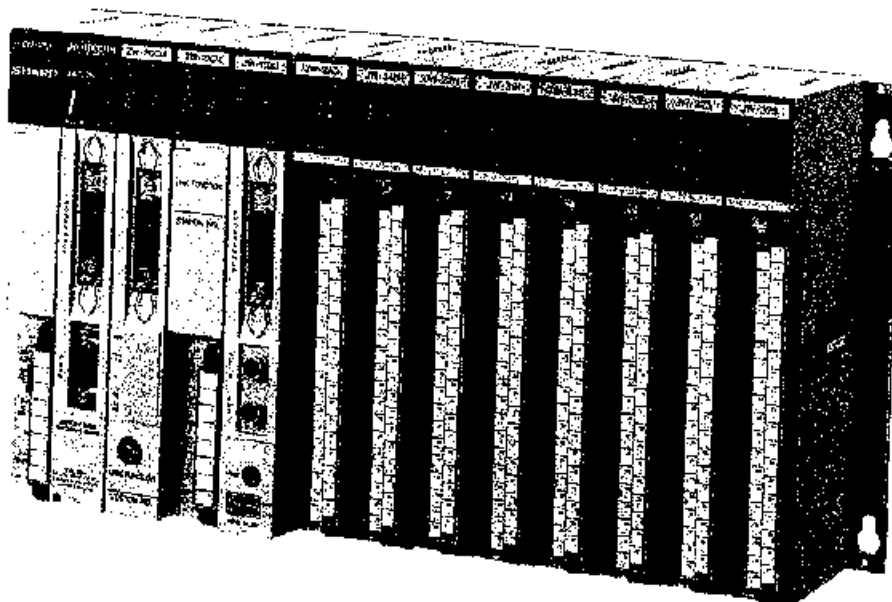# SHARP

## Programmable controller

## *New Satellite* **J**W

Model name

# *JW50H/70H/100H*

## User's Manual/Hardware version

We thank you for your purchase of the SHARP programmable controller new satellite JW50H/70H/100H.

This booklet (user's manual, hardware version) explains mainly the JW30H's hardware; the system configuration, specifications, installation method etc.

Carefully read this user's manual, hardware version and the JW50H/70H/100H instruction manual attached to the system module of JW50H/70H/100H so that you are able to operate JW50H/70H/100H properly, having thoroughly familiarized yourself with the functions of the system module and their operation method.

Keep this user's manual, hardware version with you together with the JW50H/70H/100H instructions manual.
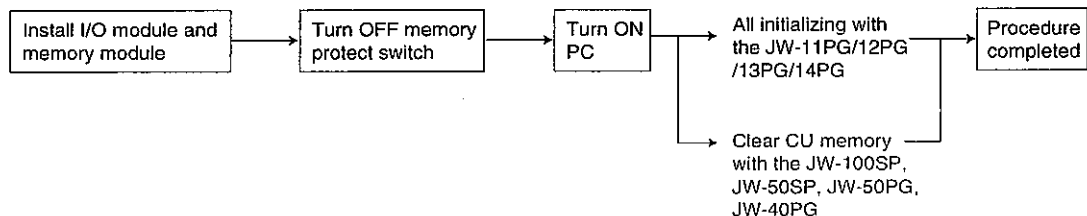
We are confident that these booklets will be helpful whenever you face problem.

Please refer to the programming manual ladder instruction version or programming manual.
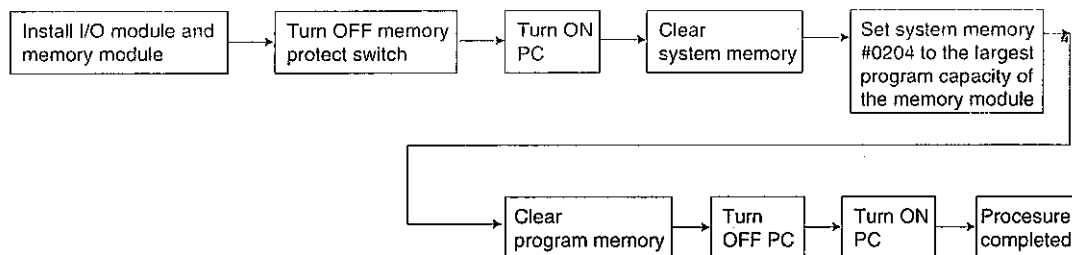
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**Note**

When first powering up the JW50H/70H/100H, be sure to use a support tool and follow the procedures below to clear the system memory and program memory, and to perform auto I/O module registration of the relay numbers of the I/O module.

- To use the high speed compatible JW-11PG, JW-12PG/13PG/14PG, JW-100SP, JW-50SP, JW-40PG, and JW-50PG as support tool.

| Install I/O module and memory module | → | Turn OFF memory protect switch | → | Turn ON PC | → | All initializing with the JW-11PG/12PG/13PG/14PG | → | Procedure completed |

    → Clear CU memory with the JW-100SP, JW-50SP, JW-50PG, JW-40PG

- To use the high speed non-compatible JW-10PG/11PG, JW-30PG/32PG, ZW-101PG1, ZW-100LP2S as support tool.

| Install I/O module and memory module | → | Turn OFF memory protect switch | → | Turn ON PC | → | Clear system memory | → | Set system memory #0204 to the largest program capacity of the memory module |

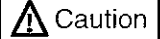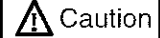| Clear program memory | → | Turn OFF PC | → | Turn ON PC | → | Procesure completed |

---

**Note**

- This module is made in accordance with Japanese domestic specifications. Its guarantee clauses are described in a separate guarantee card (packed together with the module). When this module is used outside Japan, these guarantee clauses are not applicable. In addition, the guarantee should be understood as a guarantee of the delivered product as a single unit and every other damages or losses due to damage or malfunction of the product will not be included in this guarantee.
- Should you have any questions and inquiries, please feel free to contact our dealers.
- The whole or partial photocopy of this booklet is prohibited.
- Contents of this booklet may be revised for improvement without notice.

Read this manual and attached documents carefully before installation, operation, maintenance and checking in order to use the machine correctly. Understand all of the machine knowledge, safety information, and cautions before starting to use. In this instruction manual, safety precautions are ranked into "danger" and "caution" as follows.

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

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

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

The picture signs of Prohibit and Compel are explained below.

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

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

## 1) Installation

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

## 2) Wiring

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

| ⚠ Caution |
|---|
| • Connect the rated power source. Connection of a wrong power source may cause a fire. <br> • Wiring should be done by qualified electrician. Wrong wiring may lead to fire, trouble or electric shock. |

## 3) Use

| ⬦ Danger |
|---|
| • Don't touch the terminal while the power is being supplied or you may have on electric shock.<br>• Assemble the emergency stop circuit and interlock circuit outside of the programmable controller. Otherwise breakdown or accident damage of the machine may be caused by the trouble of the programmable controller. |

| ⚠ Caution |
|---|
| • "Run" or "stop" during operation should be done with particular care by confirming safety. Misoperation may lead to damage or accident of the machine.<br>• Turn ON the power source in the specified sequence. Turn ON with wrong sequence may lead to machine breakdown or accident. |

## 4) Maintenance

| ⬦ Danger |
|---|
| • Never connect battery in wrong polarity, or charge, disassemble, heat, throw into fire, or short-circuit. Or it may be broken or ignited.<br>• Do not subject the battery to impact of any kind. Do not pull on the lead wires of the battery, or liquid leakage accident may occur. |

| 🚫 Prohibit |
|---|
| • Don't disassemble or modify the modules.<br>Or fire, breakdown or malfunction may be caused. |

| ⚠ Caution |
|---|
| • Turn OFF the power source before detaching or attaching the module.<br>Or electric shock, malfunction or breakdown may be caused.<br>• Replace with the fuses in specified ratings only.<br>Or fire, breakdown may be caused. |

This manual covers systems of JW50/70/100.

- The difference between the JW50/70/100 and JW50H/70H/100H is the control module used in the system.

| | Control module in use |
|---|---|
| JW50 | JW-50CU |
| JW70 | JW-70CU |
| JW100 | JW-100CU |
| JW50H | JW-50CUH |
| JW70H | JW-70CUH |
| JW100H | JW-100CUH |

- Compared to the JW50/70/100, functions ① to ⑨ shown below have been enhanced or added in the JW50H/70H/100H.

| Function | See page |
|---|---|
| ①Faster processing speed | 4-13 |
| ②Additional application instructions | 4-13 |
| ③Increased number of timers and counters | 4-14 |
| ④Additional memory modules | 4-20 |
| ⑤Enhanced memory protect switch function | 4-10 |
| ⑥Additional ROM operation mode | 7-1 |
| ⑦Simplified activate operation | Previous page |
| ⑧Improved communication port | 4-103 to 107 |
| ⑨H-series compatibility for support tools | 10-1 |

- See the programming manual for details on the processing speed and application instructions etc.

**Note**

- The additional functions of the JW50H/70H/100H(compared with JW50/70/100) are not available if they are used together with the communication modules listed below and the computer link and remote programming and monitoring are used.

**[Communication modules]**
ZW-20CM, ZW-20RS, ZW-10CM, ZW-20CM2,
ZW-30CM, ZW-98CM (version 3.0 or less), ZW-20AX(version 1.0)

**[Additional functions]**
1. If the memory protect switch is ON, the mode change(run/halt, etc.) of the PC is disabled.
2. Expanded timers and counters (1000 to 1777: 512 points)
3. Additional application instructions
   Fx ○○ :Hexadecimal constant arithmetic
   F-22 to 29, F-34 to 38, F-67 to 69
   F-260/Fc-260, F-261/Fc261

# Table of contents

# Chapter 1. Overview

This manual describes the specifications and operation of the individual functional components of the new satellite series JW50/70/100, JW50H/70H/100H.

As the nucleus of a new generation of flexible automation systems, the PC provides enhanced features and speed in data communications, information processing, and system maintenance.

## ■ Features

### 1. Faster processing speed, increased number of timers and counters and enhanced application instructions

Compared to the JW50/70/100, the JW50H/70H/100H features the following enhanced functions.

- 50% increase in processing speed
- Increase from 512 timers and counters to 1024
- Expansion from 116 application instructions to 157

### 2. Enhanced data processing capability

- Data width has been increased to 8/16/32 bits.
- Data retrieve, replace, insert, delete, ASCII conversion, and other data manipulation instruction have been enhanced.
- In addition to the existing general I/O refresh instruction, another features, these instructions allow increased processing throughput.

### 3. Enhanced communication features

- The enhanced satellite net capabilities have enabled the PC to start up a communication sequence with a dedicated send/receive instruction.
- Equipped with a SUMINET(note) interface, an optical local area network.
- The satellite I/O link allows the PC to be connected to scattered factory automation devices through a single twisted-pair cable to each device. This significantly reduces field cabling manpower requirements and installation overhead.

### 4. Enhanced I/O bus

- Data is transferred between the PC and spacial I/O module during the I/O refresh. This eliminates the need for a separate data transfer program.
- There is no restriction on device address allocations to I/O modules, provided they are used in separate cages.
- The I/O bus extension adapter allows an expansion rack panel to be situated up to 50m from the PC rack panel, enabling real-time remote I/O operation. Since a programming terminal can be connected to the expansion rack panel, the program can be monitored in the field, where the expansion rack panel is installed.
- The enhanced diagnostic features include input data parity check, output data check, installed module check, and others.

### 5. Reduced burn-in overhead

- Remote monitoring and processing are allowed across networks with different hierarchical levels.
- Extensive debugging features available include: sampling trace, break monitor, step-by-step execution, forced I/O ON/OFF control, and others.
- On an error condition, the system automatically registers the error code, time and data.
- A support tool allows replacement of any I/O module, with the exception of special I/O modules, with the system power left turned ON.
- I/O indicators allow the I/O modules' device addresses to be checked at a glance.

(Note) SUMINET is a trademark of Sumitomo Electric Industry Co., Ltd.

When handling or operating the PC, keep th following precautions is mind:

■ **Installation**

Avoid keeping the PC in the following conditions:
* Direct sunlight or temperature extremes outside the range of 0 to 55 degrees.
* Relative humidity which exceeds 35 to 90 %. No condensation due to rapid temperature variation.
* Corrosive and flammable gases.
* Vibration or hard jolts.

■ **Grounding**
* Prepare a class-3 grounding of the PC separately. Never co-ground with high power equipment grounding lines (see page 6-1).

■ **Module Installation**
* Securely fasten the retaining screws in each module.
* Firmly connect cable (I/O expansion cable), connecting to the basic/expansion rack panel. Confirm connectors are fastened prior to supplying power. Looseness may cause malfunction.
* Each module has a ventilation hole to allow for cooling. Do not block the holes.

■ **Wiring**
* Take special care to avoid cross connection of the 5VDC and 24VDC supplies to the basic rack panel to an expansion rack panel or expansion rack panels to each other. Looseness of screws may cause malfunction.
* Keep the input/output lines away from high voltage or strong current lines such as power lines.

■ **Cautions for static electricity**
* Significant volume of static electricity may build up on the human body in extremely dry conditions. Prior to touching the module, discharge the static electricity by touching grounded metals.

■ **Cleaning**
* Use the soft cloths for cleaning. Volatile solvents (alcohol, paint thinner, freon etc.) and wet rags may cause deformation or change of color.

■ **Storage**
* Keep the control module in cool and dry conditions as it equipped with a battery for memory backup.High ambient temperature may shorten its battery life.

■ **Other precautions**
* Use separate relay logic for the emergency stop control. The relay logic should include a circuit which will shut off the PC output in an emergency.
* Do not apply excessive operating stress to switches and connectors.
* The following table lists the maximum number of input/output relay contacts, program memory capacity, and file memory capacity available:

| Model | Max. No. of I/O points | Program memory capacity | File memory capacity |
|---|---|---|---|
| JW50, JW50H | 512 | 7.5K words | 16K words |
| JW70, JW70H | 1024 | | |
| JW100, JW100H | 4096 (using JW-I/O) 2048 (using ZW-I/O) | 63K words max.(note) | 448K bytes max.(note) |

(Note) Optional memory module are available for the JW70/100, JW70H/100H. For more details, see page 4-20.

• Never attempt o install or remove a control module, option module, or I/O module with the system power ON. Permanent damage to on-board memories or other circuit devices may result.

Note A support tool placed in the "Live I/O replace" mode allows you to replace an I/O module with the system power left turned ON. For more details, see page 9-3.

• The PC's watchdog timer is set to an interval of 320ms. If the scan time exceeds this interval, the halt output contacts will be opened. (For details on scan time, see the progamming manual 2-7[3](9), "Scan time").

• The type of I/O modules used must be specified in the control module using the DIP switches (see page 4-2). Either JW-I/O or ZW-I/O modules may be used with the control module.
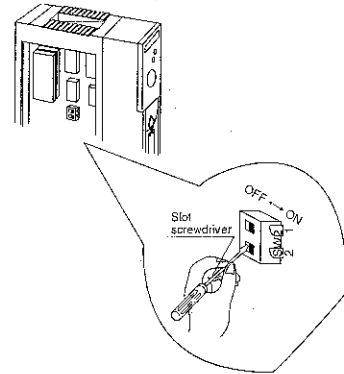
Table of switch setting (in case of JW-50CU/70CU/100CU)

|  | ZW-I/O | | JW-I/O |
|---|---|---|---|
|  | All OFF | Output hold | Output hold |
| SW2-1 | OFF | ON | ON |
| SW2-2 | OFF | OFF | ON |

JW-I/O: I/O module dedicated to JW50H/70H/100H
ZW-I/O: I/O module designed for use in conventional W51, W70H, and W100

## ■ At initial power ON

• When first powering up the PC, the contents of the momory module installed in the PC are underfined and the I/O installation configuration is not stored in the system memory.
Use a support tool to clear the system memory and progam memory and to perform auto I/O registration of the relay numbers for the I/O module. Refer to the page following the table of contents for the procedure.

## ■ Installing the module

Do not force and bend the pin when installing the module to the connector at the rack panel.

Module

Rack panel
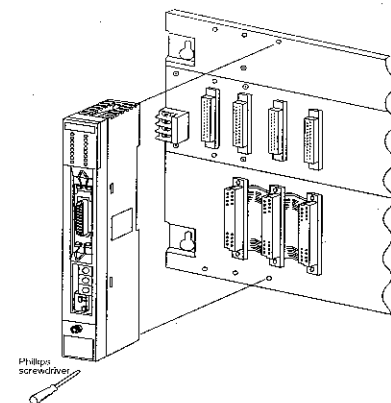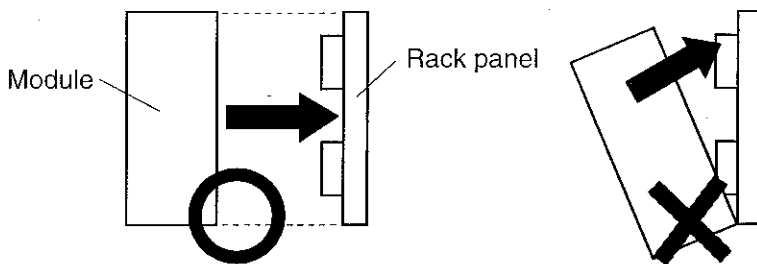
## ■ When AC power is used

Connect the INPUT terminal of power supply module JW-1PU pay attention to LIVE terminal (non-grounding) and NEUTRAL terminal (grounding).

POWER INPUT 100 to 240 VAC

N
L

4 — NEUTRAL terminal
5 — LIVE terminal
6

Input terminal block of JW-1PU
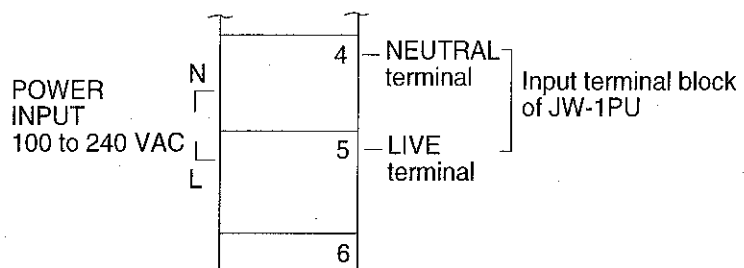
## 3-1 System design procedure

The system design procedure is virtually as the same as those of the other conventional relay controllers. The following is an example of the system design procedure of the PC. The following shows a sample design sequence for a system including the PC.

```
                    (    Start    )
                          │
                          ▼
                 ┌─────────────────┐
                 │  System design  │──── Spcify memory capacity, the member of input and
                 └─────────────────┘     output modules, etc.
                          │
                          ▼
              ┌──────────────────────┐
              │ Preparation of operation │
              │      flow chart      │
              └──────────────────────┘
                          │
                          ▼
                 ┌──────────────────┐
                 │ Address allocation │──── With JW-I/O modules, the auto I/O registration mode
                 └──────────────────┘      or the manual I/O registration mode may be used.
              │                             With ZW-I/O modules, the sequential address system
              │                   │         is used (see page 4-43).
              ▼                   ▼
┌──────────────────────┐   ┌──────────────┐
│ Individual operation check │   │ Ladder design │
│    of each module    │   └──────────────┘
└──────────────────────┘          │
              │                   ▼
              ▼          ┌──────────────┐
  ┌──────────────────┐   │ Programming  │
  │ Wiring input/output │   └──────────────┘
  │  device with PC  │          │
  └──────────────────┘          │
              │                   ▼
              │          ┌──────────────┐
              └─────────▶│  Debugging   │        ┌────────────────┐
                         └──────────────┘        │ Revise program │
                                │                └────────────────┘
                                ▼            NG          ▲
                         < Trial operation >─────────────┘
                                │ OK
                                ▼
                    ┌──────────────────────┐
                    │     Save program     │──── Save program to floppy disk,
                    │ Revising ladder diagram │     or PROM.
                    └──────────────────────┘
                                │
                                ▼
                         ┌──────────────┐
                         │     Run      │
                         └──────────────┘
```

# 3-2 Cautions on system design

A principle difference between a programmable controller (PC) and a conventional relay circuit is that a PC controls each operation cyclically (in series), whereas relay circuit controls it in parallel.
Therefore, relay circuits limit the effect of an abnormal operation to a block.
However, a PC allows abnormal operations of the whole system when an abnormal condition occur.
In order to create a fail-safe system, we recommend preparing independent external protective circuits for following functions, which may cause a breakdown of machine or injury to workers:

- Emergency stop circuit,
- Protection circuit,
- Operating circuit of high voltage device.

Also, be aware of the operation response time, as a PC operates using cyclic processing.
To prevent mis-operation due to output signal of the output module soon after switching on power to the PC, connect in series the halt output for the PC in the following operation stand-by circuit. (The shutoff circuit will open its gate approximately 1 second after the PC is turned ON.

**[ In case of using AC power supply ]**



- Connecting the input module and output module for lighting lamps in front of emergency stop circuit makes it possible to grasp the stop condition of devices.

- When the PC stops its operation, all the output module indicate ON/OFF condition just before stopping.
  Note: When setting an output holding address in the system memory, all the output after the setting address is retained and you can reset the previously set address.
  (only available when power is supplied to the PC.)

- Halt output (triac output 100/200 VAC, 0.5A)

- Interlock circuit
  Prepare external interlock circuit to prevent reverse operation, damage of machines and injury of workers.
  Note: When DC output module is used as a output module, use AC relay and install its contact in the emergency stop circuit.

## [ In case of using DC power supply ] *Note 1
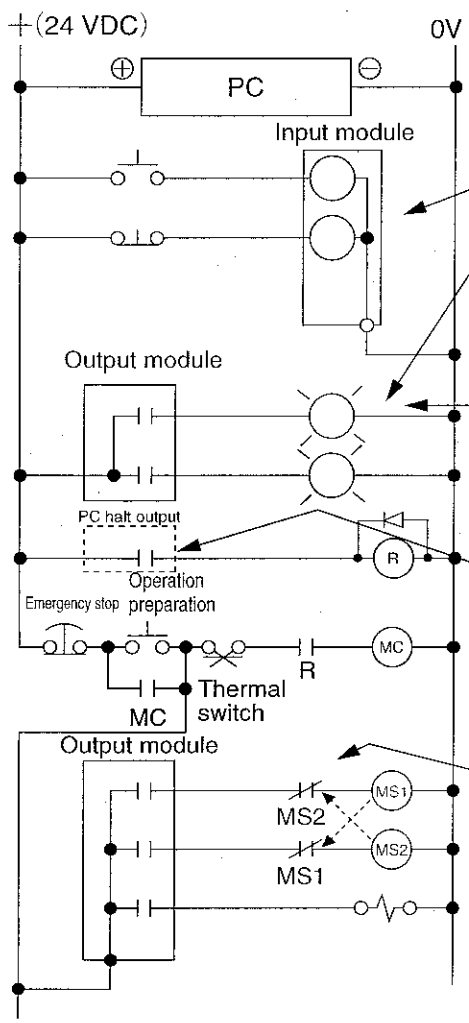


- Connecting an input module and output module for lighting lamps in front of emergency stop circuit makes it possible to grasp the stop condition of devices.

- When the PC stops its operation, all the output module indicate ON/OFF condition just before stopping.

  Note: When setting an output holding address in the system memory, all the output after the setting address is retained and you can reset the previously set address.
  (only available when power is supplied to the PC.)

- Halt output (transistor rated at 24VDC, 0.5A) (Note 1). Use this output to drive an external relay, and insert the relay contacts into the emergency stop circuit in series.

- Interlock circuit
  Prepare external interlock circuit to prevent reverse operation, damage to machines and injury of workers.

*Note 1: The JW-2PU power supply module is used.

# 3-3 System configuration

## [1] Basic system configuration using JW-I/O modules



| Module | Model |
|---|---|
| (JW-4BU) (JW-6BU) (JW-8BU) (JW-13BU) | Rack panel |
| (ZW-1MA) (ZW-2MA) (ZW-3MA) (ZW-4MA) | Memory module |
| (JW-70CU) (JW-100CU) | Control module |
| (JW-50CU) | Control module |
| (JW-1MAH) (JW-2MAH) (JW-3MAH) (JW-4MAH) | Memory module |
| (JW-70CUH) (JW-100CUH) | Control module |
| (JW-50CUH) | Control module |
| (JW-10PG/11PG) (JW-12PG/13PG) (JW-14PG) | Hand-held programmer |
| (JW-30PG/32PG) (JW-40PG) (JW-50PG) | Multipurpose programmer |
| (JW-50SP) (JW-100SP) | Ladder software |
| | Personal computer (IBM PC) |
| (Z-100LP2S) | Ladder processor II |
| (JW-1PU) (JW-2PU) | Power supply module |

I/O bus extension adapter (JW-2EA)

Option cables
(ZW-2CC)
(ZW-4CC)
(ZW-6CC)

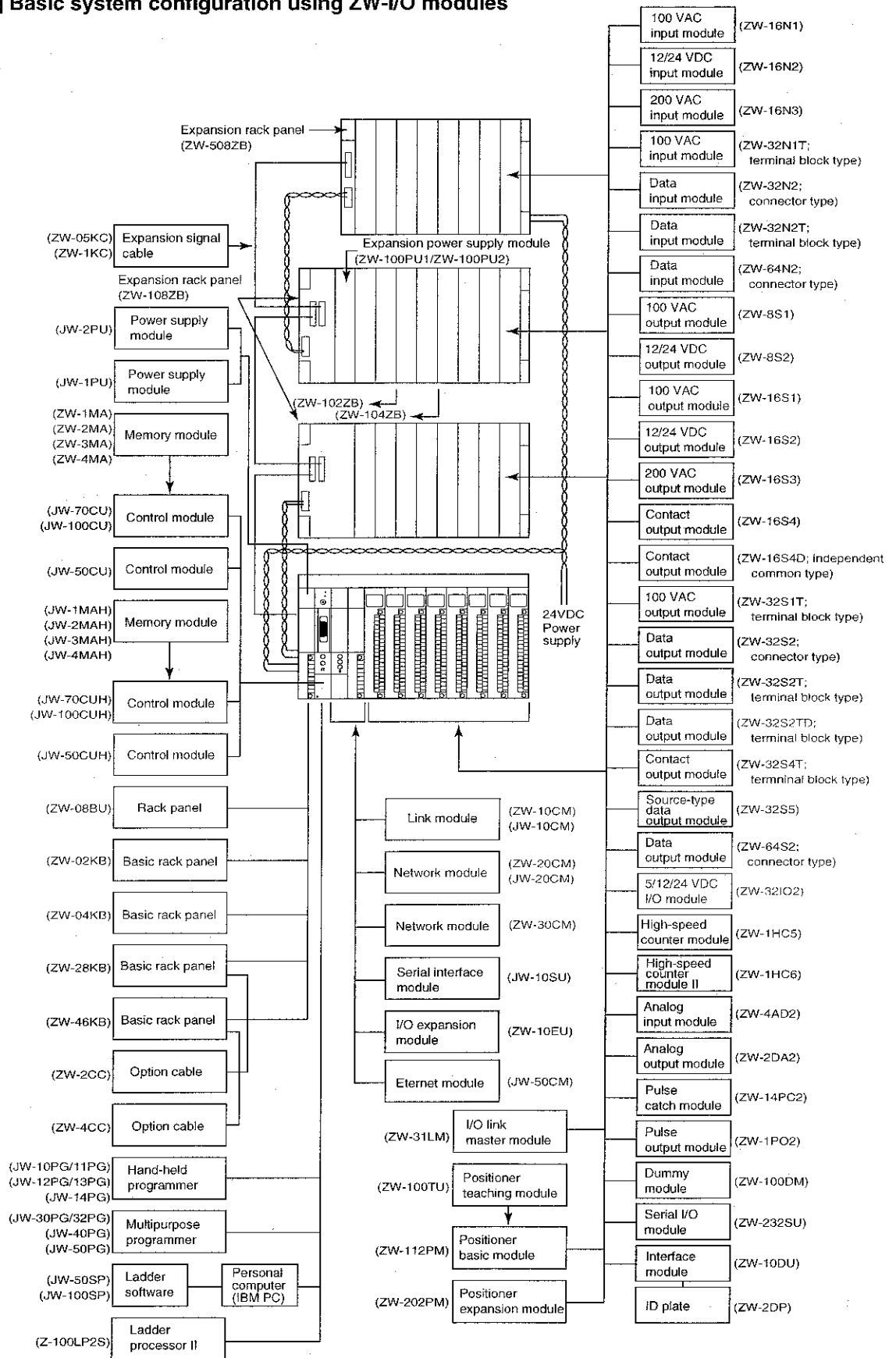| | Module | Model |
|---|---|---|
| (ZW-10CM) (JW-10CM) | Link module | |
| (ZW-20CM) (JW-20CM) | Network module | |
| (ZW-30CM) | Network module | |
| (JW-10SU) | Serial interface module | |
| (ZW-20CM2) (JW-20MN) | ME-NET module | |
| (JW-50CM) | Ethernet module | |

| | Module | Model |
|---|---|---|
| I/O expansion cable | (JW-05KC) (JW-1KC) |
| I/O expansion cable | (JW-05EC) (JW-1EC) (JW-3EC) (JW-10EC) (JW-20EC) (JW-30EC) (JW-50EC) |
| I/O bus extension adapter | (JW-1EA) |
| 100 VAC input module | (JW-11N) |
| 12/24 VDC/24 VAC input module | (JW-12N) |
| 200 VAC input module | (JW-13N) |
| 100 VAC input module | (JW-31N) |
| 12/24 VDC/24 VAC input module | (JW-32N) |
| 12/24 VDC input module | (JW-34N) (JW-34NC) (JW-64NC) |
| 5/12/24 VDC output module | (JW-12S) |
| 100/200 VDC output module | (JW-13S) |
| 12/24 VDC output module | (JW-35S) |
| 5/12/24 VDC output module | (JW-32S) (JW-32SC) (JW-64SC) |
| 100/200 VAC output module | (JW-33S) |
| Relay output module | (JW-34S) |
| Analog input module | (JW-8AD) |
| Analog output module | (JW-2DA) |
| High-speed counter module | (JW-2HC) |
| I/O link master module | (JW-31LM) (JW-31LMH) |
| ID control module | (JW-11DU) (JW-12DU) |
| Positioner teaching module | (JW-10TU) |
| Positioner basic module | (JW-12PM) |
| Positioner expansion module | (JW-22PM) |
| Pulse output module | (JW-12PS) (JW-14PS) |

Note 1: For DC output modules and contact output modules, use commercial DC power supplies to drive their output devices or splenoid coils.

Note 2: See page 10-1 to confirm the applicable support tool for each control module.

## [2] Basic system configuration using ZW-I/O modules



Expansion rack panel (ZW-508ZB)

(ZW-05KC) (ZW-1KC) — Expansion signal cable

Expansion rack panel (ZW-108ZB)

Expansion power supply module (ZW-100PU1/ZW-100PU2)

(ZW-102ZB) / (ZW-104ZB)

(JW-2PU) — Power supply module
(JW-1PU) — Power supply module
(ZW-1MA) (ZW-2MA) (ZW-3MA) (ZW-4MA) — Memory module
(JW-70CU) (JW-100CU) — Control module
(JW-50CU) — Control module
(JW-1MAH) (JW-2MAH) (JW-3MAH) (JW-4MAH) — Memory module
(JW-70CUH) (JW-100CUH) — Control module
(JW-50CUH) — Control module

24VDC Power supply

(ZW-08BU) — Rack panel
(ZW-02KB) — Basic rack panel
(ZW-04KB) — Basic rack panel
(ZW-28KB) — Basic rack panel
(ZW-46KB) — Basic rack panel
(ZW-2CC) — Option cable
(ZW-4CC) — Option cable
(JW-10PG/11PG) (JW-12PG/13PG) (JW-14PG) — Hand-held programmer
(JW-30PG/32PG) (JW-40PG) (JW-50PG) — Multipurpose programmer
(JW-50SP) (JW-100SP) — Ladder software
Personal computer (IBM PC)
(Z-100LP2S) — Ladder processor II

Link module (ZW-10CM) (JW-10CM)
Network module (ZW-20CM) (JW-20CM)
Network module (ZW-30CM)
Serial interface module (JW-10SU)
I/O expansion module (ZW-10EU)
Eternet module (JW-50CM)

(ZW-31LM) — I/O link master module
(ZW-100TU) — Positioner teaching module
(ZW-112PM) — Positioner basic module
(ZW-202PM) — Positioner expansion module

100 VAC input module (ZW-16N1)
12/24 VDC input module (ZW-16N2)
200 VAC input module (ZW-16N3)
100 VAC input module (ZW-32N1T; terminal block type)
Data input module (ZW-32N2; connector type)
Data input module (ZW-32N2T; terminal block type)
Data input module (ZW-64N2; connector type)
100 VAC output module (ZW-8S1)
12/24 VDC output module (ZW-8S2)
100 VAC output module (ZW-16S1)
12/24 VDC output module (ZW-16S2)
200 VAC output module (ZW-16S3)
Contact output module (ZW-16S4)
Contact output module (ZW-16S4D; independent common type)
100 VAC output module (ZW-32S1T; terminal block type)
Data output module (ZW-32S2; connector type)
Data output module (ZW-32S2T; terminal block type)
Data output module (ZW-32S2TD; terminal block type)
Contact output module (ZW-32S4T; termninal block type)
Source-type data output module (ZW-32S5)
Data output module (ZW-64S2; connector type)
5/12/24 VDC I/O module (ZW-32IO2)
High-speed counter module (ZW-1HC5)
High-speed counter module II (ZW-1HC6)
Analog input module (ZW-4AD2)
Analog output module (ZW-2DA2)
Pulse catch module (ZW-14PC2)
Pulse output module (ZW-1PO2)
Dummy module (ZW-100DM)
Serial I/O module (ZW-232SU)
Interface module (ZW-10DU)
iD plate (ZW-2DP)

Note 1: The ZW-100PU1 and ZW-100PU2 expansion power supply modules have difference capacities. Use them within their respective current capacities.

Note 2: For DC output modules and contact output modules, use commercial DC power supplies to drive their output devices or solenoid coils.

Note 3: See page 10-1 to confirm the applicable support tool for each control module.

# [3] System configuration using network and link modules
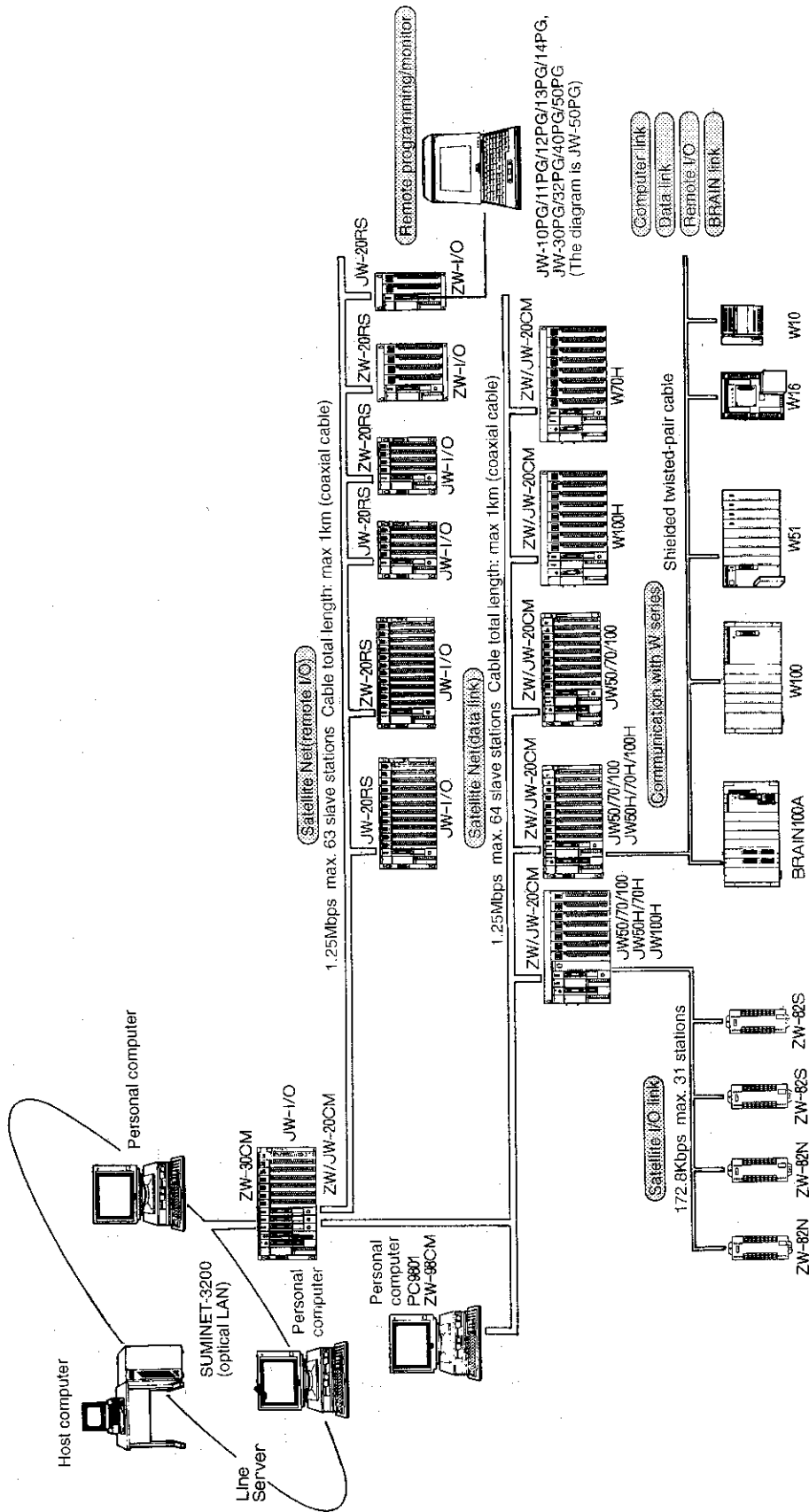
## 3-4 Table of module

### [1] JW series modules

| Module name | Model name | Outline | Accessories | | Appropriate to UL/CSA standard |
|---|---|---|---|---|---|
| | | | Item | Quality | |
| Control module | JW-50CU | CPU Max. I/O points:512 Program ROM capacity: 7.5K words (standard) | Battery-less connector Memory protect key | 1 2 | |
| | JW-50CUH | Battery-less operation possible using program ROM(at ROM operating). | | | ○ |
| | JW-70CU | CPU Max. I/O points:1024 Program ROM capacity: 63K words | Battery-less connector Memory protect key Dsub connector (15-pin male) | 1 2 1 | |
| | JW-70CUH | Battery-less operation possible using program ROM(at ROM operating). | | | ○ |
| | JW-100CU | CPU Max. I/O points:4096 Program ROM capacity: 63K words | Ditto | Ditto | |
| | JW-100CUH | Battery-less operation possible using program ROM(at ROM operating). | | | ○ |
| Memory module | ZW-1MA | Program memory: 7.5K words | Retention screws | 3 | |
| | JW-1MAH | File register: 16K bytes | Retention screws | 2 | ○ |
| | ZW-2MA | Program memory: 15.5K words | Retention screws | 3 | |
| | JW-2MAH | File register: 64K bytes | | | ○ |
| | ZW-3MA | Program memory: 31.5K words | Retention screws | 3 | |
| | JW-3MAH | File register: 128K bytes | Retention screws | 2 | ○ |
| | ZW-4MA | Program memory: 63K words | Retention screws | 3 | |
| | JW-4MAH | File register: 448K bytes | Retention screws | 3 | ○ |
| Rack panel | JW-4BU | Can be installed the control module, power supply module, and I/O module: up to 4 modules | Side plate for I/O module | 1 | ○ |
| | | | Connector cover | 2 | |
| | JW-6BU | Can be installed the control module, power supply module, and I/O module: up to 6 modules | Side plate for I/O module | 1 | ○ |
| | JW-8BU | Can be installed the control module, power supply module, and I/O module: up to 8 modules | Side plate for I/O module | 1 | ○ |
| | | | Connector cover | 6 | |
| | JW-13BU | Can be installed the control module, power supply module, and I/O module: up to 13 modules | Side plate for I/O module | 1 | ○ |
| Power supply module | JW-1PU | 100/200 VAC input, 5 VDC, 7A output | Fuse (250V, 1A) | 1 | ○ |
| | JW-2PU | 24 VDC input, 5 VDC, 5A output | Fuse (250V, 1A) | 1 | |

| Module name | Model name | Outline | Accessories | | Appropriate to UL/CSA standard |
|---|---|---|---|---|---|
| | | | Item | Quality | |
| I/O bus expansion adapter | JW-1EA | For rack panel of basic part | Termination connector | 2 | ○ |
| | JW-2EA | For rack panel of expansion part | | | ○ |
| Input module | JW-11N | Input 16 points for 12/24 VAC | | | ○ |
| | JW-12N | Input 16 points for 12/24 VDC, 24 VAC | | | ○ |
| | JW-13N | Input 16 points for 200 VAC | | | ○ |
| | JW-31N | Input 32 points for 100 VAC | | | ○ |
| | JW-32N | Input 32 points for 12/24 VDC, 24 VAC | | | ○ |
| | JW-34N | Input 32 points for 12/24 VDC | | | ○ |
| | JW-34N | Input 32 points for 12/24 VDC | | | ○ |
| | JW-34NC | Input 32 points for 12/24 VDC, connector type | Connector | 1 | ○ |
| | JW-64NC | Input 64 points for 12/24 VDC, connector type | Connector | 2 | ○ |
| Output module | JW-12S | 5/12/24 VDC, 1A, sink output, 16 points | Mini-fuse (125V, 8A) | 1 | ○ |
| | JW-13S | 100/200 VAC, 2A, SSR output, 16 points | Mini-fuse (125V, 8A) | 1 | ○ |
| | JW-32S | 5/12/24 VDC, 1A, sink output, 32 points | Mini-fuse (125V, 8A) | 1 | ○ |
| | JW-33S | 100/200 VAC, 1A, SSR output, 32 points | Mini-fuse (250V, 4A) | 1 | ○ |
| | JW-34S | 100/200 VAC, 5/12/24 VDC 2A, relay contact output | | | ○ |
| | JW-35S | 12/24 VDC 1A, source output, 32 points | Mini-fuse (125V, 8A) | 1 | ○ |
| | JW-32SC | 5/12/24 VDC 0.3A sink output, 32 points, connector type | Connector | 1 | ○ |
| | JW-62SC | 5/12/24 VDC 0.1A sink output, 64 points, connector type | Connector | 2 | ○ |

| Module name | | Model name | Outline | | Accessories | | Appropriate to UL/CSA standard |
|---|---|---|---|---|---|---|---|
| | | | | | Item | Quality | |
| Special module | High speed counter module | JW-2HC | 50 kpps(90 degrees phase signal) Binary 24 bits 2 channels/module | | | | ○ |
| | Analog input module | JW-8AD | Input rating: 0 to ±20mADC or 0 to 10 VDC 2 channels/module | | | | ○ |
| | Analog output module | JW-2DA | Output rating: 0 to ±20mADC or 0 to 10 VDC 2 channels/module | | | | ○ |
| | I/O link master module | JW-31LM | Max. 32 stations (No. of link stations) | | | | |
| | | JW-31LMH | Max. 504 points (No. of link points) | | | | |
| | ID control module | JW-11DU | Microwave/optical system ID antenna: 2 channels | | | | |
| | | JW-12DU | | | | | |
| | Positioning basic module | JW-12PM | Control axis:4 CP, PTP control system X axis, Y axis deviation counter | | Connector | 1 | |
| | Positioning expansion module | JW-22PM | Z axis, A axis deviation counter | | Connector | 2 | |
| | Pulse output module | JW-12PS | Positioning control (close droop control, sigmoid adjustable-speed etc.) | 2 axes control (X,Y) | 50P connector | 1 | |
| | | JW-14PS | | 4 axes control (X,Y, Z, A) | 50P connector | 2 | |
| Option module | Link module | ZW-10CM | Remote I/O master station function Data link DL1 funtion Data link DL9 funtion Computer link (command mode) function | | Set label | 1 | |
| | | JW-10CM | Computer link (character string output mode) function BRAIN link function | | | | ○ |
| | Network module | ZW-20CM | Remote I/O master station function | | Set label | 1 | |
| | | JW-20CM | Computer link function | | | | ○ |
| | | ZW-30CM | SUMINET-3200 optical LAN interface | | | | |
| | ME-NET module | ZW-20CM2 | Network between different maker's every devices | | | | |
| | | JW-20MN | | | | | ○ |
| | Remote I/O slave module | ZW-20RS | No. of remote I/O points Fixed allocation: max. 128 points/station | | Set label | 1 | |
| | | JW-20RS | Manual allocation: 8 to 1024 points/station | | | | ○ |

| Module name | | Model name | Outline | Accessories | | Appropriate to UL/CSA standard |
|---|---|---|---|---|---|---|
| | | | | Item | Quality | |
| Option module | Serial interface module | JW-10SU | EIA RS232C/RS422 2 channels/module half duplex/ full duplex | Connector(15P, 25P) | 1 in each | ○ |
| | Ethernet module | JW-50CM | For Ethernet, 10M bits/s, protocol: TCP/IP or UDP/IP | | | |
| Option cable | | ZW-2CC | For 2 option modules (with 1 connector cover) | Installation screws (M2.6×6) | 6 | |
| | | ZW-4CC | For 4 option modules (with 3 connector covers) | Installation screws (M2.6×6) | 10 | |
| | | ZW-6CC | For 6 option modules (with 5 connector covers) | Installation screws (M2.6×6) | 14 | |
| I/O expansion cable | | JW-05KC | Signal cable for expansion: 50cm | 5 VDC cable(50cm) Installation screws M4×8 | 1 2 | |
| | | JW-1KC | Signal cable for expansion: 1m | 5 VDC cable(1m) Installation screws M4×8 | 1 2 | |
| | | JW-05EC | Signal cable for EA: 50cm | 5 VDC cable(50cm) | 1 | |
| | | JW-1EC | Signal cable for EA: 1m | 5 VDC cable(1m) | 1 | |
| | | JW-3EC | Signal cable for EA: 3m | | | |
| | | JW-10EC | Signal cable for EA: 10m | | | |
| | | JW-20EC | Signal cable for EA: 20m | | | |
| | | JW-30EC | Signal cable for EA: 30m | | | |
| | | JW-50EC | Signal cable for EA: 50m | | | |
| Control module interconnect cable | | ZW-3KC | For support tool(3m) | | | |
| Support tools | Hand-held programmer | JW-10PG *Note 1 JW-11PG *Note 2 JW-12PG JW-13PG *Note 3 JW-14PG | LCD dot matrix Display language programmer | Locking spring Mounting bracket Bracket retention screws(M3×6) | 2 1 1 | |
| | Multi-purpose progammer | JW-30PG (with EL back light) JW-32PG *Note 1 | LCD display (640×480) Built in 2 sets of 3.5" floppy disk drive | AC adapter AC adapter cable Standard software Control module interface cable Printer interface cable List of service facilities | 1 1 5 1 1 1 | |
| | | JW-40PG *Note 3 | 16 gradation EL display (640×480 dot) Built in 1 set of 3.5" floppy disk drive Built in 1 set of 2.5" hard disk drive(20MB) | Software(2HD floppy disk) AC cable Key label Lock key | 5 1 1 2 | |
| | | JW-50PG *Note 3 | LCD display (640×480 dot) Built in 1 set of 3.5" floppy disk drive Built in 1 set of 2.5" hard disk drive(256MB) | Software(floppy disk) Power supply cable | 2 1 | |

| Module name | | Model name | Outline | Accessories | | Appropriate to UL/CSA standard |
|---|---|---|---|---|---|---|
| | | | | Item | Quality | |
| Support tools | Ladder software | JW-50SP*Note 3 | Ladder software for IBM PC | Key label | 1 | |
| | | | | Communiation adapter | 1 | |
| | Ladder programming support software | JW-100SP *Note 3 | Ladder programming support software (One CD-ROM) | User registration card | 1 | |

Note 1: For JW50/70/100. Not for JW50H/70H/100H.

Note 2: Two types are released. One is for JW50/70/100. Another one (H version) is for JW50/70/100 and JW50H/70H/100H.(See page 10-1.)

Note 3: For JW50/70/100 and JW50H/70H/100H.

## [2] ZW series modules

| Module name | Model name | Outline | Accessories | |
|---|---|---|---|---|
| | | | Item | Quality |
| Rack panel | ZW-08BU | Can be installed the control module, power supply module, and I/O module: up to 8 modules | I/O module's side plate<br>Side plate retention screw | 1<br>2 |
| Basic rack panel | ZW-28KB | Can be installed the control module, power supply module, up to 2 option modules, and up to 8 I/O modules. | I/O module's side plate<br>Side plate retention screw | 1<br>2 |
| | ZW-46KB | Can be installed the control module, power supply module, up to 4 option modules, and up to 6 I/O modules. | I/O module's side plate<br>Side plate retention screw | 1<br>2 |
| | ZW-04KB | Can be installed the control module, power supply module, and I/O module: up to 4 modules | I/O module's side plate<br>Side plate retention screw | 1<br>2 |
| | ZW-02KB | Can be installed the control module, power supply module, and I/O module: up to 2 modules | I/O module's side plate<br>Side plate retention screw | 1<br>2 |
| Expansion rack panel | ZW-108ZB | Can be installed the expansion power supply module and up to 8 I/O modules | Signal cable for expansion (54cm)<br>5V cable for expansion (60cm)<br>I/O module's side panel<br>Side panel retention screw | 1<br>1<br>1<br>2 |
| | ZW-104ZB | Can be installed the expansion power supply module and up to 4 I/O modules | Signal cable for expansion (54cm)<br>5V cable for expansion (60cm)<br>I/O module's side panel<br>Side panel retention screw | 1<br>1<br>1<br>2 |
| | ZW-102ZB | Can be installed the expansion power supply module and up to 2 I/O modules | Signal cable for expansion (54cm)<br>5V cable for expansion (60cm)<br>I/O module's side panel<br>Side panel retention screw | 1<br>1<br>1<br>2 |
| | ZW-508ZB | Can be installed up to 8 I/O modules | Signal cable for expansion (54cm)<br>5V cable for expansion (60cm)<br>I/O module's side panel<br>Side panel retention screw | 1<br>1<br>1<br>2 |
| Expansion power supply module (for expansion rack panel) | ZW-100PU1 | 5 VDC 7A | Mini-fuse (250V, 1A)<br>Mini-fuse (250V, 2A) | 1<br>1 |
| | ZW-100PU2 | 5 VDC 12A | Mini-fuse (250V, 1A)<br>Mini-fuse (250V, 2A) | 1<br>1 |
| I/O expansion module | ZW-10EU | Supports up to 32 I/O modules | | |
| I/O link master module | ZW-31LM | Max. 31 stations(No. of link stations)<br>Max. 504 points(No. of link points) | | |

| Module name | | Model name | Outline | Accessories | |
|---|---|---|---|---|---|
| | | | | Item | Quality |
| Input module | | ZW-16N1 | Input 16 points for 100 VAC | Name label | 2 |
| | | ZW-16N2 | Input 16 points for 12/24 VDC | Name label | 2 |
| | | ZW-16N3 | Input 16 points for 200 VAC | Name label | 2 |
| | | ZW-32N1T | Input 32 points for 100 VAC | | |
| | | ZW-32N2 | Input 32 points for 12/24 VDC | Connector | 1 |
| | | ZW-32N2T | Input 32 points for 12/24 VDC | | |
| | | ZW-64N2 | Input 64 points for 12/24 VDC | Connector | 2 |
| Output module | | ZW-8S1 | 100 VAC, 2A triac output 8 points | Name label Mini-fuse(125 VAC, 5A) | 2 2 |
| | | ZW-8S2 | 12/24 VDC, 2A transistor output 8 points | Name label Mini-fuse(125 VAC, 5A) | 2 2 |
| | | ZW-16S1 | 100 VAC, 2A triac output 16 points | Name label Mini-fuse(125 VAC, 5A) | 2 2 |
| | | ZW-16S2 | 12/24 VDC, 2A transistor output 16 points | Name label Mini-fuse(125 VAC, 5A) | 2 2 |
| | | ZW-16S3 | 200 VAC, 2A triac output 16 points | Name label Mini-fuse(125 VAC, 5A) | 2 2 |
| | | ZW-16S4 | 240 VAC, 30 VDC, 2A contact output 16 points | Name label Mini-fuse(125 VAC, 5A slow-blow) | 2 2 |
| | | ZW-16S4D | 240 VAC, 30 VDC, 2A contact output 16 points | | |
| | | ZW-32S1T | 100 VAC, 0.6A triac output 32 points | 3.2A alarm fuse | 1 |
| | | ZW-32S2 | 5/12/24 VDC, 0.5A transistor output 32 points | Mini-fuse(125 VAC, 5A) Connector | 2 1 |
| | | ZW-32S2T | 5/12/24 VDC, 0.5A transistor output 32 points | 5.0A alarm fuse | 1 |
| | | ZW-32S2TD | 5/12/24 VDC, 0.1A transistor output 32 points source type | 5.0A alarm fuse | 1 |
| | | ZW-32S4T | 240 VAC, 30 VDC, 2A contact output 32 points | | |
| | | ZW-32S5 | 5/12/24 VDC, 0.1A transistor output 64 points | Mini-fuse(125 VAC, 250mA) Mini-fuse(125 VAC, 5A) Connector | |
| | | ZW-64S2 | 5/12/24 VDC, 0.1A transistor output 64 points | Connector | 1 |
| Special module | I/O module | ZW-32IO2 | 5/12/24 VDC Input port 16 points Output port transistor output 16 points | Mini-fuse(125 VAC, 2A) Mini-fuse(125 VAC, 300mA) Connector | 1 2 1 |
| | High speed counter module | ZW-1HC5 | 50 kpps(90 degrees phase signal) BCD 6 digits, compare output 8 points Data transferred every 3 scans | Mini-fuse(125 VAC, 0.5A) Mini-fuse(125 VAC, 2A) | 1 1 |

| Module name | | Model name | Outline | Accessories | |
|---|---|---|---|---|---|
| | | | | Item | Quality |
| Special module | High speed counter II module | ZW-1HC6 | 50 kpps(90 degrees phase signal) BCD 6 digits, Match output 1 point Data transferred every 3 scans | | |
| | Analog input module | ZW-4AD2 | Input rating: 0 to ±20mADC or 0 to 10 VDC Output BCD three and half digits 4 channel module | | |
| | Analog output module | ZW-2DA2 | Output BCD three and half digits Output rating: 0 to ±20mADC or 0 to 10 VDC 4 channel module | | |
| | Pulse catch module | ZW-14PC2 | 12/24 VDC Input port 14 points(pulse) 1 point(ENABLE) Output port 1 point | Name label Mini-fuse(125 VAC, 0.3A) Mini-fuse(125 VAC, 1A) | 2 1 1 |
| | Pulse output module | ZW-1PO2 | 12/24 VDC 1 axis, 80 points BCD 6 digits absolute value command, 10 kpps | | |
| | Positioning basic module | ZW-112PM | 4 control axes CP, PTP control scheme Includes X and Y axis deviation counters | Connector | 1 |
| | Positioning expansion module | ZW-202PM | Z and A axis deviation counters | Connector Connection cable(with connector) | 1 1 |
| | Positioning teaching module | ZW-100TU | LCD dot matrix display | Basic module connection cable(3m) | 1 |
| | Serial I/O module | ZW-232SU | EIA RS232C/RS422 1 channel/module half/full duplex system | Connector | 1 |
| | Dummy module | ZW-100DM | Dummy points: 8/16/24/ 32/40/48/56/64 points | | |
| | ID plate I/F module | ZW-10DU | Interface module for ID plate | Antenna module | 1 |
| Signal cable for expansion | | ZW-05KC | 34 core signal cable for system expansion(50cm) | 5 VDC cable(50cm) | 1 |
| | | ZW-1KC | 34 core signal cable for system expansion(1m) | | |
| Control module connection cable | | ZW-3KC | For support tool(3m) | | |
| Support tool | Programmer | ZW-101PG1 | LCD dot matrix display language programmer | Control module connection cable(3m) Cassete tape recorder connection cable(1.5m) Connector locking spring | 1 1 2 |
| | Ladder processor II | Z-100LP2S | EL display 11 relay contacts + 1 coil per row 11 relay lines + 2 message lines per column Built-in 3.5" floppy disk drive | AC code Ground wire Printer connection cable PG connection cable 25P connector Mlini-fuse(125 VAC, 3A) | 1 1 1 1 1 1 |

# 3-5 General specifications

## [1] When AC power is used

| Item | Specifications | |
|---|---|---|
| Power voltage | 100 to 120/200 to 240 VAC, 50/60 Hz | *Note 1 |
| Supply voltage tolerance | 85 to 132 VAC/170 to 264 VAC | *Note 1 |
| Voltage interruption detection interval | Available voltage interruption time of 10ms max. | *Note 2 |
| Insulation resistance | No less than 10M ohms when measured witha 500 VDC megger (between AC external terminal and rack panel) | *Note 3 |
| Dielectrical strength | 1500 VAC, 50/60 Hz, 1 minites (between AC external terminal and rack panel) | *Note 3 |
| Noise immunity | 1000 Vp-p, 1 $\mu$s (by noise simulator between the power line and and rack panel) | *Note 4 |
| Storage temperature | -20 to 70 ℃ | *Note 5 |
| Ambient temperature | 0 to 55 ℃ | *Note 5 |
| Ambient humidity | 35 to 90%RH(non-condensing) | *Note 5 |
| Atmosphere | Free from corrosive gas | |
| Vibration resistance | JIS C 0911 or equivalent, vibration with 0.075 mm amplitude (10 to 55Hz), 1G acceleration (55 to 150Hz), and 10 to 150 to 10Hz frequency cycle(8 minutes/cycle) applied along X, Y, and Z directions for 2 hours in each, 15 cycles each | |
| Shock resistance | JIS C 0912 or equivalent (10G, 3 times in each X, Y, and Z directions) | |
| Power consumption | 55W or less (when one power supply module is loaded to capacity) | *Note 6 |
| Weight | Approx. 9kg (when power supply modue, one control module, eight I/O modules, and two option modules installed in basic rack panel) | |
| Grounding | Class-3 grounding | |

Note 1: Specifications for the power supply module (JW-1PU) installed in this PC basic rack panel.

Note 2: Voltage interruption detection interval is variable with system memory setting. For more details, see the programming manual, 2-4-(5) "Control module function setting area". The default setting is 10ms.

Note 3: Measured across power supply module's AC input terminal and basic rack panel frame holding the JW-1PU power supply module.

Note 4: With the JW-1PU power supply module, control module, option module, and I/O modules installed in the basic rack panel, a noise voltage of 1000 Vp-p, 1 $\mu$s applied from a noise simulator across the power line and rack panel frame, with the system power turned ON.

Note 5: For the storage and operating temperatures for support tools, see the specifications for each tool.

Note 6: Measured with the JW-1PU power supply module installed in the basic rack panel and electrically loaded to capacity.

## [2] When DC power is used

| Item | Specifications |
|---|---|
| Power voltage | 240 VDC                                      *Note 1 |
| Supply voltage tolerance | 20.4 to 32.0 VDC                    *Note 1 |
| Voltage interruption detection interval | Available voltage interruption time of 10ms max.      *Note 2 |
| Insulation resistance | No less than 10M ohms when measured witha 500 VDC megger (between DC external terminal and rack panel)      *Note 3 |
| Dielectrical strength | 1000 VAC, 1 minites                            *Note 3 <br> (between DC external terminal and rack panel) |
| Noise immunity | 1000 Vp-p, 1 $\mu$s (by noise simulator between the power line and and rack panel)      *Note 4 |
| Storage temperature | -20 to 70 ℃                                 *Note 5 |
| Ambient temperature | 0 to 55 ℃                                   *Note 5 |
| Ambient humidity | 35 to 90%RH(non-condensing)           *Note 5 |
| Atmosphere | Free from corrosive gas |
| Vibration resistance | JIS C 0911 or equivalent, vibration with 0.075 mm amplitude (10 to 55Hz), 1G acceleration (55 to 150Hz), and 10 to 150 to 10Hz frequency cycle(8 minutes/cycle) applied along X, Y, and Z directions for 2 hours in each, 15 cycles each |
| Shock resistance | JIS C 0912 or equivalent (10G, 3 times in each X, Y, and Z directions) |
| Power consumption | 37W or less (when one power supply module is loaded to capacity)      *Note 6 |
| Weight | Approx. 9kg (when power supply modue, one control module, eight I/O modules, and two option modules installed in basic rack panel) |
| Grounding | Class-3 grounding |

Note 1: Specifications for the power supply module (JW-2PU) installed in this PC basic rack panel.

Note 2: Voltage interruption detection interval is variable with system memory setting. For more details, see the programming manual, 2-4-(5) "Control module function setting area". The default setting is 10ms.

Note 3: Measured across power supply module's AC input terminal and basic rack panel frame holding the JW-2PU power supply module.

Note 4: With the JW-2PU power supply module, control module, option module, and I/O modules installed in the basic rack panel, a noise voltage of 1000 Vp-p, 1 $\mu$s applied from a noise simulator across the power line and rack panel frame, with the system power turned ON.

Note 5: For the storage and operating temperatures for support tools, see the specifications for each tool.

Note 6: Measured with the JW-2PU power supply module installed in the basic rack panel and electrically loaded to capacity.

## 4-1　Combination of each module

Sharp PC are built up using different functional modules, which combine to suit the application. The type of the rack panel required depends on type of the I/O modules (JW-I/O or ZW-I/O) used.

### [1] Module configuration using JW-series I/O modules

The JW-series I/O module require the JW-4BU/6BU/8BU/13BU rack panel.

### (1) Module configuration when JW-I/O modules is used as a basic rack panel
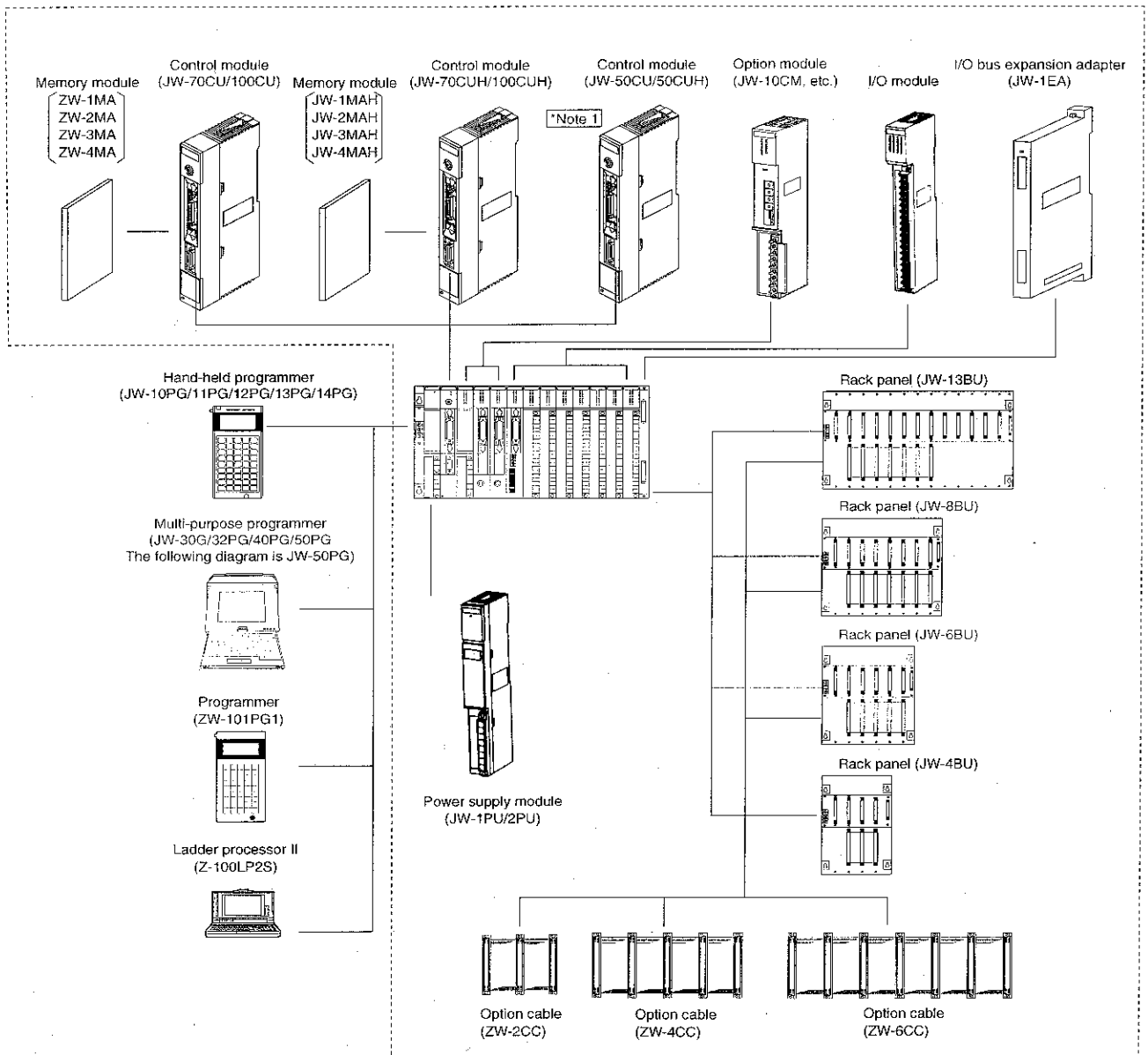
This example shows a JW-13BU rack panel with a power supply module, a control module, two option modules, and nine I/O modules.

Note 1: The JW-50CU, JW-50CUH control module includes a memory modules as a standard feature.

Note 2: The ZW-6CC cable cannot be connected to the JW-6BU rack panel.

The devices within the dotted line make up posssible basic rack panel.

Note 3: Refer to page 10-1 to confirm the applicable support tool for each control module.

## (2) Module configuration when JW-I/O modules is used as a expansion rack panel

When additional I/O modules are required, use another JW-4BU/6BU/8BU/13BU rack panel, as in the following example.



Power supply module (JW-1PU/2PU)

I/O module

I/O bus expansion adapter (JW-2EA)

Rack panel (JW-13BU)

Rack panel (JW-8BU)

Rack panel (JW-6BU)

Rack panel (JW-4BU)

This example shows a JW-13BU rack panel holding one power supply module, 12 I/O modules, and one one I/O bus expansion adapter (JW-2EA).
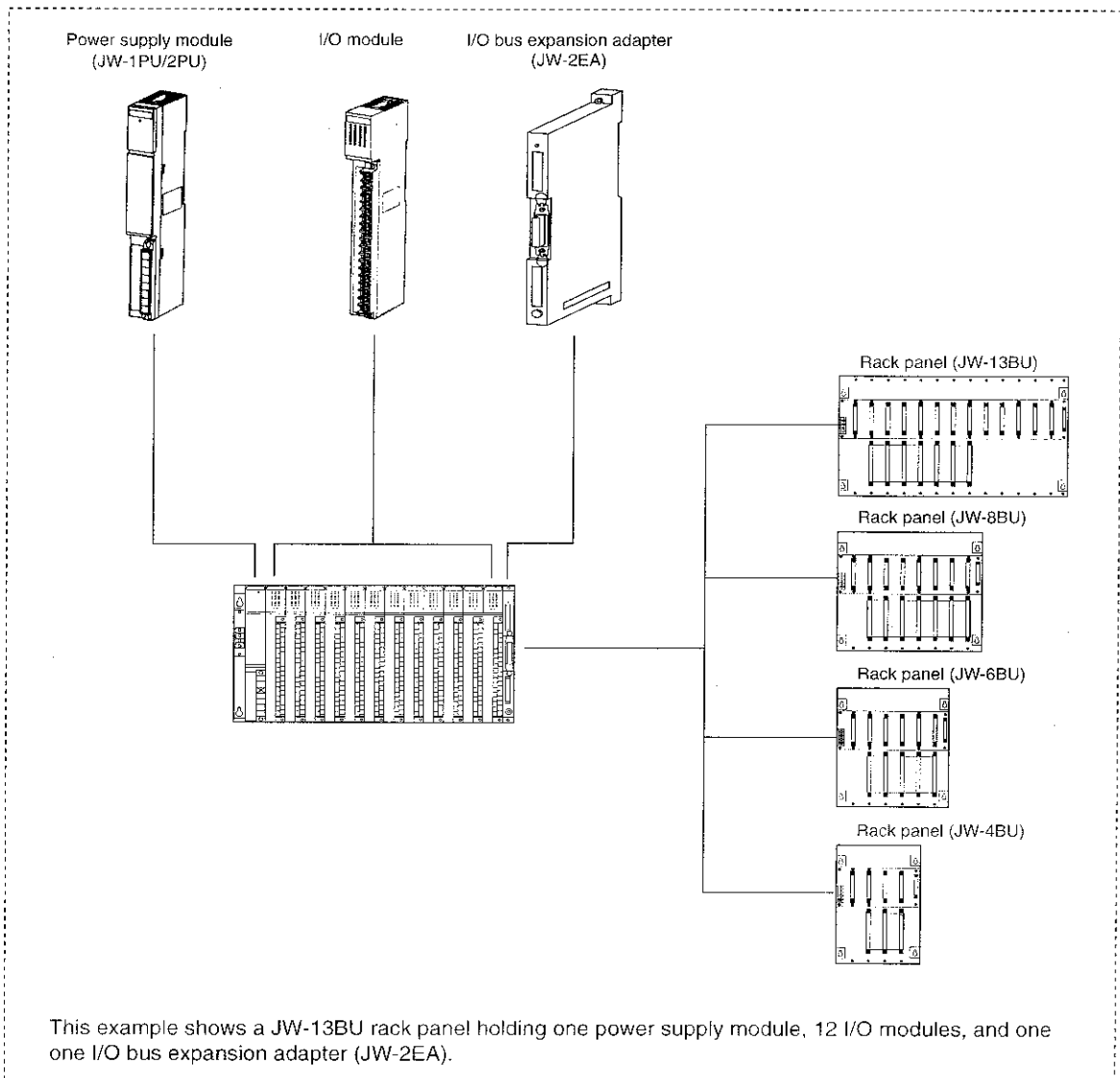
Note 1: Be sure to install the power supply module in the left end slot a power supply module in the expansion rack panel is required only if that in the basic rack panel does not have enough marginal power to supply the I/O module in the expansion rack panel.

Note 2: Install the I/O bus expansion adapter JW-2EA in the right end I/O expansion slot.

Note 3: I/O modules may be installed in any slot the JW-4BU/6BU/8BU/13BU rack panel. However,that I/O modules can be not installed in a slot to which an option cable (ZW-2CC/4CC/6CC) is connected.
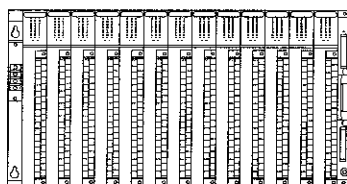


JW-13BU rack panel holding 13 I/O modules.

## [2] Module configuration using ZW-series I/O modules

### (1) Module configuration when ZW-I/O modules is used as a basic rack panel

The following types of rack panel may be used as a basic rack panel (which hold the control module) for ZW-series I/O modules;

| Model name | Installable modules |
|------------|---------------------|
| ZW-28KB | Power supply module, control module, 2 option modules, 8 I/O modules |
| ZW-46KB | Power supply module, control module, 4 option modules, 6 I/O modules |
| ZW-04KB | Power supply module, control module, 4 I/O modules     *Note 1 |
| ZW-02KB | Power supply module, control module, 2 I/O modules     *Note 1 |
| ZW-08BU | Power supply module, control module, 8 I/O modules |

Note 1: ZW-04KB and ZW-02KB have no I/O expansion connector.
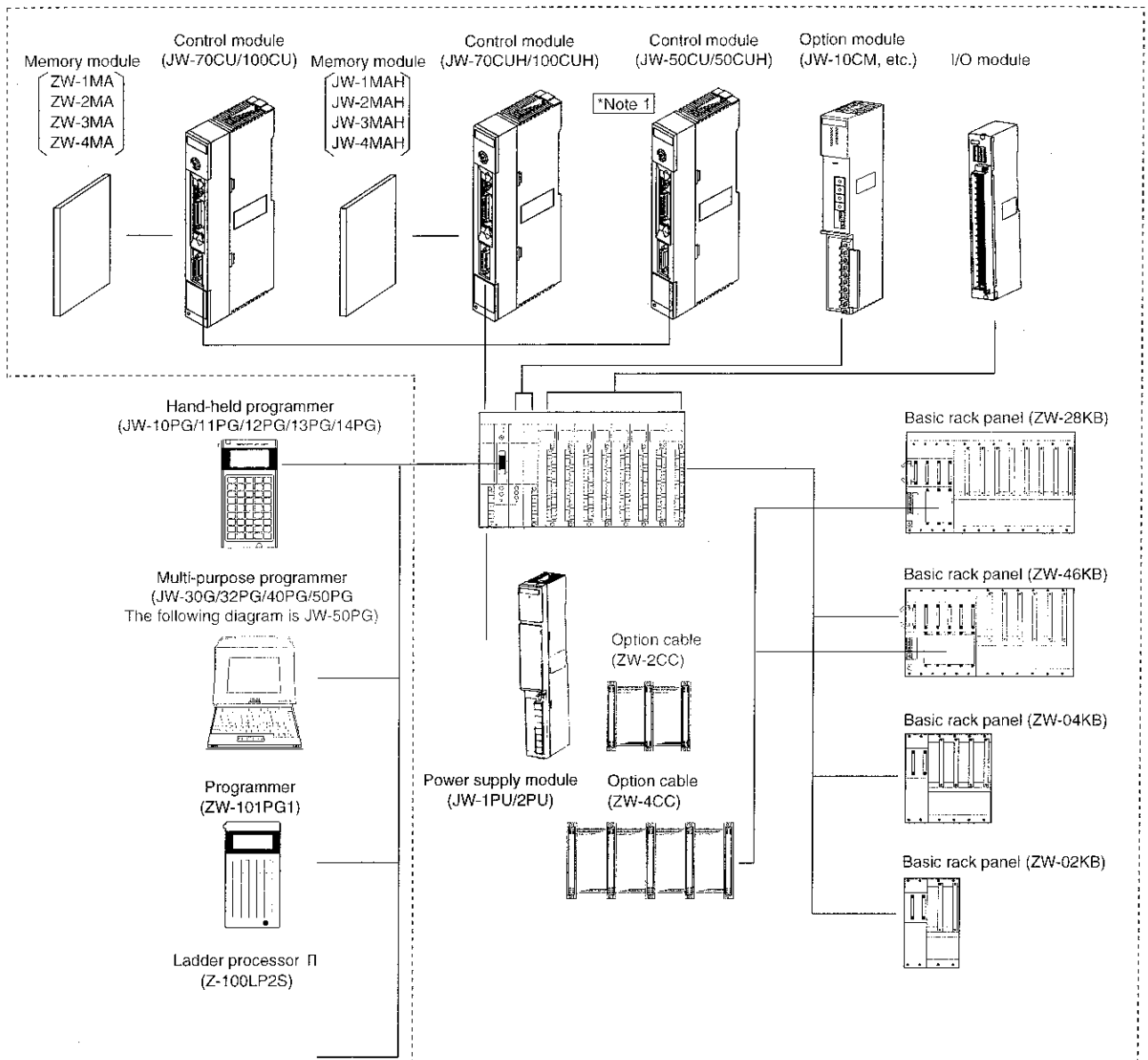


This example shows a ZW-28KB basic rack panel with a power supply module, a control module, two option modules, and eight I/O modules.

Note 1: The JW-50CU, JW-50CUH control module includes a memory modules as a standard feature.
Note 2: Refer to page 10-1 to confirm the applicable support tool for each control module.

The devices within the dotted line make up posssible basic rack panel.

4-3

## (2) Module configuration when ZW-I/O modules is used as a expansion rack panel

When additional ZW-series I/O modules are required, use any of the following expansion rack panel and module combinations;

| Model name | Installable modules |
|---|---|
| ZW-108ZB | Expansion power supply module, 8 I/O modules |
| ZW-104ZB | Expansion power supply module, 4 I/O modules |
| ZW-102ZB | Expansion power supply module, 2 I/O modules |
| ZW-508ZB | 8 I/O modules |
| ZW-08BU | Power supply module, option module, 8 I/O modules |



Expansion power supply module (ZW-100PU1)   Expansion power supply module (ZW-100PU2)   I/O module (31 kinds)   Power supply module (ZW-1PU/ZW-2PU)   I/O expansion module (ZW-10EU)   I/O module (31 kinds)

Signal cable for expansion (ZW-05KC/ZW-1KC) *Note 2

Rack panel (ZW-08BU)

Expansion rack panel (ZW-108ZB)   Expansion rack panel (ZW-104ZB)   Expansion rack panel (ZW-102ZB)   Expansion rack panel (ZW-508ZB)
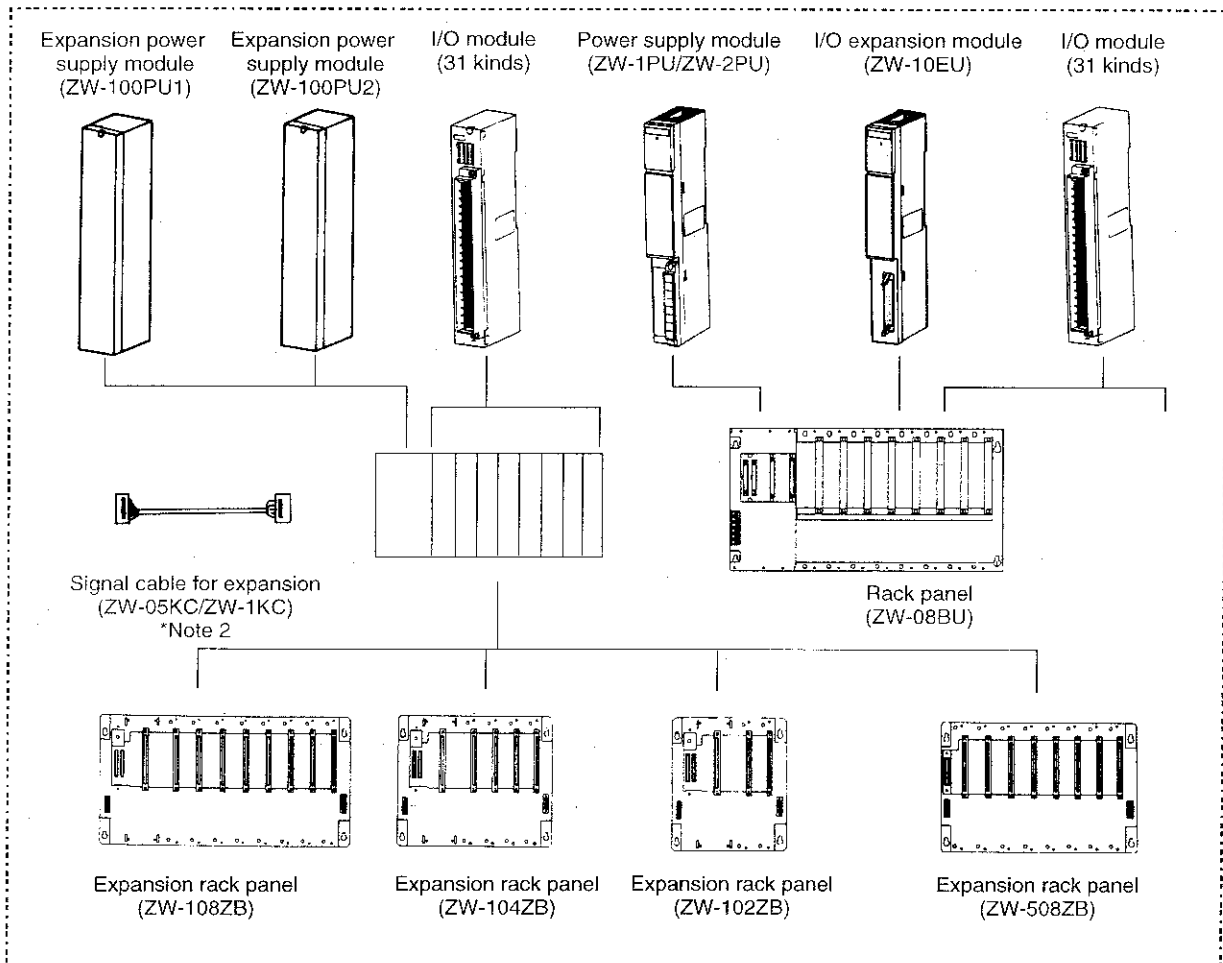
The devices within the dotted line make up possible basic rack panel.

Note 1: Choose the appropriate expansion power supply module type depending on the power required for the I/O modules used in the expansion rack panel.

To determine the reauired power, see page 4-73.

Note 2: When the expansion rack panel is to be positioned on the right hand side of the basic rack panel, a ZW-1KC signal cable for expansion (length: 1m) is required.

## [3] Choosing procedure in each modules

Choose the modules for JW50/70/100, JW50H/70H/100H in the following sequence:

| Choose a power supply module |
|---|

Choose a power supply module according to the input supply voltage.

| Model name | Specifications |
|---|---|
| JW-1PU | For 100/200 VAC input |
| JW-2PU | For 24 VDC input |

| Choose a control module |
|---|

Choose a control module according to the number of I/O points and program capacity required;

| Model name | Max. No. of I/O points | Program memory | File memory |
|---|---|---|---|
| JW-50CU JW-50CUH | 512 | 7.5K words | 16K bytes |
| JW-70CU JW-70CUH | 1024 | 63K words max. | 448K bytes max. |
| JW-100CU JW-100CUH | 4096(using JW-I/O) 2048(using ZW-I/O) | 63K words max. | 448K bytes max. |

| Choose a memory module |
|---|

The JW-70CU/100CU, JW-70CUH/100CUH control module functions only if a memory module is installed in it.
Choose a memory module according to the program and file capacities required;

| Model name | Program capacity | File capacity |
|---|---|---|
| ZW-1MA, ZW-1MAH | 7.5K words | 16K bytes |
| ZW-2MA, ZW-2MAH | 15.5K words | 64K bytes |
| ZW-3MA, ZW-3MAH | 31.5K words | 128K bytes |
| ZW-4MA, ZW-4MAH | 63K words | 448K bytes |

Note 1: The JW-50CU, JW-50CUH control module contains a memory module as a standard feature. No additional memory module can be installed in it.

| Choose a I/O module |
|---|

First choose either the JW and ZW series I/O module type. Only one type can be used in a rack panel. Then choose the specific I/O module model list given in page 3-7, depending on the application.

Once the type of I/O module (either JW or ZW) is selected, program the control module by setting the module's internal DIP switches accordingly (see page 4-11).

| Choose a rack panel |
|---|

Now choose the type of rack panel depending on the types and numbers of the I/O and option modules.
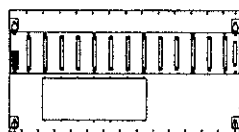
| Model name | No. of installable modules | Kinds of I/O module |
|---|---|---|
| JW-13BU | 13 modules | For JW-I/O |
| JW-8BU | 8 modules | For JW-I/O |
| JW-6BU | 6 modules | For JW-I/O |
| JW-4BU | 4 modules | For JW-I/O |
| ZW-28KB | 2 option, 8 I/O | For ZW-I/O |
| ZW-46KB | 4 option, 6 I/O | For ZW-I/O |
| ZW-04KB | 0 option, 4 I/O | For ZW-I/O |
| ZW-02KB | 0 option, 2 I/O | For ZW-I/O |
| ZW-08BU | 0 option, 8 I/O | For ZW-I/O |

To next page

From previous page

```
Choose an option
module
        │
        ▼
Choose an option
cable
        *Note 1
        *Note 2
```

Using ZW-I/O

Using JW-I/O

```
Choose   an
expansion rack
panel
        │
        ▼
Choose a
I/O bus expansion
adapter
        │
        ▼
Choose a power
supply module
        │
        ▼
Choose a power
supply module
```

To next page    To next page
    *2              *1

| Model name | Remarks |
|---|---|
| ZW-10CM | Link module |
| ZW-20CM | Network module |
| ZW-30CM | Network module |
| JW-10CM | Link module |
| JW-20CM | Network module |

Note 1: Not necessary when no option module is to be used.

| Model name | Remarks |
|---|---|
| ZW-2CC | For 2 option modules |
| ZW-4CC | For 4 option modules |
| ZW-6CC | For 6 option modules |

Note 2: The ZW-6CC cable can be used only for the JW-13BU rack panel.

| Model name | Remarks |
|---|---|
| JW-13BU | 13 modules (for JW-I/O) |
| JW-8BU | 8 modules (for JW-I/O) |
| JW-6BU | 6 modules (for JW-I/O) |
| JW-4BU | 4 modules (for JW-I/O) |

When the system requires three steps or more rack panels or a power supply module have to be installed on second rack panel, the I/O bus expansion adapter is needed.

| Model name | Remarks |
|---|---|
| JW-1EA | Required in the basic rack rack panel where the control module is installed. |
| JW-2EA | Required in each expansion rack panel(one set in each rack panel). |

If the total power requiremnts for the control and expansion rack panels exceed the capacity of the power supply module installed in the basic rack panel, an expansion power supply module is requires in the expansion rack panel. To determine the power requirements, see page 4-73.

