.6		16k bytes	48k − (d) − (e)	—	
	Block No.5		16k bytes	64k − (d) − (e)	—	
	Block No.4		16k bytes	80k − (d) − (e)	—	
	Block No.3		16k bytes	96k − (d) − (e)	16k − (d) − (e)	
	Block No.2		16k bytes	112k − (d) − (e)	32k − (d) − (e)	
	Block No.1		16k bytes	128k − (d) − (e)	48k − (d) − (e)	
File register			(d) *1	144k − (d) − (e)	64k − (d) − (e)	
Comment			(e) *1	144k − (e)	64k − (e)	
Expansion file register *3	Block No.16		16k bytes	144k	—	
	Block No.15		16k bytes	160k	—	
	Block No.14		16k bytes	176k	—	
	Block No.13		16k bytes	192k	—	
	Block No.12		16k bytes	208k	—	
	Block No.11	*2	16k bytes	224k	—	
	Block No.10		16k bytes	240k	—	

*1: Can be confirmed in the memory capacity setting of the parameter setting on GX Developer.

*2: The expansion comments are stored into the expansion file register area.

1) If the expansion file register capacity cannot be taken up in the expansion file register block No. 1 to 8 area, data are stored into the expansion file register block No. 10 to 16 area.

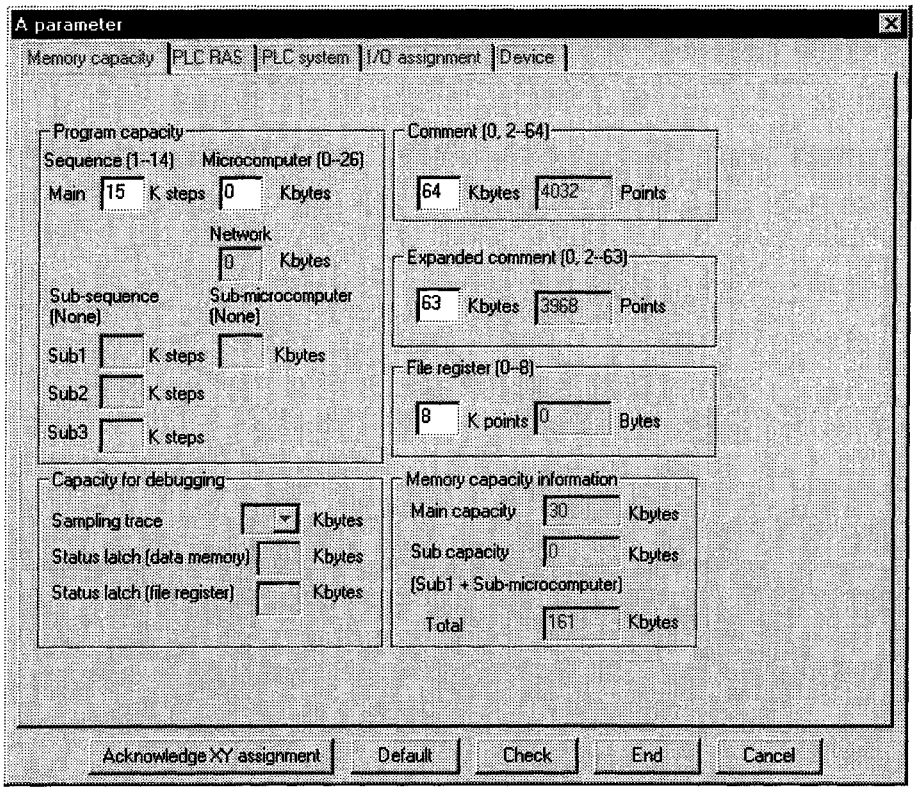
2) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 1 to 8 area, the area is used in order of block Nos. 8, 7, 6, 5, 4, 3, 2 and 1.
When the A2USCPU is used and data are stored into the expansion file register block No. 1 to 3 area, the area is used in order of block Nos. 3, 2 and 1.

3) When the A2USCPU-S1 is used and data are stored into the expansion file register block No. 10 to 16 area, the area is used in order of block Nos. 10, 11, 12 and 13.

*3: Sampling trace data and status latch data are stored into the expansion file register area.
Determine the storage block Nos. in the parameter setting of GX Developer.

REMARK

The following table indicates an example of calculating addresses where various data will be stored when the A2USCPU-S1 is used and RAM operation is performed in the following parameter setting.



Item		Memory capacity	Head addresses where data will be stored into RAM memory	Remark
Parameter, T/C set value		4k bytes	0k	
Main program	Sequence program	30k bytes	4k	
	Microcomputer program	0k bytes	—	
MELSECNET/10 network parameter		2k bytes	34k	
Not used area		(12k)	(36k)	
Expansion file register	Block No.8	16k bytes	—	Since the free memory capacity is 12k bytes, only one block of the expansion file register area can be used.
	Block No.7	16k bytes	—	
	Block No.6	16k bytes	—	
	Block No.5	16k bytes	—	
	Block No.4	16k bytes	—	
	Block No.3	16k bytes	—	
	Block No.2	16k bytes	—	
	Block No.1	16k bytes	48k	
File register		(d) *1	64k	
Comment		(e) *1	80k	
Expansion file register	Block No.16	16k bytes	144k	
	Block No.15	16k bytes	160k	
	Block No.14	16k bytes	176k	
Expansion comment	Block No.13	16k bytes	192k	Since the memory capacity of the block No. 1 to 8 area is insufficient, the expansion comments are stored into the block Nos. 10 to 13.
	Block No.12	16k bytes	208k	
	Block No.11	16k bytes	224k	
	Block No.10	16k bytes	240k	

4.2.3 Timer and counter setting ranges

(1) Timer setting range

(a) Default values of the timer setting range are shown below.

Number of timer points	: 256 points
100 msec timer	: T0 to T199
10 msec timer	: T200 to T255
Retentive timer	: Absent

(b) Default values when setting the number of used timer points to 257 or more are shown below.

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

(c) Timer types can be set as required by serial numbers in units of 8 points in the range of T0 to T255 and in units of 16 points in the range of T256 to T2047.

By setting to the number of timer points actually used, timer processing time after the END instruction can be shortened.

(d) Timer set values of T0 to T255 can be specified by constants or word devices; however, timer set values of T256 to T2047 should be specified by word device (D,W,R).

The timer set value cannot be specified by a constant.

Any required device must be allocated in parameter settings to word devices (D,W,R) to be used for storing timer set value of timers T256 to T2047.

(2) Counter setting range

(a) Default values of the counter setting range are shown below.

Number of counter points	: 256 points
Normal counter	: C0 to C255
Interrupt counter	: Absent

(b) Default values when setting the number of used counter points to 256 or more are shown below.

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

(c) The counters which can be set as interrupt counters are within the range of C224 to C255. Counters outside this range cannot be set as interrupt counters.

Set interrupt counters in units of 1 point in the range of C224 to C255 using parameters.

Counters of C224 to C255 which are not set for interrupt counters can be used as normal counters.

Interrupt counters in the A2USCPU count the number of interrupts I0 to I31.

Interrupt counters C224 to C255 are allocated to interrupt pointers I0 to I31 as shown below.

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	C242	I26	C250
I3	C227	I11	C235	I19	C243	I27	C251
I4	C228	I12	C236	I20	C244	I28	C252
I5	C229	I13	C237	I21	C245	I29	C253
I6	C230	I14	C238	I22	C246	I30	C254
I7	C231	I15	C239	I23	C247	I31	C255

(d) The number of used counter points can be set as the actual number of counter points used in the sequence program. (Can be set to 0 points.)
By setting the actual number of counter points to be used, counter processing time after the END instruction can be shortened.

(e) Counter set values of C0 to C255 can be specified by constants or word devices; however, counter set values of C256 to C1023 should be specified by word device (D,W,R).
The counter set value cannot be specified by a constant.
Word devices to be used for storing set value counters C256 to C1023 must be allocated in parameter settings.

POINT

When the number of timer points is set to 257 or over or the number of counter points to 256 or over, the set value storage devices (D, R and W) specified when the number of timer and counter points to be used were set are automatically set in serial numbers.
<EX.>
When the set number of timer points is 512 and the set value storage device is D1000, the D devices (D1000 to D1255) will be given serial numbers and used for storing the set values for the 256 timers from T256 to T511.

4.2.4 I/O devices

A2USCPU (S1) has 8192 I/O device points (X/Y0 to 1FFF) each for input (X) and output (Y). There are actual I/O devices and remote I/O devices in this I/O range.

(1) Actual I/O device
This is the device range where an I/O module or special function module can be installed to the basic base module/extension base module and controlled.
A2USCPU: 512 points (X/Y0 to 1FF)
A2USCPU-S1: 1024 points (X/Y0 to 3FF)

(2) Remote I/O device
The remote I/O devices, following the actual I/O devices, can be used for the following objectives:
(a) Allocate to a remote I/O station in the MELSECNET(II) data link system.
(b) Allocate to a remote I/O station in the MELSECNET/10 network system.
(c) Allocate to the reception data storage device or transmission data storage device in the MELSECNET/MINI-S3's automatic refresh setting.
(d) Use as the substitute to an internal relay.

4.2.5 I/O allocation of special function modules

By registering the model name of the following special function modules upon the I/O allocation from a peripheral device, dedicated commands for special function modules can be used.

Model name of special function module	Model name of the module to be set
AD61	AD61
AD61-S1	AD61S1
AD59	AD59
AD59-S1	AD59S1
AJ71C24	AJ71C24
AJ71C24-S3	AJ71C24S3
AJ71C24-S6	AJ71C24S6
AJ71C24-S8	AJ71C24S8
AJ71UC24	AJ71UC24
AJ71C21	AJ71C21
AJ71C21-S1	AJ71C21S1
AJ71PT32-S3	PT32S3
AD57	AD57
AD57-S1	AD57S1
AD58	AD58
A1SJ71UC24-R2	A1SJ71UC24
A1SJ71UC24-R4	
A1SJ71UC24-PRF	
A1SJ71PT32-S3	A1SPT32S3

POINT

If a FROM or TO instruction is executed to the special function module frequently with short scanning intervals, the special function module may not be processed normally.
When you execute a FROM or TO instruction to the special function module, adjust the processing time and conversion time using the timer, constant scan and other measures of the special function module.

4.2.6 MELSECNET/MINI-S3 automatic refresh

To execute automatic communications with the batch refresh send/receive data area of the A1SJ71PT32-S3/AJ71PT32-S3 (hereafter the "master module"), set the MELSECNET/MINI-S3 link information, I/O storage devices, etc., in the parameters.

The I/O devices allocated for send/receive operations by automatic refresh can be used to create a sequence program without modifications (FROM/TO instructions are not necessary).

POINTS

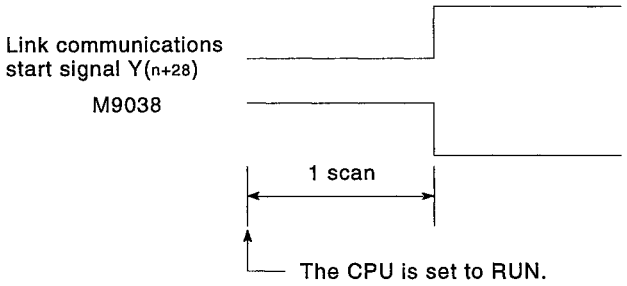
(1) Parameter setting for automatic refresh can be used to set up to 8 master modules, so that up to 8 modules can be handled with automatic refresh processing.
When 9 or more modules are used, use sequence program FROM/TO instructions.

(2) Automatic refresh is disabled with send/receive data for the partial refresh and I/O modules and send/receive data for remote terminal module numbers 1 to 14. Use FROM/TO instructions to handle such data.
However, partial automatic refresh is possible with the following remote terminal modules.
- AJ35PTF-R2 RS-232C interface module
- AJ35PT-OPB-M1-S3 mount type operation box
- AJ35PT-OPB-P1-S3 portable type operation box

(3) The CPU automatically turns on the link communications start signal Y(n+18) or Y(n+28) for master modules subject to automatic refresh setting. It is not necessary to turn the signal on by using the sequence program.

(4) Automatic refresh of I/O data is batch processed after execution of the END instruction. (Automatic refresh is performed when the CPU is in the RUN/PAUSE/STEP RUN state.)

(5) Dpending on the connected remote terminal modules, the master module may execute processing while the link communications start signal Y(n+28) is OFF.
For example, when an AJ35PTF-R2 RS-232C interface module is used with no control sequence, parameters must be written to the parameter area (buffer memory address: 860 to 929) while the link communications start signal is OFF.
Because the link communications start signal is turned on one scan after the CPU runs, write parameters at the first scan.



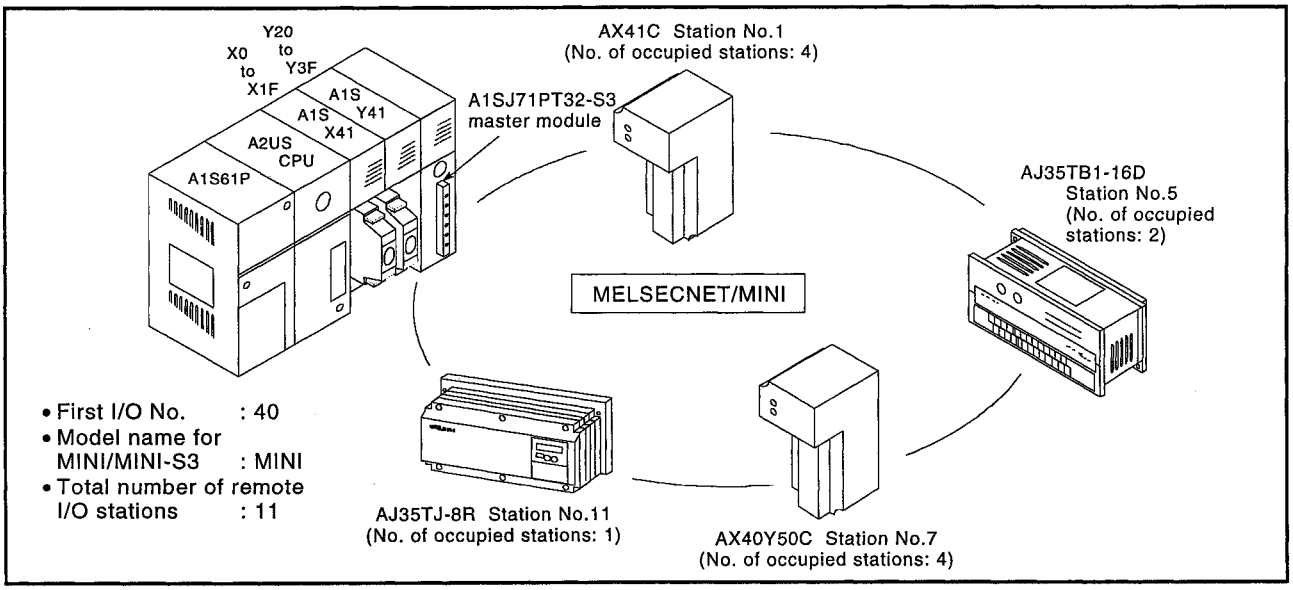
(1) The parameter setting items, ranges, and contents for automatic refresh, and the buffer memory addresses of the master module engaged in data communication with the A2USCPU are given in the table below. Make parameter settings for each of the number of A1SJ71PT32-S3/AJ71PT32-S3 master modules used.

I/O Signal of Master Module	Buffer Memory Address of Master Module	Item	Setting Range	Description
—	—	Number of master modules	1 to 8 modules	• Set the total number of used master units.
—	—	Head I/O number	I/O points of CPU	• Set the head I/O number with which the master unit is installed.
—	—	Name entry	• MINI or MINI-S3	• MINI..... for I/O dedicated mode (32 points occupied) • MINI-S3.. for extension mode (48 points occupied)
—	0	Total number of remote I/O stations *2	0 to 64 stations	• Set only when MINI is used. • This setting is not necessary when MINI-S3 is used since the number of the initial ROM of the master modules is effective. (Ignored when set.)
—	110 to 141	Receive data storage device	• X • M, L, B, T, C, D, W, R, absent (bit devices in units of 16 points)	• Set the devices to store batch refresh send/receive data. • Set the head device number. • The area equal to the number of stations beginning with the head device is occupied as the automatic refresh area. (8 points/station x 64 stations = 512 points .... bit devices) *2 • Use of X/Y for remote I/O range is recommended.
—	10 to 41	Send data storage device	• Y • M, L, B, T, C, D, W, R, absent (bit devices in units of 16 points)	
—	1	Number of retries	0 to 32 times	• Set the number of retries to be made when a communication error occurs. • Error is not output when communication is restarted within the set number of the retries.
*1 Y(n+1A)	—	FROM/TO response specification	Link priority, CPU priority (Select the access to the master unit buffer memory.)	(1) Link priority.....Priority is given to the MINI-S3 link access FROM /TO instructions are kept waiting during link access. • Refreshed receive data can be read at the same timing. • Max. waiting time (0.3 ms + 0.2 ms x number of partial refresh stations) for FROM/TO instructions will be provided. (2) CPU priority.....Priority is given to CPU's FROM/TO instruction access. This access interrupts in the link access. • Depending on timing, received data being refreshed may be read out. • No waiting time for FROM/TO instructions.
*1 Y(n+1B)	—	Faulty station data clear specification	Retain/clear (receive data)	• Retain.... Retains data for batch/partial refresh. • Clear..... All points set to OFF.

I/O Signal of Master Module	Buffer Memory Address of Master Module	Item	Setting Range	Description
—	100 to 103 195	Faulty station detection	M, L, B, T, C, D, W, R, absent (bit devices in units of 16 points)	• Set the head device to store faulty station detection data. • MINI ... 4 words, MINI-S3 ... 5 words are occupied.
—	107 196 to 209	Error number	T, C, D, W, R	• Set the head device to store error code when an error occurs. • MINI ... 1 word, MINI-S3 ... (1 + number of remote terminals) words
—	4	Line error check setting (line error)	• Sending test message • Sending OFF data • Sending data immediately before a line error occurrence	• Set the data communications method to check faulty position when an line error occurs.

*1 "n" is determined according to the location of the master module.
*2 If the total number of remote I/O stations is odd, each storage device occupies one more station.

(2) The setting method of the send/receive data storage device is explained using the system example shown below.
<Example> If the area following device X/Y 400 is used for remote I/O stations



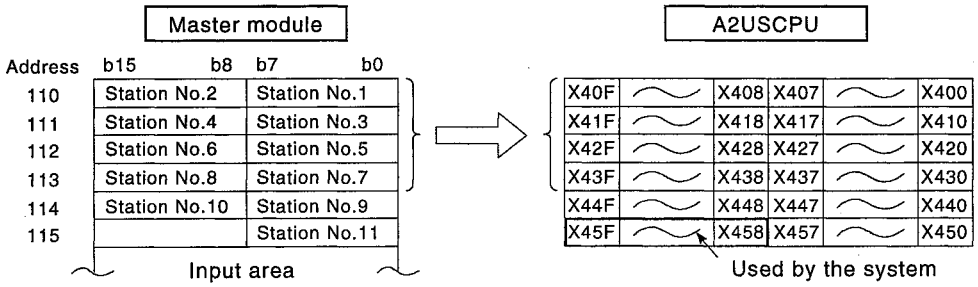
A parameter setting example for the GPP function software package shown in the above system example is shown below.

No. of modules [1] (0-8)

I/O No.	0040
Model name	MINI
No. of stations	11
Reception	X0400
Transmission	Y0400
Retry	5
Response	CPU
Data clear	Clear
Detection	
Error No.	
Error	Retained

The send/receive data storage devices in the system example are as follows.

(a) Receive data storage device



1) As a receive data storage device, specify the device number (X400) of b0 of station number 1.

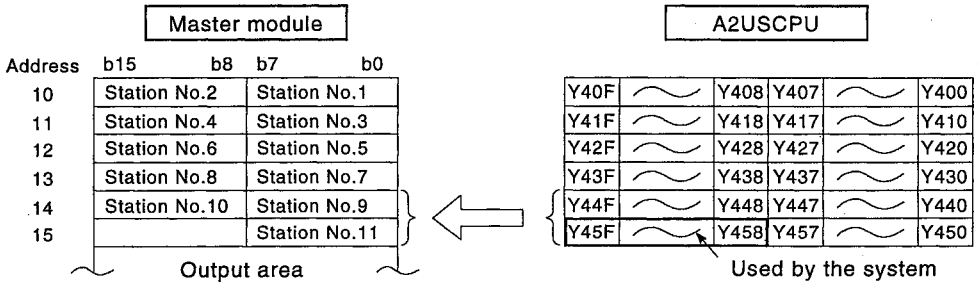
2) The reception data storage device uses from X400 to X45F. Because the total number of stations is odd in the system example, area for one more station is reserved.

3) The device numbers of connected input modules are as shown below.

Station No. 1 - 4 AX41C ——— X400 to X41F
Station No. 5 - 6 AJ35TB-16D ——— X420 to X42F
Station No. 7 - 8 AX40Y50C ——— X430 to X43F

X440 through X45F are simultaneously refreshed and always turned off.
Do not use X440 through X45F for the sequence program.

(b) Send data storage device



1) As a send data storage device, specify the device number (Y400) corresponding to b0 of station number 1.

2) The send data storage device uses from Y400 to Y45F.
Because the total number of stations is odd in the system example, area for one more station is reserved.

3) The device numbers of connected output modules are as shown below.
Station No. 9 - 10 AX40Y50C ———Y400 to Y44F
Station No. 11 AJ35TJ-8R ———Y450 to Y457

Y400 through Y43F and Y458 through Y44F are simultaneously refreshed.
But they are not output.

POINTS

(1) Specify the send/receive data storage devices without duplicate device numbers.
If "B0" is specified for the receive data storage device in the system configuration example, B0 through B5F are used for the device range.
Specify the area of B60 or higher for send data storage devices.
If the send data storage device is set to "B60," the device range becomes from B60 to BBF.

(2) To specify the bit device for the send/receive data storage device, be sure to specify a device number in a multiple of 16.
<Example> { X0, X10, ... X100, ...
M0, M16, ... M256, ...
B0, B10, ... B100, ... }

(3) The occupied device range is 8 points multiplied by the number of stations.
However, if the number of stations is odd, extra 8 points are necessary.

4.3 Function List

Various functions of the A2USCPU are explained in the table below.

Table 4.6 Function List

Function (Application)	Description	Settings and Operations
Constant scan [•Program execution at fixed intervals. •Simple positioning]	• The sequence program is executed while maintaining a constant scan time. • The range for the constant scan time setting is from 10 ms to 190 ms in units of 10 ms.	• The set value is written to special data register D9020.
Latch (power failure backup) [Continued control by retaining data at power failure]	• Retains data of latched devices when momentary power failure occurs 20 ms or longer, CPU is reset, or power is turned OFF. • L, B, T, C, D and W can be latched. • The data in the latch range is stored in the CPU module and is backed up by the battery in the memory cassette.	• Latch devices and latch ranges are set by using the parameter setting on peripheral devices.
MELSECNET/MINI-S3 automatic refresh [Simplification of sequence program]	• I/O automatic refresh communications with the send/receive data area for partial refresh of up to 8 AJ71PT32-S3/A1SJ71PT32-S3 modules are executed. • Automatic refresh is executed in batch after END processing. • The FROM/TO instructions for input/output used with the sequence program are not necessary. Allocated I/O devices can be used directly for programming.	• Use automatic refresh parameter setting of peripheral devices. (Refer to Section 4.2.6.)
Remote RUN/STOP [PC RUN/STOP is controlled by an external device.]	• When PC CPU is in the RUN state (key switch at RUN), PC RUN/STOP is controlled by an external device (external input, peripheral device, computer).	• To use an external input (X), set parameter by a peripheral device. • To use a peripheral device, use the PC test mode. • To use a computer through a computer link module, use a special command.
PAUSE [•Stops CPU operation while retaining the output (Y). •PC RUN/PAUSE control is externally executed.]	• PC CPU operation is stopped while retaining the ON/OFF status of all outputs (Y). [When operation is stopped by STOP, all outputs (Y) are turned OFF.] • When PC CPU is in the RUN state (key switch at RUN), PC RUN/PAUSE is controlled by an external device (external input, peripheral device, computer).	• To use a peripheral device, use the PC test mode. • To use an external input (X), set parameter by a peripheral device, and turn M9040 ON by using the sequence program.
Status latch [Used to check device status and fault factors when debugging or when a fault factor is established.]	• When status latch condition is established, status of devices set for status latch is stored to the extension file register in the status latch area in the memory cassette. (Stored data can be cleared by latch clear operation.) Condition establishment can be set for the • SLT instruction execution by sequence program or for the matching of set condition with device value.	• Set the status latch devices and the extension file registers to store latched data by using a peripheral device. • Monitor status latch data by a peripheral device.
Sampling trace [Used to check function of devices tracing the time when debugging or when operation is faulty.]	• Devices set for sampling trace are sampled by scan or set time intervals for set number of times, and the result is stored to the extension file registers for sampling trace in the memory cassette. (Stored data can be cleared by latch clear operation.) • Sampling trace is executed by executing a STRA instruction by the sequence program.	• Set the sampling trace devices, trace points, number of times and the extension file registers to store traced data by using a peripheral device. • Monitor sampling trace results by a peripheral device.

Table 4.6 Function List (continued)

Function (Application)	Description	Settings and Operations
Step run [Used to check program execution condition and operation when debugging.]	• Sequence program operation is executed under the following (1) to (5) conditions and then stopped. (1) Execution by instruction (2) Execution by circuit block (3) Execution by step interval and loop count (4) Execution by loop count and break point (5) Execution when device value is matched	• Select step run condition by a peripheral device, and set for execution.
Clock [Program management by clock data/external display of clock data]	• Clock built in the CPU module is operated. • Clock data: Year, month, day, hour, minute, second, day of the week • Clock data is read and stored to D9025 to D9028 by a clock device after sequence program END processing when a clock data read request M9028 is ON. • Clock device is backed up by the battery in the memory cassette.	• Set data to D9025 to D9028 by a peripheral device, and turn ON M9025 to write clock data to the clock device. • Use the sequence program to write to the clock device (dedicated instructions can be used).
LED display priority [Changes display priority/ display cancel]	• Display priority is changed/canceled for errors except the errors which stop operation and default display items of the LED display.	• Use the sequence program to write priority/display cancel data to D9038 and D9039.
Self diagnosis [CPU operation fault detection, preventive maintenance]	• Stops CPU module operation when an error included in the self diagnosis items occurs when the CPU is powered ON or running, and displays error message for malfunction prevention. • Stores error code corresponding to the self diagnosis items.	• Parameter setting by peripheral device can control operation to stop or continue. Read error codes by peripheral device and perform troubleshooting. (Refer to Section 4.1.4.)

4.4 Handling precautions

⚠ CAUTION

- Use the PC in the environment given in the general specifications of this manual. Using the PC outside the range of the general specifications may result in electric shock, fire or malfunctioning, or may damage or degrade the module.
- Insert the tabs at the bottom of the module into the mounting holes in the base module before installing the module, and tighten the module fixed screws with the specified torque. Improper installation may result in malfunctioning, breakdowns or cause the module to fall out.
- Tighten the screws with the specified torque. If the screws are loose, it may result in short circuits, malfunctioning or cause the module to fall out.
- If the screws are tightened too much, it may damage the screws and the module may result in short circuits, malfunctioning or cause the module to fall out.
- Make sure the memory cassette is installed securely in its installation connector. After installation, confirm that it is securely tightened. Defective contact may cause malfunctioning.
- Do not touch the conducted part of the module or electric parts. This may cause malfunctioning or breakdowns.

(1) Do not subject the CPU module and memory cassette to impact or shock.

(2) Do not remove printed circuit boards from the housing. There are no user-serviceable parts on the boards.
(See Section 8.5 for detail.)

(3) Ensure that no conductive debris can enter the module. If it does, make sure that it is removed. Guard particularly against wire offcuts.

(4) Tighten the module mounting and terminal screws as specified below.

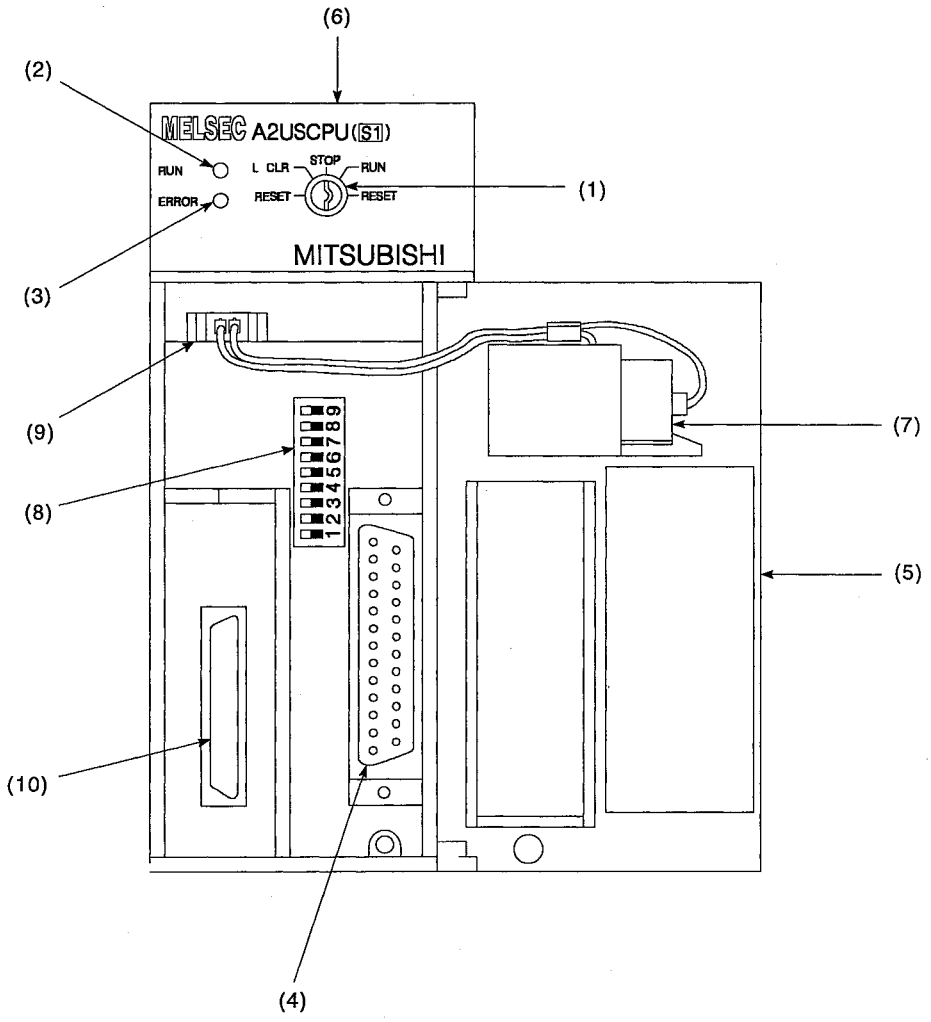
Screw	Tightening Torque N·cm [kg·cm] (lb·inches)
Module mounting screws (M4)	78 [8] (6.93) to 118 [12] (10.39)
I/O module terminal block terminal screw (M3.5 screw)	59 [6] (5.2) to 88 [9] (7.79)

(5) When loading a module onto a base unit, make sure that the module mounting projections on the module are inserted into the module mounting hole on the base unit, then secure the module by tightening the module mounting screws. To remove a module from a base unit, unscrew the module mounting screws, then draw the module mounting projections out of the module mounting hole.

4.5 Part Identification and Setting

This section gives the names of the parts of the A2USCPU module, and describes the switch settings required to use the A2USCPU.

4.5.1 Part identification of A2USCPU

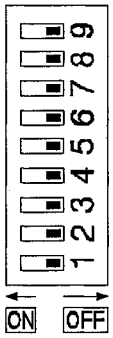


No.	Name	Function
(1)	RUN/STOP key switch	• RUN/STOP : To start/stop running a sequence program. • RESET : To reset the hardware. To reset an error occurring during operation to initialize operation. • LATCH CLEAR (L-CLR) : To clear (turning OFF, or clearing to "0") the devices in the latch range and non-latch range which are set by parameters. For the latch clear operation procedure, refer to Section 4.5.3.

No.	Name	Function
(2)	"RUN" LED	• ON : A sequence program operation is being executed with the RUN key switch set in the RUN position. (The LED remains lit if an error (Section 10.3), which permits sequence operation to continue, occurs.) • OFF : The RUN LED goes out in the following cases. • 100/200 VAC is not supplied to the A2USCPU. • The RUN key switch is in the STOP position. • The remote STOP signal is input. • The remote PAUSE signal is input. • Flashing : The RUN LED flashes in the following cases. • An error which causes sequence operation to stop is detected by the self-diagnosis function. • The latch clear operation is executed.
(3)	"ERROR" LED	• ON : The self-diagnosis function detects an error. (When the detected error is set to "not lit" in the ERROR LED indication priority setting) • OFF : No error occurs or a malfunction is detected by the [CHK] instruction. • Flashing : An annunciator (F) is turned ON by the sequence program.
(4)	RS-422 connector	• Used to connect a peripheral device to write/read, monitor, or test a program with a peripheral device. • Close with the cover when not connected to a peripheral device.
(5)	Cover	• Protects A2USCPU printed circuit board, memory cassette, RS-422 connector, battery, etc. • Execute the following operations with the cover open. • Memory cassette connection/disconnection • Setting a dip switch • Connection to battery connector • For mounting the module to the base unit battery replacement
(6)	Module fixing screws	• For mounting the module to the base unit
(7)	Battery	• For refaining the base unitretains data such as programs, device latch ranges, file registers, etc. (See 7.2 for battery replacement.)
(8)	Dip switch	• Used for setting the memory-protect function. (See sections 4.5.2)
(9)	Battery connector	• For connection to the battery
(10)	Memory cassette installing connector	• For installing the memory cassette (A2SMCA-14KP/14KE) (With a memory cassette installed, ROM automatically becomes available.)

4.5.2 Memory protect switch setting

The memory protect switches are designed to protect the programs, comment data, etc. in the RAM memory from being overwritten by accidental incorrect operation of the peripheral device.
The switches are OFF when delivered.



Memory Protect Range (Kbytes)	Setting Switch	
	A2USCPU	A2USCPU-S1
0 to 16	Turn ON switch 1.	Turn ON switch 1.
16 to 32	Turn ON switch 2.	Turn ON switch 2.
32 to 48	Turn ON switch 3.	Turn ON switch 3.
48 to 64	Turn ON switch 4.	Turn ON switch 4.
64 to 80	Unused	Turn ON switch 5.
80 to 96	Unused	Turn ON switch 6.
96 to 112	Unused	Turn ON switch 7.
112 to 144	Unused	Turn ON switch 8.
144 to 256	Unused	Turn ON switch 9.

POINTS

(1) When protecting the memory, calculate the addresses (step numbers) of the memory areas (sequence program, comment, sampling trace, status latch, file register) and make protect setting. (Refer to Section 4.2.2.)

(2) Do not use the memory protect function for the data storage areas when either a sampling trace or a status latch is executed. If used, the data executed cannot be stored in memory.

REMARK

For E^2PROM operation, provide the memory protect of the sequence program area with the memory protect setting pins of the A2SNMCA-30KE. Refer to Section 7.1.4.

