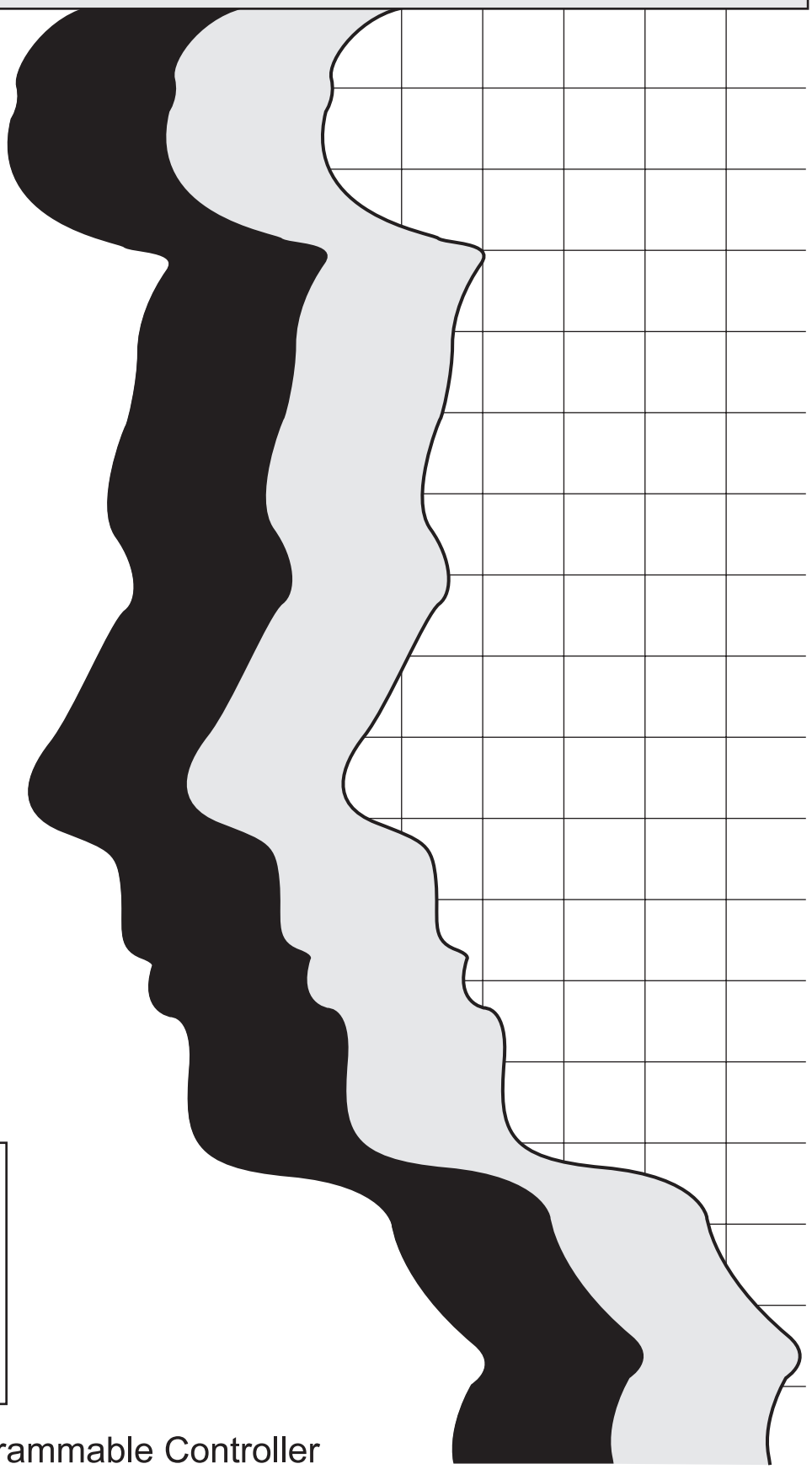
MITSUBISHI

A0J2HCPU(P21/R21)

User's Manual



MELSEC

Mitsubishi Programmable Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.
These SAFETY PRECAUTIONS classify the safety precautions into two categories: "DANGER" and "CAUTION".

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

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results. In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER

● 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 module. Otherwise, trouble could result from erroneous output or erroneous operation.

(1) Outside the PLC, construct mechanical damage preventing interlock circuits such as emergency stop, protective circuits, positioning upper and lower limits switches and interlocking forward/reverse operations.

(2) When the PLC detects the following problems, it will stop calculation and turn off all output in the case of (a). In the case of (b), it will stop calculation and hold or turn off all output according to the parameter setting.
Note that the AnS series module will turn off the output in either of cases (a) and (b).

(a) The power supply module has over current protection equipment and over voltage protection equipment.

(b) The PLC CPUs self-diagnosis functions, such as the watch dog 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 fail safe circuit exterior to the PLC that will make sure the equipment operates safely at such times. See section 9.1 of this manual for example fail safe circuits.

(3) Output could be left on or off when there is trouble in the outputs module relay or transistor. So build an external monitoring circuit that will monitor any single outputs that could cause serious trouble.

[DESIGN PRECAUTIONS]

⚠ DANGER

- When overcurrent which exceeds the rating or caused by short-circuited load flows in the output module for a long time, it may cause smoke or fire. To prevent this, configure an external safety circuit, such as fuse.

- Build a circuit that turns on the external power supply when the PLC main module power is turned on. If the external power supply is turned on first, it could result in erroneous output or erroneous operation.

- When a data link results in a communication error, the faulty station changes in operating status depending on the used data link type.
  (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. remote setting.
  Refer to the data link manuals regarding the method for setting the communication problem station and the operation status when there are communication problem.

- When connecting a peripheral device to the CPU module or connecting a personal computer or the like to the intelligent function module to exercise control (data change) on the running PLC, configure up an interlock circuit in the sequence program to ensure that the whole system will always operate safely.
  Also before exercising other control (program change, operating status change (status control)) on the running PLC, read the manual carefully and fully confirm safety.
  Especially for the above control on the remote PLC from an external device, an immediate action may not be taken for PLC trouble due to a data communication fault.
  In addition to configuring up the interlock circuit in the sequence program, corrective and other actions to be taken as a system for the occurrence of a data communication fault should be predetermined between the external device and PLC CPU.

- When configuring a system, do not leave any slots vacant on the base. Should there be any vacant slots, always use a blank cover (AG60) or dummy module (AG62).
  When the extension base, A55B is used, attach the dustproof cover supplied with the product to the module installed in slot 0.
  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.

[DESIGN PRECAUTIONS]

⚠ CAUTION

- 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 (3.94 inch) or more from each other. Not doing so could result in noise that would cause erroneous operation.

- When controlling items like lamp load, heater or solenoid valve using an output module, large current (approximately ten times greater than that present in normal circumstances) may flow when the output is turned OFF to ON.
  Take measures such as replacing the module with one having sufficient rated current.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the PLC in an environment that meets the general specifications contained in this manual. Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.

- Hold down the module loading lever at the module bottom, and securely insert the module fixing latch into the fixing hole in the base unit.
  Incorrect loading of the module can cause a malfunction, failure or drop.
  When using the PLC in the environment of much vibration, tighten the module with a screw.
  Tighten the screw in the specified torque range. Undertightening can cause a drop, short circuit or malfunction. Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

- When installing extension cables, be sure that the connectors of base unit are installed correctly. After installation, check them for looseness. Poor connections could cause an input or output failure.

- Correctly connect the memory soket to the memory.
  After installation, be sure that the connection is not loose. A poor connection could cause an operation failure.

- Completely turn off the external power supply before loading or unloading the module. Not doing so could result in electric shock or damage to the product.

- Do not directly touch the module's conductive parts or electronic components. Touching the conductive parts could cause an operation failure or give damage to the module.

[WIRING PRECAUTIONS]

⚠ DANGER

- Completely turn off the external power supply when installing or placing wiring. Not completely turning off all power could result in electric shock or damage to the product.

- When turning on the power supply or operating the module after installation or wiring work, be sure that the module's terminal covers are correctly attached. Not attaching the terminal cover could result in electric shock.

⚠ CAUTION

- Be sure to ground the FG terminals and LG terminals to the protective ground conductor. Not doing so could result in electric shock or erroneous operation.

- When wiring in the PLC, be sure that it is done correctly by checking the product's rated voltage and the terminal layout. Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.

- Do not connect multiple power supply modules in parallel.
  Doing so could cause overheating, fire or damage to the power supply module.

- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered. Imperfect connections could result in short circuit, fires, or erroneous operation.

- Tighten the terminal screws with the specified torque. If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation. Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

- Be sure there are no foreign substances such as sawdust or wiring debris inside the module. Such debris could cause fires, damage, or erroneous operation.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ DANGER

- Do not touch the terminals while power is on.
  Doing so could cause shock or erroneous operation.

- Correctly connect the battery.
  Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery.
  Mishandling of battery can cause overheating or cracks which could result in injury and fires.

- Switch all phases of the external power supply off when cleaning the module or retightening the terminal or module mounting screws. Not doing so could result in electric shock.
  Undertightening of terminal screws can cause a short circuit or malfunction. Overtightening of screws can cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.

⚠ DANGER

- 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.

- When replacing fuses, be sure to use the prescribed fuse. A fuse of the wrong capacity could cause a fire.

- 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 5.)

[TRANSPORTATION PRECAUTIONS]

⚠ CAUTION
● When transporting lithium batteries, make sure to treat them based on the transport regulations. (Refer to Appendix 4 for details of the controlled models.)

REVISIONS

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

Print Date	*Manual Number	Revision
Oct., 1990	IB (NA) 66268-A	First edition
Mar., 1997	IB (NA) 66268-B	Addition SAFETY PRECAUTIONS, A0J2HCPU-DC24, A8PUE, A0J2C10, A0J2C20, About Manuals, Section 1.1.1, 2.2.1, 4.5.1, 4.6.1, 5.2.1, 5.3, 6.1.2, 7.5.2, 9.2, APP. 2.1.3 Correction Chapter 1, Section 2.1, 3.1, Chapter 4, Section 7.3, 10.3.1, APP. 2.1.4
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Nov., 2008	IB (NA) 66268-E	Correction SAFETY PRECAUTIONS, Section 7.2.1 Addition Appendix 5, 5.1, 5.2

Japanese Manual Version SH-3505-E

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About Manuals

The manuals related to this positioning module are listed below.
Please order those you require.

Related Manuals

Manual Title	Manual No. (Type Code)
AD75M1/M2/M3 Type Positioning Module User's Manual (Hardware) Describes the performance specifications, I/O interface, nomenclature and start-up procedure of the AD75M1/M2/M3 type positioning modules. (Packed with the module)	IB-66735 (13J885)
A1SD75M1/M2/M3 Type Positioning Module User's Manual (Hardware) Describes the performance specifications, I/O interface, nomenclature and start-up procedure of the A1SD75M1/M2/M3 type positioning modules. (Packed with the module)	IB-66734 (13J884)
SW1IVD-AD75P Type Positioning Module Software Package Operating Manual Describes how to use the above software package to create and transmit data (parameters, positioning data, etc.) to a positioning module, and perform position monitoring and testing. (Packed with each software package)	IB-66068 (13J602)

1. FOREWORD

This manual gives specifications and handling procedures for the A0J2HCPU, A0J2HCPUP21, A0J2HCPUR21 general-purpose programmable controllers (referred to as "A0J2H") and A0J2HCPU-DC24 general-purpose programmable controller (referred to as A0J2H-DC24).
The points of difference between A0J2H and A0J2H-DC24 are shown in Table 1.1.
(Apart from the points indicated in Table 1.1, the specifications for A0J2H and A0J2H-DC24 are identical.)

Table 1.1 Points of Difference between A0J2H and A0J2H-DC24

Item	A0J2H	A0J2H-DC24
Input power supply	100/200 VAC	24 VDC

Hereafter in this manual, the term "A0J2HCPU" will be used in cases where both A0J2H and A0J2H-DC24 are applicable.
The A0J2HCPU offers greater performance and improved functions over the A0J2CPU and can run the A0J2CPU sequence program.
Users are encouraged to take every advantage of these improvements for effective use of the A0J2HCPU.
This section explains the features, performance, and functions of the A0J2HCPU.

Peripheral devices in this manual (A6GPP, A6GHP, A7PU, A6PHP) are abbreviated as follows.

A6GPP → GPP
A6HGP → HGP
A7PU/A8PUE → PU
A6PHP → PHP

"Peripheral device" is the general term for the above devices.

1.1 Features

(1) High-speed operation processing

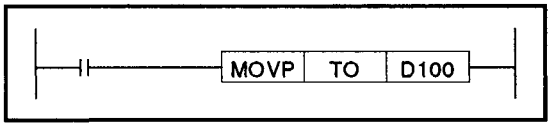
Instruction processing time in the A0J2HCPU is 2 to 3 times faster than that in the A0J2CPU. (Equivalent to A2CPU instruction processing time)

(2) More basic and application instructions

A greater selection of instructions (22 sequence instructions, 131 basic instructions, 109 application instructions) facilitates creating the sequence program.

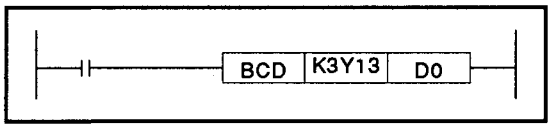
(a) Pulse conversion instructions

Pulse conversion instructions such as MOVP, BCDP, TOP, etc. are now possible.



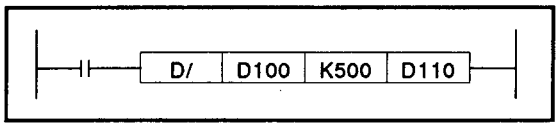
(b) Number of bit device digits can be set to any device number

Only multiples of 8 can be set for the head device number when specifying the number of bit device digits in the A0J2CPU, whereas any device number can be set in the A0J2HCPU.



(c) 32-bit data operations possible

32-bit data instructions, such as DMOV, DBIN, and four-operation instructions (D+, D–, D*, D/), can easily be used.



(3) Microcomputer program can be used

Since microcomputer programs can be used, in addition to user microcomputer programs, utility program packages can be used.

Usable utility program packages are given below.

- SW0GHP-UTLPC-FNO
- SW0GHP-UTLPC-FN1
- SW0GHP-UTLPC-PID
- SW0GHP-UTLP-FD1
- SW1GP-AD57P

(4) Increased program capacity and number of device points

The program capacity and number of device points of the A0J2HCPU are greater than those of the A0J2CPU.
Refer to Performance (Section 4.1) for the number of points for each device.

(a) Program capacity

Increased from a maximum of 7k steps to 8k steps.

(b) Number of device points

- Timer/counter : from 128 to 256 points
- Data register : from 512 to 1024 points
- File register : up to 4096 points

(5) Enhanced debugging functions

To improve debugging efficiency, the following debugging functions have been enhanced.

(a) Off line switch

(b) Sampling trace

(c) Status latch

(6) Switching I/O control systems is possible

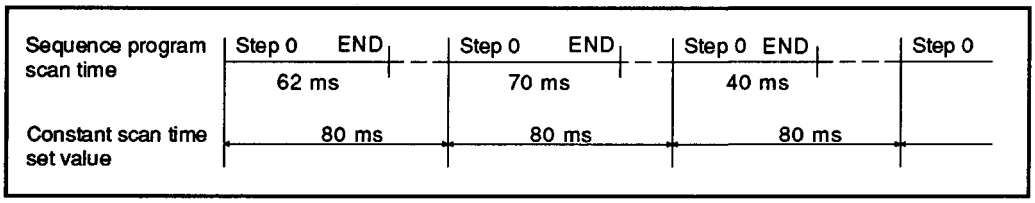
The I/O control system can be switched between the refresh mode and the direct mode using a switch.
There are 2 types of I/O control system combinations.

- Direct mode for both input and output
- Refresh mode for both input and output

(7) Constant scan function

Constant scan sets sequence program execution cycles and constantly maintains the varying of control intervals to external devices due to varying program scan times in specified intervals.

(8) Data link module used in both master and local stations



The A0J2HCPUP21/R21 can be used in both master and local stations in the MELSECNET.

Note that it cannot be used as a master station in the third tier.

(9) Compatibility with the A0J2CPU

(a) In general, the A0J2CPU sequence program can be used in the A0J2HCPU. Parameters settings differ, however, and must be changed.

(b) Special function modules

The following computer link/multidrop link modules can be used with the A0J2HCPU.

Module Name / Function	A0J2-C214	A0J2-C214S1	AJ71C24(S3)
Computer link function	X	O	O
Multidrop link function	O	O	X

O : Can be used
X : Cannot be used

All special function modules other than those indicated above can be used.
It is now possible to use AD57 and AD58.

(c) Peripheral devices

1) Program writing, monitoring, and storage onto ROM for the A0J2HCPU are possible by using the SW4GP-GPPA.
Previous SW3GP-GPPA software package operations are possible by selecting PC type "A2". Data cannot be stored in ROM, however.

2) Both the A6PU and A7PU can be used.

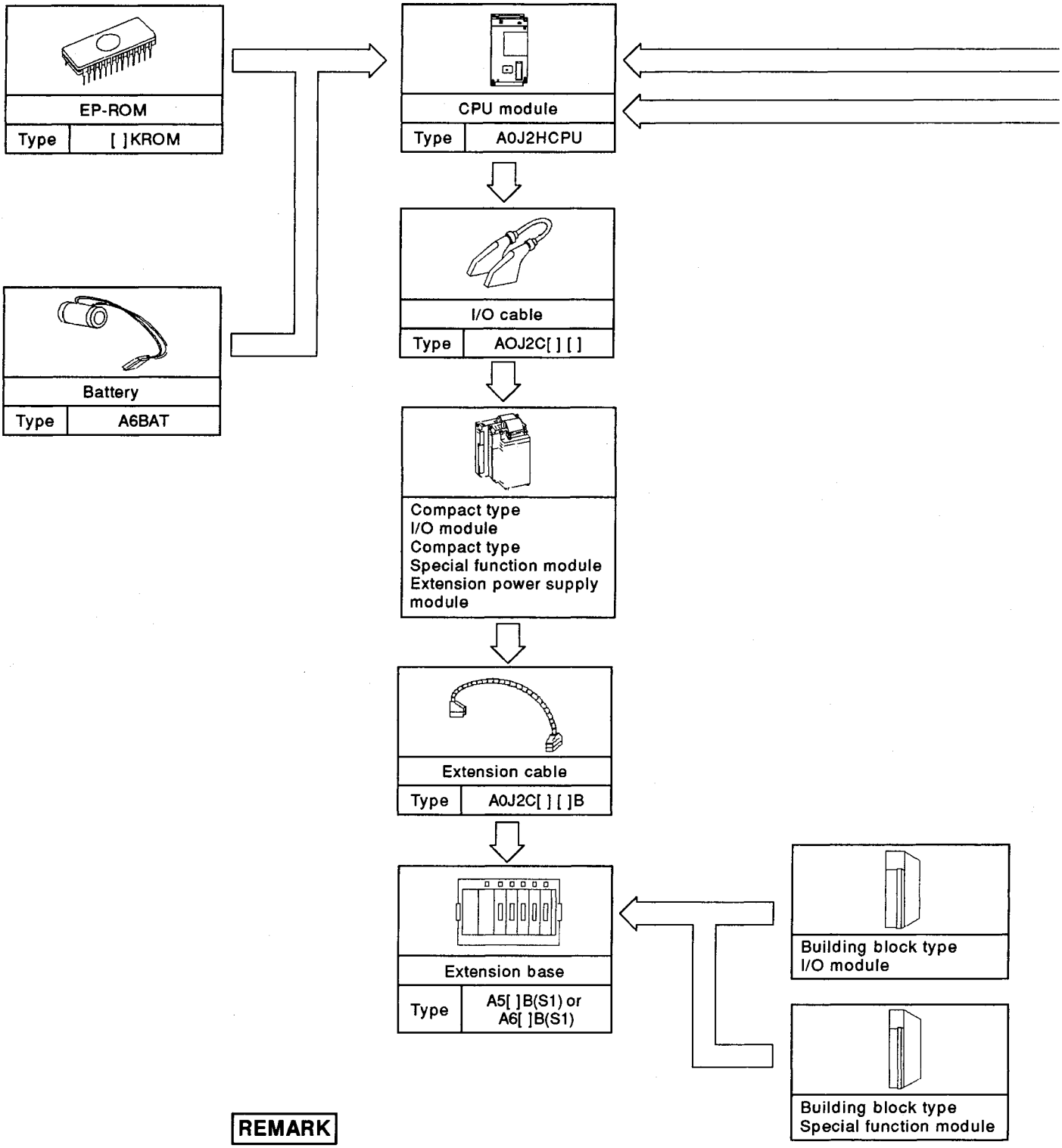
3) The upgraded A6WU version is required for use with the A0J2HCPU. Storing the A0J2HCPU sequence program in ROM is not possible using the previous A6WU.

(d) EEPROM unusable

4KEROM cannot be used in the A0J2HCPU.

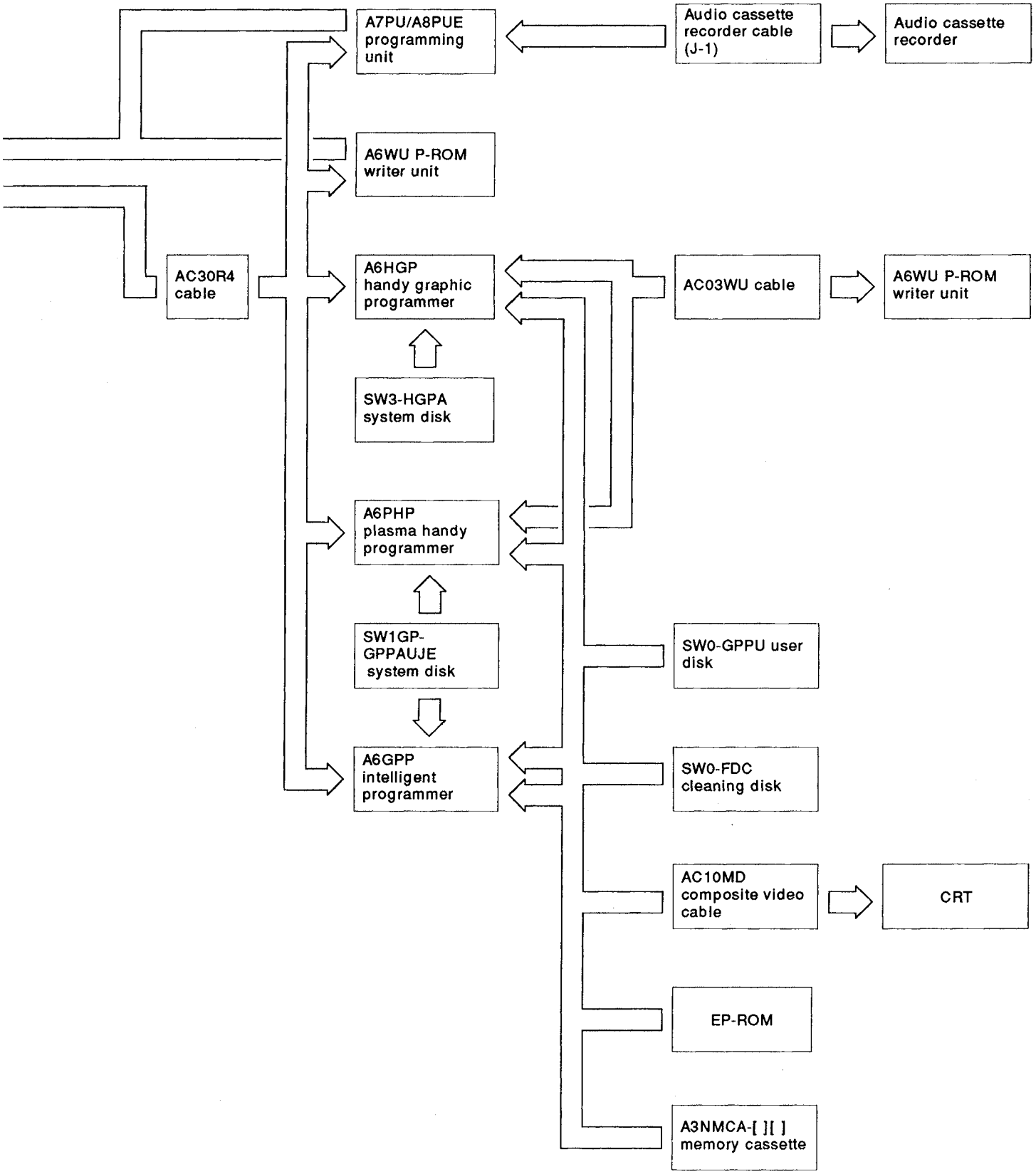
2. SYSTEM CONFIGURATION

2.1 Overall Configuration



REMARK

1. Only 1 compact type extension power supply module can be connected to the A0J2HCPU.
2. Calculate the power supply capacity since it is insufficient when using the A5[ ]B(S1).
3. Up to 4 building block type modules can be loaded into an extension base unit.


A7PU/A8PUE programming unit
Audio cassette recorder cable (J-1)
Audio cassette recorder
A6WU P-ROM writer unit
AC30R4 cable
A6HGP handy graphic programmer
AC03WU cable
A6WU P-ROM writer unit
SW3-HGPA system disk
A6PHP plasma handy programmer
SW1GP-GPPAUJE system disk
SW0-GPPU user disk
A6GPP intelligent programmer
SW0-FDC cleaning disk
AC10MD composite video cable
CRT
EP-ROM
A3NMCA-[ ][ ] memory cassette

2.2 Cautions on Constructing the System

2.2.1 Hardware

(1) I/O modules

All compact type I/O modules and baseless building block type I/O modules can be used.

(2) Special function modules

(a) Compact type special function modules

The following computer link/multidrop link modules can be used with the A0J2HCPU.

Function \ Module Name	A0J2-C214	A0J2-C214S1
Computer link function	X	O
Multidrop link function	O	O

O : Can be used
X : Cannot be used

All other compact type special function modules can be used.

(b) Baseless building block type special function modules

The AJ71P22, AJ71R22, AJ71AP22, AJ71AR22, AJ71C22, AJ71C23, and AJ71P41 cannot be used.
All other baseless building block type special function modules can be used.
For each CPU module, up to AJ71C24(S3) or AD51(S3) can be used.

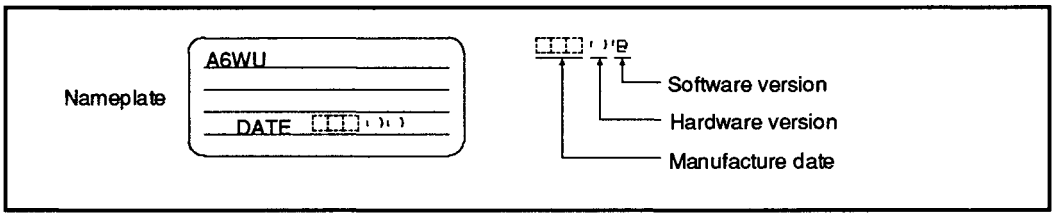
(3) Peripheral devices

(a) The A6PU and A7PU can be used by selecting CPU module "A2". With A7PUS, A8PUE and A7PU (software version F and later), the CPU model name is displayed as "A0J2H".

(b) A6WU units using software version E or above can be used.

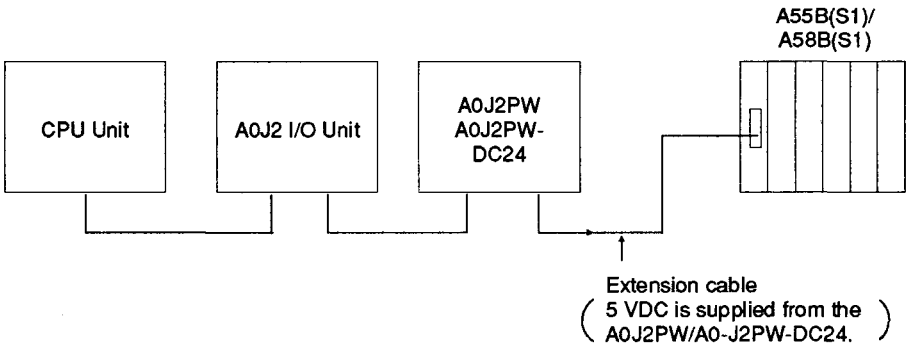
REMARK

Verify the software version marked at the DATE column on the nameplate.



(4) Extension base units (A5[ ]B(S1))

(a) WhenA52B(S1)/A55B(S1)/A58B(S1) extension base units (hereafter abbreviated as "A5[ ]B(S1)") are used, an A0J2PW/A0J2PW-DC24 type extension power supply module (hereafter abbreviated as "A0J2PW/A0J2PW-DC24") is required.
If an A0J2PW/A0J2PW-DC24 is not used, the modules mounted to the A5[ ]B(S1) will not operate normally.
This is because the 5 VDC supply to the A5[ ]B(S1) is taken from the A0J2PW/A0J2PW-DC24.



(b) Since 5 VDC power is supplied to the A5[ ]B(S1) via I/O cables and an extension cable, there is some voltage drop in the cables. When using an A5[ ]B(S1), select the position where the A0J2PW/A0J2PW-DC24 is connected, and cables used, so that the receiving end voltage is no less than the stipulated voltage of 4.75 VDC. If the receiving end voltage does not reach 4.75 VDC, use an A65B/A68B type extension base unit. For details on the method for measuring the receiving end voltage of the A5[ ]B(S1), refer to Section 5.3 "Precautions for Use of Extension Power Supply Module".

(5) I/O cable (A0J2C[ ][ ])

(a) When connecting the CPU module and I/O modules, keep the overall distance of the I/O cable within 6.6 m (21.65 ft.).
If this distance is exceeded, there may be erroneous outputs to the output modules.

(b) When connecting the CPU module and I/O modules, the receiving end voltage at each of the I/O modules must be at least 4.75 V.
For details on the method for measuring the receiving end voltage, refer to Section 5.3 "Precautions for Use of Extension Power Supply Module".

2.2.2 Software version

(1) A series system start up floppy

(a) All SW4GP-GPPA software operations are possible by selecting the A0J2HCPU(P21/R21) PC type.

(b) Select PC type "A2CPU" when using SW0-GPPA, SW1-GPPA, SW2-GPPA, SW3-GPPA, SW3GP-GPPA, SW2-HGPA, and SW3-HGPA. Data cannot be stored in ROM, however.

(2) Utility program packages

Utility program packages which can be used in the A0J2HCPU(P21/R21) are given below.

- SW0GHP-UTLPC-FN1
- SW0GHP-UTLPC-PID
- SW0C-UTLP-PID
- SW0GHP-UTLPC-FN0
- SW0C-UTLP-FN0
- SW1GP-AD57P
- SW0-AD57P

(a) SW0GHP-UTLPC-FN1

Use by selecting CPU type "A2CPU" for the initial screen (SW0GHP-UTLPC-FN1 displayed when started up).

(b) SW1GP-AD57P

Specify the file name of the "AD57P-COM" when operating the SW1GP-AD57P after starting up other utility program packages.

3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 General Specifications

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating 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>Operating ambient humidity</td><td colspan="5">10 to 90% RH (dewing unallowable)</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90% RH (dewing unallowable)</td></tr>
<tr><td rowspan="3">Vibration resistance</td><td rowspan="3">Conforms to *JIS C 0911</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 55 Hz</td><td>–</td><td>0.075 mm (0.003 in)</td><td rowspan="2">10 times **(1 octave /minute)</td></tr>
<tr><td>55 to 150 Hz</td><td>9.8 m/s^2 (1 g)</td><td>–</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Conforms to JIS C 0912 (10 g x 3 times in 3 directions)</td></tr>
<tr><td>Noise durability</td><td colspan="5">By noise simulator of 1500 Vpp noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency</td></tr>
<tr><td>Dielectric withstand voltage</td><td colspan="5">1500 VAC for 1 minute across AC external terminals and ground
500 VAC for 1 minute across DC external terminals and ground</td></tr>
<tr><td>Insulation resistance</td><td colspan="5">5 MΩ or larger by 500 VDC insulation resistance tester across AC external terminals and ground</td></tr>
<tr><td>Grounding</td><td colspan="5">Class 3 grounding; grounding is not required when it is impossible.</td></tr>
<tr><td>Operating atmosphere</td><td colspan="5">Free of corrosive gases. Dust should be minimal.</td></tr>
<tr><td>Cooling method</td><td colspan="5">Self-cooling</td></tr>
</table>

REMARK

One octave marked ** indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10 Hz to 20 Hz, from 20 Hz to 40 Hz, from 40 Hz to 20 Hz, and 20 Hz to 10 Hz are referred to as one octave.

*Note: *JIS : Japanese Industrial Standard*

4. A0J2HCPU

4.1 Performance

(1) This section describes the performance of the A0J2HCPU module, including memory capacity, devices, etc.

Table 4.1 List of Performance

Item \ Type			A0J2H	A0J2H-DC24
Control system			Repeated operation (using stored program)	
I/O control method			Refresh mode/Direct mode selectable	
Programming language			Language dedicated to sequence control (Combined use of relay symbol type and logic symbolic language)	
Number of instructions		Sequence instruction	22	
		Basic instruction	131	
		Application instruction	109	
Processing speed (sequence instructtion) (μ sec/step)			Direct : 1.25 to 2.25 Refresh : 1.25	
I/O points			336 (Max. 480 points when using extension base units)	
Watch dog timer (WDT)(msec)			10 to 2000	
*1 Memory capacity			32k byte (RAM)	
Program capacity			Main sequence program + main microcomputer program = 8k steps max. Internal microcomputer program can be set to 7k steps (14k bytes) max. (subsequence program not available).	
Device	Internal relay (M) (point)		1000 (M0 to 999)	The number of Ms + Ls+ Ss = 2048 (set in parameters)
	Latch relay (L) (point)		1048 (L1000 to 2047)	
	Number of step relays (S) (point)		0 (Defaults to no value)	
	Link relay (B) (point)		1024 (B0 to 3FF)	
	Timer	Number of points	256	
		Specifications	100 ms timer : setting time 0.1 to 3276.7 sec (T0 to 199) 10 ms timer : setting timer 0.01 to 327.67 sec (T200 to 255) 100 ms retentive timer : depending on setting (setting time 0.1 to 3276.7 sec) } Set in parameters	
	Counter	Number of points	256	
		Specifications	Normal counter : Setting range 1 to 32767 (C0 to 255) Interrupt program counter : Setting range 1 to 32767 Counter to be used in interrupt program } Set in parameters	
	Data register (D) (points)		1024 (D0 to 1023)	
	Link register (W) (points)		1024 (W0 to 3FF)	
	Annunciator (F) (points)		256 (F0 to 255)	
	File register (R) (points)		Max. 4096 (R0 to 4095)	
	Accumulator (A) (points)		2 (A0, A1)	
	Index register (V,Z) (points)		2 (V,Z)	
	Pointer (P) (points)		256 (P0 to 255)	

Table 4.1 List of Performance (Continued)

Item		Type A0J2H	A0J2H-DC24
Device	Interrupt pointer (I) (points)	32 (I0 to 31)	
	Special relay (M) (points)	256 (M9000 to 9255)	
	Special register (D) (points)	256 (D9000 to 9255)	
*2 Comment (points)		Max. 1600 (Specify in batches of 64 points)	
Self-diagnostic functions		Watch dog error monitor (watch dog timer 200 ms), Memory error detection, CPU error detection, I/O error detection, battery error detection, etc.	
Operation mode at the time of error		STOP/CONTINUE	
STOP → RUN output mode		Output data at time of STOP restored/data output after operation execution	
Allowable momentary power interruption time (ms)		No greater than 20	—
*3 Allowable momentary drop time (ms)		—	No greater than 1
Current consumption (5 VDC)		A0J2HCPU :0.4 A A0J2HCPUP21 :0.53 A A0J2HCPUR21 :0.86 A	
Weight (kg) (lb)		A0J2HCPU : 0.75 (1.65) A0J2HCPUP21 : 1.16 (2.56) A0J2HCPUR21 : 1.16 (2.56)	0.65 (1.43)

*1 The total memory used for parameters, T/C set values, program capacity, file registers, number of comments, sampling trace, and status latch is 32k bytes.

