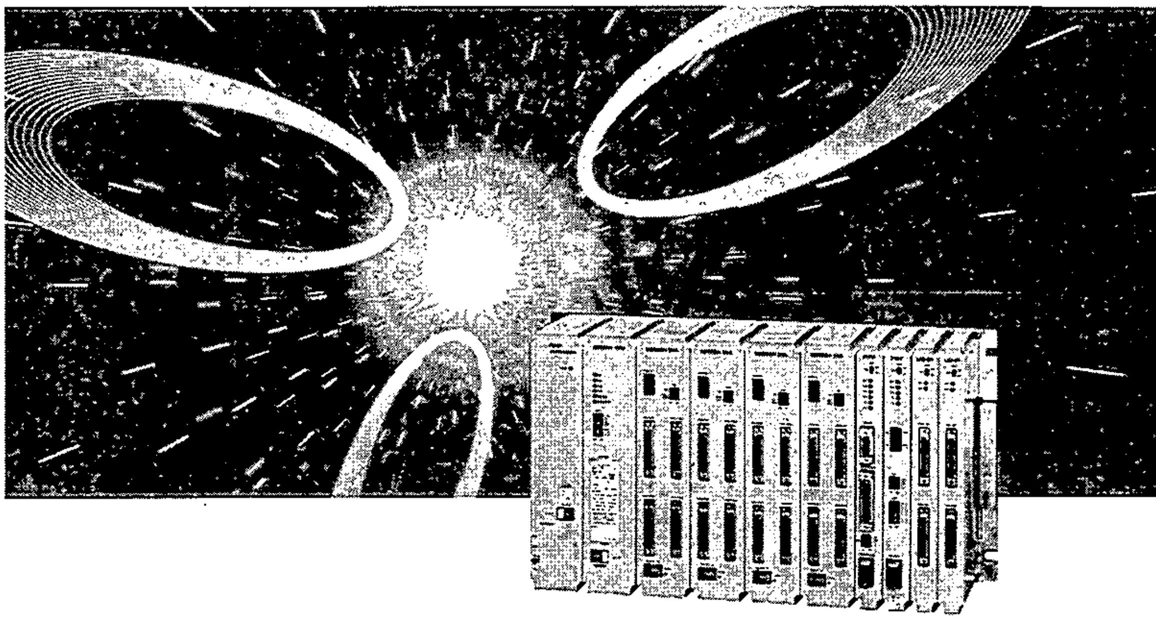
YASKAWA

MACHINE CONTROLLER CP-9200SH

USER'S MANUAL



YASKAWA

MANUAL NO. SIE-C879-40.1B

This User's Manual provides descriptions on the basic specifications and system design precautions which are essential for hardware/software design of systems to which Machine Controller CP-9200SH (referred to hereinafter as "CP-9200SH") is applied.

In this manual, "CP-717" refers to Control Pack CP-717, which is one of the peripheral devices for CP-9200SH.

Listed below are other manuals relevant to CP-9200SH. Please refer to these manuals.

■ **Relevant Manuals**

Manual No.	Manual Name
SIE-C873-16.4	FDS System Installation Manual
SIE-C877-17.4	Control Pack CP-717 Operation Manual (Vol.1)
SIE-C877-17.5	Control Pack CP-717 Operation Manual (Vol.2)
TOE-C877-17.7	CP-717 Instructions
CHE-C879-40	CP-9200SH Brochure
KAE-C879-40	CP-9200SH Catalog
SIE-C879-40.2	CP-9200SH Servo Controller User's Manual
SIE-C879-40.3	CP-9200SH Programming Manual

◆ Ethernet is trademark of Xerox Corporation.

NOTES FOR SAFE OPERATION

- Be sure to read the Instruction and Maintenance Manual, this supplementary manual, and other attached documents thoroughly before use (installation, operation, maintenance, inspection, etc.). Also, be sure to use the equipment upon acquiring a thorough knowledge of the equipment, the safety information, and all of the precautions.
  Keep the manual at hand for those who use the device.

- Symbol marks about safety in this Manual
  In this manual, the following symbols are used according to the descriptions on safety.

⚠ **WARNING**	○ Warning Indicates cases where erroneous handling may lead to a dangerous situation that accompanies the possibility of mortal or serious injury.
⚠ **CAUTION**	○ Caution Indicates cases where erroneous handling may lead to a dangerous situation that accompanies the possibility of medium or light injury or only material damage.
MANDATORY GROUNDING	○ Mandatory Grounding Indicates that grounding must be provided.
PROHIBITION	○ Prohibition Strong indication of a prohibited matter which may otherwise lead to serious results depending on the circumstances.

- Notes on use that do not come under "WARNING" or a "CAUTION" but should be observed are also described at points in this manual.

INSTALLATION

⚠ WARNING

- **Be sure to turn OFF before installation or removal.**
  There is danger of electric shock, death, or serious injury if the power is ON.

⚠ CAUTION

- **Use the product in an environment described in the "CP-9200SH User's Manual".**
  Electric shock, fire, or malfunction may occur if the product is used in an environment with high temperature, high humidity, dust, corrosive gas, vibration, or shock.

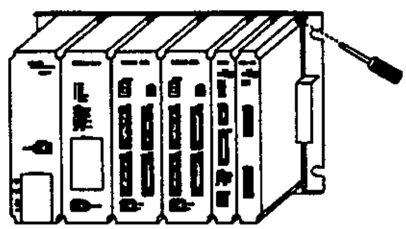
Avoid use in the following environments.

- Places exposed to direct sunlight or places where the ambient temperature falls outside the range, 0 to 55°C.
- Places where the relative humidity falls outside the range, 5 to 95%, and places where condensation may occur due to rapid changes in humidity.
- Places with corrosive gas or flammable gas.
- Places where direct vibration or shock may be transmitted to CP-9200SH.
- Places where the product may get splashed with water, oil, chemicals.

- **Install the product in according to the manual.**
  Falling, failure, or malfunction may occur if there are any inadequacies in installation.

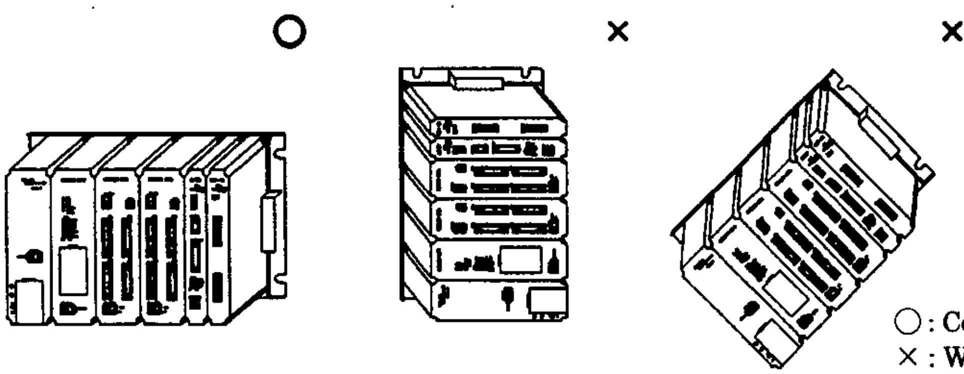
① **Tighten the fastening screws securely!**

Tighten the CP-9200SH fastening screws and terminal block fixing screws securely so that they should loosen.
Loose screws may malfunction of the CP-9200SH.



② **Install in the proper direction!**

If the device is not installed correctly, fault heat generation may result.



○ : Correct
× : Wrong

- **Do not let wire scraps or other foreign matters inside the unit.**
  This may lead to fire, failure, or malfunction.

2 WIRING

⚠ CAUTION

- **Connect to the rated power supply.**
  Power supplies of wrong specifications may result in fire.

CP-9200SH Power Supply Voltage

When using PS-01 power source	**85 to 132 VAC**
or	**90 to 140 VDC**
When using PS-02 power source	**170 to 230 VAC**
When using PS-03 power source	**19.2 to 28.8 VDC**

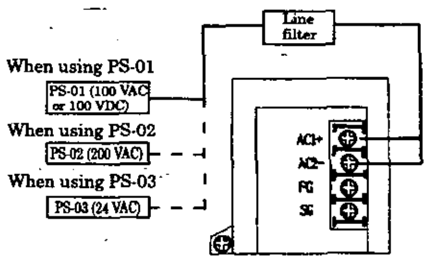
- **Wiring work must be performed by qualified personnel.**
  Electric shock, fire, or failure may be caused by erroneous wiring.

CONNECT THE INTERFACE CABLES SECURELY!

- Insert and fix the connectors of the interface cables to CP-9200SH securely.

IN THE CASE OF POOR POWER SUPPLY CONDITIONS

- If power supply conditions are poor, use a line filter in the power line to prevent malfunction of CP-9200SH due to noise.



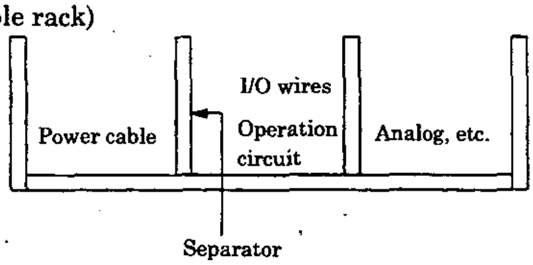
LAY THE EXTERNAL WIRING CORRECTLY

- Select the I/O wires (external wiring) for connecting CP-9200SH with external equipment in consideration of the followings.

  - Mechanical strength
  - Noise
  - Cable length
  - Signal voltage

  Lay and wire I/O wires apart from the power cables at the in and out of the control panel. This will reduce the influence of noise.

(Cable rack)



3 NOTES ON USE

⚠ WARNING

- **Do not touch the terminals while the power is ON.**
  There is danger of electric shock, so do not touch terminals while the dpower is ON.

- **Place an emergency stop circuit, interlock circuit, at the external of CP-9200SH.**
  Otherwise, the failure of CP-9200SH may cause breakage of the machine and other accidents.

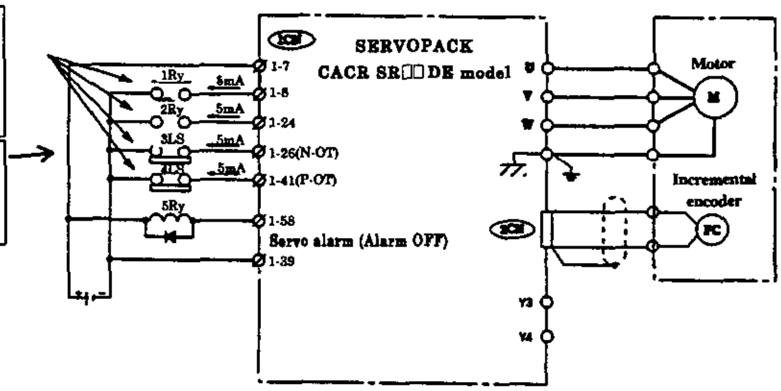
① Provide an interlock at the external of CP-9200SH!

Make an interlock circuit at the external of CP-9200SH in cases where failure of the CP-9200SH may lead to accidents resulting in injury or death or breakage of products and auxiliary facilities.

(Example)
Please use highly reliable relays.

[Make a two point grounded parallel connection using Yaskawa Bestact relays or similar product or low level relays.]

[Install a limit switch at the nearest right/left end within the control limit range of the machine.]



⚠ CAUTION

- **Changing the program, forcing output, or RUN, STOP operation with the CP-9200SH may cause program errors and operation errors which may lead to damage of the machine or to accidents. Perform these upon adequate verification and with the special care.**

⚠ CAUTION

- **Power up the device following the order for turning power is ON.**
  If the order mistakes made, it could result in an accident or damage to the machine.

  ① **Always turn the Servo pack power on first!**

  Turn the power to the SERVOPACK on before other devices.
  If the CP-9200SH are turned on first, the I/O signal of the SERVOPACK will be delayed, which may cause malfunction or damage to the device.
  SERVOPACK power should be turned on at the same time as, or before the CP-9200SH.

4 MAINTENANCE AND DISPOSAL

⚠ WARNING

- **Connect the ⊕ and ⊖ sides of the battery correctly. Do not recharge, disassemble, heat, put into fire, or short-circuit, or battery cell.**
  There is danger of explosion or fire.

⚠ CAUTION PROHIBITION

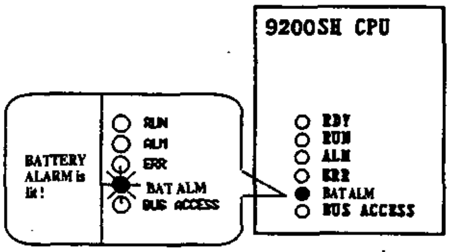
- **Do not disassemble or modify.**
  There is danger of fire, failure, or malfunction.

⚠ CAUTION

- **Treat the worn-out parts or devices as industrial waste.**

BE CAREFUL WITH THE BATTERY LIFE!

- When the BAT ALM lamp lights up, the battery is drained. Following battery replacement procedures, replace it with a new battery.
  Refer to chapter 13 "MAINTENANCE AND INSPECTION" for procedures for replacing the battery.



5 GENERAL PRECAUTIONS

- CP-9200SH was not designed or manufactured for use in devices or systems that concern peoples' lives. Users who intend to use the product described in this manual for special purposes such as devices or systems relating to transportation, medical, space aviation, atomic power control, or underwater use must contact Yaskawa Electric Corporation beforehand.

- This product has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of CP-9200SH involves a life and death situation or in a facility where failure may cause a serious accident, safety devices MUST be installed to minimize the likelihood of any accident.

TABLE OF CONTENTS

1 OUTLINE

This chapter provides the system configuration diagram of CP-9200SH.

1.1 Outline

The CP-9200SH is an "integrated controller" which combines sequence control and motion control, incorporating all necessary functions for general machine control. It is the optimum high class controller for industrial machinery which performs high speed complete synchronized operation through a base axis of which the "electronic shaft" and "electronic cam" are representative. Mounting is organized into modules for each function. The basic configuration consists of a power module, CPU module, and an SVA module. Adding various types of optional communication modules and I/O modules to this basic configuration makes it possible to expand your other I/O and communications with our company's unique real time core network CP-215 communication, international standard Ethernet, or RS-232. Two types of mount bases, a long mount base and a short mount base, are available. The optimum system configuration to meet any need can be provided.

User programs use ladder programs or SFC language, and are created with the CP-717. The CP-717 has a desktop type which uses CP-215 transmissions and can be quickly connected, and a notebook type which uses RS-232 interface. Operation and maintenance are simple.

CP-9200SH configuration

· Power module

For use with 100 VAC, 200 VAC, 24 VDC, and 100 VDC.

· Mounting base

Both a short mounting base and a long mounting base are available.
A maximum of four mounting bases can be connected.

· CPU module

A maximum of two CPU modules can be mounted. The user programs are executed at each module independently.

· Motion module

Three kinds of motion modules are available: analog-output SVA modules, pulse-train-output PO-01 modules, and digital-output SVB modules for MECKATROLINK. Up to 16 motion modules can be connected.

The SVA module has position control, speed control, torque control and phase control. It can be connected to a servo driver with a maximum of 4 axes. Because reversible counter, interval counter, and frequency measurement are provided, it can be used also as a general-purpose counter module. Up to 11 SVA modules (modules No. 1 to 11) can be mounted to control a maximum of 44 axes.

The PO-01 module has position control functions such as positioning, zero-point return, interpolation, constant speed feed, and step feed. It can be connected to a pulse motor driver with a maximum of 4 axes. Up to 16 PO-01 modules (modules No. 1 to 16) can be mounted to control a maximum of 64 axes.

SVB modules have position control functions such as positioning, zero point return, interpolation, constant-speed feeding, and constant-step feeding. Both a servo driver and an I/O module for MECHATROLINK with a maximum of 14 axes may be connected. A maximum of 16 SVB modules can be mounted, so up to 224 axes can be controlled.

With CP-216 transmission, the SVB modules can be connected to the inverter used for CP-216 transmission (VS-616G5, VS-676H5).

· Communications module

Various types of interface modules including the CP-215IF, the CP-216IF, and the RS-217IF can be provided. The CP-717 is connected to the CP-217IF or the CP-215IF module.

· I/O module

Local I/O or 2000 series I/O module can be connected.

· Other

There are modules that can connect between mounting bases.

.2 System Configuration

Fig. 1.1 shows the system configuration of CP-9200SH.

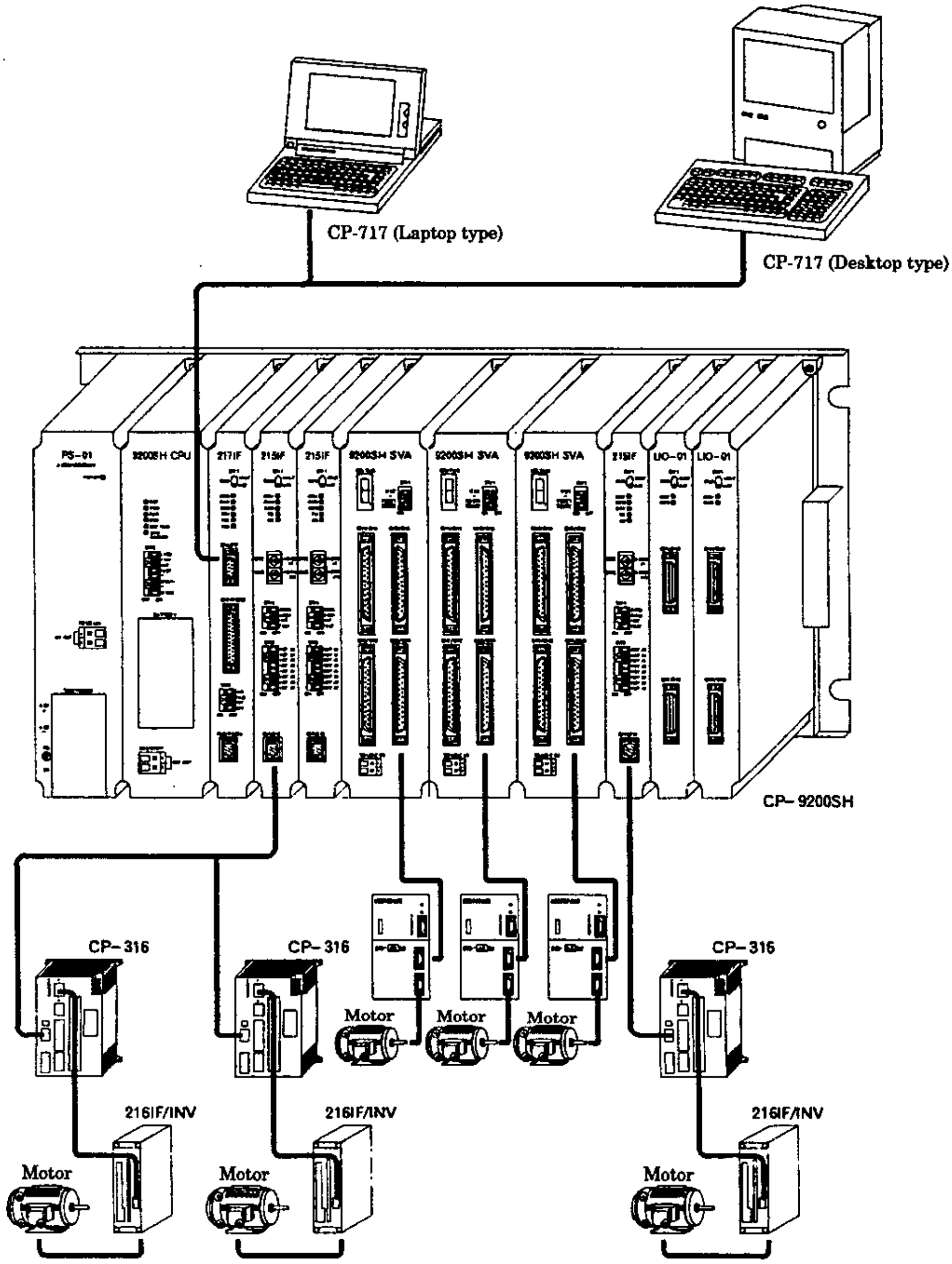


Fig. 1.1 CP-9200SH System configuration

2 PRODUCT LISTS

This chapter provides lists of the names and product code No. of CP-9200SH products.

Lists of CP-9200SH products are shown below.

Table 2.1 List of Products

Name	Product Code No.	Description
CPU Module CP-9200SH CPU	87921-3100□-S030△	CPU-CPU for single/multiple use (1MB)
	87921-3110□-S030△	CPU-CPU for single/multiple use (2MB)
Servo Module CP-9200SH SVA	87921-9000□-S010△	4-shafts Servo Controller
Servo Module for MECHATROLINK SVB	87921-9100□-S010△	Servo Controller for MECHAREOLINK
Pulse Output Module PO-01	87921-9200□-S010△	4-shafts Motion Controller (Pulse string output type)
Communication Module CP-213	87317-2130□-S010△	CP-213IF Communication Module
Communication Module CP-215	87317-2150□-S010△	CP-215IF Communication Module
Communication Module CP-216	87317-2160□-S010△	CP-216IF Communication Module
Communication Module CP-217	87317-2170□-S010△	CP-217IF Communication Module
Communication Module CP-218	87317-2180□-S010△	CP-218IF Communication Module
Communication Module CP-225	87317-2250□-S010△	CP-225IF Communication Module
Communication Module CP-2500	87317-2500□-S010△	CP-2500IF Communication Module
I/O Module LIO-01	87317-8000□	LIO-01 Local I/O Module
Input Module CNTR-01	87317-8050□-S010△	CNTR-01 Counter Input Module
Input Module AI-01	87317-8030□	AI-01 Analog Input Module
Input Module DI-01	87317-8010□	DI-01 Digital Input Module
Output Module AO-01	87317-8040□	AO-01 Analog Output Module
Output Module DO-01	87317-8020□	DO-01 Digital Output Module
Expansion Module EXIOIF	87317-9000□	EXIOIF mount base Expansion Module
2000IO Expansion Module 2000IOIF	87317-9010□-S010△	2000IOIF Expansion Module
Local I/O Expansion Module 820IF	87317-9020□	820IF Connecting Module (Terminator provided)
	87317-9021□	820IF Connecting Module (Terminator not provided)
Mounting Base MB-01	87317-1100□	Long type mounting base for single/multiple use
Mounting Base MB-03	87317-1120□	Short type mounting base for single/multiple use
Power Module PS-01	87317-1200□	100 VAC/100 VDC Power Module
Power Module PS-02	87317-1210□	200 VAC Power Module
Power Module PS-03	87317-1220□	24 VDC Power Module
Temperature Input Unit	87921-8000□	Temperature Input Unit (Thermocouple 4-point input)
	87921-8010□	Temperature Input Unit (Thermocouple 8-point input)

Note: The product code No.s described in this manual may be changed without notice when the product is modified.

Table 2.2 List of Products (cables)

Name	Product Code No.	Description
Mounting base expansion cable	87317-13000	WRMW41032-1 • EXIO expansion cable (0.5 m)
	87317-13100	WRMW41033-1 • EXIO expansion cable (1.0 m)
2000I/O connecting cables	YCN500001	JZMSZ-W20-1 • 2000I/O connecting cable (0.5 m) • Connection layout ① (Refer to Fig. 10.28)
	YCN500002	JZMSZ-W20-2 • 2000I/O connecting cable (1.5 m) • Connection layout ① (Refer to Fig. 10.28)
	87317-13200	JZCP-317132 • 2000I/O connecting cable (0.5 m) • Connection layout ② (Refer to Fig. 10.29)
	87317-13300	JZCP-317133 • 2000I/O connecting cable (1.5 m) • Connection layout ② (Refer to Fig. 10.29)
Σ SERVOPACK (SGDA) connecting cables	87921-13000	WRMW31030-1 • Σ series SERVOPACK (SGDA) connecting cable (1.0 m)
	87921-13100	WRMW31030-2 • Σ series SERVOPACK (SGDA) connecting cable (3.0 m)
	87921-13200	WRMW31030-3 • Σ series SERVOPACK (SGDA) connecting cable (5.0 m)
Σ SERVOPACK (SGDB) connecting cables	87921-13300	WRMW31027-1 • Σ series SERVOPACK (SGDB) connecting cable (1.0 m)
	87921-13400	WRMW31027-2 • Σ series SERVOPACK (SGDB) connecting cable (3.0 m)
	87921-13500	WRMW31027-3 • Σ series SERVOPACK (SGDB) connecting cable (5.0 m)
Temperature input unit connecting cables	87921-13600	WRMW31028-1 • Temperature input unit connecting cable (1.0 m)

Note: The product code No.s described in this manual may be changed without notice when the product is modified.

Table 2.3 List of Products (softwere)

Name	Product Code No.	Description
CP-717	Refer to the CP-717 Instructions (TOE-C877-17.7).	

Table 2.4 List of Products (spare parts)

Name	Product Code No.	Description
Battery	BA000024	Lithium battery ER6VC (Toshiba Corp.)

3 BASIC SPECIFICATIONS

This chapter provides the specifications of CP-9200SH and a list of the instructions that can be used with CP-9200SH.

Please refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details.

3.1 General Specifications

Table 3.1 General Specifications

Item	Specifications
Power source specifications	
PS-01 Power Module	
Rated voltage	100 VAC / 100 VDC
Allowable voltage range 100 VAC	Rated voltage 85 VAC to 132 VAC
Allowable frequency range 100 VAC	47 to 440 Hz
Allowable voltage range 100 VDC	Rated voltage 100 VDC − 10 %, +40 % (90 VDC to 140 VDC)
Allowable momentary power interruption time	10 ms or less
Allowable percent ripple	5 % or less (within the allowable voltage range)
Power consumption	150 W or less
Leakage current	1 mA or less
Inrush current	15 A or less
Dielectric strength	1500 VAC, 1 min., 1500 VDC, 1 min. across each external terminal and the ground
Insulation resistance	Insulation resistance of 5 M Ω or more upon application of 500 VDC across each external terminal and the ground
PS-02 Power Module	
Rated voltage	200 VAC
Allowable voltage range 200 VAC	Rated voltage 170 VAC to 230 VAC
Allowale frequency range 200 VAC	47 to 440 Hz
Allowable momentary power interruption time	10 ms or less
Allowable percent ripple	5 % or less (within allowable voltage range)
Power consumption	150 W or less
Leakage current	1 mA or less
Inrush current	15 A or less
Dielectric strength	1500 VAC, 1 minute, across each external terminal and the ground
Insulation resistance	Insulation resistance of 5 M Ω or more upon application of 500 VDC across each external terminal and the ground
PS-03 Power Module	
Rated voltage	24 VDC
Allowable voltage range 200 VAC	Rated voltage 19.2 VDC to 28.8 VDC
Allowable momentary power interruption time	5 ms or less
Allowable percent ripple	5 % or less (within allowable voltage range)
Power consumption	150 W or less
Leakage current	1 mA or less
Inrush current	30 A or less (approx. 30 ms)
Dielectric strength	1500 VDC, 1 minute, across each external terminal and the ground
Insulation resistance	Insulation resistance of 5 M Ω or more upon application of 500 VDC across each external terminal and the ground
Environment conditions	
Ambient operating temperature	0 to 55 ℃ ; average temperature for 24 hours must be +50 ℃ or less (right under equipment)
Ambient storage temperature	− 25 to 85 ℃ (however, data backup is not guaranteed)
Ambient operating relative humidity	5 to 95 % RH (without dew condensation)
Dust	0.1 mg/m³ or less; there must be no conductive dust
Corrosive gas	No corrosive gases
Operating altitude	Less than 2000 m above sea level

(continued)

Table 3.1 General Specifications (Cont'd)

Item	Specifications
Mechanical operating conditions	
Vibration resistance (Vibration immunity)	In compliance with JIS B 3502. Frequency range: 10 ≦ f ≦ 57 Hz, constant amplitude vibration, half-amplitude: 0.075 mm 57 ≦ f ≦ 150 Hz, constant acceleration vibration, acceleration: 9.8 m/s (1.0 G) Apply vibration for 2 hours in each of the 3 orthogonal axial directions.
Shock resistance (Shock immunity)	In compliance with JIS B 3502. Peak acceleration: 147 m/s (15 G) Application time: 11 ms Apply shock twice in each of the 3 orthogonal axial directions.
Electrical operating conditions	
Noise resistance	In compliance with JIS B 3502. First transient/burst noise: 2 kV (power supply line only) Damped oscillation noise : 1 kV (power supply line only)
Resistant to electrostatic discharge	In compliance with JIS B 3502. Apply ESD − 18 kV ten times by the contact discharge method.
Grounding	Protective ground: class 3 ground (ground to 100 Ω or less)
Cooling method	Natural cooling
Weight	MB-01 (Fully mounted): 5400 g (Option to mount 215IF) MB-03 (Fully mounted): 3400 g (Option to mount 215IF) Refer to Table 3.2 for individual modules
Complying standards	JIS B 3501
Reliability	Module life is 10 years (at an average annual temperature of 40 ℃) Refer to Table 3.2 for individual modules

Table 3.2 Module Weight

Name	Weight
CP-9200SH CPU	700 g
SVA	700 g
SVB	350 g
PO-01	400 g
213IF	350 g
215IF	350 g
216IF	350 g
217IF	350 g
218IF	450 g
225IF	400 g
2500IF	350 g
LIO-01	350 g
CNTR-01	350 g
AI-01	350 g
DI-01	350 g
AO-01	350 g
DO-01	350 g
EXIOIF	350 g
2000IOIF	350 g
820IF	350 g
MB-01	1400 g
MB-03	950 g
PS-01	750 g
PS-02	750 g
PS-03	1000 g

3.2 Performance and Functional Specifications

Table 3.3 Performance and Functional Specifications

<table>
<tr><th>Item</th><th colspan="2">Specifications</th></tr>
<tr><td>CPU</td><td colspan="2">32-bit general-purpose processor</td></tr>
<tr><td colspan="3">Main memory</td></tr>
<tr><td>Program memory</td><td>1 MB unit: 432 k bytes
(Product code No.: 87921-3100□-S030△)
2 MB unit: 1132 k bytes
(Product code No.: 87921-3110□-S030△)</td><td rowspan="4">Retained for 1 year or more by battery backup.</td></tr>
<tr><td>Data memory</td><td>32 k words : data (M) register
1 k words : system (S) register
5 k words : input (I) register
5 k words : output (O) register
16 k words : common constant (C) register
Max. 16 k words/DWG : DWG (D) register
Max. 16 k words/DWG : constant (#) register</td></tr>
<tr><td rowspan="2">Trace memory</td><td>32 k words × 4 : data trace, 16 points defined</td></tr>
<tr><td>4 k words : trouble trace, 64 items defined</td></tr>
<tr><td>Program execution control method</td><td colspan="2">Constant-cycle scanning method: 2 levels; high-speed and low-speed
High-speed scan time setting : 0.4 to 300 ms (in 0.1 ms units)
Low-speed scan time setting : 1.0 to 300 ms (in 0.1 ms units)</td></tr>
<tr><td>User drawings/functions</td><td colspan="2"><table>
<tr><th></th><th>1 MB unit</th><th>2 MB unit</th></tr>
<tr><td>Startup drawings (DWG.A)[*1]</td><td>Max. 64 drawings</td><td>Max. 64 drawings</td></tr>
<tr><td>High-speed scanning drawings (DWG.H)[*1]</td><td>Max. 100 drawings</td><td>Max. 200 drawings</td></tr>
<tr><td>Low-speed scanning drawings (DWG.L)[*1]</td><td>Max. 100 drawings</td><td>Max. 500 drawings</td></tr>
<tr><td>Interruption process drawings (DWG.I)[*1]</td><td>Max. 64 drawings</td><td>Max. 64 drawings</td></tr>
<tr><td>User functions</td><td>Max. 100 functions</td><td>Max. 500 functions</td></tr>
<tr><td>No. of steps</td><td colspan="2">Max. 500 steps/drawing</td></tr>
</table>With drawing modification record
With security function for each drawing (can be set according to attribute)
With adjusting screen</td></tr>
<tr><td>Instructions</td><td colspan="2">Program control instructions :14 types
Direct I/O instructions : 2 types
Relay circuit instructions :14 types
Logic operation instructions : 3 types
Numerical operation instructions :16 types
Numerical conversion instructions : 9 types
Numerical comparison instructions : 7 types
Data transfer instructions :25 types
Basic function instructions :10 types
DDC instructions :13 types
SFC instructions : 8 types
System function :11 types Total : 132 types</td></tr>
<tr><td>Operating speed</td><td colspan="2">Relay instruction : 0.13 µs
Add/subtract instruction : 0.36 µs (in case of integer operation)
Multiply/divide instruction: 0.36 to 0.75 µs (in case of integer operation)</td></tr>
<tr><td>Data types</td><td colspan="2">Bit (relay) : ON/OFF
Integer : − 32768 to +32767
(8000H to 7FFFH)
Double-length integer : − 2147483648 to +2147483647
(80000000H to 7FFFFFFFH)
Real number : $\pm (1.17 \times 10^{-38}$ to $3.40 \times 10^{38})$, 0</td></tr>
<tr><td>Register designation method</td><td colspan="2">Register number designation : direct designation of register number
Symbolic designation : alphanumeric 8 characters max (200 symbols max/drawing).
with automatic numbering or symbol assignment
With subscripting register (I, J)</td></tr>
<tr><td>Programming method</td><td colspan="2">Ladder diagram : relay circuit
Text-type language : numerical operations, logic operations</td></tr>
</table>

(continued)

Table 3.3 Performance and Functional Specifications (Cont'd)

Item		Specification
Motion control		
	SVA module	Position control, speed control, torque control, and phase control of a maximum of 4 axes Instructions: Analog Position detection method: Yaskawa's absolute encoder or incremental encoder Hardwawre pulse latch function: 1 point/axis
	SVB Module	Position control of a maximum of 14 axes Instructions: MECHATROLINK or CP-216 transmission Connectable to both a servo driver and an I/O module for MECHATROLINK with a maximum of 14 axes Connectable to the inverter used for CP-216 transmission (VS-616G5, VS-676H5) with CP-216 transmission
	PO-01 module	Position control of a maximum of 4 axes Instructions: pulse train Position detection method: None (Position detection requires a separately mounted counter module).
Optional modules		
	I/O (CP-213 : 1 line/module)	Register input : 512 words*2 Register output : 512 words*2
	I/O (CP-215 : 1 line/module)	Register input : 2048 words Register output : 512 words
	I/O (CP-216 : 1 line/module)	Register input : 1024 words/line Register output : 1024 words/line
	I/O (CP-225 : 1 line/module)	Register input: 1024 words Register output: 1024 words
	I/O (CP-2500 : 1 line/module)	Register input: 1024 words Register output 256 words (max.)
	I/O (2000IOIF : 1 line/module)	Register input: 512 words Register output: 512 words
	I/O (820IF : 1 line/module)	Register iutput: 512 words Register output: 512 words
	I/O (LIO-01)	DI : 32 point DO : 32 point
	I/O (CNTR-01)	PI: 4 points
	I/O (AI-01)	AI: 8 points
	I/O (DI-01)	DI: 64 points
	I/O (AO-01)	AO: 4 points
	I/O (DO-01)	DO: 64 points
	Message transmission (optional)	CP-213 : exclusive procedure CP-215 : MEMOBUS protocol / no protocol CP-216 : MEMOBUS protocol / no protocol CP-217 : MEMOBUS protocol / no protocol CP-218 : MEMOBUS protocol / no protocol CP-225 : MEMOBUS protocol / no protocol CP-2500 : MEMOBUS protocol / no protocol
Others		Calender and clock (year, month, day, hour, minute, second)
Diagnostic functions		Operation error detection by watchdog timer and bus timer ROM: sumcheck RAM: read/write check Detection of lowered battery voltage

*1 Up to 3 hierarchical drawing levels

*2 The first 496 words are for I/O, and the remaining 16 words are for the system.

3.3 List of Instructions

The instructions that can be used with CP-9200SH are shown in the list below. Refer to the "C 9200SH Programming Manual" for details.

Table 3.4 List of Instructions (1)

Type	Name	Symbol	Data Type B	Data Type W	Data Type L	Data Type F	[ ] Instruction	Description
Program control instructions	SEE child drawing	SEE					○	Specify the no. of the child drawing or the grandchild drawing to be referenced after "SEE." SEE H01
	FOR statement	FOR FEND						Loop execution statement − 1 FOR V = a to b by c V: arbitrary integer register May specify as I or J. a, b, c: May specify an arbitrary integer. (b > a > 0, c > 0) FEND: END of FOR instruction
	WHILE statement	WHILE ON/OFF WEND						Loop execution statement − 2 WEND: END of WHILE-ON/OFF instruction
	IF statement	IFON/IFOFF ELSE IEND						Conditional execution statement IEND: END of IFON/IFOFF instruction
	END	FEND WEND IEND DEND						The exclusive END instruction is indicated automatically by the CP-717 for each of the above statements. DEND is indicated for the END of a drawing. Only "END" is accepted as an input from the CP-717; FEND, WEND, etc. will not be accepted.
	Comment	"nnnnnnnn"						Character strings enclosed in " " will be handled as a comment.

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.5 List of Instructions (2)

Type	Name	Symbol	Data Type				[] Instruction	Description
			B	W	L	F		
Program control instructions	Function I/F	FSTART						Function reference instruction
		FIN	○	○	○	○		Function input instruction Store input data from the designated input register into the function input register. Designated input register B-VAL: CPU internal register (B register) I-VAL: CPU internal register (A register) L-VAL: CPU internal register (A register) F-VAL: CPU internal register (F register) I-REG: arbitrary integer register L-REG: arbitrary double-length integer register F-REG: arbitrary real number register Address input
		FOUT	○	○	○	○		Function output instruction Store output data from the function output register to the designated output register. Designated output register B-VAL: CPU internal register (B register) I-VAL: CPU internal register (A register) L-VAL: CPU internal register (A register) F-VAL: CPU internal register (F register) I-REG: arbitrary integer register L-REG: arbitrary double-length integer register F-REG: arbitrary real number register
Direct I/O Instructions	Extended program execution instruction	XCALL		○			○	Reference instruction for an extended program*.
	Input instruction (Continuous execution type)	INS		○			○	INS MA00100 —○—┤ Input and store the data with interruptions prohibitted.
	Output instruction (Continuous execution type)	OUTS					○	OUTS MA00100 —○—┤ Set and output the data with interruptions prohibitted.

* : An extended program refers to a table format program. There are 4 types of table format programs: constant table (M register), I/O conversion table, interlock table, and parts assembly table.

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.6 List of Instructions (3)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
Relay Circuit Instructions	Normally open (N.O.) contact	-| |-	○					No restrictions in the series circuit. Bit type designation of any register as a relay number is possible (MB00011A).
	Normally closed (N.C.) contact	-|/|-	○					No restrictions in the series circuit. Bit type designation of any register as a relay number is possible (MB00011A).
	Rise pulse	-↑-	○					No restrictions in the series circuit. Bit type designation of any register as a relay number is possible (MB00011A).
	Fall pulse	-↓-	○					No restrictions in the series circuit. Bit type designation of any register as a relay number is possible (MB00011A).
	On-delay timer (Measurement units 10 ms)	-[T]-	○					Set value count register -[T]- Set value = All register, constant (setting unit: 10ms) Count register = M or D register
	Off-delay timer (Measurement units 10 ms)	-[T]-	○					
	On-delay timer (Measurement units 1 s)	-[S]-	○					Set value count register -[S]- Set value = All register, constant (setting unit: 1ms) Count register = M or D register
	Off-delay timer (Measurement units 1 s)	-[S]-	○					
	Coil	—O—|	○					MB000000 |-MW00200 = 00001 ——O——| MB000000 |—| |—— IFON
	Set Coil	-[S]-	○					MB000000 MB000010 |——| |————[S]——| By turning MB000000 "ON," MB000010 turns "ON." Subsequently, even if MB000000 turns "OFF," MB000010 stays "ON."
	Reset Coil	-[R]-	○					MB000020 MB000010 |——| |————[R]——| By turning MB000020 "ON," MB000010 turns "OFF." Subsequently, even if MB000020 turns "OFF," MB000010 stays "OFF."
	Branch • Converging	┬, ┬, ┘						A branch or converging instruction can be attached to any of the above relay type instructions.

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.7 List of Instructions (4)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
Logic Operation Instructions	AND	∧		○	○		○	Integer type designation of any register or constant is possible.
	OR	∨		○	○		○	Integer type designation of any register or constant is possible.
	Exclusive OR	⊕		○	○		○	Integer type designation of any register or constant is possible.
Numerical Operations Instructions	Integer type entry	⊢		○	○		○	Start integer type operation. ⊢MW00280+00100 ⇒MW00220
	Real number type entry	⊩		○	○	○	○	Start real number type operation. ⊩ MW00280+00100⇒MW00220
	Store	⇒		○	○	○	○	Store operation result in designated register.
	Add	+		○	○	○	○	Ordinary numerical addition (with operation error). ⊢MW00280+00100 ⇒MW00220 All registers and constants can be designated.
	Subtract	−		○	○	○	○	Ordinary numerical subtraction (with operation error). ⊢MW00280-00100 ⇒MW00220 All registers and constants can be designated.
	Extended add	++		○	○		○	Closed numerical addition (without operation error). 32767+1= − 32768 0→32767→− 32768→0
	Extended subtract	--		○	○		○	Closed numerical subtraction (without operation error). − 32768 − 1=32767 0→− 32768→32767→0

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.8 List of Instructions (5)

Type	Name	Symbol	Data Type B	Data Type W	Data Type L	Data Type F	[ ] Instruction	Description
Numerical Operations Instructions	Multiply	×		○	○	○	○	When integer formats and double-length integer formats are used, × and ÷ are used in pairs.
	Divide	÷		○	○	○	○	
	Increment	INC		○	○		○	Adds 1 to the designated register. INC MW00100 If MW00100 = 99, the operation result = 100.
	Decrement	DEC		○	○		○	Substracts 1 from the designated register. DEC MW00100 If MW00100 = 99, the operation result = 98.
	Integer type remainder	MOD		○	○		○	⊢ MW00100 × 01000 ÷ 00121 MOD ⇒MW00101 Takes out the remainder resulting from division.
	Real number type remainder	REM		○		○	○	⊩ MF00200 REM1.5 ⇒ MF00202 Takes out the remainder resulting from division.
	Time addition	TMADD		○			○	Addition of hrs/min/sec TMADD MW00000, MW00100
	Time subtraction	TMSUB		○			○	Subtraction of hrs/min/sec TMSUB MW00000, MW00100
	Time spend	SPEND					○	Finds elapsed time between two times. (Difference in yr./mo./day/hr/min/sec in total number of seconds.) SPEND MW00000, MW00100

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.9 List of Instructions (6)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
Numerical Conversion Instructions	Sign inversion	INV		○	○	○	○	⊢MW00100 INV If MW00100 = 99, the operation result = − 99.
	Complement of 1	COM		○	○		○	⊢MW00100 COM If MW00100 = FFFFH, the operation result = 0000H.
	Absolute value conversion	ABS		○	○	○	○	⊢MW00100 ABS If MW00100 = − 99, the operation result = 99.
	Binary conversion	BIN		○	○		○	⊢MW00100 BIN If MW00100 = 1234H (hexadecimal), the operation result = 01234 (decimal).
	BCD conversion	BCD		○	○		○	⊢MW00100 BCD If MW00100 = 01234 (decimal), the operation result = 1234H (hexadecimal).
	Parity conversion	PARITY		○	○		○	Calculates the number of binary expression bits that are ON (=1). ⊢MW00100 PARITY If MW00100 = F0F0H, the operation result = 8.
	ASCII conversion 1	ASCII		○			○	The designated character string is converted to ASCII code and substituted in the register. ASCII MW00200 "ABCDEFG"
	ASCII conversion 2	BINASC		○			○	This instruction converts the 16-bit binary data to a four digit hexadecimal ASCII code. BINASC MW00100
	ASCII conversion 3	ASCBIN		○			○	This instruction converts a numerical value expressed in a four digit hexadecimal ASCII code to 16-bit binary data. ASCBIN MW00100

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.10 List of Instructions (7)

Type	Name	Symbol	Data Type B	Data Type W	Data Type L	Data Type F	[ ] Instruction	Description
Numerical Comparison Instructions	<	<		○	○	○	○	As a result of the comparison instruction, ON and OFF remains f the B register. MB000010 ├MW00000 <10000 ——○┤ MB000010 ├——┤├—— IFON
	≦	≦		○	○	○	○	
	=	=		○	○	○	○	
	≠	≠		○	○	○	○	
	≧	≧		○	○	○	○	
	>	>		○	○	○	○	
	Range check	RCHK		○	○	○	○	Checks whether the value in the A register is in range or not. Lower limit Upper lim ├MW00100 RCHK −1000, 100 If it is in range, B register turns ON if out of range, OFF.
Data Operating Instruction	Bit rotation (L) (counter-clockwise rotation)	ROTL	○				○	Bit-addr Count Widt ROTL MB00100A → N=1 W=2
	Bit rotation (R) (clockwise rotation)	ROTR	○				○	Bit-addr Count Widt ROTR MB00100A → N=1 W=2
	Bit transfer	MOVB	○	○			○	Source Desti. Widt MOVB MB00100A → MB00200A W=2
	Word transfer	MOVW		○			○	Source Desti. Widt MOVW MW00100 → MW00200 W=2
	Exhane transfer	XCHG		○			○	Source1 Source2 Widt XCHG MW00100 → MW00200 W=2
	Data initialization	SETW					○	Desti. Data Widt SETW MW00200 → D=00000 W=2

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-lengtl integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data typ with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according t the value of the immediately preceding B register) can be added to the instruction.

Table 3.11 List of Instructions (8)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
Data Operating Instructions	Byte → Word development	BEXTD		○			○	The byte data string stored in the word form register area is developed, byte by byte, into words. BEXTD MW00100 to MW00200 B=10
	Word → Byte compression	BPRESS		○			○	The lower byte only of the word data stored in the word form register area are gathered into a byte string, and stored as a byte string. BPRESS MW00100 to MW00200 B=10
	Data search	BSRCH		○	○	○	○	A search is made within the designated register range for data positions which match stipulated data. BSRCH MW00000 W=20 D=100 R=MW00100
	Sort	SORT		○	○	○	○	A sort is performed on registers within the designated register range. SORT MW00000 W=100
	Bit shift left	SHFTL	○				○	The designated bit strings are shifted to the left. SHFTL MB00100A N=1 W=20
	Bit shift right	SHFTR	○				○	The designated bit strings are shifted to the right. SHFTR MB00100A N=1 W=20
	Word copy	COPYW		○			○	The designated register range is copied. Even if there is overlap between the copy destination and copy source, the copy will be correctly performed. COPYW MW00100 → MW00200 W=20
	Byte swap	BSWAP		○			○	The upper and lower bytes of the designated word variable are swapped. BSWAP MW00100

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.12 List of Instructions (9)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
Basic Function Instructions	Square root	SQRT		○		○	○	The square root of a negative number results in the square root of the absolute value multiplied by − 1. ‖- MF00100 SQRT
	Sine	SIN		○		○	○	Input = in degrees ‖- MF00100 SIN
	Cosine	COS		○		○	○	Input = in degrees ‖- MF00100 COS
	Tangent	TAN				○	○	Input = in degrees ‖- MF00100 TAN
	Arc sine	ASIN				○	○	‖- MF00100 ASIN
	Arc cosine	ACOS				○	○	‖- MF00100 ACOS
	Arc tangent	ATAN		○		○	○	‖- MF00100 ATAN
	Exponent	EXP				○	○	‖- MF00100 EXP $e^{MF00100}$
	Natural log	LN				○	○	‖- MF00100 LN $\log_e$ (MF00100)
	Log	LOG				○	○	‖- MF00100 LOG $\log_{10}$ (MF00100)

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.13 List of Instructions (10)

Type	Name	Symbol	Data Type B	W	L	F	[ ] Instruction	Description
DDC Instructions	Dead zone A	DZA		○	○	○	○	⊢MW00100 DZA 00100
	Dead zone B	DZB		○	○	○	○	⊢MW00100 DZB 00100
	Upper/lower limit	LIMIT		○	○	○	○	⊢MW00100 LIMIT −00100 00100
	PI control	PI		○		○	○	⊢MW00100 PI MA00200
	PD control	PD		○		○	○	⊢MW00100 PD MA00200
	PID control	PID		○		○	○	⊢MW00100 PID MA00200
	First-order lag	LAG		○		○	○	⊢MW00100 LAG MA00200
	Phase-lead-lag	LLAG		○		○	○	⊢MW00100 LLAG MA00200
	Function generator	FGN		○	○	○	○	⊢MW00100 FGN MA00200
	Inverse function generator	IFGN		○	○	○	○	⊢MW00100 IFGN MA00200
	Linear accelerator unit 1	LAU		○		○	○	⊢MW00100 LAU MA00200
	Linear accelerator unit 2	SLAU		○		○	○	⊢MW00100 SLAU MA00200
	Pulse width modulation	PWM		○			○	⊢MW00100 PWM MA00200

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.14 List of Instructions (11)

Type	Name	Symbol	Data Type B	Data Type W	Data Type L	Data Type F	[ ] Instruction	Description
Table Data Operating Instruction	Block read	TBLBR		○			○	TBLBR TBL1, MA00000, MA00100
	Block write	TBLBW		○			○	TBLBW TBL1, MA00000, MA00100
	Row search (Vertical direction)	TBLSRL		○			○	TBLSRL TBL1, MA00000, MA00100
	Column search (Horizontal direction)	TBLSRC		○			○	TBLSRC TBL1, MA00000, MA00100
	Block clear	TBLCL		○			○	TBLCL TBL1, MA00000
	Inter table block transfer	TBLMV		○			○	TBLMV TBL1, TBL2, MA00000
	Cue table read (Pointer doesn't move)	QTBLR		○			○	QTBLR TBL1, MA00000, MA00100
	Cue table read (Pointer advances)	QTBLRI		○			○	QTBLRI TBL1, MA00000, MA00100
	Cue table write (Pointer doesn't move)	QTBLW		○			○	QTBLW TBL1, MA00000, MA00100
	Cue table write (Pointer advances)	QTBLWI		○			○	QTBLWI TBL1, MA00000, MA00100
	Cue pointer clear	QTBLCL		○			○	QTBLCL TBL1

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-lengt integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data typ with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according t the value of the immediately preceding B register) can be added to the instruction.

Table 3.15 List of Instructions (12)

Type	Name	Symbol	Data Type				[ ] Instruction	Description
			B	W	L	F		
	SFC execution	SFC						SFC EXECUTE OUT MA□□□□□
	N.O. contact transition judgment	=|=						Designation of transition condition =|= IB0010A (Cannot modify with a subscript.)
	N.C. contact transition judgment	=/=						Designation of transition condition =/= MB00012B (Cannot modify with a subscript.)
SFC Instructions	Timer transition judgment	+						Transition timer setting +10.00 (Cannot modify with a subscript.)
	Action box	ABOX						ABOX S10 : After transition to step box S10 and until transition to the next step, execute corresponding program on each scan.
	Action box	SBOX						SBOX S11 : Execute corresponding program just once upon transition to step box S11.
	End action box	AEND						End of SFC action box.
	SFC step entry	SFCSTEP					○	SFCSTEP STEP name ⇒ DW00000 Store system STEP No. of designated STEP in the A register.

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

Table 3.16 List of Instructions (13)

Type	Name	Symbol	Data Type B	W	L	F	[] Instruction	Description
System Standard Functions	Counter	COUNTER						Up/down counter
	First-in first-out	FINFOUT						First-in first-out function
	Trace function	TRACE						Execution and control of data trace.
	Data trace read function	DTRC-RD						Readout of data from data trace memory to user memory.
	Failure trace read function.	FTRC-RD						Readout of data from failure trace memory to user memory.
	Inverter trace read function	ITRC-RD						Readout of data from inverter trace memory to user memory.
	Send message function	MSG-SND						CP-215/CP-216/CP-217/CP-218/ Send CP-2500 message.
	Receive message function	MSG-RCV						CP-215/CP-216/CP-217/CP-218/ Receive CP-2500 message.
	Inverter constant write function	ICNS-WR						Applicable to the inverter connected to CP-216 or CP215.
	Inverter constant read function	ICNS-RD						Applicable to the inverter connected to CP-216 or CP215.
	CP-213 initial data setting function	ISET-213						Sets the initial data for the inverter connected to the CP-213 line.

(Note) In the "Data Type" column, B means bit type, W means integer type, L means double-length integer type, and F means real number type.
A ○ mark in the "Data Type" column means that the instruction can handle the data type with the ○ mark.
A ○ mark in the "[ ] Instruction" column means that "[ ]" (conditional execution according to the value of the immediately preceding B register) can be added to the instruction.

4 STARTUP OF THE CP-9200SH

This chapter describes the startup method for the CP-9200SH.

4.1 Mounting Modules

Install a mounting base on the panel, and then mount modules on the mounting base. Be sure to securely tighten the mounting screws.
Loose screws may cause malfunctions.
For connection of the CP-9200SH, refer to Chapter 10 "INSTALLATION AND WIRING" and consider the operation conditions such as ambient temperature, humidity and noise. The CP-9200SH should be used at an ambient temperature between 0 to 55 ℃ and a relative humidity of 5 to 95 %.
The mounting positions for power and CPU modules are fixed: the power module on the left end, and the CPU modules in slots 0 and 1 (for multi-CPU configuration, also slots 2 and 3). Optional modules can be mounted at any position.

4.2 Battery Connection

The battery for the CPU is unconnected upon delivered. Referring to Fig 4.1, remove the battery cover and connect the battery to the battery connector.

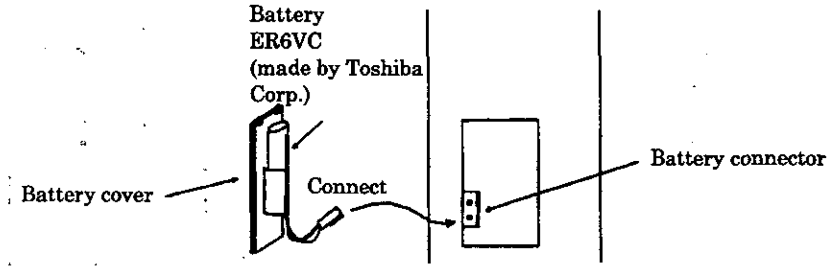


Fig. 4.1 Battery Connection

4.3 CPU Memory Initialization

Before turning ON the power supply for the first time, initialize the CPU memory. To initialize the memory, set the dip switch (SW2) of the CPU as shown in Fig. 4.2, and then turn ON the power supply or turn the M.RST from ON to OFF.

RUN switch: OFF
INIT switch: ON
TEST switch: ON

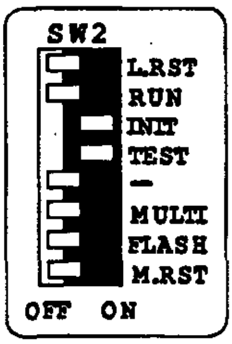


Fig. 4.2 Dip Switch Setting for Initialization

Initializing the memory deletes the user program and the definition data. After completing initialization, reset the dip switches according to the operation mode. (Refer to Chapter 7 "BASIC OPERATIONS".)

4.4 Connection to the CP-717

The CP-9200SH can be connected to a CP-717 through a CP-215IF module or CP-217IF module. Since the setting parameters are not defined when the memory has been initialized, proceed with the following procedures for connection.

■ When connecting through CN1 (PORT#0) of the CP-217IF module

Set the dip switch (SW2) of the CP-217IF module as shown in Fig. 4.3 or 4.4.

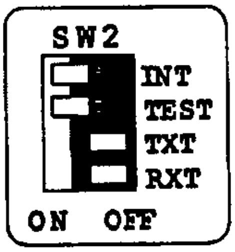


Fig. 4.3 Setting at 9600 bps

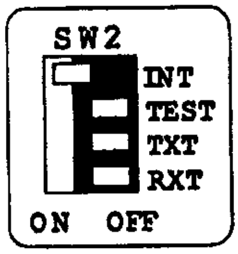


Fig. 4.4 Setting at 19.2 kbps

With the INIT switch "ON", the values set in the module configuration screen are invalid, and the PORT#0 operates according to the dip switch (SW2) setting. The baud rate is either 9600 bps or 19.2 kbps depending on the TEST switch setting.
With the INIT switch "OFF", the values set in the module configuration screen are valid. After making the settings for the settings for the CP-717, set the INIT switch to OFF and use with the values set in the module configuration screen.
The status of the INIT switch is read in only once when turning ON the power or resetting (turning the M.RST of the CPU from ON to OFF).
Whenever the switch setting is changed, turn ON the power or reset.

■ When connecting through the CP-215IF module

Set the station address of the CP-215IF module with the rotary switches (SW2 and SW3) and the network address by the dip switch (SW5), and the dip switch (SW4) as shown in Fig 4.5.

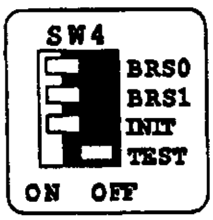


Fig. 4.5 Setting for 4 Mbps

Display	Name	Status	Settings
BRS0	Baud Rate Select 0	ON	Transmission speed setting (Valid only with INIT switch ON.)
		OFF	
BRS1	Baud Rate Select 1	ON	
		OFF	
INIT*	INITIAL	ON	SW2, SW3 and both BRS0 and BRS1 of SW4 are valid.
		OFF	According to the CPU transmission parameter setting (software setting).

Transmission speed (bps)	4M	2M	1M	–
BRS0	ON	OFF	ON	OFF
BRS1	ON	ON	OFF	OFF

With the INIT switch "ON", the values set in the module configuration screen are invalid. The CP-215IF executes a message transmission according to the station addresses of SW2 and SW3, the transmission speed setting of both BPS0 and BPS1 of SW4, and the network address of SW5. In this case, a link transmission is not executed.
With the INIT switch "OFF", a link transmission and a message transmission are executed according to the values set in the module configuration screen.
After making the settings for the CP-717, set the INIT switch OFF and use with the values set in the module configuration screen.
The status of the INIT switch is read in only once when turning ON the power or resetting (turning the M.RST of the CPU from ON to OFF).
When the switch setting is changed, turn ON the power or reset.

5 COMPONENT MODULES

This chapter explains specifications and functions of both modules composed the CP-9200SH and mounting bases. Module components include CPU modules, motion modules, power modules, communications modules, and I/O modules.

5.1 CP-9200SH CPU Modules

The CPU module is the primary control unit of the CP-9200SH. It possesses both single and multiple CPU functions, and can be mounted on either the MB-01 or MB-03 mount base. The internal main memory is backed up with a lithium battery, so even if the power is off, user programs and user data are saved. In addition, since flash memory is installed, a user program can be saved in memory. Since the main memory is backed up with a battery, data protection is highly reliable.

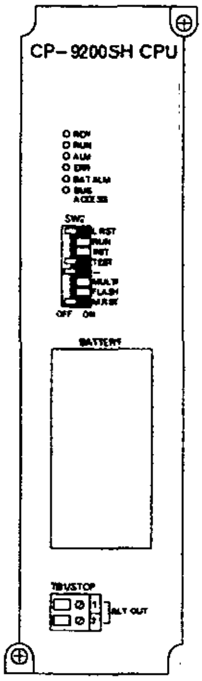


Fig. 5.2
Front of the CP-9200SH CPU Module

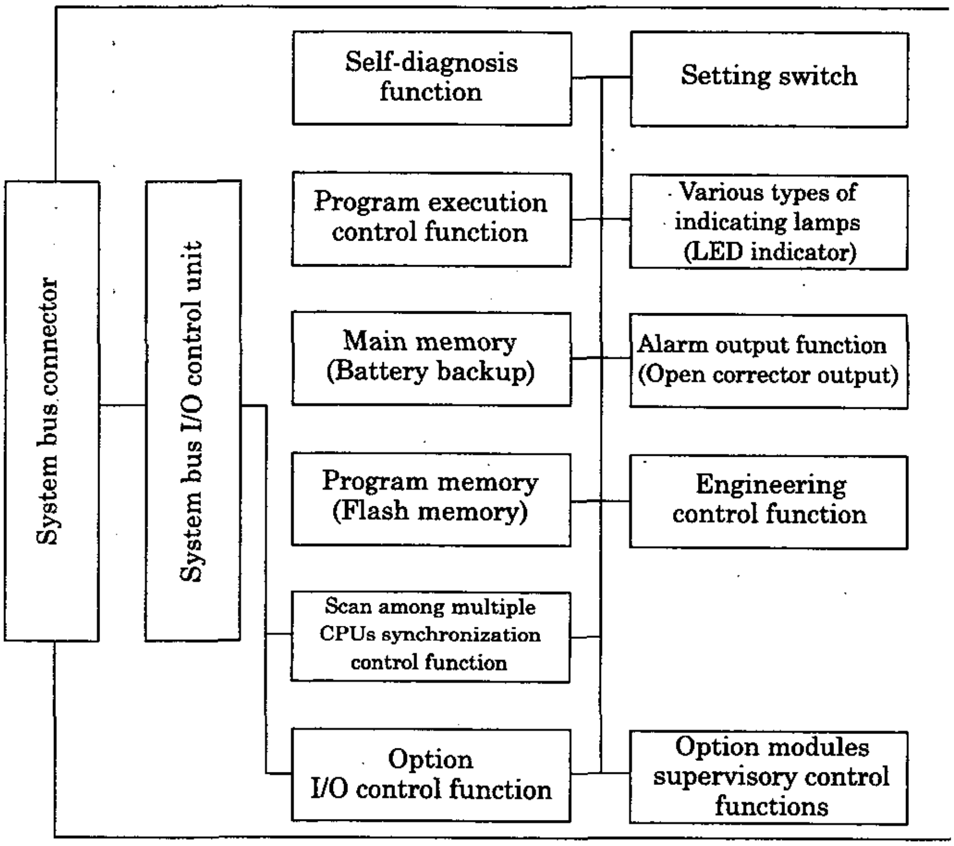


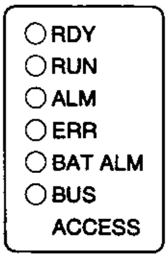
Fig. 5.1 CPU Module Block Diagram of the CP-9200SH

Table 5.1 Outline of the Functions

Function	Outline
Program execution control function	User programs are executed by a fixed-cycle scan method. Scanning can be performed at the two levels of high-speed (0.4 to 300 ms) and low-speed (1 to 300 ms). A total of 132 types of instructions including relay instructions and numerical operation instructions can be used.
Main memory (with battery backup)	The main memory has the following capacity · 1 MB unit: 12 k step equivalence (Product code No. : 87921-3100□-S030△) · 2 MB unit: 30 k step equivalence (Product code No. : 87921-3110□-S030△) The main memory is backed up by a battery to prevent erasure of data upon interruption of power. Backup by a capacitor is also provided along with the battery in order to prevent erasure of data during battery replacement.
Main memory (flash memory)	User program memory is stored in flash memory, and can be saved.
Optional modules I/O and monitoring control functions	Performs control and monitoring of transmission and I/O optional modules. Optional modules can be inserted and extracted with a live connection.
Indication of various conditions	The operation state of the CPU (READY, RUN/STOP, ALARM, ERROR, BATTERY ALARM, etc.) is indicated with display lamps (LED).
Status output function	If damage occurs to the CPU, outputs a signal to the outside. Relay contact output (Rated: 24 VDC / 50 mA)
Setting switches	Sets the CPU operations.

Indicating lamps

When the CP-9200SH CPU is online and operating normally, the RDY LED and RUN LED lamps are on, and the ALM LED and the ERR LED are off. If an alarm or failure occurs with the CP-9200SH, the ALM LED or the ERR LED turn on (flash). Refer to Chapter 12 "Trial Operation and Remedies for Malfunctions," and remedy the problem.
The BAT ALM LED lights up when the battery voltage declines. Refer to Chapter 13 "Maintenance and Inspections" and replace the battery.

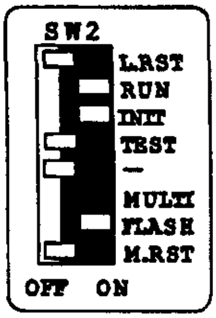


Indication	Name	Indicator color	Lighting conditions
RDY	READY	Green	While the microprocessor for control is operating normally.
RUN	RUN	Green	While a program is running.
ALM	ALARM	Red	Lights or flashes when an alarm occurs (minor problem).
ERR	ERROR	Red	Lights or flashes when an error occurs (serious problem).
BAT ALM	BATTERY ALARM	Red	Lights up when battery voltage becomes low.
BUS ACCESS	BUS ACCESS	Green	When the CPU is accessing the bus

Setting switches

· Dip switch (SW2)

When shipped out, all dip switches are set to OFF (left). In this state, when power is supplied, the CP-9200SH enters offline stop mode. In the offline stop mode, user programs will not run. To get the CP-9200SH to run in online run mode, after loading the program, turn the RUN switch ON (right) and the power supply ON. All dip switches, excluding L.RST and M.RST, are valid only after turning ON the power or resetting. When the mode is changed, restart the power.

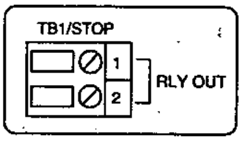


Indication	Name	Condition	Operation
L.RST	LOCAL RESET	ON	Manual reset (CPU independent)
		OFF	Online
RUN	RUN	ON	Run user program.
		OFF	Stop user program.
INIT	INITIAL	ON	When TEST is ON: Memory clear
		OFF	When TEST is ON: Offline test mode
TEST	TEST	ON	When INIT is ON: Memory clear
		OFF	When INIT is OFF: Offline test mode
-	For future use	(Always set it "OFF.")	
MULTI	MULTI CPU	ON	Multi CPU mode
		OFF	Single CPU mode
FLASH	FLASH	ON	When INIT is ON: Copy from FLASH to RAM (only programs) Clear user data to 0 When INIT is OFF: Copy from FLASH to RAM (only programs) The user data remains as is. (Note)
		OFF	User program FLASH → RAM not copies
M.RST	MASTER RESET	ON	Manual reset (CPU + Option module).
		OFF	Online

Note: "Only programs" includes D and # register data. "User data" is data for the S, I, O, and M registers.

■ Terminal Block (TB1/STOP)

This terminal block is for status output. This is contact output.
It is linked to the action of the RDY LED. Between RLY OUT-1 and 2, a short circuit occurs in RUN state, and a release in STOP state. Contact ratings are 24 VDC 0.5 A and 125 VAC 0.5 A.

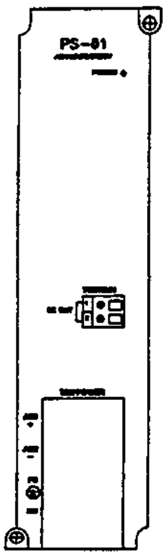


Indication	Name	Operation
RLY OUT	1	Short circuit while running
	2	Release during stop

5.2 POWER Module

5.2.1 PS-01 POWER Module

The PS-01 power module is the power supply unit for the CP-9200SH. Through input of 100 VAC or 100 VDC, each of the CP-9200SH modules can be supplied with necessary power supply. In addition, it has a power interruption detection function, so that when input voltage declines, it outputs an ACFAIL signal. The system will reset upon receiving an ASFAIL signal.



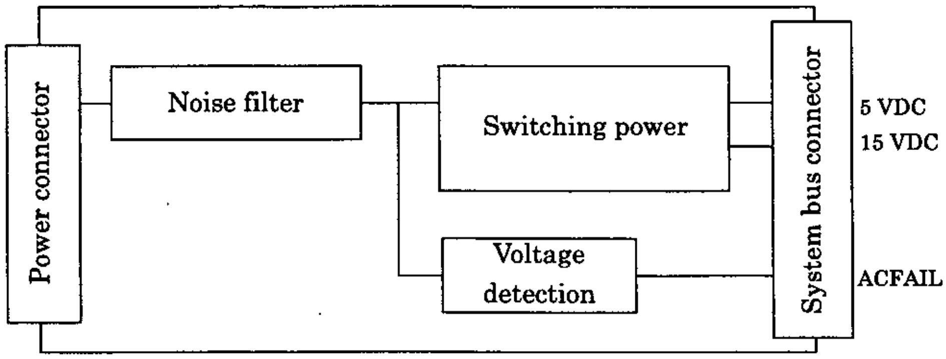


Fig. 5.3 Power Module Block Diagram of the PS-01

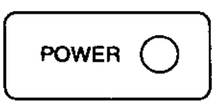
Fig. 5.4 Front of the PS-01 Power Module

Table 5.2 PS-01 Power Module Basic Specifications

Item	Specifications	
Input voltage	100 VAC	100 VDC
Input allowable voltage range	85 VAC to 132 VAC	90 VDC to 140 VDC
Allowable frequency range	47 to 440 Hz	——
Power consumption	150W (Max)	150W (Max)
Inrush current	15 A (Max)	15 A (Max)
Output hold time	AC input cut off time, less than 5 ms	DC input cut off time, less than 5 ms
ACFAIL detection voltage	70 VAC ±10% (100 VAC)	75 VDC ±10% (100 VDC)

■ Indicating lamps

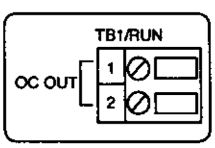
If 100 ACV or 100 DCV is input into the PS-01 power module, the POWER LED on the front of the module will light up. If the POWER LED remains off regardless of whether 100 VAC or 100 VDC is supplied, refer to Chapter 12 "Trial Operation and Remedies for Malfunctions".



Indication	Name	Indicator color	Lighting conditions
POWER	POWER	Green	During 5 VDC output

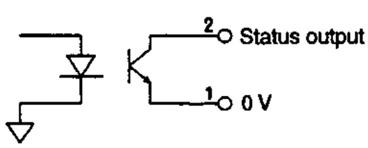
■ Terminal block (TB1/RUN)

This terminal block is for alarm output. This is an open-collector output. Short-circuited occur when outputting a normal 5 VDC.



Indication	Name	Operation
OC OUT	1	0 V
	2	Status output (shorted in normal output)

Specifications	
Input voltage	24 VDC
Current capacity	50 mA (Max)



5.2.2 PS-02 Power Module

The PS-02 power module is the power supply unit for the CP-9200SH.
Through input of 200 VAC, each of the CP-9200SH modules can be supplied with necessary power supply. In addition, it has a power interruption detection function, so that when input voltage declines it outputs an ACFAIL signal. The system will reset upon receiving an ASFAIL signal.

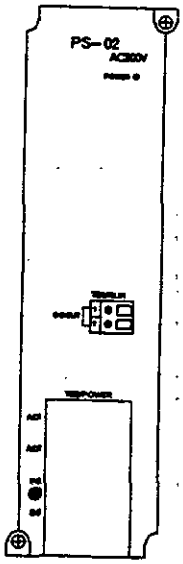


Fig. 5.6 Front of the PS-02 Power Module

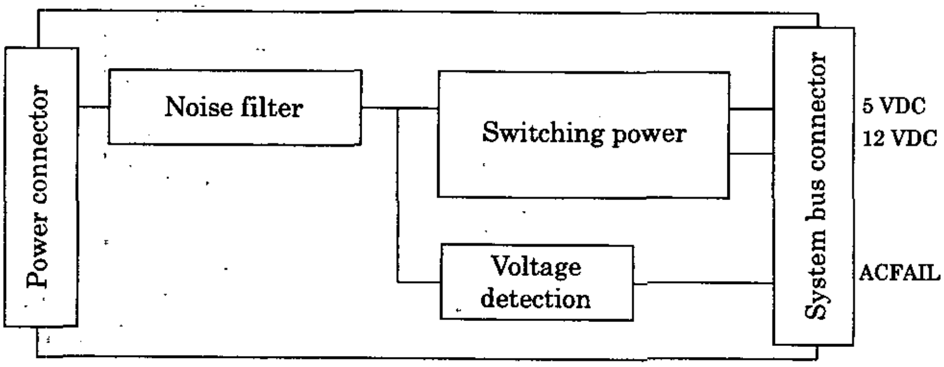


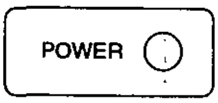
Fig. 5.5 Power Module Block Diagram of the PS-02

Table 5.3 PS-02 Power Module Basic Specifications

Item	Specifications
Input voltage	200 VAC
Input allowable voltage range	170 VAC to 230 VAC
Allowable frequency range	47 to 440 Hz
Power consumption	150 W (Max)
Inrush current	15 A (Max)
Output hold time	AC input cut off time, 5 ms or more
ACFAIL detection voltage	140 VAC ±10 %

■ Indicating lamps

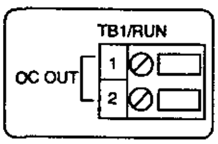
If 200 VAC is input into the PS-02 power module, the POWER LED on the front of the module wi light up. If the POWER LED remains off regardless of whether 200 VAC is supplied, refer to Chapt 12 "Trial Operation and Remedies for Malfunctions".



Indication	Name	Indicating color	Lighting condition
POWER	POWER	Green	During 5 VDC output

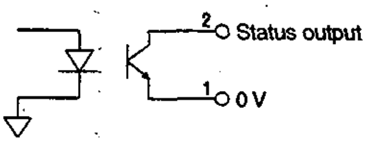
■ Terminal block (TB1/RUN)

This terminal block is for alarm output. This is an open-collector output. It short-circuited when outputting a normal 5 VDC.



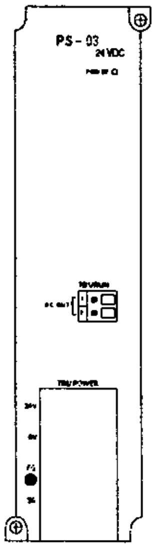
Indication	Name	Operation
OC OUT	1	0V
	2	Status output (shorted in normal output)

Specifications	
Input voltage	24 VDC
Current amount	50 mA (Max)



5.2.3 PS-03 Power Module

The PS-03 power module is the power supply unit for the CP-9200SH.
With a 24 VDC charge, each of the CP-9200SH modules can be supplied with necessary power.
It also has a power interruption detection, so that when input voltage is lowered, it sends out a PWR FAIL signal. The system will reset itself upon receiving a PWR FAIL signal.



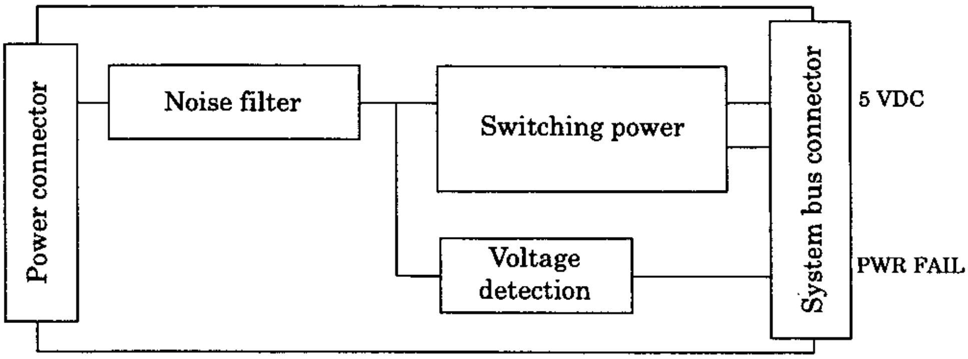


Fig. 5.7 Power Module Block Diagram of the PS-03

Fig. 5.8 Front of the PS-03 Power Module

Table 5.4 PS-03 Power Module Basic Specifications

Item	Specifications
Input voltage	24 VDC
Input allowable voltage range	19.2 VDC to 28.8 VDC
Power consumption	150W (Max)
Inrush current	30 A (Max)
Output hold time	5 ms or less when DC input cut off
PWR FAIL detection voltage	18 VDC

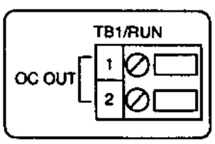
■ Indicating lamps

When the PS-03 power module is charged with 24 VDC, the POWER LED on the front of the module lights up. If the POWER LED remains off regardless of whether 24 VDC is supplied, refer to Chapter 12 "Trial Operation and Remedies for Malfunctions".

Indication	Name	Indicating color	Lighting condition
POWER	POWER	Green	During 5 VDC output

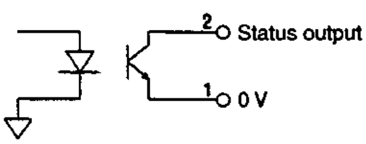
■ Terminal block (TB1/RUN)

This terminal block is for alarm output. This is an open-collector output. It short-circuited when outputting 5 VDC.



Indication	Name	Operation
OC OUT	1	0V
	2	Status output (shorted in normal output)

Specifications	
Input voltage	24 VDC
Current amount	50 mA (Max)



5.3 Optional Modules

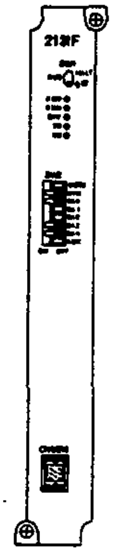
Optional modules can be mounted on the CP-9200SH. There are sixteen types of optional modu shown in Table 5.5.

Table 5.5 Types of Optional Modules

Name	Outline
CP-213IF Module	CP-213IF One line
CP-215IF Module	CP-215IF One line
CP-216IF Module	CP-216IF One line
CP-217IF Module	RS-232(DSUB-9), RS-232(DSUB-25), RS-422/485(MR-8) Each for one line
CP-218IF Module	CP-218IF (Ethernet: AUI connector) One line
CP-225IF Module	CP-225IF
CP-2500IF Module	CP-2500IF One line
EXIOIF Module	Expansion modules MB-01, MB-03
2000IOIF Module	Interface for 2000 series I/O connection
820IF Module	Interface for 820 series connection
LIO-01 Module	DI: 32, DO: 32, Local I/O module
CNTR-01 Module	PI: 4, Counter input module
AI-01 Module	AI: 8, Analog input module
DI-01 Module	DI: 64, Digital input module
AO-01 Module	AO: 4, Analog output module
DO-01 Module	DO: 64, Digital output module
SVA Module	Servo module (analog output)
PO-01 Module	Motion module (pulse train output)
SVB Module	Servo module (MECHATROLINK /CP-216 transmission)

.3.1 CP-213IF Modules

The CP-213 transmission system has comprised YASKAWA's drive systems for industrial use since previously. Inverters, such as the VS-676V and VS-616 Series inverters, I/O's of 2000 Series general-purpose I/O devices, the Control Center can be connected to the CP-213IF Module.
Refer to the Control Pack CP-213 FA Bus (SIE-C872-13.1) for details.



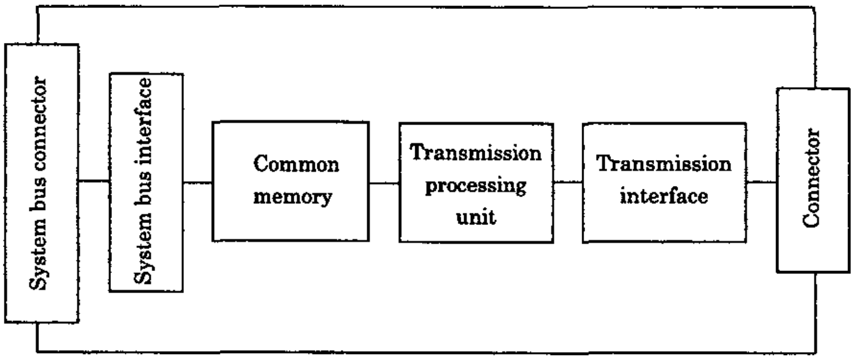
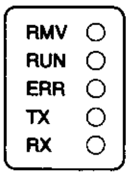


Fig. 5.9 Module Block Diagram of the 213 IF

Fig. 5.10 Front of the 213 IF Module

■ Indicating lamps

If the module is operating normally, the RUN LED lights up and the ERR LED is off. When an error occurs, the RUN RED becomes unlit and the ERR LED lights up or flashes. The TX LED and RX LED are respectively lit at data send and receive.



Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX	BUS TX	Green	During sending of data via CP-213.
RX	BUS RX	Green	During receiving of data via CP-213.

The conditions of the indicating lamps (LEDs) will be as shown in Table 5.6 when an error occurs within the module.

Table 5.6 Indicating Lamps When Failure Occurs (LED)

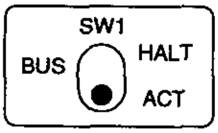
Error	Description of Error	Indicating Lamp(LED)			
		RUN	ERR	TX	RX
PROM sumcheck error	A PROM sumcheck error is detected during online self-diagnosis.	●	★ (1)	○	○
Hardware error within module	A hardware error is detected during online self-diagnosis.	●	★ (2/4)	○	○
CPU interface error	Detection of CPU and data transmission error during online self-diagnosis.	●	★ (3)	○	○
Transmission error	A transmission error is detected during online self-diagnosis.	●	★ (5)	○	○
	An error is detected during ordinary transmission.	●	★	★	★
Watchdog timer	Watchdog timer	○	●	○	○

○ : Unlit, ● : Lit, ★ : Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

■ Setting Switches

· BUS switch (SW1)

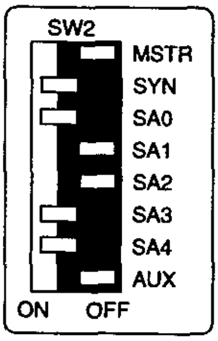
The BUS switch should be switched to the HALT side when replacing 213IF modules. During nc mal operation, it should be on the ACT side.



Indicator	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

· Dip switch (SW2)

This switch sets the operating mode of the CP-213IF.
When shipped out, all dip switches are set to OFF (right).



Indication	Name	Condition	Operation	
MSTR	MASTER	ON	Sets this module to be the master station.	
		OFF	Sets this module to be the slave station.	
SYN	SYNCHRONOUS MODE	ON	Operation is synchronized with the CPU scan.	Only effectiv for the maste station.
		OFF	Operation is not synchronized with the CPU scan.	
SA0	STATION ADDRESS 0	ON/ OFF	Setting of the transmission distance mode when module is used as the master station. Setting of the station address when module is used as the slave station.	
SA1	STATION ADDRESS 1			
SA2	STATION ADDRESS 2			
SA3	STATION ADDRESS 3			
SA4	STATION ADDRESS 4			
AUX	AUXILIARY (DIAGNOSIS)	ON	Self-diagnosis (Self-diagnosis is performed when the module is started with this switch ON.)	
		OFF		

Settings for the case when the module is used as the master station

Switch	Setting	Description
MSTR	ON	Set to be the master station.
SYN	ON	Synchronous mode Data transfer is performed in synchronization with CPU. The uniqueness of data between stations is thus ensured.
	OFF	Non-synchronous mode Data transfer is performed in a non-synchronous manner with respect to CPU. Although there is no uniqueness of data among stations, but the data renewal speed will be maximized.
SA0 to SA4	All ON	Long-distance transmission mode (300 m or more) To extend the transmission distance to 300 m or more using a photo-converter, set the MSTR switch and SA0 to SA4 switches all to ON.
	Not All "ON"	Standard transmission mode (within 300 m). If the transmission distance is within the standard length of 300 m, set one of the switches among the MSTR switch and SA0 to SA4 switches to OFF.
AUX	OFF	Set without any self-diagnosis

Settings for the case when the module is used as the slave station

Switch	Setting					Description
MSTR	OFF					Set to be the slave station.
SYN	OFF					Invalid
	Station No.					
	1	2	3	…	31	
SA0	ON	OFF	ON		ON	Set the station address using the combinations shown to the left.
SA1	OFF	ON	ON		ON	
SA2	OFF	OFF	OFF		ON	
SA3	OFF	OFF	OFF		ON	
SA4	OFF	OFF	OFF		ON	
AUX	OFF					Set without any self-diagnosis

Arrangement of Connector Terminals

213IF Connector (CN1/213)

No.	Signal	Remarks	No.	Signal	Remarks
1	SRD+	Send/receive data (+)	5	I/O −	Send/receive control line (−)
2	I/O+	Send/receive control line (+)	6	N.C.	Not connected.
3	N.C.	Not connected.	7	SCLK −	Transmission clock (−)
4	SCLK+	Transmission clock(+)	8	SRD −	Send/receive data (−)

MR-8RFA (G) (made by Honda Communication Industries Co., Ltd.) is used as the connector.
Use MR-8M (G) (case: MR-8L) for connection.

Table 5.7 shows the specifications of the CP-213IF Module.

Table 5.7 Basic Transmission Specifications of the CP-213IF Module

Item	Specifications
Form of transmission line	Electrical bus
Transmission line *	Electrical bus YS-IPEV-SB, 0.3 mm² × 1P (75 Ω system) YS-IPEV-SB, 0.3 mm² × 3P (75 Ω system) YS-IPEV-S(Cu), 1.25 mm² × 1P (75 Ω system)
Transmission distance	Total length 300 m (single-line bus system)
Transmission speed	1Mbps
Execution speed method	Control transmission : approx. 16 words/ms Broadcast transmission : approx. 8 words/ms Message transmission : approx. 8 words/ms
Transmission control method	HDLC method
Data exchange	1:N
Transmission mode	Control transmission, broadcast transmission, message transmission
Error processing	CRC check, data word length check, timer
Number of units connected	Total number of stations: 32 units Master : 1 unit, Sub master : 8 units
Quantity of transmitted data	Master - Remote Broadcast transmission: fixed, 8 words Control transmission: Transmission 127 words max. Reception 127 words max. Message transmission : 127 words max.

*: Refer to the FDS System Installation Manual (SIE-C873-16.4) for details on the wiring.

5.3.2 CP-215IF Module

The CP-215 transmission system is YASKAWA's unique real time core network with 4 Mbps transmissic speed. Since it uses a twisted pair cable as its transmission medium, an inexpensive but highly reliab transmission system can be constructed. The VS-676H5 series system inverter or a CP-316, a CP-71 or a CP-816 RIO-05 can be connected to the CP-215IF module.

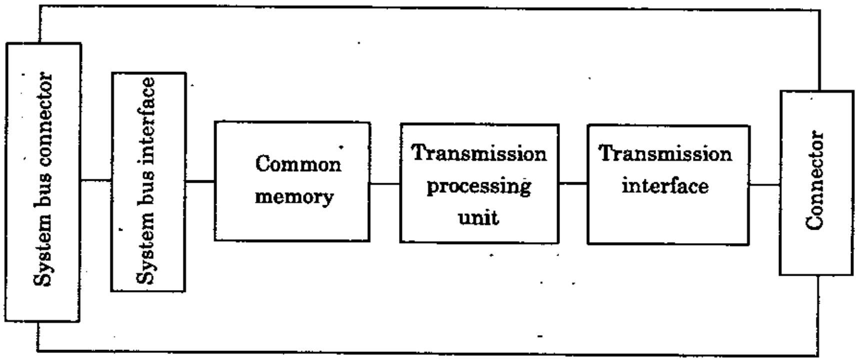
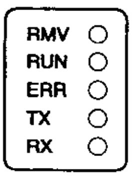


Fig. 5.11 Module Block Diagram of the 215IF

Fig. 5.12
Front of the 215 IF Module

■ Indicating lamps

If the module is operating normally, the RUN LED lights up and the ERR LED is off. When an erro occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes. The TX LED and R LED are respectively lit at data transmission and reception.



Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX	215 TX	Green	During sending of data via CP-215.
RX	215 RX	Green	During receiving of data via CP-215.

The conditions of the indicating lamps (LEDs) will be as shown in Table 5.8 when an error occurs within the module.

Table 5.8 Indicating Lamps When Failure Occurs (LED)

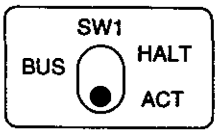
Error	Description of Error	Indicating Lamp (LED)			
		RUN	ERR	TX	RX
PROM sumcheck error	A PROM sumcheck error is detected during online self-diagnosis.	○	★ (1)	○	○
Hardware error within module	Hardware error detected by an online self diagnosis	○	★ (2)	○	○
CPU interface error	A CPU interface error is detected during online self-diagnosis.	○	★ (3)	○	○
Transmission error	An error is detected during ordinary transmission.	●	●	●	●
Watchdog timer	Watchdog timer	○	●	○	○

○ : Unlit, ●: Lit, ★ : Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

■ Setting Switch

- BUS switch (SW1)

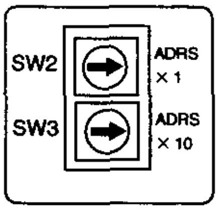
The BUS switch should be switched to the HALT side when replacing modules. During normal operation, it should be on the ACT side.



Indicator	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

- Rotary switches (SW2, SW3)

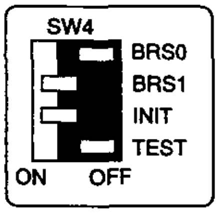
The SW2 and SW3 switches set the address for CP-215 transmissions. SW2 sets the first lower digit, and SW3 the second lower digit. A value from 1 to 64 is set for a station address.



Indicator	Name	Condition	Operation
ADRS × 1	ADRESS × 1	1 to 10	Station address first digit
ADRS × 10	ADRESS × 10	1 to 10	Station address second digit

- Dip switch (SW4)

This switch sets the transmission speed and self-diagnosis and other operating modes.
When shipped out, all dip switches are set to OFF (right).



Indicator	Name	Condition	Operation
BRS0	Baud Rate Select 0	ON	Transmission speed setting (Effective only with the INIT switch "ON")
		OFF	
BRS1	Baud Rate Select 1	ON	
		OFF	
INIT*	INITIAL	ON	BRS0 and BRS1 of SW2, SW3 and SW4 are effective.
		OFF	According to the CPU transmission parameter setting (software setting).
TEST	TEST	ON	Offline self diagnosis mode
		OFF	Normal operating mode

Transmission speed(bps)	4M	2M	1M	—
BRS0	ON	OFF	ON	OFF
BRS1	ON	ON	OFF	OFF

* INIT switches

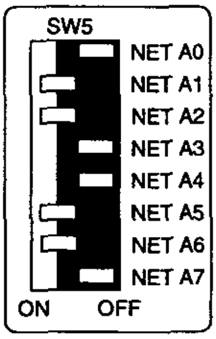
With the INIT switch "ON", the CP-215 performs only message transmission in accordance with the station address of SW2 and SW3, the baud rate setting of BRS0 and BRS1 of SW4, and the network address of SW5. At this time a link transmission is not performed.

With the INIT switch "OFF", the CP-215 follows the settings of module configuration definition, and sends a link transmission and a message transmission. At this time, SW2 and SW3, BRS0 and BRS1 of SW4, and the network address of SW5 are ignored.

Prior to setting module configuration definition, for engineering such as programming and register display with the CP-717, turn the INIT switch ON.

Set the INIT Switch ON only when communicating forcibly with the CP-717 for such cases as when the memory of the CPU has been cleared.

- Dip switch (SW5)
  This switch sets the network number of CP-215 transmissions. For the network number, a value
  set from 1 to 254. The switch is effective with the INIT switch "ON".
  When shipped out, all dip switches are set to OFF (right).



Indication	Name	Condition	Operation
NET A0	NETWORK	ON	Network No.
	ADDRESS 0	OFF	
NET A1	NETWORK	ON	
	ADDRESS 1	OFF	
NET A2	NETWORK	ON	
	ADDRESS 2	OFF	
NET A3	NETWORK	ON	
	ADDRESS 3	OFF	
NET A4	NETWORK	ON	
	ADDRESS 4	OFF	
NET A5	NETWORK	ON	
	ADDRESS 5	OFF	
NET A6	NETWORK	ON	
	ADDRESS 6	OFF	
NET A7	NETWORK	ON	
	ADDRESS 7	OFF	

Network No.