4.5.3 Latch clear

To clear the latch using the RUN/STOP switch, follow the steps described below. Once it is cleared, the unlatched devices and the A2USCPU self-diagnosis error information (latest error information and last 15 errors) will be also cleared.

(1) Turn the RUN/STOP switch from the "STOP" position to the "L.CLR" position several times to make the "RUN" LED start flashing at very short intervals (ON for approx. 0.2 second and OFF for 0.2 second). The quickly flashing LED indicates that the preparations for latch clear have been completed.

(2) After the "RUN" LED has started flashing quickly, again turn the RUN/STOP switch from the "STOP" position to the "L.CLR" position. Latch clear will be completed, and the "RUN" LED will go off.
To cancel latch clear, turn the RUN/STOP switch to the "RUN" position to bring the A2USCPU into the RUN status, or to the "RESET" position to reset the A2USCPU.

REMARK

Latch clear can be executed by the GPP function.
Latch clear by an A6GPP, for example, is achieved by "Device All Clear" of the PC mode test function.
For details of operation, see the operating manual covering the GPP function.

5. POWER SUPPLY MODULE

5.1 Specifications

The specification of the power supply module are shown below.

Table 5.1 Power supply module specifications

Item		Performance specifications		
		A1S61PN	A1S62PN	A1S63P
Base installation location		Power supply module installation slot		
Input power supply		100 to 240VAC $^{+10\%}_{-15\%}$ (85 to 264VAC)		24VDC $^{+30\%}_{-35\%}$ (15.6 to 31.2VDC)
Input frequency		50/60Hz±5%		—
Maximum input apparent power		105VA		41W
Inrush current		20A 8ms or less		81A 1ms or less
Output current rating	5VDC	5A	3A	5A
	24VDC	—	0.6A	—
Overcurrent protection	5VDC	5.5A or above	3.3A or above	5.5A or above
	24VDC	—	0.66A or above	—
Overvoltage protection	5VDC	5.5 to 6.5V		
	24VDC	—		
Efficiency		65% or above		
Allowable period of momentary power failure		20ms or less		1ms or less
Dielectric withstand voltage	Primary-5VDC	Between input: batch LG and output: batch FG, 2,830VAC rms/3 cycle (altitude 2,000m (6562 ft)		500VAC
	Primary-24VDC			—
Insulation resistance		Between input: batch LG and output: batch FG 500VAC (5MΩ or above by insulation resistance tester)		5MΩ or above by insulation resistance tester
Noise durability		• By noise simulator with noise voltage of 1,500Vp-p, noise width of 1μs, and noise frequency of 25 to 60Hz. • Noise voltage IEC801-4, 2kV		By noise simulator with noise voltage of 500Vp-p, noise width of 1μs, and noise frequency of 25 to 60Hz.
Operation display		LED display (ON for 5VDC output)		
Terminal screw size		M3.5 × 7		
Applicable wire size		0.75 to 2mm^2		
Applicable crimp-style terminal		RAV1.25-3.5, RAV2-3.5		
Applicable tightening torque		59 to 88N·cm		
External dimensions (mm (inch))		130 (5.12) ×55 (2.17) ×93.6 (3.69)		
Weight (kg)		0.60	0.60	0.50

*1 Since a varistor is installed between AC and LG, do not apply a voltage of 400 volts or more between AC and LG.

POINT

***1: Overcurrent protection**

If the current above the spec value flows in the 5VDC or 24VDC circuit, overcurrent protection device interrupts the circuit and stops the system operation. LED display of the power supply module is either OFF or ON dimly, due to the voltage drop.

When this device is once activated, remove factors of insufficient current capacity and short-circuit before starting up the system. When the current restores to the normal value, the system performs the initial start.

***2: Overvoltage protection**

When 5.5V to 6.5V of overvoltage is applied to the 5VDC circuit, overvoltage protection device interrupts the circuit and stops the system operation.

LED display of the power supply module turns OFF. To restart the system, turn OFF the input power supply, then back to ON. The system performs the initial start.

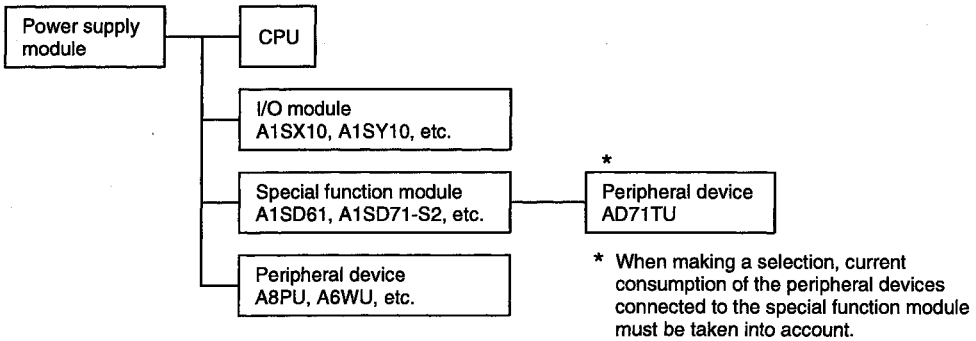
If the system does not start and LED display remains OFF, the power supply module needs to be replaced

***3: Allowable period of momentary power failure**

This indicates allowable period of momentary power failure of PC CPU, and is determined by the power supply module used. Allowable period of momentary power failure for a system using A1S63P is the period it takes until the 24VDC falls below the specified voltage (15.6VDC) after cutting off the primary power supply of the stabilized power supply, which supplies the 24VDC power to A1S63P.

5.1.1 Selecting a power supply module

Power supply module is selected based on to the total current consumption of the I/O module, special function module and peripheral devices to which power is supplied by the subject power supply module. When extension base module A1S52B, A1S55B, A1S58B, A52B, A55B or A58B is used, take into consideration that the power to the module is supplied by the power supply module of the basic base.
For 5VDC current consumption of I/O modules, special function modules and peripheral devices, refer to Section 2.3.



(1) Power supply module selection when extension base module A1S52B, A1S55B, A1S58B, A52B A55B, or A58B is used

When extension base module A1S52B, A1S55B, A1S58B, A52B A55B, or A58B is used, 5VDC power is supplied from the power supply module of the basic base module via extension cable. Thus, when one of these modules is used, be careful with the following:

(a) Select a 5VDC power supply module of the basic base module with sufficient capacity to supply 5VDC current consumed by A1S52B, A1S55B, A1S58B, A52B A55B, or A58B.

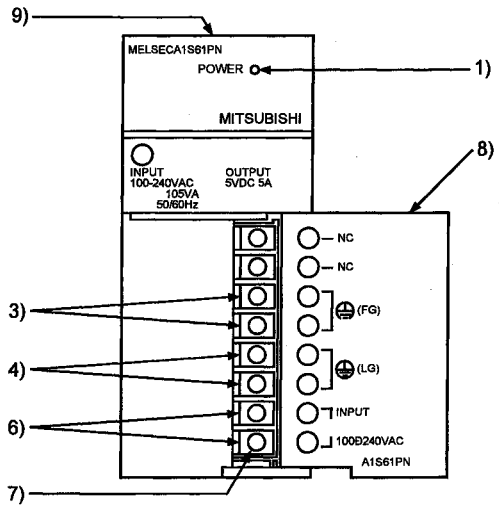
Example

If 5VDC current consumption on the basic base module is 3A and 5VDC current consumption on the A1S55B is 1A,
then, the power supply module installed to the basic base module must be A1S61P(5VDC 5A).

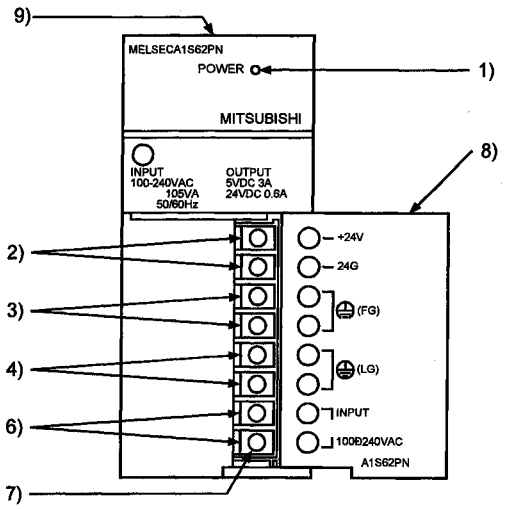
(b) Since the power to A1S52B, A1S55B, A1S58B, A52B A55B, or A58B is supplied via extension cable, a voltage drop occurs through the cable. It is necessary to select a power supply module and cable with proper length so that 4.75VDC or more is available at the receiving end. For the details of voltage drop, refer to Section 6.1.3, the operation standard of extension base module.

5.2 Name and Setting of Each Part

Name of each part of different power supply modules is provided below.

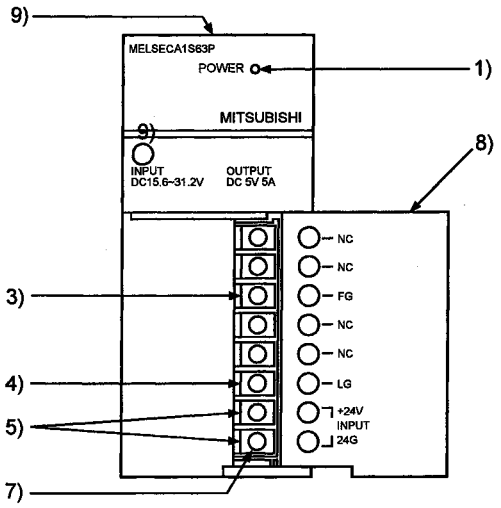


(1) A1S61PN



(2) A1S62PN

No.	Name	Application
1)	"POWER" LED	LED for the display of 5VDC power supply
2)	24VDC, 24GDC terminal	For power supply to the module which requires 24VDC power at inside the output module (supplied to the module via external wiring).
3)	FG terminal	Ground terminals connected to shielding patterns on the printed circuit board.
4)	LG terminal	For grounding the power supply filter. In case of A1S61P and A1S62P, it has a potential of half the input voltage.



(3) A1S63P

(Continued to the following page)

No.	Name	Application
5)	Power supply input terminals	Input terminal for power supply. Connect the 24VDC direct current power supply.
6)	Power supply input terminals	Input terminal for power supply. Connect the 100VAC to 200VAC alternating current power supply.
7)	Terminal screw	M3.5 × 7
8)	Terminal cover	A protective cover for the terminal block.
9)	Module fixing screws	Screws to fix the module to the base module. (M4 screw; tightening torque range: 78 to 118N·cm)

POINT

(1) Do not wire to terminals not used by FG or LG on the terminal block (terminals for which no name is provided on the terminal block cover).

(2) The protective ground terminal ⏚ LG must be grounded with class D (class-3) grounding or above.

6. BASE UNIT AND EXTENSION CABLE

6.1 Specification

Specifications of the base units (basic base unit and extension base unit) applicable to the system and of extension cables, and the usage standards of extension base unit are explained.

6.1.1 Base unit specifications

(1) Basic base unit specifications

Table 6.1 Basic base unit specifications

Item \ Model	A1S32B	A1S33B	A1S35B	A1S38B
I/O module installation range	2 modules can be installed.	3 modules can be installed.	5 modules can be installed.	8 modules can be installed.
Extension connection capability	Possible			
Dimensions of the installation hole	φ6 bell-shaped holes (for M5 screws)			
External dimensions (mm (inch))	220 (8.66) × 130 (5.12) × 28 (1.10)	255 (10.03) × 130 (5.12) × 28 (1.10)	325 (12.80) × 130 (5.12) × 28 (1.10)	430 (16.92) × 130 (5.12) × 28 (1.10)
Weight (kg)	0.52	0.65	0.75	0.97
Accessories	Installation screws; M5 × 25, 4 pcs.			

(2) Extension base unit specifications

Table 6.2 Extension base unit specifications

Item \ Model	A1S65B	A1S68B	A1S52B	A1S55B	A1S58B
I/O module installation range	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 installation requirement	Power supply module required		Power supply module not required		
Dimensions of the installation hole	φ6 bell-shaped holes (for M5 screw)				
Dimensions of terminal screw	—	—	M4 × 6 (FG terminal)		
Applicable wire size	—	—	0.75 to 2mm^2		
Applicable crimp-style terminal	—	—	(V) 1.25-4 (V) 1.25-YS4(V)2-YS4A (Applicable tightening torque: 118N·cm)		
External dimensions (mm (inch))	315 (12.40) × 130 (5.12) × 28 (1.10)	420 (16.54) × 130 (5.12) × 28 (1.10)	135 (5.31) × 130 (5.12) × 28 (1.10)	260 (10.24) × 130 (5.12) × 28 (1.10)	365 (14.37) × 130 (5.12) × 28 (1.10)
Weight (kg)	0.71	0.95	0.38	0.61	0.87
Accessories	Installation screws; M5 × 25, 4 pcs.		*1 Dustproof cover (for I/O module): 1 pc. Attachment screws: M5 × 25, 4 pcs.		

*1 For the installation of the rustproof cover, refer to Section 8.6.

POINT

For the usage of the base units which do not require power supply module A1S52B, A1S55B and A1S58B, refer to the power supply module selection in Sections 5.1.2 and 6.1.3.

6.1.2 Extension cable specifications

The specifications of the extension cables applicable to the A2USHCPU-S1 system are shown in Table 6.3.

Table 6.3 Extension cable specifications

Item	A1SC01B	A1SC03B	A1SC07B	A1SC12B	A1SC30B	A1SC60B	A1SC05NB	A1SC07NB	A1SC30NB	A1SC50NB
Cable length (m (ft))	0.055 (0.18)	0.33 (1.08)	0.7 (2.30)	1.2 (3.94)	3.0 (9.84)	6.0 (19.69)	0.45 (1.48)	0.7 (2.30)	3 (9.86)	5 (16.43)
Resistance of 5VDC supply line (Ω(at 55 °C))	0.02	0.021	0.036	0.055	0.121	0.182	0.037	0.045	0.12	0.18
Application	Connection between the basic base and the extension base									
Weight (kg)	0.025	0.10	0.14	0.20	0.4	0.65	0.2	0.22	0.4	0.56

When an extension cable is used, do not bunch it with the main circuit (high voltage, large current) line or place close to each other.

6.1.3 Usage standards of extension base units (A1S52B, A1S55B, A1S58B, A52B, A55B, A58B)

When the A1S52B, A1S55B, A1S58B, A52B, A55B or A58B extension base unit is used, confirm that the receiving port voltage (voltage of the module installed to the last slot of the extension base unit) is 4.75V or higher.
Since the power supply module on the basic base unit supplies 5VDC to A1S52B, A1S55B, A1S58B, A52B, A55B and A58B extension base unit, a voltage drop occurs through base unit or extension base unit. If the specified voltage is not supplied at the receiving end, misinput and misoutput may result.
When voltage at the receiving end is less than 4.75V, change the extension base unit to A1S65B, A1S68B, A62B, A65B or A68B with the power supply.

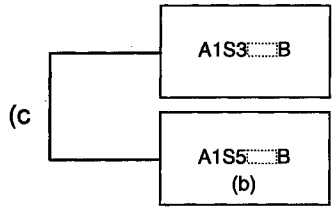
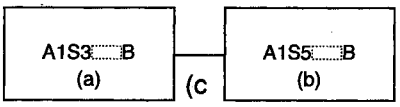
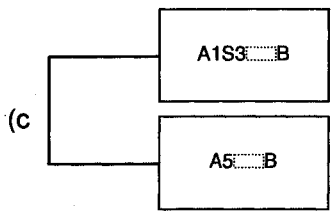
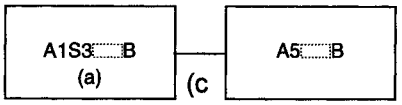
(1) Conditions for selection

Receiving voltage of the module installed to the final slot of A1S52B, A1S55B, A1S58B, A52B, A55B or A58B type extension base unit must be 4.75V or above. The output voltage of the power supply module is set to 5.1V or above. Thus, it can be used if the voltage drop is 0.35V or less.

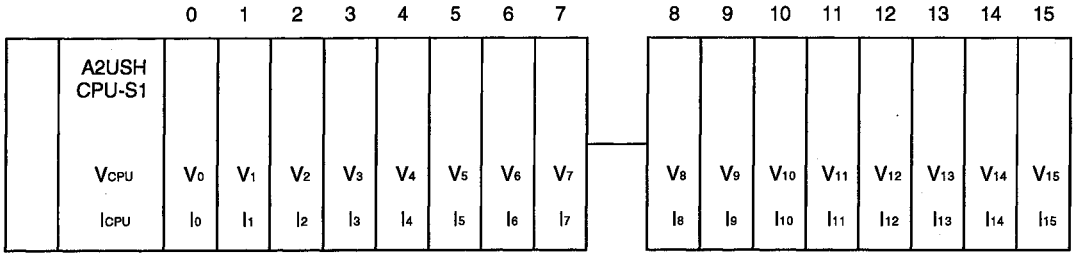
(2) Elements of voltage drop

Elements of voltage drop (a) to (c) are shown in figure below according to the connection method of the extension base unit and the type of extension base unit.

(a) A voltage drop at the basic base unit is shown.
(b) A voltage drop at the extension base unit is shown.
(c) A voltage drop through the extension cable is shown.

	Extension base unit is connected to the left side of the basic base unit (series installation).	**Extension base unit is connected to the right side of the basic base unit (parallel installation).**
A1S52B, A1S55B or A1S58B extension base unit is used.	 * The voltage drop at the basic base unit is negligible.	
A52B, A55B or A58B extension base unit is used.	 * The voltage drop at the basic base unit is negligible.	 * The voltage drop at the extension base unit is negligible.

(3) Voltage drop calculation method



V_{CPU}, V_0 to V_7 : Voltage drop at each slot of the basic base unit
I_{CPU}, I_0 to I_7 : Current consumption at each slot of the basic base unit
V_8 to V_{15} : Voltage drop at each slot of extension base unit
I_8 to I_{15} : Current consumption at each slot of the extension base unit

(a) Calculation of voltage drops with the basic base unit (A1S32B, A1S33B, A1S35B, A1S38B)
Resistance with the basic base unit is 0.007Ω per slot. Calculate a voltage drop at each slot and obtain the total voltage drop.

1) Voltage drop at the CPU module: V_{CPU}
$V_{CPU}=0.007 \times (I_{CPU} + I_0 + I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

2) Voltage drop at slot 0: V_0
$V_0=0.007 \times (I_0 + I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

3) Voltage drop at slot 1: V_1
$V_1=0.007 \times (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

4) Voltage drop at slot 2: V_2
$V_2=0.007 \times (I_2 + I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

5) Voltage drop at slot 3: V_3
$V_3=0.007 \times (I_3 + I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

6) Voltage drop at slot 4: V_4
$V_4=0.007 \times (I_4 + I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

7) Voltage drop at slot 5: V_5
$V_5=0.007 \times (I_5 + I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

8) Voltage drop at slot 6: V_6
$V_6=0.007 \times (I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

9) Voltage drop at slot 7: V_7
$V_7=0.007 \times (I_7 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

10) Total voltage drop at the basic base unit : V_K
$V_K=V_{CPU} + V_0 + V_1 + V_2 + V_3 + V_4 + V_5 + V_6 + V_7$

(b) Calculation of voltage drops of the extension base unit (A1S52B, A1S55B, A1S58B)
Resistance with the extension base unit is 0.006 Ω per slot. Calculate a voltage drop at each slot and obtain the total voltage drop.

1) Voltage drop at slot 8: V_8
$V_8=0.006 \times (I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$
2) Voltage drop at slot 9: V_9
$V_9=0.006 \times (I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$
3) Voltage drop at slot 10: V_{10}
$V_{10}=0.006 \times (I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$
4) Voltage drop at slot 11: V_{11}
$V_{11}=0.006 \times (I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$
5) Voltage drop at slot 12: V_{12}
$V_{12}=0.006 \times (I12 + I13 + I14 + I15)$
6) Voltage drop at slot 13: V13
V13=0.006 × (I13 + I14 + I15)
7) Voltage drop at slot 14: V14
V14=0.006 × (I14 + I15)
8) Voltage drop at slot 15: V15
V15=0.006 × I15
9) Total voltage drop of the extension base unit : Vz
$V_Z=V_8 + V_9 + V_{10} + V_{11} + V_{12} + V_{13} + V_{14} + V_{15}$

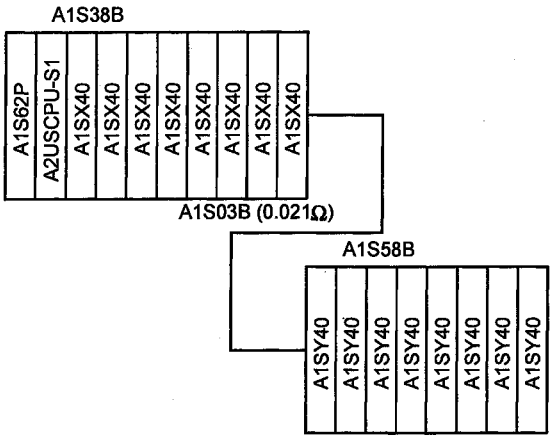
(c) Calculation of voltage drop through the extension cable
[1] Total current consumption of the extension base unit: Iz
$I_Z= I_8 + I9 + I10 + I11 + I12 + I13 + I14 + I15$
[2] Voltage drop of the extension cable: Vc
Vc=(Resistance of the extension cable) x Iz

Resistance of extension cable

A1SC01B..... 0.02 Ω	A1SC30B .....0.121 Ω
A1SC03B..... 0.021 Ω	A1SC60B .....0.182 Ω
A1SC07B..... 0.036 Ω	A1SC05NB.....0.037 Ω
A1SC12B..... 0.055 Ω	A1SC07NB.....0.045 Ω

(d) Confirmation of voltage at the receiving end
$(5.1(V)-V_K-V_Z-V_C) \geq 4.75(V)$

(4) Calculation examples



(a) Calculation of voltage drop of the basic base unit

$V_K = 0.007 \times \{0.32 + 0.05 \times (9+8+7+6+5+4+3+2) + (0.27 \times 8) \times 9\} = 0.15372$

(b) Calculation of voltage drop of the extension base unit

$V_Z = 0.006 \times 0.27 \times (8+7+6+5+4+3+2+1) = 0.05832$

(c) Calculation of voltage drop through the extension cable

$V_C = 0.021 \times (0.27 \times 8) = 0.04536$

(d) Confirmation of voltage at the receiving end

5.1 - 0.15372 - 0.05832 - 0.04536 = 4.8426(V)

Above system can be used, since the voltage at the receiving end is more than 4.75V.

(5) Scheme to reduce the voltage drop

Following methods are effective in reducing the voltage drop:

(a) Change the installation location of the module

Install modules with a large current consumption subsequently starting from slot 0 of the basic base unit.

Install modules with a small current consumption to the extension base unit.

(b) Attachment of base units in series

By attaching base units in series (connect the extension cable to the left side of the basic base module), the voltage drop with the basic base unit can be made negligible.

However, if the extension cable used is long, the voltage drop through it may become larger than that with the basic base unit, so calculate the voltage drop according to (3) above.

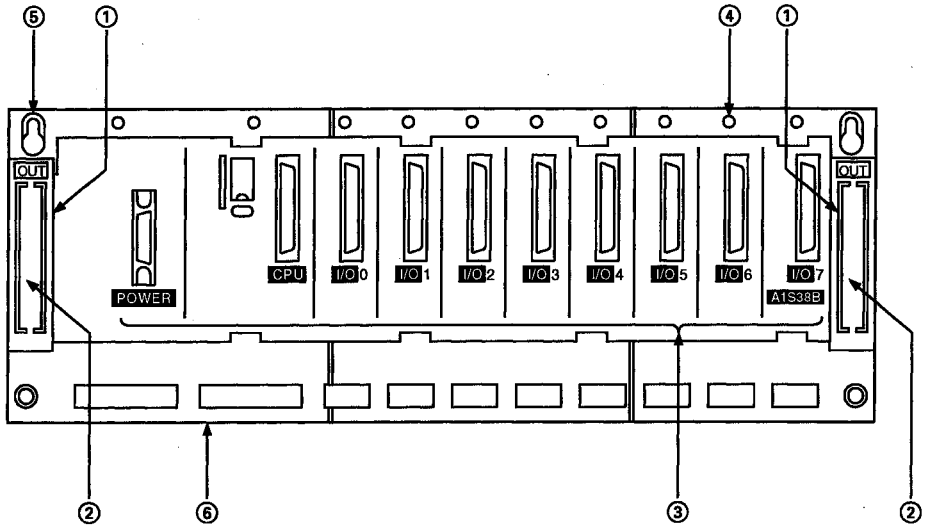
(c) Use of a short extension cable

The shorter the extension cable is, the smaller the resistance and the voltage drop become. Use the shortest extension cable possible.

6.2 Name and Setting of Each Part

Name of each part of the base unit is explained.

(1) Basic base u nit (A1S32B, A1S33B, A1S35B, A1S38B)



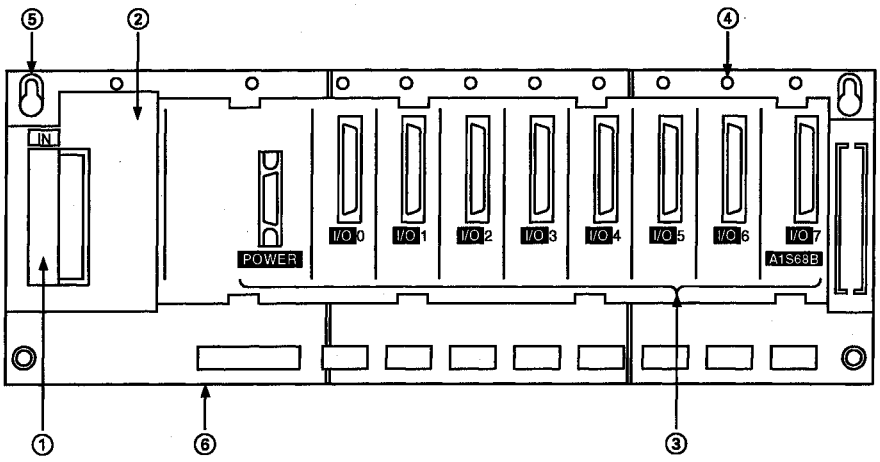
No.	Name	Application
1)	Connector for extension cable	Connects the extension cable with the connector for exchanging signals with the extension base unit.
2)	Base cover	A protective cover for the connector for the extension cable. When installing an extension, it is necessary to remove the area enclosed by the groove below the OUT sign on the base cover with a tool, such as a cutting nipper, etc.
3)	Module connector	Connectors for power supply module, CPU module, I/O module, and the special function module. To prevent the intrusion of dust, install the accessory connector cover or a blank cover (A1SG60) to the connectors to which no module is installed.
4)	Module fixing screw	Screw to fix the module to the base. Screw size: M4 × 12
5)	Base installation hole	A bell-shaped hole to mount the present base unit to a panel, such as the control panel. (For M5 screw)
6)	Hook for DIN rail	Hook for DIN rail attachment. A1S32B, A1S33B:..... 1 pc. A1S35B, A1S38B:..... 2 pcs

IMPORTANT

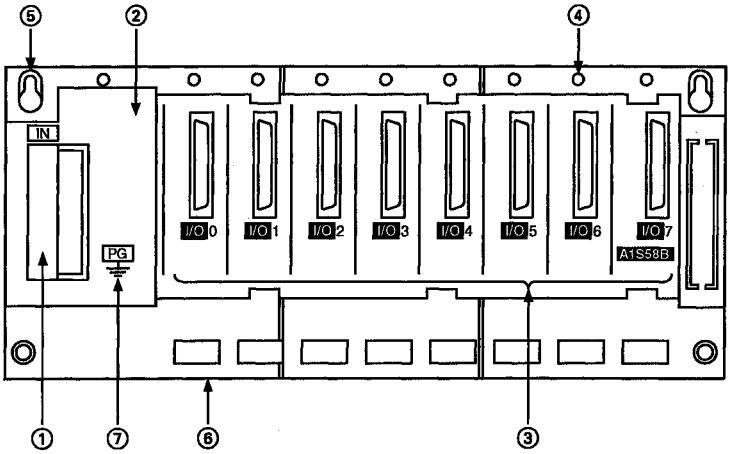
Only one extension base unit can be connected to the basic base unit. If an extension base unit is connected to each of the two connectors of the basic base unit, misinput and misoutput may result.

(2) Extension base unit

A1S65B, A1S68B



A1S52B, A1S55B, A1S58B



No.	Name	Application
1)	Connector for extension cable	A connector for exchanging signals with the basic base unit. An extension cable is connected to it. Remove the accessory connector cover to connect an extension cable.
2)	Base cover	A protective cover for the connector for the extension cable.
3)	Module connector	Connectors for the power supply module, CPU module, I/O module, and the special function module. To prevent the intrusion of dust, install the accessory connector cover or a blank cover (A1SG60) to the connectors to which no module is installed.
4)	Module fixing screw	Screw to fix the module to the base. Screw size: M4 × 12
5)	Base installation hole	A bell-shaped hole to mount the present base unit to a panel, such as the control panel. (for M5 screw)
6)	Hook for DIN rail	Hook for DIN rail attachment. A1S52B, A1S55B:..... 1 pc. A1S65B, A1S68B A1S58B:..... 2 pcs
7)	FG terminal	Ground terminal connected to the shielding pattern on the printed circuit board.

7. MEMORY CASSETTES AND BATTERY

7.1 Memory Cassettes

This section describes specifications, handling instructions and installation of the memory cassettes used in the A2USCPU.

7.1.1 Specifications

Table 7.1 shows specifications of the ROMs.

Table 7.1 Memory Specifications

Item \ Model	A2SMCA-14KP	A2SNMCA-14KE
Memory specifications	EP-ROM	EEP-ROM
Memory capacity (bytes)	64K bytes (max. 14 K steps)	64K bytes (max. 30 K steps)
Outside dimension mm (in)	15 x 68.6 x 42 (0.59 x 2.7 x 1.65)	15 x 69.6 x 40.5
Weight (kg) (lb)	0.03 (0.06)	

7.1.2 Handling instructions

(1) Handle with care memory cassettes and pin connectors since their plastic body cannot resist strong impacts.

(2) Do not remove the printed circuit board from the memory cassette.

(3) Use caution not to let chips of wires and other foreign material enter the memory cassette.

(4) When installing a memory cassette to an A2USCPU module, engage the connectors securely.

(5) Never place the memory on metal, which may allow current flow, or on an object which is charged with static electricity, such as wood, plastic vinyl, fiber, cable and paper.

(6) Do not touch or bend the memory leads.

(7) Do not touch by hand the connector of a memory cassette. Touching it by hand may lead to incomplete contact.

IMPORTANT

(1) Always turn OFF the power to the A2USCPU module when installing or removing a memory cassette. If a memory cassette is installed or removed with the power to the CPU module ON, contents of the memory will be destroyed.

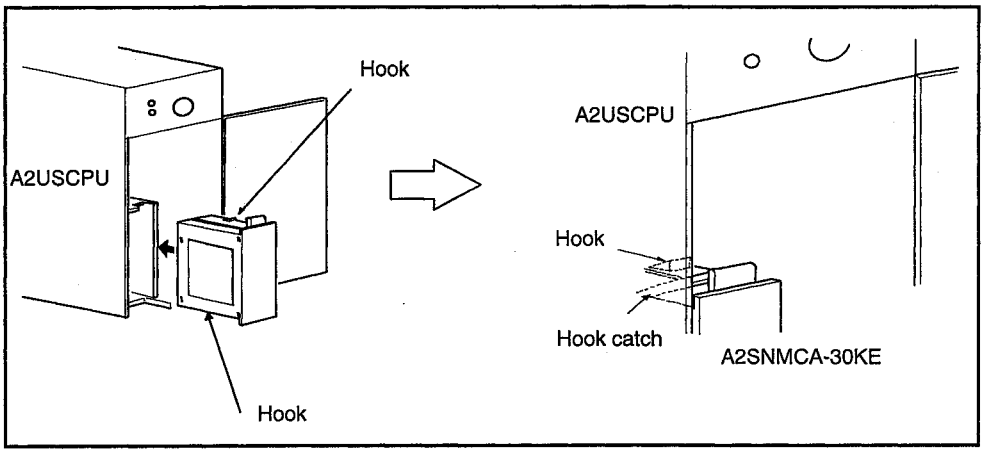
(2) When the A2USCPU fitted with an EEP-ROM memory cassette is powered on, the contents of the RAM memory (parameters, T/C set values, main programs, MELSECNET/10 network parameters) incorporated in the A2USCPU are overwritten.
If the EP-ROM memory cassette is installed, the data are not overwritten.

(3) The A1SMCA-[ ]KE/[ ]KP memory cassette cannot be used for A2USCPU.

7.1.3 Installing and removing a memory cassette

Follow the procedures below when installing or removing a memory cassette.

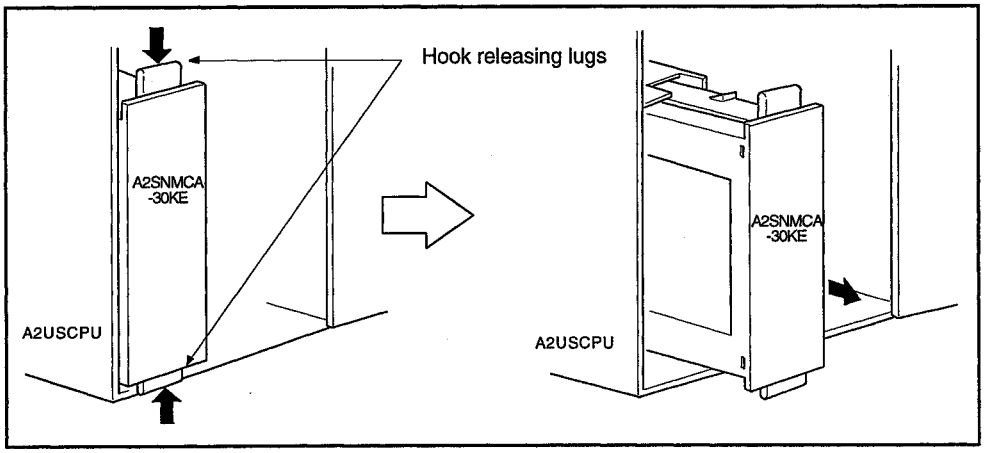
(1) Installing a memory cassette



(a) Hold a memory cassette vertically so that its model name is right side up and its connector faces the A2USCPU module. Insert the memory cassette all the way in the A2USCPU module so that the hooks of the memory cassette are completely engaged (they "click").

(b) Make sure the hooks are completely engaged. (If the memory cassette is not inserted all the way, the front lid of the A2USCPU cannot be closed.)

(2) Removing a memory cassette



(a) Pull out the memory cassette while pushing the hook releasing lugs that are provided at the top and the bottom of the memory cassette.

7.1.4 Writing a sequence program to an A2SMCA-14KP

A sequence program can be written to, or erased from, an A2SMCA-14KP using a ROM writer/eraser.

If an A2SMCA-14KP is installed to the ROM socket of an A6GPP or A6WU, use a memory write adaptor (A2SWA-28P).

