MITSUBISHI

Type A1SCPUC24-R2/A1SHCPU/ A2SHCPU(S1)/A2ASCPU(S1/S30)/ A2USHCPU-S1

Mitsubishi Programmable Controller

User's Manual

(Hardware)

Thank you for purchasing the Mitsubishi programmable controller MELSEC-A series.

Prior to use, please read both this and relevant manuals thoroughly to fully understand the product.

MODEL	A1S/A2S/A2ASCPU(H/W)-U-E
MODEL CODE	13JE59
IB(NA)-66468-O(0810)MEE	

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● SAFETY PRECAUTIONS ●

(Be sure to read these instructions before use.)

Before using the product, read this and relevant manuals carefully and handle the product correctly with full attention to safety.
In this manual, ● SAFETY PRECAUTIONS ●are classified into 2 levels: "DANGER" and "CAUTION".

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

Under some circumstances, failure to observe the ⚠ **CAUTION** level instructions may also lead to serious results.
Be sure to observe the instructions of both levels to ensure the safety.
Please keep this manual in a safe place for future reference and also pass this manual on to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER

- Create a safety circuit outside the programmable controller to ensure the whole system will operate safely even if an external power failure or a programmable controller failure occurs.
  Otherwise, incorrect output or malfunction may cause an accident.
  (1) For an emergency stop circuit, protection circuit and interlock circuit that is designed for incompatible actions such as forward/reverse rotation or for damage prevention such as the upper/lower limit setting in positioning, any of them must be created outside the programmable controller.
  Install the emergency stop switch outside the controlpanel so that workers can operate it easily.

[DESIGN PRECAUTIONS]

⚠ DANGER

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

In the case of an error of a part such as an I/O control part that cannot be detected by the programmable controller CPU, all the outputs may turn on. In order to make all machines operate safely in such a case, set up a fail-safe circuit or a specific mechanism outside the programmable controller.

Refer to "LOADING AND INSTALLATION" in this manual for example fail safe circuits.

(3) Depending on the failure of the output module's relay or transistor, the output status may remain ON or OFF incorrectly. For output signals that may lead to a serious accident, create an external monitoring circuit.
- If load current more than the rating or overcurrent due to a short circuit in the load has flowed in the output module for a long time, it may cause a fire and smoke. Provide an external safety device such as a fuse.
- Design a circuit so that the external power will be supplied after power-up of the programmable controller.
  Activating the external power supply prior to the programmable controller may result in an accident due to incorrect output or malfunction.
- For the operation status of each station at a communication error in data link, refer to the respective data link manual.
  The communication error may result in an accident due to incorrect output or malfunction.

[DESIGN PRECAUTIONS]

⚠ DANGER

- When controlling a running programmable controller (data modification) by connecting a peripheral device to the CPU module or a PC to a special function module, create an interlock circuit on sequence programs so that the whole system functions safely all the time.
  Also, before performing any other controls (e.g. program modification, operating status change (status control)), read the manual carefully and ensure the safety.
  In these controls, especially the one from an external device to a programmable controller in a remote location, some programmable controller side problem may not be resolved immediately due to failure of data communications.
  To prevent this, create an interlock circuit on sequence programs and establish corrective procedures for communication failure between the external device and the programmable controller CPU.
- When setting up the system, do not allow any empty slot on the base unit.
  If any slot is left empty, be sure to use a blank cover (A1SG60) or a dummy module (A1SG62) for it.
  When using the extension base unit, A1S52B(S1), A1S55B(S1) or A1S58B(S1), attach the included dustproof cover to the module in slot 0.
  Otherwise, internal parts of the module may be flied in the short circuit test or when an overcurrent or overvoltage is accidentally applied to external I/O section.

⚠ CAUTION

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

[INSTALLATION PRECAUTIONS]

⚠ CAUTION
● Use the programmable controller under the environment specified in the user's manual. Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage. ● Insert the module fixing projection into the fixing hole in the base unit and then tighten the module mounting screw within the specified torque. When no screw is tightened, even if the module is installed correctly, it may cause malfunctions, a failure or a drop of the module. Tightening the screw excessively may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions. ● Connect the extension cable to the connector of the base unit or module. Check the cable for incomplete connection after connecting it. Poor electrical contact may cause incorrect inputs and/or outputs. ● Correctly connect the memory cassette installation connector to the memory cassette. After installation, be sure that the connection is not loose. A poor connection could cause an operation failure. ● Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module. Failure to do so may damage the module. ● Do not directly touch the conductive part or electronic components of the module. Doing so may cause malfunctions or a failure of the module.

[WIRING PRECAUTIONS]

DANGER

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

CAUTION

- Always ground the FG and LG terminals to the protective ground conductor.
  Failure to do so may cause an electric shock or malfunctions.
- Wire the module correctly after confirming the rated voltage and terminal layout.
  Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.
- Do not connect multiple power supply modules to one module in parallel.
  The power supply modules may be heated, resulting in a fire or failure.
- Press, crimp or properly solder the connector for external connection with the specified tool.
  Incomplete connection may cause a short circuit, fire or malfunctions.
- Tighten terminal screws within the specified torque range. If the screw is too loose, it may cause a short circuit, fire or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a short circuit or malfunctions.
- Carefully prevent foreign matter such as dust or wire chips from entering the module.
  Failure to do so may cause a fire, failure or malfunctions.
- Install our programmable controller in a control panel for use.
  Wire the main power supply to the power supply module installed in a control panel through a distribution terminal block.
  Furthermore, the wiring and replacement of a power supply module have to be performed by a maintenance worker who acquainted with shock protection.
  (For the wiring methods, refer to Type A1SCPUC24-R2/A1SHCPU/ A2SHCPU(S1)/A2ASCPU(S1/S30)/A2USHCPU-S1 User's Manual (Hardware))

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ DANGER

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

⚠ CAUTION

- When performing online operations (especially, program modification, forced output or operating status change) by connecting a peripheral device to the running CPU module, read the manual carefully and ensure the safety. Incorrect operation will cause mechanical damage or accidents.
- Do not disassemble or modify each of modules.
  Doing so may cause failure, malfunctions, personal injuries and/or a fire.
- When using a wireless communication device such as a mobile phone, keep a distance of 25cm (9.84inch) or more from the programmable controller in all directions.
  Failure to do so may cause malfunctions.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may result in failure or malfunctions of the module.
- Do not drop or apply any impact to the battery.
  Doing so may damage the battery, resulting in electrolyte spillage inside the battery.
  If any impact has been applied, discard the battery and never use it.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)
- Before handling modules, touch a grounded metal object to discharge the static electricity from the human body.
  Failure to do so may cause failure or malfunctions of the module.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION
● When disposing of the product, treat it as an industrial waste. When disposing of batteries, separate them from other wastes according to the local regulations. (For details of the battery directive in EU member states, refer to the A1SCPU/A1SCPUC24-R2/A2SCPU User's manual.)

[TRANSPORTATION PRECAUTIONS]

⚠ CAUTION
● When transporting lithium batteries, make sure to treat them based on the transportation regulations. (Refer to Appendix 2 for details of the relevant models.)

REVISIONS

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

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Japanese Manual Version IB(NA)68419-P

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This manual describes cautions on handling, connection to I/O modules, and error codes of A2ASCPU(S1/S30), and A1SHCPU, A2SHCPU(S1), A1SCPUC24-R2 (hereafter called "the CPU").

Manuals

The following manuals are related to this product.
Refer to the following manuals when necessary.

Detailed manuals

Manual Name	Manual No. (Model Code)
type A1SCPU/A1SCPUC24-R2/A2SCPU User's manual This manual describes the specifications and functions of A1S, A1SC24-R2 and A2SCPU(S1), and specifications etc. of the memory cassettes, the power supply module and extension base unit. (Sold separately)	IB-66320 (13J672)
type A2ASCPU(S1/S30) User's manual This manual describes the specifications and functions of A2ASCPU(S1/S30) and the specifications of the memory cassettes, the power supply modules and extension base units that can be used with it. (Sold separately)	IB-66455
type A1SJH/A1SH/A2SHCPU(S1) User's manual This manual describes the specifications and functions of A1SJHCPU, A1SH, and A2SHCPU(S1) and the specifications of the memory cassettes, the power supply modules and extension base units that can be used with it. (Sold separately)	IB-66779 (13JL22)
Computer Link Module User's Manual (Comms. link func./ Print func.) This manual describes communication between the A1SCPUC24-R2 and external devices using the dedicated protocol, no protocol, and bidirectional modes, and the settings, wiring, programming, troubleshooting, etc., for this module. (Sold separately)	SH-3511 (13JE77)
Computer Link Module Guidebook This manual gives the basic information required to execute data communication with external devices (computers, for example), in each mode of the computer link function. (Sold separately)	SH-3510 (13JE76)

Related manuals

Manual Name	Manual No. (Model Code)
ACPU Programming Manual (Fundamentals) Describes programming methods necessary for creating programs, device names, parameters, program types, memory area configuration, and so on. (Optional)	IB-66249 (13J740)
ACPU Programming Manual (Common Instructions) Describes how to use the sequence instruction, basic instructions, applied instructions and microcomputer programs. (Optional)	IB-66250 (13J741)
AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) Programming Manual (Dedicated Instructions) Describes instructions that have been expanded for A1SJHCPU/A1SHCPU/A2SHCPU(S1). (Optional)	IB-66251 (13J742)
AnS Module type I/O User's Manual Describes the specification of the compact building block type I/O module. (Optional)	IB-66541 (13JE81)

USER PRECAUTONS

Precautions when using the AnS series

For a new CPU module, which has never used before, the contents of built-in RAM and device data are undefined.
Make sure to clear the built-in RAM memory (PC memory all clear) in the CPU module by peripheral devices and operate latch clear by RUN/STOP key switches.

Precautions for battery

(1) The operation after a battery is unmounted and the programmable controller is stored.

When reoperating after a battery is uncounted and the programmable controller is stored, the contents of built-in RAM and device data may be undefined. For this reason, make sure to clear the built-in RAM memory (PC memory all clear) in the CPU module by peripheral devices and operate latch clear by RUN/STOP key switch before start the operation again.

(2) If a battery exceeded its guaranteed life is stored and reoperated.

If a battery exceeded its guaranteed life is stored and reoperated, the contents of built-in RAM and device data may be undefined. For this reason, make sure to clear the built-in RAM memory (PC memory all clear) in the CPU module by peripheral devices and operate latch clear by RUN/STOP key switches before start the operation again.
After the built-in RAM clear and latch clear of the CPU module, write the backed-up memory contents to the CPU module before saving.

POINT
Make sure to back-up each memory contents before storing the programmable controller.

*: Refer to the following manuals for details of built-in RAM clear (programmable controller memory all clear) by peripheral devices.

- GX Developer Operating Manual
- A6GPP/A6PHP Operating Manual
- SW□SRX/SW□NX/SW□IVD-GPPA Operating Manual

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

1.1 SPECIFICATIONS

Table 1.1 General specification

<table>
<tr><th>Item</th><th colspan="6">Specifications</th></tr>
<tr><td>Ambient operating temperature</td><td colspan="6">0 to 55 °C</td></tr>
<tr><td>Ambient storage temperature</td><td colspan="6">−20 to 75 °C</td></tr>
<tr><td>Ambient operating humidity</td><td colspan="6">10 to 90 % RH, No-condensing</td></tr>
<tr><td>Ambient storage humidity</td><td colspan="6">10 to 90 % RH, No-condensing</td></tr>
<tr><td rowspan="5">Vibration resistance</td><td rowspan="5">Conforming to JIS B 3502, IEC 61131-2</td><td></td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>No. of sweeps</td></tr>
<tr><td rowspan="2">Under intermittent vibration</td><td>10 to 57Hz</td><td>——</td><td>0.075mm (0.003in.)</td><td rowspan="4">10 times each in X, Y, Z directions (for 80min.)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>——</td></tr>
<tr><td rowspan="2">Under continuous vibration</td><td>10 to 57Hz</td><td>——</td><td>00.35mm (0.001in.)</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>——</td></tr>
<tr><td>Shock resistance</td><td colspan="6">Conforming to JIS B 3502, IEC 61131-2
(147m/s^2, 3 times in each of 3 directions X Y Z)</td></tr>
<tr><td>Operating ambience</td><td colspan="6">No corrosive gases</td></tr>
<tr><td>Operating elevation *3</td><td colspan="6">2000m (6562ft.) max.</td></tr>
<tr><td>Installation location</td><td colspan="6">Control panel</td></tr>
<tr><td>Over voltage category *1</td><td colspan="6">II max.</td></tr>
<tr><td>Pollution level *2</td><td colspan="6">2 max.</td></tr>
<tr><td>Equipment category</td><td colspan="6">Class I</td></tr>
</table>

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

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

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

2.1 Performance Specifications

2.1.1 A1SCPUC24-R2 Module Performance Specifications

The memory capacity, device performances and other specifications of A1SCPUC24-R2 module are provided below.

Table 2.1 Performance specifications

Item \ Type		A1SCPUC24-R2
Control system		Repeated operation (using stored program)
I/O control method		Refresh mode/Direct mode selectable
Programming language		Language dedicated to sequence control. Relay symbol type and logic symbolic language, MELSAP-II (SFC) (for A1SCPU)
Processing speed (sequence instruction)		Direct : 1.0 to 2.3 μs/step Refresh : 1.0 μs/step
Number of I/O points		256 points (32 points are used for the computer link function)
Watchdog timer (WDT)		10 to 2000 ms
Memory capacity *1 (built-in RAM)		32k bytes
Program capacity	Main sequence	Max. 8 k steps
	Sub sequence	None
Self-diagnostics functions		Watchdog error monitor, Memory error detection, CPU error detection, I/O error detection, Battery error detection, etc.
Operation mode at the time of error		STOP/CONTINUE
Start method at the time of RUN		Initial start (Automatic restart by turning on the "RUN" switch of the CPU after power-ON/recovery from power failure)
STOP → RUN output mode		Output data at time of STOP restored/data output after operation execution
Clock function		Year, month, day, hour, minute, second (Automatically recognizes leap years.) Accuracy −2.3 to +4.4 s (TYP. +1.8 s)/d at 0 °C −1.1 to +4.4 s (TYP. +2.2 s)/d at 25 °C −9.6 to +2.7 s (TYP. -2.4 s)/d at 55 °C
Allowable momentary power interruption time		20 ms
Current consumption (5 V DC)		0.56 A
Weight		0.41 kg
Standard		UL/CSA

*1 : The maximum total memory that can be used for parameters, T/C set values, program capacity, file registers, number of comments, sampling trace, and status latch is 32k/64k bytes.
The memory capacity is fixed. No expansion memory is available.
Section 4.1.7 shows how to calculate the memory capacity.

2.1.2 AnSHCPU Module Performance Specifications

The memory capacity, device performances and other specifications of AnSHCPU modules are provided below.

Table 2.2 Performance specifications

Item \ Type		A1SHCPU	A2SHCPU(S1)
Control system		Repeated operation (using stored program)	
I/O control method		Refresh mode/Direct mode selectable	
Programming language		Language dedicated to sequence control. Relay symbol type and logic symbolic language, MELSAP-II(SFC)	
Processing speed (sequence instruction)		Direct : 0.33 to 2.2 μs/step Refresh : 0.33 μs/step	Direct : 0.25 to 2.15 μs/step Refresh : 0.25 μs/step
Number of I/O device points		2048 *2	
Number of I/O points		256 points	A2SH : 512 points, A2SH-S1 : 1024 points
Watchdog timer (WDT)		10 to 2000 ms	
Memory capacity *1 (built-in RAM)		64k bytes	A2SH : 64 k bytes, A2SH-S1 : 192 k bytes
Program capacity	Main sequence	Max. 8 k steps	A2SH : Max. 14 k steps, A2SH-S1 : Max. 30 k steps
	Sub sequence	Unavailable	
Self-diagnostics functions		Watchdog error monitor, 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	
Start method at the time of RUN		Initial start (Automatic restart by turning on the "RUN" switch of the CPU after power-ON/recovery from power failure)	
Clock function		Year, month, day, hour, minute, second (Automatically recognizes leap years.) Accuracy −3.1 to +5.3 s (TYP. +1.7 s)/d at 0 °C −1.6 to +5.3 s (TYP. +2.4 s)/d at 25 °C −9.6 to +3.6 s (TYP. -2.1 s)/d at 55 °C	
Allowable momentary power failure period		20 ms (1 ms or less for the A1S63P only.)	
Current consumption (5 V DC)		0.3 A	0.4 A
Weight		0.33 kg	0.33 kg
Standard		UL/cUL	UL/cUL

*1 : The maximum total memory that can be used for parameters, T/C set values, program capacity, file registers, number of comments, sampling trace, and status latch is 32 k/64 k bytes. The memory capacity is fixed. No expansion memory is available. Section 4.1.7 shows how to calculate the memory capacity.

*2 : The I/O device after the actual input points can be used as MELSECNET(/B), MELSECNET/MINI-S3, or CC-Link.

2.1.3 A2ASCPU(S1), A2USHCPU-S1 Module Performance Specifications

The memory capacity, device performances and other specifications of A2ASCPU(S1/S30) modules are provided below.

Table 2.3 Performance specifications

Item		Performance				Remarks
		A2ASCPU	A2ASCPU-S1	A2ASCPU-S30	A2USHCPU-S1	
Control system		Stored program, repeated operation				
I/O control method		Refresh method				Instructions to enable partial direct I/O are available.
Programming language		Language dedicated to sequence control				
		Combined use of relay symbol type, logic symbolic language and MELSAP-II(SFC)				
Processing speed (sequence instruction)		0.2 μs/step			0.09 μs/step	
Constant scan (program start at specified intervals)		Can be set between 10 ms and 190 ms in 10 ms increments				Set in special register D9020.
Memory capacity		64 kbytes (built-in RAM)	256 kbytes (built-in RAM)			
Memory cassettes		A2SMCA-14KP/14KE			A2SMCA-14KP/ 14KE A2SMCA-30KE	
Program capacity	Main sequence program	Max. 14k steps		Max. 30K steps		Set in parameters.
	Sub sequence program	None		None		
Number of I/O device points		8192 points (X/Y0 to 1FFF)				The number of points usable in the program
Number of I/O points		512 points (X/Y0 to 1FF)		1024 points (X/Y0 to 3FF)		The number of points which can be used for accessibility to I/O modules

Table 2.3 Performance specifications (Continued)

Item	Performance				Remarks
	A2ASCPU	A2ASCPU-S1	A2ASCPU-S30	A2USHCPU-S1	
Output mode switching at STOP → RUN	Selection of re-output of operation state before STOP (default)/output after operation execution				Set in parameters.
Self-diagnostic functions	Watchdog error timer (watchdog timer 200 ms fixed) Memory error detection, CPU error detection, I/O error detection, battery error detection, etc.				Refer to Section 4.3.1 for details.
Operation mode at error occurrence	Stop or continue selectable				Set in parameters. (Refer to Section 4.4.1.)
Starting method at RUN	Initial start (Automatic restart when "RUN" switch is moved to ON position at power-on, at power restoration after power failure)				
Latch (power failure compensation) range	Defaults to L1000 to L2047 (Latch range can be set for L, B, T, C, D and W relays.)				Set range in parameters.
Remote RUN/PAUSE contact	One RUN contact and one PAUSE contact can be set within the range from X0 to X1FF (A2AS) or X3FF (A2AS-S1/A2USH-S1)				Set range in parameters.
Clock function	Year, month, day, hour, minute, second (Automatically recognizes leap years.) Accuracy −3.1 to +5.3 s (TYP. +1.7 s)/d at 0 °C −1.6 to +5.3 s (TYP. +2.4 s)/d at 25 °C −9.6 to +3.6 s (TYP. -2.1 s)/d at 55 °C				
Allowable momentary power failure time	Depends on used power supply module				Refer to Section 6.1.
5 VDC internal power consumption	0.32 A				
Weight	0.41 kg			0.46 kg	
External dimensions	130 × 54.5 × 93.6 (5.12 × 2.15 × 3.69) mm (inch)				

CAUTION

When the existing system software package and peripheral devices are used, the applicable device range is limited. Refer to Section 1.3 for details.

The products sold in the European countries have been required by law to comply with the EMC Directives and Low Voltage Directives of the EU Directives since 1996 and 1997, respectively.
The manufacturers must confirm by self-declaration that their products meet the requirements of these directives, and put the CE mark on the products.

3.1 Requirements for Compliance with EMC Directives

The EMC Directives specifies emission and immunity criteria and requires the products to meet both of them, i.e., not to emit excessive electromagnetic interference (emission): to be immune to electromagnetic interference outside (immunity).
Guidelines for complying the machinery including MELSEC-AnS series programmable controller with the EMC Directives are provided in Section 3.1.1 to 3.1.6 below.
The guidelines are created based on the requirements of the regulations and relevant standards, however, they do not guarantee that the machinery constructed according to them will not comply with the Directives.
Therefore, the manufacturer of the machinery must finally determine how to make it comply with the EMC Directives: if it is actually compliant with the EMC Directives.

3.1.1 EMC standards

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

Specifications	Test Item	Test Description	Standard Values
EN61000-6-4 (2001)	EN55011 *2 Radiated noise	Measure the emission released by the product.	30M-230 M Hz QP: 30dBμ V/m (30m measurement) *1 230M-1000MHz QP: 37dBμ V/m (30m measurement) *1
	EN55011 *2 Conduction noise	Measure the emission released by the product to the power line.	150k-500kHz QP: 79dB, Mean: 66dB*1 500k-30MHz QP: 73dB, Mean: 60dB *1
EN61131-2/A12 (2000)	EN61000-4-2 *2 Static electricity immunity	Immunity test by applying static electricity to the module enclosure.	4kV contact discharge 8kV air discharge
	EN61000-4-4 *2 First transient burst noise	Immunity test by applying burst noise to the power line and signal line.	2kV Power line 1kV Signal line
	EN61000-4-12 *2 Damped oscillatory wave	Immunity test in which a damped oscillatory wave is superimposed on the power line.	1kV
	EN61000-4-3 *2 Radiated electromagnetic field	Immunity test by applying a radiated electric field to the product.	10V/m, 26-1000MHz
EN61000-6-2 (2001)	EN61000-4-6 *2 Conduction noise	Immunity test by inducting an electromagnetic field in the power line signal line.	10 V/ms, 0.15-80MHZ, 80% AM modulation@1kHz

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

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

3.1.2 Installation instructions for EMC Directive

The programmable controller is open equipment and must be installed within a control cabinet for use.* This not only ensures safety but also ensues effective shielding of programmable controller-generated electromagnetic noise.

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

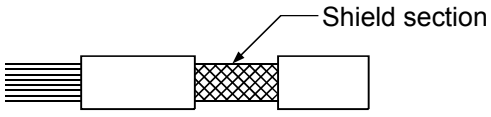
(1) Control cabinet
- (a) Use a conductive control cabinet.
- (b) When attaching the control cabinet's top plate or base plate, mask painting and weld so that good surface contact can be made between the cabinet and plate.
- (c) To ensure good electrical contact with the control cabinet, mask the paint on the installation bolts of the inner plate in the control cabinet so that contact between surfaces can be ensured over the widest possible area.
- (d) Earth the control cabinet with a thick wire so that a low impedance connection to ground can be ensured even at high frequencies.
- (e) Holes made in the control cabinet must be 10 cm (3.94 in.) diameter or less. If the holes are 10 cm (3.94 in.) or larger, radio frequency noise may be emitted.
- (f) Lock the control panel so that only those who are trained and have acquiredenough knowledge of electric facilities can open the control panel.