*2 Up to 1600 comments can be stored in the A0J2HCPU. In the GPP/PHP/HGP, 4032 comments points can be written.

*3 Indicates the allowable momentary drop time from lower limit input (power supply voltage: 15.6 V).

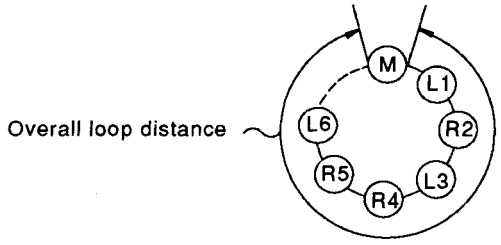
(2) This section describes the performance specifications of optical and coaxial links when using A0J2HCPU(P21/R21) data link modules.

Table 4.2 Data Link Performance Specification

		Optical Data Link	Coaxial Data Link
		A0J2HCPUP21	A0J2HCPUR21
Maximum number of I/O points		336 (480 when extension base is used)	
Max. number of usable link points per station	Input (X)	512 points (64 bytes)	
	Output (Y)	512 points (64 bytes)	
Max. number of link points in 1 system	Link relay (B)	1024 (1/8 byte / point, 128 bytes)	
	Link register (W)	1024 (2 bytes / points, 2048 bytes)	
Max. number of link points in 1 station		Y + B + W ≤ 1024 bytes	
Allowable momentary power failure time		Within 20 ms	
Communication speed		1.25 mbps	
Communication method		Half duplex bit serial method	
Synchronous method		Frame synchronous method	
Transmission path method		Duplex loop method	
Overall loop distance *1		Max. 10 km (32810 ft) (1 km (3281 ft) station interval)	Max. 10 km (32810 ft) (500 m (1640.5 ft) station interval)
Number of connected stations		Max. 65 units/loop (1 master station, 64 local/remote I/O stations)	
Demodulation method		CMI method	
Transmission format		Conforms to HDLC (frame method)	
Error control system		Retry due to CRC (generating polynomial $X^{16} + X^{12} + X^5 + 1$) and time over	
RAS function		Loopback function due to error detection and cable breakage, diagnostic function such as host link line	
Connector		2-core optical connector plug (CA9003)	BNC-P-5, BNC-P-3-NI (DDK) equivalent
Cable used		SI-200/250	3C-2V, 5C-2V equivalent

REMARK

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



(3) If using an A0J2HCPU at a master station or local station in a MELSECNET/B data link system, mount the MELSECNET/B data link module (AJ71AT21B) on an extension base unit.

4.1.1 A0J2HCPU operation processing

Operation processing after turning the A0J2HCPU power ON until the sequence program is executed will be explained.
A0J2HCPU processing is divided generally into the four following types.

(1) Initial processing

Pre-processing for executing sequence operations, initial processing is executed once at start up or reset.

(a) Initialize by resetting the I/O module.

(b) Initialize the data memory's unset latch range (bit device turned OFF, word device set to 0).

(c) I/O module I/O addresses are automatically assigned according to the I/O module number and the module's installation position in the extension base unit.

(d) Automatic diagnostic check of parameter settings and operation circuits is executed. (Refer to Section 4.1.6.)

(e) When the A0J2HCPUP21/R21 is used in the master station of MELSECNET, data link begins after setting the link parameter data to the data link module.

(2) I/O module refresh processing

If the refresh mode for both input and output is set by the I/O control switch, the I/O module is refreshed. (Refer to Section 4.1.5.)

(3) Sequence program operation processing

The sequence program written to the PC CPU is executed from step 0 to the END instruction.

(4) END processing

When sequence program operation processing has been completed, the sequence program is returned to step 0.

(a) Self-diagnosis checks for blown fuses, I/O module verification, low battery voltage, etc. are executed. (Refer to Section 4.1.6.)

(b) T/C present values are updated and contacts are turned ON/OFF. (Refer to the ACPU Programming Manual (Fundamentals).)

(c) Data is read from computer link modules (AJ71C24(S3), AD51(S3), etc.) and PC CPU and computer link module data are replaced at write instruction execution.

(d) Link refresh processing is executed when the link refresh request is given from the MELSECNET data link.

Note that the A0J2HCPUP21/R21 can enable and disable execution of link refresh by turning ON/OFF M9053 and by DI/EI instruction.

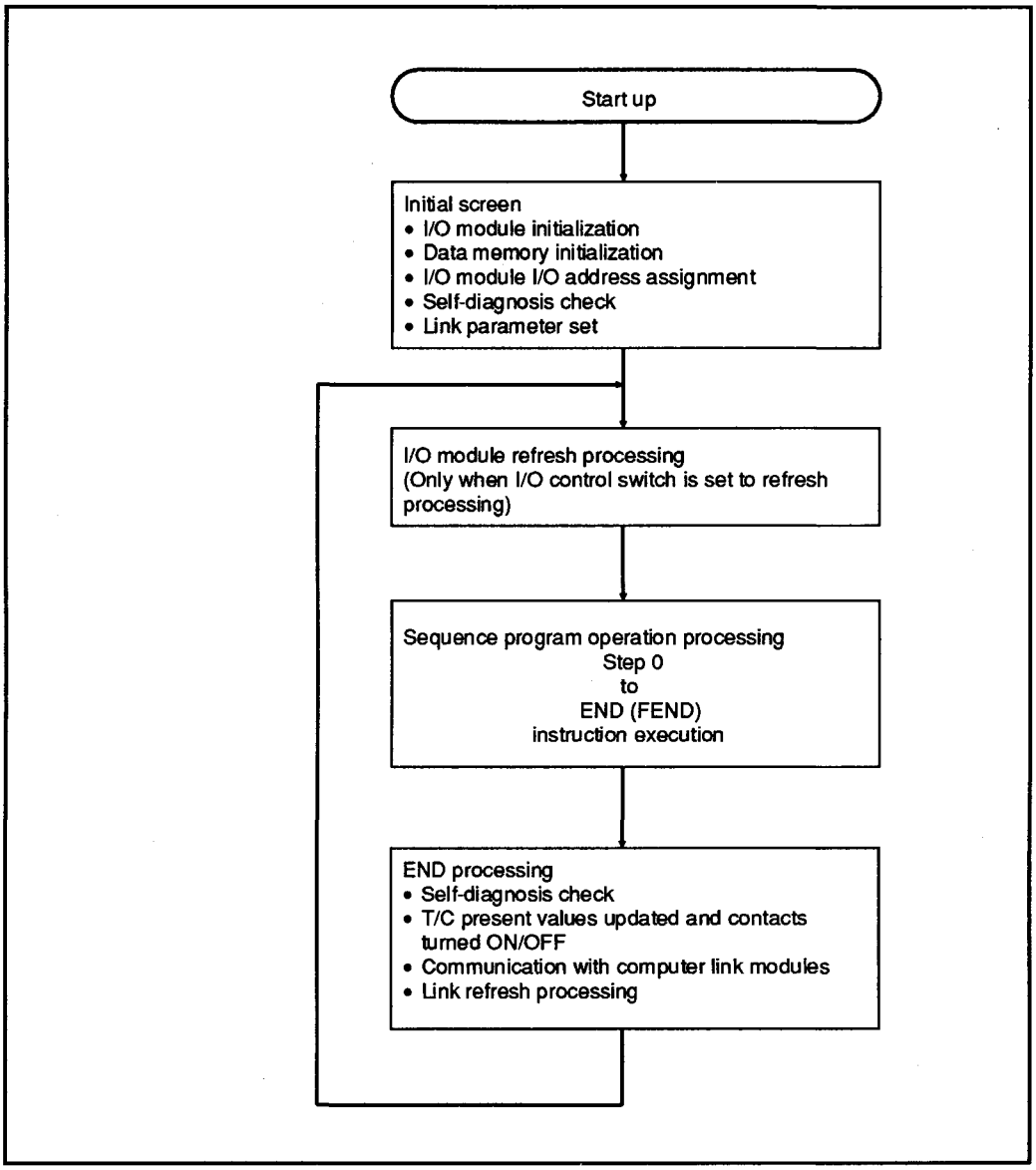


Fig. 4.1 A0J2HCPU Operation Processing

4.1.2 RUN, STOP, PAUSE operation processing

The PC CPU is operated in either of the RUN, STOP and PAUSE states as described below.

(1) RUN operation processing

RUN indicates repeated operation of the sequence program in order of step 0 to END (FEND) instruction.

When the CPU is set to RUN, the output status at the time of STOP is provided in accordance with the STOP → RUN output mode setting in the parameter.

The PC CPU requires processing time before it starts the sequence program operation. It requires 2 to 3 seconds after a power on or reset, and 1 to 3 seconds after mode has changed from STOP to RUN.

(2) STOP operation processing

STOP indicates a stop or the sequence program operation by using the RUN/STOP switch of remote STOP (Section 4.2.3).

When the CPU is set to STOP, the output status is saved and all outputs are switched off. Data other than the outputs (Y) is retained.

(3) PAUSE operation processing

PAUSE indicates a stop of the sequence program operation with the output and data memory status retained.

The PC CPU can set to PAUSE state in accordance with Section 4.2.4.

POINT

The following processing is executed regardless of whether the A0J2HCPU is in the RUN, STOP, or PAUSE state:
- Refresh processing of I/O module when refresh mode is set,
- Data communication with computer link modules,
- Link refresh processing.

Therefore, the following operations are possible even when the A0J2HCPU is set in the STOP or PAUSE status:
- Monitoring I/O status and testing using a peripheral device,
- Read/write with a computer link module, and
- Communications with other station in the MELSECNET.

4.1.3 Watchdog timer (WDT)

The watchdog timer is an internal PC timer monitors one scan of a sequence program execution. The WDT also detects PC hardware errors and whether or not sequence program processing has been completed within the predetermined sequence program scan time.

The watchdog timer default value is 200 ms. This setting can be changed to between 10 ms and 2000 ms by using a parameter.

(1) Normal PC operation (scan time is within the set value)

The watchdog timer is reset after execution of the END instruction.

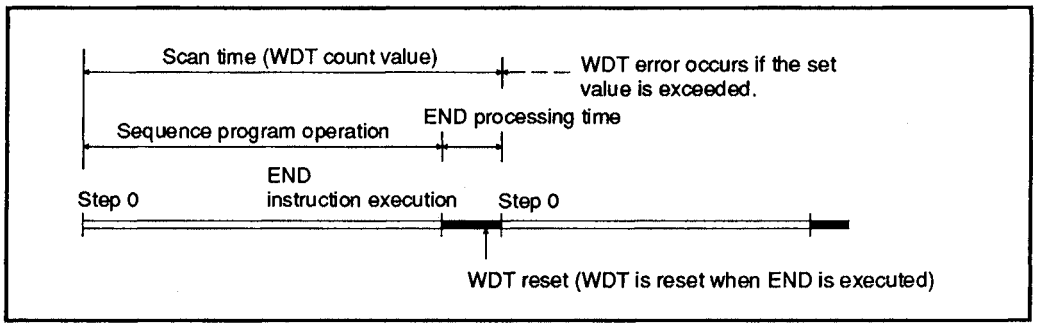
(2) Faulty PC operation (scan time is not within the set value)

(a) A watchdog timer error occurs, operation stops, and the RUN LED of the CPU module's previous screen flickers.

(b) There are two types of error code for the watchdog timer, error codes "22" and "25".

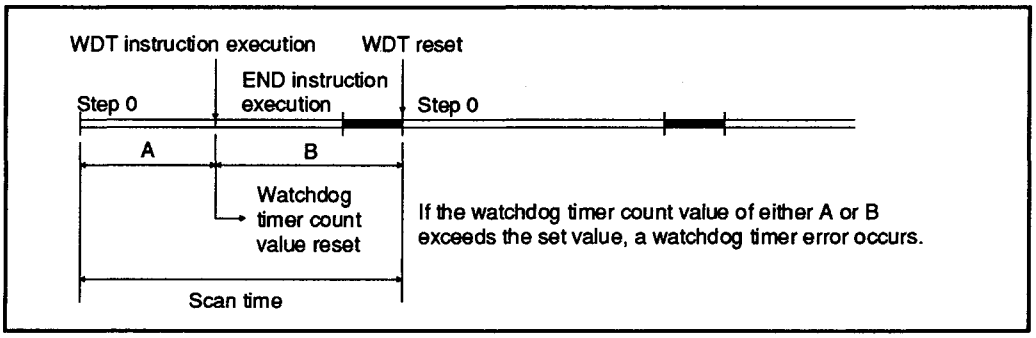
1) "22" is the error code when the END instruction has been executed when the WDT setting range has been exceeded.

2) "25" is the error code when sequence program operation continues in an infinite loop and the END instruction is executed when the WDT setting range has been exceeded.
(Refer to Section 10.3 Error Codes for details of error content.)



(3) Watchdog timer reset using the sequence program

The watchdog timer is reset with the WDT instruction in the sequence program.
The watchdog timer begins counting again from 0.
The scan time values registered in D9017 to D9019 are not reset when the WDT instruction is executed.



(4) When a watchdog timer error occurs, verify the error according to Section 10. Troubleshooting, then press the RESET switch to clear the error.

4.1.4 Operation processing at momentary power failure occurrence

When the input power supply voltage supplied to the power supply module is insufficient, the A0J2HCPU detects a momentary power failure.

When the A0J2HCPU detects a momentary power failure period less than the allowable momentary power failure period (20 ms), the following operations are executed.

[With A0J2H]

(1) Momentary power failure within 20 ms

(a) The operation processing is stopped with the output retained.

(b) The operation processing is resumed when normal status is restored.

(c) The watchdog timer (WDT) keeps timing while the operation is at a stop. For example, if a momentary power failure of 20 ms occurs when the scan time is 190 ms, a watchdog timer error (200 ms) results.

(2) Momentary power failure over 20 ms

With A0J2H, an initial start is executed.
When the power is switched on or the CPU is reset with the reset switch, the same operation processing occurs.

[With A0J2H-DC24]

(1) Momentary power failure within 1 ms

(a) When a momentary drop occurs, operation processing is suspended with the current output statuses retained.

(b) On recovery from the momentary drop, the operation processing is resumed.

(c) Even if a momentary drop occurs and operation is suspended, the watchdog timer (WDT) count continues.

(2) Momentary power failure over 1 ms

The A0J2H-DC24 executes an initial start. The operation processing is the same as that performed when the power is switched on or the CPU is reset with the reset switch.

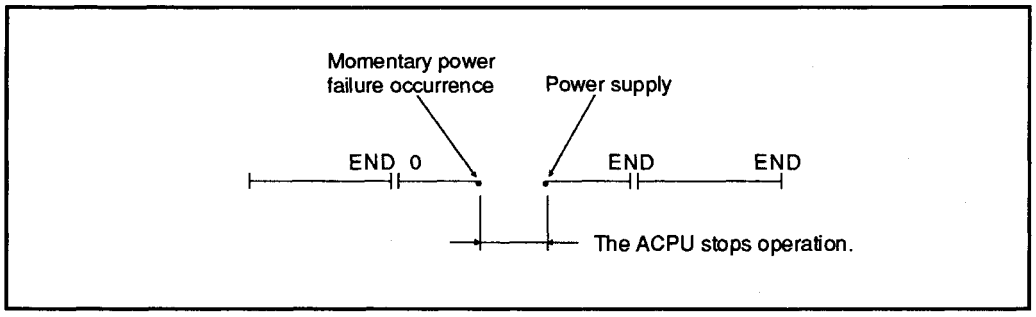


Fig. 4.2 Operation Processing at Occurrence of Momentary Power Failure

4.1.5 I/O control system

In the A0J2HCPU, the I/O control system can be switched between the following 2 modes using the I/O control switch.

1) Direct mode for both input and output

2) Refresh mode for both input and output

The direct and refresh modes are explained below. Processing between the direct and refresh modes differs only in input (X) and output (Y). Processing in other devices or special function modules (FROM/TO instruction) is the same for both modes.

POINT

Switch I/O control systems after turning the A0J2HCPU power supply OFF.

(1) Direct mode

I/O modules are accessed whenever handling I/O signals by sequence program operation processing.
Output module changes corresponding to input signal changes are executed for a maximum of 1 scan.

(2) Refresh mode

I/O modules are accessed by batching data before executing step 0 of the sequence program.
This is called I/O module refresh processing. Input module information is read to the data memory input (X). Data memory output (Y) information is output to the output module.
When handling input signals by sequence program operation processing, data is read from and written to data memory input (X) and output (Y). Output module changes corresponding to input signal changes are executed for a maximum of 2 scans.

POINT

Use the SEG instruction when accessing one segment of an I/O module as with the direct mode. Refer to the ACPU Programming Manual (Common Instructions) for details.

(3) I/O refresh time

I/O refresh time for 1 module (64 points) is approximately 50 μsec.

When 8 modules are connected, refresh time is 400 μsec.

4.1.6 Self-diagnosis

The self-diagnosis function permits the A0J2HCPU to detect its own errors.

Self-diagnosis is carried out when the PC power supply is turned on and when an error occurs while the PC is in the RUN state. If the A0J2HCPU detects an error, it displays the error and stops operation to prevent faulty PC operation.

The A0J2HCPU may operate in one of two modes when an error is detected by the self-diagnosis function. In the stop mode, PC operation is stopped when the error is detected; in the continuous mode, PC operation is continued. In the continuous mode, however, parameters can be set to cause operation to stop if specified errors occur.

When an error occurs, the error occurrence and the error content are stored in special relay (M) or special register (D). In the continuous mode, in particular, the program should read the details of the error and take appropriate action to prevent faulty PC and machine operation.

Operation stops and all outputs (Y) turn OFF immediately after the self-diagnosis function detects an error which stops PC operation.

If the self-diagnosis function detects an error at which PC operation continues, the part of the program where the error was detected is skipped and the rest of the program executed.

If a module comparison error is detected, operation is continued with the I/O addresses at the time the error occurred.

Explanations of the errors detected by the self-diagnosis function are listed on the following page.

REMARK

(1) In the "CPU Status" and "RUN LED Status" columns of Table 4.3, the places in which 2 types are written show change possibilities by settings using peripheral devices.

(2) "LED Display Message" in Table 4.3 are messages displayed by peripheral devices' PC diagnosis.

Table 4.3 Self-Diagnosis List

Diagnosis		Diagnosis Timing	CPU Status	"RUN" LED Status	LED Display Message
Memory error	Instruction code check	When the corresponding instruction is executed	Stop	Flicker	INSTRUCT. CODE ERR.
	Parameter setting check	When power is switched on or reset performed When switched from STOP/PAUSE to RUN			PARAMETER ERROR
	No END instruction	When M9056 or M9057 is switched on When switched from STOP/PAUSE to RUN			MISSING END INS.
	Instruction execution disable	When CJ, SCJ, JMP, CALL(P), FOR and NEXT instruction is executed When switched from STOP/PAUSE to RUN			CAN'T EXECUTE (P)
	Format (CHK instruction) check	When switched from STOP/PAUSE to RUN			CHK FORMAT ERR.
	Instruction execution disable	When interrupt occurs When switched from STOP/PAUSE to RUN			CAN'T EXECUTE (I)
CPU error	RAM check	When power is switched on or reset performed When M9084 is switched on during STOP	Stop	Flicker	RAM ERROR
	Operation circuit check	When power is switched on or reset performed			OPE. CIRCUIT ERR.
	Watchdog error check	When END instruction is executed			WDT ERROR
	END instruction unexecution	When END instruction is executed			END NOT EXECUTE
	Endless loop execution	At any time			WDT ERROR
I/O error	Module comparison	When END instruction is executed (Not checked when M9084 is on)	Stop / Run	Flicker / On	UNIT VERIFY ERR.
	Fuse blow	When END instruction is executed (Not checked when M9084 is on)			FUSE BREAK OFF.
Special function module error	Control bus check	When FROM, TO instruction is executed	Stop	Flicker	CONTROL-BUS ERR.
	Special function module error	When FROM, TO instruction is executed			SP. UNIT DOWN
	Link module error	When power is switched on or reset performed When switched from STOP/PAUSE to RUN			LINK UNIT ERROR
	I/O interruption error	When interrupt occurs			I/O INT. ERROR
	Special function module assignment error	When power is switched on or reset performed When switched from STOP/PAUSE to RUN			SP. UNIT LAY. ERR.
	Special function access error	When FROM, TO instruction is executed	Stop / Run	Flicker / On	SP. UNIT ERROR
	Link parameter error	When power is switched on or reset performed When switched from STOP/PAUSE to RUN	Run	On	LINK PARA. ERROR
Battery error	Battery low	At any time (Not checked When M9084 is on)	Run	On	BATTERY ERROR
* Operation error		When the corresponding instruction is executed	Stop / Run	Flicker / On	OPERATION ERROR

4.1.7 Device list

A device is any contact, coil, or timer used in PC program operation.
A0J2HCPU devices and their range of use are shown below. Note the items marked "*" can be used by setting parameters for peripheral devices or by changing their range of use.
Set parameters compatible with the system to be used and its program. (Refer to 4.1.8 Parameters for details of parameter settings.)

Table 4.4 Device List

Device			Application Range (Number of points)		Explanation
	X	Input	X,Y0 to 1FF (512 points) The number of points usable by the I/O modules is 336 points (480 points when an extension base unit is added.)		Provides PC command and data from external device, e.g. pushbutton, select switch, limit switch, digital switch.
	Y	Output			Provides program control result to external device, e.g. solenoid, magnetic switch, signal light, digital display.
	M	Special relay	M9000 to 9255 (256 points)		Predefined auxiliary relay for special purpose and for use in the PC.
*		Internal relay	M0 to M999 (1000 points)	Number of Ms + Ls + Ss = 2048	Auxiliary relay in the PC which cannot be output directly.
*	L	Latch relay	L1000 to 2047 (1048 points)		Auxiliary relay in the PC which cannot be output directly. Backed up during power failure.
*	S	Step relay	Can be used by setting the parameter (0 point)		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 B3FF (1024 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 F255 (256 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 ms timer	T0 to T199 (200 points)		Up timers available in 100 ms, 10 ms and 100 ms retentive types.
		10 ms timer	T200 to T255 (56 points)		
		100 ms retentive timer	Can be used by setting the parameter (0 point)		
*	C	Counter	C0 to C255 (256 points)		Up counters available in normal and interrupt types.
		Interrupt counter	Can be used by setting the parameter (0 point)		
	D	Data register	D0 to D1023 (1024 points)		Memory for storing PC data.
		Special register	D9000 to 9255 (256 points)		Predefined data memory for special purpose.
	W	Link register	W0 to W3FF (1024 points)		Data register for use with data link. The range not set with link parameters can be used for data registers.
*	R	File register	Can be used by setting the parameter (0 point)		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	Index register	Z (1 point)		Used to modify devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, P).
	V		V (1 point)		
	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)		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.
			K-2147483648 to 2147483647 (32-bit instruction)		
	H	Hexadecimal constant	H0 to FFFF (16-bit instruction)		Used to specify the basic and application instruction values.
			H0 to FFFFFFFF (32-bit instruction)		

REMARK

The step relay (S) may be used in the same manner as the internal relay (M). The step relay is useful when writing a program which has two functions or applications, i.e., the step relay can be used specifically in accordance with the function or application, independently of the internal relay.

4.1.8 Parameter setting range list

Parameter setting involves specifying various PC functions and device ranges as well as assigning the user memory (32 k bytes). The set data is stored in the parameter memory area.
As shown in Table 4.5, default values can be used as set in parameter data. Setting ranges shown here can be changed depending on their purpose. Parameters are set with peripheral devices.
Refer to the operation manual of each peripheral device for parameter settings.

Table 4.5 Parameter Setting Range

Item \ Setting		Default Value	Setting Range	Valid Peripheral Devices			
				PU	GPP	HGP	PHP
Main sequence program area		6k steps	1 to 8k steps (in units of 1k step)	o	o	o	o
File register capacity		Absent	1 to 4k points (in units of 1k points)	o	o	o	o
Comment capacity		Absent	0 to 1600 points (in units of 64 points)	–	o	o	o
Status latch	Memory capacity	Absent	0/8 to 16k bytes	–	o	o	o
	Data memory		Absent/present				
	File register		Absent/present (2 to 8k bytes)				
Sampling trace	Memory capacity	Absent	0/8k bytes	–	o	o	o
	Device setting		Device number				
	Extension condition		Per scan				
			Per time				
	Sampling count		0 to 1024 times (in units of 129 times)				
Microcomputer program capacity		Absent	0 to 14k bytes (in units of 2k bytes)	–	o	o	o
Setting of latch (power failure compensation) range	Link relay (B)	Only for L1000 to 2047. Absent for others.	B0 to B3FF (in units of 1 point)	o	o	o	o
	Timer (T)		T0 to B255 (in units of 1 point)				
	Counter (C)		C0 to C255 (in units of 1 point)				
	Data register (D)		D0 to D1023 (in units of 1 point)				
	Link register (W)		W0 to W3FF (in units of 1 point)				
Setting of link range	Number of link stations	Absent	1 to 64	–	o	o	o
	Input (X)		X0 to X1FF (in units of 16 points)				
	Output (Y)		Y0 to Y1FF (in units of 16 points)				
	Link relay (B)		B0 to B3FF (in units of 16 points)				
	Link register (W)		W0 to W3FF (in units of 1 point)				
I/O assignment		Absent	X/Y0 to X/Y1FF (in units of 64 points)				
Setting of internal relay (M) latch relay (L) step relay (S) setting		M0 to M999 L1000 to L2047 Absent for S	M/L/S 0 to 2047 (M, L, S are serial numbers)	o	o	o	o
Watchdog timer setting		200 ms	10 ms to 2000 ms (in units of 10 ms)	o	o	o	o

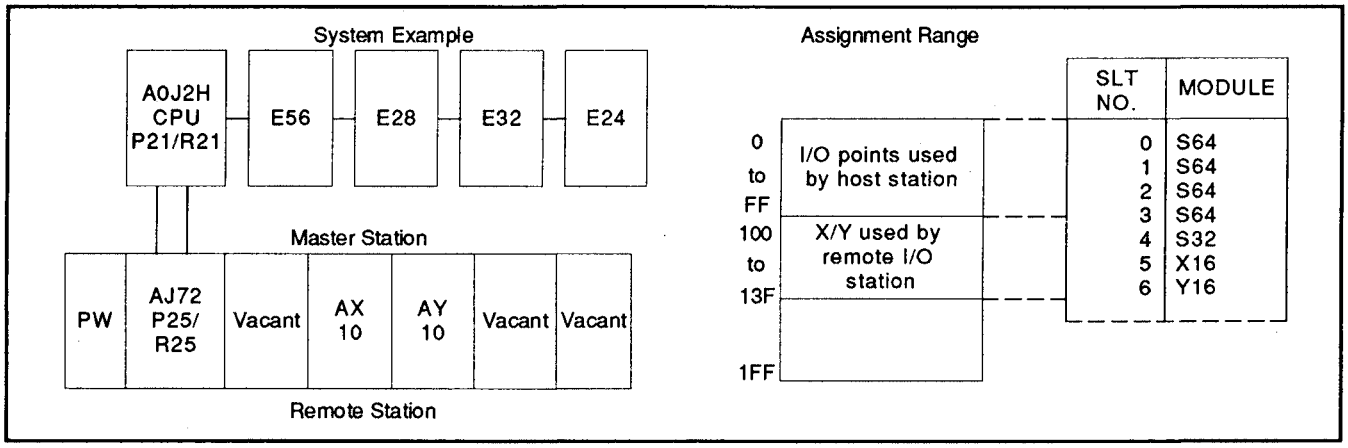
Table 4.5 Parameter Setting Range (Continued)

Item \ Setting		Default Value	Setting Range	Valid Peripheral Devices			
				PU	GPP	HGP	PHP
Setting of timer		100 ms: T0 to T199 10 ms: T200 to T255	256 points of 100 ms, 10 ms, and integrating timers (in units of 8 points) Timers have serial numbers.	o	o	o	o
Setting of counter		Not provided for interrupt counter	256 points (in units of 8 points) for counters and interrupt counters Must be consecutive numbers	–	o	o	o
Setting of remote RUN/PAUSE contact		Absent	X0 to X1FF 1 point for each of run and pause contacts. Setting of only pause contact cannot be performed	–	o	o	o
Operation mode at the time of error	Fuse blow	Continuation	Stop/continuation	–	o	o	o
	I/O verify error	Stop					
	Operation error	Continuation					
	Special function unit check error	Stop					
STOP → RUN display mode		Operation status prior to stop is re-output	Output before stop or after operation execution	–	o	o	o
Print title entry		Absent	128 characters with all keys of MELSAP	–	o	o	o
Keyword entry		Absent	* Max. 6 digits in hexadecimal (0 to 9, A to F)	o	o	o	o

REMARKS

(1) I/O assignment for A0J2HCPUP21/R21 is possible only for the remote I/O station that uses the AJ72P25/R25 data link module.
It is not allowed to change the number of I/O points by I/O assignment for the I/O modules connected to the A0J2HCPUP21/R21 and the remote I/O stations connected to the A0J2P25/R25 data link module.

(2) For the number of used points, vacant area, and M/L area (used for communications between a master and a local station) of an I/O module connected to the A0J2HCPUP21/R21 or A0J2 P25/R25, set them assuming that an arbitrary input module and/or output module is loaded or that a vacant slot exists.
In the system configuration as illustrated below, the I/O points X/Y0 to X/YFF used for the host station is assigned to vacant 64 points x 4 modules.



4.1.9 Memory capacity (main programs, file registers, comments, etc.) settings

The A0J2HCPU provides 32k bytes of user memory area (RAM).
Data for parameters, T/C set values, main programs, sampling trace, status latch, file registers, and comments can be stored in the user memory area.

(1) Calculating memory capacity

The user memory area should be used after determining the type of data to be stored and the memory capacity by using parameter settings.
Calculate the memory capacity according to Table 4.6.

Table 4.6 Parameter Settings and Memory Capacity

Item		Setting Unit	Memory Capacity	Storage onto ROM	Remark
Main program	Parameter, T/C set values	–	4k bytes (fixed)	Possible	Occupies 4k bytes for parameters and T/C set values
	Sequence program	1k steps	(Main sequence program capacity) x 2k bytes		
	Microcomputer program	2k bytes	(Main microcomputer program capacity) x k bytes		
Sampling trace		Not available/ available	0/8k bytes	Impossible	
Status latch	Data memory	Not available/ available	0/8k bytes		The memory capacity for file register status latch is determined by the number of file register points set using parameters.
	File registers	Not available/ available	(File registers' memory capacity) K bytes		
File registers		1k points	(File registers' number of points) x 2k bytes		
Comments		64 points	$\frac{\text{(Number of comments)}}{64}$ + 1k bytes		1k bytes is occupied by the system when setting comment capacity.

(2) User memory storage order

Each kind of data set by parameters is stored according to the following order. When the memory protect switch is turned ON, 20k bytes beginning with the head address is memory protected.
Be sure that the sampling trace area and the file register area are not within this 20k bytes memory protect range.

(a) The parameter area, T/C setting area, and main program area are stored in order from the head address of the user memory.

(b) Comments, file registers, status latch, and sampling trace are stored in order from the last address of the user memory.

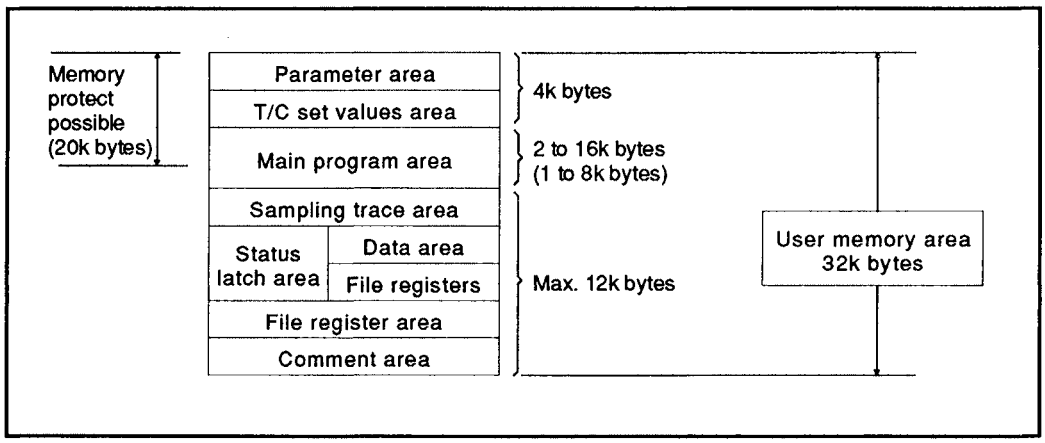


Fig. 4.3 User Memory Assignments

POINT

Even if parameters or the main sequence program is stored in ROM, the memory capacity of sampling trace, status latch, file registers, and comments cannot be increased.

4.2 Functions

Table 4.7 List of Functions

Function	Description	Refer to:
Constant scan	• Executes the sequence program at the predetermined intervals independently of the scan time. • Setting allowed between 10 and 2000 ms.	Section 4.2.1
Latch (power failure compensation)	• Retains device data if the PC is switched off or reset or momentary power failure occurs 20 ms or longer. • L, B, T, C, D and W can be latched	Section 4.2.2
Remote RUN/STOP	• Allows remote RUN/STOP from external device (e.g. peripheral, external input, computer) with RUN/STOP switch in RUN position.	Section 4.2.3

PAUSE	• Stops operation with the output (Y) status retained.
	• Pause function may be switched on by any of the following ways:
	  • Remote PAUSE contact
	  • Peripheral device
		Section 4.2.4

Status latch	• Stores all device data in the status latch area in the A2C when the status latch condition is switched on. • The stored data can be monitored by the peripheral device.	Section 4.2.5
Sampling trace	• Samples the specified device operating status at predetermined intervals and stores the sampling result in the sampling trace area in the A2C. • The stored data can be monitored by the peripheral device.	Section 4.2.6
Offline switch	• Allows the device (Y, M, L, S, F, B) used with the OUT instruction to be disconnected from the sequence program operation processing.	Section 4.2.7

4.2.1 Constant scan

Because the processing time of each individual instruction in a sequence program differs depending on whether or not the instruction is executed, the scan time differs accordingly for each scan.

The constant scan function sets such varying scan times to a fixed value regardless of the sequence program processing time.

