
Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed the precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or related equipment and systems.


 **WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

Symbol  is used in labels attached to the product.

 **CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.

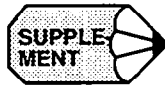
Even items described in  **CAUTION** may result in a vital accident in some situations. In either case, follow these important items.

Visual Aids

The following aids are used to indicate certain types of information for easier reference.



Indicates important information that should be memorized, including precautions such as alarm displays to avoid damaging the devices.



Indicates supplemental information.



Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

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About this Manual

This manual describes the specifications for connecting YASNAC J300 with machines, machine interfaces and external equipment.

Necessary connections to be provided by the machine tool builder differ depending on the type of the CNC cabinet supplied by Yaskawa. Make additions or deletions of connections in accordance with the combination for standard cabinets and integrated units.

The programmable controller system (hereafter called PLC) is installed in the YASNAC J300 CNC cabinet. For details of the PLC, refer to YASNAC J300/J100 PLC Programming Manual (SIE-C844-0.1).

Related Manuals

Refer to the following manuals as required.

Read this manual carefully to ensure the proper use of J300. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

Manual Name	Manual Number	Contents
YASNAC J300M/J100M Operating Manual	TOE-C844-2.1	Describes the basic configuration and operation procedure of YASNAC J300M/J100M.
YASNAC J300M/J100M Programming Manual	TOE-C844-2.2	Describes the information necessary for creating a program using the YASNAC J300M/J100M.
YASNAC J300L Operating Manual	TOE-C843-13.20	Describes the basic configuration and operation procedure of YASNAC J300L.
YASNAC J300L Programming Manual	TOE-C843-13.21	Describes the information necessary for creating a program using the YASNAC J300L.
YASNAC J300/J100 PLC Programming Manual	SIE-C844-0.1	Describes the PLC instructions and the operation for developing the PLC programs.
YASNAC J300M/J100M I/O Signal Function Manual	SIE-C844-2.3	Describes the functions of I/O signals between YASNAC J300M/J100M and PLC.
YASNAC J300L I/O Signal Function Manual	SIE-C843-13.4	Describes the functions of I/O signals between YASNAC J300L and PLC.
YASNAC J300 Connecting Manual(Type B)	SIE-C843-13.5	Describes the specifications for connecting YASNAC J300 with machines, machine interface and external equipment.

Notes for Safe Operation

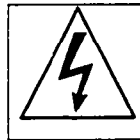
Read this programming manual thoroughly before installation, operation, maintenance or inspection of the YASNAC J300.

The functions and performance as an NC machine tool are not determined only by an CNC unit itself. Before the operation, read thoroughly the machine tool builder's documents relating to the machine tool concerned.

In this manual, the Notes for Safe Operation are classified as "WARNING" or "CAUTION".

■ Key to Warning Labels

The following warning labels are used with the YASNAC J300.

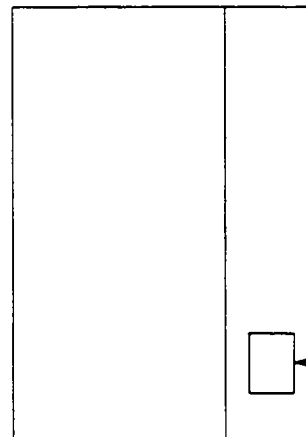


Electric shock hazard

Do not touch the terminals while the power is on, and for 5 minutes after switching off the power supply!

Location of label

CNC unit



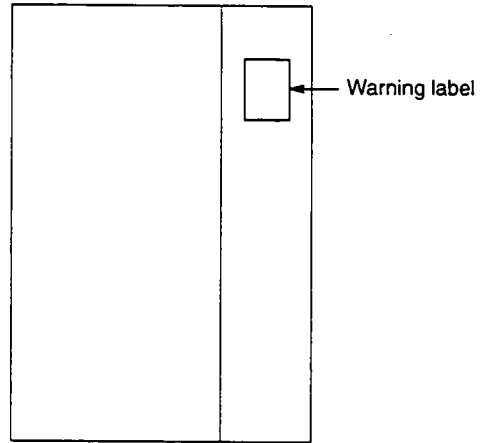
Warning label



Grounding wires must be connected to the unit's grounding terminals.

Location of label

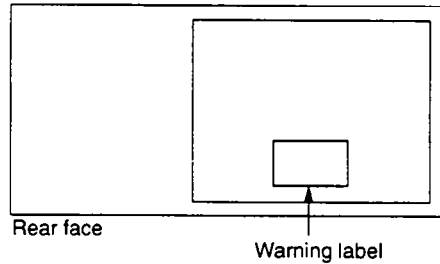
CNC unit



Electric shock hazard
Do not touch inside.

Location of label

CNC operation panel with 9 inch CRT



■ Transport Precautions

CAUTION

- Do not lift the cable when moving the product.
Failure to observe this caution may lead to personal injury or product failure.
- Cover the eyebolt mounting holes with bolts of the corresponding size after having removed the eyebolts with the product installed on the machine.
Failure to observe this caution may lead to product failure.
- Do not move the product in a place subject to rain, water drops, harmful gases or liquids.
Failure to observe this caution may result in personnel accident or product failure.

■ Storage

CAUTION

- Do not store the product in a place subject to rain, water drops, harmful gases or liquids.
Failure to observe this caution may result in product failure.
- Select a storage area indoors that is clean and meets the following temperature and humidity conditions.
Failure to observe this caution may result in product failure.
 - Ambient temperature : $-20\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$ to $140\text{ }^{\circ}\text{F}$)
 - Relative humidity : 10% to 90%
 - Altitude : 1000 m and less

■ Installation

CAUTION

- When installing the product, avoid shutting the intake port or the exhaust port. Also avoid foreign matter from entering the device.
Failure to observe this caution may lead to fire or product failure.
- Avoid strong impact during installation.
Failure to observe this caution may result in product failure.
- Set the power line capacity higher than the power consumption of the device.
Failure to observe this caution may result in product malfunction.

 **CAUTION**

- The current capacity of 24 VDC external power unit for input / output contacts is determined by the number of contact points to be used. When the current capacity is low, install an additional external power unit.
- Rust preventive has been applied to the shaft end and the flange surface of the motor, so remove it by wiping with a clean cloth before installing the device.
- When connecting the motor shaft to a driven machine, make sure that they are centered accurately to prevent vibration.
Failure to observe this caution may lead to vibration causing product failure or personal injury.
- Design and install the box in accordance with the following.
Failure in box such as electric control panel may result in product failure or malfunction.
 1. Use an airtight enclosure.
 2. Limit the average temperature increase of internal air within the enclosure to under 10 °C (50 °F) compared to the ambient temperature.
 3. Use a fan to circulate air in order to improve the cooling efficiency of a closed enclosure and to prevent abnormal temperature rise.
 4. Seal the cable inlet, door, etc. completely.
 5. CRT display attracts airborne particles because of its high voltage and may result in malfunction, therefore, provide a structure to prevent the entry of such particles.
 6. In the CNC unit, various units and printed circuit boards, dust in the air may result in malfunction, therefore, make structures to prevent the entry of dust.
 7. Install packing on the cable inlet, doors, back covers, etc. to eliminate gaps or openings.
 8. Ambient magnetic field may cause screen fluctuations of the CRT display, therefore, prevent this by layout and magnetism shield.

 **CAUTION**

- Install various units in accordance with the following.
Failure to observe this caution may result in product failure or malfunction.
 1. Mount the servo unit vertically with screws or bolts.
 2. The servo unit will generate heat, therefore, install it with adequate clearance around it.
 3. In order to reduce the internal loss causing heat generation, arrange the cooling fin of the servo unit outside the enclosure so that the fin is exposed to the external atmosphere.
 4. When circulating air inside the enclosure, do not blow air directly onto the servo unit (in order to prevent dust contamination).
 5. Regenerating resistor will generate heat, therefore, install it away from devices that may be affected by heat.
 6. Arrange units so that maintenance, inspection or change of parts may be made easily.

■ Wiring



CAUTION

- Correct and precise wiring should be performed by qualified, authorized personnel only.
Failure to observe this caution may result in electric shock, fire, or malfunction.
- Never connect a 3-phase power supply to motor output terminals "U, V, and W" of the drive unit.
Otherwise, the device may be damaged.
- Select the type of wire and its size according to your requirement and current capacity.
When the ambient temperature exceeds 30 °C (86 °F), the allowable current goes down.
Select the cable size in conformance with local electrical codes or the cable manufacturer's technical data.
Failure to observe this caution may result in fire.
- Use twisted wire or multi-core twisted pair shielded wire for general signal wires and feedback signal wires for the encoder.
This helps the prevention of malfunction.



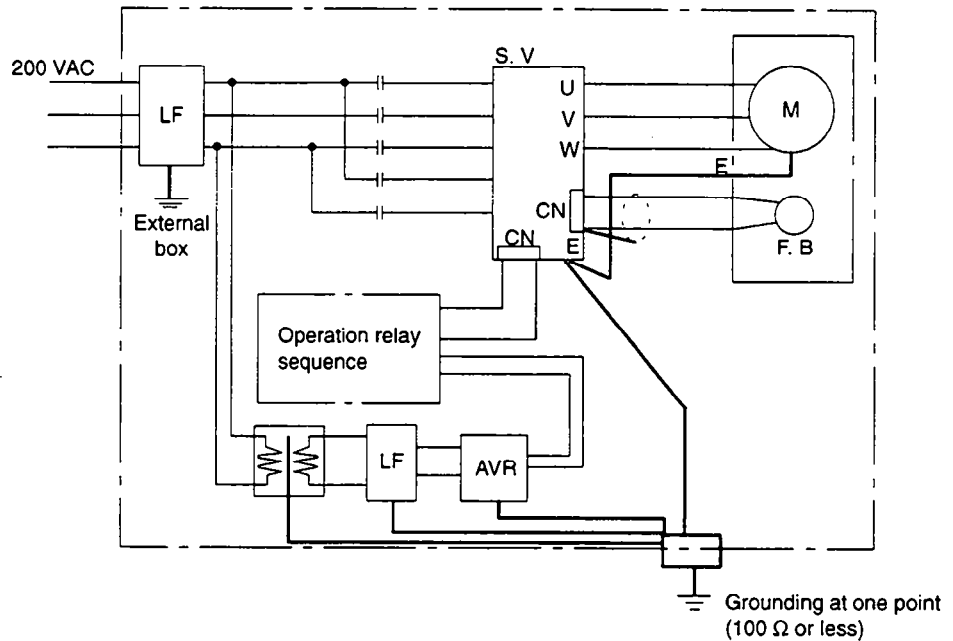
CAUTION

- Connect wires in the shortest possible length.
This helps the prevention of malfunction.
- Connect the power supply +24 VDC to the CNC unit.
 1. The power supply should be provided at the customer side.
(The power supply unit (JZNC-JAU07) is available as option.)
 2. Supply the power in the range of +24 VDC \pm 10% to the power terminals of the CNC unit.
- Do not run the I/O signal wires with power wires or in the same duct with power wires.
Sufficient separation of signal wires from power wires will reduce the noise influence slight.
- In the event of noise from a power wire, use a noise suppressor to prevent it.
As for the specifications and capacity of noise filter, refer to this connection manual.
Correct use of noise filter will reduce the noise influence.
- Be sure to complete the end terminal processing to the last module of the remote I/O module.
Set the "TERMINATION" shorting pin to "ON."
Failure to observe this caution may lead to malfunction.

⚠ CAUTION

- Connect the grounding line of each unit to the housing or grounding plate independently.

Example of grounding



- Select the wire for grounding in conformance with local electrical codes.
- Be sure to connect the grounding terminal of the motor to the grounding terminal of the drive unit.
- Ground at one point. (Ground resistance 100 Ω or less)
Failure to observe this caution may lead to electric shock, fire, or malfunction.
- Be sure to separate the grounding line of the unit from a power unit.
Failure to observe this caution may lead to malfunction.

■ Application Safety Precautions

 **WARNING**

- During operation, be sure to observe the following.
Failure to observe this warning may lead to electric shock or device malfunction.
 1. Do not touch the unit or terminal while the unit is turned ON.
 2. Just after the unit is turned OFF, it is still in charging status. Do not touch the running parts for 5 minutes after the unit is turned OFF.
- Do not damage, pinch, or give excessive stress to cables.
Excessive load on cable may cause electric shock.
- While the unit is turned ON, never touch its rotating parts.
Failure to observe this warning may lead to personal injury.
- Never modify the product.
Failure to observe this warning may result in electric shock, fire, or product failure.

 **CAUTION**

- Use the product under the following conditions.
Use in an environment with high temperature, high humidity, dust, corrosive gases, vibration, or impact may cause fire, electric shock, or malfunction.
 1. Free from explosive gases or steam
 2. Free from oil, organic solvent, corrosive liquids, etc.
 3. Relative humidity 20 to 90% RH and non-condensation
 4. Ambient temperature 0 °C to 45 °C (32 °F to 113 °F) and without freezing
(Free from direct sunlight, heat generating devices, and outside atmosphere)
 5. Vibration under 4.9m/s² (0.5G)
- Do not let foreign matter such as electric wire scrap enter the unit.
Failure to observe this caution may result in fire, product failure or malfunction.
- For the programming functions, follow the procedures in the user's manual.
Failure to observe this caution may lead to personnel accident or malfunction.
- Use the unit with "System Number Switch" of CNC unit set to "0."
Failure to observe this caution may lead to malfunction.



CAUTION

- Before turning the unit ON again, wait for 2 seconds or more after turning it OFF.
Failure to observe this caution may lead to malfunction.
- Never disassemble or modify the components of the unit.
Failure to observe this caution may result in fire, product failure or malfunction.
- Never change the set values of the components and variable resistors used in the control panel.
Failure to observe this caution may result in fire, product failure or malfunction.

1

GENERALS

Chapter 1 describes the requirements for designing the controller..

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1.1 CONFIGURATION

This section describes the configuration of the controller.

1.1.1 System Configuration

The system configuration of YASNAC is as shown in Fig.1.1.

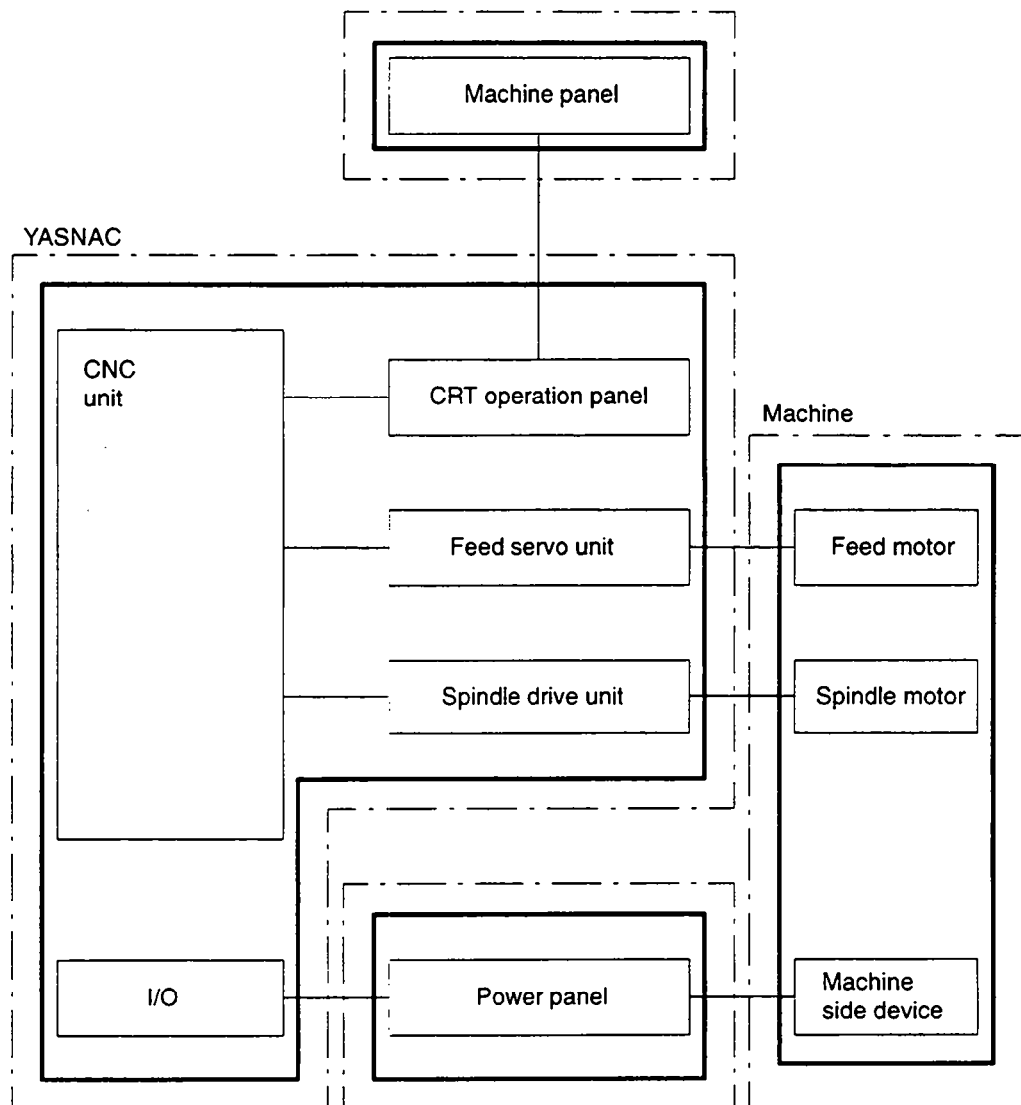


Fig.1.1 System Configuration

1.1.2 Connection between Devices

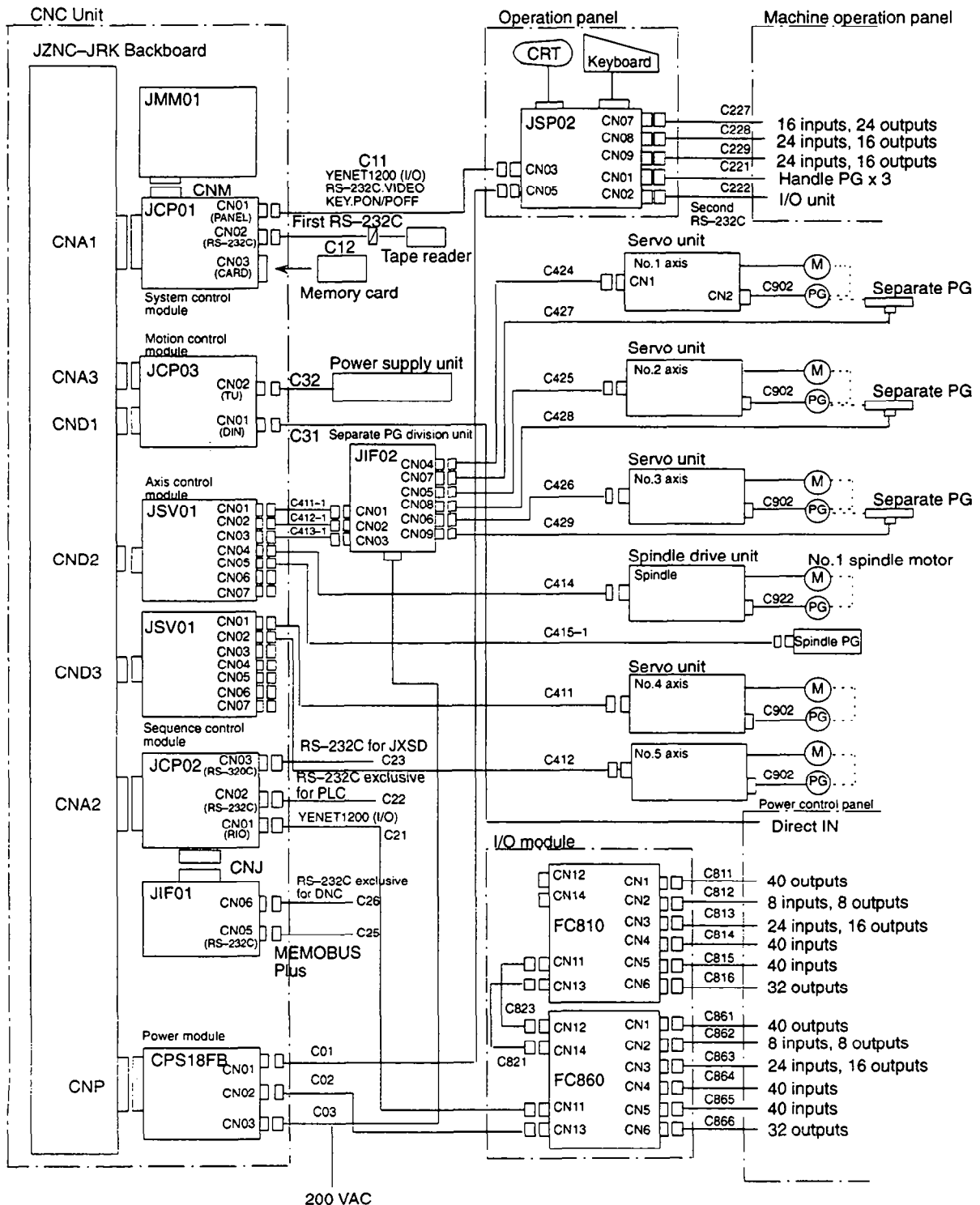
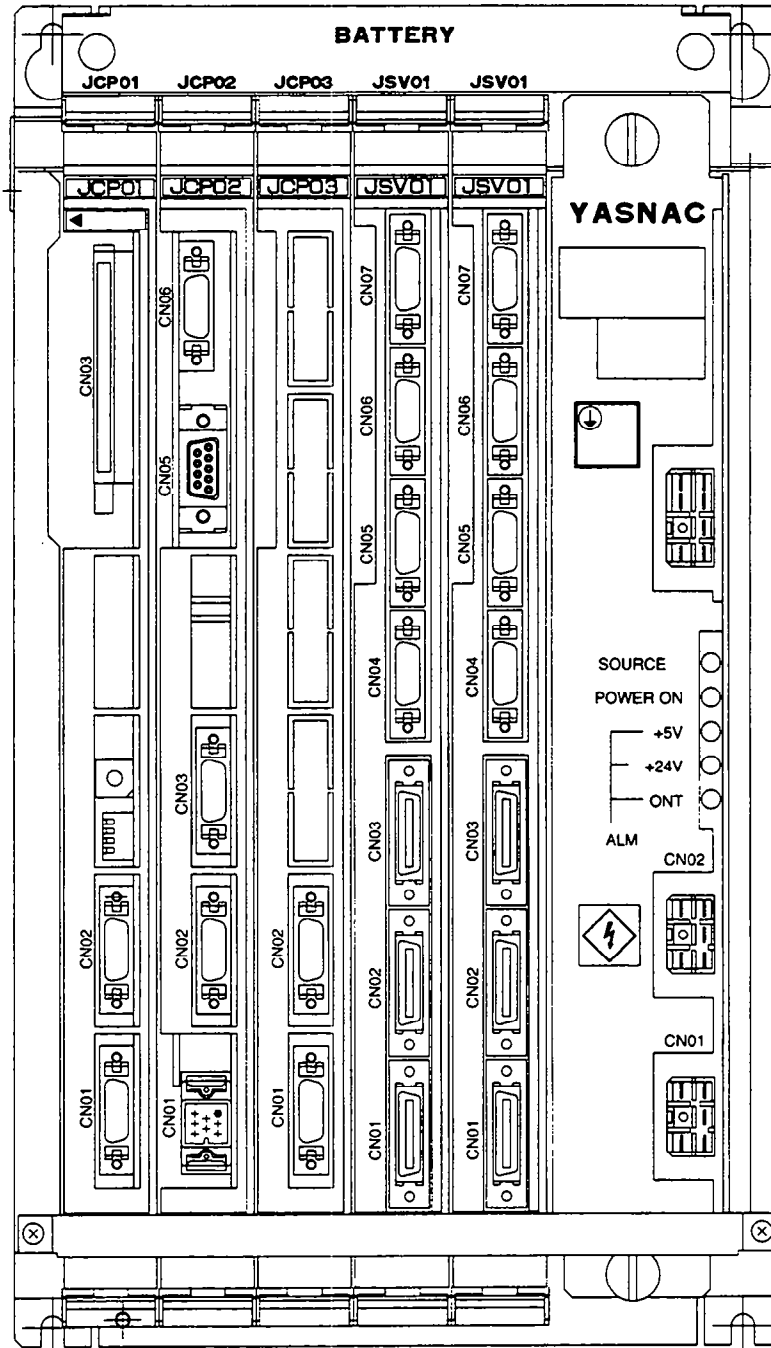


Fig.1.2 Connection between Devices

1.1.3 Connector Layout



— Axis control module
 — Motion control module
 — Sequence control module
 — System control module

Fig.1.3 Connector Layout(Model:JZNC~JRK30)

1.2 GENERAL SPECIFICATIONS

Design the controller to meet the following conditions completely.

Table 1.1 Specifications

Item		Specifications
Ambient Conditions	Temperature	0 °C to 45 °C at operation. (note) -20 °C to +60°C at storage and transportation.
	Humidity	10% to 90% RH (non-condensing)
	Vibration	Less than 4.9 m/s ²
	Others	Free from much dust, coolant or organic solvent.
	Input Power Source Input Voltage	CPU unit 200/220/230 VAC-15% to +10%
	Frequency	50/60 Hz ± 2 Hz
	Momentary Power Loss	Power loss is detected at power storage over 1 cycle.

Note: Avoid installation of the control panel in a location subject to direct sunlight, near heat generating devices, or outdoors even if the ambient temperature is lower than 45 °C.

1.3 DESIGN OF BOX

1.3.1 Thermal Design

Design should be made on the condition that the average temperature increase of internal air of the box to contain the CNC unit and other units should be below 10°C of the external air.

(1) Enclosure Internal Temperature Increase (Average temperature increase)

The internal temperature increase of enclosure made of sheet metal is generally as shown below:

$$\Delta T = \frac{P}{q_e} = \frac{P}{k \cdot A}$$

where,

ΔT : Internal temperature increase (°C)

P : Heat generation in enclosure (W)

q_e : Enclosure heat percolation ratio (W/°C)

k : Heat transit ratio of sheet metal (W/m²°C)

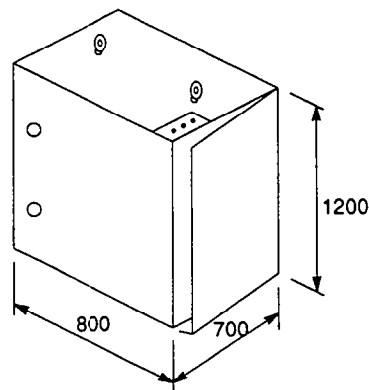
6W/m²°C : With internal circulating fan

4W/m²°C : Without internal circulating fan

A : Efficient heat diffusion area of enclosure (m²)

Area capable of diffusing heat in surface area of the enclosure
(Excluding area contacting other devices)

(Example) Allowable heat generation in the enclosure with internal circulating fan



Efficient heat diffusion area is independently located, so bottom area is excluded.

$$A = 4.16 \text{ m}^2$$

If the heat generation in the enclosure is supposed to be 246 W (113 W in CNC portion, 104 W in servo portion, and 29 W in I/O portion),

$$\begin{aligned} \Delta T &= \frac{P}{q_e} = \frac{P}{k \cdot A} \\ &= \frac{246}{6 \times 4.16} = 9.9 \text{ (}^\circ\text{C)} \end{aligned}$$

Therefore, it is all right to clear the temperature increase value below 10°C.
Where 10°C is exceeded, it is necessary to arrange separate cooling countermeasures.

(2) Cooling Capacity of Heat Exchanger

Where cooling capacity is insufficient by mounting the circulating fan in the enclosure, the following heat exchangers are supplied by Yaskawa:

Table 1.2 Heat Exchangers

Heat Exchanger	Cooling Capacity	External Dimensions (mm)
REX1550	100W/10°C	295(W) × 890(H) × 50(D)
HEATEX02	250W/10°C	440(W) × 924(H) × 50(D)

The heat generation in the cooling capacity column is the allowable heat generation amount where the internal temperature increase within the enclosure is limited to below 10°C.

(Example) Allowable heat generation amount in the enclosure with heat exchanger

The internal heat generation amount to make the internal temperature increase below 10°C when the enclosure equipped with HEATEX02 is expressed by the following equation:

$$\begin{aligned}
 P &= k \cdot A \cdot \Delta T + 250\text{W}/10^\circ\text{C} \\
 &= 6 \times 4.16 \times 10 + 250 \\
 &= 499\text{W}/10^\circ\text{C}
 \end{aligned}$$

therefore, it is necessary to be below 499W.

(3) Mounting of Heat Exchanger

Heat exchanger should be mounted on the enclosure manufactured by the machine tool builder.

Fig.1.4 shows an example. Mount it so that internal air is taken in from the upper portion and discharged from the lower portion, while external air is taken in from the lower portion and discharged from the upper portion.

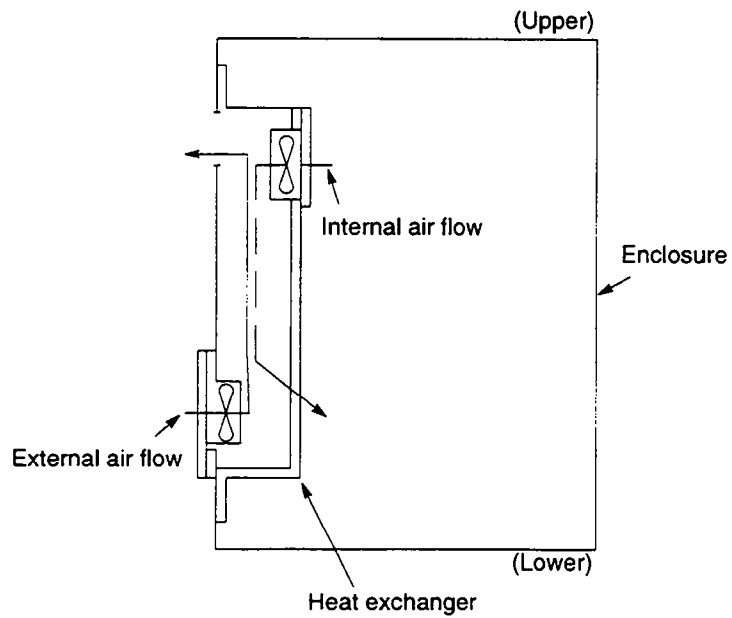


Fig.1.4 Mounting of Heat Exchanger

(4) Heat Generating Capacity of Respective Units

(a) CNC unit

Table 1.3 CNC Unit and Heat Generation

Unit Name	Heat Generation (W)
CNC unit (JRK30)	113
9-inch CRT operation panel	16
14-inch CRT operation panel	100
Tape reader	25
6-inch tape reader with handler	55
8-inch tape reader with handler	125
I/O module	29 (Note)

Note: Where current of 10.2 mA is supplied from 96 outputs to all the 112 inputs.



The heat generation of the CNC unit varies with addition of options.
The heat generation of the I/O module varies with the I/O status.

(b) Servo unit

Table 1.4 Servo Unit and Heat Generation

Servo Unit	Total Heat Generation (W)	Internal Heat Generation(W)		
		100% Load Factor	5% Load Factor	50% Load Factor
IR05SE	100	58	52	49
IR10SE	110	61	55	50
IR15SE	130	70	63	58
IR20SE	150	73	65	60
IR30SE	200	97	82	71
IR44SE	250	112	92	79
IR050505EB	160	-	74	64
IR101010EB	180	-	80	68
IR151515EB	220	-	90	76



1. Internal heat generation amount is the heat generation amount remaining inside the enclosure when the fin of the servo unit is exposed outside the enclosure and external air over 2.5 m/s is applied to the fin.
2. Thermal design of the enclosure to contain the servo unit varies with specifications for the machines, but it is generally acknowledged to use a value of 70% of the load factor.

1.3.2 Dustproof Design

The inside of the CNC units and other boards (especially CRTs) to be packaged in enclosure designed and manufactured by the machine tool builders are subject to airborne matter (dust, oil mist, etc.) and may cause malfunction. Therefore, structures should be constructed so as to prevent such matter from entering into the enclosure.

- Use an airtight enclosure.
- Seal the cable inlet with packing material. (Refer to Fig.1.5.)
- Secure the rear door lid with packing material. (Refer to Fig.1.6.)
- The front sides of units on the surface of the enclosure such as CNC operation panels and tape readers are of dustproof type, however, avoid installing them at places subject to coolant liquids. And seal the circumference of the mounting portion securely.
- Note that the CRT unit will attract airborne dust owing its high voltage. For the mounting pendant box of the CRT unit, observe the following points:
 - Seal the clearance at the cable inlet, door, rear lid, etc. with packing material. (Refer to Fig.1.7.)
 - The CRT unit mounting surface has already been sealed with packing material, so use it as it is.
 - Close all the openings.
 - Oil will collect on the ceiling and enter the inside of the enclosure through screw holes, therefore, carry out special countermeasures using oil preventive packing material, etc.

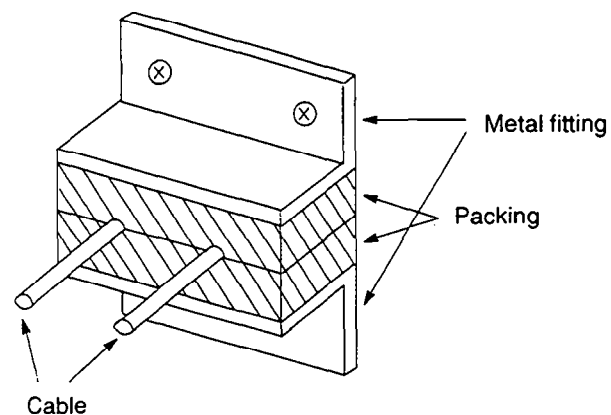


Fig.1.5 Cable Inlet

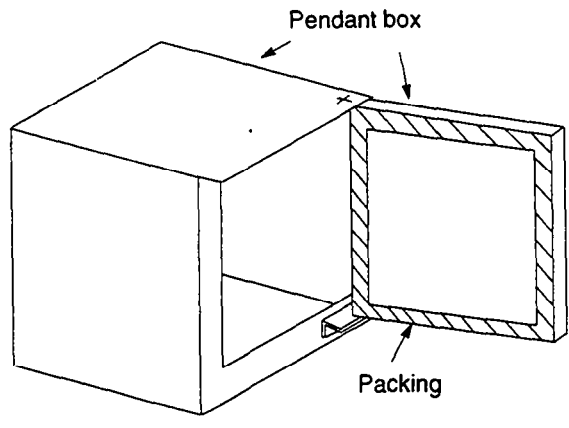


Fig.1.6 Door Packing

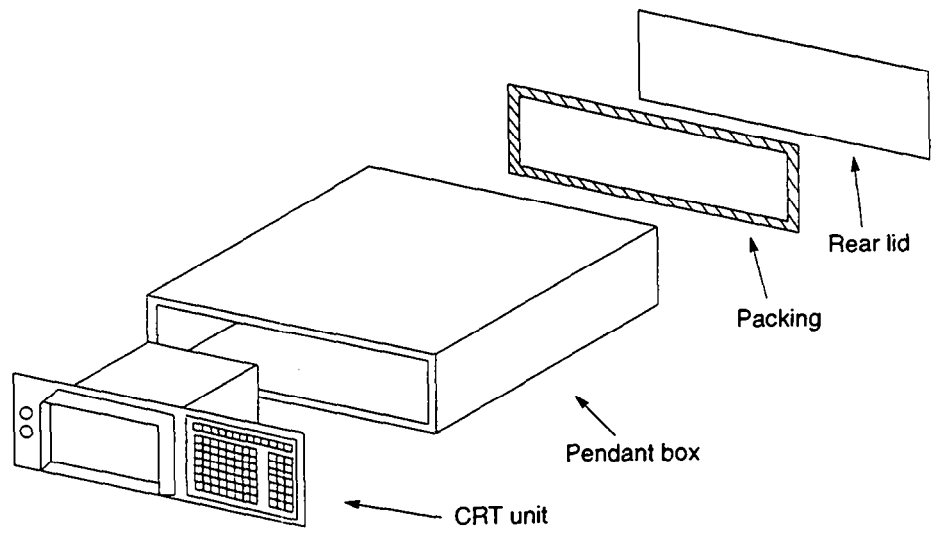



Fig.1.7 CRT Unit

1.3.3 Countermeasures against Magnetic Fields


The screen of CRT display may fluctuate owing to ambient magnetic fields.

Keep magnetism generating materials (for example, transformers, reactors, fans, electromagnetic switches, solenoid relays, exchange power supply cables, etc.) 300 mm from the CRT display. This value of 300 mm is a general standard and may vary with different situations, therefore, pay sufficient attention to determining the layout of magnetism generating sources, and finally check them with the machine.

1.4 CABLE CLAMP AND SHIELDING

Clamp those cables requiring shielding securely from cables to be connected to YASNAC to the grounding plate by using "cable clamp metal fitting" as shown in Fig. ****.

This clamp not only supports cables but also functions as a shield, therefore, it is very important, particular for system safety.

- Remove part of the cable sheath as shown in Fig. **** to expose the shield, and clamp the part to the grounding plate using a cable clamp.
- Arrange the grounding plate by the cable lead-in portion.
- When clamping a cable without a shield, there is no need to remove the cable sheath.