Choose the cable type or types depending on the distance between rack panels.
The I/O expansion cables include the following 8 modules in two types:

| Model name | Specifications | Remarks |
|---|---|---|
| JW-05KC | 50 cm cable | For rack panel |
| JW-1KC | 1m cable | For rack panel |
| JW-05EC | 50 cm cable | For JW-1EA/2EA |
| JW-1EC | 1m cable | For JW-1EA/2EA |
| JW-3EC | 3m cable | For JW-1EA/2EA |
| JW-10EC | 10m cable | For JW-1EA/2EA |
| JW-30EC | 30m cable | For JW-1EA/2EA |
| JW-50EC | 50m cable | For JW-1EA/2EA |

Using ZW-I/O
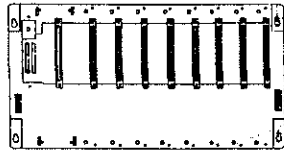
Choose one or more expansion rack panels depending on the number of I/O modules required.

| Choose an expansion rack panel. |
| --- |



| Model name | Remarks |
| --- | --- |
| ZW-108ZB | Can be installed the one expansion rack panel and eight I/O modules |
| ZW-104ZB | Can be installed the one expansion rack panel and four I/O modules |
| ZW-102ZB | Can be installed the one expansion rack panel and two I/O modules |
| ZW-508ZB | Can be installed the eight modules |
| ZW-08BU | Can be installed the one expansion rack panel and eight I/O modules |

| Choose an I/O expansion module (ZW-10EU). |
| --- |

The I/O expansion module is needed for a system requiring 32 or more I/O modules. It is not needed for a system with 32 or less I/O modules.

| Choose a expansion power supply module |
| --- |

Choose the appropriate expansion power supply module depnding on the overall system power reauirements. To determine the power requirements, see page 4-73.

| Model name | Remarks |
| --- | --- |
| ZW-100PU1 | 5 VDC, 7A output |
| ZW-100PU2 | 5 VDC, 12A output |

| Choose a expansion signal cable |
| --- |

If the signal cable supplied with the expansion rack panel is too short when using the ZW-08BU expansion rack panel, use the appropriate signal cable for expansion.
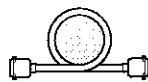
| Model name | Remarks |
| --- | --- |
| ZW-05KC | 50cm cable |
| ZW-1KC | 1m cable |

| Choose a support tool. |
| --- |

Choose a applicable support tool for a control module depnding on the application. Refer to page 10-1 for details.

Hand-held programmer
(JW-10PG/11PG/12PG/13PG/14PG)

Multi-purpose programmer
(JW-30G/32PG/40PG/50PG)
The following diagram is JW-50PG)

Programmer
(ZW-101PG1)

Ladder processor II
(Z-100LP2S)

| Model name | Remarks |
| --- | --- |
| Hand-held programmer (JW-14PG ,etc.) | Program creation, monitor,and change (compatible with JW series) |
| Multi-purpose progra-mmer(JW-50PG ,etc.) | Program creation, monitor, change, recording, and reloading (compatible with JW series) |
| Programmer (ZW-101PG1) | Program creation, monitor,and change |
| Ladder processor II (Z-100LP2S) | Program creation, monitor, change, recording, and reloading |

# 4-2 Control module

## [1] Name and function of each part

⑫Control module retention screws

⑫Control module retention screws

⑭Model name
①RUN indicator
⑬Memory protect key
⑦Battery replacement label location

⑭Model name
②Fault indicator
③Memory protection switch
④Support tool connector
⑤Rating plate
⑥Connector for communication port
⑧Battery compartment lid
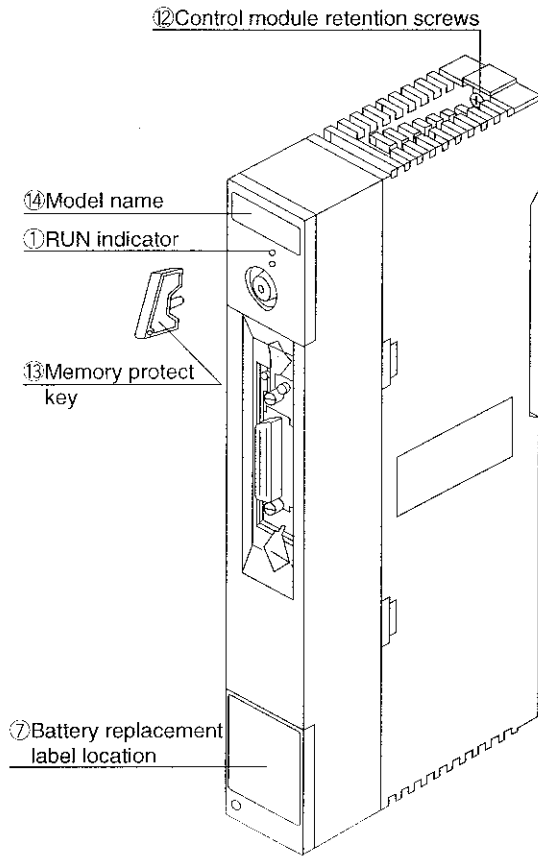
JW-50CU
JW-50CUH

JW-70CU/100CU
JW-70CUH/100CUH

⑨Battery module
⑩Battery connector
⑪Battery-less operating plug
(Accessories)

⑮DIP switch

4-8
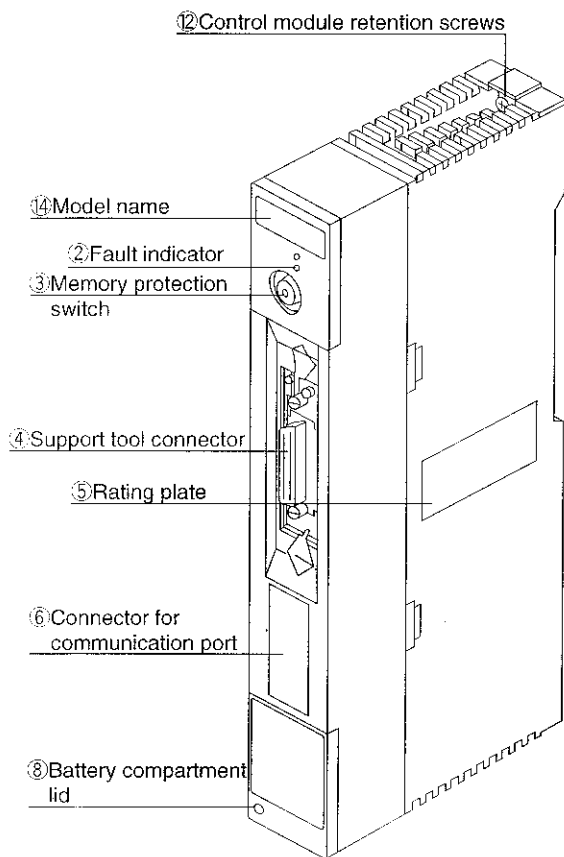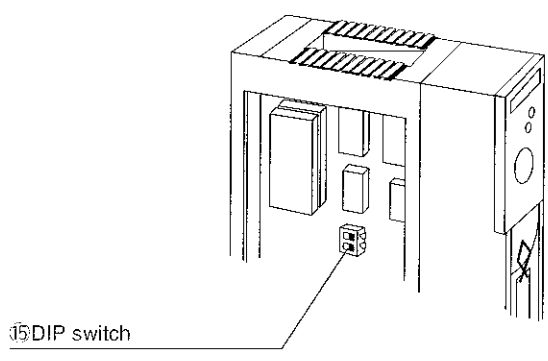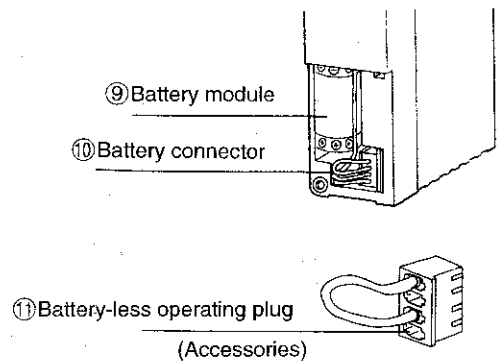
① RUN indicator (green)

| Appearance | Contents |
|---|---|
| Light ON | Normally operating |
| Flashing at regular intervals | PC stopping |
| Flashing intermittntly | Live I/O replace mode is selected, or a fuse failure or option module error occured when uninterrupted operation is specified (in which case fuse failure or an option module error is ignored and operation is continued.) |
| Light OFF | An error detected during self-diagnosis. (Also comes on in the event of battery error) |

② Fault indicator (red)

This light comes on if an error was detected during self test. The PC stops program run.(The PC continues operation in the event of a battery error.)

③ Memory protect switch

Use this switch to write-protect the program and system memories (set to ON). It is useful to prevent inadvertent write access to the memories while monitoring PC operation. When downloading a program from your host system to the PC via an option module(JW-10CM, etc.) or when making any change or correction to the contents of the program or system memory with the support tool , set this switch to OFF.

④ Connector for connecting support tool

Connect a programmer or any other support tool to this connector.

⑤ Rating plate

⑥ Connector for connecting communication port (JW-70CU/100CU, JW-70CUH/100CUH)

Connect a device with serial communication port, such as a personal computer, to this connector. (refer to page 4-103).

⑦ Battery replacement label location

Affix a label indicating the due date of the next battery replacement.Be sure to replace the battery before the date indicated on the label. After replacing the battery, replace the label with a new due date label.

⑧ Battery compartment lid

Remove this lid to gain access to the internal battery.

⑨ Battery module

This battery (DUNT-5784NCZZ) is used to back up the RAM on the memory module.

⑩ Battery connector

This connector normally accepts a battery harness plug to connect the battery to the CPU board. For operation without battery backup, insert a battery-less operation into this connector in place of the battery harness plug.

⑪ Battery-less operation plug

For operation without battery backup, insert this plug into the battery connector ál on the CPU board.

⑫ Control module retention screws

Use these screws to secure the control module to the rack panel frame.

⑬ Memory protect key

The ON position of this key switch write-protects the contains of internal memories. The key can be removed only if set at the ON position.

⑭ Module name

JW-50CU: Control module for the JW50
JW-70CU: Control module for the JW70
JW-100CU: Control module for the JW100
JW-50CUH: Control module for the JW50H
JW-70CUH: Control module for the JW70H
JW-100CUH: Control module for the JW100H

⑮ DIP switch

For the details of DIP switch setting, see page 4-11.

## [2] Memory protect switch

The memory protect key switch is used to write-protect the program and system memories within the control module.*Note 1

ON position: Write protect
OFF position: Write enable

ON

OFF
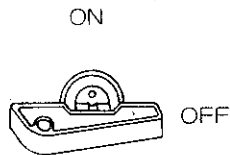
MEMORY PROTECT

| Key position | | JW-10/11/12/ 13/14PG mode | System memory/ program memory write | EEPROM write | File memory write | Auto I/O registration |
|---|---|---|---|---|---|---|
| ON | Monitor | | × | × | ○ | × |
| | Change | | | | | |
| | Program | | | | | |
| OFF | Monitor | × · | | × | ○ | ○ |
| | Change | × | | ○ | | |
| | Program | ○ | | ○ | | |

× : Write protected   ○ : Write enabled

Note 1: The memory protect switch key can be removed from the sky hole only if it is set the ON position. Do not lose it.

ON

OFF
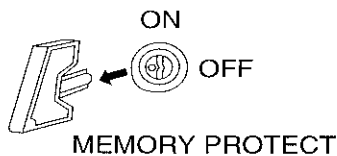
MEMORY PROTECT

Note 2: The mode of JW-50CUH/70CUH/100CUH can not be changed when the memory protect switch is ON. Turn ON the memory protect switch during the PC operation to protect the PC stop causing from the mis-operation.

## [3] DIP switch

DIP switches SW2-1 and SW2-2 are found on the CPU board in the control module. Set them to match the application of the PC.

• For the JW-50CU/70CU/100CU    • For the JW-50CUH/70CUH/100CUH

Slot screwdriver
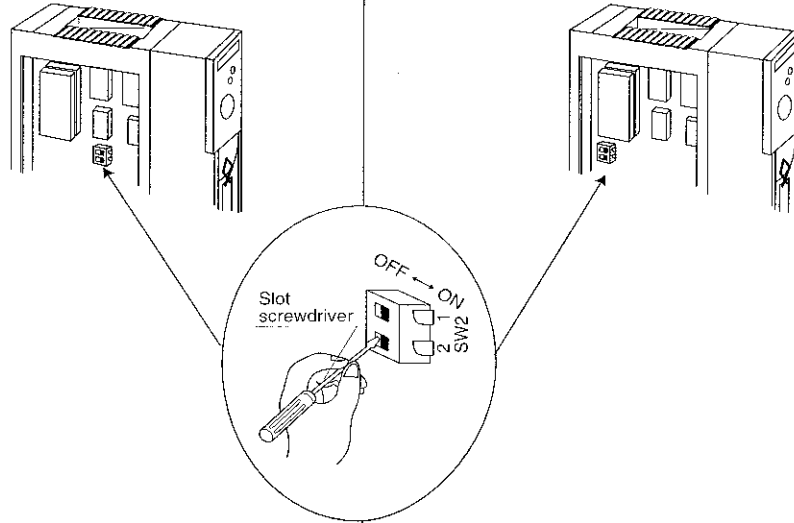
Switch setting table

|  | ZW-I/O | | JW-I/O |
|---|---|---|---|
|  | All OFF | Output hold | Output hold |
| SW2-1 | OFF | ON | ON |
| SW2-2 | OFF | OFF | ON |

Switch setting table

|  | ZW-I/O | | JW-I/O |
|---|---|---|---|
|  | All OFF | Output hold | Output hold |
| SW2-1 | OFF | OFF* | ON |
| SW2-2 | OFF | ON* | ON |

*: Difference with JW-50CU/70CU/100CU

### (1) Description of switch settings

①Output hold and all points OFF selection

Selects the operating state of the output circuit when the CPU halts.

(Set the switches according to the type of control module.)

| Control module | JW-50CU/70CU/100CU | JW-50CUH/70CUH/100CUH |
|---|---|---|
| Switch | SW2-1 | SW2-2 |

| Switch setting | Description |
|---|---|
| ON | Output hold<br>Retains the address area set in system memory #0232 and #0233. |
| OFF | All points OFF |

• Factory setting at delivery : ON

Note: Be sure to set the switch to ON (output hold) when using the JW-I/O module.

②I/O module type selection

Selects the type of I/O module used with the PC.

(Set the switches according to the type of control module.)

| Control module | JW-50CU/70CU/100CU | JW-50CUH/70CUH/100CUH |
|---|---|---|
| Switch | SW2-2 | SW2-1 |

| Switch setting | Description |
|---|---|
| ON | JW-I/O module in use |
| OFF | ZW-I/O module in use |

• Factory setting at delivery : ON

## (2) Monitoring the switch settings

The switch settings are stored in system memory #0042 and can be monitored using a support tool such as the support tool.



```
      7    6    5    4    3    2    1    0
#0042 [  ][  ][  ][  ][  ][  ][  ][  ]
                                      └─────────── I/O module selection switch
                              └───────────────── Output hold switch
                    └───────────────────────── Memory protect switch
```
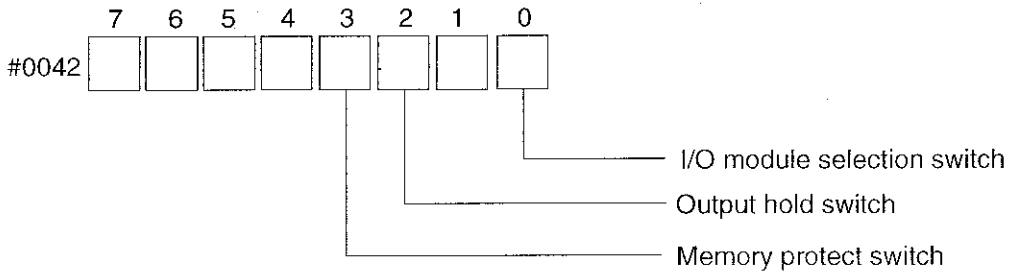
□ : ON(indicates switch is ON)

■ : OFF(indicates switch is OFF)

Refer to the instruction manual of each support tool for the monitoring procedure.

## [4] Outline dimensions drawings



Approx. 20

250

33.5

Approx. 30

105

110(include rack panel)

150

(Unit: mm)
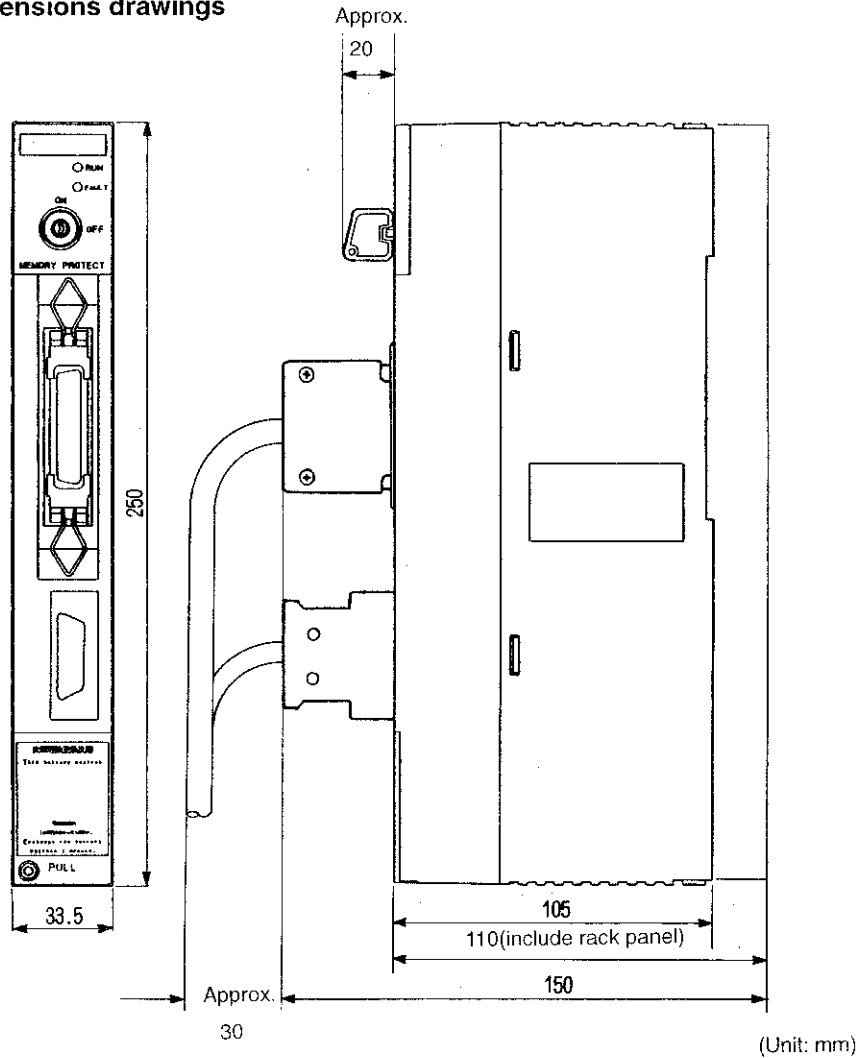
Note 1: These dimensions refer to the front edge of the rack panel.

Note 2: The drawings above are for the JW-70CU/100CU and JW-70CUH/100CUH control modules.

## [5] Performance specifications

| | | | JW-50CU/70CU/100CU | JW-50CUH/70CUH/100CUH |
|---|---|---|---|---|
| Progam method | | | Stored program method | |
| Control method | | | Cyclic operation method and interupt processing method | |
| Proce-ssing speed | Basic instructions (except for the TMR, CNT, MD, and application instructions) | | 0.38 $\mu$s/instruction | 0.25 $\mu$s/instruction*Note 2 |
| | Application instructions, TMR, CNT, and MD instruction | | Avrage a few microseconds/instruction (Note 1, 2) (JW-50CUH/70CUH/100CUH process approximately 1.5 times as fast as JW50H/70H/100H.) | |
| Instruction type | Basic instructions | | 20 kinds | |
| | Application instructions | | 116 kinds | 157 kinds |
| Program memory capacity | RAM | | JW-50CU, JW-50CUH: 7.5K words max. (standard installed) JW-70CU/100CU, JW-70CUH/100CUH: 7.5K to 63K words (optional) | |
| | EPROM | | JW-50CU, JW-50CUH: 7.5K words max. (27C512×1) JW-70CU/100CU, JW-70CUH/100CUH: 31.5K words max. (27C512×1) | |
| | EEPROM | | JW-50CU, JW-50CUH: 7.5K words max. (28C256×1) JW-70CU/100CU, JW-70CUH/100CUH: 15.5K words max. (28C256×1) | |
| Memory backup | | | Internal lithium battery (DUNT-5784NCZZ) backs up RAM contents. Operation on ROM without battery backup is possible by setting address #0225 of the system memory. | |
| I/O control method | For JW-I/Os | | Batch refresh method and refresh method by instruction | |
| | For ZW-I/Os | | Batch refresh and method | |
| No. of control I/O points | JW-I/Os | No. of I/O points | JW-50CU, JW-50CUH: 512 points max. JW-70CU, JW-70CUH: 1024 points max. JW-100CU, JW-100CUH: 4096 points max. | |
| | | No. of modules | 8 rack panels max. | |
| | ZW-I/Os | No. of I/O points | JW-50CU, JW-50CUH: 512 points max. JW-70CU, JW-70CUH: 1024 points max. JW-100CU, JW-100CUH: 2048 points max. | |

Note 1: For the execution speed of each instruction, refer to the "Instruction list" in the programming manual.

Note 2: The processing speed of JW50H/70H/100H can be set for the same speed as JW50/70/100 by setting the memory module switch.(See page 4-20).

4-13

| | | JW-50CU/70CU/100CU | JW-50CUH/70CUH/100CUH |
|---|---|---|---|
| Data memory | I/O relays | 2048 points(00000 to 03777) | The latched relay area can be expanded or reduced in an 8-point increment by setting the system memory addresses #0230 and #0231 (to allow the last output status to be held at power failure.) |
| | Auxiliary relay | 1536 points (04000 to 06777) | |
| | Latched relay | 224 points (07000 to 07337) (addresses 07300 to 07337 are used for the ZW/JW-10CM link module).<br>256 points (04000 to 07777) | |
| | Special relay | 32 points (07340 to 07377)<br>Non-carry flag (07354)<br>Error flag (07355)<br>Carry flag (07356)<br>Zero flag (07357)<br>0.1 sec.clock (07360)<br>Initialize pulse (07362)<br>Output module fuse blown (07362) *Note 2<br>1.0 sec. clock (07364)<br>DIP switch (07365)<br>Normally OFF contacts (07336)<br>Zero-cross switch (07367)<br>Memory error (07370)<br>CPU error (07371)<br>Battery error (07372)<br>I/O error (07373)<br>Option error (07374)<br>Special I/O module error (07375) *Note 2<br>Expansion power supply error (07376) *Note 3<br>Power supply error (07377)<br>Error code stored (07340 to 07347) | |
| | General-purpose relay | 3072 points (10000 to 15777) used as link relay etc.<br>(latched relay available) | |
| | TMR/CNT time limit contacts | 512 points (T or C000 to C777) | 1024 points (T or C0000 to C0777, T or C1000 to C1777) |
| | TMR/CNT/MD | Total of 512 points (000 to 777)<br>Timer number:<br>100 ms timer (TMR000 to 777)<br>10 ms timer (TMR700 to 777) | Total of 1024 points (0000 to 1777) *Note 4<br>Timer number:<br>100 ms timer (TMR0000 to 1777)<br>10 ms timer (TMR0400 to 0777)<br>The setting value of a timer, counter and MD can be specified in a register. *Note 5 |
| | | Timer setting time: 100 ms timer; 0.1 to 3276.7 sec. (BIN)<br> ; 0.1 to 799.9 sec. (BCD)<br> 10 ms timer; 0.01 to 19.99 sec. (BCD)<br>Counter setting value: 1 to 32767 (BIN), 1 to 7999 (BCD)<br>MD setting value: 0 to 999<br>The current values of the counter and MD are retained on power failure. The current timer data can be either reset or retained on power failure at user's choice.<br>Timer function is user-selctable in 10ms increments. | |
| | Registers | 5120 bytes (backup at battery failure)<br>09000 to 09777, 49000 to 49777, 89000 to 89777<br>19000 to 19777, 59000 to 59777, 99000 to 99777<br>29000 to 29777, 69000 to 69777<br>39000 to 39777, 79000 to 79777 | |

Note 1: The maximum number of control I/O points differs from on model to another. The remaining I/O relay area can be used for auxiliary relays.

JW-50CU, JW-50CUH: 01000 to 03777

JW-70CU, JW-70CUH: 02000 to 03777

If more than 2048 I/Os are required, convert the auxiliary, latch, and general purpose relays into I/O relays.

Note 2: Available only for JW-series I/Os.

Note 3: Available only if the I/O bus expansion adapter is used.

Note 4: System memory #0201 can be used to set the number of contacts either 512 or 1024. If 1024 points are set, T or C1000 to C1777 are shared with general purpose relays 13000 to 14777.

Note 5: See the description of application instructions F-260, Fc260, F-261 and Fc261 in the programming manual.

| | | JW-50CU/70CU/100CU, JW-50CUH/70CUH/100CUH |
|---|---|---|
| Data memory | File register | JW-50CU, JW-50CUH: 16K bytes (file 1)<br>JW-70CU/100CU, JW-70CUH/100CUH<br>When using ZW-1MA and JW-1MAH: 16 kbytes (file 1)<br>When using ZW-2MA and JW-2MAH: 64 kbytes (file 1)<br>When using ZW-3MA and ZW-3MAH: 128 kbytes (file 1, 2)<br>When using ZW-4MA and ZW-4MAH: 448 kbytes (file 1 to 7) |
| | Areas used by link module (ZW-10CM, JW-10CM) | [Areas for data link]<br>Initial sequence computer flag (07305)<br>Data link operating (07304, 07307)<br>[Areas for remote I/O]<br>Remote I/O operating (07316)<br>Individual remote I/O flags (15771 to 15777)<br>[Area for computer link]<br>Format errors (07310, 07313)<br>Output relays (07311, 07314)<br>Trigger contacts (07312, 07315)<br>Global address command complete (07317)<br>Output format's first address storage area (19750, 19751, 19754, 19755)<br>Data memory's first address storage area (19752, 19753, 19756, 19757) |

**Areas for storing real-time clock's present time *Note 1**

| | |
|---|---|
| Second | 99770 |
| Minute | 99771 |
| Hour | 99772 |
| Date | 99773 |
| Month | 99774 |
| Year | 99775 |
| Day | 99776 |
| Control code | 99777 |

**Contents of control code 99777**

| Contents | D7 | D6 D5 D4 | D3 | D2 D1 | D0 |
|---|---|---|---|---|---|
| ON | Set time | Not used | 30 sec. correction | Not used | Stop clock |
| OFF | Time monior | | — | | Start clock |

**Error history storage area *Note 2**

| | |
|---|---|
| E0000 to E0177 | Port 7 |
| E0200 to E0377 | Port 6 |
| E0400 to E0577 | Port 5 |
| E0600 to E0777 | Port 4 |
| E1000 to E1177 | Port 3 |
| E1200 to E1377 | Port 2 |
| E1400 to E1577 | Reserved |
| E1600 to E1777 | Control module |

| | |
|---|---|
| Error 8 |
| Error 7 |
| Error 6 |
| Error 5 |
| Error 4 |
| Error 3 |
| Error 2 |
| Error 1 |

| | |
|---|---|
| 00 | Second |
| 01 | Minute |
| 02 | Hour |
| 03 | Date |
| 04 | Month |
| 05 | Year |
| 06 | Day |
| 07 | Error code |
| 10 | Faulty port, slot, rack panel |
| 11 | Error count |
| 12 | Reserved |
| 13 | Reserved |
| 14 | Reserved |
| 15 | Reserved |
| 16 | Reserved |
| 17 | Reserved |

Note 3: When an error occurs, the real-time clock is reset to 24-hour represe-ntation.

Note 1: In a control module with no battery, the real-time clock start with 00H: 00M: 00S, 00 year 00 month 00 day at power ON.

Note 2: The address range E0000 to E1577 is assigned as an error history storage area of variable size that depends on the number of installed option modules. The areas assigned to uninstalled option module are available as general-purpose registers.

| | JW-50CU/70CU/100CU, JW-50CUH/70CUH/100CUH | |
|---|---|---|
| | **Address** | **Function** |
| System memory | #0010 to #0017 | Clock feature |
| | #0020 | User program EEPROM area |
| | #0030 | Minimum scan time monitor (lower BCD digit) |
| | #0031 | Minimum scan time monitor (upper BCD digit) |
| | #0032 | Current scan time monitor (lower BCD digit) |
| | #0033 | Current scan time monitor (upper BCD digit) |
| | #0034 | Maximum scan time monitor (lower BCD digit) |
| | #0035 | Maximum scan time monitor (upper BCD digit) |
| | #0036 | Last I/O address monitor (OCT) |
| | #0042 | ID code monitor of the installed memory module |
| | #0046 | I/O address monitor where an error was detected (OCT) |
| | #0050 | Error slot number monitor |
| | #0052 | Error address monitor on user program (lower octal digit) |
| | #0053 | Error address monitor on user program (upper octal digit) |
| | #0054 | Error address monitor on user program (file number) |
| | #0160 to #0167 | Error codes obtained from self diagnosis |
| | #0170 to #0177 | Option error codes |
| | #0201 | Specifies the TMR reset condition |
| | #0202 | Specifies the CNT reset condition |
| | #0204 | Specifies the program memory capacity |
| | #0205 | Specifies file register capacity (file No.1) |
| | #0206 | Specifies continue/stop operation upon detection of a fuse failure |
| | #0207 | Specifies continue/stop operation upon detection of an option error |
| | #0210 to #0222 | ZW-10CM, JW-10CM: Area used by a remote I/O master station manual allocation |
| | #0223 | Selects clock functions |
| | #0224, #0225 | Specifies the use of comment memory |
| | #0226 | Specifies scan time |
| | #0227 | Selects 10ms timer functions |
| | #0230 | Sets latched relay area (lower octal digit) |
| | #0231 | Sets latched relay area (upper octal digit) |
| | #0232 | Specifies the output holding address (lower octal digit) |
| | #0233 | Specifies the output holding address (upper octal digit) |
| | #0236,#0237 | Sets the commniation port's mode |
| | #0241 to #0243 | Sets interrupt inputs (JW) |
| | #0244 | Enables/disables data write into file memories (files 1to 7) |
| | #0246 | Extends voltage interruption detction interval |
| | #0247 | Selects either automatic or manual registration of I/O addresses. |
| | #0250 | Specifies the total number of bytes used by I/O modules (ZW) |
| | #0252 | Specifies the I/O address self-test feature (ZW) |
| | #0255 | Specifies battery-less operation |
| | #0256 | Selects ROM type |
| | #0260 to #0377 | Specifies parameters for the ZW-10CM, JW-10CM data link master station |

Note 1: The JW and ZW given in parentheses denote the functions and for the JW-I/Os and ZW-I/Os respectively.

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| JW-50CU/70CU/100CU, JW-50CUH/70CUH/100CUH | | |
|---|---|---|
| | **Address** | **Function** |
| System memory | #0660 to #0757 | The number of dummy I/Os |
| | #0760 to #0777 | The first address of each rack panel |
| | #1200 to #1376 | The first address of special I/O modules. |
| | #0660 to #1377 can be assigned with auto I/O registration or manual I/O registration using a support tool (JW-14PG, etc.) It is impossible to register directly to system memory #0660 to #1377. | |
| Comment memory | JW-50CU, JW-50CUH: The registers for file number 1 can beused for comment memory. (16 kbytes maximum) | |
| | JW-70CU/100CU, JW-70CUH/100CUH: The registers for file numbers 1 to 7 and C to E can be used for comment memory. (Note 1) | |
| | JW-50CU, JW-50CUH: None | |
| | JW-70CU/100CU, JW-70CUH/100CUH: Built-in<br>Communication interface standard: RS-485, RS-232C<br>Transfer speed: 9600, 4800, 2400, 1200, 600 bps<br>Data length: 7 bits<br>Parity bit: odd, even, none<br>Stop bit: 1 or 2 bits<br>Connection configuration: 1:1 (RS-232C), 1:N(RS-485)<br>Data format: Subset of computer link format<br>Connector: Dsub-15P | |
| Interrupt program | Input interrupt: 16 levels (LB1360 to LC1377)<br>Timer interrupt: 1, 2, 5, 10, or 20ms interval (LB1353 to LB1357)<br>The input and timer interrupts can be enabled or disabled independently.<br>The labels for disabled interrupts may be used as common labels. | |
| Debug function | Sampling trace | Data for (16 relay points + 6 bytes register)×256 times or 16 relay points×1024 times can b traced at an arbitrary period (50ms units) at every scan to 1 second (up to 64 kbytes of data can be traced when a file register is used for trace memory). |
| | Break function | Any program address or data memory address can be set as a breakpoint. (Continuation or break of the opeation can be selected when a break condition is met.) |
| | Step operation | Executes the program, one circuit at a time. |
| | N scan operation | Executes operations for the specified number of scans (1 to 9999 scans) |
| | Forced ON-OFF of I/O relay | Turns an I/O relay ON or OFF regardless of the input signal or operation result (maximum of 32 points each for ON and OFF) |

Note 1: The memory module installed in the control module determines the files that can be used.

| Memory module | File register which can be used as comment memory | | |
|---|---|---|---|
| | **File number** | **Address** | **Maximum capacity** |
| ZW-1MA, JW-1MAH | File 1 | 00000 to 03777 | 16 kbytes |
| ZW-2MA, JW-2MAH | File 1 | 00000 to 17777 | 64 kbytes |
| ZW-3MA, JW-3MAH | File 1 and 2 | 00000 to 17777 for each | 128 kbytes |
| ZW-4MA | Files 1 to 7 Files C to E | 00000 to 17777 for each | 448 kbytes Files 4 to 6 and C to E are switched for use (see page 5-7) |
| JW-4MAH | | | 576 k bytes Files 6 and E are switched for use (see page 5-10) |

| JW-50CU/70CU/100CU, JW-50CUH/70CUH/100CUH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Item | Contents | PC operation status | Halt output | Control module indicators | | Power supply module indicator | Special relay | Error code *Note 1 | | |
| | | | | RUN | FAULT | POWER | | Special register ]0734 | System memory #0160 to #0167 | Priority level |
| Self-diagnosis — Memory error | Parity check | Stop | Open | OFF | | ON | ON | 07370 | 20 | 21 | 5 |
| | Instruction code check | | | | | | | | | 24 | 5 |
| | System memory address check | | | | | | | | | 23 | 2 |
| | Program ROM check | | | | | | | | | 25 | 1 |
| | Data ROM check | | | | | | | | | 26 | 1 |
| | Program ROM size check | | | | | | | | | 27 | 1 |
| | I/O registration table check | | | | | | | | | 28 | 4 |
| | I/O table parity check | | | | | | | | | 29 | 4 |
| CPU error | RAM check (R/W) | | | | | | | 07371 | 30 | 32 | 1 |
| | Parity check | | | | | | | | | 33 | 3 |
| | Hardware check | | | | | | | | | 35 | 3 |
| I/O error | I/O data bus | | | | | | | 07373 | 40 | 44 | 4 |
| | I/O signal | | | | | | | | | 45 | 4 |
| | Input data parity check | | | | | | | | | 41 | 4 |
| | Output data parity check | | | | | | | | | 42 | 4 |
| | Installed module check | | | | | | | | | 40 | 4 |
| | Output module fuse failure *Note 2 | Operation | Close | Flash (Intermittent) | | OFF | | 07363 | | 49 | 4 |
| | | Stop | Open | OFF | | ON | | | | | |
| | Special I/O error | Operation | Close | Flash (Intermittent) | | OFF | | 07375 | | 46 | 4 |
| Power supply error | Power failure or supply voltage drop | Stop | Open | OFF | | OFF | OFF | 07377 | 10 | 13 | 7 |
| Expansion power supply error | Power failure or supply voltage drop | | | | ON | ON | | 07376 | 40 | 43 | 7 |
| Option error | Option module error *Note 2 | Operation | Close | Flash (Intermittent) | | OFF | ON | 07374 | 50 | 53 | 6 |
| | | Stop | Open | OFF | | ON | | | | | |
| | Option bus error | Stop | Open | OFF | | ON | | | | 52 *Note 5 | 2 |
| Battery error | Battery voltage drop | Operation | Close | ON | | ON | | 07372 | 20 | 22 | 8 |
| Halt output | | Triac output, 100/200 VAC, 0.5A. Turned ON (closed) when the PC is running. (Note 3) | | | | | | | | | |

Note 1: All error codes are in BCD.

Note 2: The upper or lower state of each item may occur when the fuse is melted down in the system memory #0206 or #0207, or by the setting in the case of option abnormality.

| (Setting) | (State) |
|---|---|
| Continue operation | ⇨ Upper column |
| Halt ouput | ⇨ Lower column |

Note 3: When the JW-1PU power supply module is used. If the JW-2PU power supply module is used, a transistor output with 24 VDC, 0.5 A rating is used.

Note 4: Valid only for JW-series I/O modules.

Note 5: If the system detects an error in the optional bus, it stops operation by turning ON the normally OFF contact point 07366. In the case of turning ON 07366 with the user's program or that 07366 is ON without clearing the data memory when putting the power in the PC for the first time, error code 52 may be shown.

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# 4-3  Memory module

The memory module is used for program creation and storage. The relationship between the control module and memory module is given below.

| Control module | Memory module |
|---|---|
| JW-50CU, JW-50CUH | Installed as a standard module (use of any other memory modules ZW-1MA/JW-1MA are not allowed) |
| JW-70CU/100CU JW-70CUH/100CUH | Module not installed (install the memory module as described below) |

## [1] Memory module selection

Select a memory module according to the program capacity and processing speed of the control module.

### (1) Processing speed of the control module



Control module (JW-70CUH/100CUH)

Memory module
JW-1MAH
JW-2MAH
JW-3MAH
JW-4MAH

Memory module
JW-1MAH
JW-2MAH
JW-3MAH
JW-4MAH

Control module (JW-70CUH/100CUH)
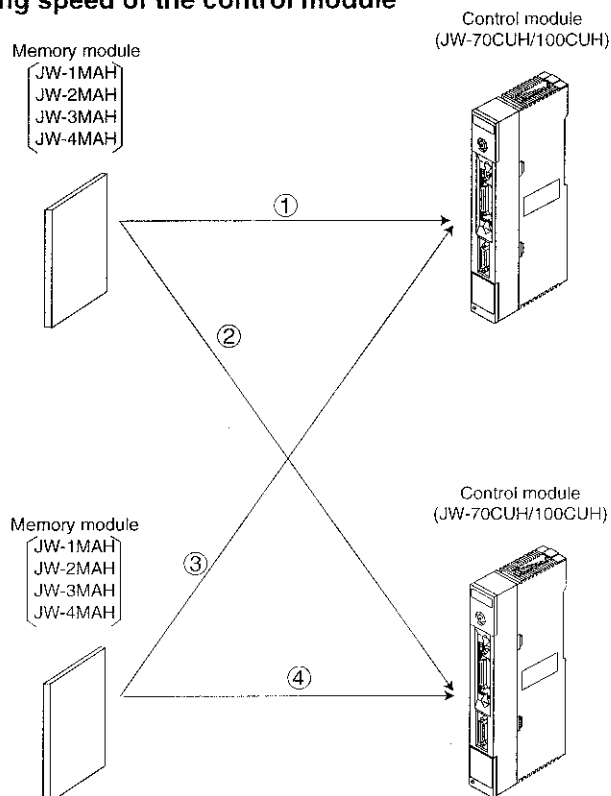
The relationship between the four installation configurations ① to ④ shown above and the processing speed of the control module is described below. In installation configuration ①, select conventional or high speed operation using the switch on the memory module. (See pages 5-8 to 5-10).Conventional speed refers to the same processing speed that is available on the JW50/70/100.

| Installation configuration | Processing speed of the control module | | |
|---|---|---|---|
| | | Basic instuctions (except TMR, CNT and MD) | TMR, CNT and MD application instructions |
| ① | High speed operation | 0.25 μs/instruction | Average μs/instruction ·Processing speed during high speed operation is approximately 1.5 times that of conventional speed operation. |
| | Conventional speed operation | 0.38 μs/instruction | |
| ②, ③, ④ | Conventional speed operation | | |

• For the processing speed of each instruction, refer to the "Description of instructions" in the programming manual.

### (2) Program memory, file memory

| Memory module Model name | Program memory | | File memory | | |
|---|---|---|---|---|---|
| | Capacity | Address | Capacity | Address | File in use |
| ZW-1MA, JW-1MAH | 7.5 K words | 00000 to 16777 | 7.5 K words | 00000 to 37777 | File 1 |
| ZW-2MA, JW-2MAH | 15.5 K words | 00000 to 36777 | 15.5 K words | 00000 to 17777 | File 1 |
| ZW-3MA, JW-3MAH | 31.5 K words | 00000 to 76777 | 31.5 K words | 00000 to 17777 | File 1,2 |
| ZW-4MA, JW-4MAH | 63 K words | 00000 to 76777 | 63 K words | 00000 to 17777 | File 1 to 7 |

• Address map of each memory module

ZW-1MA, JW-1MAH

| Program memory (7.5 K words) | File register (16 K words) [File 1] |
|---|---|
| 00000 to 16777 | 000000 to 037777 |

ZW-2MA, JW-2MAH

| Program memory (15.5 K words) | File register (64 K words) [File 1] |
|---|---|
| 00000 to 36777 | 000000 to 177777 |

ZW-3MA, JW-3MAH

| Program memory (31.5 K words) | File register (64 K words) [File 1] | File register (64 K words) [File 2] |
|---|---|---|
| 00000 to 76777 | 000000 to 177777 | 000000 to 177777 |

ZW-4MA, JW-4MAH

| Program memory (31.5 K words) [File 8] | File register (31.5K words) [File 9] | File register (64 K words) [File 1] | File register (64 K words) [File 2] | File register (64 K words) [File 3] | File register (64 K words) [File 4] | File register (64 K words) [File 5] | File register (64 K words) [File 6] | File register (64 K words) [File 7] |
|---|---|---|---|---|---|---|---|---|
| 00000 to 76777 | 00000 to 76777 | 000000 to 177777 | 000000 to 177777 | 000000 to 177777 | 000000 to 177777 | 000000 to 177777 | 000000 to 177777 | 000000 to 177777 |

• Refer to page 4-18 for comment memory.

## [2] Name and function of each part



(ZW-1MA/2MA/3MA)

(ZW-4MA)

(JW-1MAH/3MAH)

(JW-2MAH)

(JW-4MAH)
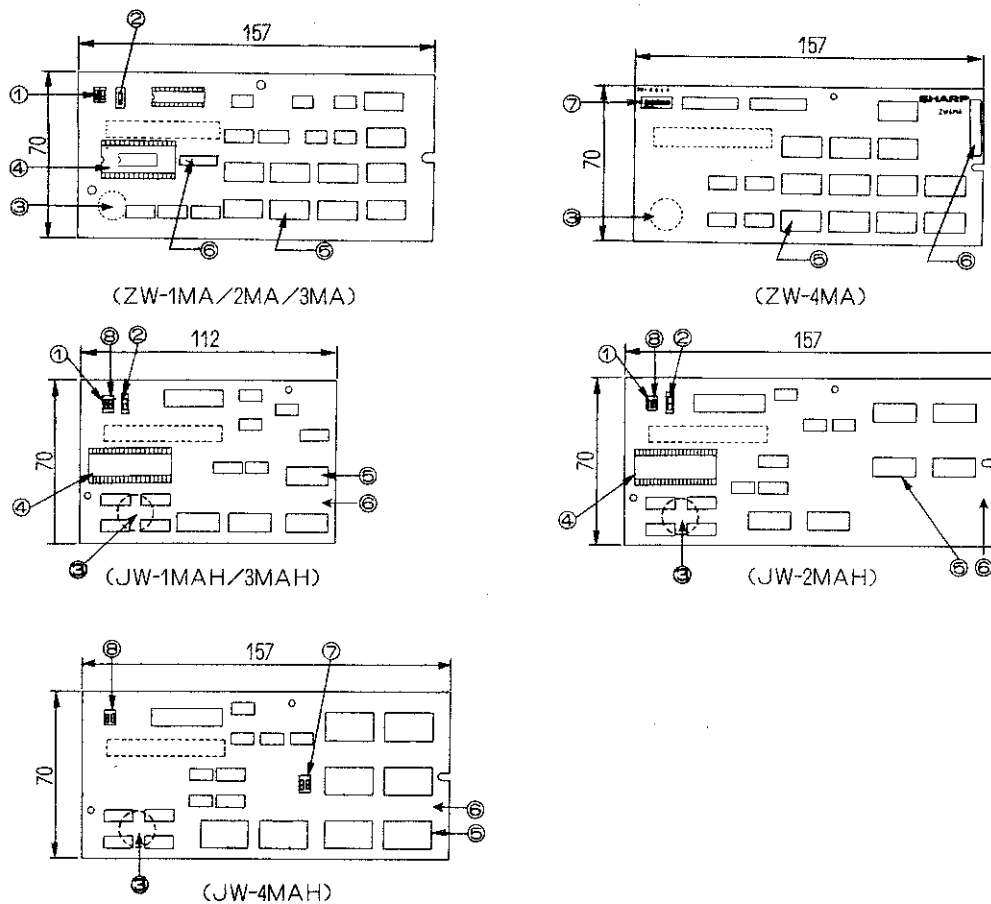
① ROM/RAM selector switch

If you installed an EPROM or EEPROM chip in the ROM socket, set this switch to ROM. Otherwise set it to RAM (see page 5-6, 5-8, and 5-9.)

② EPROM/EEPROM selector switch

Set this switch to the appropriate position depending on the type of the ROM chip installed in the ROM socket. If no ROM is installed, it may be set to any position.

③ Super capacitor

The RAM backup capacitor retains the RAM contents for approximately 10 minutes after the memory module is removed from the CPU board.

④ ROM socket

This socket accepts an EPROM or EEPROM chip.

⑤ RAM

These RAM chips are used as program memory.

⑥ Module name

Contains the model name of the memory module.

⑦ DIP switch

Set this switch depending on the application purposes of files. (see page 5-7, 5-10).

⑧ Normal/high speed switch

Set processing speed of control module.(see page 5-8 to 5-10).

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## [3] How to use

### (1) Registration of memory capacity

Store the capacity of the program memory and the capacity of the file 1 register into the system memory according to the installed memory module.

| Program memory capacity | | |
|---|---|---|
| System memory #0204 (set in octal) | 200 | 7.5 Kwords |
| | 201 | 15.5 Kwords |
| | 202 | 23.5 Kwords |
| | 203 | 31.5 Kwords |
| | 207 | 63 Kwords |

| Register capacity of file 1 | | |
|---|---|---|
| System memory #0205 (set in octal) | 000 | ——— |
| | 001 | 16 Kwords |
| | 002 | 32 Kwords |
| | 003 | 48 Kwords |
| | 004 | 64 Kwords |

Note 1: The file register capacity setting is unrelated to whether the file is used or not. The setting is used when transferring files with ladder processor II(Z-100LP2S).

### (2) ROM operation

ROM operation can be executed by installing an EPROM or EEPROM into the IC socket on the memory module (ZW-1MA/2MA/3MA, JW-1MAH/2MAH/3MAH). To use a PROM or EEPROM, set the area to be ROMed to system memory #0256.*Note 2
See page 7-1 to 7-11.

*Except for B version is not used.

| | Setting value | | Contents to be ROMed | | | | ROM type | ROM model name | |
|---|---|---|---|---|---|---|---|---|---|
| | Octal | Hexa-decimal | System memory | User program | Register | File 1 | | | |
| System memory #0256 | 000(8) | 00(H) | - | - | - | - | - | - | *Note 3 |
| | 146(8) | 66(H) | #0200 to #2177 | 3.5 Kwords | - | - | EEPROM | AT28C64B-15PC (ATMEL)* | |
| | 167(8) | 77(H) | #0200 to #2177 | 31.5 Kwords | - | - | EPROM | 27C512 (Fujitsu) | |
| | 200(8) | 80(H) | #0200 to #2177 | 15.5 Kwords | - | - | EPROM | AT28C256-15PC (ATMEL) | |
| | 201(8) | 81(H) | #0200 to #2177 | 7.5 Kwords | 09000 to 09777 19000 to 19777 | - | | | |
| | 202(8) | 82(H) | #0200 to #2177 | 7.5 Kwords | - | 16 kbytes | EEPROM | AT28C256-15PC (ATMEL) | |
| | 203(8) | 83(H) | #0200 to #2177 | - | 09000 to 09777 19000 to 19777 | - | | | |
| | 204(8) | 84(H) | #0200 to #2177 | - | - | 31 kbytes | | | |

Note 2: ROM operation is not available when memory module ZW-4MA or JW-4MAH is used.

Note 3: If the memory module is removed from the CPU board, place it on an insulating material or into its storage bag to prevent its circuits from shorting.

## [4] Using the 63K-word program memory (ZW-4MA, JW-4MAH)

The JW70/100, JW70H/100H with a ZW-4MA, JW-4MAH memory module allows you to create a user program of up to 63K words in size. The program is stored in files No.8 and No.9, 31.5K words in each.



Memory address 00000 ... 76777 — END — File No. 8

Memory address 100000 ... 176777 — END — File No. 9
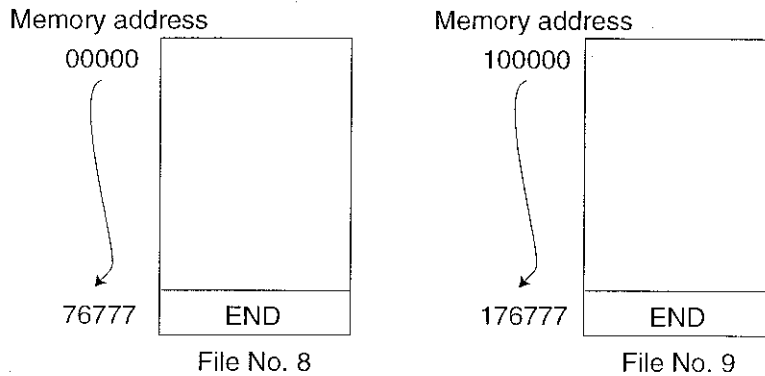
Preparution of program

• An END instruction is placed at the end of both files. If a program written into file 8 is too big, place a jump instruction (F-141, F-151) before the END instruction in file No. 8 to indication that the program continues in file 9. Otherwise operation will terminate at the end of file No.9 left unexecuted.

## [Programming example using a jump instruction]



| 07366 | F-141 | LB0000 |
| END |

Address 00000 ... END 76777 — File No. 8

F-140 LB0000

Address 100000 ... END 176777 — File No. 9
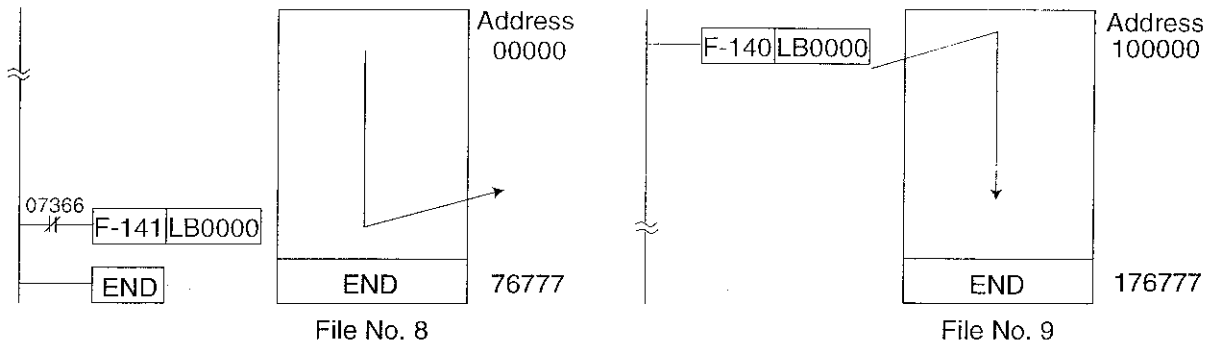
Note 1: Inserting or deleting program lines will not cause the subsequent lines of the program to be moved from one file to the other. If it is expected that program lines will be inserted in the future, leave space for insertion in the last portion of file No.8.

# 4-4 Rack panel

## [1] Rack panel type description

Rack panels for the JW50/70/100, JW50H/70H/100H PC include 13 models in three types. Choose one or more depending on the types of I/O and power supply modules you use.

| I/O module type | Module name | Model name | Outline |
|---|---|---|---|
| JW-I/O | Rack panel | JW-4BU | 4 slots for control, power supply, option, and I/O modules. |
| | | JW-6BU | 6 slots for control, power supply, option, and I/O modules. |
| | | JW-8BU | 8 slots for control, power supply, option, and I/O modules. |
| | | JW-13BU | 13 slots for control, power supply, option, and I/O modules. |
| ZW-I/O | | ZW-08BU | 8 slots for control, power supply, and I/O modules. |
| | Basic rack panel | ZW-28KB | 12 slots for a control module, a power supply modules, up to two option modules, and up to 8 I/O modules. |
| | | ZW-46KB | 12 slots for a control module, a power supply modules, up to two option modules, and up to 6 I/O modules. |
| | | ZW-04KB | 6 slots for a control module, a power supply modules, up to two option modules, and up to 4 I/O modules. |
| | | ZW-02KB | 4 slots for a control module, a power supply modules, up to two option modules, and up to 2 I/O modules. |
| | Expansion rack panel | ZW-108ZB | 9 slots for an expansion power supply module and up to 8 I/O modules. |
| | | ZW-104ZB | 5 slots for an expansion power supply module and up to 8 I/O modules. |
| | | ZW-102ZB | 3 slots for an expansion power supply module and up to 2 I/O modules. |
| | | ZW-508ZB | 8 slots for up to 8 I/O modules. |

Rack panel: May be used as either a basic rack panel or an expansion rack panel. Use a JW-1PU or JW-2PU for the power supply module. None that no option module can be installed in the ZW-08BU rack panel.

Basic rack panel: Accepts control, power supply, option, and I/O modules.

Expansion rack panel: Accepts an expansion power supply module and ZW-100PU2 for the expansion power supply module can be installed in the ZW-508ZB expansion rack panel.

## [2] Name and function of each part
### (1) Rack panel

⑥Module retention screw hole

⑯Module connectors

①Rack mounting hole

⑧5 VDC terminal block

②I/O expansion connector

⑮Option cabl port

⑥Module retention screw hole
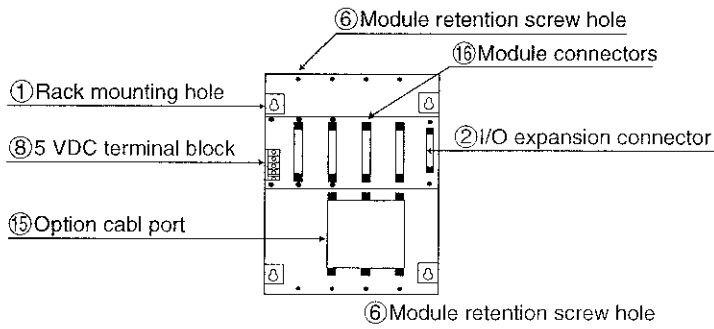
Rack panel (JW-4BU)
(for JW-I/Os)

⑥Module retention screw hole

⑯Module connectors

①Rack mounting hole

⑧5 VDC terminal block

②I/O expansion connector

⑮Option cabl port
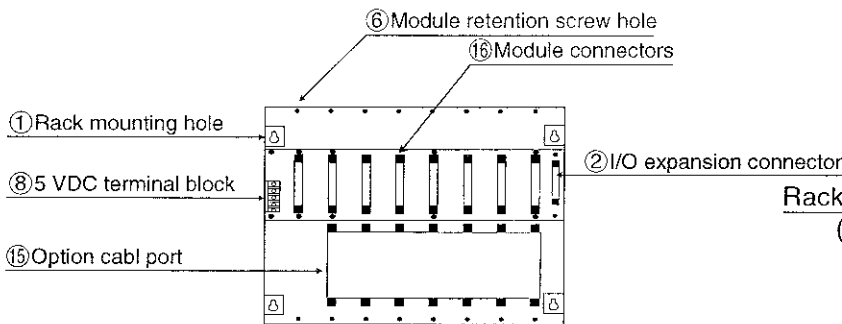
Rack panel (JW-8BU)
(for JW-I/Os)

⑥Module retention screw hole

⑯Module connectors

①Rack mounting hole

⑧5 VDC terminal block

⑮Option cabl port
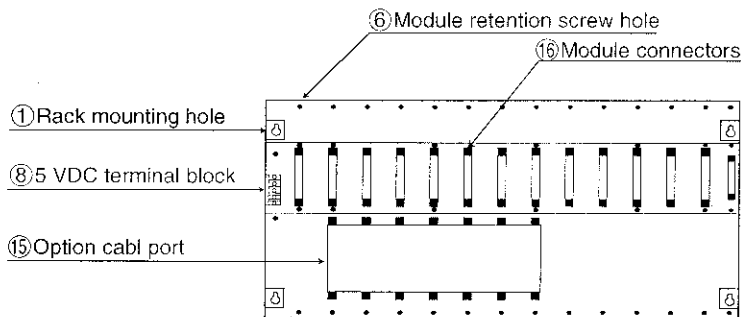
Rack panel (JW-13BU)
(for JW-I/Os)

⑥Module retention screw hole

⑯Module connectors

①Rack mounting hole

⑪I/O expansion connector(IN)

⑫I/O expansion connector(OUT)

⑧5 VDC terminal block

⑦24 VDC terminal block
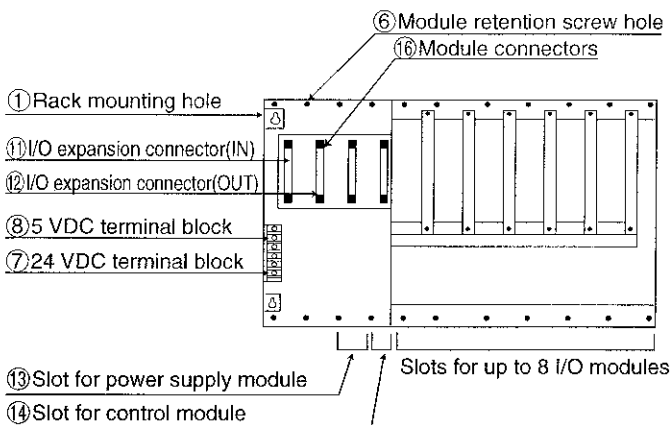
Rack panel (ZW-08BU)
(for JW-I/Os)

⑬Slot for power supply module

Slots for up to 8 I/O modules

⑭Slot for control module

4-26

## (2) Basic rack panel

⑥Module retention screw hole
③Card-edge connector receptacle
⑤I/O module mounting guide hole

①Rack mounting hole
②I/O expansion connector
⑧5 VDC terminal block
⑦24 VDC terminal block
①Rack mounting hole
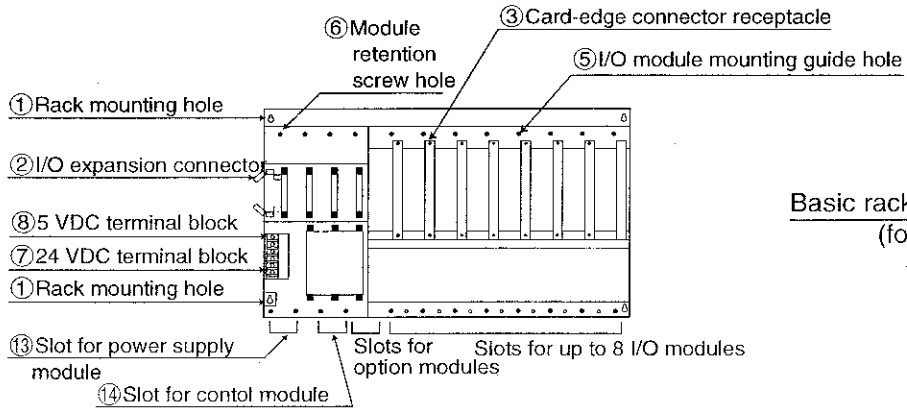
Basic rack panel (ZW-28KB)
(for ZW-I/Os)

⑬Slot for power supply module
Slots for option modules
Slots for up to 8 I/O modules
⑭Slot for contol module

①Rack mounting hole
⑥Module retention screw hole
⑦24 VDC terminal block
①Rack mounting hole
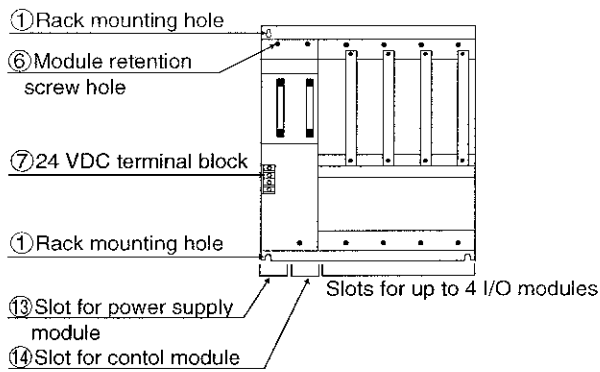
Basic rack panel (ZW-04KB)
(for ZW-I/Os)

⑬Slot for power supply module
Slots for up to 4 I/O modules
⑭Slot for contol module

## (3) Expansion rack panel

⑨Expansion power supply module mounting guide hole
⑤I/O module mounting guide hole
③Card-edge connector receptacle
⑥Module retention screw holes

⑩Power indicator
⑪I/O expansion connector (IN)
⑦I/O expansion connector (OUT)
⑧5V terminal block
①Rack mounting holes
⑦24 VDC terminal block
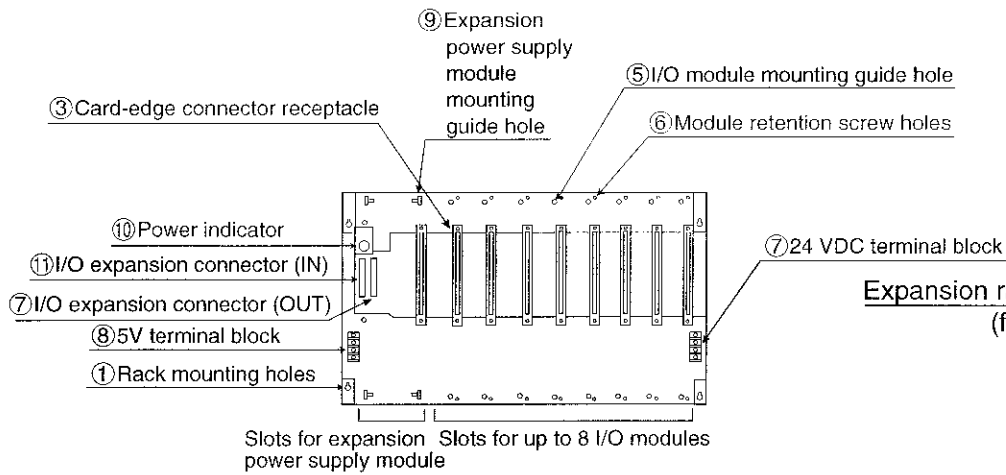
Expansion rack panel (ZW-108ZB)
(for ZW-I/Os)

Slots for expansion power supply module
Slots for up to 8 I/O modules

⑤I/O module mounting guide hole
③Card-edge connector receptacle
⑥Module retention screw holes

②I/O expansion connector
⑧5V terminal block
①Rack mounting holes
⑦24 VDC terminal block
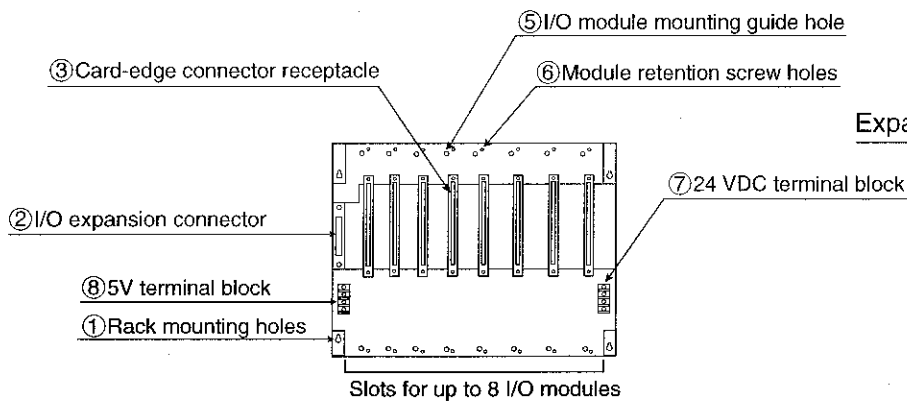
Expansion rack panel (ZW-508ZB)
(for ZW-I/Os)

Slots for up to 8 I/O modules

4-27

① Rack mounting holes

Use these holes and M5 screws for mounting the rack panel on the cabinet.

② I/O expansion connector

Use this connector to establish signal and bus connections between the basic and expansion rack panels. Connectors on rack panel and basic rack panel are provided with connector covers.

③ Card-edge connector receptacles

Plug the expansion power supply module's or I/O module's card-edge connectors into these receptacles. The basic rack panel have receptacles for up to 8 (ZW-28KB) or 6 (ZW-46KB) I/O modules; the expansion rack panel (ZW-108ZB) has receptacles for one expansion power supply module and up to 8 I/O modules.

These receptacles are provided with covers. For I/O slots holding no I/O modules, leave the covers installed on receptacles.

④ Option cable (optional)

This cable is used to connect an option module to the control module.

⑤ I/O module mounting guide hole

This hold receives an I/O module's mounting guide pin.

⑥ Module retention screw holes

Use these holes to secure the control, I/O, and/or expansion power supply modules to the rack panel frame.

⑦ 24 VDC terminal block

Use this terminal block to supply a 24 VDC(or 12 VDC) power from an external source to the DC-type output module (ZW-16S2) installed in the rack panel.

⑧ 5 VDC terminal block (on expansion rack panel only)

Use this terminal block to supply a 5 VDC power from the basic rack panel (power supply module) to the expansion rack panel. For connection, be sure to use the 5 VDC cable supplied with the expansion rack panel.

⑨ Expansion power supply module mounting guide hole

This hole receives the expansion power supply module's mounting guide claw.

⑩ Power indicator

Come on when 5 VDC power is supplied to the expansion rack panel (ZW-108ZB).

⑪ I/O expansion connector (IN)

Use this connector to connect the expansion rack panel from the basic rack panel, or from the preceding expansion rack panel (ZW-108ZB) in a daisy-chain configuration.

⑫ I/O expansion connector (OUT)

Use this connector to connect the expansion rack panel to the succeeding expansion rack panel in a daisy-chain configuration.

⑬ Slot for power supply module

Install the JW-1PU or JW-2PU power supply module into this slot.

⑭ Slot for control module

Install the control module into this slot.

⑮ Option cable port

This pot receives the ZW-6CC/4CC/2CC option cable.

⑯ Module connectors

Plug I/O modules into these receptacles. When these receptacles are to be left unused, leave the connector covers in place.

## [3] Description of rack panel (JW-4BU/6BU/8BU/13BU)

The JW-4BU, JW-6BU, JW-8BU and JW-13BU rack panels are primarily designed to hold JW-series I/O modules. They may be used as either basic rack panels or expansion rack panels.

| Model name | Module capacity | Outline |
|------------|-----------------|---------|
| JW-4BU | 4 | Contol module |
| JW-6BU | 6 | Power supply module |
| JW-8BU | 8 | Option module |
| JW-13BU | 13 | JW-series I/O modules |

### (1) Installing power supply, control, and I/O modules



JW-6BU                    JW-13BU
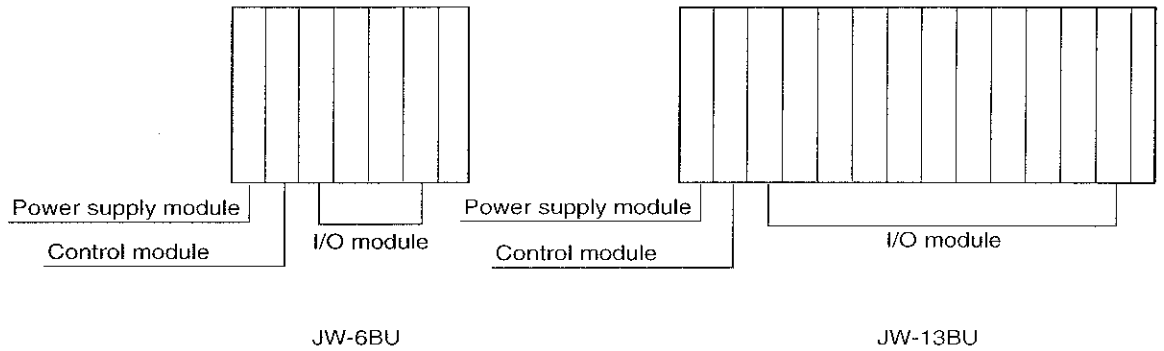
### (2) Installing power supply, control, option, and I/O modules



JW-6BU                    JW-13BU
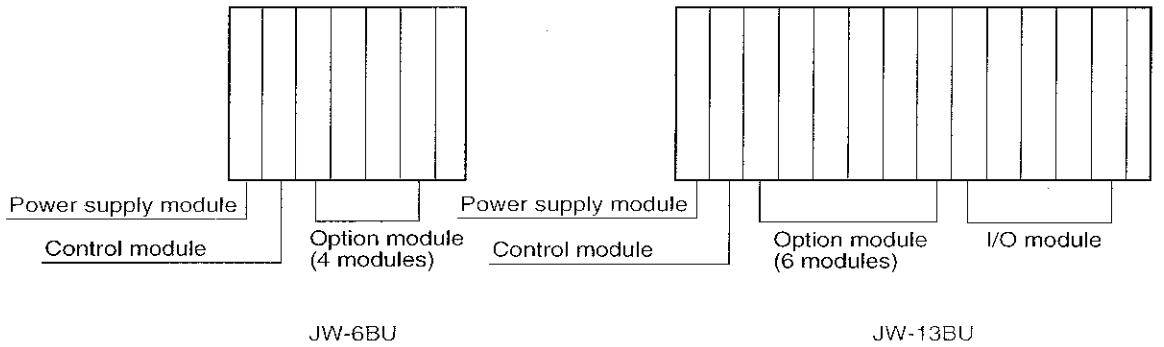
Note 1: Using option modules in the rack panel requires the ZW-2CC/4CC/6CC option cable (optional).

### (3) Using the JW-1EA/2EA I/O bus extension adapter



JW-6BU    I/O bus expansion adapter                    JW-13BU
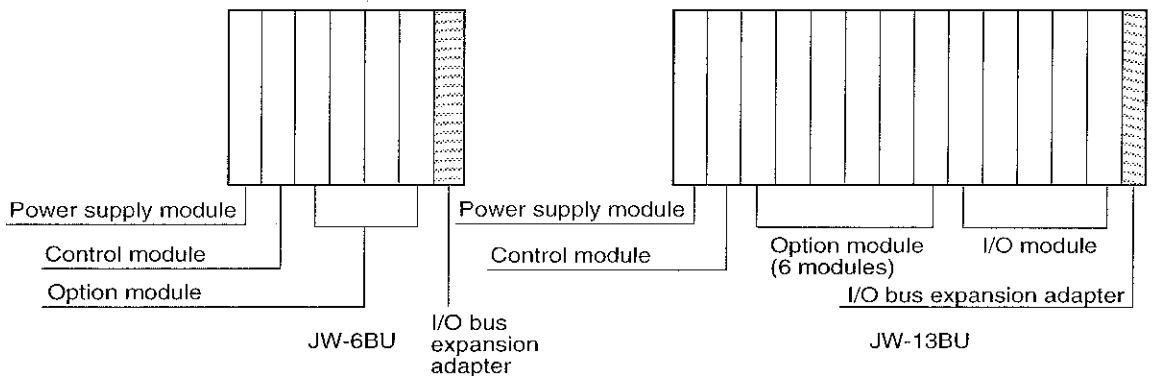
Note 2: Install the I/O bus expansion adapter (JW-1EA/2EA) directly into the I/O expansion connector on the right end of the rack panel.

## [4] Description of rack panel (ZW-08BU)

The ZW-08BU rack panel is primarily designed to hold ZW-series I/O modules. It may be used as either a basic rack panel or an expansion rack panel.

### (1) Using only the control module



I/O module (8 modules)

Power supply
module

Control module
(JW-50CU/70CU/100CU, JW-50CUH/70CUH/100CUH)
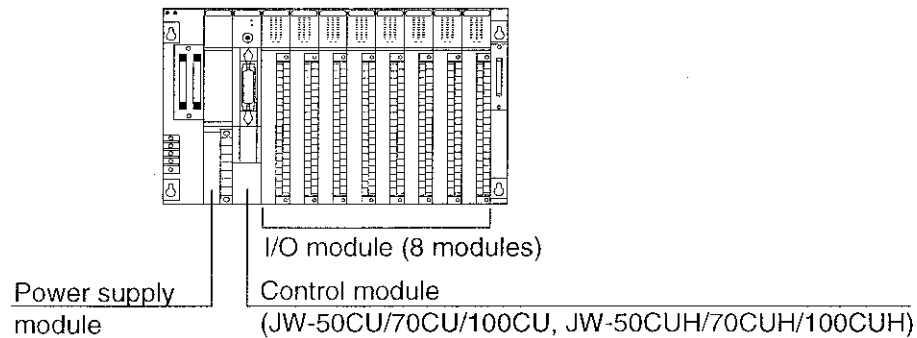
### (2) Using as a remote I/O slave module



I/O module (8 modules)

Power supply
module

Remote I/O slave module (ZW-20RS)
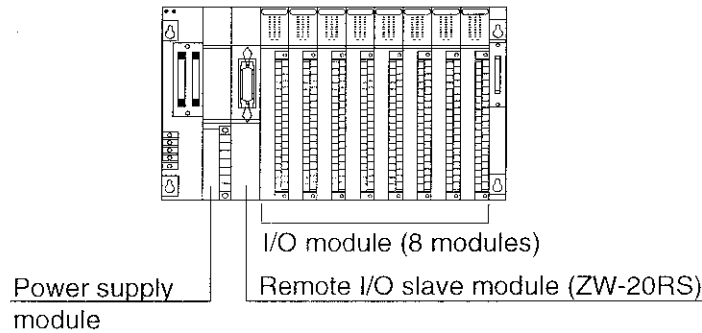
### (3) Using as an expansion rack panel *Note 1

The ZW-08BU rack panel may be used as an expansion rack panel if a power supply module is installed in it.



I/O module (8 modules)

Power supply
module

Vacant slot
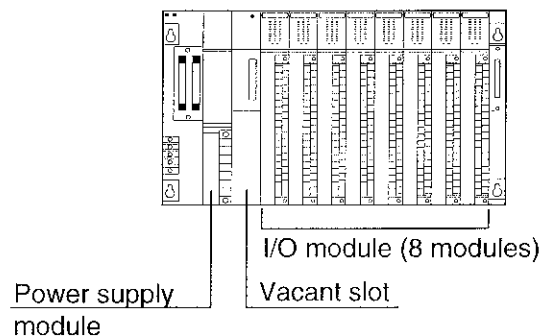
Note 1: When using the rack panel to hold the I/O bus expansion adapter (ZW-10EU), see page 109.

Note 2: When using the rack panel to hold a remote I/O slave module or I/O bus expansion adapter (ZW-10EU), read the instruction manual for the corresponding module or adapter as well.

## [5] Notes on the usage of rack panels
### (1) Using JW-series I/O modules

1. Using the I/O bus expansion adapter (JW-1EA/2EA) in each rack panel allows up to eight rack panels to be connected in a daisy chain configuration. However, the number of usable I/O modules depends on the number of I/O points controllable by the control module installed in the rack panel. The following table lists the number of usable I/O modules for the various control module types:

| | JW-50CU JW-50CUH | JW-70CU JW-70CUH | JW-100CU JW-100CUH |
|---|---|---|---|
| Max. No. of rack panels | 8 | 8 | 8 |
| I/O points and I/O modules supported using only 64-point I/O modules | 512 points/ 8 modules | 1024 points/ 16 modules | 4096 points/ 64 modules |
| I/O points and I/O modules supported using only 32-point I/O modules | 512 points/ 16 modules | 1024 points/ 32 modules | 3168 points/ 99 modules *Note 1 |
| I/O points and I/O modules supported using only 16-point I/O modules | | | 1584 points/ 99 modules *Note 1 |
| I/O points supported using X 64-point, Y 32-point, and Z 16-point I/O modules | 64X+ 32Y+16Z ≦512 points | 64X+ 32Y+16Z ≦1024 points | 64X+ 32Y+16Z ≦1024 points |

Note 1: These numbers are attained using eight JW-13BU rack panels, one control module, and four power supply modules.

2. If two rack panels are used with no power supply module installed in the second rack panel, only an I/O expansion cable may be used to connect the two rack panels (no I/O bus expansion adapter required). Use a JW-1KC(1m) or JW-05KC (50 cm cable). Do not use a cable 1m or more in length.



I/O module

I/O expansion cable (JW-05KC/JW-1KC)

Power supply module

Control module
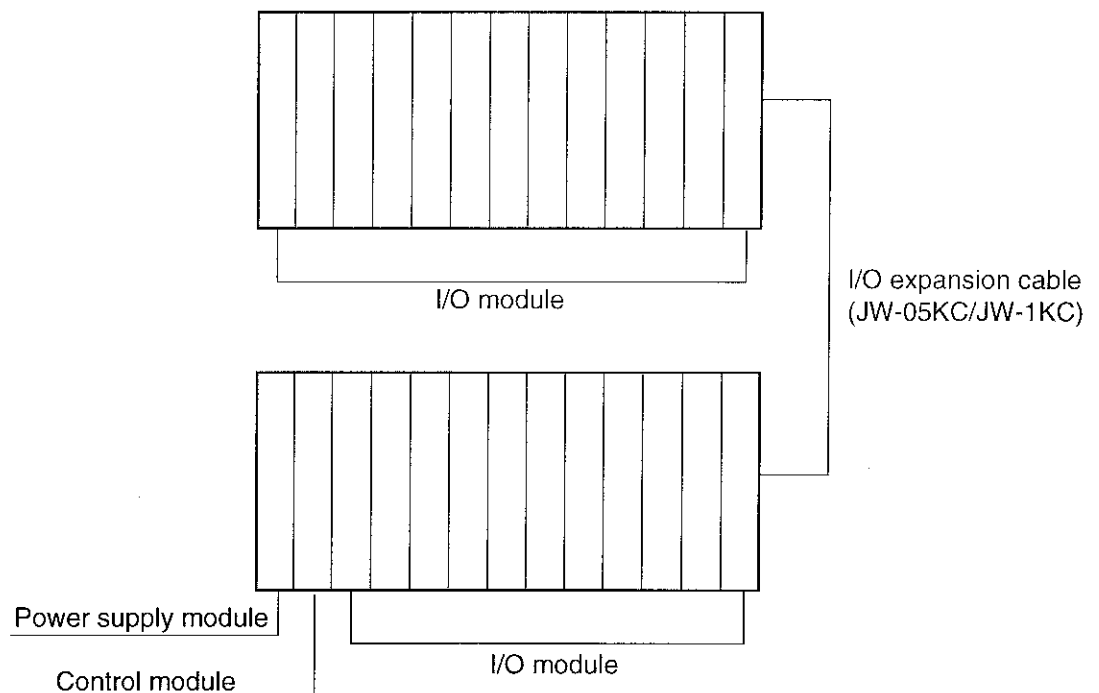
I/O module

## (2) Using ZW-series I/O modules

1. A basic rack panel combined with expansion rack panels can be hold a total of up to 32 ZW-series I/O modules. However, the number of usable I/O modules depends on the number of I/O points controllable by the control module installed in the rack panel. The following table lists the number of usable I/O modules for the various control module type:

|  | JW-50CU<br>JW-50CUH | JW-70CU<br>JW-70CUH | JW-100CU<br>JW-100CUH |
|---|---|---|---|
| Max. No. of I/O modules | 32 | 32 | 32 |
| I/O points and I/O modules supported using only 64-point I/O modules | 512 points/<br>8 modules | 1024 points/<br>16 modules | 2048 points/<br>32 modules |
| I/O points and I/O modules supported using only 32-point I/O modules | 512 points/<br>32 modules | 1024 points/<br>32 modules | 512 points/<br>32 modules<br>*Note 1 |
| I/O points and I/O modules supported using only 16-point I/O modules | 512 points/<br>32 modules<br>*Note 1 | 512 points/<br>32 modules | 512 points/<br>32 modules<br>*Note 1 |
| I/O points supported using X 64-point, Y 32-point, and Z 16-point I/O modules | 64X+ 32Y+16Z<br>$\leqq$512 points | 64X+ 32Y+16Z<br>$\leqq$1024 points | 64X+ 32Y+16Z<br>$\leqq$2048 points |

Note 1: If more than 512 I/O points are required with 8 or 16 point modules, see page 101.

2. Up to three expansion rack panels may be attached to the basic rack panel's I/O expansion connector in a daisy chain. If more than three expansion rack panels are needed, see page 4-84.

3. When two or more expansion rack panels are to be used, use an expansion power supply module(ZW-100PU1/100PU2) in one of them, depending on the total system power requirement and the current capacity of the power supply module used in the rack panel.
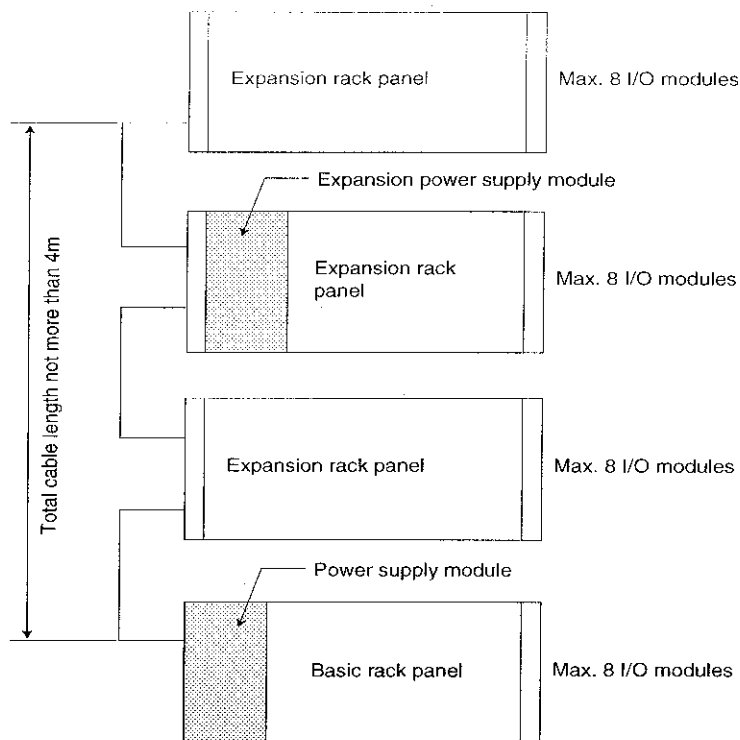


Note: The I/O expansion cables should not exceed 4m in total length.

4. For connection between the basic and expansion rack panels or among more than one expansion rack panels, use the I/O expansion cable and 5 VDC power cable supplied with each expansion rack panel.

5. Install I/O modules in the slots of the basic or expansion rack panels from left to right, leaving no vacant slot will be inoperative. If you need an intermediate vacant slot for future system expansion, install a dummy module (ZW-100DM).