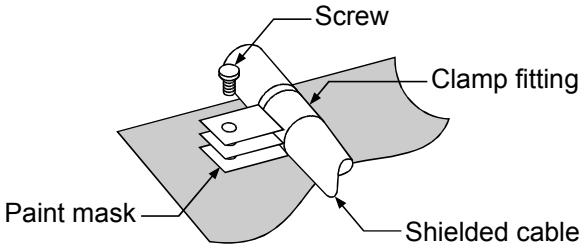
(2) Connection of power and earth wires
Earthing and power supply wires for the programmable controller system must be connected as described below.
- (a) Provide an earthing point near the power supply module. Earth the power supply's LG and FG terminals (LG : Line Ground, FG : Frame Ground) with the thickest and shortest wire possible. (The wire length must be 30 cm (11.18 in.) or shorter.) The LG and FG terminals function is to pass the noise generated in the programmable controller system to the ground, so an impedance that is as low as possible must be ensured. In addition, make sure to wire the ground cable short as the wires are used to relieve the noise, the wire itself carries large noise content and thus short wiring means that the wire is prevented from acting as an antenna.
- (b) The earth wire led from the earthing point must be twisted with the power supply wires. By twisting with the earthing wire, noise flowing from the power supply wires can be relieved to the earthing. However, if a filter is installed on the power supply wires, the wires and the earthing wire may not need to be twisted.

3.1.3 Cables

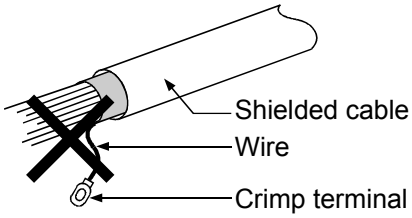
The cables pulled out of the control panel contain a high frequency noise component. On the outside of the control panel, therefore, they serve as antennas to emit noise.
Ensure to use shielded cables for the cables, which are connected to the I/O modules, special modules and those pulled out to outside of the control panel. Mounting ferrite core is not required except some types of CPU however, noise emanated via the cable can be restrained using it.
The use of a shielded cable also increases noise resistance. The signal lines (including common line) connected to the programmable controller input/output modules and intelligent modules use shielded cables to assure noise resistance, as a condition, standardized on EN61131-2/A12(2000).
If a shielded cable is not used or not earthed correctly, the noise resistance will be less than the rated value

(1) Earthing of shielded of cables
   (a) Earth the shield of the shielded cable as near the unit as possible taking care so that the earthed cables are not induced electromagnetically by the cable to be earthed.
   (b) Take appropriate measures so that the shield section of the shielded cable from which the outer cover was partly removed for exposure is earthed to the control panel on an increased contact surface. A clamp may also be used as shown in the figure below. In this case, however, apply a cover to the painted inner wall surface of the control panel which comes in contact with the clamp.



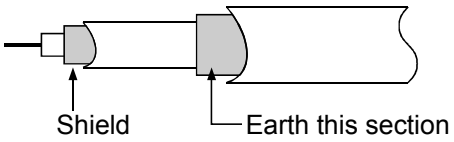


Note) The method of earthing by soldering a wire onto the shield section of the shielded cable as shown below is not recommended. The high frequency impedance will increase and the shield will be ineffective.



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

(a) Use a double-shielded coaxial cable for the MELSECNET unit which uses coaxial cables. Noise in the range of 30 MHz or higher in radiation noise can be suppressed by the use of double-shielded coaxial cables (Mitsubishi Cable: 5C-2V-CCY). Earth the outer shield to the ground. The precautions on shielding to be followed are the same as those stated in item (1) above.

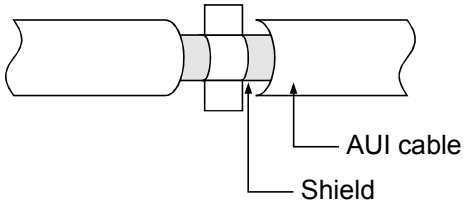


(b) Ensure to attach a ferrite core to the double-shielded coaxial cable connected to the MELSECNET unit. In addition, position the ferrite core on each cable near the outlet of the control panel. TDK-make ZCAT3035 ferrite core is recommended.

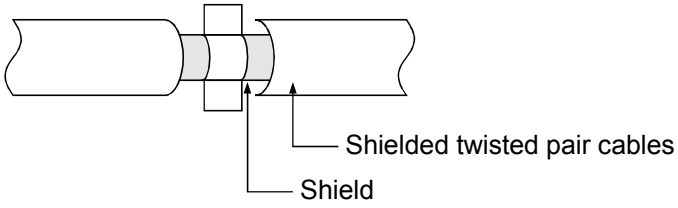
(3) Ethernet module

Precautions to be followed when AUI cables and coaxial cables are used are described below.

(a) Ensure to earth also the AUI cables connected to the 10BASE5 connectors of the A1SJ71E71-B5. Because the AUI cable is of the shielded type, as shown in the figure below, partly remove the outer cover of it, and earth the exposed shield section to the ground on the widest contact surface.



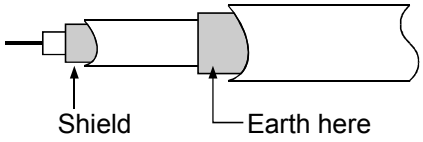
(b) Use shielded twisted pair cables as the twisted pair cables*1 connected to the 10BASE-T connectors. For the shielded twisted pair cables, strip part of the outer cover and earth the exposed shield section to the ground on the widest contact surface as shown below.



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

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

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



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

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

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

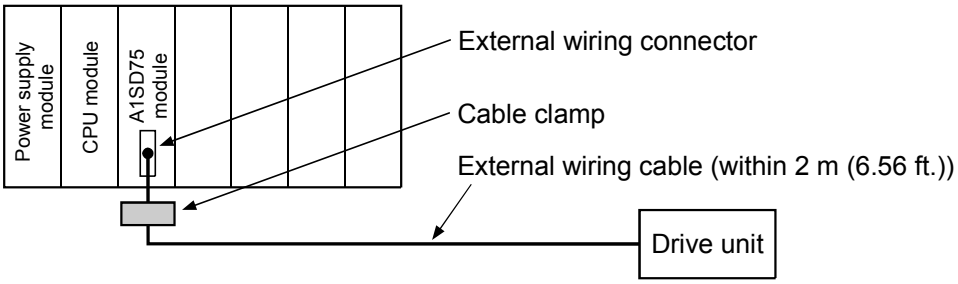
(4) I/O and other communication cables
For the I/O signal lines (including common line) and other communication cables (RS-232, RS-422, etc), if extracted to the outside of the control panel, also ensure to earth the shield section of these lines and cables in the same manner as in item (1) above.

(5) Positioning Modules

Precautions to be followed when the machinery conforming to the EMC Directive is configured using the A1SD75P□-S3 are described below.

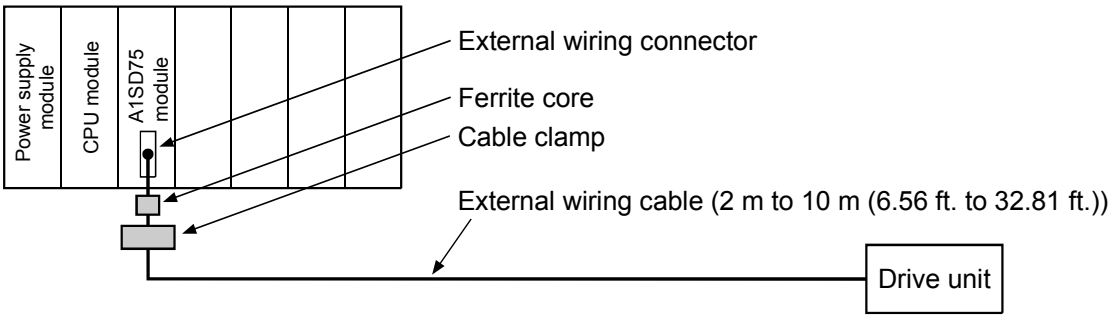
(a) When wiring with a 2 m (6.56 ft.) or less cable

- Ground the shield section of the external wiring cable with the cable clamp.
  (Ground the shield at the closest location to the A1SD75 external wiring connector.)
- Wire the external wiring cable to the drive unit and external device with the shortest practicable length of cable.
- Install the drive unit in the same panel.



(b) When wiring with cable that exceeds 2 m (6.56 ft.), but is 10 m (32.81 ft.) or less

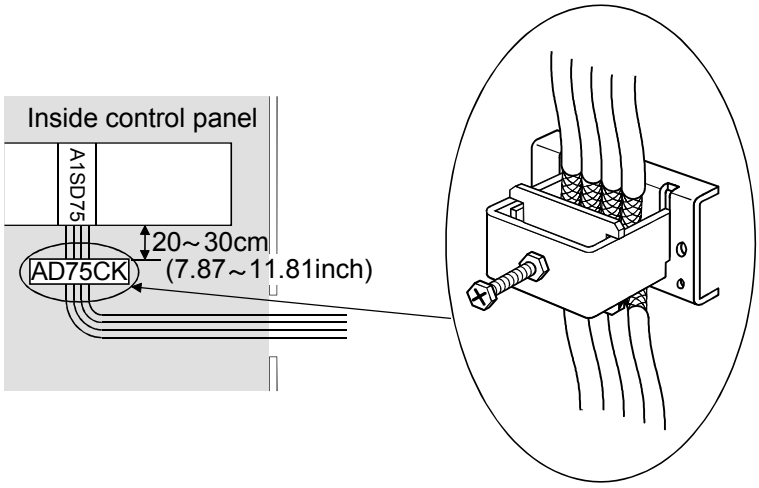
- Ground the shield section of the external wiring cable with the cable clamp.
  (Ground the shield at the closest location to the A1SD75 external wiring connector.)
- Install a ferrite core.
- Wire the external wiring cable to the drive unit and external device with the shortest practicable length of cable.



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

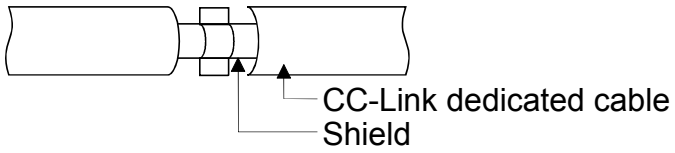
• Cable clamp
  Type : AD75CK (Mitsubishi Electric)
• Ferrite core
  Type : ZCAT3035-1330 (TDK ferrite core)
• Required quantity

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



(6) CC-Link Module

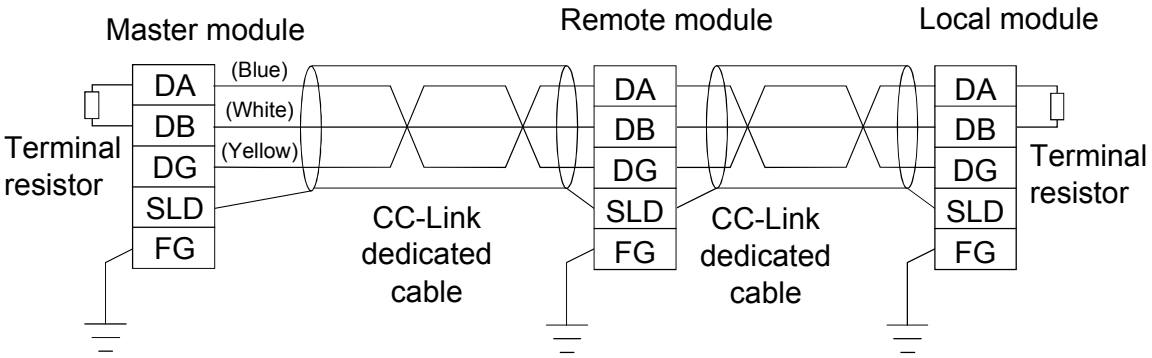
(a) Be sure to ground the cable shield that is connected to the CC-Link module close to the exit of control panel or to any of the CC-Link stations within 30 cm (11.81 in.) from the module or stations.
The CC-Link dedicated cable is a shielded cable. As shown in the illustration below, remove a portion of the outer covering and ground as large a surface area of the exposed shield part as possible.



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

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

[Simplified diagram]



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

(e) A power line connecting to the analog input of the following modules should be 30cm or less.

- AJ65BT-64RD3
- AJ65BT-64RD4
- AJ65BT-68TD

(7) Measures against static electricity

When using an insulation displacement connector without connector cover, a connected cable for the connector is thin in applicable wire size and coating. Therefore, note that the module may cause an electric discharge failure.

As measures against the failure, using pressure-displacement type connector whose applicable wire size is thick or soldering type connector is recommended.

3.1.4 Power supply module

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

Model	Precautions
A1S61PN, A1S62PN	Make sure to short and ground the LG and FG terminals.∗2
A1S63P∗1	Use the 24VDC panel power equipment conforming to the EU Directive.

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

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

3.1.5 Ferrite core

Use of ferrite cores is effective in reducing the conduction noise in the band of about 10 MHz and radiated noise in 30 to 100 MHz band.

It is recommended to attach ferrite cores when the shield of the shielded cable coming out of control panel does not work effectively, or when emission of the conduction noise from the power line has to be suppressed. *1 The ferrite cores used in our tests are TDK's ZCAT3035.

It should be noted that the ferrite cores should be fitted to the cables in the position immediately before they are pulled out of the enclosure. If the fitting position is improper, the ferrite will not produce any effect.

＊1:To response with CE(EN61131-2/A12), make sure to mount 2 or more ferrite cores onto the power supply line. The mounting position should be as near the power supply module as possible.

Ferrite core

Type: ZCAT2235-1030A (TDK ferrite core)

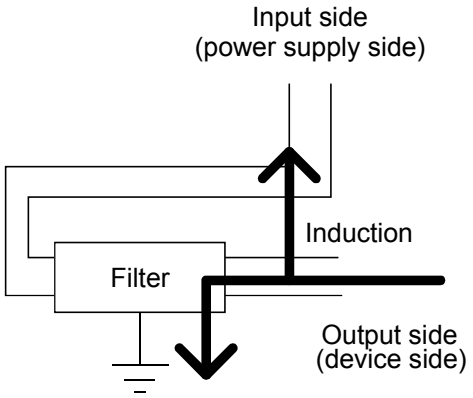
3.1.6 Noise filter (power supply line filter)

A noise filter is a component which has an effect on conducted noise. With the exception of some models, it is not required to fit the noise filter to the power supply line, but fitting it can further suppress noise. (The noise filter has the effect of reducing conducted noise of 10 M Hz or less.) Use any of the following noise filters (double π type filters) or equivalent.

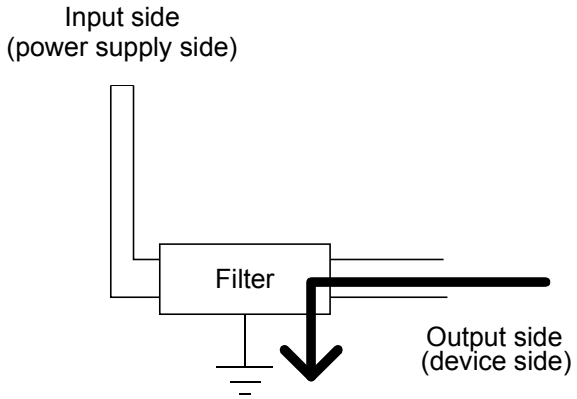
Model name	FN343-3/01	FN660-6/06	ZHC2203-11
Manufacturer	SCHAFFNER	SCHAFFNER	TDK
Rated current	3 A	6 A	3 A
Rated voltage	250 V		

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

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



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



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

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

3.1.7 Power line for external power supply terminal

The power line connecting to the external power supply terminal of the module should be 30m (98.43 ft.) or less.

3.2 Requirements for Compliance with Low Voltage Directives

The Low Voltage Directives apply to the electrical equipment operating from 50 to 1000VAC or 75 to 1500VDC; the manufacturer must ensure the adequate safety of the equipment.
Guidelines for installation and wiring of MELSEC-AnS series programmable controller are provided in Section 3.2.1 to 3.2.7 for the purpose of compliance with the EMC Directives.
The guidelines are created based on the requirements of the regulations and relevant standards, however, they do not guarantee that the machinery constructed according to them will comply with the Directives.
Therefore, the manufacturer of the machinery must finally determine how to make it comply with the EMC Directives: if it is actually compliant with the EMC Directives.

3.2.1 Standard applied for MELSEC-AnS series programmable controller

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

For the modules which operate with the rated voltage of 50 VAC/75 VDC or above, we have developed new models that conform to the above standard.
For the modules which operate with the rated voltage under 50 VAC/75 VDC, the conventional models can be used, because they are out of the low voltage directive application range.

3.2.2 Precautions when using the MELSEC-AnS series programmable controller

Module selection

(1) Power module
For a power module with rated input voltage of 100/200 VAC, select a model in which the internal part between the first order and second order is intensively insulated, because it generates hazardous voltage (voltage of 42.4 V or more at the peak) area.
For a power module with 24 VDC rated input, a conventional model can be used.

(2) I/O module
For I/O module with rated input voltage of 100/200 VAC, select a model in which the internal area between the first order and second order is intensively insulated, because it has hazardous voltage area.
For I/O module with 24 VDC rated input, a conventional model can be used.

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

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

(5) Display device
Use the CE-marked product.

3.2.3 Power supply

The insulation specification of the power module was designed assuming installation category II. Be sure to use the installation category II power supply to the programmable controller.

The installation category indicates the durability level against surge voltage generated by a thunderbolt. Category I has the lowest durability; category IV has the highest durability.

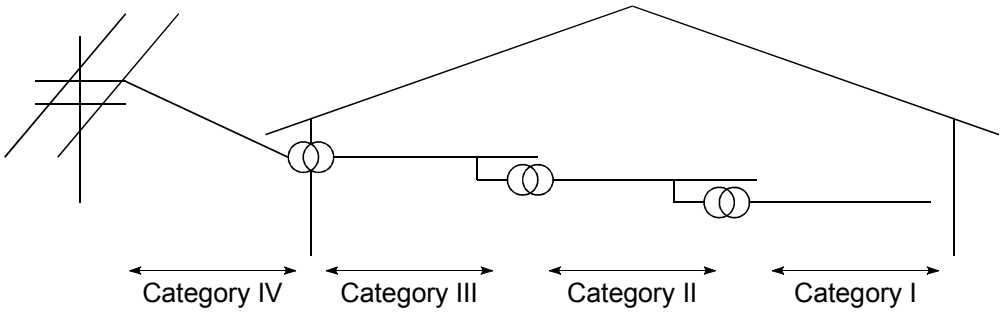


Figure 1. : Installation Category

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

3.2.4 Control panel

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

(1) Electrical shock prevention

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

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

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

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

(2) Dustproof and waterproof features

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

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

Pollution level 2 : An environment where conductive dust does not usually exist, but occasional temporary conductivity occurs due to the accumulated dust. Generally, this is the level for inside the control panel equivalent to IP54 in a control room or on the floor of a typical factory.

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

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

As shown above, the programmable controller can realize the pollution level 2 when stored in a control panel equivalent to IP54.

3.2.5 Module installation

(1) Installing modules contiguously

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

3.2.6 Grounding

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

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

Protective grounding : Maintains the safety of the programmable controller and improves the noise resistance.

Functional grounding : Improves the noise resistance.

3.2.7 External wiring

(1) Module power supply and external power supply

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

(2) External devices

When a device with a hazardous voltage circuit is externally connected to the programmable controller, use a model whose circuit section of the interface to the programmable controller is intensively insulated from the hazardous voltage circuit.

(3) Intensive insulation

Intensive insulation refers to the insulation with the dielectric withstand voltage shown in Table 1.

Table 1 :Intensive Insulation Withstand Voltage
(Installation Category II, source : IEC664)

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

4.1 Installing the Module

4.1.1 Notes on handling the module

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

(1) Do not drop or allow any impact to the modules case, memory card, terminal block cover, or pin connector.

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

(3) Use caution to prevent foreign matter, such as wire chips, falling into the module during wiring. If foreign matter enters the module, remove it.

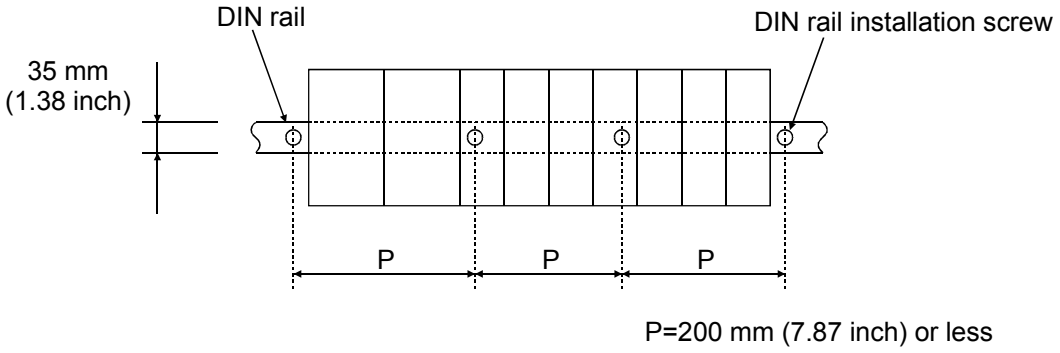
(4) Use the fallowing torque range to tighten the module fixing screws and terminal block screws:

Screw portion	Tightening torque range
Module fixing screw (M4 screw)	78 to 118 N·cm
I/O module (M3.5 screw)	59 to 88 N·cm
Power supply module terminal screws (M3.5 screw)	59 to 78 N·cm

(5) Observe the following points when you are installing the DIN rail:

(a) Applicable DIN rail type (JIS C 2812)
TH35-7.5Fe
TH35-7.5Al
TH35-15Fe

(b) DIN rail installation screw interval
When you are using the TH35-7.5Fe or TH35-7.5Al DIN rail, tighten the DIN rail installation screw with a pitch of 200 mm (7.87 inch) or less to maintain the strength.



(6) When installing the base unit to DIN rail in an environment with large vibration, use a vibration-proofing bracket (A1S-PLT-D). Mounting the vibration-proofing bracket (A1S-PLT-D) enhances the resistance to vibration. Depending on the environment to set up the base unit, it is also recommended to fix the base unit to the control panel directly.

4.1.2 Installation environment

Avoid the following environment when you install the CPU system:

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

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

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

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

(5) A location in which the system is easily exposed to conductive powder, such as dust and iron filings, oil mist, salt, or organic solvent.

(6) A location exposed to direct sunlight.

(7) A location in which strong electrical or magnetic fields are generated.

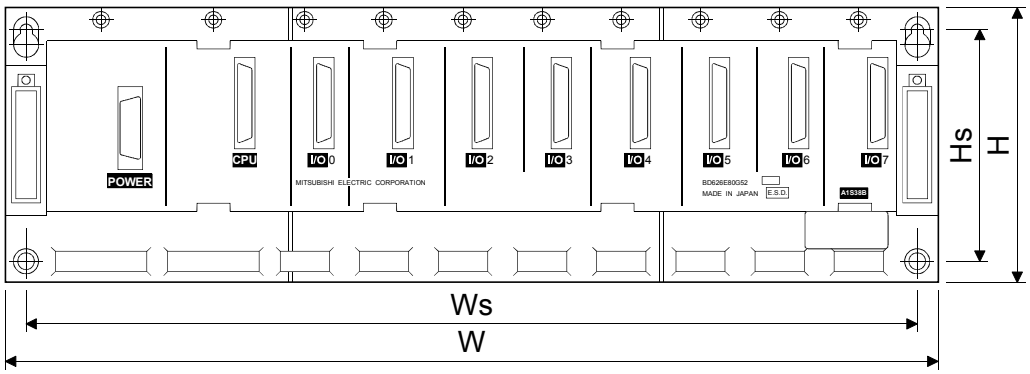
(8) A location in which the module is exposed to direct vibration or impact.

4.1.3 Notes on installing the base unit

Take ease of operation, ease of maintenance, and environmental durability into consideration when you are installing the programmable controller on the panel.

