SHARP

Sharp Programmable Controller

Model name

I/O link master module *JW-31LMH*

Instruction Manual

JW-31LMH
NO.

COMM
MODE 3
ERROR
FAULT

PULL

1
2
3
L1 — 4
L2 — 5
6
SHIELD — 7
FG — 8
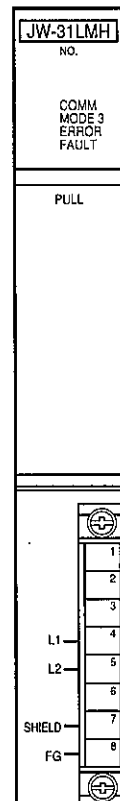
We'd like to thank you for your purchase of the SHARP programmable controller new satellite W series, I/O link master module (JW-31LMH).

Familiarize yourself with the JW-31LMH by reading this instruction manual thoroughly.

This manual describes functions and usages of JW-31LMH and I/O link slave module (ZW-82N/82S, ZW-161N/162N/161S/162S/164S/162M, ZW-164NH/162SH/162MH, ZW-324NH/322SH/322MH, and ZW-84NC/162MC).

Beside this manual, user's manual hardware version and programming manuals are provided and delivered together with each control module of JW50/70/100, or JW50H/70H/100H. We recommend that you refer these manuals along with this manual.

Keep this manual with you. We are confident that these booklets will be helpful whenever you face a problem.
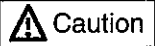
Read this manual and attached documents carefully before installation, operation, maintenance and checking in order to use the machine correctly. Understand all of the machine knowledge, safety information, and cautions before starting to use. In this instruction manual, safety precautions are ranked into "Danger" and "Caution" as follows.

| ◇ Danger | : Wrong handling may possibly lead to death or heavy injury.

| ⚠ Caution | : Wrong handling may possibly lead to medium or light injury.

Even in the case of | ⚠ Caution |, a serious result may be experienced depending on the circumstances. Anyway, important points are mentioned. Be sure to observe them strictly.

The picture signs of prohibit and compel are explained below.

🚫   : It means don'ts. For example, prohibition of disassembly is indicated as (🚫).

❗   : It means a must. For example, obligation of grounding is indicated as (⏚).

1) Installation

⚠ Caution
• Use in the environments specified in the catalog and instruction manual. Electric shock, fire or malfunction may be caused when used in the environments of high temperature, high humidity, dusty or corrosive atmosphere, vibration or impact. • Install according to the manual and user's manual. Wrong installation may cause drop, trouble or malfunction. • Never admit wire chips or foreign matter. Or fire, trouble or malfunction may be caused.

2) Wiring

⏚ Compel
• Be sure to ground. Unless grounded, electric shock or malfunction may be caused.

⚠ Caution
• Wiring should be done by qualified electrician. Wrong wiring may lead to fire, trouble or electric shock.

3) Use

◇ Danger
• Assemble the emergency stop circuit and interlock circuit outside of the programmable controller. Otherwise the machine breakdown or accident may be caused by the trouble of the programmable controller.

⚠ Caution
• Manipulation for program change, forced output, run or stop during operation should be done with particular care by confirming safety. Misoperation may lead to damage or accident of the machine. • Turn ON the power source in the specified sequence. Turning ON with wrong sequence may lead to machine breakdown or accident.

4) Maintenance

🚫 Prohibit
• Don't disassemble or modify. Or fire, trouble or malfunction may be caused.

⚠ Caution
• Turn OFF the power source before detaching or attaching the module. Or electric shock, malfunction or trouble may be caused.

Table of Contents

§1 Preface

1-1 I/O link

I/O link is designed with the aim of minimizing input and output wirings of PCs. It supersedes all wirings from PC I/O slots to input devices and loads with single communication cable. It is applied installing "I/O link master module: JW-31LMH" (hereafter called "master module") at I/O slot of the PC and "I/O link input module and I/O link output module" (hereafter called "slave module") at input devices and load sides.

1-2 Features

[1] High data transfer speed

The JW-31LMH transfer speed is 345.6 k bits/sec., which is twice the conventional JW-31LM model. This allows high speed communications with the ZW-324NH/322SH/322MH I/Olink slave modules. By setting the switches, the JW-31LMH can also be connected to the following conventional I/O link slave modules: ZW-82N/82S, ZW-161N/162N/161S/162S/164S/162M. In this case, the transfer speed will be 172.8 k bits/sec.

[2] Up to 32 slave modules can be connected to one master module

The I/O link slave modules and LCD terminals can be installed in discrete layout by a maximum of 32 units, in a range of total distance of 1 km, using shielded twisted pair wires.
(However, number of I/O link points is 504 points at maximum.)

[3] Up to 504 points of I/O link point available

Max. 504 points of I/O link is usable per master module. (In cases where 8-point modules are used, max. number of points becomes 256.) Installation of multiple master module in a PC makes another increase of I/O link points.

(Ex. JW-13BU)　　　JW-31LMH

No. of I/O link points
Max. 504 points

Control module
(JW-70CUH)

Power supply module
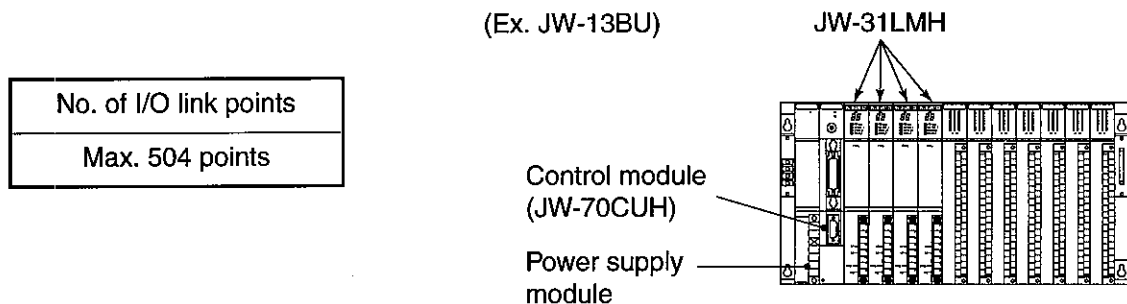
[4] Capable data exchange approx. 13.1 ms

The JW-31LMH enables data to be exchanged between a master module and all connected slave modules in approximately 13.1 ms (assuming that 504 I/O link points are connected and the data transfer speed is 345.6 k bits/sec.). As for details, see page 31 of this manual.

[5] Error station display function

When abnormality occurs at a slave station, the master module displays number of this slave station with LEDs, which shortens recovery from trouble.

[6] Output function alternation at error communication

Output at error communication of each slave station can be set either "reset" or "hold" individually.

[7] Shorten wiring work and wiring change work time

As I/O link slave module can be installed nearby input devices and loading equipment, manufacturers of machines to be controlled by our PC can work input and output wiring at their factories. Only communication cable necessary be wired at field.
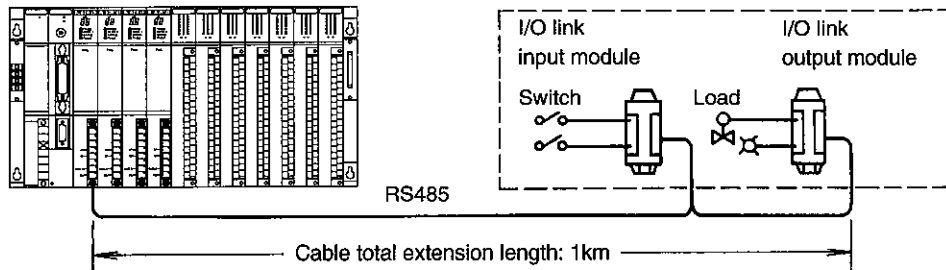
[8] I/O link master module can be used inserting in the PC slots for below W series models.

Applicable PC	JW-50CU, JW-50CUH
	JW-70CU, JW-70CUH
	JW-100CU, JW-100CUH

[9] Selectable communication mode from 3 types

In accordance with system contents, three types of communication operation are selectable. See page 19 for details.

Mode 1	Stop communication	Confirm recovery automatically
Mode 2	Continue communication	
Mode 3		Confirm recovery manually

§2 Safety precautions

Be aware of the following points prior to use and store the master and slave modules.

1) Avoid keeping the JW-31LMH in the following conditions:
   • Direct sunlight.
   • Corrosive and flammable gases.

2) Excessive static electricity may be generated on the human body in extremely dry conditions. Prior to touching the master module or slave module, discharge static electricity by touching grounded metals.

3) Be sure to tighten retention screws of the master module or slave module.

4) Use dry and soft cloths for cleaning. Organic solvents such as alcohol, paint thinner, and wet cloths may cause deformation or color change.

5) The outside cases of the master module or slave module have ventilation hole so as to prevent the inside temperature from rising. Do not block this hole or prevent ventilation.

6) When the master module or slave module is out of order or in abnormal condition (overheat, emitting a bad smell or smoking), stop operation and contact our dealer or service center.

7) **Cautions at required transfer time**
   Input signals for short operating time output and pulse shaped short input signals may not be input or output in some required transfer time. In order to secure safety of equipment, signals to input should be directly input to the PC.
   (As for calculation of required transfer time, see page 33 of this manual.)

8) Be sure to set dip switches of the master module and slave modules at power "OFF."
   When these switches are changed at power "ON," it may cause malfunction.

9) The master module is special I/O module for JW series. It cannot, however, shorten data exchange time between slave stations even using application instruction F-81.

§3 System configuration

Master module
JW-31LMH

PC JW50H/70H/100H

Slave module
(32 points)
ZW-324NH (Input)
ZW-322SH (Output)
ZW-322MH (I/O)

Slave module
(16 points)
ZW-164NH (Input)
ZW-162SH (Output)
ZW-162MH (I/O)

Transfer speed : 345.6 k bits/s

Transfer speed : 172.8 k bits/s

Slave module
(8 points)
ZW-82N (Input)
ZW-82S (Output)

Slave module
(16 points)
ZW-161N/162N (Input)
ZW-161S/162S (Output)
ZW-164S (Output)
ZW-162M (I/O)

Slave module
ZW-164NH/162SH/162MH
ZW-324NH/322SH/322MH
ZW-84NC/162MC

LCD terminal
Z-SM10
Manifold solenoid valve
Signal converter

Slave module
ZW-84NC
(Input: 8 points)
ZW-162MC
(Input: 8 points,
Output: 8 points)

■ Master module

Model	Remarks
JW-31LMH	• JW-31LMH can be installed on the I/O slot of the JW50H/70H/100H. • 32 sets of slave module can be connected per master module. However, the master module can be used a data register area that has less than 64 bytes. (See page 16.) • Set in the "S/H" of switch SW2 for transfer speed (345.6 k bits/s, 172.8 k bits/s.) • Total cable length is 1 km at maximum.

■ I/O link slave module

Model name		No. of points	Specifications	Transfer speed
Input	ZW-82N	8 points	12/24 VDC	172.8 k bits/s
	ZW-161N	16 points	100 to 120 VAC	
	ZW-162N	16 points	12/24 VDC	
	ZW-164NH	16 points	24 VDC	345.6 k bits/s 172.8 k bits/s ※2
	ZW-324NH	32 points	24 VDC	
	ZW-84NC	8 points	24 VDC	
Output	ZW-82S	8 points	12/24 VDC, 0.3 A, transistor output	172.8 k bits/s
	ZW-161S	16 points	100 to 120 VAC, 0.5 A, triac output	
	ZW-162S	16 points	12/24 VDC, 0.3 A, transistor output	
	ZW-164S	16 points	264 VAC/30 VDC, 2 A, relay outpt (separated common)	
	ZW-162SH	16 points	24 VDC, 0.3 A, transistor output	345.6 k bits/s 172.8 k bits/s ※2
	ZW-322SH	32 points	24 VDC, 0.3 A, transistor output	
I/O	ZW-162M	16 points	12/24 VDC, 0.3 A, transistor output 8 points 12/24 VDC input 8 points	172.8 k bits/s
	ZW-162MH	16 points	24 VDC, 0.3 A, transistor output 8 points 24 VDC input 8 points	345.6 k bits/s 172.8 k bits/s ※2
	ZW-322MH	32 points	24 VDC, 0.3 A, transistor output 16 points 24 VDC input 16 points	
	ZW-162MC	16 points	24 VDC, 0.3 A, transistor output 8 points 24 VDC input 8 points	

※ The data transfer speed of ZW-164NH/162SH/162MH, ZW-324NH/322SH/322MH, and ZW-84NC/
162MC changes automatically according to the data transfer speed of the JW-31LMH master station.
· Pay attention to the notes (transfer speed of the JW-31LMH) in the next page.

■ LCD terminal

Model name	Remarks	
Z-SM10	• Dot matrix, super twist LCD panel • Number of dots: 240 × 128 dots • Available indication area: 134 × 76 mm	(Transfer speed) 172.8 k bits/s

| Note | **When the liquid crystal display terminal (Z-SM10) is operated in mode 3 of master module**
If the power sources of the master module and Z-SM10 are turned ON simultaneously, the Z-SM10 delays start-up for reset and self-diagnosis.
Therefore, the master module, when the power is turned ON, may not communicate, if the connection station is confirmed, because there is no response from the Z-SM10.
As shown below, delay the "ON" of the check relay in the program at the master station side.

-5-
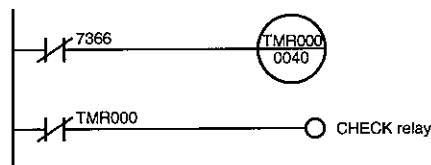
■ Manifold solenoid valve

Series	Corresponding module	Manufacturer
VQ 0000/1000/2000	EX120-SSH1	SMC Co., Ltd.
SY 3000/5000	EX121-SSH1 ES122-SSH1	
SX 3000/5000	EX130-SSH1	
VZS 2000/3000	IN313-SH1	
VFS 2000/3000/4000/5000		
VFR 2000/3000/4000		
M4TB1/2	OPP-14	CKD Co., Ltd.
M4LB2/3		
110, 180, 240	FIT-SP	Koganei Seisakusho Co., Ltd.
SR530/540/550/551/561	SRS-2416	Taiyo Tekko Co., Ltd.
Valve terminal	FB-20	Fest Co., Ltd.

■ Signal transformer

Model name	Specifications	Manufacturer
28S series	Sensor input transformer	M-System Giken Co., Ltd.
	Distributor (transformer for 2-wire transmitter)	
	Characteristic transformer	
	Isolator	

Note (Transfer speed of the JW-31LMH)

★ When connected to a module with a low transfer speed, as shown below, including mixed use with modules that has high transfer speeds, make sure to set the transfer speed of the JW-31LMH to 172.8 k bits/s (turn OFF "S/H" on SW2).
If the speed is set to 345.6 k bits/s (turn ON "S/H" of SW2), the JW-31LMH will assume that no low speed modules are connected.

Low transfer speed module: Slave module which can only set transfer data at a maximum speed of 172.8 k bits/s.

High transfer speed module: Slave module which can transfer data at 172.8 k bits and 345.6 k bits/s.

• When only high transfer speed modules are connected to the JW-31LMH, it can be set to 345.6 k bits/s.

• For details about the transfer speed of the manifold solenoid valves and signal converters, contact the respective suppliers of those devices.

§4 Master module specifications

4-1 General specifications

Item	Specifications
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90% RH (without dew condensation)
Vibration resistance	JIS-C-0911 or equivalent (2 hours for X, Y, and Z axes)
Shock resistance	JIS-C-0912 or equivalent (10G 3 times for X, Y, and Z axes)
Power consumption	300 mA (5 VDC)
Weight	Approx. 370 g
Accessories	One instruction manual

[Outside dimensions]

(Unit: mm)
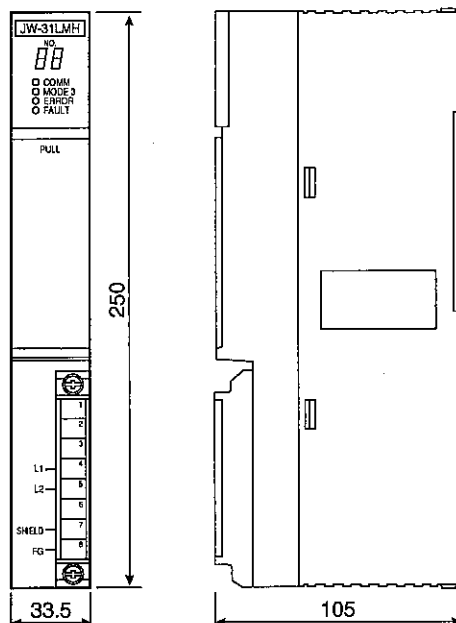
- As for I/O link slave module ZW-82N/82S, ZW-161N/162N/161S/162S/164S/162M, ZW-164NH/162SH/162MH, ZW-324NH/322SH/322MH, and ZW-84NC/162MC, see page 43 to 107.
- As for LCD terminal and manifold solenoid valve, see the individual manuals.

4-2 Specifications of master module

[1] General specifications

Item	Specifications
Number of I/O link stations	Max. 32
Number of I/O link points	Max. 504 (63 bytes)
Number of I/O occupied points	I/O relay: 16 points (2 bytes) Data register for special I/O module: 64 bytes (For communication monitoring flag : 1 byte) (For I/O data link : 63 bytes)
Synchronous with PC processing	(However, I/O linked communication begins synchronously with the PC scan cycle.)
Operation indication	COMM, MODE 3, ERROR, FAULT, CHECK, HALT Error code, error slave station number
Outer wire connection	8 P terminal block (M 3.5 × 7 screws)

[2] Communication specifications

Item	Specifications
Data transfer standard	EIA RS-485 or equivalent
Transfer speed	345.6 k bits/sec, 172.8 k bits/sec. (Changeover by S/H of switch SW2)
Data format	Start-stop synchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and double-reverse check
Synchronous mode	Start-stop system
Transfer mode	Time sharing cyclic digital system
Communication line	Party line Shielded twisted pair cable Cable total length: 1 km max.

§5 Name of function of each part

① Indicator lamp

Operation lamp
(For detail, see page 29)
No. .... Error code or error slave
                    station number indication
COMM .... Communicating
MODE3 .... Mode is set to 3
ERROR .... Error
FAULT .... Fault
CHECK .... Checking   ┐ ※
HALT .... Stop communication ┘

② Rating plate

③ Setting section cover

④ Terminal block (connector type terminal block)
   for communication cable connection.

⑤ Module retention screw

⑥ Setting switch (see page 18)
   Switches to select function of the module.
   SW1 .... For setting I/O link bytes
   SW2 .... For mode setting
   SW3 .... Termination resistance switch
   SW4 .... CHECK switch

⑦ Terminal block cover

Indicator ① lamp

Rating plate ②

Setting section ③ cover

Terminal block ④

Module retension screw ⑤

Setting switch ⑥

Setting section ③ cover

Terminal block ⑦ cover
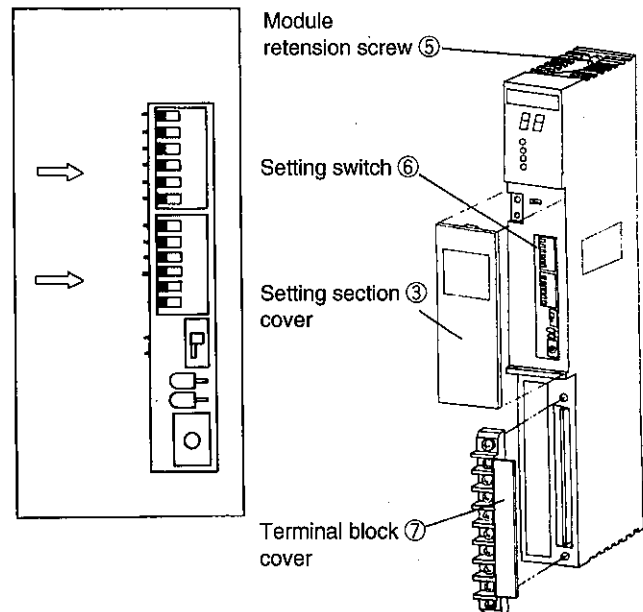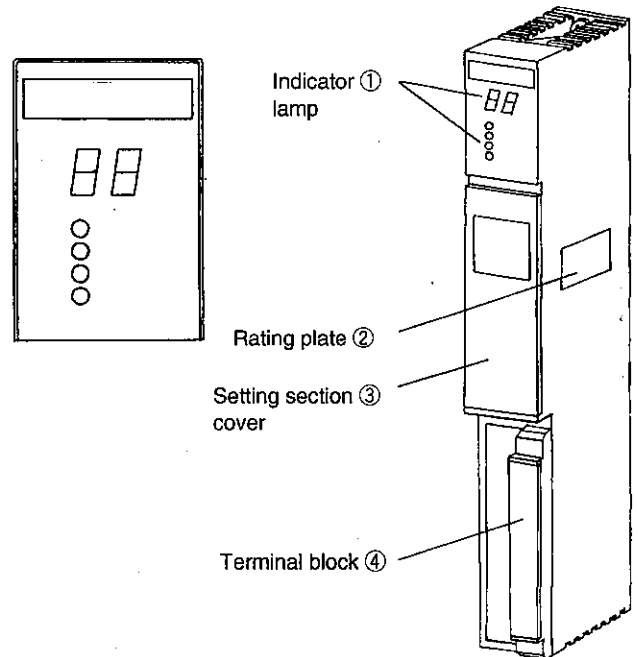
※ As for the CHECK lamp and HALT lamp, see pages 15 (CHECK relay) and 16 (HALT relay) respectively.

Each position of lamp is located on the setting section cover.

§6 Installation/wiring

6-1 Installation method

1) Insert the master module connector of the I/O module into module connector of the basic rack panel.

2) Tighten 2 pcs. of rack panel retention screw of the master module onto the rack panel using philips screwdriver.

Philips screwdriver

JW-31LMH

Side panel
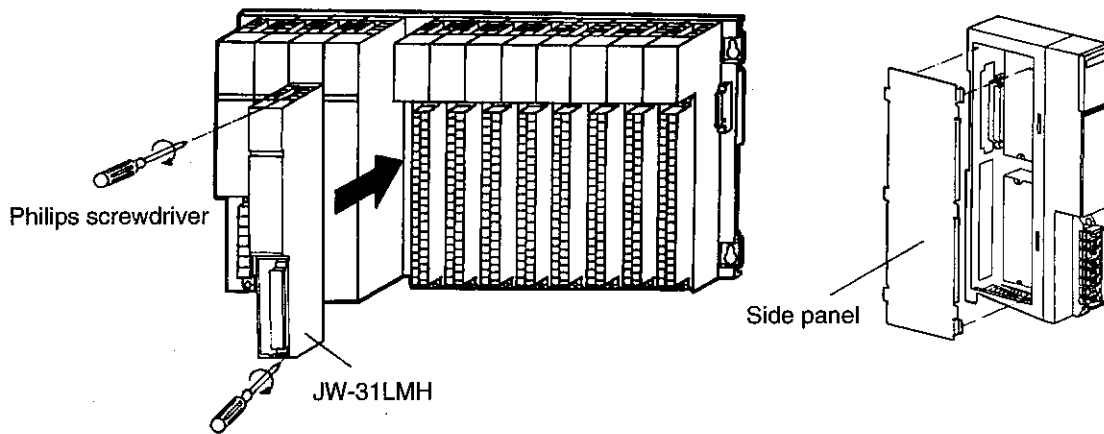
| Note 1 | When detaching or attaching the rack panel in the master module, be sure to turn OFF the power source of the rack panel. Detaching or attaching operation cannot be done in I/O live line. |

| Note 2 | When you install the master module at the left end of the rack panel: JW-13BU or JW-6BU, be sure to install a side plate to the rack panel which is supplied as an accessory. |

| Note 3 | The master modules cannot be installed onto slots already equipped optional cable: ZW-2CC, ZW-4CC, or ZW-6CC. |

Basic rack panel: JW-13BU

Cable for option module: ZW-4CC

Unable to install master module on these slots.
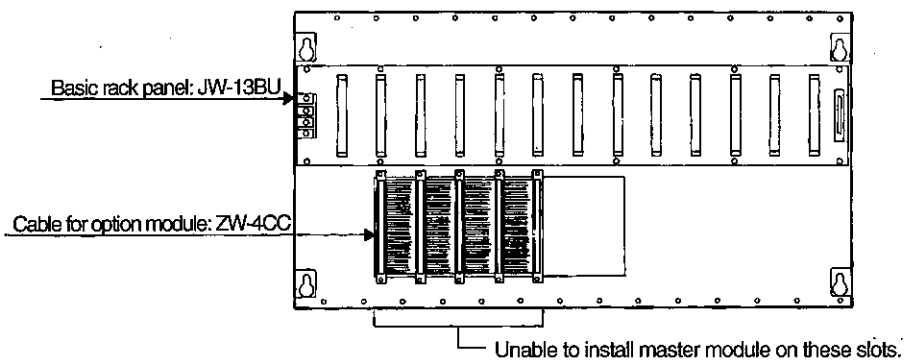
6-2 Wiring method

[1] Terminal block number
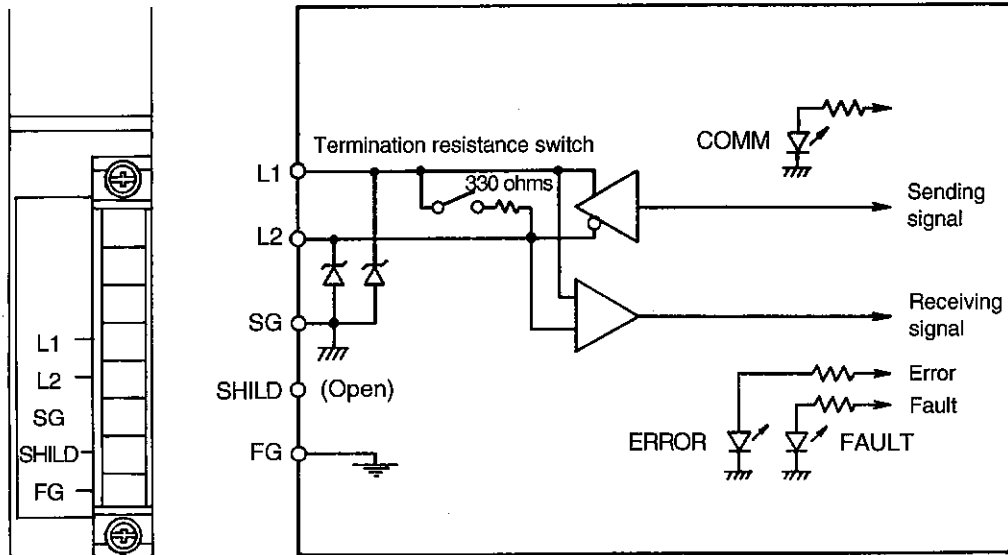
[2] Wiring of communication cable

(1) Recommended cable

Use our recommended cable, twisted shield pair cables, for wiring.

Wiring method	Recommended cable		
2-wire system	• HITACHI CABLE LTD.	S-IREV-SW2 * 0.5 S-IREV-SB2 * 0.5	
	• FUJIKURA LTD.	RG-22B/U	

Don't use wiring communication cables in a place exposed to severe stress or bending due to moving of the master module or slave module.

(2) Wiring of the master module

Wire in 2-wire system communication cable of the master module as follows:

Terminal block

Insulation tape

Signal cable

Note 2

Twisted cable
30 mm

L₁

L₂

SHIELD

※

FG

Class-3 grounding
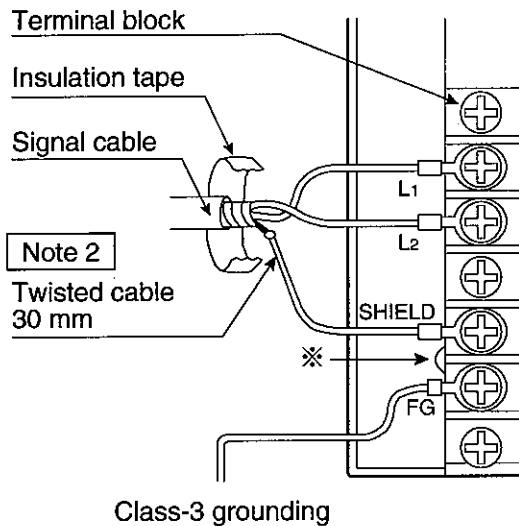
※ SHIELD terminal and FG terminal are shorted using a shorting tab.

Note 1	Use our recommended twisted pair shield cable for wiring to the terminals L_1, L_2, and SHIELD. When wiring the shield line to the terminal block, it is convenient to relay 0.5 mm² twisted cable at the outside of the shield cable.
Note 2	Cables connected with the shield cable should be kept as short as possible (below 30 mm).
Note 3	In I/O link function, do not connect the signal cable except for the terminals of L_1, L_2, SG and SHIELD.
Note 4	Use the crimp-style terminals for wiring to terminal block. Select crimp-style terminals with referring the illustration as below.

7.7mm

M 3.5 × 6 mm
Self lock-up screw
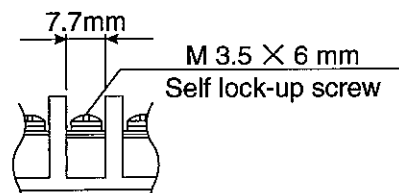
(3) Wiring method with slave station

Wiring in 2 wire system.
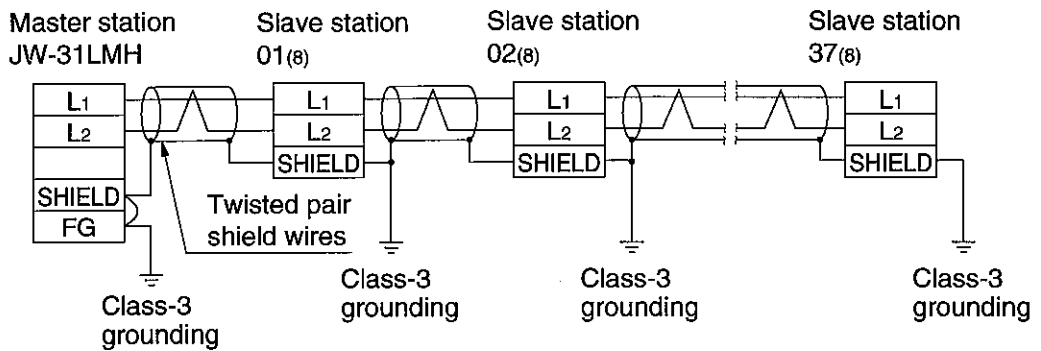
Note 1   Connect the shield line of the communication cable with SHIELD terminal.

Note 2   Be sure to short circuit between the SHIELD terminal and the FG terminal of the master module externally. In case of slave module, connect class-3 grounding with its SHIELD terminal. Otherwise, it may easily pick up electrical noise and cause malfunction.

Note 3   Be sure to execute class-3 grounding for the FG terminal. Avoid co-grounding with other modules. If not grounded, modules easily pick up electric noise, which causes a malfunction.

Note 4   Each SHIELD terminal of master and slave module are open terminals. According to the noise condition, it is a good idea to execute one point grounding for the shield line of the communication cable.

Note 5   Cable should be lined from one master module to one slave module and next slave module one by one. Do not execute multiple wiring from one source point.
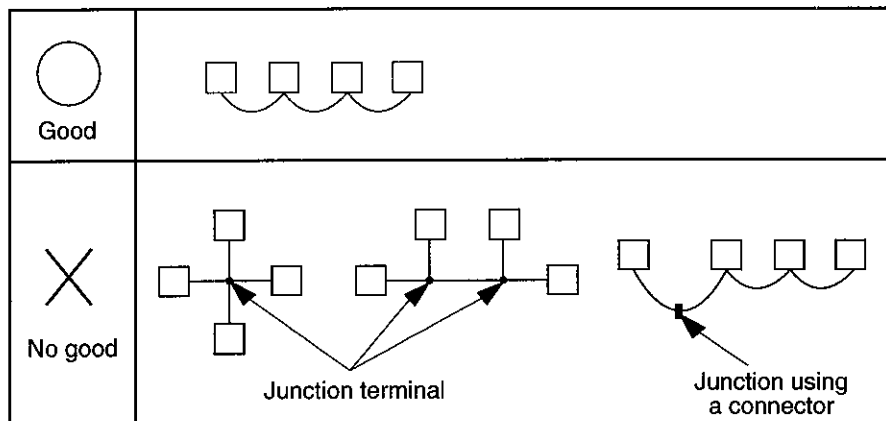
Note 6   Keep the communication cable as far away as possible from the high voltage and power lines, so as not to close in parallel.

Note 7   Use our recommended cable for communication cable and keep its total length within 1 km.

Note 8   Do not mis-set or double set slave module numbers and not to use larger slave module numbers than total number of set master module.

Note 9 Not necessary to set the modules in order, one by one, nor setting the master module as termination station. The following example is available.

| Slave station 4 | Slave station 6 | Slave station 1 | Master station | Slave station 2 | Slave station 3 | Slave station 7 | Slave station 5 |

Switch ON termination resistance
switch on both termination station
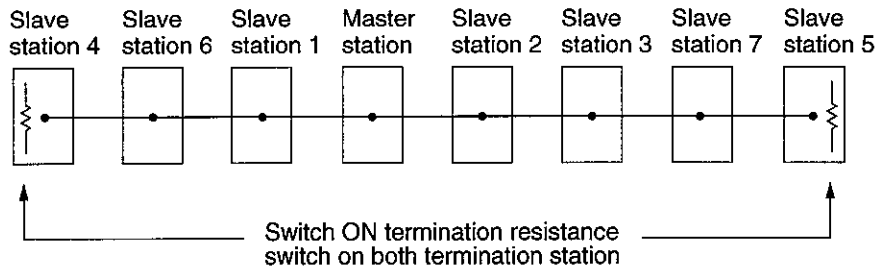
Note 10 Do not wire load driving cables and power supply in the same duct of communication cable. (For the cable supplying power to a slave module exclusively and not for load driving, wiring in the same duct is available.)

Communication cable

Slave module

Master module

Wiring for DC power supply

Power cable pipe

DC power supply

– 14 –
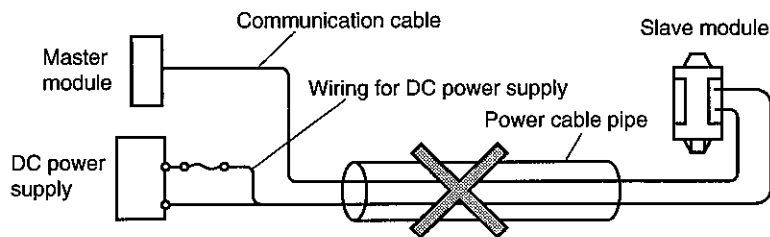
§7 I/O link usage

7-1 Setting at master module side

[1] I/O processing

The master module is operated by "special I/O for JW50H/70H/100H" (hereafter called JW-I/O processing).
The JW-I/O processing uses 2 data memory areas of I/O relay and data register.

(I/O relay)

| 2 bytes | For control output ➤ |

(Data register)

| 64 bytes | ◄ Input data |
| | Output data ➤ |
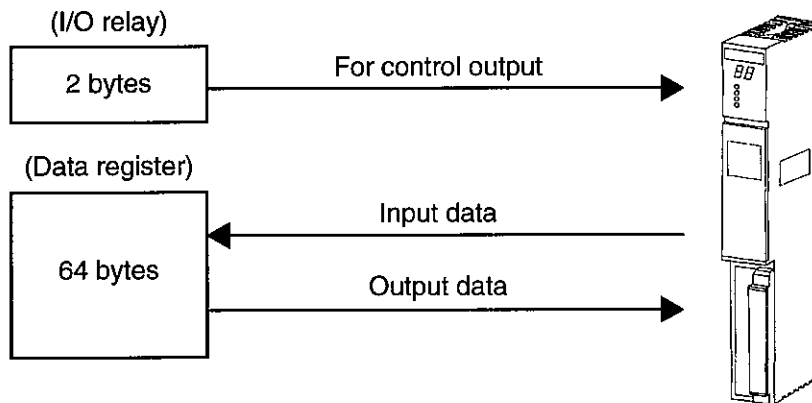
(1) I/O relay number

At automatic I/O registration mode, I/O relay number of the JW-I/O processing is determined by the order of installation arrangement.
(See the programming manual of JW50H/70H/100H)
The master module occupies 16 points (2 bytes) of I/O relays.
The illustrated example shows that the module is installed into first slot of rack No. "0."
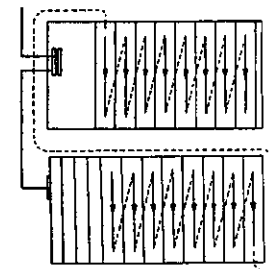
	D7	D6	D5	D4	D3	D2	D1	D0	
PC→Module			Not used				HALT	CHECK	⊐0000
(OUT PUT)				Not used					⊐0001

SW2 (ON) →
M1
M2
M3
S/H
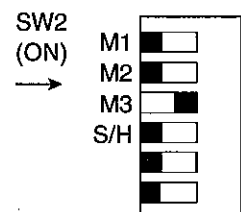
1) CHECK (connected station check) relay
  - This is output relay which becomes effective when the mode setting switch (SW2) is set to "Mode 3 setting."
  - When the CHECK relay is "ON," the JW-31LMH stops I/O link communication and repeats connection station check. Output of slave module is based on its switch setting. (See page 36 for connection check)
  - When the CHECK relay is "ON," the CHECK lamp of master module lights ON.

```
 ┤├──────────────○ CHECK reray
                   00000
```
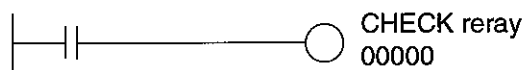
2) HALT (communication stop relay)
   • When this relay is "ON," the JW-31LMH stops I/O link communication, and cannot renew data with slave modules.
   • When the HALT relay is "ON," output condition of slave modules are in accordance with their switch settings. The HOLD lamp of each slave module lights as it becomes stopping communication.
   • When the HALT relay is "ON," the master module lights its HALT lamp.

```
├──┤ ├──────────────────◯  HALT relay
                            00001
```

If you turn ON both the CHECK and HALT relays, the master module will display the slave station address which has an error on its display panel. (See page 28.)

(2) Data register (area to enter output to slave stations and input from slave station)
   • At automatic I/O registration mode of the PC, data registers are allocated from register 49000 for each 64 bytes per special I/O module.
   • After allocated data registers, this master module uses max. 64 bytes and number of using bytes are designated by number of I/O link byte switch SW1.
   • The below illustration shows an example of installing the module in first slot of the rack No. "0." (When data register is used at relay area, see page 109.)