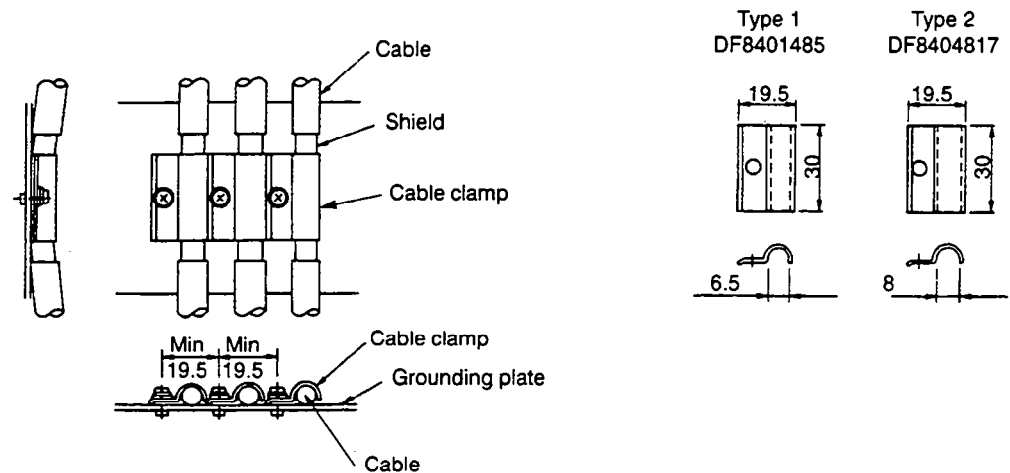


Fig.1.8 Cable Clamp and Shielding

1.5 PACKAGING

When designing the box to contain CNC unit and other units, take the following into consideration.

1.5.1 General Notes

- Use an air-tight enclosure.
- Arrange packaging of units so that maintenance, inspection, removal, mounting should be performed easily.
- Secure clearance of 100 mm between parts and enclosure wall in order not to restrict air flow.
- When the operation panel is built-in the machine door or the like, it is subject to vibration of the machine, therefore, be sure to reinforce it against vibration.
- Limit the average temperature increase of internal air of enclosure to below 10 °C of the external air.
- Use a fan to circulate air in order to improve the cooling efficiency of a closed enclosure and to prevent local temperature increase. (As a standard, arrange so that air over 1m/s flows over the surface of printed circuit boards within various units.)
- Do not blow the fan air directly onto printed circuit boards.
- In order to prevent malfunctions owing to noise, keep various units 10 mm away from cables or parts over 90 VDC, cables such as AC power supply or parts.
- When wiring, observe the following points:
 - Separate AC lines from DC lines.
 - Separate the primary side and the secondary side of transformer, line filter, etc.

1.5.2 Installation of CNC Unit

When installing the CNC unit, observe the following notes:

- Mount the CNC unit in the direction as shown in Fig.1.9.

(Upper)

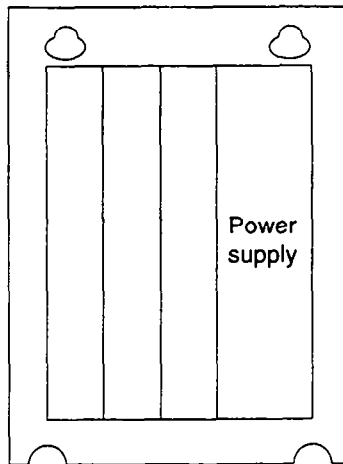


Fig.1.9 Mounting of CNC Unit

- This CNC unit has a built-in fan so that air flows at 1m/s over the upper side of the unit.
- Arrange clearance over 50 mm above the CNC unit and over 100 mm below it for ventilation and ease of maintenance.

1.5.3 Installation of Servo Unit

- Since the servo unit is a wall-mounted type, mount it vertically with screws or bolts.
- Arrange it so that maintenance, inspection and parts replacement can be made easily.
- Since the servo unit will generate heat to some extent, arrange other units or devices with sufficient space above and below it.
- In order to reduce the internal loss from the viewpoint of heat generation, arrange the cooling fin of the servo unit outside of the enclosure, and blow external air on the cooling fin. (2 m/s)
- When circulating the internal air in the enclosure, do not blow air directly to the servo unit (in order to prevent dust contamination).
- For the installation of the feed servo unit and the spindle drive unit, refer to the respective operation manuals.
- In order to reduce the internal loss from the viewpoint of heat generation, it is recommended to arrange the cooling fin of the servo unit outside of the enclosure. This helps make the enclosure closed structure and make the capacity of the heat exchange unit small.

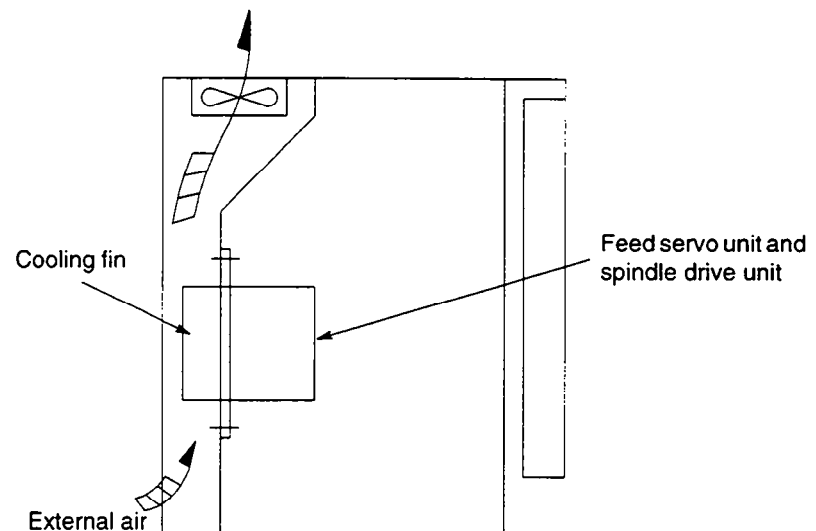


Fig.1.10 Cooling Fin Installed Outside of Enclosure

2

CONNECTION OF POWER SUPPLY

Chapter 2 describes the power supply connection.

2.1	CONNECTION BETWEEN DEVICES	.. 2 - 2
2.1.1	Power Supply to CNC Unit	2 - 2
2.1.2	Power Supply to Converter Unit	2 - 2
2.2	DETAILED CONNECTION 2 - 3
2.2.1	Power Supply to CNC Unit	2 - 3
2.2.2	Power Supply to Converter Unit	2 - 3

2.1 CONNECTION BETWEEN DEVICES

This section describes the connection between devices.

2.1.1 Power Supply to CNC Unit

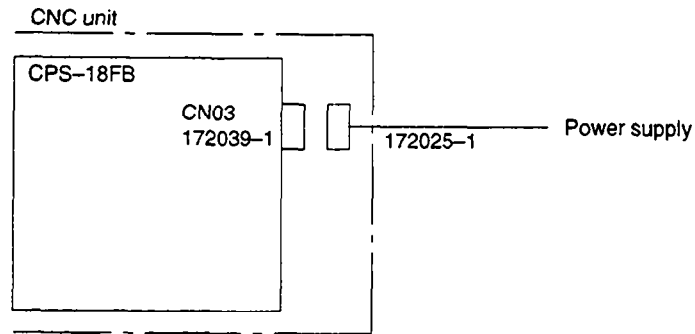


Fig. 2.1 Power Supply to CNC Unit

2.1.2 Power Supply to Converter Unit

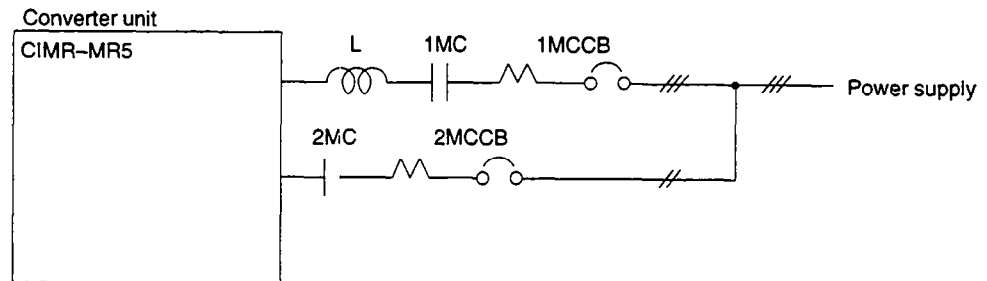


Fig. 2.2 Power Supply to Converter Unit

2.2 DETAILED CONNECTION

This section describes the detailed connection of power supply.

2.2.1 Power Supply to CNC Unit

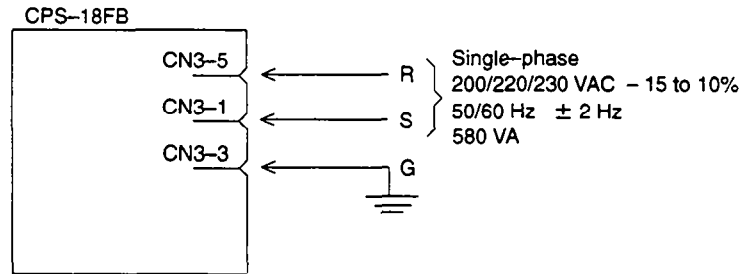


Fig. 2.3 Detailed Connection of Power Supply

2.2.2 Power Supply to Converter Unit

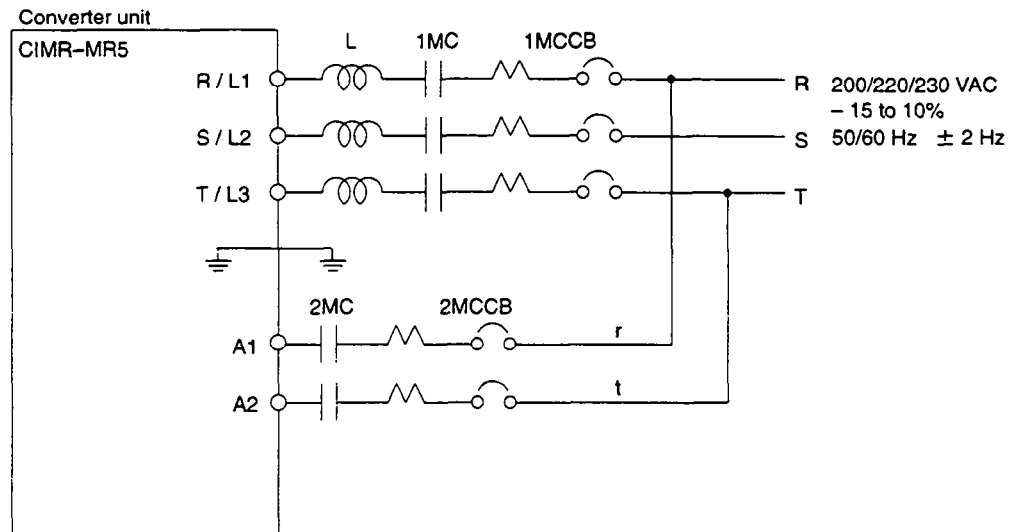


Fig. 2.4 Detailed Connection of Power Supply

3

CONNECTION OF CNC OPERATION PANEL

3

Chapter 3 describes the connection between the CNC unit and the CNC operation panel.

3.1	CONNECTION BETWEEN DEVICES ..	3 - 2
3.1.1	Connection with 9-inch CRT Operation Panel	3 - 2
3.2	DETAILED CONNECTION OF CNC OPERATION PANEL	3 - 3
3.2.1	Connection with 9-inch CRT Operation Panel	3 - 3
3.2.2	General Notes on the Connection of CRT Operation Panel	3 - 4

3.1 CONNECTION BETWEEN DEVICES

This section describes the connection between CNC unit (including the power supply unit) and CNC operation panel and the type of connector as well as the cable specifications.

3.1.1 Connection with 9-inch CRT Operation Panel

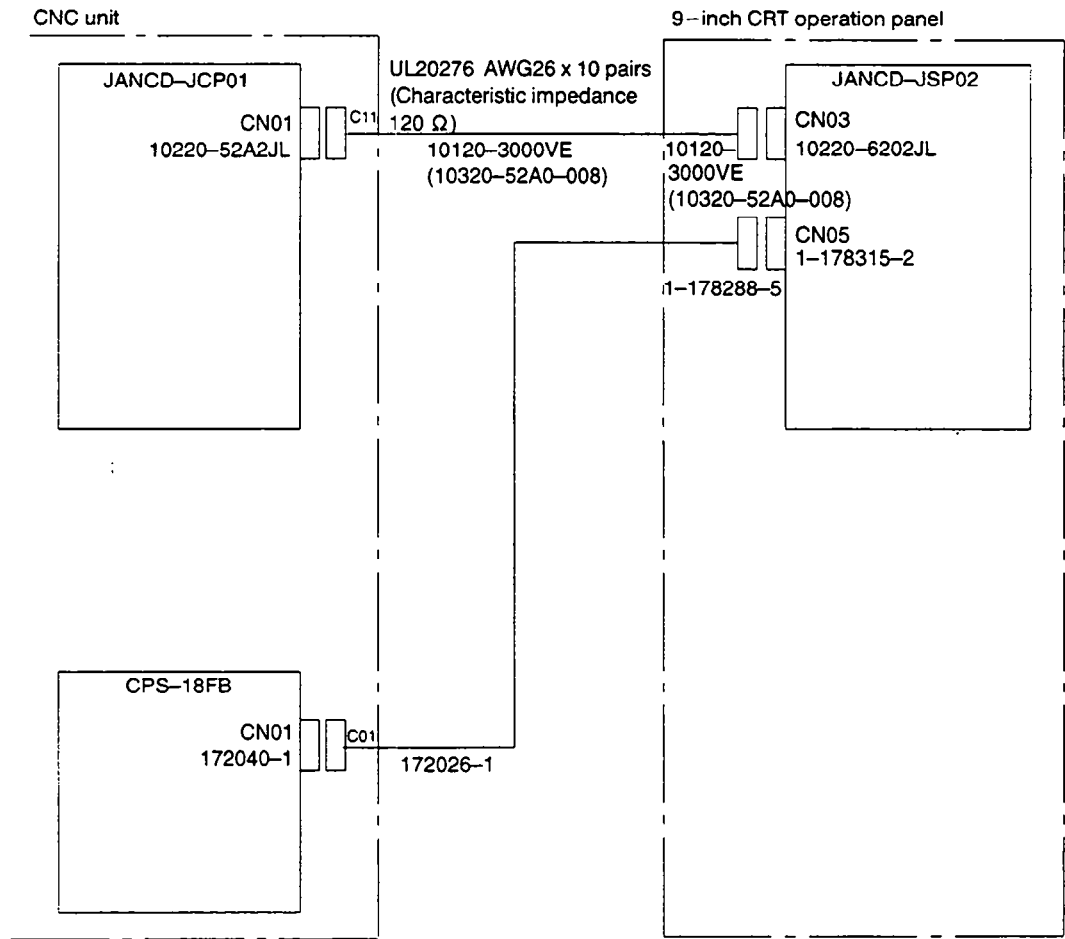


Fig. 3.1 Connection between Devices

3.2 DETAILED CONNECTION OF CNC OPERATION PANEL

This section describes the detailed connection between CNC unit (including the power unit) and CNC operation panel and the type of connector as well as the cable specifications.

3.2.1 Connection with 9-inch CRT Operation Panel

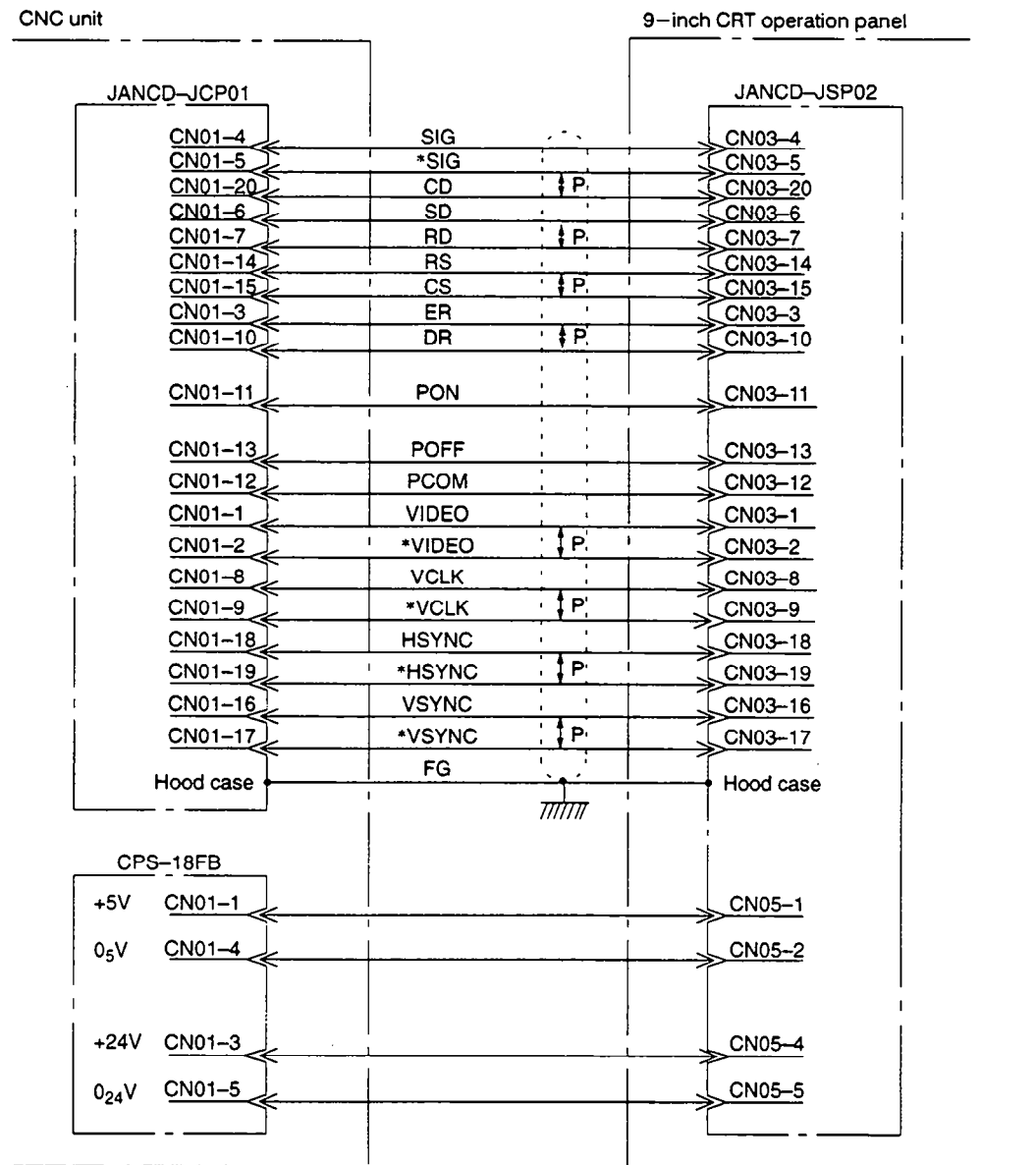
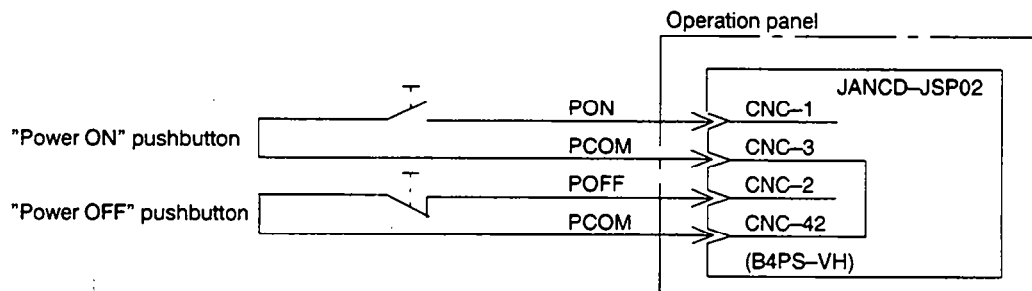


Fig. 3.2 Connection with 9-inch CRT Operation Panel

3.2.2 General Notes on the Connention of CRT Operation Panel

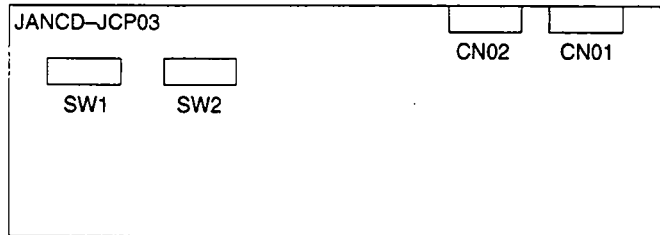
(1) Wiring of the Power ON/OFF Switch

For a standard horizontal 9-inch CRT operation panel, the wiring of the power ON/OFF switch has been made by Yaskawa. For a vertical type, use the wiring in the figure below or external ON/OFF switch.



(2) Switches for External Power Supply

External power supply ON/OFF is selected by the following switches:
Switches (SW1, 2) are arranged on JANCD-JCP03.

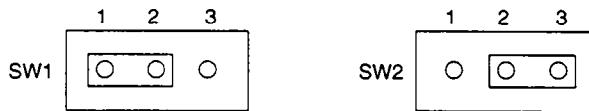


3

- For setting external power ON/OFF effective, and operation panel power ON/OFF effective



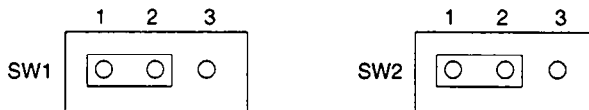
- For setting external power ON/OFF invalid, and operation panel power ON/OFF effective



- For setting external power ON/OFF effective, and operation panel power ON/OFF invalid



- Do not set. Setting shown below disables the power ON/OFF.



(3) Factory Setting

Before shipment, the operation panel power ON/OFF is set to "Effective," and the external power ON/OFF is set to "Invalid."

4

CONNECTION OF MANUAL PULSE GENERATOR

Chapter 4 describes the connection between the CNC operation panel and the manual pulse generator and type of the connector as well as the cable specifications.

4.1	CONNECTION BETWEEN DEVICES ..	4 - 2
4.1.1	Connection with 9-inch CRT Operation Panel	4 - 2
4.2	DETAILED CONNECTION OF MANUAL PULSE GENERATOR	4 - 3
4.2.1	Non-parallel I/F	4 - 3
4.2.2	Parallel I/F	4 - 4

4.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the CNC operation panel and devices of the manual pulse generator, and the type of connector, and the cable specifications.

4.1.1 Connection with 9-inch CRT Operation Panel

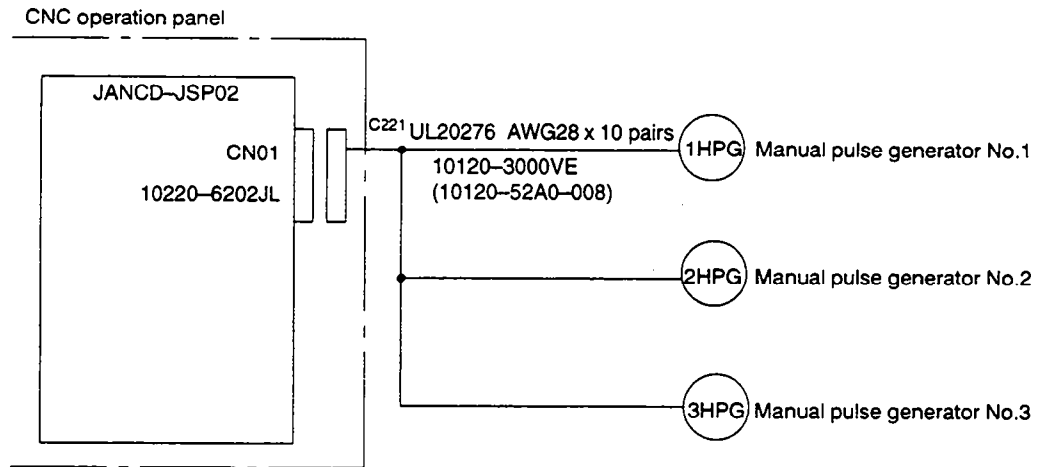


Fig. 4.1 Connection between Devices

4.2 DETAILED CONNECTION OF MANUAL PULSE GENERATOR

This section describes the detailed connection between the CNC operation panel and the manual pulse generator.

4.2.1 Non-parallel I/F

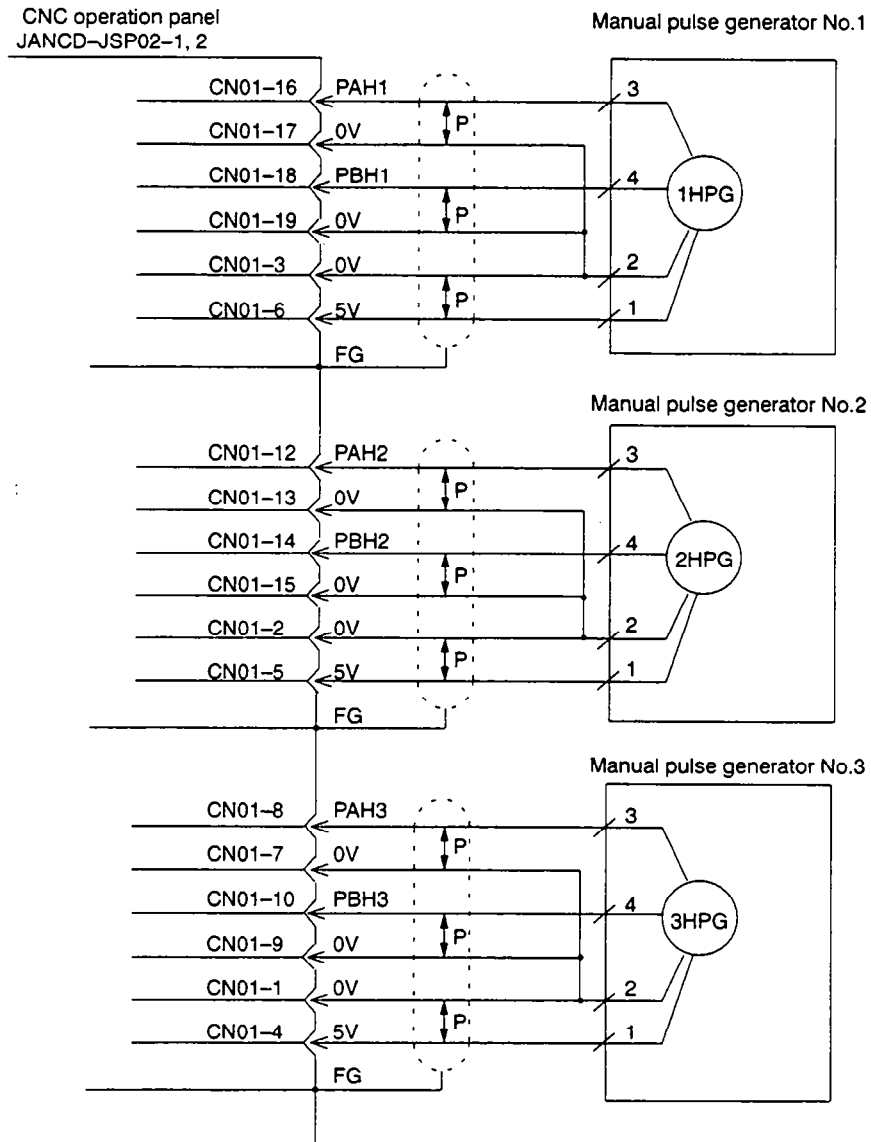


Fig. 4.2 Detailed Connection of Manual Pulse Generator (Model:PREH-2E5T/100-M)



Use the cable within 5 m for non-parallel type I/F.

Connect FG and the cable to the case using cable clamp metal fitting.

4.2.2 Parallel I/F

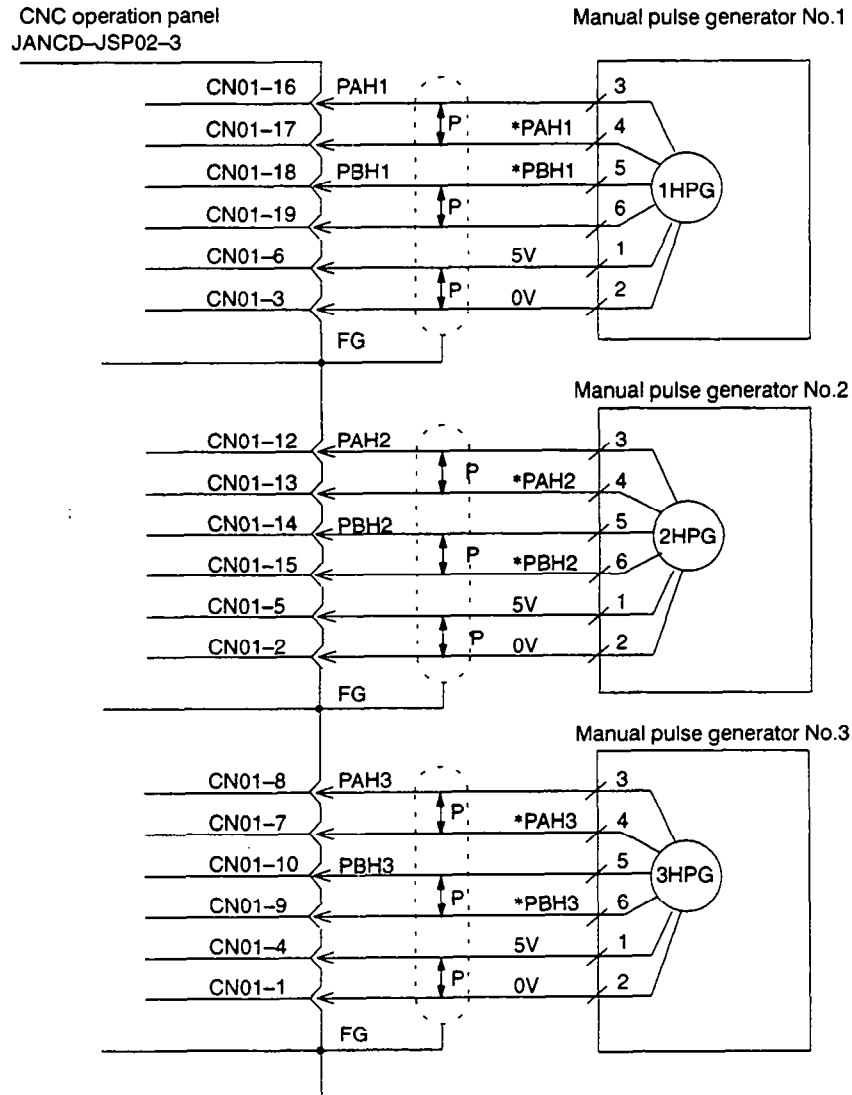


Fig. 4.3 Detailed Connection of Manual Pulse Generator (Parallel I/F)



Use the cable within 15 m in the case of parallel I/F.

Parallel type manual pulse generator is not provided by Yaskawa.

Connect FG and the cable to the case using cable clamp metal fitting.

5

CONNECTION OF POWER ON/OFF EXCLUSIVE SIGNAL

Chapter 5 describes the connection of the power ON/OFF exclusive signal.

5.1	CONNECTION BETWEEN DEVICES	5 - 2
5.1.1	Connection to CNC Unit	5 - 2
5.2	DETAILED CONNECTION OF POWER ON/OFF EXCLUSIVE SIGNAL	5 - 3
5.2.1	Connection to CNC Unit	5 - 3
5.3	DETAILS OF SIGNAL	5 - 4
5.3.1	Servo Power ON (SVMX), Brake Release (BKX) Output	5 - 4
5.3.2	Emergency Stop (*ESP) Input	5 - 5
5.3.3	External Power ON/OFF (EON, EOF, ECOM) Input	5 - 5

5.1 CONNECTION BETWEEN DEVICES

This section describes the connection between devices related to the power ON/OFF exclusive signal, the type of connector, and the cable specifications.

5.1.1 Connection to CNC Unit

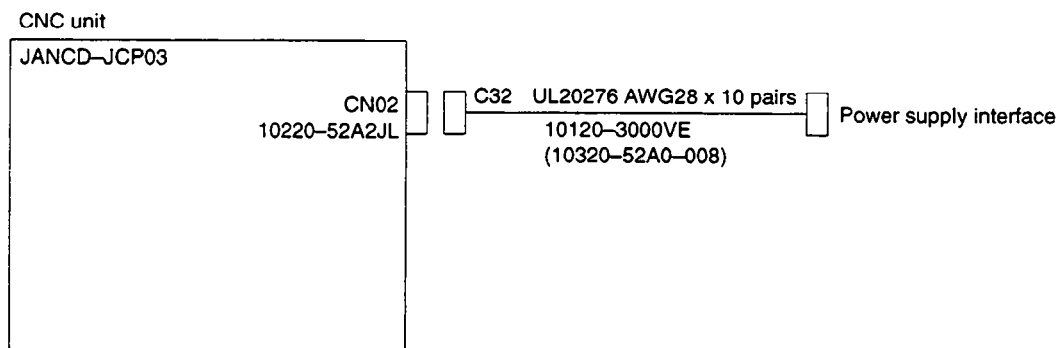


Fig. 5.1 Connection between Devices

5.2 DETAILED CONNECTION OF POWER ON/OFF EXCLUSIVE SIGNAL

This section describes the detailed connection of the power ON/OFF exclusive signal.

5.2.1 Connection to CNC Unit

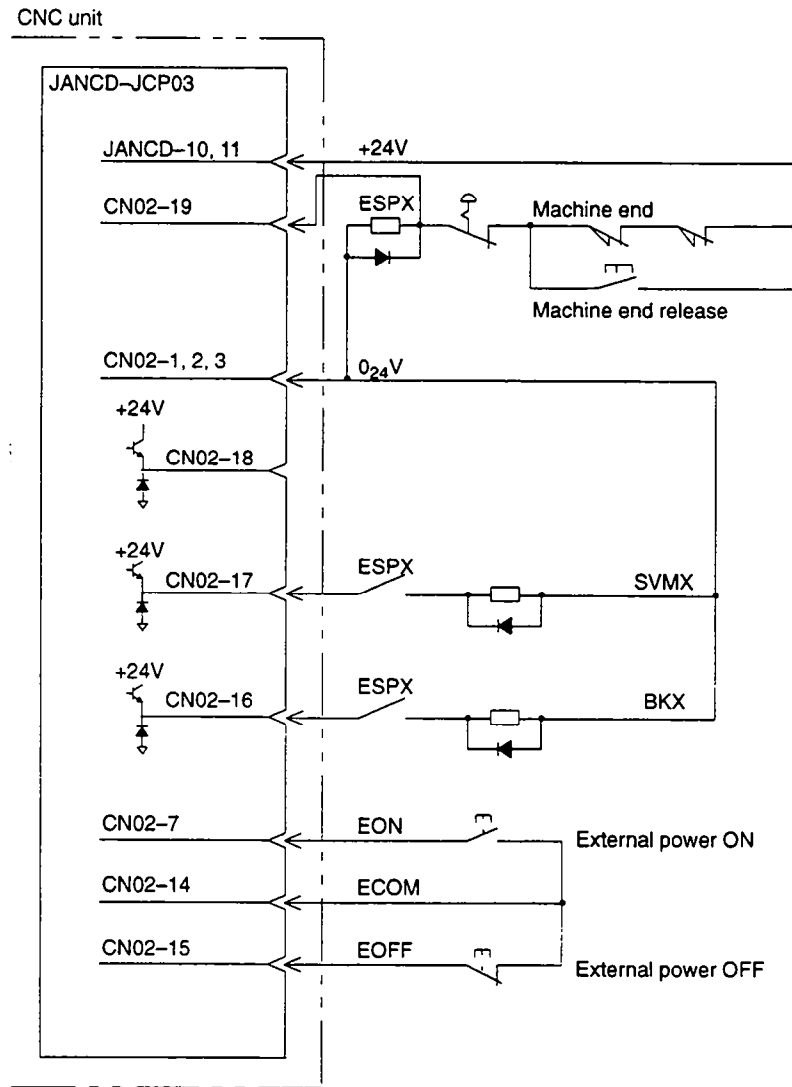


Fig. 5.2 Detailed Connection of Power ON/OFF Exclusive Signal

For the relay of SVMX, BKX, use miniature relay 24 VDC.
(Recommended part: MY-4Z by OMRON)

5.3 DETAILS OF SIGNAL

This section describes the signals to be used in the power supply sequence.

5.3.1 Servo Power ON (SVMX), Brake Release (BKX) Output

(1) Signal Names and Descriptions

SVMX : This is the output that turns ON when the power is supplied to the servo unit. When a servo unit is externally installed, supply power to the servo unit by this output.

BKX : This is the output to release the holding brake of the feed axis (vertical axis).

(2) Power Supply Sequence

Power supply sequence is executed as shown below:

- ① Supply power to the controller.
- ② Perform the power supply operation (Press [POWER ON] pushbutton on the CNC operation panel, or close the circuit between the external EON and ECOM.), and the logic circuit power is turned ON.
- ③ Perform the power supply operation again. SVMX output is closed, and the servo power is turned ON.
When a servo unit is externally installed, carry out servo power ON sequence by SVMX output.
- ④ After completion of servo ready (servo clamp status), BKX output is closed after the time set by parameter. Release the brake unit by this signal.
- ⑤ After SVMX output is closed and the controller is ready, if external preparation has been completed, close the MRD (machine ready completed) input of the general-purpose output module. "RDY" is displayed on the CRT screen, and operation is possible.

