SHARP®

Version 1.0
Produced in Dec. 1997

Sharp Programmable Controller

Model name

I/O link master module *JW-23LMH*

User's Manual

We thank you for your purchase of the I/O link master module, JW-23LMH for the programmable controller new satellite JW20H/30H.

This manual describes about specifications, usage etc. of the I/O link master module and slave module.

Be familiarize yourself with the module by reading this user's manual thoroughly.

Keep this manual with you as well as the instruction manuals attached to each control module of JW-23LMH and JW20H/30H. We are confident that these booklets will be helpful whenever you face a problem.

Besides this manual, the following manuals are provided for your further understanding.

JW-23LMH ——— User's manual (this book)

JW20H
Control module ——— User's manual, hardware version
└— Programming manual (ladder instruction version)

JW30H
Control module ——— User's manual
└— Programming manual (ladder instruction version)

Note

- Should you have any questions and inquires please feel free to contact our dealer's shop.
- Whole or partial photocopy of this booklet is prohibited.
- The contents of this booklet may be revised for improvement without notice.

Safety Precautions

Read this user's 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 user's 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 user's 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 instruction 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

- To avoid electrical shock, do not touch terminals when power is ON.
- 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 machine trouble 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.

I/O Link Master Module: JW-23LMH

- User's Manual -

Table of Contents

Chapter 1 Outline

I/O link master module: JW-23LMH (hereafter called "master module") is I/O link master module for programmable controller JW20H/JW30H (hereafter called "PC").

The master module is connected to a PC basic rack panel and linked by a single twisted pair shielded cable to each of the I/O link slave module installed in various locations.

■ Features

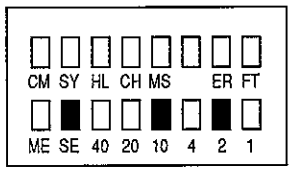
1. **High data transfer speed**
   The JW-23LMH transfer speed is 345.6 k-bit/sec., which is twice the conventional JW-23LM model. This allows high speed communications with the ZW-324NH/322SH/322MH I/O link slave modules. By setting the switches, the JW-23LMH can also be connected to the following conventional 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-bit/sec.

2. **Up to 32 slave module can be connected to a master module.**
   Up to 4 master module can be connected to a PC basic rack panel (excluding remote I/O slave station), and up to 32 slave module can be connected to 1 master module.
   (However, number of I/O link points is maximum 504 points.)

3. **Each slave module can select between output hold and reset when a communication error occurs.**

4. **Module addresses of malfunctioning slave module are displayed.**
   Should a problem arise with a slave module, its address is displayed by the master module. This makes it easy to identify malfunctioning slave station.

Display panel



This display shows that station No. 12 is malfunctioning.

5. **Multiple errors can be monitored.**
   It is possible to monitor stations generating multiple errors, making it easy to recover readily.

Chapter 2 Special Precautions for Use

Observe the following precautions when using the master module.

1. Installation

Avoid installation in places such as these.

- Places that receive direct sunlight
- Panels in which high-voltage equipment is installed
- Places with flammable gases

2. Connecting

- Before connecting, you must set the "I/O link byte number setting switches" on the side of the master module.
- Connect the master module to the PC basic rack panel by plugging it into the I/O slot. Connections cannot be made to expansion rack panel and remote I/O slave station.
- Make connections only after cutting the power to PC. No more than 4 sets can be connected. If more than 4 sets are connected, the PC will not function.
- Do not install directly above equipment that generates much heat, such as heaters, transformers, or large-capacity resistance. Keep as far away as possible from high-voltage lines and power lines.
- The connecting screws should be zinc-plated M3 screws. Tighten firmly when connecting.

3. Wiring

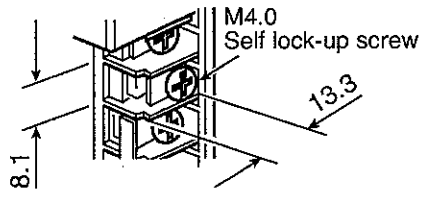
- Before wiring, check all connections and switch settings.
- Avoid laying communication cable in parallel proximity to power lines or other high-voltage or high-current lines.
- Wiring that makes connecting and disconnecting easy will facilitate subsequent maintenance work.
- Do not remove the caution label affixed to the top of the unit. This will prevent cable waste and other foreign matter generated during wiring from entering the ventilation hole, which is provided to keep the interior temperature from rising. Remove the caution label only after all wiring has been completed.
- For wiring, use Sharp-recommended twisted pair shielded cable.

Recommended twisted pair shielded cable

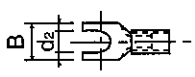
Wiring system	Cable model	Manufacturer
2-wire system	S-IREV-SW2 * 0.5 S-IREV-SB2 * 0.5	Hitachi Cable Ltd.
	RG-22B/U	Fujikura Ltd.

- Use Sharp-recommended crimp-style terminals for wiring to the terminal block.

Terminal block dimensions (mm)



- **Recommended crimp-style terminals (made by Japan Solderless Terminal Mfg. Co., Ltd.)**

Crimp-style terminal	Dimensions	Model name
	B<8.1 d_2>4	1.25 - YS4A V1.25 - YS4A 2 - YS4A V2 - YS4A

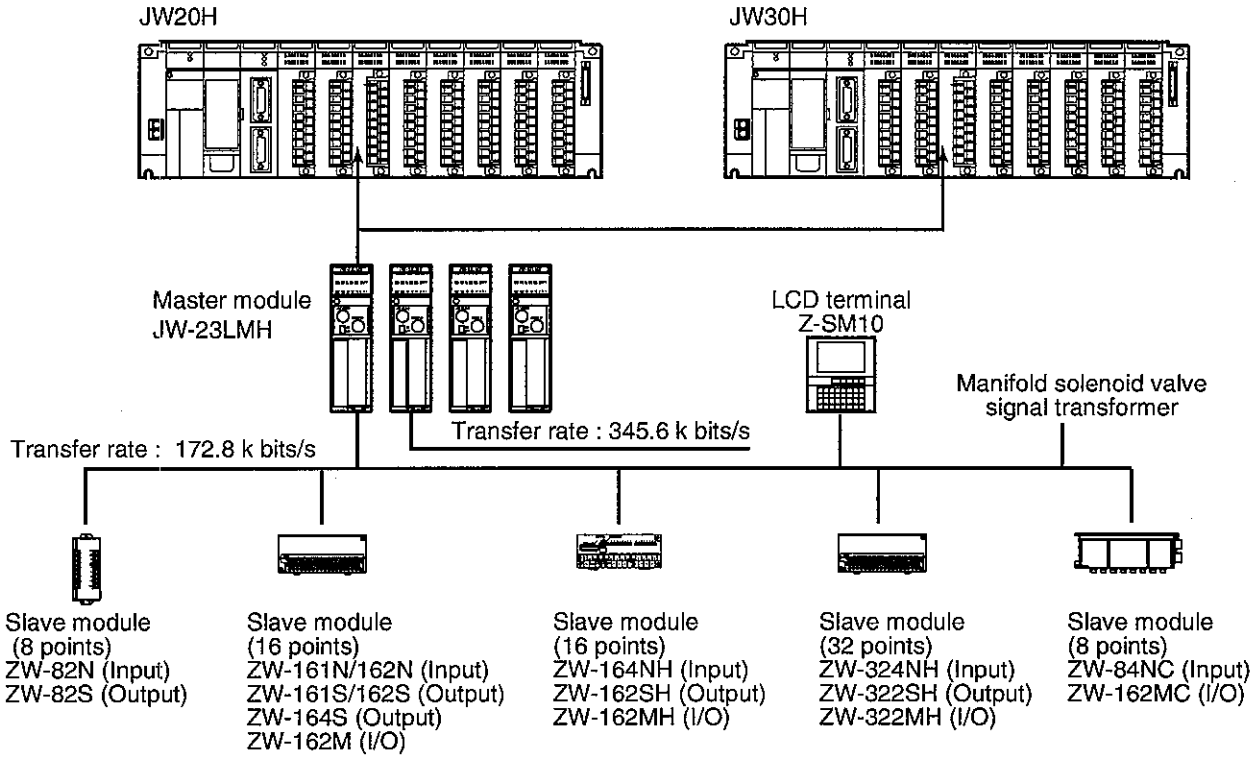
4. **Switch setting and operation**
   - Set switches only after disconnecting power to PC. Setting switches while power is ON could cause a malfunction. Do not use excessive force to operate switches.
   - In case of JW20H, after setting switches and supplying power to the PC, register I/O by using support tool (JW-13PG, etc.). Unless I/O is registered, the PC and master module do not operate.
   - If there is trouble or error in the master module (overheat, malodor, smoke, etc.), stop using and immediately report to your dealer or our service company.

5. **Static electricity**
   - Under very dry conditions the human body generates excessive static electricity, which could adversely affect master and slave module. Begin working on module only after touching grounded metal or the like to discharge static electricity from your person.

6. **Cleaning**
   - Use a soft, dry cloth. The use of volatile substances (such as alcohol, thinner, or freon), a damp cloth, or the like could cause deformation or discoloration.

7. **Assignment of relay numbers**
   - JW20H/30H connected to a JW-23LMH master module are assigned 16 points as I/O relay numbers on the JW-23LMH. These 16 points constitute a dummy area that is not used on the JW-23LMH. (See page 23.)
   - The JW20H and JW30H allocation of I/O link area and flag area is not the same. (See page 9.)

Chapter 3 System Configuration



■ Master module

Model	Remarks
JW-23LMH	• 4 sets of JW-23LMH can be installed on the basic rack panel I/O slot of the JW20H/ JW30H. • 32 sets of slave module can be connected per master module. • Set in mode switch for transfer rate (345.6 kbits/s, 172.8 kbits/s.) • Total cable length is 1 km at maximum.

■ I/O link slave module

Model name		No. of points	Specifications	
Input	ZW-82N	8 points	12/24 VDC	(Transfer rate) 172.8 kbits/s
	ZW-161N	16 points	100 to 120 VAC	
	ZW-162N	16 points	12/24 VDC	
	ZW-164NH	16 points	24 VDC	345.6 kbits/s, 172.8 kbits/s※
	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 kbits/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 output (separated common)	
	ZW-162SH	16 points	24 VDC	345.6 kbits/s, 172.8 kbits/s※
	ZW-322SH	32 points	24 VDC, 0.3A, 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 kbits/s
	ZW-162MH	16 points	24 VDC	345.6 kbits/s, 172.8 kbits/s※
	ZW-162MC	8 points	24 VDC	
	ZW-322MH	32 points	24 VDC, 0.3 A, transistor output 16 points 24 VDC, input 16 points	

※ The data transfer speed changes automatically according to the data transfer speed of the JW-23LMH master station.

■ 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

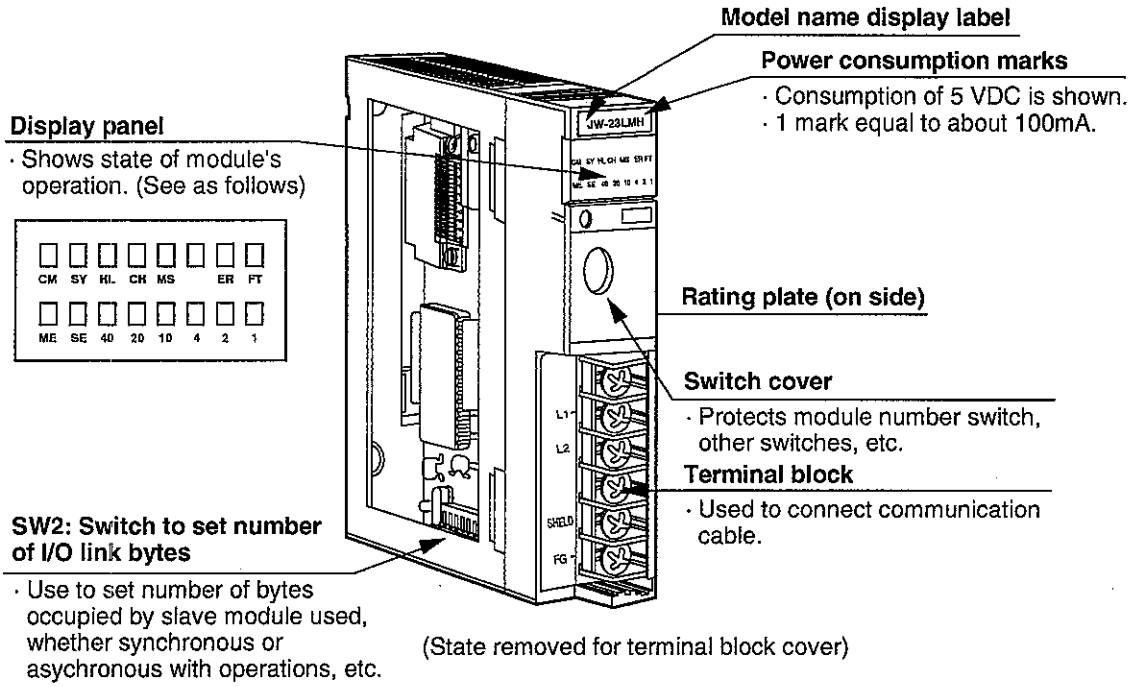
■ Manifold solenoid valve

Series	Corresponding module	Manufacturer
VQ 0000/1000/2000	EX120-SSH1 EX121-SSH1 ES122-SSH1 EX130-SSH1	SMC Co., Ltd.
SY 3000/5000		
SX 3000/5000		
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.

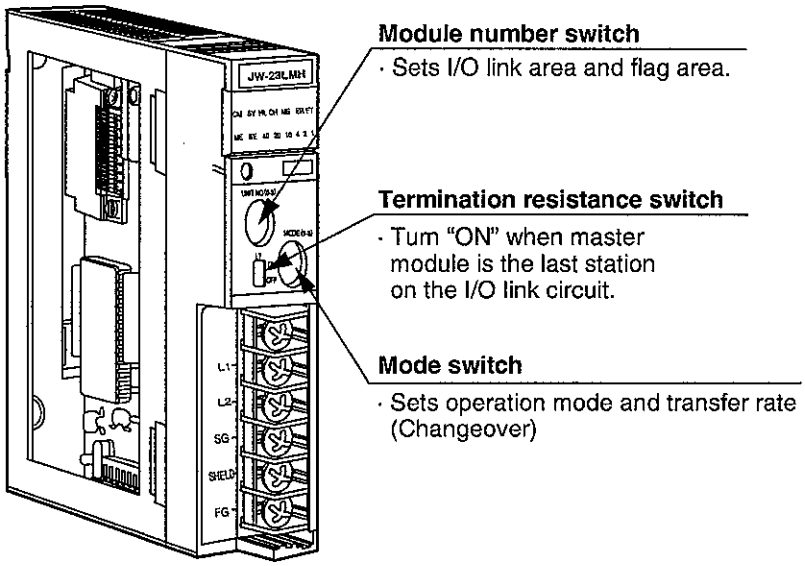
■ Signal transformer

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

Chapter 4 Name and Function of Each Part



(State removed for terminal block cover)

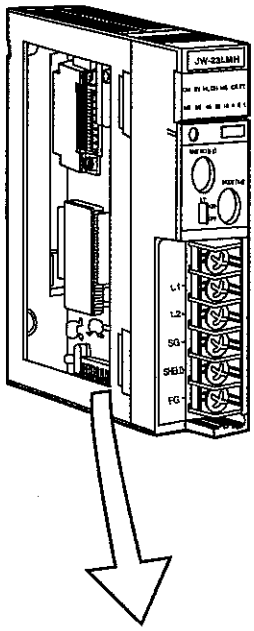


(State removed for switchcover and terminal block cover)

Lamp name	Operation contents
CM	Turn ON a light when communicating
SY	Turn ON a light when setting ON for 7 (SY) of I/O link bytes setting switch SW2.
HL	Turn ON a light when internal HALT relay is "ON."
CH	Turn ON a light when "mode switch" is set to "3 or 6," it is valid, and when internal relay (check relay) is "ON."
MS	Turn ON a light when connected check for master module, slave module is impossible.
ER	Turn ON a light when switch setting of master module is error or communication line is error.
FT	Turn ON a light when hardware of master module is error.
ME	Turn ON a light when master module is error.
SE	Turn ON a light when slave module is error.
40 to 1	Display the error code at error or station number of error slave module.

Chapter 5 Installation Method

Following are the procedures to be followed for installation and setting switches.



Turned OFF all switches at delivery

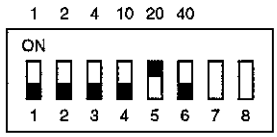
① Set the "I/O link byte setting switch SW2," located on the module's side.

- **Setting the I/O link bytes switch** (switches: 1 to 6)

  Set in octal the total number of bytes occupied by slave module.

  Example: When 4 sets of the 32 points type are used.

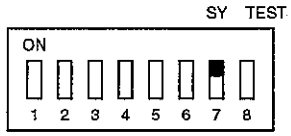
  Setting value = 4 bytes × 4 = 16 bytes$_{(D)}$ = 20$_{(8)}$



- **Communication cycle** (switch: 7)

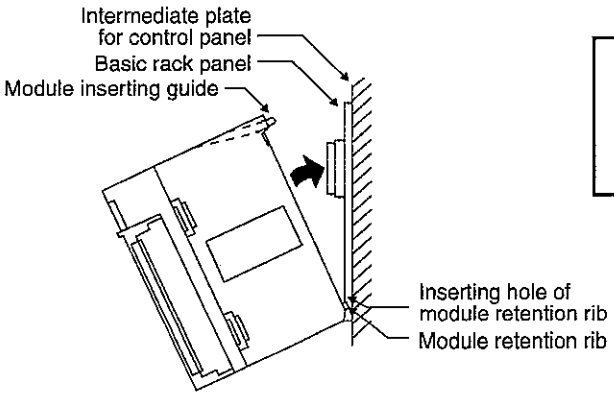
  Select whether or not communication with PC is to be synchronized with PC operations (see page 15).

  Synchronous: ON Asynchronous: OFF



Note

- The test mode (switch 8) should always be "OFF."
- Connecting a number of slave modules that is larger than the number of I/O link bytes could cause a malfunction owing to a data conflict.
- If the number of I/O link bytes set is larger than the total number of bytes occupied by the slave module, communication errors (mode 1) will be generated.



② Push in the master module by hanging the retention rib on the bottom rear part of the master module on the inserting hole of fixing rib on the basic rack panel.

- If the master module is pushed in without hanging the module retention rib in the insertion slot, it cannot be correctly installed on the basic rack panel.

  If the installed module is tilted after pushing it in, repeat the procedure from the beginning.

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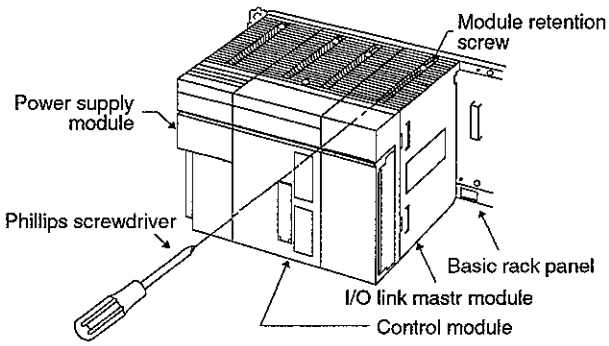
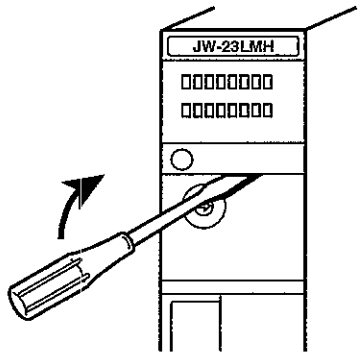


③ Use a phillips screwdriver to tighten the module retention screw on the upper part of the module.

- If the screw is not properly tightened, perform installation over from the beginning.

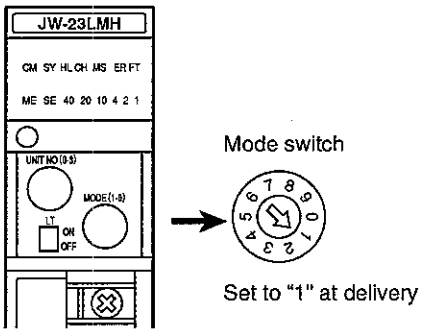
④ Use a slot screwdriver to remove the "switch cover" from the front panel.

- To remove the cover, insert the slot screwdriver into the gap between the switch cover top and cabinet, and pull it toward yourself while pushing down.



⑤ Set the "mode switch" to the desired operation mode and transfer rate.

		Mode switch setting value					
		1	2	3	4	5	6
Operation contents	At normal • When power to the master module turns "ON," the master module intially checks its connected stations one time.	○	○	○	○	○	○
	At normal • The master module continues to check its connected stations once per 100 communications with all save module.	○	○	–	○	○	–
	At normal • When the CHECK relay is "ON," the master module checks its connected stations.	–	–	○	–	–	○
	At communication error • The master module repeats connected station check until communication becomes normal.	○	–	–	○	–	–
	At communication error • The master module checks its connected stations once per 100 communications with all slave module, and check no response station's recovery	–	○	–	–	○	–
	At communication error • When the CHECK relay is ON, the master module checks its connected stations, and check no response station's recovery.	–	–	○	–	–	○
	At communication error • The master module executes communication regarding no response slave module as disconnected station.	–	○	○	–	○	○
	At communication error • No response station number is output to display panel and status section.	○	–	–	○	–	–
	At communication error • Only PC 1 cycle of no response station number is output to status section.	–	○	○	–	○	○
Transfer rate (kbits/s)		172.8			345.6		



Note

- Set the mode number switch to "1" through "6." If the switch is set to "0" or "7" through "9," errors will arise and the module will not function.
- When two or more stations slave module are functioning improperly, the status port and display panel will show the address of the minimum number.

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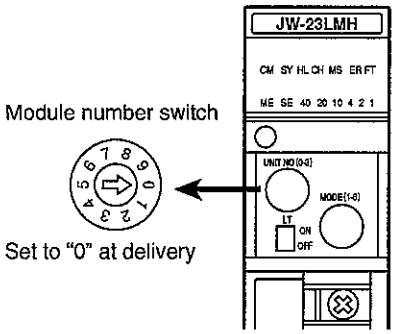

⑥ Use the "module number switch" on the front to set the module address.

Setting the module address will assign the I/O link area and the flag area.

- If a PC is the JW20H...

When 4 master modules are installed:

Switch setting	I/O link area	Flag area
0	□0100 to □0117 (128 points)	□1570 to □1571
1	□0120 to □0137 (128 points)	□1572 to □1573
2	□0140 to □0157 (128 points)	□1574 to □1575
3	□0160 to □0177 (128 points)	□1576 to □1577

When 3 master modules are installed:

Switch setting	I/O link area	Flag area
0	□0100 to □0117 (128 points)	□1570 to □1571
1	□0120 to □0137 (128 points)	□1572 to □1573
2	□0140 to □0157 (256 points) □0160 to □□0177	□1574 to □1575

When 2 master modules are installed:

Switch setting	I/O link area	Flag area
0	□0100 to □0117 (128 points)	□1570 to □1571
1	□0120 to □0137 □0140 to □0157 (384 points) □0160 to □0177	□1572 to □1573

When 1 master module is installed:

Switch setting	I/O link area	Flag area
0	□0100 to □0117 □0120 to □0137 (512 points) □0140 to □0157 □0160 to □0177	□1570 to □1571

- When a PC is the JW30H:

Switch setting	I/O link area	Flag area
0	□2000 to □2077 (512 points)	□1570 to □1571
1	□2100 to □2177 (512 points)	□1572 to □1573
2	□2200 to □2277 (512 points)	□1574 to □1575
3	□2300 to □2377 (512 points)	□1576 to □1577

Note

- Set the module number switch to "0" to "3." If the switch is set to "4" to "9," errors will arise and the module will not function.
- Make sure the switch setting does not duplicate that of another master module. If there is a duplicate, neither the PC nor the master module will function. PC system memory #160 will store the error code "$73_{(H)}$" and turn on the master module's ER lamp.
- The first byte of the I/O link area is the status area.

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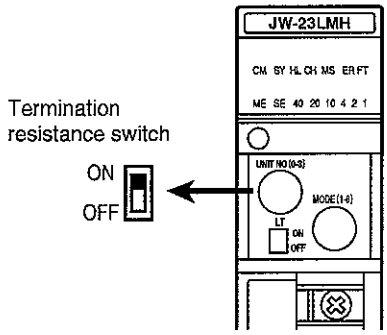
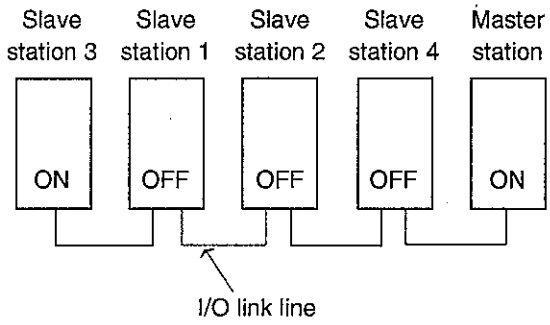
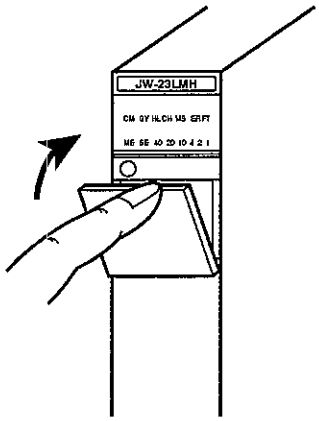


⑦ Set the "termination resistance switch" on the front.

- 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."
- It is set to "ON" at delivery.
- Setting example:
  In the diagram below, slave station 3 and the master station shall be set to "ON," while the other stations shall be set to "OFF."





⑧ Replace the switch cover

⑨ Procedure completed

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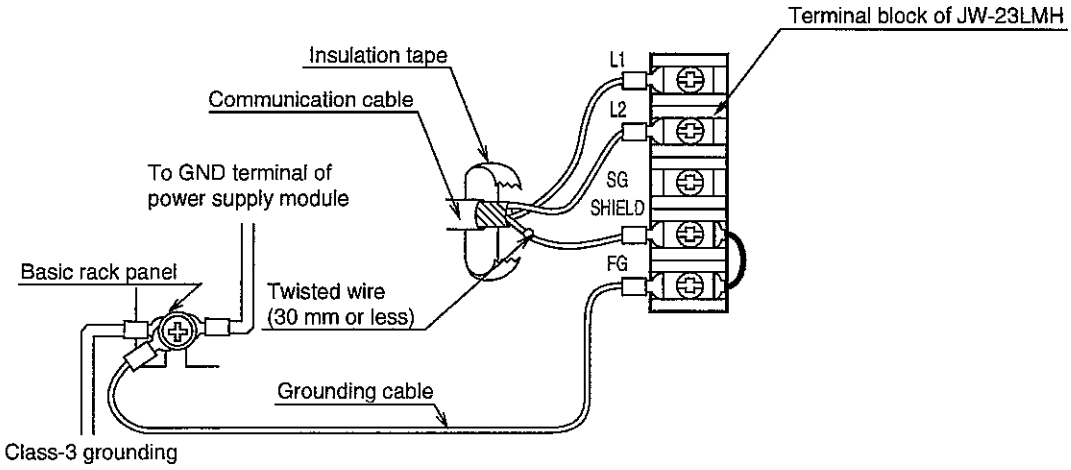
Chapter 6 Wiring Method

[1] Wiring to terminal block



※ SHIELD terminal and FG terminal are shorted using a shorting tab.

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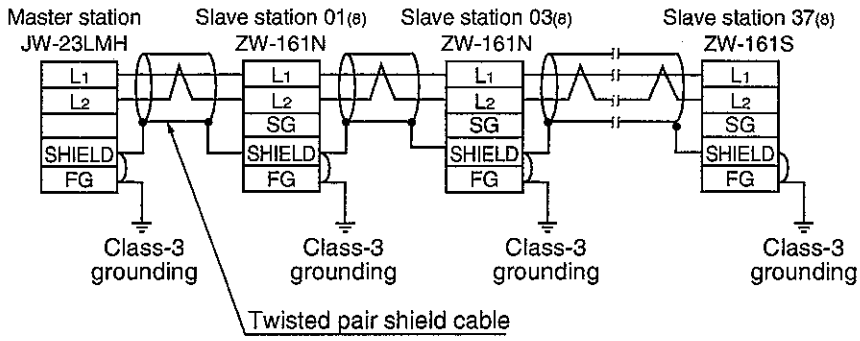
Note

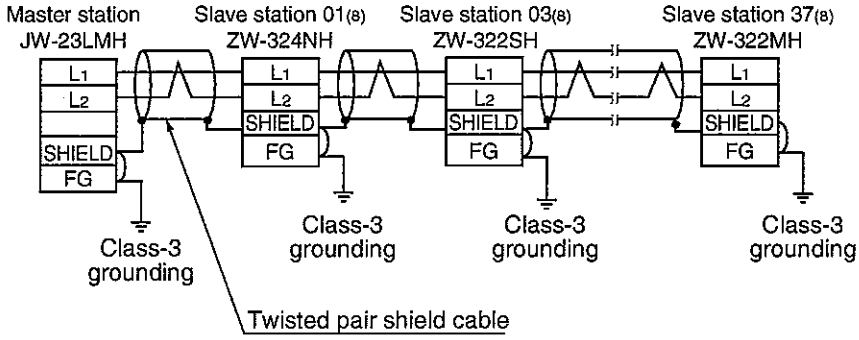
- ★ Use our recommended twisted pair shield cable for wiring to the terminals L_1, L_2, and SHIELD. When wiring the shield line to the terminal block, it is convenient to relay the twisted cable with 0.5 mm² at the outside of the shield cable.
- ★ Cables from the shield cable should be kept as short as possible (below 30 mm).
- ★ Do not connect signal cables to the FG (frame ground) terminal.
- ★ Use 1.25 mm² twisted cables to connect the FG (frame ground) terminal to a class 3 ground via the basic rack panel.
- ★ Use the crimp-style terminals for wiring to terminal block.
- ★ After wiring, check again the wiring and the retention condition.

