FANUC Robotics
I/O Unit MODEL B
Connection Manual

MARFIOUMB04701E REV. B

B–62163E/03

FANUC Robotics North America, Inc.
3900 W. Hamlin Road
Rochester Hills, Michigan 48309-3253

The descriptions and specifications contained in this manual were in effect at the time this manual was approved for printing. FANUC Robotics North America, Inc, hereinafter referred to as FANUC Robotics, reserves the right to discontinue models at any time or to change specifications or design without notice and without incurring obligations.

FANUC Robotics manuals present descriptions, specifications, drawings, schematics, bills of material, parts, connections and/or procedures for installing, disassembling, connecting, operating and programming FANUC Robotics' products and/or systems. Such systems consist of robots, extended axes, robot controllers, application software, the KAREL® programming language, INSIGHT® vision equipment, and special tools.

FANUC Robotics recommends that only persons who have been trained in one or more approved FANUC Robotics Training Course(s) be permitted to install, operate, use, perform procedures on, repair, and/or maintain FANUC Robotics' products and/or systems and their respective components. Approved training necessitates that the courses selected be relevant to the type of system installed and application performed at the customer site.

⚠ WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of the equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measure may be required to correct the interference.

FANUC Robotics conducts courses on its systems and products on a regularly scheduled basis at its headquarters in Rochester Hills, Michigan. For additional information contact

FANUC Robotics North America, Inc.
Training Department
3900 W. Hamlin Road
Rochester Hills, Michigan 48309-3253
Tel: (248)377-7234
FAX: (248)377-7367 or (248)377-7362

FANUC Robotics

TECHNICAL SUPPORT HOTLINE

1–800–47–ROBOT

(1–800–477–6268)

Local/Internal = 248–377–7159

CUSTOMER SERVICE CENTER
PRESS 1
(Marketing & Sales Department – PRESS 2)

TECHNICAL SERVICE
PRESS 1
Tel: 248–377–7159 / Fax: 248–377–7463
24 Hour Hotline

- Technical Support Hotline
- Service personnel dispatch
- After–hours parts support (8:00 p.m. to 8:00 a.m.)

Information to have available:

- Customer number (if known)
- Company name
- Your name
- Your phone & fax numbers
- Robot & controller type
- "F#" or serial number of robot
- "Hour Meter" reading
- Software type and edition
- Any error messages and LED displays (if applicable)
- Your P.O. number for warranty or down robot or preventive maintenance service orders

PARTS
PRESS 2
Tel: 248–377–7278 / Fax: 248–377–7832
8:00 am to 8:00 pm / Mon – Fri

- Parts for down robots
- Replenishment part order
- Warranty part replacement
- Robot software and PACs

Information to have available:

- Customer number (if known)
- Company name
- Your name
- Your phone & fax numbers
- Part name & number (if known)
- "F#" or serial number of robot
- "Hour Meter" reading
- Your P.O. number for warranty, down robots, and software orders
- Any error messages and LED displays (if applicable)

TRAINING
PRESS 3
Tel: 248–377–7234 / Fax: 248–377–7367
8:00 am to 5:00 pm / Mon – Fri

- Training class registration
- Consultation for special training or on–site requests

Information to have available:

- Customer number (if known)
- Company name
- Your name
- Your phone & fax numbers
- Your shipping or billing address
- Types of courses needed
- Robot and controller type
- Number of people attending
- Method of payment

PART REPAIR
PRESS 4
Tel: 248–377–7944 / Fax: 248–377–7116
8:00 am to 5:00 pm / Mon – Fri

- Repair of electronic components
- Repair of mechanical components (wrists etc.)
- Warranty part repair
- Robot rebuilds/refurbishments

Information to have available:

- Customer number (if known)
- Company name
- Your name
- Your phone & fax numbers
- Part name & number
- "F#" or serial number of robot
- "Hour Meter" reading
- Project number or P.O. #
- Shipping & billing addresses
- Reason for repair (any symptoms, error codes, or diagnostic LEDs that were identified)

****NOTE: PLEASE OBTAIN A RETURN AUTHORIZATION ("RA") FROM "PARTS" BEFORE SHIPPING ANY PARTS BACK TO FANUC ROBOTICS. THE RA IS NECESSARY FOR PROPER RECEIVING & TRACKING.***

Revised: 7/29/99

PREFACE

This manual describe the following products :

Name of products	Abbreviation
FANUC I/O Unit–MODEL B	I/O Unit–B

TABLE OF CONTENTS

Table of Contents

SAFETY

Safety

FANUC Robotics is not and does not represent itself as an expert in safety systems, safety equipment, or the specific safety aspects of your company and/or its work force. It is the responsibility of the owner, employer, or user to take all necessary steps to guarantee the safety of all personnel in the workplace.

The appropriate level of safety for your application and installation can best be determined by safety system professionals. FANUC Robotics therefore, recommends that each customer consult with such professionals in order to provide a workplace that allows for the safe application, use, and operation of FANUC Robotic systems.

According to the industry standard ANSI/RIA R15–06, the owner or user is advised to consult the standards to ensure compliance with its requests for Robotics System design, usability, operation, maintenance, and service. Additionally, as the owner, employer, or user of a robotic system, it is your responsibility to arrange for the training of the operator of a robot system to recognize and respond to known hazards associated with your robotic system and to be aware of the recommended operating procedures for your particular application and robot installation.

FANUC Robotics therefore, recommends that all personnel who intend to operate, program, repair, or otherwise use the robotics system be trained in an approved FANUC Robotics training course and become familiar with the proper operation of the system. Persons responsible for programming the system-including the design, implementation, and debugging of application programs-must be familiar with the recommended programming procedures for your application and robot installation.

The following guidelines are provided to emphasize the importance of safety in the workplace.

CONSIDERING SAFETY FOR YOUR ROBOT INSTALLATION

Safety is essential whenever robots are used. Keep in mind the following factors with regard to safety:

- The safety of people and equipment
- Use of safety enhancing devices
- Techniques for safe teaching and manual operation of the robot(s)
- Techniques for safe automatic operation of the robot(s)
- Regular scheduled inspection of the robot and workcell
- Proper maintenance of the robot

Keeping People and Equipment Safe

The safety of people is always of primary importance in any situation. However, equipment must be kept safe, too. When prioritizing how to apply safety to your robotic system, consider the following:

- People
- External devices
- Robot(s)
- Tooling
- Workpiece

Using Safety Enhancing Devices

Always give appropriate attention to the work area that surrounds the robot. The safety of the work area can be enhanced by the installation of some or all of the following devices:

- Safety fences, barriers, or chains
- Light curtains
- Interlocks
- Pressure mats
- Floor markings
- Warning lights
- Mechanical stops
- EMERGENCY STOP buttons
- DEADMAN switches

Setting Up a Safe Workcell

A safe workcell is essential to protect people and equipment. Observe the following guidelines to ensure that the workcell is set up safely. These suggestions are intended to supplement and **not** replace existing federal, state, and local laws, regulations, and guidelines that pertain to safety.

- Sponsor your personnel for training in approved FANUC Robotics training course(s) related to your application. Never permit untrained personnel to operate the robots.
- Install a lockout device that uses an access code to prevent unauthorized persons from operating the robot.
- Use anti-tie-down logic to prevent the operator from bypassing safety measures.
- Arrange the workcell so the operator faces the workcell and can see what is going on inside the cell.