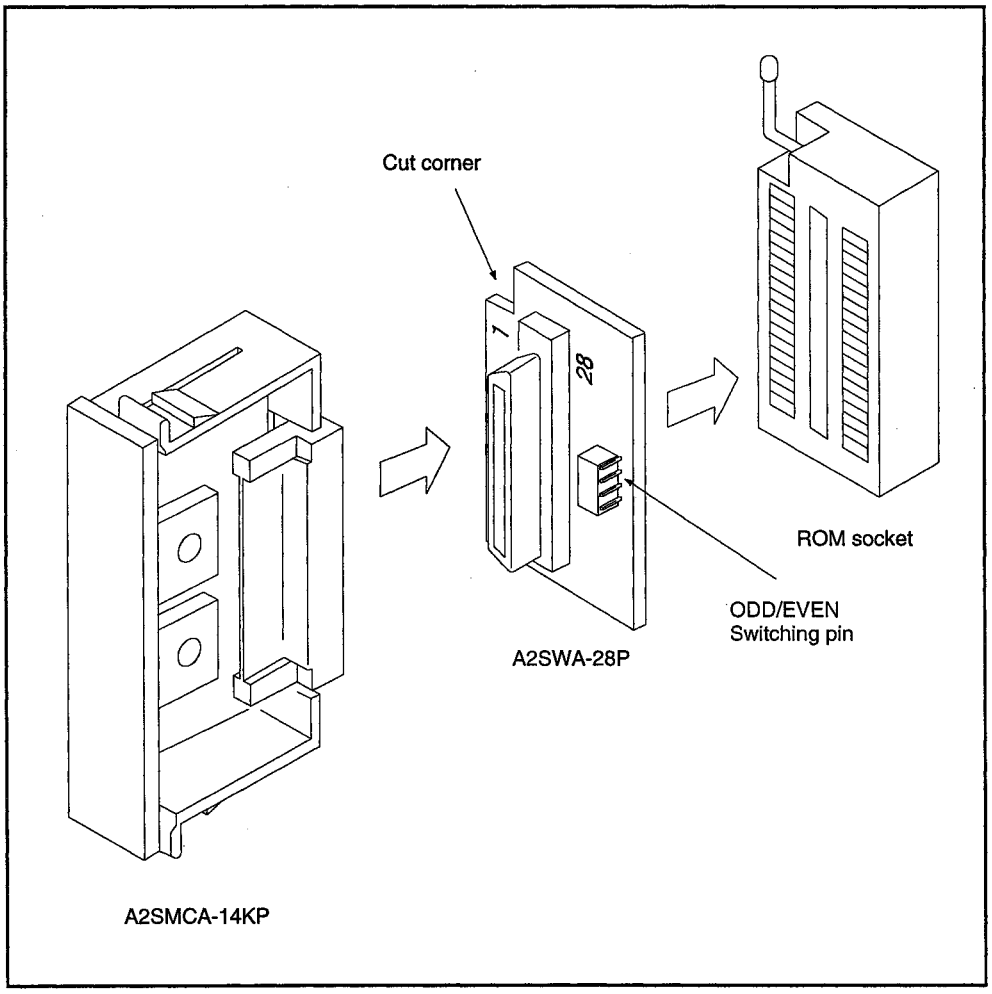
Use an A2SWA-28P as follows:

(1) The program must be written only to either of even- or odd-numbered addresses of an A2SMCA-14KP.
Set the type of the addresses using the ODD/EVEN setting selector pin of the A2SWA-28P.

(2) Install an A2SMCA-14KP to an A2SWA-28P so that their connectors couple correctly with each other.

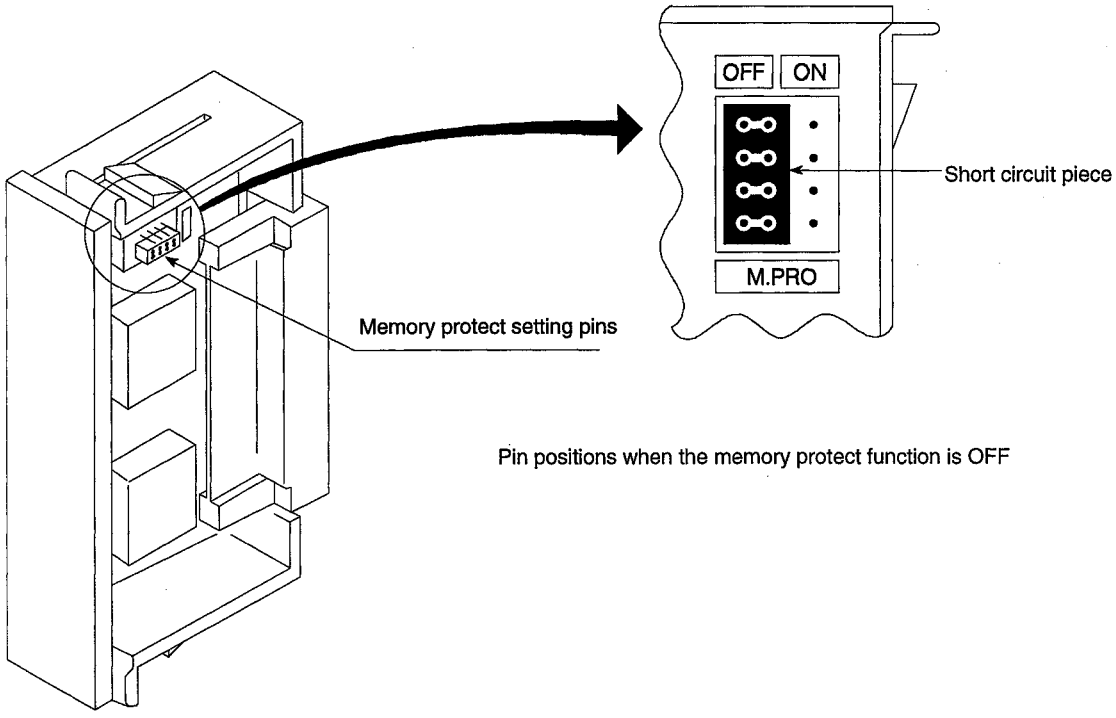
(3) Install the A2SWA-28P that is coupled with an A2SMCA-14KP to the ROM socket of an A6GPP or A6WU.

The pin next to the cut corner of the A2SWA-28P is pin No. 1. Make sure the A2SWA-28P is installed correctly to the ROM socket.



7.1.5 A2SNMCA-30KE memory protect setting

To protect the data stored in ROM memory from being overwritten by accidental incorrect operation of peripheral devices when an A2SNMCA-30KE is attached to the A2USCPU, memory protect setting can be made on the A2SNMCA-30KE.
Turning ON the memory protect setting pins can batch-protect the 64 kbyte user memory area.
When changing the data in ROM memory, turn OFF the memory protect setting pins.
The memory protect setting pins are all set to OFF when delivered.
For allocation of memory areas, see Section 4.2.2.



Pin positions when the memory protect function is OFF

A2SNMCA-30KE

7.2 Battery

7.2.1 Specifications

Table 7.2 shows specifications of the battery used to retain memory stored if power failure occurs.

Table 7.2 Battery Specifications

Item \ Model	A6BAT
Normal voltage	3.6 VDC
Guaranteed life	5 years
Application	For IC-RAM memory backup and power failure compensation function
External dimension mm (in)	ϕ16 (0.63) × 30 (1.18)

REMARK

For the battery directive in EU member states, refer to Appendix8.

7.2.2 Handling instructions

(1) Do not short circuit.

(2) Do not disassemble.

(3) Do not expose to open flame.

(4) Do not heat.

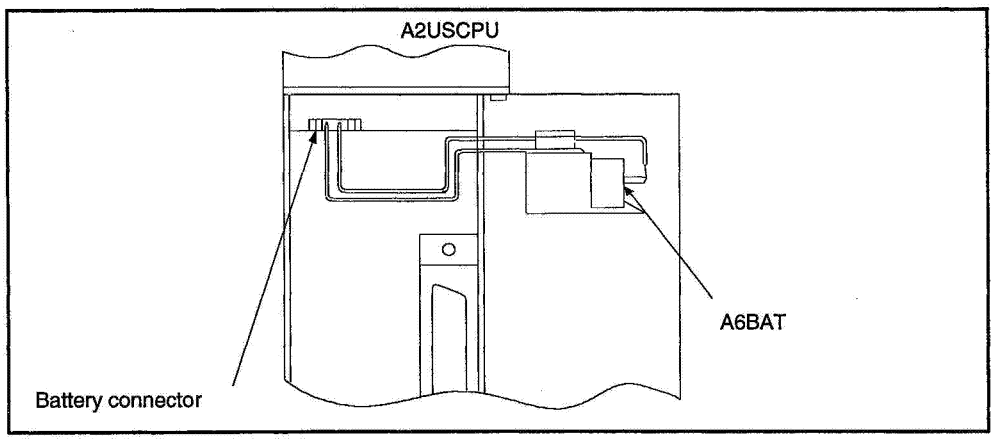
(5) Do not solder its terminals.

7.2.3 Installation

Battery lead connector is disconnected from the battery connector on the A2USCPU board to prevent discharge during transportation and storage.

Before starting the A2USCPU, plug the battery connector into the battery connector on the A2USCPU board.

- To use a sequence program stored in the user program area in the A2USCPU if a power failure occurs.
- To retain the data if a power failure occurs.



POINT

Firmly push the connector all the way.

8. LOADING AND INSTALLATION

To increase the system reliability and fully utilize the functions, procedures and cautions concerning loading and installation are described below.

8.1 Concept of Failsafe Circuit

When turning the power supply of the PC ON or OFF, because of the delay and the difference in the startup time between the power supply in the PC main module and the external power supply for processing (especially DC), processing output may not operate normally for a moment.

For instance, when the PC power supply is turned on after a DC output module is turned on with the external power supply for processing, the DC output module may misoutput momentarily upon PC power-on. Therefore, it is necessary to construct a circuit whereby the power supply of the PC main module can be energized first.

In addition, it may cause an abnormal operation when there is an abnormality in the external power supply or a failure with the PC.

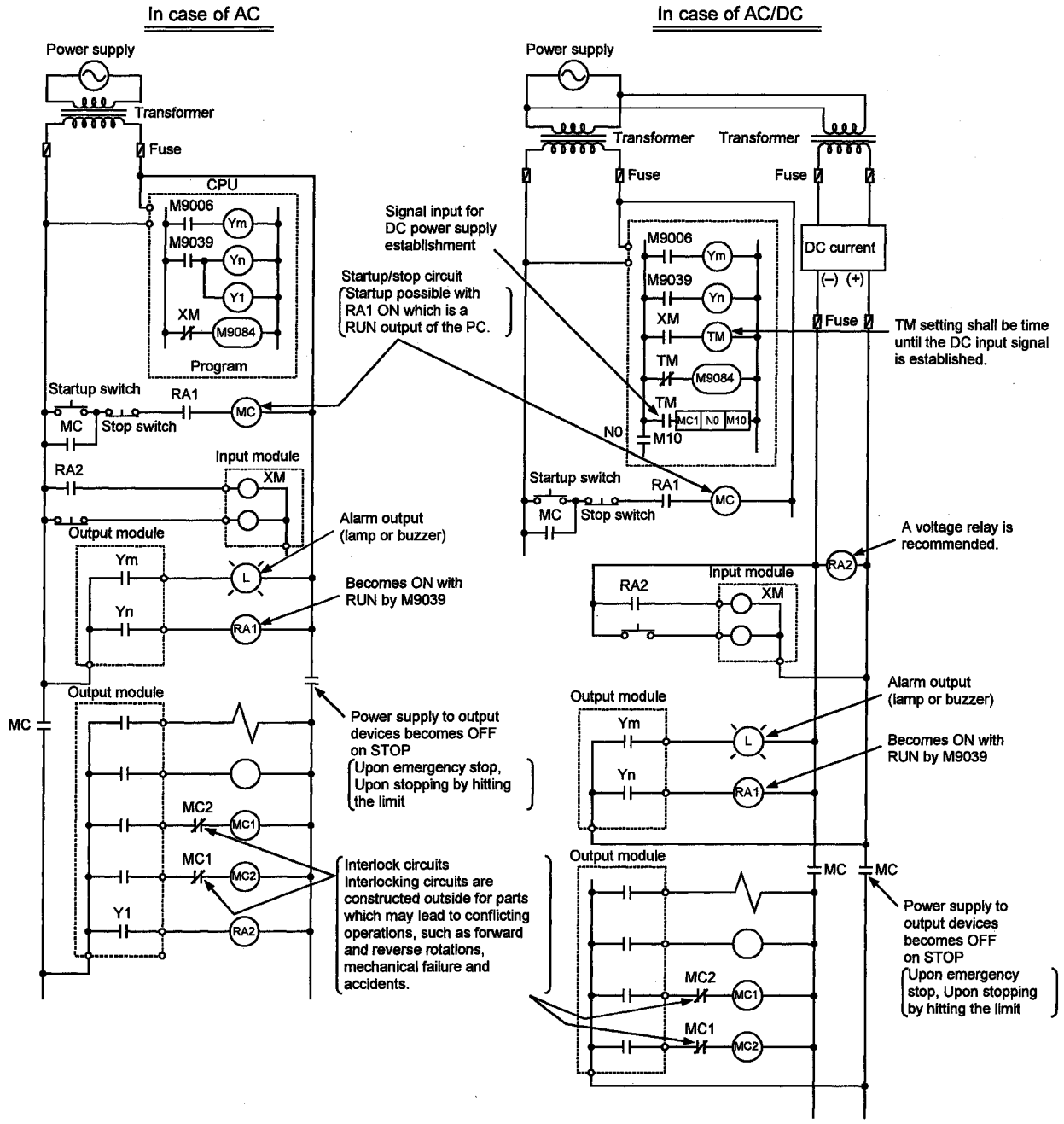
To prevent these abnormalities from causing abnormal behaviors of the system as a whole, and from the stand point of failsafe, the circuits which may cause mechanical failures or accidents (the emergency stop circuit, protection circuit, interlock circuits, etc.) should be constructed outside the PC.
An example of system circuit design in accordance with the view point mentioned above is shown on the next page.

⚠ **WARNING**

- Provide safety circuits in the outside of the PLC to ensure that the whole system will operate safely if an external power supply fault or PLC failure occurs. Not doing so may cause accidents due to improper output or malfunction.
  (1) Configure circuits, such as emergency stop circuits, protective circuits, oppositely operating interlock circuits, e.g. forward rotation and reverse rotation, and machine damage prevention interlock circuits, e.g. upper and lower limits of positioning, in the outside of the PLC.
  (2) If the PLC detects either of the following faulty states, it stops arithmetic operation and turns off all outputs.
    - When the overcurrent or overvoltage protection device of the power supply module operates.
    - When a fault is detected by the self-diagnostic function of the PLC CPU such as a watchdog timer error.

  At the occurrence of a fault in the I/O control section, etc. that cannot be detected by the PLC CPU, all outputs may turn on. Configure failsafe circuits or provide mechanisms in the outside of the PLC to ensure that the machine operation will be performed safely at such times.
  (3) Depending on the failures of the output module relays, transistors, etc., the outputs may remain on or off. Provide external monitoring circuits for the output signals that may lead to serious accidents.
- If excessive current higher than the rating or caused by a load short circuit, etc. keeps flowing in the output module for a long period of time, smoking or ignition may occur. Therefore, provide external safety circuits such as fuses.

(1) Example of system circuit design



Startup procedure of power supply is as follows:

In case of AC

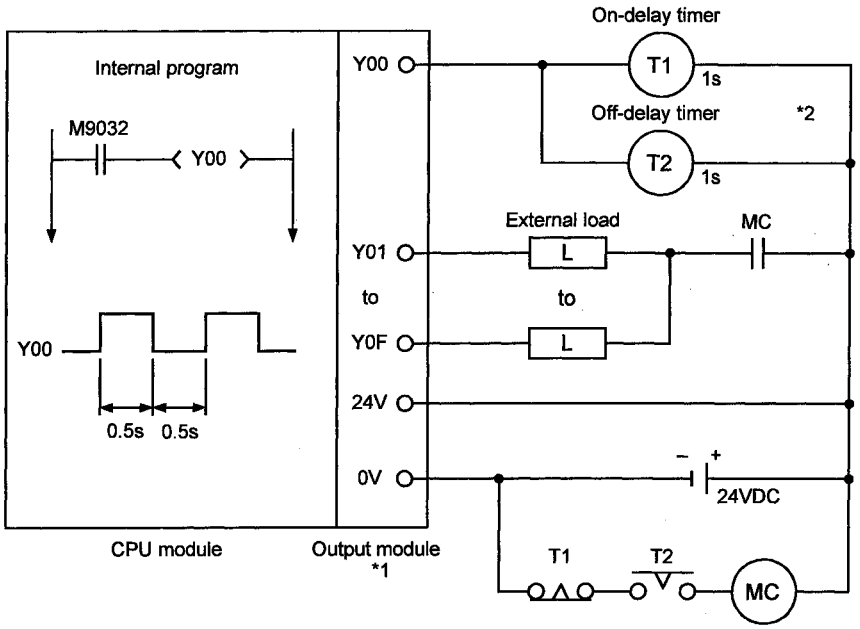
[1] Set CPU module to "RUN."
[2] Turn the power "ON."
[3] Set the start switch to "ON."
[4] Set the magnetic contactor (MC) "ON" to start driving drive output devices by a program.

In case of AC/DC

[1] Set CPU module to "RUN."
[2] Turn the power "ON."
[3] Set RA2 to "ON" when DC power supply is established.
[4] Set the timer (TM) to "ON" upon 100% establishment of DC power supply.
(Set value for TM shall be the period from RA2 turned "ON" to 100% establishment of DC power supply. Use the set value of 0.5s.)
[5] Set the start switch to "ON."
[6] Set the magnetic contactor (MC) "ON" to start driving drive output devices by a program.
(When a voltage relay is used for RA2, the timer in the program (TM) is not necessary.)

(2) Failsafe measures against PC failure

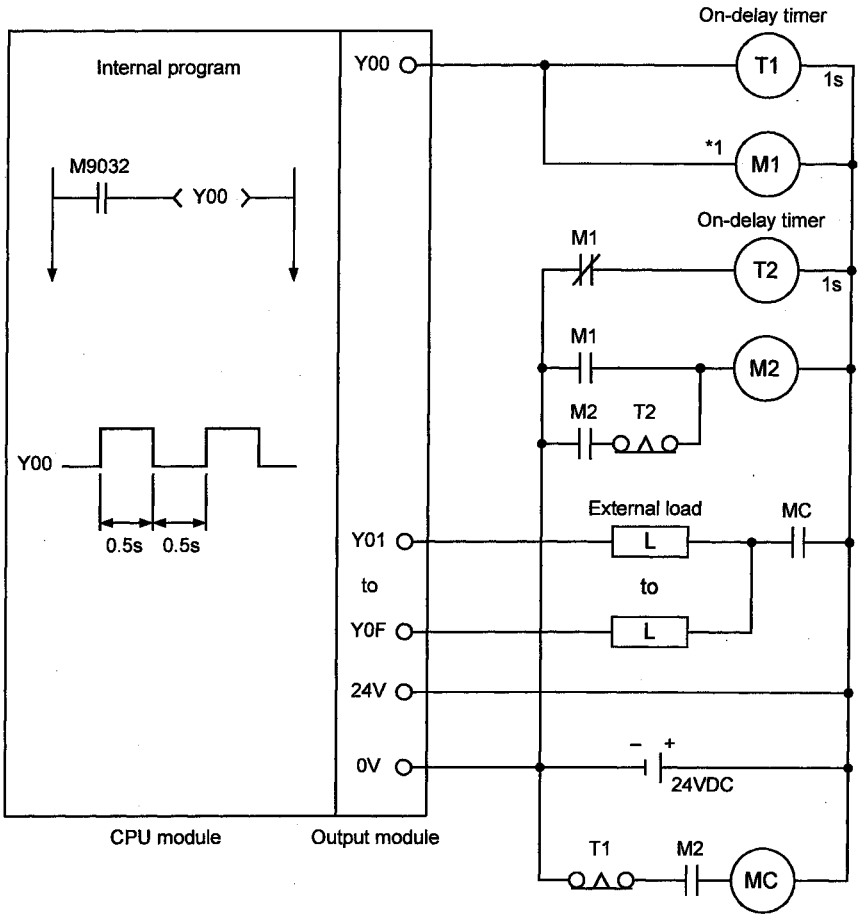
Failures in the PC CPU and memory are detected by the self-diagnostic function, but the CPU may not be able to detect abnormalities in the I/O control area, etc. In such cases, there is a possibility of setting all points to ON or OFF, or a situation may develop where normal operations and safety of the controlled subject cannot be assured, depending on the condition of the failure.
Although as a manufacturer, every possible measure is implemented to assure the product quality, the failsafe circuit should be constructed outside by the user so that if the PC fails for some reason, it would not cause any mechanical damages or accidents.
An example of failsafe circuit is shown below.



*1 Since Y00 repeats ON/OFF with 0.5s intervals, use a contactless output module (transistor is used in the above example).

*2 If an offdelay timer (especially miniature timer) is not available, construct the failsafe circuit using an ondelay timer shown on the next page.

When constructing a failsafe circuit using ondelay timers only



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

8.2 Installation Environment

Avoid the following conditions for the installation location of A2USCPU-S1 system:

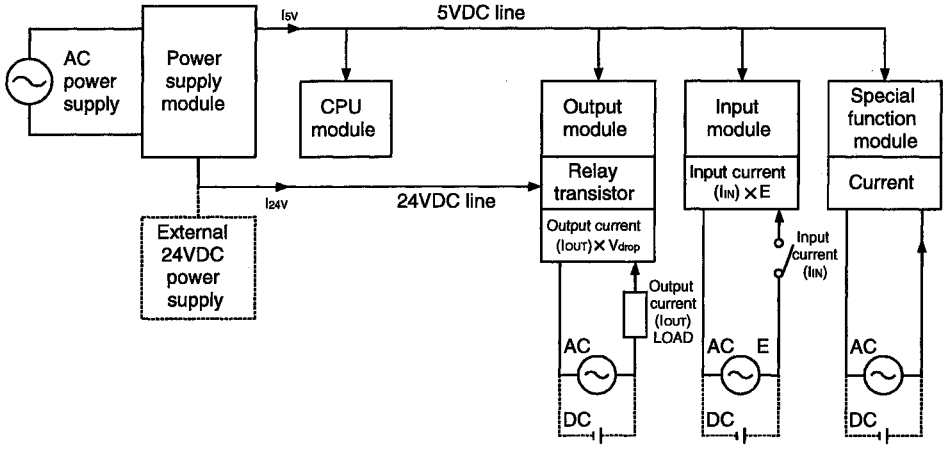
(1) Location where the ambient temperature exceeds the range of 0 to 55°C.
(2) Location where the ambient humidity exceeds the range of 10 to 90%RH.
(3) Location where condensation occurs due to a sudden temperature change.
(4) Location where corrosive gas or flammable gas exists.
(5) Location where a lot of conductive powdery substance such as dust and iron filing, oil mist, salt, or organic solvent exists.
(6) Location exposed to direct sunlight.
(7) Location where strong electric fields or magnetic fields form.
(8) Location where vibration or impact is directly applied to the main module.

8.3 Calculation Method of Heat Amount Generated by the PC

It is necessary to keep the temperature of the panel which stores the PC to the operating ambient temperature of the PC, which is 55°C, or below.
For radiation 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 A2USCPU (S1) system is explained.
Calculate the temperature increase in the panel from the power consumption.

Calculation method of average power consumption

The power consuming parts of the PC may be roughly classified into the blocks as shown below:



(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:

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

I_{5V} : Current consumption of 5VDC logic circuit of each module
I_{24V} : Average current consumption of 24VDC power supply for internal consumption of the output module
(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) Average power consumption of the output modules due to voltage drops at the output part (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 drop of 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 ratio (W)

I_{IN} : Input current (actual value in case of AC) (A)
E : Input voltage (voltage for actual usage) (V)

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

$W_s= I_{5V} \times 5 \times I_{24V} \times 24 + I_{100V} \times 100$ (W)

The total of the power consumption calculated for each block as above is the power consumption of the PC system as a whole.

$W= W_{PW} + W_{5V} + W_{24V} + W_{OUT} + W_{IN} + W_S$ (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:

$$T= \frac{W}{UA} \text{ [°C]}$$

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

POINT

When the temperature increase inside the panel exceeds the specified range, it is recommended to lower the temperature inside the panel by installing a heat exchanger to the panel.
If a conventional ventilation fan is used, it sucks dust along with the outside air, which may affect the PC, so care must be taken.

8.4 Installation of Base Unit

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

8.4.1 Precautions when installing PC

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

(1) To improve the ventilation and to facilitate the exchange of the module, provide at least 30mm (1.18in.) of distance between the top part of the module and any structure or part.
However, when A52B, A55B, A58B, A62B, A65B or A68B extension base module is used, provide at least 80mm (3.15in.) of distance between the top of the module and any structural 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 print 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 magnetic contactor or no-fuse breaker, and install to a separate panel or away from such devices.

(5) Provide wiring ducts as necessary.
However, when the clearance of the top and bottom of the PC are smaller than those shown in figure 8.1, pay attention to the following:

(a) When installing to the top of PC, to improve the ventilation, keep the height of the duct to 50mm (1.97in.) or below.
In addition, the distance from the top of the PC should be sufficient for tightening and loosening works for the installation screws on the top of the module.
The module cannot be replaced if the screws on the top of the module cannot be loosened or tightened.

(b) When installing to the bottom part of the PC, provide a sufficient space so that the 100/200VAC input line of the power module, input and output cables of I/O modules and 12/24VDC lines are not affected.

(6) If any device is installed in front of the PC (i.e. installed in the back of the door), position it to secure at least 100mm (3.94in.) of distance to avoid the effects of noise emission and heat.
Also, keep at least 50mm (1.97in.) distance from the base unit to any device placed on right or left or the module.

(7) It is recommendable to fix the base module to the control panel directly using screws, as this method ensures higher resistance to vibration than when using a DIN rail.

8.4.2 Installation

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

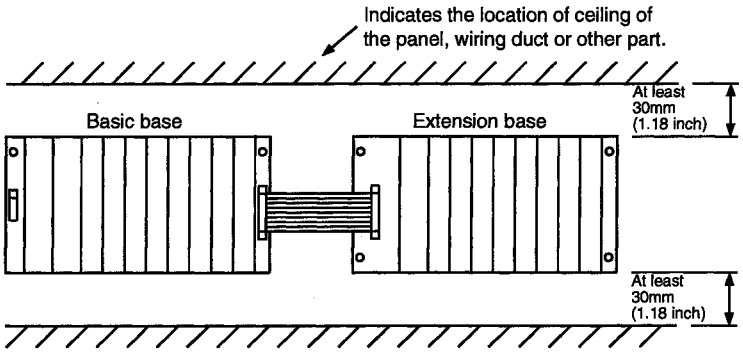


Figure 8.1 Parallel installation

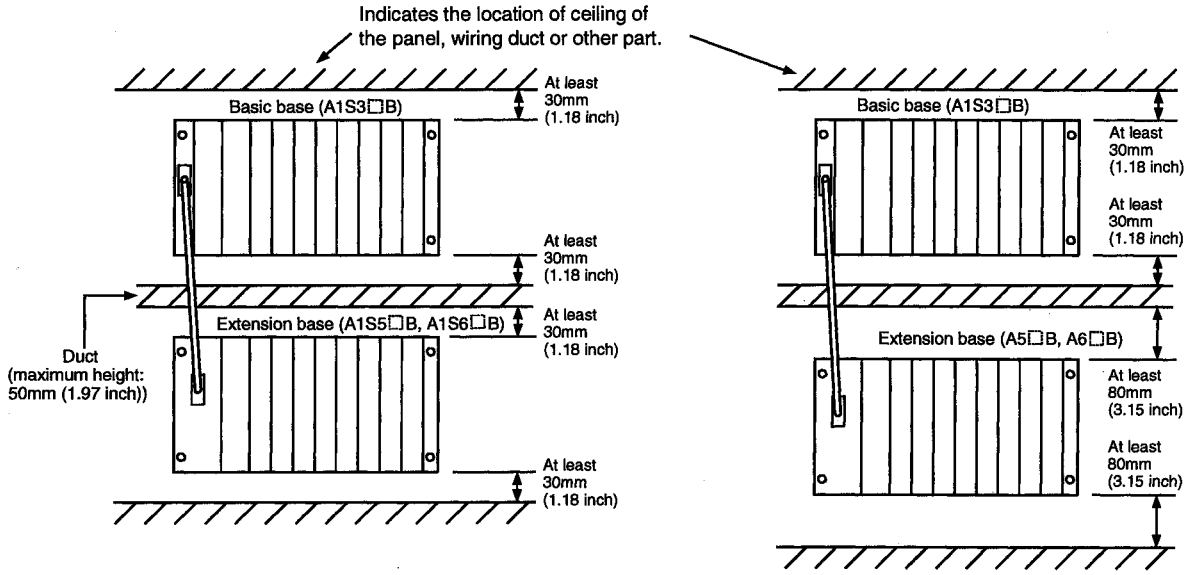


Figure 8.2 Series installation

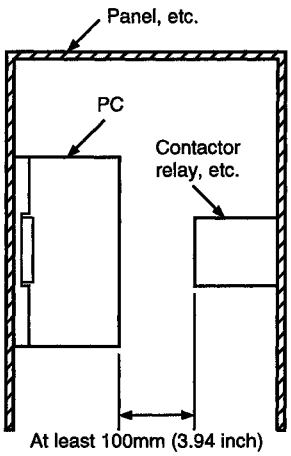


Figure 8.3 Distance between the front face of the PC and other devices

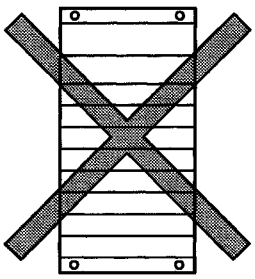


Figure 8.4 Vertical installation (not allowed)

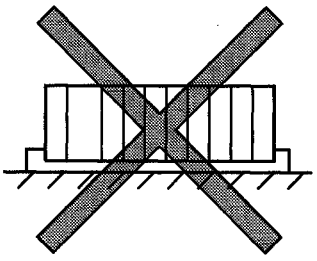


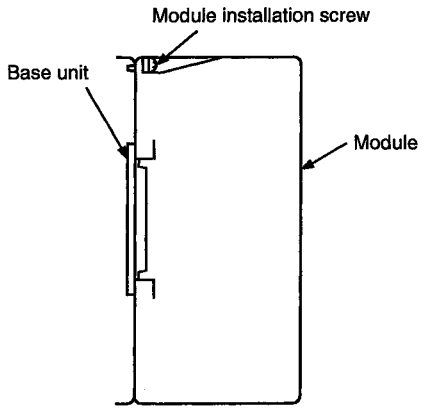
Figure 8.5 Horizontal installation (not allowed)

8.5 Installation and Removal of the Modules

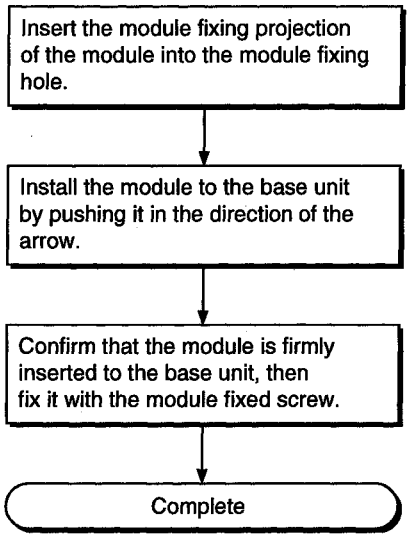
How to install and remove the power supply module, CPU module, I/O module and special function module, etc. to/from the base unit are explained.

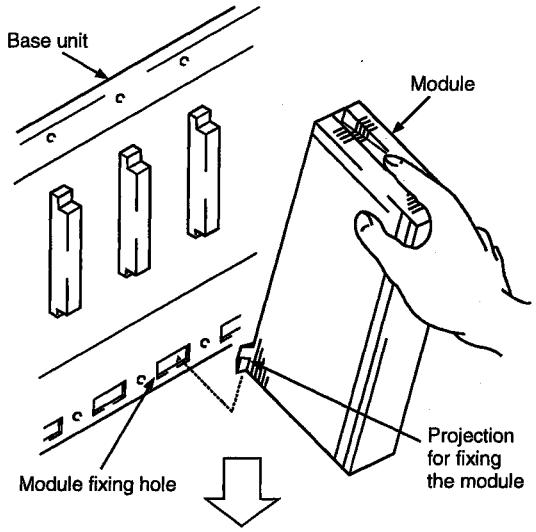
⚠CAUTION

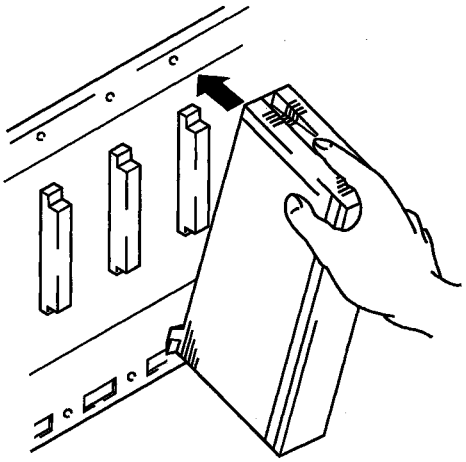
- Install the module by firmly inserting the projection for fixing the module at the bottom of the module to the fixing hole of the base unit, then tighten the module fixed screw with the specified torque. If the module is not installed correctly or the screws are loose, malfunctions, failures and fall out may result.
- Tighten the screws with the specified torque.
  If the screws are loose, it may cause short-circuit, malfunctions, or the module may fall out.
  If the screw is tightened too much, it may cause short-circuit, malfunctions or the module may fall out due to damaged screws or the module.
- Before beginning any installation or wiring work, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause breakdowns or malfunctions.



(1) Installation of the module
Installation procedure of the module is explained.