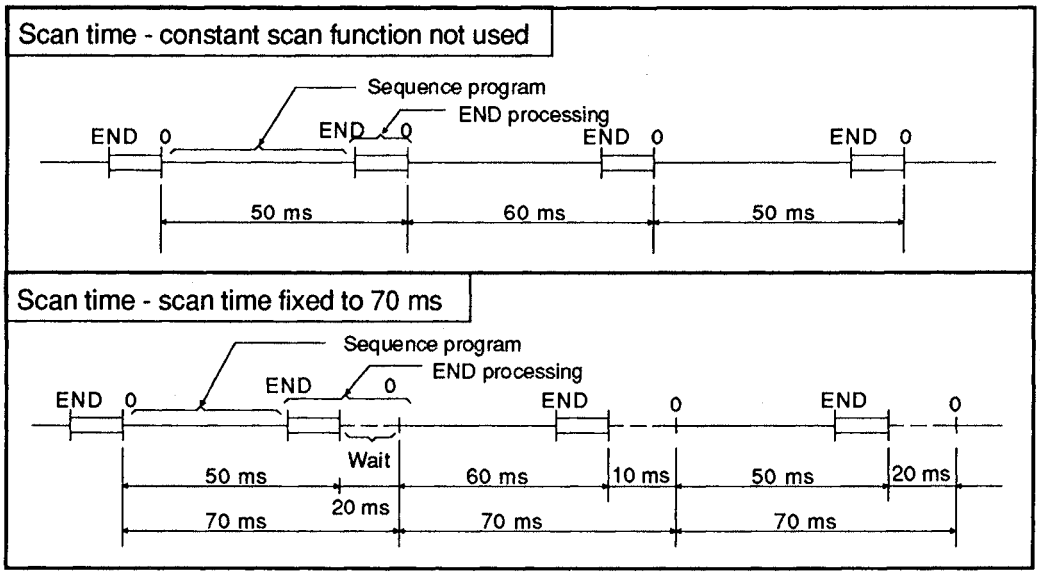


Fig. 4.4 Constant Scan Function

(1) Constant scan application

When executing simple positioning by turning output (Y) ON/OFF, since the ON/OFF timing of output (Y) differs for each scan, the positioning time may vary. When using the constant scan function, varying of the positioning timing can be decreased by the ON/OFF timing of output (Y).

(2) Setting range

(a) Constant scan time can be set in the range of 10 ms to 2000 ms.

Enter the required constant scan time to special register D9020 in units of 10 ms (setting value between 10 and 2000).

If D9020 is set outside the range of 1 ms to 200 ms, the constant scan time will be set as indicated below.

Setting for D9020	Constant Scan Time
–32768 to 0	Not set
1 to 200	10 ms to 2000 ms
201 to 32767	2000 ms

(b) The watch dog timer setting must be greater than the constant scan time setting.

If the watch dog timer setting is smaller than the constant scan time setting, a WDT error might occur.

The relationship between the constant scan time setting and the watch dog timer setting is indicated below.

(Constant scan time setting) ≤ (WDT setting) – 1

(c) The set constant scan time must be greater than the maximum scan time of the sequence program.

If the sequence program scan time is longer than the constant scan time, the constant scan function is not performed correctly.

(d) Set the constant scan setting to a value greater than the maximum scan time of the sequence program.

If the sequence program scan time is longer than the constant scan time, processing will be executed by the sequence program scan time and the constant scan time function will not perform correctly.

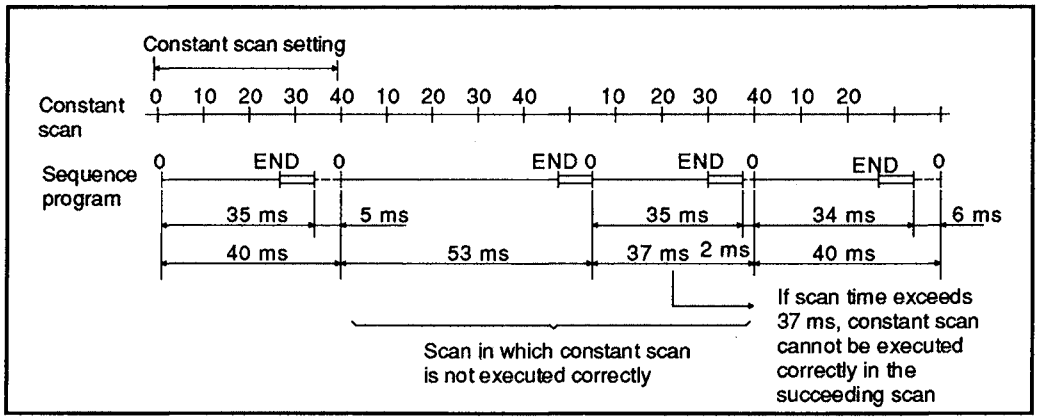


Fig. 4.5 Scan Time Larger than Constant Scan Setting

(3) Setting for constant scan execution

(a) Constant scan execution

A constant scan time setting is written to D9020 using the sequence program or the peripheral device.

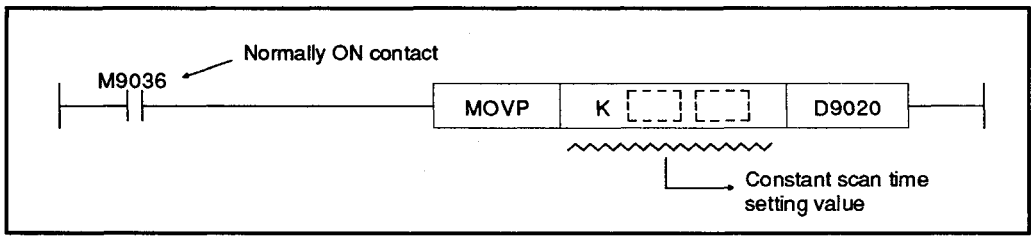
(b) Constant scan not executed

The value "0" is written to D9020 using the sequence program or the peripheral device.

(4) Caution

(a) The constant scan time setting value stored in D9020 is cleared to zero (0) when the A0J2HCPU is powered up or reset using the RUN switch.

Therefore, it is necessary to write the following program if constant scan is required from the first scan immediately after the A0J2HCPU is started or reset.



(b) If a momentary power failure within the allowable time occurs, the constant scan time is lengthened for the time of momentary power failure. Constant scan accordingly does not operate correctly.

(c) During constant scan time processing, the following interrupt processing are allowed.

Interrupt	Processing Time
I/O interrupt	AD51(S3) general data processing : 0.2 ms to 0.5 ms Interrupts from AI61 or AD51(S3) : 0.2 ms + (interrupt program execution time of 10 to 117)
10 ms interrupt	1.0 ms + interrupt program execution time of I29 to I31
Interrupt from peripheral devices	0.2 ms

When the above interrupts overlap, the interrupt processing time becomes the total of the overlapping interrupts.

4.2.2 Power failure compensation for device data in the A0J2HCPU (LATCH function)

Each individual device of the A0J2HCPU is reset when the A0J2HCPU is powered up. Device will be cleared when a momentary power failure occurs for more than 20 ms. After being reset or cleared, all device data is reset to the default values (OFF for bit devices and 0 for word devices).

The latch function retains the device data in the event that the A0J2HCPU is reset by turning on the power or pressing using the RUN switch or a momentary power failure occurs for more than 20 ms.

Sequence program operation is the same regardless whether the data is latched or not.

(1) Latch application

The latch function retains device data upon turning ON the A0J2HCPU power supply, resetting using the RUN key switch, or when a momentary power failure of 20 ms or longer occurs.

Sequence program operation is the same regardless of whether or not there is latching.

(2) Latch devices and latch range setting

(a) The devices whose data can be latched are listed below:

1) Latch relay (L0 to L2047)

2) Link relay (B0 to B3FF)

3) Timer (T0 to T255)

4) Counter (C0 to C255)

5) Data register (D0 to D1023)

6) Link register (W0 to W3FF)

POINTS

Device date within the latch range is backed by the battery (A6BAT) installed to the A0J2HCPU.

(1) The battery is required even when operation is performed using a ROM which stores the sequence program.

(2) Device data within the latch range is corrupted if the battery connector is disengaged from the A0J2HCPU when the A0J2HCPU is being turned off.

(3) Clearing the latched data

(a) To clear the latched data to the initial value, "latch clear" is performed. "Latch clear" clears unlatched device data also, as mentioned below.

After the latch clear operation, the data in the each device is set to the following:

i) Y, M/L/S, F, B	: Turned off.
ii) Special relays (9000 to 9255)	: Data is retained.
iii) T, C	: Contacts and coils are turned off; present value is set to 0.
iv) D, Z, V, W, A	: Data is set to zero.
v) R	: Data is retained.
vi) Special registers (9000 to 9127)	: Data is retained.

(b) Latched data can be cleared in either of the following two methods.

1) Using the RUN switch

i) Turn the RUN switch from the STOP position to the L.CLR position three times.

ii) The RUN LED starts flashing. This indicates that the latched data is ready to be cleared.

iii) Turn the RUN switch from the STOP position to the L.CLR position while the RUN LED is flashing; the latched data is cleared.

POINT

To cancel the data latch clear operation, turn the RUN switch to the RUN or RESET position while latch clear operation is being attempted.

(1) RUN position : The A0J2HCPU starts operation in the same manner as when the RUN switch is placed in the RUN position from the STOP position.

(2) RESET position : The A0J2HCPU is reset.

2) Using GPP/PHP/HGP

"ALL DEVICE CLEAR" of the test functions in the PC mode can be used for latch clear.
(For details, read the GPP/PHP/HGP Operating Manual.)

4.2.3 Running and stopping the A0J2HCPU from external devices (remote RUN/STOP function)

The RUN switch is used for A0J2HCPU RUN/STOP control.
The operation "remote RUN/STOP" means controlling of A0J2HCPU run/stop with external signals (peripheral devices, remote RUN contact) with the RUN switch placed in the RUN position.

(1) Application of remote RUN/STOP

Remote RUN/STOP control is possible in the following cases.

(a) The A0J2HCPU is out of reach.

(b) The A0J2HCPU is located in a control box.

(2) Executing remote RUN/STOP

Remote RUN/STOP operation is possible by the following methods:

(a) Remote RUN contacts

Remote RUN/STOP control is possible by turning on and off the remote RUN contacts which are set with parameters.

1) When remote RUN contacts is turned OFF, the A0J2HCPU is set to the RUN state.

2) When remote RUN contacts is turned ON, the A0J2HCPU is set to the STOP state.

Switching between RUN and STOP is executed after END(FEND) execution.

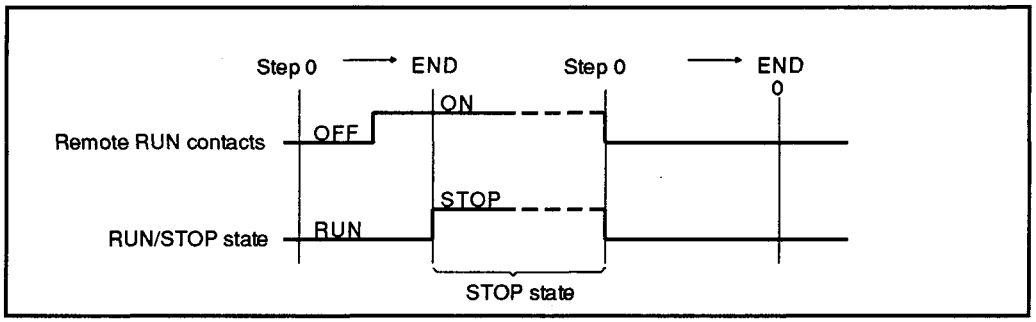


Fig. 4.6 Remote RUN/STOP Timing Using the Remote Run Contacts

(b) A0J2HCPU RUN/STOP operation is executed by specifying remote RUN/STOP from a peripheral device, computer link module, or the AD51(S3).

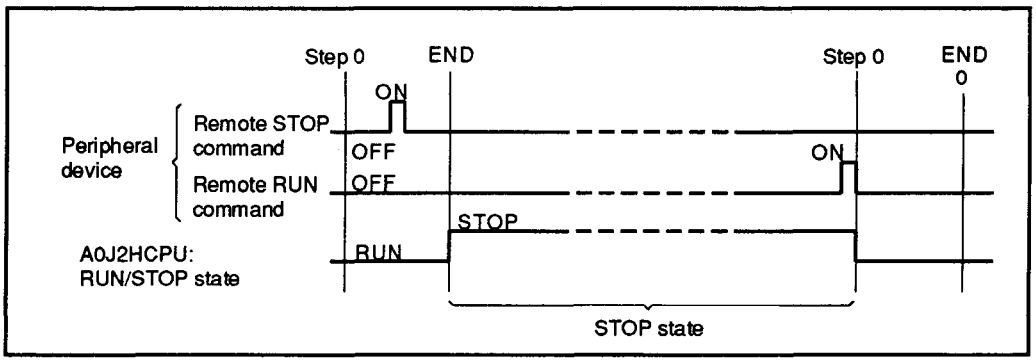


Fig. 4.7 Remote RUN/STOP Timing Using the Remote RUN/STOP Command from a Peripheral Device

(3) Caution

(a) Note the following points because the A0J2HCPU gives priority to the STOP command.

1) The A0J2HCPU is set to the STOP state when the STOP command is given from the remote RUN contact, a peripheral device, computer link module, or the AD51(S3).

2) To set the A0J2HCPU from the STOP state back to the RUN state, it is necessary to set all external factors (remote RUN contact, peripheral device, computer link module, or the AD51(S3)) which caused the remote STOP to the RUN state .

4.2.4 Stopping the sequence program operation retaining outputs (PAUSE function)

The pause function stops A0J2HCPU operation while retaining the status of all outputs (Y).

(1) Application

In process control, it is often required retain the status of the outputs (Y) when the A0J2HCPU stops operating.

(2) Using remote PAUSE contacts

(a) The PAUSE state contacts (M9041) close after the execution of the END(FEND) instruction of the scan during which the remote PAUSE contacts close and the PAUSE permission flag (M9040) is set.

When the END(FEND) instruction of the scan after M9041 has set is executed, the A0J2H is set to PAUSE and its operation stops.

(b) By opening the remote PAUSE contacts or by switching off M9040 on a external device, peripheral device, computer etc.) the PAUSE state is canceled, and sequence program operation resumes from step 0.

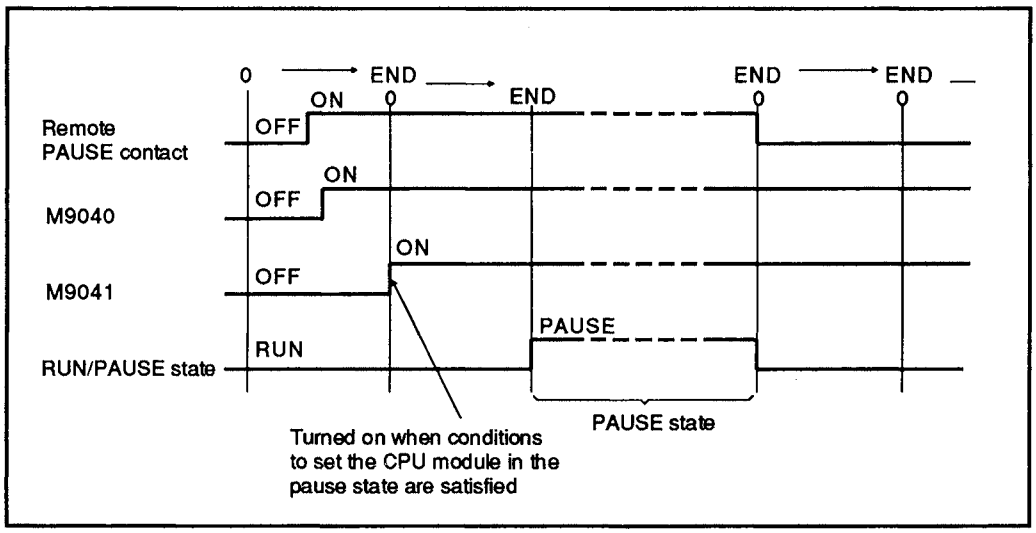


Fig. 4.8 PAUSE Timing by the Remote PAUSE Contact

(3) Peripheral device

(a) The PAUSE state contacts (M9041) close after the execution of the END(FEND) instruction of the scan during which the remote PAUSE command from a peripheral device is received.

When the END(FEND) instruction of the scan after M9041 has set is executed, the A0J2H is set to PAUSE and its operation stops.

(b) When the remote RUN command from a peripheral device is received, the PAUSE state is canceled, and sequence program operation resumes from step 0.

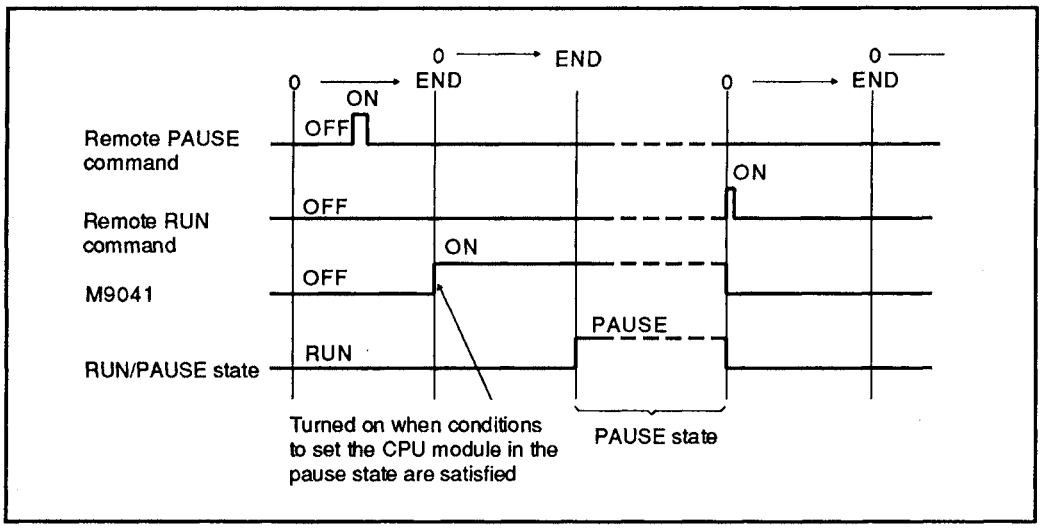
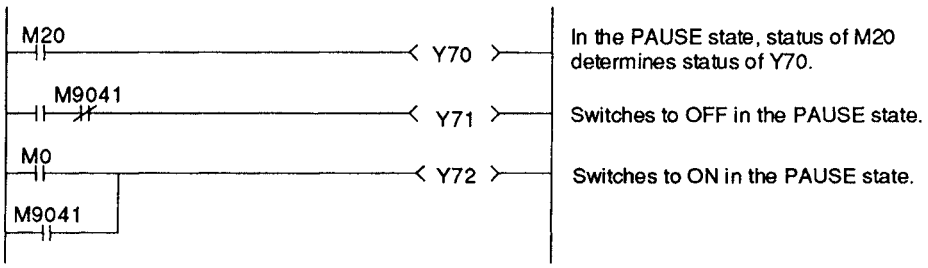


Fig. 4.9 PAUSE Timing by a Peripheral Device

POINT

To switch on or off the output (Y) in the PAUSE state, take interlock with the PAUSE state contacts (M9041).



4.2.5 Status latch

The status latch function retains the data of all devices using the sequence program to execute temporary device states which cannot be verified on peripheral device monitors.
Data retained by status latch can be monitored by reading to the GPP/PHP/HGP.

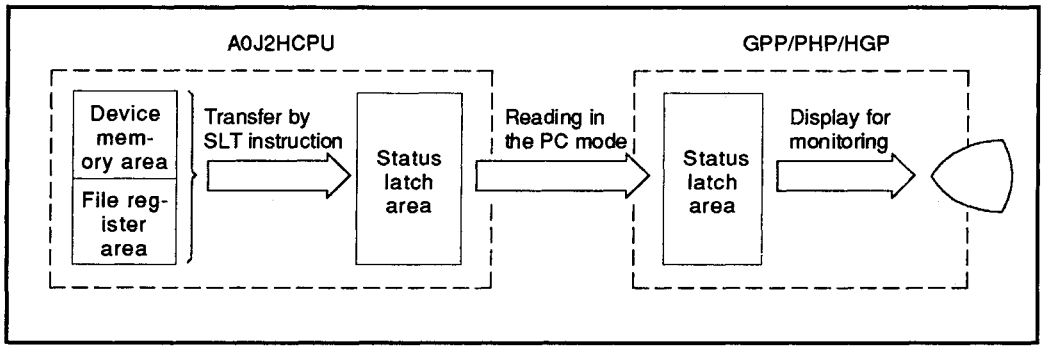


Fig. 4.10 Status Latch Sequence

(1) Application

The status latch function can be used to check the device data when a fault condition exists during debugging.

It is also used to find causes when a fault condition exists during sequence program execution by making a program that will execute the SLT instruction if such a condition exists.

(2) Processing

(a) The following data is stored in the status latch area when the SLT instruction is executed.

1) Device memory

X, Y, M, L, S, F, B	:ON/OFF data
T, C	: Contact and coil ON/OFF data and present value
D, W, A, Z, V	: Stored data

2) File register (R) : Stored data

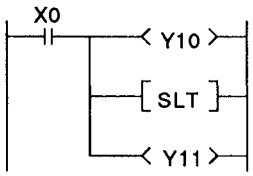
(b) Data is stored to the status latch area when the SLT instruction is executed.

With devices which turn on/off or store data using the same condition, the data to be stored in the status latch area differs before and after the execution of the SLT instruction.

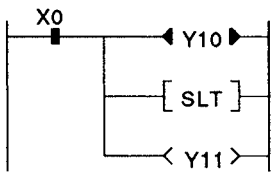
Example:

If a device which turns on and off with the same condition is present before and after the SLT instruction in a program, the ON/OFF state will differ before and after the execution of the SLT instruction.

[Circuit example]



[Monitor display of status latch data]



When the SLT instruction is executed, Y10 is ON; ON is displayed for the monitor.

When the SLT instruction is executed, Y11 is OFF; OFF is displayed for the monitor.

(3) Caution

(a) Execution of the SLT instruction causes the scan time to be increased by the value indicated below.

Therefore, take this in consideration when determining the watch dog timer setting and constant scan time setting for the A0J2HCPU taking these into consideration.

	Device Memory Only	Device Memory and File Register
Processing time (ms)	11	21

4.2.6 Sampling trace

It is not possible to check the transition of the ON/OFF state for bit devices and the data in the word devices with a peripheral device monitor function.

The sampling trace function samples data from the designated devices at fixed intervals and stores the sample data to the sampling trace area.

Upon execution of the STRA instruction, the data stored in the sampling trace area is sampled for the designated number of times and the device data is latched.

It is possible to monitor the data stored in the sampling trace area by reading it with the GPP/PHP/HGP.

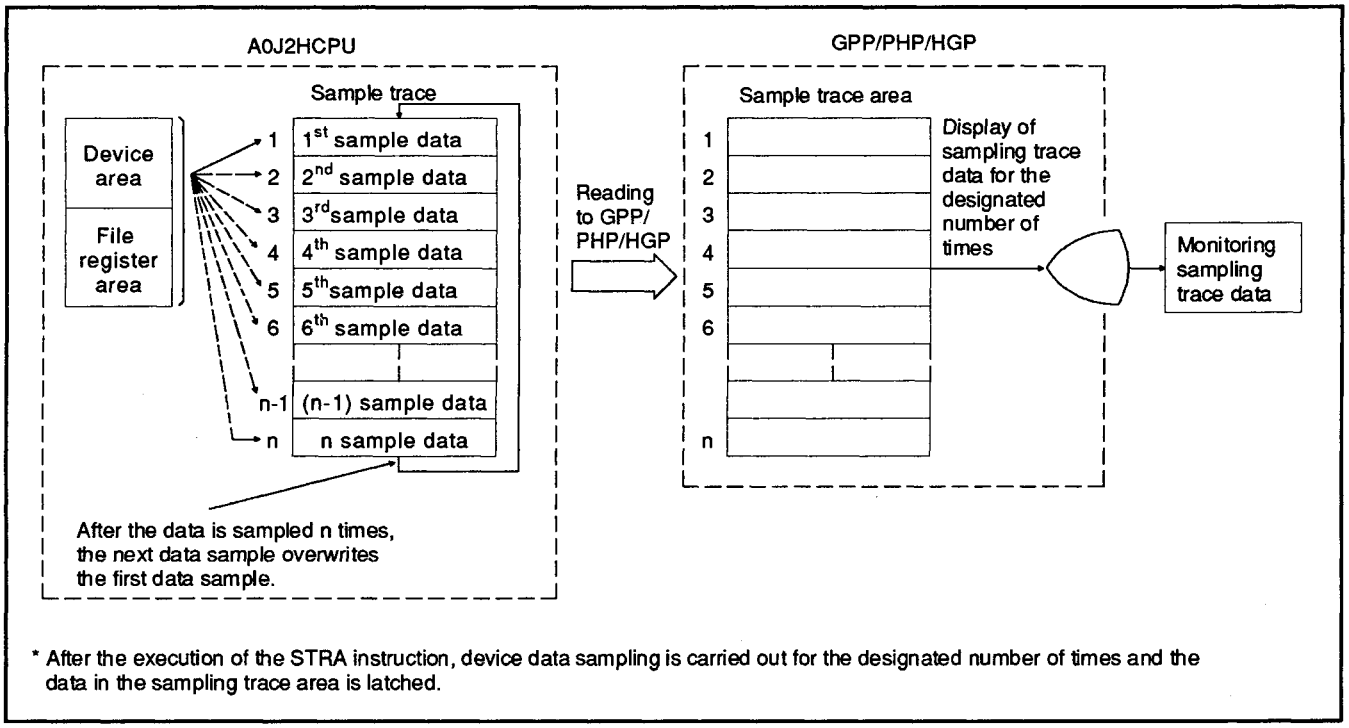


Fig. 4.11 Sampling Trace

(1) Application

By using the sampling trace function, it is possible to shorten debugging time by confirming the data of the designated devices in defined intervals during debugging.

(2) Devices which can be sampled

Devices and the number of points which can be sampled are indicated below.

(a) Bit devices

(X, Y, M, L, S, F, B, T/C coil, T/C contact).....Max. 8 points

(b) Word devices

(T/C present value, D, W, R, A, Z, V).....Max. 3 points

(3) Number of sampling times

The number of sampling times involves the following two cases: total number of sampling times and the number of sampling times after the execution of the STRA instruction.

(a) Total number of sampling times

This sets the area where the sampling data is stored.

Setting is possible in the range of 0 to 1024 times (in units of 128 times).

(b) Number of sampling times after the execution of the STRA instruction

This setting is used to end the sampling trace and latch the sampling trace data after the execution of the STRA instruction.

Setting is possible in the range of 0 to 1024 times in units of 128 times.

The number of sampling times after the execution of the STRA instruction	≤	Total number of sampling times	≤	1024 times

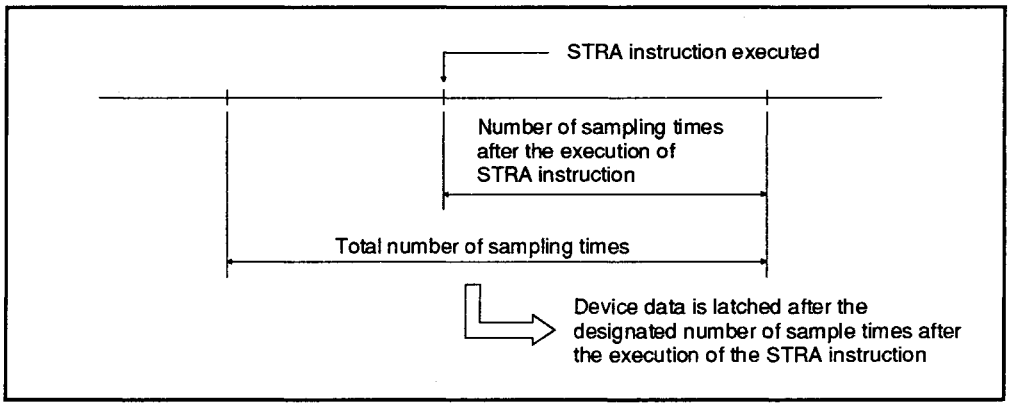


Fig. 4.12 Number of Sampling Times

(4) Sampling intervals

Sampling intervals are set in one of the following methods: after the execution of END instruction or in defined intervals.

(a) After execution of END instruction

Sampling trace data is taken each time the END instruction of the sequence program is executed.

(b) In defined intervals

Sampling trace data is taken in defined intervals, 10 x n ms (n: 0 to 199).

(In this setting, sampling trace data is even taken during the execution of a sequence program.)

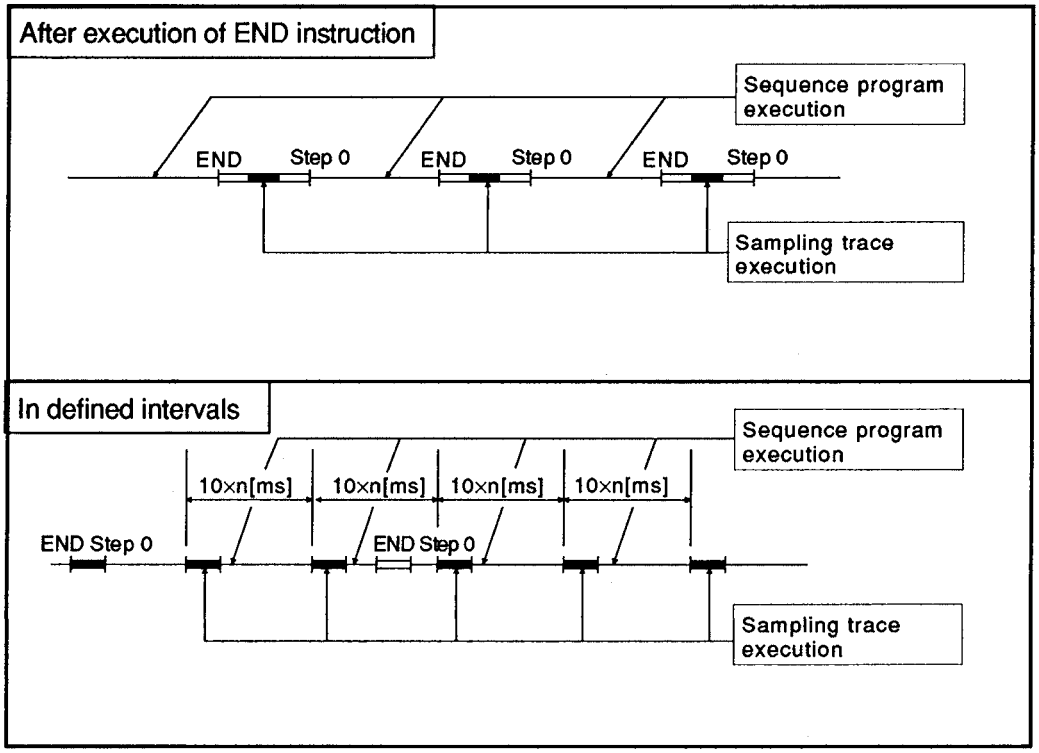


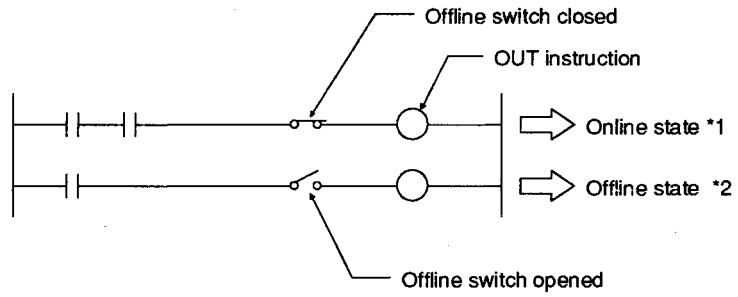
Fig. 4.13 Execution of Sampling Trace

4.2.7 Forcibly switching the OUT instruction ON/OFF from a peripheral device during RUN (Offline switch function)

While the A0J2HCPU is running (sequence program being executed), it is possible to turn the sequence program OUT instruction devices on and off with a peripheral device test function.

The offline switch function allows these devices to be turned on and off while the A0J2HCPU is running with a peripheral device the test function.

It is possible to check operation of OUT instruction devices, which are not turned on/off by the sequence program, and to check the wiring between the output module and an external device with the offline switch function.



*1 : The online state is established when the offline switch is closed.
The OUT instruction device is controlled (turned ON/OFF) by the sequence program.
*2 : The offline state is established when the offline switch is opened.
The OUT instruction is is olated from the sequence program. In the offline state, it is not possible to control the OUT devices by the sequence program.

Fig. 4.14 Offline and Online State

(1) Devices which can be used by the offline switch function

The devices which can be used by the offline switch function are indicated below:

(a) Outputs (Y)

(b) Internal relays (M)

(c) Latch relays (L)

(d) Step relays (S)

(e) Link relays (B)

(f) Annunciators (F)

(2) Status of devices in the offline state

The device status in the offline state (offline switch opened) is described below.

(a) The ON/OFF state that exists before just before the offline state is established is retained.

(b) When a forced set/reset is conducted using a peripheral in the offline state, the reset/set state after the forced set/reset is retained.

(3) Operation procedure

(a) To set the A0J2HCPU in the offline state, set the offline switch with a peripheral device.

(b) To return the A0J2HCPU back from the offline state to the online state, use either of the following two methods.

1) Reset the offline switch setting with a peripheral device.

2) Reset the A0J2HCPU with the RUN key-switch.

POINTS

(1) Devices set in the offline state cannot be turned ON/OFF with a sequence program.
The devices set in the offline state during testing, must be returned to the online state by resetting the offline switch after the completion of test operation.

(2) The devices returned from the offline state to the online state can be turned ON/OFF with a peripheral device.
Before returning these devices to the online state, check the input conditions of an OUT instruction. Return to the online state after making sure that no problems will arise when the devices are returned to the online state.

4.3 Assignment and Concept of I/O Numbers

I/O number assignment is one of the system configuration requirements. Wrong assignment results in failure. This section explains the I/O number assignment and concept of A0J2HCPU system.

(1) The maximum number of I/O points for the A0J2HCPU is 336 (or 480 if using an extension base unit).

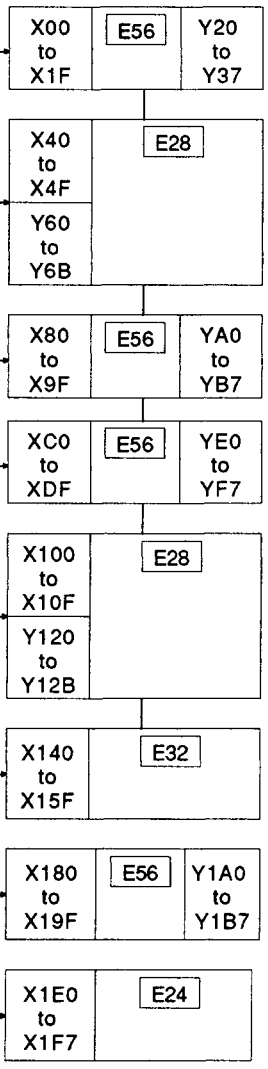
(2) X and Y represent input and output, respectively. I/O numbers are addressed in hexadecimal. (0 to F)

(3) I/O numbers are determined by the I/O module numbers in each I/O modules. One module occupies 64 points.

(4) When extension base unit (A6[ ]B(S1), A5[ ]B(S1)) is used, be sure to start I/O numbers with X/Y100. One I/O module loaded in extension base unit occupies 64 points.