- Clearly identify the work envelope of each robot in the system with floor markings, signs, and special barriers. The work envelope is the area defined by the maximum motion range of the robot, including any tooling attached to the wrist flange that extend this range.
- Position all controllers outside the robot work envelope.
- Never rely on software as the primary safety element.
- Mount an adequate number of EMERGENCY STOP buttons or switches within easy reach of the operator and at critical points inside and around the outside of the workcell.
- Install flashing lights and/or audible warning devices that activate whenever the robot is operating, that is, whenever power is applied to the servo drive system.
- Wherever possible, install safety fences to protect against unauthorized entry by personnel into the work envelope.
- Install special guarding that prevents the operator from reaching into restricted areas of the work envelope.
- Use interlocks.
- Use presence or proximity sensing devices such as light curtains, mats, and capacitance and vision systems to enhance safety.
- Periodically check the safety joints or safety clutches that can be optionally installed between the robot wrist flange and tooling. If the tooling strikes an object, these devices dislodge, remove power from the system, and help to minimize damage to the tooling and robot.
- Make sure all external devices are properly filtered, grounded, shielded, and suppressed to prevent hazardous motion due to the effects of electro-magnetic interference (EMI), radio frequency interference (RFI), and electro-static discharge (ESD).
- Make provisions for power lockout/tagout at the controller.
- Eliminate *pinch points*. Pinch points are areas where personnel could get trapped between a moving robot and other equipment.
- Provide enough room inside the workcell to permit personnel to teach the robot and perform maintenance safely.
- Program the robot to load and unload material safely.
- If high voltage electrostatics are present, be sure to provide appropriate interlocks, warning, and beacons.
- If materials are being applied at dangerously high pressure, provide electrical interlocks for lockout of material flow and pressure.

Staying Safe While Teaching or Manually Operating the Robot

Advise all personnel who must teach the robot or otherwise manually operate the robot to observe the following rules:

- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Know whether or not you are using an intrinsically safe teach pendant if you are working in a hazardous environment.
- Before teaching, visually inspect the robot and *work envelope* to make sure that no potentially hazardous conditions exist. The work envelope is the area defined by the maximum motion range of the robot. These include tooling attached to the wrist flange that extends this range.
- The area near the robot must be clean and free of oil, water, or debris. Immediately report unsafe working conditions to the supervisor or safety department.
- FANUC Robotics recommends that no one enter the work envelope of a robot that is on, except for robot teaching operations. However, if you must enter the work envelope, be sure all safeguards are in place, check the teach pendant DEADMAN switch for proper operation, and place the robot in teach mode. Take the teach pendant with you, turn it on, and be prepared to release the DEADMAN switch. Only the person with the teach pendant should be in the work envelope.

> **WARNING**
> Never bypass, strap, or otherwise deactivate a safety device, such as a limit switch, for any operational convenience. Deactivating a safety device is known to have resulted in serious injury and death.

- Know the path that can be used to escape from a moving robot; make sure the escape path is never blocked.
- Isolate the robot from all remote control signals that can cause motion while data is being taught.
- Test any program being run for the first time in the following manner:

> **WARNING**
> **Stay outside the robot work envelope whenever a program is being run. Failure to do so can result in injury.**

  - Using a low motion speed, single step the program for at least one full cycle.
  - Using a low motion speed, test run the program continuously for at least one full cycle.
  - Using the programmed speed, test run the program continuously for at least one full cycle.
- Make sure all personnel are outside the work envelope before running production.

Staying Safe During Automatic Operation

Advise all personnel who operate the robot during production to observe the following rules:

- Make sure all safety provisions are present and active.
- Know the entire workcell area. The workcell includes the robot and its work envelope, plus the area occupied by all external devices and other equipment with which the robot interacts.
- Understand the complete task the robot is programmed to perform before initiating automatic operation.
- Make sure all personnel are outside the work envelope before operating the robot.
- Never enter or allow others to enter the work envelope during automatic operation of the robot.
- Know the location and status of all switches, sensors, and control signals that could cause the robot to move.
- Know where the EMERGENCY STOP buttons are located on both the robot control and external control devices. Be prepared to press these buttons in an emergency.
- Never assume that a program is complete if the robot is not moving. The robot could be waiting for an input signal that will permit it to continue activity.
- If the robot is running in a pattern, do not assume it will continue to run in the same pattern.
- Never try to stop the robot, or break its motion, with your body. The only way to stop robot motion immediately is to press an EMERGENCY STOP button located on the controller panel, teach pendant, or emergency stop stations around the workcell.

Staying Safe During Inspection

When inspecting the robot, be sure to

- Turn off power at the controller.
- Lock out and tag out the power source at the controller according to the policies of your plant.
- Turn off the compressed air source and relieve the air pressure.
- If robot motion is not needed for inspecting the electrical circuits, press the EMERGENCY STOP button on the operator panel.
- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.

- If power is needed to check the robot motion or electrical circuits, be prepared to press the EMERGENCY STOP button, in an emergency.
- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.

Staying Safe During Maintenance

When performing maintenance on your robot system, observe the following rules:

- Never enter the work envelope while the robot or a program is in operation.
- Before entering the work envelope, visually inspect the workcell to make sure no potentially hazardous conditions exist.
- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Consider all or any overlapping work envelopes of adjoining robots when standing in a work envelope.
- Test the teach pendant for proper operation before entering the work envelope.
- If it is necessary for you to enter the robot work envelope while power is turned on, you must be sure that you are in control of the robot. Be sure to take the teach pendant with you, press the DEADMAN switch, and turn the teach pendant on. Be prepared to release the DEADMAN switch to turn off servo power to the robot immediately.
- Whenever possible, perform maintenance with the power turned off. Before you open the controller front panel or enter the work envelope, turn off and lock out the 3-phase power source at the controller.
- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.

⚠ WARNING
Lethal voltage is present in the controller WHENEVER IT IS CONNECTED to a power source. Be extremely careful to avoid electrical shock.

HIGH VOLTAGE IS PRESENT at the input side whenever the controller is connected to a power source. Turning the disconnect or circuit breaker to the OFF position removes power from the output side of the device only.

- Release or block all stored energy. Before working on the pneumatic system, shut off the system air supply and purge the air lines.

- Isolate the robot from all remote control signals. If maintenance must be done when the power is on, make sure the person inside the work envelope has sole control of the robot. The teach pendant must be held by this person.
- Make sure personnel cannot get trapped between the moving robot and other equipment. Know the path that can be used to escape from a moving robot. Make sure the escape route is never blocked.
- Use blocks, mechanical stops, and pins to prevent hazardous movement by the robot. Make sure that such devices do not create pinch points that could trap personnel.

⚠ WARNING
Do not try to remove any mechanical component from the robot before thoroughly reading and understanding the procedures in the appropriate manual. Doing so can result in serious personal injury and component destruction.

- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.
- When replacing or installing components, make sure dirt and debris do not enter the system.
- Use only specified parts for replacement. To avoid fires and damage to parts in the controller, never use nonspecified fuses.
- Before restarting a robot, make sure no one is inside the work envelope; be sure that the robot and all external devices are operating normally.

KEEPING MACHINE TOOLS AND EXTERNAL DEVICES SAFE

Certain programming and mechanical measures are useful in keeping the machine tools and other external devices safe. Some of these measures are outlined below. Make sure you know all associated measures for safe use of such devices.

Programming Safety Precautions

Implement the following programming safety measures to prevent damage to machine tools and other external devices.

- Back-check limit switches in the workcell to make sure they do not fail.
- Implement ‘‘failure routines” in programs that will provide appropriate robot actions if an external device or another robot in the workcell fails.
- Use *handshaking* protocol to synchronize robot and external device operations.
- Program the robot to check the condition of all external devices during an operating cycle.

Mechanical Safety Precautions

Implement the following mechanical safety measures to prevent damage to machine tools and other external devices.

- Make sure the workcell is clean and free of oil, water, and debris.
- Use software limits, limit switches, and mechanical hardstops to prevent undesired movement of the robot into the work area of machine tools and external devices.

KEEPING THE ROBOT SAFE

Observe the following operating and programming guidelines to prevent damage to the robot.