(1) Mounting dimension

Mounting dimensions of each base unit are as follows:

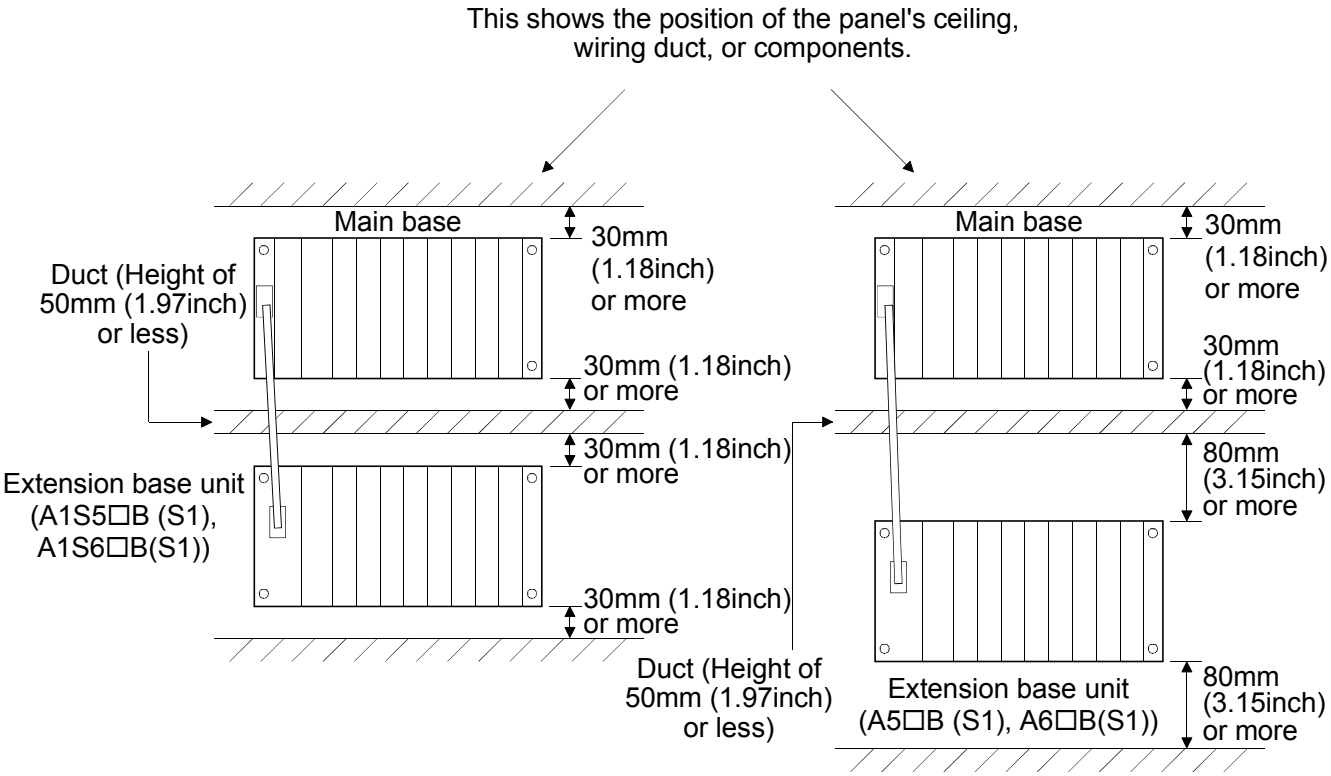


	A1S32B	A1S33B	A1S35B	A1S38B	A1S52B (S1)	A1S55B (S1)	A1S58B (S1)	A1S65B (S1)	A1S68B (S1)
W	220 (8.66)	255 (10.04)	325 (12.80)	430 (16.93)	155 (6.10)	260 (10.24)	365 (14.37)	315 (12.40)	420 (16.54)
Ws	200 (7.87)	235 (9.25)	305 (12.01)	410 (16.14)	135 (5.31)	240 (9.45)	345 (13.58)	295 (11.61)	400 (15.75)
H	130 (5.12)								
Hs	110 (4.33)								

Dimensions: mm (inch)

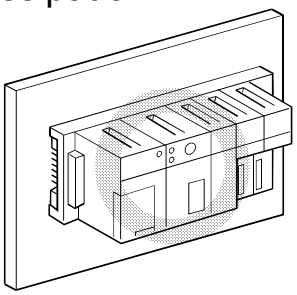
(2) Module installation position
To maintain good ventilation and make it easy to replace the module, keep the following distances between the top and bottom of the module and the structure or other components.

- A1S3□B, A1S38HB, A1S38HBEU, A1S5□B(S1), A1S6□B(S1) ..... 30 mm (1.18 inch) or over
- A5□B, A6□B ..... 80 mm (3.15 inch) or over

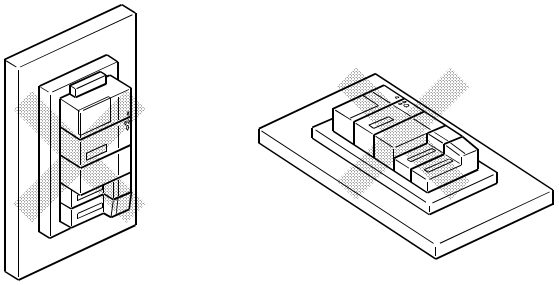


(3) Module installation direction

(a) Use the programmable controller in the following position for better ventilation and heat dissipation:



(b) Do not use the programmable controller in the following positions:



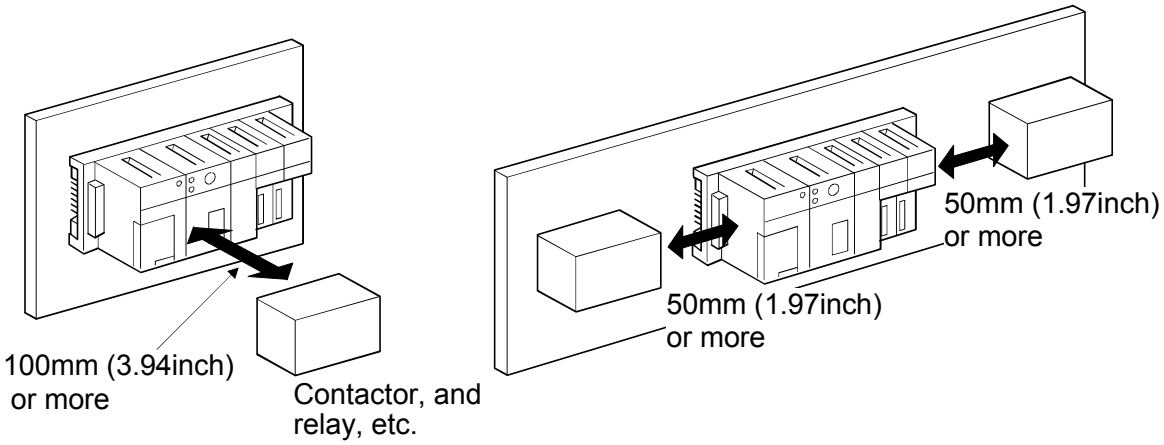
Vertical position Horizontal position

(4) Install the base unit on a level surface.
If the surface is not level, force may be applied to the printed wiring board, causing a malfunction.

(5) Install the unit far from any source of vibration, such as a large magnetic contactor and a no-fuse breaker on the same panel, or install it on a separate panel.

(6) Keep the following distance between the programmable controller and other devices (such as a contactor and a relay) in order to avoid the influence of radiated noise and heat:

- a device installed in front of the programmable controller
  ..... 100mm (3.94 inch) or more
- a device installed on the right or left of the programmable controller
  ..... 50mm (1.97 inch) or more



4.2 Fail-Safe Circuit Concept

When the programmable controller is powered ON and then OFF, improper outputs may be generated temporarily depending on the delay time and start-up time differences between the programmable controller power supply and the external power supply for the control target (especially, DC).

For example, if the external power supply for the control target is powered ON and then the programmable controller is powered ON, the DC output module may generate incorrect outputs temporarily upon the programmable controller power-ON. Therefore, it is required to build the circuit that energizes the programmable controller by priority.

The external power failure or programmable controller failure may lead to the system error.
In order to eliminate the possibility of the system error and ensure fail-safe operation, build the following circuit outside the programmable controller: emergency circuit, protection circuit and interlock circuit, as they could cause machine damages and accidents due to the abovementioned failures.

An example of system design, which is based on fail-safe concept, is provided on the next page.

⚠ DANGER

- Create a safety circuit outside the programmable controller to ensure the whole system will operate safely even if an external power failure or a programmable controller failure occurs.
  Otherwise, incorrect output or malfunction may cause an accident.
  Install the emergency stop switch outside the controlpanel so that workers can operate it easily.
  (1) For an emergency stop circuit, protection circuit and interlock circuit that is designed for incompatible actions such as forward/reverse rotation or for damage prevention such as the upper/lower limit setting in positioning, any of them must be created outside the programmable controller.
  (2) When the programmable controller detects the following error conditions, it stops the operation and turn off all the outputs.
  - The overcurrent protection device or overvoltage protection device of the power supply module is activated.
  - The programmable controller CPU detects an error such as a watchdog timer error by the self-diagnostics function.

  In the case of an error of a part such as an I/O control part that cannot be detected by the programmable controller CPU, all the outputs may turn on. In order to make all machines operate safely in such a case, set up a fail-safe circuit or a specific mechanism outside the programmable controller.
  (3) Depending on the failure of the output module's relay or transistor, the output status may remain ON or OFF incorrectly. For output signals that may lead to a serious accident, create an external monitoring circuit.
- Design a circuit so that the external power will be supplied after power-up of the programmable controller.
  Activating the external power supply prior to the programmable controller may result in an accident due to incorrect output or malfunction.
- If load current more than the rating or overcurrent due to a short circuit in the load has flowed in the output module for a long time, it may cause a fire and smoke. Provide an external safety device such as a fuse.
- For the operation status of each station at a communication error in data link, refer to the respective data link manual.
  The communication error may result in an accident due to incorrect output or malfunction.

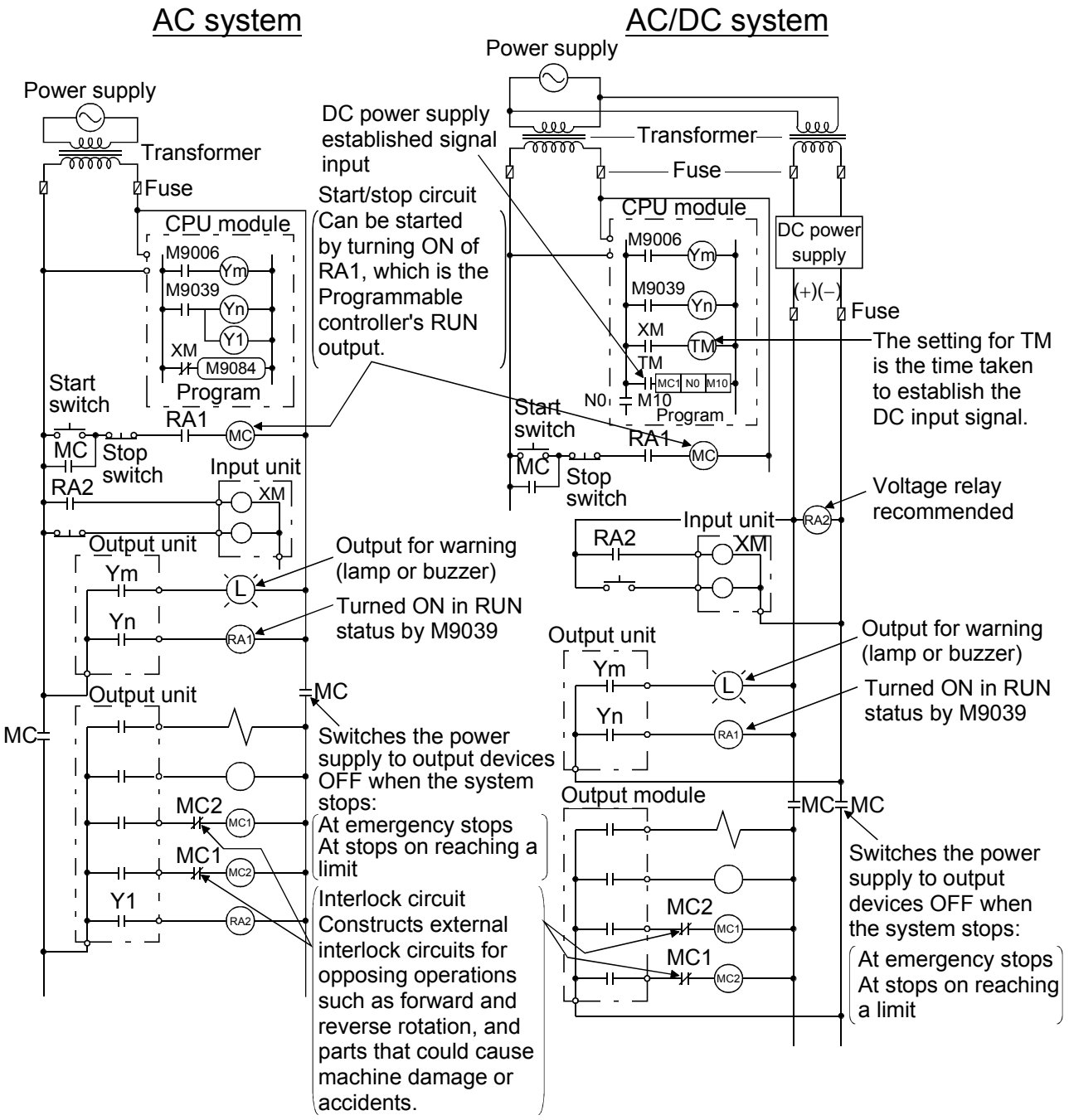
DANGER

- When controlling a running programmable controller (data modification) by connecting a peripheral device to the CPU module or a PC to a special function module, create an interlock circuit on sequence programs so that the whole system functions safely all the time.
  Also, before performing any other controls (e.g. program modification, operating status change (status control)), read the manual carefully and ensure the safety.
  In these controls, especially the one from an external device to a programmable controller in a remote location, some programmable controller side problem may not be resolved immediately due to failure of data communications.
  To prevent this, create an interlock circuit on sequence programs and establish corrective procedures for communication failure between the external device and the programmable controller CPU.
- When setting up the system, do not allow any empty slot on the base unit.
  If any slot is left empty, be sure to use a blank cover (A1SG60) or a dummy module (A1SG62) for it.
  When using the extension base unit, A1S52B(S1), A1S55B(S1) or A1S58B(S1), attach the included dustproof cover to the module in slot 0.
  Otherwise, internal parts of the module may be flied in the short circuit test or when an overcurrent or overvoltage is accidentally applied to external I/O section.

CAUTION

- Do not install the control lines or communication cables together with the main circuit or power lines, or bring them close to each other.
  Keep a distance of 100mm (3.9inch) or more between them.
  Failure to do so may cause malfunctions due to noise.
- When an output module is used to control the lamp load, heater, solenoid valve, etc., a large current (ten times larger than the normal one) may flow at the time that the output status changes from OFF to ON. Take some preventive measures such as replacing the module with the one of a suitable current rating.

(1) System design circuit example



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

AC system

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

AC/DC system

[1] Switch the power supply ON.
[2] Set the CPU module to RUN.
[3] Switch RA2 ON when the DC power supply starts.
[4] Switch the timer (TM) ON when the DC power supply reaches working voltage. (The set value for TM must be the time it takes for 100% establishment of the DC power after RA2 is switched ON. Make this set value 0.5 seconds.)
[5] Switch the start switch ON.
[6] The output devices are driven in accordance with the program when the magnetic contactor (MC) comes ON. (If a voltage relay is used at RA2, no timer (TM) is necessary in the program.)

(2) Fail-safe measures to cover the possibility of programmable controller failure

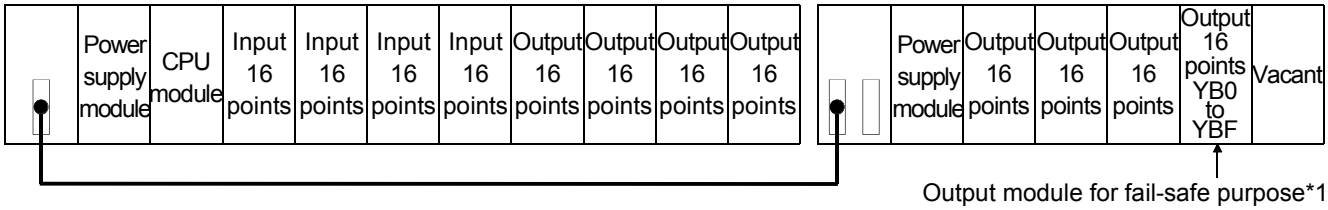
Problems with a CPU module and memory can be detected by the self diagnostics function. However, problems with I/O control area may not be detected by the CPU module.

In such cases, all I/O points turn ON or OFF depending on the problem, and normal operation and safety cannot be maintained.

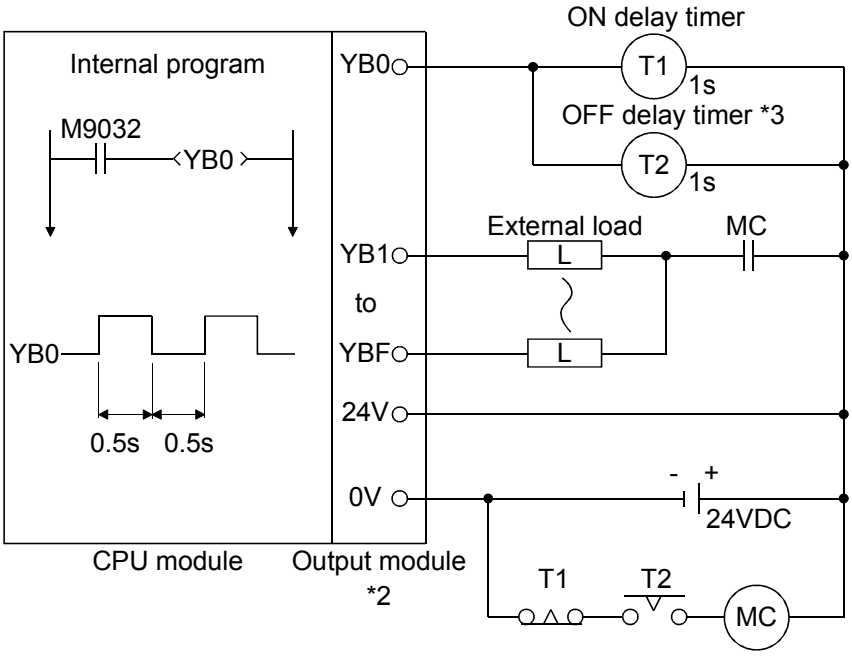
Though Mitsubishi programmable controllers are manufactured under strict quality control, they may fail or malfunction due to unspecified reasons. To prevent the whole system failure, machine breakdown, and accidents, build a fail-safe circuit outside the programmable controller.

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

<System example>



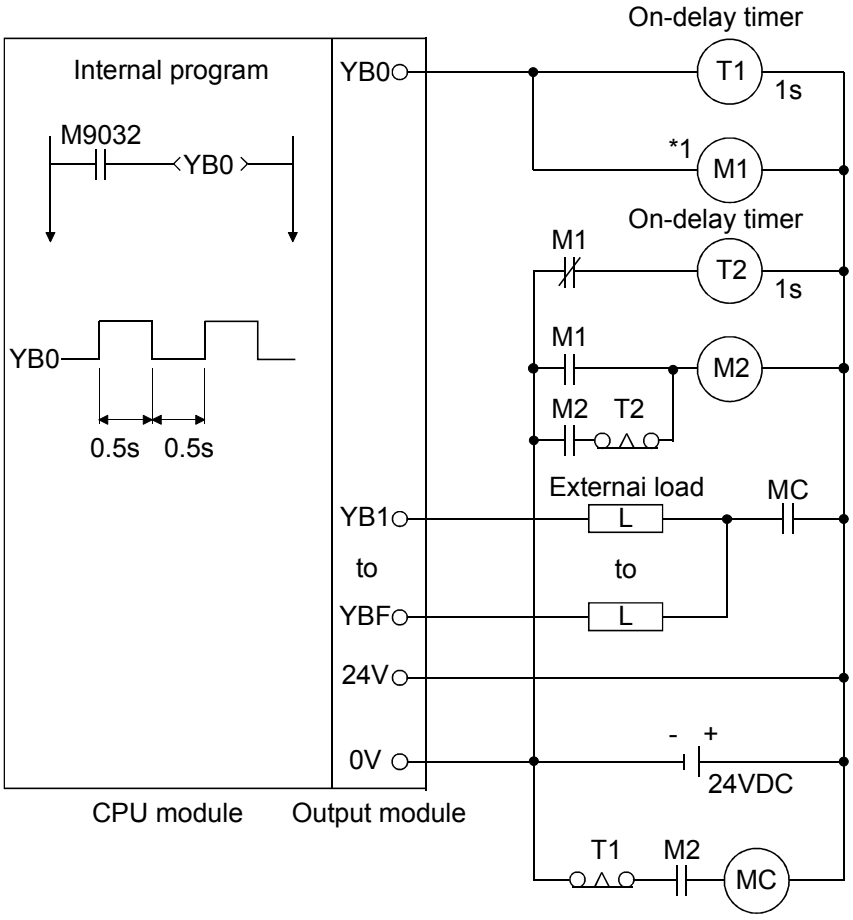
*1: The output module for fail-safe purpose should be mounted on the last slot of the system. (YB0 to YBF in the above system.)



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

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

When constructing a failsafe circuit using ondelay timers only



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

4.3 Wiring

4.3.1 Power supply module specifications

(1) Table 4.1 shows the specifications of the power supply modules.

Table 4.1 Power supply module specifications

Item		Specifications		
		A1S61PN	A1S62PN	A1S63P
Base unit position		Power supply module slot		
Rated input voltage		100 to 240 V AC (+ 10 %/-15 %) (85 to 264 V AC)		24 V DC (+ 30 %/– 35 %) (15.6 to 31.2 V DC)
Rated input frequency		50/60 Hz ± 5 %		———
Input voltage distortion factor		Within 5 % (Refer to Section 4.4)		———
Max. input apparent power		105 V A		41 W
Inrush current		20 A 8 ms or lower *4		81 A 1 ms or lower
Rated output current	5 V DC	5 A	3 A	5 A
	24 V DC ± 10 %	———	0.6 A	———
Overcurrent protection *1	5 V DC	5.5 A or higher	3.3 A or higher	5.5 A or higher
	24 V DC	———	0.66 A or higher	———
Overvoltage protection *2	5 V DC	5.5 to 6.5 V		
	24 V DC	———		
Efficiency		65 % or higher		
Allowable momentary power failure time *3		20 ms or higher		10 ms or lower
Dielectric withstand voltage	Between primary and 5 V DC	AC across input/LG and output/FG 2830 V AC rms/3 cycle (2000 m (6562 ft.))		500 V AC
	Between primary and 24 V DC			———
Insulation resistor		AC across input/LG and output/FG 10 MΩ or higher, measures with a 500 V DC insulation resistance tester		
Noise durability		(1) Noise voltage 1500 Vp-p, Noise width 1 μs, Noise frequency 25 to 60 Hz (noise simulator condition) (2) Noise voltage IEC801-4, 2 kV		Noise voltage 500 Vp-p, Noise width 1 μs, Noise frequency 25 to 60 Hz (noise simulator condition)
Power indication		Power LED indication (light at the time of output of 5 V DC)		
Terminal screw size		M3.5 × 7		
Applicable wire size		0.75 to 2 mm^2 (AWG 18 to 14)		
Applicable solderless terminal		RAV 1.25 to 3.5, RAV 2 to 3.5		
Applicable tightening torque		59 to 88 N·cm		
External dimension		130 × 55 × 93.6 (5.12 × 2.17 × 3.69) mm (inch)		
Weight		0.60 kg		0.50 kg

POINT

*1: Overcurrent protection
The overcurrent proctection device shuts off the 5VDC and/or 24VDC circuit(s) and stops the system if the current exceeding the specified value flows in the circuit(s).
As this results in voltage drop, the power supply module LED turns OFF or is dimly lit.
After that, eliminate the causes of overcurrent, e.g., insufficient current capacity and short circuit, and then start the system.
When the current has reached the normal value, the initial start up of the system will be performed.