Network No.	1	2	3	…	254
A0	ON	OFF	ON	…	OFF
A1	OFF	ON	ON	…	ON
A2	OFF	OFF	OFF	…	ON
A3	OFF	OFF	OFF	…	ON
A4	OFF	OFF	OFF	…	ON
A5	OFF	OFF	OFF	…	ON
A6	OFF	OFF	OFF	…	ON
A7	OFF	OFF	OFF	…	ON

■ Arrangement of Connector Terminals

215IF Connector (CN1/215)

No.	Signal	Remarks	No.	Signal	Remarks
1	SIG −	Send/receive data (−)	5	N.C.	Not Connected
2	N.C.	Not Connected	6	N.C.	Not Connected
3	N.C.	Not Connected	7	N.C.	Not Connected
4	N.C.	Not Connected	8	SIG+	Send/receive data (+)

MR-8RFA4(G) (made by Honda Communication Industries Co., Ltd.) is used as the connector.
Use MR-8M(G) (case: MR-8L) for connection.

Table 5.9 shows the specifications of the CP-215IF Module.

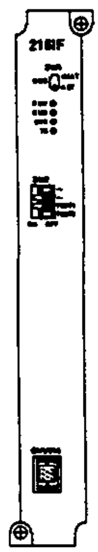
Table 5.9 Basic Transmission Specifications of the CP-215IF Module

Item	Specifications
Form of transmission line	Electrical bus
Transmission line	Electrical bus YS- IPEV-SB, 0.3 mm² × 1 P (75 Ω system) YS- IPEV-SB, 0.3 mm² × 3 P (75 Ω system) YS- IPEV-S(Cu), 1.25 mm² × 1 P (75 Ω system)
Transmission distance *1	Total length For 4 Mbps : 170 m For 2 Mbps : 270 m For 1 Mbps : 420 m Can be expanded up to 600 m max. (for 4 Mbps) by connecting 1 repeater.
Transmission speed	1/2/4 Mbps (switchable by software)
Execution speed	Message transmission : approx. 1024 words/10 ms
Number of transmission words	Link transmission : 2048 words Message transmission : 512 words
Transmission control method	Token passing method
Data exchange	N:N
Transmission mode	Link transmission, message transmission
Error processing	CRC check, data word length check, timer
Number of units connected *1	Total number of stations: 30 units (standard) A maximum of 64 units can be connected by repeater extension.

*1 : For transmission distance and number of units connected, refer to Chapter 10 "Installation and wiring."

5.3.3 CP-216IF Modules

CP-216 transmissions are used for inverter and CP-816 RIO-01 or RIO-06 control transmissions by YASKAWA's 4 Mbps high speed transmission field network. For each line, on a standard 300 m transmission distance 8 inverter units can be connected.



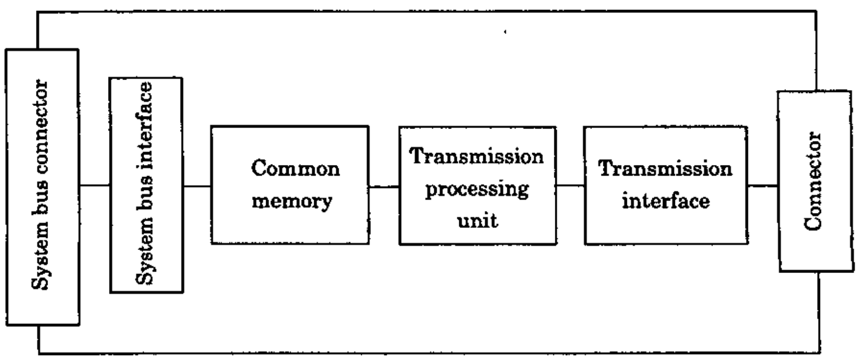
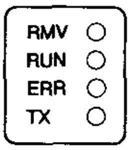


Fig. 5.13 Module Block Diagram of the 216IF

Fig. 5.14
Front of the 216IF Module

Indicating lamps

When the module is in normal operation, the RUN LED is lit and the ERR LED is unlit. When error occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes. The TX LI flashes during transmitting data respectively.



Indication	Name	Indicating color	Lighting Conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX	BUS TX	Green	During sending of data via CP-216.

The conditions of the indicator lamps (LEDs) will be as shown in Table 5.10 when an error occu within the module.

Table 5.10 Indicating Lamps When Failure Occurs (LED)

Error	Description of Error	Indicating Lamp (LED)		
		RUN	ERR	TX
PROM sumcheck error	A PROM sumcheck error was detected during online self-diagnosis.	●	★ (1)	Depends on situation
Hardware error within module	A hardware error was detected during online self-diagnosis.	●	★ (2/3/4)	○
Transmission error	Transmission error detected during normal transmission	●	●	Depends on situation
Watchdog timer	Error detected during normal transmission Watchdog timer	○	●	Depends on situation

○ : Unlit, ● : Lit, ★ : Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

Table 5.11 shows the specifications of the CP-216 transmission function.

Table 5.11 Basic Transmission Specifications of the CP-216IF

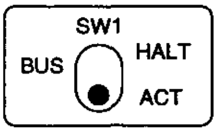
Item	Specifications
Form of transmission line	Electrical bus
Transmission line	Electrical bus YS-IPEV-SB, 0.3 mm² × 1 P (75 Ω system) YS-IPEV-S(Cu), 1.25 mm² × 1 P (77 Ω system)
Transmission distance*1	Total length For 4 Mbps : 170 m
Transmission speed	1/2/4/ Mbps (software switching only)
Execution speed method*2	When connected to the CP-816 RIO-01, The control transmission: 1 word/2 ms When connected to an inverter, The control transmission: High-speed scan data 4 words/2 ms Low-speed scan data 2 words/2 ms Message transmission: 1 word/2 ms
Transmission control method	Cyclic scan method
Data exchange	1: N
Transmission mode	Control transmission, message transmission
Error processing	CRC check, data word length check, timer
Number of units connected*1	Total number of stations: 8 units (standard) A maximum of 15 units can be connected by expansion mode selection.

*1 : Refer to Chapter 10 "Installation and wiring" for transmission distances and number of units connected.
*2 : When the expansion mode is used, the transmission time is doubled.

Setting switches

- BUS switch (SW1)

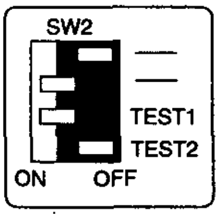
The BUS switch should be switched to the HALT side when replacing 216IF modules. During normal operation, it should be on the ACT side.



Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

- Dip switch (SW2)

This switch sets the operating mode of the CP-216.
When shipped out, all dip switches are set to OFF (right). Use in OFF state.



Indication	Name	Condition	Operation
——	For future use		
——	For future use		
TEST1	TEST1	ON	Master station mode (TEST2=when ON)
		OFF	Slave station mode (TEST2=when ON)
TEST2	TEST2	ON	Self diagnosis mode
		OFF	Operating mode

Arrangement of Connector Terminals

CP-216 Port connector Line (CN1/216)

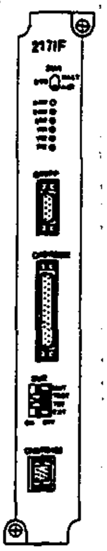
No.	Signal	Remarks	No.	Signal	Remarks
1	SRD −	Send/receive data −	5	N.C.	Not connected.
2	SRD+	Send/receive data +	6	SRD −	Send/receive data −
3	SH	Cable shield	7	SRD+	Send/receive data +
4	R	Terminal resistance connection pin.(120Ω)	8	SH	Cable shield

MR-8RMA4(G) (made by Honda Communication Industries Co., Ltd.) is used as the connector.
Use MR-8F(G) (case: MR-8L) for connection.

CP-216 transmissions have two functions, that of control transmission, and that of message transmission. Control transmission is cyclically executed between the master and slave stations. The assignment of I/O domain for each station is done through the programming panel.
When the slave station is an inverter, by using system standard functions, inverter constants can be written, inverter constants can be read, and trace data can be read. System standard functions are "ICNS-WR," "ICNS-RD," and "ITRC-RD" respectively.
Message transmissions of user data use system standard functions "MSG-SND" and "MSG-RCV." The two types of transmission procedures are MEMOBUS procedure and non-procedural.
Transmission status is output to the registers as transmission parameters for "MSG-SND" and "MSG-RCV" functions. For details of system standard functions, refer to the CP-9200SH Programming Manual (SIE-C879-40.3).

5.3.4 CP-217IF MODULE

The CP-217IF module is serial transmission interface module equipped with two RS-232 lines and o
RS-422/485 interface line. Along with various interfaces, the unit can handle a variety of protoco
especially YASKAWA's unique MEMOBUS transmission protocol. In addition, the DSUB 9-pin RS-2
can also be used as an engineering port. Connect the CP-717 and engineering of the CP-9200SH l
comes possible.



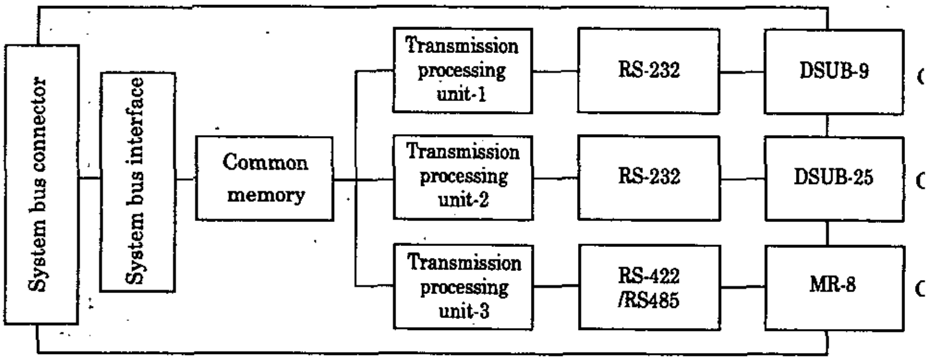
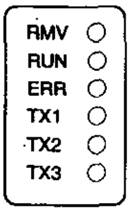


Fig. 5.15 Module Block Diagram of the 217 IF

Fig. 5.16
Front of the 217IF Module

■ Indicating lamps

When the module is in normal operation, the RUN LED is lit and the ERR LED is unlit. When a
error occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes. The TX1 LED,
TX2 LED and TX3 LED light when they send or receive data.



Indication	Name	Indicating color	Lighting Conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX1	CN1TX/RX	Green	Sending / receiving CP-217CN1 data.
TX2	CN2TX/RX	Green	Sending / receiving CP-217CN2 data.
TX3	CN3TX/RX	Green	Sending / receiving CP-217CN3 data.

The conditions of the indicator lamps (LEDs) will be as shown in Table 5.12 when an error occur
within the module.

Table 5.12 Indicator Lamps When Failure Occurs (LED)

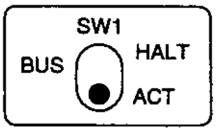
Error	Description of Error	Indicating Lamp (LED)			
		RUN	ERR	TX	RX
PROM sumcheck error	A PROM sumcheck error is detected during online self-diagnosis.	○	★ (1)	Depends on situation	
Module internal SRAM error	A hardware error is detected during online self-diagnosis.	○	★ (2)	○	○
CPU interface error	A CPU interface error is detected during online self-diagnosis.	○	★ (3)	○	○
Transmission error	Transmission data error	●	●	Depends on situation	
Watchdog timer	Watchdog timer	○	●	Depends on situation	

○ : Unlit, ● : Lit, ★ : Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

Setting Switches

- BUS Switch (SW1)

  The BUS Switch should be switched to the HALT side when replacing 217IF modules. During normal operation, it should be on the ACT side.

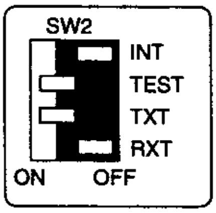


Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

- Dip switch (SW2)

  When shipped out, all dip switches are set to OFF (right).

  By turning the TXT and RXT switches ON, the sending and receiving lines can be terminated with 120 Ω.



Indication	Name	Condition	Operation	
INIT *1	INITIAL	ON	CN1 (PORT #0) can be connected to the CP-717	
		OFF	CN1 (PORT #0) setting parameters for the CP-717 are effective	
TEST *2	TEST	ON	Self diagnosis mode	Baud rate when connected to the CP-717
		OFF	Normal operating mode	(ON: 9600 bps, OFF: 19.2 kbps)
TXT	TX	ON	Transmission signal terminal (for RS-422/485)	
		OFF	No termination	
RXT	RX	ON	Reception signal terminal (for RS-422/485)	
		OFF	No termination	

*1 : INIT switch

When connecting the CP-717 to the CN1 (PORT#0), turn the INIT switch "ON". With the INIT switch "ON", the set values set on the module configuration definition screen are ignored, and PORT#0 is activated with CP-717 parameter settings. At this time, transmission speed will be either 9600 bps or 19.2 kbps depending on the TEST switch.

Switch	Connection types
	CP-717
INIT	ON
TEST	OFF
Transmission speed	19.2 kbps

*2 : When the INIT switch is ON, the TEST switch sets the Baud rate for CN1 (PORT#0).

When INIT: ON, TEST: ON : 9600 bps

When INIT: ON, TEST: OFF : 19.2 kbps

Arrangement of Connector Terminals

RS-232 Connector (CN1/PP)

No.	Signal	Remarks	No.	Signal	Remarks
1	FG	Protective ground	6	N.C.	Not connected
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	N.C.	Not connected
4	RS	Send request	9	N.C.	Not connected
5	CS	Ready for sending			

The DSUB 9-pin female type connector, 17LE-13090-27 (D2AC) (made by Daiichi Electronic Industries Co., Ltd.), is used as the connector.

The DSUB 9-pin male type connector, 17JE-23090-02 (D8B) (made by Daiichi Electronic Industries Co., Ltd.), is used as the cable side connector.

RS-232 Connector (CN2/RS232)

No.	Signal			Definition of Signal	Remarks
	EIA	ITU-T	JIS		
1	AA	101	FG	Protective ground circuit	
2	BA	103	SD	Send data circuit	
3	BB	104	RD	Receive data circuit	
4	CA	105	RS	Send request circuit	
5	CB	106	CS	Ready for sending circuit	
6	CC	107	DR	Data set ready circuit	
7	AB	102	SG	Signal ground	
8	CF	109	CD	Data channel receive carrier detection circuit	
9 to 19	Unused				
20	CD	108/2	ER	Data terminal ready circuit	
21 to 25	Unused				

The DSUB 25-pin female type connector, 17LE-13250-27 (D2AC) (made by Daiichi Electronic Industries Co., Ltd.), is used as the connector.
The DSUB 25-pin male type connector, 17JE-23250-02 (D8A) (made by Daiichi Electronic Industries Co., Ltd.), is us as the cable side connector.

RS-422/485 Connector (CN3/RS422)

No.	Signal	Remarks	No.	Signal	Remarks
1	RX(−)	Received data (−)	5	N.C.	Not connected
2	RX(+)	Received data (+)	6	TX(−)	Sent data (−)
3	N.C.	Not connected	7	TX(+)	Sent data (+)
4	N.C.	Not connected	8	N.C.	Not connected

MR-8RFA4(G) (made by Honda Communication Industries Co., Ltd.) is used as the connector.
Use MR-8M(G) (case: MR-8L) for connection.

The specifications of the CP-217IF Module are shown in Table 5.16.

Table 5.16 Basic Transmission Specifications of the CP-217IF Module

Item	Specifications
Interface	RS-232 : Two lines RS-422/485 : One line
Connector	RS-232(CN1) : DSUB-9 pins (female) RS-232(CN2) : DSUB-25 pins (female) RS-422/485(CN3) : MR-8 (female)
Transmission distance	RS-232 : 15 m max RS-422/485 : 300 m max
Transmission speed	RS-232(CN1/CN2) : 300 bps to 19.2 kbps RS-422/485 (CN3) : 2400 bps to 76.8 kbps [300/600/1200/2400/4800/9600/14400/19200/28800/38400 /48000/57600/64000/76800 bps]
Synchronization method	Non-synchronous type (start-stop synchronization), Synchronous type (ST1/ST2: CN2 only)
Transmission procedure	MEMOBUS (master/slave), MELSEC communication, OMRON communication
Form of connection	RS-232 : 1:1 RS-422 : 1:1 RS-485 : 1:N
Transmission format (that can be set)	Data bit length : 7 / 8 bits Stop bit : 1 / 2 bits Parity bit : even / odd / none

* : The maximum transmission speed of RS-422/485 (CN3) is limited by the transmission speeds of CN1 and CN2. Whe 19.2 kbps is set for CN1 and CN2, the maximum transmission speed of CN3 will be 19.2 kbps.

The CP-217IF Module can accommodate YASKAWA's unique MEMOBUS transmission protocol as well as various other types of transmission protocols.
As standard functions, the MELSEC communication protocol is available for connection with controllers made by Mitsubishi Electric Co., Ltd. and the OMRON communication protocol is available for connection with controllers made by OMRON Co., Ltd.

(1) MEMOBUS communication

Table 5.14 MEMOBUS Reference No. and Register No.

MEMOBUS reference No.	MEMOBUS command	Start No.	Register No. *
from 00001	01H/05H, 0FH: Coil	from 0	from MB000000
from 10001	02H: Input relay	from 0	from IB00000
from 30001	04H: Input register	from 0	from IW0000
from 40001	03H: Holding register	from 0	from MW00000

*: Register No. offsets can be designated when using system functions such as "MSG-SND" or "MSG-RCV" for the coil, the input relay, the input register, and the hold register.

(2) MELSEC Communication

Table 5.15 MELSEC Communication Specifications

	MELSEC - General Specifications		MELSEC Specifications Supported by CP-9200SH
Transmission method	RS-232 :half-dual, full-dual RS-422 :half-dual		RS-232 : full-dual (half-dual for protocol) RS-485 : half-dual
Synchronization method	Start-stop synchronization		Start-stop synchronization
Transmission speed	300/600/1200/2400/4800/9600/ 19200		1200/2400/4800/9600/19200
Data format	Data : 8 bit,7 bit Parity : odd, even, none Stop bit : 1 or 2 bits		Data : 8 bit,7 bit Parity : odd, even, none Stop bit : 1 or 2 bits.
Error detection	With or without sumcheck		With sumcheck
DTR/DSR (ER/DR) control	With/without (for only RS-232)	Either control is possible	Without
DC1/DC3, DC2/DC4 control	With/without		
Transmission protocol	Exclusive protocol Format 1 Format 2 Format 3 Format 4 (1:1, 1:N, N:N)		① Only Format 1 of the exclusive protocols is supported.
	No protocol (1 : 1, 1 : N)		
	Bidirectional (1 : 1)		

Table 5.16 Common Commands of MELSEC ACPU

Command	Description	Number of Points	Support *	MEMOBUS Instruction
BR	Read bit device in 1 point unit.	256 points	×	–
WR	Read bit device in 16 points unit.	32 words (512 points)	○	01H/02H
	Read word device in 1 point unit.	64 points	○	03H/04H
BW	Write bit device in 1 point unit.	160 points	×	–
WW	Write bit device in 16 points unit.	10 words (160 points)	○	0FH
	Write word device in 1 point unit.	64 points	○	10H
BT	Designate device · device No. at random and set/reset bit device in 1 point unit.	20 points	×	–
WT	Designate device · device No. at random and set/reset bit device in 16 points unit.	10 words (160 points)	×	–
	Designate device · device nos. at random and set/reset word device in 1 point unit.	10 points	×	–
BM	Set the bit device to be monitored in 1 point unit.	40 points	×	–
WM	Set the bit device to be monitored in 16 points unit.	20 words (320 points)	×	–
	Set the word device to be monitored in 1 point unit.	20 points	×	–
MB	Monitor the device for which monitor data registration has been performed (in bit units).	–	×	–
MN	Monitor the device for which monitor data registration has been performed (in word units).	–	×	–
ER	Read the extension file register in 1 point unit.	64 points	×	–
EW	Write the extension file register in 1 point unit.	64 points	×	–
ET	Designate the block No. and the device No. at random and write in the extension file register in 1 point unit.	10 points	×	–
EM	Register the extension file register to be monitored in 1 point unit.	20 points	×	–
ME	Monitor the extension file register for which monitor data registration has been performed.	–	×	–
CR	Read the data in the buffer memory.	64 words	×	–
CW	Write data into the buffer memory.	64 words	×	–
TR	Read the contents of the buffer memory of the special function unit.	64 words	×	–
TW	Write data into the buffer memory of the special function unit.	64 words	×	–
MR	Read the main sequence program.	64 steps	×	–
SR	Read the sub sequence program.	64 steps	×	–
MW	Write in the main sequence program.	64 steps	×	–
SW	Write in the sub sequence program.	64 steps	×	–
UR	Read the main microcomputer program.	128 bytes	×	–
VR	Read the sub microcomputer program.	128 bytes	×	–
UW	Write in the main microcomputer program.	128 bytes	×	–
VW	Write in the sub microcomputer program.	128 bytes	×	–
KR	Read the comment data.	128 bytes	×	–
KW	Write in the comment data.	128 bytes	×	–
PR	Read the parameter contents.	128 bytes	×	–
PW	Write in the parameter contents.	128 bytes	×	–
PS	Cause the rewritten parameter contents to be acknowledged and checked.	–	×	–
RR RS	Request for remote RUN/STOP.	–	×	–
PC	Read the PC type.	–	×	–
GW	Turn ON/OFF the global signal.	1 point	×	–
On-demand	Send a send request from the sequencer CPU.	1760 words max.	×	–
TT	Wrap test	254 characters	○	08H

*: "○" commands supported by CP-9200SH, " × " commands that are not supported by CP-9200SH.

(Note) : Dedicated AnACPU commands are not supported. Use the common ACPU commands to access AnACPU. The extension register of AnACPU cannot be accessed.

Table 5.17 MELSEC Bit Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Start No.	Register No. *
X	X0000 to X07FF	Hexadecimal	02H : input relay	0 to 2047	MB000000 to MB00127F
Y	Y0000 to Y07FF	Hexadecimal	01H/0FH : coil	0 to 2047	MB000000 to MB00127F
M	M0000 to M2047	Decimal	01H/0FH : coil	2048 to 4095	MB001280 to MB00255F
L	L0000 to L2047				
S	S0000 to S2047				
M	M9000 to M9255	Decimal	01H/0FH : coil	4096 to 4351	MB002560 to MB00271F
B	B0000 to B03FF	Hexadecimal	01H/0FH : coil	4352 to 5375	MB002720 to MB00335F
F	F0000 to F0255	Decimal	01H/0FH : coil	5376 to 5631	MB003360 to MB00351F
TS	TS000 to TS255	Decimal	02H : input relay	2048 to 2303	MB001280 to MB00143F
TC	TC000 to TC255	Decimal	02H : input relay	2304 to 2559	MB001440 to MB00159F
CS	CS000 to CS255	Decimal	02H : input relay	2560 to 2815	MB001600 to MB00175F
CC	CC000 to CC255	Decimal	02H : input relay	2816 to 3071	MB001760 to MB00191F

* : Register No. offsets can be designated when using system functions such as "MSG-SND" or "MSG-RCV" for both the input relay and the coil.

Table 5.18 MELSEC Word Devices

Device	Device Range for Common ACPU Commands	Decimal/ Hexadecimal	MEMOBUS Command	Start No.	Register No. *
TN	TN111 to TN255	Decimal	04H : input register	0 to 255	MW00000 to MW00255
CN	CN000 to CN255	Decimal	04H : input register	256 to 511	MW00256 to MW00511
D	D0000 to D1023	Decimal	03H/10H : holding register	0 to 1023	MW00000 to MW01023
D (special)	D9000 to D9255	Decimal	03H/10H : holding register	1024 to 1279	MW01024 to MW01279
W	W0000 to W03FF	Hexadecimal	03H/10H : holding register	1280 to 2303	MW01280 to MW02303
R	R0000 to R8191	Decimal	03H/10H : holding register	2304 to 10495	MW02304 to MW10495

* : Register No. offsets can be designated when using system functions such as "MSG-SND" or "MSG-RCV" for both the input and hold registers.

(3) OMRON Communication

Table 5.19 OMRON Communication Specifications

	OMRON - General Specifications	OMRON Specs Supported by CP-9200SH
Transmission method	RS-232	RS-232
Synchronization method	Start-stop synchronization	Start-stop synchronization
Transmission speed	300/600/1200/2400/4800/9600	1200/2400/4800/9600/19200
Data format	Data : ASCII 7 bits JIS 8 bits Parity : odd, even, none Stop bit : 1 or 2 bits	Data : ASCII 7 bits JIS 8 bits Parity : odd, even, none Stop bit : 1 or 2 bits
Error detection	FCS (frame sequence check)	FCS (frame sequence check)
RTS/CTS control	with/without	with
Transmission protocol	Host link mode	Supported
	Downloading/uploading of user memory	Not supported
	No protocol (ASCII input/ output modes)	No protocol

Table 5.20 List of OMRON Commands

Header Code	Description	Number of points	Support*	MEMOBUS Command
RR	Read I/O relay/internal auxiliary relay area	256 words	○	01H
RL	Read LR area	64 words	×	–
RH	Read HR area	100 words	×	–
RC	Read current value area of timer/counter	512 words	×	–
RG	Read timer/counter count-up data	512 words	×	–
RD	Read DM area	2000 words	○	03H
RJ	Read auxiliary memory relay (AR) area	28 words	×	–
WR	Write-in I/O relay/internal auxiliary relay area	252 words	○	0FH
WL	Write-in LR area	64 words	×	–
WH	Write-in HR area	100 words	×	–
WC	Write-in current value area of timer/counter	512 words	×	–
WG	Write timer/counter countup data	512 words	×	–
WD	Write-in DM area	2000 words	○	10H
WJ	Write-in auxiliary memory relay (AR) area	28 words	×	–
R#	Read set value 1	–	×	–
R$	Read set value 2	–	×	–
W#	Set value modification 1	–	×	–
W$	Set value modification 2	–	×	–
MS	Read status	–	×	–
SC	Write status	–	×	–
MF	Read failure information	–	×	–
KS	Forced set	–	×	–
KR	Forced reset	–	×	–
FK	Forced multipoint set/reset	–	×	–
FR	Read forced multipoint set/reset condition	–	×	–
KC	forced set/cancel reset	–	×	–
MM	Read machine model code	–	×	–
TS	Test	–	○	08H
RP	Read program.	–	×	–
WP	Write in program	–	×	–
XZ	Abort or initialize (Command only)	–	×	–
IC	Command undefined error (response only)	–	○	Master function
QQ	Compound Command	–	×	–

* : "○" commands supported by CP-9200SH, " × " commands that are not supported by CP-9200SH.

Table 5.21 List of OMRON Relay Numbers

Name	Channel No.	Relay No.	MEMOBUS Command *1	Start No.	Register No. *2
I/O relay	000 to 039	00000 to 03915	01H/0FH	0 to 639	MB000000 to MB00039F
Internal auxiliary relay	040 to 246	04000 to 24615	01H/0FH	640 to 3951	MB000400 to MB00246F
Special auxiliary relay	247 to 255	24700 to 25507	01H/0FH	3952 to 4088	MB002470 to MB002557
Temporary memory relay (TR)	TR0 to 7		Not supported in CP-9200SH.		
Holding relay (HR)	HR00 to 99	HR0000 to 9915			
Auxiliary memory relay (AR)	AR00 to 27	AR0000 to 2715			
Link relay (LR)	LR00 to 63	LR0000 to 6315			
Timer/counter (TIM/CNT)	TIM/CNT000 to 511				
Data memory	0 to 9999	DM0000 to 9999	03H/10H	0000 to 9999	MW00000 to MW09999

*1 : MEMOBUS command 01H/0FH : coil
03H/10H : holding register

*2 : Register No. offsets can be designated when using system functions such as "MSG-SND" or "MSG-RCV" for both the input relay and the holding register.

5.3.5 CP-218IF Module

The CP-218IF Module is a module to connect the CP-9200SH to CP-218 related devices. It is equipped with one CP-218 communications port AUI (Attachment Unit Interface), and by the external transceiver, can be connected to 10Base5, 10Base2, or 10BaseT circuits. In addition, the CP-218 transmission system can be connected to the international standard Ethernet, and thus be easily linked with controllers, personal computers, and computers of other firms.
By connecting to a CP-717, engineering (Note) of the CP-317 is possible.

(Note) This function is available when the CPU module version and the CP-218IF module version are S030 and later and S0200 and later respectively.

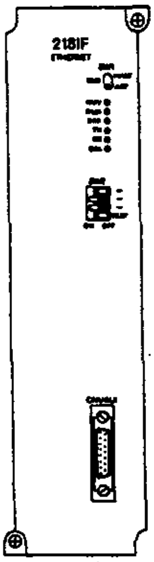


Fig. 5.18 Front of the 218IF Module

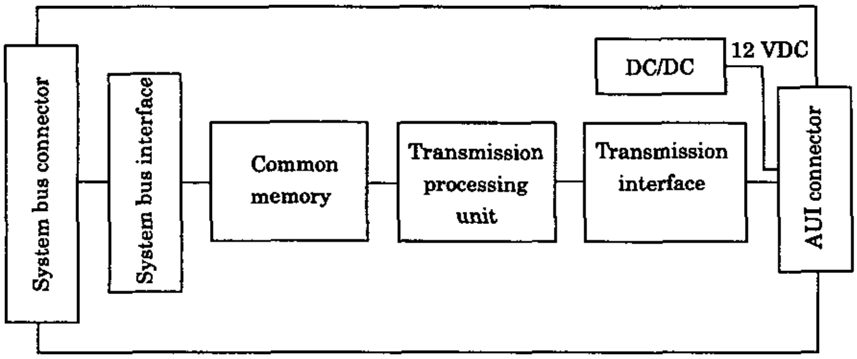
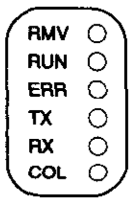


Fig. 5.17 Module Block Diagram of the 218IF

■ Indicating lamps

When the module is in normal operation, the RUN LED is lit and the ERR LED is unlit. When an error occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes. The TX1 LED and RX LED light when they send or receive data.



Indication	Name	Indicating color	Lighting Conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX	218 TX	Green	Lit during sending of data via CP-218.
RX	218 RX	Green	Lit during receiving of data via CP-218.
COL	COLLISION	Green	CP-218 shock detection

The conditions of the indicator lamps (LEDs) will be as shown in Table 5.22 when an error occu within the module.

Table 5.22 Indicating Lamps When Failure Occurs (LED)

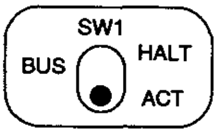
Error	Description of Error	Indicating Lamp (LED)			
		RUN	ERR	TX	RX
PROM	A PROM sumcheck error is detected during online self-diagnosis.	○	★ (1)	Depends on situatio	
Hardware error inside the module	A hardware error is detected during online self-diagnosis.	○	★ (2)	○	○
CPU interface error	A CPU and data transmission detected by online self diagnosis	○	★ (3)	○	○
Transmission error	Transmission data error	●	●	Depends on situatio	
Watchdog timer	Watchdog timer	○	●	Depends on situatio	

○ : Unlit, ● : Lit, ★ : Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

■ Setting Switches

·BUS switch (SW1)

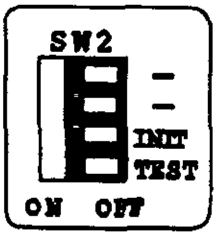
The BUS switch should be switched to the HALT side when replacing 218IF modules. During normal operation, it should be on the ACT side.



Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

·Dip switch (SW2)

This switch is used for self diagnosis. When shipped out, all dip switches are set to OFF (right).



Indication	Name	Condition	Operation
–	Unused		
–	Unused		
INIT	Initial startup	ON	Starts with the default IP address and engineering port No. (Note)
		OFF	Starts with the IP address and engineering port No. set at CP-717
TEST	TEST	ON	Self diagnosis
		OFF	(When started with TEST ON, a self diagnosis is performed.)

Note: The default values for the IP address and engineering port No. are "192, 168, 11" and "10000 (UDP)" respectively.

■ Arrangement of Connector Terminals

CP-218 AUI Connector (CN1/AUI)

No.	Signal	Remarks	No.	Signal	Remarks
1	GND	Shield ground	9	CI−	Collision detector signal (−)
2	CI+	Collision detection signal (+)	10	DO−	Send Data (−)
3	DO+	Send Data (+)	11	GND	Shield ground
4	GND	Shield ground	12	DI−	Data received (−)
5	DI+	Data received (+)	13	+12V	12 V power ground
6	PWRGND	12 V power ground	14	GND	Shield ground
7	N.C.	No connections	15	N.C.	No connections
8	GND	Shield ground			

For the connector, a DSUB-15 (slide latch) made by Hirose Electric Corporation is used.

For connections, use transceiver cables (for example: DAISET-158 made by Mitsubishi Electric Corporation) available on market.

Table 5.23 shows the specifications of the CP-218IF Module.

Table 5.23 Basic Transmission Specifications of the CP-218IF Module

Item	Specifications
Interface	AUI (Attachment Unit Interface) : DSUB-15 (Sliding latch)
Transmission distance	Total extensions 10Base 5 :500 m (Yellow Cable) 10Base2 :185 m (BNC coaxial cable) 10BaseT :100 m (Modular cable)
Transmission speed	10 Mbps
Transmission method	IEEE 802.03 CSMA/CD
Frame format	Ethernet Ver.2 (DIX specification)
Transmission protocol	TCP/UDP/IP/ARP
Max. number of nodes	10Base5: 100 units/segment 10Base2: 30 units/segment
Transmission mode	Message transmission
Max. number of transmission words	512 words (1024 bytes)
Transmission procedure	MEMOBUS (master/slave), MELSEC communication
Max. number of connections	20 connections (However, up to 10 connections at the same time. Switching the connections with the main program allows 20 connections to be used.)
Number of transmission words	Message transmission: 512 words (1024 bytes)

For the CP-218IF module, two standard functions are available: Yaskawa's MEMOBUS transmission protocol and MELSEC communication protocol for connection with the controller made by Mitsubishi Electric Corporation.

Table 5.24 MELSEC ACPU Common Commands

Command	Contents	No. of points	Availability *	MEMOBUS command
00H	Reads out the bit device in units of one point.	256	○	01H/02H
01H	Reads out the bit device in units of 16 points	128 words (2048)	×	–
	Reads out the word device in units of one point.	256	○	03H/04H/09H/0AH
02H	Writes the bit device in units of one point.	256	○	05H/0FH
03H	Writes the bit device in units of 16 points	40 words (640)	×	–
	Writes the word device in units of one point.	256	○	06H/0BH/10H
04H	Sets/Resets the bit device in units of one point by specifying a device No.	80	×	–
05H	Sets/Resets the bit device in units of 16 points by specifying a device No.	40 words (640)	×	–
	Sets/Resets the word device in units of one point by specifying a device No.	40	○	0EH
06H	Sets the bit device to be monitored in units of one point.	40	×	–
07H	Sets the bit device to be monitored in units of 16 points.	120 words (326)	×	–
	Sets the word device to be monitored in units of one point.	20	×	–
08H	Monitors the device that has been registered in monitor data (in bit units)	–	×	–
09H	Monitors the device that has been registered in monitor data (in word units)	–	×	–
17H	Reads out expansion file register in units of one point.	256	×	–
18H	Writes the expansion file register in units of one point.	256	×	–
19H	Writes the expansion file register in units of one point by specifying a block No. and a device No.	40	×	–

(continued)

(continued)

1AH	Registers the expansion file register to be monitored in the units of one point	20	×	–
1BH	Monitors the expansion file register that has been registered in the monitor data.	–	×	–
3BH	Reads out the expansion file register in units of one point by direct designation.	256	×	–
3CH	Writes the expansion file register in units of one point by direct designation.	256	×	–
0EH	Reads out the contents of the buffer memory of a specific function unit.	256 bytes (128 words)	×	–
0FH	Writes the contents of the buffer memory of a specific function unit.	256 bytes (128 words)	×	–
0AH	Reads out the main sequence program.	256 steps	×	–
0BH	Reads out the sub sequence program.	256 steps	×	–
0CH	Writes the main sequence program	256 steps	×	–
0DH	Writes the sub sequence program.	256 steps	×	–
1EH	Reads out the main micon program.	256 bytes	×	–
1FH	Reads out the sub-micon program.	256 bytes	×	–
20H	Writes the main micon program.	256 bytes	×	–
21H	Writes the sub-micon program.	256 bytes	×	–
1CH	Reads out the comment data.	256 bytes	×	–
1DH	Writes the comment data.	256 bytes	×	–
39H	Reads out the expansion comment data.	256 bytes	×	–
3AH	Writes the expansion comment data.	256 bytes	×	–
10H	Reads out the parameters.	256 bytes	×	–
11H	Writes the parameters.	256 bytes	×	–
12H	Recognizes/Checks the overwritten parameters.	–	×	–
13H	Requests for remote RUN/STOP	–	×	–
14H				
15H	Reads out the PC model name	–	×	–
16H	Loopback test	256 words	○	08H
60H	Fixed buffer communication	507 words	○	60H
61H	Reads out random access buffer communication.	508 words	○	61H
62H	Writes random access buffer communication.	508 words	○	62H

*: "○" indicates commands that are supported by the CP-9200SH; "×" indicates commands that are not supported.

Note: The commands exclusive to the AnACPU are not supported. For access to AnACPU, use ACPU common commands. It is not possible to access the expansion register of an AnACPU.

Table 5.25 MELSEC Bit Device

Device	ACPU common command device range	Decimal/ Hexadecimal	MEMOBUS command	Start No.	Register No. *
X	X0000 to X07FF	Hexadecimal	02H: Input relay	0 to 2047	MB000000 to MB00127F
Y	Y0000 to Y07FF	Hexadecimal	01H/0FH: Coil	0 to 2047	MB000000 to MB00127F
M	M0000 to M2047	Decimal	01H/05H/0FH: Coil	2048 to 4095	MB001280 to MB00255F
M	M9000 to M9255	Decimal	01H/05H/0FH: Coil	4096 to 4351	MB002560 to MB00271F
B	B0000 to B03FF	Hexadecimal	01H/05H/0FH: Coil	4352 to 5375	MB002720 to MB00335F
F	F0000 to F0255	Decimal	01H/05H/0FH: Coil	5376 to 5631	MB003360 to MB00351F
TS	TS000 to TS255	Decimal	02H: Input relay	2048 to 2303	MB001280 to MB00143F
TC	TC000 to TC255	Decimal	02H: Input relay	2304 to 2559	MB001440 to MB00159F
CS	CS000 to CS255	Decimal	02H: Input relay	2560 to 2815	MB001600 to MB00175F
CC	CC000 to CC255	Decimal	02H: Input relay	2816 to 3071	MB001760 to MB00191F

*: For register Nos., offset can be specified for both the input relay and the coil at CP-717.

Table 5.26 MELSEC Word Device

Device	ACPU common command device range	Decimal/ Hexadecimal	MEMOBUS command	Start No.	Register No. *
TN	TN000 to TN255	Decimal	04H/0AH: Input register	0 to 255	MW00000 to MW00255
CN	CN000 to CN255	Decimal	04H/0AH: Input register	256 to 511	MW00256 to MW00511
D	D0000 to D1023	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding register	0 to 123	MW00000 to MW01023
D (special)	D9000 to D9255	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding register	1024 to 1279	MW01024 to Mw01279
W	W0000 to W03FF	Hexadecimal	03H/06H/09H/0BH/0EH/ 10H: Holding register	1280 to 2815	MW01280 to MW02303
R	R0000 to R8191	Decimal	03H/06H/09H/0BH/0EH/ 10H: Holding register	2816 to 3071	MW02304 to MW10495

*: For register Nos., offset can be specified for the input register and the holding register by the system functions such as "MSG-SND" and "MSG-RCV".

5.3.6 CP-225IF Module

The CP-225IF module is a transmission module to connect the CP-9200SH to the CP-225 transmissi system. The CP-225 transmission system is a system used to connect Yaskawa's system controlle various I/O devices, and drive units. Not only system controllers such as the CP-3500H, the CP-32 and the CP-315 but also I/O devices such as the CP-820 and the CP-815 and motor drive units such the VS-680TV and the VS-686TV can be connected.

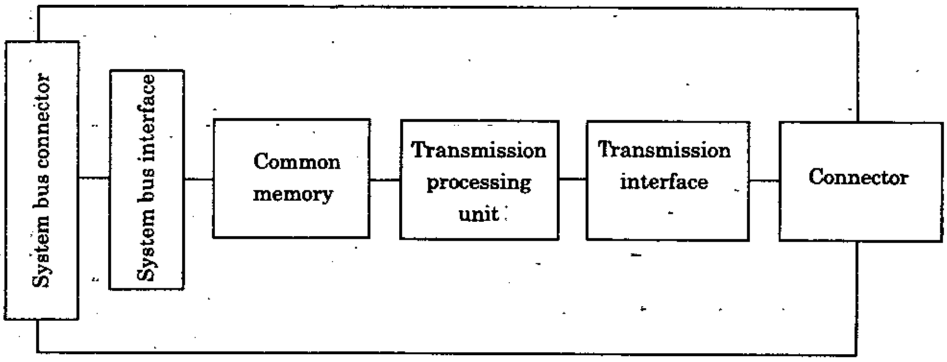


Fig. 5.19 Module Block Diagram of the 225IF

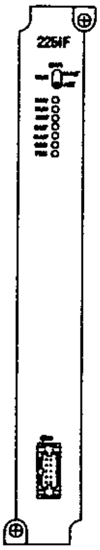
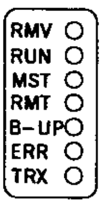


Fig. 5.20
Front of the 225IF Module

■ Indicating lamps

If the module is operating correctly, the RUN LED lights up and the ERR LED is unlit. When an err occurs, the RUN LED is unlit and the ERR LED lights up or flashes.



Indication	Name	Indicating color	Lighting Conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
MST	MASTER	Green	CP-225 master operating
RMT	REMOTE	Green	CP-255 remote operation
B-UP	BACKUP	Green	CP-225 backup operating
ERR	ERROR	Red	Error occurred
TRX	TRANSMIT/ RECEIVE	Green	CP-225 transmission data transmitting/receiving

Table 5.27 shows the status of the indicating lamps when an error occurs inside the module.

Table 5.27 Indicating Lamps When Failure Occurs

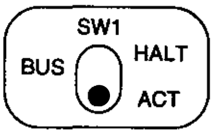
Error	Description of Error	Indicating Lamp (LED)		
		RUN	ERR	TRX
PROM sum check error	A PROM sum check error is detected during self-diagnosis when turning power ON.	○	★ (1)	○
Hardware error inside module	A hardware failure is detected during self-diagnosis when turning power ON.	○	★ (2/3/4)	○
Transmission error	An error is detected during standard transmission.	●	★ (3)	★
Watchdog timer	Watchdog timer over	○	★ (15)	○

○ : Unlit, ●: Lit, ★ : Flashing. The number in ( ) below ★ indicates the number of times the LED flashes.

Setting Switches

·BUS switch (SW1)

The BUS switch should be switched to the HALT side when replacing 225IF modules. During normal operation, it should be on the ACT side.



Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of Connector Terminals

CP-225IF Connector (CN1)

No.	Signal	Remarks	No.	Signal	Remarks
1	TRXD −	Send/receive data (−)	6	N.C.	Not connected
2	TRXD −	Send/receive data (−)	7	N.C.	Not connected
3	N.C.	Not connected	8	N.C.	Not connected
4	N.C.	Not connected	9	TRXD+	Send/receive data (+)
5	N.C.	Not connected	10	TRXD+	Send/receive data (+)

For the connectors, a PS-10PE-D4LT2-M2A, made by Japan Aviation Elec. Ind. is used.

For the cable side connector, use PS-D4C10 for the housing and 030-51307-001 (crimp: CT150-1G-PSSF) for a contact.

Table 5.28 shows the specifications of the CP-225IF module.

Table 5.28 CP-225IF Module Specification

Item	Specifications
Form of transmission line	Electric bus
Transmission line	Coaxial 75Ω 5C-2V type NC or 75Ω 2.5C-2V type G
Transmission distance	1 km/2 km (with repeaters)
Transmission speed	1 Mbps
Number of transmission words	1 K words
Transmission method	Time-division multiplexing (cyclic scanning) · High-speed scan 0 to 255 ms (varying every 1 ms) · Low-speed scan 0 to 150 ms (varying every 10 ms)
Data exchange	N:N
Transmission mode	Link transmission
Response	Approx. 90 words/10 ms
Number of stations to be connected	Total number of stations : 24 stations/bus Possible to extend the number of stations by connecting to a repeater (24 stations/repeater) : up to 10 repeaters can be connected Max. number of stations : 1 master station 28 remote stations

5.3.7 CP-2500IF Module

The CP-2500IF Module is a module to connect the CP-9200SH to CP-2500 related devices. It is equipp with one CP-2500 communication port. The CP-2500 transmission system is a high speed transmissi system which has long composed YASKAWA's industry-use transmission system. In addition to C 3500H, CP-3300, and other system controllers, a CP-5500, A, Sigma series mini computers can connected.

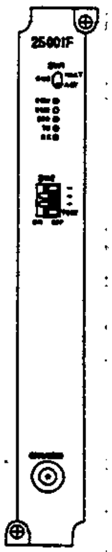


Fig. 5.22
Front of the 2500IF Module

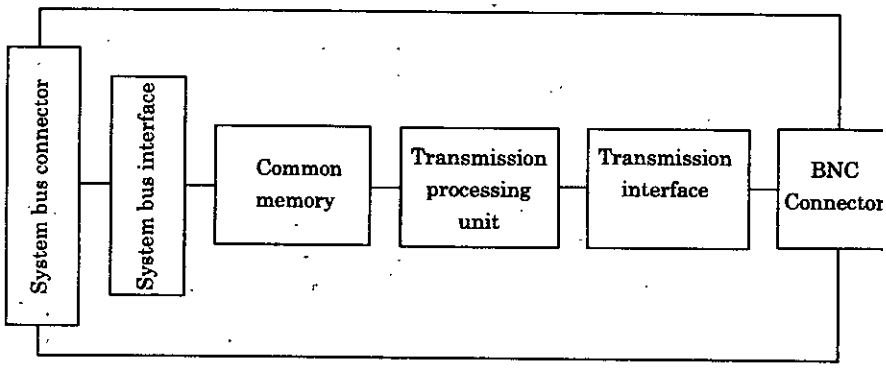
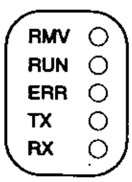


Fig. 5.21 Module Block Diagram of the 2500IF

■ Indicating lamps

If the module is operating normally, the RUN LED lights up and the ERR LED is off. When an error occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes. The TX LED and RX LED are respectively lamps for data transmission and reception.



Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.
TX	2500TX	Green	During sending of data via CP-2500.
RX	2500RX	Green	During receiving of data via CP-2500.

The conditions of the indicator lamps (LEDs) will be as shown in Table 5.29 when an error occurs within the module.

Table 5.29 Indicating Lamps When Failure Occurs (LED)

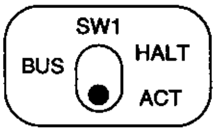
Error	Description of Error	Indicating Lamp (LED)			
		RUN	ERR	TX	RX
PROM sumcheck error	A PROM sumcheck error is detected during online self-diagnosis.	○	★ (1)	Depends on situation	
Hardware error inside the module	A hardware error is detected during online self-diagnosis.	○	★ (2)	○	○
CPU interface error	A CPU interface error is detected during online self-diagnosis.	○	★ (3)	○	○
Transmission error	An error is detected during ordinary transmission.	●	●	Depends on situation	
Watchdog timer	Watchdog timer	○	●	Depends on situation	

○: Unlit, ●: Lit, ★: Flashing. The number in ( ) below the ★ indicates the number of times the LED is flashed.

■ Setting Switch

· BUS switch (SW1)

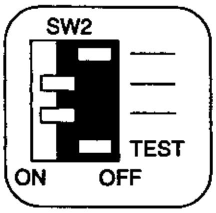
The BUS switch should be switched to the HALT side when replacing 2500IF modules. During normal operation, it should be on the ACT side.



Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

· Dip switch

When shipped out, all dip switches are set to OFF (right).
This switch is used for self diagnosis.



Indication	Name	Condition	Operation
–	Unused		
–	Unused		
–	Unused		
TEST	TEST	ON	Self-diagnosis (When started with TEST, a self diagnosis is performed.)
		OFF	Normal operating mode

■ Arrangement of Connector Terminals

The CP-2500 uses a BNC type coaxial cable connector.

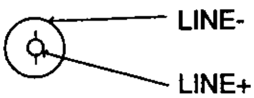


Table 5.30 shows the specifications of the CP-2500IF Module.

Table 5.30 Basic Transmission Specifications of the CP-2500IF Module

Item	Specifications
Form of transmission line	Electrical bus
Transmission line	BNC type coaxial cable connector (75Ω type)
Transmission distance	Total length For 4 Mbps : 800 m
Transmission speed	0.5/1/2/4Mbps(switchable by software)
Number of words transmitted	Link transmission : 1024 words Message transmission : 256 words
Transmission method	Token passing method
Data exchange	N : N
Transmission mode	Link transmission, Message transmission
Number of units connected	Total number of stations: 32 units (standard)

5.3.8 EXIOIF Module

The EXIOIF module is used for expansion of the CP-9200SH mounting base. The CP-9200SH is compos of MB-01 and MB-03 mounting bases with modules equipped, but when mounting modules are adde it is necessary to expand the mounting base. A maximum of four mounting bases can be added. T EXIOIF module should be mounted on each mounting base, and connected with a connecting cal between EXIOIF modules.

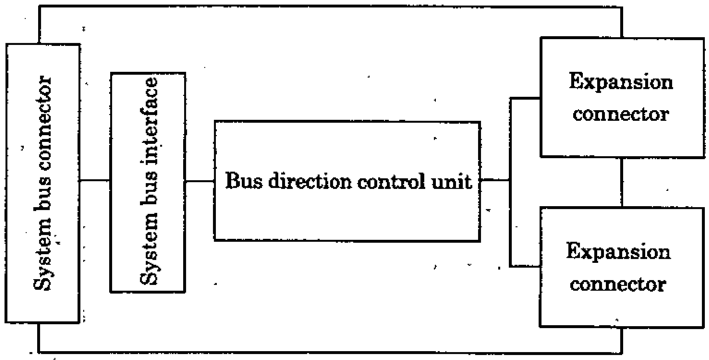
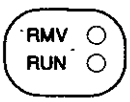


Fig. 5.23 Module Block diagram of the EXIOIF

Fig. 5.24
Front of the EXIOIF Module

■ Indicating lamps

When the module is operating normally, the RUN LED is lit.

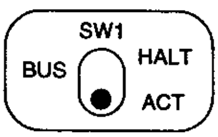


Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly

■ Setting Switch

- BUS switch (SW1)

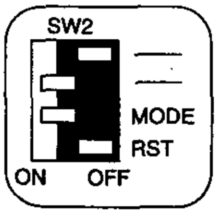
The BUS switch should be switched to the HALT side when replacing EXIOIF modules. During normal operation, it should be on the ACT side.



Indicator	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

- Dip switch (SW2)

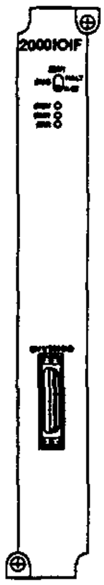
  SW2 sets the operating mode of the EXIOIF module. When troubles arise with the power supply to the expansion racks, the MODE switch sends a signal to the rack where the CPU is mounted, and can reset the CPU. When shipped, the MODE switch is OFF. Even if power supply problems to the expansion rack occur, the CPU continues to operate. If, due to problems in the expansion rack power supply, it becomes necessary to halt system operation, set the MODE switch ON.
  The RST switch resets EXIOIF module.



Indication	Name	Condition	Operation
–	Unused		
–	Unused		
MODE	MODE	ON	Entire system reset at expansion rack AC power failure
		OFF	Only the corresponding rack is reset at expansion rack AC power failure
RST	RESET	ON	Resets EXIOIF module
		OFF	Normal (operating) state

3.9 2000IOIF Modules

The 2000IOIF module is used for connecting 2000 series I/O to the CP-9200SH. It is connected to the IO BUF of the 2000 series I/O mounting base MB22A.
For details concerning the 2000 series I/O, refer to the MEMOCON-SC Users' Manuals.



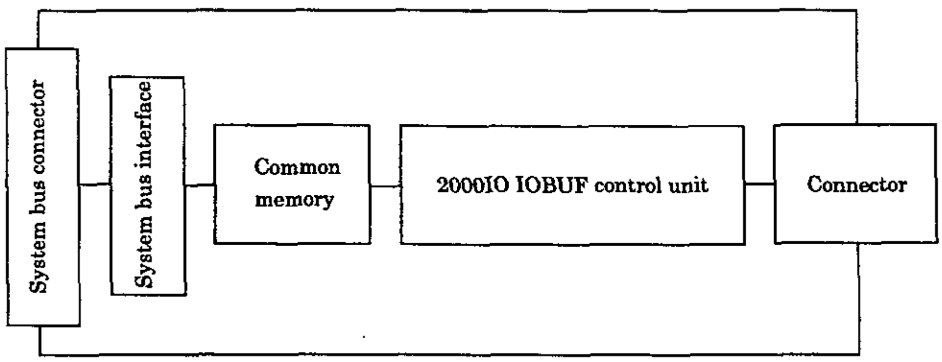
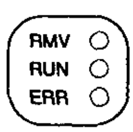


Fig. 5.25 Module Block Diagram of the 2000IOIF

Fig. 5.26
Front of the 2000IOIF Module

■ Indicating lamps

If the module is operating normally, the RUN LED lights up and the ERR LED is off. When an error occurs, the RUN LED becomes unlit and the ERR LED lights up or flashes.

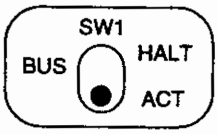


Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module.
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Lights up or flashes upon occurrence of error.

■ Setting Switch

· BUS Switch(SW1)

The BUS Switch should be switched to the HALT side when replacing 2000IOIF modules. During normal operation, it should be on the ACT side.

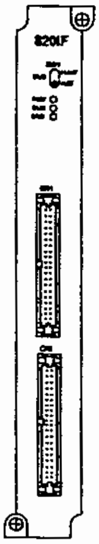


Indication	Name	Condition	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

5.3.10 820IF Module

The 820IF module is a local interface module used to connect the CP-9200SH to the CP-820, a proce I/O conversion unit.

Two types of 820IF modules are available: the 820IF module with a built-in terminator (product cod 87317-9020□) and the 820IF without a terminator (product code: 87317-9021□).



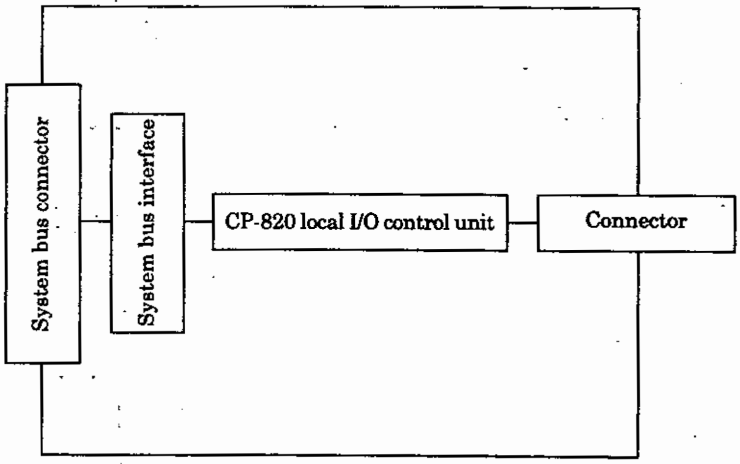
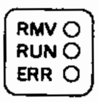


Fig. 5.27 Block Diagram of the 820IF Module

Fig. 5.28
Front of the 820IF Module

■ Indicating lamps

If the module is operating correctly, the RUN LED lights up and the ERR LED is unlit. When an error occurs, th RUN LED is unlit and the ERR LED lights up or flashes.

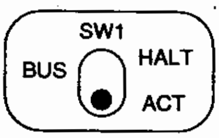


Indication	Name	Indicating color	Meaning
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Error occurred

■ Setting Switch

· BUS switch (SW1)

The BUS switch should be switched to the HALT side when replacing 225IF modules. During normal operation, it should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of Connector Terminals

820IF Connector (CN1/CN2)

No.	Signal	Remarks	No.	Signal	Remarks
1	GND	Grounding	2	GND	Grounding
3	INT −	Interrupt signal (−)	4	INT+	Interrupt signal (+)
5	ACK −	Acknowledge signal (−)	6	ACK+	Acknowledge signal (+)
7	INTACK −	Interrupt signal reset (−)	8	INTACK+	Interrupt signal reset (+)
9	GND	Grounding	10	GND	Grounding
11	IOCLK −	I/O clock (−)	12	IOCLK+	I/O clock (+)
13	ADP −	Data parity (−)	14	ADP+	Data parity (+)
15	AD00 −	Address/Data 00 (−)	16	AD00+	Address/Data 00 (−1)
17	AD01 −	Address/Data 01 (−)	18	AD01+	Address/Data 01 (−)
19	AD02 −	Address/Data 02 (−)	20	AD02+	Address/Data 02 (−)
21	AD03 −	Address/Data 03 (−)	22	AD03+	Address/Data 03 (−)
23	AD04 −	Address/Data 04 (−)	24	AD04+	Address/Data 04 (−)
25	AD05 −	Address/Data 05 (−)	26	AD05+	Address/Data 05 (−)
27	AD06 −	Address/Data 06 (−)	28	AD06+	Address/Data 06 (−)
29	AD07 −	Address/Data 07 (−)	30	AD07+	Address/Data 07 (−)
31	AD08 −	Address 08 (−)	32	AD08+	Address 08 (−)
33	I/O −	I/O change signal (−)	34	I/O+	I/O change signal (+)
35	C2 −	Sequence signal 2 (−)	36	C2+	Sequence signal 2 (+)
37	C1 −	Sequence signal 1 (−)	38	C1+	Sequence signal 1 (+)
39	P −	Control signal parity (−)	40	P+	Control signal parity (+)

Note: PS-40PE-D4LT1-M3 (made by Japan Aviation Elec. Ind.) is used as the connector.
For the cable side connector, use PS-40SM-D4P1-3D.

5.3.11 LIO-01 Module

The LIO-01 is equipped with 32 digital input points (DI) and 32 digital output points (DO). The I timing is such that input and output is performed on a regular cycle of each 9200SH CPU high-spe scan. 4 points of digital input can be used for interrupt signal by setting "interrupt" to "enable" at t module configuration screen.

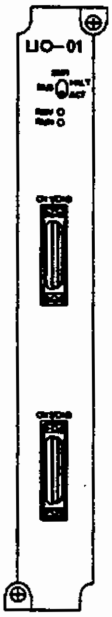


Fig. 5.26
Front of the LIO-01 Module

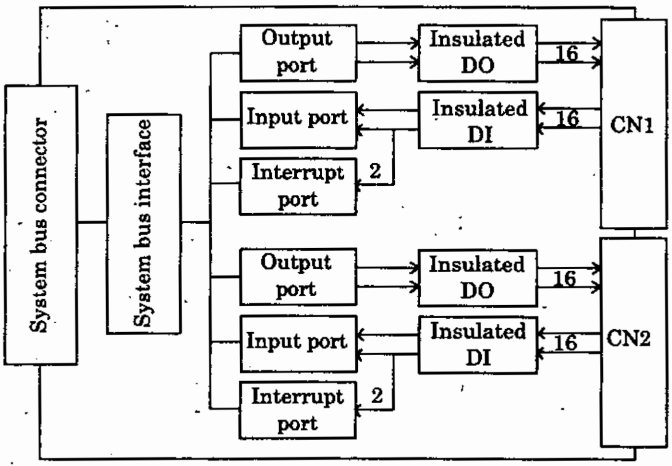
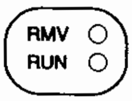


Fig. 5.25 Module Block Diagram of the LIO-01

■ Indicating lamps

When the module is operating normally, the RUN LED is lit.

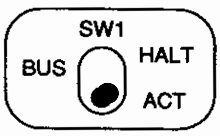


Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly

■ Setting Switch

· BUS switch (SW1)

The BUS switch should be switched to the HALT side when replacing LIO-01 modules. During normal operation, it should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of Connector Terminals

I/O connector (CN1/DIO)

No	Signal	Description	No	Signal	Description
1	+24V_0	24 V power source 0	26	N.C.	Not connected
2	DI_0	Digital input 0 (Interruption input)	27	DI_1	Digital input 1 (Interruption input)
3	DI_2	Digital input 2	28	DI_3	Digital input 3
4	DI_4	Digital input 4	29	DI_5	Digital input 5
5	DI_6	Digital input 6	30	DI_7	Digital input 7
6	+24V_1	24 V power source	31	N.C.	Not connected
7	DI_8	Digital input 8	32	DI_9	Digital input 9
8	DI_10	Digital input 10	33	DI_11	Digital input 11
9	DI_12	Digital input 12	34	DI_13	Digital input 13
10	DI_14	Digital input 14	35	DI_15	Digital input 15
11	N.C.	Not connected	36	N.C.	Not connected
12	DO_0	Digital output 0	37	DO_1	Digital output 1
13	DO_2	Digital output 2	38	DO_3	Digital output 3
14	N.C.	Not connected	39	GND_0	Common ground 0
15	N.C.	Not connected	40	N.C.	Not connected
16	DO_4	Digital output 4	41	DO_5	Digital output 5
17	DO_6	Digital output 6	42	DO_7	Digital output 7
18	N.C.	Not connected	43	GND_1	Common ground 1
19	DO_8	Digital output 8	44	DO_9	Digital output 9
20	DO_10	Digital output 10	45	DO_11	Digital output 11
21	N.C.	Not connected	46	GND_2	Common ground 2
22	N.C.	Not connected	47	N.C.	Not connected
23	DO_12	Digital output 12	48	DO_13	Digital output 13
24	DO_14	Digital output 14	49	DO_15	Digital output 15
25	N.C.	Not connected	50	GND_3	Common ground 3

Note: 10250-52A2JI (made by SUMITOMO 3M LTD.) is used as the connector.
MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.) should be used as connector on cable side.

I/O connector (CN2/DIO)

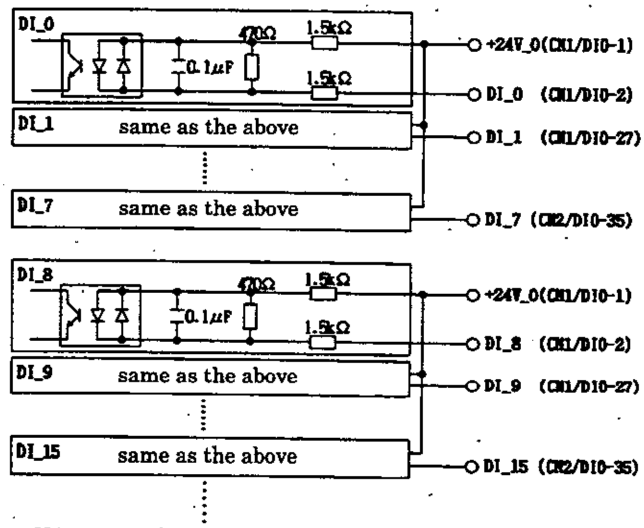
No	Signal	Description	No	Signal	Description
1	+24V_2	24 V power source 2	26	N.C.	Not connected
2	DI_16	Digital input 16 (Interruption input)	27	DI_17	Digital input 17 (Interruption input)
3	DI_18	Digital input 18	28	DI_19	Digital input 19
4	DI_20	Digital input 20	29	DI_21	Digital input 21
5	DI_22	Digital input 22	30	DI_23	Digital input 23
6	+24V_3	24 V power source 3	31	N.C.	Not connected
7	DI_24	Digital input 24	32	DI_25	Digital input 25
8	DI_26	Digital input 26	33	DI_27	Digital input 27
9	DI_28	Digital input 28	34	DI_29	Digital input 29
10	DI_30	Digital input 30	35	DI_31	Digital input 31
11	N.C.	Not connected	36	N.C.	Not connected
12	DO_16	Digital output 16	37	DO_17	Digital output 17
13	DO_18	Digital output 18	38	DO_19	Digital output 19
14	N.C.	Not connected	39	GND_4	Common ground 4
15	N.C.	Not connected	40	N.C.	Not connected
16	DO_20	Digital output 20	41	DO_21	Digital output 21
17	DO_22	Digital output 22	42	DO_23	Digital output 23
18	N.C.	Not connected	43	GND_5	Common ground 5
19	DO_24	Digital output 24	44	DO_25	Digital output 25
20	DO_26	Digital output 26	45	DO_27	Digital output 27
21	N.C.	Not connected	46	GND_6	Common ground 6
22	N.C.	Not connected	47	N.C.	Not connected
23	DO_28	Digital output 28	48	DO_29	Digital output 29
24	DO_30	Digital output 30	49	DO_31	Digital output 31
25	N.C.	Not connected	50	GND_7	Common ground 7

Note: 10250-52A2JI (made by SUMITOMO 3M LTD.) is used as the connector.
MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.) should be used as connector on cable side.

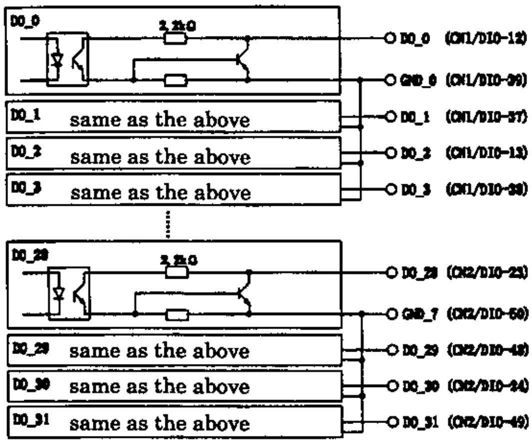
Basic unit digital I/O (DI/DO)

Assign digital input (DI) to input (I) register and digital output (DO) to output (O) register. The registers a assigned at the module configuration screen of CP-717.

(1) Digital input (DI) Specifications

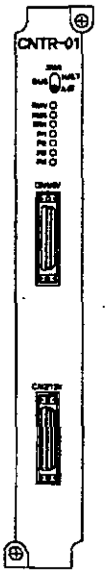
Item	Specifications
Number of inputs	32 Points (DI_0 to DI_31)
Input type	Current source input, common at the power side (+24 VDC), photocoupler isolation
Input voltage	+24 VDC ± 20 %
Input current	7 mA (TYP)
Input impedance	3 k Ω
Response time	ON response time : 1 ms or less, OFF response time : 1 ms or less
ON/OFF voltage	OFF voltage : 5 V or less, ON voltage : +15 V or more
Digital input circuit	 24 V input results in a 8 point common.

(2) Digital output (DO) Specifications

Item	Specifications
Number of output circuits	32 points (DO_0 to DO_31)
Output circuit	Open collector output (current sink type) Photocoupler isolation
Rated voltage/current	+24 VDC ± 20 % 50 mA max.
Response time (when the OUT Instruction is used)	ON response time: 1 ms or less OFF response time: 1 ms or less
Digital output circuit	 GND results in a 4 point common.

5.3.12 CNTR-01 Module

The CNTR-01 module is equipped with 4 points of pulse input (PI).
Either 5 V differential type pulse or 12 V voltage type pulse can be taken in for each channel.
For 5 V differential type, connect to CN1, and for 12 V voltage type, to CN2.
Since the CNTR-01 module has a latch input signal, the counter value can be latched when the latc signal is generated. Also, with its coincident detection signal output function, it can output to an extern device as well as CPU recognizes when the internally set value coincides the counter count value.
The count data is input in a constant cycle every scan (high-speed/low-speed) of CPU-01 module. / this moment, the scanning is the same for all 4 channels. The channels to be used can be selected b setting USE or NOT USE for each channel, therefore, the processing time of the CNTR-01 module an CPU-01 module can be shortened.



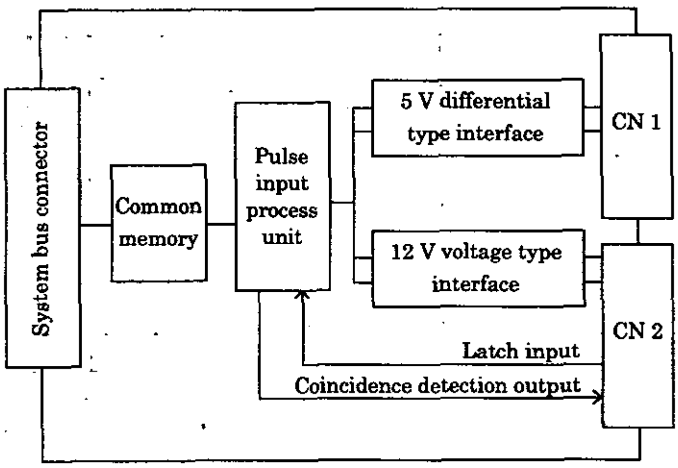
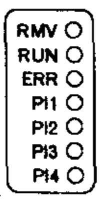


Fig. 5.31 Module Block Diagram of the CNTR-01

Fig. 5.32
Front of the CNTR-01 Module

■ Indicating lamps

If the module is operating correctly, the RUN LED lights up and the ERR LED is unlit. When a error occurs, the ERR LED lights up or flashes. PI1, PI2, PI3, and PI4 light up when the count u down is detected at each channel (CH).



Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
ERR	ERROR	Red	Error occurred
PI1	Pulse input 1	Green	CH1 counter pulse inputting
PI2	Pulse input 2	Green	CH2 counter pulse inputting
PI3	Pulse input 3	Green	CH3 counter pulse inputting
PI4	Pulse input 4	Green	CH4 counter pulse inputting

Table 5.31 shows the statuses of the indicating lamps when an error occurs inside the module.

Table 5.31 Indicating Lamps when Error Occurs

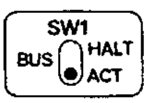
Error	Description of Error	Indicating Lamp (LED)		
		RUN	ERR	PI1 to PI4
ROM diagnosis error	A ROM diagnosis error is detected during online self-diagnosis.	●	★ (1)	Depending on the condition
RAM diagnosis error	A RAM diagnosis error is detected during online self-diagnosis.	●	★ (2)	Depending on the condition
Common memory diagnosis error	A common memory diagnosis error is detected during online self-diagnosis.	●	★ (3)	Depending on the condition
CPU built-in timer diagnosis error	A CPU built-in timer diagnosis error is detected during online self-diagnosis.	●	★ (4)	Depending on the condition
Timer diagnosis error	A timer diagnosis error is detected during online self-diagnosis.	●	★ (5)	Depending on the condition
General unjustified instruction interruption	A general unjustified instruction interruption is detected during online self-diagnosis.	○	★ (1)	Depending on the condition
Slot unjustified instruction interruption	A slot unjustified instruction interruption is detected during online self-diagnosis.	○	★ (2)	Depending on the condition
CPU address error interruption	A CPU address error interruption is detected during online self-diagnosis.	○	★ (3)	Depending on the condition
DMA address error interruption	A DMA address error interruption is detected during online self-diagnosis.	○	★ (4)	Depending on the condition
User brake interruption	A user brake interruption is detected during online self-diagnosis.	○	★ (5)	Depending on the condition
Trap instruction interruption	A trap instruction interruption is detected during online self-diagnosis.	○	★ (6)	Depending on the condition
Watchdog timer time over	A watchdog timer time-over is detected during online self-diagnosis.	●	★ (15)	Depending on the condition

○ : Unlit, ● : Lit, ★ : Flashing. The number in ( ) below ★ indicates the number of times the LED flashes.

■ Setting Switch

· BUS switch (SW1)

The BUS switch should be switched to the HALT side when replacing CNTR-01 modules. During standard operation, it should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of Connector Terminals

I/O Connector (CN1/5 V)

No.	Signal	Remarks	No.	Signal	Remarks
1	N.C.	Not connected	26	N.C.	Not connected
2	N.C.	Not connected	27	N.C.	Not connected
3	+5PA1	+5 V A-pulse input (+) (CH1)	28	−5PA1	+5 V A-pulse input (−) (CH1)
4	+5PB1	+5 V B-pulse input (+) (CH1)	29	−5PB1	+5 V B-pulse input (−) (CH1)
5	+5PC1	+5 V C-pulse input (+) (CH1)	30	−5PC1	+5 V C-pulse input (−) (CH1)
6	GND	Common grounding	31	GND	Common grounding
7	N.C.	Not connected	32	N.C.	Not connected
8	N.C.	Not connected	33	N.C.	Not connected
9	+5PA2	+5 V A-pulse input (+) (CH2)	34	−5PA2	+5 V A-pulse input (−) (CH2)
10	+5PB2	+5 V B-pulse input (+) (CH2)	35	−5PB2	+5 V B-pulse input (−) (CH2)
11	+5PC2	+5 V C-pulse input (+) (CH2)	36	−5PC2	+5 V C-pulse input (−) (CH2)
12	GND	Common grounding	37	GND	Common grounding
13	N.C.	Not connected	38	N.C.	Not connected
14	+5PA3	+5 V A-pulse input (+) (CH3)	39	−5PA3	+5 V A-pulse input (−) (CH3)
15	+5PB3	+5 V B-pulse input (+) (CH3)	40	−5PB3	+5 V B-pulse input (−) (CH3)
16	+5PC3	+5 V C-pulse input (+) (CH3)	41	−5PC3	+5 V C-pulse input (−) (CH3)
17	GND	Common grounding	42	GND	Common grounding
18	N.C.	Not connected	43	N.C.	Not connected
19	N.C.	Not connected	44	N.C.	Not connected
20	+5PA4	+5 V A-pulse input (+) (CH4)	45	−5PA4	+5 V A-pulse input (−) (CH4)
21	+5PB4	+5 V B-pulse input (+) (CH4)	46	−5PB4	+5 V B-pulse input (−) (CH4)
22	+5PC4	+5 V C-pulse input (+) (CH4)	47	−5PC4	+5 V C-pulse input (−) (CH4)
23	GND	Common grounding	48	GND	Common grounding
24	N.C.	Not connected	49	N.C.	Not connected
25	N.C.	Not connected	50	N.C.	Not connected

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

I/O Connector (CN2/12 V)

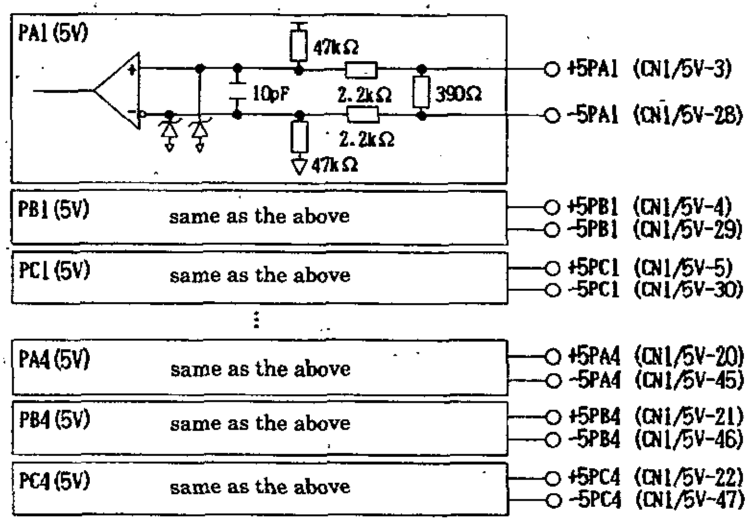
No.	Signal	Remarks	No.	Signal	Remarks
1	GND	Common grounding (for coincidence detection)	26	GND	Common grounding (for coincidence detection)
2	COIN1	Coincident output (CH1)	27	COIN2	Coincident output (CH2)
3	COIN3	Coincident output (CH3)	28	COIN4	Coincident output (CH4)
4	N.C.	Not connected	29	N.C.	Not connected
5	+24 V	24 V power supply for PI latch	30	+24 V	24 V power supply for PI latch
6	PIL1	CH1 PI latch input	31	PIL2	CH2 PI latch input
7	PIL3	CH3 PI latch input	32	PIL4	CH4 PI latch input
8	N.C.	Not connected	33	N.C.	Not connected
9	+12PA1	+12 V A-pulse input (+) (CH1)	34	−12PA1	+12 V A-pulse input (−) (CH1)
10	+12PB1	+12 V B-pulse input (+) (CH1)	35	−12PB1	+12 V B-pulse input (−) (CH1)
11	+12PC1	+12/24 V C-pulse input (+) (CH1)	36	−12PC1	+12 V C-pulse input (−) (CH1)
12	N.C.	Not connected	37	−24PC1	+24 V C-pulse input (−) (CH1)
13	+12PA2	+12 V A-pulse input (+) (CH2)	38	−12PA2	+12 V A-pulse input (−) (CH2)
14	+12PB2	+12 V B-pulse input (+) (CH2)	39	−12PB2	+12 V B-pulse input (−) (CH2)
15	+12PC2	+12/24 V C-pulse input (+) (CH2)	40	−12PC2	+12 V C-pulse input (−) (CH2)
16	N.C.	Not connected	41	−24PC2	+24 V C-pulse input (−) (CH2)
17	N.C.	Not connected	42	N.C.	Not connected
18	+12PA3	+12 V A-pulse input (+) (CH3)	43	−12PA3	+12 V A-pulse input (−) (CH3)
19	+12PB3	+12 V B-pulse input (+) (CH3)	44	−12PB3	+12 V B-pulse input (−) (CH3)
20	+12PC3	+12/24 V C-pulse input (+) (CH3)	45	−12PC3	+12 V C-pulse input (−) (CH3)
21	N.C.	Not connected	46	−24PC3	+24 V C-pulse input (−) (CH3)
22	+12PA4	+12 V A-pulse input (+) (CH4)	47	−12PA4	+12 V A-pulse input (−) (CH4)
23	+12PB4	+12 V B-pulse input (+) (CH4)	48	−12PB4	+12 V B-pulse input (−) (CH4)
24	+12PC4	+12/24 V C-pulse input (+) (CH4)	49	−12PC4	+12 V C-pulse input (−) (CH4)
25	N.C.	Not connected	50	−24PC4	+24 V C-pulse input (−) (CH4)

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

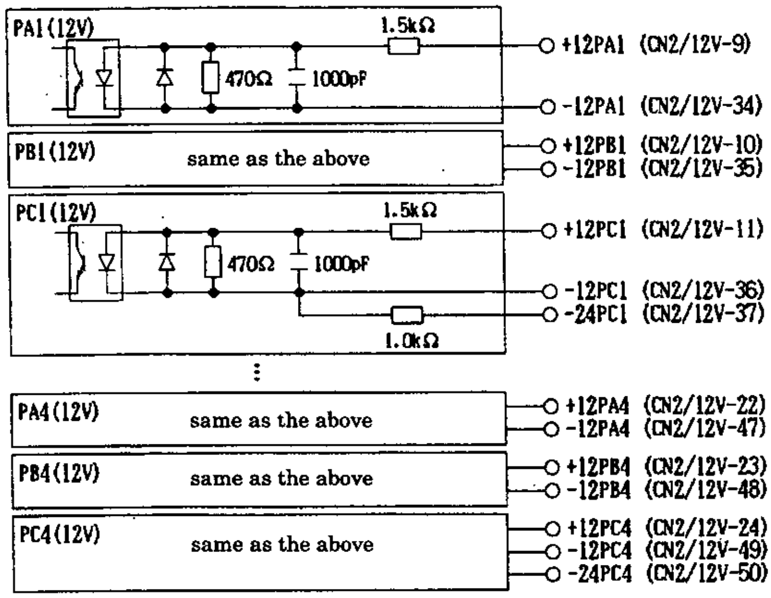
■ Pulse input (PI)

The pulse inputs (PI) are assigned to the input (I) registers IW0000 to IW0064. The registers a assigned in the module configuration screen of CP-717.

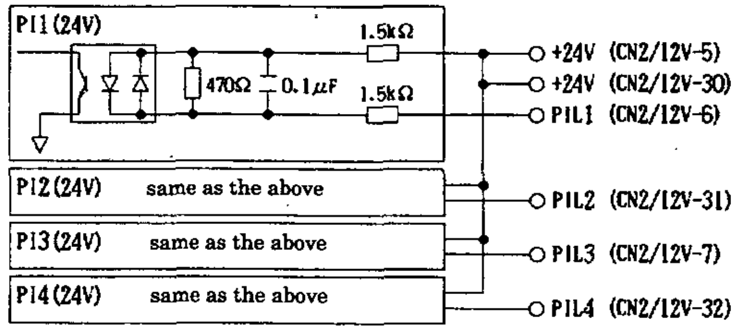
Pulse Input (CN1/+5 V differential type) Specifications

Item	Specifications
Number of input circuits	4 points
Input type	A/B/C pulse input, RS-422
Input voltage	Max. 5 V between terminals
Input current	12 mA (TYP.)
Input impedance	390Ω
Counting method	Selectable among 1, 2, and 4 multiplication, AB method, Sign method (by software switching)
Counter	Reversible counter, Interval counter, frequency measurement, coincidence detection
Max. frequency	1 MHz
Pulse input circuit	

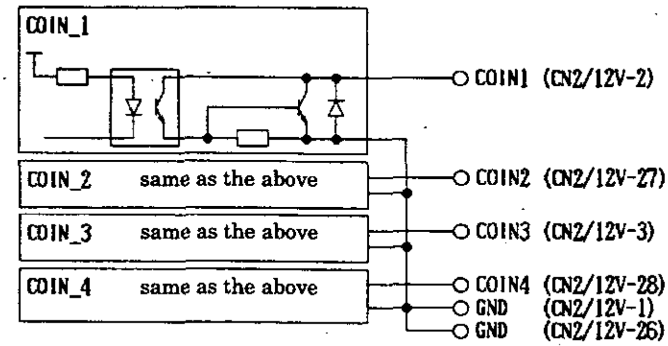
Pulse Input (CN2/12 V voltage type) Specifications

Item	Specifications
Number of input circuits	4 points
Input type Input voltage	Photocoupler insulation. A/B/C pulse input Max. 12 V between terminals (Max. 24 V only for C-pulse 24 V input terminals)
Input current Input impedance	7 mA (TYP.) (10 mA only for C-pulse 24 V input terminals) 1.5 kΩ (2.5 kΩ only for C-pulse 24 V input terminals)
Counting method	Selectable among 1, 2, and 4 multiplication, AB method, Sign method (by software switching)
Counter	Reversible counter, interval counter, frequency measurement, coincidence detection
Max. frequency	120 kHz
Pulse input circuit	

Latch Input Specifications

Item	Specifications
Number of input circuits	4 points
Input type	Current source input, common on power supply (+24 VDC) sides, photocoupler insulation
Input voltage	+24 VDC±20 %
Input current	7 mA (TYP.)
Input impedance	3 kΩ
Response time	ON response time: 1 ms or less OFF response time: 1 ms or less
ON/OFF voltage	OFF voltage: 5 V or less ON voltage: +15 V or more
Latch input circuit	

Coincident Output Specifications

Item	Specifications
Number of output circuits	4 points
Output circuit	Open-collector output (current sink output) Photocoupler insulation
Rated voltage/current	+ 24 VDC±20 % Max. 50 mA
Response time (When OUT instruction is used)	ON response time: 1 ms or less OFF response time: 1 ms or less
Coincident output circuit	

■ Pulse input (PI) counting methods

The counters shown in Table 5.32 are available.

Table 5.32 Counting Methods

Counter	Pulse counting methods *1	Multiplication*2	C-pulse function
Reversible counter	Sign method	×1	Stops counting during C-pulse input
		×2	
	A/B method	×1	
		×2	
		×4	
	UP/DOWN method	×1	
		×2	
Interval counter	Sign method	×1	Latches the count result at rising edge of C-pulse and the counter is reset.
		×2	
	A/B method	×1	
		×2	
		×4	
	UP/DOWN method	×1	
		×2	
Frequency measurement	Sign method	×1	C-pulse is not used (C-pulse is invalid)
		×2	
	A/B method	×1	
		×2	
		×4	
	UP/DOWN method	×1	
		×2	

*1: Pulse counting method

- Sign method
  (Positive logic)
  UP count by A-pulse input when B-pulse input is "LOW" (positive in frequency measurement)
  DOWN count by A-pulse input when B-pulse input is "HIGH" (negative in frequency measurement)
  (Negative logic)
  UP count by A-pulse input when B-pulse input is "HIGH" (positive in frequency measurement)
  DOWN count by A-pulse input when B-pulse input is "LOW" (negative in frequency measurement)

- A/B method
  (Positive logic with 12V pull up collector input)
  UP count when A-pulse input phase leads B-pulse (positive in frequency measurement)
  DOWN count when A-pulse input phase lags B-pulse (negative in frequency measurement)
  (Positive logic with 5V differential input)
  UP count when A-pulse input phase lags B-pulse (positive in frequency measurement)
  DOWN count when A-pulse input phase leads B-pulse (negative in frequency measurement)
  (Negative logic with 12V pull up collector input)
  UP count when A-pulse input phase leads B-pulse 0 (positive in frequency measurement)
  DOWN count when A-pulse input phase lags B-pulse 0 (negative in frequency measurement)
  (Negative logic with 5V differential input)
  UP count when A-pulse input phase lags B-pulse 0 (positive in frequency measurement)
  DOWN count when A-pulse input phase leads B-pulse 0 (negative in frequency measurement)

  Note: With the 12V pull up collector input and the 5V differential input, "lead" and "lag" of the phase are reversed.

- UP/DOWN method
  (Positive and Negative logic)
  A-pulse input is addition pulses (positive in frequency measurement)
  B-pulse input is subtraction pulses (negative in frequency measurement)

*2: Multiplication

(Positive logic)

×1: Counts at rising edge of A-pulse

×2: Counts at rising and falling edges of A-pulse

×4: Counts at rising and falling edges of A and B pulses

(Negative logic)

×1: Counts at falling edge of A-pulse

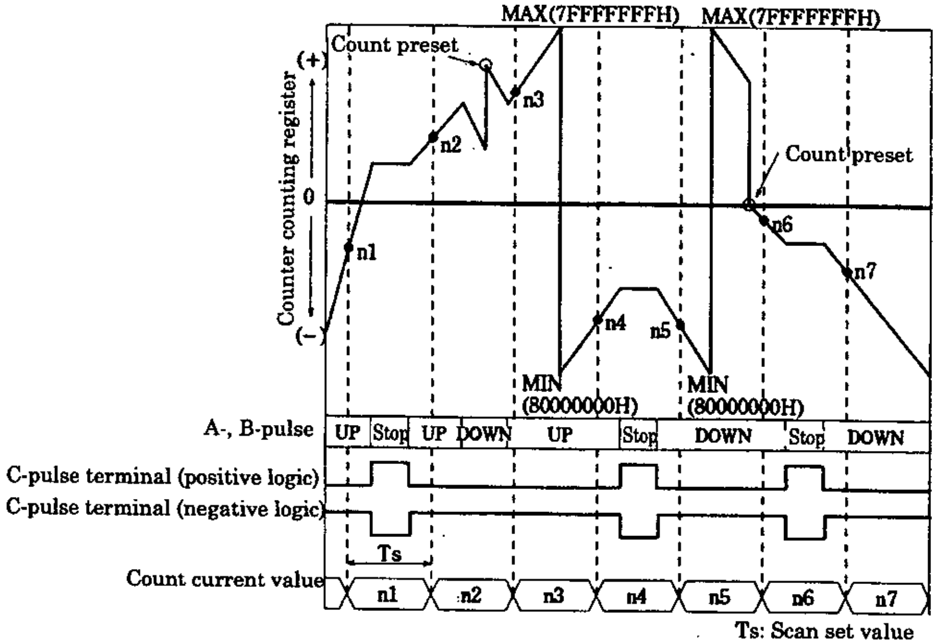
×2: Counts at falling and rising edges of A-pulse

×4: Counts at falling and rising edges of A and B pulses

Table 5.33 Timing of External Input Pulse

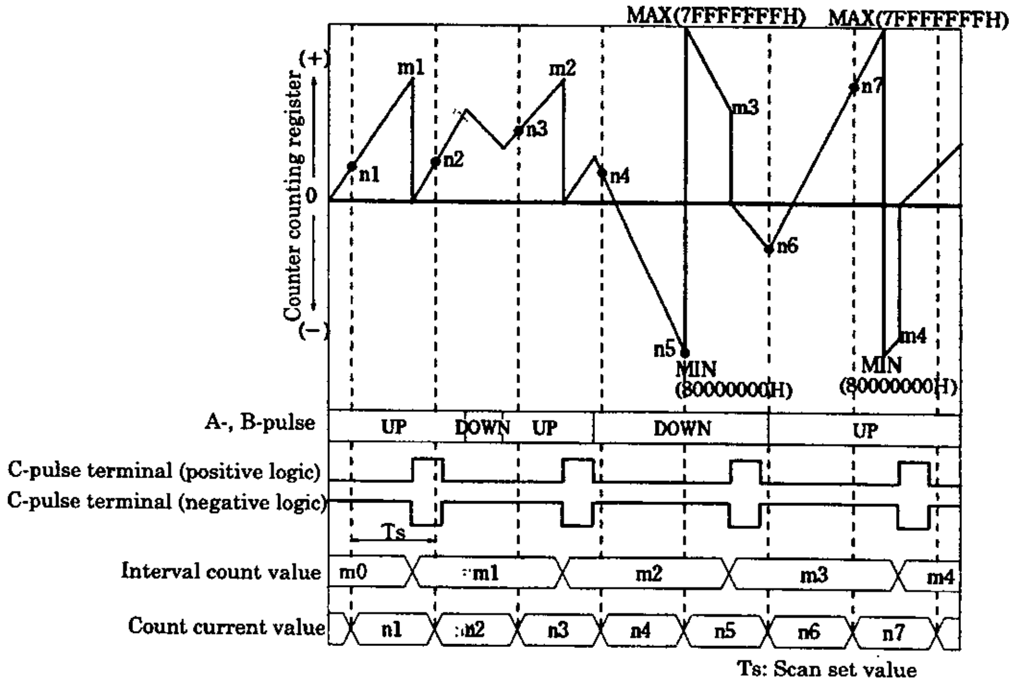
Pulse counting method		Polarity	UP count (forward rotation)		DOWN count (reversed rotation)	
Sign method	×1	Positive logic	A-pulse		A-pulse	
			B-pulse	LOW	B-pulse	HIGH
		Negative logic	A-pulse		A-pulse	
			B-pulse	HIGH	B-pulse	LOW
	×2	Positive logic	A-pulse		A-pulse	
			B-pulse	LOW	B-pulse	HIGH
		Negative logic	A-pulse		A-pulse	
			B-pulse	HIGH	B-pulse	LOW
A/B method (with 12 V pull up collector input)	×1	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
	×2	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
	×4	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
A/B method (with 5 V differential input)	×1	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
	×2	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
	×4	Positive logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
		Negative logic	A-pulse		A-pulse	
			B-pulse		B-pulse	
UP/DOWN method	×1	Positive logic	A-pulse		A-pulse	Fixed to LOW or HIGH
			B-pulse	Fixed to LOW or HIGH	B-pulse	
		Negative logic	A-pulse		A-pulse	Fixed to LOW or HIGH
			B-pulse	Fixed to LOW or HIGH	B-pulse	
	×2	Positive logic	A-pulse		A-pulse	Fixed to LOW or HIGH
			B-pulse	Fixed to LOW or HIGH	B-pulse	
		Negative logic	A-pulse		A-pulse	Fixed to LOW or HIGH
			B-pulse	Fixed to LOW or HIGH	B-pulse	

Reversible counter function



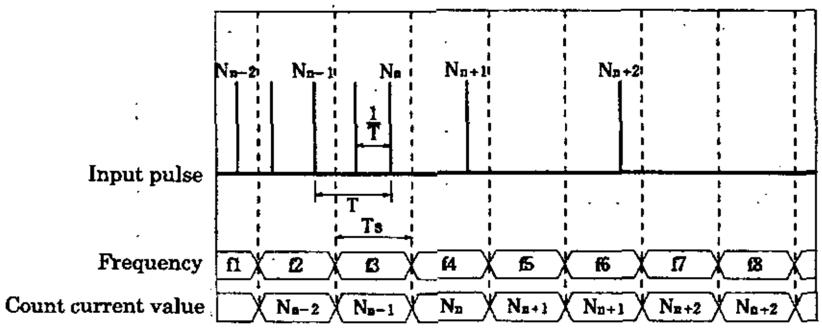
The reversible counter counts UP/DOWN by A- and B-pulse inputs.
The counting is stopped during C-pulse input.
By the output register (command setting bit), the count value preset and the counting disabled can be set.
The count current value is stored into the input register (hardware counter current value) every high-speed (low-speed) scan.