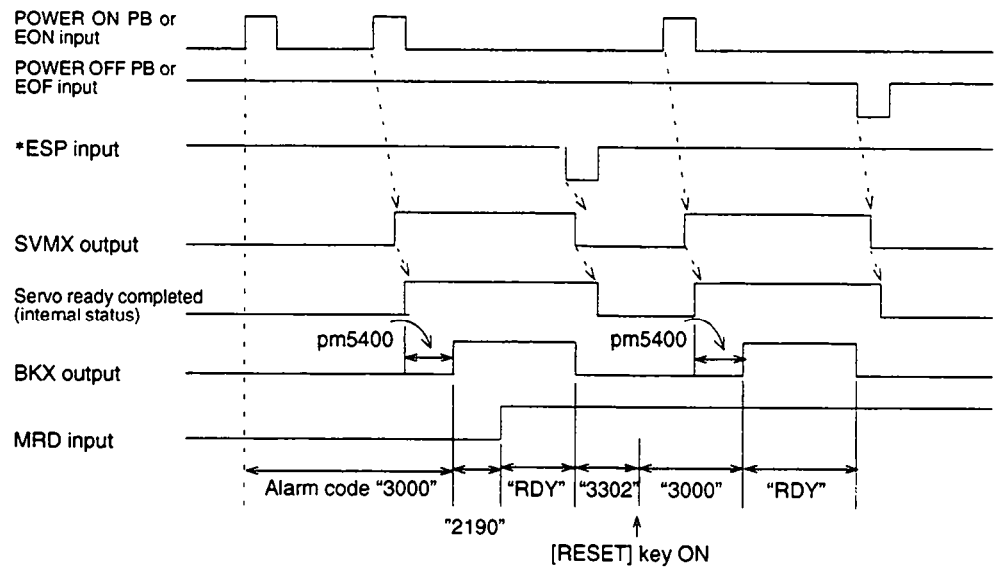


Fig. 5.3 Power Supply Sequence

5.3.2 Emergency Stop (*ESP) Input

When the emergency stop input circuit is opened, the controller stops all the actions and turns SVMX and BKX OFF. During emergency stop of the general-purpose I/O module, it makes output (*ESPS) "open."

In response to the emergency stop input, the servo should DB stop and spindle stop with brake using the delay circuit. (The spindle coasts after the main connector IMC is "opened" by the delay timer.)

5.3.3 External Power ON/OFF (EON, EOF, ECOM) Input

The controller may be turned ON/OFF by external input in the same manner as by the POWER ON/OFF pushbutton on the CNC operation panel.

Setting the portion between EON and ECOM "closed" in the state the EOF and ECOM is "closed" turns ON the logic circuit of the controller or the servo power.

Setting the portion between EON and ECOM "open" turns OFF the logic circuit of the controller and the servo power.

6

CONNECTION OF FEED SERVO UNIT

Chapter 6 describes the connection between the CNC unit, the feed servo unit, and the servo motor.

6.1	CONNECTION BETWEEN DEVICES ..	6 - 2
6.1.1	Connection with 1-axis Servo Unit	6 - 2
6.1.2	Connection with 3-axis Servo Unit	6 - 4
6.2	DETAILED CONNECTION WITH FEED SERVO UNIT	6 - 6
6.2.1	No.1 Axis	6 - 6
6.2.2	No.2 Axis	6 - 6
6.2.3	No.3 Axis	6 - 7
6.2.4	No.4 Axis	6 - 7
6.2.5	No.5 Axis	6 - 8
6.2.6	IR Type Servo Unit	6 - 8
6.3	DETAILED CONNECTION OF SERVO UNIT MAIN CIRCUIT	6 - 10
6.3.1	Connection with 1-axis Servo Unit	6 - 10
6.3.2	Connection with 3-axis Servo Unit	6 - 11
6.4	USE OF SERVO UNIT	6 - 12
6.4.1	Noise Suppression	6 - 12
6.4.2	Protection of Power Line	6 - 16

6.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the CNC unit, the feed servo unit, and the servo motor, as well as the type of connector and the cable specifications.

6.1.1 Connection with 1-axis Servo Unit

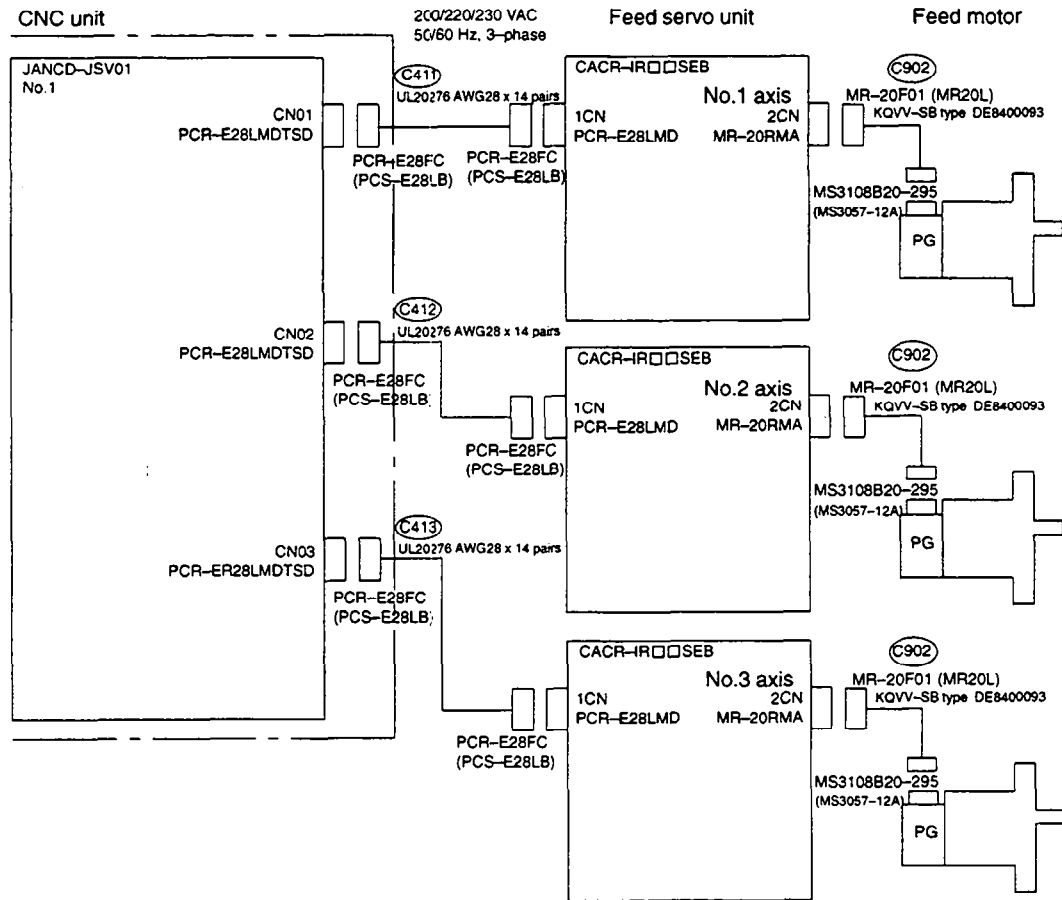


Fig. 6.1 Connection of Cable (No.1 axis to No.3 axis)

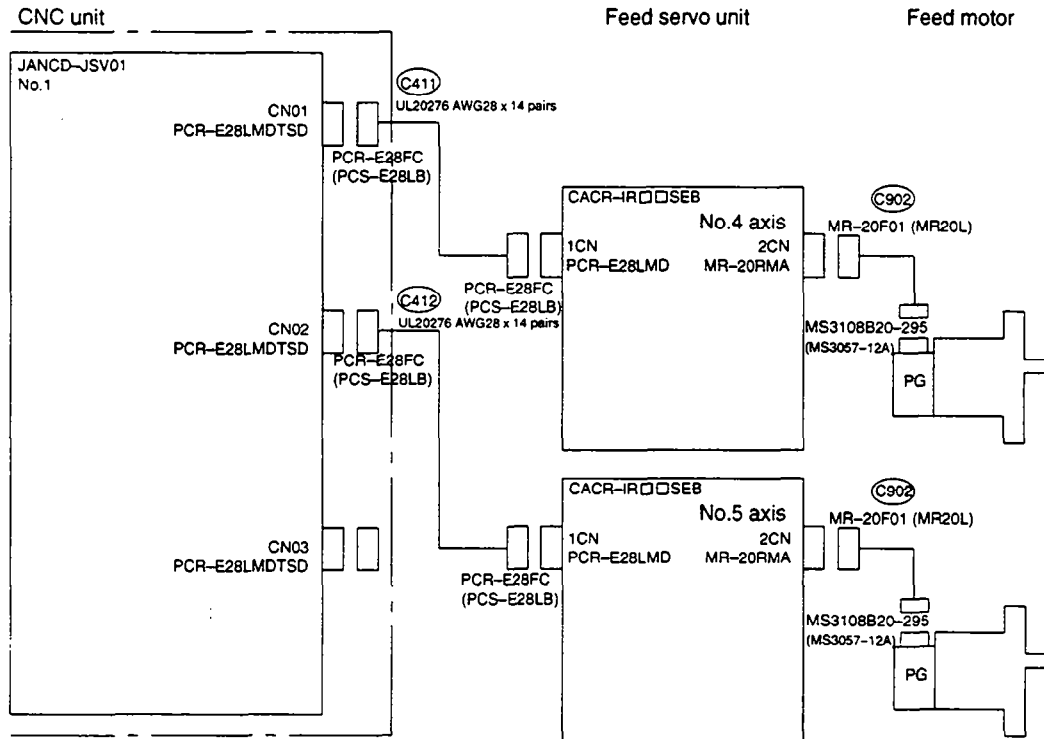


Fig. 6.2 Connection of Cable (No.4 axis and No.5 axis)

6.1.2 Connection with 3-axis Servo Unit

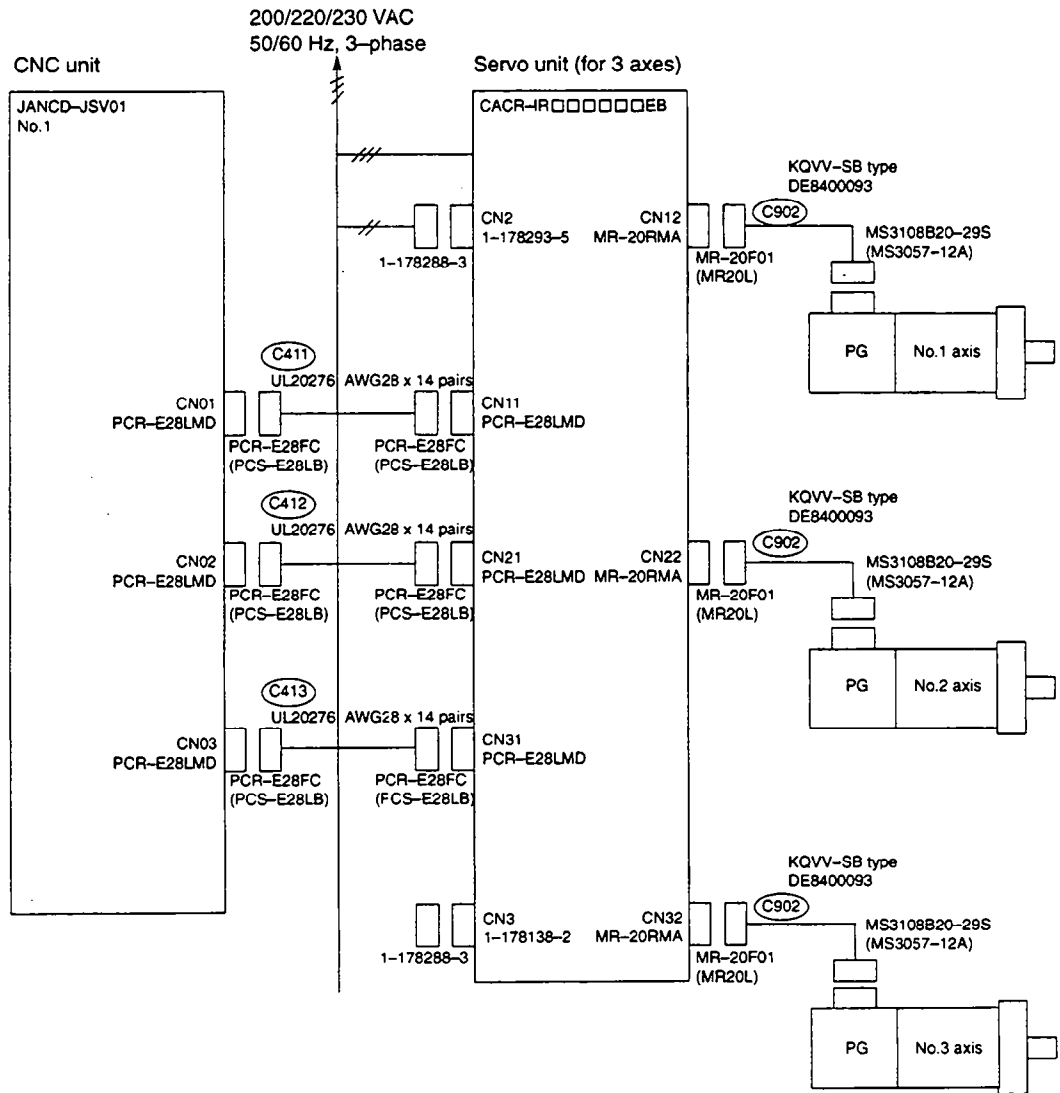


Fig. 6.3 Connection of Main Circuit

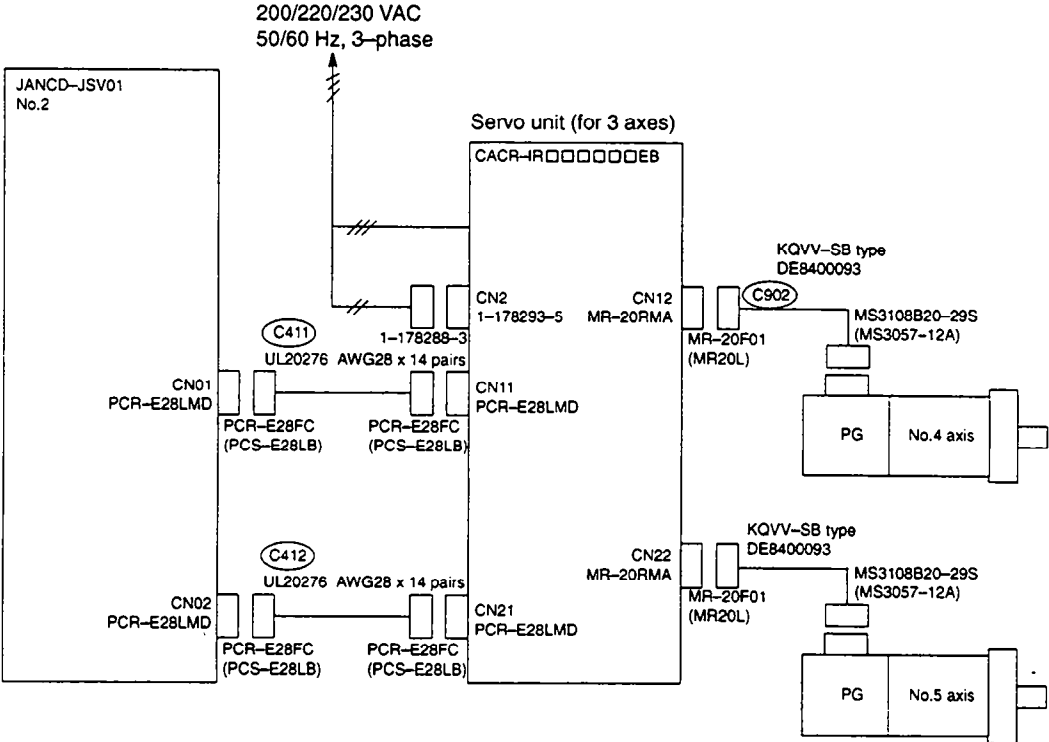


Fig. 6.4 Connection of Main Circuit

6.2 DETAILED CONNECTION WITH FEED SERVO UNIT

This section describes the detailed connection between the CNC unit, the feed servo unit, and the servo motor.

6.2.1 No.1 Axis

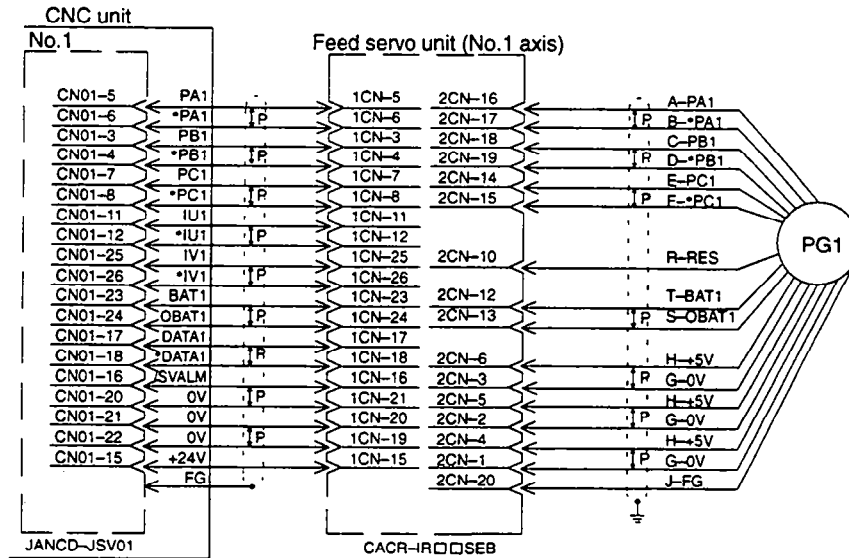


Fig. 6.5 No.1 Axis

6.2.2 No.2 Axis

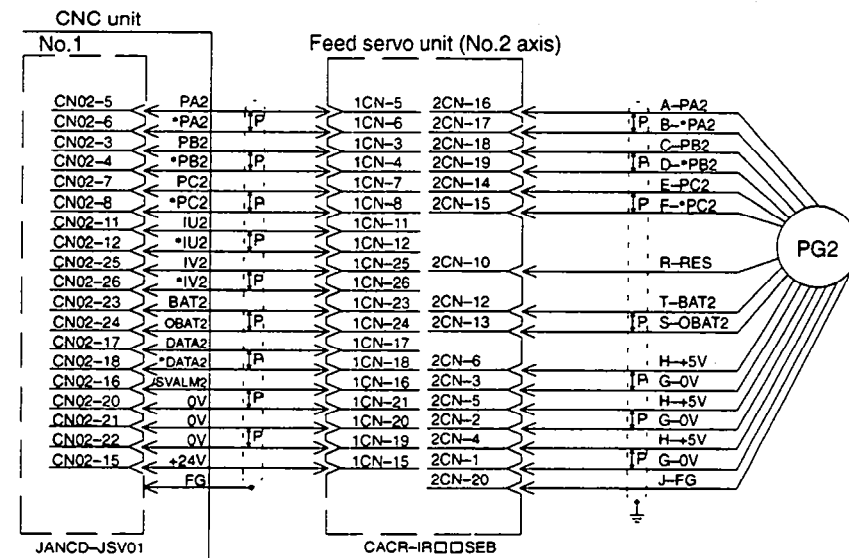


Fig. 6.6 No.2 Axis

6.2.3 No.3 Axis

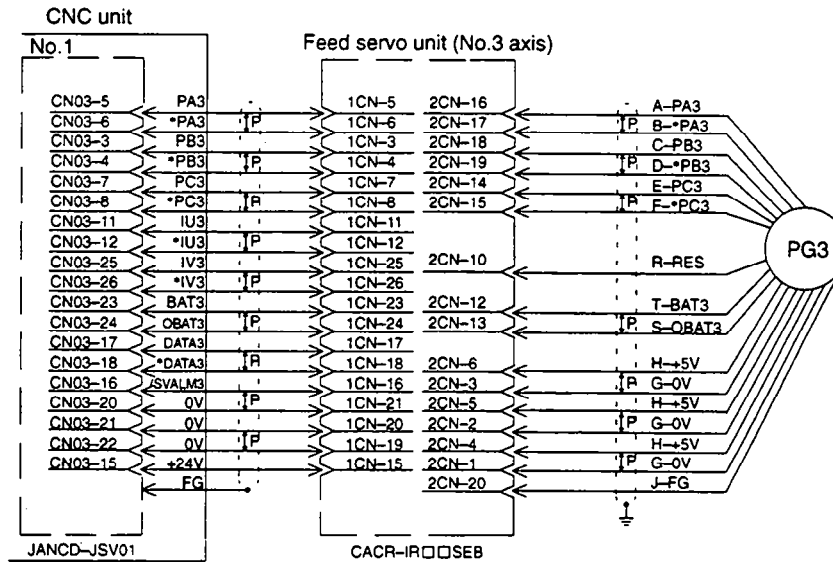


Fig. 6.7 No.3 Axis

6.2.4 No.4 Axis

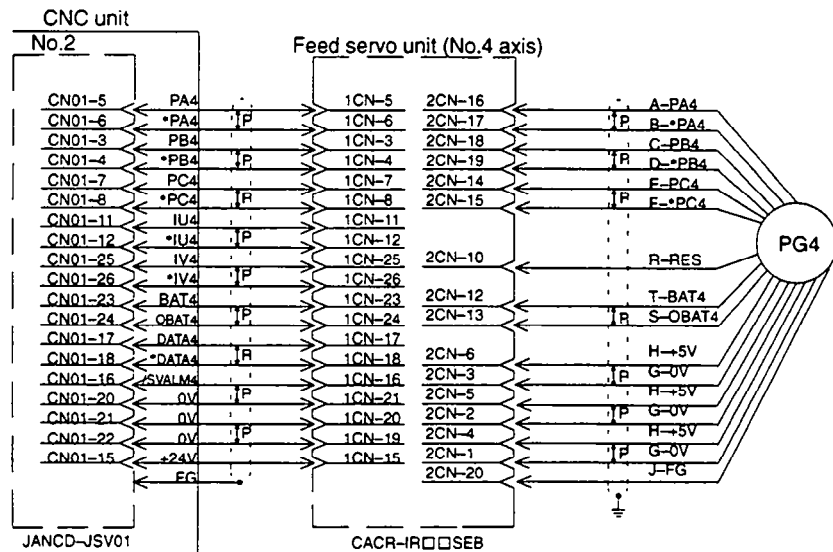


Fig. 6.8 No.4 Axis

6.2.5 No.5 Axis

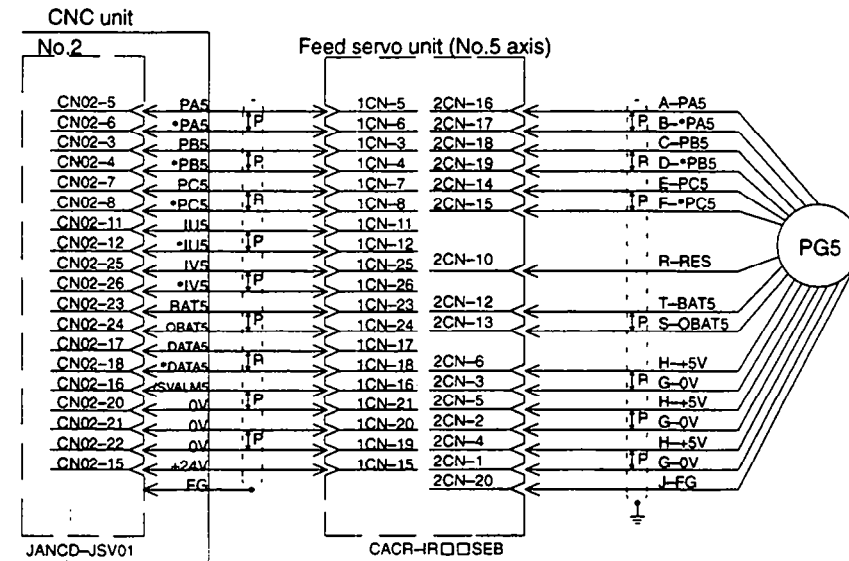


Fig. 6.9 No.5 Axis

6.2.6 IR Type Servo Unit

For IR type servo unit, the setting of connector number to be connected to CNC unit is made by SW2.

(1) IR□□SEB Type (for 1 axis) Servo Unit

SW1 : This is for test, so do not change the default setting; SW1-0 to 3: open

SW2 : Axis setting (to determine the connector to be connected)

SW2	CNC Side Connection Connector
0	JSV01 CN01
1	JSV01 CN02
2	JSV01 CN03
3 to F	Invalid

(2) IR□□EB Type (for 3 axes) Servo Unit

SW1 : This is for test, so do not change the default setting; SW1-0, 1: short-circuited, SW1-2, 3: open

SW2 : Axis setting (to determine the connector to be connected)

SW2	CN11 Connection Destination	CN21 Connection Destination	CN31 Connection Destination
0	JSV01 CN01	JSV01 CN02	JSV01 CN03
1	JSV01 CN02	JSV01 CN01	JSV01 CN03
2	JSV01 CN02	JSV01 CN03	JSV01 CN01
3	JSV01 CN01	JSV01 CN03	JSV01 CN02
4	JSV01 CN03	JSV01 CN01	JSV01 CN02
5	JSV01 CN03	JSV01 CN02	JSV01 CN01
6	JSV01 CN01	Invalid	Invalid
7	JSV01 CN02	Invalid	Invalid
8	JSV01 CN03	Invalid	Invalid
9	Invalid	JSV01 CN01	Invalid
A	Invalid	JSV01 CN02	Invalid
B	Invalid	JSV01 CN03	Invalid
C	Invalid	Invalid	JSV01 CN01
D	Invalid	Invalid	JSV01 CN02
E	Invalid	Invalid	JSV01 CN03
F	JSV01 CN01	JSV01 CN02	Invalid



The rotation direction of AC servo motor is described for normal connection. It is counterclockwise (CCW) rotation when viewed from the motor load side (flange side), when a positive (+) move command is given.

6.3 DETAILED CONNECTION OF SERVO UNIT MAIN CIRCUIT

This section describes the connection between the CNC unit, the feed servo unit, and the servo motor, as well as the type of connector, and the cable specifications.

6.3.1 Connection with 1-axis Servo Unit

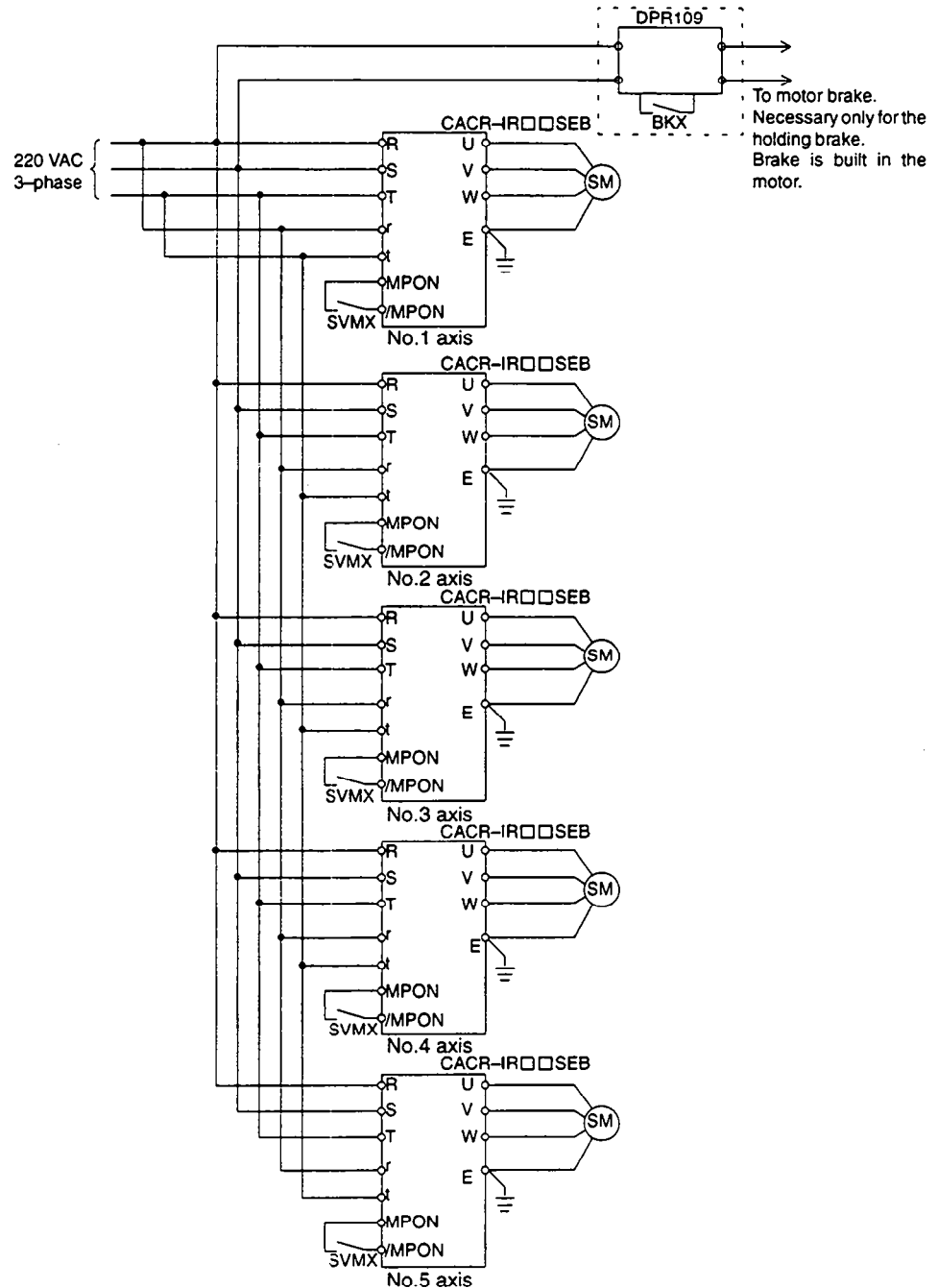


Fig. 6.10 Connection with 1-axis Servo Unit

6.3.2 Connection with 3-axis Servo Unit

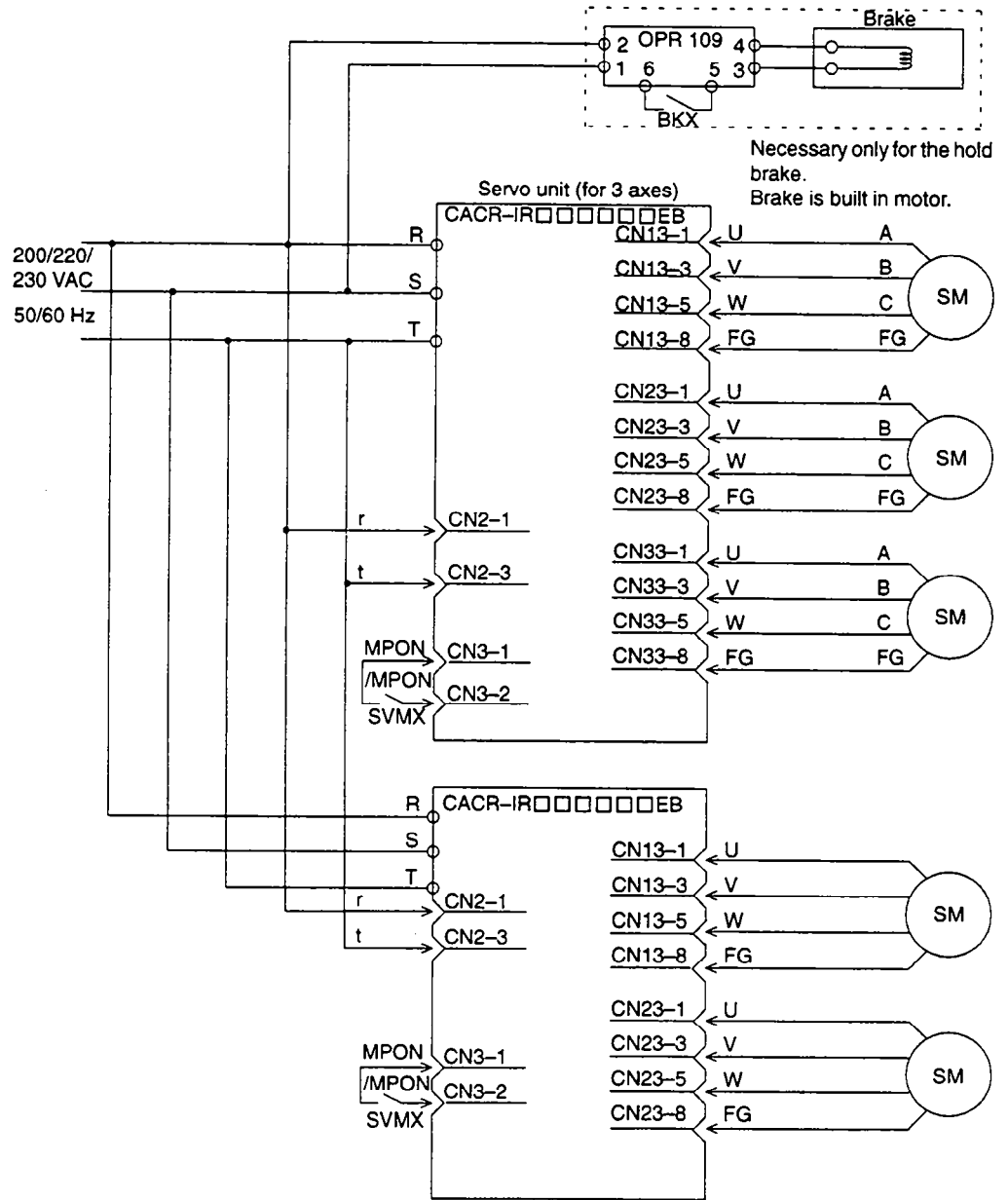


Fig. 6.11 Connection with 3-axis Servo Unit



◆ MPON and /MPON

MPON and /MPON are the contact points to shut OFF the power supply to the main circuit by turning ON/OFF the built-in connector. The contact point capacity is 200/220/230 VAC, 12 mA.

6.4 USE OF SERVO UNIT

This section describes the use of the servo unit.

6.4.1 Noise Suppression

Servopack uses power transistors in its main circuit.

The influence (switching noise) by di/dt when switching these power transistors may be caused by wiring or grounding arrangement.

Servopack has a built-in CPU. For that reason, it is necessary to arrange wiring and processing so as to prevent external noise as much as possible.

To prevent noise interference, arrange the wiring and grounding as shown in Fig. Fig. 6.12.

(1) Grounding

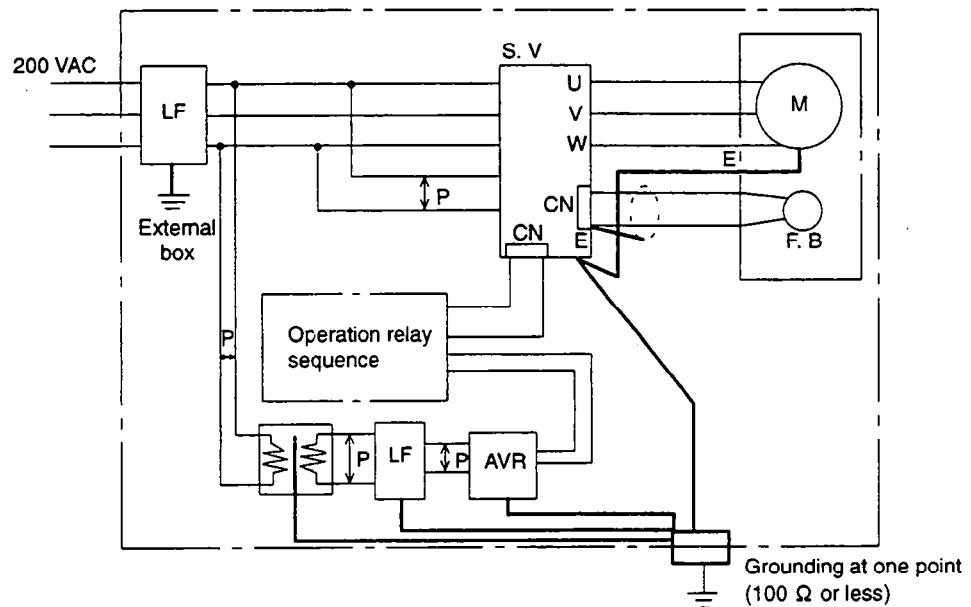


Fig. 6.12 Grounding



1. Use a heavy wire over 3.5 mm^2 (flat copper wire) as an external connection wire for grounding.
2. For the use of a noise suppressor, observe "(2) Installation of Noise suppressor".
3. Use twisted wire in connection of portion P as much as possible.

(a) Motor frame grounding

When the motor is grounded via the frame at the machine side, Cf (motor floating capacity) dv/dt current flows out from PWM power portion via motor floating capacity. Be sure to connect the terminal E (motor frame) of the motor to prevent the influence by this current to the terminal of Servopack.

(Be sure to ground the terminal of Servopack directly to the ground.)

(b) Servopack SG 0V

If noise is on the input signal line, ground SG 0V; if motor wiring is contained in metallic conduit, be sure to ground the conduit and box.

The above grounding processings are all to be one-point grounding.

(2) Installation of Noise Suppressor

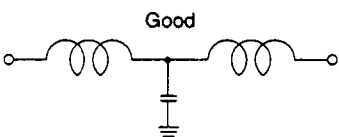
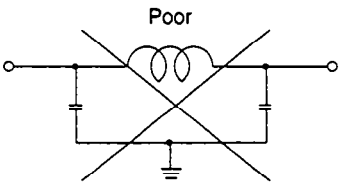
When using a noise suppressor to prevent noise from the power line, it is necessary to use a prevention type.

Applicable noise suppressors are shown in Table 6.1.

Insert noise suppressor into power supply of peripheral devices in the same manner.

When using a noise suppressor, using it the wrong way will reduce its effect by half. During assembling, follow the notes shown in Fig. 6.13 through Fig. 6.16.

Table 6.1 Applicable Noise Filter

Servopack Type CACR-	Kind of Applicable Noise Suppressor (Reference Figure)	Recommended Noise Suppressor *	
		Type	Specifications
IR05 □□	 <p style="text-align: center;">Good</p>	LF-310	3-phase 200 VAC, 10A
IR10 □□ IR15 □□		LF-315	3-phase 200 VAC, 15A
IR20 □□	 <p style="text-align: center;">Poor</p>	LF-320	3-phase 200 VAC, 20A
IR30 □□		LF-330	3-phase 200 VAC, 30A
IR44 □□		LF-340	3-phase 200 VAC, 40A

Note: * : Made by Tohkin Co., Ltd.

(a) General notes on wiring

- Separate I/O lines. Do not bundle them or run them in a single duct.