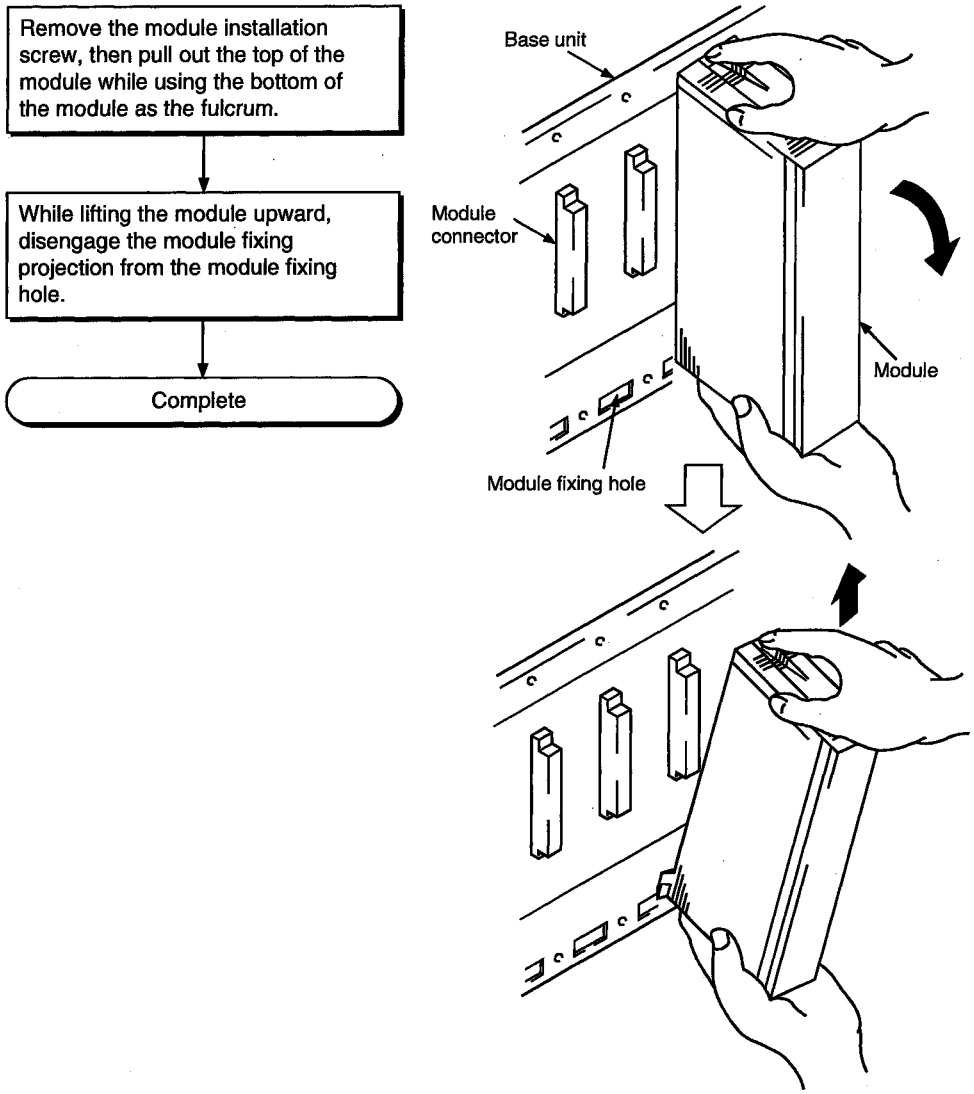






(2) Removal of the module

Removal procedure of the module is explained.



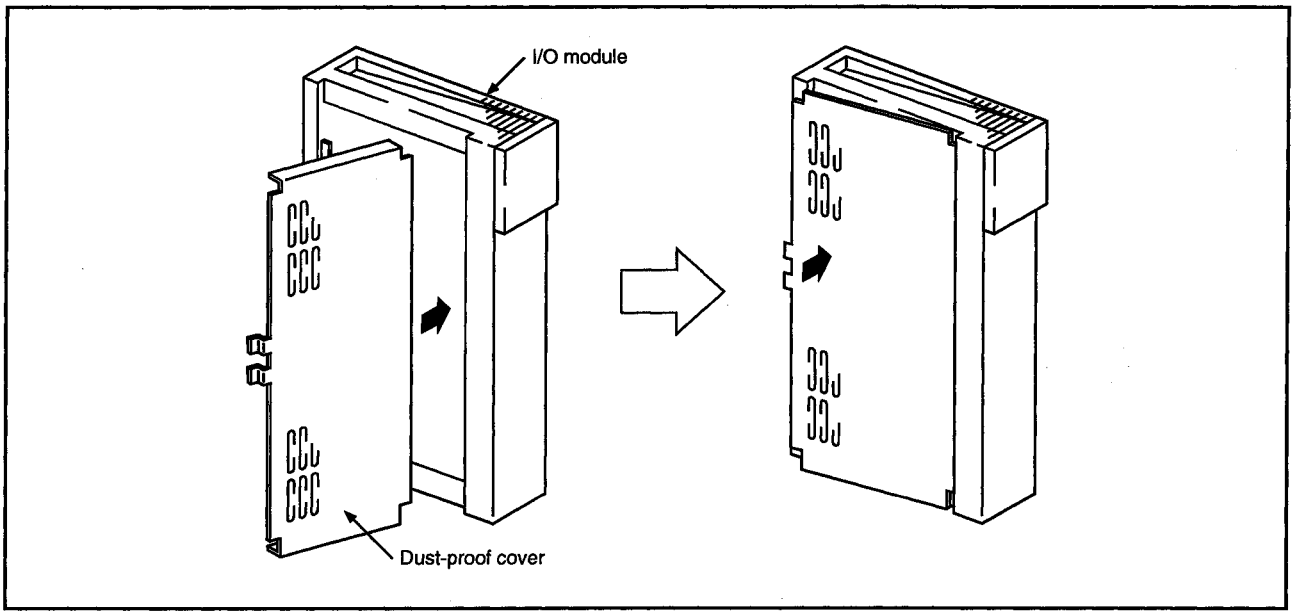
POINT

To remove the module, the module installation screw must be removed first, then disengage the projection for fixing the module from the module fixing hole. If the module is forcibly removed the projection for fixing the module will be damaged.

8.6 Installation and Removal of the Dustproof Cover

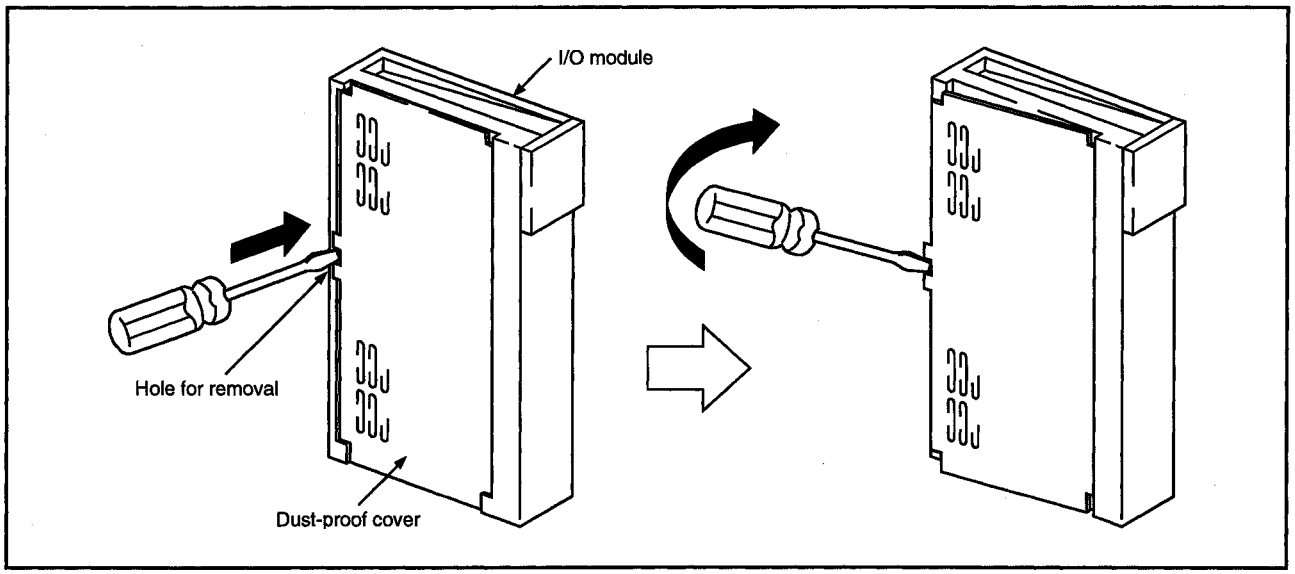
When A1S52B, A1S55B or A1S58B is used, it is necessary to install the dustproof cover, which is supplied with base to the I/O module to be installed to the left end in order to prevent intrusion of foreign material into the I/O module. Intrusion of foreign materials into the I/O module may cause breakdowns. Procedures for installing and removing the dustproof cover are described below.

(1) Installation



To insert the dustproof cover to the I/O module, insert the cover to the connector or terminal side first as shown in the figure, then push the cover to the I/O module side.

(2) Removal



To remove the dustproof cover from the I/O module, insert the tip of a flat-tip screwdriver into the removal hole as shown in the figure, then move the screwdriver towards the rear of the module to separate the clip from the removal hole and remove the cover.

8.7 Wiring

8.7.1 Precautions when wiring

⚠ WARNING

- Before beginning any installation or wiring work, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause electric shock and/or damage to the module.
- When turning on the power or operating the module after installation or wiring work, be sure the module's terminal covers are correctly attached. Failure to attach the terminal covers may result in electric shock.

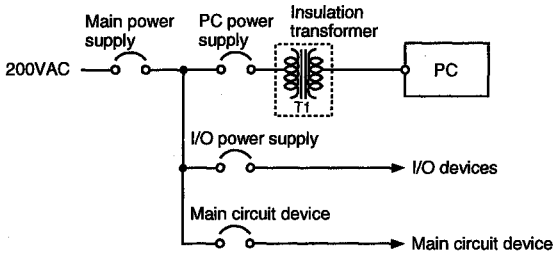
⚠CAUTION

- The FG and LG terminals should always be grounded using the class-3 or higher grounding designed specially for PC. Failure to ground these terminals may cause electric shock or malfunctioning.
- When wiring the PC, check the rated voltage and terminal layout of the wiring, and make sure the wiring is done correctly. Connecting a power supply that differs from the rated voltage or wiring it incorrectly may cause fire or breakdown.
- Do not connect output from multiple power supply modules in parallel. This may heat up the power supply module and cause fire or breakdowns.
- Tighten the terminal screws with the specified torque. If the terminal screws are loose, it may result in short circuits, fire or malfunctioning.
  If the terminal screws are tightened too much, it may damage the screws and the module may result in short circuits, malfunctioning or cause the module to fall out.
- Be careful not to let foreign matter such as filings or wire chips get inside the unit. These can cause fire, breakdowns and malfunctioning.
- Perform correct pressure-welding, crimp-contact or soldering for connectors for the outside using the specified tools. Refer to the User's Manual of the corresponding I/O module for tools required to perform pressure-welding and crimp-contact.
  Incorrect connection may cause short circuits, fire, or malfunctioning.
- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.94in.) or more from each other. Failure to do so may result in noise that would cause malfunctioning.

Precautions when wiring power supply cable are described.

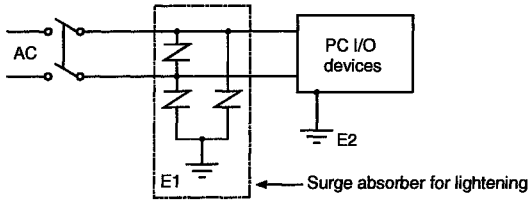
(1) Wiring power supply

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



(b) 100VAC, 200VAC and 24VDC wires should be twisted as dense as possible.
Connect the modules with a shortest distance.
Also, to reduce the voltage drop to the minimum, use thickest wires possible (maximum 2mm^2 (0.0031in.^{2})).

(c) As a countermeasure to power surge due to lightening, connect a surge absorber for lightening as shown below.



POINT

(1) Separate the ground of the surge absorber for lightening (E_1) from that of the PC (E_2).

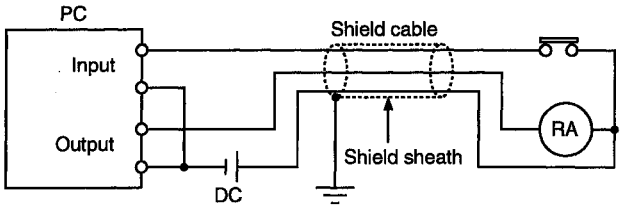
(2) Select a surge absorber for lightening whose power supply voltage does not exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

(2) Wiring I/O devices

(a) The suitable wire size for the connection to the terminals on a terminal block is 0.75 to 1.25mm^2 (0.0012 to 0.0019in.^{2}), but in view of ease of use, the wiring with wire size 0.75mm^2 is recommended.

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

(c) When it is impossible to separate the input/output wires from the main circuit wires and the power line, use a batch-shield cable and ground them at the PC side.
However, grounding them on the other side may be necessary in some cases.



(d) When duct wiring is performed, ground the duct securely.

(e) Separate the 24VDC input and output lines from the 100VAC and 200VAC lines.

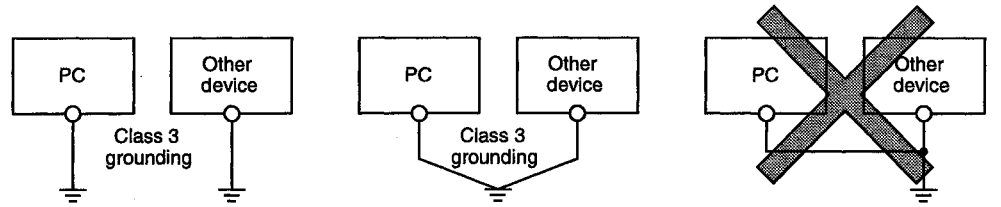
(f) With a long distance wiring of 200m (656.2ft.) or longer, leak current due to line capacity may cause troubles. Implement the countermeasures described in Section 10.4.

(3) Grounding

Perform grounding according to (a) to (c) below.

(a) Employ independent grounding whenever possible. Grounding work shall be done with class D (class 3) grounding. (Grounding resistance is 100Ω or less.)

(b) When independent grounding is not feasible, use shared grounding, shown as (2) in the figure below.



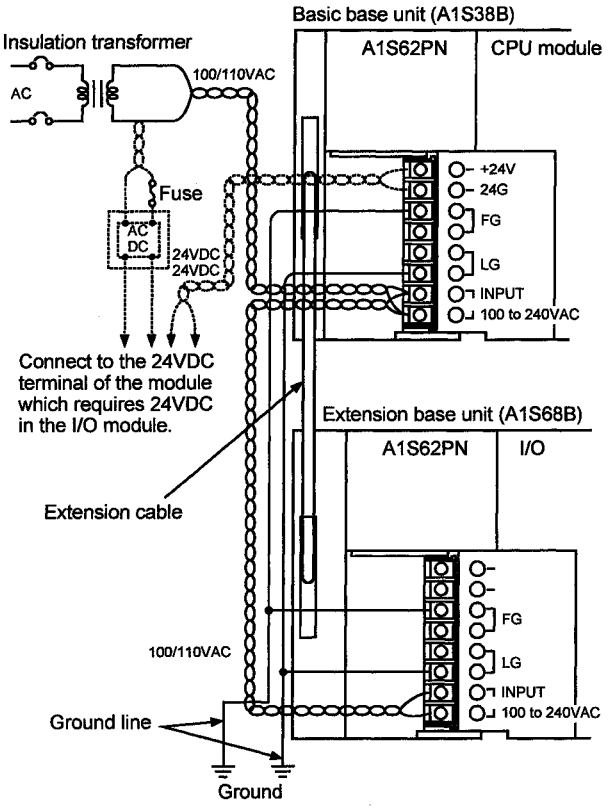
(1) Independent grounding ····· Good (2) Independent grounding ····· O.K. (3) Independent grounding ····· Not allowed

(c) Use electrical wires having a thickness of at least 2mm^2 (0.0031in.^{2}) for grounding.
Grounding point shall be as close to the PC as possible. Make the length of the ground wire short.

8.7.2 Wiring to the module terminals

Examples of wiring power supply line and ground line to the basic base and the extension base are shown below.

Wiring example



POINT

(1) For 100/200VAC and 24VDC power supply line, use the thickest electrical wire possible (maximum 2mm^2 (0.0031in.^{2})). The lines must be twisted from the connecting terminals. For the crimp-style terminals, use crimp-style terminals with an insulation sleeve in order to avoid short-circuiting when screws are loosened.

(2) When LG and FG terminals are connected, it must be grounded. When it is not grounded with LG and FG terminals connected, it will be susceptible to noises. Since the LG terminal has a potential of half the input voltage, touching the terminal may result in an electrical shock.

8.8 Precautions When Unfailure Power Supply (UPS) is Connected

When Unfailure Power System (abbreviated as UPS hereafter) is connected to the CPU system, care must be taken on the following matter:

Use the online UPS with a voltage distortion of 5% or less or line-interactive UPS.
For standby UPS, select the Mitsubishi FREQUPS-F series UPS (serial No. P or later) such as FW-F10-03K/0.5K.
Do not use the stand UPS other than above.

9. EMC DIRECTIVE AND LOW-VOLTAGE INSTRUCTION

Compliance to the EMC Directive, which is one of the EU Directives, has been a legal obligation for the products sold in European countries since 1996 as well as the Low Voltage Directive since 1997.
Manufacturers who recognize their products are compliant to the EMC and Low Voltage Directives are required to declare that print a "CE mark" on their products.

(1) Authorized representative in Europe
Authorized representative in Europe is shown below.
Name: Mitsubishi Electric Europe BV
Address: Gothaer strase 8, 40880 Ratingen, Germany

9.1 Requirements for Compliance with the EMC Directive

The EMC Directive specifies that products placed on the market must be so constructed that they do not cause excessive electromagnetic interference (emissions) and are not unduly affected by electromagnetic interference (immunity)".
Section 9.1.1 through Section 9.1.7 summarize the precautions on compliance with the EMC Directive of the machinery constructed with the MELSEC-AnS series programmable controllers.
These precautions are based on the requirements and the standards of the regulation, however, it does not guarantee that the entire machinery constructed according to the descriptions will comply with above-mentioned directive. The method and judgement for complying with the EMC Directive must be determined by the person who construct the entire machinery.

9.1.1 EMC standards

When the PLC is installed following the directions given in this manual its EMC performance is compliant to the following standards and levels as required by the EMC directive.

Specifications	Test Item	Test Description	Standard Values
EN50081-2 : 1995	EN55011 Radiated noise	Measure the electric wave released by the product.	30 M-230 M Hz QP : 30 dBμ V/m (30 m measurement) *1 230 M-1000 M Hz QP : 37 dBμ V/m (30 m measurement)
	EN55011 Conduction noise	Measure the noise released by the product to the power line.	150 K-500k Hz QP: 79 dB, Mean : 66 dB *1 500 K-30M Hz QP : 73 dB, Mean: 60 dB
prEN50082-2 : 1991	IEC801-2 Static electricity immunity *2	Immunity test by applying static electricity to the module enclosure.	4 k V contact discharge 8 k V air discharge
	IEC801-3 Radiated electromagnetic field *2	Immunity test by radiating an electric field to the product.	10 V/m, 27-500 M Hz
	IEC801-4 First transient burst noise	Immunity test by applying burst noise to the power line and signal cable.	2 k V
EN50082-2 : 1995	EN61000-4-2 Static electricity immunity *2	Immunity test by applying static electricity to the module enclosure.	4 k V contact discharge 8 k V air discharge
	EN61000-4-4 First transient burst noise	Immunity test by applying burst noise to the power line and signal cable., 2 k V	2 k V
	ENV50140 Radiated electromagnetic field AM modulation *2	Immunity test by radiating an electric field to the product.	10 V/m, 80-1000 M Hz, 80 % AM modulation@1 k Hz
	ENV50204 Radiated electromagnetic field Pulse modulation *2	Immunity test by radiating an electric field to the product.	10 V/m, 900 M Hz, 200 Hz pulse modulation, 50 % duty
	ENV50141 Conduction noise	Immunity test by inducting electromagnetic field to the power line signal cable.	10 Vrms, 0.15-80 M Hz, 80 % modulation@1 k Hz

(*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 box.
The tests for the corresponding items were performed while the PLC was installed to inside the control box.

9.1.2 Installation inside the control cabinet

Since the PLC is an open type device (device incorporated into another device), it must be installed in the control cabinet. This has a good effect of not only for assuring safety but also for shielding noise emitted from the PLC, by means of the control cabinet.

(1) Control cabinet

(a) Use a conductive control cabinet.

(b) When attaching the control cabinet's top plate or base plate, mask painting and weld so that good surface contact can be made between the cabinet and plate.

(c) To ensure good electrical contact with the control cabinet, mask the paint on the installation bolts of the inner plate in the control cabinet so that contact between surfaces can be ensured over the widest possible area.

(d) Earth the control cabinet with a thick wire so that a low impedance connection to ground can be ensured even at high frequencies. (22 mm2 wire or thicker is recommended.)

(e) Holes made in the control cabinet must be 10 cm (3.94 in.) diameter or less. If the holes are 10 cm (3.94 in.) or larger, radio frequency noise may be emitted.

(2) Connection of power and earth wires

Earthing and power supply wires for the PLC system must be connected as described below.

(a) Provide an earthing point near the power supply module. Earth the power supply's LG and FG terminals (LG : Line Ground, FG : Frame Ground) with the thickest and shortest wire possible. (The wire length must be 30 cm (11.18 in.) or shorter.) The LG and FG terminals function is to pass the noise generated in the PLC system to the ground, so an impedance that is as low as possible must be ensured. As the wires are used to relieve the noise, the wire itself carries a large noise content and thus short wiring means that the wire is prevented from acting as an antenna.

Note) A long conductor will become a highly efficient antenna at high frequency.

(b) The earth wire led from the earthing point must be twisted with the power supply wires. By twisting with the earthing wire, noise flowing from the power supply wires can be relieved to the earthing. However, if a filter is installed on the power supply wires, the wires and the earthing wire may not need to be twisted.

9.1.3 Cables

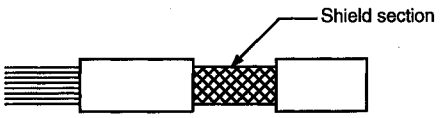
The cables led from the control cabinet contain a high frequency noise element and outside the control panel these cables act as antennae and radiate noise. The cables connected to input/output modules or special modules which leave the control panel must always be shielded cables.
Mounting of a ferrite core on the cables is not required (excluding some models) but if a ferrite core is mounted, the noise radiated through the cable can be suppressed further. Use of a shielded cable is also effective for increasing the noise immunity level. The PLC system's input/output and special function module provide a noise immunity level of equivalent to that stated in IEC801-4 : 2 k V when a shielded cable is used. If a shielded cable is not used or if the shield earthing treatment is not suitable even when used (See Section 9.1.2.4), the noise immunity level is less than 2 k V.

Note) prEN50082-2 specifies the noise resistance level based on the signal wire application.
Signals involved in process control : 2 k V
Signals not involved in process control : 1 k V

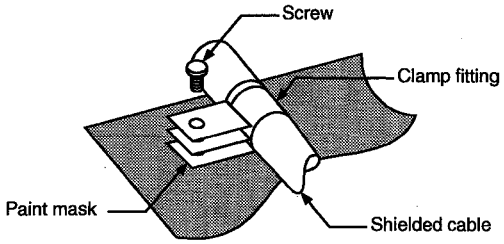
The meaning of "involved in process control" is not defined in prEN50082-2. However, when the purposes of the EMC Directive are considered, the signals that could cause personal injury or risks in the facility if a malfunction occurs should be defined as "signals involved in process control". Thus, it is assumed that a high noise immunity level is required.

(1) Shield earthing

When a shield of the shielded cable is earthed to the cabinet body, please ensure that the shield contact with the body is over a large surface area. If the cabinet body is painted it will be necessary to remove paint from the contact area. All fastenings must be metallic and the shield and earthing contact must be made over the largest available surface area. If the contact surfaces are too uneven for optimal contact to be made either use washers to correct for surface inconsistencies or use an abrasive to level the surfaces. The following diagrams show examples of how to provide good surface contact of shield earthing by use of a cable clamp.

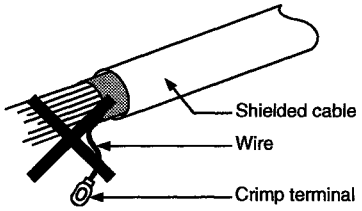


(a) Peal the cable insulation off and expose the shield section.



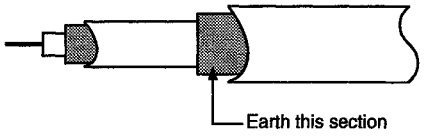
(b) Sandwich the exposed shield section with the and earth to the control cabinet over a wide area.

Note) The method of earthing by soldering a wire onto the shield section of the shielded cable as shown below is not recommended. The high frequency impedance will increase and the shield will be ineffective.



(2) MELSECNET/II, MELSECNET/10 module

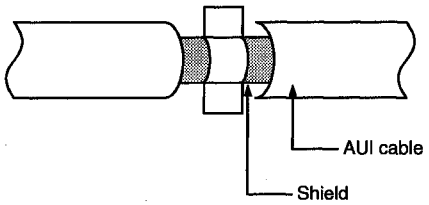
(a) The following requirements apply to A1SJ71AR21, A1SJ71BR11, AnNCPUR21, AnACPUR21.
Always use a triaxial cable for the module. The radiated noise in the band of 30 M Hz or higher can be suppressed by using a triax cable. Earth the outer shield by the method described in (1).



(b) Always mount a ferrite core onto the triaxial cable. Mount the ferrite core near the control cabinet outlet of each cable. Use of the TDK ZCAT3035 ferrite core is recommended.

(3) Ethernet module

(a) Always earth the AUI cable connected to the A1SJ71E71-B5. The AUI is a shielded cable so remove the outer insulation and connect to earth the exposed shield section using as wide a surface area as possible in the manner shown below.



(b) Always use a triaxial cable for the coaxial cable connected to the A1SJ71E71-B2. The earthing precautions are the same as (1).

(c) For A1SJ71E71-B2/B5, always mount a ferrite core in addition to items (1) and (2) above. Use of the TDK ZCAT3035 ferrite core is recommended.

Ethernet is the registered trademark of XEROX Corporation in the US.

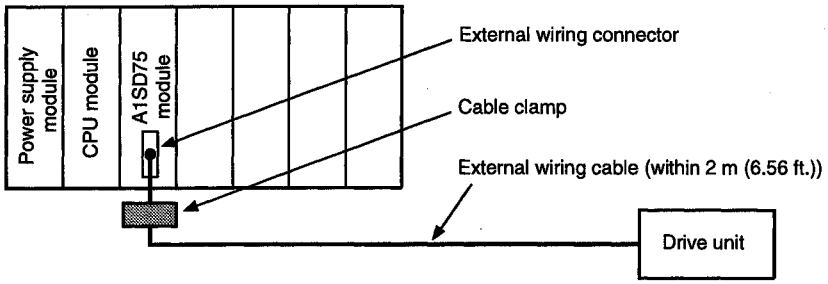
(4) Positioning Modules

(a) When wiring with a 2 m (6.6 ft.) or less cable

Ground the shield section of the external wiring cable with the cable clamp. (Ground the shield at the closest location to the A1SD75 external wiring connector.)

Wire the external wiring cable to the drive unit and external device with the shortest distance.

Install the drive unit in the same panel.

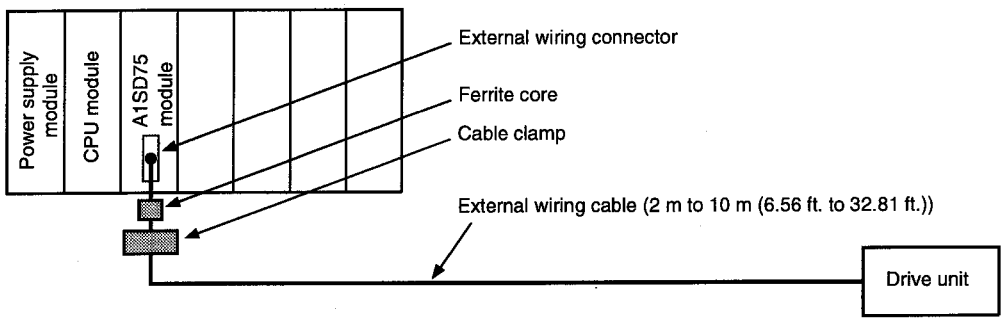


(b) When wiring with cable that exceeds 2 m (6.6 ft.), but is 10 m (32.8 ft.) or less

Ground the shield section of the external wiring cable with the cable clamp. (Ground the shield at the closest location to the A1SD75 external wiring connector.)

Install a ferrite core.

Wire the external wiring cable to the drive unit and external device with the shortest distance.



(c) Ferrite core and cable clamp types and required quantities

- Cable clamp
  Type : AD75CK (Mitsubishi Electric)
- Ferrite core
  Type : ZCAT3035-1330 (TDK ferrite core)
- Required quantity

Cable length	Prepared part	Required Qty		
		1 axis	2 axes	3 axes
Within 2 m (6.6 ft.)	AD75CK	1	1	1
2m (6.6 ft.) to 10m (32.8 ft.)	AD75CK	1	1	1
	ZCAT3035-1330	1	2	3

(5) I/O and other communication cables
Always earth the shield section of the I/O signal cables and other communication cables (RS-232-C, RS-422, etc.) in the same manner as described in Section 9.1.2.4 if the cables go outside of the control cabinet.

9.1.4 Power supply module

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

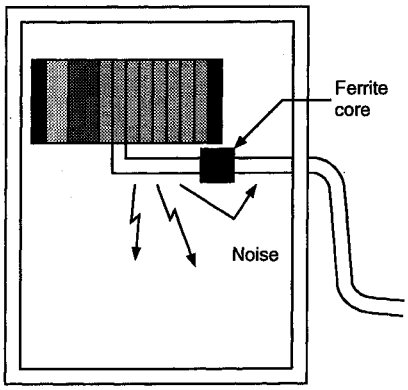
Model	Precautions
A1S61PN A1S62PN	Make sure to short and ground the LG and FG terminals. *2
A1SJHCPU A1SJHCPU-S8	Make sure to short and ground the LG and FG terminals.
A1S63P *1	Use a CE-compliant 24VDC internal power supply.

*1 If a sufficient filter circuitry is built into a 24 V DC external power supply module, the noise generated by A1S63P will be absorbed by that filter circuit, so a line filter may not be required. Filtering circuitry of version F or later of A1S63P is improved so that a external line filter is not required.

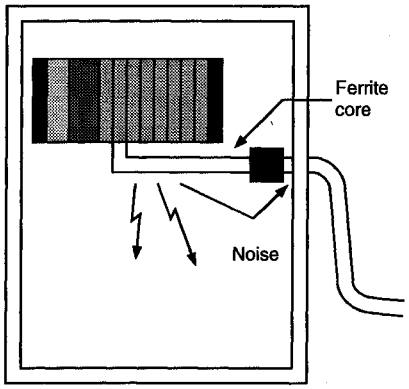
*2 To ensure the compliance with CE (EN6111-21/A11), make sure to short the LG and FG terminals using a wire of 6 to 7cm.

9.1.5 Ferrite core

A ferrite core is effective for reducing noise in the band of 30 M Hz to 100 M Hz. Mounting of a ferrite core is not necessary except for some particular models described in Section 9.1.3 (2), (3). However if further attenution of noise is necessary, mounting of a ferrite core on cables which radiate noise is recommended. When a ferrite core is mounted, mount the ferrite core just before the point where the cable goes outside of the cabinet. The ferrite will not be effective if the mounting position is not adequate.



(a) When there is a distance from the cable exit hole, the noise will jump over the ferrite, thus the effect will be halved.



(b) When mounted by the cable exit hole, the noise will not jump over the ferrite.

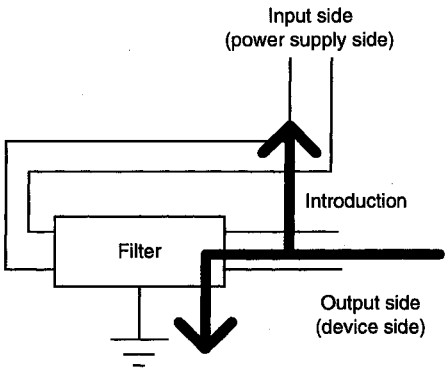
9.1.6 Noise filter (power supply line filter)

The noise filter (power supply line filter) is a device effective to reduce conducted noise. Except some particular models described in Section 9.1.3 (5), installation of a noise filter onto the power supply lines is not necessary. However conducted noise can be reduced if it is installed. (The noise filter is generally effective for reducing conducted noise in the band of 10 M Hz or less.) Usage of the following filters is recommended.

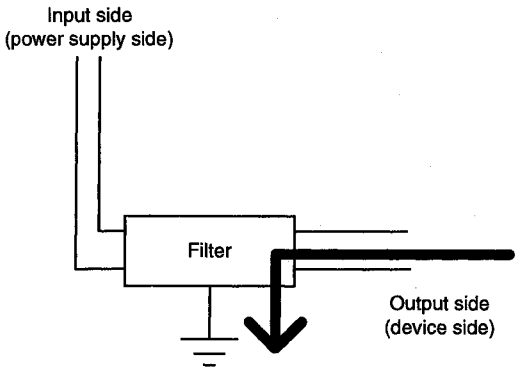
Model name	FN343-3/01	FN660-6/06	ZHC2203-11
Manufacturer	SCHAFFNER	SCHAFFNER	TDK
Rated current	3 A	6 A	3 A
Rated voltage	250 V		

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 the noise was filtered.



(a) The noise will be included when the input and output wires are bundled.



(b) Separate and lay the input and output wires.

(2) Earth the noise filter earthing terminal to the control cabinet with the shortest wire possible (approx. 10 cm (3.94 in.)).

9.2 Requirement to Conform to the Low-Voltage Instruction

The low-voltage instruction, one of the European Instructions, is now regulated.

The low-voltage instruction require each device which operates with power supply ranging from 50 V AC to 1000 V and 75 V DC to 1500 V to satisfy necessary safety items.

In the Sections from 9.2.1 to 9.2.8, cautions on installation and wiring of the MELSEC-AnS series PLC to conform to the low-voltage instruction regulation are described.

We have put the maximum effort to develop this material based on the requirements and standards of the regulation that we have collected. However, compatibility of the devices which are fabricated according to the contents of this manual to the above regulation is not guaranteed. Each manufacturer who fabricates such device should make the final judgement about the application method of the low-voltage instruction and the product compatibility.

9.2.1 Standard applied for AnS series

The standard applied for AnS series is EN61010-1 safety of devices used in measurement rooms, control rooms, or laboratories.

For the modules which operate with the rated voltage of 50 V AC/75 V DC or above, we have developed new models that conform to the above standard.

For the modules which operate with the rated voltage under 50 V AC/75 V DC, the conventional models can be used, because they are out of the low-voltage instruction application range.

9.2.2 Precautions when using the AnS series

Module selection

(1) Power module

For a power module with rated input voltage of 100/200 V AC, select a model in which the internal part between the first order and second order is intensively insulated, because it generates hazardous voltage (voltage of 42.4 V or more at the peak) area.

For a power module with 24 V DC rated input, a conventional model can be used.

(2) I/O module

For I/O module with rated input voltage of 100/200 V AC, select a model in which the internal area between the first order and second order is intensively insulated, because it has hazardous voltage area.

For I/O module with 24 V DC rated input, a conventional model can be used.

(3) CPU module, memory cassette, base unit

Conventional models can be used for these modules, because they only have a 5 V DC circuit inside.

(4) Special module

Conventional models can be used for the special modules including analog module, network module, and positioning module, because the rated voltage is 24 V DC or smaller.

(5) Display device

Use an A900 series GOT CE compatible model.

9.2.3 Power supply

The insulation specification of the power 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; category IV has the highest durability.