[2] Wiring with slave module

Wire with the 2-wire system

[Example]





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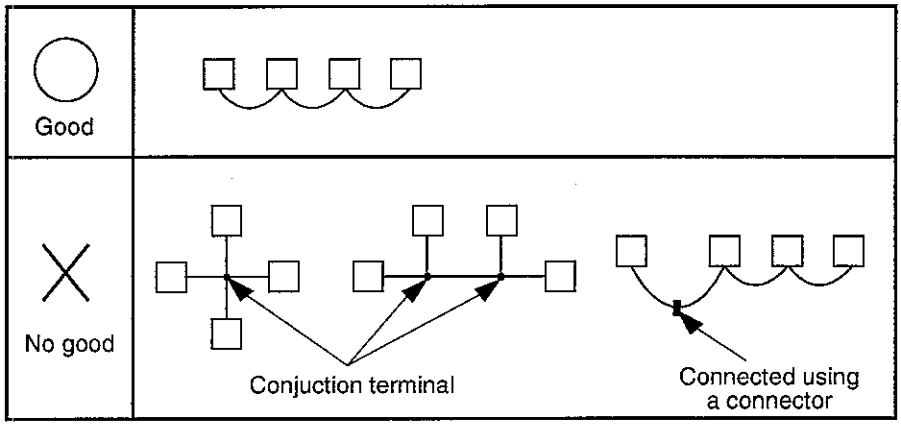
Note

★ Connect the shield line of the cable with SHIELD terminal.

★ Be sure to short circuit between the SHIELD terminal and the FG terminal of the slave module (ZW-82N/82S, ZW-161N/162N/161S/162S/164S/162M) outside the module.

★ Be sure to execute class-3 grounding for the FG terminal of the master module and slave station via the basic rack panel. Avoid co-grounding with other modules. If not grounded, modules easily pick up electric noise, which causes a malfunction.

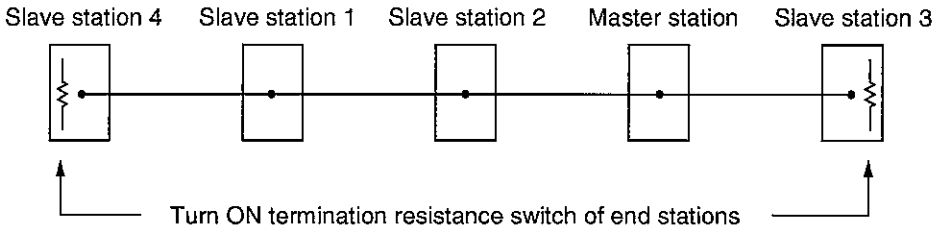
★ Do not execute multiple-wiring from one source point for communication cable.



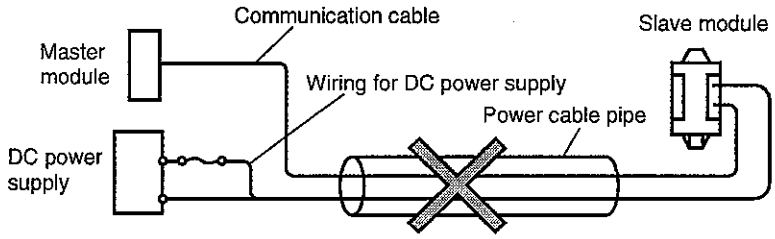
★ Keep the communication cable as far away as possible from the high voltage and power lines, so as not to close in parallel.

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

★ Not necessary to set the master module and the slave module in order, one by one, nor setting the master module as end station. The following example is available.



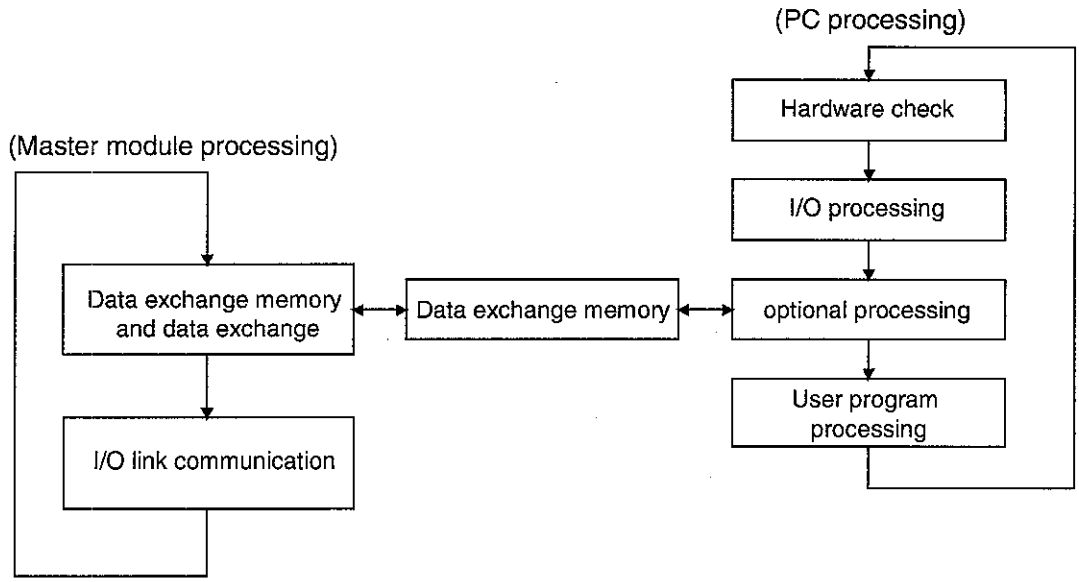
★ Do not wire load driving cables and power supply in the same duct of communication cable. (For the cable supplying power to a slave module exclusively and not for load driving, wiring in the same duct is available.)



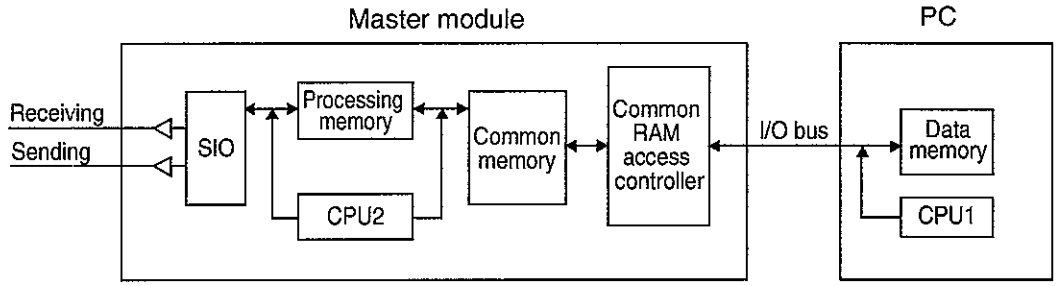
★ In case of JW20H, after completion of installation and wiring, use the support tools (such as the JW-13PG) to perform "I/O registration." Without "I/O registration" the PC will not operate. As for operating procedure of I/O registration, see the instruction manual attached to the support tool.

[1] Timing of data exchange with PC

- Data exchange between the master module and PC is performed with the PC's "optional processing."



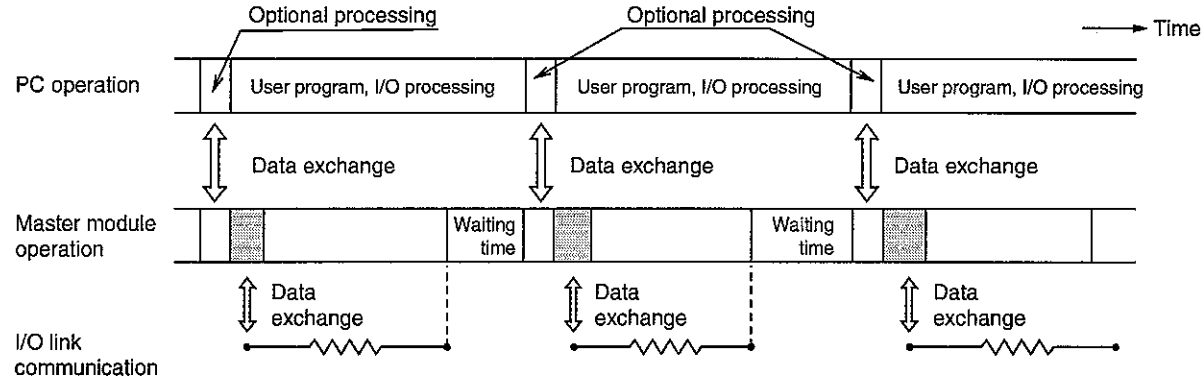
- Internal structure of master module and PC



Name of section	Functions
Common memory	• This is the memory for storing output data for slave module and input data from input module. • Also used to store control commands.
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.
Common RAM access controller	• This controls the common RAM.
Data memory	• This is data memory for the PC.
CPU1	• PC's CPU • Data exchange with master module and user program processing.

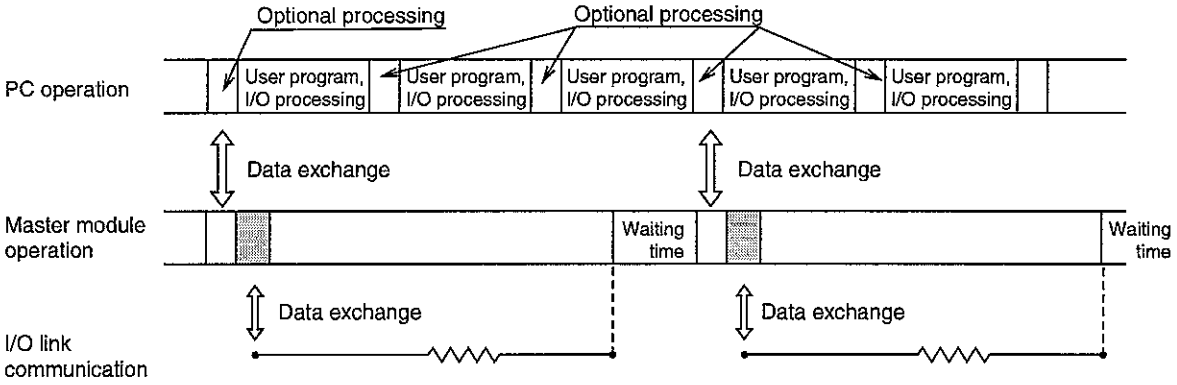
- **When I/O link communication time is shorter than PC scan time**

(Communication cycle: Asynchronous/synchronous)

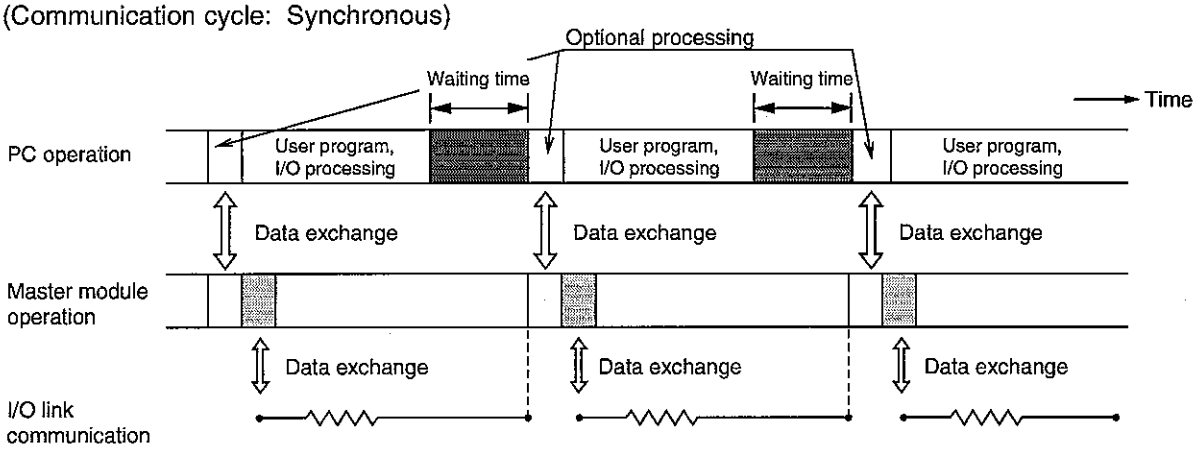


- **When I/O link communication time is longer than PC scan time**

(Communication cycle: Asynchronous)



(Communication cycle: Synchronous)

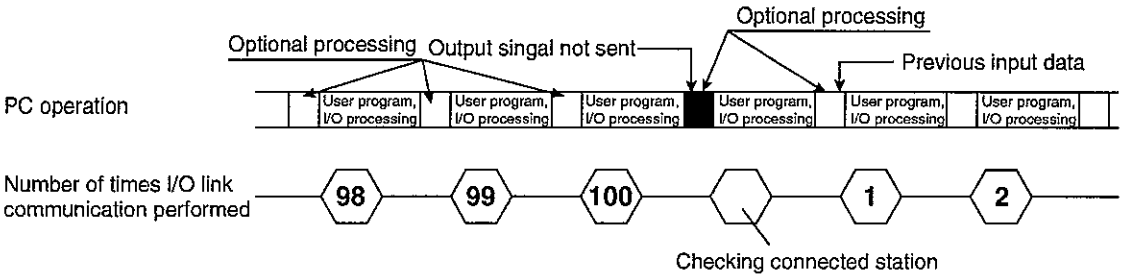


Note

★ When the mode switch is set to "1, 2, 4, 5", I/O link communication will be carried out 100 times, and connected station confirmation will be performed once, but at this time there will be no exchange of data.

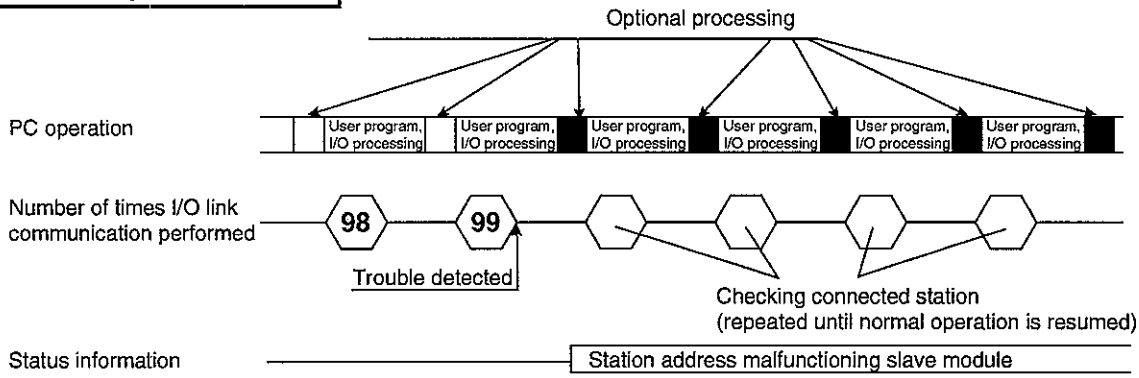
7

- **Operation when checking connected station**



- **Operation at time of I/O link communication trouble**

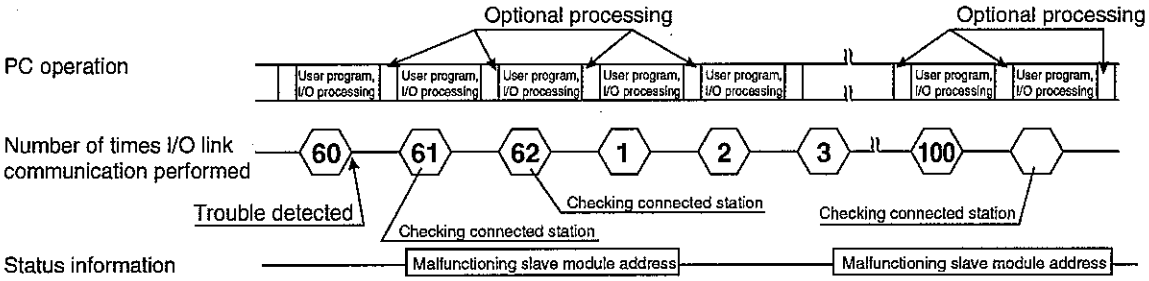
Mode changeover switch: 1



Note

★ Communication check is effected by connected station check, which is repeated until normal operation resumes.

Mode switch: 2, 5



Note

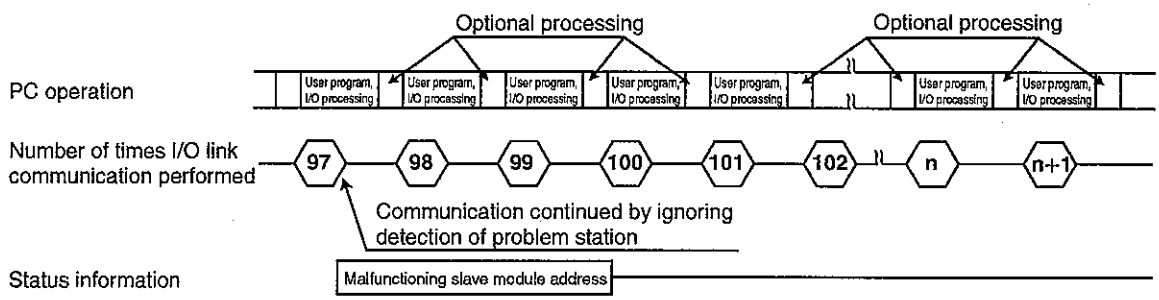
★ When the master module detects incoming data trouble:

① It performs a slave module connected station check once.

② If there is a problem, it performs a connected station recheck, outputs 1 scan of status information, and resumes I/O link communication.

③ It regards the malfunctioning slave station as an unconnected station, and outputs that slave station's address for 1 scan once in 100 connected station rechecks.

Mode switch: 3, 6



Note

★ When the master module detects incoming data trouble:

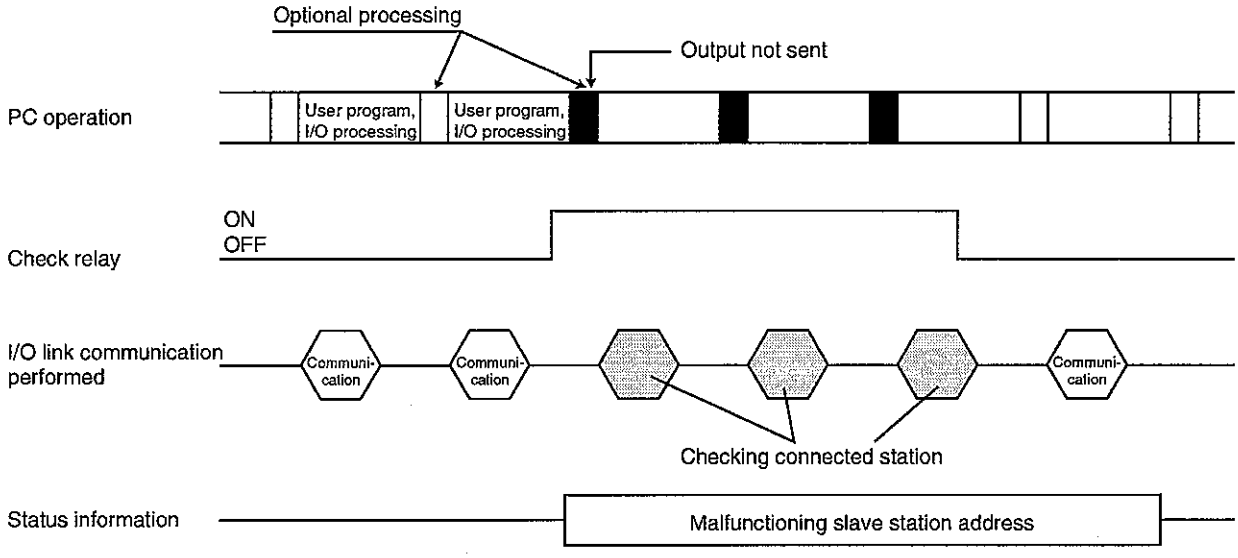
① It outputs 1 scan of status information, and resumes I/O link communication.

② It regards the malfunctioning slave station as an unconnected station, and executes communication.

③ It performs a connected station recheck when the CHECK relay is "ON."

■ When the CHECK relay is "ON"

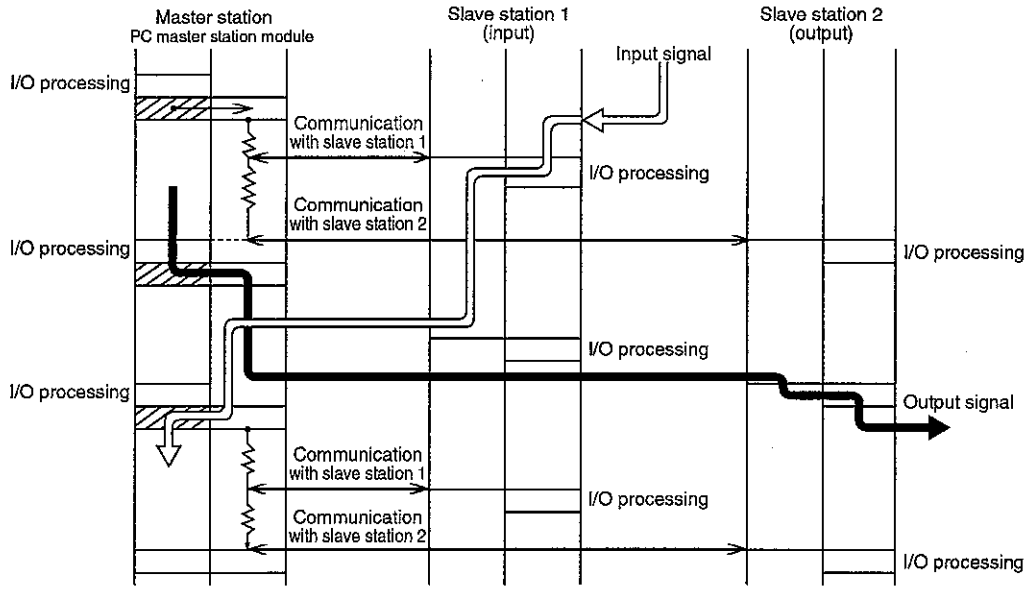
When the CHECK relay is "ON," the JW-23LMH checks connected stations.



7

[2] Data flow between a master module and slave module

(⇨ Input signal data, ➡ Output signal data)



Note

★ I/O processing of a slave module is executed after completing communication with its master station.

★ Time lag exists between optional processing of the PC and I/O processing of the slave module.

7

[3] 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.

$T = T_A + (T_B + T_S) N$ (ms)

Where,

N : Total number of bytes occupied by the slave module input/output. (Unit: 1 byte)

T_A : Preprocessing time of the master module. (1.3 ms)

T_B : Time to process 1 byte in the master module. (0.117 ms).

T_S : Necessary time to communicate 1 byte with a slave module. (Unit: ms)

[Transfer rate 172.8 k bits/s = 0.228 ms
Transfer rate 345.6 k bits/s = 0.114 ms]

Note

★ All calculation should be executed in decimal.

[Example] Required transfer time at communicating with I/O link slave module ZW-322SH (32 points output module) × 10 sets

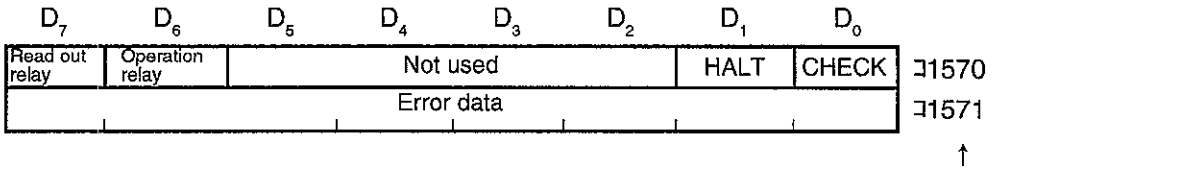
(Transfer rate 345.6 k bits/s)

$T = 1.3 + (0.117 + 0.114) \times 40 = 10.54$ ms

7

[4] Flag area

2 bytes are used for the flag area, with "connected station check," "communication stop," and other items set using the upper byte, and "error read out information" being set using the lower byte.



Relay	Name	Contents
CHECK	Connected station check relay	• Relay which becomes effective when the mode changeover switch is set to "3." • When this relay is "ON," the module repeatedly executes connected station check processing. (When executing connect station check processing, communication with slave modules is interrupted. The output status of slave module is determined by their switch settings.)
HALT	HALT relay	• When this relay is "ON," communication with slave module is halted. (The output status of slave module is determined by their switch settings.)
Operation relay Read out relay	Hand shake flag	• Read out flag for number of malfunctioning slave module (including unconnected stations) and address of malfunctioning slave station.
Error data	No. of errors, malfunctioning slave station check	• Uses operation with handshake flag to show number of errors or address of malfunctioning slave station.

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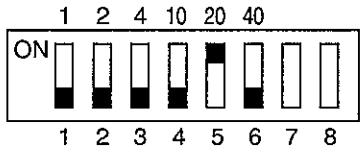
[5] I/O link area

Used as the storage area for master module and slave module data.

Example: When the I/O link byte number setting switch is set to 16 bytes$_{(D)}$ (20 bytes$_{(8)}$)



- Two 16 points slave module, four 8 points slave module, and two 32 points slave module are used.
- There is 1 master module (when the module number switch is set to "0")

JW30H	JW20H	
□2000	□0100	Status
□2001 □2002	□0101 □0102	Slave module 01$_{(8)}$ (16 points) data
□2003 □2004	□0103 □0104	Slave module 03$_{(8)}$ (16 points) data
□2005	□0105	Slave module 05$_{(8)}$ (8 points) data
□2006	□0106	Slave module 06$_{(8)}$ (8 points) data
□2007	□0107	Slave module 07$_{(8)}$ (8 points) data
□2010	□0110	Slave module 10$_{(8)}$ (8 points) data
□2011 □2012 □2013 □2014	□0111 □0112 □0113 □0114	Slave module 11$_{(8)}$ (32 points) data
□2015 □2016 □2017 □2020	□0115 □0116 □0117 □0120	Slave module 15$_{(8)}$ (32 points) data
□2077	□0177	Not used

1 byte

Number of I/O link bytes 20 bytes$_{(8)}$

64 bytes

Reference

Status is an area to indicate I/O link communication state.

Slave station data are communication area with each slave module.

- When slave module is input, slave station data is PC input data.
- When slave module is output, slave station data is PC output data.
- When slave module is input and output, the first half of slave station data is allocated to output, and the second half to input.

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Chapter 8 Program Examples

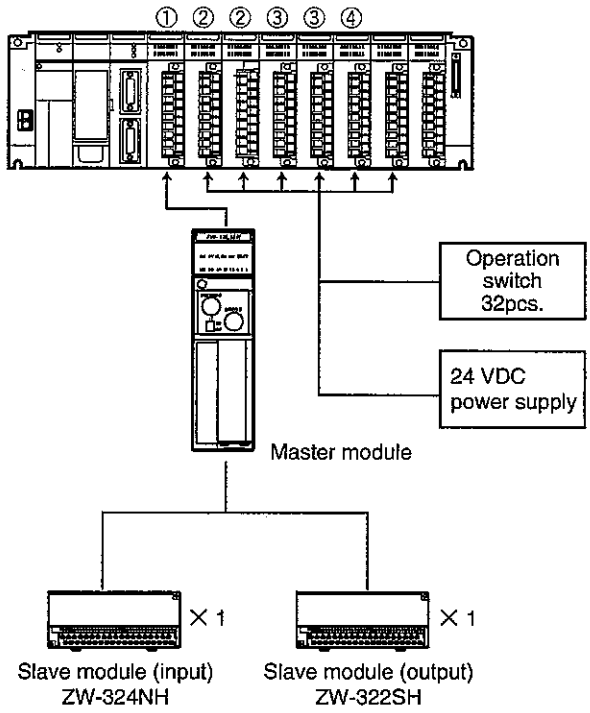
[1] System configuration

① Master module 1 set
(Slave modules:
One 32 points input module
One 32 points output module)

② Two 16 points DC input module (JW-212N) 2 sets
Install operation switches and send a signal to slave module (output).

③ Two 16 points DC output module (JW-212S) 2 sets
Display input signals from slave module (input).

④ One 16 points DC output module (JW-212S) 1 set
Used for monitoring status of I/O link communication.