Operating Safety Precautions

The following measures are designed to prevent damage to the robot during operation.

- Use a low override speed to increase your control over the robot when jogging the robot.
- Visualize the movement the robot will make before you press the jog keys on the teach pendant.
- Make sure the work envelope is clean and free of oil, water, or debris.
- Use circuit breakers to guard against electrical overload.

Programming Safety Precautions

The following safety measures are designed to prevent damage to the robot during programming:

- Establish *interference zones* to prevent collisions when two or more robots share a work area.
- Make sure that the program ends with the robot near or at the home position.
- Be aware of signals or other operations that could trigger operation of tooling resulting in personal injury or equipment damage.
- In dispensing applications, be aware of all safety guidelines with respect to the dispensing materials.

NOTE Any deviation from the methods and safety practices described in this manual must conform to the approved standards of your company. If you have questions, see your supervisor.

ADDITIONAL SAFETY CONSIDERATIONS FOR PAINT ROBOT INSTALLATIONS

Process technicians are sometimes required to enter the paint booth, for example, during daily or routine calibration or while teaching new paths to a robot. Maintenance personnel also must work inside the paint booth periodically.

Whenever personnel are working inside the paint booth, ventilation equipment must be used. Instruction on the proper use of ventilating equipment usually is provided by the paint shop supervisor.

Although paint booth hazards have been minimized, potential dangers still exist. Therefore, today's highly automated paint booth requires that process and maintenance personnel have full awareness of the system and its capabilities. They must understand the interaction that occurs between the vehicle moving along the conveyor and the robot(s), hood/deck and door opening devices, and high-voltage electrostatic tools.

Paint robots are operated in three modes:

- Teach or manual mode
- Automatic mode, including automatic and exercise operation
- Diagnostic mode

During both teach and automatic modes, the robots in the paint booth will follow a predetermined pattern of movements. In teach mode, the process technician teaches (programs) paint paths using the teach pendant.

In automatic mode, robot operation is initiated at the System Operator Console (SOC) or Manual Control Panel (MCP), if available, and can be monitored from outside the paint booth. All personnel must remain outside of the booth or in a designated safe area within the booth whenever automatic mode is initiated at the SOC or MCP.

In automatic mode, the robots will execute the path movements they were taught during teach mode, but generally at production speeds.

When process and maintenance personnel run diagnostic routines that require them to remain in the paint booth, they must stay in a designated safe area.

Paint System Safety Features

Process technicians and maintenance personnel must become totally familiar with the equipment and its capabilities. To minimize the risk of injury when working near robots and related equipment, personnel must comply strictly with the procedures in the manuals.

This section provides information about the safety features that are included in the paint system and also explains the way the robot interacts with other equipment in the system.

The paint system includes the following safety features:

- Most paint booths have red warning beacons that illuminate when the robots are armed and ready to paint. Your booth might have other kinds of indicators. Learn what these are.
- Some paint booths have a blue beacon that, when illuminated, indicates that the electrostatic devices are enabled. Your booth might have other kinds of indicators. Learn what these are.
- EMERGENCY STOP buttons are located on the robot controller and teach pendant. Become familiar with the locations of all E-STOP buttons.
- An intrinsically safe teach pendant is used when teaching in hazardous paint atmospheres.
- A DEADMAN switch is located on each teach pendant. When this switch is held in, and the teach pendant is on, power is applied to the robot servo system. If the engaged DEADMAN switch is released during robot operation, power is removed from the servo system, all axis brakes are applied, and the robot comes to an EMERGENCY STOP. Safety interlocks within the system might also E-STOP other robots.

⚠ WARNING
An EMERGENCY STOP will occur if the DEADMAN switch is released on a bypassed robot.

- Overtravel by robot axes is prevented by software limits. All of the major and minor axes are governed by software limits. Limit switches and hardstops also limit travel by the major axes.

- EMERGENCY STOP limit switches and photoelectric eyes might be part of your system. Limit switches, located on the entrance/exit doors of each booth, will EMERGENCY STOP all equipment in the booth if a door is opened while the system is operating in automatic or manual mode. For some systems, signals to these switches are inactive when the switch on the SCC is in teach mode.

  When present, photoelectric eyes are sometimes used to monitor unauthorized intrusion through the entrance/exit silhouette openings.

- System status is monitored by computer. Severe conditions result in automatic system shutdown.

Staying Safe While Operating the Paint Robot

When you work in or near the paint booth, observe the following rules, in addition to all rules for safe operation that apply to all robot systems.

⚠ WARNING
Observe all safety rules and guidelines to avoid injury.

⚠ WARNING
Never bypass, strap, or otherwise deactivate a safety device, such as a limit switch, for any operational convenience. Deactivating a safety device is known to have resulted in serious injury and death.

- Know the work area of the entire paint station (workcell).
- Know the work envelope of the robot and hood/deck and door opening devices.
- Be aware of overlapping work envelopes of adjacent robots.
- Know where all red, mushroom-shaped EMERGENCY STOP buttons are located.
- Know the location and status of all switches, sensors, and/or control signals that might cause the robot, conveyor, and opening devices to move.
- Make sure that the work area near the robot is clean and free of water, oil, and debris. Report unsafe conditions to your supervisor.
- Become familiar with the complete task the robot will perform BEFORE starting automatic mode.
- Make sure all personnel are outside the paint booth before you turn on power to the robot servo system.

- Never enter the work envelope or paint booth before you turn off power to the robot servo system.
- Never enter the work envelope during automatic operation unless a safe area has been designated.
- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Remove all metallic objects, such as rings, watches, and belts, before entering a booth when the electrostatic devices are enabled.
- Stay out of areas where you might get trapped between a moving robot, conveyor, or opening device and another object.
- Be aware of signals and/or operations that could result in the triggering of guns or bells.
- Be aware of all safety precautions when dispensing of paint is required.
- Follow the procedures described in this manual.

Staying Safe During Maintenance

When you perform maintenance on the painter system, observe the following rules, and all other maintenance safety rules that apply to all robot installations. Only qualified, trained service or maintenance personnel should perform repair work on a robot.

- Paint robots operate in a potentially explosive environment. Use caution when working with electric tools.
- When a maintenance technician is repairing or adjusting a robot, the work area is under the control of that technician. All personnel not participating in the maintenance must stay out of the area.
- For some maintenance procedures, station a second person at the control panel within reach of the EMERGENCY STOP button. This person must understand the robot and associated potential hazards.
- Be sure all covers and inspection plates are in good repair and in place.
- Always return the robot to the ‘‘home’’ position before you disarm it.
- Never use machine power to aid in removing any component from the robot.
- During robot operations, be aware of the robot’s movements. Excess vibration, unusual sounds, and so forth, can alert you to potential problems.
- Whenever possible, turn off the main electrical disconnect before you clean the robot.

- When using vinyl resin observe the following:
  - Wear eye protection and protective gloves during application and removal
  - Adequate ventilation is required. Overexposure could cause drowsiness or skin and eye irritation.
  - If there is contact with the skin, wash with water.
- When using paint remover observe the following:
  - Eye protection, protective rubber gloves, boots, and apron are required during booth cleaning.
  - Adequate ventilation is required. Overexposure could cause drowsiness.
  - If there is contact with the skin or eyes, rinse with water for at least 15 minutes.

I. CONNECTION

I. CONNECTION

1 SYSTEM CONFIGURATION

1.1 OVERVIEW

The FANUC I/O Unit–MODEL B (I/O Unit–B) consists of an interface unit and DI/DO units. A single DI/DO unit consists of a basic unit with or without an extension unit. The basic unit sends or receives data to or from the interface unit. The extension unit receives data from the basic unit to which it is connected by a connector.