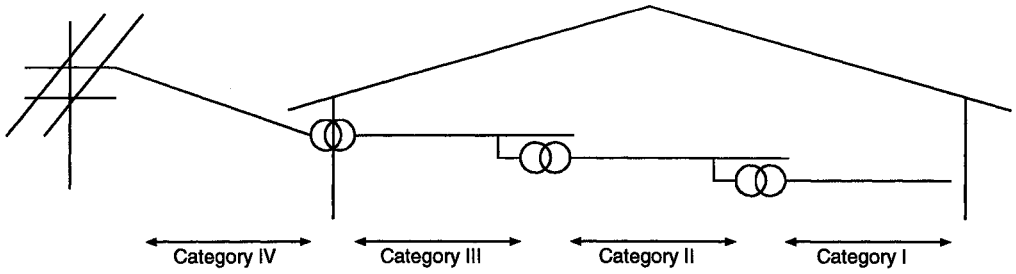


Figure 1. : Installation Category

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 box

Because the PLC is an open device (a device designed to be stored within another module), be sure to use it after storing in the control box.

(1) Electrical shock prevention

In order to prevent persons who are not familiar with the electric facility such as the operators from electric shocks, the control box must have the following functions :

(a) The control box must be equipped with a lock so that only the personnel who has studied about the electric facility and have enough knowledge can open it.

(b) The control box must have a structure which automatically stops the power supply when the box is opened.

(2) Dustproof and waterproof features

The control box also has the dustproof and waterproof functions. Insufficient dustproof and waterproof features lower the insulation withstand voltage, resulting in insulation destruction. The insulation in our PLC is designed to cope with the pollution level 2, so use in an environment with pollustion level 2 or below.

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, but occasional temporary conductivity occurs due to the accumulated dust. Generally, this is the level for inside the control box equivalent to IP54 in a control room or on the floor of a typical factory.
Pollution level 3 :	An environment where conductive dust exits and conductivity may be generated due to the 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 realize the pollution level 2 when stored in a control box equivalent to IP54.

9.2.5 Module installation

(1) Installing modules contiguously

In AnS series PLCs, the left side of each I/O module is left open. When installing an I/O module to the base, do not make any open slots between any two modules. If there is an open slot on the left side of a module with 100/200 V AC rating, the printed board which contains the hazardous voltage circuit becomes bare. When it is unavoidable to make an open slot, be sure to install the blank module (A1SG60).

When using the A1S5□B expansion base with no power supply, attach the cover packaged with the expansion base to the side of the leftmost module.

9.2.6 Grounding

There are two kinds of grounding terminals as shown below. Either grounding terminal must be used grounded.

Be sure to ground the protective grounding for the safety reasons.

Protective grounding ⏚ : Maintains the safety of the PLC and improves the noise resistance.
Functional grounding ⏚ : Improves the noise resistance.

9.2.7 External wiring

(1) 24 V DC external power supply

For special modules that require a 24 V DC I/O module or external power supply, use a model whose 24 V DC circuit is intensively insulated from the hazardous voltage circuit.

(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) Intensive insulation

Intensive insulation refers to the insulation with the dielectric withstand voltage shown in Table 2.

Table 2 : Intensive Insulation Withstand Voltage (Installation Category II, source : IEC664)

Rated voltage of hazardous voltage area	Surge withstand voltage (1.2/50 μs)
150 V AC or below	2500 V
300 V AC or below	4000 V

10. MAINTENANCE AND INSPECTION

⚠ WARNING

- Do not touch the terminals while the power is on. Doing so may cause electric shock or malfunctioning.
- Be sure to connect the battery correctly. Do not charge, disassemble, heat, throw into fire, short, or solder batteries.
  Improper handling of batteries may cause injury to the operator or fire due to heat generation, explosion, or ignition.
- Before cleaning the module or retightening the screws, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause electric shock.
  If the screws are loose, it may result in short circuits, fire or malfunctioning.
  If the screws are tightened too much, it may damage the screws and the module may result in short circuits, malfunctioning or cause the module to fall out.

⚠CAUTION

- Carefully read manuals and confirm that it is safe enough before performing online operations which require to connect peripheral devices to an operating CPU module. (especially when modifying a program, performing forced output, or modifying the operation status.)
  Misoperation may damage the module or cause accidents.
- Do not disassemble or rebuild the module.
  It may cause accidents, malfunction, injury, or fire.
- Make sure to switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause failure or malfunction of the module.
- When using a cellular phone, keep it 25 cm (9.85 inch) or more away from the PLC. Otherwise, malfunction may result.

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

10.1 Daily Inspection

Table 10.1 shows the inspection and items which are to be checked daily.

Table 10.1 Daily Inspection

No.	Check Item		Check Point	Judgment	Corrective Action
1	Base unit mounting conditions		Check for loose mounting screws and cover.	The base unit should be securely mounted.	Retighten screws.
2	Mounting conditions of I/O module, etc.		Check if the module is disengaged or the hook is securely engaged.	The hook should be securely engaged and the module should be positively mounted.	Securely engage the hook.
3	Connecting conditions		Check for loose terminal screws.	Screws should not be loose.	Retighten terminal screws.
			Check distance between solderless terminals.	Proper clearance should be provided between solderless terminals.	Correct.
			Check connectors of extension cable.	Connections should not be loose.	Retighten connector mounting screws.
4	CPU module indicator lamps	"POWER" LED	Check that the LED is ON.	ON (OFF indicates an error.)	See Section 11.2.2.
		"RUN" LED	Check that the LED is ON during RUN.	ON (OFF or flash indicates an error.)	See Sections 11.2.3 and 11.2.4.
		"ERROR" LED	Check that the LED is ON when an error occurred.	OFF (ON when an error occurred.)	See Sections 11.2.5 and 11.2.6.
		Input LED	Check that the LED turns ON and OFF.	ON when input is ON. OFF when input is OFF. (Display, which is not as mentioned above, indicates an error.)	See Section 11.4.1.
		Output LED	Check that the LED turns ON and OFF.	ON when output is ON. OFF when output is OFF. (Display, which is not as mentioned above, indicates an error.)	See Section 11.4.2.

10.2 Periodic Inspection

This section explains the inspection items which are to be checked every six months to one year. If the equipment have been moved or modified or wiring has been changed, also make the inspection.

Table 10.2 Periodic Inspection

No.	Check Item		Checking Method	Judgment	Corrective Action
1	Ambient environment	Ambient temperature	Measure with thermometer and hygrometer. Measure corrosive gas.	0 to 55°C	When PC is used inside a panel, the temperature in the panel is ambient temperature.
		Ambient humidity		10 to 90 %RH	
		Ambience		There should be no corrosive gases.	
2	Line voltage check.		Measure voltage across 100/200 VAC terminal.	85 to 132 VAC	Change supply power. Change transformer tap.
				170 to 264 VAC	
3	Mounting conditions	Looseness, play	Move the unit.	The module should be mounted securely and positively.	Retighten screws.
		Ingress of dust or foreign material	Visual check.	There should be no dust or foreign material, in the vicinity of the PC.	Remove and clean.
4	Connecting conditions	Loose terminal screws	Retighten.	Connectors should not be loose.	Retighten.
		distances between solderless terminals.	Visual check.	Proper clearance should be provided between solderless terminals.	Correct.
		Loose connector	Visual check.	Connectors should not be loose.	Retighten connector mounting screws.
5	Battery		Check battery status by mounting special auxiliary relays M9006 and M9007. Retighten battery if necessary.	Preventive maintenance	If battery capacity reduction is not indicated, change the battery when specified service life is exceeded.

10.3 Replacement of Battery

M9006 or M9007 turns ON when the voltage of battery for program backup and power failure compensation reduces.

Even if this special rely turns ON, the contents of the program and power failure compensation are not lost immediately.

However, if the ON state is overlooked, the PC contents may be lost.

Special auxiliary relays M9006 and M9007 are switched ON to indicate that the battery life has reduced to the time (minimum) indicated in Table 9.3 and it must be replaced if continued power failure RAM and /or data backup is required.

The following sections give the battery service life and the battery changing procedure.

10.3.1 Service life of battery

Table 10.3 shows the service life of battery.

Table 10.3 Battery life

CPU module model	Power-on time ratio*1	Battery life*5			
		Guaranteed value*2	Actual service value (Reference value)*3		After M9006 or M9007 is turned on. (Backup power time after an alarm*4)
			Ambient temperature 40°C	Ambient temperature 25°C	
A2USCPU, A2USCPU-S1	0%	3,600 hours 0.4 years	39,000 hours 4.5 years	43,800 hours 5.0 years	168 hours 7 years
	30%	5,140 hours 0.6 years	43,800 hours 5.0 years	43,800 hours 5.0 years	168 hours 7 years
	50%	7,200 hours 0.8 years	43,800 hours 5.0 years	43,800 hours 5.0 years	168 hours 7 years
	100%	43,800 hours 5.0 years	43,800 hours 5.0 years	43,800 hours 5.0 years	168 hours 7 years

*1 The power-on time ratio indicates the ratio of programmable controller power-on time to one day (24 hours). (When the total power-on time is 12 hours and the total power-off time is 12 hours, the power-on time ratio is 50%.)

*2 The guaranteed value represents a battery life at 70°C , which is calculated based on characteristic values of manufacturer-supplied memories (SRAM) and on the assumption of storage within the ambient temperature range of -20 to 75°C (operating ambient temperature of 0 to 55°C).

*3 The actual service value (reference value) represents a battery life that is calculated based on the values measured at storage ambient temperature of 40°C and 25°C.
This value is intended for reference only, as it varies with characteristics of the memory.

*4 In the following status, the backup time after power off is 10 minutes.
- The battery connector is disconnected.
- The lead wire of the battery is broken.

*5 The service life of the battery (service hours) is five years (43,800 hours).

Preventive maintenance is as described below.

[1] Replace a battery in 4 or 5 years even when the battery has been used less than the guaranteed time shown in the table above.

[2] Replace a battery when the battery has been used exceeding the guaranteed time and M9006 is on.

POINT

(1) Use the battery within the time shown by the guaranteed value of the battery life.

(2) If the battery may be used exceeding the guaranteed time, perform ROM operation to protect data in case that the battery will be exhausted during power-off of the programmable controller. Or, after M9006 (battery low) turns on, back up data within the specified time shown in Table 10.3.

(3) When the battery (A6BAT) is not connected to the CPU module, its service life is five years.

(4) When the battery-low special relay SM52 turned on, immediately change the battery. Even if an alarm has not yet occurred, it is recommended to replace the battery periodically according to the operating condition.

10.3.2 Battery replacement procedure

When the service life of the battery has expired, replace the battery using the following procedure:

Even if the battery is removed, the memory is backed by a capacitor for some time.

However, if the replacement time exceeds the guaranteed value shown in the following table, the contents of the memory may be lost. Therefore, replace the battery as fast as possible.

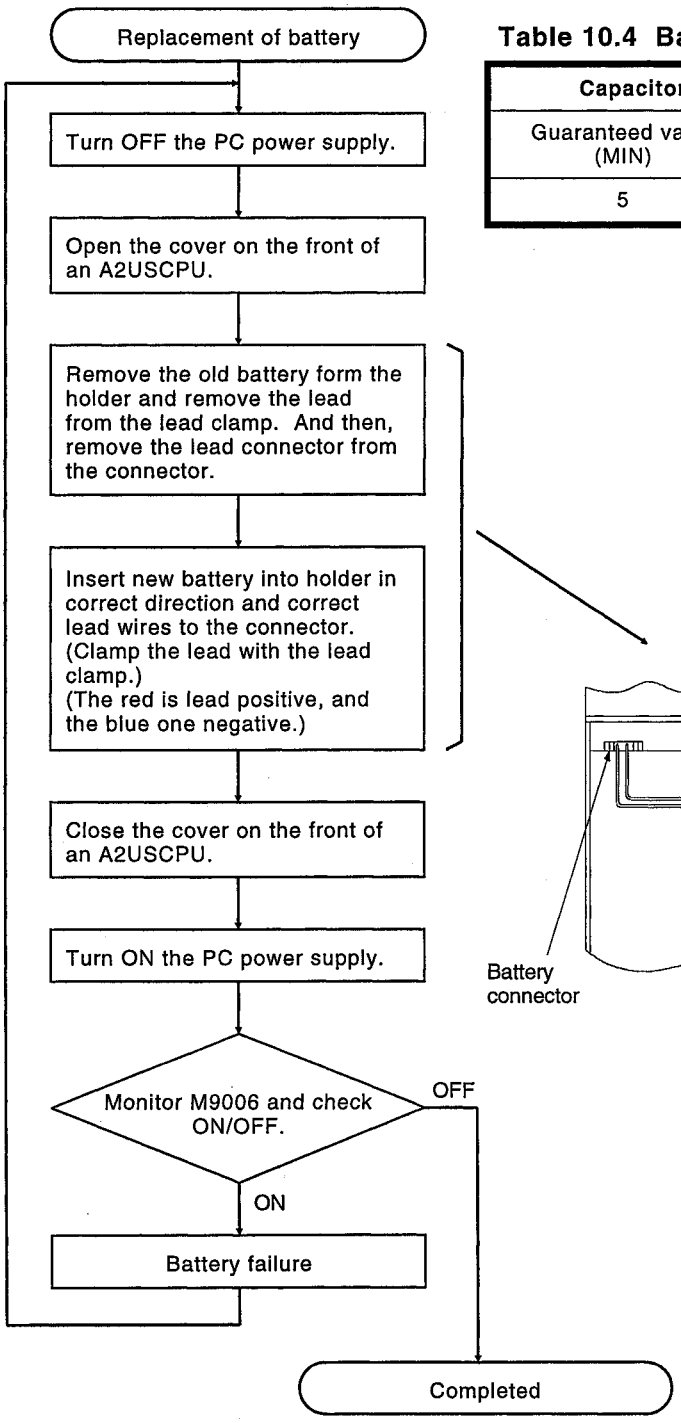
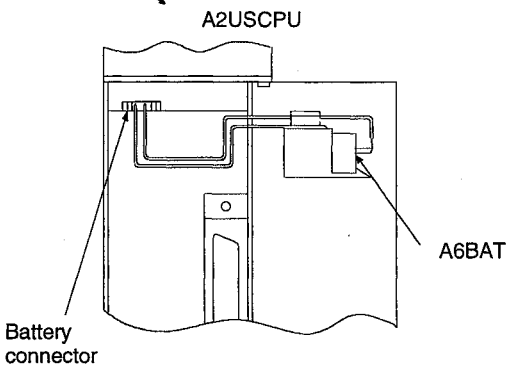


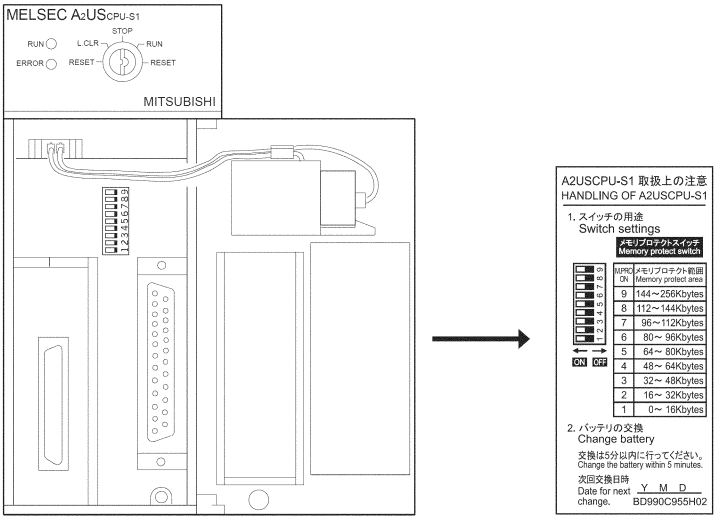
Table 10.4 Backup Time by Capacitor

Capacitor Backup Time (Minute)	
Guaranteed value (MIN)	Actually applied value (TYP)
5	15



POINT

After replacing a battery, write the date for next battery replacement on the sticker on the back side of the front cover.
Write the proper date by checking the battery life.（Refer to Section10.3.1.）



11. TROUBLESHOOTING

This section describes various procedures for troubleshooting, as well as corrective actions.

11.1 Basic Troubleshooting

System reliability not only depends on reliable equipment but also on short down-times in the event of faults.

The three basic points to be kept in mind in troubleshooting are:

(1) Visual checks

Check the following points

(a) Machine motion (in stop and operating states)

(b) Power ON or OFF

(c) Status of I/O equipment

(d) Condition of wiring (I/O wires, cables)

(e) Display states of various indicators (such as POWER LED, RUN LED, ERROR LED, and I/O LED)

(f) States of various setting switches (such as extension base and power failure compensation)

After checking (a) to (f), connect the peripheral equipment and check the running status of the PC CPU and the program contents.

(2) Trouble check

Observe any changes in the error condition during the following:

(a) Set the RUN/STOP keyswitch to the STOP position.

(b) Reset using the RUN/STOP keyswitch.

(c) Turn the power ON and OFF.

(3) Narrow down the possible causes of the trouble

Deduce where the fault lies, i.e:

(a) Inside or outside the PC CPU.

(b) I/O module or another module.

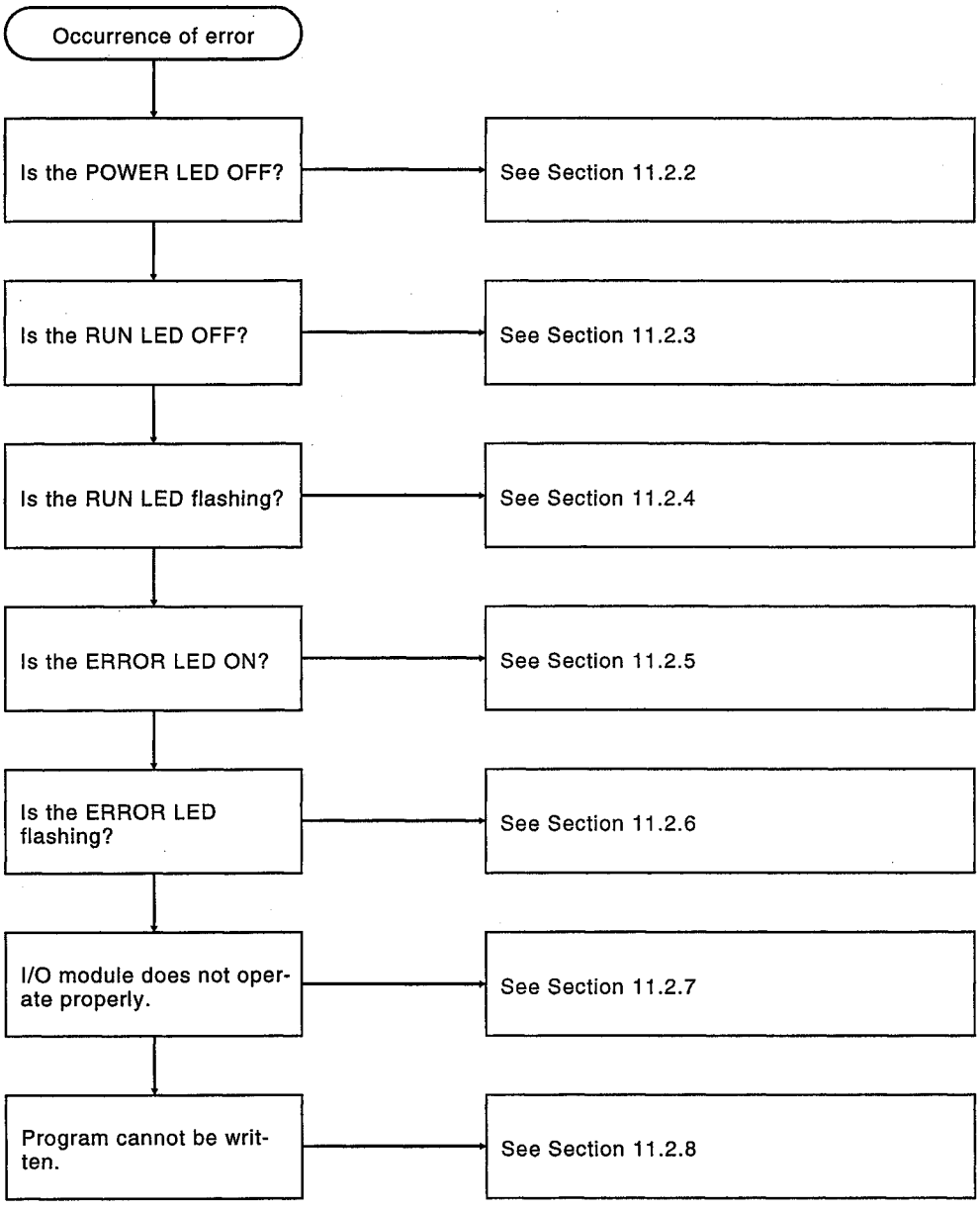
(c) Sequence program.

11.2 Troubleshooting

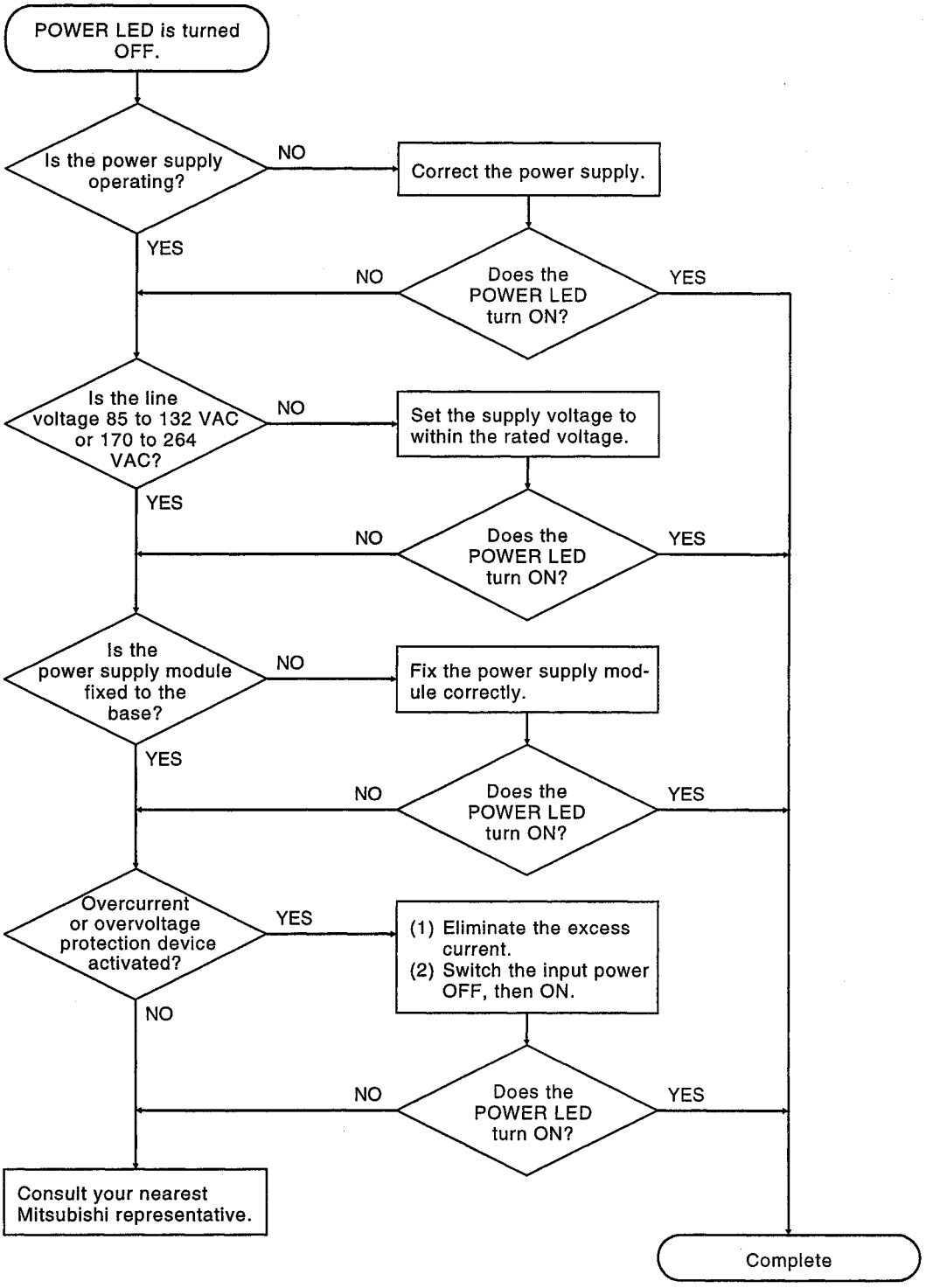
This section explains the procedure for determining the cause of problems as well as the errors and corrective actions for error codes.

11.2.1 Troubleshooting flowcharts

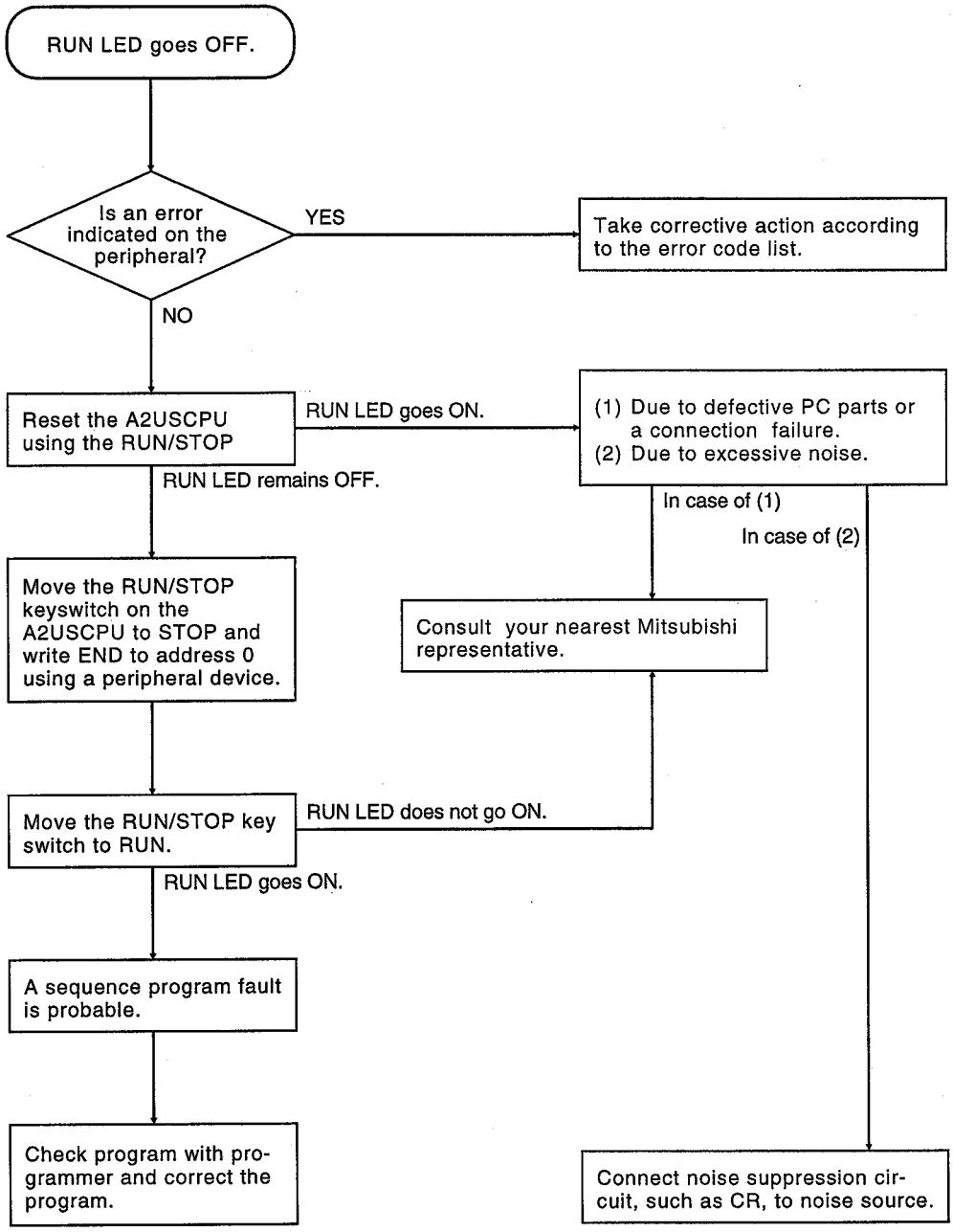
The procedures for troubleshooting are given in the following flowcharts:



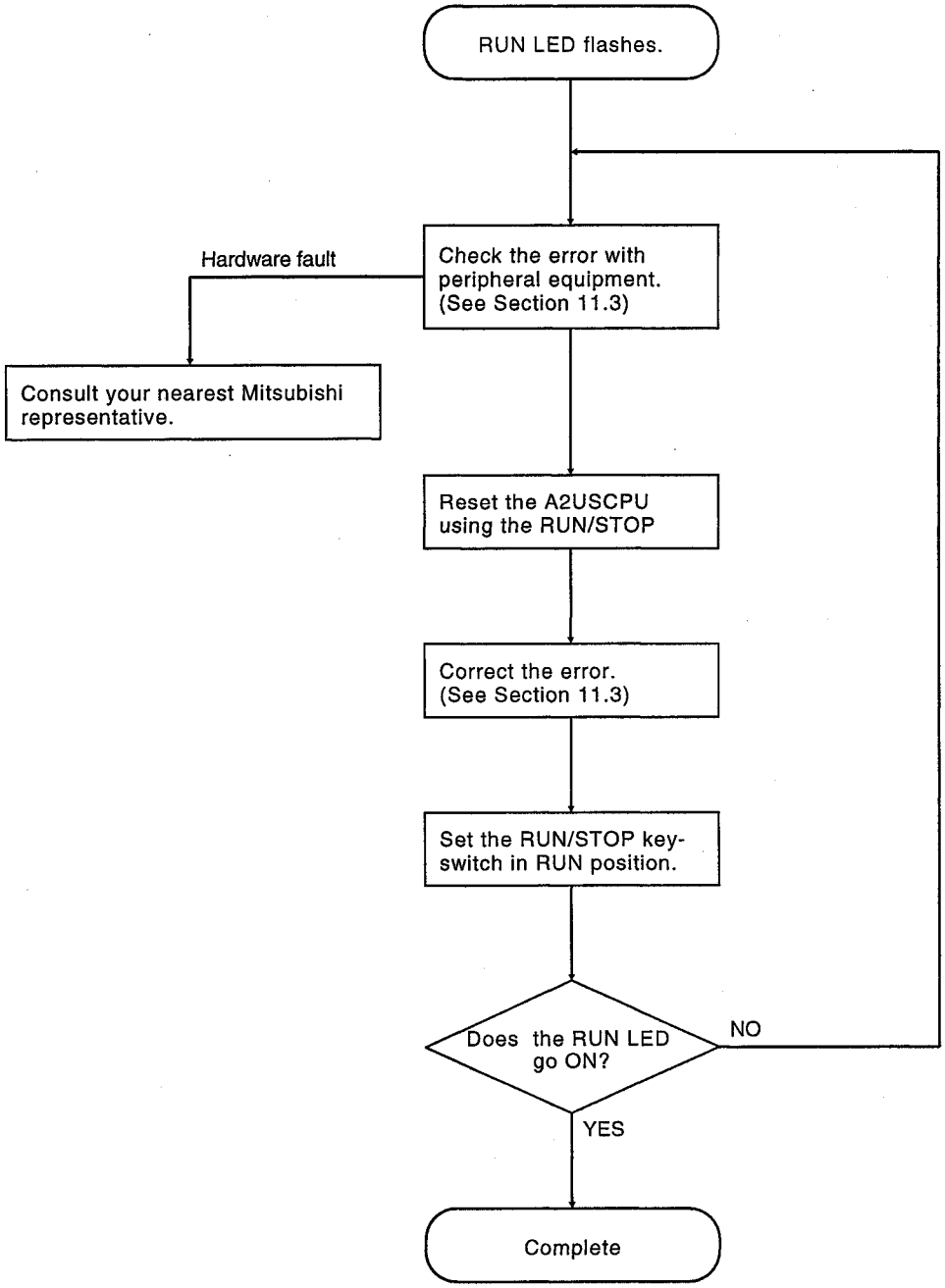
11.2.2 Flowchart used when the POWER LED goes OFF



11.2.3 Flowchart used when the RUN LED goes OFF

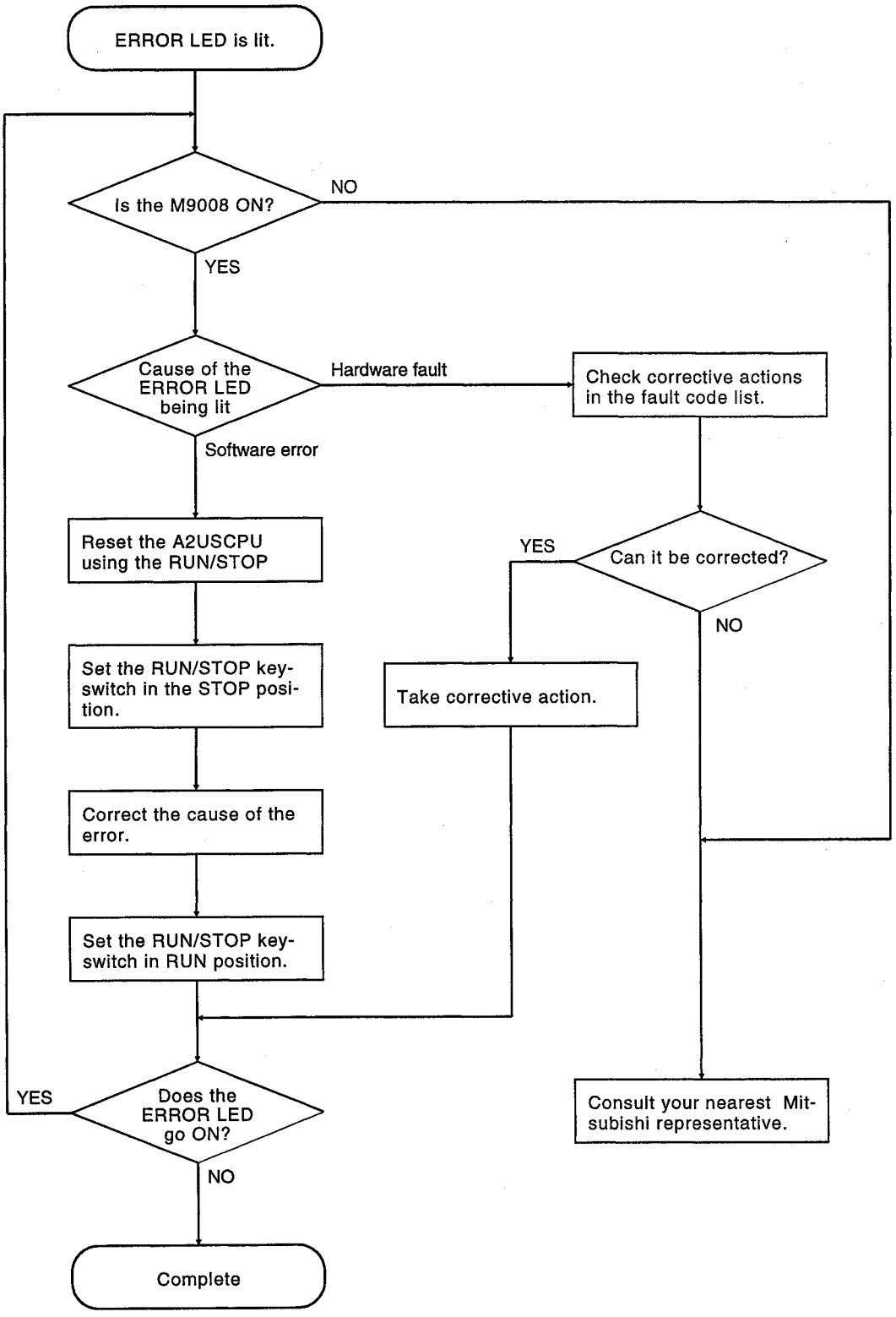


11.2.4 Flowchart used when the RUN LED flashes



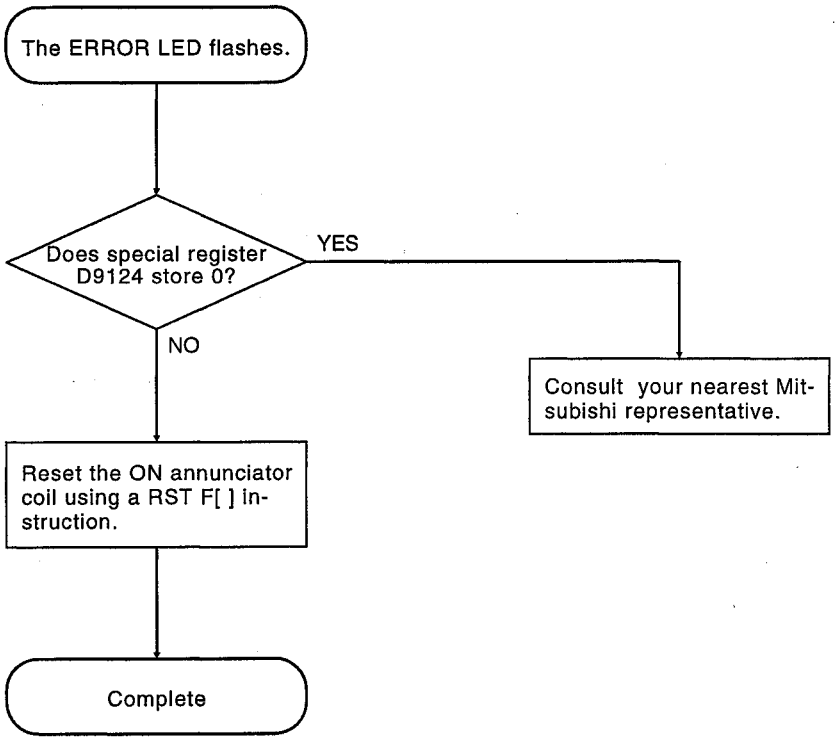
11.2.5 Flowchart used when the ERROR LED is lit

The following shows the corrective measures when the ERROR LED is lit at RUN.