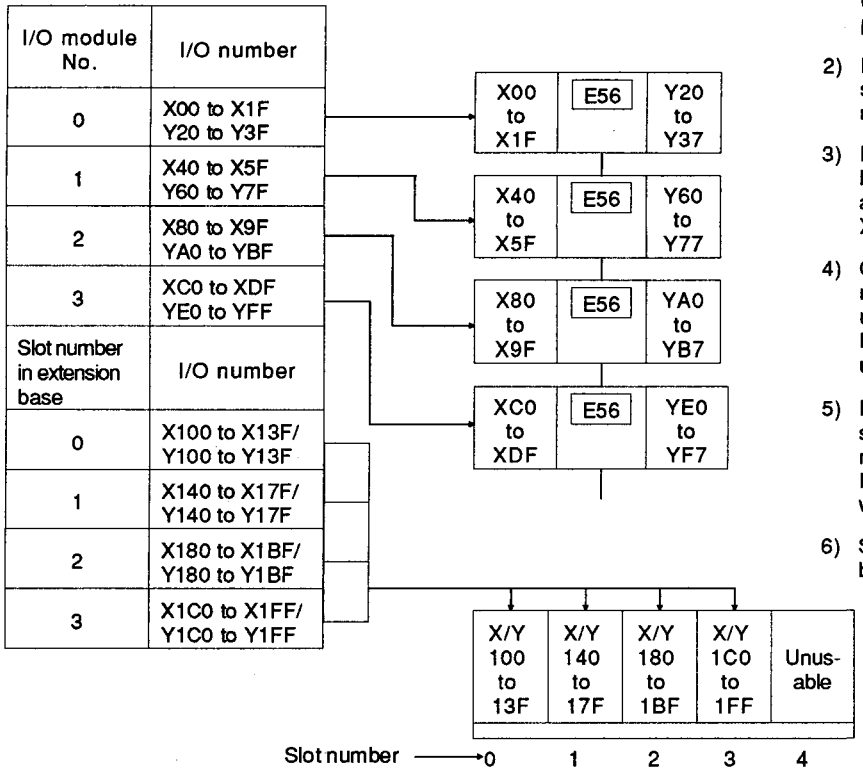
I/O number assignment in A0J2HCPU system

I/O module No.	I/O number
0	X00 to X1F Y20 to Y3F
1	X40 to X5F Y60 to Y7F
2	X80 to X9F YA0 to YBF
3	XC0 to XDF YE0 to YFF
4	X100 to X11F Y120 to Y13F
5	X140 to X15F Y160 to Y17F
6	X180 to X19F Y1A0 to Y1BF
7	X1C0 to X1DF Y1E0 to Y1FF



1) 1 module occupies 64 I/O points.
2) I/O numbers are determined by I/O module numbers (0 to 7). (For I/O module number setting, refer to Section 3.2.2 of User's Manual (I/O Module Edition).)
3) A maximum of 8 I/O modules may be connected.
4) 1 module occupies 64 I/O points. Therefore, for example, when 24-point module is used, 40 points are not used. In this case, if I/O module is changed, it is not necessary to change the presently used I/O numbers.
5) Output number corresponding to input number and unused number may be used as internal memory (M). However, these numbers cannot be used for input dedicated module.
6) Exercise care so that the same I/O module numbers are not used in a system. If the same numbers are used, the same I/O numbers will exist, resulting in failure.

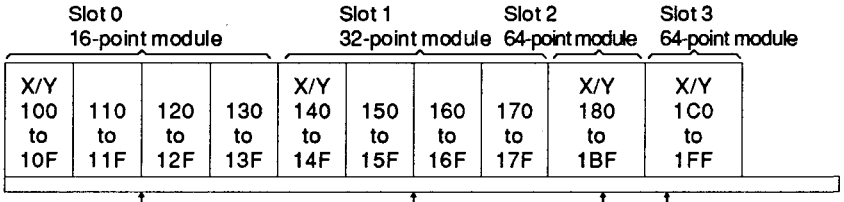
I/O number assignment in extension base unit combined system



1) 1 unit (this also applies to I/O module in extension base) occupies 64 I/O points.
2) In extension base unit combined system, a maximum of four A0J2 I/O modules may be connected.
3) Extension base unit should always be located at the final stage of system and its I/O number should begin with X/Y100.
4) Output number corresponding to input number and unused number may be used as internal memory (M). However, these numbers cannot be used for input dedicated modules.
5) In extension base unit combined system, a maximum of four A0J2 I/O modules may be connected. In this case, set I/O module numbers with 0 to 3.
6) Set the stage number of the extension base unit at "1".

Restrictions on extension base unit

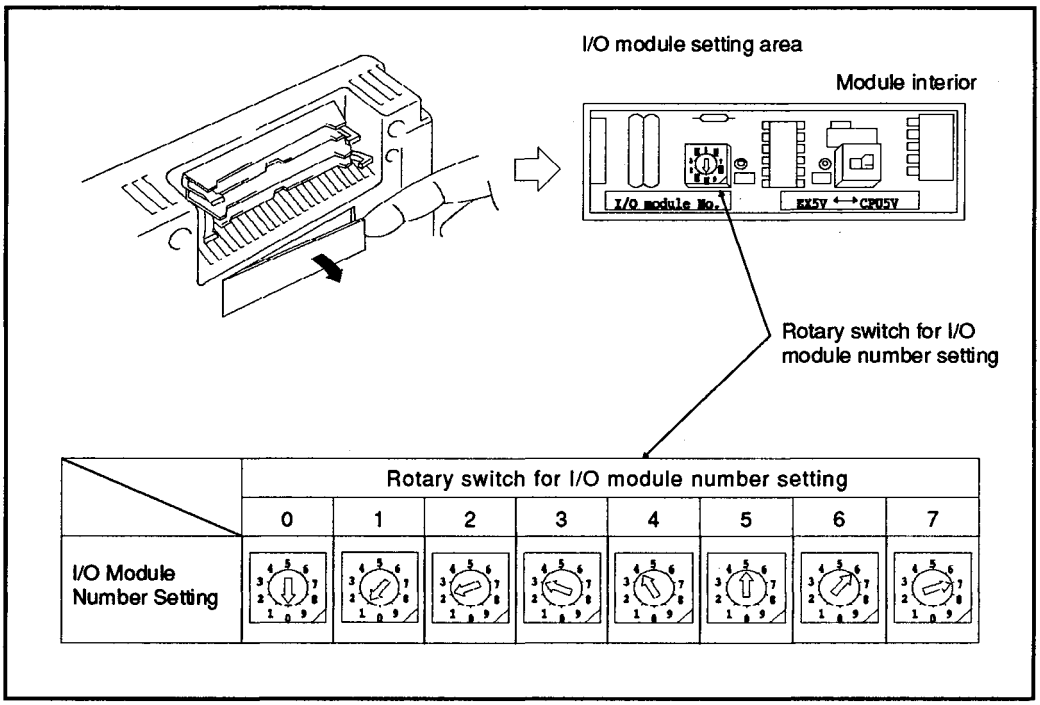
1) In extension base unit, only slots 0 to 3 are usable.
2) Irrespective of used I/O modules, 1 slot occupies 64 points. (Vacant slot also occupies 64 points.) Output number corresponding to input module cannot be used as internal memory (M).
3) When 64-point I/O module is not used (e.g. 16 or 32 point module), observe the following points:



- When a 64-point module is used, there is no restriction.
- When a 32-point module is used, the latter half 32 points are not used. Actually, however, the first half 32 points and the latter half 32 points overlap with each other and CPU makes access. Therefore, if the latter half I/O numbers are accidentally used in a program, the overlapping first half I/O number area is actually accessed.
  For example, 160 overlaps with 140 and 170 with 150.
- When a 16-point module is used, the latter 48 points are not used. Actually, however, four 16 point modules overlap with each other. For example, if any of 110, 120, and 130 is accessed, 100 is accessed actually. Be sure to use actual I/O numbers in a program. In the example shown on the left, X/Y100 to 10F are actual I/O numbers.

REMARK

Set I/O module numbers using the rotary switch for I/O module number setting (I/O MODULE NO) located in the cover of the I/O module setting area.



4.4 Handling instructions

This section explains the handling instructions for the unpacking to installation of PC main unit, memory, battery, etc.

(1) Since the case, terminal block connector, and pin connector of this PC are made of plastic, do not drop or subject to mechanical shock.

(2) Do not remove the printed circuit board of any unit from its case. Removal may cause board damage.

(3) When wiring, take care to prevent entry of wire offcuts into the unit. If any conductive debris has entered the unit, make sure that it is removed.

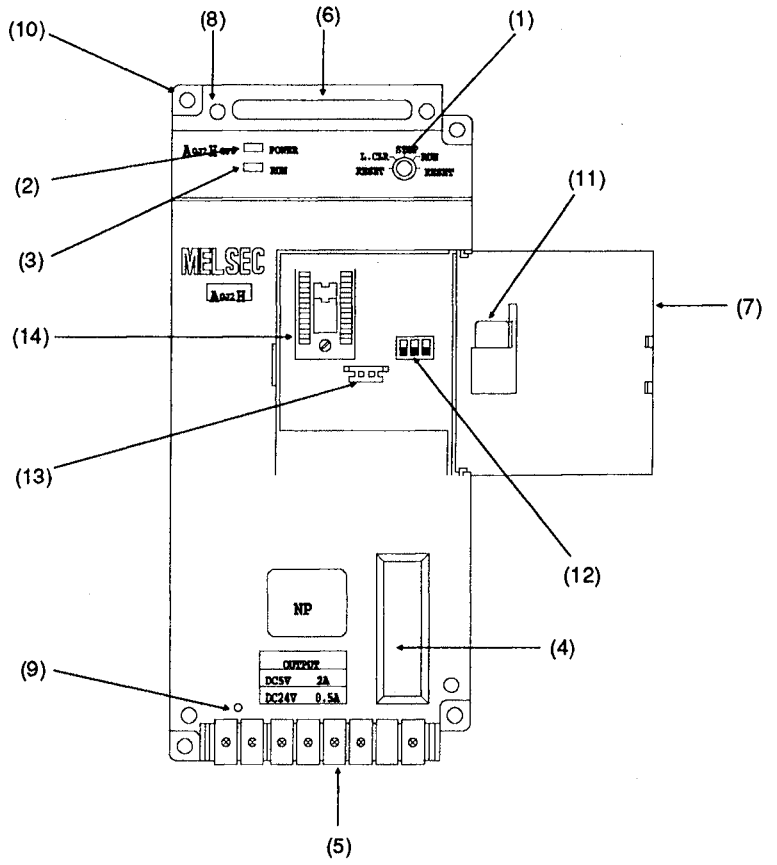
(4) Tighten the unit mounting screws and terminal screws in the following ranges.

Screw	Tightening Torque Range N·cm (Kg·cm) [lb·inch]
I/O module terminal block terminal screw (M3 screw)	49 to 78 (5 to 8) [4.35 to 6.93]
I/O module terminal block mounting screw (M4 screw)	78 to 137 (8 to 14) [6.93 to 12.17]
CPU module terminal block screw (M4 screw)	98 to 137 (10 to 14) [8.71 to 12.17]
Module mounting screw (not required normally) (M4 screw)	78 to 118 (8 to 12) [6.93 to 10.48]

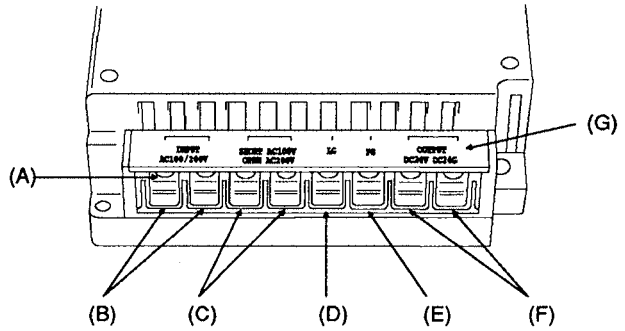
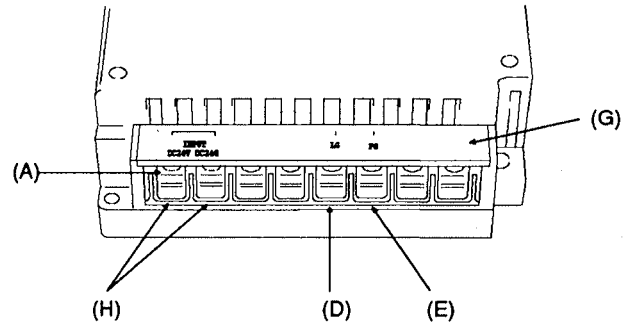
4.5 Part Identification and Setting of A0J2HCPU

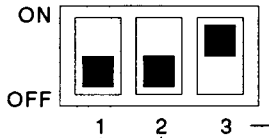
4.5.1 Part identification

(1) A0J2HCPU



No.	Name	Function
(1)	RUN/STOP key switch	• RUN/STOP : To start/stop running a sequence program. • RESET : To reset an error occurring during operation to initialize operation. • LATCH CLEAR : 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 4.2.2.
(2)	POWER LED	• ON : 100/200 VAC is supplied to the A0J2HCPU and converted into 5 VDC correctly. • OFF: 100/200 VAC is not supplied to the A0J2HCPU. Supplied 100/200 VAC is not converted into 5 VDC correctly.To reset the hardware.

<table>
<tr><th>No.</th><th>Name</th><th>Function</th></tr>
<tr><td>(3)</td><td>RUN LED</td><td>• 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 A0J2H.
• The RUN key switch is in the STOP position.
• The remote STOP signal is input.
• The remote PAUSE signal is input.
• Flash: The RUN LED flashes in the following cases.
• An error which causes sequence operation to stop is detected by the self-diagnosis function. ...ON for 0.5 sec, OFF for 0.5 sec.
• The latch clear operation is executed. ...ON for 0.2 sec., OFF for 0.2 sec.
• When an annunciator (F) is set. (only when M9048 is ON) ...ON for 2 sec., OFF for 0.5 sec.</td></tr>
<tr><td>(4)</td><td>RS-422 connector</td><td>• 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.</td></tr>
<tr><td rowspan="2">(5)</td><td rowspan="2">Terminal block for power supply</td><td>With A0J2H
 
</td></tr>
<tr><td>With A0J2H-DC24
 
</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Function</th></tr>
<tr><td>(5)</td><td>Terminal block for power supply</td><td>
<table>
<tr><td>(A)</td><td>Terminal screw
M4 × 0.7 × 8</td></tr>
<tr><td>(B)</td><td>Power input terminals
Connect 100 V/200 VAC power supply.</td></tr>
<tr><td>(C)</td><td>Operating voltage selecting terminal
When 100 VAC is applied, cause short across terminals with the furnished short-circuit chip.
For applying 200 VAC, do not cause short across the terminals. 100 VAC or 200 VAC can be selected by using the short-circuit chip.</td></tr>
<tr><td>(D)</td><td>LG terminal
Ground terminal for power filter.</td></tr>
<tr><td>(E)</td><td>FG terminal
Connected with shielding pattern on the printed circuit board.</td></tr>
<tr><td>(F)</td><td>24 VDC, 24
Terminals for 24 VDC input or for supplying internal power supply of relay and transistor outputs.
(Supplied to unit using external wiring.)</td></tr>
<tr><td>(G)</td><td>Terminal cover
Protect the terminal block. Must be kept on the terminal block except during wiring.</td></tr>
<tr><td>(H)</td><td>Power supply input terminals
Terminals for connection of the 24 VDC power supply.</td></tr>
</table>
</td></tr>
<tr><td>(6)</td><td>Connector for I/O or extension cable</td><td>• For sending and receiving signals to and from the I/O module and extension base unit. Used to connect I/O cable (A0J2C0 [ ]) or extension cable (A0J2C[ ][ ]B).</td></tr>
<tr><td>(7)</td><td>Cover</td><td>• Protects A0J2HCPU printed circuit board, EP-ROM, battery, etc.
• Execute the following operations with the cover open.
• EP-ROM connection/disconnection
• Setting of memory to be used (EP-ROM)
• Connection to battery connector
• Battery replacement</td></tr>
<tr><td>(8)</td><td>Cover mounting screw</td><td>• Fixes the front cover.</td></tr>
<tr><td>(9)</td><td>Peripheral device fixing screw</td><td>• Fixes the peripheral device</td></tr>
<tr><td>(10)</td><td>Module mounting hole</td><td>• Fixes the module onto a panel, such as a control panel, or used to mount I/O module.</td></tr>
<tr><td>(11)</td><td>Battery</td><td>Retains data such as programs, device latch ranges, file registers, etc. (Refer to 6.2 for battery replacement.)</td></tr>
<tr><td>(12)</td><td>Dip switch</td><td>Turns memory protect ON/OFF and switches ROM/RAM operations and I/O control systems.
 

At the time of delivery,
Dip switches are set as follows.
Switch 1, 2 OFF
Switch 3 ON
I/O control switching switch
Memory switching switch
Memory protect switch</td></tr>
</table>

No.	Name	Function
(13)	Battery connector	For connection to the battery
(14)	Memory installation socket	Socket for mounting EP-ROM

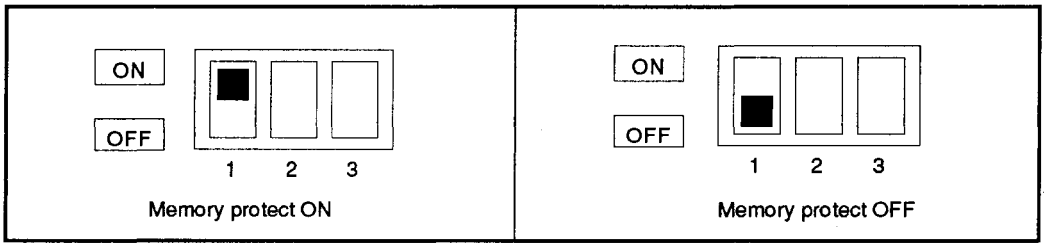
4.5.2 Parts settings

Be sure to turn the A0J2HCPU power supply OFF before setting each part.

(1) Memory protect switch setting

The memory protect switch prevents overwriting of RAM memory data due to peripheral device malfunction. The memory protect range is the first 20k bytes of 32k bytes of the user memory area.

This switch is used to prevent overwriting and deleting the program once it has been written. When modifying RAM memory data, turn the memory protect OFF.



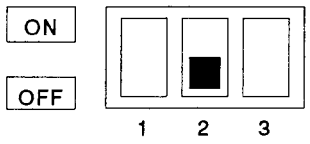
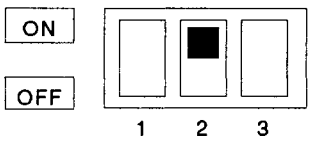
POINTS

(1) Do not execute memory protect when sampling trace or status latch are executed. If executed, protected data cannot be stored in memory.

(2) Turn the memory protect switch OFF during ROM operation. If turned ON during ROM operation, a MEMORY PROTECT ERROR will occur.

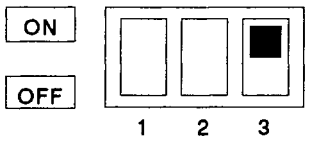
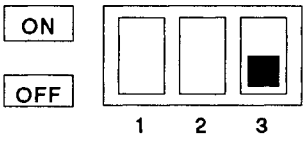
(2) Memory switching switch setting

Set RAM and ROM operations matching memory to be used by using this switch.

Internal RAM operation		1) Set RAM and ROM operations before loading memory. 2) To set RAM operation, turn switch 2 OFF. 3) To set ROM operation, turn switch 2 ON. Turn switch 1 OFF when setting ROM operation.
ROM operation		

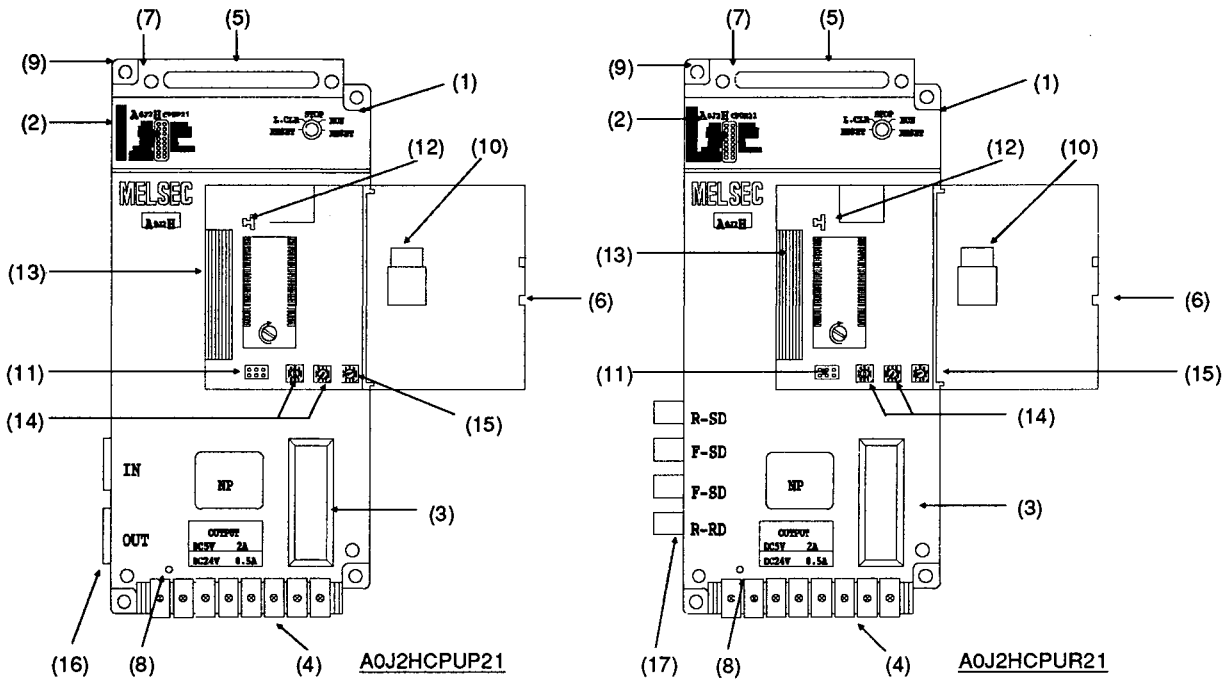
(3) I/O control switching switch

The I/O control system has a direct and a refresh mode. Set the mode using switch 3.

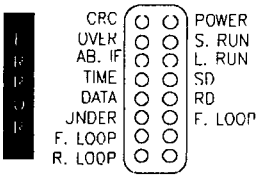
Direct mode for both input and output		1) When using the direct mode for both input and output, turn switch 3 ON. 2) When using the refresh mode for both input and output, turn switch 3 OFF.
Refresh mode for both input and output		

4.6 Part Identification and Setting of A0J2HCPUP21/R21

4.6.1 Part identification

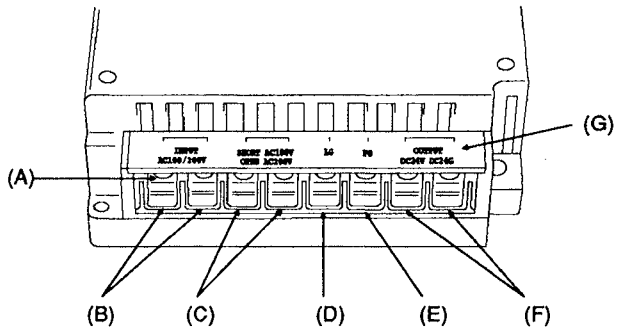


No.	Name	Use
1	RUN/STOP key switch	• RUN/STOP : Executes/stops sequence program operation. • RESET : Resets hardware. Resets after an occurrence of operation error and initializes for sequence program operation. • LATCH CLEAR: Clears (turning OFF or resets to "0") the data in the parameter set latch area. With the LATCH CLEAR operation, data in other than the latch area is also cleared. For latch clear operation, refer to Section 4.2.2.
2	Operation status and error indication LEDs	



LED	Description	LED	Description
CRC	Lit when code error check is executed.	POWER	Lit when power is turned ON.
OVER	Lit at an occurrence of data entry delay error.	S.RUN	Lit when sequence program operation is being executed.
AB. IF	Lit when all data is "1".	L.RUN	Lit when data link is normal.
TIME	Lit at an occurrence of time over error.	SD	Lit when data is being received.
DATA	Lit at an occurrence of receive data error.	RD	Lit when data is being sent.
UNDER	Lit at an occurrence of send data error.	F.LOOP	Lit when communication is executed in forward loop. Lit when forward loop is used for data receiving, unlit when reverse loop is used.
F. LOOP	Lit at an occurrence of forward loop receive error.		
R. LOOP	Lit at an occurrence of reverse loop receive error.		

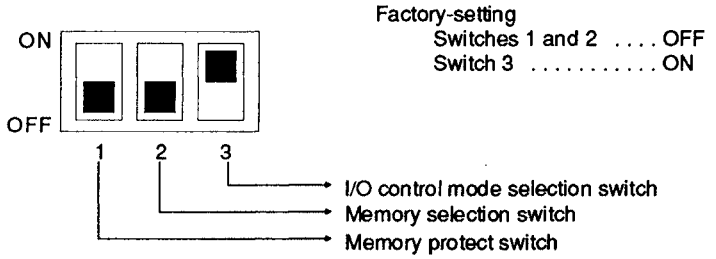
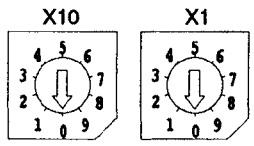
The LEDs in the left column (CRC to R.LOOP) indicate the MELSECNET operating status. For details, refer to the MELSECNET (II) Data Link System Reference Manual.

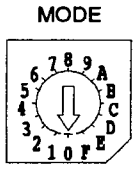
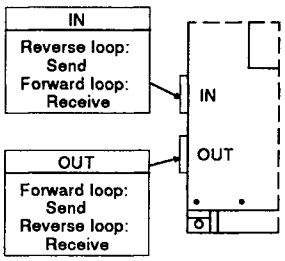
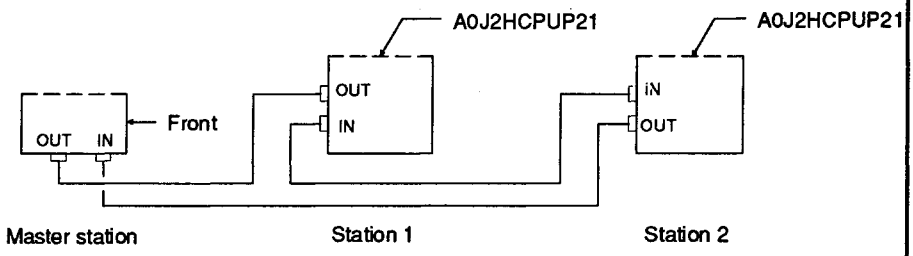
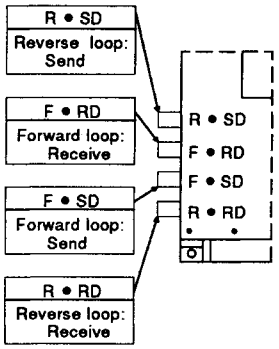
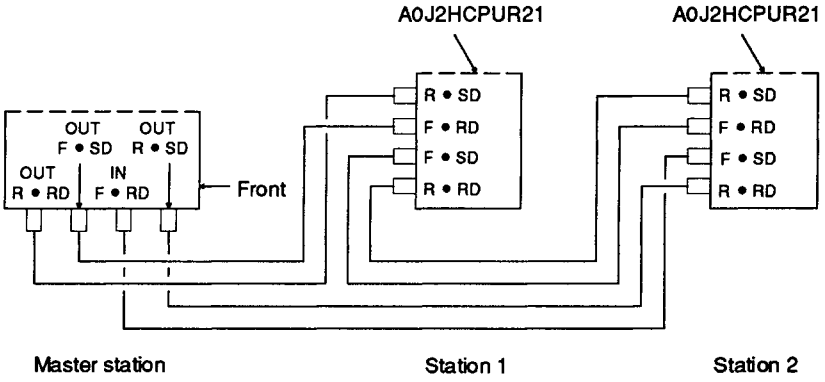
<table>
<tr><th>No.</th><th>Name</th><th>Use</th></tr>
<tr><td>2</td><td></td><td>The S.RUN LED indicates sequence program operation status:
• Lit : Sequence program operation is executed with the RUN key switch placed in the RUN position.
The LED remains lit if an error that permits continuation of a sequence program operation (see Section 10.3) occurs.
• Unlit : The S.RUN LED is turned off in the following cases.
- 100/200 VAC is not supplied to A0J2HCPUP21/R21
- The RUN key switch is in the STOP position.
- Remote stop status
• Flickering : The S.RUN LED flickers in the following cases.
- The self-diagnosis function detects an error that stops sequence program operation. ..... ON: 0.5 s, OFF: 0.5 s
- Latch clear operation is executed. ..... ON: 0.2 s, OFF: 0.2 s
- Annunciator (F) is being set (M9048 is ON).... ON: 2 s, OFF: 0.5 s</td></tr>
<tr><td>3</td><td>RS-422 connector</td><td>• The peripheral device used to rear/write main program and to execute monitor and test is connected.
• Protect the connector with a cover when not used.</td></tr>
<tr><td>4</td><td>Power supply terminal block</td><td> 

<table>
<tr><td>(A)</td><td>Terminal screw
M4 x 0.7 x 8</td></tr>
<tr><td>(B)</td><td>Power supply terminals
Connect 100 VAC or 200 VAC power supply to these terminals.</td></tr>
<tr><td>(C)</td><td>Voltage selection terminals
To receive 100 VAC: Short terminals with jumper.
To receive 200 VAC: Leave the terminals open.</td></tr>
<tr><td>(D)</td><td>LG terminal
Grounding terminal for power supply filter</td></tr>
<tr><td>(E)</td><td>FG terminal
Terminal connected to shield pattern on PCB</td></tr>
<tr><td>(F)</td><td>24 VDC, 24
Terminals to input 24 VDC or to supply internal power supply for relay and transistor output.
(Supplied to the module by external wiring)</td></tr>
<tr><td>(G)</td><td>Terminal cover
Terminal block protection cover.
Remove the cover when connecting cables to the terminals; set the cover in place after completing cable connection.</td></tr>
</table></td></tr>
</table>

No.	Name	Use
5	I/O cable and extension cable connection	• The connector for signal cables of I/O modules and extension base units. Connect the I/O cable (A0J2C0[ ]) or extension cable (A0J2C[ ][ ]B).

6	Cover	• Protection cover for PCB, EP-ROM, and battery of A0J2HCPUP21/R21
		• Open the cover to carry out the following:
		  • Removal/installation of EP-ROM
		  • Setting of memory (EP-ROM)
		  • Connection of battery
		  • Changing of battery

7	Cover mounting screws	• The screws used to fix the cover.
8	Peripheral device fixing screw	• The screw to fix the peripheral device.
9	Module mounting opening	• The opening to mount the A0J2HCPUP21/R21 module to a panel or to mount an I/O module vertically.
10	Battery	Used to retain the data such as programs, devices in the latch range, and file registers. (For the procedure to remove/install a battery, refer to Section 6.2.)
11	DIP switch	Switches used to set memory protect state, ROM/RAM selection, and input/output control mode. 
12	Battery connector	Used to connect the battery connector.
13	Memory installation socket	Socket to install EP-ROM. • Set the station number in the range of 00 to 64.
14	Station number setting switches STATION No. 	• X10 switch: Ten's place of a station number • Y1 switch: One's place of a station number • Set "00" when the station is used as the master station. • Set "00" to "64" when the station is used as a local station.

<table>
<tr><th>No.</th><th>Name</th><th>Use</th></tr>
<tr><td>15</td><td>Mode selection switch
 
</td><td>• The following functions are available according to the selected mode.
<table>
<tr><th>Setting Number</th><th>Mode Name</th><th>Description</th></tr>
<tr><td>0</td><td>Online</td><td>Automatic return is available</td></tr>
<tr><td>1</td><td>Online</td><td>Automatic return is available</td></tr>
<tr><td>2</td><td>Offline</td><td>The host station is disconnected</td></tr>
<tr><td>3</td><td>Test mode 1</td><td>Forward loop test</td></tr>
<tr><td>4</td><td>Test mode 2</td><td>Reverse loop test</td></tr>
<tr><td>5</td><td>Test mode 3</td><td>Station-to-station test mode (master station)</td></tr>
<tr><td>6</td><td>Test mode 4</td><td>Station-to-station test mode (slave station)</td></tr>
<tr><td>7</td><td>Test mode 5</td><td>Self-loopback test</td></tr>
<tr><td>8</td><td>—</td><td>Not used</td></tr>
<tr><td>9</td><td>—</td><td>Not used</td></tr>
<tr><td>A - C</td><td>—</td><td>Not usable</td></tr>
<tr><td>D - F</td><td>—</td><td>Not used</td></tr>
</table></td></tr>
<tr><td>16</td><td>Fiber-optic cable connector
 
</td><td>• Connect the cables as shown below.
 
</td></tr>
<tr><td>17</td><td>Coaxial cable connector
 
</td><td>• Connect the cables as shown below.
 
</td></tr>
</table>

4.6.2 Settings

Before changing the settings, turn off the power of the A0J2HCPUP21/R21.

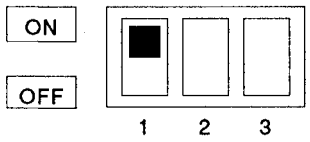
(1) Dip switch setting

(a) Memory protect switch

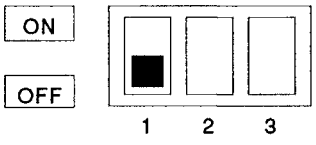
Data stored in RAM can be protected from operation error of a peripheral device.

Protected range is the first 20k bytes in the 32k byte user memory area.

Set the memory protect switch in the ON position to protect the written program from being overwritten or deleted. To change the program in RAM, set the memory protect switch in the OFF switch first.



Memory Protect ON



Memory Protect OFF

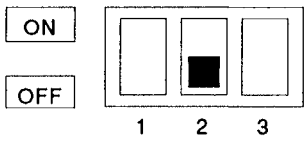
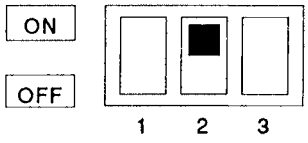
POINTS

(1) Do not set the memory protect ON when executing sampling trace and status latch. If the memory is protected, the data cannot be written to the memory.

(2) To run the CPU using ROM stored program, set the memory protect switch OFF. If the ROM stored program is executed with the memory protect switch set ON, an error (MEMORY PROTECT ERROR) occurs.

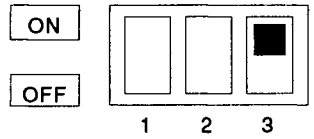
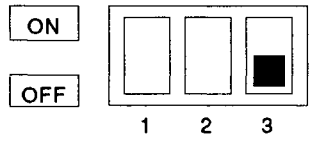
(b) Memory selection switch

Set the switch according to the memory (RAM, ROM) to be used.

Built-in RAM		1) Set the memory selection switch first before installing the memory. 2) RAM ..... Set switch 2 OFF. 3) ROM..... Set switch 2 ON. For ROM operation, set switch 1 OFF.
ROM		

(c) I/O control mode selection switch

For I/O control mode, direct and refresh modes are available. Select the control mode with switch 3.

Direct mode for both inputs and outputs		1) Set switch 3 ON when direct mode is selected for both in puts and outputs. 2) Set switch 3 OFF when refresh mode is selected for both inputs and outputs.
Refresh mode for both inputs and outputs		

(2) Setting station number

Determine the station number according to the routing of the fiber optic/co-axial cables.

Refer to the MELSECNET (II) Data Link System Reference Manual to determine the station numbers.

(3) Setting the mode

This manual describes only the self-loopback test mode for independent link module.

Refer to the MELSECNET (II) Data Link System Reference Manual for other setting modes.

(4) Setting link parameters

Setting is required only for the A0J2HCPUP21/R21 uses as a master station.

For the MELSECNET functions, processing methods, and device assignment, refer to the MELSECNET (II) Data Link System Reference Manual.

REMARK

To operate the A0J2HCPUP21/R21 independently without connecting in the MELSECNET:

(1) Set the mode selection switch in "2" (offline).
Link parameter error occurs if the offline mode is not selected. In this case, however, sequence program operation processing is executed normally.

