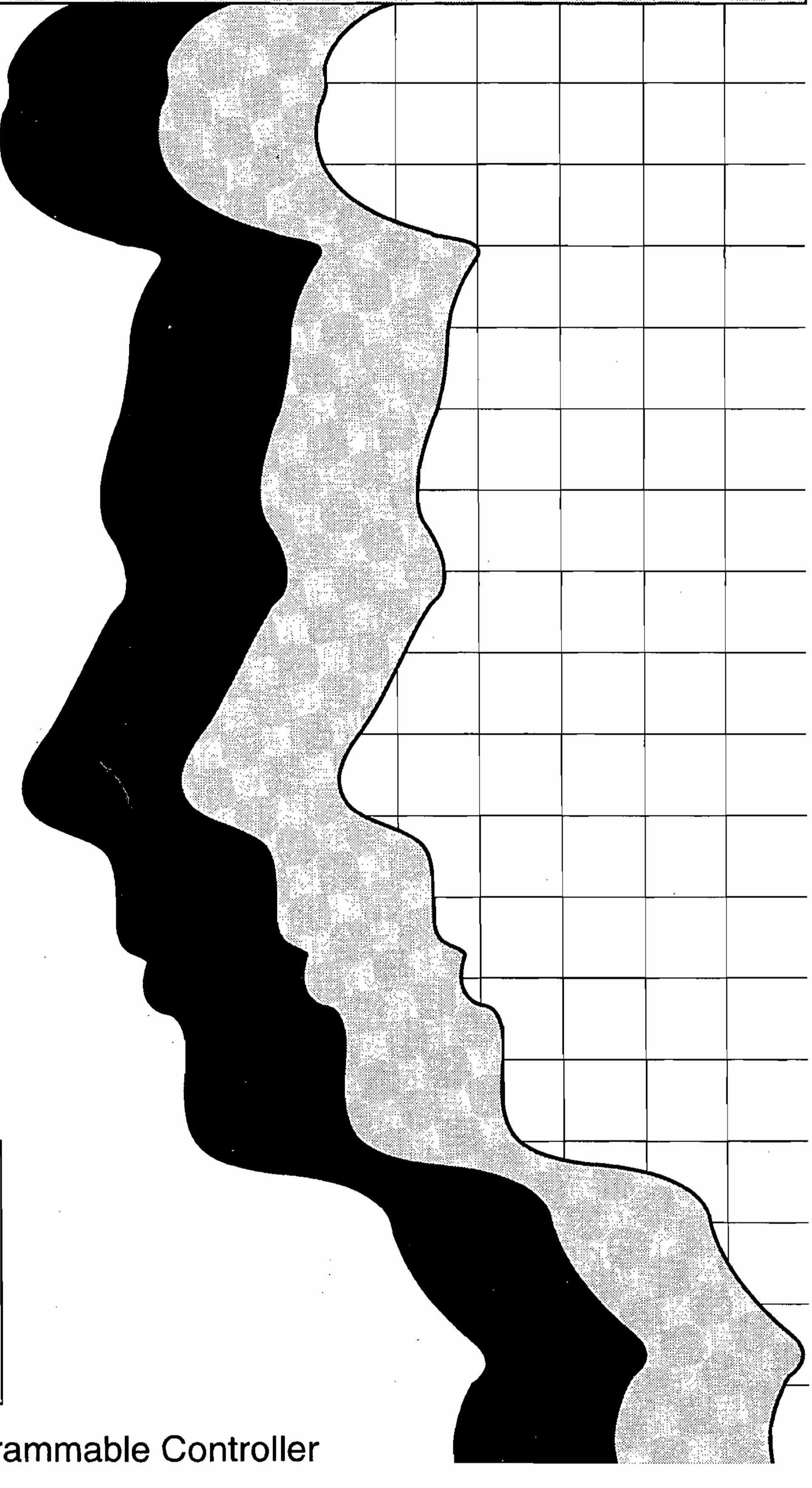
MITSUBISHI

type A1SJCPU(S3)

User's Manual



A

MELSEC

Mitsubishi Programmable Controller

REVISIONS

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

Print Date	*Manual Number	Revision
Nov.,1993	IB (NA) 66446-A	First edition
Jan.,1996	IB (NA) 66446-B	Completely revised
Jan.,1997	IB (NA) 66446-C	Addition of models A1SX41-S1, AISX42-S1, A1S65B-S1, A1S68B-S1, A1S52B-S1, A1S55B-S1, A1S58B Correction CONTENTS, SAFETY CAUTIONS, Section 10.4.2 Addition Sections 1, 2.2, 4.4.4, 5, 6, 8, 8.1, 8.2, 8.3, 8.4, 10

SAFETY CAUTIONS

(You must read these cautions before using the product)

In connection with the use of this product, in addition to carefully reading both this manual and the related manuals indicated in this manual, it is also essential to pay due attention to safety and handle the product correctly.
The safety cautions given here apply to this product in isolation. For information on the safety of the PC system as a whole, refer to the CPU module User's Manual.
These **SAFETY CAUTIONS** are classified into two grades: "DANGER" and "CAUTION".

◇ **DANGER**	Safety caution given when incorrect handling could result in hazardous situations involving the possibility of death or serious injury.
⚠ **CAUTION**	Safety caution given when incorrect handling could result in hazardous situations involving the possibility of moderate or light injury or damage to property.

Note that, depending on the circumstances, failing to follow a ⚠ **CAUTION** may also have very serious consequences.
Both of these classes of safety caution are very important and must be observed.
Store this manual carefully in a place where it is accessible for reference whenever necessary, and forward a copy of the manual to the end user.

[System Design Precautions]

DANGER

- Safety circuits should be installed external to the programmable controller to ensure that the system as a whole will continue to operate safely in the event of an external power supply malfunction or a programmable controller failure. Erroneous outputs and operation could result in an accident.
  1) The following circuitry should be installed outside the programmable controller:
     Interlock circuitry for the emergency stop circuit protective circuit, and for reciprocal operations such as forward/reverse, etc., and interlock circuitry for upper/lower positioning limits, etc., to prevent machine damage.
  2) When the programmable controller detects an abnormal condition, processing is stopped and all outputs are switched OFF. This happens in the following cases:
     - When the power supply module's over-current or over-voltage protection device is activated.
     - When an error (watchdog timer error, etc.) is detected at the PC CPU by the self-diagnosis function.

     Some errors, such as input/output control errors, cannot be detected by the PC CPU, and there may be cases when all outputs are turned ON when such errors occur. In order to ensure that the machine operates safely in such cases, a failsafe circuit or mechanism should be provided outside the programmable controller. Refer to the CPU module user's manual for an example of such a failsafe circuit.
  3) Outputs may become stuck at ON or OFF due to an output module relay or transistor failure. An external circuit should therefore be provided to monitor output signals whose incorrect operation could cause serious accidents.

- A circuit should be installed which permits the external power supply to be switched ON only after the programmable controller power has been switched ON. Accidents caused by erroneous outputs and motion could result if the external power supply is switched ON first.

- When a data link communication error occurs, the status shown below will be established at the faulty station. In order to ensure that the system operates safely at such times, an interlock circuit should be provided in the sequence program (using the communication status information).
  Erroneous outputs and operation could result in an accident.
  1) The data link data which existed prior to the error will be held.
  2) All outputs will be switched OFF at MELSECNET (II, /B, /10) remote I/O stations.
  3) At the MELSECNET/MINI-S3 remote I/O stations, all outputs will be switched OFF or output statuses will be held, depending on the E.C. mode setting.

  For details on procedures for checking faulty stations, and for operation statuses when such errors occur, refer to the appropriate data link manual.

[System Design Precautions]

⚠ CAUTION

- Do not bundle control lines or communication wires together with main circuit or power lines, or lay them close to these lines.
  As a guide, separate the lines by a distance of at least 100 mm, otherwise malfunctions may occur due to noise.

[Cautions on Mounting]

⚠ CAUTION

- Use the PC in an environment that conforms to the general specifications in the manual.
  Using the PC in environments outside the ranges stated in the general specifications will cause electric shock, fire, malfunction, or damage to/deterioration of the product.
- Insert the tabs at the bottom of the module into the holes in the base unit, and correctly tighten the module fixing screws with specified torque.
  Improper installation may acuse erroneous operation, accidents, or the module to fall out.
- Extension cables should be securely connected to base unit and module connectors. Check for loose connection after installation.
  A poor connection could result in contact problems and erroneous inputs/outputs.
- Plug the memory cassette firmly into the memory card mounting connector. Check for loose connection after installation.
  A poor connection could result in erroneous operation.
- Do not directly touch the module's conductive parts or electronic components.
  Doing so could cause malfunction or trouble in the module.

[Cautions on Wiring]

DANGER

- Switch off the external power supply before staring installation and wiring work.
  Failure to do so could result in electrical shocks and equipment damage.
- After installation and wiring is completed, be sure to attach the terminal cover before switching the power ON and starting operation.
  Failure to do so could result in electrical shocks.

CAUTION

- Be sure to ground the FG and LG terminals, carrying out at least class 3 grounding work with a ground exclusive to the PC.
  Otherwise there will be a danger of electric shock and malfunctions.
- Carry out wiring to the PC correctly, checking the rated voltage and terminal arrangement of the product.
  Using a power supply that does not conform to the rated voltage, or carrying out wiring incorrectly, will cause fire or failure.
- Outputs from multiple power supply modules should not be connected in parallel. Failure to do so could cause the power supply module to overheat, resulting in a fire or module failure.
- Tighten the terminal screws to the stipulated torque.
  Loose screws will cause short circuits, fire, or malfunctions.
- Make sure that no foreign matter such as chips or wiring offcuts gets inside the module.
  It will cause fire, failure or malfunction.
- Connectors for external connections should be crimped, pressure welded, or soldered in the correct manner using the correct tools.
  For details regarding crimping and pressure welding tools, refer to the input/output module user's manual.
  A poor connection could cause shorts, fire, and erroneous operation.

[Cautions on Startup and Maintenance]

DANGER

- Do not touch terminals while the power is ON.
  This will cause malfunctions.
- Make sure that the battery is connected properly. Do not attempt to charge or disassemble the battery, do not heat the battery or place it in a flame, and do not short or solder the battery.
  Incorrect handling of the battery can cause battery heat generation and ruptures which could result in fire or injury.
- Switch the power off before cleaning or re-tightening terminal screws.
  Carrying out this work while the power is ON will cause failure or malfunction of the module.

CAUTION

- In order to ensure safe operation, read the manual carefully to acquaint yourself with procedures for program changes, forced outputs, RUN, STOP, and PAUSE operations, etc., while operation is in progress.
  Incorrect operation could result in machine failure and injury.
- Do not disassemble or modify any module.
  This will cause failure, malfunction, injuries, or fire.
- Switch the power OFF before mounting or removing the module.
  Mounting or removing it with the power ON can cause failure or malfunction of the module.
- When replacing fuses, be sure to use the prescribed fuse. A fuse of the wrong capacity could cause a fire.

[Cautions on Disposal]

CAUTION

- Dispose of this product as industrial waste.

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the product is used to its optimum. A copy of this manual should be forwarded to the end user.

This manual describes specifications and requirements related to safety, installations, wiring and maintenance of the AnS series PC. For functional information, please refer to detail manuals of each module.

Guidelines for the safety of the user and protection of the AnS series PC

This manual provides information for the installation and use of the AnS series PC. The manual has been written to be used by trained and competent personnel. Please read the manual carefully before installation and/or operations of the product. If the product is used in a manner not specified by the manual, the protection provided by the product may be impaired.

Note: Definition of 'trained and competent personnel' is as follows:

a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, (trained and qualified to the local and national standards required to fulfill that role). These engineers should be fully aware of all aspects of safety with regards to automated equipment.

b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.

c) All operators of the completed product should be trained to use that product in a safe and co-ordinated manner in compliance to established safety practices. The operators should also be familiar with all documentation which is connected with the actual operation of the completed equipment.

Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

Note's on the symbols used in this manual

At variouse times through out this manual, certain symbols are used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of the equipment. Whenever any of the following symbols are encountered, its associated note must be read and understood. Each of the symbols used are listed with a brief description of its meaning.

◇! DANGER	Indicates that the identified danger possibly cause serious physical injury and/or death.
⚠ CAUTION	Indicates that the idetified danger possibly cause physical injury or property damage.

Notification of CE marking

The following products have shown compliance through direct testing (to the identified standards) and design analysis (forming a technical construction file) to the European Directive for Electromagnetic Compatibility (89/336/EEC)

Products:	Type:	Programmable Logic Controller (Open Type equipment, Installation category II)
	Model:	AnS-Series (Applicable units listed below)

Harmonised European Standards		**IEC Standards**	
Reference No.	Date of Issue	Reference No.	Date of Issue
EN50081-2	1992	IEC801-2	1984
prEN50082-2	1992	IEC801-3	1984
		IEC801-4	1988

AnS-Series Programmable Logic Controllers
Range of products:

Models					
A1S32B	A1S65B	A1SI61	A1SX10EU	A1SY18A	A2USCPU
A1S33B	A1S65B-S1	A1SJ51T64	A1SX20EU	A1SY18AEU	A2USCPU-S1
A1S35B	A1S68AD	A1SJ71AP21	A1SX30	A1SY22	A2USCPU-S30
A1S38B	A1S68B	A1SJ71AP21-S3	A1SX40	A1SY28A	A64DAIC
A1S52B	A1S68B-S1	A1SJ71AR21	A1SX40-S1	A1SY28EU	A64DAVC
A1S52B-S1	A1S68DAI	A1SJ71AT21B	A1SX40-S2	A1SY40	A68ADC
A1S55B	A1S68DAV	A1SJ71E71-B2	A1SX41	A1SY41	AD61C
A1S55B-S1	A1S68TD	A1SJ71E71-B5	A1SX41-S2	A1SY42	AJ55TB2-4R
A1S58B	A1SCPU	A1SJ71LP21	A1SX42	A1SY50	AJ55TB2-8R
A1S58B-S1	A1SCPU-S1	A1SJ71PT32-S3	A1SX42-S2	A1SY60E	AJ55TB3-4D
A1S61P	A1SD51S	A1SJ71C24-PRF	A1SX71	A1SY68A	AJ55TB3-8D
A1S61PEU	A1SD61	A1SJ71C24-R2	A1SX80	A1SY71	AJ55TB32-4DR
A1S62DA	A1SD70	A1SJ71C24-R4	A1SX80-S1	A1SY80	AJ55TB32-8DR
A1S62P	A1SD71-S2	A1SJ71UC24-PRF	A1SX80-S2	A1SY81	AX40Y50C
A1S62PEU	A1SD71-S7	A1SJ71UC24-R2	A1SX80-S2	A1SY81	AX80Y14CEU
A1S62RD3	A1SD75-P1	A1SJ71UC24-R4	A1SX81	A2ASCPU	AX80Y80C
A1S62RD4	A1SD75-P2	A1SJ72T25B	A1SX81-S2	A2ASCPU-S1	AX81C
A1S63ADA	A1SD75-P3	A1SJCPU-S3	A1SY10	A2ASCPU-S30	AY15CEU
A1S63P	A1SG62	A1SP60	A1SY10EU	A2SCPU	AY51C
A1S64AD	A1SH42	A1ST60	A1SY14EU	A2SCPU-S1	AY81C

The products listed above must be used as directed by the associated documentation in order to provide full compliance. Please contact your local Mitsubishi Sales office or distributor for further details.

CONTENTS

1. GENERAL DESCRIPTION

1.1 General Description

This manual describes the specifications and functions of the A1SJCPU, A1SJCPU-S3 programmable controller (hereinafter referred to as the A1SJCPU) and the specifications of the I/O modules, power supply modules, and extension base units used with the A1SJCPU.
The A1SJCPU has a compact building-block type body in which a CPU module, power supply module, and a base unit are built together to form one solid structure. It is characterized by high cost performance.
Since its performance and functions are equal to those of the A1SCPU, the sequence programs (instructions), I/O modules, and special function modules compatible with the A1SCPU are compatible also with the A1SJCPU.
Slim type I/O combination modules (input 32 points, output 24 points) for use exclusively with the A1SJCPU are also available. The three sizes when the slim type is used with the A1SJCPU are 330 mm (W) x 130 mm (H) x 82 mm (D) (13.0 inch x 5.12 inch x 3.23 inch).
This user's manual refers to the peripheral devices (A6GPP, A6PHP, A6HGP, IBM PC/AT, A7PU, A7PUS, and A8PUE) as abbreviated as mentioned below.

A6GPP, A6PHP, A6HGP, and IBM PC/AT
(started up with SW□IVD-GPPA, MELSEC-MEDOC)
.... Abbreviated as "GPP function".
A7PU, A7PUS, and A8PUE.............. Abbreviated as "PU".

<Reference manuals>

Refer to the following manuals if necessary:

- ACPU Programming Manual (Fundamentals) (IB 66249)
  Information such as programming procedures, device names, parameters, classification of programs, and memory area allocation which are necessary for programming are described.
- ACPU Programming Manual (Common Instructions) (IB66250)
  The methods of use of sequence instructions, basic instructions, application instructions, and microcomputer programs are described.
- AnS Module type I/O User's Mannual (IB66541)
  The specifications of compact building block type I/O modules are described.

1.2 Differences Between A1SJCPU and A1SJCPU-S3

The differences between A1SJCPU and A1SJCPU-S3 are indicated in the table below.

Table of Difference

	Differences	A1SJCPU	A1SJCPU-S3
1	Operating switches	RESET is a pushbutton switch. RUN, STOP, and L.CLR are toggle switches.	RESET, RUN, STOP and L.CLR are incorporated in a single key switch.
1	Front cover	Opens the entire CPU module (power supply part and CPU part).	Opens only part of the CPU module (CPU part).

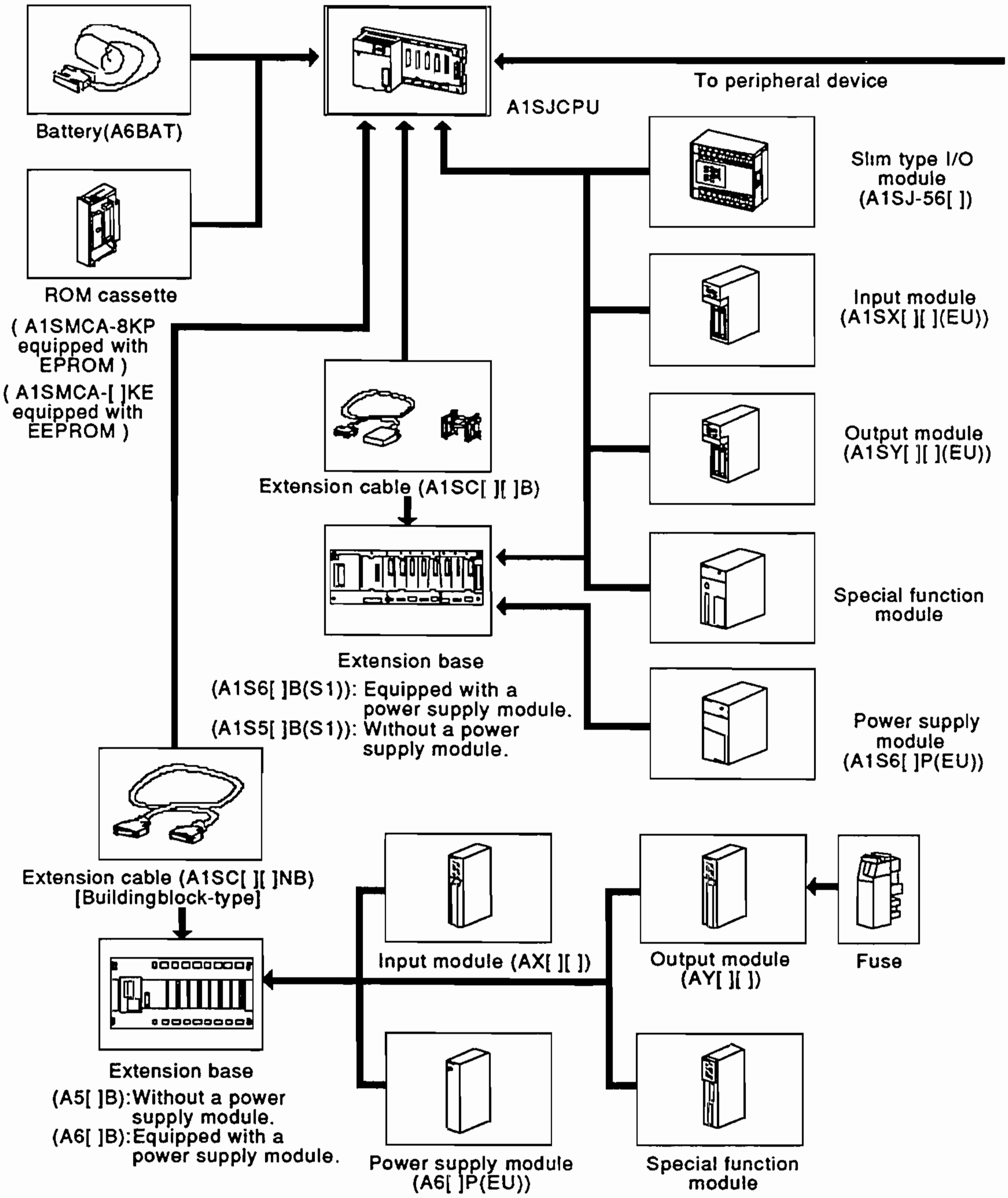
A1SJCPU and A1SJCPU-S3 have identical functions and performance.

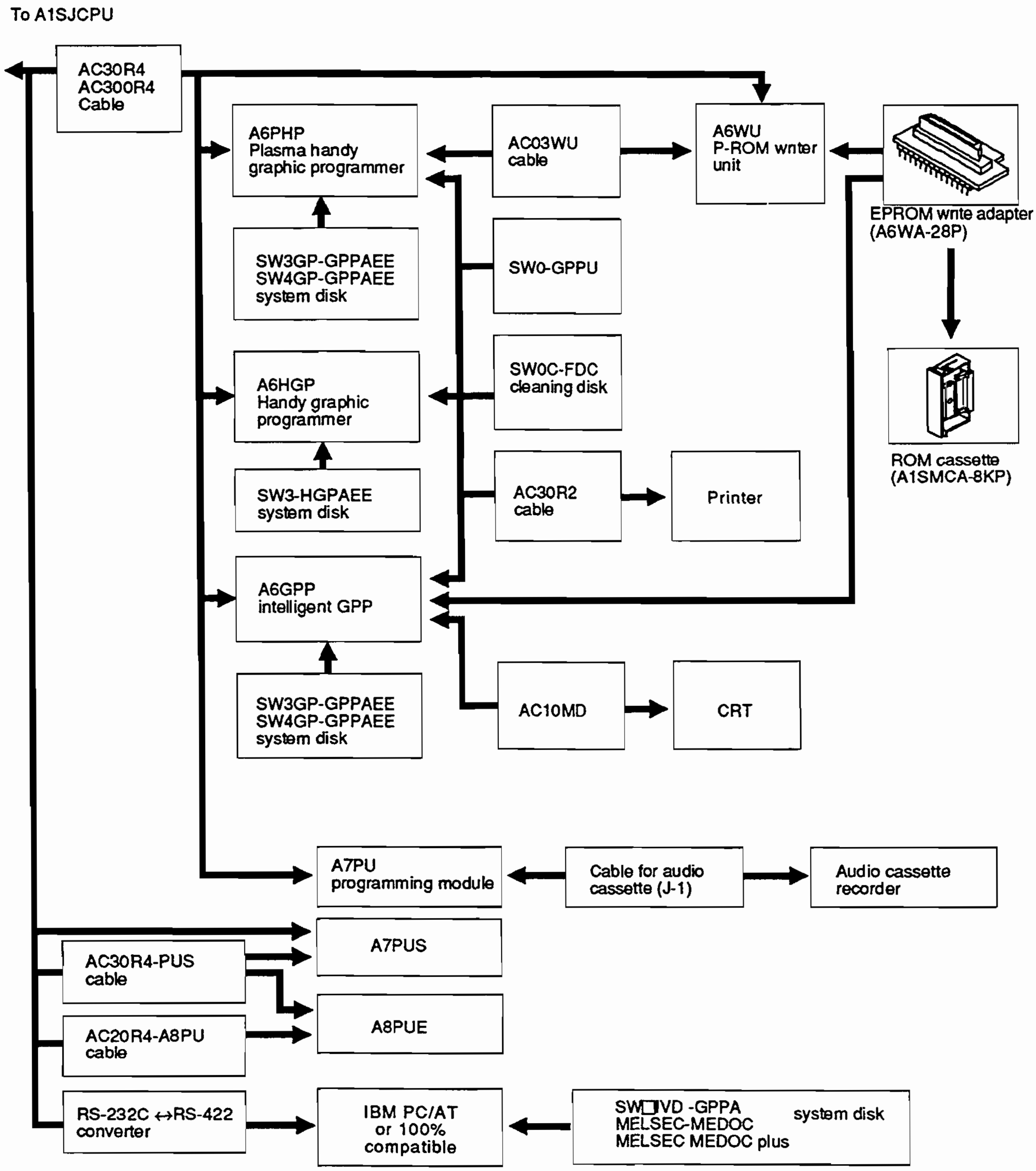
2. SYSTEM CONFIGURATION

This section describes the applicable system configuration, cautions on the system configuration, and component devices of the A1SJCPU.

2.1 Overall Configuration

The following figure shows a configuration when the A1SJCPU is used independently.





(See the SW□VD-GPPA manual,
the MELSEC MEDOC manual or the
MELSEC MEDOC plus manual.)

2.2 Cautions on System Configurations

The following describes the hardware and software that can be used with the A1SJCPU.

2.2.1 Hardware

(1) I/O module

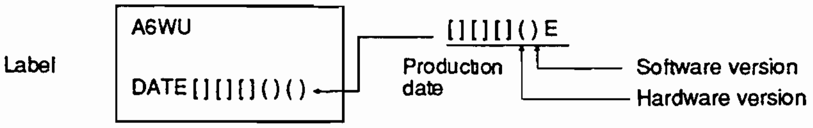
An A[ ]N or A[ ]A building type I/O module can be used by loading the module to the A5[ ]B/A6[ ]B extension base.

(2) Special function module

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

(b) The following special function modules can be used up to the number of modules specified herein.

AD51 (S3) AD51FD AJ71C22 AJ71C24 (S3/S6/S8) AJ71P41	AD51H (S3) AD57G (S3) AJ71UC24 AJ71E71(S3)	Up to two modules can be used
A1SJ71E71(S3) A1SJ71UC24-R2 (PRF/R4)		
AI61 (S1)		Only one module can be used.
A1SI61		
AJ71AP21 AJ71LP21 AJ71AT21B	AJ71AR21 AJ71BR11	Only one module can be used.
A1SJ71AP21 A1SJ71LP21 A1SJ71T21B	A1SJ71AR21 A1SJ71BR11	



(3) Peripheral device

(a) Use an A6WU P-ROM writer of which the version is "E" or after.

(b) The A6WU P-ROM writer unit cannot be directly installed (add-on type) to the A1SJCPU.
It can be connected as a hand-held unit to the A1SJCPU with a cable.

(c) Only the A7PUS programming unit (among A7PU, A7PUS, and A8PUE) can be directly installed (add-on type) to the A1SJCPU. Other types of units (A7PU and A8PUE) are connected as hand-held units to the A1SJCPU with a cable.

(4) EPROM memory cassette ROM partition

Partitioning the ROM in the A1SMCA-8KP EPROM with an A6GPP (SW4GP-GPPAEE)/A6WU requires an A6WA-28P memory write adapter (option).

(5) Write at RUN when an operation is done with EEPROM (equipped with A1SMCA-2KE/A1SMCA-8KE).

(a) When an operation is done using the EEPROM, writing at RUN gives to the peripheral devices the following messages:

- When the SW3GP-GPPA is used: "PC COMMUNICATIONS ERROR ERROR CODE = 17" is displayed;
- When the A7PU is used: "PC NOT RESPOND" is displayed.

(b) It is not possible to write a program from a computer link module or a peripheral device connected to another station in a MELSECNET system.
Write programs from a peripheral device connected to the RS-422 interface of the A1SJCPU.

(c) When writing a program to an A1SMCA-2KE, set the main sequence program capacity in the parameters to 2K steps or less.
If you attempt to write a program with the main sequence program capacity set to 3K steps or greater, the program will not run correctly. Mismatches will also occur in verification between the A1SJCPU and a peripheral device.

2.2.2 Software packages

(1) System startup software and module name specification at startup

When using any of the software packages for programming or monitoring on-line, "A2", "A1S" or "A0J2H" should be set for the PC type selection. If the EPROM write facility is required, then this should be carried out off-line and either "A0J2H" or "A1S" should be selected as the PC type if the software package has these selections. In the event that the software package does not have any of these two selections, then the EPROM write facility is not available. Please refer to the table below as a reference guide to the software packages available and the correct PC type selection for the A1SJCPU.

Peripheral device	Software package	CPU Type		Remarks
		On-line	Off-line	
A6PHP	SW3GP-GPPAEE	A2	—	EPROM write not possible.
	SW4GP-GPPAEE	A0J2H	A0J2H/A1S	Set "A1S" when software of version "R" or later.
A6GPP	SW3-GPPAEE	A2	—	EPROM write not possible.
	SW3GP-GPPAEE			
	SW4GP-GPPAEE	A0J2H	A0J2H/A1S	Set "A1S" when software of version "R" or later.
A6HGP	SW3-HGPAEE	A2	—	EPROM write not possible.
IBM PC/AT	SW0IX-GPPAE	A1S	A0J2H/A1S	
	MEDOC	A2	—	EPROM wite not possible.
	MELSEC-MEDOC	A1S	—	
A6WU		A1S	—	• "A1S" is displayed when the system is started up. (Software version "E" or later) Cannot be used. (Software version "D" or before.) • An add-on (direct) installment is not possible.
A7PU		A2	—	• "A2" is displayed when the system is started up. (Software version "E" or before) Cannot be used. (Software version "F" or later) • An add-on (direct) installment is not possible.
A7PUS, A8PUE		A1S	—	"A1S" is displayed the system is started up.

POINTS

(1) When an A6GPP, A6HGP, or A6PHP is used, use an SW3-GPPAEE, SW3-HGPAEE, SW3GP-GPPAEE, or SW4GP-GPPAEE as the system startup software.
Other old software packages cannot be applied.

(2) Specifying the PC CPU name using the above-mentioned devices allows more than 256 I/O signals input from the keyboard.
However, those signals cannot be used in the A1SJCPU.

(2) Utility package

Applicable utility packages are shown below.

- SW0GHP-UTLPC-FN1
- SW0GHP-UTLP-FD1
- SW1GP-AD57P
- SW0GHP-UTLPC-PID
- SW0GHP-UTLPC-FN0
- SW0-AD57P
- SWOC-UTLP-FID
- SWOC-UTLP-FNO

(a) Select "A2CPU" when an SW0GHP-UTLPC-FN1 or SW0GHP-UTLP-FD1 is started up.

(b) If both an SW1GP-AD57P and another utility package combined are used, specify "AD57P-COM" as the file name.

2.3 System Equipment

The following table shows the system equipment consisting of various modules and devices which can be used.

Module	Model	Description		Number of Inputs/ Outputs	Current Consumption		Remarks	* Approved Standard
					5 VDC(A)	24 VDC(A)		
CPU module	A1SJCPU A1SJCPU -S3	See the "Performance Specifications" in Section 4 (Number of I/O points : 256, memory capacity : 32 Kbytes)		—	0.40	—	RAM memory embedded	
Power supply module	A1S61P	5 VDC, 5 A	Input 100/200 VAC	—	—	—	Loaded to the slot for power supply for main base or extension base	UL/CSA
	A1S61PEU		Input 200 VAC					
	A1S62P	5 VDC, 3 A/24 VDC, 0.6A	Input 100/200 VAC					UL/CSA
	A1S62PEU		Input 200 VAC					
	A1S63P	5 VDC, 5 A	Input 24 VDC					
Input module	A1SX10	16-input 100 VAC input module		16 [16 inputs]	0.05	—		UL/CSA
	A1SX10EU	16-input 100 VAC input module		16 [16 inputs]	0.05	—		
	A1SX20	16-input 200 VAC input module		16 [16 inputs]	0.05	—		
	A1SX20EU	16-input 200 VAC input module		16 [16 inputs]	0.05	—		
	A1SX30	16-input 12/24 VDC, 12/24 VAC input module		16 [16 inputs]	0.05	—		
	A1SX40	16-input 12/24 VDC input module		16 [16 inputs]	0.05	—		UL/CSA
	A1SX40-S1	16-input 24 VDC input module		16 [16 inputs]	0.05	—		
	A1SX40-S2	16-input 24 VDC input module		16 [16 inputs]	0.05	—		
	A1SX41	32-input 12/24 VDC input module		32 [32 inputs]	0.08	—		UL/CSA
	A1SX41-S1	32-input 24 VDC input module		32 [32 inputs]	0,12	—		
	A1SX41-S2	32-input 24 VDC input module		32 [32 inputs]	0.08	—		
	A1SX42	64-input 12/24 VDC input module		64 [64 inputs]	0.09	—		UL/CSA
	A1SX42-S1	64-input 24 VDC input module		64 [64 inputs]	0.16	—		
	A1SX42-S2	64-input 24 VDC input module		64 [64 inputs]	0.09	—		
	A1SX71	32-input 5/12 VDC input module		32 [32 inputs]	0.075	—		
	A1SX80	16-input 12/24 VDC sink/source input module		16 [16 inputs]	0.05	—		UL/CSA
	A1SX80-S1	16-input 24 VDC sink/source input module		16 [16 inputs]	0.05	—		
	A1SX80-S2	16-input 24 VDC input module		16 [16 inputs]	0.05	—		
	A1SX81	32-input 12/24 VDC sink/source input module		32 [32 inputs]	0.08	—		UL/CSA
	A1SX81-S2	32-input 24 VDC input module		32 [32 inputs]	0.08	—		

* : Class 2 power supply specified by the UL/CSA Standard must be used.

Module	Model	Description	Number of Inputs/ Outputs	Current Consumption		Remarks	* Approved Standard
				5 VDC(A)	24 VDC(A)		
Output module	A1SY10	16-output relay contact output module (2 A)	16 [16 outputs]	0.12	0.09		UL/CSA
	A1SY10EU	16-output relay contact output module (2 A)	16 [16 outputs]	0.12	0.09		
	A1SY14EU	12-point relay contact output module (2 A)	16 [16 outputs]	0.12	0.1		
	A1SY18A	8-point relay contact output module (2 A) All points independent	16 [16 outputs]	0.24	0.075		
	A1SY18 AEU	8-point relay contact output module (2 A) All points independent	16 [16 outputs]	0.24	0.75		
	A1SY22	16-output triac output module (0.6 A)	16 [16 outputs]	0.27	(200 VAC) 0.004		UL/CSA
	A1SY28A	8-point triac output module (1 A) All points independent	16 [16 outputs]	0.11	—		
	A1SY28EU	8-point triac output module (0.6 A)	16 [16 outputs]	0.27	—		
	A1SY40	16-output 12/24 VDC transistor output module (0.1 A) sink type	16 [16 outputs]	0.27	0.016		UL/CSA
	A1SY41	32-output 12/24 VDC transistor output module (0.1 A) sink type	32 [32 outputs]	0.50	0.016		
	A1SY42	64-output 12/24 VDC transistor output module (0 1 A) sink type	64 [64 outputs]	0.93	0.016		
	A1SY50	16-output 12/24 VDC transistor output module (0.5 A) sink type	16 [16 outputs]	0.12	0.12		
	A1SY60	16-output 24 VDC transistor output module (2 A) sink type	16 [16 outputs]	0.12	0.015		
	A1SY60E	16-output 12 VDC transistor output module (1 A) source type	16 [16 outputs]	0.20	0.01		
	A1SY68A	8-point 5/12/24/48 VDC transister output module sink/source typeAll points independent	16 [16 outputs]	0.13	—		
	A1SY71	32-output 5/12 VDC transistor output module (0 016 A) sink type	32 [32 outputs]	0.40	0.15		
	A1SY80	16-output 12/24 VDC transistor output module (0.8 A) source type	16 [16 outputs]	0.12	0.04		UL/CSA
	A1SY81	32-output 12/24 VDC transistor output module (0.1 A) source type	32 [32 outputs]	0 50	0.016		
Input/ output combination module	A1SH42	32-input 12/24 VDC input module 32-output 12/24 VDC transistor output module (0.1 A) sink type	32 [32 inputs/ outputs]	0.50	0.008		
	A1SX 48Y18	8-input 24 VDC input module (sink type) 8-output relay contact output module (2 A)	16 [8 inputs/ outputs]	0.085	0.045		
	A1SX 48Y58	8-input 24 VDC input module (sink type) 8-output 12/24 VDC transistor output module (0.5 A)	16 [8 inputs/ outputs]	0.06	0.06		
I/O combination module	A1SJ-56DR	32-point 24 VDC input (sink type)24-point 24 VDC/240 VAC relay contact output (2 A)	128 points [Slot 0: 64 outputs Slot 1 to slot 4: Vacant 16 points]	0.22	0.14		
	A1SJ-56DT	32-point 24 VDC input (sink type) 24-point 24 VDC transistor output (0.5 A) sink type		0.22	—		
Dynamic input module	A1S42X	16-, 32-, 48- and 64-point 12/24 VDC dynamic input module	Number of set points (Inputs [ ])	0.08	—		
Dynamic output module	A1S42Y	16-, 32-, 48-, and 64-point 12/24 VDC dynamic output module	Number of set points (Outputs [ ])	0.10	0.008		

* : Class 2 power supply specified by the UL/CSA Standard must be used.

Item	Model	Description		Number of Inputs/ Output	Current Consumption		Remarks	* Approved Standard
					5 VDC(A)	12 VDC(A)		
Blank cover	A1SG60	Keeps unused slots from dust		16 [empty]	—	—		UL/CSA
Dummy module	A1SG62	16-, 32-, 48-, and 64-input selectable module		Number of set points ([ ] inputs)	—	—		
40-pin connector	A6CON1	Soldered joint type	Sink type	—	—	—		UL/CSA
	A6CON1E		Source type					
	A6CON2	Solderless attachment type	Sink type					
	A6CON2E		Source type					
	A6CON3	Pressed joint type	Sink type					
	A6CON3E		Source type					
Positioning module	A1SD70	Analog output, 1 axis		48 (first half. vacant 16 points, second half special 32 points)	0.3	—		
	A1SD71-S2	Pulse output, 2 axes			0.8	—		
	A1SD71-S7	Pulse output, 2 axes (MPG can be used)			0.8	—		
MELSECNET/ MINI-S3 data link module	A1SJ71PT32-S3	Master module for fiber-optic/ twisted-wire pair cable		32/45 (special 32 points/special 48 points)	0.35	—	The number of occupying points in I/O exclusive mode: 32, in extension mode: 48	
Analog I/O module	A1S63ADA	Analog input. 2 channels Analog output: 1 channel		32 (speical 32 points)	0.8	—		
Pulse catch module	A1SP60	Pulse input module with short ON time (Pulse : min. 0.5 msec) 16-point inputs		16 [16 outputs]	0.055	—		
Analog timer module	A1ST60	For changing timer set values(0.1 to 1.0 sec, 1 to 10 sec, 10 to 60 sec, 60 to 600 sec) by using volume adjustment knobs. Analog timer 8 points		16 [16 outputs]	0.055	—		
Interruption module	A1SI61	Interruption module for interruption program execution designation (Input for interruption : 16 points)		32 [Special 32-point]	0.057	—		
High-speed counter module	A1SD61	32-bit signed binary 50 KBPS, 1 channel		32 [Special 32-point]	0.35	—		UL/CSA
A-D converter module	A1S64AD	4 to 20 mA / 0 to 10 V Analog 4 channels		32 [Special 32-point]	0.4	—		
Temperature-digital converter module	A1S62RD3	For connecting a Pt100 (3-lead type) Temperature input: 2 channels		32 [Special 32-point]	0.54	—		
	A1S62RD4	For connecting a Pt100 (4-lead type) Temperature input: 2 channels		32 [Special 32-point]	0.44	—		
D-A converter module	A1S62DA	4 to 20 mA / 0 to 10 V Analog output: 2 channels		32 [Special 32-point]	0.8	—		

* : Class 2 power supply specified by the UL/CSA Standard must be used.

Item	Model	Description	Number of Inputs/ Output	Current Consumption		Remarks	* Approved Standard
				5 VDC(A)	12 VDC(A)		
Computer link module	A1SJ71UC24-R2	Computer link function RS-232C: 1 channel	32 [Special 32-point]	0.1	—		UL/CSA
	A1SJ71UC24-PRF	Computer link and printer functions RS-232C: 1 channel	32 [Special 32-point]	0.1	—		
	A1SJ71UC24-R4	Computer link and multidrop link functions RS-422/485: 1 channel	32 [Special 32-point]	0.1	—		
MELSECNET (II) data link module	A1SJ71AP21	For master or local station of MELSECNET (II) optical data link	32 [Special 32-point]	0.5	—		
	A1SJ71AR21	For master or local station of MELSECNET (II) coaxial data link	32 [Special 32-point]	0.9	—		
MELSECNET /B data link module	A1SJ71T21B	For master or local station of MELSECNET/B data link system	32 [Special 32-point]	0.66	—		UL/CSA
MELSECNET /10 network module	A1SJ71LP21	For normal station of MELSECNET/10 Optical network	32 [Special 32-point]	0.65	—		
	A1SJ71BR11	For normal station of MELSECNET/10 coaxial network	32 [Special 32-point]	0.8	—		
Extension base unit	A1S52B(S1)	Up to two I/O modules can be loaded.	—	—	—	Power supply module cannot be loaded. (Power is supplied from the main base module.)	UL/CSA (except for S1 type)
	A1S55B(S1)	Up to five I/O modules can be loaded.	—	—	—		
	A1S58B(S1)	Up to eight I/O modules can be loaded.	—	—	—		
	A1S65B(S1)	Up to five I/O modules can be loaded.	—	—	—	Needs a power supply module.	
	A1S68B(S1)	Up to eight I/O modules can be loaded.	—	—	—		
Extension cable	A1SC01B	55 mm (2.17 inch) long flat cable	—	—	—	For extension on the right side	UL/CSA
	A1SC03B	330 mm (11.8 inch) long	—	—	—	Extension base unit connection cable	
	A1SC07B	700 mm (27.6 inch) long	—	—	—		
	A1SC12B	1200 mm (47.24 inch) long	—	—	—		UL/CSA
	A1SC30B	3000 mm (118.11 inch) long	—	—	—		
	A1SC60B	6000 mm (236.22 inch) long	—	—	—		
	A1SC05NB	450 mm (17.72 inch) long	—	—	—	A[ ]N, A[ ]A extension base cable	UL/CSA
	A1SC07NB	700 mm (27.6 inch) long					
Memory cassette EPROM	A1SMCA-8KP	8K steps equipped with ROM (directly)	—	—	—	Needs a memory write adapter.	UL/CSA
EEPROM	A1SMCA-2KE	2K steps equipped with 4K EROM (directly)	—	—	—	Direct write/read from peripheral devices can be done.	
	A1SMCA-8KE	8K steps equipped with 16K ROM (directly)	—	—	—		

* : Class 2 power supply specified by the UL/CSA Standard must be used.

Item	Model	Description	Number of Inputs/ Output	Current Consumption		Remarks	Approved Standard
				5 VDC(A)	12 VDC(A)		
Memory write adapter	A6WA-28P	Used for memory cassette connector/EPROM 28-pin.	—	—	—	Used to partition ROM in EPROM memory cassette.	UL/CSA
Battery	A6BAT	IC-RAM memory backup	—	—	—		

Item	Model	Description	Applicable Model
Connector/ terminal block conversion module	A6TBXY36	For sink type input module and sink type output module (standard type)	A1SX41(S2), A1SX42(S2), A1SY41, A1SY42, A1SH42
	A6TBXY54	For sink type input module and sink type output module (2-wire type)	AX42(S1), AY42(S1/S3/S4), AH42
	A6TBX70	For sink type input module (3-wire type)	A1SX41(S2), A1SX42(S2), A1SH42, AX42(S1), AH42
	A6TBX36-E	For source type input module (standard type)	A1SX81(S2), AX82
	A6TBY36-E	For source type output module (standard type)	A1SY81, AY82EP
	A6TBX54-E	For source type input module (2-wire type)	A1SX81(S2), AX82
	A6TBY54-E	For source type output module (2-wire type)	A1SY81, AY82EP
	A6TBX70-E	For source type input module (3-wire type)	A1S81(S2), AX82
Cable for connector/ terminal block conversion module	AC05TB	0.5 m (1.64 ft) for source module	A6TBXY36 A6TBXY54 A6TBX70
	AC10TB	1 m (3.28 ft) for source module	
	AC20TB	2 m (6.56 ft) for source moduel	
	AC30TB	3 m (9.84 ft) for source module	
	AC50TB	5 m (16.4 ft) for source module	
	AC05TB-E	0.5 m (1 64 ft) for source module	A6TBX36-E A6TBY36-E A6TBX54-E A6TBY54-E A6TBX70-E
	AC10TB-E	1 m (3.28 ft) for source module	
	AC20TB-E	2 m (6.56 ft) for source module	
	AC30TB-E	3 m (9.84 ft) for source module	
	AC50TB-E	5 m (16.4 ft) for source module	

REMARK

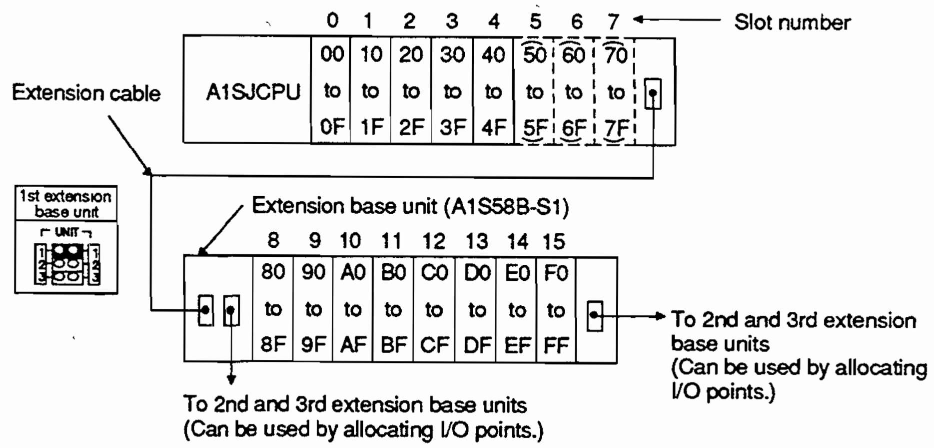
I/O cables with connectors for I/O modules of 40-pin connector specifications (A1SX41, A1SX42, A1SY41, A1SY42, etc.) or 37-pin D-sub connector specificaions (A1SX81, A1SY81) are available.
Consult the nearest Mitsubishi representative for the I/O cables with connectors.

- Peripheral devices

Item	Module	Remarks	
Plasma handy graphic programmer	A6PHP-SET	• A6PHP • SW[ ]GP-GPPAEE A-series GPP function system disk • SW[ ]GP-GPPKEE K-series GPP function system disk • SW0-GPPU User disk (2DD) • AC30R4 RS-422 cable (3 m (9.84 ft) length)	
Intelligent GPP	A6GPP-SET	• A6GPP • SW[ ]GP-GPPAEE A-series GPP function system disk • SW[ ]GP-GPPAEE K-series GPP function system disk • SW0-GPPU User disk (2DD) • AC30R4 RS-422 cable (3 m (9.84 ft) length)	
Handy graphic programmer	A6HGP-SET	• A6HGP • SW[ ]GP-HGPAEE. A-series GPP function system disk • SW[ ]GP-HGPKEE K-series GPP function system disk • SW0-GPPU User disk (2DD) • AC30R4 RS-422 cable (3 m (9.84 ft) length)	
Composite video cable	AC10MD	• Connects between A6GPP and monitor display (1 m (3.28 ft) length)	
RS-422 cable	AC30R4	3 m (9.84 ft) length	Connects between CPU and A6GPP/A6PHP
	AC300R4	30 m (98.4 ft) length	
User disk	SW0-GPPU	2DD	Used for storing user program (3.5 inch, formatted)
	SW0S-USER	2HD	
Cleaning disk	SW0-FDC	Applicable to A6GPP/A6PHP	Used for cleaning disk drive
Programming unit	A7PU	• Connected directly to the CPU with an RS-422 cable (AC30R4, AC300R4) to read and write a program. Provided with an MT function • The product package includes a cable used to connect to an audio cassette recorder	
	A7PUS	Connected directly to the CPU with an RS-422 cable (AC30R4-PUS) to read and wirte a program	
	A8PUE	Connected directly to the CPU with an RS-422 cable (AC30R4-PUS, AC20R4-A8PU) to read and wirte a program	
RS-422 cable	AC30R4 AC300R4	Used to connect the A7PU to the CPU. Length 3 m/30 m (9.84/98.4 ft)	
	AC30R4-PUS	Used to connect the A7PUS or A8PUE to the CPU Length 3 m (9.84 ft)	
	AC20R4-A8PU	Used to connect the A8PUE to the CPU. Length 2 m (6.56 ft)	
P-ROM writer module	A6WU	• Used for writing a program in CPU/A6PHP to ROM, or for reading a CPU program from ROM • Connected to CPU/A6PHP using an AC30R4/AC03WU cable	
RS-422 cable	AC30R4, AC300R4	Connects between CPU and A6WU. 3 m/30 m (9.84/98.4 ft) length	
	AC03WU	Connects between CPU and A6WU 0.3 m (0.98 ft) length	

2.4 Overview of System Configuration

This section describes the system configuration, numbers of I/O points, I/O allocations, etc., for a stand-alone A1SJCPU system.

System configuration	 * In this example, a 16-point module is installed at each slot.
Maximum number of extension base units	Three
Maximum number of I/O points	256
Usable extension base units	A1S52B(S1), A1S55B(S1), A1S58B(S1), A1S65B(S1), A1S68B(S1), A52B, A55B, A58B, A62B, A65B, A68B
Usable extension cables	A1SC03B, A1SC07B, A1SC12B, A1SC30B, A1SC60B, A1SC01B, AC06B, AC12B, AC30B, A1SC05NB, A1SC07NB
Restrictions	(1) If using a type of extension base unit for A1S use other than the S1 type, only one extension base unit can be installed. (Combined use of S1 type extension base units and extension base units other than the S1 type is not possible.) (2) When using one or more S1 type extension base units for A1S use in combination with one or more extension base units for A[ ]N or A[ ]A use, the final extension base unit must be one for A[ ]N or A[ ]A use. (An S1 type extension base for A1S use cannot be connected from an extension base for A[ ]N or A[ ]A use.) (3) Extension base units A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, A58B are supplied with a 5 VDC power supply from the power supply module on the main base unit; refer to Section 7.1.3 to determine whether or not these extension base units can be used. (4) The total length of extension cable used must not exceed 6 m.
Allocation of I/O numbers	(1) I/O numbers are allocated in the order of the numbers set in extension base number setting, regardless of the order of connection of extension cables. (2) When allocating I/O points, all main bases and extension bases are regarded as having 8 slots of I/O points. Accordingly, 16 points per slot are allocated to the part of the system configuration drawing indicated using dotted lines. (3) 16 points are allocated to vacant slots. (4) If extension base number setting has not been performed at one or more units, I/O points are allocated by regarding each slot in the total number of slots involved - obtained by multiplying the number of extension bases for which setting was skipped by 8 slots - as occupying 16 points per slot. (5) The allocations in (2) to (4) above can be changed by performing "I/O allocation". When using two or three extension base units, perform "I/O allocation" to allocate 0 points to vacant slots of the A1SJCPU and some slots of the first extension base unit, and allocate I/O points to the second and third extension base units. (The total number of I/O points for the A1SJCPU and 1st, 2nd, and 3rd extension base units is 256.) For details on "I/O allocation", refer to the ACPU Programming Manual (Fundamentals).

3. GENERAL SPECIFICATIONS

3.1 General Specifications

Table 3.1 General Specifications

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">–20 to 75°C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90%RH, no dewing</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, no dewing</td></tr>
<tr><td rowspan="8">Vibration resistance</td><td rowspan="8">Conforms to
* JIS B 3501,
IEC 1131-2</td><td colspan="4">For intermittent vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 57Hz</td><td>——</td><td>0.075mm (0.003 inch)</td><td rowspan="6">10 times each in X, Y and Z directions (80 minutes)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8 m/s^2 {1G}</td><td>——</td></tr>
<tr><td colspan="3">For continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>10 to 57Hz</td><td>——</td><td>0.035mm (0.001 inch)</td></tr>
<tr><td>57 to 150Hz</td><td>4.9 m/s^2{0.5G}</td><td>——</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Conforms to JIS B 3501, IEC 1131-2
(147 m/s^2 (15G) × 3 times in 3 directions)</td></tr>
<tr><td>Operating atomosphere</td><td colspan="5">To be free of corrosive gases</td></tr>
<tr><td>Altitude</td><td colspan="5">Up to 2,000 m</td></tr>
<tr><td>Insulation site</td><td colspan="5">Inside a control cabinet</td></tr>
<tr><td>Overvoltage category</td><td colspan="5">11 or lower</td></tr>
<tr><td>Degree of contamination</td><td colspan="5">No greater than 2</td></tr>
</table>

REMARK

* JIS: Japanese Industrial Standard

4. A1SJCPU

4.1 Performance Specifications

(1) Performance specifications of A1SJCPU unit

Table 4.1 Performance Specifications of A1SJCPU unit

Type Item		A1SJCPU	
Control system		Repeated operation (using stored program)	
I/O control method		Refresh mode/Direct mode selectable	
Programming language		Language dedicated to sequence control (Combined use of relay symbol type and logic symbolic language, MELSAP-II(SFC)	
Number of instructions	Sequence instructions	26	
	Basic instructions	131	
	Application instructions	104	
Processing speed (sequence instructtion) (μ sec/step)		Direct : 1.0 to 2.3 Refresh : 1.0	
I/O points		256	
Watchdog timer (WDT)(msec)		10 to 2000	
Memory capacity *1		32K byte (RAM)	
Program capacity		Main sequence program + main microcomputer program = 8K steps max. Internal microcomputer program can be set to 7K steps (14K bytes) max. (subsequence program not available).	
Internal relay (M) (point)		1000 (M0 to 999)	The number of M + L + S = 2048 (set in parameters)
Latch relay (L) (point)		1048 (L1000 to 2047)	
Number of step relays (S) (point)		0 (Defaults to no value)	
Link relay (B) (point)		1024 (B0 to 3FF)	
Timer (T)	Number of points	256	
	Specifications	100 msec timer : setting time 0.1 to 3276.7 sec (T0 to 199) 10 msec timer : setting timer 0.01 to 327.67 sec (T200 to 255) 100 msec retentive timer : depending on setting (setting time 0.1 to 3276.7 sec)	Set in parameters
Counter (C)	Number of points	256	
	Specifications	Normal counter : Setting range 1 to 32767 (C0 to 255) Interrupt program counter : Setting range 1 to 32767 → Counter to be used in interrupt program	Set in parameters
Data register (D) (points)		1024 (D0 to D1023)	
Link register (W) (points)		1024 (W0 to W3FF)	
Annunciator (F) (points)		256 (F0 to F255)	
File register (R) (points)		Max. 4096 (R0 to R4095)	
Accumulator (A) (points)		2 (A0, A1)	
Index register (V,Z) (points)		2 (V,Z)	
Pointer (P) (points)		256 (P0 to P255)	
Interrupt pointer (I) (points)		32 (I0 to I31)	
Special relay (M) (points)		256 (M9000 to M9255)	

Table 4.1 Performance Specifications of A1SJCPU unit (Continued)

<table>
<tr><th>Item / Type</th><th>A1SJCPU</th></tr>
<tr><td>Special register (D) (points)</td><td>256 (D9000 to D9255)</td></tr>
<tr><td>Comment (points) *2</td><td>Max. 1600 (Specify in batches of 64 points)</td></tr>
<tr><td>Self-diagnostic functions</td><td>Watchdog error monitor, Memory error detection, CPU error detection, I/O error detection, battery error detection, etc.</td></tr>
<tr><td>Operation mode at the time of error</td><td>STOP/CONTINUE</td></tr>
<tr><td>STOP → RUN output mode</td><td>Output data at time of STOP restored/data output after operation execution</td></tr>
<tr><td>Clock function</td><td>Year, Month, Date, Hour, Minutes, Seconds, Day
(Leap year automatically detected.)
Clock accuracy
<table>
<tr><th>Ambient Temperature (°C)</th><th>Accuracy (Weekly difference, sec)</th></tr>
<tr><td>+ 55</td><td>within ± 8</td></tr>
<tr><td>+ 25</td><td>within ± 15</td></tr>
<tr><td>0</td><td>within ± 7</td></tr>
</table></td></tr>
<tr><td>Allowable momentary power failure time</td><td>20 msec</td></tr>
<tr><td>Current consumption (5 VDC)</td><td>0.4 A</td></tr>
<tr><td>Weight (kg) (lb)</td><td>1.00 (2.19)</td></tr>
</table>

*1 The total memory used for parameters, T/C set values, program capacity, file registers, number of comments, sampling trace, and status latch is 32K bytes.
Memory capacity is fixed to 32 Kbytes. No expansion memory is available.
Section 4.9.1 gives how to calculate the memory capacity.

*2 Up to 1600 comments can be stored in the A1SJCPU. In the GPP/PHP/HGP, 4032 comments can be written.

(2) Performance specifications for the A1SJCPU built-in power supply.

Table 4.2 Performance Specifications for the A1SJCPU Built-In Power Supply

Type Item	A1SJCPU
Input power supply	100-120 VAC $\pm^{10}_{15}$ % (85 to 132 VAC) 200-240 VAC $\pm^{10}_{15}$ % (170 to 264 VAC)
Input frequency	50/60 Hz ± 3 Hz
Input maximum apparent power	100 VA
Rush current	20 A 8 msec or less
Rated output	5 VDC 3 A
Overcurrent protection *1	3.3 A or over
Overvoltage protection	Not provided
Efficiency	65 % or over
Power supply indication	POWER LED indicator
Terminal screw size	M3.5 X 8
Applicable cable size	0.3 to 2 mm^2
Applicable solderless terminal	1.25-3.5, V1.25-YS3A, 2-3.5, 2-YS3A, V1.25-M3, V2-YS3A, V2-S3, V2-YS3A
Allowable momentary power failure	20 msec or less (100 VAC or over)

POINT

*1: Overcurrent protection

When a current larger than the specification value flows through the 5 VDC circuit, the overcurrent protection device cuts off the circuit and stops the system.
The POWER LED turns off or lights dimly due to the voltage drop. If this device operated, remove causes of failures such as current capacity shortage and short-circuit and restart the system.

4.1.1 A1SJCPU operation processing

This section explains the operation processing which takes place from the time the A1SJCPU power ON until the sequence program is executed. A1SJCPU processing is generally divided into the following four types:

(1) Initial processing

This is the pre-processing for executing sequence operations. Initial processing is executed once at start up or reset.

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

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

(c) I/O module addresses are automatically assigned in accordance with the I/O module number and where the module is installed in the extension base unit.

(d) Automatic diagnostic check of parameter settings and operation circuits is executed (see Section 4.1.4).

(e) If the A1SJCPU is used in the master station of an MELSECNET/B, data linking begins after setting the link parameter data to the data link module.

(2) I/O module refresh processing

If the refresh mode for both input and output is set by the I/O control switch, the I/O module is refreshed. (The ACPU programming manual (Fundamentals) gives details.)

(3) Sequence program operation processing

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

(4) END processing

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

(a) Self-diagnosis checks for blown fuses, I/O module verification, low battery voltage, etc. are executed (see Section 4.1.4).

(b) T/C present values are updated and contacts are turned ON/OFF. (The ACPU Programming Manual (Fundamentals) gives details.)

(c) Data is read from computer link modules (A1SJ71C24-R2, AJ71C24(S3), AD51(S3), etc.) and PC CPU and computer link module data is replaced when the write instruction is executed.

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

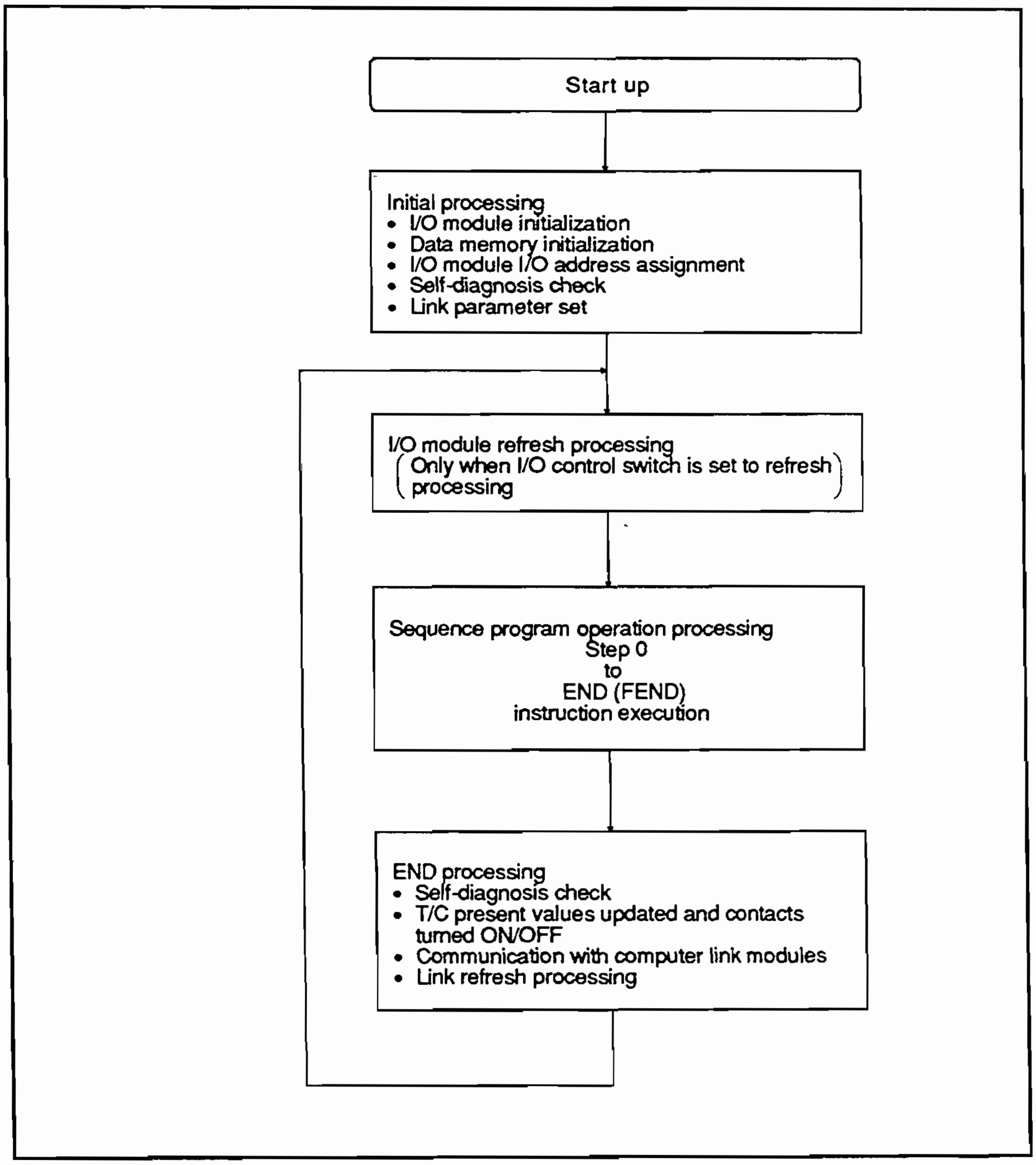


Fig. 4.1 A1SJCPU Operation Processing

4.1.2 Operation processing in the RUN, STOP, PAUSE states

The PC CPU can be operated in the RUN, STOP and PAUSE states as described below.

(1) RUN operation processing

RUN indicates repeated operations of the sequence program from step 0 to the END (FEND) instruction.

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

The PC CPU needs processing time before starting a sequence program operation. It requires two to three seconds after a power ON or reset, and one to three seconds after the mode is changed from STOP to RUN.

(2) STOP operation processing

STOP indicates a stop of the sequence program operation by executing a STOP instruction or using the remote STOP.

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

(3) PAUSE operation processing

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

POINT

The following processing is executed whether or not the A1SJCPU is in the RUN, STOP, or PAUSE state:
- Refresh processing of I/O module when the refresh mode is set,
- Data communications with computer link modules,
- Link refresh processing.