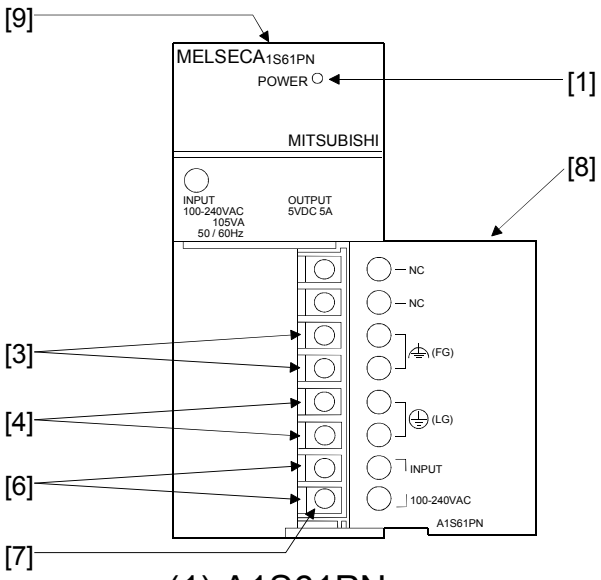
*2: Overvoltage protection
The overvoltage protection shuts off the 5VDC circuit and stops the system if the overvoltage of 5.5 to 6.5V is applied to the circuit.
This results in the power supply module LED turning OFF.
When restarting the system, power OFF and ON the input power supply, and the initial start up of the system will be performed.
If the system is not booted and the LED remains off, this means that the power supply module has to be replaced.

*3: Allowable momentary power failure period
The programmable controller CPU allowable momentary power failure period varies with the power supply module used.
In case of the A1S63P power supply module, the allowable momentary power failure period is defined as the time from when the primary side of the stabilized power supply for supplying 24VDC to the A1S63P is turned OFF until when the voltage (secondary side) has dropped from 24VDC to the specified value (15.6VDC) or less.

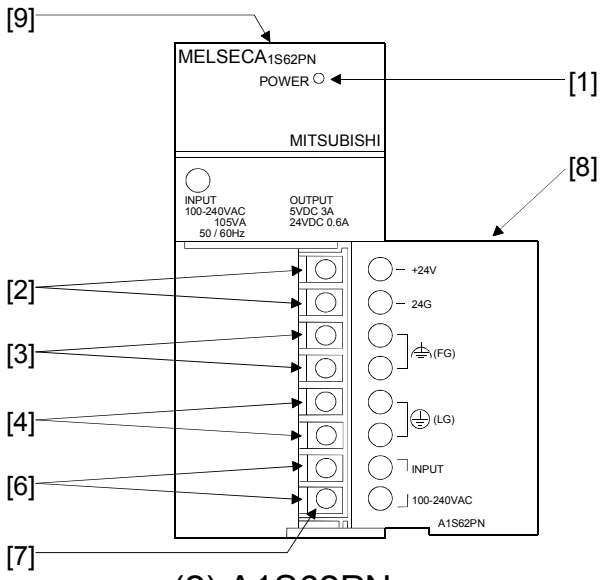
*4: Inrush current
If the power supply module is re-powered ON right after powered OFF (within 5seconds), the inrush current exceeding the specified value (2ms or less) may be generated. Therefore, make sure to re-power ON the module 5seconds after power off.
When selecting a fuse or breaker for external circuit, consider the above point as well as meltdown and detection characteristics.

4.3.2 Parts names

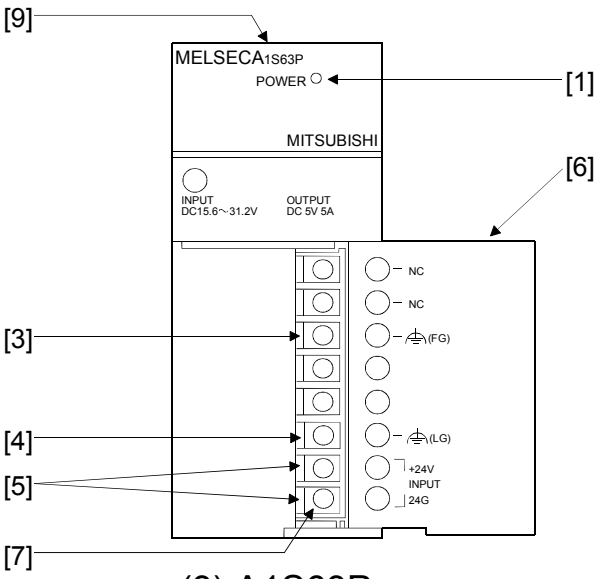
The following gives the names and description of the parts of the power supply modules :



(1) A1S61PN



(2) A1S62PN



(3) A1S63P

No.	Name	Description
[1]	POWER LED	The indicator LED for the 5 V DC power.
[2]	24 V and 24 G terminals	Used to supply 24 V DC to inside the output module (using external wiring).
[3]	FG terminal	The grounding terminal connected to the shield pattern of the printed circuit board.
[4]	LG terminal	Grounding for the power supply filter. The potential of A1S61PN or A1S62PN terminal is 1/2 of the input voltage.
[5]	Power supply input terminals	Used to connect a 24 V DC power supply.

No.	Name	Description
[6]	Power supply input terminals	Used to connect 100 V AC to 200 V AC power supply.
[7]	Terminal screw	M3.5 × 7
[8]	Terminal cover	The protective cover of the terminal block.
[9]	Module fixing screw	Used to fix the module to the base unit. (M4 screw, tightening torque: 78 to 118 N·cm)

POINT

(1) Do not cable to the unused terminals such as FG and LG on the terminal block (terminals whose name is not printed on the terminal cover).

(2) Be sure to ground the terminal LG to the protective ground conductor with class D (class-3) grounding or above.

4.3.3 Wiring instructions

Instructions for wiring the power supply cable and I/O cable.

⚠ DANGER

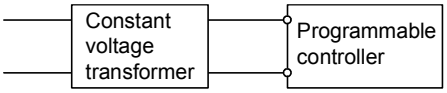
- Be sure to shut off all phases of the external power supply used by the system before wiring.
  Failure to do so may result in an electric shock or damage of the product.
- Before energizing and operating the system after wiring, be sure to attach the terminal cover supplied with the product.
  Failure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

⚠ CAUTION

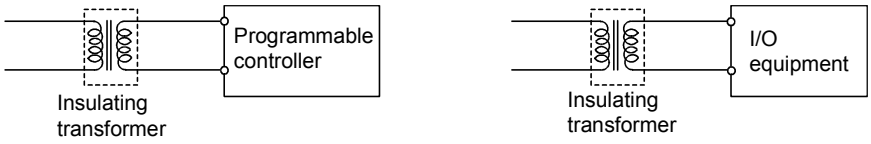
- Always ground the FG and LG terminals to the protective ground conductor.
  Failure to do so may cause an electric shock or malfunctions.
- Wire the module correctly after confirming the rated voltage and terminal layout.
  Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.
- Do not connect multiple power supply modules to one module in parallel. The power supply modules may be heated, resulting in a fire or failure.
- Press, crimp or properly solder the connector for external connection with the specified tool.
  Incomplete connection may cause a short circuit, fire or malfunctions.
- Tighten terminal screws within the specified torque range. If the screw is too loose, it may cause a short circuit, fire or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a short circuit or malfunctions.
- Carefully prevent foreign matter such as dust or wire chips from entering the module.
  Failure to do so may cause a fire, failure or malfunctions.
- Install our programmable controller in a control panel for use.
  Wire the main power supply to the power supply module installed in a control panel through a distribution terminal block.
  Furthermore, the wiring and replacement of a power supply module have to be performed by a maintenance worker who acquainted with shock protection. (For the wiring methods, refer to Type A1SCPUC24-R2/ A1SHCPU/A2SHCPU(S1)/A2ASCPU(S1/S30)/A2USHCPU-S1.User's Manual(Hardware))

(1) Wiring of power supply

(a) When voltage fluctuations are larger than the specified value, connect a constant-voltage transformer.



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



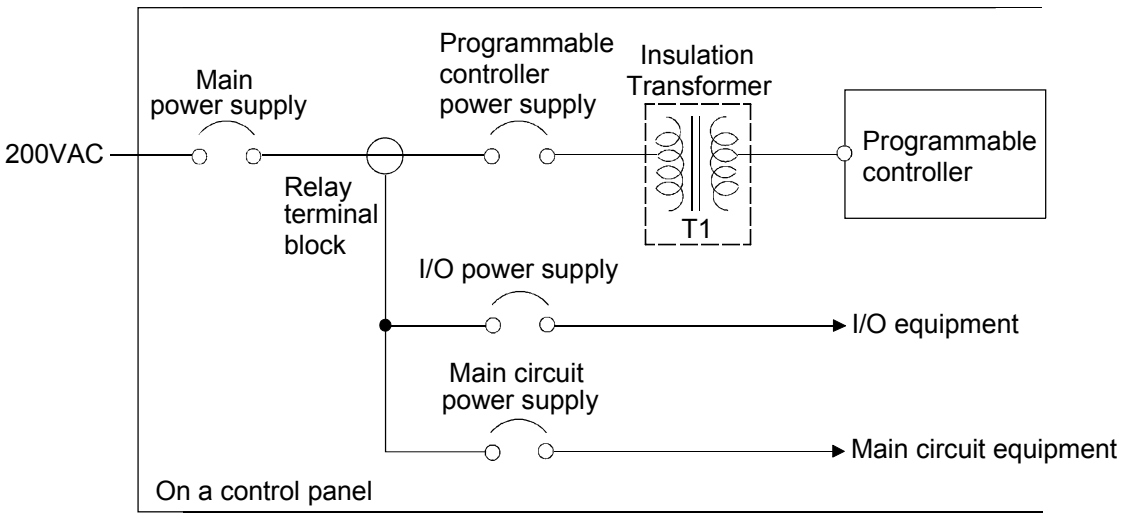
(c) When a power transformer or insulating transformer is employed to reduce the voltage from 200 VAC to 100 VAC, use one with a capacity greater than those indicated in the following table.

Power Supply Module	Transformer Capacity
A1S61PN	110VA × n
A1S62PN	110VA × n

n: Stands for the number of power supply modules.

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

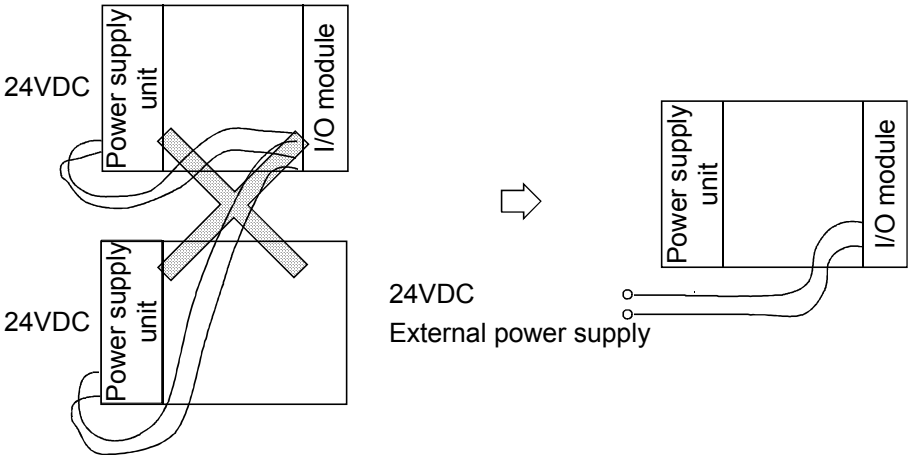
(e) Taking rated current or inrush current into consideration when wiring the power supply, be sure to connect a breaker or an external fuse that have proper blown and detection.
When using a single programmable controller, a 10A breaker or an external fuse are recommended for wiring protection.



(f) Note on using the 24 VDC output of the A1S62PN power supply module.

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

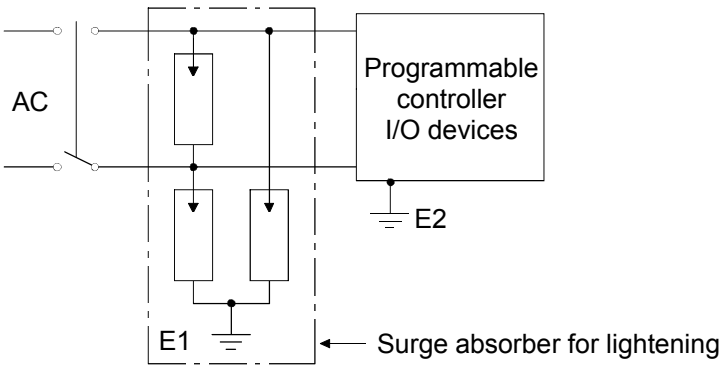
If the 24 VDC output capacity is insufficient for one power supply module, supply 24 VDC from the external 24 VDC power supply as shown below:



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

(h) Do not bind 100VAC and 24VDC wires together with main circuit (high tension and large current) wires or I/O signal lines (including common line) nor place them near each other. Provide 100mm (3.94 inch) clearance between the wires if possible.

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



POINT

(1) Separate the ground of the surge absorber for lightening (E1) from that of the programmable controller (E2).
(2) Select a surge absorber for lightening whose power supply voltage does no exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

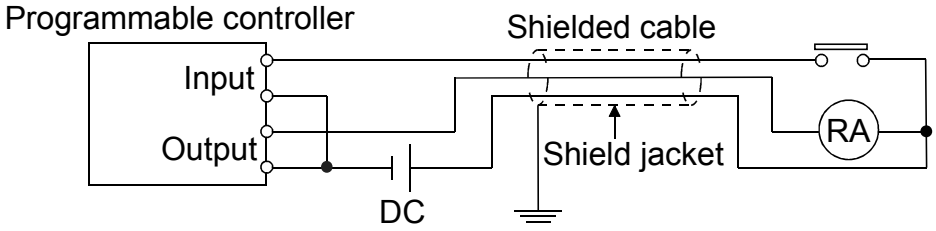
(2) Wiring to I/O device

(a) The solderless terminal with insulation sleeve is inapplicable to a terminal block.
It is advisable to cover the wire connection part of a terminal with a mark tube or insulation tube.

(b) Install wiring to a terminal block using the cable of core diameter 0.3 to 0.75mm^2, and outside diameter 2.8mm or less.

(c) Run the I/O line and output line away from each other.

(d) When the main circuit line and power line cannot be separated, use a shielding cable and ground it on the programmable controller side. However, ground it on the opposite side in some cases.



(e) When cables are run through pipes, securely ground the pipes.

(f) Run the 24VDC input line away from the 100VAC and 200 VAC lines.

(g) The cabling of 200m (656.2ft.) or longer distance may produce leakage current depending on the capacity between lines and result in an accident.

(h) As a countermeasure against the power surge due to lightning, separate the AC wiring and DC wiring and connect a surge absorber for lightning as shown in (i) of item (1).
Failure to do so increases the risk of I/O device failure due to lightning.

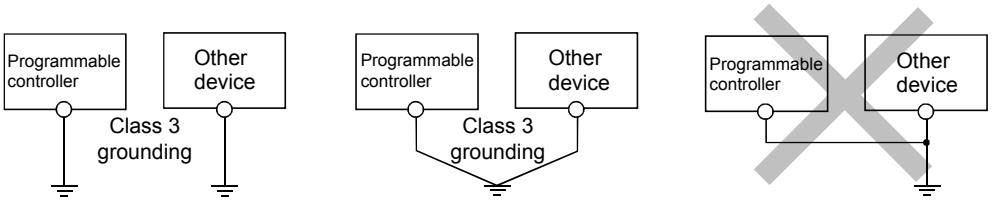
(3) Grounding

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.

(a) Carry out the independent grounding if possible. (Grounding resistance 100Ω or less.)

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



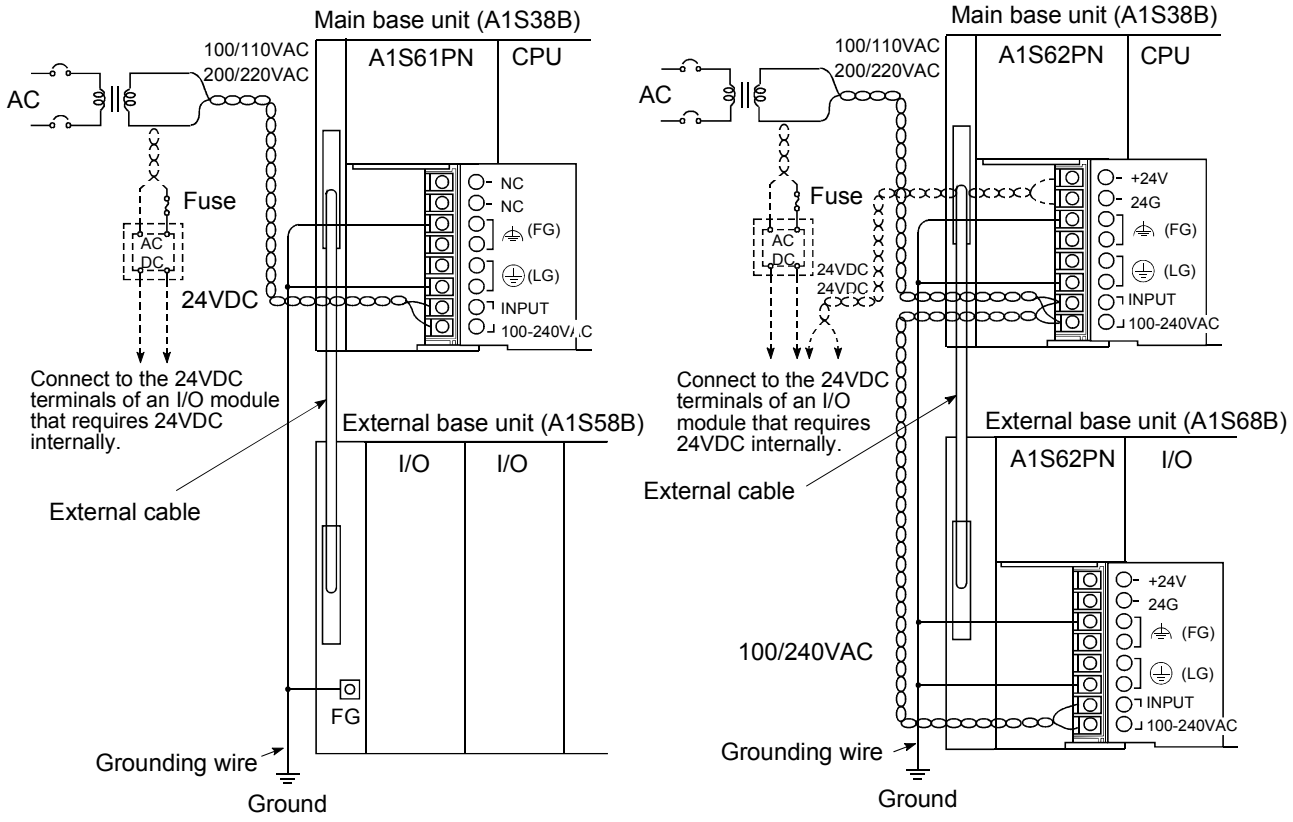
(1) Independent grounding.....Best (2) Shared grounding.....Good (3) Common grounding.....Not allowed

(c) Use the cable of 2mm^2 or more for grounding.
Set the grounding point closer to the programmable controller to make the grounding cable short as possible.

(d) If a malfunction occurs due to earthling, separate either LG or FG of the base module, the device combination, or all the connection from the earthling.

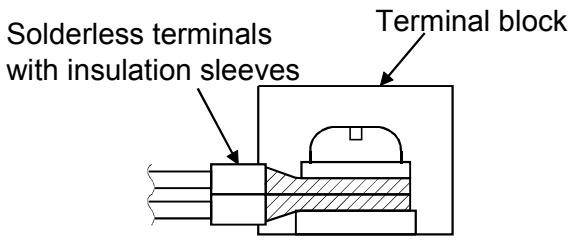
4.3.4 Wiring to module terminals

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



POINT

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



(2) Be sure to ground the LG and FG terminals. Failure to do so may cause the programmable controller to be susceptible to noise. Note that LG terminals include the potential as half as that of input voltage; you might get an electric shock when you touch them.

(3) A1S61PN and A1S62PN do not need to be switched as the are 100 to 240VAC wide-range.

4.4 Precautions when Connecting the Uninterruptible Power Supply (UPS)

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

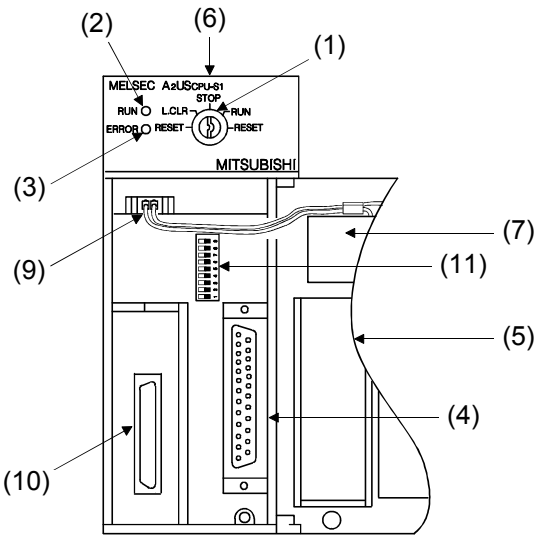
Use the on-line UPS or line interactive UPS (voltage distortion of 5% or less.) Alternatively, use the off-line UPS, i.e., FREQUPS-F series with serial number P or later (Mitsubishi).

Example: FW-F10-03.K/0.5K

Do not use the off-line UPS other than above.

4.5 Part Names

This section gives part names of the CPU.



A2ASCPU(S1/S30)/A2USHCPU-S1

(1) RUN/STOP key switch

RUN/STOP:Used to start/stop sequence program execution.
L.CLR:Used to clear the data set in the latch range set in the parameters.

(2) [RUN] LED

ON:
The RUN/STOP switch is set to "RUN" and sequence program is in operation.
OFF:
100/200VAC is not supplied to the CPU.
The RUN/STOP switch is set to "STOP".
During STOP/PAUSE execution.
Flicker:
Self-diagnostic detected a sequence program error to stop the operation.
During latch clear operation

(3) [ERROR] LED

ON:
Self-diagnostic error is detected. (when an error set to OFF is detected by the LED indication priority setting, the switch stays OFF)
OFF:
When failure of the system or target device is detected by normal or CHK instruction.
Flicker:
Annunciator (F) is turned on in the sequence program.

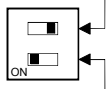
(4) RS-422 connector

(5) Cover

(6) Module fixing screws

(7) Battery

(8) Dip switch

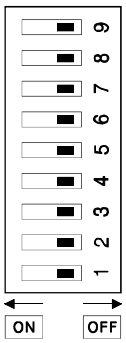


Memory write protect switch
.....A1SCPUC24-R2
(OFF: Memory not protected,
ON : Memory write protected)
I/O control switch
(OFF: Refresh mode, ON: Direct mode)

(9) Battery connector

(10) Memory cassette installing connector

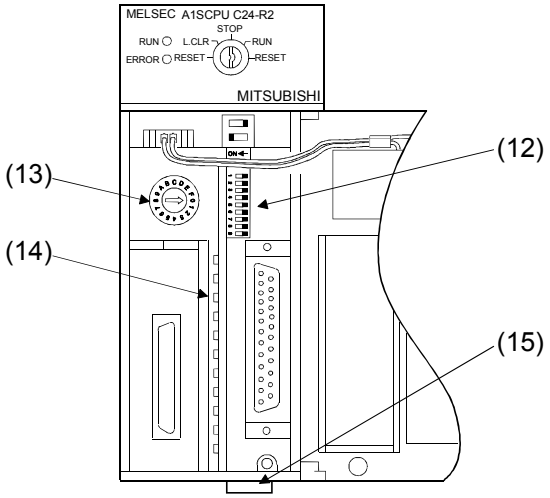
(11) Memory write protect Dip switch



Memory Write Protect Range (kbytes)	Setting Switch	
	A2SHCPU A2ASCPU	A2SHCPU-S1 A2ASCPU-S1/S30 A2USHCPU-S1
0 to 16	1: ON	1: ON
16 to 32	2: ON	2: ON
48 to 64	4: ON	4: ON
64 to 80	Unused	5: ON
80 to 96	Unused	6: ON
96 to 112	Unused	7: ON
112 to 144	Unused	8: ON
144 to 256	Unused	9: ON

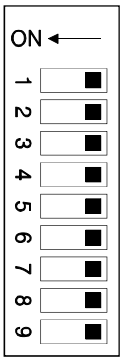
Latch clear method

1) Turn the RUN/STOP key switch from the "STOP" position to the "L.CLR" position several times to make the "RUN" LED start flashing.
2) Turn the RUN/STOP switch from the "STOP" position to the "L.CLR" position once more.
3) The latch clear operation is completed when the "RUN" LED goes OFF.