Data register address

49000	Status	1 byte
49001	Slave module "01(8)"data	
49002	Slave module "02(8)"data	
49003	Slave module "03(8)"data	
49004	Slave module "04(8)"data	Setting of No. of I/O link bytes
49024	Slave module "24(8)"data	Ex.: 31 bytes
49025	Slave module "25(8)"data	• When 31 ZW-82N module (each module occupies one byte) are connected to the slave module.
49026	Slave module "26(8)"data	
49036	Slave module "36(8)"data	
49037	Slave module "37(8)"data	
	Not used	
49077		

64 bytes unit

SW1

(Decimal)	(Octal)	
1	1	
2	2	
4	4	
8	10	
16	20	
32	40	

(Decimal) (Octal) ⇒ ON

1) Status
   The status above is an area to indicate I/O link communication. (For details, see page 27.)

2) Slave station data
   • This is communication area with each slave module.
   • When a slave module is input type, slave station data becomes input data of the PC.
   • When a slave module is output type, slave station data becomes output data of the PC.
   • When a slave module is input and output type, this area is allocated input and output with 1 byte unit.
   • Address of the slave station is set by slave module switch.
   • In case of slave module using "n" bytes area, set the top address.

[Example for connection]

	Slave station 01(8) ZW-82N	Slave station 02(8) ZW-162N	Slave station 04(8) ZW-82S	Slave station 05(8) ZW-324NH

Data register

49000	Status
49001	Slave station 01(8) (input)
49002	Slave station 02(8) (input)
49003	Slave station 02(8) (input)
49004	Slave station 04(8) (output)
49005	Slave station 05(8) (input)
49006	Slave station 05(8) (input)
49007	Slave station 05(8) (input)
49010	Slave station 05(8) (input)

* It must be noted that address setting of LCD terminal Z-SM10 is of decimal notation.

[2] Setting switch of master module

In order to actuate the master module I/O link communication, necessary to set switches.

Setting at delivery
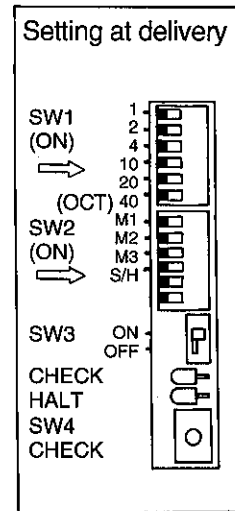
(1) Setting number of I/O link bytes (SW1)

a. Set number of I/O link bytes using the number of I/O link bytes setting switch. Unit: 1 byte.

b. Value to set should be total number of bytes of used slave module.

Setting value = No. of bytes of module (1) + No. of bytes of module (2) +

.... No. of bytes of module (n)

Ex.: An example in which two 8-point modules (each module occupies 1 byte), three 16-point modules (each module occupies 2 bytes), and two 32-point modules (each module occupies 4 bytes) are connected.

|	Status		1 byte
49000			
49001	Slave station address 01(8) (8-point module)		
49002	Slave station address 02(8) (8-point module)		
49003	Slave station address 03(8) (16-point module)	2 bytes	
49004	Slave station address 03(8) (16-point module)		
49005	Slave station address 05(8) (16-point module)	2 bytes	
49006	Slave station address 05(8) (16-point module)		
49007	Slave station address 07(8) (16-point module)	2 bytes	
49010	Slave station address 07(8) (16-point module)		
49011	Slave station address 11(8) (32-point module)		
49012	Slave station address 11(8) (32-point module)	4 bytes	
49013	Slave station address 11(8) (32-point module)		
49014	Slave station address 11(8) (32-point module)		
49015	Slave station address 15(8) (32-point module)		
49016	Slave station address 15(8) (32-point module)	4 bytes	
49017	Slave station address 15(8) (32-point module)		
49020	Slave station address 15(8) (32-point module)		

Setting of No. of link bytes
16 bytes

SW1

(Decimal)	(Octal)
1	1
2	2
4	4
8	10
16	20
32	40

(Decimal) (Octal) ⟹ ON

Note 1 Total number of I/O link slave modules should be less than 32 sets.

Note 2 When the setting is larger than the total number of used bytes, it becomes communication error. (See page 27 for details.)

Or, if this amount is smaller than the total number of bytes used by the slave modules, the slave modules after the setting number of the master module fall in error, and the "RUN" lamp of the slave modules flickers.

(2) Setting mode/ transfer speed (SW2)

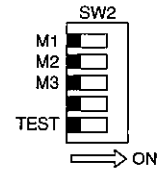Using the SW 2 switches "M1, M2, M3, and TEST," select the operation mode that will be executed when a communication error occurs between the slave modules. Using the "S/H" parameter of SW2, select a data transfer speed.
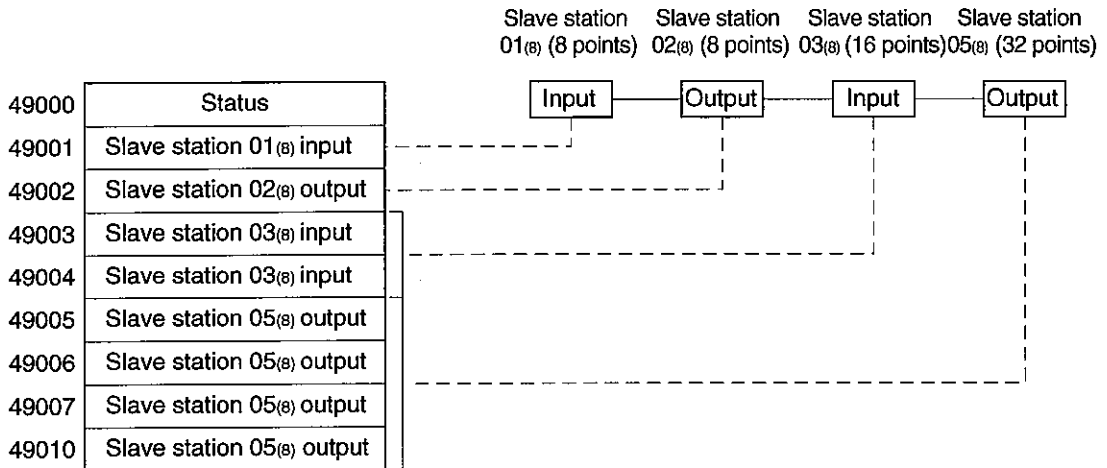
Mode (Setting switch)	Condition	Operation contents
Mode 1 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • The master module continues to check its connected stations once per 100 communications with all slave modules.
	At error communication	• If no response slave module exists, the JW-31LMH outputs the abnormal signal to the status section and the indication panel. (It turns OFF after recovering to normal condition.) • The master module repeats connected station check until communication becomes normal. • At abnormal condition, the module does not execute I/O Link communication and stay holding data.
Mode 2 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • The master module checks its connected stations once per 100 communications with all slave modules.
	At error communication	• Even if no response slave module exists, the master module does not indicate the abnormal condition. The master module outputs the abnormal slave module No. on the status section for only one PC cycle. • The master module checks its connected stations once per 100 communications with all slave modules, and check no response station's recovery. • The master module executes communication regarding no response slave module as disconnected station.
Mode 3 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • When the CHECK relay is "ON," the master module checks its connected stations and display "00" at normal communication. • When you switch ON SW4, the master module check connected stations one time and display "00" at normal communication.
	At error communication	• Even if no response slave module exists, the master module does not indicate error condition. The master module outputs the error slave module No. on the status section for only one PC cycle. • The master module checks its connected stations when the CHECK relay is "ON" or SW4 is "ON" and confirms recovery of no response station. • The master module executes communication regarding no response slave module as disconnected station. • In mode 3, the MODE 3 lamp at the master module lights.

Transfer speed	172.8 k bits/s	345.6 k bits/s
See "S/H" of SW2	OFF [S/H]	ON [S/H]

Note 1 When multiple stations have errors, the master module outputs smaller address no. slave module to the status section and the indicator lamps. (See page 27 and 29)

Note 2 See the next page for connected station check. (See page 36 of this manual for connected station check at error communication.)

Note 3 Switch ON only one of three model setting switches. Multiple setting of these switches is treated as mode 3 by the module. When all of M1, M2, and M3 are set to OFF, setting error occurs. (Error : See page 31 to 32)

Communication to connected stations check

After the power being ON, the master module executes communication check of connected stations for set number I/O bytes slave stations before processing of the PC. With this communication, the master module recognizes whether the connected slave stations are input modules or output modules.

Slave station 01(8) (8 points) Slave station 02(8) (8 points) Slave station 03(8) (16 points) Slave station 05(8) (32 points)

49000	Status
49001	Slave station 01(8) input
49002	Slave station 02(8) output
49003	Slave station 03(8) input
49004	Slave station 03(8) input
49005	Slave station 05(8) output
49006	Slave station 05(8) output
49007	Slave station 05(8) output
49010	Slave station 05(8) output

Input — Output — Input — Output

Note 1 In mode 1 or mode 2, the module repeats communication for connected station check every 100 communication cycles. (See page 36 for this time chart.)

Note 2 As for calculation of this communication time with I/O link, see page 33.

(3) Termination resistance switch (SW3)

Switch ON this switch when the I/O link master module is an termination station of the line.
When it is an intermediate station, switch OFF.

SW3
ON
OFF

Switch ON termination resistance switch these stations only.
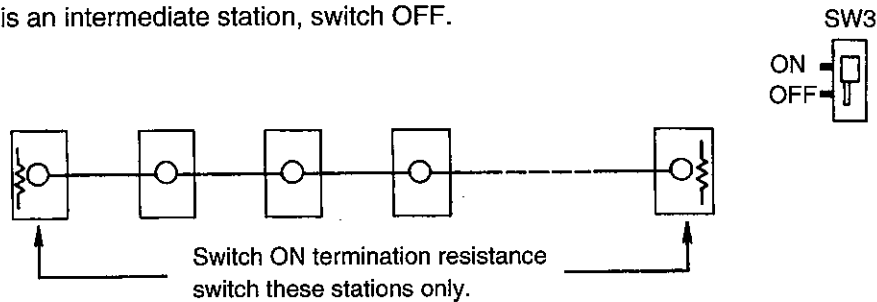
Why is termination resistance required?

1. When the receiving side has high impedance, it may be influenced with AC induction voltage. The termination resistance decreases this AC induction voltage.

2. Communication of I/O link using high frequency signals of 172.8 k bits/sec. or 345.6 k bits/s. If the termination resistance is not provided, signals generate reflection waves at signal ends and these waves collide with sending signals. The termination resistance prevent generating these reflection waves.

(4) CHECK (connection check) switch (SW4)

This is a switch to check connected station at mode 3.
With switching ON, the module checks connected stations one time. (See page 19 for mode 3.)

SW4

PUSH
ON
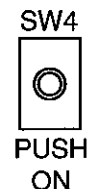
7-2 I/O link module setting procedure

Set I/O link module functions using the switches. Follow the below flow chart for setting.
(Slave module indicates in case of I/O link slave module. See page 42 to 106.)

```
┌─────────────────────────────────────┐
│ Turn "OFF" master module PC power.   │
│ Turn "OFF" slave module power.       │
└─────────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────────┐
│ Set the switch of slave module      │
└─────────────────────────────────────┘
```

(I/O link output module)

MODE

Termination resistance......OFF	■□	ON
Function setting.............I/O link	■□	M net
Output hold......................Hold	■□	Reset
Prohibit output..............Prohibit	■□	Allowed

Set these switches for all of the slave module.

```
┌─────────────────────────────────────┐
│ Set the termination resistance      │   Slave station
└─────────────────────────────────────┘
```

Termination resistance switch
Switch "ON" when the slave module is an termination station of link circuit.
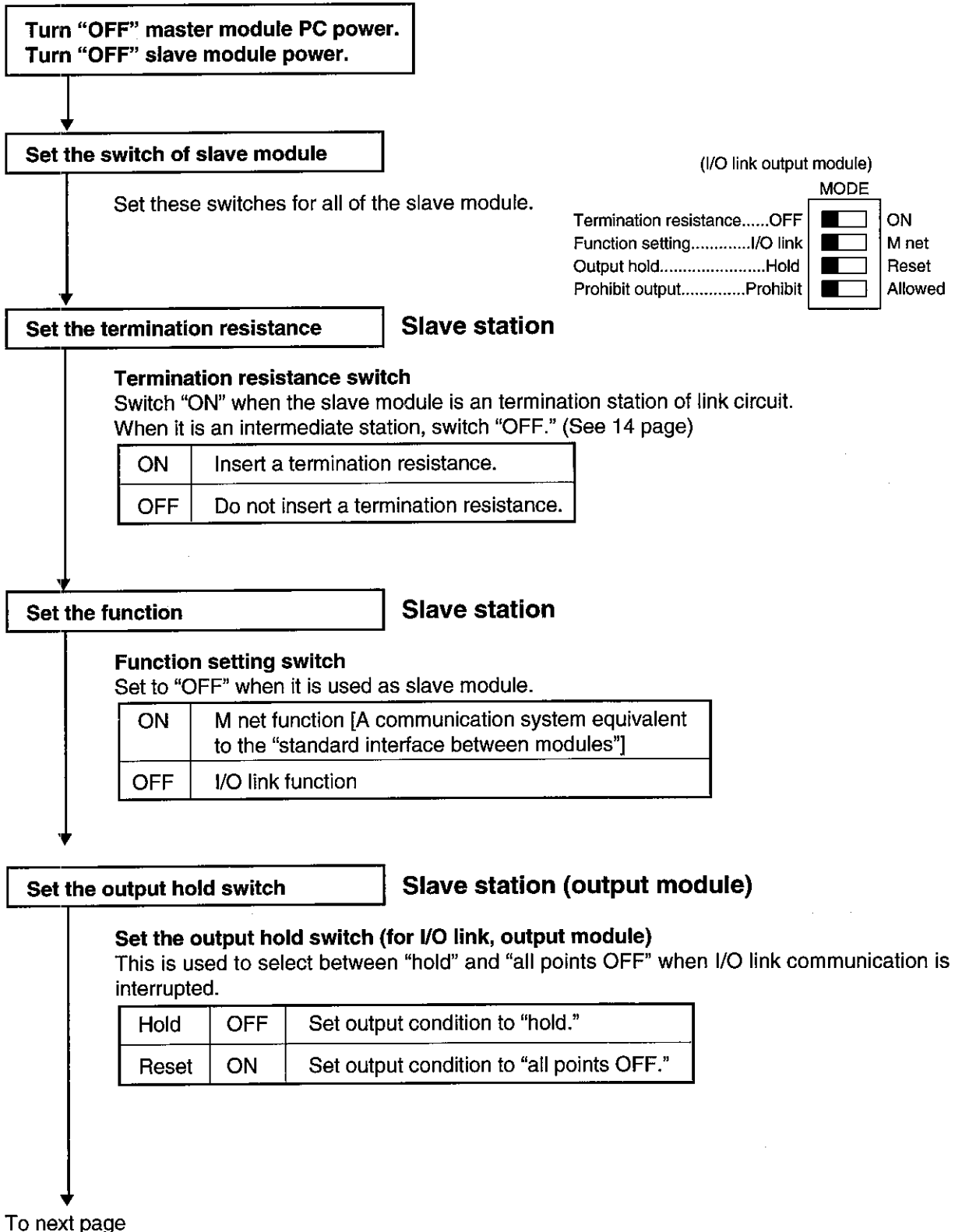When it is an intermediate station, switch "OFF." (See 14 page)

ON	Insert a termination resistance.
OFF	Do not insert a termination resistance.

```
┌─────────────────────────────────────┐
│ Set the function                    │   Slave station
└─────────────────────────────────────┘
```

Function setting switch
Set to "OFF" when it is used as slave module.

ON	M net function [A communication system equivalent to the "standard interface between modules"]
OFF	I/O link function

```
┌─────────────────────────────────────┐
│ Set the output hold switch          │   Slave station (output module)
└─────────────────────────────────────┘
```

Set the output hold switch (for I/O link, output module)
This is used to select between "hold" and "all points OFF" when I/O link communication is interrupted.

Hold	OFF	Set output condition to "hold."
Reset	ON	Set output condition to "all points OFF."

To next page

| **Set the output prohibition switch** | **Slave station (output module)** |

Output prohibition switch

This is a switch for communication test of the I/O link output module. When this switch is actuated, I/O link communication is available, but all the output become "all points OFF."

Allowed	ON	"ON" "OFF" operation of normal output.
Prohibited	OFF	Output becomes "All points OFF."

• After completion of the communication test, be sure to set the switch to "allowed."

| **Set the slave station address switch** | **Slave station** |

Slave station address setting switch

Set using address of slave module on the PC data memory. Allocate head address of each in accordance with occupied amount (byte unit) of bytes of each slave module. Set with octal notation.
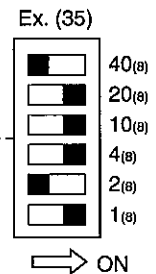
Set total of 6 switches' ($1_{(8)}$ to $40_{(8)}$) weight. (See setting switch of slave module)

−40(8)
−20(8)
−10(8)
−4(8)
−2(8)
−1(8)

ADDRESS
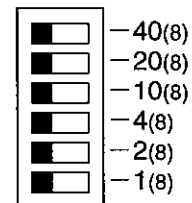
	Slave station address 20(8)
Slave station address 01(8)	Slave station address 21(8)
Slave station address 02(8)	Slave station address 22(8)
Slave station address 03(8)	Slave station address 23(8)
Slave station address 04(8)	Slave station address 24(8)
Slave station address 05(8)	Slave station address 25(8)
Slave station address 06(8)	Slave station address 26(8)
Slave station address 07(8)	Slave station address 27(8)
Slave station address 10(8)	Slave station address 30(8)
Slave station address 11(6)	Slave station address 31(8)
Slave station address 12(8)	Slave station address 32(8)
Slave station address 13(8)	Slave station address 33(8)
Slave station address 14(8)	Slave station address 34(8)
Slave station address 15(8)	Slave station address 35(8)
Slave station address 16(8)	Slave station address 36(8)
Slave station address 17(8)	Slave station address 37(8)

Ex. (06)

40(8)
20(8)
10(8)
4(8)
2(8)
1(8)

⇒ ON

Ex. (35)

40(8)
20(8)
10(8)
4(8)
2(8)
1(8)

⇒ ON

$\downarrow$

Setting of master module switches

To remove the setting section cover, put your finger on its upper end and pull back while pressing down.

* Do not damage the cover as it should be put on again after setting switches.
  Do not loose the cover.

Setting at delivery

SW1 (ON) $\Longrightarrow$ (OCT)
1
2
4
10
20
40

SW2 (ON) $\Longrightarrow$
M1
M2
M3
S/H

SW3 ON OFF
CHECK
HALT
SW4
CHECK
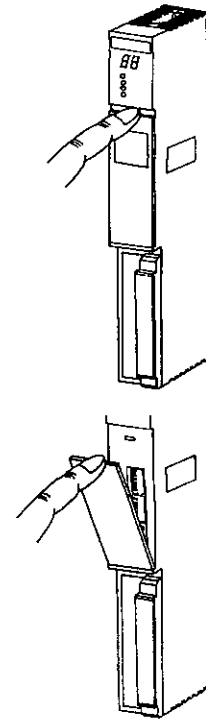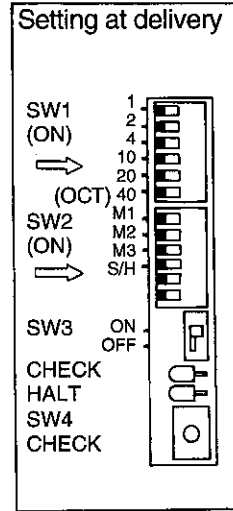
Set amount of I/O link bytes

Master station

Amount of I/O link bytes setting (SW1)
Set amount of bytes of slave module.
This number should be total amount of occupied bytes of slave modules.

(Decimal)	(Octal)
1	1
2	2
4	4
8	10
16	20
32	40

$\Longrightarrow$ ON

Setting value = No. of bytes of slave module (1) +
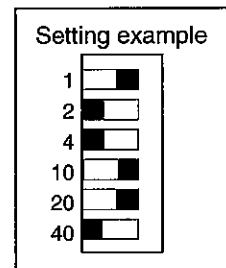+ No. of bytes of slave module (2) ..... + No. of bytes of slave module (n)
Number of I/O link bytes is total amount of each switch setting.

Ex.: Setting of number of I/O link bytes is 25 (31(8)).
For switch setting, see the illustration right.
Set in octal notation as shown below.
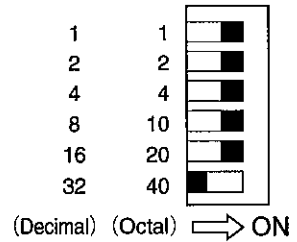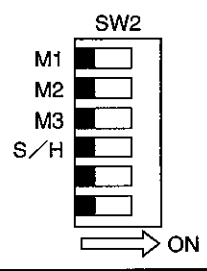
| Calculation by octal | $31(8) = 20(8) + 10(8) + 1(8)$

Setting example
1
2
4
10
20
40

Set the operation mode

Master station
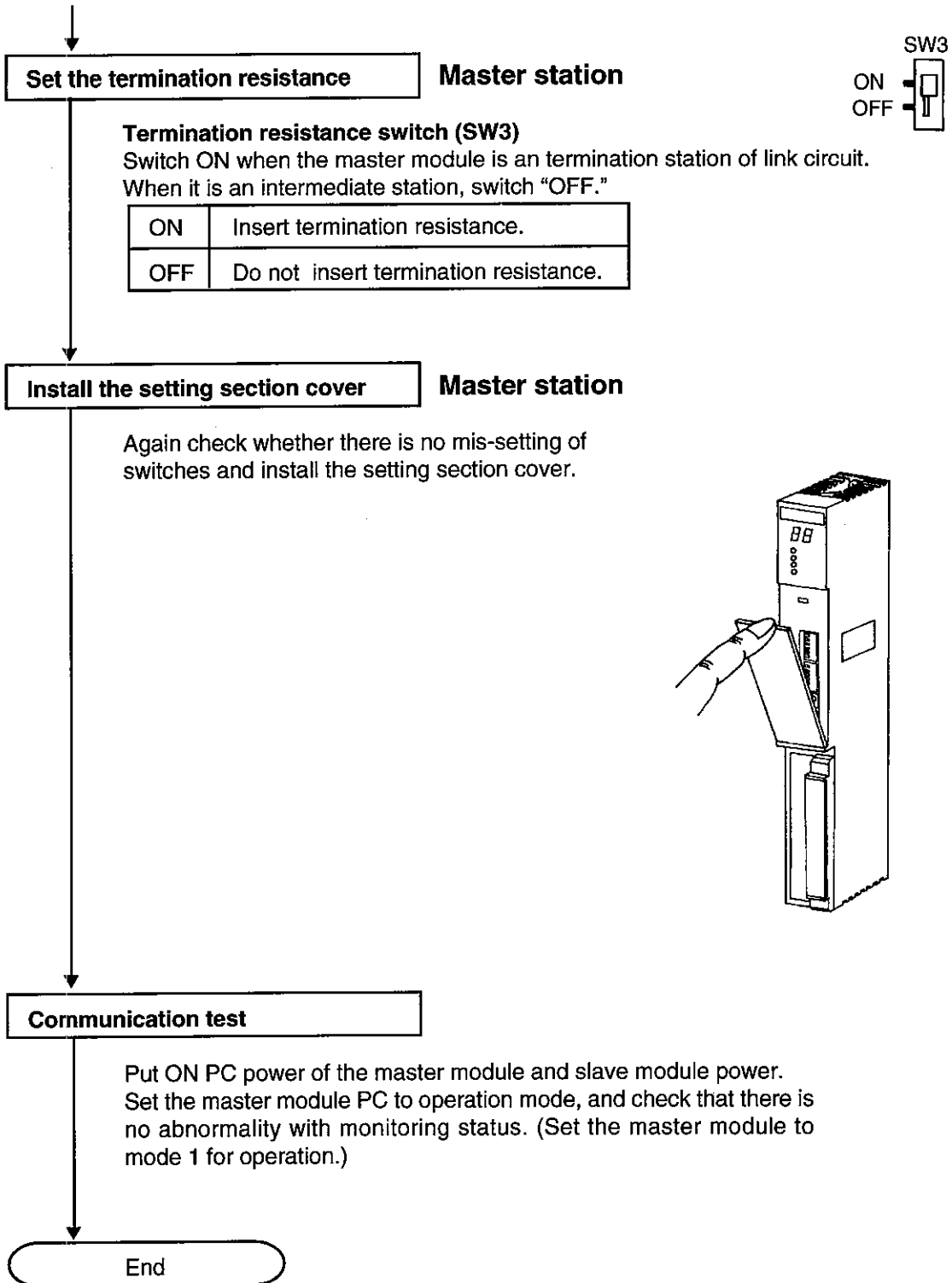
SW2

M1
M2
M3
S/H

ON

Mode setting switch (SW2)
Set the master module operation at communication error of I/O link communication.

Mode (Setting switch)	Condition	Operation contents
Mode 1 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • The master module continues to check its connected stations once per 100 communications with all slave modules.
	At error communication	• If no response slave module exists, the JW-31LMH outputs the abnormal signal to the status section and the indicator panel. (It turns OFF after recovering normal condition.) • The master module repeats connected station check until communication becomes normal. • At abnormal condition, the module does not execute I/O link communication and stay holding data.
Mode 2 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • The master module checks its connected stations once per 100 communications with all slave modules.
	At error communication	• Even if no response slave module exists, the master module does not indicate the abnormal condition. The master module outputs the abnormal slave module No. on the status section for only one PC cycle. • The master module checks its connected stations once per 100 communications with all slave modules, and check no response station's recovery. • The master module executes communication regarding no response slave module as disconnected station.
Mode 3 M1 M2 M3	At normal	• When power to the master module turns "ON," the master module initially checks its connected stations one time. • When the CHECK relay is "ON," the master module checks its connected stations and displays "00" at normal communication. • When you switch ON SW4, the master module checks connected stations one time and displays "00" at normal communication.
	At error communication	• Even if no response slave module exists, the master module does not indicate error condition. The master module outputs the error slave module No. on the status section for only one PC cycle. • The master module checks its connected stations when the CHECK relay is "ON" or SW4 is "ON" and confirms recovery of no response station. • The master module executes communication regarding no response slave module as disconnected station. • In mode 3, the MODE 3 lamp at the master module lights.

Transfer speed	172.8 k bits/s	345.6 k bits/s
See "S/H" of SW2	OFF [S/H]	ON [S/H]

Note 1 — When multiple stations have errors, the master module outputs smaller address no. slave module to the status section and the indicator lamps. (See page 28 and 30)

Note 2 — See the next page for connected station check. (See page 36 of this manual for connected station check at error communication.)

Note 3 — Switch ON only one of three model setting switches. Multiple setting of these switches is treated as mode 3 by the module. When all of M1, M2 and M3 are set to OFF, setting error occurs. (See page 31 and 32)

Set the termination resistance | **Master station**

SW3
ON
OFF

Termination resistance switch (SW3)
Switch ON when the master module is an termination station of link circuit.
When it is an intermediate station, switch "OFF."

| ON | Insert termination resistance. |
| OFF | Do not insert termination resistance. |

Install the setting section cover | **Master station**

Again check whether there is no mis-setting of
switches and install the setting section cover.

Communication test

Put ON PC power of the master module and slave module power.
Set the master module PC to operation mode, and check that there is
no abnormality with monitoring status. (Set the master module to
mode 1 for operation.)

(End)

With above, setting of master module and slave modules are completed.

Note 1 | After communication test, be sure to switch ON (allowed) the output prohibition
switch of each slave module.

7-3 Cautions concerning I/O link setting

1. More than 32 sets of I/O link slave module are not connectable.

2. Be careful when setting range of number of I/O link bytes.
    Setting "0" causes an error. Setting more than number of slave station addresses causes the JW-31LMH an error in mode 1, due to inability to confirm a connecting station. (See page 16)

3. See page 16 for slave station address and the address allocated on the PC data register.
    Setting "00" for address of a slave module causes an error.

4. Avoid double setting of slave station address or following errors occur. Error code and display may not be output.

Double address setting	Operation condition
Double address setting of the input module.	No designation of input data.
Double address setting of the input and output module.	No designation of input data or condition of the output module.
Double address setting of the output module.	Output of the same data.

5. Turn ON the termination resistance switch only for both termination stations in the link circuit. (See page 14)

6. Set dip switches of the master module and slave modules when the PC power is "OFF." When the PC power is "ON," changeover of switches are not accepted internally, and may cause an error.

7. The master module can only use up to 47 sheets with combination of other special I/O as it is one of JW special I/O module. Be sure not to double set data register area with register area for data link and remote I/O.
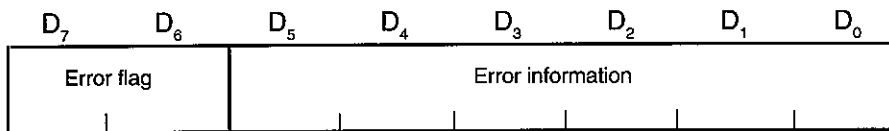
§8 Monitor I/O link operation

8-1 Monitor master module operation

[1] Status information

(1) The first byte of data register address of master module is input to the PC as status information.

(2) Status information inputs error information in the PC by lower 6 bits and error contents in upper 2 bits.

	Status
n	
n + 1	Slave station address 01
n + 2	Slave station address 02
n + 3	Slave station address 03

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
Error flag		Error information					

(3) **Error flag**

These flags turn ON at error.

Flag bit	Error contents	Related processing
D_6	• When checking connected stations during power "ON" and I/O link communication, this bit turns ON. • When errors exist in received input signal data, this bit turns ON.	• Outputs to an indicator lamp. • Outputs error slave module address to status.
D_7	• When the master module is error, this bit turns ON. • When mis-setting of the master module switch occurs, this bit turns ON.	• Outputs to an indicator lamp. • Outputs error code to status.

- See the next page for details of indicator lamps.
  For recovery from mode setting errors of master module, see page 19.
- Error informations of D_0 to D_5 varies depending on D_6 and D_7.
  Error information of D_7 "ON" has priority.

(4) **The address No. of error slave modules (When D_6 is "ON")**

- When error flag D_6 is "ON," the JW-31LMH outputs the address of error slave modules to "D_0 to D_5."
- When more than one error slave module exists, the master module outputs the smallest address No.
- The error slave module address is the address set by the slave module address setting switch. See page 72.
- Output method of status information varies depending on the operation mode of the master module. See page 19.

Contents	Error slave module No. D_0 to D_5	Indicator lamp				Priority
		At communication COMM	Error ERROR	Fault FAULT	Status	
Communication error (Unable to check connected station)	01(8) to 77(8) [Note 3]	●	●		8̶.8̶. Indicates an error slave station in octal (zero sapless)	5
Communication error (At I/O link) [Note 1]	01(8) to 77(8)	●	●		8 8 Indicates an abnormal slave station in octal (zero sapless)	6
Normal communication	00(8)	●			No indication	7

●: Lights, ⊗ : Blinks

- Each bit of D_0 to D_5 expresses weight of octal figure.

D_5	D_4	D_3	D_2	D_1	D_0
×40(8)	× 20(8)	×10(8)	× 4	× 2	× 1

Note 1 The master module can only detect error data from an input module.

Note 2 In case of communication error, check the following and replace a slave module if necessary:
a) Connection with a slave station by a communication cable
b) Address setting of a slave module
c) Power OFF of slave modules
d) Number of I/O bytes setting in a master module.

Note 3 When more than one error slave modules exist, the master module indicates the smallest slave station address while flickering.

(5) Error information (When D_7 is "ON")
- When error flag D_7 is "ON," the master module outputs the error information in error codes (hexadecimal) to D_0 to D_5.

Error code (hexadecimal)	Error contents	Indicator lamp				Remedy	Priority
		At communication COMM	Error ERROR	Fault FAULT	7 segments LED		
0(H)	Line check error		●		No indication	Note 4	3
1	ROM error			●	1..		
2	RAM error (1) (CPU inside RAM)			●	2..		
3	RAM error (2) (For data remedy)			●	3..	Replace master module	1
4	Memory error for data exchange with PC			●	4..		
5	Communication control timer			●	5..		
8	Switch mis-setting		●		8 8	Reset switch	2
−	PC stops operation (program mode)	⊗			No indication	−	4

●: Lights, ⊗ : Blinks

Note 4 A circuit cable error may be caused by short circuit of signal cable, communication signal collides on a cable (a slave module malfunction, wiring error), or a master module malfunction.

Note 5 When error flags D_6 and D_7 are "ON" at the same time, the error information of D_7 has priority.
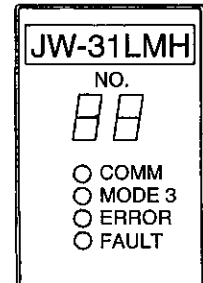
[2] Display error station

If you turn ON both the HALT and CHECK relays, the master module will display the slave station address which has an error on its display panel.

If the more than one slave module has an error, repeatedly turning both the HALT and CHECK relays ON and OFF will cause the master module to display the addresses of slave stations with errors, one at a time, starting with the lowest address. This function can be used in modes 1 to 3.
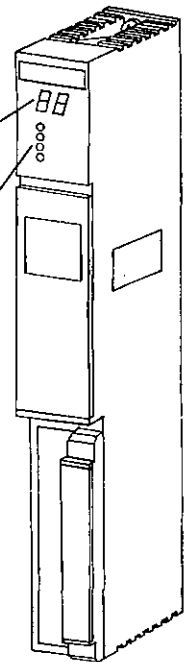
[3] Indicator lamps

Each indicator lamp of master module lights ON/OFF in the following conditions:

Indicator lamp	Indicator meaning	Lighting condition	Recovery
COMM	Communicating	Light at communication	–
MODE 3	Mode 3	SW2 (MODE setting) on master module is set to M3	–
ERROR	Error	• Master station switch setting error • Communication circuit error	• Reset switch (master and slave station) • Check communication cable • Replace master module or slave module
FAULT	Abnormal	Error of master module	Replace master module

Segment indication	Abnormal contents	Remedy
2 .	Master module circuit error (Error code appears at 7 segments upper digit)	Replace master module
8 8	Master modules switch setting error	• Set number of I/O occupied bytes between 1 to 77(8).
. 1	Unable to check slave station 01 connected station (Communication error)	• Check communication cable wiring • Power "ON" slave module • Recheck amount of byte setting switch of master station • Recheck address setting of slave module. • Malfunction of a slave module
. 2	Unable to check slave station 02 connected station	
to	to	
7 . 7 .	Unable to check slave station 77 connected station (Communication error)	
1	Slave station 01 I/O link communication error	• Communication cable wiring check • Slave module power "ON" • Double setting of slave module address • Exchange slave module ※1
2	Slave station 02 I/O link communication error	
to	to	
7 7	Slave station 77 I/O link communication error	
0 0	Turn ON CHECK relay or SW4 at Mode 3, and this indication displays "00" when connected station check is normal.	At normal operation ※2

※1   The master module can check I/O link communication error only through data checking from an input module.

※2   "00" display appears while the CHECK relay is "ON" or for 2 seconds after SW4 is "ON."

JW-31LMH

NO.

○ COMM
○ MODE 3
○ ERROR
○ FAULT

7 segments

LED

Lamp

[1] PC operation conditions and I/O link modules

Operating conditions of master/slave modules become as follows in compliance with the PC conditions, run, stop, error and power OFF.

PC body operating condition	PC body			Master module				Slave module			
	At operating RUN	FAULT	System memory #160	At communication COMM	Error ERROR	Fault FAULT	7 segment indication Note 2	At operating RUN	Error ERROR	Output module output hold switch	
										OFF	ON
Normal operating	●			●				●		–	–
PC stopping	⊗			⊗				●	●	Hold	Reset
I/O link master module error		●	Error code Note 1					●	●	Hold	Reset
PC power "OFF"								●	●	Hold	Reset
At HALT relay "ON" (PC operating)	●			● Note 2				● Note 2			

●: Lights,   ⊗ : Blinks

Note 1   When the master module is error condition, one of error codes "40, 41, 42, 44, 45, 46$_{(BCD)}$" are stored at system memory #0160 of the PC.

For details, see the JW50H/70H/100H "programming manual."

Error code	Error code contents
44 (BCD)	I/O data bus error
45	I/O signal error
41	Input data parity check error
42	Output data check error
40	Installed module check
46	Special I/O error

Note 2   When the HALT relay of the master module is ON, both the HALT lamp of a master module and the HOLD lamps of slave module light.

[2] I/O link operation mode and status information

When an I/O link is abnormal, status information and indication of operating condition of a master/slave module become as follows, according to I/O link operation mode setting:

Mode	Error contents	D_6	D_7	D_0 to D_5	I/O link communi-cation (Note 3)	At communi-cation COMM	Error ERROR	Fault FAULT	7 segments	At opera-tion RUN	Error ERROR	OFF	ON
1	Master module switch setting error		●	Error contents	Stop		●		8 8	●	●	-	
	Slave module error or power OFF	●				●	●						Reset
	Communication error (Input signal)	●		Error slave station address No.	Check connected station	●	●		Error slave station adress indication	●		Hold	Reset
	Communication error (Output module)	●					●	●		●	●		
2	Master module switch setting error		●	Error contents	Stop		●						
	Slave module error or power OFF	●				●					- Ditto -		
	Communication error (Input signal)	●		Error slave station address No.	Continue I/O link communi-cation	●			-				
	Communication error (Output module)	●				●							
3	Master module switch setting error		●	Error contents	Stop		●		8 8				
	Slave module error or power OFF	●		Error slave station address No.		●					- Ditto -		
	Communication error (Input signal)	●			Continue I/O link communi-cation	●			-				
	Communication error (Output module)			-		●							

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- In mode 3, master/slave module becomes as follows at checking connected station by the CHECK relay or CHECK switch SW4:

Mode	Error contents	Master module								Slave module			
		Status			Indicator lamp					Indicator lamp		Output condition of output hold switch	
		D_6	D_7	D_0 to D_5	I/O link communication	At communication	Error	Fault	7 segments	At operation	Error		
					Note 3	COMM	ERROR	FAULT		RUN	ERROR	OFF	ON
3	Master module switch setting error		●	Error contents	Stop			●		- Ditto -			
	Slave module error or power OFF	●					●	●					
	Communication error (Input signal)	●		Error slave station address No.	Continue check connected station		●	●	Error slave address Note 1				
	Communication error (Output module)	●					●	●					

●: Lights, ⊗ : Blinks

Note 1   This indicator lights while the CHECK relay is ON or after 2 seconds of CHECK SW4 switch turns ON.