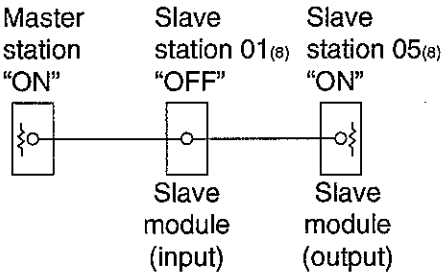


[2] Switch setting of a master/slave module

① Switch setting of a master module

- Setting of the module No. switch: "0"
- Setting of the mode switch: "5: transfer rate 345.6 k bits/s"
- Setting of the number of I/O link byte setting switch:
  Number of I/O link bytes : 8 bytes$_{(8)}$: 10 bytes$_{(8)}$
  Communication cycle : Synchronize

- Setting of the termination resistance switch:



② Setting the switch of slave module

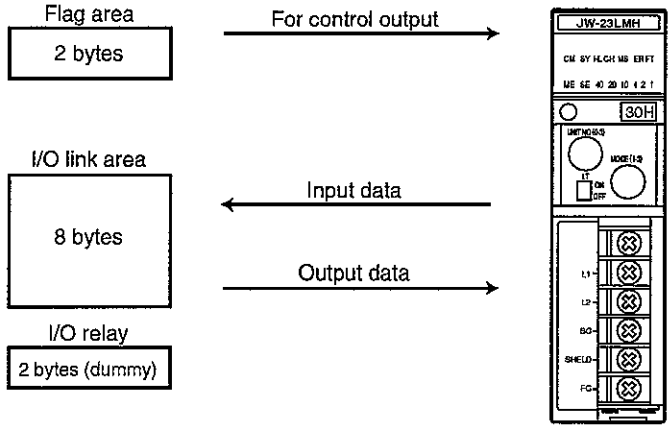
- Setting the address switch

Slave station No.	01$_{(8)}$	05$_{(8)}$
Setting switch	40 20 10 4 2 1 ON	40 20 10 4 2 1 ON

- Setting the termination resistance

Slave station No.	01$_{(8)}$	05$_{(8)}$
Termination resistance of mode switch	OFF	ON

[3] Data memory allocation



∃0000	Master module		Dummy I/O relay (2 bytes)
∃0001			
∃0002	Sending data to slave module (output) (switch input)		DC input module (JW-212N × 2)
∃0003			
∃0004			
∃0005			
∃0006	For receiving data monitor from slave module (input)		DC output module (JW-212S × 2)
∃0007			
∃0010			
∃0011			
∃0012	Monitor status	(Current value)	DC output module (JW-212S × 1)
∃0013	Monitor status	(Memory)	

I/O link area

JW30H	JW20H		
∃2000	∃0100	D_7 , D_6 status information	Status section
∃2001	∃0101	Slave station 01(8)	Slave module (input) (ZW-324NH×1)
∃2002	∃0102		
∃2003	∃0103		
∃2004	∃0104		
∃2005	∃0105	Slave station 05(8)	Slave module (output) (ZW-322SH×1)
∃2006	∃0106		
∃2007	∃0107		
∃2010	∃0110		
∃2011	∃0111	Not used	
∃2077	∃0177		

64 bytes

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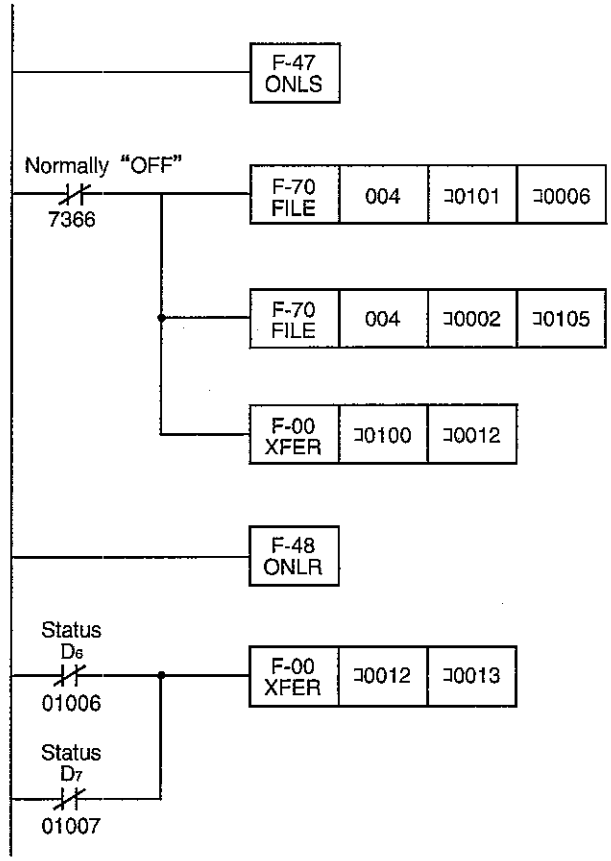
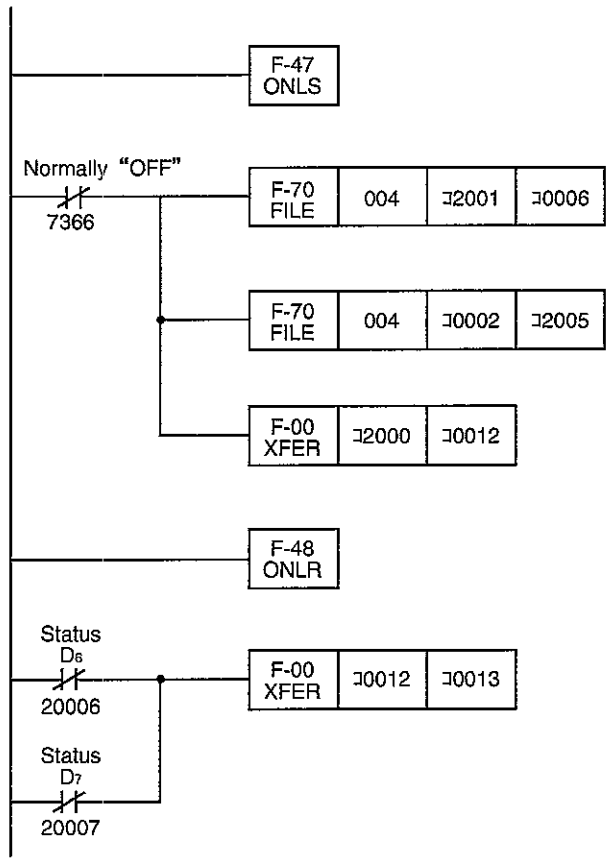
[4] Program

(1) When a PC is a JW20H



- Transfers slave module (input) information for monitoring.
- Transfers switch input to the allocated slave module address of the slave module (output).
- Transfers status information when error occurs for purpose of monitoring.

(2) When a PC is a JW30H

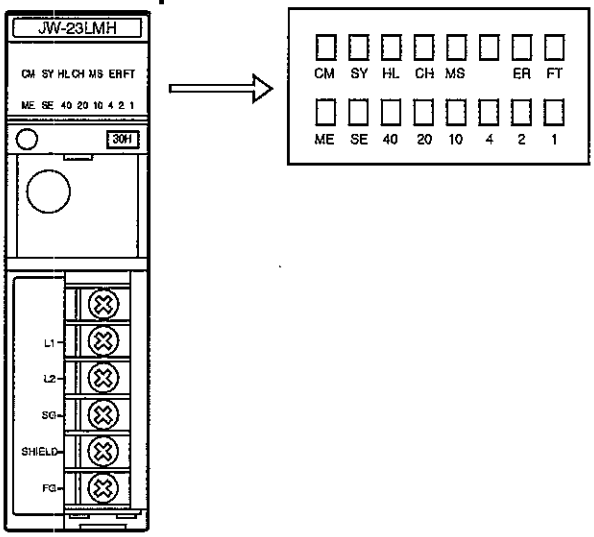


- Transfers slave module (input) information for monitoring.
- Transfers switch input to the allocated slave module address of the slave module (output).
- Transfers status information when error occurs for purpose of monitoring.

Chapter 9 Error and Treatment

You can see the self-diagnosis results using the "indication panel," "flag area," "status area," and "PC system memory (#160)."

[1] Indication panel



LED display	Description	Action
CM	On when communicating	———
SY	On when communication cycle setting is "synchronous"	———
HL	On when internal HALT relay is "ON"	———
CH	On when "mode switch" is set to "3," and when internal relay (CHECK) is "ON"	———
ER	On when there is a master module switch setting problem	Check switches and reset.
	On when there is a communication line problem	Check communication cable. Change master or slave module.
FT	On when there is master module trouble	Change master module.
ME 2	On when there is master module line trouble	Change master module.
ME, SE 40 to 1	On when there is a master module switch setting problem	Reset number of occupied bytes to 1 to $77_{(8)}$.
MS, SE 40 to 1	On when connected station check for slave station 01 is impossible (communication problem) to On when connected station check for slave station 77 is impossible (communication problem)	Check communication cable wiring. Make sure slave module power supply is "ON." Check master station I/O byte number setting switch. Check slave module address setting. Change slave module.
※ SE 40 to 1	On when there is I/O link communication trouble with slave station 01 to On when there is I/O link communication trouble with slave station 77	Check communication cable wiring. Make sure slave module power supply is "ON." Make sure there are no duplicate slave module address settings. Change slave module.
All LEDs OFF	Off when "mode switch" is set to "3," CHECK relay is "ON," and connected station check is normal.	———

※ You can check I/O link communication problems at the master module only by a data check from input slave module.

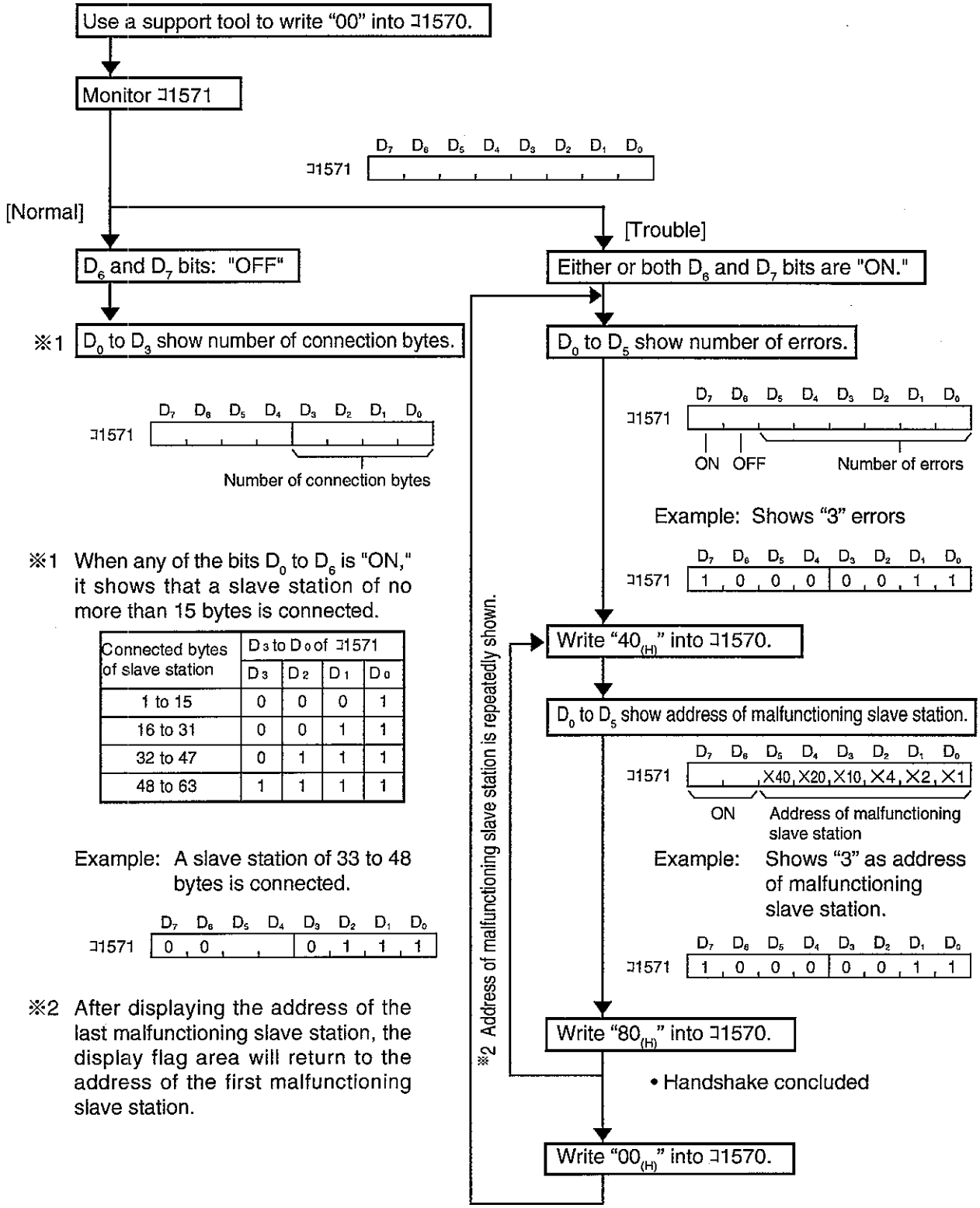
[2] Flag area

- Allows you to find the number of errors or the addresses of malfunctioning slave stations.

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
Read out relay	Operation relay	Not used				HALT	CHECK	ㅋ1570
Error data								ㅋ1571

↑
When module number switch is set to "0."

- Operation example
  When the master module's module number switch is set to "0":
  (Flag area ㅋ1570 to ㅋ1571)



※1 When any of the bits D_0 to D_6 is "ON," it shows that a slave station of no more than 15 bytes is connected.

Connected bytes of slave station	D3 to D0 of ㅋ1571			
	D3	D2	D1	D0
1 to 15	0	0	0	1
16 to 31	0	0	1	1
32 to 47	0	1	1	1
48 to 63	1	1	1	1

Example: A slave station of 33 to 48 bytes is connected.

	D7	D6	D5	D4	D3	D2	D1	D0
ㅋ1571	0	0			0	1	1	1

※2 After displaying the address of the last malfunctioning slave station, the display flag area will return to the address of the first malfunctioning slave station.

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[3] Status area

- The lower 6 bits input malfunction information, and the upper 2 bits input the malfunction flag, into the PC.

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

① 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. • Address of malfunctioning slave station is output 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.

② Malfunction information (when D_6 is "ON")

- Error informations of D_0 to D_5 varies depending on D_6 and D_7. Error information of D_7 "ON" has priority.
- Address of malfunctioning slave module is output to "D_0 to D_5".
- Each bit of D_0 to D_5 expresses weight of octal figure. [$00_{(8)}$ to $77_{(8)}$]

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

- The error slave module number is the address set by the slave module address setting switch.
- When more than one error slave module exists, the master module outputs the smallest address number.
- LED status is as shown below when D_6 is "ON."

●: Lights

Contents	Error slave module No. D_0 to D_5	Indicator lamp					Priority
		CM	ER	FT	MS	1 to 40	
Communication error (Unable to check connected station)	$01_{(8)}$ to $77_{(8)}$ ※2	●	●		●	Shows address of malfunctioning slave station	5
Communication error (At I/O link) ※1	$01_{(8)}$ to $77_{(8)}$	●	●				6
Normal communication	$00_{(8)}$	●					7

※1: It is only data problems from input slave module that can be detected with a master module.

※2: When more than one error slave module exist, the master module indicates the smallest slave station address while flickering.

Check the following when you experience communication problems.
① Is the communication cable broken?
② Is the slave module address correct, and is the power "ON"?
③ Is the master module's number of I/O bytes set correctly?
④ Should the slave module be replaced?

9

③ Error information (When D_7 is "ON")
- Error codes (hexadecimal) are output to D_0 to D_5.

●: Lights, ◑ : Blinks

Error code (hexa-decimal)	Error contents	Indicator lamp			Status	Remedy	Priority
		CM	ER	FT			
0	Line check error		●		No output	※	3
1	ROM error			●	D_0: [ON]	Exchange master module	1
2	RAM error (1) (CPU inside RAM)			●	D_1: [ON]		
3	RAM error (2) (For data processing)			●	D_0, D_1: [ON]		
4	Memory error for data exchange with PC			●	D_2: [ON]		
5	Communication control timer			●	D_0, D_2: [ON]		
8	Switch mis-setting		●		D_0, D_7: [ON]	Reset switch	2
–	PC stops operation (program mode)	◑			No output	—	4

※ Check for shorted signal cable, or change the slave or master module.

- When error flags D_6 and D_7 are both "ON" at the same time, the error information of D_7 has priority.

9

④ Relationship between operation mode and malfunction information (D_6, D_7)

• The operation mode settings will determine the "status area," "master module," and "slave module" operation displays at times of malfunctions, as shown below.

●: Lights, ◑ : Blinks

Setting 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 communi-cation	CM	ER	FT	ME	SE	1 to 40	RUN	ERROR	OFF	ON
1 or 4	Master module switch setting error		●	Error contents	Stop		●		●	●	All light	●	●	—	Reset
	Slave module error or power "OFF"	●		Error slave station address No.	Check connected station	●	●			◑	Error code indica-tion (blinks)			Reset	
	Communication error (Input module)	●				●	●			◑		●	●	Hold	
	Communication error (Output module)	●				●	●			◑		●	●		
2 or 5	Master module switch setting error		●	Error contents	Stop		●		●	●	All light	- Ditto -			
	Slave module error or power "OFF"	●		Error slave station address No.	Continue I/O link communi-cation	●					—				
	Communication error (Input module)	●				●					—				
	Communication error (Output module)	●				●					—				
3 or 6	Master module switch setting error		●	Error contents	Stop		●		●	●	All light	- Ditto -			
	Slave module error or power "OFF"	●		Error slave station address No.	Continue I/O link communi-cation	●					—				
	Communication error (Input module)	●				●					—				
	Communication error (Output module)					●					—				

When the mode is set to 2 or 5, the ER display lamp lights for two seconds and the SE display lamp and LEDs 1 to 40 will flash for 2 seconds if a processing error has occurred, the power is OFF, or a communication error has occurred.

9

Note

★ When the mode setting is "3 or 6," indicator lamps are as shown below during connected station checks by the CHECK relay.

Error contents	Master module										Slave module			
	Status			I/O link communi-cation	Indicator lamp						Indicator lamp		Output condition of output hold switch	
	D_6	D_7	D_0 to D_5		COM	ER	FT	ME	SE	1 to 40	RUN	ERROR	OFF	ON
Master module switch setting error		●	Error contents	Stop		●		●	●	Error code indi-cation (blink)	●	●	Hold	Reset
Slave module error or power "OFF"	●		Error slave station address No.	Continue check connected station	●	●			◑					
Communication error (Input module)	●				●	●			◑		●	●	Reset	
Communication error (Output module)	●				●	●			◑		●	●		

9

[4] PC system memory

- When the master module malfunctions, PC system memory #160 will store the error codes.

Error code	Contents
$40_{(H)}$	Installed module error
$44_{(H)}$	I/O data bus error
※ $53_{(H)}$	Hard error (option error)
$60_{(H)}$	Table verification error
$61_{(H)}$	Module number switch verification error
$70_{(H)}$	Table registration error
$73_{(H)}$	Module number switch setting error

※ If you are using a JW30H, when error code $53_{(H)}$ is stored in system memory address #160, the I/O link master module in which the error occurred can be identified according to its switch number on the basic rack panel by reading system memory #051. (See the JW30H's programming manual)
In case of JW20H, switch number of error I/O link master module can't check.

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

●: Lights, ◑ : Blinks

PC operating condition	PC			Master module						Slave module			
	Indicator lamp		System memory #160	Indicator lamp						Indicator lamp		Output module output hold switch	
	RUN	FAULT		CM	ER	FT	ME	SE	1 to 40	RUN	ERROR	OFF	ON
Normal operating	●			●						●		–	–
Stopping	◑			◑						●	●	Hold	Reset
I/O link master module error		●	Error code			●	●		●	●	●		
Power "OFF"										●	●		
At HALT relay "ON" (at PC operation)	●			●						●			

- When the HALT relay of the master module is "ON," the HOLD lamp of slave module light.

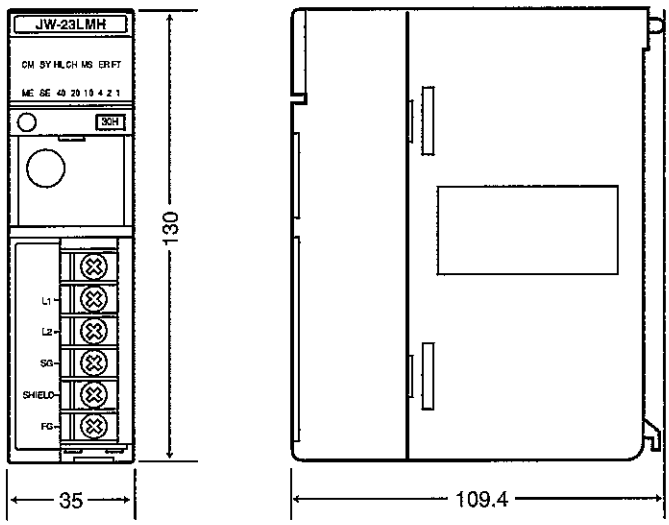
9

Chapter 10 Specifications

Item	Specifications
No. of I/O link station	Max. 32 stations
No. of I/O link point	Max. 504 points (63 bytes)
Number of I/O occupied points	I/O relay : 16 points (2 bytes) Flag area : 16 points (2 bytes) I/O link area : In case of JW20H, Max. 512 points (64 bytes), In case of JW30H, 512 points (64 bytes)
Synchronous with PC processing	Synchronous/asynchronous
Data transfer standard	EIA RS485 or equivalent
Transfer rate	345.6 k bits/sec., 172.8 k bits/sec. (Changeover by the mode switch)
Transfer 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
Communication line	Party line Shielded twisted pair cable Cable total length: 1 km max.
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 (5 VDC)	120 mA
Operator indication	CM, SY, HL, CH, MS, ER, FT, ME, SE 40, 20, 10, 4, 2, 1 (abnormal slave station number)
Outer wire connection	6P terminal block (M 4.0 x 7 screws)
Weight	Approx. 220 g
Accessories	One instruction manual

[Outside dimensions]

(Unit: mm)

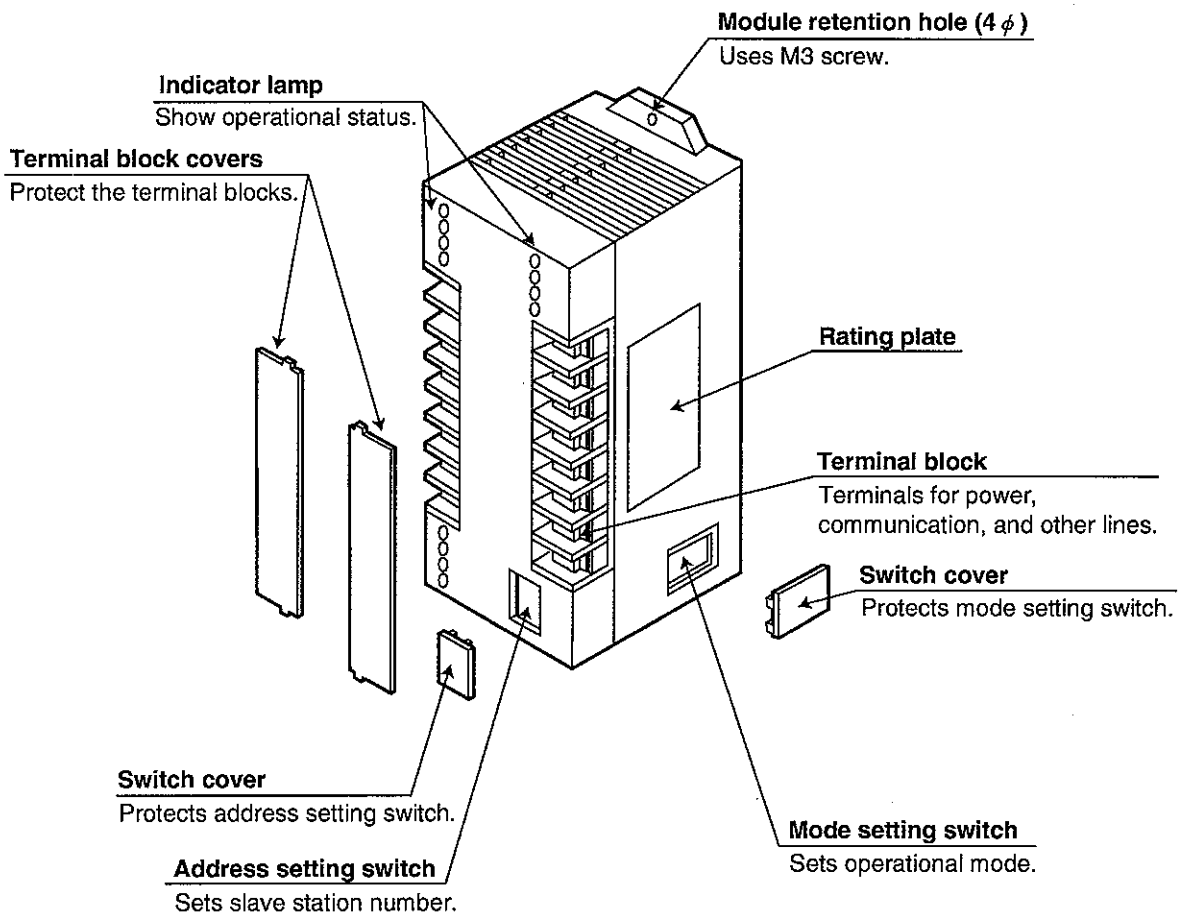


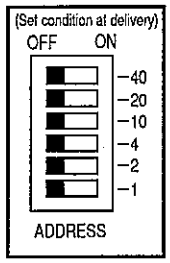
10

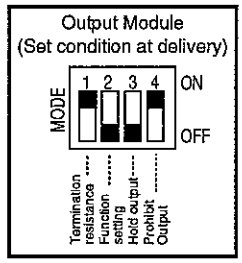
Appendix 1. Slave Module

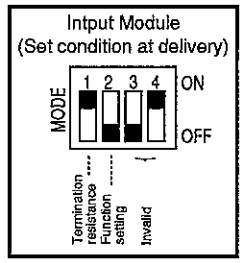
Appendix 1-1 ZW-82N/ZW-82S

[1] Name and function of each part









A1

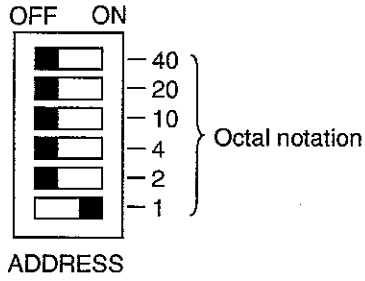
[2] Setting switch

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

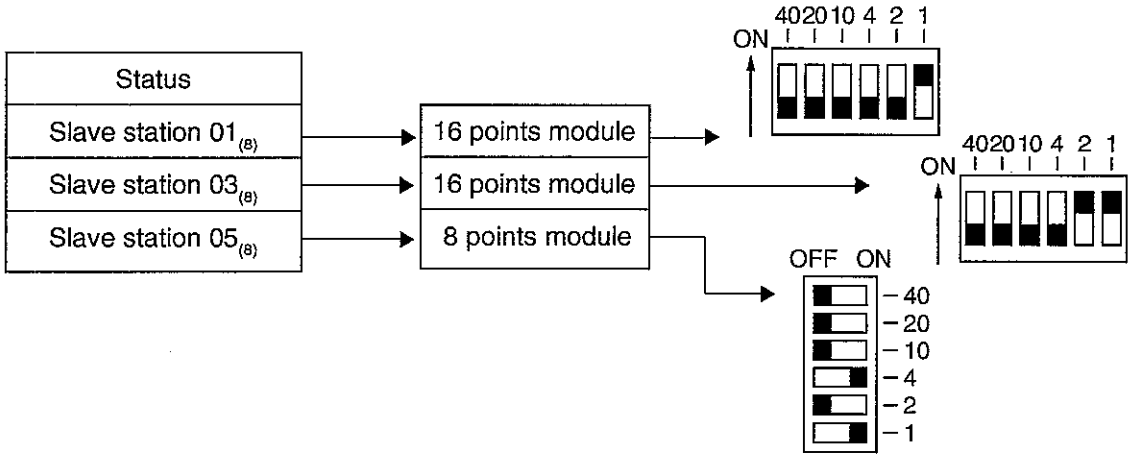
(1) Address setting switch (ST No.)

Set slave station number (ST No.).

- Set from "01" in octal notation.
- Set which byte of the "I/O link area" in the master module is used.



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



Note

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

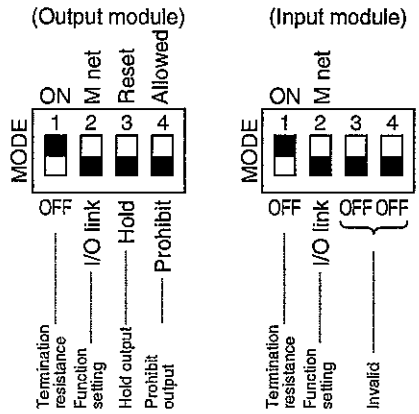
Duplicate setting	Operation
If two input modules have the same address	Unspecified input data
If an input module and an output module have the same address	Unspecified data and output module condition
If two output modules have the same address	Output of same data

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

A1

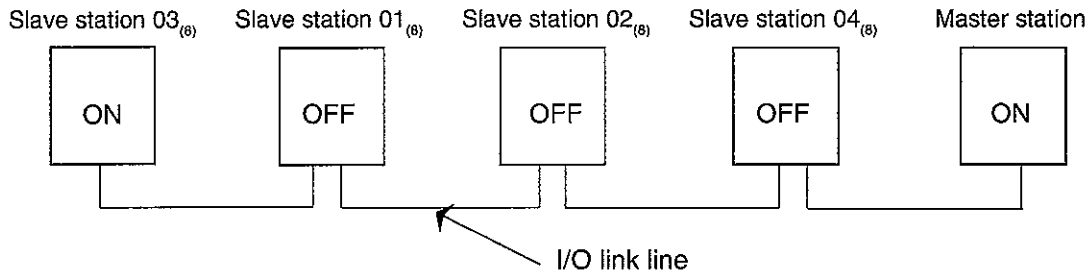
(2) Mode setting switch

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.