Power supply module ⎯⎯⎯

Vacant space

These I/O modules are inoperative. They become operative if a dummy module is installed in the vacant space.
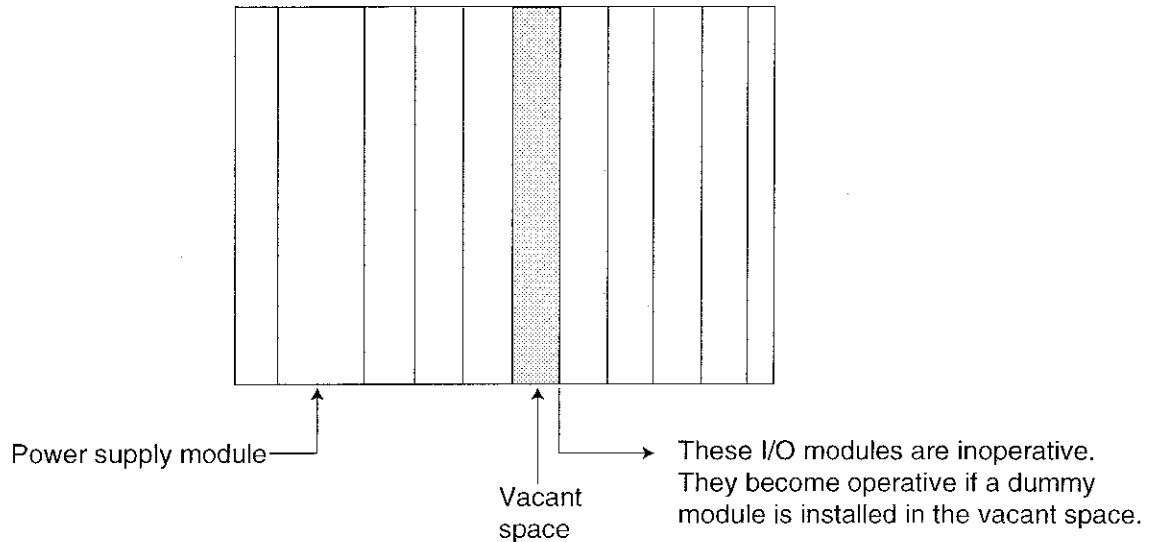
6. After powering up the system, verify that the power indicator on each expansion rack panel comes on. If a light remains OFF, no 5 VDC power is being supplied to the rack panel. Check the power connection. Note, however, that the ZW-508ZB expansion rack panel has no power indicator.

7. For details on module installation and cabling see Chapter 5 (page 5-1), "Installation" and Chapter 6 (page 6-1), "Wiring."

## [6] Outline dimension drawings
### (1) Rack panel
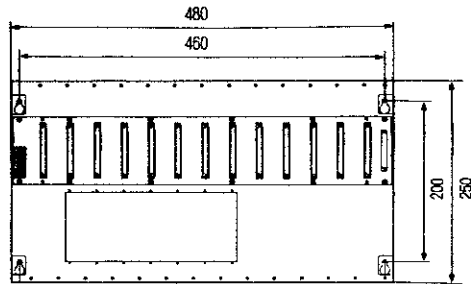
Rack panel (JW-13BU)
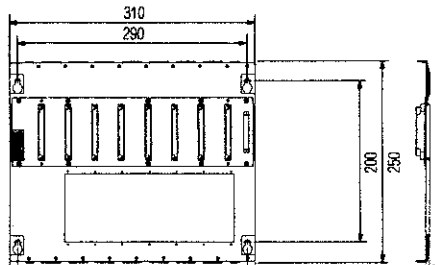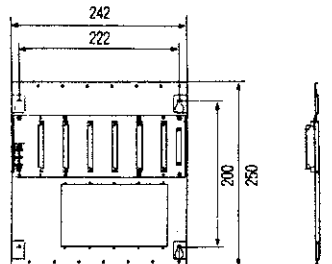
Rack panel (JW-8BU)
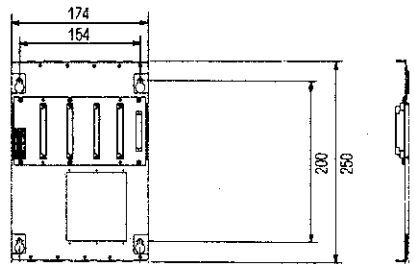
Rack panel (JW-6BU)

Rack panel (JW-4BU)
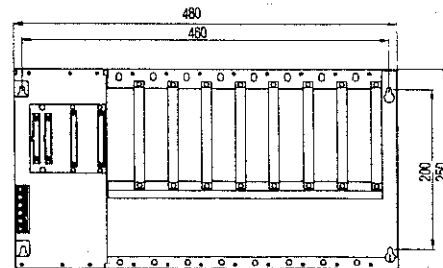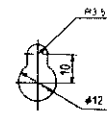
Rack panel (ZW-08BU)

Detail of mounting hole

## (2) Basic rack panel

Basic rack panel (ZW-28KB)

Basic rack panel (ZW-46KB)

Basic rack panel (ZW-04KB)

Detail of mounting hole

Basic rack panel (ZW-02KB)
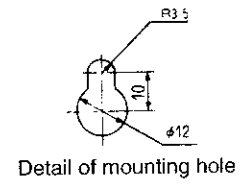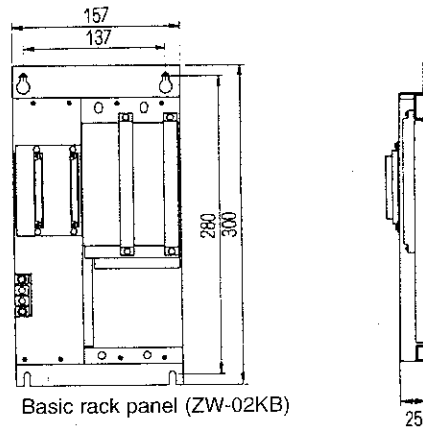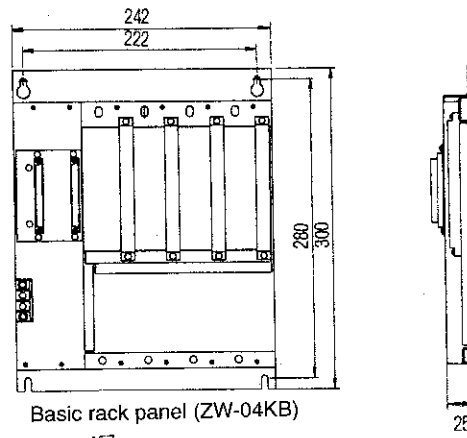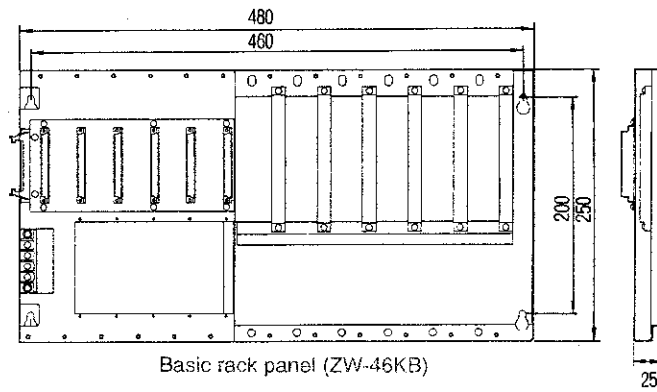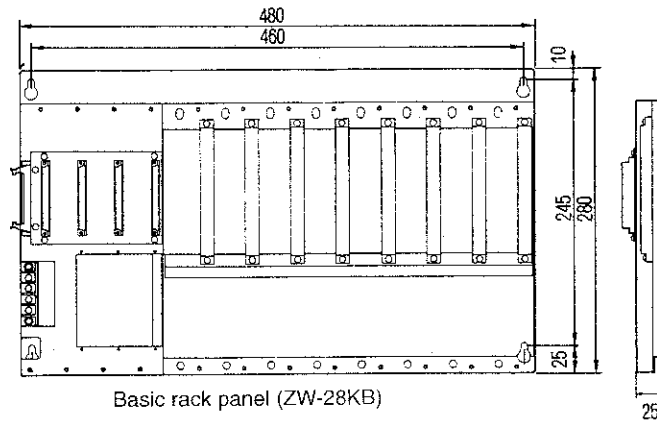
## (3) Expansion rack panel
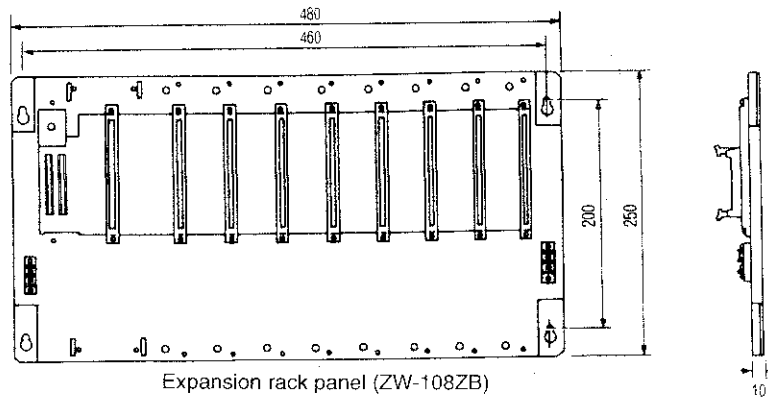


Expansion rack panel (ZW-108ZB)
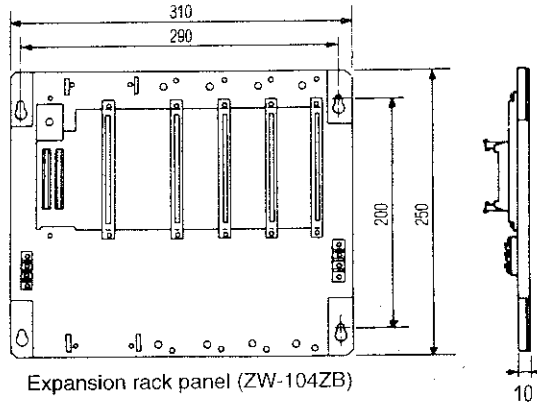


Expansion rack panel (ZW-104ZB)
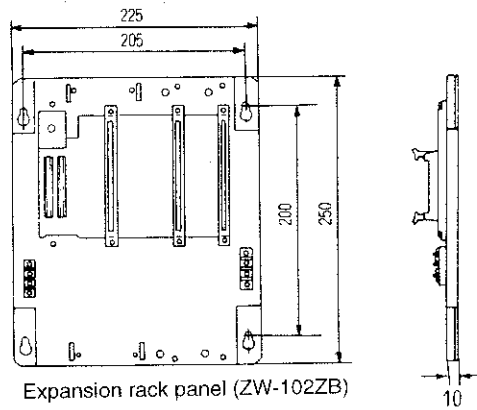


Expansion rack panel (ZW-102ZB)
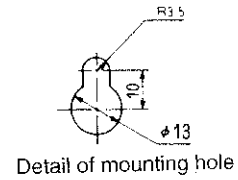
Detail of mounting hole
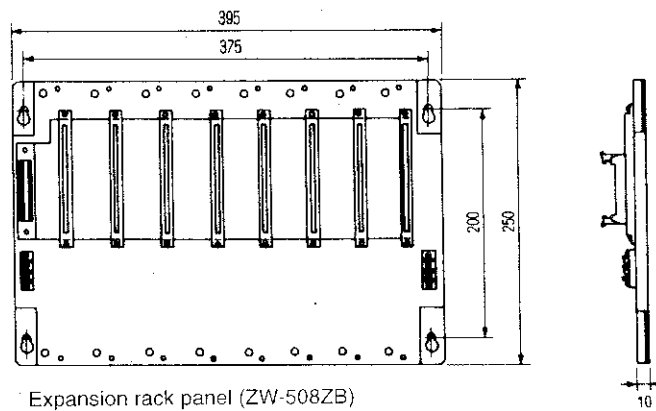


Expansion rack panel (ZW-508ZB)

## [7] Specifications for rack panel, basic rack panel, and expansion rack panel

### 1. Rack panel(for JW-series I/Os)

|  | JW-13BU | JW-8BU | JW-6BU | JW-4BU |
|---|---|---|---|---|
| Power supply module slots | 1 | 1 | 1 | 1 |
| Control module slots | 1 | 1 | 1 | 1 |
| Option module slots | 6 | 6 | 4 | 2 |
| I/O module slots | 13 max. | 8 max. | 6 max. | 4 max. |
| Mounting method | Screw mounting with four M5 screws (mounting hole; slotted round hole with 7mm diameter) | | | |
| Outline dimensions (W×H× D) | 480×250×5 | 310×250×5 | 242×250×5 | 174×250×5 |
| Weight | Approx. 1.3 kg | Approx. 0.8 kg | Approx. 0.6 kg | Approx. 0.4 kg |

### 2. Rack panel(for ZW-series I/Os)

|  | ZW-08BU |
|---|---|
| Power supply module slots | 1 |
| Control module slots | 1 |
| Option module slots | 0 |
| I/O module slots | 8 |
| Mounting method | Screw mounting with four M5 screws (mounting hole; slotted round hole with 7mm diameter) |
| Outline dimensions (W×H× D) | 480×250×25 |
| Weight | Approx. 1.3 kg |

### 3. Basic rack panel (for ZW-series I/Os)

|  | ZW-28KB | ZW-46KB | ZW-04KB | ZW-02KB |
|---|---|---|---|---|
| Power supply module slots | 1 | 1 | 1 | 1 |
| Control module slots | 1 | 1 | 1 | 1 |
| Option module slots | 2 | 4 | 0 | 0 |
| I/O module slots | 8 | 6 | 4 | 2 |
| Mounting method | Screw mounting with four M5 screws (mounting hole; slotted round hole with 7mm diameter) | | | |
| Outline dimensions (W×H× D) | 480×250×5 | 480×250×25.5 | 242×300×25 | 157×300×25 |
| Weight | Approx. 2.1 kg | Approx. 2.2 kg | Approx. 1.3 kg | Approx. 1.0 kg |

## 4. Expansion rack panel (for ZW-series I/Os)

| | ZW-108ZB | ZW-104ZB | ZW-102ZB | ZW-508ZB |
|---|---|---|---|---|
| Expansion power supply module slots | 1 | 1 | 1 | - |
| I/O module slots | 8 | 4 | 2 | 8 |
| Mounting method | Screw mounting with four M5 screws (mounting hole; slotted round hole with 7mm diameter) | | | |
| Outline dimensions (W×H×D) | 480×250×10 | 310×250×10 | 225×250×10 | 395×250×10 |
| Weight | Approx. 1.7 kg | Approx. 1.1 kg | Approx. 0.9 kg | Approx. 1.4 kg |

# 4-5　Input/output modules

## [1] Name and function of each part
### (1) JW-series I/O modules

①Retention screw

④Module connector

②Ratings plate

③I/O terminal block

(The diagram is JW-32S)

⑤Input signal indicators

| JW-32S | |
|---|---|
| ○ 0 ○ | ○ 0 ○ |
| ○ 1 ○ | ○ 1 ○ |
| ○ 2 ○ | ○ 2 ○ |
| ○ 3 ○ | ○ 3 ○ |
| ○ 4 ○ | ○ 4 ○ |
| ○ 5 ○ | ○ 5 ○ |
| ○ 6 ○ | ○ 6 ○ |
| ○ 7 ○ | ○ 7 ○ |

A　B　C　D

⑥Search module indicator ── ○　○

S.U.　FUSE

OUTPUT　5/12/24 VDC

⑦Fuse alarm indicator
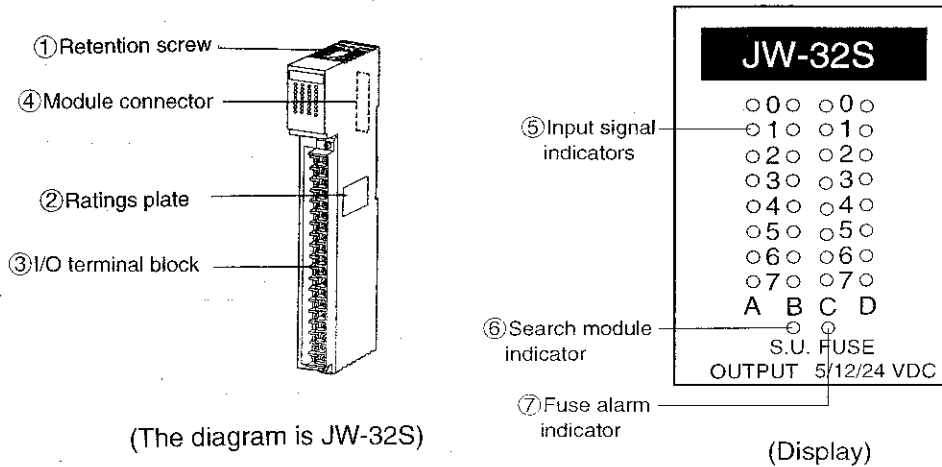
(Display)

① Retention screw

Use this screw to secure the module to the rack panel frame.

② Ratings plate

③ I/O terminal block (I/O module with 16 I/O points has a single row terminal block).

Use this terminal block to connect I/O cable wires from I/O devices. Since it is detachable from the I/O module housing, you can replace the module without having to disconnect the cable wires from the terminal block.

④ Module connector

Plug this connector into the mating receptacle on the rack panel.

⑤ I/O signal indicators (red LED)

These indicator comes on when the input or output signal on the corresponding channel is turned ON.

Note 1: At power ON, the input signal indicators on input modules and the FUSE indicator on output modules come on momentarily (approx. 20ms.), but this is not an error.

⑥ Search module indicator

This indicator comes on if th corresponding module is addressed by a support tool. For more details, see the instruction manual for the relevant JW-series support tool.

⑦ Fuse alarm indicator

This indicator is provided only on output modules. It comes on if any of the output circuit protection fuses have blown.

## (2) ZW-series I/O modules



(The diagram is ZW-32S2T)

(The diagram is ZW-32S2)
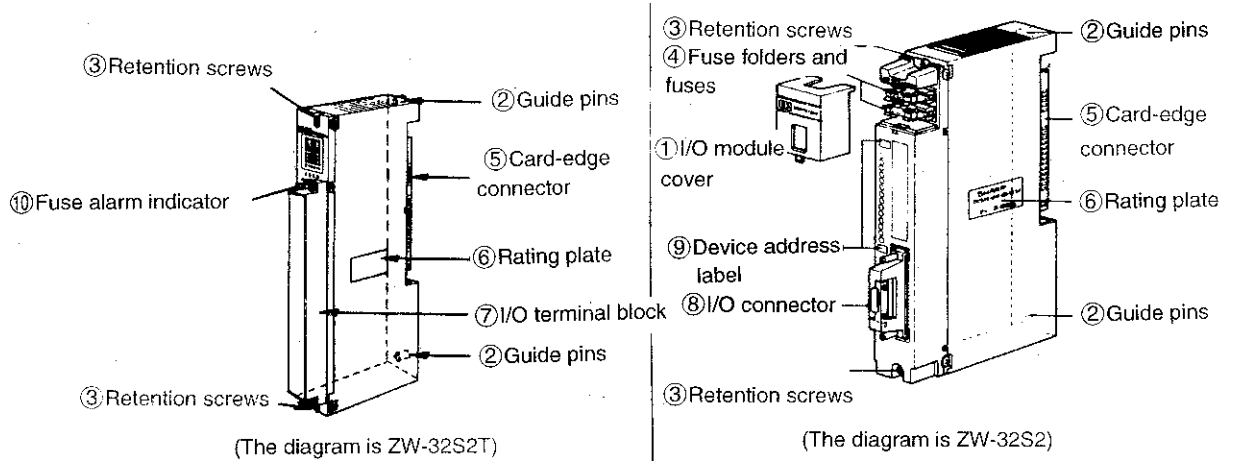
① I/O module cover (no cover on ZW-32N1T/32N2T/16S4D/32S1T/32S2T/32S4T)
This cover shields the fuses ④ and I/O terminal block ⑦ to prevent possible shock hazard.

② Guide pins (2 pins)
These pins guide the I/O module while it is being inserted into a basic or expansion rack panel slot.

③ Retention screws (2 screws)
Use these screws to secure the I/O module to the basic or expansion rack panel frame.

④ Fuse holders and fuses (no fuses on input modules)
These fuses protect the circuits from short-circuit failure.

⑤ Card-edge connector
Plug this connector into the mating receptacle on the basic or expansion rack panel.

⑥ Rating plate

⑦ I/O terminal block (ZW-32N2T/32S2T modules have two row terminal blocks.)
Use this terminal block to connect I/O cable wires from I/O devices. Since it is detachable from the I/O module housing, you can replace the module without having to disconnect the cable wires from the terminal block.

⑧ I/O connector
Connect an I/O device cable to this connector.

⑨ Device address label
This label is supplied with the control module as an accessory. Affix it according to the slot position of the individual I/O module. The device address represents the 2nd, 3rd, and 4th digits of a relay number.

⑩ Fuse alarm indicator
This indicator is provided only on the output modules (ZW-32S1T/32S2T). It comes on if any of the output circuit protection fuses have blown.

Note 1: For details of the data input module, data output module, data output module (source type), and pulse catch module, see the instruction manual supplied with each module.

**•Removing the terminal block**



Terminal block installation screw

Terminal block installation screw
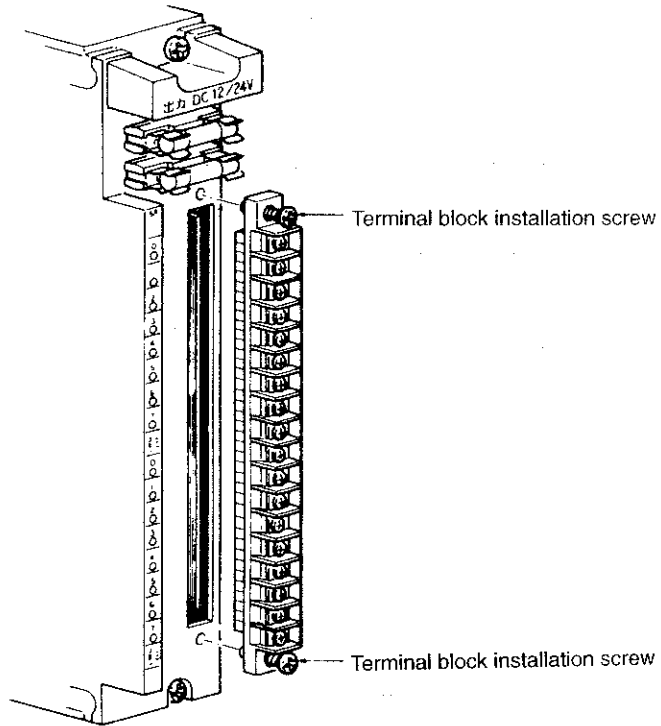
Loosen the top and bottom screws retaining the terminal block and remove the block from the module housing.

Note 2: The terminal block retention screws cannot be removed from the terminal block.

## [2] Outline dimention drawings
### (1) JW-series I/O modules



33.5

250

105

110

(Include the rack panel)
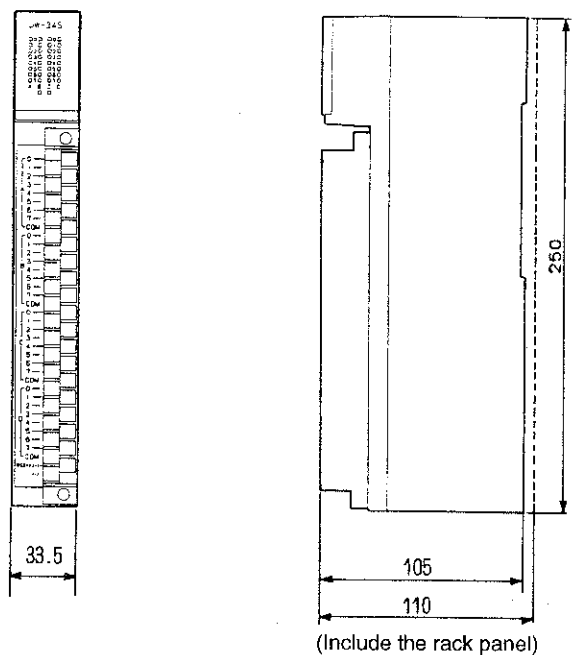
(Unit: mm)

## (2) ZW-series I/O modules
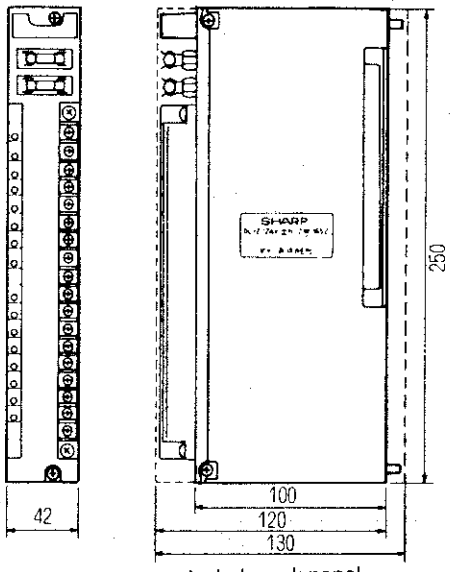


Include rack panel

Terminal block type
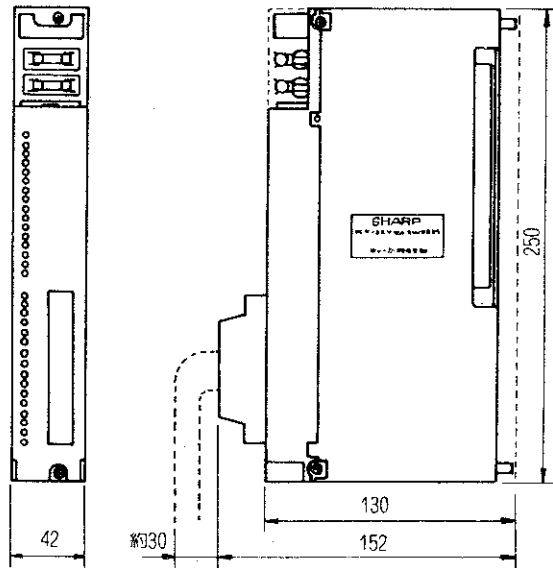
Include rack panel

Connector type
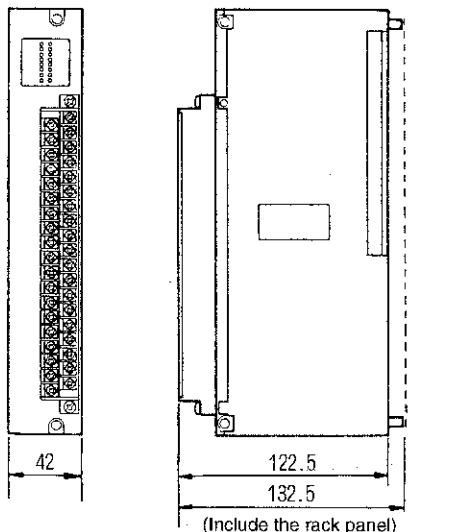
(Include the rack panel)

(Unit : mm)

## [3] Description of I/O module relay numbers

Specify the type of I/O modules (JW or ZW) to be used by setting the control module DIP switches. (see page 29).

### (1) Using JW-series I/O module (JW-I/O mode)

In the JW-I/O mode, relay number is identified by rack panel numbers and slot numbers.

#### 1) Setting relay numbers

Relay number allocated by auto I/O registration or manual I/O registration using support tool. I/O registration mode is decided by the data of system memory #0247.

•Auto I/O registration : Set automatically according to installed modules.

•Manual I/O registration : First address of rack panel and dummy points for a vacant slot can be set optionally.

### • Max. I/O points and I/O relay areas

| Model name | Auto I/O registration | | Manual I/O registration | |
|---|---|---|---|---|
| | Max. I/O points | Max. I/O relay areas | Max. I/O points | Max. I/O relay areas |
| JW50, JW50H | 512 | ]0000 to ]0077 | 512 | ]0000 to ]0727 ]0740 to ]1007 |
| JW70, JW70H | 1024 | ]0000 to ]0177 | 1024 | |
| JW100, JW100H | 3776 | ]0000 to ]0727 | 4096 | |

\* The area not using for I/O relay can be used for auxiliary relay area.

### • The method of auto I/O registration and manual I/O registration

| | | Auto I/O registration | Manual I/O registration |
|---|---|---|---|
| Registration method | | The installed state is automatically registered each time the PC is powered up. The installed modules are assigned addresses in sequence beginning with ]0000. The data registers for the special I/O modules are assigned addresses in sequence beginning with 49000, apart from the addresses for the I/O modules. Vacant slots are not assigned points. ·If auto I/O registration has been selected and power is rapplied after a failure occurs at an I/O module, the I/O address registration may shift, resulting in malfunctions. After completing the I/O installation and correct registration, write $003_{(8)}$ into system memory location #0247. | When the PC is powered up, auto registration is not performed and I/O addresses can be manually assigned only with the registration operation using a support tool. Dummy points for a vacant slot, the top address of a rack panel and data registers for a special I/O module all can be manually assigned. ·Perform all manual I/O registration settings from the setting menu of the support tool. (System memory cannot be used to perform these settings.) Refer to page 61 for how to use support tools in manual I/O registration. |
| Contents of registration | Dummy points | Cannot be set | 0 to 240 dummy points can be set (in 16 point increments) for each vacant slot |
| | Top address of rack panel | Cannot be set | Top address can be set for each rack panel (basic rack panel: rack 0 is fixed at ]0000) |
| | Data registers for special I/O module | ·Top addresses are assigned from 49000 in the installed sequence. ·The number of bytes available for each number is set at 64 bytes. ·A maximum of 47 special I/O modules can be installed. | ·Top addresses can be manually assigned (relay area also) ·The number of bytes in a module can be set to a maximum of 256 bytes. ·Unlimited number of special I/O modules can be installed (provided the maximum number of I/O points is not exceeded). |

## 2) Auto registration procedure

 ON / OFF
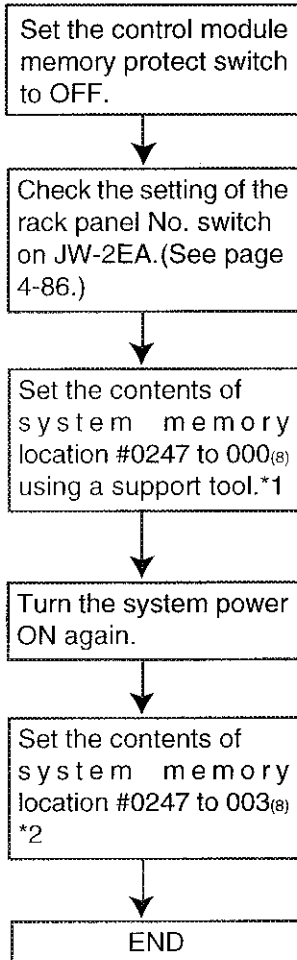
**MEMORY PROTECT**
(Setting value of system memory #0247)

```
┌─────────────────────┐
│ Set the control module │
│ memory protect switch │
│ to OFF.              │
└─────────────────────┘
          ↓
┌─────────────────────┐
│ Check the setting of the │
│ rack panel No. switch │
│ on JW-2EA.(See page │
│ 4-86.)              │
└─────────────────────┘
          ↓
┌─────────────────────┐
│ Set the contents of │
│ s y s t e m   m e m o r y │
│ location #0247 to 000(8) │
│ using a support tool.*1 │
└─────────────────────┘
          ↓
┌─────────────────────┐
│ Turn the system power │
│ ON again.           │
└─────────────────────┘
          ↓
┌─────────────────────┐
│ Set the contents of │
│ s y s t e m   m e m o r y │
│ location #0247 to 003(8) │
│ *2                  │
└─────────────────────┘
          ↓
┌─────────────────────┐
│        END          │
└─────────────────────┘
```

| Setting value | Address of I/O module | Address of special I/O module data register |
|---|---|---|
| 000(8) | Auto I/O registration (Auto registration at power ON) | Auto I/O registration (Auto registration at power ON) |
| 001(8) | Manual I/O registration (Manual operation) | |
| 002(8) | Auto I/O registration (Auto registration at power ON) | Manual I/O registration (Manual operation) |
| 003(8) | Manual I/O registration (Manual operation) | |

• When the system memory clean is given, its set value is 000(8).

*1 In this case address of I/O module or address of special I/O module data register are registered automatically.

2 If auto I/O registration has been selected and power is reapplied after a failure occurs at an I/O module, the I/O address registration may shift, resulting in malfunctions.
After completing the I/O installation and correct registration, write 003(8) into system memory location #0247.
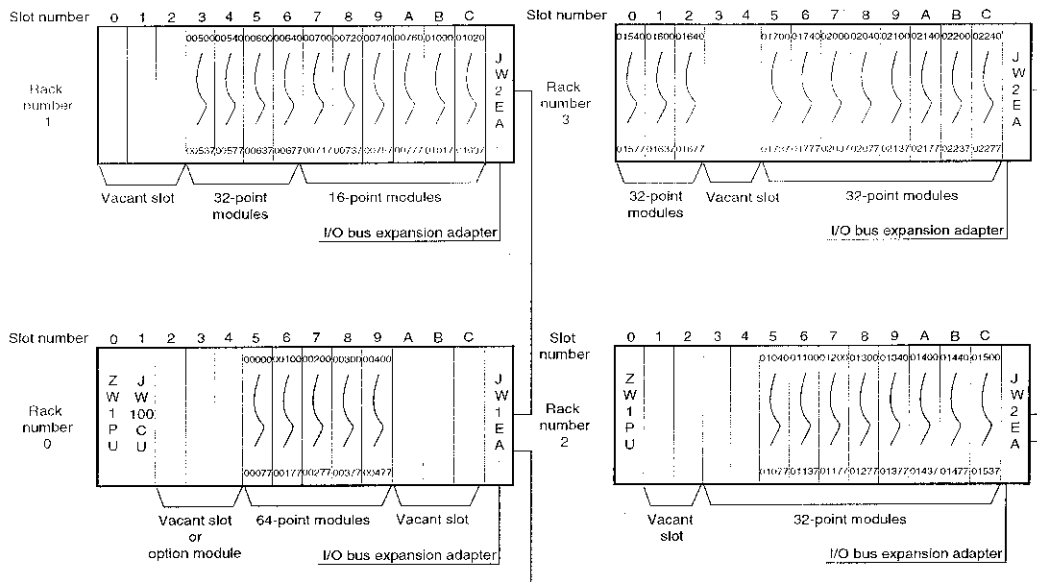


Note 1: Vacant slots or slots installed option modules are ignored (registered as zero point). Special modules are registered as 16 points of I/O relay.

Note 2: Relays are assigned consecutive numbers referred to the first I/O address (relay address 00000: ]00000) of rack panel No. 0 rack panels are also assigned consecutive numbers referring to the rack panel number setting on the I/O bus expansion adapter.

Note 3: The number of dummy points cannot be specified.

Note 4: Rack panel No. 0 is permanently assigned to the rack panel where the control module is installed.

2) Auto registration procedure

```
┌─────────────────────────┐
│ Set the control module  │
│ memory protect switch   │
│ to OFF.                 │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Check the setting of the│
│ rack panel No. switch   │
│ on JW-2EA.(See page     │
│ 4-86.)                  │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Set the top address of  │
│ each rack panel using   │
│ a support tool.         │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ If necessary, set the   │
│ number of dummy         │
│ points using the support│
│ tool.                   │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│           END           │
└─────────────────────────┘
```

ON

OFF
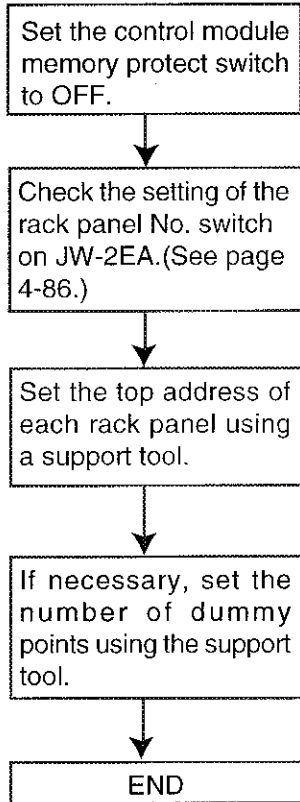
MEMORY PROTECT

(The support tool for manual I/O registration)
• Hand-held programmer : JW-10PG/12PG/13PG/14PG
• Multi-purpose programmer: JW-30PG/32PG, JW-40PG/50PG
• Ladder software: JW-50SP, JW-100SP

For details on how to set the top address of rack panel and the number of dummy points, see the instuction manual for the support tool.

① Setting the rack panels' top address

If the top address of rack panel 1, 2, and 3 are set to ]0100 to ]0200, and ]0300, respectively, the module and relay numbers are allocated as follows:
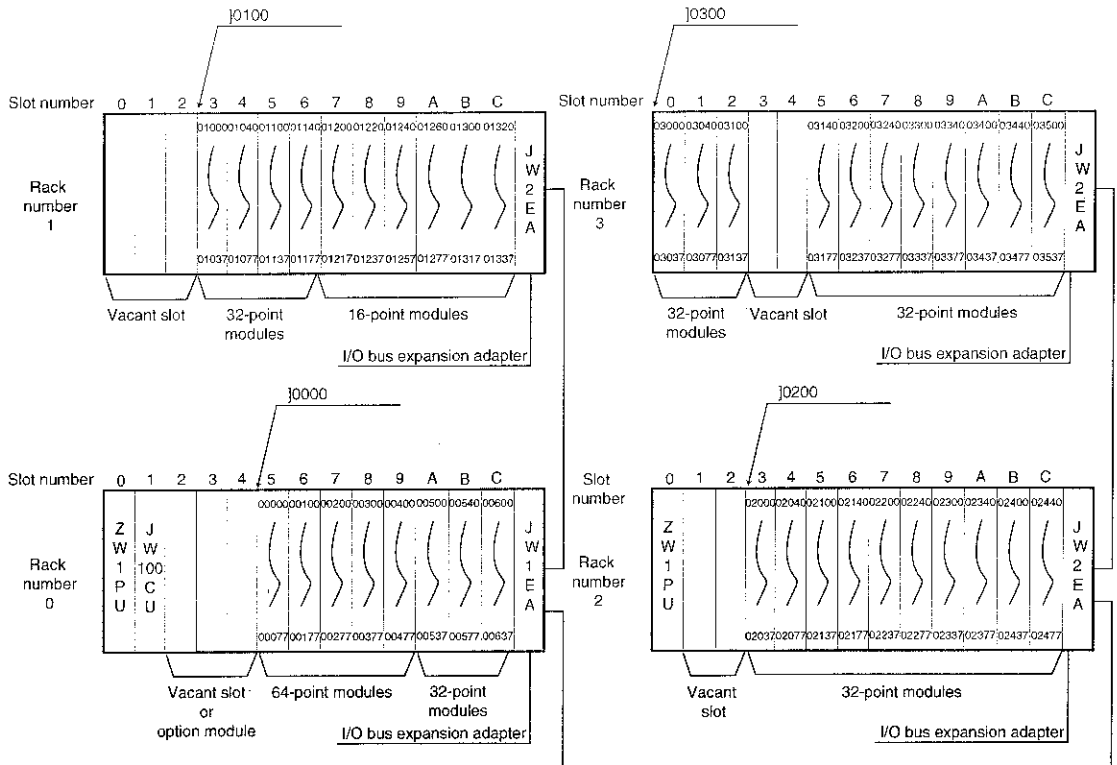
Note 1: The top address of rack panel No. 0 is always ]0000. Address ]0000 is not usable for rack panel No. 1 to 7.

Note 2: Avoid double definition of the same relay number in two rack panels with consecutive rack panel numbers.

Note 3: Rack panel numbers are determined by referring to the rack panel number setting on the I/O bus expansion adapter.

Note 4: If the top address of rack panels and/or the number of dummy points is specified, the manual I/O registration mode is selected, in which the rack panels' top addresses, the number of dummy points, and the device addresses of installed module are recalculated.

② Setting the number of dummy points

When in the manual I/O registration mode, you can specify the number of dummy points for vacant slots or slots installed option modules in the range of 0 to 240 points in 16-point increments.
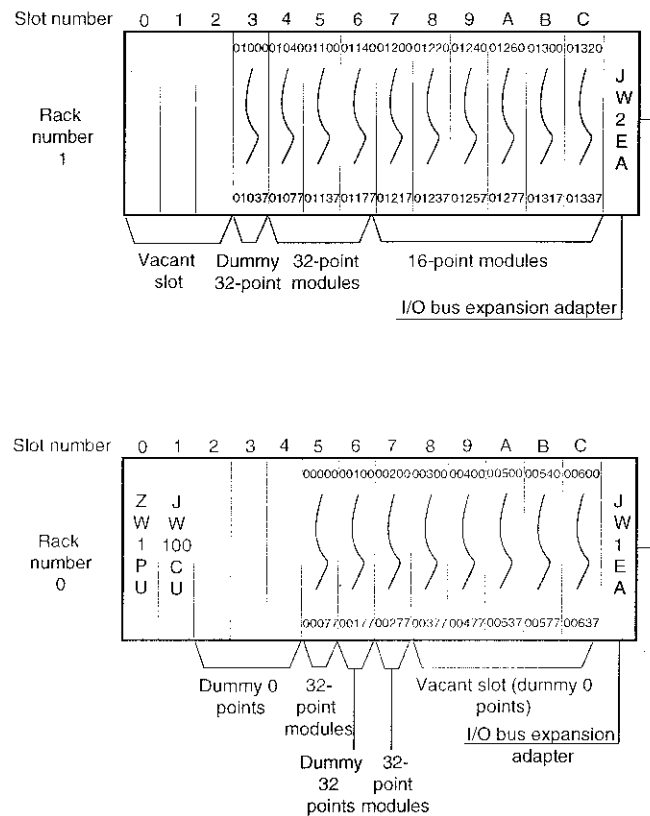


Note 1: No dummy points may be specified for slots where I/O, special modules are installed.

Note 2: Vacant slots or slots installed option modules for which no dummy point is specified are registered with a null dummy point.

Note 3: If an I/O, special module is installed in a slot for which non-null dummy points are specified (even if the module has the same number of relay points as that of the specified dummy points as that of the specified dummy points), the PC will stop due to an I/O error.

Note 4: For details on how to specify the number of dummy points, see the instruction manual for the support tool.

Note 5: For details on the I/O bus expansion adapter (JW-1EA/2EA), see page 4-84 of this manual.

```
** Dummy points are useful to : **
• When reserving for I/O modules needed for future system  expansion.
• When transplant a program into another system with partially different
   I/O configuration.
```

## (2) Using ZW-series I/O modules (ZW-I/O mode)

ZW-series I/O modules' relay numbers are defined in sequence according to the sequential order of slots in which the modules are installed. The following shows an example of the system where 64-, 32-, and 16-point I/O modules are used (JW100/100H):



Special modules have 32 points each.

— Slot for option module
— Control module
— Power supply module (ZW-1PU)
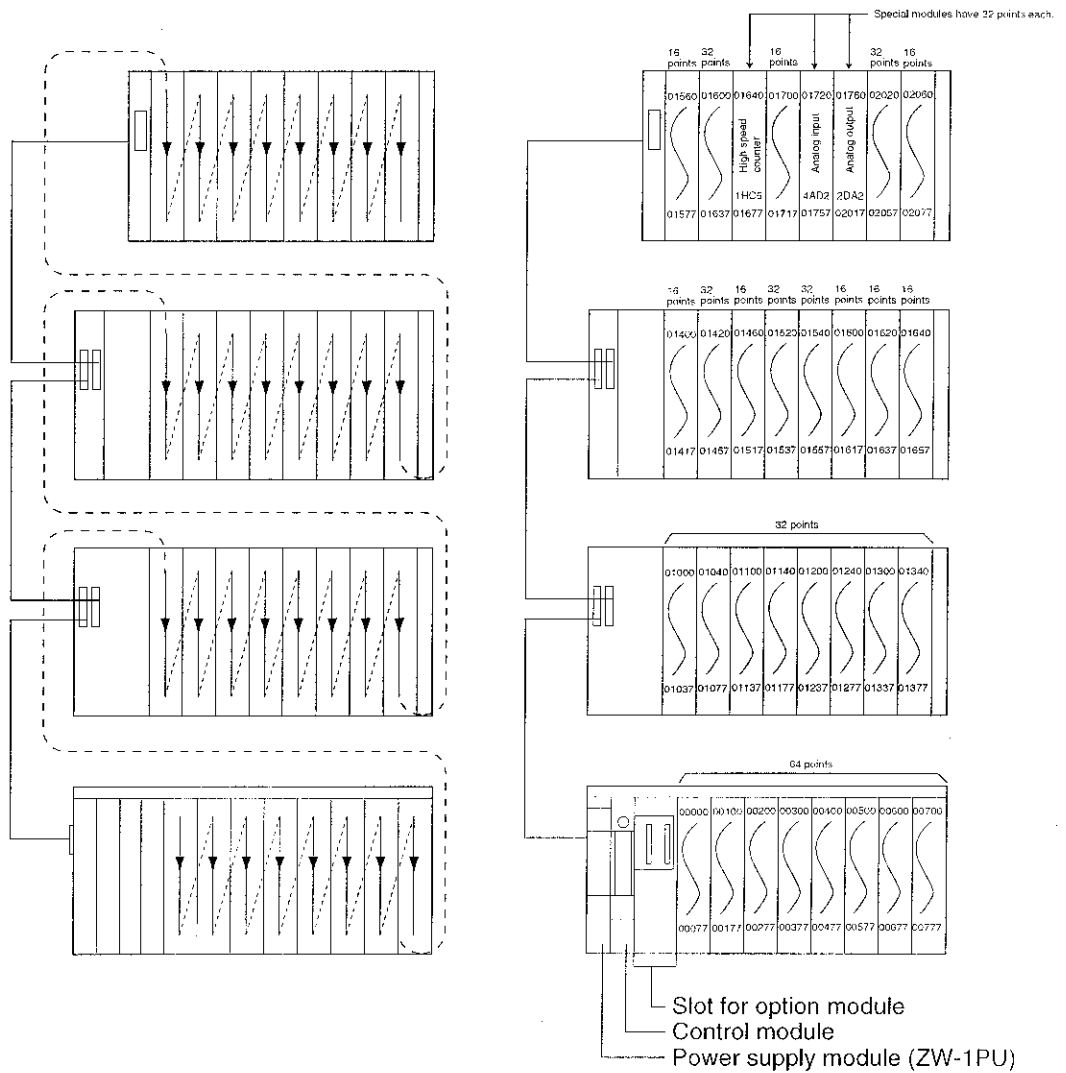
Relay numbers are sequentially defined from top to bottom, and from left to right, with the topmost relay in the first I/O module (which is next to the option module) assigned number 00000.

We recommend that you attach device address labels (which are supplied with the control module) to the front panels of I/O modules with the corresponding slot numbers. The address given in the labels represent the lower three digits of byte address (]xxxx):

Byte address of ]0200 appears as 200 on the label.

]0200
    └── Address indicated on a device address label
       (lower 3 digits)

Note 1: In a standard system configuration, a control module can control up to 32 ZW-series I/O modules. The maximum number of controllable I/O points is 512 using the JW50/JW50H, 1024 using the JW70/JW70H, and 2048 using the JW100/100H. If more than 32 I/O modules are required, use an I/O expansion module, see page 4-93 of this manual.

Note 2 : If an I/O module with a given number of relays in replaced with another with different number of relays, the leading number all allocations in all subsequent modules will change:

| 01500 ⟨ 01507 | 01520 ⟨ 01527 | 01540 ⟨ 01547 |
| | | 01550 ⟨ 01557 |
| 01510 ⟨ 01517 | 01530 ⟨ 01537 | 01560 ⟨ 01567 |
| | | 01570 ⟨ 01577 |

➡

| 01500 ⟨ 01507 | 01520 ⟨ 01527 | 01560 ⟨ 01577 |
| | 01530 ⟨ 01537 | 01570 ⟨ 01577 |
| 01510 ⟨ 01517 | 01540 ⟨ 01547 | 01600 ⟨ 01607 |
| | 01550 ⟨ 01557 | 01610 ⟨ 01617 |

⬇

Replaced by a 32-point module.

Relay number allocations in all subsequent modules change.
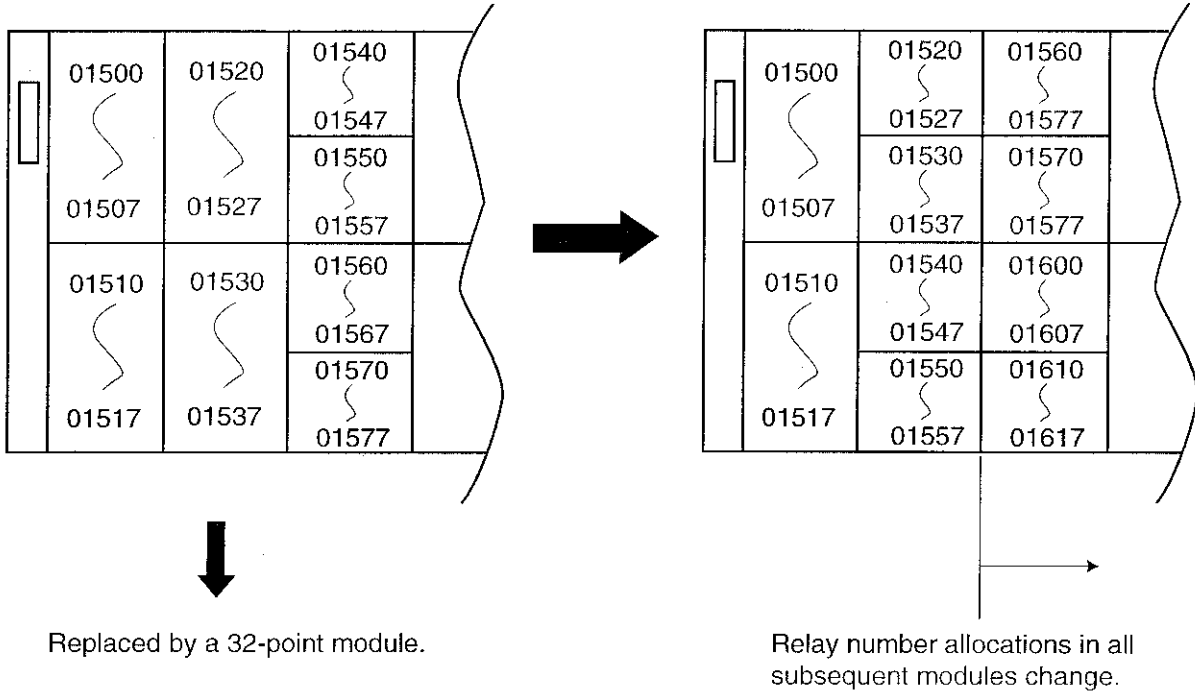
Note 3: The maximum number of controllable I/O points is 512 using the JW50/JW50H, 1024 using the JW70/70H, and 2048 using the JW100/JW100H. If I/O modules are installed which provide more than these maximum numbers of I/O points, an I/O error will occur. Using the JW70/JW70H, if a 32-point module is installed in slot A of the last rack panel as shown below, an I/O error will occur. (In this example, too many special modules are used. It is not possible to build a 1024-point system using only 16-point modules.)

| 01700 ⟨ 01707 | 01720 ⟨ 01727 | 01740 ⟨ 01747 | 01760 ⟨ 01767 | |
| 01710 ⟨ 01717 | 01730 ⟨ 01737 | 01750 ⟨ 01757 | 01770 ⟨ 01777 | |

16-point module

➡

| 01700 ⟨ 01707 | 01720 ⟨ 01727 | 01740 ⟨ 01747 | 01760 ⟨ 01767 01770 ⟨ 01777 | |
| 01710 ⟨ 01717 | 01730 ⟨ 01737 | 01750 ⟨ 01757 | 02000 ⟨ 02007 02010 ⟨ 02017 | |

This portion is inoperative.

32-point module
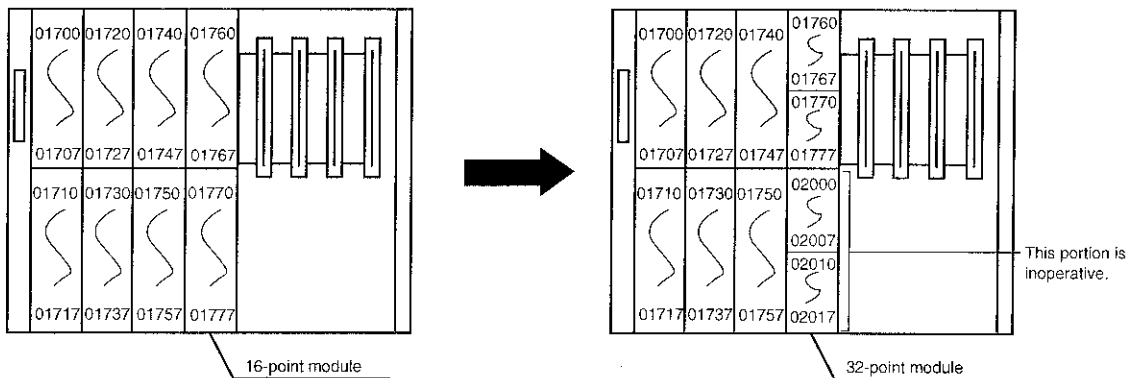
Note 4: If a special module has an invalid I/O address, that module will remain inoperative.

## [4] Precautions for operating input module

### 1) ON/OFF time of the input signal

In order to ensure ON/OFF condition of the input device correctly (limit switch etc.) on the operation of the JW50H/70H/100H, ON or OFF time should meet the following conditions.

| | |
|---|---|
| ON time of the input device ($T_{ON}$)<br>OFF time of the input device ($T_{OFF}$) | $T_{on} > \Delta t + t_{on}$<br>$T_{off} > \Delta t + t_{off}$<br>$\Delta t$      One scanning time of PC<br>$t_{on}$     OFF to ON response time of the input module<br>$t_{off}$     ON to OFF response time of the input module |
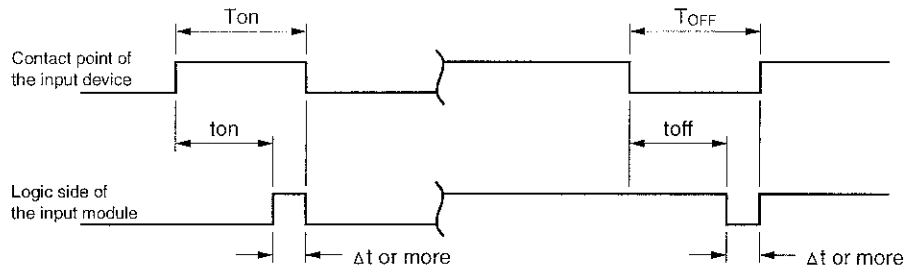


In the input/output process at the beginning of each scanning cycle, ON/OFF state of the logic side of the input module is written in the data memory and used as input data for operation of the user's program within its scanning cycle. Therefore, if ON or OFF time of the logic side of the input module is less than one scanning time ($\Delta t$), ON/OFF data may not be included in the data memory.

Note: The response time of the input module is made by the electricity charge/discharge characteristics of the integral circuit of the input module, and it varies depending on the time of duration of ON or OFF.
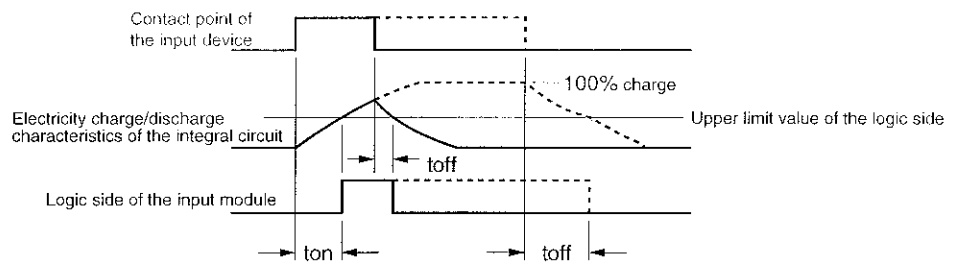


toff shows the difference, shown in the above, between the case when the ON time of the contact point of the input device is longer as shown by dotted lines and the case when the ON time is shorter as shown by solid line.

(Calculation example in case the ZW-16N2 is used as an input module)

If one scanning time is 5ms,

$T_{on} > \Delta t + t_{on} = 5 + 15 = 20$ (ms)

$T_{off} > \Delta t + t_{off} = 5 + 20 = 25$ (ms)

## 2) Connectable input device

The followings are sensors and switches which can be connected as input. See below for selection and connection of the input device.

### • DC input device

① 
```
DC 2-lines system          DC input module
                        IN
  Power switch
  main circuit
                        COM
```

② 
```
NPN open-collector output type        DC input module
                  +    Sensor
                       power
                       supply
        Output         IN
                       COM
              0V
```

③ 
```
NPN current output type      DC input module
                  +    Sensor
                       power
                       supply
  Constant
  current    Output        IN
  circuit
                           COM
              0V
```

④ 
```
PNP current output type       DC input module
                  +    Sensor
                       power
                       supply
        Output         IN
              0V       COM
```

⑤ 
```
Contact point output type      DC input module

                        IN

                        COM
```

### • AC input device

⑥ 
```
Contact point output type     AC input module

                        IN

                        COM
```

⑦ 
```
AC open/close type        AC input module

                        IN
  Proximity
  switch
  main circuit
                        COM
```

Note 1: In cases of ①, ②, ③, ④, and ⑤, use a transistor having current driving capacity larger than that of the constant input current of the DC input module.

Note 2: In cases of ④, only an input module with a non-polarized input circuit can be used.

Note 3: In cases of ① and ⑦, pay attention to leakage current at OFF. (When leakage current is higher than the OFF input current level of the input module, the proximity switch may not turn OFF.)

Be careful that voltage output type DC input device shown in the right may not be connected. (Driving capacity of an output transistor should be higher than the ON level of the input module).

```
Voltage output type
                              Positive side
                              of power line
                              Output
                              0V
```

4-50
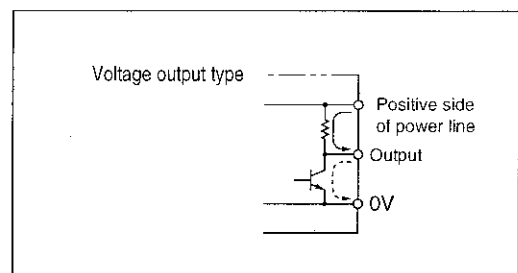
## 3) Countermeasure for leakage current on input device

In the following device, there is also leakage current at OFF. If the leakage current is higher than the OFF level of the input module, the input module may not turn OFF, or noise margin at OFF state may drop.

### a. Limit switch with LED
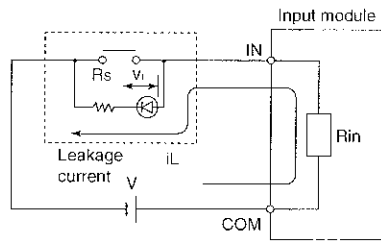


**Reference**

Calculation of leakage current $i_L$

$$i_L = \frac{V - V_F}{R_s + R_{in}}$$

V: Power supply voltage
$V_F$: Voltage drop in the forward direction of LED
$R_S$: Current limit resistance
$R_{in}$: Input impedance of input module

### b. Limit switch with neon lamp (the neon lamp is connected in parallel with the contact point.)
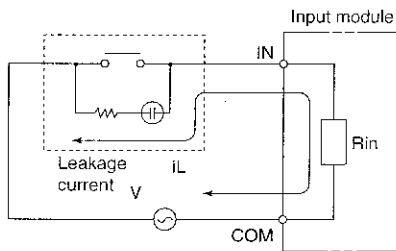


### c. Proximity and photo switches of AC two lines system

In the AC two lines system, even at OFF there is leakage current from current consumption of the internal circuit, and this might prevent the input module from falling in the OFF state. This is nominated as "leakage current" in the specifications of photo switches etc. Make sure that this value is less than the OFF level of the input module.
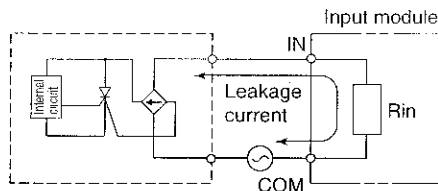


### d. Built-in triac, thyristor and contact point output of surge killers

Some device has CR device as a surge killer for the purpose of avoiding the check mistakes of triac and thyristor, and the leakage current of this CR may prevent the input module from falling in the OFF state. In such a case, the best remedy is to remove the CR. If this is not possible, use the C value of the CR of less than 0.033 µF for 100 VAC; and that of less than 0.015 µF, for 200 VAC.
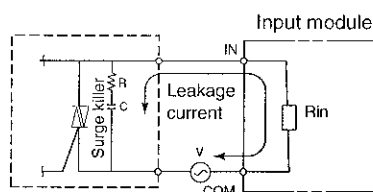


**Reference**

Calculation of leakage current $i_L$

$$i_L = \frac{V}{2\pi \, fc}$$

V: Power supply voltage
f: Power frequency (50/60Hz)
C: Capacitor

Countermeasure : Connection of bleeder resistance

As a countermeasure, a bleeder resistance can be inserted in the input side of the input module as shown below.
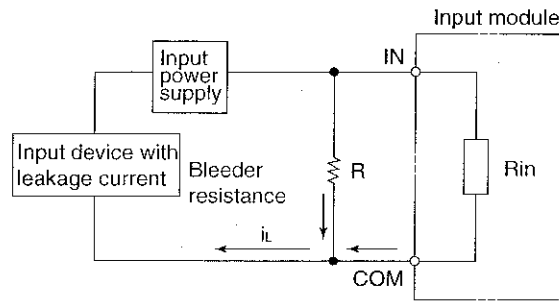


Choose the bleeder resistance value R to meet the following conditions:

$$i_L = \left( \frac{R_{in} \times R}{R_{in} + R} \right) < V_{in\ OFF}$$

Composite impedance of the bleeder resistance and the input impedance

$$R < \left( \frac{V_{in\ OFF} \times R_{in}}{R_{in} \times i_L - V_{in\ OFF}} \right) \times \underset{Margin}{0.5}$$

$i_L$: Current leakage of the input device
$V_{in\ OFF}$: Input of the input module OFF level voltage
$R_{in}$: Input impedance of the input module
$V$: Input power supply voltage

In this case, the rating electric power W is,

$$W > \frac{V^2}{R} \times \underset{Margin}{3}$$

[Example] In case that the ZW-32NT is used as an input module at the input power supply voltage of 24 V, and that the leakage current of the input device is 5 mA,

$$i_L = 5\ mA$$
$$V_{in\ OFF} = 6\ V$$
$$R_{in} = 2.6\ k\ ohm$$
$$V = 24\ V$$

$$R < \frac{6 \times 2.6}{2.6 \times 5 - 6} \times 0.5 = 1.11k\ ohm$$

If R is 1 k ohm,

$$W > \frac{24^2}{1 \times 10^3} \times 3 = 1.73W$$

W will be 2 W.

## 4) Notes for long-distance wiring and by-pass wiring

In the AC input module, when the cables to external device are very long or wiring along with power lines is made, the input module might be turned ON in spite of the OFF command in the input device, due to leakage current and inducement by floating capacity among cables.



Power line, etc.
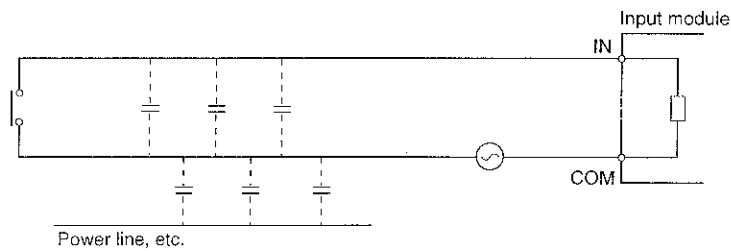
Countermeasure 1: Connect a bleeder resistance and a CR surge killer in parallel with the input module to reduce the composite impedance of the input module.
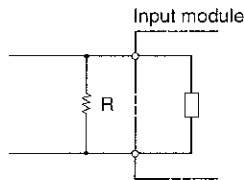


The smaller the R value, the more effective. However, when R becomes small, power consumption $(\frac{V^2}{R})$ increases. Therefore, note the R's watt value.
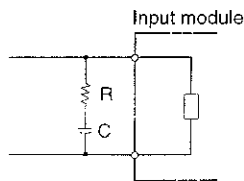
C: 0.033 to 0.33μF
 (Pressure resistance of over 250 VAC)
R: 47 to 120 ohm

Countermeasure 2: Change the input power supply to DC (use DC input module).
In general, the direct current signals are little affected by floating capacity and inducement.

Countermeasure 3: Close circuit by making use of the b contact.
When the b contact is used to make a close circuit at OFF, very little induced voltage is generated.
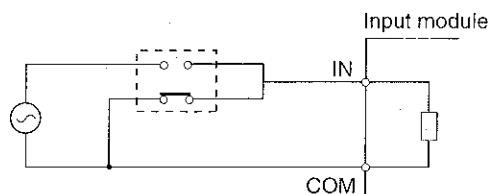


Note: Do not wire the input signal line near and in parallel with power lines of a motor and an inverter.

## 5) Surge current of the AC input module

There is surge current in the AC input module, when turning ON the input.

The surge current of the AC input module is determined by constants (R, C) of the input circuit inside the module, power supply voltage at ON input, phase, power supply current capacity and wiring impedance. The surge current stated in the AC input module specifications is the worst value for the case of the ON input at the maximum impressed voltage and at the peak phase.

If, in certain input device, contact points are affected (adhered etc.) by the surge current, the surge current should be reduced by connecting a limit resistance Rs outside the module as shown below.
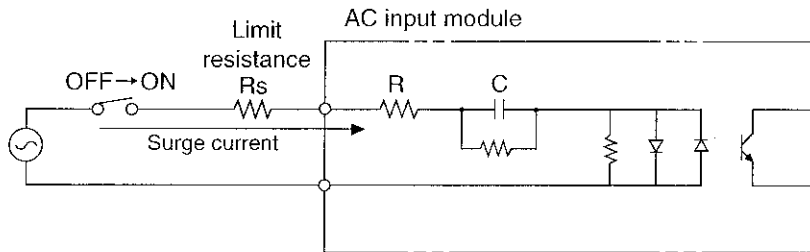


The following limit resistances Rs can be connected outside the module:

      For 100 VAC input module, less than 2 k ohm (over 2 W rate electricity)

      For 200 VAC input module, less than 4 k ohm (over 2 W rate electricity)

Reference

---

- When a limit resistance of 2 k ohm (or 4 k ohm) is connected for the 100 VAC (or 200 VAC) input module, the surge current becomes less than 80 mA at the peak ON.

---

Note: If a resistance bigger than the above value is connected, the input ON/OFF levels and the response times cannot be guaranteed.

| Module name | Surge current specifications |
|-------------|------------------------------|
| JW-11N | Max. 480mA (0.2ms or less, 132 VAC peak ON) |
| JW-13N | Max. 500mA (0.2ms or less, 264 VAC peak ON) |
| JW-31N | Max. 480mA (0.2ms or less, 132 VAC peak ON) |
| ZW-16N1 | Max. 365mA (0.4ms or less, 121 VAC peak ON) |
| ZW-16N3 | Max. 342mA (0.4ms or less, 242 VAC peak ON) |
| ZW-32N1 | Max. 440mA (0.2ms or less, 121 VAC peak ON) |

## 6) Countermeasure in case of connection of induced load to input signal

If the induced load is connected to the input signal, in order to absorb the noise, connect a surge killer near the load for the AC circuit; and a diode, for the DC circuit, as shown below.

For AC power supply
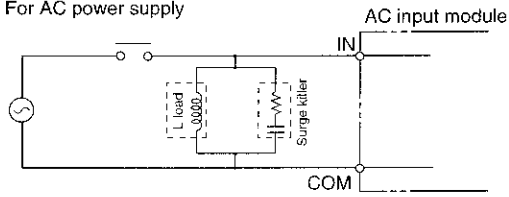


Surge killer: R, C

C: 0.033 to 0.33 µF
(Resistance voltage of over 250 VAC)
R: 47 to 120 ohm

Diode:

For DC power supply
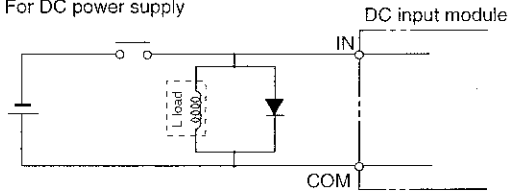


Peak inverse voltage ($V_{RM}$) should be more than 3 times bigger than the load voltage, and the average rectification current should be bigger than load current.

## [5] Precautions for operating the output module

### 1) Protection from output short circuit

In case of a short circuit of the load connected to an output terminal, output devices and print board may be burned. Be sure to insert a protection fuse in the output.

Some modules have a built-in fuse per common line for protection of the module from heating and burning due to excessive current. It is not intended, however, for protection of the output devices and load from excessive current; therefore, insert fuse for each line outside the module. This is also advisable from maintenance point of view.
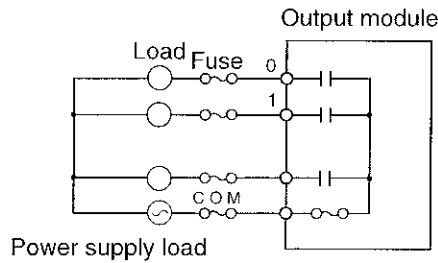


### 2) Countermeasure to surge current of lamp load

At turning ON an incandescent lamp, there is surge current 10 to 20 times bigger than normal current for several 10ms. For reduction of the surge current, insert either a bleeder resistance or an electric current limit resistance.

#### a. To insert a bleeder resistance
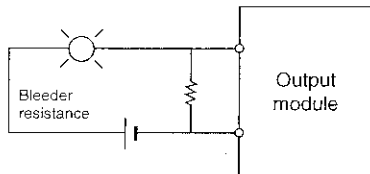


During the OFF state of the output module, keep supplying dark current so small as to turn ON the lamp dimly.

#### b. To insert an electric current limit resistance
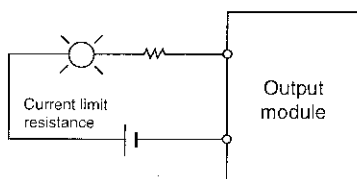


This limits the current within a value determined by the value of the current limit resistance. When the resistance value is high, the voltage on the lamp decreases. Determine the resistance value by the brightness needed when turning ON the lamp.

### 3) Countermeasure to surge voltage at opening/closing induced load

Some load generates surge voltage of several thousands volt when an induced load is opened or closed its circuit. All output module except the relay output module have a circuit to absorb surge within module. However, when the wiring to the load is long, its effectiveness is reduced and a surge countermeasure is required in the load side as well. In case of the relay output module without surge absorption circuit, surge countermeasure outside the module is indispensable in case the load generates high voltage. (This surge voltage countermeasure can extend the life time of the contact points of the relay.)

Surge voltage countermeasure
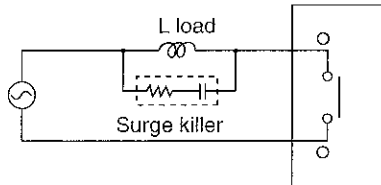


Relay output module
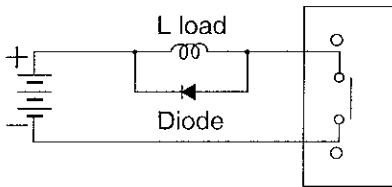


Relay contact point output module
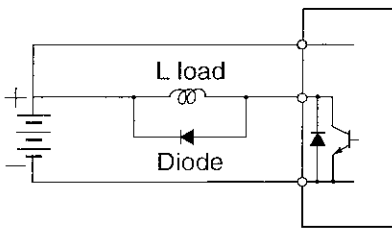


Transistor output module, FET output module



Triac output module

(In case of contact points in series line)
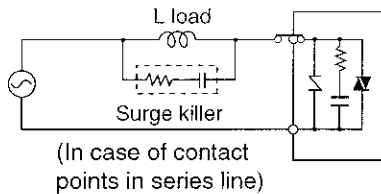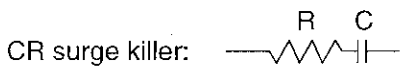
CR surge killer:     —⟋⟍⟋⟍—∣∣—    C: 0.033 to 0.33 µF (Pressure resistance of over 250 VAC)
                   R   C         R: 47 to 120 ohm

Example of CR surge killer

| | |
|---|---|
| For 100 VAC | 953M2503 10411(0.1 µ + 120 ohm) (made by Matsuo Electric Co., Ltd.) |
| For 200 VAC | 953M5003 33311(0.033 µ + 120 ohm) (made by Matsuo Electric Co.,Ltd.) |
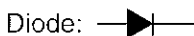
Diode:   —▶∣—    Peak inverse voltage ($V_{RM}$) is more than three times of the load voltage.
                        Average rectified current (Io) is more than load current.

In case of AC load, a varistor can be used in place of the CR surge killer for the same effect. (Installation of both of the CR surge killer and the varistor increases the effect.)

| | |
|---|---|
| For 85 to 132 VAC | TNR12G221K (made by Marcon Co., Ltd.), NV220D14 (made by NEC) |
| For 170 to 264 VAC | TNR12G431K (made by Marcon Co., Ltd.), NV430D14 (made by NEC) |

Note 1: Avoid the use of a capacitor only as an arc killer, as shown below:



| | |
|---|---|
| Though a capacitor is very effective for the arc deletion at shut-off. But charged current to the capacitor may melt the contact point at turning ON a contact point. | Though a capacitor is very effective for the arc deletion at shut-off. But at the opening of the circuit of a contact point, electricity is accumulated at the capacitor. Therefore, the short circuit current of the capacitor may melt the contact point at turning ON the contact. |

Note 2: DC output module uses a zener diode as a surge absorber within the module. In case of using an induced load of large load current such as solenoid valves, note the followings:
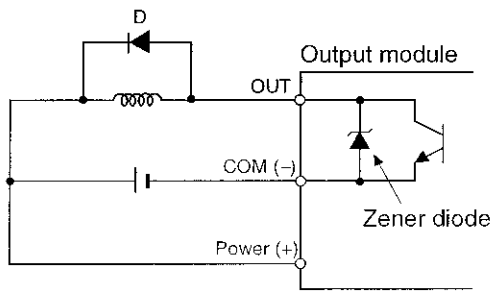


| Applicable models |
|---|
| JW-12S |
| JW-32S |
| JW-35S |
| ZW-32S2TD |

D: Diode for counter surge voltage absorption at OFF

• When the load current is an induced load of over 0.3 A(0.8A for JW-12S), use the module with the open/close frequency at less than 30 times/min. (1 sec. ON/1 sec. OFF or so).

| JW-12S | 0.5A |
|---|---|
| JW-32S | |
| JW-35S | 0.3A |
| ZW-32S2TD | |

• When more frequent opening/closing, a surge countermeasure for counter voltage absorption is needed in the load side. When the load current is an induced load of over 0.5 A(0.8A for JW-12S), a surge countermeasure for counter surge voltage absorption is indispensable in the load side.

| JW-12S | 0.8A |
|---|---|
| JW-32S | |
| JW-35S | 0.5A |
| ZW-32S2TD | |

• The output transistors of JW-32SC and JW-62SC may turn ON for a moment when the contact point (A) turn OFF to ON under the connection with the load in series, even if the output data from PC is OFF. Therefore, the load which response under 1ms may turn ON for a moment. To protect the abnormal processing, connect 100k ohms resistor between the contact point (A).
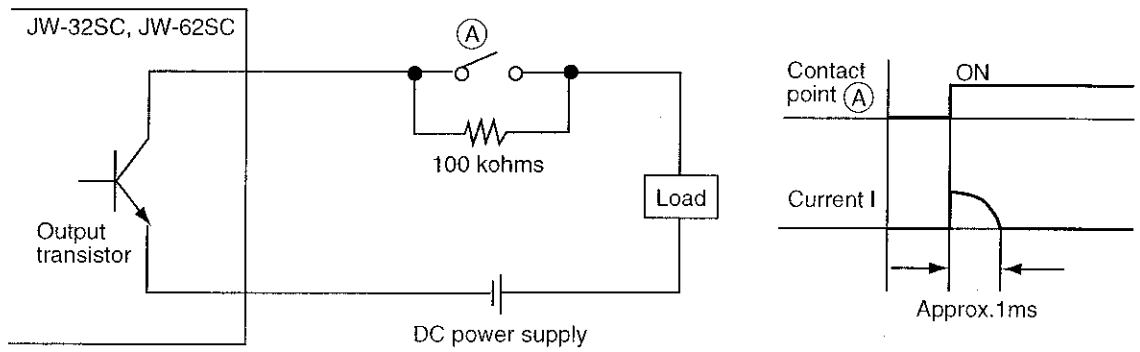
## 4) Load which can be driven by the AC output module

The AC output module with SSR as an output device can drive directly the loads of electro-magnetic switches, solenoid valves and lamps. In such cases note the surge current at turning ON (from OFF to ON) and the maintenance current during the maintenance state (ON state). Concretely, use the module within the following range:

| Model name | Load voltage range | OFF to ON transient | Holding | |
| | | Allowable repetitive surge current | Min. holding current | Max. rated load current |
|---|---|---|---|---|
| JW-13S | 15 to 264 VAC | 6A (100 ms) | 10 mA | 2A (1 point), 4A(8 points comment) |
| JW-33S | | 6A (100 ms) | 10 mA | 1A (1 point), 4A(16 points comment) |
| ZW-8S1 | 15 to 121 VAC | 8A (100 ms) | 30 mA | 2A (1 point), 5A(4 points comment) |
| ZW-16S1 | | 8A (100 ms) | 30 mA | 2A (1 point), 4A(8 points comment) |
| ZW-32S1T | | 6A (100 ms) | 10 mA | 0.6A (1 point), 2.4A(8 points comment) |
| ZW-16S3 | 15 to 242 VAC | 8A (100 ms) | - | 2A (1 point), 5A(8 points comment) |

The ZW-32S1T has two versions with different minimum operating currents :
OUT PUT AC100V(N): 15A(50 ms) or less
OUT PUT AC100V : 50 mA (former version, not produced after Feb.1988.)

• When the AC output module drives the load, note the surge current at turning ON and the holding current during the maintenance state. Keep the surge current below the repeated allowed surge current at the turning ON; and keep the maintenance current, over the minimum action current and below the maximum rated load current during the maintenance state.

• The repeated allowable surge current is a value in case of the pulse width below 100 ms and repeated switching frequency below 20 times/minute. When, in case of the load of a motor, the pulse width of the surge current is large and that the switching frequency is high, keep the ON time of 1 pulse below 50%.
(When the repeated surge current is below the maximum rated load current, there is no limit in the pulse width or in the switching frequency.)

• When many loads with big surge current are driven within a same common line circuit, make the number of points which turn from OFF to ON at the same time minimum. When a strong surge current goes through a built-in fuse in a common unit, the built-in fuse may be damaged or fused. The number of the surge current per common which can be turned from OFF to ON at the same time is determined by a fusing property of the built-in fuse as follows (as a guidance):
Below 15A (50ms)
Below 10A (50ms)
The numbers in (  ) are pulse widths.

• For a light load of the holding current which is smaller than the minimum action current, some characteristics of load may prevent turning OFF. In such a case, connect a bleeder resistance in parallel with the load to increase the maintenance current up to the minimum action current or more.
Some electro-magnetic switches of the pulse-driven cannot be turned OFF even if the holding current is over the minimum action current. In such a case, also, connect a bleeder resistance in parallel with the load. (Select a value of the bleeder resistance so that it can allow the minimum action current by itself.)
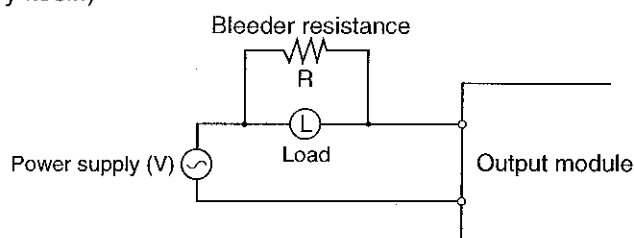
Calculate the value R of the bleeder resistance in the following formula:

$$R < \frac{V}{I}$$

V: Power supply voltage
I: Minimum action current of the output module

Then, the capacity of R (W) is

$$W > \frac{V^2}{R} \times 3$$

### 5) OFF delay time when the DC output module drives the induced load

When the DC output module with a built-in cramp diode is used as a surge killer to drive the induced load of direct current such as electro-magnetic valves and solenoid valves, it may be impossible to complete high-speed switching due to the delay of response, since electric current goes to the load through the cramp diode. In such a case, the DC output module with a built-in zener diode, instead of the cramp diode, could speed up the response.
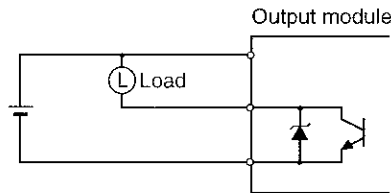


DC output module with a built-in zener diode
JW-12S
JW-32S
JW-35S
ZW-32S2TD

### 6) Driving a load current of 1A or more (2A max.) from a JW-series DC output module

The JW-12S output module uses FETs in its final stage. It can thus drive a load current of up to 2A if two FET outputs are connected in parallel.
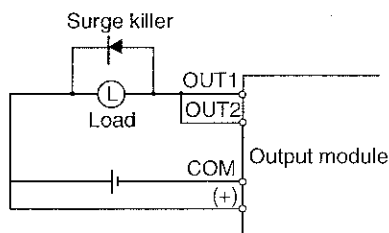


Note 1: For parallel driving, be sure to turn both OUT1 and OUT2 on or OFF simultaneously.
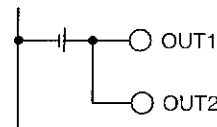


Note 2: Be sure to use a flywheel diode in parallel with the load.

Note 3: The allowable surge current is not doubled by the parallel connection. It remains 4A(100 ms).

Note 4: The JW-32S is not capacity of doubling its output capacity by parallel connection (1A max.)

### 7) External power source

DC and relay output modules require external power sources to supply DC output modules with output transistor's base current, and relay output module's coil driving current. Connecting an external power source also makes any output module's internal flywheel diodes effective. If a DC output module is used with no external power source connected to it, the internal flywheel diode will remain ineffective and the output transistors may sustain damage.

| | Supply destination | Module's terminal block or connection pins | System rack panel 24 VDC terminal block |
|---|---|---|---|
| Module name | DC output modules | JW-12S  JW-32S<br>ZW-32S2  ZW-32S5<br>ZW-32S2T  ZW-35S<br>ZW-32S5  ZW-32S2TD<br>ZW-64S2 | ZW-8S2<br>ZW-16S2 |
| | Relay output module | JW-34S<br>ZW-16S4D  ZW-32S4T | ZW-16S4 |

• For DC output modules, one power source should, as a rule, be shared for both the external and load power supplies.

[Example for connrction]
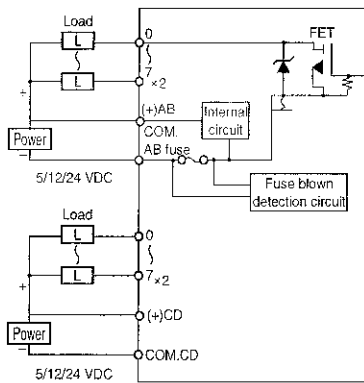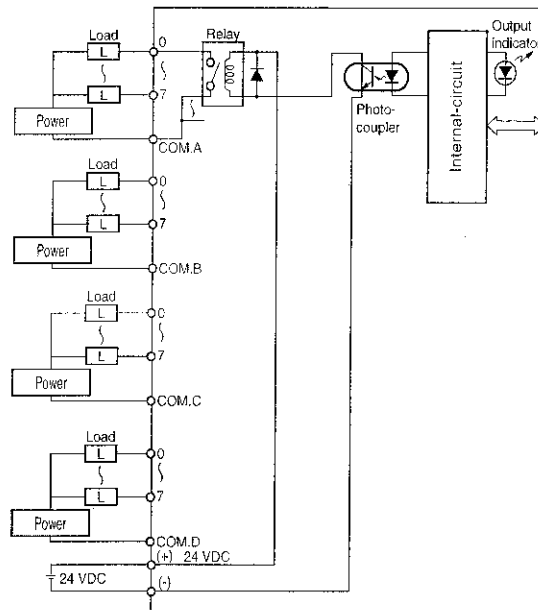


In case of JW-12S/32S          In case of JW-34S
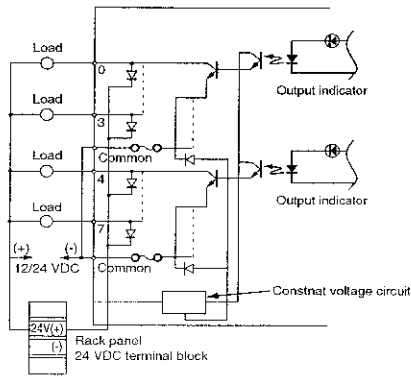
In case of ZW-16S2/8S2
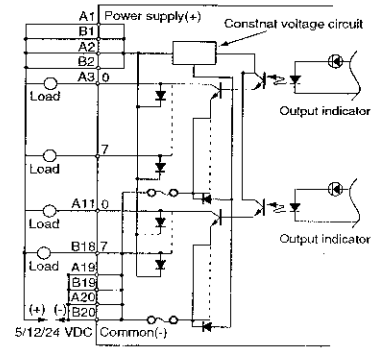


In case of ZW-32S2
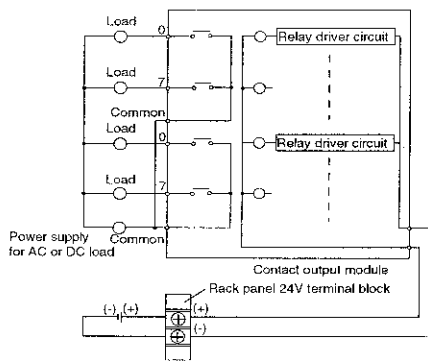


In case of ZW-16S4
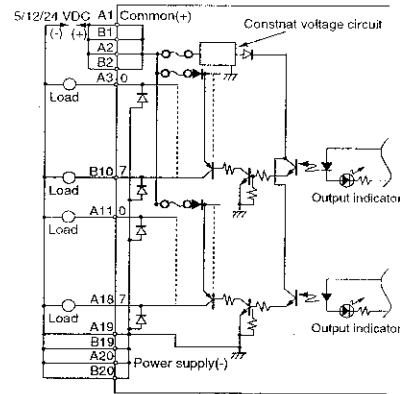


In case of ZW-32S5
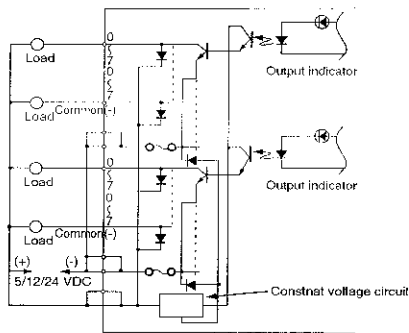


In case of ZW-32S2T
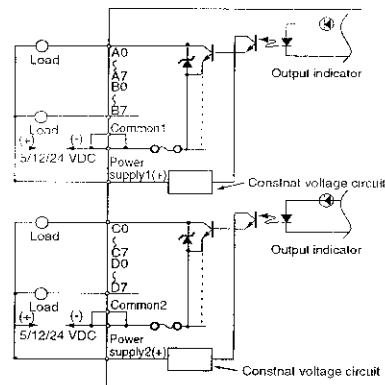


In case of ZW-32S2TD

Note 1: External 24 VDC power supplied to the 24 VDC terminal block on a rack panel is shared by any of ZW-8S2, ZW-16S2, and ZW-16S4 module installed.