§9 Required transfer time and communication timing

9-1 Required transfer time

This is the time required for a master module to communicate with all stations. The following calculation includes actual communication time and internal processing time of the master module.

$$T = T_A + (T_B + T_S) N \text{ (ms)}$$

N : Total number of occupied bytes of I/O link (input/output) slave modules. (Unit: 1 byte)

T_A : Pre-processing time of the master module.
$$\left[\begin{array}{l}\text{Transfer speed 172.8 k bit/s} = 0.7 \text{ ms} \\ \text{Transfer speed 345.6 k bit/s} = 0.4 \text{ ms}\end{array}\right]$$

T_B : Necessary time to process 1 byte with master module.
$$\left[\begin{array}{l}\text{Transfer speed 172.8 k bit/s} = 0.175 \text{ ms} \\ \text{Transfer speed 345.6 k bit/s} = 0.088 \text{ ms}\end{array}\right]$$

T_S : Necessary time to communicate 1 byte with a slave module.
$$\left[\begin{array}{l}\text{Transfer speed 172.8 k bit/s} = 0.228 \text{ ms} \\ \text{Transfer speed 345.6 k bit/s} = 0.114 \text{ ms}\end{array}\right]$$

|Note 1| All calculation should be executed in decimal.

Ex.: Transfer time at normal communication with 10 sets of I/O link slave module ZW-322SH (32-point output module.) (When transfer speed is 345.6 k bits per second.)

$$T = 0.4 + (0.088 + 0.114) \times 40 = 8.48 \text{ ms}$$

9-2　PC processing and communication timing

I/O link communication is operated asynchronous with PC scan cycle. However, start up of I/O link communication synchronizes with PC scan cycle.

[1]　Module configuration
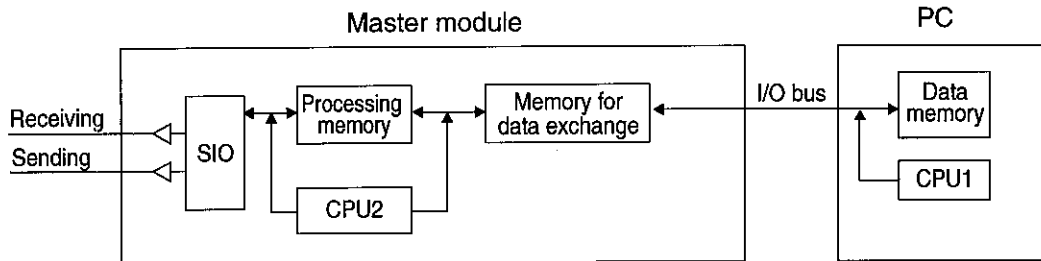
Master module   PC

Memory for data exchange:	This is memory for storing output data for slave module and data from input module.
CPU2:	This is CPU of the master module. The CPU2 exchanges data with the PC and controls SIO.
Processing memory:	This is the internal processing memory of the master module.
SIO:	This is control circuit for serial communication.
Data memory:	This is data memory for the PC.
CPU1:	The CPU1 executes the master module processing and the PC processing. Communication and the PC operation timing are as follows:

Processing at master module side   Processing at PC side
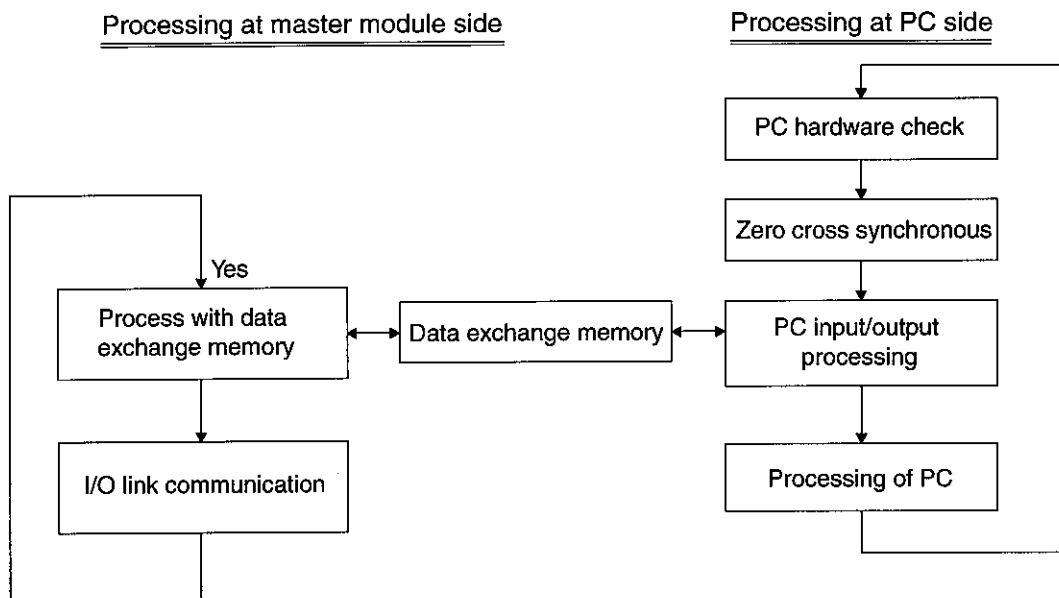
[2] PC's I/O cycle and communication timing

I/O link communication is executed synchronized with the I/O processing of the PC.
When communication time is longer or shorter than the PC scanning time, their time charts are as follows:

(1) When I/O link communication time is shorter than the PC scan time.
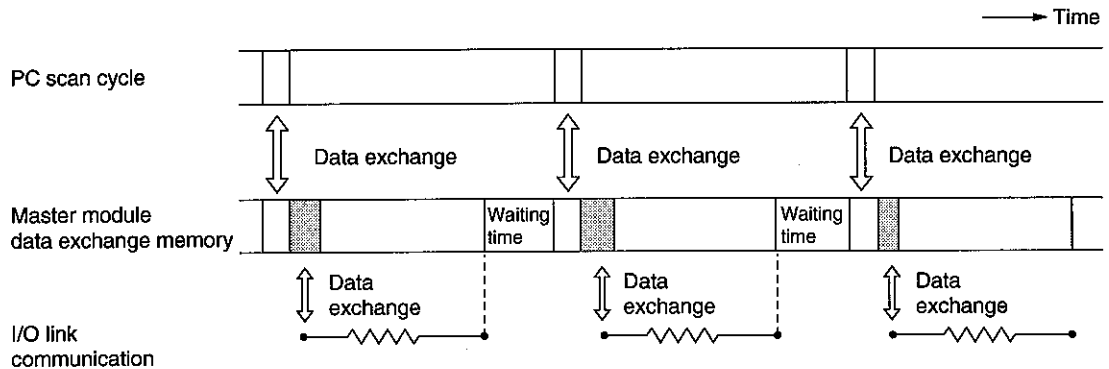
(2) When I/O link communication time is longer than the PC scan time.
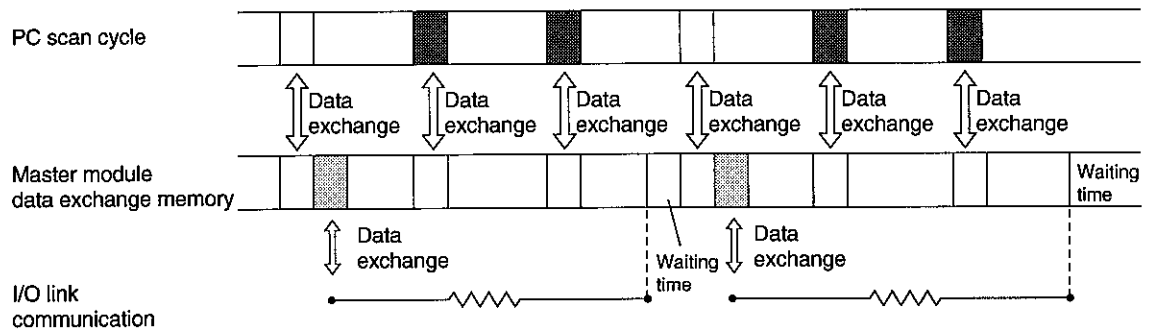
Note 1	☐ shows data processing time between the data exchange memory of a master module and the internal processing memory. It takes approx. 0.32 ms for data of 64 bytes.
Note 2	In case of ■, data to be read and written by the PC stays unchanged. Slave stations do not receive output from the PC and do not change input signal to the PC.
Note 3	In mode 1 and mode 2, connection check communication of slave modules is executed once per 100 communication cycles. In this check, data is not exchanged. (See the next page.)

(3) In the case of connected station check of slave modules:

Below shows time chart to check connected stations. This is an example of the I/O link communication being shorter than the PC scan time. (when mode 1 and mode 2 are normal.)
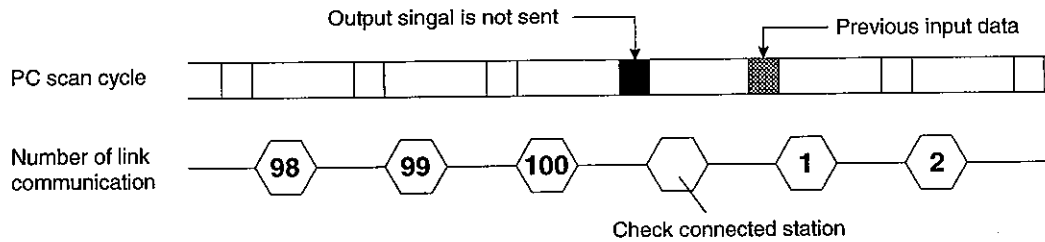
(4) When I/O link communication is abnormal.

In I/O link communication, when the received data is abnormal, output data to the PC varies depending on its operation mode (set by mode setting switch on master module).

1) In mode 1
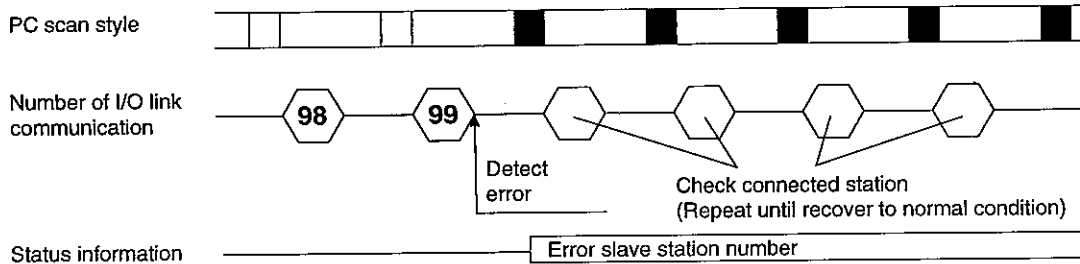
| Note 1 | Communication check is executed by checking of the connected stations of the slave modules, and repeated until communication becomes normal.

2) In mode 2
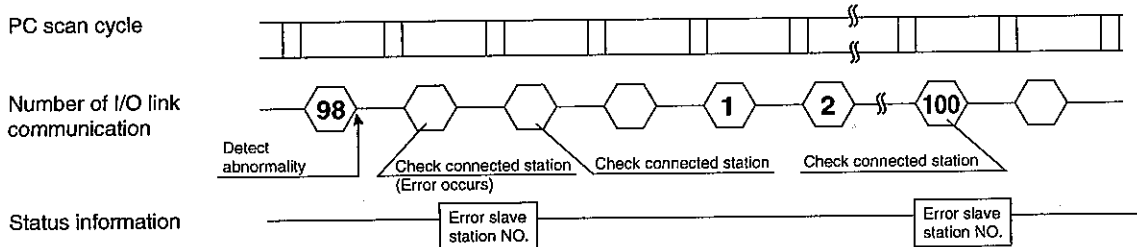
| Note 2 | When the master station detects an error in received data, the JW-31LMH checks the connected stations of the slave modules once. Then, outputs status information for one scan. Therefore, it executes I/O link communication. It treats the error slave station as the disconnected station. The JW-31LMH outputs the error slave station No. for one scan at every 100 scan of connected station check.

3) In mode 3

PC scan cycle

Number of I/O link communication

98 → Detect abnormality → Check connected station (Errir occurs) → Check connected station → 1 → 2 → 100 → 101

Status information — Error slave station No.
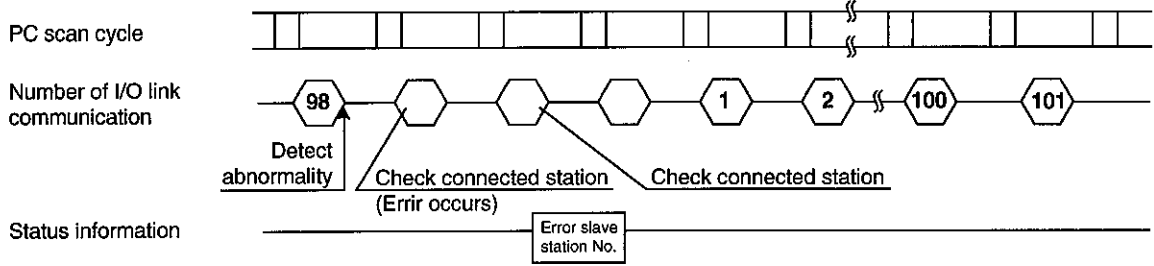
Note 1 When the master station detects an error in received data, the JW-31LMH checks the connected stations of the slave modules once. Then, output status information for one scan. Therefore, it executes I/O link communication. It treats the error slave station as the disconnected station, and execute connected station check again when the CHECK relay or SW4 is ON.

■ When the CHECK relay is ON
When the CHECK relay is "ON," the JW-31LMH checks connected stations.

Output signal is not sent

PC scan cycle

CHECK relay — ON / OFF

I/O link communication — Communication / Communication / Checking connected station / Communication

Status information — Error slave station number (at error only)
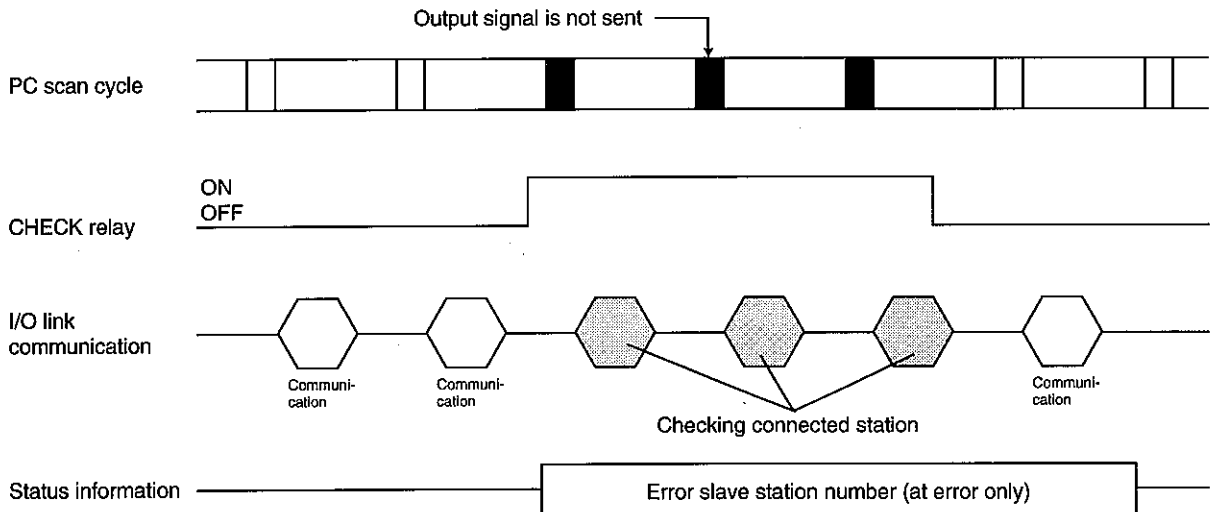
■ When the SW4 (connected station check switch) is ON
The JW-31LMH check connected stations only one time after SW4 is switched "ON."

PC scan cycle

SW4 — ON / OFF — Note 3

I/O cycle — Communication / Communication / Check connected station / Communication / Communication / Communication

Status information — Error slave station number
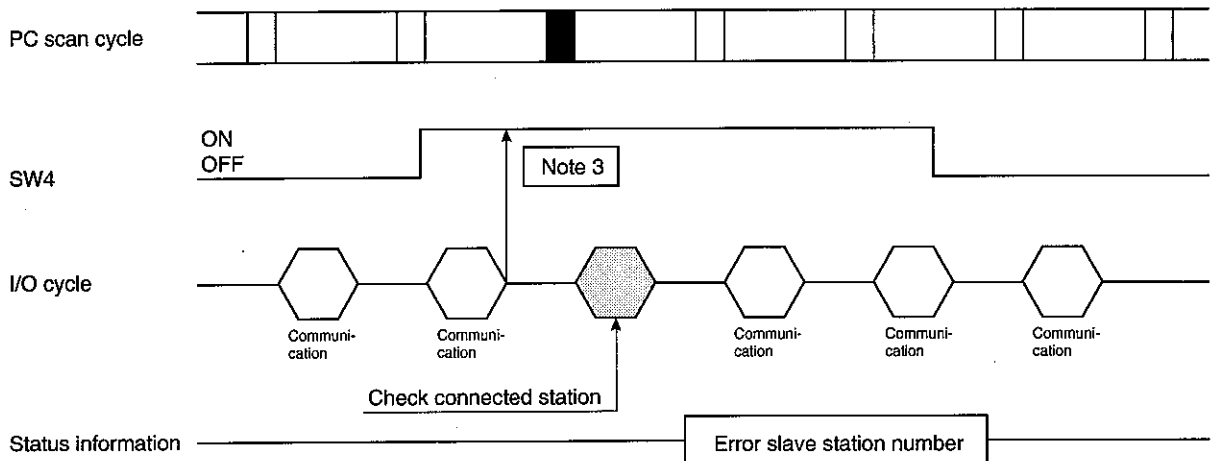
Note 2 SW4 check is executed after communication is completed.

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(5) Data flow between a master module and slave modules

(⇨ Input signal data, ➡ Output signal data)
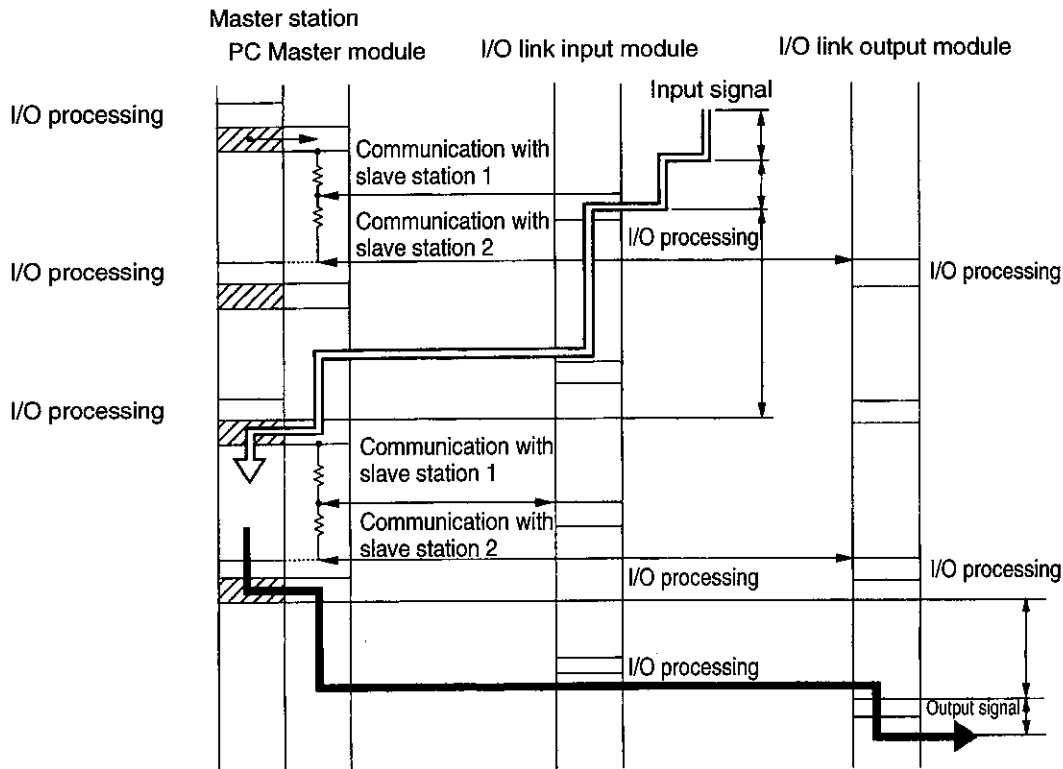
Note 1 | I/O processing of a slave module is executed after completing communication with its master station.

Note 2 | Time lag exists between I/O processing of the PC and those of the slave module.

The time required to receive an input signal is a total of ①, ②, and ③ below.

1. Responce time of input module. ①

2. Waiting time to receive an input signal inside the input module for I/O processing
   Communication waiting time and communication time.
   Waiting time and reading time up to control module.
   ② plus ③ is max. 2 cycles. (1 cycle: see the next page.)

   ┐
   ├ ② + ③
   ┘

Time required to send an output signal is a total of ④, and ⑤ below.

1. Communication time. ④
   Maximum communication time for a single unit (Depends upon the station number. The slave module with the smallest station number takes the least time. The slave module with the largest station number takes the longest time.)

2. Responce time of output module. ⑤

[Description of 1 cycle: see the previous page]

• When the I/O link communication time is shorter than the PC scan time, one cycle time will be equal to PC's scan time.
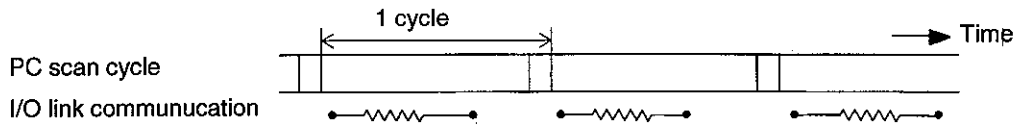
• When the I/O link relay communication time is longer than the PC's scan time, one cycle time will terminate at the end of the PC scan the next time after the communication is complete.
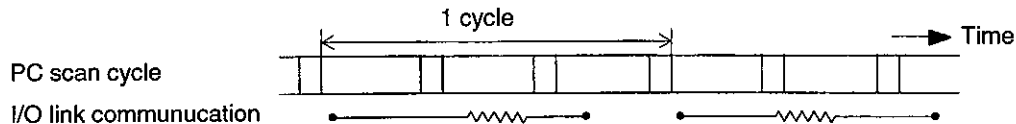
9-3   Minimum scan time of the PC

The master module reads and writes I/O link data as PC special I/O module data.
The master module reads and writes through the data exchange memory so the PC is able to read and write the data.
When the PC scan time is shorter than this processing time, the PC keeps the previous data until the PC completes reading and writing in the data exchange memory in the next scanning.
The minimum scan time of the PC is determined in the following formula.

$$T_{sc} = 0.005 \, (N_1 + N_2)$$

N_1:   The total number of bytes of I/O link input module (Unit: 1 byte)

N_2:   The total number of bytes of I/O link output module (Unit: 1 byte)

0.005:   Processing time to input/output data to the PC (Unit: ms)

Ex.;   PC minimum scan time with 32 sets of 8 points output module.

$$T_{sc} = 0.005 \times 32 = 0.16 \, ms$$

| Note 1 | PC scan time at synchronize PC processing and I/O link communication should be longer than transfer time.

(See page 33 for I/O link transfer time.)

| Note 2 | If the PC scan time is shorter than the PC scan time of this calculation, only the data is not exchanged in every scan, but the value of the I/O link communication and data register in PC is not changed.

§10 Program examples

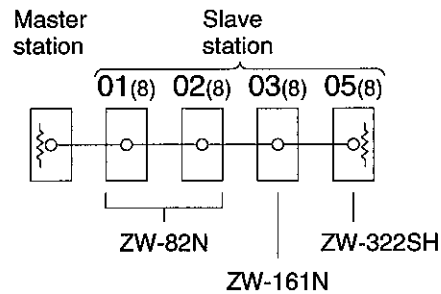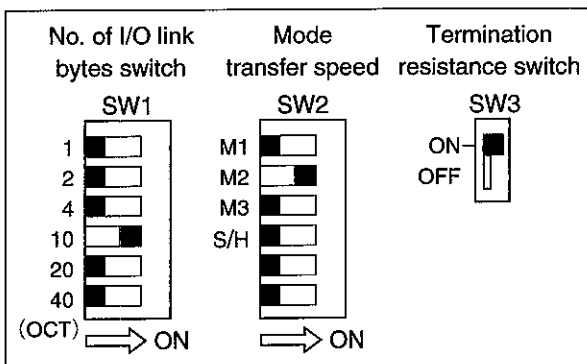Program examples in the following system are shown below.

[1] System configuration

① **Master module (JW-31LMH)**
In this example, 2 sets of 8-point input slave modules, 1 set of 16-point input slave modules, and 1 set of 32-point output slave modules are used.
Therefore, the total number of link bytes should be set as 8 bytes.

② **The 32-point DC input module (JW-32N)**
Installs operation switches and sends a signal to the I/O link output module.

③ **The 32-point DC output module (JW-32S)**
Displays input signal from an I/O link input module (ZW-82N).

④ **The 32-point DC output module (JW-32S)**
Used for monitoring status of I/O link communication.

⑤ **Slave module (ZW-82N, ZW-161N, ZW-322SH)**

Control module
Power supply module

| 24VDC power supply |
| Operation switch 32 pcs. |

(Input module)	(Output module)
2 sets of ZW-82N	1 set of ZW-322SH
1 set of ZW-161N	
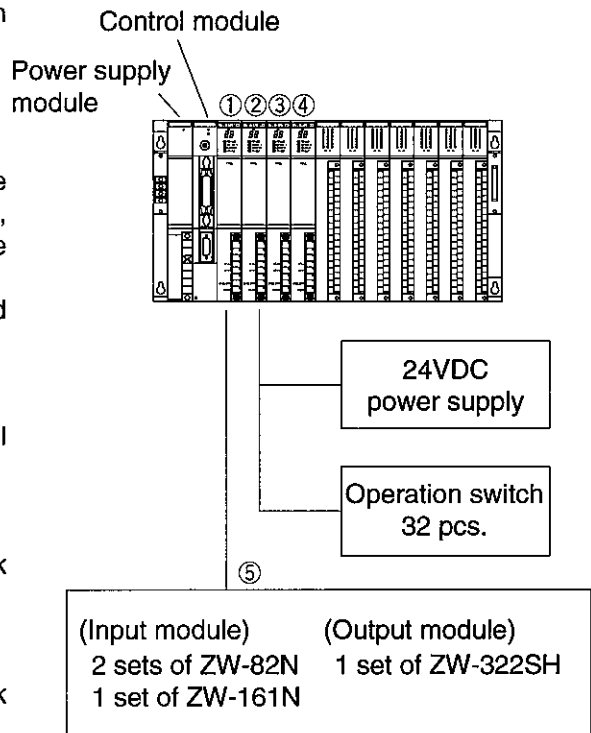
[2] Switch setting of modules

Switch setting of master module

Switch setting of slave module

Slave station No.	01(8)	02(8)	03(8)	05(8)
Switch setting	■□ −40 ■□ −20 ■□ −10 ■□ −4 ■□ −2 □■ −1	■□ −40 ■□ −20 ■□ −10 ■□ −4 □■ −2 ■□ −1	40 20 10 4 2 1	40 20 10 4 2 1 (Switch ON terminal resistance)

[3] Data memory allocation

	1	0	
⊐0000	HALT	CHECK	(JW-31LMH)
⊐0001			
⊐0002	Sending data to I/O		
⊐0003	link output module		DC input module
⊐0004	(switch input)		(JW-32N)
⊐0005			
⊐0006	For monitor receiving		
⊐0007	data from I/O link		DC output module
⊐0010	input module		(JW-32S)
⊐0011			
⊐0012	Monitor status section	(Current value)	DC output module
⊐0013	Monitor status section	(Memory)	(JW-32S)
⊐0014			
⊐0015			

Data register

49000	D7, D6 status information
49001	Slave station address 01(8)
49002	Slave station address 02(8)
49003	Slave station address 03(8)
49004	Slave station address 03(8)
49005	Slave station address 05(8)
49006	Slave station address 05(8)
49007	Slave station address 05(8)
49010	Slave station address 05(8)
49011	
	Not used
49077	

ZW-82N
(2 sets, input) I/O link
input module

ZW-161N
(1 set, input)

I/O link data
(JW-31LMH)

ZW-322SH
(1 set, output) I/O link
output module

Timer

000	For error release detection

• For details of status information, see page 27 of this manual.

[4] PC program
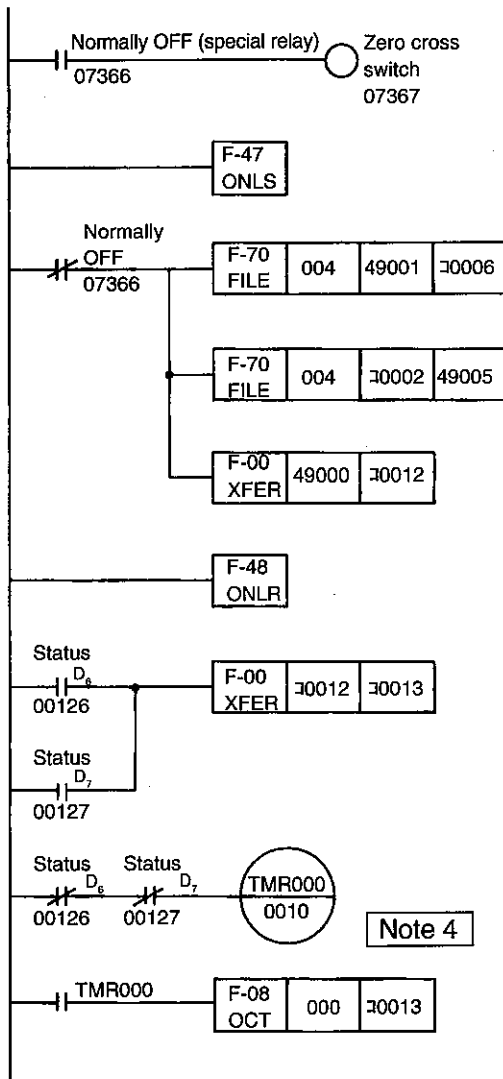
Set PC scan time to 8.3 ms (at zero cross synchronous 60 Hz) and execute communication within a PC scan time.

| Note 1 | Note 2 | Note 3 |

```
   Normally OFF (special relay)    Zero cross
─┤├──────────────────────────────○  switch
   07366                             07367

                    ┌──────┐
─────────────────── │ F-47 │
                    │ ONLS │
                    └──────┘

   Normally
   OFF             ┌──────┬─────┬─────┬───────┐
─┤/├────────────── │ F-70 │ 004 │49001│ ﬞ0006 │
   07366           │ FILE │     │     │       │
    │              └──────┴─────┴─────┴───────┘
    │
    │              ┌──────┬─────┬─────┬───────┐
    ├───────────── │ F-70 │ 004 │ﬞ0002│ 49005 │
    │              │ FILE │     │     │       │
    │              └──────┴─────┴─────┴───────┘
    │
    │              ┌──────┬──────┬───────┐
    └───────────── │ F-00 │49000 │ ﬞ0012 │
                   │ XFER │      │       │
                   └──────┴──────┴───────┘

                    ┌──────┐
─────────────────── │ F-48 │
                    │ ONLR │
                    └──────┘

   Status
     D₆            ┌──────┬───────┬───────┐
─┤├─────────────── │ F-00 │ ﬞ0012 │ ﬞ0013 │
   00126    │      │ XFER │       │       │
            │      └──────┴───────┴───────┘
   Status   │
     D₇     │
─┤├─────────┘
   00127

   Status    Status     ╱‾‾‾‾‾‾╲
     D₆        D₇       ( TMR000 )
─┤/├────────┤/├─────────╲ 0010 ╱       ┌────────┐
   00126    00127        ╲____╱        │ Note 4 │
                                       └────────┘
    TMR000         ┌──────┬─────┬───────┐
─┤├────────────────│ F-08 │ 000 │ ﬞ0013 │
                   │ OCT  │     │       │
                   └──────┴─────┴───────┘
```

Transfers the information of I/O link input module for monitoring.

Transfers switches input to the allocated slave station address No. of the I/O link output module.

The status information is transferred for monitoring when an error occurs.
When an error occurs, the JW-31LMH stores the status information in mode 2 to enable monitoring.

When no error exists in 100 communication cycles, the JW-31LMH deletes monitor of status (error contents).

$$\text{Time} = \frac{\text{Required scan time for monitoring} \times 100}{100 \text{ (timer is 100 ms unit)}} + 2 = 8.3 + 2$$

When there is no error, the TMR 000 will time out and delete error information.

Note 1	See page 39 for calculating the minimum scan time.
Note 2	See page 33 for the required transfer time.
Note 3	When you use JW-2PU as a DC input power supply for PC power supply module, switch ON zero cross switch (07367) and set scan time ($09_{(H)}$) in PC system memory #0226.
Note 4	Set the timer with an integral number. In order to get timer accuracy, two correction values of allowance -1 plus digit are provided as follows: timer allowance = digit setting $^{+0}_{-1}$.

§11 Slave module

The table below lists the Sharp I/O link slave modules which can be connected to the JW-31LMH as slave modules.

Model name		No. of points	Specification
Input	ZW-82N	8 points	12/24 VDC
	ZW-161N	16 points	100 to 120 VAC
	ZW-162N	16 points	12/24 VDC
	ZW-164NH	16 points	24 VDC
	ZW-324NH	32 points	24 VDC
	ZW-84NC	8 points	24 VDC
Output	ZW-82S	8 points	12/24 VDC, 0.3 A, transistor output
	ZW-161S	16 points	100 to 120 VAC, 0.5 A, triac output
	ZW-162S	16 points	12/24 VDC, 0.3 A, transistor output
	ZW-164S	16 points	264 VAC/30 VDC, 2 A, relay output (separated common)
	ZW-162SH	16 points	24 VDC, 0.3 A, transistor output
	ZW-322SH	32points	24 VDC, 0.3 A, transistor output
I/O	ZW-162M	16 points	12/24 VDC, 0.3 A, transistor output 8 points, 12/24 VDC input 8 points
	ZW-162MH	16 points	24 VDC, 0.3 A, transistor output 8 points, 24 VDC input 8 points
	ZW-322MH	32 points	24 VDC, 0.3 A, transistor output 16 points, 24 VDC input 16 points
	ZW-162MC	16 points	24 VDC, 0.3 A, transistor output 8 points, 24 VDC input 8 points

• For LCD terminal and manifold solenaid valve, see respective instruction manuals.

11-1 ZW-82N/82S

[1] Name and function of each part

Module retention hole (4 φ)
Uses M3 screw.

Indicator lamp
Show operational status.

Terminal block covers
Protect the terminal blocks.

Rating plate

Terminal block
Terminals for power,
communication, and other lines.

Switch cover
Protects mode setting switch.

Switch cover
Protects address setting switch.

Address setting switch
Sets slave station number.

Mode setting switch
Sets operational mode.

(Set condition at delivery)
OFF   ON
▮ −40
▮ −20
▮ −10
▮ −4
▮ −2
▮ −1
ADDRESS

Output Module (Set condition at delivery)
MODE 1 2 3 4 ON / OFF
Termination resistance / Function setting / Hold output / Prohibit Output

Intput Module (Set condition at delivery)
MODE 1 2 3 4 ON / OFF
Termination resistance / Function setting / Invalid

[2] Setting switch

Be sure to turn OFF the power to the PC before setting switches. Setting switches while power is ON could cause a malfunction.

(1) Address setting switch (ST No.)

Set slave station number (ST No.).
- Set from "01" in octal notation.
- Set which byte of the "I/O link area" in the mastermodule is used.

OFF   ON

```
ADDRESS
— 40 ⎫
— 20 ⎪
— 10 ⎬ Octal notation
— 4  ⎪
— 2  ⎪
— 1  ⎭
```

Example: When using two 16 points slave module and one 8 points slave module:

Status
Slave station 01$_{(8)}$
Slave station 03$_{(8)}$
Slave station 05$_{(8)}$

| 16 points module |
| 16 points module |
| 8 points module |

```
      402010 4 2 1
ON    ｜ ｜ ｜ ｜ ｜ ｜
```

```
      402010 4 2 1
ON    ｜ ｜ ｜ ｜ ｜ ｜
```

OFF   ON
```
— 40
— 20
— 10
— 4
— 2
— 1
```

──────────────────────────────

| Note 1 | Duplicate setting of slave station addresses will result in a malfunction.

Duplicate setting	Operation
If two input modules have the same address	Unspecified input data
If an input module and an output module have the same address	Unspecified data and output module condition
If two output modules have the same address	Output of same data

| Note 2 | The slave station address of the LCD terminal Z-SM10 shall be set in decimal notation.

(2) Mode setting switch

Sets termination resistance, function, and other items.

① Termination resistance

- When setting termination resistance switches, those for stations on the ends of I/O link lines should be "ON," and all other stations should be "OFF."
- The delivery setting is "ON."
- Setting example:
  In the diagram below, slave station $03_{(8)}$ and the master station are set to "ON," while the other stations are set to "OFF."
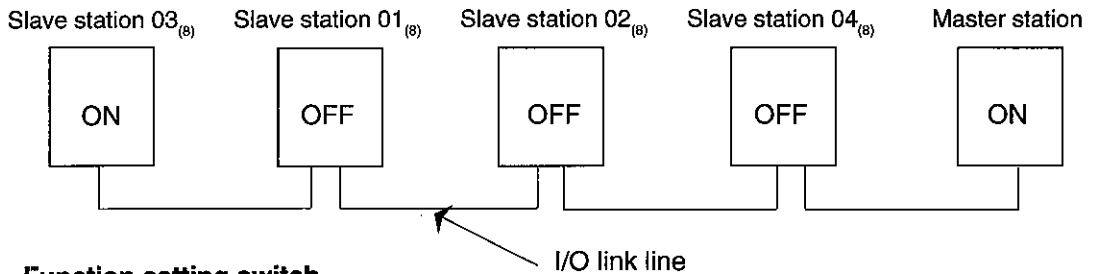
② Function setting switch

- Sets "OFF : I/O link" as communication functions.
- The delivery setting is "OFF."
- Module will not operate, if turned "ON."

③ Output hold switch (on output module only)

- When the I/O link communication is error, set the operation at the slave module side. If there is no communication from the master module for more than 1 second, it is judged that the communication is suspended.
  The communication is also suspended when the master module HALT relay is "ON."