(2) LEDs indicating the link operation status do not indicate the actual status unless the fiber-optic cable or coaxial cable is not connected to the module.
To check whether the link module is operating normally or not, execute the self-loopback test indicated in Section 4.6.4.

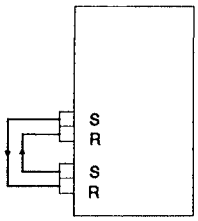
4.6.3 Setting the test mode

To check the link module hardware or breakage of fiber-optic cable/coaxial cable, the A0J2HCPUP21/R21 has the test modes as indicated below.

Switch Position	Mode Designation	Description
3	Forward loop test mode	In this mode, the fiber-optic cable or coaxial cable line of the entire data link system is checked. The forward loop side on which normal linking is performed is checked.
4	Reverse loop test mode	In this mode, the fiber-optic cable or coaxial cable line of the entire data link system is checked. The reverse loop side, on which loopback is performed in the event of an error, is checked.
5	Station-to-station test mode (main station)	In this mode, the line connecting the two stations is checked. Before checking, the station with the smaller station number is designated as the main station; the other is the subordinate station.
6	Station-to-station test mode (subordinate station)	
7	Self-loopback test mode	In the self-loopback test, the hardware containing the transmission and receiving circuits is checked on an individual link unit basis.

4.6.4 Self-loopback test

In the self-loopback test mode, the hardware of a link module including data send/receive circuit is executed by checking whether the data sent from the forward loop send side is received at the forward loop receive side correctly within a preset time. The same check is executed in the reverse loop.



(1) Testing

- Connect the link cable (fiber-optic or coaxial cable).
  From the forward loop send port to the forward loop receive port, or from the reverse loop sent port to the reverse loop receive port.
- Place the RUN key switch in the STOP position for the station for which the self-loopback test is executed.
  For a remote I/O station, set the master station in the STOP status.
- Place the mode selection switch in "7" and reset the PC CPU with the reset switch.

(2) Test results

The test results are known from the ON/OFF status of the LEDs in the front panel.

- Normal : The following six LEDs flicker sequentially.
  CRC, OVER, AB.IF, TIME, DATA, UNDER
- Error : The LED(s) corresponding to the detected error light and the test stop.
  Example: Forward loop cable is broken.
  .....F.LOOP, R.LOOP, and DATA LEDs light.

5. POWER SUPPLY MODULE AND CABLE SPECIFICATIONS

5.1 Power Supply Module Specifications

Table 5.1 Power Supply Module Specifications

Item \ Type			Performance Specification			
			A0J2H	A0J2PW	A0J2H-DC24	A0J2PW-DC24
Input/ Output	Input power		100–120 VAC $^{+10\%}_{-15\%}$ (85 to 132 VAC) / 200–240 VAC $^{+10\%}_{-15\%}$ (170 to 264 VAC)		24 VDC $^{+10\%}_{-15\%}$ (15.6 to 31.2 VDC)	
	Input current		0.7 A or less/0.35 A or less	1.5 A or less/0.8 A or less	1.5 A (15.6 VDC) or less/ 1 A (24 VDC) or less	—
	Input frequency		50/60 HZ±5%	50/60 HZ±5%	—	
	Maximum input apparent power		56 VA or less	120 VA or less/ 150 VA or less	—	
	Input electric power		—	—	24 W or less	
	Inrush current		40 A, within 5 ms	40 A, within 5 ms	50 A (within 2 ms)	65 A TYP (within 2 ms)
	Efficiency		65% or more			
	Rated output current	5 VDC	2 A	2.3 A	2 A	2.5 A
		24 VDC	0.5 A	1.5 A	—	
	Overcurrent protection	5V DC	2.4 A	2.6 A	2.4 A	2.7 A
		24 VDC	0.6 A	1.95 A	—	
Power supply display			LED display provided			
Size (mm)(in)			A0J2HCPU : 250×112×41 (9.84×4.41×1.61) A0J2HCPUP21 : 250×112×68 (9.84×4.41×2.68) A0J2HCPUR21 : 250×112×68 (9.84×4.41×2.68)	250×112×41 (9.84×4.41×1.61)		
Weight (kg)(lb)			A0J2HCPU : 0.75 (1.65) A0J2HCPUP21 : 1.16 (2.25) A0J2HCPUR21 : 1.16 (2.25)	0.71 (1.56)	0.65 (1.43)	0.71 (1.56)

POINTS

(1) An extension power supply module is used when power capacity is insufficient with only the CPU module's built-in power supply.

(2) One extension power supply module may be used for the A0J2HCPU.

(3) Oscillation noise will occur when using the A0J2PW with a light load, but no error has occurred.

(4) Overvoltage protection
If 5.5 to 6.5 V of overvoltage is applied to the 5 VDC circuit, an overvoltage protection device breaks the circuit and stops the system. The LED display of the power supply module goes OFF. If the input power is turned ON after having gone OFF, the system restarts by initial start. If the LED display remains OFF without starting the system, the power supply module must be replaced.

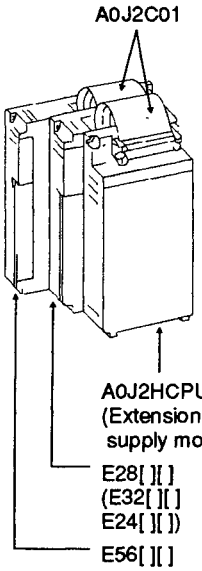
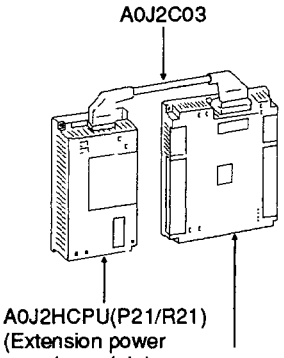
5.2 Cable Specifications

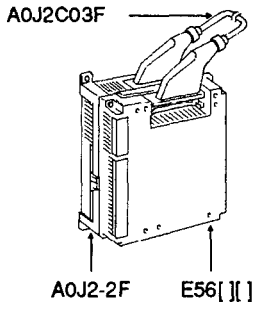
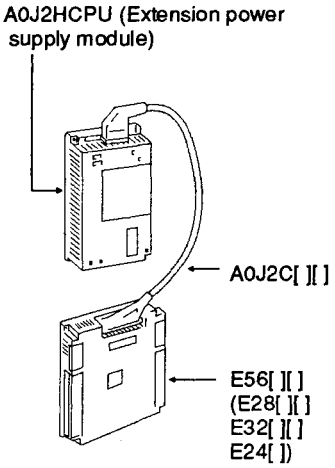
This section describes specifications of the I/O and extension cables to be used for the A0J2HCPU system.

5.2.1 I/O cable specifications

Table 5.2 shows specifications of the I/O cables to be used for the A0J2HCPU system. Select I/O cable according to module mounting method.

Table 5.2 I/O Cable Specifications

<table>
<tr><th>Item \ Type</th><th>A0J2C01</th><th>A0J2C03(F)</th><th>A0J2C06</th><th>A0J2C10</th><th>A0J2C20</th></tr>
<tr><td>Cable length (mm) (in)</td><td>80 (3.15)</td><td>300 (11.81)</td><td>550 (21.65)</td><td>1000 (39.37)</td><td>2000 (78.74)</td></tr>
<tr><td>5 VDC supply line resistance (Ω: at 55°C)</td><td>0.047</td><td>0.0617</td><td>0.0882</td><td>0.168</td><td>0.294</td></tr>
<tr><td rowspan="2">Application</td><td>Used for module-to-module mounting
 
</td><td>Used for side-to-side installation
 

Used for double mounting with A0J2-2F
 
</td><td colspan="3">Used for top-to-bottom installation
 
</td></tr>
<tr><td colspan="5">Connection between A0J2HCPU module and A0J2 I/O module
Connection between an extension power supply module and A0J2 I/O module
Connection between A0J2 I/O modules</td></tr>
<tr><td>Weight (Kg) (lb)</td><td>0.025 (0.01)</td><td>0.085 (0.003)</td><td>0.130 (0.005)</td><td>0.196 (0.43)</td><td>0.375 (0.83)</td></tr>
</table>

POINTS

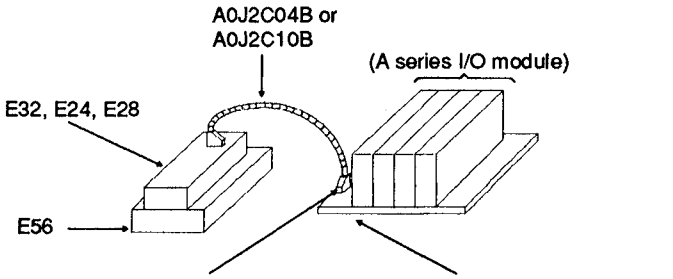
(1) When connecting the CPU module and I/O modules, the overall distance of the I/O cable must not be made longer than 6.6 m (21.65 ft).
If a length of I/O cable longer than this is used, erroneous outputs may be made to the output units.

(2) When connecting the CPU module and I/O modules, the receiving end voltage at each I/O module must be 4.75 V or greater.
For details on the method for calculating the receiving end voltage see Section 5.3.

5.2.2 Extension cable specifications

This section describes specifications of the extension cable used for the A0J2HCPU system.

Table 5.3 Extension Cable Specifications

	A0J2C04B	A0J2C10B
Cable length (mm) (in)	400 (15.75)	1000 (39.37)
5 VDC supply line resistance (Ω: at 55°C)	0.0626	0.126
Application	Connection between A0J2 I/O module and A series extension base unit Connection between an extension power supply module and A series extension base unit	
Connecting method outline		
Weight (kg) (lb)	0.160 (0.006)	0.260 (0.01)

5.3 Precautions for Use of Extension Power Supply Module

(1) Determine the use of extension power supply module by the total internal current consumption of the A0J2HCPU module, I/O modules, special function modules, and peripheral devices. When using the extension base unit A55B, consider the total current consumption of modules in the base unit because 5 VDC power is supplied by the A0J2HCPU module's built-in power supply or extension power supply module.

Table 5.4 Power Supply Module Current Capacities

Module Type	Rated Output Current (A)	
	5 VDC	24 VDC
A0J2H, built-in power supply	2	0.5
A0J2-PW type extension power supply module	2.3	1.5
A0J2H-DC24, built-in power supply	2	—
A0J2PW-DC24 type extension power supply module	2.5	—

Table 5.5 Current Consumption

Module Type		Internal Current Consumption (A)		
		5 VDC	24 VDC	
			Input (7 mA/point)	Output
CPU	A0J2HCPU	0.4	—	—
	A0J2HCPU-DC24	0.4	—	—
	A0J2HCPUP21	0.53	—	—
	A0J2HCPUR21	0.86	—	—
Input module	A0J2-E32A	0.105	—	—
	A0J2-E32D	0.105	0.224	—
	A0J2E-E32D	0.105	0.224	—
Output module	A0J2-E24R	0.145	—	0.23
	A0J2-E24S	0.4	—	—
	A0J2-E24T	0.145	—	0.069
	A0J2E-E24R	0.145	—	0.22
	A0J2E-E24T	0.145	—	0.2
I/O module	A0J2-E28AR	0.14	—	0.125
	A0J2-E28AS	0.26	—	—
	A0J2-E28DR	0.13	0.112	0.125
	A0J2-E28DS	0.26	0.112	—
	A0J2-E28DT	0.125	0.112	0.035
	A0J2E-E28DR	0.13	0.112	0.11
	A0J2E-E28DS	0.23	0.112	—
	A0J2E-E28DT	0.25	0.112	0.1
	A0J2-E56AR	0.225	—	0.23
	A0J2-E56AS	0.46	—	—

Module Type		Internal Current Consumption (A)		
		5 VDC	24 VDC	
			Input (7 mA/point)	Output
I/O module	A0J2-E56DR	0.23	0.224	0.23
	A0J2-E56DS	0.46	0.224	—
	A0J2-E56DT	0.225	0.224	0.069
	A0J2E-E56DR	0.23	0.224	0.22
	A0J2E-E56DS	0.46	0.224	—
	A0J2E-E56DT	0.025	0.224	0.2
Peripheral module	A7PU	0.3	—	—
	A6WU	*0.3 (0.8)	—	—

*The A6WU is 0.3 A in standby state (online) and 0.8 A during write (offline).

The internal current consumption values in Table 5.4 when all points are on.

When the power is supplied from the A0J2HCPU's built-in power supply, the total internal current consumption of the entire system should be within A0J2HCPU's built in power supply capacity range.

{CPU's built-in power supply capacity: 5 VDC, 2A} > {5 V current consumption of CPU + 5 V current consumption of simultaneously "ON" I/O modules + 5 V current consumption of peripheral device (A7PU)}

{24 VDC, 0.5 A} > {Current consumption of 24 VDC input simultaneously "ON" points + 24 VDC internal current consumption of simultaneously "ON" relay/transistor outputs}

If the total consumption exceeds the CPU's built-in power supply capacity range, use the extension power supply module. For the I/O modules which is supplied with 5 VDC power by the extension unit, set the I/O module's internal power supply select switch to "EX5V". (For details, refer to the I/O Module Manuals.)

POINT

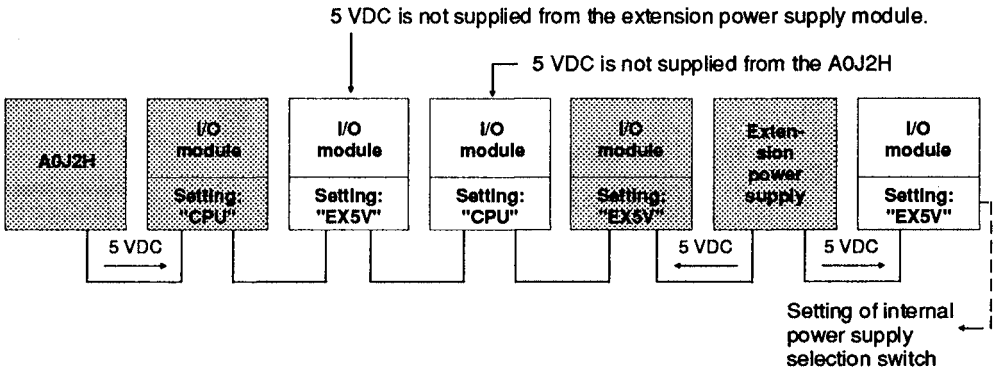
(1) The allowable current capacity of the 5 VDC power supply which can be supplied from the extension power supply module to the I/O modules and extension base unit is 2.3 A. If it exceeds 2.3 A, use the extension base unit A65B(S1).

(2) When the A0J2PW is used with light loads, a noise caused by oscillation may occur, but this is not abnormal.

(3) The supply ranges for 5 VDC from an A0J2H and extension base unit are as follows. Set the internal power supply selection switch of the I/O module in consideration of the points below.

(a) The 5 VDC from an A0J2H is supplied to all the modules connected before the one whose internal power supply selection switch is set to "EX5V".
It is not supplied to the I/O module whose internal power supply selection switch is set to "EX5V" and subsequent I/O modules.

(b) The 5 VDC from the extension power supply module is supplied to all the modules connected before the one whose internal power supply selection switch is set to "CPU".
It is not supplied to the I/O module whose internal power supply selection switch is set to "CPU" and subsequent I/O modules.



(2) Since the 5 VDC power is supplied to the I/O modules and extension base unit through the I/O cables and extension cables, respectively, the voltage may drop at the cables. Therefore, specified voltage (4.75 VDC or more) may not be supplied at the receiving end, causing input/output errors. Calculate the voltage requirement as described below and determine whether or not the A0J2PW is to be used.

1) 5 VDC power requirement

i) 5 VDC output voltage range of the power supply module is 4.9 to 5.2 VDC.

ii) The specified voltage at the I/O module or the extension base unit is 4.75 VDC or more.

2) Cable resistances

Refer to 5.2 for cable resistances.
Due to the above requirements 1) and 2), it is necessary to satisfy the specified voltage (4.75 VDC or more) of the system at the receiving end when the 5 VDC output of the power supply module is a minimum of 4.9 VDC. Voltage calculation at the receiving end is as described on the next page.

Method for calculating the voltage at the receiving end

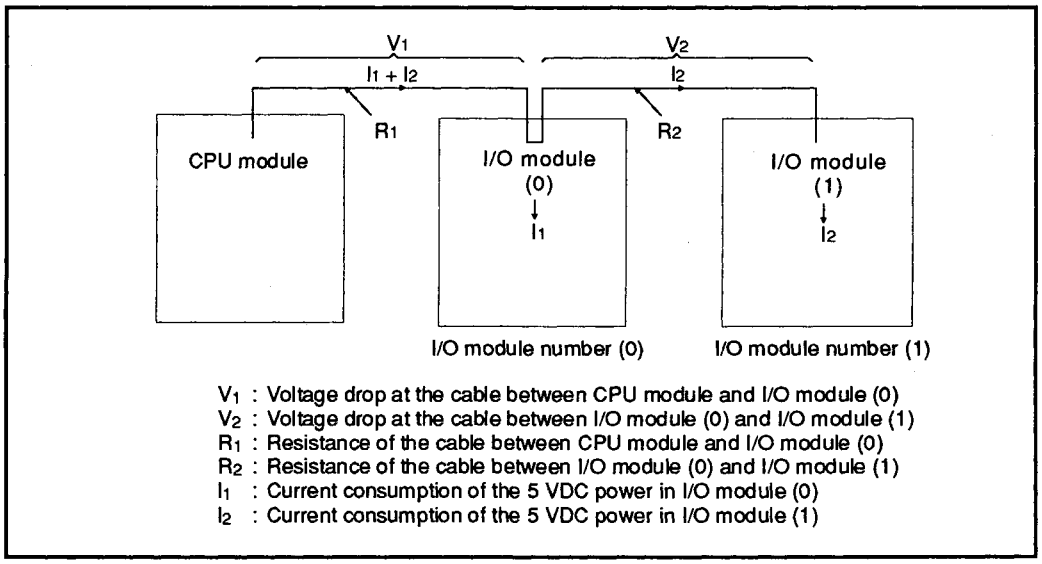


Fig 5.1 System Configuration and Symbols Used

The voltage drops V_1 and V_2 are,

$V_1 = R_1 (I_1 + I_2)$

$V_2 + R_2 I_2$

The voltage at the receiving end of I/O module (1) is,

Receiving end voltage $= 4.9 - (V_1 + V_2) > 4.75$

To satisfy the requirement that the receiving end voltage must be 4.75 VDC or more,

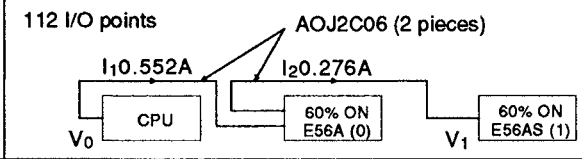
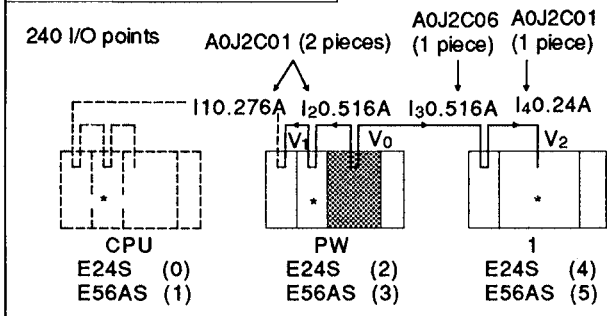
$4.9 - 4.75 \geq V_1 + V_2$

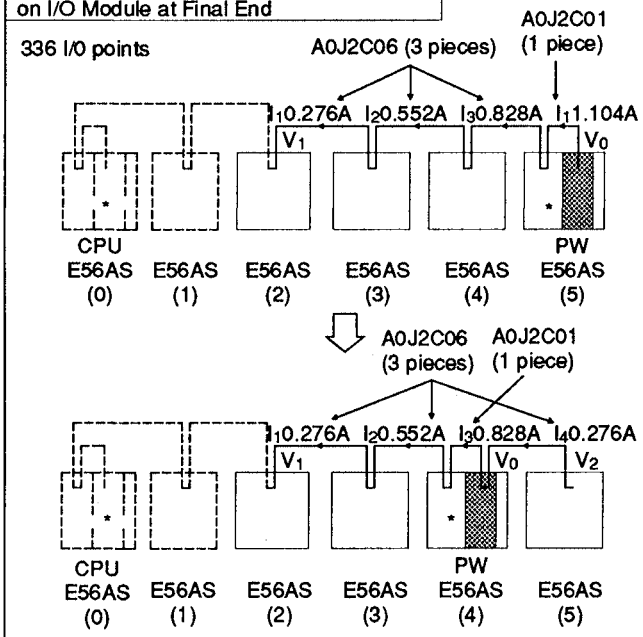
$0.15 \geq R_1 (I_1 + I_2) + R_2 I_2$

If the condition is met, extension is allowed up to the I/O module (1).

Therefore, the number of I/O modules to be extended or use of the extension base unit (A55B(S1)) can be determined when the following condition is met:
0.15(= 4.9 – 4.75) ≥ sum of the voltage drops up to the receiving end.

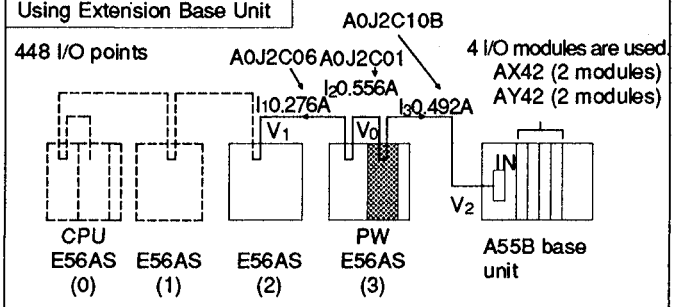
(3) 5 VDC power voltage drop calculation example using A0J2 cables.

<table>
<tr><th></th><th>System Configuration</th><th>Voltage Drop</th><th>Judg-ment</th><th>Power Select Switch</th></tr>
<tr><td>Example 1</td><td>Using CPU's Built-in Power Supply Only
 
</td><td>V1 = A0J206 Resistance x (I1 + I2)
= 0.0882 x (0.552 + 0.276)
= 0.073 (V)</td><td>0.15 V or less o</td><td>CPU5V position</td></tr>
<tr><td>Example 2</td><td>Using Extension Power Supply
 
</td><td>V1 = A0J2C01 Resistance x (I1 + I2)
= 0.047 x (0.276 + 0.516)
= 0.037 (V)
V2 = A0J2C06 Resistance x I3 +A0J2C01 Resistance x I4
= 0.0882 x 0.516 + 0.047 x 0.24
= 0.057 (V)</td><td>o</td><td>CPU5V position: I/O module 0.1

EX5V position: I/O modules 2,3,4,5</td></tr>
<tr><td>Example 3</td><td>Mounting Extension Power Supply Module on I/O Module at Final End
 
</td><td>V1 = A0J2C01 Resistance x I4 +A0J2C06 Resistance x (I1+I2+I3)
= 0.047 x 1.104 +0.0882 x (0.276 + 0.552 +0.828)
= 0.198(V)
When the extension power supply module is used at the final end, voltage drop at the final end module supplied with power is large and the requirement of 0.15 V or less is not satisfied.
Therefore, take the following remedy.

V1 = A0J2C01 Resistance x I3 +A0J2C06 Resistance x (I1 + I2)
= 0.047 x 0.828 + 0.0882 x (0.276 + 0.552)
= 0.112(V)
V2 = A0J2C06 Resistance x I4
= 0.0882 x 0.276
= 0.024(V)</td><td>0.15 V or more x

o</td><td>CPU5V position: I/O Modules 0.1

EX5V position: I/O modules 2,3,4,5</td></tr>
<tr><td>Example 4</td><td>Using Extension Base Unit
 
</td><td>V1 = A0J2C06 Resistance x I1 +A0J2C01 Resistance x I2
= 0.0882 x 0.276 + 0.047 x 0.552
= 0.0503 (V)
V2 = A0J2C10B Resistance x I3
= 0.126 x 0.492
= 0.062(V)</td><td>o</td><td>CPU5V position: I/O modules 0.1

EX5V position: I/O modules 2,3</td></tr>
</table>

* Module-to-module mounting

1) I/O module numbers are indicated in parentheses. I/O module current consumption has been calculated, assuming that the simultaneous ON ratio is maximum of 60%.

2) In Examples 2, 3, and 4, the modules supplied with 5 VDC power from the extension power supply module are indicated by the full line. The modules supplied with the power by the CPU's built-in power supply are shown by the dotted line.

3) Indicated above are voltage drops occurring between the power supply module and the I/O module at the final end.

POINT

(1) As shown in Examples 3 and 4, the voltage drop of the I/O module are the final end varies depending on the location of the extension power supply module and the connection of the cable. Therefore, select the I/O or extension cable or select I/O module so that the voltage drop may be 0.15 V in the system.

(2) Avoid using the extension power supply module at the final end because the voltage drop value is larger.

5.4 Precaution when Connecting the Uninterruptive Power Supply (UPS)

Be sure of the following items when connecting the PLC system to the uninterruptive power supply (abbreviated as UPS hereafter):
As for UPS, use the online power system or online interactive system with a voltage distortion rate of 5% or less.
For the UPS of the commercial online power system, use Mitsubishi Electric's F Series UPS (serial number P or later) (Ex.: FW-F10-0.3K/0.5K).
Do not use any UPS of the commercial online power system other than the F series mentioned above.

6. MEMORY ICs AND BATTERY

6.1 Memory ICs

This section describes specifications, handling instructions and installation of the memory ICs used in the A0J2HCPU.

6.1.1 Specifications

Table 6.1 shows specifications of the ROMs to be installed to the program memory socket of the A0J2HCPU.

Table 6.1 Memory Specifications

Item \ Type	4KROM	8KROM	16KROM
Memory specifications	EP-ROM (only read is possible)		
Memory capacity (bytes)	8K (max. 2k steps)	16K (max. 6k steps)	32K (max. 8k steps)
Structure	28-pin IC package	28-pin IC package	28-pin IC package
Remark	Make sure the correct installing direction.		

6.1.2 Handling instructions

This chapter explains the handling instructions from unpacking to installation and also the nomenclature and setting of various conditions.

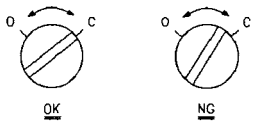
(1) When loading the memory into the socket, press the memory securely against the socket and the lock it with the lever. After loading, check that the memory is flush with the socket.

(2) 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.

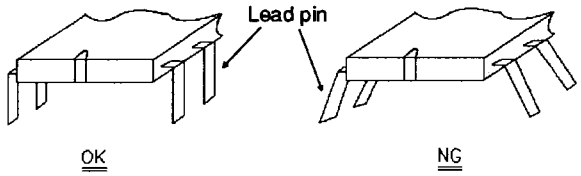
(3) Do not touch or bend the memory leads.

(4) When mounting the memory, be sure to install the memory in the direction indicated on the socket. If installed in the wrong direction, the memory will be damaged.

(5) When an IC memory is installed in the memory socket, turn the lock nut fully round to the "C" (:CLOSE) position. It must not be left part way between "0" and "C".



(6) If the lead pins of the IC memory are splayed out at either side, bend them back so that the pins on either side are parallel with each other before installing the IC memory in the IC memory socket.



6.1.3 Installation

(1) How to hold

Hold the memory IC as shown in Fig. 6.1 so that fingers do not touch the memory leads. If touched, the memory may be destroyed by static electricity or leads may be bent and cause incomplete contact.

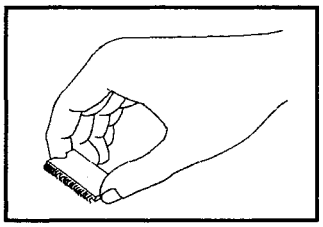


Fig. 6.1 How to Hold

(2) Installing direction

Install the memory IC in the direction marked on the memory socket, matching the notch position. If installed in wrong direction, the memory will be destroyed when the A0J2HCPU is turned on.

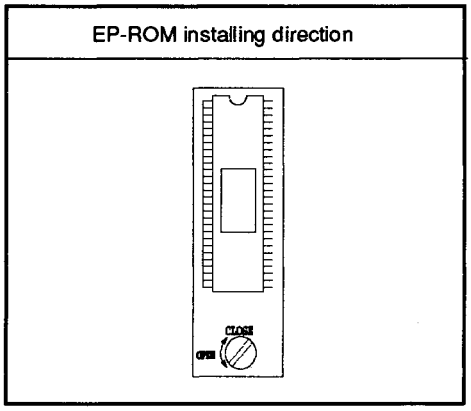
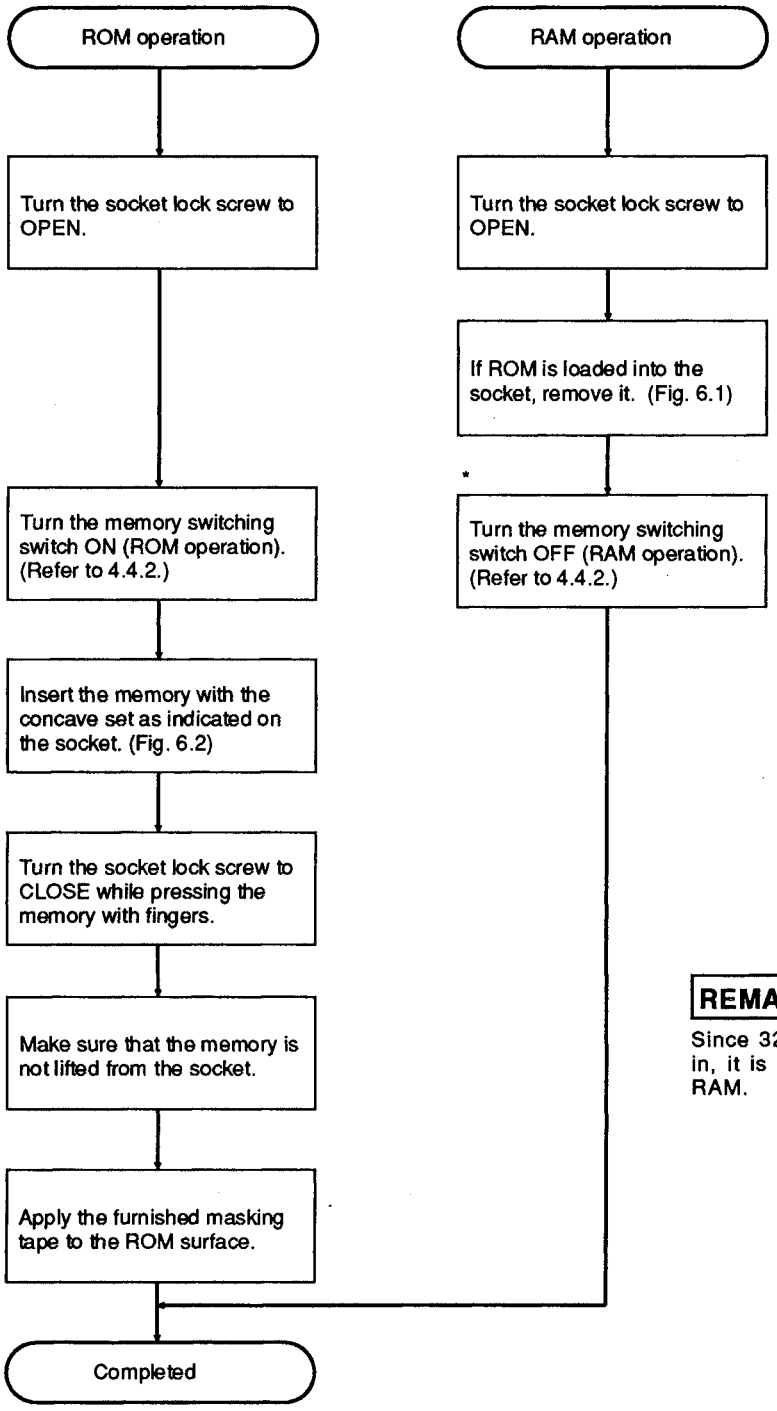


Fig. 6.2 Installing Direction

(3) Memory installation order

Install memory correctly according to the following order.



REMARK

Since 32k bytes of RAM is built in, it is not necessary to install RAM.

6.2 Battery

6.2.1 Specifications

Table 6.2 shows specifications of the battery used to retain memory stored if power failure occurs.

Table 6.2. Battery Specifications

Item \ Type	A6BAT
Classification	Manganese dioxide lithium primary battery
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) X 30 (1.18)

REMARK

For the battery directive in EU member states, refer to Appendix 5.

6.2.2 Handling instructions

(1) Do not short circuit.

(2) Do not disassemble.

(3) Do not expose to open flame.

(4) Do not heat.

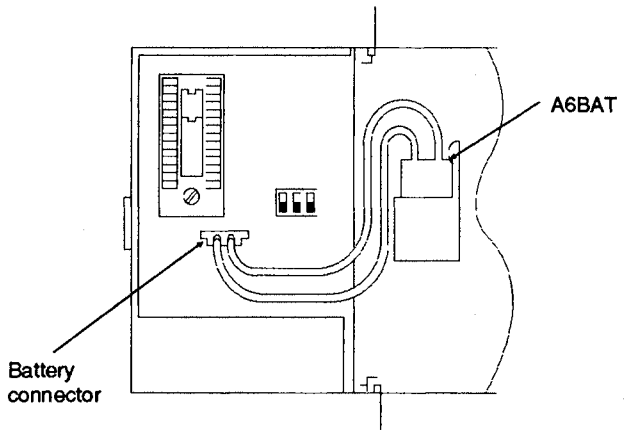
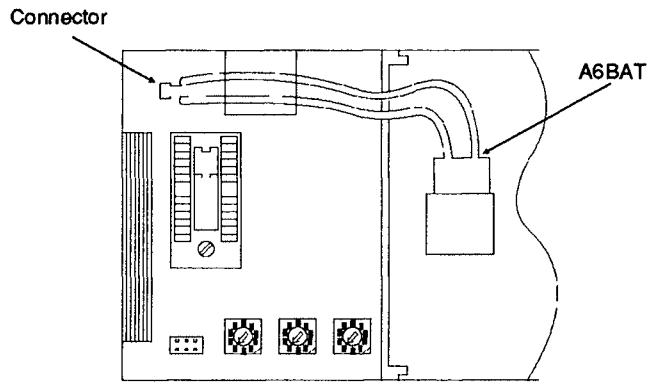
(5) Do not solder its terminals.

6.2.3 Installation

Battery lead connector is disconnected from the battery connector on the A0J2HCPU board to prevent discharge during transportation and storage.

Before starting the A0J2HCPU, plug the battery connector into the battery connector on the A0J2HCPU board.

- To use a sequence program stored in the user program area in the A0J2HCPU if a power failure occurs.
- To retain the data if a power failure occurs.