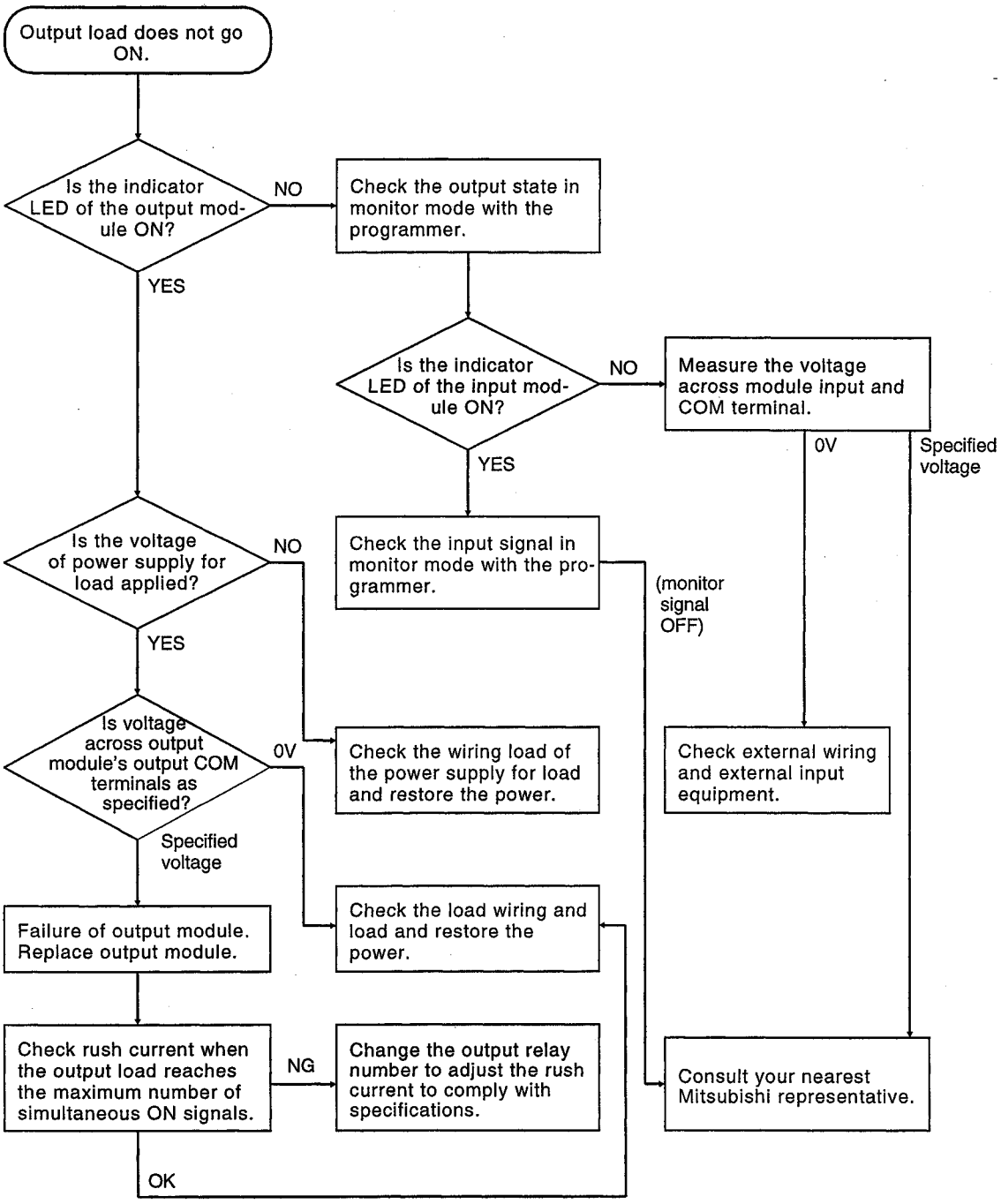


11.2.6 Flowchart used when the ERROR LED flashes

The following shows the corrective measures when the ERROR LED flashes.



11.2.7 Flowchart used when the output load of the output module does not go ON

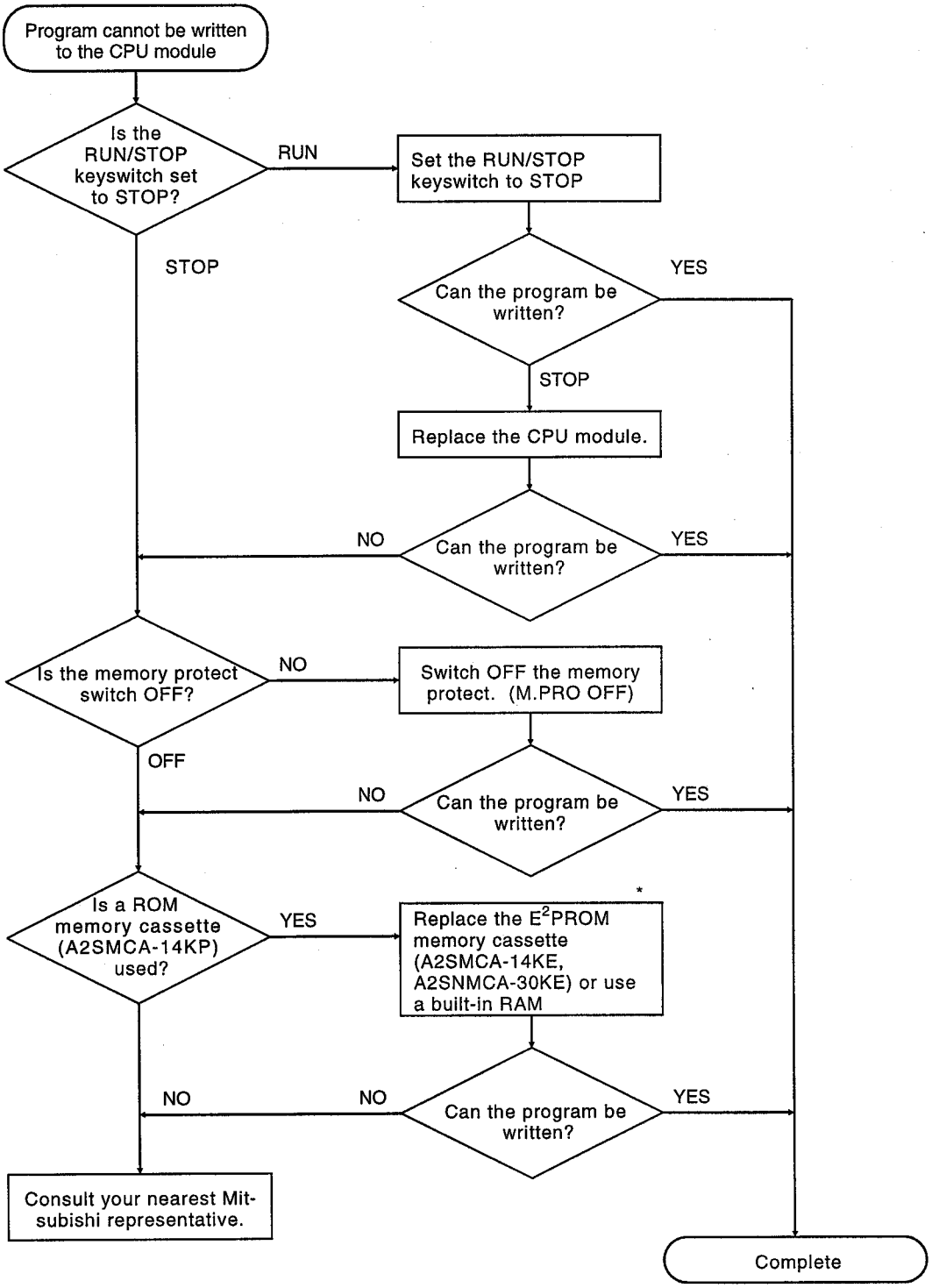


POINT

If the input or load signals are not switched OFF, see Section 11.4 and take corrective measures.

11.2.8 Flowchart used when a program cannot be written to the CPU module

The following shows the corrective measures when a program cannot be written to the CPU module.



* When the E^2PROM memory cassette is used, make sure that the memory protect setting pins of the A2SMCA-14KE, A2SNMCA-30KE are set to OFF.

11.3 Error Code List

When an error occurs at PC RUN or during Run, the error is displayed or error code is stored in special register D9008, the detailed error code is stored in special register D9091, and the error step is stored in special register D9010 by the self-diagnostic function.
The error content and corrective action are shown in Table 11.1.

11.3.1 Reading of error codes

When an error occurs, the error code can be read by peripheral device. Refer to the Peripheral Device Operating Manual for the operation method.

11.3.2 Error Code List

Error codes are generated as follows:

Table 11.1 Error Code List

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/B IX and LEDA/B IXEND.	
		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 (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, sampl-ing 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.
		123		(1) When subprogram 2 is set by a parameter, there is no END (FEND) instruction in subprogram 2. (2) When subprogram 2 is set by a parameter, subprogram 2 has not been written from a peripheral device.	
		124		(1) When subprogram 3 is set by a parameter, there is no END (FEND) instruction in subprogram 3. (2) When subprogram 3 is set by a parameter, subprogram 2 has not been written from a peripheral device.	

Table 11.1 Error Code List (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/B][FCALL] or [LEDA/B][BREAK] 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/B][BREAK] 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/B][IX] and [LEDA/B][IXEND] instructions are not paired. (2) There are 33 or more sets of [LEDA/B][IX] and [LEDA/B][IXEND] 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/B][IX] and [LEDA/B][IXEND] instructions to 32 or less.

Table 11.1 Error Code List (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 (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" (Checked at power on.)	21	211	STOP	The operation circuit for index qualification in the CPU does not work correctly.	Since this is CPU hardware error, consult Mitsubishi representative.
		212		Hardware (logic) in the CPU does not operate correctly.	
		213		The operation circuit for sequential processing in the CPU does not operate correctly.	
"OPE. CIRCUIT ERR." (Checked at execution of the END instruction)		214		In the END processing check, the operation circuit for index qualification in the CPU does not work correctly.	
		215		In the END processing check, the hardware in the CPU does not operate correctly.	
"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
"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".

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"FUSE BREAK OFF" (Checked continuously.)	32	—	Stop or Continue (set by parameter)	(1) There is an output module of which fuse is blown. (2) The external power supply for output load is turned OFF or is not connected.	(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". (3) Check the ON/OFF status of the external power supply for output load.
"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.	
"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.

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"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 x 125) Total > 1344	Reduce the number of loaded special function modules.
		448*		(1) Five or more network modules have been installed. (2) A total of five or more of network modules and data link modules have been installed.	Make the total of the installed network modules and data link modules four or less.

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"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		(1) Module specified by the dedicated instruction for special function module is not a special function module or not a corresponding special function module. (2) A command was issued to a CC-Link module with function version under B. (3) A CC-Link dedicated command was issued to a CC-Link module for which the network parameters have not been set.	(1) Read the error step using a peripheral device and check and correct contents of the dedicated instruction for special function modules of the step. (2) Replace with a CC-Link module having function version B and above. (3) Set the parameters.
"LINK PARA. ERROR"	47	0	Continue	[When using MELSECNET/(II)] (1) When the link range at a data link CPU which is also a master station (station number = 00) is set by parameter setting at a peripheral device, for some reason the data written to the link parameter area differs from the link parameter data read by the CPU. Alternatively, no link parameters have been written. (2) The total number of slave stations is set at 0.	(1) Write the parameters again and check. (2) Check the station number settings. (3) Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		470*		[When using MELSECNET/10] (1) The contents of the network refresh parameters written from a peripheral device differ from the actual system at the base unit. (2) The network refresh parameters have not been written.	Write the network refresh parameters again and check.
		471*		[When using MELSECNET/10] (1) The transfer source device range and transfer destination device range specified for the inter-network transfer parameters are in the same network. (2) The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters spans two or more networks. (3) The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters is not used by the network.	Write the network parameters again and check.
		472*		[When using MELSECNET/10] The contents of the routing parameters written from a peripheral device differ from the actual network system.	Write the routing parameters again and check.

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"LINK PARA. ERROR"	47	473*	Continue	[When using MELSECNET/10] (1) The contents of the network parameters for the first link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the first link unit have not been written. (3) The setting for the total number of stations is 0.	(1) Write the parameters again and check. (2) Check the station number settings. (3) Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		474*		[When using MELSECNET/10] (1) The contents of the network parameters for the second link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the second link unit have not been written. (3) The setting for the total number of stations is 0.	
		475*		[When using MELSECNET/10] (1) The contents of the network parameters for the third link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the third link unit have not been written. (3) The setting for the total number of stations is 0.	
		476*		[When using MELSECNET/10] (1) The contents of the network parameters for the fourth link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the fourth link unit have not been written. (3) The setting for the total number of stations is 0.	
		477		A ink parameter error was detected by the CC-Link module.	(1) Write the parameters in again and check. (2) If the error appears again, there is a problem with the hardware. Consult your nearest System Service, sales office or branch office.

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"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/B LRDP LCDA/B LWTP, LRDP, LWTP instructions is not a local station. (2) Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, RFRP, RTOP instructions is not of a remote station.	
		506		Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, 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.
		508		A CC-Link dedicated command was issued to three or more CC-Link modules.	The CC-Link dedicated command can be issued only to two or less CC-Link modules.

Table 11.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"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) Though there are 32 entries of FROM or TO instructions registered with a PRC instruction in the mailbox (memory area waiting for execution), another PRC instruction is executed to cause an overflow in the mail box (memory area waiting for execution). (3) The PIDCONT instruction was executed without executing the PIDINIT instruction. The PID57 instruction was executed without executing the PIDINIT or PIDCONT instruction. The program presently executed was specified by the ZCHG instruction. (4) The number of CC-Link dedicated command executed in one scan exceeded 10.	(1) Read the error step using a peripheral device and correct the program, meeting loaded conditions of remote terminal modules. (2) Use special register D9081 (number of empty entries in mailbox) or special relay M9081 (BUSY signal of mail box) to suppress registration or execution of the PRC instruction. (3) Correct the program specified by the ZCHG instruction to other. (4) Set the number of CC-Link dedicated commands executed in one scan to 10 or less.
"MAIN CPU DOWN"	60	—	STOP	(1) The CPU malfunctioned due to noise. (2) Hardware failure.	(1) Take proper countermeasures for noise. (2) Hardware failure.
	62	—		(1) The power supply module detected an incorrect power waveform. (2) Failure in the power module, CPU module, main base unit or expansion cable is detected.	(1) Correct the power waveform applied to the power supply module. (2) Replace the power module, CPU module, main base unit or expansion cable.
"BATTERY ERROR" (Checked at power on.)	70	—	Contin ue	(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 Possible Troubles with I/O Modules

Examples of troubles concerning I/O circuits and the countermeasures are explained.

11.4.1 Troubles with the input circuit and the countermeasures

Examples of troubles concerning input circuits and the countermeasures are explained.

Table 11.2 Troubles with the input circuit and the countermeasures

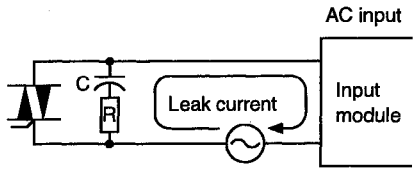
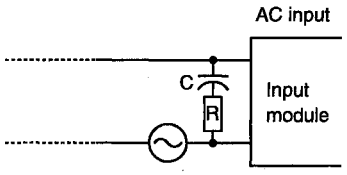
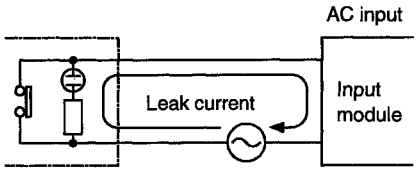
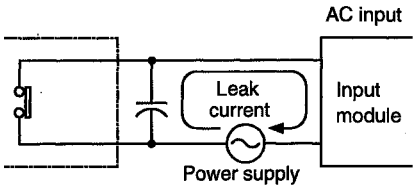
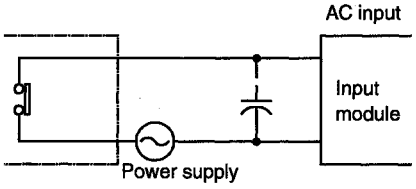
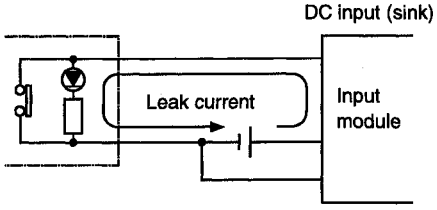
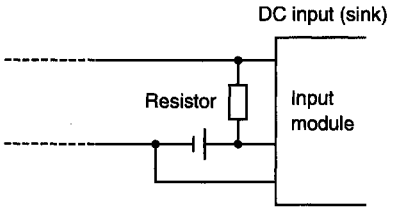
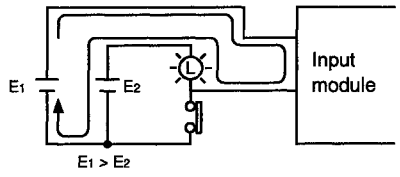
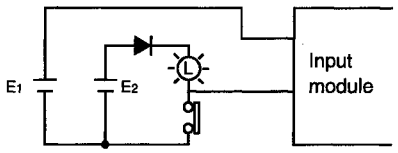
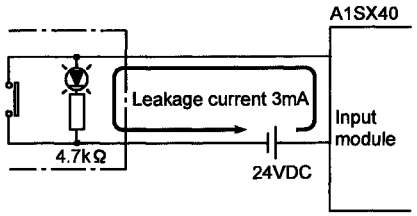
	Situation	Cause	Countermeasure
Example 1	Input signal does not turn OFF.	• Leak current from input switch (driven by a contactless switch, etc.) 	• Connect an appropriate resistance so that voltage between the terminals of the input module is lower than the OFF voltage.  For OR constant, 0.1 to 0.47μF+47 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, it does not occur when 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 display 	• 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 resistance to be connected is provided on the following page.

Table 11.2 Troubles with the input circuit and the countermeasures

	Situation	Cause	Countermeasure
Example 5	Input signal does not turn OFF.	• Revolving path due to the use of two power supplies. 	• Use only one power supply. • Connect a diode to prevent the revolving path (figure below). 

<Example 4s Calculation Example>

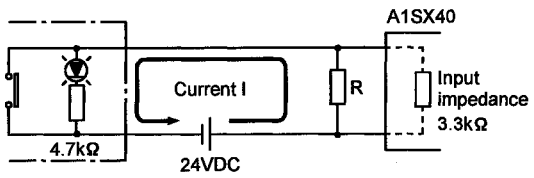


If a switch with an LED display is connected to A1SX40 and a leak current of 3 mA is observed

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

  V_{TB} = 3 [mA] × 3.3 [kΩ] = 9.9 [V] (Ignore the voltage drop caused by the LED.)

  Because the condition for the OFF voltage (≤ 4 [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 A1SX40 across the terminals must be reduced to within 4 [V]. The current for reducing the voltage across the terminals to within 4 [V] is:

  (24 − 4 [V] ÷ 4.7 [kΩ] = 4.26 mA)

  Therefore resistor R for flowing current I of 4.26 [mA] must be connected.

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

  4 [V] ÷ R > 4.26 − 1.21 [mA] ← 4 [V] ÷ Input impedance 3.3 [kΩ]

  4 [V] ÷ 3.05 [mA] > R

  1.31 [kΩ] > R

  Suppose that the resistance R is 1.2 [kΩ].

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

  W = (Applied voltage)^2/R

  W = (26.4 [V])^2/ 1.2 [kΩ] = 0.58 [W]

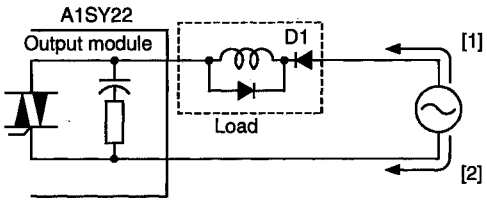
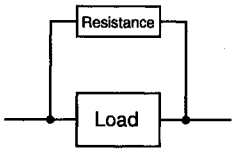
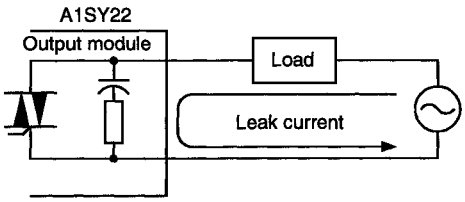
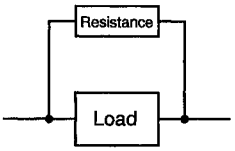
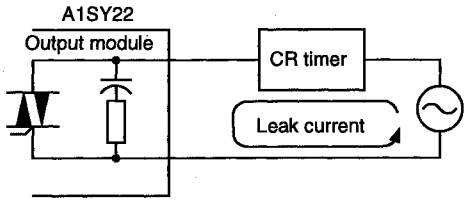
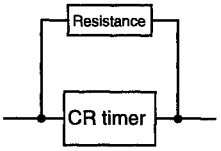
- Because the resistance is selected so that the power capacity is three to five times the actual power consumption, 2 to 3 [W] should be selected.

  From the above, the resistor to be connected across the terminal in question and COM is 1.2 [kΩ] 2 to 3 [W].

11.4.2 Possible troubles in the output circuit

Examples of troubles concerning output circuits and the countermeasures are explained.

Table 11.3 Troubles with the output circuit and the countermeasures

	Situation	Cause	Countermeasure
Example 1	An excessive voltage is impressed to the load when output is off.	• 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 impressed to the both ends of D1. The maximum value of the voltage is about 2.2E.	• Connect a resistance at several tens to several hundred of k 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 OFF (Triac output)	• Leak current caused by built-in surge killer 	• Connect a resistance to the both ends of the load. (When the wiring distance from the output card to the load is long, be aware of the risk of a leak current due to line capacity.) 
Example 3	When load is CR type timer, the time limit fluctuates. (Triac output)		• Start the relay first, then start the CR-type timer at the contact. (In some timers, internal circuit may be half wave rectification type, so the caution as to the example 1 is necessary here.)  Calculate the constant of the resistance based on the load.

APPENDICES

APPENDIX 1 INSTRUCTION LIST

Instructions used with the A2USCPU are listed below.
Refer to the following programming manuals for details of the instructions.

• ACPU 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 Programming Manual (PID Control Instructions)	IB-66258

(1) Sequence instructions

(a) Contact instruction

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

(b) Connection instruction

Connection	ANB , ORB, MPS, MRD, MPP

(c) Output instruction

Output	OUT, SET, RST, PLS, PLF

(d) Shift instruction

Shift	SFT, SFTP

(e) Master control instruction

Master control	MC, MCR

(f) Termination instruction

Program end	FEND, END

(g) Other instructions

Stop	STOP
No operation	NOP
Page feed (page feed operation of printer output)	NOPLF

(2) Basic instructions

(a) Comparison instructions

=	16 bits	LD=, AND=, OR=
	32 bits	LDD=, ANDD=, ORD=
< >	16 bits	LD<>, AND<>, OR<>
	32 bits	LDD<>, ANDD<>, ORD<>
>	16 bits	LD>, AND>, OR>
	32 bits	LDD>, ANDD>, ORD>
≤	16 bits	LD<=, AND<=, OR<=
	32 bits	LDD<=, ANDD<=, ORD<=
<	16 bits	LD<, AND<, OR<
	32 bits	LDD<, ANDD<, ORD<
≥	16 bits	LD>=, AND>=, OR>=
	32 bits	LDD>=, ANDD>=, ORD>=

(b) BIN arithmetic operation instruction

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

(c) BCD arithmetic operation instructions

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

(d) BCD - BIN conversion instructions

BIN→BCD	16 bits	BCD, BCDP
	32 bits	DBCD, DBCDP
BCD→BIN	16 bits	BIN, BINP
	32 bits	DBIN, DBINP

(e) Data transfer instructions

Transfer	16 bits	MOV, MOVP
	32 bits	DMOV, DMOVP
Change	16 bits	XCH, XCHP
	32 bits	DXCH, DXCHP
Undefined transfer	16 bits	CML, CMLP
	32 bits	DCML, DCMLP
Block transfer	16 bits	BMOV, BMOVP
Repeat data block transfer	16 bits	FMOV, FMOVP

(f) Program branch instructions

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

(g) Refresh instructions

Link refresh	COM
Partial refresh	SEG

(3) Application instructions

(a) Logical operation instruction

Logical product	16 bits	Two types each for WAND and WANDP
	32 bits	DAND, DANDP
Logical sum	16 bits	Two types each for WOR and WORP
	32 bits	DOR, DORP
Exclusive logical sum	16 bits	Two types each for WXOR and WXORP
	32 bits	DXOR, DXORP
NOT exclusive logical sum	16 bits	Two types each for WXNR and WXNRP
	32 bits	DXNR, DXNRP
2's complement (reversed sign)	16 bits	NEG, NEGP

(b) Rotation instructions

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

(c) Shift instructions

Right ward shift	16 bits	SFR, SFRP, BSFR, BSFRP
	Per device	DSFR, DSFRP
Left ward shift	16 bits	SFL, SFLP, BSFL, BSFLP
	Per device	DSFL, DSFLP

(d) Data processing instruction

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

(e) FIFO instructions

Write	16 bits	FIFW, FIFWP
Read	16 bits	FIFR, FIFRP

(f) ASCII instructions

ASCII conversion	ASC
ASCII print	Two types each for PR and PRC

(g) Buffer memory access instructions

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

(h) FOR NEXT instruction

Repetition	FOR, NEXT

(i) Display instructions

Display	LED, DEDC
Display reset	LEDR

(j) Data link unit instructions

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

(k) Other instructions

WDT reset		WDT, WDTP
Fault 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) Instructions for structured program

Circuit index qualification	IX, IXEND
Repeat forced end	BREAK
Subroutine call	FCALL
Changes in error check circuit pattern	CHK, CHKEND

(c) Data operation instructions

32-bit data search	DSER
16-bit upper and lower byte exchange	SWAP
Separation of data	DIS
Association of data	UNI
Bit test	TEST, DTEST

(d) I/O operation instructions

Flip-flop control	FF
Numerical key input from keyboard	KEY

(e) Real number processing instructions (BCD real number processing instructions)

The square root calculation of BCD 4 digits	BSQR
The square root calculation of BCD 8 digits	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 number processing instructions (Floating point real number processing)

Real numbers to 16-/32-bit BIN conversion	INT, DINT
16-/32-bit BIN to real numbers conversion	FLOAT, DFLOAT
Addition	ADD
Subtraction	SUB
Multiplication	MUL
Division	DIV
Angle to radian conversion	RAD
Radian to angle 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
Exponent	EXP
Logarithm	LOG

(g) Character string processing instructions

16-/32-bit BIN to decimal ASCII conversion	BINDA, DBINDA
16-/32-bit BIN to hexadecimal ASCII conversion	BANHA, DBINHA
16-/32-bit BCD to decimal ASCII conversion	BCDDA, DBCDDA
Decimal ASCII to 16-/32-bit BIN conversion	DABIN, DDABIN
Hexadecimal ASCII to 16-/32-bit BIN conversion	HABIN, DHABIN
Decimal ASCII to 16-/32-bit BCD conversion	DABCD, DDABCD
Device comment read	COMRD
Character string length detection	LEN
16-/32-bit BIN to decimal character string conversion	STR, DSTR
Decimal character string to 16-/32-bit BIN conversion	VAL, DVAL
Hexadecimal data to ASCII conversion	ASC
ASCII to hexadecimal data conversion	HEX
Character string transfer	SMOV
Character string association	SADD
Character string comparison	SCMP
Separation into units of 1 byte	WTOB
Combination into units of 1 byte	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

Block number change of extension file register	RSET
Block move of extension file register	BMOVR
Block exchange of extension file register	BXCHR
Direct read in units of 1 word of extension file register	ZRRD
Direct read in units of 1 byte of extension file register	ZRRDB
Direct write in units of 1 word of extension file register	ZRWR
Direct write in units of 1 byte of extension file register	ZRWRB

(k) Data link instructions

	Reading word device data from local stations	LRDP
	Writing data to word devices in local stations	LWTP
	Reading data from remote I/O station special function modules	RFRP
	Writing data to remote I/O station special function modules	RTOP
*1	Reading from word devices in connected station	ZNRD
*1	Writing to word devices in connected station	ZCWR
*1	Network refersh instruction	ZCOM

* Instruction newly provided for the exclusive use with AnUCPU

(l) AD61(S1) high speed counter module control instructions

Preset value data setting	PVWR1, PVWR2
Set value data write for comparison and coincidence identification	SVWR1, SVWR2
Present value read from CH1/CH2	PVRD1, PVRD2

*: These instructions cannot be used for A1SD61.

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

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

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

Data output to RS-232C (data up to 00H code)	PR2
Data output to RS-422 (data up to 00H code)	PR4
Data output to RS-232C (designated number of points)	PRN2
Data output to RS-422 (designated number of points)	PRN4
Data read and input through RS-232C	INPUT2
Data input from RS-422	INPUT4
Read from the RAM memory	GET
Write to the RAM memory	PUT
Communication status read	SPBUSY
Communication processing forced stop	SPCLR

(o) AJ71PT32-S3 MELSECNET/MINI-S3 master module control instructions

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

(p) PID instructions

Control data setting	PIDINIT
PID operations	PIDCONT
Monitoring PID operation results at AD57(S1)	PID57

*1: Newly created dedicated instructions for AnUCPU

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

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

(r) AD57(S1)/AD58 control instructions

Display mode setting instruction		CMODE
Screen display control instruction	Canvas screen display	CPS1
	VRAM display address change	CPS2
	Canvas transfer	CMOV
	Screen clear	CLS
	VRAM clear	CLV
	Scroll up/down	CSCRU, CSCRD
Cursor control instructions	Cursor display	CON1, CON2
	Cursor delete	COFF
	Cursor setting	LOCATE
Display condition setting instructions	Forward/reverse rotation of characters to be displayed	CNOR, CREV
	Forward/reverse rotation switching of characters	CRDSP, CRDSPV
	Character color specification	COLOR
	Character color change	CCDSP, CCDSPV
Specified character display instructions	ASCII character display	PR, PRN
	ASCII character write	PRV, PRNV
	Character display	EPR, EPRN
	Character write	EPRV, EPRNV
	Repetitive display of same characters	CR1, CR2, CC1, CC2
Fixed character display instructions	Minus display	CINMP
	Hyphen display	CINHP
	Period (decimal) display	CINPT
	Numeral display	CIN0 to CIN9
	English alphabet display	CINA to CINZ
	Space display	CINSP
Specified column clear instruction		CINCLR
ASCII code conversion instructions of display character string		INPUT
VRAM data control instructions	VRAM data read	GET
	VRAM data write	PUT
Display condition read instruction		STAT

APPENDIX 2 SPECIAL RELAY/SPECIAL REGISTER LIST

A list of the special relays and special registers that can be used by the A2USCPU is presented here.

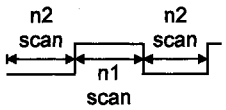
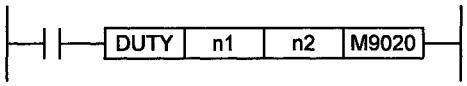
2.1 Special Relay List

Special relays are internal relays whose uses are determined inside the PC. Therefore, they cannot be turned ON/OFF as coils is a program. (Except for *1 and *2 in the table)

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.

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).

Special Relay List (Continue)

Number	Name	Description	Details	Applicable CPU	
M9030	0.1 second clock	0.05 seconds / 0.05 seconds	• 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	0.1 seconds / 0.1 seconds			
M9032	1 second clock	0.5 seconds / 0.5 seconds			
M9033	2 second clock	1 second / 1 second			
M9034	1 minute clock	30 seconds / 30 seconds			
M9036	Normally ON	ON / OFF	• 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	ON / OFF			
M9038	On only for 1 scan after run	ON / OFF, 1 scan			
M9039	RUN flag (off only for 1 scan after run)	ON / OFF, 1 scan			
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, A1N,AnA,AnU and QCPU-A(A mode).
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.

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				

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.

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 standard 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 standard ROM	OFF: Failed writing to ROM ON: Successfully completed writing to ROM	• Turned on when writing to the standard 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 standard ROM	OFF: Writing to ROM disabled ON: Writing to ROM enabled	• Turns ON when writing to standard 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.

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>

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).
* 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.
*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.

Special Relay List (Continue)

Number	Name	Description	Details	Applicable CPU	
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.
*2 M9103	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.

*: 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.