Setting value	Function	Description
ON	Reset	All outputs are "OFF" when communication is suspended.
OFF	Hold	Output before suspension is held when communication is suspended. ※

※When the CPU is error (when the watchdog timer is actuated), all outputs are "OFF."

④ Output prohibit switch (on output module only)

- This is the communication test switch of output module.

Setting value	Function	Description
ON	Permit	Lamp of output module and output element are "ON/OFF" depending on the output signal of PC.
OFF	Hold	Output elements are all "OFF" regardless of PC output signal.

[3] Installation method

(1) Installation

Avoid keeping slave module in the following condition.
* Direct sunlight.
* Ambient temperatures below 0°C and over 55°C.
* No condensation due to rapid temperature variation.
* Relative humidity which exceeds 35 to 90%.
* Corrosive and flammable gases.
* Dusts, iron, and salty conditions.
* Vibration and shock producing and transferring positions.
* Slave module should be installed with its top facing up.

Good installation   No-good installation
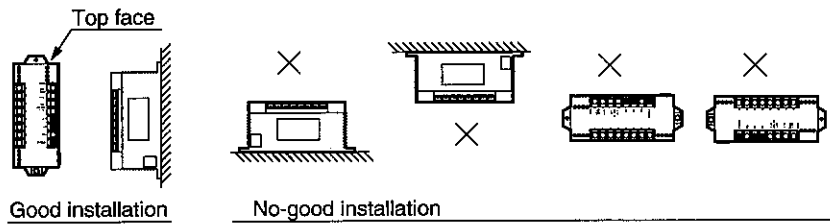
* As module are not dustproof or waterproof, install them in sealed cabinets if at all possible.
* Avoid installation just above high calorie heat generating devices (heaters, transformers, high capacity resistance etc.). Also avoid to install other equipment close to slave module.
* Avoid installation in a box in which high voltage device is installed.
* As much as possible keep away from high voltage cables and power cables.
* Install on a good conductivity metal plated panel instead of painted one for easy grounding and better noise tolerance.
* Use zinc plated retention screws of M3 for installing slave module.

(2) Installation dimensions

(Unit: mm)

129

30
15
(Wiring allowance)

M3 tapped hole

Wiring duct

50

50

Wiring duct
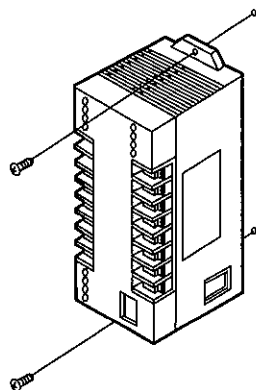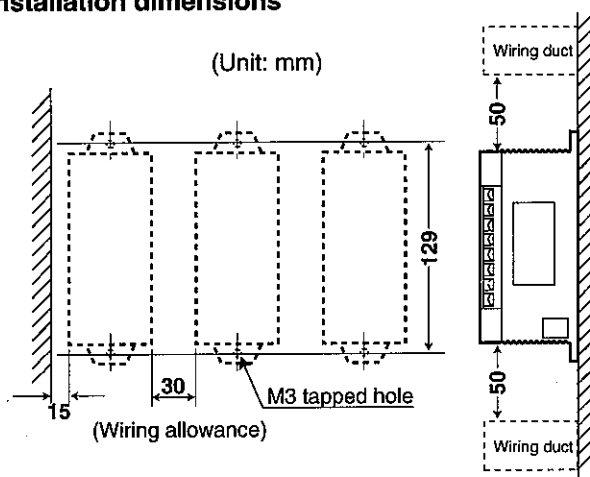
* Secure 50 mm or more space above and below the module for heat radiation. Keep away for 30 mm or more between modules for wiring.
* Use 2 M3 x 10 screws for retention.

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[4] Wiring method

(1) Wiring cautions

Use crimp-style terminals for connecting external devices such as limit switches and solenoid valves with input/output module. Select crimp-style terminals referring the dimensions below.
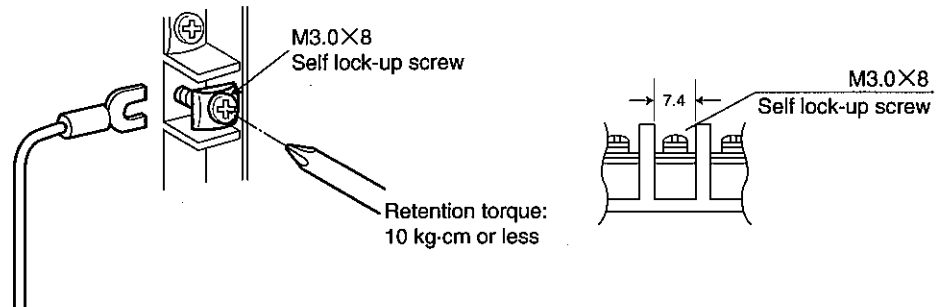
(2) Connecting communication cables
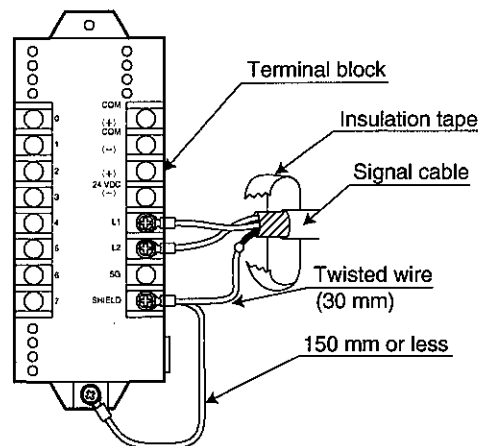
Note 1	Use the recommended twisted pair shield cable for wiring to the terminals L_1, L_2, and SHIELD. When wiring the shield line to the terminal block, it is convenient to relay the twisted cable with 0.5 mm² at the outside of the shield cable.
Note 2	When installing a slave module in a new location or otherwise moving it, be careful that the communication cable is not excessively stressed or bent.
Note 3	Cables from the shield should be kept as short as possible (below 30 mm).
Note 4	Ground the slave module's FG terminal (frame ground terminal) with a twisted cable of about 0.5 mm² using the SHIELD terminal. From FG terminal, ground to the control panel chassis with a cable not longer than 150 mm.
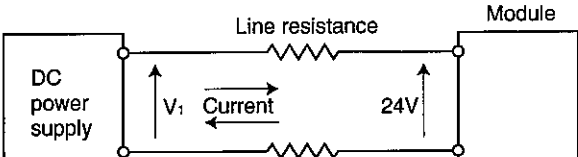
(3) Power supply wiring

Twist DC power input lines with each other. As DC input power supply uses a insulation type DC/DC converter inside the module, it is also applicable as power for input signal or output signal.

FG terminal
Class-3 grounding
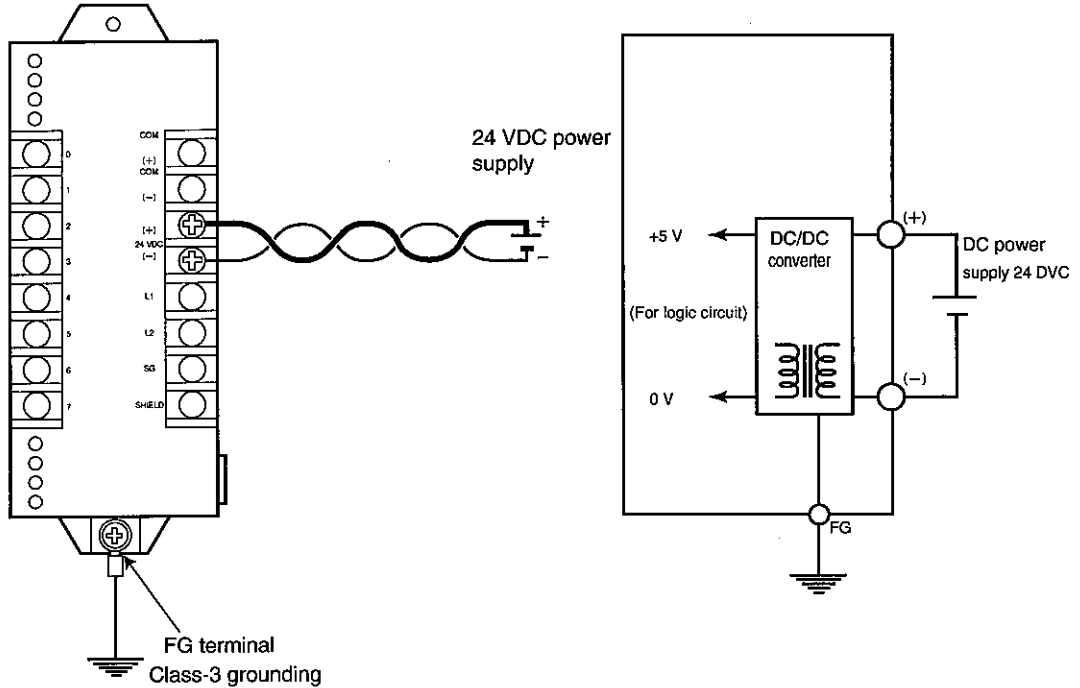
Note 1	In case of sharing this power with load driving power for DC input/output signal, note wiring and noise prevention method.

Note 2	FG terminal of slave module is sure to connect with ground through base by cable below 150 mm. It is also used as ground for the DC/DC converter.

Note 3	When DC power is supplied to a slave module positioned away from it, provide fuse elements for the DC power supply and each module respectively. Be careful for voltage drop due to long distance wiring.

<Reference> Power voltage and line resistance	Line resistance
DC power voltage (V_1) = 24V + slave module current × line resistance × 2 × wire length (km)	Nominal sectional area 0.3 mm² .... 61.9 ohm/km 0.5 mm² .... 37.1 ohm/km 0.75 mm² .... 24.8 ohm/km

(4) Wiring input signal cable

■ DC input
(ZW-82N)

DC power supply: 12/24 VDC

Input tools

External supply power
12/24 VDC
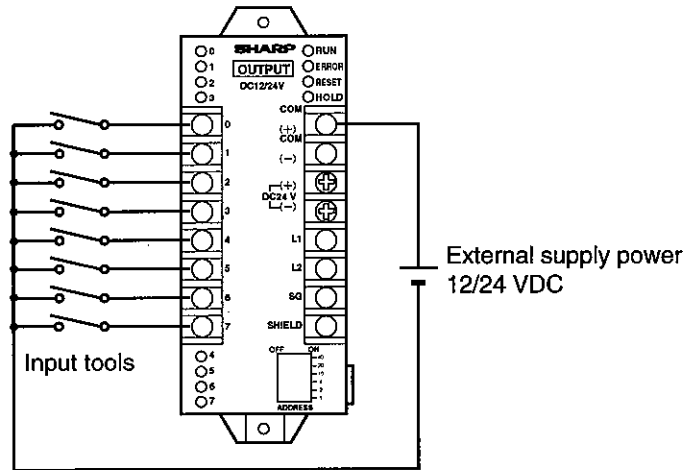
(5) Wiring output signal cable

■ Transistor output
(ZW-82S)

DC power supply: 12/24 VDC
Fuse element   : 125 VAC, 3A
(on the market)

Output tools
(load)

External supply power
12/24 VDC
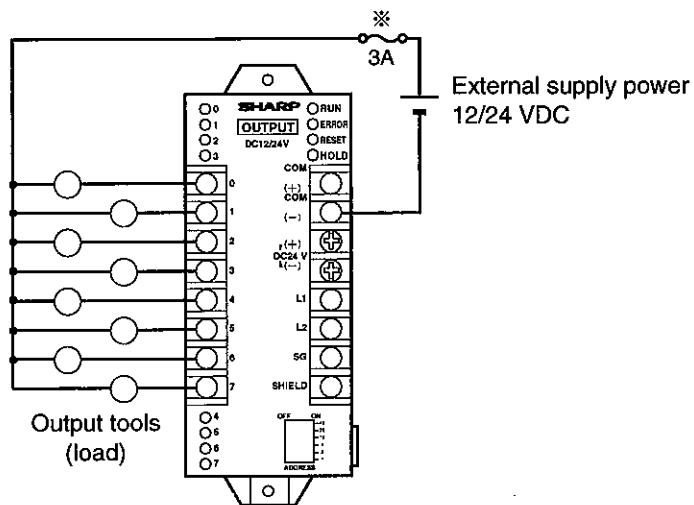
※ Be sure to provide a fuse element for the slave module so as not to burn it out.

• In a DC output module, the (–) pole of external power supply and the (–) pole of DC power are conductive, and be sure to connect wiring to COM (–) terminal.

[5] Error and treatment

You can see the self-diagnosis results by the indicator lamps.

Indicator lamp	Display meaning	Lighting condition	Reset method
RUN	In operation	Slave station normal operation	—
ERROR	Error	• Slave station switch setting error	• Set slave station switch again.
		• Communication error	• Check communication cable.
		• PC stopped	• Operate PC.
		• Slave module defective	• Replace slave module .
RESET	Reset	Note	—
HOLD	Hold	• At master station HALT relay "ON."	—
0 to 7	Input indicator lamp	Comes on when the input signal to the slave module is "ON."	—
	Output indicator lamp	Lights when output signal from PC is "ON".	—

Operation description		In operation RUN	Error ERROR	Input	Output	Reset method	Priority order
Normal operation	No control input	●		"ON", "OFF" by input signal	Changes due to signal from PC	—	4
	Reset input (Note)	●			All points "OFF"		
	Hold input (Note)	●			Output hold		
	Reset and hold input (Note)	●			All points "OFF"	Reset input is given priority.	
	Output prohibit switch "ON"	●	·				
Abnormal operation	Slave module error		●			Replace slave module.	1
	Switch setting error		●			Set address switch again.	
	Communication suspended	●	●		Holding state before abnormality	PC operation	2
	Communication error (output only)	●	◗			Check communication cable. Replace slave module.	3

●: Lighting, ◗: Blinks

Note 1   The RESET lamp lights ON only when ZW-31LM is used for master module.

Note 2   The HOLD lamp lights ON when JW-31LM/JW-23LM/JW-23LMH are used for master module as synchronizing to internal relay, and also lights ON with CHECK relay "ON" in the case of mode 3 and mode 6.

[6] Specifications

(1) General specifications

Item	Specifications
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (No condensation)
Vibration resistance	Conforming to JIS-C-0911 (2 hours each in X, Y, Z directions)
Shock resistance	Conforming to JIS-C-0912
Allowable power voltage	24 VDC ± 15% (ripple factor: less than 5%), power source for logic circuit
Power consumption current	100 mA (24 VDC)
Weight	Approx. 300 g (ZW-82N, ZW-82S)

(2) Communication specifications

Item	Specifications
Data transfer rate	EIA RS485 or equivalent
Transfer rate	172.8 k bits/s
Transfer format	Asynchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and reverse-double verification
Synchronous mode	Asynchronous
Transfer mode	Time sharing cyclic digital system
Communication line	Party line
	Shielded twisted pain cable
	Cable total length : 1 km max.

(3) Outside dimensions (same for both input and output module)

(Unit: mm)
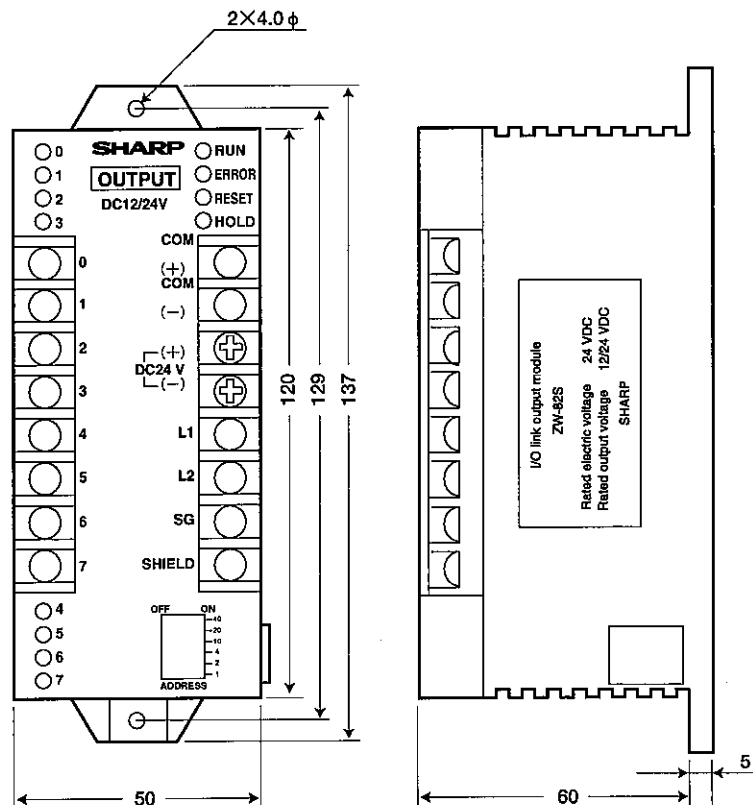
(4) Specification of each module

① ZW-82N (12/24 VDC input module)

Item	Specifications
No. of input points	8 points
No. of slave station occupied bytes	1 byte
Rated input voltage	12/24 VDC ※
Max. input voltage	26.4 VDC
Rated input current	10.5 mA (at TYP. 24 VDC), 5.5 mA (at TYP. 12 VDC)
Input voltage level	ON level : 10 V or less (at ripple lower limit voltage) OFF level: 6 V or up (at ripple upper limit voltage)
Input current level	ON level : 3.5 mA or less, OFF level: 1.5 mA or up
Input impedance	2.3 k ohm (TYP.)
Response time	OFF → ON: 30 ms or less (12/24 VDC) ON → OFF: 30 ms or less (12/24 VDC)
DC power consumption with current (24 VDC)	Max. 100 mA (power for logic circuit)
Operation indication	Light at ON (8 pcs. of LED)
Connection terminal	Terminal block 8P x 2 pcs.
Applicable wire	1.25 mm² or less
Ambient temperature, humidity	0 to 55°C, 35 to 90%RH
Dielectric strength	250 VAC, 1 minute (between input terminal, power input terminal and secondary circuit)
Insulation resistance terminal	500 VDC, 10 M ohm or up (between input terminal, power input and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points

Outside connection drawings	Surface view

DC power supply 24 VDC

24 VDC
(+)
(−)
DC/DC converter (Isolated) → Logic circuit

External supply power 12/24 VDC

Common (+)   Input indicator lamp

0

Input indicator lamp

7
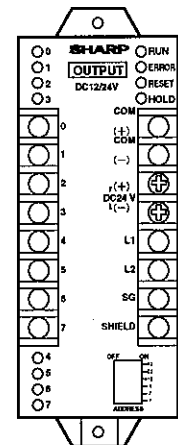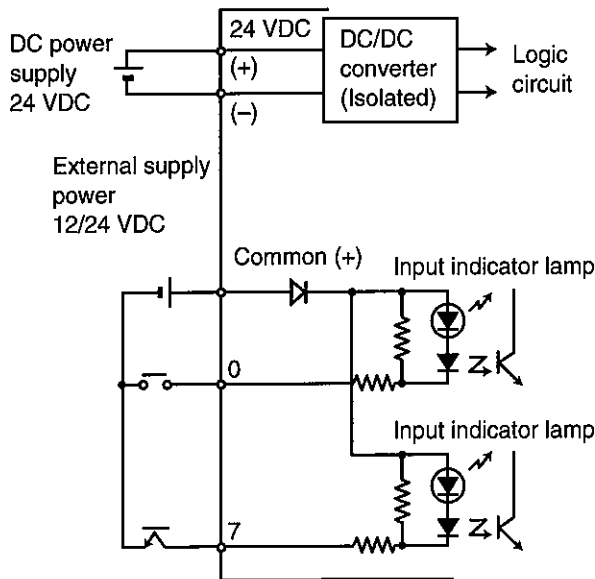
※ Full wave rectified DC power without smoothing cannot be used. Ripple factor should be less than 5% in 12 VDC and less than 15% in 24 VDC.

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② ZW-82S (12/24 VDC output module)

Item	Specifications
No. of output points	8 points
No. of slave station occupied bytes	1 byte
Rated output voltage	12/24 VDC
Allowable output voltage	10 to 30 VDC
Rated max. output current	0.3 A
Surge ON current	Output element capacity: 1 A (PULSE PW = 20 ms, DUTY = 1/2)
Leakage current	0.1 mA or less
ON voltage	0.5 V or less (0.3 A)
Response time	OFF → ON: 1 ms or less, ON → OFF: 1 ms or less ※
DC power consumption with current (24 VDC)	Max. 100 mA (power for logic circuit)
External supply power (10 to 30 VDC)	Max. 5 mA/point
Operation indication	Light at ON (8 pcs. of LED)
Connection terminal	Terminal block 8P x 2 pcs.
Applicable wire	1.25 mm² or less
Ambient temperature, humidity	0 to 55°C, 35 to 90%RH
Dielectric strength and	250 VAC, 1 minute (between output terminal, power input terminal, secondary circuit)
Insulation resistance terminal,	500 VDC, 10 M-ohm or up (between output terminal, power input and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points
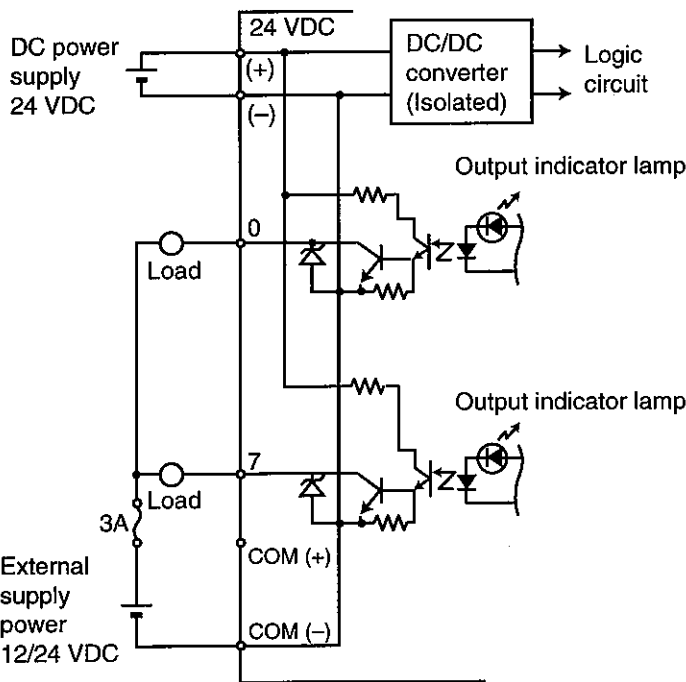
Outside connection drawings	Surface view
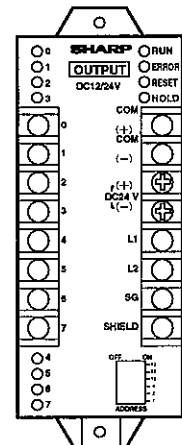
※ When induction load is applied, the switching time from "ON" to "OFF" may delay 1 second or more by inductance of load.

11-2 ZW-161N/162N/161S/162S/164S/162M

[1] Name and function of each part

⑥ Mode setting switch
⑦ Module retention hole
⑧ Rating plate
④ Station number (ST No.)
③ Switch cover
② Terminal block cover
① Indicator lamp

⑤ Terminal block
⑨ DIN rail lever
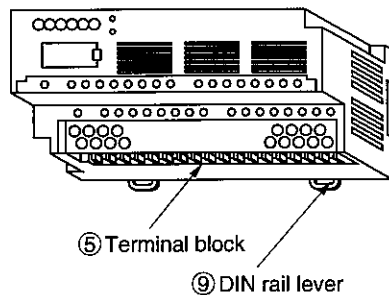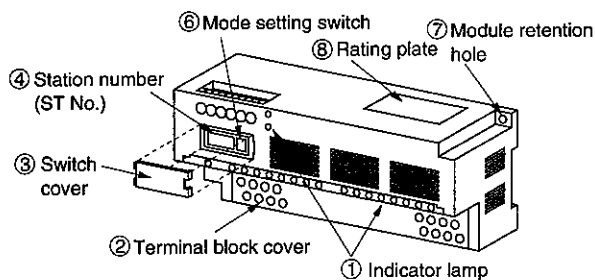
① Indicator lamp
Display each operation condition. (See as below)

② Terminal block cover (integral with case)
Protective cover for terminal block
Detachable by cutting off fixing portion.

③ Switch cover
Protective cover of station number (ST No.) setting switch ④ and mode setting switch ⑥

④ Station number (ST No.) setting switch
Set the station number of slave module.

⑤ Terminal block
Connect power source wire, signal wire and other cables.

⑥ Mode switch
Switch to set operation mode of slave module.

⑦ Module retention hole (4ø)
Mounting holes of M3 screws

⑧ Rating plate

⑨ DIN rail lever
For detaching from and attaching to DIN lever.

[Indicator lamp]

ERROR lamp   RUN lamp

24 VDC power lamp

I/O lamp
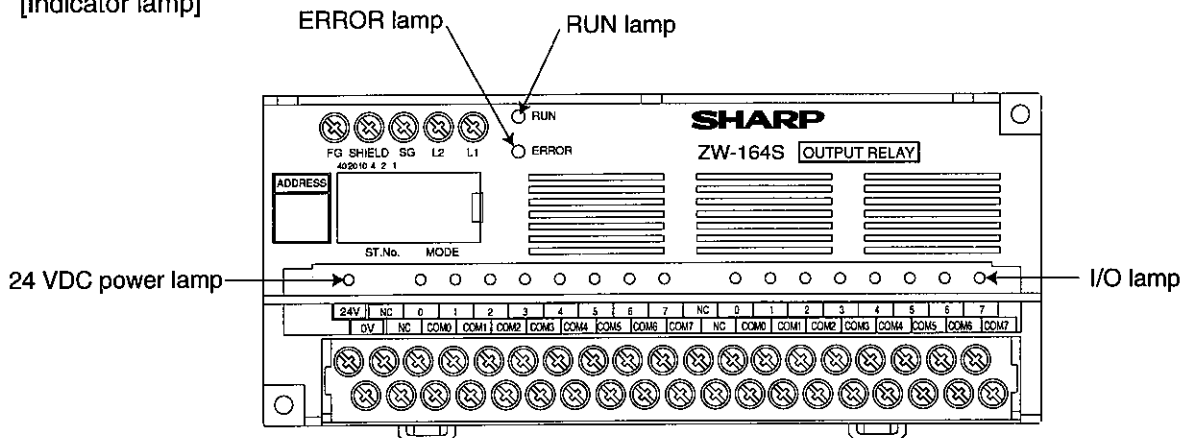
(Indicator lamps are common to all models.)

Lamp name	Color	Operation
Run lamp	Green	Lighting during normal operation
Error lamp	Red	Lights up when slave station is error or when impossible to communicate with the master station.
24 VDC power lamp	Green	Light when the DC input power source is turned "ON."
Input, output lamps	Red	Light when input and output are "ON."

The 24 VDC power lamp does not light when the fuse of DC input power supply is blown the polarity of power source is wrong.

[2] Setting switch

Before setting the switch, turn OFF the power supply to the PC. Switch setting without turning OFF the power supply may cause malfunction.

(1) Address switch (ST No.)

Set slave station number (ST No.).
- Set from "01" in octal notation.
- Set which byte of the "I/O link area" in the master module is used.

Setting at delivery

ST No

Example: When using two 16 points slave module and one 8 points slave module:

Status
Slave station $01_{(8)}$
Slave station $03_{(8)}$
Slave station $05_{(8)}$
Slave station $06_{(8)}$
Slave station $12_{(8)}$

Note 1   Duplicate setting of slave station addresses will result in a malfunction.

Duplicate setting	Operation
If two input modules have the same address	Unspecified input data
If an input module and an output module have the same address	Unspecified data and output module condition
If two output modules have the same address	Output of same data

Note 2   The slave station address of the LCD terminal Z-SM10 shall be set in decimal notation.

(2) Mode setting switch

Sets termination resistance, function, and other items.

Set condition at delivery
as an output module
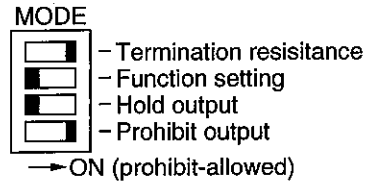
Set condition at delivery
as an input module
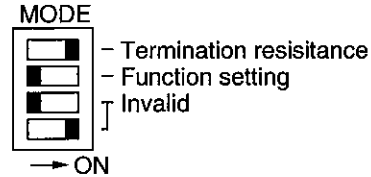
MODE

[switch diagram] – Termination resisitance
– Function setting
– Hold output
– Prohibit output
→ ON (prohibit-allowed)

MODE

[switch diagram] – Termination resisitance
– Function setting
⊥ Invalid
→ ON

① Termination resistance

- When setting termination resistance switches, those for stations on the ends of I/O link lines should be "ON," and all other stations should be "OFF."
- The delivery setting is "ON."
- Setting example:
  In the diagram below, slave station $03_{(8)}$ and the master station are set to "ON," while the other stations are set to "OFF."

Slave station $03_{(8)}$ Slave station $01_{(8)}$ Slave station $02_{(8)}$ Slave station $04_{(8)}$ Master station

| ON | OFF | OFF | OFF | ON |

I/O link line
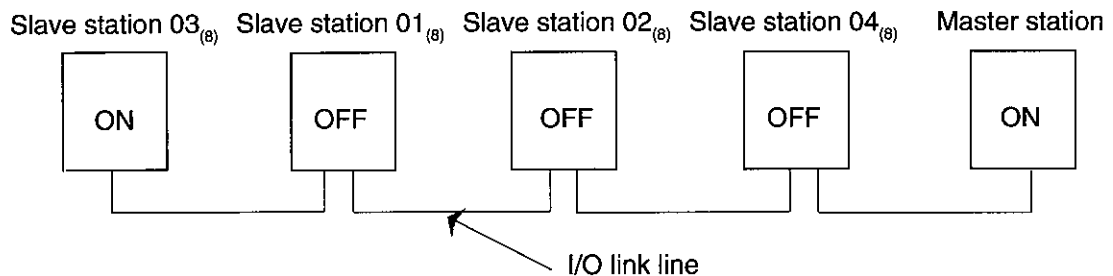
② Function setting switch

- Sets "OFF: I/O link" as communication function.
- The delivery setting is "OFF."
- Module will not operate if turned "ON."

③ Output hold setting switch (on output module only)

- When the I/O link communication is error, set the operation at the slave module side. If there is no communication from the master module for more than 1 second, it is judged that the communication is suspended.
  The communication is also suspended when the master module HALT relay is "ON."

Set value	Function	Description
ON	Reset	All outputs are "OFF" when communication is suspended.
OFF	Hold	Output before suspension is held when communication is suspended. ※

※ When the CPU is error (when the watchdog timer is actuated), all outputs are "OFF."

④ Output prohibit setting switch (on output module only)

- This is the communication test switch of output module.

Set value	Function	Description
ON	Permit	Lamp of output module and output element are "ON/OFF" depending on the output signal of PC.
OFF	Hold	Output elements are all "OFF" regardless of PC output signal.

[3] Installation method

(1) Installation

Avoid keeping slave module in the following condition.
* Direct sunlight.
* Ambient temperatures below 0°C and over 55°C.
* No condensation due to rapid temperature variation.
* Relative humidity which exceeds 35 to 90%.
* Corrosive and flammable gases.
* Dusts, iron, and salty conditions.
* Vibration and shock producing and transferring positions.
* Peripheral space needed in 5 directions for ventilation and wiring.

※ Slave module should be placed at least 100 mm apart for adequate cooling.
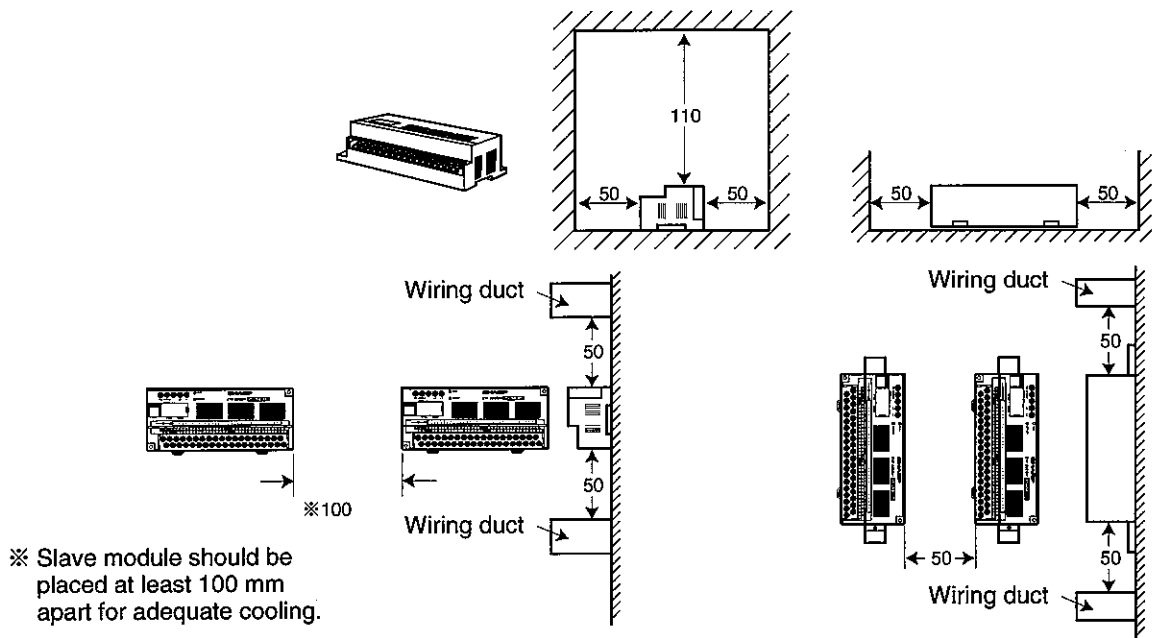
* Install in one of the following 4 directions, which afford good cooling.

| Horizontal mounting | Vertical mounting |
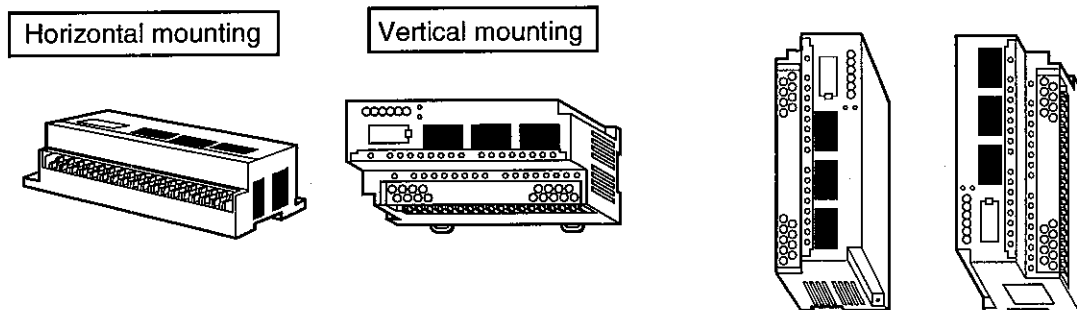
* Being not designed for dust and water proof construction, install in an enclosed panel.
* Avoid installation just above high calorie heat generating devices (heaters, transformers, high capacity resistance etc.) Also avoid to install other equipment close to slave module.
* Avoid installation in a box in which high voltage device is installed.
* As much as possible keep away from high voltage cables and power cables.
* Install on a good conductivity metal plated panel instead of painted one for easy grounding and better noise tolerance.
* Use zinc plated retention screws of M3 for installing slave module.

(2) When using fixing screws

- Use 2 galvanized screws of M3-10.
- Tighten securely to a torque of 5 kgf•cm or less.

■ Installation procedure
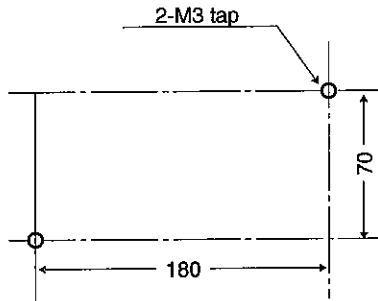
① Drill M3 tap holes in the control panel for installation as shown at left.

② Tighten fixing screws (M3-10, 2 pieces) with a phillips screwdriver, and fix I/O link slave module.
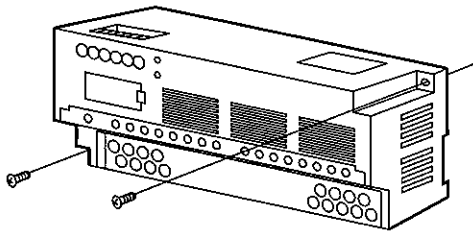
(3) When using DIN rail

- The slave module can be attached to or detached from the 35 mm wide DIN rail instantly.
- Not applicable to DIN rail with the width exceeding or less than 35 mm.

(Unit: mm)

DIN rail

DIN rail lever

I/O link slave module (The back side)
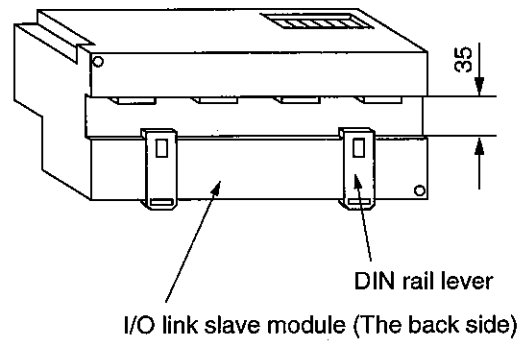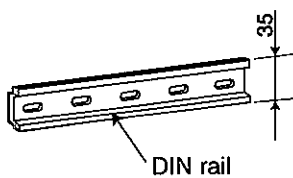
- Using DIN rail lever, fix securely to DIN rail.

■ Installation procedure

Claw

DIN rail lever
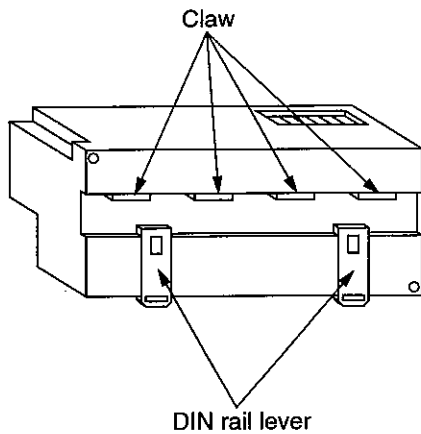
① Match the claw of the back side of the I/O link slave module with DIN rail.

② Push the lower side of the I/O link slave module to DIN rail.

| Reference | When installing in the vertical direction, use a bracket to prevent from dropping off due to vibration.