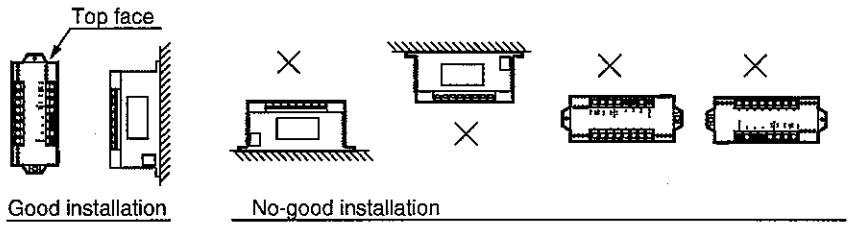
A1

[3] Installation method

(1) Installation

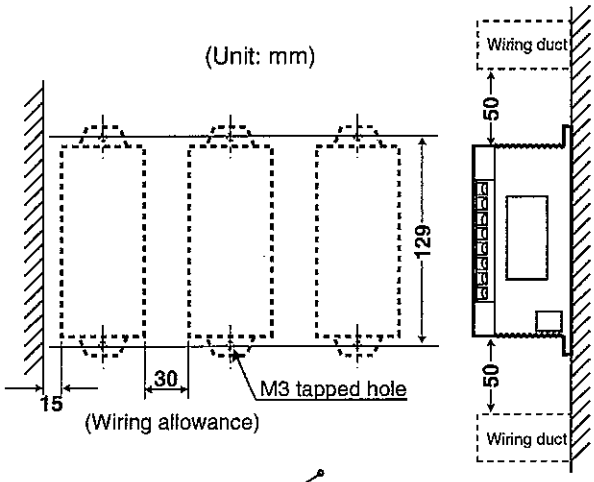
Avoid keeping slave module in the following condition.

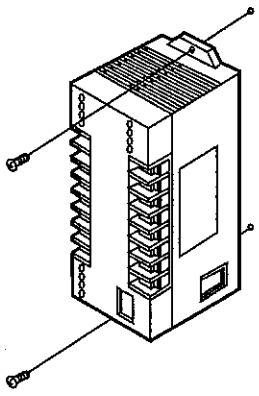
- Direct sunlight.
- Ambient temperatures below 0°C and over 55°C.
- No condensation due to rapid temperature variation.
- Relative humidity which exceeds 35 to 90%.
- Corrosive and flammable gases.
- Dusts, iron, and salty conditions.
- Vibration and shock producing and transferring positions.
- Slave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



- 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





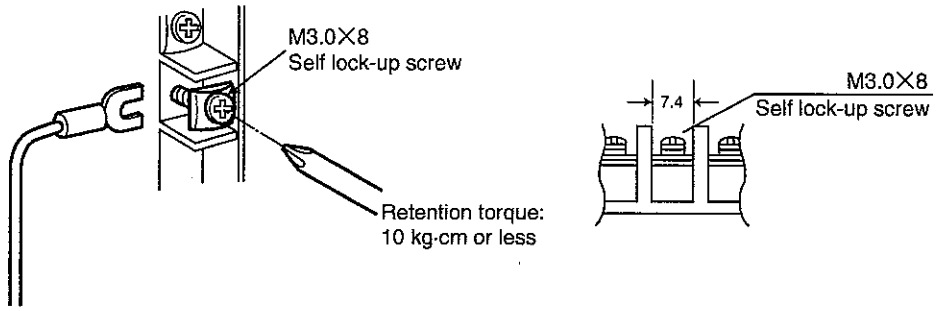
- Secure 50 mm or more space above and below the module for heat radiation. Keep away for 30 mm or more between modules for wiring.
- Use 2 M3 x 10 screws for retention.

A1

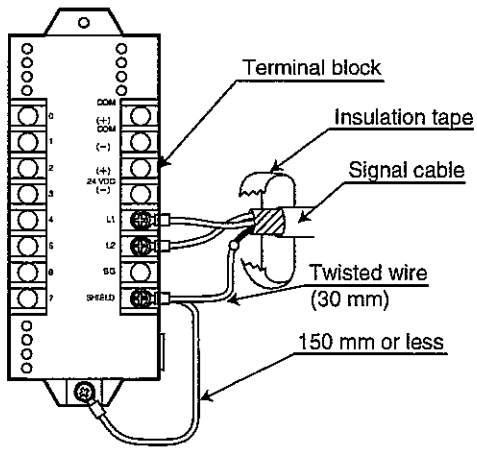
[4] Wiring method

(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

★ 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.

★ 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.

★ Cables from the shield should be kept as short as possible (below 30 mm).

★ 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.

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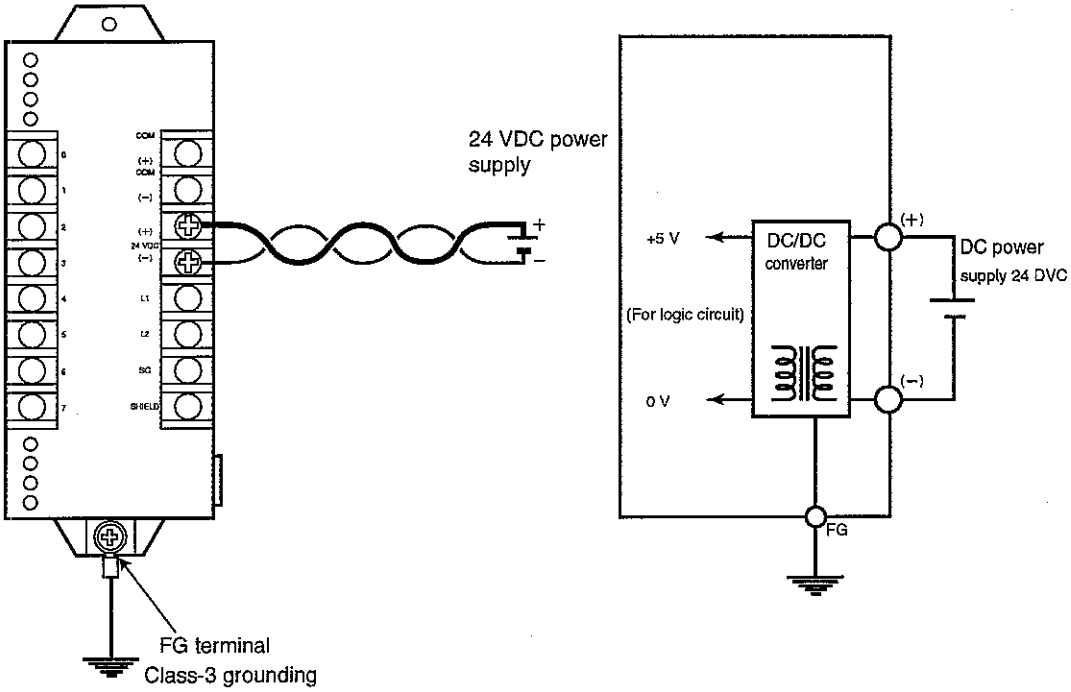
(3) Power supply wiring

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.

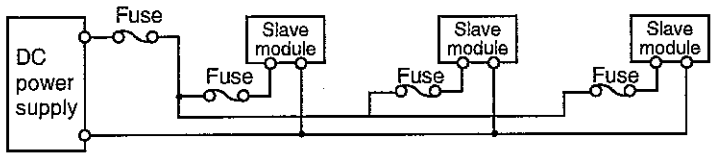


Note

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

★ 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.

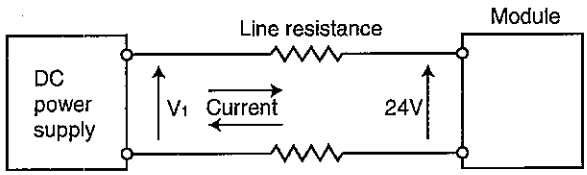
★ When DC power is supplied to a slave module positioned away from it, provide fuse elements for the DC power supply and each module respectively. Be careful for voltage drop due to long distance wiring.



<Reference> Power voltage and line resistance

DC power voltage (V_1) =

24V + slave module current × line resistance × 2 × wire length (km)



Line resistance	
Nominal sectional area	0.3 mm² ..... 61.9 ohm/km
	0.5 mm² ..... 37.1 ohm/km
	0.75 mm² ..... 24.8 ohm/km

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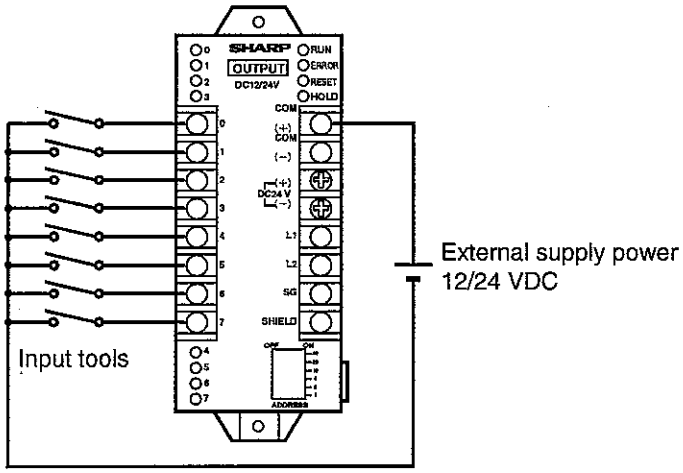
(4) Wiring input signal cable

■ **DC input**
(ZW-82N)

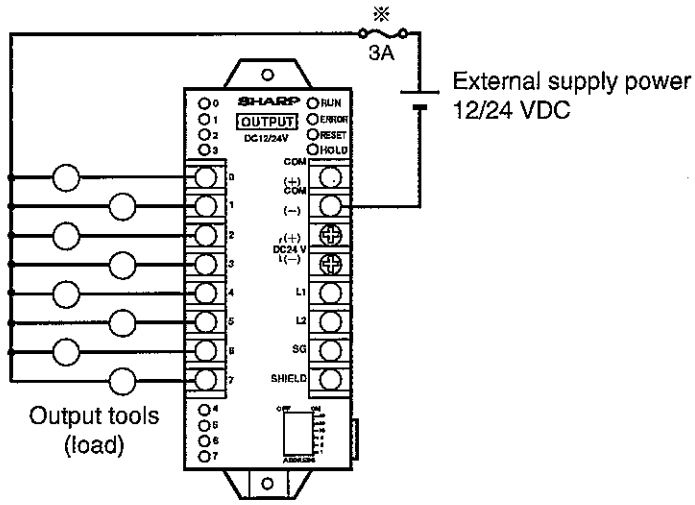
DC power supply : 12/24 VDC



(5) Wiring output signal cable

■ **Transistor output**
(ZW-82S)

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



※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.

A1

[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		Indicator lamp				Reset method	Priority order
		In operation RUN	Error ERROR	Input	Output		
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

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

★ 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.

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[6] Specifications

(1) General specifications

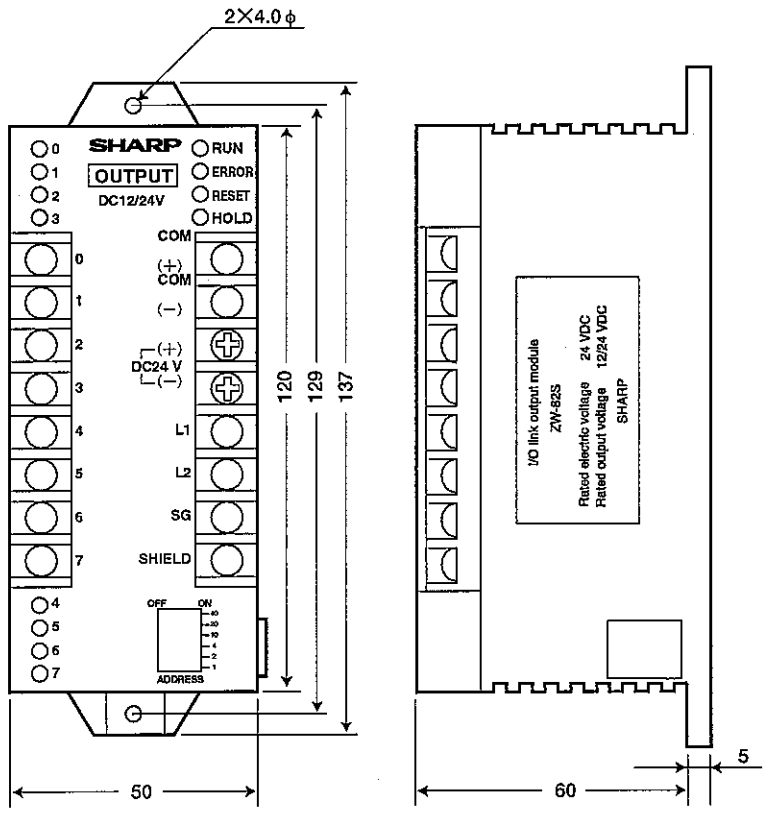
Item	Specifications
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (No condensation)
Vibration resistance	Conforming to JIS-C-0911 (2 hours each in X, Y, Z directions)
Shock resistance	Conforming to JIS-C-0912
Allowable power voltage	24 VDC ± 15% (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)



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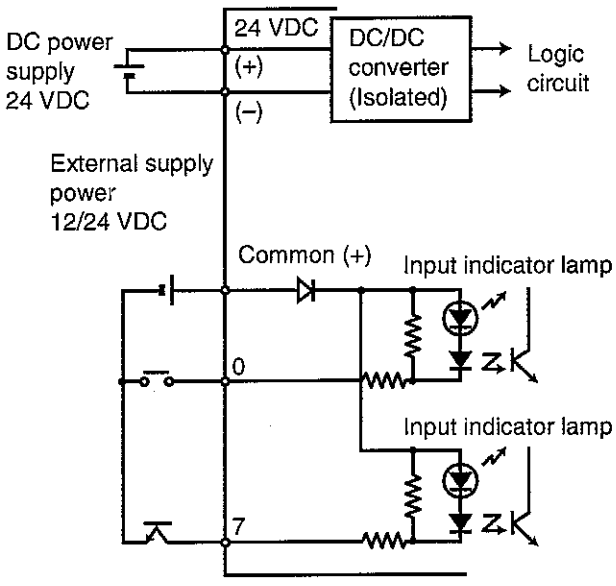
(4) Specification of each module

① ZW-82N (12/24 VDC input module)

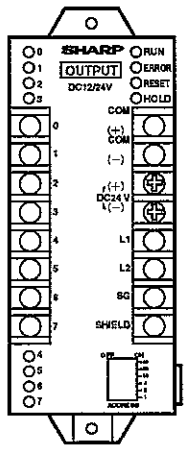
Item	Specifications
No. of input points	8 points
No. of slave station occupied bytes	1 byte
Rated input voltage	12/24 VDC ※
Max. input voltage	26.4 VDC
Rated input current	10.5 mA (at TYP. 24 VDC), 5.5 mA (at TYP. 12 VDC)
Input voltage level	ON level : 10 V or less (at ripple lower limit voltage) OFF 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 mm^2 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	500 VDC, 10 M ohm or up (between input terminal, power input terminal and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points

Outside connection drawings



※ 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.

Surface view



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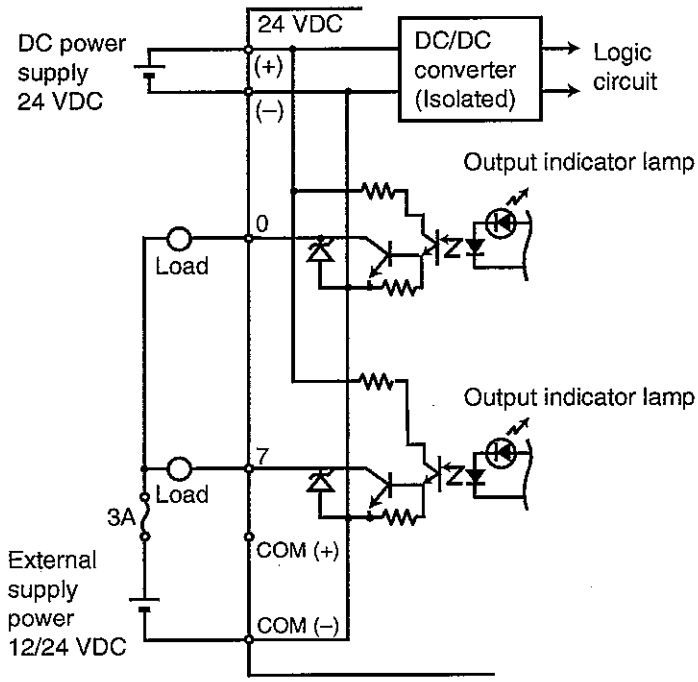
② ZW-82S (12/24 VDC output module)

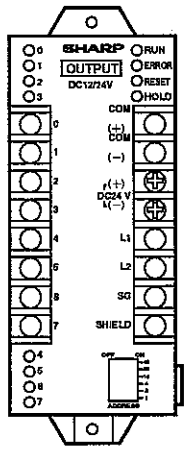
Item	Specifications
No. of output points	8 points
No. of slave station occupied bytes	1 byte
Rated output voltage	12/24 VDC
Allowable output voltage	10 to 30 VDC
Rated max. output current	0.3 A
Surge ON current	Output element capacity: 1 A (PULSE PW = 20 ms, DUTY = 1/2)
Leakage current	0.1 mA or less
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	250 VAC, 1 minute (between output terminal, power input terminal, and secondary circuit)
Insulation resistance	500 VDC, 10 M-ohm or up (between output terminal, power input terminal, and secondary circuit)
Insulation system	By photo-coupler
Common terminal	1 common per 8 points

Outside connection drawings



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

Surface view



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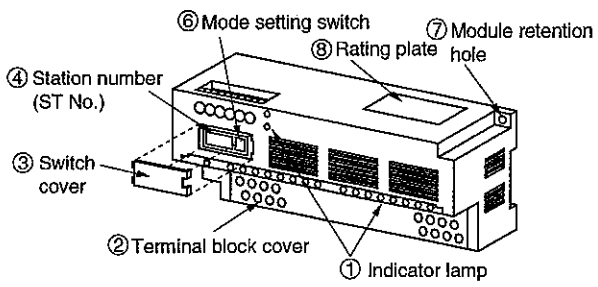
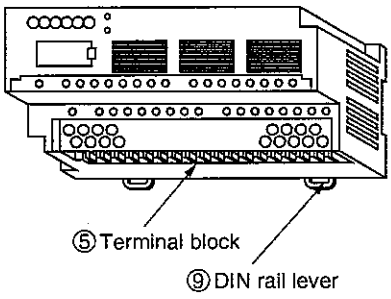
Appendix 1-2 ZW-161N/162N/161S/162S/164S/162M

[1] Name and function of each part





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.

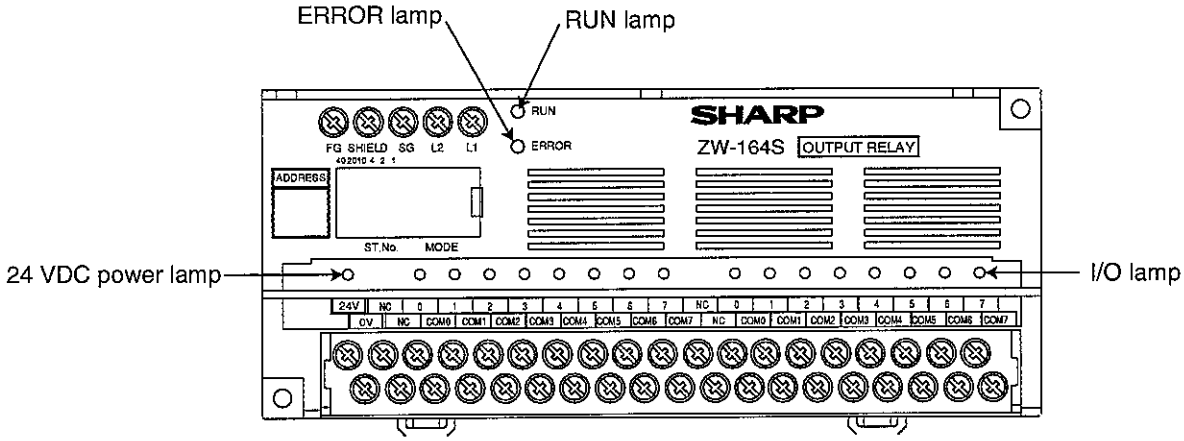
⑥ Mode switch
Switch to set operation mode of slave module.

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]



(Indicator lamps are common to all models.)

A1

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

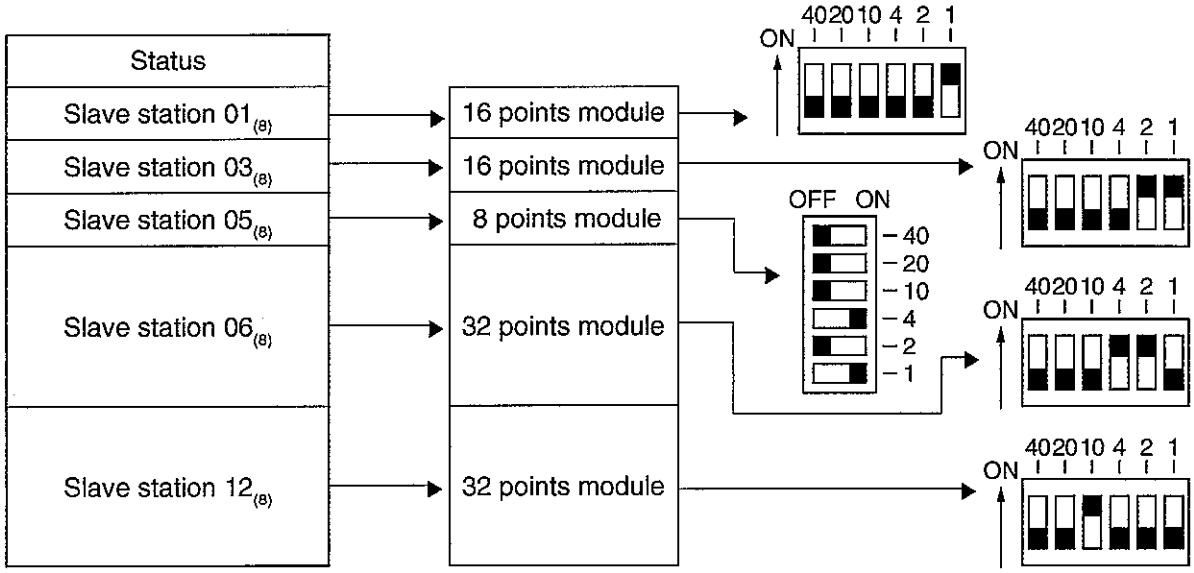
Before setting the switch, turn OFF the power supply to the PC. Switch setting without turning OFF the power supply may cause malfunction.

(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.

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



Note

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

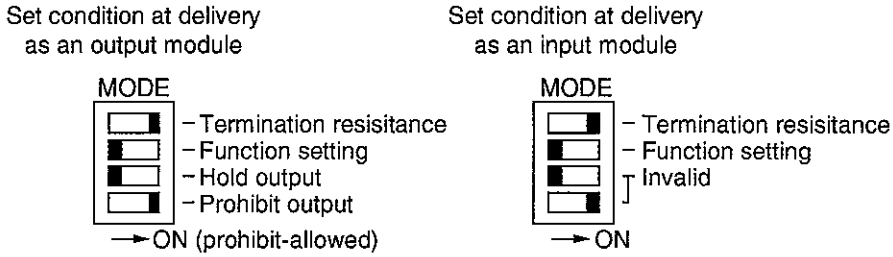
Duplicate setting	Operation
If two input modules have the same address	Unspecified input data
If an input module and an output module have the same address	Unspecified data and output module condition
If two output modules have the same address	Output of same data

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

A1

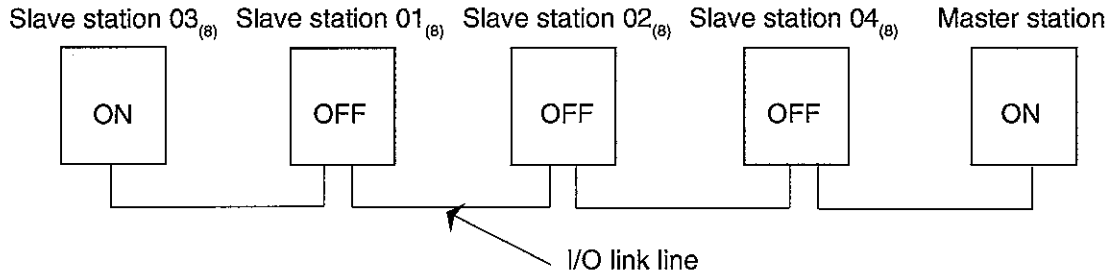
(2) Mode setting switch

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 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."

A1

④ Output prohibit setting switch (on output module only)

- This is the communication test switch of output module.

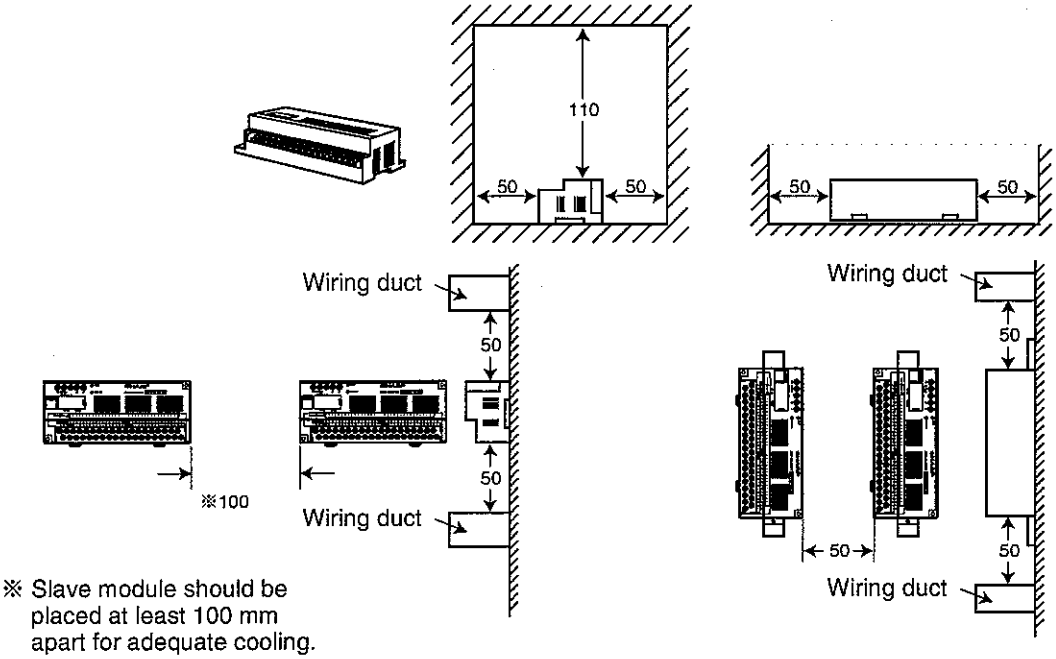
Set value	Function	Description
ON	Permit	Lamp of output module and output element are "ON/OFF" depending on the output signal of PC.
OFF	Hold	Output elements are all "OFF" regardless of PC output signal.

[3] Installation method

(1) Installation

Avoid keeping slave module in the following condition.

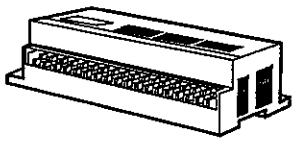
- Direct sunlight.
- Ambient temperatures below 0°C and over 55°C.
- No condensation due to rapid temperature variation.
- Relative humidity which exceeds 35 to 90%.
- Corrosive and flammable gases.
- Dusts, iron, and salty conditions.
- Vibration and shock producing and transferring positions.
- Peripheral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



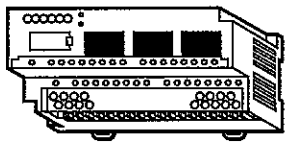
※ Slave module should be placed at least 100 mm apart for adequate cooling.

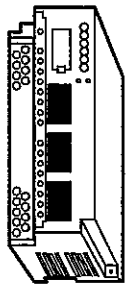
- Install in one of the following 4 directions, which afford good cooling.