A1SCPUC24-R2

(12) Transmission specification setting switch

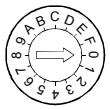


Transmission specification settings (factory setting: all OFF)			
SW	Setting Items	Position of Setting Switch	
		ON	OFF
1	Write during RUN enabled/disabled setting	Enabled	Disabled
2	Transmission speed setting	Refer to *1	
3			
4			
5	Data bit setting	8 bit	7 bit
6	Parity bit setting	Set	Not set
7	Even/odd parity setting	Even	Odd
8	Stop bit setting	2 bit	1 bit
9	Sum check setting	7Set	Not set

*1 Transmission speed setting

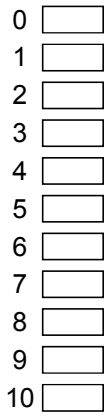
Baud rate (BPS)	300	600	1200	2400	4800	9600	19200
SW05	OFF	ON	OFF	ON	OFF	ON	OFF
SW06	OFF	OFF	ON	ON	OFF	OFF	ON
SW07	OFF	OFF	OFF	OFF	ON	ON	ON

(13) Mode setting switch



Mode settings (factory setting: 0)	
Mode Setting Switch Number	Setting
0	Unusable
1	Protocol 1
2	Protocol 2
3	Protocol 3
4	Protocol 4
5	No-protocol or printer function
6 to E	Unusable
F	Used for testing the independent module

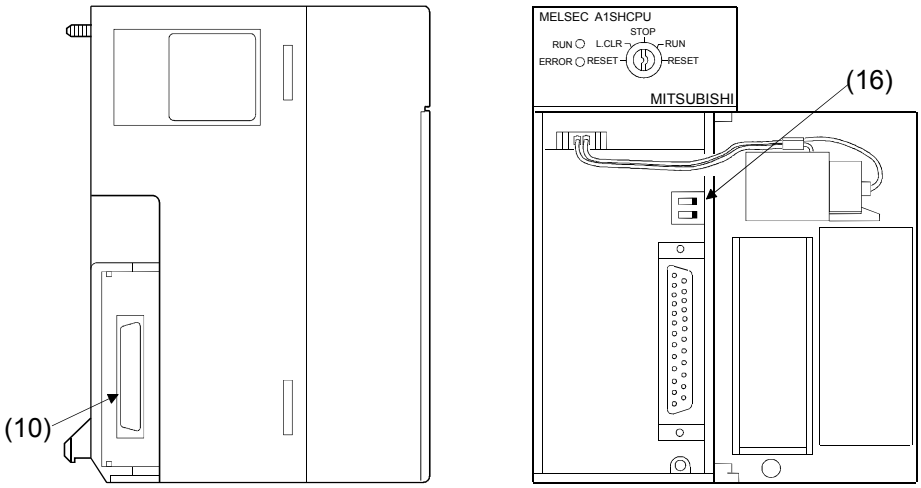
(14) Computer link LED



LED No.	Description	
0	RUN	Normal run Normal: ON Error: OFF
1	SD	Transmitting Flashes during data transmission
2	RD	Receiving Flashes during data receive
3	CPU	Communications with programmable controller CPU Flashes during communications with programmable controller CPU
4	NEU	Neutral Transmission sequence initial state (waiting for ENQ): ON ENQ received: OFF
5	ACK	ACK After sending ACK: ON After sending NAK: OFF
6	NAK	NAK After sending NAK: ON After sending ACK: OFF
7	C/N	Result of programmable controller CPU communications Error: ON Normal: OFF
8	P/S	Parity/Sum check error Error: ON Normal: OFF
9	PRO	Protocol error Communications protocol error: ON Normal: OFF
10	SIO	SIO error Normal: OFF

(15) RS-232C connector

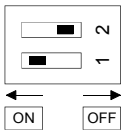
Refer to the following manual for computer link function. Computer Link/Multidrop unit User's Manual (Computer link/Printer function) SH-3511



A1SHCPU/A2SHCPU(S1)

(16) Dip switch

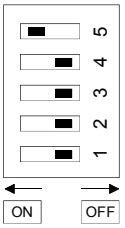
A1SHCPU



Switch No.	Application
2	Memory write protect setting (RAM and E^2PROM) ON: With memory write protection *1 OFF: Without memory write protection
1	I/O select switch setting ON: Direct method OFF: Refresh method

*1 When installing the memory cassette, the setting becomes invalid to RAM only.

A2SHCPU



Switch No.	Application
5	I/O switch setting ON: Direct method OFF: Refresh method
	Memory write protect setting (RAM and E^2PROM) ON: With memory write protection *1 OFF: Without memory write protection
	Memory write protection range
4	48 to 64k bytes
3	32 to 48k bytes
2	16 to 32k bytes
1	0 to 16k bytes

*1 When installing the memory cassette, the setting becomes invalid to RAM only.

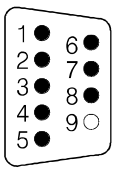
A2SHCPU-S1

Switch No.	Application
10	I/O select switch setting ON: Direct method OFF: Refresh method
	Memory write protect setting (RAM and E^2PROM) ON: With memory write protection *1 OFF: Without memory write protection
	Memory write protection range
9	144 to 192k bytes
8	112 to 144k bytes
7	96 to 112k bytes
6	80 to 96k bytes
5	64 to 80k bytes
4	48 to 64k bytes
3	32 to 48k bytes
2	16 to 32k bytes
1	0 to 16k bytes

*1 When installing the memory cassette, the setting becomes invalid to RAM only.

4.6 RS232C Interface (A1SCPUC24-R2 only)

(1) RS-232C connector specifications



Pin Number	Signal Abbreviation	Signal Name	Signal Direction A1SCPUC24-R2↔External Device
1	CD	Receive carrier detection	←
2	RD(RXD)	Receive data	←
3	SD(TXD)	Send data	→
4	DTR(ER)	Data terminal ready	→
5	SG	Signal ground	↔
6	DSR(DR)	Data set ready	←
7	RS(RTS)	Request to send	→
8	CS(CTS)	Clear to send	←

A 9-pin D subconnector is supplied in the same package as the A1SCPUC24-R2 body.

Product name

9-pin Dsub (male), screw mounted

17JE-23090-02-D8A, made by DDK

(2) RS-232C cable

For the RS-232C cable, use a cable that conforms to the RS-232C standard and is no longer than 15 m.

(Recommended cable)

7/0. 127[ ]P HRV-SV.....(RS-232C cable made by Oki Densen)

└──── Specify the number of wire pairs.

For example, if the number of pairs is thirteen:

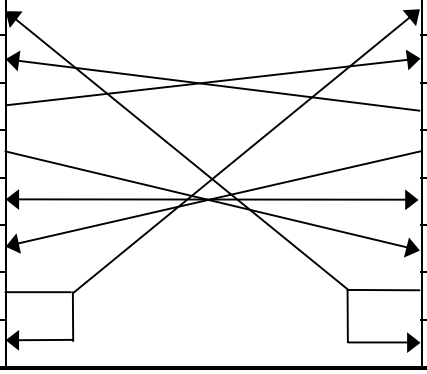
7/0. 127 13P HRV-SV

(3) Connecting the RS-232C connectors

The standard method for connecting the RS-232C connectors is shown below.

For details on the connection method, refer to the Computer Link Module User's Manual (Com. link func./Print func.).

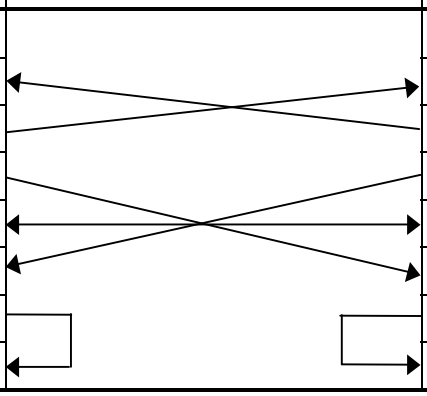
(a) Example connection to an external device in which the CD signal (pin No.8) can be switched ON and OFF.

A1SCPUC24-R2		Cable Connections and Signal Directions	External Device
Signal Names	Pin Number		Signal Names
CD	1		CD
RD(RXD)	2		RD(RXD)
SD(TXD)	3		SD(TXD)
DTR(ER)	4		DTR(ER)
SG	5		SG
DSR(DR)	6		DSR(DR)
RS(RTS)	7		RS(RTS)
CS(CTS)	8		CS(CTS)

(b) Example connection to an external device in which the CD signal (pin No.8) cannot be switched ON and OFF.

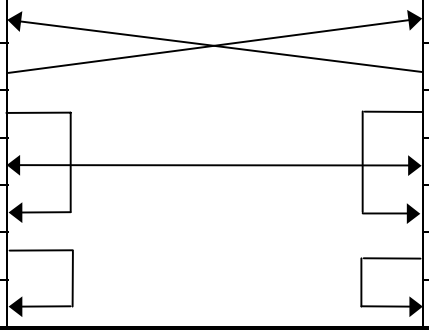
In the case of a connection to a device in which the device's CD signal cannot be switched ON and OFF, set non-execution of the buffer memory address 10BH RS232C CD terminal check.

1) Example connection to an external device in which DC code control or DTR/DSR code control is executed.

A1SCPUC24-R2		Cable Connections and Signal Directions	External Device
Signal Names	Pin Number		Signal Names
CD	1		CD
RD(RXD)	2		RD(RXD)
SD(TXD)	3		SD(TXD)
DTR(ER)	4		DTR(ER)
SG	5		SG
DSR(DR)	6		DSR(DR)
RS(RTS)	7		RS(RTS)
CS(CTS)	8		CS(CTS)

2) Example connection to an external device in which DC code control is executed.

A1SCPUC24-R2		Cable Connections and Signal Directions	External Device
Signal Names	Pin Number		Signal Names
CD	1		CD
RD(RXD)	2		RD(RXD)
SD(TXD)	3		SD(TXD)
DTR(ER)	4		DTR(ER)
SG	5		SG
DSR(DR)	6		DSR(DR)
RS(RTS)	7		RS(RTS)
CS(CTS)	8		CS(CTS)



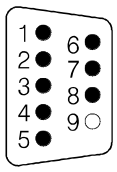
4.7 Self-Loopback Test (A1SCPUC24-R2 only)

The self-loopback test checks whether or not the isolated A1SCPUC24-R2 (not connected to any external devices) will operate correctly.

For details on the self-loopback test, refer to the Computer Link Module User's Manual (Com. link func./Printer func.).

Connect the cables

- Connect cables to the RS-232C connectors.



Pin Number	Signal Abbreviation	Signal Name	Cable Connections
1	CD	Receive carrier detection	
2	RD(RXD)	Receive data	
3	SD(TXD)	Send data	
4	DTR(ER)	Data terminal ready	
5	SG	Signal ground	
6	DSR(DR)	Data set ready	
7	RS(RTS)	Request to send	
8	CS(CTS)	Clear to send	

Set the mode setting switch

- Set the mode setting switch to "F".

Execute the self-loopback test

- Turn the programmable controller CPU power supply ON or reset the programmable controller CPU.

Check the LED display status

Check Item	Display When Normal		Display in Error Status	
Programmable controller CPU communications check	C/N	OFF	C/N (LED No.7)	ON
	CPU	Flicker		
RS-232C communications check	SIO	OFF	SIO (LED No.10)	ON
	SD	Flicker		
	RD			

Completed

- Turn the power supply OFF.

5.1 Input modules

5.1.1 Input module specifications

Model	Type	No. of Points	Rated Input Voltage	Input Current	Operating Voltage		
					ON voltage	OFF voltage	
A1SX10	AC input	16	100 to 120VAC	6mA	80VAC or hsigher	30VAC or lower	
A1SX10EU			100 to 120VAC	7mA			
A1SX20			200 to 240VAC	9mA			
A1SX20EU			200 to 240VAC	11mA			
A1SX30	AC/DC input		12/24VAC	4/8.5mA	7VAC/DC or higher	2.7VAC/DC or lower	
			12/24VDC				
A1SX40	DC input (sink type)		12/24VDC	3/7mA	8VDC or higher	4VDC or lower	
A1SX40-S1			24VDC	7mA	DC14V or higher	6.5VDCor lower	
A1SX40-S2							
A1SX41		32	12/24VDC	3/7mA	8VDC or higher	4VDC or lower	
A1SX41-S1			24VDC	7mA	17VDC or higher	3.5VDC or lower	
A1SX41-S2			24VDC	7mA	14VDC or higher	6.5VDC or lower	
A1SX42		64	12/24VDC	2/5mA	8VDC or higher	4VDC or lower	
A1SX42-S1			24VDC	5mA	18.5VDC or higher	3VDC or lower	
A1SX42-S2			24VDC	5mA	17.5VDC or higher	7VDC or lower	
A1SX71	DC input (sink/source type)	32	5/12/24VDC	1.2/3.3/7mA	3.5VDC or higher	1VDC or lower	
A1SX80		16	12/24VDC	3/7mA	8VDC or higher	4VDC or lower	
A1SX80-S1			24VDC	7mA	17VDC or higher	5VDC or lower	
A1SX80-S2			24VDC	7mA	13VDC or higher	6VDC or lower	
A1SX81		32	12/24VDC	3/7mA	8VDC or higher	4VDC or lower	
A1SX81-S2			24VDC	7mA	13VDC or higher	6VDC or lower	
A1SX82-S1		64	24VDC	5mA	18.5VDC or higher	3VDC or lower	
A1S42X	DC input (dynamic)	16/32 *2 48/64	12/24VDC	4/9mA	8VDC or higher	4VDC or lower	

	Maximum Simultaneous Input Points (Percentage Simultaneously ON)	Max. Response Time		Field Wiring	Points/ Common	Internal Current Consump-tion (5VDC)	NO. of Occupied Points
		OFF to ON	ON to OFF				
	100%(110VAC) 60%(132VAC)	20ms or lower	35ms or lower	Terminal	16	0.05A	16
	100%(110VAC)	20ms or lower	35ms or lower				
	60%(220VAC)	30ms or lower	55ms or lower				
	60%(220VAC)	30ms or lower	55ms or lower				
	75%(26.4VDC)	25ms or lower	20ms or lower				
		20ms or lower	20ms or lower				
	100%(26.4VDC)	10ms or lower	10ms or lower				
		0.1ms or lower	0.2ms or lower				
		10ms or lower	10ms or lower				
	60%(26.4VDC)	10ms or lower	10ms or lower	40-pin connector	32	0.08A	32
		0.3ms or lower	0.3ms or lower			0.12A	
		10ms or lower	10ms or lower			0.08A	
	50%(24VDC)	10ms or lower	10ms or lower	40-pin connector ×2		0.09A	64
		0.3ms or lower	0.3ms or lower			0.16A	
						0.09A	
	100%	1.5ms or lower	3ms or lower	40-pin connector	32	0.075A	32
	100%(26.4VDC)	10ms or lower	10ms or lower	Terminal	16	0.05A	16
		0.4ms or lower	0.5ms or lower				
		10ms or lower	10ms or lower				
	60%(26.4VDC)	10ms or lower	10ms or lower	37-pin D-sub connector	32	0.08A	32
	50%(26.4VDC)	0.3ms or lower	0.3ms or lower	40-pin connector	32	0.16A	64
	100%(26.4VDC)	0.4ms or lower*1	0.4ms or lower*1	24-pin connector	-	0.08A	16/32/48/64

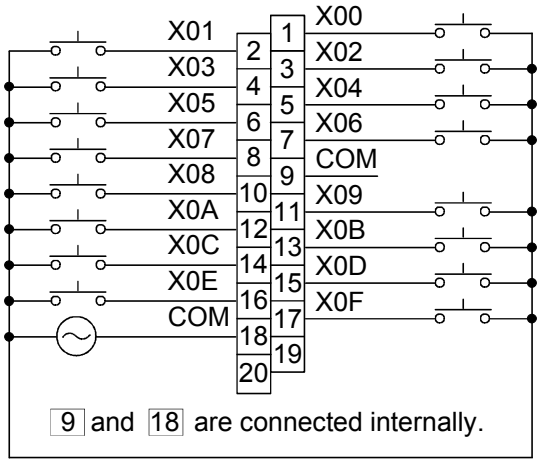
For all modules, the insulation system is photocoupler insulation and the input indications are LED indications.

*1 .....The dynamic scan cycle is 13.3ms.
*2 .....Set using the DIP switch on the module front.

5.1.2 Input module connections

(1)

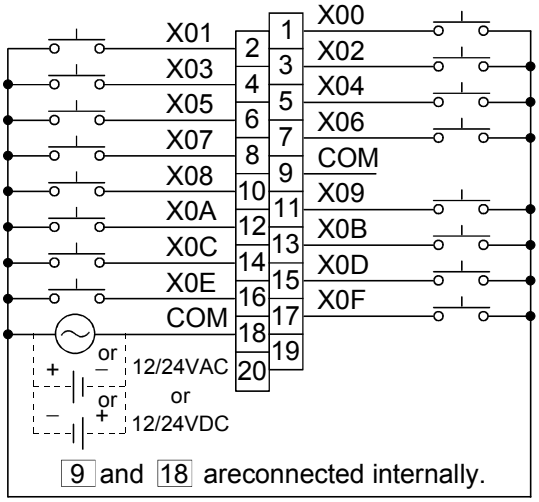
Model	Rated Input Voltage
A1SX10	100 to 120 VAC
A1SX10EU	
A1SX20	200 to 240 VAC
A1SX20EU	



⚠DANGER
- Do not touch terminals while the power is supplied.

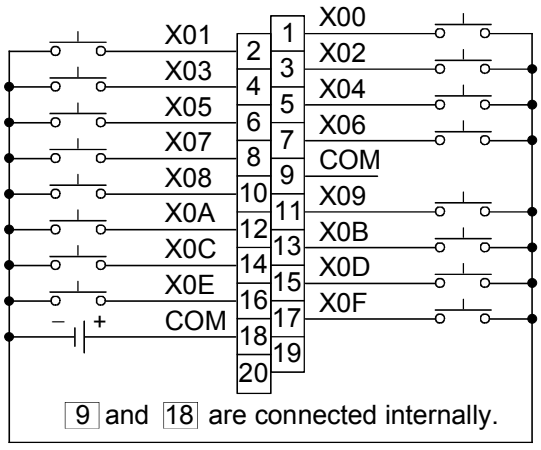
(2)

Model	Rated Input Voltage
A1SX30	12/24 VAC/DC



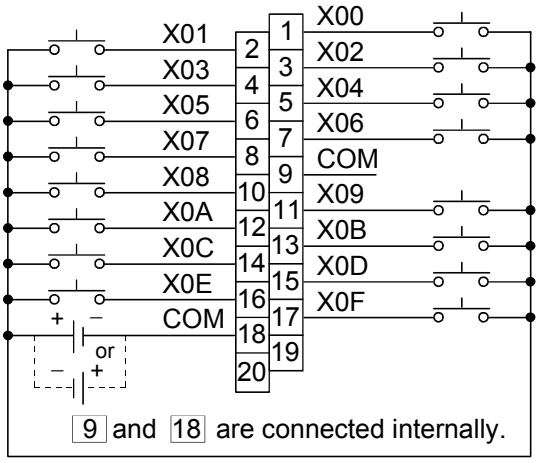
(3)

Model	Rated Input Voltage
A1SX40	12/24 VAC
A1SX40-S1	24 VAC
A1SX40-S2	



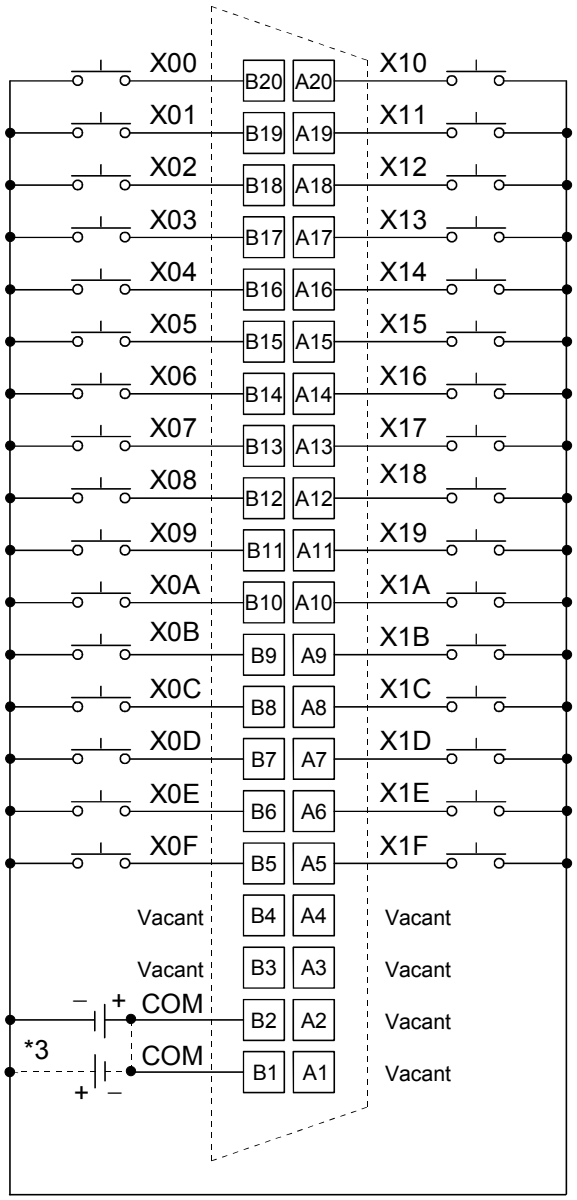
(4)

Model	Rated Input Voltage
A1SX80	12/24 VAC
A1SX80-S1	24 VAC
A1SX80-S2	



(5)

Model	Rated Input Voltage
A1SX41	12/24 VDC
A1SX41-S1(S2)	24 VDC
A1SX42	12/24 VDC
A1SX42-S1(S2)	24 VDC
A1SX82-S1*3	



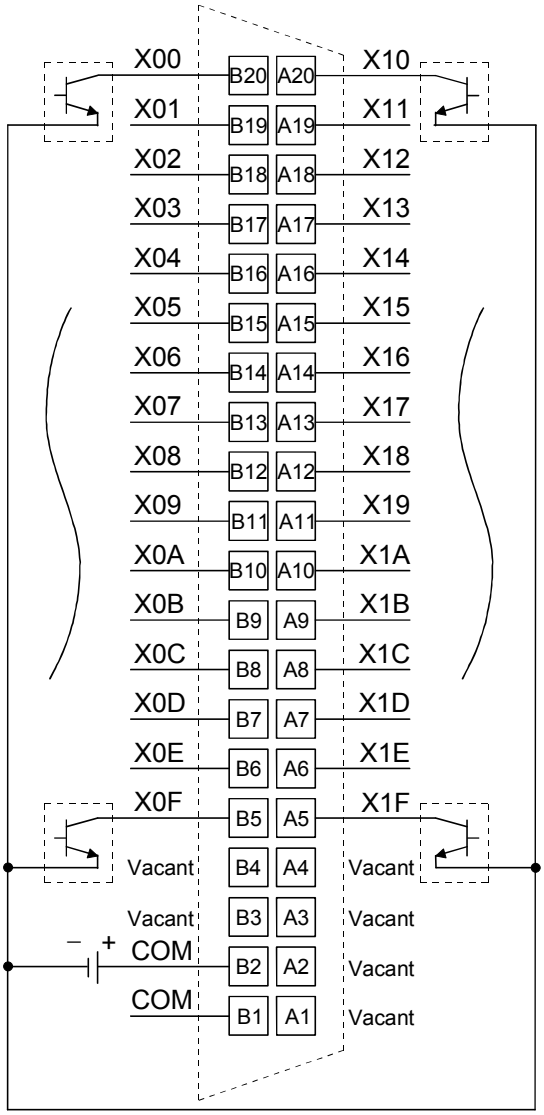
*1 The figure above indicates F (the first half 32 points).
The connections for L (the latter half 32 points) are the same as for F (regard X00 to X1F as X20 to X3F.)
B1 and B2 are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

*3 A1SX82-S1 can use both positive common and negative common.