A0J2HCPU	A0J2HCPU(P21/R21)
	

7. LOADING AND INSTALLATION

7.1 Consideration for Safety

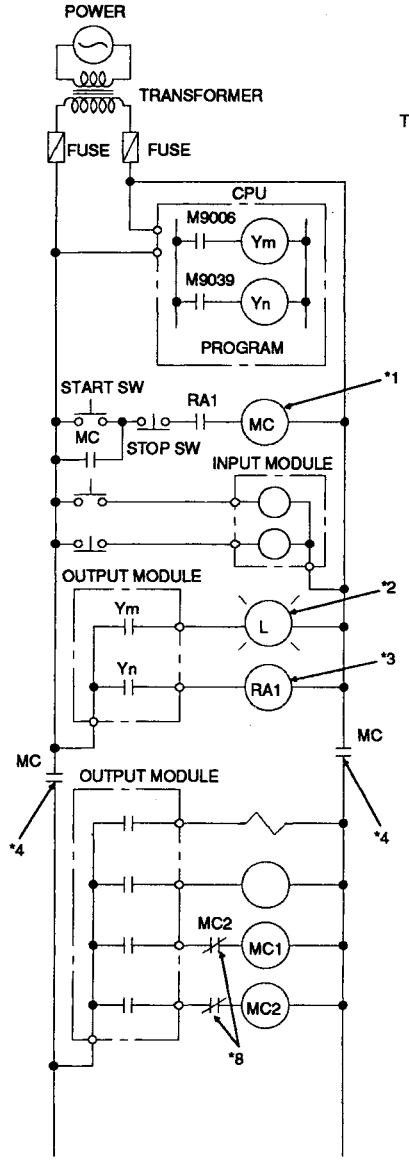
When the power of the system is turned on or off, process output may not temporarily perform normal operation due to the difference between the delay time and rise time of the power supply of programmable controller main module and the external power supply (especially DC) for the process. Also, at the time of an error of the external power supply, output process may possible make an erroneous operation.

In order to prevent the aforementioned erroneous operations from resulting in an erroneous operation of the entire system and also for safety reasons, constitute circuits (such as emergency stop circuit, protection circuit, and interlock circuit), that prevent machine damage or and accident due to erroneous operation outside the programmable controller.

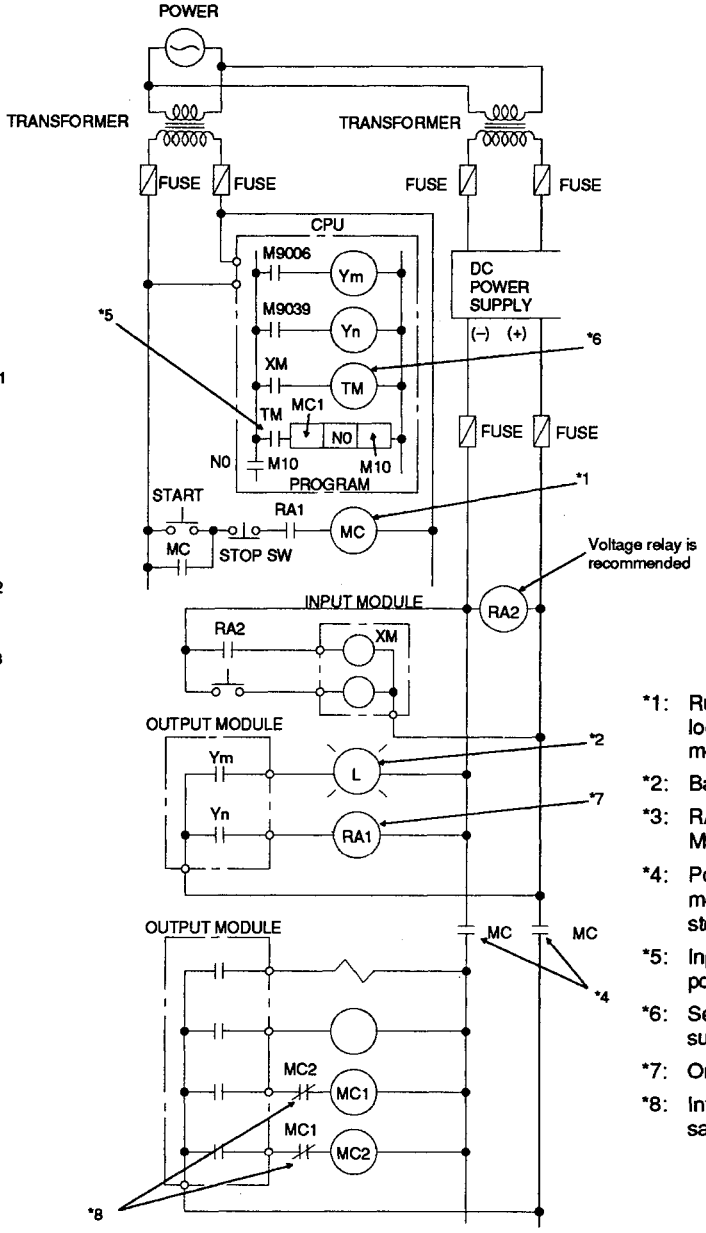
A system design circuit example based on the above concept is shown on the following page.

System design circuit example

ALL AC



Mixed AC and DC



*1: Run/stop circuit interlocked with RA1 (run monitor relay)

*2: Battery low alarm

*3: RA1 switched on by M9039 (run monitor relay)

*4: Power to output equipment switched off when stop signal given.

*5: Input switched when power supply established.

*6: Set time for DC power supply to be established.

*7: On when run by M9039

*8: Interlock circuit as necessary.

The power-on produce is as follows:

For AC

1) Switch on power.
2) Set CPU to RUN.
3) Switch on the start switch.
4) When the magnetic contactor (MC) comes in, output equipment is powered and may be driven from the program.

For AC/DC

1) Switch on power.
2) Set CPU to RUN.
3) When DC power is established, RA2 turns on.
4) Timer (TM) times out after the DC power reaches 100%.

   (The set value of TM should be the period of time from when RA2 switches on to the establishment of 100% DC voltage. Set value to approximately 0.5 seconds.)
5) Switch on the start switch.
6) When the magnetic container (MC) comes in, the output equipment is powered and may be driven the program.

7.2 Installation Environment

Never install the A0J2HCPU system in the following environments:

(1) Locations where ambient temperature is outside the range 0 to 55°C.

(2) Locations where ambient humidity is outside the range of 10 and 90% RH.

(3) Locations where dew condensation takes place due to sudden temperature changes.

(4) Locations where there are corrosive gasses and combustible gasses.

(5) Locations where there is high level of conductive powder such as dust and iron filings, oil mist, salt, and organic solvent.

(6) Locations exposed to the direct rays of the sun.

(7) Locations where strong power and magnetic fields are generated.

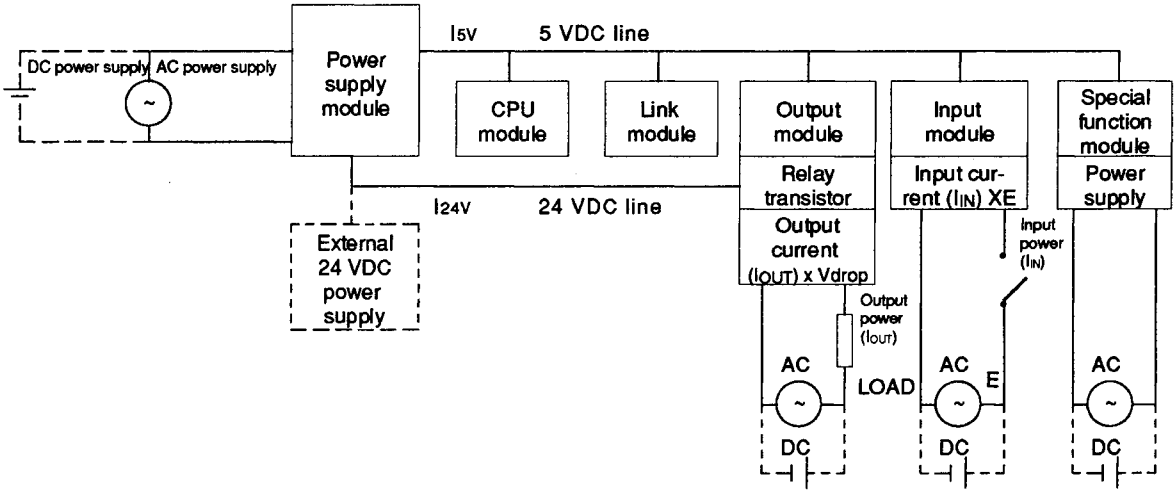
(8) Locations where vibration and shock are directly transmitted to the main module.

7.3 Calculation of Heat Generated by the Programmable Controller System

The operating ambient temperature of the PC must be kept below 55°C. The power generated by the PC should be dissipated by fans or similar and is calculated as follows:

Average power consumption

Power is consumed by the following PC areas:



(1) Power consumption of power supply module

Approximately 70% of the power supply module current is converted into power with the remaining 30% dissipated as heat, i.e., 3/7 of the output power is used.

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

where, I_{5V} = VDC logic circuit current consumption of each module.

I_{24V} = current consumption of the output modules (with an average number of points switched on) ...(Not for 24 V input power supply modules)

(2) Total 5 VDC power consumption

5 V is supplied to each module via the base plate, this powers the logic circuitry.

$W_{5v} = I_{5v} + 5(W)$

(3) Total 24 VDC output module power consumption (with an average number of points switched on)

24 V is supplied to drive output devices.

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

(4) Power consumption of output circuits (with an average number of points switched on)

$W_{out} = I_{out} \times Vdrop \times$ average number of outputs on at one time (W)

where, I_{out} =output current (actual operating current) (A)

Vdrop =voltage dropped across each output load (V)

(5) Power consumption of input circuits (with an average number of points switched on)

$W_{in} = I_{in} \times E \times$ average number of inputs on at one time (W)

Where, I_{in} = input current (effective value for AC) (A)

E = input voltage (actual operating voltage) (V)

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

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

The sum of the above values is the power consumption of the entire PC system.

$\underline{W = Wpw + W_{5v} + W_{24v} + W_{out} + W_{in} + W_S (W)}$

Further calculations are necessary to work out the power dissipated by the other equipment in the panel.

Generally temperature rise in the panel is expressed as:

$$T = \frac{W}{UA} \ (°C)$$

where, W = power consumption of the entire PC system (obtained as above)

A = panel inside surface area (m^2)

U = 6 if the panel temperature is controlled by a fan, etc.

4 if panel air is not circulated.

POINT

Fans, heat exchangers or cooling units must be installed if the panel temperature is likely to exceed 55°C.

Fans should be fitted with surface filters and guards.

7.4 Module Mounting

This section explains module mounting instructions.

7.4.1 Mounting instructions

Explaination is given to the instructions for mounting the PC to a panel, etc.

(1) To improve ventilation or facilitate the replacement of module, provide 50 mm (1.97 in) or more the clearance around the PC.

(2) Do not mount the base unit vertically or horizontally to allow ventilation.

(3) Ensure that the base unit mounting surface is uniform to prevent strain. It excessive force is applied to the printed circuit boards, this will result in incorrect operation. Therefore, mount the base unit on a flat surface.

(4) Avoid mounting the base unit close to vibration sources, such as large-sized magnetic contractors and no-fuse breakers, install the base unit in another panel or separate the base unit from the vibration source.

(5) Provide a wiring duct as necessary.

However, if the dimensions from the top and bottom of the PC are less than those shown in Fig. 7.1, note the following points:

(a) When the duct is located above the PC, the height of the duct should be 50 mm (1.97 in) or less to allow for sufficient ventilation.

Between the duct and the top of the PC, provide a distance so that the cable may be removed by opening the cable connector fixing lever.

If the lever at the module top cannot be opened, module replacement cannot be made.

7.4.2 Installation

This section describes the installation of the module.

(1) For the mounting hole positions of each module, refer to Appendix 3, Dimensional Outline Drawing.

(2) Fig. 7.1 shows dimensions when the A7PU is mounted on the CPU module. For the dimensions of side-to-side and top-to-bottom arrangements, refer to Figs. 7.2 and 7.3, respectively.

(3) Fig. 7.4 shows dimensions when the extension base unit is installed. If type A0J2C10B extension cable is used, the unit can also be mounted on the door of the panel.

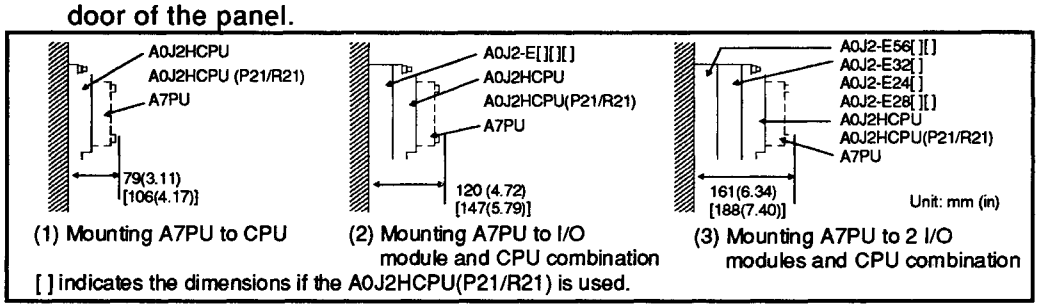


Fig. 7.1 Dimensions in Module-to-Module Mounting

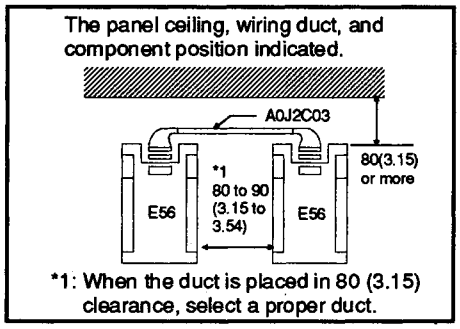


Fig. 7.2 Side-to-Side Installation

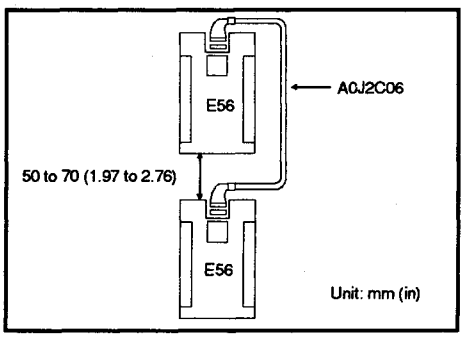


Fig. 7.3 Top to Bottom Installation

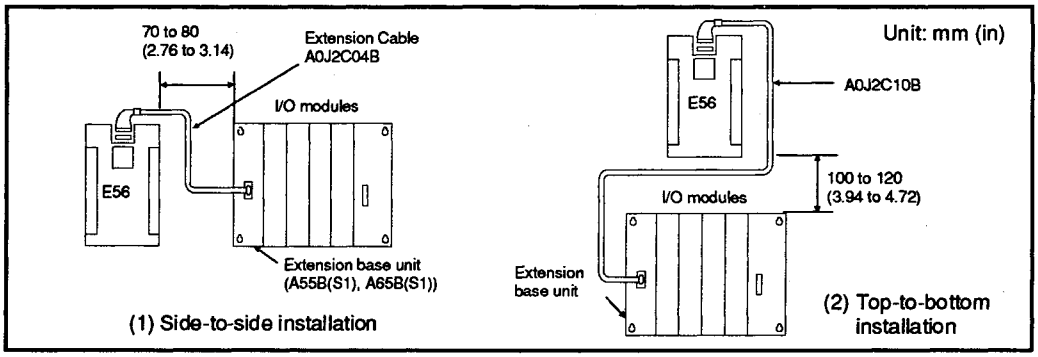


Fig. 7.4 Installation of Extension Base Unit

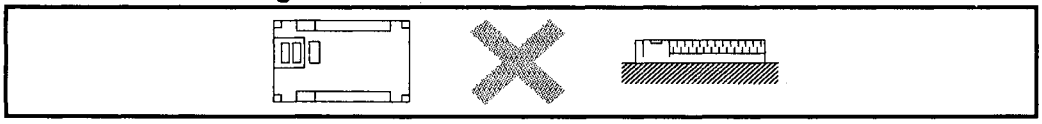


Fig. 7.5 Horizontal Installation (not allowed)

POINT

The distance from the CPU module front to the external device should be 100 mm (3.94in) or more.

7.4.3 Module-to-module mounting

This section describes module-to-module mounting.

Up to three modules can be mounted on the panel. When two or three modules are mounted, module combinations are as follows:

2 modules

Upper (1) module
Lower (2) module

Lower (2) module \ Upper (1) module	CPU	PW	E32[ ]	E28[ ][ ]	E28[ ][ ]
E32[ ]	o	o			
E24[ ]	o	o			
E28[ ][ ]	o	o			
E56[ ][ ]	o	o	o	o	o

O indicates that the upper (1) and lower (2) modules may be combined.

3 modules

Upper (1) module
Intermediate(2) module
E56[ ][ ] fixed: Lower (3) module

Intermediate (2) module \ Upper (1) module	CPU	PW
E32[ ]	o	o
E24[ ]	o	o
E28[ ][ ]	o	o

O indicates that the upper (1), intermediate (2), and lower modules may be combined.

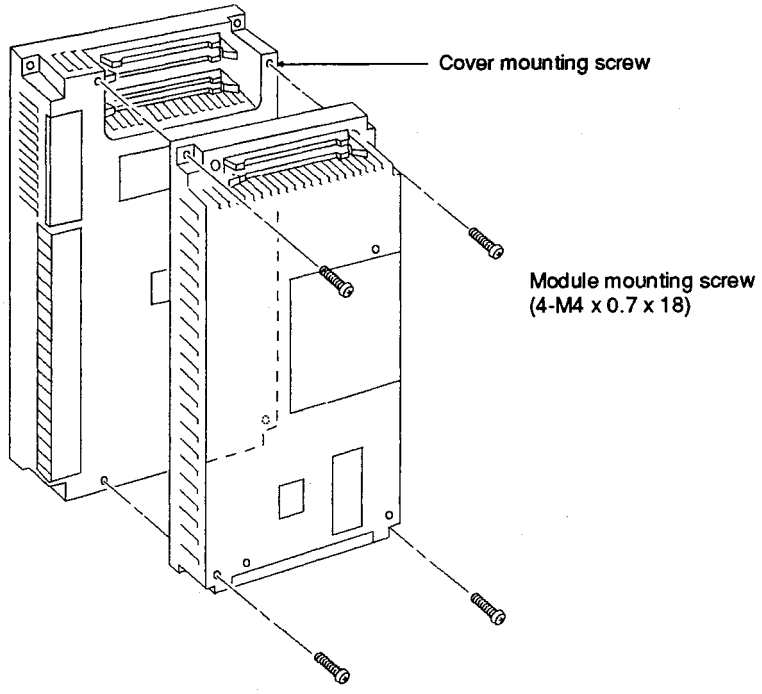
REMARK

By using double mounting with the A0J2-2F, double mounting with the E56[ ][ ] can also be performed. (Refer to Section 7.4.4.)

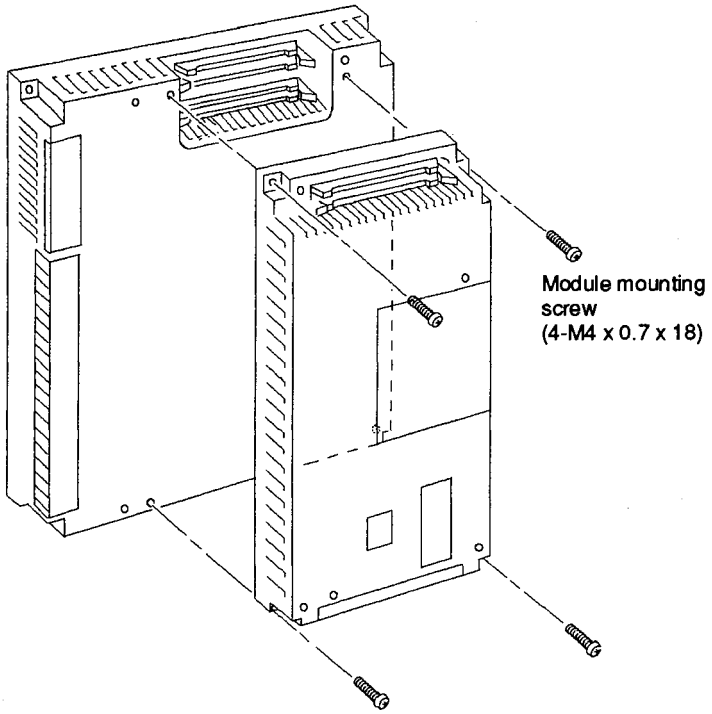
7.4.4 Module-to-module mounting method

Install the modules as described as below.

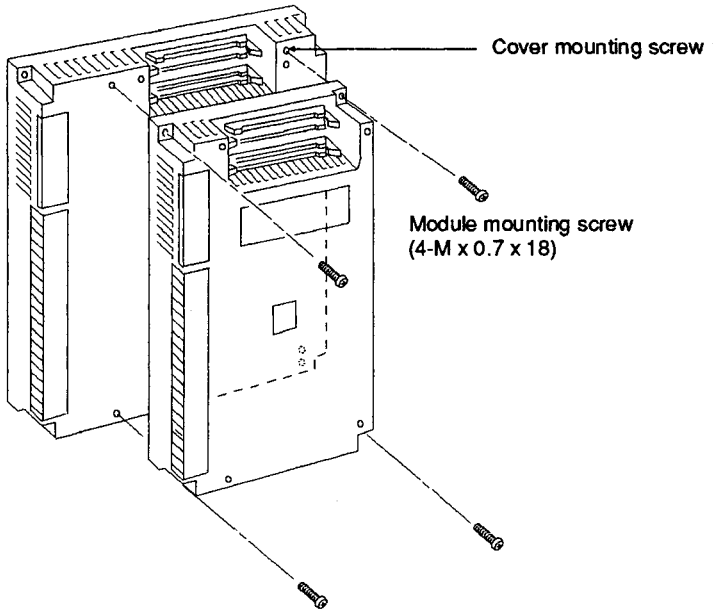
(1) Mounting the CPU module (or extension power supply module) to Type E28[ ][ ] I/O module (or E32[ ], E24[ ])



(2) Mounting the CPU module (or extension power supply module) to Type E56[ ][ ] I/O module

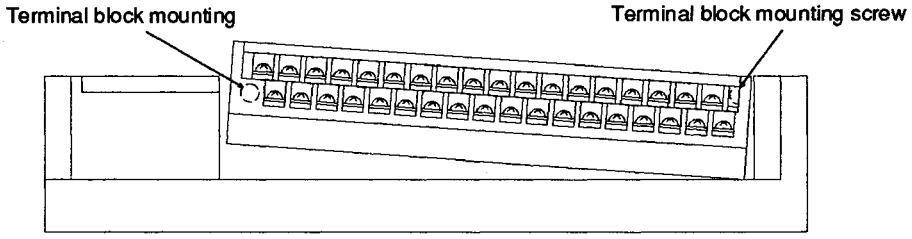


(3) Mounting type E28[ ][ ] I/O module (or, E32[ ], E24[ ]) to the E56[ ][ ] I/O module



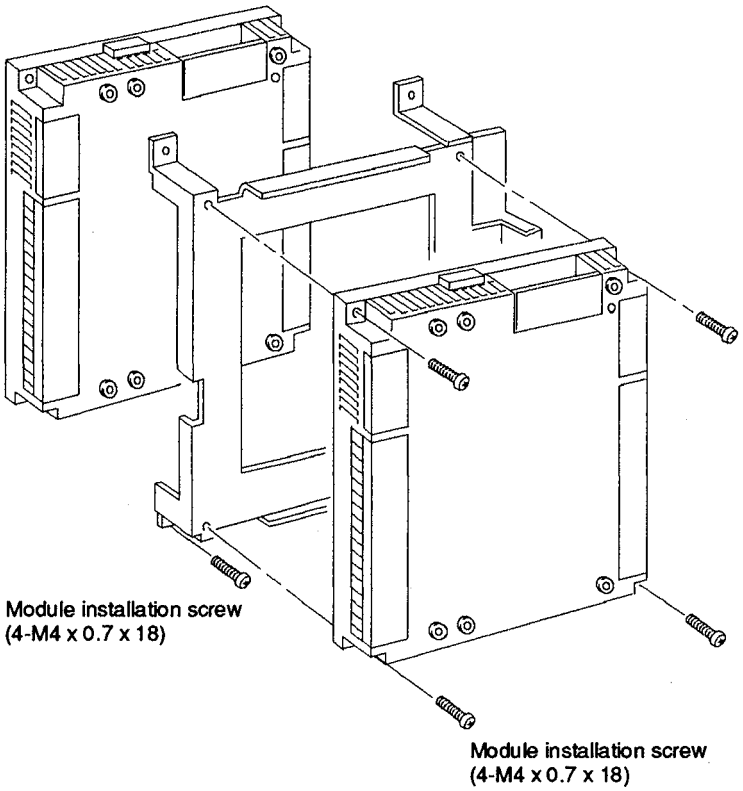
POINT

The terminal block of the I/O module is fixed by 2 mounting screws.
To remove the terminal block, loosen the mounting screws.

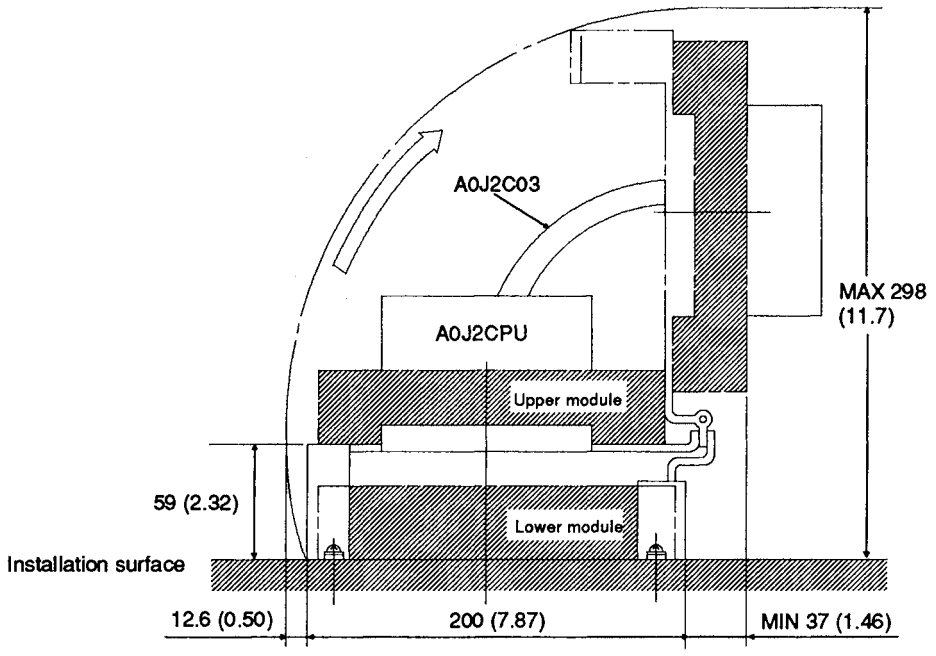


(4) Connecting modules using the A0J2-2F bracket

(a) Installation method



(b) Installed module dimensions



7.5 Wiring

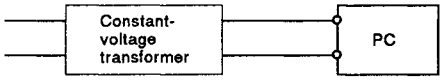
Wiring instructions for the A0J2HCPU system.

7.5.1 Wiring instructions

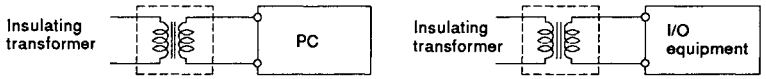
Instructions for wiring the power cable or I/O cables.

(1) Wiring of power source

(a) If voltage variations are greater than specifications, connect a constant-voltage transformer. In this case, use a transformer of within 5% output distortion factor.



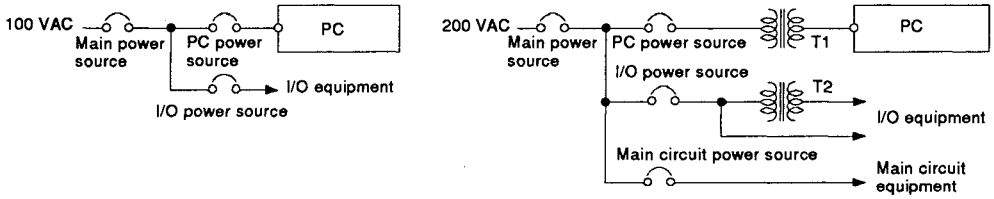
(b) Use a power supply which generates minimal noise across wire and across PC and ground. When excessive noise is generated, connect an insulating transformer.



(c) When power transformer or insulating transformer is employed to reduce the voltage from 200 VAC to 100 VAC, use one with a capacity greater than that indicated in the following table.

Power Supply Module	Transformer Capacity
A0J2HCPU(P21/R21)	56 VA
A0J2-PW	120 VA

(d) When wiring, separate the PC power source from those for I/O equipment and power equipment as shown below.

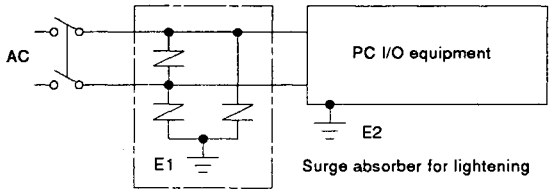


(e) Twist the 100 VAC, 200 VAC, and 24 VDC cables as closely as possible. Connect units with the shortest possible wire lengths.

(f) To minimize voltage drop, use the thicket (max. 2mm^2 (0.0031"sq.)) wires possible for the 100 VAC, 200 VAC, and 24 VDC cables.

(g) Do not bundle the 100 VAC and 24 VDC cables with main circuit wires or the I/O signal wires (high-voltage, large current). Also, do not wire these cables close to the wires indicated above. If possible, provide more than 100 mm (3.94 in) distance between the cables and wires.

(h) As a protective measure against large power surges (e.g. due to lightening), connect a resistor as shown below.



POINTS

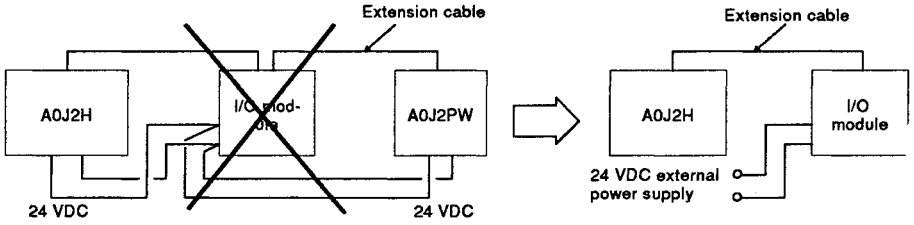
(1) Ground the surge absorber (E_1) and the PC (E_2) separately from each other.

(2) Select a surge absorber making allowances for power voltage rises.

(2) Cautions on A0J2H and A0J2PW 24 VDC output use

1) If the output capacity of the A0J2H/A0J2PW is insufficient, supply power from the external 24 VDC power supply.

2) Do not use 1 common I/O module for parallel connection of the A0J2H and A0J2PW 24 VDC output. If connected parallel, the A0J2HCPU and A0J2PW internal power supply will be damaged.



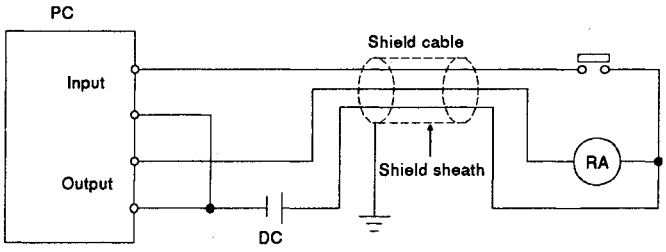
(3) Wiring of I/O equipment

(a) Applicable size of wire to the terminal block connector is 0.75 to 2mm^2 (0.0012 to 0.0032"sq.). However, it is recommended to use wires of 0.75mm^2 (0.0012"sq.) for convenience.

(b) Separate the input and output line

(c) I/O signal wires must be at least 100 mm (3.93 in) away from high-voltage and large-current main circuit wires.

(d) When the I/O signal wires cannot be separated from the main circuit wires and power wires, ground on the PC side with batch-shielded cables. Under some conditions it may be preferable to ground on the other side.



(e) If wiring has been done with of piping, ground the piping.

(f) Separate the 24 VDC I/O cables from the 100 VAC and 200 VAC cables.

(g) If wiring over 200 mm (7.87 in) or longer distance, trouble can be caused by leakage currents due to line capacity.

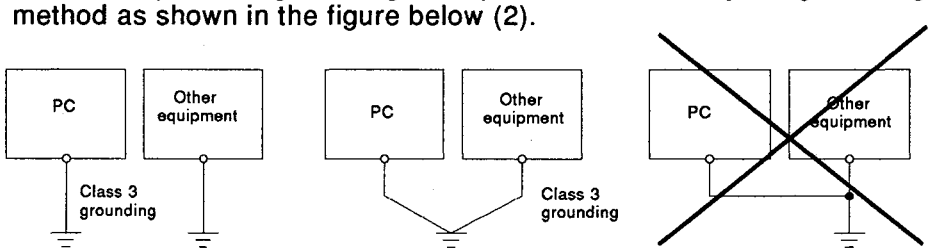
(4) Grounding

(a) The A series PC has good noise resistance (see Section 3.1). Therefore, the PC may be used without grounding except when there is excessive noise.

However, follow (b) to (e) described below.

(b) Ground the PC as independently as possible. Class 3 grounding should be used (grounding resistance 100 Ω or less).

(c) When independent grounding is impossible, use the joint grounding method as shown in the figure below (2).



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

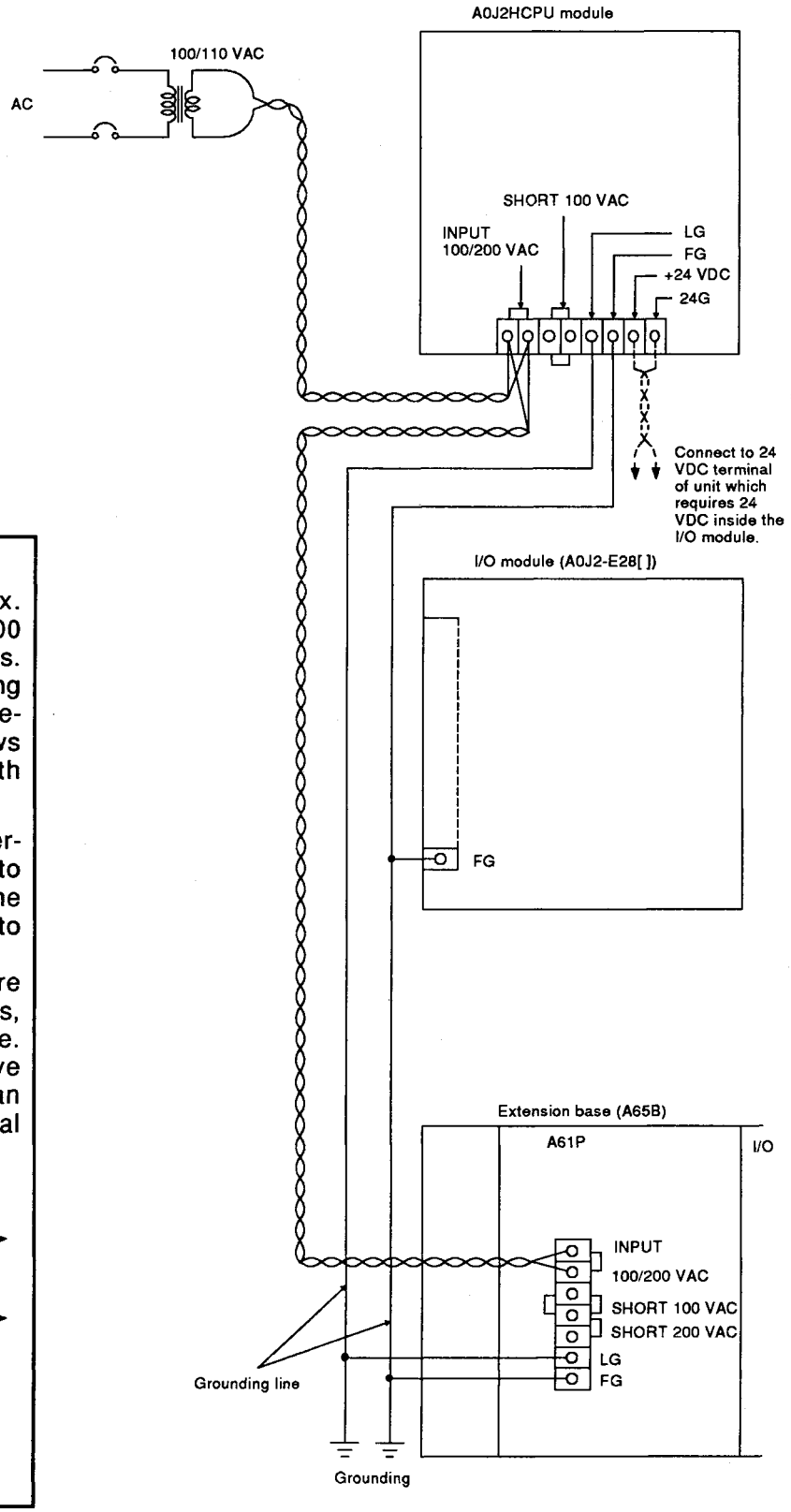
(d) Use 2mm^2 (0.0031"sq.) (AWG #14) or thicker grounding wire. Grounding point should be as near as possible to the PC to minimize the distance of grounding cable.