Interval counter function



The interval counter counts UP/DOWN by A- and B-pulse input.
The count value is latched at the rising edge of C-pulse and the count is reset. The latched data is stored into the input register (interval data count value) every high-speed (low-speed) scan. Also, the count current value is stored into the input register (hardware counter current value). By the output register (command setting bit), the counting disabled can be set.

Frequency measurement function



The frequency measurement function counts the frequency by A- and B-pulse train.
The frequency is stored into the input register (detected frequency) every high-speed (low-speed) sca
Also, the count current value is stored in the input register (hardware counter current value).

[Frequency measurement theory]

A frequency can be obtained in the following formula.

$$f = \frac{Nn - Nn_{-1}}{T} \times \text{MULT}$$

Where Nn_{-1}, Nn : Count current value of input pulse every high-speed (low-speed) scan
T : Time between input pulses (measuring units: 8 MHz = 0.125 μ s)
MULT : Frequency count (set at the fixed parameter)

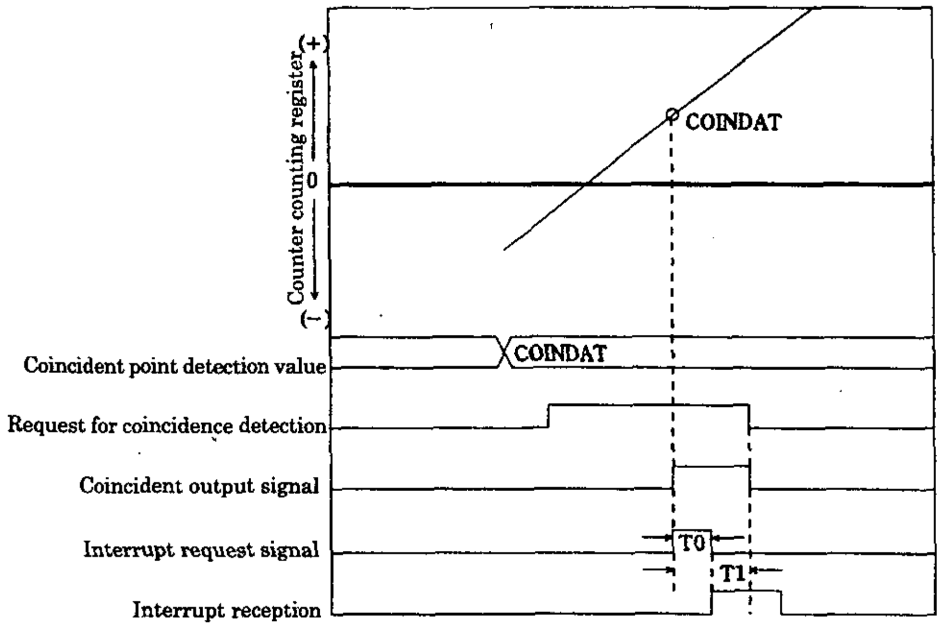
Note: Frequency count accuracy $= \pm \dfrac{1}{8\text{ MHz} \times \text{Ts}}$

For example, with high-speed scan 10 ms, $\pm \dfrac{1}{8\text{ MHz} \times 10\text{ ms}} = \pm \dfrac{1}{40000} = \pm 0.00125\ \%$

Where Ts: High-speed (low-speed) scan set value

When 1 pulse or more is input within the counting cycle, the above formula is valid, however, when
pulse is input, the value estimated from the previous frequency is taken as the calculation result.
The true value is calculated with the counting cycle where the pulse is input.

Coincident output/interrupt function



T0: Maximum time (approx. 70 to 120 μs) from the moment CPU module receives INT signal until the interrupt process starts.

T1: Maximum time from the moment an interrupt request signal is received until the execution of DWG.I starts.

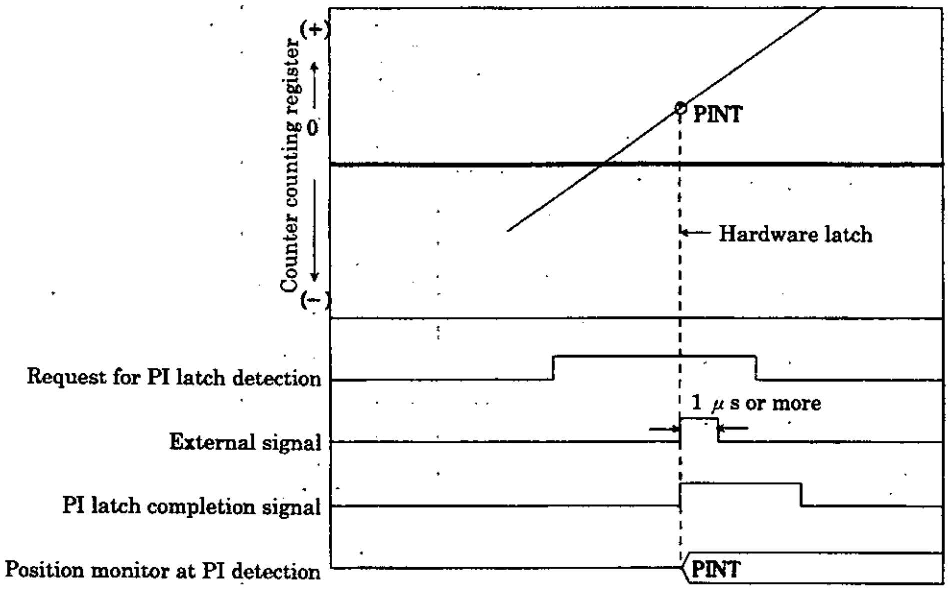
At execution of standard program: approx. 90 to 170 μs

At execution of direct I/O instruction: approx. 90 to (1460 +40×N) μs

N: number of direct I/O words (Max. 8)

The coincident output/interrupt function outputs externally a coincident output signal (DO) and an interrupt signal to the CPU module when the counter current value coincides the pre-set output register (coincidence detection set value).
The coincident output function is valid when the "coincidence detection function selection" of fixed parameter is set to "Use". When the coincident interrupt function is valid, the coincident output function is valid as well.
The coincident output/interrupt function can be used in any of reversible counter, interval counter, and frequency measurement.

PI latch function



The PI latch function latches the current position when an external signal is input (detected at risi edge) and stores in the storage register.
For external signal, specific discrete input (PI input) or C-pulse input can be used.
Specify the external signal at the fixed parameter "PI latch detection signal selection". (This functi can be used only in reversible counter.)

Fixed parameters

Table 5.34 Fixed Parameters

No.	Name	Contents	Default value
-	Head register No.	Specifies the head No. of I/O registers to be used at each channel. Without specification, the channel is not used.	
1	A/B pulse signal form selection	Specifies A/B pulse input signal form: +5 V differential input or +12 V collector input.	+5 V differential input
2	C-pulse signal form selection	Specifies C-pulse input signal form: +5 V differential input, +12 V collector input or 24 V input	+5 V differential input
3	A/B pulse signal polarity selection	Specifies A/B pulse polarity: positive logic or negative logic	Positive logic
4	C-pulse signal polarity selection	Specifies C-pulse polarity: positive logic or negative logic	Positive logic
5	Pulse counting method selection	Selects a pulse counting method. · Sign ×1 · Sign ×2 · UP/DOWN ×1 · UP/DOWN ×2 · A/B pulse ×1 · A/B pulse ×2 · A/B pulse ×4	A/B pulse (×4)
6	Counter mode selection	Specifies the counter mode. · Reversible counter · Interval counter · Frequency measurement	Reversible counter
7	PI latch detection signal selection	Selects an external signal to execute PI latch detection. When PI latch is selected, the PI latch input signal of the corresponding channel is used as detecting signal. When C pulse is selected, the C-pulse of the corresponding channel is used as PI latch detecting signal.	PI latch
8	Selection to use coincidence detection function	Specifies whether to use the coincidence detection function or not. When "Use" is selected, a coincident output (DO) of the corresponding channel is output when coincidence is detected.	Not use
9	Selection to use coincident interrupt function	Specifies whether to use the coincident interrupt function or not. When "Use" is selected, an interrupt signal is output to the CPU module when coincidence is detected. (However, this is valid only when "Use" is selected for selection to use coincidence detection function.)	Not use
10	Frequency counter selection	Specifies the detecting number of digits when frequency measurement is selected for the counter mode. The actual frequency multiplied by the value set in this parameter is reported as the detected frequency. · ×1 · ×10 · ×100 · ×1000	×100

■ I/O registers

· Input registers

These are data that the counter module reports. The data are input to the CPU module in bat
at the head of scan.

Table 5.35 Input Registers (CPU module ← Counter module)

Name	Register No.	Meaning	Range	Remarks	Reversible counter	Interval counter	Frequency measurement	Direct I
Status (RUNSTS)	IW□□□□	bit by bit	–	–	○	○	○	○
RESERVE	IW□□□□+1	–	–	–	–	–	–	–
Incremental number of pulses per scan (PDV)	IL□□□□+2	0 to $\pm2^{31}-1$	1 = 1 pulse	–	○	–	○	–
Hardware counter current value (PFB)	IL□□□□+4	0 to $\pm2^{31}-1$	1 = 1 pulse	–	○	○	○	○
PI latch data or Interval data or Detected frequency (FREQ)	IL□□□□+6	0 to $\pm2^{31}-1$ (1 = 1 pulse)						
		Reversible counter: PI latch data			○	–	–	○
		Interval counter: Interval data			–	○	–	○
		Frequency measurement: Detected frequency			–	–	○	–
Averaged frequency (FRQAVE)	IL□□□□+8	0 to $\pm2^{31}-1$	1 = 1 pulse	–	–	–	○	–
RESERVE	IW□□□□+A to IW□□□□+B	–	–	–	–	–	–	–
T counter current value	IL□□□□+C	–	–	System reserved	–	–	○	–
System monitor	IL□□□□+E	–	–	For system analysis	○	○	○	–

· Output registers

These are used for command to the counter module. They are output to the counter module
batch at the head of scan.

Table 5.36 Output Registers (CPU module → Counter module)

Name	Register No.	Meaning	Range	Remarks	Reversible counter	Interval counter	Frequency measurement	Direct I/
Command setting (RUNMOD)	OW□□□□	bit by bit	–	–	○	○	○	○
Averaging number of times setting (NNUM)	OW□□□□+1	0 to 255	1 = 1 time (0 = 1 = No averaging)	–	–	–	○	–
Counter preset data (PRSDAT)	OL□□□□+2	0 to $\pm2^{31}-1$	1 = 1 pulse	–	○	–	–	○
Coincident detecting set value (COINDAT)	OL□□□□+4	0 to $\pm2^{31}-1$	1 = 1 pulse	–	○	○	○	○
RESERVE	OL□□□□+6 to OW□□□□+D	–	–	–	–	–	–	–
System monitor	OL□□□□+E	–	–	–	○	○	○	–

Table 5.37 Bit Configuration for Status (RUNSTS)

Name	Bit No.	Meanings	Remarks	Reversible counter	Interval counter	Frequency measurement
Data setting error (PRMERR)	0	1: Data setting error	Automatic restoration	○	○	○
Fixed parameter setting error (FPRMERR)	1	1: Fixed parameter setting error	for error reset	○	○	○
Counter value preset completed (PRESET)	2	1: Counter value preset completed	–	○	–	–
PI latch completion signal (PILAT)	3	1: PI latch completed	–	○	–	–
A/B pulse 0 (PULSE0)	4	1: Feedback pulse ±1 or less	–	○	○	○
Coincident detection signal (CNTCOIN)	5	1: Coincident detection signal "ON"	–	○	○	○
A pulse status display (APULSE)	6	1: HIGH	–	○	○	○
B pulse status display (BPULSE)	7	1: HIGH	–	○	○	○
C pulse status display (CPULSE)	8	1: HIGH	–	○	○	○
Fixed parameter writing (PRMUPD)	9	1: Online parameter writing	–	○	○	○
Not used	A	–	–	–	–	–
Not used	B	–	–	–	–	–
Not used	C	–	–	–	–	–
Not used	D	–	–	–	–	–
Not used	E	–	–	–	–	–
Module ready (MREADY)	F	1: Startup completed normally	–	○	○	○

Table 5.38 Bit Configuration for Command (RUNMOD)

Name	Bit No.	Meanings	Remarks	Reversible counter	Interval counter	Frequency measurement
Counting disabled (CNTDIS)	0	1: Counting disabled	–	○	○	–
Counter value preset completed (PREREQ)	1	1: Count value preset request	–	○	–	–
PI latch detection request (PILATREQ)	2	1: PI latch detection request	–	○	–	–
Coincidence detection request (PILATREQ)	3	1: Coincidence detection request	–	○	○	○
Not used	4	–	–	–	–	–
Not used	5	–	–	–	–	–
Not used	6	–	–	–	–	–
Not used	7	–	–	–	–	–
Not used	8	–	–	–	–	–
Not used	9	–	–	–	–	–
Not used	A	–	–	–	–	–
Not used	B	–	–	–	–	–
Not used	C	–	–	–	–	–
Not used	D	–	–	–	–	–
Not used	E	–	–	–	–	–
Not used	F	–	–	–	–	–

5.3.13 AI-01 Module

The AI-01 module is equipped with 8 analog input (AI) channels. There is no insulation between chann while the circuit is insulated.

The number of channels to be used can be selected among 1, 2, 4, and 8. With less number of chann selected, the CPU does not have to scan all eight channels, accordingly the processing speed is improv The data are input in a constant cycle every scan (high-speed/low-speed) of the CPU-01 module. For t channels to be used, set high-speed or low-speed for each channel.

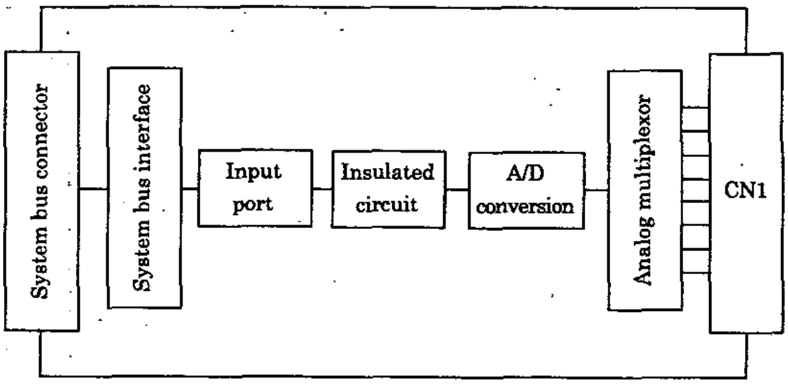


Fig. 5.33 Module Block Diagram of the AI-01

Fig. 5.34
Front of the AI-01 Module

The number of channels to be used inside the AI-01 module, which is affected by the sampling interv on the AI-01 module side, is automatically determined by the CP-717 as shown in Table 5.39. Howev the CPU-01 module executes the input for the number of channels (CH) assigned at the CP-717 regardle of the number of channels to be used in the AI-01 module.

Table 5.39 Number of Channels to be used

Assignment	No. of channels to be used in AI-01 module
Assigned only CH1	1
Assigned only between CH1 and CH2	2
Assigned only from CH1 to CH4	4
Assigned CH5 and later*	8

*: Even when only CH5 is assigned, all eight channels are used.

■ Indicating lamps

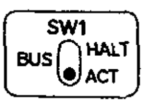
When the module is operating normally, the RUN LED lights up.

Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly

■ Setting switch

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the AI-01 module.
During standard operation, the switch should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of Connector Terminals

Connector (CN1)

No.	Signal	Remarks	No.	Signal	Remarks
1	AI1V	Voltage input 1	26	MD1P	Mode switching terminal 1
2	AI1G	Grounding 1 (for signal)	27	AI1G	Grounding 1 (for shield)
3	AI1A	Current input 1	28	MD1N	Mode switching terminal 1
4	AI2V	Voltage input 2	29	MD2P	Mode switching terminal 2
5	AI2G	Grounding 2 (for signal)	30	AI2G	Grounding 2 (for shield)
6	AI2A	Current input 2	31	MD2N	Mode switching terminal 2
7	AI3V	Voltage input 3	32	MD3P	Mode switching terminal 3
8	AI3G	Grounding 3 (for signal)	33	AI3G	Grounding 3 (for shield)
9	AI3A	Current input 3	34	MD3N	Mode switching terminal 3
10	AI4V	Voltage input 4	35	MD4P	Mode switching terminal 4
11	AI4G	Grounding 4 (for signal)	36	AI4G	Grounding 4 (for shield)
12	AI4A	Current input 4	37	MD4N	Mode switching terminal 4
13	AI5V	Voltage input 5	38	MD5P	Mode switching terminal 5
14	AI5G	Grounding 5 (for signal)	39	AI5G	Grounding 5 (for shield)
15	AI5A	Current input 5	40	MD5N	Mode switching terminal 5
16	AI6V	Voltage input 6	41	MD6P	Mode switching terminal 6
17	AI6G	Grounding 6 (for signal)	42	AI6G	Grounding 6 (for shield)
18	AI6A	Current input 6	43	MD6N	Mode switching terminal 6
19	AI7V	Voltage input 7	44	MD7P	Mode switching terminal 7
20	AI7G	Grounding 7 (for signal)	45	AI7G	Grounding 7 (for shield)
21	AI7A	Current input 7	46	MD7N	Mode switching terminal 7
22	AI8V	Voltage input 8	47	MD8P	Mode switching terminal 8
23	AI8G	Grounding 8 (for signal)	48	AI8G	Grounding 8 (for shield)
24	AI8A	Current input 8	49	MD8N	Mode switching terminal 8
25	N.C.	Not connected	50	N.C.	Not connected

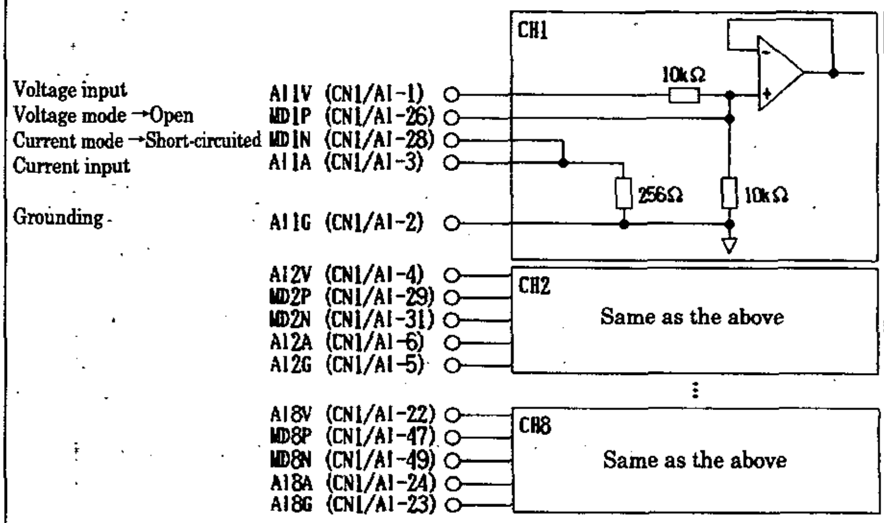
Note 1: For MDnP and MDnN (n represents the channel (CH) No.), open for voltage input and short-circuited for current input.

Note 2: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

Analog inputs

The analog inputs are assigned to input (I) registers. Assign the registers in the module configurat screen of CP-717.

Analog Input (AI) Specifications

Item	Specifications
Number of input circuits	8 points
Input type	Insulated type
Input range	Selectable among −10 to 10 V, 0 to 10 V, or 0 to 20 mA
Input impedance	20 kΩ (voltage input), 250 Ω (current input)
Resolution	16 bits, −31276 to +31276 (−10 to 10 V), 0 to +31276 (0 to 10 V or 0 to 20 mA)
Variation	100 mA or less
Temperature drift	100 μ V/℃
Analog input circuit	

Input voltage (current) and register input value

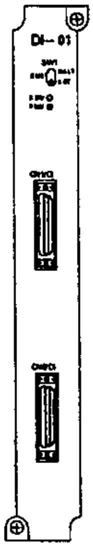
Setting	Input voltage (current)	Register input value
−10 to +10 V	−10 V to +10 V	−31276 to +31276
0 to 10 V	0 V to 10 V	0 to +31276
0 to 20 mA	0 mA to 20 mA	0 to +31276

Gain/Offset setting

The AI-01 module has been adjusted before shipment so that a register input value fixed foı specified voltage (current) is input. Therefore, the gain/offset setting is not required.
If adjustment of 0 V point is required, the input value can be adjusted by changing the gain/offs setting.
For the gain/offset setting, refer to the CP-717 Operation Manual (SIE-C877-17.4, -17.5).

.3.14 DI-01 Module

The DI-01 module is equipped with 64 digital input (DI) channels.
The data are input in a constant cycle every scan (high-speed/low-speed) of CPU-01 module.



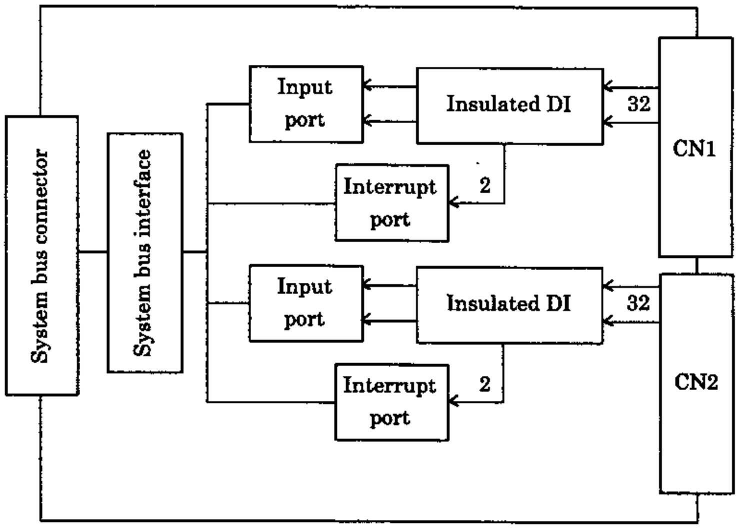


Fig. 5.36 Module Block Diagram of the DI-01

Fig. 5.37
Front of the DI-01 Module

■ Indicating lamps

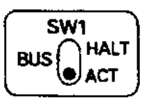
When the module is operating correctly, the RUN LED lights up.

Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly

■ Setting switch

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the DI-01 module.
During standard operation, the switch should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of connector terminals

Connector (CN1)

No.	Signal	Remarks	No.	Signal	Remarks
1	+24V_0	24 V power supply 0	26	+24V_0	24 V power supply 0
2	DI_00	Digital input 0 (also interrupt input)	27	DI_01	Digital input 1 (also interrupt input)
3	DI_02	Digital input 2	28	DI_03	Digital input 3
4	DI_04	Digital input 4	29	DI_05	Digital input 5
5	DI_06	Digital input 6	30	DI_07	Digital input 7
6	N.C.	Not connected	31	N.C.	Not connected
7	+24V_1	24 V power supply 1	32	+24V_1	24 V power supply 1
8	DI_08	Digital input 8	33	DI_09	Digital input 9
9	DI_10	Digital input 10	34	DI_11	Digital input 11
10	DI_12	Digital input 12	35	DI_13	Digital input 13
11	DI_14	Digital input 14	36	DI_15	Digital input 15
12	N.C.	Not connected	37	N.C.	Not connected
13	+24V_2	24 V power supply 2	38	+24V_2	24 V power supply 2
14	DI_16	Digital input 16	39	DI_17	Digital input 17
15	DI_18	Digital input 18	40	DI_19	Digital input 19
16	DI_20	Digital input 20	41	DI_21	Digital input 21
17	DI_22	Digital input 22	42	DI_23	Digital input 23
18	N.C.	Not connected	43	N.C.	Not connected
19	+24V_3	24 V power supply 3	44	+24V_3	24 V power supply 3
20	DI_24	Digital input 24	45	DI_25	Digital input 25
21	DI_26	Digital input 26	46	DI_27	Digital input 27
22	DI_28	Digital input 28	47	DI_29	Digital input 29
23	DI_30	Digital input 30	48	DI_31	Digital input 31
24	N.C.	Not connected	49	N.C.	Not connected
25	N.C.	Not connected	50	N.C.	Not connected

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

Connector (CN2)

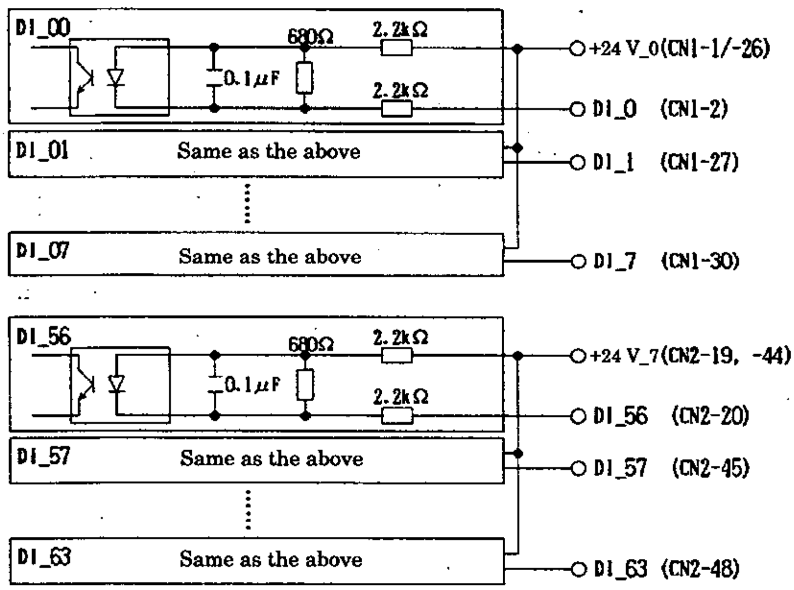
No.	Signal	Remarks	No.	Signal	Remarks
1	+24V_4	24 V power supply 4	26	+24V_4	24 V power supply 4
2	DI_32	Digital input 32 (also interrupt input)	27	DI_33	Digital input 33 (also interrupt input)
3	DI_34	Digital input 34	28	DI_35	Digital input 35
4	DI_36	Digital input 36	29	DI_37	Digital input 37
5	DI_38	Digital input 38	30	DI_39	Digital input 39
6	N.C.	Not connected	31	N.C.	Not connected
7	+24V_5	24 V power supply 5	32	+24V_5	24 V power supply 5
8	DI_40	Digital input 40	33	DI_41	Digital input 41
9	DI_42	Digital input 42	34	DI_43	Digital input 43
10	DI_44	Digital input 44	35	DI_45	Digital input 45
11	DI_46	Digital input 46	36	DI_47	Digital input 47
12	N.C.	Not connected	37	N.C.	Not connected
13	+24V_6	24 V power supply 6	38	+24V_6	24 V power supply 6
14	DI_48	Digital input 48	39	DI_49	Digital input 49
15	DI_50	Digital input 50	40	DI_51	Digital input 51
16	DI_52	Digital input 52	41	DI_53	Digital input 53
17	DI_54	Digital input 54	42	DI_55	Digital input 55
18	N.C.	Not connected	43	N.C.	Not connected
19	+24V_7	24 V power supply 7	44	+24V_7	24 V power supply 7
20	DI_56	Digital input 56	45	DI_57	Digital input 57
21	DI_58	Digital input 58	46	DI_59	Digital input 59
22	DI_60	Digital input 60	47	DI_61	Digital input 61
23	DI_62	Digital input 62	48	DI_63	Digital input 63
24	N.C.	Not connected	49	N.C.	Not connected
25	N.C.	Not connected	50	N.C.	Not connected

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

■ Digital input

The digital inputs (DI) are assigned to the input (I) register of IW0000. Assign the register in t
module configuration screen of CP-717.

Digital Input (DI) Specifications

Item	Specifications
Number of input points	64 points (DI_00 to DI_63) (4 points of these are used also for interrupt input)
Input type	Current source input, common on power supply (+24 VDC) sides, 8 points common, photocoupler insulation
Input voltage	+24 VDC±20 %
Input current	5 mA (TYP)
Input impedance	4.4 kΩ
Response time (when OUT instruction is used)	ON response time: 1 ms or less OFF response time: 1 ms or less
ON/OFF voltage	OFF voltage: 5 V or less ON voltage: +15 V or more
Digital input circuit	

.3.15 AO-01 Module

The AO-01 module is equipped with 4 analog output (AO) channels.

There is no insulation between channels while the circuit is insulated. The output is of voltage type, and can be set in the ranges –10 to 10 V or 0 to +10 V.

The data are output in a constant cycle every scan (high-speed/low-speed) of the CPU-01 module. For the channels to be used, set high-speed, low-speed, or non-use for each channel.

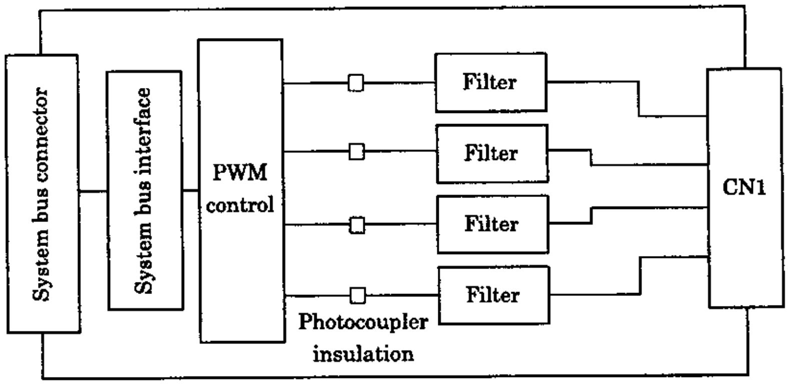


Fig. 5.38 Module Block Diagram of the AO-01

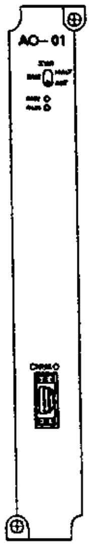


Fig. 5.39 Front of the AO-01 Module

■ Indicating lamps

When the module is operating correctly, the RUN LED lights up.

RMV ○
RUN ○

Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly

■ Setting switch

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the AI-01 module.
During standard operation, the switch should be on the ACT side.

SW1
BUS HALT ACT

Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

■ Arrangement of connector terminals

I/O Connector (CN1)

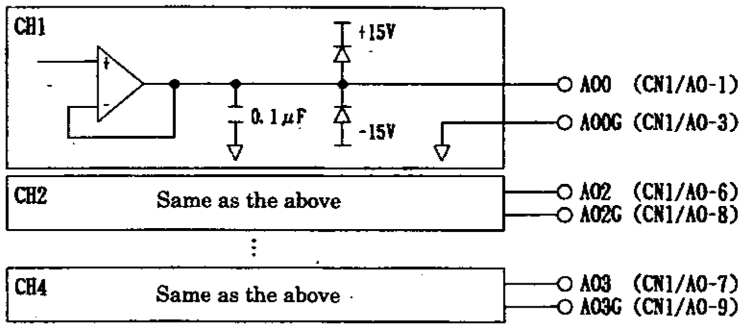
No.	Signal	Remarks	No.	Signal	Remarks
1	AO0	Analog output 0	11	AO0G	Grounding 0 (for shield)
2	AO1	Analog output 1	12	N.C.	Not connected
3	AO0G	Grounding 0	13	AO1G	Grounding 1 (for shield)
4	AO1G	Grounding 1	14	N.C.	Not connected
5	N.C.	Not connected	15	N.C.	Not connected
6	AO2	Analog output 2	16	AO2G	Grounding 2 (for shield)
7	AO3	Analog output 3	17	N.C.	Not connected
8	AO2G	Grounding 2	18	AO3G	Grounding 3 (for shield)
9	AO3G	Grounding 3	19	N.C.	Not connected
10	N.C.	Not connected	20	N.C.	Not connected

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

■ Analog output

The analog outputs are assigned to output (O) register.
Assign the register in the module configuration screen of CP-717.

Analog Output (AO) Specifications

Item	Specifications
Number of output circuits	4 points
Output type	Insulated type (Non-insulated between channels)
Output range	Selectable between −10 to 10 V and 0 to 10 V
Output impedance	20Ω or less
Resolution	16 bits, −31276 to +31276 (−10 to 10 V), 0 to +31276 (0 to 10 V)
Variation	100 mV or less
Temperature drift	100 μV/℃
Analog output circuit	

■ Output voltage and register output value

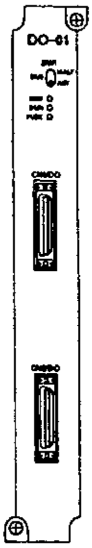
Setting	Input voltage (current)	Register input value
−10 to +10 V	−10 V to +10 V	−31276 to +31276
0 to 10 V	0 V to 10 V	0 to +31276

■ Gain/Offset setting

The AO-01 module has been adjusted before shipment so that a register output value fixed fo specified voltage is output. Therefore, the gain/offset setting is not required.
If adjustment of 0 V point is required, the input value can be adjusted by changing the gain/offs setting.
For the gain/offset setting, refer to the CP-717 Operation Manual (SIE-C877-17.4, -17.5).

.3.16 DO-01 Module

The DO-01 module is equipped with 64 digital output (DO) channels.
The data is output in a constant cycle every scan (high-speed/low-speed) of CPU-01 module.



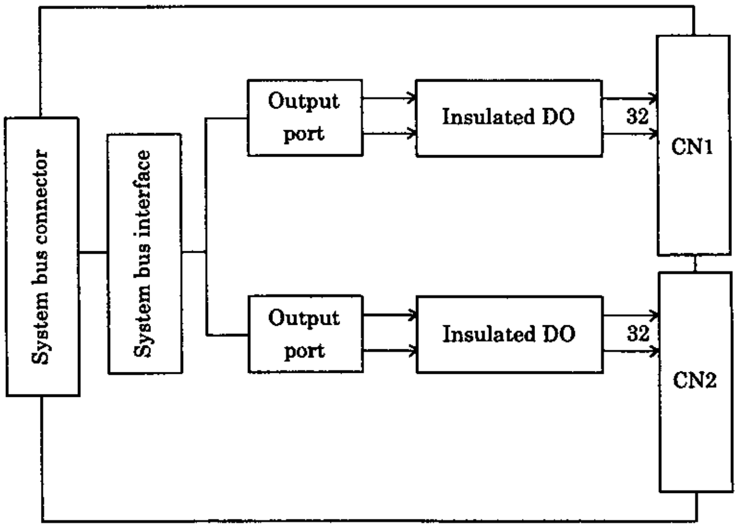


Fig. 5.40 Module Block Diagram of the DO-01

Fig. 5.41
Front of the DO-01 Module

■ Indicating lamps

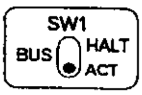
When the module is operating correctly, the RUN LED lights up.

Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module
RUN	RUN	Green	Operating correctly
FUSE	FUSE	Red	Fuse for output protection blowout

■ Setting switch

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the DO-01 module.
During standard operation, the switch should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

■ Arrangement of connector terminals

Connector (CN1)

No.	Signal	Remarks	No.	Signal	Remarks
1	+24V_0	24 V power supply 0	26	+24V_0	24 V power supply 0
2	DO_00	Digital output 0	27	DO_01	Digital output 1
3	DO_02	Digital output 2	28	DO_03	Digital output 3
4	DO_04	Digital output 4	29	DO_05	Digital output 5
5	DO_06	Digital output 6	30	DO_07	Digital output 7
6	GND_0	Common grounding 0	31	GND_0	Common grounding 0
7	+24V_1	24 V power supply 1	32	+24V_1	24 V power supply 1
8	DO_08	Digital output 8	33	DO_09	Digital output 9
9	DO_10	Digital output 10	34	DO_11	Digital output 11
10	DO_12	Digital output 12	35	DO_13	Digital output 13
11	DO_14	Digital output 14	36	DO_15	Digital output 15
12	GND_1	Common grounding 1	37	GND_1	Common grounding 1
13	+24V_2	24 V power supply 2	38	+24V_2	24 V power supply 2
14	DO_16	Digital output 16	39	DO_17	Digital output 17
15	DO_18	Digital output 18	40	DO_19	Digital output 19
16	DO_20	Digital output 20	41	DO_21	Digital output 21
17	DO_22	Digital output 22	42	DO_23	Digital output 23
18	GND_2	Common grounding 2	43	GND_2	Common grounding 2
19	+24V_3	24 V power supply 3	44	+24V_3	24 V power supply 3
20	DO_24	Digital output 24	45	DO_25	Digital output 25
21	DO_26	Digital output 26	46	DO_27	Digital output 27
22	DO_28	Digital output 28	47	DO_29	Digital output 29
23	DO_30	Digital output 30	48	DO_31	Digital output 31
24	GND_3	Common grounding 3	49	GND_3	Common grounding 3
25	N.C.	Not connected	50	N.C.	Not connected

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

Connector (CN2)

No.	Signal	Remarks	No.	Signal	Remarks
1	+24V_4	24 V power supply 4	26	+24V_4	24 V power supply 4
2	DO_32	Digital output 32	27	DO_33	Digital output 33
3	DO_34	Digital output 34	28	DO_35	Digital output 35
4	DO_36	Digital output 36	29	DO_37	Digital output 37
5	DO_38	Digital output 38	30	DO_39	Digital output 39
6	GND_4	Common grounding 4	31	GND_4	Common grounding 4
7	+24V_5	24 V power supply 5	32	+24V_5	24 V power supply 5
8	DO_40	Digital output 40	33	DO_41	Digital output 41
9	DO_42	Digital output 42	34	DO_43	Digital output 43
10	DO_44	Digital output 44	35	DO_45	Digital output 45
11	DO_46	Digital output 46	36	DO_47	Digital output 47
12	GND_5	Common grounding 5	37	GND_5	Common grounding 5
13	+24V_6	24 V power supply 6	38	+24V_6	24 V power supply 6
14	DO_48	Digital output 48	39	DO_49	Digital output 49
15	DO_50	Digital output 50	40	DO_51	Digital output 51
16	DO_52	Digital output 52	41	DO_53	Digital output 53
17	DO_54	Digital output 54	42	DO_55	Digital output 55
18	GND_6	Common grounding 6	43	GND_6	Common grounding 6
19	+24V_7	24 V power supply 7	44	+24V_7	24 V power supply 7
20	DO_56	Digital output 56	45	DO_57	Digital output 57
21	DO_58	Digital output 58	46	DO_59	Digital output 59
22	DO_60	Digital output 60	47	DO_61	Digital output 61
23	DO_62	Digital output 62	48	DO_63	Digital output 63
24	GND_7	Common grounding 7	49	GND_7	Common grounding 7
25	N.C.	Not connected	50	N.C.	Not connected

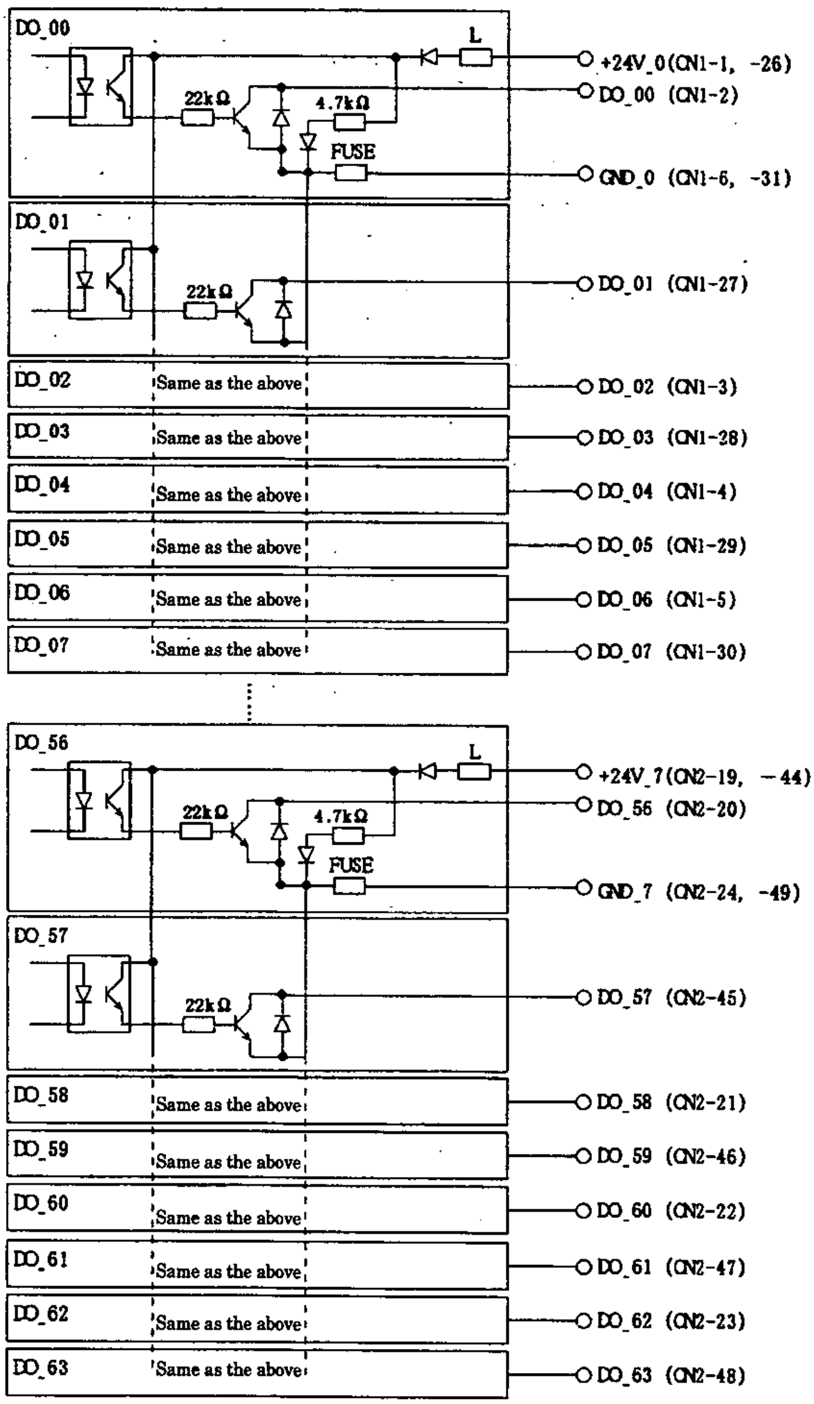
Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

Digital output

The digital outputs (DO) are assigned to the output (O) registers. Assign the register in the modu configuration screen of CP-717.

Digital Output (DO) Specifications

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Number of output points</td><td>64 points (DO_00 to DO_63)</td></tr>
<tr><td>Output circuit</td><td>Open collector output (current sink output)
Photocoupler insulation, 8 points common, with fuse for protection (for each 8 points common)</td></tr>
<tr><td>Rated voltage/current</td><td>+24 VDC±20 %
Max. 100 mA</td></tr>
<tr><td>Response time
(when OUT instruction is used)</td><td>ON response time: 1 ms or less
OFF response time: 1 ms or less</td></tr>
<tr><td>Digital output circuit</td><td>



GND is 8-point common.</td></tr>
</table>

3.17 CP-9200SH SVA Module

Each SVA module can perform counter function or Servo control on up to 4 axes.
A front view is shown in Fig. 5.42, and Function Block Diagram in Fig. 5.43. It has four connectors (CN1 to CN4) to permit connection to an SVA module. Each connector is equipped with three analog output points for speed instructions, positive torque instructions, and negative torque instructions, plus two analog input points for speed monitoring and torque monitoring. Each also has pulse input A/B/C phase (5 V differential motion or 12 V input) and pulse latch digital input, four general digital input points, and six general digital output points.

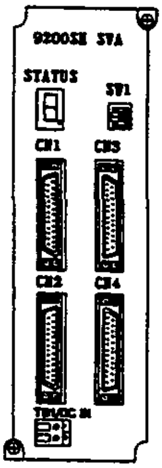


Fig. 5.42
ront of the CP-9200SH SVA Module

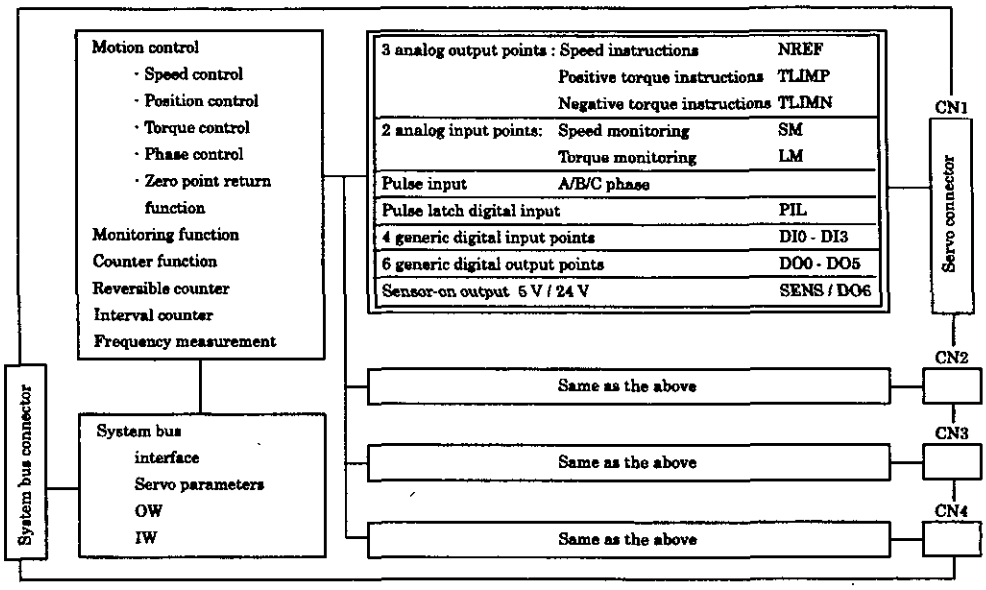


Fig. 5.43 Module Function Block Diagram of the SVA

Table 5.41 SVA Module Basic Hardware Specifications

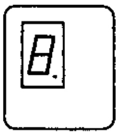
Item	Specifications
Instructions (D/A 12 points)	Analog instructions (can also be used as a general D/A converter)
Speed instructions ⎤ × 4 axes	· Speed instructions: Sign + 15 bits
Positive torque instructions	· Positive torque instructions: Sign + 15 bits
Negative torque instructions ⎦	· Negative torque instructions: Sign + 15 bits
	Note : Analog output full range 0 to ± 11 V
Monitor input (A/D 8 points)	Each has a sign + 15 bits (can also be used as a general A/D converter)
Speed monitoring ⎤ × 4 axes	· Speed monitoring: 0 to ± 10 V
Torque monitoring ⎦	· Torque monitoring: 0 to ± 10 V
RUN command / RUN status	(Can also be used as a general DI converter)
RUN command ⎤ × 4 axes	· RUN command (DO): 6 points
RUN status ⎦	· RUN status (DI): 4 points
Pulse input	A/B/C phase 5 V differential motion or 12 V pull up type collector input can be selected
Position detection method	YASKAWA absolute value encoder or incremental encoder
Maximum pulse measurement speed	4 Mbps (with 4-fold amplification)

Table 5.42 SVA Module Basic Software Specifications

Item	Specifications
Servo functions Instructions Axis 1 position instruction Axis 2 position instruction Axis 3 position instruction Axis 4 position instruction	Position instruction : 0 to ± 2147483647 pulses (when 0.01 mm/ pulse 0 to ± 21474836 mm) Unlimited length positioning also possible
Axis 1 speed instruction Axis 2 speed instruction Axis 3 speed instruction Axis 4 speed instruction	Speed instruction Analog : 0 to ± 327.67 % (Note) Designation of D/A output voltage at 100 % is possible (default: 6 V)
Axis 1 positive torque instruction Axis 1 negative torque instruction Axis 2 positive torque instruction Axis 2 negative torque instruction Axis 3 positive torque instruction Axis 3 negative torque instruction Axis 4 positive torque instruction Axis 4 negative torque instruction	Positive / negative torque limit instruction Analog : 0 to ± 327.67 % (Note) Designation of D/A output voltage at 100 % is possible (default: 3 V)
Position loop gain (Kp)	1 to 999.9
Linear acceleration and deceleration time setting	Acceleration time: 0 to 32.767 s Deceleration time: 0 to 32.767 s
Additional functions	Has zero point return function (when incremental encoder is used) Has hardware position latch function (DI input signal or C pulse input signal) While online (in operation), control can be freely modified Servo parameters can also be freely changed
Monitor input (A/D 8 points) Axis 1 speed monitor Axis 2 speed monitor Axis 3 speed monitor Axis 4 speed monitor	Speed monitor : 0 to ± 327.67 % (Note) Designation of A/D output voltage at 100 % is possible (default: 6 V)
Axis 1 torque monitor Axis 2 torque monitor Axis 3 torque monitor Axis 4 torque monitor	Torque monitor : 0 to ± 327.67 % (Note) Designation of A/D output voltage at 100 % is possible (default: 3 V)
Counter function Reversible counter	Pulse count prohibit selection Count value preset function
Interval counter	Pulse count prohibit selection
Frequency measurement	Frequency detection unit setting (1 Hz, 0.1 Hz, 0.01 Hz, or 0.001 Hz)
Pulse count method	Sign type, Up/down type, or A/B type (with amplification function) Sign type (single or double amplification) Up/down type (single or double amplification) A/B type (single, double, or quadruple amplification)
Coincident output	Comparison of 32 bit Up/down counter (set value: 32 bit counter value) DO (DO5) output by coincident detection

Indicating lamps

When the CP-9200SH SVA is online and operating normally, the status lamps display the module number (1 to b). If a warning or error occurs, refer to Table 5.43.



STATUS (7SEG LED)

Indicating lamp name	Indicating color	Lighting conditions
STATUS	Green	7 SEG LED module No. / error indication (refer to Table 5.43)

Table 5.43 LED Display State

Indication	Description	Remedy
8.	Hardware reset state	Indicates hardware reset state. Check the dip switch, if even that does not restore the former state, replace the main unit.
0.	Initialization	(1) This state is entered from one to six seconds after supplying power or resetting the machine. The main unit is set by the absolute value encoder connection. If there is trouble in the absolute value encoder interface, this state will continue on a single axis for 30 seconds. (2) If an infinite loop is entered in PLC(CPU 1, 2) of drawing A, this state will persist. (3) This indicates that the main unit is not registered in the module definition. If you want to use this unit, first register it in the module definition, and then set the Servo fixed parameters for each axis. (4) If none of the above problems exists, replace the main unit. (5) If even that does not restore the former state, this may imply hardware malfunction such as a synchronization error during initialization between the PLC (CPU 1, 2) and this module. Replace other modules and mounting bases in order.
1	Module number: No. 1	Indicates Module number (1 to 11). This display results when there is no fault or warning, and the machine is operating normally. Please note that this state also results when axis unused is selected.
2	Module number: No. 2	
3	Module number: No. 3	
4	Module number: No. 4	
5	Module number: No. 5	
6	Module number: No. 6	
7	Module number: No. 7	
8	Module number: No. 8	
9	Module number: No. 9	
A	Module number: No. 10	
b	Module number: No. 11	
C	System reserve	
d	System reserve	
E	System reserve	

(continued)

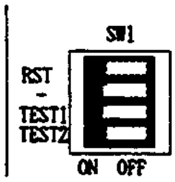
(continued)

Table 5.43 LED Display State

Indication	Description	Remedy
Error code following "F" or "F".	Serious problem (Operation stop) F → 0 → 1 : Watch dog time over F → 0 → 2 : Synchronization error F → 4 → 1 : ROM diagnostic error F → 4 → 2 : RAM diagnostic error F → 4 → 3 : Shared memory diagnostic error F → 4 → 4 : CPU built in timer diagnostic error F → 4 → 5 : Timer diagnostic error F → 4 → 6 : NVRAM read out error F → 4 → 7 : NVRAM write error F → 4 → 8 : Occurrence of general illogical interrupt F → 4 → 9 : Occurrence of slot illogical interrupt F → 5 → 0 : Occurrence of CPU address error interrupt F → 5 → 1 : Occurrence of DMA address error interrupt F → 5 → 2 : Occurrence of user break interrupt F → 5 → 3 : Occurrence of trap instruction interrupt	A hardware error of SVA module. Replace the module. However, for synchronization error, suspect the following causes. (1) The user program processing time may exceed the scan time set value. Check the user program and the scan time setting. (2) It may be a synchronization error between CPU module and other SVA module. Check the other modules. If no problem is found, replace the modules and mounting base in order.
⊔ Axis 1 L Axis 2 ⊓ Axis 3 U Axis 4	Warning (SVRDY "ON") (1) Deviation fault (2) Fault with the Servo parameter setting (3) A/D conversion fault Fault (SVRDY "OFF") (1) Fault with the fixed Servo parameter settings (2) I/F fault with the absolute value encoder	Depending on the content of [IW□□00 + axis ofs], check which of the categories on the left have a fault occurring. When there is a deviation fault, refer to 5.2 "Detailed Explanation of Servo Parameters" in the CP-9200SH Servo Controller User's Manual (SIE-C879-40.2). A fault with the Servo parameter settings indicates data outside the range of Servo parameters has been set. Check the Servo parameter settings. An A/D conversion fault means a hardware fault with the main module. Replace the main module. A fault with the Servo fixed parameter settings indicates data outside the range of Servo fixed parameters has been set. Check the Servo fixed parameter settings, and set them again. If there is an I/F fault with the absolute value encoder, the absolute value encoder should be initialized.
P	Other CPUs operation stop	This indicates that other modules have stopped operation. Inspect the other modules. For example, check whether the CPU modules might have stopped.
Γ	Chat mode	This indicates chat mode. The dip switches should be checked.

■ Setting switches

When shipped out, all switches are set to OFF (right). There is no need to operate the setting switches. They should be used in the OFF position.



Equipment sign	Switch name	State	Setting action	
1SW-1	RST	ON	Reset (For test)	Always keep this switch OFF.
		OFF	ON_LINE	
1SW-2	Unused	ON	Please turn OFF	
		OFF		
1SW-3	TEST1	ON	Shipment adjustment	Please turn OFF
		OFF	ON_LINE	
1SW-4	TEST2	ON	Chat mode	Please turn OFF
		OFF	ON_LINE	

■ Connector terminal arrangement

I/O connector terminals (CN1, CN2, CN3, CN4)

No	Signal name	Remark	No	Signal name	Remark
1	SENS	5 V system sensor on	26	SENSG	5 V system sensor on 0 V
2	N.C.	No connected	27	N.C.	Not connected
3	NREF	Analog output speed instruction	28	TFB	Analog input torque monitor
4	NREFG	Analog output speed instruction 0 V	29	TFBG	Analog input torque monitor 0 V
5	TLIMN	Analog output negative torque limiter	30	NFB	Analog input speed monitor
6	TLIMNG	Analog output negative torque limiter 0 V	31	NFBG	Analog input speed monitor 0 V
7	TLIMP	Analog output positive torque limiter	32	N.C.	Not connected
8	TLIMPG	Analog output positive torque limiter 0 V	33	N.C.	Not connected
9	PG (5V)G	PG input (5 V differential motion) 0 V	34	—	—
10	PA (5V)	PG input (5 V differential motion) A phase	35	PG 12V	PG 12 V input
11	PAL (5V)	PG input (5 V differential motion) A phase reverse	36	PA (12V)	PG input (12 V differential motion) A phase
12	PB (5V)	PG input (5 V differential motion) B phase	37	PG 12V	PG 12 V input
13	PBL (5V)	PG input (5 V differential motion) B phase reverse	38	PB (12V)	PG input (12 V differential motion) B phase
14	PC (5V)	PG input (5 V differential motion) C phase	39	PG 12V	PG 12 V input
15	PCL (5V)	PG input (5 V differential motion) C phase reverse	40	PC (12V)	PG input (12 V differential motion) C phase
16	N.C.	Not connected	41	N.C.	Not connected
17	DC	24 VDC power output	42	PIL	PI latch input
18	DI0	Generic DI0	43	DI1	Generic DI1
19	DI2	Generic DI2	44	DI3	Generic DI3
20	0 V	0 V	45	DO 0V	0 V
21	DOSK	DO surge absorb terminal	46	DOSK	DO surge absorb terminal
22	DO 0	Generic DO0	47	DO1	Generic DO1
23	DO 2	Generic DO2	48	DO3	Generic DO3
24	DO 4	Generic DO4	49	DO5	Generic DO5 (in common with coincident output)
25	DO 6	Sensor on	50	N.C.	Not connected

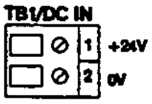
10250-52A2JL (made by SUMITOMO 3M LTD.) is used as the connector.

MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.) should be used as connector on cable side.

As standard cables, the followings are available.

	Product code	Contents
SGDA connecting cable (1 m)	87921-13000	Σ Series SERVOPACK (SGDA) connecting cable (1 m)
〃 (3 m)	87921-13100	〃 (3 m)
〃 (5 m)	87921-13200	〃 (5 m)
SGDB connecting cable (1 m)	87921-13300	Σ Series SERVOPACK (SGDB) connecting cable (1 m)
〃 (3 m)	87921-13400	〃 (3 m)
〃 (5 m)	87921-13500	〃 (5 m)

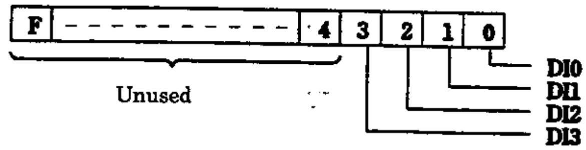
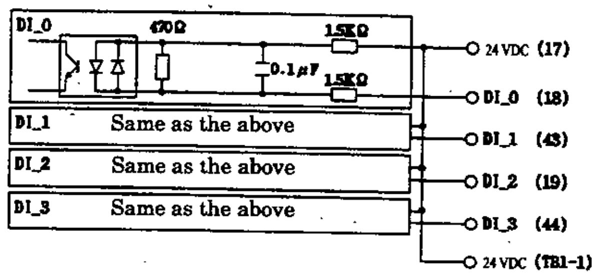
■ 24 VDC input terminal (TB1)



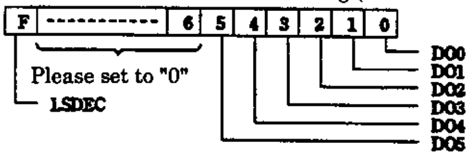
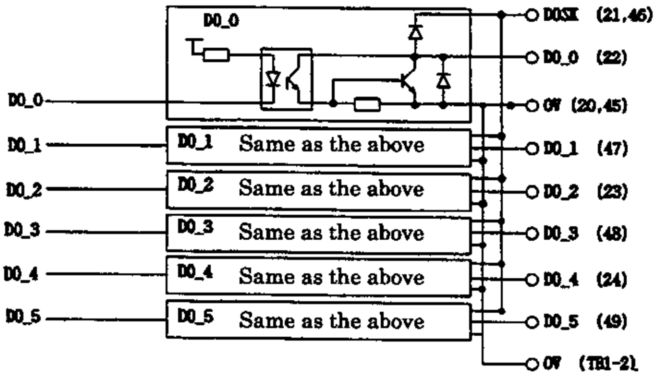
By connecting an external DC power supply (24 VDC output) to TB1, TB1 can supply power to No. 17 terminal of CN1, CN2, CN3 and CN4. Use a cable of size 0.13 to 2.5 mm² (AWG26 to 14) for connection.

■ I/O specifications

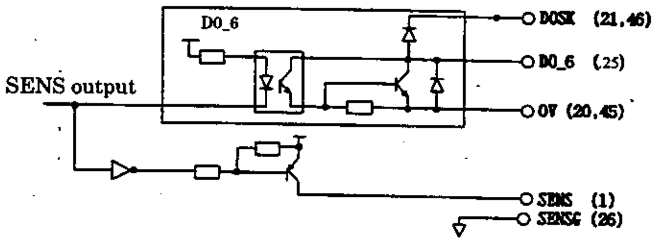
(1) Digital input (DI) Specifications

Item	Specifications
Number of input points	4 points
Register number / Name	IW□□Y1, Servo drive status (INVSTS) 
Input type	Current source input, common on power supply (+24 VDC) side, Photocoupler isolation
Input voltage	+24 VDC ± 20 %
Input current	7 mA (TYP)
Input impedance	3 k Ω
Response time	ON response time: less than 1 ms. OFF response time: less than 1 ms
ON/OFF voltage	OFF voltage: 5 V or less, ON voltage: +15 V or more
Digital input circuit	

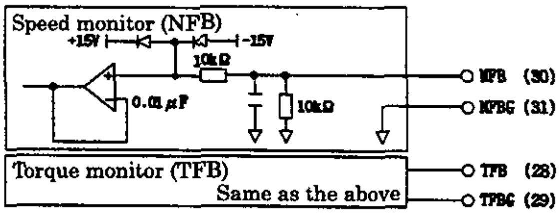
(2) Digital output (DO) Specifications

Item	Specifications
Number of output circuits	6 points (DO 0 to DO 6) General digital output DO 5 is shared with the pulse coincident detection output
Register number / Name	OW□□ 01, Servo drive RUN COMMAND setting (SVRUNCMD) 
Output circuit	Open collector output (current sink output) Photocoupler isolation
Rated voltage / current	24 VDC ± 20 % Maximum 50 mA
Response time (time at which OUT instruction used)	ON response time: 1 ms or less OFF response time: 2 ms or less
Digital input circuit	 DO5 may be used for pulse coincident detection (CNTCOIN) or as a general DO.

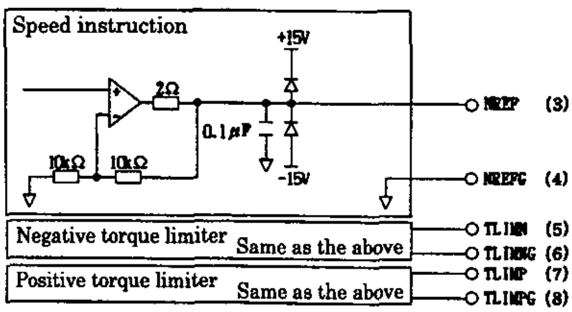
(3) 5 V system sensor-on output (SENS) Specifications

Item	Specifications	
Number of output circuits	1 point (SENS)	
Register number / Name	Settings depending on the system User setting is impossible	
Output circuits	Open emitter output (current source output) Non-isolated	Open collector output (DO6) Photocoupler isolation
Rated voltage / Current	+5 VDC ± 10 % Maximum 10 mA	+24 VDC ± 20 % Maximum 50 mA
Response time (time at which OUT instruction used)	ON response time: 1 ms or less OFF response time: 2 ms or less	ON response time: 1 ms or less OFF response time: 2 ms or less
Digital input circuit		

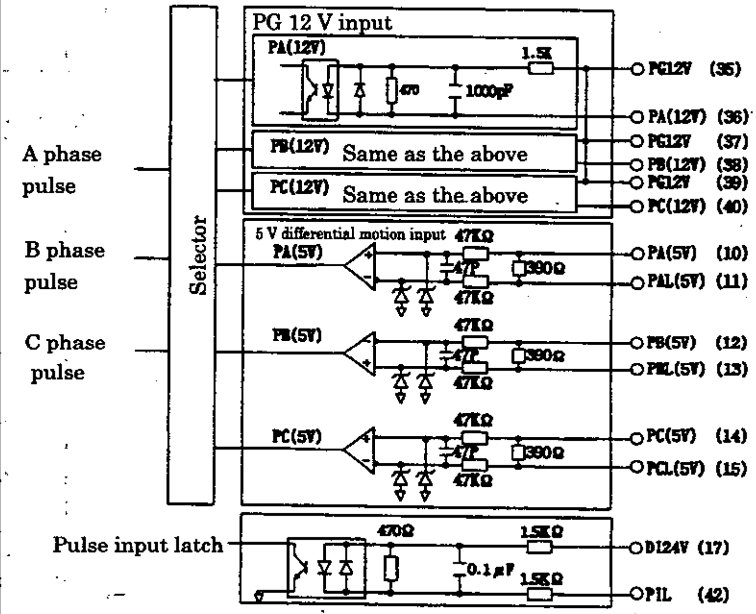
(4) Analog input (AI) Specifications

Item	Specifications
Number of input circuits	2 point NFB : Speed monitor analog input TFB : Torque monitor analog input
Register number / Name	IW□□ 0D: Speed monitor (NFB) IW□□ 0E : Torque monitor (TFB)
Input voltage range	− 10 V to +10 V
Input deviation (maximum)	± 1 %
Input impedance	10 k Ω
Lowest bit value	0.5 mV or less
Resolution	Sign + 15 bits ± 1LSB (Not a guaranteed value)
Other	Non-isolated
Analog output circuit	

(5) Analog output (AO) specifications

Item	Specifications
Number of output circuits	3 points NREF : Analog output for speed instructions TLIMP : Analog output for positive torque limiter TLIMN : Analog output for negative torque limiter
Register number / Name	OW□□ 15 : Speed instruction setting (NREF) OW□□ 02 : Positive torque limit setting (TLIMN) OW□□ 03 : Negative torque limit setting (TLIMP)
Output voltage range	− 10 V to 10 V
Output error (maximum)	± 1 %
Lowest bit value	0.5 mV
Output impedance	20 Ω or less
Output current	5 mV
Delay time	When starting up: 1 ms or less When shutting down: 1 ms or less
Resolution	Sign + 15 bits ± 1 LSB (not a guaranteed value)
Other	Non-isolated
Analog output circuits	

(6) Pulse input (PI) specifications

Item	Specifications	
Number of input circuits	1 point A/B/C phase input	
Register number / Name	IL□□08: Position monitor or Current value of the hardware counter (PFB)	
Input type	12 V open collector input	5 V differential motion input
	Current source type: +12 V, Photocoupler isolation	Non-isolated
Input voltage	+12 VDC ± 10%	+5 VDC ± 5 %
Input current	7 mA (TYP.)	12 mA (TYP.)
Input impedance	1.5 k Ω	390 Ω
Maximum frequency	80 kHz (single amplification)	1 MHz (single amplification)
Pulse input type	A/B phase type, Sign type, Addition and subtraction method	
Amplification function	× 1, × 2, × 4 amplification possible	
Measurement methods	Reversible counter, interval counter, frequency measurement	
Pulse latch function	PIL input	
Pulse input circuit		

5.3.18 PO-01 Module

The PO-01 module is a motion control module of pulse train output type. A pulse motor drive of up to 4 axes can be connected per module.

Fig. 5.43 shows the front view of PO-01 module and Fig. 5.44 shows its function block diagram. The PO-01 module is equipped with 4 connectors (CN1 to CN4) for connection with a pulse motor driver, and each connector has 5 V differential type pulse train output, and both 4-point digital output (DO) and 5-point digital input (DI) for various pulse driver control.

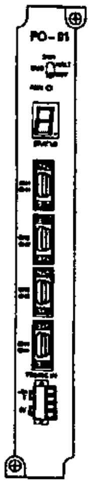


Fig. 5.43 Front of the PO-01 Module

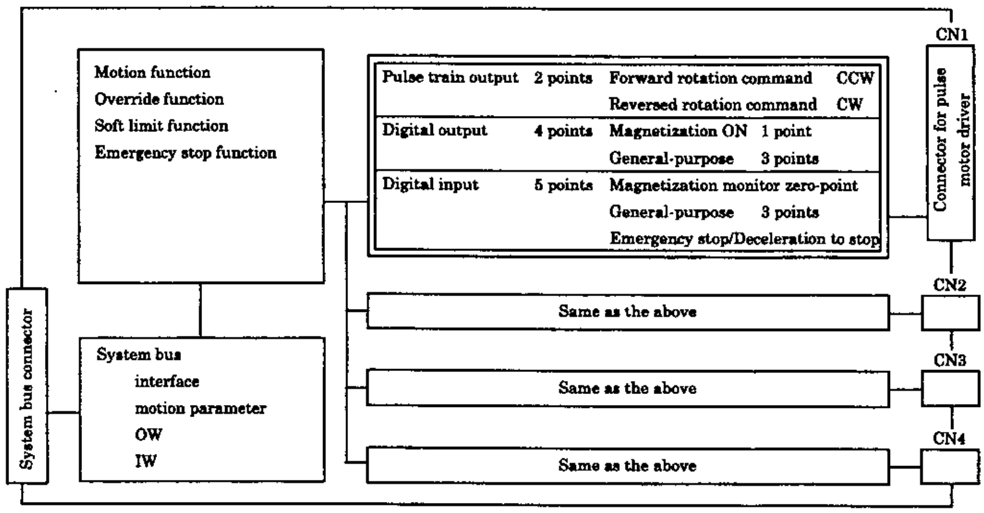


Fig. 5.44 Module Function Block Diagram of the PO-01

Table 5.44 Module Hardware Basic Specifications

Item	Specifications
Command (pulse train) Forward rotation (CCW) Reversed rotation (CW)	Pulse train command · Speed reference: Sign + pulse, ±pulse · Interface: 5 V differential type · Max. frequency: 500 kbpps
Digital input (DI 5 points)	· Magnetizing timing monitor/zero-point : 1 point · Emergency stop/Deceleration to stop : 1 point · Dog signal : 1 point (can be used also for general-purpose) · Limit 1 : 1 point (can be used also for general-purpose) · Limit 2 : 1 point (can be used also for general-purpose)
Digital output (DO 4 points)	· Magnetization ON : 1 point · General-purpose : 3 points

Table 5.45 PO-01 Module Software Basic Specifications

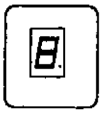
Item		Specifications	
On board I/O			
	DI	5 points · Magnetizing timing monitor/zero-point · Limit switch · Reversed rotation side limit signal for zero-point return · Forward rotation side limit signal for zero-point return · Emergency stop/Deceleration to stop * These other than magnetizing timing monitor/zero-point and Emergency stop can be used also for general-purpose.	
	DO	4 points · Magnetizing ON · Electromagnetic brake release · Other general-purpose DO× 2 points * These other than magnetizing ON can be used also for general purpose.	
Motion control function			
	Number of control axes	Max. 64 axes (4 axes per module, max., 16 modules)	
	Motion parameter	Fixed parameter	Setting in CP-717 screen
		Setting parameter	OW□□00 to OW□□3F (64 words/axis)
		Monitor parameter	IW□□00 to IW□□3F (64 words/axis)
	Motion function	POSING	Positioning
		ZRET	Zero-point return
		INTERPOLATE	Interpolation
		FEED	Constant speed feed
		STEP	Step feed
	Reference unit	pulse	Selectable
		mm	Selectable
		deg	Selectable
		inch	Selectable
	Additional function	Infinite length axis selection	Selectable
		Override function	Selectable
		Soft limit function	Selectable
		Acceleration/Deceleration type	Linear acceleration/deceleration (possible with bias)
			Exponential acceleration/deceleration (bias can be set
			Simple S-curve acceleration/deceleration
Driver to be connected		Pulse train output type (CW/CCW method, sign (CCW) + pulse (CW) method)	

Indicating lamps

When the PO-01 is operating correctly in online mode, the status indicating lamps display the module No. (1 to G). At occurrence of alarm or error, refer to Table. 5.46.

Indication	Name	Indicating color	Lighting conditions
RMV	REMOVE	Green	Okay to remove module

STATUS (7SEG LED)



Indicator name	Indicating color	Lighting conditions
STATUS	Green	7SEG LED displays the module No. / error (Refer to Table 5.46)

Table 5.46 LED Display

Display	Contents	Remedy
8.	Hardware reset status	Indicates the hardware reset status. Check the dip switches. If not restored, replace the PO-01 module
0	At initialization	(1) This status remains for 1 to 6 seconds after turning the power ON or reset. (2) This status continues when A drawing of CPU module (CPU1, 2) enters closed loop. (3) Displayed when the PO-01 module is not registered in the module configuration definition. To use the PO-01 module, register in the module configuration definition and set the motion parameter for each axis. (4) If not the above cases, replace the module. (5) If not restored after having replaced the module, a hardware failure such as interface fault between CPU module and the PO-01 module may occur. Change the other modules and mounting base in order.
1	Module number: No. 1	Indicates the module No. (1 to 16). When no error/alarm occurs, LED display in this way. Note that this display appears also when no axis to be used is selected.
2	Module number: No. 2	
3	Module number: No. 3	
4	Module number: No. 4	
5	Module number: No. 5	
6	Module number: No. 6	
7	Module number: No. 7	
8	Module number: No. 8	
9	Module number: No. 9	
A	Module number: No. 10	
b	Module number: No. 11	
C	Module number: No. 12	
d	Module number: No. 13	
E	Module number: No. 14	
F	Module number: No. 15	
G	Module number: No. 16	

(continued)

Table 5.46 LED Display State

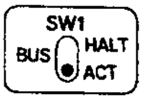
(continued)

Display	Contents	Remedy
Error code following "F" or "F."	Serious failure (operation stops) F→0→1 : Watchdog time over F→0→2 : Synchronization error F→4→1 : ROM diagnosis error F→4→2 : RAM diagnosis error F→4→3 : Common memory diagnosis error F→4→4 : CPU built-in timer diagnosis error F→4→5 : – F→4→8 : General unjustified interruption F→4→9 : Slot unjustified interruption F→5→0 : CPU address error interruption F→5→1 : DMA address error interruption F→5→2 : User brake interruption F→5→3 : Trap instruction interruption F→5→4 : uPD71054 diagnosis error	A hardware failure of the PO-01 module. Replace the module. (1) In case of a synchronization error, the user program processing time may exceed the scan time set value. Check the user program and the scan time setting. (2) Synchronization error indicates a synchronization error between CPU module and the PO-01 module. Check the CPU module. If no problem is found, replace the PO-01 module.
⊔ (1st Axis)	Alarm (SVRDY "ON") (1) Motion setting parameter setting error (See IB□□001) (2) Alarm occurrence (See IL□□22) (3) Motion command error end status (When IB□□115 is ON) (4) At emergency stop (When IB□□014 is ON) Error (SVRDY "OFF") (1) Motion fixed parameter setting error (See IB□□002)	Check for which item an error occurs. · Motion setting parameter setting error indicates that a data out of the range is set in the motion setting parameter. Check the set value of motion setting parameter. · Alarm occurrence indicates that an alarm occurs. As the cause of alarm is reported to each bit of IL□□22, investigate and eliminate the cause, then reset the alarm. · Motion command error end status occurs when the position control mode (OB□□002) is OFF or the magnetization ON (OB□□010) is OFF. Clear the motion command code (OW□□20) to 0. · At emergency stop, reset the emergency stop signal (DI04) and set the magnetization ON (OB□□010) to OFF, then set the emergency stop/deceleration to stop signal release from ON to OFF. · Motion fixed parameter setting error indicates that a data out of the range is set at the motion fixed parameter. Change the setting of the motion fixed parameter.
L (2nd Axis)		
Π (3rd Axis)		
⊔ (4th Axis)		
⊓	RMV (remove) error	(1) Hot swapping (module removal) is specified to be disabled in the module configuration definition, while the removal switch (BUS) is set to HALT. Set the switch to ACT. (2) Hot swapping (module removal) is specified to be enabled and the removal switch (BUS) is set to HALT, however, the magnetization ON (OB□□010) is ON. Set the magnetization ON to OFF. (3) A hardware failure. (Replace the PO-01 module).
□	Diagnosis mode (offline)	Indicates that the module is in diagnosis mode. Replace the PO-01 module.
P	CPU or other module operation stop	Indicates that other module is in stop status. Check other modules. For example, CPU module may be in STOP status.
Γ	Chattering mode	Indicates the conversational mode. Replace the PO-01 module.

Setting switches

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the PO-01 module.
During standard operation, the switch should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

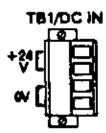
Arrangement of connector terminals

I/O connector terminals (CN1, CN2, CN3, CN4)

No.	Signal	Remarks	No.	Signal	Remarks
1	CW+	CW pulse output (+)	11	CCW+ (with sign+)	CCW (sign) pulse output (+)
2	CW−	CW pulse output (−)	12	CCW− (with sign−)	CCW (sign) pulse output (−)
3	PO_0V	Common with module 0 V	13	DI_0+	DI input_0 (+)
4	DI_1	DI input_1	14	DI_0− (24V)	DI input_0 (−) 24 V
5	DI_2	DI input_2	15	DI_0− (5V/12V)	DI input_0 (−) 5 V/12 V
6	DI_3	DI input_3	16	DI_4	DI input_4 emergency stop
7	DI_0V	Common with power supply input terminal 0 V	17	DO_0	DO output_0
8	DO_1	DO output_1	18	DO_0 (with R)	DO output_2 with 2 kΩ resistance
9	DO_1 (with R)	DO output_1 with 2 kΩ resistance	19	DO_2	DO output_2
10	DO_3	DO output_3	20	DO24V	Common with power supply input terminal 24 V

Note: For connector, 10250-52A2JL (made by SUMITOMO 3M LTD.) is used. For the cable side connector, use MDR plug 10150-3000VE and MDR shell 10350-52A0-008 (made by SUMITOMO 3M LTD.).

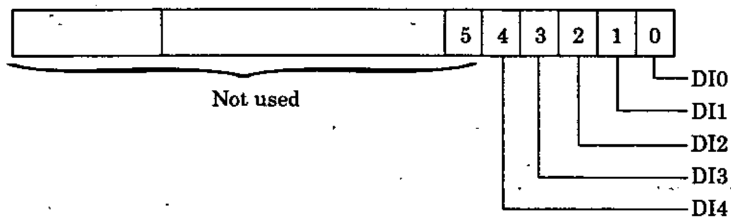
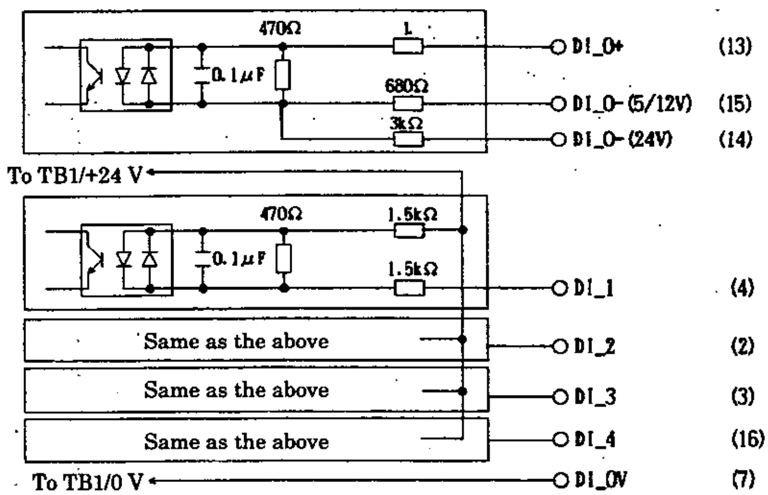
24 VDC input terminal (TB1)



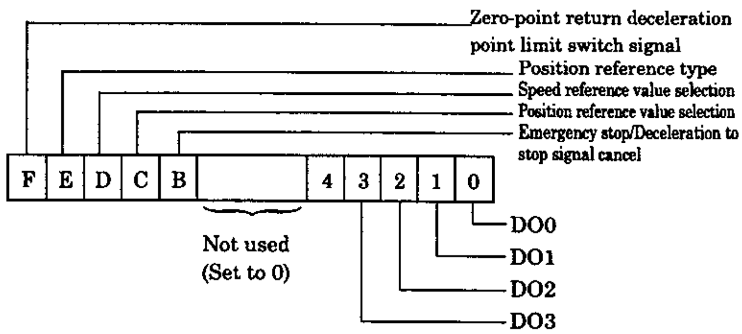
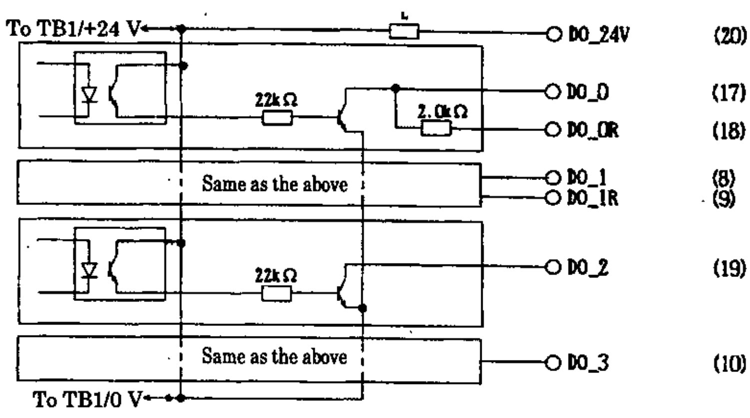
By connecting an external DC power supply (24 VDC output) to TB1, TB1 can supply power to No.17 terminal of CN1, CN2, CN3 and CN4. Use a cable of size 0.13 to 2.5 mm² (AWG26 to 14) for connection.

■ I/O specifications

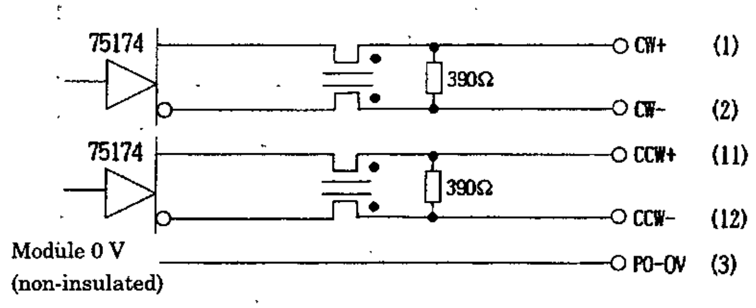
(1) Digital Input (DI) Specifications

Item	Specifications
Number of input points	5 points
Register No./Name	IW□□01 (General-purpose DI monitor) 
Input type	Current source input, common on power supply (24 VDC) side, photocoupler insulation
Input voltage	24 VDC±20 % (5 V/12V can be input to DI_0)
Input current	7 mA/24 V (TYP), 20 mA/12 V, 7 mA/5 V
Input impedance	3 kΩ (24 V), 680 Ω (5 V/12 V)
Response time	ON response time: 1 ms or less OFF response time: 1 ms or less
ON/OFF voltage	(24 V) OFF voltage: +5 V or less, ON voltage: +15 V or more (12 V) OFF voltage: +2.4 V or less, ON voltage: +5.6 V or more
Digital input circuit	

(2) Digital Output (DO) Specifications

Item	Specifications
Number of output circuits	4 points
Register No./Name	OW□□01 <Run command setting> 
Output circuit	Open collector output (current sink output) Photocoupler insulation
Rated voltage/current	+24 VDC ± 20 % Max. 100 mA
Response time (when OUT instruction is used)	ON response time: 1 ms or less OFF response time: 1 ms or less
Digital output circuit	

(3) Pulse Output (PO) Specifications

Item	Specifications
Number of output circuits	2 points for each axis (CW/CCW)
Output circuit	5 V differential type (equivalent to SN757174).
Pulse output circuit	

5.3.19 SVB Module

SVB modules have position control functions such as positioning, zero point return, interpolati constant-speed feeding, and constant-step feeding. Both a servo driver and an I/O module MECHATROLINK with a maximum of 14 axes may be connected. A maximum of 16 SVB modules c be mounted, so up to 224 axes can be controlled.
With CP-216 transmission, the SVB modules can be connected to the inverter used for CP-2 transmission (VS-616G5, VS-676H5). Refer to the Machine Controller CP-9200SH/SVB Motion Control User's Manual (SIE-C879-40.5) for details.

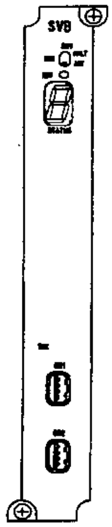


Fig. 5.45
Front of the SVB Module

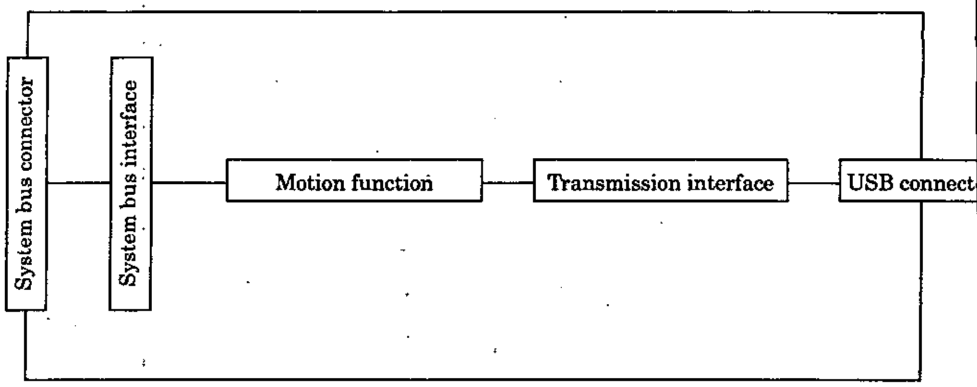


Fig. 5.46 Module Function Block Diagram of the SVB

Table 5.47 SVB Module Software Basic Specifications

Item		Specifications	
Servo control	Number of control axes	14 axes	
	Control mode	POSING	Positioning
		EX_POSING	External positioning
		ZRET	Zero-point return
		INTERPOLATE	Interpolation
		LATCH	Interpolation with position detection
		FEED	Constant speed feed
		STEP	Step feed
	Reference unit	pulse	Selectable
		mm	Selectable
		deg	Selectable
		inch	Selectable
	Additional function	Infinite length positioning	Selectable
		Change of SERVOPACK constant	Selectable
		SERVOPACK alarm detection	Selectable
		Soft limit	Selectable
	Others	Read-in of motion parameter	CPU high-speed scan cycle
		Position reference output cycle	MECHATROLINK communication cycle (2 ms)
CP-216 transmission function		Inverter	Can be connected
		Distributed I/O	Can be connected
Number of message channels		User message channel	8 channels
		Programming panel channel	2 channels
		Configuration channel	1 channel
Hot swapping		Can be mounted or removed with power ON	

Indicating lamps

When the SVB is operating correctly in online mode, the status indicating lamps display the mod
No. (1 to ㅂ). At occurrence of alarm or error, refer to Table. 5.48.

RMV ○

Indicator	Name	Color	Meaning when lit
RMV	REMOVE	Green	Okay to remove module

8.

STATUS (7SEG LED)

Indicator name	Color	Meaning when lit
STATUS	Green	7SEG LED displays the module No. / error (Refer to Table 5.

TRX ○

STATUS (7SEG LED)

Indicator	Color	Meaning when lit
TRX	Green	Receiving/Sending transmission data

Table 5.48 LED Display

Display	Contents	Remedy
–	Undefined	Indicates that the SVB module is not registered in the modul configuration definition. Before using the module, register th module in the module configuration definition and specify th motion fixed parameter and the motion setting parameter of eac axis.
8.	Hardware reset status	Indicates the hardware reset status. Check the dip switches. I not restored, replace the SVB module
0	At initialization	(1) This status remains for 1 to 6 seconds after turning the power ON or reset. (2) This status continues when A drawing of CPU module (CPU1, 2) enters closed loop. (3) Displayed when the SVB module is not registered in the module configuration definition. To use the SVB module, register in the module configuration definition and set the motion parameter for each axis. (4) If not the above cases, replace the module. (5) If not restored after having replaced the module, a hardware failure such as interface fault between CPU module and the SVB module may occur. Change the other modules and mounting base in order.
1	Module number: No. 1	Indicates the module No. (1 to 16). When no error/alarm occurs, LED display in this way. Note that this display appears also when no axis to be used is selected.
2	Module number: No. 2	
3	Module number: No. 3	
4	Module number: No. 4	
5	Module number: No. 5	
6	Module number: No. 6	
7	Module number: No. 7	
8	Module number: No. 8	
9	Module number: No. 9	
A	Module number: No. 10	
b	Module number: No. 11	
C	Module number: No. 12	
d	Module number: No. 13	
E	Module number: No. 14	
F	Module number: No. 15	
ㅂ	Module number: No. 16	

(continue

Table 5.48 LED Display State

(continued)

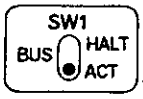
Display	Contents	Remedy
Error code following "E" or "F"	Serious failure (operation stops) F → 0 → 1 : Watchdog time over F → 4 → 1 : ROM diagnosis error F → 4 → 2 : RAM diagnosis error F → 4 → 3 : Common memory diagnosis error F → 4 → 8 : General unjustified interruption F → 4 → 9 : Slot unjustified interruption F → 5 → 0 : CPU address error interruption F → 5 → 2 : User brake interruption F → 5 → 3 : Trap instruction interruption F → 5 → 5 : Transmission section initialization error F → 5 → 8 : TLB exception interrupt F → 5 → 9 : TLB exception interrupt F → 6 → 0 : TLB invalid exception interrupt F → 6 → 1 : TLB invalid exception interrupt F → 6 → 2 : Initial page writing exception interrupt F → 6 → 3 : TLB protection exception interrupt F → 6 → 4 : TLB protection exception interrupt	A hardware failure of the SVB module. Replace the module. In case of a watchdog time over, the user program processing time may exceed the scan time set value. Check the user program and the scan time setting.
C	—	—
H	Reference hold status	Indicates the holding status of the previous setting of the motion parameter when configuring a dual system or dual copying.
u	Alarm (SVRDY "ON") (1) Motion setting parameter setting error (See IB□□001) (2) Alarm occurrence (See IL□□22) (3) Motion command end with error status (When IB□□115 is ON) Error (SVRDY "OFF") (1) Motion fixed parameter setting error (See IB□□002)	Indicates that one of the alarms and errors described on the left occurs on one of the axes from No. 1 to 14. Check for which item an error occurs. · Motion setting parameter setting error indicates that a data out of the range is set in the motion setting parameter. Check the set value of motion setting parameter. · Alarm occurrence indicates that an alarm occurs. As the cause of alarm is reported to each bit of IL□□22, investigate and eliminate the cause, then reset the alarm. · Motion command end with error status occurs when an alarm occurs during execution of motion command. Clear the motion command code (OW□□20) to 0. Motion command end with error status occurs, for example, when the position control mode (OB□□002) or the Servo ON (OB□□010) is turned OFF. · Motion fixed parameter setting error indicates that a data out of the range is set at the motion fixed parameter. Change the setting of the motion fixed parameter.
n	RMV (remove) error	(1) Hot swapping (module removal) is specified to be disabled in the module configuration definition, while the removal switch (BUS) is set to HALT. Set the switch to ACT. (2) Hot swapping (module removal) is specified to be enabled and the removal switch (BUS) is set to HALT, however, the magnetization ON (OB□□010) is ON. Set the magnetization ON to OFF. (3) A hardware failure. (Replace the SVB module).
P	CPU or other module operation stop	Indicates that other module is in stop status. Check other modules. For example, CPU module may be in STOP status.
U	—	—

Setting switches

· BUS switch (SW1)

Switch the BUS switch to the HALT side when replacing the SVB module.