### a. When external supply voltage is lower than load supply voltage (see page 4-49 note )

The load may be activated by a load current ($I_{OUT}$) passing through the output module's flywheel diode.

When $V_1 < V_2$:
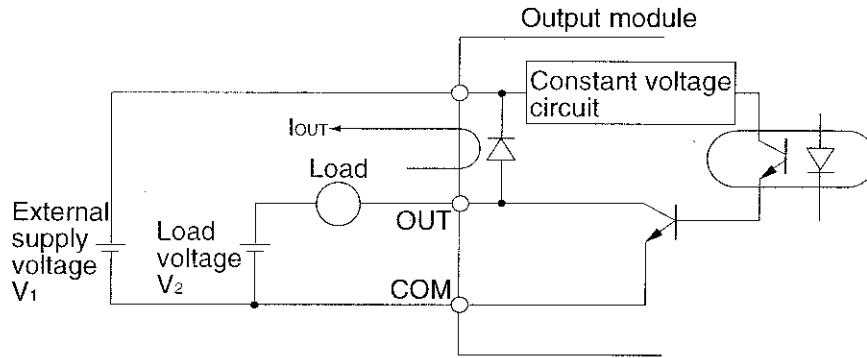


### b. Power ON/OFF sequence (see page 4-49 note)

When powering up the system, first turn the external power source ON, followed by the load power supply. When turning the system power OFF, first turn the load power supply OFF, followed by the external power source. If this power ON/OFF sequence is not followed, the load will malfunction.
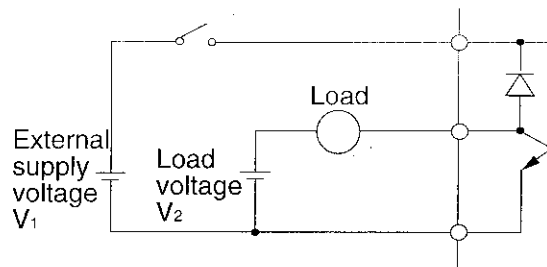
## c. When using both DC and relay output modules on one rack panel:
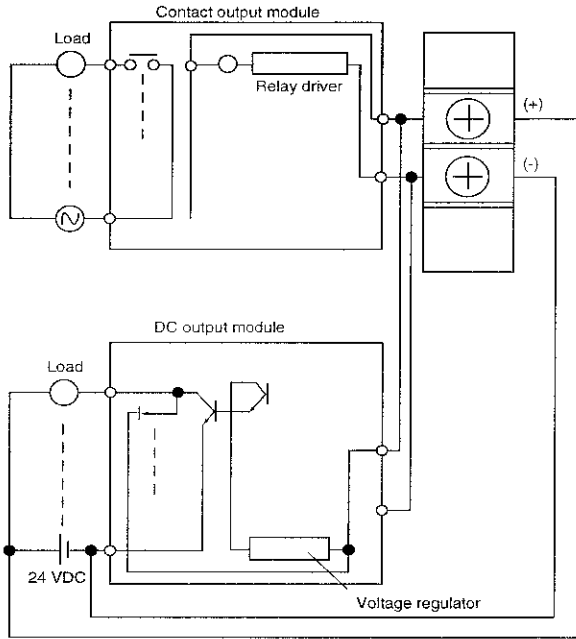


1) When a DC output modules is used to drive 24 VDC loads, connect the 24 VDC load power supply terminals to the pertinent terminals on the basic or expansion rack panel's 24 VDC terminal block.
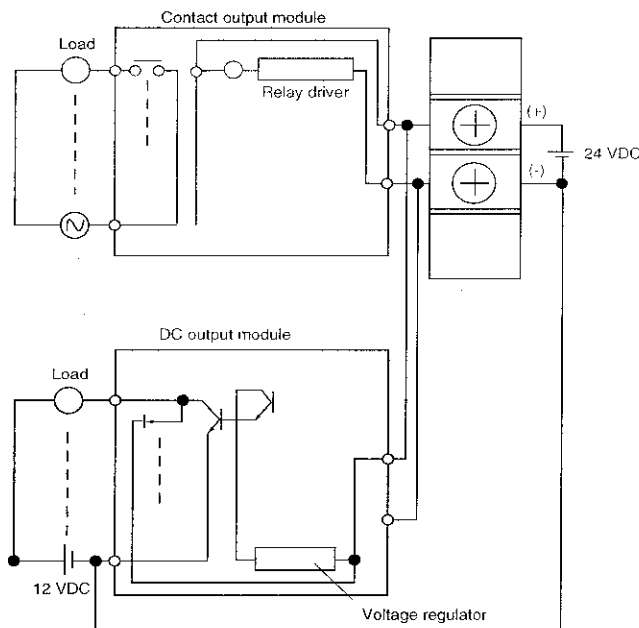


2) When a DC output modules is used to drive 12 VDC loads, connect an external 24 VDC loads, connect an external 24 VDC power source (which is separate from the 12 VDC load power supply) to the 24 VDC terminal block on the basic or expansion rack panel, and connect the negative terminal of the terminal block to that of the terminal block on the basic or expansion rack panel, and connect the negative terminal of the terminal block o that of the load power supply. The separate 24 VDC power source is needed for driving the relays 1 within the relay output modules.

Note: Using the JW-12S/JW-32S/ZW-32S2TD output modules with zener diodes as surge suppressors can prevent load malfunction due to loop current. Also, they may be used in the circuit with separate external and load power supplies as shown:



Output module (ZW-32S2TD)
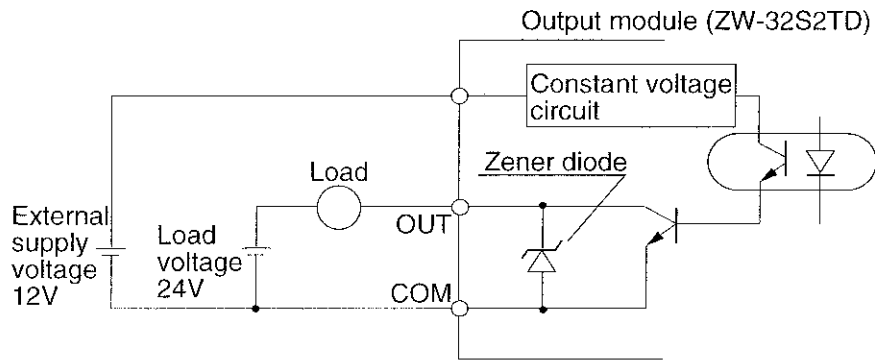
### 8) Driving micro loads with relay output modules

The relays used in relay output modules are suited for driving relatively high-power loads. For low-power loads rated, for example, at 24 VDC , 10mA, the reliability of the relay contacts will be reduced. For low-power applications, we recommend that you use DC output modules with transistor outputs. If the use of low-power relay contacts is necessary, use external low-power miniature relays with high contact reliability and drive them from either a DC or relay output module as shown:



DC output module
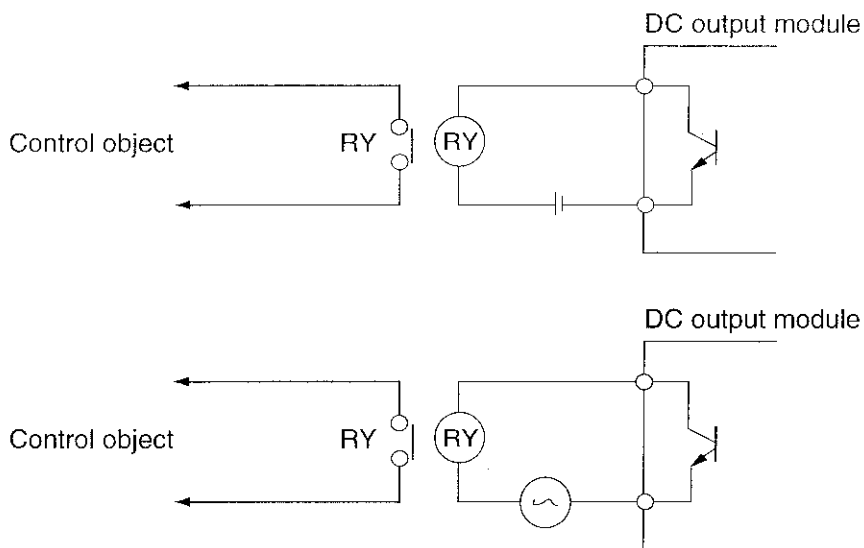


DC output module

## 9) Life of relays of the relay output module

The relay's life of the module (JW-34S, ZW-16S4, ZW-16S4D, ZW-32S4T), which uses a relay in output circuit, varies depending on the kind of loads (difference of the power rate of the signal on the contact point is AC or DC and its current value). The following shows characteristic curves of the relay contact point.
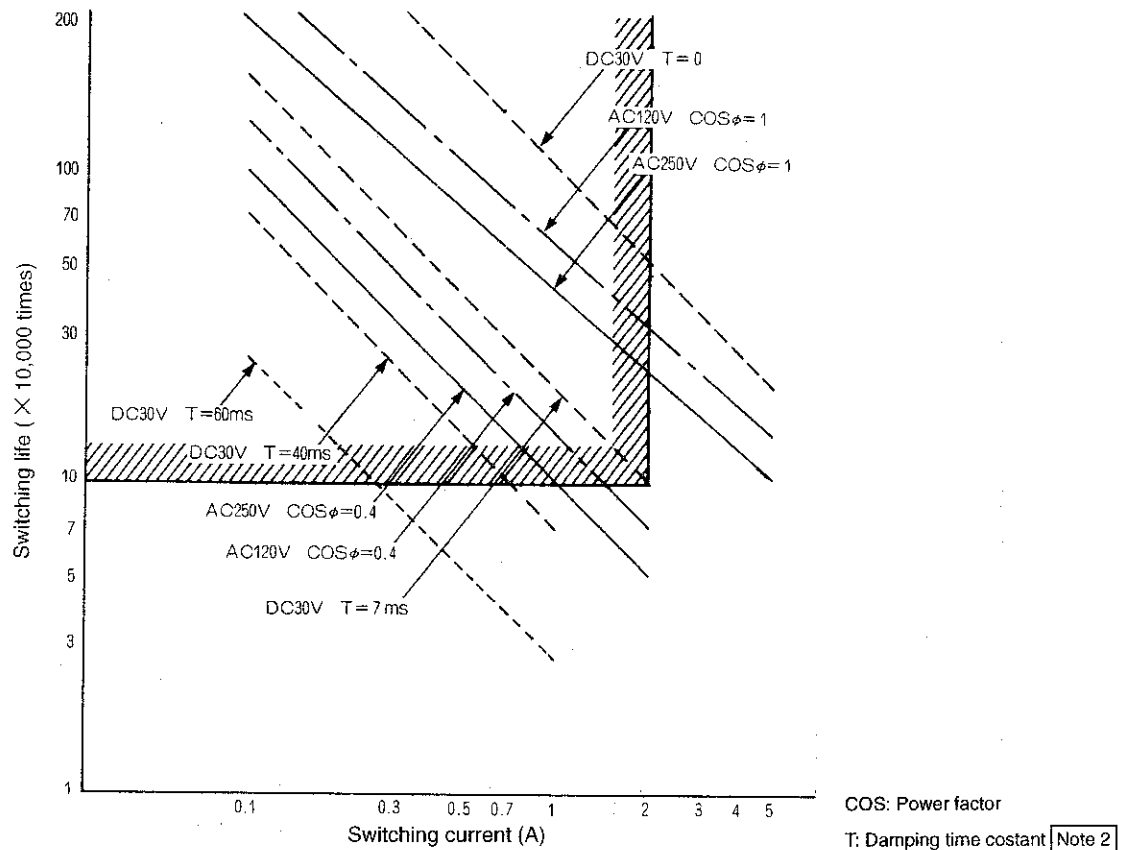


Note 1: The above chart shows standard values.

Depending on the environment of usage (ambient temperature and humidity), different life may result.

Note 2: When the signal to the contact point is DC, the life of relays varies according to the load rise characteristics (time constant: T) of the load. The load rise characteristics of the load after the contact point is turned ON are determined by inductance: L and resistance: R

$$\left( T = \frac{R}{L} \right)$$

For the time constant of the load used, see below:

In case of resistance load:      T < 1ms

In case of small size relay:      T = 7 ms

In case of large current L load and magnet:   T = 40ms

In case of the L load with a diode for surge countermeasure, the life of relays may be similar to the case of T < 1ms.

Note 3: When magnetic value containing rectification current (diode) is load, full-wave rectification should be used. Half-wave rectification makes the life shorter.

Note 4: Use the relay output module, with the contact switching life of more than 100,000 times and within the current capacity of less than 2A.

## 10) Fuse blown detction on JW-series output modules

Model name | JW-12S, JW-32S, JW-33S, JW-35S

The JW-12S, JW-32S, JW-33S, and JW-35S DC output modules have an internal fuse failure detection circuit as shown below. Due to the circuit configuration, it can detect fuse failures only if load power is present at the module outputs. If no load power is present, the fuse indicator light on the output module and fuse OFF plug (7363) to the control module will both remain OFF, even when a failure exists.
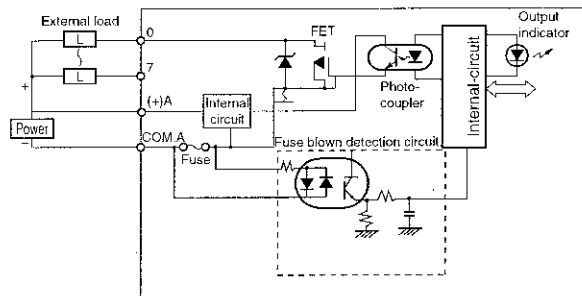


JW-12S/JW-32S
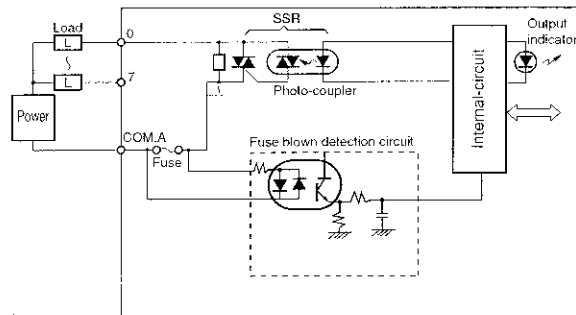


JW-33S

## [6] Precautions for operating the special I/O module

### 1) Scan time (ZW-I/Os)

ZW-series special I/O modules perform data and command transfer with external devices through I/O relays controlled by an internal microprocessor. For this reason, each scan time must be set longer than the internal processor's execution cycle time. If it is set shorter than the cycle time, a data transfer error will occur.

(Unit for processing time : ms)

| Module name | Model name | Processing time | Module name | Model name | Processing time |
|---|---|---|---|---|---|
| High-speed counter module | ZW-1HC5 | 2 | Pulse catch module | ZW-14PC2 | 0 |
| High-speed counter module | ZW-1HC6 | 0 | Pulse output module | ZW-1PO2 | 2 |
| Analog input module | ZW-4AD2 | 2 | Positioner module | ZW-112PM | 3 |
| Analog output module | ZW-2DA2 | 2 | Serial I/O module | ZW-232SU | 3 |
| Interface module | ZW-10DU | 6 | | | |

Note 1: JW-series special I/O modules need no consideration for scan time setting.

### a. Checking scan time setting

The current scan time setting can be checked by reading the contents of system memory address #0032 and #0033:

| | #0032 | Lower BCD digit |
|---|---|---|
| System memory | | |
| | #0033 | Upper BCD digit |

### b. Setting scan time (constant scan)

If the preset scan time is shorter than the special I/O module's execution cycle time, set system memory address #0226 to the appropriate value:

| Zero cross 07367 | Set in #0226 | PC's scan time |
|---|---|---|
| OFF | Invalid(BCD) | Zero-cross sync. |
| ON | 00(BCD) | Zero-cross sync. (minimum scan) |
| ON | 01 to 99(BCD) | Scan time of 01 to 99ms |

### 2) Special I/O module installation

Special I/O modules handle high-frequency pulses and/or low currents. Do not install them in slots next to slots where relay output modules (JW-34S/ZW-16S4/ZW-16S4D/ZW-32S4T) are installed.

Relay output module ⎯⎯⎯⎯ ⎯⎯⎯⎯ Special I/O module

### 3) JW-series special I/O modules

(I/O relay)

For control output

2 bytes

(Data register)

For measure data
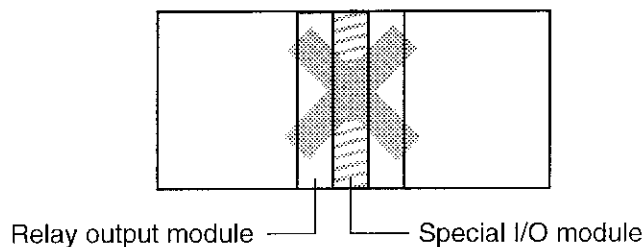
64 bytes
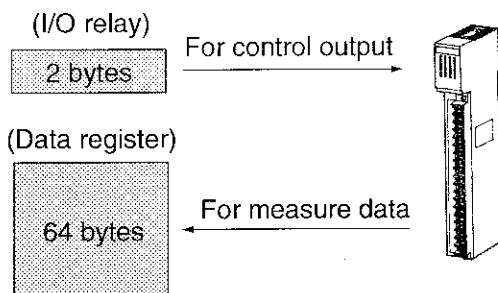
I/O operations through JW-series I/O modules access two data memory areas for I/O relays and data registers. For more information, read the programming manual, section 4-1.

# 4-6 Power supply module (JW-1PU: Approved UL/CSA)

## [1] Name and function of each part
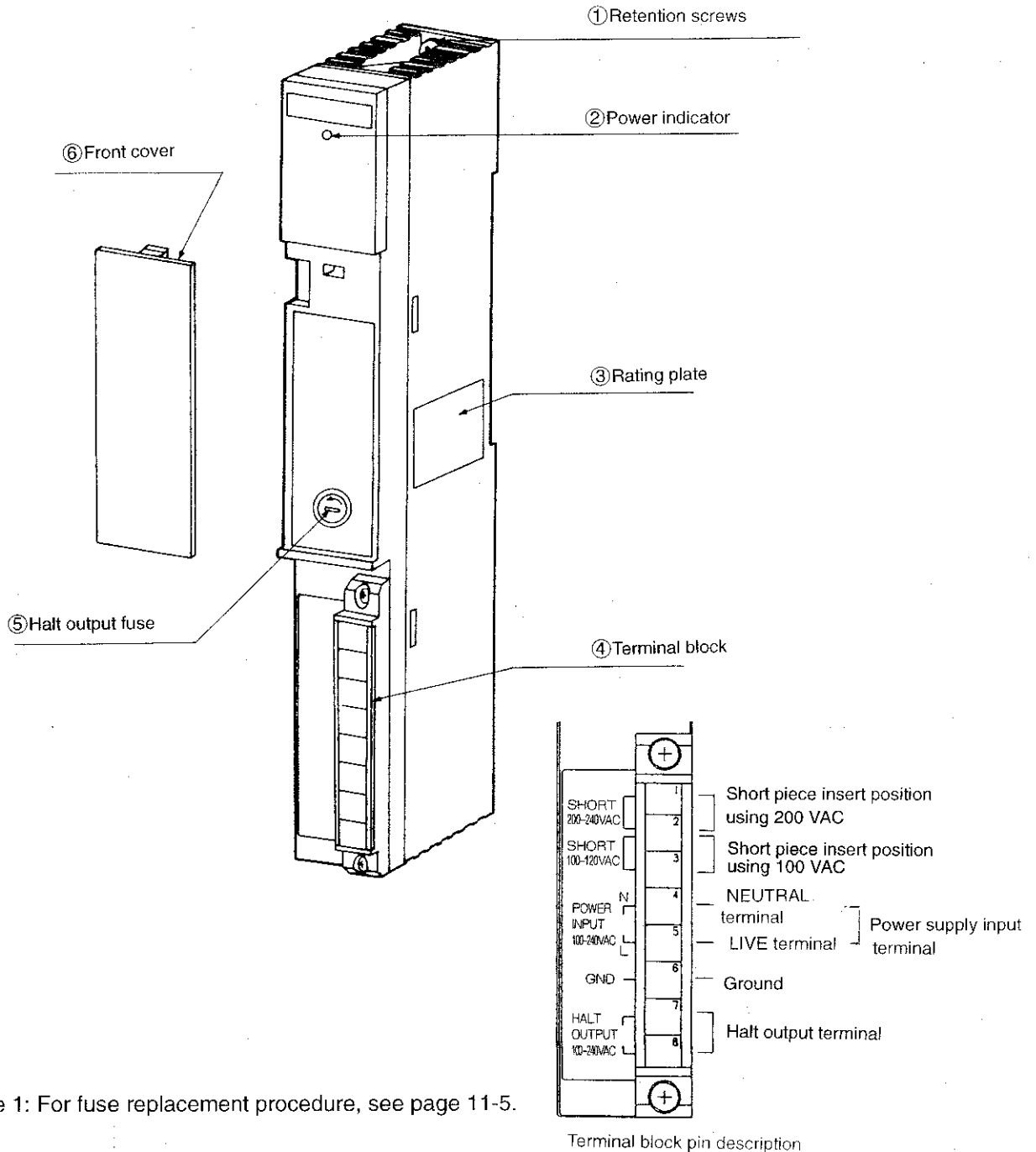


Terminal block pin description

Note 1: For fuse replacement procedure, see page 11-5.

① Retention screws

    Use these screws to secure the power supply module to the rack panel frame.

② Power indicator

    Comes on when +5V power is available.

③ Rating plate

④ Terminal block (8 pin)

    Connect cable wires for power, ground, and the halt output signal to this terminal block. Also used for input voltage selection.

⑤ Halt output fuse (1A normal class)

    Use a glass-tubed fuse with 250V, 1A rating for the halt output circuit.

⑥ Front cover

    Remove this cover to gain access to the fuse.

## [2] Outline dimension drawings
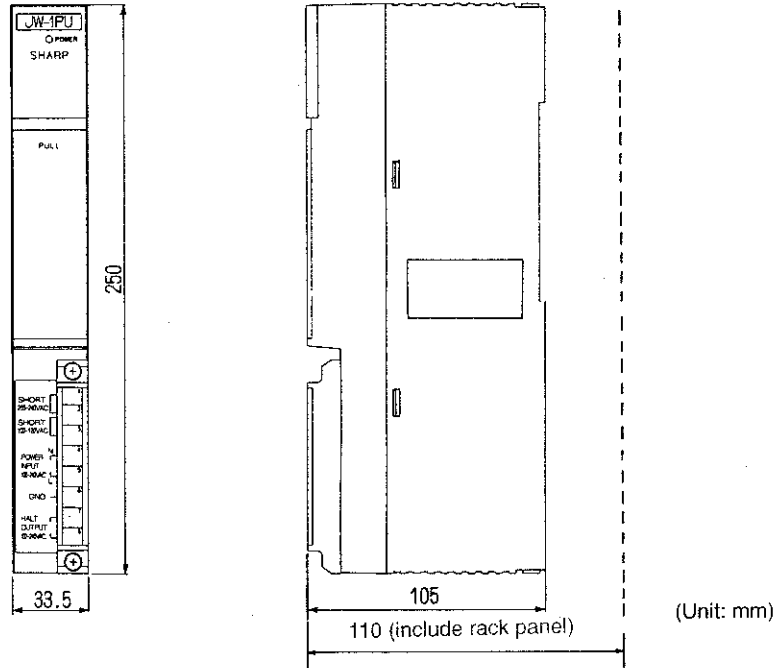


105
110 (include rack panel)
33.5

(Unit: mm)

## [3] Specifications

| Item | Specifications | |
|---|---|---|
| Rack panl slot | Power supply module slot in basic rack panel (ZW-28KB/46KB) or rack panel (ZW-08BU or JW-4BU/6BU/8BU/13BU) | |
| Input power | Input voltage | 100 VAC to 120 V+10% (85 to 132 VAC) - 15% |
| | | 200 VAC to 240 V+10% (85 to 132 VAC) - 15% |
| | Input frequency 47 to 66 Hz | |
| Power consumption | Max. 55 watts (at 7A output current) | |
| Surge current | Max. 40 A(10 ms or less) with rated load and at 240 VAC input | |
| Leakage current | Max. 1 mA at 240 VAC input | |
| Output voltage | 5.1 VDC ±0.05 V | |
| Output current | 0 to 7A | |
| Output rise time | 20 to 200 ms at rated load | |
| Output hold time | Min. 15ms at rated load | |
| Protection circuits | Overcurrent protection : Voltage-drop, auto-recovery type (8.8 to 9.6A) | |
| | Overvoltage protection | Shut-off, manual-recovery type (6.0 to 6.75 V) |
| Protection fuses | AC power input | Time-lag miniature fuse with 2A rating (internal mounting) (Approved to UL/CSA/) |
| | Halt output | Normal blow miniature fuse with 1A rating (front mounting) (Approved to UL/CSA/) |
| Halt output | Function | Triac output, shut OFF if contol module stops functioning |
| | Load voltage | 85 to 264 VAC |
| | Load current | 0.5 A max. |
| | Leakage current | Max. 3mA |
| Insulation resistance | Min. 10M ohms when measured with a 500 VDC megohmmeter | |
| Dielectrical strength | Withstands 1500 VAC for 1 minute. | |
| Power indicator | Green LED | |
| Terminal block | For primary input and halt output connections (terminal block detachable) | |
| Connector | 44-pin DIN connector | |
| Outer dimensions | 33.5(W)×250(H)×104.5(D) | |
| Weight | 0.7kg | |
| Accessories | Normal blow miniature fuse with 250 V, 1A rating:1 (Approved to UL/CSA/) | |

Input voltage selection is accomplished by mounting a metal short across the appropriate terminals on the terminal block.

Note: The power supply module is designed for installation in a rack panel (ZW-08BU, JW-4BU/6BU/ 8BU/13BU) only. It cannot be installed in an expansion rack panel.

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## [4] Input voltage selection

The primary supply voltage to the power supply module can be selected as 100 VAC or 200 VAC. The default selection is 100 VAC position on the terminal block. To select 200 VAC, move it to the 200 VAC position.

SHORT
AC200V

SHORT
AC100V

Selection for 100 VAC

Metal short

SHORT
AC200V

SHORT
AC100V

Selection for 200 VAC
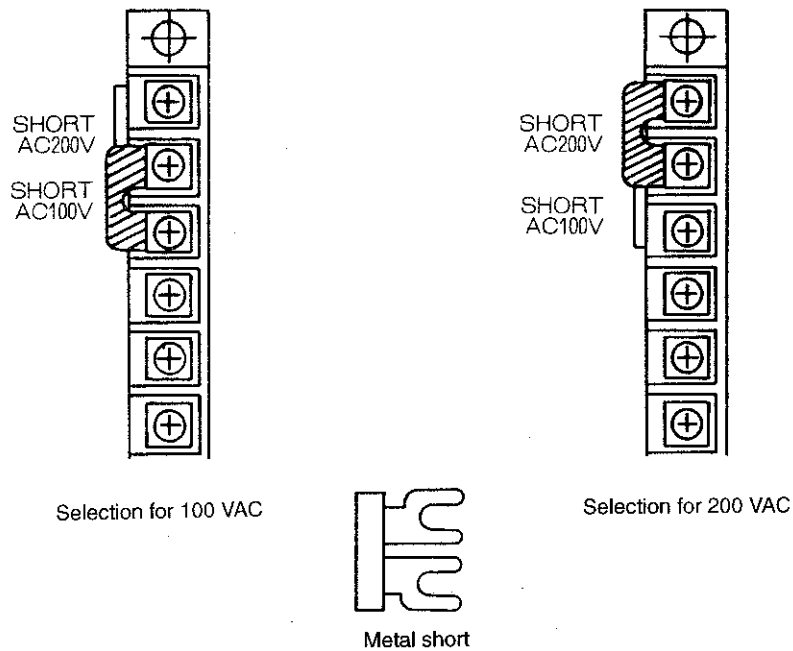
Note 1: Never supply 200 VAC to the power supply module with the input voltage selection left at 100 VAC, or the module will sustain permanent damage.

Note 2: Take care not to lose the metal short if you have temporarily removed it from the terminal block.

Note 3: The input voltage tolerance for the expansion power supply modules (ZW-100PU1/ZW-100PU2) is 100 VAC + 10%/15% or 200 VAC + 10%/-15%.

Note 4: The following schematic shows the JW-1PU's halt output circuit:

7   1A

8

SSR
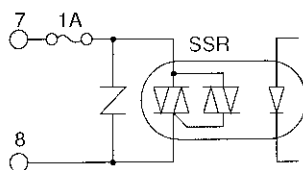
## [5] Power supply capacity

The JW-1PU power supply module has a rated load capacity of 5 VDC, 7A. The ZW-100PU1/100PU2 expansion power supply modules have capacities of 5 VDC, 7A(PU1) and 5 VDC, 12 A(PU2). If the load current exceeds these ratings, the power supply module's internal current limiter will be activated to shut off the 5V supply to all other modules. During system design, set the total current consumption by I/O modules below the rated load capacity of the power supply module to be used.

### 1) JW-series I/O modules

| Model name | Current consumption with all I/O points turned OFF I (OFF) (mA) | Current consumption with all I/O points turned ON I (ON) (mA) | Current consumption with n I/O points turned ON I (n) (mA) |
|---|---|---|---|
| JW-50CU(Control module) | 400 | | |
| JW-70CU(Control module) | 300 | | |
| JW-100CU(Control module) | 300 | | |
| JW-50CUH(Control module) | 550 | | |
| JW-70CUH(Control module) | 420 | | |
| JW-100CUH(Control module) | 420 | | |
| JW-1EA(I/O bus expansion adapter) | 550 | | |
| JW-2EA(I/O bus expansion adapter) | 550 | | |
| JW-10PG(Hand-held programmer) | 200 | | |
| JW-11PG(Hand-held programmer) | 200 | | |
| JW-12PG(Hand-held programmer) | 200 | | |
| JW-13PG(Hand-held programmer) | 200 | | |
| JW-14PG(Hand-held programmer) | 110 | | |
| JW-10TU(positioning teaching module) | 300 | | |
| JW-11N(100 VAC, input) | 25 | 57 | $25+2n$ |
| JW-12N(12/24 VDC or 24 VAC, input ) | 25 | 57 | $25+2n$ |
| JW-13N(200 VAC, input) | 25 | 57 | $25+2n$ |
| JW-31N(100 VAC, input) | 25 | 89 | $25+2n$ |
| JW-32N(100 VAC, input) | 25 | 89 | $25+2n$ |
| JW-34N(12/24 VDC, input) | 25 | 89 | $25+2n$ |
| JW-64NC(12/24 VDC, input) | 28 | 100 | $28+2n_1+0.13n_2$ |
| JW-12S(5/12/24 VDC, output) | 25 | 121 | $25+6n$ |
| JW-13S(100/200 VAC, output) | 25 | 265 | $25+15n$ |
| JW-32S(100/200 VAC, output) | 25 | 217 | $25+6n$ |
| JW-33S(100/200 VAC, output) | 25 | 505 | $25+15n$ |
| JW-34S(Relay output module) | 25 | 217 | $25+6n$ |
| JW-62SC(5/12/24 VDC, output) | 28 | 650 | $28+12.6n_1+6.6n_2$ |
| JW-35S(12/24 VDC, output) | 25 | 217 | $25+6n$ |
| JW-8AD(Analog input) | 450 | | |
| JW-2DA(Analog output) | 250 | | |
| JW-2HC(High-speed counter) | 210 | | |
| JW-34NC(12/24 VDC, input) | 25 | 89 | $25+2n$ |
| JW-32SC(5/12/24 VDC, output) | 25 | 217 | $25+6n$ |
| JW-31LM (I/O link master module) | 300 | | |
| JW-31LMH (I/O link master module) | 300 | | |
| JW-11DU(ID control module) | 450 (at connecting the programmer: 600) | | |
| JW-12DU(ID control module) | 350 (at connecting the programmer: 550) | | |
| JW-12PM(Positioning basic module) | 600 | | |
| JW-22PM(Positioning expansion module) | 280 | | |
| JW-12PS(Pulse output module) | 450 | | |
| JW-14PS(Pulse output module) | 550 | | |
| JW-10CM(Link module) | 200 | | |
| JW-20CM(Network module) | 465 | | |
| JW-20MN(ME-NET module) | 465 | | |
| JW-10SU(Serial interface module) | 260 | | |
| JW-50CM(Ethernet module) | 1300 | | |

Note 1: $n_1$; I/O points turn ON, $n_2$; I/O points turn OFF.

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## 2) ZW-series I/O modules

| Model name | Current consumption with all I/O points turned OFF I (OFF) (mA) | Current consumption with all I/O points turned ON I (ON) (mA) | Current consumption with n I/O points turned ON I (n) (mA) |
|---|---|---|---|
| ZW-10CM(Link module) | 200 | | |
| ZW-20CM(Network module) | 600 | | |
| ZW-30CM(Network module) | 750 | | |
| ZW-20RS(Remote I/O slave module) | 600 | | |
| ZW-10SU(Serial interface module) | 260 | | |
| ZW-10EU(I/O expansion module) | 70 | | |
| ZW-101PG1(pogrammer) | 700 | | |
| ZW-16N1(100 VAC, input) | 50 | 120 | $50+4.4n$ |
| ZW-16N2(12/24 VAC, input) | 50 | 120 | $50+4.4n$ |
| ZW-16N3(200 VAC, input) | 50 | 120 | $50+4.4n$ |
| ZW-32N1T(100 VAC input) | 75 | 200 | $75+3.9n$ |
| ZW-32N2/N2T(data input) | 85 | 85 | 85 |
| ZW-64N2(data input) | 40 | 170 | $40+4.0n_1+0.05n_2$ |
| ZW-8S1(100 VAC, output) | 80 | 240 | $80+20n$ |
| ZW-8S2(12/24 VDC, output) | 80 | 160 | $80+10n$ |
| ZW-16S1(100 VAC, output) | 80 | 400 | $80+20n$ |
| ZW-16S2(12/24 VDC, output) | 80 | 240 | $80+10n$ |
| ZW-16S3(200 VAC, output) | 80 | 400 | $80+20n$ |
| ZW-16S4(relay output) | 85 | 180 | $85+6n$ |
| ZW-16S4D(relay output) | 20 | 80 | $20+3.8n$ |
| ZW-16S1T(100 VAC, output) | 85 | 600 | $85+16.1n$ |
| ZW-32S2/S2T/S2TD (data output) | 100 | 320 | $100+6.9n$ |
| ZW-32S4T(relay output) | 100 | 220 | $100+3.7n$ |
| ZW-32S5(Source-type data output) | 85 | 185 | $85+3.1n$ |
| ZW-64S2(data output) | 80 | 420 | $80+7.0n_1+3.0n_2$ |
| ZW-32IO2(5/12/24 VDC, I/O) | 180 | 320 | $180+5n_{IN}+3.5n_{OUT}$ |
| ZW-1HC5(High-speed counter) | 600 | | |
| ZW-1HC6(High-speed counter II) | 740 | | |
| ZW-4AD2(Analog input) | 400 | | |
| ZW-2AD2(Analog output) | 300 | | |
| ZW-14PC2(Pulse catch) | 170 | | |
| ZW-1PO2(Pulse output) | 600 | | |
| ZW-100DM(Dummy) | 60 | | |
| ZW-232SU(Serial I/O module) | 900 | | |
| ZW-112PM(Positioning basic module) | 600 | | |
| ZW-202PM(Positioning basic module) | 280 | | |
| ZW-31LM (I/O link master module) | 330 | | |
| ZW-10DU(Interface module) | 250 | | |

Note 1: $n_1$; I/O points turn ON, $n_2$; I/O points turn OFF.

## 3) Memory module

| Model name | Current consumption (mA) | Model name | Current consumption (mA) |
|---|---|---|---|
| ZW-1MA | 100 | JW-1MAH | 130 |
| ZW-2MA | 100 | JW-2MAH | 135 |
| ZW-3MA | 100 | JW-3MAH | 145 |
| ZW-4MA | 180 | JW-4MAH | 185 |

**[Example 1]**

| JW-50CUH control module | |
| --- | --- |
| JW-13PG hand-held programmer | |
| JW-34N | 11 sets |
| JW-32S | 5 sets |
| JW-33S | 8 sets |

The maximum allowable current load for the JW-2PU power supply module is 5A.
Do not exceed this limit.

The total current required when all I/O points are turned ON is:

| | |
| --- | --- |
| JW-50CUH | 0.55A |
| JW-13PG | 0.2A |
| JW-34N | $0.089 \times 11 = 0.979$A |
| JW-32S | $0.217 \times 5 = 1.085$A |
| JW-33S | $0.505 \times 8 = 4.04$A |
| | Total$=6.854$A |

This total current is acceptable because it is below the JW-1PU power supply module's maximum allowable current load(7A).

**[Example 2]**

| JW-50CUH control module | |
| --- | --- |
| JW-13PG hand-held programmer | |
| JW-34N DC input module | 11 sets |
| JW-33S AC output module | 10 sets |
| JW-10CM link module | 3 sets |

The total current required when all I/O points are turned ON is:

| | |
| --- | --- |
| JW-50CUH | 0.55A |
| JW-13PG | 0.2A |
| JW-34N | $0.089 \times 11 = 0.979$A |
| JW-32S | $0.505 \times 10 = 5.05$A |
| JW-10CM | $0.2 \times 3 = 0.6$A |
| | Total$=7.379$A |

The total current exceeds the JW-1PU's maximum allowable load current. Now determine the maximum possible number of I/O points that can be simultaneously turned ON. If we assume that 300 out of 352 inputs and 300 out of 320 outputs are simultaneously turn ON, then the total current required is recalculated as follows:

| | |
| --- | --- |
| JW-50CUH | 5.5A |
| JW-13PG | 0.2A |
| JW-34N | $0.025 \times 11 + 0.002 \times 300 = 0.875$A |
| JW-32S | $0.025 \times 10 + 0.015 \times 300 = 4.75$A |
| JW-10CM | $0.2 \times 3 = 0.6$A |
| | Total$=6.975$ A |

This total current is acceptable because it is below the JW-1PU power supply module's maximum allowable current load(7A).

# 4-7 JW-2PU Power supply module

## [1] Name and function of each part
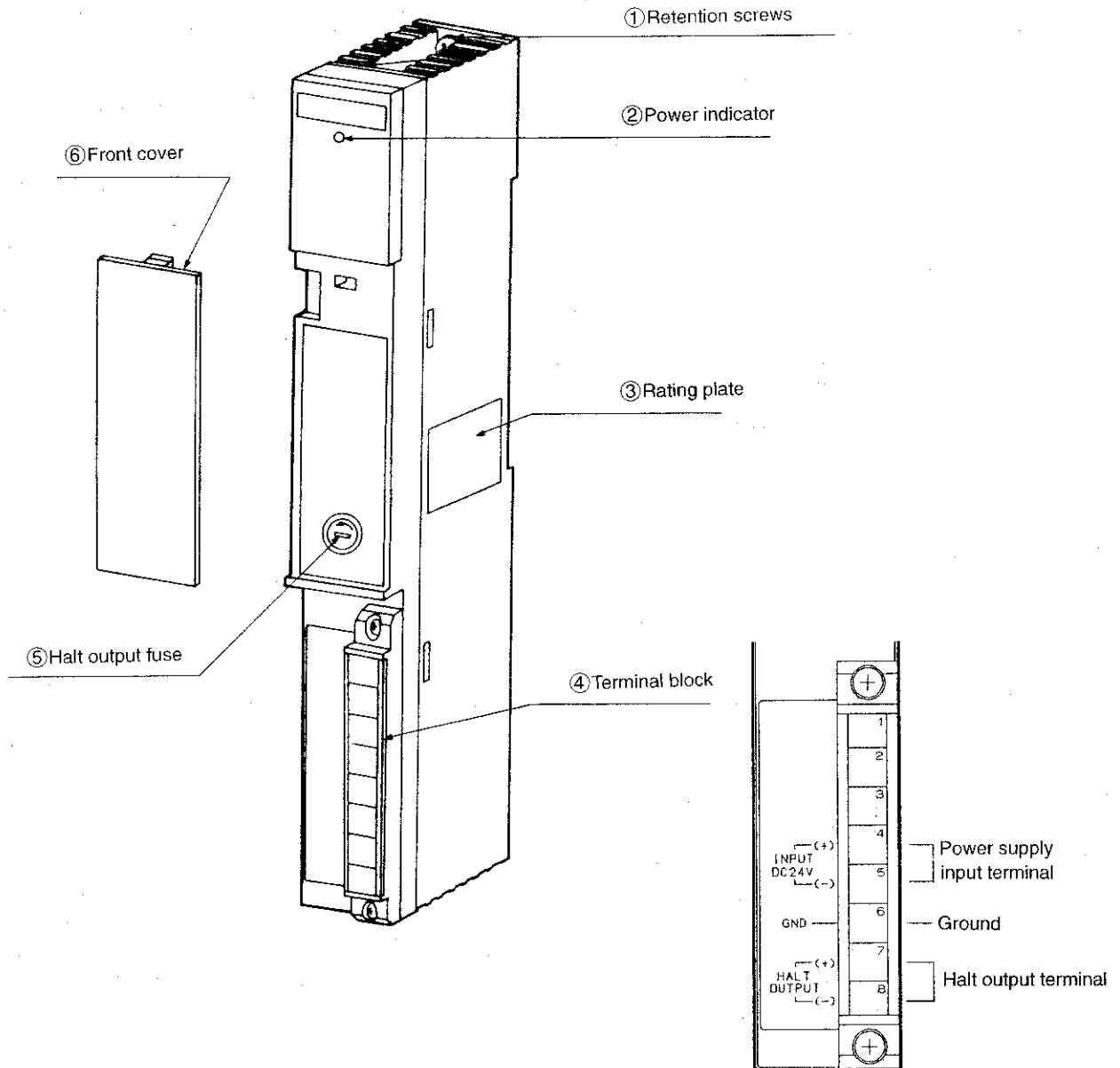


Note: For fuse replacement procedure, see page 11-5.

① Retention screws

Use these screws to secure the power supply module to the rack panel frame.

② Power indicator

Comes on when +5V power is available.

③ Rating plate

④ Terminal block (8 pin)

Connect cable wires for power, ground, and the halt output signal to this terminal block. It is also used for input voltage selection.

⑤ Halt output fuse (1A normal blow)

Use a glass-turned fuse with 250V, 1A rating for the halt output circuit.

⑥ Front cover

Remove this cover to gain access to the fuse.

---

**The JW-2PU is designed for a maximum allowable load current of 5A.**

**The total current requirement for the system should not exceed this limit.**

---

## [2] Outline dimension drawings
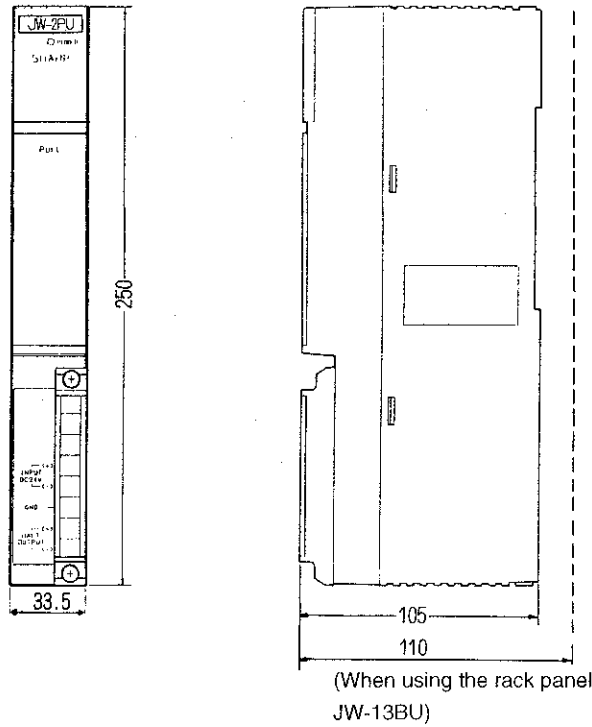


(When using the rack panel
JW-13BU)

## [3] Specifications

| Item | Specifications | | |
|---|---|---|---|
| Rack panl slot | Power supply module slot in basic rack panel (JW-4BU/6BU/8BU/13BU, ZW-28KB/46KB/08BU) | | |
| Input voltage | 24 VDC+33%/-15% (20.4 to 32.0 VDC) | | |
| Power consumption | Max. 40 watts (at 5A output current) | | |
| Surge current | Max. 40 A(at 24 VDC input, rated load) | | |
| Output voltage | 5.1 VDC ± 0.05 V | | |
| Output current | 0 to 5A | | |
| Output rise time | 20 to 200 ms at rated load | | |
| Output hold time | Min. 15ms at rated load | | |
| Protection circuits | Overcurrent protection | Voltage-drop, auto-recovery type (8.8 to 9.6A) | |
| | Overvoltage protection | Voltage-limiting, auto-recovery type (6.0 to 6.8A) | |
| Protection fuses | AC power input | Time-lag miniature fuse with 3A rating (internal mounting) | |
| | Halt output | Normal blow miniature fuse with 1A rating (front mounting) | |
| Halt output | Function | Transistor output, shut OFF if contol module stops functioning | |
| | Load voltage | 20.4 to 32.0 VDC | |
| | Load current | 0.5 A max. | |
| | Leakage current | Max. 0.1mA | |
| Insulation resistance | Min. 10M ohms when measured with a 500 VDC megohmmeter | | |
| Dielectrical strength | Withstands 1000 VAC for 1 minute. | | |
| Power indicator | Green LED | | |
| Terminal block | For primary input and halt output connections (terminal block detachable) | | |
| Connector | For power supply output to modules (44-pin DIN connector) | | |
| Outer dimensions | 33.5(W)×250(H)×105(D) | | |
| Weight | Approx. 1kg | | |
| Accessories | Normal blow miniature fuse with 250 V, 1A rating:1 | | |

Note: The JW-2PU power supply module is designed for installation in a rack panel (ZW-08BU) only.
It cannot be installed in an expansion rack panel.

## [4] Direct voltage source for power supply module

The following specifies the requirements for the direct voltage source for the JW-2PU power supply module:

### (1) Voltage fluctuation

The voltage fluctuation in the primary DC power source's output should not exceed the following range:

| Input voltage range: 20.4 to 32.0 VDC |

Note 1: If batteries are to be used as a primary DC power source, verify that both charged and discharged battery voltages fall within the input voltage range specified above.

Note 2: If a rectified AC power is to be used as a primary DC power source, verify that its ripple voltage does not exceed the input voltage range specified above.



3-phase, half-wave rectified power
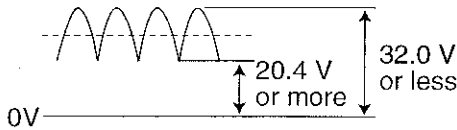
Single-phase, hull-wave rectified power

20.4 V or more    32.0 V or less

0V
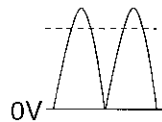
◯ Acceptable    ✕ Unacceptable

### (2) Current capacity of primary DC power source

Determine the required current capacity to the primary DC power source from the power consumed by the JW-2PU power supply module under maximum loaded condition. Since the JW-2PU consumes a maximum of 40 watts under maximum load (5A), the capacity required of the primary power source is: 40 W/24 V ≒ 2A.

## [5] Other notes

### (1) Guaranteed power-lapse interval

If a primary DC power source is to be switched on-line in the event of a power failure, the switching time should not exceed 10 ms. If it exceeds 10ms, the CPU may enter a power failure service sequence. If you wish to extend this interval, change the setting in system memory address #0246. It can be varied over 0 to 255 ms, although some restrictions may apply depending on the number of I/O and/or option modules used. For the details of how to change the interval setting, see the programming manual, section 2-4, "System memory description".

### (2) Zero-cross synchronization

With the JW-2PU DC power supply module, zero-cross synchronization remains ineffective. This means that completion of one operation on the PC is immediately followed by another operation.

### [Reference]

If you wish to use a constant scan time. Use the scan time fixing feature, which is set using system memory address #0226 and the zero-cross switch (relay #07367):

| Scan time | System memory #0226 | Zero-cross switch 07367 |
|---|---|---|
| Unfixed<br>01 to 99ms | 00 (H)<br>01 to 99ms (H) | ON |



07366    07367
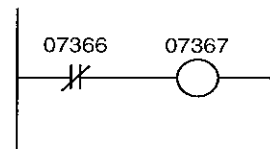
Circuit to close the zero-cross switch

Note 1: For zero-cross switch (07367) operation and system memory setting, see the instruction manual for the support tool you are using.

Note 2: The following shows the schematic of the JW-2PU power supply module's halt circuit: (Figure)
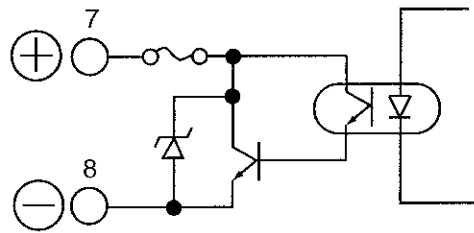
# 4-8  ZW-100PU1/100PU2 expansion supply module

## [1]  Name and function of each part

③ Cover retention screw hole

⑪ Module retention screws (4)

⑩ Switch locking plate

⑨ Locking plate retention screw

② Cover retention screw

① Power supply module cover

⑧ Power supply voltage selector switch

⑦ Halt output fuse (1A)

⑥ Power fuse (2A)

⑤ Terminal block

④ Hinge
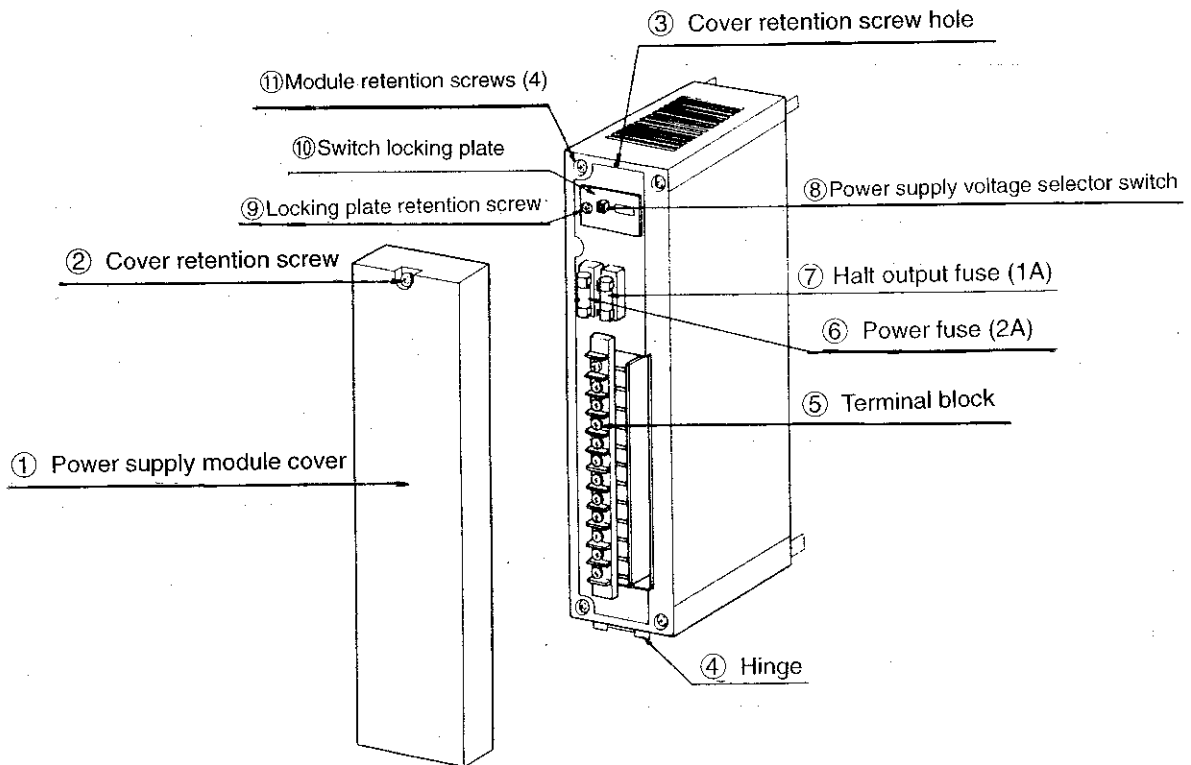
① Power supply module cover
   Remove this cover when you wish to:
   • Establish power, halt output, and other cable connections to the terminal block,
   • Replace a fuse, or
   • Switch primary supply voltage.
   Be sure to keep this cover installed on the module when it is being operated.

② Cover retention screw, ③ Cover retention screw hole, and ④ Hinge
   These are used to secure the front cover.

⑤ Terminal block (12 pin)
   Connect power, halt output, and other necessary cable wires to this terminal block.

⑥ Power fuse (2A)
   This fuse is inserted in the module's primary supply circuit. Use a tubed minifuse with 250 V, 2A rating.

⑦ Halt output fuse (1A)
   This fuse is inserted in the module's halt output circuit.
   Use a glass-tubed fuse with 250 V, 1A rating.

⑧ Power supply voltage selector switch

This switch allows you to select the primary supply voltage to the expansion power supply module as 100 VAC or 200 VAC. The default selection is 100 VAC.

⑨ Locking plate retention screw, ⑩ Switch locking plate

These are used to lock the voltage selector switch into the selected position to prevent inadvertent selection of the wrong voltage.

⑪ Rack panel retention screws

Use these screws to secure the expansion power supply module to the expansion rack panel frame (ZW-108ZB, etc.)

## [2]    Outline dimension drawings

250

65.5

120

130

(Include expansion rack panel)

(Unit: mm)
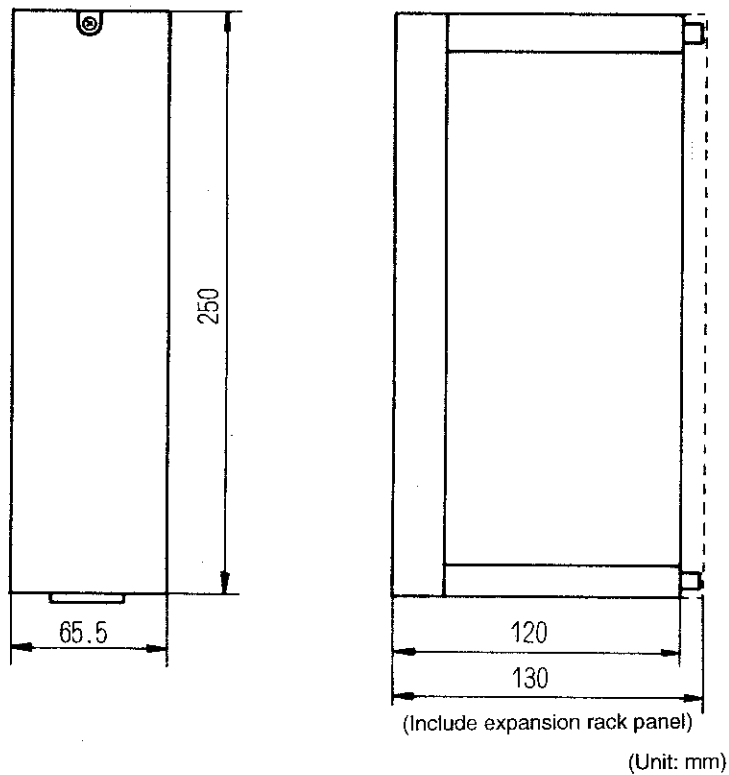
## [3]  Specifications

| Item | ZW-100PU1 | | ZW-100PU2 |
|---|---|---|---|
| Applicable rack panel | ZW-108ZB/ZW-104ZB/ZW-102ZB | | |
| Input voltage | Primary supply voltage | 100 VAC+10%(85 to 110 VAC) -15% 200 VAC+10%(170 to 220 VAC) -15% | |
| Power drawn | Max. 40 watts (at 7A output current) | | Max. 100 watts (at 12A output current) |
| Surge current | Max. 20 A, 10 ms(at 220 VAC input, rated load) | | |
| Leakage current | Max. 1 mA at 220 VAC input | | |
| Output voltage | 5.1 VDC ±0.05 VDC | | |
| Output current | 0 to 7A | | 0 to 12A |
| Output rise time | 20 to 200 ms at rated load | | |
| Output hold time | Min. 15ms at rated load | | |
| Protection circuits | Overcurrent protection | Voltage-drop, auto-recovery type (7.7 to 8.4A) | |
| | Overvoltage protection | Voltage-limiting, auto-recovery type (6.0 to 6.75A) | |
| Protection fuses | AC power input | Normal blow miniature fuse with 2A rating (front mounting) | |
| | Halt output | Normal blow miniature fuse with 1A rating (front mounting) | |
| Halt output | Function | Triac output, shut OFF if the contol module stops functioning | |
| | Load voltage | 85 to 240 VAC | |
| | Load current | 1A | |
| | Leakage current | 3 mA max. | |
| Insulation resistance | Min. 10M ohms when measured with a 500 VDC megohmmeter | | |
| Dielectrical strength | Withstands 1500 VAC for 1 minute. | | |
| Terminal block | For primary input and halt output connections | | |
| Outer dimensions | 65.5(W)×250(H)×130(D) | | |
| Weight | 1.5 kg | | |
| Accessories | Normal blow miniature fuse with 1A and 2A ratings: 1 each | | |

Primary supply voltage is selectable with a front panel switch.

Note: The ZW-100PU1/100PU2 power supply module cannot be installed in a basic rack panel or in the ZW-508ZB expansion rack panel.

## [4] Primary supply voltage switching

The primary supply voltage to the ZW-100PU1/100PU2 expansion power supply modules is selectable as 100 VAC or 200 VAC using a front panel switch. The default selection is 100 VAC. If you wish to operate the module on 200 VAC, change the voltage selection in the following sequence:



Voltage chengeover switch

Switch lock plate

Lock plate retention screw

100V
200V

(100 VAC setting condition)

| | |
|---|---|
| 100 VAC setting condition | ⊕ ⊕ ▤ 100V ⊕ Power voltage |
| 200 VAC setting condition | ⊕ ⊕ ▤ 200V ⊕ Power voltage |
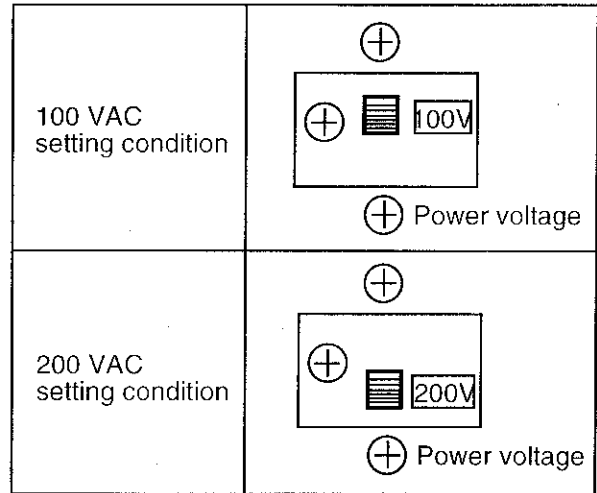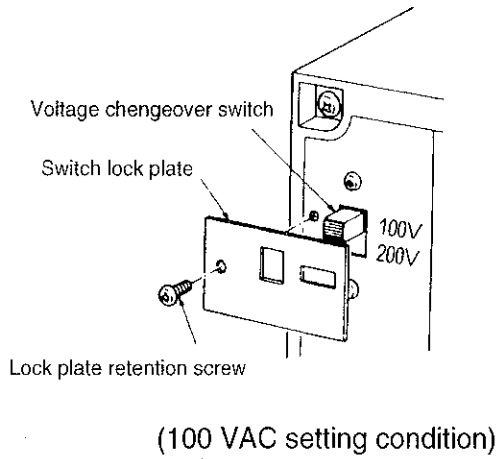
1) Remove the locking plate retention screw.
2) Remove the switch locking plate.
3) Set the voltage selector switch to 200 VAC.
4) Replace the switch locking plate over the switch, this time with its reverse side facing forward so that it locks the switch tab into the 200 VAC position.
5) Secure the plate with the retention screw.

Note 1: Never supply 200 VAC to the expansion power supply module with the supply voltage selection left at 100 VAC, or the module will sustain permanent damage.

Note 2: The tolerance of primary supply voltage for the expansion power supply module is not identical to that for the ZW-1PU power supply module. Take care to avoid using the expansion power supply module outside the supply voltage tolerance specified.

Note 3: The following schematic shows the ZW-100PU1/100PU2's halt output circuit:



1A
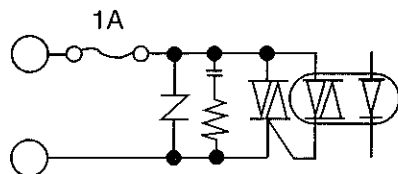
# 4-9 JW-1EA/2EA I/O bus expansion adapter

## [1] Outline and features

The JW-1EA/2EA I/O bus expansion adapter (hereafter called the JW-1EA/2EA) are used for bus interconnection among racks which contain JW-series I/O modules. The JW-1EA is used solely in the rack panel where the control module is installed, whereas the JW-2EA is used in all rack panels other than the first rack panel.

Containing high-speed line drivers and receivers, the JW-1EA/2EA allow reliable transmission over longer distance than that available with a conventional expansion signal cable:

1) The allowable total cable length from the first to the last rack panel in a daisy chain is 50 meters (160 feet).



Total cabl length: 50m
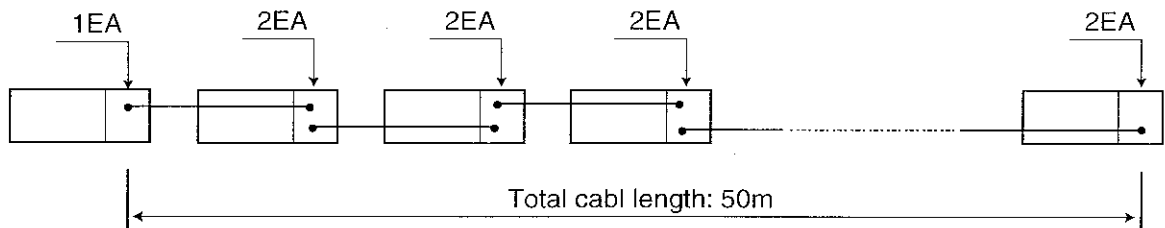
2) Remote programming capability allows you to program system operations, change an existing program, or monitor a running program, using a support tool attached to a rack panel which is up to 50m(in cable length) away from the rack panel where the control module is installed.



Support tool
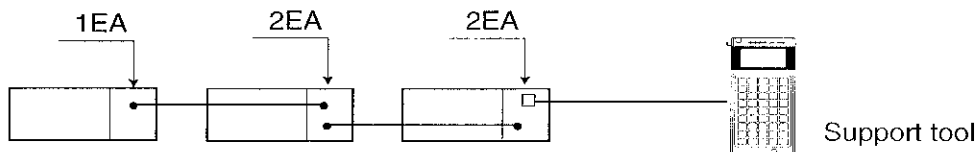
3) I/O module installed in the farthest rack have processing speeds equivalent to those in the control rack panel. Communication time delay inherent in conventional remote I/O is eliminated.

4) Power supply modules' halt output signal lines need not be connected in a daisy chain. If any of the power supply modules fail, the PC automatically stops running and the halt output signal of all the power supply modules are simultaneously activated (contact opened).
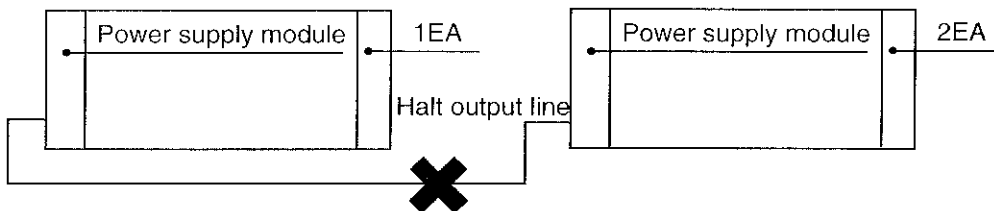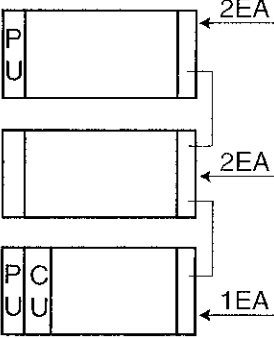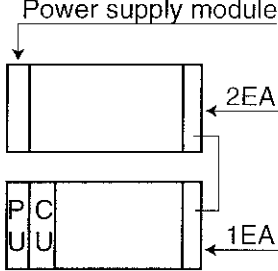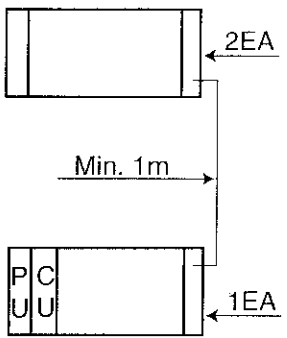


5) One control module can control up to eight rack panels including the one where the control module is installed.



Up to 8 racks
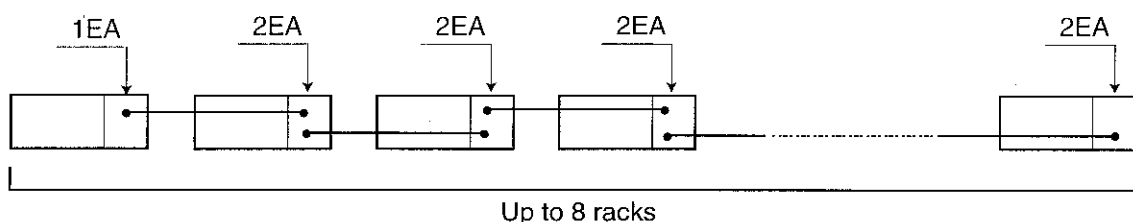
## [When the I/O bus expansion adapter is used]

In the following cases, an I/O bus expansion adapter is necessary.

| ① | ② | ③ |
|---|---|---|
| Three or more rack panels are connected. | Although the quantity of connected rack panels are two,the expansion rack panel another power supply module.(The total current consumption of modules exceeds the capacity of the power supply module, the expansion rack panel needs power supply module.) | The length of I/O expansion cable exceeds 1m. (In this case, the expansion rack panel needs another power supply module.) |



## [Some notes on bus extension cabling]

• The total length of the I/O expansion cables used should not exceed 50m.(50m in one direction, 100m in both direction)

• Do not install I/O expansion cables in ducts or conduits where cabling to I/O devices or power cables are installed.

• Plug each I/O expansion cable plug firmly into its mating receptacle. Loose connections may cause an I/O error, causing the PC to stop running.

• Be sure to install the termination connector the JW-1EA/2EA at both ends of the I/O bus. Also keep the connector cover installed on every unused connector.

• Do not apply a tensile stress of more than 2kg to the I/O expansion cables.

• When using the I/O expansion cable over a distance greater than 1m, be sure to use an expansion power supply module in the expansion rack panel.

• The JW-1EA is supplied with two termination connector. Take care not to lose them while unpacking.

## [2] Name and function of each part



JW-1EA
- ① Module retention screw
- ② RUN indicator
- ③ I/O expansion connector
- ③ I/O expansion connector
- ⑨ Termination connector slot

JW-2EA
- ② RUN indicator
- ③ I/O expansion connector
- ⑤ Support tool interface connector
- ④ Rating plate
- ③ I/O expansion connector
- ⑥ Device number selector switch
- ⑨ Termination connector slot

⑧ Connector cover

⑦ Termination connector
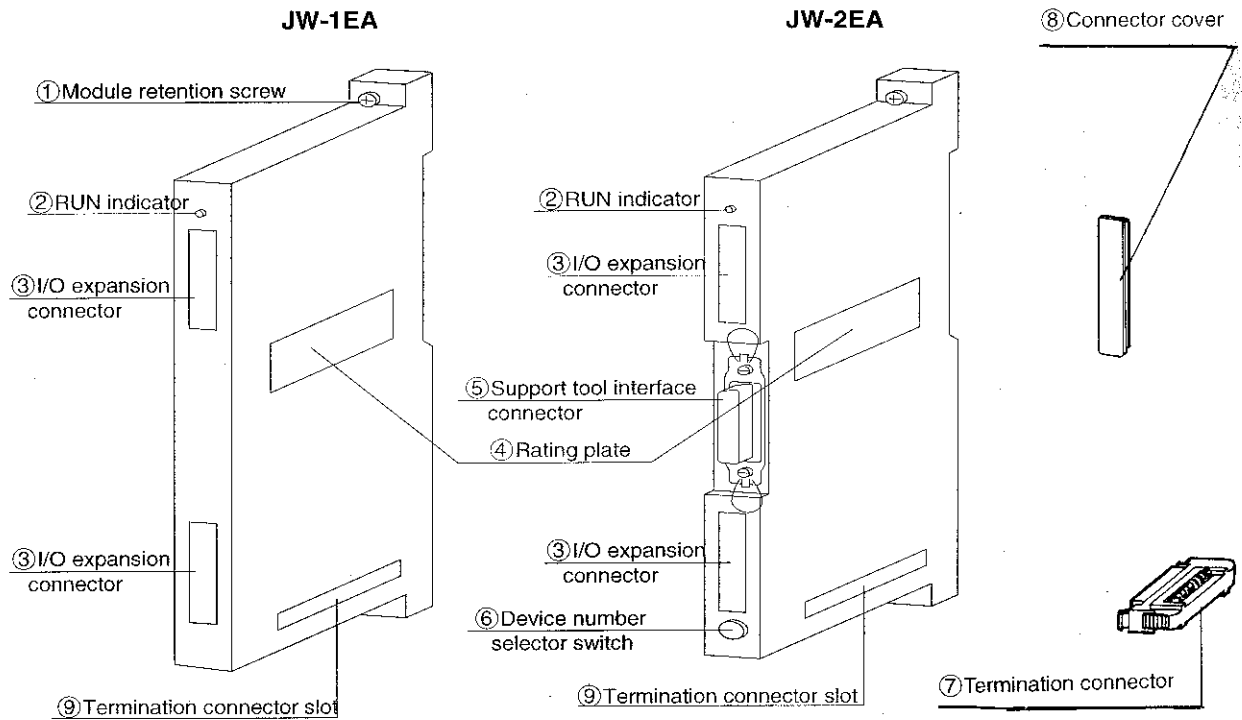
① Module retention screw (two sets)

Use these screw to secure the module to the rack panel frame.

② RUN indicator

O RUN
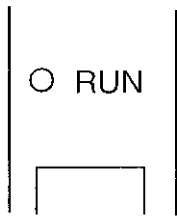
This light remains on while the PC is normally running; it goes off if an error has occurred or the PC has entered the program mode.

③ I/O expansion connectors

Use these connectors to establish I/O bus connections among expansion rack panels.

④ Rating plate

⑤ Support tool interface connector

Connect your support tool (hand-held programmer, etc.) to this connector.

⑥ Rack panel number selector switch
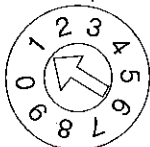


Rack No.

Use this switch to set the rack panel number (1 to 7) which the module is connected. Select rack panel No.0 for the rack panel where the control module is installed (default setting is No.1), and allocate ascending numbers to the rest of the rack panels from near to far. Avoid allocation of the number to more than one rack panel.

⑦ Termination connector

Install this connector on the JW-1EA/2EA at both ends of the I/O bus. The JW-1EA comes with two termination connector (for more details, see page 4-89).

⑧ Connector cover

Keep this cover installed on every unused I/O connector. The JW-1EA is supplied with two connector covers.

⑨ Termination connector slot

## [3] How to use

### (1) Installation

Install the JW-1EA/2EA in the I/O expansion connector located on the right-hand side of the JW-4BU/6BU/8BU/13BU rack panel as shown:



Philips screwdriver

I/O expansion connector

Rack panel (JW-4BU/6BU/8BU/13BU)

Terminal connector | Note 1 |
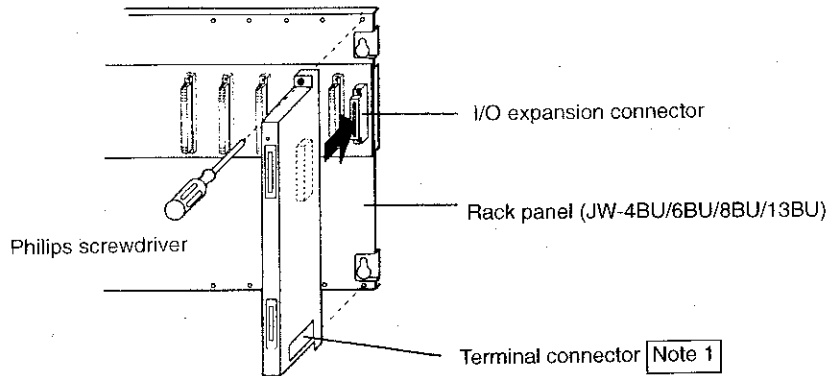
Use the JW-1EA in the rack panel (where the control module is installed); use the JW-2EA in expansion rack panels.

Note: Allow a space of more than 50mm (2 in.) on the right-hand side of the JW-1EA/2EA to enable insertion/removal of the termination connector.

### (2) Bus connections

The are two possible ways of bus connection. Choose according to the operating conditions and purpose.

| Method | Description | Status |
|---|---|---|
| Using one I/O expansion connector on the JW-1EA | Use this format for a single bus with a total bus length of max. 50m. |  |
| Using one I/O expansion connector on the JW-1EA | Use this format for two buses with a total bus length of max. 50m each. |  |

1) Method using either I/O expansion connector on the JW-1EA either of the two I/O expansion Connectors (IO-1 and IO-2) on the JW-1EA may be used for I/O bus extension, as shown below:



I/O-1

JW-1EA     JW-2EA     JW-2EA     JW-2EA

Termination connector     IO-2(Connector cover installation)     Termination connector

Total cable length 50m max. (for up to 8 rack panels)
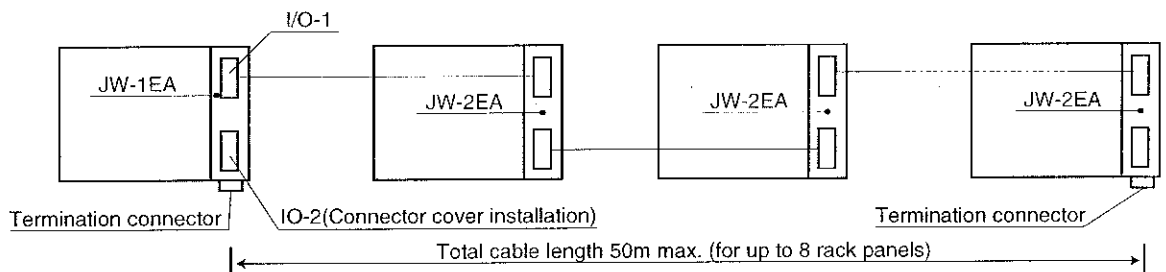
*For the first (JW-1EA) and last (JW-2EA) adapters, install bus termination connector in their termination plug slots and connector covers over the IO-2 connectors.

*Set a range 1 to 7 for a rack panel number. Avoid definition of the same device number for more than one rack panel. Numbers 0, 8, or 9 are usable for device numbers JW-2EA.

Note: No restriction exists regarding whether you use IO-1 or IO-2 connector on each adapter. Use whichever is more convenient.

2) Method using either I/O expansion connectors on the JW-1EA

Both of the I/O expansion connectors (IO-1 and IO-2) on the JW-1EA may be used for I/O bus extension, as shown below:
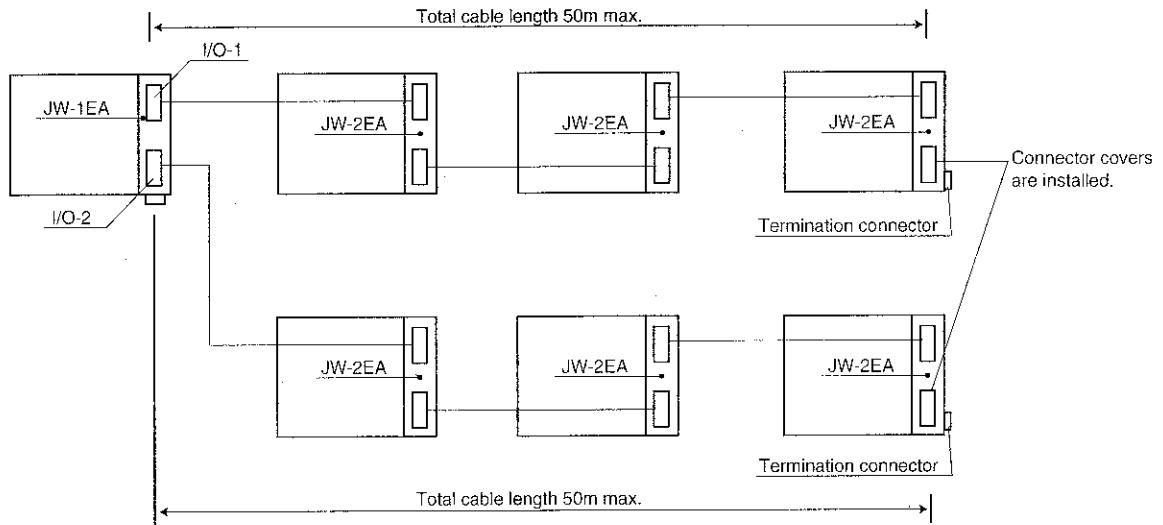


*The maximum total cable length allowable for each I/O expansion bus is 50m.

*Install a bus termination plug and connector cover on the last adaptor on each bus.

*The maximum total number of rack panels are attached to JW-1EA module's IO-1 connector, up to 3 rack panels may be attached to its IO-2 connector.

*Set a range 1 to 7 for a rack panel number. Avoid definition of the same device number for more than one rack panel. Numbers 0, 8, or 9 are usable for device numbers JW-2EA.

3) I/O expansion cables

The following I/O expansion cables are optionally available for the JW-1EA/2EA:

| Model name | Specifications |
|---|---|
| JW-05EC | 50 cm long (50 conductor) |
| JW-1EC | 1 m long (50 conductor) |
| JW-3EC | 3 m long (50 conductor) |
| JW-10EC | 10 m long (50 conductor) |
| JW-30EC | 30 m long (50 conductor) |
| JW-50EC | 50 m long (50 conductor) |



Secure the shield conductor leads to the rack panel frame using the module retention screws.
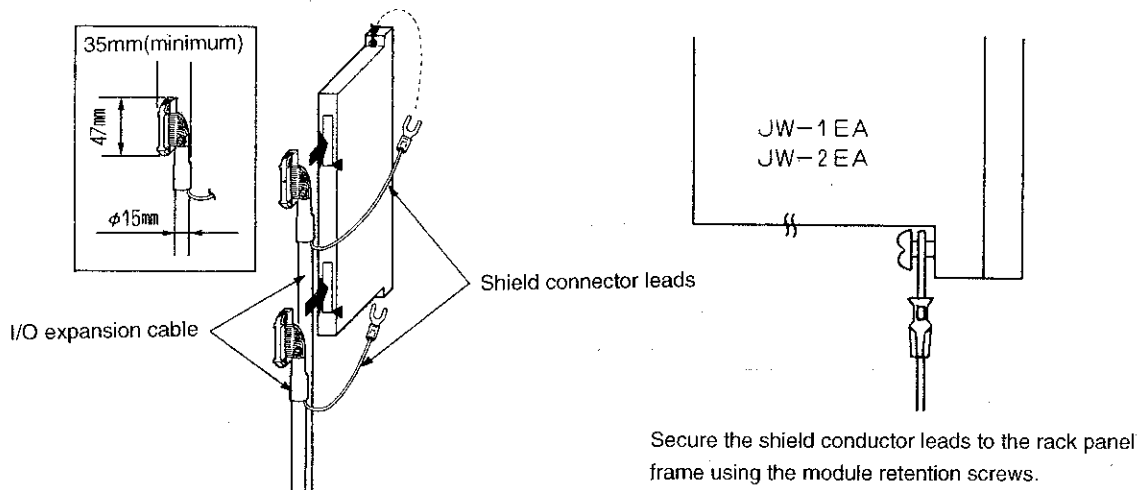
Note: Clamp the I/O expansion cable to relieve tensile stress on their connections.

### (3) Setting the rack panel number selector switch

The JW-2EA has a rotary-type rack panel number selector switch. Set a unique rack panel number for each rack panel using this switch:



| Setting range |
|---|
| 1 to 7 |
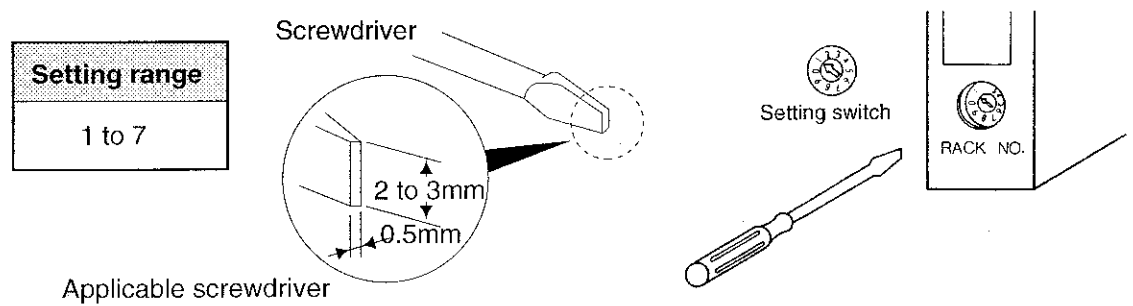
Note : Set a unique rack panel number for each rack panel. Numbers 0, 8, or 9 are not usable for rack panel numbers with the JW-2EA.

### (4) Installing a termination connector

The I/O bus extended with the JW-1EA and JW-2EA must be terminated with a termination connector at each end.

1) For a single I/O expansion connector
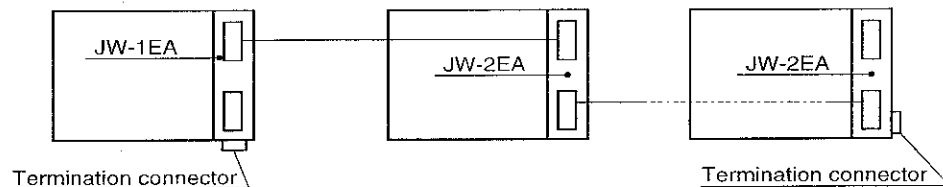


2) For double I/O expansion connector
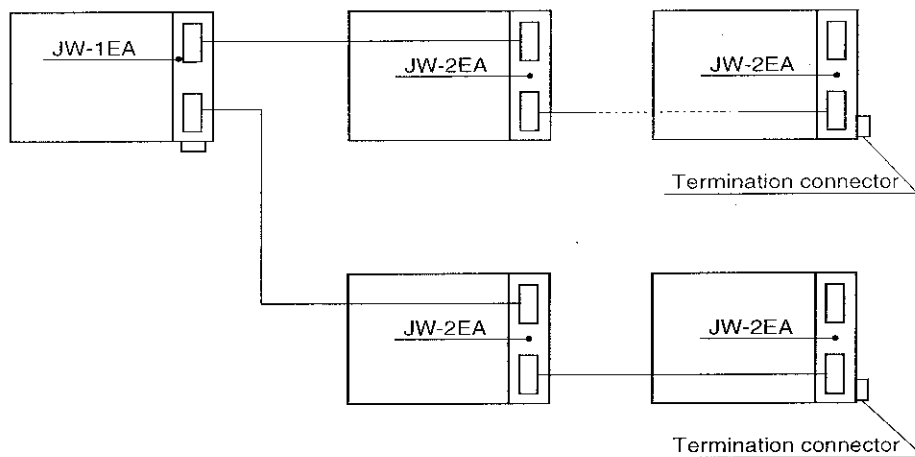


### (Reference) Reason needing for termination connector

1. Termination connector must be used at both ends of the I/O bus to prevent signal reflection pulse from the ends of the bus. Otherwise reflection pulse will interfere with the forward signal and cause data errors. Installing a termination connector terminates the end of the bus though a resistor.