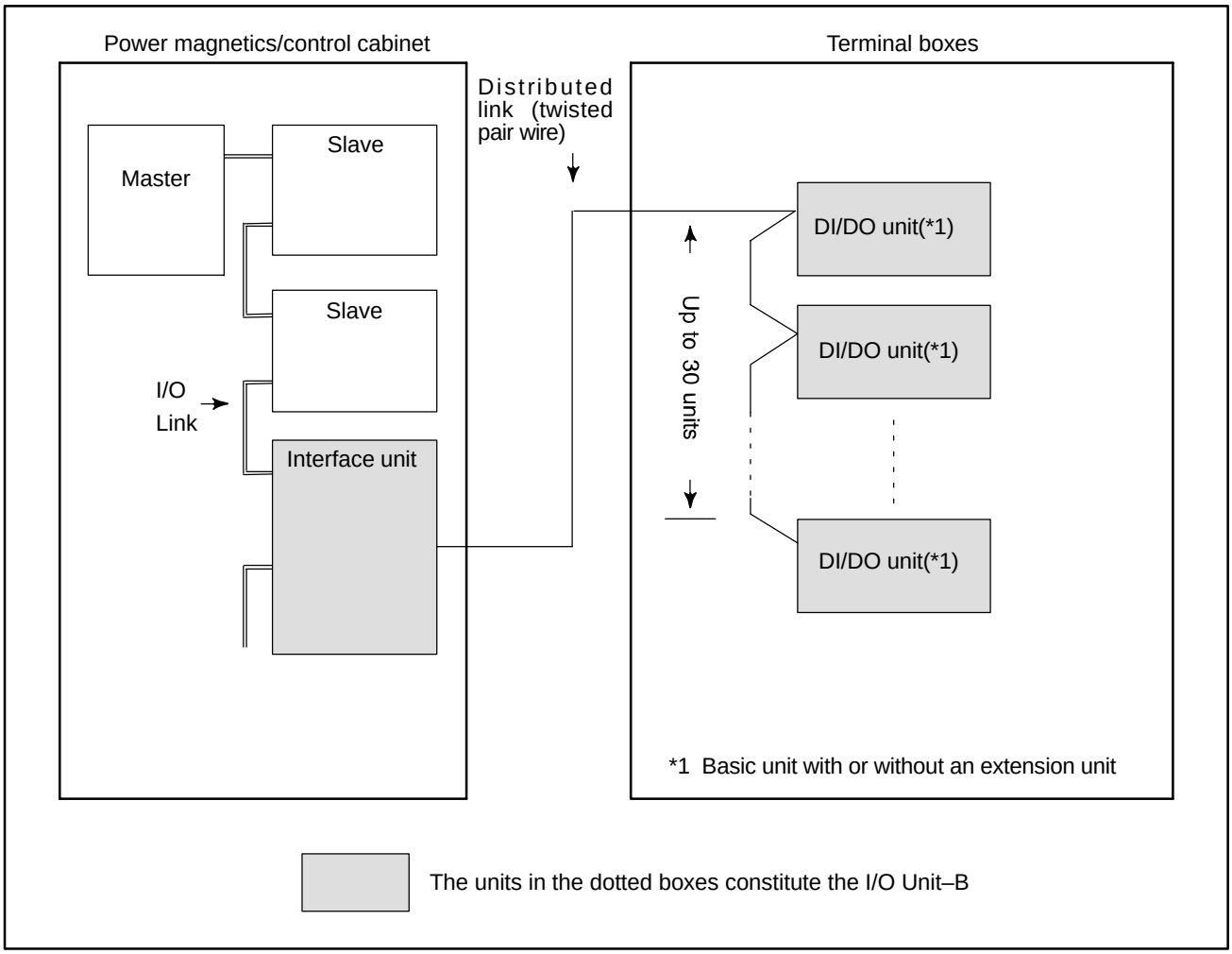
The interface unit controls communication and is installed in the power magnetics/control cabinet. The DI/DO unit is installed in the terminal box near the devices to be interfaced and controlled. The interface unit can be connected to the FANUC I/O Link (I/O Link). The interface unit is connected to the DI/DO unit by a shielded twisted pair wire. The interface unit and DI/DO unit establish a distributed link.

As the power magnetics/control cabinet and the terminal boxes are connected through a communications cable, the need for extensive wiring is eliminated and the wiring cost is reduced.

As for the Interface Module “AIF02C” of FANUC I/O Unit–MODEL A/B, refer to “FANUC I/O Unit–MODEL A CONNECTION· MAINTENANCE MANUAL (B–61813E)”.

1.2 CONFIGURATION

The I/O Unit–B provides a distributed link under the I/O Link. DI/DO units are connected to the distributed link.



2 SPECIFICATIONS

2.1 SYSTEM

The table below lists the specifications of the I/O Unit–B. The maximum number of DI points is 224. This is because 32 points (four bytes) are used for the power on/off information indicating whether the interface unit communicates with the DI/DO unit. (For details, see Section 4.3.2, “Power on/off information.”)

Item	Description	Remarks
Connection to the CNC, Robot control or etc.	Connected to the master I/O link through the interface unit	
Maximum DI/DO points	DI : 224, DO : 256	The system occupies up to 256 points for both input and output. (See Section 4.3 ”CONNECTION WITH THE I/O LINK”)
Maximum DI/DO units that can be connected	30 max	
Maximum total length of the communications cable per channel.	100m max	

2.2 COMMUNICATION OF THE INTERFACE UNIT

The table below lists the specifications of the communication of the distributed link established by the interface unit.

Item	Description	Remarks
Communication speed	1.2 Mbps	
Typical communication cycle	2ms : 224 DI points and 256 DO points, up to 20 units 4ms : 224 DI points and 256 DO points, 21 to 30 units (upper limit)	
Transmission system	Half duplex	
Transmission error check	CRC and other methods	
Communications cable	Shielded twisted pair wire	
Connection to the communications line	Multidrop	Two or more nodes are connected on a single communications line.

2.3 DI/DO UNIT

The table below lists the specifications of the DI/DO unit.
As for expansion unit, this manual.

Item	Description	Remarks
DI/DO of the basic unit	DC input and output unit (DC 8 input points + DC 8 output points)	
	DC input unit (DC 16 input points)	
	DC output unit (DC 16 output points)	
	AC output unit (AC 12 output points)	
DI/DO of the extension unit	DC input and output unit (DC 8 input points + DC 8 output points)	
	DC input unit (DC 16 input points)	
	DC output unit (DC 16 output points)	
	AC input unit (AC 16 input points)	
DI Power	DC input (24VDC, 7.5mA)	
	AC input (100 to 115VAC, 50 to 60Hz)	
DO Power	DC output (12 to 24VDC, 0.6A)	With overheat and overcurrent protection functions
	AC output (100 to 230VAC, 0.3A, 50 to 60Hz)	0.5 A when up to 8 points are used
Power supply for the control and input circuits	24V DC ±10%	Use a stable power supply.
DI/DO terminal	Two–row screw terminal board (M3)	Screw tightening torque: 5 kg·cm
Power on/off	Can be executed at any time.	
Unit number	Specified by a DIP switch.	Of 1 to 30, select a desired number for each unit. (Each unit must have a unique number.)
When the NC power is turned off while the power of the DI/DO unit is on	The output is cleared.	
Installation	The DIN rail can be used.	Use a DIN rail which is 35mm wide and 7.5mm high.
Installation location	In the terminal box	IP–54 (Recommended rating)

3 INSTALLATION

3.1 ENVIRONMENTAL CONDITIONS

Install the I/O Unit–B where the following conditions are satisfied.

3.1.1 Interface Unit

3.1.1.1 Installation location

Install the interface unit in the power magnetics/control cabinet.