Therefore, the following operations are possible even when the A1SJCPU is set in the STOP or PAUSE state:
- Monitoring I/O status and testing using a peripheral device,
- Read/write with a computer link module, and
- Communications with other stations in the MELSECNET/B.

4.1.3 Operation processing when a momentary power failure occurs

When voltage below the specified range is supplied to the power supply module, the A1SJCPU detects a momentary power failure.

If the A1SJCPU detects a momentary power failure for 20 msec (the allowable momentary power failure period) of less, the following operations are executed:

(1) Momentary power failure within 20 msec

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

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

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

(2) Momentary power failure over 20 msec

The A1SJCPU will return to the initial start status. The necessary operations are the same as when the CPU power is turned ON or when the CPU is reset.

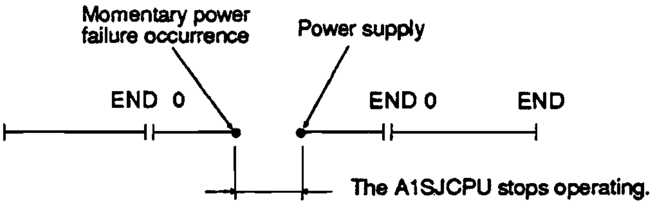


Fig. 4.2 Operation Processing When a Momentary Power Failure Occurs

4.1.4 Self-diagnosis

The self-diagnosis function permits the A1SJCPU to detect its own errors.

Self-diagnosis is carried out when the PC power supply is turned ON and if an error occurs while the PC is in the RUN state. If the A1SJCPU detects an error, it displays an error message and stops to prevent a faulty PC operation.

The A1SJCPU may operate in one of two modes when an error is detected by the self-diagnosis function. In the stop mode, the PC operation is stopped when the error is detected; in the continuous mode, the PC operation is continued. In the continuous mode, however, parameters can be set to cause the operation to stop if specified errors occur.

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

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

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

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

Explanations of the errors detected by the self-diagnosis function are given in Table 4.3.

REMARKS

(1) In Table 4.3, in the I/O error I/O module verify, fuse blown, special-function module error, and operation check error diagnoses, the CPU status can be selected between stop and run; and the RUN LED status between flashing and ON by using peripheral devices.

(2) The LED Display Message column in Table 4.3 lists messages displayed by the peripheral devices' PC diagnosis.

Table 4.3 Self-Diagnosis

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

4.1.5 Devices

A device is any contact, coil, or timer used in PC program operations.

A1SJCPU devices and their range of use are shown below. The items marked "*" can be used by setting parameters for peripheral devices or by changing their range of use.

Set parameters which are compatible with the system to be used and its program. Section 4.1.6 gives details about parameter settings.

Table 4.4 Devices

Device		Application Range (Number of points)		Explanation
X	Input	X, Y0 to FF (X, Y total 256 points)		Provides the PC command and data from an external device, e.g. pushbutton, select switch, limit switch, digital switch.
Y	Output			Provides the program control result to an external device, e.g. solenoid, magnetic switch, signal light, digital display.
M	Special relay	M9000 to M9255 (256 points)		Redefined auxiliary relay for special purposes and for use in the PC.
M	Internal relay*	M0 to M999 (1000 points)	Number of M + L + S = 2048	Auxiliary relay in the PC which cannot be directly output.
L	Latch relay*	L1000 to L2047 (1048 points)		Auxiliary relay in the PC which cannot be directly output. Backed up during power failure.
S	Step relay*	Can be used by setting the parameter (0)		Used in the same manner as an internal relay (M), e.g. as a relay indicating the stage number of a step-by-step process operation program.
B	Link relay	B0 to B3FF (1024 points)		Internal relay for data link which cannot be output. May be used as an internal relay if not set for link initial data.
F	Annunciator	F0 to F255 (256 points)		Used to detect a fault. When switched ON during RUN by a fault detection program, it stores a corresponding number in special register D.
T	100 msec timer*	T0 to T199 (200 points)		Forward timers are available in 100 msec, 10 msec and 100 msec retentive types.
T	10 msec timer*	T200 to T255 (56 points)		
T	100 msec retentive timer*	Can be used by setting the parameter (0 point)		
C	Counter*	C0 to C255 (256 points)		Forward counters are available in normal and interrupt types.
C	Interrupt counter*	Can be used by setting parameter. (0 point)		
D	Data register	D0 to D1023 (1024 points)		Memory for storing PC data.
D	Special register	D9000 to D9255 (256 points)		Predefined data memory for special purposes.
W	Link register	W0 to W3FF (1024 points)		Data register for use with data link. Any range not set with link parameters can be used for data registers.
R	File register*	Can be used by setting the parameter (0 point)		Extends the data register utilizing the user memory area.
A	Accumulator	A0, A1 (2 points)		Data register for storing the operation results of basic and application instructions.
Z	Index register	Z (1 point)		Used to modify devices (X, Y, M, L, B, F, T, C, D, W, R, K, H, P).
V	Index register	V (1 point)		
N	Nesting	N0 to N7 (8 levels)		Indicates the nesting of master controls.

Table 4.4 Device (Continued)

Device		Application Range (Number of points)	Explanation
P	Pointer	P0 to P255 (256 points)	Indicates the destination of the branch instruction (CJ, SCJ, CALL, JMP).
I	Pointer for interruption	I0 to I31 (32 points)	Indicates the destination of an interrupt program corresponding to the interrupt factor which has occurred
K	Decimal constant	K-32768 to 32767 (16-bit instruction) K-2147483648 to 2147483647 (32-bit instruction)	Used to specify the timer/counter set value, pointer number, interrupt pointer number, the number of bit device digits, and basic and application instruction values.
H	Hexadecimal constant	H0 to FFFF (16-bit instruction) H0 to FFFFFFFF (32-bit instruction)	Used to specify the basic and application instruction values.

REMARK

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

4.1.6 Parameter setting ranges

Parameter setting involves specifying various PC functions and device ranges as well as assigning the user memory (32 K bytes). The set data is stored in the parameter memory area.

As shown in Table 4.5, default values can be used as set in parameter data. Setting ranges shown here can be changed depending on their purpose. Parameters are set with peripheral devices.

The operating manual of each peripheral device gives details parameter settings.

Table 4.5 Parameter Setting Ranges

Item / Setting		Default Value	Setting Range	Valid Peripheral Devices	
				PU	GPP
Main sequence program area		6K steps	1 to 8K steps (in units of 1K steps)	○	○
File register capacity		Absent	1 to 4K points (in units of 1K points)	○	○
Comment capacity		Absent	0 to 1600 points (in units of 64 points)	–	○
Status latch	Memory capacity	Absent	0/8 to 16K bytes	–	○
	Data memory		Absent/present		
	File register		Absent/present (2 to 8K bytes)		
Sampling trace	Memory capacity	Absent	0/8K bytes	–	○
	Device setting		Device number		
	Execution condition		Per scan		
			Per time		
	Sampling count		0 to 1024 times (in units of 129 times)		
Microcomputer program capacity		Absent	0 to 14K bytes (in units of 2K bytes)	–	○
Setting of latch (power failure compensation) range	Link relay (B)	Only for L1000 to L2047. Absent for others.	B0 to B3FF (in units of 1 point)	○	○
	Timer (T)		T0 to T255 (in units of 1 point)		
	Counter (C)		C0 to C255 (in units of 1 point)		
	Data register (D)		D0 to D1023 (in units of 1 point)		
	Link register (W)		W0 to W3FF (in units of 1 point)		
Setting of link range	Number of link stations	Absent	1 to 64	–	○
	Input (X)		X0 to XFF (in units of 16 points)		
	Output (Y)		Y0 to YFF (in units of 16 points)		
	Link relay (B)		B0 to B3FF (in units of 16 points)		
	Link register (W)		W0 to W3FF (in units of 1 point)		
I/O assignment		Absent	X/Y0 to X/Y1FF (in units of 16 points)	–	○

Table 4.5 Parameter Setting Ranges (Continued)

Item \ Setting		Default Value	Setting Range	Valid Peripheral Devices	
				PU	GPP
Setting of internal relay (M) latch relay (L) step relay (S) setting		M0 to M999 L1000 to L2047 Absent for S	M/L/S 0 to 2047 (M, L, S are serial numbers)	o	o
Watchdog timer setting		200 msec	10 msec to 2000 msec (in units of 10 msec)	o	o
Setting of timer		100 msec: T0 to T199 10 msec: T200 to T255	256 points of 100 msec, 10 msec, and integrating timers (in units of 8 points) Timers have serial numbers.	o	o
Setting of counter		Not provided for interrupt counter	256 points (in units of 8 points) for counters and interrupt counters Must be consecutive numbers	–	o
Setting of remote RUN/PAUSE contact		Absent	X0 to XFF 1 point for each of RUN and PAUSE contacts. Setting of only PAUSE contact cannot be done	–	o
Operation mode at the time of error	Fuse blown	Continuation	Stop/continuation	–	o
	I/O verify error	Stop			
	Operation error	Continuation			
	Special function unit check error	Stop			
STOP → RUN display mode		Operation status prior to STOP is re-output	Output before STOP or after operation execution	–	o
Print title entry		Absent	Up to 128 characters	–	o
Keyword entry		Absent	Max. 6 digits in hexadecimal (0 to 9, A to F)	o	o

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

The A1SJCPU provides 32K bytes of user memory area (RAM).
Data for parameters, T/C set values, main programs, sampling trace, status latch, file registers, and comments can be stored in the user memory area.

(1) Calculating memory capacity

The user memory area should be utilized after setting parameters to determine the type of data to be stored and the memory capacity.
Calculate the memory capacity according to Table 4.6.

Table 4.6 Parameter Settings and Memory Capacity

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

(2) How to store user memory

All data set by parameters is stored in the following sequence. When the memory protect switch is turned ON, 20K bytes (beginning with the head address) is memory-protected.
Make sure that the sampling trace area and the file register areas are not within this 20K byte memory-protected range.

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

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

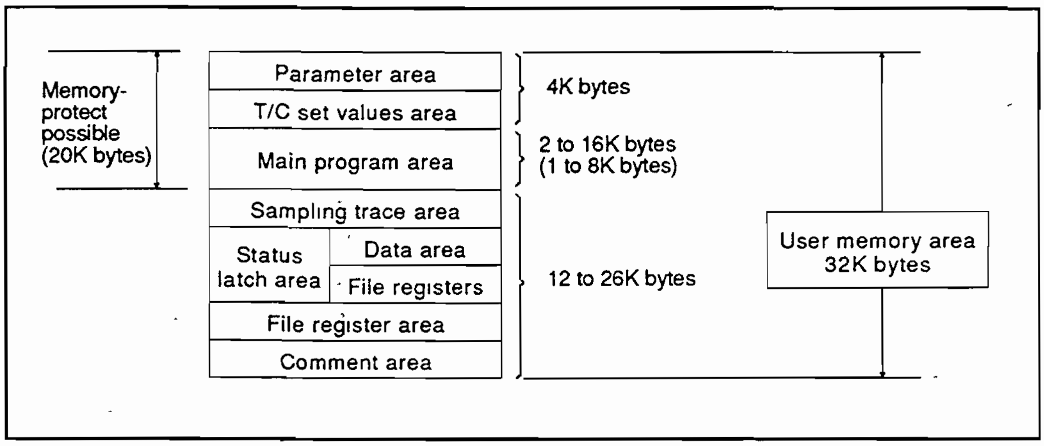


Fig. 4.3 User Memory Assignments

POINT

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

4.2 Functions

The following table describes the functions of the A1SJCPU.
The ACPU programming manual (Fundamentals) gives details.

Table 4.7 List of Functions

Function	Description
Constant scan	• Executes the sequence program at the predetermined intervals independently of the scan time. • Setting allowed between 10 and 2000 msec.
Latch (power failure compensation)	• Retains device data if the PC is switched OFF or reset or a momentary power failure of 20 msec or longer occurs. • L, B, T, C, D and W can be latched
Remote RUN/STOP	• Allows remote RUN/STOP from external device (e.g. peripheral, external input, computer) with the RUN/STOP switch in RUN position.
PAUSE	• Stops operation with the output (Y) status retained. • Pause function may be switched ON by any of the following ways: Remote PAUSE contact Peripheral device
Status latch	• Stores all device data in the status latch area in the A1S when the status latch condition is switched ON. • The stored data can be monitored by the peripheral device.
Sampling trace	• Samples the specified device operating status at predetermined intervals and stores the sampling result in the sampling trace area in the A1S. • The stored data can be monitored by the peripheral device.
Offline switch	• Allows the device (Y, M, L, S, F, B) used with the OUT instruction to be disconnected from the sequence program operation processing.
Priority setting ERROR LED	• Sets ON/OFF of the ERROR LED in case of an error .
Clock	• Execute clock operation in the CPU module. • Clock data includes the year, month, day, hour, minute, second, and day of the week. • Clock data can be read from special registers D9025 to D9028.

REMARK

The A1SJCPU cannot do "step operation", "PAUSE using RUN/STOP key switch", and "I/O module replacement at online".

4.3 Handling Instructions

This section gives handling instructions from unpacking to installation of the A1SJCPU, I/O modules and extension base unit, etc.

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

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

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

(4) Tighten the unit mounting screws and terminal screws as indicated below.

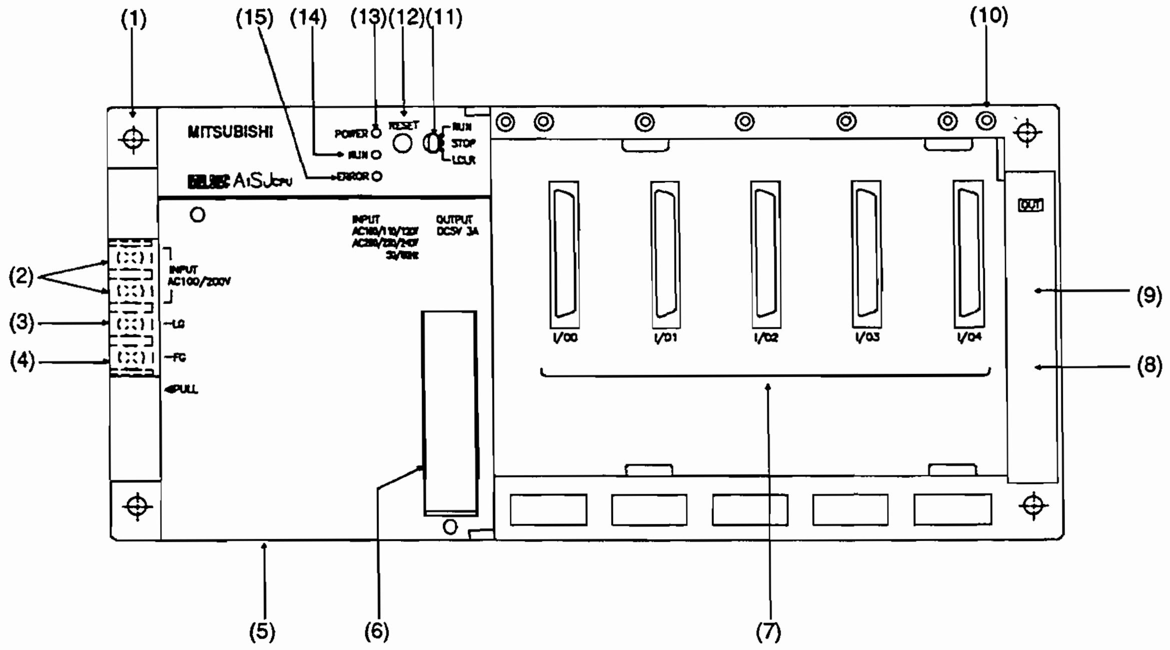
Screw	Tightening Torque Range N•cm (Kg•cm) [lb•inch]
Unit mounting screw (M4 screw)	78.4(8)[6.93] to 117.6(12)[10.39]
I/O module terminal block terminal screw (M3.5 screw)	58.8(6)[5.2] to 88.2(9)[7.79]
Power supply module terminal block terminal screw (M3.5 screw)	58.8(6)[5.2] to 78.4(8)[6.93]

4.4 Names and Purposes of Parts and Settings

The names and purposes of parts of the A1SJCPU and the switch settings necessary for operating the A1SJCPU are explained below.

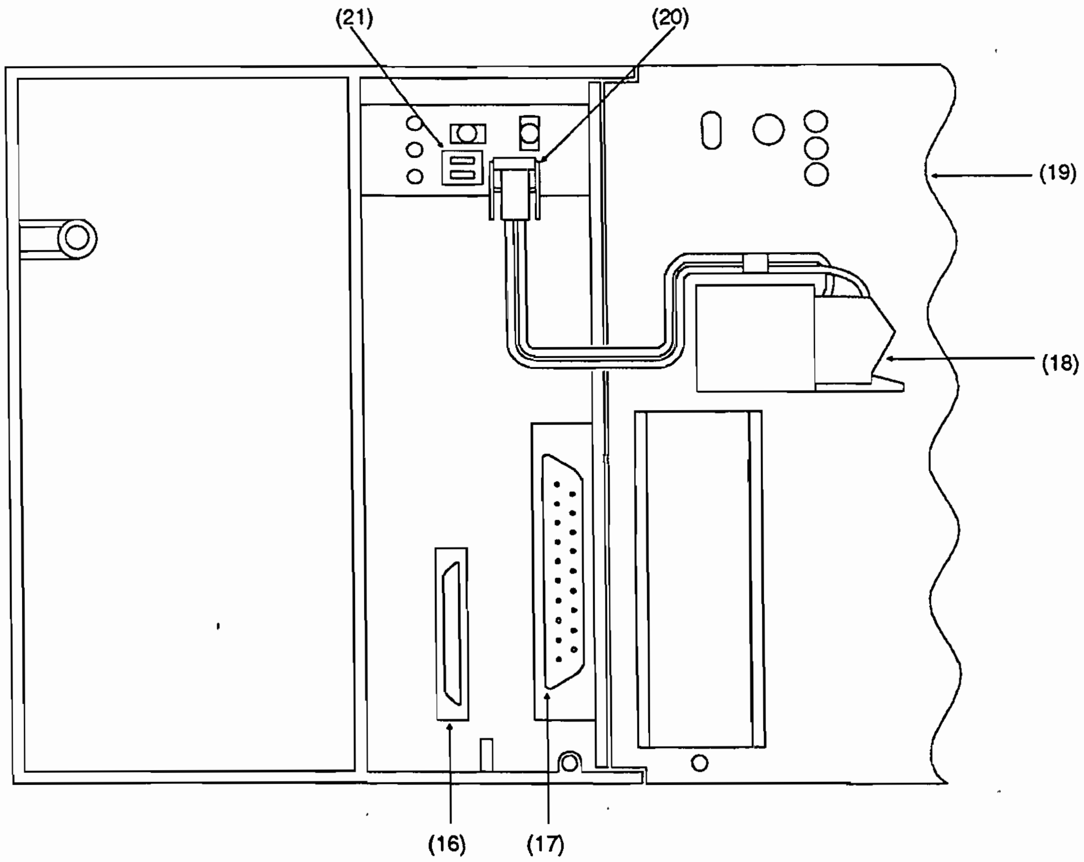
4.4.1 Names of parts of A1SJCPU

(1) Name of parts of A1SJCPU



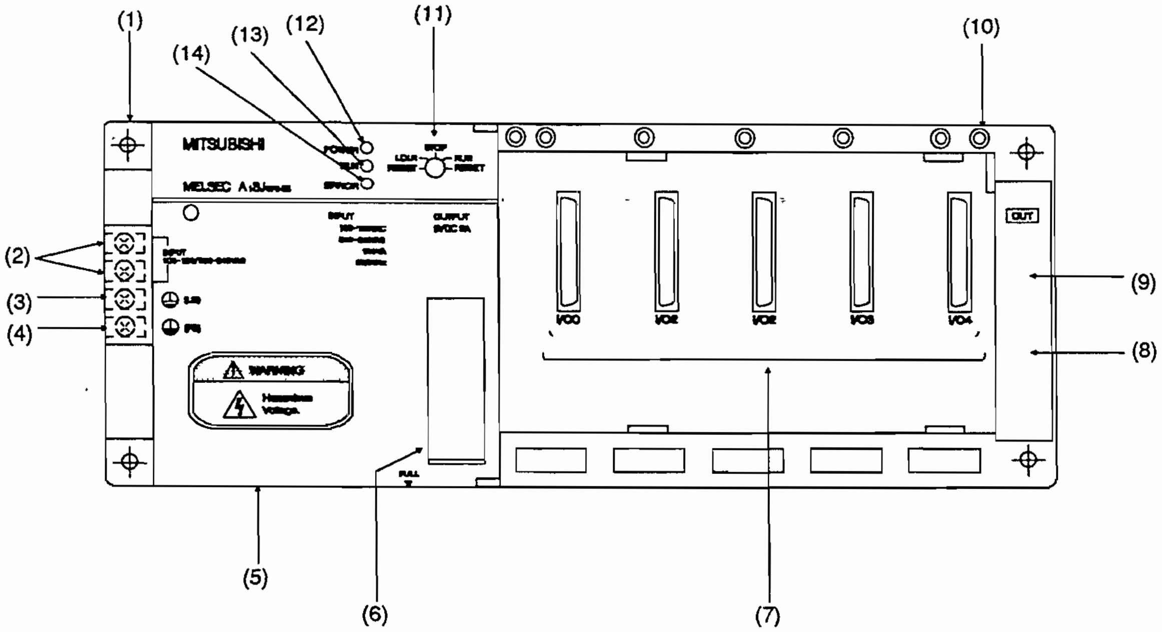
No.	Name	Purpose
(1)	Base mounting hole	Used to mount the base unit to a control panel. (for M5 screw)
(2)	Power input terminal	Used to connect to 100 VAC or 200 VAC power supply.
(3)	LG terminal	Used to ground the power supply filter. Provided with a potential half the input voltage.
(4)	FG terminal	Ground terminal connected to the shield pattern on the PC board.
(5)	DIN rail hook	Used to install the module to the DIN rail. (2 hooks)
(6)	RS-422 connector cover	Cover for the RS-422 connector
(7)	Module connector	Used to connect to an I/O module or special function module. Put a supplied cover or blank cover (A1SG60) on unused connector to protect it from dust.
(8)	Extension cable connector	Used to connect an extension cable to an extension base unit for signal transmissions.
(9)	Base cover	Extension cable connector protective cover. Remove this cover surrounded by grooves below the "OUT" indication by using a removing tool.

No.	Name	Purpose
(10)	Module mounting screw	Used to secure the module to the base. M4 x 12 screw
(11)	RUN / STOP switch	RUN / STOP: Used to run or stop the sequence program operation. L.CLR (LATCH CLEAR): Used to clear (OFF or 0) data in the latch area designated by parameter setting. (Data in other than the latch area are also cleared by LATCH CLEAR.) See Section 4.4.4 for the latch clear operation.
(12)	RESET switch	Used to perform hardware reset. Used when an operation error occurs and to initialize the operation.
(13)	POWER LED	Used to indicate the 5 VDC power supply.
(14)	RUN LED	Lit: Indicates the execution of sequence program with the RUN/STOP switch set in the RUN position. (When an error which does not cause the sequence program execution to stop occurs (see Section 10.3), this LED remains lit.) Unlit: The RUN LED does not light in the following cases: • The 100/200 VAC power is not supplied to the A1SJCPU. • The RUN/STOP switch is set in the STOP position. • Remote STOP is executed. • Remote PAUSE is executed. Flash: The RUN LED flashes in the following cases: • An error to stop the sequence program execution is detected by the self-diagnosis check. • Latch clear is executed.
(15)	ERROR LED	Lit: A self-diagnosis error is detected. (When an error which has been set for "unlit" with the LED indication priority setting is detected, this LED remains unlit.) Unlit: The operation is normal, or when an error is detected by a CHK instruction execution. Flash: Annunciator (F) is turned ON by the sequence program.



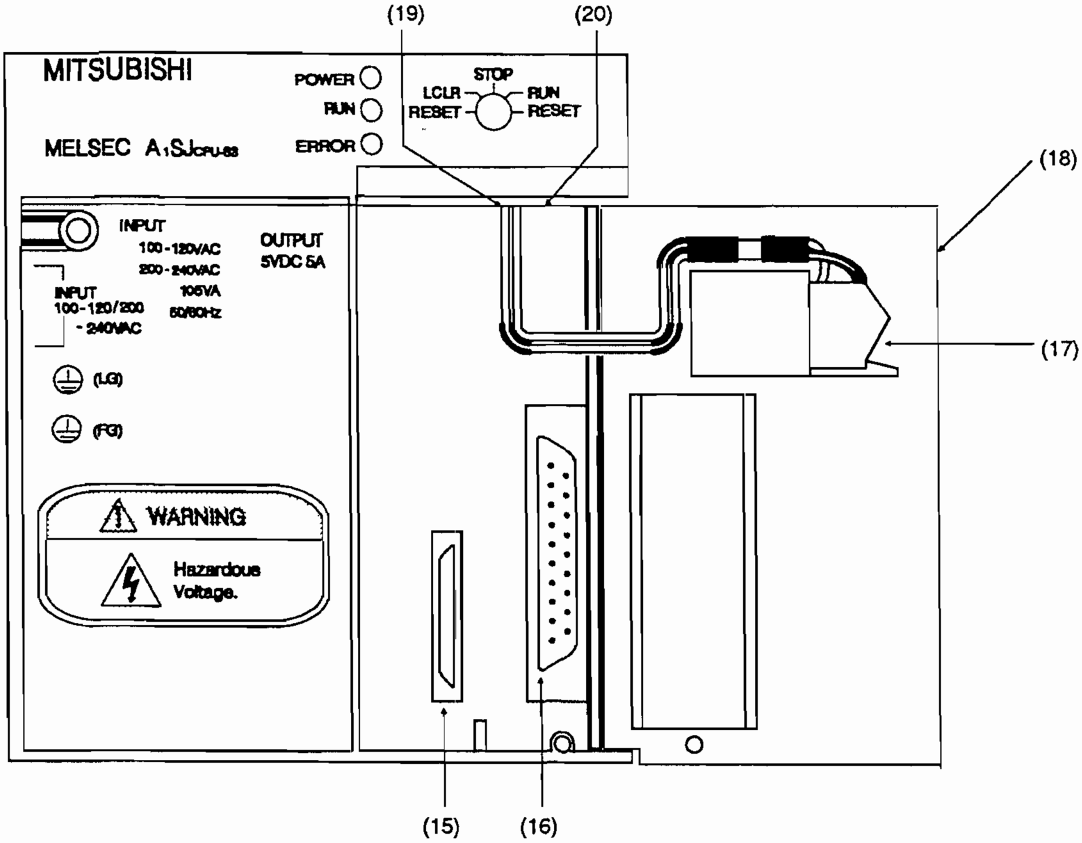
No.	Name	Purpose
(16)	Memory cassette connector	Used to install a memory cassette (A1SMCA-8KP/[ ]KE).
(17)	RS-422 connector	Used to connect a peripheral device to perform reading and writing of main programs, monitoring, and tests. Put a cover when a peripheral device is not connected.
(18)	Battery	Used to backup the retention of data such as programs, latch range devices, and file registers. (see Section 8.2 for the battery installation)
(19)	Cover	Used to protect the PC board, memory cassette, RS-422 connector, and battery of the A1SJCPU.
(20)	Battery connector	Used to connect to the connector on the battery.
(21)	DIP switch	Used to set the I/O control method and memory protect function. (see Section 4.4.2 and 4.4.3 for details)

(2) Name of parts of A1SJCPU-S3



No.	Name	Purpose
(1)	Base mounting hole	Used to mount the base unit to a control panel. (for M5 screw)
(2)	Power input terminal	Used to connect to 100 VAC or 200 VAC power supply.
(3)	LG terminal	Used to ground the power supply filter. Provided with a potential half the input voltage.
(4)	FG terminal	Ground terminal connected to the shield pattern on the PC board.
(5)	DIN rail hook	Used to install the module to the DIN rail. (2 hooks)
(6)	RS-422 connector cover	Cover for the RS-422 connector
(7)	Module connector	Used to connect to an I/O module or special function module. Put a supplied cover or blank cover (A1SG60) on unused connector to protect it from dust.
(8)	Extension cable connector	Used to connect an extension cable to an extension base unit for signal transmissions.
(9)	Base cover	Extension cable connector protective cover. Remove this cover surrounded by grooves below the "OUT" indication by using a removing tool.

No.	Name	Purpose
(10)	Module mounting screw	Used to secure the module to the base. M4 x 12 screw
(11)	RUN / STOP switch	RUN / STOP: Used to run or stop the sequence program operation. L.CLR (LATCH CLEAR): Used to clear (OFF or 0) data in the latch area designated by parameter setting. (Data in other than the latch area are also cleared by LATCH CLEAR.) See Section 4.4.4 for the latch clear operation. RESET: Used to perform hardware reset. Used when an operation error occurs and to initialize the operation.
(12)	POWER LED	Used to indicate the 5 VDC power supply.
(13)	RUN LED	Lit: Indicates the execution of sequence program with the RUN/STOP switch set in the RUN position. (When an error which does not cause the sequence program execution to stop occurs (see Section 10.3), this LED remains lit.) Unlit: The RUN LED does not light in the following cases: • The 100/200 VAC power is not supplied to the A1SJCPU-S3. • The RUN/STOP switch is set in the STOP position. • Remote STOP is executed. • Remote PAUSE is executed. Flash: The RUN LED flashes in the following cases: • An error to stop the sequence program execution is detected by the self-diagnosis check. • Latch clear is executed.
(14)	ERROR LED	Lit: A self-diagnosis error is detected. (When an error which has been set for "unlit" with the LED indication priority setting is detected, this LED remains unlit.) Unlit: The operation is normal, or when an error is detected by a CHK instruction execution. Flash: Annunciator (F) is turned ON by the sequence program.

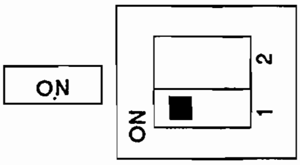


No.	Name	Purpose
(15)	Memory cassette connector	Used to install a memory cassette (A1SMCA-8KP/[ ]KE).
(16)	RS-422 connector	Used to connect a peripheral device to perform reading and writing of main programs, monitoring, and tests. Put a cover when a peripheral device is not connected.
(17)	Battery	Used to backup the retention of data such as programs, latch range devices, and file registers. (see Section 8.2 for the battery installation)
(18)	Cover	Used to protect the PC board, memory cassette, RS-422 connector, and battery of the A1SJCPU-S3.
(19)	Battery connector	Used to connect to the connector on the battery.
(20)	DIP switch	Used to set the I/O control method and memory protect function. (see Section 4.4.2 and 4.4.3 for details)

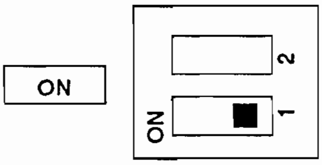
4.4.2 I/O control switch setting

The I/O control system uses either a direct or a refresh mode. Use the dip switch (SW2-1) to switch the I/O control mode.

When shipment from the factory, both inputs and outputs are set for direct mode (SW2-1: ON).



Controls both inputs and outputs in the direct mode



Controls both inputs and outputs in the refresh mode

POINT

Make sure that the power is OFF when the I/O control mode is switched.

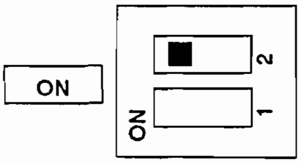
4.4.3 Memory protect switch setting

The memory protect switch is used for protecting RAM memory data from being overwritten by a peripheral device malfunction. (When the CPU installed with a memory cassette is operated using ROM or E^2PROM, the memory switch setting will be invalid.) Use the DIP switch (SW2-2) to switch the memory protect setting.

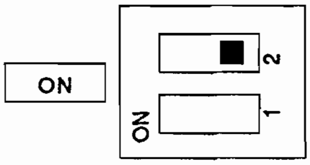
This memory protect function protects the first 20K bytes of the user memory area (32K bytes).

The function prevents overwriting and deleting the program once it has been written. When the contents of RAM memory are changed, make sure that the memory protect switch is OFF.

When shipment from the factory, the memory protect function is turned OFF (SW2-2: OFF).



Memory protect switch is ON.



Memory protect switch is OFF.

POINT

Do not use the memory protect function when either a sampling trace or a status latch is executed. If the protect function is used, the data cannot be stored to memory.

4.4.4 Latch clear

Follow the procedures mentioned below to execute latch clear by using the RUN/STOP switch.
Devices outside the latch range are also cleared by the latch clear operation.

(1) Operating procedure for latch clear

RUN/STOP keyswitch	RUN LED	
(1) "STOP" position	○ Unlit	: Before latch clear operation
↓	↓	
(2) Turn several times from "STOP" to "L.CLR" position	☀ High-speed flickering :	Ready for latch clear (approx. 0.2 s ON, 0.2 s OFF)
↓	↓	
(3) Turn once more from "STOP" to "L.CLR" position	○ Unlit	: Latch clear completed

(2) Canceling latch clear part way through

Latch clear can be canceled part way through by using either of the methods (a) and (b) below.

(a) Turn the RUN/STOP keyswitch to "RUN" to set the A1SJCPU to the RUN status.

(b) Turn the RUN/STOP keyswitch to the RESET position to reset the A1SJCPU.
(Or, press the RESET switch to reset the A1SJCPU.)

REMARK

It is possible to perform latch clear by using the GPP function operation.

For example, when an A6GPP is used, latch clear can be done by using the "Device Memory All Clear" of the test function in PC mode

See the GPP function operating manual for the operation procedure.

MEMO

5. POWER SUPPLY MODULE

5.1 Specifications

Table 5.1 shows the specifications of power supply modules.

Table 5.1 Power Supply Module Specifications

Item		Specifications				
		A1S61PEU *4	A1S61P	A1S62PEU *4	A1S62P	A1S63P
Base loading slot		Power supply module loading slot				
Rated input voltage		200 to 240 VAC +10%/-15%	100 to 120/ 200 to 240 VAC +10%/-15%	200 to 240 VAC +10%/-15%	100 to 120/ 200 to 240 VAC +10%/-15%	24 VDC +30%/ -35%
Rated input frequency		50/60 Hz ±3%				
Max. input apparent power		20 A within 8 ms				81 A within 1 ms
Inrush current		105 VA				41 W
Rated output current	5 VDC	5 A		3 A		5 A
	24 VDC±10%	——		0 6 A		——
Overcurrent protection *1	5 VDC	5.5 A or higher		3.3 A or higher		5.5 A or higher
	24 VDC	——		0.66 A or higher		——
Overvoltage protection *2	5 VDC	5.5 to 6.5 V				
	24 VDC	——		——		——
Efficiency		65% or higher				
Insulation withstand voltage	Between primary and 5 VDC	1780 VAC	1500 VAC	1780 VAC	1500 VAC	500 VAC
	Between primary and 24 VDC	——	——	1780 VAC	1500 VAC	——
Noise immunity		IEC801-4, 2 kV				
Power indication		Power LED indication				
Terminal crew size		M3.5 x 7				
Applicable wire size		AWG16 to 22				
Applicable tighteni g torque		83 to 113 N·cm (8.5 to 11.5 kg·cm) [7.4 to 10.1 lb inch]				
External dimension mm (inch)		130 x 55.94 (5 12 x 2.17 x 3 70)				
Weight kg (lb)		0.53 (1.17)	0.53 (1 17)	0.55 (1.21)	0.55 (1.21)	0.5 (1.1)
Allowable momentary power failure time *3		Within 20 ms				Within 1 ms

*1: Overcurrent protection

The overcurrent protection device shuts off the 5 V, 24 VDC circuit and stops the system if the current flowing in the circuit exceeds the specified value. When this device is activated, the power supply module LED is switched OFF or dimly lit. If this happens, eliminate the cause of the overcurrent and start up the system again.

*2: Overvoltage protection

The overvoltage protection device shuts off the 5 VDC circuit and stops the system if a voltage of 5.5 to 6.5 V is applied to the circuit When this device is activated, the power supply module LED is switched OFF. If this happens, switch the input power OFF, then ON to restart the system. The power supply module must be changed if the system is not booted and the LED remains OFF.

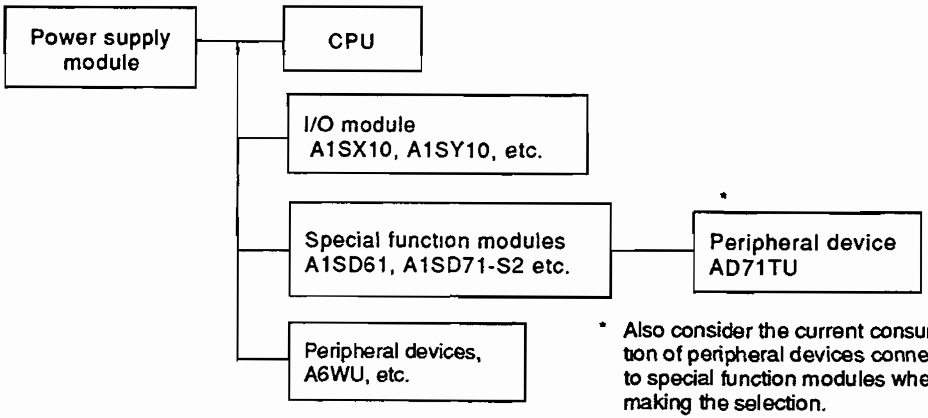
*3: Allowable momentary power interruption time
This value indicates the momentary power interruption time allowed for the PC CPU and varies according to the power supply module used with the PC CPU module. The allowable momentary power interruption time for a system in which an A1S63P is used is defined as starting when the primary power supply of the 24 VDC stabilized power supply of the A1S63P is turned OFF and lasting until the 24 VDC becomes less than the specified voltage (15 6 VDC).

*4: A1S61PEU and A1S62PEU comply with EN61010-1 and safety aspects of IEC 1131-2 to meet the Low Voltage Directive which will be mandatory from the 1st of January 1997.

5.1.1 Selection of a power supply module

Select a power supply module by considering the total current consumption of the I/O modules, special function modules and peripheral devices to be supplied with power by the module. In addition, if using an A1S52B (S1), A1S55B(S1), A1S58B(S1), A52B, A55B, or A58B extension base unit, note that this unit will also draw its power from the power supply module on the main base unit, and this must also be taken into consideration.

For details on the 5 VDC current consumption of I/O modules, special function modules and peripheral devices, refer to Section 2.3.



* Also consider the current consumption of peripheral devices connected to special function modules when making the selection.
For example, if an AD71TU is connected to an A1SD71-S2, the current consumption of the AD71TU must also be taken into account.

(1) Selection of a power supply module when using A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, A58B extension base units
When using A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, A58B extension base units, the 5 VDC power supply is taken from the main base unit via the extension cable. Accordingly, the following cautions must be observed when using one of these extension base units.

(a) Make sure that the 5 VDC capacity of the selected power supply module on the main base unit will cover the 5 VDC current consumption of the A1S52B(S1), A1S55B(S1), A1S58(S1), A52B, A55B, or A58B.

[Example]

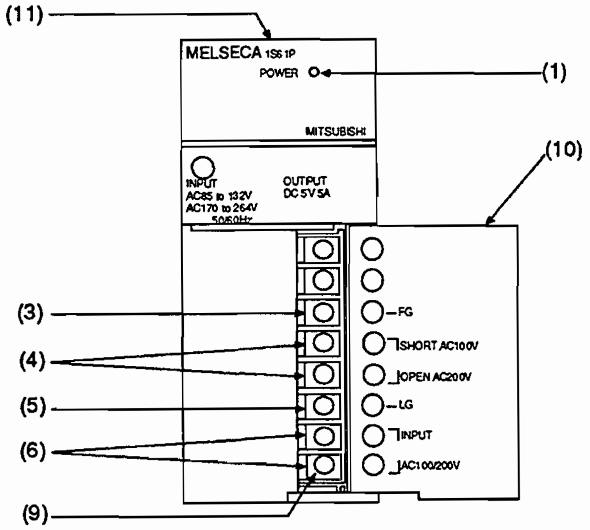
Assume that the 5 VDC current consumption at the main base unit is 3 A, and the 5 VDC current consumption at the A1S55B(S1) is 1 A:Since the capacity of the power supply module on the main base unit (3 VDC, 3A) is exceeded, it is necessary to establish a separate power supply using an A1S65B(S1) or A1S68B(S1).

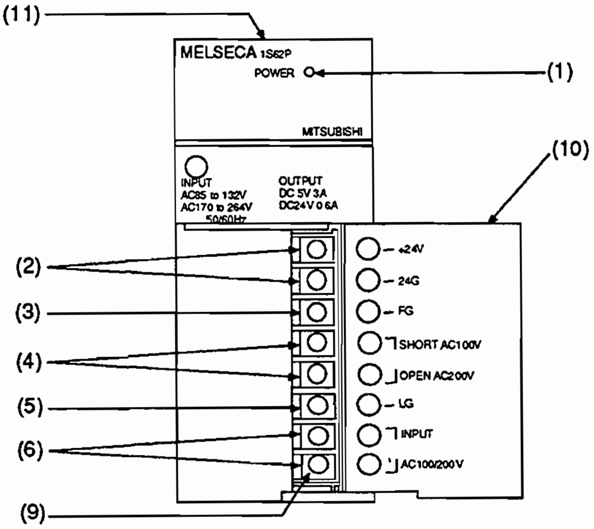
(b) Since power is supplied to the A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, and A58B through an extension cable, there is some voltage drop. The power supply module and cable length must be selected to ensure that at least 4.75 VDC reaches the receiving terminals.

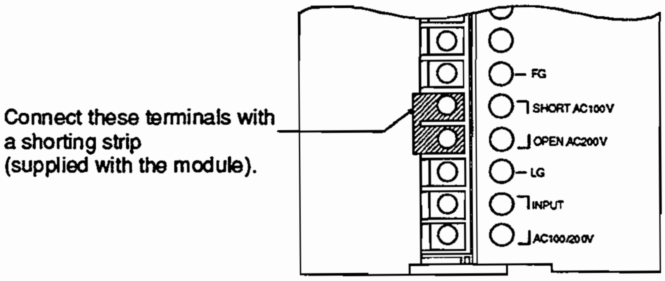
(c) For details on voltage drop and other topics, see Section 6.1.3 extension base unit.

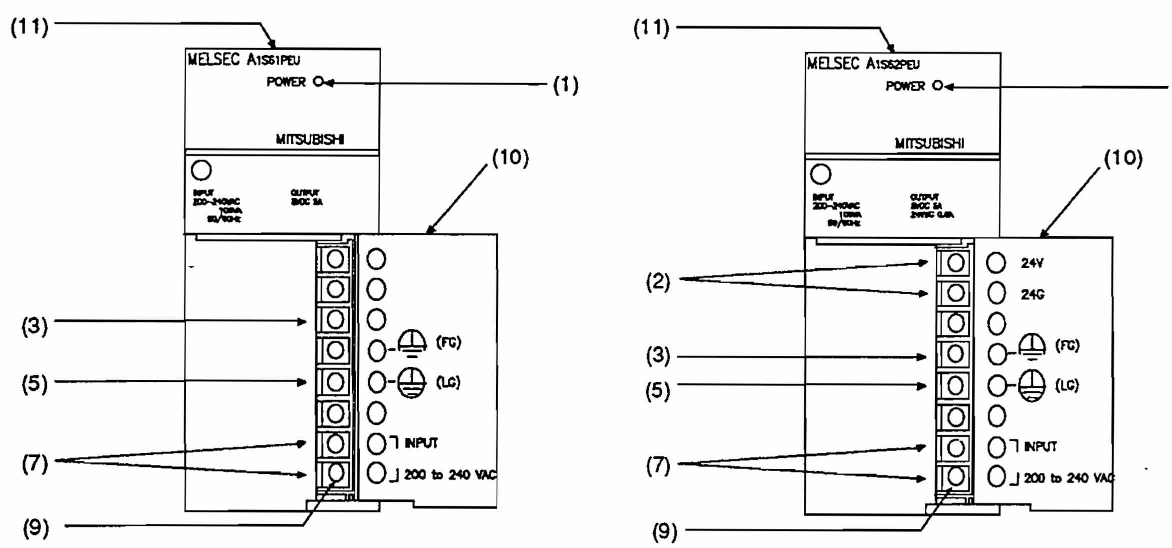
5.2 Names and Purposes of Parts and Settings

The names and purposes of parts of the power supply module are described below.





No.	Name	Purpose
(1)	POWER LED	Used to indicate the 5 VDC power supply.
(2)	24 VDC and DC24G terminals	Used to supply the 24 VDC power to the output module as the internal power supply. (supplied by an external wire)
(3)	FG terminal	Grounding terminal connected to the shield pattern on the PC board.
(4)	Operating voltage switching terminals	Used to switch the input voltage. Connect these terminals with a shorting strip when a 100 VAC power is supplied. Leave these terminals open when a 200 VAC power is supplied.
		<Setting when a 100 VAC power is supplied>  Connect these terminals with a shorting strip (supplied with the module).

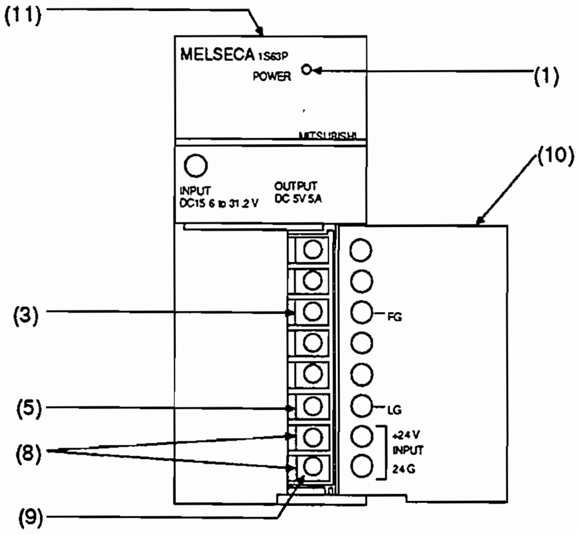


No.	Name	Purpose
(5)	LG terminal	Used to ground the power supply filter. Provided with a potential half the input voltage.
(6)	Power input terminal	Used to connect to 100 or 200 VAC power supply.
(7)	Power input terminal	Used to connect to 200 to 240 VAC power supply.
(8)	Power input terminal	Used to connect to a 24 VDC power supply.
(9)	Terminal screw	M3.5 x 7
(10)	Terminal cover	Used to protect the terminal block
(11)	Module mounting screw	Used to secure the module to the base unit.

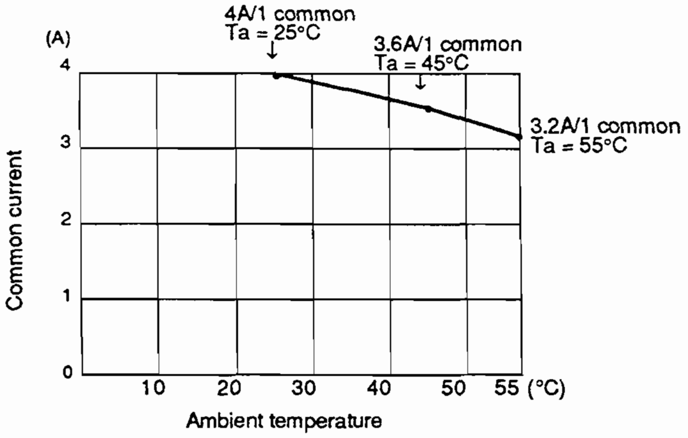
POINT

If the power supply voltage setting is different from actual power supply voltage, the following problem will occur.

	Power Supply Voltage	
	100 VAC	200 VAC
Setting for 100 VAC (the operating voltage switching terminals are shorted)	——	The power supply module will be destroyed. (The CPU will not cause problem.)
Setting for 200 VAC (the operating voltage switching terminals are open)	The power supply module will not cause problem The CPU will not operate.	——


(11)
MELSECA 1S63P
POWER
(1)
MITSUBISHI
(10)
INPUT
DC15.6 to 31.2 V
OUTPUT
DC 5V 5A
(3)
FG
(5)
LG
(8)
+24 V
INPUT
24 G
(9)

(7) The common current of an A1SY60 varies according to ambient temperature. Select a common current referring to the chart shown below.



(8) The A1SX41 and A1SX42 input modules and the A1SY41 and A1SY42 output modules are supplied with soldering-type 40-pin connectors. The 40-pin connectors of pressure-displacement type and crimp contact type are also available. Tools for the pressure-displacement and crimp contact type connectors must be procured from the following suppliers:

(a) Soldering-type 40-pin connector

Model name : A6CON1

(b) Crimp-contact-type 40-pin connector

Model name : A6CON2

Tool : Fujitsu FCN-363-T005/H

Applicable wire size : AWG #24 to 28

(c) Pressure-displacement-type 40-pin connector

Model name : A6CON3

Tool : Fujitsu
FCN-367T-T012/H (locator plate)
FCN-707T-T001/H (cable cutter)
FCN-707T-T101/H (hand press)

Applicable wire size : AWG #28 (twisted)
AWG #30 (single wire)

(d) Supplier's offices:

Fujitsu Limited

North and South America:

Fujitsu Component of America, Inc.
3545 North First Street, San Jose, CA 95134-1804 U.S.A.
Phone: (408) 922-9000
Telex: (910) 338-0190
Fax: (408) 428-0640

Europe:

Fujitsu Microelectronik GmbH

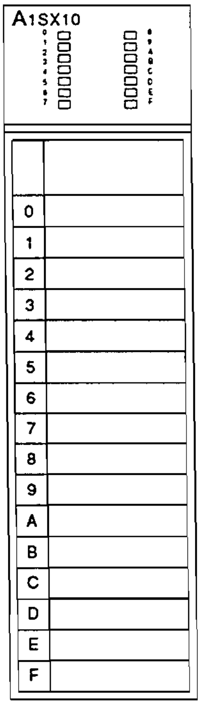
Am Siebestein 6-10 6072, Dreieich-Buchschtag, F.R. Germany
Phone: (061) 03-690-0
Telex: 411963
Fax: (061) 03-690-122

Asia:

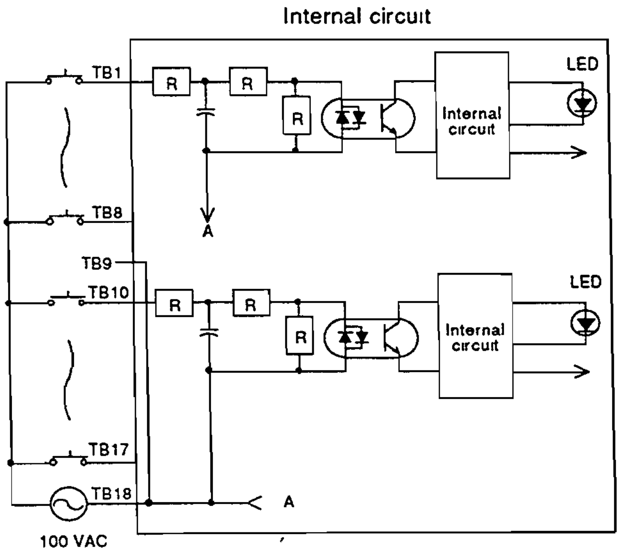
Fujitsu Microelectronics Asia PTE, Limited
#06-04 to #06-07 Plaza, By The Park, No.51 Bras Basah Road,
Singapore 0719
Phone: 336-1600
Telex: 55573
Fax: 336-1609

5.2 Input Module Specifications

5.2.1 A1SX10 AC input module

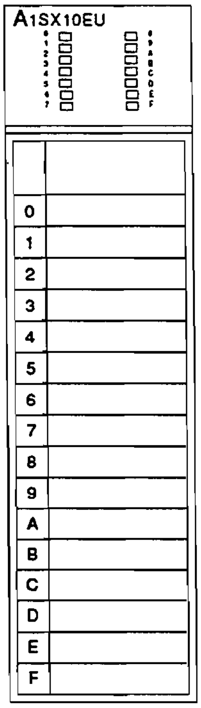
Model Specifications		AC Input Module	
		A1SX10	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		100 to 120 VAC 50/60 Hz	
Rated input current		Approx. 6 mA (100 VAC 60 Hz)	
Operating voltage range		85 to 132 VAC (50/60 Hz ±5%)	
Max. simultaneous input points		100% simultaneously ON (at 110 VAC) 60% simultaneously ON (at 132 VAC)	
Inrush current		Max. 200 mA, within 1 ms (132 VAC)	
ON voltage/ON current		80 VAC or higher/5 mA or higher	
OFF voltage/OFF current		30 VAC or lower/1 mA or lower	
Input impedance		Approx 18 kΩ (60 Hz), Approx. 21 kΩ (50 Hz)	
Response time	OFF → ON	20 ms or less (100 VAC 60 Hz)	
	ON → OFF	35 ms or less (100 VAC 60 Hz)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0 75 to 1.5 mm^2	
Applicable crimp terminals		1.25-3 5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A	
Accessories		None	
Insulation withstand voltage		1500 VAC	
Noise immunity		1000 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.21 (0 46)	

External Connections

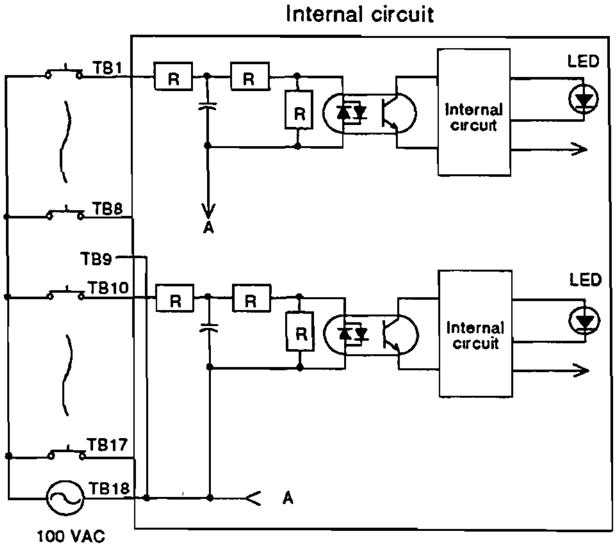


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.2 A1SX10EU AC input module

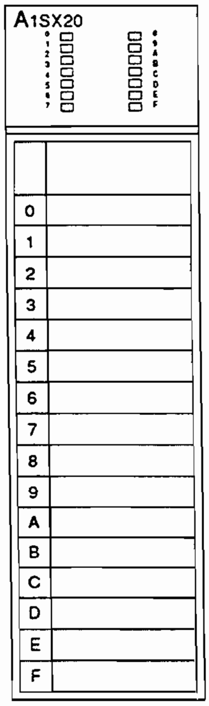
Model / Specifications		AC Input Module	
		A1SX10EU	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		100 to 120 VAC 50/60 Hz	
Rated input current		Approx. 7 mA (120 VAC 60 Hz)	
Operating voltage range		85 to 132 VAC (50/60 Hz ±5%)	
Max. simultaneous input points		100% simultaneously ON	
Inrush current		Max. 200 mA, within 1 ms (132 VAC)	
ON voltage/ON current		80 VAC or higher/5 mA or higher	
OFF voltage/OFF current		30 VAC or lower/1 mA or lower	
Input impedance		Approx. 18 kΩ (60 Hz), Approx. 21 kΩ (50 Hz)	
Response time	OFF → ON	20 ms or less (100 VAC 60 Hz)	
	ON → OFF	35 ms or less (100 VAC 60 Hz)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2 (AWG15 to AWG19)	
Applicable crimp terminals		RAV1.25-3.5	
Accessories		None	
Insulation withstand voltage		1780 VAC	
Noise immunity		1000 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.21 (0.46)	

External Connections

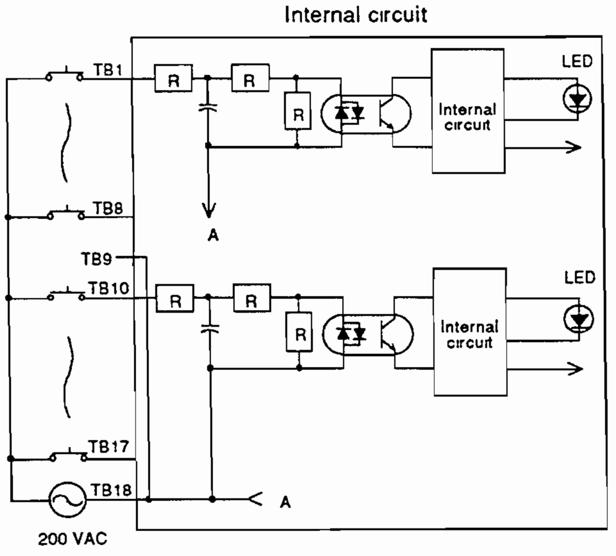


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.3 A1SX20 AC input module

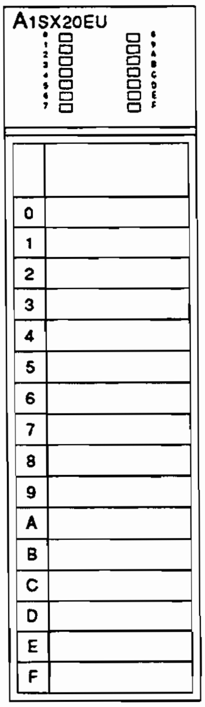
Specifications \ Model		AC Input Module A1SX20	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		200 to 240 VAC 50/60 Hz	
Rated input current		Approx. 9 mA (200 VAC 60 Hz)	
Operating voltage range		170 to 264 VAC (50/60 Hz ±5%)	
Max. simultaneous input points		60% simultaneously ON (at 220 VAC)	
Inrush current		Max. 500 mA, within 1 ms (264 VAC)	
ON voltage/ON current		80 VAC or higher/4 mA or higher	
OFF voltage/OFF current		30 VAC or lower/1 mA or lower	
Input impedance		Approx. 22 kΩ (60 Hz), Approx 27 kΩ (50 Hz)	
Response time	OFF → ON	30 ms or less (200 VAC 60 Hz)	
	ON → OFF	55 ms or less (200 VAC 60 Hz)	
Common terminal arrangement		16 points/common (common terminals TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm²	
Applicable crimp terminals		1.25-3.5 2-3.5 1.25-YS3A 2-YS3A V1.25-M3 V2-S3 V1.25-YS3A V2-YS3A	
Accessories		None	
Insulation withstand voltage		1500 VAC	
Noise immunity		1500 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.23 (0.50)	

External Connections

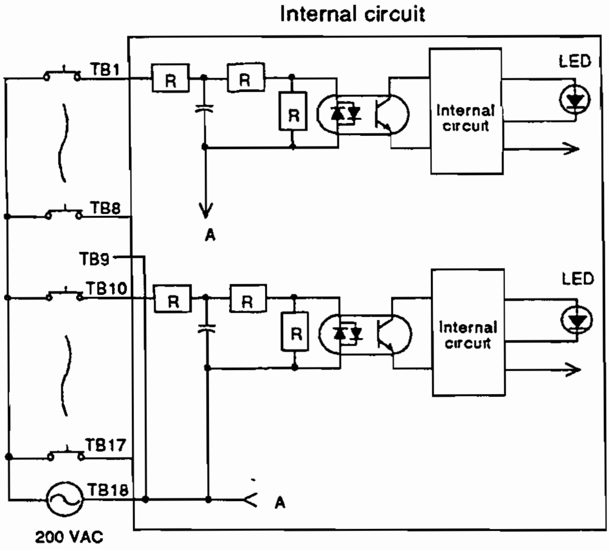


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.4 A1SX20EU AC input module

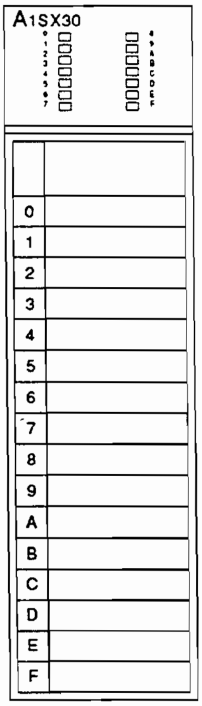
Model Specifications		AC Input Module A1SX20EU	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		200 to 240 VAC 50/60 Hz	
Rated input current		Approx 11 mA (240 VAC 60 Hz)	
Operating voltage range		170 to 264 VAC (50/60 Hz ±5%)	
Max. simultaneous input points		60% simultaneously ON (at 220 VAC)	
Inrush current		Max. 500 mA, within 1 ms (264 VAC)	
ON voltage/ON current		80 VAC or higher/4 mA or higher	
OFF voltage/OFF current		30 VAC or lower/1 mA or lower	
Input impedance		Approx. 22 kΩ (60 Hz), Approx. 27 kΩ (50 Hz)	
Response time	OFF → ON	30 ms or less (200 VAC 60 Hz)	
	ON → OFF	55 ms or less (200 VAC 60 Hz)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2 (AWG15 to AWG19)	
Applicable crimp terminals		RAV1.25-3.5	
Accessories		None	
Insulation withstand voltage		2830 VAC	
Noise immunity		1000 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.23 (0.50)	

External Connections



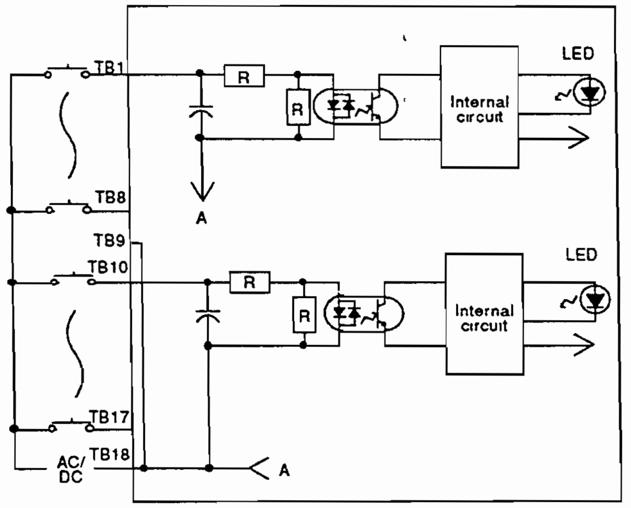
Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.5 A1SX30 DC/AC input module

Model / Specifications		DC/AC Input Module A1SX30		Appearance
Number of input points		16 points		
Insulation method		Photocoupler		
Rated input voltage		12/24 VDC	12/24 VAC 50/60 Hz	
Rated input current		4.2 mA (12 VDC/VAC), 8.6 mA (24 VDC/VAC)		
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)	10.2 to 26.4 VAC (50/60 Hz ±5%)	
Max. simultaneous input points		75% simultaneously ON		
ON voltage/ON current		7 VDC/AC or higher/2 mA or higher		
OFF voltage/OFF current		2.7 VDC/AC or lower/0.7 mA or lower		
Input impedance		Approx. 2.7 kΩ		
Response time	OFF → ON	20 ms or less (12/24 VDC)	25 ms or less (12/24 VAC 60Hz)	
	ON → OFF	20 ms or less (12/24 VDC)	20 ms or less (12/24 VAC 60Hz)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)		
Operating indicator		ON state is indicated (LEDs)		
External connections		20-point terminal block connector (M3.5 x 7 screws)		
Applicable wire size		0.75 to 1.5 mm^2		
Applicable crimp terminals		1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A		
Accessories		None		
Insulation withstand voltage		500 VAC		
Noise immunity		1500 VAC		
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)		
Weight kg (lb)		0.2 (0.44)		

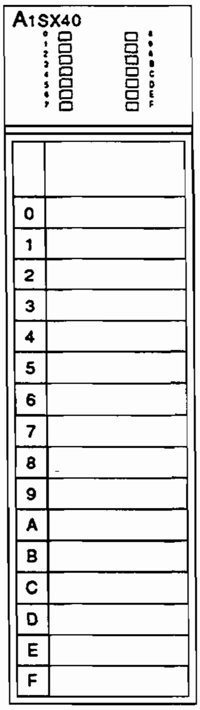
External Connections

Internal circuit

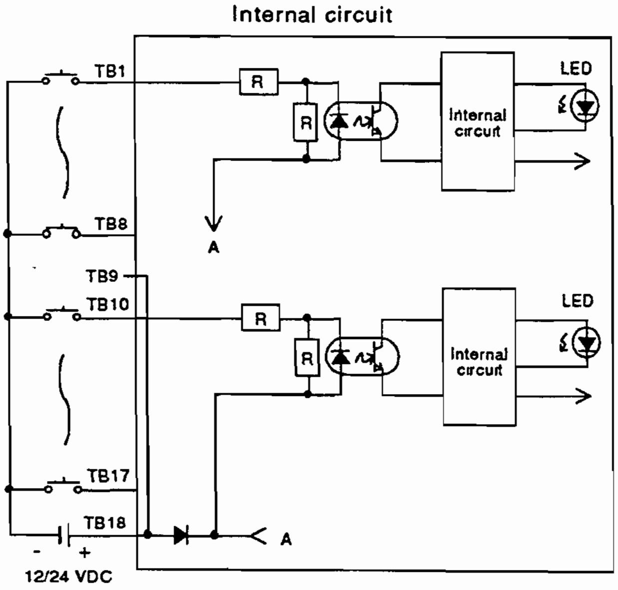


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.6 A1SX40 DC input module (sink type)