2. If a termination connector is installed on an intermediate rack, the resulting reflection and/or attenuation will cause data errors.

The termination connector is installed in the slot provided in the lower section of the JW-1EA/2EA module, as shown below.
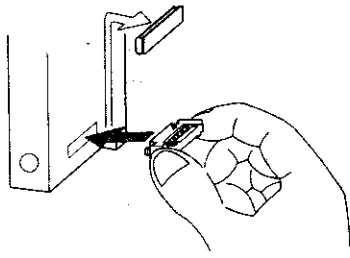
Note: The termination connector will only fit oriented one way. Do not forcibly insert it with the wrong orientation, as this will damage the connector and/or receptacle.

### (5) Connecting a support tool

The JW-2EA has a support tool interface connector. When attached to this connector, a support tool can be used in much the same ways as if it was attached to the control module.

JW-2EA
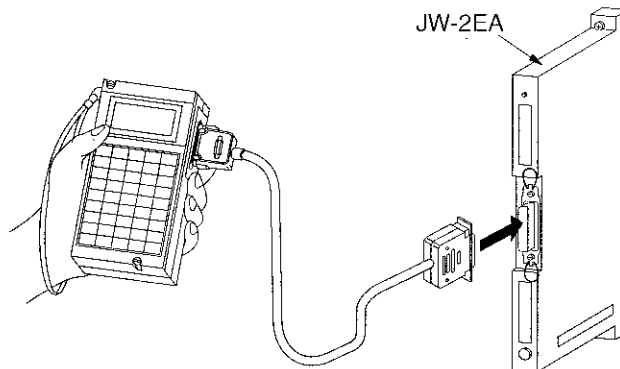
**[Connectable support tools]**

Hand-held programmer (JW-10PG/11PG/12PG/13PG/14PG)
Programmer (ZW-101PG1) Note 1
Multi-purpose progammer (JW-30PG, JW-32PG, JW-40PG, JW-50PG)
Ladder processor II (Z-100LP2, Z-100LP2F) Note 1

Note 1: Each support tool can be used within the range of its capabilities.
Note 2: Only one support tool can be used with a system at one time. If a support tool is already attached to the control module or any other JW-2EA module in a system, do not attach another to the same system. (Refer to page 11-3.)

Unacceptable

Control module

1EA

2EA

2EA

Support tool

Support tool

1EA

2EA

2EA

Support tool

Support tool
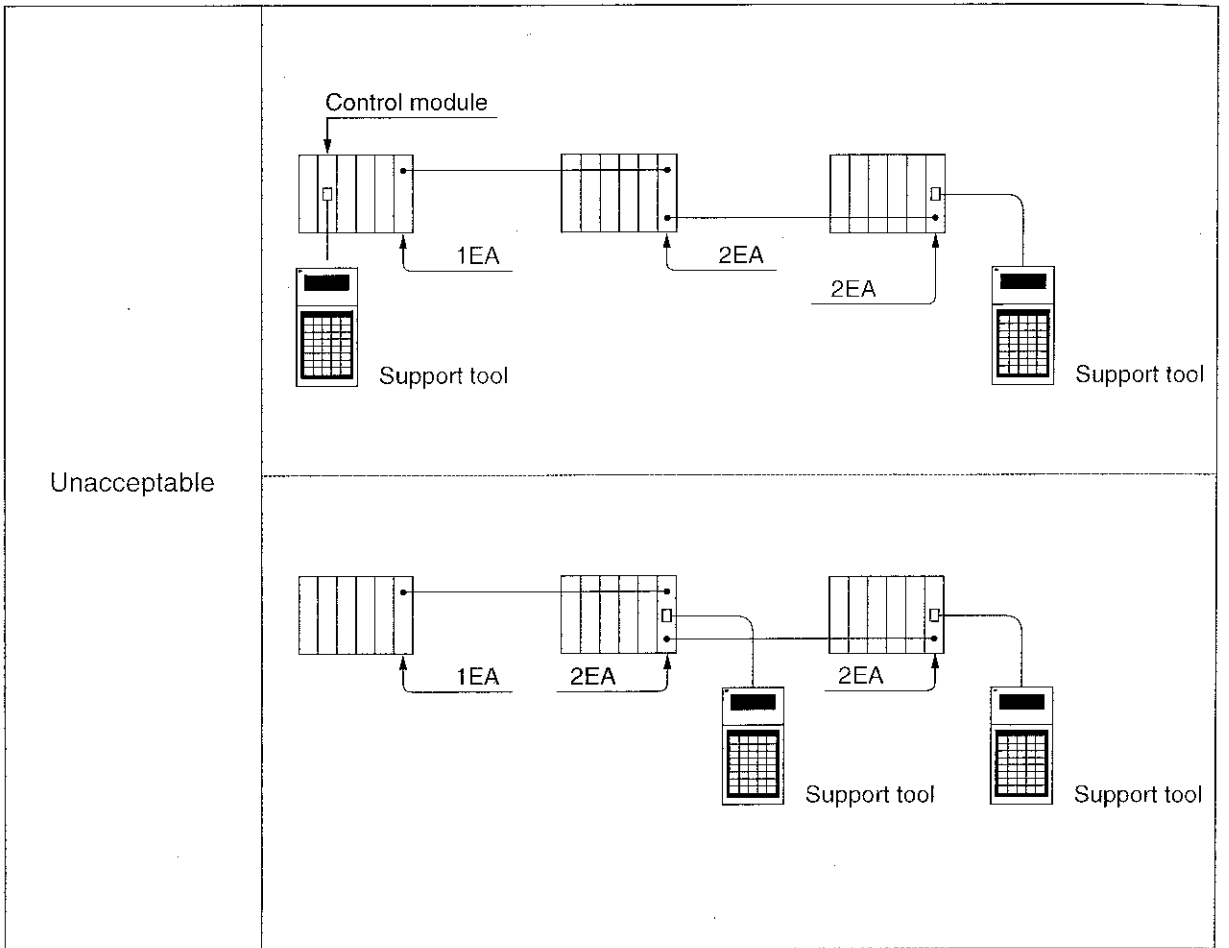
## [4]　Outline dimension drawings
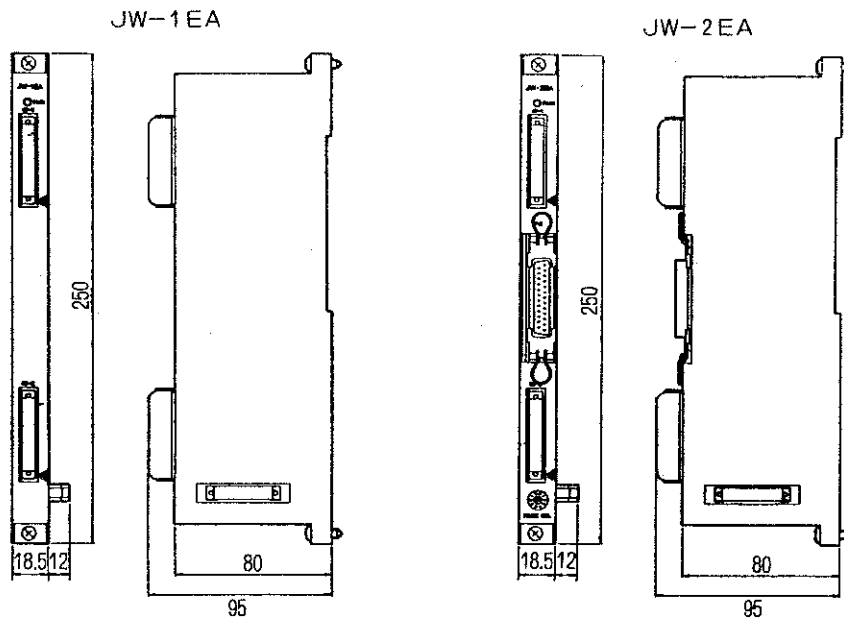
JW–1EA

JW–2EA

## [5]　Specifications

| | JW-1EA | JW-2EA |
|---|---|---|
| Applicable rack panels | JW-4BU/6BU/8BU/13BU | |
| Total cable length | 50 m max. from JW-1EA (per system) | |
| Applicable I/O expansion cables | JW-05EC (50cm long)<br>JW-1EC(1 m long)<br>JW-3EC(3 m long)<br>JW-10EC(10 m long)<br>JW-20EC(20 m long)<br>JW-30EC(30 m long)<br>JW-50EC(50 m long) | |
| Internal current consumption | 550 mA (5 VDC) | |
| Weight | 0.4kg | |
| Accessories | Two termination connector | None |

# 4-10 ZW-10EU I/O expansion module

## [1] Outline and features

### (1) Outline

The ZW-10EU I/O expansion module is used to expand the system by allowing additional ZW-series I/O modules to be included. It allows up to 32 ZW-series I/O modules to be added to the basic system, although the number of available I/O points supported is unaffected by the addition of I/O modules past the specified maximum.

| PC model name | Max. No. of I/O points | No. of basic I/O modules | No. of all I/O modules when using the ZW-10EU |
|---|---|---|---|
| JW-50CU, JW-50CUH | 512 | 32 | 64(Note 1) |
| JW-70CU, JW-70CUH | 1024 | 32 | 64(Note 1) |
| JW-100CU, JW-100CUH | 2048 | 32 | 64(Note 1) |

Note: While the ZW-10EU allows the system to be expanded from a 32-module into a 64-module system, the maximum number of I/O points available is not increased by additional I/O modules.

### (2) Features

1) The ZW-10EU expands the PC system from being able to support 32 modules to being able to support 64 modules. (Note)



Basic system    Expansion system

(Basic)    (Using the I/O expansion module)
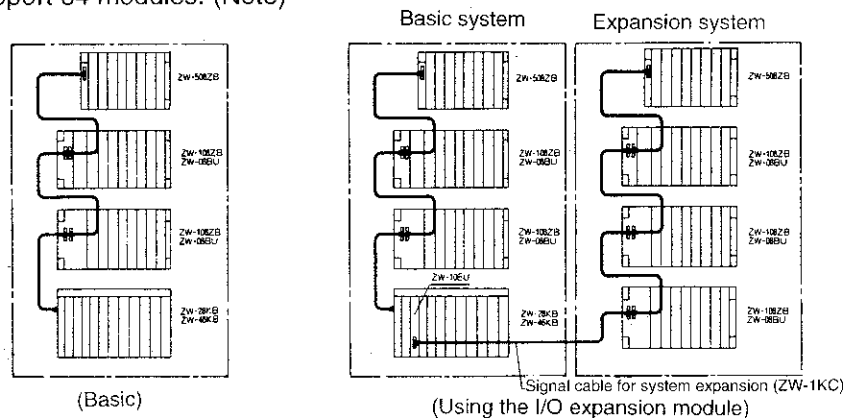
Note: A 64-module system consists of 32 I/O modules in the basic system and 32 I/O modules in the expansion system.

2) One dummy area be defined without the need for a dummy module. The interval between the last address of the basic system and the top address of the expansion system is defined as a dummy area (see the following figure):



I/O address (byte address)

]0000

Last address of basic system
]0123

Dummy area
(]0124 to ]0177)

Top address of expansion system
]0200

I/O area corresponding to the I/O expansion module

]0377
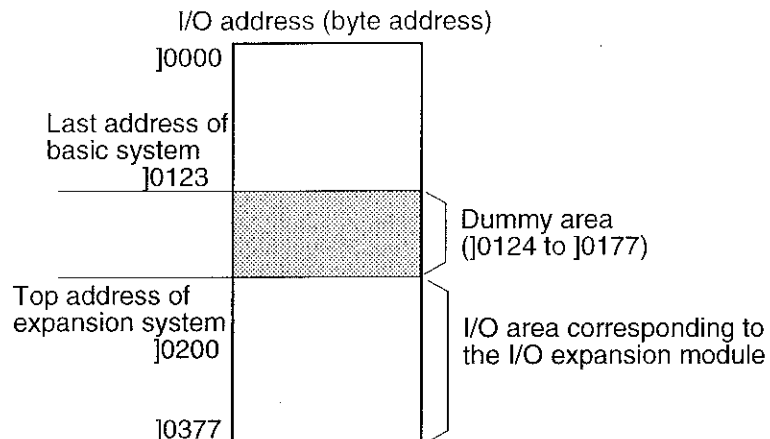
## [2] Name and function of each part

①Module retention screws

②RUN indicator

③Address switches

⑥Address switch cover

④Rating plate

⑤I/O expansion connector (OUT)

①Module retention screws
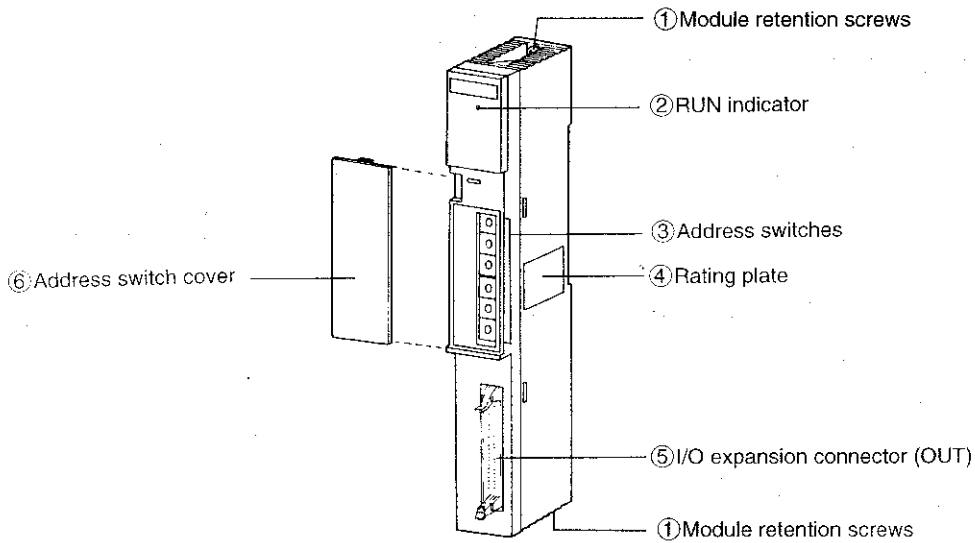
① Module retention screws
Use these screws to secure the I/O expansion module to the rack panel frame.

② RUN indicator
When lit, this indicates that the control module is controlling the I/O modules in the expansion port.

③ Address switches
Use these switches to set the last address of the basic port and top address of the expansion port.
Basic system's last address switches:①
Use these switches to set the last address of the I/O module included in the basic port, using byte address representation.
(Default setting at delivery : ]000).
Expansion system's top address switches:②
Use these switches to set the top address of the I/O module included in the expansion port, using byte address representation
(Default setting at delivery : ]200)

④ Ratings plate

⑤ I/O expansion connector (OUT)
Use this connector to connect an expansion signal cable for the expansion port.

⑥ Address switch cover
Remove this cover to gain access to the address switches.

LAST ADRS. MAIN
A
B
� ABC
D
E
DEF
FIRST ADRS. EXP.

①

②
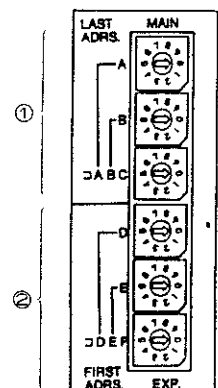
**[3]  Using the ZW-10EU I/O expansion module**

The ZW-10EU is installed in a basic rack panel (ZW-28KB/ZW-46KB) or a rack panel (ZW-08BU used as an expansion I/O rack panel).

**(1) Installation configurations**

**1) Standard installation**

When the ZW-10EU is installed in a basic rack panel ZW-28KB/ZW-46KB.

1. Install the ZW-10EU in any one of the option slots in the basic rack panel.

(Example: Installing the ZW-10EU in the ZW-28KB basic rack panel)
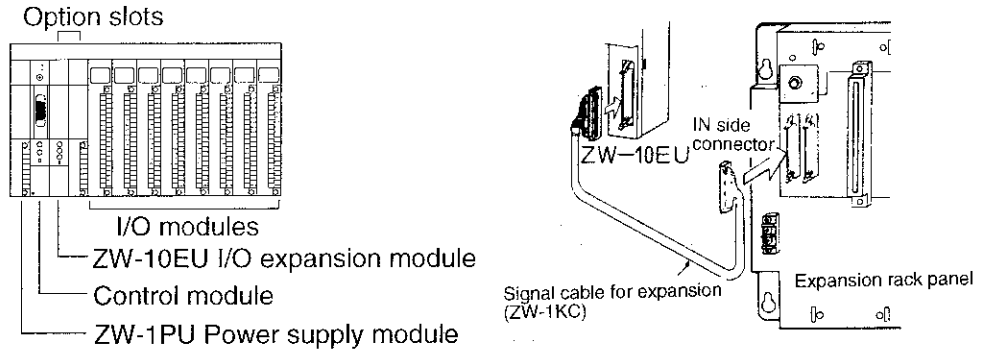


2. Use the optional ZW-1KC signal cable for system expansion for connection to and within the expansion system.

3. The total length of the signal cable for system expansion connected to the ZW-10EU should not exceed 4m (dotted line in the figure below).

4. Use a separate power supply module (+5V) to supply the expansion system. Do not supply the expansion port from the basic system's power supply module.
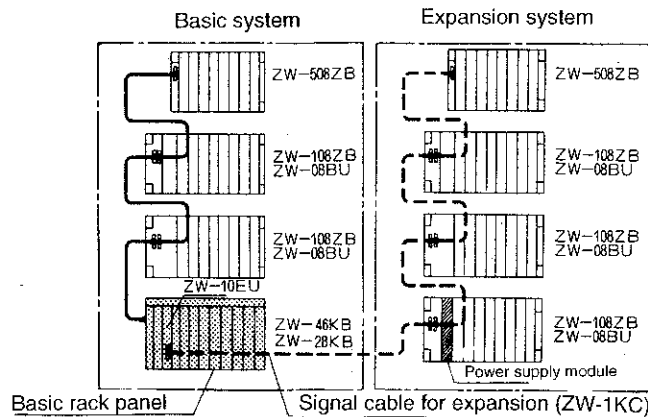


Note : If no module other than the ZW-10EU is to be installed in the option slots, the ZW-2CC position cable is not needed.

## 2) Special installation

For special installation, the ZW-10EU is installed in a rack panel in the basic system when all of the option slots in the basic rack panel are occupied.

1. The ZW-10EU is installed in a ZW-08BU rack panel.



I/O module
I/O expansion module (ZW-10EU)
Vacant or power supply module (ZW-1PU)
IN side connector
ZW-10EU
Expansion rack panel
Signal cable for expansion (ZW-1KC)
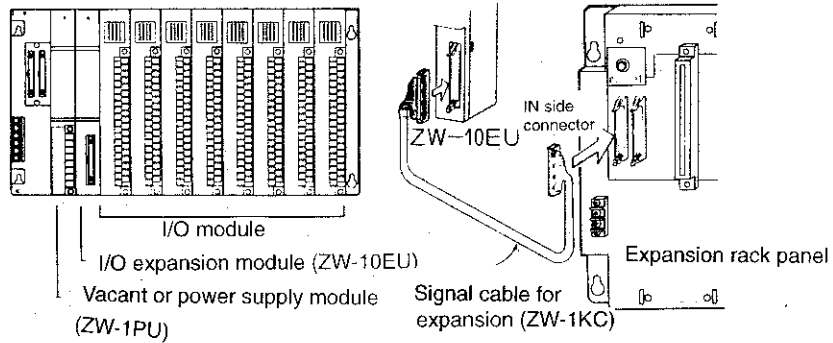
2. Install the ZW-10EU into the slot next to the second slot from left slot (which normally holds the control module).

3. The ZW-10EU may be installed in any ZW-08BU rack panel within the basic port.

4. Use the optional ZW-1KC signal cable for system expansion for connection to and within the expansion port.

5. The total length of the signal cable for system expansion connected to the ZW-10EU should not exceed 4m (dotted line in the figure below).

6. Use a separate power supply module (+5V) to supply the expansion port. Do not supply the expansion port from the basic port's power supply module.



Basic system          Expansion system

3 段目      ZW—508ZB          ZW—508ZB

2 段目      ZW—108ZB          ZW—108ZB
            ZW—08BU           ZW—08BU

1 段目      ZW—08BU           ZW—108ZB
            ZW—10EU           ZW—08BU

            ZW—46KB           ZW—108ZB
            ZW—28KB           ZW—08BU

                              Power supply module
            Signal cable for expansion (ZW-1KC)
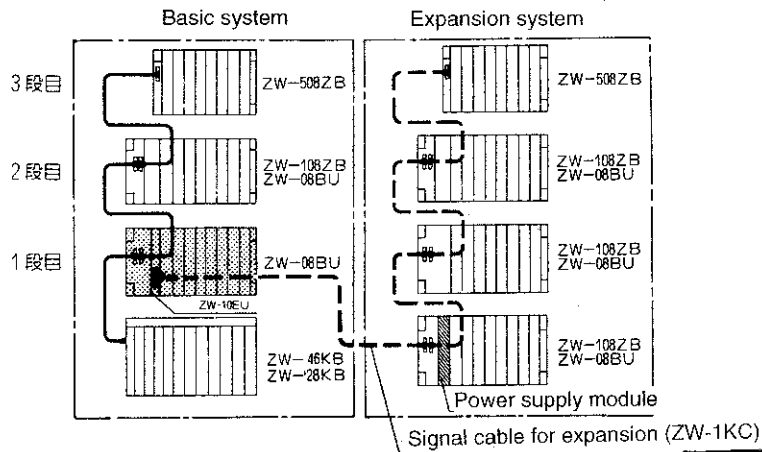
## (2) Installing the ZW-10EU and setting the address switches

The following describes how to install the ZW-10EU into the basic rack panel and how to set address switches.

| | |
|---|---|
| Switch the system power OFF. | Mounting screw hole for power supply module<br>Mounting screw hole for control module<br><br>Phillips screwdriver |
| Install the ZW-10EU into one of the option slots in the basic rack panel. | Note: The ZW-10EU requires no option cable. |
| Remove the address power OFF. | Remove the cover by pulling its top edge forward. |
| Set the last address (byte address) of the basic system. | Set the last address of the basic system using the upper three address switched A, B and C (address range: 000 to 376) Note 2.<br><br>Example) If the last address of the basic system is 01237, it becomes ]0123 in byte address representation. Set the lower three digits, 123, of the address using the switches (see the figure at right).<br><br>Note 1: Use a slot screwdriver to set the switches.<br>Note 2: The address range is 000 to 176 if the JW-70CU, JW-70CUH control module is used. |
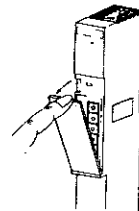
Last address of the basic system

A  "1"
B  "2"
C  "3"

Screwdriver

2 to 3mm
0.5mm
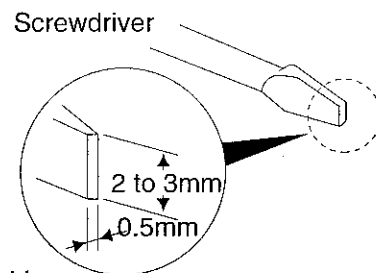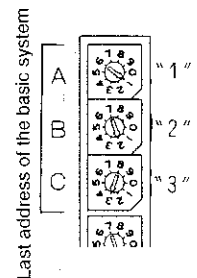
To next page.  Applicable screwdriver

```
Define   dummy
address area.
```

Predefining a dummy area is convenient for future system expansion. The difference between the basic port's last address and expansion port's top address is defined as a dummy area.

I/O address (byte address)

]0000

Last address of basic system
]0123

Dummy area (]0124 to ]0177)

Top address of expansion system
]0200

I/O area corresponding to the I/O expansion module

]0377
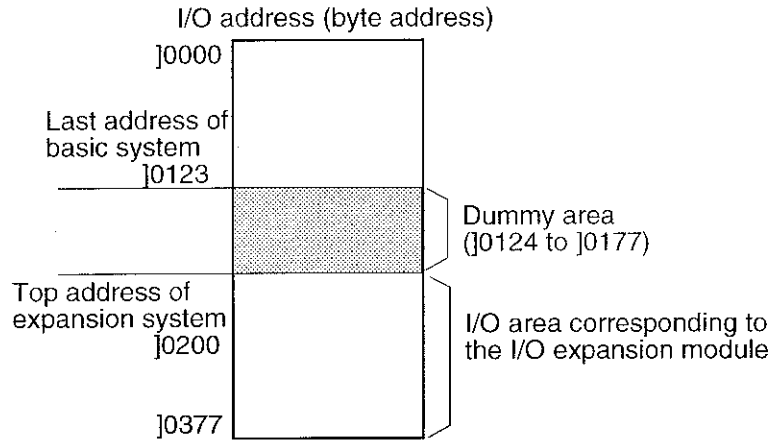
```
Set the top addres
(byte address) of the
expansion port.
```

Set the top address of the expansion port using the lower three rotary switches:

| Setting area | Basic port's last address | < | Expansion port's top address | ≦ | 377 (Note 2) |
|---|---|---|---|---|---|

Example) To set the top I/O address of the expansion port to 02000 (]0200 byte address), set the lower 3 digits "200" of ]0200 as shown at right:

First address of expansion system

D    "2"

E    "0"

F    "0"
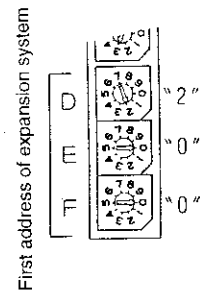
Note 1: Whenever possible, use an even number for the top address of the expansion port. This will make the PC's word instructions easier to use.

Note 2: The allowable address range is 001 to 177 (octal) for the W70H, and 001 to 377 (octal) for the W70H.

To next page.

From previous page

```
Connect the signal
cable for system
expansion.
```

Basic system                    Expansion system

ZW-508ZB                         ZW-508ZB

ZW-108ZB                         ZW-108ZB
ZW-08BU                          ZW-08BU

ZW-108ZB                         ZW-108ZB
ZW-08BU                          ZW-08BU

ZW-10EU

ZW-28KB                          ZW-108ZB
ZW-46KB                          ZW-08BU

Signal cable for expansion (ZW-1KC)

```
Turn the system
power ON.
```

ZW-10EU

IN side
connecotor

IN OUT

Signal cable for expansion (ZW-1KC)

Expansion rack panel
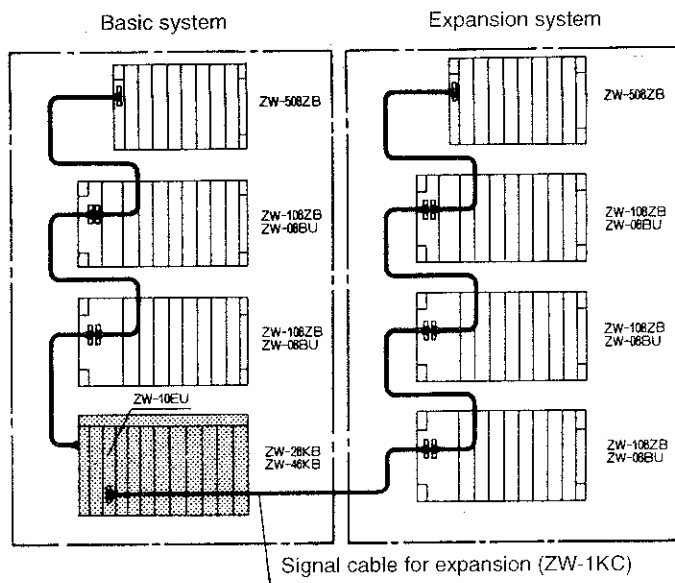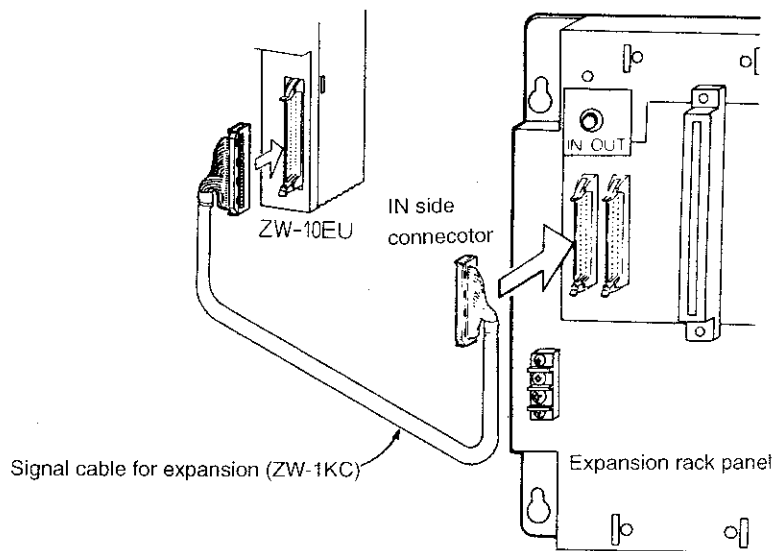
To next page.

From previous page

Set the I/O address self-diagnosis function

```
┌─────────────────┐
│ Set system memory │
│ address #0252   │
└─────────────────┘
```

Specify whether the I/O address self diagnosis feature is to be used or not:

$000_{(8)}$: Self diagnosis is not used.

$105_{(8)}$: Self diagnosis is used.

```
┌─────────────────┐
│ Set system memory │
│ address #0252   │
└─────────────────┘
```

Write the total number of I/O points (through the last I/O address of the expansion system) into system memory address #0250.

The I/O address self diagnosis feature checks the number of bytes used for I/O in the basic system, dummy area, and expansion system. It is implemented if the value $105_{(8)}$ is written into system memory address #0252 (Note 1).

(Example) When using 1056 points of I/O relays up to address ]0203, write 204 into system memory address #0250.

]0203(1056 points): 132 bytes : $204_{(8)}$

Note 1: For more details, see the programming manual, section 2-4, system memory.

Note 2: If you write $000_{(8)}$ into system memory location #0252, location #0250 does not need to be set.

```
┌─────────────────┐
│      End        │
└─────────────────┘
```

## (3) Checking system run (RUN indicator)

When the ZW-10EU I/O expansion module is functioning normally, the green RUN indicator on the module comes on. The RUN indicator goes OFF in any of the following cases :

•The power to the ZW-10EU I/O expansion module is turned OFF. The indicator also goes OFF if the power to the top rack panel attached to the module is turned OFF.

•The last address of the basic port is improperly set.

•The ZW-10EU is not connected to the expansion port with a signal cable for system expansion, or no I/O module is installed on the first rack panel in the expansion port attached to the module.

```
┌─────────────┐
│ │ ZW-10EU │ │
│             │
│  RUN O      │
│        ↑    │
│       /     │
└──────/──────┘
RUN indicator (green) /
```
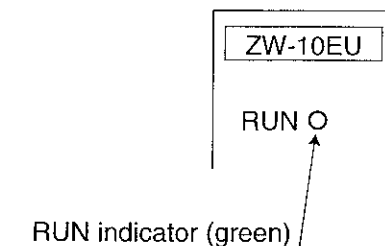
### (4) Self diagnosis

The following lists the I/O module self diagnostic features available when the ZW-10EU I/O expansion module is installed :

| Self diagnosis | Contents | Basic system I/O signals | Expansion system I/O signals |
|---|---|---|---|
| I/O data bus (error code 44) | I/O bus floating check | Yes | Yes |
| I/O signal (error code 45) | Input or output module discrimination signal's simultaneous ON check | Yes | Yes |
| | Input or output module discrimination signal response check | Yes | Yes *Note 2 |
| | Output-data-bus check | Yes | No *Note 2 |

Note 1: The self diagnostic features above must be specified in system memory addresses #0250 and #0252. For more details, see the programming manual, section 2-4, system memory.

Note 2: The self diagnostic feature does not check the expansion port's I/O signal output onto the data bus.

Note 3: If an error is detected during the self diagnosis, error code 44 or 45 is written into system memory address #0160 and special relay 07373 is activated. For more details, see the programming manual, section 2-8, "Self-diagnosis".

## [4] Outline dimension drawings
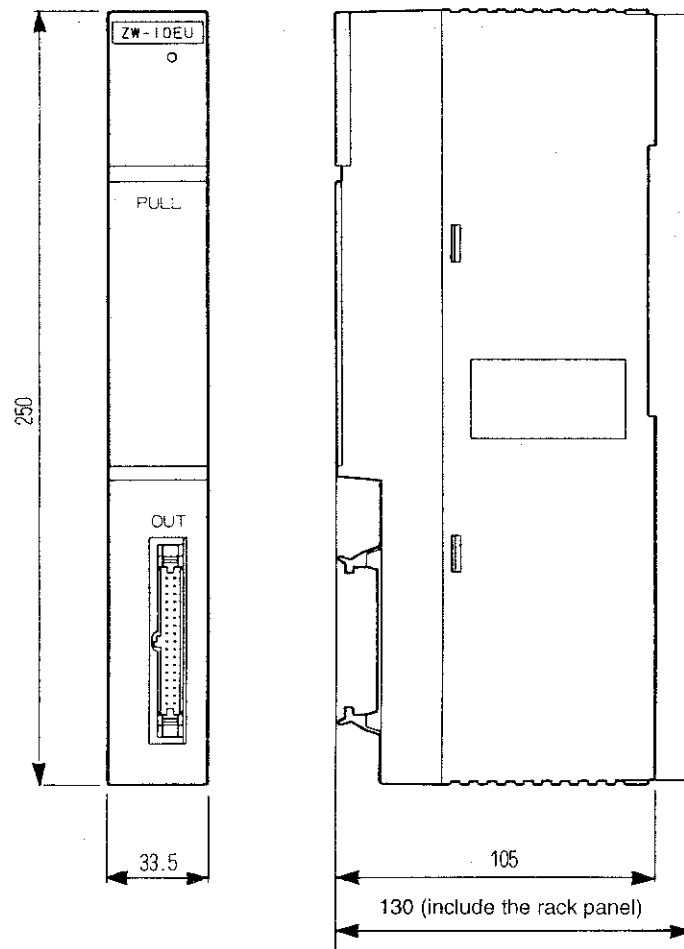


## [5] Specifications

| Item | Specifications |
|------|----------------|
| Expansion I/O modules supported | Max. 32 modules (64 modules in total) |
| Length of expansion signal cable | Total 4m |
| Current drawn | 70 mA |
| Weight | 0.3 kg |
| Accessory | Instruction manual |

The general specifications for storage temperature, operating temperature, relative humidity, vibration, impact, and so forth are identical to those given in section 3-5 (page 3-15), "General Specifications".

# 4-11 Communication port

## [1] Outline

The special communication port provided on the JW-70CU/
100CU, JW-70CUH/100CUH control module allows the PC to
communicate with a personal computer or any other host device
with an internal RS-232C/422/485 serial port.

Communication port
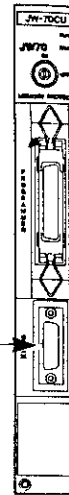
## [2] Usable commands

The ZW-10CM, JW-10CM link module's computer link commands
listed below are available for communication with a host device:

### ■ Read/Write commands (Note 1)

|  | Read commands | Write commands |
|---|---|---|
| Relay | MRL | SRR (Set/Reset) |
| Timer/counter/MD | MTC | SRT (Set/Reset) |
| Register | MRG | WRG<br>FRG (Writ the same data) |
| File register | RFL<br>RFLF | WFL<br>WFLF (for files 1 to 7) |
| System memory | RSM | WSM |
| Program | RPM | WPM<br>CTC (change setting value of<br>timer/counter) |

### ■ Control commands

| HLT | Halt PC run |
|---|---|
| RUN | Restart PC run |
| MPC | Monitor PC run |
| VLM | Read memory capacity |
| SVL | Set memory capacity |
| EWR | Set write mode |
| SWE | Read status in write mode |

Note 1: When executing a write command to system or program memory, set the control module's
memory protection switch to OFF(write enable). Write access to the file registers can be disabled
by setting the contents of system memory address #0244.

Note 2: The global address feature (command to write station address 00 into all PCs) is not available.

Note 3: For the JW-70CUH/100CUH, the current value monitor command (MTC) for the timer and
counter cannot read 777 or below and 1000 or above simultaneously.
The responses of 1000 and above apply to the ZW mode (without additional information) and
not to the JW mode (with additional information).

## [3] Setting the communication format

Specify the communication format needed for communication with the host device in the PC's system memory.

| System memory | Contents |
|---|---|
| #0236 | Transmission rate, parity bit, stop bit length |
| #0237 | Station No. ($001_{(8)}$ to $037_{(8)}$) |

•Contents of system memory location #0236.

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | |

• For more details, refer to programming manual.

Transmission rate (600 to 19200 bits/s)

Parity (none, odd, even)

Stop bit length (1 or 2 bits)
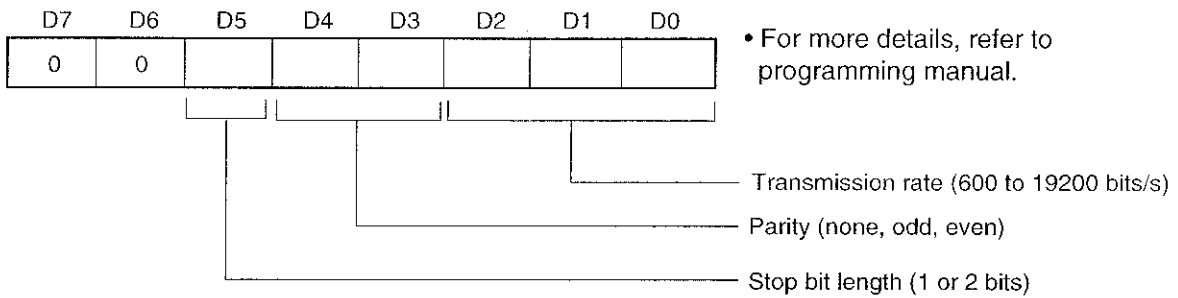
The communication port doesn't operation in the case of writing the other data in the system memory #0236 by WSM command.

## [4] Precautions for use of the communication port

(1) The writing mode (modes 0,1, and 2) can be selected and the operation of the JW70/100 or JW70H/100H PC can be restarted or stopped using external signals input thorough the communication port or through the support tool connector.

There is no priority for triggers whether they received through the communication port or through the support tool connector. However, the most recent trigger received will take priority over all precious triggers. Therefore, pay attention to the PC operation status (start/stop operation) when operating a support tool or sending a command, as shown in the example below.

Ex.: When you send a RUN command through the communication port after stopping the PC operation using the hand-held programmer, the PC will restart operation with this RUN command. In this case, even if the PC is running, the hand-held programmer can write a program into the PC and this will cause a malfunction.

(2) With the JW70/100, if you cannot write data through the communication port, the PC mode may have been changed (from the write mode to the RUN mode) through the support tool connector or the expansion module connector. If this is the case, reset the PC mode.

(3) Command resend wait time

If you want to send another command immediately after receiving a response through the communication port, make sure to wait at least 30 ms.
The communication port needs 30ms to change from its send operation to a receive operation.

(4) We recommend that you reissue the command (retry) when any communication error occurs, including a simple failure to respond. This will not have a negative influence on the system.
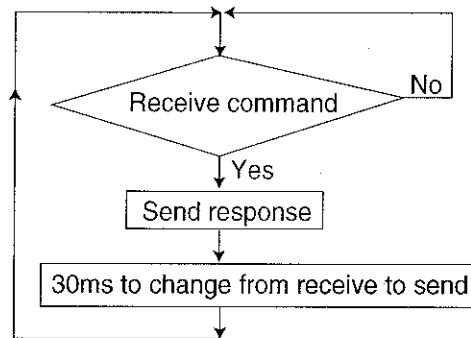
## [5] Wiring

### (1) Port connector pin description

RS-232C

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | FG | Protective ground |
| 2 | TXD | Transmit data (PC to host) |
| 3 | RXD | Receive data (host to PC) |
| 4 | RTS | Active whenever the PC power is turned ON. |
| 5 | CTS | Clear to send. Transmission is enabled when active ;disables when inactive. |
| 7 | SG | Signal ground |
| 12,14 | Shorting pins | Short these pins when the port is to be used in RS-232C mode. |

RS-422/485

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | FG | Protective ground |
| 10 | TXD | Transmit data (PC to host) |
| 11 | $\overline{TXD}$ | |
| 12 | RXD | Receive data (host to PC) |
| 13 | $\overline{RXD}$ | |
| 6 | Termination resistance | Only the termination station connects to 3 (RXD) |

Note : Pin No. 6 (termination resistance) is available on the JW-70CUH/100CUH but not on the JW-70CU/100CU.

### (2) In case that target station is RS-232C

•When the total cable length is less than 15m:



Short for RS-232C mode

15 m or less
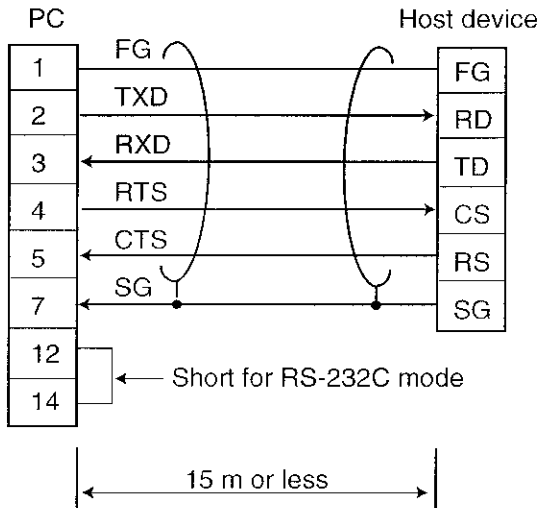
Recommended cable :

Fujikura cable 7P×7/0.18
57VV-SB vinyl-insulated, multicore cable

•When the total cable length exceeds 15m:

Signal converter (Z-101HE)



Class-3 grounding

1 km or less
RS-485

15 m or less
RS-232C

4-105

## (3) In case that target station is RS-485



PC

PC
(Up to 31 sets)

Host device

| 10 | TXD |
| 11 | $\overline{\text{TXD}}$ |
| 12 | RXD |
| 13 | $\overline{\text{RXD}}$ |
| 1 | FG |

| 10 | TXD |
| 11 | $\overline{\text{TXD}}$ |
| 12 | RXD |
| 13 | $\overline{\text{RXD}}$ |
| 1 | FG |

| RXD |
| $\overline{\text{RXD}}$ |
| TXD |
| $\overline{\text{TXD}}$ |
| FG |
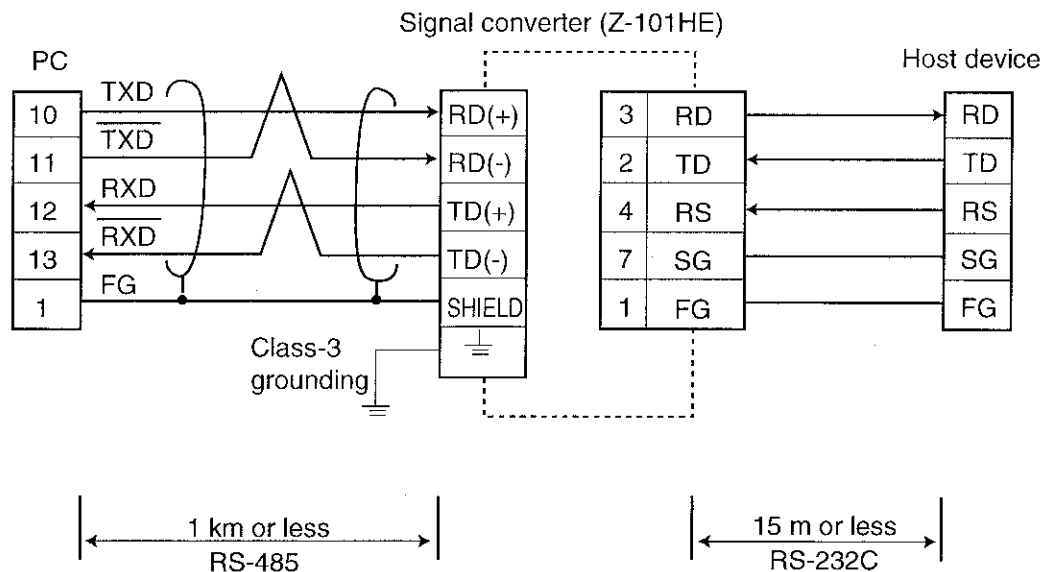
1 km or less
RS-485
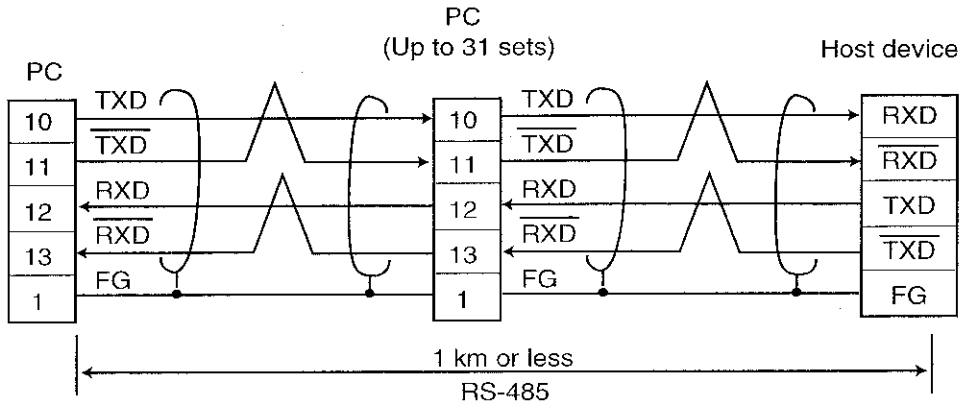
Recommended cable :
Hitachi cable CO-SPEV-SB0.5

Note 1: The Z-101HE signal converts RS-232C/RS-422 compatible signals transferred from the host device into RS-485 compatible signals with high noise immunity.

Note 2: The RS-485 standard was set forth by EIA in April 1983 as an enhancement of the RS-422 standard. The conventional computer link, data link, and remote I/O modules also conform to the RS-485 standard.

## [6] Preparing the cable

Before soldering the serial communication cable to the plug pins, prepare it as described below:



Strip the outer sheath to about 30mm from the cable end.

30mm

Cable

Cut the braided outer shield conductor to about 10 mm length.

10mm

Sleeve

Pass a sleeve over the cable.

Fold back the shield conductor onto the sleeve.

(10mm)

Alminium foil tape

Wrap the folded shield conductor with aluminium fiol tape.

(12mm)

Strip the core insulators to about 4mm from the wire ends.

4 mm

Soldering

Solder

Soldering iron

Wet core conductors with solder.

Cable

Recommended cable:
Fujikura Cable 7P x 7/0.18
57VV-SB vinyl-insulated,
multicore cable

## [7]  15-pin Dsub connector

The serial communication port uses a 15-pin Dsub connector. The mating cable plug is supplied with the JW-70CU/100CU, JW-70CUH/100CUH control module.



Connector

M3X12 screws

Shell

Aluminium foil tape

M3X6 screws

Sleeve

Fitting screws

Cable clamp

Shell

D-sub connector (15P male)
Daiichi Electronics Industries
17JE-23150-02(D8A)

M3 hex nuts
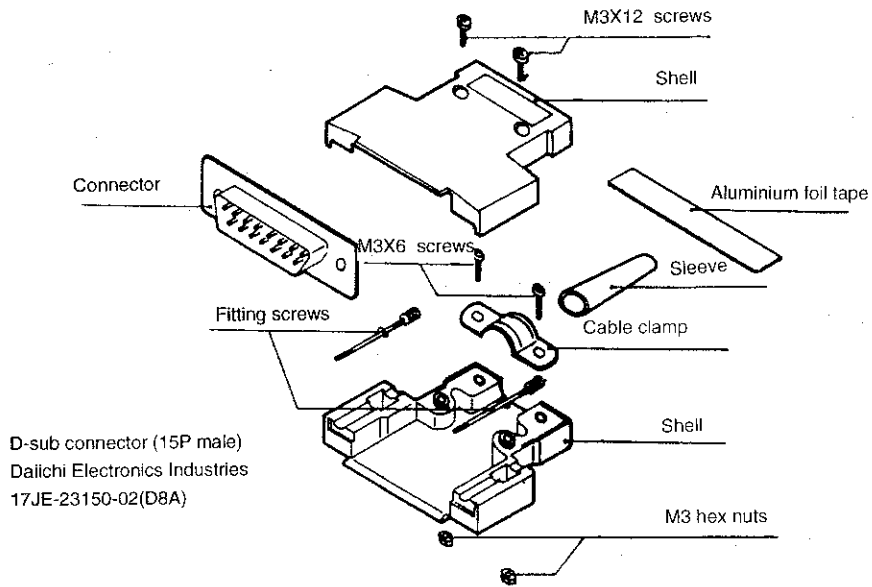
## [8]  Soldering and assembly



Solder

Soldering iron

Phillips head machine screw

(M3－12)

Shell

Fitting screw

Heat shrink tube

Philips head machine screw

(M3×6)

Cable clamp

M3 hex nut

Connector pin number diagram
(outer view)
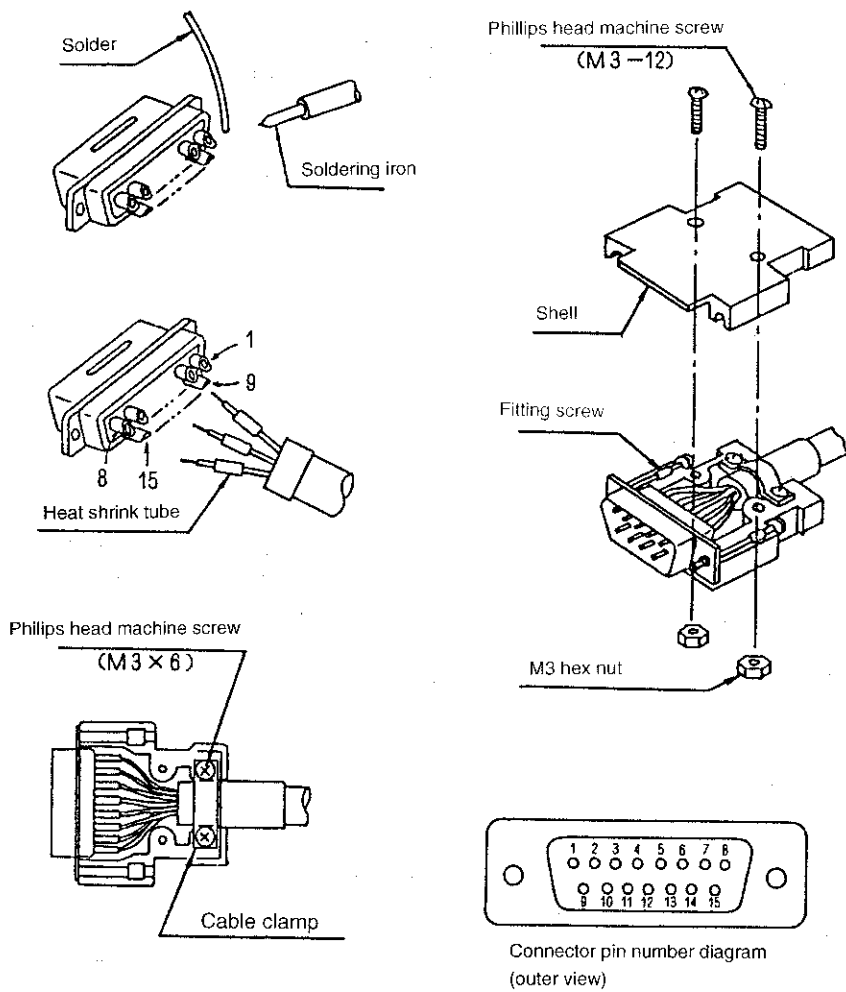
## Chapter 5. Installation

## 5-1 Precautions in installation

The JW50H/70H/100H is not designed for dust and water proof construction.
Therefore, install JW50H/70H/100H in an enclosed panel.
Avoid keeping the JW50H/70H/100H in the following conditions:

1. Ambient temperature extremes outside the range of 0 to 55 °C
2. The relative humidity exceeding the range of 35 to 90%
3. Sudden temperature changes which may cause condensation.
4. Corrosive and flammable gases.
5. Water, oil and organic solvents dripping positions.
6. Dusts, iron and salty conditions.
7. A box in which high voltage device is installed.
8. Strong vibration and shock may usually occur.

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 M5 for installing JW30H.

**Calculation the average consumption electric power (heating value) of JW30H.**
Determine the average power consumption of the entire machine in the following formula, and calculate the temperature rise in the panel.

1) Power supply module

$$Wpw = \frac{3}{7} \times (I_{5v} \times 5)(W)$$

$I_{5v}$: Current consumption of 5 VDC circuit of respective module

2) Total consumption electric power of respective module (5 VDC)

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

3) Average consumption electric power of total 24 VDC power supply of output module (power consumption for simultaneous ON points)

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

4) Average power consumption by output port drop voltage of output module (power consumption for simultaneous ON points)

$$Wour = Iour \times Vdrop \times \text{No. of output points} \times \text{Simultaneous ON rate}(W)$$

Iour: Output current (current of use)(A)

Vdrop: Drop voltage of respective output module(V)

5) Input port average power consumption of input module (power consumption for simultaneous ON points)

* In case of DC input

$$W_{IN} = I_{IN} \times E \times \text{No. of input points} \times \text{Simultaneous ON rate}(W)$$

* In case of AC input

$$W_{IN} = 0.1 \times I_{IN} \times E \times \text{No. of input points} \times \text{Simultaneous ON rate}(W)$$

$I_{IN}$ = Input current (Rms value in the case of AC)(A)

E = Input voltage (voltage of use)(V)

6) Consumption electric power of special function module

$$Ws = I_{5v} \times 5 + I_{24v} \times 24 \ (W)$$

The total of the power consumptions calculated in each module is the power consumption of the entire machine. From this entire power consumption (W), calculate the heat generation and temperature rise in the panel.

# 5-2 Installation procedures

The JW50/70/100, JW50H/70H/100H programmable controller usually comprises many modules. This section describes the installation procedures, from module unpacking through rack panel mounting in a cabinet.

[ Example of basic system configuration ]

| | Module name | Model |
|---|---|---|
| 1 | Rack panel | JW-4BU/6BU/8BU/13BU |
| 2 | Power supply module | ZW-1PU/2PU |
| 3 | Contol module | JW-50CU/70CU/100CU  JW-50CUH/70CUH/100CUH |
| 4 | Memory module | ZW-1MA/2MA/3MA/4MA  JW-1MAH/2MAH/3MAH/4MAH |
| 5 | Option cable | ZW-2CC/ZW-4CC/ZW-6CC |
| 6 | Option module | ZW-10CM/20CM/30CM  JW-10CM/20CM, etc. |
| 7 | I/O module | JW-32N, etc. |

```
Start
  ↓
Check quantities of
packed items
  ↓
Unpack modules
  ↓
Install memory module
in control module.
  ↓        (Note 1)
      Memory
      module
  ↓
Install rack panels in a
cabinet.
  ↓
Install power supply
module.
  ↓         Power supply module
Install option cable.
  ↓         (Note 2)
            Cable for option
```

```
Install control module on
rack panel.
  ↓          Control module
Install option module.
  ↓          Option module
Install I/O module.
  ↓          I/O module
END
```
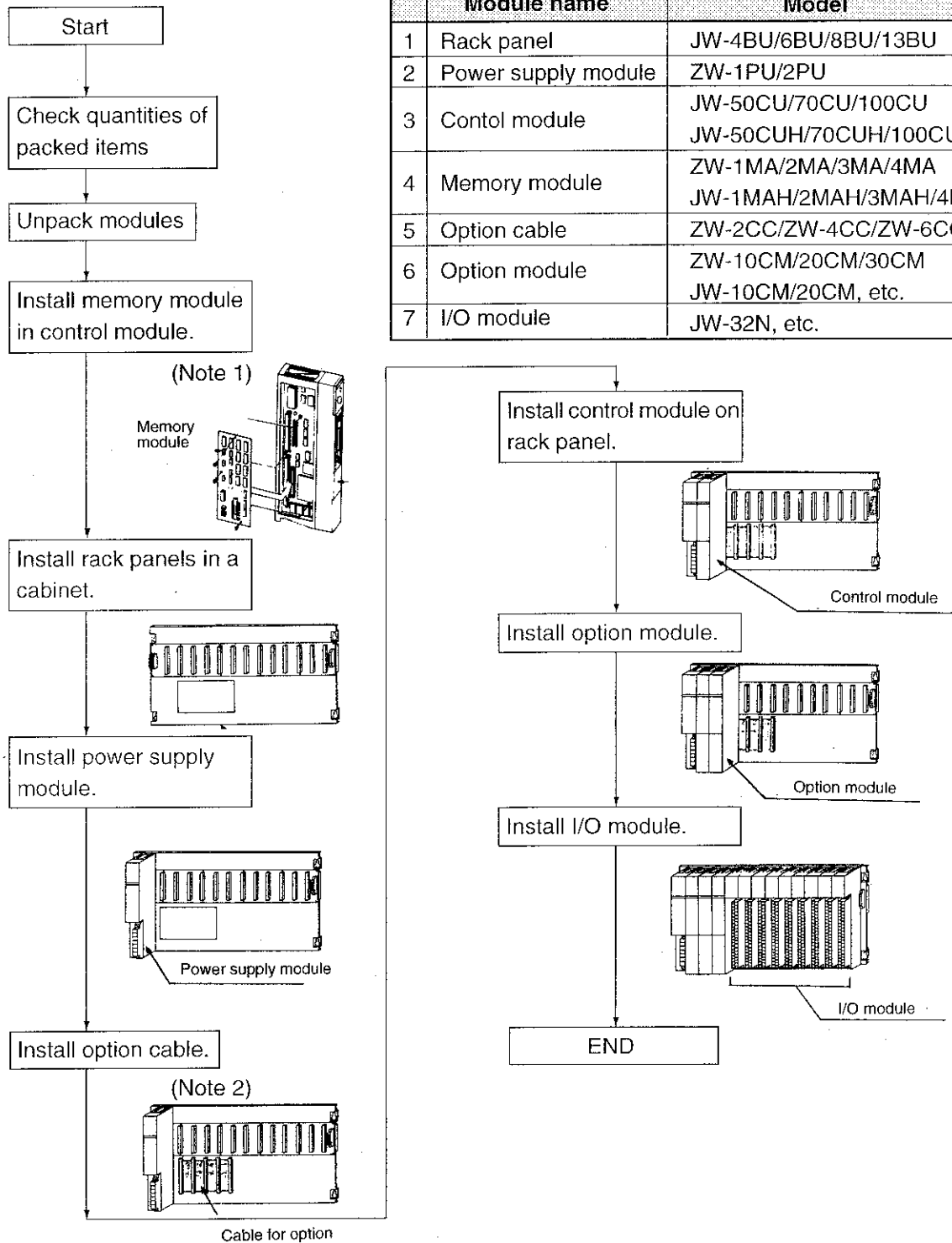
Note 1: The JW-50CU, JW-50CUH doesn't require memory module installation as it already contains one as a standard feature.

Note 2: Not needed for a stand-alone system.

Note 3: For the details on how to install each module, see the descriptions in later sections.

## 5-3 Mounting rack panels inside a cabinet
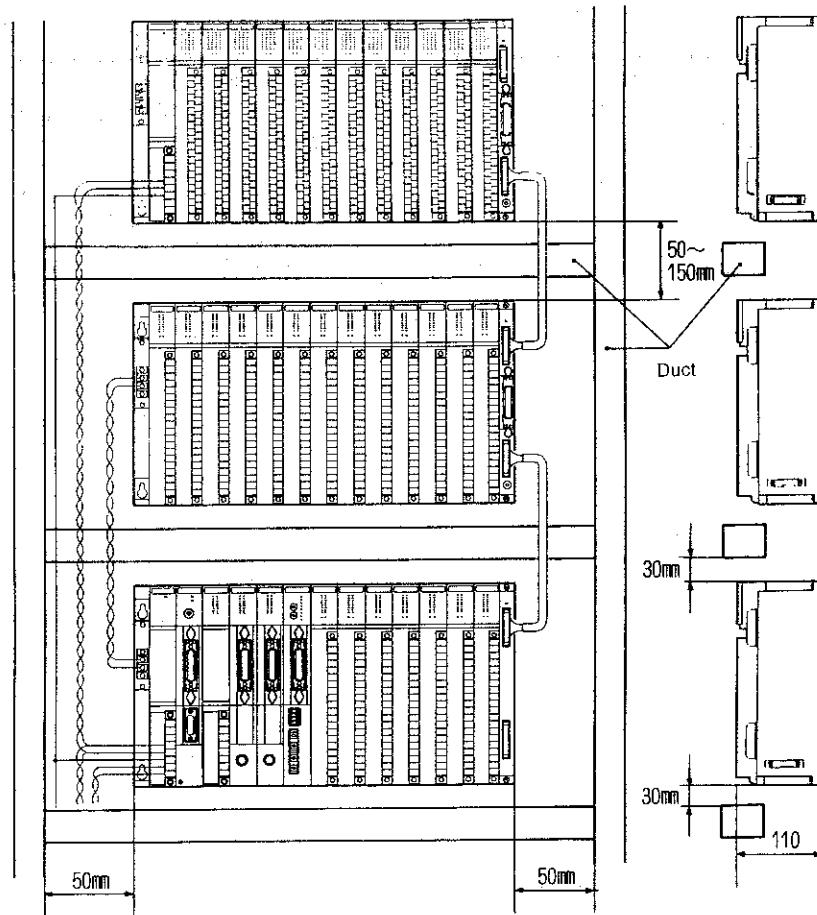


Note 1: The example above shows JW-13BU mounted in a cabinet.

Note 2: To secure adequate ventilation and make module mounting/removal and cabling easy, allow vertical spacing of 50 to 150mm between rack panels. A space of less than 50mm may cause an abnormal temperature rise within modules.

Note 3: Allow a space of more than 50mm on the left-hand side of the basic rack panel.

•Do not install the rack panels in the orientations shown below, as this will cause an usual temperature rise within the system :



Installtion with vertical side
facing upward (no good)
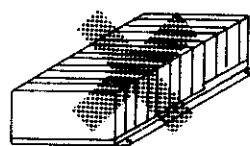
Installtion with horizontal side
facing upward (no good)

• When installing rack panels side-by-side, allow a space of 50 to 100 mm between them.



50~100mm

Duct

(Unit : mm)

174

JW-4BU

154 ± 1

JW-6BU

222 ± 1

JW-8BU

290 ± 1

JW-13BU

460 ± 1

ZW-508ZB

375 ± 1

ZW-108ZB

460 ± 1

ZW-28KB

460 ± 1

M5-16 tapped hole
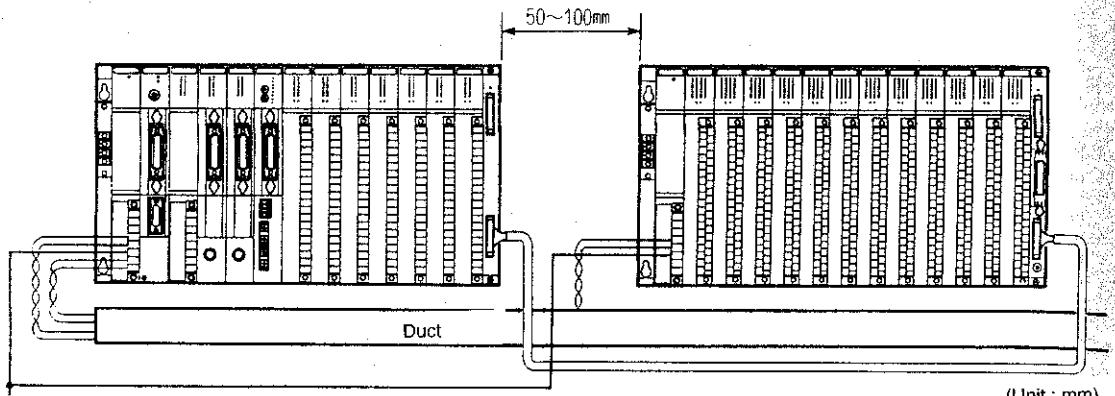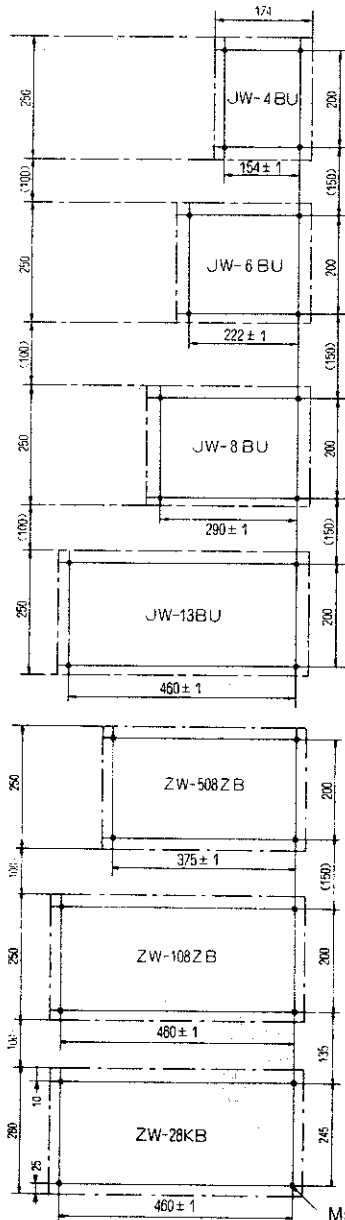
Rack panel mounting hole location with
board-to board spacing set to 100mm.

ZW-46KB

460 ± 1
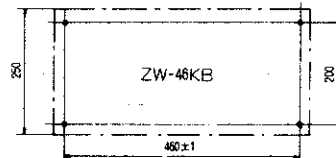
ZW-46KB mounting hole location

ZW-102ZB

205
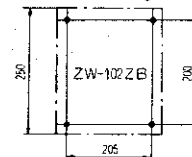
ZW-102ZB mounting hole location

ZW-104ZB

290
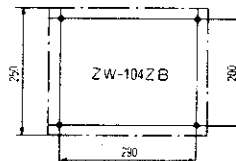
ZW-104ZB mounting hole location

ZW-08BU

460 ± 1
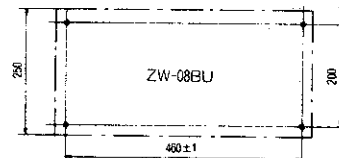
ZW-08BU mounting hole location

## 5-4 Installation of power supply module

Module attachment screw hole

Phillips screwdriver

Output connector

Module attachment screw hole

Phillips screwdriver

Rack panel attachment screw
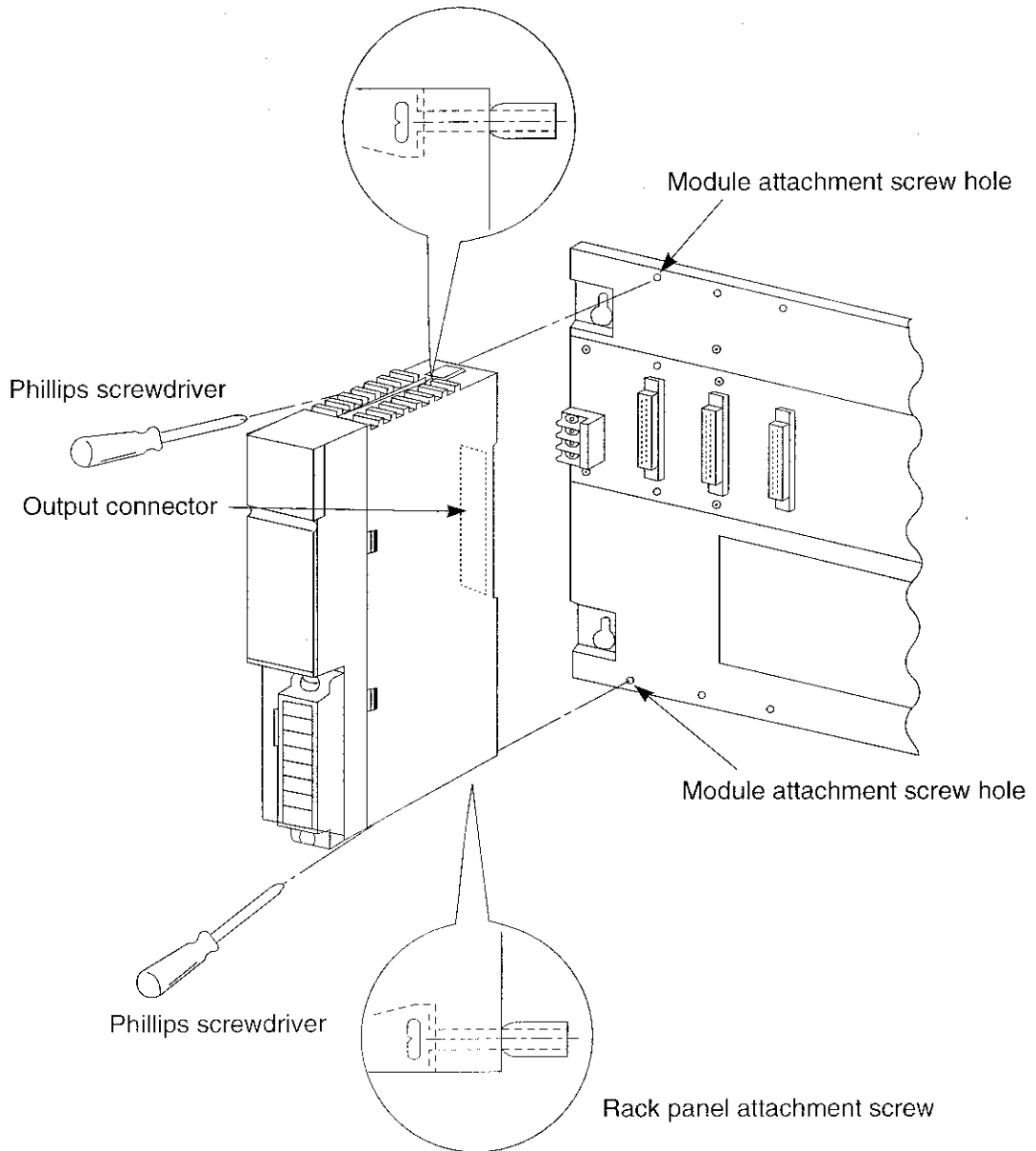
1) Plug the power supply module's output connector plug into the left end connector on the rack panel.
2) Secure the two rack panel retention screws of power supply module into module retention screw hole of rack panel using a phillips screwdriver.

## 5-5 Installation of memory module

This is the way to install th memory module on the control module (JW-70CU/100CU, JW-70CUH/100H).

### [1] Installation of memory module (ZW-1MA/ZW-2MA/ZW-3MA)

| Put the memory module on the CPU board of control module. Connect the memory module's connector and the CPU board's connector. |
| --- |

↓

| Fix the memory module with 3 screws to the CPU board. |
| --- |

↓

| Install EPROM or EEPROM to IC socket when the ROM operation is used. (see page 162). |
| --- |

↓

| Set SW1 and SW2. |
| --- |

↓

| End |
| --- |

Control module
JW-70CU
JW-100CU

CPU board
Memory module
ZW-1MA
ZW-2MA
ZW-3MA

Screws

SW1
SW2
IC socket

RAM          EEPROM

SW2 [ ] SW1

ROM          EPROM
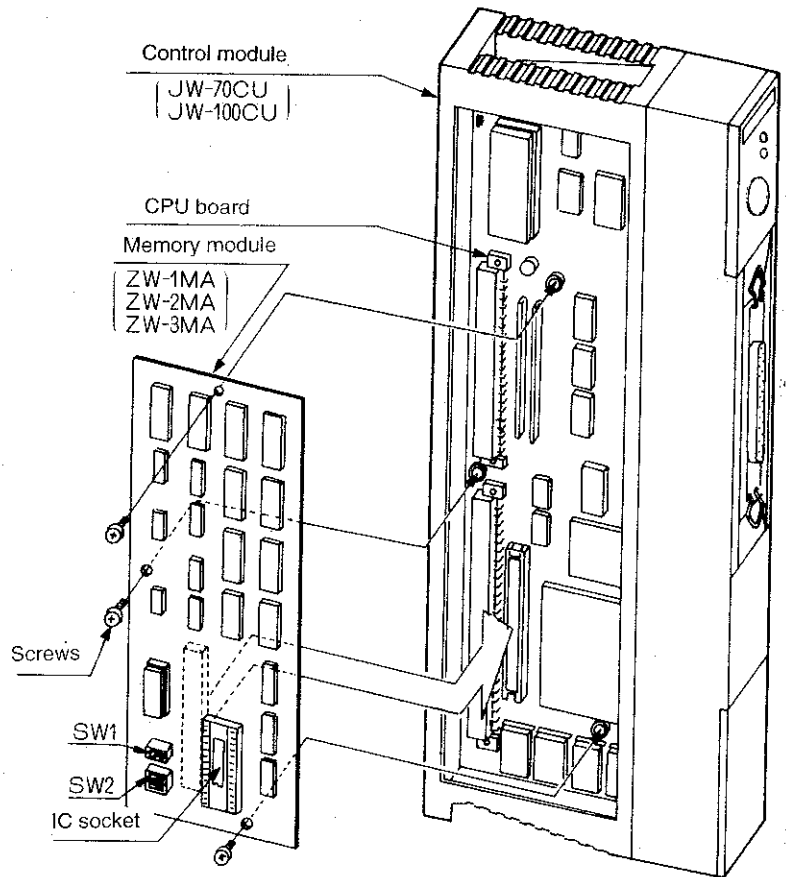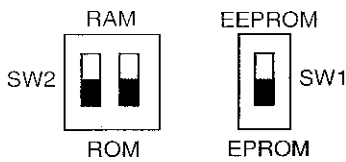
**SW1: Set the type of ROM**

| Setting | ROM model name |
| --- | --- |
| EEPROM | AT28C64B-15PC (made by ATMEL, available for only B version) AT28C256-15PC (made by ATMEL) |
| EPROM | 27C512(Fuitsu) |

**SW2: Select ROM/RAM operation**

| Setting | Contents |
| --- | --- |
| ROM | Setting at ROM operation. |
| RAM | Setting at RAM operation.(normal operation). Note 1 |

Note 1: ROM operation is only available when SW2 is set for ROM operation and the ROM chip is installed.

Note 2: Be sure to install the memory back-up battery on the RAM operation, otherwise, all program will be cleared when the power is OFF.

Note 3: ZW-1MA/2MA/3MA can be installed on the control module (JW-70CUH/100CUH), but processing speed is same as normal level.(See page 4-20.)

## [2] Installation of memory module (ZW-4MA)

```
┌─────────────────────────────────┐
│ Put the memory module on the CPU │
│ board of control module.         │
│ Connect the memory module's      │
│ connector and the CPU board's    │
│ connector.                       │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│ Fix the memory module with 3 screws │
│ to the CPU board.                │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│ Set SW1 to SW4.                 │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│ End.                            │
└─────────────────────────────────┘
```

Control module
JW-70CU
JW-100CU

CPU board

Memory module
(ZW-4MA)

Screws

SW1~SW4
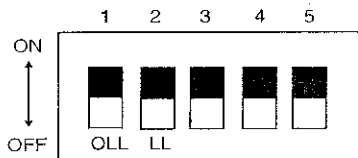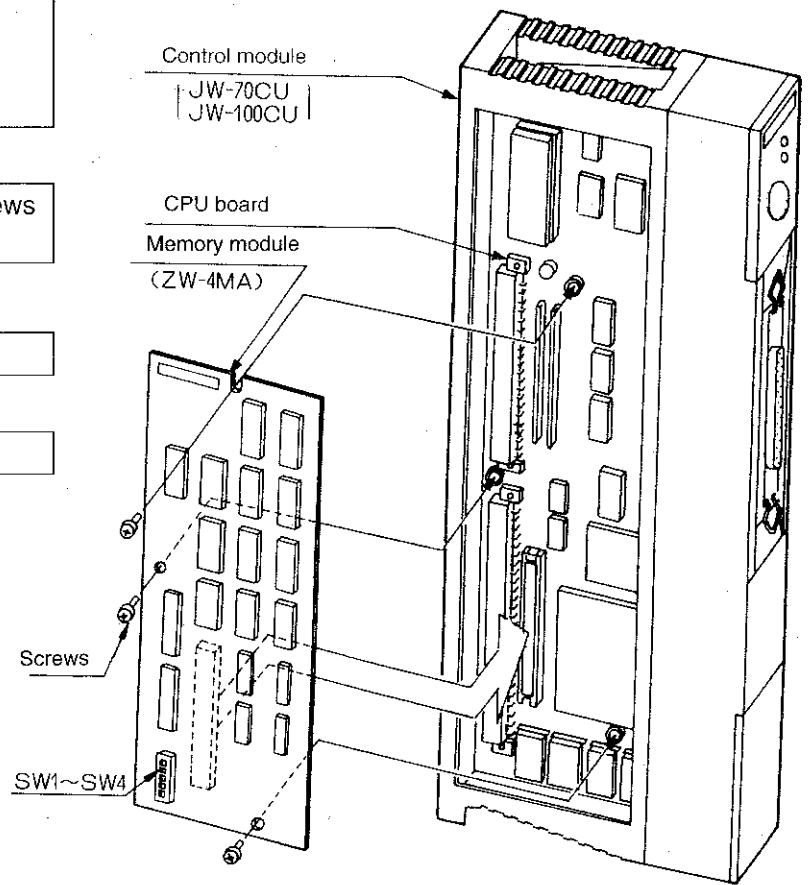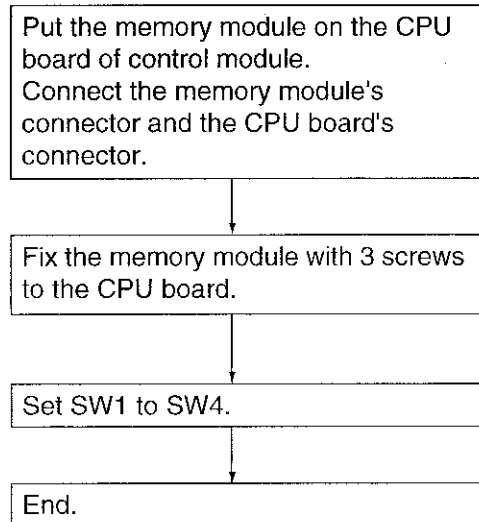
### Setting of SW1 to SW4

| SW No. | Contents | ON | OFF |
|--------|----------|----|----|
| 1 | Switch file #4 and #C | #4 | #C |
| 2 | Switch file #5 and #D | #5 | #D |
| 3 | Switch file #6 and #E | #6 | #E |
| 4 | File #7 is used or not | Used | Not used |
| 5 | Vacant | | |

ON / OFF  1 2 3 4 5  OLL  LL

Note 1 : Be sure to install the memory back-up battery when ZW-4MA is used.

Note 2 : Clear the memory area by using support tools after the installing the memory module. Refer to each manuals of support tools for details.

Note 3 : The ZW-4MA can be installed on the control module (JW-70CUH/100CUH), but processing speed is same as normal level. (See page 4-20.)

## [3] Installation of memory module (JW-1MAH/3MAH)

Put the memory module on the CPU board of control module.
Connect the memory module's connector and the CPU board's connector.

↓

Fix the memory module with 2 screws to the CPU board.

↓

Install EPROM or EEPROM to IC socket when the ROM operation is used.

↓

Set SW1 to SW2.

↓

End.

Control module
JW-70CUH
JW-100CUH

CPU board

Memory module
JW-1MAH
JW-3MAH

Screw

SW2

SW1

IC socket

(○ mark : Setting at delivery)

SW2 : Set the type of ROM

| Setting | ROM model name |
|---|---|
| EEPROM | AT28C64B-15PC (made by ATMEL, available for only B version) AT28C256-15PC (made by ATMEL) |
| ○EPROM | 27C512(Fuitsu) |

SW1: Select ROM/RAM operation and normal/high speed

| Setting | | Contents | |
|---|---|---|---|
| SW1-1 | ○RAM | Setting at RAM operation | |
| | ROM | Setting at ROM operation | Note 1 |
| SW1-2 | L | Normal speed | Note 2 |
| | ○ H | High speed | Note 2 |

Note 1: ROM operation is only available when SW1-1 is set for ROM operation and the ROM chip is installed. Be sure to install the memory back-up battery on the RAM operation, otherwise, all program will be cleared when the power is OFF.

Note 2: Refer to the programming manual "Chapter 3. Description of instructions" to confirm the each processing time. (Normal/high speed).
•Processing time of normal speed operation → Processing time of JW50/70/100.
•Processing time of high speed operation → Processing time of JW50H/70H/100H.
(When the JW-1MAH/3MAH is installed on the JW-70CU/100CU,

## [4] Installation of memory module (JW-2MAH)

| Put the memory module on the CPU board of control module. Connect the memory module's connector and the CPU board's connector. |

↓

| Fix the memory module with 3 screws to the CPU board. |

↓

| Install EPROM or EEPROM to IC socket when the ROM operation is used. |

↓

| Set SW2 to SW3. |

↓

| End. |

Control module
JW-70CUH
JW-100CUH

CPU board

Memory module
(JW-2MAH)

SW3
SW2
IC socket
Screws

SW2
RAM
RAM | 1 | 2
ROM
H
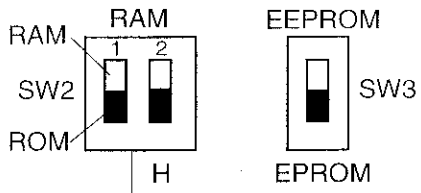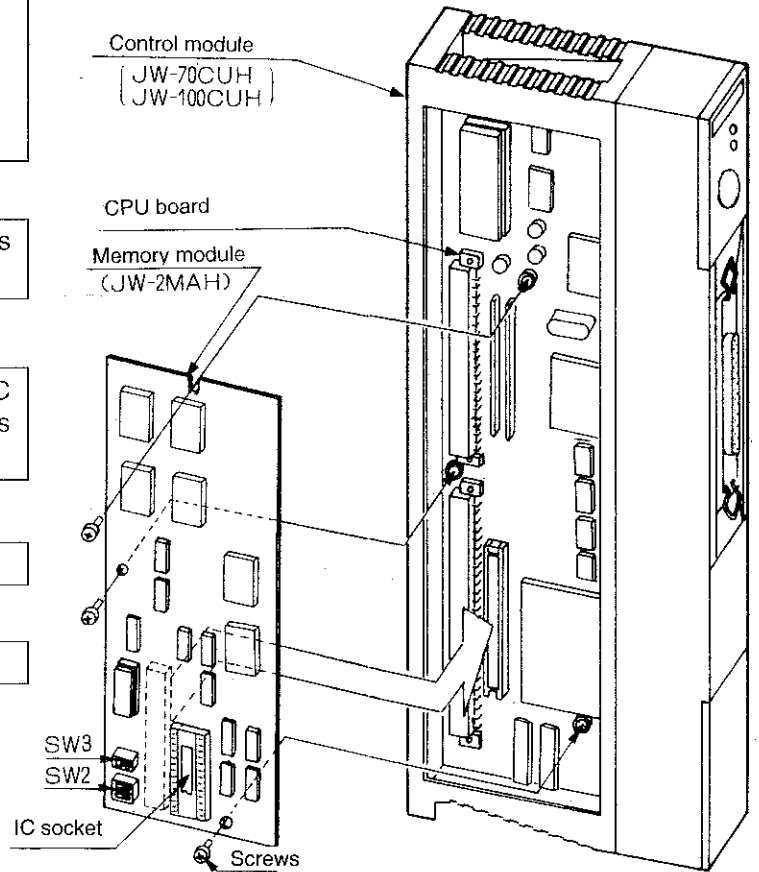
EEPROM
SW3
EPROM

(○ mark : Setting at delivery)

SW3 : Set the type of ROM

| Setting | ROM model name |
|---------|----------------|
| EEPROM | AT28C64B-15PC (made by ATMEL, available for only B version) AT28C256-15PC (made by ATMEL) |
| ○EPROM | 27C512(Fuitsu) |

SW2: Select ROM/RAM operation and normal/high speed

| Setting | | Contents | |
|---------|---|----------|---|
| SW1-1 | ○RAM | Setting at RAM operation | |
| | ROM | Setting at ROM operation | Note 1 |
| SW1-2 | L | Normal speed | Note 2 |
| | ○ H | High speed | Note 2 |

Note 1: ROM operation is only available when SW2-1 is set for ROM operation and the ROM chip is installed. Be sure to install the memory back-up battery on the RAM operation, otherwise, all program will be cleared when the power is OFF.