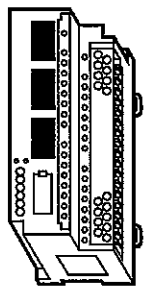
Horizontal mounting



Vertical mounting







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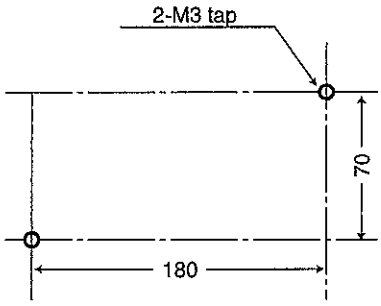
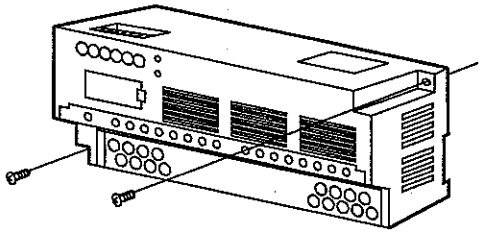
- Being not designed for dust and water proof construction, install in an enclosed panel.
- Avoid installation just above high calorie heat generating devices (heaters, transformers, high capacity resistance etc.) Also avoid to install other equipment close to slave module.
- Avoid installation in a 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**





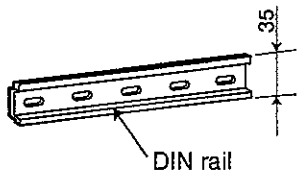
① Drill M3 tap holes in the control panel for installation as shown at left.

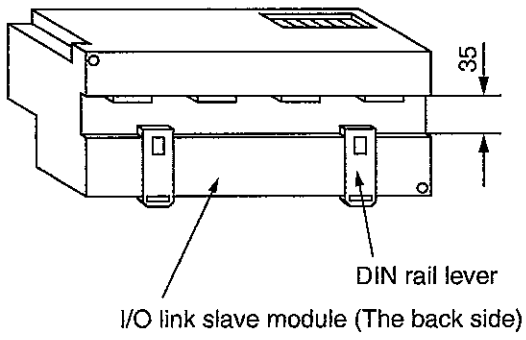
② Tighten fixing screws (M3-10, 2 pieces) with a phillips screwdriver, and fix I/O link slave module.

(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)





- Using DIN rail lever, fix securely to DIN rail.

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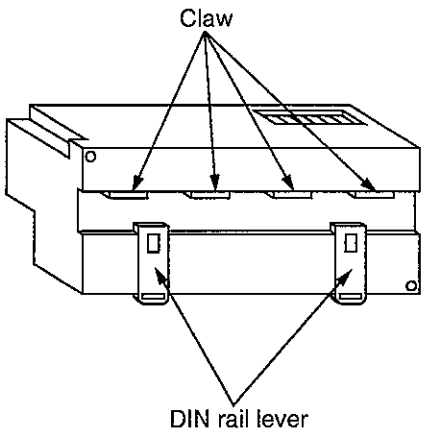
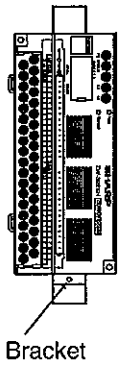
■ Installation procedure



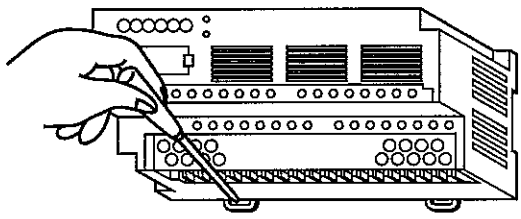
① Match the claw of the back side of the I/O link slave module with DIN rail.

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.



■ 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.

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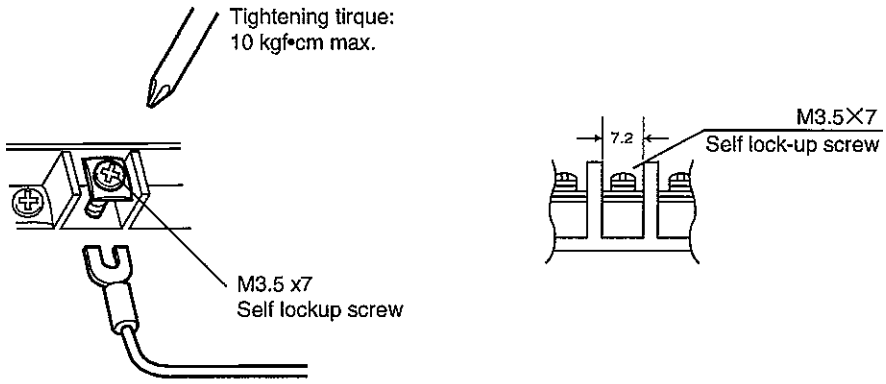
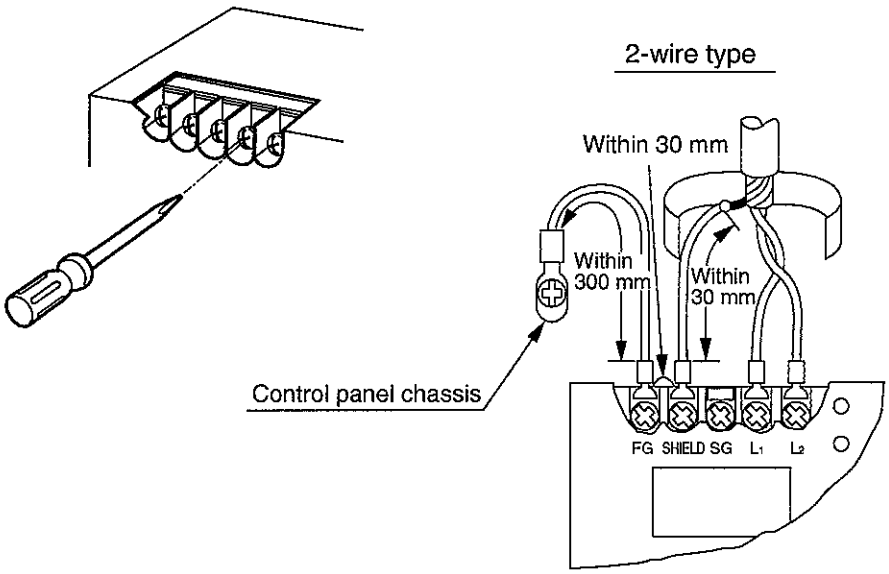
[4] Wiring method

(1) Wiring cautions

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



(2) Connecting communication cables



Note

★ 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.

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

★ 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.

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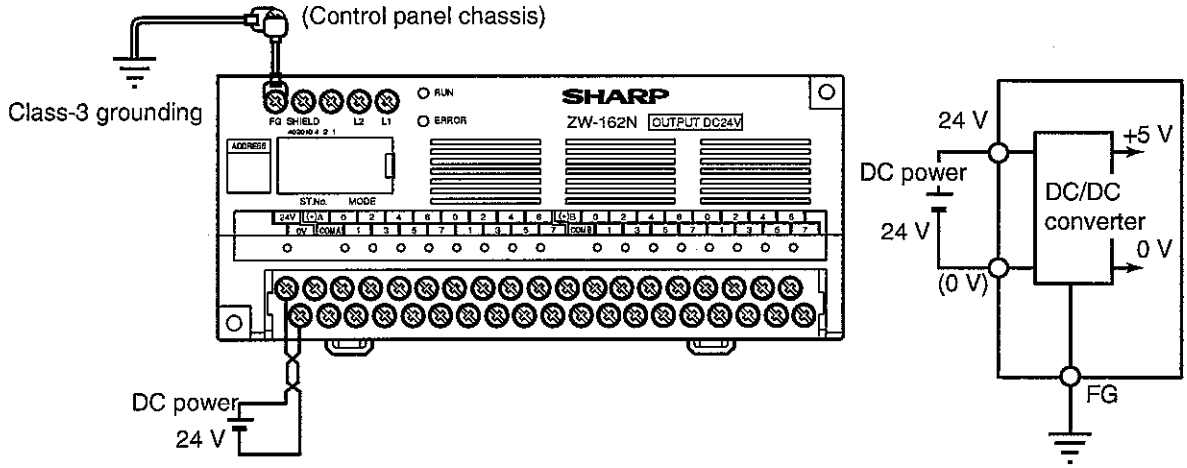
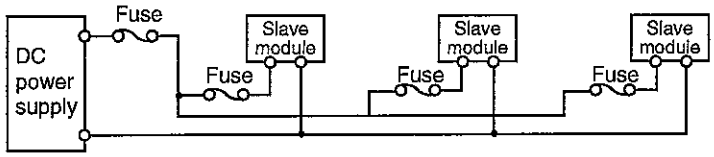
(3) Power supply wiring

- 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

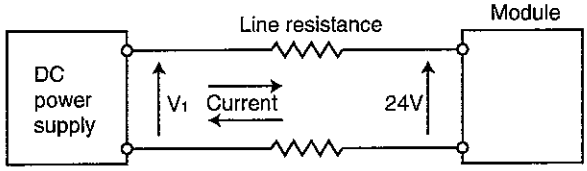
- ★ In case of sharing this power with load driving power for DC input/output signal, note wiring and noise prevention method.
- ★ Be sure that the I/O link slave module's FG terminal is grounded through the control panel. It is also used as ground for the DC/DC converter.
- ★ When DC power is supplied 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

DC power voltage (V_1) =

24V + slave module current × line resistance × 2 × wire length (km)



Line resistance

Nominal sectional area 0.3 mm² ..... 61.9 ohm/km

0.5 mm² ..... 37.1 ohm/km

0.75 mm² ..... 24.8 ohm/km

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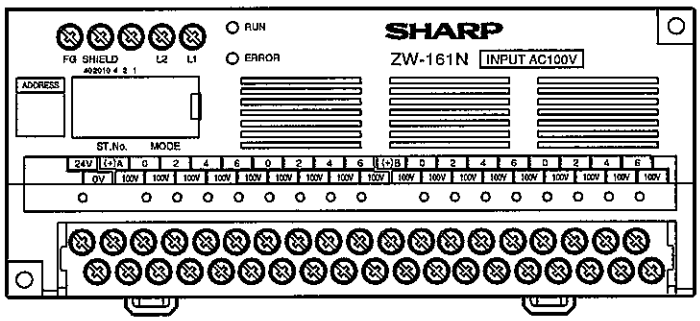
[5] Error and treatment

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		Indicator lamp: In operation RUN	Indicator lamp: Error ERROR	Indicator lamp: Input	Indicator lamp: Output	Reset method	Priority order
Normal operation	No control input	●		"ON", "OFF" by input signal	Changes due to signal from PC	—	4
	Reset input	●			All points "OFF"		
	Hold input	●			Output hold		
	Reset and hold input	●			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



(Indicator lamps are common to all models.)

[6] Specifications

(1) General specifications

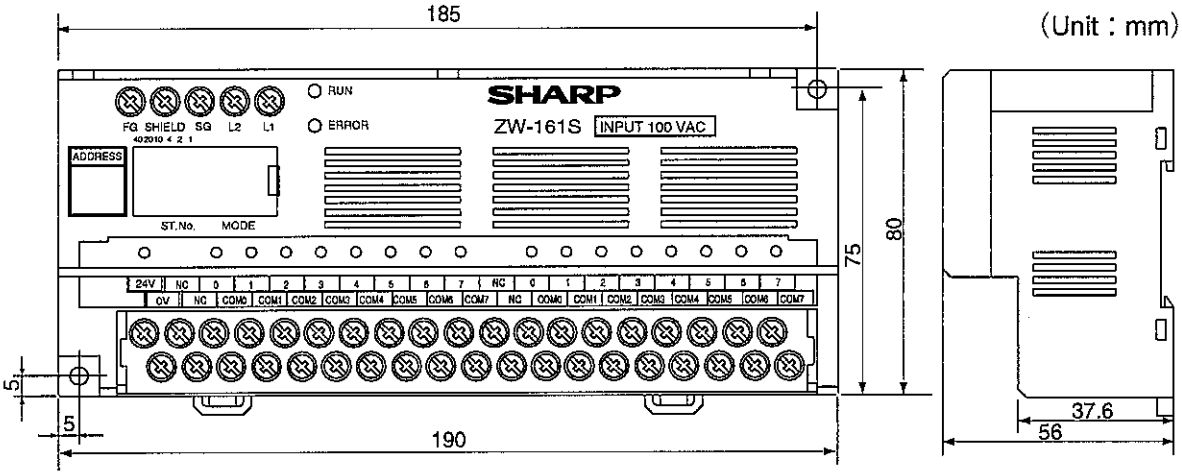
Item	Specifications
Storage temperature	-20 to +70°C
Ambient operation temperature	0 to +55°C
Ambient humidity	35 to 90%RH (No condensation)
Vibration resistance	Conforming to JIS-C-0911, amplification and acceleration 0.075 mm (10 to 55 Hz), 1 G (55 to 150 Hz), vibration frequency 10 to 150 to 10 Hz (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.



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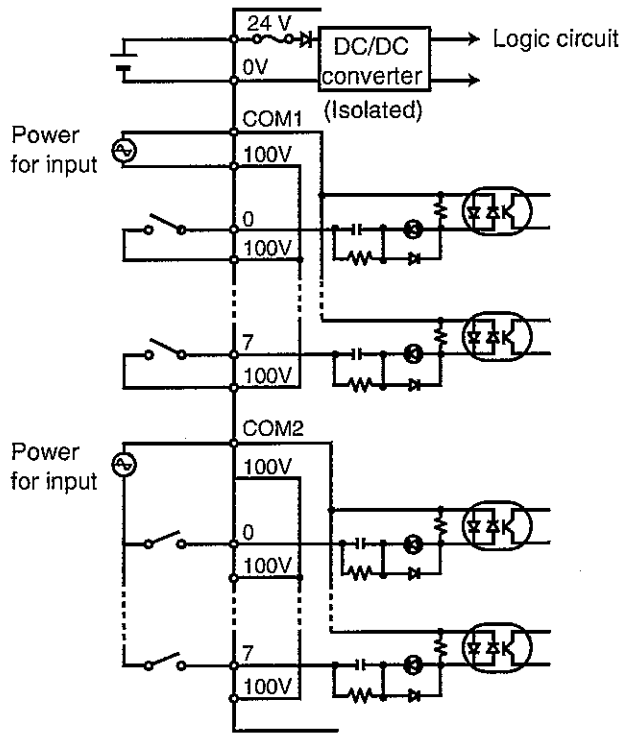
(4) Specifications of each module

① ZW-161N (100 VAC input module)

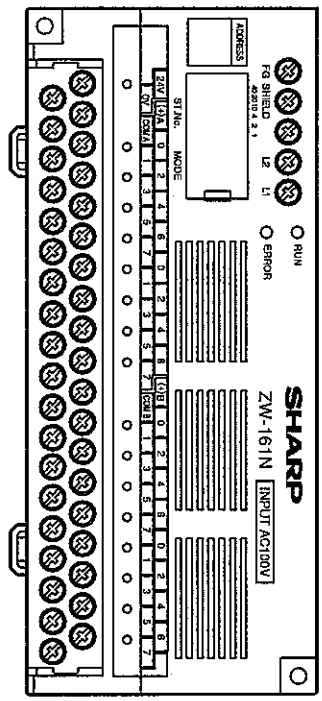
Item	Specifications
No. of input points	16 points
No. of slave station occupied bytes	2 bytes
Rated input voltage	100 to 120 VAC (50 to 60 Hz)
Allowable input voltage	85 to 132 VAC (50/60 Hz, waveform distortion: 5% or less)
Rated input current	10 mA (at TYP. 100 VAC, 60 Hz), 8.3 mA (at TYP. 100 VAC, 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



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

Surface view



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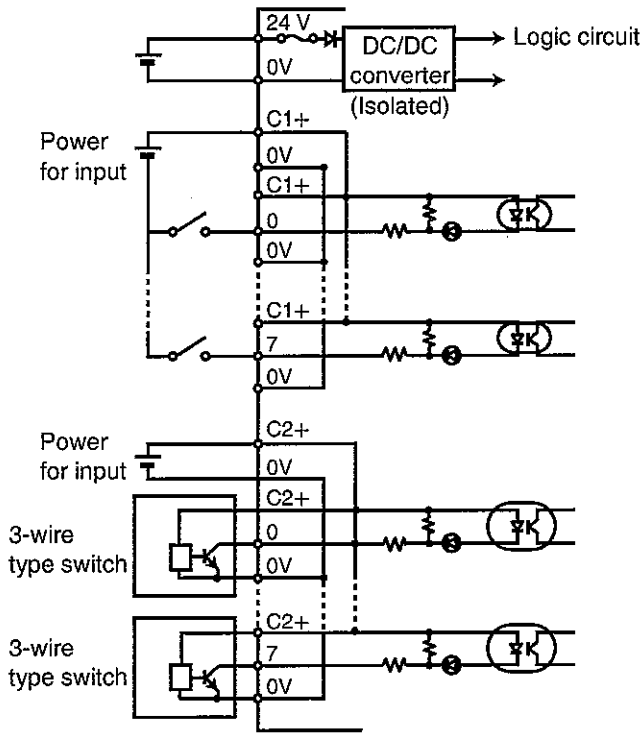
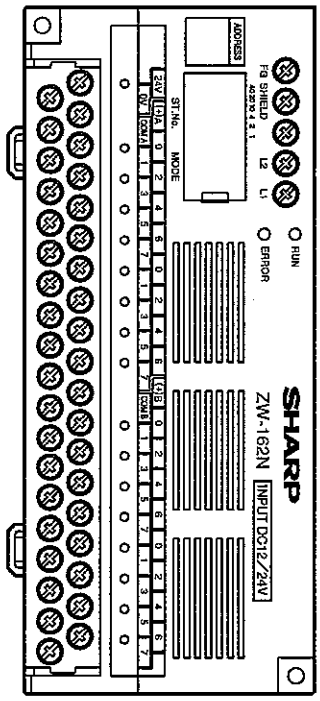
② ZW-162N (12/24 VAC input module)

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.

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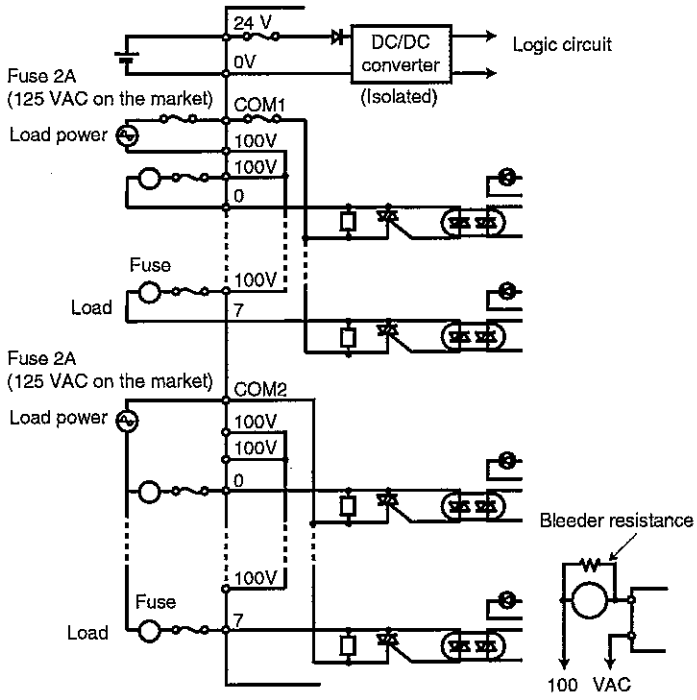
③ ZW-161S (triac output module)

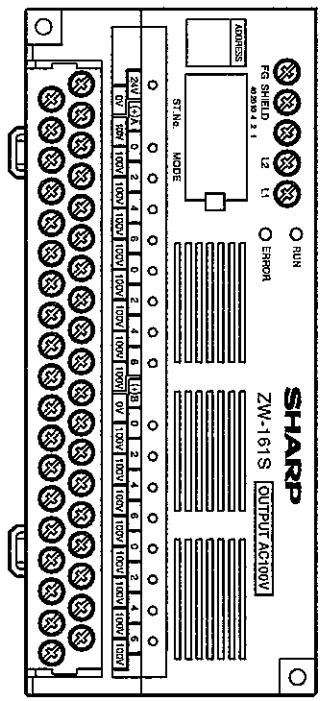
Item	Specifications
No. of output points	16 points
No. of slave station occupied bytes	2 bytes
Rated load voltage	100 to 120 VAC (50/60 Hz)
Allowable load voltage	15 to 132 VAC (50/60 Hz, waveform distortion: 5% or less)
Rated max. output current	0.5 A/point, 2 A/common
Surge ON current	Output element 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



- "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.

Surface view



※ 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.

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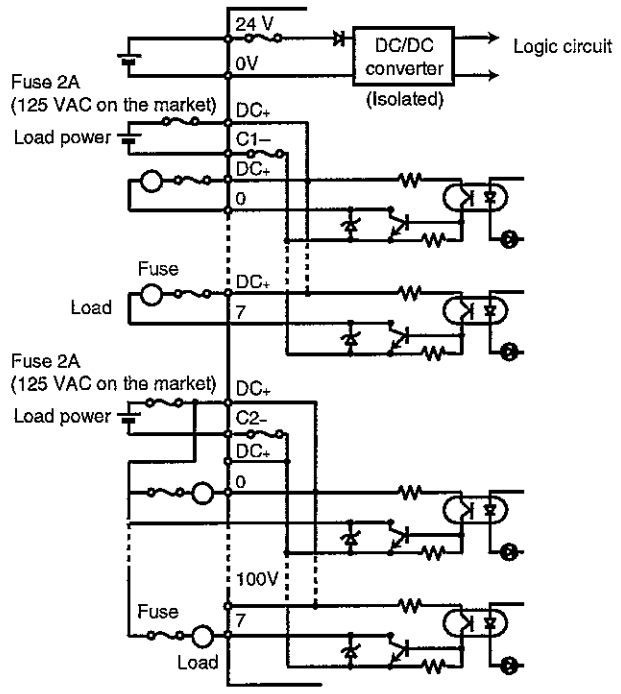
④ ZW-162S (transistor output module)

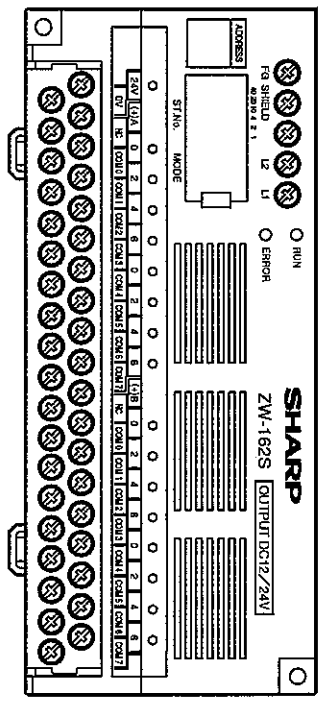
Item	Specifications
No. of output points	16 points
No. of slave station occupied bytes	2 bytes
Rated load voltage	12/24 VAC
Allowable load voltage	10 to 30 VAC
Rated max. output current	0.3 A/point, 2 A/common
Surge ON current	Output element capacity: 2 A (100 ms)
Min. load current	—
Leakage current	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



- "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.

Surface view



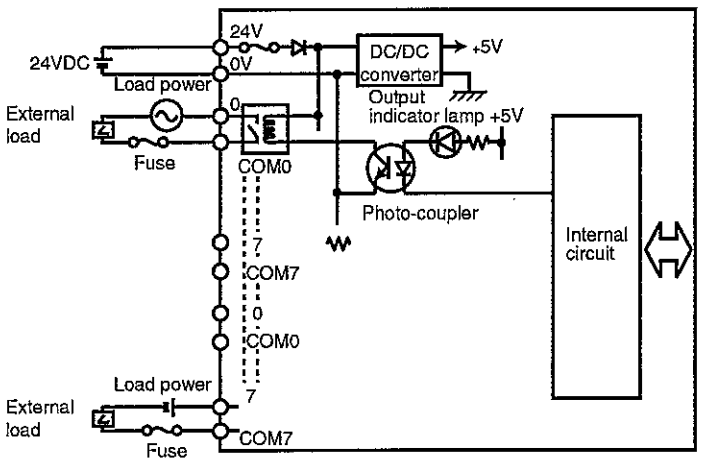
※ When induction load is applied, the switching time from "ON" to "OFF" may be delayed 1 second or more by inductance of load.

A1

⑤ ZW-164S (relay output module)

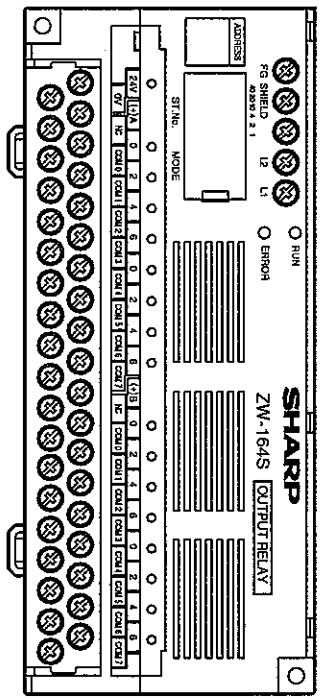
Item		Specifications
No. of output points		16 points
No. of occupied bytes		2 bytes
Max, open-close voltage, current		264 VAC/30 VDC, 2 A (resistance load)
Min, load		5 VDC, 1 mA
Operation life	Mechanical	20,000,000 times or more
	Electrical	1. Max, open-close voltage current resistance 100,000 times 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



- We recommend to install applicable fuse to every output for safety operation.

Surface view

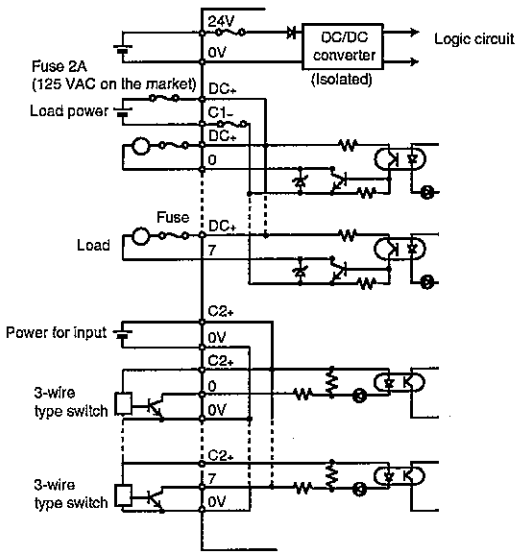


A1

⑤ ZW-162M (transistor output module, 12/24 VDC input module)

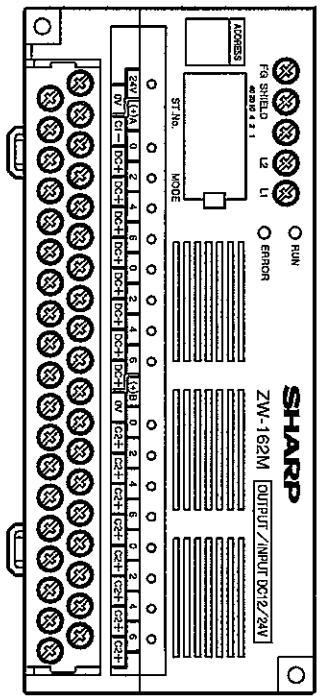
Item		Specifications
No. of slave station occupied bytes		2 bytes
Output specification	No. of output points	8 points
	Rated load voltage	12/24 VAC
	Allowable load voltage	10 to 30 VAC
	Rated max. output power	0.3 A/point, 2 A/common
	Surge ON current	Output element capacity: 2 A (100 ms)
	Leakage current	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



- 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.

Surface view

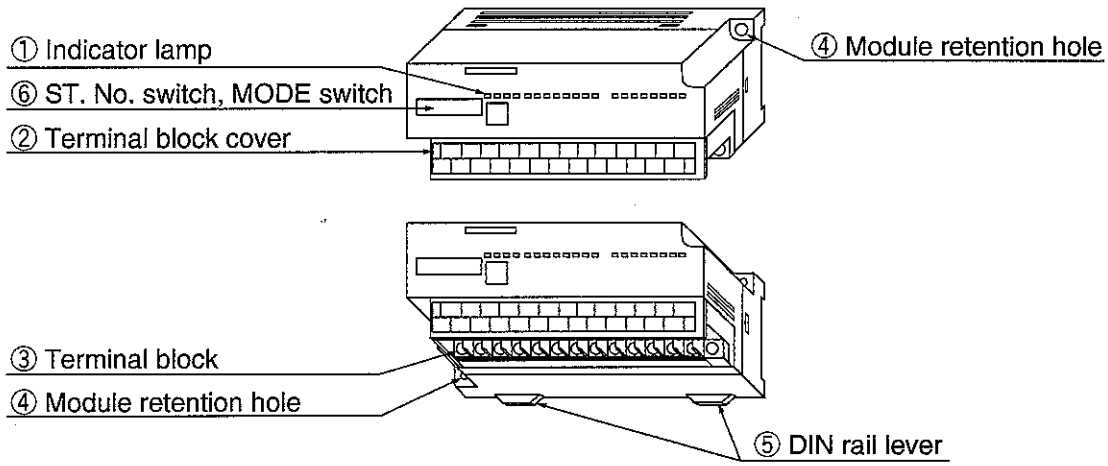


※ When induction load is applied, the switching time from "ON" to "OFF" may be delayed 1 second or more by inductance of load.

A1

Appendix 1-3 ZW-164NH/162SH/162MH

[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.