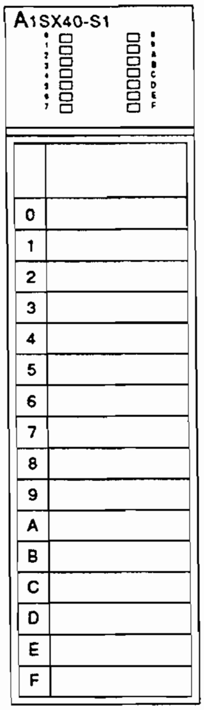
Model Specifications		DC Input Module (Sink Type)		
		A1SX40		Appearance
Number of input points		16 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 3 mA	Approx 7 mA	
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)		
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/1 mA or lower		
Input impedance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)		
Operating indicator		ON state is indicated (LEDs)		
External connections		20-point terminal block connector (M3.5 x 7 screws)		
Applicable wire size		0.75 to 1.5 mm^2		
Applicable crimp terminals		1.25-3 .5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A		
Accessories		None		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)		
Weight kg (lb)		0.2(0.44)		

External Connections

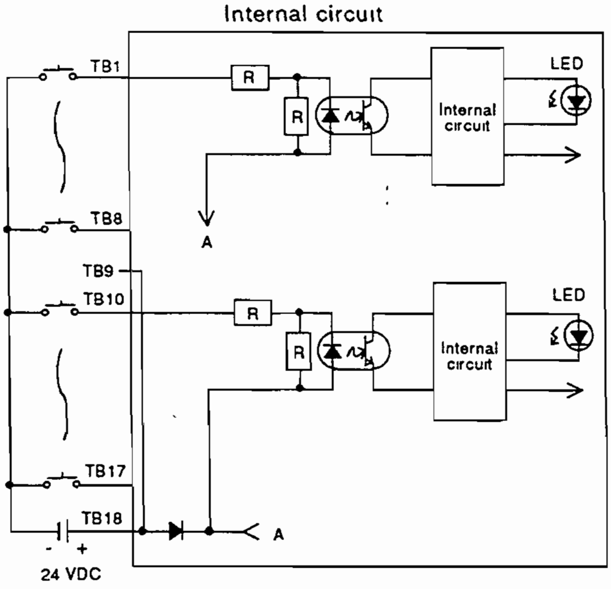


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.7 A1SX40-S1 DC input module (sink type)

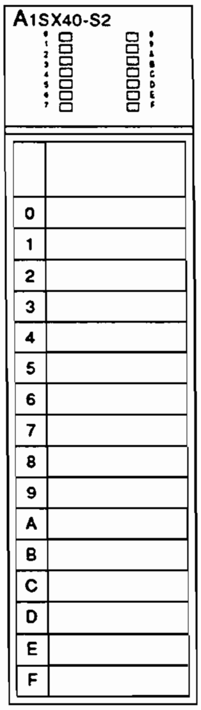
Model / Specifications		DC Input Module (Sink Type) A1SX40-S1	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 26.4 VDC (ripple: less than 5%)	
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)	
ON voltage/ON current		14 VDC or higher/4 mA or higher	
OFF voltage/OFF current		6.5 VDC or lower/1.7 mA or lower	
Input impedance		Approx. 3.3 kΩ	
Response time	OFF → ON	0.1 ms or less (24 VDC)	
	ON → OFF	0.2 ms or less (24 VDC)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2	
Applicable crimp terminals		1.25-3 1.25-YS3A 2-3.5 2-YS3A V1.25-3 V1.25-YS3A V2-S3 V2-YS3A	
Accessories		None	
Insulation withstand voltage		500 VAC	
Noise immunity		500 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.2 (0.44)	

External Connections

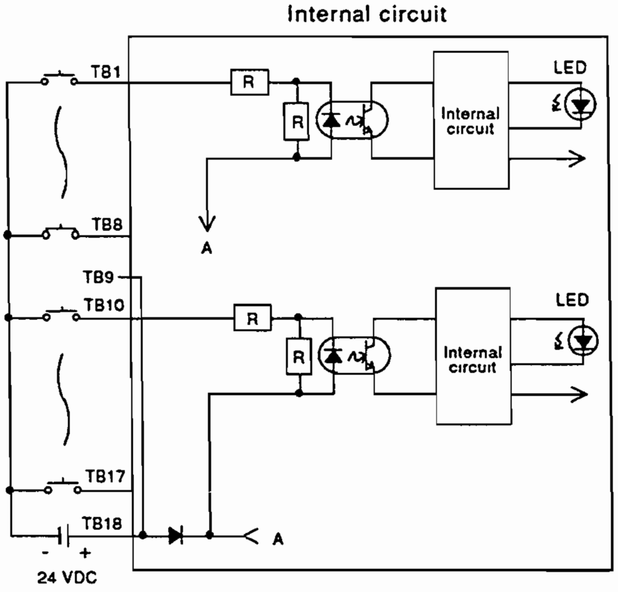


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.8 A1SX40-S2 DC input module (sink type)

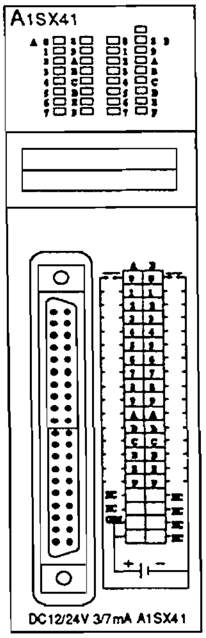
Specifications \ Model		DC Input Module (Sink Type)	
		A1SX40-S2	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 26.4 VDC (ripple: less than 5%)	
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)	
ON voltage/ON current		14 VDC or higher/3.5 mA or higher	
OFF voltage/OFF current		6.5 VDC or lower/1.7 mA or lower	
Input impedance		Approx. 3.3 kΩ	
Response time	OFF → ON	10 ms or less (24 VDC)	
	ON → OFF	10 ms or less (24 VDC)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2	
Applicable crimp terminals		1.25-3 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A	
Accessories		None	
Insulation withstand voltage		500 VAC	
Noise immunity		500 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.2 (0.44)	

External Connections

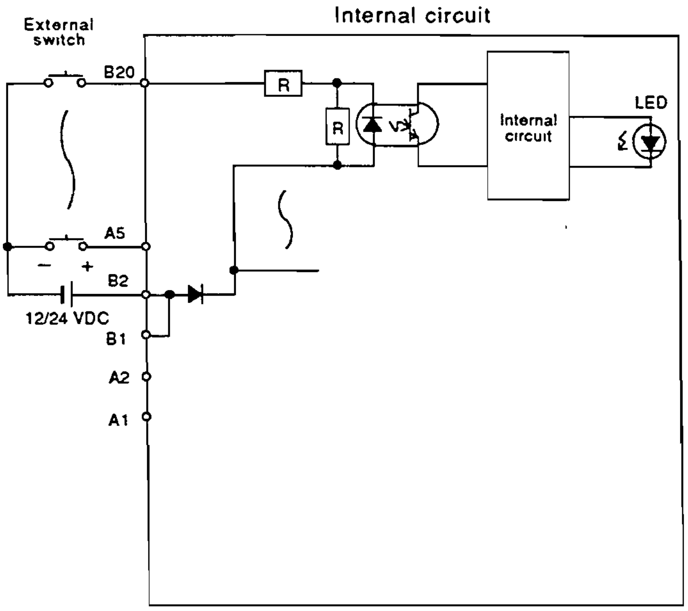


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

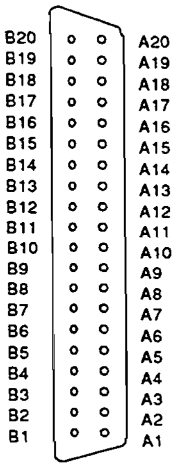
5.2.9 A1SX41 DC input module (sink type)

Specifications \ Model		DC Input Module (Sink Type) A1SX41		Appearance
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx 3 mA	Approx 7 mA	
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)		
Max simultaneous input points		60% (20 points/common) simultaneously ON (at 26.4 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/1 mA or lower		
Input impedance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		32 points/common (common terminals: B1, B2)		
Operating indicator		ON state is indicated (LEDs)		
External connections		40-pin connector		
Applicable wire size		0.3 mm^2		
Accessories		Connector (1 pce.) for external wiring (soldering type)		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
Internal current consumption (5 VDC)		80 mA (TYP, all points ON)		
Weight kg (lb)		0.21(0.46)		

External Connections



Pin Arrangement

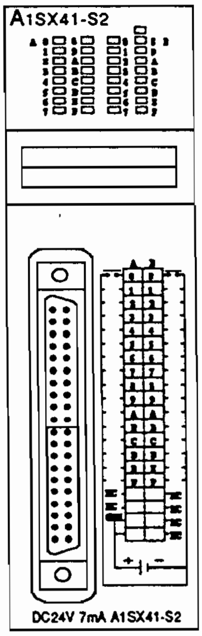


Front view

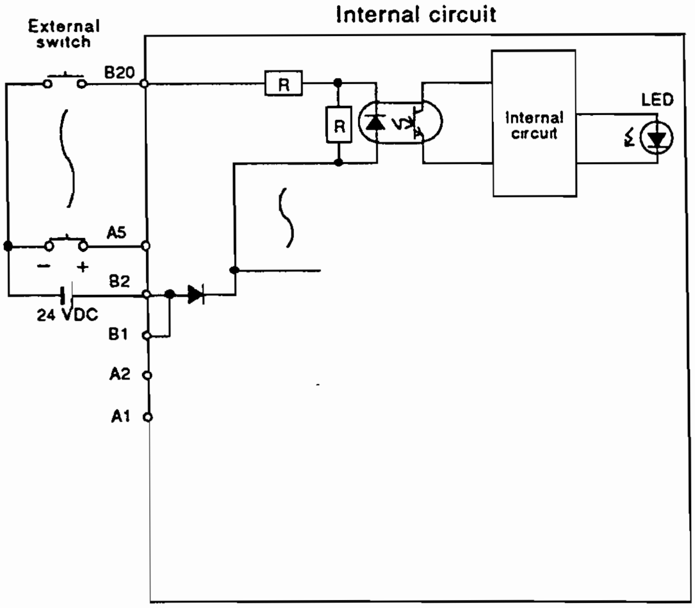
Pin No.	Signal Name (FH)	Pin No.	Signal Name (FH)
B20	X00	A20	X10
B19	X01	A19	X11
B18	X02	A18	X12
B17	X03	A17	X13
B16	X04	A16	X14
B15	X05	A15	X15
B14	X06	A14	X16
B13	X07	A13	X17
B12	X08	A12	X18
B11	X09	A11	X19
B10	X0A	A10	X1A
B9	X0B	A9	X1B
B8	X0C	A8	X1C
B7	X0D	A7	X1D
B6	X0E	A6	X1E
B5	X0F	A5	X1F
B4	Vacant	A4	Vacant
B3	Vacant	A3	Vacant
B2	COM	A2	Vacant
B1	COM	A1	Vacant

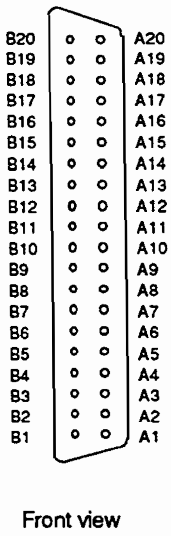
*1: Arrangement of pins A and B shown above is opposite to the arrangement of pins of the connector on the module.

5.2.10 A1SX41-S2 DC input module (sink type)

Specifications \ Model		DC Input Module (Sink Type) A1SX41-S2	Appearance
Number of input points		32 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 26.4 VDC (ripple: less than 5%)	
Max. simultaneous input points		60% (20 points/common) simultaneously ON (at 26.4 VDC)	
ON voltage/ON current		14 VDC or higher/3.5 mA or higher	
OFF voltage/OFF current		6.5 VDC or lower/1.7 mA or lower	
Input impedance		Approx. 3.3 kΩ	
Response time	OFF → ON	10 ms or less (24 VDC)	
	ON → OFF	10 ms or less (24 VDC)	
Common terminal arrangement		32 points/common (common terminals: B1, B2)	
Operating indicator		ON state is indicated (LEDs)	
External connections		40-pin connector	
Applicable wire size		0.3 mm^2	
Accessories		Connector (1 pce.) for external wiring (soldering type)	
Insulation withstand voltage		500 VAC	
Noise immunity		500 VAC	
Internal current consumption (5 VDC)		80 mA (TYP, all points ON)	
Weight kg (lb)		0.21(0.46)	

External Connections

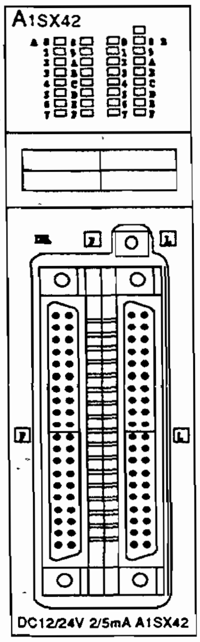




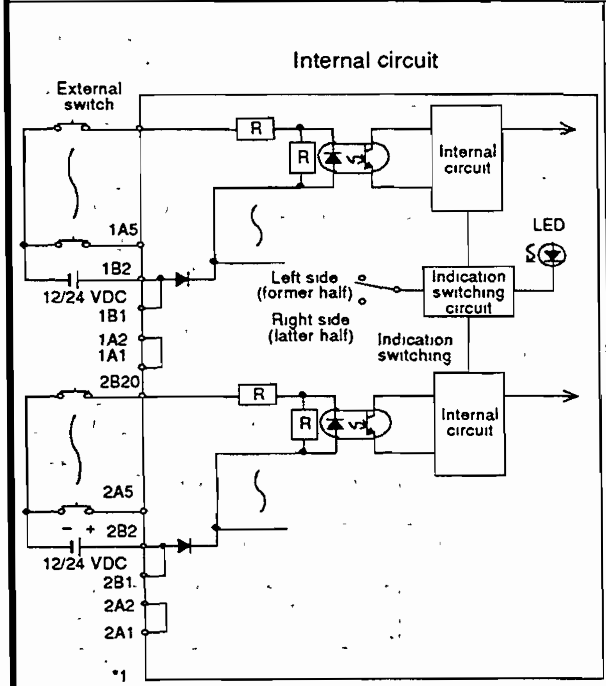
Pin Arrangement	Pin No.	Signal Name (FH)	Pin No.	Signal Name (FH)
	B20	X00	A20	X10
	B19	X01	A19	X11
	B18	X02	A18	X12
	B17	X03	A17	X13
	B16	X04	A16	X14
	B15	X05	A15	X15
	B14	X06	A14	X16
	B13	X07	A13	X17
	B12	X08	A12	X18
	B11	X09	A11	X19
	B10	X0A	A10	X1A
	B9	X0B	A9	X1B
	B8	X0C	A8	X1C
	B7	X0D	A7	X1D
	B6	X0E	A6	X1E
	B5	X0F	A5	X1F
	B4	Vacant	A4	Vacant
	B3	Vacant	A3	Vacant
	B2	COM	A2	Vacant
	B1	COM	A1	Vacant

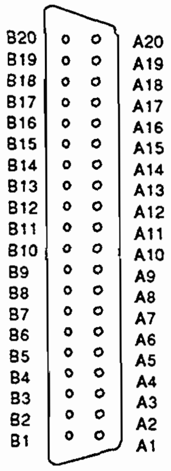
*1: Arrangement of pins A and B shown above is opposite to the arrangement of pins of the connector on the module.

5.2.11 A1SX42 DC input module (sink type)

Specifications \ Model		DC Input Module (Sink Type)		Appearance
		A1SX42		
Number of input points		64 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 2 mA	Approx. 5 mA	
Operating voltage range		10 2 to 26 4 VDC (ripple: less than 5%)		
Max. simultaneous input points		50% (16 points/common) simultaneously ON (at 24 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/0.6 mA or lower		
Input impedance		Approx. 5 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		32 points/common (common terminals: 1B1, 1B2, 2B1, 2B2)		
Operating indicator		ON state is indicated (LEDs), 32-bit indication by switch		
External connections		40-pin connector		
Applicable wire size		0.3 mm^2		
Accessories		Connectors (2 pces.) for external wiring (soldering type)		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
Internal current consumption (5 VDC)		90 mA (TYP, all points ON)		
Weight kg (lb)		0.28(0 62)		

External Connections



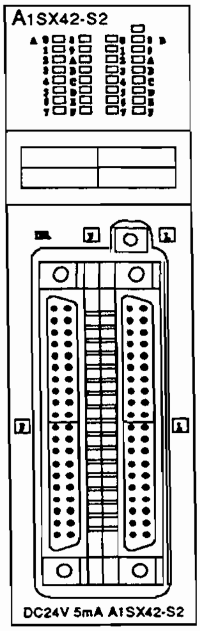
Pin Arrangement	Pin No	Signal Name (FH)	Pin No.	Signal Name (FH)	Pin No.	Signal Name (LH)	Pin No.	Signal Name (LH)
 Front view	1B20	X00	1A20	X10	2B20	X20	2A20	X30
	1B19	X01	1A19	X11	2B19	X21	2A19	X31
	1B18	X02	1A18	X12	2B18	X22	2A18	X32
	1B17	X03	1A17	X13	2B17	X23	2A17	X33
	1B16	X04	1A16	X14	2B16	X24	2A16	X34
	1B15	X05	1A15	X15	2B15	X25	2A15	X35
	1B14	X06	1A14	X16	2B14	X26	2A14	X36
	1B13	X07	1A13	X17	2B13	X27	2A13	X37
	1B12	X08	1A12	X18	2B12	X28	2A12	X38
	1B11	X09	1A11	X19	2B11	X29	2A11	X39
	1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
	1B9	X0B	1A9	X1B	2B9	X2B	2A9	X3B
	1B8	X0C	1A8	X1C	2B8	X2C	2A8	X3C
	1B7	X0D	1A7	X1D	2B7	X2D	2A7	X3D
	1B6	X0E	1A6	X1E	2B6	X2E	2A6	X3E
	1B5	X0F	1A5	X1F	2B5	X2F	2A5	X3F
	1B4	Vacant	1A4	Vacant	2B4	Vacant	2A4	Vacant
	1B3	Vacant	1A3	Vacant	2B3	Vacant	2A3	Vacant
	1B2	COM1	1A2	Vacant	2B2	COM2	2A2	Vacant
	1B1	COM1	1A1	Vacant	2B1	COM2	2A1	Vacant

*1 : In the pin number column, the pins beginning with "1[ ][ ]" are left connector pins and those beginning with "2[ ][ ]" are right connector pins.

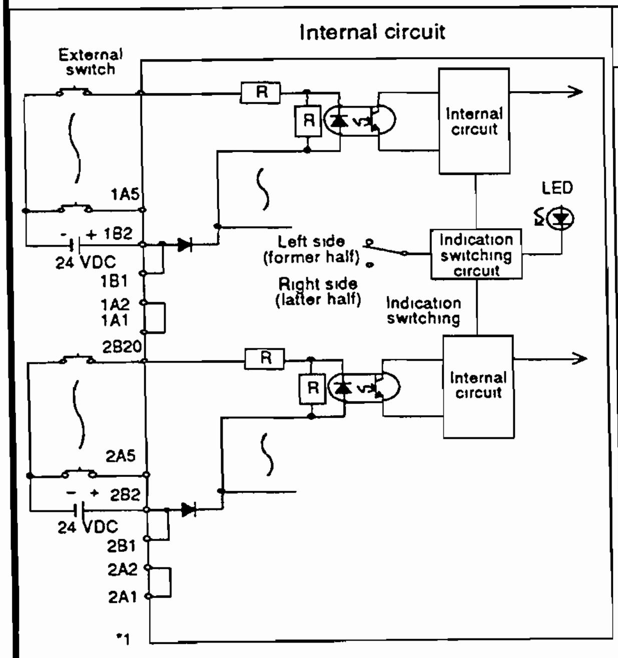
*2 : With the switch set to the left side position, the status of former half devices (X00 to X1F) is displayed by LEDs. When it is set to the right side, the status of latter half devices (X20 to X3F) is displayed by LEDs.

*3 : Arrangement of pins A and B shown above is opposite to the arrangement of pins of the connector on the module.

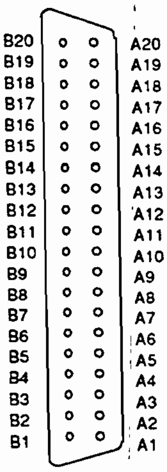
5.2.12 A1SX42-S2 DC input module (sink type)

Model / Specifications		DC Input Module (Sink Type) A1SX42-S2	Appearance
Number of input points		64 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 5 mA	
Operating voltage range		19 2 to 26 4 VDC (ripple: less than 5%)	
Max simultaneous input points		50% (16 points/common) simultaneously ON (at 24 VDC)	
ON voltage/ON current		17 5 VDC or higher/3.5 mA or higher	
OFF voltage/OFF current		7 VDC or lower/1 7 mA or lower	
Input impedance		Approx. 4.7 kΩ	
Response time	OFF → ON	10 ms or less (24 VDC)	
	ON → OFF	10 ms or less (24 VDC)	
Common terminal arrangement		32 points/common (common terminals: 1B1, 1B2, 2B1, 2B2)	
Operating indicator		ON state is indicated (LEDs), 32-bit indication by switch	
External connections		40-pin connector	
Applicable wire size		0.3 mm^2	
Accessories		Connectors (2 pces) for external wiring (soldering type)	
Insulation withstand voltage		500 VAC	
Noise immunity		500 VAC	
Internal current consumption (5 VDC)		90 mA (TYP, all points ON)	
Weight kg (lb)		0 28(0.62)	

External Connections



Pin Arrangement



Front view

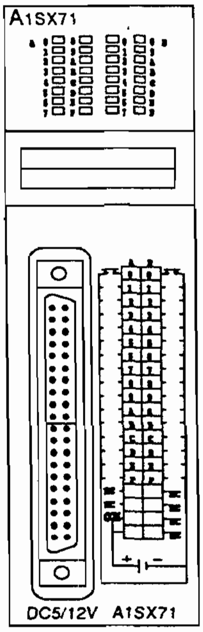
Pin No.	Signal Name (FH)	Pin No.	Signal Name (FH)	Pin No.	Signal Name (LH)	Pin No.	Signal Name (LH)
1B20	X00	1A20	X10	2B20	X20	2A20	X30
1B19	X01	1A19	X11	2B19	X21	2A19	X31
1B18	X02	1A18	X12	2B18	X22	2A18	X32
1B17	X03	1A17	X13	2B17	X23	2A17	X33
1B16	X04	1A16	X14	2B16	X24	2A16	X34
1B15	X05	1A15	X15	2B15	X25	2A15	X35
1B14	X06	1A14	X16	2B14	X26	2A14	X36
1B13	X07	1A13	X17	2B13	X27	2A13	X37
1B12	X08	1A12	X18	2B12	X28	2A12	X38
1B11	X09	1A11	X19	2B11	X29	2A11	X39
1B10	X0A	1A10	X1A	2B10	X2A	2A10	X3A
1B9	X0B	1A9	X1B	2B9	X2B	2A9	X3B
1B8	X0C	1A8	X1C	2B8	X2C	2A8	X3C
1B7	X0D	1A7	X1D	2B7	X2D	2A7	X3D
1B6	X0E	1A6	X1E	2B6	X2E	2A6	X3E
1B5	X0F	1A5	X1F	2B5	X2F	2A5	X3F
1B4	Vacant	1A4	Vacant	2B4	Vacant	2A4	Vacant
1B3	Vacant	1A3	Vacant	2B3	Vacant	2A3	Vacant
1B2	COM1	1A2	Vacant	2B2	COM2	2A2	Vacant
1B1	COM1	1A1	Vacant	2B1	COM2	2A1	Vacant

*1 : In the pin number column, the pins beginning with "1[ ][ ]" are left connector pins and those beginning with "2[ ][ ]" are right connector pins.

*2 : With the switch set to the left side position, the status of former half devices (X00 to X1F) is displayed by LEDs. When it is set to the right side, the status of latter half devices (X20 to X3F) is displayed by LEDs.

*3 : Arrangement of pins A and B shown above is opposite to the arrangement of pins of the connector on the module.

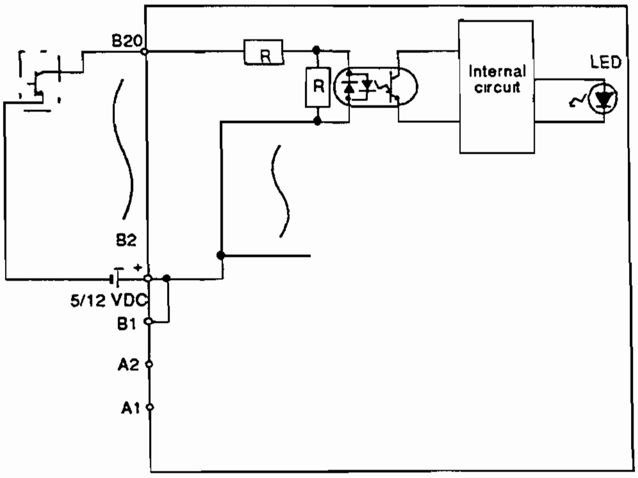
5.2.13 A1SX71 DC input module (sink/source common type)

Model		DC Input Module (Sink Type)		
Specifications		**A1SX71**		**Appearance**
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		5 VDC	12 VDC	
Rated input current		1.2 mA	3.3 mA	
Operating voltage range		4.5 to 13.2 VDC (ripple. less than 5%)		
Max. simultaneous input points		100% (32 points/common) simultaneously ON		
ON voltage/ON current		3.5 VDC or higher/1 mA or higher		
OFF voltage/OFF current		1.0 VDC or lower/0.1 mA or lower		
Input impedance		Approx. 3.5 kΩ		
Response time	OFF → ON	1.5 ms or less		
	ON → OFF	3 ms or less		
Common terminal arrangement		32 points/common (common terminals: B1, B2)		
Operating indicator		ON state is indicated (LEDs)		
External connections		40-pin connector		
Applicable wire size		0.3 mm^2		
Accessories		Connector (1 pce.) for external wiring (soldering type)		
Insulation withstand voltage		500 VAC		
Noise immunity		250 VAC		
Internal current consumption (5 VDC)		75 mA (TYP, all points ON)		
Weight kg (lb)		0.19 (0.42)		

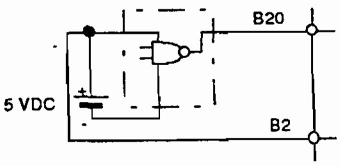
External Connections

Open collector (Sink)

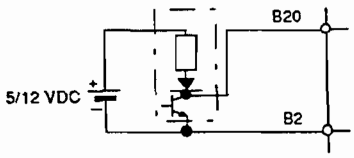
Internal circuit



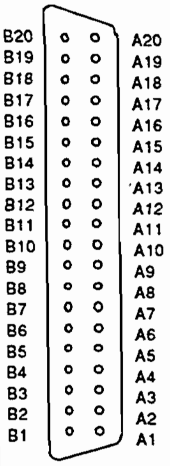
TTL, LS-TTL, CMOS buffer (Sink)



Sensor (Source)



Pin Arrangement

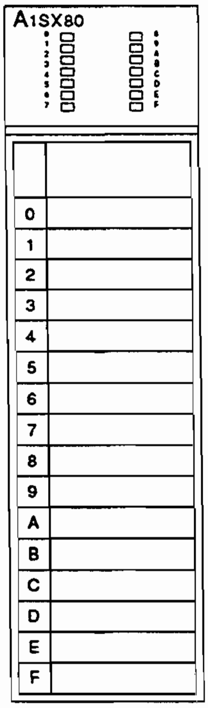


Front view

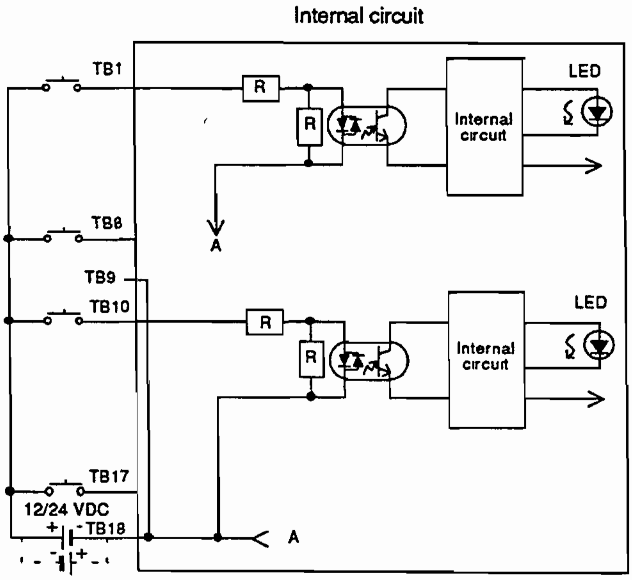
Pin No.	Signal Name	Pin No.	Signal Name
B20	X00	A20	X10
B19	X01	A19	X11
B18	X02	A18	X12
B17	X03	A17	X13
B16	X04	A16	X14
B15	X05	A15	X15
B14	X06	A14	X16
B13	X07	A13	X17
B12	X08	A12	X18
B11	X09	A11	X19
B10	X0A	A10	X1A
B9	X0B	A9	X1B
B8	X0C	A8	X1C
B7	X0D	A7	X1D
B6	X0E	A6	X1E
B5	X0F	A5	X1F
B4	Vacant	A4	Vacant
B3	Vacant	A3	Vacant
B2	COM	A2	Vacant
B1	COM	A1	Vacant

*1: Arrangement of pins A and B shown above is opposite to the arrangement of pins of the connector on the module.

5.2.14 A1SX80 DC input module (sink/source common type)

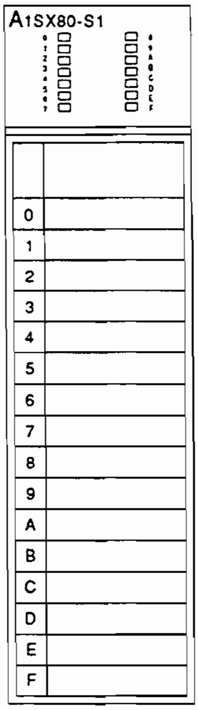
Specifications \ **Model**		**DC Input Module (Sink/Source Common Type)**		
		A1SX80		**Appearance**
Number of input points		16 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 3 mA	Approx. 7 mA	
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)		
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/1 mA or lower		
Input impedance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)		
Operating indicator		ON state is indicated (LEDs)		
External connections		20-point terminal block connector (M3.5 x 7 screws)		
Applicable wire size		0.75 to 1.5 mm^2		
Applicable crimp terminals		1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A		
Accessories		None		
Insulation withstand voltage		500 VAC		
Noise immunity		1000 VAC		
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)		
Weight kg (lb)		0.2(0.44)		

External Connections

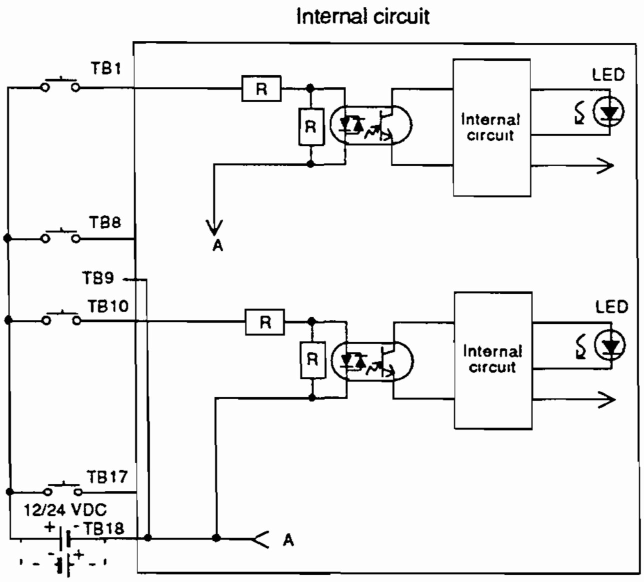


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

5.2.15 A1SX80-S1 DC input module (sink/source common type)

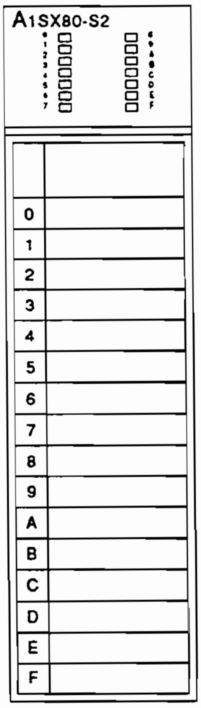
Specifications \ Model		DC Input Module (Sink/Source Common Type)	
		A1SX80-S1	**Appearance**
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 26.4 VDC (ripple less than 5%)	
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)	
ON voltage/ON current		17 VDC or higher/5 mA or higher	
OFF voltage/OFF current		5 VDC or lower/1.7 mA or lower	
Input impedance		Approx. 3.3 kΩ	
Response time	OFF → ON	0.4 ms or less (24 DCV)	
	ON → OFF	0.5 ms or less (24 DCV)	
Common terminal		16 points/common (common terminals. TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 × 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2	
Applicable crimp terminals		1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A	
Accessories		None	
Insulation withstand voltage		500 VAC	
Noise immunity		1000 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.2 (0.44)	

External connections

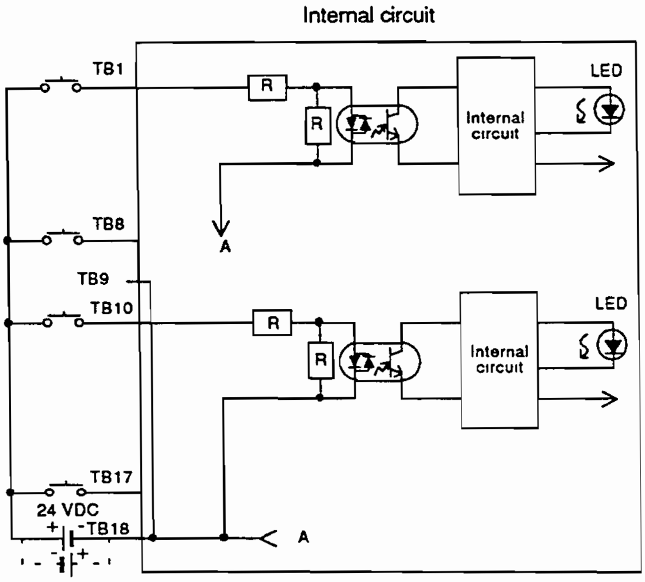


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vccant

5.2.16 A1SX80-S2 DC input module (sink/source common type)

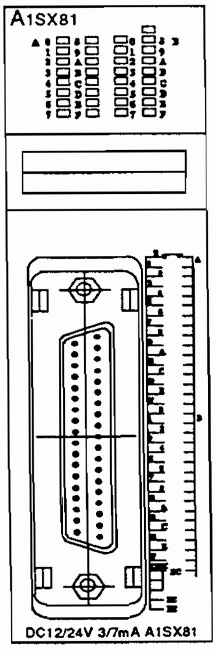
Specifications \ Model		DC Input Module (Sink/Source Common Type)	
		A1SX80-S2	Appearance
Number of input points		16 points	
Insulation method		Photocoupler	
Rated input voltage		24 VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 26.4 VDC (ripple: less than 5%)	
Max. simultaneous input points		100% simultaneously ON (at 26.4 VDC)	
ON voltage/ON current		13 VDC or higher/3.5 mA or higher	
OFF voltage/OFF current		6 VDC or lower/1.7 mA or lower	
Input impedance		Approx. 3.3 kΩ	
Response time	OFF → ON	10 ms or less (24 VDC)	
	ON → OFF	10 ms or less (24 VDC)	
Common terminal arrangement		16 points/common (common terminals: TB9, TB18)	
Operating indicator		ON state is indicated (LEDs)	
External connections		20-point terminal block connector (M3.5 x 7 screws)	
Applicable wire size		0.75 to 1.5 mm^2	
Applicable crimp terminals		1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-3 V1.25-YS3A V2-S3 V2-YS3A	
Accessories		None	
Insulation withstand voltage		500 VAC	
Noise immunity		1000 VAC	
Internal current consumption (5 VDC)		50 mA (TYP, all points ON)	
Weight kg (lb)		0.2(0.44)	

External Connections

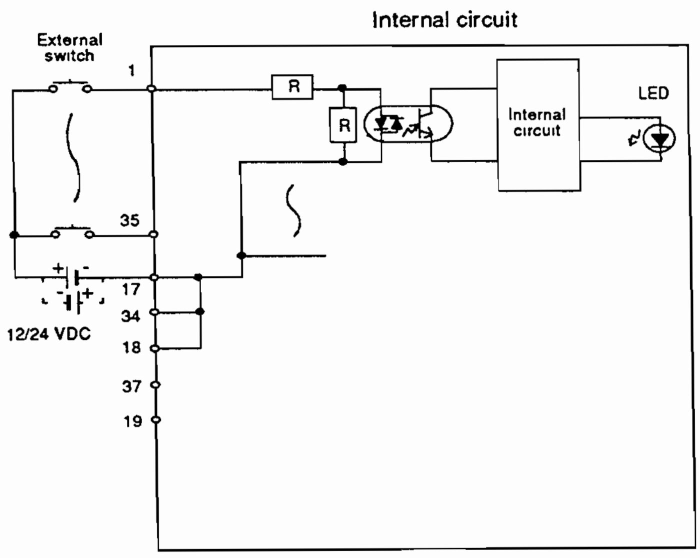


Terminal No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM
TB19	Vacant
TB20	Vacant

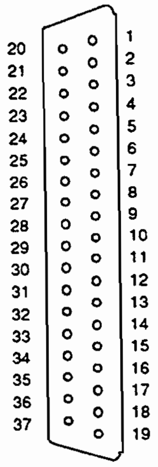
5.2.17 A1SX81 DC input module (sink/source common type)

Model Specifications		DC Input Module (Sink/Source Common Type)		
		A1SX81		Appearance
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 3 mA	Approx. 7 mA	
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)		
Max. simultaneous input points		60% simultaneously ON (at 26.4 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/1 mA or lower		
Input impedance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		32 points/common (common terminals: 17, 18, 36)		
Operating indicator		ON state is indicated (LEDs)		
External connections		37-pin D sub-connector		
Applicable wire size		0.3 mm^2		
Accessories		Connector (1 pce.) for external wiring (soldering type)		
Insulation withstand voltage		500 VAC		
Noise immunity		1000 VAC		
Internal current consumption (5 VDC)		80 mA (TYP, all points ON)		
Weight kg (lb)		0.24(0.53)		

External Connections



Pin Arrangement

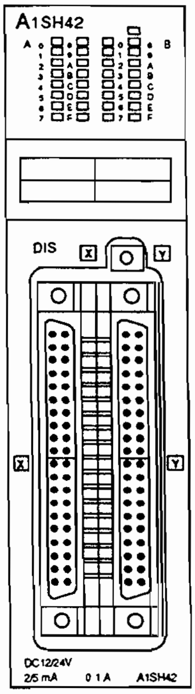


Front view

Pin No.	Signal Name	Pin No.	Signal Name
1	X00	9	X10
20	X01	28	X11
2	X02	10	X12
21	X03	29	X13
3	X04	11	X14
22	X05	30	X15
4	X06	12	X16
23	X07	31	X17
5	X08	13	X18
24	X09	32	X19
6	X0A	14	X1A
25	X0B	33	X1B
7	X0C	15	X1C
26	X0D	34	X1D
8	X0E	16	X1E
27	X0F	35	X1F
17	COM	37	Vacant
36	COM	19	Vacant
18	COM		

5.4 Input/Output Combination Module Specifications

5.4.1 A1SH42 input/output module

Specifications \ Model		Input/Output Combination Module		
		Input Specifications		**Appearance**
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 2 mA	Approx. 5 mA	
Operating voltage range		10.2 to 26.4 VDC (ripple: less than 5%)		
Max. simultaneuos input points		60% (20 points/common) simultaneuosly ON (at 24 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/0.6 mA or lower		
Input impedance		Approx. 5 kΩ		
Response time	OFF → ON	10 ms or less (24 VDC)		
	ON → OFF	10 ms or less (24 VDC)		
Common terminal arrangement		32 points/common (common terminals: 1B1, 1B2)		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
		Output Specifications		
Number of input points		32 points		
Insulation method		Photocoupler		
Rated input voltage		12/24 VDC		
Operating voltage range		10.2 to 30 VDC (peak voltage 30 VDC)		
Max. load current		0.1 A/point, 1.6 A/common		
Max. input current		0.4 A 10 ms or less		
Leakage current at OFF circuit		0.1 mA or less		
Max. voltage drop at ON circuit		1.0 VDC (TYP) 0.1 A, 2.5 VDC (MAX) 0.1 A		
Response time	OFF → ON	2 ms or less		
	ON → OFF	2 ms or less (resistive load)		
Surge absorber		Zender diode		
Fuse rating		Fuse 3.2 A (1 piece/common), not replaceable *1		
Fuse capacity		50 A		
Error display		LED goes ON when fuse blows: signal output to PC CPU *2		
Common terminal arrangement		32 points/common (common terminals: 2A1, 2A2)		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
External power supply	Voltage	12/24 VDC (10.2 to 30 VDC)		
	Current	8 mA (TYP 24 VDC/common)		
		Common Specifications		
Number of I/O points		32 (I/O allocation is set as a 32-point output module)		
Operating indicator		ON state is indicated (LEDs), 32-points indication by switch		
External connections		40-pin connector		
Applicable wire size		0.3 mm^2		
Accessories		Connector (2 cps.) for external wiring (soldering type)		
Internal current consumption (5 VDC)		500 mA (TYP, all points ON)		
Weight kg (lb)		0.27 (0.59)		

*1 : The fuse in the output module is provided to prevent the external wiring form burning in case of a short in the module's output. Therefore, the fuse might 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. indicating LED will also light when the external power supply is shut OFF.

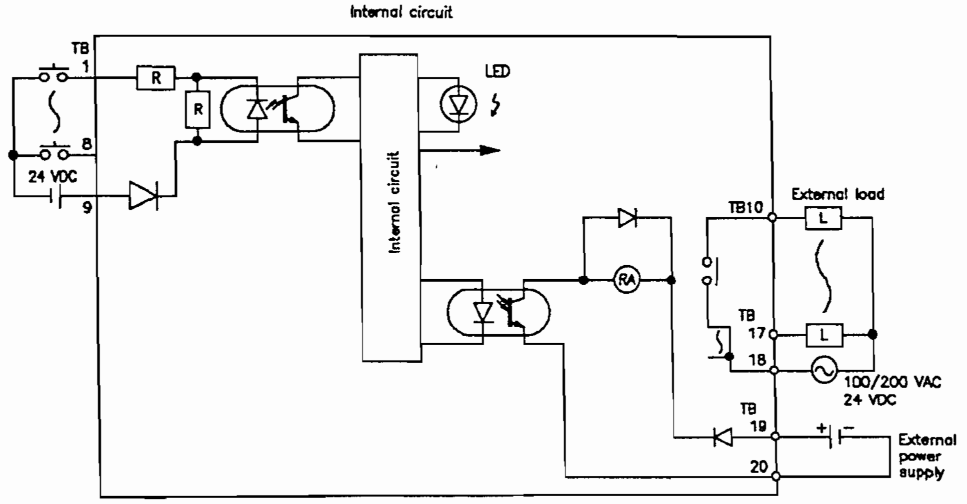
5.4.4 A1SX48Y18 I/O module (24 VDC input (sink type), relay contact output)

Input Specifications		
Number of input points		8 points
Insulation method		Photocoupler
Rated input voltage Rated input current		24 VDC, approx. 7 mA
Operating voltage range		19.2 to 26.4 VDC (ripple. less than 5%)
ON voltage/ON current		14 VDC or higher/3.5 mA or higher
OFF voltage/OFF current		6.5 VDC or lower/1.7 mA or lower
Input resistance		Approx. 3.3 KΩ
Input method		Sink input (method by which the input current flows out)
Response time	OFF → ON	10 ms or less (24 VDC)
	ON → OFF	10 ms or less (24 VDC)
Common method		8 points/common (common terminal: TB9)
Operation indicator		Provided (The LED lights when the input is ON.)
Maximum simultaneous input points		100 % simultaneous ON (at 26.4 VDC)
Insulation withstand voltage		500 VAC
Noise immunity		500 VAC

Output Specifications		
Number of output points		8 points
Insulation method		Photocoupler
Rated switching voltage and current		24 VDC 2 A (resistive load) 240 VAC 2A (COSϕ=1)/point, 8 A/common
Minimum switching load		5 VDC 1mA
Maximum switching voltage		264 VDC 125 VDC
Maximum switching frequency		3600 times/hour
Service life	Mechanical	20,000,000 times of switching or over
	Electrical	At rated switching voltage and current loads 100,000 times of switching or over
		At 200 VAC 1.5 A, 240 VAC 1 A (COSϕ=0.7) 100,000 times of switching or over
		At 200 VAC 1 A, 240 VAC 0.5 A (COSϕ=0.35) 100,000 times of switching or over
		At 24 VDC 1 A, 100 VDC 0.1 A (L/R = 7 ms) 100,000 times of switching or over
Response time	OFF → ON	10 ms or less
	ON → OFF	12 ms or less (resistive load)
Insulation withstand voltage		1500 VAC
Noise immunity		1000 VAC
External power supply (relay coil drive)	Voltage	24 VDC ±0%, ripple voltage: 4 Vp-p or less
	Current	45 mA (TYP. 24 VDC all points ON)
Surge absorber		Not provided
Common method		8 points/common (common terminal: TB18)

Operation indicator	Provided (The LED lights when the input/output is ON.)
Number of I/O points	16 points (Make I/O allocation as a 16-point output module.)
Internal current consumption (5 VDC)	85 mA (TYP. all points ON)
External wiring connection method	20-point terminal block connector (M3.5 x 7 screw)
Applicable cable size	0.75 to 1.5 mm^2
Applicable solderless terminal	1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A
Weight kg (lb)	0.225 (0.495)

External Connections



Pin No.	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM1
TB10	X08
TB11	X09
TB12	X0A
TB13	X0B
TB14	X0C
TB15	X0D
TB16	X0E
TB17	X0F
TB18	COM2
TB19	24 VDC
TB20	0 V

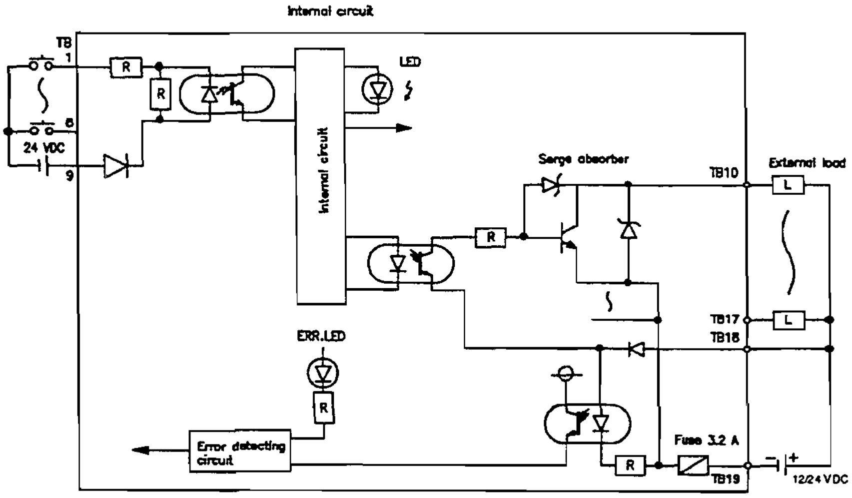
5.4.5 A1SX48Y58 I/O module (24 VDC input (sink type), 12/24 VDC transistor output)

Input Specifications		
Number of input points		8 points
Insulation method		Photocoupler
Rated input voltage		24 VDC
Rated input current		Approx. 7 mA
Operating voltage range		19.2 to 26.4 VDC (ripple: less than 5%)
ON voltage / ON current		14 VDC or higher/3.5 mA or higher
OFF voltage / OFF current		6.5 VDC or lower/1.7 mA or lower
Input resistance		Approx. 3.3 KΩ
Input method		Sink input (method by which the input current flows out)
Response time	OFF → ON	10 ms or less (24 VDC)
	ON → OFF	10 ms or less (24 VDC)
Insulation withstand voltage		500 VAC
Noise immunity		500 VAC
Common method		8 points/common (common terminal: TB9)
Operation indicator		Provided (The LED lights when the input is ON.)
Maximum simultaneous input points		100 % simultaneous ON (at 26.4 VDC)

Output Specifications		
Number of output points		8 points
Insulation method		Photocoupler
Rated load voltage		12/24 VDC
Operating voltage range		10.2 to 30 VDC (peak voltage 30 VDC)
Maximum load current		0.5 A/point, 2 A/common
Maximum inrush current		4 A 10 ms or less
Leakage current at OFF circuit		0.1 mA or less
Maximum voltage drop at ON circuit		0.9 V (TYP.) 0.5 A 1.5 V (MAX.) 0.5 A
Response time	OFF → ON	2 ms or less
	ON → OFF	2 ms or less (resistive load)
Insulation withstand voltage		500 VAC
Noise immunity		500 VAC
External power supply	Voltage	12/24 VDC (10.2 to 30 VDC)
	Current	60 mA (TYP. 24 VDC per common)
Surge absorber		Zener diode
Fuse rating		Fuse 3.2 A (1 per common) Not replaceable
Fuse breaking capacity		5.0 A
Common method		8 points/common (common terminal: TB19)

Operation indicator	Provided (The LED lights when the input/output is ON.)
Number of I/O points	16 points (Make I/O allocation as a 16-point output module.)
Internal current consumption (5 VDC)	60 mA (TYP. all points ON)
External wiring connection method	20-point terminal block connector (M3.5 x 7 screw), 2 connectors
Applicable cable size	0.75 to 1.5 mm^2
Applicable solderless terminal	1.25-3.5 1.25-YS3A 2-3.5 2-YS3A V1.25-M3 V1.25-YS3A V2-S3 V2-YS3A
Weight kg (lb)	0.2 (0 44)

External Connections



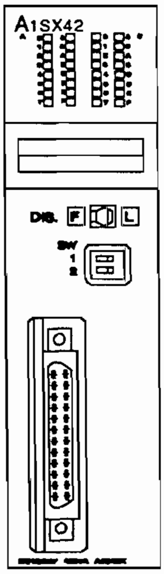
Pin No	Signal Name
TB1	X00
TB2	X01
TB3	X02
TB4	X03
TB5	X04
TB6	X05
TB7	X06
TB8	X07
TB9	COM1
TB10	Y08
TB11	Y09
TB12	Y0A
TB13	Y0B
TB14	Y0C
TB15	Y0D
TB16	Y0E
TB17	Y0F
TB18	12/24 VDC
TB19	COM2
TB20	Vacant

*1 : The fuse in the output module is provided to prevent the external wiring form burning in case of a short in the module's output. Therefore, the fuse might not be able to protect output devices.

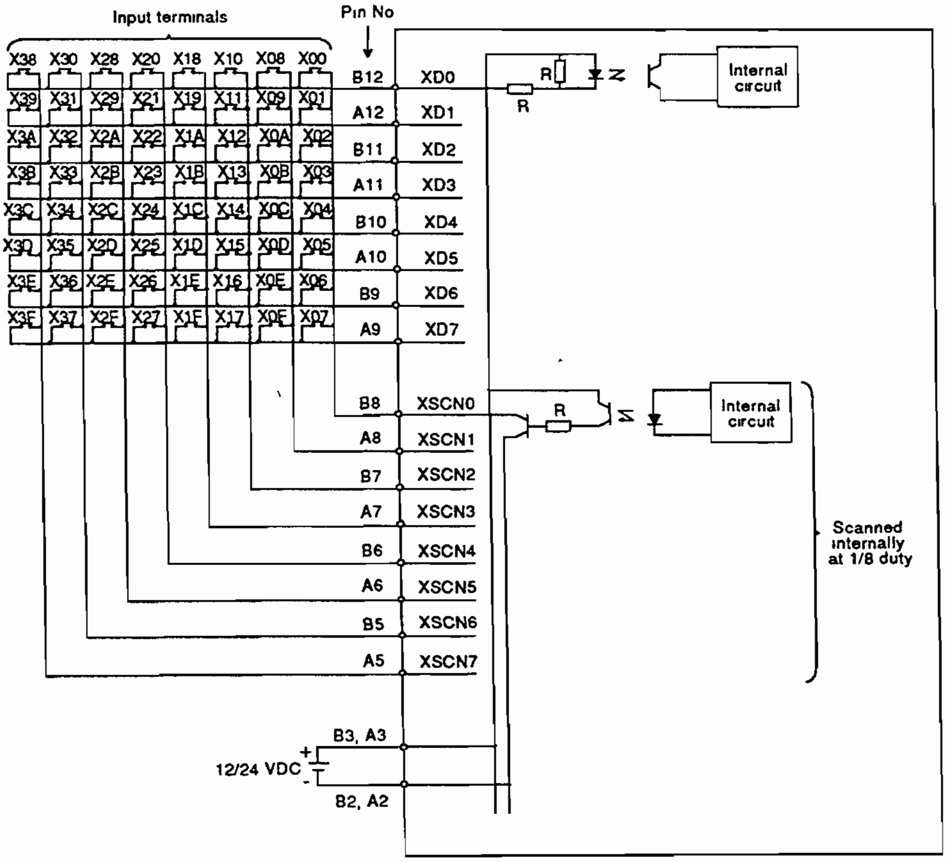
If an output device is damaged in a failure mode other than a short circuit, the fuse might not be blown.

*2 : The ERR. indicating LED will also light when the external power supply is shut OFF.

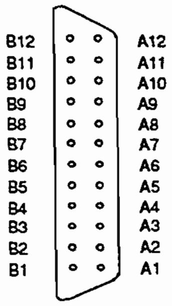
5.4.6 A1S42X dynamic input module

Specifications \ Model		Dynamic Input Module A1S42X		Appearance
Number of output points *1		16/32/48/64 points (switch setting)		
Insulation method		Photocoupler		
Rated input voltage		12 VDC	24 VDC	
Rated input current		Approx. 4 mA	Approx. 9 mA	
Operating voltage range		10.2 to 26 4 VDC (ripple : less than 5 %)		
Max. simultaneous input points		100 % simultaneously ON (at 26.4 VDC)		
ON voltage/ON current		8 VDC or higher/2 mA or higher		
OFF voltage/OFF current		4 VDC or lower/1 mA or lower		
Input impedance		Approx. 2.4 kΩ		
Response time	OFF → ON	0.4 ms or less (24 VDC)		
	ON → OFF	0.4 ms or less (24 VDC)		
Dynamic scan cycle		13.3 ms		
Operating indicator		On state is indicated (LEDs), 32-points indication by switch		
External connections		24-pin connector		
Applicable wire size		0 3 mm^2		
Accessories		Connector (1 pce.) for external wiring (soldering type)		
Insulation withstand voltage		500 VAC		
Noise immunity		500 VAC		
Internal current consumption (5 VDC)		80 mA (TYP, all points ON)		
Weight kg (lb)		0.18 (0.40)		

External Connections



Pin Arrangement



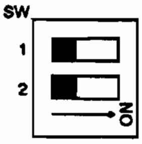
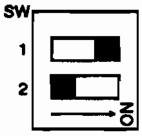
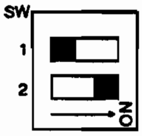
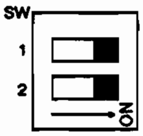
Front view

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

*1 Be sure to connect a diode to each switch when there is a case that 2 or more switches are pressed simultaneously. (Refer to the figure on the right.)

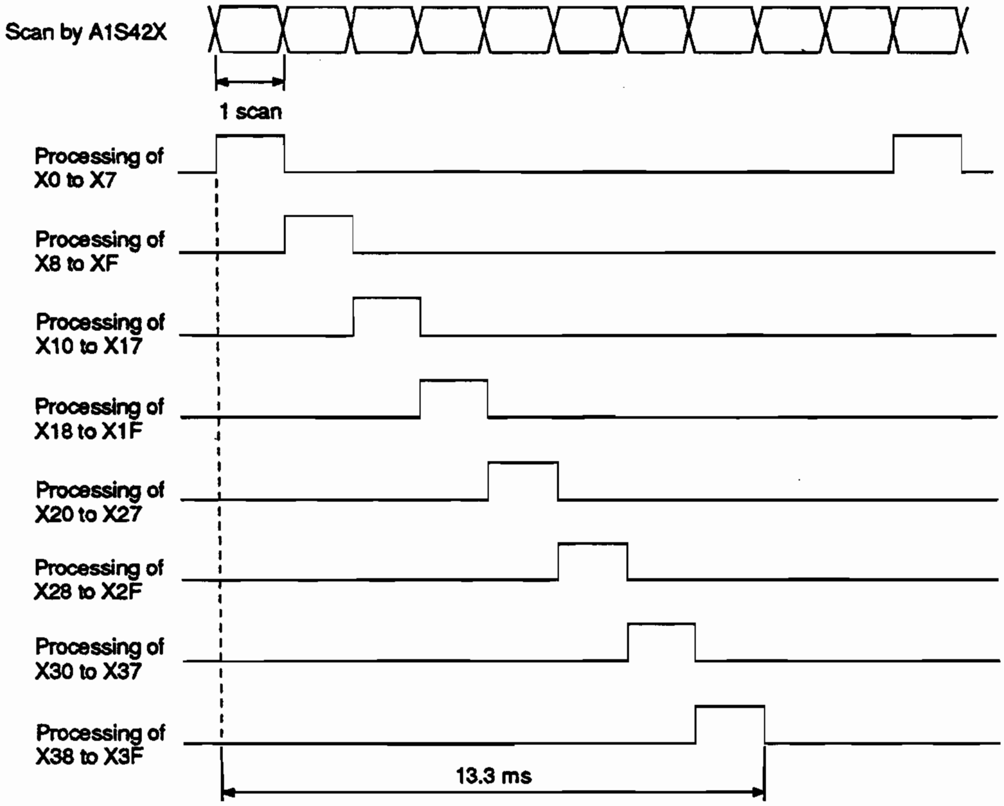
(1) Number of occupied I/O points setting

The Number of occupied I/O points is set by the DIP switches on the front surface of the module. It is factory-set to 64 points.

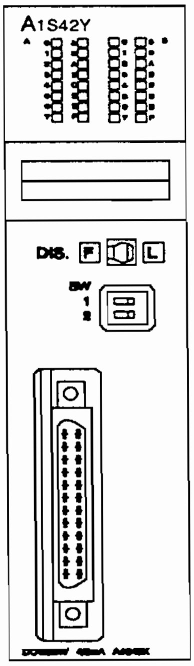
Number of occupied I/O points	**16 points**	**32 points**	**48 points**	**64 points**
Switch setting				

(2) Dynamic scan method

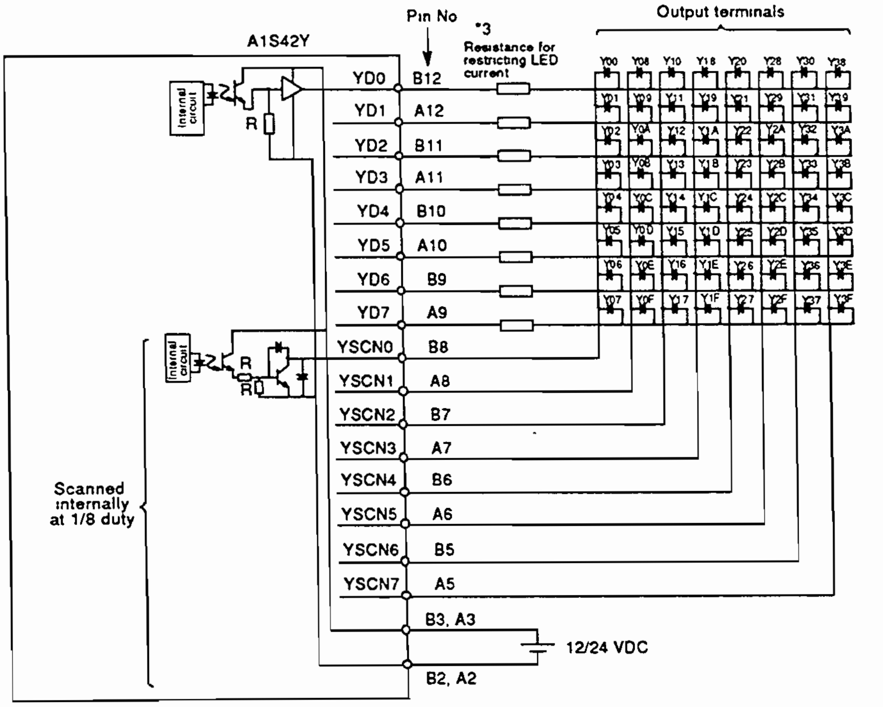
In the dynamic scan method, the whole number of occupied I/O points is divided into several groups of specified number of points, and processed in several scans. 64 input points are divided into 8 groups of 8 points, and processed by group as shown in the figure below. Even if the number of occupied I/O points is set at 16, 32, or 48 points, dynamic scan cycle is fixed at 13.3 ms.



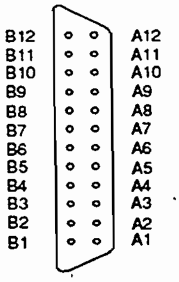
5.4.7 A1S42Y dynamic output module

Specifications \ Model		Transistor Output Module A1S42Y	Appearance
Number of output points		16/32/48/64 points (switch setting)	
Insulation method		Photocoupler	
Rated input voltage		12/24 VDC	
Operating voltage range		10.2 to 26.4 VDC (ripple : less than 5 %)	
Max. load current		0.1 A/point	
Leakage current at OFF circuit		0.1 mA or less	
Max. volgate drop at ON circuit		Source : 1.1 VDC, Sink : 1.5 VDC	
Response time	OFF → ON	2 ms or less (resistive load)	
	ON → OFF	2 ms or less (resistive load)	
Fuse rating		Fuse 1.6 A, not replaceable *1	
Fuse capacity		50 A	
Error display		LED goes ON when fuse blows : signal output to PC CPU *2	
Operating indicator		On state is indicated (LEDs), 32-points indication by switch	
External connections		24-pin connector	
Applicable wire size		0.3 mm^2	
Accessories		Connector (1 pce.) for external wiring (soldering type)	
Insulation withstand voltage		500 VAC	
Noise immunity		500 VAC	
External power supply	Volgate	12/24 VDC (10.2 to 26.4 VDC)	
	Current	8 mA (TYP, 24 VDC/common)	
Internal current consumption (5 VDC)		100 mA (TYP, all points ON)	
Weight kg (lb)		0.19 (0.42)	

External Connections



Pin Arrangement



Front view

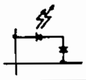
Pin No.	Signal Name (FH)	Pin No.	Signal Nane (FH)
B12	YD0	A12	YD1
B11	YD2	A11	YD3
B10	YD4	A10	YD5
B9	YD6	A9	YD7
B8	YSCN0	A8	YSCN1
B7	YSCN2	A7	YSCN3
B6	YSCN4	A6	YSCN5
B5	YSCN6	A5	YSCN7
B4	Vacant	A4	Vacant
B3	12/24 VDC	A3	12/24 VDC
B2	0V	A2	0V
B1	Vacant	A1	Vacant

[*1] The fuse in the output module is provided to prevent the external wiring from burning in case of a short in the module's output. Therefore, the fuse might 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. indicating LED will also light when the external power supply is shut OFF.

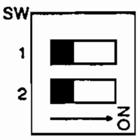
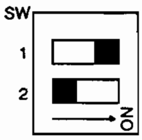
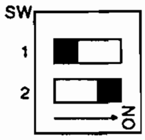
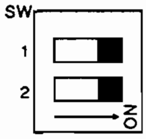
[*3] Install the resistance for restricting LED current outside the A1S42Y module.

[*4] Power supply voltage (24/12 VDC) is applied to the reverse direction of the LED. If opposite voltage resistance is not enough, connect a diode for serial protection to each LED.