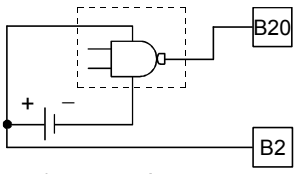
(6)

Model	Rated Input Voltage
A1SX71	5/12/24 VDC

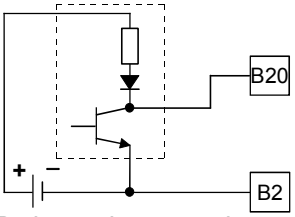


*1 The figure above shows the connections for the open collector (sink) type.
B1 and B2 are connected internally.

- TTL, LS-TTL, CMOS buffer (sink) connection

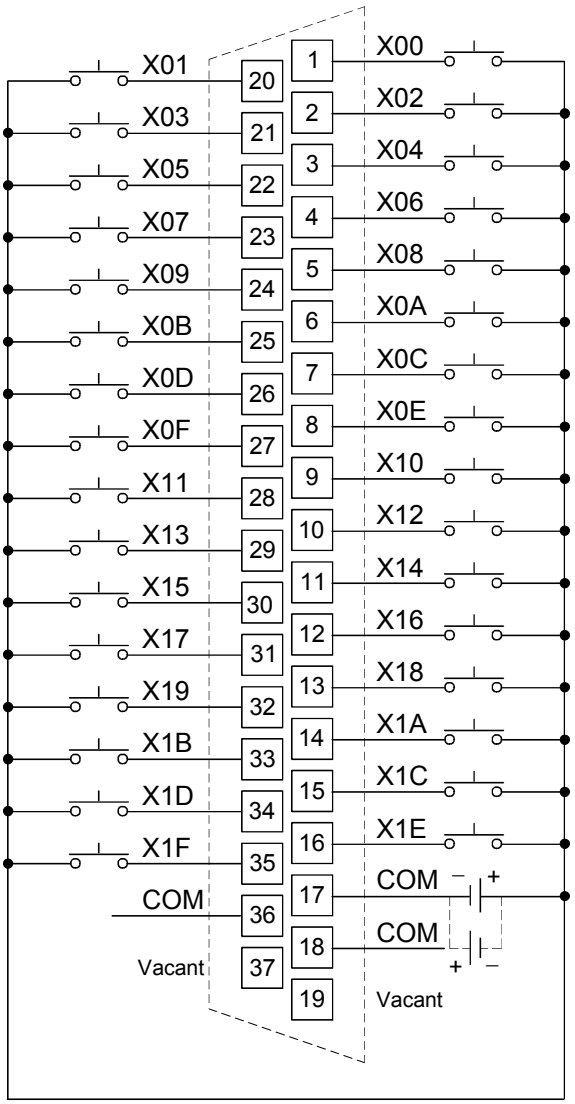


- Sensor (source) connection



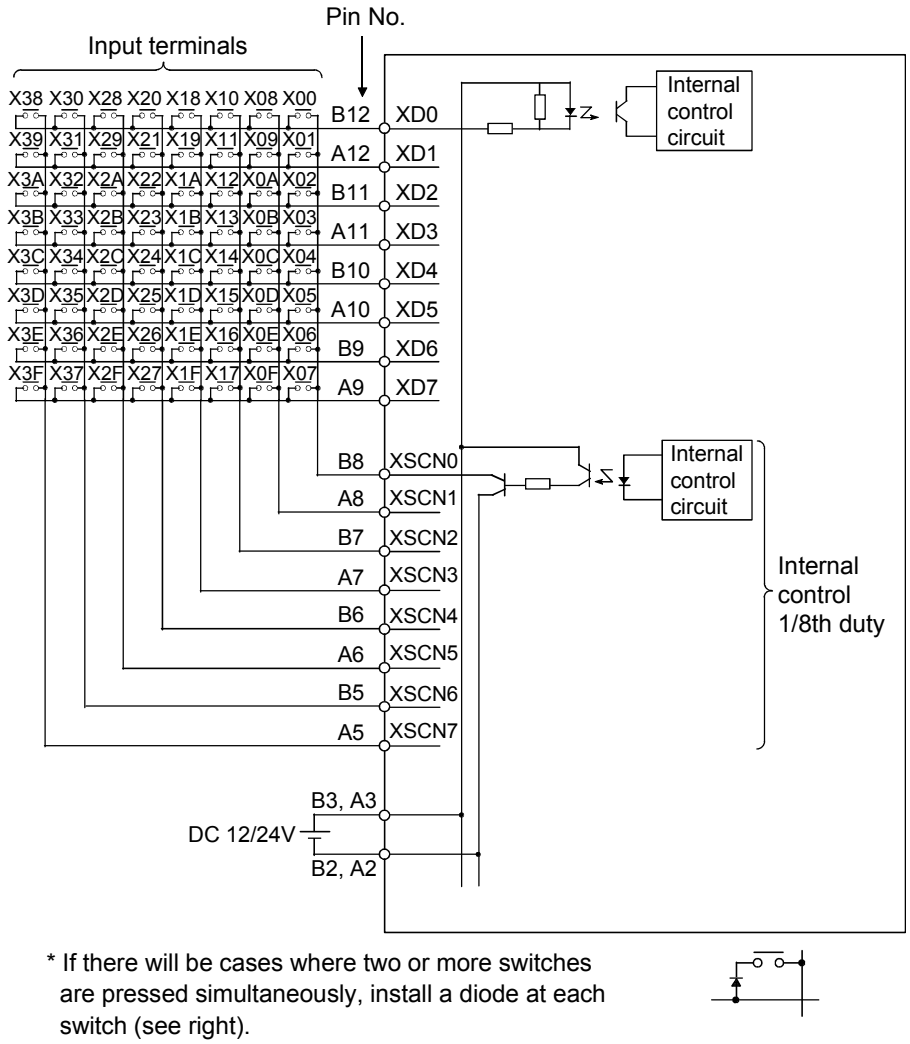
*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

(7)	Model	Rated Input Voltage
	A1SX81	12/24 VDC
	A1SX81-S2	24 VDC



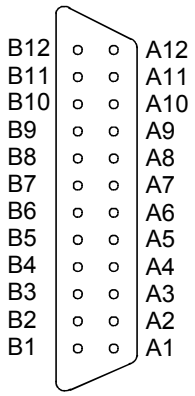
● 17 , 18 and 36 are connected internally.

(8)	Model	Rated Input Voltage
	A1S42X	12/24 VDC



* If there will be cases where two or more switches are pressed simultaneously, install a diode at each switch (see right).

Pin Arrangement



Seen from front face of the module

Pin No.	Signal Name	Pin No.	Signal Name
B12	XD0	A12	XD1
B11	XD2	A11	XD3
B10	XD4	A10	XD5
B9	XD6	A9	XD7
B8	XSCN0	A8	XSCN1
B7	XSCN2	A7	XSCN3
B6	XSCN4	A6	XSCN5
B5	XSCN6	A5	XSCN7
B4	Vacant	A4	Vacant
B3	12/24 VDC	A3	12/24 VDC
B2	0V	A2	0V
B1	FG	A1	FG

5.2 Output modules

5.2.1 Output module specifications

Model	Type	No. of Points	Rated Load Voltage	Max. Load Current			Max. Output Response Time		
				Point	Common	Module	OFF to ON	ON to OFF	
A1SY10	Relay Output	16	100V to 240VAC 24VDC	2A	8A	-	10ms or lower	12ms or lower	
A1SY10EU		16		2A	8A	-			
A1SY14EU		12		2A	8A	-			
A1SY18A		8		2A	-	8A			
A1SY18AEU		8		2A	-	-			
A1SY22	Triac Output	16	100V to 240VAC	0.6A	2.4A	-	1ms or lower	1ms + 0.5 cycles or less	
A1SY28A		8		1A	-	8A (AC132V, 46°C), 8A (AC264V, 40°C), 4A (AC132V, 55°C), 2A (AC264V, 55°C)			
A1SY28EU				0.6A	2.4A (46°C) 1.9A (46°C)	-		1ms + 0.5 cycles or less	
A1SY40	Transistor Output (sink type)	16	12/24V DC	0.1A	0.8A	-	2ms or lower	2ms or lower	
A1SY40P					0.8A	-	1ms or lower	1ms or lower	
A1SY41		32			2A	-	2ms or lower	2ms or lower	
A1SY41P					2A	-	1ms or lower	1ms or lower	
A1SY42		64		0.1A	1.6A	-	2ms or lower	2ms or lower	
A1SY42P					2A	-	1ms or lower	1ms or lower	
A1SY50		16		0.5A	2A	-	2ms or lower	2ms or lower	
A1SY60			24VDC	2A	4A	-			
A1SY60E	Transistor Output (source type)		5/12 /24VDC	2A	4A	-	3ms or lower	10ms or lower	
A1SY68A	Transistor Output (sink/source type)	8	5/12 24/48VDC	2A	-	-			

For all modules, the insulation system is photocoupler insulation and the output indications are LED indications.
*1 .....The dynamic scan cycle is 13.3ms (FAST mode) or 106.7ms (SLOW mode).
(Set using the DIP switch on the module rear.)
*2 .....Set using the DIP switch on the module front.
*3 .....Value at TYP 200VAC.
*4 .....Value at TYP 12VDC.
*5 ....."ERR".LED turns on when fuse is blown or external supply power is off.
*6 .....0.08A is shown on the rating plate of the module.
*7 .....0.15A is shown on the rating plate of the module.

	Field Wiring	Points/ Common	Surge Suppression	Fuse Rating	Error display	External Power Supply (TYP DC24V) Current	Internal Current Consumption	No. of Occupied Points
	Terminal	8	None	None	None	0.090A	0.12A	16
		8				0.090A	0.12A	
		4				0.1A	0.12A	
		-				0.075A	0.24A	
						0.075A	0.24A	
		8	CR absorber	5A	LED	0.002A *3	0.27A	
		-	CR absorber varistor	None	None	-	0.13A	
		4	CR absorber				0.27A	
		8	Zener diode	1.6A	LED*5	0.008A	0.27A	
				None	None	0.011A	0.79A *6	
	40-pin connector	32		3.2A	LED*5	0.008A	0.5A	32
				None	None	0.012A	0.141A *7	
	40-pin connector ×2			3.2A	LED	0.008A	0.93A	64
				None	None	0.014A	0.17A	
	Terminal	8		3.2A	LED	0.06A	0.12A	16
				5A		0.015A	0.12A	
				7A		0.01A	0.2A	
		-		None	None	-	0.11A	

Model	Type	No. of Points	Rated Load Voltage	Max. Load Current			Max. Output Response Time		
				Point	Common	Module	OFF to ON	ON to OFF	
A1SY71	Transistor Output (for TTL/CMOS) sink type	32	5/12VDC	0.016A	0.256A	-	1ms or lower	1ms or lower	
A1SY80	Transistor Output (source type)	16	12/24V DC	0.8A	3.2A	-	2ms or lower	2ms or lower	
A1SY81		32		0.1A	2A	-			
A1SY81EP				0.1A(25°C) 0.05A(55°C)	2A(25°C) 1.6A(55°C)	-	0.5ms or lower	1.5ms or lower	
A1SY82		64		12VDC 0.1A	12VDC 1.6A	-	2ms or lower	2ms or lower	
				24VDC 0.05A	24VDC 1.6A				
A1S42Y	Transistor Output (dynamic)	16/32 48/64*2		0.1A(40°C) 0.05A(55°C)	-	-	2ms or lower *1	2ms or lower *1	

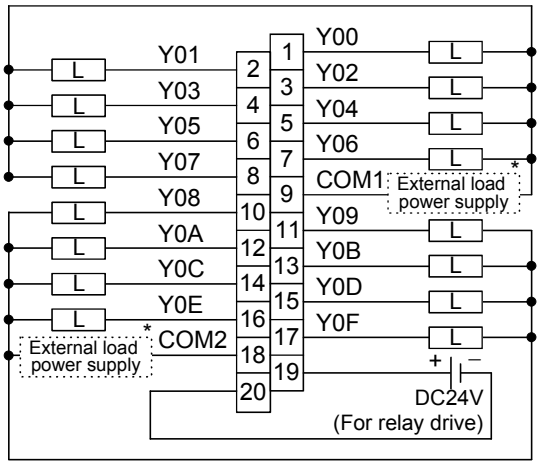
*1 .....The dynamic scan cycle is 13.3ms (FAST mode) or 106.7ms (SLOW mode).
(Set using the DIP switch on the module rear.)
*2 .....Set using the DIP switch on the module front.
*3 .....Value at TYP 200VAC.
*4 .....Value at TYP 12VDC.
*5 ....."ERR".LED turns on when fuse is blown or external supply power is off.
*6 .....0.08A is shown on the rating plate of the module.
*7 .....0.15A is shown on the rating plate of the module.

	Field Wiring	Points/ Common	Surge Suppression	Fuse Rating	Error display	External Power Supply (TYP DC24V)	Internal Current Consumption	No. of Occupied Points
	40-pin connector	32	None	1.6A	LED	0.15A *4	0.4A	32
	Terminal	8	Zener diode	5A		0.02A	0.12A	16
	37-pin D-sub connector	32		3.2A		0.008A	0.5A	32
			Clamp diode	None	None	0.080A	0.5A	
	40-pin connector ×2	32	Zener diode	3.2A	LED	0.008	0.93A	64
	24-pin connector	-	None	1.6A	LED	0.055	0.18	16/32 48/64

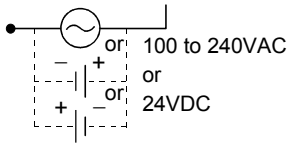
5.2.2 Output module connections

(1)

Model	Rated Load Voltage
A1SY10	240 VAC, 24 VDC



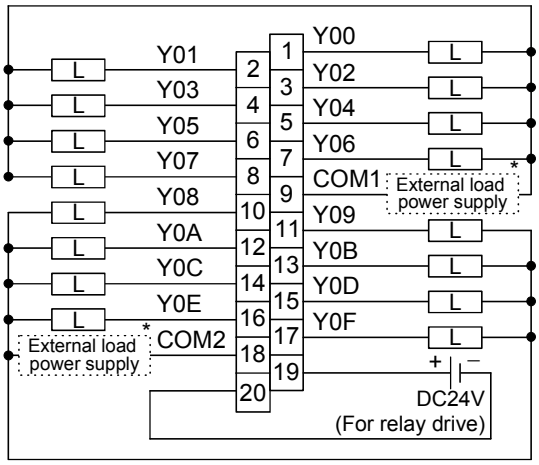
*: The external load power supply section is as shown below.



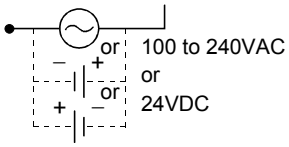
⚠DANGER ● Do not touch terminals while the power is supplied.

(2)

Model	Rated Load Voltage
A1SY10EU	120 VAC, 24 VDC



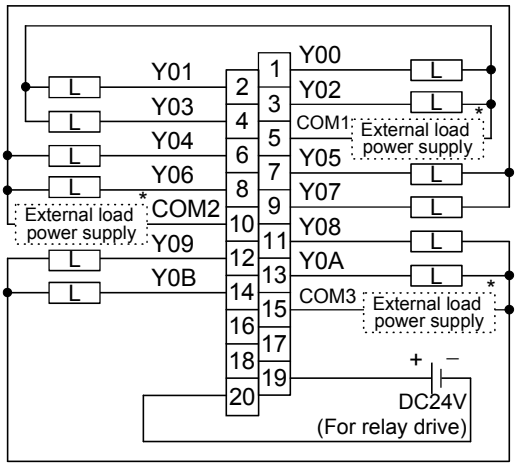
*: The external load power supply section is as shown below.



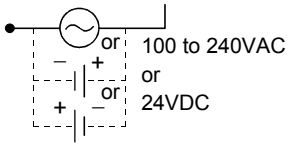
⚠DANGER ● Do not touch terminals while the power is supplied.

(3)

Model	Rated Load Voltage
A1SY14EU	240 VAC, 24 VDC



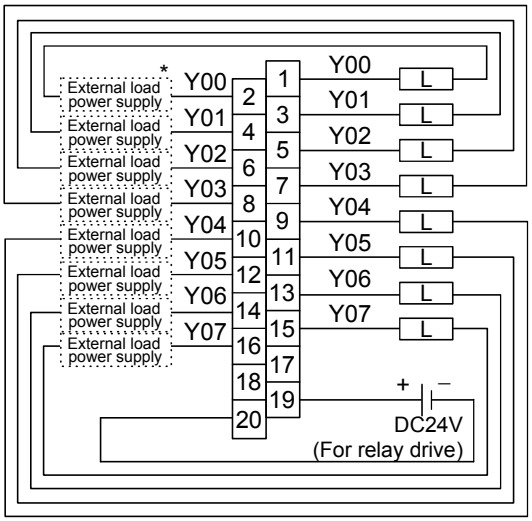
*: The external load power supply section is as shown below.



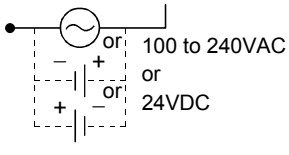
⚠DANGER ● Do not touch terminals while the power is supplied.

(4)

Model	Rated Load Voltage
A1SY18A A1SY18AEU	240 VAC, 24 VDC



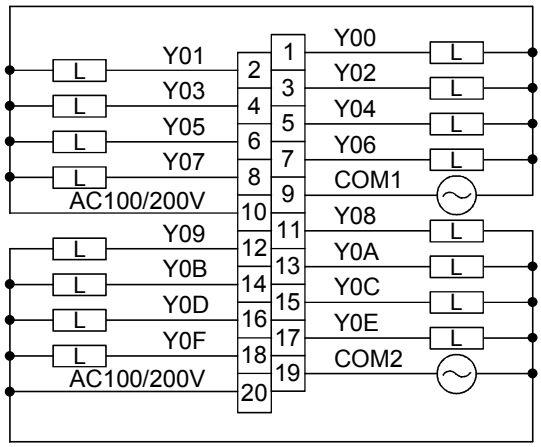
*: The external load power supply section is as shown below.



⚠DANGER ● Do not touch terminals while the power is supplied.

(5)

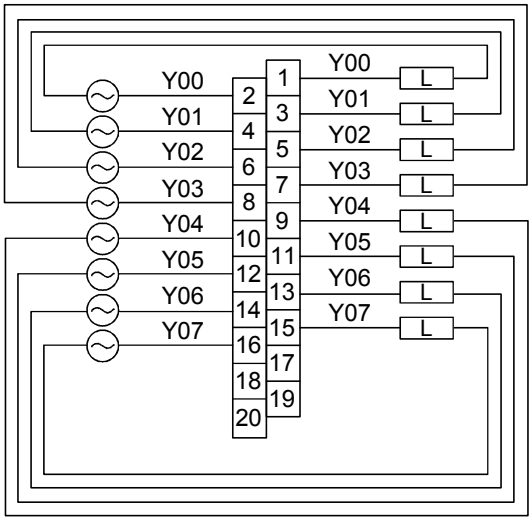
Model	Rated Load Voltage
A1SY22	100 to 240 VAC



⚠DANGER
- Do not touch terminals while the power is supplied.

(6)

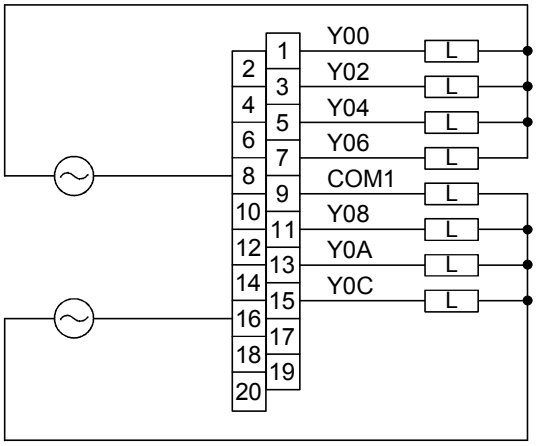
Model	Rated Load Voltage
A1SY28A	100 to 240 VAC



⚠DANGER
- Do not touch terminals while the power is supplied.

(7)

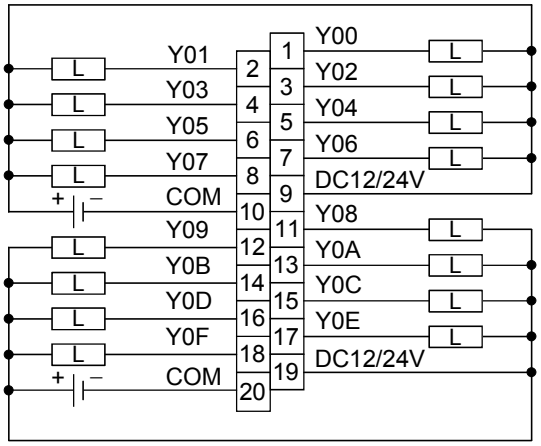
Model	Rated Load Voltage
A1SY28EU	100 to 240 VAC



⚠DANGER
- Do not touch terminals while the power is supplied.

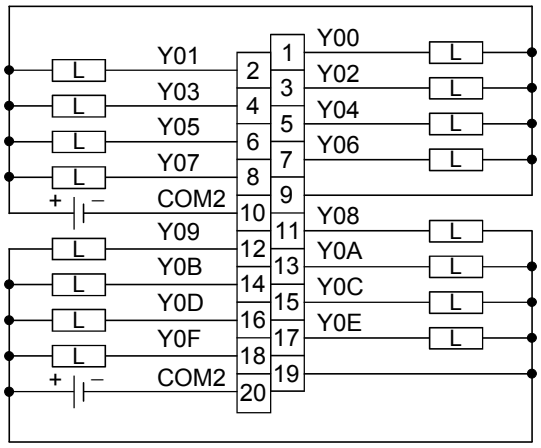
(8)

Model	Rated Load Voltage
A1SY40	12/24 VAC
A1SY40P	



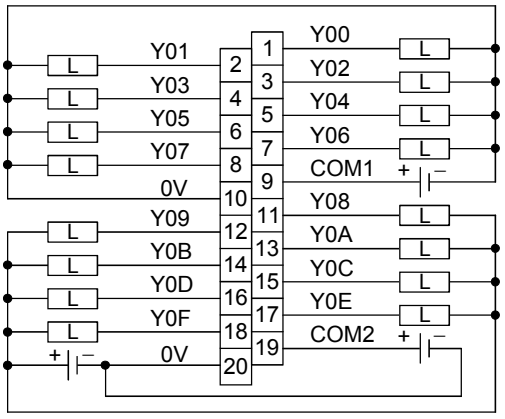
(9)

Model	Rated Load Voltage
A1SY50	12/24 VDC
A1SY60	24 VDC



(10)

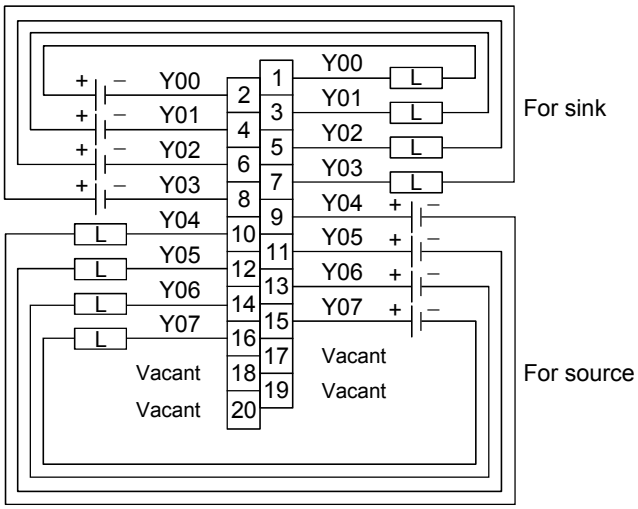
Model	Rated Load Voltage
A1SY60E	5/12/24 VDC



* When using a working load voltage of 5VDC, a separate 12/24VDC source is required for the external power supply.