(e) Should incorrect operation occur due to grounding, disconnect one or both of the LG and FG terminals of base units from the grounding.

7.5.2 Wiring to module terminals

This section explains the wiring of power lines and grounding lines to the main and extension bases.

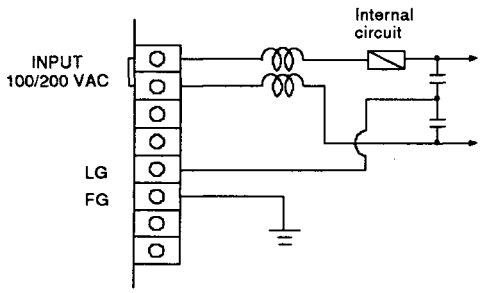
(1) A0J2HCPU



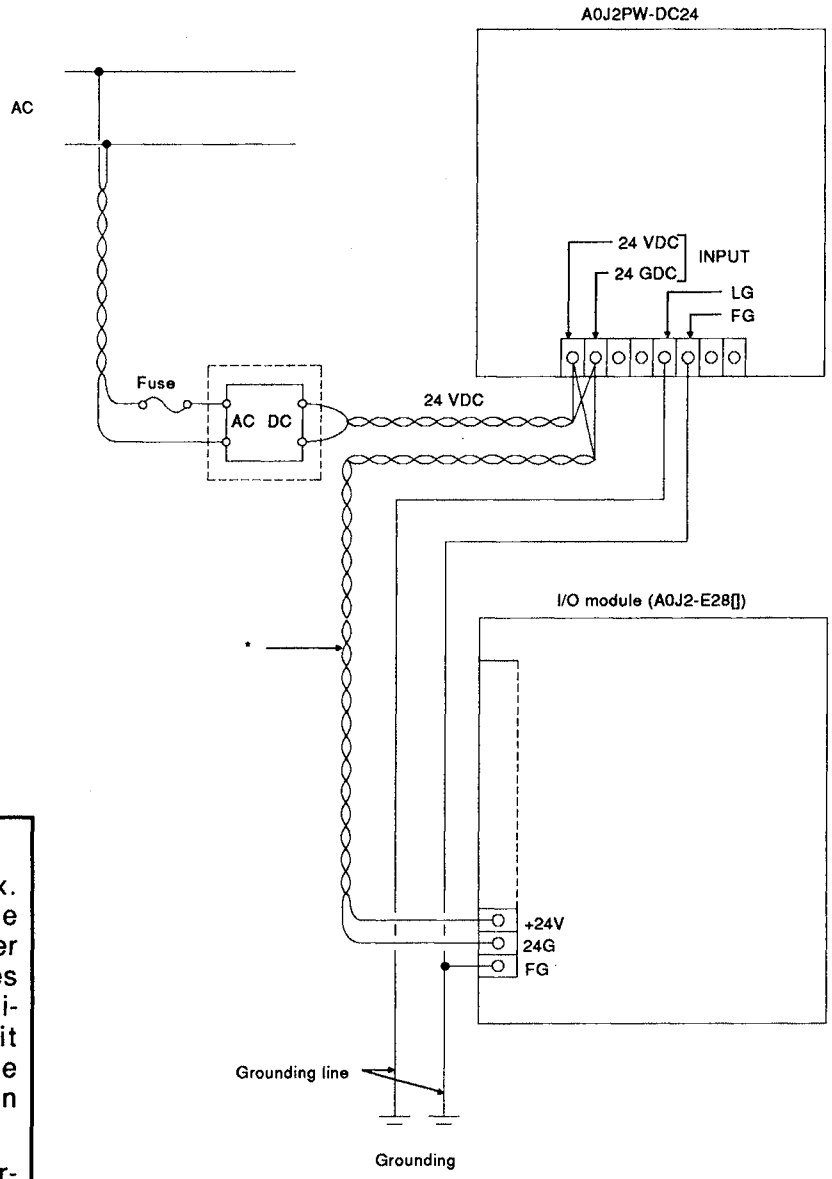
POINTS

(1) Use the thickest possible (max. 2mm^2 (0.0031"sq.)) wires for the 100 /200 VAC and 24 VDC power cables. Be sure to twist these wires stating at the connection terminals. To prevent short-circuit should any screws loosen, use solderless terminals with insulation sleeves.

(2) When the LG terminals and FG terminals are connected, be sure to ground the wires. Do not connect the LG terminals and FG terminals to anything other than ground.
If LG terminals and FG terminals are connected without grounding wires, the PC may be susceptible to noise. Also, since the LG terminals have potential, the operator may get an electric shock when touching metal parts.



(2) A0J2PW-DC24



POINTS

(1) Use the thickest possible (max. 2mm^2 (0.0031"sq.)) wires for the 100/200 VAC and 24 VDC power cables. Be sure to twist these wires starting at the connection terminals. To prevent short-circuit should any screws loosen, use solderless terminals with insulation sleeves.

(2) When the LG terminals and FG terminals are connected, be sure to ground the wires. Do not connect the LG terminals and FG terminals to anything other than ground.
If LG terminals and FG terminals are connected without grounding wires, the PC may be susceptible to noise. Also, since the LG terminals have potential, the operator may get an electric shock when touching metal parts.

(3) *....The power supply used to supply 24 VDC to both the A0J2PW-DC24 and I/O module must satisfy the operating voltage ranges of the A0J2PW-D24 and I/O module.

8. TEST OPERATION AND ADJUSTMENT

This chapter explains the procedures to be performed before, during, and after the test operation.

8.1 Check Points before Start of Test Operation

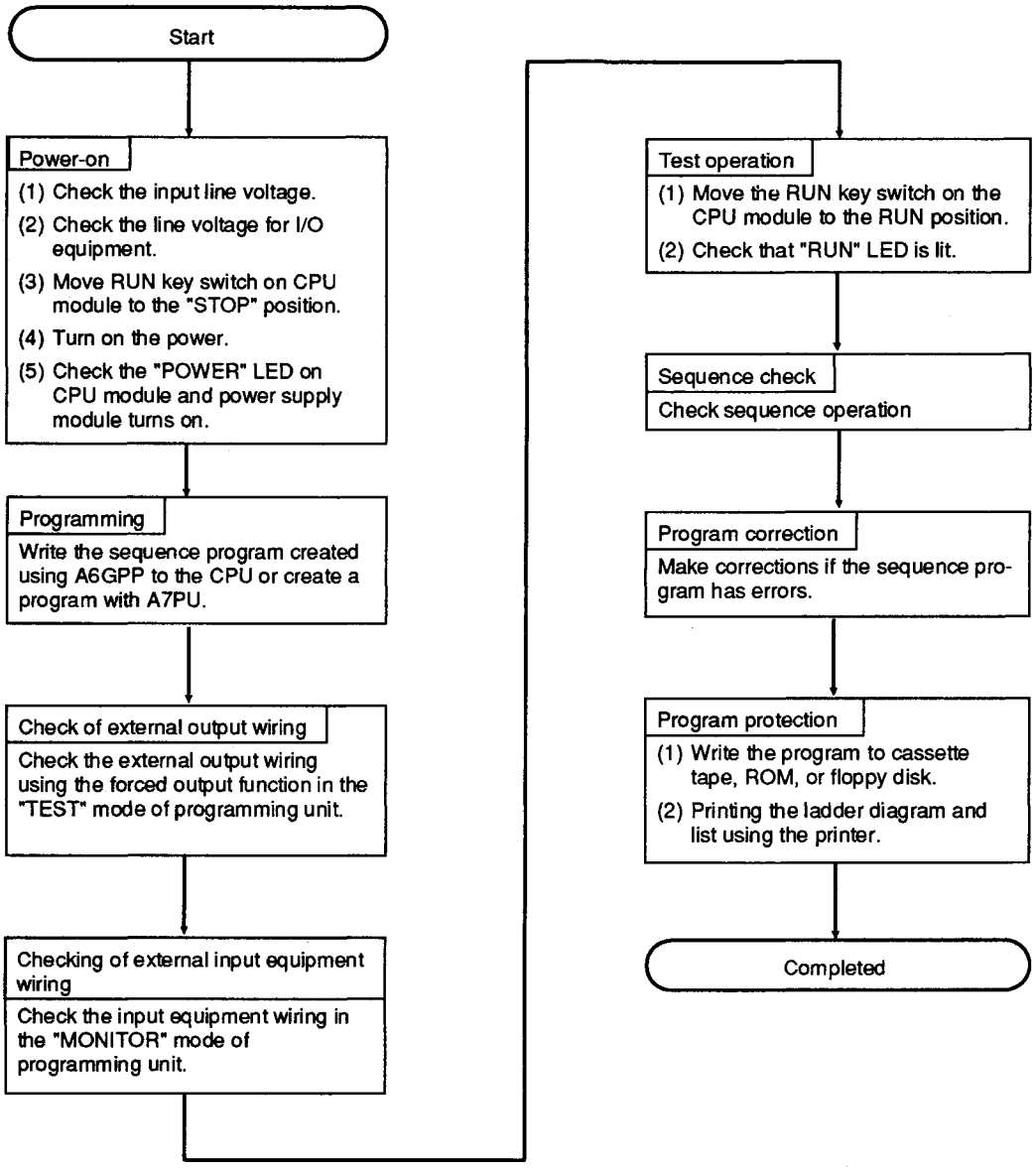
This section explains the points to be checked prior to the test operation of programmable controllers.

Table 8.1 Check Points

Item	Check Point	Description
1	Memory installation and settings	(1) ROM operation (a) Is the ROM firmly loaded into the Memory socket? (b) Is the memory switching switch set to ROM? (c) Is the memory protect switch OFF?
2	Loading of battery (Inside the memory cassette)	(1) Check whether the connector for battery lead wires, which has been disconnected before shipment, is securely inserted in the pin connector on the printed circuit board. (2) Check that the voltage of battery has not dropped. (Nominal value 3.6 V).
3	Connection of I/O or extension cables	(1) Check that the A0J2HCPU module, and extension base connectors are properly connected with the cable connectors. Are they locked securely? (2) Check that the cable connector positions are proper.
4	I/O module or extension base stage setting	(1) Make sure that the setting has been performed. (2) Check if the same number has been set.

8.2 Test Operation and Adjustment Procedure

This section shows the flow chart from after the completion of installation to the test operation of programmable controller.



9. MAINTENANCE AND INSPECTION

This chapter describes items for daily and periodic maintenance and inspection in order to maintain the programmable controller in the normal and best conditions.

9.1 Daily Inspection

Table 9.1 Daily inspection

Number	Check Item		Check Point	Judgement	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.	Screw should not be loose.	Retighten terminal screws.
			Check distances between solderless terminals.	Proper clearance should be provided between solderless terminals.	Correct.
			Check connectors of extension cable.	Connectors should not be loose.	Retighten connector mounting screws.
4	Main module indicator lamps	"POWER" LED	Check that the LED is on.	On. (Off indicates an error.)	Refer to 10.2.2.
		"RUN" LED	Check that the LED is on during run.	On. (Off or flashing indicates an error.)	Refer to 10.2.3 and 10.2.4.
		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.)	Refer to 10.2.5.
		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.)	Refer to 10.2.5.

9.2 Periodic Inspection

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

Table 9.2 Periodic Inspection

Number	Check Item		Check Method	Judgement	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 VDC 170 to 264 VAC	Change supply power.
			24 VDC	15.6 to 31.2 VDC	
3	Mounting conditions	Looseness, play	Move the module.	The module should be mounted securely and positively.	Retighten screws. For CPU, I/O, and power supply modules check all connections.
		Ingress of dust or foreign material	Visual check.	There should be no dust or foreign material, in the vicinity of the P.C.	Remove and clean.
4	Connecting conditions	Loose terminal screws	Retighten with a screwdriver.	Connections should not be loose.	Retighten.
		Distances between solderless terminals	Visual check.	Proper clearance should be provided between solderless terminals.	Correct.
		Loose connector	Visual check.	Connections should not be loose.	Retighten connector mounting screws.
5	Battery		Ensure that M9006 or M9007 are off in monitor mode of A7PU or A6GPP.	(Preventive maintenance)	If battery capacity reduction is not indicated, change the battery when specified service life is exceeded.

Table 9.2 Periodic Inspection (Continued)

Number	Check Item	Check Method	Judgement	Corrective Action
6	Fuse	Check whether fuse is blown.	(Preventative maintenance)	Even if the fuse is not blown, since there is element consumption due to inrush current, replace periodically.

9.3 Battery Replacement

When the voltage of the backup battery for programs and power failure compensation function drops below the predetermined level, M9006 or M9007 turns on. The contents of the programs and the latched date are not lost immediately after this special relay turns on. The contents may be lost if you overlook the turning on of the special relay.

9.3.1 Battery life

The period in which stored data is guaranteed will vary depending on device memory capacity to be retained or length of power failure. However, as a preventive maintenance measure, it is recommended to replace the battery after 4 or 5 years of use even if the total power failure time is less than the guaranteed period.

Table 9.3 Battery Life

Battery Life (Total power failure time)[Hr]		
Guaranteed Value (MINIMUM)	* Actually Applied Value (TYP)	After M9006, M9007 has turned on
5400	13000	168

* The actually applied value indicates a typical value and the guaranteed value indicates the minimum value.

9.3.2 Replacing procedures

(1) Procedures

(a) Back up the programs and data.

(b) Turn off the A0J2HCPU.

(c) Disconnect the battery lead connector from the connector on the A0J2HCPU board.

(d) Remove the battery from the battery holder by pressing down the holder lug.

(e) Insert a new battery.

(f) Connect the battery lead connector with the battery connector on the A0J2HCPU board.

(g) Turn on the A0J2HCPU.

(h) Check that the low battery flag (M9006) is reset. If it is set, replace the battery again.

(2) Caution

Replace the battery within the guaranteed period specified in Table 9.4.
If it takes longer than the guaranteed period, sequence programs or latched data would be lost.

Table 9.4 Capacitor Backup Time

Capacitor Backup Time (min)	
Guaranteed Period (MINIMUM)	Under Normal Operating Conditions (TYP)
5	15

10. TROUBLESHOOTING

This chapter describes various procedures for establishing the nature of any faults, and corrective action.

10.1 Basic Troubleshooting

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

The basic points to be kept in mind in troubleshooting are the following three.

(1) Visual checks

Check the following points.

1) Machine motions (in stop and operating statuses)
2) On or off of power
3) Status of I/O equipment
4) Conditions of wiring (I/O wires, cables)
5) Display states of various indicators (such as POWER LED, RUN LED, and I/O LED)
6) States of various setting switches (such as extension base and power failure compensation)

After checking 1) to 6), connect the peripheral device and check the running status of PC and the contents of program.

(2) Trouble check

Observe any changes in the error condition during the following.

1) Set the RUN key switch to the "STOP" position.
2) Perform reset by the RESET key switch.
3) Turn the power on and off.

(3) Narrow down the possible causes of the trouble

Deduce where the fault lies i.e.:

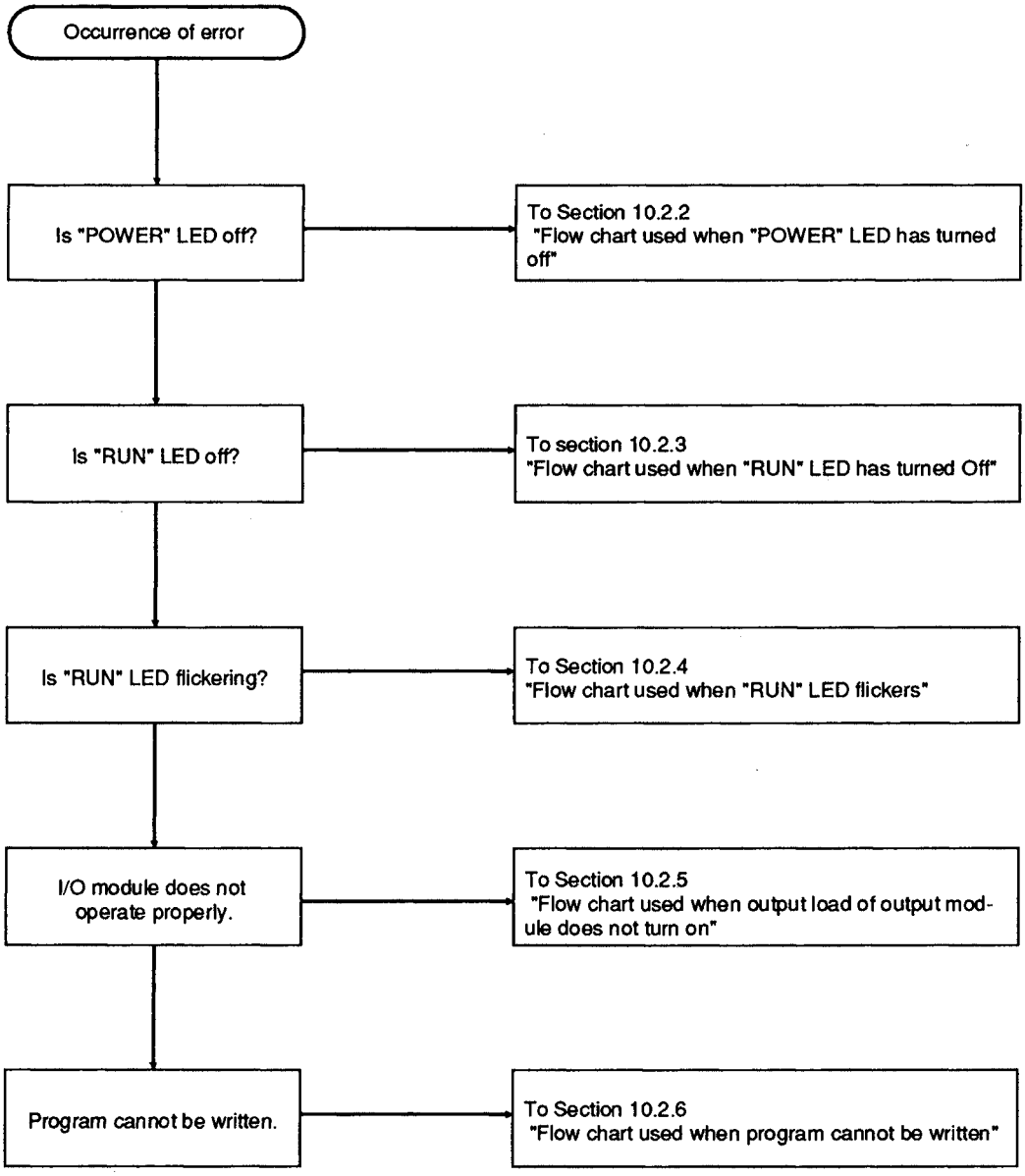
1) Inside or outside of PC.
2) I/O module or another module.
3) Sequence program.

10.2 Troubleshooting

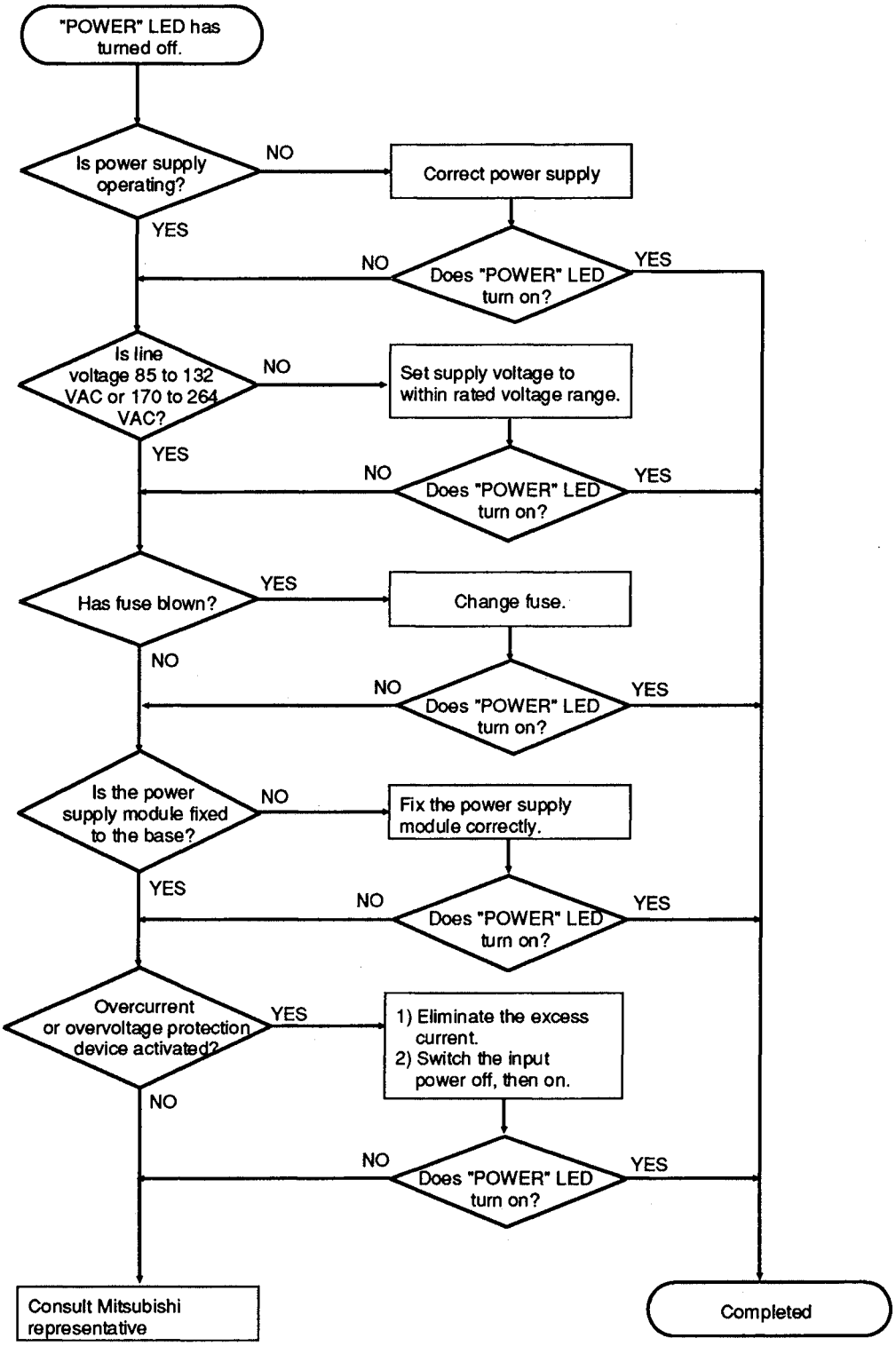
This section explains the procedure for determining the cause of problems and the errors and corrective actions for error codes.

10.2.1 Troubleshooting flow charts

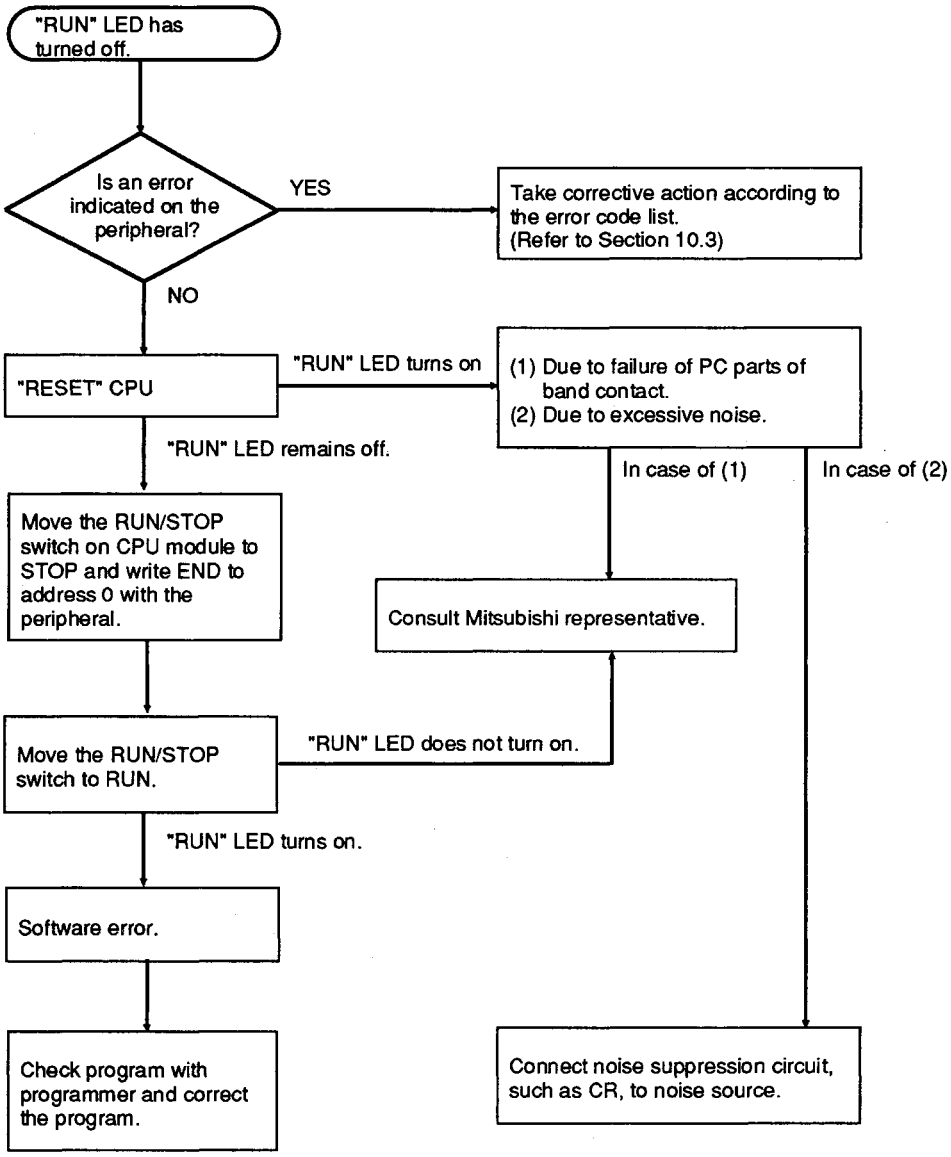
Details for fault finding may be found as follows.



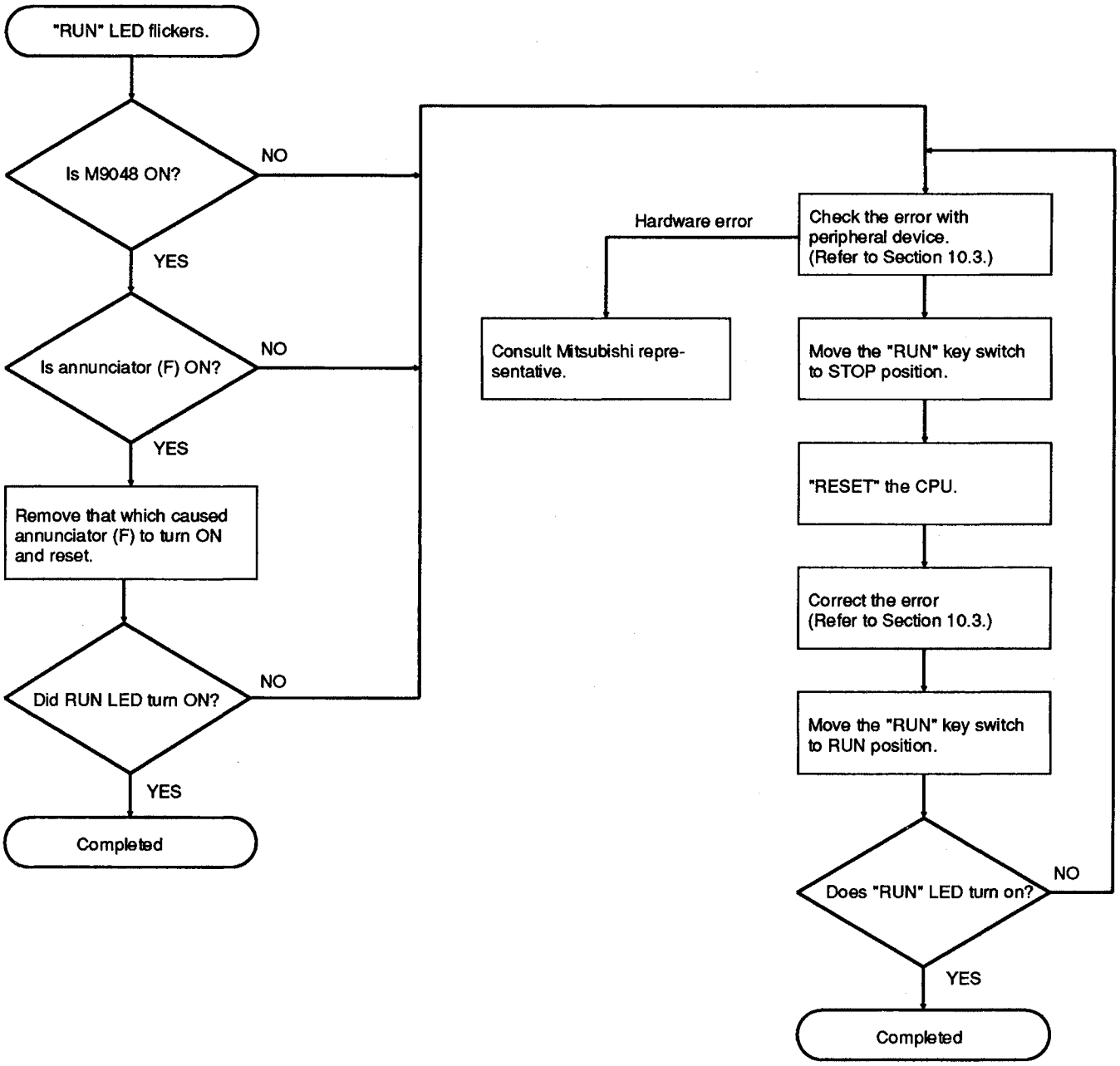
10.2.2 Flow chart used when the "POWER" RED has turned off



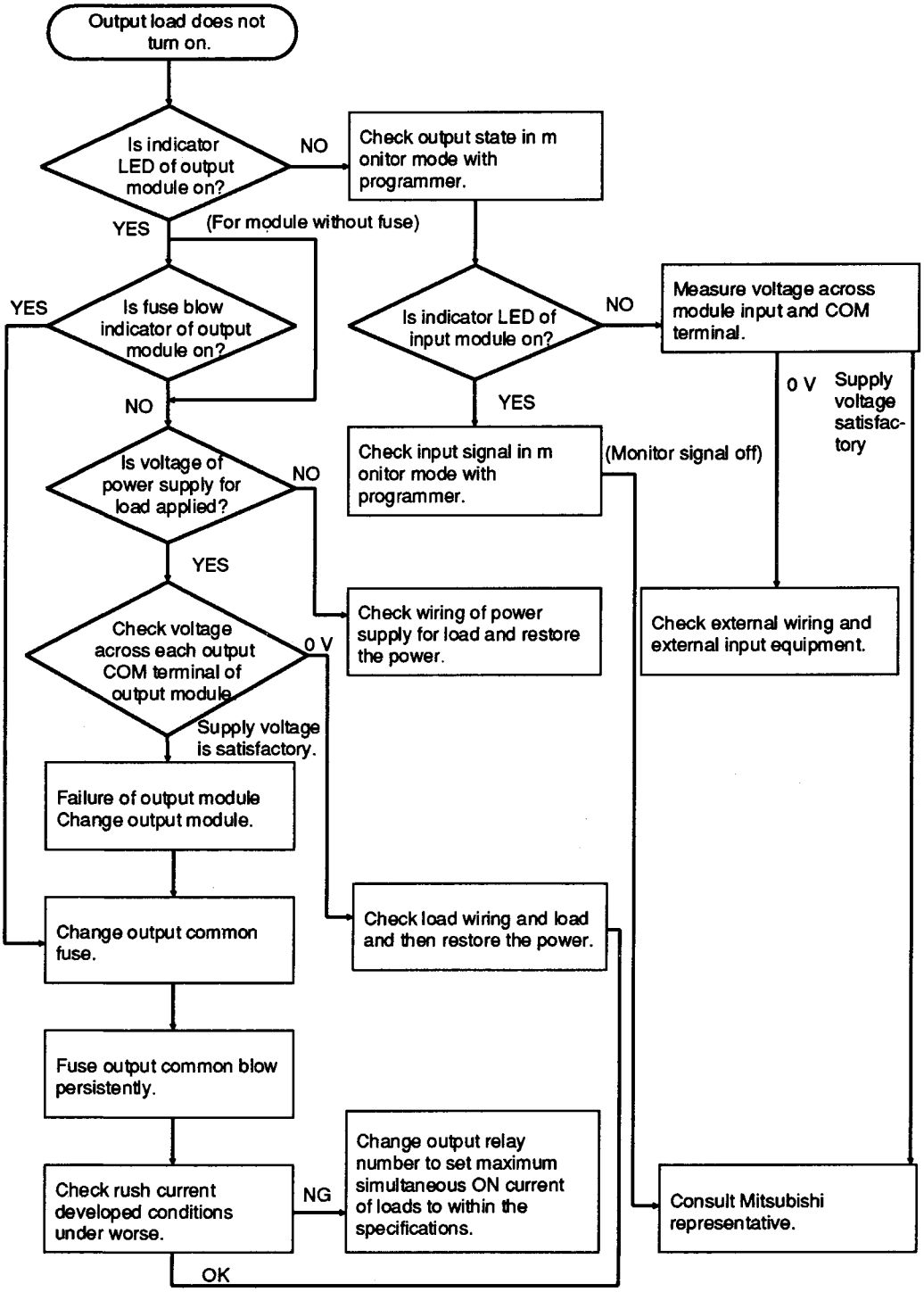
10.2.3 Flow chart used when the "RUN" LED has turned off



10.2.4 Flow chart used when the "RUN" LED flickers



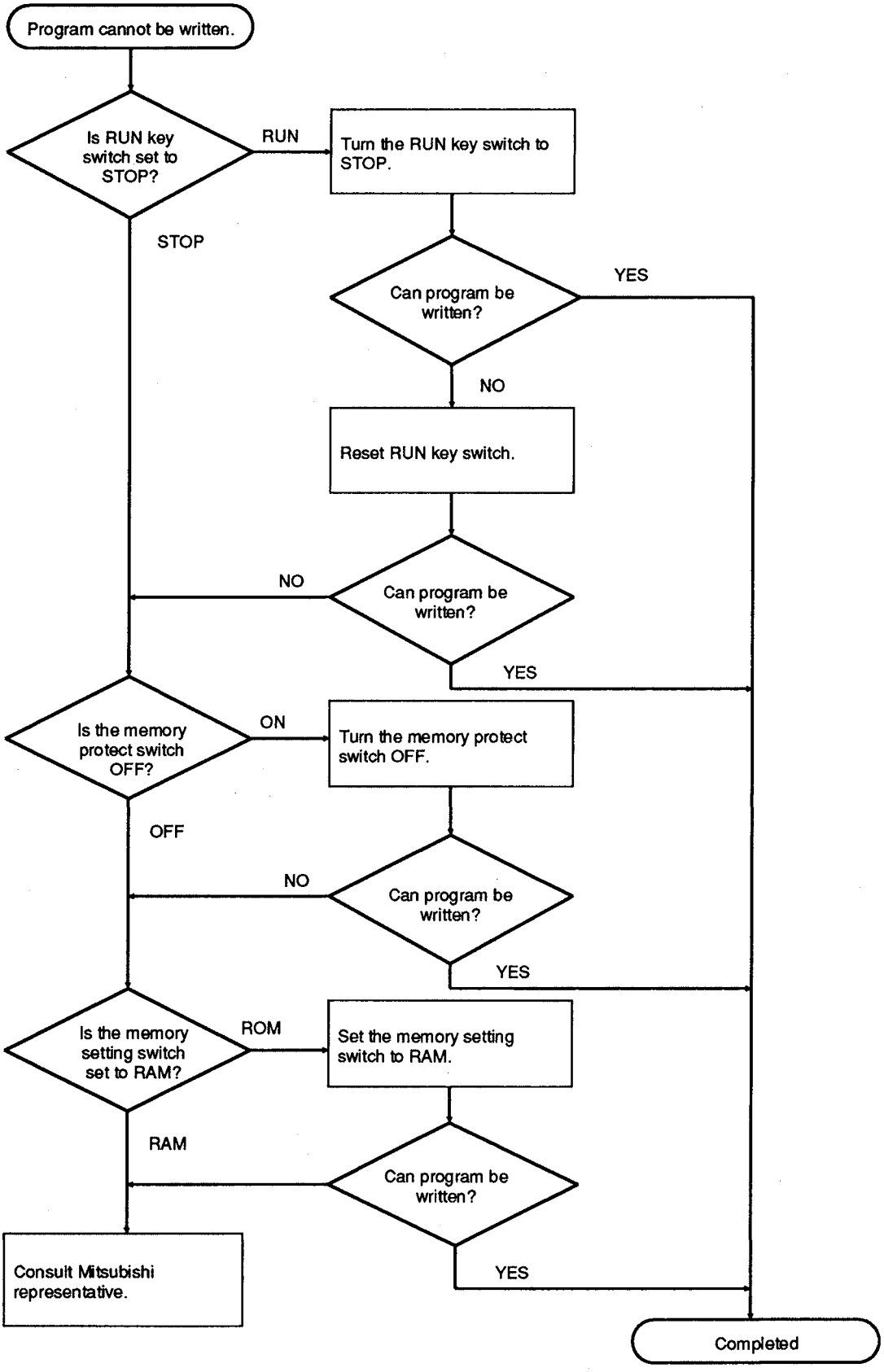
10.2.5 Flow chart used when output load of output module does not turn on



POINT

For trouble when the input signal or load are OFF, refer to Troubleshooting in the A0J2 (I/O Module) User's Manual and carry out troubleshooting.