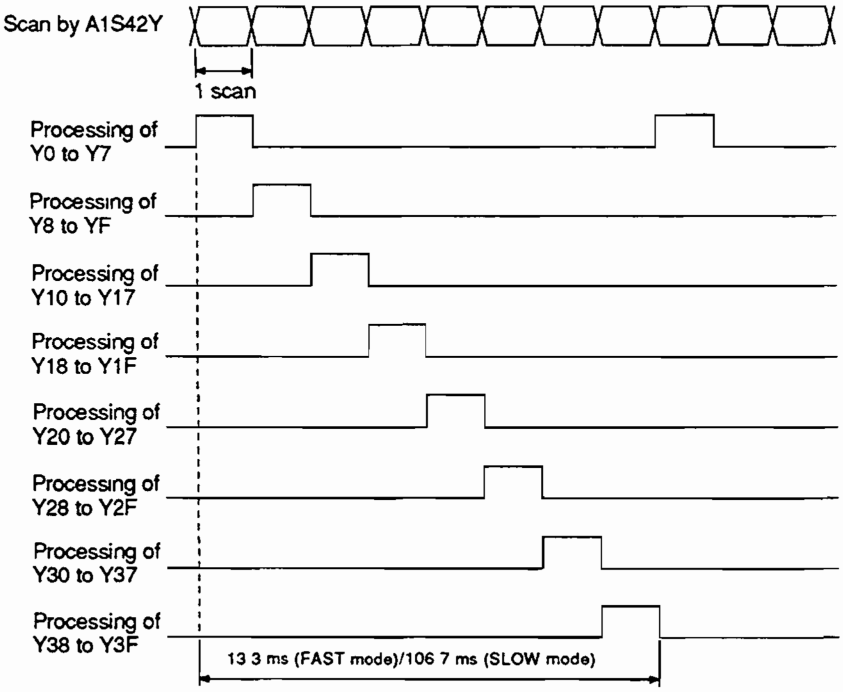
(1) Number of occupied I/O points setting

The number of occupied I/O points is set by the DIP switches on the front surface of the module. It is factory-set to 64 points.

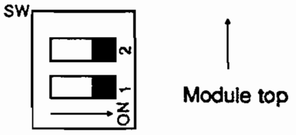
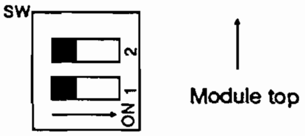
Number of occupied I/O points	16 points	32 points	48 points	64 points
Switch setting				

(2) Dynamic scan method and dynamic scan cycle setting

(a) Dynamic scan method
In the dynamic scan method, the whole number of occupied I/O points is divided into several groups of specified number of points, and processed in several scans. 64 input points are divided into 8 groups of 8 points, and processed by group as shown in the figure below. Even if the number of occupied I/O points is set at 16, 32, or 48 points, dynamic scan cycle is fixed at 13.3/106.7 ms.



(b) Dynamic scan cycle setting
Dynamic scan cycle is set by the DIP switches on the rear surface of the module. It is factory-set to FAST mode.

FAST mode	SLOW mode
	

5.5 Blank Cover (A1SG60), Dummy Module (A1SG62) Specifications

The A1SG60 blank cover is used to protect base unit vacant slots against dust etc.

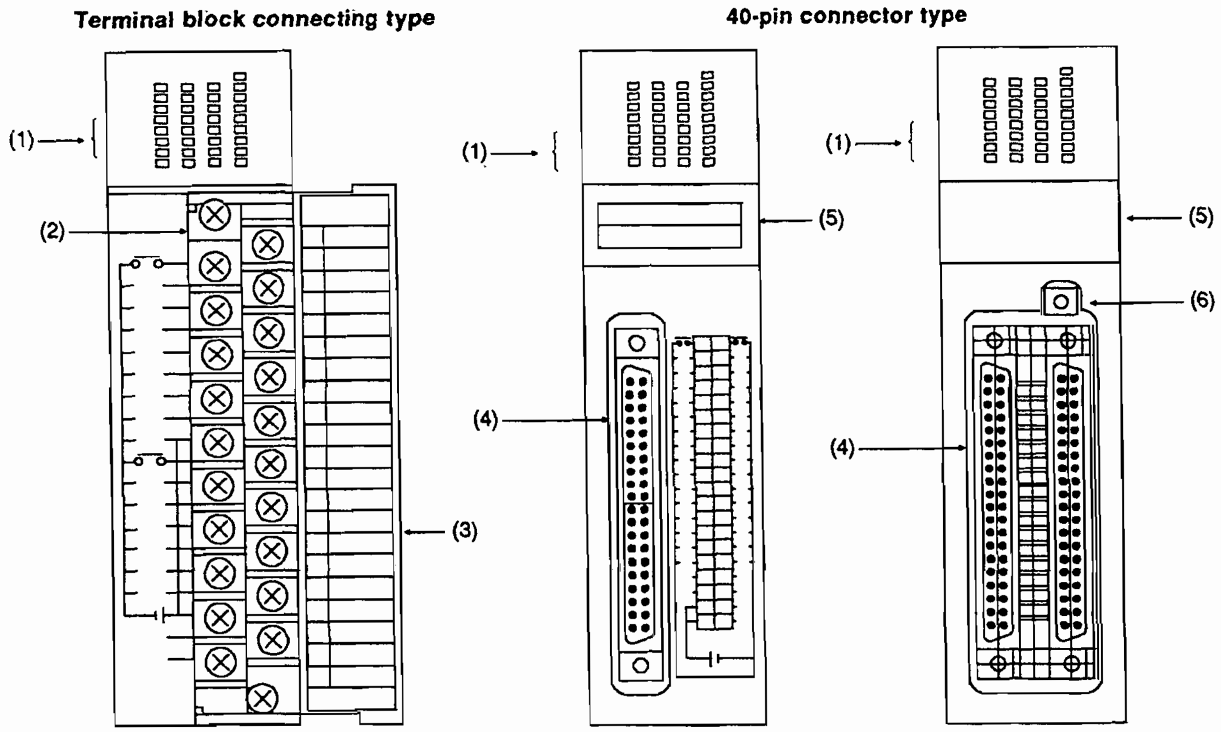
The A1SG62 dummy module is used to reserve a specified number of I/O points at any base unit slot.

Table 5.1 Dummy Module, Blank Cover Specifications

Item / Model	A1SG60	A1SG62
Occupying I/O points	16 points	Max. 64 (16, 32, 48, or 64 points can be selected by using a select switch on the front of the module.)
I/O allocation specification	16 vacant points	[ ] input (X) points Designate the number of points set with the select switch in the [ ]
Purpose of use	Used as a dust preventive cover of an unused slot where no input/output module is installed (e. g., a vacant slot between modules).	A module used to reserve 16, 32, 48, or 64 points for the I/O module to be installed in the future.
Other functions	—	Being equipped with simulation switches for 16 points beginning with the head of I/O numbers, inputs can be turned ON/OFF without using any external switch.
Internal current consumption (5 VDC)	—	60 mA
Outside dimensions (mm)(in)	130(H) x 34.5(W) x 93.6 (D) (5.12 x 1.36 x 3.69)	130(H) x 34.5(W) x 93.6 (D) (5.12 x 1.36 x 3.69)
Weight (kg)(lb)	0.08 (0.18)	0.13 (0.29)

5.6 Names of Parts and Settings

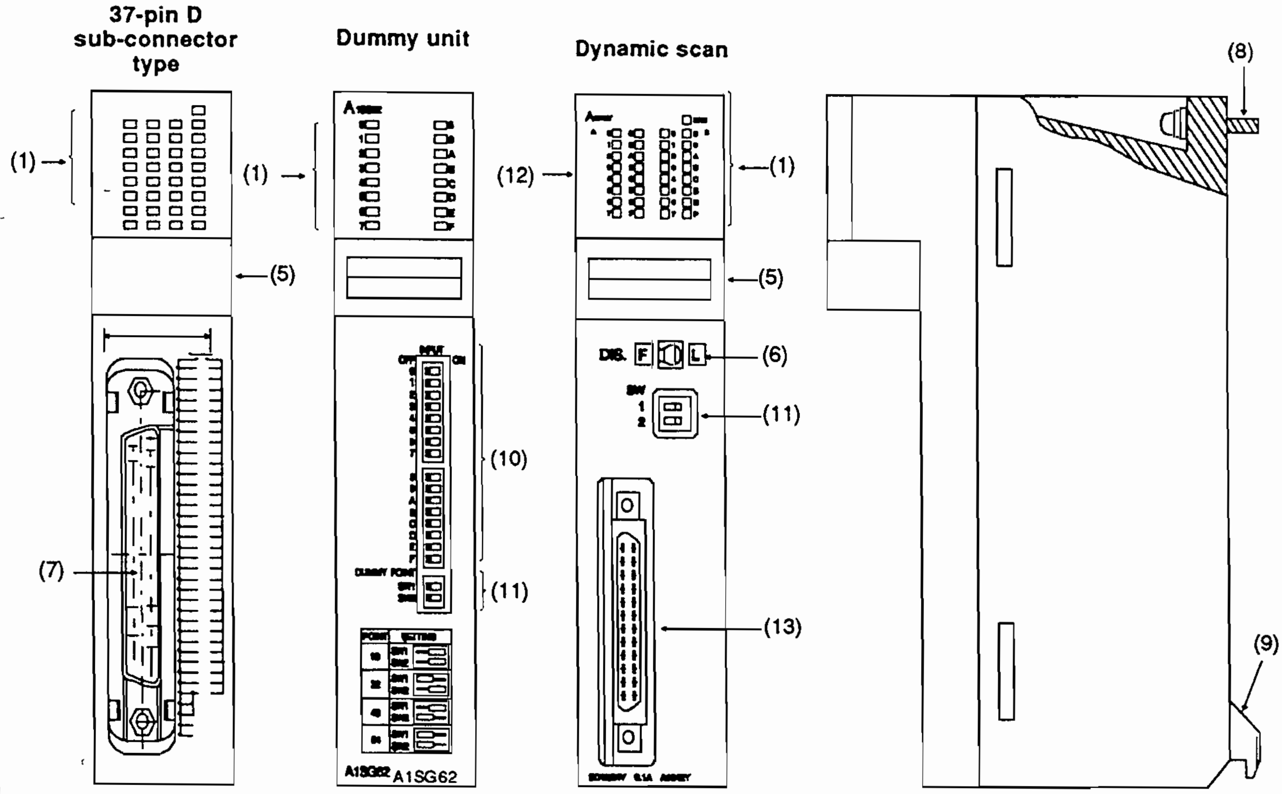
The figures and table below describe the names of parts of I/O modules.



No.	Name	Description
(1)	I/O indicator LED	Indicates the ON/OFF state of input and output. Indicates the ON state when it is lit.
(2)	Terminal block	Used to connect a power cable and I/O cables.
(3)	Terminal cover	Covers the terminals. Terminal symbols can be written on the card attached to the inside of the cover.
(4)	40-pin connector	For 32-I/O and 64-I/O modules. Used to connect a power cable and I/O cables.
(5)	Symbol card cover	Symbol card cover
(6)	Indicator select switch	Used to switch the LED indication for the first-half 32 I/Os or for the second-half 32 I/Os of a 64-I/O module.
(7)	37-pin D sub connector	For 32-I/O and 64-I/O modules. Used to connect a power cable and I/O signal cables.
(8)	Module fixing screw	Used to fix the module to the base unit.
(9)	Module mounting hook	Engages with the mounting hole in the base unit to hook the module.

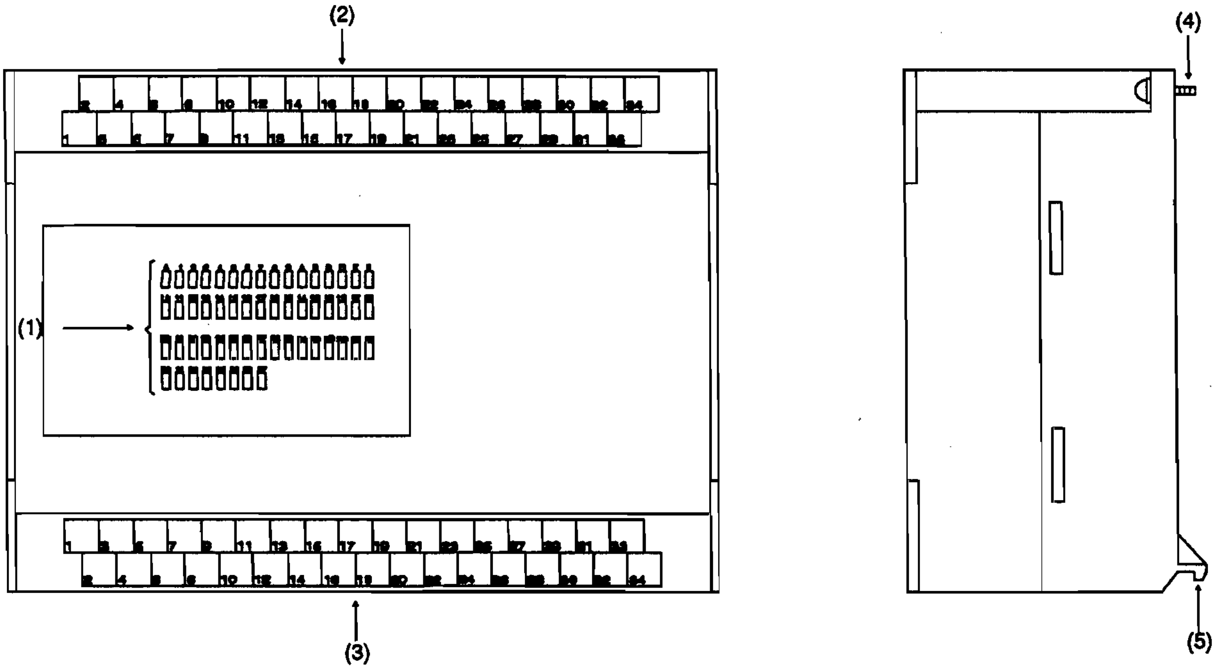
REMARK

When pulling out the terminal symbol card, pick up the edge of the card a little to pull it out smoothly from the terminal cover.



No.	Name	Description
(10)	Simulation switches	Used for input simulation. 16 points beginning with the head of I/O numbers of the dummy module are allocated.
(11)	Occupying I/O points	16, 32, 48, or 64 points can be selected for the occupying I/O points.
(12)	Dynamic scan cycle	Used to set the dynamic scan cycle at 13.3 msec (FAST mode) or 106.7 msec (SLOW mode). (This switch is located on the back side of the module.)
(13)	24-pin connector	Used for the dynamic scan I/O module to connect a power supply cable and I/O signal wires.

A1SJ-56[ ]



No.	Name	Description
(1)	I/O indicator LED	Used to indicate the ON/OFF states of inputs and outputs. Lights when the I/O state is ON. 0 to 1F: Inputs X0 to 1F, 20 to 37: Output Y20 to 37
(2)	Terminal block	Used to connect the power supply and the input signal wires.
(3)	Terminal block	Used to connect the power supply and the output signal wires.
(4)	Module mounting screw	Used to secure the module to the base unit.
(5)	Module mounting hook	Used to insert the module mounting slot in the base unit to install the module.

6. EXTENSION BASE UNIT AND EXTENSION CABLE

6.1 Specifications

6.1.1 Specifications of extension base units

Table 6.1 Extension Base Unit Specifications

Item Model	A1S65B(S1)	A1S68B(S1)	A1S52B(S1)	A1S55B(S1)	A1S58B(S1)
Loaded I/O modules	5 can be loaded	8 can be loaded	2 can be loaded	5 can be loaded	8 can be loaded
Power supply module loading	Required		Not required		
Installation hole size	φ6-mm (0.24 inch) slot (for M5 screw)				
Terminal screw size	—	—	M4 x 6 (FG terminal)		
Applicable wire size	—	—	0.75 to 2 mm^2		
Applicable solderless terminal size	—	—	(V)1.25-4, (V)1.25-YS4, (V)2-YS4A (Applicable tightening torque: 12 kg/cm (67.1 lb/inch)		
External dimensions mm(inch)	315 x 130 x 28 (12.40 X 5.12 X 1 10)	420 x 130 x 28 (16.54 X 5.12 X 1.10)	135 x 130 x 28 (5.31 X 5 12 X 1.10)	260 x 130 x 28 (10.24 X 5.12 X 1.10)	365 x 130 x 28 (14.37 X 5.12 X 1.10)
Weight kg(lb)	0.71 (1.56)	0.95 (2.09)	0.38 (0.84)	0.61 (1.34)	0.87 (1.91)
Accessory	Four mounting screws (M5 x 25)		*1 One dustproof cover (for I/O module) Four mounting screws (M5 x 25)		

*1: For the installaton of the dustproof cover, see Section 8.6.

POINT

When using either base unit A1S52B(S1), A1S52B(S1) or A1S58B(S1) which do not require supply module, refer to Section 6.1.3.

6.1.2 Specifications of extension cables

Table 6.2 shows the specifications of extension cables which can be used for the A1SJCPU system.

Table 6.2 Extension Cable Specifications

Item Model	A1SC01B	A1SC03B	A1SC07B	A1SC12B	A1SC30B	A1SC60B	A1SC05NB	A1SC07NB
Cable length m(ft)	0.055 (0.18)	0.33 (1.08)	0.7 (2.3)	1.2 (3.94)	3.0 (9.84)	6.0 (19.68)	0.45 (1.48)	0.7 (2.3)
Resistance value of 5 VDC supply line (Ω at 55 °C)	0.02	0.021	0.036	0.055	0.121	0.182	0.037	0.045
Application	Connection between A1SJCPU and A1S5[ ]B(S1)/A1S6[ ]B(S1)						Connection between A1SJCPU and A5[ ]B/A6[ ]B	
Weight kg(lb)	0.025 (0.055)	0.1 (0.22)	0.14 (0.31)	0.20 (0 44)	0.4 (0.88)	0.65 (1.43)	0.2 (0.44)	0.22 (0.48)

(a) If an extension base unit is installed (by series connection) after the A1SJCPU, use an extension cable with a length of 0.7 m (27.56 in.) or greater.

(b) When using an extension cable, do not bundle it together with main circuit (high voltage, large current) wires or allow it to run close to such lines.

6.1.3 Application standards of extension base unit (A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, A58B)

When an extension base unit of models A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, or A58B is used, make sure a voltage of 4.75 V or above is supplied to the receiving end (at the module installed in the last slot of the extension base unit).

With the A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, or A58B extension base unit, 5 VDC is supplied from the power supply module of the main base unit via extension cable. Therefore, some voltage drop occurs over the extension cable and the specified voltage is not supplied to the receiving end , resulting in mis-input and mis-output.

If the voltage at the receiving end is less than 4.75 V, use an extension base unit of models A1S65B(S1), A1S68B(S1), A65B, or A68B equipped with a power supply unit.

(1) Selection conditions

The voltage received by the module installed in the last slot of an extension base unit A1S52B(S1), A1S55B(S1), A1S58B(S1), A52B, A55B, or A58B must be 4.75 V or above.

Since the output voltage of the power supply module is set at 5.1 V or above, the voltage drop must be 0.35 V or less.

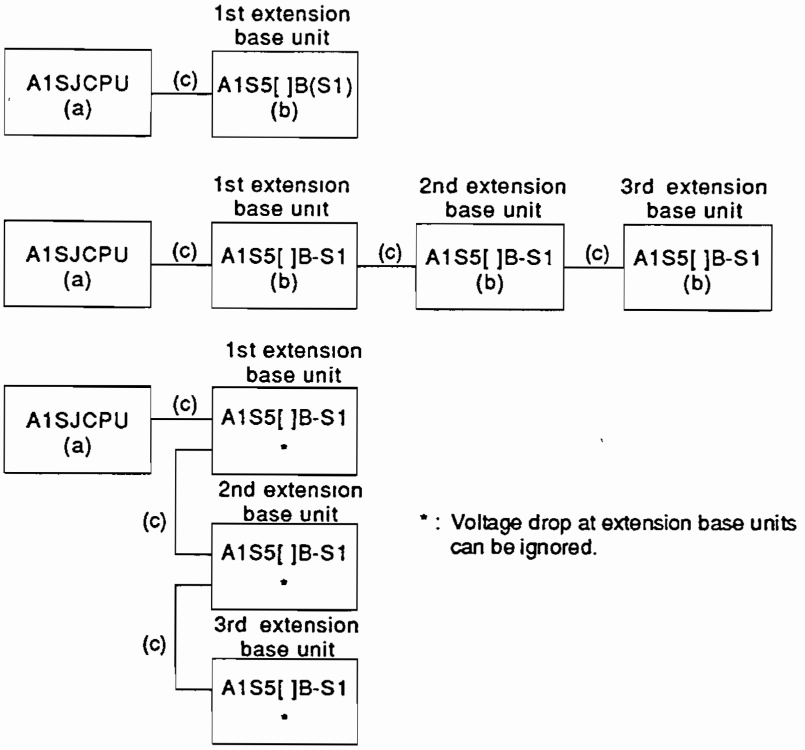
(2) Classification of voltage drop

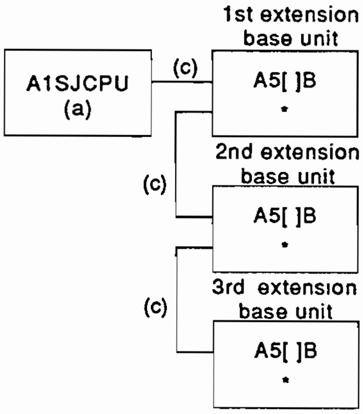
Voltage drop is classified into (a), (b), and (c) as follows according to the connecting method and type of extension base units.

(a) Voltage drop of an A1SJCPU

(b) Voltage drop of an extension base unit

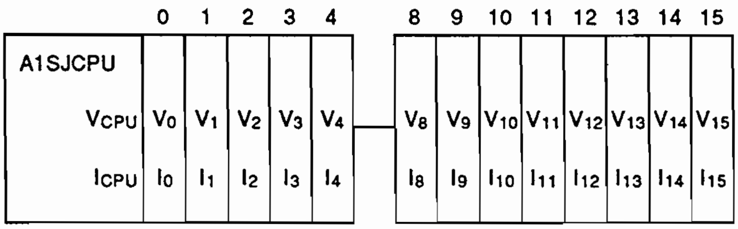
(c) Voltage drop over an extension cable

<table>
<tr>
<td>Use of extension base units A1S52B(S1), A1S55B(S1), and A1S58B(S1)</td>
<td>


* : Voltage drop at extension base units can be ignored.
</td>
</tr>
<tr>
<td>Use of extension base units A55B and A58B</td>
<td>


* : Voltage drop at extension base units can be ignored.
</td>
</tr>
</table>

(3) Calculation of the receiving-end voltage



V_{CPU}, V_0 to V_4 : Voltage drop at respective slot of the A1SJCPU unit
I_{CPU}, I_0 to I_4 : Current consumption at respective slot of the A1SJCPU unit
V_8 to V_{15} : Voltage drop at respective slot of the extension base unit
I_8 to I_{15} : Current consumption at respective slot of the extension base unit

(a) Voltage drop of the A1SJCPU
Each slot of an A1SJCPU has a resistance of 0.022 Ω. Calculate voltage drop of each slot, and obtain the total voltage drop of the unit.

1) Voltage drop of the CPU unit: V_{CPU}

$V_{CPU} = 0.022 \times (0.4 + I_0 + I_1 + I_2 + I_3 + I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

2) Voltage drop of slot 0: V_0

$V_0 = 0.022 \times (I_0 + I_1 + I_2 + I_3 + I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

3) Voltage drop of slot 1: V_1

$V_1 = 0.022 \times (I_1 + I_2 + I_3 + I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

4) Voltage drop of slot 2: V_2

$V_2 = 0.022 \times (I_2 + I_3 + I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

5) Voltage drop of slot 3: V_3

$V_3 = 0.022 \times (I_3 + I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

6) Voltage drop of slot 4: V_4

$V_4 = 0.022 \times (I_4 + I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

7) Total voltage drop of the A1SJCPU: V_K

$V_K = V_{CPU} + V_0 + V_1 + V_2 + V_3 + V_4$

(b) Voltage drop of an extension base unit (A1S52B(S1), A1S55B(S1), A1S58B(S1))

Each slot of an extension base unit has a resistance of 0.006 Ω.

Calculate voltage drop of each slot, and obtain the total voltage drop of a base unit.

1) Voltage drop of slot 8: V_8

$V_8 = 0.006 \times (I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

2) Voltage drop of slot 9: V_9

$V_9 = 0.006 \times (I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

3) Voltage drop of slot 10: V_{10}

$V_{10} = 0.006 \times (I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

4) Voltage drop of slot 11: V_{11}

$V_{11} = 0.006 \times (I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

5) Voltage drop of slot 12: V_{12}

$V_{12} = 0.006 \times (I_{12} + I_{13} + I_{14} + I_{15})$

6) Voltage drop of slot 13: V_{13}

7) Voltage drop of slot 14: V_{14}

$V_{14} = 0.006 \times (I_{14} + I_{15})$

8) Voltage drop of slot 15: V_{15}

$V_{15} = 0.006 \times (I_{15})$

9) Voltage drop of an extension base unit: V_Z

$V_Z = V_8 + V_9 + V_{10} + V_{11} + V_{12} + V_{13} + V_{14} + V_{15}$

(c) Voltage drop over extension cables

$V_C =$ (Resistance of an extension cable) $\times (I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

(d) Voltage at the receiving end

$(5.1 - V_K - V_Z - V_C) \geq 4.75$ (V)

POINT

If 3 extension base units are installed, determine the voltage at the receiving end as follows:

(1) Calculation of voltage drop at the A1SJCPU

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.022 Ω) by the [sum of current consumptions of all slots in the AISJCPU + sum of current consumptions of all slots in the 1st, 2nd and 3rd extension base units], then sum the voltage drops at the individual slots.

(2) Calculation of voltage drop at 1st extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 1st extension base unit + sum of current consumptions of all slots in the 2nd and 3rd extension base units], then sum the voltage drops at the individual slots.

(3) Calculation of voltage drop at 2nd extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 2nd extension base unit + sum of current consumptions of all slots in the 3rd extension base unit], then sum the voltage drops at the individual slots.

(4) Calculation of voltage drop at 3rd extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 3rd extension base unit], then sum the voltage drops at the individual slots.

(5) Calculation of voltage drop in the extension cable

Calculate the sum of (a) + (b) + (c):

(a) (Resistance of the extension cable that connects the AISJCPU and 1st extension base unit) x (sum of current consumptions of 1st, 2nd and 3rd extension base units)

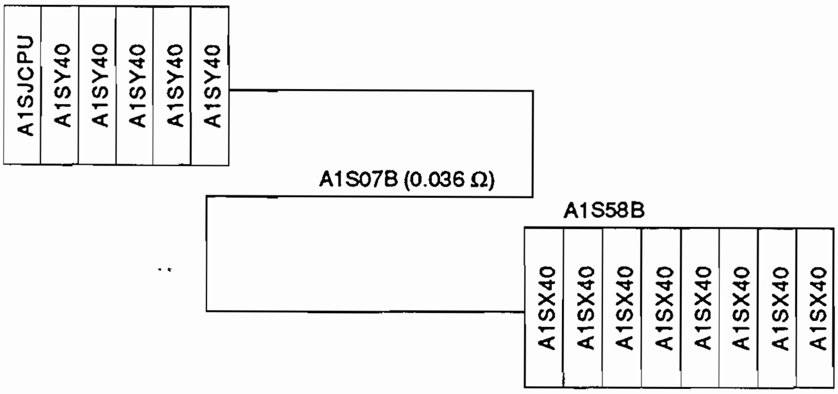
(b) (Resistance of the extension cable that connects the 1st extension base unit and 2nd extension base unit) x (sum of current consumptions of 2nd and 3rd extension base units)

(c) (Resistance of the extension cable that connects the 2nd extension base unit and 3rd extension base unit) x (total current consumption of 3rd extension base unit)

(6) Checking the voltage at the receiving end

5.1 - (sum of (1) through (5)) ≥ 4.75 (V)

(4) Examples



(a) Voltage drop of an A1SJCPU

$V_K = 0.022 \times \{0.4 + (0.27 \times 5) \times 2 + (0.27 \times 4) + (0.27 \times 3) + (0.27 \times 2) + 0.27 + (0.05 \times 8) \times 6\} = 0.1804$

(b) Voltage drop of an extension base unit

$V_Z = 0.006 \times 0.05 \times (8 + 7 + 6 + 5 + 4 + 3 + 2 + 1) = 0.0108$

(c) Voltage drop over an extension cable

$V_C = 0.036 \times (0.05 \times 8) = 0.0144$

(d) Voltage at the receiving end

$5.1 - 0.1804 - 0.0108 - 0.0144 = 4.8944$ (V)
Since the voltage at the receiving end is more than 4.75 V, the above system can be put into operation.

(5) Minimizing the voltage drop

Try the following to minimize the voltage drop.

(a) Change the positions of modules.

Install the modules beginning with slot 0 of an A1SJCPU in the order of current consumption from large to small.
Install the modules of small current consumption to extension base units.

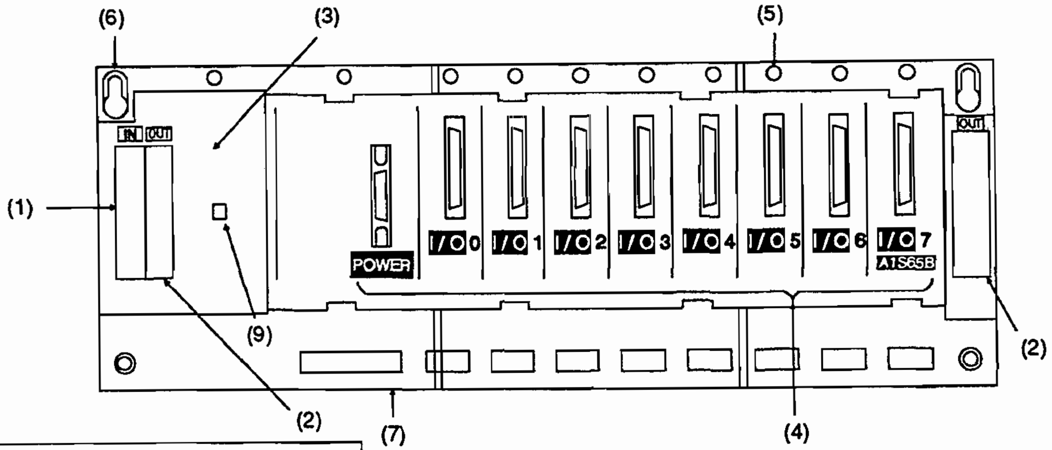
(b) Use a short cable for extension.

The shorter an extension cable, the smaller the resistance it has, consequently minimizing its voltage drop. Make extension cables as short as possible.

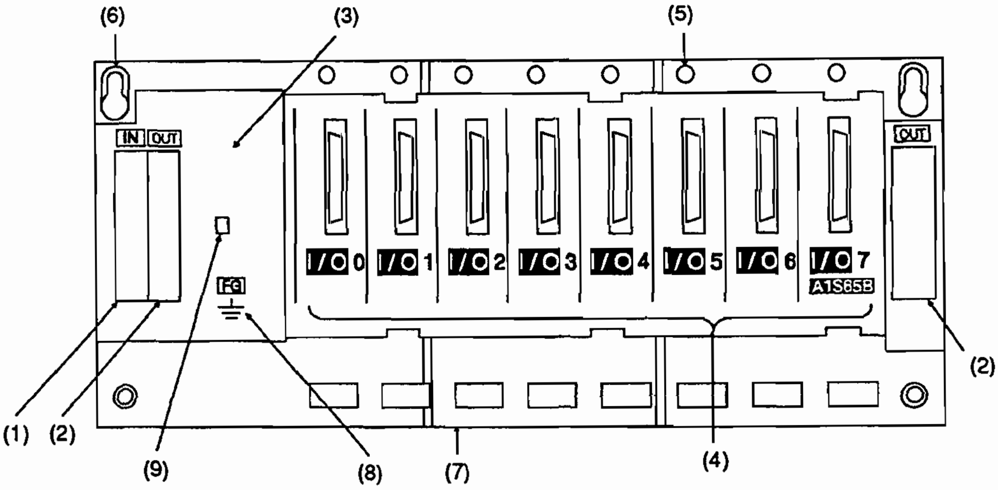
6.2 Names and Purposes of Parts and Settings

The names and purposes of parts of the base units are explained below.

A1S65B(S1), A1S68B(S1)



A1S52B(S1), A1S55B(S1), A1S58B(S1)



No.	Name	Purpose
(1)	Extension cable connector (IN)	Used to connect an extension cable to an extension base unit or an A1SJCPU for signal transmissions. Remove the connector cover attached to the unit and connect an extension cable.
(2)	Extension cable connector (OUT) (for A1S[ ][ ]B-S1)	
(3)	Base cover	Extension cable connector protective cover.
(4)	Module connector	Used to connect to power supply module, an I/O module or special function module. Put a supplied cover or blank cover (A1SG60) on unused connector to protect it from dust.
(5)	Module mounting screw	Used to secure a module to the base unit. Screw size: M4 x 12
(6)	Base mounting hole	Used to mount the base unit to a control panel. (for M5 screw)
(7)	DIN rail hook	Used to install the module to the DIN rail. A1S52B(S1), A1S55B(S1): One hook A1S65B(S1), A1S68B(S1), A1S58B(S1): Two hooks
(8)	FG terminal	Grounding terminal connected to the shield pattern on the PC board.
(9)	Stage number setting switch (for A1S[ ][ ]B-S1)	Switch for setting the stage number of extension base. For the stage number setting procedure, refer to Section 6.3.

6.3 Extension Base Number Setting (A1S[ ][ ]B-S1 Extension Base Units Only)

This section describes the method for setting the extension base unit numbers when extension base units are used.

Remove the base cover from the extension base unit.

↓

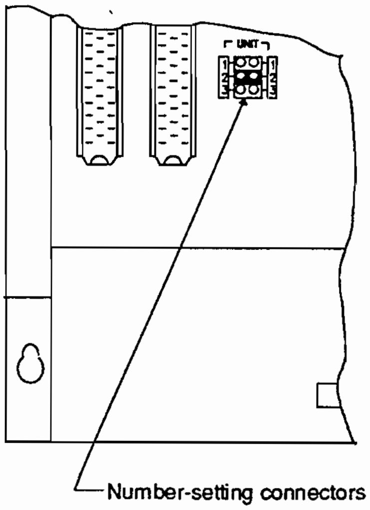
At the bottom left of the base unit there are three connectors (numbered 1 through three). Insert the connector pin into the connector whose number corresponds to the number to be set for the extension base unit.

↓

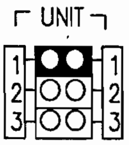
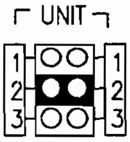
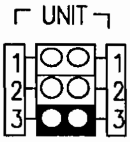
Replace the base unit cover.

↓

End



Extension base unit number setting

	Setting		
	1st	2nd	3rd
Setting of number-setting connectors			

POINT

Set one of the connectors, 1 through 3, whose number corresponds to the number to be set for the extension base unit. Do not set more than one connector, set the same connector number at more than one unit, or fail to set any connector number, since erroneous inputs and outputs will result.

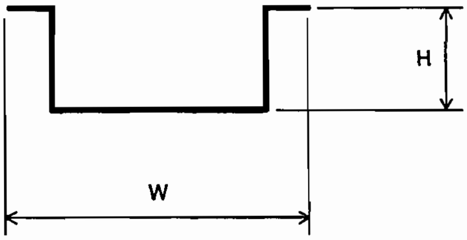
6.4 Installing a DIN Rail

Both the main base units and extension base units are equipped with hooks used for mounting to a DIN rail.

The following explains the method of mounting a DIN rail:

(1) Applicable DIN rails type

(a) form and dimentions



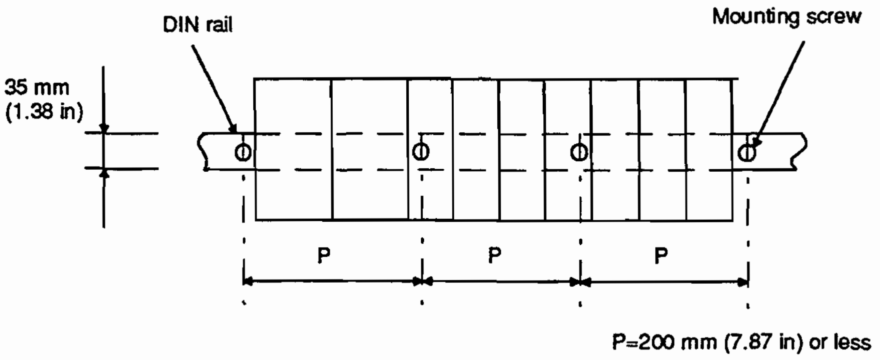
W	H
35mm(1.38inch)	7.5mm(0.30inch)
	15mm(0.60inch)

(b) material

Material	Applicable Dimension (W x H) mm(inch)
Iron	35 x 7.5(1.38 x 0.30), 35 x 15(1.38 x 0.60)
Aluminum	35 x 7.5(1.38 x 0.30)

(2) Intervals of mounting screws

When a dimension 35 x 7.5 rail is mounted, fix it with screws with intervals of 200 mm or less between each of the screws.

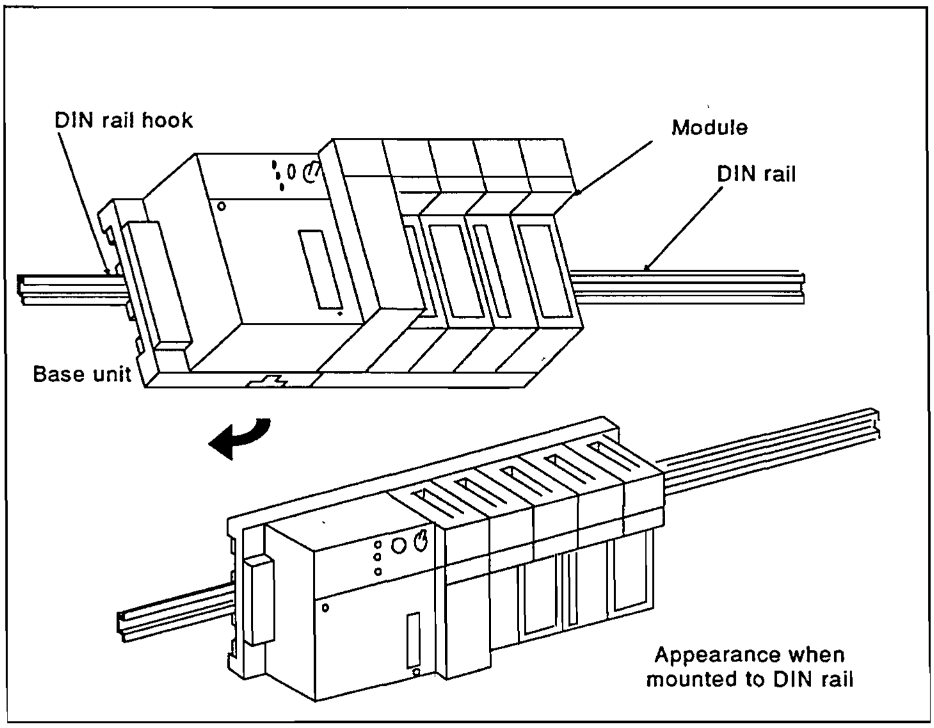


(3) Mounting to/removal from a DIN rail

(a) Mounting procedure

Mount a base unit to a DIN rail as follows:

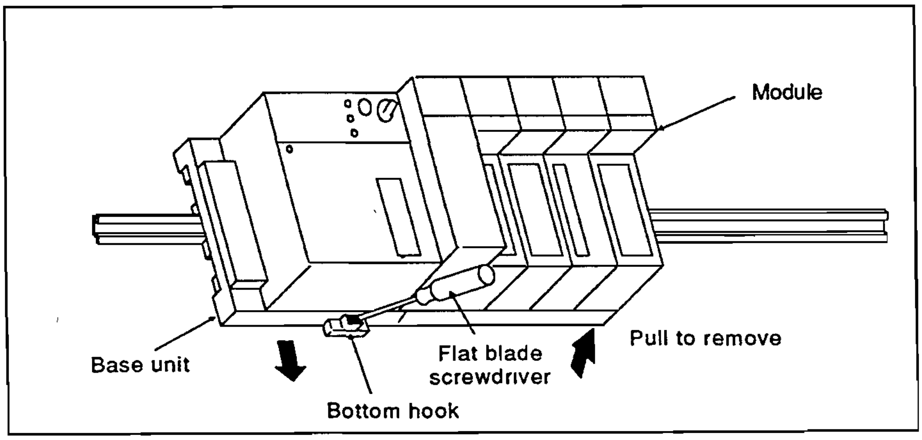
1) Engage the hook of the base unit with the rail from above.
2) Push the base unit onto the rail to secure it in position.



(b) Removing procedure

Remove a base unit from a DIN rail as follows:

1) Pull down the bottom hook of the base unit using a flat blade screwdriver (6 x 100).
2) Pull the base unit away from the rail while pulling down the bottom hook.



MEMO

7. MEMORY ICs AND BATTERY

7.1 Memory ICs

This section describes specifications, handling instructions and installation of the memory ICs used in the A1SJCPU.

7.1.1 Specifications

Table 7.1 shows specifications of the ROMs.

Table 7.1 Memory Specifications

Item \ Model	A1SMCA-2KE	A1SMCA-8KE	A1SMCA-8KP
Memory specifications	EEP-ROM		EP-ROM
Memory capacity (bytes)	8 K bytes (max. 2 K steps)	32 K bytes (max. 8 K steps)	32 K bytes (max. 8 K steps)
Outside dimension mm (in)	15 x 68.6 x 42 (0.59 x 2.7 x 1.65)		
Weight (kg) (lb)	0.03 (0 06)		

7.1.2 Handling instructions

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

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

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

(4) When installing a memory cassette to an A1SJCPU unit, engage the connectors securely.

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

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

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

IMPORTANT

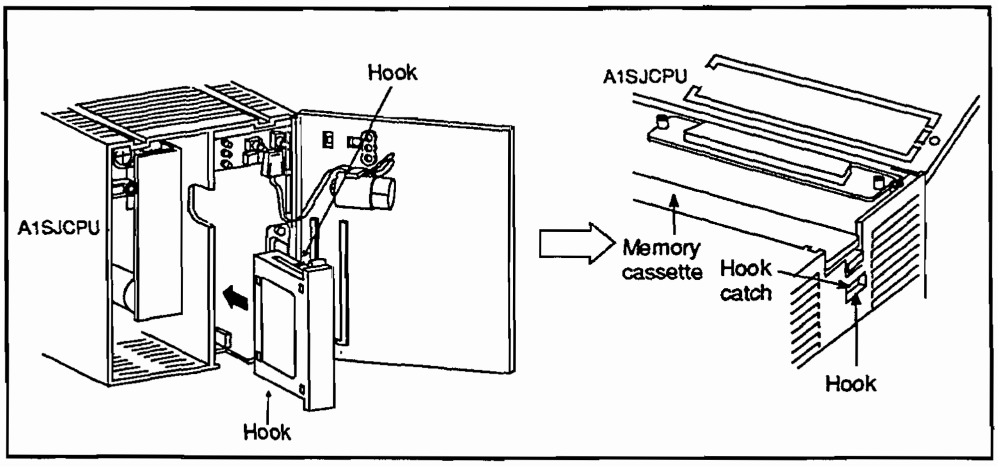
(1) Always turn OFF the power to the A1SJCPU unit when installing or removing a memory cassette. If a memory cassette is installed or removed with the power to the CPU ON, contents of the memory will be destroyed.

(2) If the power is turned ON when the memory cassete is installed, the contents of the RAM memory incorporated in the A1SJCPU is overwritten.
If the contents of the RAM memory needs to be saved, install a memory cassette after making a backup of the contents using a peripheral device.

7.1.3 Installing and removing a memory cassette

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

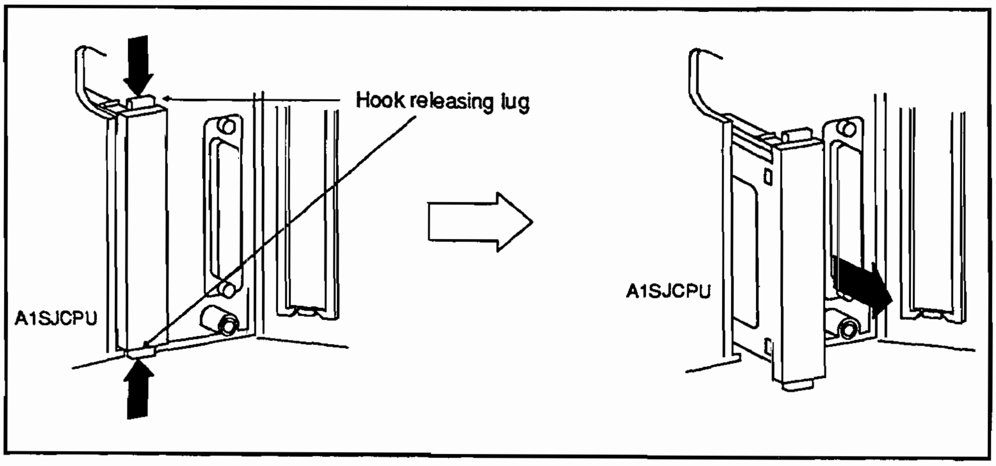
(1) Installing a memory cassette



(a) Hold a memory cassette vertically so that its model name is right side up and its connector faces the A1SJCPU unit. Insert the memory cassette all the way in the A1SJCPU unit so that the hooks of the memory cassette are completely engaged (they "click").

(b) Make sure the hooks are completely engaged. (If the memory cassette is not inserted all the way, the front lid of the A1SJCPU cannot be closed.)

(2) Removing a memory cassette



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

7.1.4 Writing a sequence program to an A1SMCA-8KP

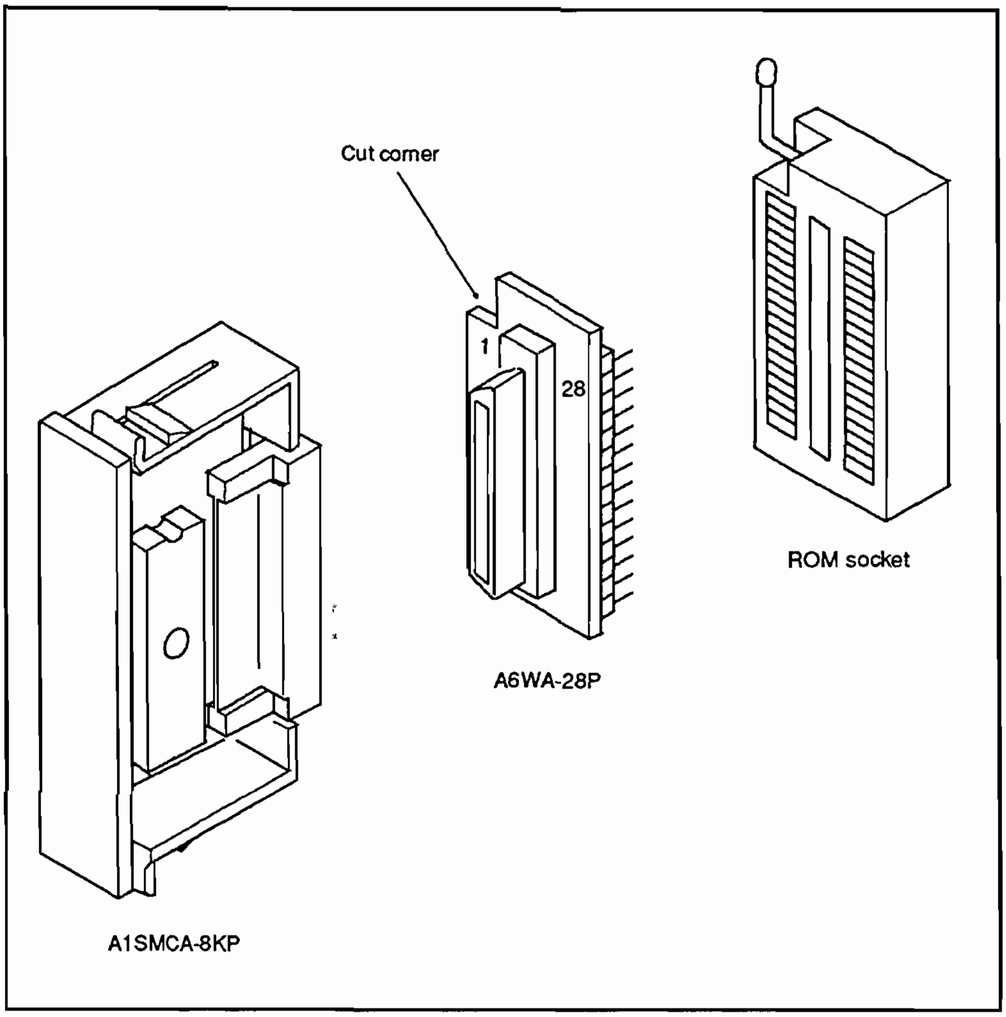
A sequence program can be written to, or erased from, an A1SMCA-8KP using a ROM writer/eraser.

If an A1SMCA-8KP is installed to the ROM socket of an A6GPP or A6WU, use a memory write adaptor (A6WA-28P).

Use an A6WA-28P as follows:

(1) Install an A1SMCA-8KP to an A6WA-28P so that their connectors couple correctly with each other.

(2) Install the A6WA-28P that is coupled with an A1SMCA-8KP to the ROM socket of an A6GPP or A6WU.
The pin next to the cut corner of the A6WA-28P is pin No. 1. Make sure the A6WA-28P is installed correctly to the ROM socket.



7.2 Battery

7.2.1 Specifications

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

Table 7.2 Battery Specifications

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

7.2.2 Handling instructions

(1) Do not short circuit.

(2) Do not disassemble.

(3) Do not expose to open flame.

(4) Do not heat.

(5) Do not solder its terminals.

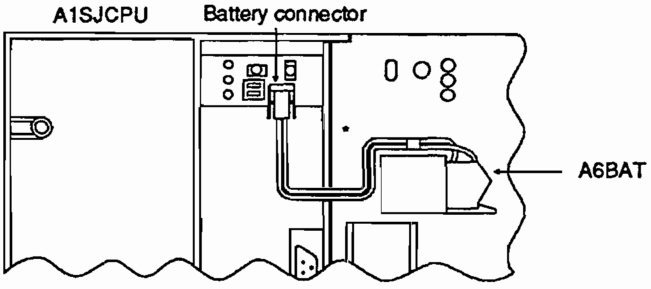
(6) Route the battery cable as shown below so that the battery connector is not strained.

7.2.3 Installation

Battery lead connector is disconnected from the battery connector on the A1SJCPU board to prevent discharge during transportation and storage.

Before starting the A1SJCPU, plug the battery connector into the battery connector on the A1SJCPU board.

- To use a sequence program stored in the user program area in the A1SJCPU if a power failure occurs.
- To retain the data if a power failure occurs.



* Route the battery cable on the bottom of the battery case as shown above.

7) Voltage drop of slot 14: V_{14}

$V_{14} = 0.006 \times (I_{14} + I_{15})$

8) Voltage drop of slot 15: V_{15}

$V_{15} = 0.006 \times (I_{15})$

9) Voltage drop of an extension base unit: V_Z

$V_Z = V_8 + V_9 + V_{10} + V_{11} + V_{12} + V_{13} + V_{14} + V_{15}$

(c) Voltage drop over extension cables

V_C = (Resistance of an extension cable) x $(I_8 + I_9 + I_{10} + I_{11} + I_{12} + I_{13} + I_{14} + I_{15})$

(d) Voltage at the receiving end

$(5.1 - V_K - V_Z - V_C) \geq 4.75$ (V)

POINT

If 3 extension base units are installed, determine the voltage at the receiving end as follows:

(1) Calculation of voltage drop at the A1SJCPU

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.022 Ω) by the [sum of current consumptions of all slots in the AISJCPU + sum of current consumptions of all slots in the 1st, 2nd and 3rd extension base units], then sum the voltage drops at the individual slots.

(2) Calculation of voltage drop at 1st extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 1st extension base unit + sum of current consumptions of all slots in the 2nd and 3rd extension base units], then sum the voltage drops at the individual slots.

(3) Calculation of voltage drop at 2nd extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 2nd extension base unit + sum of current consumptions of all slots in the 3rd extension base unit], then sum the voltage drops at the individual slots.

(4) Calculation of voltage drop at 3rd extension base unit

Determine the voltage drop at individual slots by multiplying the resistance of one slot (0.006 Ω) by the [sum of current consumptions of all slots in the 3rd extension base unit], then sum the voltage drops at the individual slots.

(5) Calculation of voltage drop in the extension cable

Calculate the sum of (a) + (b) + (c):

(a) (Resistance of the extension cable that connects the AISJCPU and 1st extension base unit) x (sum of current consumptions of 1st, 2nd and 3rd extension base units)

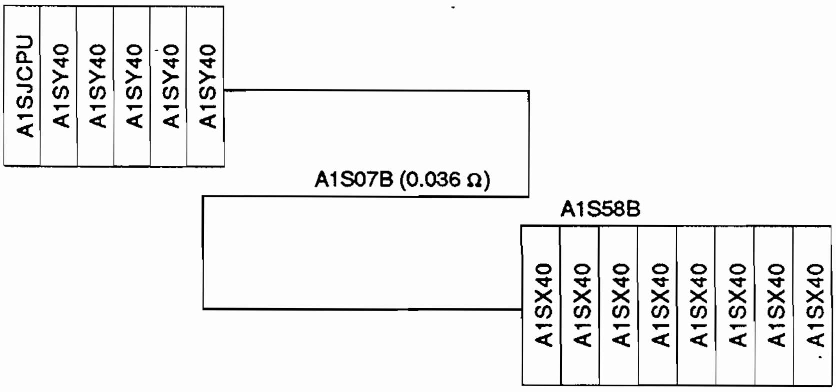
(b) (Resistance of the extension cable that connects the 1st extension base unit and 2nd extension base unit) x (sum of current consumptions of 2nd and 3rd extension base units)

(c) (Resistance of the extension cable that connects the 2nd extension base unit and 3rd extension base unit) x (total current consumption of 3rd extension base unit)

(6) Checking the voltage at the receiving end

5.1 - (sum of (1) through (5)) ≥ 4.75 (V)

(4) Examples



(a) Voltage drop of an A1SJCPU

$V_K = 0.022 \times \{0.4 + (0.27 \times 5) \times 2 + (0.27 \times 4) + (0.27 \times 3) + (0.27 \times 2) + 0.27 + (0.05 \times 8) \times 6\} = 0.1804$

(b) Voltage drop of an extension base unit

$V_Z = 0.006 \times 0.05 \times (8 + 7 + 6 + 5 + 4 + 3 + 2 + 1) = 0.0108$

(c) Voltage drop over an extension cable

$V_C = 0.036 \times (0.05 \times 8) = 0.0144$

(d) Voltage at the receiving end

$5.1 - 0.1804 - 0.0108 - 0.0144 = 4.8944$ (V)
Since the voltage at the receiving end is more than 4.75 V, the above system can be put into operation.

(5) Minimizing the voltage drop

Try the following to minimize the voltage drop.

(a) Change the positions of modules.

Install the modules beginning with slot 0 of an A1SJCPU in the order of current consumption from large to small.
Install the modules of small current consumption to extension base units.

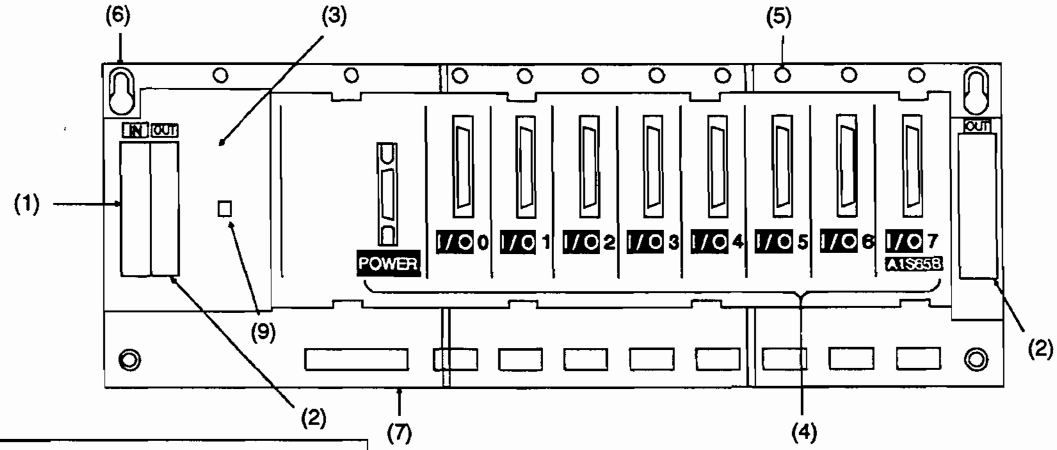
(b) Use a short cable for extension.

The shorter an extension cable, the smaller the resistance it has, consequently minimizing its voltage drop. Make extension cables as short as possible.

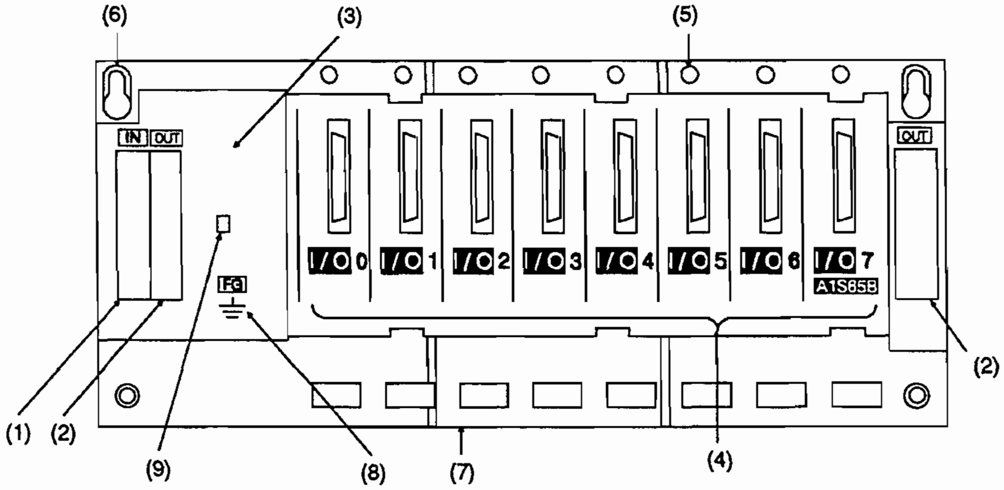
7.2 Names and Purposes of Parts and Settings

The names and purposes of parts of the base units are explained below.

A1S65B(S1), A1S68B(S1)



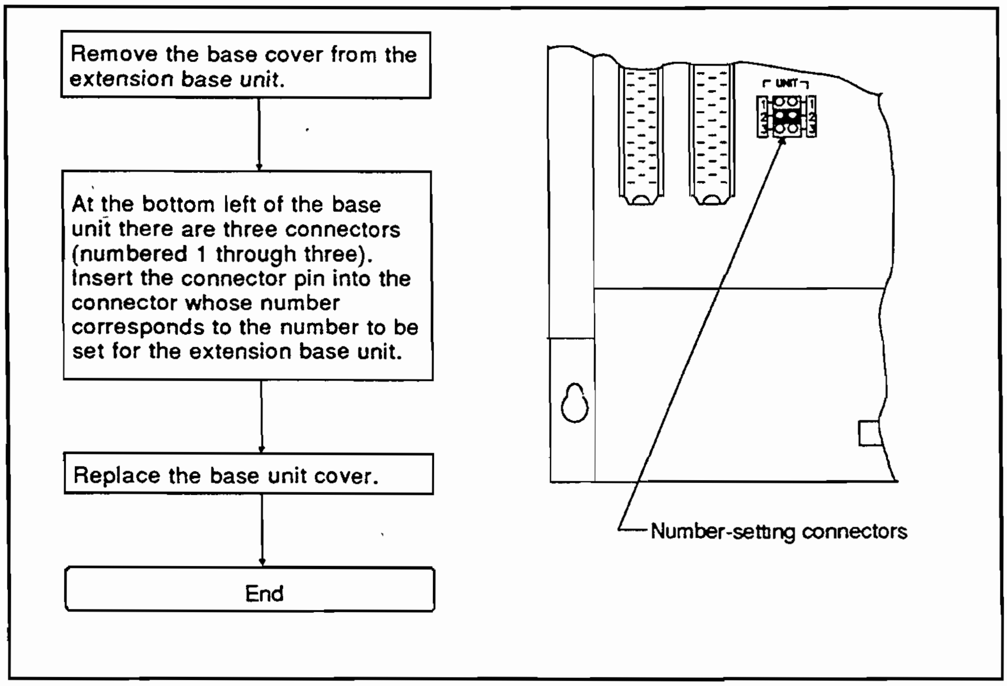
A1S52B(S1), A1S55B(S1), A1S58B(S1)



No.	Name	Purpose
(1)	Extension cable connector (IN)	Used to connect an extension cable to an extension base unit or an A1SJCPU for signal transmissions. Remove the connector cover attached to the unit and connect an extension cable.
(2)	Extension cable connector (OUT) (for A1S[ ][ ]B-S1)	
(3)	Base cover	Extension cable connector protective cover.
(4)	Module connector	Used to connect to power supply module, an I/O module or special function module. Put a supplied cover or blank cover (A1SG60) on unused connector to protect it from dust.
(5)	Module mounting screw	Used to secure a module to the base unit. Screw size: M4 x 12
(6)	Base mounting hole	Used to mount the base unit to a control panel. (for M5 screw)
(7)	DIN rail hook	Used to install the module to the DIN rail. A1S52B(S1), A1S55B(S1): One hook A1S65B(S1), A1S68B(S1), A1S58B(S1): Two hooks
(8)	FG terminal	Grounding terminal connected to the shield pattern on the PC board.
(9)	Stage number setting switch (for A1S[ ][ ]B-S1)	Switch for setting the stage number of extension base. For the stage number setting procedure, refer to Section 7.3.

7.3 Extension Base Number Setting (A1S[ ][ ]B-S1 Extension Base Units Only)

This section describes the method for setting the extension base unit numbers when extension base units are used.



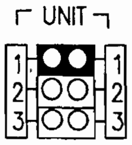
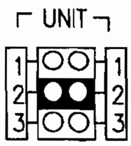
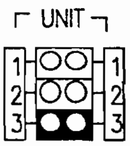
Remove the base cover from the extension base unit.

At the bottom left of the base unit there are three connectors (numbered 1 through three). Insert the connector pin into the connector whose number corresponds to the number to be set for the extension base unit.

Replace the base unit cover.

End

Extension base unit number setting

	Setting		
	1st	**2nd**	**3rd**
Setting of number-setting connectors			

POINT

Set one of the connectors, 1 through 3, whose number corresponds to the number to be set for the extension base unit. Do not set more than one connector, set the same connector number at more than one unit, or fail to set any connector number, since erroneous inputs and outputs will result.

7.4 Installing a DIN Rail

Both the main base units and extension base units are equipped with hooks used for mounting to a DIN rail.

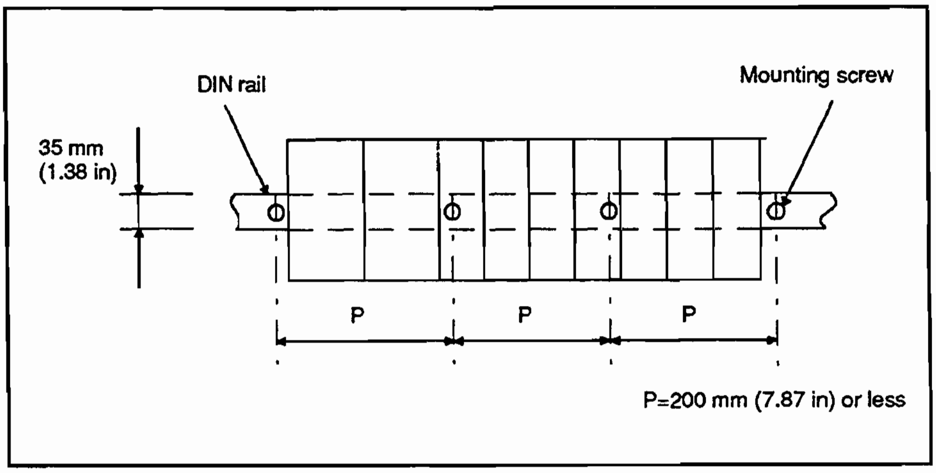
The following explains the method of mounting a DIN rail:

(1) Applicable DIN rails (JIS-C2B12)

TH35-7.5 Fe
TH35-7.5 Al
TH35-15 Fe

(2) Intervals of mounting screws

When a TH35-7.5 Fe or TH35-7.5 Al rail is mounted, fix it with screws with intervals of 200 mm or less between each of the screws.



8. LOADING AND INSTALLATION

8.1 Installation Environment

Avoid the following places when installing the A1SJCPU system:

(1) Places where ambient temperature is out of 0 to 55 °C range.

(2) Places where ambient humidity is out of 10 to 90 %RH range.

(3) Places where dewing (condensation) occurs due to sudden temperature changes.

(4) Places where corrosive or inflammable gas exists.

(5) Places where a large amount of dust, iron powder and other conductive power, oil mist, salt, of organic solvent exists.