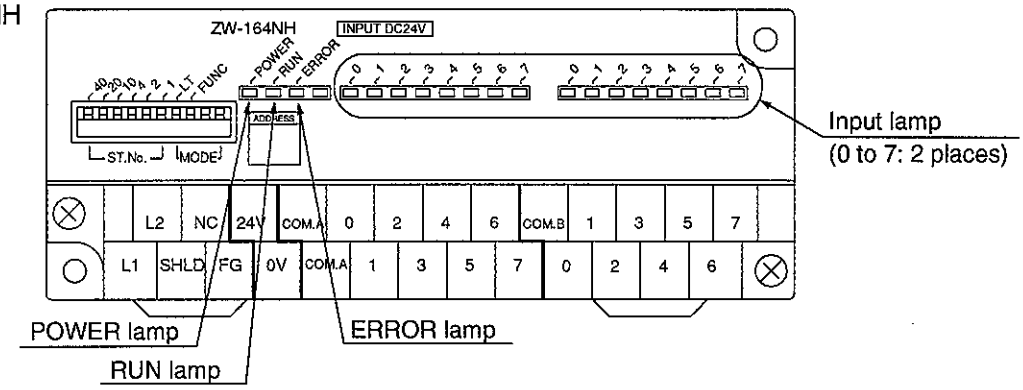
⑤ DIN rail lever
Detaching for DIN rail.

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

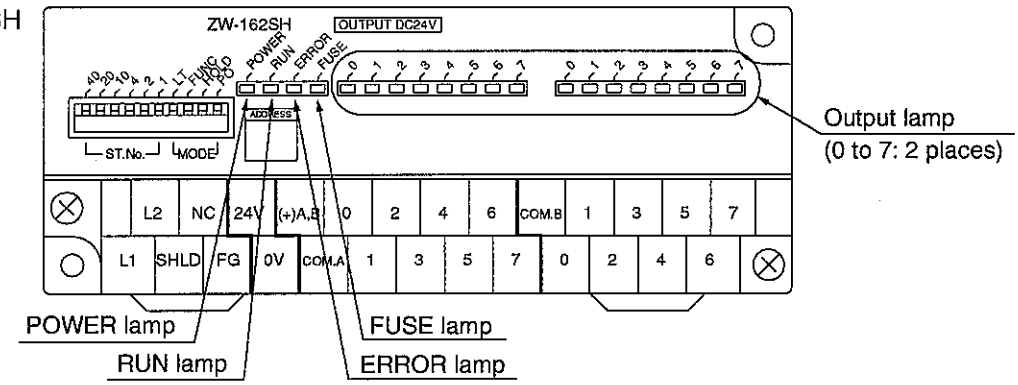
A1

[Indicator lamp]

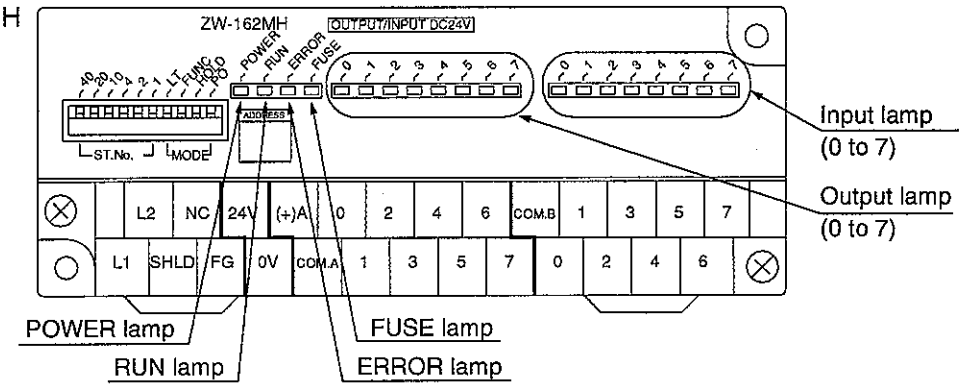
· ZW-164NH



· ZW-162SH



· ZW-162MH

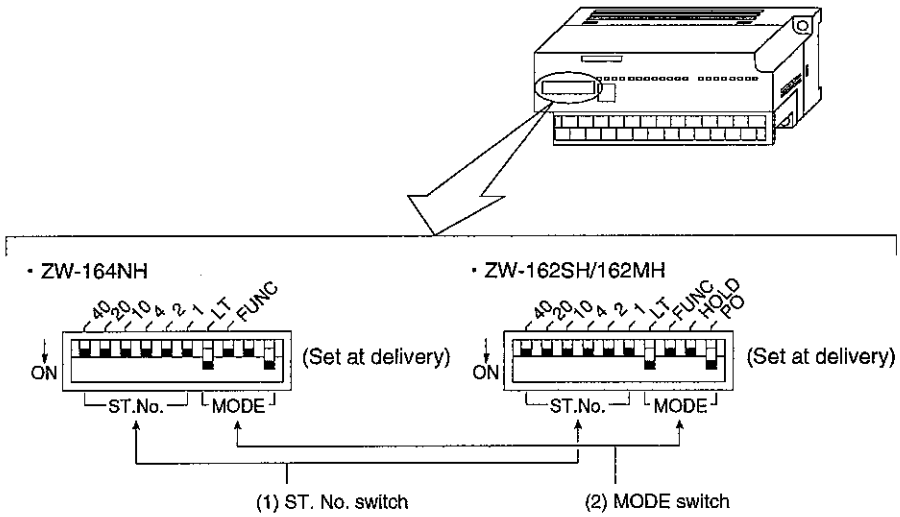


Lamp name	Color	Operation contents
RUN	Green	Lighting during normal operation
ERROR	Red	Lights up when slave station is error or when impossible to communicate with the master station.
POWER	Green	It is lit when the 24 VDC power is ON. · The POWER lamp will not be lit when the DC power fuse is blown, 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.

A1

[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.



Switch		Setting details	Setting when delivered
ST. No.	40 20 10 4 2 1	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
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

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[3] Installation method

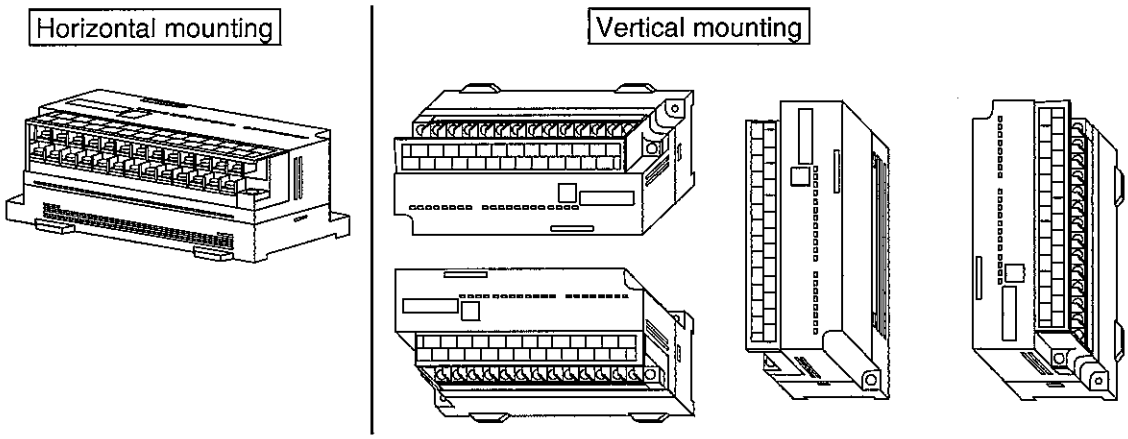
Install the ZW-164NH/162SH/162MH following the precautions below in order to get the best use of these stations.

(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.

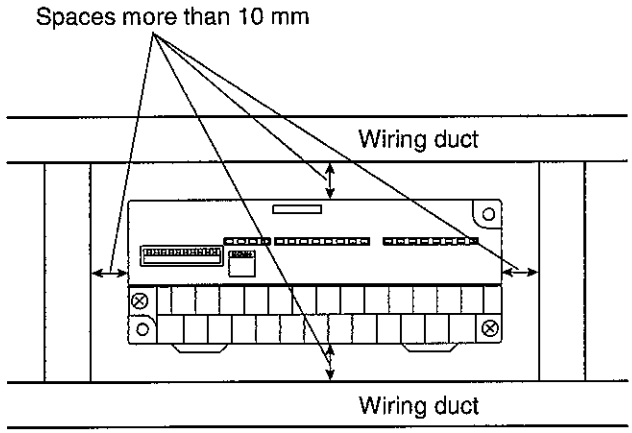
(2) Installation directions

- 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.



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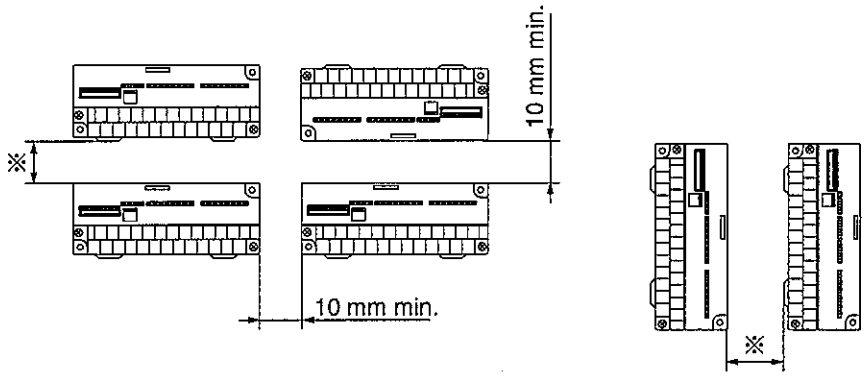
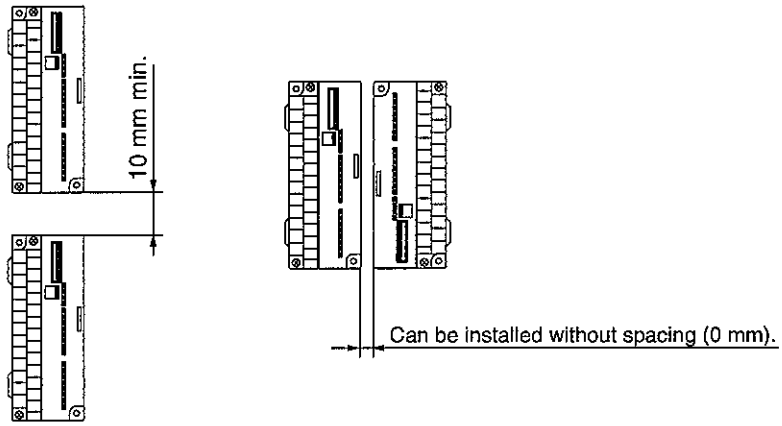
Make sure to provide the spacings shown below when installing more than one slave module.



* Leave spaces for wiring (2 places)

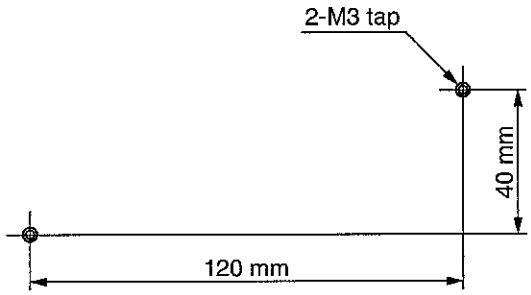


(4) Installation method

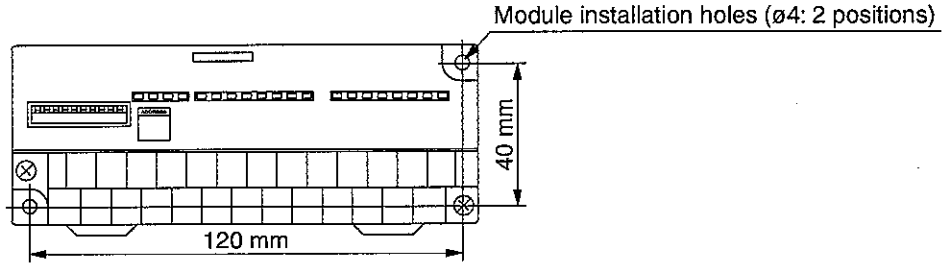
Use screws or a DIN rail to install the slave module.

①Using screws

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



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.



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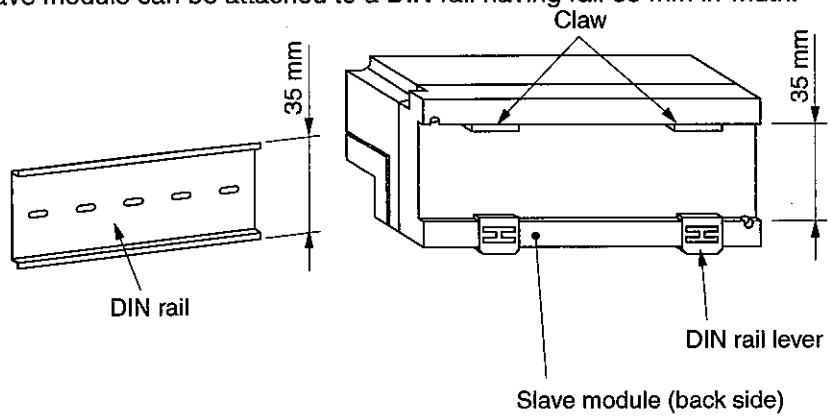
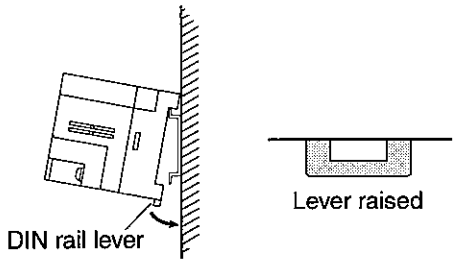
② Using a DIN rail

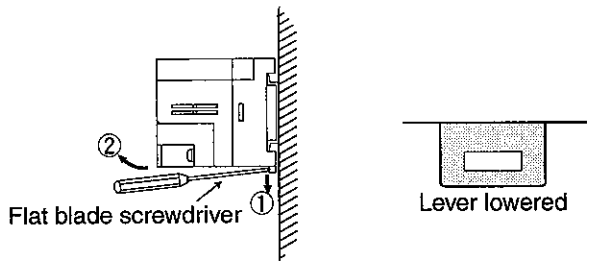
The slave module can be attached to a DIN rail having rail 35 mm in width.



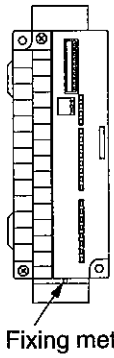
1. Hook the claws on the back of the slave module on a DIN rail, and press in the direction shown by the arrow.



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.



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



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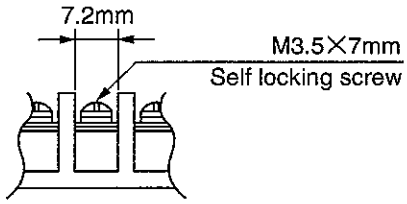
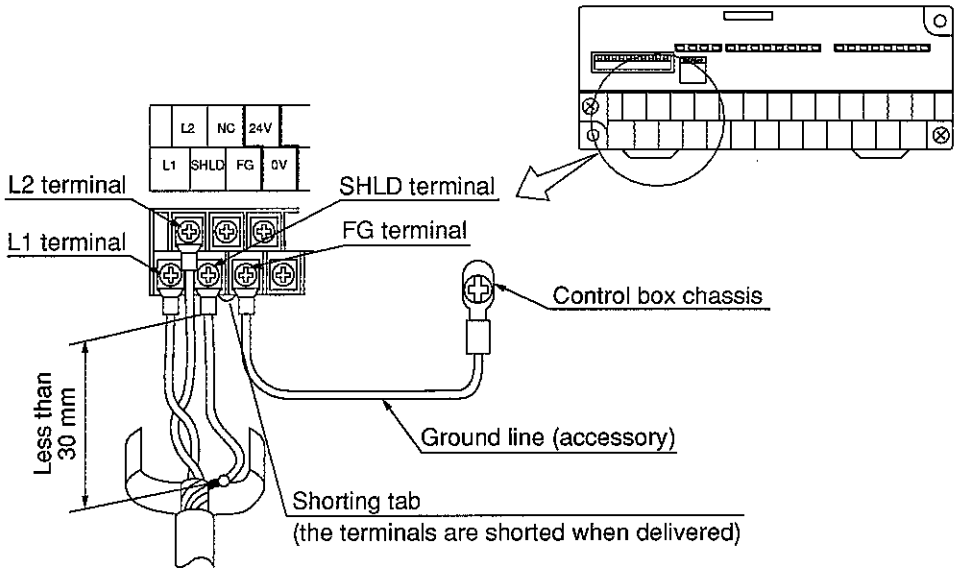
[4] Wiring method

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) .

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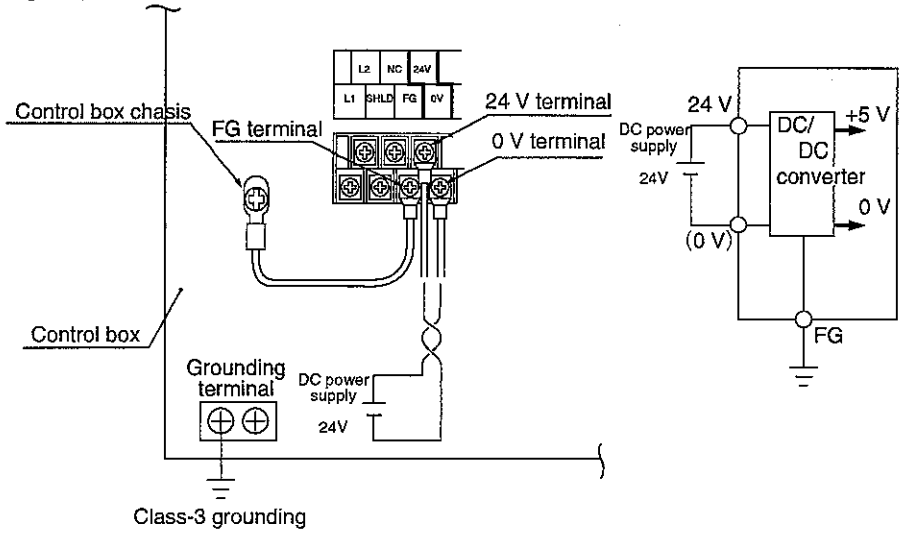
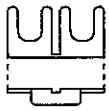
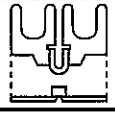
(2) Wiring of power lines

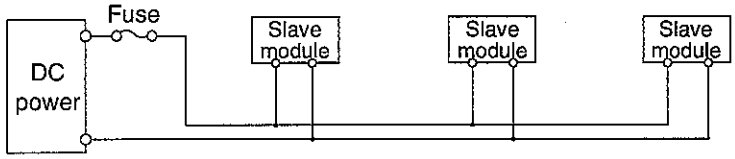


1. Twist DC power input lines with each other. As DC input power supply uses a insulation type DC/DC converter inside the module, it is also applicable as power for input signal or output signal. If you use a DC power input in common with the input signal or output signal power source, short circuit 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

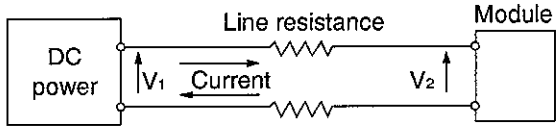
2. In case of sharing this power with load during power for DC input/output signal, note wiring and noise prevention method.
3. Be sure that the I/O link slave module's FG terminal is grounded through the grounding terminal of control box.
   It is also used as ground for the DC/DC converter.

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 distance wiring.



<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.)

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[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: In operation RUN	Indicator lamp: Error ERROR	Indicator lamp: Input	Indicator lamp: Output	Reset method	Priority order
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

A1

[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)

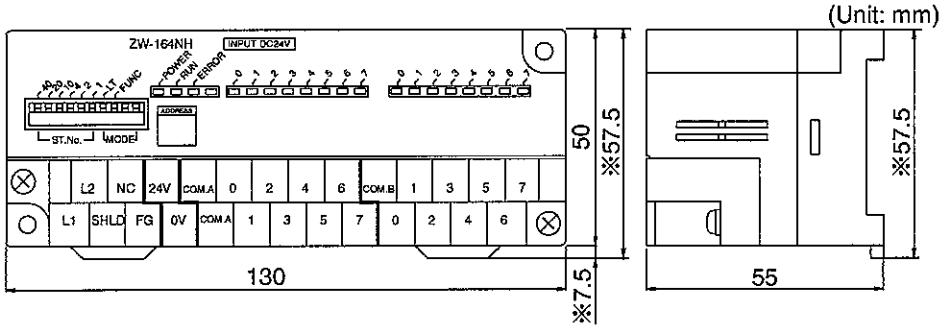
(2) Communication specifications

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.

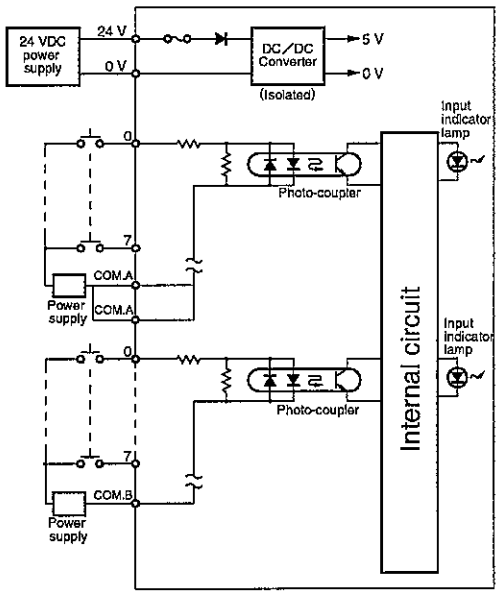
A1

(4) Specifications of I/O

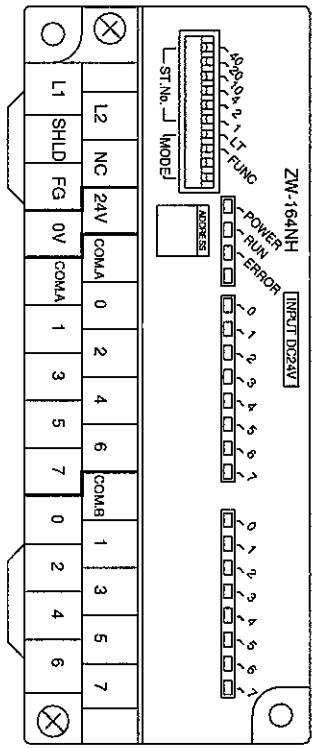
① ZW-164NH (24 VDC input module)

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



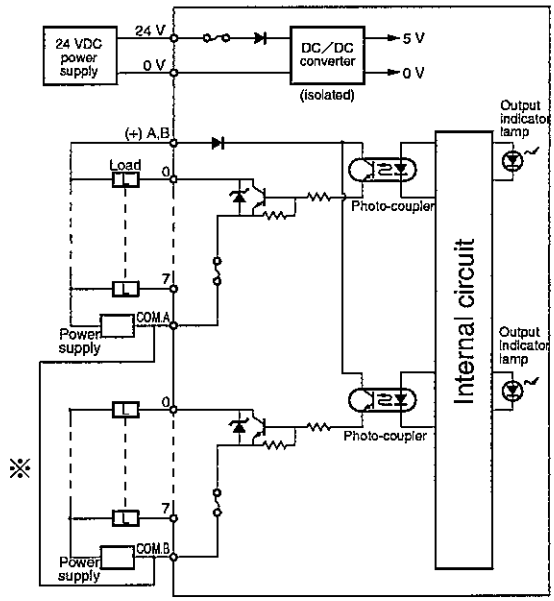
A1

• 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

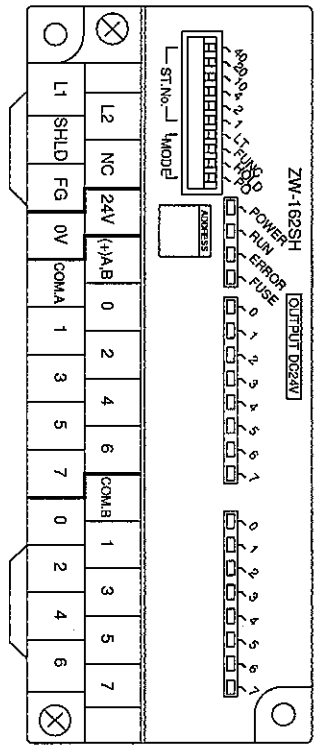
Outside connection drawings



※ 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.

Surface view

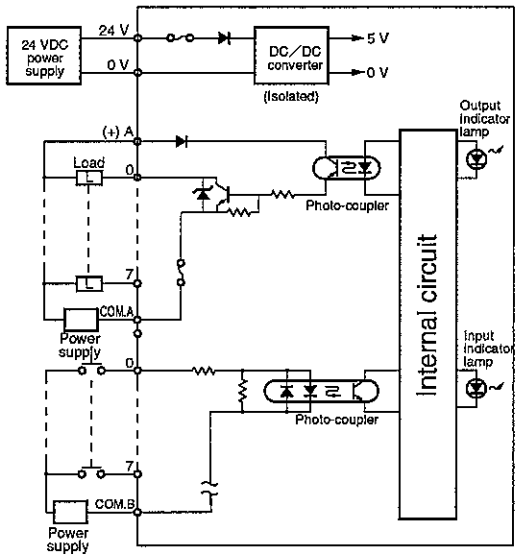
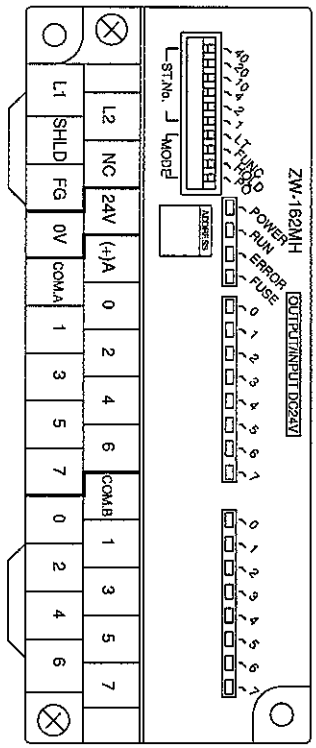


A1

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)

A1

Outside connection drawings	Surface view
	

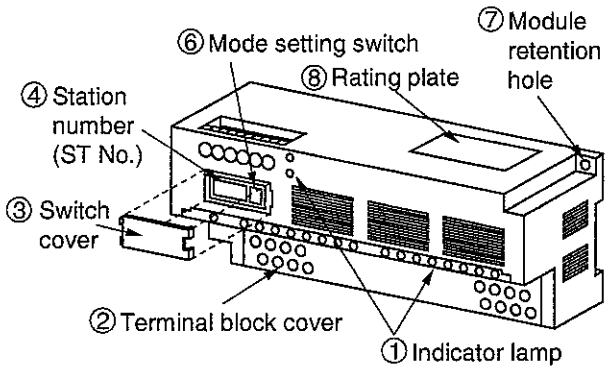
- "COM.A" is assigned at the output side, and at I/O link master module lower number of the communication area.
- We recommend to install applicable fuse to every output for safety.

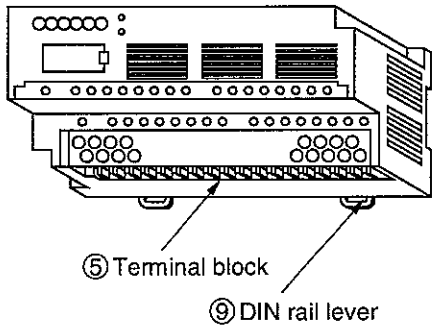
A1

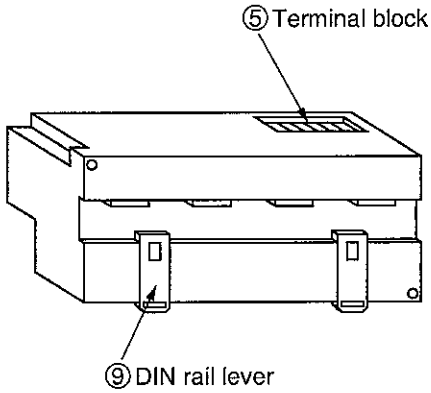
Appendix 1-4 ZW-324NH/322SH/322MH

The switch settings, installation method, and errors, and their troubleshooting measures are the same for models ZW-161N to 164M. (See page 45 to 49, and 52.)

[1] Name and function of each part







① Indicator lamp

Display each operation condition. (See the below)

② Terminal block cover (integral with case)

Protective cover for terminal block

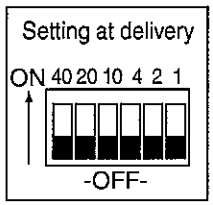
Detachable by cutting off fixing portion.

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.

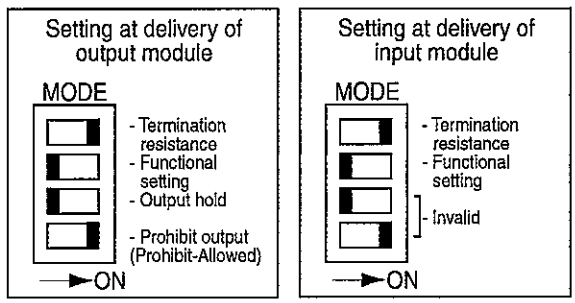


⑤ Terminal block

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 rail.