Bracket
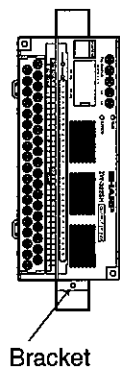
■ Dismounting procedure
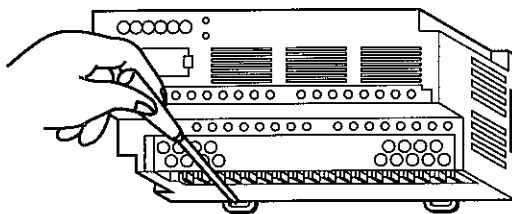
① Lower the groove of DIN rail lever at the back side of I/O link slave module with slot screwdriver, and lift the entire I/O link slave module, then it is detached from the DIN rail.

[4] Wiring method

(1) Wiring cautions

- Use crimp-style terminals for connections to the limit switch, solenoid valve, and other external devices.

Tightening tirque:
10 kgf•cm max.

M3.5 x7
Self lockup screw

M3.5✕7
Self lock-up screw

7.2

(2) Connecting communication cables

2-wire type

Within 30 mm

Within
300 mm

Within
30 mm

Control panel chassis

FG SHIELD SG L₁ L₂
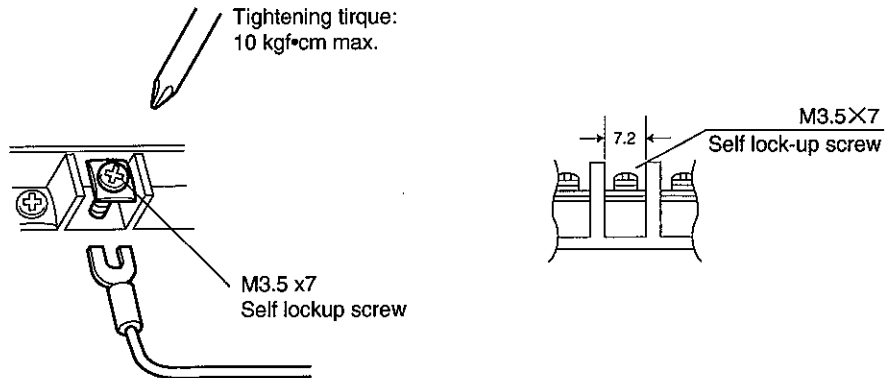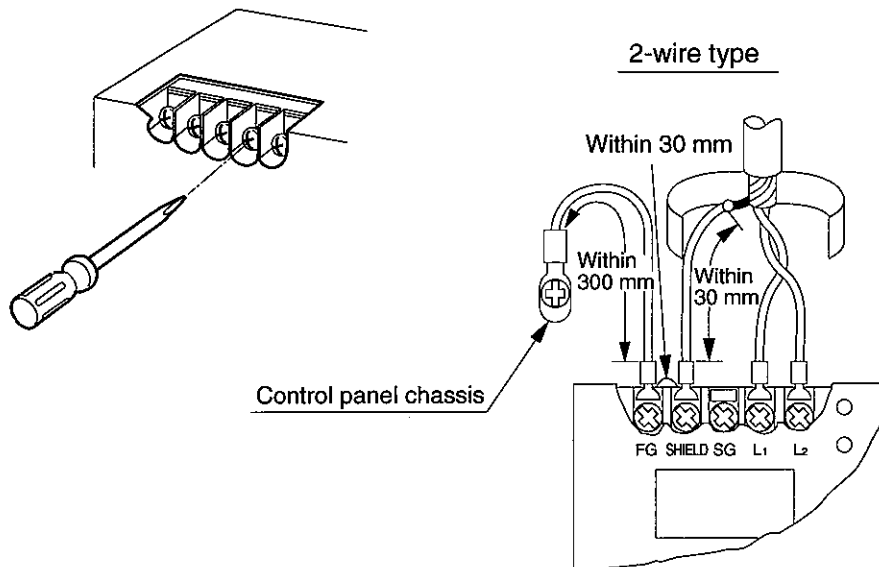
| Note 1 | For wiring to L_1, L_2, and SHIELD terminals, use our recommended twisted pair wire with shield. For shielding of the shield wire, relay with a twisted air of about 0.5 mm² outside, and then wiring to the terminal block will be easier. |

| Note 2 | Keep the wire coming out of the shield as short as possible (30 mm or less), and connect to SHIELD terminal. |

| Note 3 | To not connect signal cables to terminals other than the L_1, L_2, or SHIELD terminals. Ground the I/O link slave module's FG terminal (frame ground terminal) with a twisted cable of about 0.5 mm² using the SHIELD terminal. Attach a ground wire no longer than 300 mm between the FG terminal and the control panel chassis. |

(3) Power supply wiring

- Twist DC power input lines with each other. As DC input power supply uses an insulation type DC/DC converter inside the module, it is also applicable as power for input signal or output signal.

Note 1	In case of sharing this power with load driving power for DC input/output signal, note wiring and noise prevention method.
Note 2	Be sure that the I/O link slave module's FG terminal is grounded through the control panel. It is also used as ground for the DC/DC converter.
Note 3	When DC power is supplied to I/O link slave module positioned away from it, provide fuse elements for the DC power supply and each module respectively. Be careful for voltage drop due to long distance wiring.

<Reference> Power voltage and line resistance	Line resistance
DC power voltage (V_1) = 24V + slave module current × line resistance × 2 × wire length (km) 	Nominal sectional area 0.3 mm² .... 61.9 ohm/km 0.5 mm² .... 37.1 ohm/km 0.75 mm² .... 24.8 ohm/km

[5] Error and treatment

You can see the self-diagnosis results by the indicator lamp.

Indicator lamp	Display meaning	Lighting condition	Reset method
RUN	In operation	Slave station normal operation	—
ERROR	Error	• Slave station switch setting error	• Set slave station switch again.
		• Communication error	• Check communication cable.
		• PC stopped	• Operate PC.
		• Slave module defective	• Replace slave module.
0 to 7	Input indicator lamp	Comes on when the input signal to the slave module is "ON."	—
	Output indicator lamp	Lights when output signal from PC is "ON."	—

Operation description		In operation RUN	Error ERROR	Input	Output	Reset method	Priority order
Normal operation	No control input	●			Changes due to signal from PC	—	4
	Reset input	●			All points "OFF"		
	Hold input	●			Output hold		
	Reset and hold input	●		"ON", "OFF" by input signal	All points "OFF"	Reset input is given priority.	
	Output prohibit switch "ON"	●					
Abnormal operation	Slave module error		●			Replace slave module.	1
	Switch setting error		●			Set address switch again.	
	Communication suspended	●	●		Holding state before abnormality	PC operation	2
	Communication error (output only)	●	◖			Check communication cable. Replace slave module.	3

●: Lighting, ◖: Blinks

[6] Specifications

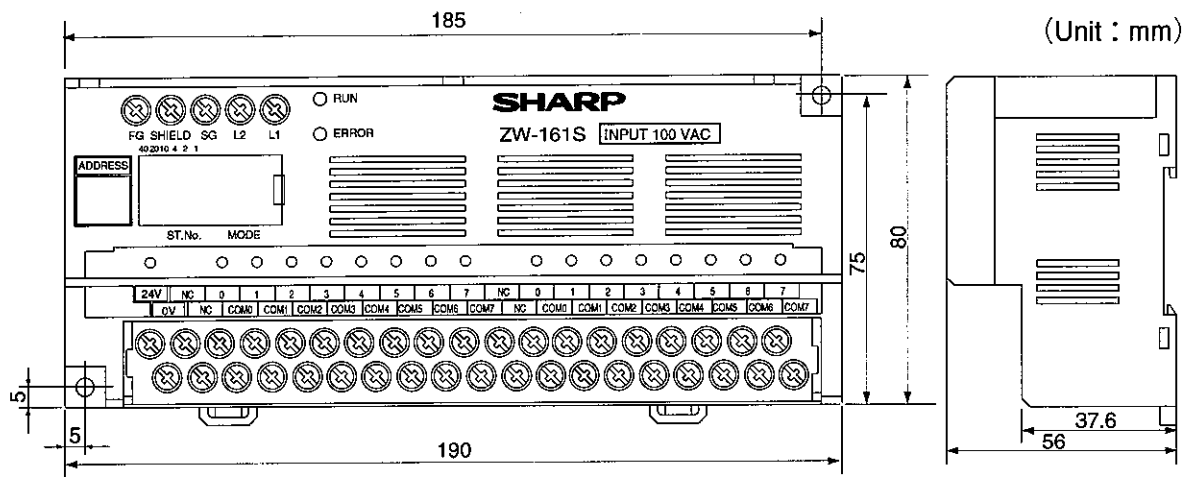## (1) General specifications

Item	Specifications
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (No condensation)
Vibration resistance	Conforming to JIS-C-0911, amplification and acceleration 0.075 mm (10 to 55 Hz), 1 G (55 to 150 Hz), vibration frequency 10 to 150 to 10 Hz (8 min./1 sweep), 2 hours each in X, Y, Z directions (15 times of sweep)
Shock resistance	Conforming to JIS-C-0912 (10 G, 3 times each in X, Y, Z directions)
Allowable power voltage	24 VDC ± 10% (containing ripple factor), power source for logic circuit
Operation display	Lights at ON (16 LEDs)
Connection terminal	38 P and 5 P (M 3.5 × 7 screws)
Applicable wire	1.25 mm² or less

(2) Communication specifications

Item	Specifications
Data transfer rate	EIA RS485 or equivalent
Transfer rate	172.8 k bits/s
Transfer format	Asynchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and reverse-double verification
Synchronous mode	Asynchronous
Transfer mode	Time sharing cyclic digital system
Communication line	Party line
	Shielded twisted pair cable
	Cable total length : 1 km max.

(3) Outside dimensions

Outline dimensions are common to all models.

(Unit : mm)

(4) Specifications of each module

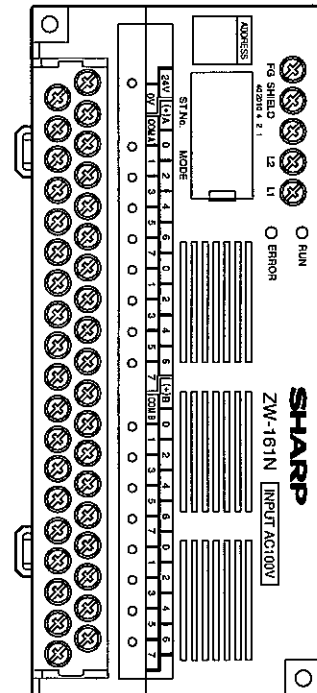### ① ZW-161N (100 VAC input module)

Item	Specifications
No. of input points	16 points
No. of slave station occupied bytes	2 bytes
Rated input voltage	100 to 120 VAC (50 to 60 Hz)
Allowable input voltage	85 to 132 VAC (50/60 Hz, waveform distortion: 5% or less)
Rated input current	10 mA (at TYP. 100 VAC, 60 Hz), 8.3 mA (at TYP. 100 VAC, 50 Hz)
Input voltage level	ON level: 80 V or less, OFF level: 30 V or more
Input current level	ON level: 7 mA or less, OFF level: 3 mA or more
Input impedance	10 k ohm (TYP.) 60 Hz, 12 kΩ (TYP.) 50 Hz
Surge current	Max. 300 mA, 0.3 ms (132 VAC, at peak ON)
Response time (module alone)	OFF → ON: 30 ms or less ON → OFF: 40 ms or less
DC power consumption with current (24 VDC)	Max. 100 mA (power for logic circuit, 24 VDC±10%, containing ripple factor)
Rated fuse	500 mA for DC power (unable replacement)
Dielectric strength	1500 VAC, 1 minute (between input terminal, DC power terminal, and secondary circuit) 250 VAC, 1 minute (between DC power terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or up (between input terminal, DC power terminal and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points
Weight	Approx. 400 g

Outside connection drawings	Surface view

• "COM1" is assigned at I/O link master module lower number of communication area.

② ZW-162N (12/24 VAC input module)

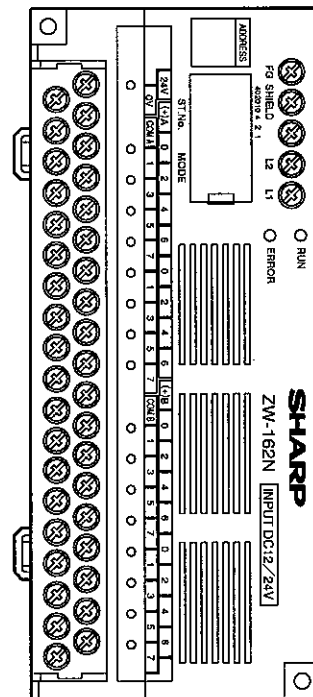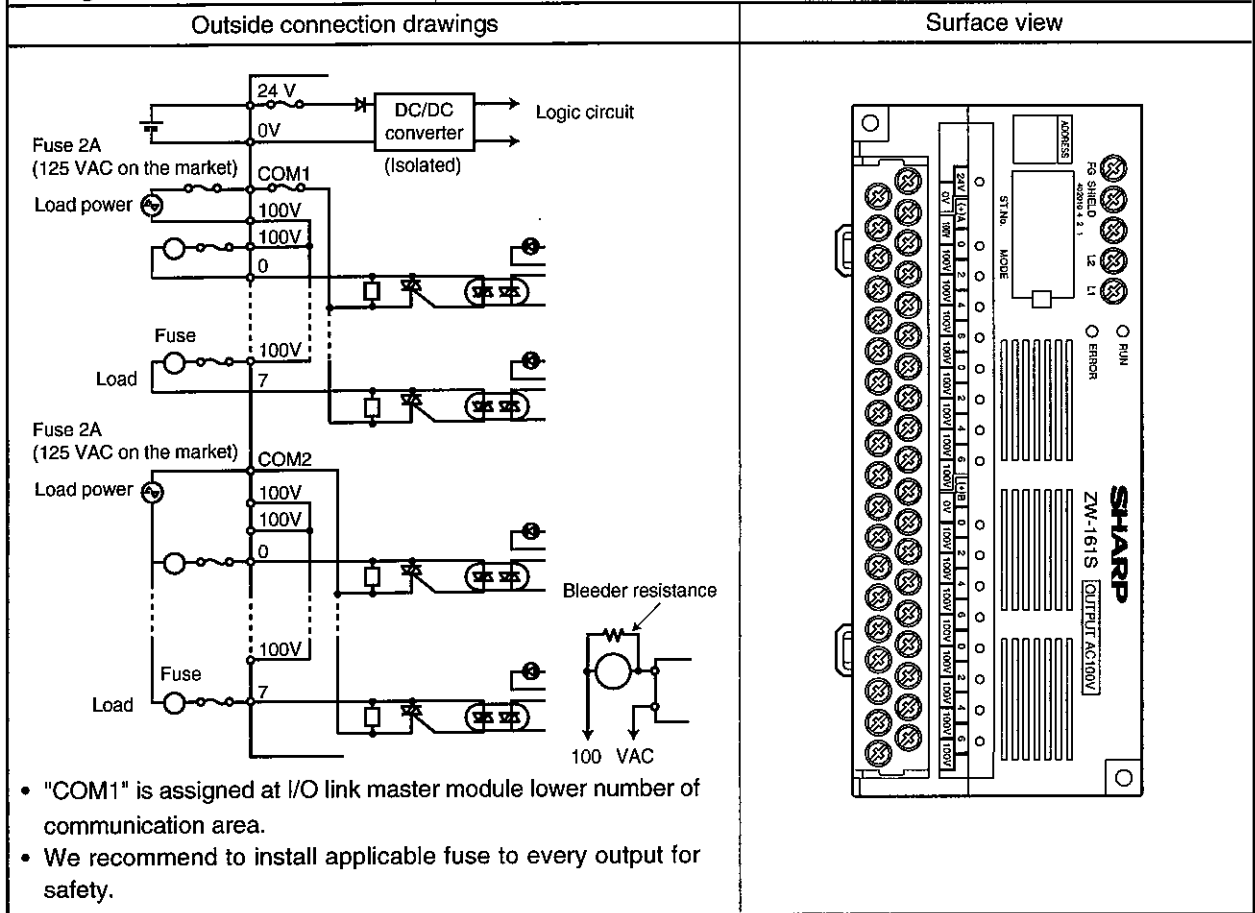| Item	Specifications
No. of input points	16 points
No. of slave station occupied bytes	2 bytes
Rated input voltage	12/24 VDC
Allowable input voltage	10 to 26.4 VDC (includes ripple factor at 12/24 VDC)
Rated input current	8 mA (at TYP. 24 VDC), 3.5 mA (at TYP. 12 VDC)
Input voltage level	ON level: 10 V or less, OFF level: 6 V or more
Input current level	ON level: 3.5 mA or less, OFF level: 1.5 mA or more
Input impedance	3 k ohm (TYP.)
Surge current	—
Response time (module alone)	OFF → ON: 30 ms or less (12/24 VDC) ON → OFF: 30 ms or less (12/24 VDC)
DC power consumption with current (24 VDC)	Max. 100 mA (power for logic circuit, 24 VDC±10%, containing ripple factor)
Rated fuse	500 mA for DC power (unable replacement)
Dielectric strength	1500 VAC, 1 minute (between input terminal, DC power terminal, and secondary circuit) 250 VAC, 1 minute (between DC power terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or up (between input terminal, DC power terminal, and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points
Weight	Approx. 350 g

Outside connection drawings	Surface view
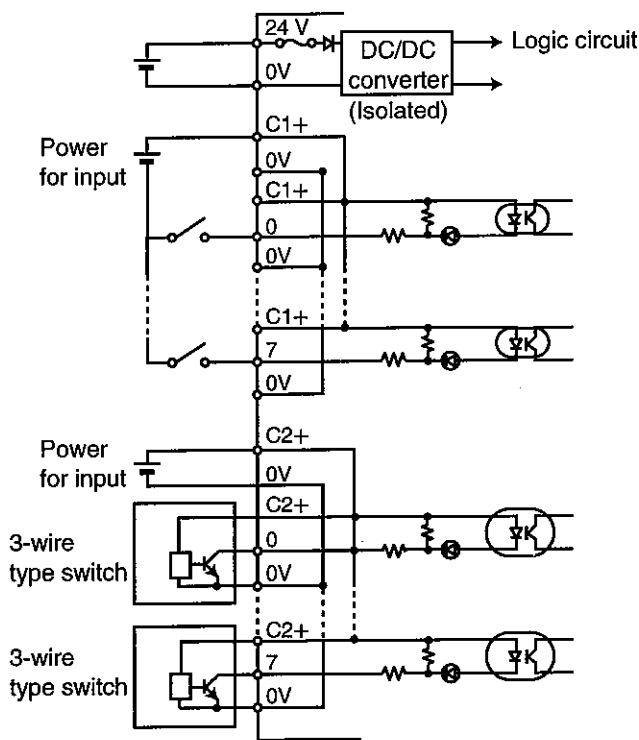
• "C1" is assigned at I/O link master module lower number of communication area.

③ ZW-161S (triac output module)

Item	Specifications
No. of output points	16 points
No. of slave station occupied bytes	2 bytes
Rated load voltage	100 to 120 VAC (50/60 Hz)
Allowable load voltage	15 to 132 VAC (50/60 Hz, waveform distortion: 5% or less)
Rated max. output current	0.5 A/point, 2 A/common
Surge ON current	Output element capacity: 6 A (100 ms)
※ Min. load current	10 mA or less
Leakage current	1.5 mA or less
ON voltage	2 V or less (0.5 A)
Response time	OFF → ON: 1 ms or less, ON → OFF: 1/2 power frequency +1 ms or less
Surge killer	CR absorber, varistor
Rated fuse	500 mA for DC power (unable replacement), 2 A for load power (unable replacement)
DC power consumption with current (24 VDC)	Max. 150 mA (power for logic circuit 24 VDC ±10%, containing ripple factor)
Dielectric strength	1500 VAC, 1 minute (between output terminal, power terminal and secondary circuit) 250 VAC, 1 minute (between DC power terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or up (between output terminal, power terminal and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points
Weight	Approx. 500 g

Outside connection drawings	Surface view

• "COM1" is assigned at I/O link master module lower number of communication area.
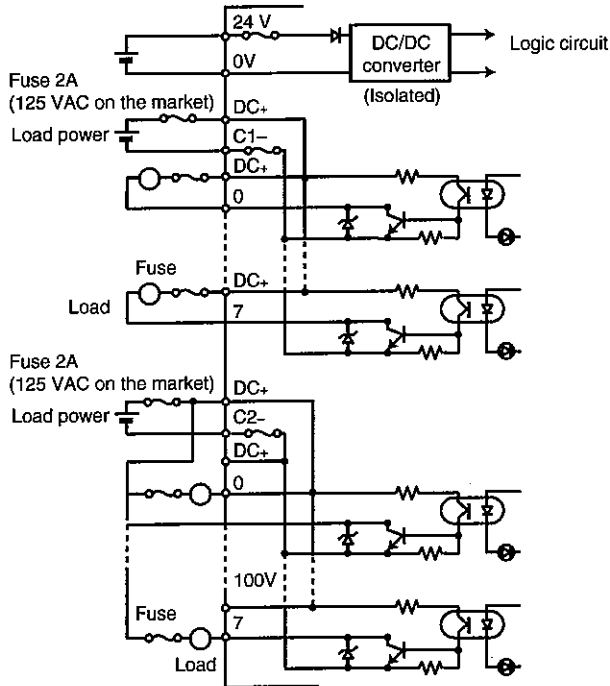• We recommend to install applicable fuse to every output for safety.

※ When the load current (in holding) is smaller than the minimum load current of 10 mA, it may not be turned OFF depending on the load characteristic. In such a case, connect a bleeder resistance parallel to the load as shown above, and increase the load current more than 10 mA.
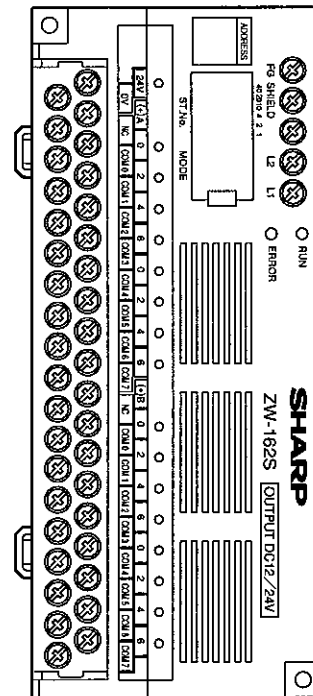
④ ZW-162S (transistor output module)

Item	Specifications
No. of output points	16 points
No. of slave station occupied bytes	2 bytes
Rated load voltage	12/24 VAC
Allowable load voltage	10 to 30 VAC
Rated max. output current	0.3 A/point, 2 A/common
Surge ON current	Output element capacity: 2 A (100 ms)
Min. load current	—
Leakage current	0.1 mA or less
ON voltage	0.5 V or less (0.3 A)
※ Response time	OFF → ON: 1 ms or less, ON → OFF: 1 ms or less (resistance load)
Surge killer	Zener diode
Rated fuse	500 mA for DC power (unable replacement), 2 A for load power (unable replacement)
DC power consumption with current (24 VDC)	Max. 100 mA (power for logic circuit 24 VDC ±10%, containing ripple factor)
Dielectric strength	1500 VAC, 1 minute (between output terminal, power terminal and secondary circuit) 250 VAC, 1 minute (between DC power terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or up (between output terminal, power terminal and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points
Weight	Approx. 400 g

Outside connection drawings	Surface view

• "C1" is assigned at I/O link master module lower number of communication area.
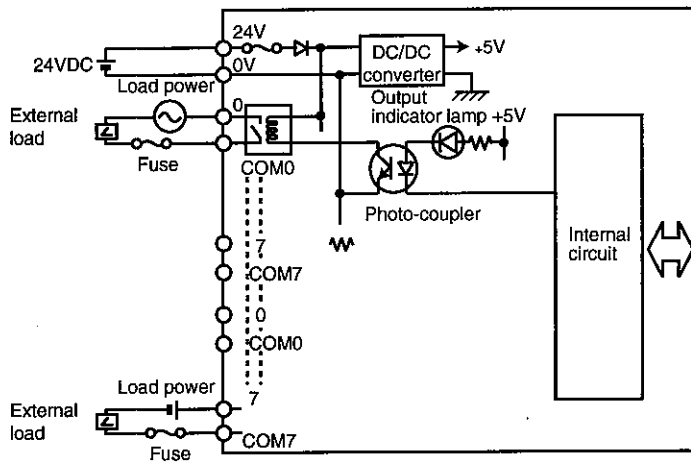• We recommend to install applicable fuse to every output for safety.

※ When induction load is applied, the switching time from "ON" to "OFF" may be delayed 1 second or more by inductance of load.

⑤ ZW-164S (relay output module)

Item		Specifications
No. of output points		16 points
No. of occupied bytes		2 bytes
Max, open-close voltage, current		264 VAC/30 VDC, 2 A (resistance load)
Min, load		5 VDC, 1 mA
Operation life	Mechanical	20,000,000 times or more
	Electrical	1. Max, open-close voltage current resistance 100,000 times or more
		2. Inductive load: 250 VAC, 0.5 A (COS ø = 0.4) 300,000 times or more
		3. Inductive load: 30 VDC, 0.5 A (T = 7 ms) 300,000 times or more
Response time		OFF → ON: 10 ms or less (resistance load)
		ON → OFF: 10 ms or less (resistance load)
Surge killer		—
Rated fuse		500 mA for DC power (unable replacement)
DC power consumption with current (24 VDC)		Max. 200 mA
Dielectric strength		1500 VAC, 1 minute (between output terminal, DC power terminal and secondary circuit)
		250 VAC, 1 minute (between DC power terminal and secondary circuit)
Insulation resistance		500 VDC, 10 M ohm or up (between output terminal, DC power terminal and secondary circuit)
Common terminal		1 common per 1 point
Weight		Approx. 400 g

Outside connection drawings	Surface view

• We recommend to install applicable fuse to every output for safety operation.
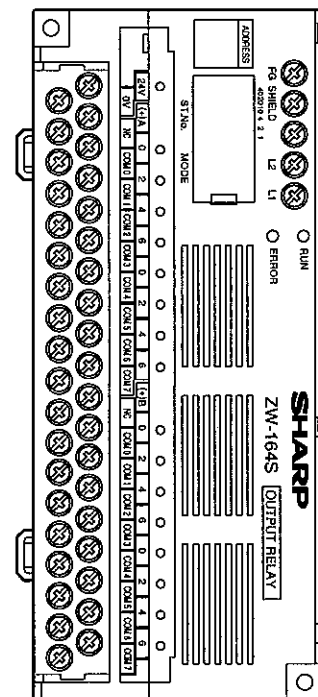
⑤ ZW-162M (transistor output module, 12/24 VDC input module)

| Item		Specifications
No. of slave station occupied bytes		2 bytes
Output specification	No. of output points	8 points
	Rated load voltage	12/24 VAC
	Allowable load voltage	10 to 30 VAC
	Rated max. output power	0.3 A/point, 2 A/common
	Surge ON current	Output element capacity: 2 A (100 ms)
	Leakage current	0.1 mA or less
	ON voltage	0.5 V or less (0.3 A)
	※ Response time	OFF → ON: 1 ms or less, ON → OFF: 1 ms or less (resistance load)
	Surge killer	Zener diode
Input specification	No. of input point	8 points
	Rated input voltage	12/24 VDC
	Allowable input voltage	10 to 26.4 VDC (includes ripple factor at 12/24 VDC)
	Rated input current	8 mA (at TYP. 24 VDC), 3.5 mA (at TYP. 12 VDC)
	Input voltage level	ON level: 10 V or less, OFF level: 6 V or up
	Input current level	ON level: 3.5 mA or less, OFF level: 1.5 mA or up
	Input impedance	3 k ohm (TYP.)
	Surge current	—
	Response time (Module alone)	OFF → ON: 30 ms or less (12/24 VDC) ON → OFF: 30 ms or less (12/24 VDC)
Rated fuse		500 mA for DC power (unable replacement), 2 A for load power (unable replacement)
DC power consumption with current (24 VDC)		Max. 100 mA (power for logic circuit 24 VDC ±10%, containing ripple factor)
Dielectric strength		1500 VAC, 1 minute (between input/output terminal, power input terminal, and secondary circuit) 250 VAC, 1 minute (between DC power terminal, and secondary circuit)
Insulation resistance		500 VDC, 10 M ohm or up (between input/output terminal, power input terminal and secondary circuit)
Insulation system		By photo-coupler
Common terminal		Output: 8 pts./common, Input: 8 pts./common
Weight		Approx. 400 g

Outside connection drawings	Surface view
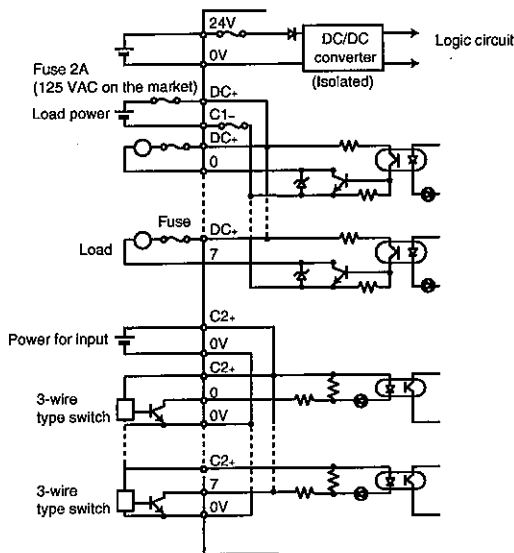
• Output is assigned at I/O link master module lower number of communication area.
• We recommend to install applicable fuse to every output for safety operation.
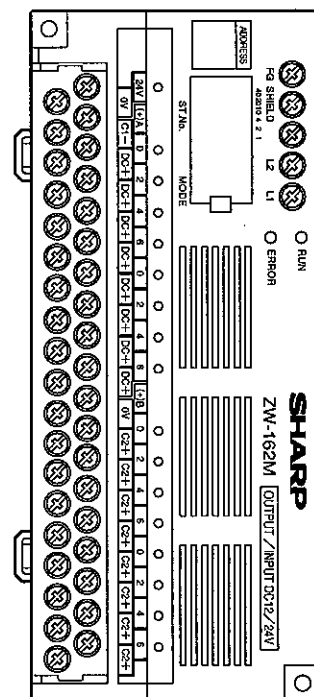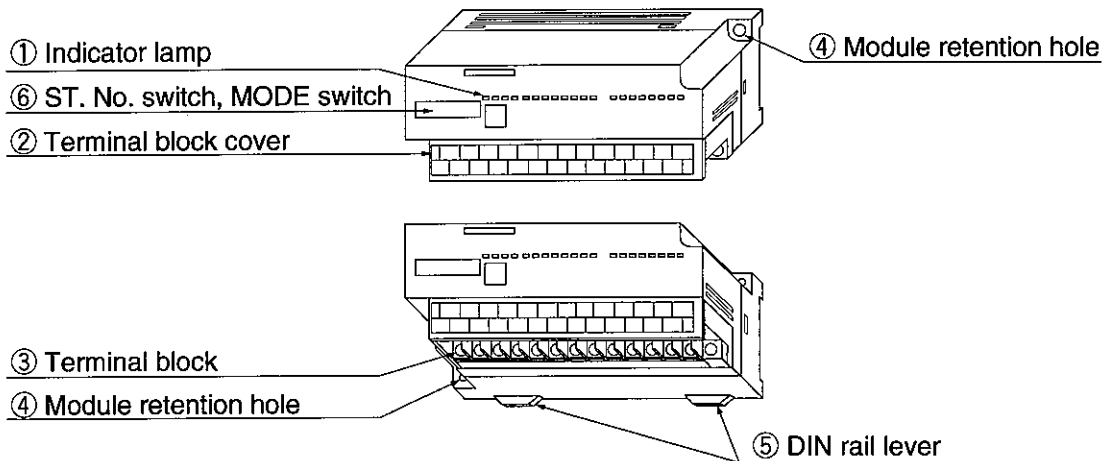
※ When induction load is applied, the switching time from "ON" to "OFF" may be delayed 1 second or more by inductance of load.

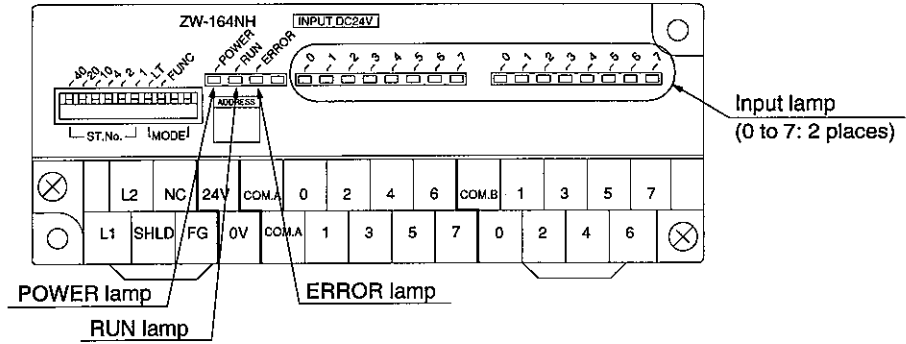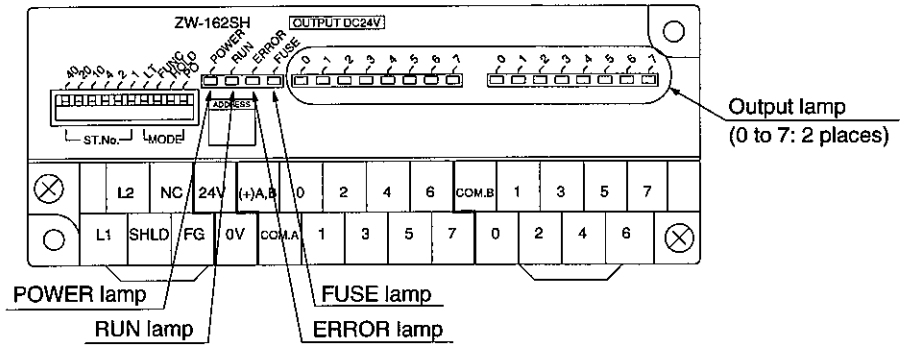## [1] Name and function of each part

① Indicator lamp
   Display each operation condition. (See next page)

② Terminal block cover
   Protect the terminal block

③ Terminal block (26 p detachable M 3.5 × 7 screws)
   Connect power source wire, signal wire and other cables.

④ Module retention hole (φ 4: 2 places)
                        Holes to attach the slave module to the control panel using M3 screws.

⑤ DIN rail lever
   Detaching for DIN rail.

⑥ ST. No. switch, MODE switch
   Set slave station number, termination resistance, function, output hold, and output prohibit.
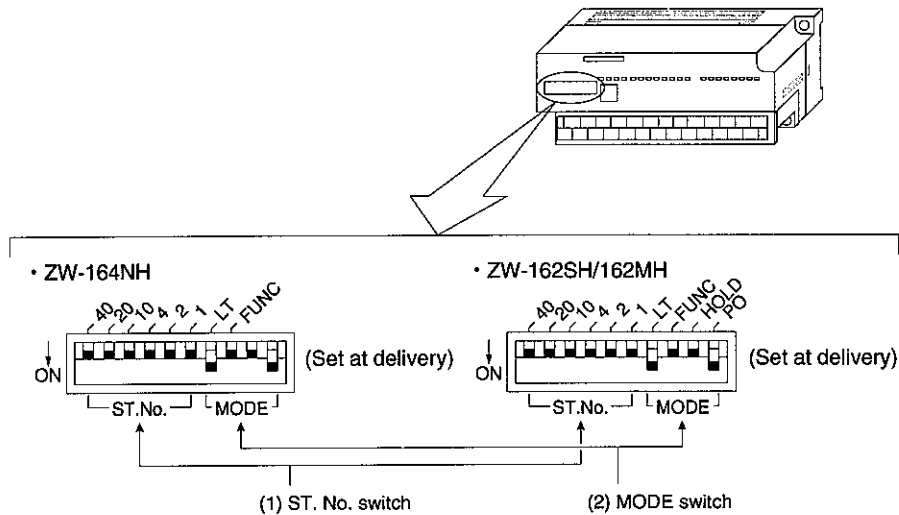   (See [2] Setting switch).

[Indicator lamp]

• ZW-164NH

POWER lamp
RUN lamp
ERROR lamp
Input lamp (0 to 7: 2 places)

• ZW-162SH

POWER lamp
RUN lamp
FUSE lamp
ERROR lamp
Output lamp (0 to 7: 2 places)

• ZW-162MH

POWER lamp
RUN lamp
FUSE lamp
ERROR lamp
Input lamp (0 to 7)
Output lamp (0 to 7)

Lamp name	Color	Operation contents
RUN	Green	Lighting during normal operation
ERROR	Red	Lights up when slave station is error or when impossible to communicate with the master station.
POWER	Green	It is lit when the 24 VDC power is ON. · The POWER lamp will not be lit when the DC power fuse is blown, or if the power source polarity is reversed.
0 to 7 (2 places)	Red	· When the ZW-164NH is used, this lamp will light when any of the input signals (16 points) is ON · When the ZW-162SH is used, this lamp will light when any of the output signals (16 points) is ON · When the ZW-162MH is used, this lamp will light when any of the I/O signals (8 points) is ON
FUSE	Red	Lights when the common fuse for the output circuit (inside the module) is blown, or the load power is OFF. · There is a FUSE lamp on the ZW-162SH/162MH models, but not on the ZW-164NH model.

[2] Setting switch

Before setting the switch, turn OFF the power supply to the I/O link system. Switch setting without turning OFF the power supply may cause malfunction.
Set station number, termination resistance, function, output hold (ZW-162SH/162MH), and output prohibit (ZW-162SH/162MH) by using switch of ZW-164NH/162SH/162MH.

・ZW-164NH   ・ZW-162SH/162MH

(1) ST. No. switch   (2) MODE switch

| Switch		Setting details	Setting when delivered
ST. No.	40	Enter slave station number - Enter starting from "01," using octal notation - Assign which byte will be used in the I/O link area of the master station	All OFF
	20		
	10		
	4		
	2		
	1		
MODE switch	LT	Termination resistance - Turn ON this switch at both ends of the I/O link circuit. Turn this switch OFF on all other stations.	ON
	FUNC	Function selection - Select "OFF: I/O link" for the communication function. (ON: M-net function)	OFF
	HOLD	Latched output - Set the operation of the slave station module, when an I/O link communication error occurs. If there is no communication from the master module for more than one second, it will be treated as a communication interruption. If the master module HALT relay is ON, the communication will also be interrupted. ON (reset): Turn OFF all outputs when communication interruption OFF (latched): Latch the output condition before interruption. When a CPU error occurs (the watchdog timer times out) the all outputs turn OFF.	OFF
	PO	Output prohibited - A switch to test communication of the output module. ON (permitted): The output module lamps and output elements turn ON and OFF according to the output signal conditions in the PC. OFF (latched): All elements turn OFF regardless of the output signal conditions in the PC.	ON

[3] Installation method

Install the ZW-164NH/162SH/162MH following the precautions below in order to get the best use of these stations.