10.2.6 Flow chart used when a program cannot be written



10.3 Error Code List

If an error occurs in the RUN mode, an error display or error code (including a step number) is stored in the special resister by the self-diagnostic function. The error code reading procedure and the causes and corrective actions for errors are shown in Table 10.1.

The error code can be read from the peripheral device. Refer to peripheral device operation manuals for operations.

10.3.1 Error code list

Table 10.1 Error Code List

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

Table 10.1 Error Code List (Continued)

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

Table 10.1 Error Code List (Continued)

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

Table 10.1 Error Code List (Continued)

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

Table 10.1 Error Code List (Continued)

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

APPENDICES

APPENDIX 1 PERFORMANCE COMPARISON BETWEEN A0J2HCPU(P21/R21) AND A0J2CPU(P23/R23)

Table 1 Performance Comparison Between A0J2HCPU(P21/R21) and A0J2CPU(P23/R23)

<table>
<tr><td colspan="3">Item \ Type</td><td colspan="2">A0J2HCPU(P21/R21)</td><td colspan="2">A0J2CPU(P23/R23)</td></tr>
<tr><td colspan="3">Control system</td><td colspan="2">Repeat operations (by stored program)</td><td colspan="2"></td></tr>
<tr><td colspan="3">I/O control system</td><td colspan="2">Selection of refresh/direct modes possible</td><td colspan="2">Direct mode</td></tr>
<tr><td colspan="3">Program language</td><td colspan="2">Sequence control language
(relay symbol language,
logic symbol language)</td><td colspan="2">Sequence control language
(relay symbol language, logic symbol language, MELSAP language)</td></tr>
<tr><td rowspan="3">Number of instructions (types)</td><td colspan="2">Sequence instructions</td><td colspan="2">22</td><td colspan="2">21</td></tr>
<tr><td colspan="2">Basic instructions</td><td colspan="2">131</td><td colspan="2">38</td></tr>
<tr><td colspan="2">Application instructions</td><td colspan="2">109</td><td colspan="2">21</td></tr>
<tr><td colspan="3">Processing speed (sequence instructions) (μsec/step)</td><td colspan="2">At direct : 1.25 to 2.25
At refresh : 1.25</td><td colspan="2">4.4 to 5.6</td></tr>
<tr><td colspan="3">Number of I/O points</td><td colspan="4">336 points (Max. 480 points when using extension base units)</td></tr>
<tr><td colspan="3">*1 Watchdog timer (WDT) (ms)</td><td colspan="2">10 to 2000</td><td colspan="2">200</td></tr>
<tr><td colspan="3">Memory capacity</td><td colspan="2">32k bytes</td><td colspan="2">4KEROM/4KRAM/4KROM (3k steps)
16KRAM/8KROM (7k steps)</td></tr>
<tr><td colspan="3">Program capacity</td><td colspan="2">(Main sequence program + microcomputer program) = 8k steps max.
Internal microcomputer program can be set to 7k steps (14k bytes) max. (subsequence program not available)</td><td colspan="2">Max. 7k steps (including utility program capacity)</td></tr>
<tr><td rowspan="8">Device</td><td colspan="2">Internal relay (M) points</td><td>1000
(M0 to 999)</td><td rowspan="3">Total of 2048 for M, S, L (set in parameters)</td><td>1024
(M0 to 1023)</td><td rowspan="3">Total of 2048 for M, S, L (set in parameters)</td></tr>
<tr><td colspan="2">Latch relay (L)</td><td>1048
(L100 to 2047)</td><td>1024
(L1024 to 2047)</td></tr>
<tr><td colspan="2">Step relay (S)</td><td>0 (Initial state not available)</td><td>0 (Initial state not available)</td></tr>
<tr><td colspan="2">Link relay (B)</td><td colspan="2">1024 (B0 to 3FF)</td><td colspan="2">1024 (B0 to 3FF)</td></tr>
<tr><td rowspan="2">Timer (T)</td><td>Points</td><td colspan="2">256</td><td colspan="2">128</td></tr>
<tr><td>Specifications</td><td colspan="2">100 ms : Setting range 0.1 to 3276.7 s (T0 to 199)
10 ms : Setting range 0.01 to 327.67 s (T200 to 255)
100 ms retentive timer: Setting range 0.1 ms to 3276.7 s
Set in parameters</td><td colspan="2">100 ms : Setting range 0.1 to 3276.7 s (T0 to 79)
10 ms : Setting range 0.01 to 327.67 s (T80 to 119)
100 ms retentive timer: Setting range 0.1 ms to 3276.7 s (T120 to 127)</td></tr>
</table>

Table 1 Performance Comparison Between A0J2HCPU(P21/R21) and A0J2CPU(P23/R23) (Continued)

Item \ Type			A0J2HCPU(P21/R21)	A0J2CPU(P23/R23)
Device	Counter (C)	Points	256	128
		Specifications	Normal counter: Setting range 1 to 32767 (C0 to 255) Interrupt program counter: Setting range 1 to 32767 →Counter used in interrupt program Set in parameters	Normal counter: Setting range 1 to 32767 (C0 to 127)
	Data register (D) points		1024 (D0 to 1023)	512 (D0 to 511)
	Link register (W)		1024 (W0 to 3FF)	Not available (1024 points available in A0J2CPU/R23)
	Annunciator (F)		256 (F0 to 255)	256 (F0 to 255)
	File register (R)		Max. 4096 (R0 to 4095)	Not available
	Accumulator (A)		2 (A0, A1)	Not available
	Index register (V,Z)		2 (V, Z)	
	Pointer (P)		256 (P0 to 255)	64 (P0 to 63)
	Interrupt pointer (I)		32 (I0 to 31)	Not available
	Special relay (M)		256 (M9000 to 9255)	
	Special register (D)		256 (D9000 to 9255)	127 (D9000 to 9127)
Number of comments			Max. 1600 (set in units of 64 points)	Max. 95 (only F0 to 94 can be set)
Self-diagnosis			Watchdog error supervision, memory error detection, CPU error detection, I/O error detection, faulty battery detection, etc.	
RUN mode at error occurrence			Stop/continuous selection	STOP
Output mode switching from STOP to RUN			Re-output of operation status before STOP/output selection after operation execution	Re-output of operation status before STOP
Weight (kg) (lb)			A0J2HCPU : 0.75 (1.65) A0J2HCPU-DC24 : 0.65 (1.43) A0J2HCPUP21 : 1.1 (2.42) A0J2HCPUR21 : 1.1 (2.42)	A0J2CPU : 0.75 (1.65) A0J2HCPU-DC24 : 0.75 (1.65) A0J2CPUP23 : 1.05 (2.31) A0J2CPUR23 : 1.08 (2.38)

APPENDIX 2 CAUTIONS WHEN USING THE A0J2HCPU IN EXISTING SYSTEMS

Hardware and sequence programs cautions when using the existing system CPU module created for the A0J2CPU(P23/R23) in the A0J2HCPU will be explained.

2.1 Hardware Cautions

2.1.1 Power supply module

The current consumption of the A0J2HCPU is 0.1 A greater than that of the A0J2CPU. Be sure that the current capacity is sufficient.

		A0J2HCPU(P21/R21)	A0J2CPU(P23/R23)
Current consumption (5 VDC)		A0J2HCPU :0.4A A0J2HCPUP21 :0.53A A0J2HCPUR21 :0.86A	A0J2CPU : 0.3A A0J2CPUP23 : 0.52A A0J2CPUR23 : 0.96A
Built-in power supply module's rated output current	5 VDC	2 A	
	24 VDC	0.5 A	

2.1.2 Memory capacity

(1) The A0J2HCPU has 32k bytes of built-in RAM memory. As with the A0J2CPU, it is not necessary to load 4KRAM or 16KRAM.

(2) 4KROM cannot be used in the A0J2HCPU.

2.1.3 Special function module

The following modules can be used as computer link/multidrop link modules with A0J2HCPU.

Function \ Module name	A0J2-C214	A0J2-C214S1	AJ71C24(S3)
Computer link function	X	O	O
Multidrop link function	O	O	X

O :Can be used X :Cannot be used

An extension base unit is necessary when using the AJ71C24 (S3).

2.1.4 Peripheral devices

The following peripheral devices can be used with the A0J2HCPU.

(1) A6GPP : SW4GP-GPPA

(2) A6PHP : SW4GP-GPPA

(3) A6PU, A7PU : CPU type "A2" is displayed.

(4) A7PU (software version F or later), A7PUS, A8PUE
: The CPU type is displayed as "A0J2H".

(5) A6WU : Software version E or above (refer to Section 2.2 of this manual).

REMARK

When using software packages other than A6HGPP and A6GPP/A6PHP, select PC type "A2CPU" and operate. Operation in the ROM are not possible.

2.2 Cautions When Using the Sequence Program

The sequence program created by the existing system can be used only when changing parameter settings. Note that some specifications for instructions, special relays, special registers, latch ranges, etc. differ.

2.2.1 Instructions with different specifications

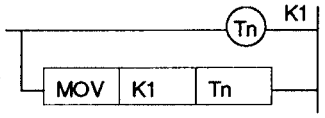
Table 3 shows differences between instructions with different specifications in the A0J2HCPU and A0J2CPU. (Instructions added to the A0J2HCPU and instructions with A0J2CPU processing content are excluded.)

Refer to the ACPU Programming Manual (Common Instructions) for details on instructions.

Table 3 Instructions with Different Specifications

Instruction	A0J2HCPU	A0J2CPU	Content of program changes required for use in the A0J2HCPU
DBCD DBIN	Data which can be handled is in the range of 0 to 99999999 (8-digit BCD)	Data which can be handled is in the range of 0 to 999999 (6-digit BCD)	In the A0J2CPU, if 999999 (6-digit BCD) are exceeded, an OPERATION ERROR occurs. In the A0J2HCPU, no error occurs. When controlling using the operation flag (M9011), sequence program changes are necessary.
CJ CALL	(1) Pointers which can be used are in the range of P0 to 255. (2) P255 is used when jumping to the END/FEND instruction.	(1) Pointers which can be used are in the range of P0 to 63. (2) P63 is used when jumping to the END/FEND instruction.	When using P63, change to P255.
SUM	Operation results are stored in D9003 and A0.	Operation results are stored in D9003.	In the A0J2HCPU, program changes are not necessary since operation results are stored to D9003 and A0.
DUTY	Devices which can be used are M9020 to 9024.	Devices which can be used are M9020 to 9021.	Sequence program changes are not necessary.
PR	(1) When M9049 is turned OFF, outputs from the head specified device to NULL (00H). (2) When M9049 is turned ON, outputs 16 characters from the head specified device.	Outputs 16 characters from the head specified device.	Use after turning M9049 ON.
6-digit BCD Multiplication	Use DB * instruction (8-digit BCD multiplication)	Operate using special register D9030 to 9036 by SUB HFFFF instruction.	Change to DB * instruction. For devices to be used, change special register D9030 to 9036 to user devices.
6-digit BCD Division	Use DB/instruction (8-digit BCD division)	Use special register D9030 to 9037 by SUB HFFFE instruction.	Change to DB/instruction. For devices to be used, change special register D9030 to 9037 to user devices.
32-bit BIN Addition	Use D + instruction.	Operate using special register D9030 to 9035 by SUB HFFFD instruction.	Change to DB + instruction. For devices to be used, change special register D9030 to 9035 to user devices.
32-bit BIN Subtraction	Use D - instruction.	Operate using special register D9030 to 9035 by SUB HFFFC instruction.	Change to DB - instruction. For devices to be used, change special register D9030 to 9035 to user devices.

Table 3 Instructions with Different Specifications (Continued)

Instruction	A0J2HCPU	A0J2CPU	Content of program changes required for use in the A0J2HCPU
32-bit BIN Multiplication	Use D * instruction.	Operate using special register D9030 to 9037 by SUB HFFFB instruction.	Change to DB * instruction. For devices to be used, change special register D9030 to 9037 to user devices.
32-bit BIN Division	Use D/instruction.	Operate using special register D9030 to 9037 by SUB HFFFA instruction.	Change to DB/instruction. For devices to be used, change special register D9030 to 9037 to user devices.
OUT Tn	The timer does not count up if the setting is "0".	The timer counts up at the END processing in the scan in which the Tn coil is turned ON if the setting is "0".	Change OUT Tn K0 to the circuit as indicated below. 

2.2.2 Special relays and special registers with different specifications

(1) Table 4 shows special relays and special registers with different specifications in the A0J2HCPU and A0J2CPU. (Relays and registers added to the A0J2HCPU and those with specifications are excluded.)

Table 4 Special Relays and Special Registers with Different Specifications

Device Number	A0J2HCPU	A0J2CPU
M9048	RUN LED blinking flag when annunciator is turned ON OFF : not blinking ON : blinking	Not used In the A0J2CPU, even with the annunciator turned ON, RUN LED does not blink.
D9016	Program number 0 : Main program (ROM) 1 : Main program (RAM)	ROM/RAM settings 0 : ROM 1 : RAM 2 : EEPROM
D9030 to D9037	Not used	Use as registers for operation of additional instruction SUB HFFF[ ].

(2) When using the A0J2HCPUP21/R21 as a local station in the MELSECNET (II) data link system, device number of the special registers which store the link status of the MELSECNET (II) data link system is changed in addition to the special relays and special link registers indicated in (1) above.

The data to be stored in these registers is not changed, however.

Table 5 Special Registers for Which Device Number is Changd

Name	Device Number	
	A0J2HCPUP21/R21	A0J2CPUP23/R23
Host station's station number	D9243	D9115
Total number of slave stations in the link	D9244	D9116
Receive error detection count	D9245	D9117
Local station operation condition (Station 1 to station 16)	D9248	D9120
Local station operation condition (Station 17 to station 32)	D9249	D9121
Local station operation condition (Station 33 to station 48)	D9250	D9122
Local station operation condition (Station 49 to station 64)	D9251	D9123
Faulty local station (Station 1 to station 16)	D9252	D9124
Faulty local station (Station 17 to station 32)	D9253	D9125
Faulty local station (Station 33 to station 48)	D9254	D9126

2.2.3 Parameter settings

When using the A0J2CPU program, parameter setting must be changed. The primary changes will be shown.

(1) Latch range

As shown in Table 6, A0J2CPU latch range settings are "last half latched" or "whole range latched."

(a) Set parameters matching existing system latch ranges.

(b) When using by latching A0J2CPU step relay ranges, change to the latch relays to be used in the A0J2HCPU. As shown in Table 5, in A0J2CPU step relay (S), latch setting is possible whereas in A0J2HCPU step relay (S), it is not.

Table 6 A0J2CPU Latch Range

	Non-latch Range	Latch Range
No latch	M0 to M2047 (M0 to M1535, S1536 to S2047)* T0 to T127 C0 to C127 D0 to D511 B0 to B3FF	—
Last half latched	M0 to M1023 T0 to T39/T80 to T99/T120/T123 C0 to C63 D0 to D255 B0 to B1FF	L1024 to L2047 (L1024 to L1535, S1536 to S2027)* T40 to T79/T100 to T119/T124 to T127 C64 to C127 D256 to D511 B200 to B3FF
Whole range latched	—	L0 to L2047 (L0 to L1535, S1536 to S2047)* T0 to T127 C0 to C127 D0 to D511 B0 to B3FF

* : Indicates the M, L and S ranges when step relays (S) are set.

(2) Timer (T) range

Set parameters matching A0J2HCPU timer specifications to A0J2CPU timer specifications as shown below.

- 100 ms timer : T0 to 79
- 10 ms timer : T80 to 119
- 100 ms retentive timer: T120 to 255

(3) Counter (C) range

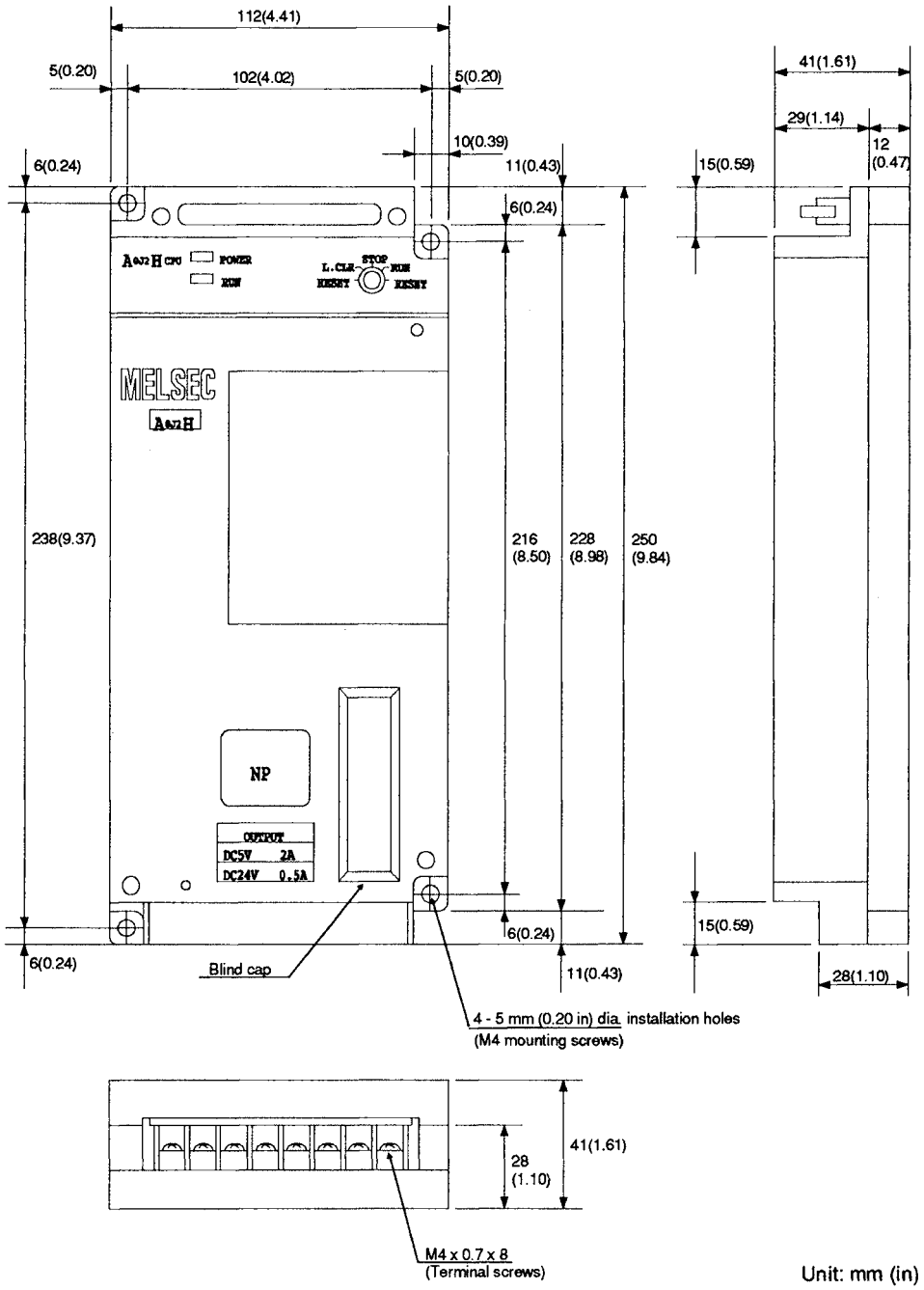
A0J2CPU specifications can be used if C0 to 127 of the A0J2HCPU are set as normal counters.

2.2.4 I/O control system switching

Since the A0J2CPU is set to the I/O direct mode, use the A0J2HCPU by setting to the I/O direct mode.

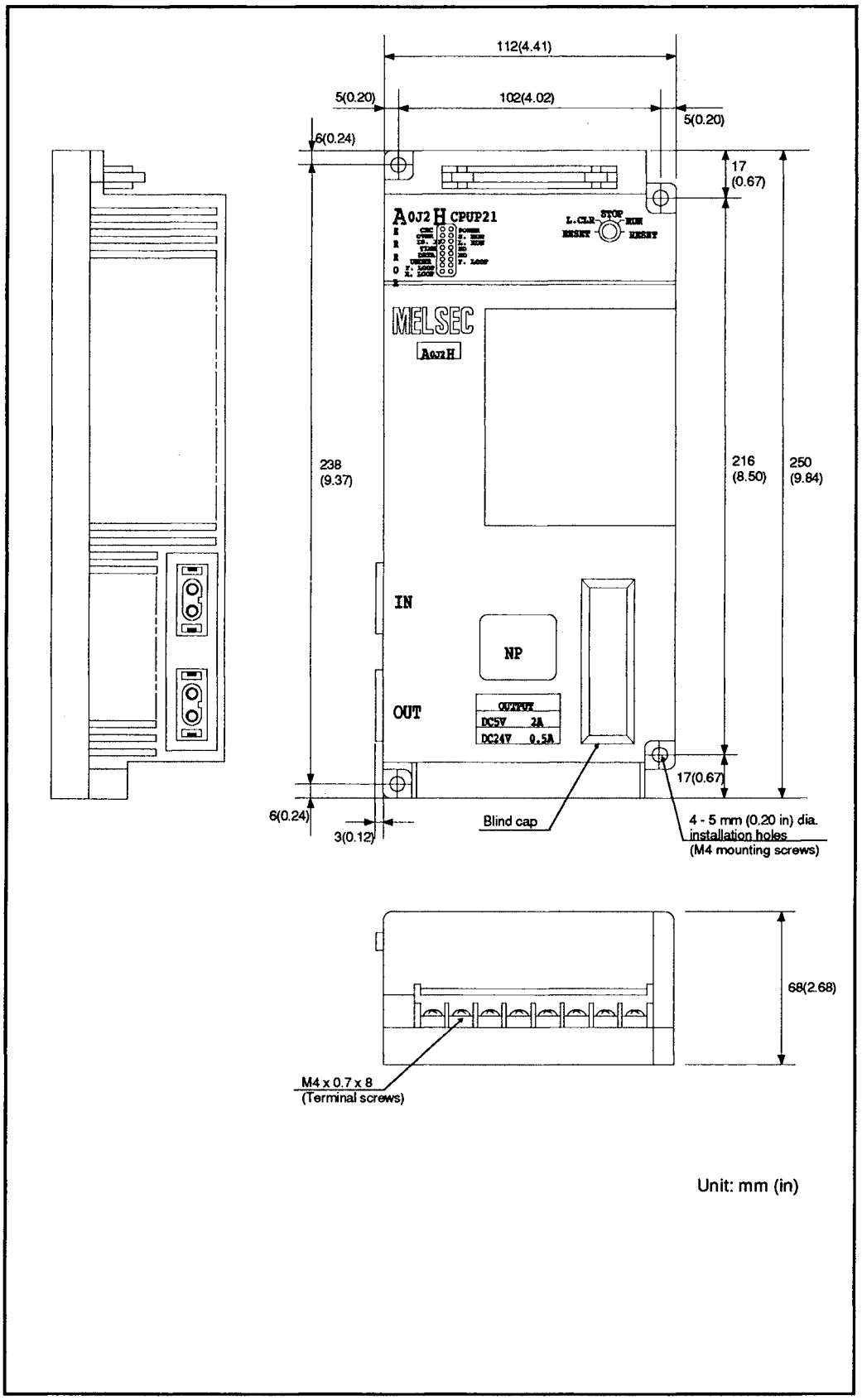
APPENDIX 3 OUTSIDE DIMENSIONS

3.1 A0J2HCPU Module

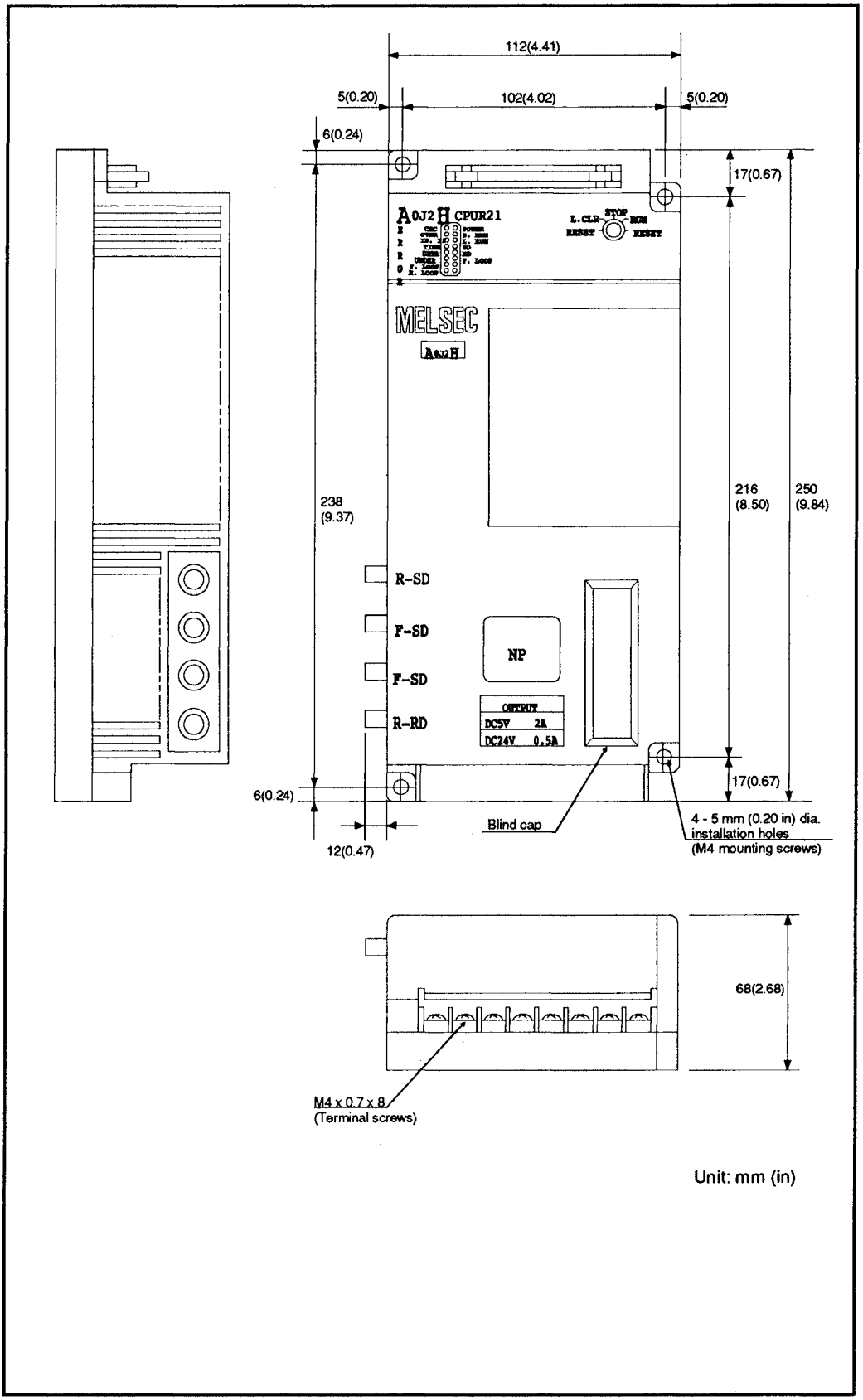


Use M4 mounting screws with a length of M4 x 0.7 x 18 (mm).

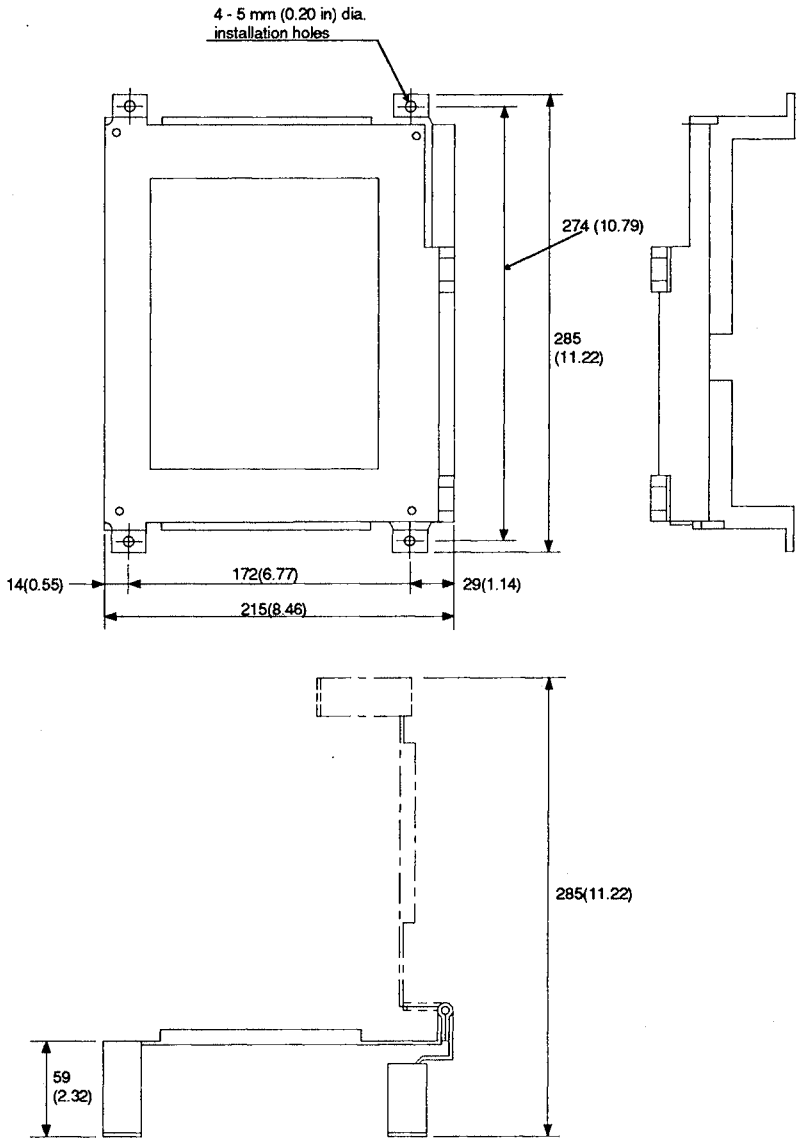
3.2 A0J2HCPUP21 Module



3.3 A0J2HCPUR21 Module



3.4 A0J2-2F Double Mounting



Unit: mm (in)

APPENDIX 4 TRANSPORTATION PRECAUTIONS

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

APPENDIX 4.1 Controlled models

The batteries for Memory card is classified as follows:

Product name	Model	Product supply status	Transport guidelines
A series battery	A6BAT	Packed with lithium coin battery (BR2325)	Non-dangerous goods

APPENDIX 4.2 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.

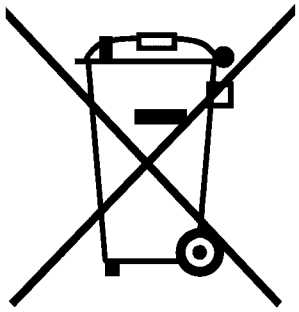
APPENDIX 5 HANDLING OF BATTERIES AND DEVICES WITH BUILT-IN BATTERIES IN EU MEMBER STATES

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

Appendix 5.1 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.

Appendix 5.2 Exportation precautions

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

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

(1) Labelling

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

(2) Explaining the symbol in the manuals

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

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

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

IMPORTANT

(1) Design the configuration of a system to provide an external protective or safety inter locking circuit for the PCs.

(2) The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.

(a) Ground your body and the work bench.

(b) Do not touch the conductive areas of the printed circuit board and its electrical parts with non-grounded tools, etc.

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

MEMO

WARRANTY

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

1. Gratis Warranty Term and Gratis Warranty Range

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

[Gratis Warranty Term]

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

[Gratis Warranty Range]

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

2. Onerous repair term after discontinuation of production

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

3. Overseas service

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

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

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

5. Changes in product specifications

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

6. Product application

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

A0J2HCPU(P21/R21)

User's Manual

MODEL	A0J2HCPU(P21/R21)-USERS-E
MODEL CODE	13J788
IB(NA)-66268-E(0811)MEE	

MITSUBISHI ELECTRIC CORPORATION

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

Specifications subject to change without notice.