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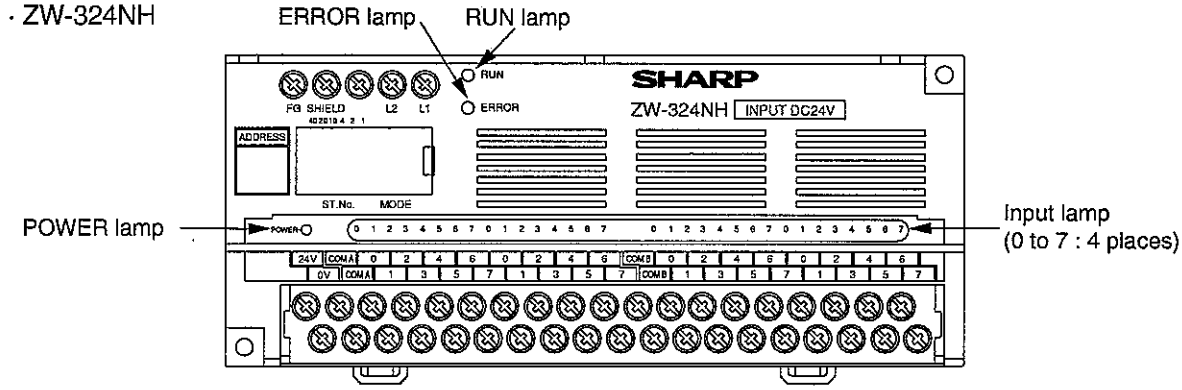
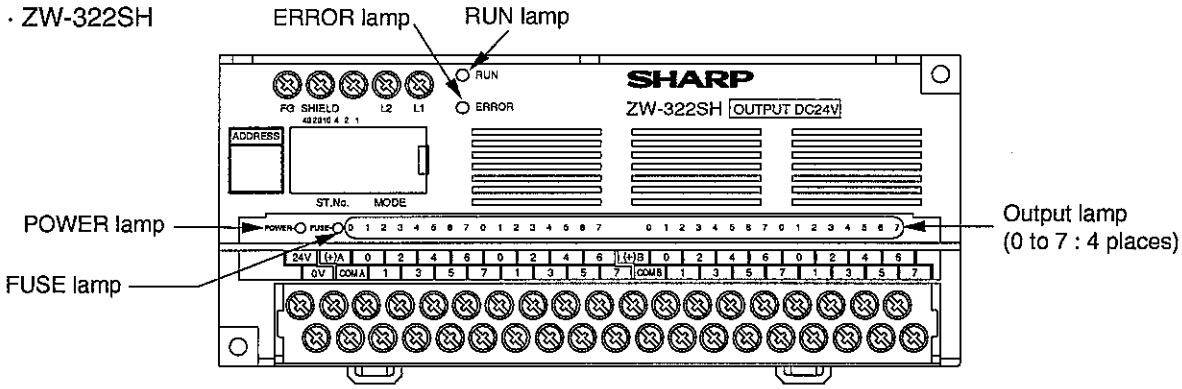
[Indicator lamp]

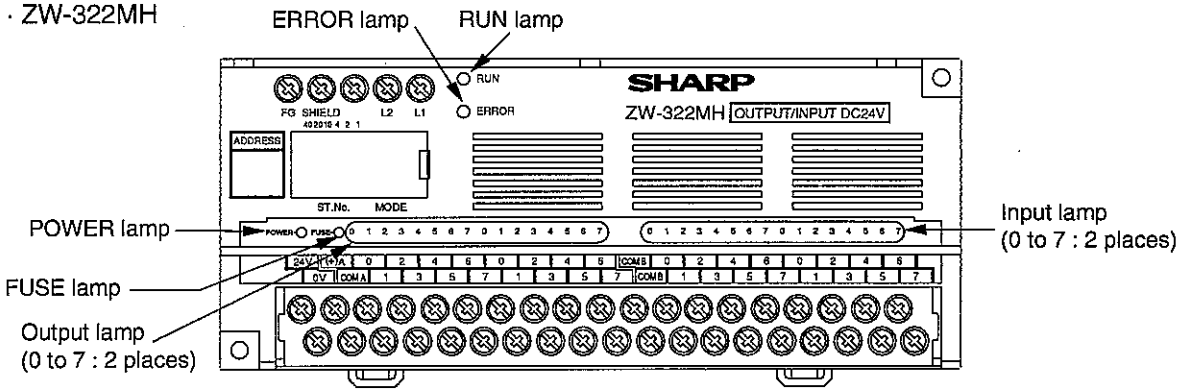
· ZW-324NH



· ZW-322SH



· ZW-322MH



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.

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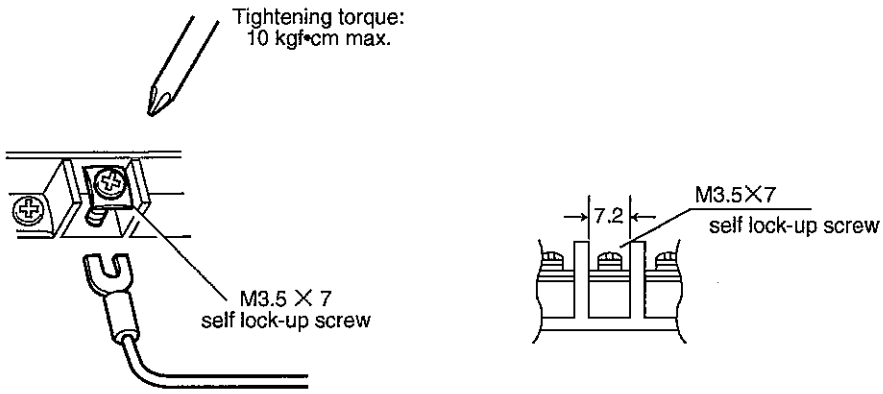
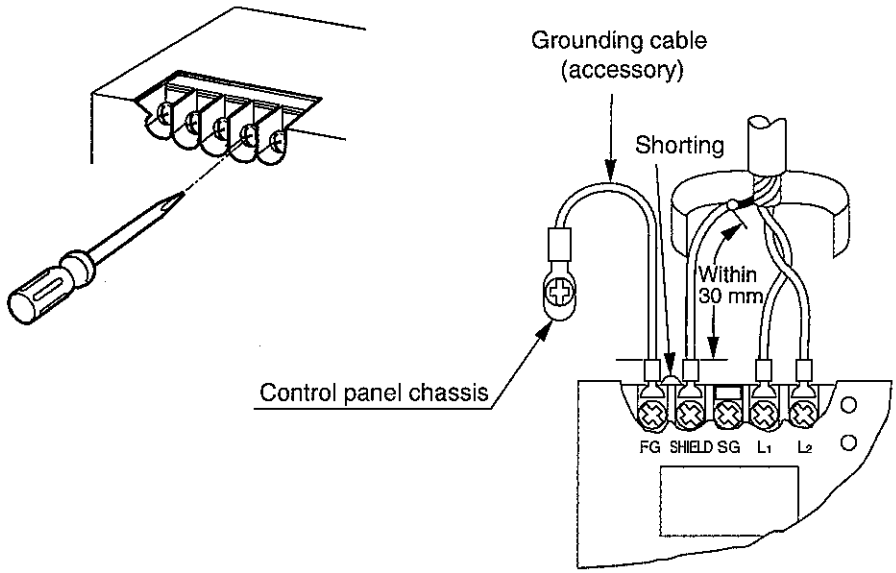
[2] Wiring method

(1) Wiring cautions

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



(2) Connecting communication cables



Note

★ 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.

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

★ 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.

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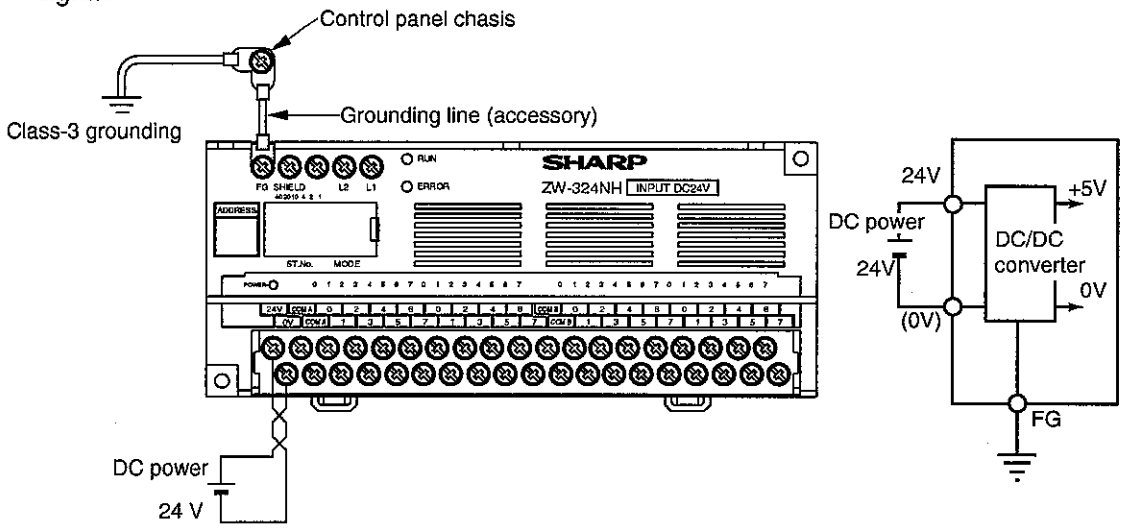
(3) Power supply wiring

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.

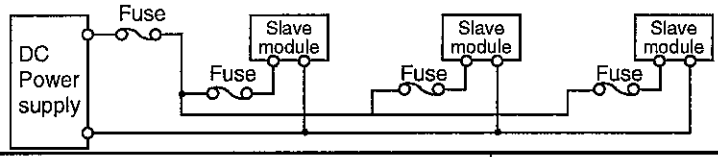


Note

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

★ 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.

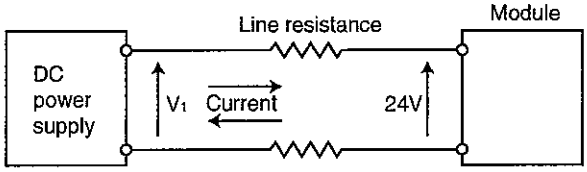
★ When DC power is supplied to I/O link slave module positioned away from it, provide fuse elements for the DC power supply and each module respectively. Be careful for voltage drop due to long distance wiring



<Reference> Power voltage and line resistance

DC power voltage (V_1) =

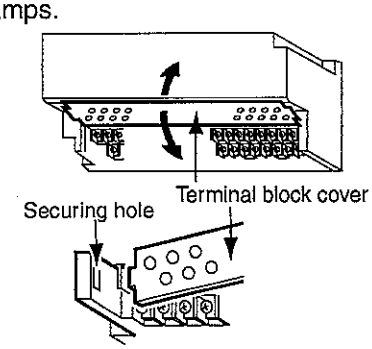
24V + slave module current × line resistance × 2 × wire length (km)



Line resistance	
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

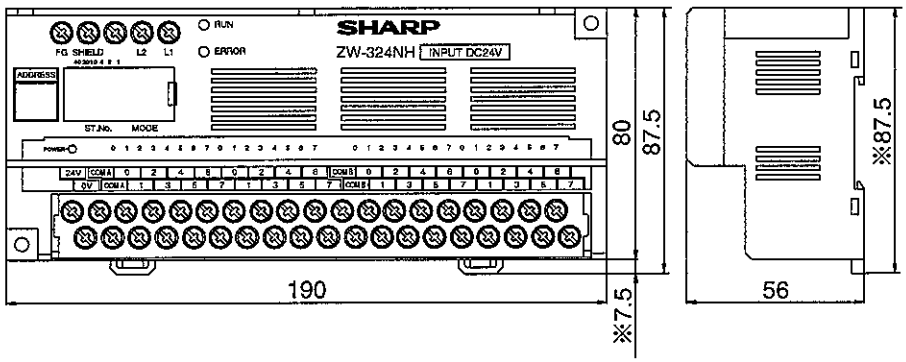
(2) Communication specifications

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.

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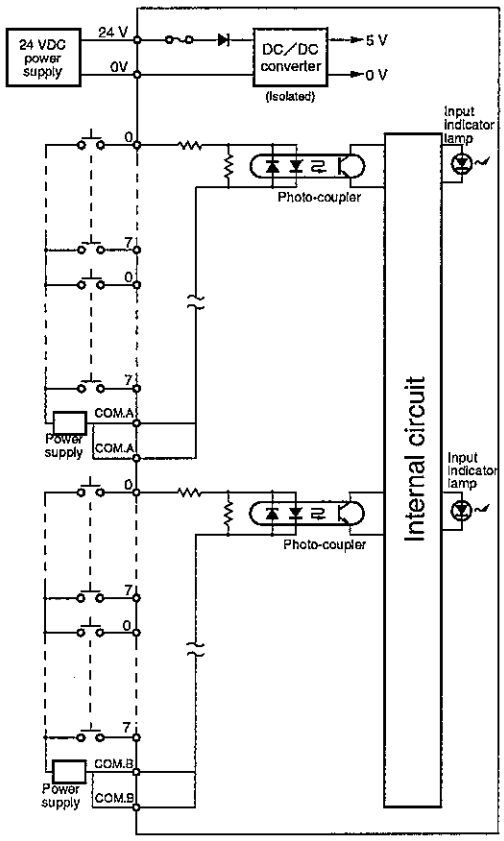
(4) Specifications of I/O

① ZW-324NH (24 VDC input module)

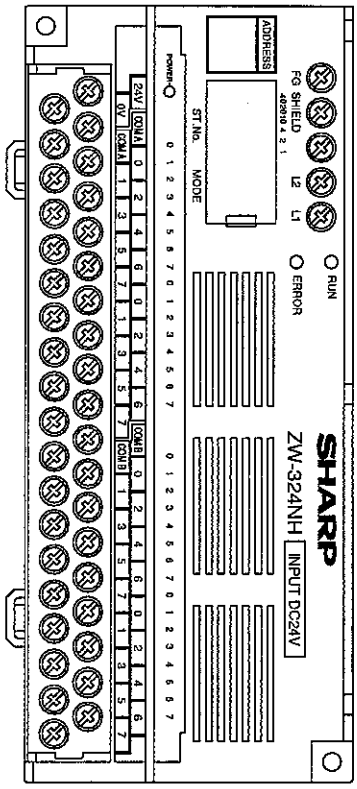
Item	Specifications
No. of input point	32 points
No. of slave station occupied bytes	4 bytes
Rated input voltage	24 VDC
Allowable input voltage	20.0 to 26.4 VDC Ripple factor: Less than 15%
Rated input current	4.6 mA TYP. (at 24 VDC)
Input voltage level	ON level: 18.0 V or less, OFF level: 8.0 V or more
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



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

Surface view



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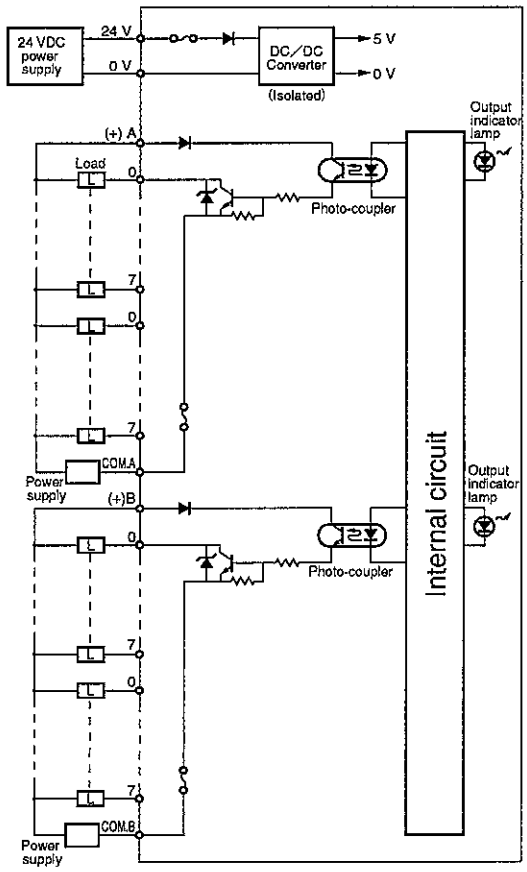
② ZW-322SH (transistor output module)

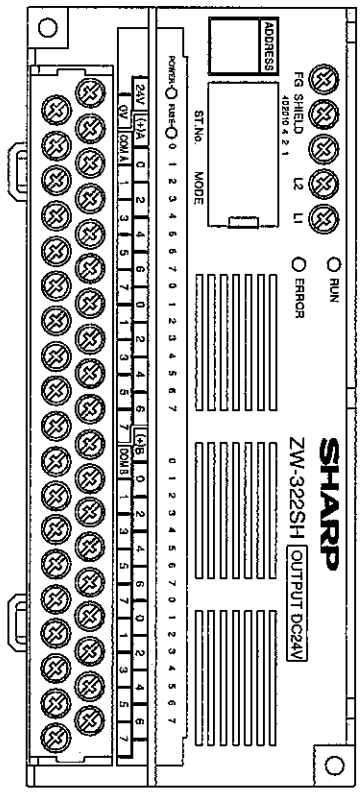
Item	Specifications
No. of output point	32 points
No. of slave station occupied bytes	4 bytes
Rated load voltage	24 VDC
Allowable load voltage	10.0 to 26.4 VDC
Rated max. output current	0.3 A/point, 2 A/common
Surge ON current	0.2 A (100 ms)
Min. load current	–
Leakage current	0.1 mA or less
Voltage 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



- "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.

Surface view



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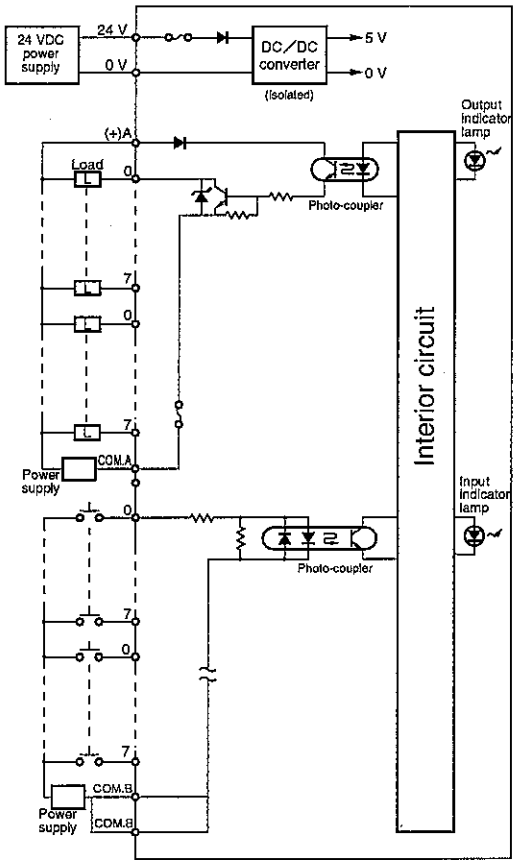
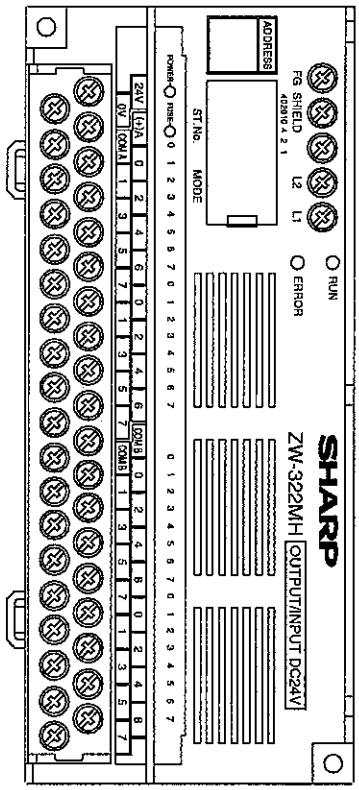
③ ZW-322MH (transistor output, 24 VDC input module)

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.

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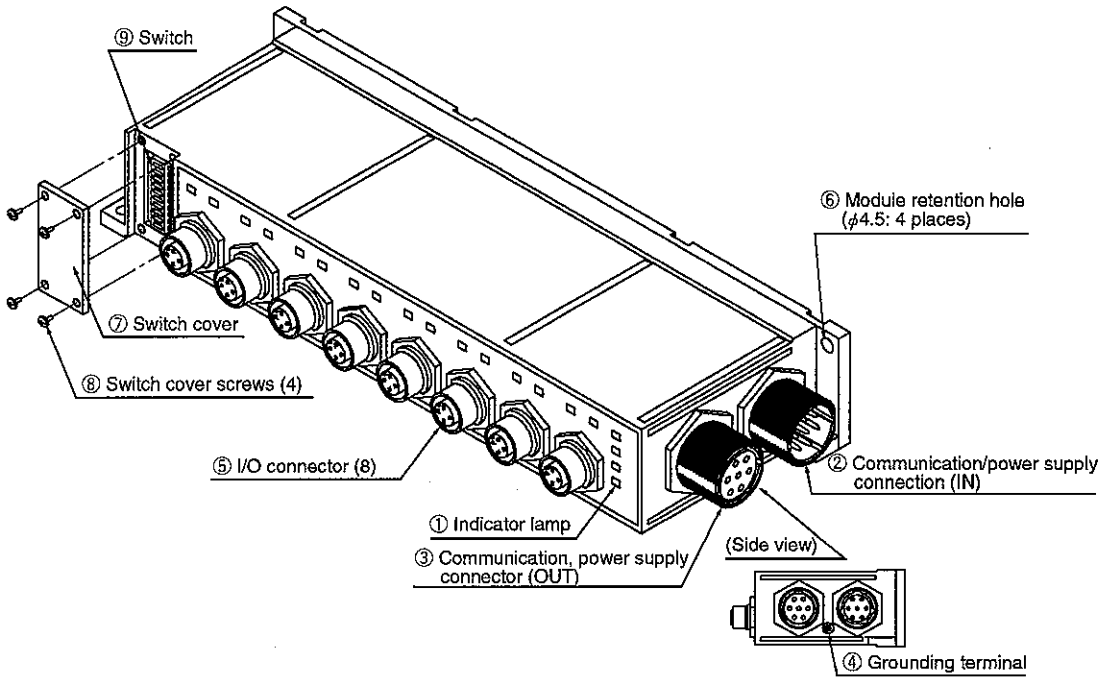
Appendix 1-5 ZW-84NC/162MC

[1] Name and function of each part



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.

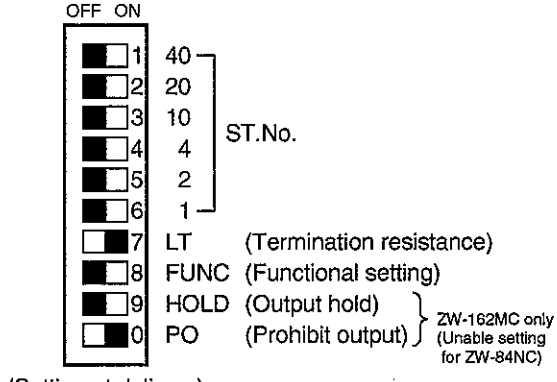
⑤ I/O connector
Connect to input equipment when a ZW-84NC is used. Connect to input/output equipment when a ZW-162MC is used.
Put a cover if you do nor use this connector.

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.

⑨ Switch



(Setting at delivery)

See page 85 for setting contents.

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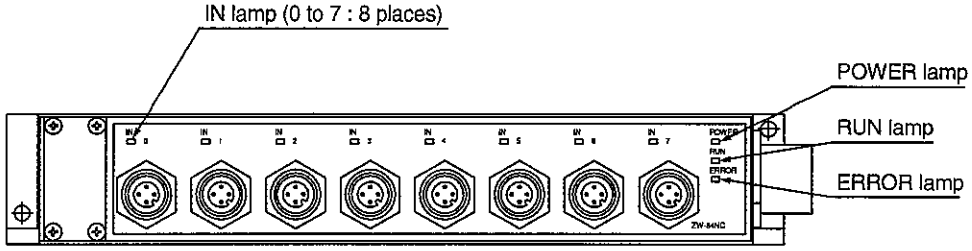
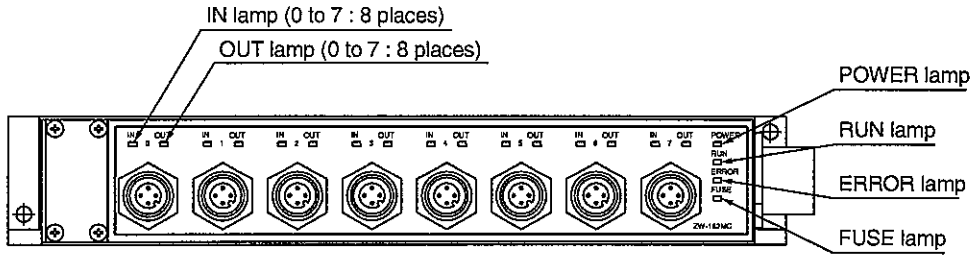
[Indicator lamp]

· ZW-84NC



· ZW-162MC



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.

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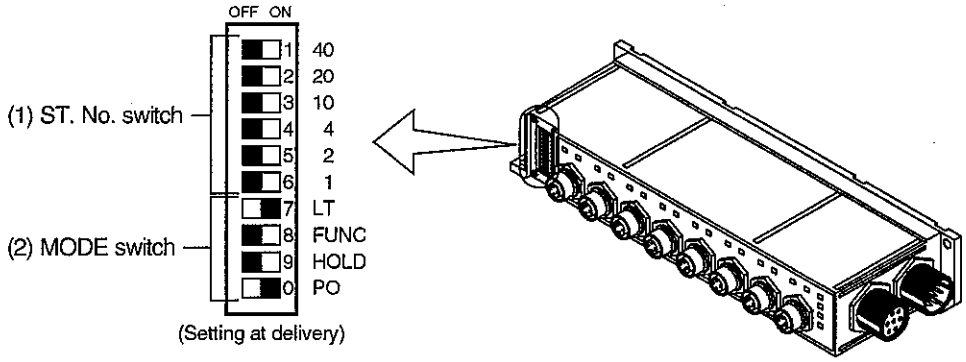
[2] Setting switch

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.



Switch		Setting details	Setting when delivered
ST. No. (station number)	40 20 10 4 2 1	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
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)

A1

[3] Installation method

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

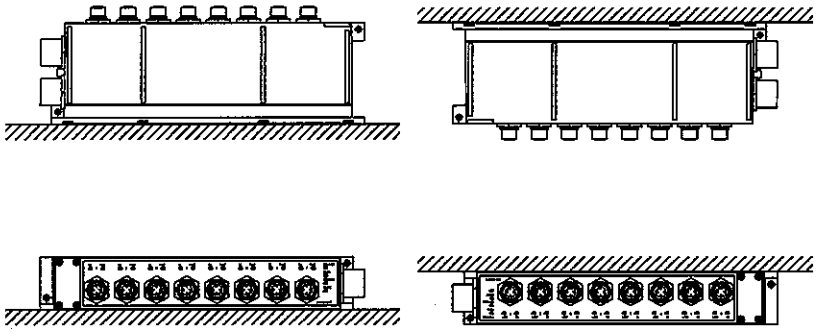
(1) Installation conditions

- Avoid installation just above high calorie heat generating devices (heaters, transformers, 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.