Note 2: Refer to the programming manual "Chapter 3. Description of instructions" to confirm the each processing time. (Normal/high speed).
•Processing time of normal speed operation → Processing time of JW50/70/100.
•Processing time of high speed operation → Processing time of JW50H/70H/100H.
(When the JW-2MAH is installed on the JW-70CU/100CU,

## [5] Installation of memory module (JW-4MAH)

Put the memory module on the CPU board of control module.
Connect the memory module's connector and the CPU board's connector.

↓

Fix the memory module with 3 screws to the CPU board.

↓

Set SW1 and SW2.

↓

End



Control module
[ JW-70CUH ]
[ JW-100CUH ]

CPU board
Memory module
(JW-4MAH)

SW1

SW2

Screws
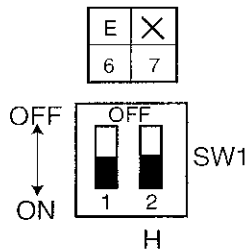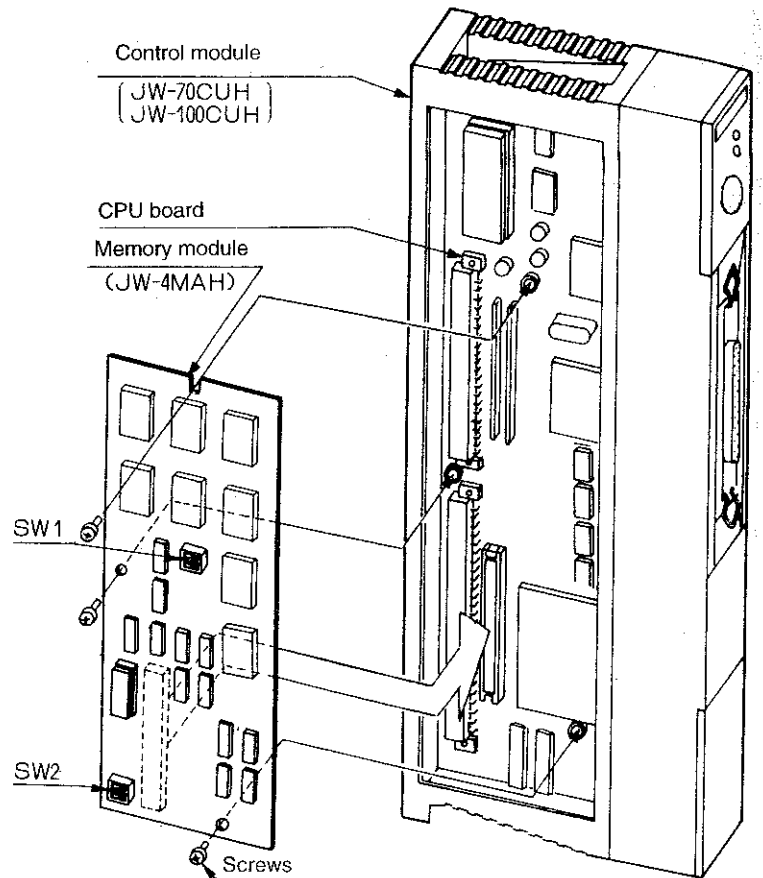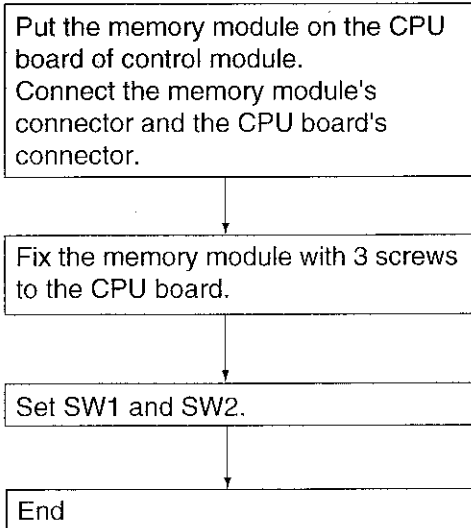
SW1: Select the file memory

| Setting | Contents | OFF | ON |
|---------|----------|-----|-----|
| SW1-1 | File #7 is used or not | Unused | Used |
| SW1-2 | Switch file #6 and #E | #E | #6 |

SW2: Select normal/high speed

| Setting | | Contents |
|---------|------|----------|
| SW2-1 | ○RAM | Unused |
| | ROM | |
| SW2-2 | L | Normal speed |
| | ○ H | High speed |

Note 1: Be sure to install the memory back-up when JW-4MAH is used.

Note 2: Clear the memory area by using support tools after the installing the memory module (JW-4MAH). Refer to each manuals of support tools for details.

Note 3: Refer to the programming manual "Chapter 3. Description of instructions" to confirm the each processing time. (Normal/high speed).

•Processing time of normal speed operation → Processing time of JW50/70/100.

•Processing time of high speed operation → Processing time of JW50H/70H/100H.

(When the JW-4MAH is installed on the JW-70CU/100CU,

## 5-6 Installing the control module



**Module attachment screw hole**

**Power supply module**

**Installation position for optional cable**

**Phillips screwdriver**

**Installation procedure for optional cable**
① Bend the option cable.

Note 3

② Attach the connectors in the optional cable one after another, starting from the left side.

Note 1
Connector details

**Option module installation slot**
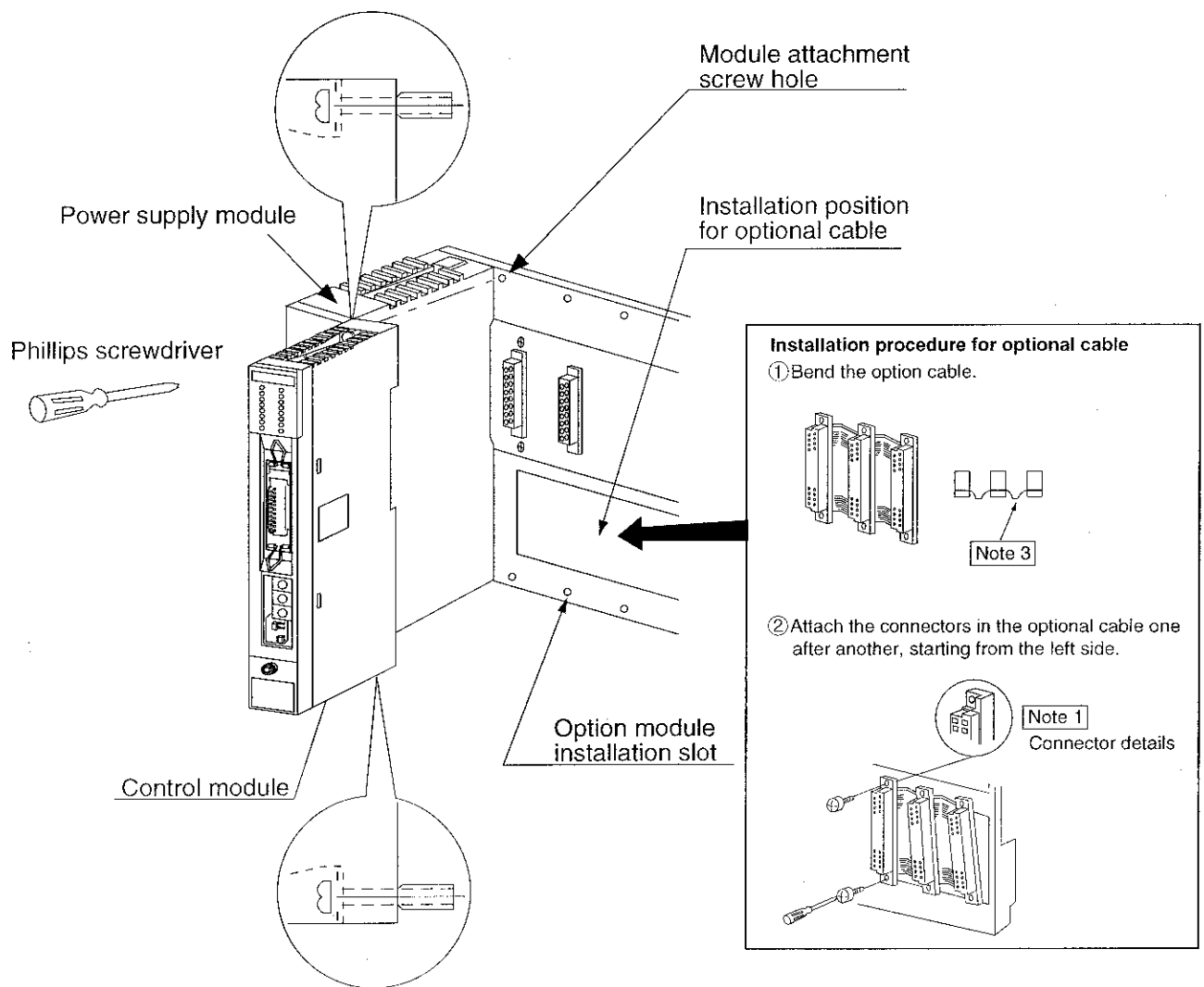
**Control module**

1) Plug the control module's connector into the mating socket next to the left end socket on the basic rack panel.
2) Secure the two rack panel retention screws of control module into module retention screw hole of rack panel using a philips screwdriver.

Note 1: When using an option module, install the option cable on the basic rack panel before installing the control module. When installing the option cable, ensure the correct connector orientation.
Note 2: Be sure to install the control module right next to the power supply module.
Note 3: Bend the option ribbon cable toward the basic rack panel.

# 5-7   Installation of I/O modules

## [1] Installing JW-series I/O modules

The JW-series I/O modules can be installed on any of the following types of rack panels:

| Model name | Model | Remarks |
|---|---|---|
| Rack panel | JW-13BU | Accommodates up to 13 JW I/O modules. |
| | JW-8BU | Accommodates up to 8 JW I/O modules. |
| | JW-6BU | Accommodates up to 6 JW I/O modules. |
| | JW-4BU | Accommodates up to 4 JW I/O modules. |



Philips screwdriver

Input module, output module
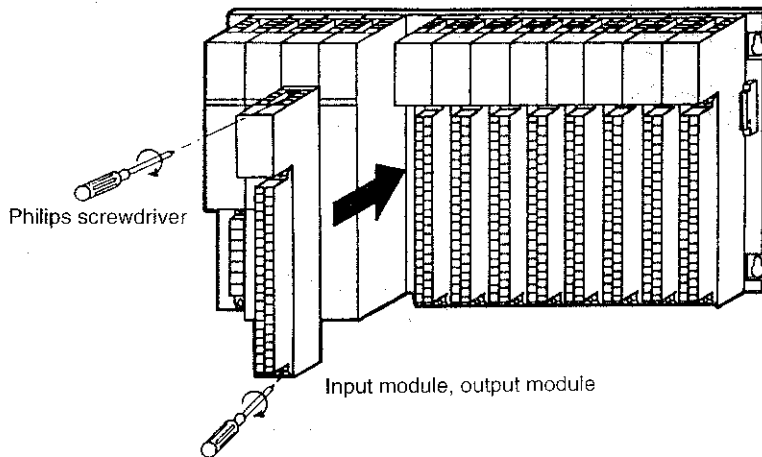
1) Plug the I/O module's connector into the mating socket on the rack panel.
2) Secure the two rack panel retention screws of I/O module into module retention screw
hole of rack panel using a philips screwdriver.

Note 1: Whenever installing or removing an I/O module, be sure to turn off the power supply to the rack
panel or enter the "Live I/O replace" mode.
Note 2: Do not install a contact output module (JW-34S, etc.) next to an option module as voltage
spikes from relay contacts may cause the option module to malfunction.
Note 3: No I/O modules can be installed in positions where the option cable (ZW-2CC/4CC/6CC) is
already installed.



Rack panel
(JW-13BU)

Cable for option
(ZW-4CC)

I/O modules cannot be installed in these
positions.
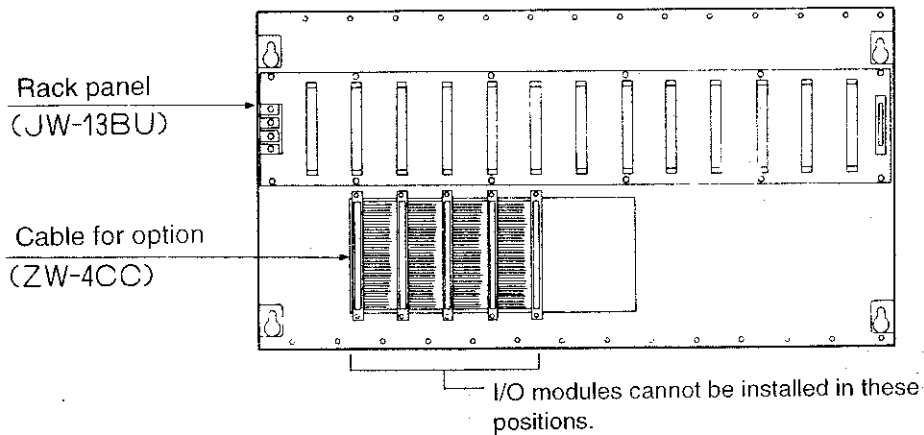
## [2] Installing ZW-series I/O modules

The ZW-series I/O modules can be installed on any of the following types of rack panels:

| Model name | Model | Remarks |
|---|---|---|
| Rack panel | ZW-08BU | Accommodates up to 8 ZW I/O modules. |
| Basic rack panel | ZW-28KB | Accommodates up to 8 ZW I/O modules. |
| | ZW-46KB | Accommodates up to 6 ZW I/O modules. |
| | ZW-04KB | Accommodates up to 4 ZW I/O modules. |
| | ZW-02KB | Accommodates up to 2 ZW I/O modules. |
| Expansion rack panel | ZW-108ZB | Accommodates up to 8 ZW I/O modules. |
| | ZW-104ZB | Accommodates up to 4 ZW I/O modules. |
| | ZW-102ZB | Accommodates up to 2 ZW I/O modules. |
| | ZW-508ZB | Accommodates up to 8 ZW I/O modules. |
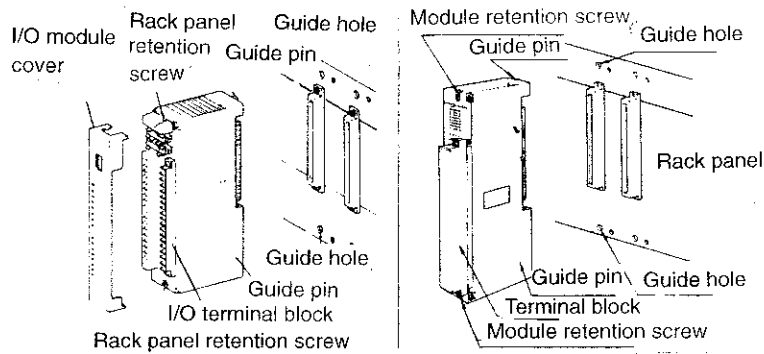


1) Remove the front access cover from the I/O module to be installed (insert your finger into the cover's top opening and pull the cover forward).
2) Insert the guide pins at the back of the I/O module into the mating guide holes in the rack panel, then push in the module until its connector is firmly plugged into the mating socket.
3) Secure the module to the rack panel with the top and bottom module retention screws.
4) Connect the cable wires from an external I/O device to the terminal block (terminal type), or to the I/O connector(connector type).
5) Replace the front access cover, with the cables from the terminal block passing through the bottom opening of the cover (terminal block type).
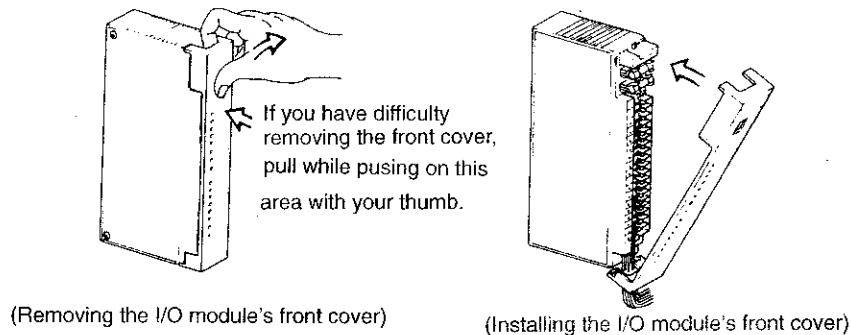


If you have difficulty removing the front cover, pull while pusing on this area with your thumb.

(Removing the I/O module's front cover)     (Installing the I/O module's front cover)

Note 1: Whenever installing or removing an I/O module, be sure to turn off the power supply to the control module or the expansion rack panel on which the I/O module is installed.

Note 2: Do not install a contact output module (ZW-16S4/16S4D/32S4T, etc.) next to an option module as voltages spikes from relay contacts may cause the option module to malfunction.

# 5-8 Installing the side panel on an I/O module

## [1] Installing the side panel on a JW-series I/O module
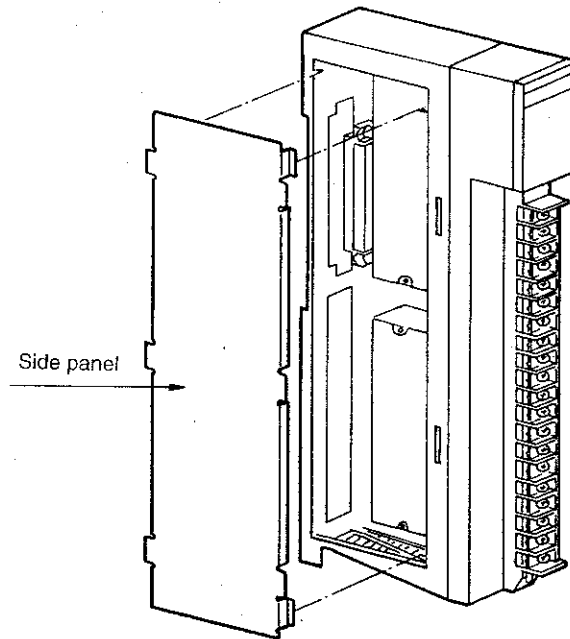
Side panel

## [2] Installing the side panel on a ZW-series I/O module

The side panel to be installed on the left side of the left end I/O module on an expansion rack panel is supplied with the expansion rack panel.

Supplied tapping screws
(M3X8)

Insert these claws the module.

Side panel
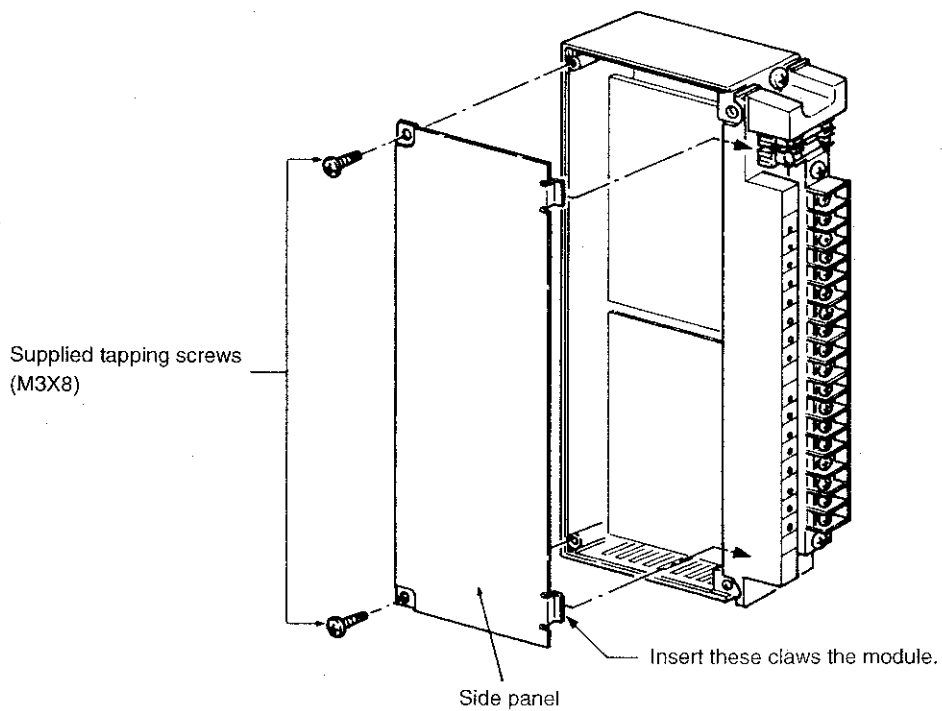
• Apply a torque of less than 0.49N•m to the tapping screws.

## 5-9 Installing the expansion power supply module (for ZW-I/Os)
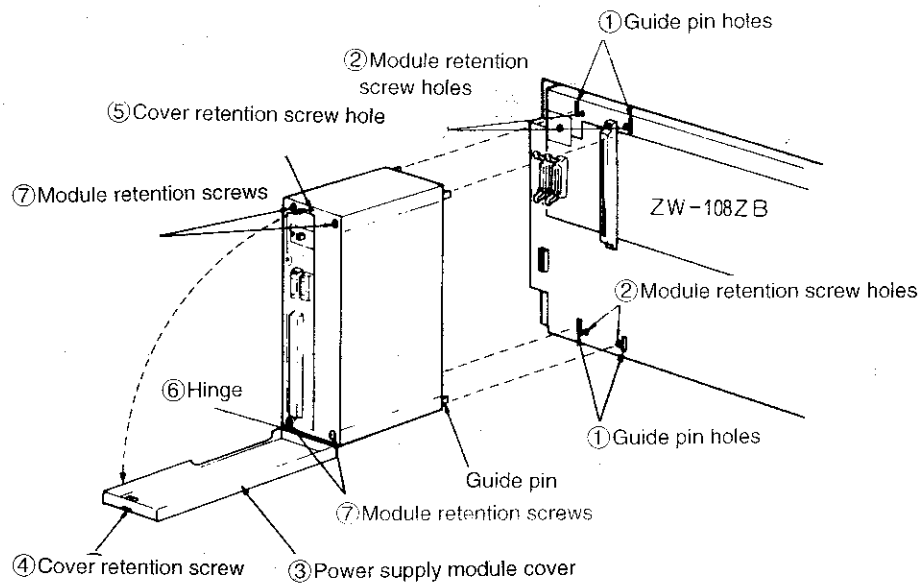


1) Loosen the cover retention screw ④ with a Philips screwdriver and remove the cover ③ from the expansion power supply module.

2) Insert the four guide pins at the back of the module into the mating guide pin holes ① in the expansion rack panel (ZW-108ZB, etc.) then push in the module until its connector is firmly plugged into the mating socket.

3) Secure the two rack panel retention screws of expansion power supply module into module retention screw hole of rack panel using a philips screwdriver.

Note 1: The expansion power supply module cannot be installed on the JW-4BU/6BU/8BU/13BU rack panels, ZW-28KB/46KB basic rack panels, or ZW-508ZB expansion rack panel.

# Chapter 6. Wiring

## 6-1 Precaution for wiring

Follow the below instructions for wiring:

1) Separate power line and I/O lines of the JW50H/70H/100H from high voltage lines and power lines as far as possible. Do not run power lines and I/O lines in parallel with high voltage or power lines.
2) For the I/O expansion cable and wiring the 5 VDC cable, use supplied accessories for the I/O expansion cable.
3) Do not install the I/O expansion signal cables and 5 VDC power cables (Note 1)
4) Don't run the I/O expansion cable and the 5 VDC cable inside a duct.
5) Cables connected to I/O modules should be routed in such a manner that the indicator lights on the modules are not hidden.
6) Use twisted cables of over KIV 1.25 square for connection to the primary power input terminal of the power supply module.
7) Use cables of over KIV 0.5 square for wiring from the relay terminal block of the control panel to the input module.
8) Use wires with KIV 0.75 or larger gauge for the wiring from the cabinet's bulkhead terminal block to the output modules that drive high-power loads such as solenoids. Use wires with KIV 0.5 or large gauge for lighter loads.
9) Use wires of over KIV 1.25 square for wiring from the relay terminal block to input/output equipment.
10) When the whole factory site is grounded for high electricity and not suitable for the grounding of the JW50H/70H/100H, connect the GND terminal of the JW50H/70H/100H with just the board ground.(See the next page.)
11) Use crimp-type terminals for all connections to the PC's terminal blocks. For suitable sizes of crimp-style terminals, see the following table.
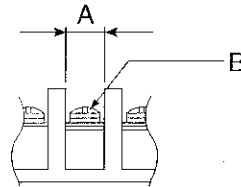


| | | Dimension A(mm) | Spacs. of screw B |
|---|---|---|---|
| JW-series I/O modules | | 7.3 | M3.5×7 self-locking screw |
| ZW-series I/O modules | 8/16-point modules | 7.7 | M3.5×8 self-locking screw |
| | 32-point modules | 7.5 | M3.5×8 self-locking screw |
| Power supply module | | 7.4 | M3.5×6 self-locking screw |
| Basic rack panel | | 8.5 | M3.5×8 self-locking screw |
| Rack panel | | 8 | M3.5×8 self-locking screw |
| Expansion rack panel | | 8 | M3.5×8 self-locking screw |
| Expansion power supply module | | 7.3 | M3.5×8 self-locking screw |

## 12) Wiring with noise countermeasures

Malfunctions are often caused by noise interference. This paragraph describes how to improve the system's immunity to noise interface and to prevent possible malfunctions resulting from them. Malfunctions due to noise could result from more than one cause or from a cause which cannot be analyzed in quantitative terms. Attempt appropriate field actions case-by-case by referring to the following typical countermeasures:

### (1) Grounding

Grounding has two purposes; to protect operators from electric shock and to prevent malfunction by noise. The grounding for noise prevention is shown here.

#### 1) Don't use a common ground for the JW50H/70H/100H and other device.

When the GND cable of the JW50H/70H/100H is also used for grounding for other device, noise might come into the JW50H/70H/100H from other device.



Common grounding
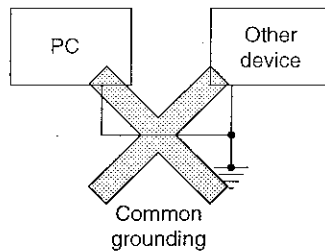
Bad example:     Don't use the GND line of the JW50H/70H/100H for grounding of a motor or an inverter.
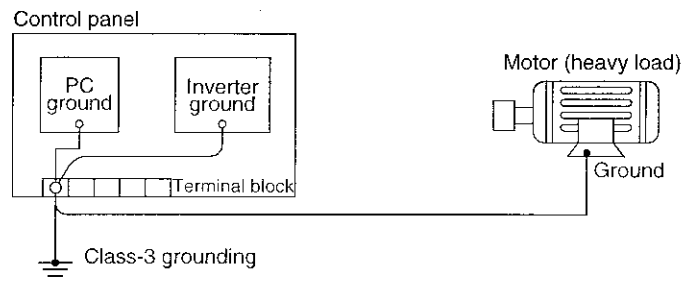


Countermeasure 1: Separate grounding for each of the PC, the motor and the inverter.
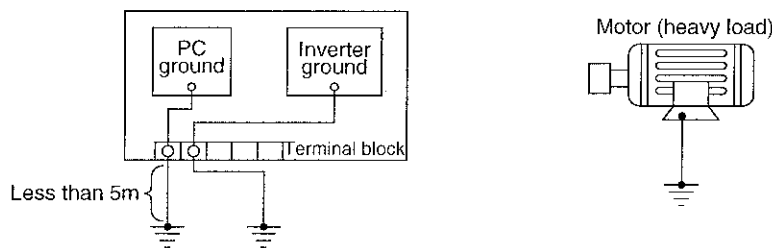


Note 1: Use a twisted wire of over 2 mm$^2$ sectional area and less than 5m long in grounding the PC for the noise prevention purpose.

Note 2: If sharing a single ground wire with an inverter cannot be avoided, use separate ground wires to the grounding points as shown:
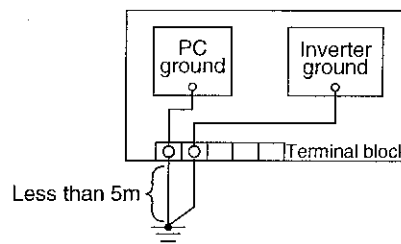
Countermeasure 2: When a separate ground point is not available for the PC :
Connect the PC's grounding post directly to the cabinat chassis on which the basic rack panel is mounted.
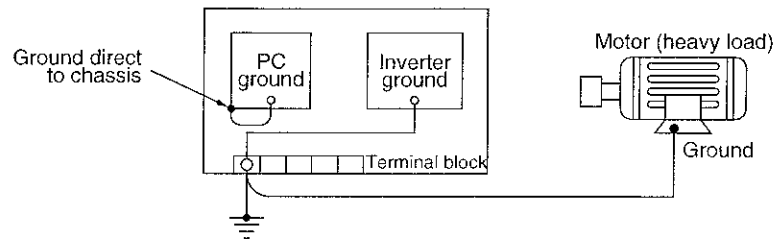


Note 1: When grounding the PC directly to the cabinet chassis, note the following points :

• Use the minimum length of wire of necessary to connect the power supply module's grounding post to the rack panel mounting screw.The same wiring manner should be used for the expansion rack panel.
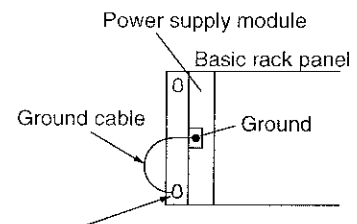


Drop the grounding cable into the fastening screw on the basic rack panel.

• Install firmly the basic rack panel and the expansion rack panel on the chassis of the control panel and make sure of the electric conductivity.
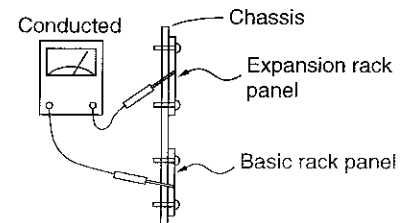


• Where the control panel itself is grounded, do not wire between the grounding point and the GND terminal of the JW50H/70H/100H.
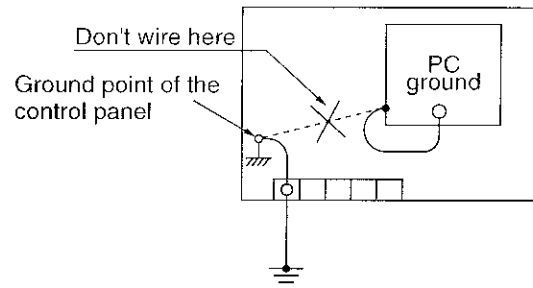


Reference: Note for fitting the JW50H/70H/100H on the control panel door.
•Ground from the GND terminal of the JW50H/70H/100H to the door.
•Use a twisted wire of over 2 mm$^2$ sectional area for grounding cable of the control panel from its door (less than 50 cm.)
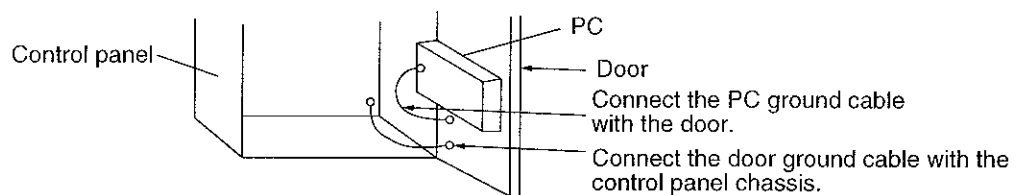
## (2) Countermeasure of noise from power supply line

The AC power supply input noise resistance capacity of the JW50H/70H/100H is 1000 Vp-p. When any noise over this limit is possible to come through the power supply line, install an insulation transformer.

Countermeasure:    Install an insulation transformer

Noise has a high frequency of 100 KHz to 2 MHz, which should be blocked by a transformer.
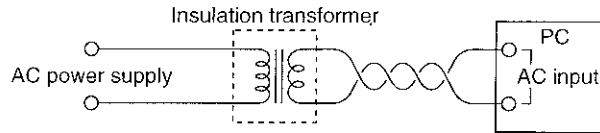


Note 1: When using an insulation transformer, note the following points:

• An insulation transformer with static electricity shield can also prevent noise by static coupling.

• Install and insulation transformer near the power supply input of the control panel in order to block noise at the entrance of the control panel.
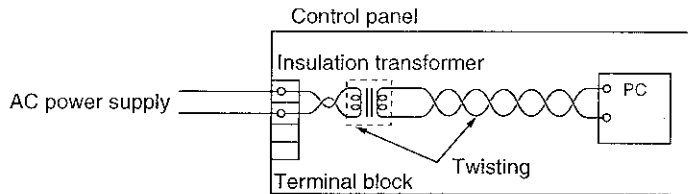


• Use two twisted wires in the primary and secondary sides of the transformer.

• Choose the insulation transformer of the capacity of more than 20% higher than that of the rated load. When a transformer of the same capacity as that of the rated load is used, a primary input voltage might exceed the transformer rated capacity and become dangerous state such as emitting smoke.

• When a large-capacity transformer with higher voltage in the secondary side is chosen, we recommend to install a intermediate voltage tap.
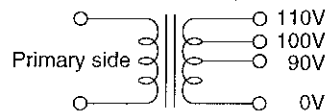


• With particularly large noise, several transformers can be installed, not only to the power supply input of the JW50H/70H/100H but also to the load and AC input.



6-4
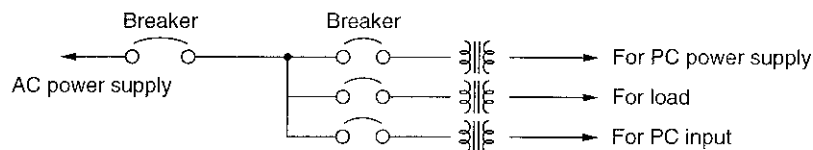
### (3) Safeguard from lightning

Below are countermeasures in case when the factory facilities are located far from residential areas and that effects from induced lightning (induced voltage by lightning strikes) are expected. Note, however, that they are not the measures for direct strikes of lightning. In some cases, the voltage of the induced lightning may go beyond 4000 KV. Therefore, the purpose of these countermeasure is just to minimize the damage on the device.
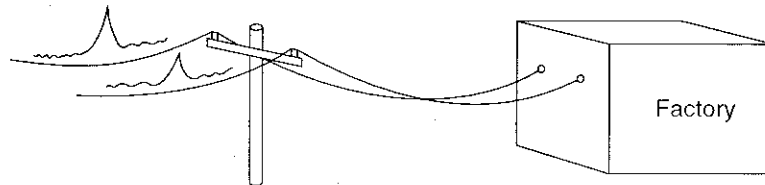


Countermeasure 1: Install a surge absorber on the receiver panel of commercial electric power as protection from induced lightning.

Different models should be chosen according to the facilities load and power supply voltage. For your reference, below is a wiring diagram of the outdoor type cubicle for 1.7 KVA.
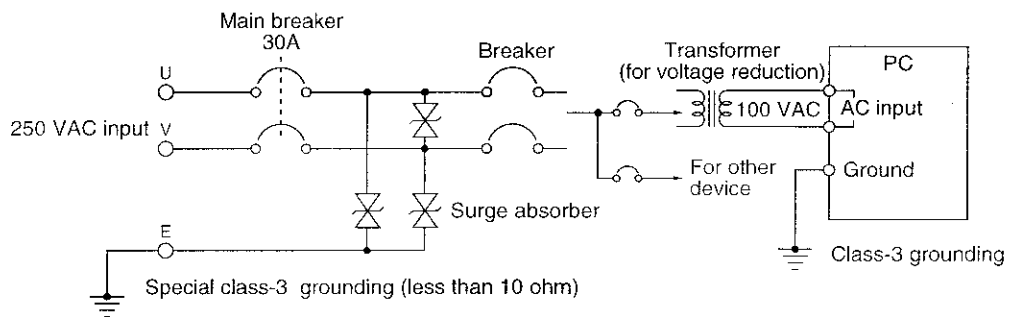


Note: Note the following when wiring.

• The ground of the surge absorber is the special class-3 ground (less than 10 ohm ground resistance) and should be separated from the ground of the JW50H/70H/100H. (Class-3 grounding.)

• Install the main breaker before the surge absorber.

• The followings are known surge absorbers in the market. Different types for different power supply voltages.

| Commercial power voltage | Model name | Specifications | Manufacturer |
|---|---|---|---|
| 100 VAC | ERZ-A20PK251 | Varistor voltage: 250V ± 10%<br>Surge resistant volume:<br>1,500A (8 × 20µs)<br>Energy resistant volume: 15 Joule | Matsushita Electric Co.,Ltd. |
| 200 VAC | ERZ-A20PK501 | Varistor voltage: 500V ± 10%<br>Surge resistant volume:<br>1,500A (8 × 20µs)<br>Energy resistant volume: 70 Joule | |

• Use the ground wire of over 3.5mm$^2$ section area for the surge absorber.

Countermeasure 2: Underground wiring as a countermeasure of lightning.
When communication cables and input cables of the JW50H/70H/100H go out of a building, place them underground. Provide junction for input/output signals using relays.

1. Underground cabling
In a lightning weather condition, the atmosphere is electrically charged and a wiring in the air induces a voltage of over 24 VDC. Therefore, place the wiring under the ground.



60 cm or 120 cm below ground level
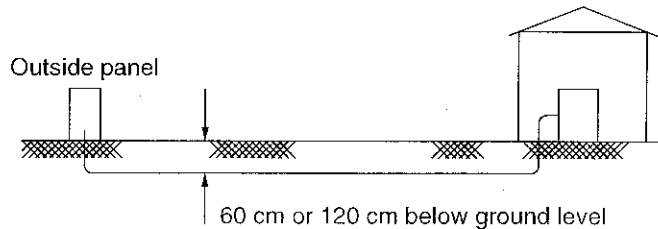
As for the depth of cable installation, refer to local regulations.

2. Relay connection for the input/output signals using relays.
The relay isolates the effects of lightning and minimizes the damage.
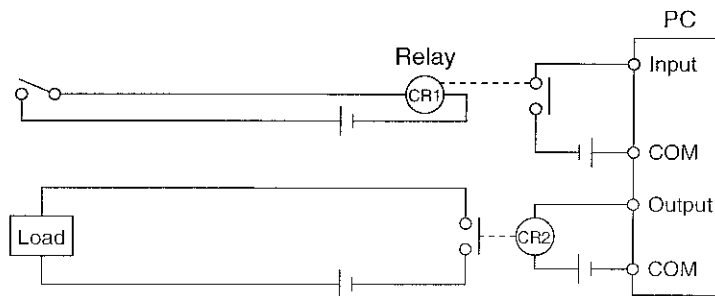


### (4) Wire of signal cable for expansion

When turning ON/OFF of the magnet switch installed near the JW50H/70H/100H and the signal cable for expansion, high noise and high voltage may occur to give bad effects on the operation of the JW50H/70H/100H. Therefore, for prevention of the noise occurrence, insert a noise killer, such as a varistor, at the contact point of the magnet switch. Do not place the signal cable for expansion and the 5 VDC cable inside the duct, through which input/output signal lines and power lines are running.



6-6
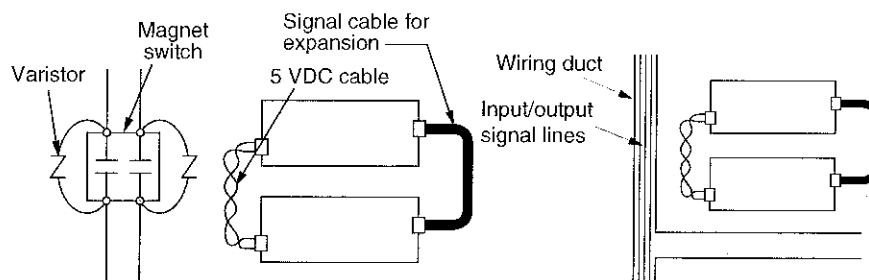
**(5) Precautions for input/output signal wiring**

1. Relay output module installation

If a relay output module is used to switch heavy loads, switching transients can have undesirable affects on the operation of the CPU board, option module, and/or special modules. To avoid this, do not install the relay output module next to these modules.

Example for JW50/70/100, JW50H/70H/100H
(ZW-28KB)



Option module

Do not install a relay output module next to a option module.
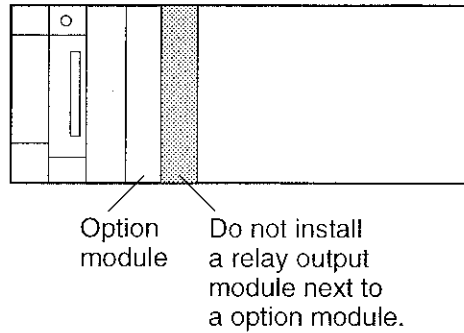
Note : When a relay output module is loaded with inductive loads, use a varistor or C/R filter across each set of relay contacts to absorb transients (see page 73.)

2. DC input module

When extending the external line of the DC input module for more than 100 m, use shielding wire. Even in case of less than 100 m extension, shielding wires should be used under certain conditions. Do not forget to connect the shield of the shielding wire with the ground of the JW50H/70H/100H.
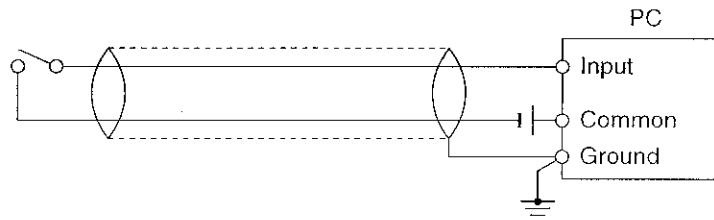


Note : The outer shield conductor may be grounded at either or both ends depending on the situation.

3. AC input module

Do not use the outputs from a constant voltage transformer and an AC regulator, for the AC power supply to the AC input module. When the constant voltage transformer and the AC regulator are used, the module signal could be turned ON even with an input voltage less than the rate voltage due to a high distortion rate (10 to 50%) of alternative current waves. The power supply to the AC input module should have a distortion rate of less than 5%.
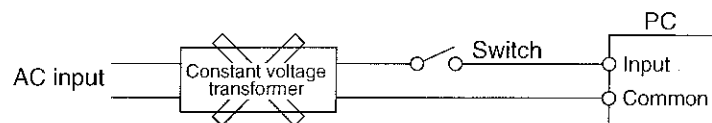
4. Wiring with power line

Do not run the input signal, output signal and communication cables of the JW50H/70H/100H near and in parallel with the power line.

• When input and output signal cables are extended over 100 m, make separate wiring for the input signal and the output signal of JW50H/70H/100H.
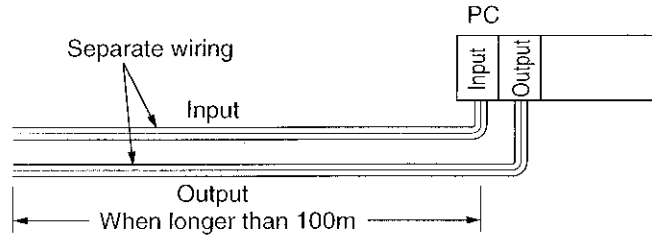


• Make separate wiring for the input signal and the output signal of the JW50H/70H/100H from the power line. Particularly with the power line for the inverter and the servo driver, do not place signal wires inside the same duct or pipe with the power line, even if they are less than 100 m.
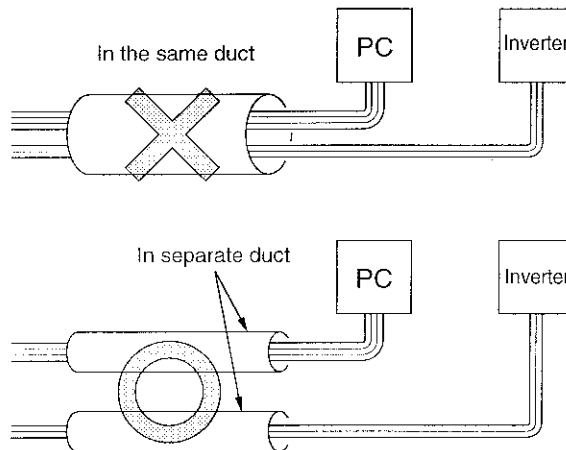
## 6-2 Wiring for JW-1PU power supply module

Open the terminal cover and connect the cables to the terminal block as shown :

In case of 100 VAC input   Terminal block cover

SHORT
200 VAC
SHORT
100 VAC

INPUT

100 VAC
or 200 VAC

GND

halt output
line

DC relay

Terminal block
cover

The coil rating must conform to the power supply voltage.
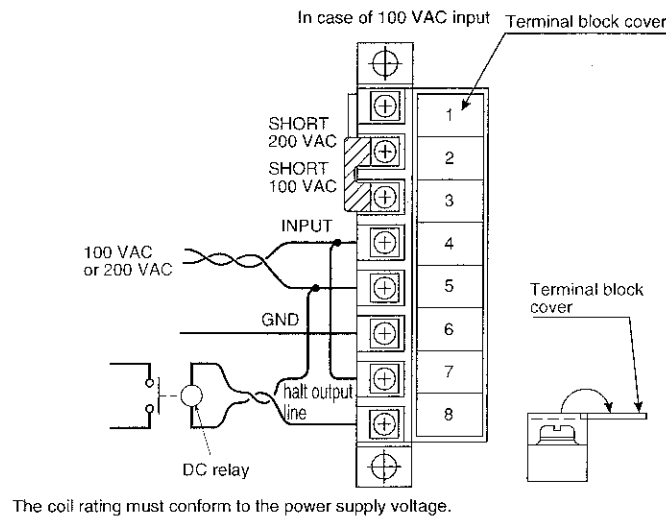
• When a DC output module is used,
connect an AC relay coil to the halt output
terminals and insert the relay contacts
into emergency stop circuit.

Note 1: Apply a torque of 1.18N•m or less to the terminal screws.

Note 2: Up to three halt output circuits can be connected in series. For more circuits, use an intermediate relay.

Note 3: For a line voltage of 200 VAC, the metal short on the terminal block must be placed in the 200 VAC position. If 200 VAC power is applied with the line voltage selection left at 100 VAC, the power supply module will sustain permanent damage.

In case of 100 VAC input

SHORT
200 VAC
SHORT
100 VAC

200 VAC
input

GND

7    1A

8

SSR

Halt output internal circuit
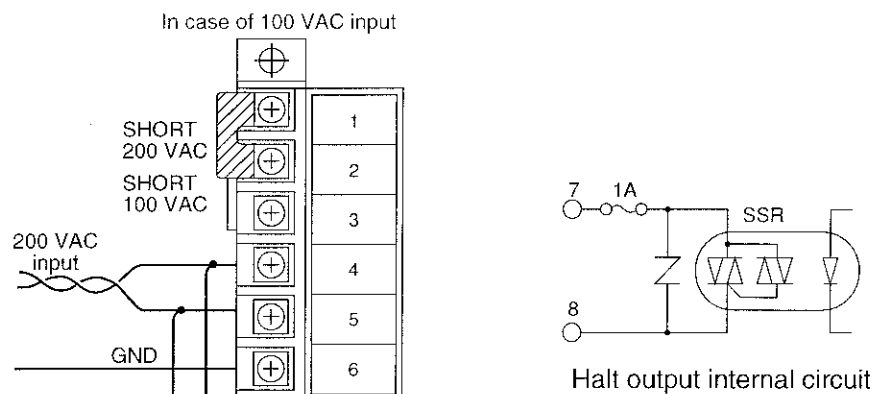
# 6-3 Wiring for JW-2PU power supply module

Open the terminal cover and connect the cables to the terminal block as shown :
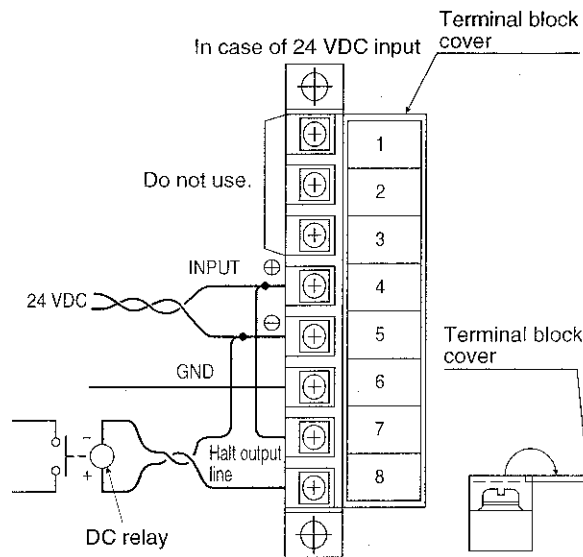


The coil rating must conform to the power supply voltage.

•Connect a DC relay coil to the halt output terminals and insert the relay contacts into the emergency stop circuit.

Note 1: Apply a torque of 1.18N•m or less to the terminal screws.
Note 2: More than one halt output circuit cannot be connected in series. For serial connections, use relays.
Note 3: Make sure that the input power and halt output are connected with the correct polarity. Cross connection will result in permanent damage to the power supply module.
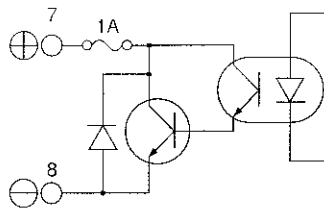


Halt output internal circuit

## 6-4  Wiring for ZW-100PU1/100PU2 expansion power supply module

Open the terminal cover and connect the cables to the terminal block as shown :
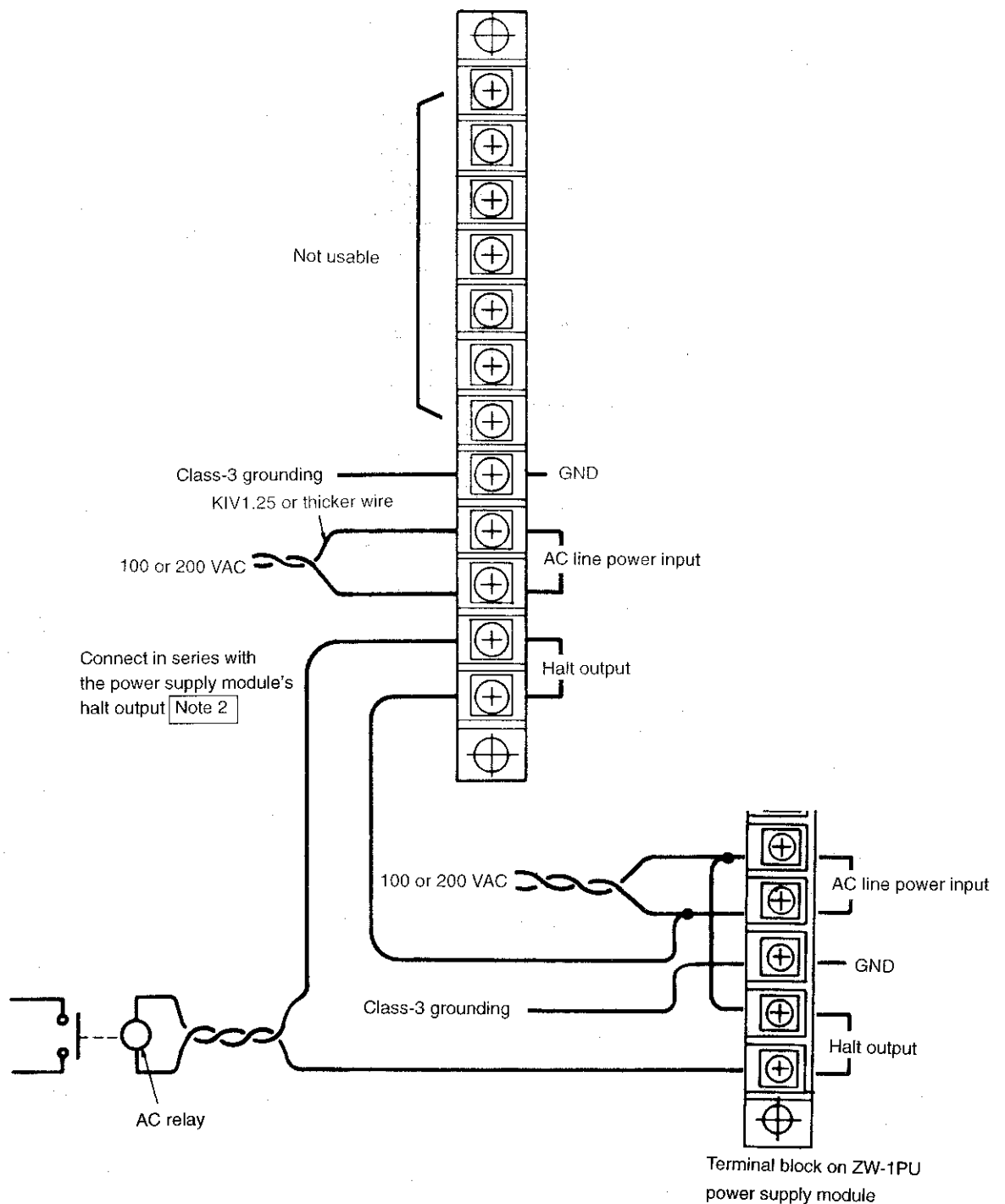


Note 1: Apply a torque of 1.18N•m or less to the terminal screws.

Note 2: Up to three halt output circuits can be connected in series. For more circuits, use an intermediate relay.

Note 3: For a line voltage of 200 VAC, the supply voltage selector switch on the expansion power supply module must be set to the 200 VAC position (see page 4-83).

## 6-5 Wiring for expansion rack panel

When one or more expansion rack panels are to be used, interconnect them and the basic rack panel as shown below, using the I/O expansion signal and 5V power cables supplied with each rack panel. When connecting cables, pay special attention to the discrimination between the IN and OUT ports of the I/O expansion connectors.

I/O expansion signal cable (45 cm)

I/O expansion signal cable (60 cm)

ZW-508ZB

ZW-108ZB

ZW-108ZB

ZW-28KB
ZW-46KB

Red + 
Blue 5 V

Red (+)┐
OUTPUT
Blue DC5V
(−)┘
(+)┐
INPUT
DC24V
(−)┘
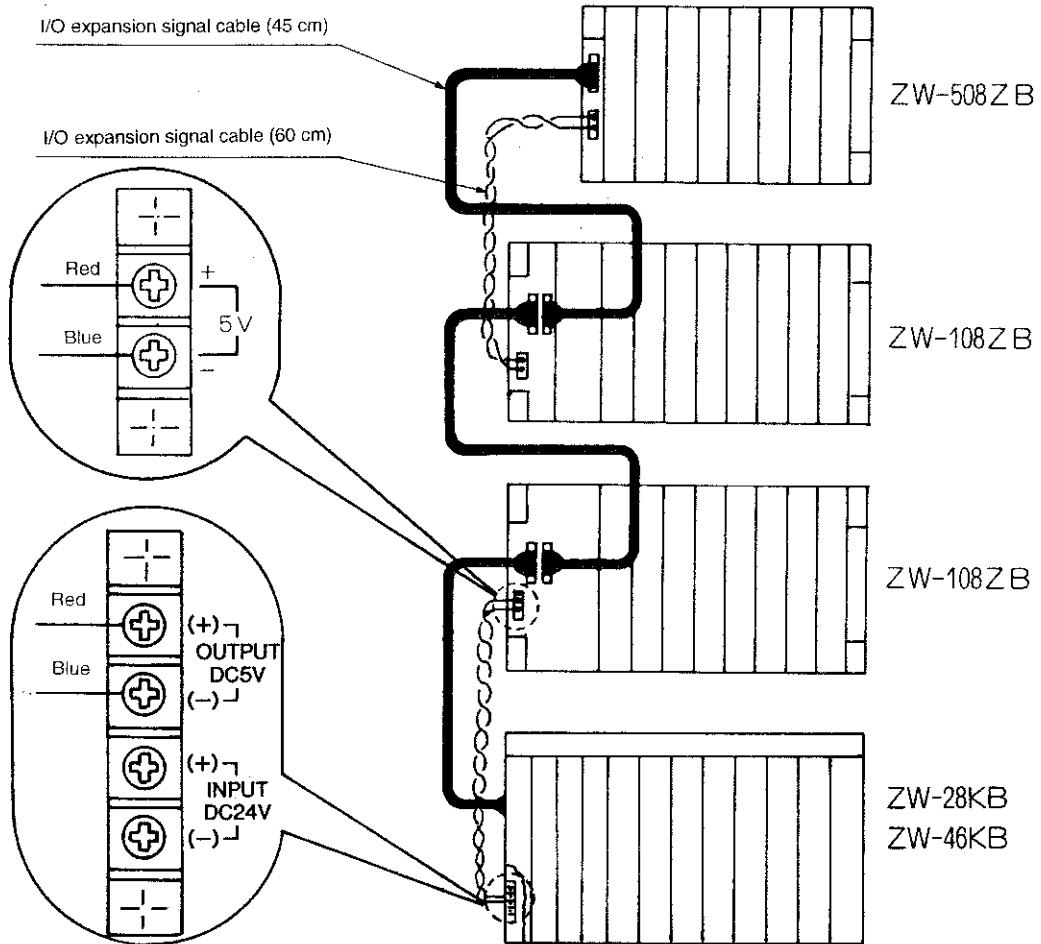
When installing expansion rack panels side-by-side, use the ZW-1KC I/O expansion signal cables. For connection to the ZW-10EU I/O expansion module, see the description in section 4-10-1.

Signal cable for expansion: ZW-1KC (1m)

5V cable for I/O expansion
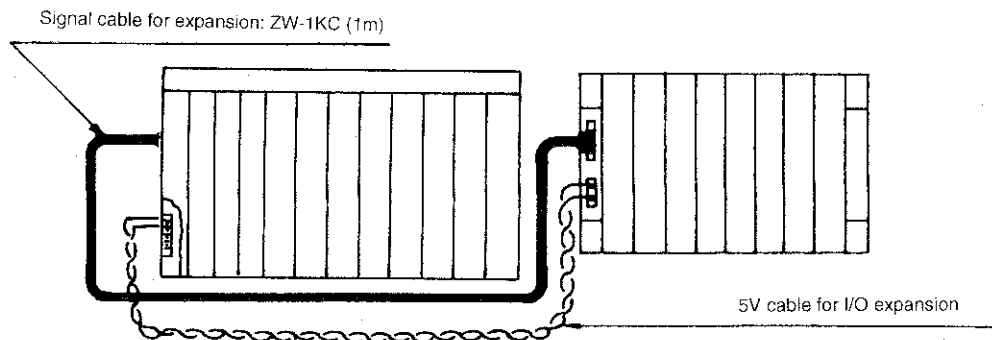
Note 1: Use wires with a thickness of KIV 1.25 or more for the I/O expansion 5V power cables.

•Connecting the I/O expansion signal cable



Reverse insertion prevention key
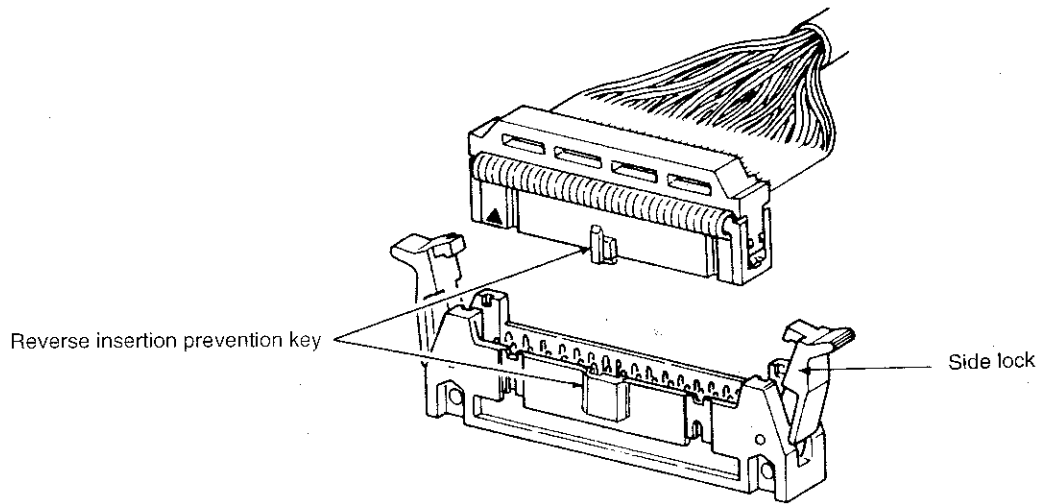
Side lock

The I/O expansion signal cable plug has a reverse insertion prevention key. After plugging the cable into its socket, lock it with the side locks.



I N                    OUT
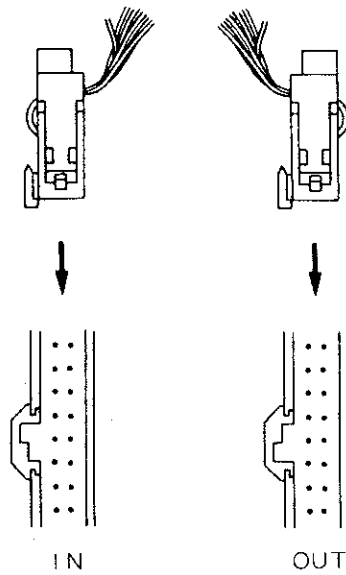
Note 1: Do not tie the I/O expansion signal and 5V power cables with the PC's input/output signal cables or power cables, nor install one in the duct or conduit where the other is installed.

# 6-6 Wiring for input and output modules

## [1] Terminal block type

Use a crimp-style terminal for every connection of external devices, such as limit switches and solenoids, to input/output modules.



M3.5
Self lock up screw

Screw torque 1.18 Nm max.
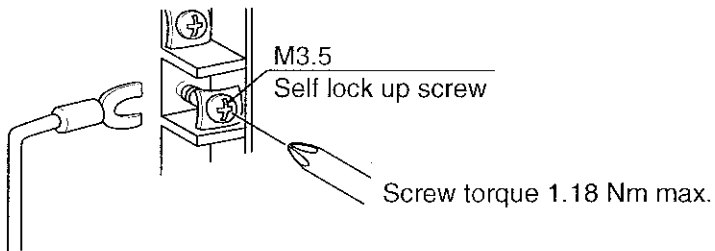
|  | JW series | ZW series | Crimp-style terminal models |
|---|---|---|---|
|  | B < 7.2<br>d2 > 3.5 | B < 7.4<br>d2 > 3.5 | 1.25-YS3A<br>2-YS3A<br>V1.25-YS3A<br>V2-YS3A |
|  | | | 1.25-3.7<br>2-S3<br>V1.25-3.7<br>V2-S3 |

After typing all wires to the terminal block, pass the wire harness through the slot between the terminal block and the I/O module's terminal block on the left.
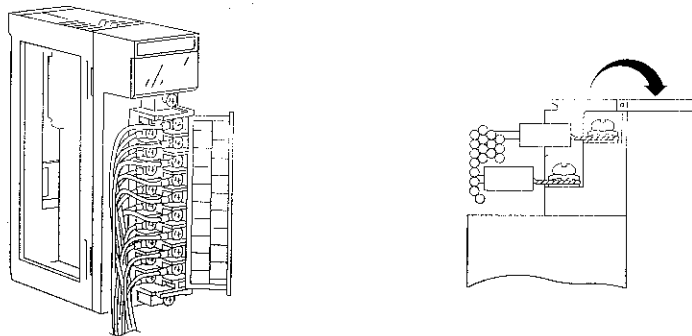


The terminal block can be detached from the I/O module with the cable wires connected.

## [2] Connector type description

(1)         (2)         (3)         (4)



Pin block: FCN-361J040-Au (Fujitsu)
Shell: FCN-360C040-B (Fujitsu)
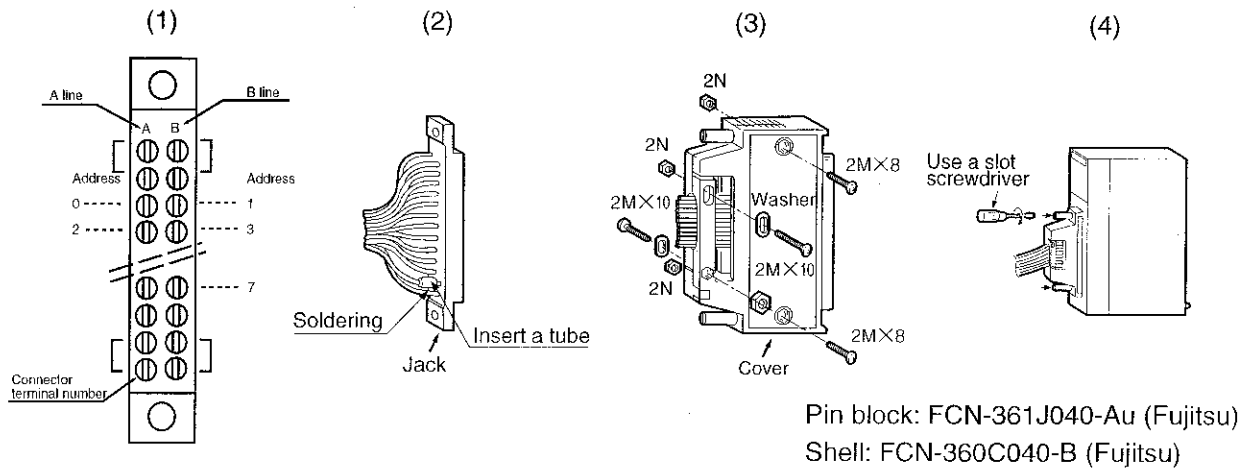
1) Address number assignments are not identical to pin number assignments. Assemble the plug with special attention paid to the address number assignments.
2) Cover every soldered wire end with an insulating sleeve.
3) Use a screwdriver to secure the cable plug to the mating receptacle on the module.

Recommended cable: Fujikura Electrical Wire Co.
18 × 7/0.18 57VV-SB (Multicore vinyl-insulated, vinyl-sheathed cable)

Note 1: If it is expected that a large current returns from an output module through the common line, use a thicker wire.

## 6-7 Wiring for 24 VDC terminal block on rack panel (for ZW-8S2/16S2/16S4)

When a DC output module (ZW-8S2, etc.) or contact output module (ZW-16S4, etc.) is used to drive DC loads, an external supply of 24 VDC must be supplied to the 24 VDC terminal block on the standard of expansion rack panel on which the module is installed.

### [1] Driving a 12 or 24 VDC load from a DC output module
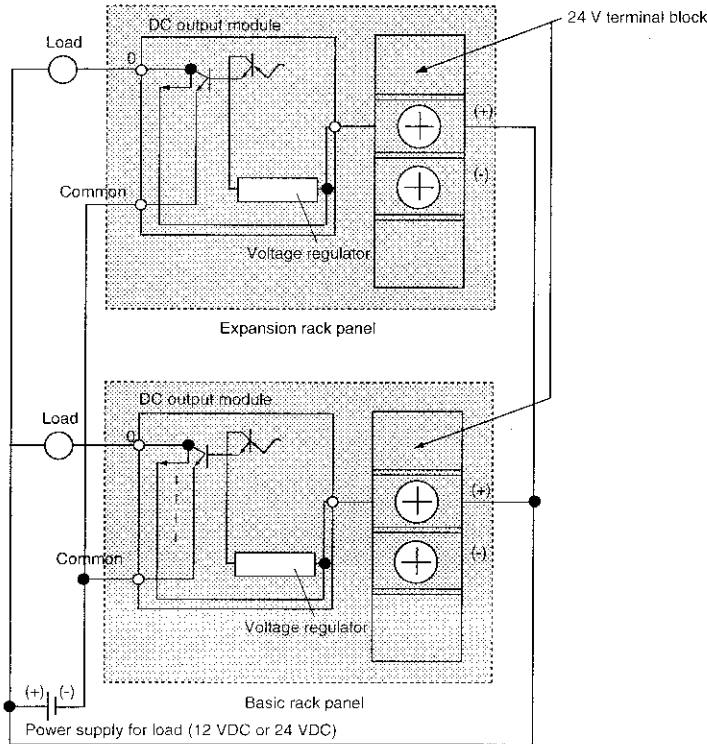


• When driving a 12 VDC load from a DC output module, the external power supplied to the 24 VDC terminal block on the rack panel must have a voltage equal to or higher than that of the load power supply.

### [2] Driving a load from a contact output module
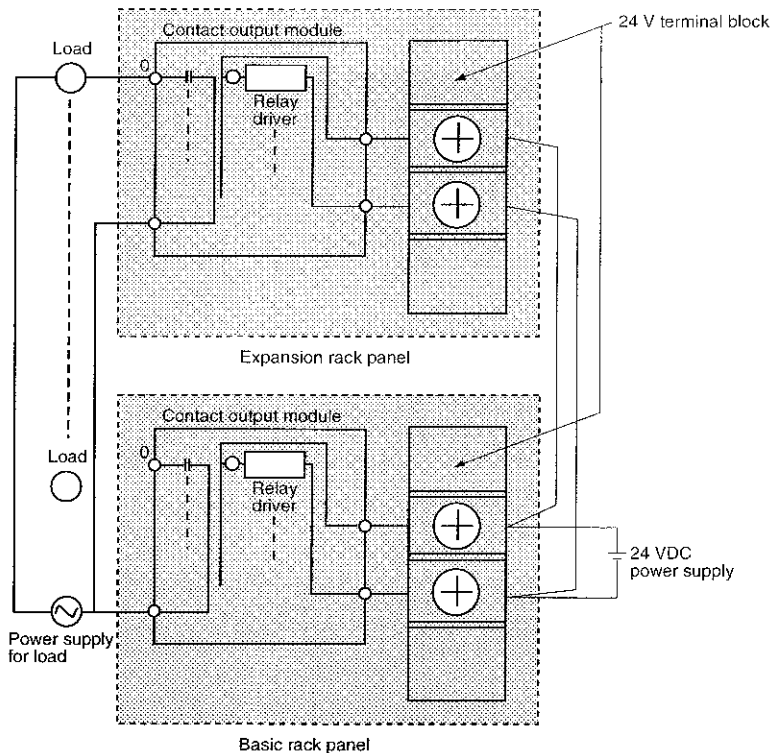


• Use a DC power source separate from the load power supply and connect it to the 24 VDC terminal block on the expansion rack panel.

## [3] Using both DC and contact output modules on the same rack panel
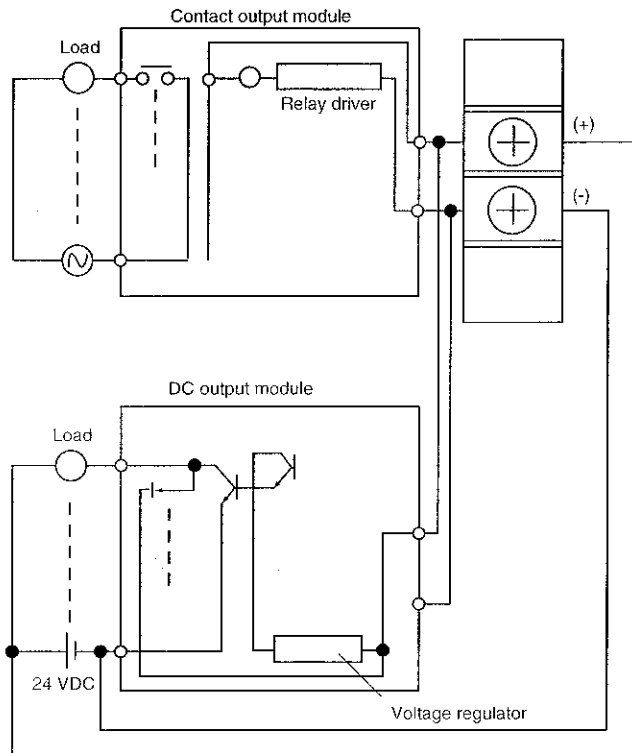


•When driving a 24 VDC load from a DC output module, connect the positive and negative terminals of the 24 VDC load power supply to the corresponding terminals of the 24 VDC terminal block on the basic or expansion rack panel.
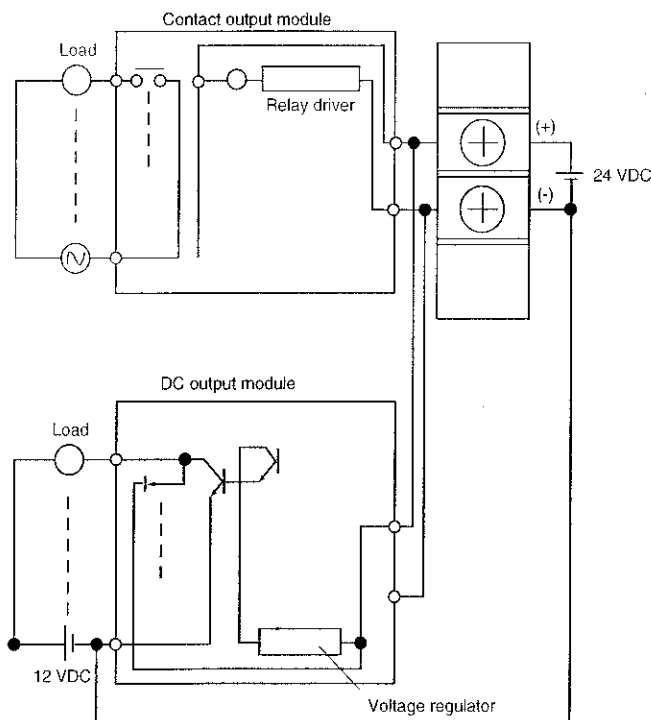


•When driving a 12 VDC load from a DC output module, connect a separate 24 VDC power source to the 24 VDC terminal block on the basic or expansion rack panel, with its negative terminal connected to the appropriate terminal of the load power supply. The 24 VDC power is required to drive the contact output module's relay coils.

Note 1: Apply a torque of 1.18N•m or less to the terminal screws.
Note 2: When using an external source separate from the load power supply, observe the precautions given in page 4-64.

# 6-8 Intercabinet cable routing examples

## [1] Example for use JW-series I/O modules (1)

The system given in this example consists of eight rack panels holding JW-series I/O modules and an I/O bus extension adapter:
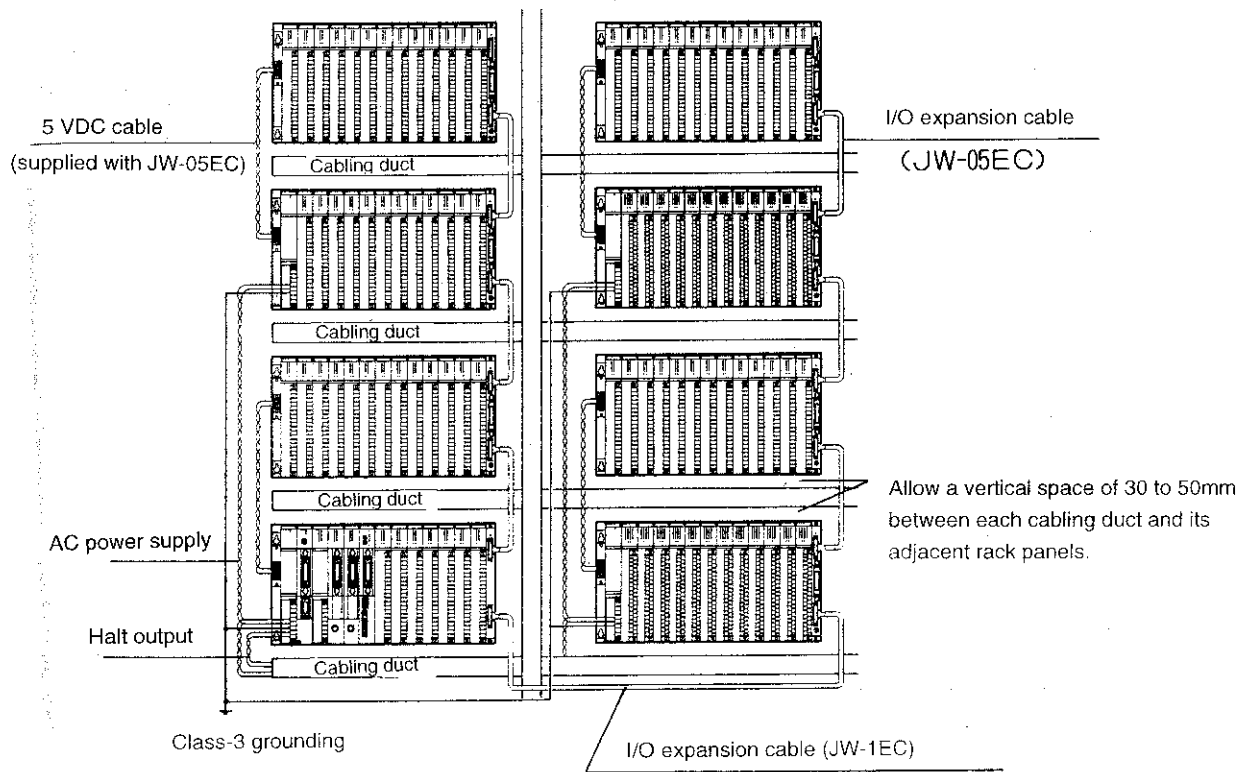


Note 1: Use the same AC line power source for all rack panels.

Note 2: DC and contact output modules require a 24 VDC power source which is separate from the load power supply.

Note 3: Do not install expansion signal cables or I/O expansion 5VDC power cables in the same duct or conduct in which the PC's I/O signal cables or power cables are installed.

Note 4: For ZW-series I/O module, do not connect more than three halt output circuits in series. If more than three circuits must be connected in series as expansion power supply module operations are monitored by the control module through the I/O expansion cables. Use only the halt output of the power supply module on the rack panel. (The halt outputs of the ZW-2PU power supply modules cannot be connected in series. Be sure to use intermediate relays.)

## [2] Example for use JW-series I/O modules (2)

The system given in this example consists of two rack panels holding JW-series I/O modules and no I/O bus expansion adapter.
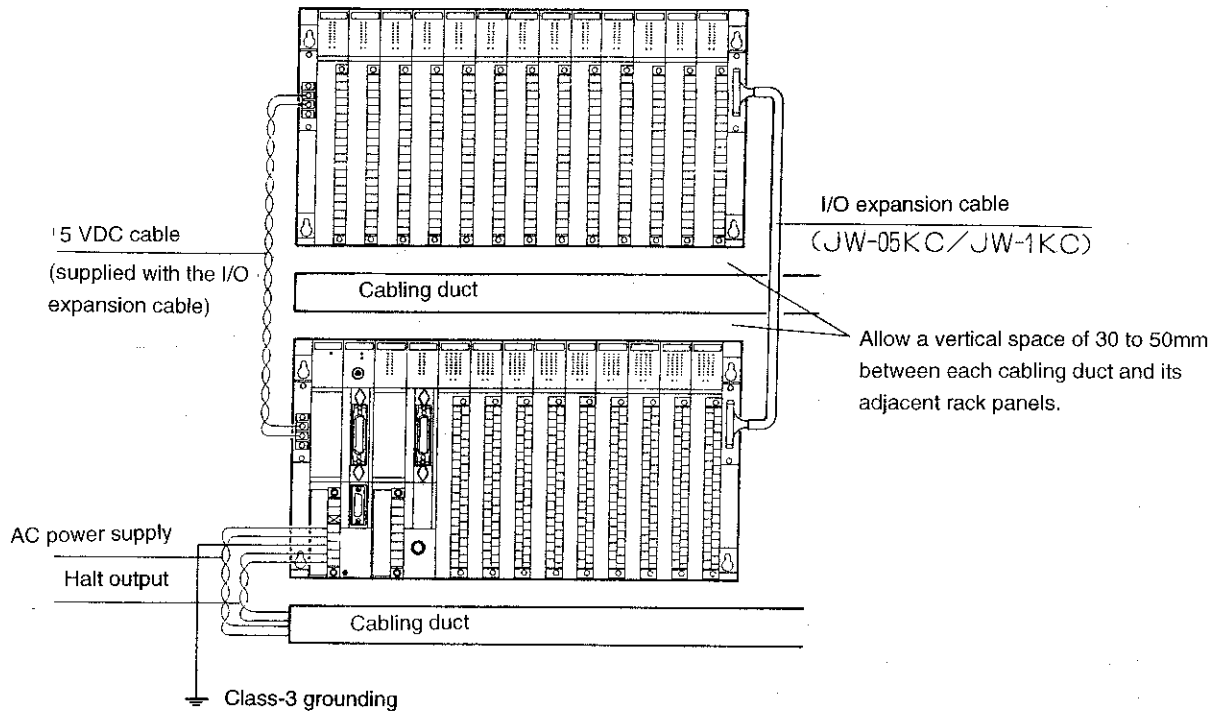


Note 1: An expansion power supply module can be installed on the expansion rack panel only if the I/O bus expansion adapter (JW-1EA/2EA) is used in the expansion port.

Note 2: Use a JW-05KC or JW-1KC I/O expansion cable to establish bus connection between the rack panels. If a cable length of more than 1 m is needed, you have to use an I/O bus expansion adapter (JW-1EA/2EA).

Note 3: DC and contact output modules require a 24 VDC power source which is separate from the load power supply.

Note 4: Do not install expansion signal cables or I/O expansion 5 VDC power cables in the same duct or conduct in which the PC's I/O signal cables or power driving lines are installed.

## [3] Example for use ZW-series I/O modules

The system given in this example consists of four rack panels holding ZW-series I/O modules :

I/O expansion signal cable

5 VDC power cable

24 VDC cable

Use the cables supplied with the expansion rack panel

Cabling duct

Cabling duct

Allow a vertical space of 30 to 50 mm between each cabling duct and its adjacent rack panels.

AC line power

To external 24 VDC power source (required when DC or contact output modules are used.)

Cabling duct

Halt output

Class-3 grounding
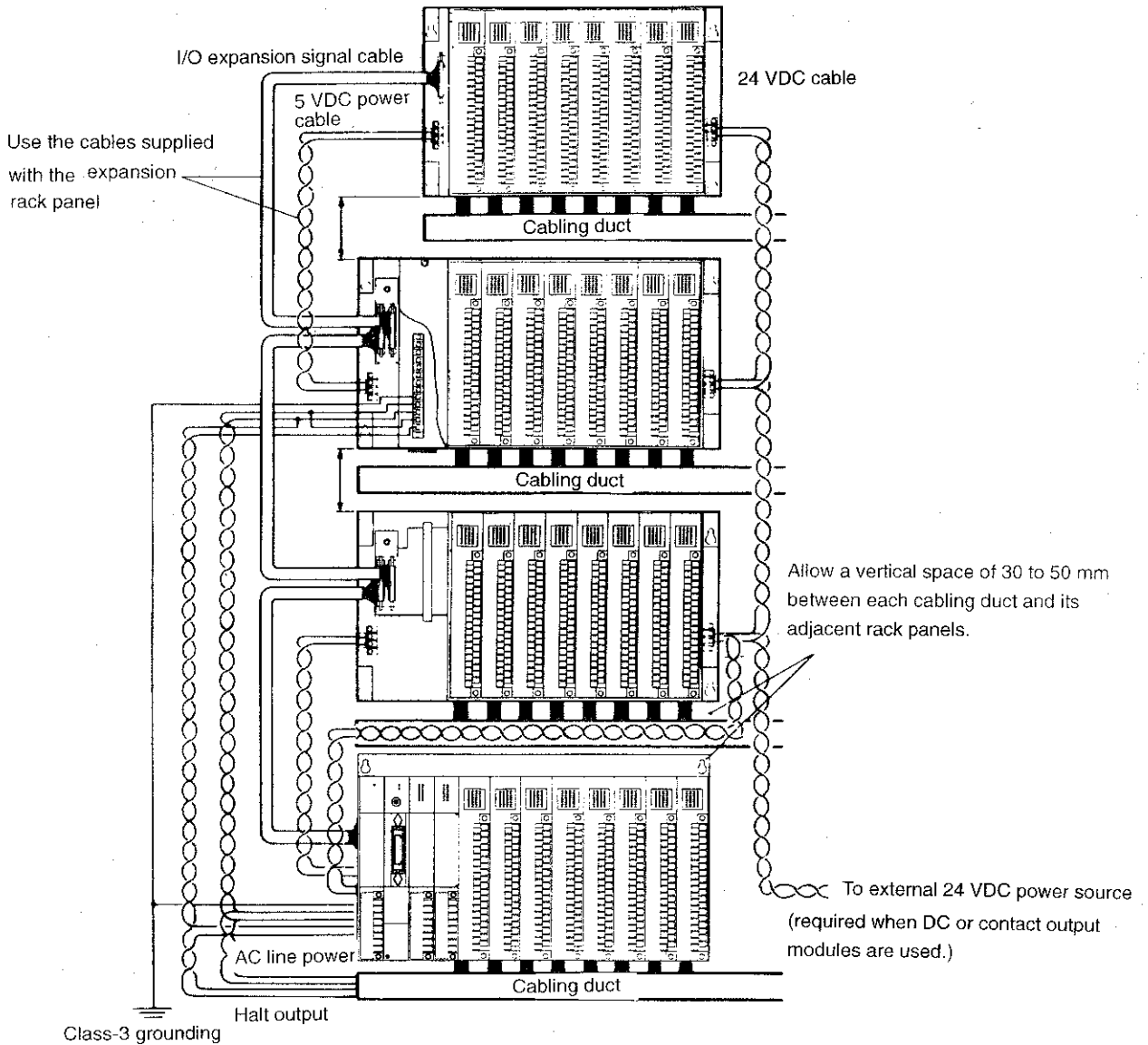
Note 1: The power module and expansion power supply module used in the system should be supplied from the same AC line power source.