(1) Installation conditions

- Ventilation holes are provided in order to keep the internal temperature from rising. Do not block these holes.
- Slave module is not designed for dust and water proof construction, install in an enclosed control box.
- Avoid installation just above high calorie heat generating devices (heaters, transformers, high capacity resistance etc.) Also avoid to install other equipment close to slave module.
- Avoid installation in a box in which high voltage device is installed.
- As much as possible keep away from high voltage cables and power cables.
- Use a metallic chassis in order to get a good ground and suppress noise.

(2) Installation directions

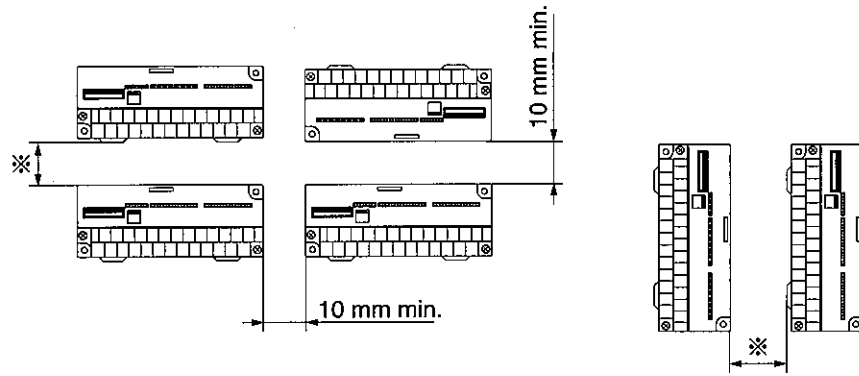- Install in one of the following 5 directions, which afford good cooling.
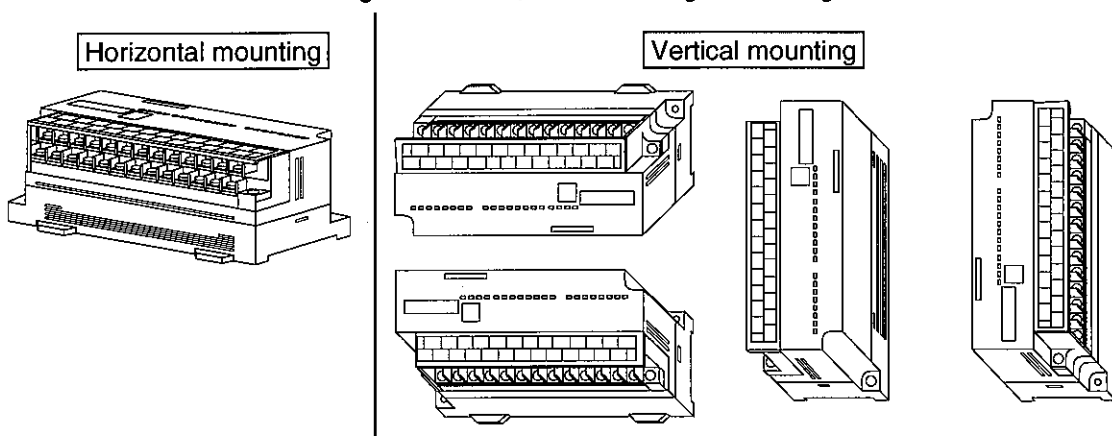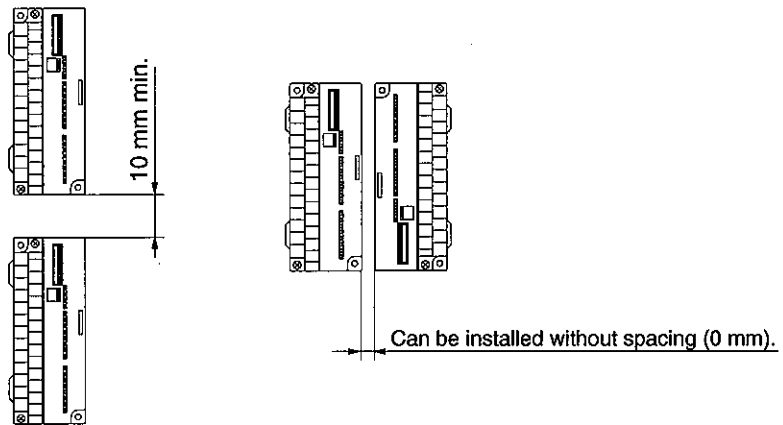

(3) Installation space

Make sure to provide the spacings shown below, between the slave module and the wiring ducts, to allow proper heat dissipation.

-74-
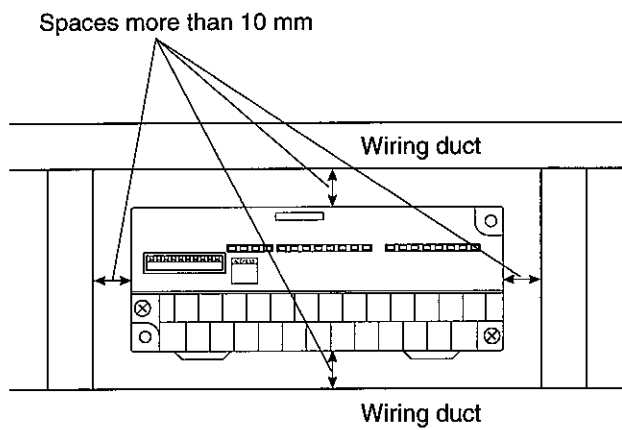
Make sure to provide the spacings shown below when installing more than one slave module.

10 mm min.

10 mm min.

※

* Leave spaces for wiring (2 places)

10 mm min.
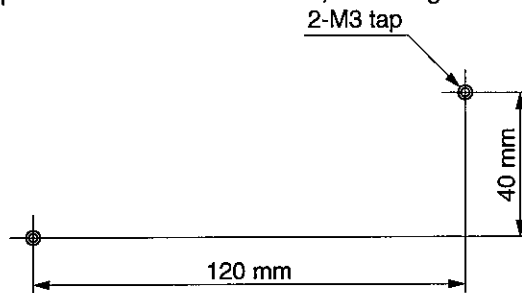
Can be installed without spacing (0 mm).

(4) Installation method

Use screws or a DIN rail to install the slave module.

① Using screws

1. Drill M3 tapped holes in a control box, referring to the installation dimensions shown below.

2-M3 tap

40 mm

120 mm

2. Tighten the two screws using a Phillips screwdriver to secure the slave module.
   · Use 2 zinc plated M3-10 screws.
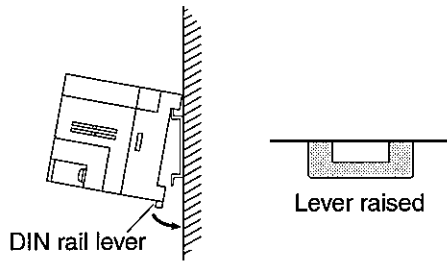   · Tighten them to 5 kgf-cm of torque, or less.

Module installation holes (ø4: 2 positions)

40 mm

120 mm
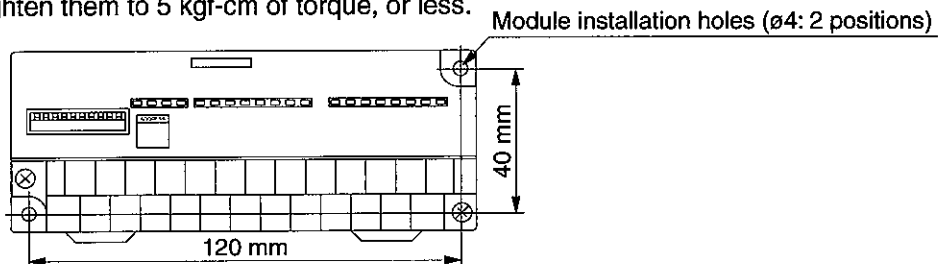
② Using a DIN rail
   The slave module can be attached to a DIN rail having rail 35 mm in width.


DIN rail

Claw

DIN rail lever

Slave module (back side)
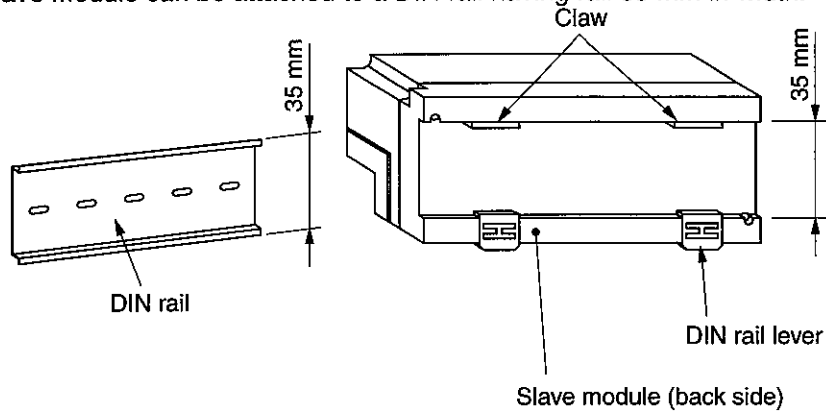
1. Hook the claws on the back of the slave module on a DIN rail, and press in the direction shown by the arrow.

DIN rail lever

Lever raised

2. To remove the slave station from the DIN rail, lower the DIN rail lever groove using a flat blade screwdriver, and lift the module. Then the slave station will be free of the DIN rail.
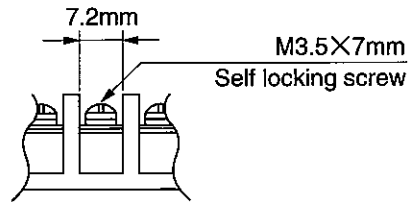

Flat blade screwdriver

Lever lowered
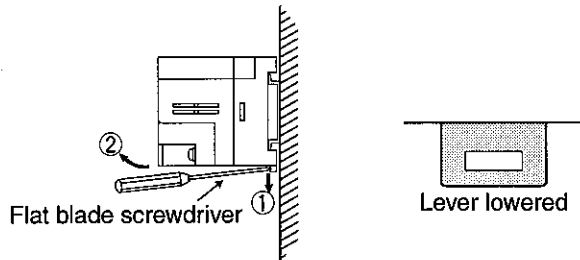
3. If you want to install the slave module horizontally, use a bracket in order to prevent it from falling off due to vibration.
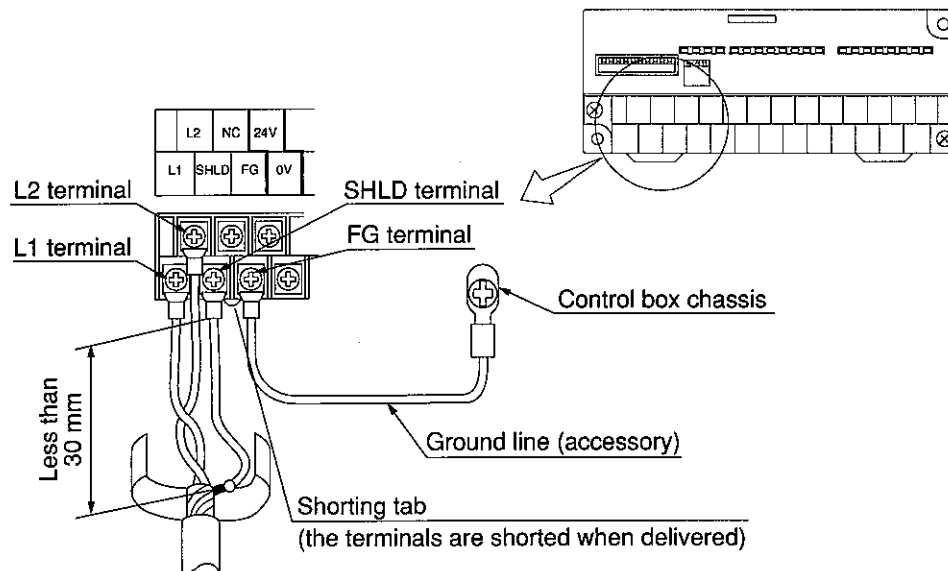

Fixing metal
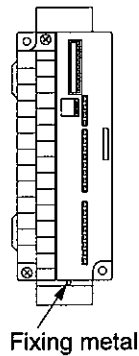
[4] Wiring method

Use crimp-style terminals to connect the ZW-164NH/162SH/162MH to other equipment. Select the crimp-style terminal size by referring to the dimensions given below.

### (1) Connecting the communication lines

1. Make sure to use the recommended shielded twisted pair cables shown below to wire L1, L2, and SHLD (shield line). The shield can be wired easily by using 0.5 mm² twisted cable at outside the cable.

Recommended cables	
Hitachi cable	S-IREV-SW2*0.5, S-IREV-SB2*0.5
Fujikura Electric	RG-22B/U

Do not install the slave module where mechanical stress or bending force will be placed on the signal lines.

2. The lead wire from the shield should be less than 30 mm long. Connect it to the SHLD terminal.

3. Do not connect any signal line to the NC terminal. Do not use it as a relay terminal.

4. The SHLD and FG terminals are connected by a shorting tab when delivered. Connect the FG terminal to the control box chassis using a ground cable (accessory) .

(2) Wiring of power lines
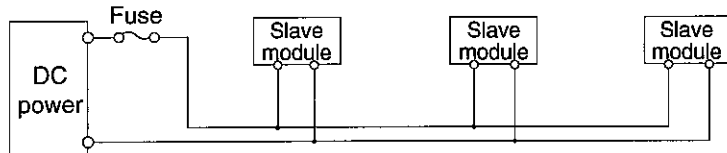

Class-3 grounding
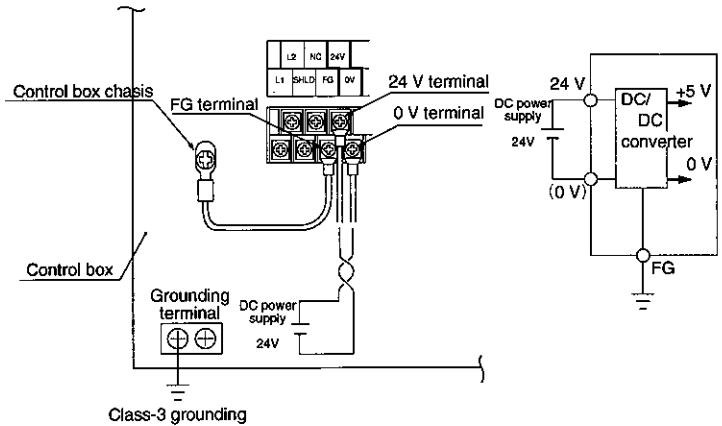
1. Twist DC power input lines with each other. As DC input power supply uses a insulation type DC/DC converter inside the module, it is also applicable as power for input signal or output signal. If you use a DC power input in common with the input signal or output signal power source, short circuit the COM.A side using a shorting tab (accessory).

Shorting tab (accessory)	Model	Shorting positions
· Upper row of the terminal block	ZW-164NH	Connect the 24 V and COM.A terminals on the terminal block
	ZW-162SH	Connect the 24 V and (+) A, B terminals on the terminal block
	ZW-162MH	Connect the 24 V and (+) A terminals on the terminal block
· Lower row of the terminal block	ZW-162SH	Connect the 0 V and COM.A terminals on the terminal block
	ZW-162MH	Connect the 0 V and COM.A terminals on the terminal block

2. In case of sharing this power with load during power for DC input/output signal, note wiring and noise prevention method.

3. Be sure that the I/O link slave module's FG terminal is grounded through the grounding terminal of control box.
   It is also used as ground for the DC/DC converter.

   Reference   When DC power is supplied to slave module positioned away from it, provide fuse elements for baking prevention of wiriness in DC power supply and each module respectively. Be careful for voltage drop due to long distancewiring.

<Reference> Power voltage and line resistance

DC power voltage $(V_1 - V_2)$ = current × line resistance × 2 × wire length (km)

Line resistance

Nominal sectional area 0.75 mm² ...... 24.8 ohm/km

1.25 mm² .... 14.7 ohm/km

2 mm² .... 9.53 ohm/km

· If you set the DC power to 26.4 V, make sure the voltage drop is less than 6 V.
26.4 V − 20.4 V = 6 V (20.4 V : Minimum operating voltage for the slave module.)

[5] Error and treatment

You can see the self-diagnosis results by the indicator lamp.
See page 61 for position of indicator lamp.

Indicator lamp	Display meaning	Lighting condition	Reset method
RUN	In operation	Slave station normal operation	—
ERROR	Error	Slave station switch setting error	Set slave station switch again.
		Communication error	Check communication cable.
		PC stopping	Operate PC.
		Slave module defective	Replace slave module .
0 to 7 [2 places]	Input indicator lamp	Comes on when the input signal to the slave module is "ON."	—
	Output indicator lamp	Lights when output signal from PC is "ON".	
Fuse [ZW-162SH ZW-162MH]	Fuse	When the common fuse of the output circuit (inside the module) is blown.	Replace slave module.
		When load power is OFF	Check the load power.

Operation description		Indicator lamp				Reset method	Priority order
		In operation RUN	Error ERROR	Input	Output		
Normal operation	Turn OFF output prohibition switch	●		"ON", "OFF" by input signal	Changes due to signal from PC	—	4
	Turn ON output prohibition switch	●			All points "OFF"		
Abnormal operation	Slave module error		●			Replace slave module.	1
	Switch setting error		●			Set address switch again.	2
	Communication suspended	●	●		Holding state before abnormality	PC operation.	
	Communication error (output only)	●	◑			Check communication cable. Replace slave module.	3

●: Lighting,   ◑: Blinks

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[6] Specifications

(1) General specifications

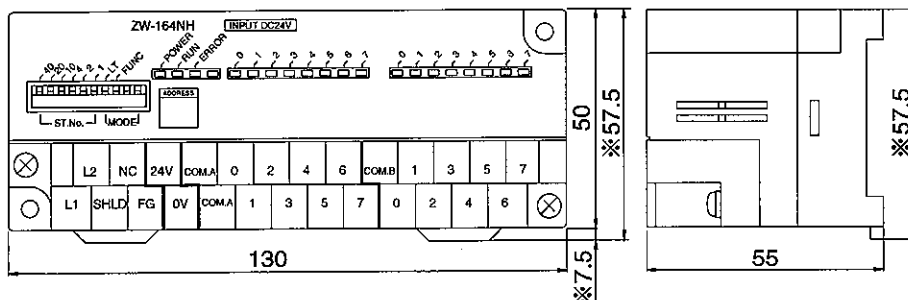| Item	Specifications
Allowable power voltage	24 VDC (+10%, -15% : ripple)
Power consumption/current	1.4 W/70 mA max.
Storage temperature	–20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (Not to condense dew)
Vibration resistance	Conforming to JIS-C-0911 (2 hours each in X, Y, Z directions)
Shock resistance	Conforming to JIS-C-0912 (10 G, 3 times each in X, Y, Z directions)
Withstand voltage	1000 VAC for one minute (between input/output terminals, DC power input terminal, and secondary circuit)
Insulation resistance	500 VDC, 10 M-ohm min. ((between input/output terminals, DC power input terminal, and secondary circuit)
Insulation method	Photo-coupler
External line connection	26 P detachable terminal block (M 3.5 × 7 screws)
Weight	Approximately 320 g
Accessories	One grounding cable, one user's manual, short tab (one for ZW-164NH, two for ZW-162SH/162MH)

(2) Communication specifications

Item	Specifications
Data transfer rate	EIA RS485 or equivalent
Transfer rate	345.6 k bits/s, 172.8 k bits/s (changes automatically according to the data transfer speed of master station.)
Transfer format	Asynchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and reverse-double verification
Synchronous mode	Asynchronous
Transfer mode	Time sharing cyclic digital system
Communication line	Party line
	Shielded twisted pain cable
	Cable total length : 1 km max.

(3) Outside dimensions
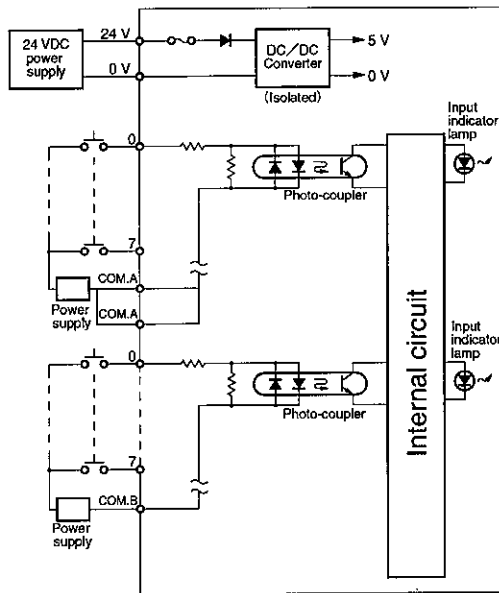
Outline dimensions are common to all models.

(Unit: mm)

※ Dimensions when a DIN rail lever is moved.
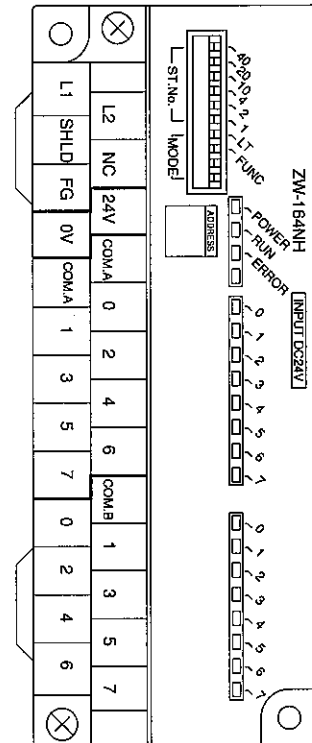
(4) Specifications of I/O

① ZW-164NH (24 VDC input module)

Item	Specifications
No. of input point	16 points
No. of slave station occupied bytes	2 bytes
Rated input voltage	24 VDC
Allowable input voltage	20.0 to 26.4 VDC Ripple factor: Less than 15%
Rated input current	4.6 mA TYP. (at 24 VDC)
Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or more
Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or more
Input impedance	5.2 k ohm TYP.
Surge current	–
Response time (module alone)	OFF → ON: 1.0 ms or less (24 VDC) ON → OFF: 1.5 ms or less (24 VDC)
Common terminal	1 common per 8 points

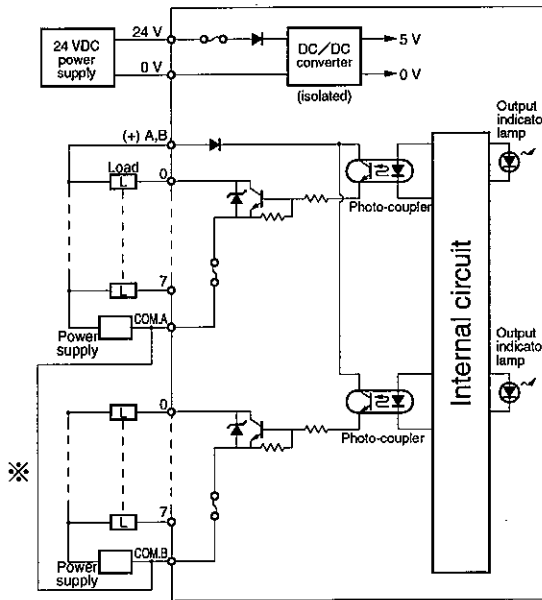| Outside connection drawings	Surface view

• The "COM.A" is assigned at I/O link master module lower numbers of the communication area.

② ZW-162SH (transistor output module)

Item	Specifications
No. of output points	16 points
No. of slave station occupied bytes	2 bytes
Rated load voltage	24 VDC
Allowable load voltage	20.4 to 26.4 VDC
Rated max. output current	0.3 A/point, 1 A/common
Surge ON current	Output element capacity: 2 A (100 ms)
Min. load current	–
Leakage current	0.1 mA or less
Voltage drop at turning ON	0.5 V or less (0.3 A)
Response time (module alone)	OFF → ON: 1 ms or less
	ON → OFF: 1 ms or less (resistance load)
Surge killer	Zener diode
Rated fuse	1.25 A (unable replacement)
	Meltdown detection function is provided
	(When melted down or load power is turned OFF, the FUSE lamp lights)
Common terminal	1 common per 8 points

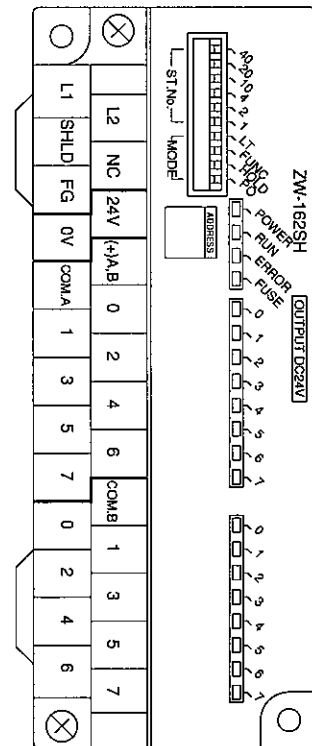| Outside connection drawings	Surface view

※ If you use the side A common line and side B common line with different power sources, connect the negative sides of the both power supplies.

- "COM. A" is assigned at I/O link master module lower number of the communication area.
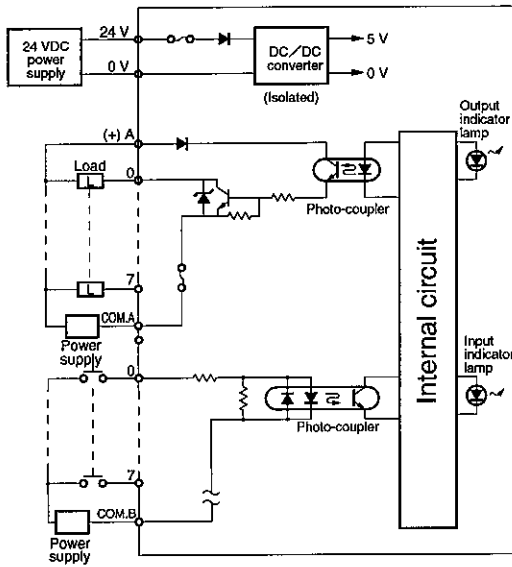- We recommend to install applicable fuse to every output for safety.
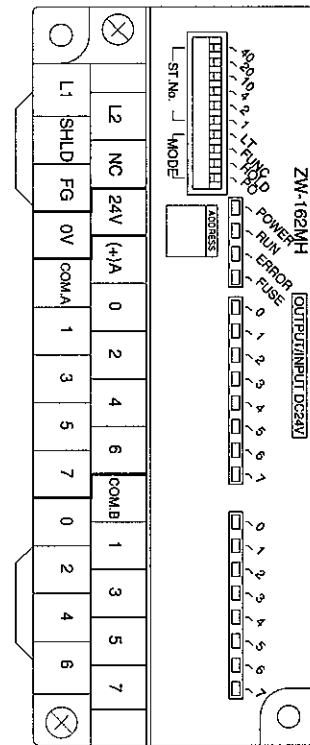
③ ZW-162MH (transistor output, 24 VDC input module)

	Item	Specifications
	No. of slave station occupied bytes	2 bytes
Output specification	No. of output points	8 points
	Rated load voltage	24 VDC
	Allowable load voltage	20.4 to 26.4 VDC
	Rated max. output power	0.3 A/point, 1 A/common
	Surge ON current	0.5 A (10 ms)
	Minimum load current	—
	Leakage current (when OFF)	0.1 mA or less
	Voltage drop at turning ON	0.5 V or less (0.3 A)
	Response time (module alone)	OFF → ON: 1 ms or less
		ON → OFF: 1 ms or less (resistance load)
	Surge killer	Zener diode
	Rated fuse	Built-in 1.25 A fuse (unable replacement)
		Meltdown detection function is provided
		(When melted down or load power is turned OFF, the FUSE lamp lights)
	Common terminal	1 common per 8 points
Input specification	No. of input point	8 points
	Rated input voltage	24 VDC
	Allowable input voltage	20.0 to 26.4 VDC (ripple factor: Less than 15%)
	Rated input current	4.6 mA TYP. (at 24 VDC)
	Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or up
	Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or up
	Input impedance	5.2 k ohm (TYP.)
	Surge current	—
	Response time	OFF → ON: 1.0 ms or less (24 VDC)
	(Module alone)	ON → OFF: 1.5 ms or less (24 VDC)
	Common terminal	1 common line for 8 points (no polarity)

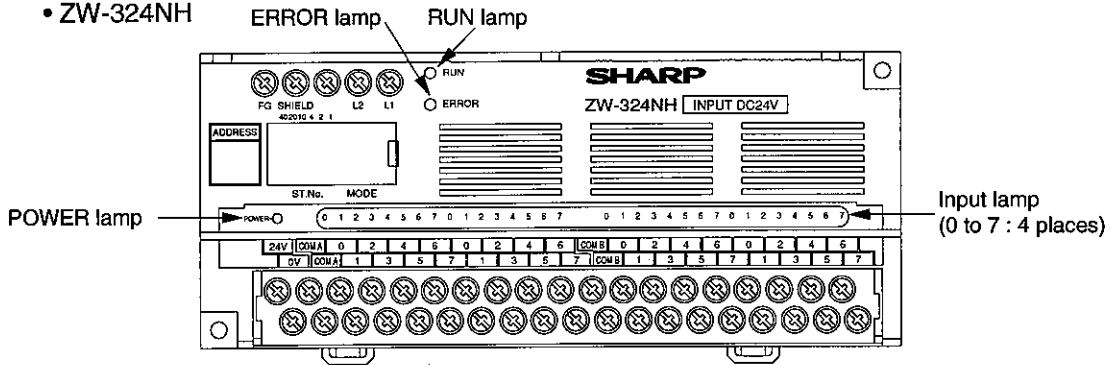| Outside connection drawings	Surface view

- "COM.A" is assigned at the output side, and at I/O link master module lower number of the communication area.
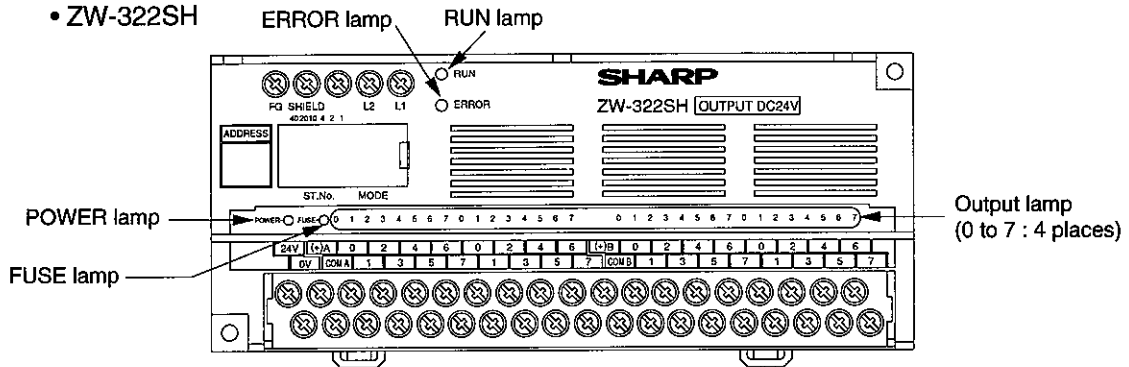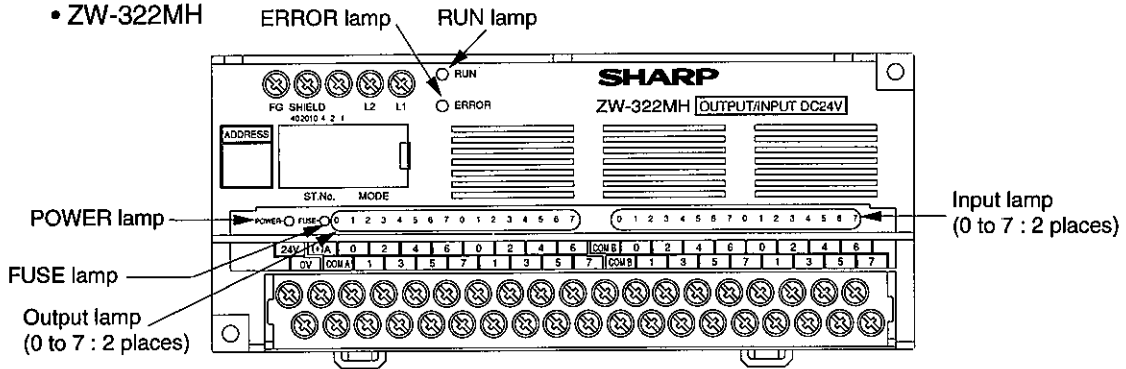- We recommend to install applicable fuse to every output for safety.

11-4 ZW-324NH/322SH/322MH

The switch settings, installation method, and errors, and their troubleshooting measures are the same for models ZW-161N to 164M. (See page 56 to 63.)

[1] Name and function of each part

⑥ Mode setting switch
⑦ Module retention hole
⑧ Rating plate
④ Station number (ST No.)
③ Switch cover
② Terminal block cover
① Indicator lamp

⑤ Terminal block
⑨ DIN rail lever

⑤ Terminal block
⑨ DIN rail lever

① Indicator lamp
Display each operation condition. (See the below)

② Terminal block cover (integral with case)
Protective cover for terminal block
Detachable by cutting off fixing portion.

③ Switch cover
Protective cover of station number (ST No.) setting switch ④ and mode setting switch ⑥.

④ Station number (ST No.) setting switch
Set the station number of slave module.

Setting at delivery
ON 40 20 10 4 2 1
-OFF-

⑤ Terminal block
Connect power source wire, signal wire and other cables.

⑥ Mode switch
Switch to set operation mode of slave module.

Setting at delivery of output module	Setting at delivery of input module
MODE	MODE
- Termination resistance	- Termination resistance
- Functional setting	- Functional setting
- Output hold	- Invalid
- Prohibit output (Prohibit-Allowed)	
──►ON	──►ON

⑦ Module retention hole (4ø)
Mounting holes of M3 screws.

⑧ Rating plate

⑨ DIN rail lever
For detaching from and attaching to DIN rail.

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• ZW-324NH

ERROR lamp　RUN lamp

POWER lamp

Input lamp
(0 to 7 : 4 places)

• ZW-322SH

ERROR lamp　RUN lamp

POWER lamp

FUSE lamp

Output lamp
(0 to 7 : 4 places)

• ZW-322MH

ERROR lamp　RUN lamp

POWER lamp

FUSE lamp

Output lamp
(0 to 7 : 2 places)

Input lamp
(0 to 7 : 2 places)

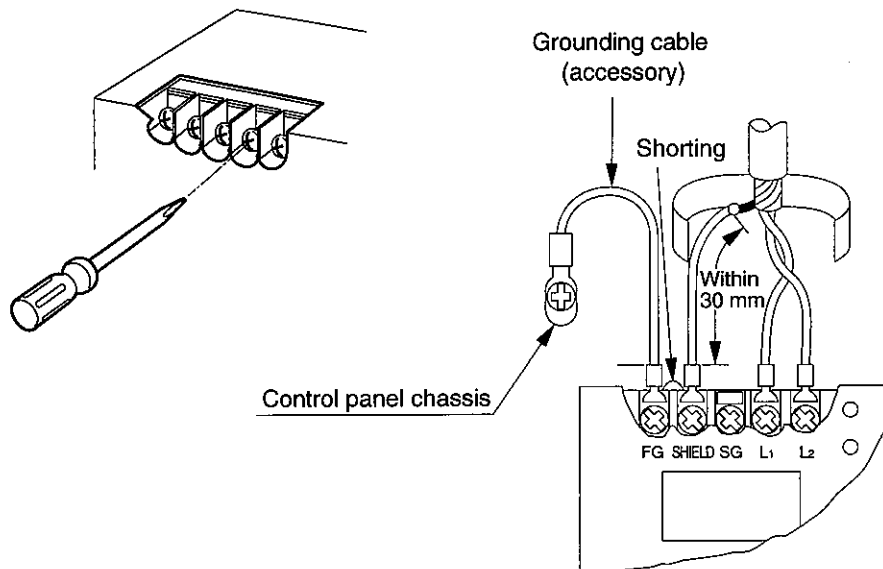| Lamp name	Color	Operation contents
RUN	Green	Lighting during normal operation
ERROR	Red	Lights up when slave station is error or when impossible to communicate with the master station.
POWER	Green	It is lit when the 24 VDC power is ON. · The POWER lamp will not be lit when the DC power fuse is blown, or if the power source polarity is reversed.
0 to 7 (4 places)	Red	· When the ZW-324NH is used, this lamp will light when any of the input signals (32 points) is ON · When the ZW-322SH is used, this lamp will light when any of the output signals (32 points) is ON · When the ZW-322MH is used, this lamp will light when any of the I/O signals (16 points) is ON
FUSE	Red	Lights when the common fuse for the output circuit (inside the module) is blown, or the load power is OFF. · There is a FUSE lamp on the ZW-322SH/322MH models, but not on the ZW-324NH model.

[2] Wiring method

(1) Wiring cautions

- Use crimp-style terminals for connections to the limit switch, solenoid valve, and other external devices.
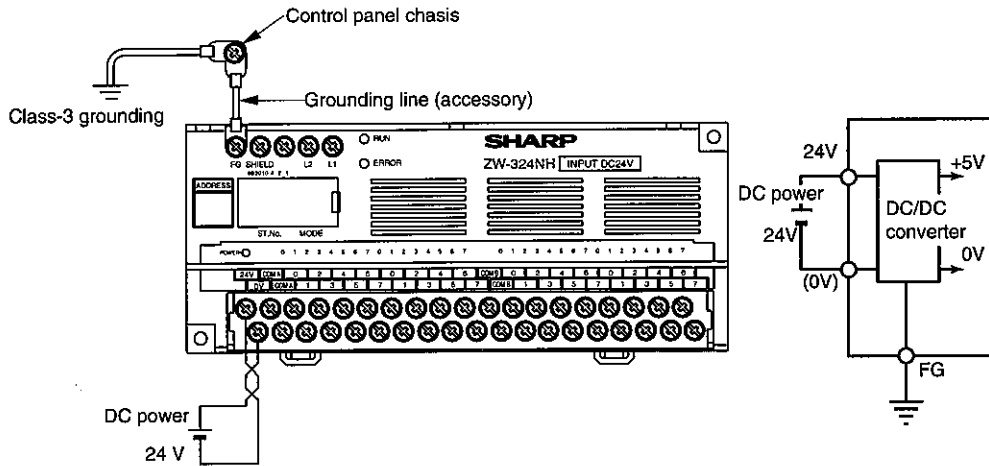
Tightening torque:
10 kgf•cm max.