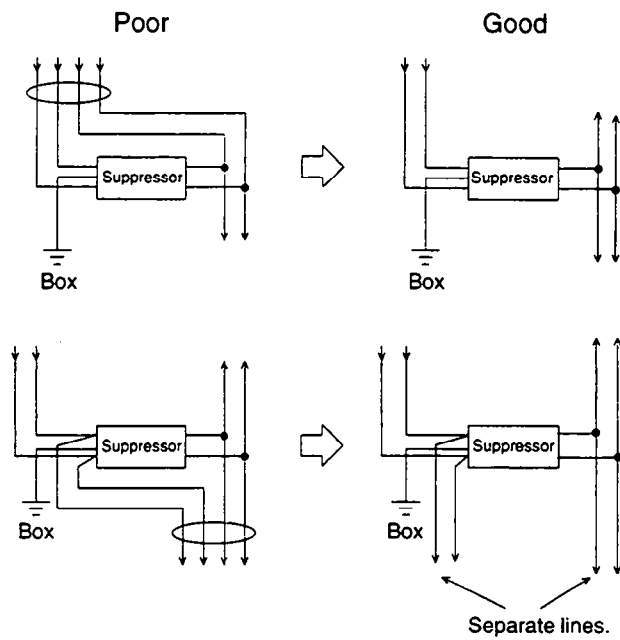


Fig. 6.13

- Do not bundle the grounding line with the suppressor output lines or other signal lines, or run it together with them in a single duct.

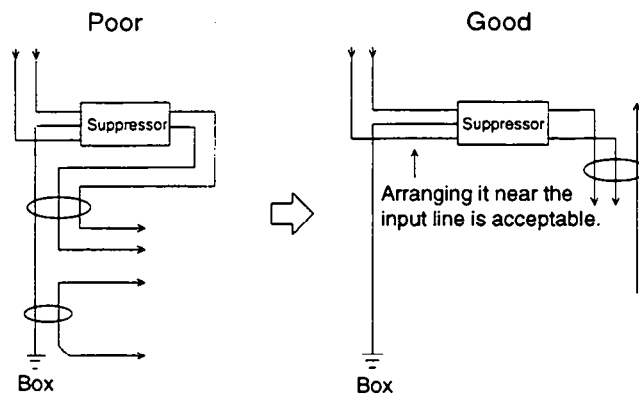


Fig. 6.14

- Arrange the grounding line singly to the enclosure or grounding plate.

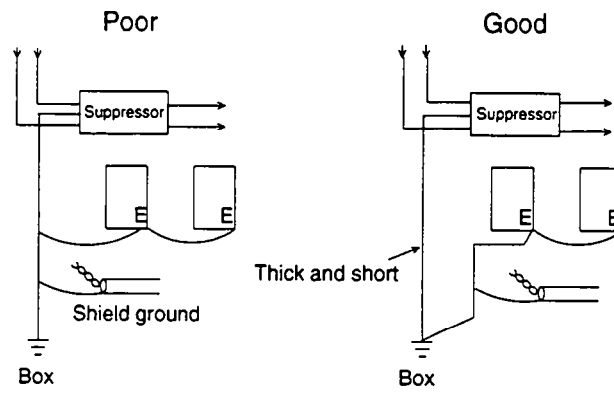


Fig. 6.15

- When there is a suppressor within the unit, connect the suppressor grounding line and the grounding line of the devices in the unit to the base of the unit.

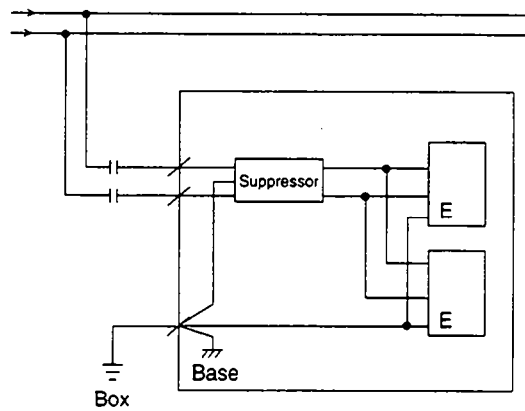


Fig. 6.16

6.4.2 Protection of Power Line

Servopack is of a line operating type using a commercial power source (200V system).

Therefore, it is necessary to use a circuit breaker (MCCB) or fuse according to the number of Servopacks to be used in order to protect the power line from grounding or contact with other wires. (Table 6.2)

Table 6.2 Power Capacity

Type CACR-	Applicable Motor Type* USAGED-	Power Capacity per Unit (KVA)	Current Capacity per One Unit of MCCB (A)
IR05SEB	05A*	1.1	5
IR10SEB	09A*	2.1	8
IR15SEB	13A*	3.1	10
IR20SEB	20A*	4.1	12
IR30-SEB	30A*	6.0	18
IR44SEB	44A*	8.0	24
IR050505EB	05A*	3.1	10
IR101010EB	09A*	6.0	18
IR151515EB	13A*	8.0	24

Note: *: Value at rated load.

7

CONNECTION OF SPINDLE DRIVE UNIT

Chapter 7 describes the connection of the spindle drive unit.

7.1	Connection between Devices	7 - 2
7.1.1	Pulse Generator with Built-in Motor	7 - 2
7.1.2	Separate Spindle Pulse Generator	7 - 2
7.1.3	Main Circuit, Converter, and Inverter	7 - 3
7.2	DETAILED CONNECTION WITH SPINDLE DRIVE UNIT	7 - 4
7.2.1	Pulse Generator with Built-in Motor	7 - 4
7.2.2	Separate Spindle Pulse Generator	7 - 5
7.2.3	Main Circuit, Converter, and Inverter	7 - 6

7.1.3 Main Circuit, Converter, and Inverter

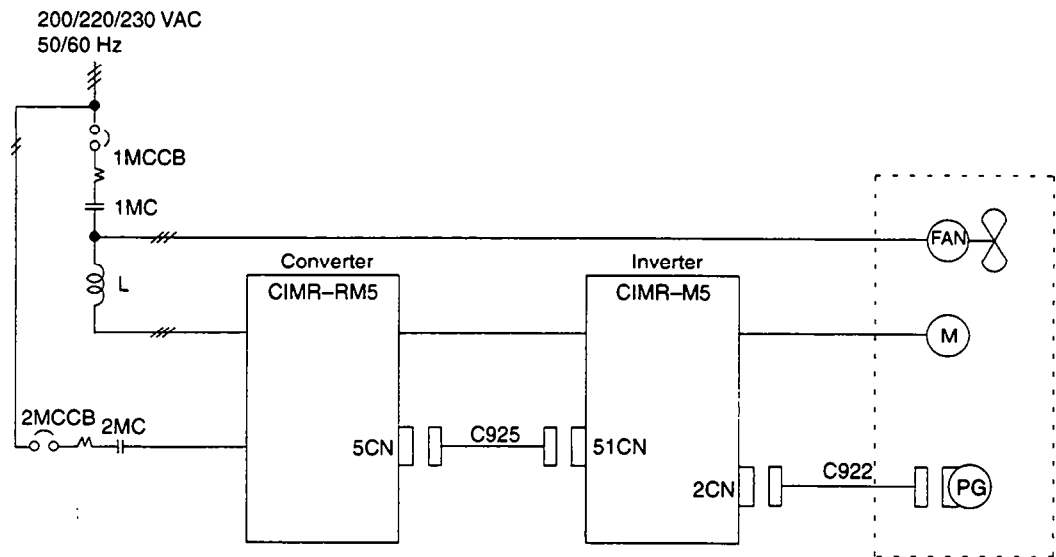


Fig. 7.3 Main Circuit, Converter, and Inverter

7.2 DETAILED CONNECTION WITH SPINDLE DRIVE UNIT

This section describes the detailed connection of the spindle drive unit.

7.2.1 Pulse Generator with Built-in Motor

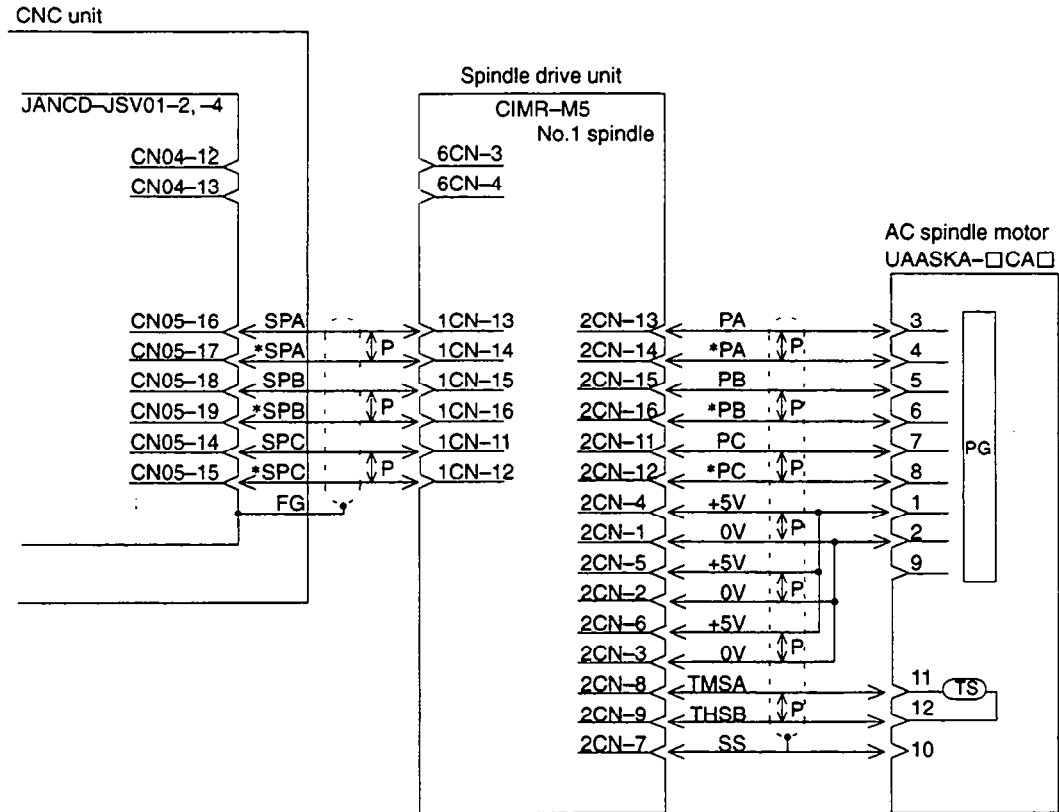


Fig. 7.4 Pulse Generator with Built-in Motor

7.2.2 Separate Spindle Pulse Generator

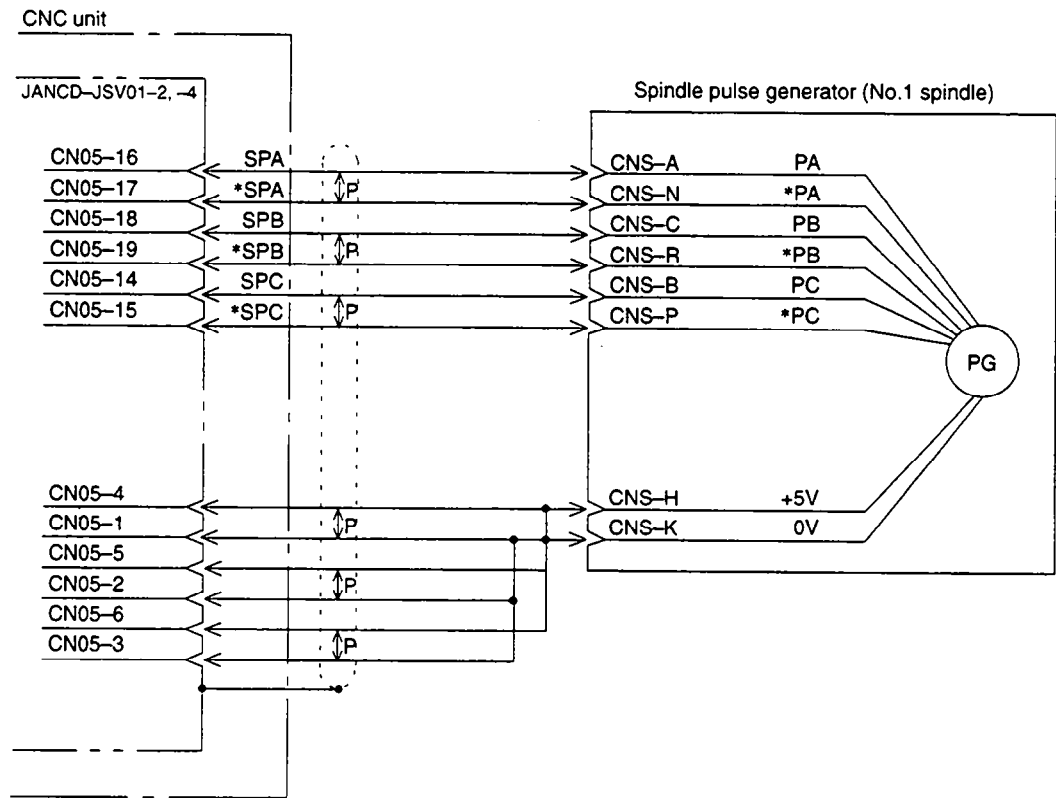


Fig. 7.5 Separate Spindle Pulse Generator

7.2.3 Main Circuit, Converter, and Inverter

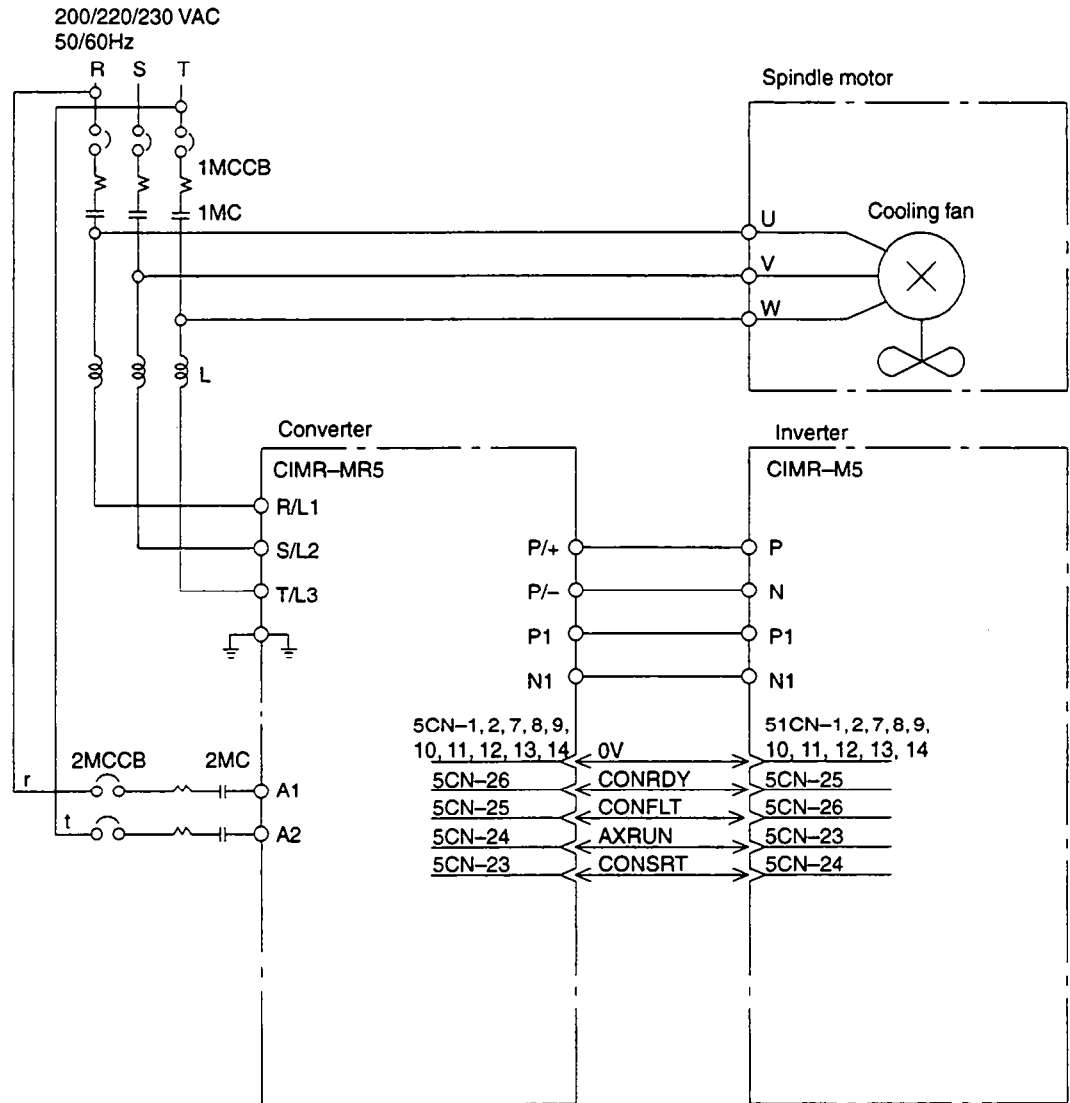


Fig. 7.6 Main Circuit, Converter, and Inverter

8

CONNECTION OF TAPE READER

Chapter 8 describes the connection between the CNC unit and the tape reader unit.

8.1	CONNECTION BETWEEN DEVICES ..	8 - 2
8.1.1	Connection with CNC Unit	8 - 2
8.2	DETAILED CONNECTION OF TAPE READER	8 - 3
8.2.1	MODEL 2801E	8 - 3

8.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the CNC unit and the tape reader unit, the type of connector, and the cable specifications.

8.1.1 Connection with CNC Unit

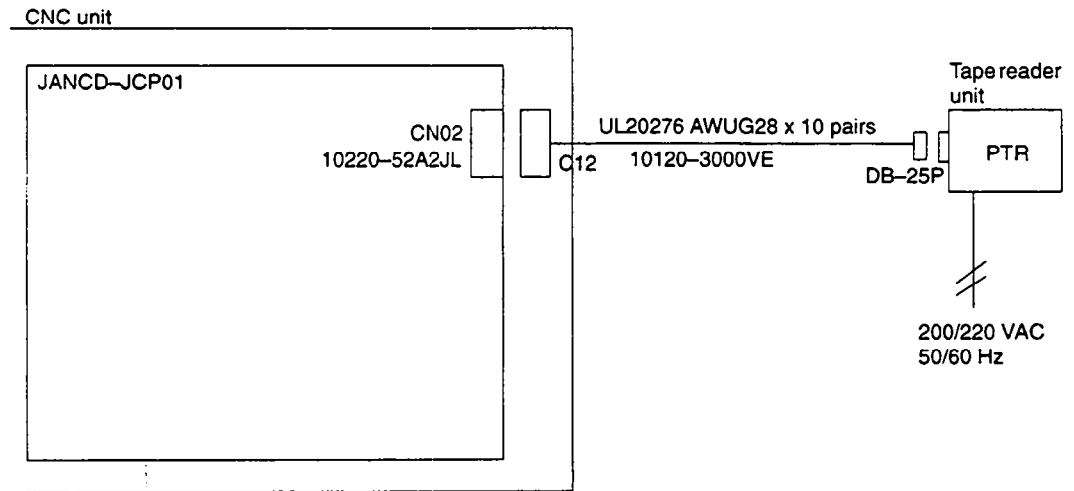


Fig. 8.1 Connection between Devices

8.2 DETAILED CONNECTION OF TAPE READER

This section describes the detailed connection between the CNC unit and the tape reader unit.

8.2.1 MODEL 2801E

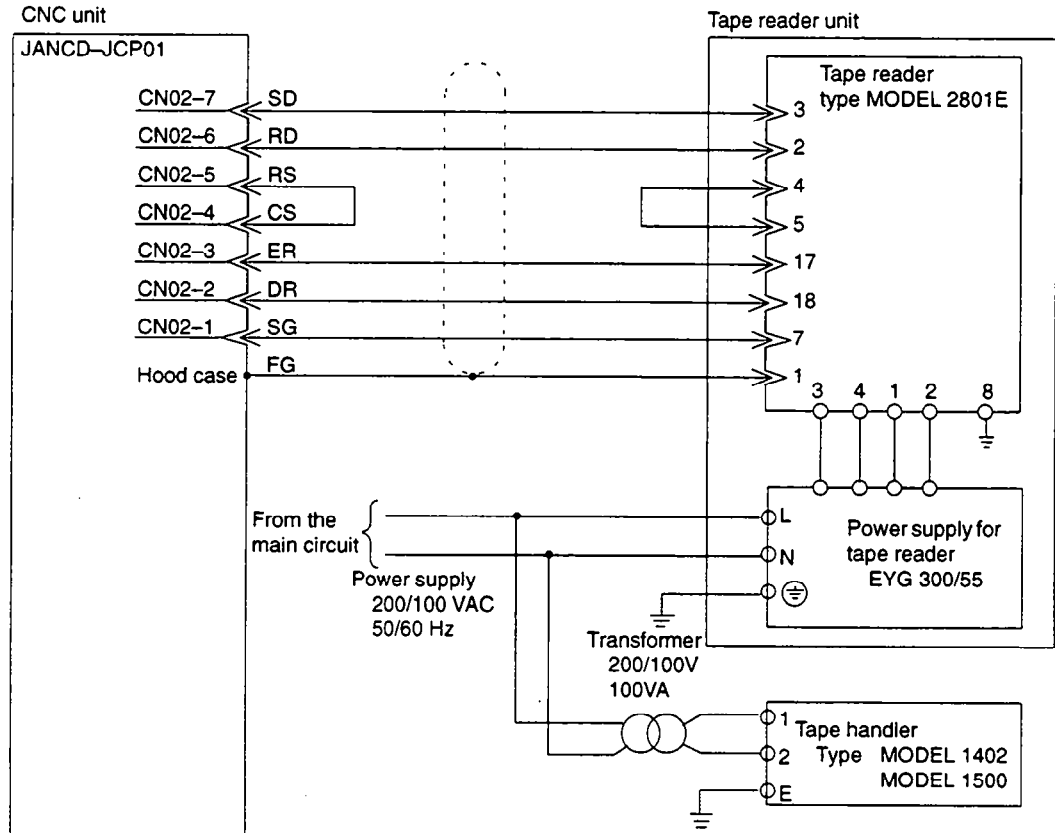


Fig. 8.2 Detailed Connection of Tape Reader

The length of wire from the tape reader to the CNC unit shall be within 3 m.
If the length exceeds 3 m, contact your Yaskawa representative.

9

CONNECTION OF RS-232C

Chapter 9 describes the connection between the CNC unit and the devices having RS-232C interface.

9.1	CONNECTION BETWEEN DEVICES ..	9 - 2
9.1.1	Connection with CNC Operation Panel	9 - 2
9.2	DETAILED CONNECTION OF RS-232C	9 - 3
9.2.1	Connection with CNC Operation Panel	9 - 3
9.3	RS-232C INTERFACE	9 - 4
9.3.1	Transmission Method	9 - 4
9.3.2	Codes to be Used	9 - 4
9.3.3	Communication Baud Rate	9 - 5
9.3.4	Cable Length	9 - 5
9.3.5	Connection between Devices	9 - 5
9.3.6	Signal Communication Timing	9 - 7

9.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the CNC operation panel and devices having RS-232C interface, the type of connector, and the cable specifications.

9.1.1 Connection with CNC Operation Panel

For the port of RS-232C, No.1 port is CN02 of JCP01, while No.2 port is CN02 of JSP02.

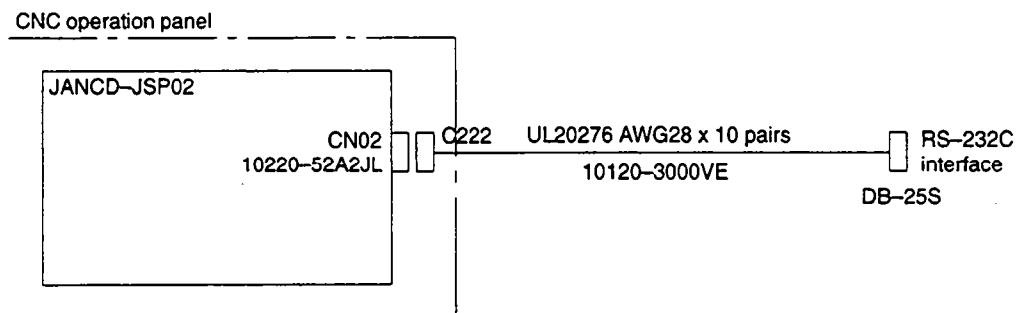


Fig. 9.1 Connection between Devices

9.2 DETAILED CONNECTION OF RS-232C

This section describes the detailed connection between the CNC operation panel and devices having RS-232C interface.

9.2.1 Connection with CNC Operation Panel

Besides No.1 and No.2 ports, there are PLC exclusive ports (CN02, CN03 of JCP02) and DNC exclusive port (CN06 of JIF01).

The pin number to each signal on the CNC side is the same as that for No.1 and No.2 ports.

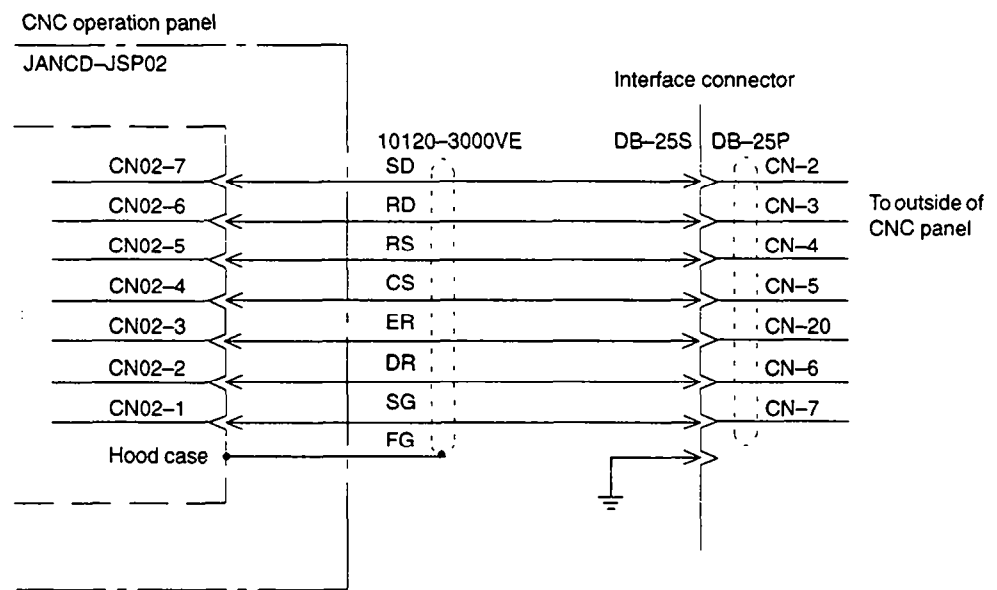


Fig. 9.2 Detailed Connection of RS-232C

9.3 RS-232C INTERFACE

This section describes the specifications for RS-232C interface, including important related data.

9.3.1 Transmission Method

Start-stop transmission, where the start signal goes ahead of information bits, and the stop signal follows the information bits.

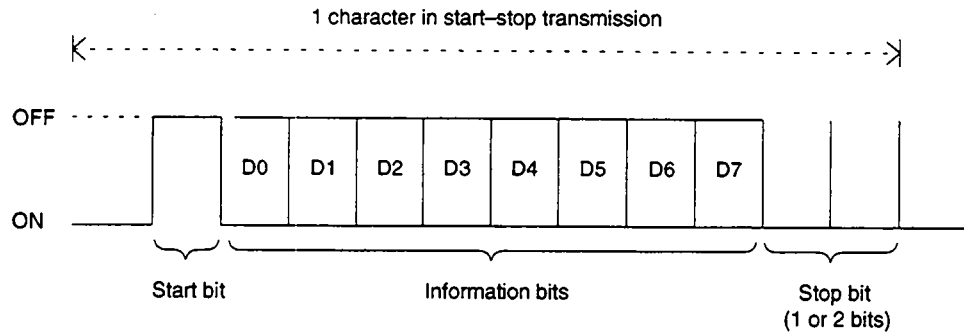


Table 9.1 RS-232C Voltage Level

	$V_0 < -3V$	$V_0 > +3V$
Function	OFF	ON
Signal status	Mark	Space
Logic	1	0

9.3.2 Codes to be Used

There are the following 2 kinds of codes to be used, and they may be switched by parameters.

- EIA code or ISO code
- EIA code or ISO code + control code (DC1 to DC4)

When using the control code, it is necessary for the objective device to be able to discriminate codes from DC1 to DC4.

Pattern of the codes and characters of DC1 to DC4 are as shown in Table Table 9.2.

Table 9.2 Codes and Characters of DC1 to DC4

Character		D7	D6	D5	D4	D3	D2	D1	D0
DC1	Tape reader start				○				○
DC2	Tape punch designation				○			○	
DC3	Tape reader stop	○			○			○	○
DC4	Tape punch				○		○		

9.3.3 Communication Baud Rate

Communication baud rate may be designated by parameters.

9.3.4 Cable Length

The maximum cable length varies with devices, so follow the operation manual for each device. (Standard maximum cable length : 15 m)

9.3.5 Connection between Devices

(1) Connection Cable for RS-232C Interface

Connection is shown in Table 9.3.

Table 9.3 Connection Cable for RS-232C Interface for End Connection (A)

CNC Side			Connection	External Device Side
Code	Signal Name	Pin No.		Code
FG	Frame grounding	Frame	○ ————— ○	FG
SD	Send data	7	○ ———— X ———— ○	SD
RD	Receive data	6	○ ———— X ———— ○	RD
RS	Send request	5	○ ———— X ———— ○	RS
CS	Send possible	4	○ ———— X ———— ○	CS
DR	Data set ready	2	○ ———— X ———— ○	DR
SG	Signal grounding	1	○ ———— X ———— ○	SG
ER	Data end ready	3	○ ———— X ———— ○	$\overline{IO\ BUSY}$
				ER

CNC can start and stop the objective device by sending out control codes DC1 to DC4. However, the objective device cannot control CNC by sending out control codes.

But, if the processing of the objective device is not in time, the data sending from CNC can be stopped temporarily by controlling CS signal at CNC side.

When the CS signal is not used at CNC side, short CS and RS as shown in Table 9.4.

Table 9.4 Connection Cable for RS-232C Interface for End Connection (B)

CNC Side			Connection	External Device Side
Code	Signal Name	Pin No.		Code
FG	Frame grounding	Frame	○ ————— ○	FG
SD	Send data	7	○ ———— X ———— ○	SD
RD	Receive data	6	○ ———— X ———— ○	RD
RS	Send request	5	○ ———— □ ———— ○	RS
CS	Send possible	4	○ ———— □ ———— ○	CS
DR	Data set ready	2	○ ———— ———— ○	DR
SG	Signal grounding	1	○ ———— ———— ○	SG
ER	Data end ready	3	○ ———— ———— ○	
				ER (or IO alarm)

(2) Description of Signals

FG : Frame grounding

SD : Send data (output)

RD : Receive data (input)

RS : Send request (output) — This is the output signal that turns ON upon send start of data from CNC and turns OFF upon completion of send.

CS : Send possible (input) — When this input signal is ON, data may be sent out from CNC.

Therefore, when the processing of the objective device is not in time, turning OFF this signal causes send data from CNC to stop within 2 characters.

When this signal is not used, connect as shown in Table 9.4.

SG : Signal ground

ER : Data end ready — This is used as a tape rewind signal when using RS-232C interface for a tape reader.

When this signal is ON, tape reader rewind is possible.

DR : Data set ready

ER : Data end ready

If "1" is set to pm0012 D2, pm0014 D2, pm0017 D2 or pm0019 D2, interlock of DR is added.

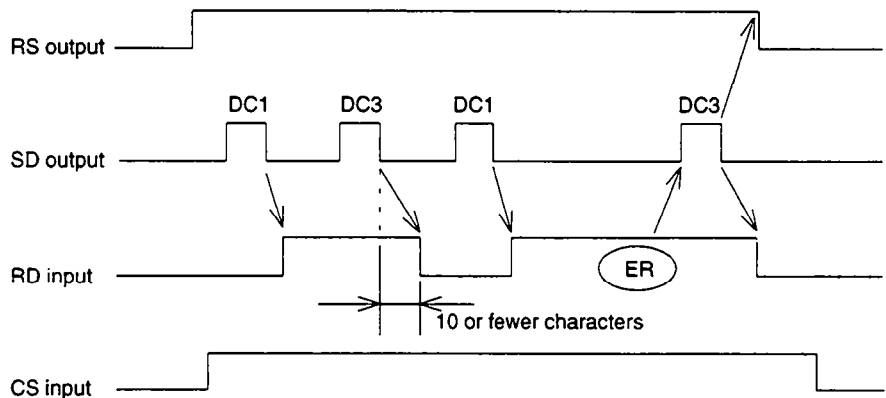
Normally, signals DR and ER of RS-232C interface are not used on CNC side .

9.3.6 Signal Communication Timing

(1) When CNC Receives Data

Receiving is accomplished in the following order and timing.

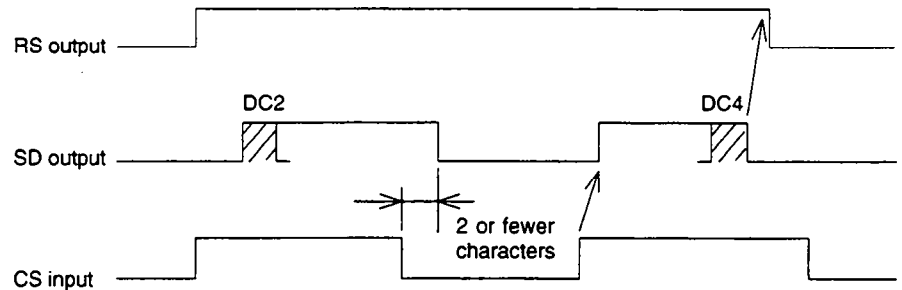
- ① CNC sends out DC1 code.
- ② Upon receiving DC1 code, the objective device starts sending data to CNC.
- ③ When the processing of CNC side is not in time, CNC sends out DC3 code.
- ④ Upon receiving DC3 code, the objective device stops sending data within 10 characters.
- ⑤ After completion of processing, CNC sends out DC1 code again.
- ⑥ Upon receiving DC1 code, the objective device sends out the remainder of the previous data.
- ⑦ Upon completion of data reading, CNC sends out DC3 code.
- ⑧ The objective device stops sending data.



(2) When CNC Sends out Data

Sending is made in the following order and timing.

- ① CNC sends out DC2 code and data.
- ② When the processing of the objective device is not in time, IO BUSY signal turns CS OFF at CNC side. CNC stops sending data within 2 characters.
- ③ After completion of the processing of the objective device, CS at CNC side is turned ON. CNC sends out the remainder of the previous data.
- ④ After completion of sending data, CNC sends out DC4 code.



10

CONNECTION OF DIRECT-IN

Chapter 10 describes the connection of direct IN signal to be input directly into CNC unit.

10.1 CONNECTION BETWEEN DEVICES .	10 - 2
10.1.1 Connection to CNC Unit	10 - 2
10.2 DETAILED CONNECTION OF DIRECT-IN	10 - 3
10.2.1 Connection to CNC Unit	10 - 3
10.3 DESCRIPTION OF SIGNAL	10 - 4
10.3.1 Input Circuit on CNC Side	10 - 4

10.1 CONNECTION BETWEEN DEVICES

This section describes the connection of direct IN signal to be input directly into CNC unit, the type of connector, and the cable specifications.

10.1.1 Connection to CNC Unit

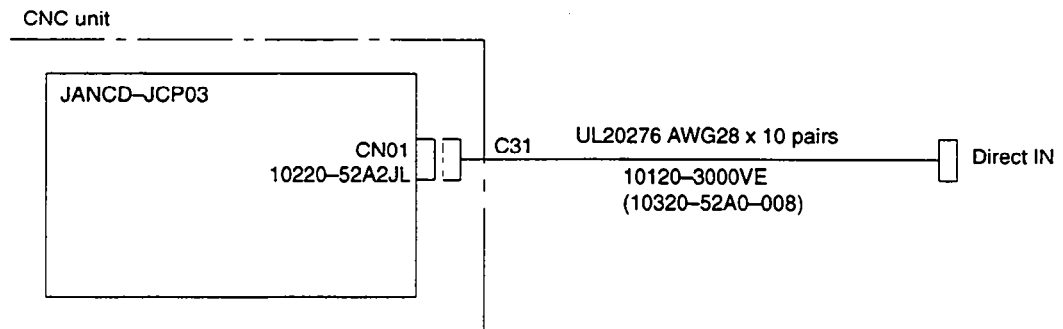


Fig. 10.1 Connection between Devices

10.2 DETAILED CONNECTION OF DIRECT-IN

This section describes the detailed connection of the direct IN signal to be input directly into CNC unit.