3.1.1.2 Ambient temperature

In operation : 0°C to 55°C (temperature in the power magnetics cabinet)

In storage or transportation : –20°C to 60°C

3.1.1.3 Variations in temperature

Up to 1.1°C per minute

3.1.1.4 Humidity

General condition : 75% or lower (relative humidity)

Short–period condition (up to one month) : Up to 95%

3.1.1.5 Vibration

In operation: 0.5 G

3.1.2 DI/DO Unit

3.1.2.1 Installation location

The DI/DO unit is not resistant to dust or oil. Install it in a terminal box. The terminal box must be dust–proof and oil–proof. (Design the terminal box so that it will keep out dust, mist, coolant, and organic solvent.)
Recommended rating of IP–54 or better. The ID degree requied is dependent on the circumslances of macine tool, so please choose the adequate degree in accordance with such environment.

3.1.2.2 Ambient temperature

In operation : 0°C to 55°C (temperature in the terminal box)

In storage or transportation : –20°C to 60°C

3.1.2.3 Variations in temperature

Up to 1.1°C per minute

3.1.2.4 Humidity

General condition : 75% or less (relative humidity)

Short–period condition (up to one month) : Up to 95%

3.1.2.5 Vibration

In operation of the basic unit without an extension unit : 3 G

In operation of the basic unit with an extension unit : 1.5 G

3.1.2.6 Altitude

Maximum altitude in operation : 2000m

3.1.2.7 Electrical isolation (for AC unit)

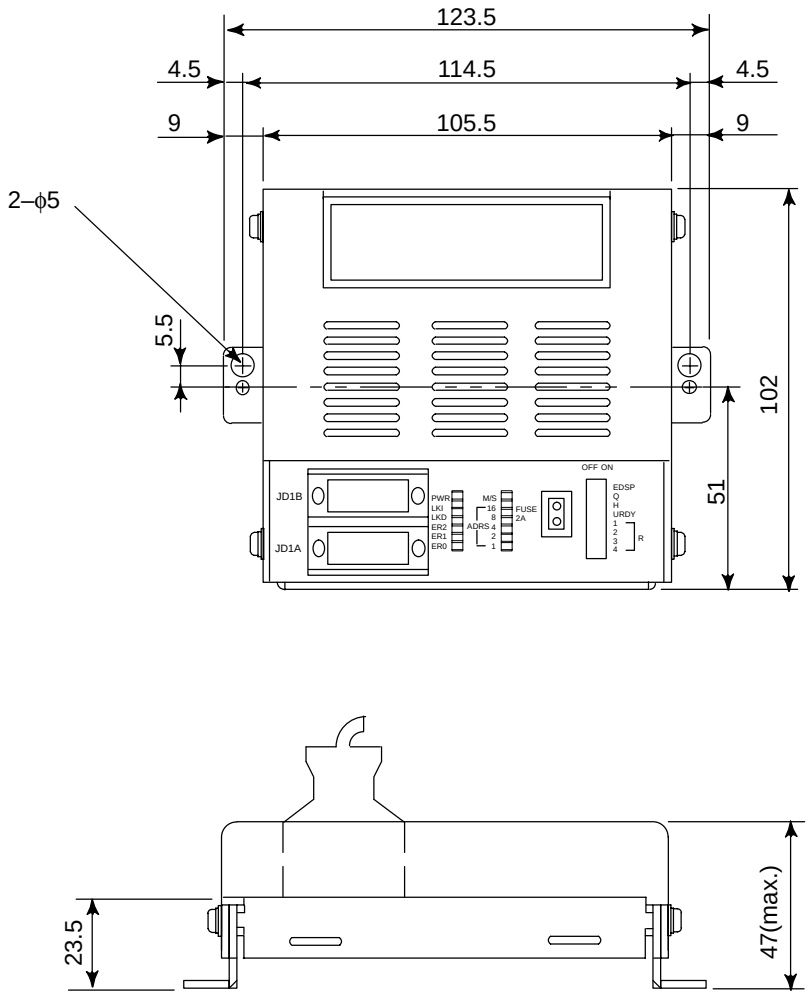
100 VAC is used for AC input unit, and 100 VAC or 200 VAC is used for AC output unit.
Protective sepalation is featured between 100 VAC or 200 VAC and DC (24V or 5V).

3.2 DIMENSIONS

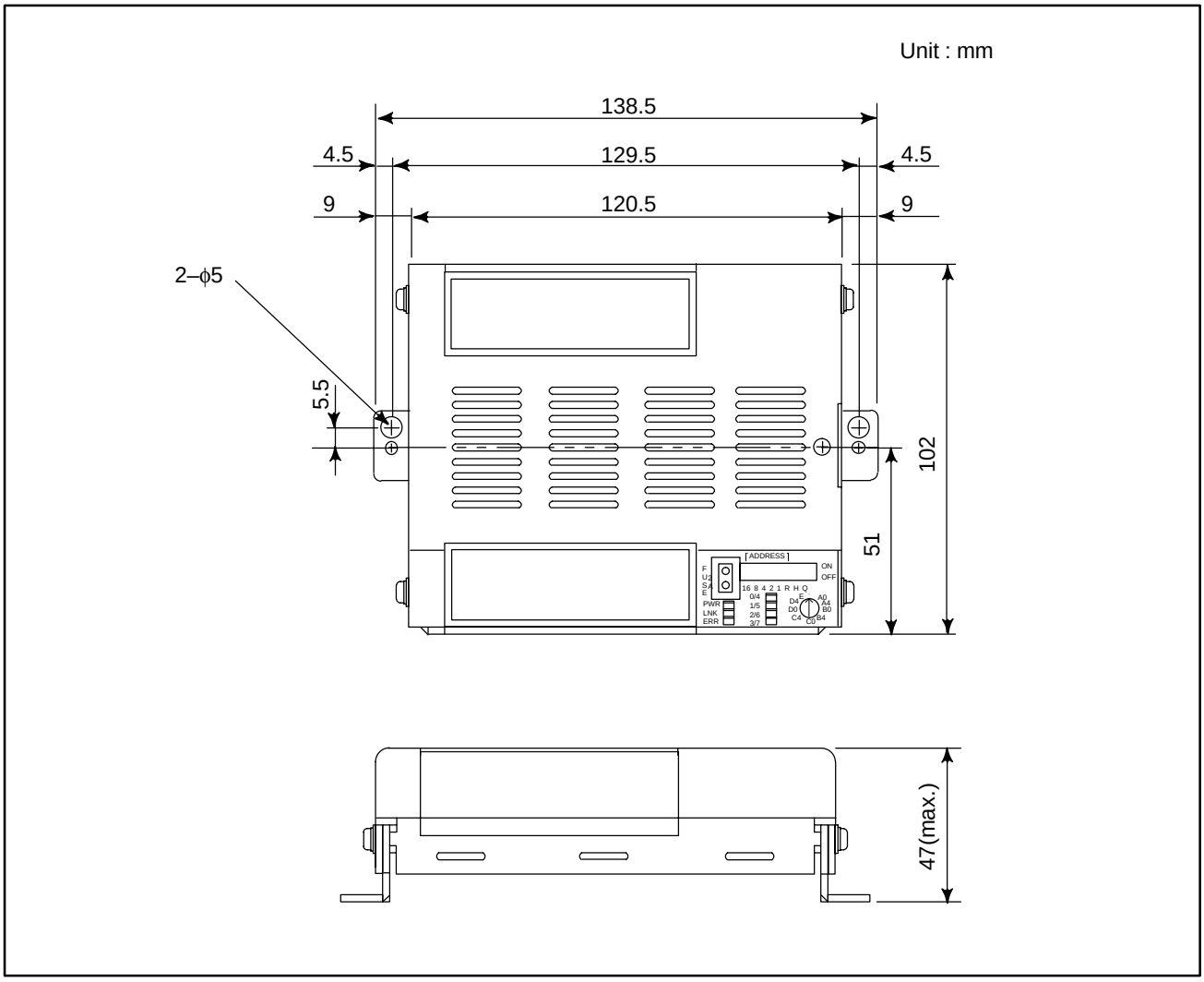
3.2.1 Dimensions for Permanent Installation (Direct Installation without DIN Rail)