M3.5 × 7
self lock-up screw

M3.5×7
self lock-up screw

7.2

(2) Connecting communication cables

Grounding cable
(accessory)

Shorting

Within
30 mm

Control panel chassis

FG SHIELD SG L₁ L₂
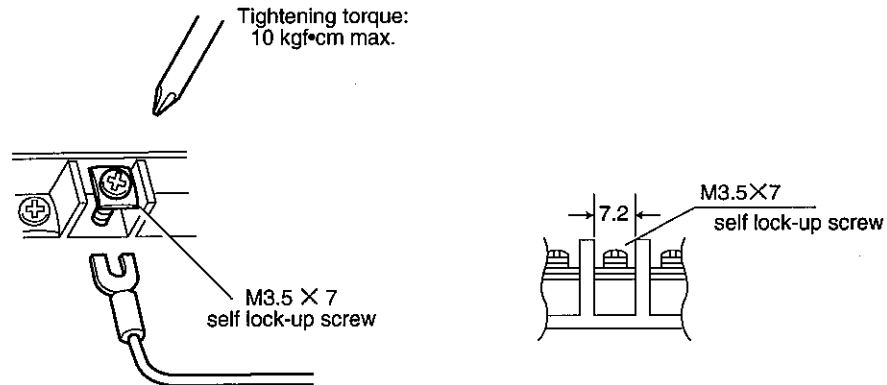
| Note 1 | For wiring to L_1, L_2, and SHIELD terminals, use our recommended twisted pair wire with shield. For shielding of the shield wire, relay with a twisted air of about 0.5 mm² outside, and then wiring to the terminal block will be easier. |

| Note 2 | Keep the wire coming out of the shield as short as possible (30 mm or less), and connect to SHIELD terminal. |

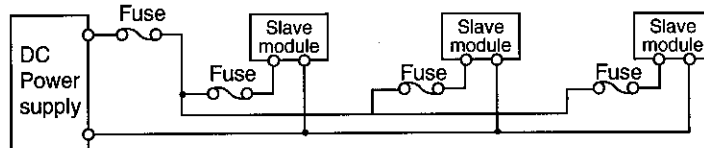| Note 3 | Do not connect signal cables to terminals other than the L_1, L_2, or SHIELD terminals. SHIELD and FG terminals are already shoted. Attach a ground wire between the FG terminal and the control panel chassis. |

(3) Power supply wiring

Twist DC power input lines with each other. As DC input power supply uses an insulation type DC/DC converter inside the module, it is also applicable as power for input signal or output signal.

| Note 1	In case of sharing this power with load driving power for DC input/output signal, note wiring and noise prevention method.
Note 2	Be sure that the I/O link slave module's FG terminal is grounded through the control panel. It is also used us ground for the DC/DC converter.
Note 3	When DC power is supplied to I/O link slave module positioned away from it, provide fuse elements for the DC power supply and each module respectively. Be careful for voltage drop due to long distance wiring

<Reference> Power voltage and line resistance	Line resistance
DC power voltage (V_1) = 24V + slave module current × line resistance × 2 × wire length (km)	Nominal sectional area 0.3 mm² .... 61.9 ohm/km 0.5 mm² .... 37.1 ohm/km 0.75 mm² .... 24.8 ohm/km

Reference	Terminal block cover

If it is difficulty to make the connections, you can raise the terminal block cover and bold it on the module indicator lamps.
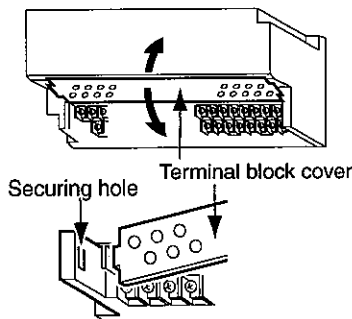
· After the completion the wiring, secure the terminal block cover in its original position.

· The bending portion of the terminal block cover is designed to be bent dozens of times. However, if the terminal block cover breaks at bending point, you can secure the terminal block cover using the holes shown left.
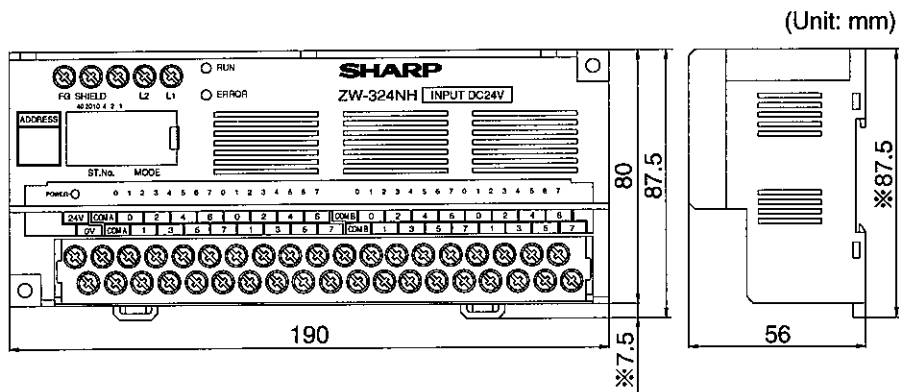
[3] Specifications

(1) General specifications

Item	Specifications
Allowable power voltage	24 VDC ±10% (Ripple factor: Less than 5%), power for logic circuit
Power consumption/current	100 mA max.
Storage temperature	–20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (Not to condense dew)
Vibration resistance	Conforming to JIS-C-0911 (2 hours each in X, Y, Z directions)
Shock resistance	Conforming to JIS-C-0912 (10 G, 3 times each in X, Y, Z directions)
Withstand voltage	1000 VAC for one minute (between input/output terminals, DC power input terminal, and secondary circuit)
Insulation resistance	500 VDC, 10 M-ohm min. (between input/output terminals, DC power input terminal, and secondary circuit)
Insulation method	Photo-coupler
Weight	Approximately 500 g
Accessories	One grounding cable, one user's manual

(2) Communication specifications

Item	Specifications
Data transfer rate	EIA RS485 or equivalent
Transfer rate	345.6 k bits/s, 172.8 k bits/s (changes automatically according to the data transfer speed of master station.
Transfer format	Asynchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and reverse-double verification
Synchronous mode	Asynchronous
Transfer mode	Time sharing cyclic digital system
Communication line	Party line
	Shielded twisted pain cable
	Cable total length : 1 km max.

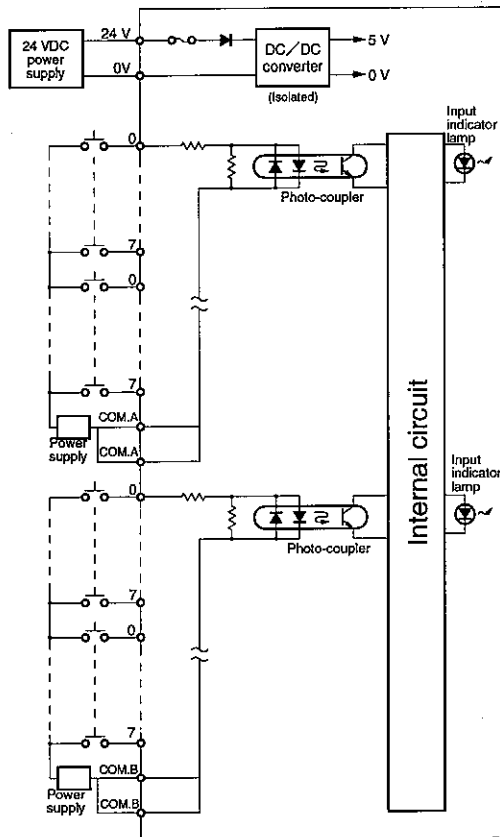## (3) Outside dimensions

Outline dimensions are common to all models.

(Unit: mm)

※ Dimensions when a DIN rail lever is movd.
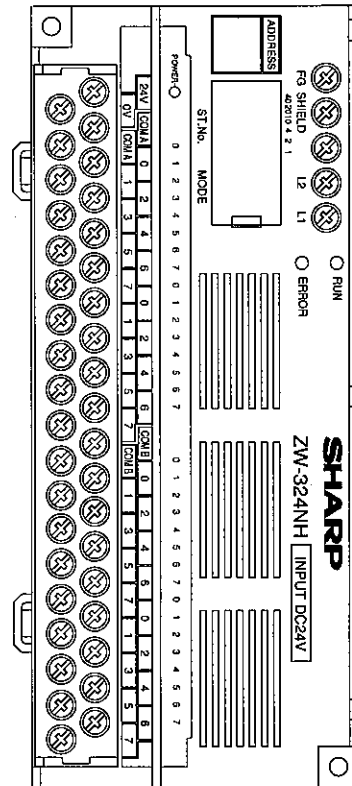
(4) Specifications of I/O

① ZW-324NH (24 VDC input module)

Item	Specifications
No. of input point	32 points
No. of slave station occupied bytes	4 bytes
Rated input voltage	24 VDC
Allowable input voltage	20.0 to 26.4 VDC Ripple factor: Less than 15%
Rated input current	4.6 mA TYP. (at 24 VDC)
Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or more
Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or more
Input impedance	5.2 k ohm TYP.
Surge current	—
Response time (module alone)	OFF → ON: 1.0 ms or less (24 VDC) ON → OFF: 1.5 ms or less (24 VDC)
Common terminal	1 common per 16 points

Outside connection drawings	Surface view

• "COM.A" is assigned at I/O link master module lower number of the communication area.

② ZW-322SH (transistor output module)

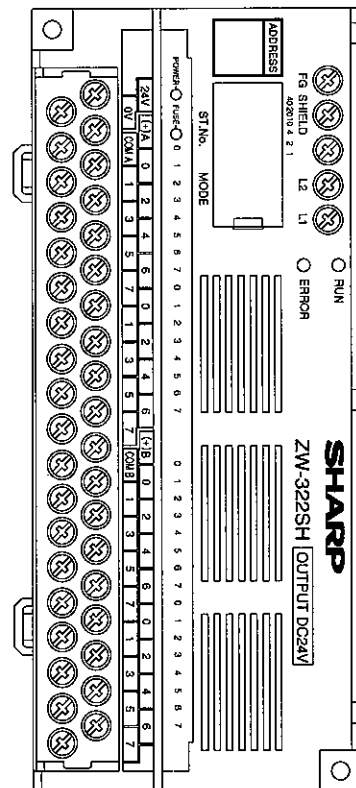| Item	Specifications
No. of output point	32 points
No. of slave station occupied bytes	4 bytes
Rated load voltage	24 VDC
Allowable load voltage	10.0 to 26.4 VDC
Rated max. output current	0.3 A/point, 2 A/common
Surge ON current	0.2 A (100 ms)
Min. load current	–
Leakage current	0.1 mA or less
Voltage drop at turning ON	0.5 V or less (0.3 A)
Response time (module alone)	OFF → ON: 1 ms or less
	ON → OFF: 1 ms or less (resistance load)
Surge killer	Zener diode
Rated fuse	2 A (unavailable replacement)
	Meltdown detection function is provided
	(When melted down or load power is turned OFF, the FUSE lamp lights)
Common terminal	1 common per 16 points

Outside connection drawings	Surface view

- "COM.A" is assigned at I/O link master module lower number of the communication area.
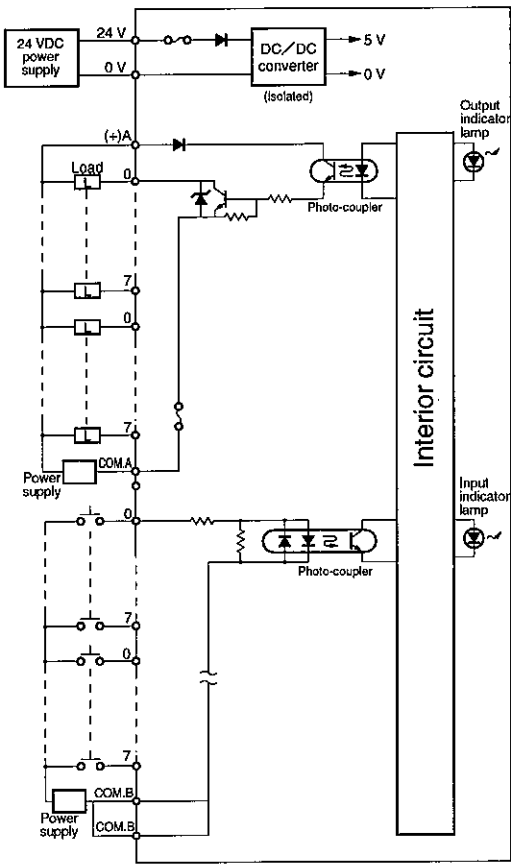- We recommend to install applicable fuse to every output for safety.
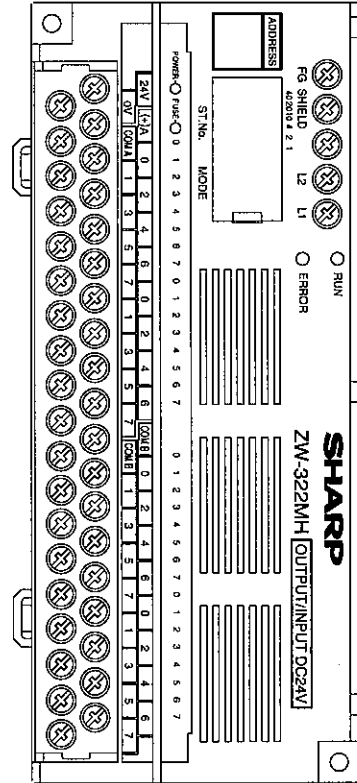
③ ZW-322MH (transistor output, 24 VDC input module)

Item		Specifications
No. of slave station occupied bytes		4 bytes
Output specification	No. of output point	16 points
	Rated load voltage	24 VDC
	Allowable load voltage	10 to 26.4 VDC
	Rated max. output power	0.3 A/point, 2 A/common
	Surge ON current	0.5 A (100 ms)
	Minimum load current	–
	Leakage current (when OFF)	0.1 mA or less
	Voltage drop at turning ON	0.5 V or less (0.3 A)
	Response time (module alone)	OFF → ON: 1 ms or less
		ON → OFF: 1 ms or less (resistance load)
	Surge killer	Zener diode
	Rated fuse	Built-in 2 A fuse (unable replacement) Meltdown detection function is provided (When melted down or lead power is turned OFF, the FUSE lamp lights)
	Common terminal	1 common per 16 points
Input specification	No. of input point	16 points
	Rated input voltage	24 VDC
	Allowable input voltage	20.0 to 26.4 VDC (Ripple factor: 15% or less)
	Rated input current	4.6 mA TYP. (at 24 VDC)
	Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or up
	Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or up
	Input impedance	5.2 k ohm (TYP.)
	Surge current	—
	Response time	OFF → ON: 1.0 ms or less (24 VDC)
	(Module alone)	ON → OFF: 1.5 ms or less (24 VDC)
	Common terminal	1 common line for 16 points (no polarity)

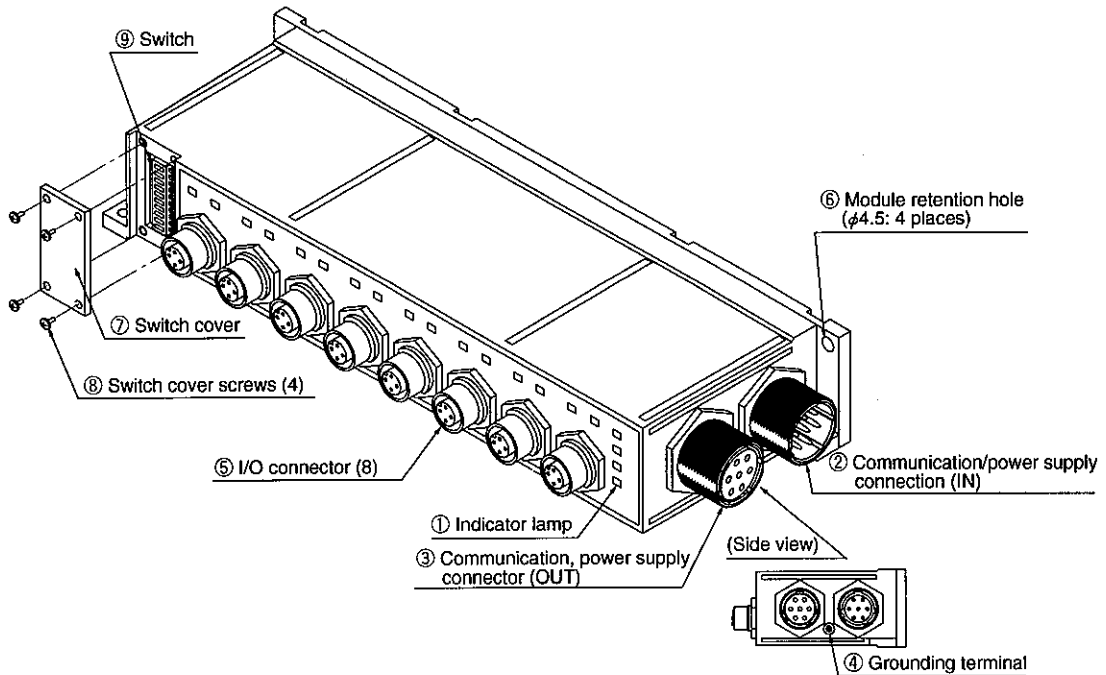| Outside connection drawings	Surface view

- "COM.A" is assigned at the output inside, and at I/O link master module lower numbers of the communication area.
- We recommend to install applicable fuse to every output is recommended for safety.

[1] Name and function of each part

① Switch

⑥ Module retention hole
(φ4.5: 4 places)

⑦ Switch cover

⑧ Switch cover screws (4)

⑤ I/O connector (8)

① Indicator lamp

③ Communication, power supply
connector (OUT)

(Side view)

② Communication/power supply
connection (IN)

④ Grounding terminal

① Indicator lamp
Display each operation condition. (See the next page)

② Communication/power supply connection (IN)
Connects the communication lines from the master module or the previous slave station module in the line.

③ Communication, power supply connector (OUT)
Connect the communication lines and power lines to the next stage slave module in the line.
If this is the final module, put a cover.

④ Grounding terminal
Connect the class-3 grounding.

⑤ I/O connector
Connect to input equipment when a ZW-84NC is used. Connect to input/output equipment when a ZW-162MC is used. Put a cover if you do nor use this connector.

⑥ Module retention hole (φ 4.5: 4 places)
Holes to attach the slave module to the control panel using M3 screws.

⑦ Switch cover

⑧ Switch cover screws (4)
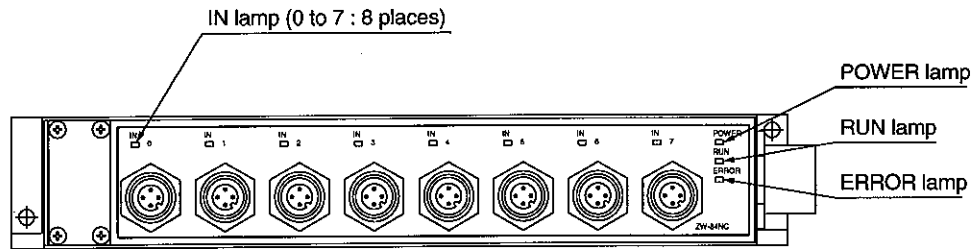Loosen and remove to install the switch.

⑨Switch

OFF ON

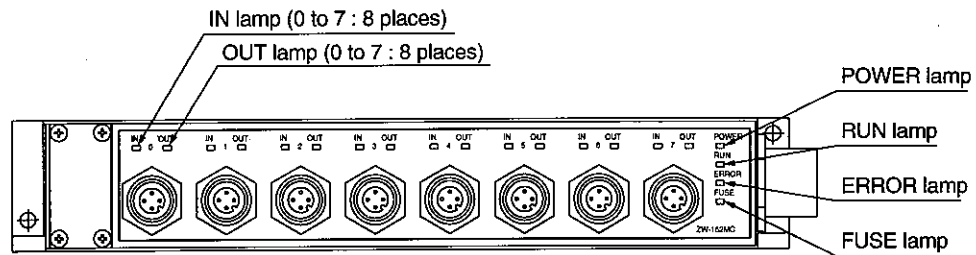|		
1	40	
2	20	
3	10	ST.No.
4	4	
5	2	
6	1	
7	LT	(Termination resistance)
8	FUNC	(Functional setting)
9	HOLD	(Output hold)
0	PO	(Prohibit output)

ZW-162MC only
(Unable setting
for ZW-84NC)

(Setting at delivery)

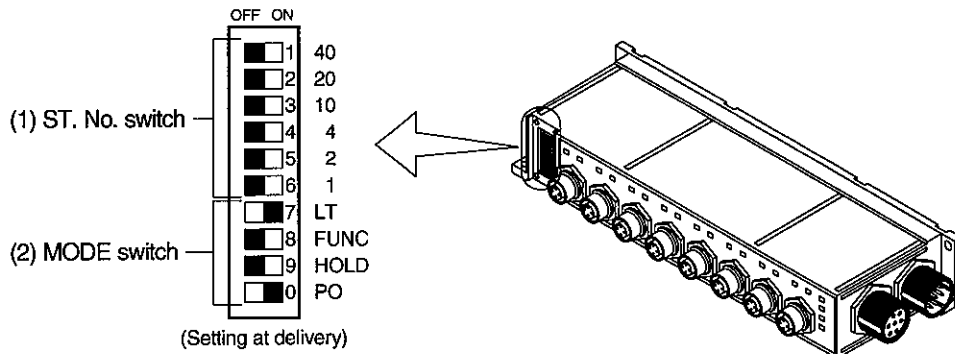See page 96 for setting contents.

[Indicator lamp]
• ZW-84NC

IN lamp (0 to 7 : 8 places)

POWER lamp

RUN lamp

ERROR lamp

• ZW-162MC

IN lamp (0 to 7 : 8 places)

OUT lamp (0 to 7 : 8 places)

POWER lamp

RUN lamp

ERROR lamp

FUSE lamp

Lamp name	Color	Operation contents
POWER	Green	It is lit when the 24 VDC power is ON. · The POWER lamp will not be lit when the DC power fuse is blown, or if the power source polarity is reversed.
RUN	Green	Lighting during normal operation
ERROR	Red	Lights up when slave station is error or when impossible to communicate with the master station.
FUSE ※	Red	Lights when the fuse for the output circuit is blown OFF.
IN (0 to 7)	Red	This lamp will light when any of the input signals (8 points) is ON
OUT (0 to 7) ※	Red	This lamp will light when any of the output signals (8 points) is ON

※ ZW-84NC does not have FUSE and OUT lamps.

[2] Setting switch

Before setting the switch of ZW-84NC/162MC, turn OFF the power supply to the I/O link system. Switch setting without turning OFF the power supply may cause malfunction.
Set transfer rate, station number, termination resistance, function, output hold (ZW-162MC), and output prohibit (ZW-162MC) by using switch of ZW-84NC/162MC.

(Setting at delivery)

Switch		Setting details	Setting when delivered
ST. No. (station number)	40	Enter slave station number - Enter starting from "01," using octal notation - Assign which byte will be used in the I/O link area of the master module	All OFF
	20		
	10		
	4		
	2		
	1		
LT (Termination resistance)		Termination resistance - Turn ON this switch at both ends of the I/O link circuit. Turn this switch OFF on all other stations.	ON
FUNC (Functional setting)		Function selection - Select "OFF: I/O link" for the communication function. (ON: M-net function)	OFF
HOLD (Output hold setting) ※		Latched output - Set the operation of the slave module, when an I/O link communication error occurs. If there is no communication from the master module for more than one second, it will be treated as a communication interruption. If the master module HALT relay is ON, the communication will also be interrupted. ON (reset): Turn OFF all outputs when communication interruption OFF (latched): Latch the output condition before interruption. When a CPU error occurs (the watchdog timer times out) the all outputs turn OFF.	OFF
PO (Output prohibition setting) ※		Output prohibited - A switch to test communication of the output module. ON (permitted): The output module lamps and output elements turn ON and OFF according to the output signal conditions in the PC. OFF (latched): All elements turn OFF regardless of the output signal conditions in the PC.	ON

※ ZW-84NC does not have HOLD and PO switches. (Invalid the settings)

[3] Installation method

Install the ZW-84NC/162MC following the precautions below in order to get the best use of these stations.
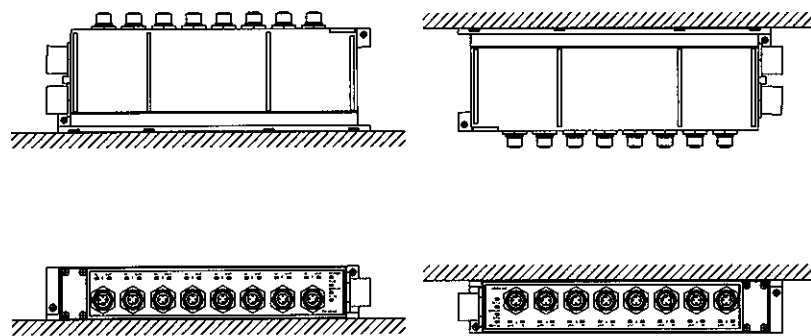
(1)　Installation conditions

· Avoid installation just above high calorie heat generating devices(heaters,transformers, highcapacity resistance etc.) Also avoid to install other equipment close to slave module.

· Avoid installation in a box in which high voltage device is installed.

· As much as possible keep away from high voltage cables and power cables.
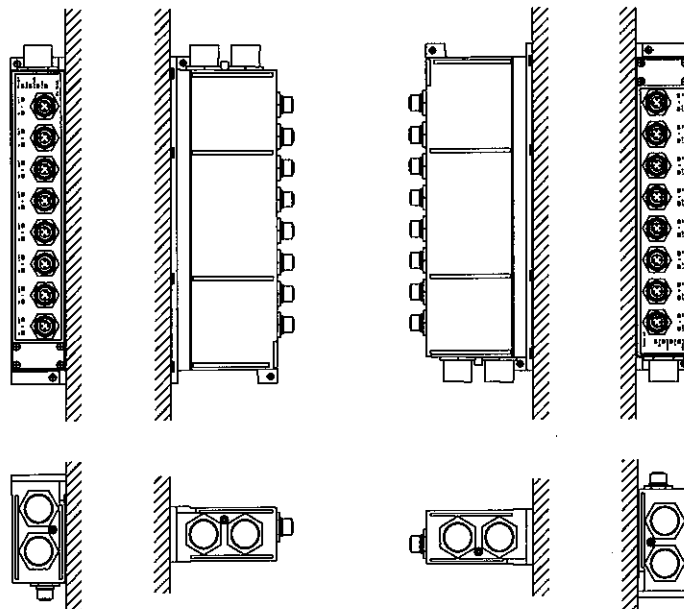
(2)　Installation directions

· Install in one of the following directions, which afford good cooling.
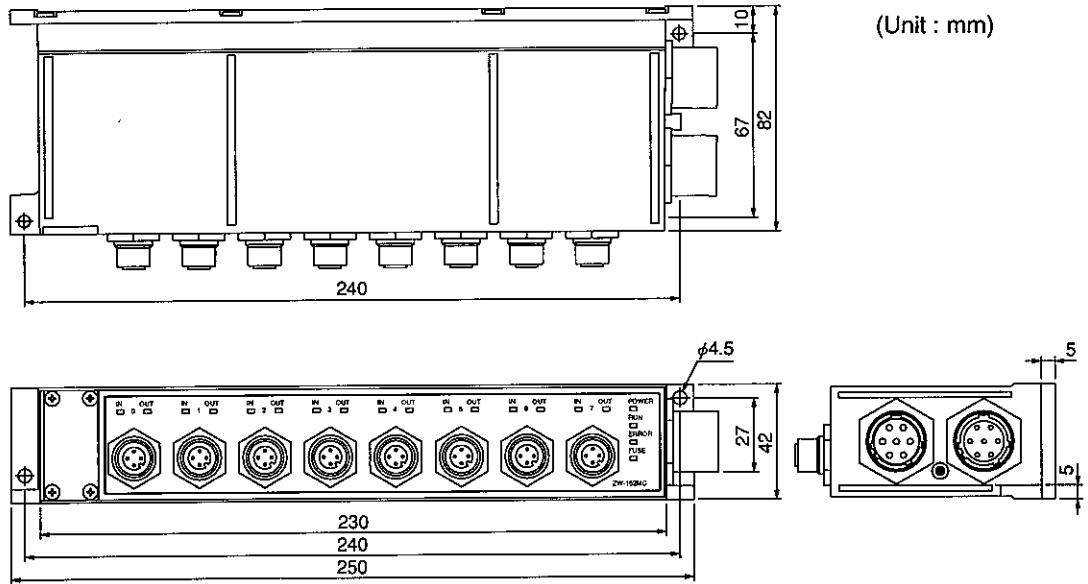
Horizontal mounting
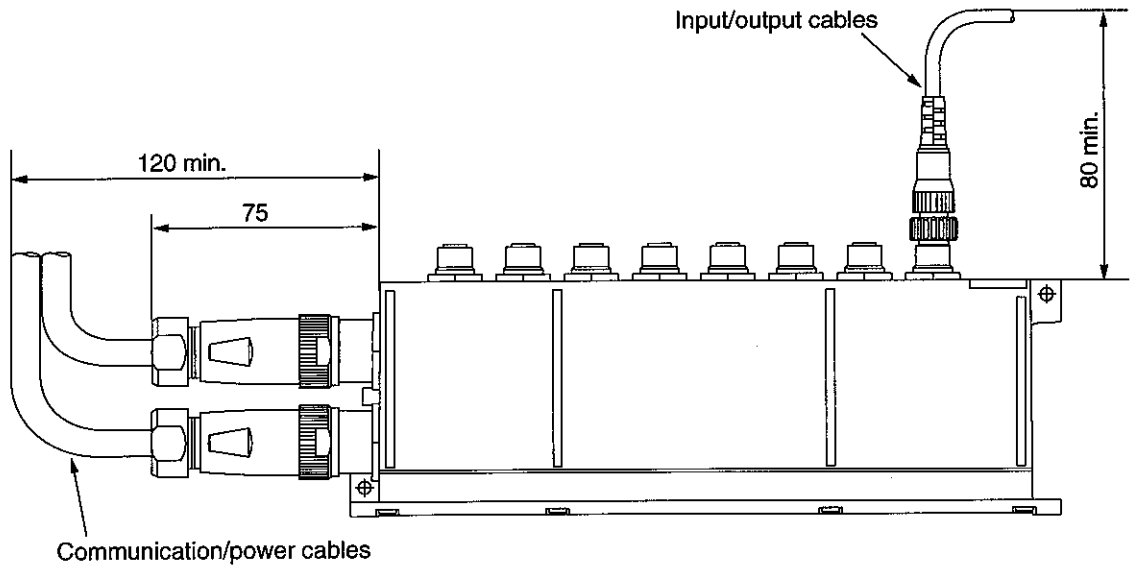

Vertical mounting

(3) Installation method

Use M4 screws (2) or a DIN rail to install the slave module.
Tighten to 10 kgf-cm of torque or less.

[Installation dimensions]

(Unit : mm)

Install after considering the dimensions of the communication/power cables, and input/output cables.

[4] Wiring method

(1) Recommended cables and plugs

Use only the recommended items for communication/power cables, and clamps.

(2) Connecting communication/power lines

[Wiring method]
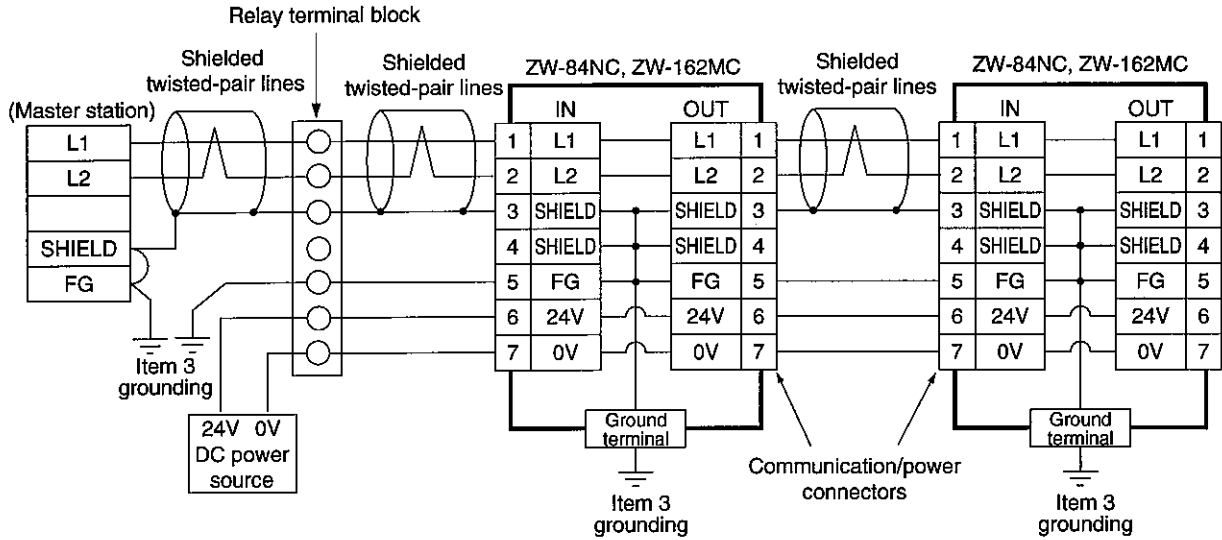
| Note | Pins 3, 4, and 5 on the communication/power connector are connected to each other inside the module. |

[Pin allocation on the connection/power connector] [ZW-84NC/162MC side]

Pin number	Signal name
1	L1
2	L2
3	SHIELD
4	SHIELD
5	FG
6	24V
7	0V

[Connection drawings for the recommended cable (MRC-SB-5C) and plug]

Red ──→ To No. 1 pin (L1)
White ──→ To No. 2 pin (L2)
Brack ──→ To No. 7 pin (0V)

MRC-SB-5C
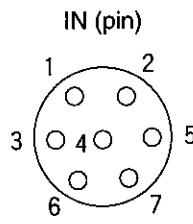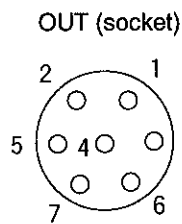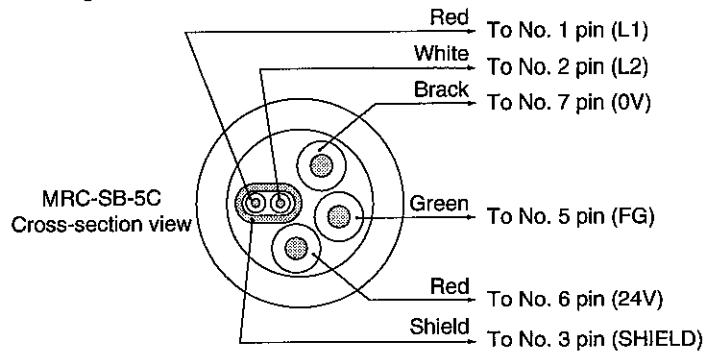Cross-section view

Green ──→ To No. 5 pin (FG)

Red ──→ To No. 6 pin (24V)
Shield ──→ To No. 3 pin (SHIELD)

1. Keep the communication/power cable as far away as possible from high voltage lines and power lines.
2. Provide relay terminal blocks, if required.
3. Make sure to turn OFF the power before inserting or removing the connector.
4. To attach the connector, insert it all the way and screw it down tight. Be careful not to damage the threads.

Fixing metal when loose

Fixing metal when tight

Screw

Screw
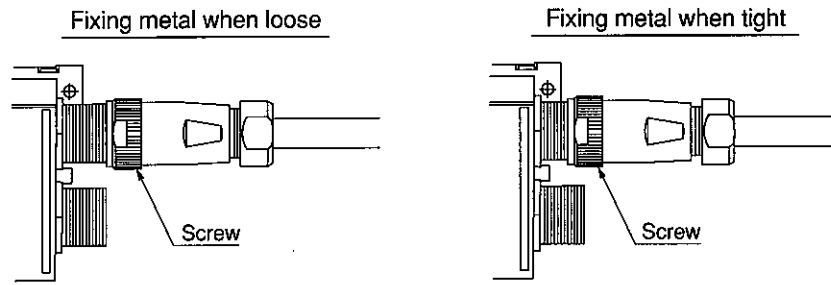
5. Make sure to connect the ground terminal (FG) to earth through the ground terminal of the control box.

Control box chassis

Grounding terminal

Control box

Grounding terminal

Item 3 grounding
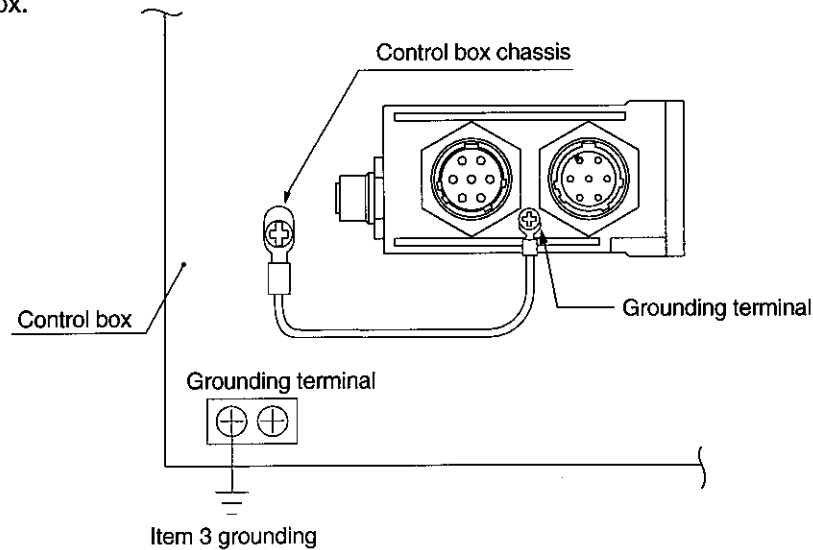
6. Pay attention to the voltage drop in the cable used to supply 24 VDC. The power input voltage at the slave module must be 20.4 V or more.