(6) Places exposed to direct sunlight.

(7) Places where a strong electric or magnetic field exists.

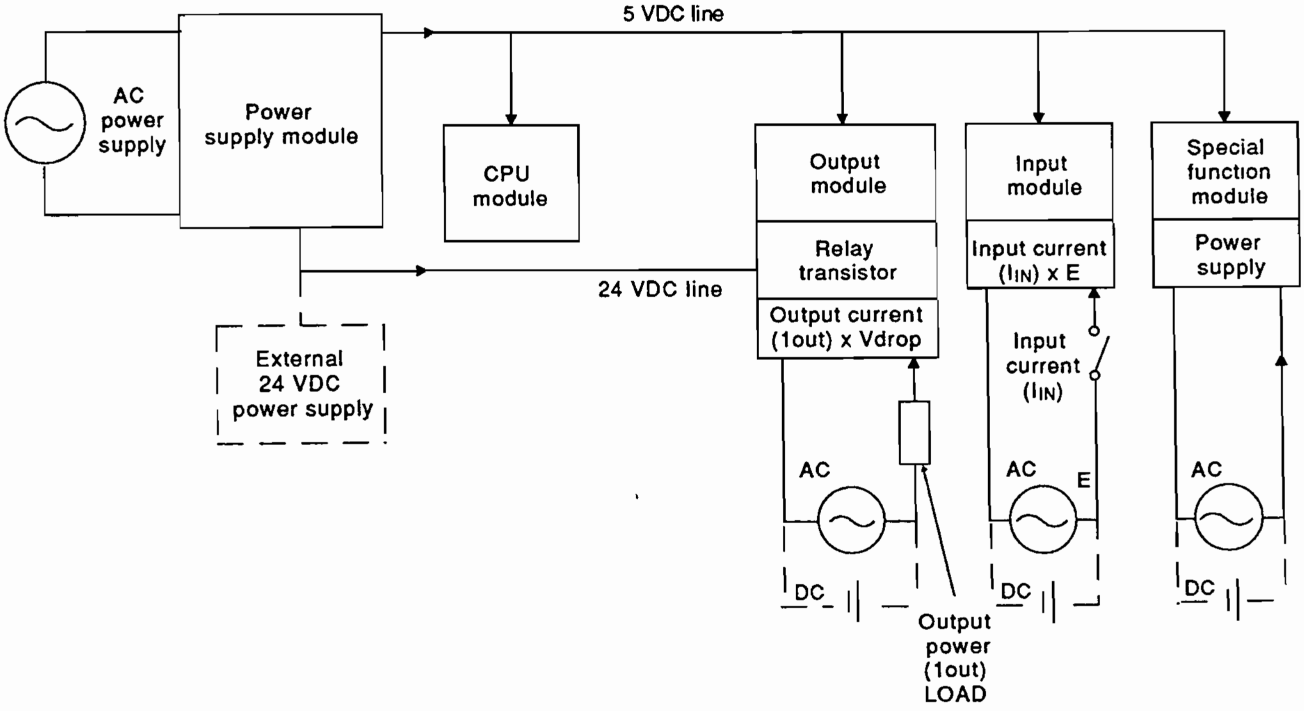
(8) Places where mechanical vibrations of impacts are transmitted directly to the module body.

8.2 Calculation of Heat Generated by the Programmable Controller System

The operating ambient temperature inside the panel in which the programmable controller is installed must be kept below 55 °C. In order to design heat-dissipating measures inside the panel where the PC is installed, the average power consumption (amount of heat generated) of the units and equipment inside the panel must be known. The method for determining the average power consumption of the A1SJCPU system is presented here. Calculate the temperature rise inside the panel from this power consumption

Average power consumption

Power is consumed by the following PC parts:



(1) Power consumption of a power supply module

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

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

I_{5V} : I5V= 5 VDC logic circuit current consumption of each module

I_{24V} : I24V= Average current consumption of 24 VDC for output module internal consumption (with average number of points switche ON)

This is not relevant if 24 VDC is supplied from an external source and a power supply module with no 24 VDC output is used.

(2) Total 5 VDC logic circuit power consumption

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

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

(3) Total 24 VDC average power consumption of output modules (with an average number of points switched ON.

The 24 VDC output circuit average power consumption of the power supply module is the total power consumption of each of the modules:

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

(4) Average power consumption due to voltage drop in output circuits of output modules (with an average number of points switched ON)

$W_{OUT} = I_{OUT} \times V_{drop} \times$ number of output points x average number of outputs on at one time (W)

I_{OUT} : Output current (actual operating current) (A)

Vdrop : Voltage drop across each output module (V)

(5) Average power consumption of input circuits of input modules (with an average number of points switched ON)

$W_{IN} = I_{IN} \times E \times$ X number of input points x average number of inputs on at one time (W)

I_{IN} : Input current (effective value for AC) (A)

E : Input voltage (actual operating voltage) (V)

(6) Power consumption of special function modules is expressed as follows:

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

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

$$\underline{\underline{W = W_{PW} + W_{5V} + W_{24V} + W_{OUT} + W_{IN} + W_S \ (W)}}$$

The amount of heat generated and the temperature rise in the panel can be calculated from this total power consumption (W).

Generally, the temperature rise in the panel is expressed as follows:

$$T = \frac{W}{UA} \quad [^\circ C]$$

W : Power consumption of the entire PC system (obtained as shown above.

A : Panel internal surface area (m_2)

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

U = 4 : if the air in the panel is not circulated

POINT

If the temperature inside the panel exceeds 55 °C, the temperature must be reduced by installing a heat exchanger.
If a fan is used, it will suck in dust together with air from outside, with adverse effects on the programmable controller.

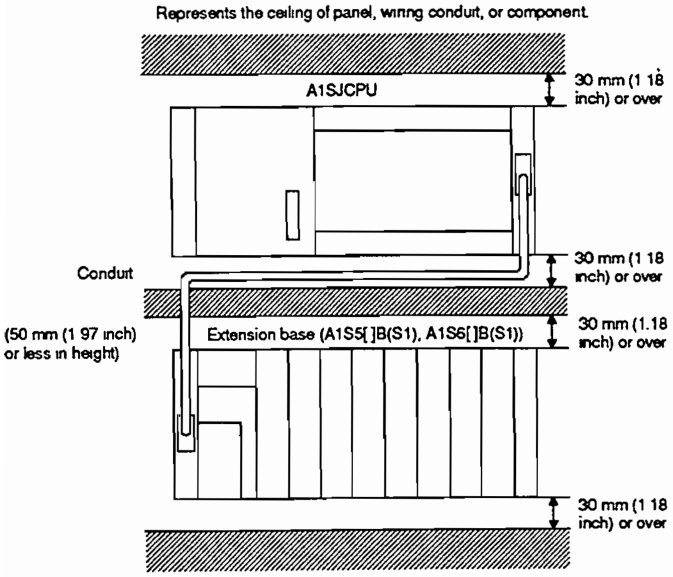
8.3 Precautions Relating to the Installation of the Base Unit

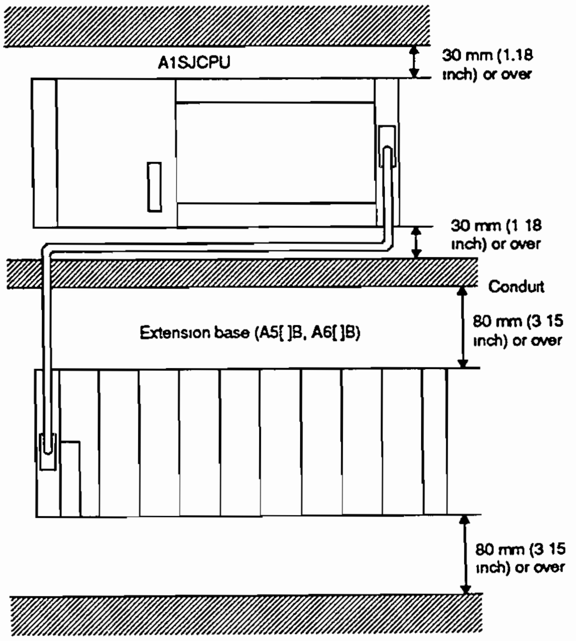
The following precautions must be observed when installing a PC to an operation panel or other bases considering fully the operability, maintainability, and resistance to the environmnt.

(1) Base unit mounting position

Provide a clearance between the top and bottom sides of the unit and the wall of structure or components as given below. This is required for ventilation and replacing ease.

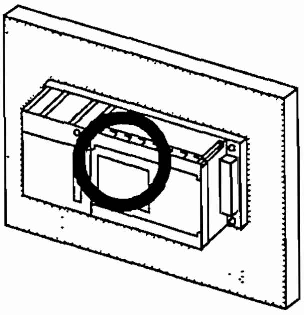
- Where:A1SJCPU, A1S5[ ]B(S1), A1S6[ ]B(S1) .... 30 mm (1.18 inch) or over
- A5[ ]B, A6[ ]B .... 80 mm (3.15 inch) or oveR



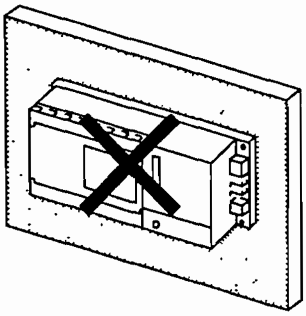


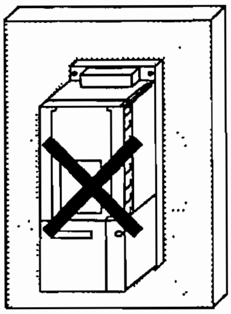
(2) Installing direction

(a) Install the PC in the direction shown below for good ventilation



(b) The following installing directions must be avoided.





(3) Install the base unit on a flat surface.

It it is mounted on an uneven surface, the PC board in the module is starained and malfunction will occur.

(4) Avoid installing the base unit near a vibrating source such as a large electromagnetic switch and no-fuse circuit breaker. Install it to a separate panel or away form such vibrating source.

(5) Provide a wiring duct if necessary.

However, if the clearance with the top/bottom of the PC is less than 30 mm (1.18 inch), note the following points:

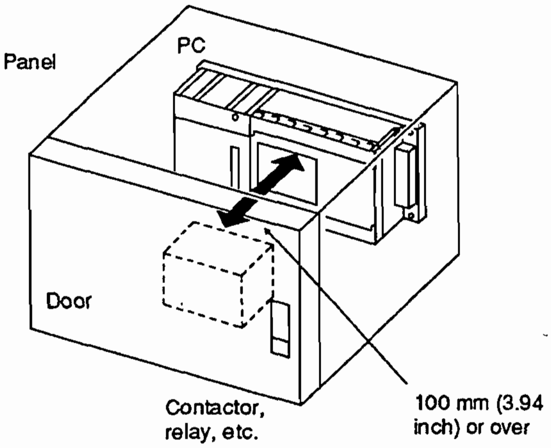
(a) When the duct is located above the PC, the height of the duct should be 50 mm (1.97 inch) or less to allow for sufficient ventilation.

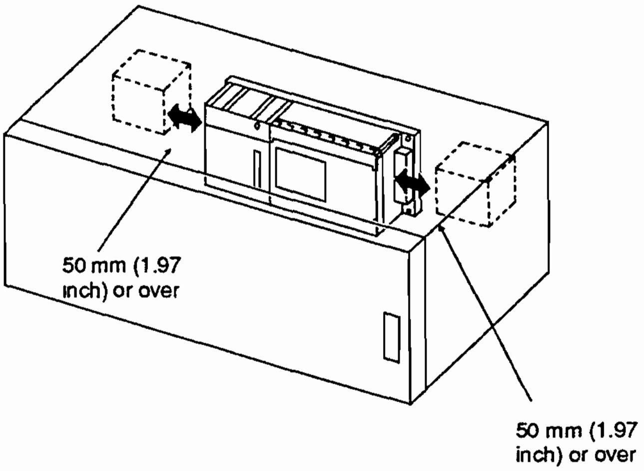
Set the distance from the top of the PC so that the hook latch at the top of the module can be pressed. If it cannot be pressed, it will be impossible to replace the module.

(b) When the duct is located under the PC, provide sufficient clearance so that there is no effect on the 100/200 VAC input line of the power supply module, I/O wires of I/O modules, and 12/24 VDC wires.

(6) Provide clearances, mentioned below, between the PC and other devices (contactors and relays) to avoid the influence of radiating noise and heat.

- Between the PC and a device installed in front of the PC: 100 mm (3.94 inch) or over.
- Between the PC and devices installed on the right and left sides of the PC: 50 mm (1.97 inch) or over



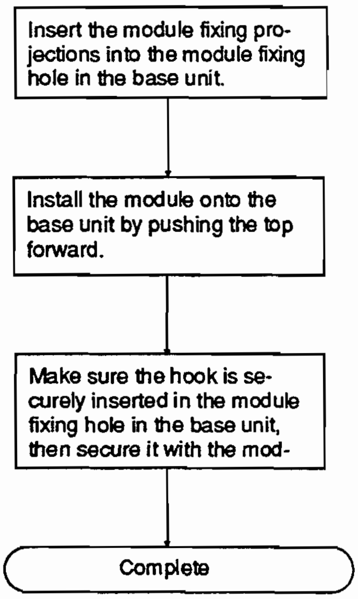


8.4 Mounting and Removing Modules

This section explains how to mount power supply modules, PC CPU modules, I/O modules, special function modules, etc., to a base unit, and how to remove them.

(1) Module mounting

The module mounting procedure is as follows.

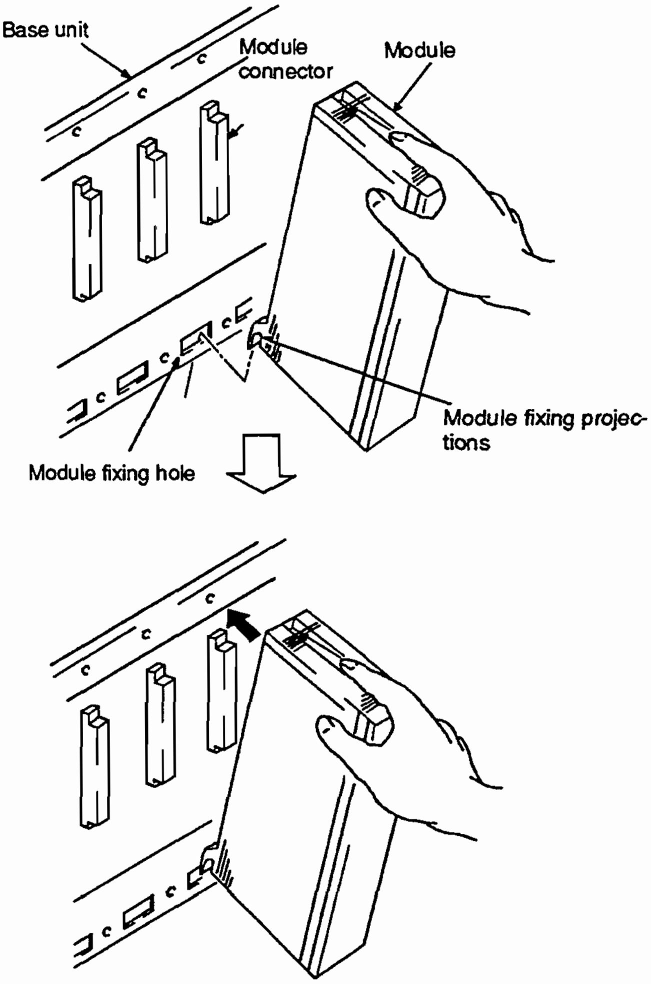


Insert the module fixing projections into the module fixing hole in the base unit.

Install the module onto the base unit by pushing the top forward.

Make sure the hook is securely inserted in the module fixing hole in the base unit, then secure it with the mod-

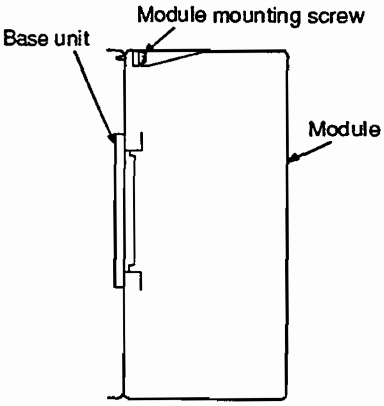
Complete



POINTS

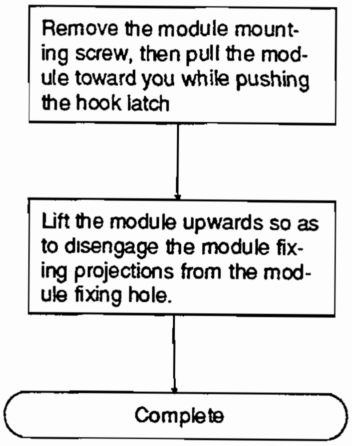
(1) *Before securing the module, make sure the module fixing projections are inserte in the module fixing hole. If the module is forcibly secured without inserting the projections, the pins in the module connector may be bent or damaged.*

(2) Always turn the power supply OFF before mounting or removing



(2) Module removal

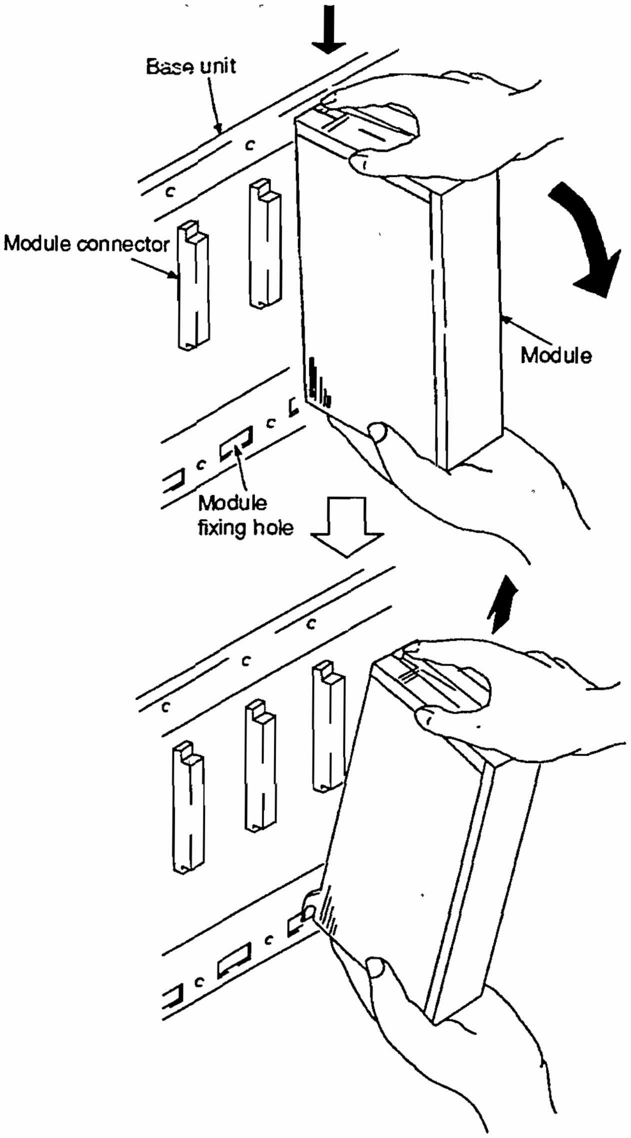
The module removal procedure is as follows.



Remove the module mounting screw, then pull the module toward you while pushing the hook latch

Lift the module upwards so as to disengage the module fixing projections from the module fixing hole.

Complete



POINTS

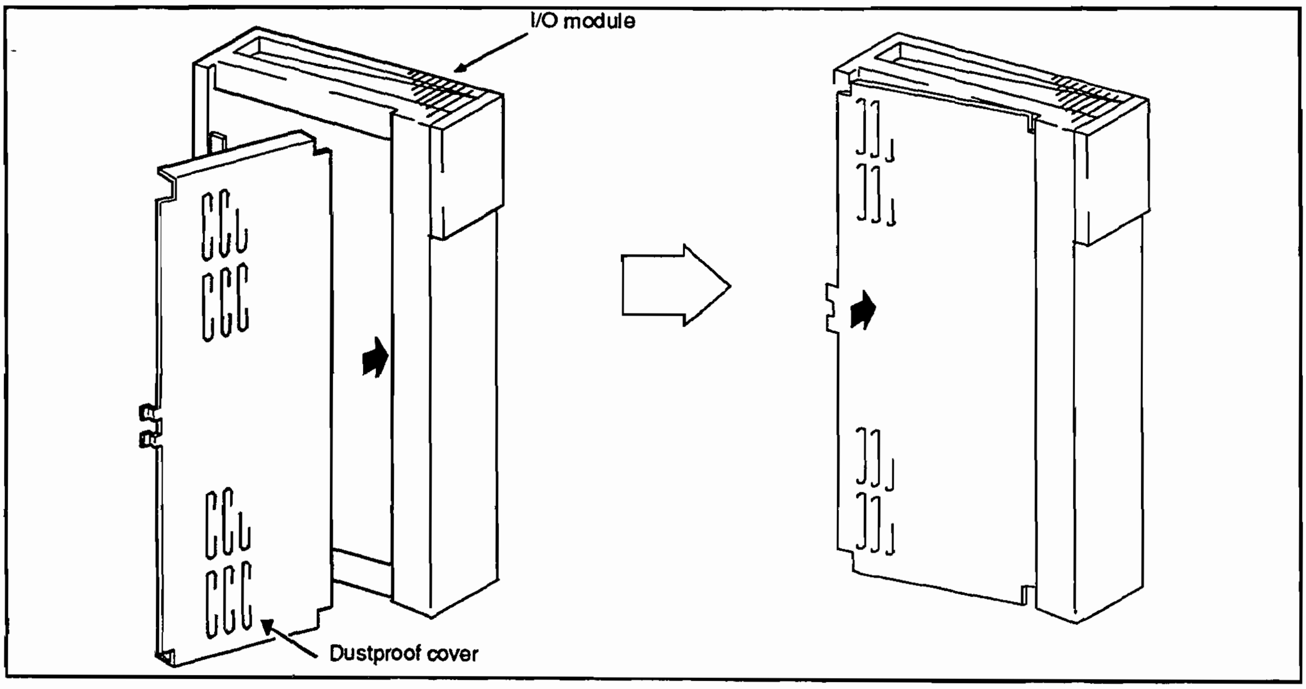
(1) When removing a module, be sure to remove the module mounting screw before attempting to disengage the module fixing projections from the module fixing hole. If the module is forcibly removed, the module fixing projections will be damaged.

(2) Always turn the power supply OFF before mounting or removing any module.

8.5 Installing and Removing the Dustproof Cover

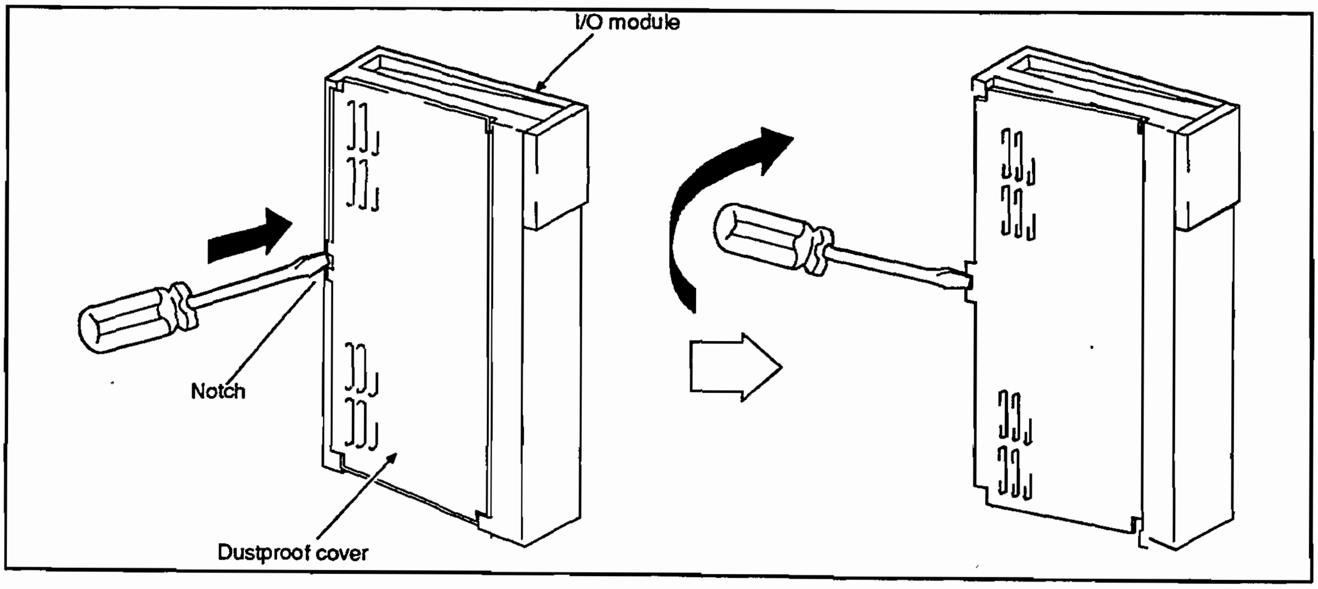
When an A1S52B(S1), A1S55B(S1), or A1S58B(S1) is used, the dustproof cover which is supplied with the base unit must be fitted to the I/O module loaded at the left end in order to prevent foreign matter from entering the I/O module. If this cover is not fitted, foreign matter will enter the I/O module and cause malfunctions. The following explains how to fit and remove the dustproof cover.

(1) Fitting



To fit the dustproof cover onto the I/O module, first insert the cover at the terminal side and then press the cover against the I/O module as shown in the figure.

(2) Removal



Fit the tip of a flat blade screwdriver into the notch on the left side of the dustproof cover. While keeping the screwdriver tip in the notch, gently move the screwdriver to the left (as shown above) until the cover snaps open.

8.6 Failsafe Circuits

When the power to the programmable controller is turned ON or OFF, the process output may not perform normally at times due to the difference between the delay time and the rise time of the power supply of the PC CPU module and the external power supply (especially DC).
For example, when the PC main power supply is turned on after turning on the process external power supply to a DC output module, the DC output module may momentarily issue faulty outputs when thePC power is turned on. To avoid this problem, the circuit must be configured so that the PC main power supply is turned on first.
Erroneous operation may also occur due to faults of the external power supply or programmable controller.
In order to prevent faults such as these from causing erroneous operation of the entire system, and also for safety reasons, configure circuits external to the programmable controller (such as emergency stop, protection, and interlock circuits) that prevent machine damage and accidents.

An example circuit for a system design based on the above points is presented overpage.

POINT

Some A1S series output modules detect a blown fuse error when the external power supply is turned OFF.

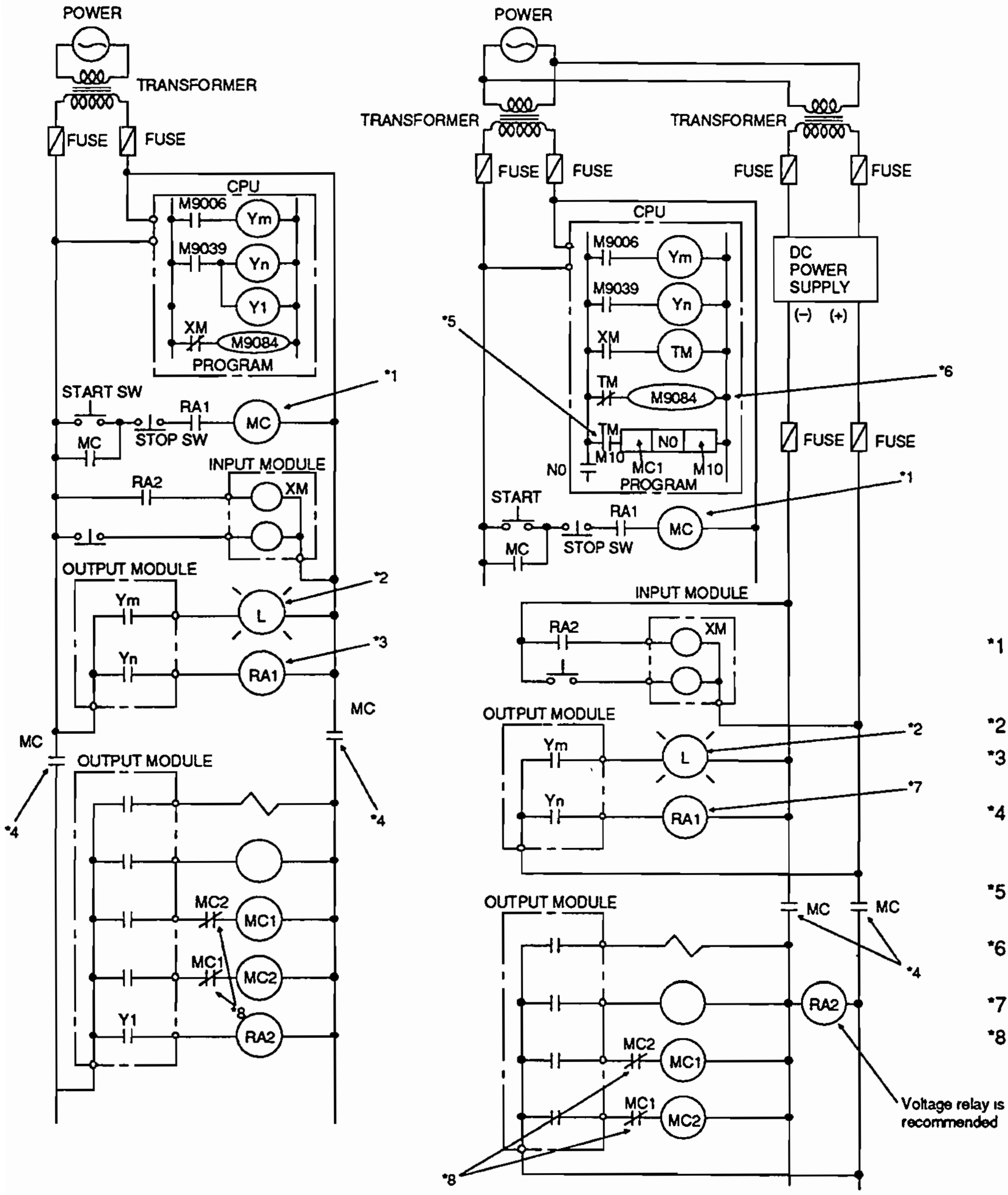
In the example circuit shown overpage, since the start-up of the A1SJCPU takes place earlier than the rise of the external power supply to the output module, a blown fuse error is detected.

To solve this problem, the system is designed to keep M9084 on until the external power supply has risen, so as not to check for blown fuses. (When M9084 is ON, the I/O module verification and battery checks are not performed.)

(1) System design circuit example

ALL AC

Mixed AC and DC



*1: RUN/STOP circuit interlocked with RA1 (run monitor relay)

*2: Low battery alarm

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

*4: Power to output equipment switched OFF when the STOP signal is given.

*5: Input switched when power supply established.

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

*7: ON when run by M9039

*8: Interlock circuits as necessary.

The power-ON procedure is as follows:

For AC

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

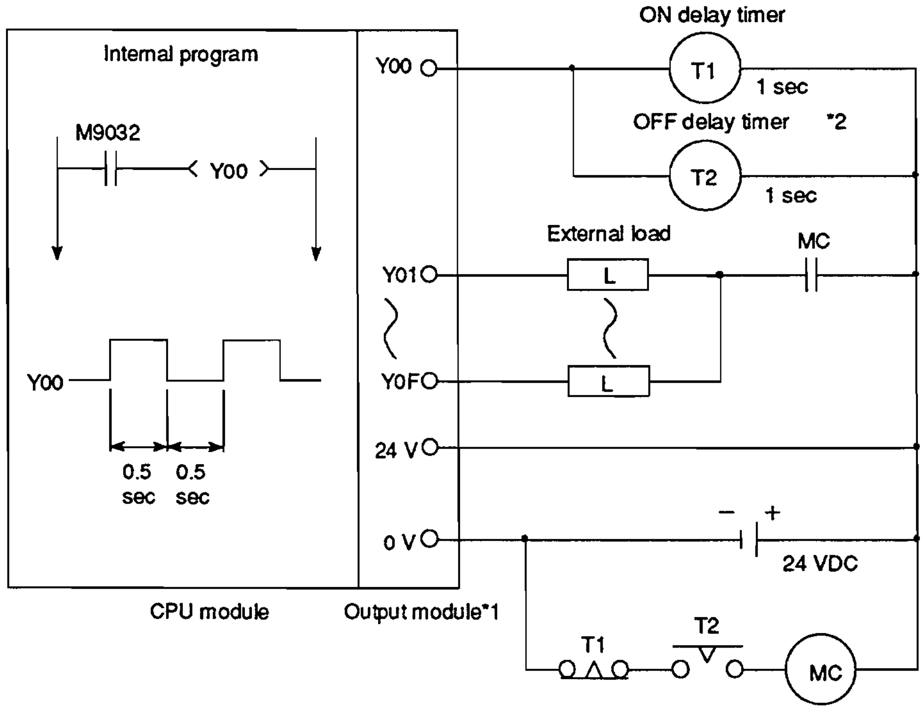
For AC/DC

1) Set the CPU to RUN
2) Switch ON the power.
3) Turn ON the start switch.
4) When DC power is established, RA2 comes ON.
5) Timer (TM) times out after the DC power reaches 100%.

   (The TM set value should be the period of time from when RA2 comes ON to the establishment of 100% DC voltage.. Set this value to approximately 0.5 seconds.)
6) When the magnetic contractor (MC) comes in, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

(2) Fail-safe measures against PC failures

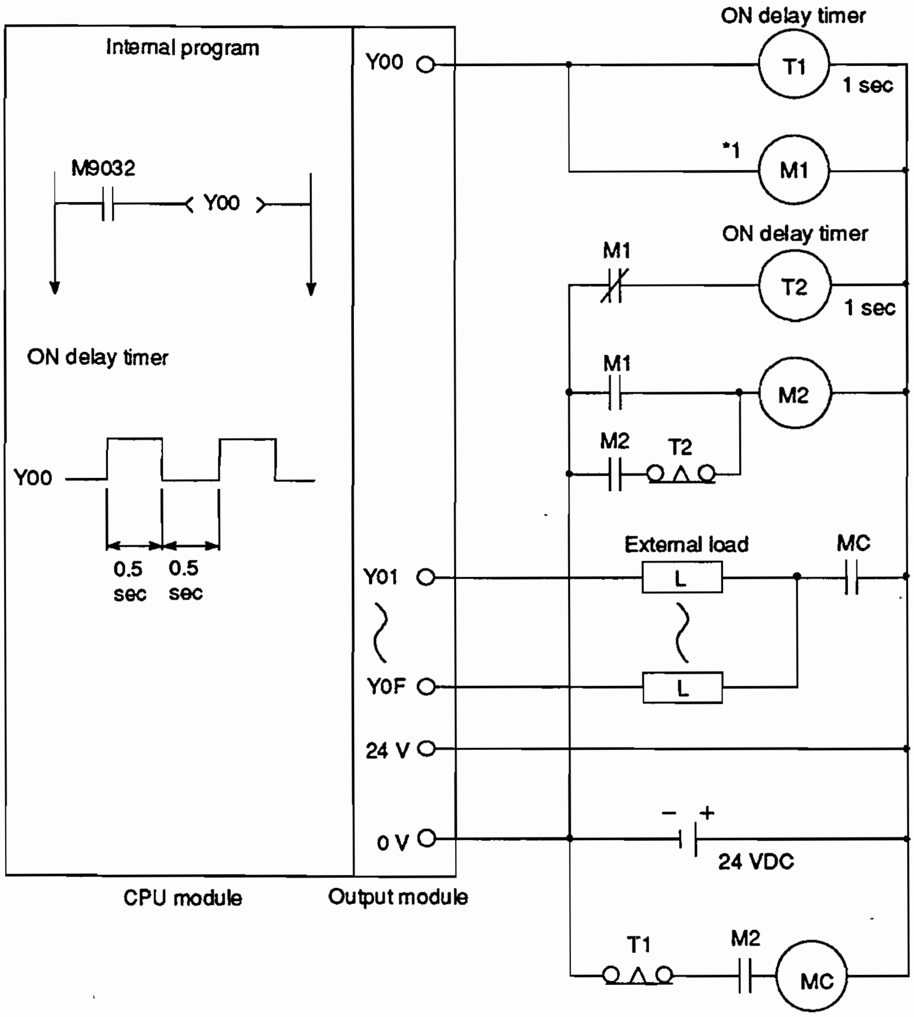
Problems with the CPU or memory can be detected by the self diagnosis function. However, problems with the I/O control area may not be detected by the CPU.
In such cases, all I/O points turn ON or OFF depending on the condition of problem, and normal operating conditions and operating safety cannot sometimes be maintained.
Though Mitsubishi PCs are manufactured under strict quality control, they may cause failure or abnormal operations due to unspecific reasons. To prevent the abnormal operation of the whole system, machine breakdown, and accidents, build a fail-safe circuit outside the PC.
The following gives an example of a fail-safe circuitry.



*1: Y00 repeats turning ON and then OFF at 0.5 second intervals. Use a no-contact output module (transistor in the example shown above).

*2: If an OFF delay timer (especially a miniature timer) is not available, use ON delay timers to make a fail-safe circuit as shown on the next page.

A fail-safe circuit built with ON delay timers



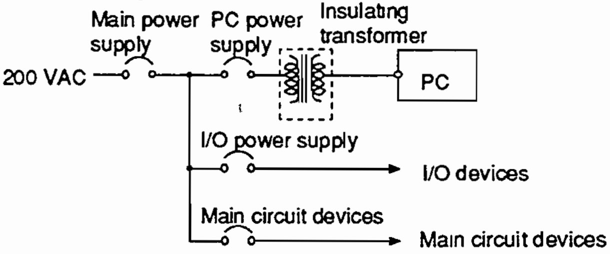
*1: Use a solid-state relay for the M1 relay.

8.7 Power Supply Connection

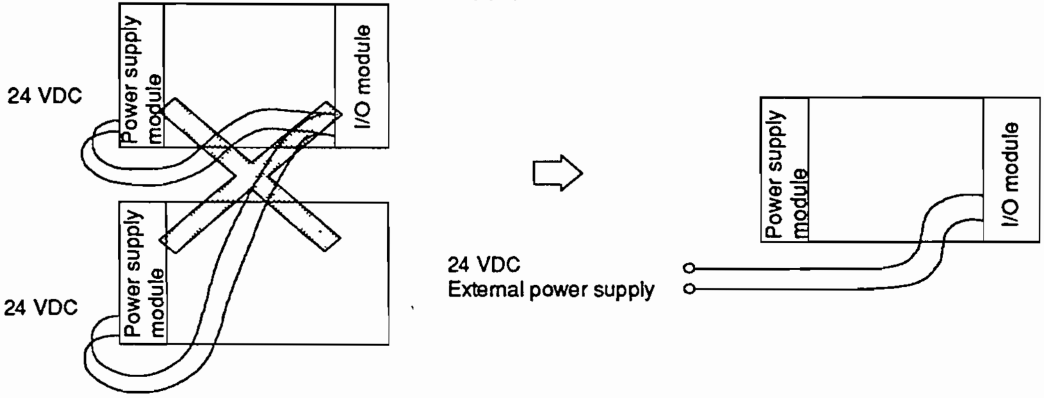
Observe the following precautions when making the power supply wiring.

(1) Power supply connection

(a) Provide separate wiring systems for the PC power, I/O devices, and operating devices as shown below.
If the wiring is influenced by intensive noise, connect an insulating transformer.



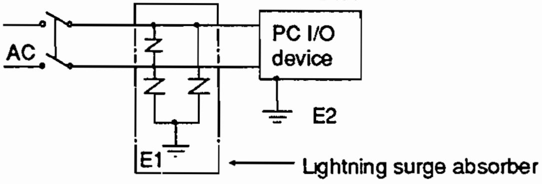
(b) Do not connect the 24 VDC outputs from more than one power supply module in parallel to supply to one I/O module. If they are connected in parallel, the power supply modules will break.



(c) The 100 VAC, 200 VAC, and 24 VDC wires should be twisted as tightly as possible, and connect the modules at the shortest distance between them.
To minimize the voltage drop, use thick wires (MAX. 2 mm^2) as much as possible.

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

(e) As a measure against surges caused by lightning, insert a lightning surge absorber as shown below.



POINTS

(1) Provide separate grounding for the lightning surge absorber (E1) and the PC (E2).

(2) Select a lightning surge absorber whose maximum allowable circuit voltage is larger than the circuit voltage at the maximum power supply voltage.

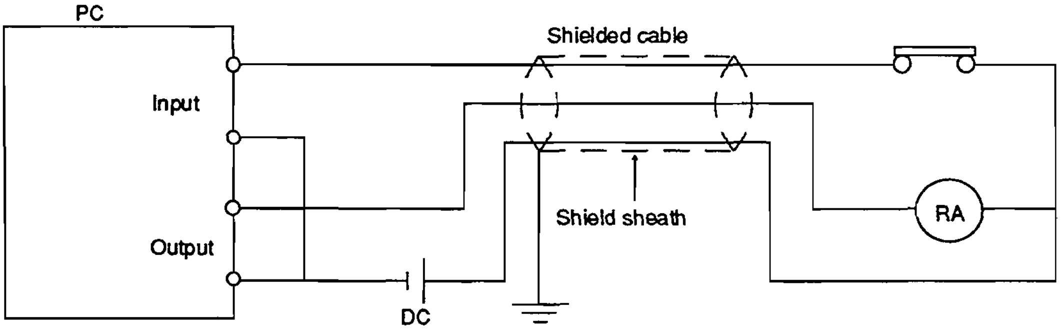
(2) Wiring of I/O equipment

(a) The applicable size of wire to the terminal block connector is 0.75 to 1.5 mm2. However, you arerecommended to use wires of 0.75 mm2 for convenience.

(b) Separate the input and output lines.

(c) I/O signal wires must be at least 100 mm (3.94 in.) away from high-voltage and large-current main circuit wires.

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



(e) If the wiring is routed through piping, ground the piping properly.

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

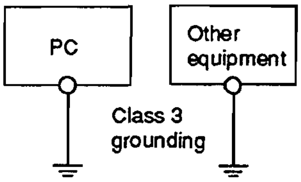
(g) If wiring over 200 m (7.87 inch) or a greater distance, problems can be caused by leakage current due to line capacity. Take corrective action as described in Section 10.4.

(3) Grounding

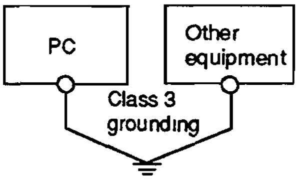
Grounding must be carried out as described in (a) to (d) below.

(a) Ground independently if possible. Class 3 grounding should be used (grounding resistance of 100 Ω or less).

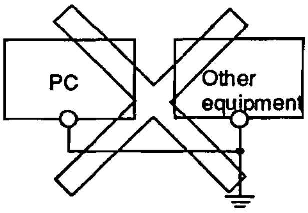
(b) When independent grounding is impossible, use common grounding as shown in the figure below (2).



(1) Independent grounding ... Best



(2) Common grounding ... Good



(3) Common grounding ... Not allow

(c) The grounding wire used must have a cross sectional area of at least 2 mm_2.

Make the grounding point as close as possible to the PC and the grounding wire as short as possible

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

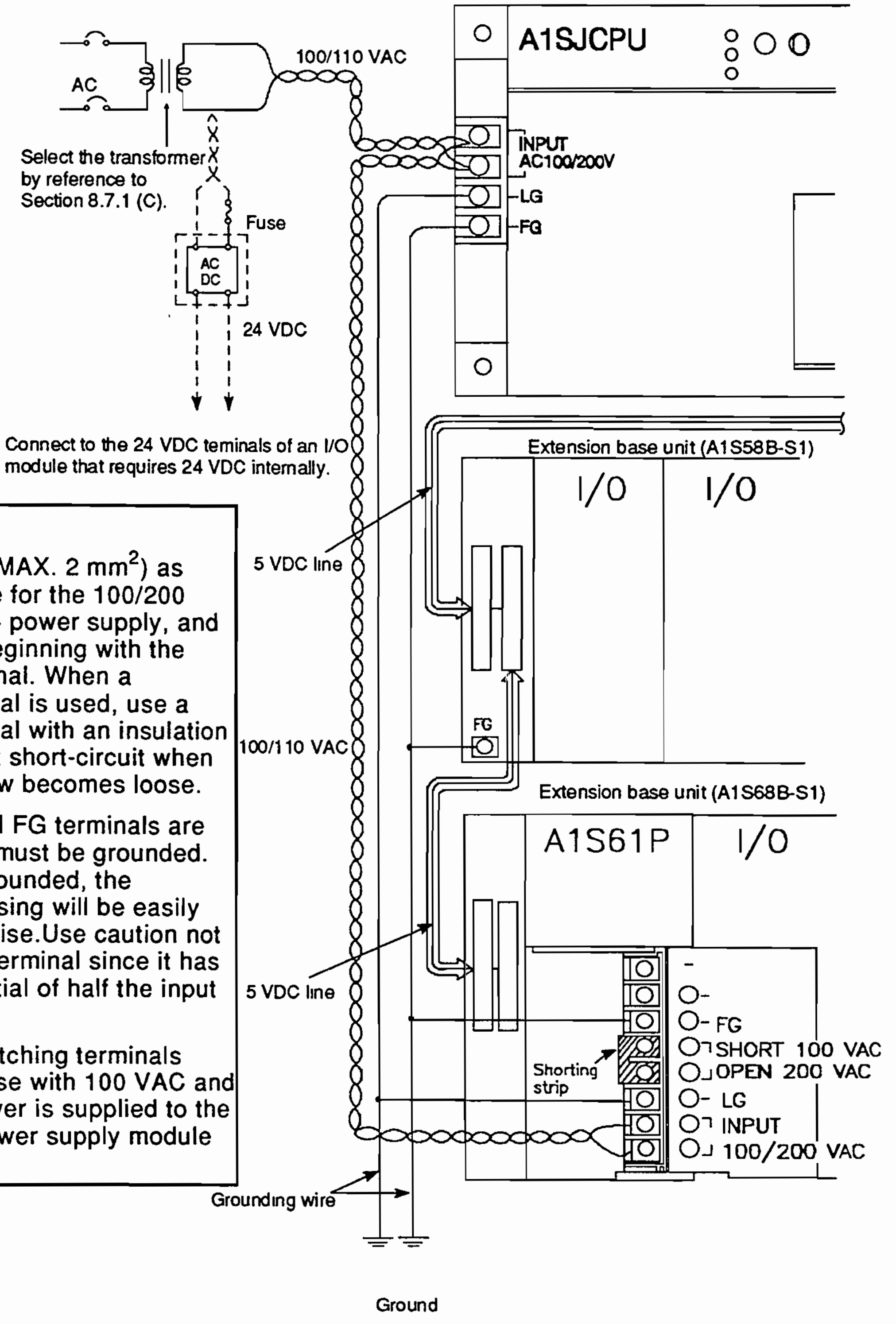
(4) The following is an example of wiring of the power supply and grounding wires to the A1SJCPU and extension base unit.

When the power supply voltage for the power supply module(a1S61P, A1S61PEU, A1S62P, A1S62PEU) is set at 100V, put a shorting strip on the voltage switching terminals of the power supply module.

Since the voltage switching terminals are factory-set for the open state, it is not necessary to put the shorting strip when the power supply boltage 200 VAC is used.

The A1SJCPU can operate with the 85 to 264 VAC power supply voltage range without switching the voltavge setting.

(a) Wiring example



POINTS

(1) Use thick wires (MAX. 2 mm^2) as much as possible for the 100/200 VAC and 24 VDC power supply, and twist the wires beginning with the connecting terminal. When a solderless terminal is used, use a solderless terminal with an insulation sleeve to prevent short-circuit when the terminal screw becomes loose.

(2) When the LG and FG terminals are connected, they must be grounded. If they are not grounded, the operation processing will be easily influenced by noise.Use caution not to touch the LG terminal since it has an electric potential of half the input voltage.

(3) If the voltage switching terminals are shorted for use with 100 VAC and if a 200 VAC power is supplied to the terminals, the power supply module will break.

9. MAINTENANCE AND INSPECTION

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

9.1 Daily Inspection

Table 9.1 shows the inspection and items which are to be checked daily.

Table 9.1 Daily Inspection

No.	Check Item		Check Point	Judgment	Corrective Action
1	Base unit mounting conditions		Check for loose mounting screws and cover.	The base unit should be securely mounted.	Retighten screws.
2	Mounting conditions of I/O module, etc.		Check if the module is disengaged or the hook is securely engaged.	The hook should be securely engaged and the module should be positively mounted.	Securely engage the hook.
3	Connecting conditions		Check for loose terminal screws.	Screws should not be loose.	Retighten terminal screws.
			Check distance between solderless terminals.	Proper clearance should be provided between solderless terminals.	Correct.
			Check connectors of extension cable.	Connections should not be loose.	Retighten connector mounting screws.
4	CPU module indicator lamps	"POWER" LED	Check that the LED is ON.	ON (OFF indicates an error.)	See Section 10.2.2.
		"RUN" LED	Check that the LED is ON during RUN.	ON (OFF or flash indicates an error.)	See Section 10.2.3 and 10.2.4.
		"ERROR" LED	Check that the LED is ON when an error occurred.	OFF (ON when an error occurred.)	See Section 10.2.5. and 10.2.6.
		Input LED	Check that the LED turns ON and OFF.	ON when input is ON. OFF when input is OFF. (Display, which is not as mentioned above, indicates an error.)	See Section 10.2.7.
		Output LED	Check that the LED turns ON and OFF.	ON when output is ON. OFF when output is OFF. (Display, which is not as mentioned above, indicates an error.)	See Section 10.2.7.

9.2 Periodic Inspection

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

Table 9.2 Periodic Inspection

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

9.3 Replacement of Battery

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

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

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

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

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

9.3.1 Service life of battery

Table 9.3 shows the service life of battery.

Table 9.3 Battery Life

Battery Life (Total Power Failure Time) [Hr]		
Guaranteed value (MIN)	Actually applied value (TYP)	After M9006 or M9007 is turned ON
5400	13000	168

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

Preventive maintenance is as described below.

(1) Even if the total power failure time is less than the guaranteed value in the above table, change the battery after four to five years.

(2) When the total power failure time has exceeded the guaranteed value in the above table and M9006 has turned ON, change the battery.

9.3.2 Replacing the battery

Follow the procedure given below when replacing the battery. The data in memory is backed up by a capacitor for several minutes (see Table 9.4 below) after the battery is removed.
Memory data will not be held by the capacitor over the time specified below.

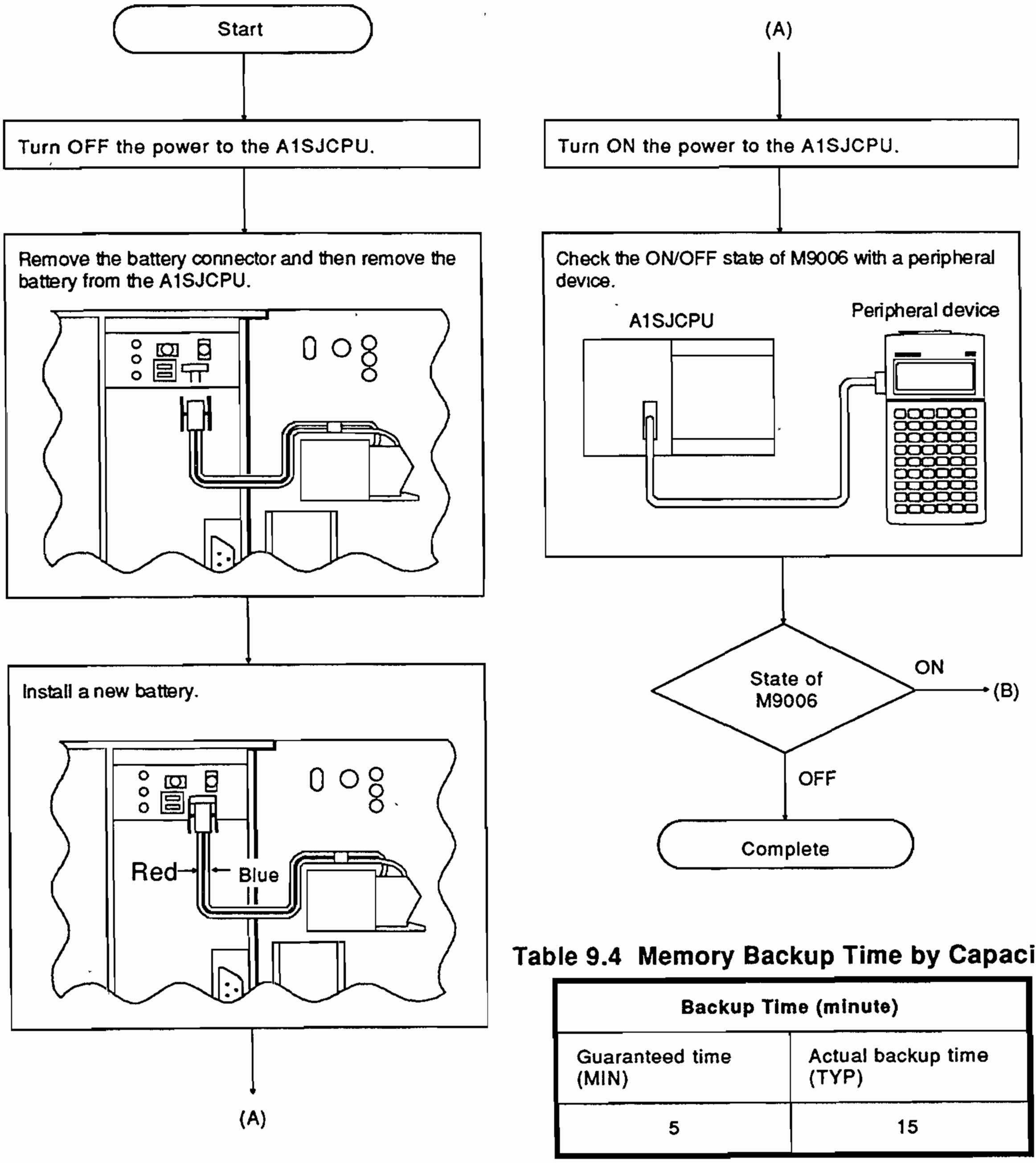
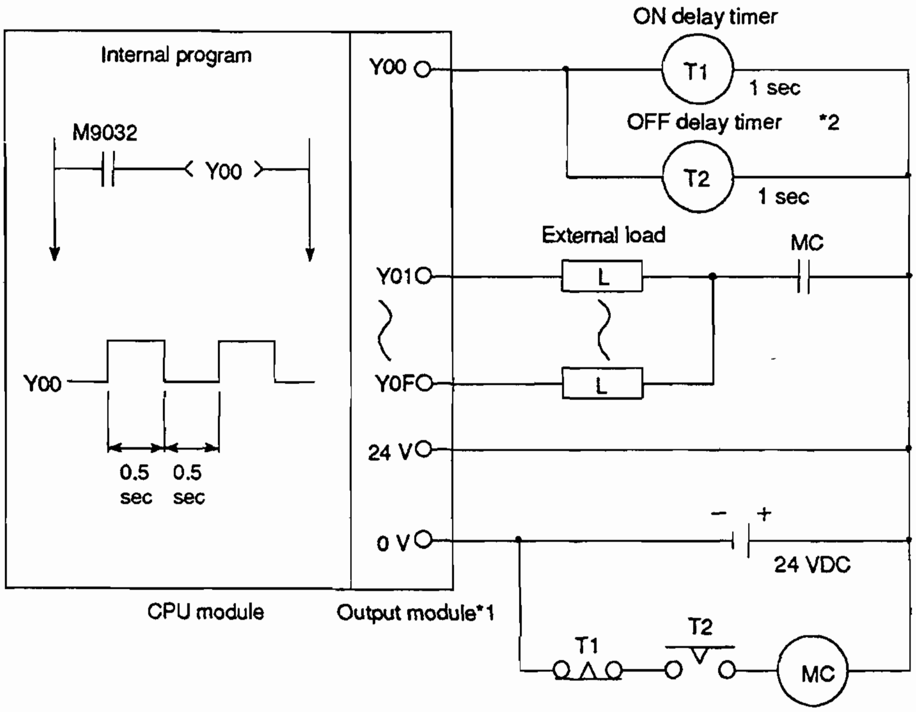


Table 9.4 Memory Backup Time by Capacitor

Backup Time (minute)	
Guaranteed time (MIN)	Actual backup time (TYP)
5	15

(2) Fail-safe measures against PC failures

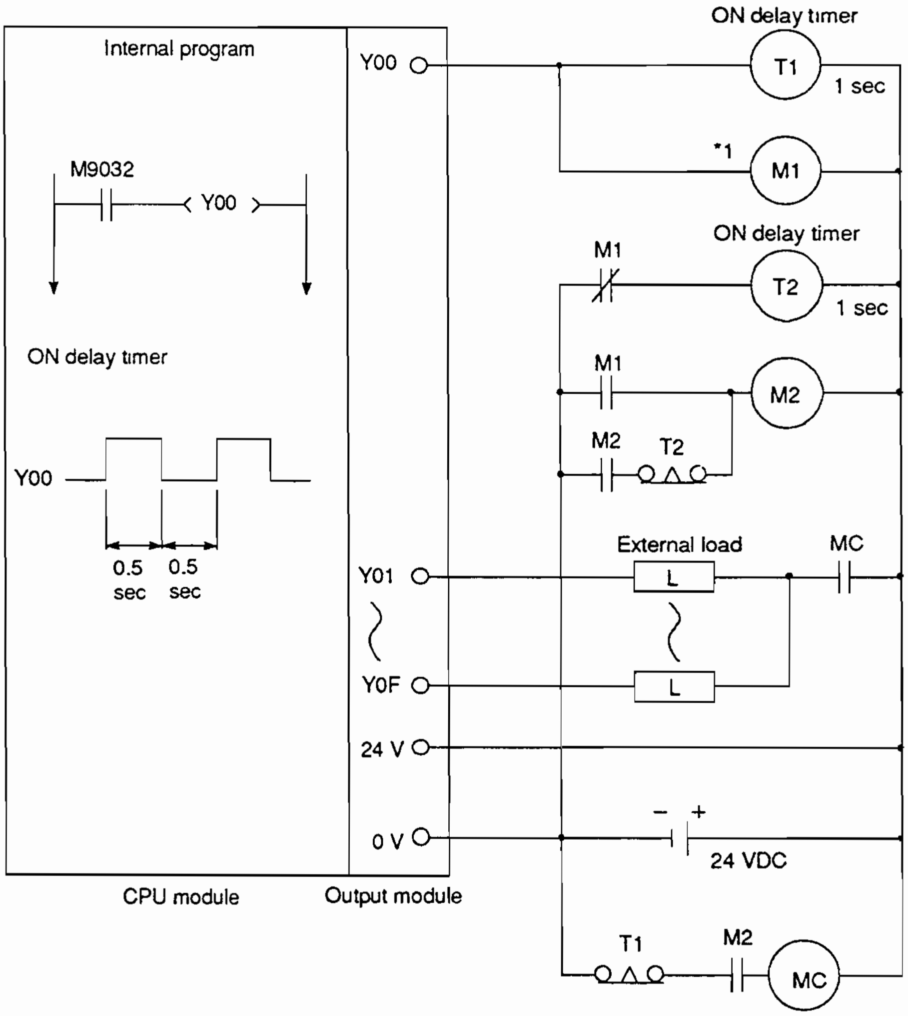
Problems with the CPU or memory can be detected by the self diagnosis function. However, problems with the I/O control area may not be detected by the CPU.
In such cases, all I/O points turn ON or OFF depending on the condition of problem, and normal operating conditions and operating safety cannot sometimes be maintained.
Though Mitsubishi PCs are manufactured under strict quality control, they may cause failure or abnormal operations due to unspecific reasons. To prevent the abnormal operation of the whole system, machine breakdown, and accidents, build a fail-safe circuit outside the PC.
The following gives an example of a fail-safe circuitry.



*1: Y00 repeats turning ON and then OFF at 0.5 second intervals. Use a no-contact output module (transistor in the example shown above).

*2: If an OFF delay timer (especially a miniature timer) is not available, use ON delay timers to make a fail-safe circuit as shown on the next page.

A fail-safe circuit built with ON delay timers

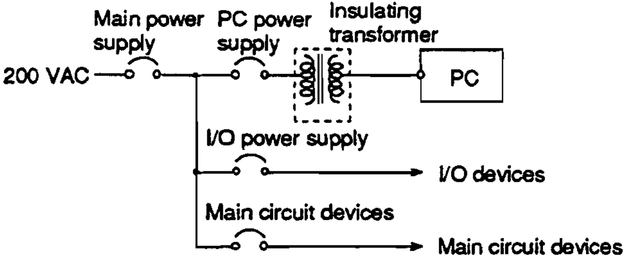


*1: Use a solid-state relay for the M1 relay.

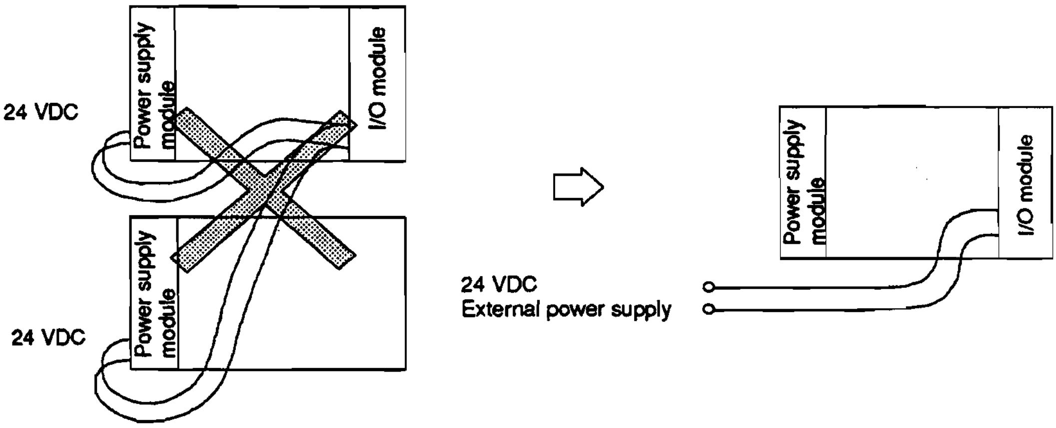
9.4 Power Supply Connection

Observe the following precautions when making the power supply wiring.

(1) Provide separate wiring systems for the PC power, I/O devices, and operating devices as shown below.
If the wiring is influenced by intensive noise, connect an insulating transformer.



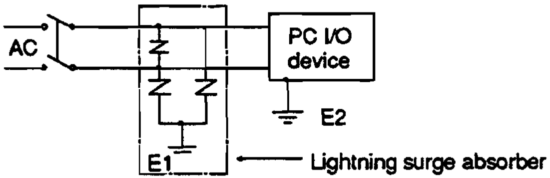
(2) Do not connect the 24 VDC outputs from more than one power supply module in parallel to supply to one I/O module. If they are connected in parallel, the power supply modules will break.



(3) The 100 VAC, 200 VAC, and 24 VDC wires should be twisted as tightly as possible, and connect the modules at the shortest distance between them.
To minimize the voltage drop, use thick wires (MAX. 2 mm^2) as much as possible.

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

(5) As a measure against surges caused by lightning, insert a lightning surge absorber as shown below.