During standard operation, the switch should be on the ACT side.



Indication	Name	Status	Operation
BUS	BUS	HALT	Module removal request
		ACT	Module mounting request

Arrangement of connector terminals

Transmission connector terminals (CN1, CN2)

No.	Signal	Remarks
1	No connection	–
2	*DATA (SRD−)	Send/Receive data (−)
3	DATA (SRD+)	Send/Receive data (+)
4	SH	Shield

Notes: 1. Use DUSB-APA41-B1-C50 (made by DDK) for the connector on the cable's side.

2. The SVB module is equipped with two connectors, CN1 and CN2. Because these are used as cross wiring, the same signal line is connected. Those two lines as one channel serves for the MECHATROLINK port.

.4 Mounting Base

4.1 MB-01 Mounting Base

The MB-01 mounting base is used for mounting various modules of the CP-9200SH. Excluding the power module, a maximum of 14 modules can be mounted. It can be used as a fundamental mounting base for mounting the CPU module or as an expansion mounting base for mounting only optional modules.

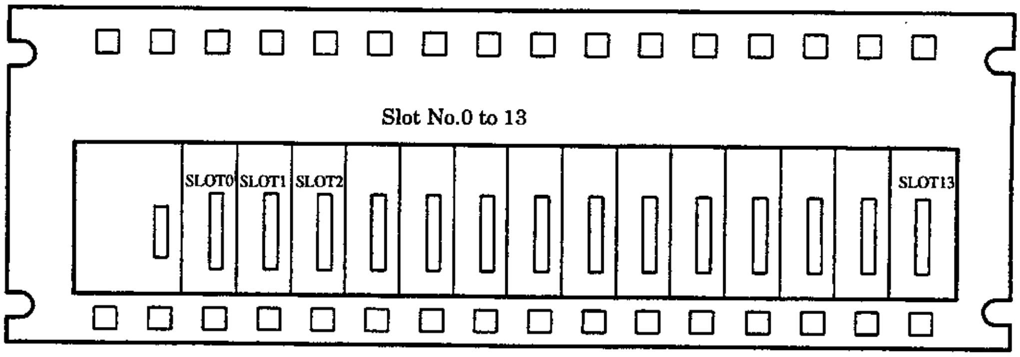


Fig. 5.47 MB-01 Mounting Base

.2 MB-03 Mounting Base

The MB-03 mounting base is used for mounting various modules on the CP-9200SH. Excluding the power module, a maximum of eight modules can be mounted. It is effective when there are only a few modules.

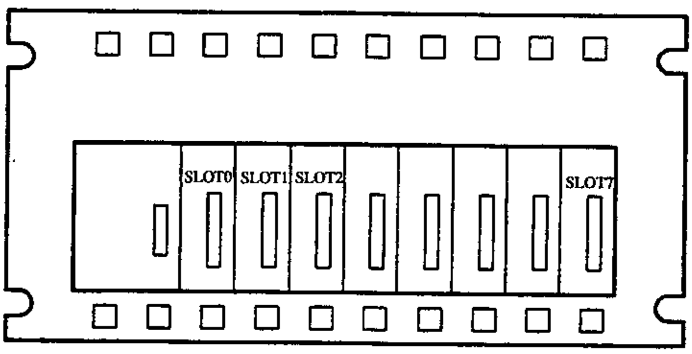


Fig. 5.48 MB-03 Mounting Base

5.5 CP-215 Repeater

The CP-215 repeater is used to extend the transmission distance for CP-215 transmission and CP-
transmission.
The CP-215 repeaters for twisted pair cable, coaxial cable, and optical fiber cable allow you to constr
an optimum system for the required transmission distance.
For the applicable cables and installation, refer to FDS System Installation Manual (SIE-C873-16
Table 5.49 shows the CP-215 repeater product list.

Table 5.49 CP-215 Repeater Product List

Name	Product code No.	Description
CP-215 REPEATER-TT	87215-1100□	Repeater between twisted pair cables (for power supply 24 VDC)
CP-215 REPEATER-TT (100 VAC/200 VAC/100 VDC)	87215-1110□	Repeater between twisted pair cables (for power supply 100 VAC/200 VAC/100 VDC)
CP-215 REPEATER-TC	87215-1200□	Repeater between twisted pair cable and coaxial cable (for power supply 24 VDC)
CP-215 REPEATER-TC (100 VAC/200 VAC/100 VDC)	87215-1210□	Repeater between twisted pair cable and coaxial cable (for power supply 100 VAC/200 VAC/100 VDC)
CP-215 REPEATER-TP	87215-1300□	Repeater between twisted pair cable and H-PCF optical fiber cable (850 m) (for power supply 24 VDC)
CP-215 REPEATER-TP (100 VAC/200 VAC/100 VDC)	87215-1310□	Repeater between twisted pair cable and H-PCF optical fiber cable (850 m) (for power supply 100 VAC/200 VAC/100 VDC)
CP-215 REPEATER-TS2	87215-1400□	Repeater between twisted pair cable and silica glass optical fiber cable (2 km) (for power supply 24 VDC)
CP-215 REPEATER-TS2 (100 VAC/200 VAC/100 VDC)	87215-1410□	Repeater between twisted pair cable and silica glass optical fiber cable (2 km) (for power supply 100 VAC/200 VAC/100 VDC)
CP-215 REPEATER-TS5	87215-1500□	Repeater between twisted pair cable and silica glass optical fiber cable (5 km) (for power supply 24 VDC)
CP-215 REPEATER-TS5 (100 VAC/200 VAC/100 VDC)	87215-1510□	Repeater between twisted pair cable and silica glass optical fiber cable (5 km) (for power supply 100 VAC/200 VAC/100 VDC)

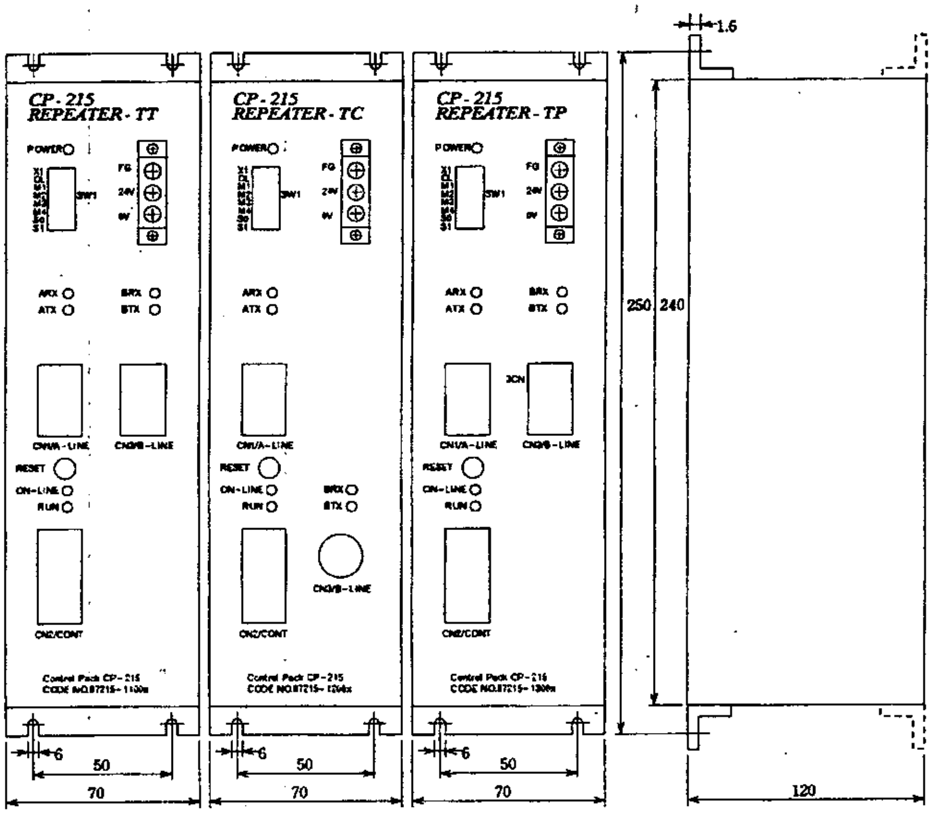


Fig. 5.49 CP-215 Repeater External Dimensions (mm)

5.5.1 System Configuration

(1) Basic System Configuration

Fig. 5.50 shows a basic system configuration with one repeater with metalic wire interface. This is an example to connect 60 stations by connecting REPEATER-TT between the main bus and branch bus.

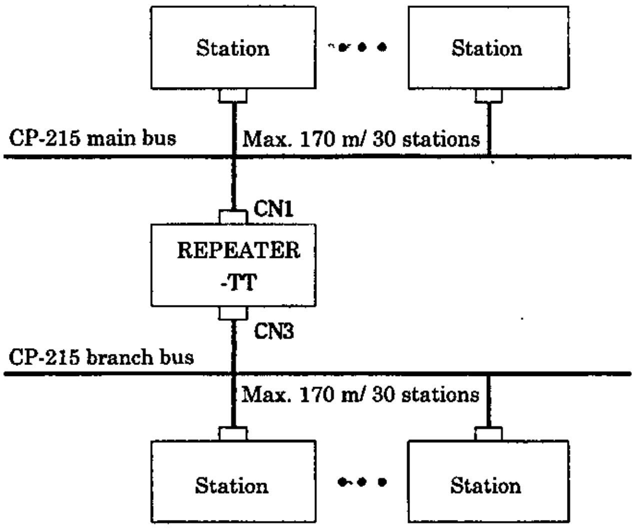


Fig. 5.50 Basic System Configuration with One REPEATER-TT

Fig 5.51 shows a basic system configuration with two repeaters with metalic wire interface.
For long transmission distance, use two repeaters: REPEATER-TT or REPEATER-TC. Use twisted pair cable or coaxial cable for connection between two repeaters.

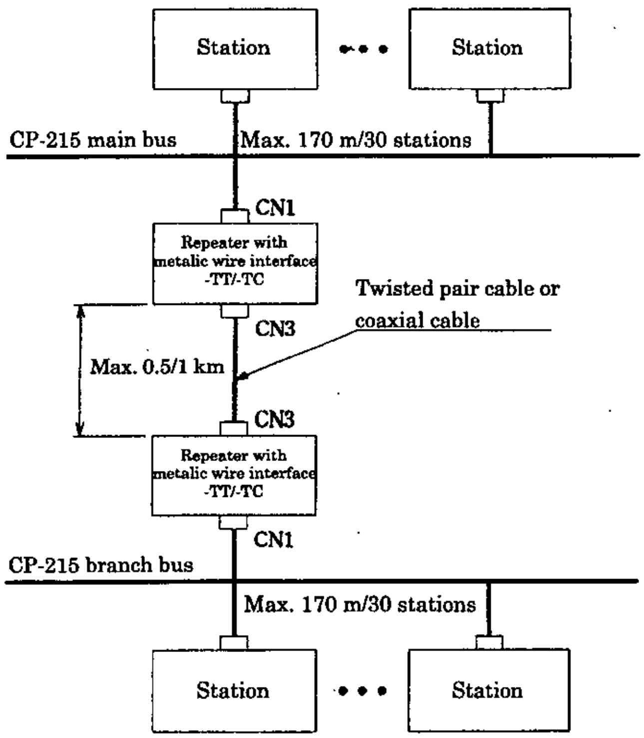


Fig. 5.51 Basic System Configuration with Two Repeaters with metalic wire interface -TT/-TC

(2) Basic System Configuration with Optical Repeater

Figs. 5.52 and 5.53 show basic system configurations with REPEATER-TP/-TS (optical repeater
For long transmission distance with unfavorable noise influence, use the optical repeaters. Use t
specified 2-core optical fiber cable and optical connector for connection between repeaters.

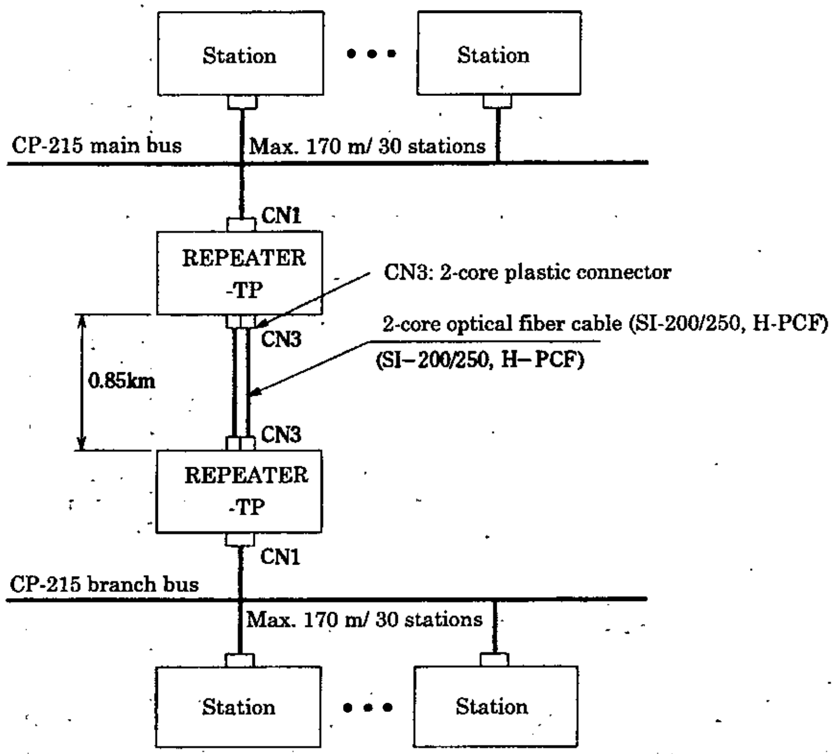


Fig. 5.52 Basic System Configuration with Optical REPEATER-TP

Fig. 5.53 shows a basic system configuration with two optical repeaters.

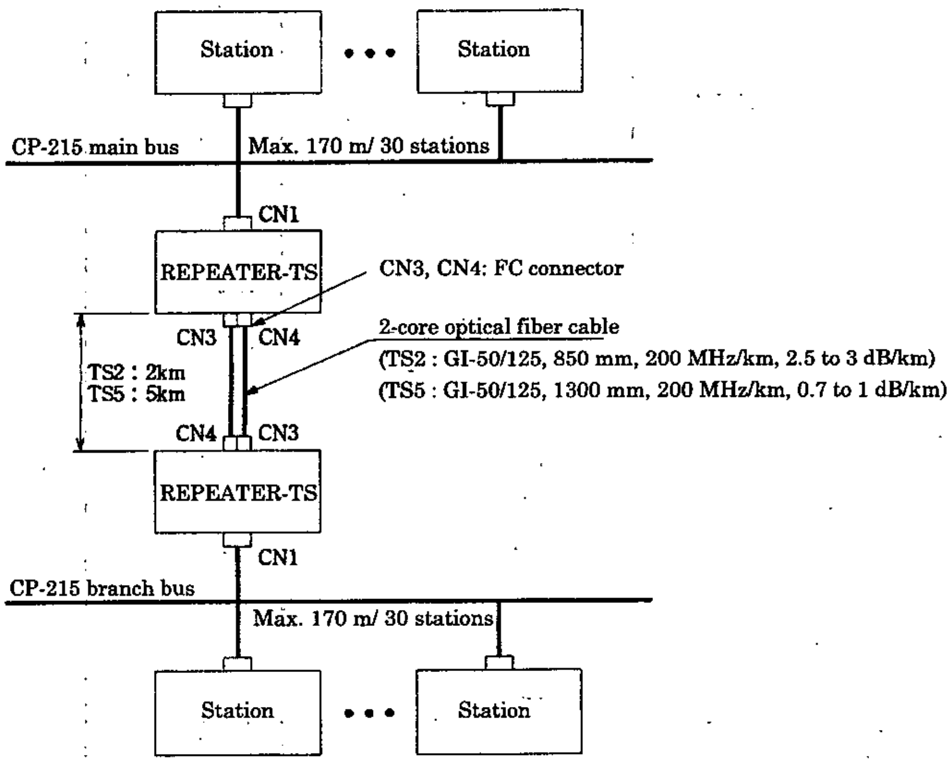


Fig. 5.53 Basic System Configuration with Two Optical REPEATER-TS

(3) Duplex System Configuration

Fig. 5.54 shows a duplex system configuration with repeaters.
In the CP-215 transmission circuit in duplex system configuration, the upper stream side repeaters of A-system and B-system can control "use system" and "standby system" by using the switching contact input signal (CN2). Switching should be performed in the sequence: after having completed the switching from previously use system to newly idle system, switch each system to previously use or newly standby. Set always the switching contact input signal of the lower stream side repeaters to ON or set the SW1-7 to ON.
In case of failure of use system repeater and transmission cable, the transmission can be restored properly by switching to the standby system. However, during the time from the occurrence of failure until the completion of switching from standby system to use system, a transmission error occurs.
The difference between cable extensions between repeaters of A-system and B-system should be less than 2 km.

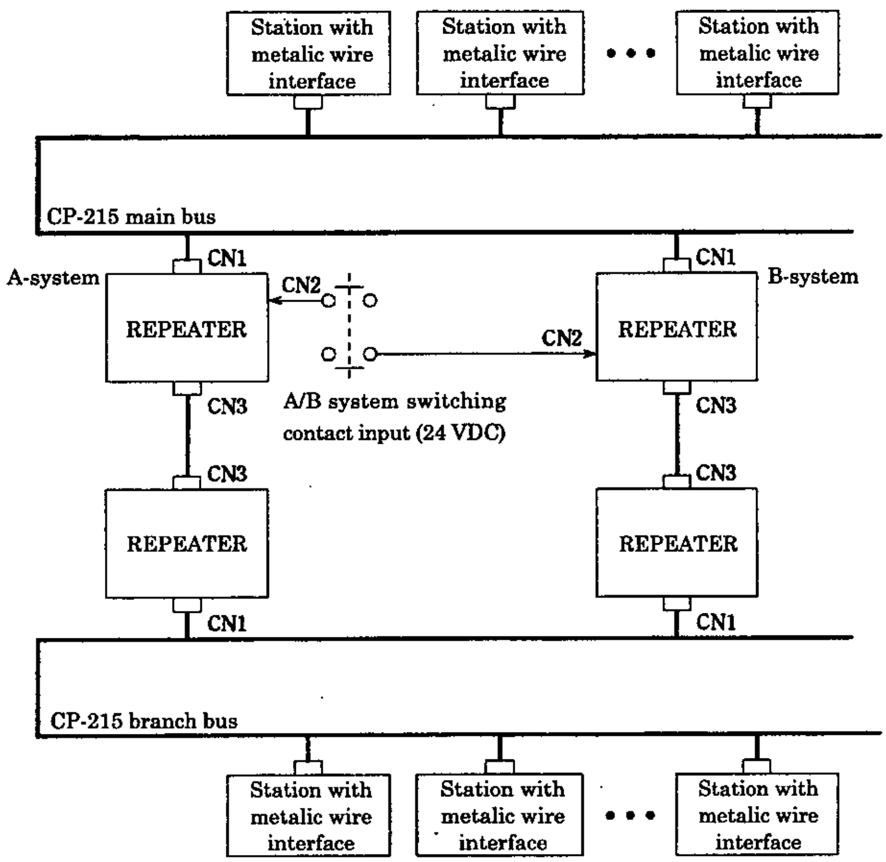


Fig. 5.54 Repeater Duplex System Configuration

(4) System Configuration with Max. Number of Repeaters Connected between Stations

Fig. 5.55 shows a system configuration example with maximum number of repeaters connec between stations. Up to 8 repeaters can be connected. When the number of repeaters connec between stations is 8 or more, apply star connection method to reduce the number of repeat between stations.

Figs. 5.55 and 5.56 shows system examples: one in cascade connection method and the othe star connection method. In the example in Fig. 5.56, the number of repeaters connected betw stations is 4.

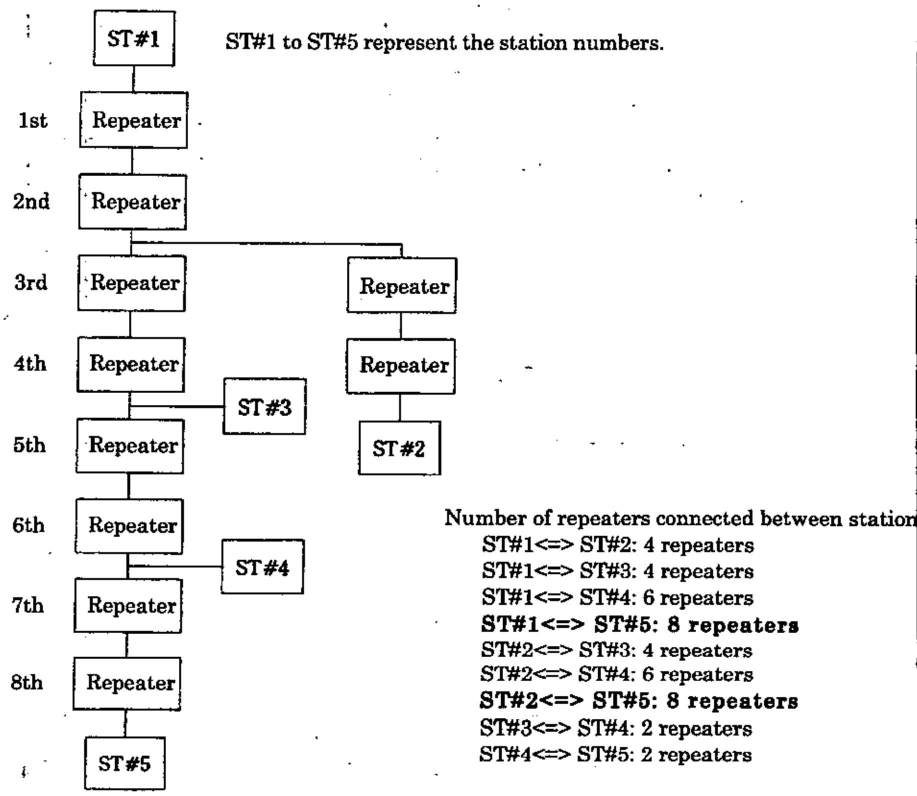


Fig. 5.55 System Configuration with Max. Number of Repeaters Connected between Stations

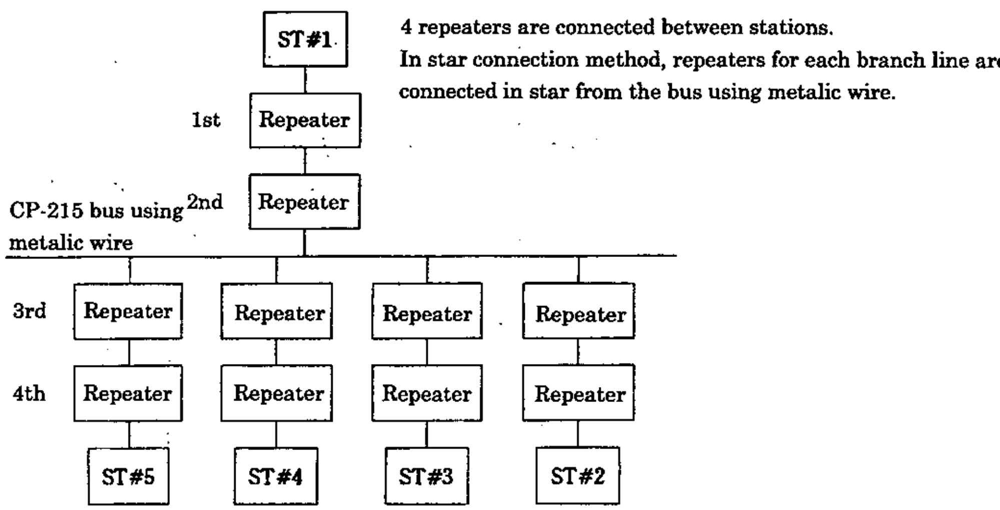


Fig. 5.56 System Configuration in Star Connection

5.2 CP-215 Repeater Common Specifications

(1) Power Supply Specifications

Item		Specifications
Rated input voltage	For 24 VDC	24 VDC±20 % (19.2 VDC to 28.8 VDC)
	For 100 VAC/200 VAC/100 VDC	100/115 VAC±15 % (85 VAC to 132 VAC/47 to 63 Hz) 100 VDC−10 %, +40 % (90 VDC to 140 VDC) 200 VAC±15% (170 VAC to 230 VAC/47 to 63 Hz)
Power consumption	For 24 VDC	5 W
	For 100 VAC/200 VAC/100 VDC	10 W
Input inrush current	For 24 VDC	5 A peak at 24 VDC
	For 100 VAC/200 VAC/100 VDC	15 A peak at 100 VDC 15 A peak at 100 VAC 30 A peak at 200 VAC
Over current protection	For 24 VDC	1 A fuse built-in
	For 100 VAC/200 VAC/100 VDC	2 A fuse built-in
Allowable momentary power interruption		10 ms or less

(2) Environmental Conditions

Item	Conditions
Operation temperature	0 to 55Ω
Operation humidity	5 to 95 %RH, no condensation
Storage temperature	−25 to +85Ω
Storage humidity	5 to 95 %, no condensation
Vibration resistance	Complied to JIS B 3502 Constant amplitude vibration: half-amplitude 0.075 mm, 10 to 57 Hz Constant acceleration vibration: acceleration 9.8 m/s^2 (1 G), 57 to 150 Hz
Shock resistance	Complied to JIS B3502 Max. 147 m/s^2 (15 G), applied in 11 ms
Grounding	Grounding resistance 100Ω or less

(3) Structural Specifications

Item	Specifications
Mounting	Panel mounted type (mounting screws: M5×4)
External dimensions (mm)	70 (W) × 250 (H) × 120 (D)
Cooling method	Natural cooling
Mass	1.6 kg

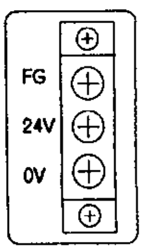
(4) Maximum Number of Repeaters Connected between Stations

For CP-215 transmission: 8 repeaters or less (Total extension: 12 km or less)

For CP-216 transmission: 2 repeaters or less (Total extension with one repeater: 600 m or less/4 Mbps)
(Total extension with two repeaters: 350 m or less/4 Mbps)

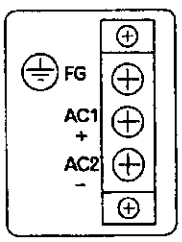
(5) Terminal Block

■ For 24 VDC power supply



Indication	Remarks
FG	Protective grounding
24 V	24 VDC +side
0 V	24 VDC −side

■ For 100 VAC/200 VAC/100 VDC power supply



Indication	Remarks
FG	Protective grounding
AC1/+	AC input, or 100 VDC +side
AC2/−	AC input, or 100 VDC −side

(6) Connectors

<CN1: Connection port to CP-215 Bus using metalic wire>

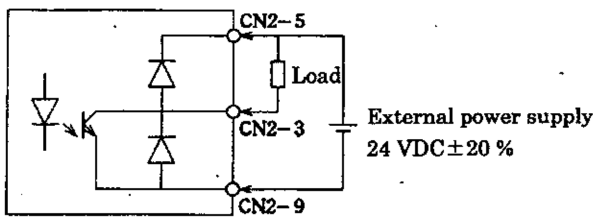
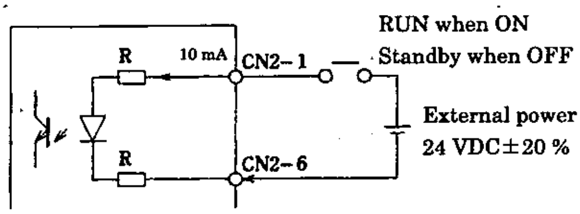
Item	Specifications
Transmission speed	1 Mbps, 2 Mbpsm, 4 Mbps (can be set by SW1)
Transmission distance	120 m/32 repeaters (4 Mbps)
Twisted cable	In-panel: YS-IPEV-S(CU), 1P±0.3 mm², 75 Ω system, made by Fujikura Corporation Between panels: YS-IPEV-S(CU), 1P±1.25 mm², 75 Ω system, made by Fujikura Corporation
Applicable connector	MR-8LM(G), made by Honda Communication Industries Co., Ltd.
Sending level	68.9 dBm (2.8 Vp)
Receiving level	53.5 dBm (0.475 Vp)

Arrangement of Connector Signals

No.	Signal name	No.	Signal name
1	SRD*	5	RT2
2	Not used	6	Not used
3	Not used	7	Not used
4	RT1	8	SRD

Note : Short-circuiting between RT1 and RT2 terminals connects the terminator (75 Ω) inside.

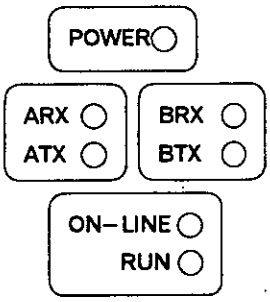
<CN2 : RUN Status I/O Connector (DSUB-9 pins)>

<table>
<tr><th>Name</th><th>Specifications</th></tr>
<tr><td>DO</td><td>RUN output (open collector output)
Allowable output capacity : 24 VDC, 50 mA or less
Turns OFF when the power is shut off or the receiving carrier sensor time is over (approx. 1 second or more).
Automatic restoration at recovery.

</td></tr>
<tr><td>DI</td><td>Duplex switching input (24 VDC, 10 mA)

</td></tr>
</table>

Note: For the external connector, use DSUB-9 pins male connector type 17JE-23090-02 (D8B) with case and mount screws (M3) made by Daiichi Electronic Industries Co., Ltd.

(7) Indicating lamps

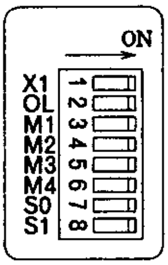
The indicating lamps indicate the operation status of CP-215REPEATER-TT101.



Indication	Status	Description
POWER	Lit	Power ON
	Unlit	Power OFF
ARX	Lit	Receiving at each port
BRX	Unlit	Receiving stopped at each port
ATX	Lit	Sending at each port
BTX	Unlit	Sending stopped at each port
ON-LINE	Lit	In operating status (DI input or SW1-7 to ON)
	Unlit	In standby status (DI input and SW1-7 to OFF)
RUN	Lit	Receiving circuit in normal state
	Unlit	Receiving circuit in abnormal state

(8) Setting switches

■ Operation mode setting switch (SW1)



Indicator	Switch name	Setting	
X1	Not used		
OL	Duplex mode	ON	Operation possible when the duplex switching DI input is OFF
		OFF	Operation possible when the duplex switching DI input is ON
M1	215/216 mode switching	See Table 5.47	
M2			
M3			
M4			
S0	Transmission speed	See Table 5.48	
S1			

Table 5.50 215/216 Mode Switching

	CP-215 transmission	CP-216 transmission	Setting disabled
M1	ON	ON	OFF
M2	ON	ON	OFF
M3	ON	OFF	–
M4	ON	OFF	–

Table 5.51 Transmission Speed

Transmission speed	1 Mbps	2 Mbps	4 Mbps	Invalid
S0	ON	OFF	ON	OFF
S1	OFF	ON	ON	OFF

■ **RESET Push Button**

Resets (OFF → ON) the RUN output from CN2.

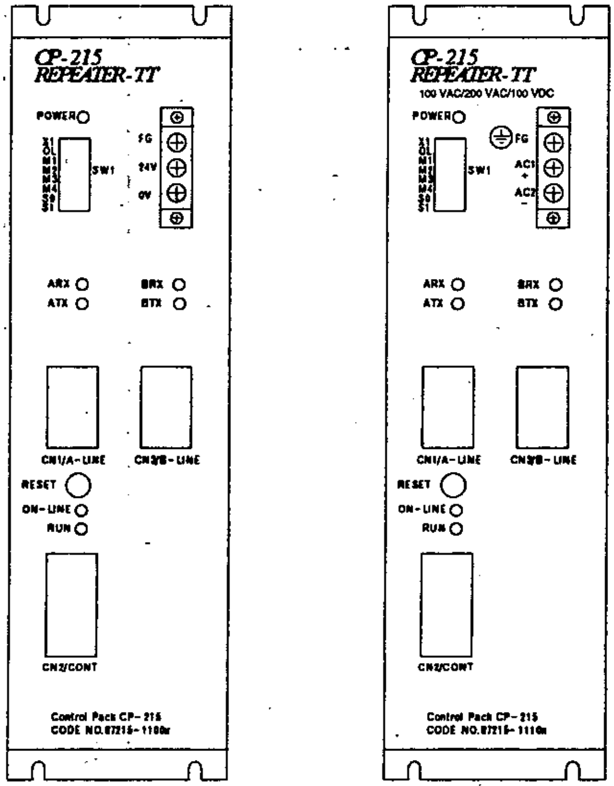
5.5.3 CP-215 REPEATER-TT

The CP-215 REPEATER-TT is a repeater with metalic wire that relays the CP-215 transmission or CP-216 transmission sig through a twisted pair cable.

The following 2 types of CP-215 REPEATER-TT are available:

- For 24 VDC power supply
- For 100/115 VAC, 200 VAC, and 100 VDC power supply

The transmission distance is 500 m max.



For 24 VDC power supply   For 100 VAC/200 VAC/100 VDC power supply

Fig. 5.57 Front View of CP-215 REPEATER-TT

■ Connector between repeaters (CN3/B-LINE)

Item	Specifications (Between repeaters)
Transmission speed	1 Mbps, 2 Mbps, 4 Mbps (can be set by SW1)
Transmission distance*	500 m/between repeaters (4 Mbps)
Twisted pair cable	In-panel: YS-IPEV-S(CU), 1P×0.3 mm², 75 Ω system, made by Fujikura Corporation Between-panels: YS-IPEV-S(CU), 1P×1.25 mm², 75 Ω system, made by Fujikura Corporation
Applicable connector	MR-8LM (G), made by Honda Communication Industries Co., Ltd.
Sending level	68.9 dBm (2.8 Vp)
Receiving level	53.5 dBm (0.475 Vp)

*: For the number of repeaters connected and the total extension distance, refer to 5.5.2 (4) "Maximum Number of Repeaters Connected between Stations".

Arrangement of Connector Signals

No.	Signal name	No.	Signal name
1	SRD*	5	RT2
2	Not used	6	Not used
3	Not used	7	Not used
4	RT1	8	SRD

*: Short-circuiting between RT1 and RT2 terminals connects the internal terminator (75 Ω).

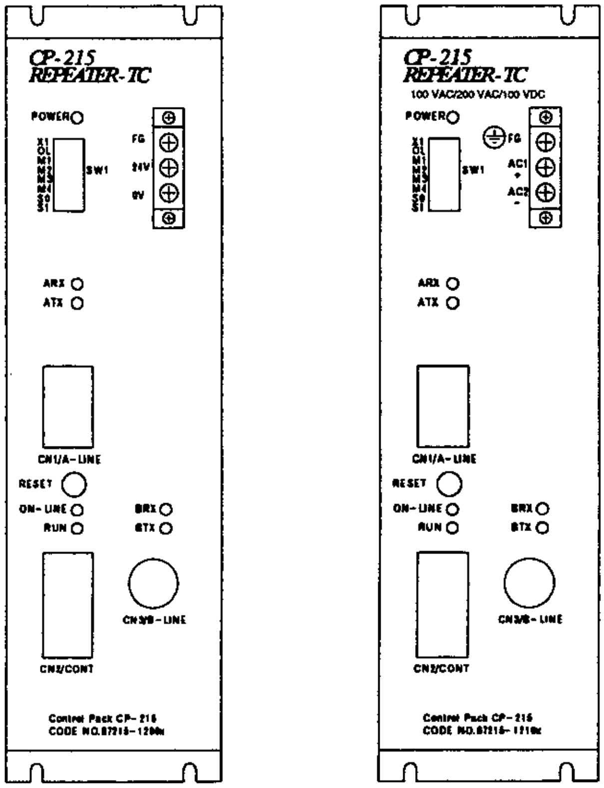
.5.4 CP-215 REPEATER-TC

The CP-215 REPEATER-TC is a repeater with metalic wire that relays the CP-215 transmission or CP-216 transmission signal through a coaxial cable.

The following 2 types of CP-215 REPEATER-TC are available.

- For 24 VDC power supply
- For 100/115 VAC, 200 VAC, and 100 VDC power supply

The transmission distance is 1000 m max.



For 24 VDC power supply　　For 100 VAC/200 VAC/100 VDC power supply

Fig. 5.58 Front View of CP-215 REPEATER-TC

■ Connector between repeaters (CN3/B-LINE)

Item	Specifications (Between repeaters)
Transmission speed	1 Mbps, 2 Mbps, 4 Mbps (can be set by SW1)
Transmission distance*	1 km/between repeaters (7C-FB, 4 Mbps)
Coaxial cable	75Ω system
Applicable connector	In-panel : BNC type, Between-panels : F type
Sending level	68.9 dBm (2.8 Vp)
Receiving level	53.5 dBm (0.475 Vp)

*: For the number of repeaters connected and the total extension distance, refer to 5.5.2 (4) "Maximum Number of Repeaters Connected between Stations".

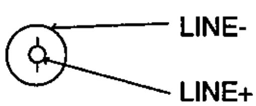


Fig. 5.59 BNC type Coaxial Connector

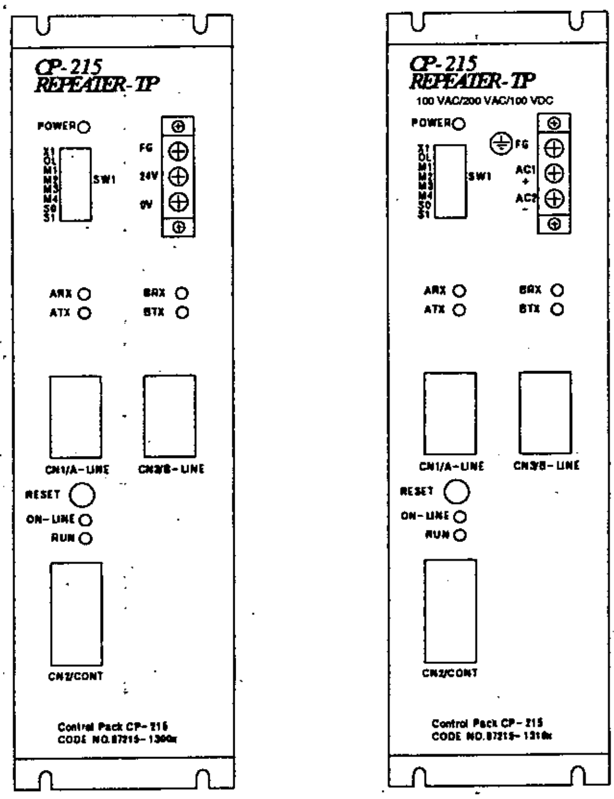
5.5.5 CP-215 REPEATER-TP

The CP-215 REPEATER-TP is an optical repeater that relays the CP-215 transmission or CP-216 transmission signal throu
H-PCF optical fiber cable.

The following 2 types of CP-215 REPEATER-TP are available.

- For 24 VDC power supply
- For 100/115 VAC, 200 VAC, and 100 VDC power supply

The transmission distance is 850 m max.



For 24 VDC power supply　　For 100 VAC/200 VAC/100 VDC power supply

Fig. 5.60 Front View of CP-215 REPEATER-TP

■ Connector between repeaters (CN3/B-LINE)

Item	Specifications (Between repeaters)
Transmission speed	1 Mbps, 2 Mbps, 4 Mbps (can be set by SW1)
Transmission distance*	0 to 650 m (with crimped connector)/650 to 850 m (with bonded connector)
Optical fiber	H-PCF, SI-200/250, wave length λ =850 nm loss=7 dB/km, band width=14.5 MHz · km
Applicable optical connector	2-core plastic connector, DL-92/DL-92H (complied to JIS C 5977 F08 type)
Optical sending level	−14 to −18 dBm
Optical receiving level	−14 to −28 dBm

*: For the number of repeaters connected and the total extension distance, refer to 5.5.2 (4) "Maximum Number of Repeaters Connected between Stations".

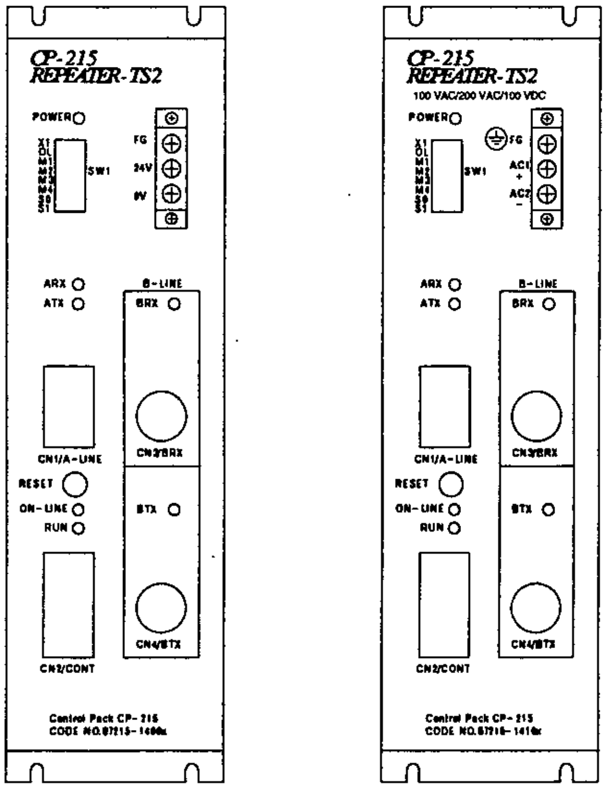
5.5.6 CP-215 REPEATER-TS2

The CP-215 REPEATER-TS2 is an optical repeater that relays the CP-215 transmission or CP-216 transmission signal through a twisted pair cable.

The following 2 types of CP-215 REPEATER-TS2 are available.

- For 24 VDC power supply
- For 100/115 VAC, 200 VAC, and 100 VDC power supply

The transmission distance is 2 km max.



For 24 VDC power supply　　For 100 VAC/200 VAC/100 VDC power supply

Fig. 5.61 Front View of CP-215 REPEATER-TS2

■ Connector between repeaters (CN3/BRX, CN4/BTX)

Item	Specifications (Between repeaters)
Transmission speed	1 Mbps, 2 Mbps, 4 Mbps (can be set by SW1)
Transmission distance*	0 to 2 km
Optical fiber	Silica glass fiber, GI-50/125, wave length λ =850 nm , loss=3 dB/km or less, band width=200 MHz · km
Applicable optical connector	FC type connector (complied to JIS C 5970 F01 type)
Optical sending level (CN4)	−18 dBm
Optical receiving level (CN3)	−15 to −28 dBm

*: For the number of repeaters connected and the total extension distance, refer to 5.5.2 (4) "Maximum Number of Repeaters Connected between Stations".

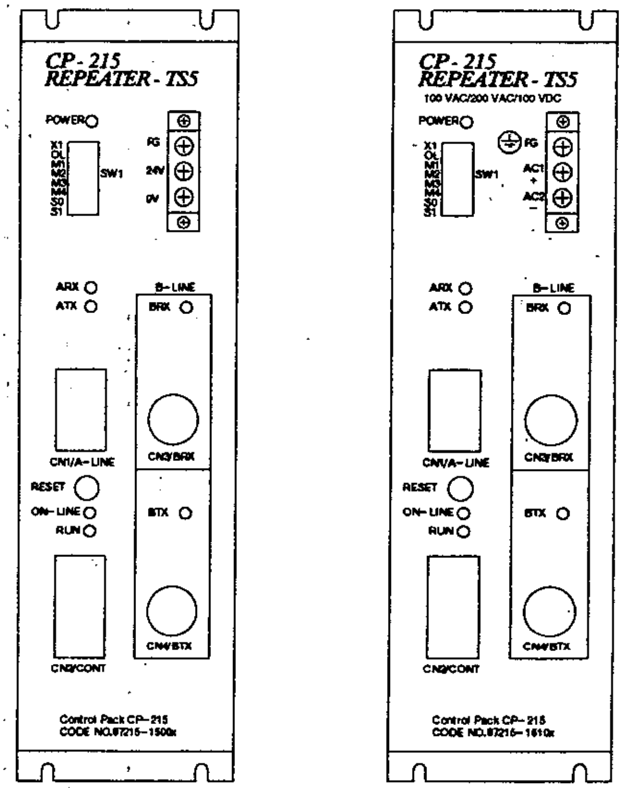
5.5.7 CP-215 REPEATER-TS5

The CP-215 REPEATER-TS5 is an optical repeater that relays the CP-215 transmission or CP-216 transmission signal thr
a twisted pair cable.

The following 2 types of CP-215 REPEATER-TS5 are available.

- For 24 VDC power supply
- For 100/115 VAC, 200 VAC, and 100 VDC power supply

The transmission distance is 5 km max.



For 24 VDC power supply　　For 100 VAC/200 VAC/100 VDC power supply

Fig. 5.62 Front View of CP-215 REPEATER-TS5

■ Connector between repeaters (CN3/BRX, CN4/BTX)

Item	Specifications (Between repeaters)
Transmission speed	1 Mbps, 2 Mbps, 4 Mbps (can be set by SW1)
Transmission distance*	0 to 5 km
Optical fiber	Silica glass fiber, GI-50/125, wave length λ=1300 nm, loss=1 dB/km or less, band width=200 MHz · km
Applicable optical connector	FC type connector (complied to JIS C 5970 F01 type)
Optical sending level (CN4)	−22 dBm
Optical receiving level (CN3)	−16 to −29 dBm

*: For the number of repeaters connected and the total extension distance, refer to 5.5.2 (4) "Maximum Number of Repeaters Connected between Stations".

6 SYSTEM CONFIGURATION

This chapter explains the configuration of the CP-9200SH CPU module.
A maximum of two CPU module can be mounted on the CP-9200SH. Multiple CPU configurations as well as a single CPU configuration with only one CPU module are also possible.

6.1 Single CPU Configuration

This is single CPU configuration of the CP-9200SH. One CPU-01 module is mounted on MB-01 or M 03 mounting base. The CPU-01 module is mounted in slots numbered 0 and 1 of an MB-01 or an MB- mounting base.

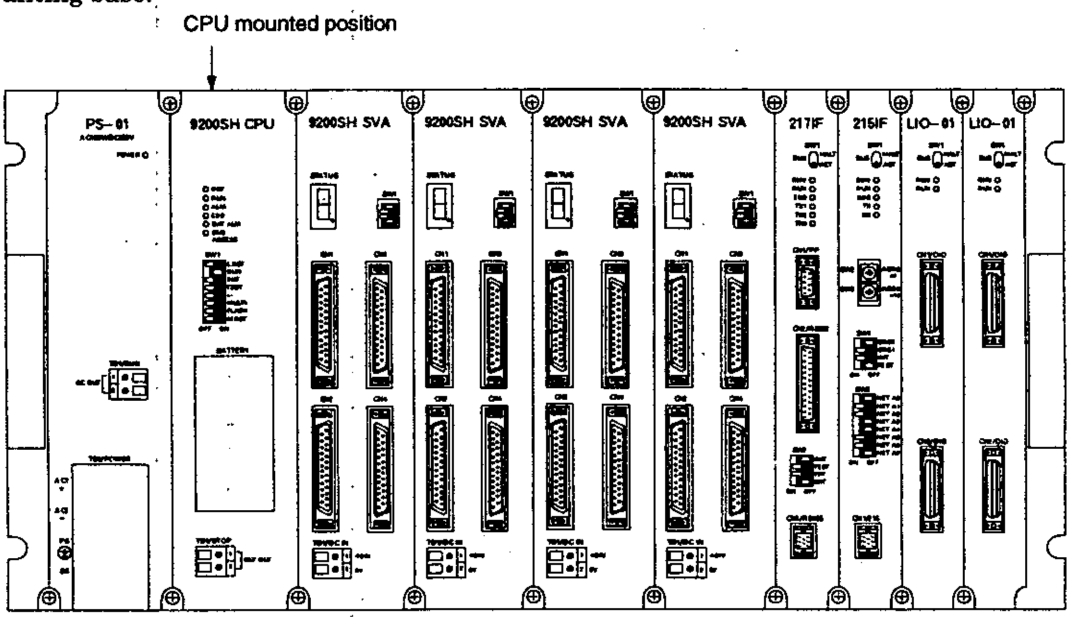


Fig. 6.1 Single CPU Configuration (MB-01)

6.2 Multiple CPU Configuration

An MB-01 mounting base is used in multiple CPU configurations of the CP-9200SH. Two CPU- modules are mounted. The CPU-01 modules are mounted in slots numbered 0 and 1 and in sl numbered 2 and 3 of the MB-01.

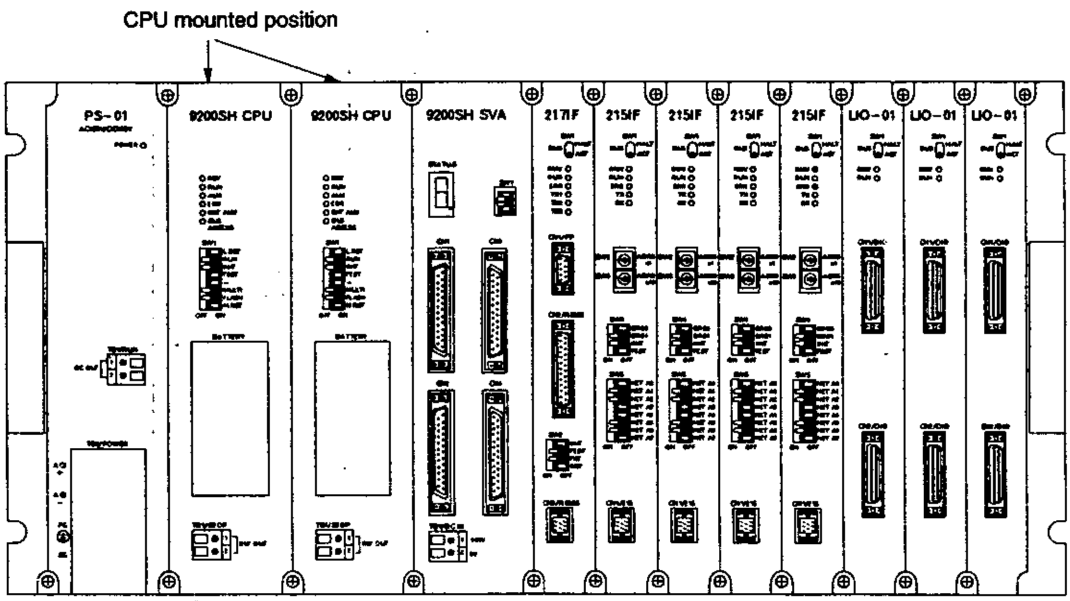


Fig. 6.2 Multiple CPU Configuration (MB-01)

.3 Connecting Expansion Racks

By using the EXIOIF module, up to three expansion racks can be added.

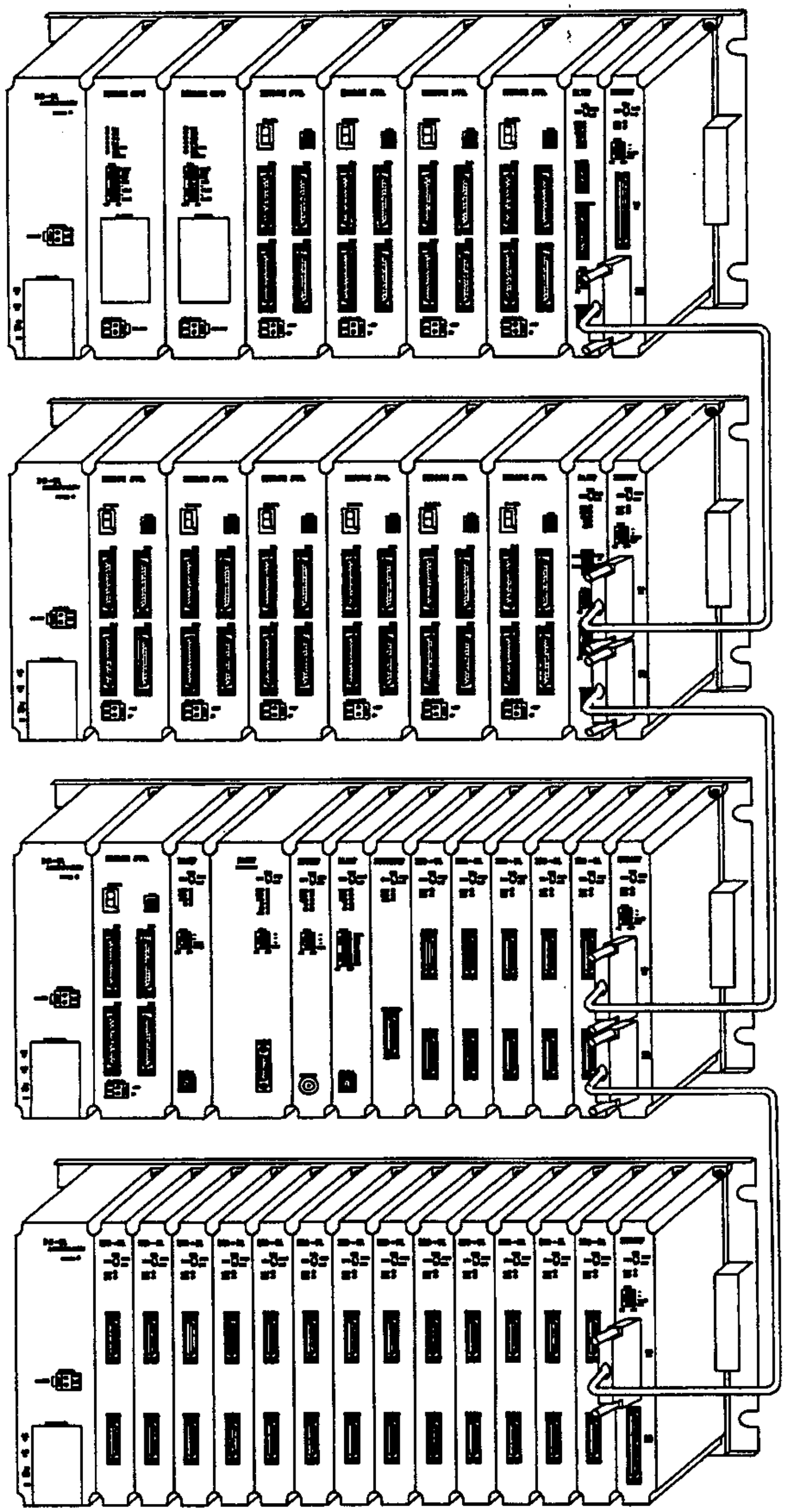


Fig. 6.3 Maximum Module Configuration of the CP-9200SH

Table 6.1 shows the maximum number of modules of each type to be mounted when the rack is expand up to 4 racks.

Table 6.1 Maximum Number of Modules Mounted

Module name	Number of modules	Remarks
CP-9200SH CPU	2	—
CP-9200SH SVA	11	Max. 16 modules with the PO-01 module
213IF, 215IF, 216IF, 217IF, 218IF, 225IF, 2500IF, 2000IOIF, 820IF	8	—
LIO-01, CNTR-01, AI-01, AO-01, DI-01, DO-01	No limitation	—
EXIOIF	8	Max. 2 modules in one rack (only for duplex system configuration)
PO-01	16	Max. 16 modules with the SVA module

7 BASIC OPERATIONS

This chapter describes the start/stop sequences and the basic operations of CP-9200SH.

7.1 Operation Modes

CP-9200SH has two operating modes, the online run mode and the offline stop mode.

7.1.1 Online Run Mode

Usually when the power of CP-9200SH is turned on, the RDY LED and the RUN LED become li (with ERR LED and ALM LED unlit) and the online run mode is entered. This means that the use program and the I/O operations are being executed without any malfunctions or failures at CP-9200SH The execution of the user program is continued and the online run mode is maintained even when a alarm, such as the I/O conversion error and the user operation error, occurs. However, in this cas the ALM LED lights up to indicate the occurrence of an error. Refer to Chapter 12 "TRIAL OPERATIO AND REMEDEIS FOR MALFANCTIONS" for details on the error and the actions to be taken.

7.1.2 Offline Stop Mode

In this mode, the execution of the user program is stopped and all outputs are reset (0 V is output b the analog outputs and "0" is output by the digital outputs). Also, the RUN LED or the RDY LE becomes unlit to indicate the state. Drawings (DWG.H and DWG.L) are not executed in this stat The offline stop mode is entered in the following five cases.

1 When the scan time is not set.
2 When the program memory is not initialized.
3 When a serious failure, such as watchdog time over, has occurred.
4 When a STOP operation is performed from the CP-717.
5 When power is supplied with the RUN/STOP switch set to the OFF (STOP) position.

* 1 to 3 are cases in which "a fault has occurred in the user program" or "there is fault or failure a CP-9200SH" (refer to Chapter 12 "TRIAL OPERATION AND REMEDIES FOR MALFUNCTIONS for details on the error and the actions to be taken). In the case of 4, the online run mode can b entered by performing the RUN operation. In the case of 5, the online run mode can be entered b setting the RUN/STOP switch to ON (RUN).

.2 Start and Stop Sequences

The start and stop sequences of CP-9200SH shall be explained below. At the same time, the DIP switch setting methods, the types of self-diagnosis, and the indicator lamp (LED) patterns shall also be explained.

2.1 Setting the DIP Switches

For Start/Stop sequence operation control, the DIP switches on CPU module are used.
There are eight switches in the CPU module as shown in Figure 7.1. Each of the switches is explained in Table 7.1.

<CP-9200SH CPU Module>

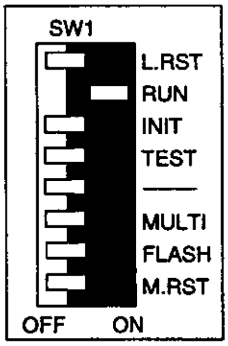


Fig. 7.1 DIP switches

Table 7.1 DIP Switches

Name	Function	Description
L.RST	CPU reset switch	By turning OFF →ON →OFF, only the CPU module is reset (Usually set to OFF)
RUN	RUN/STOP switch	ON : RUN OFF : STOP - Stops the user program upon start-up. (Usually set to ON)
INIT	Memory initialization switch	ON : Initializes memory during start-up when TEST = ON. OFF : Does not initialize memory when started up (Usually set to OFF)
TEST	Test mode switch	ON : Offline test mode when INIT = OFF. OFF : Ordinary mode (Usually set to OFF)
—	Unused	Set to OFF.
MULTI	Multiple CPU operation switch	ON : Multiple CPUs OFF : Single CPU
FLASH	Flash memory switch	ON : Program copied from flash memory. OFF : Program not copied from flash memory.
M.RST	Master reset switch	By turning OFF → ON → OFF, the CPU module and the optional modules can be simultaneously reset (Usually set to OFF)

(Note) : The right side of the switch is ON and left side OFF.

Memory Initialization

By turning on the power or turning off, on and off the L/RST or M.RST switch with the dip switches set as follows, the memory is initialized, and the user programs and the definition data are erased.

RUN switch : OFF
INIT switch : ON
TEST switch : ON

> After the memory is initialized, set the DIP switches back to the original position and then turn on the power again. Be sure to carry out memory initialization after removing the battery with the power of the module being OFF.

7.2.2 Start Sequence

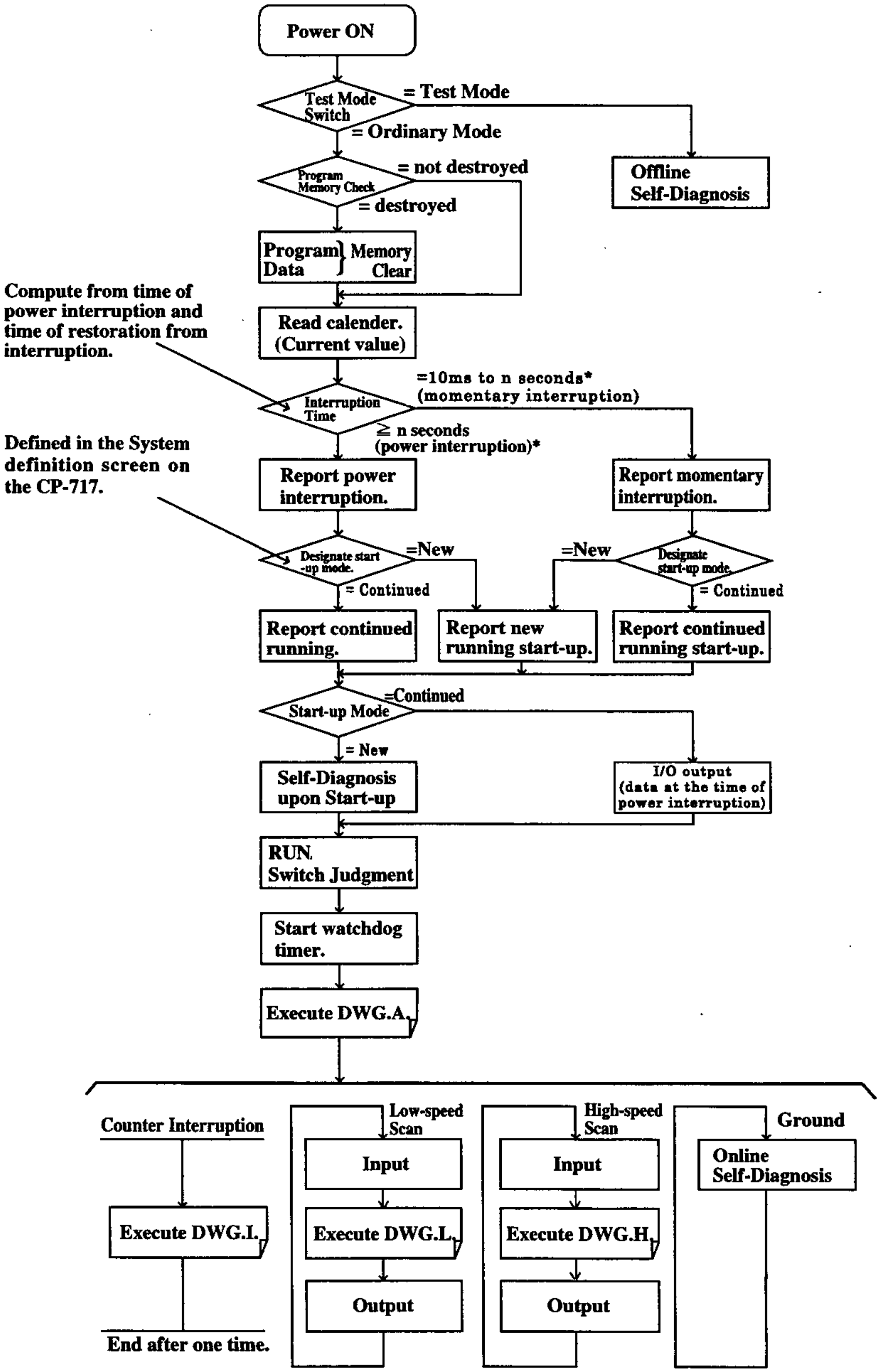
Upon starting, CP-9200SH carries out various diagnoses. When a error is found, the ERR LED i flashed and the contents of the error is indicated by the number of times the ERR LED is flashed. Th CP-717 cannot be operated while the indicator lamp (LED) is flashing. Refer to Chapter 12 "TRIA OPERATION AND REMEDIES FOR MALFUNCTIONS" for details on the error and the actions t be taken.

Table 7.2 provides a description of the indicator lamps (LEDs) of CP-9200SH while Fig. 7.2 shows th start sequence and basic operations of CP-9200SH.

Table 7.2 Indicating Lamp (LED) Indication Patterns (partial)

Classification	Indicating Lamp (LED)*						Contents of the Indication
	RMV	RDY	RUN	ALM	ERR	BAT ALM	
Normal	○	●	○	○	○	○	The user program is stopped.
	○	●	●	○	○	○	The user program is being executed normally.
Fault	○	○	○	○	●	○	Hardware reset condition (while indication is continued)
	○	○	○	○	○	○	During initial execution (when indication is continued)
	○	○	○	○	●	○	A serious failure has occurred.
	○	○	○	○	★	○	(1) 2 flashings : RAM error (2) 3 flashings : ROM error (3) 4 flashings : Peripheral LSI error
Alarm	—	—	—	—	—	●	Battery alarm
	○	●	●	●	○	○	(1) Operation error (2) I/O error (3) Illogical interruption (4) Transmission error
	Reported to the system (S) register (No LED indication)						(1) Information on connection/non-connection of an optional module (2) Hardware status (momentary interruption, RUN/STOP, tes mode, etc.)
Others	○	★	★	○	○	○	Memory initialization has been completed according to DIP switch settings.
	RDY and RUN flash repeatedly at the same time.						
	○	★	★	○	○	○	Offline test mode
	RDY and RUN flash alternately.						

* : In the Indicating Lamp (LED) column, ○ : Unlit, ● : Lit, ★ : Flashing, — : Any condition.



* : The momentary interruption judgment time is defined in the System Definition Screen of the CP-717

Fig. 7.2 Start Sequence and Basic Operation of CP-9200SH

Self-diagnosis upon Start-up

The self-diagnosis upon start-up has the following menu:

- Read/write diagnosis of the memory (RAM)
- Diagnosis of the system program (ROM)
- Function diagnosis of the main processor (CPU)
- Function diagnosis of the arithmetic operation coprocessor (FCPU)

When an error is found in a diagnosis, the RDY LED is flashed the prescribed number of times
Refer to Table 7.2 (p.7-4).

Online Self-diagnosis

The online self-diagnosis has the following menu:

- Diagnosis of the system program (ROM)
- Function diagnosis of the main processor (CPU)
- Function diagnosis of the numerical operation coprocessor (FCPU)

When an error is found in a diagnosis, the RDY LED is flashed the prescribed number of times
Refer to Table 7.2 (p.7-4).

New Start-up

Set the run mode to "New Start-up" in the System Definition screen of the CP-717. New runnin start-up will be performed for the next start-up. Unlike the continued running start-up, the sel diagnosis process will be carried out before the execution of DWG.A.

Continued Start-up

Set the run mode to "Continued Start-up" in the System Definition screen of the CP-717. Continue running start-up will be performed for the next start-up. Since the self-diagnosis process will no be carried out as in new running start-up, the start-up time for DWG execution will be shortened

If no error is detected as a result of self-diagnosis, the setting condition of the RUN switch will b judged. If the RUN switch is OFF (STOP), waiting is performed until the switch turns ON (RUN However, in the case of continued start-up, the RUN switch will actually never be OFF (STOP Thus the above mentioned waiting has significance only for the case of new running start-up. If the RUN switch is ON (RUN) or if it turns ON (RUN) from OFF (STOP), the CPU starts up th watchdog timer and then executes DWG.A. The scan process is started when the execution o DWG.A has been completed. The initial scan process is executed after the time for the high-spee or low-speed scan has passed following the end of DWG.A. Although system inputs will be execute from the first scan, system outputs will be executed only from the fourth scan. This is done t avoid inconsistencies in control due to reversal of the sequence.

Stopping Operations

CP-9200SH stops operating in the following cases.

1 When the power supply is interrupted.
2 When a power interruption has occurred.
3 When a critical fault has occurred.
4 When a STOP operation has been performed at the CP-717.

* In the case of 1 or 2, CP-9200SH will not restart unless the power is turned on again. In th case of 3, restart is performed by turning ON to OFF the L.RST or M.RST switch, or by turnin off and then turning on the power again. The fault can be found by the condition of the indicatin lamps (LED). In the case of 4, restart is performed by performing the RUN operation from th CP-717.

Flash Startup

When the CPU is started up with FLASH switch of SW2 set to "ON", the user program stored i the flash memory is copied on RAM and the online operation starts.

7.3 Detection of Power Interruption

Table 7.3 shows the start-up modes that follow power interruption of the CP-9200SH.
Continued Start-up or new Start-up can be selected for starting up the CP-9200SH. The selection of continued Start-up or new running is made in the System Definition screen of the CP-717. Refer to the Control Pack CP-717 Operation Manual (SIE-C877-17.4, 17.5) for the operation method of the CP-717.

Table 7.3 Start-up Modes of CP-9200SH

Interruption Time	Continued Start-up / New Start-up	Start-up Mode
0 to 10 ms	————	The device continues to run.
10 ms to Ns*	When continued Start-up is selected	After the CPU is reset, the device continues to run without performing self-diagnosis.
(momentary interruption)	When new Start-up is selected	After the CPU is reset, self-diagnosis is performed and running is started anew.
Ns* or more	When continued Start-up is selected	After the CPU is reset, the device continues to run without performing self-diagnosis.
	When new Start-up is selected	After the CPU is reset, self-diagnosis is performed and running is started anew.

* : Ns (The momentary interruption time) is defined in the System Definition screen of the CP-717.

8 USER PROGRAMS

This chapter describes the DWGs (drawings), the functions and the registers, which composes the user program.

8.1 DWG (Drawings)

The user programs are composed of DWGs (drawings). A user program is divided and controlled in DWG (drawing) units and the drawing No. serves as the basis of a user program.
Here, the types of DWGs (drawings) and a flowchart of the program shall be described. Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details on the execution control of DWGs.
There are 4 types of DWGs (drawings): DWG.A, DWG.I, DWG.H, and DWG.L. Each type serves different roles. The types and priority levels of DWGs are shown in Table 8.1.

Table 8.1 Types and Priority Levels of Parent Drawings

Type of Drawing	Role of Drawing	Number of Drawings	Priority level	Condition of Execution	Remarks
DWG.A	Starting process	64	1	Power ON	Executed just once when the power is turned on.
DWG.I	Interruption process	64	2	Interruption start	Executed by external interruption *
DWG.H	High-speed scan process	100	3	Fixed-cycle start	Executed on every high-speed scan time.
DWG.L	Low-speed scan process	100	4	Fixed-cycle start	Executed on every low-speed scan time.

* : External interruption occurs by counter correspondence interruption or DI interruption from option modules

The drawings are arranged in a hierarchy consisting of the parent drawing, child drawing, grandchi drawing, and operation error processing drawing.

- **Parent Drawing**

  This is executed automatically by the system program when the Condition of Execution sho in Table 8.1 is established.

- **Child Drawings**

  These are executed upon being referenced from the parent drawing by the SEE instruction.

- **Grandchild Drawings**

  These are executed upon being referenced from the child drawing by the SEE instruction.

- **Operation Error Processing Drawing**

  This is executed automatically by the system program when an operation error occurs.

DWG.A is shown in Fig. 8.1 as an example of the hierarchical structure of DWG (drawing).

The system program starts when the execution conditions are satisfied.

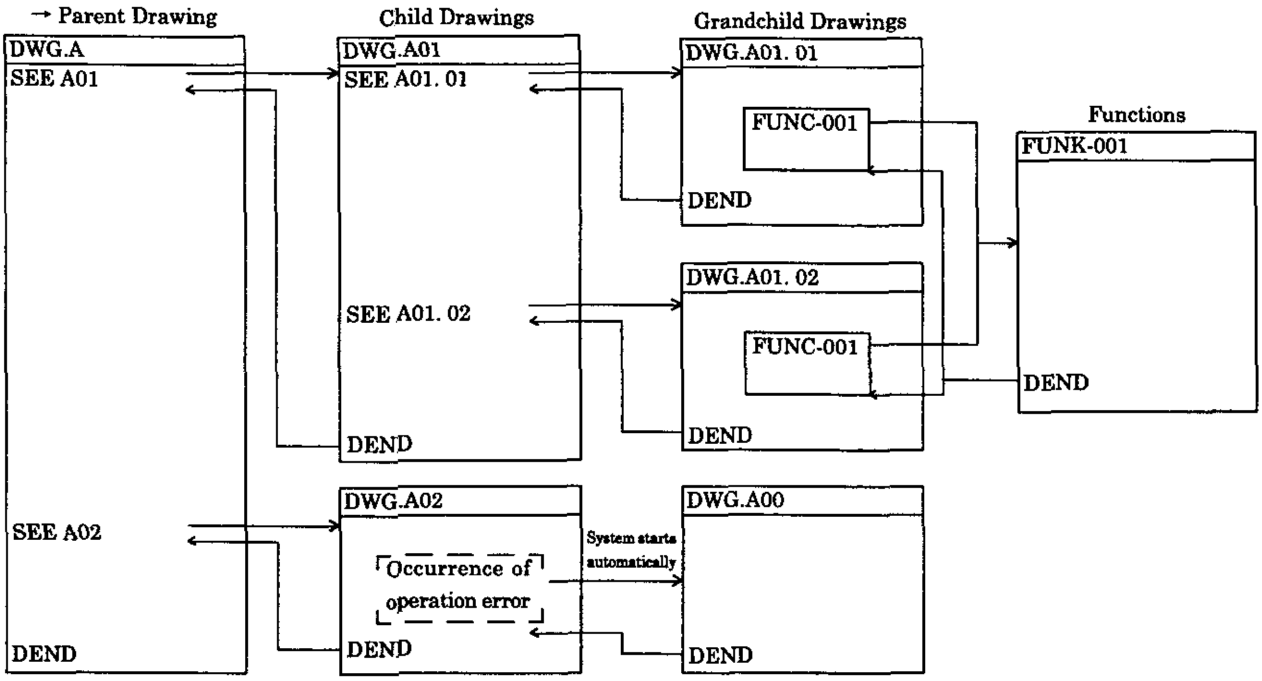


Fig. 8.1 DWG Execution Method (Example)

In the example of Fig. 8.1, DWG.A is composed of five drawings: one parent drawing, two child drawings, and two grandchild drawings. As was indicated in Table 8.1, the maximum number of drawings is 64, the details is shown in Table 8.2.

Table 8.2 Details of the Drawings

Drawing	Quantity	
Parent drawing	1 drawing	Total of 64 drawings.
Operation error processing drawing	1 drawing	
Child drawing	A maximum total	
Grandchild drawing	of 62 drawings.	

(Common to DWG.A, and I.)

DWGs No. are explained in Fig. 8.2.

Description of DWG: DWG.X YY ZZ

- ZZ: Grandchild drawing No. (01 to 99)
- YY: Child drawing No. (01 to 99)
- X: Parent drawing type (A, I, H, L)

Fig. 8.2 DWG No.

Operation error drawings are explained in Fig. 8.3.

DWG.X 00

- X: Parent drawing type (A, I, H, L)

Fig. 8.3 DWG No. for Operation Error Drawing

8.2 Functions

Functions can be referenced freely from each drawing. The same function can be referenc simultaneously from the drawings of different type and hierarchy. Also, function can be referenc from another function.

Using functions give the following advantages:

- Easy to arrange the program into parts
- Easy to prepare and manage programs

Two types of functions are used: System standard functions that have been prepared by the syste and User functions that are defined by the user.

■ Standard System Functions

11 types of functions, including functions for transmission are made available in advance as stand system functions. Standard system functions cannot be modified by the user. Refer to the CP-9200 Programming Manual (SIE-C879-40.3) for details of the standard system functions.

■ User Functions

The main body (program) and definition of these functions can be defined (programmed) freely by user. A maximum of 500 user functions can be defined.

The user function preparation method is indicated in Fig. 8.4.

Decide the I/O specifications	Decide the number of I/O and the data type.
↓ Create the function definition	Use CP-717 to input.
↓ Create the function main body program	Create in the same way as the DWG. However, the types of regist used are different. Pay attention to the correspondence of the regis numbers used in the function main body program and input/out data when referring to the functions.
↓ Create the function reference program	Input with the following procedure. ① Input the function name at the FSTART instruction. ② Use the FIN instruction to connect the input data. ③ Use the FOUT instruction to connect the output data.

Fig. 8.4 User Function Preparation Method

Refer to the Control Pack CP-717 Operation Manual (SIE-C877-17.4, 17.5) for details of CP-717 operat and to the CP-9200SH Programming Manual (SIE-C879-40.3) for details of instructions includ FSTART. Hereafter, the user function preparation method outlined in Fig. 8.4 will be explained detail.

.2.1 Determination of I/O Specifications

When preparing a user function, determine the specifications for the number of I/Os to meet the purpose of the function. Determine the 4 types of specifications shown in Table 8.3.

Table 8.3 Outline of Function Definitions

Specification to be Determined	Outline
Function Name	A maximum of 8 characters may be input.
Number of inputs	The number of input into the function. Up to 16 inputs may be input, that is, a maximum of 17 inputs including the address input may be input into the function.
Number of address inputs*	The designated number of addresses necessary for the function. Up to 1 may be input.
Number of outputs	Number of outputs from the function. Up to 16 outputs may be input.

* : Indicates how many pointers are necessary for the external registers used by the function.

.2.2 Preparing the I/O Definition of the Function

The function name and other specifications determined in section 8.2.1 are defined at the CP-717. Refer to the Control Pack CP-717 Operation Manual (SIE-C877-17.4, 17.5) for details on the operation method.

Example) Graphic expression of a function defined with function name = TEST, number of inputs =4, number of address inputs = 1, and number of outputs = 4.

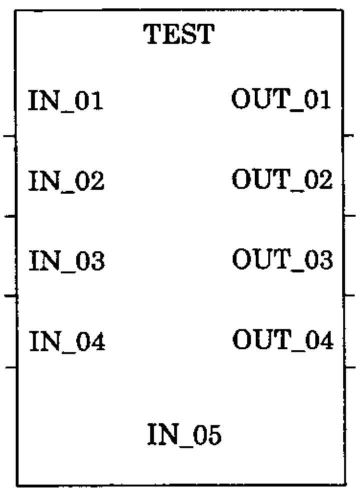


Fig. 8.5 Graphic Expression of a Function (Example)

After preparing the graphic expression of the function, define the data types of the function inputs, outputs, and address input. The data type can be defined as one of 3 type: Bit, Integer, and Double-length integer. Once the data types are defined, the system automatically assigns the inputs to the X register, the outputs to the Y register, and the address inputs to the A register.

An example of the function I/O definition based on Fig. 8.5 is shown in Fig. 8.6.

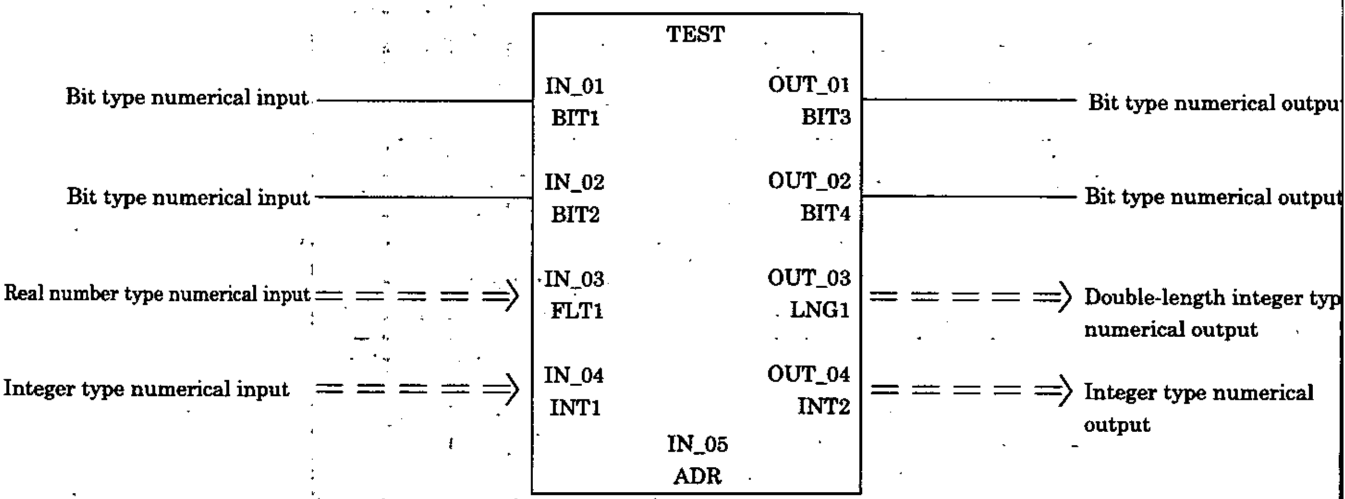


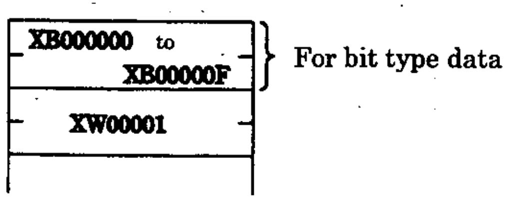
Fig. 8.6 Graphic Expression of a Function 2 (Example)

Addresses are automatically assigned to the I/O signals in order from the highest located signal on t graphic expression. For the example of Fig. 8.6, the assignment of each I/O register will be as shown Table 8.4.

Table 8.4 Addresses of I/O Registers

Name	Data Type	I/O Register
IN_01 (BIT1)	Bit type	XB000000
IN_02 (BIT2)	Bit type	XB000001
IN_03 (FLT1)	Real number type	XF00001
IN_04 (INT1)	Integer type	XW00003
IN_05 (ADR)	Address input type	AW00000
OUT_01 (BIT3)	Bit type	YB000000
OUT_02 (BIT4)	Bit type	YB000001
OUT_03 (LNG1)	Double-length integer type	YL00001
OUT_04 (INT2)	Integer type	YW00003

(Note) XW00000 and YW00000 of the X and Y registers are used for the bit type data.



The function I/O registers in Table 8.4 are assigned automatically. The outer frame of the function prepared at this stage.

8.2.3 Preparing the Function Main Program

The function main program is prepared in the same manner as the DWGs. However, the types registers used will be different. Refer to 8.3.3 "Types of Registers" for details on the registers.

.2.4 Preparing the Function Referencing Program

The user function is completed when the graphic expression and the program of the function have been prepared. As with the standard system functions, user functions may be referenced from any parent, child, grandchild drawing or any other user function. Functions may be called from a drawing or from within the program of another user function by the following procedure. Refer to the Control Pack CP-717 Operation Manual (SIE-C877-17.4, 17.5) for the operation method.

① Input the function name with the FSTART instruction.

(Example) Input "FSTART, [Enter] key, TEST, [Enter] key" with the keys.

The graphic expression of the previously defined function of Fig. 8.6 will be displayed.

② Use the FIN instruction to prepare the program for the input data.

Provide the inputs and address input of the function with input data.

③ Use the FOUT instruction to prepare the program for the output data.

Provide the outputs of the function with output data.

(Example) Input and output data are provided to the graphic expression of Fig. 8.6 as shown in Fig. 8.7.

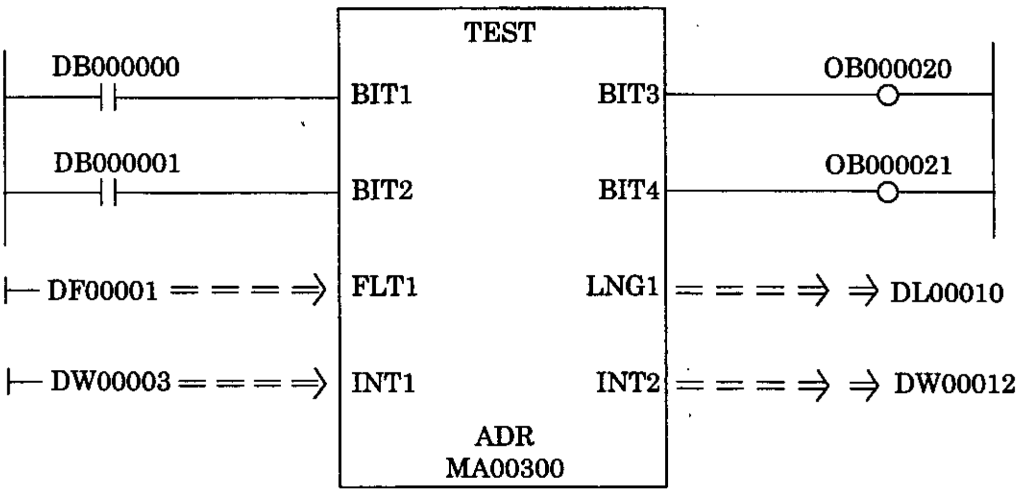


Fig. 8.7 Graphic Expression to which Input Data have been Provided (Example)

Table 8.5 The Relationship between I/O Data and the Registers inside the Function

Name	I/O Data	Register inside the Function
BIT1	DB000000 →	XB000000
BIT2	DB00001 →	XB000001
FLT1	DF00001 →	XF00001
INT1	DW00003 →	XW00003
ADR	MA00300 ←	→ AW00000
BIT3	OB00020 ←	YB000000
BIT4	OB00021 ←	YB000001
LNG1	DL00010 ←	YL00001
INT2	DW00012 ←	YW00003

In Table 8.5, the address input register AW00000 is assigned to MA00300. That is, the registe AW00000, AW00001,... used inside the TEST function correspond to the external registers, MA003C MA00301,... . Therefore, if a certain value is stored in AW00000 in the function, this value will stored in MA00300.

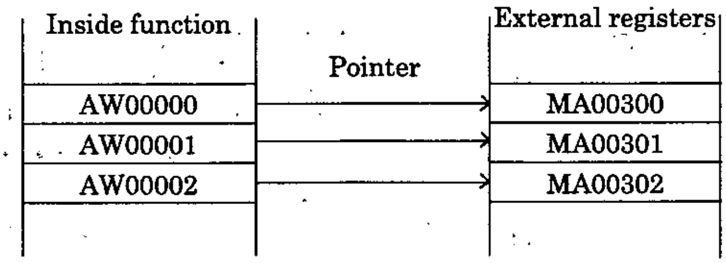


Fig. 8.8 Designate pointers of the address input register

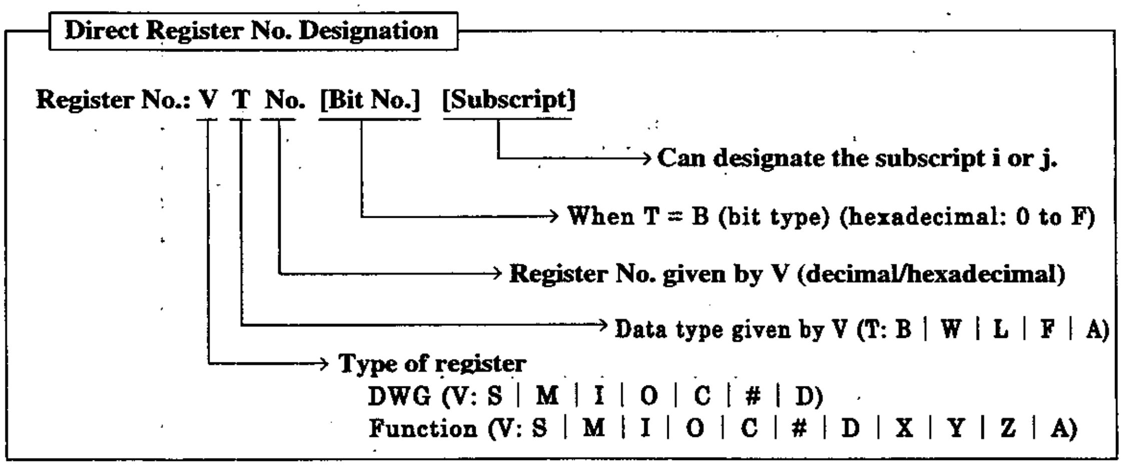
8.3 Registers

8.3.1 Register Designation Methods

As shown in Table 8.6, registers may be designated by direct register No. designation or by symbo designation. These two types of register designation methods may be used together in the user prograr When symbolic designation is to be used, the relationship between the symbol and the register No. defined in the symbol table to be described later.

Table 8.6 Register Designation Methods

Type of Designation	Designation Method	
Direct register No. designation	Bit type register designation Integer type register designation Double-length integer type register designation Real number type register designation Address type register designation x : In the case of subscript designation, the subscript i or j is attached after the register No.	: MB00100Ax : MW00100x : ML00100x : MF00100x : MA00100x
Symbolic designation	Bit type register designation Integer type register designation Double-length integer type register designation Real number type register designation Address type register designation An alphanumeric expression with 8 characters or less. .x :In the case of subscript designation, a "." and then the subscript i or j are attached after the alphanumeric expression of the symbol with 8 characters or less.	: RESET1-A.x : STIME-H.x : POS-REF.x : IN_DEF.x : PID-DATA.x



Symbolic Designation

Symbol : [Symbol Name] [.] [Subscript]

- [Subscript] → **Can designate the subscript i or j.**
- [.] → **Necessary when a subscript is to be used (to differentiate between the symbol name and the subscript).**
- [Symbol Name] → **Name attached to the register: 8 characters or less**

  □ □□□□□□□

  - □□□□□□□ → **Alphanumeric or symbolic character**
  - □ → **Alphabetic or symbolic character (A number cannot be used at the head of a symbol name.)**

.2 Data Types

As shown in Table 8.7, there are five data types; the bit type, the integer type, the double-length integer type, the real number type, and the address type. These are used according to the purpose. However, address type data may be used only for pointer designation within the function. Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details.

Table 8.7 Data Types

Type	Data Type	Numerical Range	Remarks
B	Bit	ON, OFF	Used for relay circuits.
W	Integer	− 32768 to + 32767 (8000H) (7FFFH)	Used for numerical operations. Values in ( ) are used in the case of logic operations.
L	Double-length	− 2147483648 to +2147483647 (80000000H) (7FFFFFFFH)	Used for numerical operations. Values in ( ) are used in the case of logic operations.
F	Real number	± (1.175E-38 to 3.402E+38), 0	Used for numerical operations.
A	Address	0 to 32767	Used only for pointer designation.

8.3.3 Types of Registers

(1) DWG Registers

The 7 types of registers shown in Table 8.8 can be used in each DWG.

Table 8.8 DWG Registers

Type	Name	Designation Method	Range	Description	Characterist
S	System register	SB, SW, SL, SFnnnnn (SAnnnnn)	SW00000 to SW01023	Registers made available by the system. The register No. nnnnn is a decimal expression. Upon system start-up , SW00000 to SW00049 are all cleared and set to 0.	
M	Data register	MB, MW, ML, MFnnnnn (MAnnnnn)	MW00000 to MW32767	Registers used in common among DWGs. Used for I/F between DWGs. The register No. nnnnn is a decimal expression.	Common to DWGs
I	Input register	IB, IW, IL, IFhhhh (IAhhhh)	IW0000 to IW13FF	Register used for the input data. The register No. hhhh is a hexadecimal expression.	
O	Output register	OB,OW,OL,OFhhhh (OAhhhh)	OW0000 to OW13FF	Register used for the output data. The register No. hhhh is a hexadecimal expression.	
C	Constant register	CB,CW,CL,CFnnnnn (CAnnnnn)	CW00000 to CW16383	Register that can only be referenced in the program. The register No. nnnnn is a decimal number.	
#	# register	#B, #W, #L, #Fnnnnn (#Annnnn)	#W00000 to #W16383	Registers that can only be referenced in the program. Can only be referenced by the corresponding DWG. The actual range of use is designated by the user at the CP-717. The register No. nnnnn is a decimal expression.	Unique to each DWGs
D	D register	DB, DW, DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each DWG. Can only be used in the corresponding DWG. The actual range of use is designated by the user at the CP-717. The register No. nnnnn is a decimal expression.	

The motion parameter register Nos. (input or output register number) will vary with the module N and each axis (axes 1 to 4).

The motion parameter register No. can be derived with the following equation.

Motion parameter register No. (IW□□□□ and OW□□□□) = Module No. offset + Axis offset

The module No. offset depends on the module No. as follows.

Module No. 1 = C000 Module No. 2 = C400 Module No. 3 = C800 Module No. 4 = CC00
Module No. 5 = D000 Module No. 6 = D400 Module No. 7 = D800 Module No. 8 = DC00
Module No. 9 = E000 Module No. 10 = E400 Module No. 11 = E800 Module No. 12 = EC00
Module No. 13 = F000 Module No. 14 = F400 Module No. 15 = F800 Module No. 16 = FC00

The axis offset depends on each axis No. as follows.