3.2.1.1 Interface unit

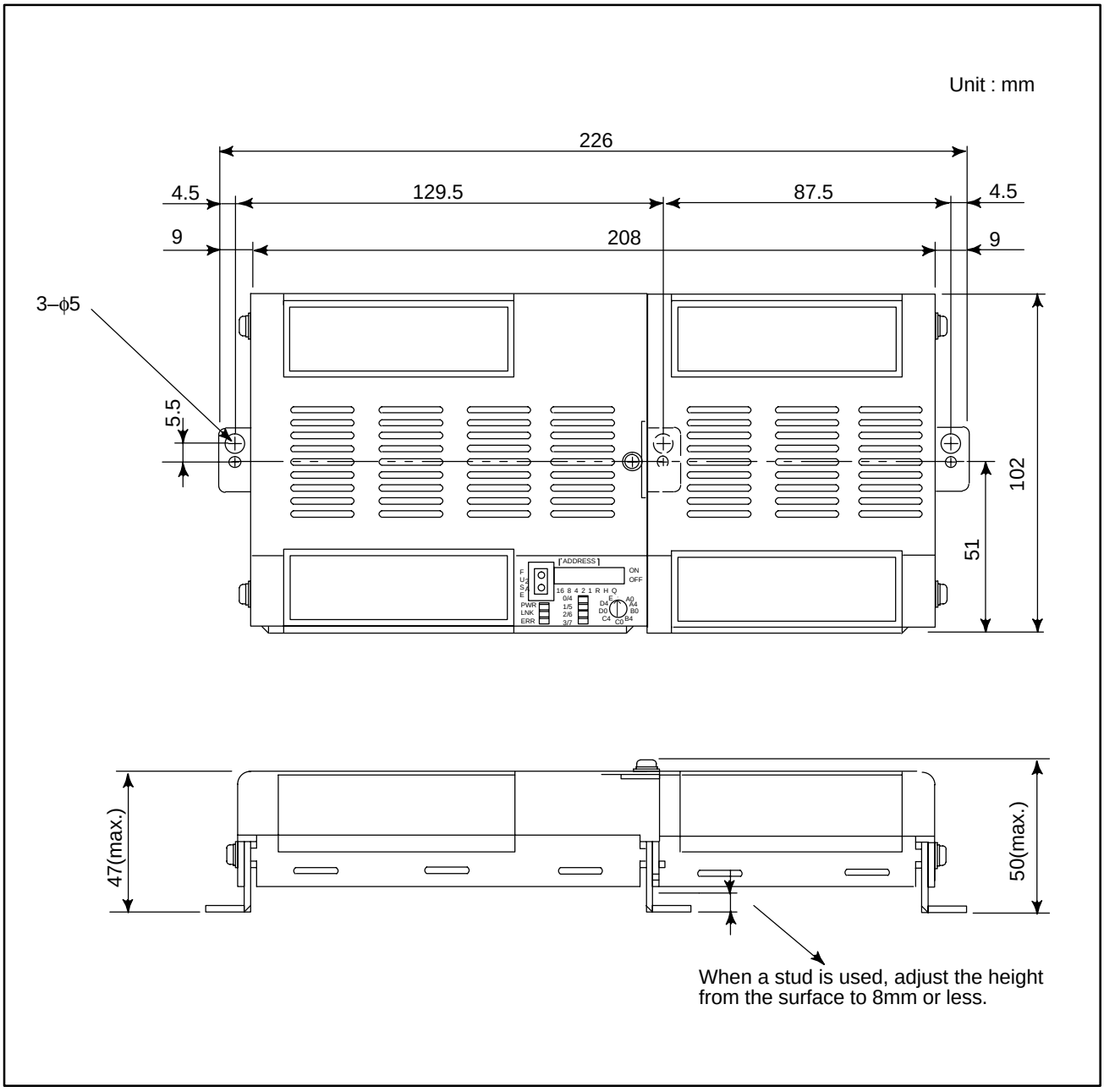
Unit : mm



3.2.1.2
Basic unit

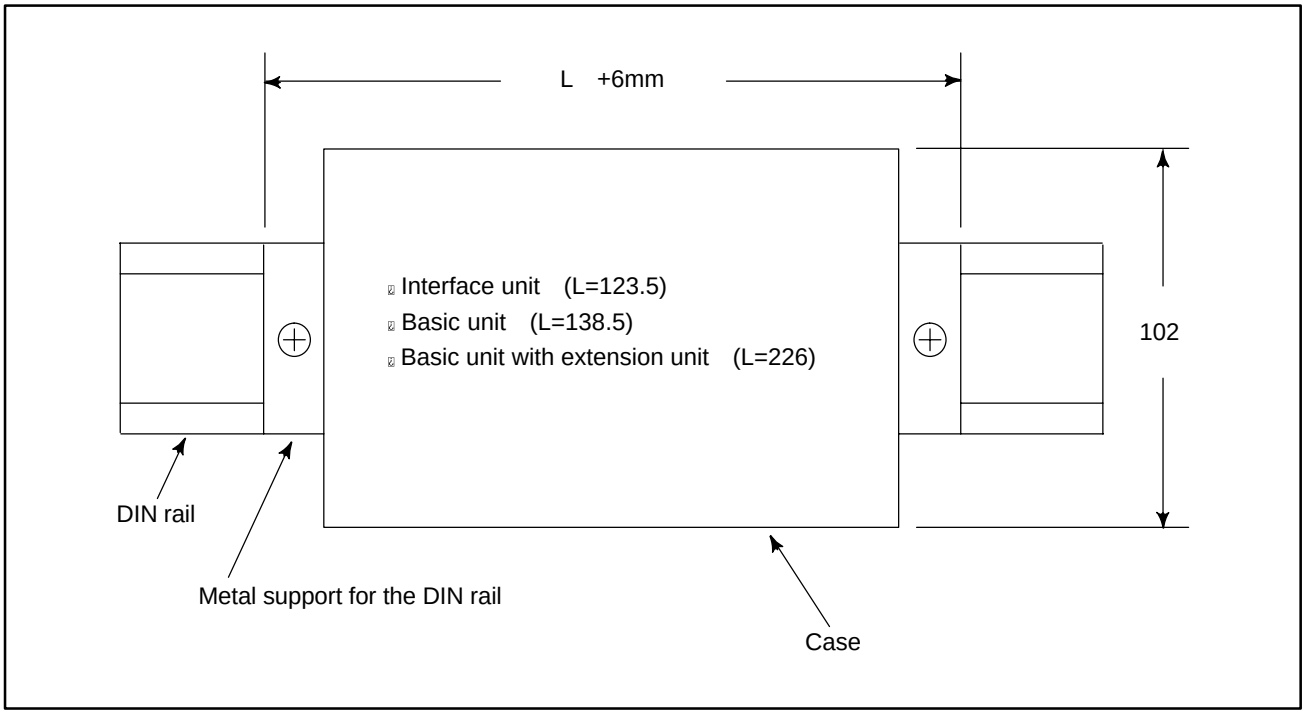


3.2.1.3
Basic unit with extension unit

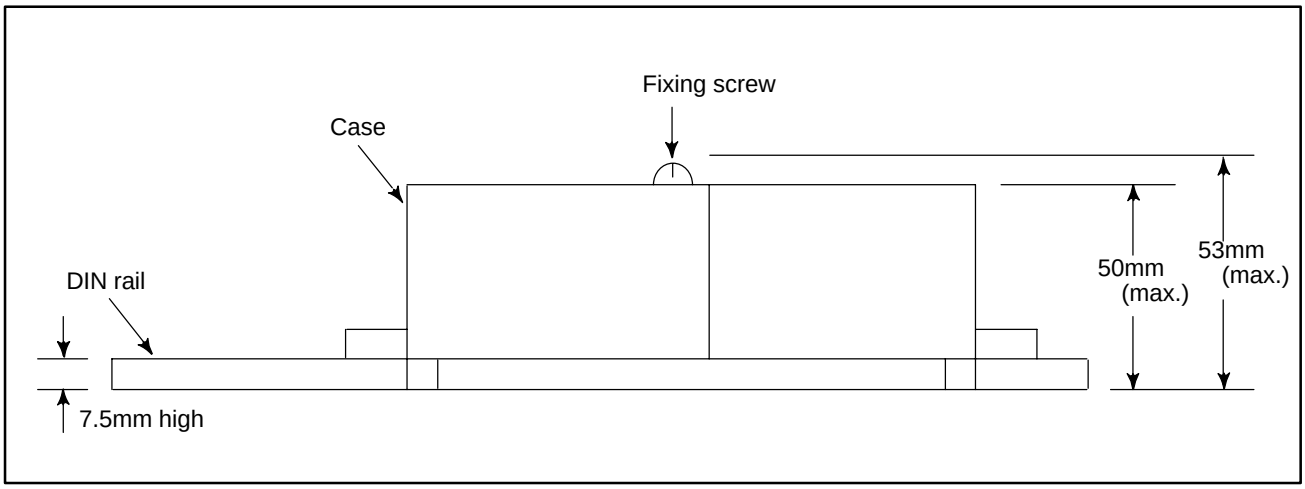


3.2.2 Dimensions for Installation on the DIN Rail (Use a DIN Rail That is 35mm Wide and 7.5mm High.)

Metal supports are provided to install the unit on the DIN rail. The total width is 6mm greater than the dimension for direct installation. (See the following figure.)

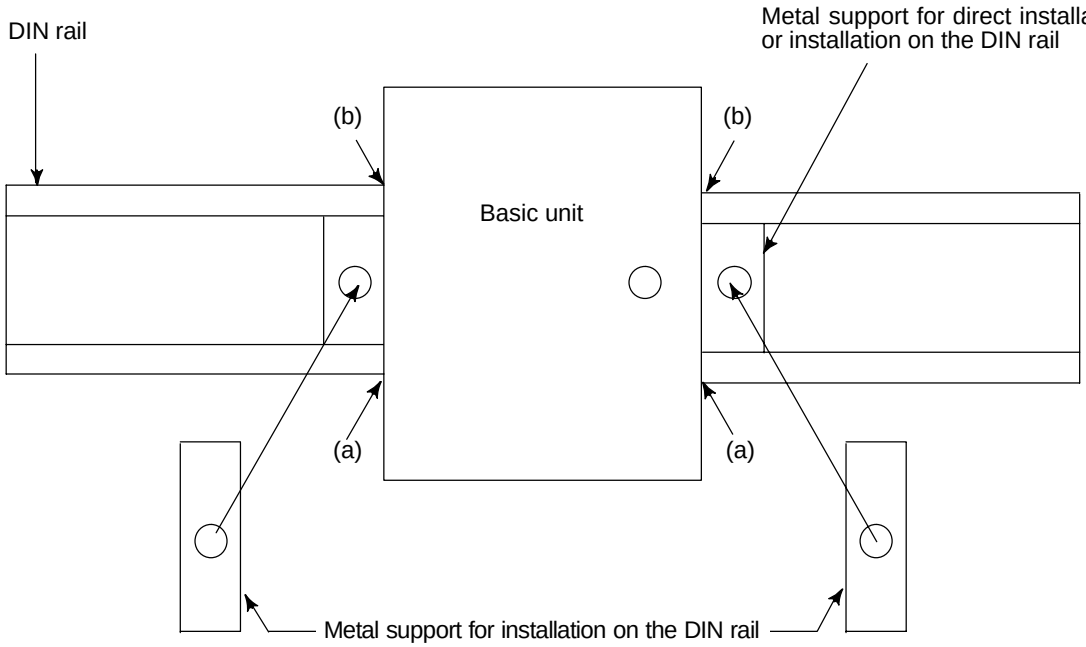