POINTS

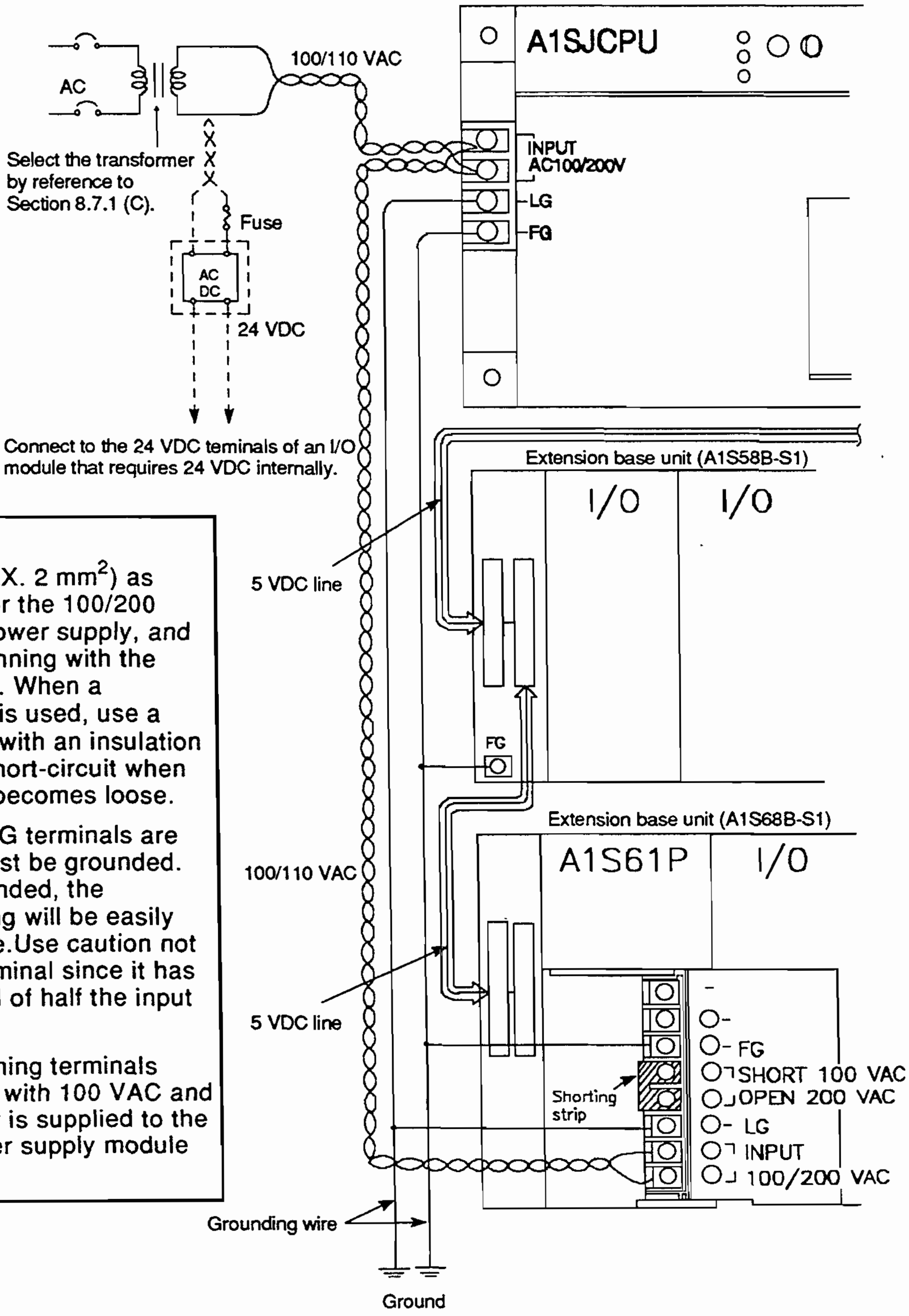
(1) Provide separate grounding for the lightning surge absorber (E1) and the PC (E2).

(2) Select a lightning surge absorber whose maximum allowable circuit voltage is larger than the circuit voltage at the maximum power supply voltage.

(6) The following is an example of wiring of the power supply and grounding wires to the A1SJCPU and extension base unit.

(a) When the power supply voltage for the power supply module (A1S61P, A1S61PEU, A1S62P, A1S62PEU) is set at 100 V, put a shorting strip on the voltage switching terminals of the power supply module.
Since the voltage switching terminals are factory-set for the open state, it is not necessary to put the shorting strip when the power supply voltage 200 VAC is used.
The A1SJCPU can operate with the 85 to 264 VAC power supply voltage range without switching the voltage setting.

(b) Wiring example



POINTS

(1) Use thick wires (MAX. 2 mm^2) as much as possible for the 100/200 VAC and 24 VDC power supply, and twist the wires beginning with the connecting terminal. When a solderless terminal is used, use a solderless terminal with an insulation sleeve to prevent short-circuit when the terminal screw becomes loose.

(2) When the LG and FG terminals are connected, they must be grounded. If they are not grounded, the operation processing will be easily influenced by noise. Use caution not to touch the LG terminal since it has an electric potential of half the input voltage.

(3) If the voltage switching terminals are shorted for use with 100 VAC and if a 200 VAC power is supplied to the terminals, the power supply module will break.

10. TROUBLESHOOTING

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

10.1 Basic Troubleshooting

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

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

(1) Visual checks

Check the following points

(a) Machine motion (in stop and operating states)
(b) Power ON or OFF
(c) Status of I/O equipment
(d) Condition of wiring (I/O wires, cables)
(e) Display states of various indicators (such as POWER LED, RUN LED, ERROR LED, and I/O LED)
(f) States of various setting switches (such as extension base and power failure compensation)

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

(2) Trouble check

Observe any changes in the error condition during the following:

(a) Set the RUN/STOP keyswitch to the STOP position.
(b) Reset using the RUN/STOP keyswitch.
(c) Turn the power ON and OFF.

(3) Narrow down the possible causes of the trouble

Deduce where the fault lies, i.e:

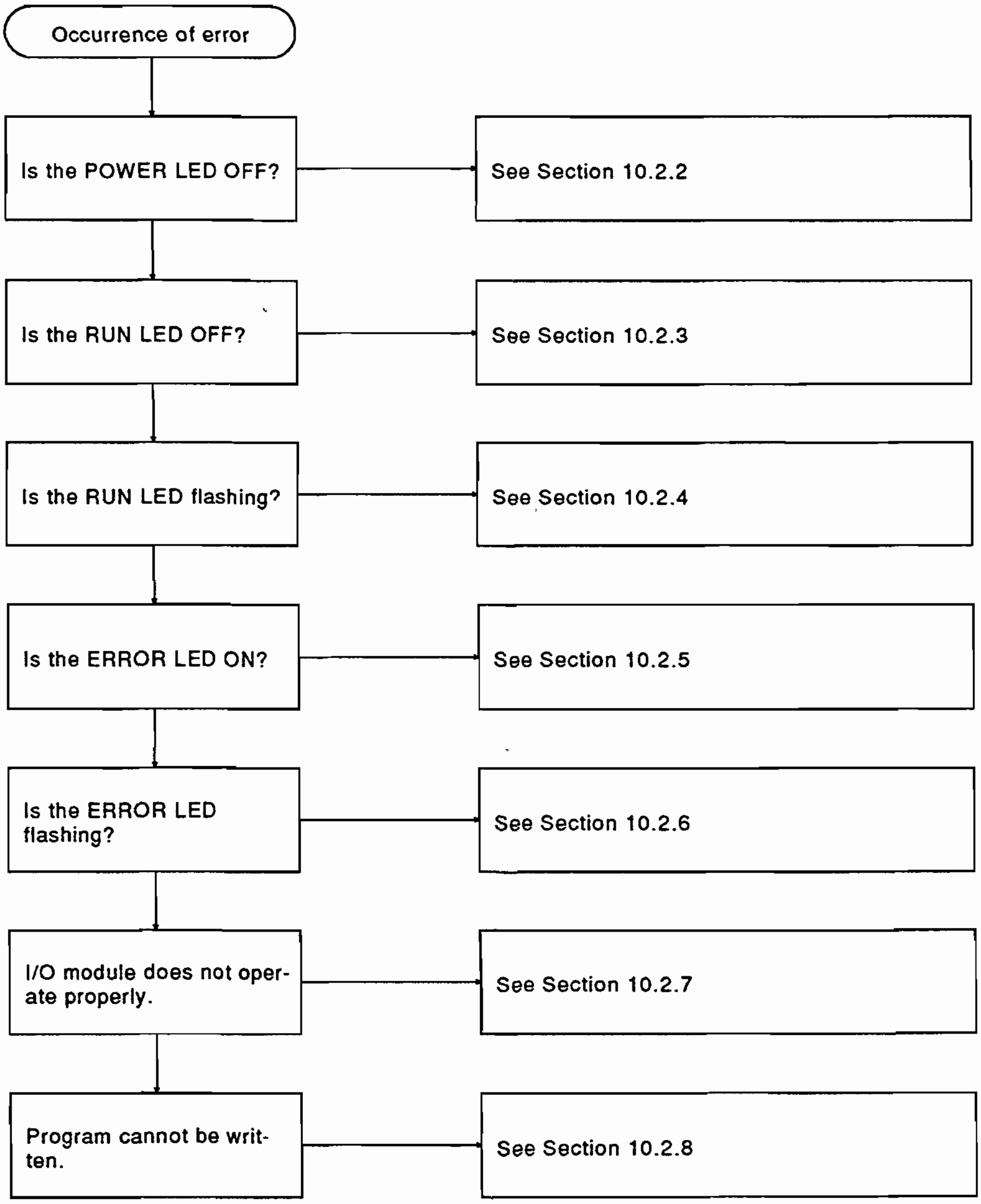
(a) Inside or outside the PC CPU.
(b) I/O module or another module.
(c) Sequence program.

10.2 Troubleshooting

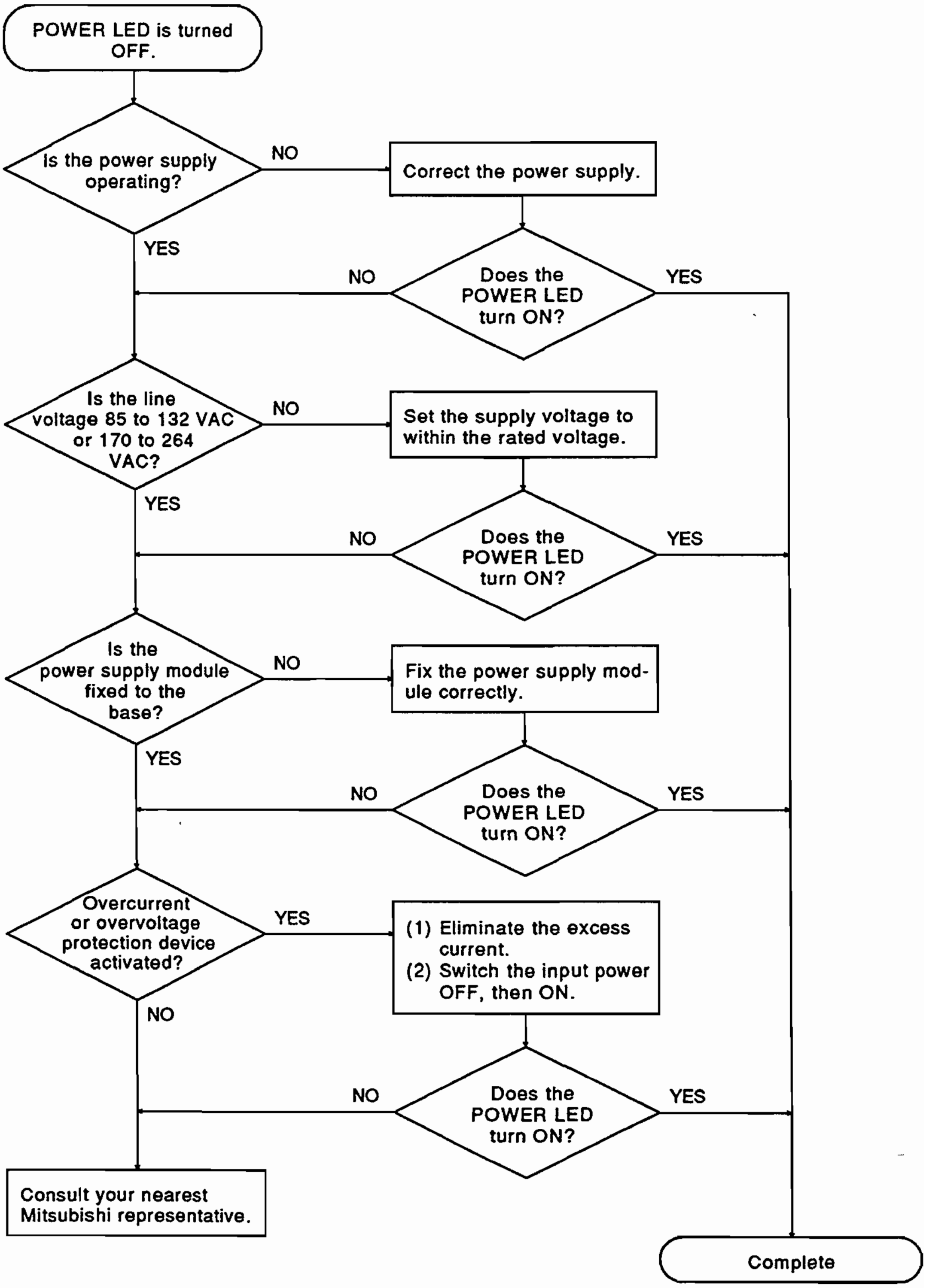
This section explains the procedure for determining the cause of problems as well as the errors and corrective actions for error codes.

10.2.1 Troubleshooting flowcharts

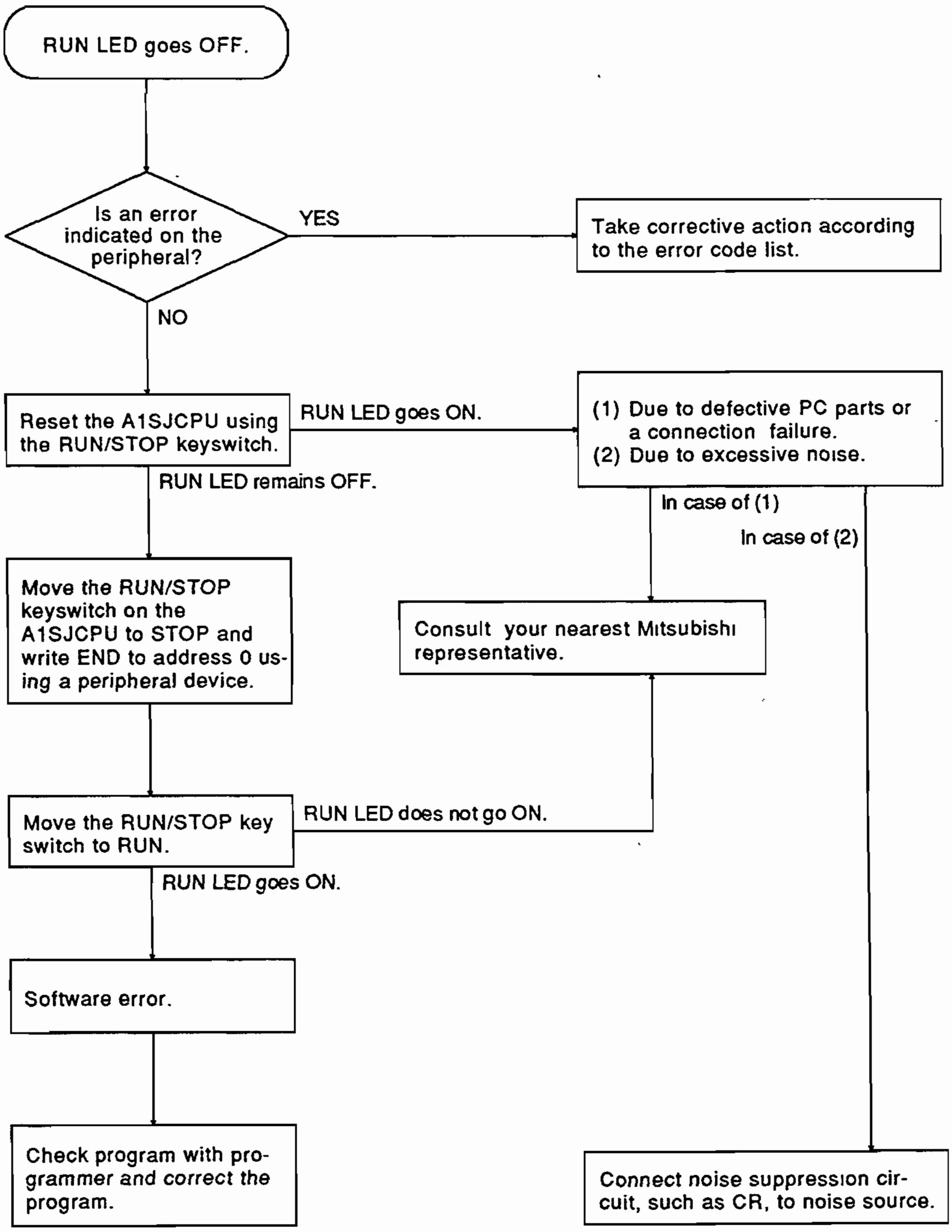
The procedures for troubleshooting are given in the following flowcharts:



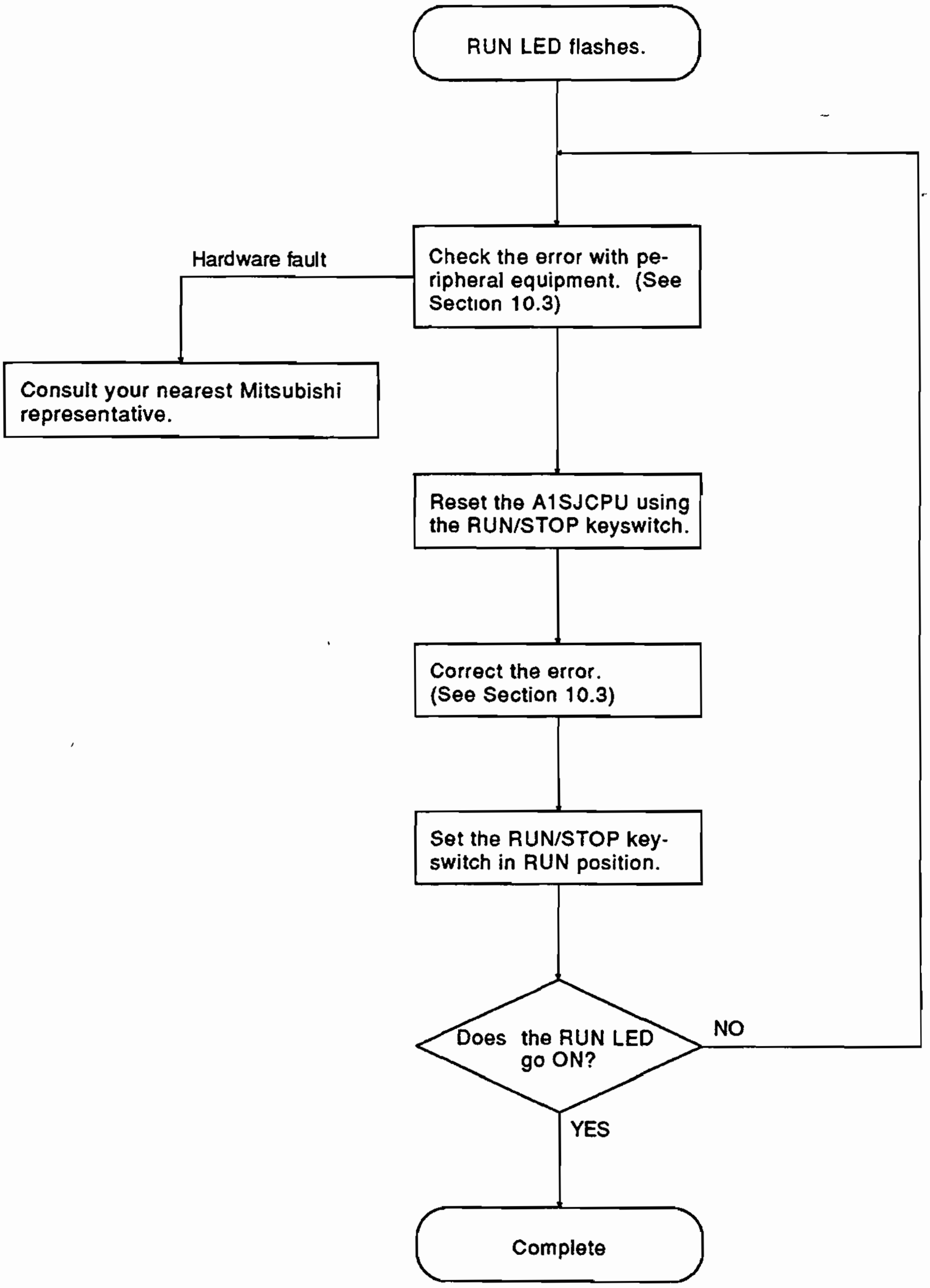
10.2.2 Flowchart used when the POWER LED goes OFF



10.2.3 Flowchart used when the RUN LED goes OFF

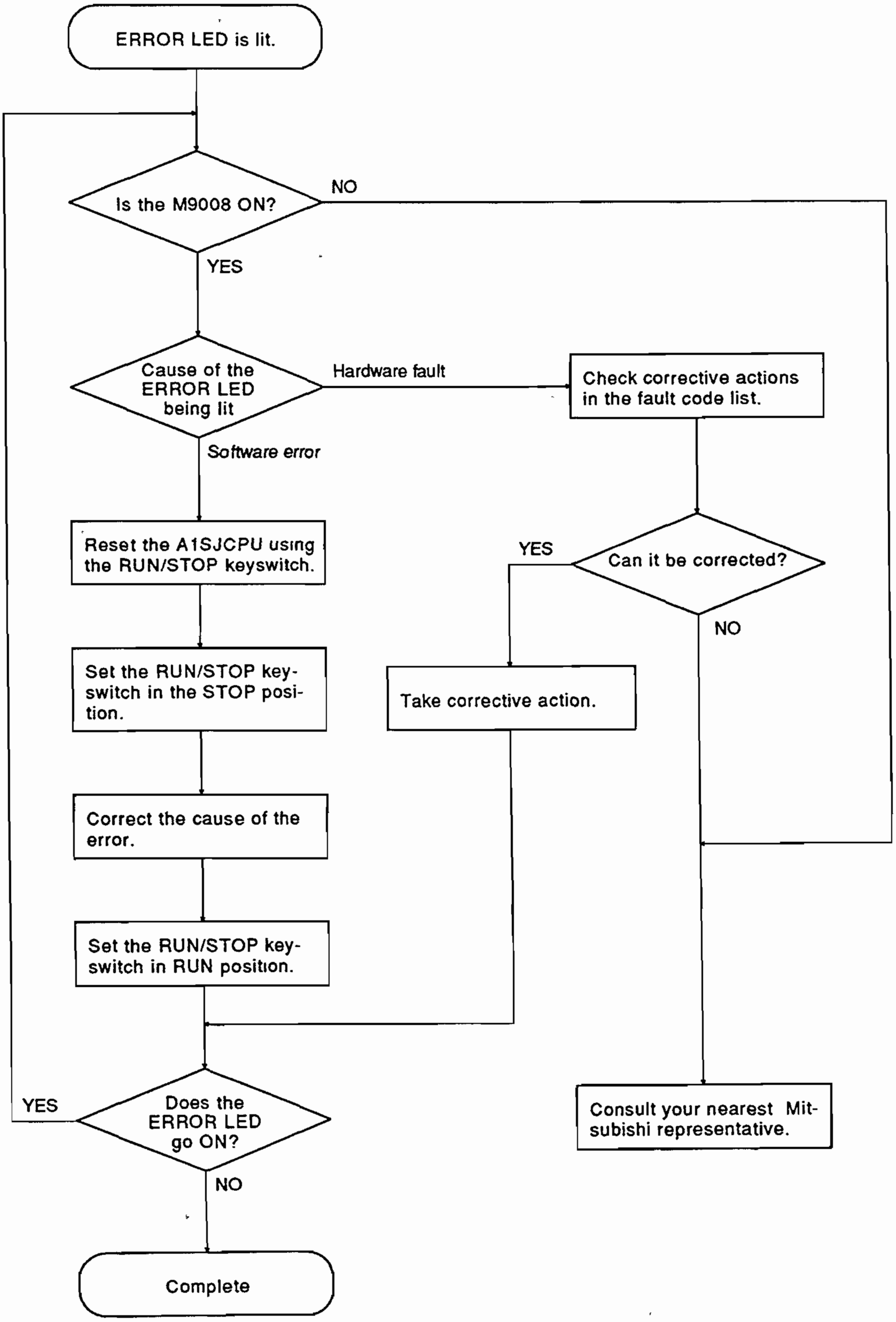


10.2.4 Flowchart used when the RUN LED flashes



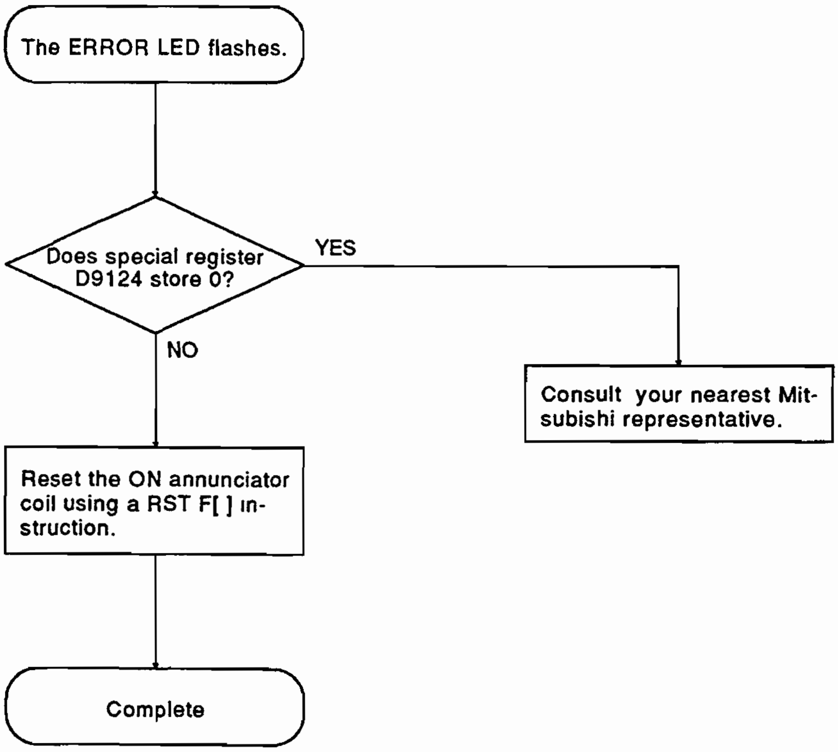
10.2.5 Flowchart used when the ERROR LED is lit

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

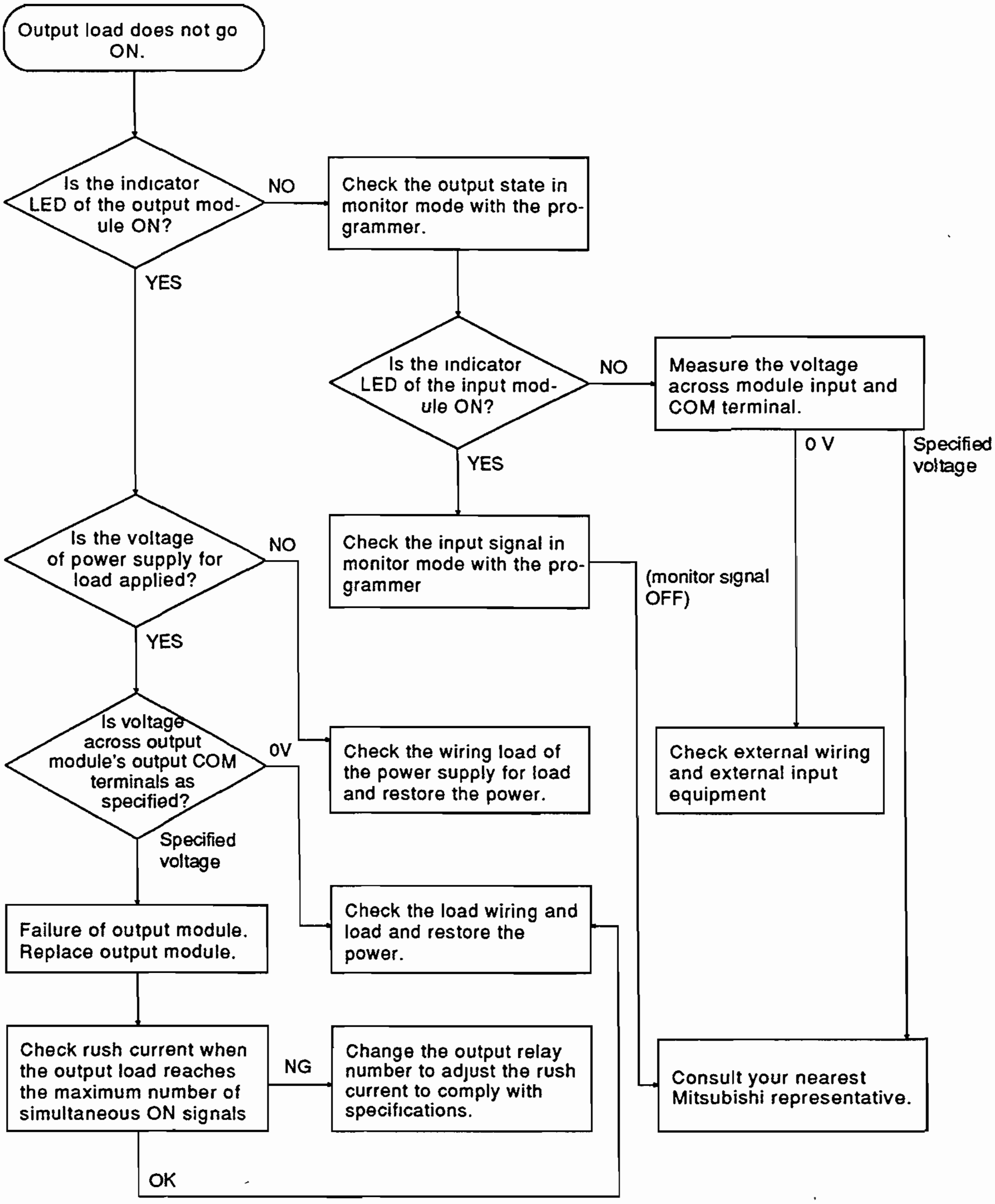


10.2.6 Flowchart used when the ERROR LED flashes

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



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

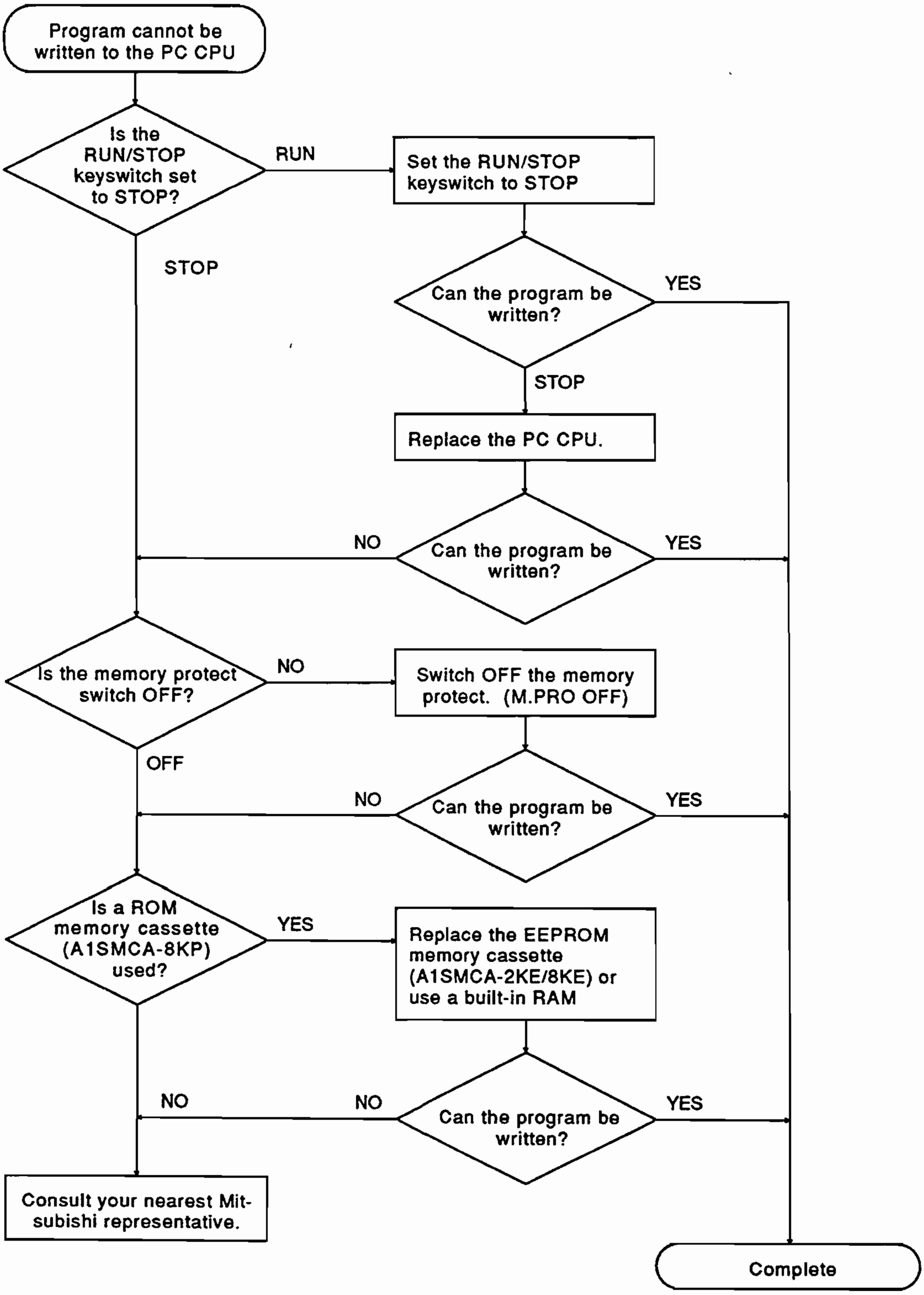


POINT

If the input or load signals are not switched OFF, see Section 10.4 and take corrective measures.

10.2.8 Flowchart used when a program cannot be written to the PC CPU

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

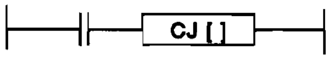
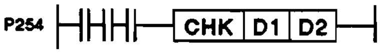


10.3 Error Code List

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

Table 10.1 Error Codes

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
INSTRUCT CODE ERR.	10	STOP	An instruction code, which cannot be decoded by CPU, is included in the program. (1) A memory cassette containing invalid instruction code, has been loaded. (2) The occurrence of an error destroyed the memory contents, adding an instruction code that cannot be read to the memory.	(1) Read the error step by use of peripheral device and correct the program at that step. (2) In the case of the memory cassette, rewrite the contents of the ROM, or replace with a memory cassette whose contents have been correctly written.
PARAMETER ERROR	11	STOP	The contents of the memory installed in the PC CPU have been destroyed because of (a) the occurrence of noise, or (b) the failure of the memory cassette.	(1) Check the loading of the PC CPU memory cassette and load it correctly. (2) Read the parameter data from the PC CPU by use of a periperhal device. Make any necessary corrections and write it again to the PC CPU
MISSING END INS.	12	STOP	(1) There is no END(FEND) instruction in the program.	(1) Write END at the end of the program.
CAN'T EXECUTE (P)	13	STOP	(1) There is no jump destination for plural 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 FOR instructions does not match the number of NEXT instructions. (5) The JMP instruction specified between FOR to NEXT has caused the execution to deviate from between FOR to NEXT. (6) The JMP instruction has caused the execution to deviate from the subroutine before the RET instruction is executed. (7) The JMP instruction has caused execution to jump to a step or subroutine between FOR to NEXT.	(1) Read the error step by use of a peripheral device and correct the program at that step. (Make corrections such as the insertion of jump destination or the changing of jump destinations to one)

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
CHK FORMAT ERR.	14	STOP	(1) There are instructions (including NOP) other than LDX, LDIX, ANDX and ANIX in the CHK instruction circuit block. (2) There is more than one CHK instruction. (3) The number of contact points in the CHK instruction circuit block exceeds 150. (4) The X device number in the CHK instruction circuit block exceeds X7FE. (5) There is no circuit block in front of the CHK instruction circuit block.  (6) D1 device (number) of the CHK/D1/D2 instruction is different from the contact device (number) above the CJ[ ] instruction. (7) Pointer P254 is not attached to the start of the CHK instruction circuit block. 	(1) Check the program of the CHK instruction circuit block (1) to (7) in the left column. Correct errors using a peripheral device and restart the operation. (2) This error code is only valid when the I/O control uses the direct method.
CAN'T EXECUTE (I)	15	STOP	(1) Although the interrupt module is used, there is no number for interrupt pointer I, which corresponds to that module, in the program or several numbers of pointer I exist in the program. (2) No IRET instruction has been entered in the interrupt program. (3) There is an IRET instruction somewhere besides the interrupt program.	(1) Check for the presence of interrupt program which corresponds to the interrupt module and create and interrupt program or reduce the numbers of I to one. (2) Check if there is IRET instruction in the interrupt program and enter the IRET instruction. (3) Check if there is an IRET instruction somewhere besides the interrupt program and delete that IRET instruction.
ROM ERR	17	STOP	(1) Parameters and/or sequence programs are not correctly written to the installed memory cassette (EPROM or EEPROM).	(1) Write parameters and/or sequence programs correctly to the memory cassette (EPROM or EEPROM). (2) Remove a memory cassette which does not have any parameter and/or sequence program.
RAM ERROR	20	STOP	(1) The PC CPU has checked if write and read operations can be performed properly to the data memory area of the PC CPU. Normal writing and/or read/write turned out to be impossible.	Since this is a PC CPU hardware fault, consult your nearest Mitsubishi representative.
OPE. CIRCUIT ERR.	21	STOP	(1) The operation circuit, which performs the sequence processing in the PC CPU, does not operate properly.	
WDT ERROR	22	STOP	Scan time exceeds watchdog monitoring time. (1) Scan time of user program is excessive. (2) Scan time has lengthened due to instantaneous power failure which occurred during the scan.	(1) Calculate and check the scan time of the user program and reduce the scan time by the use of CJ instructions, etc. (2) Monitor the content of special register D9005 by use of a peripheral device. If the content is other than 0, line voltage is insufficient. Therefore, check the power and eliminate the voltage fluctuation.

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
END NOT EXECUTE	24	STOP	(1) When the END instruction is executed, another instruction code has been read due to noise, etc. (2) The END instruction has changed to another instruction code.	(1) Perform reset and RUN. If the same error is displayed again, it is a PC CPU hardware fault. Therefore, consult your nearest Mitsubishi representative.
WDT ERROR	25	STOP	The END instruction cannot be executed with the program looped	Check for an endless loop and correct the program.
UNIT VERIFY ERR.	31	STOP (RUN)	I/O module data is different from that at power ON. (1) The I/O module (including the special-function module) is (a) incorrectly disengaged or has been removed, or (b) a different module has been loaded	(1) Among special registers D9116 to D9123, the bit corresponding to the module verify error is "1". Therefore, monitor the registers by use of a peripheral device and check for the module with "1". (2) When the fault has been corrected, reset the PC CPU.
FUSE BREAK OFF	32	STOP (RUN)	(1) There is an output module with a blown fuse. (2) The external power supply for the output load is OFF or not connected.	(1) Check the blown fuse indicator LED of the output module and change the module whose LED is ON. (2) Checking the module for a blown fuse can also be done with a peripheral device. Among special registers D9100 to D9107, the bit corresponding to the module of verify error is "1". Therefore, check by monitoring the registers. (3) Check the ON/OFF state of the external power supply for the output load
CONTROL-BUS ERR.	40	STOP	The FROM and TO instructions cannot be executed (1) Error of control bus with special-function module.	(1) This is a special-function module, CPU module or base unit hardware fault. Therefore, change the unit and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
SP. UNIT DOWN	41	STOP	When FROM and TO instructions cannot be executed. (1) Control bus error in the special-function module.	This is a special-function module, CPU module or base unit hardware fault. Therefore, change the unit and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
I/O INT. ERROR	43	STOP	Although the interrupt module is not installed, an interruption has occurred.	(1) This is a certain module hardware fault. Therefore, change the module and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
SP. UNIT LAY. ERR.	44	STOP	(1) Three or more computer link modules are installed into a single CPU module. (2) Two or more modules of A1SJ71AP21, A1SJ71AR21, A1SJ71T21B, A1SJ71LP21, A1SJ71BR11 are installed. (3) Two or more interrupt modules are installed. (4) In the parameter setting of the peripheral device, while an I/O module is actually installed, a special-function module has been set in the I/O assignment, and vice versa.	(1) reduce the computer link modules to two or less. (2) Use one A1SJ71AP21, A1SJ71AR21, A1SJ71T21B, A1SJ71LP21, A1SJ71BR11. (3) Use one interrupt module. (4) Reset the I/O assignment of parameter setting by use of peripheral device according to the actually loaded special-function module.
SP. UNIT ERROR	46	STOP (RUN)	(1) Access (execution of FROM/TO instruction) has been made to a location where there is no special-function module.	(1) Read the error step by use of peripheral device, and check and correct the content of the FROM/TO instruction at that step by using a peripheral device.

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
SP. UNIT ERROR	46	STOP (RUN)	(1) Access (execution of FROM/TO instruction) has been made to a location where there is no special-function module.	(1) Read the error step by use of peripheral device, and check and correct the content of the FROM/TO instruction at that step by using a peripheral device.
LINK PARA. ERROR	47	RUN	(1) The contents, which have been written to the parameter area of the link by setting the link range in the parameter setting of peripheral device, are different from the link parameter contents. (2) The setting of the total number of slave stations is 0.	(1) Write the parameters again and check. (2) If this message is displayed again, it is a hardware fault. Therefore, consult your nearest Mitsubishi representative.
OPERATION ERROR	50	RUN (STOP)	(1) The result of BCD conversion has exceeded the specified range (9999 or 99999999). (2) A setting has been done which exceeds the specified device range and the operation cannot be done. (3) File registers are used in the program without performing the capacity setting of file registers.	(1) Use a peripheral device to read the error step and check and correct the program at that step. (Check device setting range, BCD conversion value, etc.)
MAIN CPU DOWN	60	STOP	(1) An interrupt instruction (INT instruction) was used in a microcomputer program. (2) CPU has malfunctioned due to noise or other cause. (3) CPU hardware fault.	(1) Do not use INT instructions in microcomputer programs (reomove the INT instruction) (2) Implement measures against noise (3) Replace the CPU.
BATTERY ERROR	70	RUN	(1) The battery voltage is below 24 VDC. (2) The battery lead is disconnected.	(1) Change the battery. (2) When RAM or power failure compensation is used, connect the battery.

10.4 I/O Connection Troubleshooting

This section explains possible problems with I/O circuits.

10.4.1 Input circuit troubleshooting

This section describes possible problems with input circuits, as well as corrective actions.

Table 10.2 Input Circuit Problems and Corrective Actions

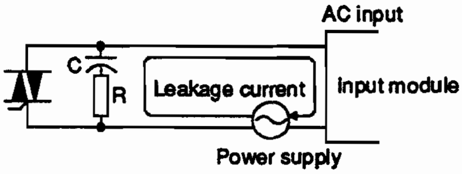
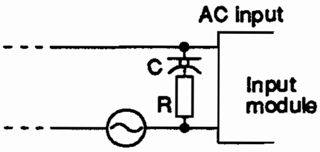
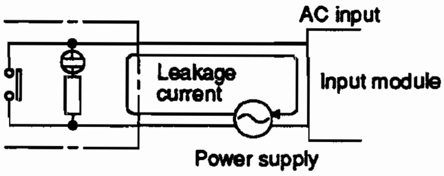
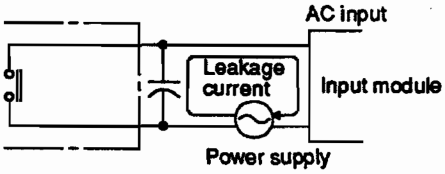
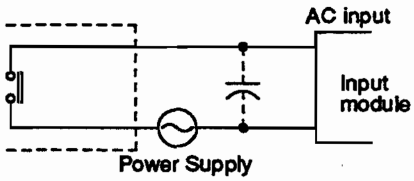
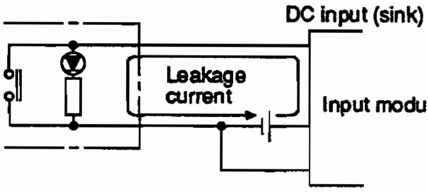
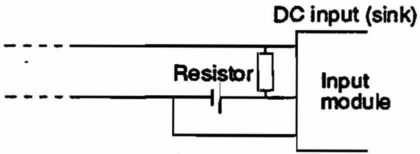
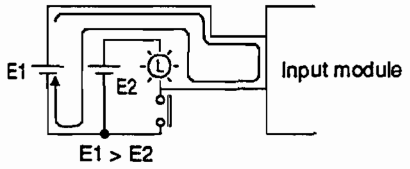
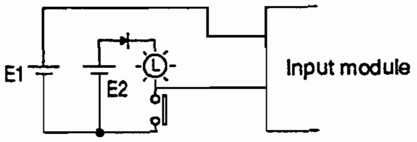
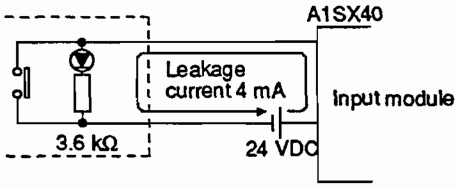
	Condition	Cause	Corrective Action
Example 1	Input signal does not turn OFF.	Leakage current of input switch (such as a drive by non-contact switch). 	• Connect an appropriate register which will make the voltage across the terminals of the input module lower than the OFF voltage value.  It is recommended to use 0.1 to 0.47 μF + 47 to 120 Ω (1/2 W) for the constant.
Example 2	Input signal does not turn OFF.	Drive by a limit switch with neon lamp. 	• Same as Example 1. • Or make up another independent display circuit.
Example 3	Input signal does not turn OFF.	Leakage current due to line capacity of wiring cable. Line capacity C of twisted pair wire is approx. 100 PF/m). 	• Same as Example 1. • However, leakage current is not generated when power supply is located on the input equipment side as shown below. 
Example 4	Input signal does not turn OFF.	Drive by switch with LED indicator. 	• Connect a register which will make the voltage across input module terminal and common higher than the OFF voltage, as shown below.  * A sample calculation of a connected resistor value is given on the following page.

Table 10.2 Input Circuit Problems and Corrective Actions (Continued)

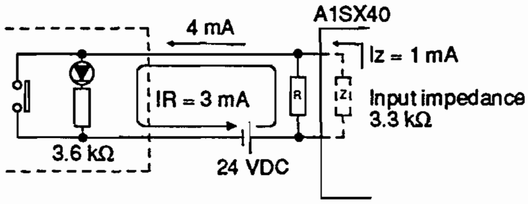
	Condition	Cause	Corrective Action
Example 5	Input signal does not turn OFF.	• Sneak path due to the use of two power supplies.  	• Use only one power supply. • Connect a sneak path prevention diode. (Figure below) 

Sample calculation for Example 4

The switch with the LED indicator is connected to A1SX40 and there is a 4 mA leakage current.



(1) Since this voltage does not satisfy the OFF voltage of 1 [mA] or lower, the input signal does not go OFF. Therefore, connect a resistor as shown below.



(2) Calculate the resistance value of R as follows:
To obtain the 1 mA OFF current for the A1SX40, a 3 mA current or larger must flow to R.

$$I_R : I_Z = Z \text{ (input impedance)} : R$$

$$R \leq \frac{I_Z}{I_R} \times \text{(input impedance)} = \frac{1}{3} \times 3.3 = 1.1 \text{ [k}\Omega\text{]}$$

$$R < 1.1\text{K}\Omega$$

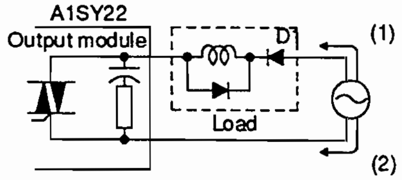
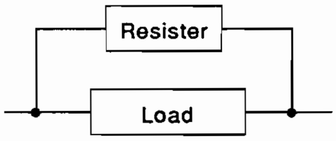
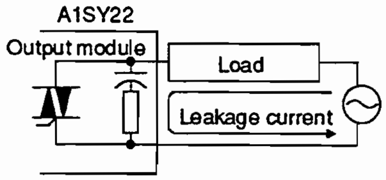
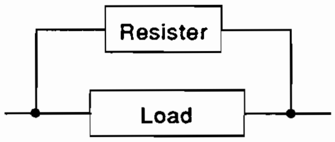
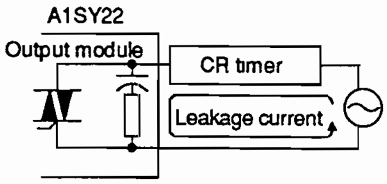
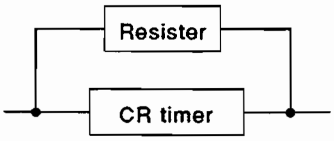
If the resistance value of R is 1 kΩ, the power capacity W of the resistor R is calculated as follows:

$$W = (\text{current value})^2 \times R = 0.003^2 \text{ (A)} \times 1000 \text{ } (\Omega) = 0.009 \text{ (W)}$$

(3) Since the power capacity of the resistor is usually selected as 3 to 5 times the actual power consumption, a 1 kΩ 0.5 W resistor must be connected to the terminals concerned.

10.4.2 Output circuit failures and corrective actions

Table 10.3 Output Circuit Failures and Corrective Actions

	Condition	Cause	Corrective Action
Example 1	When the output is OFF, excessive voltage is applied to the load.	- Load is half-wave rectified inside (in some cases, it is true of a solenoid).  - When the polarity of the power supply is as shown in [1], C is charged. When the polarity is as shown in [2], the voltage charged in C plus the line voltage are applied across D1. Max. voltage is approx. 2.2E.	- Connect a resistor of several tens or hundreds of kΩ across the terminals of the load. (If a resistor is used in this way, it does not pose a problem to the output element. But it may cause the diode, which is built in the load, to deteriorate, resulting in a fire, etc.) 
Example 2	The load does not turn OFF (triac output).	- Leakage current due to built-in noise suppression  	- Connect C and R across the load. (When the wiring distance from the output card to the load is long, there may be a leakage current due to the line capacity.) 
Example 3	When the load is a C-R type timer, time constant fluctuates (triac output).	 	- Drive the relay using a contact and drive the C-R type timer using the same contact. (Some timers have half-wave rectified internal circuits. Therefore, take the precautions indicated in the example.)  Calculate the CR constant depending on the load.

11. TROUBLESHOOTING

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

11.1 Basic Troubleshooting

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

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

(1) Visual checks

Check the following points

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

(b) Power ON or OFF

(c) Status of I/O equipment

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

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

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

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

(2) Trouble check

Observe any changes in the error condition during the following:

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

(b) Reset using the RUN/STOP keyswitch.

(c) Turn the power ON and OFF.

(3) Narrow down the possible causes of the trouble

Deduce where the fault lies, i.e:

(a) Inside or outside the PC CPU.

(b) I/O module or another module.

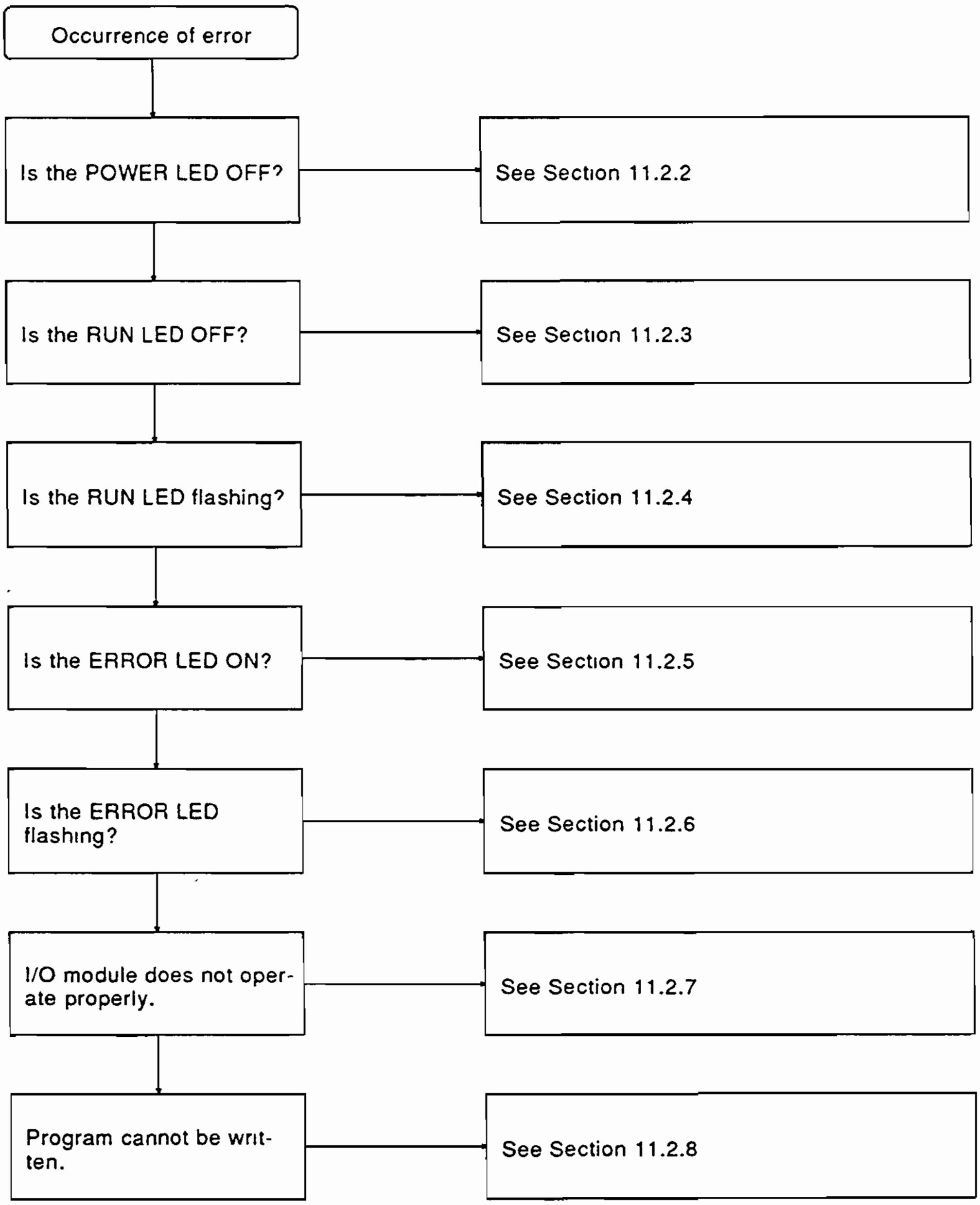
(c) Sequence program.

11.2 Troubleshooting

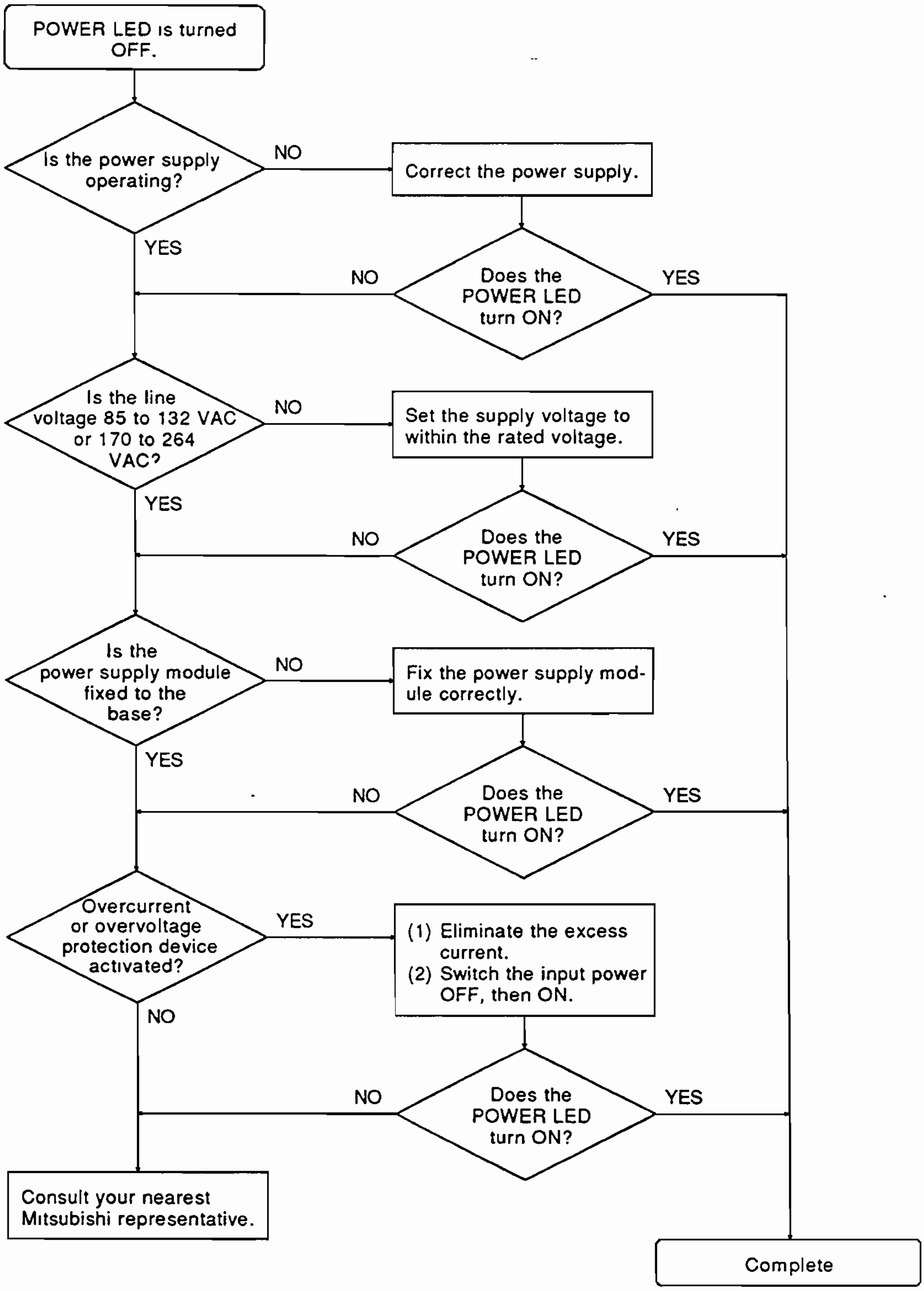
This section explains the procedure for determining the cause of problems as well as the errors and corrective actions for error codes.