Axis offset = (Axis No. − 1) × 40H (64 words)

The above relation is summarized in Table 8.9.

Table 8.9 Motion parameter register No.

Module No.	Axis 1 IW(OW)	Axis 2 IW(OW)	Axis 3 IW(OW)	Axis 4 IW(OW)
1	C000 to C03F	C040 to C07F	C080 to C0BF	C0C0 to C0FF
2	C400 to C43F	C440 to C47F	C480 to C4BF	C4C0 to C4FF
3	C800 to C83F	C840 to C87F	C880 to C8BF	C8C0 to C8FF
4	CC00 to CC3F	CC40 to CC7F	CC80 to CCBF	CCC0 to CCFF
5	D000 to D03F	D040 to D07F	D080 to D0BF	D0C0 to D0FF
6	D400 to D43F	D440 to D47F	D480 to D4BF	D4C0 to D4FF
7	D800 to D83F	D840 to D87F	D880 to D8BF	D8C0 to D8FF
8	DC00 to DC3F	DC40 to DC7F	DC80 to DCBF	DCC0 to DCFF
9	E000 to E03F	E040 to E07F	E080 to E0BF	E0C0 to E0FF
10	E400 to E43F	E440 to E47F	E480 to E4BF	E4C0 to E4FF
11	E800 to E83F	E840 to E87F	E880 to E8BF	E8C0 to E8FF
12	EC00 to EC3F	EC40 to EC7F	EC80 to ECBF	ECC0 to ECFF
13	F000 to F03F	F040 to F07F	F080 to F0BF	F0C0 to F0FF
14	F400 to F43F	F440 to F47F	F480 to F4BF	F4C0 to F4FF
15	F800 to F83F	F840 to F87F	F880 to F8BF	F8C0 to F8FF
16	FC00 to FC3F	FC40 to FC7F	FC80 to FCBF	FCC0 to FCFF

(Caution) If the module Nos. are different, the registers between the axes are not continuous.
If the module Nos. are the same, the registers between the axes are continuous.
Handle with care when using subscripts (i, j) in user programs.

(Example)

In ├IWC000i, i = 0 to 255 can be read out correctly.

IWC000 can read and write correctly the register range of module No.1; the range IWC000 to IWC0FF.

When i > 256, it can not be read out.

(2) Function Registers

The 11 types of registers shown in Table 8.10 can be used in each function.

Table 8.10 Function Registers

Type	Name	Designation Method	Range	Description	Characteristic
X	Function input register	XB,XW,XL,XFnnnnn	XW00000 to XW00016	Inputs into a function Bit input : XB000000 to XB00000F Integer input : XW00001 to XW00016 Double-length integer input : XL00001 to XL00015 The register No. nnnnn is a decimal expression.	Unique to each function
Y	Function output register	YB,YW,YL,YFnnnnn	YW00000 to YW00016	Outputs from a function Bit output : YB000000 to YB00000F Integer output : YW00001 to YW00016 Double-length integer output : YL00001 to YL00015 The register No. nnnnn is a decimal expression.	
Z	Register inside function	ZB,ZW,ZL,ZFnnnnn	ZW00000 to ZW00063	Internal registers unique to each function. Can be used for processes inside the function. The register No. nnnnn is a decimal expression.	
A	Register outside function	AB,AW,AL,AFnnnnn	AW00000 to AW32767	External registers that use the address input value as the base address. For linking with (S, M, I, O, #, DAnnnnn). The register No. nnnnn is a decimal expression.	
#	# register	#B, #W, #L, #Fnnnnn (#Annnnn)	#W00000 to #W16383	Register that can only be referenced by a function. Can be referenced only by the corresponding function. The user designates the actual range of use with the CP-717. The register No. nnnnn is a decimal number.	
D	D register	DB,DW,DL,DFnnnnn (DAnnnnn)	DW00000 to DW16383	Specific internal register inside each function. Can be referenced only by the corresponding function. The user designates the actual range of use with the CP-717. The register No. nnnnn is a decimal number.	
S	System register	SB,SW,SL,SFnnnnn (SAnnnnn)	Same as the DWG registers. [Since these registers are common to both DWGs and functions, be careful of their use when the same function is referenced from DWGs of different priority levels.]		Common to DWGs
M	Data register	MB,MW,ML,MFnnnnn (MAnnnnn)			
I	Input register	IB,IW,IL,IFhhhh (IAhhhh)			
O	Output register	OB, OW,OL, OFhhhh(OAhhhh)			
C	Constant register	CB,CW,CL,CFhhhh (CAnnnnn)			

(Note) SA, MA, IA, OA,DA, #A and CA may also be used inside a function.

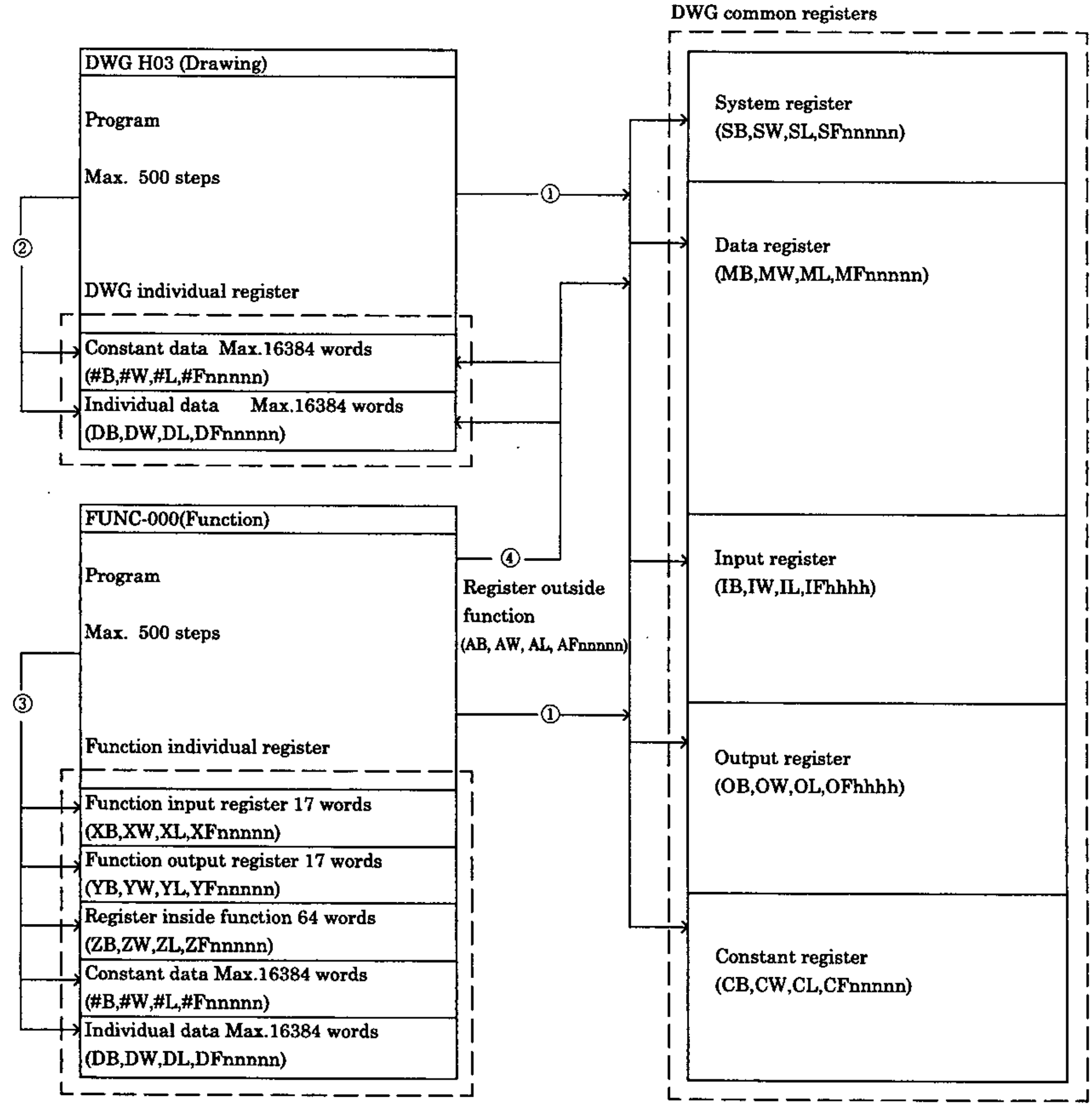
8.3.4 Function I/O and Function Registers

The function referencing correspond to the function registers as shown in Table 8.11.

Table 8.11 Correspondence between Function I/O and Function Registers

Function I/O	Function Register
Bit input	The bit No. increases continuously from XB000000 in the order of bit input. (XB000000, XB00000 XB000002, ... , XB00000F)
Integer, Double-length integer, and Real number inputs	The register No. increases continuously from XW, XL, and XF00001 in the order of the intege double-length integer, and real number inputs, respectively. (XW00001, XW00002, XW00003, ... , XW00016) (XL00001, XL00003, XL00005, ... , XL00015) (XF00001, XF00003, XF00005, ... , XF00015)
Address input	The address input value corresponds to register No. 0 of the external register. (Input value = MA00100 : MW00100 = AW00000, MW00101 = AW00001...)
Bit output	The bit No. increases continuously from YB000000 in the order of bit output. (YB000000, (YB00000 YB000001, YB000002, ... , YB00000F)
Integer, Double-length integer, and Real number outputs	The register No. increases continuously from YW, YL, and YF00001 in the order of the intege double-length integer, and real number output, respectively. (YW00001, YW00002, YW00003, ... , YW00016) (YL00001, YL00003, YL00005, ... , YL00015) (YF00001, YF00003, YF00005, ... , YF00015)

.3.5 Program and Register Referencing Ranges



① : The DWG common registers can be referenced from any drawing and any function.

② : The DWG individual registers can be referenced only from that drawing.

③ : The individual function registers can be referenced only from that function.

④ : The DWG common registers and DWG individual registers can be referenced from functions, using registers inside function.

8.3.6 Symbol Management

(1) Symbol management in the DWGs
The symbols used in the DWGs are all managed with a symbol table shown in Table 8.12. Refer t
the CP-9200SH Programming Manual (SIE-C879-40.3) for details.

Table 8.12 DWG Symbol Table (Example)

No.	Register No.	Symbol	Size *	Remarks
0	IB0000	STARTPBL	1	The register No. is a hexadecimal expression.
1	OB0000	STARTCOM	1	The register No. is a hexadecimal expression.
2	MW00000	SPDMAS	1	
3	MB000010	WORK-DB	16	
4	MW00010	PIDDATA	10	
5	MW00020	LAUIN	1	
6	MW00021	LAUOUT	1	
⋮				
N				

* : If a program is prepared using data configurations as arrays, index process data, define the sizes used in the respecti
data configurations.
For example, if data is referenced as PIDDATA.i and i takes on values in the range 0 to 9, define the size as 10.

(2) Symbol management in the functions
The symbols used in the functions are all managed with a symbol table shown in Table 8.1
Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details.

Table 8.13 Function Symbol Table (Example)

No.	Register No.	Symbol	Size *	Remarks
0	XB000000	EXECOM	1	
1	XW00001	INPUT	1	
2	AW00001	P-GAIN	1	
3	AB00000F	ERROR	1	
4	YB000000	PIDEXE	1	
5	YW00001	PIDOUT	1	
6	ZB000000	WORKCOIL	4	
7	ZW00001	WORK1	1	
8	ZW00002	WORK2	1	
⋮				
N				

* : If a program is prepared using data configurations as arrays, index process data, etc., define the sizes used in the respectiv
data configurations.
For example, if data is referenced as PIDDATA.i and i takes on values in the range 0 to 9, define the size as 10.

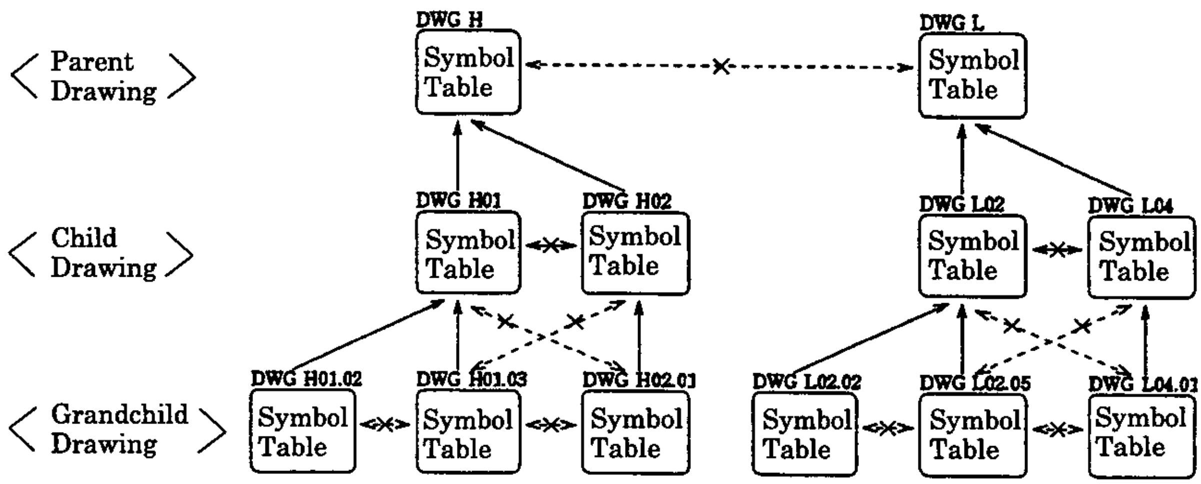
.3.7 Upward Linking of Symbols

Table 8.14 shows the relationship between symbols that can be linked and the symbol tables that are subject to linking.

Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) and the Control Pack CP-717 Operation Manual (SIE-C877-17.5) for details on the upward linking of symbols.

Table 8.13 Linkable Symbols and Symbol Table for Linking

Symbol \ Symbol Table	Parent drawing	Child drawing	Grandchild drawing
Symbols of a parent drawing	×	×	×
Symbols of a child drawing	○	×	×
Symbols of a grandchild drawing	○	○	×
Symbols inside a function	×	×	×



8.3.8 Automatic Register Number Assignment

Table 8.15 shows when the automatic register number assignment is enabled or not enabled.

Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) and the Control Pack CP-717 Operation Manual (SIE-C877-17.4, 17.5) for details on automatic register number assignment.

Table 8.15 Automatic Register Number Assignment

DWG Symbol Table	Automatic Number Assignment	Function Symbol Table	Automatic Number Assignment
	CP-717		CP-717
System register S	○	System register S	○
Input register I	○	Input register I	○
Output register O	○	Output register O	○
Data register M	○	Data register M	○
# register #	○	# register #	○
C register C	○	C register C	○
D register D	○	D register D	○
—	—	Function input register X	×
—	—	Function output register Y	×
—	—	Register internal function Z	○
—	—	Register external function A	×

○: Automatic number assignment is enabled. × : Automatic number assignment is not enabled

9 DEBUGGING AND MONITORING FUNCTIONS

The data trace and failure trace functions are provided as debugging and monitoring functions.
This chapter describes these functions and the parameter definition methods.

9.1 Data Trace

The desired data can be chosen among the temperature data, speed data, torque data, and othe various data that change every moment and set in the Trace Definition screen for storage in the data trace memory.

The stored data can be called when desired and displayed on the CP-717. The changing state may also be displayed in a list or a trend graph.

9.1.1 Outline of the Data Trace Process

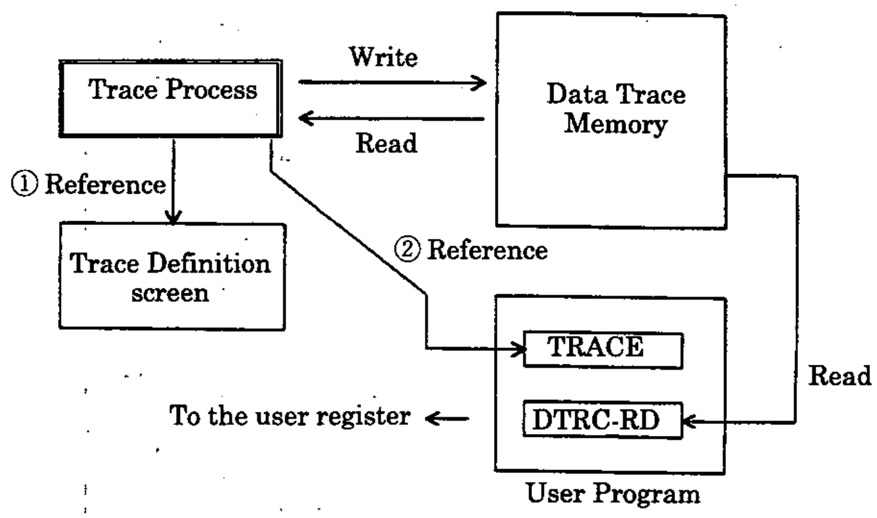


Fig. 9.1 Data Tracing

There are 2 types of data tracing shown as ① and ② in the Figure 9.1.

① Parameters are set and saved in the Trace Definition screen using the CP-717. The trace is started according to the setting conditions and data are traced on each scan (H or L) that is set. The traced data can be read out whenever desired using CP-717 or ACGC4000.

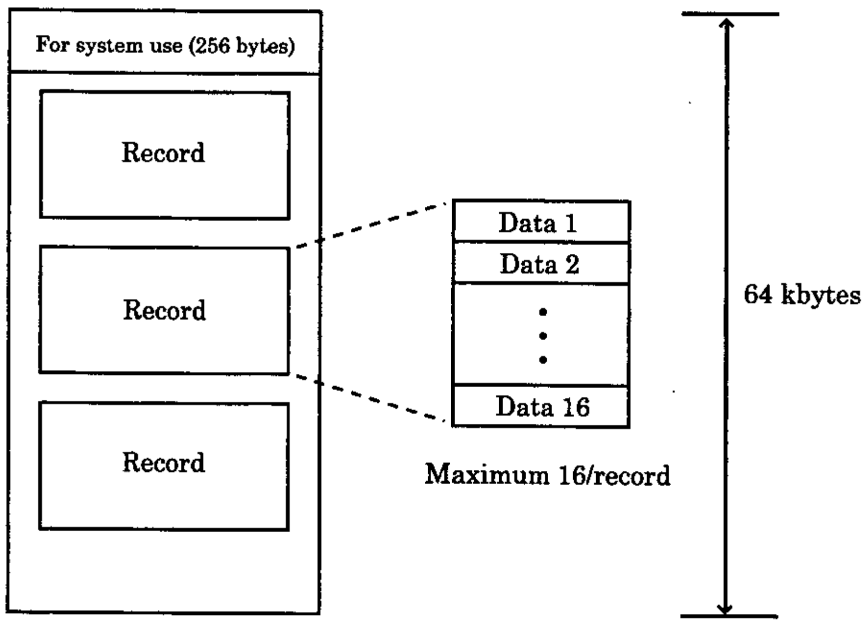
② When a "TRACE" function is executed inside a user program, the trace is started according to the parameters of the function.
Also, when the "DTRC-RD" function is executed, the traced data are read out and stored in the user register. The necessary items can be read out by the designation.

The data trace specifications are shown in Table 9.1.

Table 9.1 List of Data Trace Specifications

Item	Specifications
Maximum number of groups	4 groups
Maximum number of trace data per group	16 data
Trace memory capacity	Max 512 k bytes 64 k bytes per group, of which 256 bytes are used by the system (battery backup)
Data type	Bit type data (B), integer type data (W), double-length integer type data (L), and real number type data (F) are traceable.
Register type	S, I, O, M, and D registers may be used. In the case of the D register, the DWG No. must be set.

The Data Trace Memory Configuration



Data length: Bit type data・Integer type data = 2 bytes
Double-length integer type data・Real number type data = 4 bytes

Length of 1 record = Data 1 + Data 2 + ... + Data n
$(0 \leqq n \leqq 16)$

Maximum number of records = {(Data trace memory capacity - 256)/length of 1 record}
(cut off below the decimal point)

(Example) If there are 5 integer data and 5 real number data,

Length of 1 record = $(2 \times 5) + (4 \times 5) = 30$ bytes
Maximum number of records = $(64 \times 1024 - 256)/30 \fallingdotseq 2176$

Thus, the maximum number of records = 2176 records.

9.1.2 Data Trace Definition Method

Data Trace Definition Screen

The Data Trace Definition screen is shown below. Refer to the Control Pack CP-717 Operation Manua (SIE-C877-17.4) for details on the setting process.

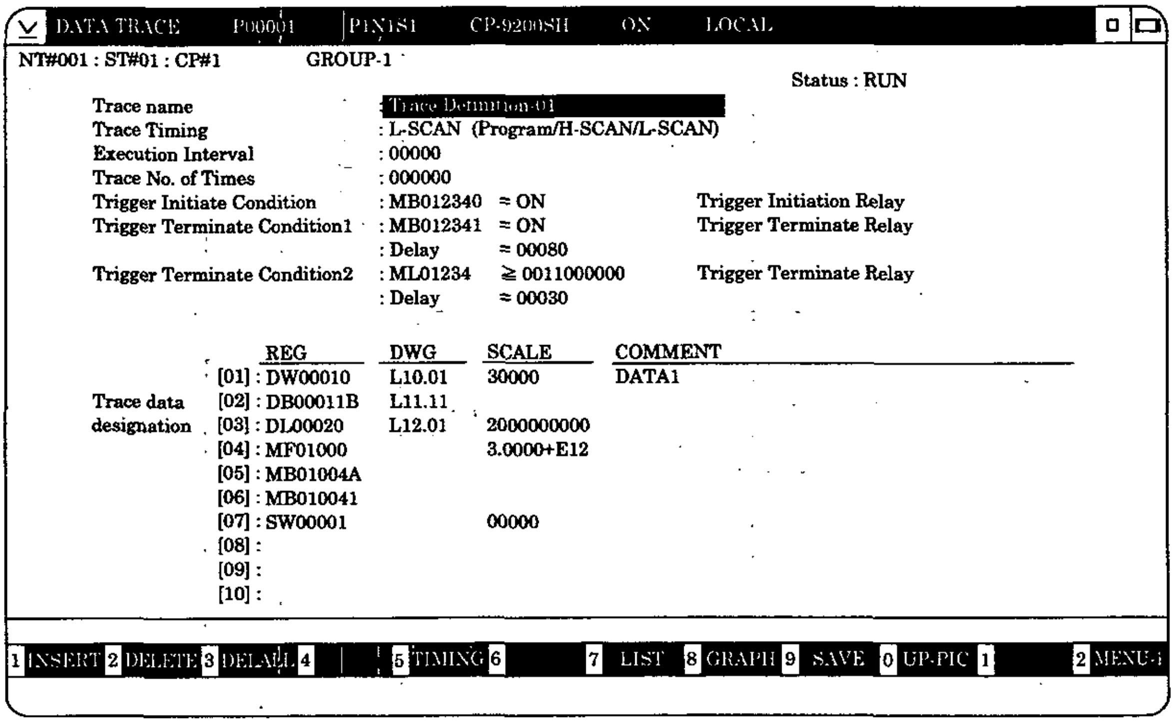


Fig. 9.2 Data Trace Definition Screen

When the trace definition is set in the above manner (Fig. 9.2), the trace process will be as follows.

■ **Trace Initiation**

The trace is initiated when the Trace Initiate Condition, "MB010001 = ON", is satisfied in the L scan. The trace will be continued even when MB010001 is set to OFF in the middle.

■ **Trace Process**

In the L scan, the 4 preset types of data (length of 1 record = 10 bytes), are traced every 20 scans and stored in the trace memory.

If the Execution Interval is set to 0, the trace will be executed on every scan of the type set a Trace Timing.

If "Program" is set at Trace Timing, the trace will be executed by the standard system function TRACE.

■ **Trace Stop**

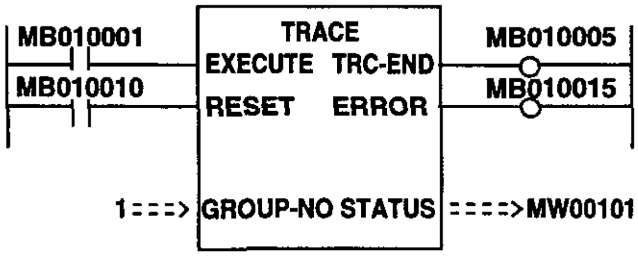
When one of the Trigger Terminate Condition 1, "MB010002 = ON", the Trigger Terminate Condition 2, "ML00034≧100" or Trace No. of Times = 150, is satisfied in the L scan, the trace is terminated. When the Trigger Terminate Condition 1 or the Trigger Terminate Condition 2 is satisfied, the trace is terminated after being executed for the number of times set at Delay. When Trace No. of Times is set to 0, the trace is continued until the Trigger Terminate Conditions are satisfied.

.1.3 Standard System Functions "TRACE" and "DTRC-RD"

When "Program" is set at Trace Timing in the Data Trace Definition screen, the data trace is executed using the standard system functions, "TRACE" and "DTRC-RD", in the user program.
Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details on the standard system functions.

(1) "TRACE" Function Setting (Example)

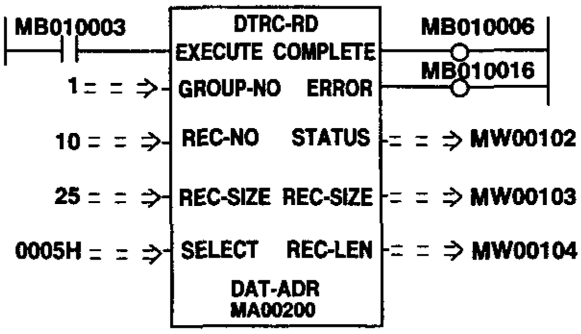
In this example, the trace definition of Section 9.1.2 is used.



The tracing of group 1 is started when "MB010001 = ON" in the Trace Timing, "Program". The trace will be continued even when MB010001 becomes OFF in the middle.
When the number of times of trace becomes equal to the set number (= 150 times), the trace end bit MB010005 becomes ON and the trace is terminated.
When RESET bit MB010010 becomes ON, the number of times of trace is reset and the trace end bit is also reset (set ON → OFF).

(2) "DTRC-RD" Function Setting (Example)

In this example, the trace definition of Section 9.1.2 is used.



The readout of the trace data of group 1 is started when "MB010003 = ON" in the Trace Timing, "Program". The data to be read can be selected with SELECT. Since there may be a maximum of 16 data in one record, whether or not a certain data is to be read is expressed with 1 bit each as follows:

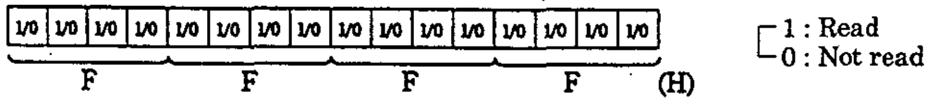


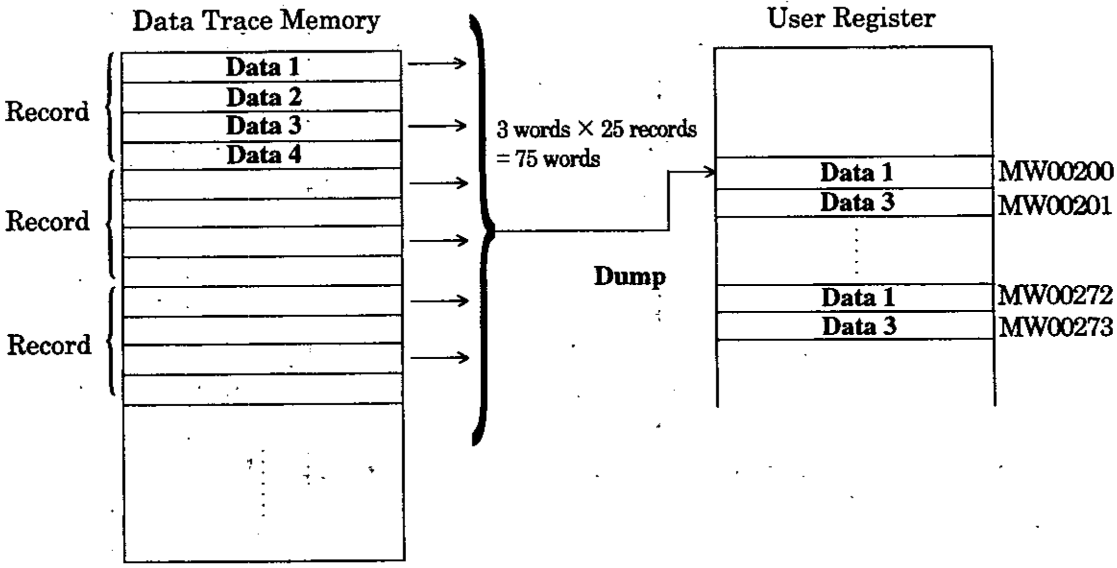
Fig. 9.3 Readout of Each Data

In this example, since "SELECT = 0005H", the expression will be:

0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0				0				0				5			(H)

That is, only the 1st (MW00000) and 3rd (DL00020 L10.01) data will be read out (1 record = 1 + 2 = 3 words).

Only the 1st and 3rd data from each of the total of 25 records from record No.10 to 35 are stored a address MW00200 and onwards.



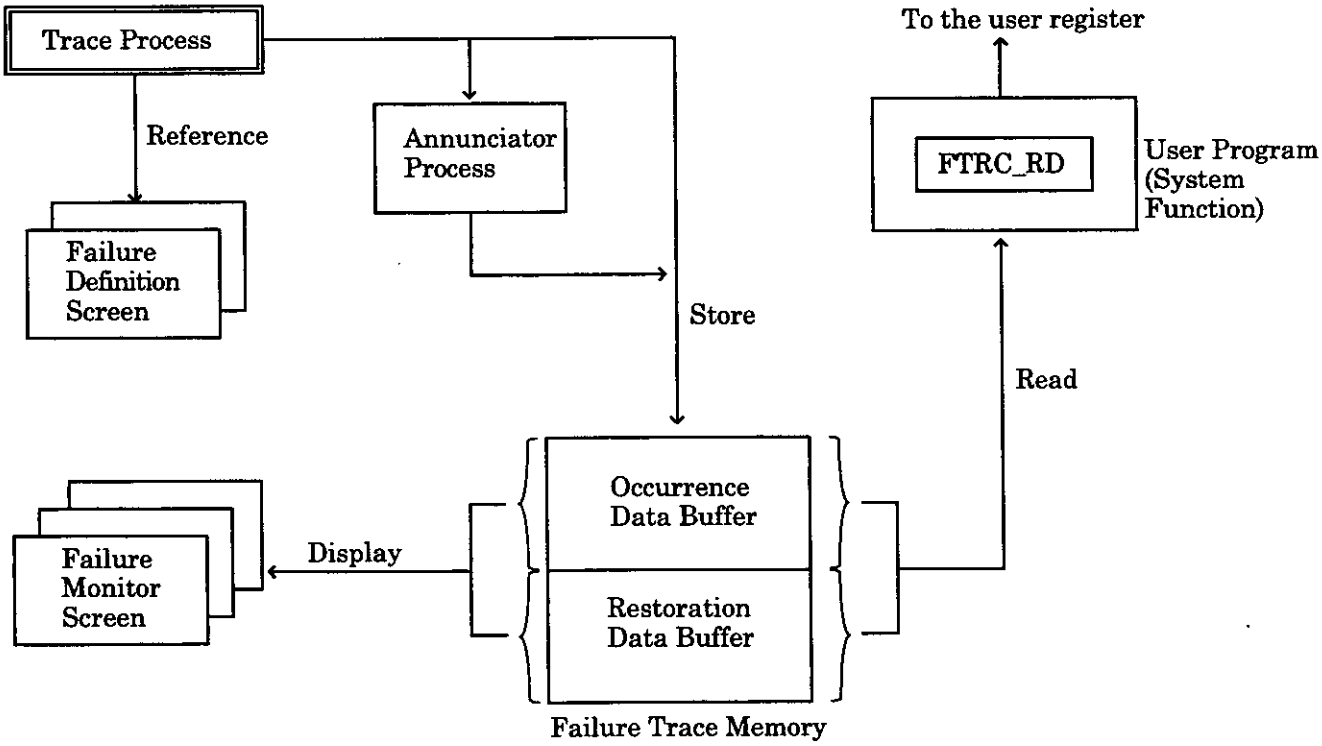
.2 Failure Trace

By the failure trace function, predefined failure items are monitored and occurrence/restoration information are stored in the failure trace memory along with time information on each occurrence of and restoration from failure.

The stored data may be referenced at CP-717.

2.1 Outline

(1) Outline of the failure trace process



The occurrence of and restoration from the failure items defined in the Failure Definition screen are monitored at the designated scan timing (L or H scan). Whenever a failure occurs or is restored, the occurrence/restoration information, to which time information has been attached, is edited and stored in the failure trace memory in order of occurrence/restoration. The stored data may be referenced freely at CP-717.

Table 9.2 Failure Trace Specifications (Reference)

Items	Specifications	Remarks
Maximum number of definitions	500	The maximum number of failure items that can be defined in the Failures Definition screen.
Maximum number of restoration data stored	1500	The maximum number of restoration data that can be stored in the restoration data buffer of the failure trace memory.

(2) Annunciator Function

An annunciator function is provided in addition to the ordinary trace function mentioned in (1). Table 9.3 is a state transition table for ordinary failure trace.

Table 9.3 Ordinary Failure Trace State Transition Table

Condition	Failure Detection	Alarm Indication
No failure	OFF	Unlit [○]
Failure Occurrence	↓ ON	Lit [●]
Failure Restoration (= No failure)	↓ OFF	Unlit [○]

The above represents an unconfirmed trace in which the "no failure" state changes automatically t the "failure occurrence/restoration" state in accordance with the conditions of the failure detectio relay.

On the other hand, the annunciator enables the judgment of whether a defined failure item has bee confirmed or has not been confirmed.

The relays and coils used with the annunciator function are shown in Table 9.4.

Table 9.4 Annunciator I/O Signals

Signal	Name of Relay or Coil
Input signal	Failure detection relay Confirm input relay Reset input relay
Output signal	Failure memory output coil Unconfirmed output coil Confirmed output coil

Fig. 9.4 shows the annunciator circuit specifications as expressed in ladder language, while Table 9.5 is the signal state transition table.

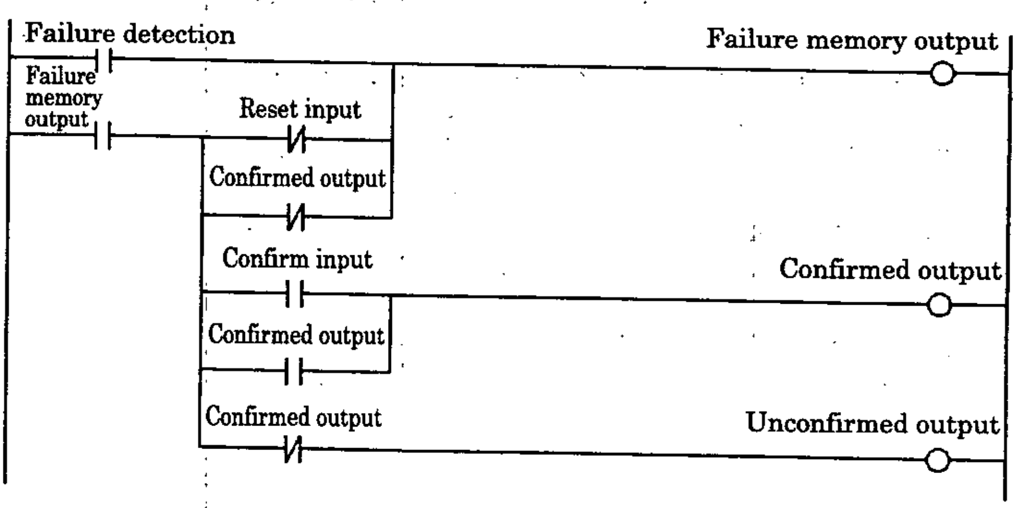
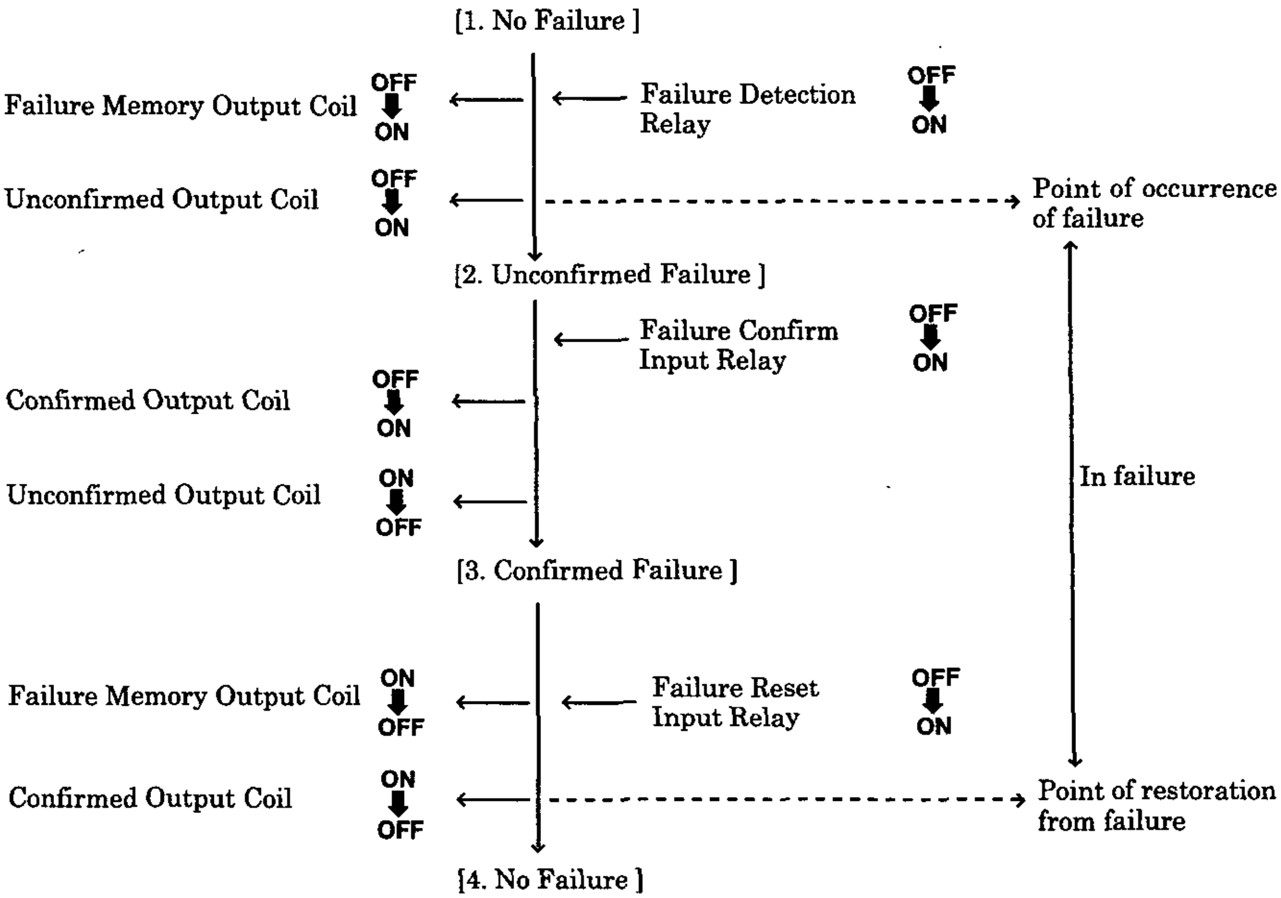


Fig. 9.4 Annunciator Circuit Specifications

Table 9.5 Annunciator Signal Condition Transition Table

Condition	Failure Detection	Alarm Indication	Failure Unconfirmed Output	Failure Confirmed Output	Failure Confirm Input	Failure Reset Input
No failure	OFF	OFF [○]	OFF	OFF		
Unconfirmed failure (Occurrence of failure)	ON	Flashing [★]	ON ←	OFF ←	OFF ↓ ON	
Confirmed failure (Failure state is continuing)	ON	ON [●]	↓ OFF	↓ ON		
Confirmed failure (Restoration from failure)	OFF	ON [●]	OFF	ON ←		OFF ↓ ON
No failure (Failure reset)	OFF	OFF [○]	OFF	↓ OFF		

The condition transition of Fig. 9.5 will have the following sequence.



Although the failure detection relay setting cannot be omitted, the setting of other relays and coils (failure memory output, unconfirmed output, confirmed output, confirm input, reset input) may be omitted.
The annunciator will not function when a setting has been omitted. That is, the state transition will be the same as that of the ordinary operation performed when the annunciator is not selected. Refer to Table 9.3.

(3) General Outputs Accompanying the Annunciator Function

When the annunciator function is selected, the following 3 types of general output signal informatio can be obtained by setting the general output bits in the Failure Definition screen of CP-717.

- Failure memory general output coil
- Unconfirmed general output coil
- Confirmed general output coil

Any of these output signals may be omitted.

If, for example, the failure memory general output coil is set, the failure memory general output coi will turn ON when any of the failure memory output coil conditions among all failure definitions fo which the annunciator function has been selected becomes ON.

It can thus be confirmed whether or not a currently occurring failure exists.

(4) Failure Occurrence Counter and Failure Restoration Counter

Counters are provided which increment the count each time data is stored in the failure trace memor at the time of failure occurrence and time of failure restoration.

The changes in the counters can be monitored and trace data may be taken out from the failure trac memory and displayed whenever there is a change.

Table 9.6 Failure Occurrence/Restoration Counter

Failure occurrence counter	SW00092 (a ring type counter with a counting range of 0 to 9999); increments the count by 1 each time a failure occurs.
Failure restoration counter	SW00093 (a ring type counter with a counting range of 0 to 9999); increments the count by 1 each time restoration from failure is performed.

2.2 Failure Trace Definition Method

The Failure Definition and the Failure Monitoring screens are described below. Refer to the Control Pack CP-717 Operation Manual (SIE-C877-17.4) for details.

(1) Failure Definition Screens

There are two types of Failure Definition screens, the "Failure Definition" screen and the "Annunciator Signal Definition" screen. The failure trace process is carried out in accordance with the settings in these Failure Definition screens.

Failure Definition Screen

FAILURES MONITORING DEFINITION P00001 P1N1S1 CP-9200SH ON LOCAL

NT#001 : ST#01 : CP#1

No.	Relay	B	R	S	T	Failure name
1	MB010001	B	A	L	F	No.1 PAY OFF REEL (POR) SPEED CONTROL ABNORMAL
2	MB010002		A	H	A	No.2 PAY OFF REEL (POR) SPEED CONTROL ABNORMAL
3	MB010003	B	B	H	F	ENTRY CATENARY SENSOR ABNORMAL
4	MB010004	B	C	L	A	CENTER CATENARY SENSOR ABNORMAL
5	MB010005		C	L	F	EXIT CATENARY SENCOR ABNORMAL

Fig. 9.5 Failure Definition Screen

■ **No.**

A maximum of 64 failures may be defined.

■ **Relay**

This is for designating the failure detection relays. A suitable relay No. of the S, I, O, or M registers may be designated.

■ **B**

This is for designating the NC contact. If there is no designation, the NO contact has been designated.

■ **R**

This is for designating the rank of failure. This is only a comment and will not affect the process.

■ **S**

This is for designating the failure detection scan.

H : Failure will be monitored on each high-speed scan.

L : Failure will be monitored on each low-speed scan.

■ **T**

This is for designating the failure trace timing.

F : Designation of ordinary failure trace. Refer to 9.2.1 (2) "Annunciator Function" for details.

A : Designation of failure trace using the annunciator function.

Annunciator Signal Definition Screen

FAILURES DEFINITION : ANNUNCIATOR SIGNAL DEFINITION P00001 P1N1S1 CP-9200SH ON LOCAL

NT#001 : ST#01 : CP#1

General Output Failure M : MB02000A Unconfirmed : MB02000B Confirmed : MB02000C

No.	Detection	B	R	Failure M Output Output	Unconfirmed Output	Confirmed Output	Confirm Input	Reset Input
01	MB010001	B	A	MB010101	MB010201	MB010301	MB010401	MB010501
02	MB010002		A	MB010102	MB010202	MB010302	MB010402	MB010502
03	MB010003	B	B	MB010103	MB010203	MB010303	MB010403	MB010503
04	MB010004	B	C	MB010104	MB010204	MB010304	MB010404	MB010504
05	MB010005		C	MB010105	MB010205	MB010305	MB010405	MB010505

Fig. 9.6 Annunciator Signal Definition Screen

This screen is for designating the annunciator I/O signals. A suitable relay No. of the O or M registe may be designated for the output coil and a suitable relay No. of the S, I, O, or M registers may b designated for the input relay. The annunciator function is enabled only for failure items for whic "A" was designated for the failure trace timing. The annunciator will not function when this settin has been omitted.

(2) Failure Monitoring Screens

There are 3 types of Failure Monitor screens, the "Current Failure Display" screen, the "Failur Trace Display" screen, and the "Failure Status Display" screen.

Current Failure Display Screen

The currently occurring failures are displayed along with the time of occurrence. These are cleared a the time of restoration from failure.

CURRENT FAILURE DISPLAY P00001 P1N1S1 CP-9200SH ON LOCAL

NT#001 : ST#01 : CP#1

Detection	B	Occurrence	R	Failure name
MB010001	B	95-01-07 14:03:01	A	NO.1 PAY OFF RELL (POR) SPEED CONTROL
MB010004	B	95-01-08 09:29:14	C	CENTER CATENARY CONTROL POSITION SENSOR ABNORMAL

Fig. 9.7 Current Failure Display Screen

Failure Trace Display Screen

Failures for which restoration has been performed are displayed along with the time of occurrenc and time of restoration.

FAILURES TRACE DISPLAY P00001 P1N1S1 CP-9200SH ON LOCAL

NT#001 : ST#01 : CP#1

Occurrence	Restoration	R	Failure name
95-01-07 14:03		A	No.1 PAY OFF RELL(POR) SPEED CONTROL ABNORMAL
95-01-08 15:27	95-01-08 15:57	A	No.2 PAY OFF RELL(POR) SPEED CONTROL ABNORMAL
95-01-08 09:29		C	CENTER CATENARY SENSOR ABNORMAL

Fig. 9.8 Failure Trace Display Screen

Failure Status Display Screen

The status of all failure items defined are displayed.

FAILURES STATUS DISPLAY P00001 P1N1S1 CP-9200SH ON LOCAL

NT#001 : ST#01 : CP#1

No.	Detection	B	R	S	Alarm	Failure name
1	MB010001	B	A	L	★	No.1 PAY OFF REEL (POR) SPEED CONTROL ABNORMAL
2	MB010002		A	H	●	No.2 PAY OFF REEL (POR) SPEED CONTROL ABNORMAL
3	MB010003	B	B	H		ENTRY CATENARY CONTROL POSITIONSENSOR ABNORMAL
4	MB010004	B	C	L		CENTER CATENARY CONTROL POSITION SENSOR ABNORMAL
5	MB010005		C	L		EXIT CATENARY CONTROL POSITION SENCOR ABNORMAL

Fig. 9.9 Failure Status Display Screen

9.2.3 Standard System Function "FTRC-RD"

By using the standard system function, "FTRC-RD", in the user program, data can be read into the user register from the failure trace buffer.

Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details on the methods for setting the standard system functions.

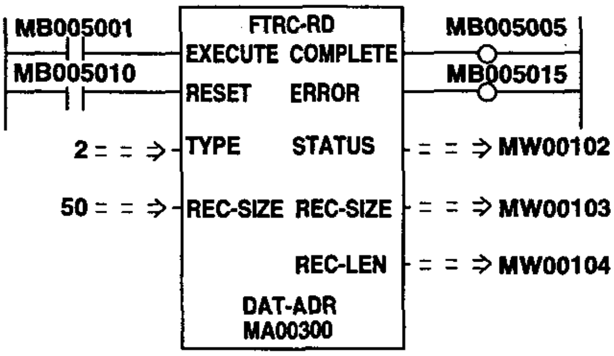


Fig. 9.10 Definition Example of "FTRC-RD"

- The readout of data starts when "MB005001 = ON".
- When "MB005010 = ON", the occurrence/restoration buffer areas of the failure trace memory are cleared.
- The type of data read out is specified using "TYPE".
  1 : Occurrence data (size of 1 data = 8 words)
  2 : Restoration data (size of 1 data = 9 words)
- The number of data read out is specified using "REC-SIZE".
- The head address of the user register into which data is to be read is specified using "DAT-ADR".
- When "MB005001 = ON" and "MB005010 = OFF" for the example in Fig. 9.10, the process will be as shown in Fig. 9.11.

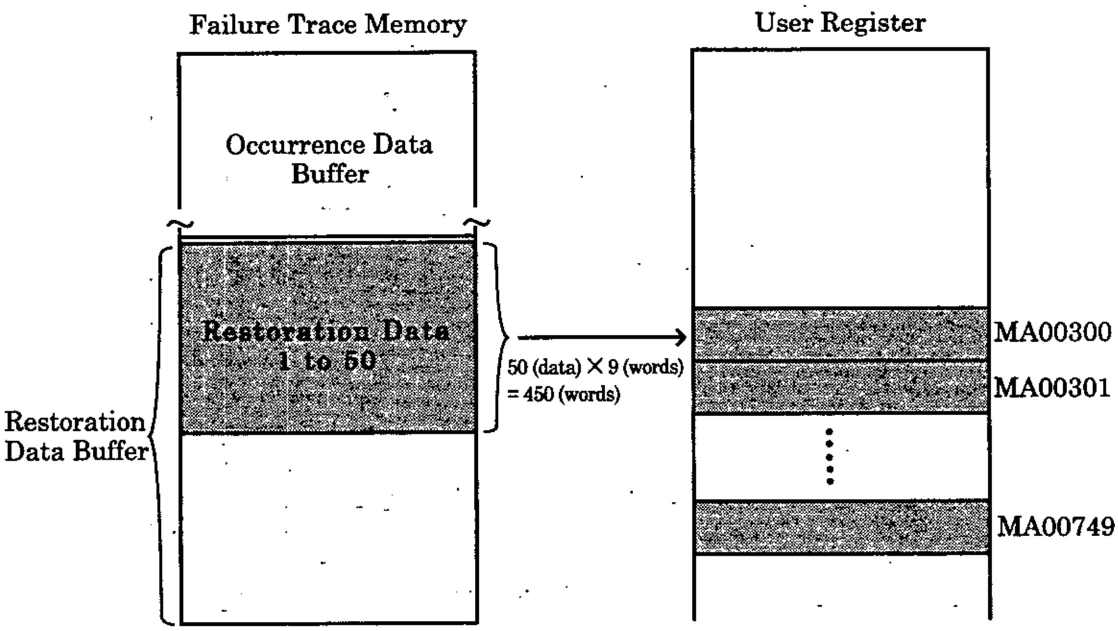


Fig. 9.11 Readout of Failure Trace Data

Refer to the CP-9200SH Programming Manual (SIE-C879-40.3) for details on the data to be re out.

10 INSTALLATION AND WIRING

This chapter describes the precautions to be taken upon designing the system, the panel mounting methods, and the wiring methods.

10.1 Precautions upon Installation

Although CP-9200SH is a highly reliable programmable controller that is strong to the environment it should be installed upon consideration of the following in order to bring out its functions adequately

10.1.1 Installation Location

Do not use the CP-9200SH in the following locations.

- Locations subject to ambient temperatures not between 0 and 55 ℃.
- Locations subject to condensation because of rapid changes in humidity.
- Locations subject to relative humidity in excess of 5 to 95 % RH.
- Locations subject to corrosive or flammable gas.
- Locations subject to excessive dust, salt content, or iron content.
- Locations that would subject the CP-9200SH to direct vibration or shock.
- Locations subject to direct sunlight.
- Locations subject to contact with water, oil, chemicals etc.

10.1.2 Installing Position internal bus

Take operability, maintainability, and environmental resistance into adequate consideration upo installing CP-9200SH in a panel.

(1) Consideration of Ambient Temperature

The ambient operating temperature range for CP-9200SH is 0 to 55 ℃. Take the following int consideration.

- Secure adequate ventilation space.
- Avoid the mounting directly above equipment that generate large quantities of heat (heater transformer, high-capacity resistor, etc.)
- Install a forced air cooling fan or a cooler if the ambient temperature becomes 55 ℃ or highe (Fig. 10.1 (1)).
- Note that the ambient operating temperature range for the CP-717 is 0 to 35 ℃.

(2) Consideration of Operability and Maintainability

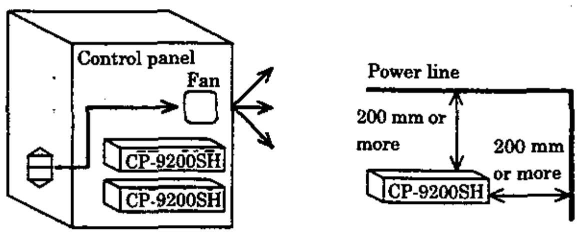
In consideration of the safety of operation and maintenance, mount CP-9200SH as far away fron high-voltage equipment and power equipment as possible.

(3) Considerations for Improved Noiseproofness

- Avoid mounting CP-9200SH in a panel with high-voltage equipment installed.
- Mount CP-9200SH 200 mm or more away from any power line (Fig. 10.1 (2)).
- In cases where there is much noise, provide a noise filter in the power supply.

(4) Consideration of Static Electricity

Since excessive static electricity may be generated at dry locations, discharge the static electricity by touching a grounded piece of metal (the panel door, etc.) before touching the device.



(1) Consideration of Ambient Temperature (2) Consideration of Noise

Fig. 10.1 Precautions upon Installation

0.2 External Dimensions and Installing Dimensions

0.2.1 External Dimensions

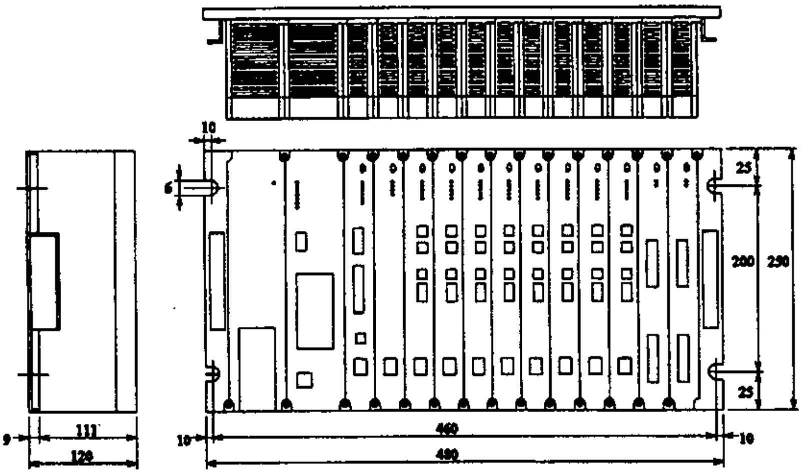


Fig. 10.2 CP-9200SH External Dimensions (MB-01)

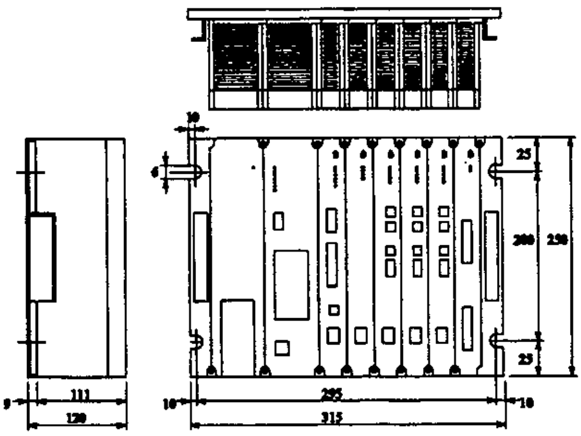
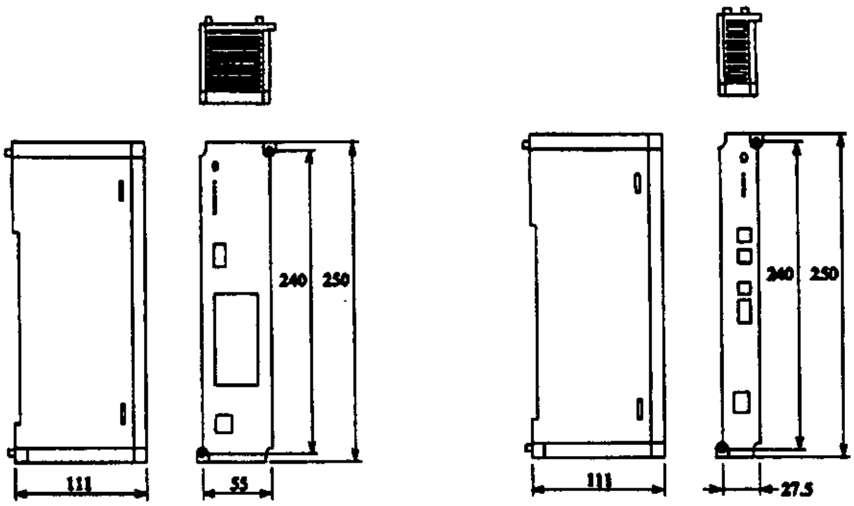


Fig. 10.3 CP-9200SH External Dimensions (MB-03)



2-slot width module

1-slot width module

Fig. 10.4 Module External Dimensions (mm)

10.2.2 Installing Dimensions

The CP-9200SH is designed to be installed on a standard 19-inch rack.
When used in combination, take heat radiation and operability into consideration. Place the units that at least the gap shown in Fig. 10.5 is maintained.

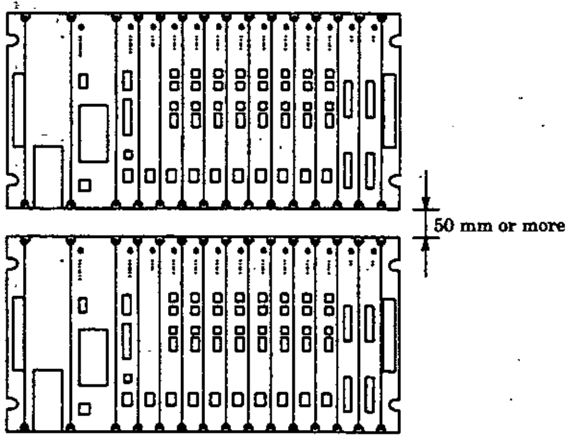


Fig. 10.5 Installing Methods

10.2.3 Installing Height

The space taken up by the CP-9200SH connecting cable is shown in Fig. 10.6. A space of 220 mm fr the mounting base will be necessary.

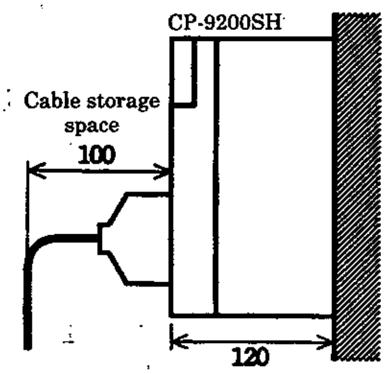


Fig. 10.6 Installing Height (mm)

0.3 Wiring Methods

0.3.1 Power Supply Wiring Method

(1) Power Supply Line

- Be sure to provide the AC power supply line for CP-9200SH apart from the power/control lines.
- Be sure to ground the frame ground for the AC power supply. When grounding the FG terminal of the power terminal board (TB2/POWER), avoid use of the ground with heavy-current grounding (with dedicated class 3 ground is desirable).
- Nothing should be connected to the SG terminal.

  If the SG terminal is connected to an FG unit when the FG noise is extremely low, radiation noise may be reduced.

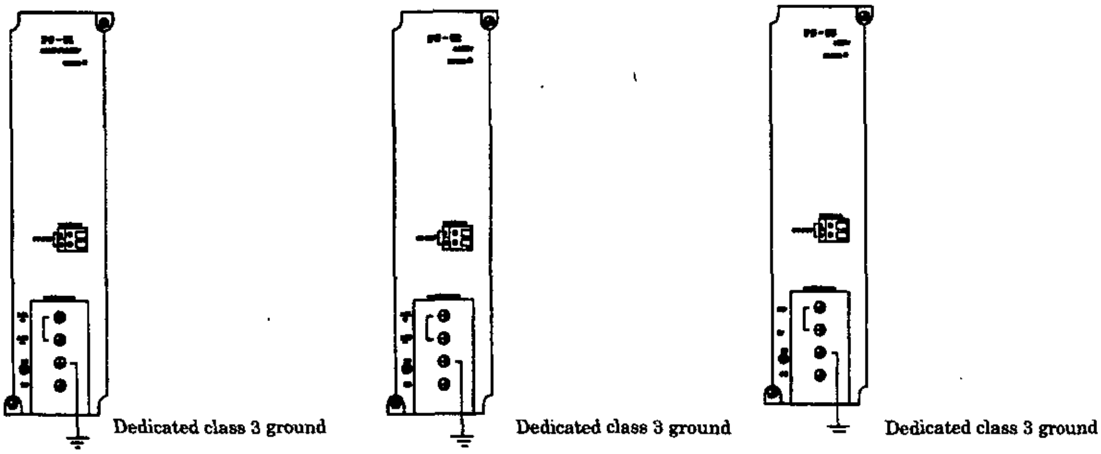


Fig. 10.7 Power Supply Wiring Method for CP-9200SH

(2) Power Supply

- Use within the allowable voltage range.

Power module name	The allowable voltage range
PS-01 Power module	100 VAC (85 V to 132 VAC)
	100 VDC (90 V to 140 VDC)
PS-02 Power module	200 VAC (170 V to 230 VAC)
PS-03 Power module	24 VDC (19.2 V to 288 VDC)

- The power consumption is 150 VA or less, but when powered on, an inrush current of 15 A flows through the machine. Be sure to provide adequate margin for power supply capacity.

(3) Grounding (FG terminal)

- When grounding the FG terminal of the power terminal board (TB2/POWER), do not use a ground with heavy-current grounding (Use a dedicated class 3 ground).

(4) Terminal Screws and Crimped Terminals

- M4 screws are used as the terminal screws of the power supply terminal board (TB2/POWER). The use of crimped terminals is recommended for wiring. Use crimped terminals with an outer diameter of 8.5 mm or less. Also, keep the tightening torque to within 8 kgf·cm (0.8 N·m).
- 0.5 to 1.25 mm^2 wires can be used. Select wires in consideration of the current capacity and the strength of the wire material.

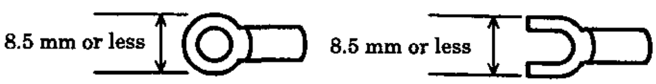
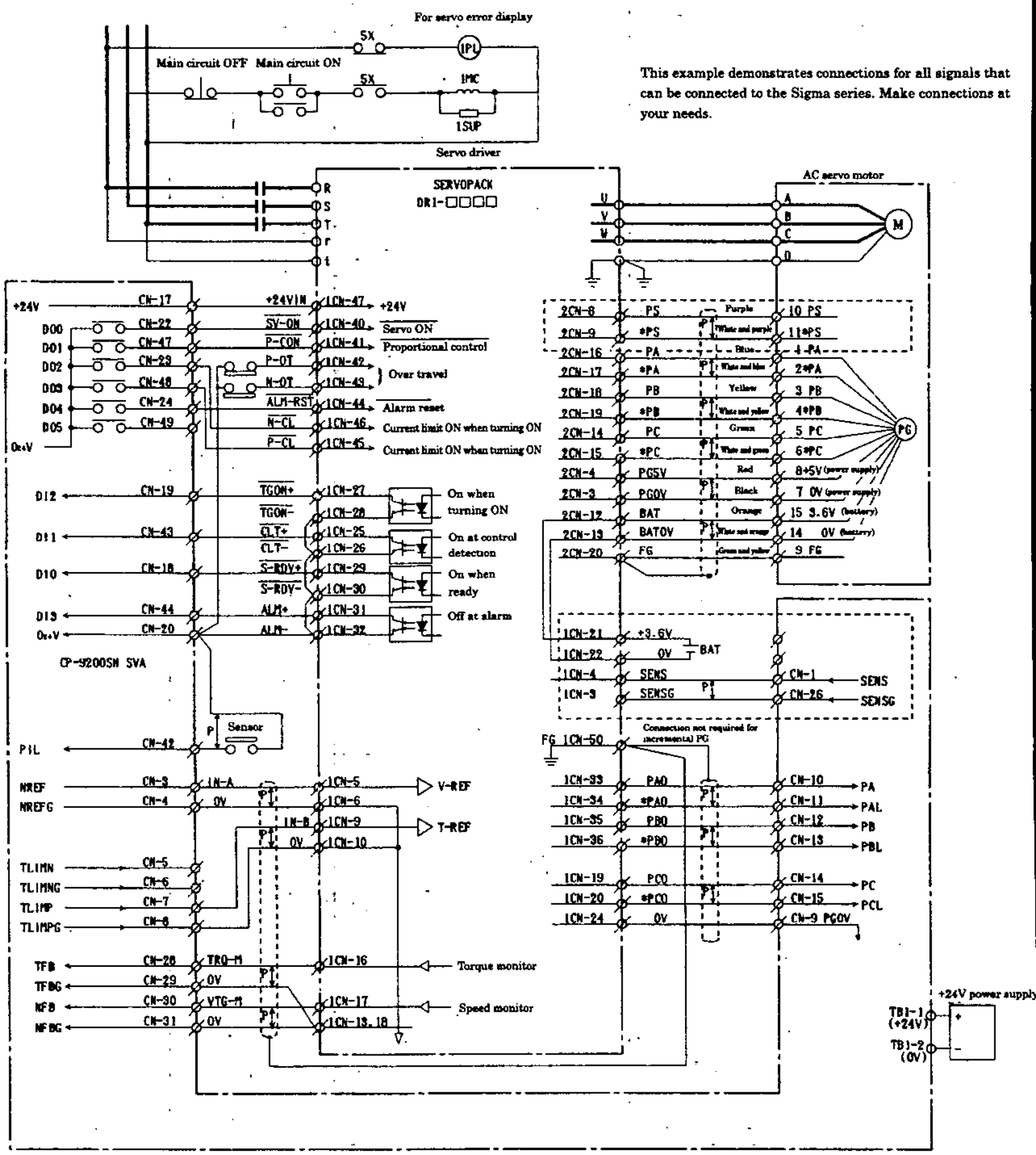


Fig. 10.8 Shape of Crimped Terminals

10.3.2 Motion Module

(1) SVA Module

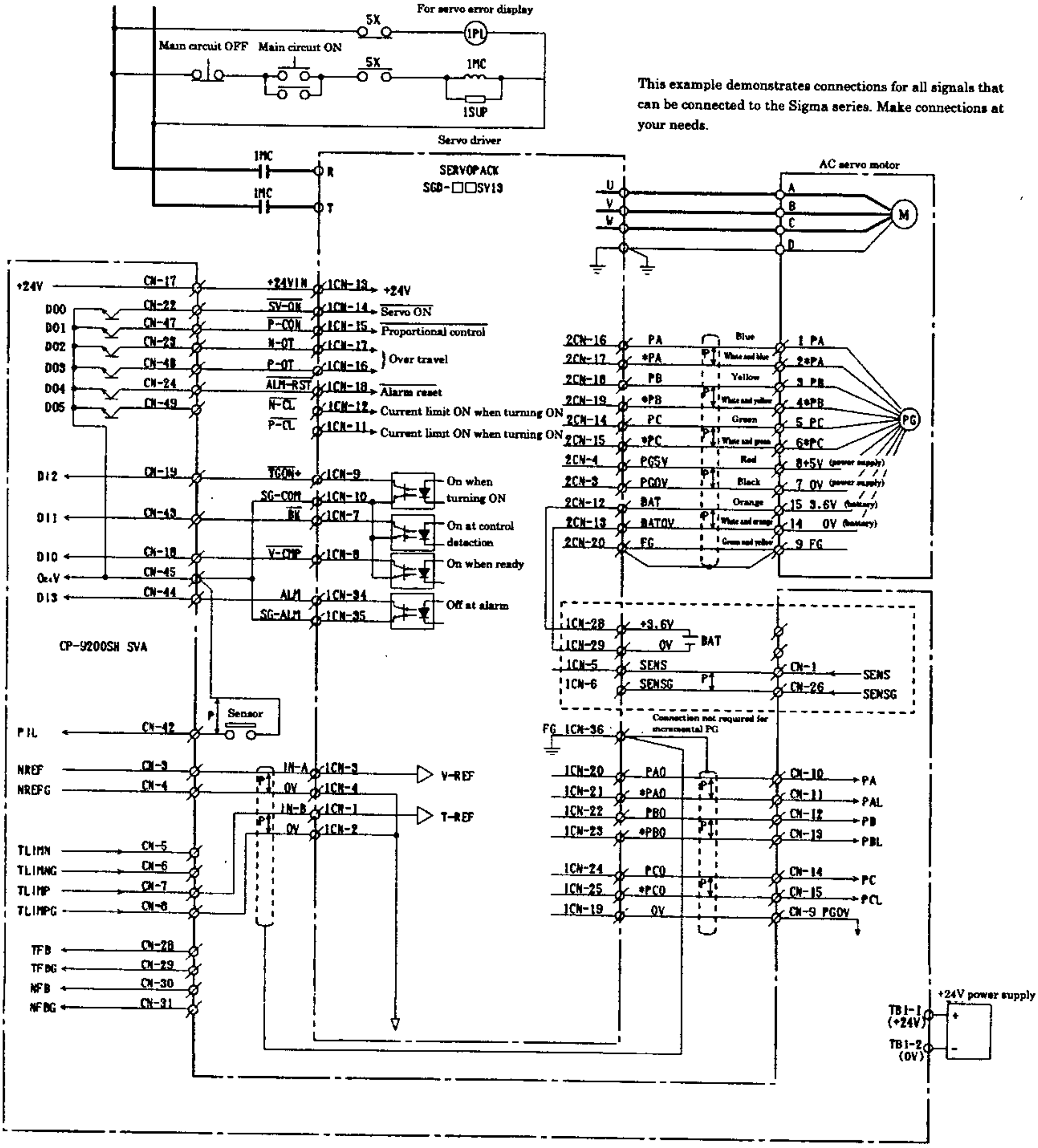
Connection example for a SERVOPACK (Sigma series, type DR)



(Note) The connector pin numbers on the CP-9200SH SVA side are the same for 1CN to 4CN.
For $\frac{\mathrm{P}}{}$, use a twisted pair cable.

Fig. 10.9 Connection Example for a SERVOPACK (Sigma series, type DR)

Connection example for a SERVOPACK (Sigma series, type SGD)

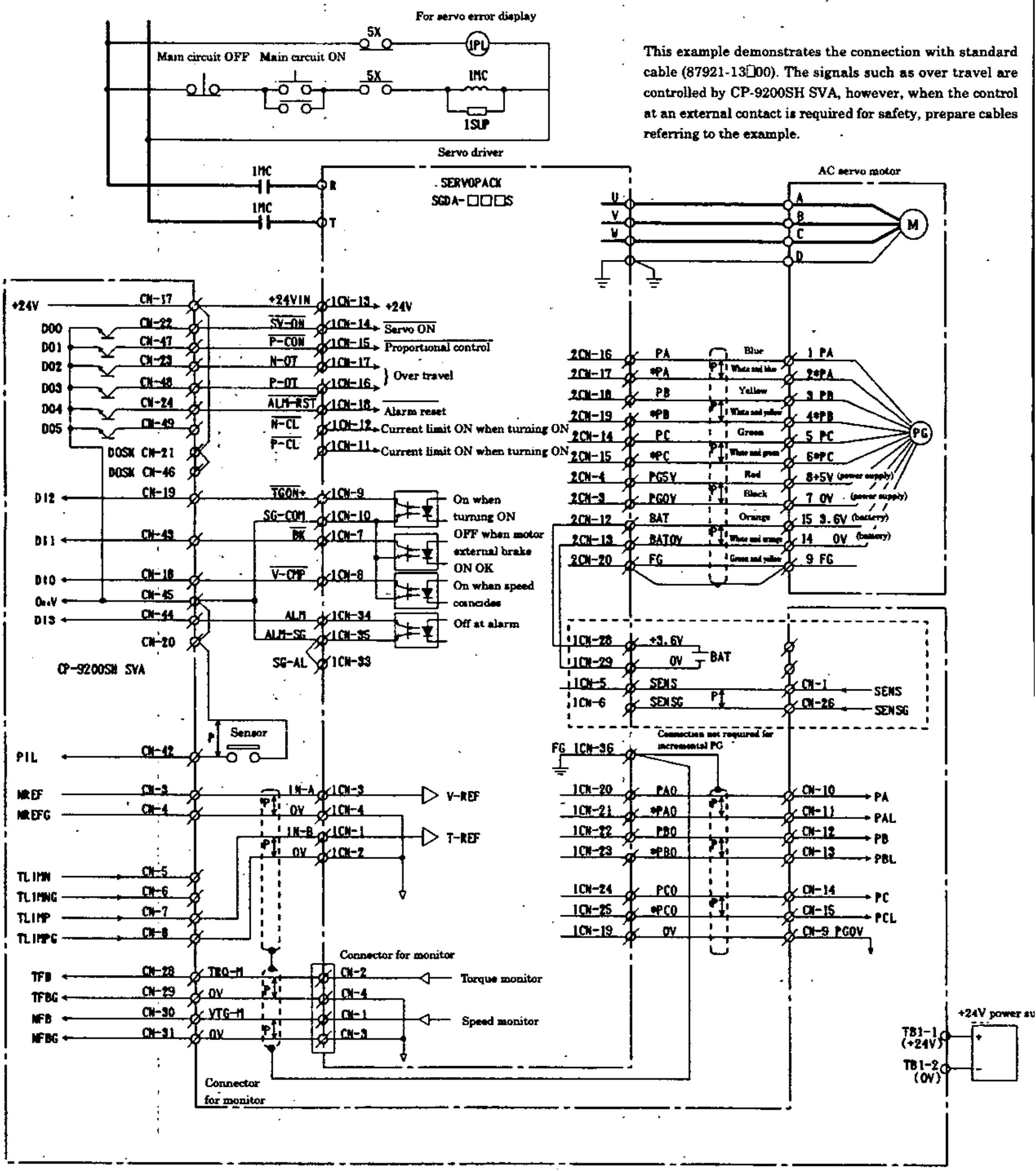


(Note) The connector pin numbers on the CP-9200SH SVB side are the same for 1CN to 4CN.
For I^{r}, use a twisted pair cable.

Fig. 10.10 Connection Example for a SERVOPACK (Sigma series, type SGD)

Connection example for a SERVOPACK (Sigma series, type SGDA)

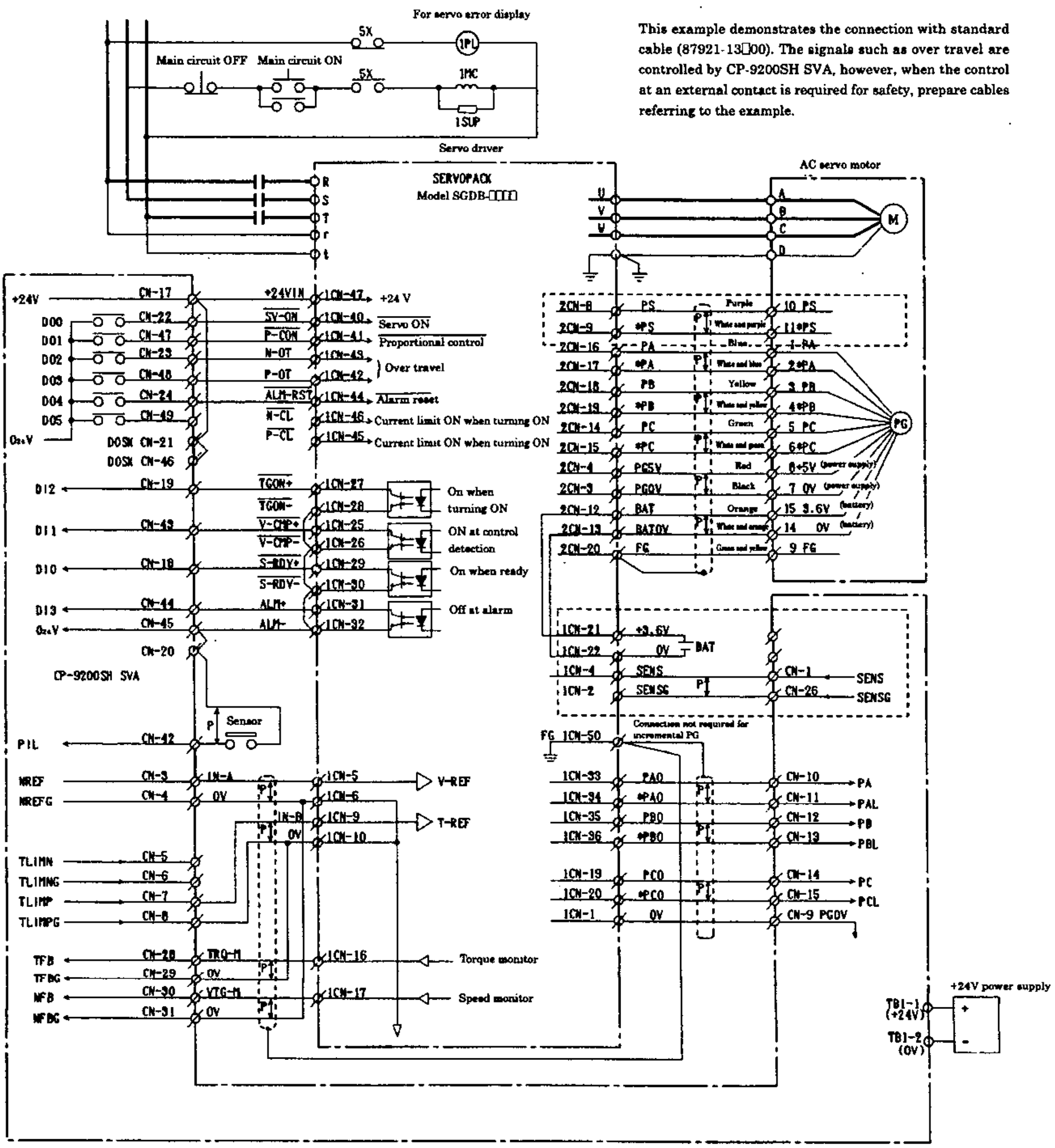
This example demonstrates the connection with standard cable (87921-13□00). The signals such as over travel are controlled by CP-9200SH SVA, however, when the control at an external contact is required for safety, prepare cables referring to the example.



(Note) The connector pin numbers on the CP-9200SH SVA side are the same for 1CN to 4CN.
For ⌶, use a twisted pair cable.

Fig. 10.11 Connection Example for a SERVOPACK (Sigma series, type SGDA)

Connection example for a SERVOPACK (Sigma series, type SGDB)



(Note) The connector pin numbers on the CP-9200SH SVA side are the same for 1CN to 4CN.
For P (twisted pair symbol), use a twisted pair cable.

Fig. 10.12 Connection Example for a SERVOPACK (Sigma series, type SGDB)

(2) PO-01 Module

The CP-9200SH can have the pulse output (PO) function by mounting a PO-01 module. Also, it digital inputs (DI) and digital outputs (DO).

Confirm the I/O specifications to connect the module. For the I/O specifications, refer to Chapt "COMPONENT MODULES".

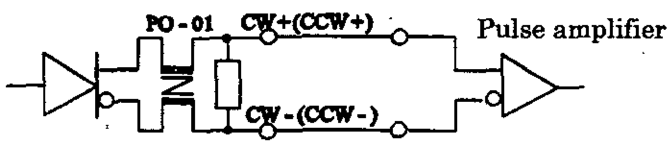
■ I/O Line Layout

- Laying I/O wiring together with high-voltage line and power line in the same pipe or d may cause induction, which may result in malfunction or damages. Separate the I/O sig from the power circuit cables both inside and outside of the control panel.
- When using multi-core cable for signal, do not use the input line of PO-01 module in com with other control lines.

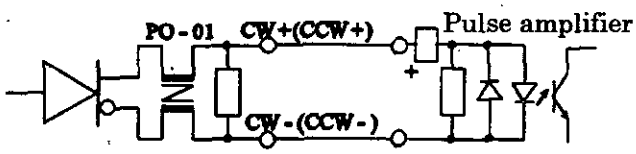
■ Pulse Outputs

- When excessive noise is expected, use a shielded wire. Connect the shielded wire to connection terminal of input side.
- The pulse is maximum 5 V differential type. An interface driver equivalent to SN7517 used.
- The pulse outputs of PO-01 are non-insulated type.

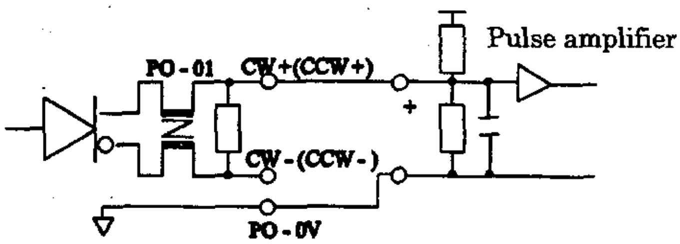
Connection when a line receiver is on the pulse amplifier side



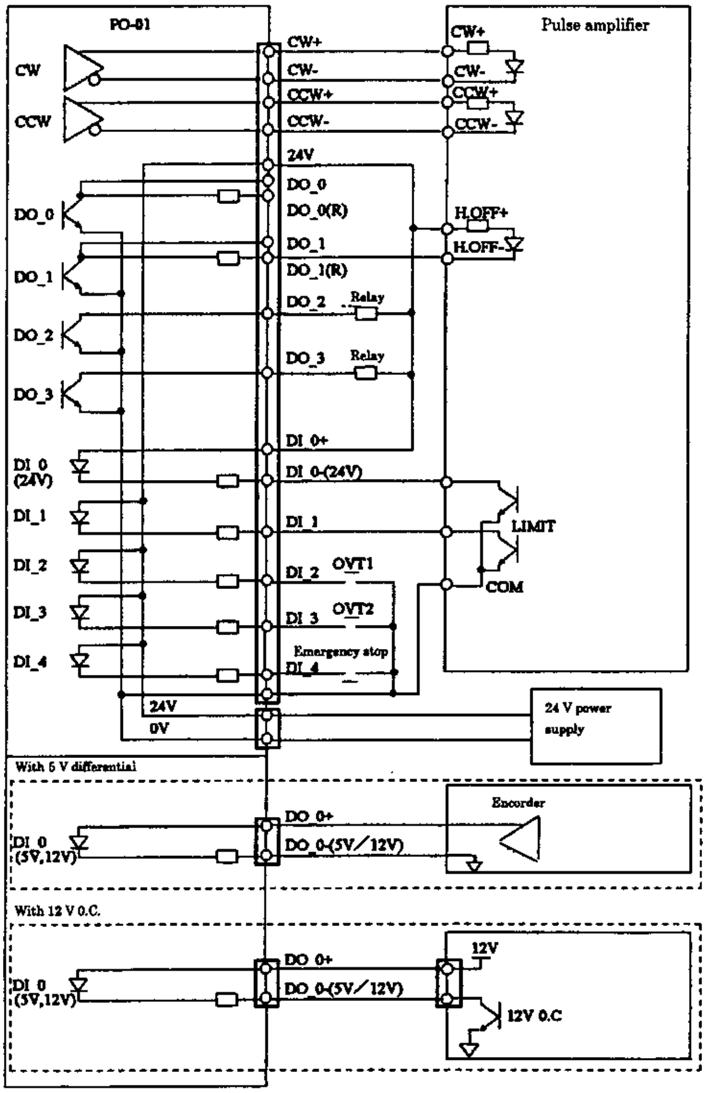
Connection when a photocoupler is on the pulse amplifier side



Connection when a CMOS is on the pulse amplifier side



■ PO-01 connection example



■ Digital Inputs

- The input voltage is +24 VDC±20 %. Use in the allowable voltage range.
- DI_0 is independent and DI_1 to DI_4 are 8-point common. Make a correct wiring.

■ Digital Outputs (Transistor)

- Short-circuit of load connected to the output terminal and reversed connection of power supply may cause damages to the output elements and printed board. The digital outputs on the grounding side are 4-point common. Make sure of correct wiring before turning ON the power. Insert a protective fuse for outputs as required.
- When connecting an inductive load, connect a diode in parallel to the load not to cause an excessive output terminal voltage (Fig. 10.13). The maximum voltage rating is 35 V.

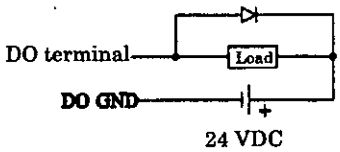


Fig. 10.13 Surge Voltage Suppression by a Diode

- Confirm the I/O specifications not to exceed the maximum current. When connecting a load with large inrush current such as incandescent lamp, take a countermeasure such as resistance shedding.

10.3.3 Precautions upon the I/O Wiring

(1) LIO-01 Module

An LIO-01 module can be mounted on the CP-9200SH to provide digital input (DI) and digi output (DO) functions. Connect the wiring after reconfirming I/O specifications. Refer to Chapte "Configuration Modules" for more information on I/O specifications.

■ Laying the I/O Wiring

- The I/O line may receive induction which may lead to malfunction or breakage if the lin provided in the same piping or duct with a high-voltage line or power line. Separate the signal cable from the power circuit cables both inside and outside the control panel.
- If a multi-core signal cable is to be used, avoid combined use of the same cable for the I/O l of LIO-01 module and other control lines.

■ Digital Inputs

- The input voltage is +24 VDC ± 20 %. Use in the allowable voltage range.
- 8 points are common at the power side. Be careful not to make a mistake in wiring.

■ Digital Outputs (Transistor)

- Output elements and printed circuit boards may be damaged if the load connected to output circuit is short-circuited or if the power supply is connected in reverse. 4 points common at the ground side. Check the wiring carefully before turning on the power necessary, insert a protective fuse in the output.
- If an inductive load is to be connected, connect a diode in parallel to the load in order prevent the output terminal voltage from becoming excessively high (Fig. 10.14). The maxim voltage rating is 35 V.

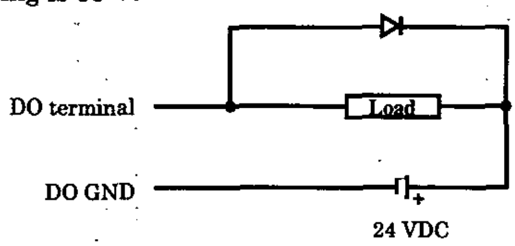


Fig. 10.14 Surge Voltage Suppression by a Diode

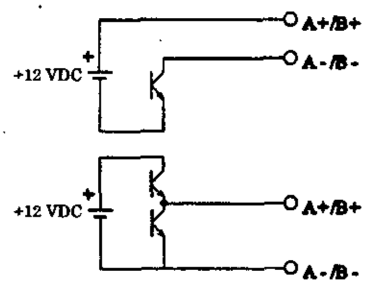
- Confirm the I/O specifications and avoid exceeding the maximum current. Especially wh connecting a load with a large inrush current such as an incandescent lamp, take measu such as attaching a limiting resistor.

(2) CNTR-01 Module

CP-9200SH can have the pulse input (PI) function by mounting a CNTR-01 module. Confirm the input specifications to make a correct wiring. For the input specifications, refer Chapter 5 "COMPONENT MODULES".

■ Pulse Inputs

- When excessive noise is expected, use a shielded wire. Connect the shielded wire to tl connection terminal on the output side.
  The input voltage is +12 VDC±10 %. Connect as shown in Fig. 10.15. With the connection shown in Fig. 10.16, note that the rated voltage may not be input due to a voltage drop of tl load resistance.



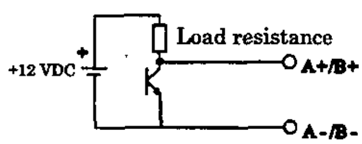


Fig. 10.15 Pulse Input Interface **Fig. 10.16 Voltage Drop by Load Resistance**

- The C-pulse of 5 V differential input is "ON" in positive logic when not connected. To be "OFF", set C-pulse to "negative logic" at CP-717.

(3) AI-01 Module

CP-9200SH can have the analog input (AI) function by mounting an AI-01 module.
Confirm the input specifications to make a correct wiring. For the input specifications, refer to Chapter 5 "COMPONENT MODULES".

■ **I/O Line Layout**

- Laying I/O wiring together with high-voltage line and power line in the same pipe or duct may cause induction, which may result in malfunction or damages. Separate the I/O signals from the power circuit cables both inside and outside of the control panel.
- When using multi-core cable for signal, do not use the input line of AI-01 module in common with other control lines.

■ **Analog Inputs**

- The input voltage range is −10 to +10V. Use in the allowable voltage range.

■ **Analog Input Wiring**

- The analog inputs of AI-01 module are insulated.
- Confirm the input voltage/current range not to apply an excessive input voltage.
- When excessive noise is expected, use a shielded wire. Connect the shielded wire to the connection terminal on the output side.
- To switch the voltage mode and the current mode of each channel of AI-01 module, open or short-circuit the signal pins MDnP and MDnN (n: channel No.) of CN1 connector. Short-circuit for the current mode while open for the voltage mode. With incorrect wiring, the correct voltage/current value can not be input. Confirm the I/O specifications to make a correct wiring.

(4) DI-01 Module

CP-9200SH can have the digital input (DI) function by mounting a DI-01 module.
Confirm the input specifications to make a correct wiring. For the input specifications, refer to Chapter 4 "COMPONENT MODULES".

■ **Input Line Layout**

- Laying the input line together with high-voltage line and power line in the same pipe or duct may cause induction, which may result in malfunction or damages. Separate the input signals from the power circuit cables both inside and outside of the control panel.
- When using multi-core cable for signal, do not use the input line of DI-01 module in common with other control lines.

■ **Digital Inputs**

- The input voltage is +24 VDC±20 %. Use in the allowable voltage range.
- 8-point common on the power supply side. Make a correct wiring.

(5) AO-01 Module

CP-9200SH can have the analog output (AO) function by mounting an AO-01 module. Confirm the output specifications to make a correct wiring. For the output specifications, refer Chapter 5 "COMPONENT MODULES".

■ Analog Output Wiring

- The analog outputs of AO-01 module are insulated.
- When excessive noise is expected, use a shielded wire. Connect the shielded wire to connection terminal on the input side.
- The output current capacity is 10 mA max. Care should be taken when driving a low-impeda load.

(6) DO-01 Module

CP-9200SH can have the digital output (DO) function by mounting a DO-01 module. Confirm the I/O specifications to make a correct wiring. For the output specifications, refe Chapter 5 "COMPONENT MODULES.

■ Output Line Layout

- Laying the output line together with high-voltage line and power line in the same pip duct may cause induction, which may result in malfunction or damages. Separate the out signals from the power circuit cables both inside and outside of the control panel.
- When using multi-core cable for signal, do not use the output line of DO-01 module in comm with other control lines.

■ Digital Outputs

- The rated voltage is +24 VDC±20 %. Use in the allowable voltage range.
- 8-point common on the power supply side. Make a correct wiring.

■ Digital Output (Transistor) [with recovery characteristic protective fuse]

- Short-circuit of the load connected to the output terminal and reversed connection of pov supply may cause damages to the output elements and printed board. The terminals are point common on the grounding side and a protective fuse is installed each 8 points. Howev make sure of correct wiring before turning ON the power. The protective fuse has recov characteristic to be reset by turning OFF the power when a protective fuse is blown o therefore, the fuse can be reused without replacement.
- When connecting an inductive load, connect a diode in parallel to the load not cause excess output terminal voltage (Fig. 10.17). The maximum voltage rating is 35 V.