Note 2: No more than three halt outputs can be connected in series. The ZW-2PU power supply module's halt output cannot be connected in series.

Note 3: When DC and/or contact output modules are to be used, prepare a 24 VDC power source which is separate from the load power supply.

Note 4: Do not install the I/O expansion signal cables and 5 VDC power cables in the same ducts or conducts where the PC's I/O signal cables or power cables are installed.

Note 5: When using the I/O expansion module, see page 4-93.

# Chapter 7. ROM operation

This chapter describes how to implement a user program or data stored in ROM. ROM operation is possible when the JW-1MA/2MA/3MA, JW-1MAH/2MAH/3MAH memory module is installed in the control module. (Note 1)

## 7-1 What is ROM operation?

ROM operation runs the programmable controller using the program or data stored in ROM. At system power-on, the user program or part of the data stored in ROM is transferred to RAM, which is then used to run the system. Since the contents of ROM are left intact power-off, the same program or data can be used repeatedly until the ROM rewritten.

> If $11_{(H)}$ is written to system memory location #0255 and ROM operation is executed on the JW50H/70H/100H, malfunctions can be prevented since :
> •The program cannot be modified (only system memory can be modified).
> •The contents of ROM are automatically transferred to RAM when they differ.

ROM operation is useful in the following cases:
1) If the PC is to be left unused for a relatively long interval. (Stored program remains intact even after backup battery is used up).
2) If you do not want to re-enter data, files, or programs.
3) If you wish access to a stored program more quickly (EEPROM allows quicker access than a floppy disk.)

There are 4 types of ROM operations depending on the set value in system memory #0255.

| Item | ROM operation | | | | See page |
|---|---|---|---|---|---|
| Set value in system memory #0255 | $00_{(H)}$ | $11_{(H)}$ (Note 2) | $22_{(H)}$ | $44_{(H)}$ | 161 164 |
| ROM to RAM transfer | Manual transfer after PC is powered ON | Automatic transfer after PC is powered ON | | | —— |
| PC mode when powered ON | Previous mode when last turned OFF | | Halt mode | Operation mode | Programming manual |
| Data memory clear when powered ON | No | | Yes | | Programming manual |
| Operation with no battery | No | | Yes | | 166 |
| Operation with battery | Yes | | | | |
| Type/mode of installed ROM | EPROM (27C512), EEPROM (AT28C64B-15PC, AT28C256-15PC) | | | | 160 |
| ROM area | Set system memory #0256 according to the type/model of installed ROM. | | | | |

Note 1: ROM operation is not available when the ZW-4MA or JW-4MAH is used for the memory module.

Note 2: Value of $11_{(H)}$ can be set when JW50H/70H/100H is used but not when JW50/70/100 is used.

## 7-2 Preparing for ROM operation

### [1] ROM types usable for ROM operation

| ROM type | ROM model | Remarks |
|---|---|---|
| EPROM | 27C512 | (250 ns) Fujitsu |
| EEPROM | AT28C64B-15PC | (250 ns) ATMEL |
| | μPD28C64C | (250 ns) NEC |
| | AT28C256-15PC | (250 ns) ATMEL |

### [2] ROM area

The address area and contents to be mapped onto ROM are defined by values stored in system memory address #0256:

*Unusable for except B version.

| Setting value | | Contents to be mapped onto ROM | | | | ROM type | ROM model | |
|---|---|---|---|---|---|---|---|---|
| Octal | Hexa-decimal | System memory | User program | Register | File 1 | | | |
| 000(8) | 00(H) | — | — | — | — | — | — | Note 1 |
| 146(8) | 66(H) | #0200 to #2177 | 3.5K words | — | — | EEPROM | AT28C64B-15PC (made by ATMEL) | |
| 167(8) | 77(H) | #0200 to #2177 | 31.5K words | — | — | EPROM | 27C512 (Fujitsu) | |
| 200(8) | 80(H) | #0200 to #2177 | 15.5K words | — | — | EEPROM | AT28C64B-15PC (made by ATMEL) | |
| 201(8) | 81(H) | #0200 to #2177 | 7.5K words | 09000 to 09777 19000 to 19777 | — | | | |
| 202(8) | 82(H) | #0200 to #2177 | 7.5K words | — | 16K bytes | | | |
| 203(8) | 83(H) | #0200 to #2177 | — | 09000 to 09777 19000 to 19777 | — | | | |
| 204(8) | 84(H) | #0200 to #2177 | — | | 31K bytes | | | |

Note 1: The default value of system memory address #0256 is 00(H), which specifies RAM operation.

Note 2: Registers 29000 through E1777 cannot be mapped onto ROM.

### [3] Type-independent ROM writing procedures

#### (1) EPROM (ROM model name : 27C512)

First transfer your program from the multipurpose programmer to the ROM programmer, then write the program into the EPROM chip set to the programmer. (See page 7-3).

Note 1: We recommend the following PROM programmer models :

| | |
|---|---|
| Ando Electric Co. | AF-9703 |
| Minato Electronics Co. | MODEL-1866A |
| Advantest Co. | TR4943 |

Note 2: For operation of the multipurpose programmer and the PROM programmer, see the user's manual supplied with the device.

Note 3: Multipurpose programmers (JW-30PG/32PG) with software versions 1.0 and 1.0A have no capability to transfer programs to a PROM programmer. The software version can be checked on the main menu.

Software version with no ROM programmer transfer function: Ver 1.0, Ver 1.0A

#### (2) EEPROM (ROM model name: AT28C64B-15PC or AT28C256-15PC)

JW50/70/100, JW50H/70H/100H                Hand-held programmer

Program transfer

RAM → EEPRAM
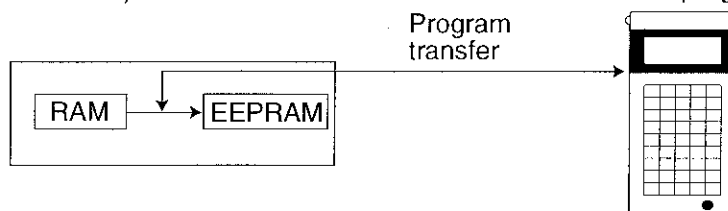
A program stored in RAM can be written into an EEPROM under control of the hand-held programmer. (See page 7-5 to 7-7.)

# 7-3 Writing a program into ROM

## [1] Procedure when using EPROM

The following describes how to use an EPROM chip (ROM model name: 27C512):

Transfer your program to the multipurpose programmer.

↓

Set up system memory address #0255 for either battery operation or battery-free operation.

↓

Set value 77(H) into system memory address #0256.

↓

Transfer the program from the multipurpose programmer to the PROM programmer.

↓

Install an EPROM chip (27C512) on the PROM programmer and write the program into it.

↓

Turn the PC power supply OFF.

↓

Remove the control module from the rack panel.

↓

*1 To next page

Multipurpose programmer
(JW-30PG/32PG/40PG/50PG
Above shown is JW-50PG.)

| System memory | Octal | Hexa-decimal | Contents |
|---|---|---|---|
| #0255 | 000(8) | 00(H) | RAM operation (operation with battery) |
| | 021(8) | 11(H) | ROM operation (previous mode when last turned OFF at power ON) |
| | 042(8) | 22(H) | ROM operation (operation without battery, halt at power ON) |
| | 104(8) | 44(H) | ROM operation (operation without battery, run at power ON) |

Note 1: When the JW50/70/100 is used, value 11(H) cannot be set to #0255. To execute ROM operation on the JW50/70/100 (with battery), set value 000(octal) and then use the hand-held programmer to perform the ROM to RAM transfer.

| System memory | Octal | Hexa-decimal | Contents |
|---|---|---|---|
| #0256 | 167(8) | 77(H) | Sets up ROM type for an EPROM (27C512) |

Note 1: When using an EPROM, do not set system memory #0256 to any value other than 77(H).

Multipurpose programmer
(JW-30PG/32PG/40PG/50PG
Above shown is JW-50PG.)

Commercial PROM programmer

Note 2: Before installing the EPROM chip on the PROM programmer, leave it in the ultra violet eraser for more than 30 minutes until its contents are completely erased.

Note 3: ROM operation is not available using the ZW-4MA, JW-4MAH memory module in the JW70/100, JW70/100H system.

Note 4: The contents of registers 29000 through E1777 cannot be transferred to ROM.

Note 1: ROM (EPROM, EEPROM) installation

Align the notches



Orient the ROM so that it is aligned with the IC socket. Check that the ROM is properly oriented and the pins are not bent.

```
┌─────────────────────────┐
│ Install the programmed  │
│ EPROM chip in the IC    │
│ socket on the memory    │
│ module (ensure correct  │
│ orientation).           │
└─────────────────────────┘
              (Note 1)
              (Note 2)
```

Note 2: Location of IC socket and location and setting of switches.
- ZW-1MA/2MA/3MA: See page 5-6
- JW-1MAH/3MAH : See page 5-8
- JW-2MAH : See page 5-9

```
┌─────────────────────────┐
│ Set the ROM/RAM switch  │
│ (SW2) on the memory     │
│ module to ROM.          │
└─────────────────────────┘
              (Note 2)
```

Slot screwdriver

```
┌─────────────────────────┐
│ Set the EPROM/EEPROM    │
│ switch(SW1) on the      │
│ memory module to ROM.   │
└─────────────────────────┘
              (Note 2)
```

Note 3: When the JW50H/70H/100H is used. Value 11(H) cannot be set to #0255 when the JW50/70/100 is used.

```
┌─────────────────────────┐
│ Install the control module │
│ onto the rack panel.    │
└─────────────────────────┘
```

```
┌─────────────────────────┐
│ Turn the PC power ON.   │
└─────────────────────────┘
```

| If 00(H) is set in #0255, the PC starts running on the RAM program. | If 11(H) is set in #0255, the PC starts running on the program transferred from ROM to RAM. (operation with battery previous mode when last turned OFF at power ON).  Note 3 | If 22(H) is set in #0255, the PC halts with ROM contents transferred to RAM. (Operation without battery) | If 44(H) is set in #0255, the PC starts running on the program transferred from ROM to RAM. (Operation without battery.) |

```
┌─────────────────────────┐
│          End            │
└─────────────────────────┘
```

## [2] Procedure when using EEPROM

The following describes how to use an EEPROM chip (ROM model name: AT28C64B-15PC or AT28C256-15PC):



Store the program and data into the PC's RAM with battery backup.

↓

Turn the PC power OFF.

↓

Remove the control module from the rack panel.

↓

Install the written EEPROM chip in the IC socket on the memory module.

(Note 1)
(Note 3)        (Note 2)

↓

Set the memory module's ROM/RAM selector switch (SW2) to RAM.

(Note 2)

↓

Set the memory module's EPROM/EEPRAM selector switch(SW1) to EEPROM.

(Note 2)

↓

Install the control module onto the rack panel.

↓

Set the contol module's memory protect switch to ON (write protect).

↓

Turn the PC power ON.

↓

Set the contol module's memory protect switch to OFF (write enable).

(Note 4)

↓

*To next page.

Note 1: ROM(EPROM, EEPROM) installation
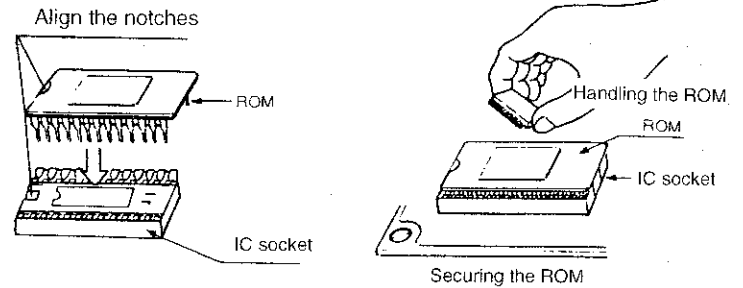
Align the notches



Handling the ROM

Securing the ROM

Orient the ROM so that it is aligned with the IC socket. Check that the ROM is properly oriented and the pins are not bent.

Note 2: Location of IC socket and location and setting of switches
- ZW-1MA/2MA/3MA: See page 5-6
- JW-1MAH/3MAH: See page 5-8
- JW-2MAH: See page 5-9



Slot screwdriver
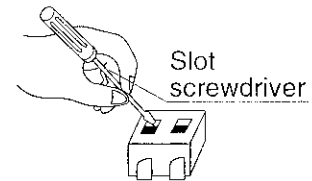
Note 3: The steps enclosed within the dotted line are needed to protect the contents of the PC's internal RAM during the power-ON performed after an already written EPROM is installed on the memory module.

Note 4:
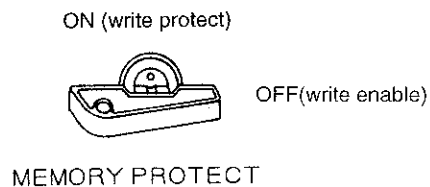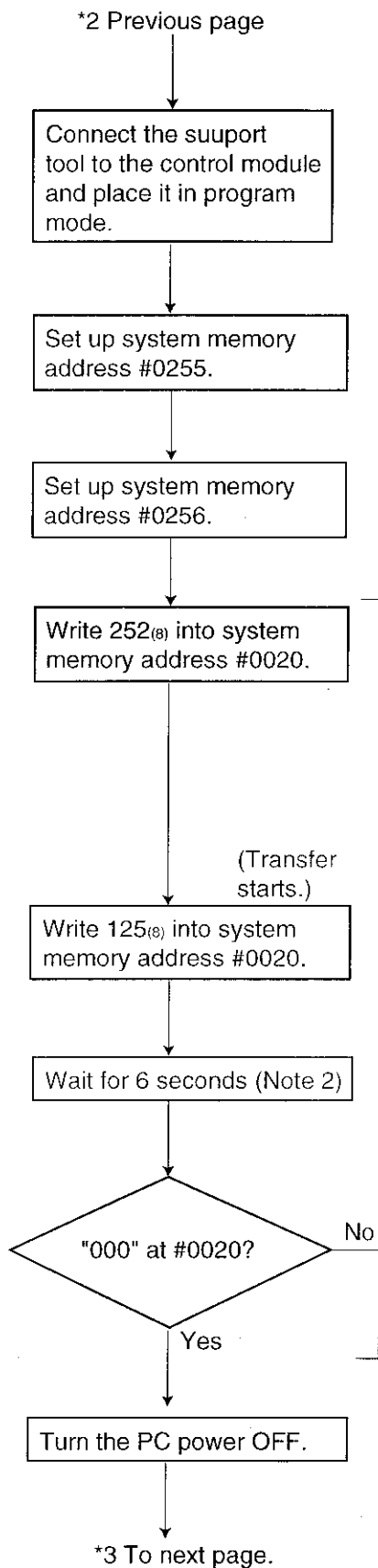
ON (write protect)



OFF(write enable)

MEMORY PROTECT

```
┌─────────────────────────┐
│ Connect the suuport     │
│ tool to the control     │
│ module and place it in  │
│ program mode.           │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Set up system memory    │
│ address #0255.          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Set up system memory    │
│ address #0256.          │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Write 252(8) into system│
│ memory address #0020.   │
└─────────────────────────┘
            │
     (Transfer starts.)
            │
            ▼
┌─────────────────────────┐
│ Write 125(8) into system│
│ memory address #0020.   │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Wait for 6 seconds      │
│ (Note 2)                │
└─────────────────────────┘
            │
            ▼
        ◇ "000" at #0020? ◇ ── No ──▶
            │
           Yes
            │
            ▼
┌─────────────────────────┐
│ Turn the PC power OFF.  │
└─────────────────────────┘
            │
            ▼
```

| System memory | Octal | Hexa-decimal | Contents |
|---|---|---|---|
| #0255 | 000(8) | 00(H) | RAM operation (operation with battery) |
| | 021(8) | 11(H) | ROM operation (previous mode when last turned OFF at power ON) Note 1 |
| | 042(8) | 22(H) | ROM operation (operation without battery, halt at power ON) |
| | 104(8) | 44(H) | ROM operation (operation without battery, run at power ON) |

Note 1: When the JW50/70/100 is used, value 11(H) cannot be set to #025. To execute ROM operation on the JW50/70/100 (with battery), set value 000(octal) and then use the hand-held programmer to perform the ROM to RAM transfer.

| | Setting value | | Contents to be mapped onto ROM | | | | ROM type | ROM model |
|---|---|---|---|---|---|---|---|---|
| | Octal | Hexa-decimal | System memory | User program | Register | File 1 | | |
| System memory address #0256 | 000(8) | 00(H) | — | — | — | — | — | — |
| | 146(8) | 66(H) | #0200 to #2177 | 3.5 K words | — | — | EEPROM | AT28C64B-15PC (ATMEL)* |
| | 167(8) | 77(H) | #0200 to #2177 | 31.5 K words | — | — | EPROM | 27C512 (Fujitsu) |
| | 200(8) | 80(H) | #0200 to #2177 | 15.5 K words | — | — | EEPROM | AT28C256-15PC (ATMEL)* |
| | 201(8) | 81(H) | #0200 to #2177 | 7.5 K words | 09000 to 09777 19000 to 19777 | — | | |
| | 202(8) | 82(H) | #0200 to #2177 | 7.5 K words | — | 16K bytes | | |
| | 203(8) | 83(H) | #0200 to #2177 | — | 09000 to 09777 19000 to 19777 | — | | |
| | 204(8) | 84(H) | #0200 to #2177 | — | — | 31K bytes | | |

Note 2: Do not operate the programmer's keys until value "000" or "001" is displayed for address #0020. Using hand-held programmer, operate the exclusive operation for writing a program to an EEPROM. A display isn't changed by writing directly a system memory.

```
┌─────────────────────────┐
│ "001" at #0020. (Note 3).│
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Replace EEPROM chip and │
│ retry progam transfer.  │
└─────────────────────────┘
```

Note 3: Value "001" indicates that an error was detected by a read-after-write test on the ROM.

```
┌─────────────────────┐
│ Remove the control  │
│ module from rack    │
│ panel.              │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ Set memory module's │
│ ROM/RAM switch (SW2)│
│ to ROM.             │
└─────────────────────┘
        (Note 1)
        (Note 2)
           │
           ▼
┌─────────────────────┐
│ Set memory module's │
│ EPROM/EEPROM        │
│ selector switch     │
│ (SW1) to EEPROM.    │
└─────────────────────┘
        (Note 1)
           │
           ▼
┌─────────────────────┐
│ Replace the control │
│ module on the rack  │
│ panel.              │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ Turn the PC power ON.│
└─────────────────────┘
```

Note 1: Location and setting of switches
  •ZW-1MA/2MA/3MA : See page 5-6
  •JW-1MAH/3MAH : See page 5-8
  •JW-2MAH: See page 5-9

Slot screwdriver

Note 2: If ROM/RAM selector switch (SW1) is set to the ROM position, the memory protect switch becomes ineffective in disabling program transfer from ROM to RAM.

| If 00(H) is set in #0255, the PC starts running on the RAM program. | If 11(H) is set in #0255, the PC starts running on the program transferred from ROM to RAM. (operation with battery previous mode when last turned OFF at power ON). Note 3 | If 22(H) is set in #0255, the PC halts with ROM contents transferred to RAM. (Operation without battery) | If 44(H) is set in #0255, the PC starts running on the program transferred from ROM to RAM. (Operation without battery.) |

```
┌─────────────────────┐
│         End         │
└─────────────────────┘
```

Note 3: JW50/70/100 is used. When the JW50/70/100 is used, value 11(H) cannot be set #0255.

# 7-4 ROM operation method

ROM operation is possible with or without a backup battery.
See page 7-10 for details on the operation without battery.

## [1] ROM operation with backup battery

If the following conditions are set on the JW50H/70H/100H, ROM operation is automatically executed with battery when the power is turned ON. This type of ROM operation is not possible on the JW50/70/100.

•Only in case of JW50H/70H/100H

| Item | Contents |
|---|---|
| ROM chip | Installed |
| ROM-RAM switch | ROM side |
| Memory protect switch | Invalid |
| System memory address #0255 | $11_{(H)}$ |
| System memory address #0256 | ROM type specified |

## [2] ROM operation without backup battery

If the following conditions are set on the JW50/70/100 or JW50H/70H/100H, ROM operation is automatically executed without battery when the power is turned ON.

| Item | Contents |
|---|---|
| ROM chip | Installed |
| ROM-RAM switch | ROM side |
| Memory protect switch | Invalid |
| System memory address #0255 | $22_{(H)}$, $44_{(H)}$ |
| System memory address #0256 | ROM type specified |

Note 1: At power ON, the control module performs a self-diagnosis on ROM-to-RAM program transfer. If a FAULT indicator comes on when the system is turned ON for ROM operation, take the necessary action by referring to the programming manual, section 2-8, "Self-diagnosis".

Note 2: The battery-free operation mode is selectable when a backup battery is installed.

## [3] Initial ROM operation sequence at power ON

Power ON

↓

Check ROM-RAM switch on memory module.

↓

ROM position? ── Yes ──→

↓ Yes

Check memory protect switch.

↓

OFF? ── Yes ──→

↓ No

ON

OFF

MEMORY PROTECT

Check address #0255. (Check the ROM address #0255.)

↓

11(H) or 22(H) or 44(H)? ── No ──→

↓ Yes

Check address #0256. (Check the ROM address #0256.)

↓

ROM type code exists? ── (right) ──→ RAM operation

↓

ROM operation

↓

ROM to RAM transfer

↓

11(H)? ── Yes ──→

↓ No

Clear data memory

↓

Start operation
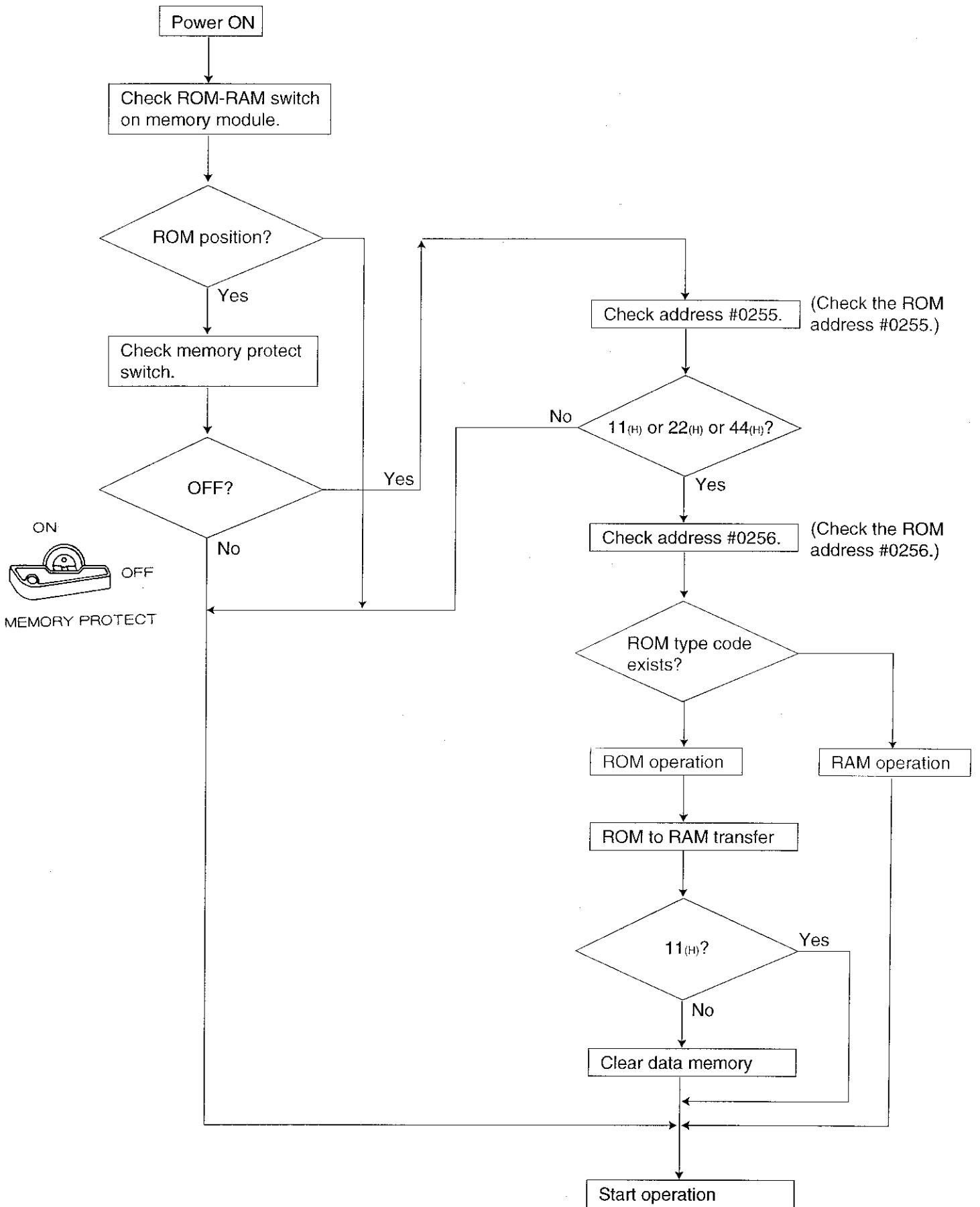
# 7-5 Battery-free operation

## [1] What is battery-free operation?

When a ROM chip storing the user program is installed, the PC can be operated without a RAM backup battery.

Requires backup battery.

Requires no backup battery.
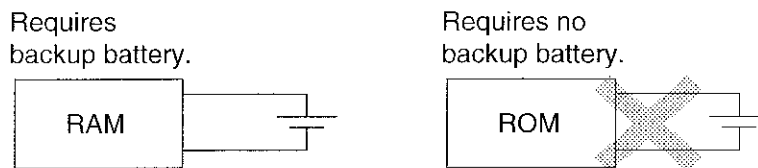


## [2] Precautions for battery-free operation

Battery-free operation is possible if your system meets all of the following conditions :

(1) At power ON, the program must be transferred from ROM to RAM. The total overhead required is approximately 4 seconds, including the program transfer time (approx. 2 sec. for 7.5 K-word program). (For RAM operation, this overhead is shortened to approx. 2 sec.)

(2) All differentiation memories are set.

(3) All latch relays are reset.

(4) The contents of all counters, timers, and registers are cleared.

(5) The contents of file registers become indefinite (not cleared). However, if the data for file registers are stored in ROM ($202_{(8)}$ or $204_{(8)}$ set in #0256), they will be transferred from ROM to the file registers at power ON.

(6) The real time clock stops functioning at power OFF. It restarts functioning with-year-month-data-hour-minute-second at a subsequent power ON.

(7) The data for the latched relays, current values of the counters, registers and file registers are not saved whenever power is interrupted.

## [3] ROM types usable for battery-free operation

For battery-free operation, the user program must first be written into a ROM chip. The ROM programming and system setup procedures differ depending on the ROM type and model you use. EPROM or EEPROM can be used.

**Usable ROM types**

| ROM type | Model | Remarks |
|---|---|---|
| EPROM | 27C512 | Fujitsu (250 ns) |
| EEPROM | AT28C64B-15PC* | ATMEL(250 ns) |
|  | $\mu$ PD28C64C | NEC (250 ns) |
|  | AT28C256-15PC | ATMEL(250 ns) |

* Unavailable for except B version.

Numbers given in parentheses indicate access time.

Note: Battery-free operation is not possible using the ZW-4MA or JW-4MAH memory module.

## [4] Procedure for battery-free operation

Prepare for battery-free operation in the following manner :

```
┌─────────────────────┐
│ Turn the PC power OFF.│
└─────────────────────┘
           │
           ▼
┌─────────────────────────┐
│ Install the ROM chip     │
│ programmed for battry-free│
│ operation onto the memory │
│ module and set memory     │
│ module switch as described│
│ under "ROM operation".   │
└─────────────────────────┘
           │
           ▼
┌─────────────────────────┐
│ Remove the battery cell  │
│ from the battery holder and│
│ unplug the battery harness│
│ plug from the connector  │
│ (CN5) on the CPU board.  │
└─────────────────────────┘
           │
           ▼
┌─────────────────────────┐
│ Install the battery-free │
│ operation plug on CN5.   │
└─────────────────────────┘
           │
           ▼
┌─────────────────────────┐
│ Replace the control module│
│ on the rack panel.       │
└─────────────────────────┘
           │
           ▼
┌─────────────────────────┐
│ Turn the PC power ON.    │
└─────────────────────────┘
```

| | Octal | Hex | Contents |
|---|---|---|---|
| System memory address #0255 | 042(8) | 22(H) | ROM operation (battery-free operation, halt at power ON) |
| | 104(8) | 44(H) | ROM operation (battery-free operation, run at power ON) |

Note 1: Battery-free operation is not possible unless value 22(H) or 44(H) is set in system memory address #0255. Since the contents of address #0255 are also stored into ROM, they must be set before the ROM chip is programmed.



Battery

Battery free operation plug

Note 2

If 22(H) is set in #0255, the PC halts with ROM contents transferred to RAM.

If 44(H) is set in #0255, the PC starts running on the program transferred from ROM to RAM.

End
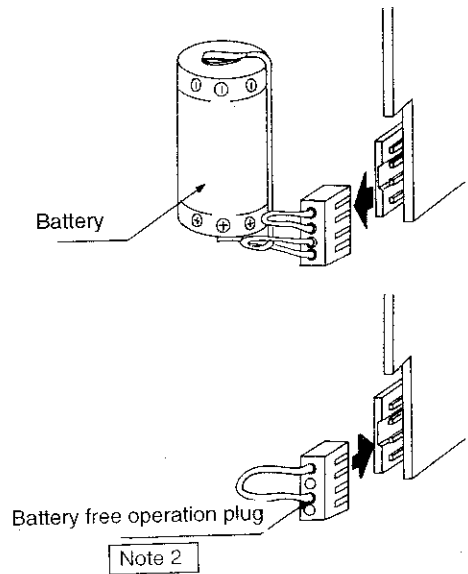
Note 1: After disconnecting the battery from CN5, be sure to install the battery-free operation plug on it in place of the battery harness plug. Otherwise a battery error will occur, in which case error code "22" is written into system memory locations #0160 to #0167, with special relay 07372 activated.

Note 2: Normal PC operation can ne continued by ignoring a voltage dip. The default voltage dip detection interval is 10ms. You can vary this interval over the range from 0 to 255 ms by setting the appropriate value into system memory address #0246, although the available range may be limited depending on the number of I/O and/or option modules used in the system. For details on setting system memory, see the programming manual, section 2-4-5, "Control module function setting area."

Note 3: In the battery-free operation mode, the contents of the counters, registers, and file registers, and the status of the latch relays will not be maintained against power failure.

The JW-series programmable controllers have upward compatibility with the conventional W-series PCs(W10/16/51/100/70H/100H). A program written for a W-series PC and be transferred to the JW-series PC and executed on it. Some restrictions exist, however, due to the difference in the number of I/O points and the I/O format:

| W100 W70H W100H | → | Support tool (See the following table) | → | JW50/70/100 JW50H/70H/100H |

(Direct transfer)

| W10 W16 W51 | → | Support tool (See the following table) | → | JW50/70/100 JW50H/70H/100H |

(Transfer after program conversion)
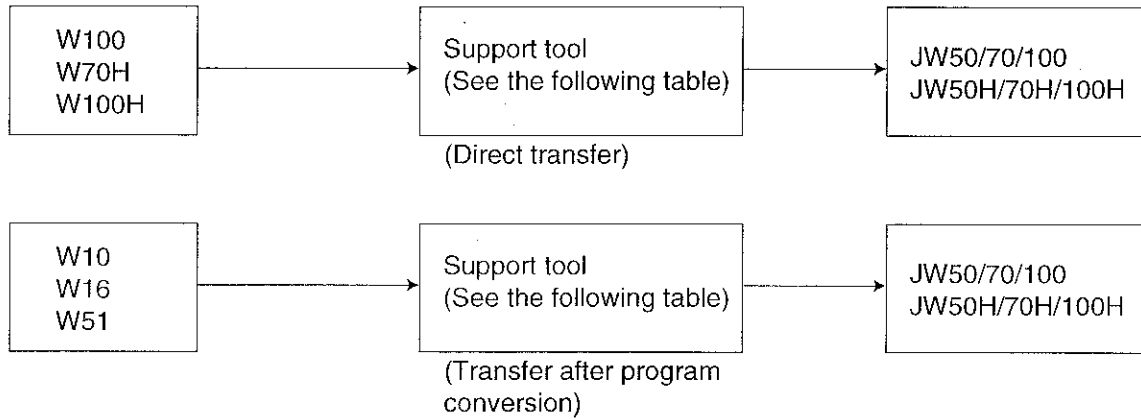
## [1] Usable support tool

Any of the following support tools can be used for program transfer.

| Model name | Support tool type |
|---|---|
| JW-50SP JW-100SP | Ladder software |
| JW-30PG | Multipurpose programmer |
| JW-32PG | |
| JW-40PG | |
| Z-100LP2S | Ladder processor II |

## [2] Notes on program transfer

Before transfering a program to the JW-series PC, check to make sure the following things.

1) Capacity mathcing

The PC's program memory capacity and/or the number of I/O points exceed those of the source PC.

| JW PC | Memory module | Progam memory capacity | File register capacity | No. of I/O points |
|---|---|---|---|---|
| JW50 JW50H | ZW-1MA, JW-1MAH | 7.5K words | 16K bytes | 512 points |
| JW70 JW70H | ZW-1MA, JW-1MAH | 7.5K words | 16K words | 1024 points |
| | ZW-2MA, JW-2MAH | 15.5K words | 64K words | |
| | ZW-3MA, JW-3MAH | 31.5K words | 128K words | |
| | ZW-4MA, JW-4MAH | 63K words | 448K words | |
| JW100 JW100H | ZW-1MA, JW-1MAH | 7.5K words | 16K words | 4096 points |
| | ZW-2MA, JW-2MAH | 15.5K words | 64K words | |
| | ZW-3MA, JW-3MAH | 31.5K words | 128K words | |
| | ZW-4MA, JW-4MAH | 63K words | 448K words | |

Note : If the source (W series) PC's program memory capacity and/or the number of I/O points exceed those of the destination (JW-series) PC, transfer will not occur due to a "Memory capacity mismatch" error.

2) Program transfer from JW-series PC to W-series PC

The JW-series PCs feature system memory and some expansion application instructions which are not available on the W series PCs. A program containing application instructions which are not included in the W-series PC.

Only a program written using functions available on the destination PC can be transferred.

| W100<br>W70H<br>W100H | ← | Support tool | ← | JW50/70/100<br>JW50H/70H/100H |
|---|---|---|---|---|
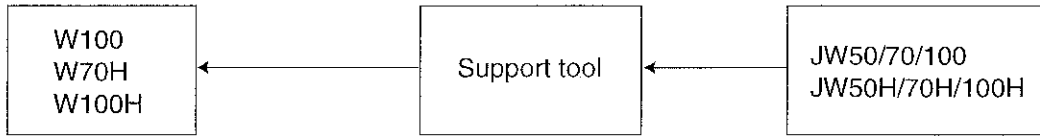
3) Transfer between JW50/70/100 and JW50H/70H/100H

Compared to the JW50/70/100, the JW50H/70H/100H features additional functions, such as some of the application instructions. The transfer operation shown below is limited to programs which do not exceed the range of functions provided by the JW50/70/100.

| JW50/70/100 | ← | Support tool | ← | JW50H/70H/100H |
|---|---|---|---|---|
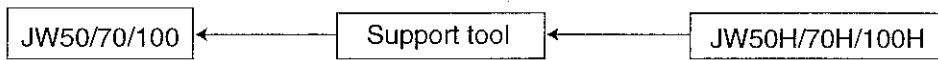
4) Differences between the JW-series PCs and the W100

The W100 has some differences from the JW-series PCs and its program requires the following modifications before this can be transferred to the JW-series PC:

(1) If an unused I/O address area exists between the OUT1 and OUT2 areas used by the W100 PC program:

*When the JW-series PC is in the ZW-I/O mode (control module's DIP switch SW2-2 set to OFF), I/O relay addresses in OUT2 area require modifications.

|   | W100's I/O address allocation | Countermeasure |
|---|---|---|
| 1 | Program using only OUT1 area<br>OUT1 — 00000, Address area used, 02000<br>OUT2 | Not necessary for countermeasure |
| 2 | Program using only OUT1 area<br>OUT1 — 00000, 02000<br>OUT2 | Not necessary for countermeasure<br>Note 2 |

Note 1: Using the I/O expansion module makes an area similar to OUT2 area available. See page 4-93, "I/O expansion module" of this manual.

Note 2: The JW50/70, JW50H/70H control modules do not allow this type of use, as they have max. 1024 I/O points.

| ZW100's I/O address allocation | Countermeasure |
|---|---|
| Unused I/O relay area exit between OUT1 and OUT2 area:  | Relocate OUT2 area as shown: Note 1  Note 2 |
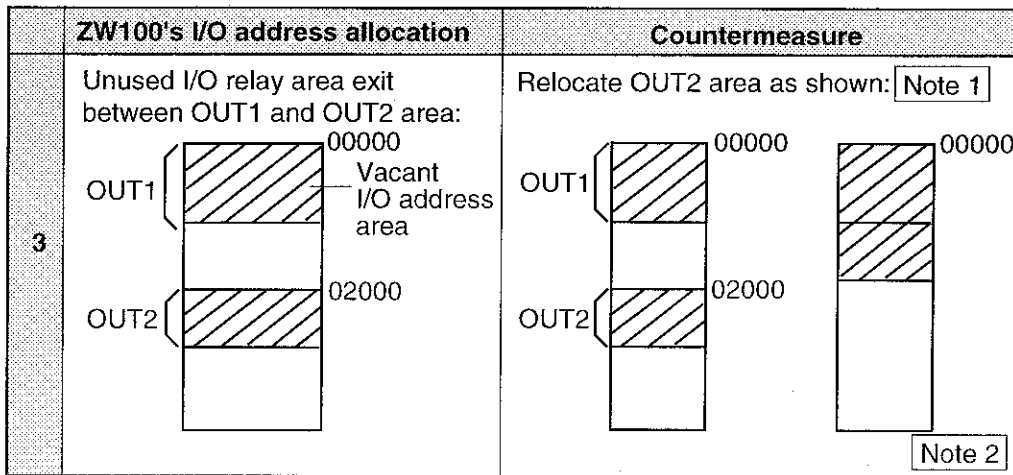
Note 1: Use the ladder processor II to relocate the programmed I/O address space.

Note 2: If the I/O expansion module is used in the ZW-I/O mode, relocation of the I/O address area is not necessay since a dummy area can be defined. For more details, see page 4-93.

(2) Allowable voltage interruption time

The JW-series PCs have a power lapse detection interval setting feature which must be set in system memory address #0246. Write $012_{(8)}$ for an interval of 10ms into address #0246.

| System memory | Setting value |
|---|---|
| #0246 | $012_{(8)}$ |

## [3] Program transfer procedure (ZW to JW)

It is not possible to directly transfer a program written for a W-series PC to the JW-series PC. First load the source system's program into a support tool, then trasnfer it to the destination PC.



Load the source program into the support tool.

Transfer the program to the destination PC.

W series PC
(W10/W16/W51
W100/W70H/W100H)

Support tool
(The following diagram is
the JW-50PG)

Support tool
(The following diagram is
the JW-50PG)

JW50/70/100, JW50H/70H/100H
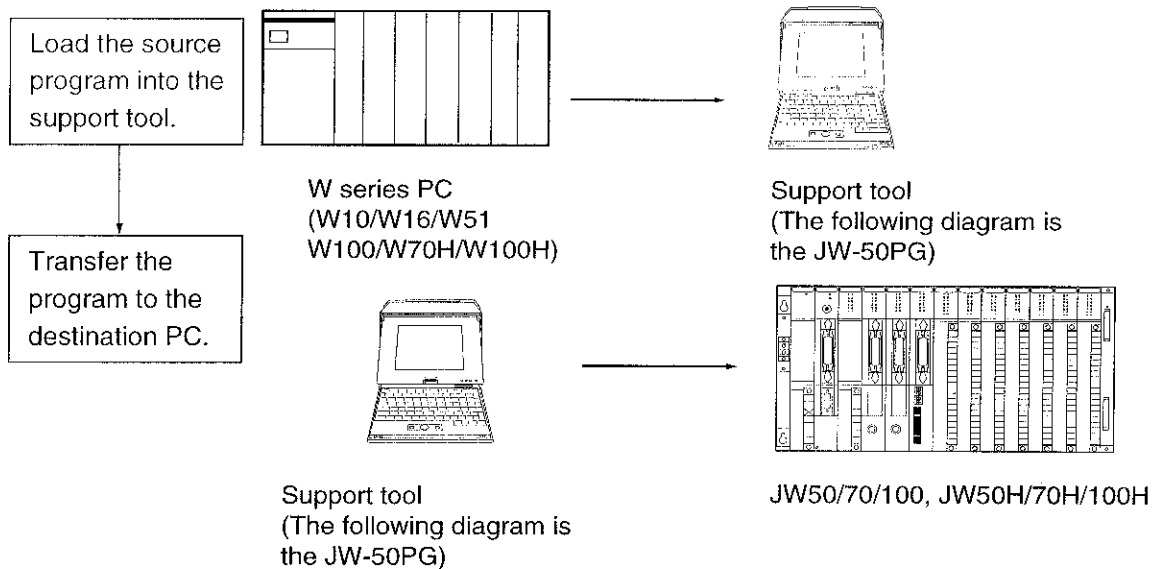
For more details on program transfer procesures, refer to the instruction manual for each support tool.

## 9-1 Periodical check

After all connections to and within the PC have been completed, go through the following checklist before powering-up:

```
Check power
connections.
      │
      ▼
Check I/O cable
connections.
      │
      ▼
Check I/O expansion
cable connections.
      │
      ▼
Check ground
connections.
      │
      ▼
Check power supply
module's line voltage
selection.
      │
      ▼
Check installation of
battery or battery-
free operation plug.
      │
      ▼
Check fuses.
      │
      ▼
Check primary AC
and DC (24V) supply
voltages.
      │
      ▼
Check halt output
circuit operation.
      │
      ▼
Power ON.
```

| No. | Item | Check |
|-----|------|-------|
| 1 | Power and I/O line connection check | • Are all cable connections correct?<br>• Are all terminal screws firmly tightened?<br>• Are all cables firmly secured to the rack panels?<br>• Are power supply wires twisted together?<br>• Do wire sizes meet the specifications? |
| 2 | I/O expansion cable connection check | • Are all expansion cables interconnecting the rack panels properly connected and clamped? |
| 3 | Ground check | • Is the PC frame properly grounded to class-3 grounding?<br>• Verify that it does not share the same ground with high-power equipment. |
| 4 | Power supply module's primary voltage selection check | • Is the power supply module's primary voltage selector set to the position that corresponds to the primary supply voltage? |
| 5 | Memory module installation check | • Is the memory module installed in the control module?<br>• Is the ROM chip for ROM operation installed? |
| 6 | Battery or battery-free operation plug installation check | • Is a battery cell installation in control module's battery holder and properly connected? (for RAM operation)<br>• Is the battery-free operation plug installed on the CPU board battery connector? (for battery-free operation) |
| 7 | Fuse check | • Verify that none of the fuses in the power supply and I/O modules are burnt through or damaged. |
| 8 | Halt output circuit check | • Is the HALT signal properly included in the shut-off sequence external to the PC? |
| 9 | Supply voltage check | • Verify that the primary source voltages are within the following ranges:<br>(AC line power)<br>100 VAC: 85 to 132 VAC<br>200 VAC: 170 to 264 VAC<br>(DC power supply)<br>24 VDC: 20.4 to 32.0 VDC<br>(I/O module's a external power source)<br>Check the voltage of the external power source used for DC or conatct output modules (ZW-16S2, etc.) |

Note: The tolerance of the supply voltage for the expansion power supply module is 100 VAC + 10% to 15% or 200 VAC +10% to 15%.

## 9-2 Test run procedure

After all checks described in the previous section are completed, start a test run in the following manner :

**Power ON.**

1) Check the primary supply voltage.
2) Check the voltages of external power sources for I/O modules.
3) Set the control module's memory protect switch OFF.
4) Connect the support tool to the control module or the I/O bus extension adapter.
5) Power-up the system.
6) Verify that the power supply module's "POWER"LED's indicator comes ON.

**System memoy setting and memory clear**

See the programming manual, section 2-6, "System memory setting and memory clear."

**I/O cabling check.**

1) To check output connections, forcibly turn the output circuits ON and OFF using the hand-held programmer in the change mode. | Note 1 |
2) To check input connections, use the indicator lights on the input modules or the programmer's monitor feature.

| Note 1 | When forcibly turning output circuits ON or OFF, set the setting value change switch (07365) to ON.

Always open

┤/├────◯ Setting value change switch
07366          07365

**Programming**

1) Program the CPU board from the hand-held programmer.
2) If your progam is already stored in the multi-purpose programmer and the like, transfer it to the CPU board.

| Note | All programming should be done with the backup battery installed in the control module.

**Test run**

1) Verify that the "RUN" indicator comes ON.
2) Check the operation sequence.

**Program debugging**

1) Correct the program if needed.

**Program saving**

1) Save the program to a cassette tape or floppy disk or write it into ROM (EPROM or EEPROM). | Note 2 |
2) List the program (ladder diagram and list) on the printer.

| Note 2 | Be sure to label the saving medium with the PC model, program capacity, facility name, data, and other necessary information.

**End**

9-2

# 9-3 Live I/O replacement

The PC's "Live I/O replacement" feature allows you to replace I/O modules with th system power left ON.

[1] Entering the live I/O replacement mode

With the hand-held programmer connected to th support tool port of the control module or I/O bus extension adapter (JW-2EA), key in:

| ✳ | ✳ | 6 | SET 8 |

The PC has now entered the live I/O replacement mode, wherein:

• The PC stops all I/O and operational processing.
• The halt output circuit is left turned ON. (closed).
• The RUN indicator alternately flashes (for approx. 0.8 sec.) and comes on (for approx. 0.8 sec.).
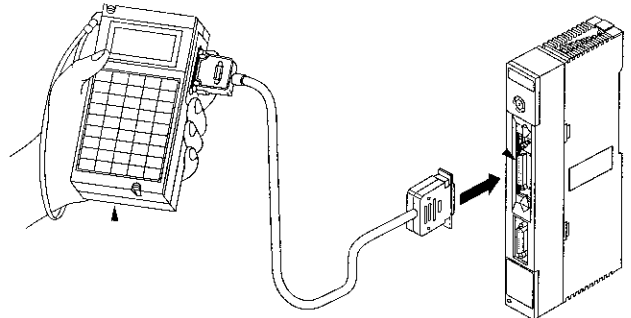
You can now replace any I/O module.

Note : Special I/O modules cannot be replaced in the live I/O replacement mode.

[2] Resuming system operation

After completing I/O module replacement, resume system operation from the support tool by typing:

| ✳ | ✳ | モニタ MNTR | SET 8 |

The support tool returns to the monitor mode.

Note : Only one support tool can be connected to the system, even if more than one rack panel is used in the system.

[3] Usable support tool

| Type | Model name |
|---|---|
| Hand-held programmer | JW-10PG/11PG/12PG/13PG/14PG |

# Chapter 10. Support tool operation

The support tools are used to create, monitor or modify programs for the PC. The various tools which support the functions of the control modules are listed below.

| Control module | Support tool | | | | |
|---|---|---|---|---|---|
| | Hand-held programmer | | | Multi-purpose programmer | |
| | JW-10PG | JW-11PG | JW-12PG/13PG/14PG | JW-30PG/32PG | JW-40PG/50PG |
| JW-50CU | | | | | |
| JW-70CU | △ | ○ | ○ | ○ | ○ |
| JW-100CU | | | | | |
| JW-50CUH | | | | | |
| JW-70CUH | △ | ○ | ○ | △ | ○ |
| JW-100CUH | | [Note 1] | | | |

| Control module | Support tool | | | |
|---|---|---|---|---|
| | Programmer | Ladder processor II | Ladder software | |
| | ZW-101PG1 | Z-100LP2S | JW-50SP | JW-100SP |
| JW-50CU | | | | |
| JW-70CU | △ | ○ | ○ | ○ |
| JW-100CU | | [Note 2] | | |
| JW-50CUH | | | | |
| JW-70CUH | △ | △ | ○ | ○ |
| JW-100CUH | | [Note 2] | | |

○ : Can be used.

△ : Can be used within the functional range of the support tool.
   (For example, if the JW-30PG/32PG is used for the JW-50CUH/70CUH/100CUH, the newly added instructions and functions on the JW50H/70H/100H will not be supported.)

Note 1: The circle only for the high-speed compatible version. The triangle for all other versions. (See the next page.)

Note 2: Installation of the expansion module (Z-3LP2EM) to the Z-100LP2S is required.

Note : Exercise care when displaying TMR/CNT 1000 to 1777 are shared with general-purpose relays 13000 to 14777.

| Setting of system memory #0201 | H-series compatible support tools | Other support tool |
|---|---|---|
| 512 timer and counter points | Displays as 13000 to 14777. | Incorrectly displayed. |
| 1024 timer and counter points | Correctly displayed | |

Note : When the system memory of the JW50H/70H/100H is cleared with a support tool (including those that are not H-series compatible), the program memory capacity is set to the maximum capacity of the installed memory module. (The capacity is set to 7.5K words on the JW50/70/100.)

See the instruction manual included with your support tool for details regarding the operation.
"10-1 Hand-held programmer (JW-11PG/12PG/13PG/14PG)" is provided for reference.

# 10-1 Hand-held programmer (JW-11PG/12PG/13PG/14PG)

## [1] Connecting to the control module

The hand-held programmer connects to the support tool port connector on the control module using the ZW-3KC cable (optional).

Connector for
support tool
Note 1

ZW-3KC cable

Hand-held programmer
JW-11PG/12PG/13PG/14PG
Note 2

Control module
(JW-50CU/70CU/100CU
JW-50CUH/70CUH/100CUH)
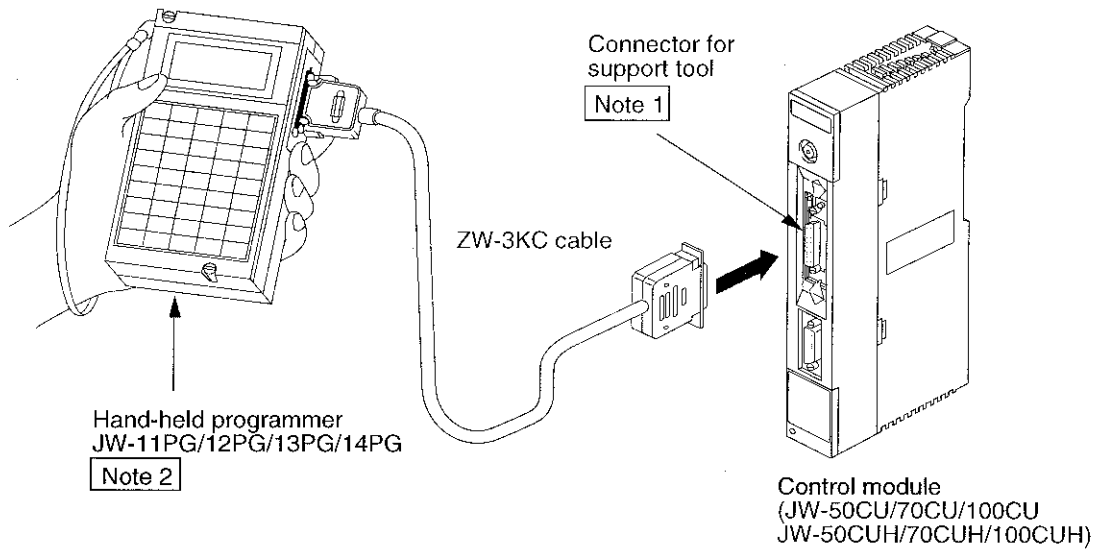
Note 1: Refer to page 11-3, if it is impossible for support tools to operation "write".
Note 2: Use the JW-11PG (compatible with high-speed model), JW-12PG/13PG/14PG for the JW-50CUH/70CUH/100CUH.

Otherwise the hand-held programmer can be directly mounted on the control module by using the mounting bracket supplied with the programmer.

**[Installing mounting bracket on power supply module]**
Remove the front cover from the power supply module and secure the mounting bracket to the power supply module with a screw as shown:



Control module
$$\begin{pmatrix} \text{JW-50CU/70CU/100CU} \\ \text{JW-50CUH/70CUH/100CUH} \end{pmatrix}$$
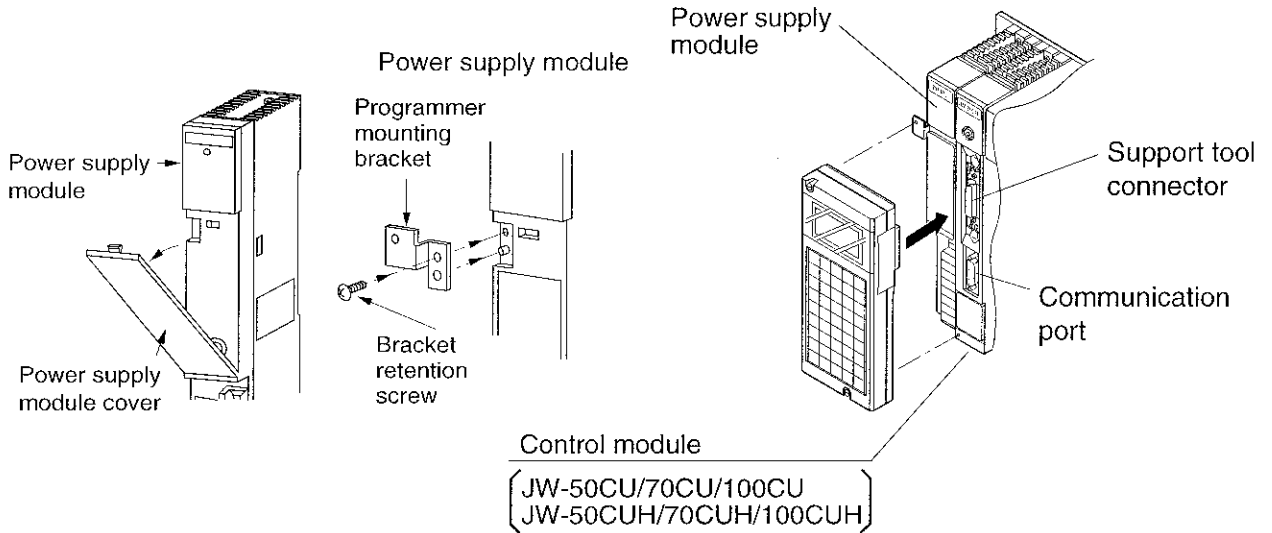
**[Installing programmer]**
Plug the hand-held programmer's back connector plug into the support tool port connector on the control module, then secure the programmer to the mounting bracket using two screws.

Note: Before mounting the programmer on the control module, remove the communication port connector cover from the control module. Keep the cover in a safe place.

**[2] Table of function**
The hand-held programmer (JW-11PG/12PG/13PG/14PG) which has as following functions.

| Function | | Mode | | | | |
|---|---|---|---|---|---|---|
| | | Program | Monitor | Change | Terminal | Initial |
| PC mode | | Stop | Run | Run | — | — |
| 1 | Memory clear (all memories: program, data, file, and system memories) | O | | | | |
| 2 | System memory read | O | O | O | | |
| | System memory write | O | | | | |
| 3 | Instruction read | O | O | O | | |
| | Write, insert, delete, batch write, batch insert, and batch delete instructions | O | | | | |
| | Program copy (write, insert) | O | | | | |
| 4 | Read relay ON/OFF status | O | | | | |
| | Set/reset relays | O | O | O | | |
| 5 | Read timer, counter, and MD's current values | O | O | O | | |
| | Set/reset timers and counters | | | O | | |

| Function | | Mode | | | | |
|---|---|---|---|---|---|---|
| | | Program | Monitor | Change | Terminal | Initial |
| 6 | Read register and file register's current values (binary, octal, decimal, hex, and ASCII) | ○ | ○ | ○ | | |
| | Write, insert, delete, batch write, batch delete, copy write, and copy insert cuurent values of registers and file registers | ○ | | ○ | | |
| 7 | All memory read | ○ | ○ | ○ | | |
| | All memory write | ○ | | | | |
| 8 | Instruction search | ○ | ○ | ○ | | |
| | Data memory search | ○ | ○ | ○ | | |
| 9 | Change preset values of timers, counters, and MDs | ○ | | ○ | | |
| | Change constants for application instructions | ○ | | ○ | | |
| 10 | Forced ON/OFF control over I/O relays | | | ○ | | |
| | Break monitor | ○ | | ○ | | |
| | Step operation | ○ | | ○ | | |
| | N-scan operation | ○ | | ○ | | |
| 11 | Device features (display output, key entry) | | | | ○ | |
| 12 | Program check | ○ | | | | |
| | Parity check | ○ | | | | |
| 13 | Cassette tape transfer (save, verify) | ○ | ○ | ○ | | |
| | Cassete tape transfer (load) | ○ | | | | |
| 14 | EEPROM write/read | ○ | | | | |
| 15 | I/O module setup (I/O address and dummy areas) | | | | | ○ |
| | I/O information monitor (address, type, No. of points) | ○ | ○ | ○ | | |
| | I/O module's lamp check | ○ | ○ | ○ | | |
| 16 | Time setting | | | | | ○ |
| | Time monitor | ○ | ○ | ○ | | |
| 17 | Remote parameter setting | | | | | ○ |
| | Set parameters for communication module | | | | | ○ |
| | Remote programming | | | | | ○ |
| | Remote monitoring | | | | | ○ |
| 18 | Key press tone ON/OFF control | ○ | ○ | ○ | | ○ |
| | EL backlight ON/OFF control | ○ | ○ | ○ | | ○ |
| | LCD contrast adjustment | ○ | ○ | ○ | | ○ |

## [3] Handling

For handling of the hand-held programmer, see the instruction manual for the programmer.

## 11-1 Periodic check

### [1] Check items

The following lists daily and periodic check items required to maintain the programmable controller in its best condition :

(1) General check

| Check item | Check | OK/NG judgment criteria | Remarks |
|---|---|---|---|
| Ambient temperature | Check that all of these parameters fall in the ranges of specifications. (Where the PC is installed in a cabinet, the temperature within the cabinet should be within the allowable range.) | 0 to +55 degrees | Check for condensation |
| Ambient humidity | | 35 to 90% RH | |
| Atmosphere | | No corrosive gas | |
| Vibration | | None | |
| Impact | | None | |

(2) Control module

| Check item | Check | OK/NG judgment criteria | Remarks |
|---|---|---|---|
| Fault indicator | Visually check FAULT indicator | Off | |
| Battery | Does battery require replacement? | Within the replacement interval? | For RAM operation only |
| Module installation | Is module firmly secured to rack panel? | No loose module | |
| | Are terminal screws firmly tightened? | No loose screw | |
| | Are all I/O expansion cable plugs firmly clamped? | Firmly clamped | |

(3) Program

| Check item | Check | OK/NG judgment criteria | Remarks |
|---|---|---|---|
| Memory capacity | Is the memory module model being used labeled? | Must be labeled at an easy-to-read location inside the cabinet. | Needed for CPU board replacement. |
| Floppy disk | Does the program diskette require rewriting? | No loose module No loose screw | |
| | Does the data diskette require rewriting? | Firmly clamped | Not needed if data memory contents need not be stored. |

Note : For easier program maintenance, we recommend that you store your programs on floppy disks.

(4) I/O modules

| Check item | Check | OK/NG judgment | Remarks |
|---|---|---|---|
| Input or output voltages | Verify that input and output module's I/O signal voltages fall within the specified ranges.<br><br>Note 1:<br>Turn-ON voltages are specified for input modules.<br><br>Note 2:<br>For the ZW-8S2 and ZW-16S2 output modules, also note the external power sources' voltages. | 100 VAC input modules:<br>85 to 132 VAC | JW-11N<br>JW-31N |
| | | DC input modules :<br>10 to 26.4 VDC | JW-12N<br>JW-32N<br>JW-34N |
| | | 200 VAC input modules:<br>170 to 264 VAC | JW-13N |
| | | DC output modules :<br>4.75 to 30 VAC | JW-12S<br>JW-32S |
| | | DC output modules :<br>10 to 30 VAC | JW-35S |
| | | 200 VAC output modules :<br>15 to 264 VAC | JW-13S<br>JW-33S |
| | | Conatct output modules :<br>AC: 264 VAC or less<br>DC: 30 VDC or less | JW-34S |
| | | 100 VAC input modules:<br>80 to 121 VAC | ZW-16N1 |
| | | 100 VAC input modules:<br>80 to 121 VAC | ZW-32N1T |
| | | DC input modules:<br>10 to 30 VDC | ZW-16N2 |
| | | Data input modules:<br>10 to 26.4 VDC | ZW-32N2<br>ZW-32N2T<br>ZW-64N2 |
| | | 200 VAC input modules:<br>160 to 242 VAC | ZW-16N3 |
| | | 100 VAC output modules:<br>15 to 121 VAC | ZW-8S1<br>ZW-16S1 |
| | | 100 VAC output modules:<br>15 to 121 VAC | ZW-32S1T |
| | | DC output modules:<br>10 to 30 VAC (Note 2) | ZW-8S2<br>ZW-16S2<br>ZW-64S2 |
| | | Data output modules:<br>4.75 to 30 VDC | ZW-32S2<br>ZW-32S2T<br>ZW-32STD |
| | | 200 VAC output modules:<br>15 to 242 VAC | ZW-16S3 |
| | | Conatct output modules:<br>AC: 240 VAC or less<br>DC: 30 VDC or less | ZW-32S5 |
| | | Source-type data output modules: 4.75 to 30 VDC | ZW-32IO2 |
| | | Pulse catch modules:<br>12/24 VDC or 10.8 to 26.4 VDC | ZW-14PC2 |
| | | Pulse output modules:<br>12/24 VDC | ZW-1PO2 |
| Installation | Verify that all modules are firmly secured to the rack panels. | No loose module | |
| | Verify that all terminal screws are firmly tightened. | No loose screw | |

(5) Power supply module and expansion power supply module

| Check item | Check | OK/NG judgment criteria | Remarks |
|---|---|---|---|
| Primary input voltage | Verify that the primary input voltage measured at the power receiving terminal block is within the range specified for each module. | -15% to +10% of the ratings | Note 1 |
| Installation | Verify that the module is firmly secured to the rack panel. | No loose module | |
| | Verify that all terminal screws are firmly tightened. | No loose screw | |

Note 1: The rated primary input voltage for the JW-1PU power supply module is 85 to 132 VAC or 170 to 264 VAC.
That for the JW-2PU power supply module is 20.4 to 32.0 VDC.

**[Reference] Notes on the support tool connector**
- Mode changes for the JW70/100 and JW70H/100H can be performed via the support tool connector or the communication port (see page 4-103).
- If write operations are ineffective through the support tool connector on the JW70/100, it is possible that the write mode of the PC has been changed through the communication port. If this is the case, set the mode again. The write mode switches upon receiving an instruction from the port for which the mode was set. The programmer's mode display does not change, even if the mode is changed through the communication port.
- When write operations are ineffective, monitor memory location #0100 in system memory.

PG

Support tool connection connector

PC

Communication port

Write mode

```
        7 6 5 4 3 2 1 0
#0010 [              |  | ]
        Write disable 0 ──┘  └── 0 Run
        Write enable 1 ──┘       1 Stop
```
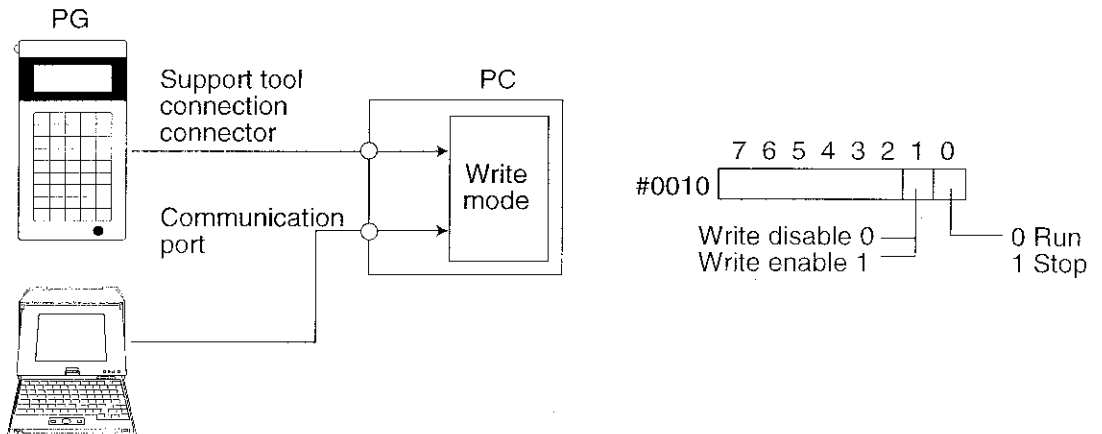
# 11-2 Battery replacement

When the programmable controller is run in the RAM operation mode, its internal backup battery requires periodical replacement before it is fully discharged. Battery replacement should be done with the power supply to the control module left active.

**1) Power supply module name**

DUNT-5784NCZZ

**2) Replacement procedure**

Prepare a replacement battery pack.

↓

Remove the battery compartment lid from the control module.

↓

Disconnect the used battery's harness plug from the CPU board's connector, then plug the replacement battery's harness plug onto it within five minutes.

↓

Replace the battery compartment label.



Battery module

Battery replacement label
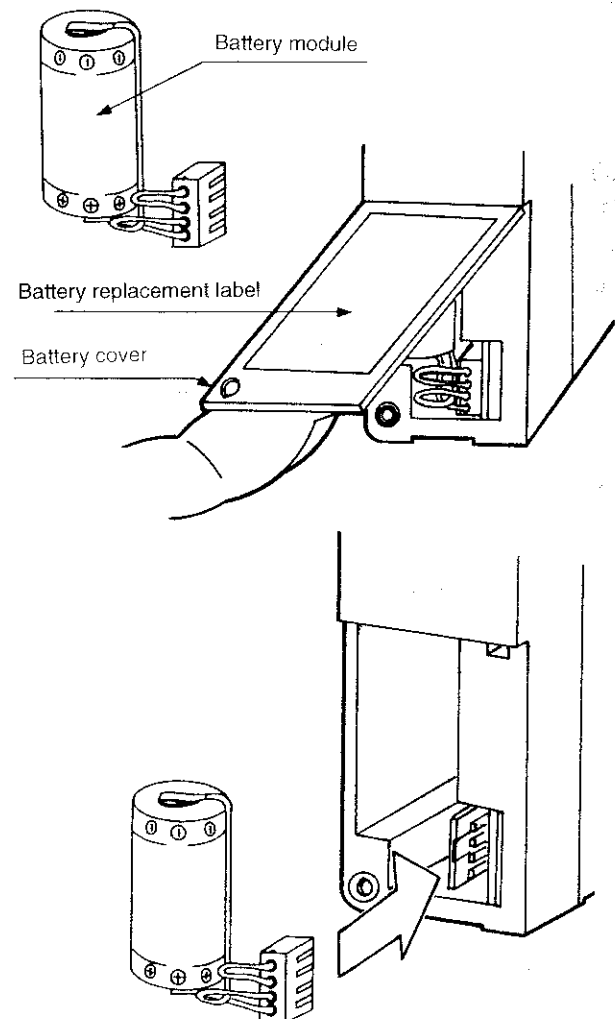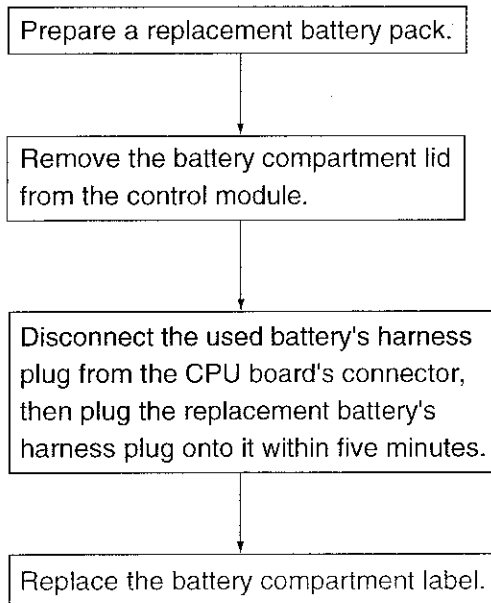
Battery cover

Note 1: Be sure to replace the battery replacement label. Take care not to lose the battery compartment lid.

Note 2: To prevent rupture or electrolyte leakage, never short the battery terminals, nor recharge, disassemble, or heat the battery, not throw it into a fire.

11-4

# 11-3 Replacing a fuse

## 1) Replacing a fuse (halt output fuse) in the power supply module

### (1) Objective fuse

| Model | Fuse ratings |
|---|---|
| JW-1PU | Glass-tubed minuture fuse (normal blow), 250V, 1A(5.2∅×20), approved UL/CSA |
| JW-2PU | Glass-tubed minuture fuse (normal blow), 250V, 1A(5.2∅×20) |

### (2) Replacement procedure (halt output fuse)



250V, 1A (normal class)

Track down the cause of fuse failure and repair.
↓
Prepare a replacement fuse.
↓
Turn OFF the halt output circuit power supply.
↓
Remove the front cover from the power supply module.
↓
Remove the fuse holder with a slot screwdriver.
↓
Replace the fuse.
↓
Remount the fuse holder into the module.
↓
Turn ON the halt output circuit power supply.
↓
External device operating normally? — No (fuse blown out again.) → Check the circuits connected to the halt output.
↓
End

Front cover

Fuse holder

Slot screwdriver

Fuse

Fuse holder

Note 1: Before replacing any fuse, be sure to track down the cause of the fuse failure. If you replace one without identifying the cause, damage to module's internal circuitry may result.

Note 2: If the power supply module's internal AC line fuse is burnt out, call your local Sharp service office in Japan. Do not attempt to replace this fuse as its failure results from a problem in the power supply module's internal circuit.

## 2) Replacing a fuse in an I/O module

### (1) Replacement fuses

Exchange a fuse since you have found a solution of the cause (external wiring, output module failure), when the fuse blown.

Glass-tubed miniature fuse with 125V rating(Class-B normal blow)

| Rated current | 0.3A | 0.5A | 1A | 2A | 5A |
|---|---|---|---|---|---|
| Module name | ZW-32IO2 ZW-14PC2 | ZW-1HC5 | ZW-14PC2 | ZW-32IO2 ZW-1HC5 | ZW-8S1 ZW-8S2 ZW-16S1 ZW-16S2 ZW-32S2 ZW-32S5 |

### (2) Replacement procedure

Prepare a replacement fuse.

↓

Turn OFF the external power supply to the I/O module.

↓

Turn the PC power OFF.

↓

Track down the cause of the fuse failure.

↓

Remove the front cover from the I/O module.

↓

Remove the burnt out fuse from its holder.

↓

Install the replacement fuse in the holder.

↓

Turn ON the external power supply to the I/O module.

↓

Turn ON the PC power.

↓

Check if module is turned ON or OFF(from programmer).

On (normal) → END

→ Check external device's circuit.



Fuse

JW-I/O

Pull cover while pushing here with your thumb.

W-I/O

Fuse

W-I/O

Glass-tubed miniature fuse with 250V rating (Slow blow)

| Reted current | 5A |
|---|---|
| Module | ZW-16S4 |

(Normal blow)

| Reted current | 5A |
|---|---|
| Module | ZW-16S3 |

Alarm fuse  Note 1

| Reted current | 3.2A | 3.2A |
|---|---|---|
| Module | ZW-32S1T | ZW-32S2T |
| Fuse type | HP-32 | HP-50 |

Alarm fuse

| Reted current | 5.0A |
|---|---|
| Module | ZW-32S2TD |
| Fuse type | MP-50 |

Glass-tubed miniature fuse (Class-A normal blow)

| Reted current | 8A | 4A |
|---|---|---|
| Module | JW-12S JW-32S JW-35S | JW-13S JW-33S |
| Fuse type | SO(A)-8A 125A | SO(A)-4A 250A |

Note 1: Only the ZW-32S1T AC output module and ZW-32S2T data output module contain alarm fuses. If any alarm fuse is burnt out, the fuse light on the corresponding module will come on.

Note 2: Before replacing any fuse, be sure to track down the cause of the fuse failure. If you replace the fuse without identifying the cause, damage to the module's internal circuitry may result.

### 3) Replacing a fuse in an expansion power supply module

(1) Replacement fuses

Glass-tubed miniature fuse with 250V rating

| Rated current | 1A(normal blow) | 2A(slow blow) | 3A(slow blow) |
|---|---|---|---|
| Module | ZW-100PU1 ZW-100PU2 | ZW-100PU1 | ZW-100PU2 |
| Application | Halt output circuit | Power line | Power line |

(2) Replacement procedure

Track down the cause of fuse failure.

↓

Prepare a replacement fuse.

↓

Turn OFF all the external circuits that connect to the module's halt output.

↓

Turn OFF all the external circuits that connect to the module's halt output.

↓

Remove the cover from the module.

↓

Install the replacement fuse in the holder.

↓

Turn ON the external power supply to the I/O module.

↓

Remove the burnt out fuse from its holder.

↓

Install the replacement fuse in the holder.

↓

Turn OFF all the external circuits that use the halt output.

↓

Turn ON the PC power.

↓

Fuse burnt out again?

Yes ↓

Remount the front cover on the module.

↓

End
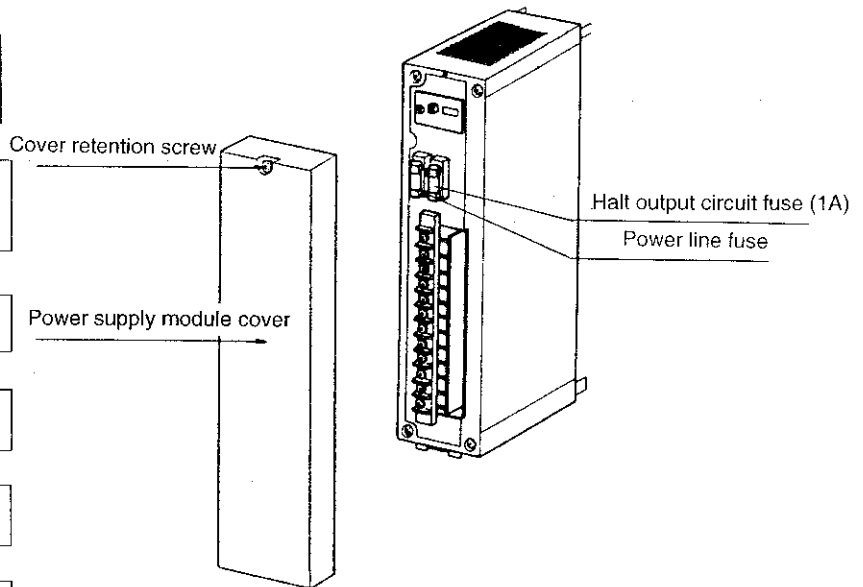
If the halt output circuit fuse is burnt out, check the circuits that connect to the halt output.

Cover retention screw

Power supply module cover

Halt output circuit fuse (1A)

Power line fuse

Note 1: Before replacing any fuse, be sure to track down the cause of the fuse failure. If you replace a fuse without identifying the cause, damage to the module's internal circuitry may result.

Note 2: If the expansion power supply module's internal AC line fuse is burnt out, call your local Sharp service office in Japan.

# 11-4 Check at error

## [1] Precondition of check flow

This troubleshooting describes the countermeasure method (replacement of defective module and subsequent restoring method) in the event the system running normally so far suddenly breaks down. Therefore, the following cases are excluded.

1. Trouble due to error in initial setting when starting up the system (system memory, parameter, setting switch, etc.)
2. Momentary failure due to transient error due to noise or other effect (irreproducible trouble).
3. Trouble due to effect of ladder program (customer's application).

See each instruction manual for troubleshooting of special I/O module and option module with this manual.

## [2] Prepare for causing trouble

### 1. Be sure to keep backup for program memory and system memory

When the control module is abnormal, the current program memory and the like may not be saved by the support tool, or the saved data may be incorrect. Therefore, store the latest program memory and backup of system memory always in the floppy disk (FD).
In the case of ROM operation, store the backup in the FD, too.

### 2. Prepare for support tool at hand

Prepare the support tool (JW-50SP, JW-100SP, etc.) that can load/save of hand-held programmer of program(JW-14PG, etc.).

### 3. Prepare for spare parts

Prepare always a spare of each module to be ready for error.

### 4. Prepare for setting table of each module

For prompt troubleshooting, prepare the "switch setting table and I/O relay allocation table of each module.
Prepare also the parameter setting table in the module which requires setting of parameter aside from switches, such as special I/O module and option module.

## [3] State of LED

In the event of error, check the LED(RUN, FAULT) of the power supply module and control module, and remedy according to the check flow depending on the state.

| RUN | FAULT | Contents | | Check flow | See page |
|---|---|---|---|---|---|
| OFF○ | ON● | Disable detection error by self-diagnosis | | Check flow 1 | 11-9 |
| ON● | ON● | | | | |
| Blink◎ | OFF○ | | | | |
| OFF○ | OFF○ | Power supply error | | Check flow 2 | 11-15 |
| Blink◎ | OFF○ | Halt mode | | Check flow 3 | 11-16 |
| ON● | OFF○ | Detectable error for self-diagnosis | Support tool error | Check flow 4 | 11-16 |
| | | | Halt output error | Check flow 5 | 11-17 |
| | | | Input relation | Check flow 6 | 11-18 |
| | | | Output relation | Check flow 7 | 11-19 |

## [4] Check flow

**( Check flow 1 )**
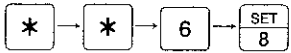
| Monitor system memory #0160 using a hand-held programmer. |

(Operation in hand-held programmer)  クリア CLR → システム SYS → [B] 1 → 6 → [A] 0 → モニタ MNTR
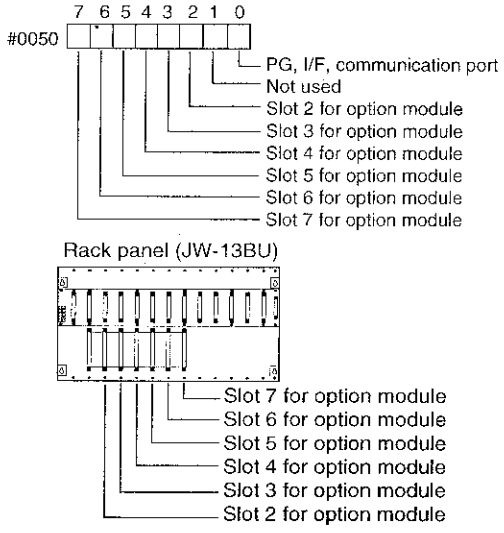
| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| Memory error | 21 | Parity check | ①Load the programs to the program memory again.<br>②Replace the memory module.<br>③Replace the control module.<br><br>(Reference)<br>You can check the parity with the hand-held programmer and obtain the program address ofparity error.<br><br>**[Hand-held programmer key-in procedure]**<br>Set the program mode.<br>(Omit the steps when the program mode has been set.)<br>Continuous check<br>クリア CLR → * → * → PROG MODE → SET 8 → クリア CLR → * → * → クリア CLR |
| | 23 | System memory setting check | ①Load the system programs to the system memory again.<br>②Replace the memory module.<br>③Replace the control module. |
| | 24 | Command code check | ①Load the programs to the program memory again.<br>②Replace the memory module.<br>③Replace the control module.<br><br>(Reference)<br>You can monitor the system memory #0052 to #0054, and obtain the defective program address.<br><br>#0054　　　　#0053　　　　　　　#0052<br>\| File No. \| \| \| \| \| \| \| \| \| \| \| \| \| \| \| \| \|<br>6th digit  5th digit   4th digit   3rd digit   2nd digit  1st digit |
| | 25 | Program ROM check | ①Check the setting of RAM/ROM changeover switch of memory module and set the switch (to the ROM position).<br>②Check the setting of EPROM/EEPROM changeover switch of memory module and, if it is improper, set the switch again.<br>③Check the setting of system memory #0255 (which selects the ROM operation) and 0256 (which selects the ROM type)and, if it is improper, set the switch again.<br>④Check whether the ROM program capacity (setting of system memory #0204 in ROM) is not larger than the program capacity of memory module, and if it exceeds, set the program ROM size again.<br>⑤Replace the ROM(in which programs have been written).<br>⑥Replace the memory module.<br>⑦Replace the control module. |
| | 26 | Data ROM check | |
| | 27 | Program ROM size check | |
| | 28 | I/O registration table check | ①Re-execute the I/O module registration. Then, set the system memory to #0247=03(H).<br>②Replace the memory module.<br>③Replace the control module. |
| | 29 | I/O table parity check | |

| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| CPU error | 32 | RAM check (RW) | ①Replace the memory module.<br>②Replace the control module. |
| | 33 | Parity check | ①Replace the control module. |
| | 35 | Hardware check | |
| I/O error | 40 | Mounted module check | **■ When using JW-I/O**<br>①Monitor the system memory #0247. If any value other than 03(H) is set, select the halt mode and write 03(H) at #0247, then start operation.<br>Note 1: If you turn OFF and ON the power supply with the automatic I/O module registration set, the error detection status may change. Therefore, be sure to check it before turning OFF the power supply.<br>②Monitor the system memory #0046 and obtain the I/O rack, slot where the error has been detected. |
| | 41 | Input data parity check | |
| | 42 | Output data check | |
| | 44 | I/O data bus | |
| | 45 | I/O signal | |

7 6 5 4 3 2 1 0

#0046 | 0 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |

Rack No.    Slot No.

③Check whether the I/O module of the rack, slot monitored in the above ② has been securely mounted.

④Check whether the I/O bus expansion adapters (1EA/2EA) of the rack monitored in the above ② has been securely mounted.

⑤Check whether the setting of the switch of 2EA is proper. (Check the setting of switch No. 0,8 and 9 and check for duplicate set values.)

⑥Check wheter the I/O expansion cables of the rack monitored in the above ② has been securely connected.

⑦Check whether all the termination plug slot has been properly attached.

⑧Check whether all the modules and I/O expansion cables have been securely mounted and attached.

⑨Replace the I/O module checked in the above ③.

⑩Replace the 1EA/2EA checked in the above ④.

⑪Replace the I/O expansion cables checked in the above ⑥.

⑫Replace 1EA.

⑬Sequentially replace all the JW-2EAs.

⑭Sequentially replace all the I/O expansion cables.

⑮Replace the rack panel of the rack monitored in the above ②.

⑯Replace the control module.

⑰Replace all the I/O modules sequentially from the one nearest to the control module.

⑱Replace all the rack panels sequentially from the rack 0.