Special Relay List (Continue)

Number	Name	Description	Details	Applicable CPU	
*2 M9108	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.
*2 M9109	Step transfer monitoring timer start (corresponds to D9109)				
*2 M9110	Step transfer monitoring timer start (corresponds to D9110)				
*2 M9111	Step transfer monitoring timer start (corresponds to D9111)				
*2 M9112	Step transfer monitoring timer start (corresponds to D9112)				
*2 M9113	Step transfer monitoring timer start (corresponds to D9113)				
*2 M9114	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.

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.
*2 M9182	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.
*2 M9196	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)

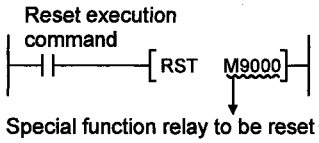
*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

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 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.

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

2.2 Special Register List

The special register are data registers used for specific purposes.

Therefore, do not write data to the registers in the program (except the ones with numbers marked *2 in the table).

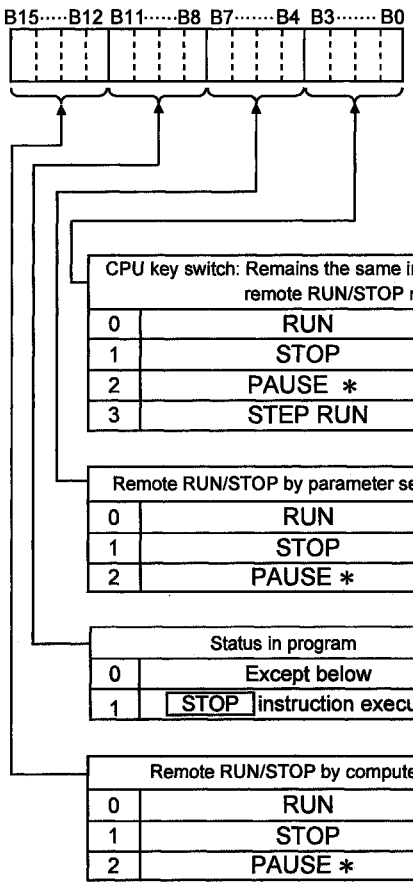
Special Register List

<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 I/O modules, of which data are different from data entered, are detected when the power is turned on, the first I/O number of the lowest number unit among the detected units is stored in hexadecimal. (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>

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. b15 to b8 b7 to b0 8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1 Data communication between the PLC CPU and MINI (S3) link module is disabled. Bits which correspond to the signals of MINI (S3) link module, shown below, are turned on as the signals are turned on. · Hardware error (X0/X20) · MINI(S3) link error detection (X6/X26) · MINI(S3) link communication error (X7/X27)	—	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. B15 B3 B2 B1 B0 0 0 CPU A CPU B CPU C 0: Normal 1: Battery low	—	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.

Special Register List (Continue)

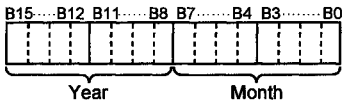
<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9010</td><td>Error step</td><td>Step number at which operation error has occurred</td><td>• When operation error has occurred during execution of application instruction, the 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.</td><td>△</td><td>Unusable with A3H and A3M.</td></tr>
<tr><td>*1
D9011</td><td>Error step</td><td>Step number at which operation error has occurred</td><td>• 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.</td><td>○</td><td>Usable with all types of CPUs.</td></tr>
<tr><td>D9014</td><td>I/O control mode</td><td>I/O control mode number</td><td>• 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</td><td>△</td><td>Unusable with An, A3H and A3M.</td></tr>
<tr><td>D9015</td><td>CPU operating states</td><td>Operating states of CPU</td><td>• The operation states of CPU as shown below are stored in D9015.
 

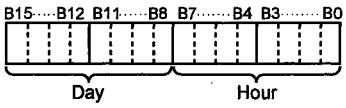
* When the CPU is in RUN mode and M9040 is off, the CPU remains in RUN mode if changed to PAUSE mode.</td><td>○</td><td>Usable with all types of CPUs.</td></tr>
</table>

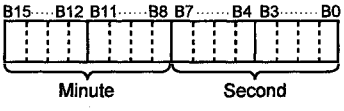
Special Register List (Continue)

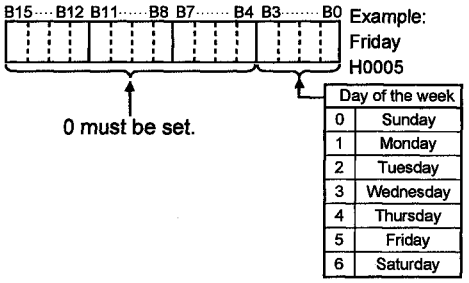
Number	Name	Description	Details	Applicable CPU	
D9016	ROM/RAM setting	0: ROM 1: RAM 2: E^2PROM	• Indicates the setting of memory select chip. One value of 0 to 2 is stored in BIN code.	—	Usable with A1 and A1N.
	Program number	0: Main program (ROM) 1: Main program (RAM) 2: Subprogram (RAM)	• Indicates 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.
*2 D9020	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.	—	

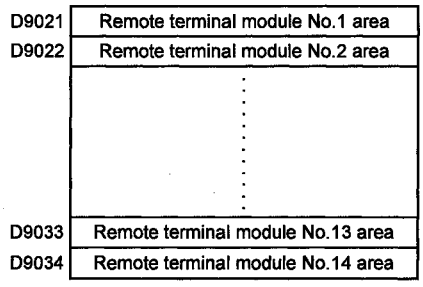
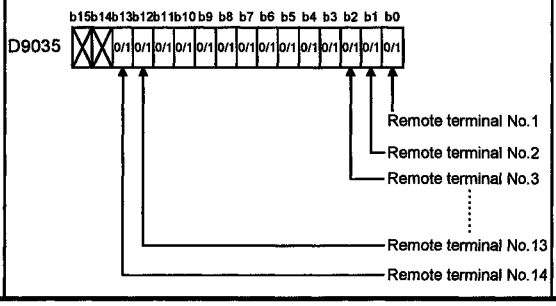
Special Register List (Continue)

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>*2
D9025</td><td>Clock data</td><td>Clock data
(Year, month)</td><td>• Stores the year (2 lower digits) and month in BCD.
 

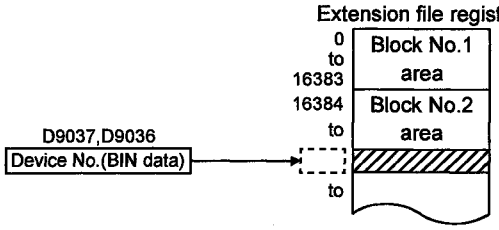
Example:
1987,July
H8707</td><td>△</td><td rowspan="3">Unusable with An, A3H, A3M, A3V, A2C and A0J2H.</td></tr>
<tr><td>*2
D9026</td><td>Clock data</td><td>Clock data
(Day, hour)</td><td>• Stores the day and hour in BCD.
 

Example:
31th,10
o'clock
H3110</td><td>△</td></tr>
<tr><td>*2
D9027</td><td>Clock data</td><td>Clock data
(Minute, second)</td><td>• Stores the Minute and second in BCD.
 

Example:
35 minutes,
48 seconds
H3548</td><td>△</td></tr>
<tr><td>*2
D9028</td><td>Clock data</td><td>Clock data
(, day of the week)</td><td>• Stores the day of the week in BCD.
 

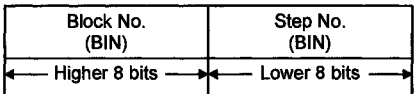
Example:
Friday
H0005</td><td>△</td><td>Unusable with An, A3H, A3M, A3V, A2C and A0J2H.</td></tr>
<tr><td>D9021
D9022
D9023
D9024
D9025
D9026
D9027
D9028
D9029
D9030
D9031
D9032
D9033
D9034</td><td>Remote terminal parameter setting</td><td>1 to 61</td><td>• Sets the head station number of remote terminal 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
 
</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
<tr><td>D9035</td><td>Attribute of remote terminal module</td><td>0: MINI standard protocol
1: No protocol</td><td>• 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
 
</td><td></td><td></td></tr>
</table>

Special Register List (Continue)

Number	Name	Description	Details		Applicable CPU
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.
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. b15 ····· b12 b11 ····· b8 b7 ····· b4 b3 ····· b0 D9038: Priority 4 | Priority 3 | Priority 2 | Priority 1 D9039: Priority 7 | Priority 6 | Priority 5 • 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.	—	

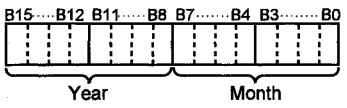
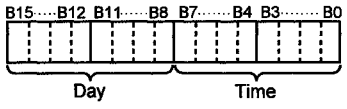
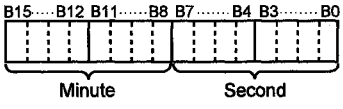
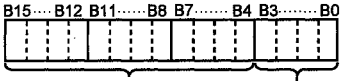
*: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

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>
</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.

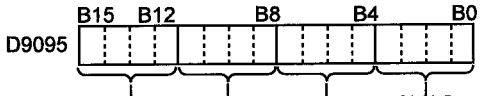
Special Register List (Continue)

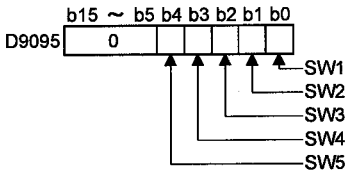
Number	Name	Description	Details	Applicable CPU	
D9061	Communication error code	0: Normal 1: Initial data error 2: Line error	• Stores error code when M9061 is turned on (communication with I/O modules or remote terminal modules fails). • 1 ..... Total number of stations of I/O modules or remote terminal 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.	—	Usable with A2C and A52G.
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 standard ROM	Stores the status of writing to the standard ROM	Stores the status of writing to the standard ROM. 0: Writing enabled F1H: During RAM operation F2H: Writing to standard 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)

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>D9076</td><td>Status of writing to standard ROM</td><td>Stores the status of writing (enabled/disabled) to the standard ROM</td><td>Stores the status of writing (enabled/disabled) to the standard 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</td><td>—</td><td>Dedicated to QCPU-A (A Mode)</td></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>

Special Register List (Continue)

<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th>Applicable CPU</th></tr>
<tr><td>D9091</td><td>SFC program detail error number</td><td>Detail error number of the error which occurred in a SFC program</td><td>• Stores the detail error number of the error occurred in a SFC program in a binary value.</td><td>—</td><td>Usable with AnA, A2AS, QCPU-A (A Mode),AnA board and AnU.</td></tr>
<tr><td>*2 *3 D9094</td><td>Changed I/O module head address</td><td>Changed I/O module head address</td><td>• 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</td><td>—</td><td>Usable with AnA, A2AS, QCPU-A (A Mode),AnA board and AnU.</td></tr>
<tr><td rowspan="2">D9095</td><td>Operation state of the A3VTS system and A3VCPU</td><td>Stores operation with 4 hexadecimal digits.</td><td>• Monitors operation state of the A3VTS system and the A3VCPU.
 

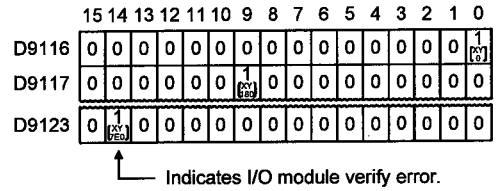
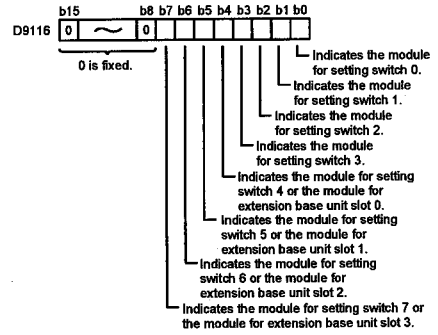
<table>
<tr><th>Data(H)</th><th>Operation state</th></tr>
<tr><td>A</td><td>RUN</td></tr>
<tr><td>B</td><td>STEP-RUN</td></tr>
<tr><td>C</td><td>PAUSE</td></tr>
<tr><td>D</td><td>STOP</td></tr>
<tr><td>E</td><td>ERROR</td></tr>
</table>
<table>
<tr><th>Data(H)</th><th>Operation state</th></tr>
<tr><td>0</td><td>RUN</td></tr>
<tr><td>1</td><td>STAND-BY</td></tr>
<tr><td>2</td><td>STEP-RUN</td></tr>
<tr><td>3</td><td>PAUSE</td></tr>
<tr><td>4</td><td>STOP</td></tr>
<tr><td>5</td><td>WAIT</td></tr>
<tr><td>6</td><td>ERROR</td></tr>
<tr><td>7</td><td>NO RIGHT OF OPERATION</td></tr>
</table></td><td>—</td><td>Dedicated to A3V.</td></tr>
<tr><td>DIP switch information</td><td>DIP switch information</td><td>• The DIP switch information of the CPU module is stored in the following format.
0: OFF
1: ON
 
</td><td>—</td><td>Usable with QCPU-A (A Mode)</td></tr>
<tr><td>D9096</td><td>A3VCPU A Self-check error</td><td>Self-check error code</td><td>• Error code of self-check error on CPU A is stored in BIN code.
• Cleared when D9008 of CPU A is cleared.</td><td>—</td><td>Dedicated to A3V.</td></tr>
<tr><td>D9097</td><td>A3VCPU B Self-check error</td><td>Self-check error code</td><td>• Error code of self-check error on CPU B is stored in BIN code.
• Cleared when D9008 of CPU B is cleared.</td><td>—</td><td>Dedicated to A3V.</td></tr>
<tr><td>D9098</td><td>A3VCPU C Self-check error</td><td>Self-check error code</td><td>• Error code of self-check error on CPU C is stored in BIN code.
• Cleared when D9008 of CPU C is cleared.</td><td>—</td><td>Dedicated to A3V.</td></tr>
<tr><td>D9099</td><td>A3VTU Self-check error</td><td>Self-check error code</td><td>• Error code of self-check error on A3VTU is stored in BIN code.</td><td>—</td><td>Dedicated to A3V.</td></tr>
</table>

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.) 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 D9100 0 0 0 1 (YC0) 0 0 0 1 (Y80) 0 0 0 0 0 0 0 0 D9101 1 (Y1F9) 0 0 0 0 1 (Y1A) 0 0 0 0 0 0 0 0 0 D9107 0 0 0 0 1 (Y7) 0 0 0 0 0 0 0 1 (Y70) 0 0 0 Indicates fuse blow. • 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.)	○	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. b15 b8 b7 b6 b5 b4 b3 b2 b1 b0 D9100 0 ~ 0 0 is fixed. Indicates the module for setting switch 0. Indicates the module for setting switch 1. Indicates the module for setting switch 2. Indicates the module for setting switch 3. Indicates the module for setting switch 4 or the module for extension base unit slot 0. Indicates the module for setting switch 5 or the module for extension base unit slot 1. Indicates the module for setting switch 6 or the module for extension base unit slot 2. Indicates the module for setting switch 7 or the module for extension base unit slot 3.	—	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. b15 to b8 b7 to b0 Timer setting (1 to 255 sec in seconds) F number setting (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.

Special Register List (Continue)

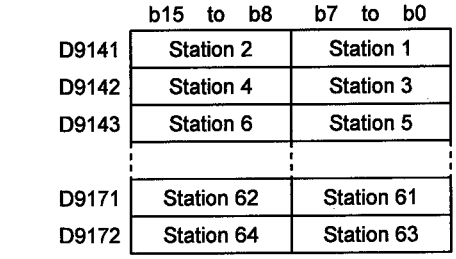
Number	Name	Description	Details	Applicable CPU	
＊1 D9116 ＊1 D9117 ＊1 D9118 ＊1 D9119 ＊1 D9120 ＊1 D9121 ＊1 D9122 ＊1 D9123	I/O module verify error	Bit pattern in units of 16 points of verify error units	• When I/O modules, of which data are different from those entered at power-on, have been detected, the 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.

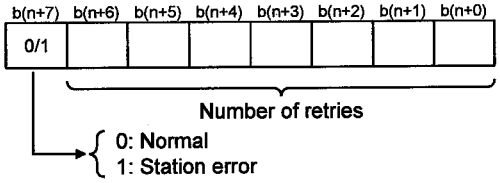
＊: Usable with AnN and AnA which are compatible with SFC.
For the AnN and AnA which are compatible with SFC, refer to the MELSAP-II Programming Manual.

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.
SET F50 SET F25 SET F99 RST F25 SET F15 SET F70 SET F65 SET F38 SET F110 SET F151 SET F210 LEDR
<table><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><td></td><td>b15 b14</td><td>b13 b12</td><td>b11 b10</td><td>b9 b8</td><td>b7 b6</td><td>b5 b4</td><td>b3 b2</td><td>b1 b0</td></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>

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>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</td><td>Number of times of retry execution</td><td>Number of retries</td><td>• 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)</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
<tr><td>D9173</td><td>Mode setting</td><td>0: Automatic online return enabled
1: Automatic online return disabled
2: Transmission stop at online error
3: Line check</td><td>Mode setting
0 Auto-matic online return enabled — • 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.
1 Auto-matic online return disabled — • 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.
2 Trans-mission stop at online error — • 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.
3 Line check — • Checks hardware and connecting cables of I/O modules and remote terminal modules.</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
</table>

Special Register List (Continue)

Number	Name	Description	Details	Applicable CPU	
D9174	Setting of the number of retries	Number of retries	• 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.	—	Usable with A2C and A52G.
D9175	Line error retry counter	Number of retries	• 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.	—	Usable with A2C and A52G.
D9180 D9181 D9182 D9183 D9184 D9185 D9186 D9187 D9188 D9189 D9190 D9191 D9192 D9193	Remote terminal module error number	0: Normal	• 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.	—	Usable with A2C and A52G.
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. b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 D9180 Y0F Y0E Y0D Y0C Y0B Y0A Y09 Y08 Y07 Y06 Y05 Y04 Y03 Y02 Y01 Y00 Axis 2 Axis 1 D9181 Y1F Y1E Y1D Y1C Y1B Y1A Y19 Y18 Y17 Y16 Y15 Y14 Y13 Y12 Y11 Y10 Axis 4 Axis 3 D9182 Y2F Y2E Y2D Y2C Y2B Y2A Y29 Y28 Y27 Y26 Y25 Y24 Y23 Y22 Y21 Y20 Axis 6 Axis 5 D9183 Y3F Y3E Y3D Y3C Y3B Y3A Y39 Y38 Y37 Y36 Y35 Y34 Y33 Y32 Y31 Y30 Axis 8 Axis 7 "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.

Special Register List (Continue)

Number	Name	Description	Details	Applicable CPU	
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. b15 to b8 b7 to b0 0 0 0 0 0 0 0 0 | For axis 8 | For axis 7 | For axis 6 | For axis 5 | For axis 4 | For axis 3 | For axis 2 | For axis 1 All 0 Connected: 1 Disconnected: 0	—	Dedicated to A73.
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. b15 to b8 b7 to b0 For axis 8 | For axis 7 | For axis 6 | For axis 5 | For axis 4 | For axis 3 | For axis 2 | For axis 1 | 0 0 0 0 0 | For P3 | For P2 | For P1 "1" is stored in the bit which corresponds to the axis number which caused 1 pulse input magnification setting error. 0: Normal 1: Input magnification is out of the range from 1 to 100. (Not used) "1" is stored in the bit which corresponds to the manual pulse generator number which caused manual pulse generator axis setting error. 0: Normal 1: Axis setting is out of the range from 1 to 8.	—	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. b15 to b8 b7 to b0 0 0 0 0 0 0 0 0 | For axis 8 | For axis 7 | For axis 6 | For axis 5 | For axis 4 | For axis 3 | For axis 2 | For axis 1 (Not used) "1" is stored when running. "0" is stored when not running.	—	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. b15 to b8 b7 to b0 0 0 0 0 0 0 0 0 | For axis 8 | For axis 7 | For axis 6 | For axis 5 | For axis 4 | For axis 3 | For axis 2 | For axis 1 All 0 Type of servo amplifier set at each axis is stored with "0" or "1".	—	Dedicated to A73.

Special Register List (Continue)

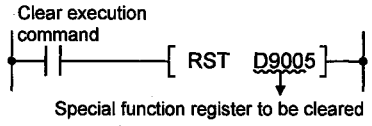
<table>
<tr><th>Number</th><th>Name</th><th>Description</th><th>Details</th><th colspan="2">Applicable CPU</th></tr>
<tr><td>D9196
D9197
D9198
D9199</td><td>Faulty station detection</td><td>Bit pattern of the faulty station</td><td>• Bit which corresponds to faulty I/O module or remote terminal module 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
<table>
<tr><th>Address</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>D9196</td><td>Stasion 16</td><td>Stasion 15</td><td>Stasion 14</td><td>Stasion 13</td><td>Stasion 12</td><td>Stasion 11</td><td>Stasion 10</td><td>Stasion 9</td><td>Stasion 8</td><td>Stasion 7</td><td>Stasion 6</td><td>Stasion 5</td><td>Stasion 4</td><td>Stasion 3</td><td>Stasion 2</td><td>Stasion 1</td></tr>
<tr><td>D9197</td><td>Stasion 32</td><td>Stasion 31</td><td>Stasion 30</td><td>Stasion 29</td><td>Stasion 28</td><td>Stasion 27</td><td>Stasion 26</td><td>Stasion 25</td><td>Stasion 24</td><td>Stasion 23</td><td>Stasion 22</td><td>Stasion 21</td><td>Stasion 20</td><td>Stasion 19</td><td>Stasion 18</td><td>Stasion 17</td></tr>
<tr><td>D9198</td><td>Stasion 48</td><td>Stasion 47</td><td>Stasion 46</td><td>Stasion 45</td><td>Stasion 44</td><td>Stasion 43</td><td>Stasion 42</td><td>Stasion 41</td><td>Stasion 40</td><td>Stasion 39</td><td>Stasion 38</td><td>Stasion 37</td><td>Stasion 36</td><td>Stasion 35</td><td>Stasion 34</td><td>Stasion 33</td></tr>
<tr><td>D9199</td><td>Stasion 64</td><td>Stasion 63</td><td>Stasion 62</td><td>Stasion 61</td><td>Stasion 60</td><td>Stasion 59</td><td>Stasion 58</td><td>Stasion 57</td><td>Stasion 56</td><td>Stasion 55</td><td>Stasion 54</td><td>Stasion 53</td><td>Stasion 52</td><td>Stasion 51</td><td>Stasion 50</td><td>Stasion 49</td></tr>
</table>
1: Error
0: Normal</td><td>—</td><td>Usable with A2C and A52G.</td></tr>
</table>

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 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.

APPENDIX 3 PERIPHERAL DEVICES

(1) Compatibility of peripheral devices and system FDs which have been used with existing systems is as given in the table below.

Peripheral Device Name	Software Package Name	Comp-atibility	Usable Range	PC Type Set at Start Up
A6GPP/A6PHP	SW4GP-GPPAEE	Usable	Within the device range of A2ACPU(S1)	A2A
	SW3GP-GPPAEE	Usable	Within the device range of A3HCPU	A3H
	Before SW2[ ][ ] type	Unus-able	————	————
A6HGP	SW3-HGPA	Usable	Within the device range of A3HCPU	A3H
	Before SW2[ ][ ] type	Unus-able	————	————
PC/AT (IBM)	SW0IX-GPPAE MELSEC-MEDOC	Usable	Within the device range of A2ACPU(S1)	A2A
A8PUE	————	Usable	Within the device range of A2ACPU(S1)	————
A7PU A7PUS	————	Usable	Within the device range of A3HCPU	————
A6WU	• A6WU which has an "E" mark on the name plate.	Usable	Within the device range of A3HCPU	————
	• A6WU which does not have an "D" mark on the name plate.	Unus-able	————	————

(2) The compatibility when as existing product (for the existing system) is used together with a new product (for AnU) is as given below.

No.	Product Used to Write to CPU	Product to Read from CPU	Compatibility
1	Existing product (PC: started up as A2A)	New product (PC: started up as A2A)	• All data are compatible.
2	New product (PC: started up as A2A)	Existing product (PC: started up as A2A)	
3	Existing product (PC: started up as A2A)	New product (PC: started up as A2U)	• Since the PC type at writing is different from that at reading, the following will occur: (1) A verification error will occur if verified after reading. (Data can be used.) (2) The setting values of sampling trace and status latch (data stored in CPU) cannot be displayed. (3) If the network parameters have been set with the new product, those parameters cannot be displayed by the existing product.
4	New product (PC: started up as A2U)	Existing product (PC: started up as A2A)	

POINT

If an existing product is used to read the MELSECNET/10 network parameters which have been set in the A2UCPU by a new product and then to perform the following operation, "LINK PARA. ERROR" (CPU error) will occur.

(a) Modifying and writing the main sequence program area (memory capacity)
(b) Writing the read parameters to other A2USCPU in the network system

APPENDIX 4 PRECAUTIONS FOR USING EXISTING SEQUENCE PROGRAMS WITH THE A2USCPU

Described below are the precautions for using sequence programs prepared for the A1SCPU with the A2USCPU.

POINT

(1) The following three instructions created exclusively for the AnUCPU can be used by adding to the existing sequence program.

- ZNWR instruction..... For writing to word devices of the stations connected to the MELSECNET/10
- ZNRD instruction..... For reading from word devices of the stations connected to the MELSECNET/10
- ZCOM instruction..... MELSECNET/10 network refresh instruction

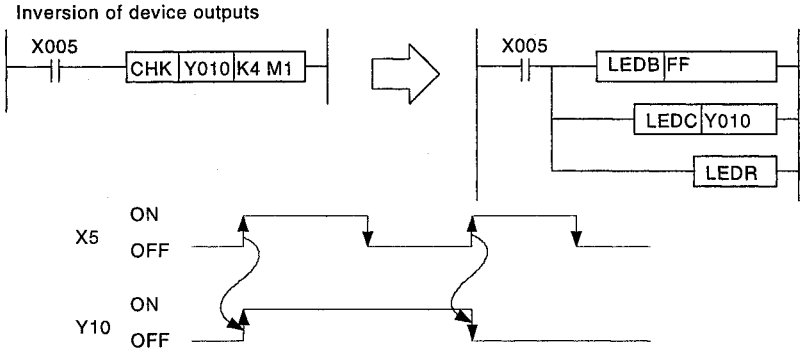
(2) All sequence programs for the A1SCPU are compatible with the A2USCPU.

(3) If a FROM or TO instruction is executed to the special function module frequently with short scanning intervals, the special funcion module may not be processed normally. When you execute a FROM or TO instruction to the special function module, adjust the processing time and conversion time using the timer, constant scan and other measures of the special function module.

4.1 Instructions of Different Specifications

This section describes how to change a sequence program to use instructions of different specifications. Instructions not included herein basically need not be changed.

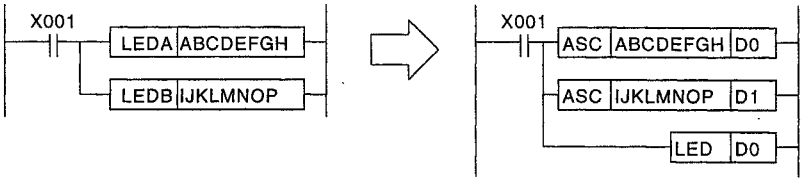
(1) CHK instruction ..... This instruction must be changed when the A1SCPU is to be used in the refresh mode.



(2) DI/EI instructions..... These instructions must be changed when the special relay M9053 is turned ON.

- When the M9053 is ON, link refresh is enabled (EI) or disabled (DI).
- The A2USCPU cannot enable or disable link refresh while a sequence program is being executed, because link refresh is performed by END processing.
  Correct the sequence program.

(3) LEDA/LEDB instructions



(4) SUB and SUBP instructions ..... Incompatible with the A2USCPU.

- Since the A2USCPU cannot store microcomputer programs, the SUB instruction cannot be used.

4.2 Special Relays and Special Registers of Different Specifications

The A2USCPU cannot use the following special relays and special register. The relays and register in the program to be used with the A2USCPU do not cause errors (they will be ignored), however, it is advisable to delete them from the program.

- M9010 ..... Turned ON when an operation error occurs during execution, and turned OFF when the error is eliminated.
- M9053 ..... Enables the EI instruction for link refresh/interrupt program, and disables the DI instruction for link refresh/interrupt program.

4.3 Parameter Setting

The parameters, whose settings are stored in the existing CPU, can be used without any change, if they are not as described below.

Setting Item	Description
Microcomputer program capacity	The microcomputer program area of the A2USCPU is dedicated to the SFC. If a microcomputer program utility package is stored in the microcomputer program area of the existing CPU, a "parameter error" occurs.
Module type registration by I/O allocation	When the existing system uses an AD57, an AD57-S1 and an AD58, a SW[ ]-AD57P utility package is stored in the microcomputer program area. Because the A2USCPU has no microcomputer program area, it cannot store the utility package. To make use of this utility package function, the A2USCPU incorporates a dedicated instruction for special function modules. Before using this A2USCPU's dedicated instruction, the modules must be registered in their module types by parameter I/O allocation.

The following parameters are not processed according to the settings in the existing CPU.

- Watchdog timer setting .... The set time is ignored, and this parameter is treated as 200 msec.
- Interrupt counter setting ... The interrupt counter set in the A1SCPU is ignored, and the interrupt counter is treated as a normal one on the sequence program.

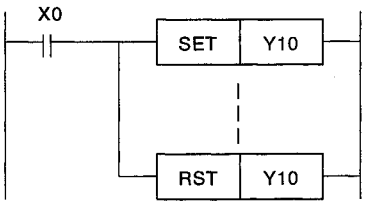
4.4 I/O Control System

For the I/O control system, the A2USCPU adopts the refresh mode (partial direct I/O according to instructions), which is different from that for the A1SCPU. Consequently, the input (X) read timing and the output (Y) transmission timing to external devices are different between the two CPUs.

(1) Pulse processing program on SET/RST instructions

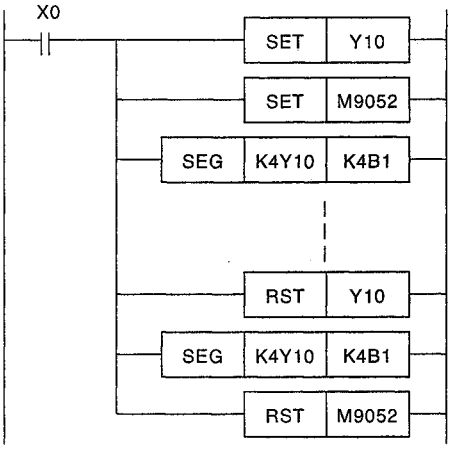
Use the following program to allow the A2USCPU to execute pulse output to external devices on the SET/RST instructions processed by the A1SCPU in the direct mode.

A1SCPU direct mode

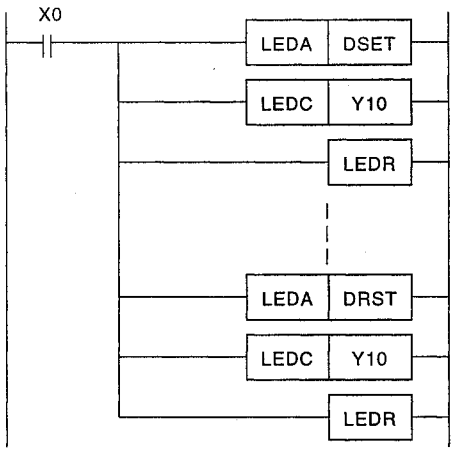


(a) When using instructions common to ACPUs

A2USCPU



(b) When using dedicated instructions for the A2USCPU



POINT

Also when a special function module, such as the AD61 (S1) high speed counter module, is mounted, use the above program to give out pulse signals to it.

4.5 Microcomputer Programs

Since the A2USCPU adopts no microcomputer mode, it cannot use the utility software packages and user-prepared microcomputer programs used for the A1SCPU. (The microcomputer program area of the A2USCPU is exclusively allocated to the SFC.)
When the above software packages and microcomputer programs are used, delete all the SUB instructions (microcomputer program calls) to execute them from the sequence program.
To use the utility packages listed below, change them into programs based on dedicated instructions for the A2USCPU.

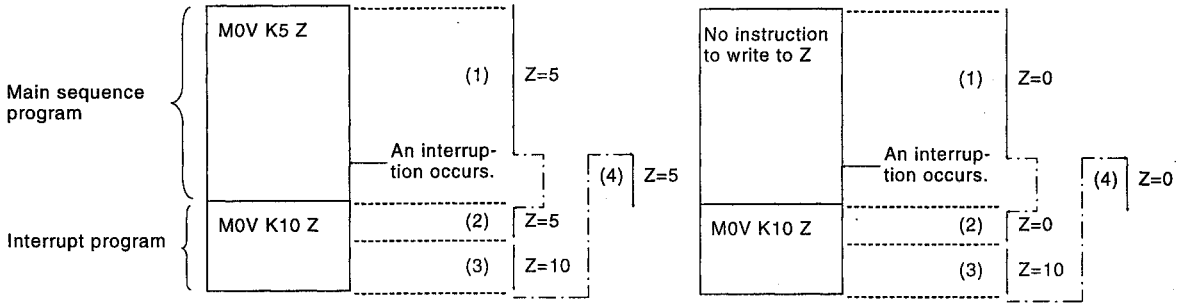
(1) SW[ ]-AD57P ..... AnACPU Programming Manual (AD57)
(usable for creating campus
and character generators)

(2) SW[ ]-UTLP-FN0 ..... AnACPU Programming Manual (Dedicated Instructions)

(3) SW[ ]-UTLP-PID ..... AnACPU Programming Manual (PID)

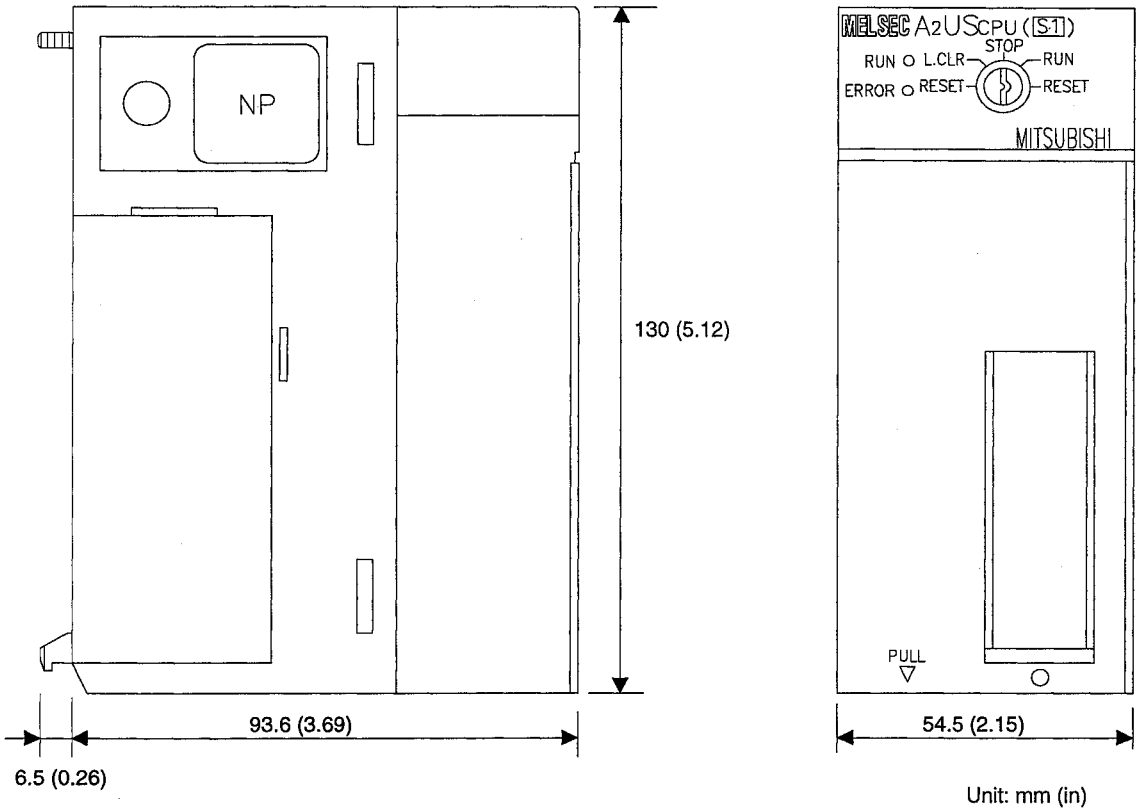
4.6 Index Register Processing

Even if they are updated while an interrupt program is being executed, the index registers in the A2USCPU will return to the values before executing the interrupt program when processing proceeds to the main or sequence program.