10.2.1 Connection to CNC Unit

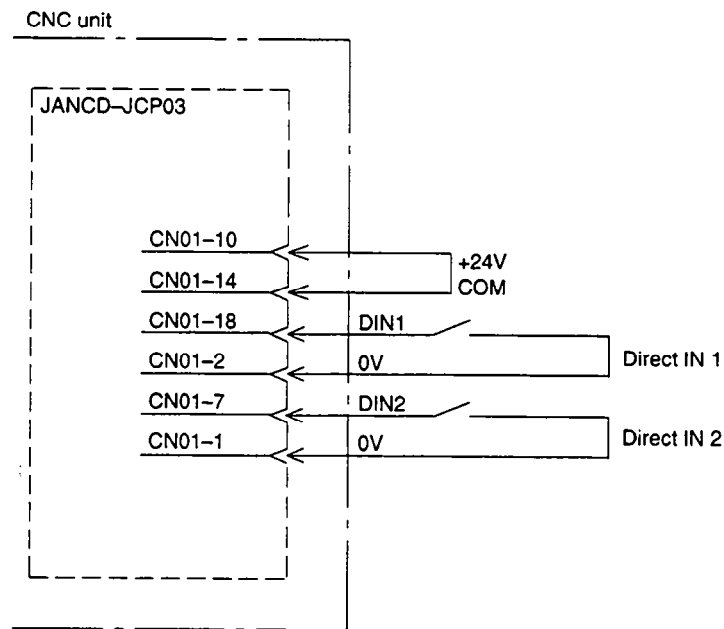


Fig. 10.2 Detailed Connection of Direct IN (for 0V Common)

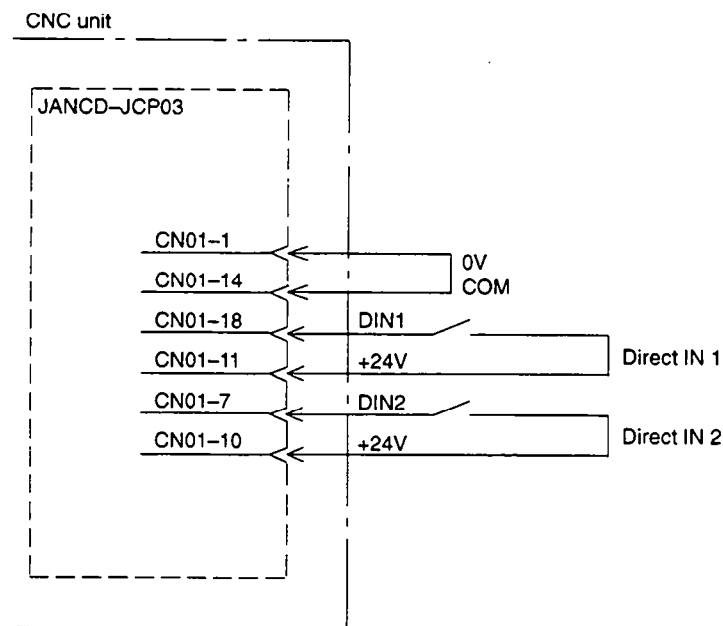


Fig. 10.3 Detailed Connection of Direct IN (for 24V Common)

10.3 DESCRIPTION OF SIGNAL

This section describes the contents of the direct IN signal to be input directly into CNC unit.

10.3.1 Input Circuit on CNC Side

Direct In signal is the signal to be input directly into CNC without using general-purpose I/O when high speed processing is necessary. The timing chart of signal is as shown in Fig. 10.4. Input circuit is as shown in Fig. 10.5.

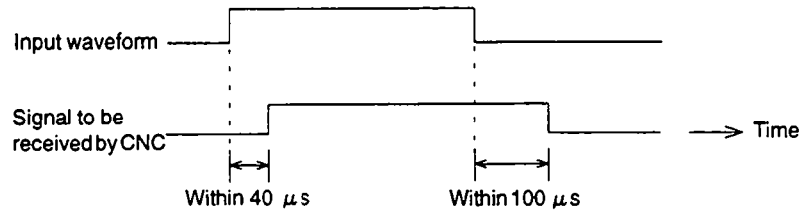


Fig. 10.4 Timing Chart

(1) For 0V Common

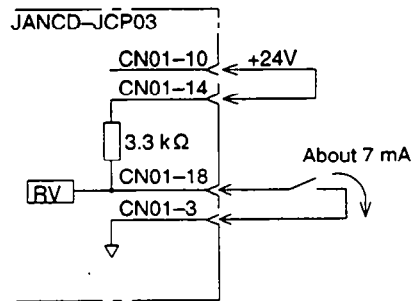


Fig. 10.5 Input Circuit(for 0V Common)

(2) For 24V Common

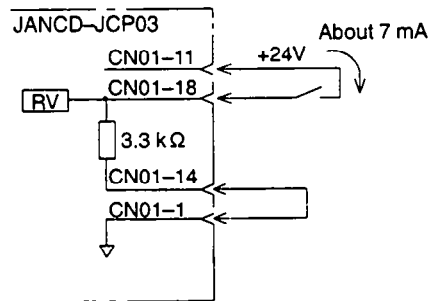


Fig. 10.6 Input Circuit(for 24V Common)

11

CONNECTION OF I/O MODULE

Chapter 11 describes the connection between CNC unit and I/O module.

11.1 CONNECTION BETWEEN DEVICES .	11 - 2
11.1.1 Connection between Devices	11 - 2
11.2 DETAILED CONNECTION OF I/O MODULE	11 - 3
11.2.1 Connection between Devices	11 - 3
11.3 CONNECTION BETWEEN DEVICES OF ADDITIONAL I/O MODULE	11 - 4
11.3.1 Connection between Devices	11 - 4
11.4 DETAILED CONNECTION OF ADDITIONAL I/O MODULE	11 - 5
11.4.1 Connection between Devices	11 - 5

11.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the CNC unit and the I/O module, the type of connector, and the cable specifications.

11.1.1 Connection between Devices

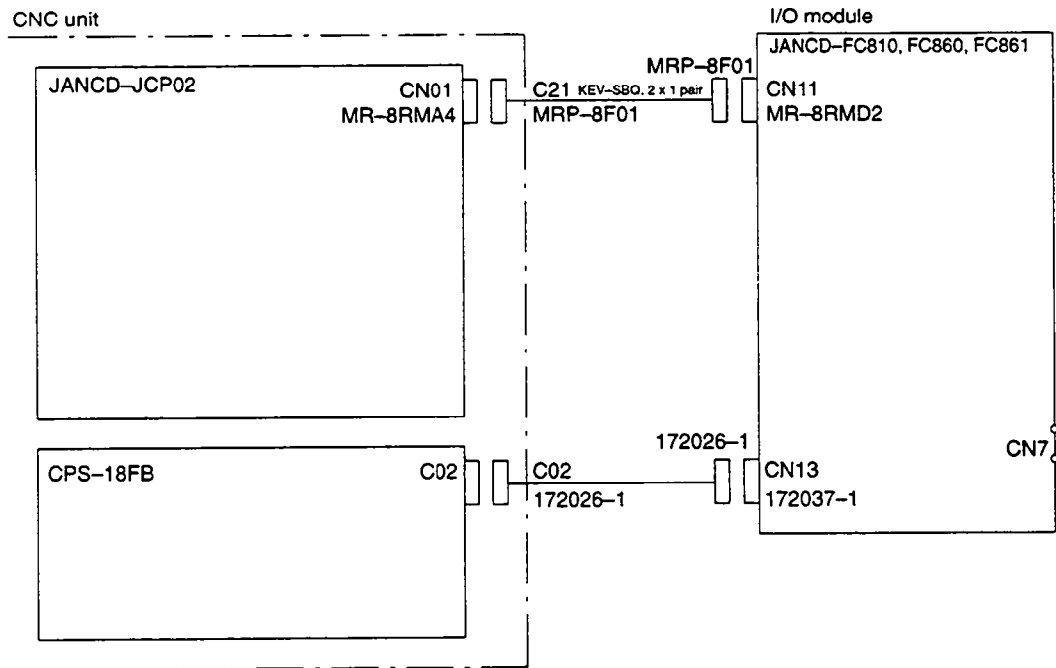


Fig. 11.1 Connection between Devices



Make the wiring cable between the CNC unit and the I/O module shortest.

11.2 DETAILED CONNECTION OF I/O MODULE

This section describes the detailed connection between the CNC unit and the I/O module.

11.2.1 Connection between Devices

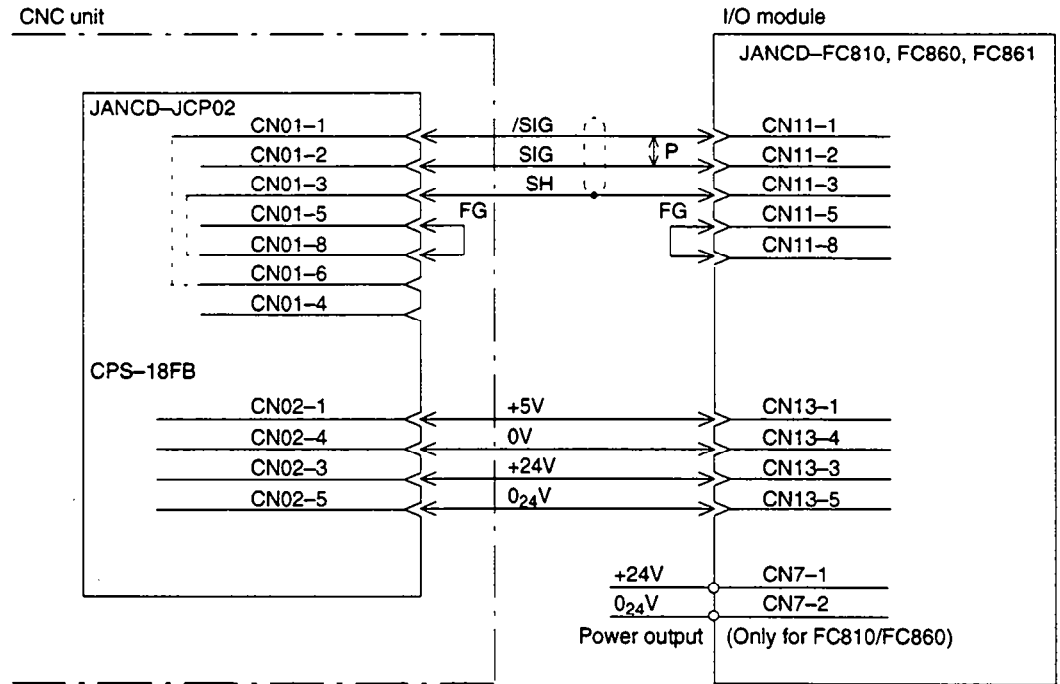


Fig. 11.2 Detailed Connection of I/O Module

11.3 CONNECTION BETWEEN DEVICES OF ADDITIONAL I/O MODULE

This section describes the connection between the CNC unit and the additional I/O module, the type of connector, and the cable specifications.

11.3.1 Connection between Devices

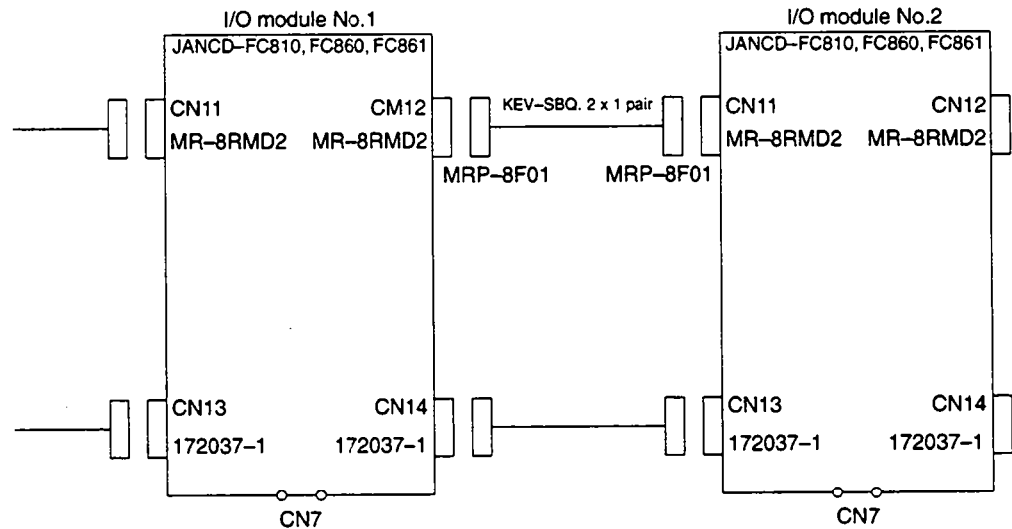


Fig. 11.3 Connection between Devices of Additional I/O Module



CN7 is arranged only in FC810 and FC860, and is a 24V output terminal from CPS18FB. There is no CN7 in FC861.

11.4 DETAILED CONNECTION OF ADDITIONAL I/O MODULE

This section describes the detailed connection between the CPU unit and the additional I/O module.

11.4.1 Connection between Devices

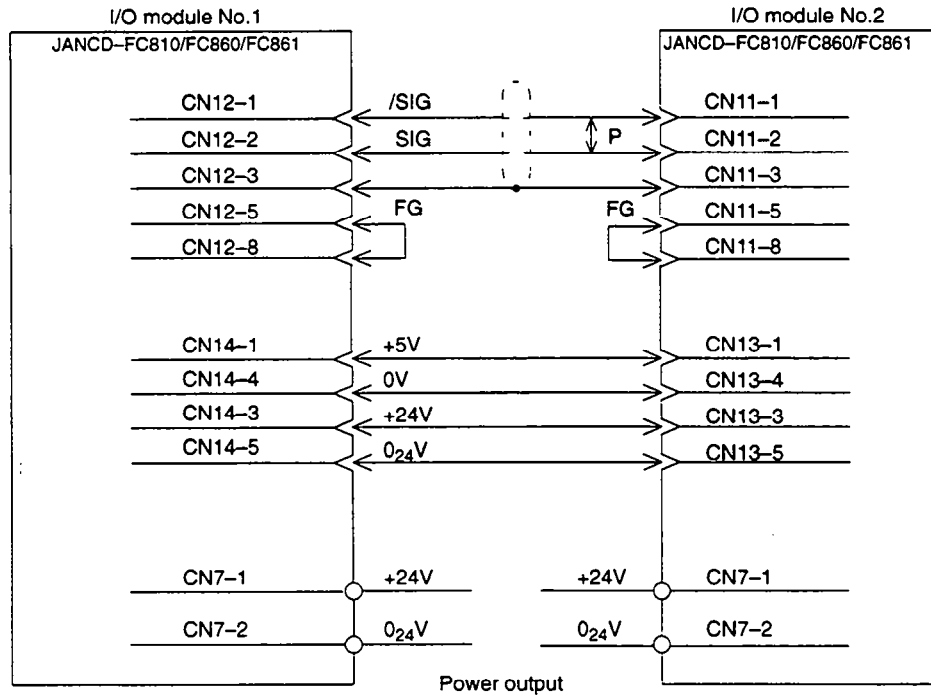
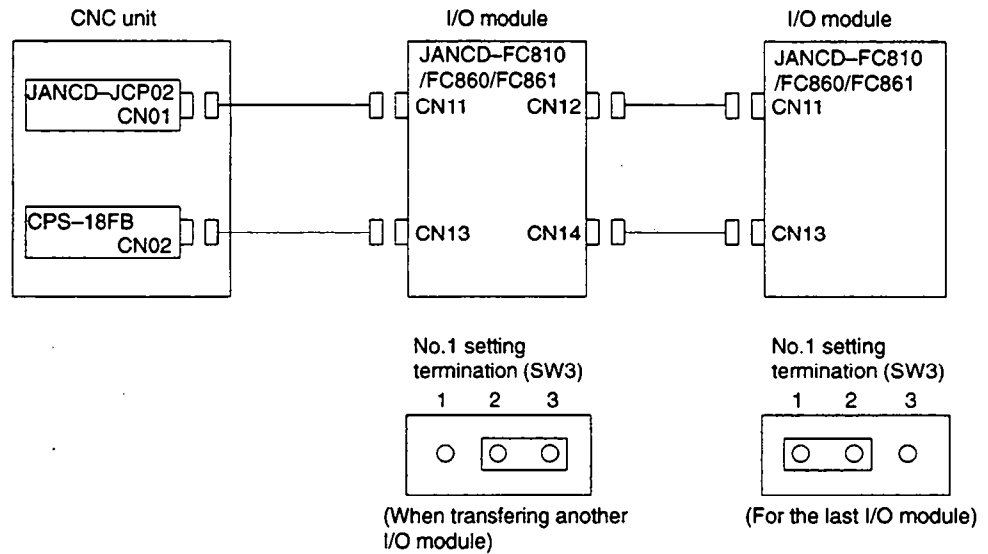


Fig. 11.4 Detailed Connection of Additional I/O Module

(1) Connection of General-purpose I/O Module

- Up to 4 general-purpose I/O modules can be connected. (when using FC810 or FC860)
- It is necessary to carry out end processing at the last module of general-purpose I/O modules.



(2) Setting of Shorting Pin(SW2)

By setting shorting pin SW2 of the I/O module (FC810, FC860, FC861), it is possible to make logic "1" when the input contact is "closed" irrespective of common 0V/24V.

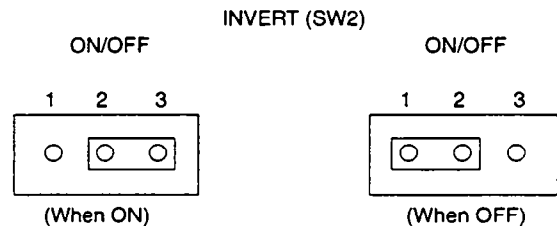
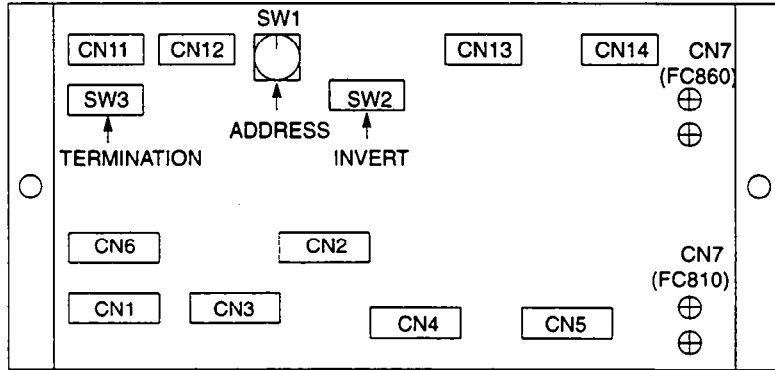


Fig. 11.5 Setting of Shorting Pin

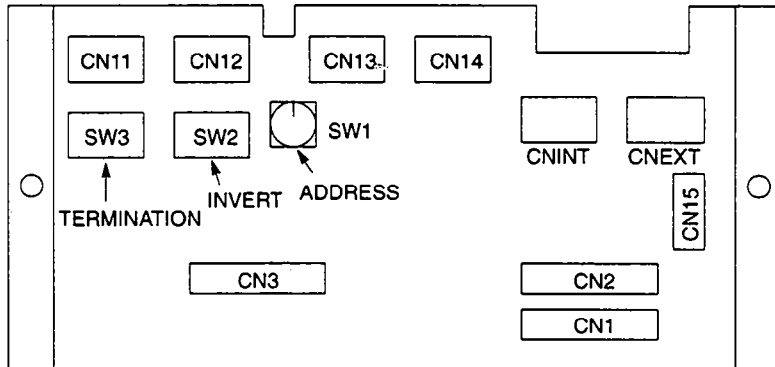
(3) Address Setting of I/O Module

I/O port address of I/O module can be set by the rotary switch (SW1).

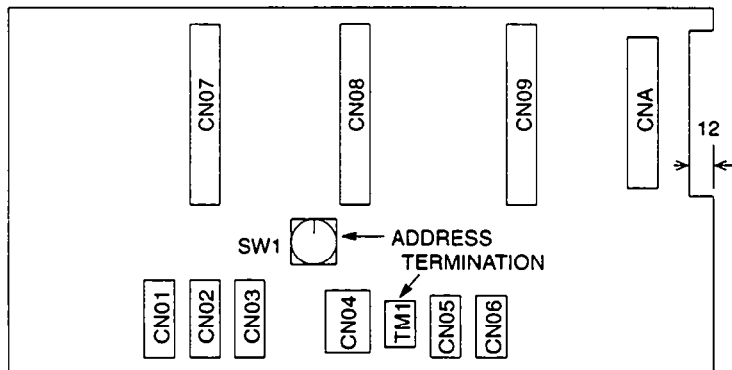
- I/O module (JANCD-FC810/FC860)



- I/O module (JANCD-FC861)



- I/O module (JANCD-JSP02)



(4) Reverse Bit Area of the Board

The reverse bit area by the common status of each board is shown in Table 11.1 and Table 11.2.

Table 11.1 Table of Bit Reverse Area

Common Connector Terminal Name	FC810, FC860 Reverse Area				
	SW1=1	SW1=3	SW1=5	SW1=7	SW1=9
COM30	#1000, #1001	#1016, #1017	#1032, #1033	#1048, #1049	#1064, #1065
COM31	#1002, #1003	#1018, #1019	#1034, #1035	#1050, #1051	#1066, #1067
COM32	#1004	#1020	#1036	#1052	#1068
COM40	#1005, #1006	#1021, #1022	#1037, #1038	#1053, #1054	#1069, #1070
COM41	#1007, #1008	#1023, #1024	#1039, #1040	#1055, #1056	#1071, #1072
COM42	#1009	#1025	#1041	#1057	#1073
COM20	#1010, #1011	#1026, #1027	#1042, #1043	#1058, #1059	#1074, #1075
COM21	#1012	#1028	#1044	#1060	#1076
COM10	#1013	#1029	#1045	#1061	#1077

Table 11.2 Table of Bit Reverse Area

Common Connector Terminal Name	FC861 Reverse Area				
	SW1=1	SW1=2	SW1=3	SW1=4	SW1=5
COM00	#1000, #1001	#1008, #1009	#1016, #1017	#1024, #1025	#1032, #1033
COM01	#1002	#1010	#1018	#1026	#1034
COM02	#1003, #1004	#1011, #1012	#1019, #1020	#1027, #1028	#1035, #1036
COM03	#1005	#1013	#1021	#1029	#1037
COM04	#1006, #1007	#1014, #1015	#1022, #1023	#1030, #1031	#1038, #1039
	SW1=6	SW1=7	SW1=8	SW1=9	SW1=A
COM00	#1040, #1041	#1048, #1049	#1056, #1057	#1064, #1065	#1072, #1073
COM01	#1042	#1050	#1058	#1066	#1074
COM02	#1043, #1044	#1051, #1052	#1059, #1060	#1067, #1068	#1075, #1076
COM03	#1045	#1053	#1061	#1069	#1077
COM04	#1046, #1047	#1054, #1055	#1062, #1063	#1070, #1071	#1078, #1079

12

CONNECTION OF GENERAL-PURPOSE I/O

Chapter 12 describes the connection between the I/O module and the device I/O signal.

12.1 CONNECTION BETWEEN DEVICES

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12.2 DETAILED CONNECTION OF

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12.2.1 FC810/FC860 Module 12 - 4

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12.1 CONNECTION BETWEEN DEVICES

This section describes the connection between the I/O module and the device I/O signal, the type of connector, and the cable specifications.

12.1.1 Connection of Signal Line with I/O Module

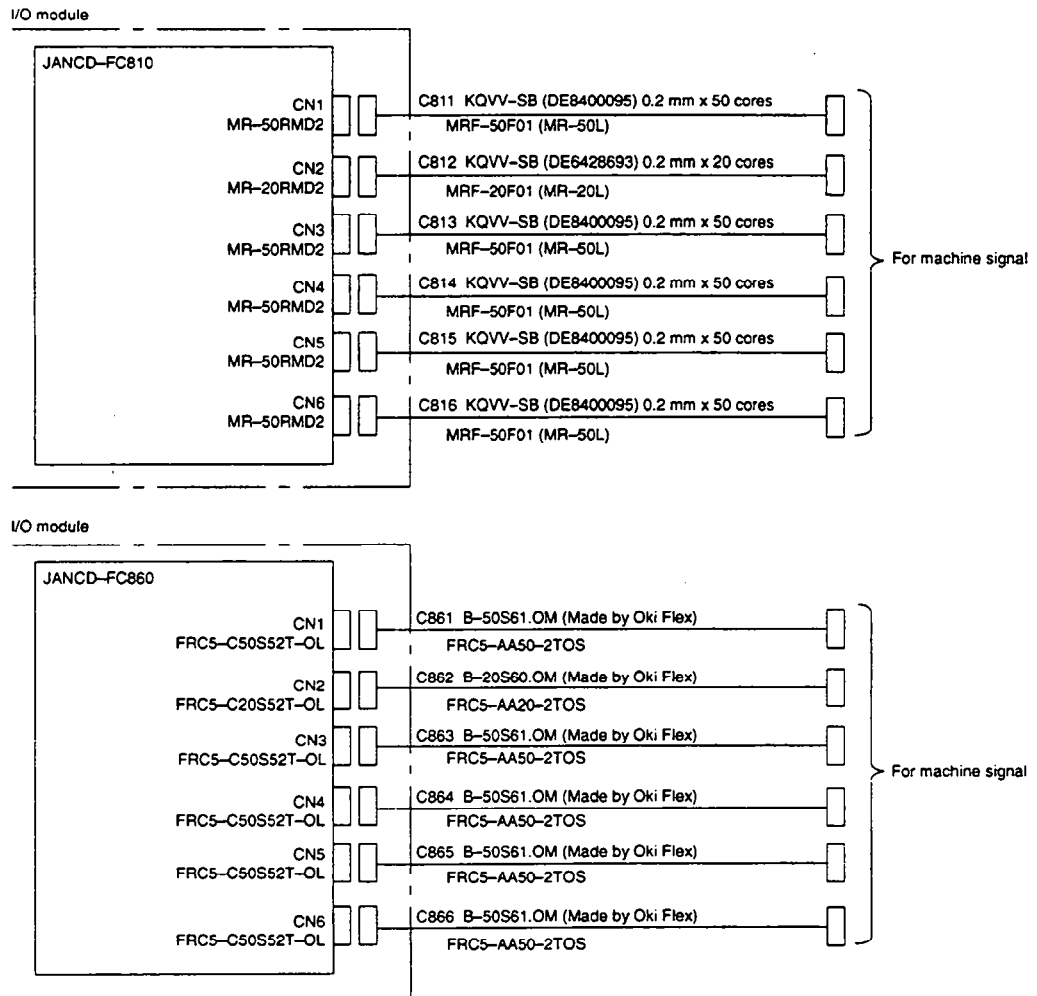


Fig. 12.1 Connection between Devices

12.2 DETAILED CONNECTION OF GENERAL-PURPOSE I/O

This section describes the detailed connection between the I/O module and the device I/O signal.

12.2.1 FC810/FC860 Module

When an internal power supply is used, supply the power from CN7-1 and CN7-2 pins.

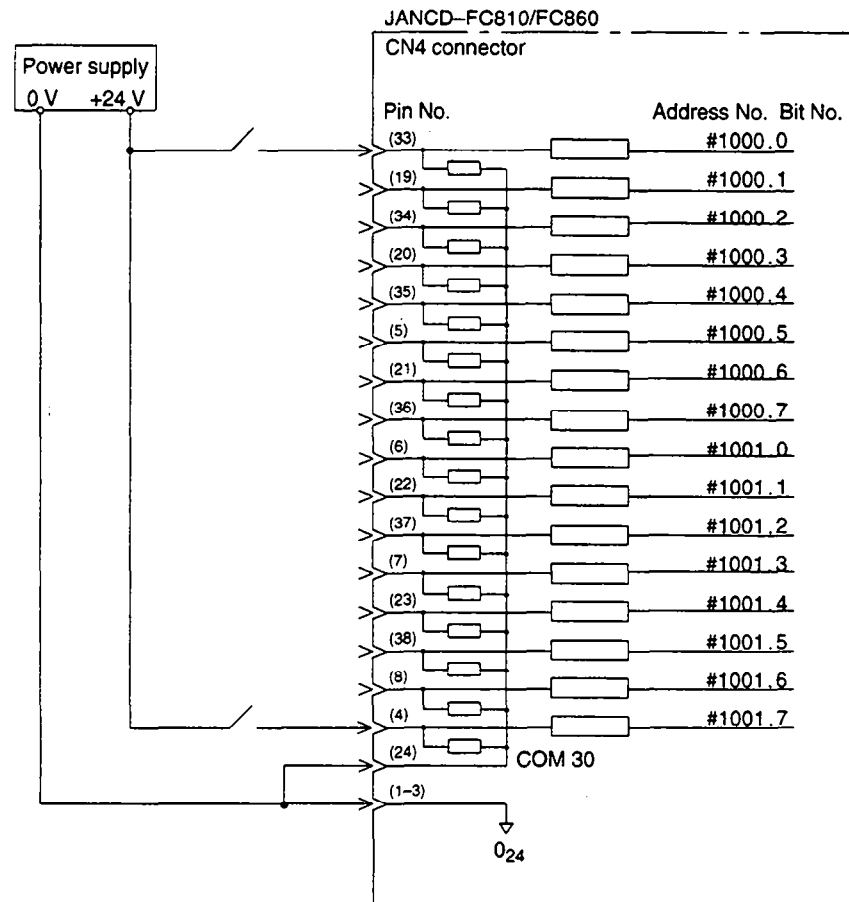


Fig. 12.3 FC810/FC860 Module Connection
(Address Number and Bit Number : #1000.0 to #1001.7)



1. The above example shows one connection of +24V common. As for the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1000.0 to #1001.7)
In modules No.2 and No.3, the layout is as shown above starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

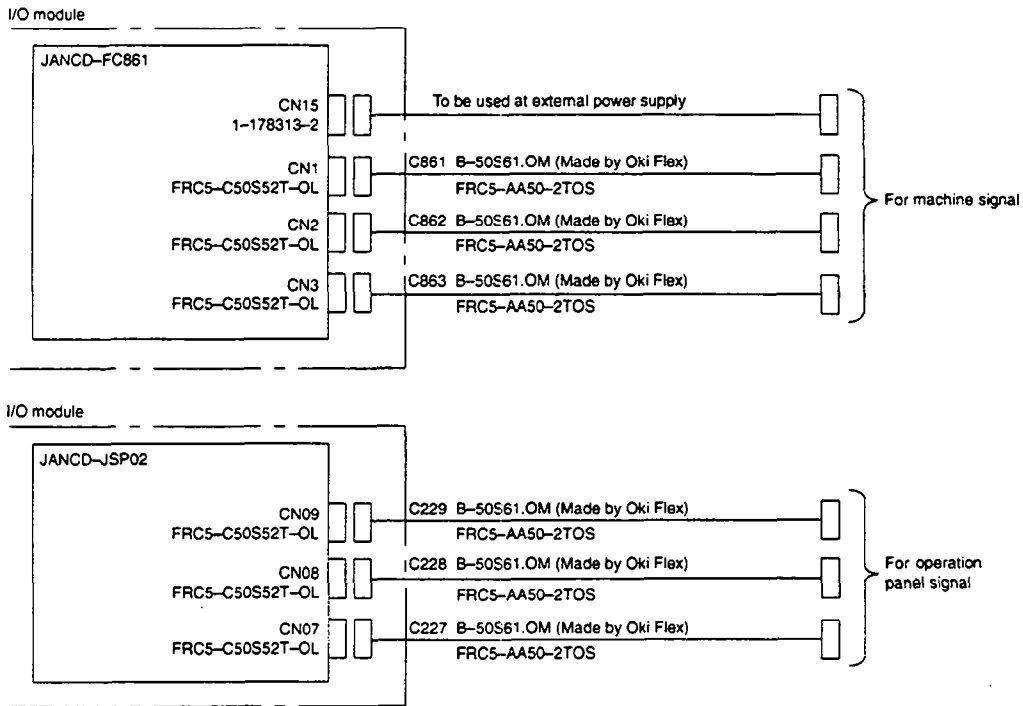


Fig. 12.2 Connection between Devices

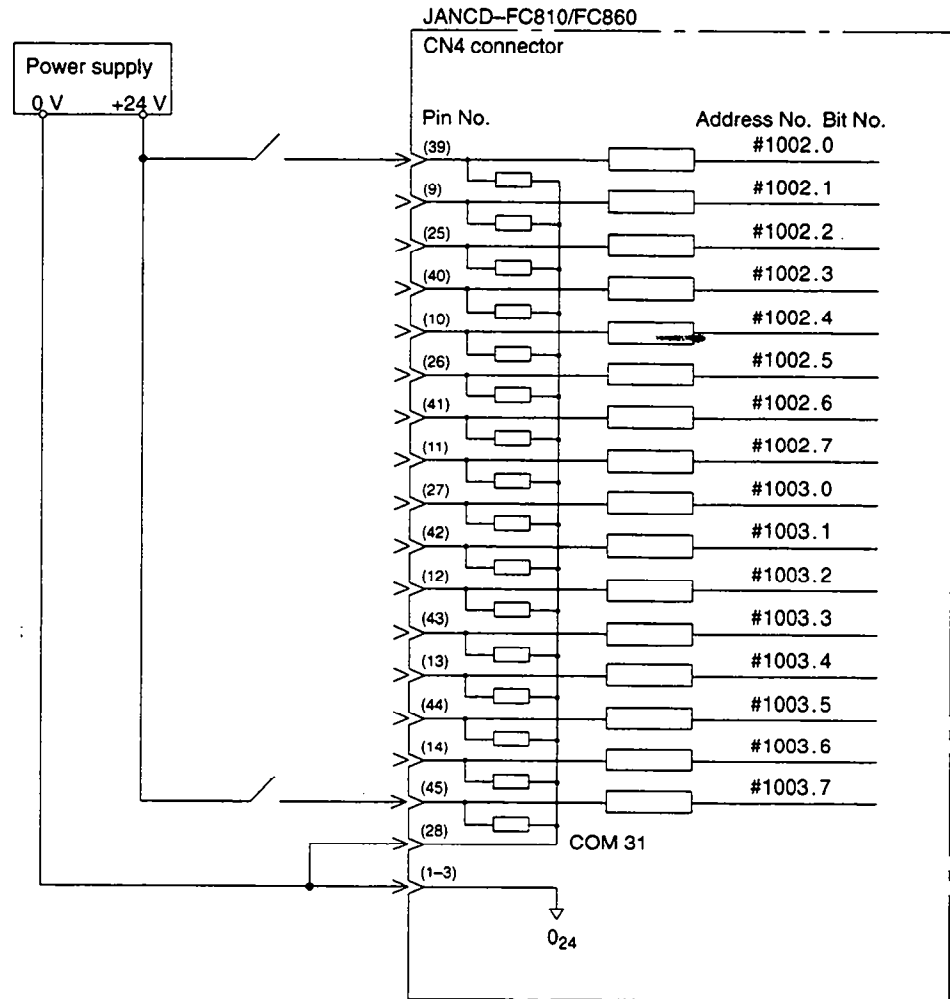


Fig. 12.4 FC810/FC860 Module Connection
(Address Number and Bit Number : #1002.0 to #1003.7)



1. The above example shows connection of +24V common. As for the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1002.0 to #1003.7)
In modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

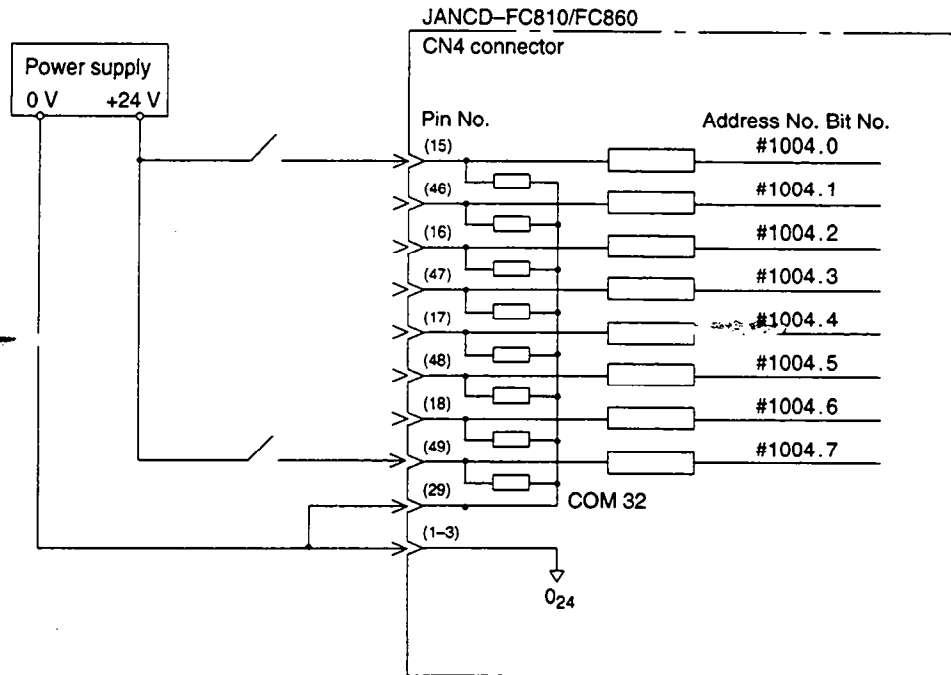


Fig. 12.5 FC810/FC860 Module Connection
(Address Number and Bit Number : #1004.0 to #1004.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1004.0 to #1004.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