Note 2: If the slot selected at #0048 is the slot of the top module mounted in the rack panel, EA or I/O expansion cable may defective with high possibility.

| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| I/O error | | | Note 3: When the error code is 40, reset the I/O collation of hand-held programmer (be specifying the rack, slot). Then, if the error does not occur, it can be judged that the I/O module of rack, slot for which I/O collation has been reset had caused the error.<br>Note 4: If you set the live I/O installation/removal, you can replace the I/O module while the power supply is kept turned ON. While the live I/O installation/removal is set, the PC calculation is halted. However, the halt output is kept turned ON (close).<br><br>**[Hand-held programmer key-in procedure]**<br>Setting the live I/O installation/removal $*$ → $*$ → $6$ → $\frac{SET}{8}$<br>Resetting the live I/O installation/removal<br>$*$ → $*$ → $6$ → $\frac{RESET}{9}$ |
| | 44 | I/O data bus | **■ When using JW-I/O**<br>①Check the setting of system memory #0250 (total number of bytes used by the I/O module) and, if it is improper, set it again. |
| | 45 | I/O signal | Note 1: Setting of #0250 is required for the system memory #0252 =105$_{(8)}$ (which specifies self-diagnosis of I/O address). When #0252 is set to 000$_{(8)}$ (which does not specify self-diagnosis of I/O address).execute the following operation step 5 and its subsequent steps.<br><br>②Monitor the system memory #0046. Then, check whether the I/O module of the I/O address (byte address) where the error has been securely mounted.<br><br>$\begin{array}{cccccccc} 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \end{array}$<br>#0046 $\boxed{2 | 1 | 4 | 2 | 1 | 4 | 2 | 1}$<br>Byte addres (]0000 to ]0037)<br><br>③Replace the I/O module mentioned in the above ②.<br>④Replace the rack panel in which the I/O module mentioned in the above ② has been installed.<br>⑤Check whether all the module and I/O expansion cables have been securely attached.<br>⑥When the I/O expansion module (ZW-10EU) is used, check the switch setting and check whether it has been securely mounted.<br>⑦Sequentially replace the signal cables for system expansion.<br>⑧When the I/O expansion module (ZW-10EU) is used, replace it.<br>⑨Replace the control module.<br>⑩Replace the I/O modules sequentially from that nearest to the control module.<br>⑪Replace the rack panels sequentially from the basic rack panel.<br><br>Note 2: If you disconnect the signal cable for system expansion to be connected with the rear-side racks while the power supply module is turned OFF, then turn ON the power supply, you can select only a few possible error causes from among many candidates. (If the error does not occur while the cable is dis-connected, any of the I/O module, rack panel, power supply module or cable may be defective.) |

| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| I/O error | 46 | Special I/O error | ① Monitor the system memory #0046 and abtain the I/O rack, slot where the error has been detected.<br><br>　　　　　　7 6 5　4 3 2　1 0<br>#0046 ⌊0 ∣ 4 ∣ 2 ∣ 1 ∣ 8 ∣ 4 ∣ 2 ∣ 1⌋<br>　　　　　　Rack No.　Slot No.<br><br>② Check whether the special I/O module of the rack, slot monitored in the above ① has been securely attached.<br>③ Check whether the 24 VDC power supply is properly supplied when JW-12DA is employed; check whether the 12 VDC power supply is properly supplied when JW-12PM is employed.<br>④ Replace the special I/O module in the above ②.<br>⑤ Replace the control module. |
| | 49 | Output module fuse blown | ① Monitor the system memory #0046 and obtain the I/O rack, slot where the error has been detected.<br><br>　　　　　　7 6 5　4 3 2　1 0<br>#0046 ⌊0 ∣ 4 ∣ 2 ∣ 1 ∣ 8 ∣ 4 ∣ 2 ∣ 1⌋<br>　　　　　　Rack No.　Slot No.<br><br>② Check whether the FUSE lamp on the front of output module of the rack, slot monitored in the above ① is lighted, replace the fuse of pertinent module.<br>③ Replace the output module mentioned in the above ②.<br>④ Replace the control module.<br><br>Note 1: You can set the system memory #0206 so that the PC operation is halted or continues when the fuse burned out is detected. |

| #0206(H) | PC operation status | Halt output | Control module indicator | |
|---|---|---|---|---|
| | | | RUN | FAULT |
| 000 | Operation continuation | Close | Flashing (intermittent) | Light OFF |
| 010 | Halted | Open | Light OFF | Light ON |

| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| Expansion power supply error | 43 | Power failure input voltage drop | ①Check whether the power voltage changeover short bar of the power supply module (JW-1PU) mounted in the expansion rack panels (racks 1 through 7) has been properly attached (on the 100 VAC position or 200 VAC position).<br>②Check whether the input voltage is properly supplied to the power supply module mounted in the expansion rack panels (racks 1 through 7).<br>　　　　- JW-1PU: 85 to 132 VAC(when 100 VAC is selected.)<br>　　　　　　　　170 to 264 VAC(when 200 VAC is selected.)<br>　　　　- JW-2PU: 20.4 to 32.0 VDC<br>③Replace the power supply whose power lamp is extinguished.<br>④Replace the control module.<br>⑤Replace the rack panel in which the power supply module whose power lamp is extinguished is mounted.<br>⑥Sequentially replace the I/O bus expansion adapters (JW-2EA).<br>⑦Replace the I/O bus expansion adapters (JW-1EA).<br>⑧Sequentially replace the I/O expansion cables. |
| Option error | 52 | Optional bus error | ①Check whether the option modules (JW-10CM, JW-20CM, JW-20MN, JW-10SU, JW-50CM, and ZW-30CM) have been securely mounted.<br>②Reset the special relay 07366 (normally-OFF contact) (to OFF).<br>③Check whether the user program turns ON 07366. If it turns ON 07366, modify the program.<br>④Initialize all the memories with the hand-held programmer, then load the programs to the program memory and the system programs to the system memory again.<br>⑤Sequentially replace the option modules.<br>⑥Replace the memory module.<br>⑦Replace the control module.<br>⑧Replace the cables for the option modules.<br>⑨Replace the rack panel (rack 0). |
| | 53 | Option module error | ①Monitor the system memory #0050, and obtain the option module slot where the error has been detected. (Any slot whose bit is turned ON is defective.)<br><br>7 6 5 4 3 2 1 0<br>#0050<br>　— PG, I/F, communication port<br>　— Not used<br>　— Slot 2 for option module<br>　— Slot 3 for option module<br>　— Slot 4 for option module<br>　— Slot 5 for option module<br>　— Slot 6 for option module<br>　— Slot 7 for option module<br><br>Rack panel (JW-13BU)<br>　— Slot 7 for option module<br>　— Slot 6 for option module<br>　— Slot 5 for option module<br>　— Slot 4 for option module<br>　— Slot 3 for option module<br>　— Slot 2 for option module |

| Error item | Value(H) of #160 | Description | Corrective actions (Execute the operation steps in this sequence and end the action when the normal status has been recovered.) |
|---|---|---|---|
| Optional error | 53 | Option module error | ②Check whether the option modules (JW-10CM, JW-20CM, JW-20MN, JW-10SU, JW-50CM, and ZW-30CM) have been securely mounted to the optional slot monitored in the above ①. <br>③Replace the option modules mentioned in the above ②. <br>④Replace the control module. <br>⑤Replace the cables for the option modules. <br>⑥Replace the rack panel (rack 0). <br>⑦Sequentially replace the option modules. <br>⑧Check whether the writing works such as wiring of communication cable, etc. of each option module have been properly done. (For details, refer to the user's manual of each option module.) <br><br>Note 1: You can set the system memory #0207 so that the PC operation is halted or continues when the option module error is detected. |

<br>

```
          7 6 5  4 3 2   1 0
   #0207 [   |   | |  |  |   ]
          7 6 5  4 3 2 ←——— Slot number
                               for option modules
```

| #0206 bit | PC operation status | Halt output | Control module indicator RUN | Control module indicator FAULT |
|---|---|---|---|---|
| 000 | Operation continuation | Close | Flashing (intermittent) | Light OFF |
| 010 | Halted | Open | Light OFF | Light ON |

<br>

| Error item | Value(H) of #160 | Description | Corrective actions |
|---|---|---|---|
| Battery error | 22 | Battery voltage drop | ①Replace the battery. <br>②Replace the control module. <br>③Replace the memory module. |
| Other error code | | | ①Turn OFF and ON the power supply. <br>②After having initialized all the memories with the hand-held programmer, load the programs to the program memory, the system memory, the data to the data memory and the files to the file memory again. <br>**[Hand-held programmer key-in operation for initializing all the memories]** <br> [ * ]→[ * ]→[PROG MODE]→[SET 8]→[クリア CLR]→[RESET 9]→[シフト SHIFT]→[A 0]→[書込 ENT] <br>③Replace the control module. <br>④Replace the memory module. <br>⑤Replace the power supply module. <br><br>Note 1: Although the power supply error (error code 13) is written when the power supply is turned ON, it is not a defect. |
| When you can not communicate with support tool <br>Hand-held programmer: "PC KIND?" <br>JW-50SP: "Connection error" | | | ①Replace the control module. |
| Others | | | ①Check whether any unlimited loop or scan time of the ladder pogram does not exceed 320ms. If it does, set the PC in the halt mode and modify the ladder program. <br>②When using the remote I/O for JW-10CM/20CM, if you select the mode 0 (specify halting PC when an error has occured to the slave station), check whether an error (including turning OFF of power supply) has not occurred to the slave station. |

Power supply error

When using
JW-2PU

Check the setting of 100 VAC/200 VAC changeover short bar or
changeover switch on the front of power supply module.

↓

If the setting is improper, set it to the proper setting.
Note : If 200 VAC is applied when 100 VAC is set, the power supply
module may be damaged.

NG

Measure the input voltage with the primary power input terminal on
the front of power supply module.

JW-1PU          : 85 to 132 VAC (when 100 VAC is set)
                          170 to 264 VAC (when 200 VAC is set)
JW-2PU          : 20.4 to 32.0 VDC
ZW-100PU1/2   : 85 to 110 VAC (when 100 VAC is set)
                          170 to 220 VAC (when 200 VAC is set)

↓

If the input voltage is outside the above pertinent range, set it to a
proper value.

NG

When using
JW-1PU/2PU

Check whether the fuse on the front of power supply module is not
burned out.

↓

If the fuse is burned out, replace it.
ZW-100PU1 : 2A/250V, resistant to surge
ZW-100PU2 : 3A/250V, resistant to surge

NG

Check whether you don't use the power supply module, exceeding
its capacity.
JW-1PU : 7A, ZW-100PU1 : 7A
JW-2PU : 5A, ZW-100PU2 : 12A

↓

Reduce the number of mounted modules or add a power supply
module.

NG

Replace the power supply module.

NG

Replace the control module.

NG

Replace the rack panel.

**Check flow 3**

Halt mode (program mode)

Set the operation mode (monitor mode, change mode) with the hand-held programmer or the like.

NG

Check whether the PC has been halted from the option module (JW-10CM, JW-20CM, JW-20MN, JW-50CM or ZW-30CM.)

⬇

If the PC has been halted from the option module, operate it from the option module.

NG

Replace the control module.

---

**Check flow 4**

The control module cannot be controlled with the support tool.

Does the hand-held programmer show "PC KIND?" or does the JW-50SP show "Connection error"?  — Not display

Display

Replace the control module.

NG

Sequentially replace the I/O bus expansion adapters (JW-1EA/2EA).

NG

Sequentially replace the option and I/O modules.

NG

Replace the rack panel.

NG

Replace the support tool (the converter when the JW-50SP is used.)

Check whether the control module and support tool have been securely connected.

⬇

Securely attach the connection cables and converter (when the JW-50SP is used.)

NG

Replace the connection cable.

NG

**( Check flow 5 )**

```
┌─────────────────────────────┐
│ The halt output operation is│
│ improper.                   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│ Short-circuit the halt output   │
│ terminal (HALT OUTPUT) on the   │
│ front of power supply module    │
│ while the PC is operating.      │
│ Note : Since the AC current     │
│        flows, be careful about  │
│        the insulated wires, etc.│
└─────────────────────────────────┘
              │
              ▼
```

Does the halt output load (circuit) operate ? ──No (unchanged)──→ Check the external wiring related to halt output.

Yes

```
┌─────────────────────────────────────┐
│ Check whether the halt output fuses │
│ on the front of power supply module │
│ are not burned out.     ▼           │
│                                     │
│ If any fuse is burned out, replace  │
│ it.                                 │
│ JW-1PU: 1A/250 V, ordinary class.   │
│ JW-2PU: 1A/250 V, ordinary class.   │
│ ZW-100PU1: 1A/250 V, ordinary class │
│ ZW-100PU2: 1A/250 V, ordinary class │
└─────────────────────────────────────┘
```

NG

Replace the power supply module.

NG

Replace the control module.

NG

Replace the rack panel.

This flow shows the checking procedure in the event of error of input signal not detected by the self-diagnosis of the control module.

Example of the error

- All inputs of specific input module fail to be turned ON.
- Specific input fails to be turned ON (OFF).
- Among input signals of a same input module, operation of a certain input signal affects other input signal.

Countermeasure: Error input signal

① Measure the voltage between the corresponding input terminal of the input module and the common terminal using a tester.
If supply voltage is applied between terminals: ON
If supply voltage is not applied between terminals: OFF

② Check the state of LED of input module.

③ Connect hand-held programmer, and check ON/OFF by monitoring the data memory (input relay) corresponding to the abnormal input.

| In case of ①=②=③ | → | Check the external wiring and power supply. |

| In case of the others | → | Exchange the I/O module. |
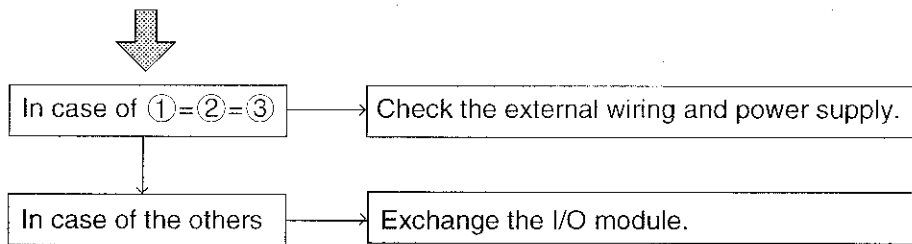
**[The flow of input signal]**
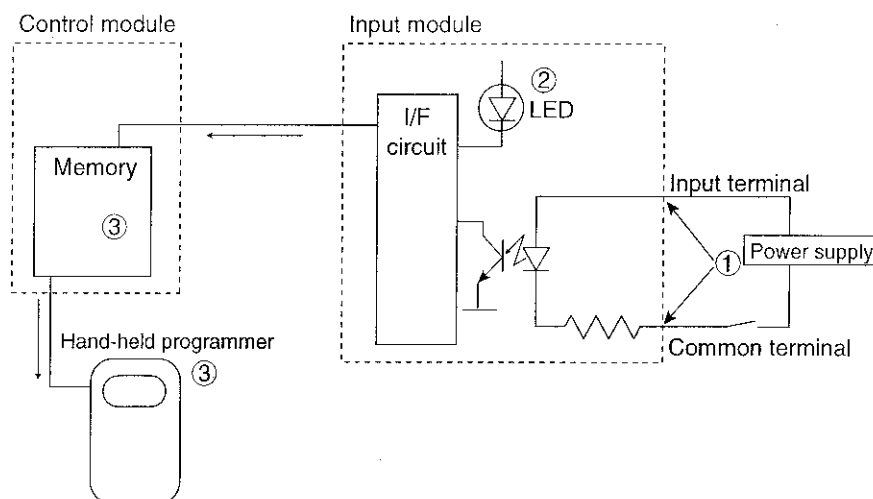
This flow shows the checking procedure in the event of error of output signal not detected by the self-diagnosis of the control module.

Example of the error

---

- All inputs of specific output module fail to be turned ON.
  (In this case, it is highly possible that the fuse of load power output is melted down.)
- Specific output fails to be turned ON (OFF).
- Among output signals of a same output module, operation of a certain output signal affects other output signal.

---

Countermeasure: Error output signal

① Connect hand-held programmer, and check ON/OFF by monitoring the data memory (output relay) corresponding to the abnormal output.

② Check the state of LED of output module.

③ Measure the voltage between the corresponding output terminal of the output module and the common terminal using a tester.
When the inter-terminal voltage is output ON voltage (about 1 V or less): ON
When the inter-terminal voltage is load supply voltage: OFF
　Note: When the load power source is OFF and wiring to the load is disconnected, it is error
　　　　if the output is normal.

| In case of ①=②=③ | ⟶ | Connecting load is error. |
| In case of ①=②=③ | ⟶ | Check the external wiring (power supply). |
| In case of the others | ⟶ | Exchange the output module. |
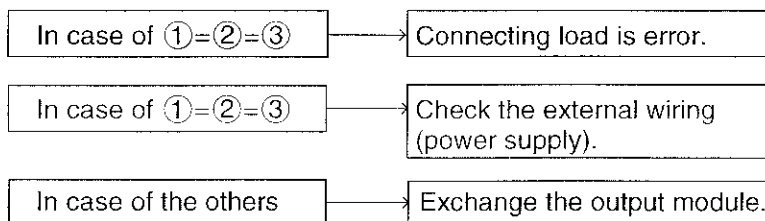
**[The flow of output signal]**
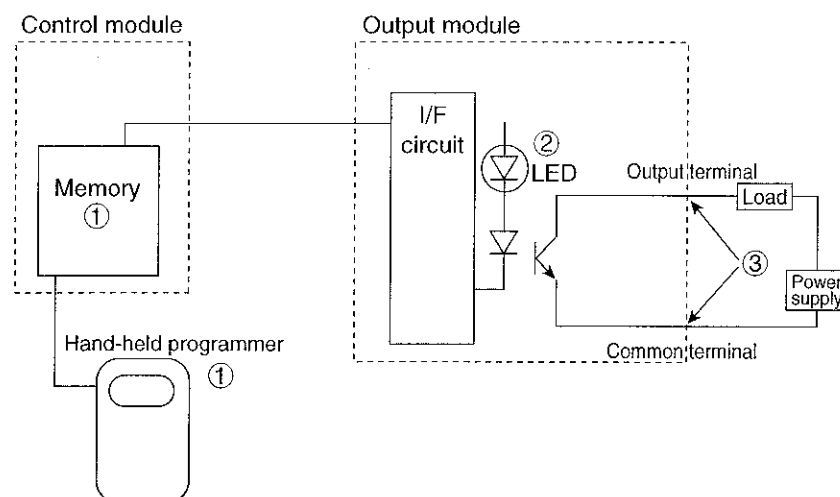
## 12-1 JW series I/O modules specifications

AC input module
**JW-11N** (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 16 points | |
| Rated input voltage | 100 to 120VAC (50/60 Hz) | |
| Input voltage range | 85 to 132 VAC (50/60 Hz), waveform distortion 5% or less) | |
| Rated input current | 10mA[TYP](100 V, 60Hz) 8.4mA[TYP](100V, 50Hz) | |
| Input impedance | 10 kohms [TYP](60Hz), 12 kohms [TYP](50Hz) | |
| Surge current | Max. 480mA, 0.2ms(at 132 VAC peak ON) | |
| Input ON level | 80 V/7mA or less | |
| Input OFF level | 30 V/3mA or more | |
| Responsetime (module unit) | OFF to ON: 25 ms or less (100 VAC) ON to OFF: 25 ms or less (100 VAC) | |
| Internal current consumption (5 VDC) | Max. 57 mA, n points at ON ➡ (25+2n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 20 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 320g | |
| Circuit diagram | | |

DC input module
## JW-12N (12/24 VDC, 24 VAC)

| Item | Specifications | | Front view |
|---|---|---|---|
| No. of input points | 16 points | | |
| Rated input voltage | 12/24 VDC | 24 VAC (50/60Hz) | |
| Input voltage range | 10 to 26.4 VDC *ripple rate: 5% or less at 12 VDC | 18 to 26.4 VDC 50/60Hz, waveform distortion 5% or less | |
| Rated input current | 8.4mA[TYP.](24 VDC/AC) 4mA[TYP.](12 VDC) | | |
| Input impedance | 2.9 kohms[TYP.] | | |
| Surge current | - | | |
| Input ON level | 10 V/3mA or less | | |
| Input OFF level | 4.7V/1.5mA or more | | |
| Responsetime (module unit) | OFF to ON: 25 ms or less (12/24 VDC) ON to OFF: 25 ms or less (12/24 VDC) | | |
| Internal current consumption (5 VDC) | Max. 57 mA, n points at ON ➡ (25+2n)mA | | |
| Operation indication | LED lights at ON condition | | |
| External wire connection system | 20 P detachable terminal block (M3.5×7 screws) | | |
| Dielectrical strength | 1000 VAC for 1 minite (between input terminal and secondary circuit) | | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | | |
| Insulation system | By photo-coupler | | |
| Common system | 1 common line for 8 points | | |
| Weight | Approx. 290g | | |
| Circuit diagram | | | |

## AC input module
### JW-13N (200 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 16 points | |
| Rated input voltage | 200 to 240VAC (50/60 Hz) | |
| Input voltage range | 170 to 264 VAC (50/60 Hz), waveform distortion 5% or less | |
| Rated input current | 9.1mA[TYP](200 V, 60Hz) 8 mA[TYP](200V, 50Hz) | |
| Input impedance | 25 kohms [TYP](60Hz), 22 kohms [TYP](50Hz) | |
| Surge current | Max. 500mA, 0.2ms(at 264 VAC peak ON) | |
| Input ON level | 160 V/7mA or less | |
| Input OFF level | 70 V/3mA or more | |
| Responsetime (module unit) | OFF to ON: 25 ms or less (200 VAC)<br>ON to OFF: 25 ms or less (200 VAC) | |
| Internal current consumption (5 VDC) | Max. 57 mA, n points at ON ➡ (25+2n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 20 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 320g | |
| Circuit diagram | | |

## AC input module
## **JW-31N** (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 100 to 120VAC (50/60 Hz) | |
| Input voltage range | 85 to 132VAC (50/60 Hz), waveform distortion 5% or less | |
| Rated input current | 10 mA[TYP.](100 V, 60Hz) 8.4mA[TYP.](100V, 50Hz) | |
| Input impedance | 10 kohms [TYP.](60Hz), 12 kohms [TYP.](50Hz) | |
| Surge current | Max. 480mA, 0.2ms(at 132 VAC peak ON) | |
| Input ON level | 80 V/7mA or less | |
| Input OFF level | 30 V/3mA or more | |
| Responsetime (module unit) | OFF to ON: 25 ms or less (100 VAC) ON to OFF: 25 ms or less (100 VAC) | |
| Internal current consumption (5 VDC) | Max. 89 mA, n points at ON ➡ (25+2n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 420g | |
| Circuit diagram |  | |

DC input module
## JW-32N (12/24 VDC, 24 VAC)

| Item | Specifications | | Front view |
|---|---|---|---|
| No. of input points | 32 points | | |
| Rated input voltage | 12/24 VDC | 24 VAC (50/60 Hz) | |
| Input voltage range | 10 to 26.4 VDC<br>*ripple rate: 5% or less at 12 VDC | 18 to 26.4 VDC<br>50/60Hz, waveform distortion 5% or less | |
| Rated input current | 8.4 mA[TYP.](24 VDC/AC) 4mA[TYP.](12 VDC) | | |
| Input impedance | 2.9 kohms [TYP.] | | |
| Surge current | - | | |
| Input ON level | 10 V/3mA or less | | |
| Input OFF level | 4.7 V/1.5mA or more | | |
| Response time (module unit) | OFF to ON: 25 ms or less (12/24 VDC)<br>ON to OFF: 25 ms or less (12/24 VDC) | | |
| Internal current consumption (5 VDC) | Max. 89 mA, n points at ON ➡ (25+2n)mA | | |
| Operation indication | LED lights at ON condition | | |
| External wire connection system | 38 P detachable terminal block (M3.5×7 screws) | | |
| Dielectrical strength | 1000 VAC for 1 minite (between input terminal and secondary circuit) | | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | | |
| Insulation system | By photo-coupler | | |
| Common system | 1 common line for 8 points (no common polatiry) | | |
| Weight | Approx. 360g | | |
| Circuit diagram | | | |

DC input module
## JW-34N (12/24 VDC High-spped type)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 10 to 26.4 VDC<br>*ripple rate: 15% or less at 24 VDC<br>*ripple rate: 5% or less at 12 VDC | |
| Rated input current | 8.4 mA[TYP.](24 VDC) 4mA[TYP.](12 VDC) | |
| Input impedance | 2.9 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 10 V/3mA or less | |
| Input OFF level | 4.7 V/1.5mA or more | |
| Responsetime (module unit) | OFF to ON: 0.5 ms or less (12/24 VDC)<br>ON to OFF: 1.5 ms or less (12/24 VDC) | |
| Internal current consumption (5 VDC) | Max. 89 mA, n points at ON ➡ (25+2n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block<br>(M3.5×7 screws) | |
| Dielectrical strength | 1000 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points (no common polatiry) | |
| Weight | Approx. 380g | |
| Circuit diagram | | |

## DC input module
### JW-34NC (12/24 VDC High-spped type)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 10.5 to 26.4 VDC<br>*ripple rate: 15% or less at 24 VDC<br>*ripple rate: 5% or less at 12 VDC | |
| Rated input current | 7.5 mA[TYP.](24 VDC) 3.5mA[TYP.](12 VDC) | |
| Input impedance | 3.3 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 10.5V/3.2mA or less | |
| Input OFF level | 5 V/1.5mA or more | |
| Responsetime (module unit) | OFF to ON: 0.5 ms or less (12/24 VDC)<br>ON to OFF: 1.5 ms or less (12/24 VDC) | |
| Internal current consumption (5 VDC) | Max. 89 mA, n points at ON ➡ (25+2n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40 P connector (soldering)<br>(applicable wire size: 0.3mm² or less) | |
| Dielectrical strength | 1000 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (no common polatiry) | |
| Weight | Approx. 400g | |
| Circuit diagram | | |

**Connector pin description**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | COM.AB | 1B | COM.AB |
| 2A | NC | 2B | NC |
| 3A | A-0 | 3B | A-1 |
| 4A | A-2 | 4B | A-3 |
| 5A | A-4 | 5B | A-5 |
| 6A | A-6 | 6B | A-7 |
| 7A | B-0 | 7B | B-1 |
| 8A | B-2 | 8B | B-3 |
| 9A | B-4 | 9B | B-5 |
| 10A | B-6 | 10B | B-7 |
| 11A | C-0 | 11B | C-1 |
| 12A | C-2 | 12B | C-3 |
| 13A | C-4 | 13B | C-5 |
| 14A | C-6 | 14B | C-7 |
| 15A | D-0 | 15B | D-1 |
| 16A | D-2 | 16B | D-3 |
| 17A | D-4 | 17B | D-5 |
| 18A | D-6 | 18B | D-7 |
| 19A | NC | 19B | NC |
| 20A | COM.CD | 20B | COM.CD |

Connector jack : FCN-361J040-A(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

DC input module
## JW-64NC (12/24 VDC connector connection)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 64 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 10.5 to 26.4 VDC<br>*ripple rate: 15% or less at 24 VDC<br>*ripple rate: 5% or less at 12 VDC | |
| Max. No. of ON input [Note 1] points at the same time | 50% (8 points/common)<br>*Ta > 45 degrees and input voltage > only in case of 13V | |
| Rated input current | 7.5 mA[TYP.](24 VDC) 3.5mA[TYP.](12 VDC) | |
| Input impedance | 3.3 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 10.5V/3.2mA or less | |
| Input OFF level | 5 V/1.5mA or more | |
| Response time (module unit) | OFF to ON: 0.5 ms or less (12/24 VDC)<br>ON to OFF: 1.5 ms or less (12/24 VDC) | |
| Internal current consumption (5 VDC) | Max. 100 mA, n points at ON $\rightarrow$ $(28+2n_1+0.13n_2)$mA [Note 2] | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40 P connector (soldering)<br>(applicable wire size: 0.3mm$^2$ or less) | |
| Dielectrical strength | 1000 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (no common polatiry) | |
| Weight | Approx. 500g | |
| Circuit diagram | *Note 1: The maximum No. of ON input points that can be used simultaneously are standard for average ON points simultaneously for 10 minutes per common.<br>*Note 2: The n₁ is the number of lamp ON points and n₂ is the number of lamp OFF points. | |



Connector pin description

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | COM.AB | 1B | COM.AB |
| 2A | Empty | 2B | Empty |
| 3A | A-0 | 3B | A-1 |
| 4A | A-2 | 4B | A-3 |
| 5A | A-4 | 5B | A-5 |
| 6A | A-6 | 6B | A-7 |
| 7A | B-0 | 7B | B-1 |
| 8A | B-2 | 8B | B-3 |
| 9A | B-4 | 9B | B-5 |
| 10A | B-6 | 10B | B-7 |
| 11A | C-0 | 11B | C-1 |
| 12A | C-2 | 12B | C-3 |
| 13A | C-4 | 13B | C-5 |
| 14A | C-6 | 14B | C-7 |
| 15A | D-0 | 15B | D-1 |
| 16A | D-2 | 16B | D-3 |
| 17A | D-4 | 17B | D-5 |
| 18A | D-6 | 18B | D-7 |
| 19A | Empty | 19B | Empty |
| 20A | COM.CD | 20B | COM.CD |

Connector jack : FCN-361J040-Au(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

DC output module
## JW-12S (5/12/24 VDC sink output)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 16 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 32 VDC, with peak voltage less than 40V<br>*Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 1A/point, 8A/common      *Note 1 | |
| Allowable surge current | 4A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.2 mA or less | |
| Voltage drop at ON | 1V or less (1A), ON resistance → Max. 1 ohm | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1 ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | Class-A, normal blow miniature fuse with 8A rating (One per common) (Using fuse type :MQ2-8A(SOC)) | |
| Fuse blow indication | Fuse indicator comes on and a fuse error signal applied to the control module. | |
| External power source | 4.75 to 30 VDC, 50mA max. | |
| Internal current consumption (5 VDC) | Max. 121 mA, n points at ON ➡ (25+6n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 20 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1000 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 310g | |
| Circuit diagram |  | |

Note 1: For an inductive load drawing a load current of more than 0.5A, the output switching rate should not exceed 30 times/minute (on for one second, off for one second). If this rate is exceeded, a counter-electromotive force absorber is required across the load.
For an inductive load drawing a load current of more than 0.8A, be sure to use a counter-electromotive force absorber across the load.
Up to 2A of load current can be driven by paralleling more than one output (for more details, see page 4-61.)

AC output module
## JW-13S (100/200 VAC)

| Item | Specifications | Front view |
|------|----------------|------------|
| No. of output points | 16 points | |
| Rated load voltage | 100 to 240 VAC (50/60Hz) | |
| Load voltage range | 15 to 264 VAC(50/60 Hz, with ripple less than 5%)<br>[Note] For a load voltage of 85 VAC or less, fuse failure may not be detectable. | |
| Max. rated load current | 2A/point, 4A/common | |
| Allowable surge current | 6A (100ms) | |
| Min. load current | 10mA *Note 1 | |
| Leakage current at OFF | 1.5 mA or less (120 VAC), 3mA or less (240 VAC) | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | CR absorber, varistor | |
| Fuse ratings | Class-A, normal blow miniature fuse with 4A rating (One per common) (Using fuse type :MQ4-4A(made by SOC)) | |
| Fuse blow indication | Fuse indicator comes on and a fuse error signal applied to the control module. | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 265 mA, n points at ON ➡ (25+15n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 20 P detachable terminal block (M3.5✕7 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 530g | |
| Circuit diagram | <br>Note 1: For a load current less than the minimum load current of 10mA, the output circuit may fail to turn OFF depending on the load characteristics. In such a case, use a bleeder resistor in parallel with the load to make the load current exceed 10 mA. | |

## DC output module
### JW-32S (5/12/24 VDC sink output)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 40V *Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 1A/point, 8A/common *Note 1 | |
| Allowable surge current | 4A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.2 mA or less | |
| Voltage drop at ON | 1V or less (1A), ON resistance→ Max. 1 ohm | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | Class-A, normal blow miniature fuse with 8A rating (One per common) (Using fuse type :MQ2-8A(made by SOC)) | |
| Fuse blow indication | Fuse indicator comes on and a fuse error signal applied to the control module. | |
| External power source | 4.75 to 30 VDC, 100 mA max. | |
| Internal current consumption (5 VDC) | Max. 217 mA, n points at ON ➡ (25+6n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1000 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 390g | |
| Circuit diagram |  | |

Note 1: For an inductive load drawing a load current of more than 0.3A, the output switching rate should not exceed 30 times/minute (on for one second, off for one second). If this rate is exceeded, a counter-electromotive-force absorber is required across the load.
For an inductive load drawing a load current of more than 0.5A, be sure to use a counter-electromotive force absorber across the load.

DC output module
## JW-32SC (5/12/24 VDC sink output)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 35V<br>*Ripple rate 5% or less at 12/24 VDC *Ripple rate 5% or less at 5 VDC | |
| Max. rated load current | 0.3A/point, 4.8A/common | |
| Allowable surge current | 1A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.2 mA or less | |
| Voltage drop at ON | 1V or less (1A) | |
| Response time<br>(module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | No fuse | |
| Fuse blow indication | - | |
| External power source | - | |
| Internal current<br>consumption (5 VDC) | Max. 217 mA, n points at ON ➡ (25+6n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40 P connector (soldering)<br>(applicable wire size: 0.3mm² or less) | |
| Dielectrical strength | 1000 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 400g | |
| Circuit diagram |  | |

Connector pin description

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | COM.AB | 1B | COM.AB |
| 2A | Empty | 2B | Empty |
| 3A | A-0 | 3B | A-1 |
| 4A | A-2 | 4B | A-3 |
| 5A | A-4 | 5B | A-5 |
| 6A | A-6 | 6B | A-7 |
| 7A | B-0 | 7B | B-1 |
| 8A | B-2 | 8B | B-3 |
| 9A | B-4 | 9B | B-5 |
| 10A | B-6 | 10B | B-7 |
| 11A | C-0 | 11B | C-1 |
| 12A | C-2 | 12B | C-3 |
| 13A | C-4 | 13B | C-5 |
| 14A | C-6 | 14B | C-7 |
| 15A | D-0 | 15B | D-1 |
| 16A | D-2 | 16B | D-3 |
| 17A | D-4 | 17B | D-5 |
| 18A | D-6 | 18B | D-7 |
| 19A | Empty | 19B | Empty |
| 20A | COM.CD | 20B | COM.CD |

Connector jack : FCN-361J040-A(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

## AC output module
### JW-33S (100/200 VAC)

| Item | Specifications | Front view |
|------|----------------|------------|
| No. of output points | 32 points | |
| Rated load voltage | 100 to 240 VAC(50/60Hz) | |
| Load voltage range | 15 to 264 VAC(50/60 Hz, with ripple less than 5%)<br>[Note] For a load voltage of 85 VAC or less, fuse failure may not be detectable. | |
| Max. rated load current | 1A/point, 4A/common | |
| Allowable surge current | 6A (100ms) | |
| Min. load current | 10mA *Note 1 | |
| Leakage current at OFF | 1.5 mA or less(120 VAC), 3mA or less(240 VAC) | |
| Voltage drop at ON | 2V or less (1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | CR absorber, varistor | |
| Fuse ratings | Class-A, normal blow miniature fuse with 4A rating (One per common) (Using fuse type :MQ4-4A(made by SOC)) | |
| Fuse blow indication | Fuse indicator comes on and a fuse error signal applied to the control module. | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 505 mA, n points at ON ➡ (25+15n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 600g | |
| Circuit diagram | <br><br>Note 1: For a load current less than the minimum load current of 10mA, the output circuit may fail to turn OFF depending on the load characteristics. In such a case, use a bleeder resistor in parallel with the load to make the load current exceed 10 mA. | |

Relay output module
## JW-34S (264 VAC/30 VDC)

| Item | | Specifications | Front view |
|---|---|---|---|
| No. of output points | | 32 points | |
| Rated load voltage | | 264 VAC/30 VDC, 2A(resistance load), 5A/common | |
| Minimum load | | 5 VDC, 1mA | |
| Operation life | Mechanical | More than 20,000,000 operations | |
| | Electrical (see life curve) | 1. Resistance load at max. switching voltage and current : More than 100,000 operations 2. Inductive load with 250 VAC, 0.5A rating (COS $\phi$ =0.4) : More than 300,000 operations 3. Inductive load with 30 VDC , 0.5A(T=7ms) : More than 300,000 operations | |
| Response time (module unit) | | OFF to ON: 10 ms or less ON to OFF: 10 ms or less | |
| Surge absorber | | None | |
| Fuse ratings | | No fuse | |
| Fuse blow indication | | None | |
| External power source | | 24 VDC ±10% with peak voltage less than 30 V, ripple not exceeding 10%, and max. current 400mA | |
| Internal current consumption (5 VDC) | | Max. 217 mA , n points at ON ➡ (25+6n)mA | |
| Operation indication | | LED lights at ON condition | |
| External wire connection system | | 38 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | | By photo-coupler | |
| Common system | | 1 common line for 8 points | |
| Weight | | Approx. 450g | |
| Circuit diagram | | | |

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## DC output module
## JW-62SC (5/12/24 VDC, connector connection, sink output)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 64 points *Note 2 | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 35V<br>*Ripple rate 10% or less at 12/24 VDC *Ripple rate 5% or less at 5 VDC | |
| Max. rated load current | 0.1A/point, 1.6A/common *Note 2 | |
| Allowable surge current | 0.12A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.2 mA or less | |
| Voltage drop at ON | 1.3V or less (0.1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | No fuse | |
| Fuse blow indication | None | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 650 mA, n points at ON ➡ $(28+12.6n_1+6.6n_2)$mA<br>*Note 2 | |
| Operation indication | LED lights at ON condition (switchable in 32-point increments) | |
| External wire connection system | 40 P connector (soldering)<br>(applicable wire size: 0.3mm² or less) | |
| Dielectrical strength | 1000 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 500g | |

Circuit diagram

**Connector pin description (same both 1 and 2)**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Empty | 1B | Empty |
| 2A | COM.AB(-) | 2B | COM.AB(-) |
| 3A | A-0 | 3B | A-1 |
| 4A | A-2 | 4B | A-3 |
| 5A | A-4 | 5B | A-5 |
| 6A | A-6 | 6B | A-7 |
| 7A | B-0 | 7B | B-1 |
| 8A | B-2 | 8B | B-3 |
| 9A | B-4 | 9B | B-5 |
| 10A | B-6 | 10B | B-7 |
| 11A | C-0 | 11B | C-1 |
| 12A | C-2 | 12B | C-3 |
| 13A | C-4 | 13B | C-5 |
| 14A | C-6 | 14B | C-7 |
| 15A | D-0 | 15B | D-1 |
| 16A | D-2 | 16B | D-3 |
| 17A | D-4 | 17B | D-5 |
| 18A | D-6 | 18B | D-7 |
| 19A | Empty | 19B | Empty |
| 20A | COM.CD(-) | 20B | COM.CD(-) |

Connector jack : FCN-361J040-A(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

Note 1: $n_1$ is the number of lamp ON points and $n_2$ is the number of lamp OFF points.
Note 2: The maximum number of consective ON points that can be used simultaneously with each common (16 points) at a temperature of 45 to 50 degees is 16 points) at a temperature of 45 to 50 degrees is 16 points for a load current of 70mA, and 12 points for a load current of 70mA, and 12 points for a load current of 100mA.

DC output module
**JW-35S** (12/24 VDC source output)
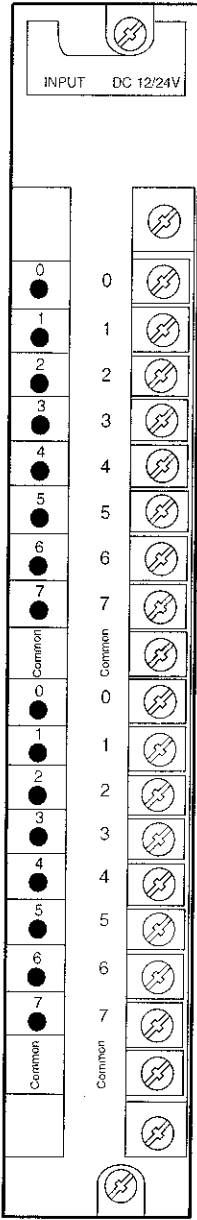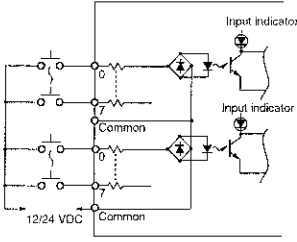
| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 12/24 VDC | |
| Load voltage range | 10 to 30 VDC with peak voltage less than 40V | |
| Max. rated load current | 1A/point, 8A/common *Note 1 | |
| Allowable surge current | 4A(100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.2mA or less | |
| Voltage drop at ON | 1.5V or less (1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1 ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | Class-A, normal blow miniature fuse with 8A rating (One per common) (Using fuse type :MQ2-8A(made by SOC)) | |
| Fuse blow indication | Fuse indicator comes on and a fuse error signal applied to the control module. | |
| External power source | 10 to 30 VDC, 300mA max. | |
| Internal current consumption (5 VDC) | Max. 217 mA, n points at ON ➡ (25+6n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×7 screws) | |
| Dielectrical strength | 1000 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 400g | |
| Circuit diagram | Note 1: For an inductive load drawing a load current of more than 0.3A, the output switching rate should not exceed 30 times/minute (on for one sec., off for one sec.). If this rate is exceeded, a counter-electromotive-force absorber is required across the load. For an inductive load drawing a load current of more than 0.5A, be sure to use a counter-electromotive force absorber across the load. | |

# 12-2 ZW series I/O modules specifications
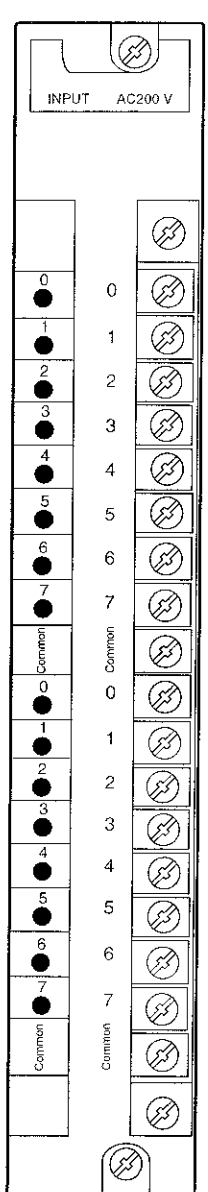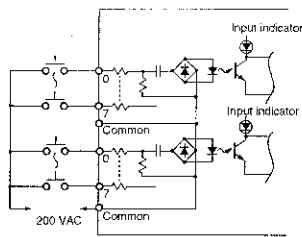
AC input module
## ZW-16N1(100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 16 points | |
| Rated input voltage | 100 to 110VAC (50/60 Hz) | |
| Input voltage range | 85 to 121 VAC (50/60 Hz), waveform distortion 5% or less | |
| Rated input current | 12mA[TYP](100 VAC, 60Hz) 10mA[TYP](100VAC, 50Hz) | |
| Input impedance | 8 kohms [TYP](60Hz), 9.7 kohms [TYP](50Hz) | |
| Surge current | Max. 365mA, 0.4ms(at 121 VAC peak ON) | |
| Input ON level | 80 V/9.5mA or less | |
| Input OFF level | 30 V/3mA or more | |
| Responsetime (module unit) | OFF to ON: 15 ms or less (100 VAC) ON to OFF: 20 ms or less (100 VAC) | |
| Internal current consumption (5 VDC) | Max. 120 mA, n points at ON ➡ $(50+4.4n)$mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 600g | |
| Circuit diagram |  | |

Front view with I/O module cover removed
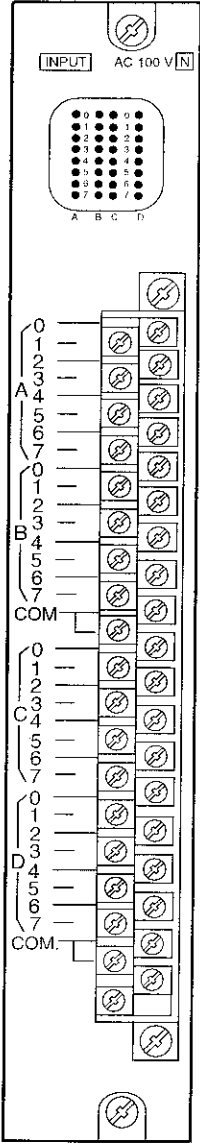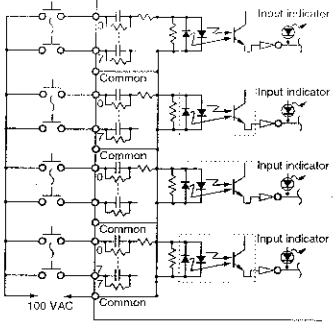
## DC input module
## ZW-16N2 (12/24 VDC)

| Item | Specifications | | Front view |
|---|---|---|---|
| No. of input points | 16 points | | |
| Rated input voltage | 12/24 VDC | 24 VAC (50/60 Hz) | |
| Input voltage range | 11 to 30 VDC<br>*ripple rate: 10% or less at 12 VDC | 20 to 28 VDC<br>50/60Hz, waveform distortion 5% or less | |
| Rated input current | 12mA[TYP](24 VDC) | 5mA[TYP](12 VDC) | |
| Input impedance | 2 kohms [TYP] | | |
| Surge current | - | | |
| Input ON level | 10 V/4 mA or less | | |
| Input OFF level | 3.6 V/1.5 mA or more | | |
| Response time (module unit) | OFF to ON: 15 ms or less (12/24 VDC)<br>ON to OFF: 20 ms or less (12/24 VDC) | | |
| Internal current consumption (5 VDC) | Max. 120 mA, n points at ON ➡ (50+4.4n)mA | | |
| Operation indication | LED lights at ON condition | | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | | |
| Insulation system | By photo-coupler | | |
| Common system | 1 common line for 16 points (no common polatiry) | | |
| Weight | Approx. 500g | | |
| Circuit diagram |  | | |

Front view with I/O module cover removed.

## AC input module
### ZW-16N3 (200 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 16 points | |
| Rated input voltage | 200 to 220VAC (50/60 Hz) | |
| Input voltage range | 170 to 242 VAC (50/60 Hz, waveform distortion 5% or less) | |
| Rated input current | 11mA[TYP](200 VAC, 60Hz), 9mA[TYP](200 VAC, 50Hz) | |
| Input impedance | 17.7 kohms [TYP](60Hz), 21.2 kohms [TYP](50Hz) | |
| Surge current | Max. 342mA, 0.4ms(at 242 VAC peak ON) | |
| Input ON level | 160 V/8.5mA or less | |
| Input OFF level | 60 V/3.5mA or more | |
| Responsetime (module unit) | OFF to ON: 15 ms or less (200 VAC)<br>ON to OFF: 20 ms or less (200 VAC) | |
| Internal current consumption (5 VDC) | Max. 120 mA, n points at ON ➡ (50+4.4n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points | |
| Weight | Approx. 600g | |
| Circuit diagram |  | |

Front view with I/O module cover removed.

## AC input module
### ZW-32N1T (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 100 to 110VAC (50/60 Hz) | |
| Input voltage range | 85 to 121 VAC (50/60 Hz, waveform distortion 5% or less) | |
| Rated input current | 10mA[TYP](100 VAC, 60Hz), 8.5mA[TYP](100 VAC, 50Hz) | |
| Input impedance | 9.8 kohms [TYP](60Hz), 11.8 kohms [TYP](50Hz) | |
| Surge current | Max. 440mA, 0.2ms (at 121 VAC peak ON) | |
| Input ON level | 80 V/7 mA or less | |
| Input OFF level | 30 V/3 mA or more | |
| Responsetime (module unit) | OFF to ON: 15 ms or less (100 VAC) ON to OFF: 20 ms or less (100 VAC) | |
| Internal current consumption (5 VDC) | Max. 200 mA, n points at ON ➡ (75+3.9n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohm or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 32 points | |
| Weight | Approx. 700g | |
| Circuit diagram | | |

Terminal block with cover

## Data input module
### ZW-32N2 (12/24 VDC)
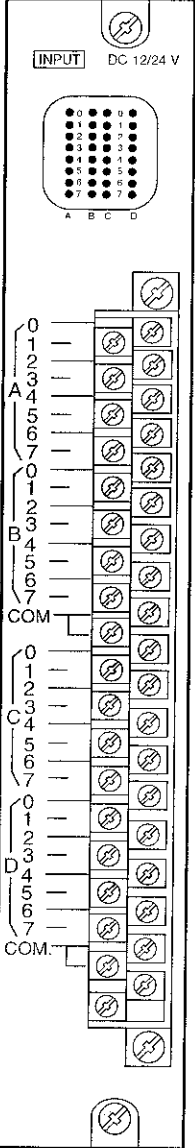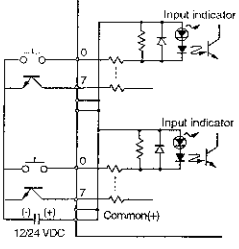
| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 11 to 26.4 VDC<br>*Ripple rate: 15% or less at 24 VDC<br>*Ripple rate: 5% or less at 12 VDC | |
| Rated input current | 9.5 mA[TYP.](24 VDC) 3.5mA[TYP.](12 VDC) | |
| Input impedance | 2.5 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 10 V/3 mA or less | |
| Input OFF level | 6 V/15 mA or more | |
| Responsetime (module unit) | OFF to ON: 15 ms or less (12/24 VDC)<br>ON to OFF: 20 ms or less (12/24 VDC) | |
| Internal current consumption (5 VDC) | Max. 95 mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40 P connector (soldering)<br>(applicable wire size: 0.3mm² or less) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 32 points (+ common) | |
| Weight | Approx. 500g | |
| Circuit diagram |  | |

**Connector pin description**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Common(+) | 1B | Common(+) |
| 2A | Common(+) | 2B | Common(+) |
| 3A | 0 | 3B | 1 |
| 4A | 2 | 4B | 3 |
| 5A | 4 | 5B | 5 |
| 6A | 6 | 6B | 7 |
| 7A | 0 | 7B | 1 |
| 8A | 2 | 8B | 3 |
| 9A | 4 | 9B | 5 |
| 10A | 6 | 10B | 7 |
| 11A | 0 | 11B | 1 |
| 12A | 2 | 12B | 3 |
| 13A | 4 | 13B | 5 |
| 14A | 6 | 14B | 7 |
| 15A | 0 | 15B | 1 |
| 16A | 2 | 16B | 3 |
| 17A | 4 | 17B | 5 |
| 18A | 6 | 18B | 7 |
| 19A | Empty | 19B | Empty |
| 20A | Empty | 20B | Empty |

Connector jack : FCN-361J040-A(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

Front view with I/O module cover removed.

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DC input module
## ZW-32N2T (12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 32 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 11 to 26.4 VDC<br>*ripple rate: 15% or less at 24 VDC<br>*ripple rate: 5% or less at 12 VDC | |
| Rated input current | 9.6 mA[TYP.](24 VDC) 4.2mA[TYP.](12 VDC) | |
| Input impedance | 2.5 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 10 V/3 mA or less | |
| Input OFF level | 6 V/1.5 mA or more | |
| Response time<br>(module unit) | OFF to ON: 15 ms or less (12/24 VDC)<br>ON to OFF: 20 ms or less (12/24 VDC) | |
| Internal current<br>consumption (5 VDC) | Max. 95 mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection<br>system | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal<br>and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal<br>and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 32 points (+ common) | |
| Weight | Approx. 600g | |
| Circuit diagram | | Terminal block with cover. |

## Data input module
## ZW-64N2 (12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of input points | 64 points | |
| Rated input voltage | 12/24 VDC | |
| Input voltage range | 11 to 26.4 VDC<br>*Ripple rate: 15% or less at 24 VDC<br>*Ripple rate: 5% or less at 12 VDC | |
| Max. No. of ON input[Note 1] points at the same time | 50% (8 points/common)<br>*Ta > 45 degrees and input voltage > only in case of 13V | |
| Rated input current | 7mA[TYP.](24 VDC) 3mA[TYP.](12 VDC) | |
| Input impedance | 3.5 kohms [TYP.] | |
| Surge current | - | |
| Input ON level | 9 V/2.6 mA or less | |
| Input OFF level | 6 V/1.5 mA or more | |
| Response time (module unit) | OFF to ON: 1 ms or less (12/24 VDC)<br>ON to OFF: 1 ms or less (12/24 VDC) | |
| Internal current consumption (5 VDC) | Max. 170 mA, n points at ON ➡ $(40+4.0n_1+0.05n_2)mA$ [Note 2] | |
| Operation indication | LED lights at ON condition (switchable in 32-point increments) | |
| External wire connection system | 40 P connector × 2 (soldering)<br>(applicable wire size: 0.3mm² or less) | |
| Dielectrical strength | 1500 VAC for 1 minite (between input terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between input terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (+ common) | |
| Weight | Approx. 800g | |
| Circuit diagram | *Note 1: The maximum No. of ON input points that can be used simultaneously are standard for average ON points simultaneously for 10 minutes per common.<br>*Note 2: The n₁ is the number of lamp ON points and n₂ is the number of lamp OFF points | |

**Connector pin description**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | A1(B1) Common (-) | 1B | A1(B1) Common (-) |
| 2A | Empty | 2B | Empty |
| 3A | A1(B1)0 | 3B | A1(B1)1 |
| 4A | A1(B1)2 | 4B | A1(B1)3 |
| 5A | A1(B1)4 | 5B | A1(B1)5 |
| 6A | A1(B1)6 | 6B | A1(B1)7 |
| 7A | A1(B1)0 | 7B | A1(B1)1 |
| 8A | A1(B1)2 | 8B | A1(B1)3 |
| 9A | A1(B1)4 | 9B | A1(B1)5 |
| 10A | A1(B1)6 | 10B | A1(B1)7 |
| 11A | A2(B2)0 | 11B | A2(B2)1 |
| 12A | A2(B2)2 | 12B | A2(B2)3 |
| 13A | A2(B2)4 | 13B | A2(B2)5 |
| 14A | A2(B2)6 | 14B | A2(B2)7 |
| 15A | A2(B2)0 | 15B | A2(B2)1 |
| 16A | A2(B2)2 | 16B | A2(B2)3 |
| 17A | A2(B2)4 | 17B | A2(B2)5 |
| 18A | A2(B2)6 | 18B | A2(B2)7 |
| 19A | Empty | 19B | Empty |
| 20A | A2(B2) Common (-) | 20B | A2(B2) Common (-) |

Front view with I/O module cover removed.

Connector jack : FCN-361J040-Au(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

AC output module
## ZW-8S1 (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 8 points | |
| Rated load voltage | 100 to 110 VAC (50/60Hz) | |
| Load voltage range | 15 to 121 VAC(50/60 Hz, with ripple less than 5%) | |
| Max. rated load current | 2A/point, 5A/common | |
| Allowable surge current | 8A (100ms) | |
| Min. load current | 30mA *Note 1 | |
| Leakage current at OFF | 2 mA or less | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | CR absorber, varistor | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One per common) (Using fuse type :FGMB-5A/125V(Fuji Tanshi) | |
| Fuse blow indication | None | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 240 mA, n points at ON ➡ (80+20n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 4 points | |
| Weight | Approx. 800g | |
| Circuit diagram |  | |

Note 1: For a light load drawing less than the minimum load current of 30mA, the output circuit may fail to turn OFF depending on the load characteristics. In such a case, use a bleeder resistor in parallel with the load to make the load current exceed 30mA.

Front view with I/O module cover removed.

DC output module
## ZW-8S2 (12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 8 points | |
| Rated load voltage | 12/24 VDC | |
| Load voltage range | 10 to 30 VDC with peak voltage less than 47V | |
| Max. rated load current | 2A/point, 5A/common | |
| Allowable surge current | 4A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1 ms or less (resistance load) | |
| Surge absorber | Flywheel diode | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One per common) (Using fuse type :FGMB-5A/125V(Fuji Tanshi) | |
| Fuse blow indication | None | |
| External power source | 10 to 30 VDC, 40mA max. | |
| Internal current consumption (5 VDC) | Max. 160 mA, n points at ON $\Rightarrow$ (80+10n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 4 points (commons are insulated from each other by diodes.) | |
| Weight | Approx. 800g | |
| Circuit diagram |  | |

Front view with I/O module cover removed.

## AC output module
### ZW-16S1 (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 16 points | |
| Rated load voltage | 100 to 110 VAC (50/60Hz) | |
| Load voltage range | 15 to 121 VAC(50/60 Hz, with ripple less than 5%) | |
| Max. rated load current | 2A/point, 5A/common | |
| Allowable surge current | 8A (100ms) | |
| Min. load current | 30mA *Note 1 | |
| Leakage current at OFF | 2 mA or less | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | CR absorber, varistor | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One per common) (Using fuse type :FGMB-5A/125V(Fuji Tanshi) | |
| Fuse blow indication | None | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 400 mA, n points at ON ➡ (80+20n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 4 points | |
| Weight | Approx. 800g | |
| Circuit diagram | <br>Note 1: For a light load drawing less than the minimum load current of 30mA, the output circuit may fail to turn OFF depending on the load characteristics. In such a case, use a bleeder resistor in parallel with the load to make the load current exceed 30mA. | Front view with I/O module cover removed. |

## DC output module
### ZW-16S2 (12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 16 points | |
| Rated load voltage | 12/24 VDC | |
| Load voltage range | 10 to 30 VDC with peak voltage less than 47V | |
| Max. rated load current | 2A/point, 5A/common | |
| Allowable surge current | 4A (100ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1 ms or less (resistance load) | |
| Surge absorber | Flywheel diode | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One per common) (Using fuse type :FGMB-5A/125V(Fuji Tanshi) | |
| Fuse blow indication | None | |
| External power source | 10 to 30 VDC, 80mA max. | |
| Internal current consumption (5 VDC) | Max. 240 mA, n points at ON $\rightarrow$ $(80+10n)$mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 4 points (commons are insulated from each other by diodes.) | |
| Weight | Approx. 700g | |
| Circuit diagram |  | |

Front view with I/O module cover removed.

## AC output module
### ZW-16S3 (100/200 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 16 points | |
| Rated load voltage | 100 to 220 VAC (50/60Hz) | |
| Load voltage range | 15 to 242 VAC(50/60 Hz, with ripple less than 5%) | |
| Max. rated load current | 2A/point, 5A/common | |
| Allowable surge current | 8A (100ms) | |
| Min. load current | - *Note 1 | |
| Leakage current at OFF | 3 mA or less | |
| Voltage drop at ON | 2V or less (2A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | CR absorber, varistor | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One per common) (Using fuse type :FGMB-5A/125V(Fuji Tanshi) | |
| Fuse blow indication | None | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 400 mA, n points at ON ➡ (80+20n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 4 points | |
| Weight | Approx. 800g | |
| Circuit diagram | <br><br>Note 1: No limitation exists for the minimum operating current. Note the leakage current. | Front view with I/O module cover removed. |

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Relay output module
# ZW-16S4 (240 VAC/30 VDC)

| Item | | Specifications | Front view |
|---|---|---|---|
| No. of output points | | 16 points | |
| Rated load voltage | | 240 VAC/30 VDC, 2A(resistance load), 5A/common | |
| Minimum load | | 5 VDC, 1mA | |
| Operation life | Mechanical | More than 20,000,000 operations | |
| | Electrical (see life curve) | 1. Resistance load at max. switching voltage and current : More than 100,000 operations<br>2. Inductive load with 250 VAC, 0.5A rating (COS $\phi$ =0.4) : More than 300,000 operations<br>3. Inductive load with 30 VDC , 0.5A(T=7ms) : More than 300,000 operations | |
| Response time (module unit) | | OFF to ON: 15 ms or less<br>ON to OFF: 20 ms or less | |
| Surge absorber | | None | |
| Fuse ratings | | Flash miniature fuse with 5A rating (one for each common) (Using fuse type : TSC-5A/250 VAC from SOC) | |
| Fuse blow indication | | None | |
| External power source | | 24 VDC ±10% with peak voltage less than 42 V, and max. current 320 mA | |
| Internal current consumption (5 VDC) | | Max. 180 mA , n points at ON ➡ (85+6n)mA | |
| Operation indication | | LED lights at ON condition | |
| External wire connection system | | 18 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | | By photo-coupler | |
| Common system | | 1 common line for 8 points | |
| Weight | | Approx. 600g | |
| Circuit diagram | |  | |

Front view with I/O module cover removed.

Relay output module
## ZW-16S4D (240 VAC/30 VDC)

| Item | | Specifications | Front view |
|---|---|---|---|
| No. of output points | | 16 points | |
| Rated load voltage | | 250 VAC/30 VDC, 2A(resistance load) | |
| Minimum load | | 5 VDC, 1mA | |
| Operation life | Mechanical | More than 10,000,000 operations | |
| | Electrical (see life curve) | 1. Resistance load at max. switching voltage and current : More than 100,000 operations 2. Inductive load with 250 VAC, 0.5A rating (COS $\phi$ =0.4) : More than 300,000 operations 3. Inductive load with 30 VDC , 0.5A(T=7ms) : More than 300,000 operations | |
| Response time (module unit) | | OFF to ON: 15 ms or less ON to OFF: 20 ms or less | |
| Surge absorber | | None | |
| Fuse ratings | | No fuse | |
| Fuse blow indication | | - | |
| External power source | | 24 VDC ±10% with peak voltage less than 30 V, ripple not exceeding 10%, and max. current 320 mA | |
| Internal current consumption (5 VDC) | | Max. 80 mA , n points at ON ➡ (20+8n) mA | |
| Operation indication | | LED lights at ON condition | |
| External wire connection system | | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | | By photo-coupler | |
| Common system | | Independent common for each output point | |
| Weight | | Approx. 700g | |
| Circuit diagram | | | Terminal block with cover |

AC output module
## ZW-32S1T (100 VAC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 100 to 110 VAC (50/60Hz) | |
| Load voltage range | 15 to 121 VAC(50/60 Hz, with ripple less than 5%) | |
| Max. rated load current | 0.6A/point, 2.4A/common | |
| Allowable surge current | 6A (100ms) | |
| Min. load current | 10 mA *Note 1, Note 2 | |
| Leakage current at OFF | 2 mA or less | |
| Voltage drop at ON | 6.6V or less (0.6A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: A half cycle of load power+ 1ms or less | |
| Surge absorber | Capacitive varistor | |
| Fuse ratings | Shut OFF alarm fuse with 3.2A rating (One for each common) (Using fuse type :HP-32 (Daito Comm.)) | |
| Fuse blow indication | LED comes on if a fuse failure occur. | |
| External power source | - | |
| Internal current consumption (5 VDC) | Max. 600 mA, n points at ON ➡ (85+16.1n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 8 points | |
| Weight | Approx. 800g | |
| Circuit diagram | <br>Breeder resistance ZW-32S1T 100 VAC<br>Note 1: For a light load drawing less than the minimum load current of 10 mA, the output circuit may fail to turn OFF depending on the load characteristics. In such a case, use a bleeder resistor in parallel with the load to make the load current exceed 10mA.<br>Note 2 : The minimum load current differs depending on module type :<br>OUTPUT 100 VAC N: 10 mA (current model)<br>OUTPUT 100 VAC : 50 mA | Terminal block with cover. |

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Data output module
## ZW-32S2 (5/12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 47V<br>*Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 0.5A/point, 5A/group of 16 points; 0.1A/point for 5VDC | |
| Allowable surge current | 2A (100ms) *Note 1 | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 1V or less (0.5A), 0.3V or less (0.1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Flywheel diode | |
| Fuse ratings | Class-B, normal blow miniature fuse with 8A rating (One for each group of 16 points) (Using fuse type :FGMB5A/125V(made by Fuji Tanshi)) | |
| Fuse blow indication | None | |
| External power source | 4.5 to 30 VDC, 160 mA max. | |
| Internal current consumption (5 VDC) | Max. 320 mA, n points at ON $\Rightarrow$ (100+6.9n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40-pin connector (soldering)<br>(Applicable wire size : 0.3mm$^2$ or less) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 32 points (No. of common pins: 4) | |
| Weight | Approx. 700g | |
| Circuit diagram | | |

Connector pin description

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Power supply (+) | 1B | Power supply (-) |
| 2A | Power supply (+) | 2B | Power supply (-) |
| 3A | 0 | 3B | 1 |
| 4A | 2 | 4B | 3 |
| 5A | 4 | 5B | 5 |
| 6A | 6 | 6B | 7 |
| 7A | 0 | 7B | 1 |
| 8A | 2 | 8B | 3 |
| 9A | 4 | 9B | 5 |
| 10A | 6 | 10B | 7 |
| 11A | 0 | 11B | 1 |
| 12A | 2 | 12B | 3 |
| 13A | 4 | 13B | 5 |
| 14A | 6 | 14B | 7 |
| 15A | 0 | 15B | 1 |
| 16A | 2 | 16B | 3 |
| 17A | 4 | 17B | 5 |
| 18A | 6 | 18B | 7 |
| 19A | Common (-) | 19B | Common (-) |
| 20A | Common (-) | 20B | Common (-) |

Note 1: For a surge current of more than 1A, it may be limited by output devices.

OUTPUT 5/12/24VDC

5A

Front view with I/O module cover removed.

Connector jack : FCN-361J040-Au(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

Data output module
## ZW-32S2T (5/12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 47V<br>*Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 0.5A/point, 5A/common | |
| Allowable surge current | 2A (100ms) *Note 1 | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 1V or less (0.5A), 0.3V or less (0.1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Flywheel diode | |
| Fuse ratings | Shut OFF alarm fuse with 5A rating (one for each common)<br>(Using fuse type :HP-50 (made by Daito Comm.)) | |
| Fuse blow indication | LED comes on if a fuse failure occur. | |
| External power source | 4.5 to 30 VDC, 160 mA max. | |
| Internal current consumption (5 VDC) | Max. 320 mA, n points at ON ➡ $(100+6.9n)$ mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (commons are insulated from each other by diodes.) | |
| Weight | Approx. 800g | |
| Circuit diagram |  | |

Note 1: For a surge current of more than 1A, it may be limited by output devices.

Terminal block with cover.

Data output module
## ZW-32S2TD (5/12/24 VDC)

| Item | Specifications | Front view |
|------|----------------|------------|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 47V *Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 0.5A/point, 5A/common *Note 1 | |
| Allowable surge current | 2A (100ms) *Note 2 | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 1V or less (0.5A), 0.3V or less(0.1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Zener diode (TYP51V) | |
| Fuse ratings | Shut OFF alarm fuse with 5A rating (one for each common) (Using fuse type :HP-50 (made by Daito Comm.)) | |
| Fuse blow indication | LED comes on if a fuse failure occur. | |
| External power source | 4.5 to 30 VDC, 160 mA max. | |
| Internal current consumption (5 VDC) | Max. 320 mA, n points at ON ➡ $(100+6.9n)$mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (each common completely isolated in 16 units) | |
| Weight | Approx. 700g | |
| Circuit diagram |  | |

Terminal block with cover.

Note 1: For an inductive load drawing a load current of more than 0.3A, the output switching rate should not exceed 30 times/minute (on for one sec., off for one sec.). If this rate is exceeded, a counter-electromotive force absorber is required across the load.
Note 2 : For a surge current of more than 1A, it may be limited by output devices.

Relay output module
## ZW-32S4T (240 VAC/30 VDC)

| Item | | Specifications | Front view |
|---|---|---|---|
| No. of output points | | 32 points | |
| Rated load voltage | | 240 VAC/30 VDC, 2A(resistance load), 5A/commom | |
| Minimum load | | 5 VDC, 1mA | |
| Operation life | Mechanical | More than 20,000,000 operations | |
| | Electrical (see life curve) | 1. Resistance load at max. switching voltage and current : More than 100,000 operations 2. Inductive load with 250 VAC, 0.5A rating (COS $\phi$ =0.4) : More than 300,000 operations 3. Inductive load with 30 VDC , 0.5A(T=7ms) : More than 300,000 operations | |
| Response time (module unit) | | OFF to ON: 15 ms or less ON to OFF: 12 ms or less | |
| Surge absorber | | None | |
| Fuse ratings | | No fuse | |
| Fuse blow indication | | None | |
| External power source | | 24 VDC ±10% with peak voltage less than 30 V, ripple not exceeding 10%, and max. current 320 mA | |
| Internal current consumption (5 VDC) | | Max. 220 mA , n points at ON ➡ (100+3.7n) mA | |
| Operation indication | | LED lights at ON condition | |
| External wire connection system | | 38 P detachable terminal block (M3.5×8 screws) | |
| Dielectrical strength | | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | | By photo-coupler | |
| Common system | | 1 common line for 8 points | |
| Weight | | Approx. 800g | |
| Circuit diagram | | | |

Data output module
## ZW-32S5 (5/12/24 VDC) source type

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 32 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 47V<br>*Ripple rate 5% or less at 5VDC | |
| Max. rated load current | 0.2A/point, 0.1A/points for 5VDC | |
| Allowable surge current | 1A (10ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 1V or less | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) *Note 1 | |
| Surge absorber | Flywheel diode | |
| Fuse ratings | Class-B, normal blow miniature fuse with 5A rating (One for each group of 16 points) (Using fuse type :FGMB5A/125V(made by Fuji Tanshi)) | |
| Fuse blow indication | None | |
| External power source | 4.75 to 30 VDC, 500 mA max. | |
| Internal current consumption (5 VDC) | Max. 185 mA, n points at ON ➡ (85+3.1n)mA | |
| Operation indication | LED lights at ON condition | |
| External wire connection system | 40-pin connector (soldering)<br>(Applicable wire size: 0.3mm$^2$ or less) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 32 points (No. of common pins: 4) | |
| Weight | Approx. 600g | |
| Circuit diagram |  | |

Connector pin description

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Common (+) | 1B | Common (+) |
| 2A | Common (+) | 2B | Common (+) |
| 3A | 0 | 3B | 1 |
| 4A | 2 | 4B | 3 |
| 5A | 4 | 5B | 5 |
| 6A | 6 | 6B | 7 |
| 7A | 0 | 7B | 1 |
| 8A | 2 | 8B | 3 |
| 9A | 4 | 9B | 5 |
| 10A | 6 | 10B | 7 |
| 11A | 0 | 11B | 1 |
| 12A | 2 | 12B | 3 |
| 13A | 4 | 13B | 5 |
| 14A | 6 | 14B | 7 |
| 15A | 0 | 15B | 1 |
| 16A | 2 | 16B | 3 |
| 17A | 4 | 17B | 5 |
| 18A | 6 | 18B | 7 |
| 19A | Power supply (-) | 19B | Power supply (-) |
| 20A | Power supply (-) | 20B | Power supply (-) |

Note 1: For an inductive load, on-to-off output response may be delayed more than 1 second depending on the inductance.

Front view with I/O module cover removed.

Connector jack : FCN-361J040-Au(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

Data output module
# ZW-64S2 (5/12/24 VDC)

| Item | Specifications | Front view |
|---|---|---|
| No. of output points | 64 points | |
| Rated load voltage | 5/12/24 VDC | |
| Load voltage range | 4.75 to 30 VDC with peak voltage less than 35V<br>*Ripple rate 5% or less at 5 VDC | |
| Max. rated load current | 0.1A/point | |
| Allowable surge current | 0.4A (10ms) | |
| Min. load current | - | |
| Leakage current at OFF | 0.1 mA or less | |
| Voltage drop at ON | 2V or less (0.1A) | |
| Response time (module unit) | OFF to ON: 1 ms or less<br>ON to OFF: 1ms or less (resistance load) | |
| Surge absorber | Zener diode | |
| Fuse ratings | 2A (not change) 1 common | |
| Fuse blow indication | None | |
| External power source | 4.75 to 30 VDC, 96 mA max. | |
| Internal current consumption (5 VDC) | Max. 650 mA, n points at ON $\Rightarrow$ $(80+7.0n_1+3.0n_2)$mA<br>*Note 1 | |
| Operation indication | LED lights at ON condition (switchable in 32-point increments) | |
| External wire connection system | 40 P connector $\times$ 2 (soldering) | |
| Dielectrical strength | 1500 VAC for 1 minite (between output terminal and secondary circuit) | |
| Insulation resistance | 500 VDC, 10M ohms or more (between output terminal and secondary circuit) | |
| Insulation system | By photo-coupler | |
| Common system | 1 common line for 16 points (each common completely isolated in 16 units) | |
| Weight | Approx. 800g | |

Circuit diagram

**Connector pin description**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Empty | 1B | Empty |
| 2A | A1(B1) Common(-) | 2B | A1(B1) Common(-) |
| 3A | A1(B1)0 | 3B | A1(B1)1 |
| 4A | A1(B1)2 | 4B | A1(B1)3 |
| 5A | A1(B1)4 | 5B | A1(B1)5 |
| 6A | A1(B1)6 | 6B | A1(B1)7 |
| 7A | A1(B1)0 | 7B | A1(B1)1 |
| 8A | A1(B1)2 | 8B | A1(B1)3 |
| 9A | A1(B1)4 | 9B | A1(B1)5 |
| 10A | A1(B1)6 | 10B | A1(B1)7 |
| 11A | A2(B2)0 | 11B | A2(B2)1 |
| 12A | A2(B2)2 | 12B | A2(B2)3 |
| 13A | A2(B2)4 | 13B | A2(B2)5 |
| 14A | A2(B2)6 | 14B | A2(B2)-7 |
| 15A | A2(B2)0 | 15B | A2(B2)1 |
| 16A | A2(B2)2 | 16B | A2(B2)3 |
| 17A | A2(B2)4 | 17B | A2(B2)5 |
| 18A | A2(B2)6 | 18B | A2(B2)7 |
| 19A | Empty | 19B | Empty |
| 20A | A2(B2) Common(-) | 20B | A2(B2) Common(-) |

Connector jack : FCN-361J040-A(Fujitsu)
Connector cover: FCN-360C040-B(Fujitsu)

Front view with I/O module cover removed.

Note 1: $n_1$ is the number of lamp ON points and $n_2$ is the number of lamp OFF points.
Note 2: The circuit diagram and connector contents are in case of control module with N mark. (See the front panel for N mark)

## DC I/O module
## ZW-32IO2 (5/12/24 VDC)

| Item | | Specifications | Front view |
|---|---|---|---|
| | Rated load voltage | 5/12/24 VDC *Note 1 | |
| | Load voltage range | 4.75 to 5.25VDC/10.8 to 26.4VDC (selectable with internal switch) | |
| Input port | No. of input points | 16 points | |
| | Rated input current | 7/4/9 mA (5/12/24 VDC) | |
| | Input impedance | 0.7k ohms [TYP.](5 VDC)  2.5kohms [TYP.](12/24 VDC) | |
| | Input ON level (active low input) | (Power voltage-1.2)V/3mA or less       *Note 2 | |
| | Input OFF level (active low input) | 1V or open/0.4mA or more  *Note 2 | |
| | Response time | OFF to ON: 1 ms or less, ON to OFF: 1ms or less | |
| Output port | No. of input points | 16 points | |
| | Rated output current | DC 50 mA/point(5 VDC), DC 100 mA/point(12/24 VDC) | |
| | Allowable surge current | 1A (10ms or less)  *Note 4 | |
| | Fuse ratings | For output load current (one for each common), Class-B, normal blow miniature fuse with 2A rating. External power source circuit Class-B, normal blow miniature fuse with 300mA rating. | |
| | ON voltage | 0.4 V or less | |
| | Leakage current | 0.1mA or less | |
| | Response time | OFF to ON: 1 ms or less, ON to OFF: 1ms or less | |
| Internal current consumption (5 VDC) | | Max. 320 mA, n points at ON ➡ (180+5nIN+3.5nOUT)mA | |
| External power source | | 4.75 to 26.4 VDC (Input) max. 12mA/point, (Output) max. 5mA/point | |
| Operation indication | | LED lights at ON condition | |
| External wire connection system | | 40-pin connector (soldering) (Applicable wire size : 0.3mm² or less) | |
| Dielectrical strength | | 1500 VAC for 1 minite (between I/O terminal and secondary circuit) | |
| Insulation resistance | | 500 VDC, 10M ohms or more (between I/O terminal and secondary circuit) | |
| Insulation system | | By photo-coupler | |
| Common system | | 1 common line for input 16 points 1 common line for output 16 points | |
| Weight | | Approx. 800g | |
| Circuit diagram | | | |

| Item | Specifications |
|---|---|

**Circuit diagram**

NC data

Data control signals

NC controller ===> Driver ===> Motor → (PG)

**Connector pin description**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1A | Input common (+) | 1B | Input common (+) |
| 2A | 0 | 2B | 1 |
| 3A | 2 | 3B | 3 |
| 4A | 4 | 4B | 5 |
| 5A | 6 | 5B | 7 |
| 6A | 0 | 6B | 1 |
| 7A | 2 | 7B | 3 |
| 8A | 4 | 8B | 5 |
| 9A | 6 | 9B | 7 |
| 10A | Input power supply(-) | 10B | Input power supply(-) |
| 11A | Output power supply(-) | 11B | Output power supply(+) |
| 12A | 0 | 12B | 1 |
| 13A | 2 | 13B | 3 |
| 14A | 4 | 14B | 5 |
| 15A | 6 | 15B | 7 |
| 16A | 0 | 16B | 1 |
| 17A | 2 | 17B | 3 |
| 18A | 4 | 18B | 5 |
| 19A | 6 | 19B | 7 |
| 20A | Output common(-) | 20B | Output common(-) |

Note 1: Full-wave rectified power sources without smoothing circuit cannot be used. Ripple in the 12 VDC power should not exceed 5%; that in the 24 VDC power should not exceed 15%.

Note 2: Input signals are switchable between active high and active low logic for every 4 points at a time. For active high logic, the ON-OFF relationship is reversed.

Note 3: When using a contactless or photoelectric switch, pay special attention to the turn OFF level of the input block. The input circuit may fail to turn OFF depending on the switch characteristics.

Note 4: An output current exceeding 0.3A may be limited by output devices.

# 12-3 Communication command list

## [1] Read commands (Note 1)

| Command | Function | Communication data format |
|---------|----------|---------------------------|
| MRL | Monitor relay | **Command** `M R L` \| Relay No. (5 characters) — 0: OFF, 1: ON <br> **Response +data** `M R L` \| Relay No. (5 characters) \| 0/1 (1 byte) |
| MTC | Monitor current values of timer/counter/MD. | **Command** `M T C` \| Timer/counter/ MD No.1 (4 characters) \| Timer/counter/ MD No.2 (4 characters) <br> **Response +data(ZW)** `M T C` \| Timer/counter/ MD No.1 (4 characters) \| Timer/counter/ MD No.2 (4 characters) \| Data 1 (2 bytes) \| Data 2 (2 bytes) \| // \| Data n (2 bytes) <br> **Response +data(JW)** `M T C` \| Timer/counter/ MD No.1 (4 characters) \| Timer/counter/ MD No.2 (4 characters) \| Data 1 (2 bytes) \| Data 2 (2 bytes) \| // \| Data n (2 bytes) <br> Data 1 (2 bytes) \| Data 2 (2 bytes) \| // \| Data n (2 bytes) |
| MRG | Register current value monitor | **Command** `M R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) <br> **Response +data** `M R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) \| Data 1 (1 byte) \| Data 2 (1 byte) \| // \| Data n (1 byte) |
| RFL | Read file register (file 1) | **Command** `R F L` \| File register address 1 (6 characters) \| File register address 2 (6 characters) <br> **Response +data** `R F L` \| File register address 1 (6 characters) \| File register address 2 (6 characters) \| Data 1 (1 byte) \| / <br> Data (n-1) (1 byte) \| Data n (1 byte) |
| RFLF | Read file register (file 1 to 7) | **Command** `R F L F ①` \| File register address 1 (6 characters) \| File register address 2 (6 characters) <br> **Response +data** `R F L F ①` \| File register address 1 (6 characters) \| File register address 2 (6 characters) \| Data 1 (1 byte) \| / <br> Data (n-1) (1 byte) \| Data n (1 byte) \| ① File numbers 1 to 7 |
| RSM | Read system memory | **Command** `R S M` \| System memory address 1 (4 characters) \| System memory address 2 (4 characters) <br> **Response +data** `R S M` \| System memory address 1 (4 characters) \| System memory address 2 (4 characters) \| Data 1 (1 byte) \| Data 2 (1 byte) \| // \| Data n (1 byte) |
| RPM | Read program memory | **Command** `R P M` \| Program memory address 1 (6 characters) \| Program memory address 2 (6 characters) <br> **Response +data** `R P M` \| Program memory address 1 (6 characters) \| Program memory address 2 (6 characters) \| Data 1 (2 bytes) \| / <br> Data (n-1) (2 bytes) \| Data n (2 bytes) |

| Command | Function | Communication data format | | |
|---------|----------|---------------------------|---|---|
| MDY | Read date information (for JW-PC only) | Command | M D Y | |
| | | Response +data | M D Y | Year (H) Year (L) Month (H) Month (L) Date (H) Date (L) Day (H) Day (L) |
| MTM | Read time information (for JW-PC only) | Command | M T M | |
| | | Response +data | M T M | Hour (H) Hour (L) Min. (H) Min. (L) Sec. (H) Sec. (L) |

## [2] Write commands (Note 1)

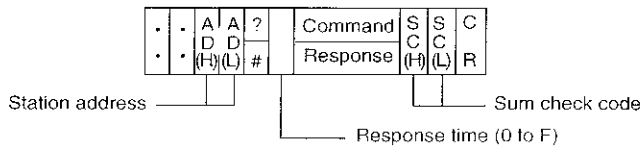| Command | Function | Communication data format | | |
|---------|----------|---------------------------|---|---|
| SRR | Set/reset relay | Command +data | `S R R` \| Relay No. (5 characters) \| 0/1 (1 byte) — 0: reset / 1: set | |
| | | Response | `S R R` \| Relay No. (5 characters) | |
| SRT | Set/reset timer/ counter | Command +data | `S R T` \| Timer/counter No. (4 characters) \| 0/1 (1 byte) — 0: reset / 1: set | |
| | | Response | `S R T` \| Timer/counter No. (4 characters) | |
| WRG | Write register | Command | `W R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) \| Data 1 (1 byte) \| Data 2 (1 byte) ... Data n (1 byte) | |
| | | Response +data | `W R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) | |
| FRG | Write the same data into all registers | Command | `F R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) \| Data 1 (1 byte) | |
| | | Response +data | `F R G` \| Register address 1 (5 characters) \| Register address 2 (5 characters) | |
| WFL | Write file register (file 1) | Command +data | `W F L` \| File register address 1 (6 characters) \| File register address 2 (6 characters) \| Data 1 (1 byte) ... Data (n-1) (1 byte) \| Data n (1 byte) | |
| | | Response | `W F L` \| File register address 1 (6 characters) \| File register address 2 (6 characters) | |
| WFLF | Write file register (file 1 to 7) | Command +data | `W F L F ①` \| File register address 1 (6 characters) \| File register address 2 (6 characters) \| Data 1 (1 byte) ... Data (n-1) (1 byte) \| Data n (1 byte)   ① File numbers 1 to 7 | |
| | | Response | `R F L F ①` \| File register address 1 (6 characters) \| File register address 2 (6 characters) | |
| WSM | Write system memory | Command +data | `W S M` \| System memory address 1 (4 characters) \| System memory address 2 (4 characters) \| Data 1 (1 byte) \| Data 2 (1 byte) ... Data n (1 byte) | |
| | | Response | `W S M` \| System memory address 1 (4 characters) \| System memory address 2 (4 characters) | |
| WPM | Write program memory | Command +data | `W P M` \| Program memory address 1 (6 characters) \| Program memory address 2 (6 characters) \| Data 1 (2 bytes) ... Data (n-1) (2 bytes) \| Data n (2 bytes) | |
| | | Response | `W P M` \| Program memory address 1 (6 characters) \| Program memory address 2 (6 characters) | |

| Command | Function | Communication data format | | |
|---------|----------|---------------------------|---|---|
| CTC | Change timer/ counter value | Command +data | C T C \| Program memory address 1 (6 characters) \| Data (2 bytes) | |
| | | Response | S R R \| Program memory address 1 (6 characters) | |
| SDY | Set date (for JW-PC only) | Command +data | S D Y \| Year (H) \| Year (L) \| Month (H) \| Month (L) \| Date (H) \| Date (L) \| Day (H) \| Day (L) | |
| | | Response | S D Y | |
| STM | Set time (for JW-PC only) | Command +data | S T M \| Hour (H) \| Hour (L) \| Min. (H) \| Min. (L) \| Sec. (H) \| Sec. (L) | |
| | | Response | S T M | |
| ACL | Correct or stop clock (for JW-PC only) | Command +data | A C L ① \| ①Contents of correction \| 01: Stop clock  08: Correct 30 sec. | |
| | | Response | A C L | |

(Note 1) Commands and response construct below the format. Refer to ZW-10CM, JW-10CM instruction manual and page 123 in this user's manual.

```
. .  A  A  ?   Command  S  S  C
.  .  D  D            C  C
     (H)(L) #  Response (H)(L) R
```

Station address ——————————┘  └—————— Sum check code
Response time (0 to F)

## [3] Control commands (see note 1 on previous page)

| Command | Function | Communication data format |
|---------|----------|---------------------------|
| HLT | Stop PC run | Command: H L T<br>Response: H L T |
| RUN | Resume PC run | Command: R U N<br>Response: R U N |
| MPC | Monitor PC run | Command: M P C — 0: Running / 1: Stopped by other option / 2: Stopped by HLT command<br>Response +data: M P C \| 0 to 2 (1 byte) |
| VLM | Read memory capacity | Command: V L M — Program capacity / 0: 7.5 K words / 1: 15.5 K words / 2: 23.5 K words / 3: 31.5 K words<br>Response +data: V L M \| 0 to 3 (1 byte) |
| SVL | Set memory capacity | Command +data: S V L \| 0 to 5 (1 byte) \| 0 to 3 (1 byte) — Program capacity / 0: 7.5 K words / 1: 15.5 K words / 2: 23.5 K words / 3: 31.5 K words<br>Response: S V L |
| SWE | Read write mode | Command: S W E — 0: Write inhibit / 1: Enable data memory write / 2: Enable all memory write<br>Response +data: S W E \| 0 to 2 (1 byte) |
| EWR | Set write mode | Command +data: E W R \| 0 to 2 (1 byte)<br>Response: E W R — 0: Write inhibit / 1: Enable data memory write / 2: Enable all memory write |

(Note 2) The format of error response



・ ・ | A A | % | | | S S C
・ ・ | D D | | | | C C
    | (H)(L) | | (H)(L) | (H)(L) | R

Response time (0 to F)

Error code

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