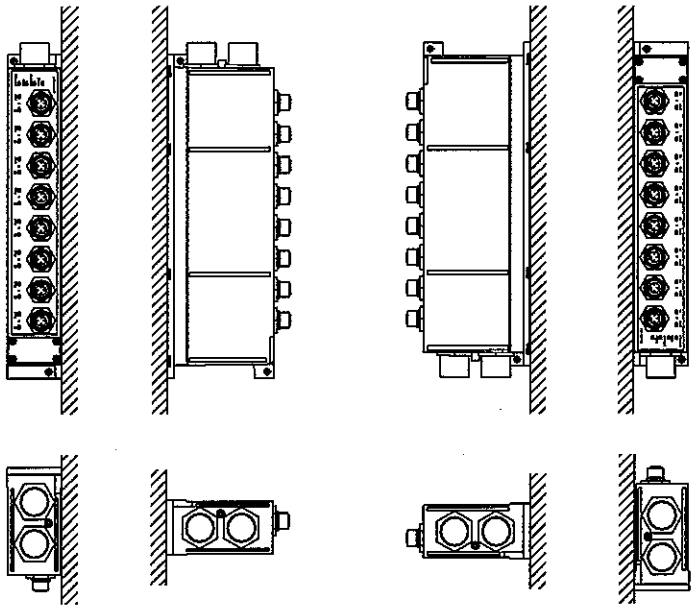
(2) Installation directions

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

Horizontal mounting



Vertical mounting



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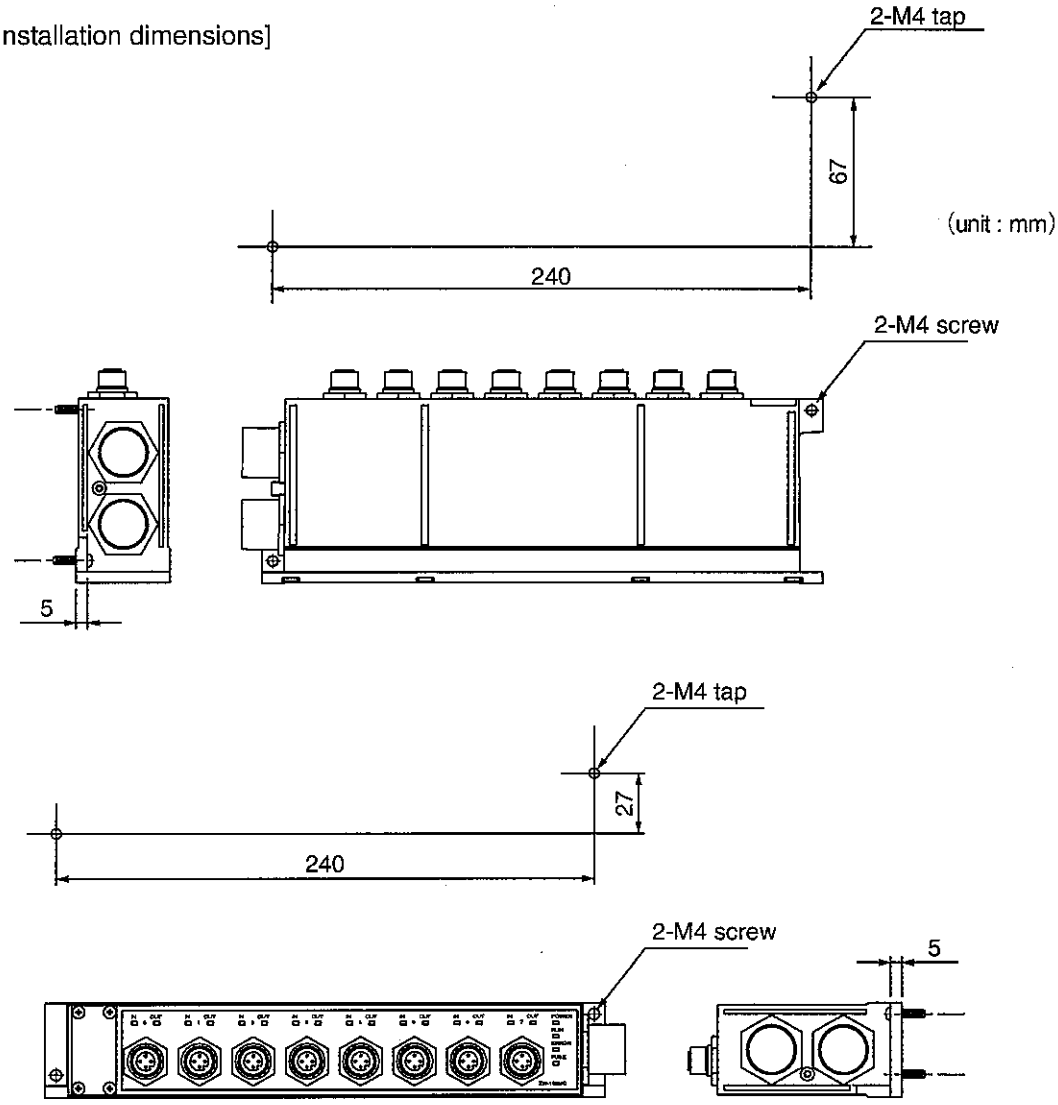
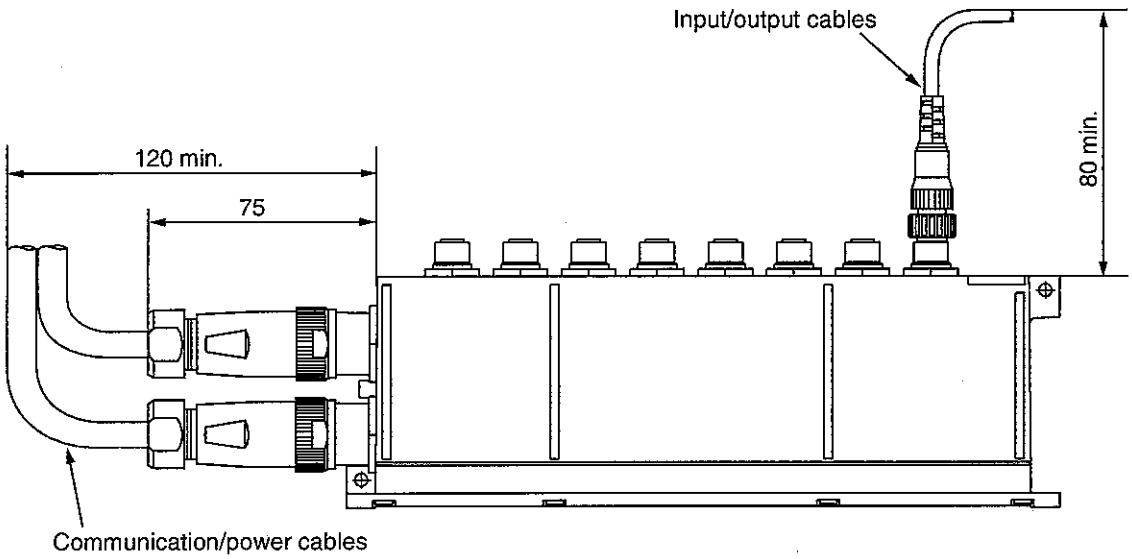
(3) Installation method

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

[Installation dimensions]



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



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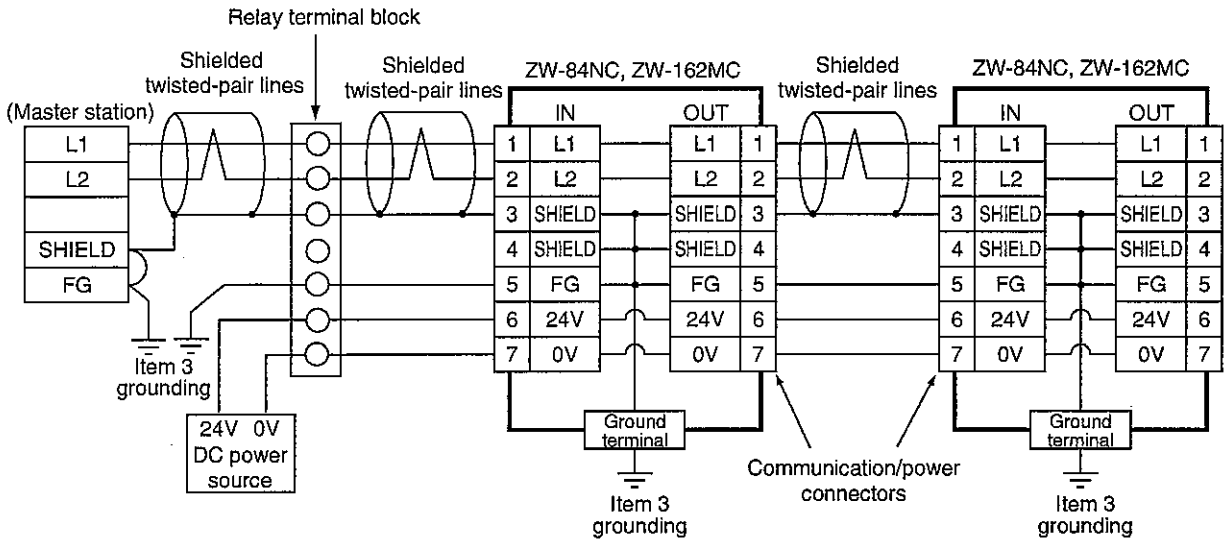
[4] Wiring method

(1) Recommended cables and plugs

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

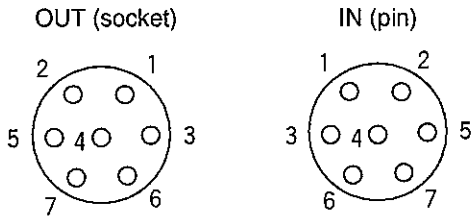
(2) Connecting communication/power lines

[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

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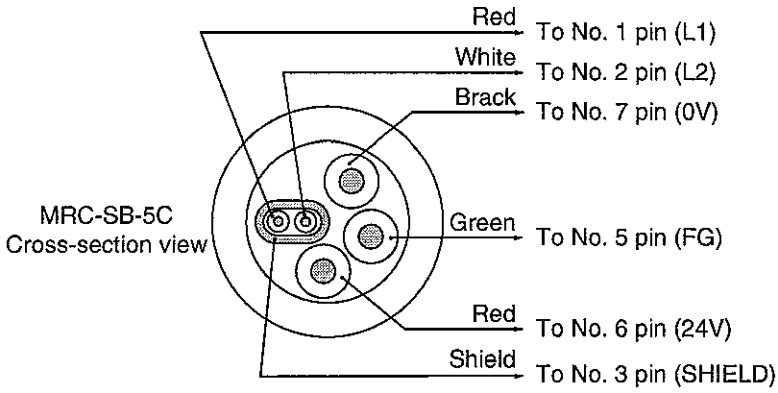
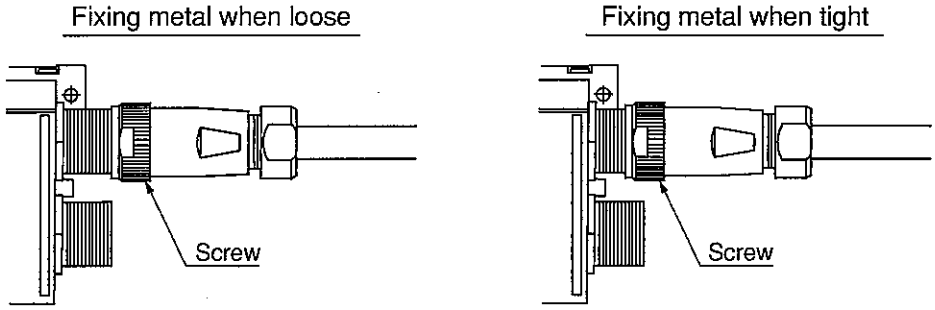
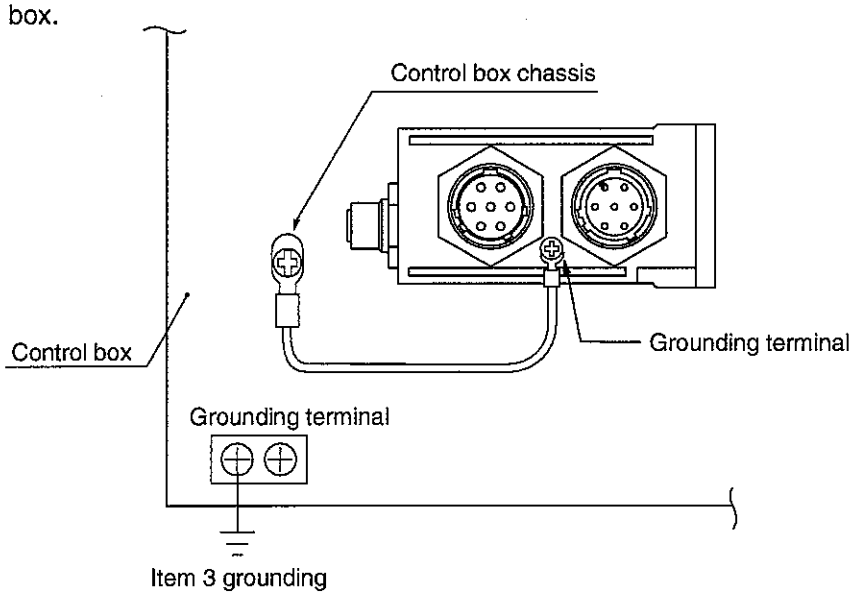
[Connection drawings for the recommended cable (MRC-SB-5C) and plug]



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.



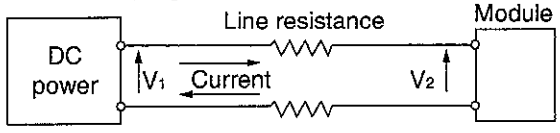
5. Make sure to connect the ground terminal (FG) to earth through the ground terminal of the control box.



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 will be 9.53 ohm/km if nominal cross-sectional area is 2 mm²

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

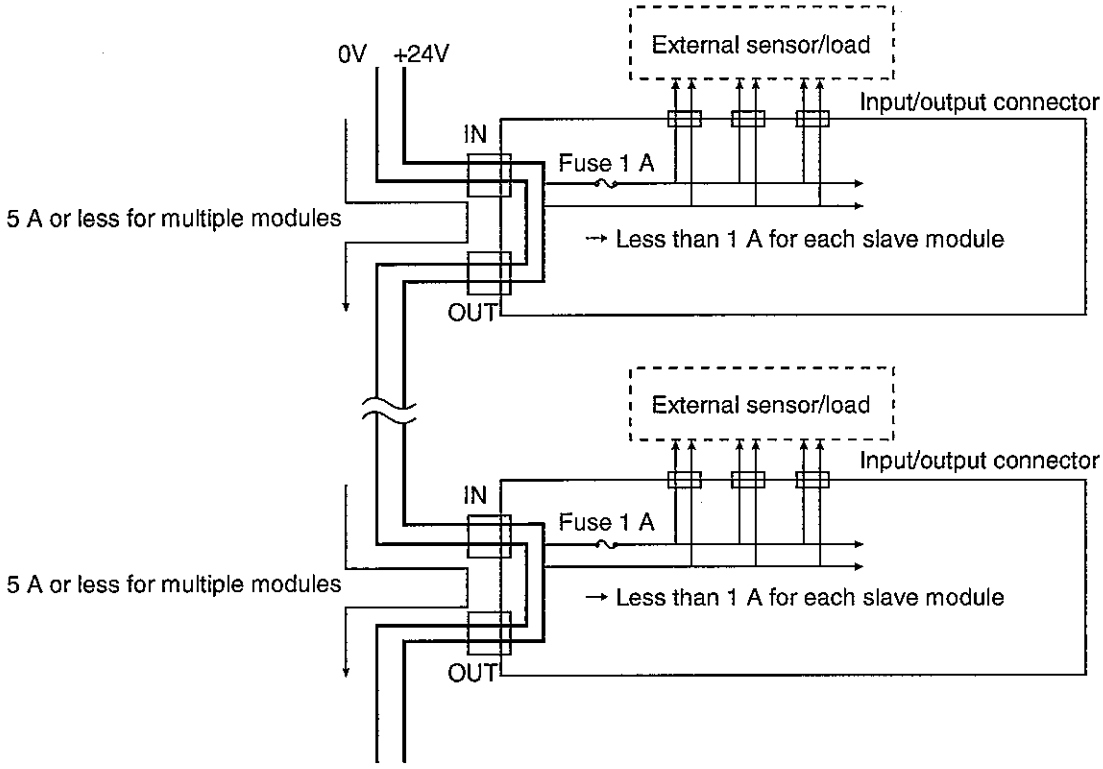
A1

Precautions when wiring power lines

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)	—	



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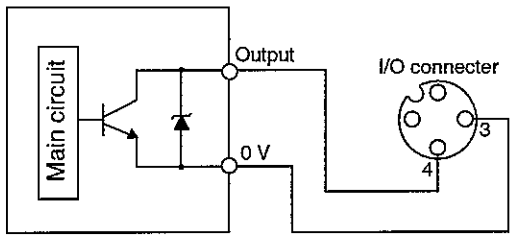
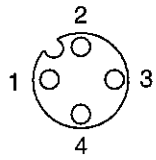
(3) Input/output signal wiring

[Wiring method]

An example for connecting
a 2-line system sensor

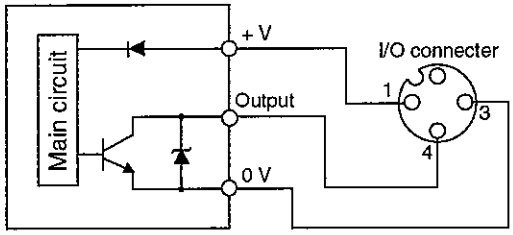


[Pin allocation on the input/output connector]

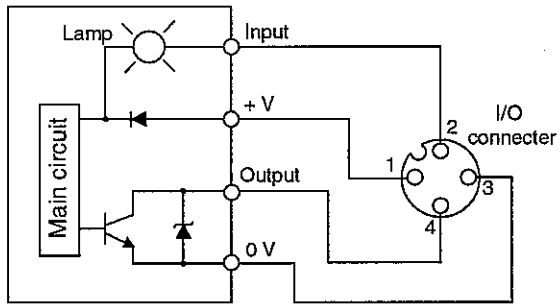


Pin number	Signal name	Remarks
1	24 V	
2	Output	ZW-162MC only
3	0 V	
4	Input	

An example for connecting
a 3-line system sensor

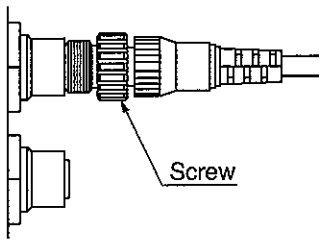


An example for connecting
a sensor to a lamp (ZW-162MC only)

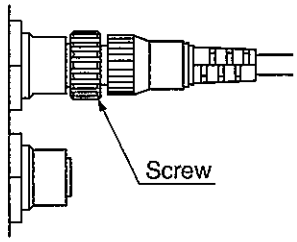


1. The new JIS standard used in the 3-line system sensor. Note the difference in the connector pin allocation for the 2-line system and the old JIS standard models.
2. PNP current output sensors cannot be used.
3. Use the recommended connector for the sensor connection.
4. Make sure to turn OFF the power 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



Fixing metal when tight



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

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[5] Error and treatment

You can see the self-diagnosis results by the indicator lamp.
See page 84 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		●			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 power	500 VDC, more than 10 M-ohm (between input/output terminal, terminal and secondary circuit)
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	Parity line: Shielded twisted pain cable Cable total length : 1 km max. Recommended cable type: MRC-SB-5C by Nichigo Tsushin Wires
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

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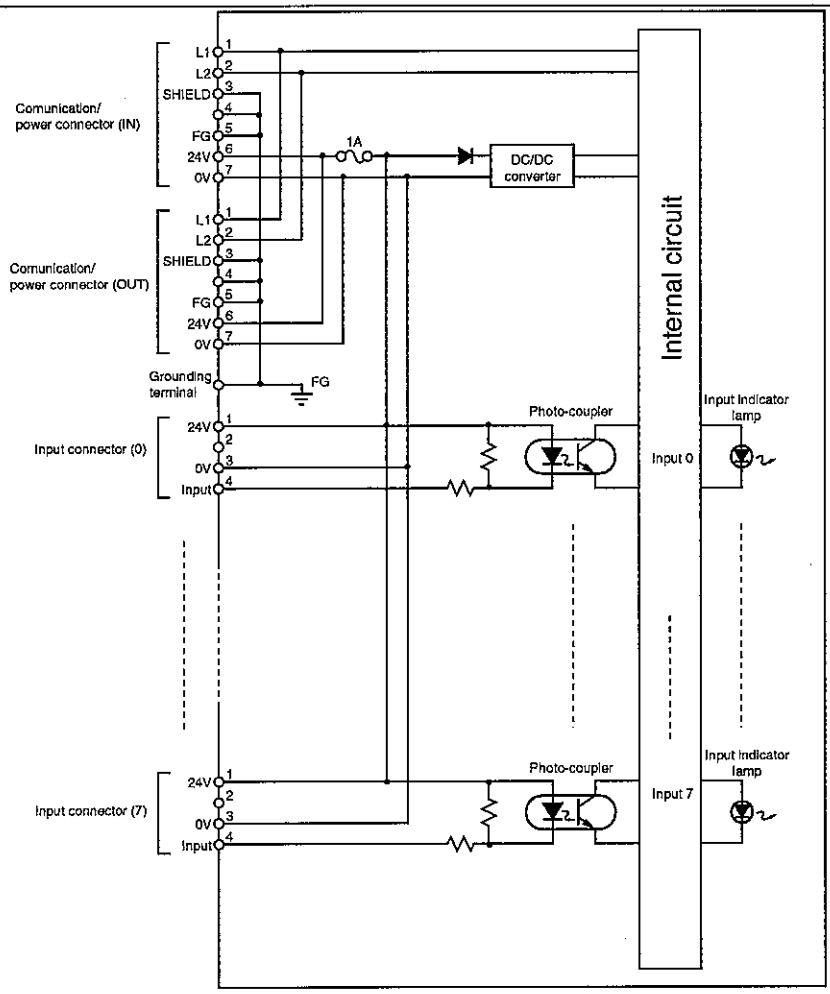
(3) Specifications of I/O

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 (module alone)	OFF → ON: 1.0 ms or less 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.

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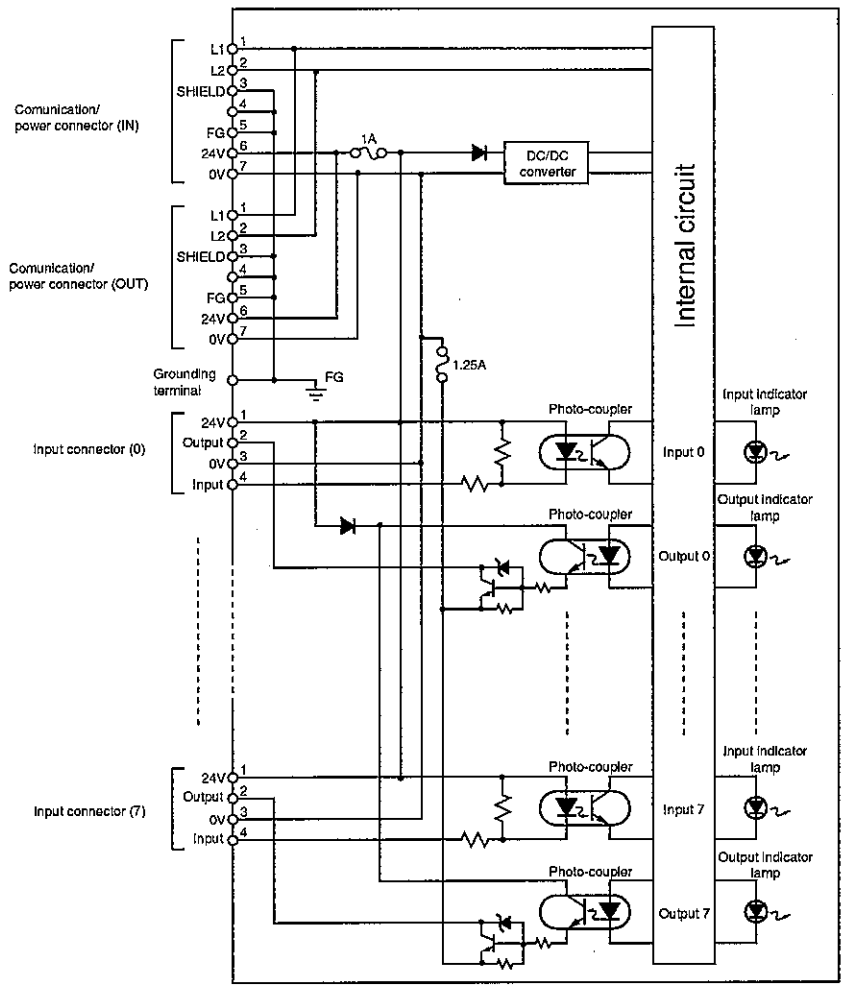
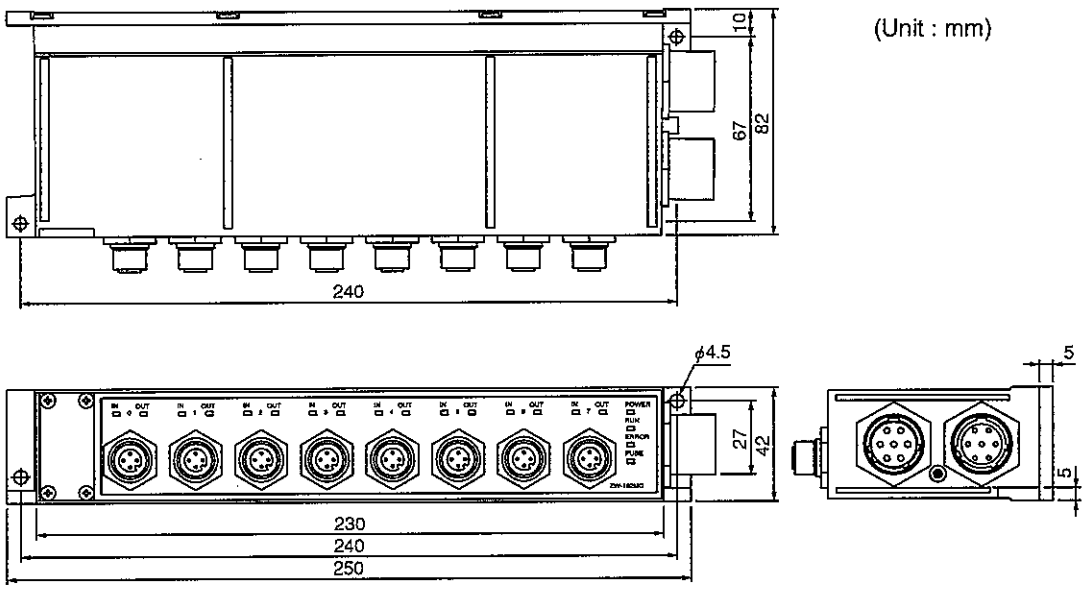
Item	Specifications
Circuit configuration	

[4] External dimension drawings (Common for ZM-84NC/ZW-162MC)

(Unit : mm)



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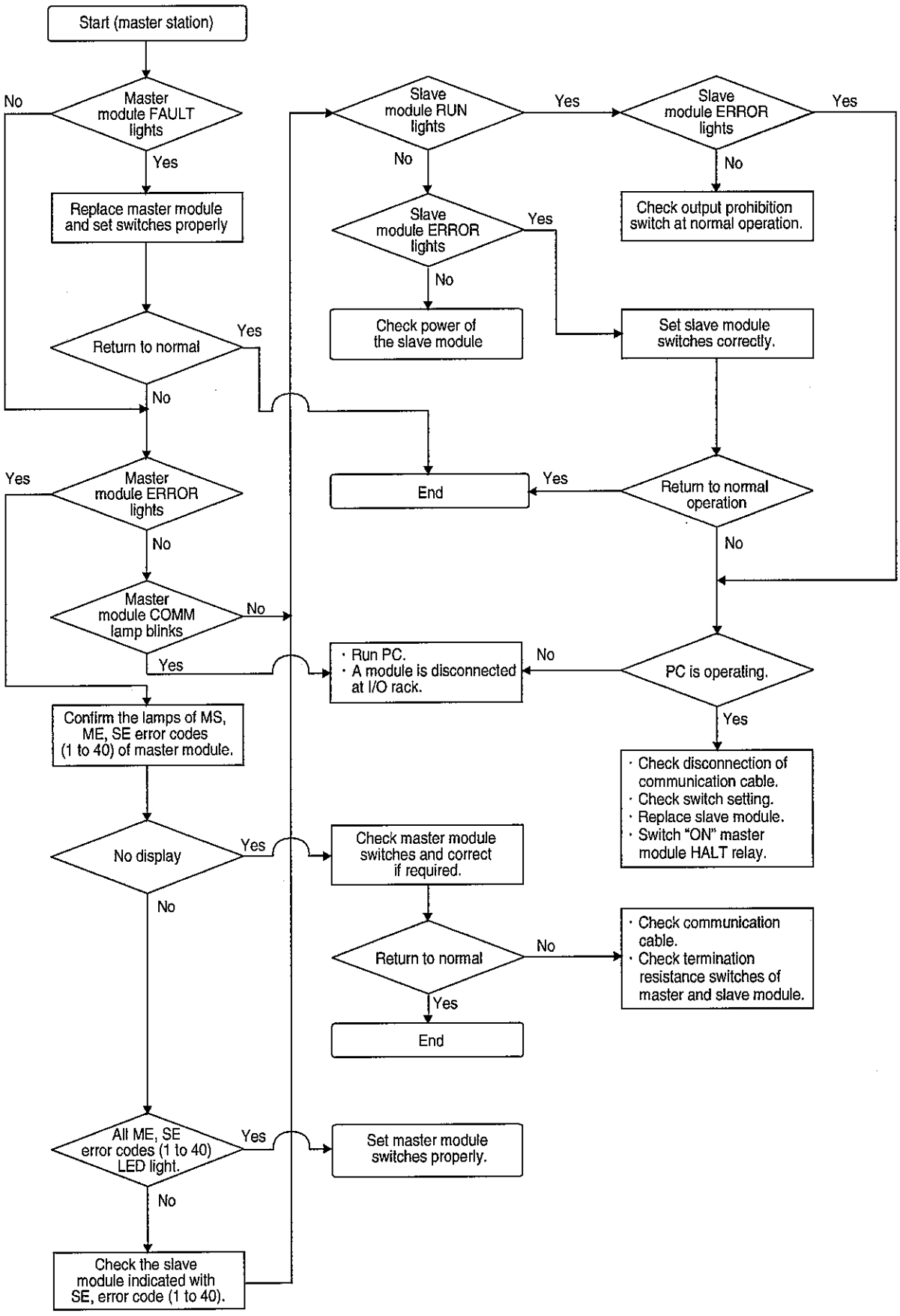
Appendix 2. Check Flow



A2

Appendix 3. Address Allocation Table of an I/O Link Slave Module

I/O link relay (8)	Used slave module
00	Status
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I/O link relay (8)	Used slave module
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SHARP

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