11.2.1 Troubleshooting flowcharts

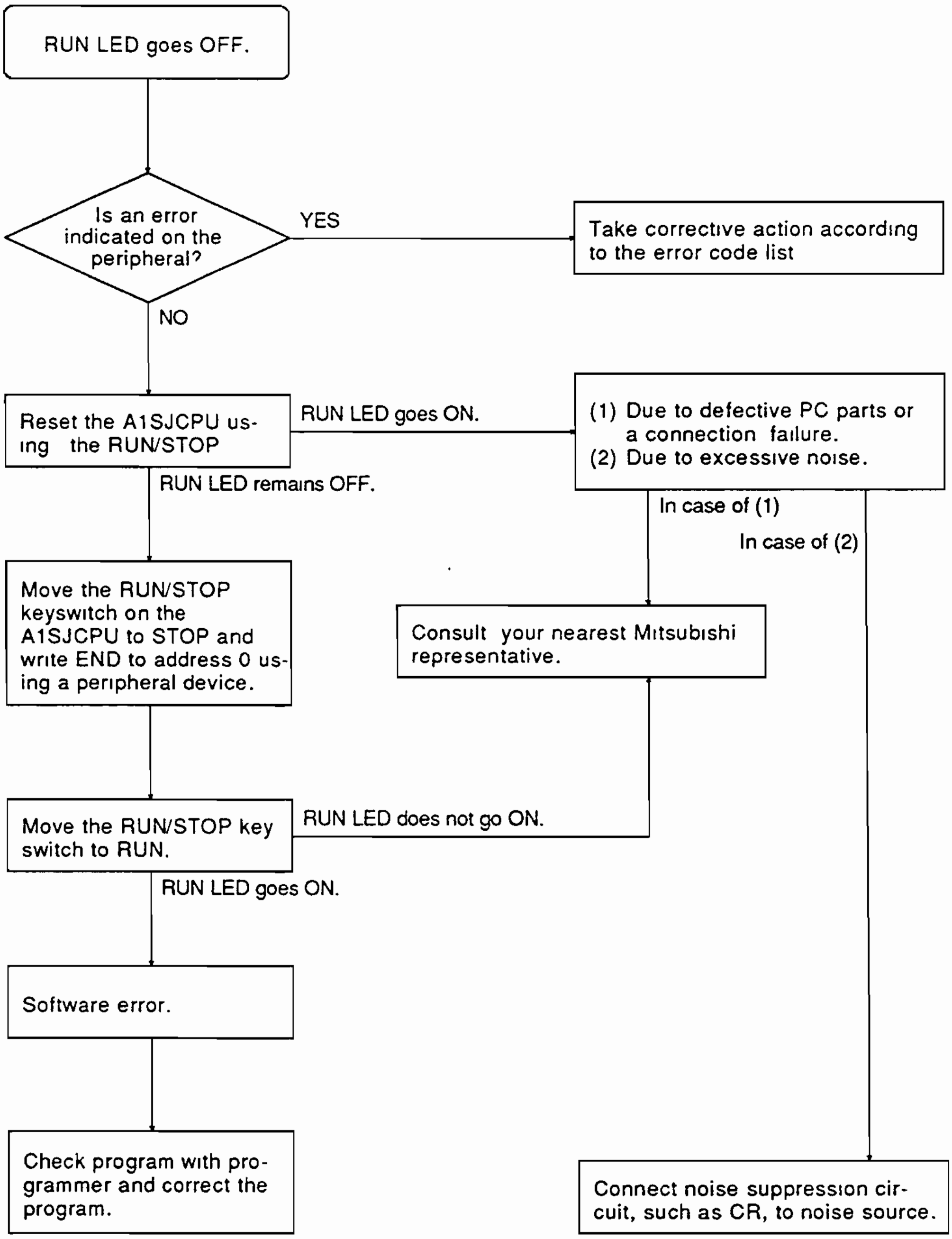
The procedures for troubleshooting are given in the following flowcharts:



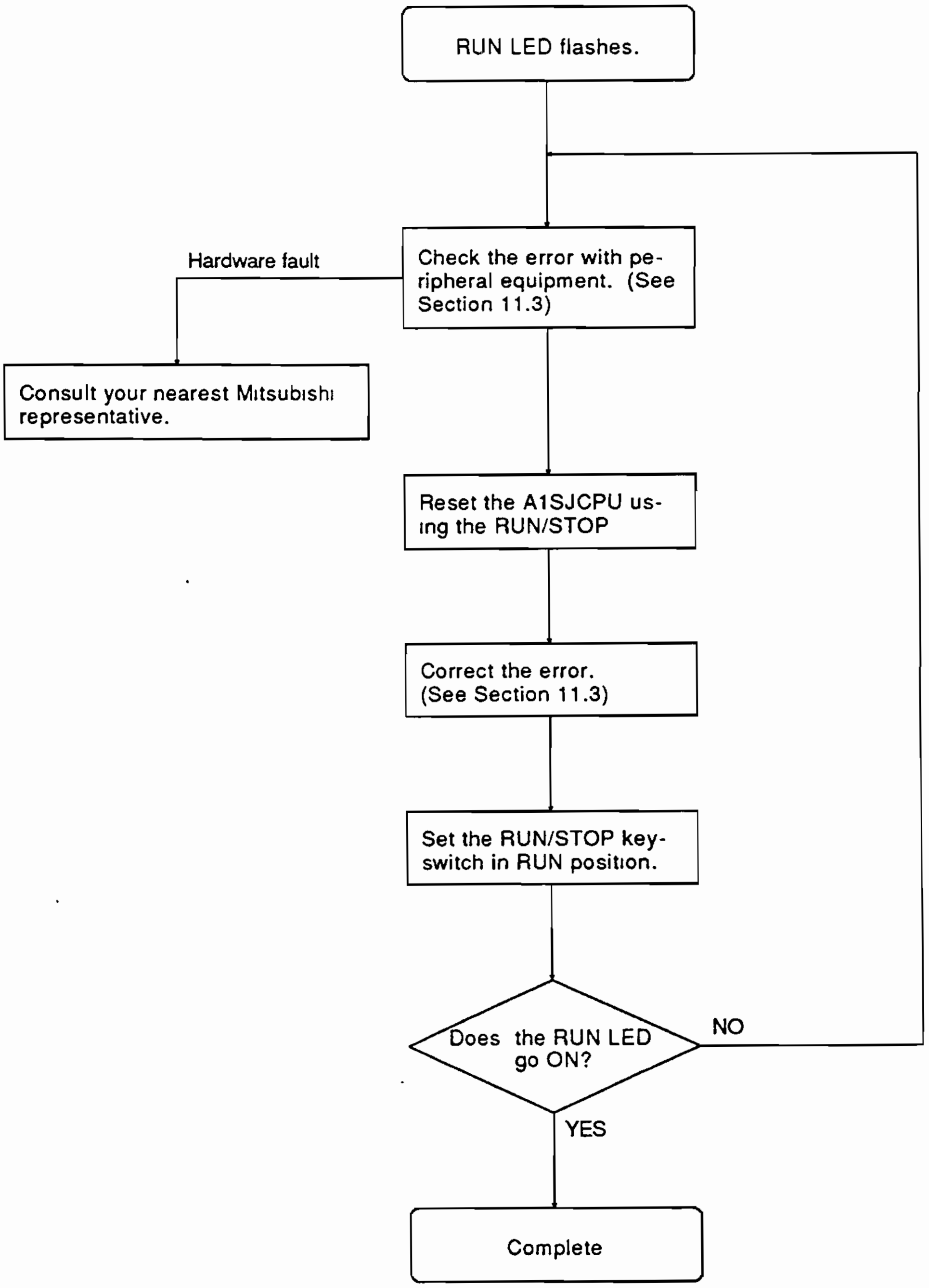
11.2.2 Flowchart used when the POWER LED goes OFF



11.2.3 Flowchart used when the RUN LED goes OFF

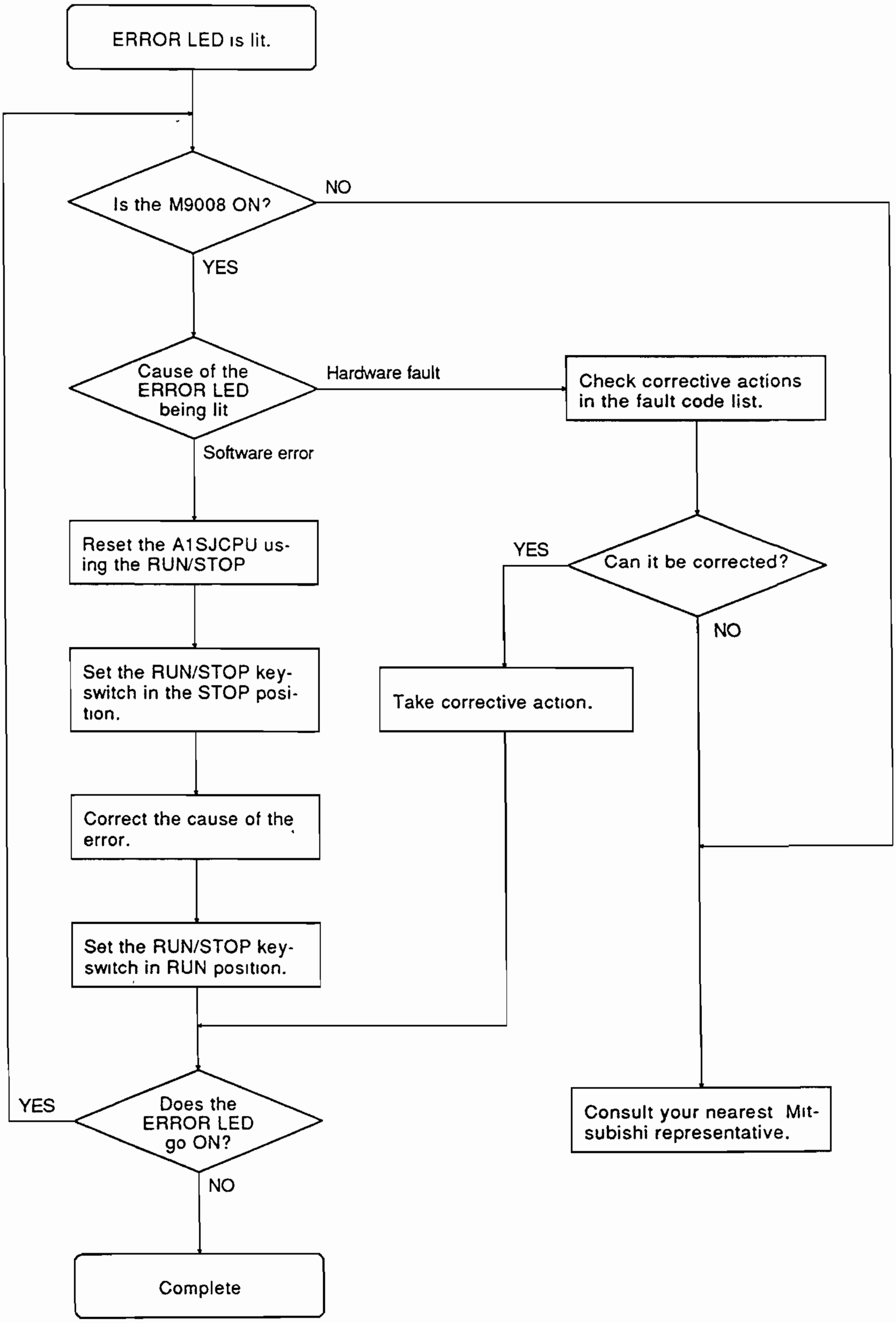


11.2.4 Flowchart used when the RUN LED flashes



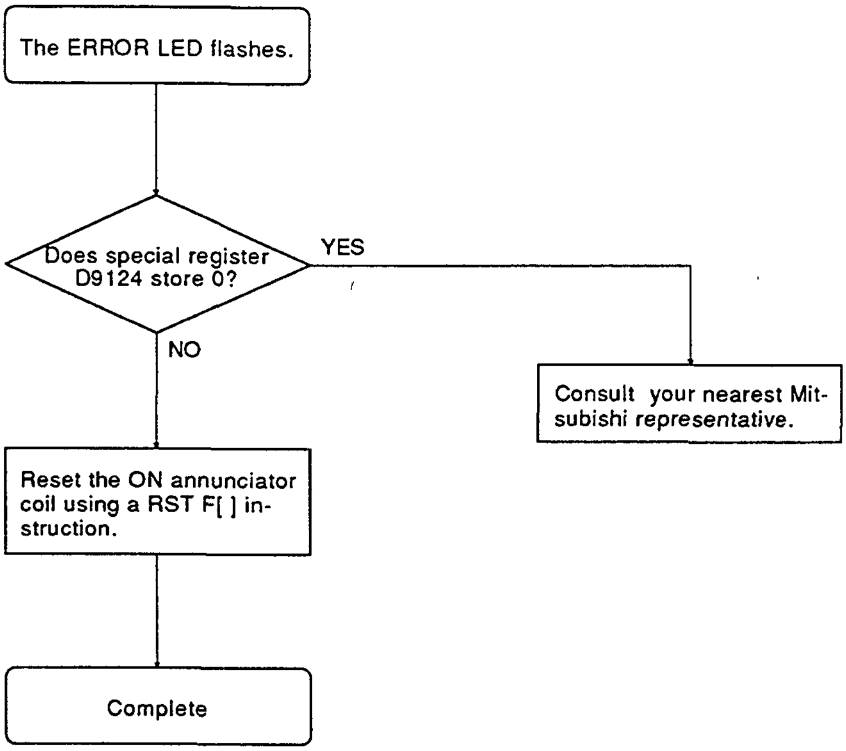
11.2.5 Flowchart used when the ERROR LED is lit

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

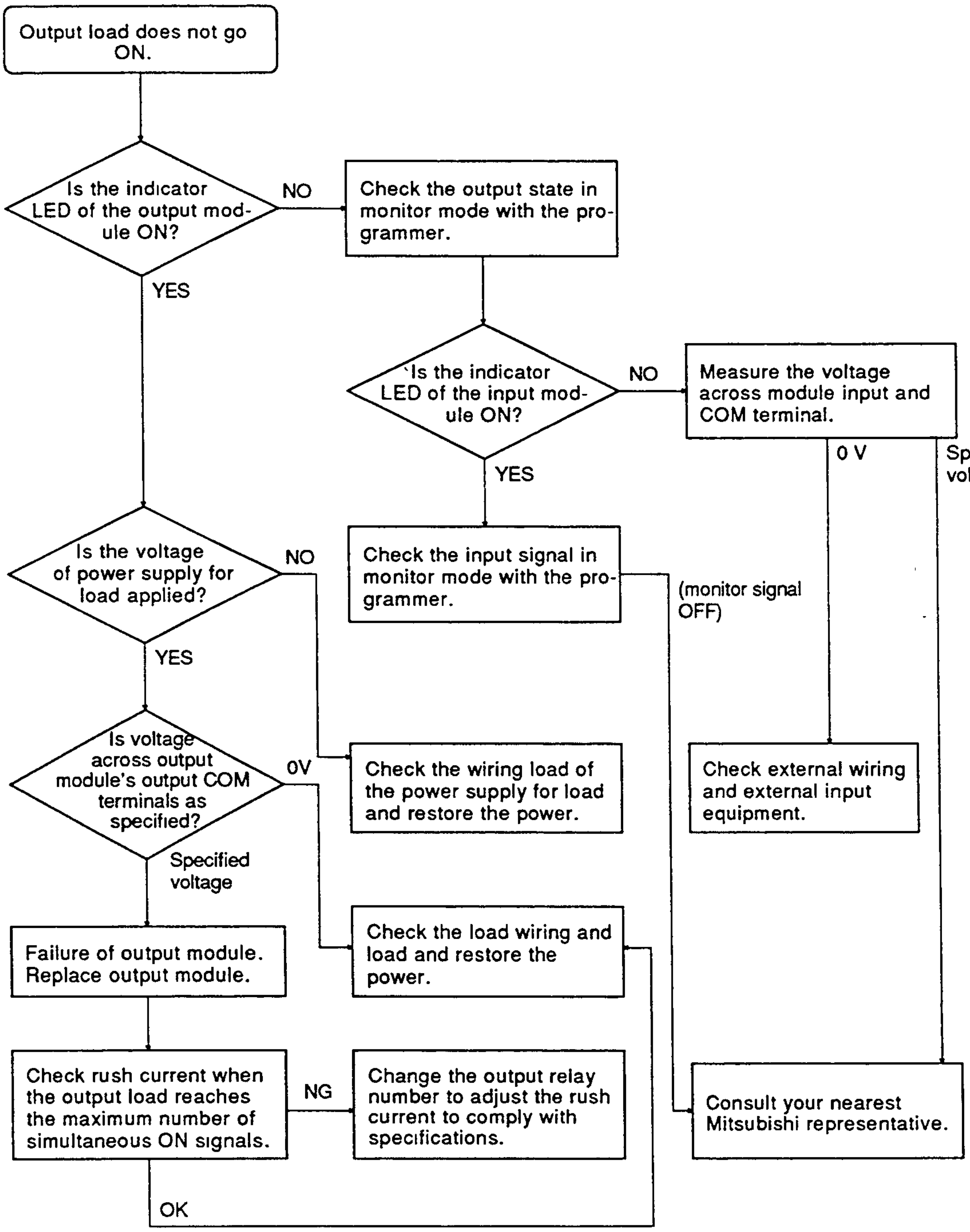


11.2.6 Flowchart used when the ERROR LED flashes

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



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

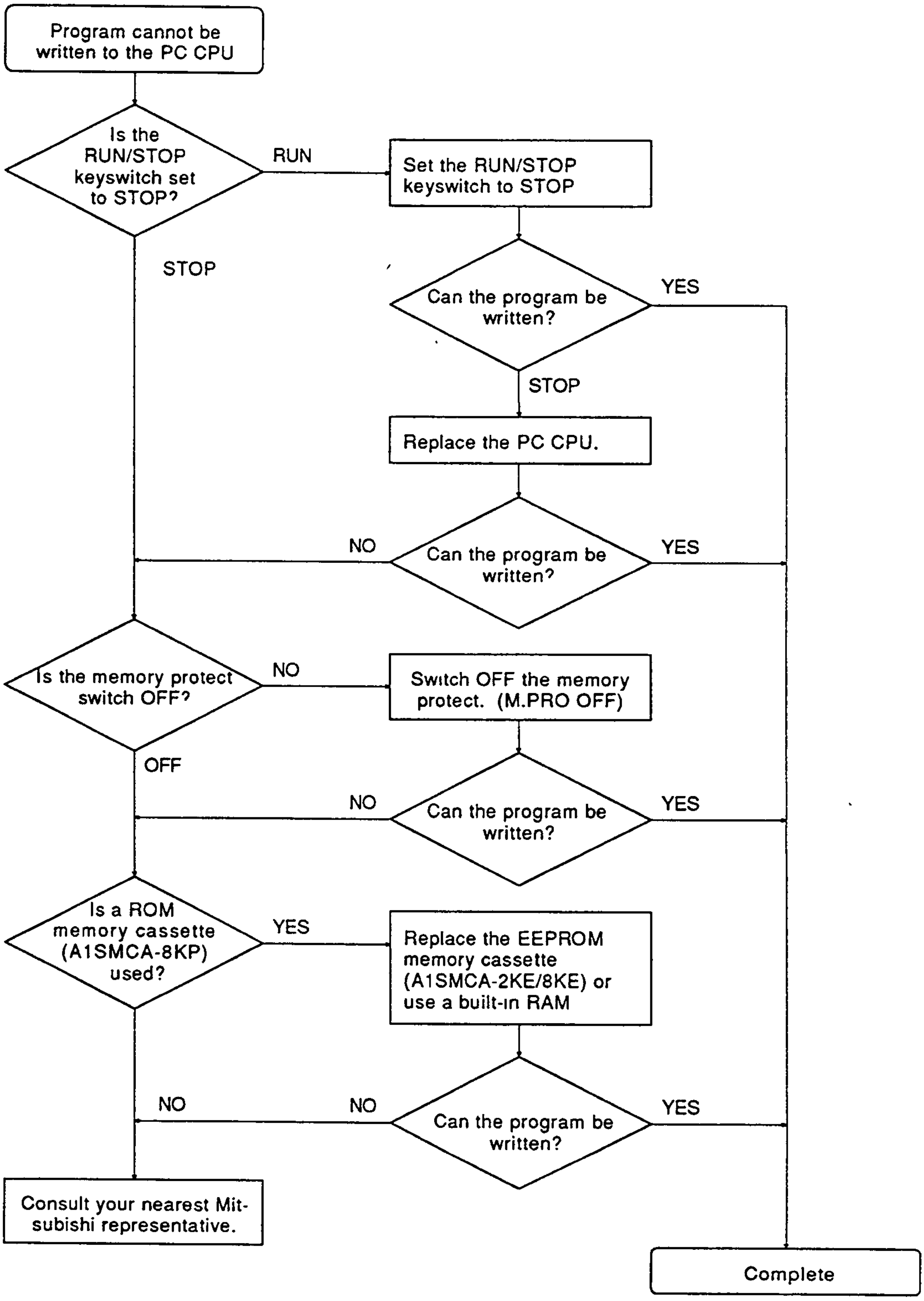


POINT

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

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

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

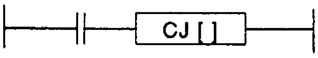
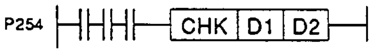


11.3 Error Code List

If an error occurs in the RUN mode, an error display or error code (including a step number) is stored in the special register by the self-diagnostic function. The error code reading procedure and the causes of and corrective actions for errors are shown in Table 11.1.

Table 11.1 Error Codes

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
INSTRUCT CODE ERR.	10	STOP	An instruction code, which cannot be decoded by CPU, is included in the program. (1) A memory cassette containing invalid instruction code, has been loaded. (2) The occurrence of an error destroyed the memory contents, adding an instruction code that cannot be read to the memory.	(1) Read the error step by use of peripheral device and correct the program at that step. (2) In the case of the memory cassette, rewrite the contents of the ROM, or replace with a memory cassette whose contents have been correctly written.
PARAMETER ERROR	11	STOP	The contents of the memory installed in the PC CPU have been destroyed because of (a) the occurrence of noise, or (b) the failure of the memory cassette.	(1) Check the loading of the PC CPU memory cassette and load it correctly. (2) Read the parameter data from the PC CPU by use of a periperhal device. Make any necessary corrections and write it again to the PC CPU.
MISSING END INS.	12	STOP	(1) There is no END(FEND) instruction in the program.	(1) Write END at the end of the program.
CAN'T EXECUTE (P)	13	STOP	(1) There is no jump destination for plural 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 FOR instructions does not match the number of NEXT instructions. (5) The JMP instruction specified between FOR to NEXT has caused the execution to deviate from between FOR to NEXT. (6) The JMP instruction has caused the execution to deviate from the subroutine before the RET instruction is executed. (7) The JMP instruction has caused execution to jump to a step or subroutine between FOR to NEXT.	(1) Read the error step by use of a peripheral device and correct the program at that step. (Make corrections such as the insertion of jump destination or the changing of jump destinations to one.)

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
CHK FORMAT ERR.	14	STOP	(1) There are instructions (including NOP) other than LDX, LDIX, ANDX and ANIX in the CHK instruction circuit block. (2) There is more than one CHK instruction. (3) The number of contact points in the CHK instruction circuit block exceeds 150. (4) The X device number in the CHK instruction circuit block exceeds X7FE. (5) There is no circuit block in front of the CHK instruction circuit block.  (6) D1 device (number) of the CHK/D1/D2 instruction is different from the contact device (number) above the CJ[ ] instruction. (7) Pointer P254 is not attached to the start of the CHK instruction circuit block. 	(1) Check the program of the CHK instruction circuit block (1) to (7) in the left column. Correct errors using a peripheral device and restart the operation. (2) This error code is only valid when the I/O control uses the direct method.
CAN'T EXECUTE (I)	15	STOP	(1) Although the interrupt module is used, there is no number for interrupt pointer I, which corresponds to that module, in the program or several numbers of pointer I exist in the program. (2) No IRET instruction has been entered in the interrupt program. (3) There is an IRET instruction somewhere besides the interrupt program.	(1) Check for the presence of interrupt program which corresponds to the interrupt module and create and interrupt program or reduce the numbers of I to one. (2) Check if there is IRET instruction in the interrupt program and enter the IRET instruction. (3) Check if there is an IRET instruction somewhere besides the interrupt program and delete that IRET instruction.
ROM ERR	17	STOP	(1) Parameters and/or sequence programs are not correctly written to the installed memory cassette (EPROM or EEPROM).	(1) Write parameters and/or sequence programs correctly to the memory cassette (EPROM or EEPROM). (2) Remove a memory cassette which does not have any parameter and/or sequence program.
RAM ERROR	20	STOP	(1) The PC CPU has checked if write and read operations can be performed properly to the data memory area of the PC CPU. Normal writing and/or read/write turned out to be impossible.	Since this is a PC CPU hardware fault, consult your nearest Mitsubishi representative.
OPE. CIRCUIT ERR.	21	STOP	(1) The operation circuit, which performs the sequence processing in the PC CPU, does not operate properly.	
WDT ERROR	22	STOP	Scan time exceeds watchdog monitoring time. (1) Scan time of user program is excessive. (2) Scan time has lengthened due to instantaneous power failure which occurred during the scan.	(1) Calculate and check the scan time of the user program and reduce the scan time by the use of CJ instructions, etc. (2) Monitor the content of special register D9005 by use of a peripheral device. If the content is other than 0, line voltage is insufficient. Therefore, check the power and eliminate the voltage fluctuation.

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
END NOT EXECUTE	24	STOP	(1) When the END instruction is executed, another instruction code has been read due to noise, etc. (2) The END instruction has changed to another instruction code.	(1) Perform reset and RUN. If the same error is displayed again, it is a PC CPU hardware fault. Therefore, consult your nearest Mitsubishi representative.
WDT ERROR	25	STOP	The END instruction cannot be executed with the program looped.	Check for an endless loop and correct the program.
UNIT VERIFY ERR.	31	STOP (RUN)	I/O module data is different from that at power ON. (1) The I/O module (including the special-function module) is (a) incorrectly disengaged or has been removed, or (b) a different module has been loaded.	(1) Among special registers D9116 to D9123, the bit corresponding to the module verify error is "1". Therefore, monitor the registers by use of a peripheral device and check for the module with "1". (2) When the fault has been corrected, reset the PC CPU.
FUSE BREAK OFF	32	STOP (RUN)	(1) There is an output module with a blown fuse. (2) The external power supply for the output load is OFF or not connected.	(1) Check the blown fuse indicator LED of the output module and change the fuse in the module whose LED is ON. (2) Checking the module for a blown fuse can also be done with a peripheral device. Among special registers D9100 to D9107, the bit corresponding to the module of verify error is "1". Therefore, check by monitoring the registers. (3) Check the ON/OFF state of the external power supply for the output load.
CONTROL-BUS ERR.	40	STOP	The FROM and TO instructions cannot be executed. (1) Error of control bus with special-function module	(1) This is a special-function module, CPU module or base unit hardware fault. Therefore, change the unit and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
SP. UNIT DOWN	41	STOP	When FROM and TO instructions cannot be executed. (1) Control bus error in the special-function module.	This is a special-function module, CPU module or base unit hardware fault. Therefore, change the unit and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
I/O INT. ERROR	43	STOP	Although the interrupt module is not installed, an interruption has occurred.	(1) This is a certain module hardware fault. Therefore, change the module and check the defective module. Consult your nearest Mitsubishi representative about the defective module.
SP. UNIT LAY. ERR.	44	STOP	(1) Three or more computer link modules are installed into a single CPU module. (2) Two or more modules of A1SJ71T21B are installed. (3) Two or more interrupt modules are installed. (4) In the parameter setting of the peripheral device, while an I/O module is actually installed, a special-function module has been set in the I/O assignment, and vice versa.	(1) reduce the computer link modules to two or less. (2) Use one A1SJ71T21B. (3) Use one interrupt module. (4) Reset the I/O assignment of parameter setting by use of peripheral device according to the actually loaded special-function module.
SP. UNIT ERROR	46	STOP (RUN)	(1) Access (execution of FROM/TO instruction) has been made to a location where there is no special-function module.	(1) Read the error step by use of peripheral device, and check and correct the content of the FROM/TO instruction at that step by using a peripheral device.

Error Message	Contents of Special Register D9008 (BIN value)	CPU State	Error and Cause	Corrective Action
LINK PARA. ERROR	47	RUN	(1) The contents, which have been written to the parameter area of the link by setting the link range in the parameter setting of peripheral device, are different from the link parameter contents. (2) The setting of the total number of slave stations is 0.	(1) Write the parameters again and check. (2) If this message is displayed again, it is a hardware fault. Therefore, consult your nearest Mitsubishi representative.
OPERATION ERROR	50	RUN (STOP)	(1) The result of BCD conversion has exceeded the specified range (9999 or 99999999). (2) A setting has been done which exceeds the specified device range and the operation cannot be done. (3) File registers are used in the program without performing the capacity setting of file registers.	(1) Use a peripheral device to read the error step and check and correct the program at that step. (Check device setting range, BCD conversion value, etc.)
BATTERY ERROR	70	RUN	(1) The battery voltage is below 24 VDC. (2) The battery lead is disconnected.	(1) Change the battery. (2) When RAM or power failure compensation is used, connect the battery.

11.4 I/O Connection Troubleshooting

This section explains possible problems with I/O circuits.

11.4.1 Input circuit troubleshooting

This section describes possible problems with input circuits, as well as corrective actions.

Table 11.2 Input Circuit Problems and Corrective Actions

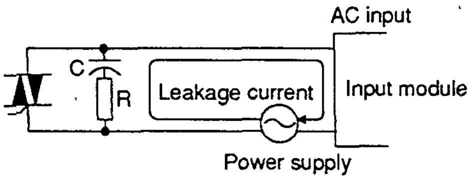
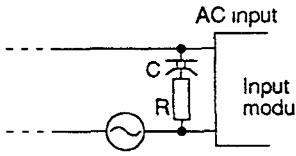
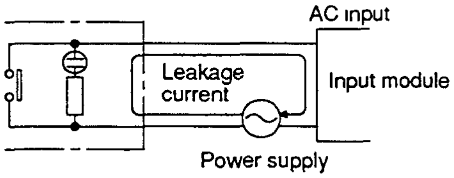
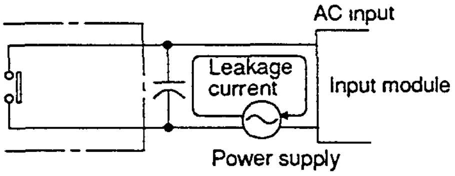
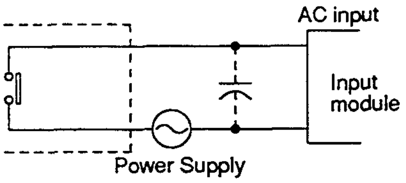
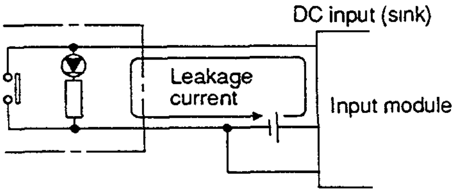
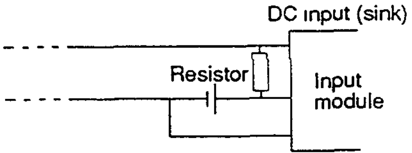
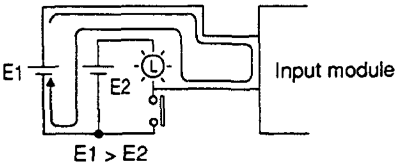
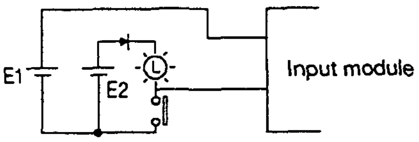
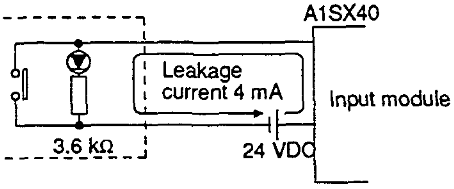
	Condition	Cause	Corrective Action
Example 1	Input signal does not turn OFF.	Leakage current of input switch (such as a drive by non-contact switch).  	• Connect an appropriate register which will make the voltage across the terminals of the input module lower than the OFF voltage value.  It is recommended to use 0.1 to 0.47 μF + 47 to 120 Ω (1/2 W) for the constant.
Example 2	Input signal does not turn OFF.	Drive by a limit switch with neon lamp.  	• Same as Example 1. • Or make up another independent display circuit.
Example 3	Input signal does not turn OFF.	Leakage current due to line capacity of wiring cable. Line capacity C of twisted pair wire is approx. 100 PF/m).  	• Same as Example 1. • However, leakage current is not generated when power supply is located on the input equipment side as shown below. 
Example 4	Input signal does not turn OFF.	Drive by switch with LED indicator.  	• Connect a register which will make the voltage across input module terminal and common higher than the OFF voltage, as shown below.  * A sample calculation of a connected resistor value is given on the following page.

Table 11.2 Input Circuit Problems and Corrective Actions (Continued)

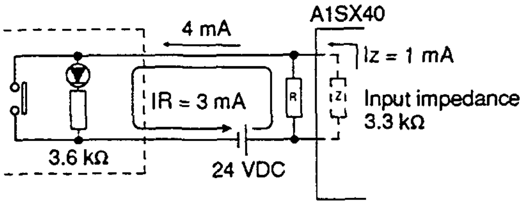
	Condition	Cause	Corrective Action
Example 5	Input signal does not turn OFF.	• Sneak path due to the use of two power supplies.  	• Use only one power supply. • Connect a sneak path prevention diode. (Figure below) 

Sample calculation for Example 4

The switch with the LED indicator is connected to A1SX40 and there is a 4 mA leakage current.



(1) Since this voltage does not satisfy the OFF voltage of 1 [mA] or lower, the input signal does not go OFF. Therefore, connect a resistor as shown below.



(2) Calculate the resistance value of R as follows:
To obtain the 1 mA OFF current for the A1SX40, a 3 mA current or larger must flow to R.

$$I_R : I_Z = Z \text{ (input impedance)} : R$$

$$R \leq \frac{I_Z}{I_R} \times \text{(input impedance)} = \frac{1}{3} \times 3.3 = 1.1\ [\text{k}\Omega]$$

$$R < 1.1\text{K}\Omega$$

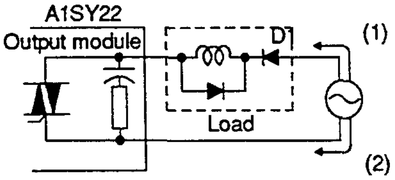
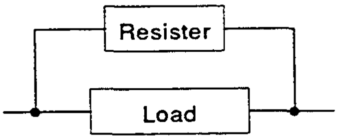
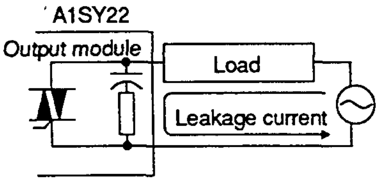
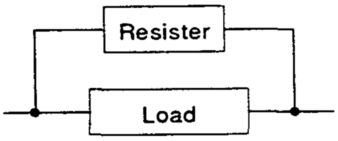
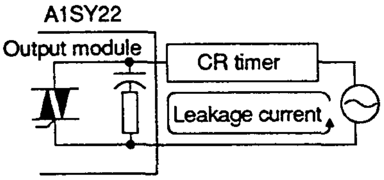
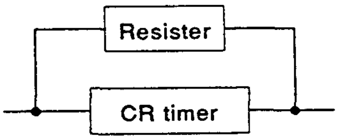
If the resistance value of R is 1 kΩ, the power capacity W of the resistor R is calculated as follows:

$$W = (\text{current value})^2 \times R = 0.003^2\ (\text{A}) \times 1000\ (\Omega) = 0.009\ (\text{W})$$

(3) Since the power capacity of the resistor is usually selected as 3 to 5 times the actual power consumption, a 1 kΩ 0.5 W resistor must be connected to the terminals concerned.

11.4.2 Output circuit failures and corrective actions

Table 11.3 Output Circuit Failures and Corrective Actions

	Condition	Cause	Corrective Action
Example 1	When the output is OFF, excessive voltage is applied to the load.	• Load is half-wave rectified inside (in some cases, it is true of a solenoid).  • When the polarity of the power supply is as shown in [1], C is charged. When the polarity is as shown in [2], the voltage charged in C plus the line voltage are applied across D1. Max. voltage is approx. 2.2E.	• Connect a resistor of 10 to 99 kΩ. across the load. (If a resistor is used in this way, it does not pose a problem to the output element. But it may cause the diode, which is built in the load, to deteriorate, resulting in a fire, etc.) 
Example 2	The load does not turn OFF (triac output).	• Leakage current due to built-in noise suppression  	• Connect C and R across the load. (When the wiring distance from the output card to the load is long, there may be a leakage current due to the line capacity.) 
Example 3	When the load is a C-R type timer, time constant fluctuates (triac output).	 	• Drive the relay using a contact and drive the C-R type timer using the same contact. (Some timers have half-wave rectified internal circuits. Therefore, take the precautions indicated in the example.)  Calculate the CR constant depending on the load.

APPENDICES

APPENDIX 1 INSTRUCTIONS

This section describes the sequence instructions, basic instructions, and application instructions that can be used with an A1SJCPU.

The ACPU Programming Manual (Common Instructions) gives details about each instruction.

The descriptions of instructions used with the A2NCPU can be applied to the A1SJCPU.

1.1 Sequence Instructions

Table 1 Sequence Instructions

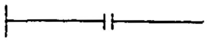
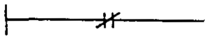
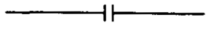
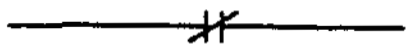
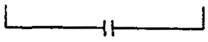
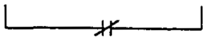
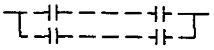
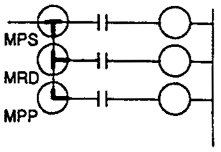
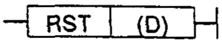
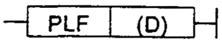
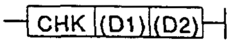
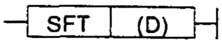
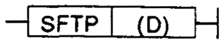
Classification	Instruction Symbol	Symbol	Contents of Processing
Contact instructions	LD		Logical operation start (NO contact operation start)
	LDI		Logical NOT operation start (NC contact operation start)
	AND		Logical product (NO contact series connection)
	ANI		Logical product NOT (NC contact series connection)
	OR		Logical add (NO contact parallel connection)
	ORI		Logical add NOT (NC contact parallel connection)
Connection instructions	ANB		ANDs logical blocks. (Series connection of blocks)
	ORB		ORs logical blocks. (Parallel connection of blocks)
	MPS		Stores the operation result.
	MRD		Reads the operation result from MPS.
	MPP		Reads the operation result from MPS and clears the result.
OUT instructions	OUT		Device output
	SET		Device set
	RST		Device reset
	PLS		Generates one-program cycle pulses on the leading edge of input signal.
	PLF		Generates one-program cycle pulses on the trailing edge of input signal.
	CHK		Inversion of device outputs (at I/O refresh)
Shift instructions	SFT		Shifts device 1 bit
	SFTP		

Table 1 Sequence Instructions (Continued)

Classification		Instruction Symbol	Symbol	Contents of Processing
Master control instructions		MC	MC n (D)	Master control start
		MCR	MCR n	Master control reset
Termination instructions	Program end	FEND	FEND	Always used at the end of the main routine program to terminate processing.
		END	—	Always used at the end of the sequence program to return to step 0.
Other instructions	Stop	STOP	STOP	Resets output after input condition is enabled, and stops the sequence program. The sequence program is resumed by setting the RUN keyswitch to RUN.
	No operation	NOP	—	No operation For program erasure or space
	Page change	NOPLF	—	Changes hard copy pages. Written in the operation list mode.

1.2 Basic Instructions

Table 2 Basic Instructions

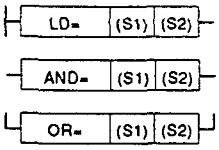
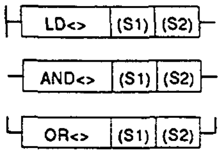
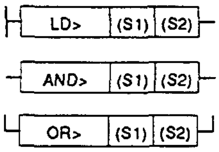
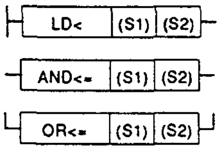
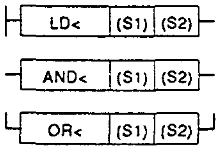
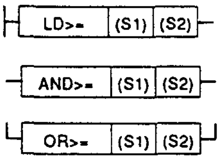
Classification		Instruction Symbol	Symbol	Contents of Processing
Comparison instructions	16-bit data comparison	LD= AND= OR=		Continuity when (S1) = (S2) Non-continuity when (S1) ≠ (S2)
		LD<> AND<> OR<>		Continuity when (S1) ≠ (S2) Non-continuity when (S1) = (S2)
		LD> AND> OR>		Continuity when (S1) > (S2) Non-continuity when (S1) ≤ (S2)
		LD<= AND<= OR<=		Continuity when (S1) ≤ (S2) Non-continuity when (S1) > (S2)
		LD< AND< OR<		Continuity when (S1) < (S2) Non-continuity when (S1) ≥ (S2)
		LD>= AND>= OR>=		Continuity when (S1) ≥ (S2) Non-continuity when (S1) < (S2)

Table 2 Basic Instructions (Continued)

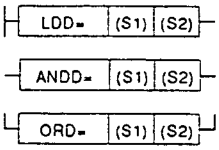
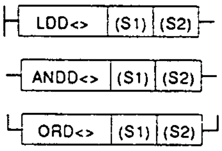
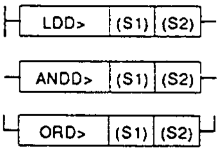
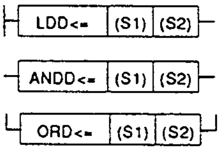
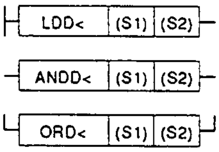
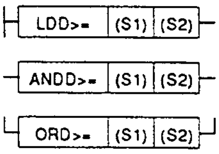
Classification		Instruction Symbol	Symbol	Contents of Processing
Comparison instructions	32-bit data comparison	LDD= ANDD= ORD=		Continuity when (S1 + 1, S1) = (S2 + 1, S2) Non-continuity when (S1 + 1, S1) ≠ (S2 + 1, S2)
		LDD<> ANDD<> ORD<>		Continuity when (S1 + 1, S1) ≠ (S2 + 1, S2) Non-continuity when (S1 + 1, S1) = (S2 + 1, S2)
		LDD> ANDD> ORD>		Continuity when (S1 + 1, S1) > (S2 + 1, S2) Non-continuity when (S1 + 1, S1) ≤ (S2 + 1, S2)
		LDD<= ANDD<= ORD<=		Continuity when (S1 + 1, S1) ≤ (S2 + 1, S2) Non-continuity when (S1 + 1, S1) > (S2 + 1, S2)
		LDD< ANDD< ORD<		Continuity when (S1 + 1, S1) < (S2 + 1, S2) Non-continuity when (S1 + 1, S1) ≥ (S2 + 1, S2)
		LDD>= ANDD>= ORD>=		Continuity when (S1 + 1, S1) ≥ (S2 + 1, S2) Non-continuity when (S1 + 1, S1) < (S2 + 1, S2)

Table 2 Basic Instructions (Continued)

Classification		Instruction Symbol	Symbol	Contents of Processing
Arithmetic operation instructions	BIN 16-bit addition/ subtraction	+	+ (S) (D)	(D) + (S) → (D)
		+P	+P (S) (D)	
		+	+ (S1) (S2) (D)	(S1) + (S2) → (D)
		+P	+P (S1) (S2) (D)	
		−	− (S) (D)	(D) − (S) → (D)
		−P	−P (S) (D)	
		−	− (S1) (S2) (D)	(S1) − (S2) → (D)
		−P	−P (S1) (S2) (D)	
	BIN 32-bit addition/ subtraction	D+	D+ (S) (D)	(D + 1, D) + (S + 1, S) → (D + 1, D)
		D+P	D+P (S) (D)	
		D+	D+ (S1) (S2) (D)	(S1 + 1, S) + (S2 + 1, S2) → (D + 1, D)
		D+P	D+P (S1) (S2) (D)	
		D−	D− (S) (D)	(D + 1, D) − (S + 1, S) → (D + 1, D)
		D−P	D−P (S) (D)	
		D−	D− (S1) (S2) (D)	(S1 + 1, S1) − (S2 + 1, S2) → (D + 1, D)
		D−P	D−P (S1) (S2) (D)	
	Bin 16-bit addition/ subtraction	*	* (S1) (S2) (D)	(S1) x (S2) → (D + 1, D)
		*P	*P (S1) (S2) (D)	
		/	/ (S1) (S2) (D)	(S1) ÷ (S2) → Quotient (D), Remainder (D + 1)
		/P	/P (S1) (S2) (D)	
	BIN 32-bit addition/ subtraction	D*	D* (S1) (S2) (D)	(S1 + 1, S1) x (S2 + 1, S2) → (D + 3, D + 2, D + 1,D)
		D*P	D*P (S1) (S2) (D)	
		D/	D/ (S1) (S2) (D)	(S1 + 1, S1) ÷ (S2 + 1, S2) → Quotient (D + 1, D), Remainder (D + 3, D + 2)
		D/P	D/P (S1) (S2) (D)	

Table 2 Basic Instructions (Continued)

Classification		Instruction Symbol	Symbol	Contents of Processing
Arithmetic operation instructions	BCD 4-digit multiplication, division	B+	B+ (S) (D)	(D) + (S) → (D)
		B+P	B+P (S) (D)	
		B+	B+ (S1) (S2) (D)	(S1) + (S2) → (D)
		B+P	B+P (S1) (S2) (D)	
		B−	B− (S) (D)	(D) + (S) → (D)
		B−P	B−P (S) (D)	
		B−	B− (S1) (S2) (D)	(S1) − (S2) → (D)
		B−P	B−P (S1) (S2) (D)	
	BCD 8-digit multiplication, division	DB+	DB+ (S) (D)	(D + 1, D) + (S + 1, S) → (D + 1, D)
		DB+P	DB+P (S) (D)	
		DB+	DB+ (S1) (S2) (D)	(S + 1, S1) + (S2 + 1, S2) → (D + 1, D)
		DB+P	DB+P (S1) (S2) (D)	
		DB−	DB− (S) (D)	(D + 1, D) − (S + 1, S) → (D + 1, D)
		DB−P	DB−P (S) (D)	
		DB−	DB− (S1) (S2) (D)	(S1 + 1, S1) + (S2 + 1, S2) → (D + 1, D)
		DB−P	DB−P (S1) (S2) (D)	

Table 2 Basic Instructions (Continued)

Classification		Instruction Symbol	Symbol	Contents of Processing
Arithmetic operation instructions	BCD 4-digit multiplication, division	B*	B* (S1) (S2) (D)	(S1) x (S2) → (D + 1, D)
		B*P	B*P (S1) (S2) (D)	
		B/	B/ (S1) (S2) (D)	(S1) ÷ (S2) → Quotient (D) Remainder (D + 1)
		B/P	B/P (S1) (S2) (D)	
	BCD 8-digit multiplication, division	DB*	DB* (S1) (S2) (D)	(S1 + 1, S1) x (S2 + 1, S2) → (D + 3, D + 2, D + 1, D)
		DB*P	DB*P (S1) (S2) (D)	
		DB/	DB/ (S1) (S2) (D)	(S1 + 1, S1) ÷ (S1 + 1, S2) → Quotient (D + 1, D), Remainder (D + 3, D + 2)
		DB/P	DB/P (S1) (S2) (D)	
	BIN data increment	INC	INC (D)	(D) + 1 → (D)
		INCP	INCP (D)	
		DINC	DINC (D)	(D + 1, D) + 1 → (D + 1, D)
		DINCP	DINCP (D)	
	BIN data increment	DEC	DEC (D)	(D) – 1 → (D)
		DECP	DECP (D)	
		DDEC	DDEC (D)	(D + 1, D) – 1 → (D + 1, D)
		DDECP	DDECP (D)	

Table 2 Basic Instructions (Continued)

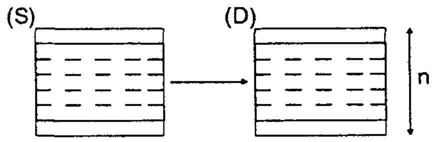
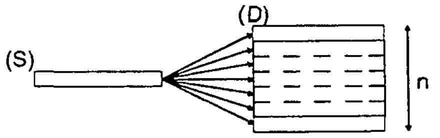
Classification		Instruction Symbol	Symbol	Contents of Processing
BCD ↔ BIN conversion instructions	BCD conversion	BCD	BCD (S) (D)	$\underset{\text{BIN (0 to 9999)}}{(S)} \xrightarrow{\text{BCD conversion}} (D)$
		BCDP	BCDP (S) (D)	
		DBCD	DBCD (S) (D)	$\underset{\text{BIN (0 to 99999999)}}{(S1+1, S1)} \xrightarrow{\text{BCD conversion}} (D1+1, D)$
		DBCDP	DBCDP (S) (D)	
	BIN conversion	BIN	BIN (S) (D)	$\underset{\text{BCD (0 to 9999)}}{(S)} \xrightarrow{\text{BIN conversion}} (D)$
		BINP	BINP (S) (D)	
		DBIN	DBIN (S) (D)	$\underset{\text{BCD (0 to 99999999)}}{(S1+1, S1)} \xrightarrow{\text{BIN conversion}} (D1+1, D)$
		DBINP	DBINP (S) (D)	
Data transfer instructions	Transfer	MOV	MOV (S) (D)	(S) → (D)
		MOVP	MOVP (S) (D)	
		DMOV	DMOV (S) (D)	(S + 1, S) → (D + 1, D)
		DMOVP	DMOVP (S) (D)	
	Negation transfer	CML	CML (S) (D)	$\overline{(S)} \rightarrow (D)$
		CMLP	CMLP (S) (D)	
		DCML	DCML (S) (D)	$\overline{(S+1, S)} \rightarrow (D+1, D)$
		DCMLP	DCMLP (S) (D)	
	Block transfer	BMOV	BMOV (S) (D) n	
		BMOVP	BMOVP (S) (D) n	
		FMOV	FMOV (S) (D) n	
		FMOVP	FMOVP (S) (D) n	
	Exchange	XCH	XCH (D1) (D2)	(D1) ↔ (D2)
		XCHP	XCHP (D1) (D2)	
		DXCH	DXCH (D1) (D2)	(D1 + 1, D1) ↔ (D2 + 1, D2)
		DXCHP	DXCHP (D1) (D2)	

Table 2 Basic Instructions (Continued)

Classification		Instruction Symbol	Symbol	Contents of Processing
Program branch instructions	Jump	CJ	CJ P**	Jumps to P** after the input condition is enabled.
		SCJ	SCJ P**	Jumps to P** beginning with the next scan after the input condition is enabled.
		JMP	JMP P**	Unconditionally jumps to P**.
	Subroutine call	CALL	CALL P**	Executes the subroutine program at P** after the input condition is enabled.
		CALLP	CALLP P**	
		RET	RET	Returns execution from the subroutine program to the sequence program.
	Interrupt program	EI	EI	Cancels execution disable setting of an interrupt program. Valid when M9053 is OFF.
		DI	DI	Execution of an interrupt program is disabled. Valid when M9053 is OFF.
		IRET	IRET	Returns operation from an interrupt program to a sequence program.
	Micro-computer program call	SUB	SUB n	Executes the microcomputer program specified by n.
		SUBP	SUBP n	
Refresh instructions	Link refresh	COM	COM	Executes link refresh, general data processing.
	Link refresh enable/ disable	EI	EI	Enables link refresh. Valid when M9053 is ON.
		DI	DI	Disables link refresh. Valid when M9053 is ON.
	Partial refresh	SEG	SEG (S) n	Corresponding devices are partial-refreshed during one scan. Valid when M9052 is ON.

1.3 Application Instructions

Table 3 Application Instructions

Classification		Instruction Symbol	Symbol	Contents of Processing
Logical operation instructions	Logical product	WAND	WAND (S) (D)	(D) AND (S) → (D)
		WANDP	WANDP (S) (D)	
		WAND	WAND (S1) (S2) (D)	(S1) AND (S2) → (D)
		WANDP	WANDP (S1) (S2) (D)	
		DAND	DAND (S) (D)	(D + 1, D) AND (S + 1, S) → (D + 1, D)
		DANDP	DANDP (S) (D)	
	Logical sum	WOR	WOR (S) (D)	(D) OR (S) → (S)
		WORP	WORP (S) (D)	
		WOR	WOR (S1) (S2) (D)	(S1) OR (S2) → (D)
		WORP	WORP (S1) (S2) (D)	
		DOR	DOR (S) (D)	(D + 1, D) OR (S + 1, S) → (D + 1, D)
		DORP	DORP (S) (D)	
	Exclusive logical sum	WXOR	WXOR (S) (D)	(D) XOR (S) → (D)
		WXORP	WXORP (S) (D)	
		WXOR	WXOR (S1) (S2) (D)	(S1) XOR (S2) → (D)
		WXORP	WXORP (S1) (S2) (D)	
		DXOR	DXOR (S) (D)	(D + 1, D) XOR (S + 1, S) → (D + 1, D)
		DXORP	DXORP (S) (D)	
	NOT exclusive logical sum	WXNR	WXNR (S) (D)	$\overline{(D)\ \mathrm{XOR}\ (S)} \rightarrow (D)$
		WXNRP	WXNRP (S) (D)	
		WXNR	WXNR (S1) (S2) (D)	$\overline{(S1)\ \mathrm{XOR}\ (S2)} \rightarrow (D)$
		WXNRP	WXNRP (S1) (S2) (D)	
		DXNR	DXNR (S) (D)	$\overline{(D + 1, D)\ \mathrm{XOR}\ (S + 1, S)} \rightarrow (D + 1, D)$
		DXNRP	DXNRP (S) (D)	
	2's complement	NEG	NEG (D)	$\overline{(D)} + 1 \rightarrow (D)$
		NEGP	NEGP (D)	

Table 3 Application Instructions (Continued)

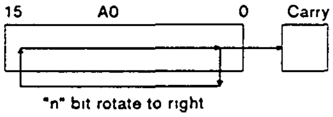
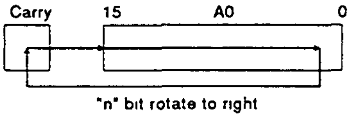
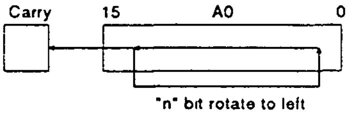
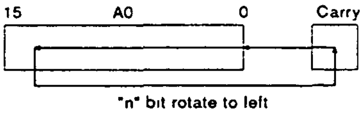
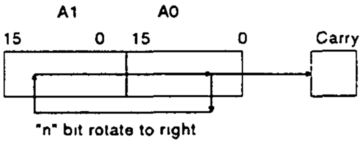
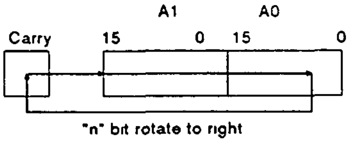
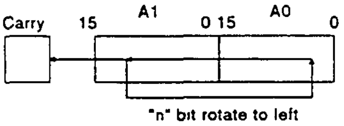
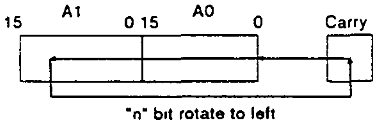
Classification		Instruction Symbol	Symbol	Contents of Processing
Rotation instructions	Rightward rotation	ROR	ROR n	 "n" bit rotate to right
		RORP	RORP n	
		RCR	RCR n	 "n" bit rotate to right
		RCRP	RCRP n	
	Leftward rotation	ROL	ROL n	 "n" bit rotate to left
		ROLP	ROLP n	
		RCL	RCL n	 "n" bit rotate to left
		RCLP	RCLP n	
	Rightward rotation	DROR	DROR n	 "n" bit rotate to right
		DRORP	DRORP n	
		DRCR	DRCR n	 "n" bit rotate to right
		DRCRP	DRCRP n	
	Leftward rotation	DROL	DROL n	 "n" bit rotate to left
		DROLP	DROLP n	
		DRCL	DRCL n	 "n" bit rotate to left
		DRCLP	DRCLP n	

Table 3 Application Instructions (Continued)

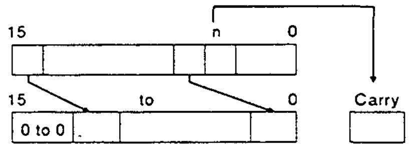
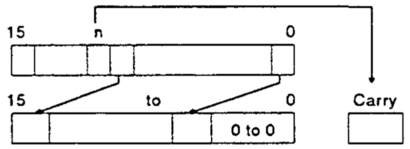
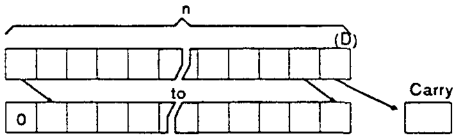
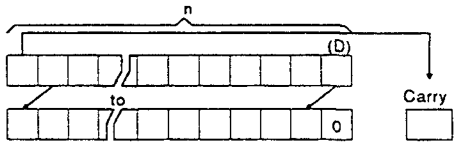
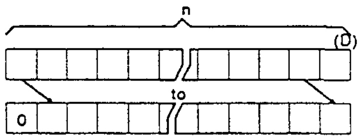
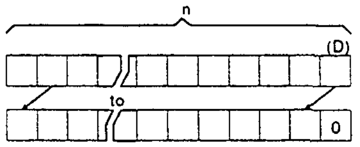
Classification		Instruction Symbol	Symbol	Contents of Processing
Shift instructions	n bit shift	SFR	SFR (D) n	
		SFRP	SFRP (D) n	
		SFL	SFL (D) n	
		SFLP	SFLP (D) n	
	1 bit shift	BSFR	BSFR (D) n	
		BSFRP	BSFRP (D) n	
		BSFL	BSFL (D) n	
		BSFLP	BSFLP (D) n	
	1 ward shift	DSFR	DSFR (D) n	
		DSFRP	DSFRP (D) n	
		DSFL	DSFL (D) n	
		DSFLP	DSFLP (D) n	

Table 3 Application Instructions (Continued)

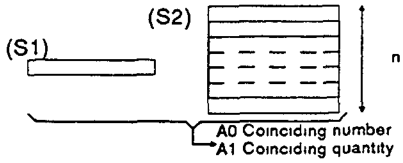
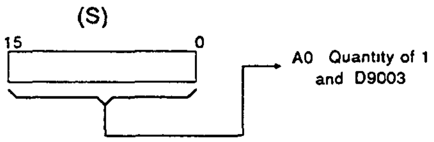
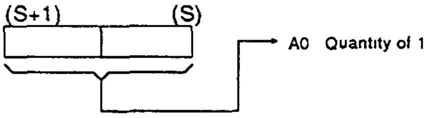
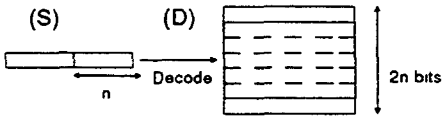
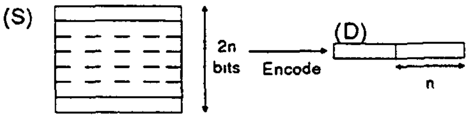
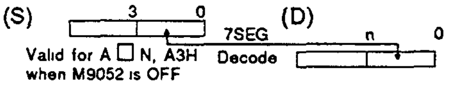
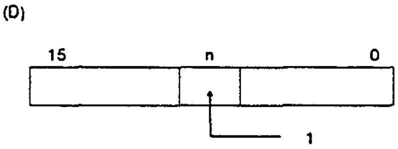
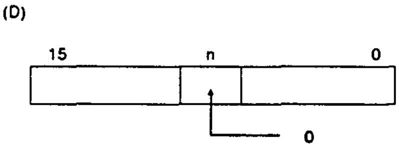
Classification		Instruction Symbol	Symbol	Contents of Processing
Data Processing instructions	Data search	SER	SER (S1) (S2) n	
		SERP	SERP (S1) (S2) n	
	Bit check	SUM	SUM (S)	
		SUMP	SUMP (S)	
		DSUM	DSUM (S)	
		DSUMP	DSUMP (S)	
	Decode/ Encode	DECO	DECO (S) (D) n	8 → 256 decode 
		DECOP	DECOP (S) (D) n	
		ENCO	ENCO (S) (D) n	256 → 8 encode 
		ENCOP	ENCOP (S) (D) n	
	7 segment decode	SEG	SEG (S) (D)	
	Bit set/reset	BSET	BSET (D) n	
		BSETP	BSETP (D) n	
		BRST	BRST (D) n	
		BRSTP	BRSTP (D) n	

Table 3 Application instructions (Continued)

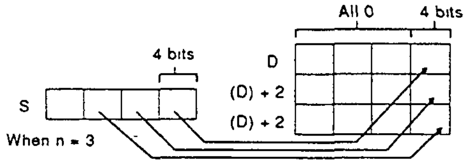
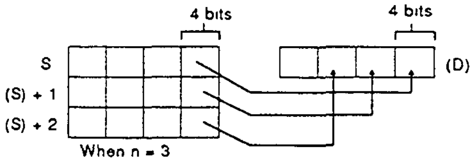
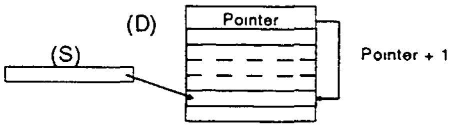
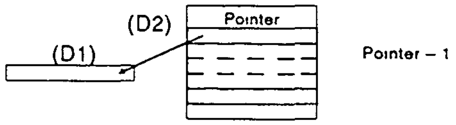
Classification		Instruction Symbol	Symbol	Contents of Processing
Data Processing instructions	Association/Dissociation	DIS	DIS (S) (D) n	
		DISP	DISP (S) (D) n	
		UNI	UNI (S) (D) n	
		UNIP	UNIP (S) (D) n	
	ASCII conversion	ASC	ASC Alphanumeric character (D)	Converts alphanumeric characters into ASCII codes and stores into 4 points beginning with the device, D.
FIFO instructions	Write	FIFW	FIFW (S) (D)	
		FIFWP	FIFWP (S) (D)	
	Read	FIFR	FIFR (D1) (D2)	
		FIFRP	FIFRP (D1) (D2)	
Buffer access instructions	Data read	FROM	FROM n1 n2 (D) n3	Reads data from the special function module.
		FROMP	FROMP n1 n2 (D) n3	
		DFRO	DFRO n1 n2 (D) n3	
		DFROP	DFROP n1 n2 (D) n3	
	Data write	TO	TO n1 n2 (S) n3	Write data to the special function module.
		TOP	TOP n1 n2 (S) n3	
		DTO	DTO n1 n2 (S) n3	
		DTOP	DTOP n1 n2 (S) n3	
FOR-NEXT instructions	Repetition	FOR	FOR n	Processing between [FOR] and [NEXT] is repeated "n" times.
		NEXT	NEXT	

Table 3 Application Instructions (Continued)

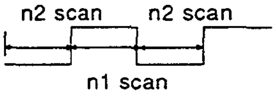
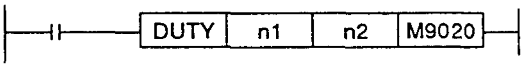
Classification			Instruction Symbol	Symbol	Contents of Processing
Local station access instructions	Local station data read/write		LRDP	LRDP n1 (S) (D) n2	Reads data from the local station.
			LWTP	LWTP n1 (D) (S) n2	
Remote I/O station access instructions	Remote I/O station data read/write		RFRP	RFRP n1 n2 (D) n3	Reads data from the special function module in the remote I/O station.
			RTOP	RTOP n1 n2 (D) n3	
Display instructions	ASCII print		PR	PR (S) (D)	Outputs 16 ASCII codes beginning with a designated device to an output module.
			PR	PR (S) (D)	Outputs ASCII codes beginning with a designated device to NUL(00H) to an output module. Valid when M9049 is OFF.
			PRC	PRC (S) (D)	Converts the comment of a designated device to ASCII code and outputs it to an output module. Comment of device 1 is also output.
	Display reset		LEDR	LEDR	Resets the display indication.
Other instructions	WDT reset		WDT	WDT	Resets WDT with a sequence program.
			WDTP	WDTP	
	Failure check		CHK	CHK (D1) (D2)	Failure → (D1) : ON, (D2) : Failure NO Normal → (D1) : OFF, (D2) : 0 When A[]N uses I/O direct method.
	Status latch	Set	SLT	SLT	At the condition set by parameter setting, data are stored into memory for status latch.
		Reset	SLTR	SLTR	Status latch is reset and [SLT] instruction is enabled.
	Sampling trace	Set	STRA	STRA	At the condition set by parameter setting, sampling data are stored into memory for status latch.
		Reset	STRAR	STRAR	Sampling trace is resumed. ([STRA] instruction is enabled.)
	Carry	Set	STC	STC	Carry flag contact (M9012) is turned on.
		Reset	CLC	CLC	Carry flag contact (M9012) is turned off.
	Timing clock		DUTY	DUTY n1 n2 (D)	Timing clock shown below is generated. Special relay (D) 

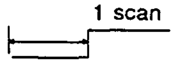
APPENDIX 2 SPECIAL RELAY, SPECIAL REGISTER LIST

2.1 Special Relay List

(1) Special relay list

The special relays are internal relays used for specific purposes. Therefore, they cannot be used as coils in the program. The special relays are used a contacts in the program.

Number	Name	Description	Details
*1 M9000	Fuse blown	OFF: Normal ON: Presence of fuse blow module	• Turned on when there is one or more output modules of which fuse has been blown. Remains on if normal status is restored.
*1 M9002	I/O module verify error	OFF: Normal ON: Presence of error	• Turned on if the status of I/O module is different from entered status when power is turned on. Remains on if normal status is restored.
*1 M9005	AC DOWN detection	OFF: AC is good ON: AC is down	• Turned on if power failure of within 10ms occurs. Reset when POWER switch is moved from OFF to ON position.
M9006	Battery low	OFF: Normal ON: Battery low	• Turned on when battery voltage reduces to less than specified. Turned off when battery voltage becomes normal.
*1 M9007	Battery low latch	OFF: Normal ON: Battery low	• Turned on when battery voltage reduces to less than specified. Remains on if battery voltage becomes normal.
*1 M9008	Self-diagnostic error	OFF: Absence of error ON: Presence of error	• Turned on when error is found as a result of self-diagnosis.
M9009	Annunciator detection	OFF: Absence of ON: Presence of	• Turned on when OUT F or SET F instruction is executed. Switched off when D9124 value is set to 0.
M9010	Operation error flag	OFF: Absence of error ON: Presence of error	• Turned on when operation error occurs during execution of application instruction. Turned off when error is eliminated.
*1 M9011	Operation error flag	OFF: Absence of error ON: Presence of error	• Turned on when operation error occurs during execution of application instruction. Remains on if normal status is restored.
M9012	Carry flag	OFF: Carry off ON: Carry on	• Carry flag used in application instruction.
M9016	Data memory clear flag	OFF: No processing ON: Output clear	• Clears all data memory (except special relays and special registers) in remote run mode from computer, etc. when M9016 is 1.
M9017	Data memory clear flag	OFF: No processing ON: Output clear	• Clears all unlatched data memory (except special relays and special registers) in remote run mode from computer, etc. when M9017 is 1.
M9020 M9021 M9022 M9023 M9024	User timing clock No.0 User timing clock No.1 User timing clock No.2 User timing clock No.3 User timing clock No.4		• Relay which repeats on/off at intervals of predetermined scan. • When power is turned on or reset is performed, the clock starts with off. • Set the intervals of on/off [DUTY] instruction. 
*2 M9025	Clock data set request	OFF: No processing ON: Data set request	• Writes clock data from D9025-D9028 to the clock devices after the END instruction is executed at the scan when M9025 is switched on.
M9026	Clock data error	OFF: No error ON: Error	• Switched on when a clock data error occurs.

Number	Name	Description	Details
*2 M9028	Clock data read request	OFF: No processing ON: Read request	• reads clock data in BCD to D9025-D9028 when M9028 is switched on.
M9030	0.1 second clock		• 0.1 second, 0.2 second, 1 second, 2 second, and 1 minute clocks are generated. • Not turned on and off per scan but turned on and off even during scan if corresponding time has elapsed. • Starts when power is turned on or reset is performed.
M9031	0.2 second clock		
M9032	1 second clock		
M9033	2 second clock		
M9034	1 minute clock		
M9036	Normally ON	ON OFF	• Used as dummy contacts of initialization and application instruction in sequence program. • M9036 and M9037 are switched on/off independently of the CPU RUN/STOP switch position. M9038 and M9039 are switched on/off in accordance with the RUN/STOP switch position, i.e. switched off when the switch is set to STOP. When the switch is set to other than STOP, M9038 is only switched on during 1 scan and M9039 is only switched off during 1 scan.
M9037	Normally OFF	ON OFF	
M9038	On only for 1 scan after run	ON OFF 	
M9039	RUN flag (off only for 1 scan after run)	ON OFF 	
M9040	PAUSE enable coil	OFF: PAUSE disabled ON: PAUSE enabled	• When RUN key switch is at PAUSE position or remote pause contact has turned on and if M9040 is on, PAUSE mode is set and M9041 is turned on.
M9041	PAUSE status contact	OFF: During pause ON: Not during pause	
M9042	Stop status contact	OFF: During stop ON: Not during stop	• Switched on when the RUN/STOP switch is set to STOP.
M9043	Sampling trace completion	OFF: During sampling trace ON: Sampling trace completion	• Turned on upon completion of sampling trace performed the number of times preset by parameter after STRA instruction is executed. Reset when STRAR instruction is executed.
M9046	Sampling trace	OFF: Except during trace ON: During trace	• On during sampling trace.
M9047	Sampling trace preparation	OFF: Sampling trace stop ON: Sampling trace start	• Sampling trace is not executed until M9047 is turned on. By turning off M9047, sampling trace is stopped.
M9049	Number of characters output switching	OFF: Characters up to NULL code output ON: 16 characters output	• When M9049 is off, characters up to NULL (00H) code are output. • When M9049 is on, ASCII codes for 16 characters are output.
*2 M9052	SEG instruction switching	OFF: 7SEG display ON: I/O partial refresh	• Serves as an I/O partial refresh instruction when M9052 is on. • Serves as a 7SEG display instruction when M9052 is off.
*2 M9053	EI/DI instruction switching	OFF: Sequence interrupt control ON: Link interrupt control	• Switch on to execute the link refresh enable, disable (EI, DI) instructions.
M9054	STEP RUN flag	OFF: Not during step run ON: During step run	• Switched on when the RUN/STOP switch is in STEP RUN.
M9055	Status latch completion flag	OFF: Uncompleted ON: Completed	• Turned on when status latch is completed. Turned off by reset instruction.
*2 M9084	Error check setting	OFF: Error checked ON: Error unchecked	• Used to set whether or not the following error checks are made at the execution of the END instruction. • Fuse blown, I/O unit verify error, batter error

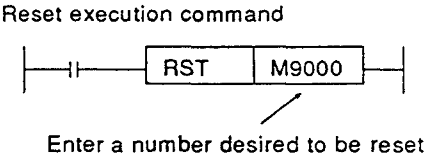
POINTS

(1) All special relays are switched off by any of the power-off, latch clear and reset operations. The special relays remain unchanged when the RUN/STOP switch is set to STOP.