<Reference> Power voltage and line resistance

DC power voltage $V_1 - V_2$ = current × line resistance × 2 × wire length (km)

Line resistance

Module

DC power

V_1 Current V_2

Line resistance will be 9.53 ohm/km if nominal cross-sectional area is 2 mm^2

7. Put a cover on the communication/power connector (OUT) of the final module.

1. Do not exceed a 5 A draw on the power line for more than one module.
   (If the current draw will exceed 5 A, use a separate cable.)

2. The supply current to the slave modules should be less than 1 A total.
   A short circuit in external equipment, or a supply current of more than 1 A may blow the internal fuse, and shut off the supply current.
   (If the internal fuse is blown, all of the indicator lamps on the slave module will go out. The entire module must be replaced.)

Supply current for the slave modules	ZW-84NC	ZW-162MC
Current consumption of the module (consumed by the module itself)	Max. 100 mA	Max. 110 mA
Input power supply (supplied to external sensors via the input/output connector)	Max. 900 mA	Totally max. 890 mA
Output load (supplied to the external load via the input/output connector)	—	
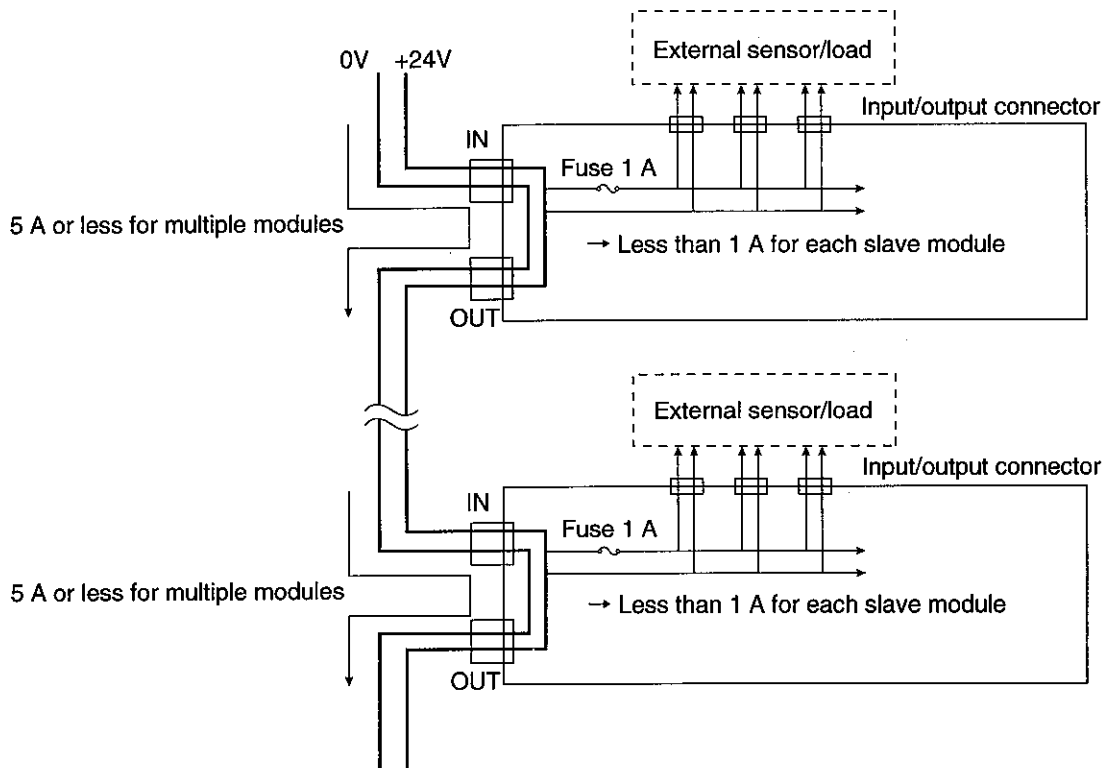
(3) Input/output signal wiring

[Wiring method]

[Pin allocation on the input/output connector]

An example for connecting
a 2-line system sensor
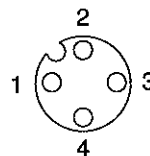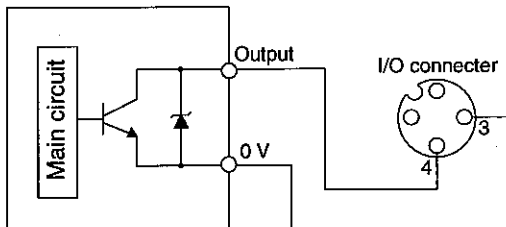
Pin number	Signal name	Remarks
1	24 V	
2	Output	ZW-162MC only
3	0 V	
4	Input	

An example for connecting
a 3-line system sensor
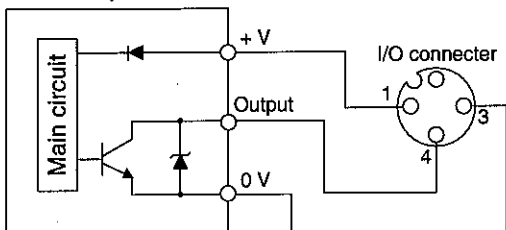
An example for connecting
a sensor to a lamp (ZW-162MC only)
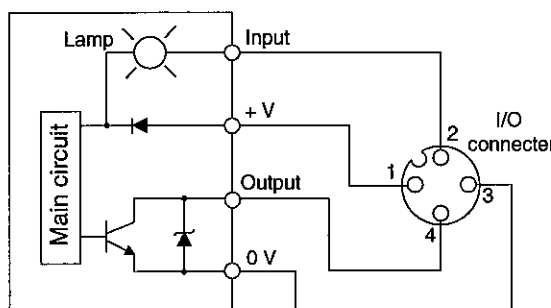
1. The new JIS standard used in the 3-line system sensor. Note the difference in the connector pin allocation for the 2-line system and the old JIS standard models.
2. PNP current output sensors cannot be used.
3. Use the recommended connector for the sensor connection.
4. Make sure to turn OFF the power before inserting or removing the connector.
5. To attach the connector, insert it all the way and screw it down tight. Be careful not to damage the threads.

Fixing metal when loose

Screw

Fixing metal when tight

Screw
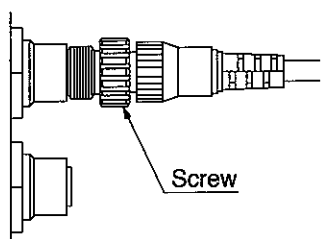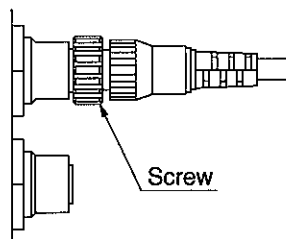
6. Put a cover on the I/O connector of the final module.

[5] Error and treatment

You can see the self-diagnosis results by the indicator lamp.
See page 95 for position of indicator lamp.

Indicator lamp	Display meaning	Lighting condition	Reset method
RUN	In operation	Slave station normal operation	—
ERROR	Error	Slave station switch setting error	Set slave station switch again.
		Communication error	Check Communication Cable.
		PC stopping	Operate PC.
		Slave module defective	Replace slave module.
IN 0 to 7	Input indicator lamp	Comes ON when the input signal to the slave module is "ON."	—
OUT 0 to 7 (ZW-162MC)	Output indicator lamp	Lights when output signal from PC is "ON".	
Fuse (ZW-162MC)	Fuse	A fuse on the output circuit is blown.	Replace slave module.

Operation description		Indicator lamp				Reset method	Priority order
		In operation RUN	Error ERROR	Input 0 to 7	Output 0 to 7 (ZW-162MC)		
Normal operation	Turn OFF output prohibition switch	●		"ON", "OFF" by input signal	Changes due to signal from PC	—	4
	Turn ON output prohibition switch	●			All points "OFF"		
Abnormal operation	Slave module error		●		All points "OFF"	Replace slave module	1
	Switch setting error		●			Set address switch again.	2
	Communication suspended	●	●		Holding state before abnormality	PC operation	
	Communication error (output only)	●	◑			Check communication cable. Replace slave module	3

●: Lighting, ◑: Blinks

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[6] Specifications

(1) General specifications

Item	Specifications
Allowable power voltage	24 VDC (+10%, -15% : Ripple factor; less than 5%)
Power consumption current	ZW-84NC : 100 mA Max, ZW-162MC : 110 mA Max · Current from 24 V power terminal (pin 1) of the input/output connector is not included. · Total current consumption supplied from the 24 V power terminal (pin 1) should be 1 A max.
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Vibration resistance	Conforming to JIS-C-0911 10 to 57 Hz with single duplicate 0.075 mm. 57 to 150 Hz at constant acceleration 9.8 m/s^2 (1 G) (2 hours each in X, Y, Z directions)
Shock resistance	Conforming to JIS-C-0912 147 m/s^2 (15 G) (3 times each in X, Y, Z directions)
Withstand voltage	1000 VAC for one minute (between input/output terminal, power terminal and secondary circuit)
Insulation resistance terminal and secondary circuit)	500 VDC, more than 10 M-ohm (between input/output terminal, power
Insulation system	Photo-coupler
Protection structure	IEC standard IP67 (Dust-proof, splash-proof type)
Weight	Approx. 660 g
Accessory	One instruction manual

(2) Communication specifications

Item	Specifications
Data transfer rate	EIA RS485 or equivalent
Transfer rate	345.6 k bits/s, 172.8 k bits/s (automatically changes according to the data transfer speed of master station.
Transfer format	Asynchronous system
Coding method	NRZ (Non Return to Zero)
Frame check	Parity check and reverse-double verification
Synchronous mode	Asynchronous
Transfer mode	Time sharing cyclic digital system
Communication line Wires	Parity line: Shielded twisted pain cable Cable total length : 1 km max. Recommended cable type: MRC-SB-5C by Nichigo Tsushin
Connection with external lines	Plug connection (plug itself is not supplied) Recommended plug: Tajimi wireless electric 　　　　　For input (socket);　TRC02-16P 7FA-ø11.2 　　　　　For output (pins);　TRC02-16P 7MA-ø11.2

(3) Specifications of I/O

① ZW-84NC (24 VDC input module)

Item	Specifications
No. of slave station occupied bytes	1 bytes
No. of input point	8 points
Rated input voltage	24 VDC
Allowable input voltage	20.4 to 26.4 VDC
Rated input current	4.6 mA TYP. (at 24 VDC)
Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or more
Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or more
Input impedance	5.2 k ohm TYP.
Surge current	–
Response time	OFF → ON: 1.0 ms or less
(module alone)	ON → OFF: 1.5 ms or less
Common terminal	1 common per 8 points
Operation indication	Light LEDs at ON
External wire connection system	Round water-proof connector for sensor. One connector for one input. (Connectors for external connections are not supplied.) Specified connector: IEC standard M12, 4 cores, DC use, male, with gold plated terminals.
Circuit configuration	

② ZW-162MC (transistor output, 24 VDC input module)

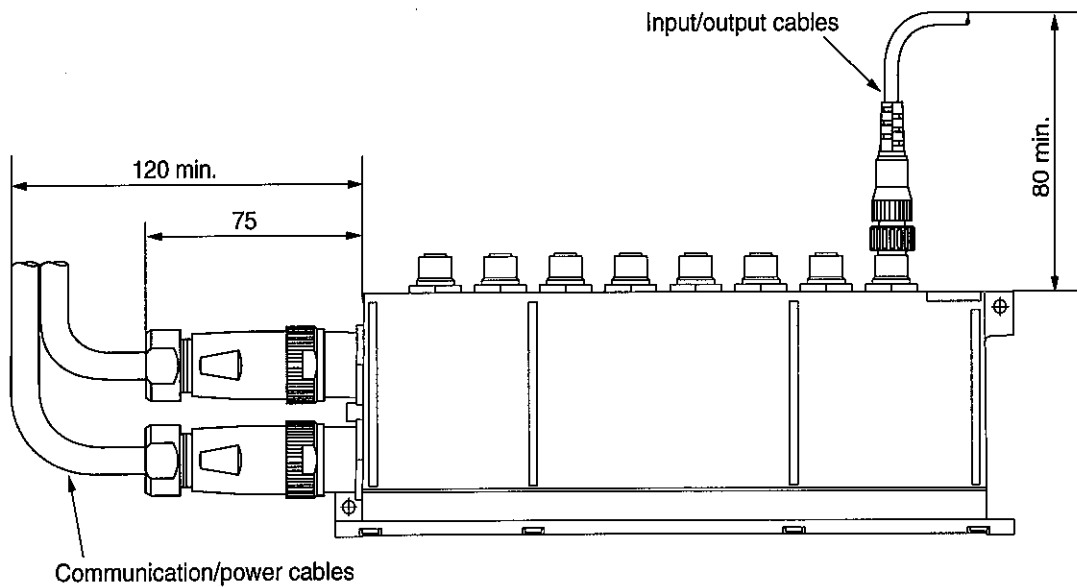| Item		Specifications
No. of slave station occupied bytes		2 bytes (Output : Front 1 byte, Input : Back 1 byte)
Output specification	No. of output point	8 points
	Rated load voltage	24 VDC
	Allowable load voltage	20.4 to 26.4 VDC
	Rated max. output power	0.3 A/point, 1 A/common ※1
	Surge ON current	Output element capacity: 2 A (100 ms)
	Min. load current	–
	Leakage current (when OFF)	0.05 mA or less
	ON voltage	0.5 V or less (0.3 A)
	Response time (module alone)	OFF → ON: 1 ms or less
		ON → OFF: 1 ms or less (resistance load) ※2
	Surge killer	Zener diode
	Rated fuse	Built-in 1.25 A fuse (unable replacement)
		Meltdown detection function is provided (When melted down or lead power is turned off, the FUSE lamp lights)
		Note : This fuse protects against abnormal heating, and burning out the module. It is not for overcurrent protection of the output elements or load.
	Common terminal	1 common per 8 points (– common)
Input specification	No. of input point	8 points
	Rated input voltage	24 VDC
	Allowable input voltage	20.4 to 26.4 VDC (includes ripple factor at 12/24 VDC)
	Rated input current	4.6 mA TYP. (at 24 VDC)
	Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or up
	Input current level	ON level: 3 mA or less, OFF level: 1.5 mA or up
	Input impedance	5.2 k ohm (TYP.)
	Surge current	—
	Response time (Module alone)	OFF → ON: 1.0 ms or less (24 VDC)
		ON → OFF: 1.5 ms or less (24 VDC)
	Common terminal	1 common line for 8 points (no polarity)
External wire connection system		Round water-proof connector for sensor. One connector for one input. (Connectors for external connections are not supplied.) Specified connector: IEC standard M12, 4 cores, DC use, male, with gold plated terminals.

Note 1   When you supply load power from the input/output connector, make sure that the total internal consumption current (110 mA), current for the 3-line external sensor, and load current are be less than 1 A.

Note 2   When you use an inductive load, the time delay from ON to OFF may be more than one second with a load value OFF.
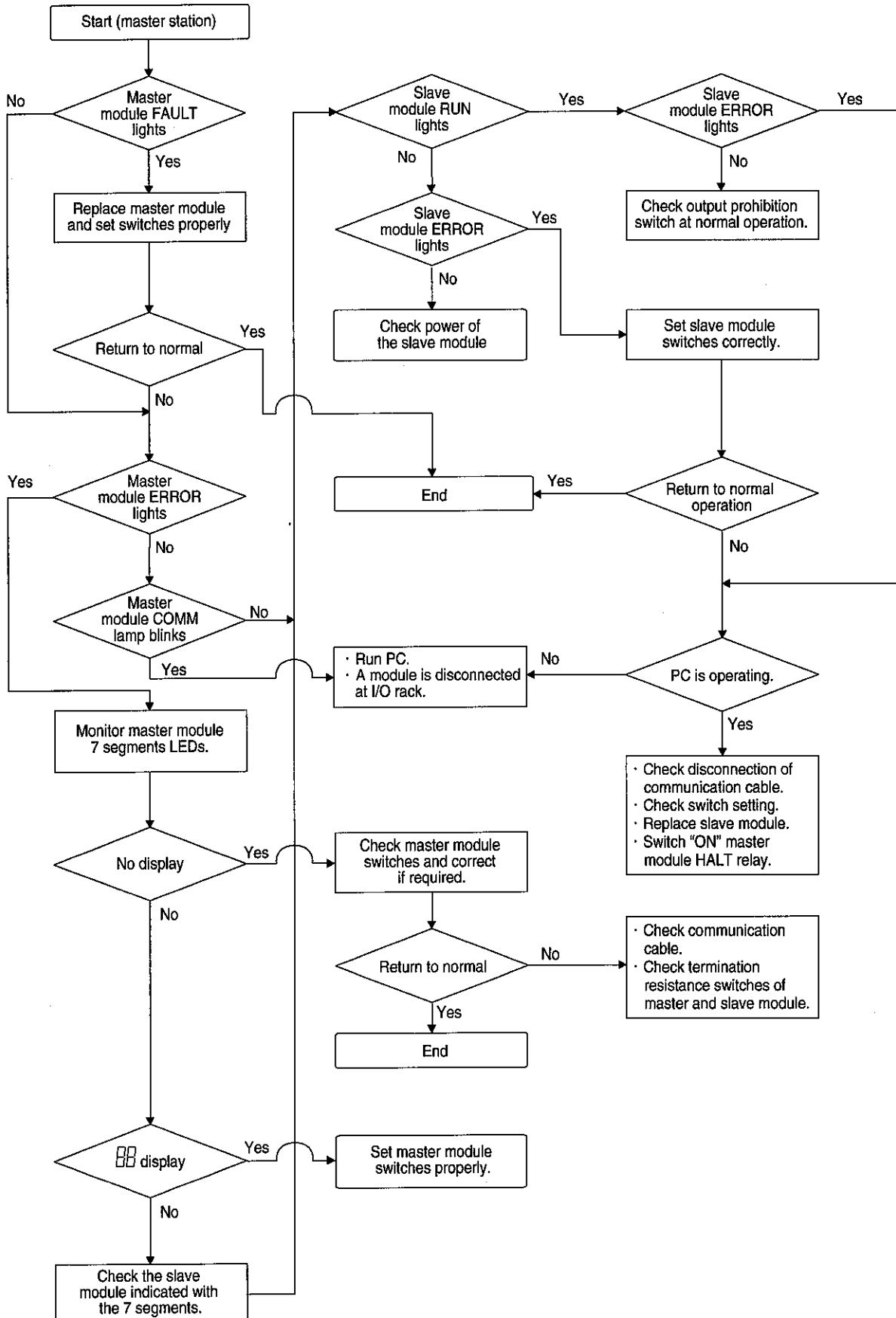
Item	Specifications
Circuit configuration	
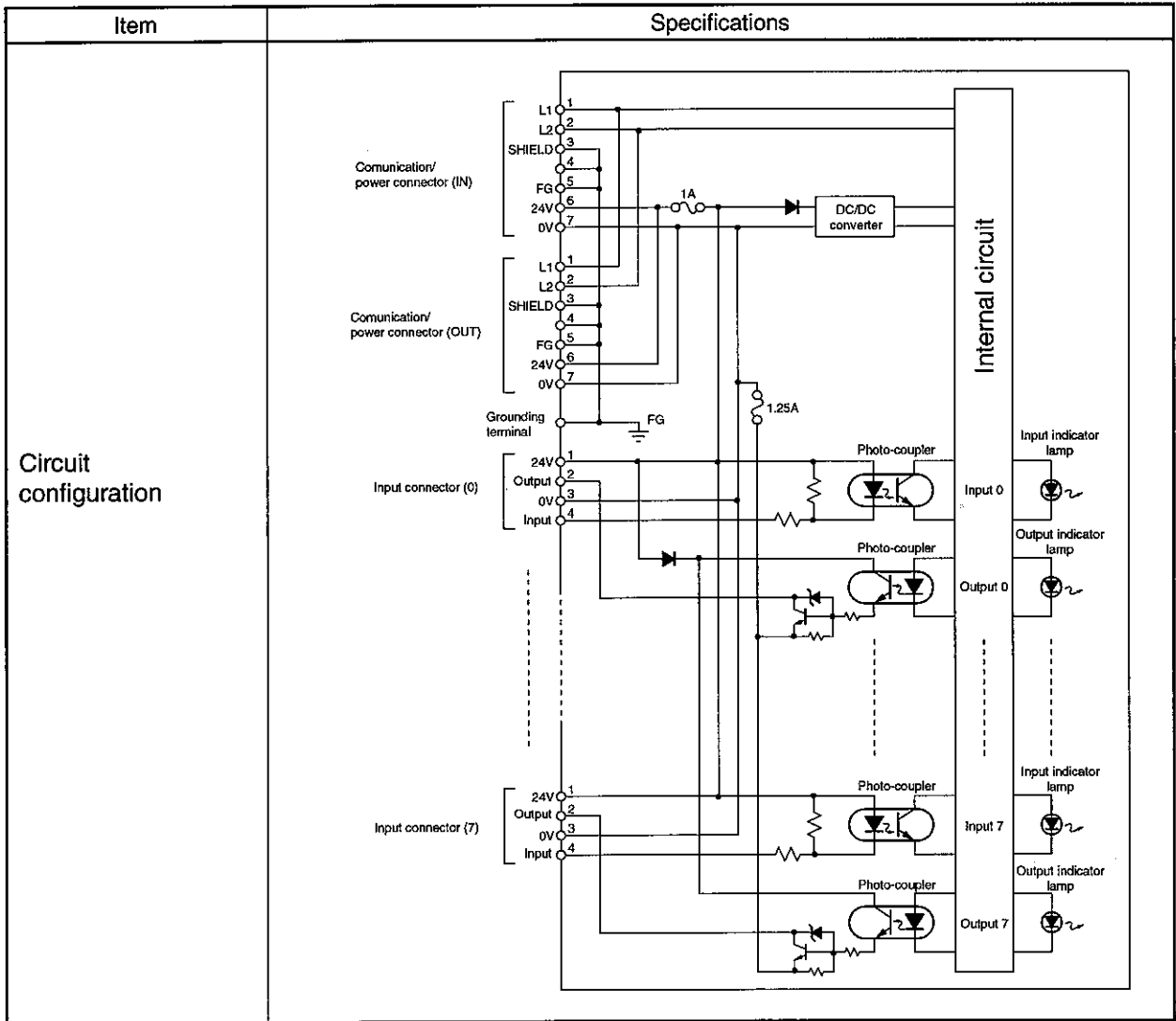
(4) External dimension drawings (Common for ZM-84NC/ZW-162MC)

§12 Appendix

12-1 I/O link check flow

```
Start (master station)
        │
        ▼
Master module FAULT lights ──No──► (to Master module ERROR lights)
        │Yes
        ▼
Replace master module and set switches properly
        │
        ▼
Return to normal ──Yes──► (to flow)
        │No
        ▼
Master module ERROR lights ──Yes──►
        │No
        ▼
Master module COMM lamp blinks ──No──►
        │Yes
        ▼
Monitor master module 7 segments LEDs.
        │
        ▼
No display ──Yes──► Check master module switches and correct if required.
        │No                    │
        │                      ▼
        │              Return to normal ──No──► · Check communication cable.
        │                      │Yes              · Check termination resistance
        │                      ▼                   switches of master and slave module.
        │                    End
        ▼
BB display ──Yes──► Set master module switches properly.
        │No
        ▼
Check the slave module indicated with the 7 segments.

Slave module RUN lights ──Yes──► Slave module ERROR lights ──Yes──►
        │No                              │No
        ▼                                ▼
Slave module ERROR lights ──Yes──►   Check output prohibition switch at normal operation.
        │No                              │
        ▼                                ▼
Check power of the slave module     Set slave module switches correctly.
                                         │
                                         ▼
                          End ◄──Yes── Return to normal operation
                                         │No
                                         ▼
· Run PC.              ◄──No── PC is operating.
· A module is disconnected            │Yes
  at I/O rack.                        ▼
                          · Check disconnection of communication cable.
                          · Check switch setting.
                          · Replace slave module.
                          · Switch "ON" master module HALT relay.
```

12-2 Data register address change of JW special I/O module

- In automatic I/O registration mode, data register address of JW special I/O module is allocated in register 49000 or up with 64 bytes unit.
- Data register address of JW special I/O module can be changed as relay area by manual I/O registration mode.

[1] Manual I/O allocation procedure

1) Operate at automatic I/O registration mode. In automatic I/O registration mode, all the installed special I/O data register address can be allocated from register 49000 with 64 bytes unit.

Note 1   The module re-registers automatic I/O registered condition when the PC power is turned ON.
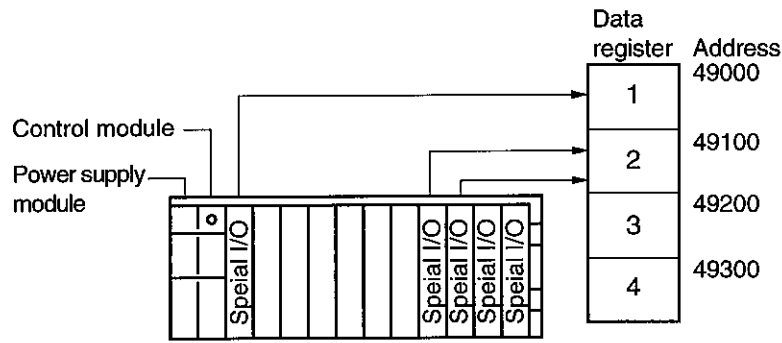
2) Move automatic I/O registered address by manual I/O allocation
   While in manual I/O registration, after one area is moved out, other data register remains unchanged.

Note 2   Once I/O registration is executed, the module does not re-register I/O address when PC power is turned ON.
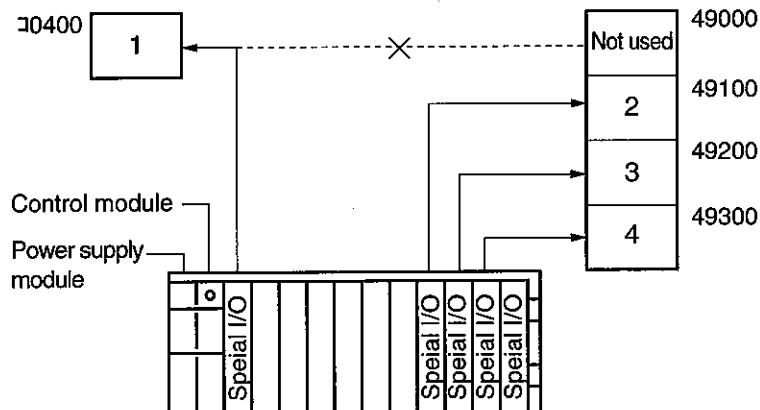
[2] Operation method

This paragraph explains how to change data register address of special I/O module using a hand-held programmer (JW-13PG, etc.) An operation example in JW-13PG is shown below.

Turn OFF PC power

Turn OFF PC power before installing I/O module into the PC.

Turn ON PC power

Connect JW-13PG

Connect JW-13PG with the control module.

Switch OFF memory protect switch

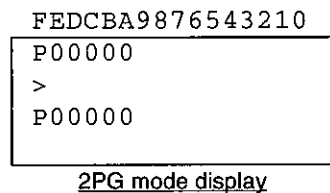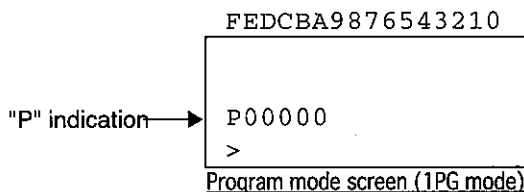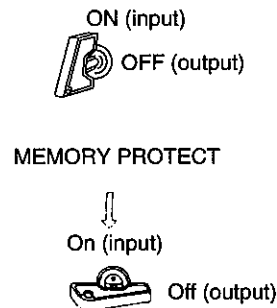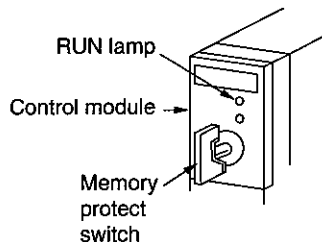Without switching "OFF" memory protect switch, I/O registration cannot be executed.

Turn the control module to program mode

Turn the control module to program mode by key operation of JW-13PG.

CLR	✳	✳	PROG MODE	SET 8

* When the control module has been turned to program mode, the JW-13PG displays "P" on its screen. The RUN lamp of the control module blinks at the same time.

Note 1	When the programmer JW-13PG is 2PG mode, it cannot display initial mode. Change to 1PG mode with the following key operation prior to operation.

✳	✳	INTL DISP

To next page

Control module

Power supply module

Control module
(Memory protect switch)

RUN lamp

Control module

Memory protect switch

ON (input)

OFF (output)

MEMORY PROTECT

On (input)

Off (output)

```
FEDCBA9876543210
┌──────────────────┐
│                  │
│  P00000          │
│  >               │
└──────────────────┘
```
"P" indication ▶ P00000

Program mode screen (1PG mode)

```
FEDCBA9876543210
┌──────────────────┐
│  P00000          │
│  >               │
│  P00000          │
└──────────────────┘
```
2PG mode display
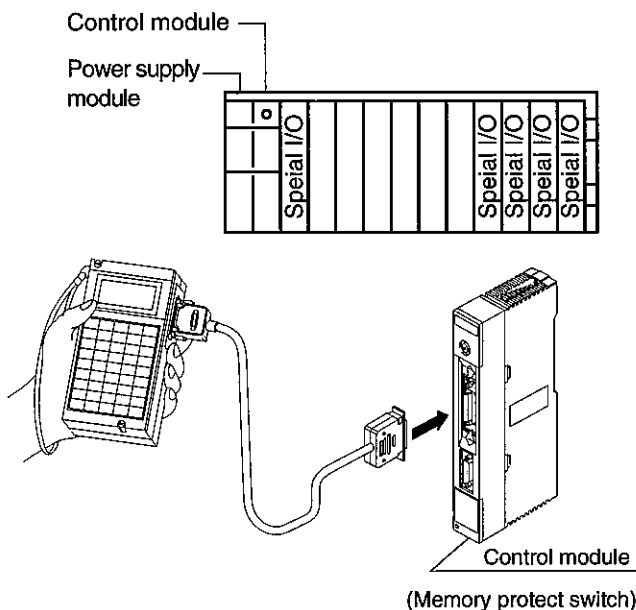
Turn to initial mode.

Enter initial mode by JW-13PG key operation.

| CLR | * | * | SHIFT | PROG MODE | SET 8 |
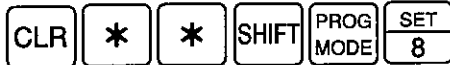
"I" appears on the screen at initial mode.

"I" indication ⟶

FEDCBA9876543210
```
I INITIAL
0)I/O
1)CLOCK
```
Initial mode menu

Select I/O registration mode

Press [A 0] key in initial mode.

FEDCBA9876543210
```
I I/O
0)I/O SET
1)POWER ON
AUTO ENTRY MODE
```

Select I/O setting

Press [A 0] key in order to register I/O.

```
I/O SET
0)COMPILE TABLE
1)AUTO ENTRY
```

Select I/O automatic registration

Press [B 1] key in order to execute I/O automatic registration.

```
I AUTO ENTRY
0)I/O
1)SPECIAL I/O
```

Select special I/O module

Press [B 1] key in order to register date of special I/O module.
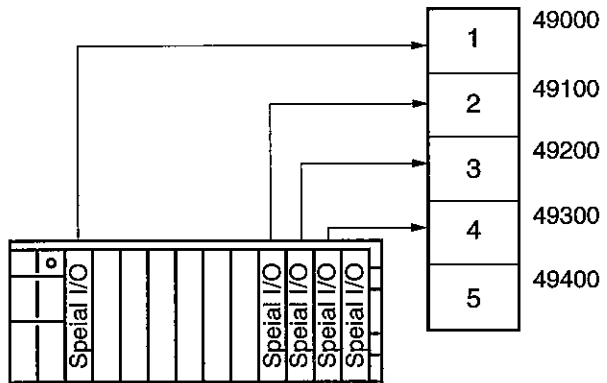
```
I SPECIAL I/O
AUTO ENTRY?
<0)NO      ,1)YES
```

To next page

Execute I/O automatic registration

Press [B]1 to start automatic registration. The screen displays ">OK" after completion of registration.

Now data register address of Special I/O module is registered in the PC system memory.

```
I SPECIAL I/O
AUTO ENTRY?
<OK
```

1	49000
2	49100
3	49200
4	49300
5	49400

Preparation for manual I/O registration

In order to register manual I/O registration, press [CLR][A]0

[A]0 keys and return to "I/O setting" screen.

```
I I/O SET
0)COMPILE TABLE
1)AUTO ENTRY
```

Select table creation

Press [A]0 key to create table.

```
I COMPILE TABLE
0)RACK ADDRESS
1)DUMMY
2)SPECIAL I/O
```
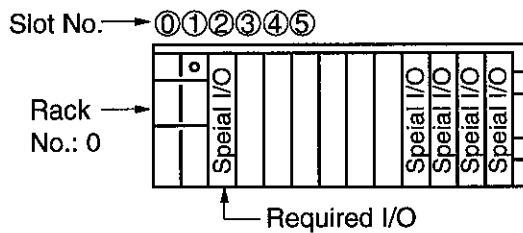
Select special I/O module

Press [C]2 key to register data register of special I/O module.

```
I SPECIAL I/O
>R:0
```

Input rack number

As the required special I/O is in rack number 0, press [A]0 and

[,] key.

Slot No. → ⓪①②③④⑤

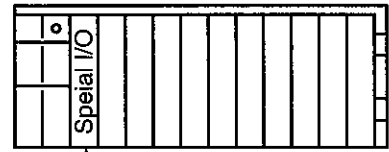Rack No.: 0

Required I/O

```
I SPECIAL I/O
>R:0,S:0
```

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↓

Input slot number

As the required special I/O module is
installed in slot number 2, press

[C 2] and [,] key.

Slot No.→Ⓞ①②③④⑤⑥⑦⑧⑨ⒶⒷⒸ

└─ Required I/O

```
I SPECIAL I/O
>R:0,S:2,NO
```

Input data register address

Input data register address.

Press [E 4] [A 0] [A 0] [,] keys to set it in ⅂0400.

```
I SPECIAL I/O
 R:0,S:2,⅂0400
>0)STOP,1)CONT
```

Note 1   Data register of special I/O module is registered with 64 bytes unit. Thus,
values other than the below cannot be input in relay area.

— Note 2	⅂0400	⅂1000	⅂1400
⅂0100	⅂0500	⅂1100	⅂1500
⅂0200	⅂0600	⅂1200	
⅂0300	⅂0700 Note 2	⅂1300	

Note 2   Area ⅂0000 cannot be set. Do not use area ⅂0700 as it is used as special
relay.

Note 3   To use other register area, change area pressing [DATA CONST] key.

⅂0000 ──→ b0000 ──→ 09000 ──→ E0000
      ↑   Note 4   │
      └──────────────────────────────────┘
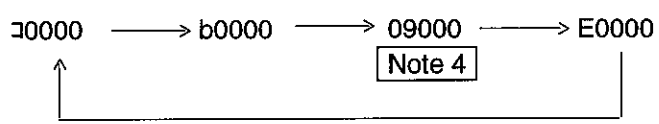
Note 4   In address setting of register 19000 to 99000, press [,] inputting first digit

value and input 3 digits sequentially.

(Ex. press [SET 8] [,] [B 1] [A 0] [A 0] keys to input 89100.)
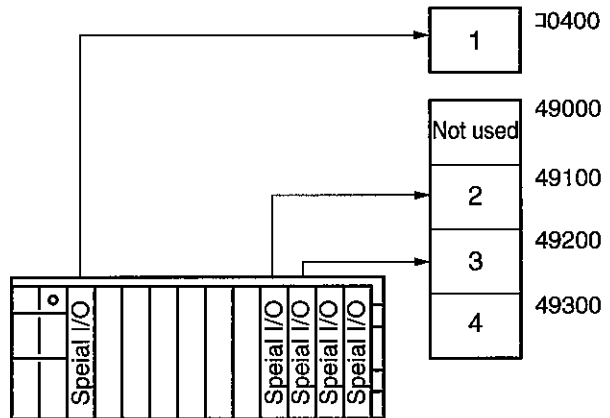
↓

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Set only one module

To complete setting, press $\boxed{^A\,0}$ key.

Register I/O table

Press $\boxed{^B\,1}$ key to register table.

The screen displays "OK" after completion.
The first data register of special I/O module has now used 64 bytes from ⊐0400.

Return to initial menu screen

Press $\boxed{\text{CLR}}$ key to return to initial menu screen.

$\boxed{\text{Note 1}}$ To get screens one by one, press $\boxed{\text{ESC}}$ key.

Return to program mode

Press $\boxed{*}$, $\boxed{*}$, $\boxed{\begin{array}{c}\text{PROG}\\\text{MODE}\end{array}}$, $\boxed{\begin{array}{c}\text{SET}\\8\end{array}}$

keys or press $\boxed{\text{ESC}}$ key to return to program mode.

$($ **End** $)$

```
I I/O TABLE
  (COMPILE ?)
>0)NO      ,1)YES
```

```
I I/O TABLE
>COMPILE OK
```

```
1        ⊐0400
```

```
Not used   49000
2          49100
3          49200
4          49300
```

Speial I/O   Speial I/O Speial I/O Speial I/O Speial I/O

```
I INITIAL
0)I/O
1)CLOCK
```

```
P00000
>
```

With above, relocation of data register address of special I/O module has completed.

12-3 Adress allocation table of slave module (Master module:JW-31LMH)

Byte address	Slave station address (octal)	Used slave module	Byte address	Slave station address (octal)	Used slave module
00	Status		40	40	
01	01		41	41	
02	02		42	42	
03	03		43	43	
04	04		44	44	
05	05		45	45	
06	06		46	46	
07	07		47	47	
10	10		50	50	
11	11		51	51	
12	12		52	52	
13	13		53	53	
14	14		54	54	
15	15		55	55	
16	16		56	56	
17	17		57	57	
20	20		60	60	
21	21		61	61	
22	22		62	62	
23	23		63	63	
24	24		64	64	
25	25		65	65	
26	26		66	66	
27	27		67	67	
30	30		70	70	
31	31		71	71	
32	32		72	72	
33	33		73	73	
34	34		74	74	
35	35		75	75	
36	36		76	76	
37	37		77	77	

SHARP

SHARP MANUFACTURING SYSTEMS CORPORATION