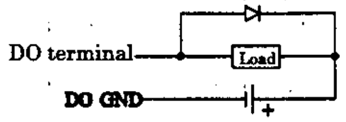


Fig. 10.17 Surge Voltage Suppression by a Diode

- Confirm the output specifications not to exceed the maximum current. When connectin load with large inrush current such as incandescent lamp, take a countermeasure such mounting a limiting resistance.

0.3.4 Precautions upon the Transmission Wiring

By mounting optional modules on the CP-9200SH, it can have transmission function of the CP-213, CP-215, CP-217 (RS-232, RS-422/485), CP-218, CP-225 or CP-2500.
Make correct wiring, respecting the following precautions.
Refer to Appendix F "TRANSMISSION WIRING" for examples of in-panel and panel-to-panel cable connections.

(1) CP-213IF module CP-213 Interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control line, power supply line, and other transmission line.
- For wiring details, refer to the CP-213 FA Bus Design Handbook (SIE-C872-13.1).

(2) CP-215IF module CP-215 Interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control line, and power supply line.
- Attach terminal resistors to both terminal stations of the transmission line.
- Panel-to-panel cables for wiring should be YS-IPEV-S (Cu) IP× 1.25 mm^2 (75Ω type) (made by Fujikura Corporation).
- Provide a separate repeater in cases where the wiring length is long.
- Restrictions in terms of transmission performance must be taken into consideration with regard to the number of stations connected. Refer to Appendix C "OUTLINE OF THE CP-215 TRANSMISSION SPECIFICATIONS".

■ Calculation of the Transmission Distance

The panel-to-panel transmission distance of a CP-215 transmission system will differ according to the transmission speed, the number of stations connected, the number of junction boxes (JC215-01 or JC215-02) connected, and the length of the transmission cable within the panels. In general, the maximum transmission distance of panel-to-panel cables will be as follows.

- Maximum transmission distance in the case of 4 Mbps = $520 - 4.5N - 3.0L_1 - 5.0M$ (m)
- Maximum transmission distance in the case of 2 Mbps = $727 - 8.48N - 2.58L_1 - 6.06M$ (m)
- Maximum transmission distance in the case of 1 Mbps = $1041 - 14.0N - 2.08L_1 - 8.33M$ (m)

N : number of stations and repeaters connected
L_1 : length of panel-to-panel cable (m)
M : number of JC215-01 or JC215-02 units connected (however, the junction boxes at the IN side and the OUT side of a panel will be counted as one junction box in the case of JC215-01)

Table 10.1 shows calculation examples of the maximum transmission distance when 32 stations a connected. Fig. 10.18 shows an example of a system configuration, and Fig. 10.19 shows a wiri example.

Table 10.1 Calculation Examples of the Maximum Transmission Distance (when 30 stations are connected)

Transmission Speed	Length of Panel-to-Panel Cable Wiring L_0: without any repeaters connected	Total Wiring Distance	
		L_{01}: with 1 repeater connected	L_{02}: with 2 repeaters connected
4Mbps	170 mm or less	600 m	1100 m
2Mbps	270 mm or less	900 m	1550 m
1Mbps	420 mm or less	1400 m	2350 m

(Note 1) : L_0 indicates calculation examples for the case where the total wiring length of the in-panel cable ≒ 55 m and where 20 JC215-01 units are used.

(Note 2) : L_{01} and L_{02} indicate calculation examples for the case where 16 stations are connected to the left and right of a repeater(s).

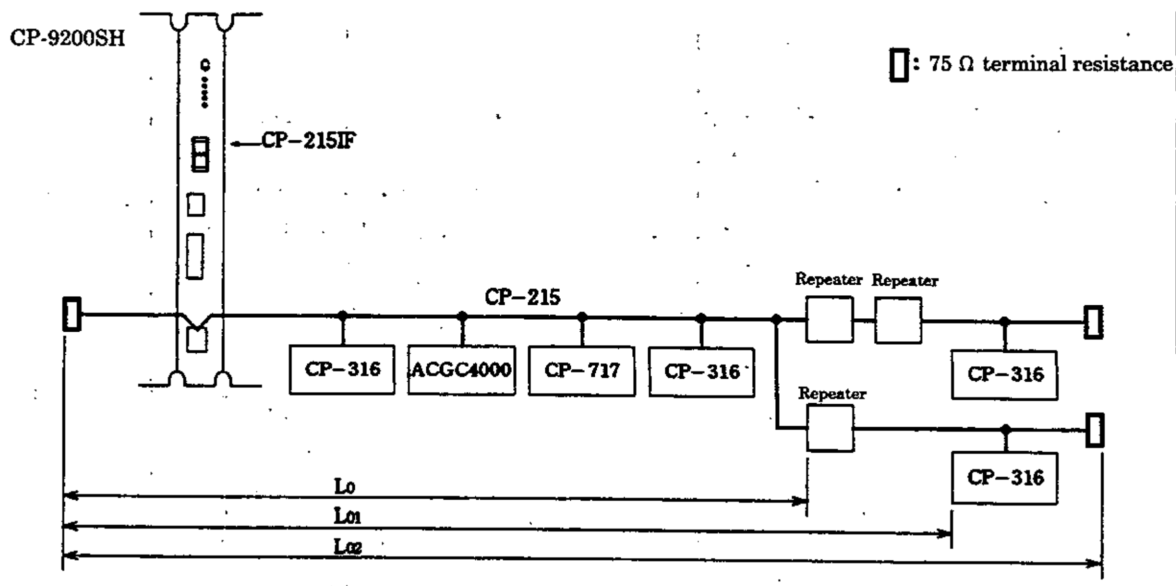


Fig. 10.18 CP-215 System Configuration Example

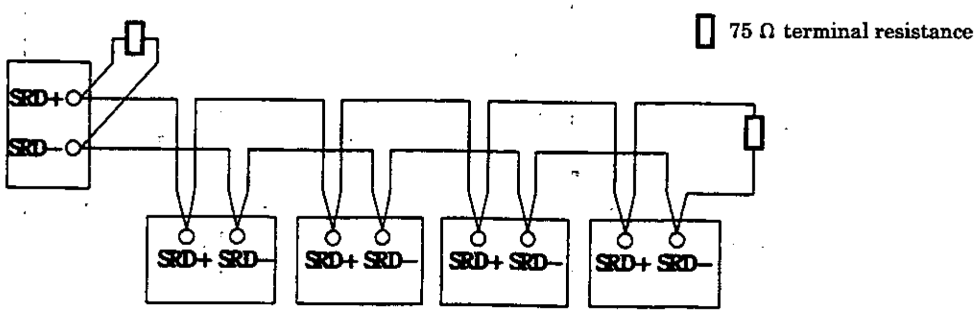


Fig. 10.19 Wiring Example for CP-215 Interface

(3) CP-216IF module CP-216 interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control line, and power supply line.
- Attach terminal resistances to both terminal stations of the transmission line.
- Panel-to-panel cables for wiring should be YS-IPEV-S(Cu) IP$\times$1.25 mm^2 (75Ω type) (made by Fujukura Corporation).
- Provide a separate repeater in cases where the wiring length is long.

■ Calculation of the Transmission Distance

The panel-to-panel transmission distance of a CP-216 transmission system will differ according to the transmission speed, the number of stations connected, the number of junction boxes (JC215-01) connected, and the length of the in-panel transmission cable. In general, the maximum transmission distance of panel-to-panel cables will be as follows.

- Maximum transmission distance in the case of 4 Mbps = $520 - 4.5N - 3.0L_1 - 5.0M$ (m)
- Maximum transmission distance in the case of 2 Mbps = $727 - 8.48N - 2.58L_1 - 6.06M$ (m)
- Maximum transmission distance in the case of 1 Mbps = $1041 - 14.0N - 2.08L_1 - 8.33M$ (m)

N : number of stations and repeaters connected

L_1 : length of in-panel cable (m)

M : number of JC215-01 units connected (however, the junction boxes at the IN side and the OUT side of a bus will be counted as one junction box.

Table 10.2 shows calculation examples of the maximum transmission distance when 30 stations are connected. Fig. 10.20 shows an example of a system configuration, and Fig. 10.21 shows a wiring example.

Table 10.2 Calculation Examples of the Maximum Transmission Distance (when 30 stations are connected)

Transmission Speed	Length of Panel-to-Panel Cable Wiring L_0: without any repeaters connected	Total Wiring Distance	
		L_1: with 1 repeater connected	L_2: with 2 repeaters connected
4Mbps	170 mm or less	600 m	350 m
2Mbps	270 mm or less	900 m	600 m
1Mbps	420 mm or less	1400 m	1250 m

(Note 1) : L_0 indicates calculation examples for the case where the total wiring length of the in-panel cable ≒ 55 m and where 20 JC215-01 units are used.

(Note 2) : L_1 and L_2 indicate calculation examples for the case where 16 stations are connected to the left and right of a repeater(s).

■ Conditions for the Number of Stations Connected

With regard to the number of stations connected, restrictions in terms of transmission performance must be taken into consideration in addition to the above restrictions.

Table 10.3 shows the maximum number of stations that can be connected in terms of transmission performance.

Table 10.3 Maximum Number of Stations Connected

Mode \ Transmission Speed	4 Mbps	2 Mbps	1 Mbps
Basic	8	12	13
Expanded (Remote I/O)	16	24	26
Expanded (Inverter)	15	15	15

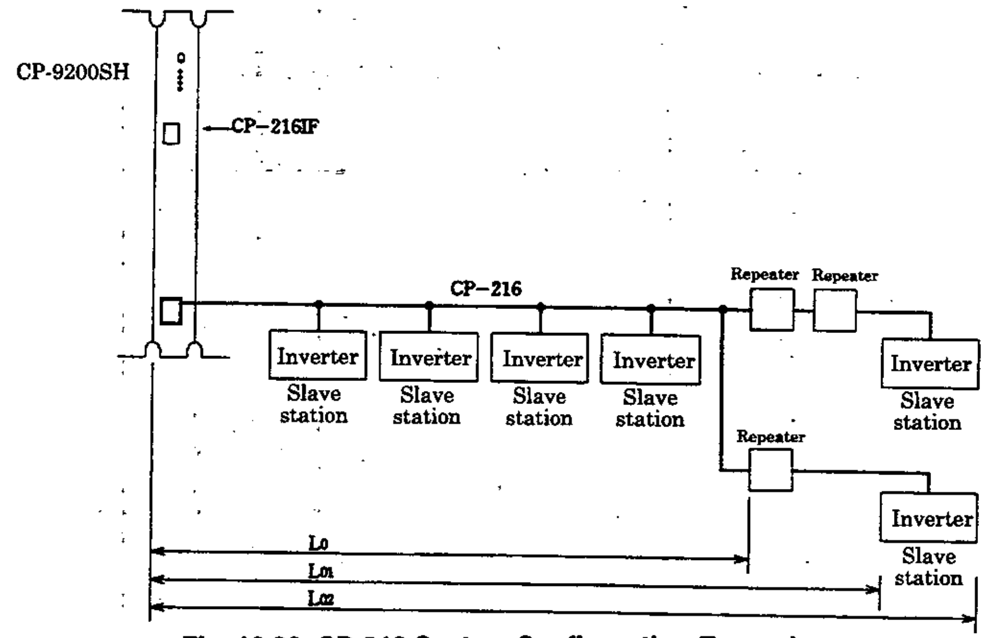


Fig. 10.20 CP-216 System Configuration Example

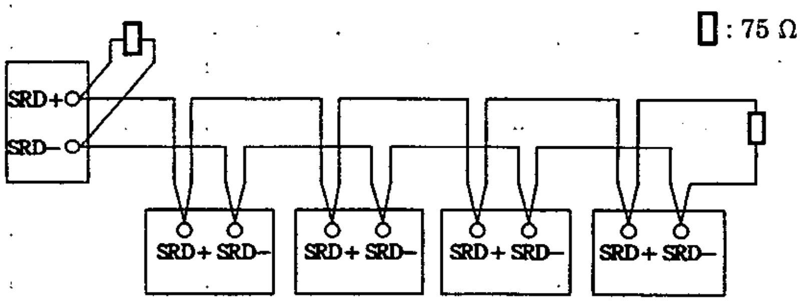


Fig. 10.21 Wiring Example of a CP-216

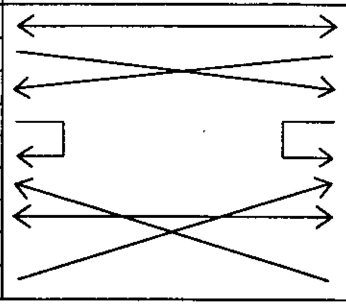
(4) CP-217 Module RS-232 Interface

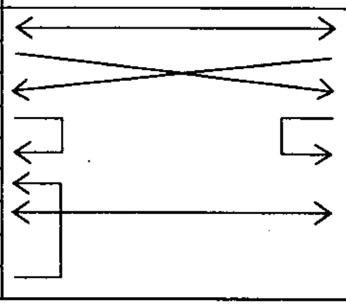
■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control li power supply line, and other transmission lines.
- The RS-232 interface of the CP-217 interface module has both DSUB-9 pin (CN1) and standard DSUB-25 pin (CN2).
- The maximum length of the RS-232 cable is 15 m. Keep the cable length as short as possib
- The RS-232 interface of the CP-217 module is non-isolated type. Noise on the connecti terminals may cause a malfunction. If this happens, use shielded cable or a modem to redu noise.

Table 10.4 shows the connection of CP-217 RS-232 transmission line.

Table 10.4 CP-217 RS-232 Transmission Line Connection

CP-9200SH 217IF (CN2)		Cable connection and Signal direction	Called station (DSUB25-pin)	
Signal name	Pin No.		Pin No.	Signal name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS (CTS)
DSR (DR)	6		6	DSR (DR)
SG	7		7	SG
CD	8		8	CD
DTR (ER)	20		20	DTR (ER)

CP-9200SH 217IF (CN7)		Cable connection and Signal direction	Called station (DSUB9-pin)	
Signal name	Pin No.		Pin No.	Signal name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS
DSR (DR)	6		6	(5V)
SG	7		7	SG
CD	8		8	—
ER (DTR)	20		9	—

(5) CP-217IF Module RS-422/485 Interface

Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control li power supply line, and other transmission lines.
- The RS-422/485 interface of the CP-217 Interface Module has an MR 8-pin (CN3).
- The RS-422/485 cable length is 300 m max. Keep the cable length as short as possible.
- The RS-422/485 interface of the CP-217 module is non-isolated type. Noise on the connecti terminals may cause a malfunction. Use a shielded cable or a modem to reduce noise.
- In the case of RS-422, insert a terminal resistance as needed. Terminate at the receiving e
- In the case of RS-485, provide terminal resistances at both terminal stations of the transmissi circuit. The terminal resistance may be inserted by the front DIP switch of the CP-217 modu

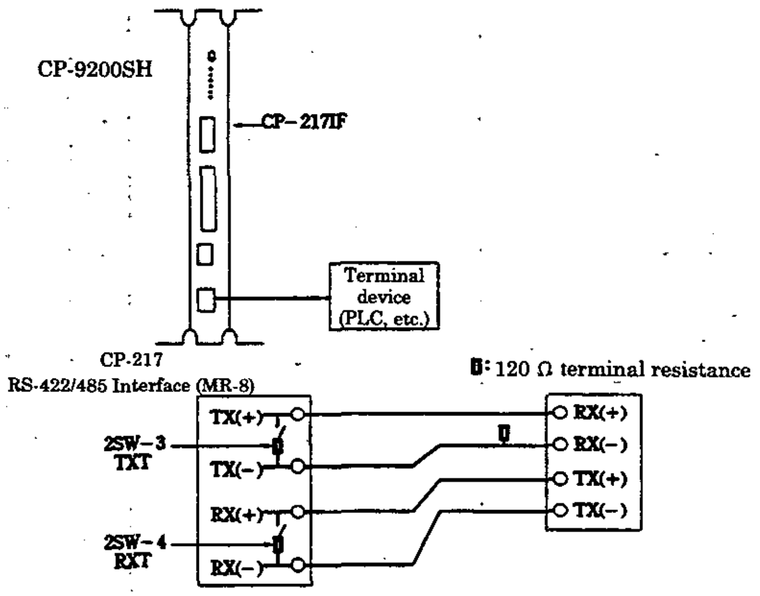


Fig. 10.22 Wiring Example for RS-422

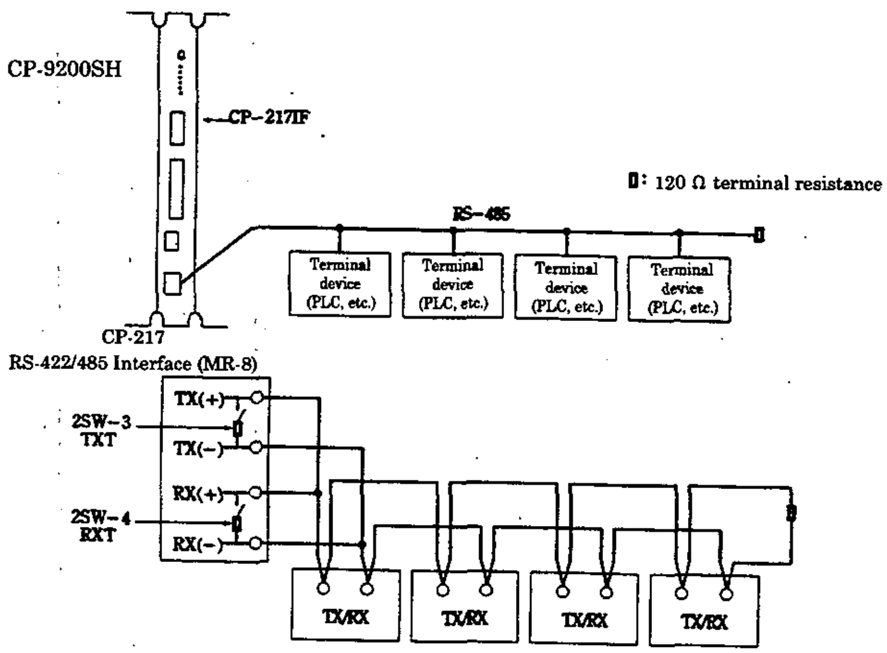


Fig. 10.23 Wiring Example for RS-485

(6) CP-218IF Module CP-218 Interface

■ **Precautions**

- Be sure to provide the interface line as a separate line apart from the power line, control line, power supply line, and other transmission lines.
- The AUI Interface of the CP-218IF module has a DSUB-15 pin (with slide lock). It can use Ethernet standard transceiver cables (for example: DAISET-1581B) made by Mitsubishi Electric Corporation available on market.

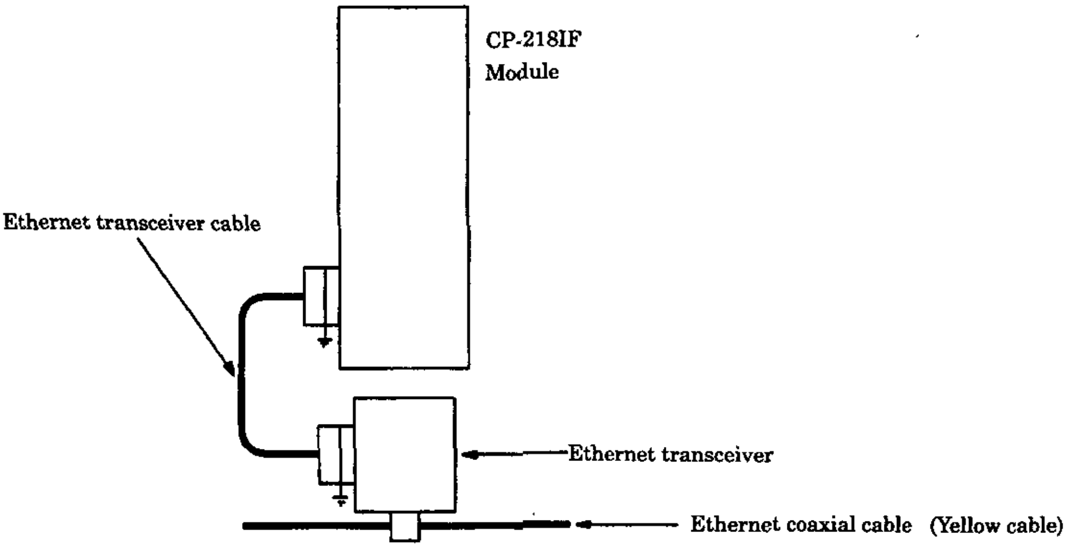
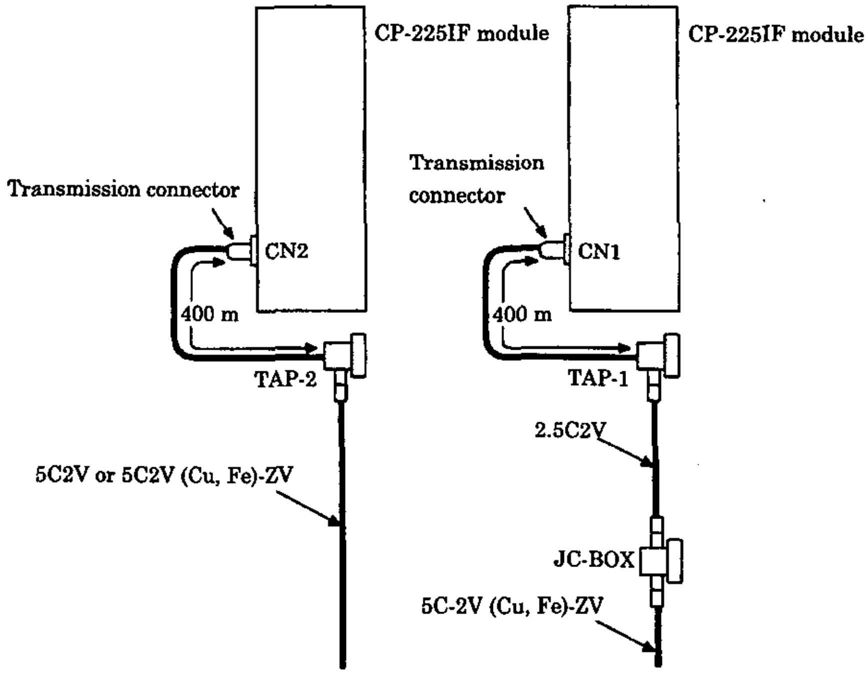


Fig. 10.24 CP-218 Wiring Example

(7) CP-225IF Module CP-225 Interface

■ **Precautions**

- Be sure to provide the interface line as a separate line apart from the power line, control line, power supply line, and other transmission lines.
- The CP-225 interface of CP-225IF module is provided with a PS connector. Use TAP-1 or TAP-2 to connect to a coaxial cable.



(a) When using TAP-2 (b) When using TAP-1

Fig. 10.25 CP-225 Wiring Example

(8) CP-2500IF Module CP-2500 Interface

Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control li power supply line, and other transmission lines.
- The CP-2500 interface of the CP-2500IF module uses the BNC type coaxial connector. Conn the T-shaped branching connector to the module and connect the BNC type coaxial cable the T-shaped branching connector.

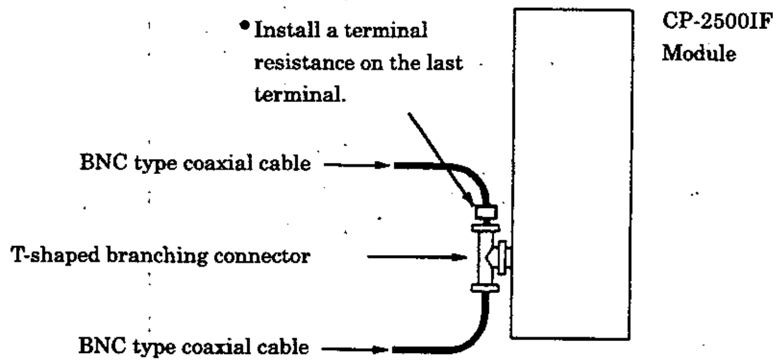


Fig. 10.26 CP-2500 Wiring Example

(9) EXIOIF Module Expansion Cable Interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control line, power supply line, and other transmission lines.
- Use a standard cable (Chapter 2 "PRODUCT LISTS") for the expansion interface cable. The expansion interface cable of the EXIOIF module uses a 100-pin half pitch connector (DX10BM-100SE) [made by Hirose Electric Corporation].

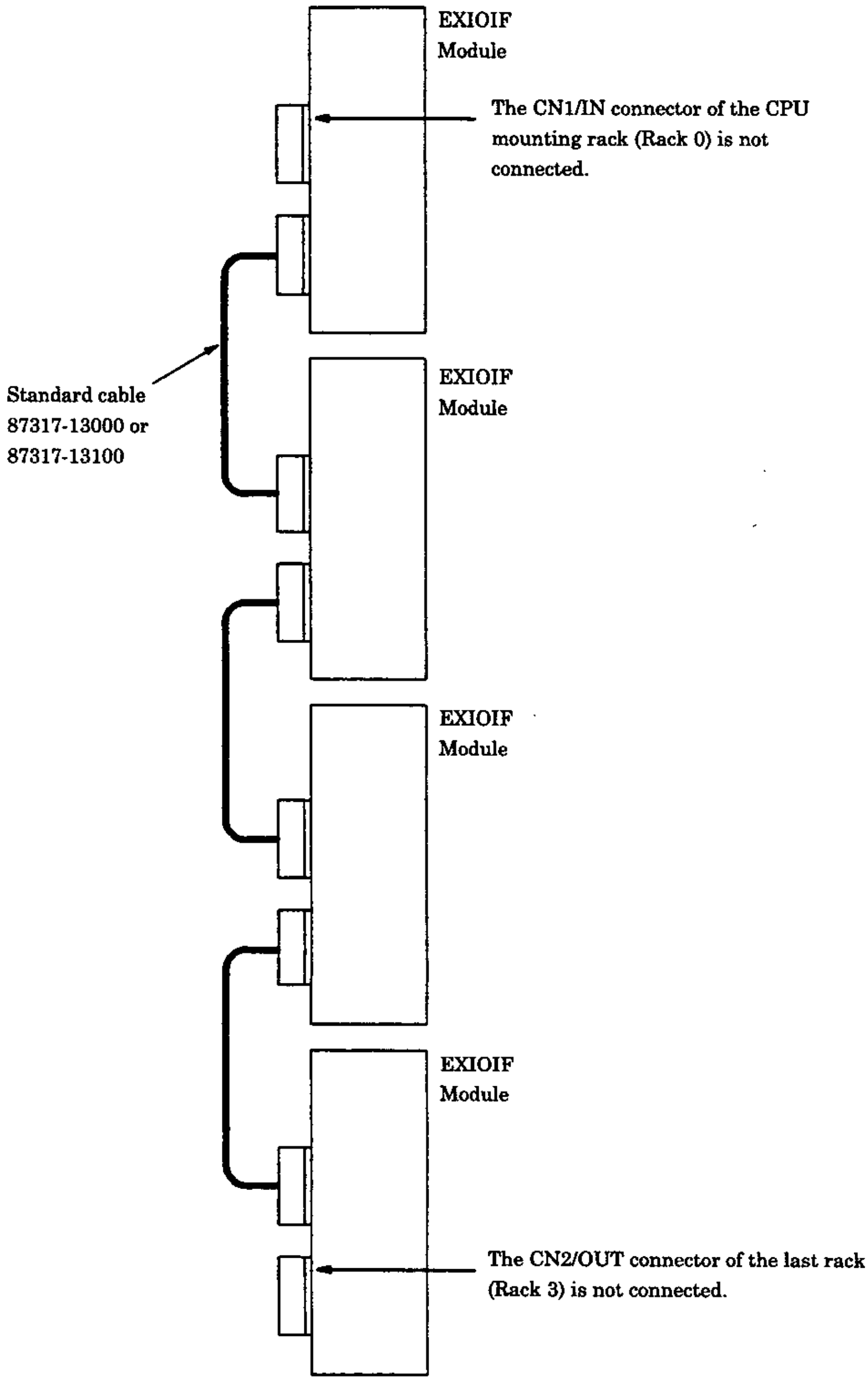


Fig. 10.27 EXIOIF Wiring Example

(10) 2000IOIF Module Expansion Cable Interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control li power supply line, and other transmission lines.
- Use a standard cable (Chapter 2 "PRODUCT LISTS") for the expansion interface cable. T expansion interface cable of the 2000IOIF module uses a 100-pin half pitch connector (D 50SA-1L1) [made by JAPAN AVIATION ELECTRICS INDUSTRY. LTD.].

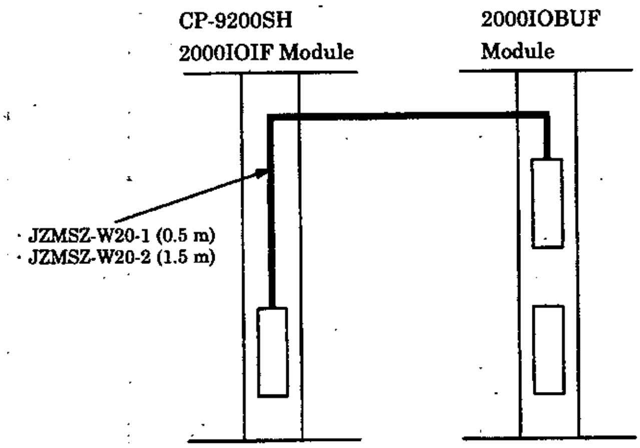


Fig. 10.28 CP-2000IOIF Wiring Example (Horizontally installed)

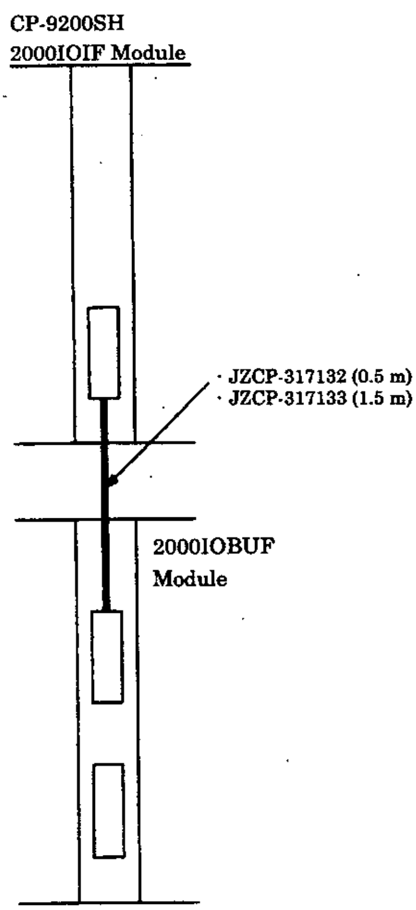
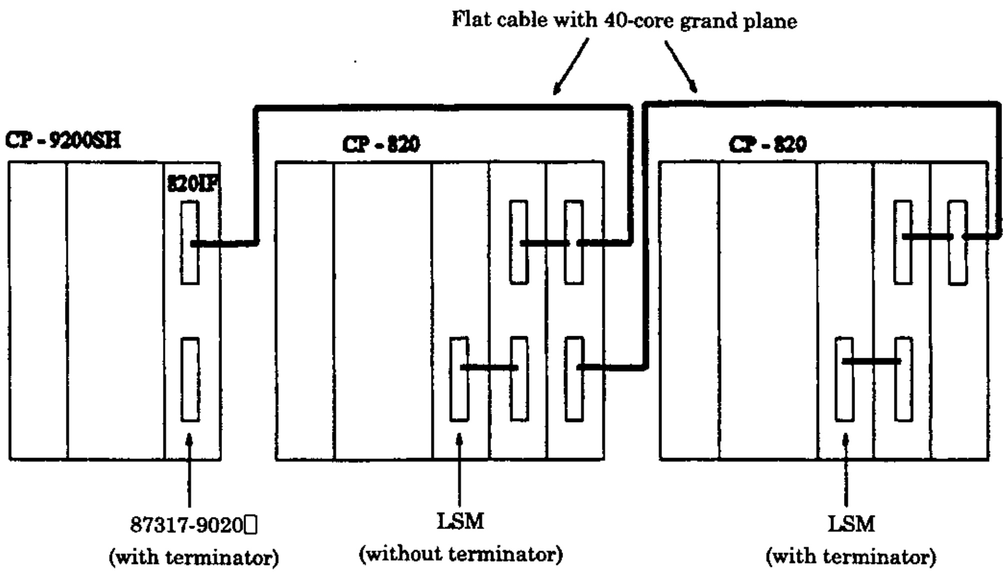


Fig. 10.29 CP-2000IOIF Wiring Example (Vertically installed)

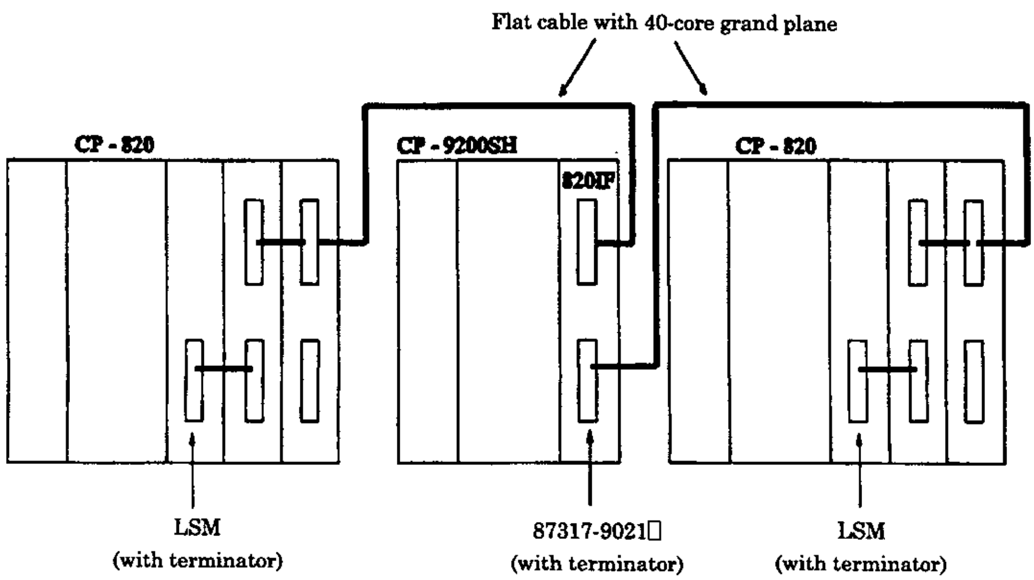
(11) 820IF Module CP-820 Local I/O Cable Interface

■ Precautions

- Be sure to provide the interface line as a separate line apart from the power line, control line, power supply line, and other transmission lines.
- When installing a 820IF module at the end of cable, use a 820IF module with terminator (Product code No.: 87317-9020□).

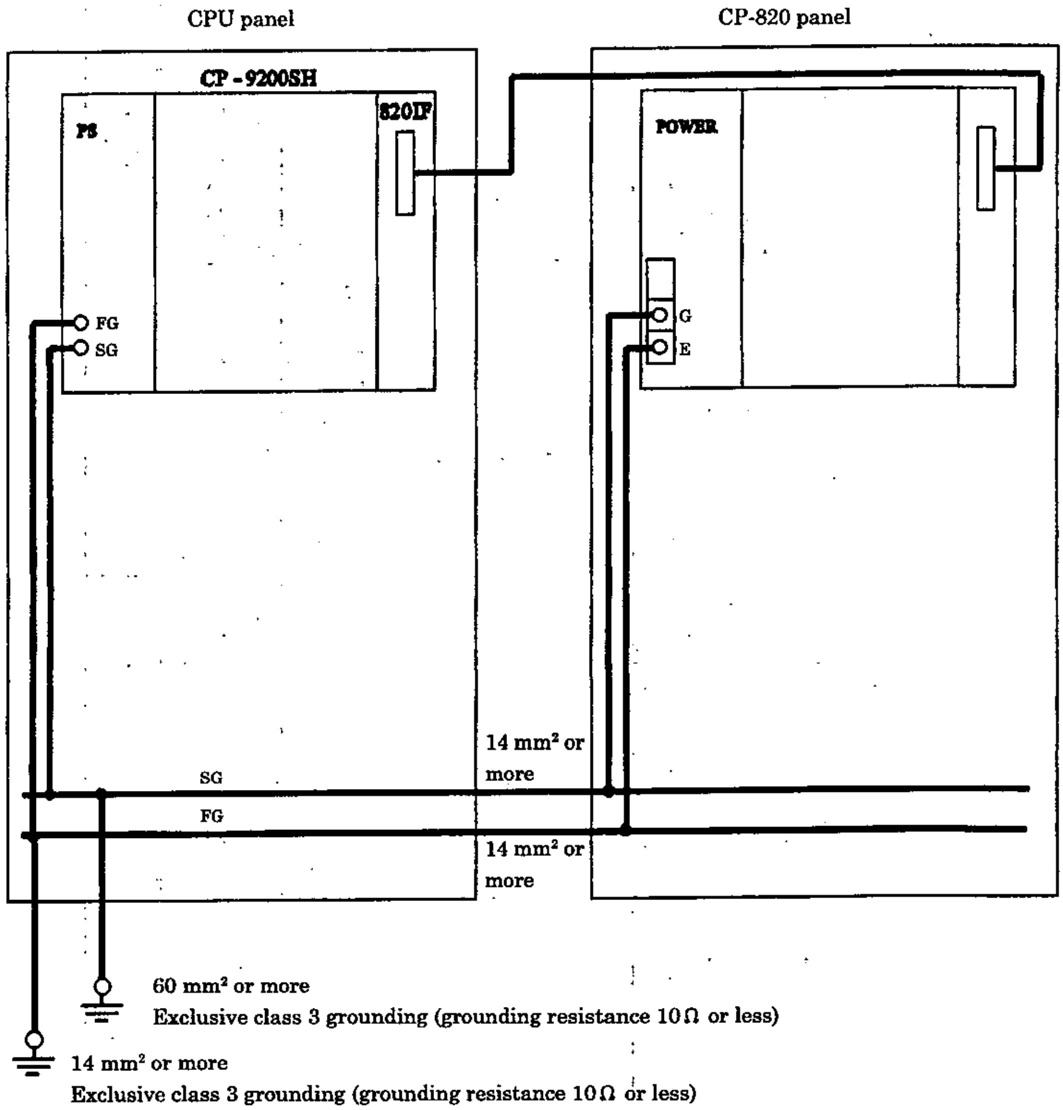


- When installing a 820IF module in the middle of cable line, use a 820IF module without terminator (Product code No.: 87317-9021□).



■ **Installation**

- Signal grounding of CP-9200SH and CP-820: Connect 0V to the exclusive class 3 (groundi resistance 10Ω or less) grounding with a grounding cable of 60 mm^2 or more.
- Frame grounding of CP-9200SH and CP-820: Connect to the exclusive class 3 (groundi resistance 10Ω or less) grounding pole with a grounding cable of 14 mm^2 or more.



(12) SVB Module MECHATROLINK

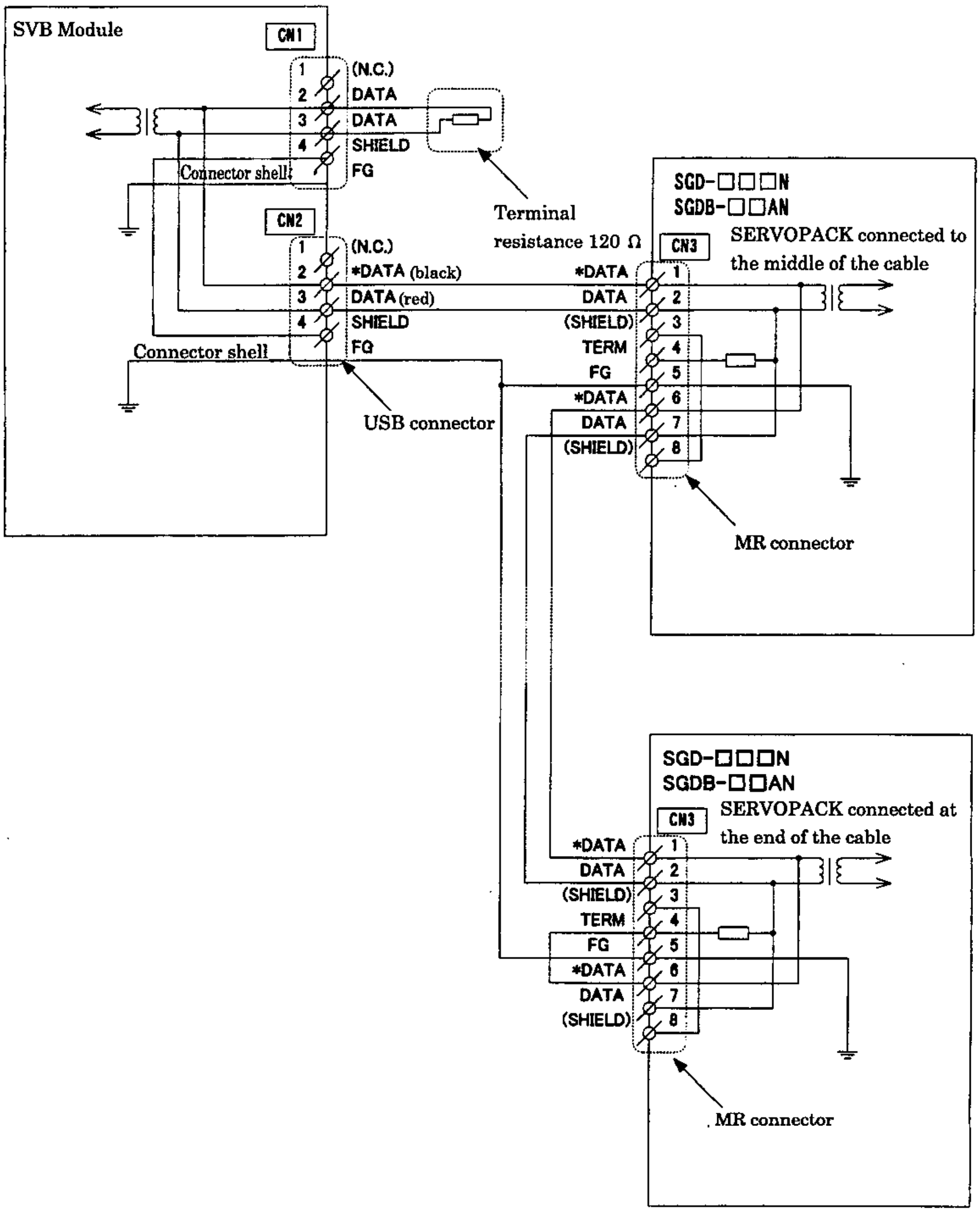
■ **Precautions**

- The SVB module can be connected to the CP-216 or the MECHATROLINK interface. For the connection to the CP-216 interface, refer to 10. 3. 4 (3) CP-216 IF Module CP-21 Interface.
- Be sure to provide the interface line as a separate line apart from the power line, control lin power supply line, and other transmission lines.
- Provide terminal resistors (120 Ω) on both terminals for the transmission line.

■ **MECHATROLINK transmissions**

Item	Specifications
Transmission speed	4 Mbps
Transmission cycle	2 ms
Transmission distance	50 m
Max. number of stations	14 stations

■ Communication circuit



Notes: 1. Do not use connector pin No. 1 on the SVB module.
Use connector pin No. 4 for one-point grounding of the entire shield of the MECHATROLINK.
Normally, to the wiring as shown in the above diagram.

2. The SERVOPACK is equipped with a built-in terminator. Switch the terminator ON or OFF by the connector connection.

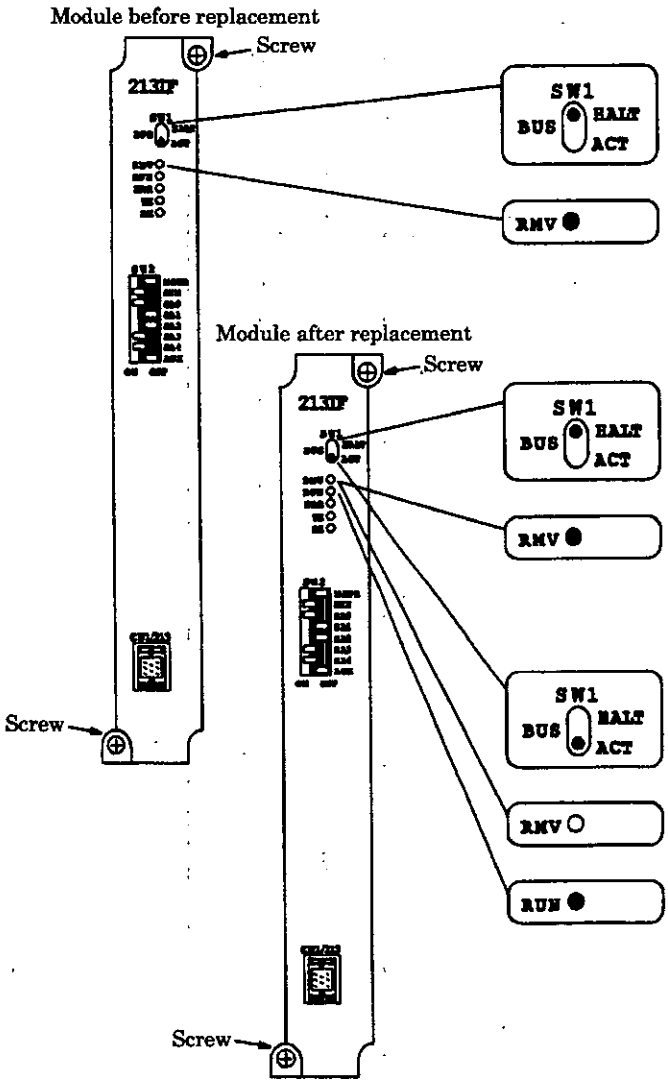
11 HOT SWAPPING

Replacing a module with power supplied is called "Hot Swapping".

This chapter explains the procedures for hot swapping.

The CP-9200SH is designed for hot swapping (replacing a module with power supplied).
Since the CPU module is always updating the data with the mounted modules, it is necessary to st the data transmission operation of modules with the CPU module when replacing a module. Therefo when a module for which stopping the data transmission with the CPU module is not possible (Refer Chapter 5 "COMPONENT MODULES".), is mounted, hot swapping is not allowed.

Hot swapping procedures (Example with CP-213 IF module)



① Set BUS switch of module to HALT side.

② Confirm that RMV LED on the module front fac lit.

③ Loosen two screws on right upper and left bottom module to remove the module.

④ With BUS switch of module on HALT side, moun module.

⑤ Confirm that REV LED on the module front face is

⑥ Tighten two screws on right upper and left bottom module.

⑦ Set BUS switch of module to ACT side.

⑧ Confirm that RMV led is unlit.

⑨ Confirm that RUN LED is lit.

Note: Be sure to set the BUS switch of the module to be removed to HALT side and confirm th the RMV LED is lit before removing the module.
While the RMV LED is unlit, the CPU module is updating the data with each modu Therefore, removing a module with the RMV LED unlit causes an error in data updati with other modules, which may cause an error in the system operation.
For hot swapping of EXIOIF module, confirm that the RMV LED is lit and disconnect t cable, then remove the module. To mount the module, insert the module, then connect t cable.

12 TRIAL OPERATION AND ACTIONS TO BE TAKEN IN CASE OF TROUBLE

This chapter describes the trial operation procedures and the actions to be taken in case of trouble.

12.1 Trial Operation

12.1.1 Check Matters

Check the items in Table 12.1 for a trial operation after wiring the CP-9200SH.

Table 12.1 Check Item

No.	Check Item	Check Matters
1	Connection of the power and I/O lines	• Has the wiring been performed correctly? • Are any terminal screws not loose? • Is the crimp terminal, etc. not short-circuited? • Is the terminal block connector attached securely? • Is the module mounted securely?
2	Connection cables	• Is the connecting cable between the modules connected properly and locked? • Is the CP-717 connecting cable connected properly and locked?

12.1.2 Trial Operation Procedures

After mounting and wiring the CP-9200SH and checking the items in Table 12.1, refer to Fig. 12.1 the trial operation procedures.

1	Turn on the power.	① Check the connection of the power supply voltage and the terminals. ② Check the connection of the power supply voltage and the terminals for the I/O equipment. ③ Turn on the power and confirm that the RDY LED and the RUN LED are lit.
2	Trial Operation	① Load the program and check the sequence operation.
3	Debug	① Correct problems of the program if any.
4	Save the program.	① The program is saved to flash memory, hard disk, or floppy disk. ② Print out the program contents with a printer.
5	Operation	

Fig. 12.1 Trial Operation Procedures

2.2 Actions to be Taken in Case of Trouble

Operation conditions and trouble conditions of CPU module can be known from the indicator lamps (LEDs) on the CP-9200SH surface and by referencing the system (S) registers. A list of indicator lamp (LED) conditions are shown in Table 12.2 and the system register configuration is shown in Table 12.3. Take appropriate actions according to the check flows. (The referencing of a register with register No.□□□□□ in word units is expressed as SW□□□□□. The referencing of the Δth bit of a register with register No.□□□□□ is expressed as SB□□□□□Δ).

With CP-9200SH, the following two types of trouble may occur:

- Critical fault : The content of the fault is indicated by the indicating lamps and the execution of the program is stopped.
- Alarm : The content of the fault is indicated by the indicating lamps but the execution of the program is continued.

Table 12.2 Operation Conditions and Faults as Indicated by the Indicating Lamps (LED) and the Actions to be Taken

	Indicating Lamp (LED)					Description of Indication	Actions
	RDY	RUN	ALM	ERR	BAT ALM		
Normal	○	○	●	●	○	Hardware reset condition	There is an user program error or a hardware failure if this condition continues for more than 1 second. Perform the countermeasure against the system error, as explained on the next page.
	○	○	○	○	○	In initialization	
	○	●	○	○	○	Executing the A drawing	
	●	○	○	○	○	User program is stopped (offline stop mode).	This condition is entered when the STOP operation is performed at CP-717 or when the RUN switch on the surface is set to OFF. The online running mode can be entered by performing the RUN operation in the System Definition Screen of the CP-717 or by turning ON the RUN switch.
	●	●	○	○	○	User program is being executed normally (online run mode).	This condition will be entered normally.
Critical Error	○	○	–	●	○	A serious failure has occurred.	Refer to 12.2.2, "Actions to be Taken in Case of User Program Error".
	●	○	○	●	○	(1) The program memory is not initialized. (2) The scan time setting is fault.	Clear the program memory in System Definition Screen of CP-717. If normal conditions are not restored, a hardware fault may be suspected. Replace the CP-9200SH.
	○	○	○	★	○	Hardware fault (1) Flashes 2 times : RAM diagnosis error (2) Flashes 3 times : ROM diagnosis error (3) Flashes 4 times : CPU function diagnosis error (4) Flashes 5 times : FPU function diagnosis error	A hardware failure has occurred. Perform the countermeasure against the system error, as explained on the next page.
Alarm	–	–	–	–	●	Battery alarm	Replace the battery
	●	●	●	○	○	(1) Operation error (SB000418) (2) I/O error (SB000419)	Refer to 12.2.3, "Actions to be Taken in Case of Operation Error." Refer to 12.2.4, "Actions to be Taken in Case of I/O Conversion Error". Check whether the power of the Optional I/O Module has been turned on.

(continued)

(continued)

	Indicating Lamp (LED)					Description of Indication	Actions
	RDY	RUN	ALM	ERR	BAT ALM		
Alarm	○	○	○	★	○	(3) An illogical interruption has occurred (SB00041A).	Take the following actions: ① Load the user programs again, and perform the error reset with the System Definition Screen of the CP-717. After a few seconds, check SB00041A and go to ② if it is ON. ② Check the influence of noise and take proper measures if necessary, and then perform the error reset in the System Definition Screen of the CP-717. If SB00041A is found ON in a few seconds, the hardware can be malfunctioning. Replace the CP-9200SH.
						(4) Transmission error (SB00041B).	Refer to 12.2.5, "Actions to be Taken in Case of Transmission Error".
	Report is made to system register (no LED indications)					(1) CP-717 connection information	Refer to Table 12.4 " System Status ".
						(2) Hardware status (momentary interruption, RUN/STOP, test mode, etc.)	Refer to Table 12.4 " System Status ".
Test mode	○	○	○	★	○	Hardware fault (1) Flashes 2 times : RAM diagnosis error (2) Flashes 3 times : ROM diagnosis error (3) Flashes 4 times : CPU function diagnosis error (4) Flashes 5 times : FPU function diagnosis error (5) Flashes 6 times : RTC interruption time diagnosis error (6) Flashes 7 times : WDT overtime diagnosis error	There is an user program error or a hardware failure if this condition continues for more than 1 second. Perform countermeasures against the system errors as explained on this page.

(Note) In the Indicator Lamp column, ○ : Unlit, ● : Lit, ★ : Flashing, — : Any condition.

Countermeasure against System Error

Perform the following operations when a system error occurs.

Turn off the power, set the RUN switch on the front cover to OFF and then turn ON the power again. If the offline stop mode is entered, an error has occurred in the user program. Reload the user program. If the offline stop mode is not entered, a hardware fault is suspected. Replace the CP-9200SH.

Table 12.3 Configuration of the System (S) Register

Register	Contents
SW00000	System Service Register
SW00030	System Status (Refer to Table 12.4.)
SW00050	System Error Status (Refer to Table 12.5.)
SW00080	User Operation Error Status (Refer to Table 12.6.)
SW00090	System Service Execution Status
SW00100	Interruption Input Status
SW00110	User Operation Error Status (Details) (Refer to Table 12.7.)
SW00200	System I/O Error Status
SW00424	System Reserved
SW00500	System analysis status
SW00530	System Reserved
SW00600	System Operation Error Status
SW00620	System Reserved
SW00698	Interruption Status
SW00800 SW01023	System Reserved

The details of the system status are given in Table 12.4 .
Refer to Appendix A "Data Memory Assignment List" concerning the bit configuration.
Refer to 2.4 "System Status" of Appendix A for information on Table 12.4.

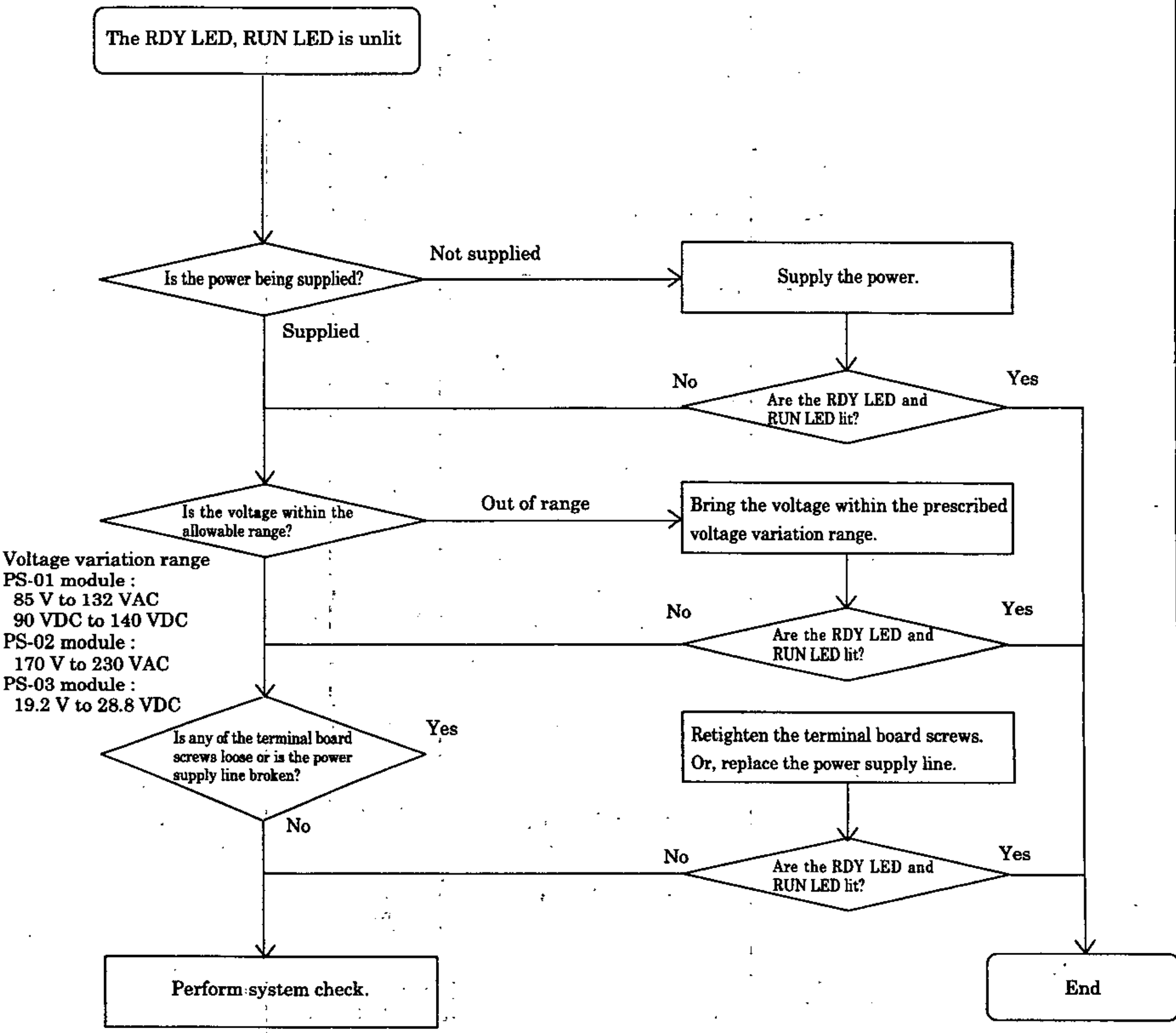
Table 12.4 System Status

Name	Resister No.	Remarks
System Reserved	SW00030 to SW00039	(Unused)
CPU Status	SW00040	Status report
CPU Error Status	SW00041	Error information
RTC Count	SW00042	Incriminated by 1 on every RTC interruption.
GND Count	SW00043	Number of times the online ground self-diagnosis has been executed.
System Reserved	SW00044 to SW00046	(Unused)
Software Switch Selection Status	SW00047	Report on the software switch selection
Hardware Status	SW00048	Hardware switch report and hardware status
Hot swapping Interlock	SW00049	Hot swapping interlock with an application program

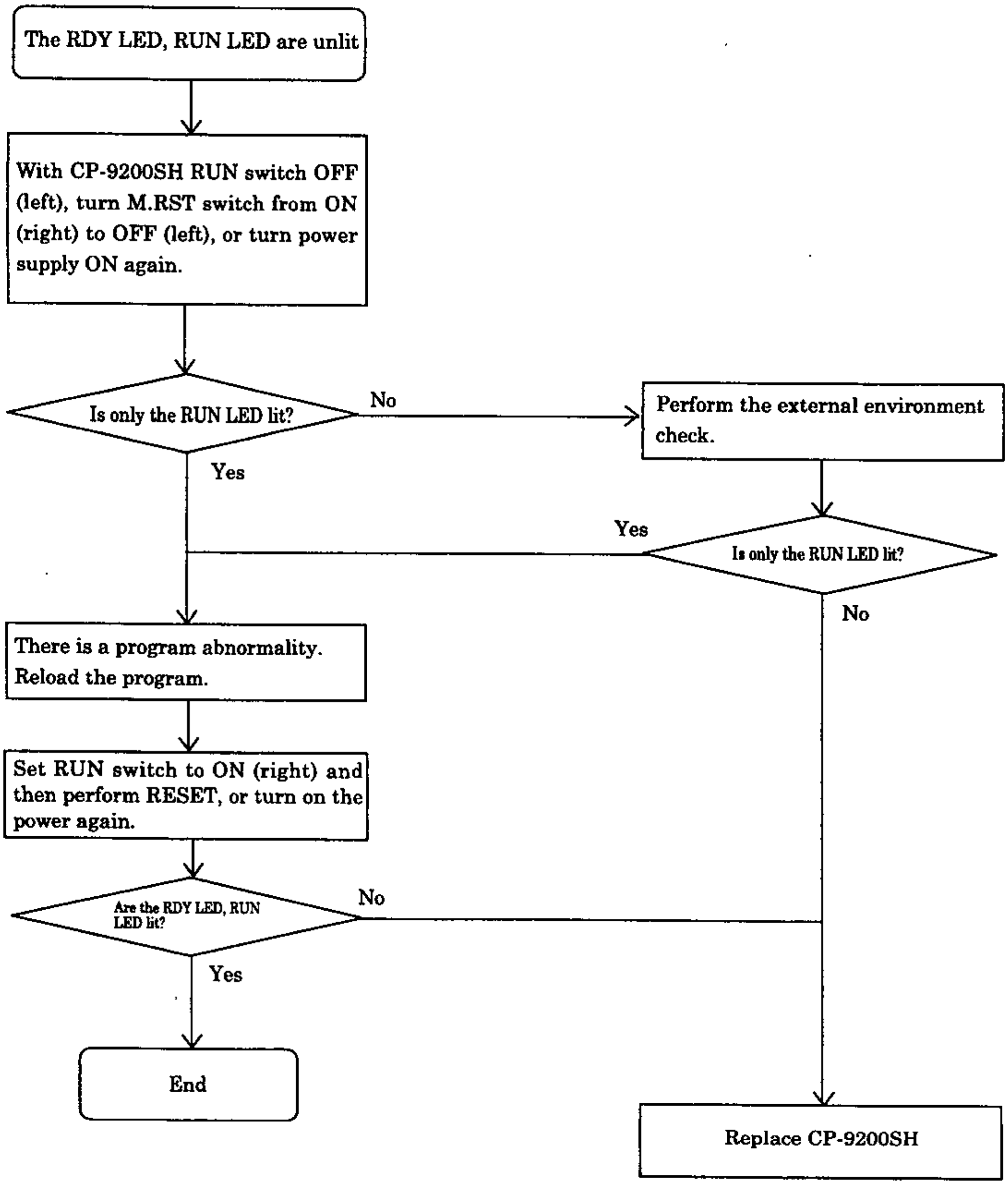
12.2.1 Check flows

Power supply check flow, system check flow, and external environment check flow are shown below.

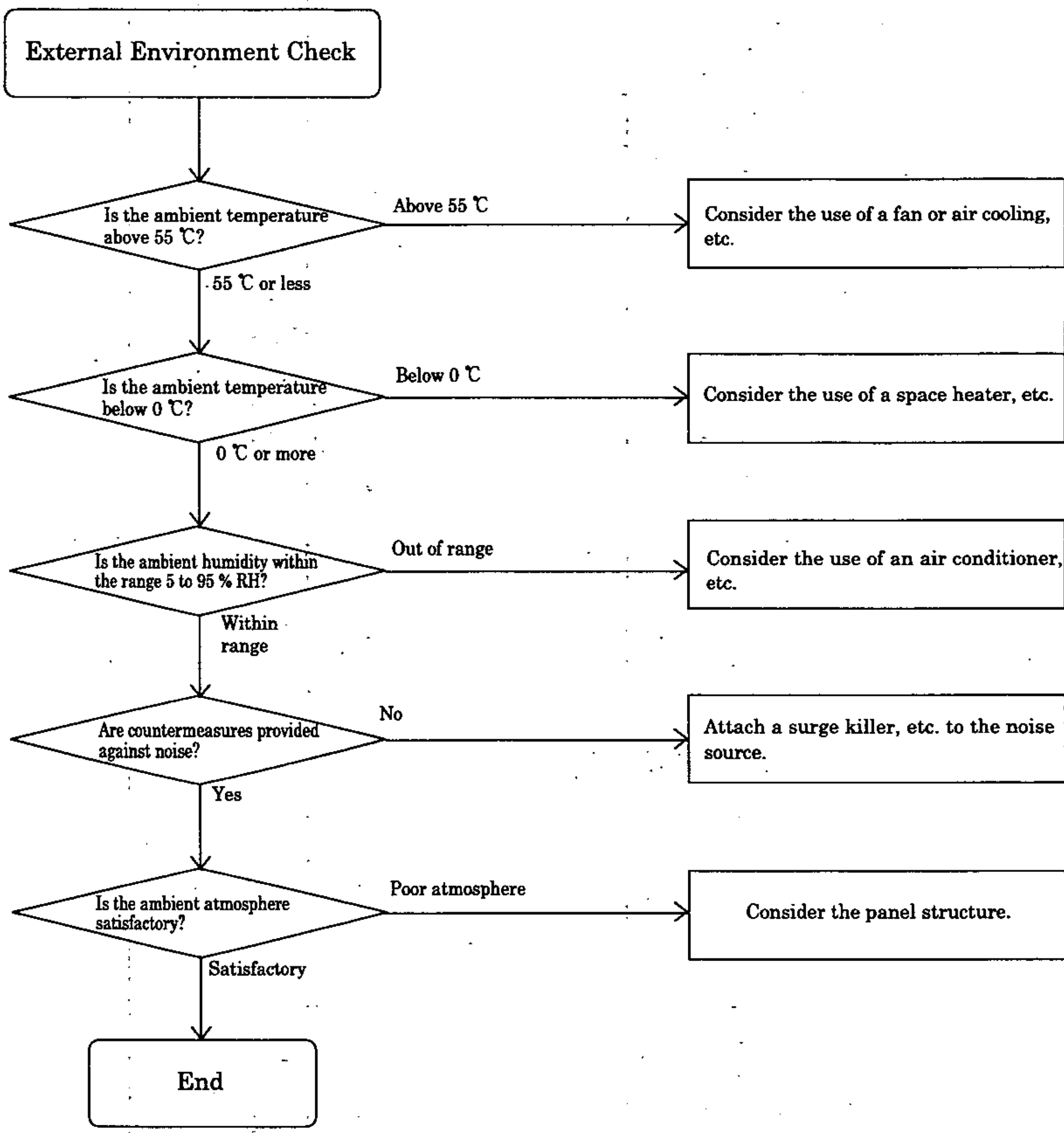
(1) Power Supply Check Flow



(2) System Check Flow



(3) External Environment Check Flow



12.2.2 Actions to be Taken in Case of the User Program Error

When the RUN and ERR LEDs of CP-9200SH/CPU module are both lit at the same time, the occurrence of any of the 18 types of serious failures shown in Table 12.5 can be suspected.

Table 12.5 Classification of Serious Failure Errors

Resister No.	Error Classification
SW00050	0001H : watchdog time over
	0002H : bus time over
	0006H : execution of a breakpoint interrupt
	0007H : BOUND error
	0008H : execution of an undefined instruction
	000CH : double fault
	000DH : illogical TSS
	000EH : segment does not exist
	000FH : stack error
	0010H : general protection error
	0011H : page fault
	0012H : segment boundary check
	0041H : ROM diagnosis error
	0042H : RAM diagnosis error
	0043H : CPU diagnosis error
	0044H : FPU diagnosis error
	0051H : multi-CPU coordinated stop *1
	0081H : integer operation error (overflow/underflow) *2
	0083H : integer operation error (division by 0) *2
	0084H : real-number operation error (FPU segment does not exist) *2
	0085H : real-number operation error (overflow/underflow/division by 0) *2
	0088H : index error *2

*1: Only for multi-CPU configuration

*2: Only for 87317-3-3□□□□-S0305 and later

In Table 12.5, the serious failure errors other than "0001H: watchdog time over", "0081H: integer operation error (overflow/underflow)", "0083H: integer operation error (division by 0)", "0084H: real-number operation error (FPU segment does not exist)", "0085H: real-number operation error (overflow/underflow/division by 0)", and "0088H: index error" are system errors. Take a countermeasure against system errors as shown in 12-4.

"0001H: watchdog time over" can be a system or user program error. Investigate and eliminate the cause, then turn the power ON from OFF to restart the operation.

"0081H: integer operation error (overflow/underflow)", "0083H: integer operation error (division by 0)", "0084H: real-number operation error (FPU segment does not exist), "0085H: real-number operation error (overflow/underflow/division by 0), and "0088H: index error" occur only when 1 is set for SW00013 (operation error processing). Investigate the cause for user program error, and take a corrective action for operation error, referring to 12.2.3 "Actions to be Taken in Case of Operation Error".

"0051H: multi-CPU coordinated stop" indicates that own CPU stops, following to a breakdown of the other CPU when the coordinated stop mode is set in the system configuration definition. Investigate the cause of breakdown of the other CPU.

(1) Investigation of the Program Type in Which the Fault Occurred

Check the contents of SW00055 (program type) in accordance with Fig. 12.2 and investigate whet[cut off]
the fault occurred within a drawing or within a function.

SW00055	Program Type
0000H	System
0001H	Within drawing
0002H	
0003H	
0005H	
0008H	Within function

System error
Perform the countermeasure against system error (P.12-4).

An error has occurred within a drawing.
Conduct (2) "Investigation of the Drawing in Which the Error Occurred".

A malfunction has occurred within a function.
Conduct (3) "Investigation of the Function in Which the Error Occurred".

Fig. 12.2 Investigation of the Program Type in Which the Fault Occurred

(2) Investigation of the Drawing in Which the Fault Occurred

Check the contents of $\underbrace{\text{SW00054 (error task)}}_{\text{Type of Drawing}}$ and $\underbrace{\text{SW00056 (Error DWG No.)}}_{\text{Drawing No.}}$ and determine th[cut off]
drawing in which error occurred.

SW00054	Error task
0000H	System
0001H	DWG.A
0002H	DWG.I
0003H	DWG.H
0005H	DWG.L

System error
Perform the countermeasure against system err[cut off]
(P.12-4)

SW00056	Error DWG No.
FFFFH	Parent drawing
□□00H	Child drawing (□□H is the child drawi[cut off] No.)
□□△△H	Grandchild drawing (△△H is the grandch[cut off] drawing No.)

(Example 1) If the error task is 0003H and the DWG No. is FFFFH, fault occurred in drawing H (parent drawin[cut off]

(Example 2) If the error task is 0005H and the DWG No. is 0A00H, fault occurred in drawing L10 (child drawin[cut off]

(Example 3) If the error task is 0005H and the DWG No. is 3012H, fault occurred in drawing L48. 18 (ground c[cut off] drawing).

Fig. 12.3 Investigation of the Drawing in Which the Fault Occurred

(3) Investigation of the Function in Which the Fault Occurred

If the DWG No. (SW00056) is 8 ○○○ H, fault occurred in a function. Follow the procedure of Fig. 12.4 and determine the function in which the fault occurred and the drawing and step No. at which this function is referenced.

SW00056	Error DWG No.
8○○○H	Function (○○○H : System management No.)

Determine the drawing which references the function.

SW00057	Function referencing DWG type
0001H	DWG.A
0002H	DWG.I
0003H	DWG.H
0005H	DWG.L
0008H	Function

Determine the drawing No.

SW00058	Type of DWG referencing the function
FFFFH	Parent drawing
□□00H	Child drawing (□□H is the child drawing No.)
□□△△H	Grandchild drawing (△△H is the grandchild drawing No.)
01○○H	Function (○○H is the system management No.)

Determine the step No.

SW00059	DWG step No. at which the function is referenced
nnnnn	Step No. at which the operation error has occurred.

nnnnn is in decimal form.

(Example 1) If SW00057 is 0003H, SW00058 is FFFFH, and SW00059 is 00100, an error occurred the function referenced at step 100 of drawing H (parent drawing).

(Example 2) If SW00057 is 0008H and SW00059 is 00050, a function in which an error occurred is being referenced at step 50 of a certain function. Since it cannot be specified which function is referencing the function in which the error occurred, use the CP-717 to investigate all functions registered in the Function Map screen and find a function that is referencing at step 50. The error is occurring with that function.

Fig. 12.4 Investigation of the Function in Which the Fault Occurred

A system error status list is shown in Table 12.6.

Table 12.6 System Error Status List

Name	Resister No.	Remarks
Error type	SW00050	See Table 11.5.
Error code	SW00051	For system error analysis
Error IP	SW00052	For system error analysis
Error CS	SW00053	For system error analysis
Error task	SW00054	0000H: System 0001H: DWG A 0002H : DWG I 0003H: DWG H 0005H: DWG L
Program type	SW00055	0000H: System 0001H: DWG A 0002H : DWG I 0003H: DWG H 0005H: DWG L 0008H : Function
Error DWG No.	SW00056	Parent drawing :FFFFH Child drawing :□□00H (□□H : child drawing No.) Grandchild drawing :□□△△H (△△H : grandchild drawing No.) Function :8○○○H (○○H : system management N
Function referencing DWG type	SW00057	Type of the DWG that references the function in which an error occurre 0001H : DWG A 0002H : DWG I 0003H : DWG H 0005H : DWG L 0008H : Function
Function referencing DWG No.	SW00058	No. of the DWG that references the function in which an error occurred. Parent drawing :FFFFH Child drawing : □□00H (□□H : child drawing No.) Grandchild drawing : □□△△H (△△H : grandchild drawing N Function : 8○○○H (○○H : system management N
Function referencing DWG step No.	SW00059	Step No. of the DWG that references the function in which an error occurred. This will be 0 if the error occurred inside the DWG.
Error data	SW00060	For system error analysis (ES)
	SW00061	For system error analysis (DS)
	SW00062	For system error analysis (DI)
	SW00063	For system error analysis (SI)
	SW00064	For system error analysis (BP)
	SW00065	For system error analysis (SP)
	SW00066	For system error analysis (BX)
	SW00067	For system error analysis (DX)
	SW00068	For system error analysis (CX)
	SW00069	For system error analysis (AX)
	SW00070 to SW00079	System reserved

12.2.3 Actions to be Taken in Case of Operation Error

When a numerical operation error (underflow, overflow, or division error) occurs in an user program (DWG, function), the operation error processing drawing (DWG A00 / DWG H00 / DWG L00) of the corresponding DWG is executed. Thereafter, the execution of the original user program is continued using numerical values designated by the modification A register.
If a corresponding operation error processing drawing (DWG A00 / DWG I00 / DWG H00 / DWG L00) does not exist, the execution of the original user program is continued using numerical values (defaults) set by the system.
For the CPU module version 87317-3□□□-S0305 and later, an action at occurrence of operation error can be selected by setting SW00013 (operation error processing).
When SW00013 = 0, the above explained processing is performed at occurrence of operation error, and operation is continued.
When SW00013 = 1, the error processing is not performed at occurrence of operation error, and the system operation is stopped. And the status at this moment is reported to SW00050 and later for system error status.
Note: SW00013 is cleared at turning power ON.

(1) Actions to be Taken in Case of Operation Error

① Reporting of the Operation Error
When an operation error occurs, the error data shown in Tables 12.7, 12.8, and 12.9 are collected and stored in the corresponding system register area.

② Default Processing by the System
If a corresponding operation error processing drawing does not exist or if the error cannot be processed by a user process, the default process set by the system, shown in Table 12.9, is performed and the execution of the user program is continued.

③ Processes in the Operation Error Processing Drawing
A program example of an operation error processing drawing is shown in Fig. 12.5.
In the operation error processing drawing of the corresponding DWG, the user checks the error codes and stores the numerical values for modification in the A register.
It should be noted that numerical values set by the system are already stored in the modification A register before the operation error processing drawing is executed (see Table 12.9).
If numerical values are not stored in the modification A register in an operation error process, the results will be the same as that of the program shown in Fig. 12.5.

```
PT#1 : NT#1 : ST#1 DWG L00
├ SW00175<H000B                                      • Is there an integer operation error?
IFON                                                 • If there is:
├ SW00175=H0001                                      • Is there an integer operation underflow?
[  ├ -32768  ]                                       •     If so, it becomes -32768
        =  H0002                                     • Is there also an integer operation overflow?
[  ├ 32767  ]                                        •     If so, it becomes 32767
        =  H0003                                     • Is there also an integer division error?
[  ├ SW00176 ]              ⇒SW00178                 •     If so, write over the contents of SW00176
├ SW00175 = H0009                                    • Is there a double length integer operation underflow?
[  ├ -2147483648 ]                                   •     If so, it becomes -2147483648
        =  H000A                                     • Is there also a double length operation overflow?
[  ├ 2147483647 ]                                    •     If so, it becomes 2147483647
        =  H000B                                     • Is there also a double length division error?
[  ├ SL00176 ]              ⇒SL00178                 •     If so, write over the contents of SL00176
ELSE                                                 • If there is no integer error, is there a real number operation error or when an integer is
├ SW00175 = H0010                                    • stored, is there a non-numerical value error?
[  ├ 00000      ]                                    •     If so it becomes 0
        =  H0011                                     • Is there an integer storage underflow?
[  ├ -32768     ]                                    •     If so, it becomes -32768
        =  H0012                                     • Is there also an integer storage overflow?
[  ├ 32767      ]           ⇒SW00178                 •     If so, it becomes 32767
                                                     • Is there an underflow when storage of real numbers is changed by values obtained
├ SW00175 = H0021                                    • above?
[  ‖├ -1.000000E+38   ] [   ⇒SF00182   ]             •     If so, it is modified to -1.000000E+38
├ SW00175 = H0022                                    • Is there a real number storage overflow?
[  ‖├ 1.000000E+38    ] [   ⇒SF00182   ]             •     If so, it is modified to 1.000000E+38
├ SW00175 = H0023                                    • Is there a real number division error?
[  ‖├ SF00180 ]          [   ⇒SF00182   ]            •     If so, write over the contents of DF00004
IEND
DEND
```

Fig. 12.5 Example of an Operation Error Processing Drawing (L00)

(2) Investigation and Countermeasures against Operation Errors

If a numerical operation error occurs, the program may not be executed properly. Investigate a correct the error program in the following procedures.

① Investigation of the Existence of an Operation Error

Display the system (S) register of Table 12.7 on the CP-717, and investigate the error count for ea drawing. When the count is incriminated, an operation error occurs, conduct the survey of ②.

Table 12.7 Investigation of the Existence of an Operation Error

Name		Data Address	Remarks
DWG.A	Error count	SW00080	Indicates the number of times an error has occurred in DWG.A.
	Error code*	SW00081	Holds the same data as SW00111.
DWG.I	Error count	SW00082	Indicates the number of times an error has occurred in DWG.I.
	Error code*	SW00083	Holds the same data as SW00127.
DWG.H	Error count	SW00084	Indicates the number of times an error has occurred in DWG.H.
	Error code*	SW00085	Holds the same data as SW00143.
System reserved		SW00086	(Unused)
		SW00087	
DWG.L	Error count	SW00088	Indicates the number of times an error has occurred in DWG.L.
	Error code*	SW00089	Holds the same data as SW00175.

*: Refer to Table 12.9 concerning the error codes.

② Investigation of the Contents and Location of an Operation Error

Investigate the operation error status (see Table 12.8) of a DWG for which the error count has been incriminated.

■ **Investigation of the Error Contents**

Check the contents of the error from the error code.
If the error count (SW00084) is incremented, investigate the error code (SW00143). If the error code is 0001H, an underflow occurred inside DWG.H.

■ **Investigation of the DWG No.**

Check the No. of the drawing in which an error has occurred from the error DWG No.
The error occurred in the parent drawing if the error DWG No. (SW00056) data is FFFFH, in a child drawing if the data is □□00H, and in a function if the data is 8○○○H.

■ **If an Error Occurred inside a Function**

If an error occurred inside a function, check the drawing No. and the step No. referencing the function from the function referencing DWG type (SW00057), the function referencing DWG No. (SW00058), and the function referencing step No. (SW00059).

③ Correction and Check of the Program with Operation Error

After the cause of operation error has been clarified, correct the program using CP-717. After the correction of the program, reset the operation error count at the register list and confirm that the count is not incremented.

Lastly, perform the error reset operation at the System Configuration screen and confirm that the indicator lamps (LED) are in the online run mode condition.

Table 12.8 User Operation Error Status

Name	Offset Register No.	Remarks
Error count	00000	Error DWG No.
Error code	00001	Parent drawing : FFFFH
Error A register	00002	Child drawing : □□00H (□□H : child drawing No.)
	00003	Grandchild drawing : □□△△H (△△H : grandchild drawing No.)
Modification A register	00004	Function : 8○○○H (○○○H : system management No.)
	00005	
Error F register	00006	
	00007	
Modification F register	00008	
	00009	
Error IP	00010	Function referencing DWG No.
Error CS	00011	No. of the DWG that references the function in which an operation
Error DWG No.	00012	error occurred.
Function referencing DWG No.	00013	Function referencing DWG step No.
Function referencing DWG step No.	00014	Step No. of the DWG that references the function in which an operation
System reserved	00015	error occurred. This will be "0" if the error occurred inside the DWG.

(Note) : The head register No. in the above table will be as follows according to the type of DWG.
DWG.A : SW00110 (SW00110 to SW00125)
DWG.I : SW00126 (SW00126 to SW00141)
DWG.H : SW00142 (SW00142 to SW00157)
DWG.L : SW00174 (SW00174 to SW00189)

Table 12.9 Error Code Data and Error Contacts

	Error code	Error Contents	User*1	System default*2
Integer Operation	0001H	Integer operation - underflow	○	− 32768 [− 32768]
	0002H	Integer operation - overflow	○	32767 [32767]
	0003H	Integer operation - division error	○	[A register remains the same]
	0009H	Double length integer operation underflow	○	− 2147483648[− 2147483648]
	000AH	Double length integer operation overflow	○	2147483647[2147483647]
	000BH	Double length integer operation division error	○	[A register remains the same]
	010xH	Integer operation error within operation error processing drawing (x = 1 to B)	×	Default indicated above
Real Number Operation	0010H	Integer storage - non-numeric error	○	Storage unexecuted [00000]
	0011H	Integer storage - underflow	○	Storage unexecuted [− 32768]
	0012H	Integer storage - overflow	○	Storage unexecuted [+32767]
	0021H	Real number storage - underflow	○	Storage unexecuted [− 1.0E+38]
	0022H	Real number storage - overflow	○	Storage unexecuted [1.0E+38]
	0023H	Real number operation - division-by-zero error	○	Operation unexecuted [F register remains the sa
	0030H	Real number operation - invalid operation (non-numeric)	×	Operation unexecuted
	0031H	Real number operation - exponent underflow	×	0.0
	0032H	Real number operation - exponent overflow	×	Maximum value
	0033H	Real number operation - division error (non-numeric 0/0)	×	Operation unexecuted
	0034H	Real number storage - exponent underflow	×	Storage of 0.0
	0035H	Real number operation - stack error	×	Operation unexecuted
	0040H to 0059H	Real number operation error within standard system function	×	Interrupt operation & set output = 0.0
		0040H: SQRT; 0041H: SIN; 0042H: COS; 0043H: TAN; 0044H: ASIN; 0045H: ACOS; 0046H: ATAN; 0047H: EXP; 0048H: LN; 0049H: LOG; 004AH: DZA; 004BH: DZB; 004CH: LIM; 004DH: PI; 004EH: PD; 004FH: PID; 0050H: LAG; 0051H: LLAG; 0052H: FGN; 0053H: IFGN; 0054H: LAU; 0055H: SLAU; 0056H: REM; 0057H: RCHK; 0058H: BSRCH; 0059H: SORT		
		1000H or 2000H is added in the case of index error.		

*1 : ○ : A value other than the system default value can be set by the user program.

× : The system default value is fixed, the user cannot set a value other than the system default.

*2 : The numerical value in [ ] is the numerical value which the system sets in the modification A register as a default va prior to the execution of the user operation error drawing.

12.2.4 Actions to be Taken in Case of I/O Error

When an input error occurs, the error status is reported to the system (S) register as shown in T 12.10.

Table 12.10 System I/O Error Status

Name	Register No.	Remarks
I/O error count	SW00200	Number of times an I/O error has occurred
Input error count	SW00201	Number of times an input error has occurred
Input error address	SW00202	The newest input error address (register No. of IW□□□□)
Output error count	SW00203	Number of times an output error has occurred
Output error address	SW00204	The newest output error address (register No. of OW□□□□)
Number of bus errors	SW00205	Number of times system bus errors detected
System reserve	SW00206	(Unused)
	SW00207	
I/O error status	SW00208 to SW00211	Slot 2 error status
	SW00212 to SW00215	Slot 3 error status
	⋮	
	SW00420 to SW00423	Slot 55 error status

2.2.5 Actions to be Taken in Case of Transmission Error

When a transmission error occurs in the system I/O, the error status is reported to the system register as shown in Table 12.11. It is valid for 13 modules: CP-213IF, CP-215IF, CP-216IF, CP-225IF, CP-2500IF, 2000IOIF, 820IF, LIO-01, CNTR-01, AI-01, AO-01, DI-01, and DO-01.

Table 12.11 System I/O Error Status-2

Name	Register No.	Remarks
Slot 2 error status	SW00208 to SW00211	(Varies depending on installed modules.)
Slot 3 error status	SW00212 to SW00215	(Varies depending on installed modules.)
	:	
Slot 55 error status	SW00420 to SW00423	(Varies depending on installed modules.)

(1) CP-213 Station Error Status

(Example) For slot 2

	F		3	2	1	0	(Bit No.)
SW00208	ST#15	....	ST#3	ST#2	ST#1	ST#0	
SW00209	ST#31	....			ST#17	ST#16	
SW00210	ST#47	....			ST#33	ST#32	
SW00211	ST#63	....			ST#49	ST#48	

(2) CP-215 Station Error Status

(Example) For slot 2

	F		3	2	1	0	(Bit No.)
SW00208	ST#16	....	ST#4	ST#3	ST#2	ST#1	
SW00209	ST#32	....			ST#18	ST#17	
SW00210	ST#48	....			ST#34	ST#33	
SW00211	ST#64	....			ST#50	ST#49	

(3) CP-216 Station Error Status

(Example) For slot 2

	F	E	D		3	2	1	0	(Bit No.)
SW00208	ST#15	....			ST#3	ST#2	ST#1	Unused	
SW00209	Unused	ST#30	ST#29	....			ST#17	ST#16	
SW00210	Unused	....						Unused	
SW00211	Unused	....						Unused	

(4) CP-225 Station Error Status

	F		1	0 (Bit No.)
SW00208	Offset 240 to 255	....	Offset 16 to 31	Offset 0 to 15
SW00209	Offset 296 to 511	....		Offset 256 to 2
SW00210	Offset 740 to 755	....		Offset 512 to 5
SW00211	Offset 1008 to 1024	....		Offset 756 to 7

(5) CP-2500 Station Error Status

(Example) For slot 2

	F		3	2	1	0 (Bit No.)
SW00208	ST#15	....	ST#3	ST#2	ST#1	ST#0
SW00209	ST#31	....			ST#17	ST#16
SW00210	ST#47	....			ST#33	ST#32
SW00211	ST#63	....			ST#49	ST#48

(6) 2000IO I/O Error Status

(Example) For slot 2

	F		9	8		1	0 (Bit No.)	
SW00208	Unused	....	Unused	MD#9	———	MD#2	MD#1	Rack 1
SW00209	Unused	....	Unused	MD#9	....		MD#1	Rack 2
SW00210	Unused	....	Unused	MD#9	....		MD#1	Rack 3
SW00211	Unused	....	Unused	MD#9	....		MD#1	Rack 4

(7) CP-820 Station Error Status

	F	9 ······ 8	1	0	(Bit No.)
SW00208	Offset 240 to 255	······	Offset 16 to 31	Offset 0 to 15	
SW00209	Offset 296 to 511	······		Offset 256 to 271	
SW00210	Unused	······		Unused	
SW00211	Unused	······		Unused	

(8) LIO-01 Error Status
(Example) For slot 2

	F	9 ······ 8	1	0	(Bit No.)
SW00208	Unused	······	Unused	Error	Error flag
SW00209	Unused	······		Unused	
SW00210	Unused	······		Unused	
SW00211	Unused	······		Unused	

(9) CNTR-01 Error Status
(Example) For slot 2

	F	9 ······ 8	1	0	(Bit No.)
SW00208	Unused	······	Unused	Error	Error flag
SW00209	Unused	······		Unused	
SW00210	Unused	······		Unused	
SW00211	Unused	······		Unused	

(10) AI-01 Error Status
(Example) For slot 2

	F	9 ······ 8	1	0	(Bit No.)
SW00208	Unused	······	Unused	Error	Error flag
SW00209	Unused	······		Unused	
SW00210	Unused	······		Unused	
SW00211	Unused	······		Unused	

(11) AI-01 Error Status

(Example) For slot 2

	F	9 … 8 …	1	0 (Bit No.)	
SW00208	Unused	…………	Unused	Error	Error flag
SW00209	Unused	…………		Unused	
SW00210	Unused	…………		Unused	
SW00211	Unused	…………		Unused	

(12) DI-01 Error Status

(Example) For slot 2

	F	9 … 8 …	1	0 (Bit No.)	
SW00208	Unused	…………	Unused	Error	Error flag
SW00209	Unused	…………		Unused	
SW00210	Unused	…………		Unused	
SW00211	Unused	…………		Unused	

(13) DI-01 Error Status

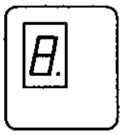
(Example) For slot 2

	F		8	7		1	0 (Bit No.)	
SW00208	Unused	…………	Unused	DO56 to DO_63	…………	DO_08 to DO_15	DO_00 to DO_07	Fuse blowou status (erro

	F		0
SW00209	Unused	…………	Unused
SW00210	Unused	…………	Unused
SW00211	Unused	…………	Unused

2.3 Actions to be Taken in Case of the CP-9200SH SVA Error

When the CP-9200SH SVA is online and operating normally, the status lamps display the Module No. (1 to b). If a warning or damage occurs, refer to Table 12.12.



STATUS1 (7SEG LED)

Indicating lamp name	Indicating color	State for lamp to be on
STATUS	Green	7 SEG LED Module No. / error indication (refer to Table 12.12)

Table 12.12 LED Display State

Display	Content	Remedy
8.	Hardware reset state	Indicates hardware reset state. Check the dip switch, if even that does not restore the former state, replace the main unit.
0.	Initialization	(1) This state is entered from one to six seconds after supplying power or resetting the machine. The unit is set by the absolute value encoder connection. If there is trouble in the absolute value encoder interface, this state will continue on a single axis for 30 seconds. (2) If an infinite loop is entered in PLC (CPU 1, 2) of drawing A, this state will persist. (3) This indicates that the main unit is not registered in the module definition. If you want to use this unit, first register it in the module definition, and then set the SV fixed parameters and Servo parameters for each axis. (4) If none of the above causes exists, replace the main unit. (5) If even that does not restore the former state, this may imply hardware malfunction such as a synchronization error during initialization between the PLC (CPU 1, 2) and unit. Replace other units and racks in order.
1	Module No.: No. 1	Indicates Module number (1 to 11). This display results when there is no damage or warning, and the machine is operating normally. Please note that this state also results when axis unused is selected.
2	Module No.: No. 2	
3	Module No.: No. 3	
4	Module No.: No. 4	
5	Module No.: No. 5	
6	Module No.: No. 6	
7	Module No.: No. 7	
8	Module No.: No. 8	
9	Module No.: No. 9	
A	Module No.: No. 10	
b	Module No.: No. 11	
C	System reserved	
d	System reserved	
E	System reserved	

Table 12.12 LED Display State (Continued)

Display	Content	Remedy
Error code following "F" or "F."	F : Serious failure (operation stop) F→0→1 : Watch dog time over F→0→2 : Synchronization error F→4→1 : ROM diagnostic error F→4→2 : RAM diagnostic error F→4→3 : Shared memory diagnostic error F→4→4 : CPU built in timer diagnostic error F→4→5 : Timer diagnostic error F→4→6 : NVRAM read out error F→4→7 : NVRAM write error F→4→8 : Occurrence of general illogical interrupt F→4→9 : Occurrence of slot illogical interrupt F→5→0 : Occurrence of CPU address error interrupt F→5→1 : Occurrence of DMA address error interrupt F→5→2 : Occurrence of user break interrupt F→5→3 : Occurrence of trap instruction interrupt	If hardware fault occur with the main unit, it should be replaced. (1) Overtime in the watchdog timer may indicate the possibility that the user program processing time exceeds the setting for the scan time. Inspect the user program and scan time settings. (2) A synchronization fault indicates problems in synchronizing between the CPU module and other SVA modules. Inspect the other modules. If there is no problem, replace the mounting base and modules in order.
J (Axis 1) L (Axis 2) n (Axis3) U (Axis4)	Warning (SVRDY "ON") (1) Deviation fault (2) Fault with the Servo parameter settings (3) A/D conversion fault Fault (SVRDY "OFF") (1) Fault with the fixed Servo parameter settings (2) I/F fault with the absolute value encoder	Depending on the content of [IW□□00 + axis ofs], check which of the categories on the left have a fault occurring. When there is a deviation problem, refer to the separate document "Detailed Explanation of Servo Parameters." A fault with the Servo parameter settings indicates data outside the range of Servo parameters has been set. Check the Servo parameter settings. An A/D conversion fault means a hardware fault with the main unit. Replace the main unit. A fault with the Servo fixed parameter settings indicates data outside the range of Servo fixed parameters has been set. Check the fixed Servo parameter settings, and set them again. If there is an I/F fault with the absolute value encoder, the absolute value encoder should be initialized.
P	Operation of other CPUs halted	This indicates that other modules have stopped operation. Inspect the other modules. For example, check whether the CPU module might have stopped.
Γ	Chat mode	This indicates chat mode. The dip switches should be checked.