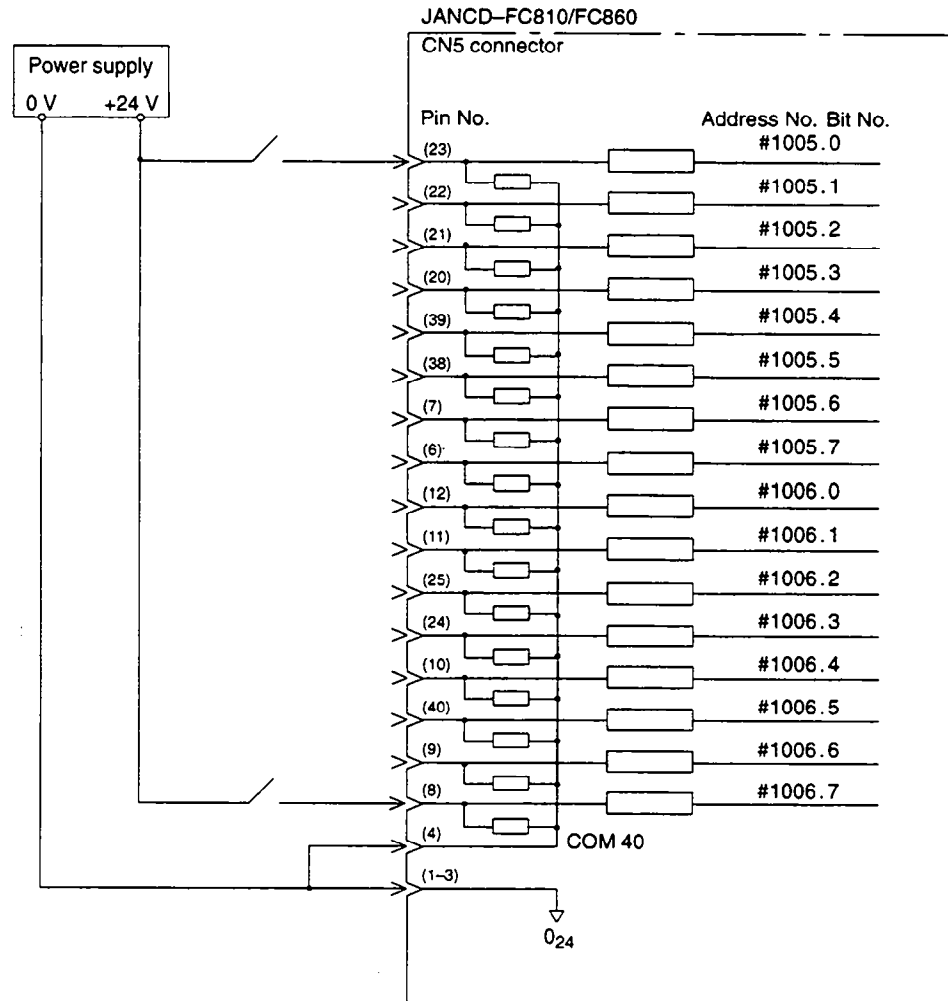


Fig. 12.6 FC810/FC860 Module Connection
(Address Number and Bit Number : #1005.0 to #1006.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1005.0 to #1006.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

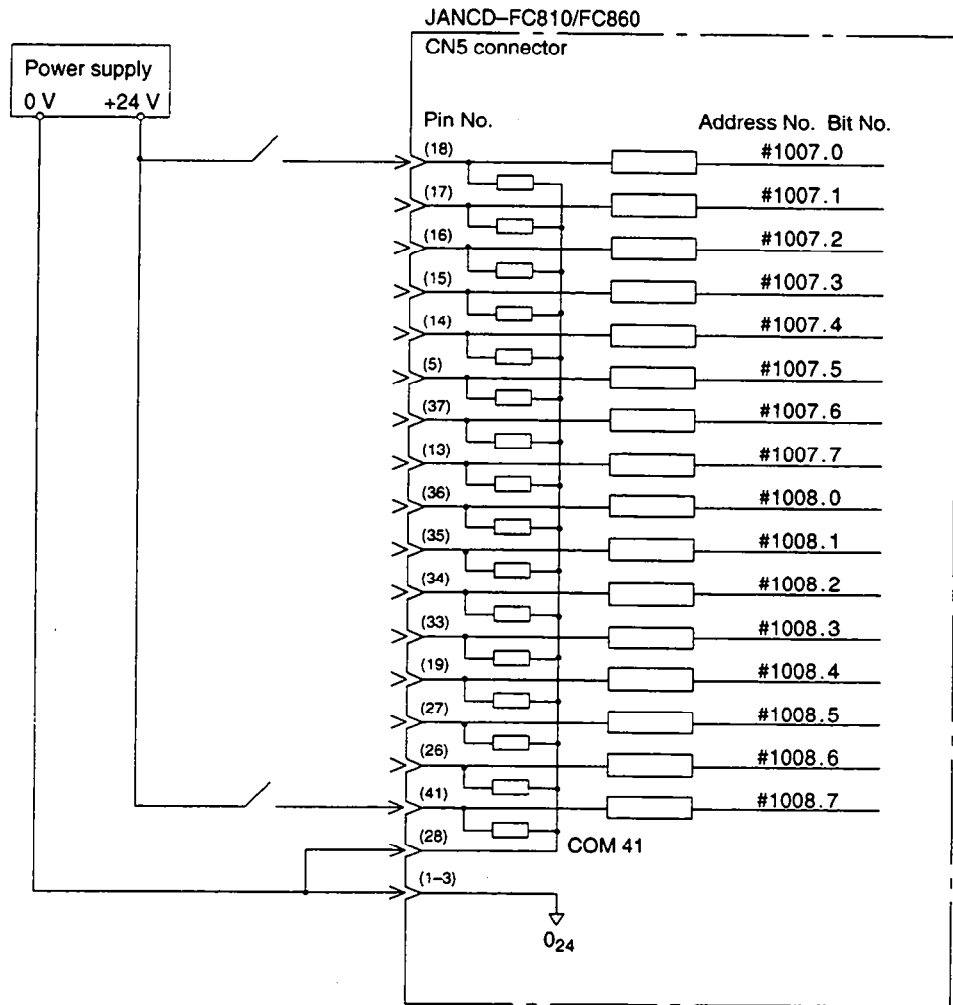


Fig. 12.7 FC810/FC860 Module Connection
(Address Number and Bit Number : #1007.0 to #1008.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1007.0 to #1008.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

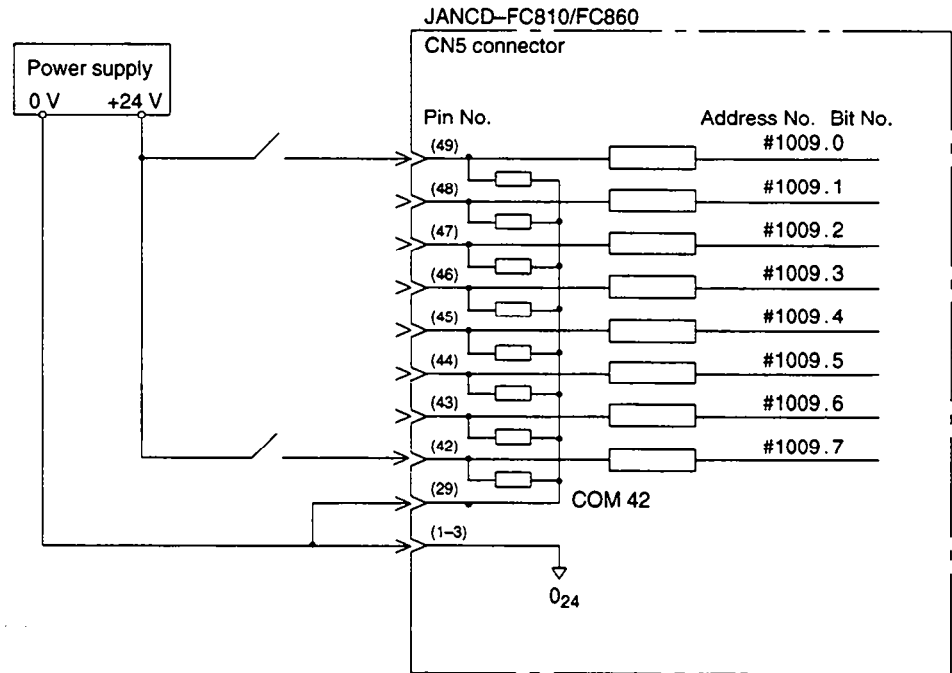


Fig. 12.8 FC810/FC860 Module Connection
(Address Number and Bit Number : #1009.0 to #1009.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1009.0 to #1009.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

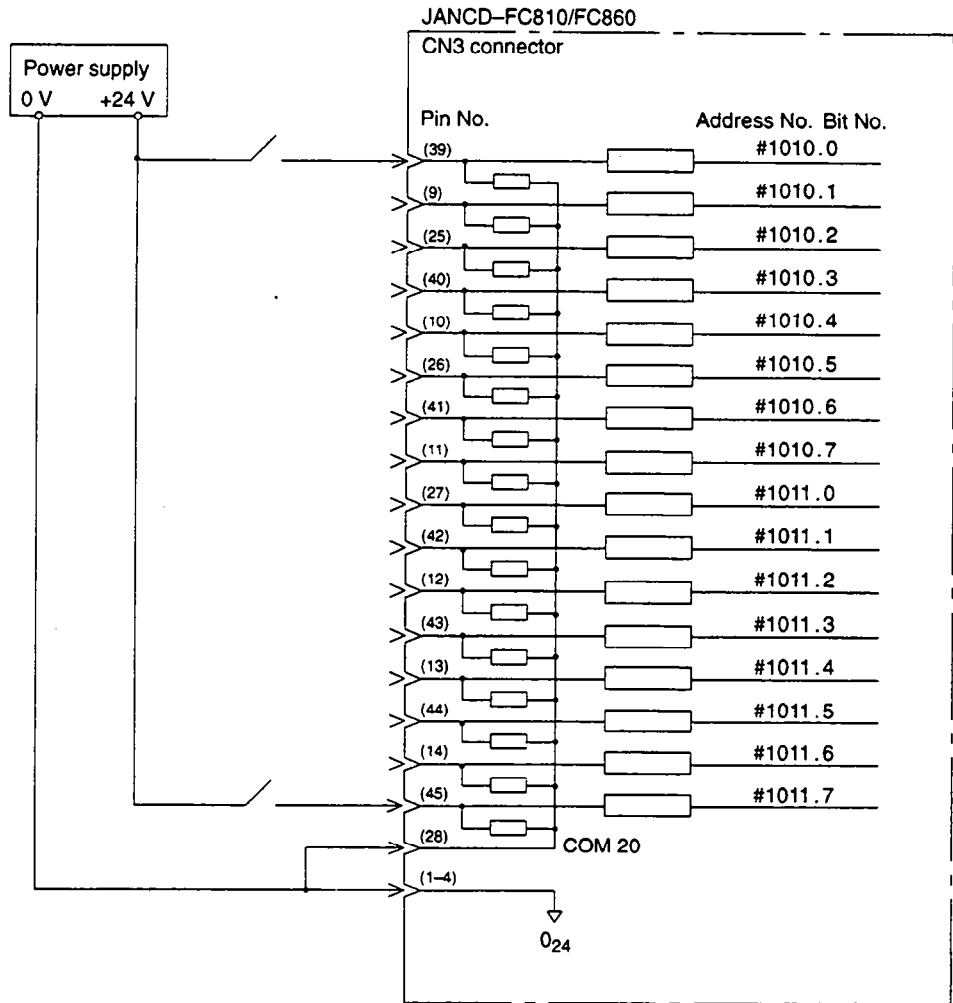


Fig. 12.9 FC810/FC860 Module Connection
(Address Number and Bit Number : #1010.0 to #1011.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1010.0 to #1011.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

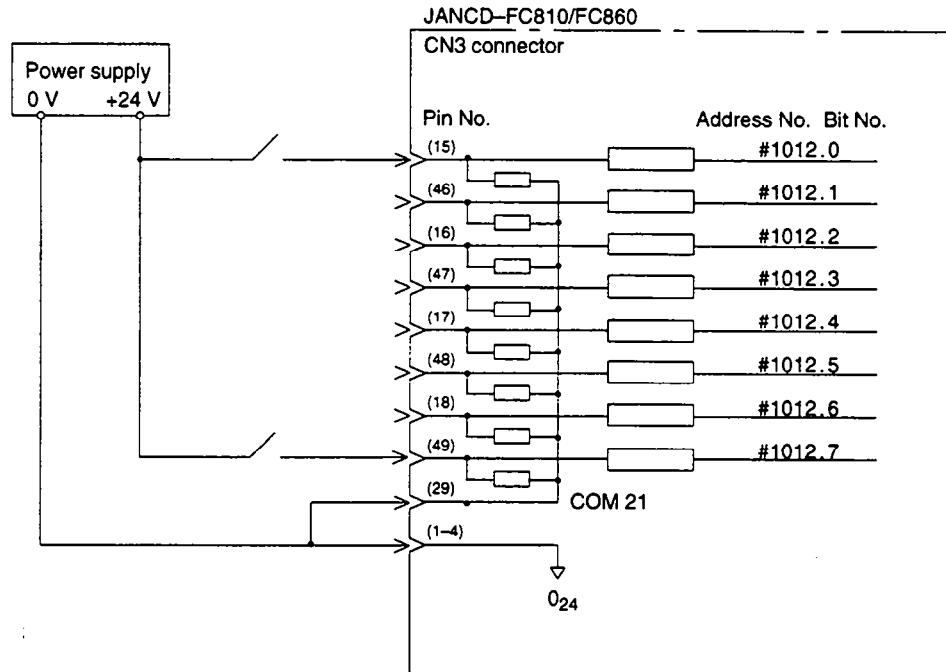


Fig. 12.10 FC810/FC860 Module Connection
(Address Number and Bit Number : #1012.0 to #1012.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1012.0 to #1012.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

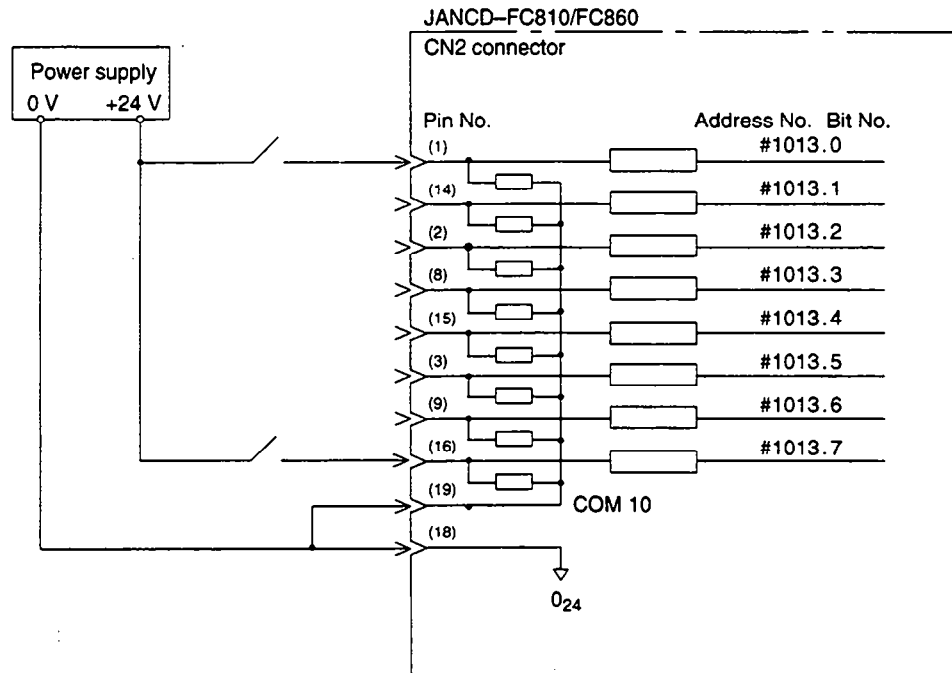


Fig. 12.11 FC810/FC860 Module Connection
(Address Number and Bit Number : #1013.0 to #1013.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC810/FC860)."
2. The address is that of module No.1. (#1013.0 to #1013.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number. For details, refer to 12.3.1 "I/O Port."

When an internal power supply is used, supply the power from CN7-1 and CN7-2 pins.

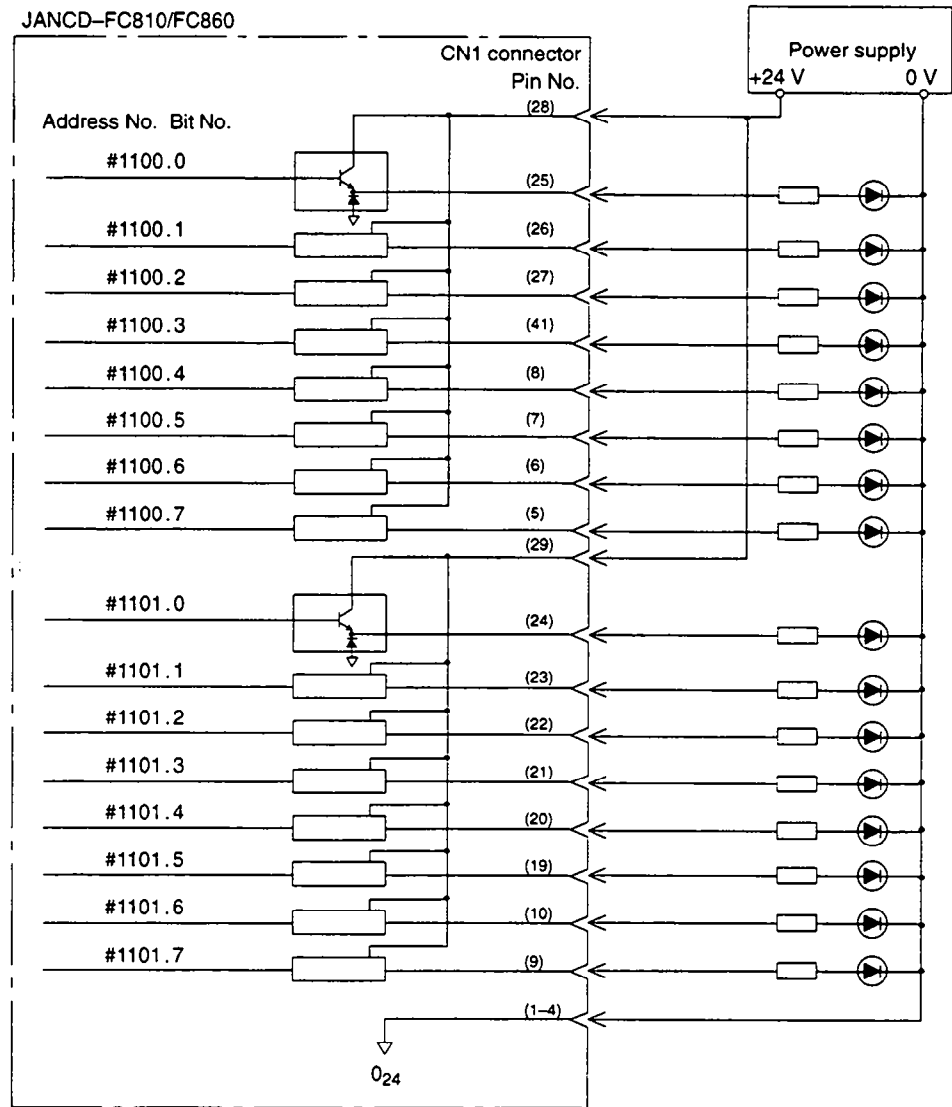


Fig. 12.12 FC810/FC860 Module Connection
(Address Number and Bit Number : #1100.0 to #1101.7)



The address is that of module No.1. (#1100.0 to #1101.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

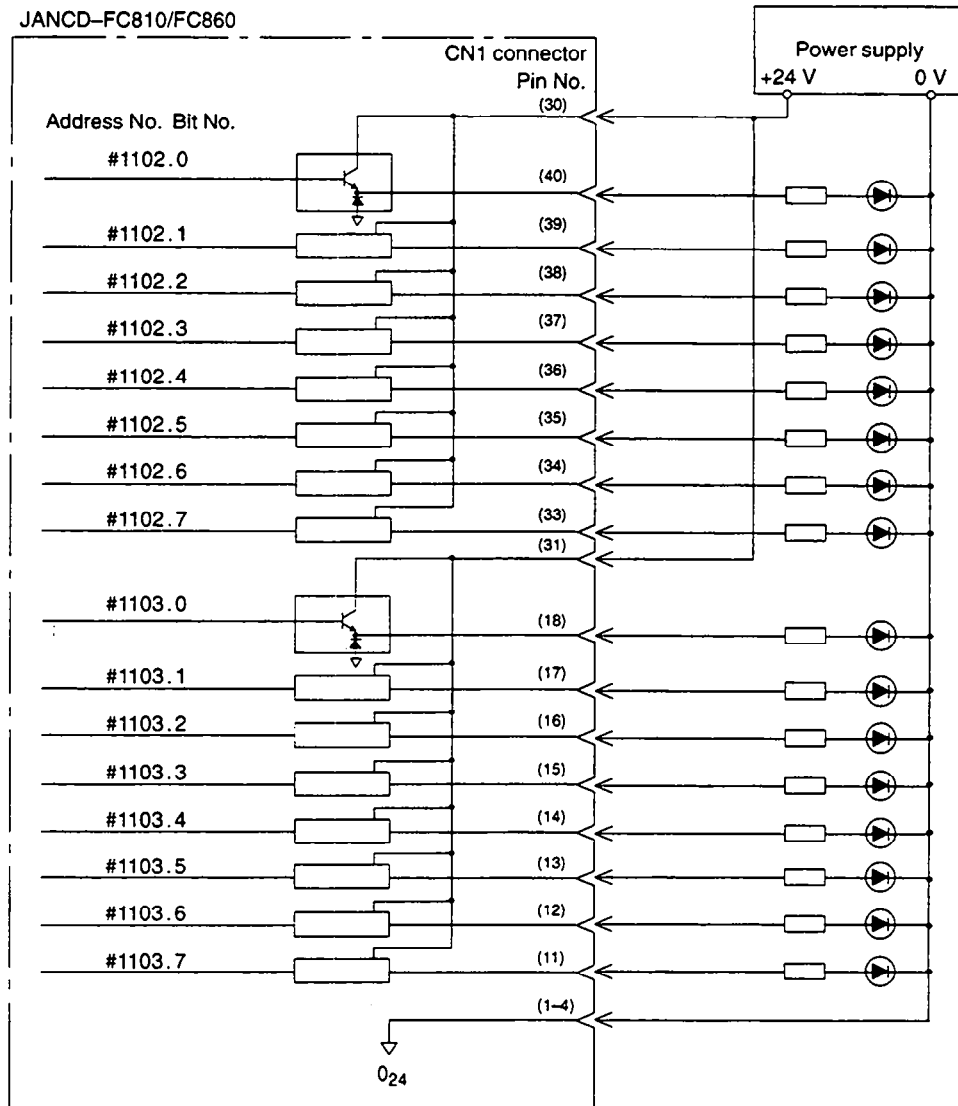


Fig. 12.13 FC810/FC860 Module Connection
(Address Number and Bit Number : #1102.0 to #1103.7)



The address is that of module No.1. (#1102.0 to #1103.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

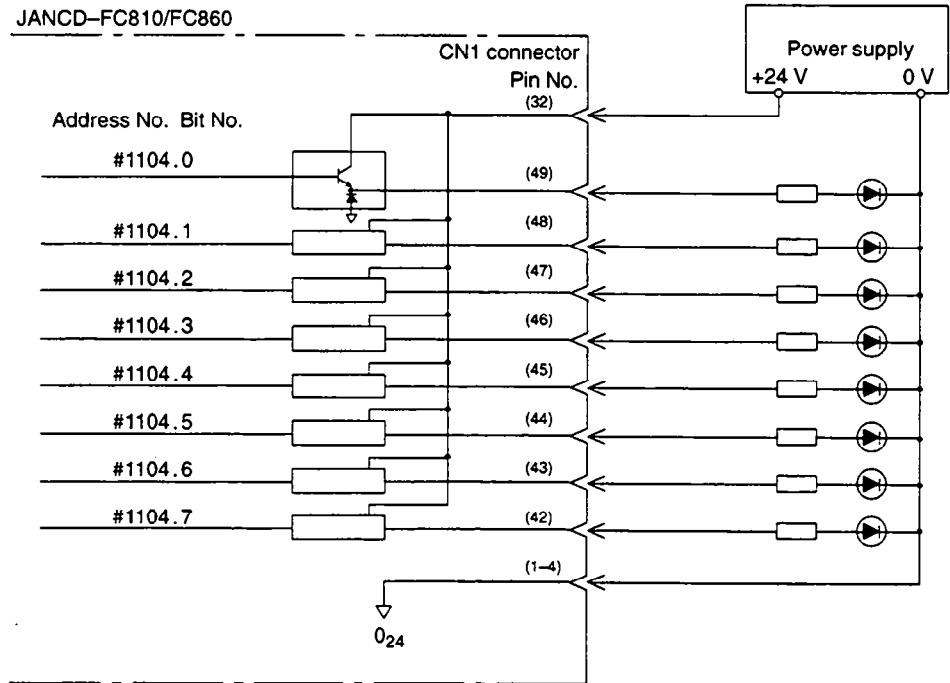


Fig. 12.14 FC810/FC860 Module Connection
(Address Number and Bit Number : #1104.0 to #1104.7)



The address is that of module No.1. (#1104.0 to #1104.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

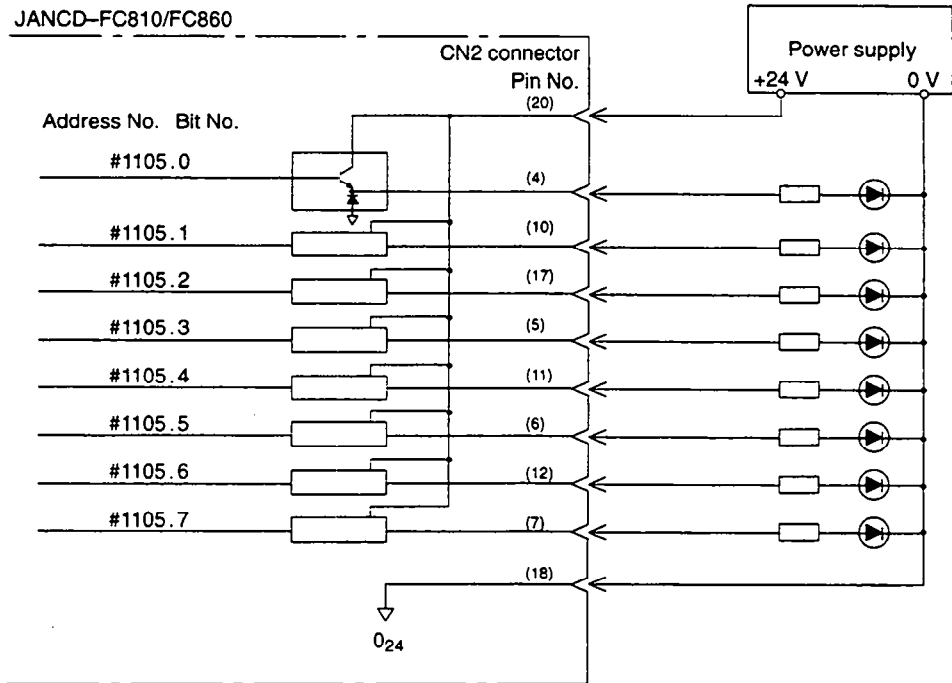


Fig. 12.15 FC810/FC860 Module Connection
(Address Number and Bit Number : #1105.0 to #1105.7)



The address is that of module No.1. (#1105.0 to #1105.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

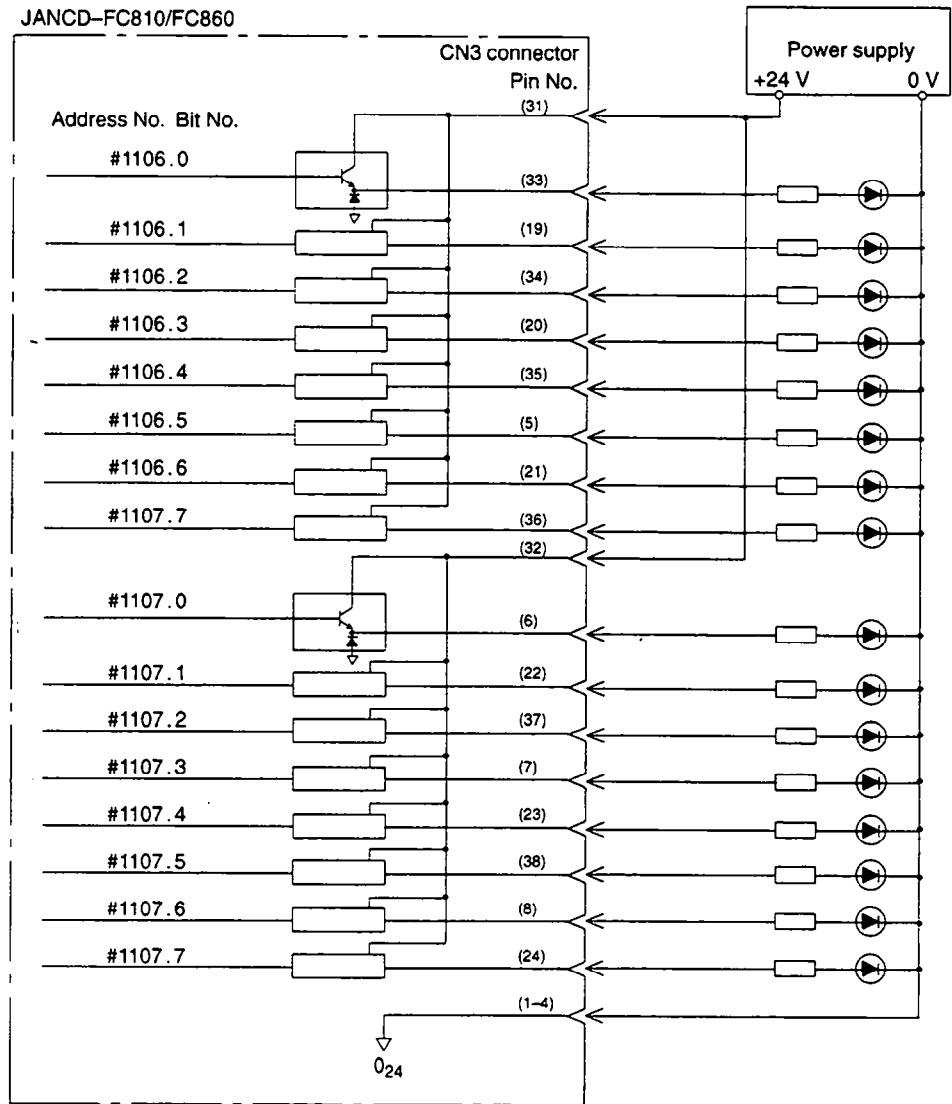


Fig. 12.16 FC810/FC860 Module Connection
(Address Number and Bit Number : #1106.0 to #1107.7)



The address is that of module No.1. (#1106.0 to #1107.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

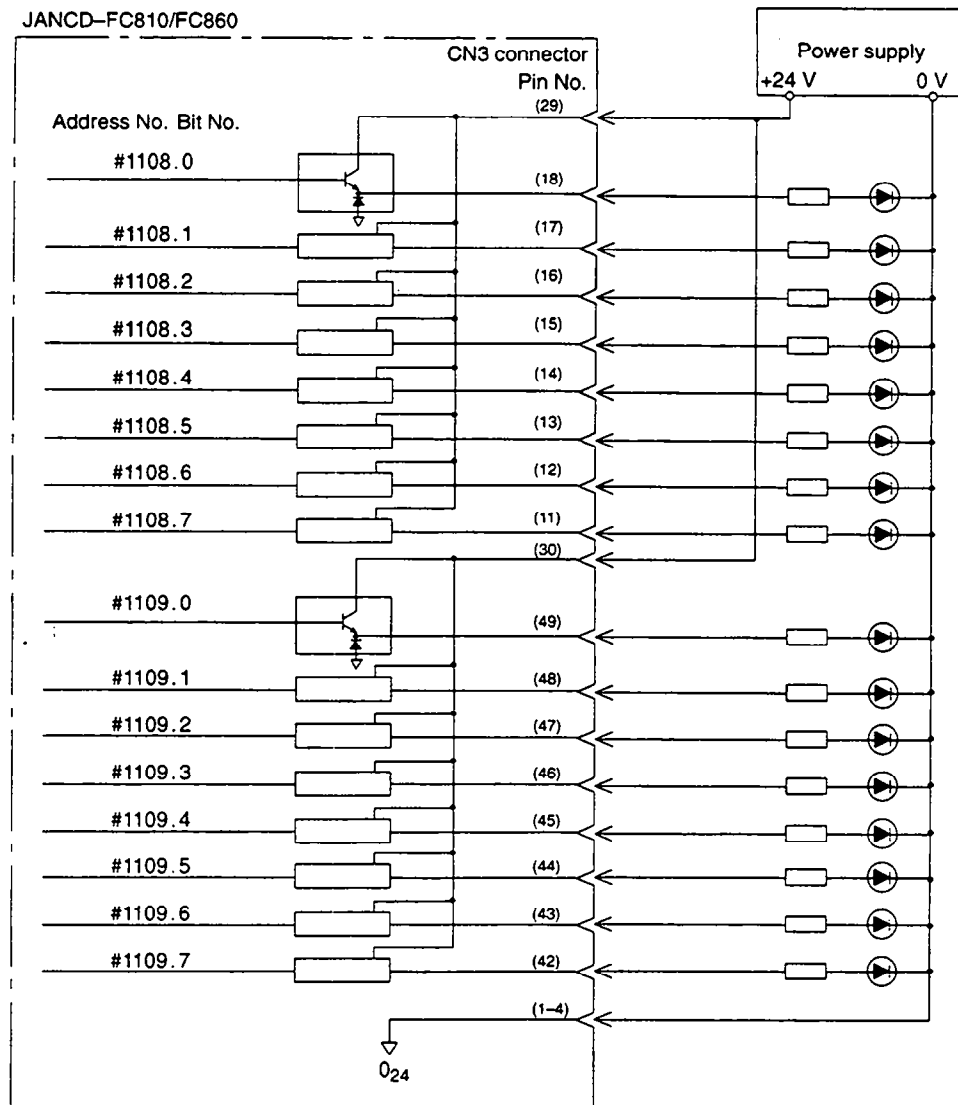


Fig. 12.17 FC810/FC860 Module Connection
 (Address Number and Bit Number : #1108.0 to #1109.7)



The address is that of module No.1. (#1106.0 to #1107.7)

For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

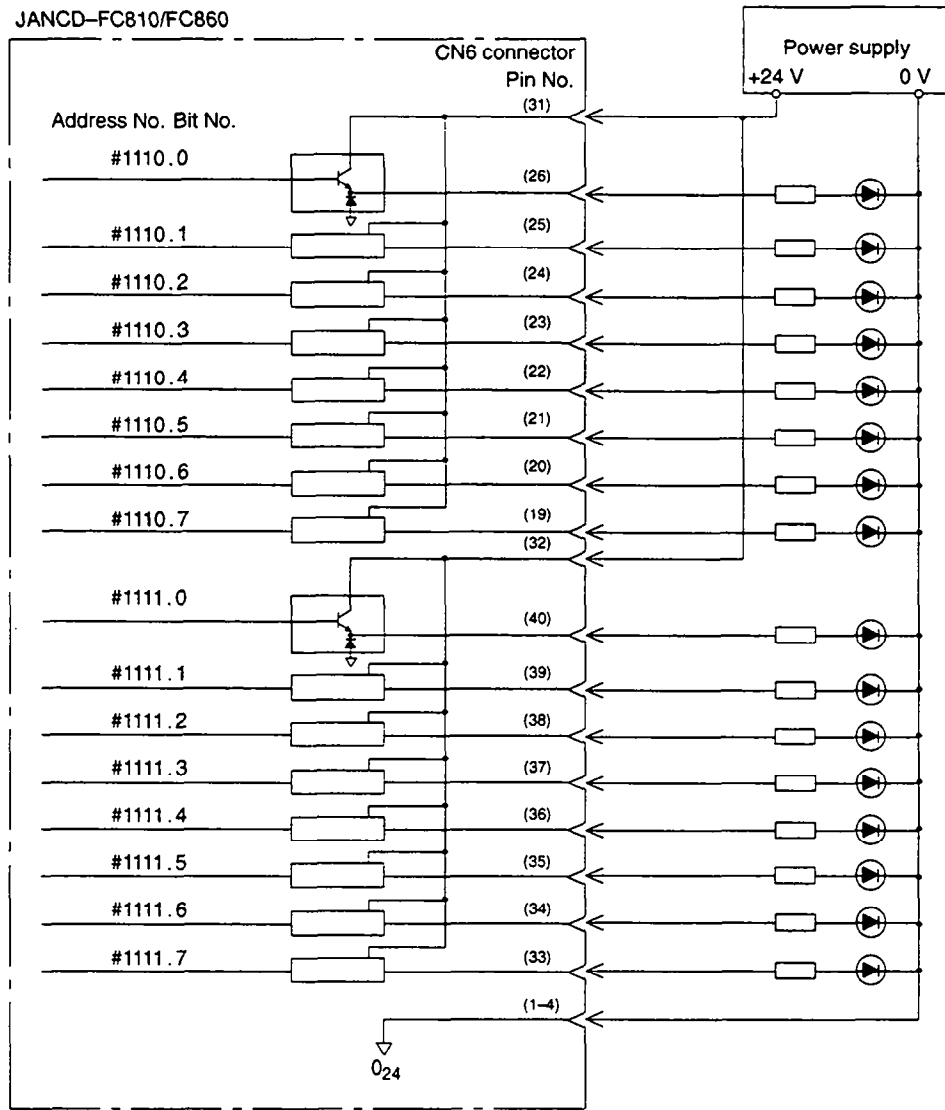


Fig. 12.18 FC810/FC860 Module Connection
(Address Number and Bit Number : #1110.0 to #1111.7)



The address is that of module No.1. (#1110.0 to #1111.7)
For modules No.2 and No.3, the layout is as shown above, starting from the smaller address number.