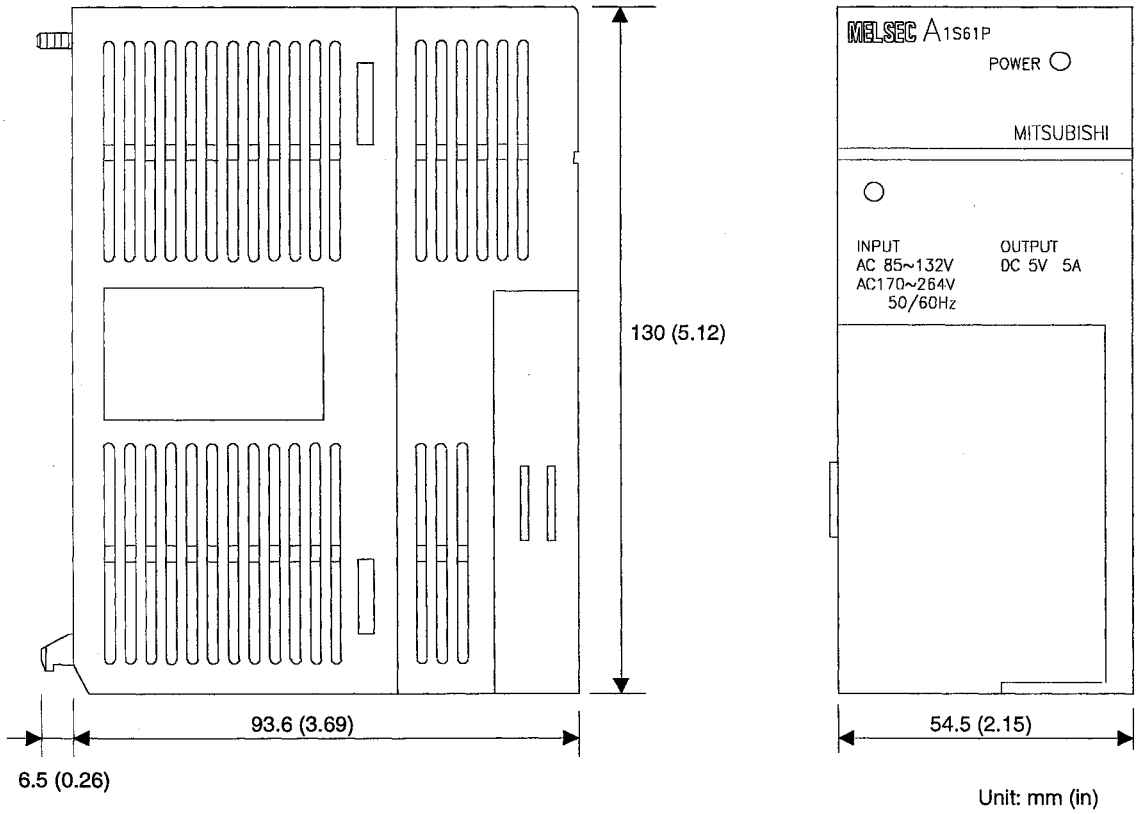
APPENDIX 5 OUTSIDE DIMENSIONS

5.1 A2USCPU (S1) Module



Unit: mm (in)

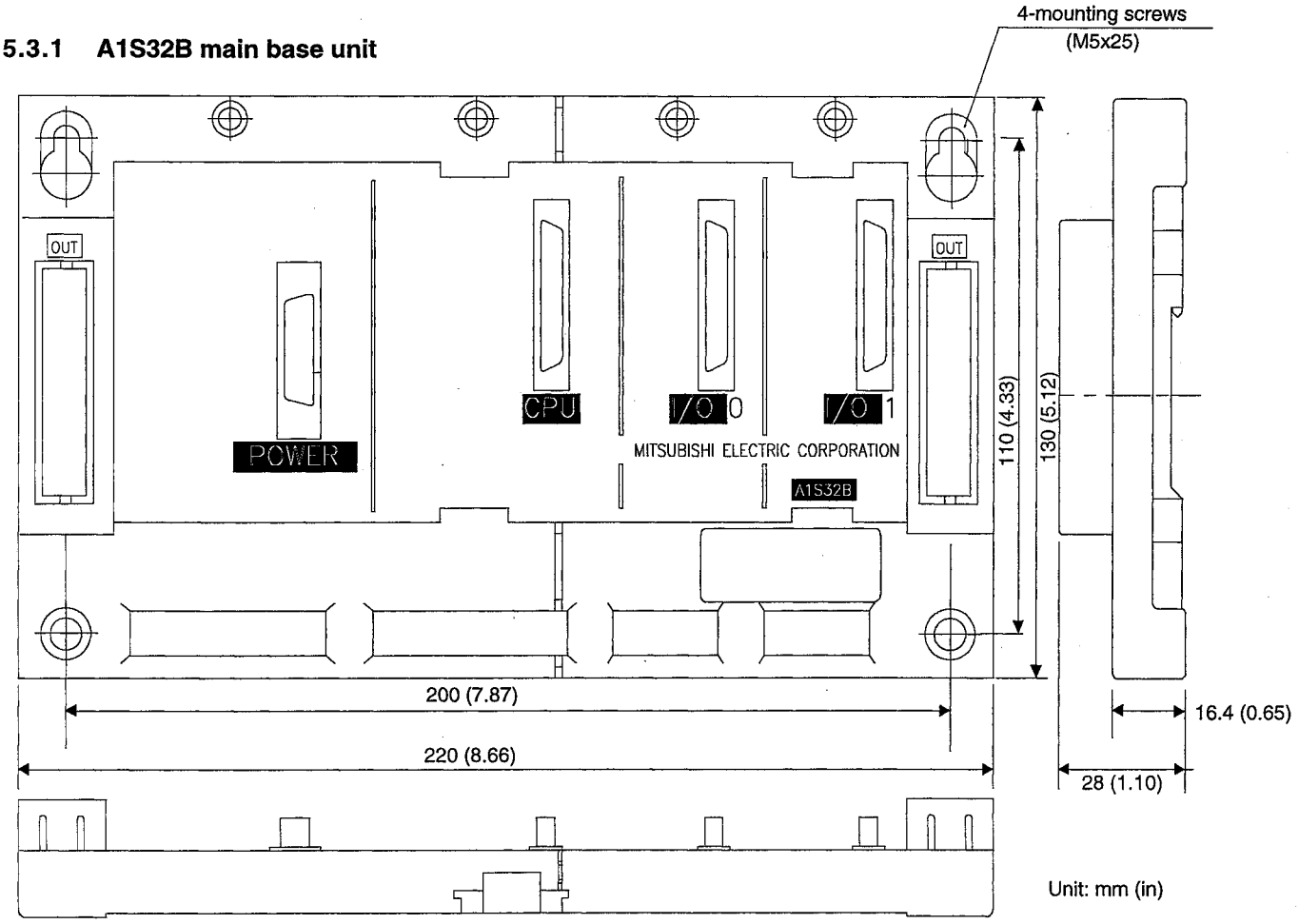
5.2 A1S61PN/A1S62PN/A1S63P Power Supply Module



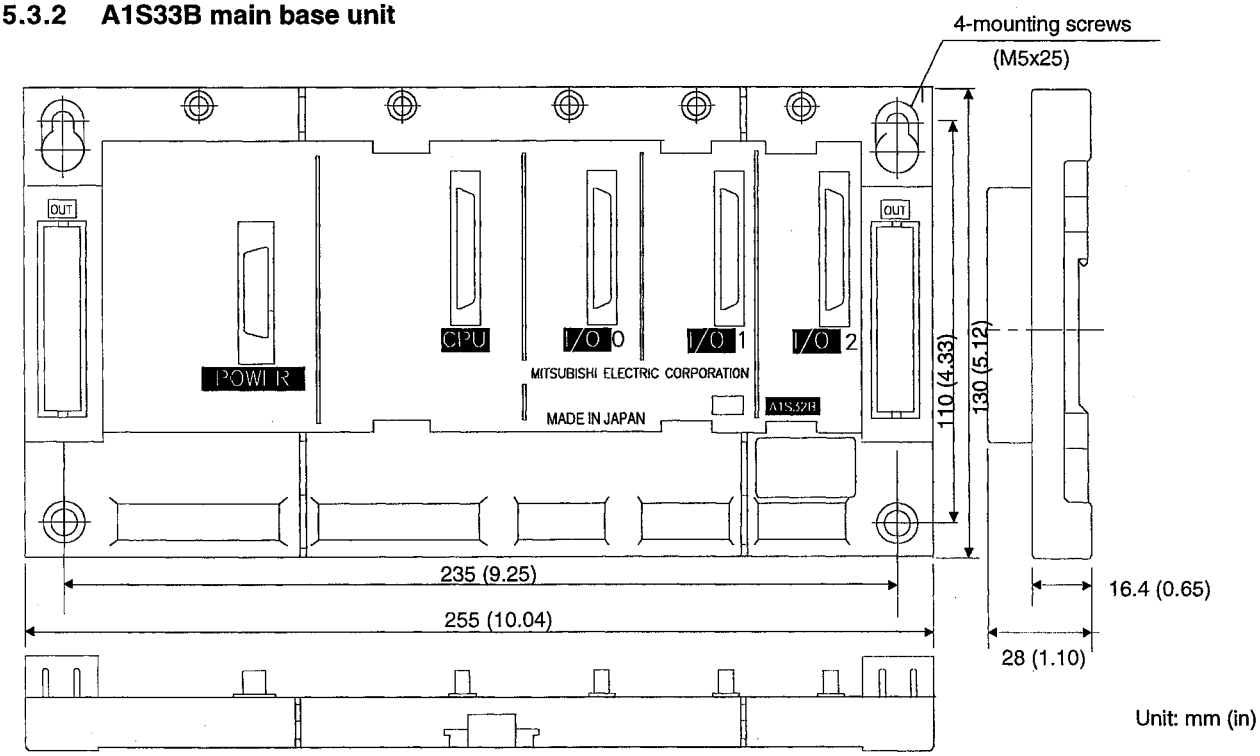
Unit: mm (in)

5.3 Main Base Units

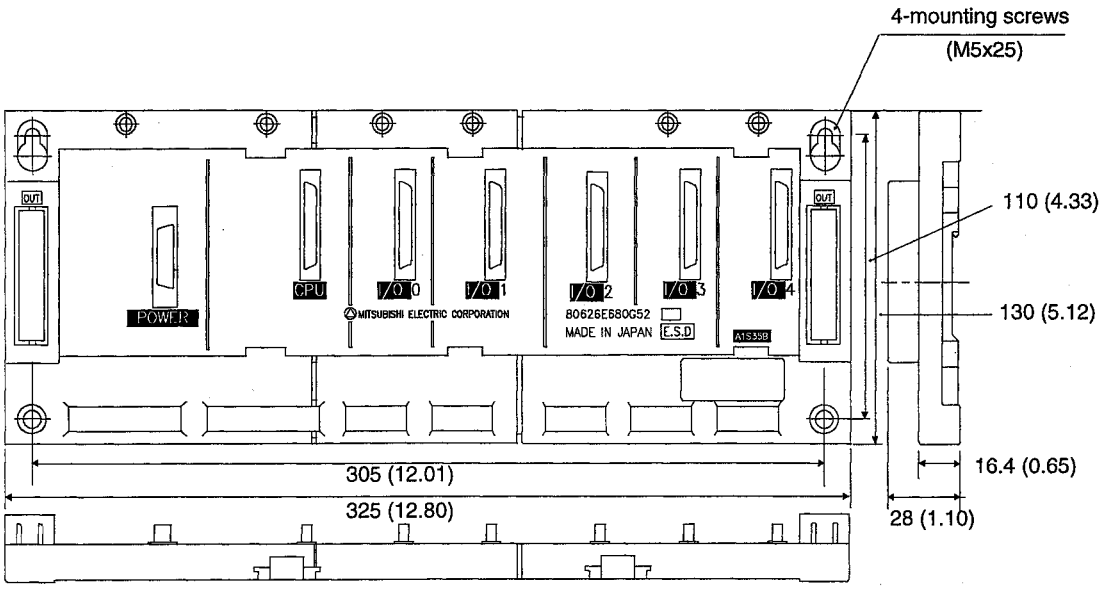
5.3.1 A1S32B main base unit



5.3.2 A1S33B main base unit

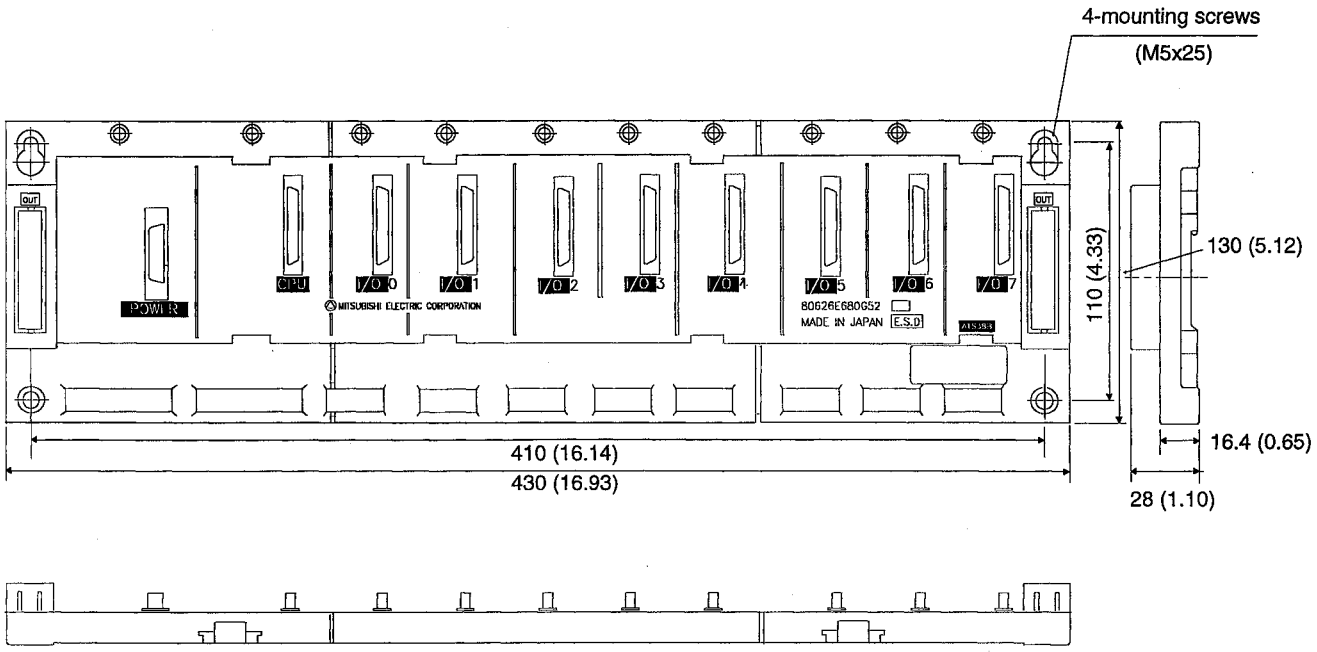


5.3.3 A1S35B main base unit



Unit: mm (in)

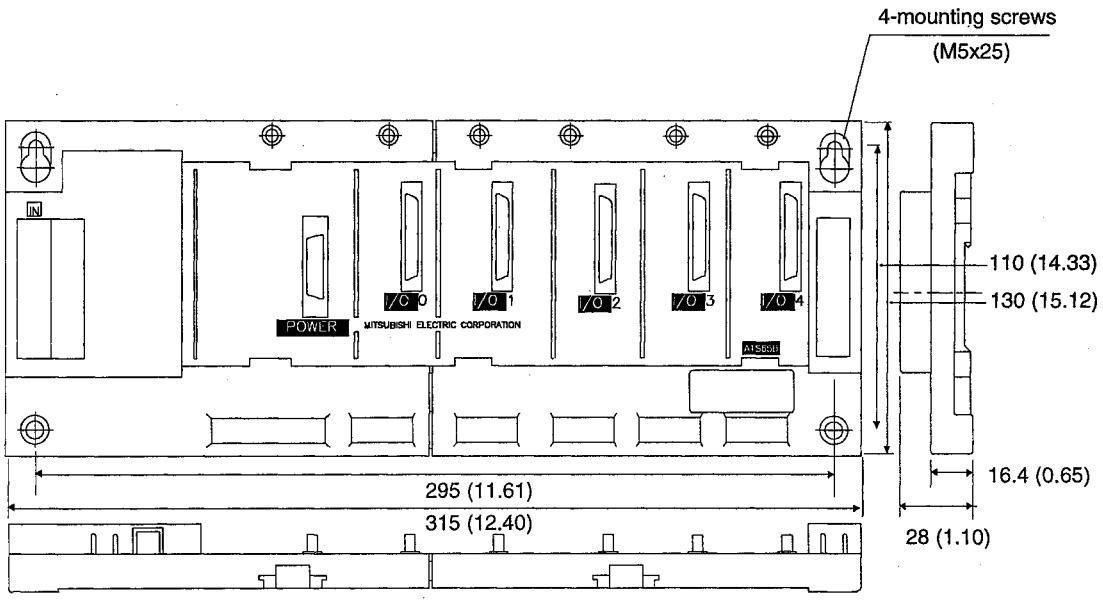
5.3.4 A1S38B main base unit



Unit: mm (in)

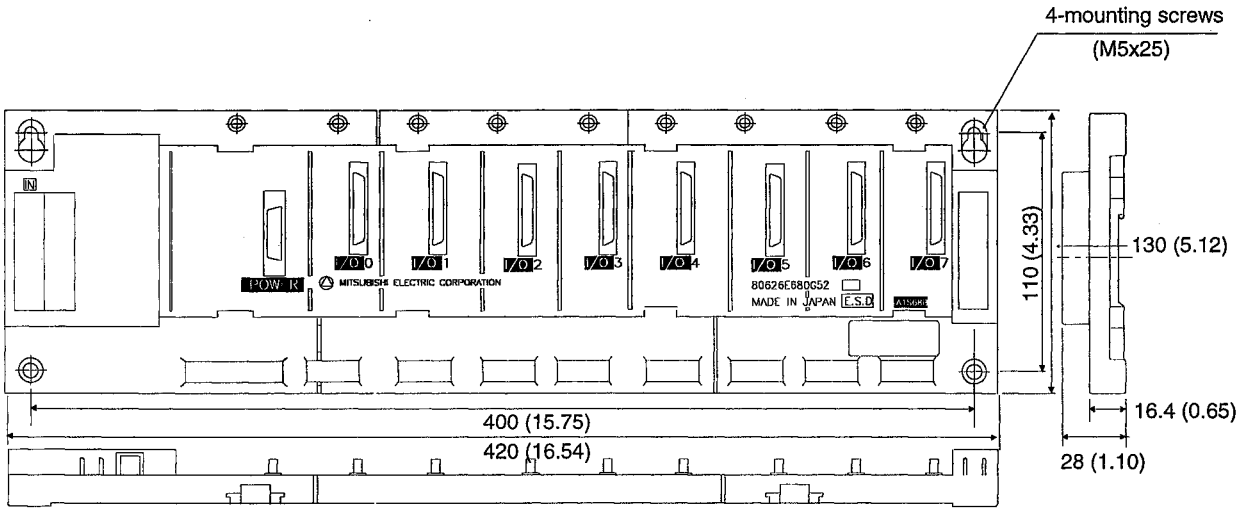
5.4 Extension Base Units

5.4.1 A1S65B extension base unit



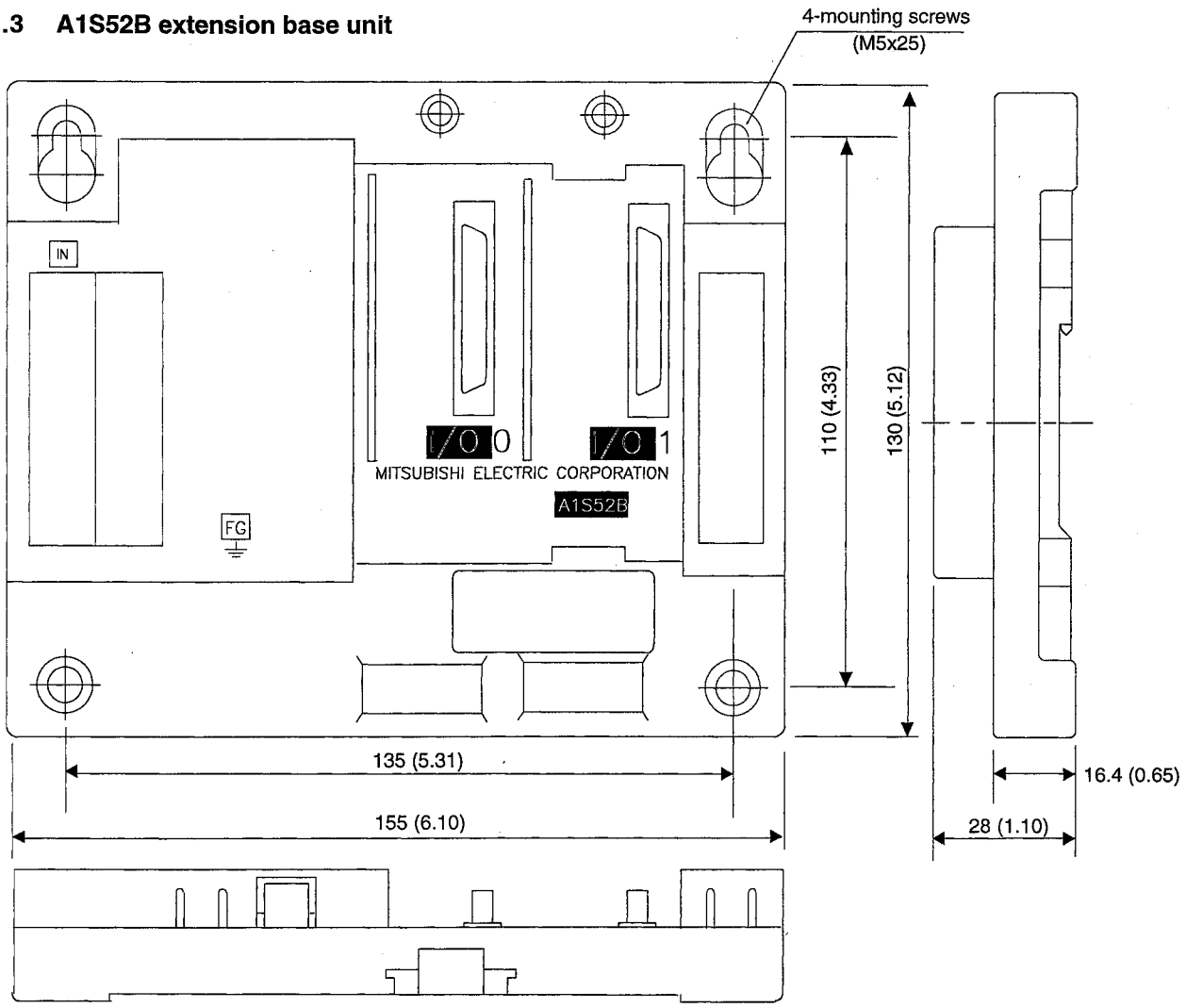
Unit: mm (in)

5.4.2 A1S68B extension base unit



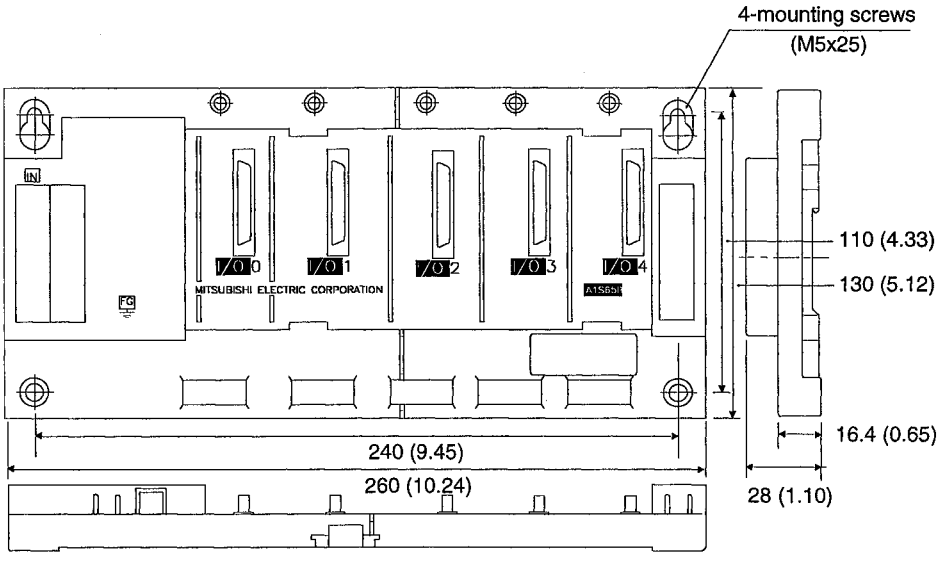
Unit: mm (in)

5.4.3 A1S52B extension base unit



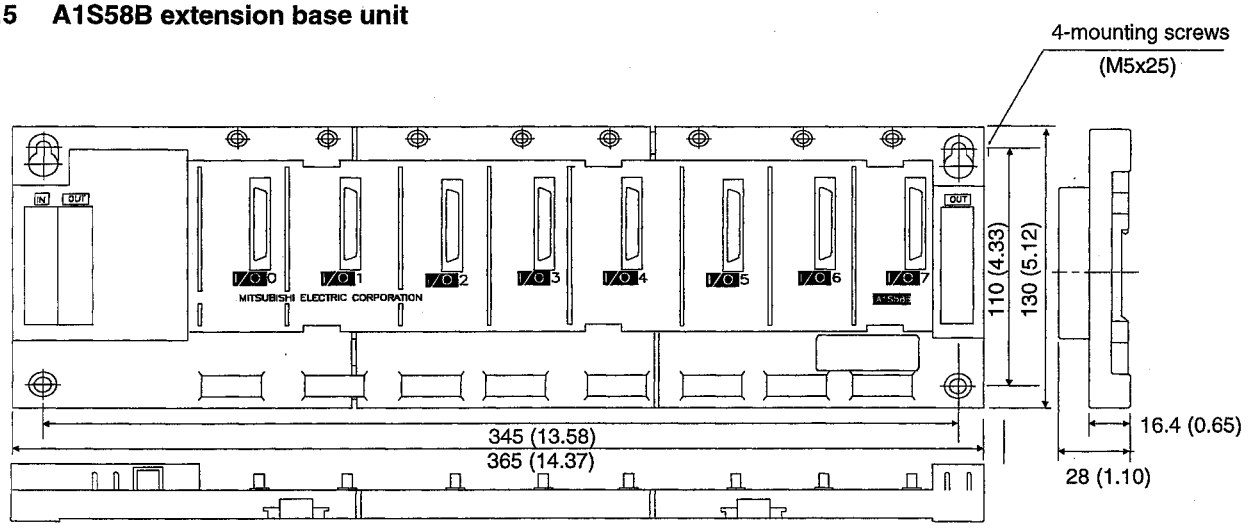
Unit: mm (in)

5.4.4 A1S55B extension base unit



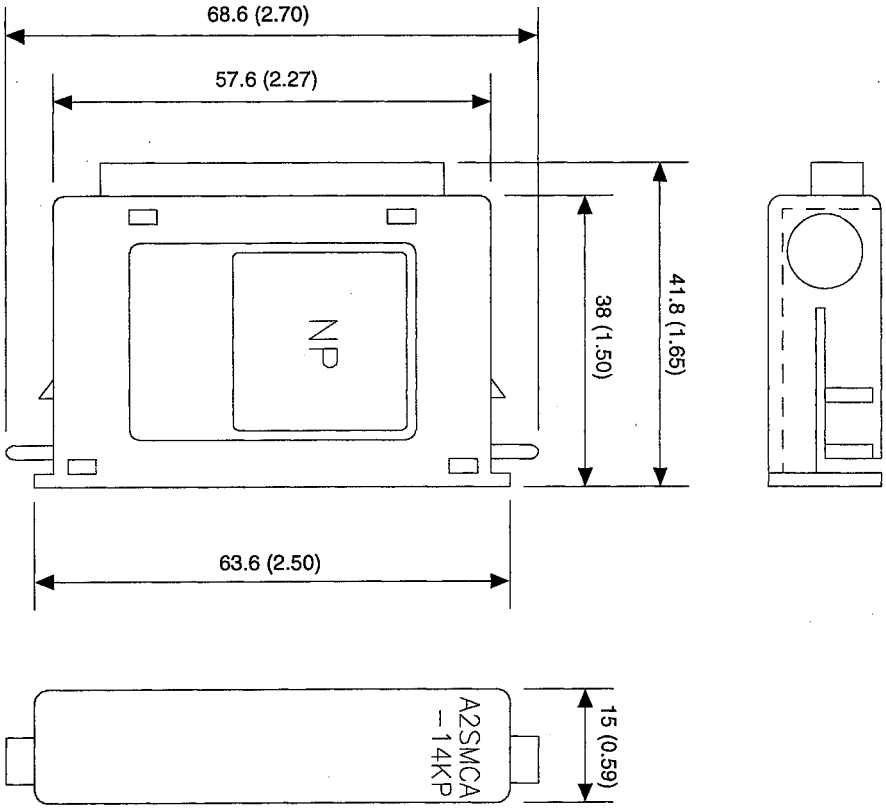
Unit: mm (in)

5.4.5 A1S58B extension base unit



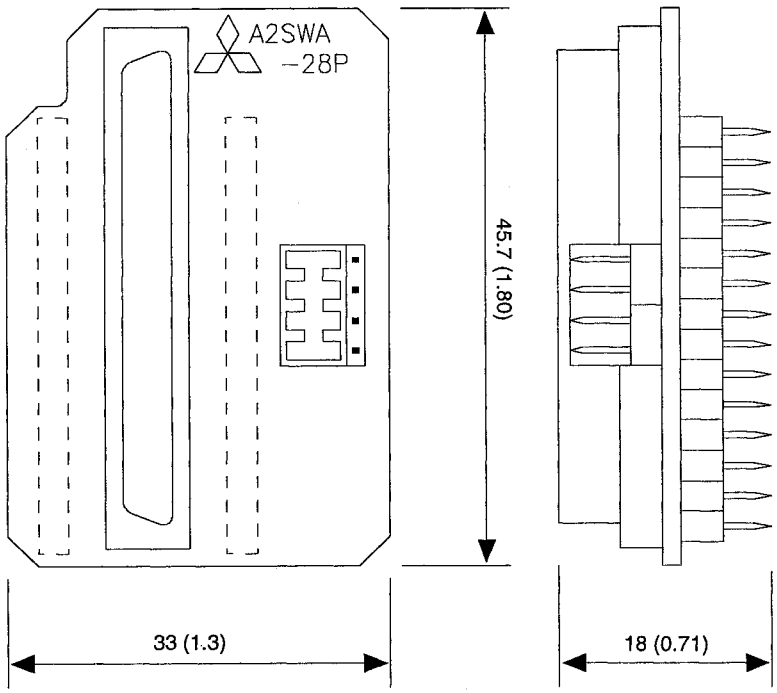
Unit: mm (in)

5.5 Memory Cassette (A2SMCA-[ ])



Unit: mm (inch)

5.6 A2SWA-28P Memory Write Adaptor



Unit: mm (inch)

APPENDIX 6 PRECAUTIONS WHEN PECKER USED TO CREATE A ROM

It may not be possible to store data in a ROM by using the PECKER series of ROM writers made by ABAR, depending on the version of the adapter used at the PECKER side.
The PECKER side adapter versions that can be used are indicated below.

Product Name			A2SMCA -14KP	16KROM		
EP ROM Used			AT27C256R -15KC	D27256	AM27C256 -150DC	TMS27C256 -15JL
Manufacturer			ATMEL	INTEL	AMD	TI
Adapter Model Name	PECKER10 (PKW1000)	FX-1	Not supported	1.1	Not supported	1.1
		FX-la	Not supported	1.1	Not supported	1.1
		FX-5	Not supported	1.1	Not supported	1.1
	PECKER11 (PKW1100)	RX-1	4.3	1.0	1.0	1.0
		RX-40	4.3	3.0	4.1	4.1
	PECKER30 (PKW3100)	ADP-B	2.9	2.0	2.0	2.0
		ADP-D	1.5	1.0	1.0	1.0

Use adapters of the versions indicated above or higher when storing data in a ROM.

APPENDIX 7 Transportation Precautions

When transporting lithium batteries, make sure to treat them based on the transport regulations.

7.1 Controlled Models

The batteries for A1SJHCPU (including memory cards) is classified as follows:

Product Name	Model	Product supply status	Classification for transportation
A series battery	A6BAT	Lithium battery	Non-dangerous goods

7.2 Transport Guidelines

Comply with IATA Dangerous Goods Regulations, IMDG code and the local transport regulations when transporting products after unpacking or repacking, while Mitsubishi ships products with packages to comply with the transport regulations.
Also, contact the transporters.

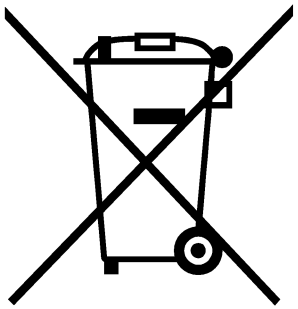
Appendix8 Handling of Batteries and Devices with Built-in Batteries in EU Member States

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.

Appendix8.1 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.

Appendix8.2 Exportation precautions

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

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

(1) Labelling

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

(2) Explaining the symbol in the manuals

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

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

POINT

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

MEMO

Warranty

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

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.
[Gratis Warranty Term]
The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.
[Gratis Warranty Range]

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

2. Onerous repair term after discontinuation of production

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

3. Overseas service

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

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

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

5. Changes in product specifications

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

Type A2USCPU(S1)

User's Manual

MODEL	A2USCPU(S1)-U-E
MODEL CODE	13JE78
IB(NA)-66536-G(1003)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