12.4 Actions to be Taken in Case of the PO-01 Error

When the PO-01 module is operating correctly in online mode, the status lamp displays the module No. (I to y). When a warning or fault occurs, refer to Table 12.14.

8.

STAUS (7SEG LED)

Indicating lamp name	Indicating color	State for lamp to be on
STATUS	Green	7 SEG LED displays Module No. / Error indication (refer to Table 12.14)

Table 12.14 LED Display State

Display	Contents	Remedy
8.	Hardware reset status	Indicates the hardware reset status. Check the dip switches. If not restored, replace the PO-01 module
0	At initialization	(1) This status remains for 1 to 6 seconds after turning the power ON or reset. (2) This status continues when A drawing of CPU module (CPU1, 2) enters closed loop. (3) Displayed when the PO-01 module is not registered in the module configuration definition. To use the PO-01 module, register in the module configuration definition and set the motion parameter for each axis. (4) If not the above cases, replace the module. (5) If not restored after having replaced the module, a hardware failure such as interface fault between CPU module and the PO-01 module. Change the other modules and mounting base in order.
1	Module No.: No. 1	Indicates the module number (1 to 16). When no error/alarm occurs, LED display in this way. Note that this display appears also when the axis not to be used is selected.
2	Module No.: No. 2	
3	Module No.: No. 3	
4	Module No.: No. 4	
5	Module No.: No. 5	
6	Module No.: No. 6	
7	Module No.: No. 7	
8	Module No.: No. 8	
9	Module No.: No. 9	
A	Module No.: No. 10	
b	Module No.: No. 11	
C	Module No.: No. 12	
d	Module No.: No. 13	
E	Module No.: No. 14	
r	Module No.: No. 15	
y	Module No.: No. 16	

(continued)

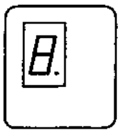
Table 12.15 LED Display State (Continued)

<table>
<tr><th>Display</th><th colspan="2">Contents</th><th>Remedy</th></tr>
<tr><td>Error code following "F" or "F."</td><td colspan="2">Serious failure (operation stops)
F→0→1 : Watchdog time over
F→0→2 : Synchronization error
F→4→1 : ROM diagnostic error
F→4→2 : RAM diagnostic error
F→4→3 : Common memory diagnostic error
F→4→4 : CPU built-in timer diagnostic error
F→4→5 : JL-035 diagnosis error
F→4→8 : General unjustified interruption
F→4→9 : Slot unjustified interruption
F→5→0 : CPU address error interruption
F→5→1 : DMA address error interruption
F→5→2 : User brake interruption
F→5→3 : Trap instruction interruption
F→5→4 : uPD71054 diagnosis error</td><td>A hardware failure of the PO-01 module. Replace the module.
(1) In case of a synchronization error, the user program processing time may exceed the scan time set value. Check the user program and the scan time setting.
(2) Synchronization error indicates a synchronization fault between the CPU module and the PO-01 module. Check the CPU module.
If the CPU module is not defective, replace the PO-01 module.</td></tr>
<tr><td>⌋</td><td>1st axis</td><td rowspan="4">Alarm (SVRDY "ON")
(1) Motion setting parameter setting error
(See IB□□001)
(2) Alarm occurrence
(See IL□□22)
(3) Motion command error end status
When IB□□115 is ON
(4) At emergency stop
When IB□□014 is ON

Error (SVRDY "OFF")
(1) Motion fixed parameter setting error
(See IB□□002)</td><td rowspan="4">Check for which item an error occurs.
Motion setting parameter setting error indicates that a data out of the range is set in the motion setting parameter. Check the set value of motion setting parameter.
Alarm occurrence indicates that an alarm occurs. As the cause of alarm is reported to each bit of IL□□22, investigate and eliminate the cause, then reset the alarm.
Motion command error end status occurs when the position control mode (OB□□002) is OFF or the magnetization ON (OB□□010) is OFF. Clear the motion command code (OW□□20) to 0.
At emergency stop, release the emergency stop signal (D104) and set the magnetization ON to OFF, then set the emergency stop/deceleration to stop signal release from ON to OFF.
Motion fixed parameter setting error indicates that a data outside of the range is set at the motion fixed parameter. Change the setting of the motion fixed parameter.</td></tr>
<tr><td>L</td><td>2nd axis</td></tr>
<tr><td>Π</td><td>3rd axis</td></tr>
<tr><td>⊔</td><td>4th axis</td></tr>
<tr><td>Π</td><td colspan="2">RMV (remove) error</td><td>(1) Hot swapping (module removal) is specified to be disabled in the module configuration definition, while the removal switch (BUS) is set to HALT.
Set the switch to ACT.
(2) Hot swapping (module removal) is specified to be enabled and the removal switch (BUS) is set to HALT, however, the magnetization ON (OB□□010) is ON. Set the magnetization ON to OFF.
(3) A hardware failure. (Replace the PO-01 module).</td></tr>
<tr><td>□</td><td colspan="2">Diagnosis mode (offline)</td><td>Indicates that the module is in diagnosis mode.
Replace the PO-01 module.</td></tr>
<tr><td>P</td><td colspan="2">CPU or other module operation stop</td><td>Indicates that other module is in stop status. Check other modules.
For example, CPU module may be in STOP status.</td></tr>
<tr><td>Γ</td><td colspan="2">Chattering mode</td><td>Indicates the conversational mode. Replace the PO-01 module.</td></tr>
</table>

2.5 Actions to be Taken in Case of the SVB Error

When the SVB module is operating correctly in online mode, the status lamp displays the module No. (| to ⊔). When a warning or fault occurs, refer to Table 12.16.



STAUS (7SEG LED)

Indicating lamp name	Indicating color	State for lamp to be ON
STATUS	Green	7 SEG LED displays Module No. / Error indication (refer to Table 12.16)

Table 12.16 LED Display State

Display	Contents	Remedy
—	Undefined	Indicates that the SVB module is not registered in the module configuration definition. Before using the module, register the module in the module configuration definition and specify the motion fixed parameter and the motion setting parameter of each axis.
⋅⋅8.	Hardware reset status	Indicates the hardware reset status. Check the dip switches. If not restored, replace the SVB module
0	At initialization	(1) This status remains for 1 to 6 seconds after turning the power ON or reset. (2) This status continues when A drawing of CPU module (CPU1, 2) enters closed loop. (3) Displayed when the SVB module is not registered in the module configuration definition. To use the SVB module, register in the module configuration definition and set the motion parameter for each axis. (4) If not the above cases, replace the module. (5) If not restored after having replaced the module, a hardware failure such as interface fault between CPU module and the SVB module. Change the other modules and mounting base in order.
1	Module No.: No. 1	Indicates the module number (1 to 16). When no error/alarm occurs, LED display in this way. Note that this display appears also when the axis not to be used is selected.
2	Module No.: No. 2	
3	Module No.: No. 3	
4	Module No.: No. 4	
5	Module No.: No. 5	
6	Module No.: No. 6	
7	Module No.: No. 7	
8	Module No.: No. 8	
9	Module No.: No. 9	
A	Module No.: No. 10	
b	Module No.: No. 11	
C	Module No.: No. 12	
d	Module No.: No. 13	
E	Module No.: No. 14	
F	Module No.: No. 15	
⊔	Module No.: No. 16	

(continued)

Table 12.16 LED Display State

(continued)

Display	Contents	Remedy
Error code following "F" or "F"	Serious failure (operation stops) F → 0 → 1 : Watchdog time over F → 4 → 1 : ROM diagnosis error F → 4 → 2 : RAM diagnosis error F → 4 → 3 : Common memory diagnosis error F → 4 → 8 : General unjustified interruption F → 4 → 9 : Slot unjustified interruption F → 5 → 0 : CPU address error interruption F → 5 → 2 : User brake interruption F → 5 → 3 : Trap instruction interruption F → 5 → 5 : Transmission section initialization error F → 5 → 8 : TLB exception interrupt F → 5 → 9 : TLB exception interrupt F → 6 → 0 : TLB invalid exception interrupt F → 6 → 1 : TLB invalid exception interrupt F → 6 → 2 : Initial page writing exception interrupt F → 6 → 3 : TLB protection exception interrupt F → 6 → 4 : TLB protection exception interrupt	A hardware failure of the SVB module. Replace the module. In case of a watchdog time over, the user program processing tim may exceed the scan time set value. Check the user program and the scan time setting.
E	—	—
H	Reference hold status	Indicates the holding status of the previous setting of the motio parameter when configuring a dual system or dual copying.
J	Alarm (SVRDY "ON") (1) Motion setting parameter setting error (See IB□□001) (2) Alarm occurrence (See IL□□22) (3) Motion command end with error status (When IB□□115 is ON) Error (SVRDY "OFF") (1) Motion fixed parameter setting error (See IB□□002)	Indicates that one of the alarms and errors described on the lef occurs on one of the axes from No. 1 to 14. Check for which item an error occurs. • Motion setting parameter setting error indicates that a data out of the range is set in the motion setting parameter. Check the set value of motion setting parameter. • Alarm occurrence indicates that an alarm occurs. As the cause of alarm is reported to each bit of IL□□22, investigate and eliminate the cause, then reset the alarm. • Motion command end with error status occurs when an alarm occurs during execution of motion command. Clear the motion command code (OW□□20) to 0. Motion command end with error status occurs, for example, when the position control mode (OB□□002) or the Servo ON (OB□□010) is turned OFF. • Motion fixed parameter setting error indicates that a data out of the range is set at the motion fixed parameter. Change the setting of the motion fixed parameter.
n	RMV (remove) error	(1) Hot swapping (module removal) is specified to be disabled in the module configuration definition, while the removal switch (BUS) is set to HALT. Set the switch to ACT. (2) Hot swapping (module removal) is specified to be enabled and the removal switch (BUS) is set to HALT, however, the magnetization ON (OB□□010) is ON. Set the magnetization ON to OFF. (3) A hardware failure. (Replace the SVB module).
P	CPU or other module operation stop	Indicates that other module is in stop status. Check other modules. For example, CPU module may be in STOP status.
U	—	—
r	Chat mode	Indicates the conversational mode. Replace the SVB module. Check the dip switches (internal switches). Or, a hardware failure.

13 MAINTENANCE AND INSPECTION

This chapter explains the maintenance and inspection methods.

For long-term use, regularly inspect the CP-9200SH as outlined in Table 13.1. Though inspection should be conducted once every 6 months to a year as standard, shorten the inspection interval accordin to the surrounding environment if necessary.

If an item falls outside the criteria range, make corrections to bring the item within the criteria range

Table 13.1 Inspections for CP-9200SH

No.	Item of Inspection	Inspection	Criteria	Tools Used
1	Supplied power	Measure the voltage at the power supply terminal board and confirm that the voltage variation is within the standard range.	For a PS-01 module: 85 VAC to 132 VAC, or 90 VDC to 140 VDC. For a PS-02 module: 170 VAC to 230 VAC For a PS-03 module : 19.2 VDC to 28.8 VDC	Tester
2	Surrounding environment	Is the ambient temperature (temperature within panel) appropriate?	0 to 55 ℃	Thermometer
		Is the ambient humidity (humidity within panel) appropriate?	5 to 95% RH (no condensation)	Hygrometer
		Has any dust accumulated?	There must be no dust.	Visual
3	I/O power supply	Measure the voltage at the I/O terminal board and confirm that the voltage variation is within the standard range.	Must be in conformance with the respective I/O specifications.	Tester
4	Mounting condition	Is the module fixed securely?	There must be no loosening.	Phillips screwdrive
		Is the connector of the connection cable inserted completely?	There must be no loosening.	―――
		Are any of the screws for external wiring loose?	There must be no loosening.	Phillips screwdrive
		Is the external wiring cable damaged?	There must be no external damage.	Visual
5	Indicator lamps	Are the indicator lamps operating properly?	Must be in the condition shown in Table 13.2.	―――

Table 13.2 LED Indication during Normal Operation

9200SH CPU module

Name	Indicating Lamp(LED) Conditions
RMV	○ [unlit]
RDY	● [lit]
RUN	● [lit]
ALM	○ [unlit]
ERR	○ [unlit]
BAT ALM	○ [unlit]
BUS ACCESS	● [lit]

PS-01 /PS-02 /PS-03 module

Name	Indicating Lamp (LED) Conditions
POWER	● [lit]

Optional module

Name	Indicating Lamp (LED) Condi
RMV	○ [unlit]
RUN	● [lit]
ERR	○ [unlit]
TX	● [lit/ flashing]
RX	● [lit/ flashing]
FUSE	○ [unlit]
MST	Only one is lit.
RMT	
B.UP	
TRX	● [lit/ flashing]

■ Replacement of the Battery

When the battery voltage is low, BAT ALM is lit. Replace the battery. If the power remains O for 1 hour or more with BAY ALM lit, the data in the memory will be erased. Replace the batt while the power is ON. (Battery : lithium battery ER6VC [Toshiba Corp.])

If the battery is to be purchased from Yaskawa, please use Electrical Item Code No. BA000024

■ Precautions upon Handling

- Replace the module after turning off the power.
- After finding and replacing a faulty module, reconfirm that there are no faults with the replac module.
- When a defective module is returned for repairs, include with the product a written reco giving as much detail as possible of the malfunction condition and return it to your YASKAV representative listed at the end of this manual.
- In the case of a connection fault, wipe the area in question with a pure cotton cloth soaked industrial grade alcohol. Reinstall the module after removing the lint.
- For replacing a module, save user programs to a floppy disk, hard disk, or magnetic optical di

APPENDIX

Appendix includes the following:

A Data Memory Assignment List

1 Data Memory Assignment

Register No.	Register Area	Referencing of Data
SW00000 to SW01023	System register 1024 words	SBnnnnn□ SWnnnnn SLnnnnn SFnnnnn (□=0 to F, nnnnn : decimal)
IW0000 to IW13FF	Input register 5120 words	IBhhhh□ IWhhhh ILhhhh IFhhhh (□=0 to F, hhhh : hexadecimal)
OW0000 to OW13FF	Output register 5120 words	OBhhhh□ OWhhhh OLhhhh OFhhhh (□=0 to F, hhhh : hexadecimal)
MW00000 to MW32767	Common DWG register 32768 words	MBnnnnn□ MWnnnnn MLnnnnn MFnnnnn (□=0 to F, nnnnn : decimal)
CW00000 to CW16383	Constant registers common for DWGs 16384 words	CBnnnnn□ CWnnnnn CLnnnnn CFnnnnn (□=0 to F, nnnnn : decimal)
DW00000 to DW16383	Individual DWG register 16384 words	DBnnnnn□ DWnnnnn DLnnnnn DFnnnnn (□=0 to F, nnnnn : decimal)
#W00000 to #W16383	Individual DWG constant register 16384 words	#Bnnnnn□ #Wnnnnn #Lnnnnn #Fnnnnn (□=0 to F, nnnnn : decimal)

1.1 Assignment of the Input (I) Registers

Name	Register No.	Remarks
Optional module input	IW0000 to IW13FF	Optional modules can be assigned one by one as you like.

1.2 Assignment of the output (O) Registers

Name	Register No.	Remarks
Optional module output	OW0000 to OW13FF	Optional modules can be assigned one by one as you like.

2 System (S) Register Assignment

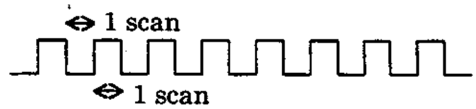
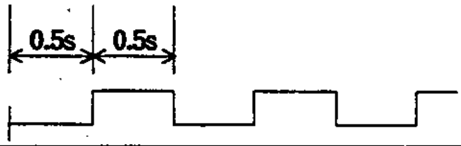
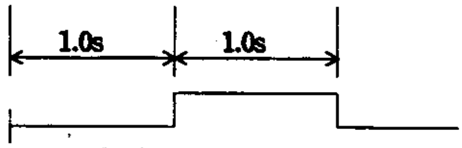
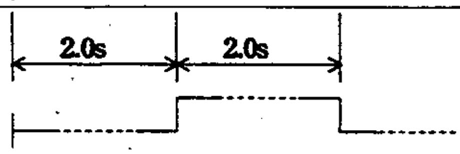
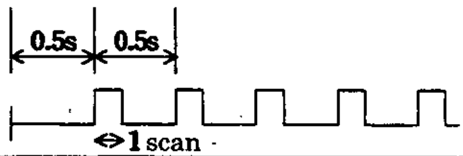
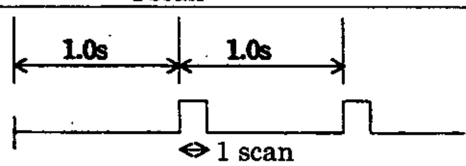
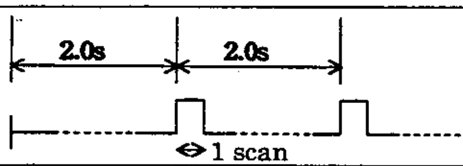
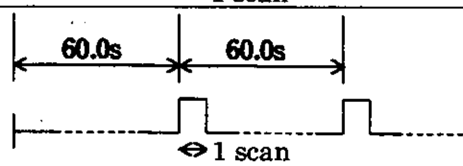
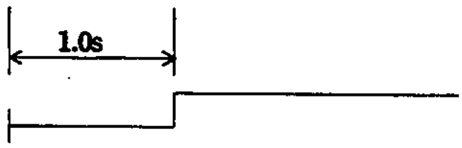
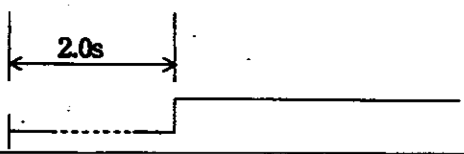
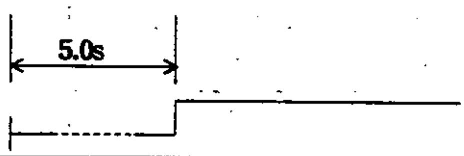
Start Register	Area
SW00000	System・Service Register
SW00030	System Status
SW00050	System Error Status
SW00080	User Operation Error Status
SW00090	System Service Execution Status
SW00100	Interruption Input Error Status
SW00110	User Operation Error Status (details)
SW00200	System I/O Error Status
SW00424	System Reserved
SW00500	Status for System Analysis
SW00530	System Reserved
SW00600	System Operation Error Status
SW00620	System Reserved
SW00698	Interruption status
SW00800	System Reserved
SW01023	

2.1 System Service Registers

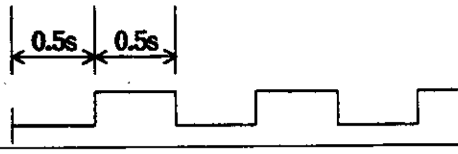
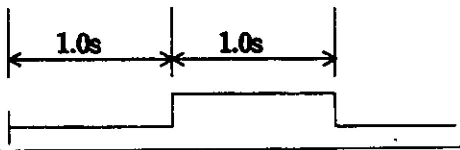
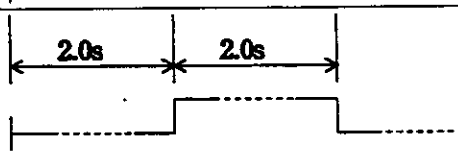
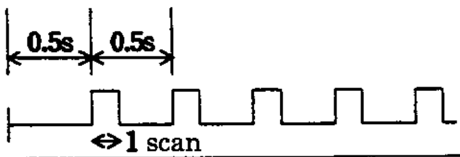
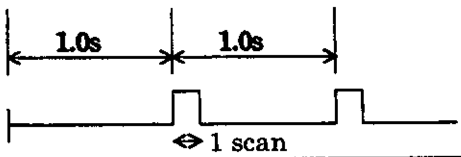
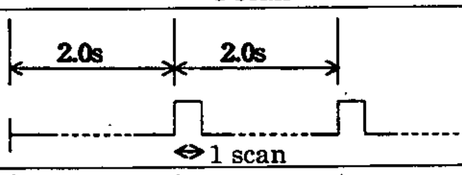
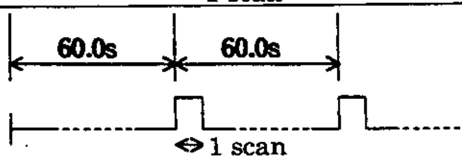
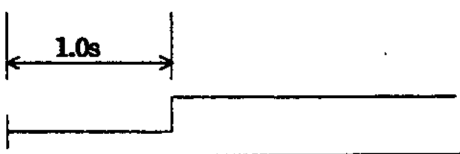
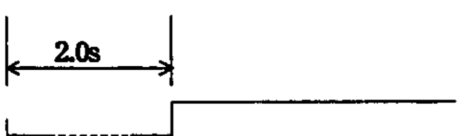
2.1.1 Registers for Common Use by All DWGs

Name	Register No.	Remarks
First scan (high-speed)	SB000001	ON for only the first scan after start of high-speed scan.
First scan (low-speed)	SB000003	ON for only the first scan after start of low-speed scan.
Always ON	SB000004	

2.1.2 Registers for Use by only DWG.H

Name	Register No.	Remarks
1-scan flicker relay	SB000010	
0.5s flicker relay	SB000011	
1.0s flicker relay	SB000012	
2.0s flicker relay	SB000013	
0.5s sampling relay	SB000014	
1.0s sampling relay	SB000015	
2.0s sampling relay	SB000016	
60.0s sampling relay	SB000017	
1.0s-after-start-of-scan process relay	SB000018	
2.0s-after-start-of-scan process relay	SB000019	
5.0s-after-start-of-scan process relay	SB00001A	

.1.3 Registers for Use by only DWG.L

Name	Register No.	Remarks
1-scan flicker relay	SB000030	
0.5s flicker relay	SB000031	
1.0s flicker relay	SB000032	
2.0s flicker relay	SB000033	
0.5s sampling relay	SB000034	
1.0s sampling relay	SB000035	
2.0s sampling relay	SB000036	
60.0s sampling relay	SB000037	
1.0s-after-start-of-scan-process relay	SB000038	
2.0s-after-start-of-scan-process relay	SB000039	
5.0s-after-start-of-scan-process relay	SB00003A	

2.2 Scan Execution Status and Calendar

Name	Register No.	Remarks
High-speed scan set value	SW00004	High-speed scan set value (0.1ms)
High-speed scan current value	SW00005	High-speed scan current value (0.1ms)
High-speed scan maximum value	SW00006	High-speed scan maximum value (0.1ms)
System reserved	SW00007 to SW00009	(Unused)
Low-speed scan set value	SW00010	Low-speed scan set value (0.1ms)
Low-speed scan current value	SW00011	Low-speed scan current value (0.1ms)
Low-speed scan maximum value	SW00012	Low-speed scan maximum value (0.1ms)
Operation error processing	SW00013	0 = Execution continues 1 = System down (Available only for version 87317-3□□□□-S0305 and later) Note: SW0013 is cleared at turning the power ON
Execution Scan current value	SW00014	Current value of the scan being executed (0.1ms)
Calendar : year	SW00015	1999 AD : 0099 (BCD) (lower 2 digits only)
Calendar : month/day	SW00016	Dec. 31 :1231 (BCD)
Calendar : hour/minute	SW00017	23 hours 59 minutes: 2359 (BCD)
Calendar : seconds	SW00018	59 seconds : 59 (BCD)
Calendar : week	SW00019	0 to 6 : Sun., Mon. to Sat.

2.3 System Program Software No. & Remaining Program Memory Capacity

Name	Register No.	Remarks
System program software No.	SW00020	S□□□□ (□□□□ is stored as a BCD value)
System reserved	SW00021 to SW00025	(Unused)
Remaining program memory capacity	SL00026	In byte units
Total amount of module memory	SL00028	In byte units

2.4 System Status

Name	Register No.	Remarks
System reserved	SW00030 to SW00039	(Unused)
CPU status	SW00040	Status report
CPU error status	SW00041	Error information
RTC count	SW00042	Incremented by 1 on every RTC interruption.
GND count	SW00043	Number of times the online ground self-diagnosis has been executed
System reserved	SW00044 to SW00046	(Unused)
Software switch selection status	SW00047	Report on the software switch selection
Hardware status	SW00048	Hardware switch report and hardware status
Hot swapping interlock	SW00049	Hot swapping interlock with an application program.

<CPU Status Configuration>

Name	Register No.	Remarks
READY	SB000400	1 = normal 0 = chat/self-diagnosis error
RUN	SB000401	1 = running (RUN) 0 = stop (STOP)
ALARM	SB000402	1 = alarm 0 = normal
ERROR	SB000403	1 = error 0 = normal
RESUME	SB000404	1 = continued start-up operation 0 = new start-up operation
START STATUS	SB000405	1 = restoration from momentary interruption 0 = ordinary restoration
SYSTEM RESERVED	SB000406	(Unused)
WEN	SB000407	1 = write enabled 0 = write disabled
SYSTEM RESERVED	SB000408	(Unused)
MASTER	SB000409	1=Control CPU 0=Stand by CPU
PREPARE FOR HOT SWAPPING	SB00040A	1=being prepared 0=normal operation
SYSTEM RESERVED	SB00040B to SB00040D	(Unused)
OPERATION STOP REQUEST	SB00040E	1 = STOP selection from CP-717 0 = RUN selection from CP-717
SYSTEM RESERVED	SB00040F	(Unused)

<CPU Error Status Configuration>

Name	Register No.	Remarks
Serious failure	SB000410	1 = serious failure (Ex. watchdog time over or execution of undefine instruction. See SW00050 for details.)
Program memory error	SB000411	1 = program memory error
Calender IC error	SB000412	1 = calender IC error
System reserved	SB000413	(Unused)
	SB000414	
Coprocessor real number operation error	SB000415	1 = coprocessor real number operation error
System reserved	SB000416	(Unused)
	SB000417	
User operation error	SB000418	1 = user operation error
I/O error	SB000419	1 = I/O error
Illogical interruption	SB00041A	1 = illogical interruption
Transmission error	SB00041B	1 = CP-213, CP-215, CP-216 transmission error, etc.
System reserved	SB00041C to SB00041F	(Unused)

<Software Switch Selection Status Configuration>

Name	Register No.	Remarks
Start-up mode in case of momentary interruption	SB000470	0 = new start-up 1 = continued start-up
System reserved	SB000471	(Unused)
	SB000472	
Program write selection	SB000473	0 = write enabled 1 = write disabled
Start-up mode in case of ordinary power interruption	SB000474	0 = new start-up 1 = continued start-up
Hot swapping program interlock	SB000475	0 = valid 1 = invalid
System reserved	SB000476 to SB00047F	(Unused)

<Hardware Status Configuration>

Name	Register No.	Remarks
RUN	SB000480	DIP switch report 0 : ON 1 : OFF
INIT	SB000481	
TEST	SB000482	
—	SB000483	
MULTI	SB000484	
FLASH	SB000485	
BUS	SB000 486	0 = HALT, 1 = ACT
Battery alarm	SB000487	1 = battery alarm

<Hot Swapping Interlock>

Name	Register No.	Remarks
Inter lock signal *	SB000490	0 = Unready 1 = Ready
System reserved	SB000491 to SB00049F	(Unused)

*: Set with an application program when the hot swapping interlock is valid (SB000475=1).

2.5 System Error Status

Name	Register No.	Remarks
Error type	SW00050	Error type 0001H : watchdog time over 0002H : bus time over 0006H : execution of a breakpoint interrupt 0007H : BOUND error (boundary check error) 0008H : execution of an undefined instruction 000CH : double fault 000DH : illogical TSS 000EH : segment does not exist 000FH : stack error 0010H : general protection error 0011H : page fault 0012H : data alignment error 0041H : ROM diagnosis error 0042H : RAM diagnosis error 0043H : CPU diagnosis error 0044H : FPU diagnosis error 0051H : multi-CPU coordinated stop *1 0081H : integer operation error (overflow/underflow) *2 0083H : integer operation error (division by 0) *2 0084H : real-number operation error (FPU segment does not exist) *2 0085H : real-number operation error (overflow/underflow/division by 0) *2 0088H : index error *2
Error code	SW00051	For system error analysis
Error IP	SW00052	For system error analysis
Error CS	SW00053	For system error analysis
Error task	SW00054	0000H : System 0003H : DWG.H 0001H : DWG.A 0005H : DWG.L 0002H : DWG.I
Program type	SW00055	0000H : System 0003H : DWG.H 0001H : DWG.A 0005H : DWG.L 0002H : DWG.I 0008H : function
Error DWG No.	SW00056	Parent drawing : FFFFH Child drawing : □□00H (□□H : child drawing No.) Grandchild drawing : □□△△H (△△H : grandchild drawing No.) Function : 8○○○H (○○○H : system management No.)
Function referencing DWG type	SW00057	Type of the DWG that references the function in which an error occurred. 0001H : DWG.A 0003H : DWG.H 0002H : DWG.I 0005H : DWG.L 0008H : function
Function referencing DWG step No.	SW00058	No. of the DWG that references the function in which an error occurred. Parent drawing : FFFFH Child drawing : □□00H (□□H : child drawing No.) Grandchild drawing : □□△△H (△△H : grandchild drawing No.) Function : 01○○H (○○H : system management No.)
Function reference DWG step No.	SW00059	Step No. of the DWG that references the function in which an error occurred. This will be "0" if the error occurred inside the DWG.

(continued)

(continued)

Name	Register No.	Remarks
Error data	SW00060	For system error analysis (ES)
	SW00061	For system error analysis (DS)
	SW00062	For system error analysis (DI)
	SW00063	For system error analysis (SI)
	SW00064	For system error analysis (BP)
	SW00065	For system error analysis (SP)
	SW00066	For system error analysis (BX)
	SW00067	For system error analysis (DX)
	SW00068	For system error analysis (CX)
	SW00069	For system error analysis (AX)
	SW00070 to SW00079	System reserved

*1: Only for multi-CPU configuration
*2: Only for 87317-3-3□□□□-C0305 and later

.6 User Operation Error Status

<User Operation Error Status - 1>

Name		Register No.	Remarks
DWG.A	Error count	SW00080	
	Error code	SW00081	
DWG.I	Error count	SW00082	Operation error code : See User Operation Error Status - 3.
	Error code	SW00083	
DWG.H	Error count	SW00084	Error code in case of index error : See User Operation Error Status - 4.
	Error code	SW00085	
System reserved		SW00086	
		SW00087	
DWG.L	Error count	SW00088	
	Error code	SW00089	

<User Operation Error Status - 2>

Name	Register No.				Remarks
	DWG.A	DWG.I	DWG.H	DWG.L	
Error count	SW00110	SW00126	SW00142	SW00174	Error DWG No.
Error code	SW00111	SW00127	SW00143	SW00175	Parent drawing : FFFFH
Error A register	SW00112	SW00128	SW00144	SW00176	Child drawing : □□00H
	SW00113	SW00129	SW00145	SW00177	(□□H : child drawing No.)
Modification A register	SW00114	SW00130	SW00146	SW00178	Grandchild drawing : □□△△H
	SW00115	SW00131	SW00147	SW00179	(△△H : grandchild drawing No.)
Error F register	SW00116	SW00132	SW00148	SW00180	Function :8○○○H
	SW00117	SW00133	SW00149	SW00181	(○○○H: system management No.)
Modification F register	SW00118	SW00134	SW00150	SW00182	Function referencing DWG No.
	SW00119	SW00135	SW00151	SW00183	No. of the DWG that references
Error IP	SW00120	SW00136	SW00152	SW00184	the function in which an operation
Error CS	SW00121	SW00137	SW00153	SW00185	error occurred.
Error DWG No.	SW00122	SW00138	SW00154	SW00186	Function referencing DWG step No.
Function referencing DWG No.	SW00123	SW00139	SW00155	SW00187	Step No. of the DWG that references the function in which
Function referencing DWG step No.	SW00124	SW00140	SW00156	SW00188	an operation error occurred. This will be "0" if the error occurred
System reserved	SW00125	SW00141	SW00157	SW00189	inside the DWG.

<User Operation Error Status - 3>

	Error code	Error Contents	User*1	System default*2
Integer Operation	0001H	Integer operation - underflow	○	− 32768 [− 32768]
	0002H	Integer operation - overflow	○	32767 [32767]
	0003H	Integer operation - division error	○	[A register remains the same]
	0009H	Double-length integer operation - underflow	○	− 2147483648 [− 2147483648]
	000AH	Double-length integer operation - overflow	○	2147483647 [2147483647]
	000BH	Double-length integer operation - division error	○	[A register remains the same]
	010□H	Integer operation error within operation error processing drawing (□ = 1 to B)	×	Default indicated above
Real Number Operation	0010H	Integer storage - non-numeric error	○	Storage unexecuted [00000]
	0011H	Integer storage - underflow	○	Storage unexecuted [− 32768]
	0012H	Integer storage - overflow	○	Storage unexecuted [+32767]
	0021H	Real number storage - underflow	○	Storage unexecuted [− 1.0E+38]
	0022H	Real number storage - overflow	○	Storage unexecuted [1.0E+38]
	0023H	Real number operation - division-by-zero error	○	Operation unexecuted [F register remains the sa
	0030H	Real number operation - invalid operation (non-numeric)	×	Operation unexecuted
	0031H	Real number operation - exponent underflow	×	0.0
	0032H	Real number operation - exponent overflow	×	Maximum value
	0033H	Real number operation - division error (non-numeric 0/0)	×	Operation unexecuted
	0034H	Real number storage - exponent underflow	×	Storage of 0.0
	0040H to 0059H	Real number operation error within standard system function	×	Interrupt operation & set output = 0.0
		0040H : SQRT, 0041H : SIN, 0042H : COS, 0043H : TAN		
		0044H : ASIN, 0045H : ACOS, 0046H : ATAN, 0047H : EXP		
		0048H : LN, 0049H : LOG, 004AH : DZA, 004BH : DZB		
		004CH : LIM, 004DH : PI, 004EH : PD, 004FH : PID		
		0050H : LAG, 0051H : LLAG, 0052H : FGN, 0053H : IFGN		
		0054H : LAU, 0055H : SLAU, 0056H : REM, 0057H : RCHK		
		0058H : BSRCH, 0059H : SORT		
		1000H or 2000H is added in the case of index error.		

*1 : ○ : A value other than the system default value can be set by the user program.
× : The system default value is fixed; the user cannot set a value other than the system default.

*2 : The numerical value in [ ] is the numerical value that the system sets in the modification A register as a default value p
to the execution of the user operation error drawing.

<User Operation Error Status - 4>

	Error code	Error Contents	User*1	System default
Integer · Real Operation	1000H	Index error within DWG	×	Re-executed with i, j = 0.
	2000H	Index error within function	×	Re-executed with i, j = 0.
Integer Operation	x060H to x077H (x=1, 2)	Index error within integer type system function	×	Stop operation & set output = input. [A register remains the same.]
		□06DH : PI, □06EH : PD, □06FH : PID, □070H : LAG		
		□071H : LLAG, □072H : FGN*2, □073H : IFGN*2, □074H : LAU		
		□075H : SLAU, □076H : FGN*3, □077H : IFGN*3		

*1 : ○: A value other than the system default value can be set by the user program.
× : The system default value is fixed; the user cannot set a value other than the system default.

*2 : Integer form

*3 : Double length integer form

.7 System Service Execution Status

Name	Register No.	Remarks
System error count	SW00090	
System error code	SW00091	
Failure occurrence count	SW00092	
Failure restoration count	SW00093	
System reserved	SW00094 to SW00097	(Unused)
Existence of data trace definition	SW00098	Bit 0 to 3 = group 1 to 4 Definition exists = 1, no definition = 0
Data trace execution status	SW00099	Bit 0 to 3 = group 1 to 4 Trace in execution = 0, trace stopped = 1

<Latest data trace record number>

Name	Register No.	Remarks
Data trace group 1	SW00100	Latest record No.
Data trace group 2	SW00101	Latest record No.
Data trace group 3	SW00102	Latest record No.
Data trace group 4	SW00103	Latest record No.

.8 Interruption Input Status

Name	Register No.	Remarks
I/O error count	SW00200	Number of I/O errors
Input error count	SW00201	Number of input errors
Input error address	SW00202	Latest input error address (For future use) (register No. of IW□□□□)
Output error count	SW00203	No. of output error.
Output error address	SW00204	Latest input error address (For future use) (register No. of OW□□□□)
Number of bus errors	SW00205	Number of times system bus errors detected
System reserved	SW00206	(Unused)
	SW00207	
I/O error status	SW00208 to SW00211	Slot 2 error status
	SW00212 to SW00215	Slot 3 error status
	:	
	SW00420 to SW00423	Slot 55 error status

2.9 System Operation Error Status

<System Operation Error Status-1>

Name	Register No.	Remarks
Error count	SW00600	Reported when an operation error occurs in the system program.
Error code	SW00601	
Error A register	SW00602	
	SW00603	
Modification A register	SW00604	
	SW00605	
Error F register	SW00606	
	SW00607	
Modification F register	SW00608	
	SW00609	
Error IP	SW00610	
Error CS	SW00611	
Error DWG No.	SW00612	
Function referencing DWG No.	SW00613	
Function referencing DWG step No.	SW00614	
System reserved	SW00615 to SW00619	(Unused)

<System Operation Error Status - 2>

	Error code	Error Contents	System default
Integer Operation	0001H	Integer operation - underflow	− 32768
	0002H	Integer operation - overflow	+32767
	0003H	Integer operation - division error	0

2.10 Interruption Status

Name	Register No.	Remarks
Interruption detection count	SW00698	
Module where interruption occurs	SW00699	Number of interruption modules per time
Interruption module	SW00700	Interruption module 1
	SW00701	
	SW00702	Interruption module 2
	SW00703	
	⋮	
	SW00798	Interruption module 3
	SW00799	

<Details of interruption module>

	15 … 8	7 … 0	
SW□□□□	Module *1	Slot *2	mmssH
SW□□□□ + 1	Status *3		□□□□ H

*1:Module

mm = 01H: System reserved

mm = 02H: LIO-01 module

*2: Slot

ss = 02H (2) to 37H (55) The number in ( ) is decimal expression.

The slot where the interruption module is installed

(A serial number starting with 0)

*3:Interruption factor

When mm = 01H (system reserved): Always 0000H

When mm = 02H (LIO-01 module):

	15 … 4	3	2	1	0
SW□□□□□ + 1					

- Bit 0: Interruption input 1 (ch1 bit0)
- Bit 1: Interruption input 2 (ch1 bit1)
- Bit 2: Interruption input 3 (ch2 bit0)
- Bit 3: Interruption input 4 (ch2 bit1)

(1 = With interruption input
0 = Without interruption input)

B Lists of Instruction Execution Times and Number of Instruction Bytes

1 Instruction Execution Times

1.1 Instructions (Bit Type) Affected by the Numeral Type

■ Bit type-1

Unit:

Instruction	Register No. or Relay No.	Constant	Subscript Register (I, J)	Register with Subscript	Remarks
⊣⊢, ⊣/⊢	0.11	—	—	0.23	
─┘┌─, ─┐└─	0.23 to 0.34	—	—	0.48 to 0.57	
⊣' ⊢, ⊣ '⊢	0.57	0.56	—	0.57	
⊣' ⊢, ⊣ '⊢	0.57	—	—	0.57	
─○─┤	0.23 to 0.34	—	—	0.48 to 0.57	
⊣S⊢, ⊣R⊢	0.45	—	—	2.95	

■ Bit type-2

Unit

Instruction	Execution Time	Remarks
ROTL, ROTR SHFTL, SHFTR	For 1 word or less: α + 1.41 × COUNT For 2 words or more α + { β +0.22 × (WD − 2)} × COUNT	Where α =3.25 β =2.35 COUNT = number of rotations WD = number of words
MOVB	If number of bits = 0 : 2.69 If number of bits ≧ 1 : α + (BIT − 1) × β	Where α =5.42 β =1.11 BIT = number of bits transferred

1.2 Instructions (Integer Type) Affected by the Numerical Type

■ Integer type -1

Unit

Instruction	Register No. or Relay No.	Constant	Subscript Register (I, J)	Register with Subscript	Remarks
AND, OR, XOR	0.22	0.22	0.22	0.22	
⊢	0.11	0.11	0.11	0.11	
⇒	0.22	—	0.34	0.34	
+, −	0.32	0.27	0.32	0.32	
++,--	0.22	0.22	0.22	0.22	
×	0.32	0.30	0.34	0.34	
÷	0.67	0.64	0.66	0.66	
INC,DEC	0.22	—	0.34	0.34	
<, ≦ ,= , ≠ >, ≧	0.22	0.22	0.22	0.22	
RCHK	1.60	1.60	1.60	1.60	

Integer type -2

Unit: μs

Instruction	Execution Time	Remarks
MOD	0.04	Logic value
TMADD	10.75	
TMSUB	10.75	
SPEND	22.85	
INV	0.08 to 0.11	Logic value
COM	0.03	Logic value
ABS	0.11 to 0.17	Logic value
BIN	2.16	
BCD	1.93	
PARITY	4.48	
ASCII	4.03 to 13.40	
ASCBIN	4.03	
BINASC	4.03	
MOVW	If number of words transferred = 0 : 2.30 If number of words transferred ≧ 1 : $\alpha + 0.18 \times (WD - 1)$	Where : α =3.92 WD = Number of words transferred
XCHG	If number of words transferred = 0 : 2.30 If number of words transferred ≧ 1 : $\alpha + 0.60 \times (WD - 1)$	Where : α =4.64 WD = Number of words transferred
SETW	If number of words transferred = 0 : 1.76 If number of words transferred ≧ 1 : $\alpha + 0.14 \times (WD - 1)$	Where : α =2.88 WD = Number of words transferred
BEXTD	If number of bytes = 0 : 3.58 If number of bytes ≧ 1 : $\alpha + 0.16 \times (BT - 1)$	Where : α = 4.48 BT = Number of bytes
BPRESS	If number of bytes = 0 : 3.58 If number of bytes ≧ 1 : $\alpha + 0.20 \times (BT - 1)$	Where : α = 5.38 BT = Number of bytes
BSRCH	If number of words searched = 0 : 4.48 If number of words searched ≧ 1 : $\alpha + 0.62 \times \log_2 (WD - 1)$	Where : α = 5.25 WD = Number of words searched
SORT	If number of words transferred = 0 : 3.14 If number of words transferred ≧ 1 : $\alpha + 1.08 \times (WD - 1)$	Where : α = 3.58 WD = Number of words transferred
COPYW	If number of words transferred = 0 : 3.58 If number of words transferred ≧ 1 : $\alpha + 0.18 \times (WD - 1)$	Where : α = 4.48 WD = Number of words transferred
BSWAP	4.48 to 13.44	
DZA	1.46	
DZB	1.51	
LIMIT	1.61	
PI	4.39	
PD	5.32	
PID	5.85	
LAG	3.97	
LLAG	4.38	
FGN	$3.80 + 0.32 \times (\log_2 N)$	Integer type case (N = Number of data)
IFGN	$4.30 + 0.36 \times (\log_2 N)$	Double-length integer type case (N = Number of data)
IFGN	4.48	
LAU	3.25	
SLAU	3.76	
PWM	6.15	

(continued)

(continued)

Unit:

Instruction	Execution Time	Remarks
TBLBR	50.18 + 0.17 × (WD − 1)	WD = Number of words transferred
TBLBW	51.52 + 0.17 × (WD − 1)	—
TBLSRL, TBLSRC	49.73 + 0.88 × (WD − 1) or less	—
TBLCL	55.10 + 0.24 × (WD − 1)	—
TBLMV	72.25 + 0.18 × (WD − 1)	—
QTBLR, QTBLRI	50.18 + 0.17 × (WD − 1)	—
QTBLW, QTBLWI	51.52 + 0.17 × (WD − 1)	—
QTBLCL	55.10 + 0.24 × (WD − 1)	—

1.3 Instructions (Real Number Type) Affected by the Numeral Type

■ Real number type - 1

Unit:

Instruction	Register No. or relay No.	Constant	Subscript Register (I, J)	Register with Subscript	Remarks
‖⊢	0.13	0.13	0.13	0.19	
	0.11	0.11	—	0.13	
⇒	0.43	—	0.55	0.58	
	0.22	—	—	0.46	
+, −	0.32	0.27	0.32	0.38 to 0.41	
	0.34	0.34	—	0.35	
×	0.27	0.28	0.30	0.35	
	0.34	0.34	—	0.35	
÷	1.12	1.10	1.12	1.14	
	1.09	1.14	—	1.09	
<, ≦, =, ≠	0.36	0.30 to 0.32	0.32 to 0.34	0.32 to 0.34	
>, ≧	0.43 to 0.45	0.43 to 0.45	—	0.45	
RCHK	2.30	2.30	2.30	2.30	

(Note) In each instruction, the value on the top row indicates cases where the operand is an integer value, and the value the bottom row indicates the cases where the operand is a real number.

■ Real number type - 2

Unit: μs

Instruction	Execution Time	Remarks
REM	2.32	
INV	0.17	Logic value
ABS	0.08	Logic value
BSRCH	If number of words searched = 0 : 3.58 If number of words searched $\geqq 1 : \alpha + 0.85 \times \mathrm{Log}_2$ (WD) or less	Where : α = 4.48 WD = Number of words searched
SORT	If number of words in range = 0 : 3.58 If number of words in range $\geqq 1 : \alpha + 2.59 \times (\mathrm{WD} - 1)$	Where : α = 4.48 WD = Number of words in range
SQRT	2.64	
SIN	3.21	
COS	2.89	
TAN	3.56	
ASIN	1.55	
ACOS	2.46	
ATAN	2.30	
EXP	3.44	
LN	6.93	
LOG	6.93	
DZA	1.86	
DZB	2.02	
LIMIT	2.30	
PI	6.10	
PD	7.12	
PID	9.52	
LAG	5.07	
LLAG	5.73	
FGN, IFGN	$5.47 + 0.56 \times (\mathrm{Log}_2 N)$	N = Number of data
LAU	2.95	
SLAU	3.33	

1.4 Instructions Unaffected by the Numeral Type

Unit:

<table>
<tr><th>Instruction</th><th>Execution Time</th><th>Remarks</th></tr>
<tr><td>SEE to DEND</td><td>1.09</td><td></td></tr>
<tr><td>FOR to FEND</td><td>(1) 0.46 α
(1) 0.57 α
(1) 0.57 α</td><td>Where α is the number of loops;
1) Integer type register No.
2) With subscript
3) Subscript</td></tr>
<tr><td>WHILE
to ON/OFF
to WEND</td><td>In the case of 0 loop :
0.45
In the case of α loops :
0.45 + 0.228 α</td><td>Where α is the number of loops.</td></tr>
<tr><td>IFON/IFOFF
to IEND</td><td>0.45</td><td></td></tr>
<tr><td>IFON/IFOFF
to ELSE to IEND</td><td>0.67</td><td></td></tr>
<tr><td>INS</td><td>LIO-01
15.23 + 0.90 × WD
2000IO
50.56 + 29.18 × WD</td><td>WD = Number of words input</td></tr>
<tr><td>OUTS</td><td>LIO-01
16.13 + 0.90 × WD
2000IO
44.92 + 28.92 × WD</td><td></td></tr>
<tr><td>XCALL</td><td>0.28</td><td></td></tr>
<tr><td>FSTART to DEND</td><td>2.37</td><td>The following value is added when there is an I/
parameter.
<table>
<tr><th></th><th>FIN</th><th>FOUT</th></tr>
<tr><td>B-VAL</td><td>0.22</td><td>0.09</td></tr>
<tr><td>I-VAL</td><td>0.38</td><td>0.23</td></tr>
<tr><td>L-VAL</td><td>0.58</td><td>0.42</td></tr>
<tr><td>F-VAL</td><td>0.58</td><td>0.42</td></tr>
<tr><td>I-REG</td><td>0.39</td><td>0.45</td></tr>
<tr><td>L-REG</td><td>0.94</td><td>0.67</td></tr>
<tr><td>F-REG</td><td>0.94</td><td>0.67</td></tr>
<tr><td>Address input</td><td>0.20</td><td>—</td></tr>
</table></td></tr>
<tr><td>-[SFC]-</td><td>(1)11.54
(2)10.64
(3)10.21</td><td>(1) Cases where execution conditions are OFF
(2) Cases where execution conditions an
transition conditions are ON
(3) Cases where execution conditions are ON an
transition conditions are OFF:
However, if there is an output bit, the followin
value is added.
<table>
<tr><td>1 to 16 :2.53</td><td>17 to 32 :3.60</td><td>33 to 48:4.70</td></tr>
<tr><td>49 to 64:5.75</td><td>65 to 80 :7.09</td><td>81 to 96:8.21</td></tr>
<tr><td>97 to 112:9.39</td><td>113 to 128 :10.35</td><td></td></tr>
</table></td></tr>
<tr><td>SFCSTEP</td><td>0.11</td><td></td></tr>
<tr><td>⊣⊢, ⊣/⊢ (contact transition)</td><td>0.21</td><td></td></tr>
<tr><td>+ (timer transition)</td><td>0.72</td><td></td></tr>
</table>

Number of Bytes

Instruction		Number of Source Steps	Number of Source Bytes	Number of Object Bytes*2	Remarks*1
SEE		1	4	26	
FOR to FEND		5	10 to 26	64 to 136	
WHILE to ON/OFF to WEND		4	8	14	
IFON/IFOFF to IEND		3	6	9	
IFON/IFOFF to ELSE to IEND		4	8	14	
DWG/function to DEND		1	2	59	DWG
				97	Function
Comment		1	4	0	
FSTART		1	12	34	User function
				31	System function
FIN	B-VAL	1	2	34	
	I-VAL	1	2	15	
	L-VAL	1	2	14	
	F-VAL	1	2	16	
	I-REG	1	2 to 6	22 to 34	
	L-REG	1	2 to 6	20 to 32	
	F-REG	1	2 to 6	20 to 32	
	Address input	1	6	32 to 52	
FOUT	B-VAL	1	2	24	
	I-VAL	1	2	15	
	L-VAL	1	2	14	
	F-VAL	1	2 to 6	17	
	I-REG	1	2 to 6	23 to 64	
	I-REG	1	2 to 6	20 to 62	
	F-REG	1	2 to 6	20 to 62	

(continued)

(Note) 1 : The contents of the Remarks column refer to the number of object bytes.
2 : Add 4 to 5 bytes to the number of object bytes in cases where [ ] is attached to the instruction.

(continued)

Instruction	Number of Source Steps	Number of Source Bytes	Number of Object Bytes*2	Remarks*1
XCALL	1	10	9	
INS,OUTS	2	8 to 12	20 to 50	In the case of integer operation.
─┤├─ ─┤/├─	1	4 to 6	18 to 57	
─┤↑├─ ─┤↓├─	1	4 to 6	44 to 123	
─[↑]─,─[↑]─,─[↓]─,─[↓]─	2	8 to 12	53 to 113	
─○┤	1	4 to 6	30 to 106	
─[S]─┤,─[R]─┤	1	4 to 6	15 to 88	
AND(∧),OR(∨), XOR(⊕)	1	2 to 6	4 to 19	In the case of integer operation.
			5 to 20	In the case of double-length integer operat
├	1	2 to 6	4 to 19	In the case of integer operation.
			5 to 20	In the case of double-length integer operat
‖├	1	2 to 6	8 to 20	In the case of integer operation.
			8 to 20	In the case of double-length integer operat
			8 to 20	In the case of real number operation.
⇒	1	2 to 6	6 to 47	In the case of integer operation.
			5 to 46	In the case of double-length integer operat
			6 to 346	In the case of real number operation.
+, −	1	2 to 6	15 to 30	In the case of integer operation.
			16 to 29	In the case of double-length integer operat
			6 to 18	In the case of real number operation.
++,--	1	2 to 6	4 to 18	In the case of integer operation.
			5 to 18	In the case of double-length integer operat
×	1	2 to 6	9 to 24	In the case of integer operation.
			7 to 18	In the case of double-length integer operat
			6 to 18	In the case of real number operation.

(continu

(Note) 1 : The contents of the Remarks column refer to the number of object bytes.
2 : Add 4 to 5 bytes to the number of object bytes in cases where [ ] is attached to the instruction.

(continued)

Instruction	Number of Source Steps	Number of Source Bytes	Number of Object Bytes*2	Remarks*1
÷	1	2 to 6	9 to 24	In the case of integer operation.
			7 to 18	In the case of double-length integer operation.
			6 to 18	In the case of real number operation.
INC DEC	1	2 to 6	7 to 47	In the case of integer operation.
			6 to 46	In the case of double-length integer operation.
MOD	1	2	1	In the case of integer operation.
			1	In the case of double-length integer operation.
REM	1	2 to 6	6	In the case of real number operation.
TMADD	2	12 to 16	28 to 98	In the case of integer operation.
TMSUB	2	12 to 16	28 to 98	In the case of integer operation.
SPEND	2	12 to 16	28 to 98	In the case of integer operation.
INV	1	2	8	In the case of integer operation.
			6	In the case of double-length integer operation.
			2	In the case of real number operation.
COM	1	2	2	In the case of integer operation.
			2	In the case of double-length integer operation.
ABS	1	2	11	In the case of integer operation.
			10	In the case of double-length integer operation.
			2	In the case of real number operation.
BIN,BCD,PARITY	1	2	2	In the case of integer operation.
			2	In the case of double-length integer operation.
ASCII	2	8 to 10	51 to 56	In the case of integer operation.
ASCBIN	1	6 to 8	20 to 35	In the case of integer operation.
BINASC	1	6 to 8	20 to 35	In the case of integer operation.
<, ≦, = ≠, ≧, >	1	2 to 6	10 to 25	In the case of integer operation.
			11 to 24	In the case of double-length integer operation.
			18 to 30	In the case of real number operation.

(continued)

(Note) 1 : The contents of the Remarks column refer to the number of object bytes.
2 : Add 4 to 5 bytes to the number of object bytes in cases where [ ] is attached to the instruction.

(continued)

Instruction	Number of Source Steps	Number of Source Bytes	Number of Object Bytes*2	Remarks*1
RCHK	2	8 to 12	20 to 50	In the case of integer operation.
			21 to 51	In the case of double-length integer operatio
			24 to 51	In the case of real number operation.
ROTL,ROTR	3	12 to 18	32 to 154	—
MOVB	3	12 to 18	40 to 192	—
MOVW,XCHG	3	12 to 18	32 to 105	In the case of integer operation.
SETW	3	12 to 18	27 to 102	In the case of integer operation.
BEXTD, BPRESS	3	12 to 18	31 to 102	In the case of integer operation.
BSRCH	4	16 to 24	33 to 69	In the case of integer operation.
			32 to 69	In the case of double-length integer operatio
			38 to 70	In the case of real number operation.
SORT	2	8 to 12	24 to 54	In the case of integer operation.
			24 to 54	In the case of double-length integer operatio
			24 to 54	In the case of real number operation.
SHFTL, SHFTR	3	12 to 18	32 to 154	—
COPYW	3	12 to 18	32 to 105	In the case of integer operation.
BSWAP	1	4 to 6	14 to 29	In the case of integer operation.
SQRT,SIN,COS,	1	2	6	In the case of integer operation.
ATAN			6	In the case of real number operation.
TAN,ASIN,ACOS,	1	2	6	In the case of real number operation.
EXP	1	2	6	In the case of real number operation.
LN	1	2	6	In the case of real number operation.
LOG	1	2	6	In the case of real number operation.

(continue

(Note) 1 : The contents of the Remarks column refer to the number of object bytes.

2 : Add 4 to 5 bytes to the number of object bytes in cases where [ ] is attached to the instruction.

(continued)

Instruction	Number of Source Steps	Number of Source Bytes	Number of Object Bytes*2	Remarks*1
DZA,DZB	1	2 to 6	14 to 29	In the case of integer operation.
			15 to 28	In the case of double-length integer operation.
			13 to 24	In the case of real number operation.
LIMIT	2	8 to 12	20 to 50	In the case of integer operation.
			21 to 51	In the case of double-length integer operation.
			24 to 51	In the case of real number operation.
PI, PD, PID, LAG, LLAG, FGN, IFGN, LAU, SLAU, PWM	1	4 to 6	20/35	Without subscript / with subscript
TBLBR	3	18 to 22	36 to 72	In the case of integer operation.
TBLBW	3	18 to 22	36 to 72	In the case of integer operation.
TBLSRL	3	18 to 22	36 to 72	In the case of integer operation.
TBLSRC	3	18 to 22	36 to 72	In the case of integer operation.
TBLCL	2	14 to 16	28 to 43	In the case of integer operation.
TBLMV	3	24 to 26	38 to 53	In the case of integer operation.
QTBLR, QTBLRI	3	18 to 22	36 to 72	In the case of integer operation.
QTBLW, QTBLWI	3	18 to 22	36 to 72	In the case of integer operation.
QTBLCL	1	10	20	In the case of integer operation.
SFC	1	6	38 to 67	
≑,≵,+	1	10 to 12	16 to 44	
ABOX,SBOX	1	2 to 3	2	
AEND	1	2	6	
SFCSTEP	1	4	5	

(Note) 1 : The contents of the Remarks column refer to the number of object bytes.

2 : Add 4 to 5 bytes to the number of object bytes in cases where [ ] is attached to the instruction.

C Outline of the CP-215 Transmission Specifications

1 Outline of the Transmission Method

The CP-215 transmission system enables transmission among a maximum of 64 stations by a tok passing bus method.
The token passing bus method is a transmission method in which data of a specific pattern, callec token, is sequentially received and sent to switch the data transmission privilege of each static (In the Figure, ST#n means that the station address is n.)

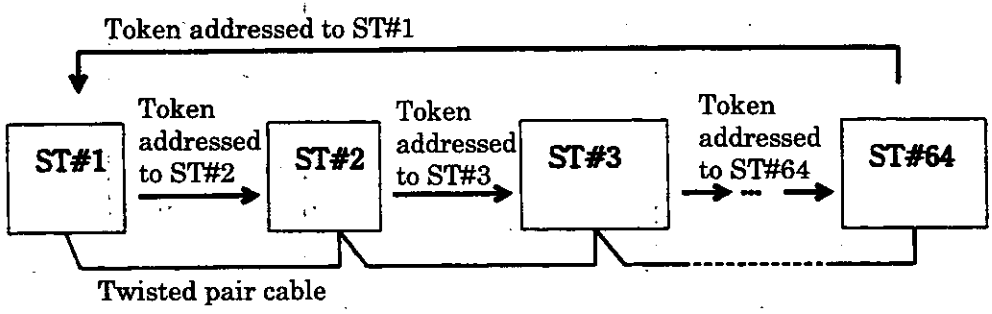


Fig. A.1 Image of the Token Passing Bus Method

At this point at each station, the interval between two consecutive receiving of the token is called t token cycle time. Also, the time during which the transmission privilege is acquired, that is, the ti from the point at which a token is received to the point at which the token is sent, is called the tok hold time.

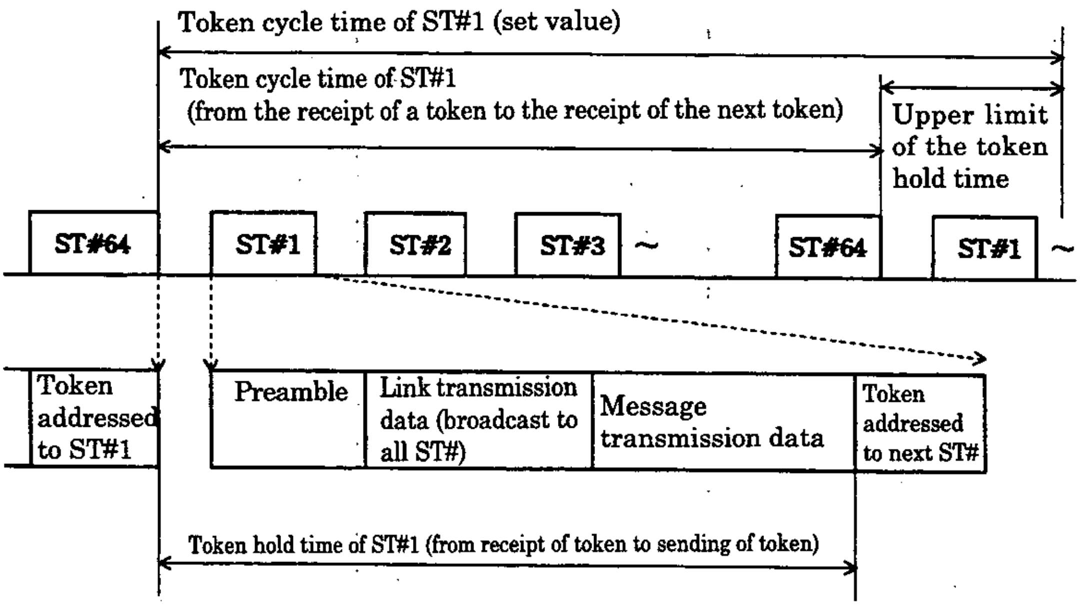


Fig. A.2 Data Transmission Timing and Data Configuration

The CP-215 transmission operates with the upper limit of the token hold time being the difference time between the token cycle time (set value) set by a transmission parameter and the token cycle ti (current value) that is measured on each receipt of token. Although link transmission data is sent ev when this upper limit is exceeded, the message transmission data is not sent but is held if there i possibility for the upper limit to be exceeded.

Estimation of the Token Cycle Time

The token cycle time (set value) at each station can be estimated with the equations below.
In each equation, the message transmission margin refers to the time margin for message transmission from each station that is included in one token cycle time. A minimum message transmission of 1.2 ms (4 Mbps), 2.4 ms (2 Mbps), or 4.8 ms (1 Mbps) should be secured for each transmission speed.
If this value is made large, although the message transmission efficiency will become high, the renewal of link transmission data will become slow.

For a transmission speed of 4Mbps

Transmission cycle (ms)
= 0.16 × number of stations + 0.004 × total number of words of link transmission data + message transmission margin (≧ 1.2 ms)

For a transmission speed of 2Mbps

Transmission cycle (ms)
= 0.23 × number of stations + 0.008 × total number of words of link transmission data + message transmission margin (≧ 2.4 ms)

For a transmission speed of 1Mbps

Transmission cycle (ms)
= 0.31 × number of stations + 0.016 × total number of words of link transmission data + message transmission margin (≧ 4.8 ms)

(Note 1) The token cycle time (set value) does not guarantee data transmission at a set cycle or a fixed cycle.

(Note 2) Do not set the token cycle time (set value) to a value no less than the value estimated by the above equations. Otherwise, engineering from CP-717 may not be possible.

(Note 3) Each parameter of the above equations depends on the system configuration and the hardware and software version No. of the transmission IF board. The obtained values should be used for reference only.

Estimation of the Maximum Number of Stations Connected

By modifying the above equations, the maximum number of stations connected can be estimated for the token cycle time (set value). The estimates are shown in Table A.1.

Table A.1 Estimation of the Maximum Number of Stations Connected in a CP-215 Transmission System

Number of Link Transmission Words	Transmission Cycle (ms)	Transmission Speed		
		4Mbps	2Mbps	1Mbps
1024words	10	30 stations	—	—
	20	64 stations	40 stations	—
	30	64 stations	64 stations	28 stations
	50	64 stations	64 stations	64 stations
	100	64 stations	64 stations	64 stations
2048words	10	—	—	—
	20	64 stations	5 stations	—
	30	64 stations	48 stations	—
	50	64 stations	64 stations	40 stations
	100	64 stations	64 stations	64 stations

(Note) The number of stations connected is not only restricted by the transmission specifications as described above but is also restricted by the number of stations connected and the transmission distance in terms of electrical conditions. Refer to 10.3.4, "Precautions upon the Transmission Wiring".

D Outline of the CP-2500 Transmission Specifications

1 Outline of the Transmission Method

The CP-2500 enables transmission among a maximum of 32 stations by a token passing bus metho
The token passing bus method is a transmission method in which data of a specific pattern, calle
token, is sequentially received and sent to switch the data transmission privilege of each stati
(In the Figure, ST#n means that the station address is n.)

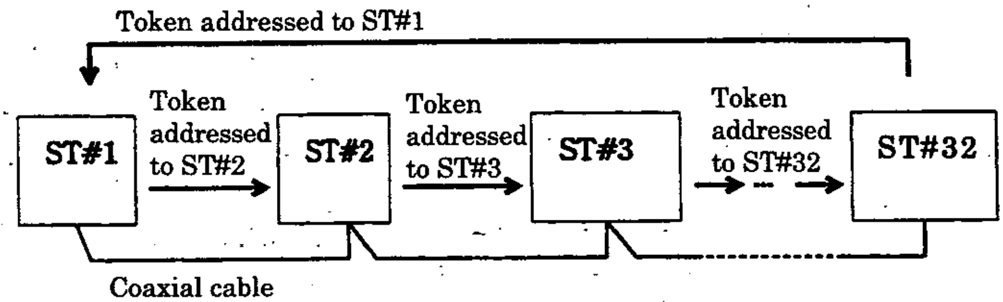


Fig. D.1 Image of the Token Passing Bus Method

At this point at each station, the time between receiving the token signal and transmitting the toke
the next station is called the token hold time current value.
The token hold time set with the transmission parameter is the upper limit for that value.

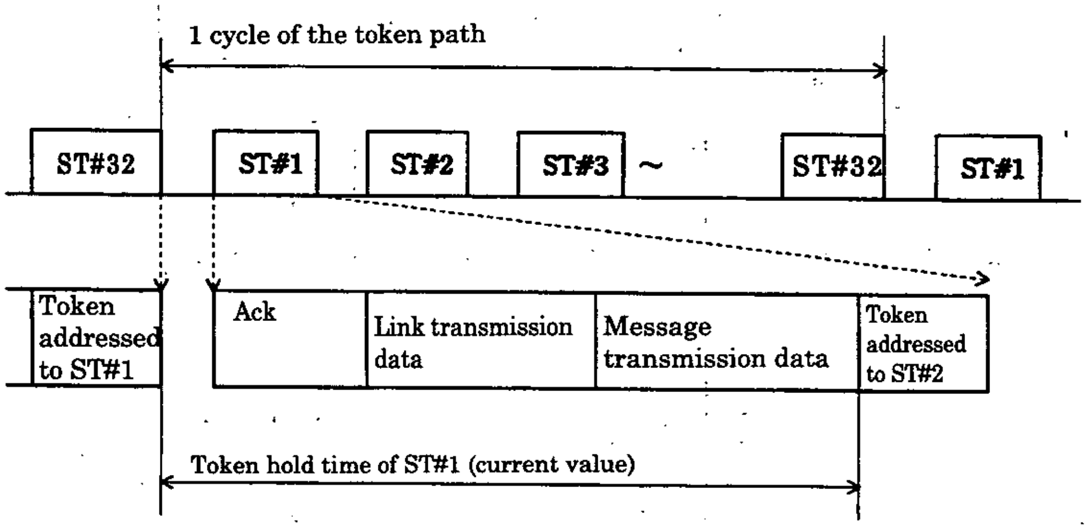


Fig. D.2 Timing for sending and receiving data between stations and data configuration

On the CP-2500, a comparison is made between the token hold time set with the transmission para
eter (upper limit) and the current token hold time, which is measured each time a token signal
received. The sending of the message transmission is monitored so that this upper limit is not
ceeded.
If the current token hold time exceeds the upper limit and there is a message that ought to be transmitt
a token is sent to the next station, which keeps the message for transmission until the timing for
next transmission. If the setting of this token hold time is too short, message transmission may s
completely, so be sure to set to a large enough value.

Setting the Token Hold Time

The token hold time set by the transmission parameter at each station should be set to a value more than the one obtained using the following calculation equation. For details, refer to the Control Pack CP-2500 FA bus II Design Handbook (SI-C872-5).

For example, when transmitting the following data at 4 Mbps,

Link data   50 bytes (25 words)

Message data   200 bytes (100 words)

the time (Thold') which the station actually holds the token is

Thold' = Tlframe + Tcsend   ··· link data transmission time

+ Tmframe + Tisend   ··· message data transmission time

+ Tpass   ··· token transmission time

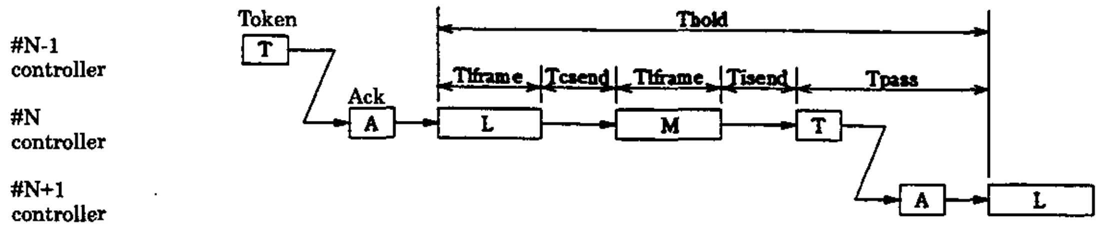
$= 8 \times (36 + 50) \div 4 + 900$

$+8 \times (21 + 200) \div 4 + 300$

$+1000$

$= 2814\ \mu s$

The token hold time (Thold') set by transmission parameter must be enough longer than Thold'.



Code	Significance	Time required (μ s)
Tpass	Token passing time	1000
Tlframe	Link frame sending time	$8 \times (36 + N) \div f$
Tmframe	Message sending time	$8 \times (21 + N) \div f$
Tcsend	Continuous sending processing time	900
Tisend	Individual sending processing time	300

(Note 1) Time required is the approximate time.

(Note 2) "f" indicates transmission speed (Mbps). "N" indicates number of bytes.

(Note 3) When a transmission is made continuously to the same station, or a transmission is made after a broadcast transmission, Tcsend = 900 μ s.

E Differences between the CP-9200SH and the CP-9200H

Item			CP-9200SH	CP-9200H	Remarks
1	Number of controlled axes		44 axes (4 axes/module, max. 11 modules)	8 axes (4 axes/module, max. 2 modules)	–
2	High-speed		Approx. 2.5 times higher	–	–
3	Addition of instruction	Program control instruction	XCALL	None	–
		Data transfer instruction	ROTR, ROTL, MOVB, SETW, COPYW, SHL, SHR		
		DDC instruction	RCHK		
		SFC instruction	SFCSTEP		
		System function	FTRC-RD		
		Sequence instruction	-[S]- (set coil) -[R]- (reset coil)		
4	Modification of instruction	DDC instruction	LAU (incorporated LAU and VLAU) SLAU (incorporated SLAU and VSLAU)	LAU and VLAU SLAU and VSLAU	–
		System function	DTRC-RD TRACE MSG-SND MSG-RCV	TRACE-RD TRACE SND RCV	
		Direct I/O instruction	INS, OUTS	IN, OUT	
5	Elimination of instruction	DDC instruction	None	LPID	· In the CP-9200SH, the functions related to the memory card (MC-WRITE MC-READ, MC-CHK) are eliminated because it has memory card connection. · In the CP-9200SH, double length multiplication/ division (LMUL, LDIV) us × and ÷ for multiplicatio division (LMUL, LDIV) of double-length integers.
		System function	None	MC-WRITE MC-READ MC-CHK	
			None	LMUL	
			None	LDIV	
6	Application capacity		1MB memory: equivalent to 12 k steps/CPU [Product code No.: 87921-3100□-S030Δ] 2 MB memory: equivalent to 30 k steps/CPU [Product code No.: 87921-3110□-S030Δ]	Equivalent to 4 k steps/CPU	–

(continue

(continued)

Item			CP-9200SH	CP-9200H	Remarks
7	Data memory	Register common to all DWGs (M)	32 k words/CPU	16128 words (common to CPUs)	· In the CP-9200H, the M, I, and O registers are common to CPU0 and CPU1. In the CP-9200SH, each CPU1 and CPU2 have their own registers. · In the CP-9200H, the D register is common to all DWGs. In the CP-9200SH, each DWG has its own D register. · The contents of the S register are different for the CP-9200H and the CP-9200SH. Be careful when the S register is used in user programs for such things as high-speed and low-speed scan set values. · In the CP-9200H, the I and O registers are cleared when turning the power ON. In the CP-9200SH, they are not cleared. · The S register Nos. and contents are different for the CP-9200H and the CP-9200SH.
		Input register (I)	5 k words/CPU	128 words (common to CPUs)	
		Output register (O)	5 k words/CPU	128 words (common to CPUs)	
		System register (S)	1 k words/CPU	256 words/CPU	
		Register unique to each DWG (D)	Max. 16 k words/DWG and function	2 k words/CPU	
		DWG constant register (#)	Max. 16 words/DWG and function	Max. 512 words/DWG	
		Common constant register (C)	16 k words/CPU	None	
8	Trace memory	Data trace	Max. 128 k words (32 k words × 4 groups)/CPU	192 k words (common to CPUs) (32 k words × 3 groups)	· In the CP-9200SH, the space allotted for trace memory can be used for user programs when trace memory is not used.
		Failure trace	Max. 4 k words (64 items × 450)/CPU	None	
9	Read-only-storage of user program		FLASH	PROM	—
10	Table programming		Possible (only at CP-717)	Impossible	
11	Drawing/ Function capacity	Starting (A)	64 drawings	32 drawings	—
		High-speed scan (H)	100 drawings	32 drawings	
		Low-speed scan (L)	100 drawings	32 drawings	
		Interrupt (I)	64 drawings	32 drawings	
		User function	100 functions	32 functions	
		Number of steps/ DWG and function	500 steps	300 steps	
		Drawing hierarchy	3 hierarchies	2 hierarchies	
12	Engineering port (RS-232C) (With 217IF option connected)	PP service	Available	Available	—
		MEMOBUS (slave)	Available	Available	
		MEMOBUS (master)	Available	Not available	
		Other sequence communication (MELSEC, OMRON)	Available	Not available	
13	Shared memory between CPUs		Possible when the M register is set on the screen	M register	—

(continued)

(continued)

Item			CP-9200SH	CP-9200H	Remarks
14	Program secret protection		Possible in units of drawing	Possible in units of CPU	—
15	Calendar function		Provided	Not provided	—
16	Failure trace function		Provided	Not provided	—
17	MEMOBUS I/F		M and I registers (possible for each CPU)	S, I, O, M, and D registers	—
18	Onboard I/O		Applicable with optional LIO unit	DI/DO each 48 points	—
19	Expansion I/O module	LIO-01	Applicable (DI/DO each 32 points)	Not applicable	—
		CNTR-01	Applicable (PI: 4 points)	Not applicable	
		AI-01	Applicable (AI: 8 points)	Not applicable	
		DI-01	Applicable (DI: 64 points)	Not applicable	
		AO-01	Applicable (AO: 4 points)	Not applicable	
		DO-01	Applicable (DO: 64 pints)	Not applicable	
		PO-01	Applicable	Not applicable	
		2000 series I/O	Applicable (optional I/F unit)	Applicable	
		820IF	Applicable	Not applicable	
		Distributed I/O	Applicable (via CP-216)	Not applicable	
		1000 series I/O	Applicable (via CP-213)	Not applicable	
	Optional communication module	CP-217 (RS-232)	Applicable (1 circuit/module)	Applicable (2 circuits)	
		CP-216 (electric)	Applicable (1 circuit/module)	Not applicable	
		CP-215	Applicable (1 circuit/module)	Not applicable	
		CP-213	Applicable (1 circuit/module)	Not applicable	
		CP-2500	Applicable (1 circuit/module)	Applicable (1 circuit)	
		CP-225	Applicable (1 circuit/module)	Not applicable	
		CP-218 (Ethernet)	Applicable (1 circuit/module)	Not applicable	
20	Servo parameters	Area	Fixed I/O register (128 words/axis) (IWC000 to IWFFFF, OWC000 to OWFFFF)	Shared with the M register (50 words/axis) (MW00000 to MW00399)	· In the CP-9200SH, the number of servo parameters, their arrangement, and functio[n] are different from those o[f] the CP-9200H.
		Servo fixed parameters	Selected on the screen (Separate from the servo parameters)	M register setting (included in the servo parameters)	
21	Counter function	Basic counter (servo control)	Available	Available	
		Frequency measurement	Applicable	Not applicable	
		Interval counter	Applicable	Not applicable	
		Reversible counter	Applicable	Not applicable	

(continu[ed])

(continued)

Item \ Product		CP-9200SH	CP-9200H	Remarks
22	Coincidence detection	Provided	Not provided	—
23	Temperature input	By using the system function MSG-SND	Temperature input screen	—
24	CRT controller	Not provided (can be replaced by a commercially available general-purpose graphic panel)	Provided with exclusive CRT controller	—
25	User program compatibility	Provided with source conversion tool to convert the user programs for the CP-9200H to those for the CP-9200SH	—	—
26	Batch loader	Batch-loading clears, the program memory and data memory (the S, I, O, M, and D registers) unique to each CPU.	Batch-loading clears the program memory and data memory (the S and D registers), but not the M register.	

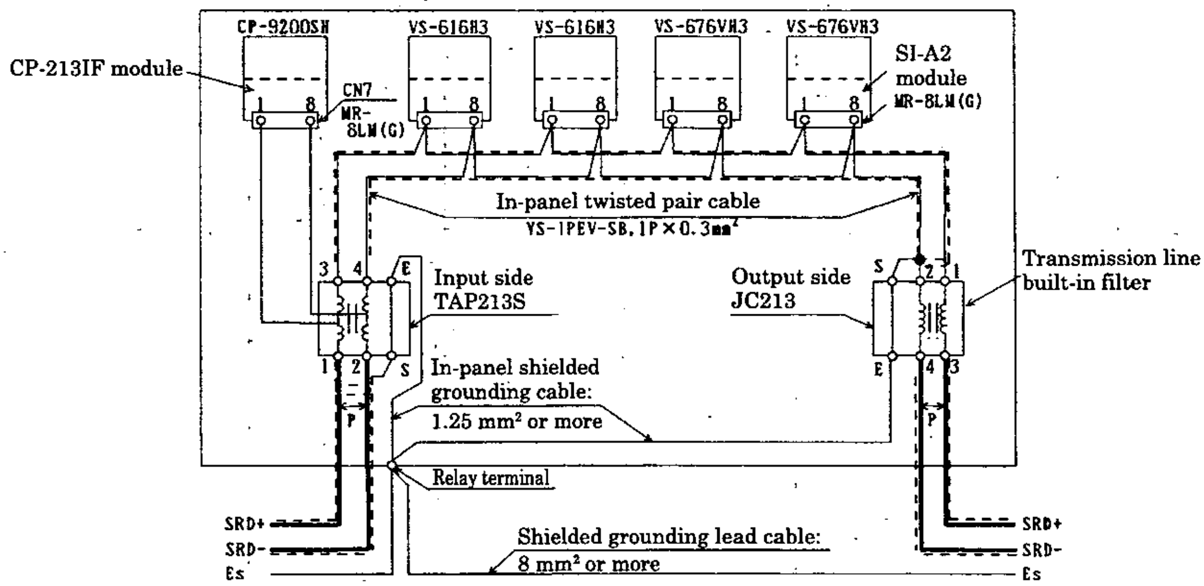
F Transmission Wiring

1 In-panel Wiring

1.1 Connection

(1) CP-213 cable connection

Fig. A.5 shows an example of connecting a CP-213 transmission line.



① The above figure shows the in-panel cable connection. Connect the CP-9200SH and the 213IF with the TAP213S

② Between each communication interface module, connect the MR-8LM (G) terminals to the in-panel cables that h the same numbers.
Connect pin No.8 of the MR-8LM (G) to SRD+, and No.1 to SRD−.

③ Install TAP213S and JC213 on the input side and the output side of the panel respectively to connect the in-pan cable and the panel-to-panel cable.

④ TAP213S and JC213 signal terminals: There is no set I/O direction between terminals 1-2 and terminals 3-4.

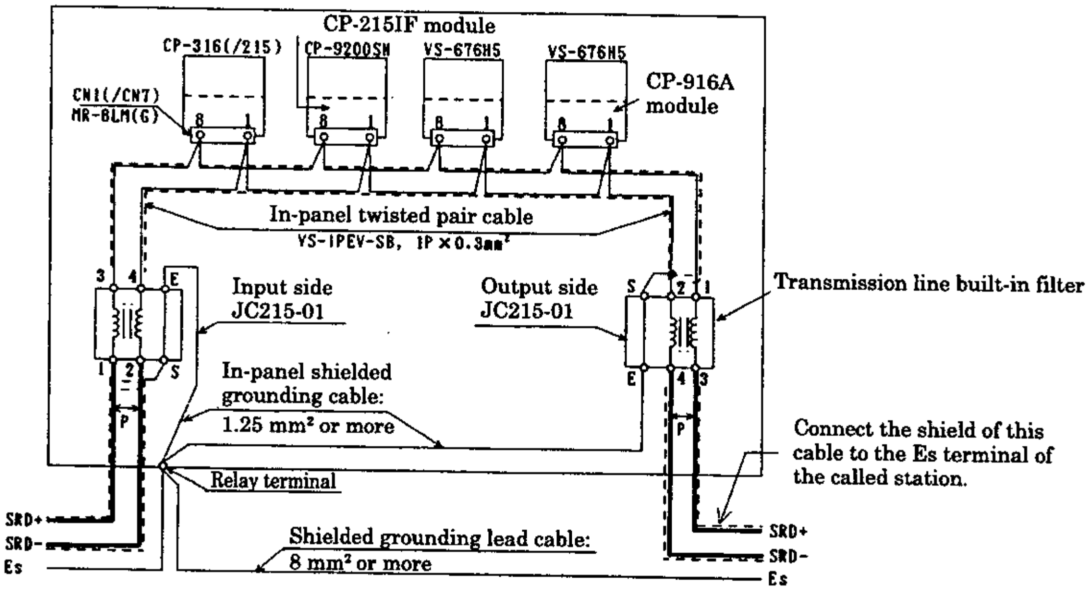
⑤ When installing the TAP213S or JC213 at the end of the transmission line, install a 75Ω terminator between terminals 1 - 2 or terminals 3 - 4 of TAP213S and JC213.

⑥ Connect only one side of the shield for the in-panel cable and the panel-to-panel cable to the S terminal on the input side of TAP213S and the output side of JC213, and connect the E terminal to the Es terminal on the panel with a 1.25 mm² grounding cable.

Fig. A.5 Example of a CP-213 Transmission Line Connection

(2) CP-215 cable connection

Figs. A.6 and A.7 show examples of connecting a CP-215 transmission line.



① The above figure shows the in-panel cable connection.

② Between each communication interface modules, connect the MR-8LM (G) terminals to the in-panel cables that have the same numbers.
Connect pin No.8 of the MR-8LM (G) to SRD+, and No.1 to SRD−.

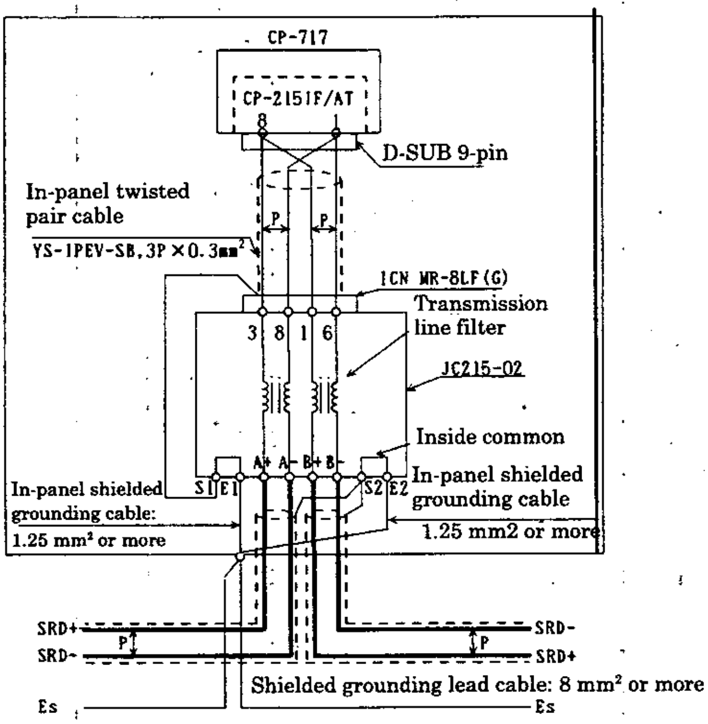
③ Install a JC215-01 on the input side and the output side of the panel to connect the in-panel cable and the panel-to-panel cables that have the same numbers.

④ JC215-01 signal terminals: There is no set I/O direction between terminals 1-2 and terminals 3-4.

⑤ When installing the JC215-01 at the end of the transmission line, install a 75Ω terminator between terminals 1 - 2 or terminals 3 - 4 of JC215-01 on each side.

⑥ Connect only one side of the shield for the in-panel cable and the panel-to-panel cable to the S terminal on JC215-01, and connect the E terminal to the Es terminal on the panel with a 1.25 mm² grounding cable.

Fig. A.6 Example of a CP-215 Transmission Line Connection (JC215-01)



① Connection

Communication interface module: Connect CP-215IF/AT to JC215-02 with the in-panel cable.

Panel-to-panel cable signal line: Connect SRD+/SRD- to terminals A+/A− (or B+/B−) of JC215-02.

② Terminator

When installing the JC215-02 at the end of the transmission line, connect a terminator to terminals A+/A− (terminals B+/B−) of JC215-02.

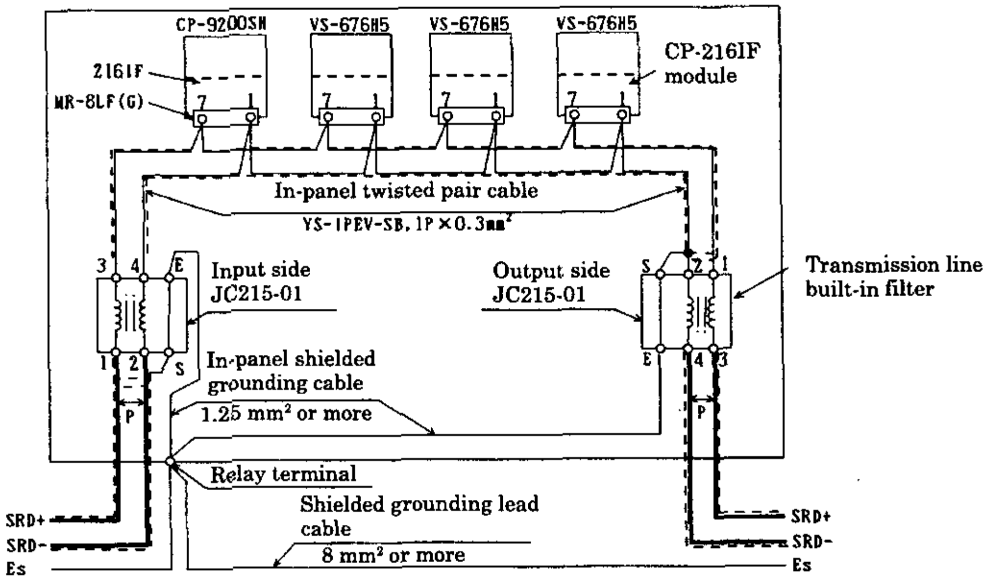
③ Termination of the shielded grounding cable

Connect only one side of the shield for the in-panel cable and the panel-to-panel cable to terminals S1 and S2 of JC215-02, and connect terminals E1 and E2 to terminal Es of the panel with a 1.25 mm² grounding cable.

Fig. A.7 Example of a CP-215 Transmission Line Connection (JC215-02)

(3) CP-216 cable connection

Fig. A.8 shows an example of connecting a CP-216 transmission line.



① The above figure shows the in-panel cable connection.

② Between each communication interface module, connect the MR-8LF (G) terminals to the in-panel cables that have the same numbers.
Connect pin No.7 of the MR-8LF (G) to SRD+, and No.1 to SRD−.

③ Install a JC215-01 on the input side and the output side of the panel to connect the in-panel cable and the panel-to-panel cable.

④ JC215-01 signal terminals: There is no set I/O direction between terminals 1-2 and terminals 3-4.

⑤ When installing the JC215-01 at the end of the transmission line, install a 75Ω terminator between terminals 1 - 2 or terminals 3 - 4 of JC215-01 on each side.

⑥ Connect only one side of the shield for the in-panel cable and the panel-to-panel cable to the S terminal of JC215-01, and connect the E terminal to the Es terminal of the panel with a 1.25 mm² grounding cable.

Fig. A.8 Example of a CP-216 Transmission Line Connection

(4) CP-217 cable connection

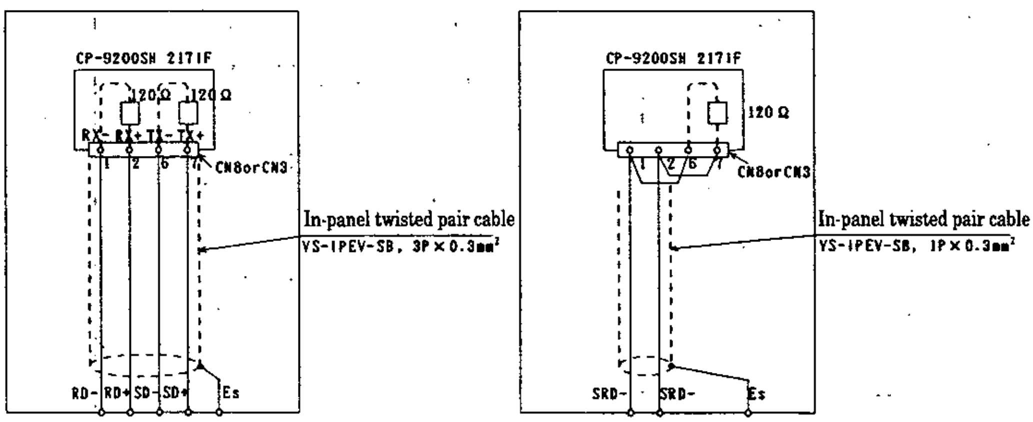
Table A.2 shows an example of connecting a CP-217 RS-232 transmission line.