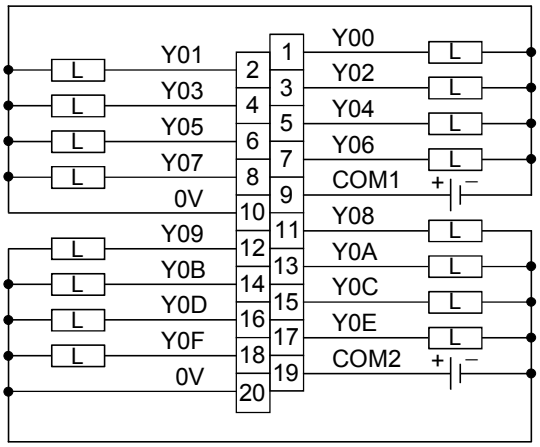
(11)

Model	Rated Load Voltage
A1SY68A	5/12/24/48 VDC



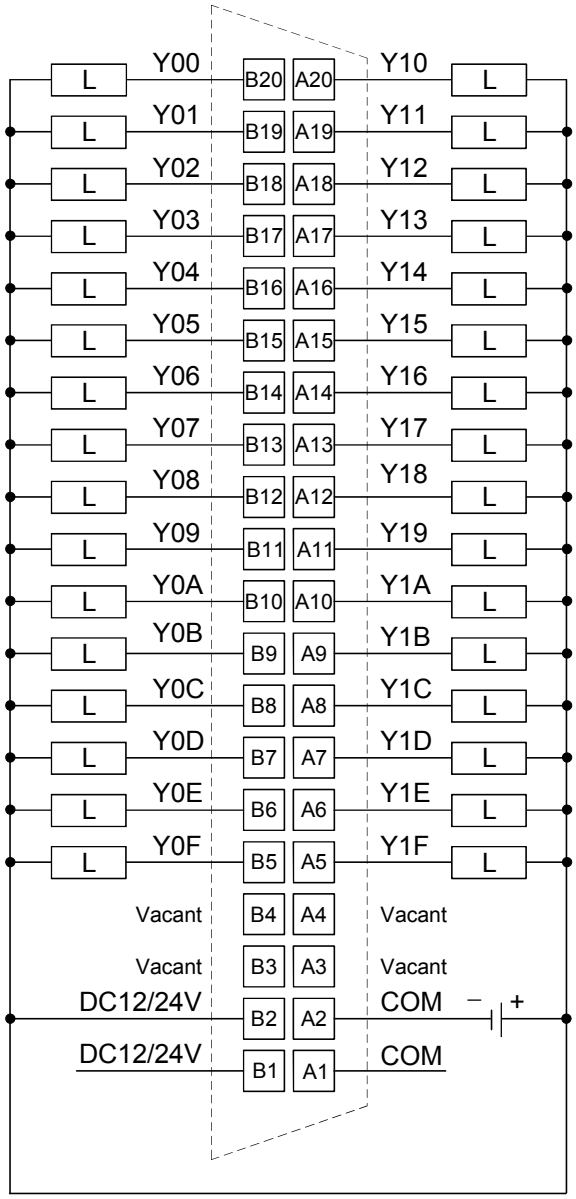
(12)

Model	Rated Load Voltage
A1SY80	12/24 VAC



(13)

Model	Rated Load Voltage
A1SY41	12/24 VDC
A1SY41P	

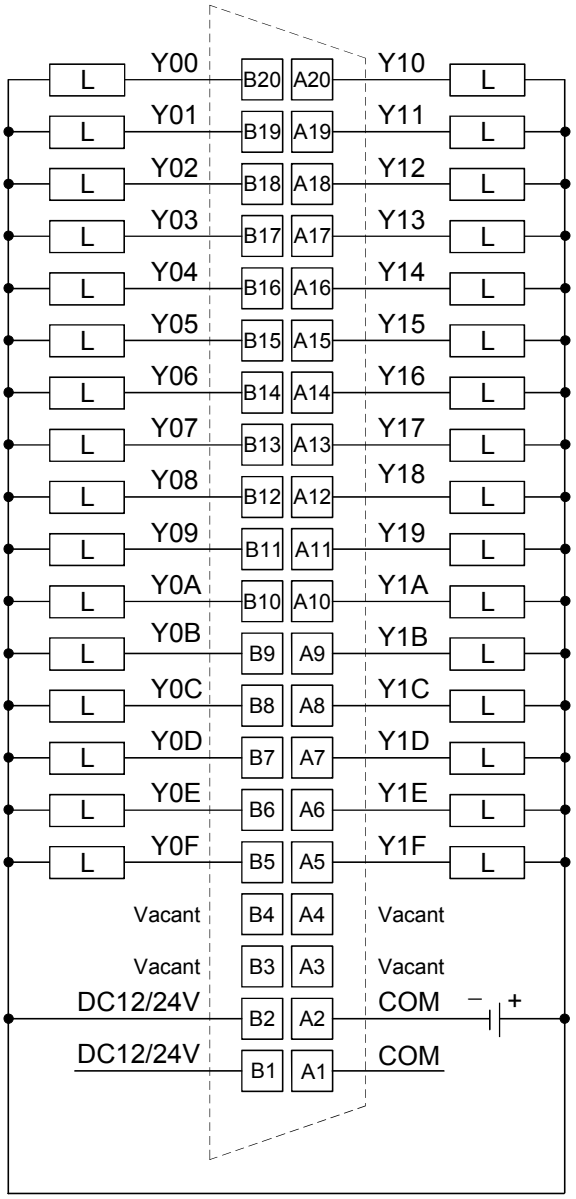


*1 B1 and B2 , and A1 and A2 , are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

(14)

Model	Rated Load Voltage
A1SY42	12/24 VDC
A1SY42P	

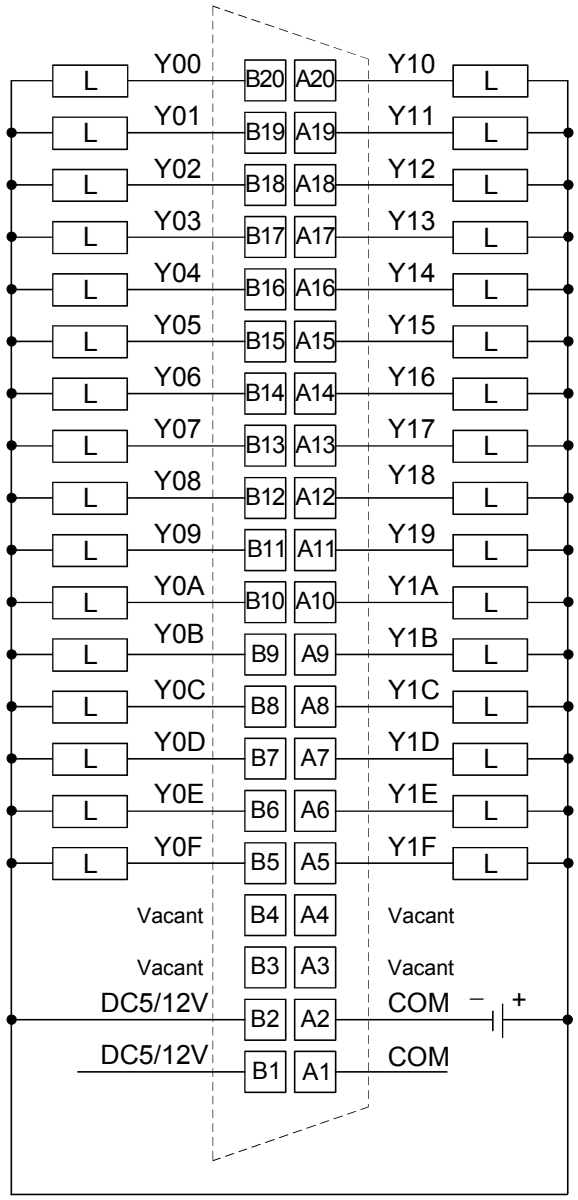


*1 The figure above indicates F (the first half 32 points).
The connections for L (the latter half 32 points) are the same as for F (regard Y00 to Y1F as Y20 to Y3F.)
B1 and B2 , and A1 and A2 , are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

(15)

Model	Rated Load Voltage
A1SY71	5/12 VDC

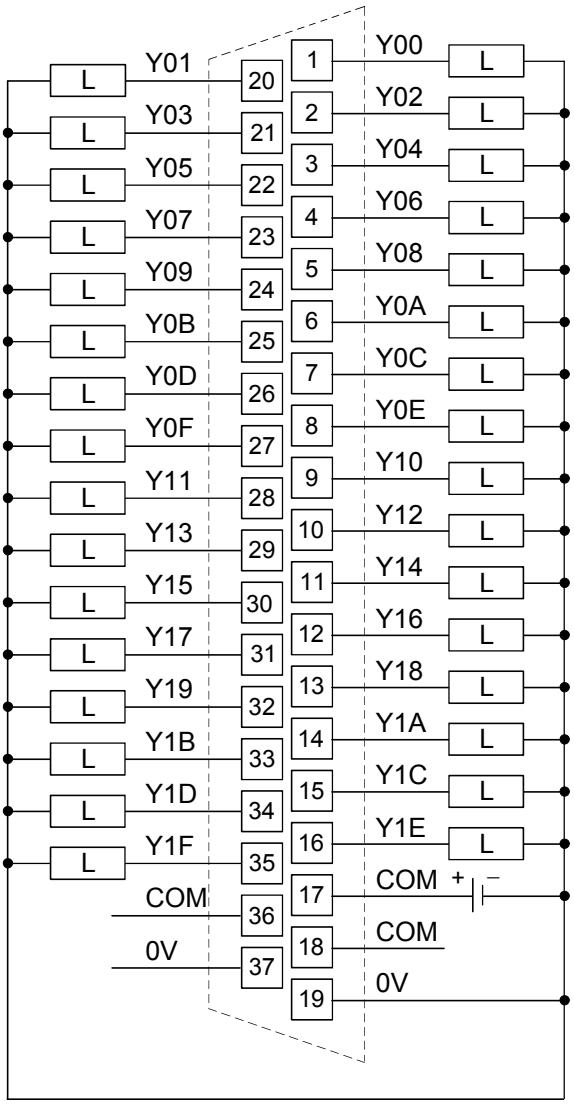


*1 B1 and B2 , and A1 and A2 , are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

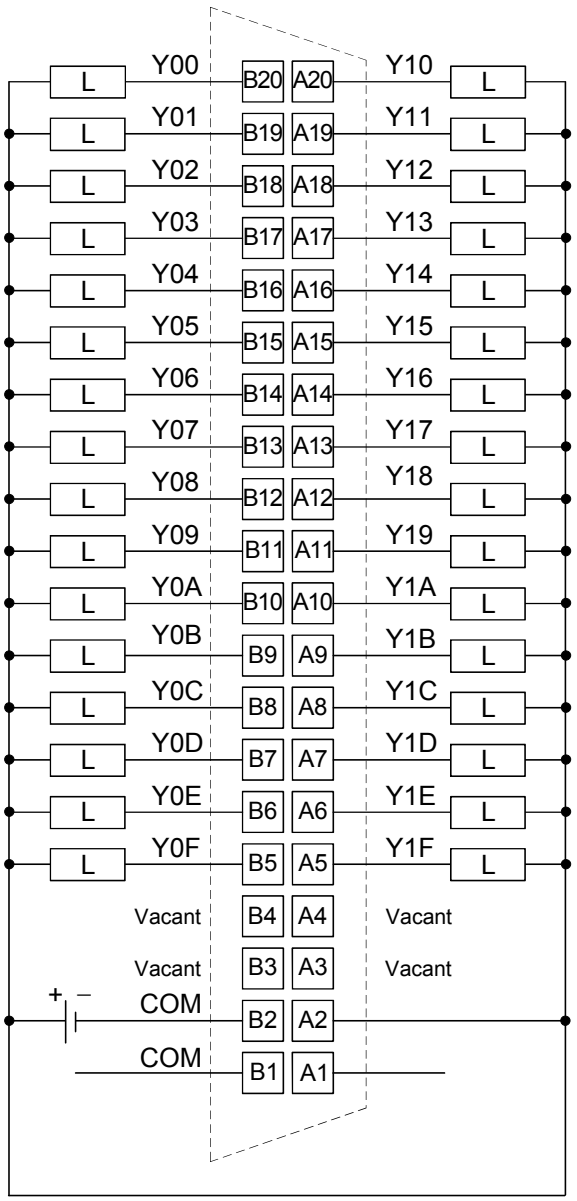
(16)

Model	Rated Load Voltage
A1SY81	12/24 VDC
A1SY81EP	



- 17 and 18 and 36 , and 19 and 37 are connected internally.

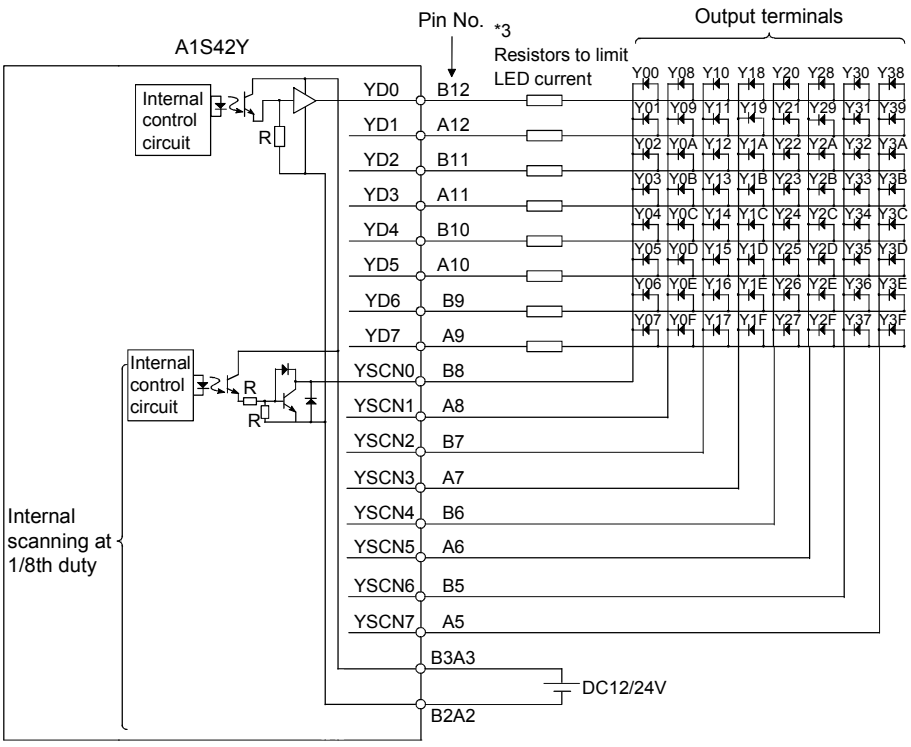
(17)	Model	Rated Load Voltage
	A1SY82	12/24 VDC



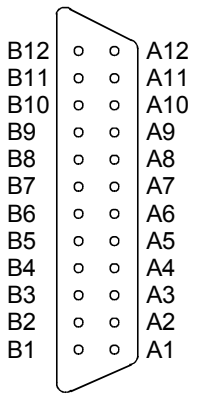
*1 The figure above indicates [F] (the first half 32 points).
The connections for [L] (the latter half 32 points) are the same as for [F] (regard Y00 to Y1F as Y20 to Y3F.)
[B1] and [B2] , and [A1] and [A2] , are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

(18)	Model	Rated Load Voltage
	A1S42Y	12/24 VDC



Pin Arrangement



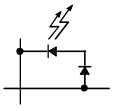
Seen from front face of the module

Pin No.	Signal Name (F_H)	Pin No.	Signal Name (F_H)
B12	YD0	A12	YD1
B11	YD2	A11	YD3
B10	YD4	A10	YD5
B9	YD6	A9	YD7
B8	YSCN0	A8	YSCN1
B7	YSCN2	A7	YSCN3
B6	YSCN4	A6	YSCN5
B5	YSCN6	A5	YSCN7
B4	Vacant	A4	Vacant
B3	12/24 VDC	A3	12/24 VDC
B2	0V	A2	0V
B1	Vacant	A1	Vacant

*1 The fuse in the output module is provided to prevent the external wiring from burning in the event of a short circuit in the module's output. Consequently, it may not be able to protect output devices.
If an output device is damaged in a failure mode other than a short circuit, the fuse might not be blown.

*2 The "ERR." LED will alxo come ON when the external power supply is cut.

*3 Mount the resistors to limit LED current externally to the A1S42Y.



*4 The power supply voltage (12/24VDC) is applied in the LED's reverse direction.
If the peak inverse voltage is insufficient, connect protective diodes in series with each of the LEDs.

MEMO

5.3 Input/output combined modules

5.3.1 Input/output combined module specifications

Model	Type	No. of Points	Rated Input Voltage	Input Current	Operating Voltage	
					ON Voltage	OFF Voltage
A1SH42	DC Input (sink type)	32	12/24VDC	2/5mA	8VDC or higher	4VDC or lower
A1SH42-S1			24VDC	5mA	15VDC or higher	3VDC or lower
A1SX48Y18		8	24VDC	7mA	14VDC or higher	6.5VDC or lower
A1SX48Y58						

Model	Type	No. of Points	Rated Load Voltage	Max. Load Current		Max. Output Response Time	
				1 Point	Common	OFF to ON	ON to OFF
A1SH42	Transistor Output (sink type)	32	12/24VDC	0.1A	1.6A	2ms or lower	2ms or lower
A1SH42-S1							
A1SX48Y18	Relay Output	8	24VDC 240VAC	2A	8A	10ms or lower	12ms or lower
A1SX48Y58	Transistor Output (sink type)		12/24VDC	0.5A	2A	2ms or lower	2ms or lower

For all modules, the insulation system is photocoupler insulation and the operation status is provided by LED indications.

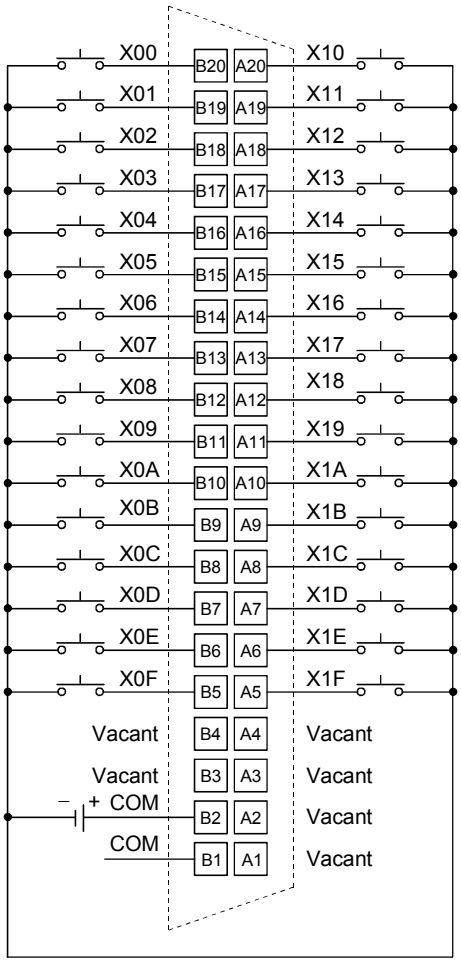
	Max. Simultaneous Input Points (Percentage Simultaneously ON)	Max. Response Time		No. of Occupied Points
		OFF to ON	ON to OFF	
	60%(24VDC)	10ms or lower	10ms or lower	32
		0.3ms or lower	0.3ms or lower	20
	100%(26.4VDC)	10ms or lower	10ms or lower	8

	Points/ Common	Field Wiring	Surge Suppression	Fuse Rating	External Power Supply (TYP 24VDC)	External Current Consumption (5VDC)	No. of Occupied Points
					Current		
	32	40-pin Connector	Zener diode	3.2A	0.008A	0.5A	32
	8	Terminal	None	None	0.045A	0.085A	16
			Zener diode	3.2A	0.06A	0.06A	

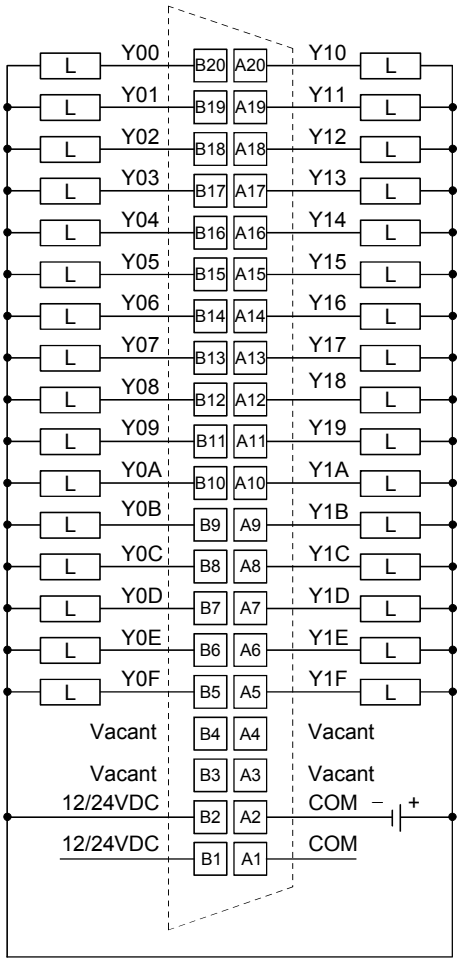
5.3.2 Input/output composite module connections

(1)

Model	Rated Input Voltage	Rated Load Voltage
A1SH42	12/24 VDC	12/24 VDC
A1SH42-S1	24 VDC	12/24 VDC



F (Input side)



L (Output side)

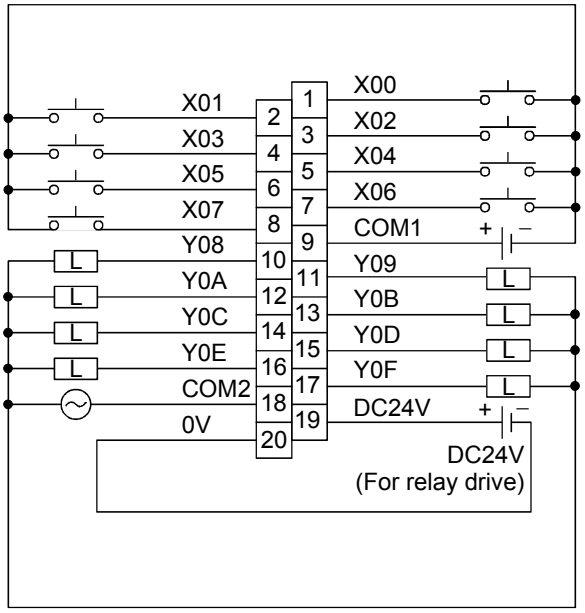
*1 B1 and B2 are connected internally.

*3 B1 and B2 , and A1 and A2 , are connected internally.

*2 The A and B pin number rows shown above are transposed with respect to the diagram of the A and B rows which is printed on the module. Remember that the A row pin numbers correspond to the B row of the module.

(2)

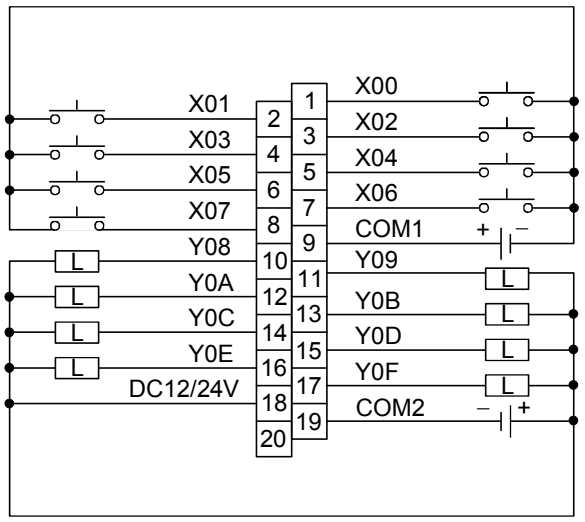
Model	Rated Input Voltage	Rated Load Voltage
A1SX48Y18	24 VDC	24 VDC/ 240 VAC



⚠DANGER ● Do not touch terminal while the power is supplied.