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

1) Method by user program

Insert the circuit shown at right into the program and turn on the reset execution command contact to clear the special relay M.



2) Method by peripheral equipment.

Cause forced reset by the test function of peripheral equipment. For the operation procedure, refer to equipment. For the operation procedure, refer to the manual of each peripheral equipment.

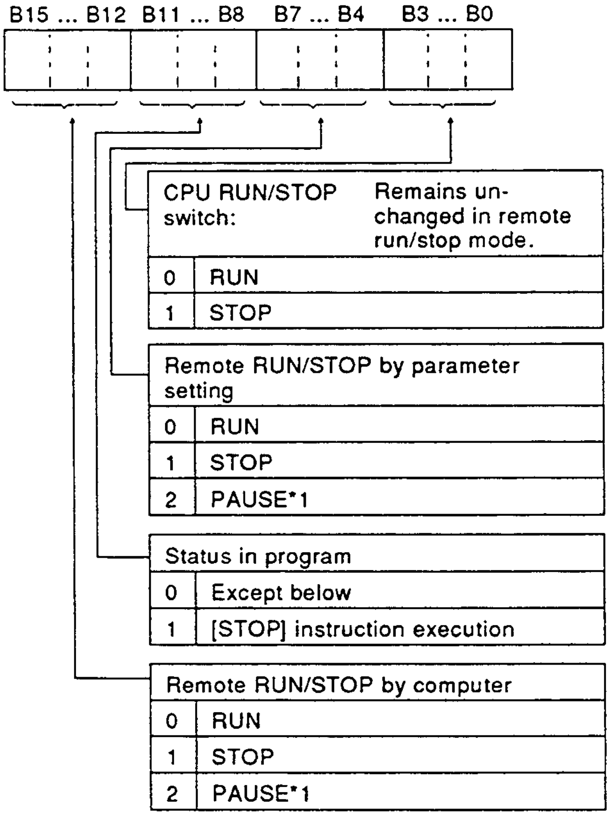
3) By moving the RESET key switch at the CPU front to the RESET position, the special relay is turned "off".

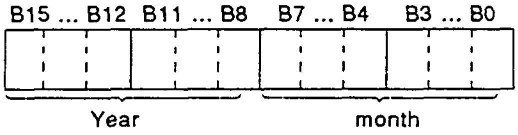
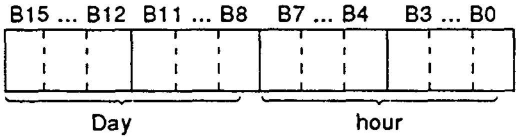
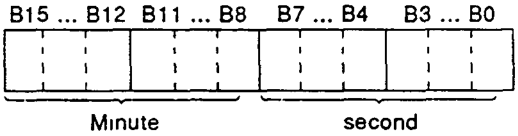
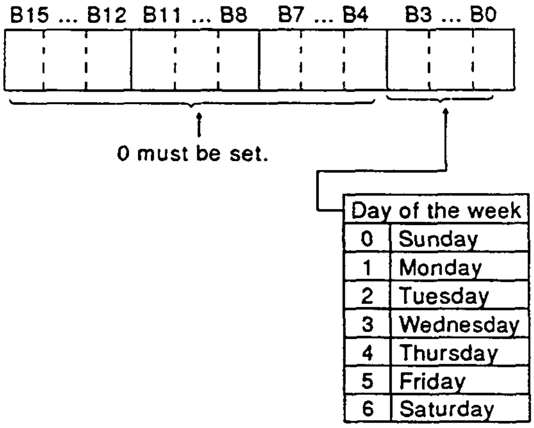
(3) Special relays marked *2 are switched on/off in the sequence program.

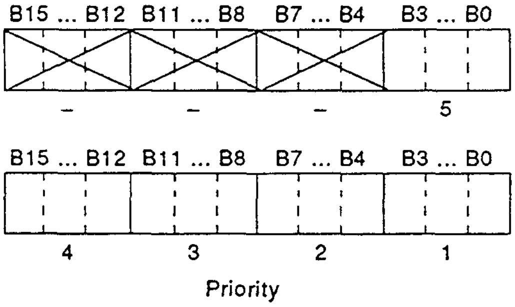
2.2 Special Registers D

The special registers are data registers used for specific purposes. Therefore, do not write data to the special registers in the program (except the ones with numbers marked * in the table).

Number	Name	Stored Data	Explanation
D9000	Fuse blown	Fuse blow module number	• When fuse flow modules are detected, the lowest number of detected units is stored in hexadecimal. (Example: When fuses of Y50 to 6F output modules have blown, "50" is stored in hexadecimal) The module number monitored by the peripheral is hexadecimal. (Cleared when all contents of D9100 are reset to 0.)
D9002	I/O unit verify error	I/O module verify error module number	• If I/O module data is different from data entered are detected when the power is turned on, the first I/O number of the lowest number module among the detected modules stored in hexadecimal. (Storing method is the same as that of D9000.) The module number monitored by the peripheral is hexadecimal. (Cleared when all contents of D9116 of D9123 are reset to 0.)
*1 D9005	AC DOWN counter	AC DOWN time count	• 1 is added each time input voltage becomes 80% or less of rating while the CPU unit is performing operation, and the value is stored in BIN code.
*1 D9008	Self-diagnostic error	Self-diagnostic error number	• When error is found as a result of self-diagnosis, error number is stored in BIN code.
D9009	Annunciator detection	F number at which external failure has occurred	• When one of to 255 is turned on by [OUT F] or [SET F], the F number, which has been detected earliest among the F numbers which have turned on, is stored in BIN code. • D9009 can be cleared by [RST F] or [LEDR] instruction. If another F number has been detected, the clearing of D9009 causes the next number to be stored in D9009.
D9010	Error step	Step number at which operation error has occurred	• When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in Bln code. Thereafter, each time operation error occurs, the contents of D9010 are renewed.
D9011	Error step	Step number at which operation error has occurred	• When operation error has occurred during execution of application instruction, the step number, at which the error has occurred, is stored in Bln code. Since storage into D9011 is made when M9011 changes from off to on, the contents of D9010 cannot be renewed unless M9011 is cleared by user program.
D9014	I/O control mode	I/O control mode number	• The set mode is represented as follows: 0 = I/O in direct mode 3 = I/O in refresh mode

Number	Name	Stored Data	Explanation
D9015	CPU operating states	Operating states of CPU	The operating states of CPU as shown below are stored in D9015.  CPU RUN/STOP switch: Remains unchanged in remote run/stop mode. 0 RUN 1 STOP Remote RUN/STOP by parameter setting 0 RUN 1 STOP 2 PAUSE*1 Status in program 0 Except below 1 [STOP] instruction execution Remote RUN/STOP by computer 0 RUN 1 STOP 2 PAUSE*1 *1 When the CPU is in RUN mode and M9040 is off, the CPU remains in RUN mode if changed to PAUSE mode.
D9016	ROM/RAM setting	0: ROM 1: RAM 2: E2PROM	• Indicates the setting of memory select chip. One value of 0 to 2 is stored in BIN code.
D9017	Scan time	Minimum scan time (per 10ms)	• If scan time is smaller than the content of D9017, the value is newly stored at each END. Namely, the minimum value of scan time is store into D9017 in BIN code.
D9018	Scan time	Scan time (per 10ms)	• Scan time is stored in BIN code at each END and always rewritten.
D9019	Scan time	Maximum scan time (per 10ms)	• If scan time is larger than the content of D9019, the value is newly stored at each END. Namely, the maximum value of scan time is stored into D9019 in BIN code.

Number	Name	Stored Data	Explanation
*2 D9020	Constant scan	Constant scan time (User specified in 10ms increments)	• Sets user program execution intervals in 10ms increments. 0: Constant scan function unused 1 to 200: Constant scan function used, program executed at intervals of (set value) x 10ms.
*2 D9025	Clock data	Clock data (Year, month)	• Stores the year (least significant digits) and month in BCD.  Example: 1987, July H8707
*2 D9026	Clock data	Clock data (Day, hour)	• Stores the day and hour in BCD.  Example: 31st, 10 O'clock, H3110
*2 D9027	Clock data	Clock data (Minute, second)	• Stores the minute and second in BCD.  Example: 35 minutes, 48 seconds, H3548
*2 D9028	Clock data	Clock data (, day of the week)	• Stores the day of the week in BCD.  Day of the week 0 Sunday 1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday

Number	Name	Stored Data	Explanation
*2 D9038	LED display priority	Priority 1 to 4	• Set the error item numbers to the ERROR LED display (flashing) priority setting registers (1 to 4 at D9038 and 5 to 7 at D9039). 
*2 D9039		Priority 5 to 7	• Even when "0" is set, the ERROR LED display is given for those errors with which the CPU operation stops (parameter setting errors are also included). Default: D9038 = H4321 D9039 = H0006 **Error item No.** — **Content** 0. — No display is given. 1. — I/O verify and fuse break errors 2. — Special-function module, link parameter, SFC parameter, and SFC operation errors 3. — CHK instruction error 4. — Annunciator (F) 6. — Battery error
*1 D9100	Fuse blown module	Bit pattern in modules of 16 points of fuse blow modules (Y000 to Y0FF)	• Output module numbers (in units of 16 points), of which fuses have blown, are entered in bit pattern. (Preset output number when parameter setting has been performed.) D9100 D9101: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 0 0 0 1 (YC0) 0 0 0 1 (Y80) 0 0 0 0 0 0 0 0 ↑ Indicated fuse blow. (If normal status is restored, clear is not performed. Therefore, it is required to perform clear by user program.)
*1 D9116	I/O module verify error	Bit pattern in modules of 16 points of verify error modules (Y000 to Y0FF)	• When I/O module data is different from those entered at power-on have been detected, the I/O module numbers (in units of 16 points) are entered in bit pattern. (Preset I/O module numbers when parameter setting has been performed.) D9116 (D9117): 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 (X/Y0) Indicated I/O unit verify error. (If normal status is restored, clear is not performed. Therefore, it is required to perform clear by user program.)

<table>
<tr><th>Number</th><th>Name</th><th>Stored Data</th><th>Explanation</th></tr>
<tr><td>D9124</td><td>Annunciator detection quantity</td><td>Annunciator detection quantity</td><td>• When one of F0 to 255 is turned on by [OUT F] or [SET F], 1 is added to the contents of D9124. When [RST F] or [LED R] instruction is executed, 1 is subtracted from the contents of D9124.
Quantity, which has been turned on by [OUT F] or [SET F] is stored into D9124 in BIN code. The value of D9124 is maximum 8.</td></tr>
<tr><td>D9125
D9126
D9127
D9128
D9129
D9130
D9131
D9132</td><td>Annunciator detection number</td><td>Annunciator detection number</td><td>• When one of F0 to 255 is turned on by [OUT F] or [SET F], F number, which has turned on, is entered into D9125 to D9132 in due order in BIN code.
F number, which has been turned off by [RST F], is erased from D9125 to D9132, and the contents of data registers succeeding the data register, where the erased F number was stored, are shifted to the preceding data registers.
By executing [LED R] instruction, the contents of D9125 to D9132 are shifted upward by one.
When there are 8 annunciator detections, the 9th one is not stored into D9125 to 9132 even if detected.
<table>
<tr><th></th><th></th><th>SET F50</th><th>SET F25</th><th>SET F19</th><th>SET F25</th><th>SET F15</th><th>SET F70</th><th>SET F65</th><th>SET F38</th><th>SET F110</th><th>SET F151</th><th>SET F210</th><th>LEDR</th></tr>
<tr><td>D9009</td><td>0</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>99</td></tr>
<tr><td>D9124</td><td>0</td><td>1</td><td>2</td><td>3</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>8</td><td>8</td></tr>
<tr><td>D9125</td><td>0</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>99</td></tr>
<tr><td>D9126</td><td>0</td><td>0</td><td>25</td><td>25</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>99</td><td>15</td></tr>
<tr><td>D9127</td><td>0</td><td>0</td><td>0</td><td>99</td><td>0</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>70</td></tr>
<tr><td>D9128</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>70</td><td>70</td><td>70</td><td>70</td><td>70</td><td>70</td><td>65</td></tr>
<tr><td>D9129</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>65</td><td>65</td><td>65</td><td>65</td><td>65</td><td>38</td></tr>
<tr><td>D9130</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>38</td><td>38</td><td>38</td><td>38</td><td>110</td></tr>
<tr><td>D9131</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>110</td><td>110</td><td>110</td><td>151</td></tr>
<tr><td>D9132</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>151</td><td>151</td><td>210</td></tr>
</table></td></tr>
</table>

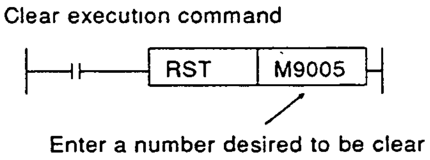
POINTS

(1) All special register data is cleared by any of the power-off, latch clear and reset operations. The data is retained when the RUN/STOP switch is set to STOP.

(2) For the above special registers with numbers marked *1, the contents of register are not cleared if normal status is restored. Therefore, to clear the contents, use the following method:

1) Method by user program.

Insert the circuit shown at right into the program and turn on the clear execution command contact to clear the contents of register.



2) Method by peripheral equipment.

Set the register to "0" by changing the present value by the test function of peripheral equipment or set to "0" by forced reset. For the operation procedure, refer to the manual of each peripheral equipment.

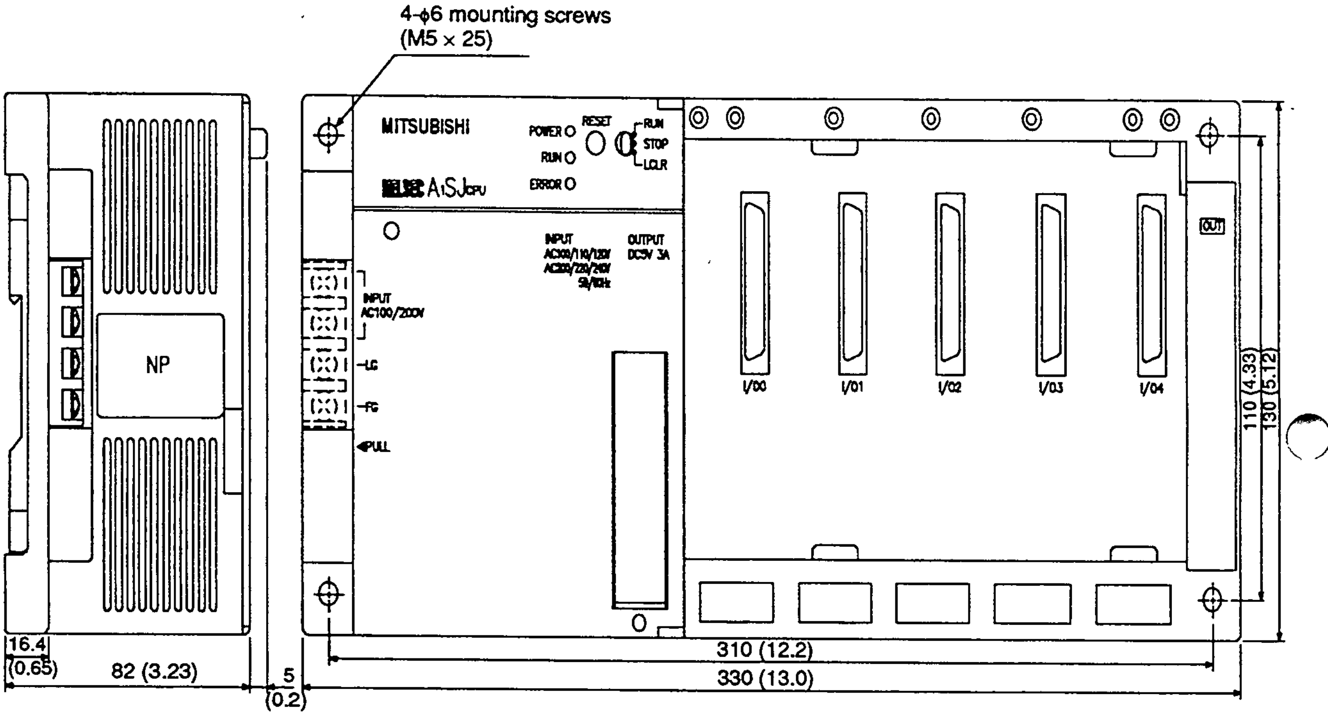
3) By moving the RESET key switch at the CPU front to the RESET position, the special register is set to "0".

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

APPENDIX 3 OUTSIDE DIMENSIONS

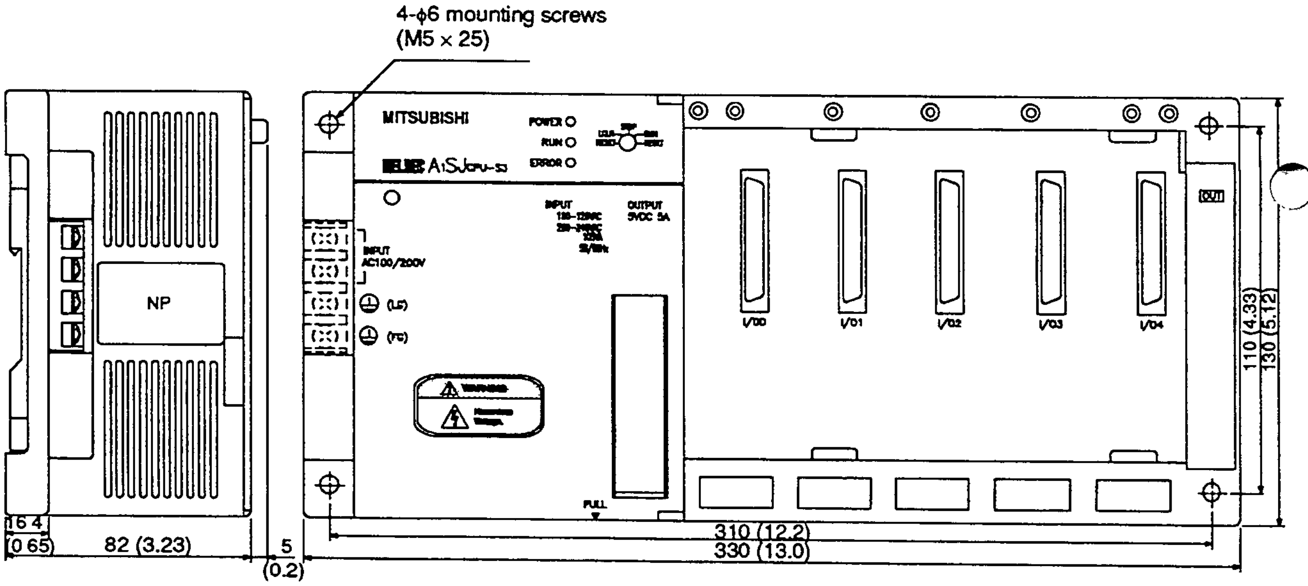
3.1 CPU Module

3.1.1 A1SJCPU module



Unit: mm (in)

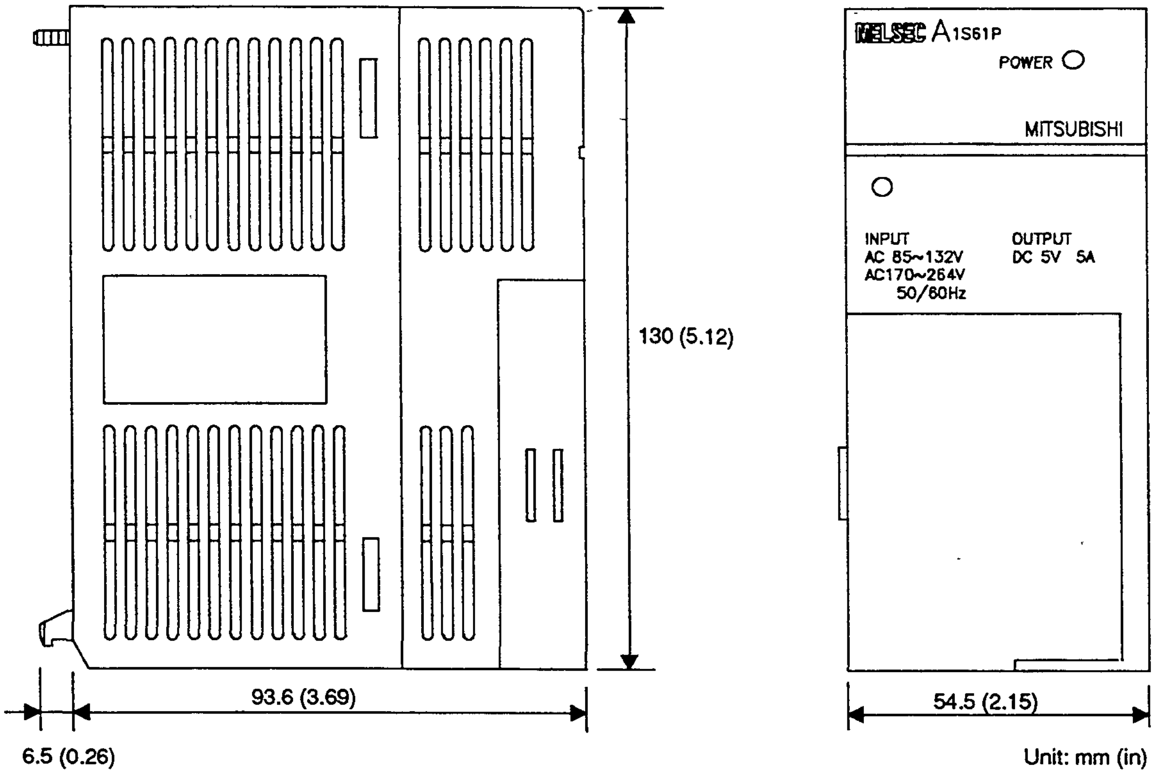
3.1.2 A1SJCPU-S3 module



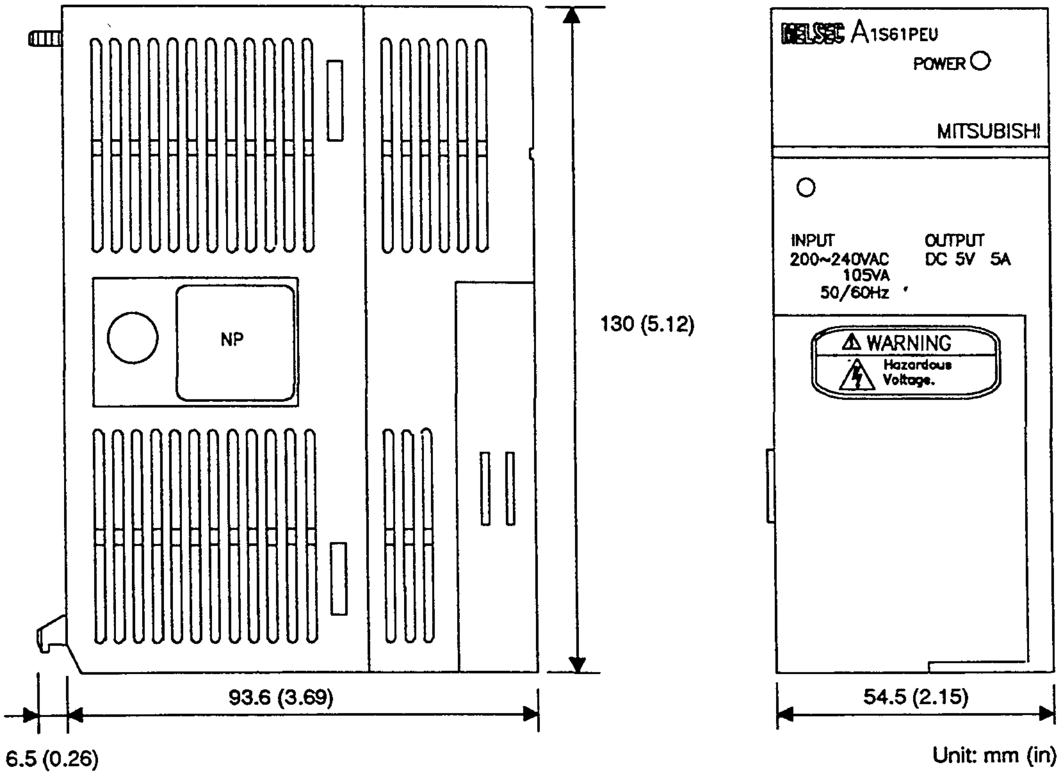
Unit: mm (in)

3.2 Power Supply Module

3.2.1 A1S61P/A1S62P/A1S63P power supply module

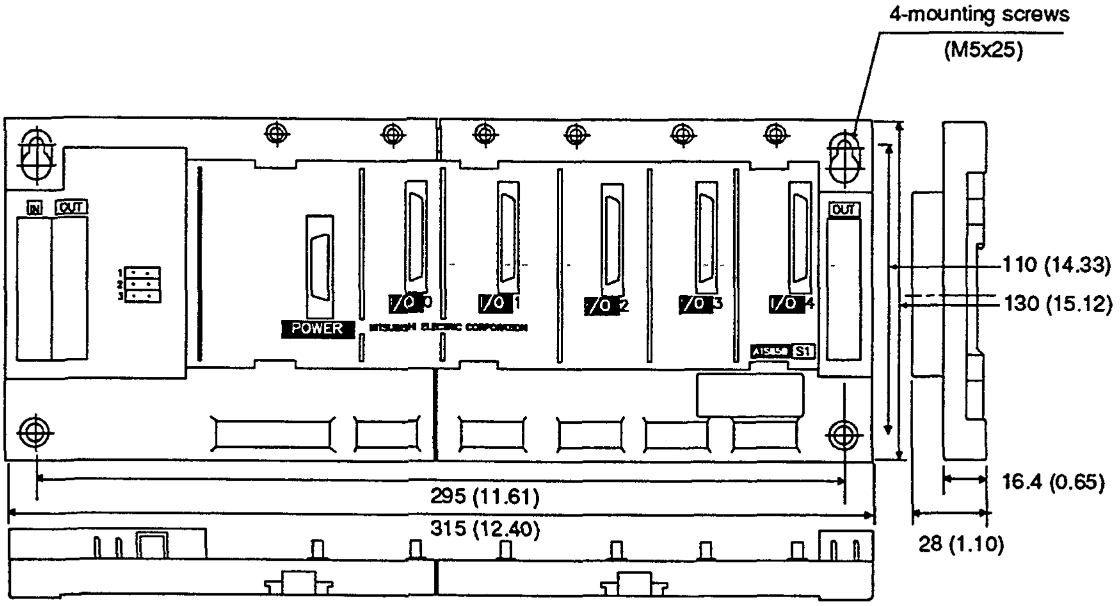


3.2.2 A1S61PEU/A1S62PEU power supply module



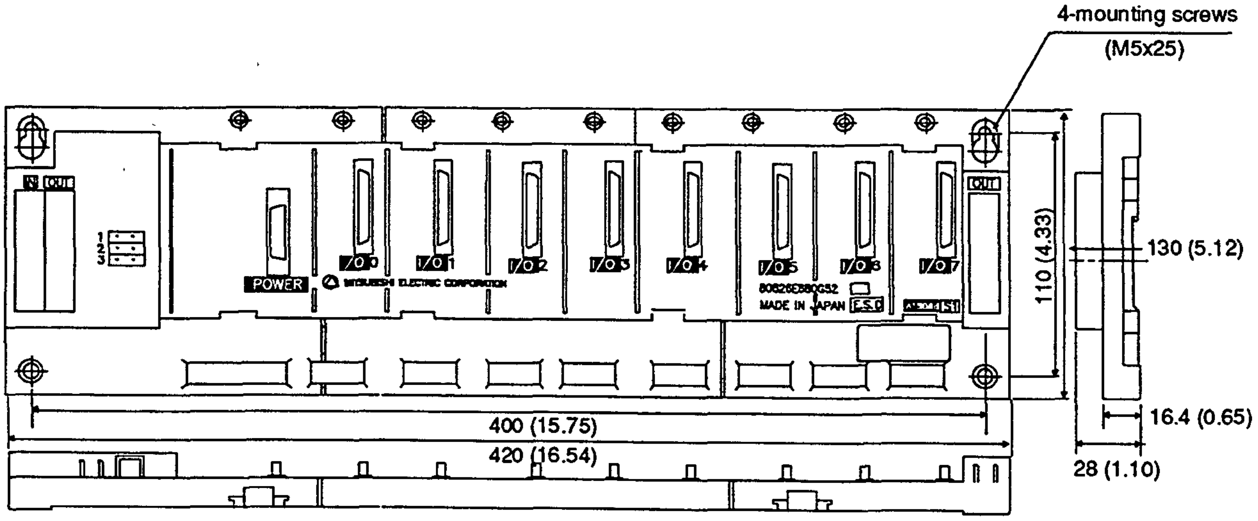
3.3 Extension Base Units

3.3.1 A1S65B, A1S65B-S1 extension base unit



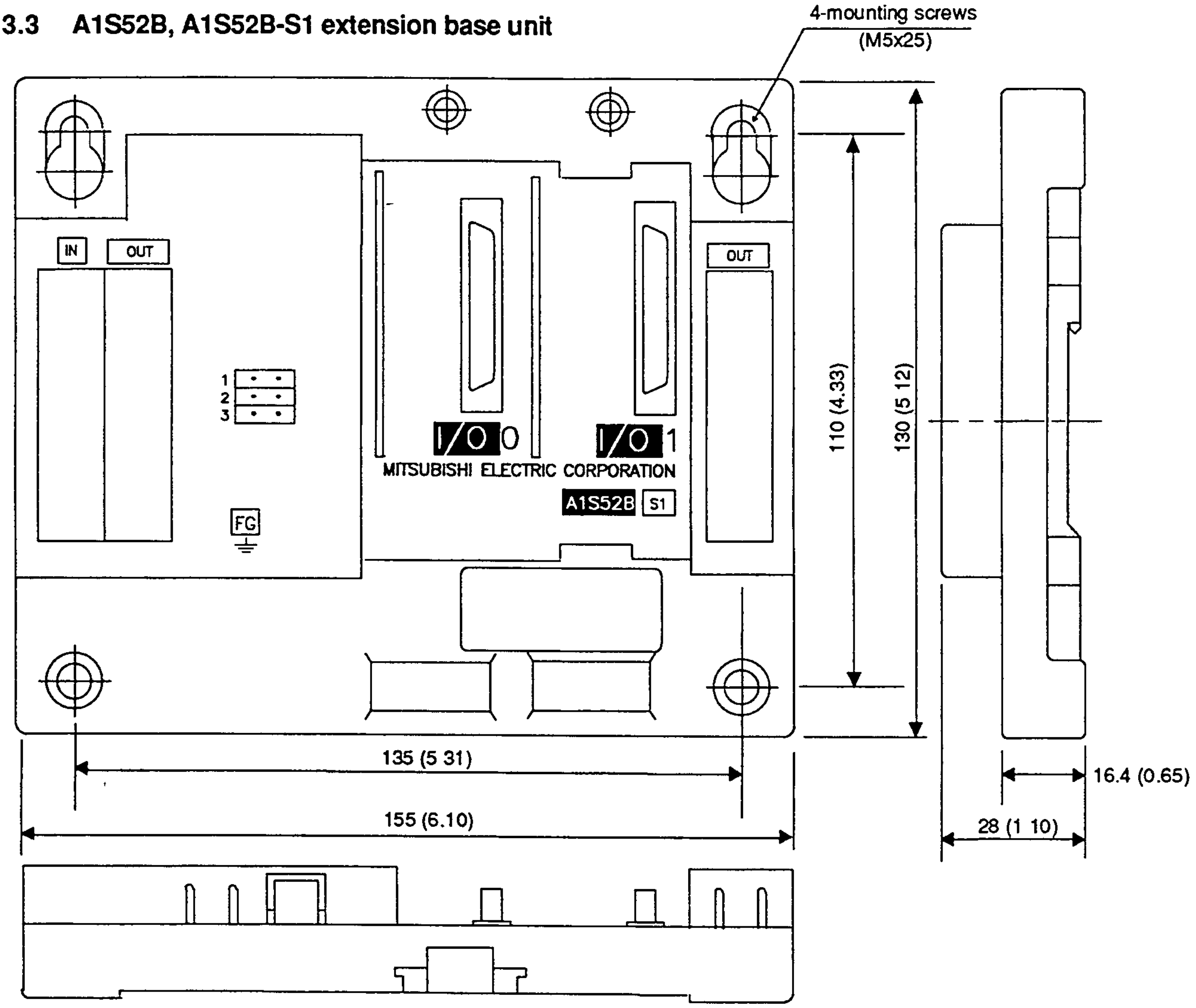
Unit: mm (in)

3.3.2 A1S68B, A1S68B-S1 extension base unit



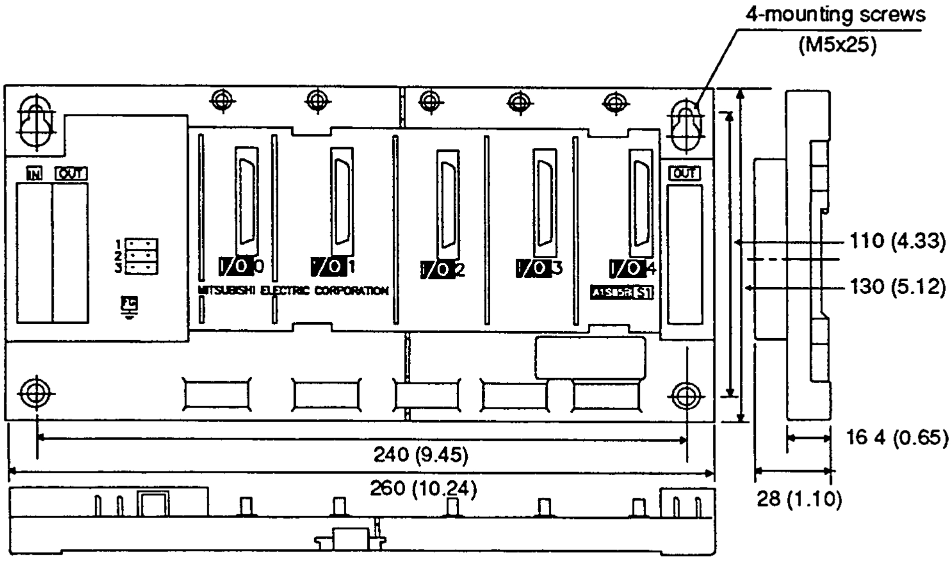
Unit: mm (in)

3.3.3 A1S52B, A1S52B-S1 extension base unit



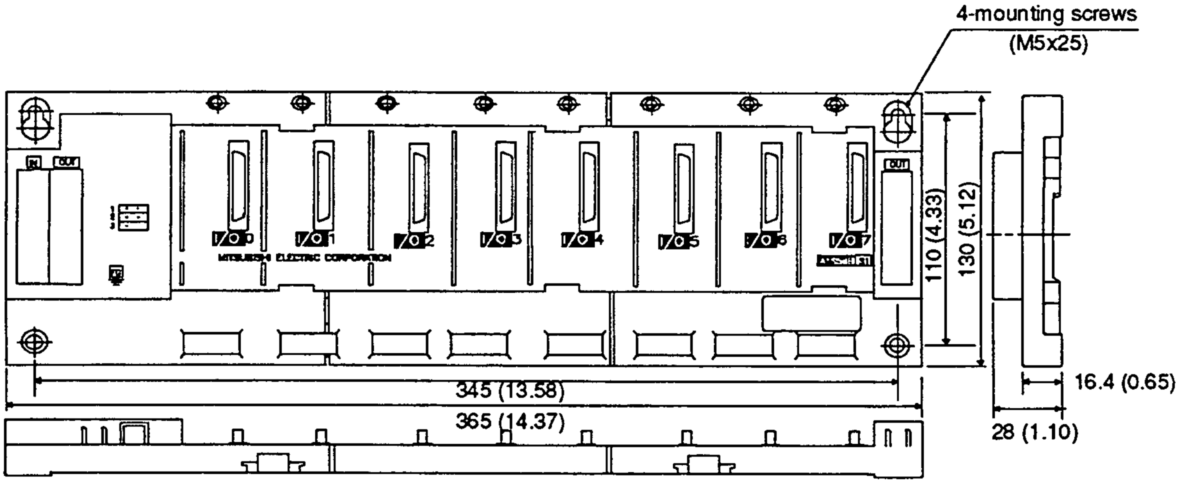
Unit. mm (in)

3.3.4 A1S55B, A1S55B-S1 extension base unit



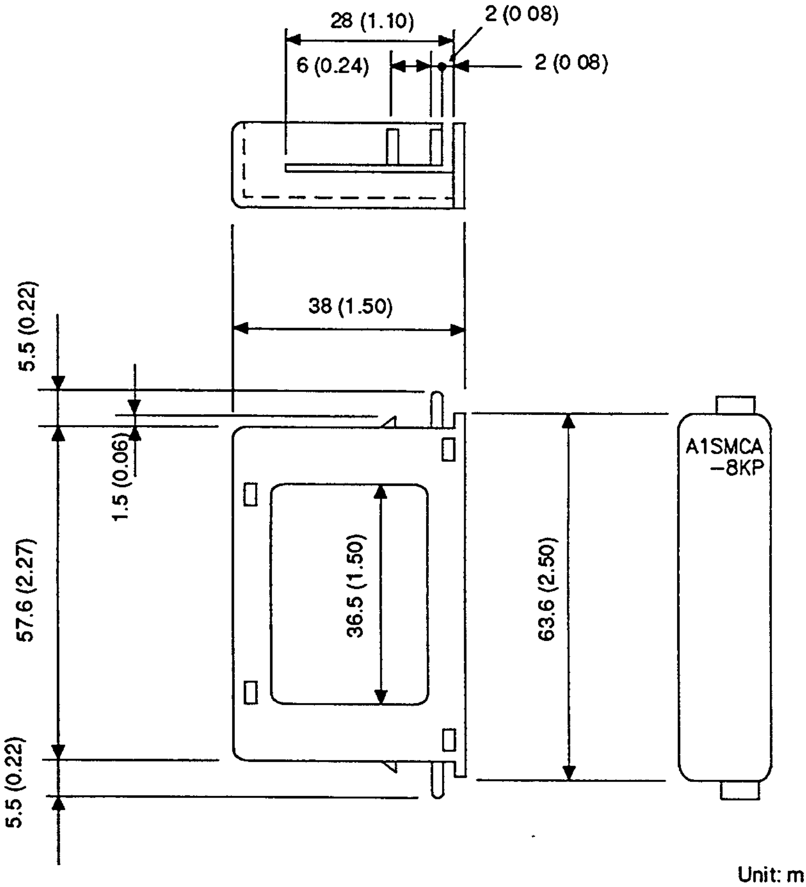
Unit: mm (in)

3.3.5 A1S58B, A1S58B-S1 extension base unit



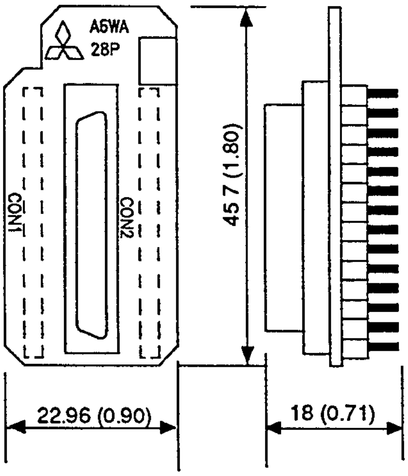
Unit: mm (in)

3.4 Memory Cassette (A1SMCA-[ ])



Unit: mm (inch)

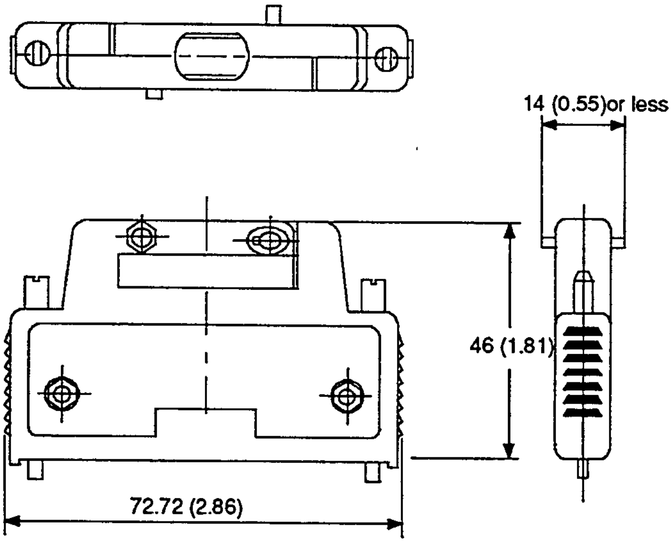
3.5 A6WA-28P Memory Write Adaptor



Unit· mm (inch)

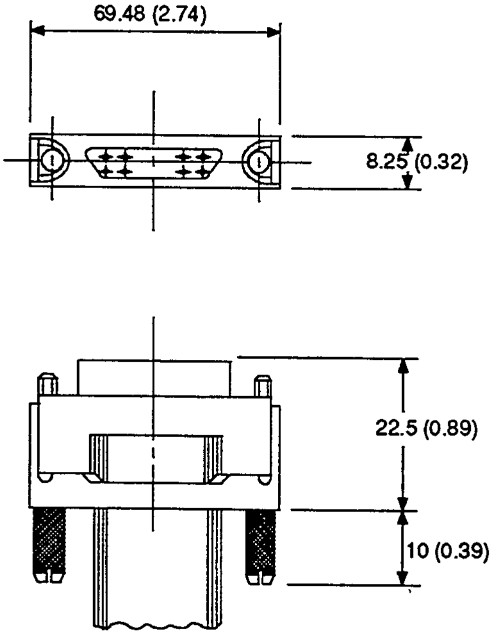
3.6 40-Pin Connectors

3.6.1 A6CON1 soldering-type 40-pin connector, A6CON2 crimp-contact-type 40-pin connector



Unit: mm (inch)

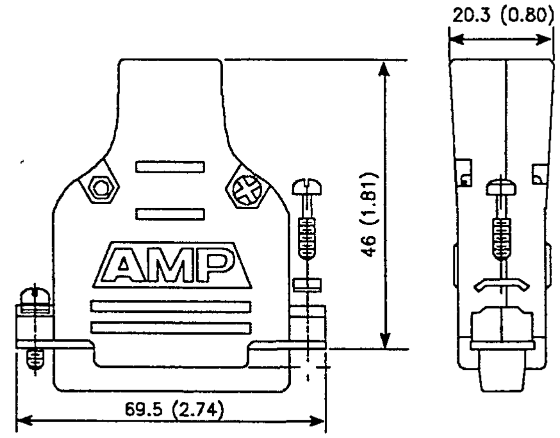
3.6.2 A6CON3 pressure-displacement-type 40-pin connector



Unit: mm (inch)

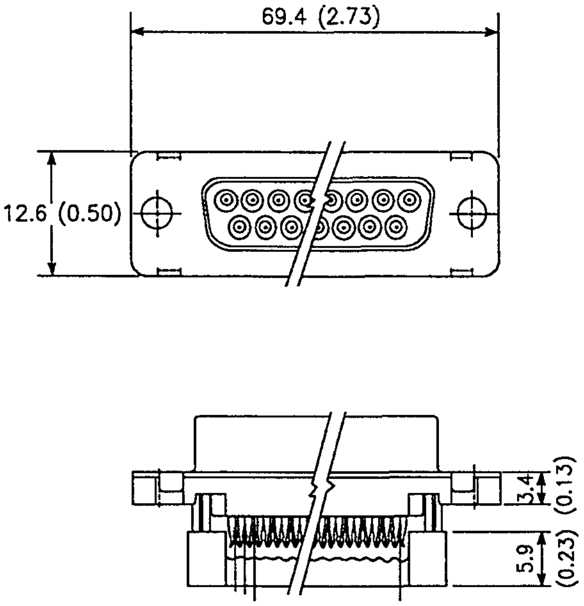
3.7 37-Pin D Sub-Connectors

3.7.1 A6CON1E soldering type 37-pin D sub-connector A6CON2E crimp-contact-type 37-pin D sub-connector



Unit: mm (inch)

3.7.2 A6CON3E pressure-displacement-type 37-pin D sub-connector



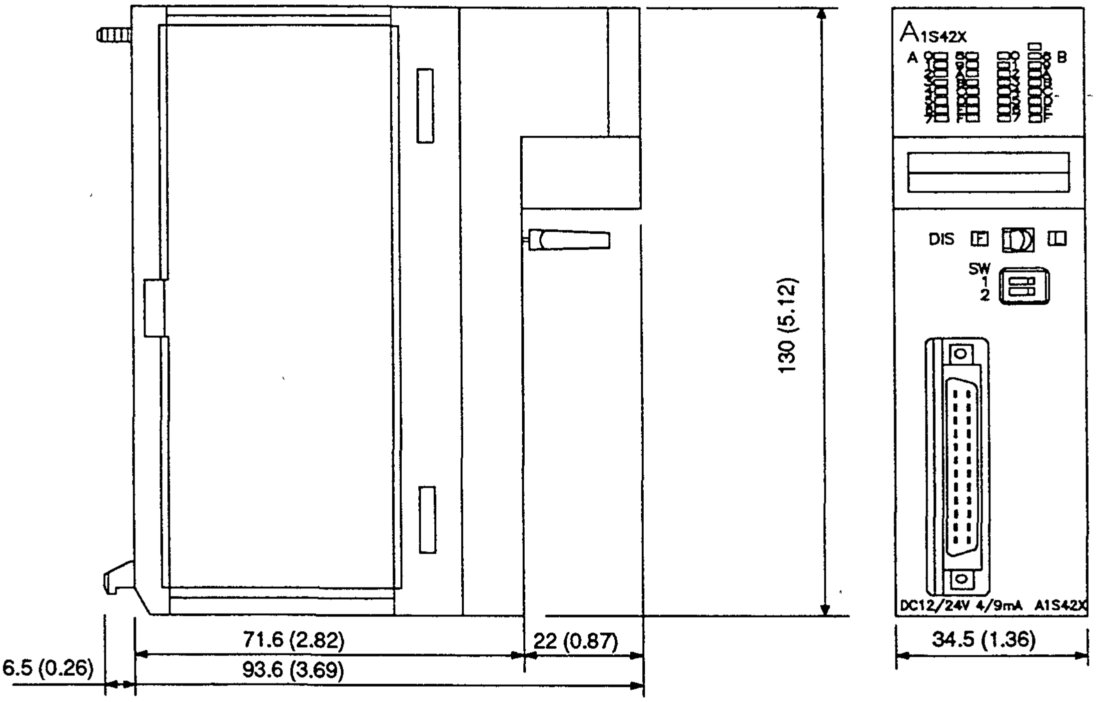
Unit: mm (inch)

APPENDIX 4 INSTRUCTION PROCESSING TIME

An A1SJCPU requires the instruction processing time as much as an An CPU does except the following instructions. See the ACPU Programming Manual (Common Instructions) for the processing time for each instruction.

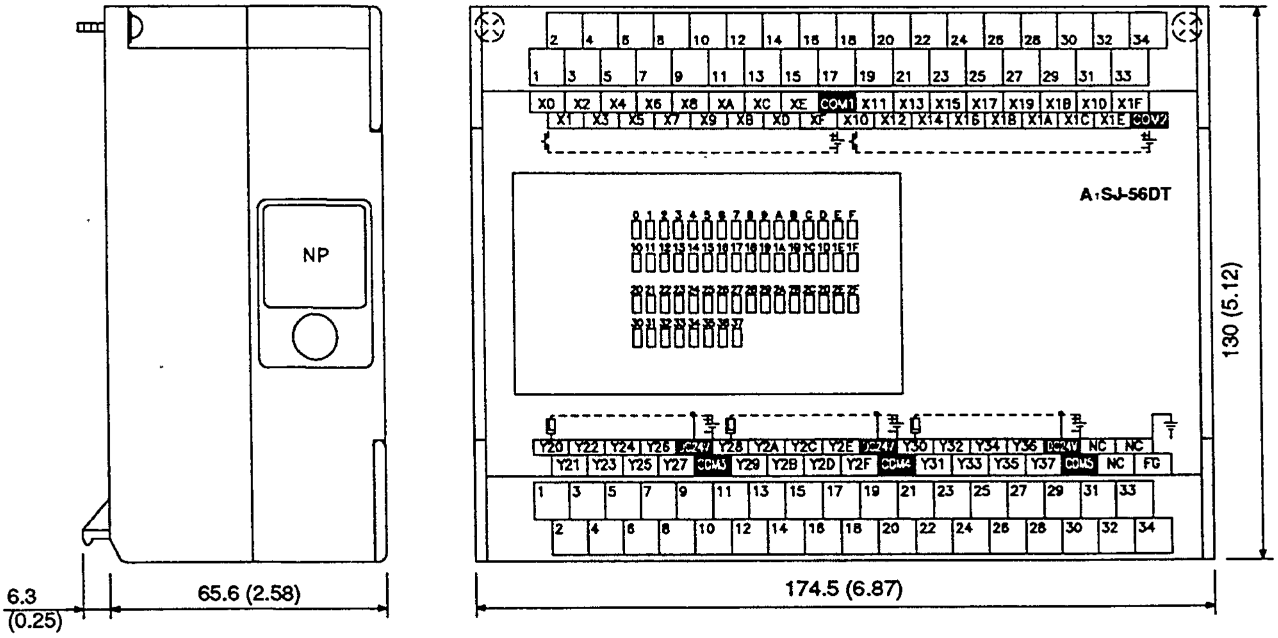
Instruction	Condition	Processing Time (μsec)	
		Direct Method	Refresh Method
OUT F	When not executed	61	62
	When executed	267	270
SET F	When not executed	3.2	2.7
	When executed	237	232
RST F	When not executed	3.0	3.6
	When executed	283	296
LEDR	When not executed	54	55
	When executed	283	283
CHK	With 1 contact condition	240	—
	With 50 contact conditions	3905	—
	With 100 contact conditions	7820	—
	With 150 contact conditions	11470	—

3.4.4 Dynamic I/O module



Unit: mm (in)

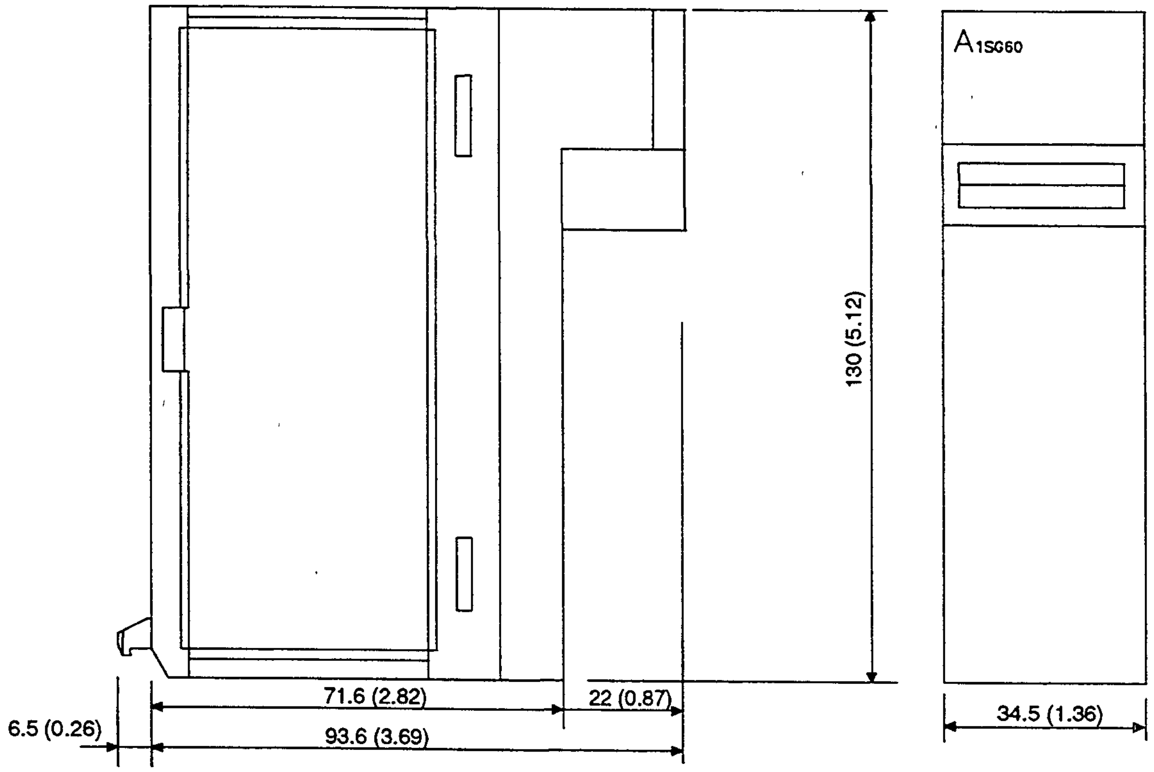
3.4.5 A1SJ-56[ ] I/O combination module



Unit: mm (in)

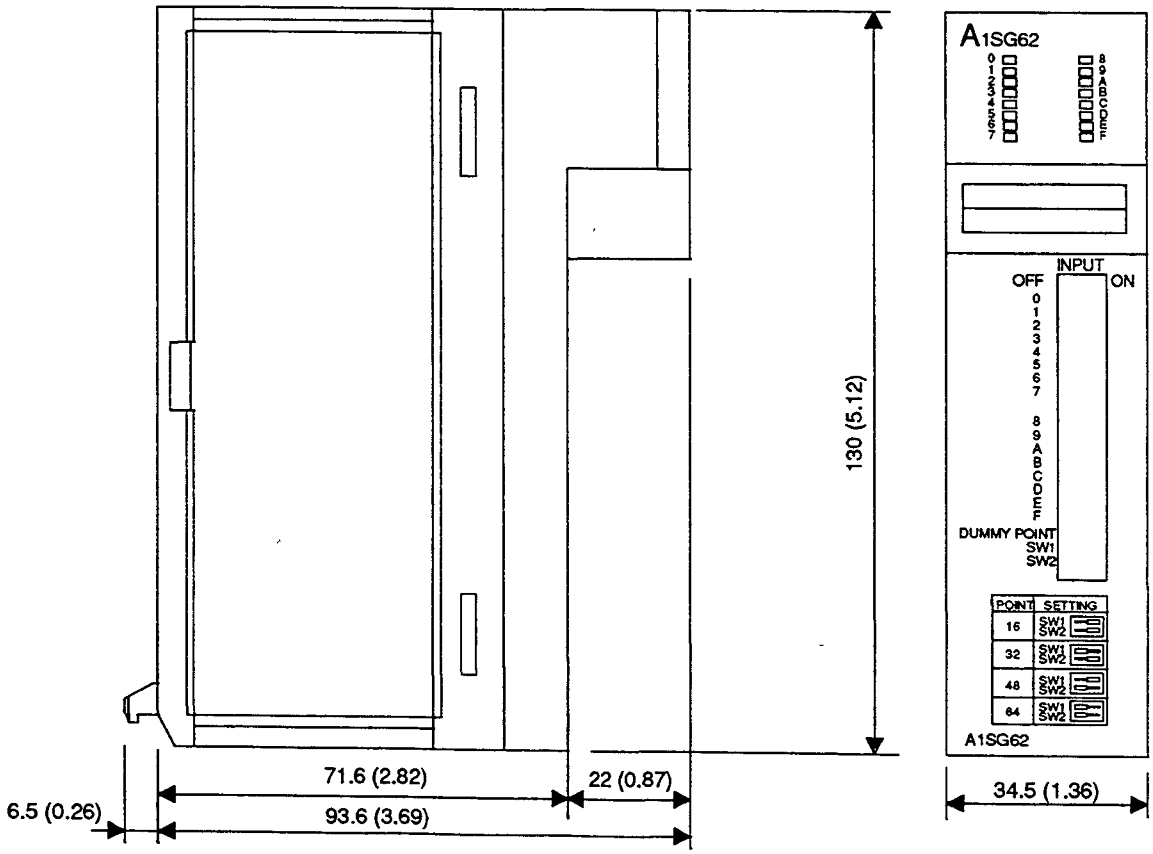
3.5 Dummy Module, Blank Cover

3.5.1 A1SG60 blank cover



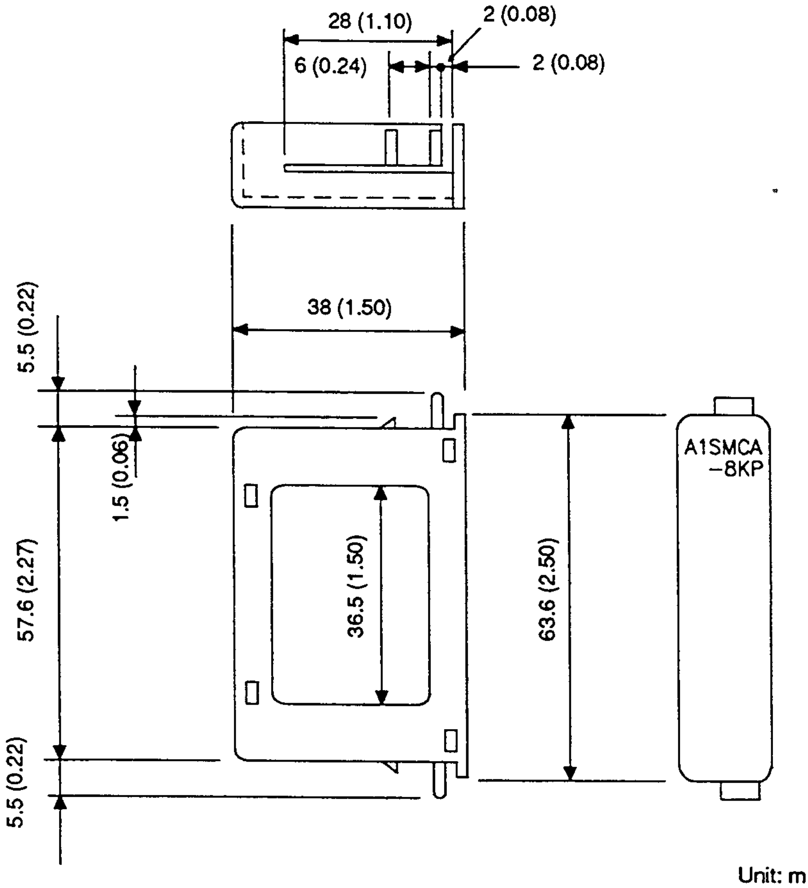
Unit: mm (in)

3.5.2 A1SG62 dummy module



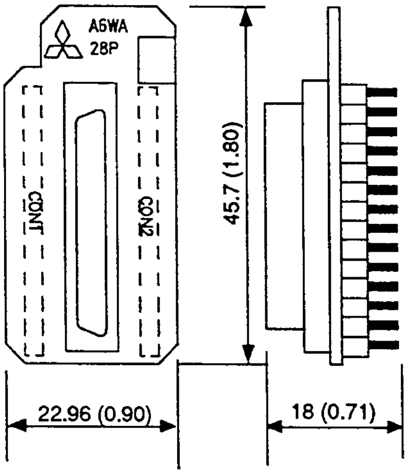
Unit: mm (in)

3.6 Memory Cassette (A1SMCA-[ ])



Unit: mm (inch)

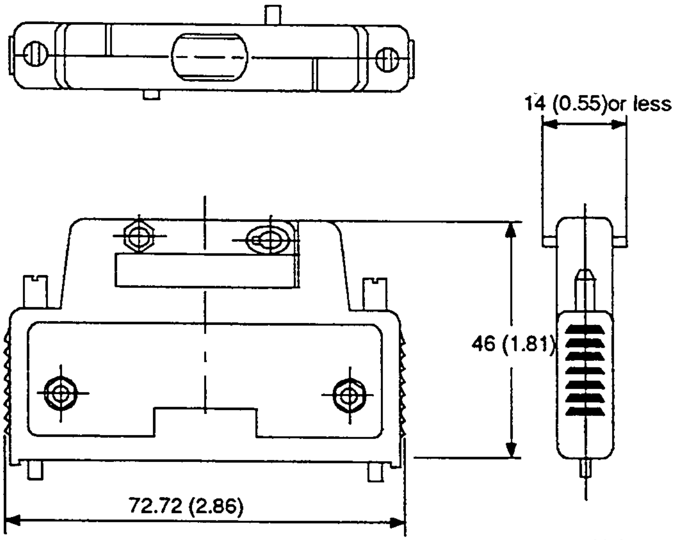
3.7 A6WA-28P Memory Write Adaptor



Unit: mm (inch)

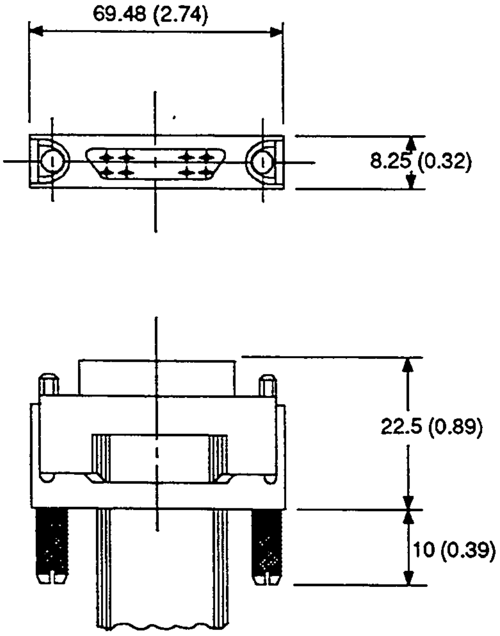
3.8 40-Pin Connectors

3.8.1 A6CON1 soldering-type 40-pin connector, A6CON2 crimp-contact-type 40-pin connector



Unit: mm (inch)

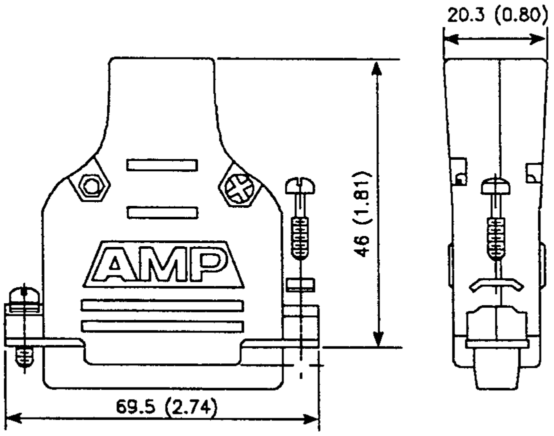
3.8.2 A6CON3 pressure-displacement-type 40-pin connector



Unit: mm (inch)

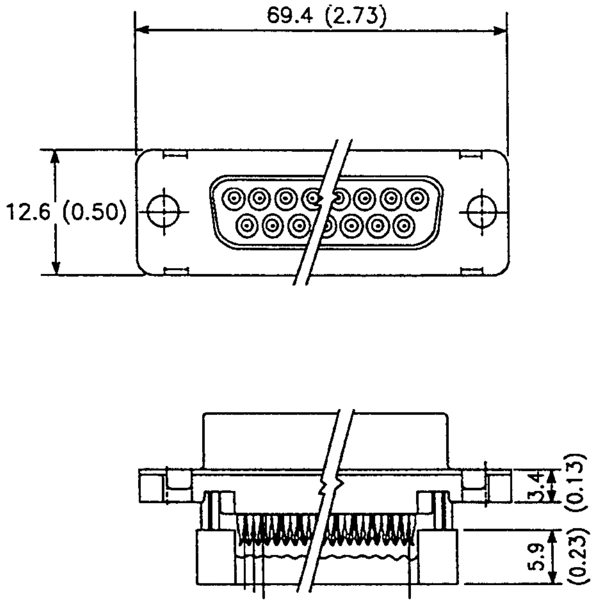
3.9 37-Pin D Sub-Connectors

3.9.1 A6CON1E soldering type 37-pin D sub-connector A6CON2E crimp-contact-type 37-pin D sub-connector



Unit: mm (inch)

3.9.2 A6CON3E pressure-displacement-type 37-pin D sub-connector



Unit: mm (inch)

APPENDIX 4 INSTRUCTION PROCESSING TIME

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RST F	When not executed	3.0	3.6
	When executed	283	296
LEDR	When not executed	54	55
	When executed	283	283
CHK	With 1 contact condition	240	—
	With 50 contact conditions	3905	—
	With 100 contact conditions	7820	—
	With 150 contact conditions	11470	—

IMPORTANT

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

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

  (a) Ground human body and work bench.

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

type A1SJCPU(S3)

User's Manual

MODEL	A1SJCPU-U-E
MODEL CODE	13J791
IB(NA)66446-C(9701)MEE	

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-0005 TELEX : J24532 CABLE MELCO TOKYO
NAGOYA WORKS : 1-14 , YADA-MINAMI 5 , HIGASHI-KU, NAGOYA , JAPAN

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