Table A.2 CP-217 RS-232 Transmission Line Connection

CP-9200SH 217IF (CN2)		Cable connection and signal direction	Called station (DSUB25-pin)	
Signal name	Pin No.		Pin No.	Signal name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS (CTS)
DSR (DR)	6		6	DSR (DR)
SG	7		7	SG
CD	8		8	CD
DTR (ER)	20		20	DTR (ER)

CP-9200SH 217IF (CN2)		Cable connection and signal direction	Called station (DSUB9-pin)	
Signal name	Pin No.		Pin No.	Signal name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS	4		4	RS
CS (CTS)	5		5	CS
DSR (DR)	6		6	5V
SG	7		7	SG
CD	8		8	—
DTR (ER)	20		9	—

Fig A.9 shows an example of connecting a CP-217 RS-485 transmission line.



① The above figure shows an example of connecting 4 lines.
② When installing at the end of the transmission line, use a terminator (120Ω) inside the module.
③ Connect the shield of the in-panel cable to the Es terminal and ground to a grounding pole with a grounding resistance of 100Ω or less.

(a) CP-217 RS-422/RS-485 4-lines

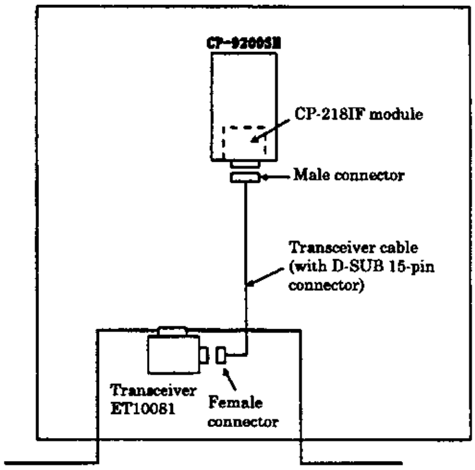
① The above figure shows an example of connecting 2 lines.
② When installing at the end of the transmission line, use a terminator (120Ω) inside the module.
③ Connect the shield of the in-panel cable to the Es terminal and ground to a grounding pole with a grounding resistance of 100Ω or less.

(b) CP-217 RS-485 2-lines

Fig. A.9 Example of a CP-217 RS-485 Transmission Line Connection

(5) CP-218 cable connection

Fig. A.10 shows an example of conecting a CP-218 transmission line.

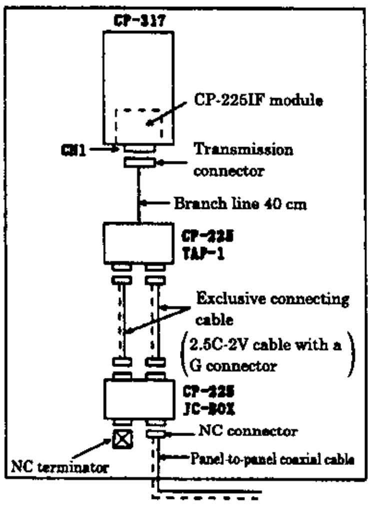


① Connect the male connector of the transceiver cable to the CP-9200SH optional CP-218IF module. Then, connect the female connector to the transceiver.

Fig. A.10 Example of a CP-218 Transmission Line Connection

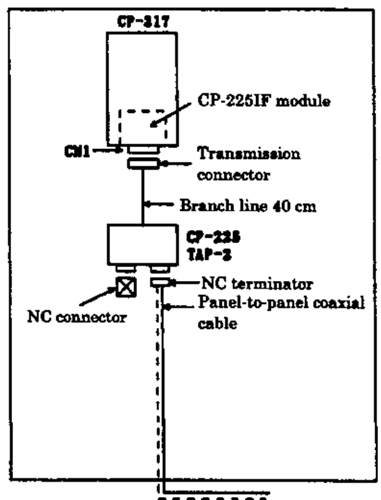
(6) CP-225 cable connection

Fig. A.11 shows an example of connecting a CP-225 transmission line.



① The connection in the above figure is used when the panel-to-panel cable can not be led in the upper section of the panel inside.
② Connect the panel-to-panel coaxial cable to JC-BOX.
③ Use the exclusive connecting cables (2.5C-2V coaxial cable with a G connector) as the in-panel cable between JC-BOX and TAP-1.
④ Connect the connector at the end of the TAP-1 branch line to CN1 of 225IF.

(a) Example of a TAP-1/J-BOX Connection



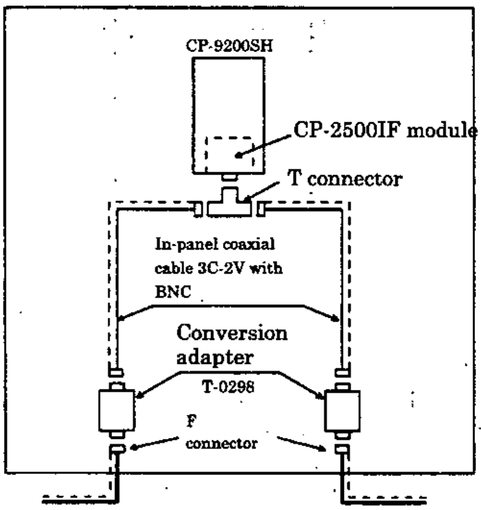
① The connection in the above figure is used when the panel-to-panel cable can not be led in the upper section of the panel inside.
② Connect the panel-to-panel coaxial cable to TAP-2.
③ Connect the connector at the end of the TAP-2 branch line to CN1 of 225IF.

(b) Example of a TAP-2 Connection

Fig. A.11 Example of a CP-225 Transmission Line Connection

(7) CP-2500 cable connection

Fig. A.12 shows an example of connecting a CP-2500 transmission line.



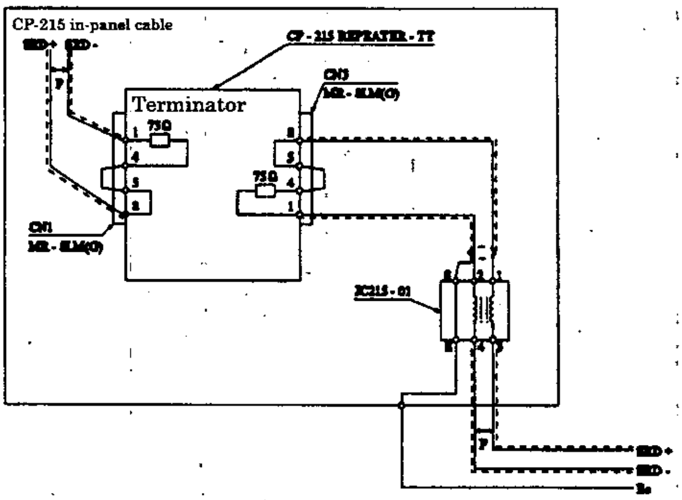
① Connect one end of the in-panel coaxial cable to the CP-9200SH's optional CP-2500IF module through the T connector for branching.

② Connect the other end of the in-panel coaxial cable to the conversion adapter.

Fig. A.12 Example of a CP-2500 Transmission Line Connection

(8) CP-215 REPEATER-TT cable connection

Fig. A.13 shows an example of connecting a CP-215 REPEATER-TT transmission line.



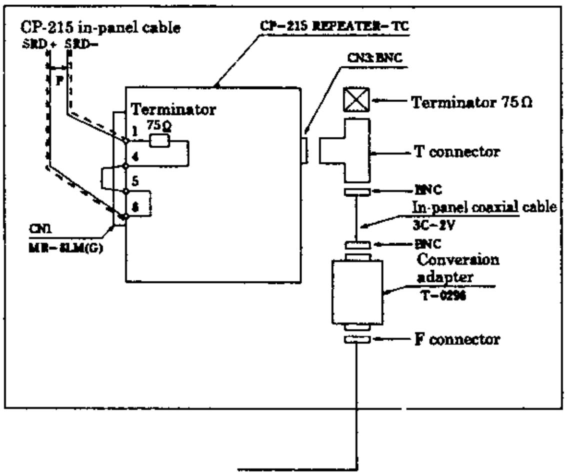
① Transmission connector of a repeater: Connect the No.8 pins of CN1 and CN3 (MR-8LM (G)) to SRD+, and the N pins to SRD−.

② When installing a repeater at the end of the transmission line, short circuit between pins No.4 and No.5 of CN1 CN3 to connect the internal terminator (75Ω).

Fig. A.13 Example of a CP-215 REPEATER-TT Transmission Line Connection

(9) CP-215 REPEATER-TC cable connection

Fig. A.14 shows an example of connecting the CP-215 REPEATER-TC transmission line.



① Transmission connector of a repeater: Connect the in-panel twisted pair cable with MR-8LM (G) (YS-IPEV-SB, 1P ×0.3 mm² made by Fujikura Corporation) to CN1.

② Transmission connector of a repeater: Connect pin No.8 of CN1 to SRD+, and pin No.1 to SRD−.

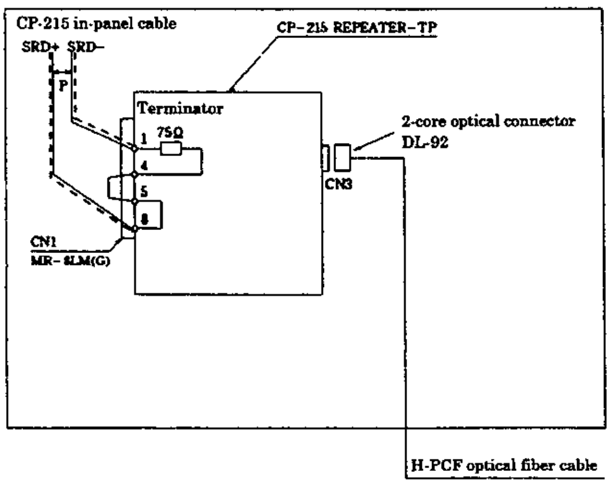
③ Transmission connector of a repeater: Install a T connector on CN3 (BNC type connector), and then connect to the in-panel coaxial cable (3C-2V) with BNC.

④ When installing a repeater at the end of transmission line, connect a terminator (75Ω). Short-circuiting between pins No.4 and No.5 of CN1 connects the internal terminator (75Ω).

Fig. A.14 Example of a CP-215 REPEATER-TC Transmission Line Connection

(10) CP-215 REPEATER-TP cable connection

Fig. A.15 shows an example of connecting a CP-215 REPEATER-TP transmission line.



① Transmission connector of a repeater: Connect the in-panel twisted pair cable with MR-8LM (G) (YS-IPEV-SB, 1P ×0.3 mm² made by Fujikura Corporation) to CN1.

② Transmission connector of a repeater: Connect pin No.8 of CN1 to SRD+, and pin No.1 to SRD−.

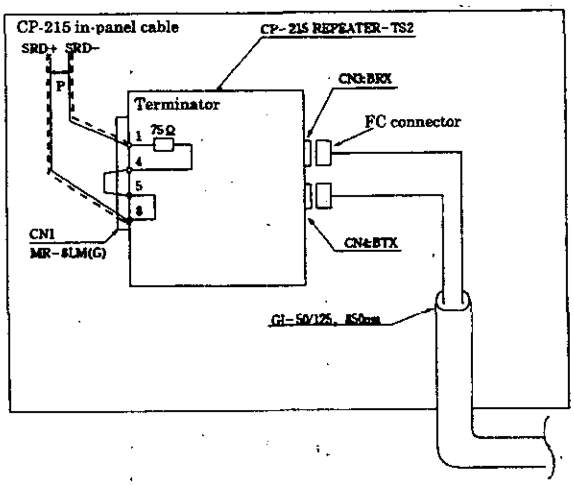
③ Optical transmission connector of a repeater: Connect an H-PCF optical fiber cable with a 2-core optical connector (DL-92) to CN3.

④ When installing a repeater at the end of the transmission line, connect a terminator (75Ω). Short-circuiting between pins No.4 and No.5 of CN1 connects the internal terminator (75Ω).

Fig. A.15 Example of a CP-215 REPEATER-TP Transmission Line Connection

(11) CP-215 REPEATER-TS2 cable connection

Fig. A.16 shows an example of connecting a CP-215 REPEATER-TS2 transmission line.



① Transmission connector of a repeater: Connect the in-panel twisted pair cable with MR-8LM (G) (YS-IPEV-SB, ×0.3 mm² made by Fujikura Corporation) to CN1.

② Transmission connector of a repeater: Connect pin No.8 of CN1 to SRD+, and pin No.1 to SRD−.

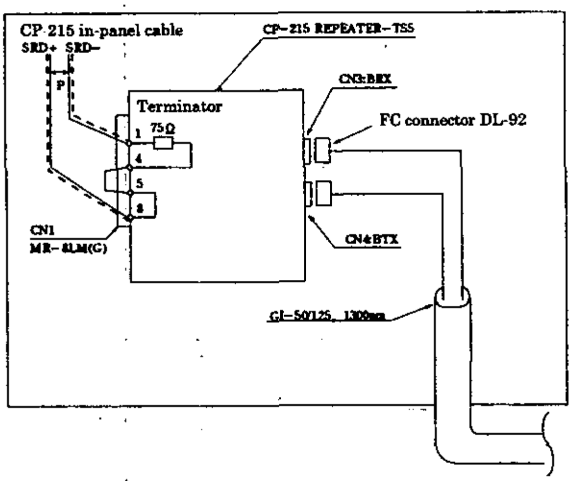
③ Optical transmission connector of a repeater: Connect CN3 and CN4 with a silica glass fiber code/cable (GI-50/1 850 nm, 2.5 to 3 dB) to on FC single-core optical connector.

④ When installing a repeater at the end of the transmission line, connect a terminator (75Ω). Short-circuiting between pins No.4 and No.5 of CN1 connects the internal terminator (75Ω).

Fig. A.16 Example of a CP-215 REPEATER-TS2 Transmission Line Connection

(12) CP-215 REPEATER-TS5 cable connection

Fig. A.17 shows an example of connecting a CP-215 REPEATER-TS5 transmission line.



① Transmission connector of a repeater: Connect the in-panel twisted pair cable with MR-8LM (G) (YS-IPEV-SB, ×0.3 mm² made by Fujikura Corporation) to CN1.

② Transmission connector of a repeater: Connect pin No.8 of CN1 to SRD+, an pin No.1 to SRD−.

③ Optical transmission connector of a repeater: Connect CN3 and CN4 with a silica glass fiber code/cable (GI-50/1 1300 nm, 0.7 to 1 dB) to an FC single-core optical connector.

④ When installing a repeater at the end of the transmission line, connect a terminator (75Ω). Short-circuiting between pins No.4 and No.5 of CN1 connects the internal terminator (75Ω).

Fig. A.17 Example of a CP-215 REPEATER-TS5 Transmission Line Connection

.2 In-panel Cables

Table A.3 shows the in-panel cables to be used for various transmissions.
Be sure to use the cable specified for the system to operate at full performance.
When wiring, use a cable bent radius that is 10 times or larger than the finish radius.

Table A.3 Cable Bent Radius

Transmission system	Cable type	Finished diameter dl (mm)	Bent radius 10 dl (mm)	Applicable duct
CP-215 CP-216	YS-IPEV-SB, 1P × 0.3 mm² made by Fujikura Corporation	5.6	56 or more	For light electric appliances
CP-213 CP-217 RS-485	YS-IPEV-SB, 3P × 0.3 mm² made by Fujikura Corporation	7.2	72 or more	For light electric appliances
CP-217 RS-232	–	–	–	For light electric appliances
CP-215 repeater	3C-2V made by Fujikura Corporation	5.6	56 or more	Exclusive
CP-2500	3C-2V (Cu, Fe) ZV made by Fujikura Corporation	8.6	86 or more	For light electric appliances
CP-218	DAISET-1581B made by Mitsubishi Cable Industries, LTD.	9.2	100 or more	For light electric appliances
CP-225	2.5C-2V made by Fujikura Corporation	4.0	40 or more	For light electric appliances
	5C-2V made by Fujikura Corporation	7.5	75 or more	

.3 In-panel Wiring Separation

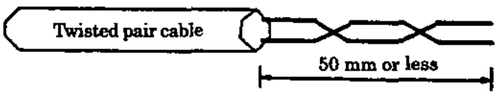
- Separate the in-panel cables without a shield from the cable lines for light electric appliances. If not, shield the cables for light electric appliances.
- Separate the in-panel cables with a shield from the cables for heavy electric appliances. If not, shield the cables for heavy electric appliances.

.4 Shielding

- Connect the shield of a shielded in-panel cable to the grounding terminal Es without making a loop.

.5 Bared Section of the Core Cable

- **Make the bared section of the panel-to-panel twisted pair cable as short as possible (50 mm or less).**
- The characteristic impedance of the bared cable end becomes more than the standard value (75Ω).
- The longer the bared section of the cable is, the greater the distortion of the transmission wave becomes. This may cause a transmission error.

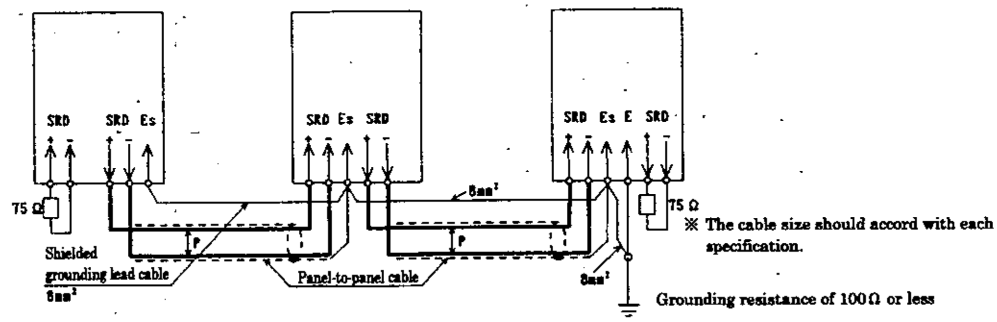


2 Indoor-use Panel-to-panel Wiring

2.1 Panel-to-Panel Connection

(1) CP-213 panel-to-panel cable connection

Fig. A.18 shows an example of connecting a CP-213 panel-to-panel cable.



① Signal line connection
Connect SRD+ and SRD− on the input/output sides of each panel with the panel-to-panel cable.

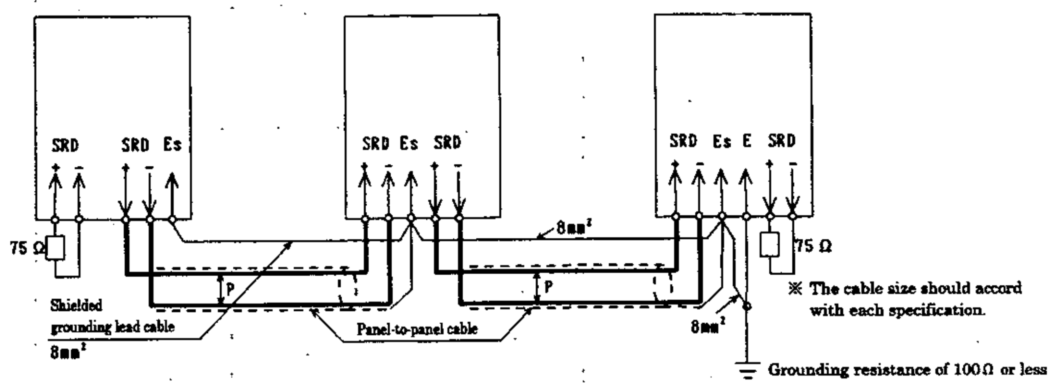
② Terminator
Install terminators (75Ω) on both ends of the transmission line.

③ Shielded grounding lead cable
Connect the Es terminal of each panel in one line.
Use a shielded grounding lead cable (8 mm² or more).
Connect the shielded grounding lead cable to a grounding pole (grounding resistance of 100Ω or less) with a 8 m
or wider grounding cable.

Fig. A.18 Example of a CP-213 Panel-to-panel Cable Connection

(2) CP-215 panel-to-panel cable connection

Fig. A.19 shows an example of connecting a CP-215 panel-to-panel cable.



① Signal line connection
Connect SRD+ and SRD− on the input/output sides of each panel with the panel-to-panel cable.

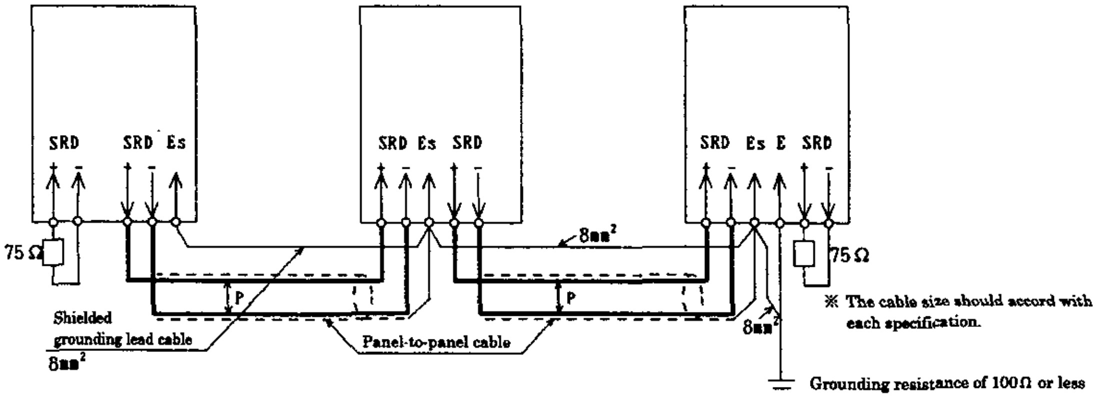
② Terminator
Install terminators (75Ω) on both ends of the transmission line.

③ Shielded grounding lead cable
Connect the Es terminal of each panel in one line.
Use a shielded grounding lead cable (8 mm² or more).
Connect the shielded grounding lead cable to a grounding pole (grounding resistance of 100Ω or less) with a 8 m
or wider grounding cable.

Fig. A.19 Example of a CP-215 Panel-to-panel Cable Connection

(3) CP-216 panel-to-panel cable connection

Fig. A.20 shows an example of connecting a CP-216 panel-to-panel cable.



① Signal line connection
Connect SRD+ and SRD− on the input/ output sides of each panel with the panel-to-panel cable.

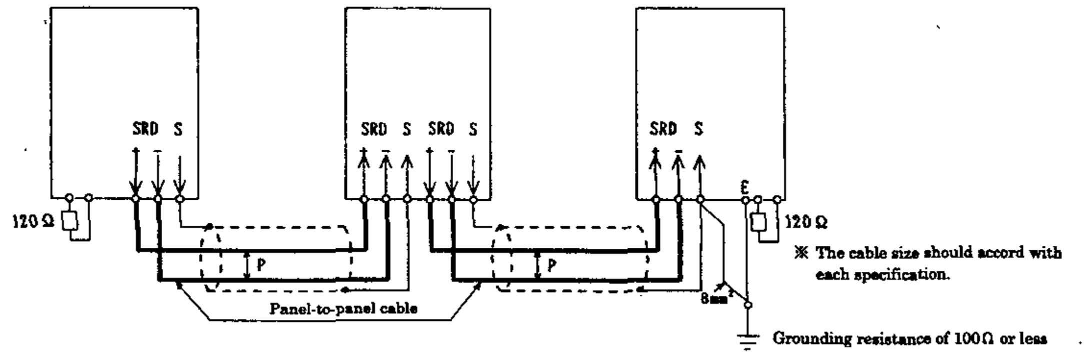
② Terminator
Install terminators (75Ω) on both ends of the transmission line.

③ Shielded grounding lead cable
Connect the Es terminal of each panel in one single line.
Use a shielded grounding lead cable (8 mm² or more).
Connect the shielded grounding lead cable to a grounding pole (grounding resistance of 100Ω or less) with a 8 mm² or wider grounding cable.

Fig. A.20 Example of a CP-216 Panel-to-Panel Cable Connection

(4) CP-217 RS-485 panel-to-panel cable connection

Fig. A.21 shows an example of connecting a CP-217 RS-485 panel-to-panel cable.



① Signal line connection
Connect SRD+ and SRD− on the input/output sides of each panel with the panel-to-panel cable.

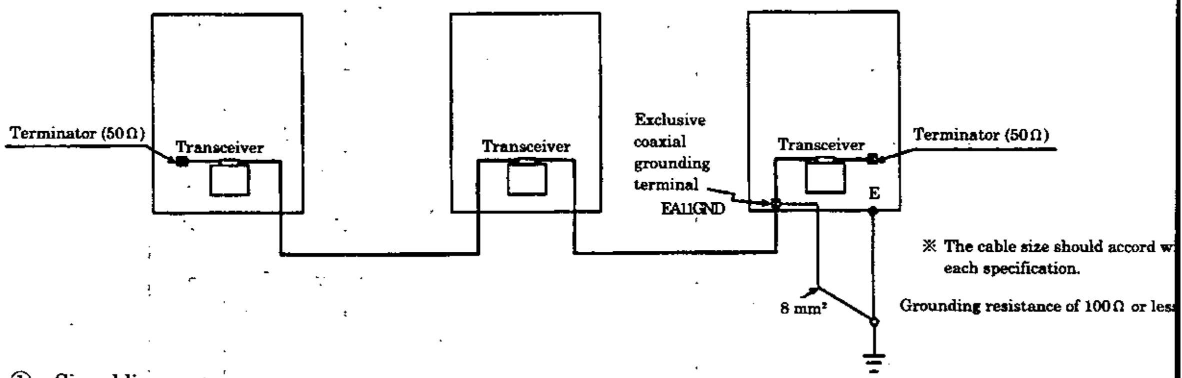
② Terminator
Install terminators (120Ω) on both ends of the transmission line

③ Shielded grounding lead cable
Ground the shield of the panel-to-panel cable to the S relay terminal for the shielded cable of each panel at one point.
And, connect the grounding of the shield to a grounding pole (grounding resistance of 100Ω or less) with a 8 mm² or wider grounding cable.

Fig. A.21 Example of a CP-217 RS-485 Panel-to-Panel Cable Connection

(5) CP-218 panel-to-panel cable connection

Fig. A.22 shows an example of connecting a CP-218 panel-to-panel cable.



① Signal line

Connect the transceiver of each panel with a coaxial cable.

② Terminator

Install terminators on both ends of the transmission line.

③ Shielded grounding lead cable

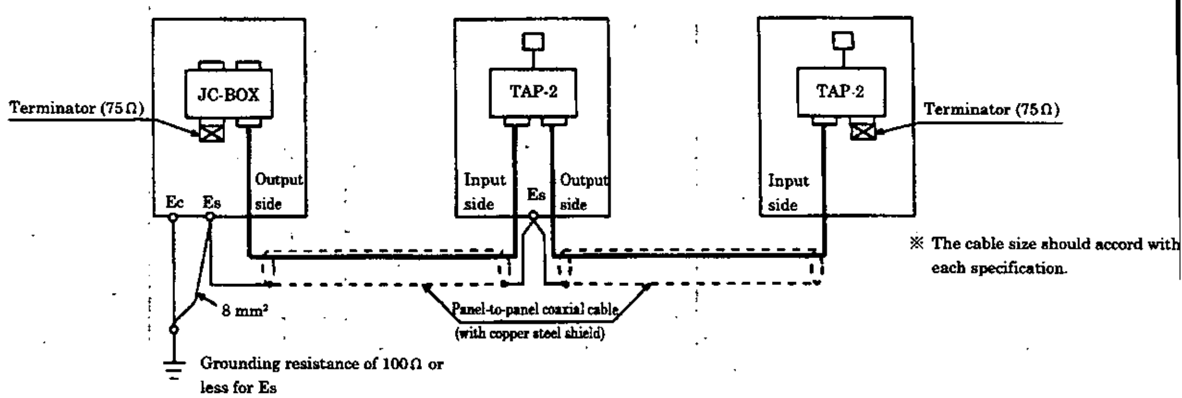
Ground the CP-218 system at one point per segment.

Connect the grounding of the shield to a grounding pole (grounding resistance of 100Ω or less) with a 8 mm² or w grounding cable (less than 10 m long).

Fig. A.22 Example of a CP-218 Panel-to-panel Cable Connection

(6) CP-225 Panel-to-panel cable connection

Fig. A.23 shows an example of connecting a CP-225 panel-to-panel cable.



① Signal line

Connect the JC-BOX and TAP-2 on the output/input sides of each panel with an NC connector.

② Terminator

Install terminators (75Ω) on both ends of the transmission line.

③ Shielded grounding lead cable

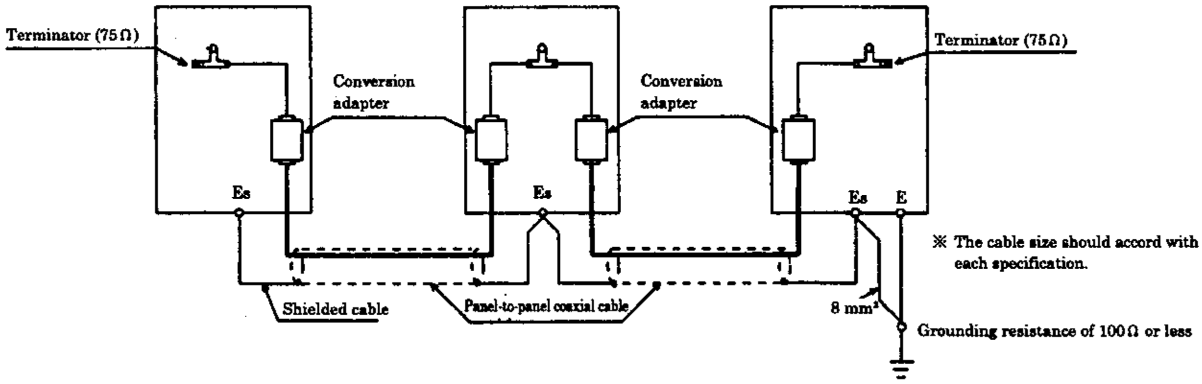
Ground the shield of a coaxial cable that has a copper steel shield in one line.

Connect the grounding of the shield to a grounding pole (grounding resistance of 100Ω or less) with a 8 mm² or wi grounding cable.

Fig. A.23 Example of a CP-225 Panel-to-panel Cable Connection

(7) CP-2500 panel-to-panel cable connection

Fig. A.24 shows an example of connecting a CP-2500 panel-to-panel cable.



① Signal line
Connect the conversion adapters on the output/input sides of each panel with an F connector.

② Terminator
Install terminators on both ends of transmission line.

③ Shielded grounding lead cable
Ground the shield of shielded coaxial cable in one line.
Connect the grounding of the shield to a grounding (grounding resistance of 100Ω or less) with a 8 mm² or wider grounding cable.

Fig. A.24 Example of a CP-2500 Panel-to-panel Cable Connection

2.2 Panel-to-panel Cables

Table A.4 shows the panel-to-panel cables used for various transmissions.
Be sure to use the cable specified for the system to operate at full performance.
When wiring, use a cable bent radius that is 10 times larger than the finish radius.

Table A.4 Cable Bent Radius

Transmission system	Cable type	Finished diameter dl (mm)	Bent radius 10 dl (mm)	Applicable duct
CP-213 CP-215 CP-216 CP-217 RS-485	YS-IPEV-SB, 1P × 1.25 mm² made by Fujikura Corporation	8.6	86 or more	For light electric appliances
CP-215 repeater	5C-2V (Cu, Fe) -ZV made by Fujikura Corporation	12.0	120 or more	For light electric appliances
CP-218	EC-06D-A, made by Mitsubishi Cable Industries, LTD.	10.3	100 or more	For light electric appliances
CP-225, CP-2500	5C-2V (Cu, Fe)-ZV made by Fujikura Corporation	12.0	120 or more	For light electric appliances
CP-2500	7C-FB (Cu, Fe)-ZV made by Fujikura Corporation	13.0	130 or more	For light electric appliances
	7C-FL (Cu, Fe)-ZV made by Fujikura Corporation	14.5	145 or more	For light electric appliances

2.3 Panel-to-Panel Wiring Separation

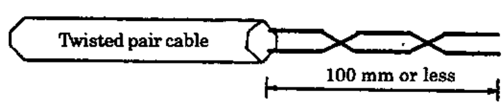
- Install the transmission cables with a shield in the duct for light electric appliances different from the duct for general operation circuit.
  If not, separate the circuit for electric appliances from the circuit for general operation for 10 mm or more.
- Also, keep a proper separation from the main circuit (300 to 1200 mm or more).

2.4 Shielding

- Ground the shield of the panel-to-panel cable at one point.
- Use a 8 mm² grounding cable connected to a grounding pole (grounding resistance of 100Ω o less).

2.5 Bared Section of the Core Cable

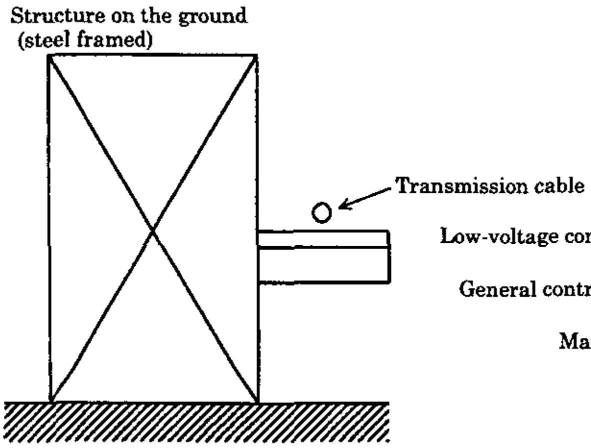
- **Make the bared section of the panel-to-panel twisted pair cable as short as possible (100 mm or less).**
- The characteristic impedance of the bared cable end becomes more than the standard value (75Ω).
- The longer the bared section of the cable is, the greater the distortion of the transmission wav becomes. This may cause a transmission error.



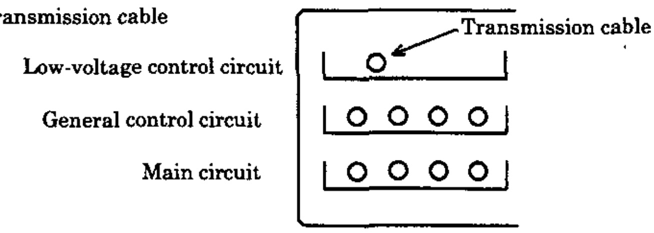
Outdoor Panel-to-Panel Wiring

When wiring outdoors, refer to the transmission cable layout described in item 2 "Indoor Panel-to-Panel Wiring" and take note of the followings.

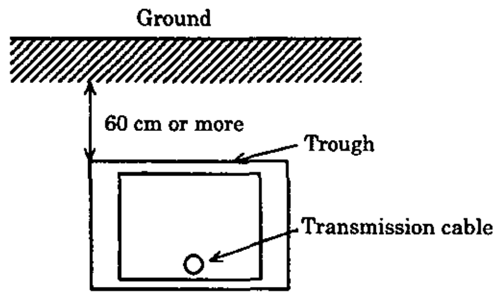
- When wiring the transmission cables outdoors, lay the cables parallel to an above-ground structure (steel flame). (Refer to Fig. A.25 (a).)
  If there is no above-ground structures, enclose the cables in an underground pit or tunnel, or bury them underground. (Refer to Fig. A.25 (b) and (c).)
- Do not wire bare transmission cables overhead. Induction noise from airborne electromagnetic waves, may cause transmission errors.
  Also, the transmission system is not protected from electric surges caused by lightning. The devices may be damaged by lightning.
- The transmission cables expand when heated and the temperature coefficient is approx. 0.05 % per 10 ℃.
  For example, a 500 m transmission cable becomes 25 cm longer when the temperature rises 10 ℃. That amount of expansion is usually absorbed elsewhere along the route. However, in such a case as the transmission cables are laid along a construction on the ground, the temperature varies so much that the amount of expansion is too big to be absorbed. Therefore, it is necessary to provide some slack in the cables so that the expansion can be absorbed.
- When using metal and wiring pipes or metal ducts, any water in the pipe or duct may freeze in winter and cause unfavorable mechanical stress on the transmission line. To avoid this problem, make weep holes on the metalic wiring pipe or duct.



(a) Above-ground structure



(b) Underground pit or tunnel



(c) Buried underground

Fig. A.25 Examples of Laying Cables Between Buildings

4 In-panel Optical Cable Wiring

Note the following precautions for wiring in-panel optical cables.

- Install in-panel ducts or clamp bars as required to prevent the tension and bent radius of the optical fiber codes and cables from becoming greater than those specified.
- When using clamps, use a shock absorbent material. Be careful not to tighten the optical fibe code too much. Tighten the clamp to a pitch of 500 mm.
- To extend the optical fiber code vertically, use clamps (approx. 500 mm pitch) to prevent tensi on the optical connector and the bent section.
- After attaching crimp terminals on the ends of the cables, install the tension members. Insula the tension members for cooper wires from the panel grounding before installation.
- When laying an optical fiber code together with a power cable for or a control cable in an in-panel duct, take care not to cause stress such as lateral pressures and loads.
- Do not pull or twist an optical fiber code/cable by its optical connector.

5 Indoor/Outdoor Panel-to-panel Optical Cable Wiring

5.1 Optical connector installation

The optical connector installation on site may be required in the following cases:

- The exact cable length can not be determined, because the layout is not fixed.
- A working space for handling the remaining cable can not be reserved.
- A working space (approx. 1 m × 1 m) for installing the optical connector can not be reserved.
- Obstacles such as piping make it difficult to wire cables with connectors on their ends. Because the head of connector is protected with a dedicated cover when wiring, the pipe line diameter, the bent radius, and the hole diameter for passing the wire through are subject to restrictions.
- For conditions other than those listed above are not subjected, it is recommended to purchase optical fiber code/cable with optical connectors on both ends.

Note: Personnel qualified in connector processing techniques must perform the connector installat on site.

For more information, contact your Yaskawa representative.

5.2 Optical Fiber Code/Cable Connections

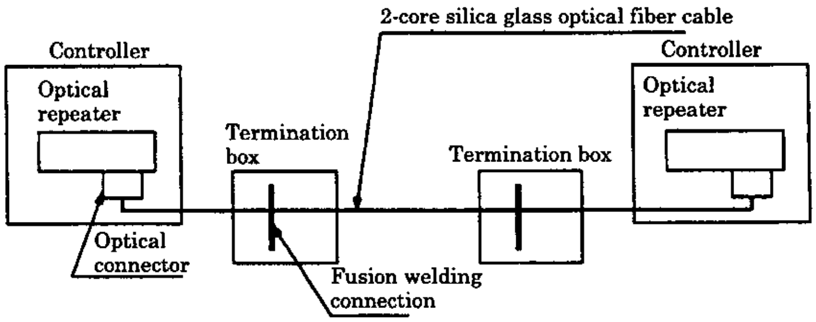
The following methods can be used for connecting an external silica glass optical fiber cable and in-panel optical repeater, or for connecting optical fiber cables from panel-to-panel.

> Note: Connecting two H-PCF cables is not allowed.

The maximum transmission distance differs depending on the connecting method (fusion welding or connectors) and the location of the connected position.
For the calculation of maximum transmission distance L, refer to 5.3 "Calculation for Max. Transmission Distance".

(1) Fusion welding

When using fusion welding to connect optical fiber cables inside the panel and outside the panel or to connect optical fiber cables from panel-to-panel. Install a termination box for processing. With this method, consider the connection loss 0.1 to 0.2 dB/connection (maximum 500 to 1000 m interval).

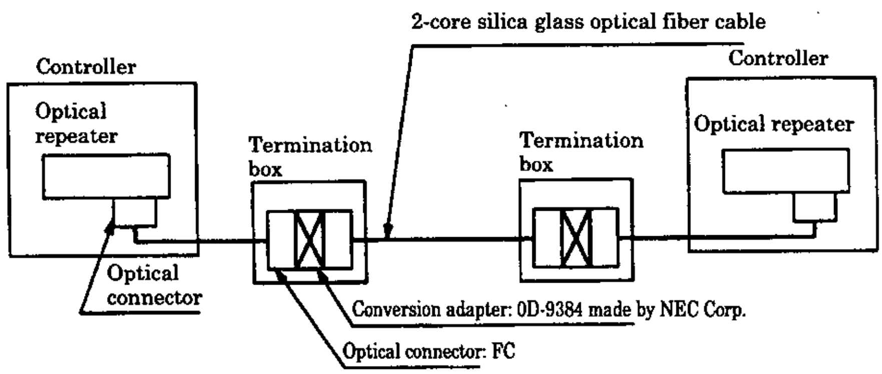


(2) Connectors

When using connectors on the cable with a conversion adapter to connect in-panel and outside the panel optical fiber cables or to connect optical fiber cables from panel-to-panel, install a termination box for processing.
With this method, the connection loss of the conversion adapter differs depending on the abrasion on the optical connector ferrule ends.

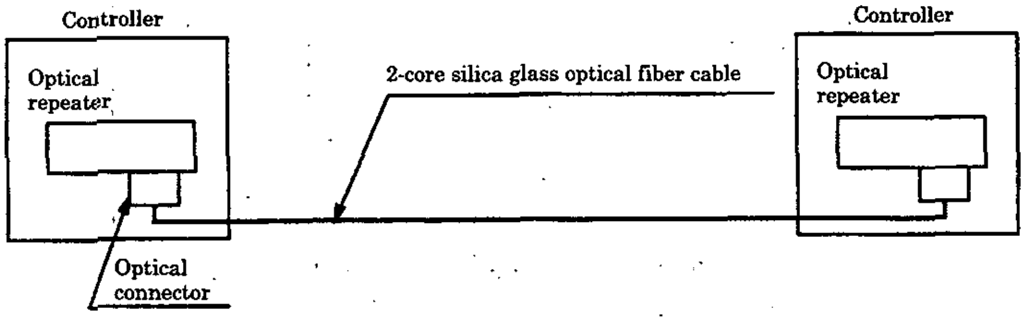
The relation between optical connector abrasion and the loss value is as follows.

- Loss with PC abrasion on FC connector: 0.8 dB/connection
- Loss with flat abrasion on FC connector: 1.2 dB/connection



(3) Direct connection

An optical fiber cable outside the panel is led in the panel to be directly connected.



5.3 Calculation for Max. Transmission Distance

The maximum transmission distance differs depending on the connecting method (fusion welding or connectors) and the location of the connection.

(1) Calculation for CP-215 REPEATER-TS2 maximum transmission distance

$$L = \frac{PL - Ps - Pa\ (dB)}{Pc\ (dB/Km)}\ (Km)$$

Under the condition,

$PL = Po - Pi - Pm\ (dB)$

$= -18 + 28 - 1.5$

$= 8.5\ (dB)$

Where PL : Optical sending/receiving allowable loss (8.5 dB)

Po : Optical sending level (−18 dBmp)

Pi : Optical receiving level (−28 dBmp)

Pm : System margin (1.5 dBmp)

Ps : Fusion welding connection loss (0.2 dB/connection)

Pa : Connector relay loss (1.2 dB/connection)

Pc : Optical fiber cable (GI-50/125, $\lambda = 850$ nm) loss (2.5 or 3.0 dB/Km)

(2) Calculation for CP-215 REPEATER-TS5 maximum transmission distance

$$L = \frac{PL - Ps - Pa\ (dB)}{Pc\ (dB/Km)}\ (Km)$$

Under the condition,

$PL = Po - Pi - Pm\ (dB)$

$= -22 + 29 - 1.5$

$= 5.5\ (dB)$

Where PL : Optical sending/receiving allowable loss (5.5 dB)

Po : Optical sending level (−22 dBmp)

Pi : Optical receiving level (−29 dBmp)

Pm : System margin (1.5 dBmp)

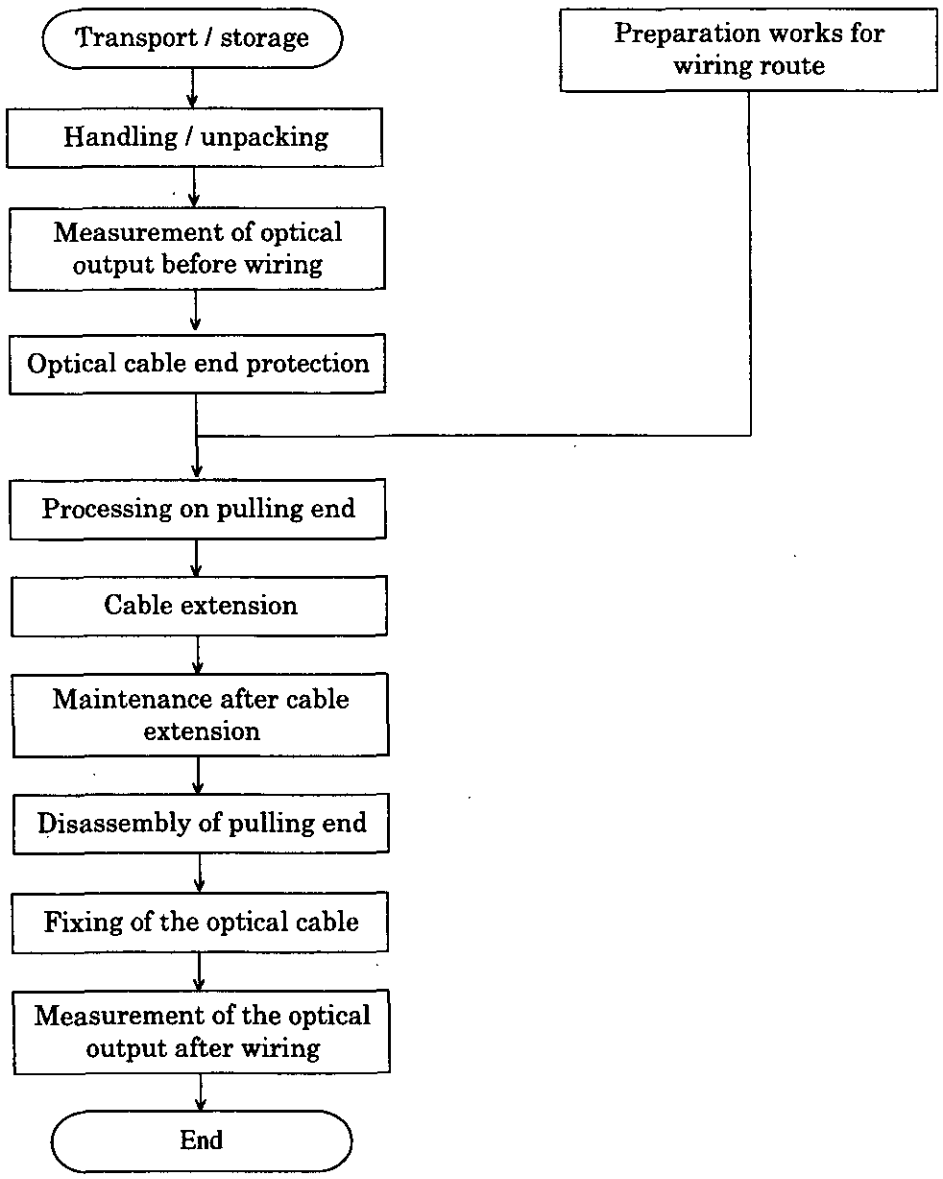
Ps : Fusion welding connection loss (0.2 dB/connection)

Pa : Connector relay loss (1.2 dB/connection)

Pc : Optical fiber cable (GI-50/125, $\lambda = 1300$ nm) loss (0.7 or 1.0 dB/Km)

.4 Procedures for Laying Optical Fiber Cables

When wiring indoor/outdoor optical fiber cables, first consult a company specializing in wiring or the cable manufacturer, and then lay the cables.
This section describes the procedures for laying optical fiber cables.



5.5 Precautions on Laying Optical Cables

The optical fiber cable can be basically treated in the same way as metalic cables when laying cabl
but take the following points into consideration.

■ General Precautions

- Do not apply any shock to a drum containing cable when handling or transporting
- When rolling a cable drum, roll in the direction indicated on the drum.
- Store drums indoors.
- Never lay a drum horizontally when loading.
- When extending a cable, be careful not to twist the cable.
- Do not step on the cables.

■ Precautions for optical fiber cable

- Do not apply excessive tension on cables.
  (The allowable tension differs depending on the cable structure. Refer to the specifications for each cable.)
- Do not bend an optical fiber cable more than the allowable degree.
  (The allowable bend radius differs depending on the cable structure. Refer to the specifications for each cable.)
- Because a welding-connection junction box is used to connect the cable, reserve 3 m minimum of extra cable on both ends.
- Differing from metal cables, the optical fiber cable is connected by a welding-connection junction box. Reserve a space of approx. 1 m×1 m for installation.

Components for Transmission Line

Specifications of Transmission Line Components

.1 CP-213 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*3	Applications	Manufacturer
Twisted pair cable	YS-IPEV-SB, 1P × 0.3 mm²*1	–	Pas1: 25 dB/km Z1 : 78 Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-SB, 3P × 0.3 mm²*1	–	Pas1: 28 dB/km Z1 : 78 Ω	In-panel duct for light electric appliances Exclusive cable for JC213A	Fujikura Corporation
	YS-IPEV-S (Cu), 1P × 1.25 mm²*2	–	Pas1: 12 dB/km Z1 : 77 Ω	Panel-to-panel duct for light electric appliances	Fujikura Corporation

*1 : According to the manufacturing specification No.II - 95J6015
*2 : According to the manufacturing specification No.II - 95J6015
*3 : Pas1 indicates the cable signal attenuation at 1 MHz. Z1 indicates the cable characteristic impedance at 1 MHz.
Note: When ordering, specify the type and length (in units of 500 m).

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
MR-8 connector	MR-8LM(G)	–	8-pin, male connector, with case	· Used when connecting CP-213IF module · Requires 1 connector per module.	Honda Communication Industries Co., Ltd.

■ Tap

Name	Type	Product code No.	Specifications	Applications	Manufacturer
TAP213S	–	87213-8010□	For connecting stations, with the MR-8LM (G)	· Used when connecting a station to a single-line bus · Branch length: 500 mm or less	Yaskawa Electric Corporation

■ Junction box

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC213	–	87213-8030□	Cable size conversion	· Used when converting in-panel/panel-to-panel cable size · Requires 21 boxes/panel.	Yaskawa Electric Corporation

■ JC213A exclusive cable

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC213A exclusive cable	—	87213-9100□	· For connecting a CP-7700 213IF module. · 3 m long	Connection cable for CP-7700	Yaskawa Electric Corporation

■ Terminator

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminal resistor	ERO-SICKF75R0	R002849	75 Ω ± 1 %, 1/2 W, 100 PPm/℃	· Install on both ends of the transmission line · Requires 2 terminators/one line	Yaskawa Electric Corporation

.2 CP-215 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*3	Applications	Manufacturer
Twisted pair cable	YS-IPEV-SB, 1P × 0.3 mm^{2}*1	–	Pas4: 60 dB/km Z4 : 75 Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-SB, 3P × 0.3 mm^{2}*1	–	Pas4: 58 dB/km Z4 : 75 Ω	In-panel duct for light electric appliances Exclusive cable for JC215-02	Fujikura Corporation
	YS-IPEV-S (Cu), 1P × 1.25 mm^{2}*2	–	Pas4: 23 dB/km Z4 : 77 Ω	In-panel duct for light electric appliances	Fujikura Corporation

*1 : According to the manufacturing specification No.II - 95J6015
*2 : According to the manufacturing specification No.II - 95J6015
*3 : Pas4 indicates the cable signal attenuation at 4 MHz. Z4 indicates the cable characteristic impedance at 4 MHz.
Note: When ordering, specify the type and length (in units of 500 m).

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
MR-8 connector	MR-8LM(G)	–	8-pin, male connector, with case	· Used when connecting and branching CP-215IF module · Requires 1 connector per module	Honda Communication Industries Co., Ltd.

■ Junction box

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC215-01	–	87215-8100□	Cable size conversion	· Used when converting in-panel and panel-to-panel cable size · Requires 2 boxes per panel	Yaskawa Electric Corporation
JC215-02	–	87215-8200□	· For connecting CP-215IF/AT module. · 3 m long	· Used when connecting ACGC4000 and CP-717	Yaskawa Electric Corporation

■ Terminator

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminal resistor	ERO-SICKF75R0	R002849	75 Ω ± 1 %, 1/2 W, 100 PPm/ ℃	· Install on both ends of the transmission line · Requires 2 terminators per one line	Yaskawa Electric Corporation

Note: Prepare a relay terminal block to install a terminator

■ In-panel cable with connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC215-02 exclusive cable	—	87215-9900□	· With MR-8LF (G)/D-SUB 9-pin on both ends · Twisted pair cable with connector · 3 m long	Connecting cable between ACGC400 and JC215-02 and between CP-717 and JC215-02	Yaskawa Electric Corporation

3 CP-216 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*3	Applications	Manufacturer
Twisted pair cable	YS-IPEV-SB, 1P × 0.3 mm^2*1	–	Pas4: 60 dB/km Z4 : 75 Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-S(Cu), 1P × 1.25 mm^2*2	–	Pas4: 22 dB/km Z4 : 77 Ω	In-panel duct for light electric appliances	Fujikura Corporation

*1 : According to the manufacturing specification No.II - 95J6015

*2 : According to the manufacturing specification No.II - 95J6015

*3 : Pas4 indicates the cable signal attenuation at 4 MHz. Z4 indicates the cable characteristic impedance at 4 MHz.

Note: When ordering, specify the type and length (in units of 500 m).

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
MR-8 connector	MR-8LM(G)	–	8-pin, female connector, with case	· Used when connecting and branching the CP-216IF module · Requires 1 connector per module	Honda Communication Industries Co., Ltd.

■ Junction box

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC215-01	–	87215-8100□	Cable size conversion	· Used when converting in-panel and panel-to-panel cable size · Requires 2 boxes per panel	Yaskawa Electric Corporation

■ Terminator

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminal resistor	ERO-SICKF75R0	R002849	75 Ω ± 1 %, 1/2 W, 100 PPm/ ℃	· Install on both ends of the transmission line · Requires 2 terminators per one line	Yaskawa Electric Corporation

Note: Prepare a relay terminal block to install a terminator

1.4 CP-217 Transmission Line Components

1.4.1 CP-217 RS-485 Transmission Line Components

■ **Cable**

Name	Type	Product code No.	Specifications*3	Applications	Manufacturer
Twisted pair cable	YS-IPEV-SB, 1P×0.3 mm²*1	–	Pas1: 25 dB/km Z1 : 78Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-SB, 3P×0.3 mm²*1	–	Pas1: 28 dB/km Z1 : 78Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-S(Cu), 1P×1.25 mm²*2	–	Pas1: 12 dB/km Z1 : 77Ω	In-panel duct for light electric appliances	Fujikura Corporation

*1 : According to the manufacturing specification No.II - 95J6015

*2 : According to the manufacturing specification No.II - 95J6015

*3 : Pas1 indicates the cable signal attenuation at 4 MHz. Z1 indicates the cable characteristic impedance at 1 MHz.

Note: When ordering, specify the type and length (in units of 500 m).

■ **Connector**

Name	Type	Product code No.	Specifications	Applications	Manufacturer
MR-8 connector	MR-8LM (G)	–	8-pin, male connector, with case	· Used when connecting and branching the CP-217IF module · Requires 1 connector per module	Honda Communicatio Industries Co Ltd.

■ **Terminator**

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminal resistor	ERO-SIPKF1200	R002854	120 Ω ±1 %, 1/2 W, 100 PPm/℃	· Install on both ends of the transmission line · Requires 2 terminators per one line	Yaskawa Electric Corporation

Note: When not using 120 Ω terminator inside the CP-217 module, prepare a relay terminal block to install a terminator.

1.4.2 CP-217 RS-232 Transmission Line Components

■ **Connector**

Name	Type	Product code No.	Specifications	Applications	Manufacturer
DSUB25A connector	17JE-23250-02 (D8A)	–	D-SUB 25-pin, male connector, M2.6 mounting screws	For CP-316/217	Daiichi Electronic Industries Co Ltd.
DSUB25B connector	17JE-23250-02 (D8B)	–	D-SUB 25-pin, male connector, M3 mounting screws	–	Daiichi Electronic Industries Co Ltd.
DSUB9A connector	17JE-23090-02 (D8A)	–	D-SUB 9-pin, male connector, M2.6 mounting screws	–	Daiichi Electronic Industries Co Ltd.
DSUB9B connector	17JE-23090-02 (D8B)	–	D-SUB 9-pin, male connector, M3 mounting screws	–	Daiichi Electronic Industries Co Ltd.

.5 CP-218 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*1	Applications	Manufacturer
Coaxial cable	EC-06D-A	–	Pas10: 8.5 dB/ 500 m Z10: 50±2Ω	Indoor-use	Mitsubishi Cable Industries, LTD.

*1 : Pas10 indicates the cable signal attenuation at 10 MHz. Z10 indicates the cable characteristic impedance at 10 MHz.

■ Transceiver

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Transceiver mounting tool	ET10081	–	For 1 channel (1CH)	Cable direct connection	Mitsubishi Cable Industries, LTD.
	EZ1000B	–	–	For ET10081	
Transceiver cable *2	DAISET-1581B	–	Standard cable length: 3, 5, 10, and 15 m	For in-panel use with a D-SUB 15-pin connector	

*2 : When ordering, specify the type and length.

■ Grounding terminal

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Grounding terminal for coaxial cable	EA11GND	–	For EC-06D-A	Protective grounding	Mitsubishi Cable Industries, LTD.

■ Terminal connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminator	EA10NJT	–	N receptacle connector, 50Ω	· Install on both ends of the transmission line · Requires 2 terminators per line	Mitsubishi Cable Industries, LTD.

■ Coaxial cable with connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Coaxial cable with connector *2	EC-06D-A with N connector on both ends	–	N plug connector : EA06 with NPC	For indoor use	Mitsubishi Cable Industries, LTD.

*2 : When ordering, specify the type and length.

1.6 CP-225 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*1	Applications	Manufacturer
Coaxial cable	2.5C-2V	—	Z1: 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	5C-2V	—	Z1: 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	5C-2V (Cu, Fe)-ZV	—	Z1: 75Ω	Duct for panel-to-panel light electric appliances	Fujikura Corporation

*1 : Z1 indicates the cable characteristic impedance at 1 MHz.

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
NC connector	NC-P-5-NiCAu	—	For 5C-2V	For in-panel use	Fujikura Corporation

■ Tap

Name	Type	Product code No.	Specifications	Applications	Manufacturer
TAP-1	—	87225-8010□	Model for G	· Requires 1 tap per module for connecting a CP-317 225IF module · Use with a J-BOX · Connect TAP-1 and J-BOX with a 2.5C-2V cable with a G connector	Yaskawa Electric Corporation
J-BOX	—	87225-8000□	G/N connector conversion		
TAP-2	—	87225-8020□	NC model	Required for a module when connecting a CP-317 225IF module	Yaskawa Electric Corporation

■ Terminal connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminator	NC 75Ω	R002495	NC, 75Ω, 1W	· Install on both ends of the transmission line · Requires 2 connectors per 1 line	Fujikura Corporation

■ Coaxial cable with connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
In-panel coaxial cable	2.5C-2V with a GS-P-2.5V on both ends	—	· 2.5C-2V cable with G connector on both ends · Cable length to be specified	For connecting a TAP-01 and a J-BOX in panel For in-panel use	Fujikura Corporation
	5C-2V with an NC-P-5 on both ends	—	· 5C-2V cable with NC connector on both ends · Cable length to be specified		

.7 CP-2500 Transmission Line Components

■ Cable

Name	Type	Product code No.	Specifications*1	Applications	Manufacturer
Coaxial cable	3C-2V	–	Pas4: 25 dB/km Z4 : 75 Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	3C-2V (Cu, Fe)-ZV	–	Pas4: 25 dB/km Z4 : 75 Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	5C-2V (Cu, Fe)-ZV	–	Pas4: 16 dB/km Z4 : 75 Ω	Duct for panel-to-panel light electric appliances	Fujikura Corporation
	7C-FB (CU, Fe)-ZV	–	Pas4: 10 dB/km Z4 : 75 Ω	Duct for panel-to-panel light electric appliances	Fujikura Corporation
	7C-FL (Cu, Fe)-ZV	–	Pas4: 8.1 dB/km Z4 : 75 Ω	Duct for panel-to-panel light electric appliances	Fujikura Corporation

*1 : Pas4 indicates the signal attenuation at 4 MHz, and Z4 indicates the cable characteristic impedance at 4 MHz.

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
BNC connector	BNC-P-3-Ni-CAu	YCN006648	For 3C-2V	For in-panel use	Daiichi Electronic Industries Co., Ltd.
F type connector	FSPW-5-Ni-CAu	YCN000144	For 5C-2V	For panel-to-panel use	Fujikura Corporation
	F-7FB	YCN000146	For 7C-FB	For panel-to-panel use	Fujikura Corporation
	FSPW-7-Ni-CAu	YCN000145	For 7C-FL	For panel-to-panel use	Fujikura Corporation

■ Connector for branching

Name	Type	Product code No.	Specifications	Applications	Manufacturer
T type connector	BNC-TA-JAJ-Ni-CAu	YCN006650	For BNC	· Used when connecting a CP-2500IF module and branching. · Requires 1 connector per module	Daiichi Electronic Industries Co., Ltd.

■ Conversion connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Conversion adapter	T-0298	YCN005244	BNC/F connector conversion	· Used when converting in-panel/panel-to-panel cable size · Requires 2 adapters per panel	DX ANNTENA Co., Ltd.

Intermediate connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Intermediate connector	F-A	YCN005244	For connecting F connectors	For connecting panel-to-panel cables	Fujikura Corporation

Note: When using an intermediate connector, bind self-adhesive tape on the coaxial cable's relay section to make it waterproof. Insulate it so it does not need to be grounded.

Terminal connector

Name	Type	Electrical product code No.	Specifications	Applications	Manufacturer
Terminator	BNC-RC-75-Ni-CAu	YCN006647	BNC, 75Ω, 1 W	· Install on both ends of the transmission line · Requires 2 connectors per 1 line	Daiichi Electronic Industries Co. Ltd.

Coaxial cable with BNC connector

Name	Type	Electrical product code No.	Specifications	Applications	Manufacturer
In-panel coaxial cable	JZMSZ-W60-1	—	· 3C-2V cable with BNC connector on both ends · 2 m long	For in-panel use	Yaskawa Electric Corporation

.8 CP-215 Repeater Transmission Line Components

.8.1 For CP-215 REPEATER-TT

■ Cable

Name	Type	Product code No.	Specifications*3	Applications	Manufacturer
Twisted pair cable	YS-IPEV-SB, 1P×0.3 mm²*1	–	Pas4: 60 dB/km Z4 : 75Ω	In-panel duct for light electric appliances	Fujikura Corporation
	YS-IPEV-S(Cu), 1P× 1.25 mm²*2	–	Pas4: 22 dB/km Z4 : 77Ω	In-panel duct for light electric appliances	Fujikura Corporation

*1 : According to the manufacturing specification No.II - 95J6015

*2 : According to the manufacturing specification No.II - 95J6015

*3 : Pas4 indicates the cable signal attenuation at 4 MHz. Z4 indicates the cable characteristic impedance at 4 MHz.

Note: When ordering, specify the type and length (in units of 500 m).

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
MR-8 connector	MR-8LM (G)	–	8-pin, male connector, with case	· Used when connecting a CP-215 repeater and branching · Requires 1 connector per repeater	Honda Communication Industries Co., Ltd.

■ Junction box

Name	Type	Product code No.	Specifications	Applications	Manufacturer
JC215-01	–	87215-8100□	Cable size conversion	· Used when converting in-panel and panel-to-panel cable size · Requires 2 boxes per panel	Yaskawa Electric Corporation

■ Terminator

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminator	ERO-SICKF75R0	R002849	75Ω ±1 %, 1/2 W, 100 PPm/℃	· Install on both ends of the transmission line · Requires 2 terminators per line	Yaskawa Electric Corporation

Note: Prepare a relay terminal block to install a terminator

1.8.2 For CP-215 REPEATER-TC

■ Cable

Name	Type	Product code No.	Specifications*1	Applications	Manufacturer
Coaxial cable	3C-2V	–	Pas4: 25 dB/km Z4 : 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	3C-2V (Cu, Fe)-ZV	–	Pas4: 25 dB/km Z4 : 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	5C-2V (Cu, Fe)-ZV	–	Pas4: 16 dB/km Z4 : 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	7C-FB (CU, Fe)-ZV	–	Pas4: 10 dB/km Z4 : 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation
	7C-FL (Cu, Fe)-ZV	–	Pas4: 8.1 dB/km Z4 : 75Ω	Duct for in-panel light electric appliances	Fujikura Corporation

*1 : Pas4 indicates the signal attenuation at 4 MHz, and Z4 indicates the cable characteristic impedance at 4 MHz.

Note: When ordering, specify the type and length (in units of 500 m).

■ Connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
BNC connector	BNC-P-3-Ni-CAu	YCN006648	For 3C-2V	For in-panel use	Daiichi Electronic Industries Co Ltd.
F connector	FSPW-5-Ni-CAu	YCN000144	For 5C-2V	For panel-to-panel use	Fujikura Corporation
	F-7FB	YCN000146	For 7C-FB	For panel-to-panel use	Fujikura Corporation
	FSPW-7-Ni-CAu	YCN000145	For 7C-FL	For panel-to-panel use	Fujikura Corporation

■ Connector for branching

Name	Type	Product code No.	Specifications	Applications	Manufacturer
T connector	BNC-TA-JAJ-Ni-CAu	YCN006650	For BNC	· Used when connecting a CP-2500IF module and branching · Requires 1 connector per module	Daiichi Electronic Industries Co Ltd.

■ Conversion connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Conversion adapter	T-0298	YCN005244	BNC/F type connector conversion	· Used when converting in-panel and panel-to-panel cable size · Requires 2 adapters per panel	DX ANNTENA Co., Ltd.

■ Intermediate connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Intermediate connector	F-A	YCN005279	For connecting F connectors	For connecting panel-to-panel cables	Fujikura Corporation

Note: When using an intermediate connector, bind self-adhesive tape on the coaxial cable's relay section to make it waterproof, and insulate it so it does not need to be grounded.

■ Terminal connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
Terminator	BNC-RC-75-Ni-CAu	YCN006647	BNC, 75Ω, 1W	· Install on both ends of the transmission line · Requires 2 connectors per 1 line	Daiichi Electronic Industries Co., Ltd.

■ Coaxial cable with BNC connector

Name	Type	Product code No.	Specifications	Applications	Manufacturer
In-panel coaxial cable	JZMSZ-W60-1	—	· 3C-2V cable with BNC connector on both ends. · 2 m long	For in-panel use	Yaskawa Electric Corporation

1.8.3 For CP-215 REPEATER-TP

■ H-PCF optical fiber code/cable with optical connector

Type (made by Sumitomo Electric Industries, Ltd.)	Application	External specifications
DL92 (DIV-L) *1 (L = 0 to 650 m)	In-panel code with crimpcut connector on both ends Indoor-use code	Without sheath
DL92 (2-FOD-V)-0.2-L *2 (L = 0 to 650 m)	Indoor-use reinforced cable with crimpcut connector on both ends	Vinyl sheath
DL92 (2-D-V)-0.2-L *2 (L = 0 to 650 m)	Indoor-use code collective cable with crimpcut connector on both ends	Vinyl sheath and cable tension member
DL92H (2-D-V)-0.2-L *2 Non-standard cable (Used when L = 650 to 850 m)	Indoor-use code collective cable with adhesive grated connector on both ends	Vinyl sheath and cable tension member
DL92 (2-D-LAP)-0.2-L *2 (L = 0 to 650 m)	Outdoor-use code collective cable with crimpcut connector on both ends	LAP sheath and tension member
DL92H (2-D-LAP)-0.2-L *2 Non-standard cable (Used when L = 650 to 850 m)	Outdoor-use code collective cable with adhesive grated connector on both ends	Lap sheath and tension member

*1 : L is 0.3, 1, or 5 m. For 10 m or more, specify the length (in units of 5 m).
*2: L is 1, 3, or 5 m. For 10 m or more, specify the length (in units of 5 m).
Note: For more detailed specifications, refer to Appendix H-1 "H-PCF Cable Specifications".
Note: The above H-PCF optical fiber codes/cables are available from Yaskawa Control Co., Ltd.

8.4 For CP-215 REPEATER-TS2

■ Silica optical fiber code/cable

Item	Type (made by Sumitomo Electric Industries, Ltd.)	Application	Appendix H-2 Spec. No.	External specifications
1	CVS-EG-5/3002,L *1	In-panel single-core code	(1)	Without sheath, only code
2	CVS-EG-5/3002,L with FC connector on one end *2	In-panel single-core code with FC connector on one end	(1)	Without sheath
3	CVS-EG-5/3002,L with FC connector on both ends *2	In-panel single-core code with FC connector on both ends	(1)	Without sheath
4	2GI-C-V-NM, (EG-5/3002),L *1	Indoor-use 2-core cable (for rack and trough)	(2)	Vinyl sheath and cable
5	2GI-GS-V-NM, (EG-5/3002),L *1	Indoor-use 2-core cable (for rack, trough, and wire piping)	(3)	Polyethylene sheath and cable
6	2GI-L-4C-LAP, (EG-5/3002) *1	Outdoor-use 2-core cable (for rack, trough, and wire piping)	(4)	LAP sheath and cable
7	2GI-C-LAP, (EG-5/3002),L *1	Indoor-use 2-core cable (for rack, trough, and wire piping)	(5)	LAP sheath and cable
8	2GI-C-V-NM, (EG-5/3002),L with FC connector on both ends *3 *4	Indoor-use 2-core code with FC connector on both ends (for rack and trough)	(5)	LAP sheath
9	2GI-C-LAP, (EG-5/3002), L with FC connector on both ends *3 *4	Outdoor-use 2-core code with FC connector on both ends (for rack, trough, and wire piping)	(5)	LAP sheath
10	2GI-L-4C-LAP-MAZE, (EG-5/3002), L *1	Burid-underground-use 2-core cable	–	Armored with steel pipe
11	2GI-L-4C-LAP-(iron wire armored), (EG-5/3002), L	Under-water-use 2-core cable	–	Armored with steel pipe

*1: L is 100, 200, 400, or 1000 m.
*2: L is 0.3, 1, 3, or 5 m. For 10 m or more, specify the length (in units of 5 m).
*3: L is 1, 3, or 5 m. For 10 m or more, specify the length (in units of 5 m).
*4: A pulling eye for protecting the optical connector can be attached upon request by adding -P at the end of the type requsted in an order.

Note: 1. When connecting an optical connector and an optical fiber cable on site, specify the length remembering to add extra length on both ends.
2. For special orders, refer to Appendix H-4 "Specification of Detailed Type for Order".
3. Do not apply excessive tension or lateral pressure on codes.
4. Specify a LAP sheath for outdoor use.
5. Since the outer surface of the cable is PVC, we recommend that you cover the cable with PE (polyethylene) if exposure to oil chemical products is possible.

1.8.5 For CP-215 REPEATER-TS5

■ Silica optical fiber code/cable

Item	Type (made by Sumitomo Electric Industries, Ltd.)	Application	Appendix H-3 Spec. No.	External specifications
1	CVS-EG-5/0702,L *1	In-panel single-core code	(1)	Without sheath, only code
2	CVS-EG-5/0702,L with FC connector on one end *2	In-panel single-core code with FC connector on one end	(1)	Without sheath
3	CVS-EG-5/0702,L with FC connector on both ends *2	In-panel single-core code with FC connector on both ends	(1)	Without sheath
4	2GI-C-V-NM, (EG-5/0702),L *1	Indoor-use 2-core cable (for rack and trough)	(2)	Vinyl sheath and cable
5	2GI-GS-V-NM, (EG-5/0702),L *1	Outdoor-use 2-core cable (for rack, trough, and wire piping)	(3)	Polyethylene sheath and cable
6	2GI-L-4C-LAP, (EG-5/0702) *1	Outdoor-use 2-core cable (for rack, trough, and wire piping)	(4)	LAP sheath and cable
7	2GI-C-LAP, (EG-5/0702),L *1	Outdoor-use 2-core cable (for rack, trough, and wire piping)	(5)	LAP sheath and cable
8	2GI-C-V-NM, (EG-5/0702),L with FC connector on both ends *3 *4	Indoor-use 2-core code with FC connector on both ends (for rack and trough)	(5)	LAP sheath
9	2GI-C-LAP, (EG-5/0702),L with FC connector on both ends *3 *4	Indoor-use 2-core code with FC connector on both ends (for rack, trough, and wire piping)	(5)	LAP sheath
10	2GI-L-4C-LAP-MAZE, (EG-5/0702),L *1	Burid-underground-use 2-core cable	–	Armored with steel pipe
11	2GI-L-4C-LAP-(iron wire armored), (EG-5/0702), L	Under-water-use 2-core cable	–	Armored with steel pipe

*1: L is 100, 200, 500, or 1000 m.
*2: L is 0.3, 1, 3, or 5 m. For 10 m or more, specify the length (in units of 5 m).
*3: L is 1, 3, or 5 m. For 10 m or more, specify the length (in units of 5 m).
*4: A pulling eye for protecting the optical connector can be attached upon request by adding -P at the end of the type requested in an order.

Note: 1. When a connection work of optical connector and optical fiber cable is performed at the spot, specify the length to reserve extra length on both ends.
: 2. For special orders, refer to Appendix H-4 "Detailed Specification of Type to Order".
: 3. Do not apply excessive tension or lateral pressure on codes.
: 4. Specify a LAP sheath for outdoor use.
: 5. Since the outer surface of cable is PVC, it is recommended to cover with PE (polyethylene where oil and chemical products that affects PVC, exist.

.9 Components for MECHATROLINK transmission line

■ Cable

Name	Type	Product code No.	Length (m)	Manufacturer
MECHATROLINK cable with USB connectors on both ends	JEPMC-W6000-A3	DUF006810	0.3 m	Yaskawa Electric Corporation
	JEPMC-W6000-A5	DUF007820	0.5 m	
	JEPMC-W6000-01	DUF007550	1 m	
	JEPMC-W6000-03	DUF007560	3 m	
	JEPMC-W6000-05	DUF007570	5 m	
	JEPMC-W6000-10	DUF007580	10 m	
	JEPMC-W6000-20	DUF007590	20 m	
	JEPMC-W6000-30	DUF007600	30 m	
MECHATROLINK cable with USB connector on one end (bare cable on the other end)	JEPMC-W6010-01	DUF006820	1 m	Yaskawa Electric Corporation
	JEPMC-W6010-03	DUF006830	3 m	
	JEPMC-W6010-05	DUF006840	5 m	
	JEPMC-W6010-07	DUF007610	7 m	
	JEPMC-W6010-10	DUF007620	10 m	
	JEPMC-W6010-15	DUF007630	15 m	
	JEPMC-W6010-20	DUF007640	20 m	
	JEPMC-W6010-30	DUF007650	30 m	
	JEPMC-W6010-40	DUF007660	40 m	
	JEPMC-W6010-50	DUF007670	50 m	
MECHATROLINK cable without connector	DE9411358-1	DUA083130	10 m	Yaskawa Electric Corporation
	DE9411358-2	DUA083140	20 m	
	DE9411358-3	DUA083150	30 m	
	DE9411358-4	DUA083160	40 m	
	DE9411358-5	DUA083170	100 m	
	DE9411358-6	DUA083180	200 m	

Cable: SS-92026 made by Daiichi Denko Co., Ltd.
Characteristic impedance between cable cores: Approx. 120 Ω at 4 MHz
Cable signal attenuation: 40 dB/km at 4 MHz

■ Connector

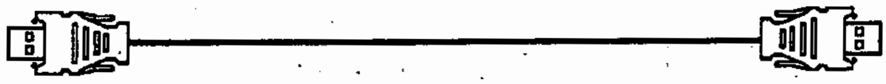
Name	Type	Product code No.	Specifications	Applications	Manufacturer
USB connector	DUSB-APA41-B1-C50	—	4-pin, USB connector, with case	Used when connecting the USB type MECHATROLINK module	Daiichi Electronic Industries Co., Ltd.

■ Terminator

Name	Type	Product code No.	Specifications	Applications	Manufacturer
USB terminator	JEPMC-W6020	DUF6950	120 Ω	Install on both ends of the transmission line	Yaskawa Electric Corporation

■ Cable's external view for the MECHATROLINK

Model: JEPMC-W6000□□



Model: JEPMC-W6010□□

■ External view of USB terminator

Model: JEPMC-W6020

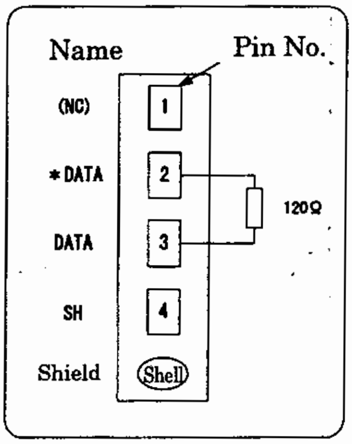


Fig. 26 USB Terminator Connection Diagram

Cable Specifications

H-PCF Cable Specifications

Item \ Spec. No.		(1)	(2)	(3)	(4)
Cable type and form		2-core code cable	Indoor use reinforced cable	Indoor use code collective cable	Outdoor use LAP sheath cable
Typical product		DLV-HD-20/07	2-FOD-V	2-D-V	2-D-LAP
Optical fiber		Plastic coated multi-mode optical fiber (made by Sumitomo Electric Industries, Ltd., type H-PCF and SI			
Transmission loss		Max. 7 dB/km (at ambient temperature 25 ℃) at wave length λ =850 nm			
Core/Clad		Material: Silica glass, diameter: 200±5 μ m Material: Acrylate fluoride resin, diameter: 250±5 μ m			
Number of apertures (NA)		Approx. 0.4			
Transmission band zone		14.5 MHz at λ = 850 nm			
Number of cores		2			
Tension member		None		Material: Plastic coated steel wire Outer diameter: 2.4 mm	
Sheath		Orange heat-resistant PVC	Orange heat-resistant vinyl sheath	Black heat-resistant vinyl sheath	Black LAP sheath
Finish outer diameter		4.3 mm	8.4 mm	13.7 mm	15.1 mm
Approx. weight		15 kg/km	50 kg/km	150 kg/km	170 kg/km
Storage temperature	Maximum	70 ℃	70 ℃	70 ℃	70 ℃
	Minimum	−40 ℃	−40 ℃	−40 ℃	−40 ℃
Operation temperature	Maximum	60 ℃	60 ℃	60 ℃	60 ℃
	Minimum	−10 ℃	−10 ℃	−10 ℃	−10 ℃
Max. allowable tension *		20 kg	30 kg	75 kg	75 kg
Allowable bend radius	Temporary bend (without load)	15 mm	25 mm	50 mm	50 mm
	Long-duration bend (without load)	45 mm	50 mm	100 mm	100 mm
Max. allowable instantaneous lateral pressure		Not allowed	50 kg/50 mm	100 kg/50 mm	100 kg/50 mm

*: 1. Temporary tension when laying cables. The allowable tension on the optical connector neck is 2 kg.
2. The applicable optical connector is DL-92 or DL-92H (complied to JIS C 5977 F08).

2 Specifications for Silica Fiber Code/Cable for Short Wave (GI-50/125, λ = 850 nm)

Item		Spec. No. (1)	(2)	(3)	(4)	(5)
Cable type and form		Single-core code	Indoor-use cable	Outdoor-use cable	Outdoor-use cable	Outdoor-us cable
Standard type (made by Sumitomo Electric Industries, Ltd.)		CSV-EG-5/3002	2GI-C-V-NM	2GI-GS-E-NM	2GI-L-4C-LAP	2GI-C-LA
Optical fiber core wire specification	Optical fiber	GI (grated index)				
	Transmission loss	3.0 dB/km or less (λ = 850 nm)				
	Transmission band zone	200 MHz · km or more				
	Core/Clad	Material: Silica glass, diameter: 50±3 μm Material: Silica glass, diameter: 125±3 μm				
	Number of apertures (NA)	0.21±0.02				
Number of cores		1	2			
Sheath		Black PVC	Black PVC	Black PE	Black PE	Black PE
Tension member		None	1.2 mm dia. FRP	4.5 mm dia. FRP	PE coated 2.3 mm dia. steel wire	PE coated mm dia. st wire
Finish outer diameter (mm)		3	11	14	12	12
Approx. weight (kg/km)		9	110	140	130	115
Storage temperature (℃)	Max.	0	0	−20	−20	0
	Min.	60	60	60	60	60
Operation temperature (℃)	Max.	0	0	−20	−20	0
	Min.	60	60	60	60	60
Max. allowable tension (kg) (Temporary tension when laying cable) *		15	50	150	150	50
Allowable bend radius (mm)	Temporary bend (without load)	30	120	450	120	120
	Long-duration bend (without load)	60	240	450	240	240
Max. allowable temporary lateral pressure (kg/50 mm)		Not allowed	Not allowed	150	100	100

*: 1. The allowable tension on the optical connector neck is 2 kg.
2. The applicable optical connector is FC connector (complied with JIS C 5970 F01).
3. For the cable specifications other than those above, contact your Yaskawa representative.
4. When using a cable from another manufacturer, refer to the above optical fiber core wire specifications.

Specifications of Silica Fiber Code/Cable for Long-Wave (GI-50/125, λ = 1300 nm)

Item \ Spec. No.		(1)	(2)	(3)	(4)	(5)
Cable type and form		Single-core code	Indoor-use cable	Indoor-use cable	Outdoor-use cable	Outdoor-use cable
Standard type (made by Sumitomo Electric Industries, Ltd.)		CSV-EG-5/0702	2GI-C-V-NM	2GI-GS-E-NM	2GI-L-4C-LAP	2GI-C-LAP
Optical fiber core wire specification	Optical fiber	GI (grated index)				
	Transmission loss	0.7 dB/km or less (λ =1300 nm)				
	Transmission band zone	200 MHz · km or more				
	Core/Clad	Material: Silica glass, diameter: 50±3 μ m Material: Silica glass, diameter: 125±3 m				
	Number of apertures (NA)	0.21±0.02				
Number of cores		1	2			
Sheath		Black PVC	Black PVC	Black PE	Black PE	Black PE
Tension member		None	1.2 mm dia. FRP	4.5 mm dia. FRP	PE coated 2.3 mm dia. steel wire	PE coated 1.0 mm dia. steel wire
Finish outer diameter (mm)		3	11	14	12	12
Approx. weight (kg/km)		9	110	140	130	115
Storage temperature (℃)	Max.	0	0	−20	−20	0
	Min.	60	60	60	60	60
Operation temperature (℃)	Max.	0	0	−20	−20	0
	Min.	60	60	60	60	60
Max. allowable tension (kg) (Temporary tension when laying cable) *		15	50	150	150	50
Allowable bend radius (mm)	Temporary bend (without load)	30	120	450	120	120
	Long-duration bend (without load)	60	240	450	240	240
Max. allowable temporary lateral pressure (kg/50 mm)		Not allowed	Not allowed	150	100	100

*: 1. The allowable tension on the optical connector neck is 2 kg.
2. The applicable optical connector is an FC connector (complied with JIS C 5970 F01).
3. For the cable specifications other than those above, contact your Yaskawa representative.
4. When using a cable form another manufacturer, refer to the above optical fiber core wire specifications.

4 Detailed Specification of Model to Order

(1) Optical fiber core wire

Optical fiber core wire: EG - 5 / 10 02

- 02 → Transmission band zone (unit: 100 MH
  - 02:200 MHz
- 10 → Transmission loss (unit: 0.1 dB/km)
  - 07:0.7 dB/km (λ = 1300 nm)
  - 10:1.0 dB/km (λ = 1300 nm)
  - 25:2.5 dB/km (λ = 850 nm)
  - 30:3.0 dB/km (λ = 850 nm)
- 5 → Core diameter (unit: 10 μ m)
  - 5:50 μ m (EG)
- EG → Optical fiber type
  - EG: Silica grated

(2) In-panel code

Optical fiber cord: CS V - EG - 5 / 1002, L

- EG - 5 / 1002 → Type of Optical fiber core wire
- V → Code sheath material
  - V: PVC
- CS → Single core cord

(3) Indoor or Outdoor cable

Optical fiber cable: n GI - C - 4C - V - NM - SSD (EG - 5 / 1002), L

- (EG - 5 / 1002) → Optical fiber core
- SSD → Special sheath armor
  - SSD: Self-supporting daru sheath (suspension)
  - MAZE: Steel pipe armor
- NM → NM: Non-metallic type (Non-metallic structure)
  - Blank: Metallic type (Structure contains metal)
- V → Sheath material
  - V: PVC (indoor-use)
  - E: PE (outdoor-use)
  - LAP: LAP (outdoor-use)
- 4C → Indicates the number of cores. Specify for twisted sheaths
- C → Configuration
  - C: Cord type (optical fiber cord collected configuration)
  - L: Twisted type (optical fiber core wire colle configuration)
  - GS: Special type (Configuration with GS structur protect optical fiber core wire)
- GI → Optical-fiber type
  - GI: Multimode fiber core
- n → n: Number of optical fiber cores (1 to 6)

Trouble Record Sheet

CP-9200SH Failure Report

Prepared on: ____________________

Prepared by: ____________________

Name of customer	
Department in which equipment is installed	
Name of equipment	
Name of device	
Date of start of operations	
Date of occurrence of fault Hours・Minutes・Seconds	
Past history of failures and problems	
Circumstances or operation performed (immediately) prior to the occurrence of failure	
Circumstances of failure (phenomenon)	
Actions taken against the failure	
Remarks Noted points, points which were noted from before, etc.	

Scan Time Settings

Set Item		Indicated Data
High-speed scan time	Set value [ms]	
	Max. value [ms]	
	Current value [ms]	
Low-speed scan time	Set value [ms]	
	Max. value [ms]	
	Current value [ms]	
Start-up scan drawing	Number of steps [step]	
Interrupt scan drawing	Number of steps [step]	
User functions	Number of steps [step]	
Total number of steps	Number of steps [step]	
Program memory size	[bytes]	
Remaining program memory	[bytes]	

■ 9200SH CPU Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RDY			
RUN			
ALM			
ERR			
BAT ALM			
BUS ACCESS			

Dip Switches (SW1)

	Left (OFF)	Right (O
L.RST		
RUN		
INIT		
TEST		
—		
MULTI		
FLASH		
M.RST		

■CP-213IF Module

Indicator Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
Tx			
Rx			

Dip Switches (SW2)

	Left (ON)	Right (OFF)
MSTR		
SYN		
SA0		
SA1		
SA2		
SA3		
SA4		
AUX		

■CP-215IF Module

Indicator Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX			
RX			

Dip Switches (SW4)

	Left (ON)	Right (OFF)
BRS0		
BRS1		
INIT		
TEST		

Rotary Switches (SW2)

	Setting
ADRS × 1	

Rotary Switches (SW3)

ADRS × 10	

Dip Switches (SW5)

	Left (ON)	Right (OFF)
NET A0		
NET A1		
NET A2		
NET A3		
NET A4		
NET A5		
NET A6		
NET A7		

■ CP-216IF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX			

Dip Switches (SW2)

	Left (ON)	Right (OF
—		
—		
TEST 1		
TEST 2		

■ CP-217IF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX 1			
TX 2			
TX 3			

Dip Switches (SW2)

	Left (ON)	Right (OF
INIT		
TEST		
TXT		
RXT		

■ CP-218IF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX			
RX			
COL			

Dip Switches (SW2)

	Left (ON)	Right (OF
—		
—		
—		
TEST		

CP-225IF Module

Indicator Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX			
RX			

CP-2500IF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
TX			
RX			

Dip Switches (SW2)

	Left (ON)	Right (OFF)
—		
—		
—		
TEST		

EXIOIF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			

Dip Switches (SW2)

	Left (ON)	Right (OFF)
—		
—		
MODE		
RST		

2000IOIF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			

■ 820IF Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			

■ LIO-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			

■ CNTR-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
ERR			
PI 1			
PI 2			
PI 3			
PI 4			

■ AI-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			

■ AO-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			

■ DI-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			

■ DO-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			
RUN			
FUSE			

■ SVA Module

Indicating Lamps (7SEG LED)

	ON	Flashing	OFF
STATUS		"F"→" "→" "	

■ PO-01 Module

Indicating Lamps (LED)

	ON	Flashing	OFF
RMV			

Indicating Lamps (7SEG LED)

	ON	Flashing	OFF
STATUS		"F"→" "→" "	

System Error Status

Register	Data	Register	Data
SW00050		SW00060	
SW00051		SW00061	
SW00052		SW00062	
SW00053		SW00063	
SW00054		SW00064	
SW00055		SW00065	
SW00056		SW00066	
SW00057		SW00067	
SW00058		SW00068	
SW00059		SW00069	

System I/O Error Status

Register	Data	Register	Data
SW00200		SW00204	
SW00201		SW00205	
SW00202		SW00206	
SW00203		SW00207	

Write if there is data which is not 0 in the range of SW00208 to SW00423

Register	Data	Register	Data
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	
SW______		SW______	

MACHINE CONTROLLER CP-9200SH
USER'S MANUAL

TOKYO OFFICE
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo 105-6891 Japan
Phone 81-3-5402-4511 Fax 81-3-5402-4580

YASKAWA ELECTRIC AMERICA, INC.
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone 1-847-887-7000 Fax 1-847-887-7370

MOTOMAN INC. HEADQUARTERS
805 Liberty Lane West Carrollton, OH 45449, U.S.A.
Phone 1-937-847-6200 Fax 1-937-847-6277

YASKAWA ELÉTRICO DO BRASIL COMÉRCIO LTDA.
Avenida Fagundes Filho, 620 Bairro Saude-Sao Pàulo-SP, Brazil CEP: 04304-000
Phone 55-11-5071-2552 Fax 55-11-5581-8795

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone 49-6196-569-300 Fax 49-6196-888-301

Motoman Robotics Europe AB
Box 504 S38525 Torsås, Sweden
Phone 46-486-48800 Fax 46-486-41410

Motoman Robotec GmbH
Kammerfeldstraβe 1, 85391 Allershausen, Germany
Phone 49-8166-900 Fax 49-8166-9039

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, United Kingdom
Phone 44-1236-735000 Fax 44-1236-458182

YASKAWA ELECTRIC KOREA CORPORATION
Kfpa Bldg #1201, 35-4 Youido-dong, Yeongdungpo-Ku, Seoul 150-010, Korea
Phone 82-2-784-7844 Fax 82-2-784-8495

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, Singapore
Phone 65-282-3003 Fax 65-289-3003

YASKAWA ELECTRIC (SHANGHAI) CO., LTD.
4F No.18 Aona Road, Waigaoqiao Free Trade Zone, Pudong New Area, Shanghai 200131, China
Phone 86-21-5866-3470 Fax 86-21-5866-3869

YATEC ENGINEERING CORPORATION
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

YASKAWA ELECTRIC (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone 852-2803-2385 Fax 852-2547-5773

BEIJING OFFICE
Room No. 301 Office Building of Beijing International Club, 21
Jianguomenwai Avenue, Beijing 100020, China
Phone 86-10-6532-1850 Fax 86-10-6532-1851

TAIPEI OFFICE
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

SHANGHAI YASKAWA-TONGJI M & E CO., LTD.
27 Hui He Road Shanghai China 200437
Phone 86-21-6531-4242 Fax 86-21-6553-6060

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO., LTD.
30 Xue Yuan Road, Haidian, Beijing P.R. China Post Code: 100083
Phone 86-10-6233-2782 Fax 86-10-6232-1536

SHOUGANG MOTOMAN ROBOT CO., LTD.
7, Yongchang-North Street, Beijing Economic Technological Investment & Development Area, Beijing 100076, P.R. China
Phone 86-10-6788-0551 Fax 86-10-6788-2878

YASKAWA ELECTRIC CORPORATION

YASKAWA

MANUAL NO. SIE-C879-40.1B

Specifications are subject to change without notice
for ongoing product modifications and improvements.

© Printed in Japan July 2000 96-9
99-7③
96-87126