(3)

Model	Rated Input Voltage	Rated Load Voltage
A1SX48Y58	24 VDC	12/24 VDC



MEMO

When an error occurs while in the PLC RUN or RUN state, the self-diagnostic function stores an error indication or error code (including step number) in the special register. This section describes how to read the error code, as well as causes of errors and corrective actions. Table 6.1 shows the error codes for A1SCPUC24-R2, Table 6.2 the error codes and detailed error codes for A1SHCPU and A2SHCPU (S1), and Table 6.3 the error codes and detailed error codes for A2ASCPU(S1/S30) and A2USHCPU-S1, respectively. Take proper action to eliminate the cause of error.

6.1 Error Code List for A1SCPUC24-R2

Table 6.1 Error Code List for A1SCPUC24-R2

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 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"CAN'T EXECUTE(P)" (Checked at the execution of instruction)	13	Stop	(1)There is no jump destination or multiple destinations specified by the CJ, SCJ, CALL, CALLP, or JMP instruction. (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.)

Table 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"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.
"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.

Table 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"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.

Table 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"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.
"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.

Table 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"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 6.1 Error Code List for A1SCPUC24-R2 (Continue)

Error Message	Error Code (D9008)	CPU States	Error and Cause	Corrective Action
"SP. UNIT ERROR" (Checked at the execution of FROM and TO instructions)	46	Stop or Continue (set by parameter)	Access (execution of FROM to TO instruction) has been made to a location where there is not special function unit.	Read the error step by use of peripheral equipment, and check and correct the content of FROM or TO instruction at that step.
"LINK PARA. ERROR"	47	Continue	(1)If a data link CPU is used to set a master station (station number "00") : The contents written to the parameter area of link by setting the link range in the parameter setting of peripheral devices are different from the link parameter contents for some reason. Or, link parameters are not written. (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.

6.2 Error Code List for A1SHCPU and A2SHCPU(S1)

The error codes, error messages, detailed error codes and corrective actions for A1SHCPU and A2SHCPU(S1) are described.
CC-Link is the abbreviation for Control & Communication Link.
It will be referred to as CC-Link in this section.
The detailed error codes are stored in D9092 only when using the dedicated instruction for CC-Link.

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"INSTRCT. CODE ERR"	10	—	Stop	Instruction code, which cannot be decoded by CPU module, is included in the program. (1)Memory cassette including instruction code, 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 peripheral equipment and correct the program at that step. (2)In the case of memory cassette, rewrite the contents or replace the cassette with a memory cassette which stores correct contents.
		101		Instruction code, which cannot be decoded by CPU module, is included in the program. (1)Memory cassette including instruction code, 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 peripheral equipment and correct the program at that step. (2)In the case of memory cassette, rewrite the contents or replace the cassette with a memory cassette which stores correct contents.
		103		Device specified by a dedicated instruction for CC-Link is not correct.	Read the error step using a peripheral device and correct the program of the step.
		104		A dedicated instruction for CC-Link has incorrect program structure.	
		105		A dedicated instruction for CC-Link has incorrect command name.	

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"PARAMETER ERROR"	11	—	Stop	The contents of parameters of CPU memory have changed due to noise or the improper loading of memory.	(1)Load the memory cassette correctly. (2)Read the parameter contents of CPU memory, check and correct the contents, and write them to CPU again.
"MISSING END INS."	12	—	Stop	There is no END (FEND) instruction in the program.	Write END instruction at the end of program.
"CAN'T EXECUTE (P)"	13	—	Stop	(1)There is no jump destination or multiple destinations specified by the CJ, SCJ, CALL, CALLP, or JMP instruction. (2)Although there is no CALL instruction, the RET instruction exists in the program and has been executed. (3)The CJ, SCJ, CALL, CALLP, or JMP instruction has been executed with its jump destination located below the END instruction. (4)The number of the FOR instructions is different from that of the NEXT instructions. (5)A JMP instruction is given within a FOR to NEXT loop causing the processing to exit the loop. (6)Processing exited subroutine by the JMP instruction before execution of the RET instruction. (7)Processing jumped into a step in a FOR to NEXT loop or into a subroutine by the JMP instruction.	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.)

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR"	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)The device number of X in the CHK instruction circuit block exceeds X7FE. (5)There is no CJ P□ circuit block before the CHK instruction circuit block. (6)The device number of D1 of the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction. (7)Pointer P254 is not given to the head of the CHK instruction circuit block. P254 CHK D1 D2	(1)Check the program in the CHK instruction circuit block according to item (1) to (7) in the left column. Correct problem using the peripheral equipment and perform operation again. (2)This error code is only effective when the input/ output control method is a direct method.
"CAN'T EXECUTE (I)"	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 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"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"	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"	21	—	Stop	The operation circuit, which performs the sequence processing in the CPU, does not operate properly.	
"WDT ERROR"	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.

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"END NOT EXECUTE"	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.	Reset and run the CPU module again. If the same error is displayed again, it is the CPU hardware error, consult Mitsubishi representative.
"WDT ERROR"	25	—	Stop	The CJ instruction or the like causes a loop in execution of the sequence program to disable execution of the END instruction.	Check the program for an endless loop and correct.
"UNIT VERIFY ERR."	31	—	Stop or Continue (set by parameter)	I/O module data are different from those at power-on. (1)The I/O module (including the special function module) is incorrectly loaded or has been removed, or a different unit has been loaded.	(1)The bit in special registers D9116 to D9123 corresponding to the module causing the verification error is “1.” Use a peripheral device to monitor the registers to locate the “1” bit, and check or replace the corresponding module. (2)To accept the current module arrangement, operate the RUN/STOP key switch to reset.
"FUSE BREAK OFF"	32	—	Stop or Continue (set by parameter)	(1)The fuse is blown in some output modules. (2)The external power supply for the output load is turned off or it is disconnected.	(1)Check the ERR LED of the output module. Replace the module with the lit LED. (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 ON/OFF of the external power supply for the output load.

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"CONTROL-BUS ERR."	40	—	Stop	The FROM and TO instructions cannot be executed. (1)Error of control bus with special function module.	The hardware of the special function module, CPU module or base unit is faulty. Replace the faulty module and check the faulty module. Consult Mitsubishi representative.
"SP. UNIT DOWN"	41	—	Stop	There is no reply from the special function module during execution of the FROM or TO instruction. (1)The special function module being accessed is faulty.	The hardware of the special function module being accessed is faulty. Consult Mitsubishi representative.
"I/O INT. ERROR"	43	—	Stop	Interrupt occurs though no interrupt module is installed.	The hardware of a module is faulty. Replace the module and check the faulty module. Consult Mitsubishi representative.
"SP. UNIT LAY. ERROR."	44	—	Stop	(1)Three or more computer link modules are installed for a single CPU module. (2)Two or more MELSECNET (II), MELSECNET /B or MELSECNET /10 data link modules are installed. (3)Two or more interrupt modules are installed. (4)A special function module is installed to a slot assigned to the I/O module with parameter setup of the peripheral device, or vice versa. (5)The I/O module or special function module is installed outside the following I/O number ranges, or GOT is connected to the bus. A1SH, A1SJHCPU: X0 to XFF A2SHCPU(S1): X0 to X1FF	(1)Reduce the number of computer link modules to within two. (2)Reduce the number of MELSECNET (II), MELSECNET /B and MELSECNET /10 data link modules to one. (3)Reduce the number of interrupt modules to one. (4)Using the peripheral device, correct the parameter I/O assignment according to the actual state of installation of the special function modules. (5)Examine the I/O number and remove the modules and GOT installed outside the range specified on the left.

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"SP. UNIT ERROR"	46	—	Stop or Continue (set by parameter)	(1)Access (execution of FROM or TO instruction) has been made to a location where no special function module is installed.	(1)Use the peripheral device to read and correct the FROM and/or TO instruction at the error step.
		462		(1)There is inconsistency in the module name between the special instruction for CC-Link and I/O assignment of the parameter. (2)The location designated by the special instruction for CC-Link is not the master module.	(1)Correct the module name of I/O assignment of the parameter to that of the special instruction for CC-Link. (2)Use the peripheral device to check and correct the special instruction for CC-Link at the error step.
"LINK PARA. ERROR"	47	—	Continue	(1)There is inconsistency for some reason between the data, which is written by the peripheral device in the parameter area of the link under link range designation using parameter setup, and the link parameter data read by the CPU module. (2)The total number of stations is set at "0."	(1)Write parameters and check again. (2)If the error persists, there is a fault in hardware. Consult Mitsubishi representative.

Table 6.2 Error Code List for A1SHCPU and A2SHCPU(S1) (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9092)	CPU States	Error and Cause	Corrective Action
"OPERATION ERROR"	50	—	Stop or Continue (set by parameter)	(1)The result of BCD conversion exceeds the rated range ("9999" or "99999999"). (2)There is a setting exceeding the rated device range, disabling execution of calculation. (3)The file register is used on the program without designation of the capacity of the file register.	Use the peripheral device to read and correct the error step in the program. (Check the setting range of the device, BCD conversion value and so on.)
		503		The data stored by the designated device or a constant exceeds the allowable range.	Use the peripheral device to read and correct the error step in the program.
		504		The setting quantity of handled data exceeds the allowable range.	
		509		The number of special instructions for CC-Link executed in each scan exceeds 64.	Reduce the special instructions for CC-Link executed in each scan to within 64.
				A special instruction for CC-Link is executed to a CC-Link module to which no parameter is defined.	Define parameters.
"MAIN CPU DOWN"	60	—	Stop	(1)The CPU walfunctioned due to noise. (2)Hardware failure.	(1)Take proper countermeasures for noise. (2)Consult Mitsubishi representative.
"BATTERY ERROR"	70	—	Continue	(1)The battery voltage is low. (2)The battery lead connector is not connected.	(1)Replace the battery. (2)Connect the lead connector to use the built-in RAM memory or power failure compensation function.

6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1

Error codes are generated as follows:

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1

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

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

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

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"MISSING END INS" (Checked at STOP → RUN.)	12	121	STOP	The END END (FEND) instruction is not given in the main program.	Write the END instruction at the end of the main program.
		122		The END (FEND) instruction is not given in the sub program if the sub program is set by parameters.	Write the END instruction at the end of the sub program.
		123		(1)When subprogram 2 is set by a parameter, there is no END (FEND) instruction in subprogram 2. (2)When subprogram 2 is set by a parameter, subprogram 2 has not been written from a peripheral device.	
		124		(1)When subprogram 3 is set by a parameter, there is no END (FEND) instruction in subprogram 3. (2)When subprogram 3 is set by a parameter, subprogram 2 has not been written from a peripheral device.	

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

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

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/ PAUSE → RUN.)	14	141	STOP	Instructions (including NOP) other than LDX, LDIX, ANDX and ANIX are included in the CHK instruction circuit block.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
		142		Multiple CHK instructions are given.	
		143		The number of contact points in the CHK instruction circuit block exceeds 150.	
		144		The LEDA CHK instructions are not paired with the LEDA CHKEND instructions, or 2 or more pairs of them are given.	
		145		Format of the block shown below, which is provided before the CHK instruction circuit block, is not as specified. P254 CJ P□	
		146		Device number of D1 in the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.	
		147		Index qualification is used in the check pattern circuit.	

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/ PAUSE → RUN.)	14	148	STOP	(1)Multiple check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are given. (2)There are 7 or more check condition circuits in the LEDA CHK - LEDA CHKEND instructions. (3)The check condition circuits in the LEDA CHK - LEDA CHKEND instructions are written without using X and Y contact instructions or compare instructions. (4)The check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are written with 257 or more steps.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
"CAN'T EXECUTE (I)" (Checked at occurrence of interrupt.)	15	151	STOP	The IRET instruction was given outside of the interrupt program and was executed.	Read the error step using a peripheral device and delete the IRET instruction.
		152		There is no IRET instruction in the interrupt program.	Check the interrupt program if the IRET instruction is given in it. Write the IRET instruction if it is not given.
		153		Though an interrupt module is used, no interrupt pointer (I) which corresponds to the module is given in the program. Upon occurrence of error, the problem pointer (I) number is stored at D9011.	Monitor special register D9011 using a peripheral device, and check if the interrupt program that corresponds to the stored data is provided or if two or more interrupt pointers (I) of the same number are given. Make necessary corrections.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CASSETTE ERROR"	16	—	STOP	Memory cassette is not loaded.	Turn off the PC power and load the memory cassette.
"RAM ERROR" (Checked at power on.)	20	201	STOP	The sequence program storage RAM in the CPU module caused an error.	Since this is CPU hardware error, consult Mitsubishi representative.
		202		The work area RAM in the CPU module caused an error.	
		203		The device memory in the CPU module caused an error.	
		204		The address RAM in the CPU module caused an error.	
"OPE CIRCUIT ERROR" (Checked at power on.)	21	211	STOP	The operation circuit for index qualification in the CPU does not work correctly.	Since this is CPU hardware error, consult Mitsubishi representative.
		212		Hardware (logic) in the CPU does not operate correctly.	
		213		The operation circuit for sequential processing in the CPU does not operate correctly.	
"OPE. CIRCUIT ERR." (Checked at execution of the END instruction)		214		In the END processing check, the operation circuit for index qualification in the CPU does not work correctly.	
		215		In the END processing check, the hardware in the CPU does not operate correctly.	
"WDT ERROR" (Checked at execution of END processing.)	22	—	STOP	Scan time is longer than the WDT time. (1)Scan time of the user's program has been extended due to certain conditions. (2)Scan time has been extended due to momentary power failure occurred during scanning.	(1)Calculate and check the scan time of user program and reduce the scan time using the CJ instruction or the like. (2)Monitor contents of special register D9005 using a peripheral device. If the contents are other than 0, power supply voltage may not be stable. Check power supply and reduce variation in voltage.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"END NOT EXECUTE" (Checked at execution of the END instruction.)	24	241	STOP	Whole program of specified program capacity was executed without executing the END instructions. (1)When the END instruction was to be executed, the instruction was read as other instruction code due to noise. (2)The END instruction changed to other instruction code due to unknown cause.	(1)Reset and run the CPU again. If the same error recurs, Since this is CPU hardware error, consult Mitsubishi representative.
"MAIN CPU DOWN"	26	—	STOP	The main CPU is malfunctioning or faulty.	Since this is CPU hardware error, consult Mitsubishi representative
"UNIT VERIFY ERR" (Checked continuously.)	31	—	Stop or Continue (set by parameter)	Current I/O module information is different from that recognized when the power was turned on. (1)The I/O module (including special function modules) connection became loose or the module was disconnected during operation, or wrong module was connected.	Read detailed error code using a peripheral device and check or replace the module which corresponds to the data (I/O head number). Or, monitor special registers D9116 to D9123 using a peripheral device and check or replace the modules if corresponding data bit is "1".
"FUSE BREAK OFF" (Checked continuously.)	32	—	Stop or Continue (set by parameter)	(1)There is an output module of which fuse is blown. (2)The external power supply for output load is turned OFF or is not connected.	(1)Check the FUSE BLOWN indicator LED on the output module and replace the fuse. (2)Read detailed error code using a peripheral device and replace the fuse of the output module which corresponds to the data (I/O head number). Or, monitor special registers D9100 to D9107 using a peripheral device and replace the fuse of the output module of which corresponding data bit is "1". (3)Check the ON/OFF status of the external power supply for output load.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CONTROL-BUS ERR"	40	401	STOP	Due to the error of the control bus which connects to special function modules, the FROM/TO instruction cannot be executed.	Since it is a hardware error of special function module, CPU module or base module, replace and check defective module(s). Consult Mitsubishi representative for defective modules.
		402		If parameter I/O assignment is being executed, special function modules are not accessible at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"SP.UNIT DOWN"	41	411	STOP	Though an access was made to a special function module at execution of the FROM/TO instruction no response is received.	Since it is hardware error of the special function module to which an access was made, consult Mitsubishi representative.
		412		If parameter I/O assignment is being executed, no response is received from a special function module at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"LINK UNIT ERROR"	42	—	STOP	(1)Either data link module is loaded to the master station. (2)There are 2 link modules which are set to the master station (station 0).	(1)Remove data link module from the master station. (2)Reduce the number of master stations to 1. Reduce the link modules to 1 when the 3-tier system is not used.
"I/O INT. ERROR"	43	—	STOP	Though the interrupt module is not loaded, an interrupt occurred.	Since it is hardware error of a module, replace and check a defective module. For defective modules, consult Mitsubishi representative.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

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

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"SP.UNIT LAY.ERR."	44	448*	STOP	(1)Five or more network modules have been installed. (2)A total of five or more of network modules and data link modules have been installed.	Make the total of the installed network modules and data link modules four or less.
"SP.UNIT ERROR" (Checked at execution of the FROM/TO instruction or the dedicated instructions for special function modules.)	46	461	Stop or Continue (set by parameter)	Module specified by the FROM/TO instruction is not a special function module.	Read the error step using a peripheral device and check and correct contents of the FROM/TO instruction of the step.
		462		(1)Module specified by the dedicated instruction for special function module is not a special function module or not a corresponding special function module. (2)A command was issued to a CC-Link module with function version under B. (3)A CC-Link dedicated command was issued to a CC-Link module for which the network parameters have not been set.	(1)Read the error step using a peripheral device and check and correct contents of the dedicated instruction for special function modules of the step. (2)Replace with a CC-Link module having function version B and above. (3)Set the parameters.
"LINK PARA. ERROR"	47	0	Continue	[When using MELSECNET/(II)] (1)When the link range at a data link CPU which is also a master station (station number = 00) is set by parameter setting at a peripheral device, for some reason the data written to the link parameter area differs from the link parameter data read by the CPU. Alternatively, no link parameters have been written. (2)The total number of slave stations is set at 0. (3)The head I/O number of the network parameters is incorrect.	(1)Write the parameters again and check. (2)Check the station number settings. (3)Check the head I/O number of the network parameters. (4)Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"LINK PARA. ERROR"	47	470*	Continue	[When using MELSECNET/10] (1)The contents of the network refresh parameters written from a peripheral device differ from the actual system at the base unit. (2)The network refresh parameters have not been written. (3)The head I/O number of the network parameters is incorrect.	Write the network refresh parameters again and check.
		471*		[When using MELSECNET/10] (1)The transfer source device range and transfer destination device range specified for the inter-network transfer parameters are in the same network. (2)The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters spans two or more networks. (3)The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters is not used by the network.	Write the network parameters again and check.
		472*		[When using MELSECNET/10] The contents of the routing parameters written from a peripheral device differ from the actual network system.	Write the routing parameters again and check.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"LINK PARA. ERROR"	47	473*	Continue	[When using MELSECNET/10] (1)The contents of the network parameters for the first link unit, written from a peripheral device, differ from the actual network system. (2)The link parameters for the first link unit have not been written. (3)The setting for the total number of stations is 0.	(1)Write the parameters again and check. (2)Check the station number settings. (3)Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		474*		[When using MELSECNET/10] (1)The contents of the network parameters for the second link unit, written from a peripheral device, differ from the actual network system. (2)The link parameters for the second link unit have not been written. (3)The setting for the total number of stations is 0.	(1)Write the parameters again and check. (2)Check the station number settings. (3)Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		475*		[When using MELSECNET/10] (1)The contents of the network parameters for the third link unit, written from a peripheral device, differ from the actual network system. (2)The link parameters for the third link unit have not been written. (3)The setting for the total number of stations is 0.	

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"LINK PARA. ERROR	47	476*	Continue	[When using MELSECNET/10] (1)The contents of the network parameters for the fourth link unit, written from a peripheral device, differ from the actual network system. (2)The link parameters for the fourth link unit have not been written. (3)The setting for the total number of stations is 0.	(1)Write the parameters again and check. (2)Check the station number settings. (3)Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		477		A ink parameter error was detected by the CC-Link module.	(1)Write the parameters in again and check. (2)If the error appears again, there is a problem with the hardware. Consult your nearest System Service, sales office or branch office.
"OPERATION ERROR" (Checked at execution of instruction.)	50	501	Stop or Continue (set by para-meter)	(1)When file registers (R) are used, operation is executed outside of specified ranges of device numbers and block numbers of file registers (R). (2)File registers are used in the program without setting capacity of file registers.	Read the error step using a peripheral device and check and correct program of the step.
		502		Combination of the devices specified by instruction is incorrect.	
		503		Stored data or constant of specified device is not in the usable range.	
		504		Set number of data to be handled is out of the usable range.	

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"OPERATION ERROR" (Checked at execution of instruction.)	50	505	Stop or Continue (set by parameter)	(1)Station number specified by the LEDA/BLRDP LEDA/BLWTP, LRDP, LWTP instructions is not a local station. (2)Head I/O number specified by the LEDA/BRFRP LEDA/BRTOP, RFRP, RTOP instructions is not of a remote station.	Read the error step using a peripheral device and check and correct program of the step.
		506		Head I/O number specified by the LEDA/BRFRP LEDA/BRTOP, RFRP, RTOP instructions is not of a special function module.	
		507		(1)When the AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed to either of them. (2)When an AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed in divided mode to another AD57(S1) or AD58.	Read the error step using a peripheral device and provide interlock with special relay M9066 or modify program structure so that, when the AD57(S1) or AD58 is executing instructions in divided processing mode, other instructions may not be executed to either of them or to another AD57(S1) or AD58 in divided mode.
		508		A CC-Link dedicated command was issued to three or more CC-Link modules.	The CC-Link dedicated command can be issued only to two or less CC-Link modules.

Table 6.3 Error Code List for A2ASCPU(S1/S30) and A2USHCPU-S1 (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	
"OPERATION ERROR" (Checked at execution of instruction.)	50	509	STOP	(1)An instruction which cannot be executed by remote terminal modules connected to the MNET/MINI-S3 was executed to the modules. (2)Though there are 32 entries of FROM or TO instructions registered with a PRC instruction in the mailbox memory area waiting for execution), another PRC instruction is executed to cause an overflow in the mail box (memory area waiting for execution). (3)The PIDCONT instruction was executed without executing the PIDINIT instruction. The PID57 instruction was executed without executing the PIDINIT or PIDCONT instruction. The program presently executed was specified by the ZCHG instruction. (4)The number of CC-Link dedicated command executed in one scan exceeded 10.	(1)Read the error step using a peripheral device and correct the program, meeting loaded conditions of remote terminal modules. (2)Use special register D9081 (number of empty entries in mailbox) or special relay M9081 (BUSY signal of mail box) to suppress registration or execution of the PRC instruction. (3)Correct the program specified by the ZCHG instruction to other. (4)Set the number of CC-Link dedicated commands executed in one scan to 10 or less.
"MAIN CPU DOWN"	60	—	STOP	(1)The CPU malfunctioned due to noise. (2)Hardware failure.	(1)Take proper countermeasures for noise. (2)Since this is hardware error, consult Mitsubishi representative.
		602		(1)Failure in the power module, CPU module, main base unit or expansion cable is detected.	(1)Replace the power module, CPU module, main base unit or expansion cable.
"BATTERY ERROR" (Checked at power on.)	70	—	Continue	(1)Battery voltage has lowered below specified level. (2)Battery lead connector is not connected.	(1)Replace battery. (2)If a RAM memory or power failure compensation function is used, connect the lead connector.

Appendix 1 CPU-by-CPU Startup Names

CPU	Startup Name	CPU Name to Be Selected If the CPU Name Given on the Left Is Not Found (Priority of selection : 1 → 2 → 3)
A1SHCPU	A1SH	A3
A2SHCPU(S1)	A2SH	A3
A1SCPUC24-R2	A1S	1 2 A0J2H → A2
A2ASCPU (S1)	A2US	1 2 3 A2U → A2A → A3H
A2ASCPU-S30	A2US	1 2 3 A3U → A3A → A3H

Appendix 2 Transportation Precautions

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

Appendix 2.1 Relevant Models

The battery for A1SHCPU, A2SHCPU(S1), A1SCPUC24-R2, A2ASCPU(S1), A2ASCPU-S30 and A2USHCPU-S1 is classified as follows:

Product Name	Model	Description	Handled as
A series battery	A6BAT	Lithium battery	Non-dangerous goods

Appendix 2.2 Transportation Guidelines

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

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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