When the unit is installed on the DIN rail which is 35mm wide and 7.5mm high, the total height is 3mm greater than the dimension for direct installation. (See the figure below.)



3.3 INSTALLING THE UNIT ON THE DIN RAIL (USE A RAIL THAT IS 35MM WIDE AND 7.5MM HIGH.)

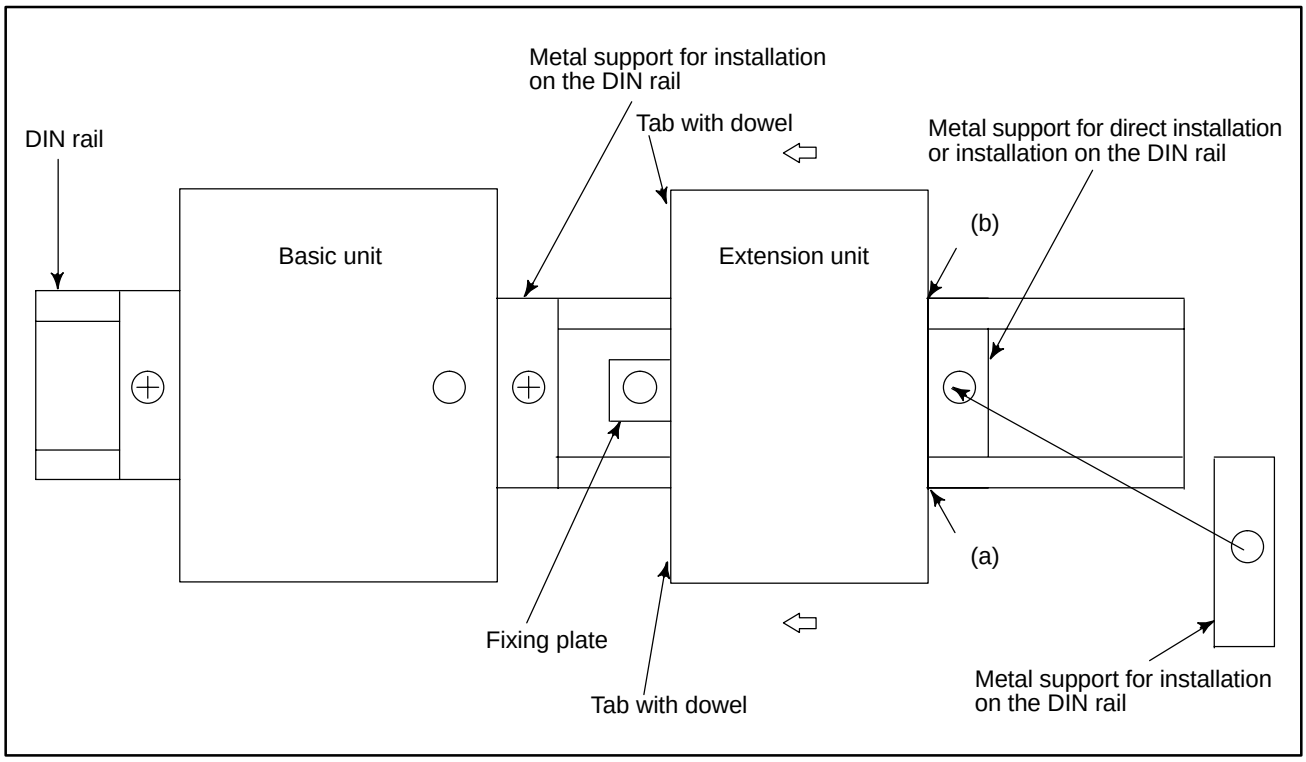
3.3.1 Installing the Interface Unit or Basic Unit



(1) Put the lower tabs (a) of the metal support for direct installation or installation on the DIN rail of the basic unit in the lower DIN rail. Raise the unit a little so that the upper tabs (b) are placed in the upper DIN rail. Pull down the unit (toward the (a) side) so that the upper tabs (b) are caught in the DIN rail.