12.2.2 FC861 Module

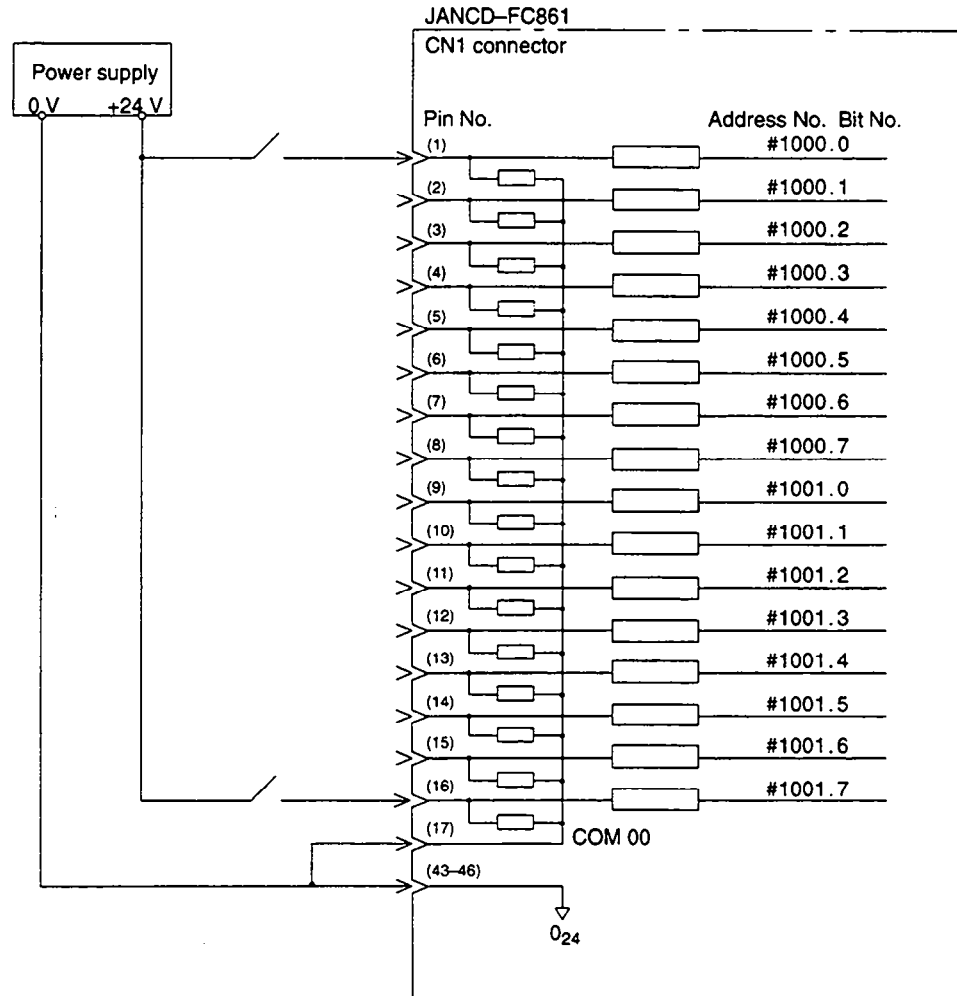


Fig. 12.19 FC861 Module Connection
(Address Number and Bit Number : #1000.0 to #1001.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC861)."
2. The address is that of module No.1-1. (#1000.0 to #1001.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

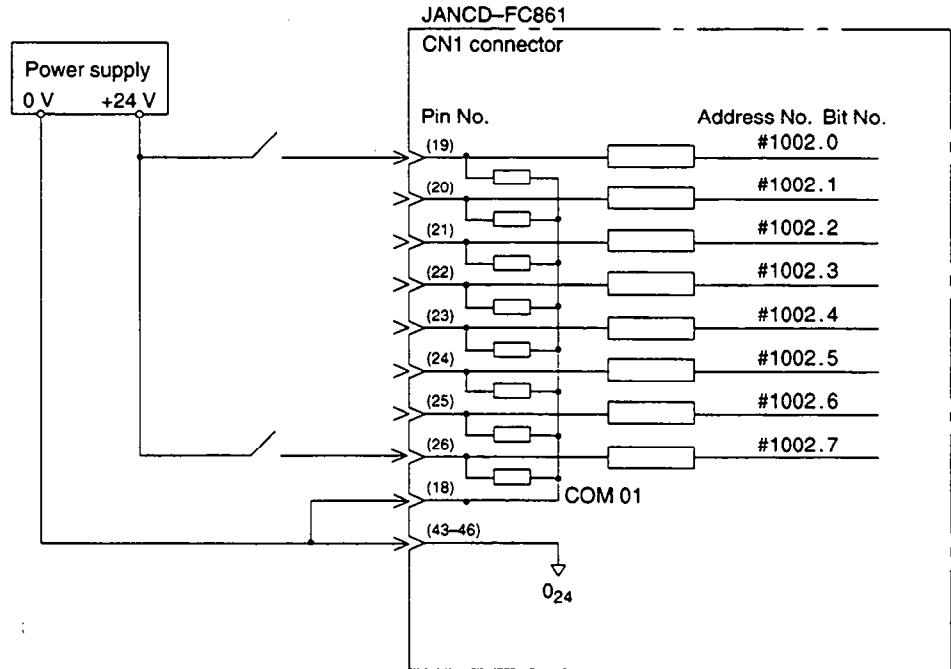


Fig. 12.20 FC861 Module Connection
(Address Number and Bit Number : #1002.0 to #1002.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC861)."
2. The address is that of module No.1-1. (#1002.0 to #1002.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

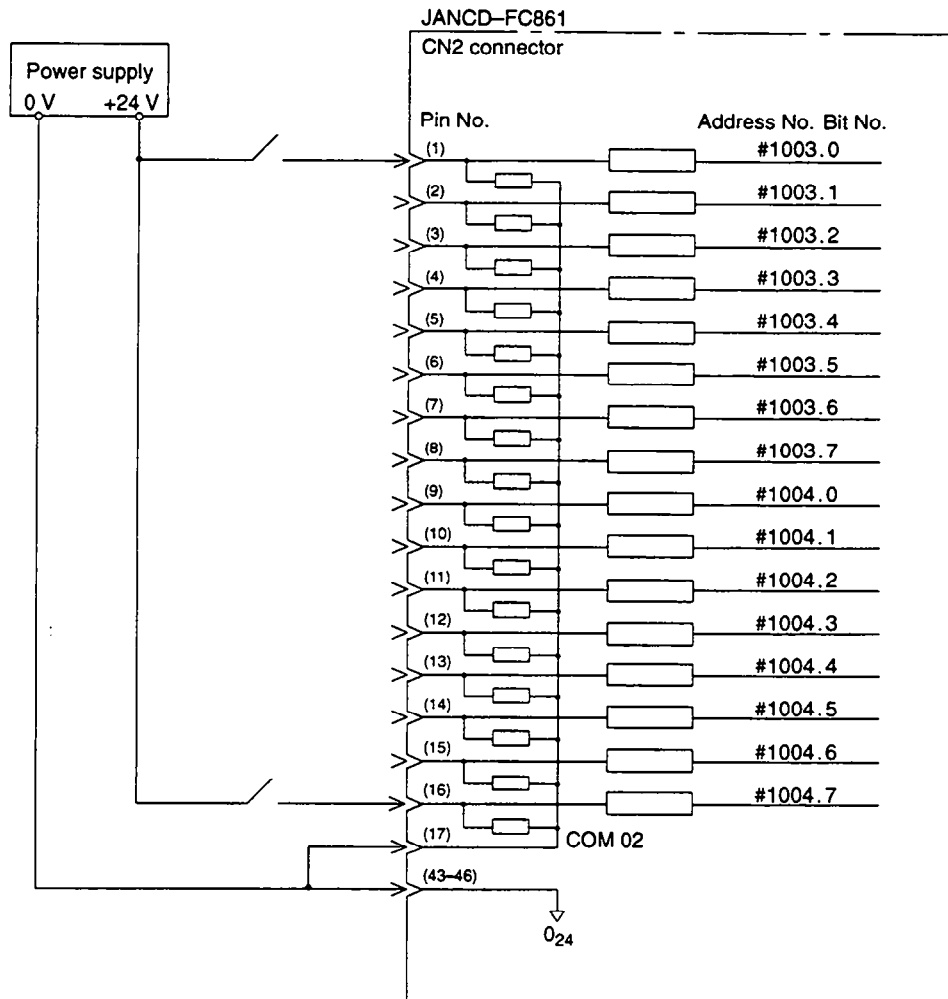


Fig. 12.21 FC861 Module Connection
(Address Number and Bit Number : #1003.0 to #1004.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC861)."
2. The address is that of module No.1-1. (#1003.0 to #1004.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

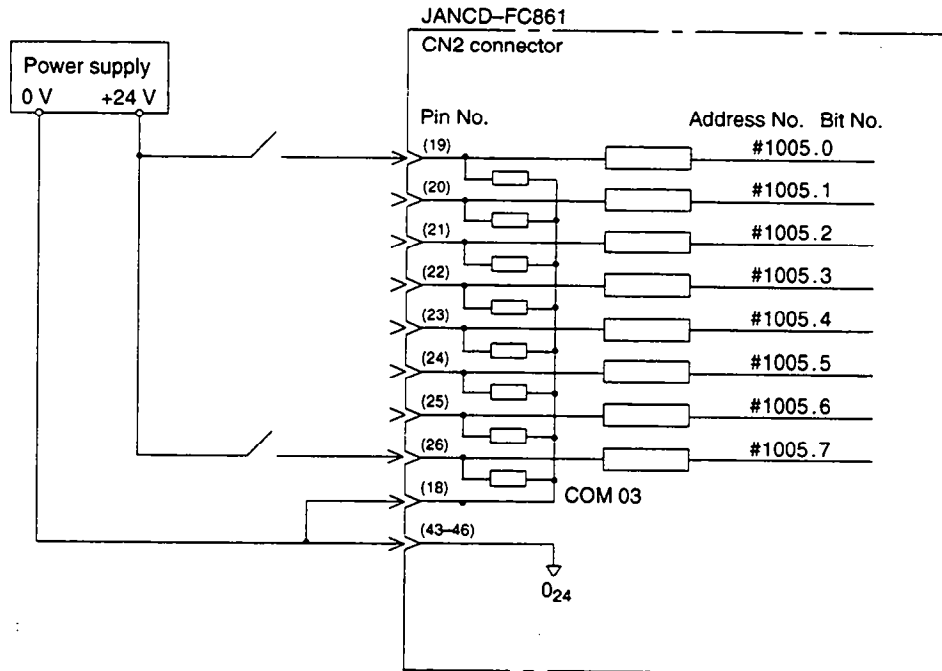


Fig. 12.22 FC861 Module Connection
(Address Number and Bit Number : #1005.0 to #1005.7)



1. The above example shows the connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC861)."
2. The address is that of module No.1-1. (#1005.0 to #1005.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

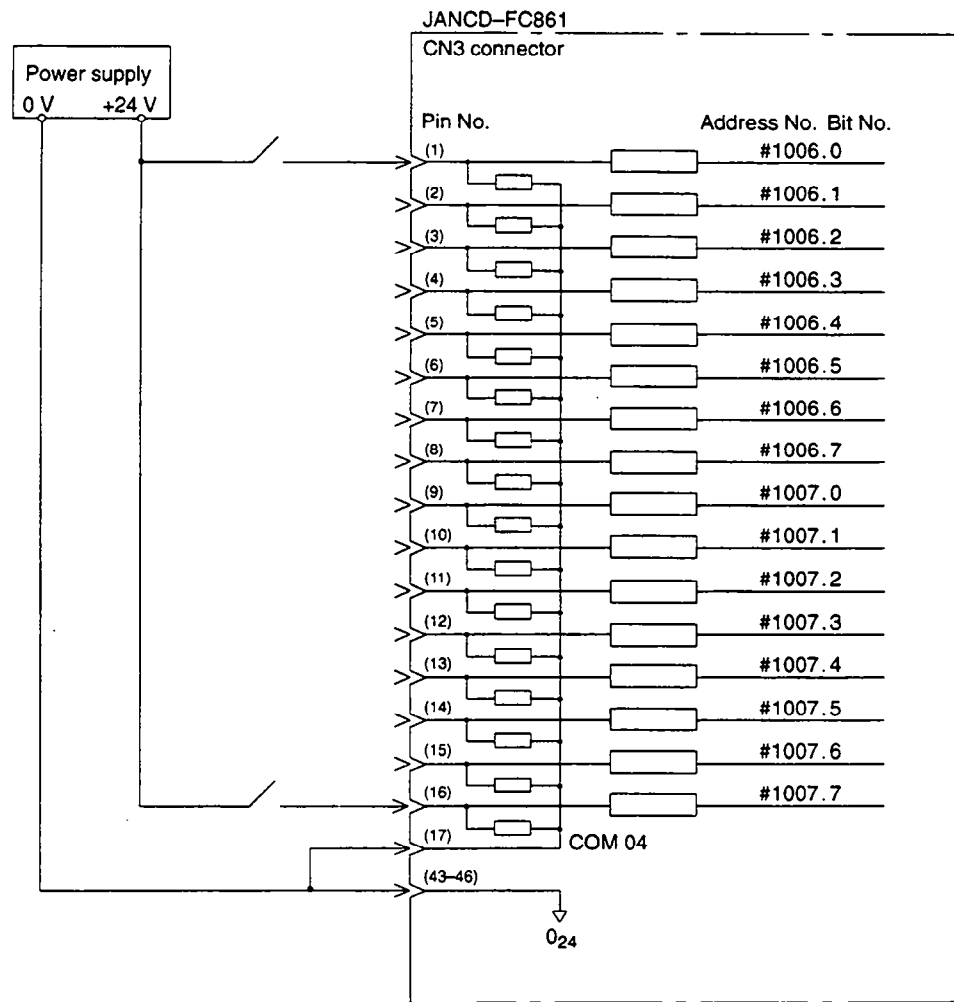


Fig. 12.23 FC861 Module Connection
(Address number and bit number : #1006.0 to #1007.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JANCD-FC861)."
2. The address is that of module No.1-1. (#1006.0 to #1007.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

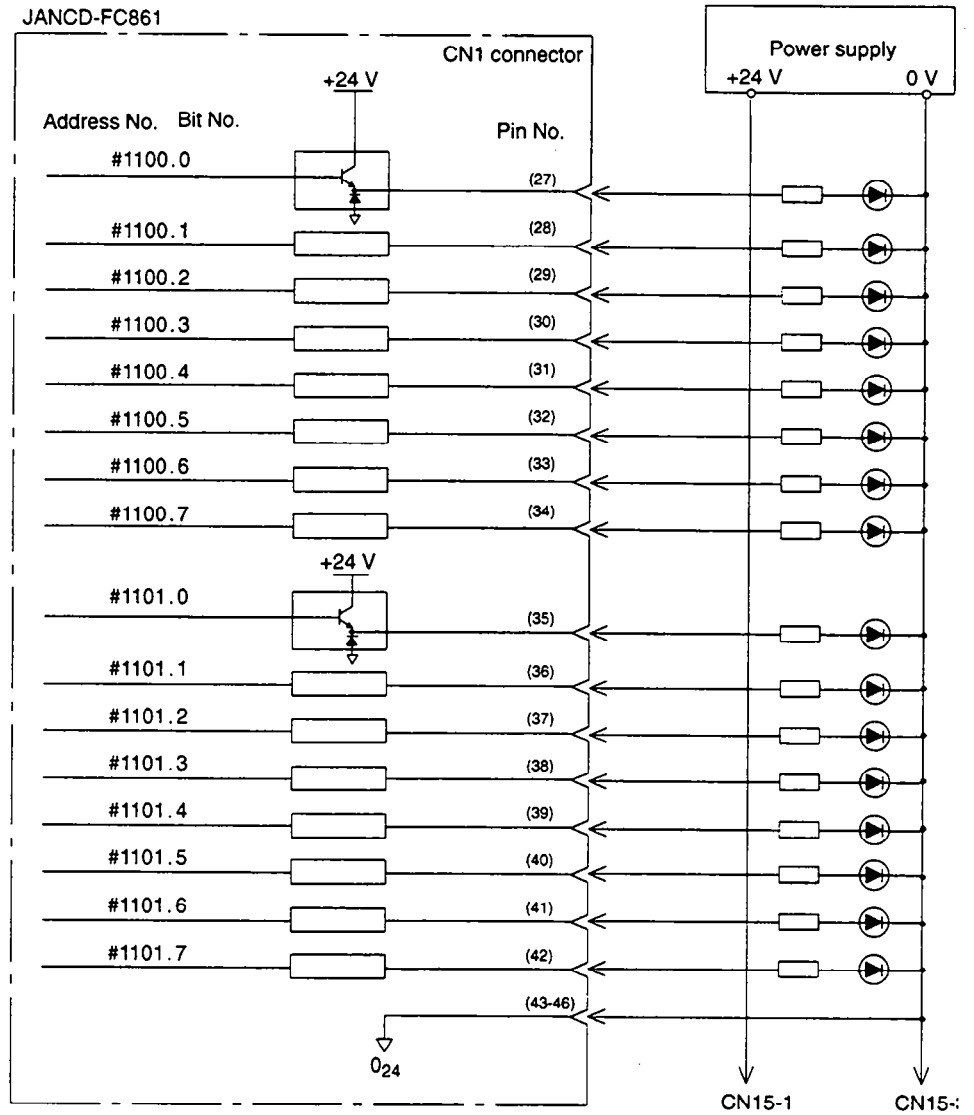


Fig. 12.24 FC861 Module Connection
(Address Number and Bit Number : #1100.0 to #1101.7)



The address is that of module No.1-1. (#1100.0 to #1101.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

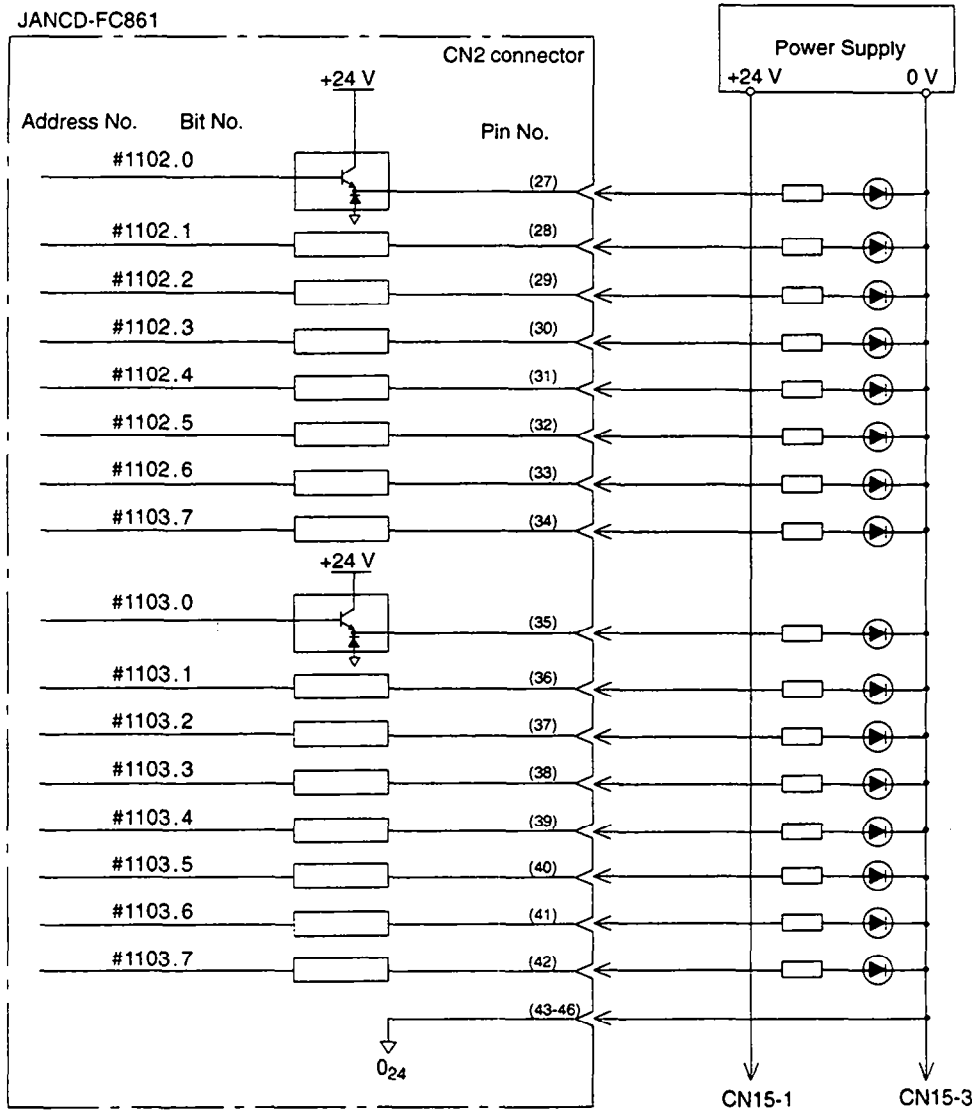


Fig. 12.25 FC861 Module Connection
(Address Number and Bit Number : #1102.0 to #1103.7)



The address is that of module No.1-1. (#1102.0 to #1103.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

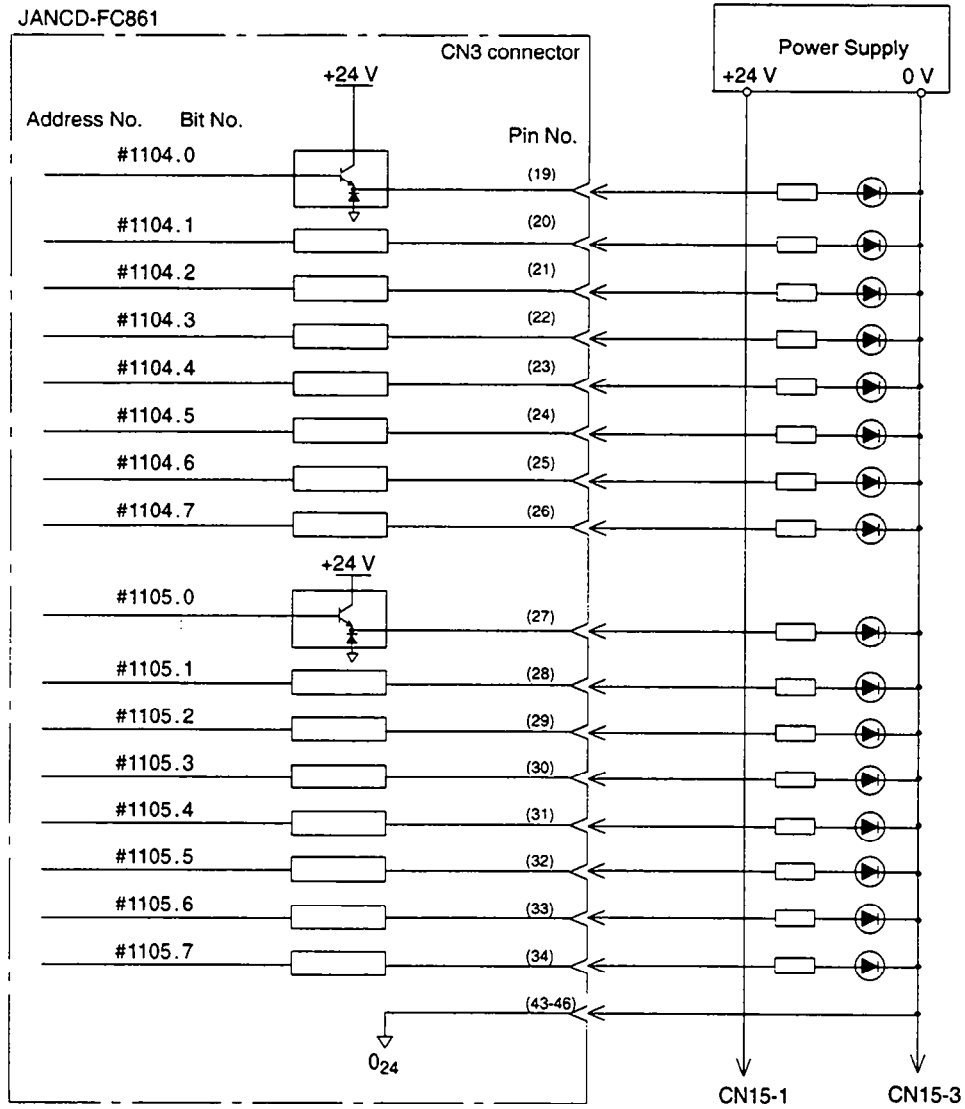


Fig. 12.26 FC861 Module Connection
(Address Number and Bit Number : #1104.0 to #1105.7)



The address is that of module No.1-1. (#1104.0 to #1105.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

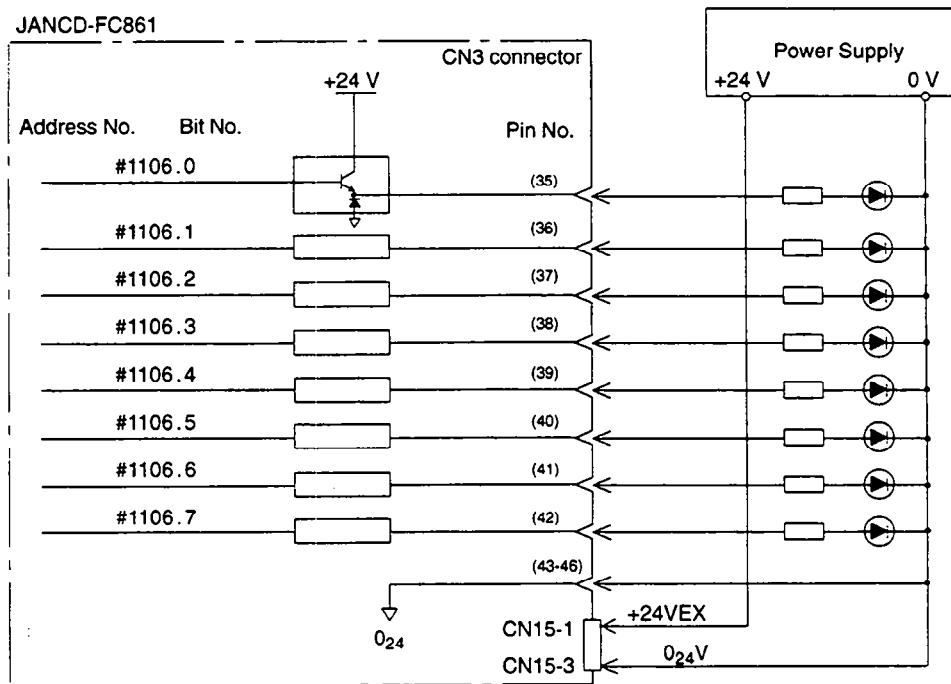


Fig. 12.27 FC861 Module Connection
(Address Number and Bit Number : #1106.0 to #1106.7)



The address is that of module No.1-1. (#1106.0 to #1106.7)
For modules No.2 to No.7, the layout is as shown above, starting from the smaller address number.

12.2.3 JSP02 Module

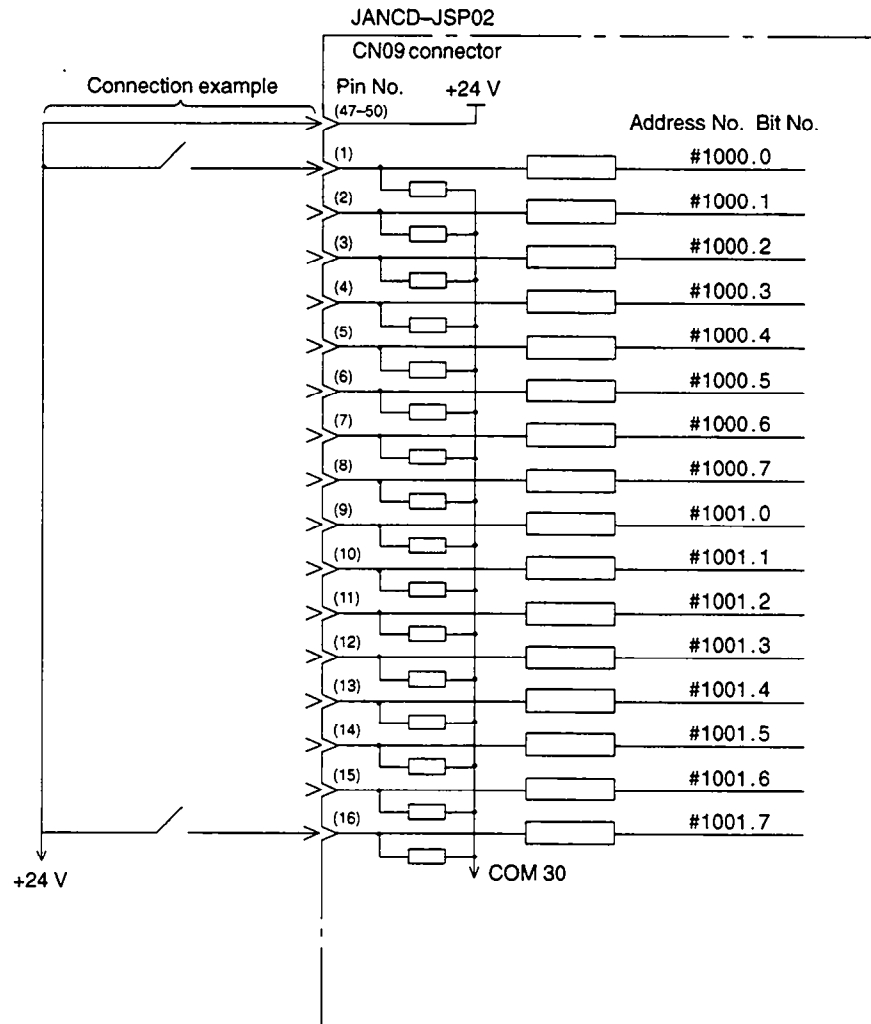


Fig. 12.28 JSP02 Module Connection
(Address Number and Bit Number : #1000.0 to #1001.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JSP02)."
2. The address is that of module No.1-1. (#1000.0 to #1001.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

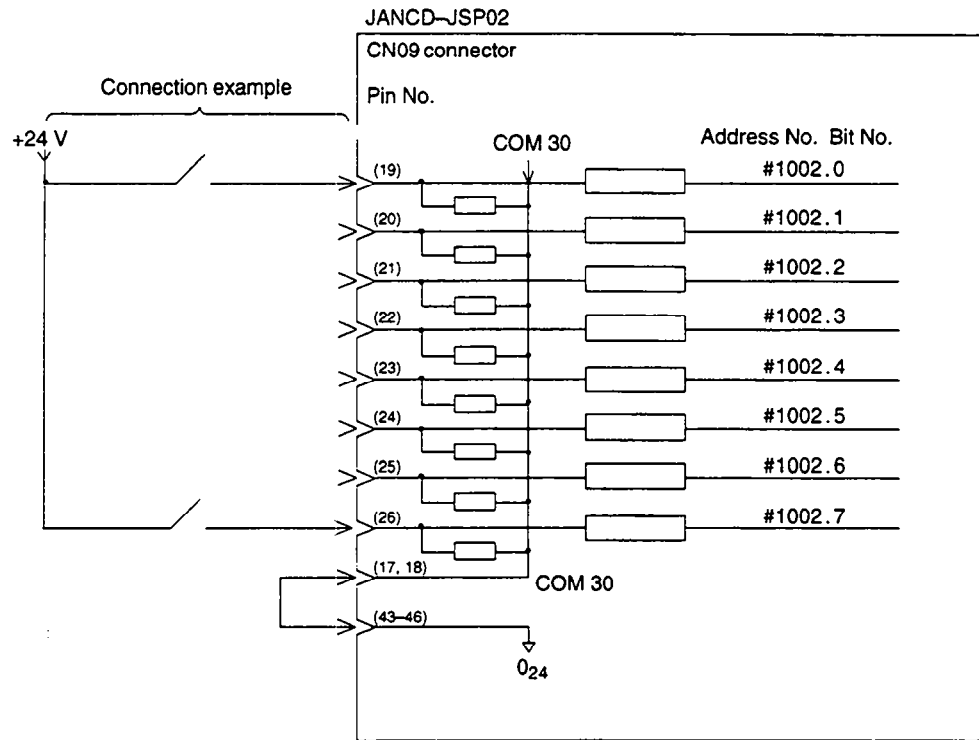


Fig. 12.29 JSP02 Module Connection
(Address Number and Bit Number : #1002.0 to #1002.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JSP02)."
2. The address is that of module No.1-1. (#1002.0 to #1002.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

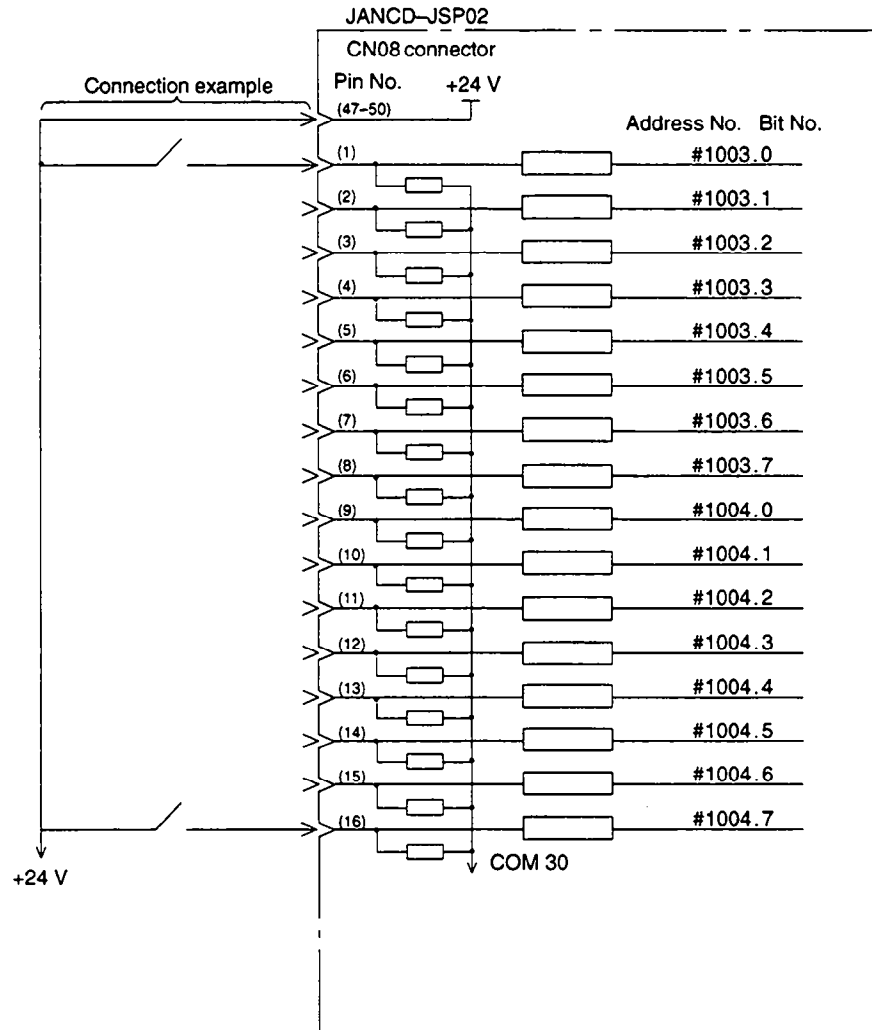


Fig. 12.30 JSP02 Module Connection
(Address Number and Bit Number : #1003.0 to #1004.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JSP02)."
2. The address is that of module No.1-1. (#1003.0 to #1004.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

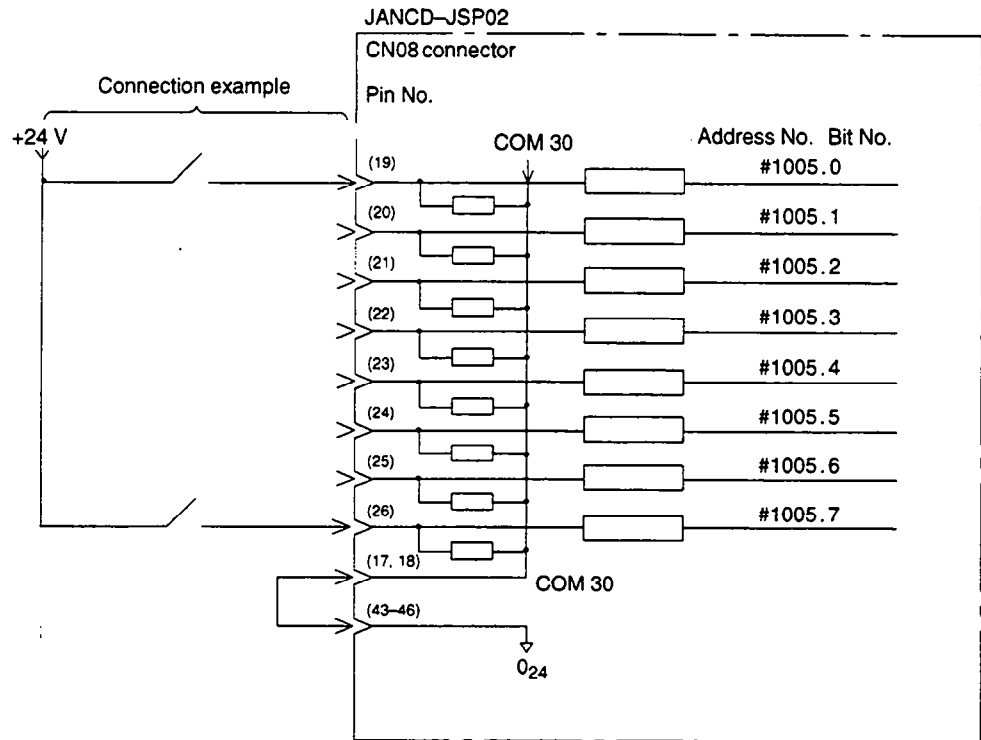


Fig. 12.31 JSP02 Module Connection
(Address Number and Bit Number : #1005.0 to #1005.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JSP02)."
2. The address is that of module No.1-1. (#1005.0 to #1005.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

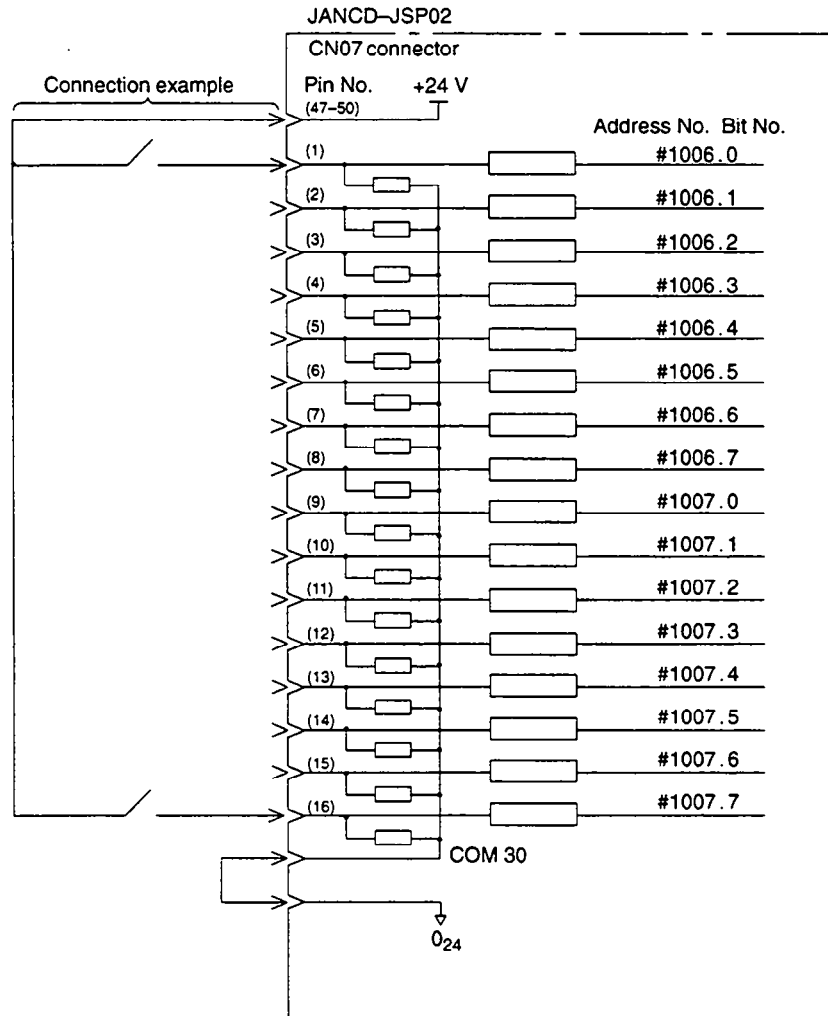


Fig. 12.32 JSP02 Module Connection
(Address Number and Bit Number : #1006.0 to #1007.7)



1. The above example shows connection of +24V common. For the connection of 0V common, refer to 12.3.2 "I/O Module (JSP02)."
2. The address is that of module No.1-1. (#1006.0 to #1007.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

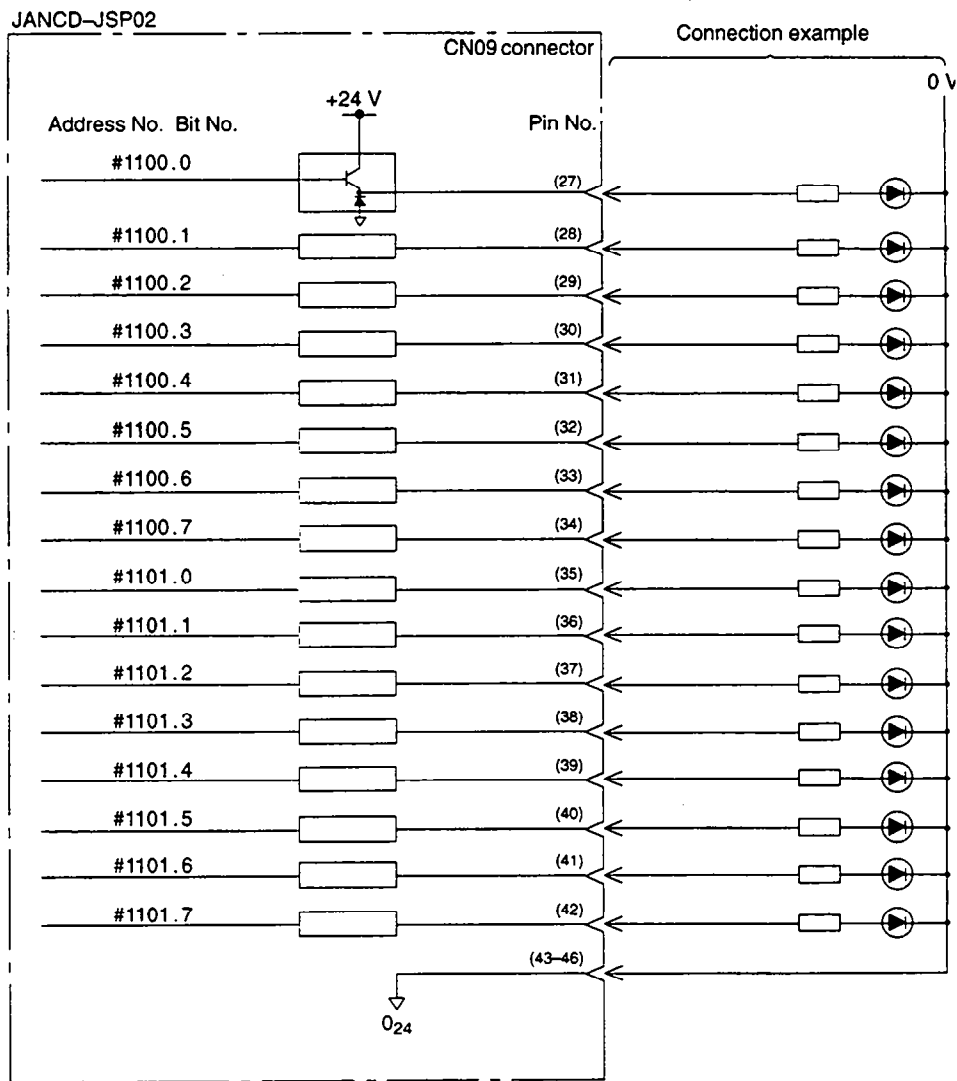


Fig. 12.33 JSP02 Module Connection
(Address Number and Bit Number : #1100.0 to #1101.7)



The address is that of module No.1-1. (#1100.0 to #1101.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

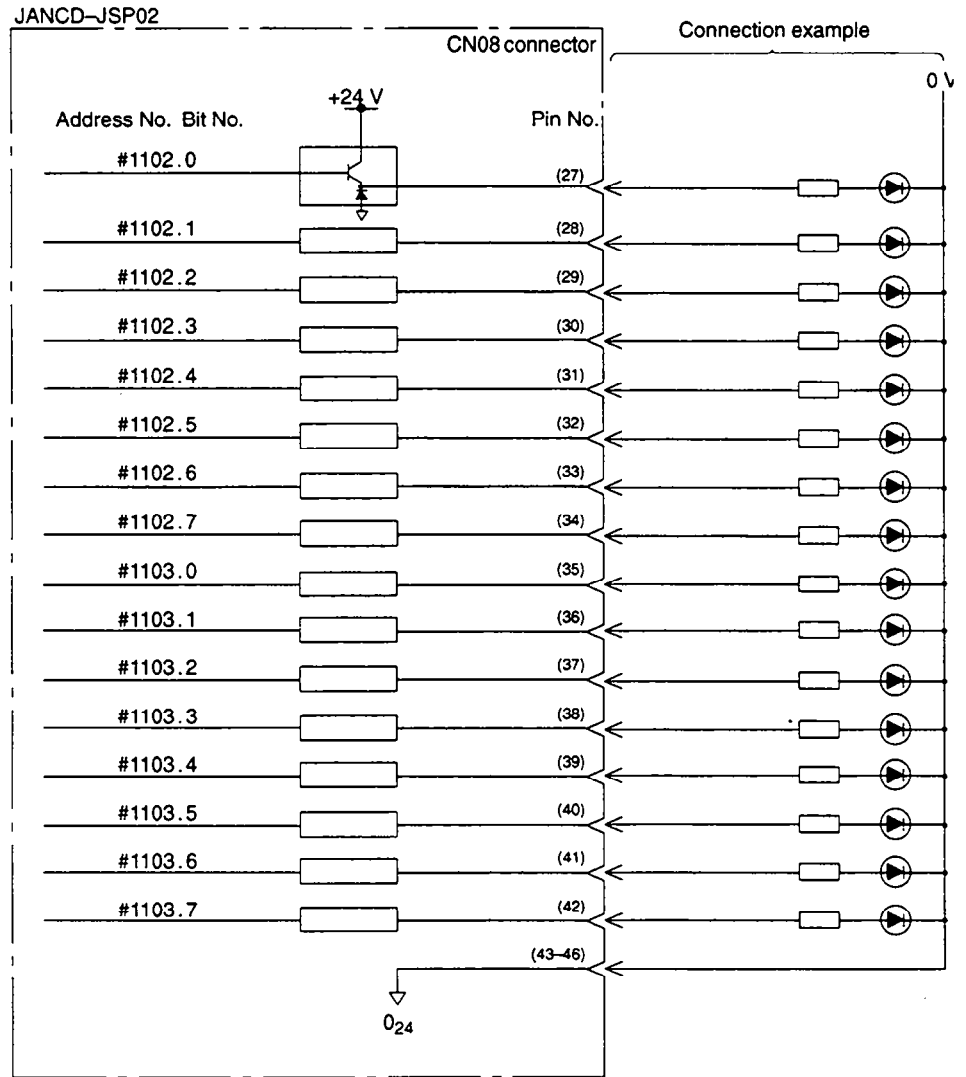


Fig. 12.34 JSP02 Module Connection
(Address Number and Bit Number : #1102.0 to #1103.7)



The address is that of module No.1-1. (#1102.0 to #1103.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

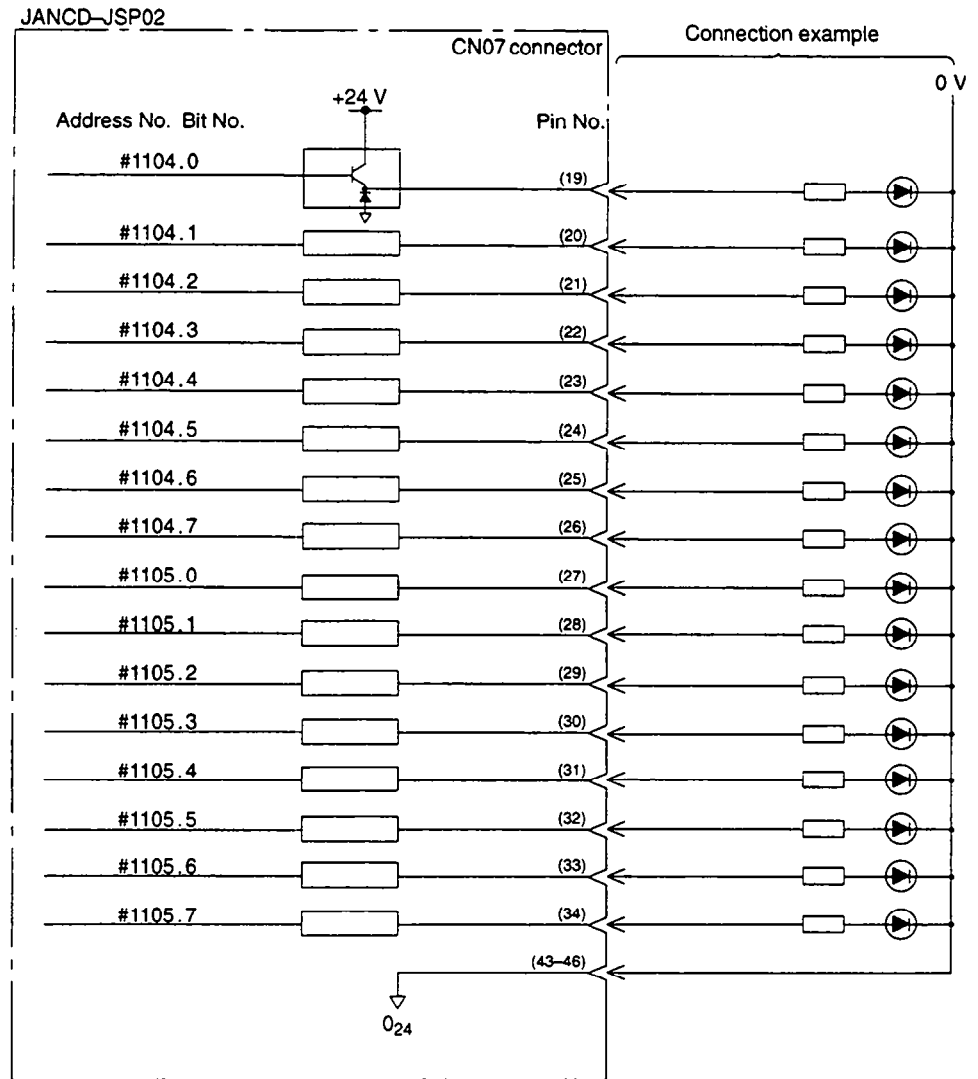


Fig. 12.35 JSP02 Module Connection
(Address Number and Bit Number : #1104.0 to #1105.7)



The address is that of module No.1-1. (#1104.0 to #1105.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

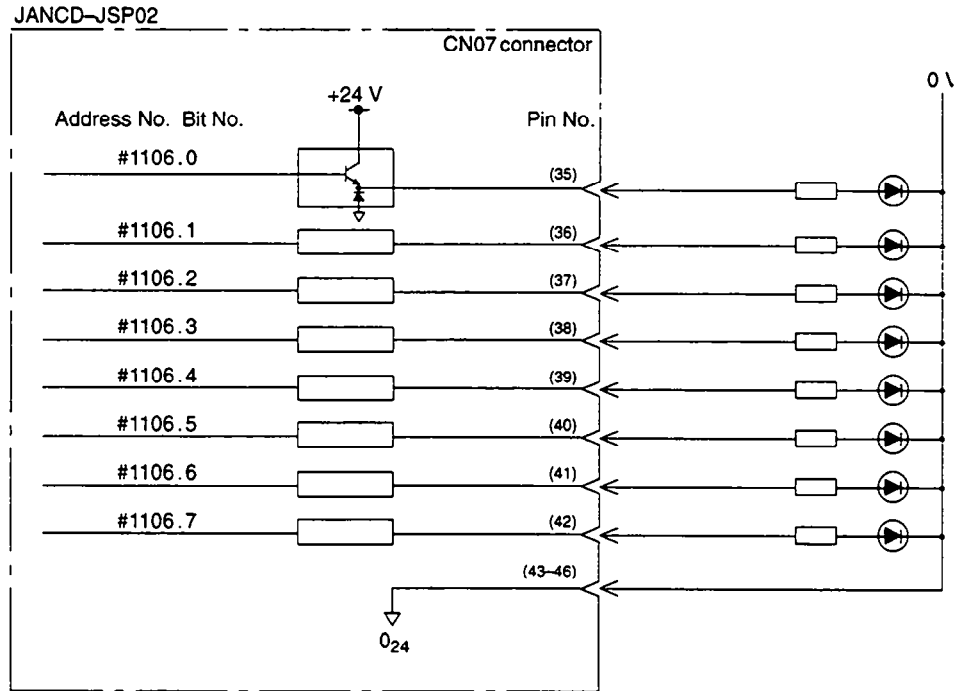


Fig. 12.36 JSP02 Module Connection
(Address Number and Bit Number : #1106.0 to #1106.7)



The address is that of module No.1-1. (#1106.0 to #1106.7)
For modules No.2 to No.8, the layout is as shown above, starting from the smaller address number.

12.3 DESCRIPTION OF GENERAL-PURPOSE I/O SIGNAL

This section describes the I/O module and the machine side I/O signal.

12.3.1 I/O Port

YASNAC is a system with a built-in machine sequencer (PLC).

Therefore, when a machine tool builder designs a built-in machine sequencer, the assignment of external signals to the I/O port may be set freely.

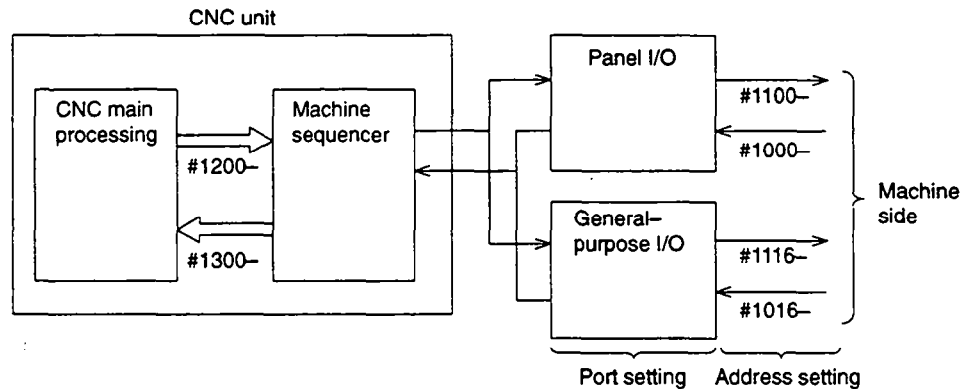


Fig. 12.37 CNC Unit and External Signals

The general-purpose I/O port is loaded on I/O modules (JANCD-FC810, FC860, FC891) and JSP02 of the CNC operation panel.

The number of I/O points to each module is as shown in Table 12.1.

Table 12.1 Number of I/O points to Each Module

Module Type JANCD-	Points of Input	Points of Output	Remarks
FC810, FC860	112	96	For machine panel
FC861	64	56	
JSP02	64	56	



1. The I/O port is built-in the control board (JSP02) of the CNC operation panel. Therefore, up to 4 sheets (maximum input: 512 points, maximum output: 440 points) may be connected for addition of FC810/FC860, and up to 9 sheets (maximum input: 640 points, maximum output: 560 points) may be connected for addition of FC861.
2. Mixture of each I/O module is possible, but they must be set so that there is no duplication in I/O area number.

(1) Address Setting

The address and connector are as shown in Table 12.2. Setting is made with port 1, so when specifying another port, the address should be changed. Refer to Table 12.3 and Table 12.4.

Table 12.2 Address and Connector

Address		Panel I/O (JANCD-JSP02)	General-purpose I/O (JANCD-FC810, FC860)		General-purpose I/O (JANCD-FC861)		
Input	Output						
#1000		CN9	COM30	CN4	COM30	CN1	COM00
#1001		CN9		CN4		CN1	
#1002		CN9		CN4	COM31	CN1	COM01
#1003		CN8		CN4		CN2	COM02
#1004		CN8		CN4	COM32	CN2	
#1005		CN8		CN5	COM40	CN2	COM03
#1006		CN7		CN5		CN3	COM04
#1007		CN7		CN5	COM41	CN3	
#1008		-		CN5		COM42	
#1009		-		CN5	COM20		
#1010		-		CN3		CN3	
#1011		-		CN3	COM21		
#1012		-		CN3	COM10		
#1013		-	CN2				
	#1100	CN9		CN1		CN1	
	#1101	CN9		CN1		CN1	
	#1102	CN8		CN1		CN2	
	#1103	CN8		CN1		CN2	
	#1104	CN7		CN1		CN3	
	#1105	CN7		CN2		CN3	
	#1106	-		CN3		CN3	
	#1107	-		CN3			
	#1108	-		CN6			
	#1109	-		CN6			
	#1110	-		CN6			
	#1111	-		CN6			
Total		64 inputs, 56 outputs		112 inputs, 96 outputs		64 inputs, 56 outputs	

(2) Address Division

The address divisions of JSP02, FC861, FC810, FC860 are shown in Table 12.3. With SW1, only the numbers listed in the table may be set.

Table 12.3 Input Port

JSP02		FC861		FC810, FC860	
SW1	Address Port	SW1	Address Port	SW1	Address Port
1	#1000 - #1007	1	#1000 - #1007	1	#1000 - #1013
2	#1008 - #1015	2	#1008 - #1015		
3	#1016 - #1023	3	#1016 - #1023	3	#1016 - #1029
4	#1024 - #1031	4	#1024 - #1031		
5	#1032 - #1039	5	#1032 - #1039	5	#1032 - #1045
6	#1040 - #1047	6	#1040 - #1047		
7	#1048 - #1055	7	#1048 - #1055	7	#1048 - #1061
8	#1056 - #1063	8	#1056 - #1063		
9	#1064 - #1071	9	#1064 - #1071	9	#1064 - #1077
A	#1072 - #1079	A	#1072 - #1079		

Table 12.4 Output Port

JSP02		FC861		FC810, FC860	
SW1	Address Port	SW1	Address Port	SW1	Address Port
1	#1100 - #1106	1	#1100 - #1106	1	#1100 - #1111
2	#1108 - #1114	2	#1108 - #1114		
3	#1116 - #1122	3	#1116 - #1122	3	#1116 - #1127
4	#1124 - #1130	4	#1124 - #1130		
5	#1132 - #1138	5	#1132 - #1138	5	#1132 - #1143
6	#1140 - #1146	6	#1140 - #1146		
7	#1148 - #1154	7	#1148 - #1154	7	#1148 - #1159
8	#1156 - #1162	8	#1156 - #1162		
9	#1164 - #1170	9	#1164 - #1170	9	#1164 - #1175
A	#1172 - #1178	A	#1172 - #1178		

12.3.2 I/O Circuit of I/O Port

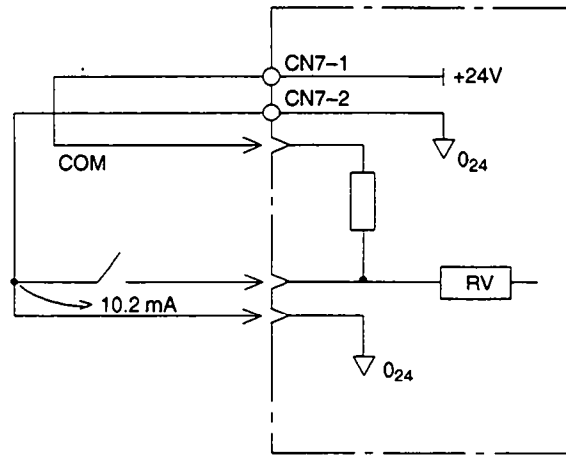
(1) I/O Module (JANCD-FC810, FC860)

(a) Input circuit

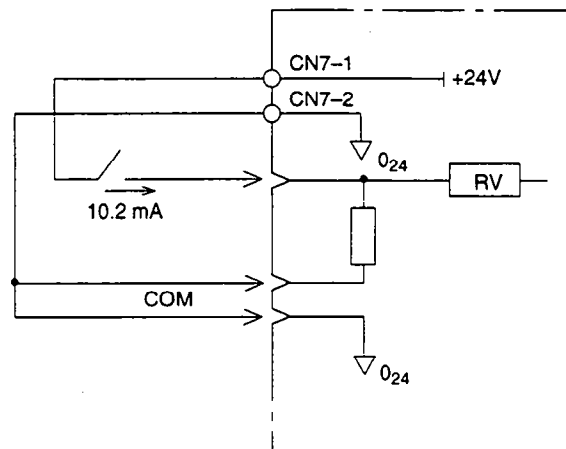
In the input circuit, 0V common and 24V common may be set externally.

For 24V power, both the internal power and the external power may be used.

- When using internal power



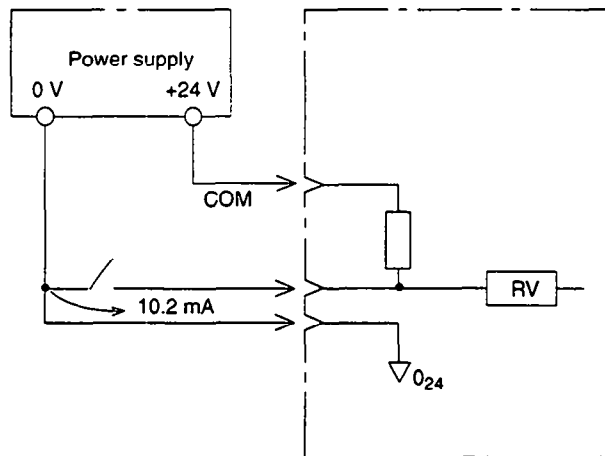
(a) For 0V common



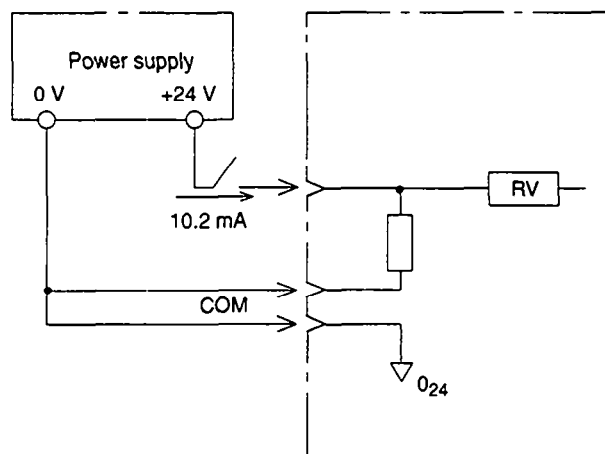
(b) For +24V common

Fig. 12.38 Input Circuit (When Using Internal Power)

- When using external power



(a) For 0V common



(b) For +24V common

Fig. 12.39 Input Circuit (When Using External Power)



In the input circuits (e.g., COM10, COM20, COM21, — 9 in total), as shown in 12.2 “Detailed Connection of General-purpose I/O,” +24V common or 0V common may be selected freely per 8 inputs, or 16 inputs. For setting, use wire at the cable side.

(b) Output Circuit

Output uses non-contact polarity points. Limit the current at operation up to 60 mA (per circuit).

For 24V power, both the internal power and the external power may be used.

- When using internal power

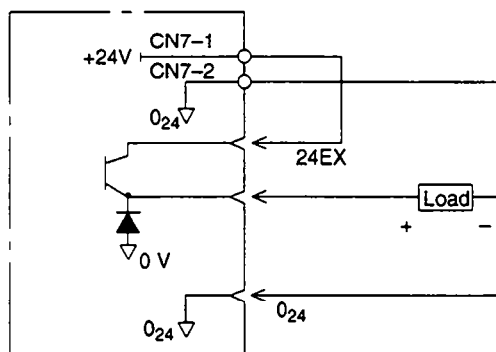


Fig. 12.40 Output Circuit (When Using Internal Power)

- When using the external power

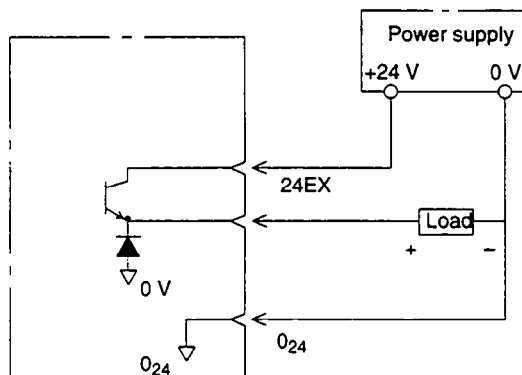


Fig. 12.41 Output Circuit (When Using External Power)



1. 96 outputs are non-contact polarity points (transistor, source driver), and limit the current at ON up to 60 mA (per circuit).
2. For 96 outputs, every 8 outputs may be connected to more than one external power supply.
3. Up to 3.0 A in the entire internal circuit (including JSP board).

(2) I/O Module (JANCD-FC861)

(a) Input circuit

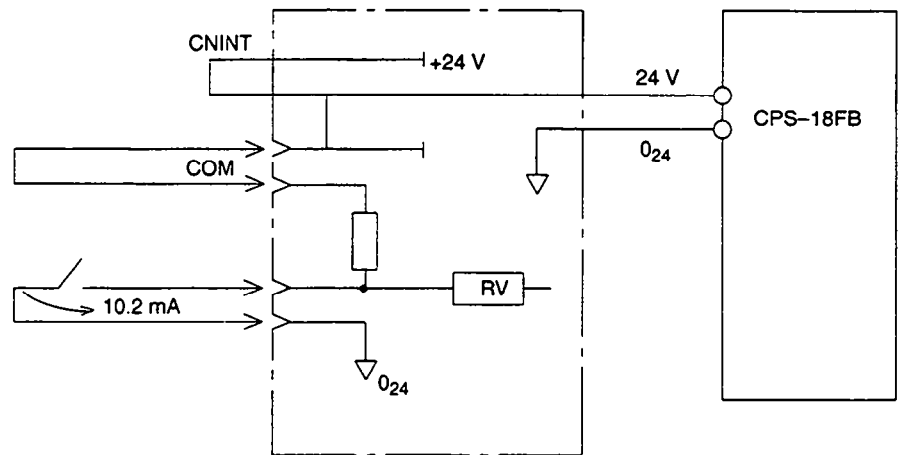
In the input circuit, 0V common and 24V common may be set externally.

For 24V power, both the internal power and the external power may be used.

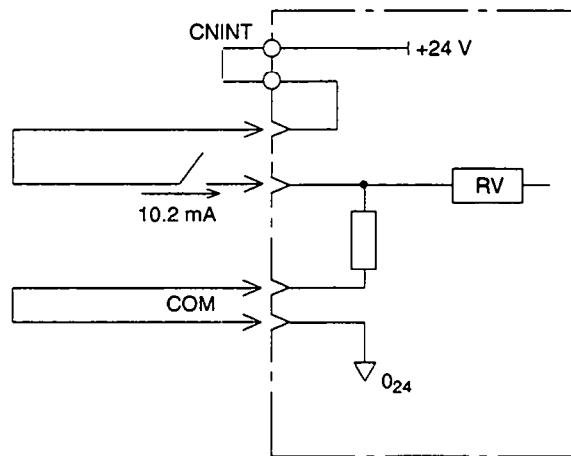
When using internal power, connect the power selection connector to CNINT.

When using external power, connect the power selection connector to CNEXT.

- When using the internal power



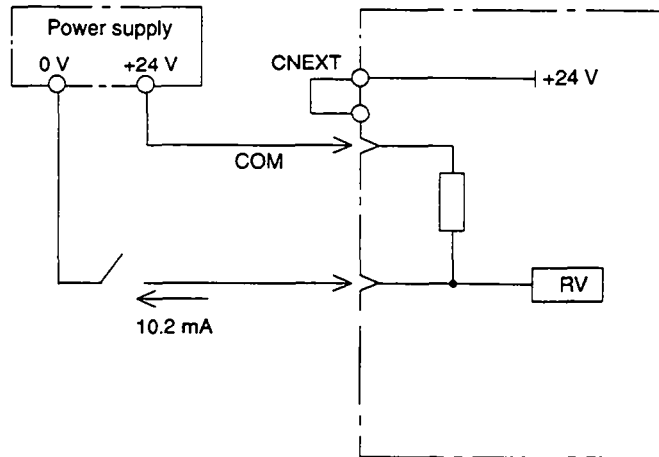
(a) For 0V common



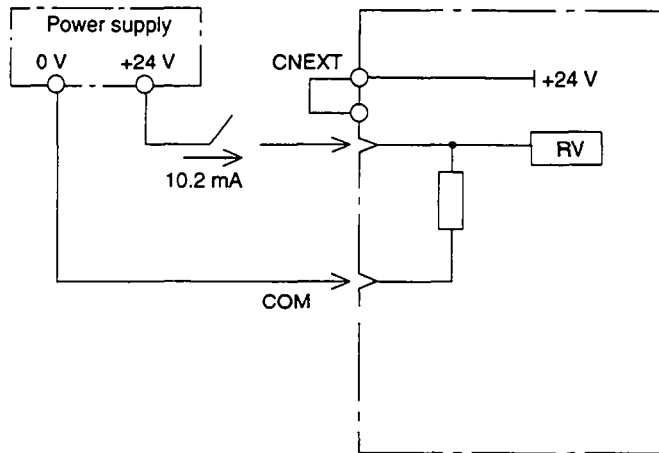
(b) For +24V common

Fig. 12.42 Input Circuit (When Using Internal Power)

- When using external power



(a) For 0V common



(b) For +24V common

Fig. 12.43 Input Circuit (When Using External Power)



In the input circuits (e.g., COM00, COM01, COM02, — 5 in total), as shown in 12.2 “DETAILED CONNECTION OF GENERAL-PURPOSE I/O,” +24V common or 0V common may be selected freely per 8 inputs, or 16 inputs. For setting, use wire at the cable side.

(b) Output circuit

Output uses non-contact polarity points. Limit the current at operation up to 60 mA (per circuit).

For 24V power, both the internal power and the external power may be used.

- When using internal power

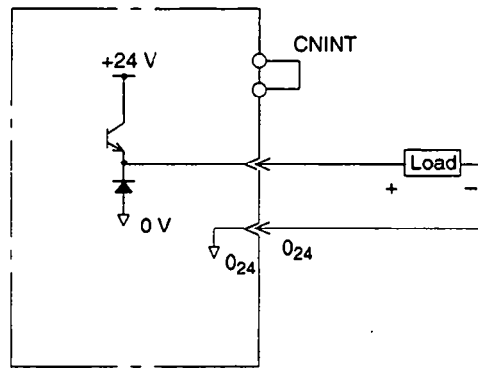


Fig. 12.44 Output Circuit (When Using Internal Power)

- When using external power

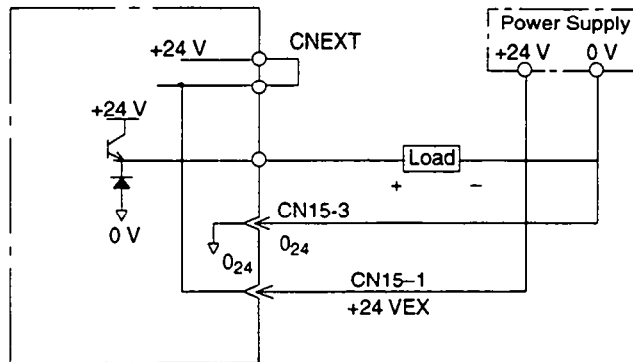


Fig. 12.45 Output Circuit (When Using External Power)



1. 56 outputs are non-contact polarity points (transistor, source driver), and limit the current at ON up to 60 mA (per circuit).
2. When driving LEDs, etc. using internal power (+24V), up to 3.0 A in the entire I/O circuit (including JSP board).

(b) Output circuit

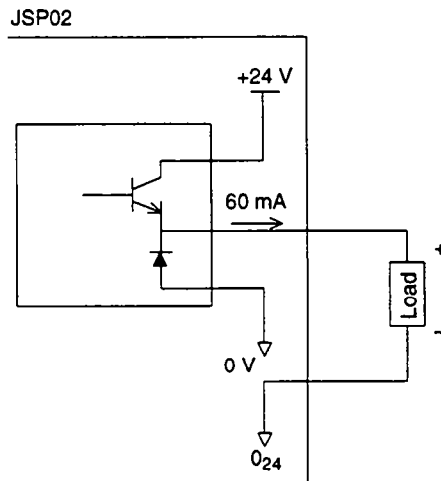


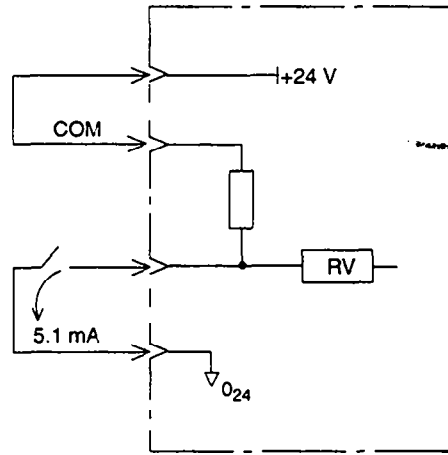
Fig. 12.47 Output Circuit



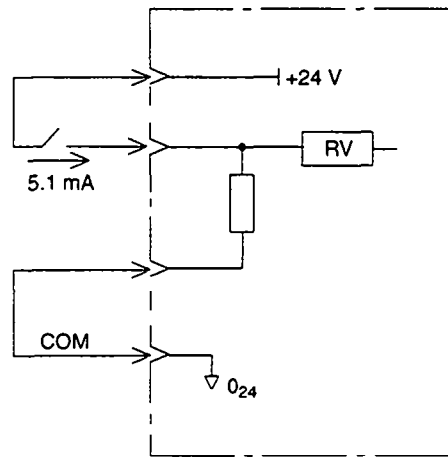
1. The I/O circuit of JSP02 and JSP04 boards is designed to have the following functions for the devices in the operation panel (very close to the JSP02 or JSP04 board): reading the operation switches, resistive load for LED indicators, and for display devices.
2. 56 outputs are non-contact polarity points (transistor, source driver), and limit the current at ON up to 60 mA (per circuit).

(3) I/O Module (JANCD-JSP02)

(a) Input circuit



(a) For 0V common



(b) For +24V common

Fig. 12.46 Input Circuit

12.3.3 Power Supply for I/O Signal

(1) Internal Power Capacity Restriction

For +24V power supply for I/O, external power should be supplied by machine tool builder.

Use of internal power is possible, but current capacity is restricted by the number of I/O ON points, therefore, calculate the load current by the number of I/O points and make sure it is within the allowable limit value.

+24V internal power current capacity: 3.0 A

(a) Power-on unit current consumption (when using internal power) : 100 mA

(b) Panel I/O JANCD-JSP02 current consumption (when using internal power)

Input current (1 point) : 5.1 mA (at ON)

Output current (1 point) : Varies with load, but up to 60 mA

(c) General-purpose I/O signal I/O module JANCD-FC810, FC860, FC861

Input current (1 point) : 10.2 mA (at ON)

Calculation example

When all I/O points ON at JANCD-JSP02 LED load (2.7 k Ω).

$5.1 \text{ mA} \times 64 = 326.4 \text{ mA}$ (JANCD-JSP02 input current consumption)

$24\text{V} / 2.7\text{K} \times 56 = 497.8 \text{ mA}$ (JANCD-JSP02 output current consumption)

$3000 \text{ mA} - 326 \text{ mA} - 498 \text{ mA} - 100 \text{ mA} = 2076 \text{ mA}$ (Feedable capacity)

In this status, if internal power is supplied to JANCD-FC810, over 203 inputs are ON, so overcurrent alarm of internal power supply (CPS18FB) results.

$2076 \text{ mA} / 10.2 \text{ mA} = 203 \text{ inputs}$

(2) External Power Supply Specifications

Voltage 24 VDC $\pm 5\%$

Ripple 10% (P-P)

Use power supply with overcurrent detection function.

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