(2) Place the metal supports for installation on the DIN rail on the metal supports for direct installation or installation on the DIN rail. Then fasten the metal supports with screws.

3.3.2 Installing the Movable Basic Unit with an Extension Unit on the DIN Rail



(1) Put the lower tab (a) of the metal support for direct installation or installation on the DIN rail of the extension unit in the lower DIN rail. Raise the unit a little so that the upper tab (b) is placed in the upper DIN rail. Pull down the unit (toward the (a) side) so that the upper tab (b) is caught in the DIN rail. Then, move the extension unit toward the basic unit and connect the two units.

(2) Align the connectors of the extension unit and the basic unit. Move the extension unit in the direction of the arrow until the connectors mate with each other. Check whether the two tabs with dowels are in position.

(3) Align the tapped hole of the fixing plate of the extension unit with the bolt hole of the basic unit. Then, fasten a screw to tightly connect the basic unit and extension unit with each other. (The screw is in the tapped hole of the fixing plate of the extension unit. Remove it from the tapped hole, and use it to connect the two units.)

(4) Place the metal support for installation on the DIN rail on the metal support for direct installation or installation on the DIN rail. Fasten them with a screw.

3.4 INSTALLING THE IMMOVABLE BASIC UNIT WITH AN EXTENSION UNIT ON THE DIN RAIL

To install the basic unit with an extension unit so it cannot be moved, first install the basic unit with its right and left metal supports for direct installation or installation on the DIN rail. Then, install the extension unit.

3.5 HEAT VALUE OF EACH UNIT AND TERMINAL BOX

3.5.1 Heat Value of Each Unit

Heat value of each unit of I/O Unit–B is shown in table below.

Table 3.5.1 Heat value of each unit

Unit name	Basic heat value (W)	Heat value per 1 input (W/pt)	Heat value per 1 output (W/pt)
BIF04A1	1.6	–	–
AIF02C	1.2	–	–
BMD88A1	1.3	0.23	$0.13+0.3\times IL^2$
BMD88B1	1.3	0.23	$0.13+0.3\times IL^2$
BID16A1	1.5	0.23	–
BID16B1	1.5	0.23	–
BOD16A1	1.0	–	$0.13+0.3\times IL^2$
BOD12A1	0.9	–	$0.09+1.1\times IL^2$
BMD88P1	0.4	0.23	$0.13+0.3\times IL^2$
BMD88Q1	0.4	0.23	$0.13+0.3\times IL^2$
BID16P1	0.6	0.23	–
BID16Q1	0.6	0.23	–
BOD16P1	0.3	–	$0.13+0.3\times IL^2$
BIA16P1	0.1	0.21	–

- IL : Load current of output
- Total “Heat value per 1 input” and “Heat value per 1 output” for simultaneous ON points plus “Basic heat value” is the heat value of the unit.

[Example of calculation]

When 6 points at 0.1A and 6 points at 0.5A for outputs and 12 points for inputs are used as to BMD88A1 and BMD88P1.

$$P = 1.3+0.4+(0.13+0.3\times 0.1^2)\times 6+(0.13+0.3\times 0.5^2)\times 6+0.23\times 12 = 6.49(W)$$

3.5.2 Terminal Box

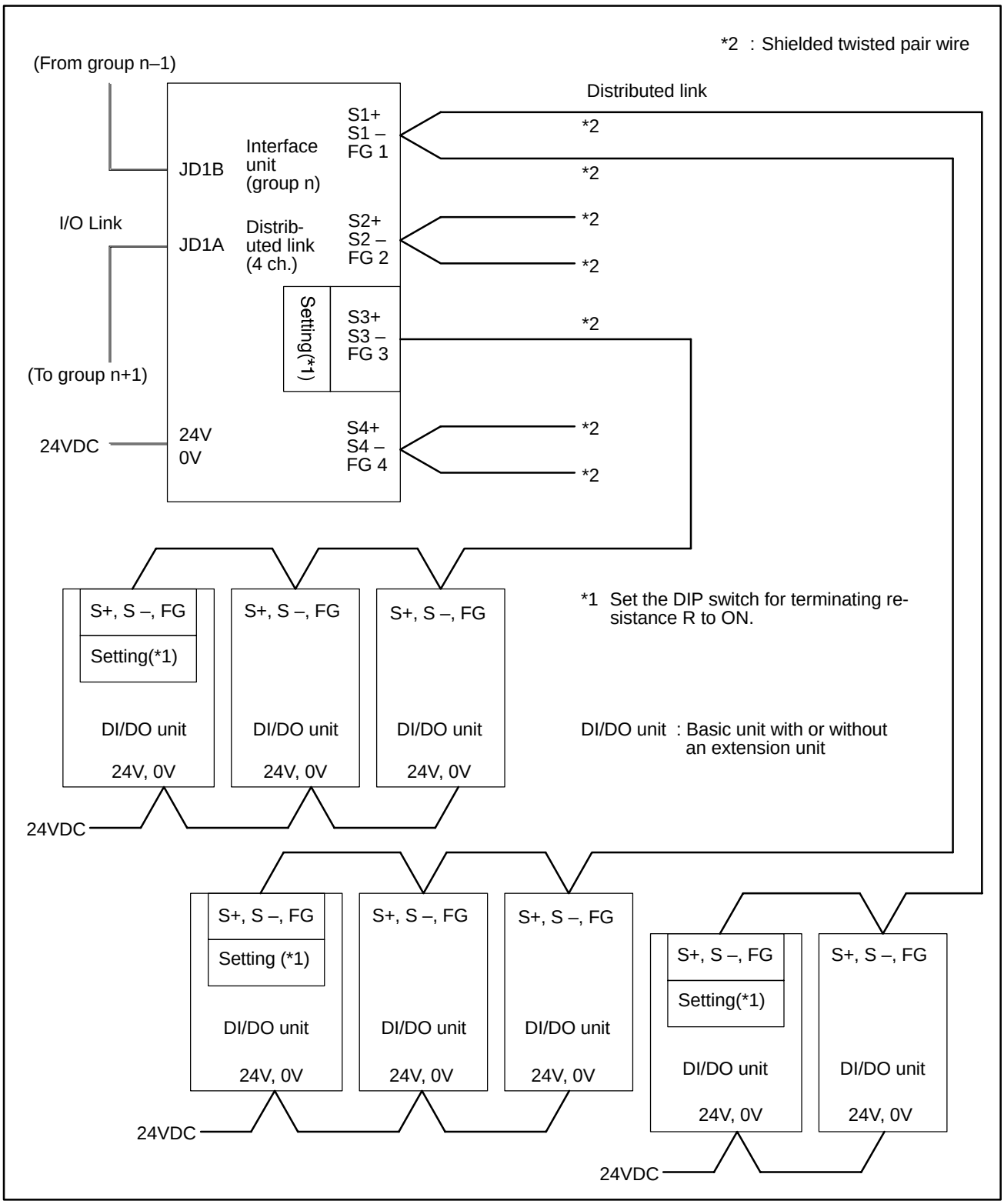
Terminal box should be designed so that the value of the numerical expression described below can be less than 55°C when the units of I/O Unit–B are used in terminal box.

$$K\times P(W)\div S(m^2)+Ta(^\circ C)\leqq 55(^\circ C)$$

K : Coefficient of temperature rise = 0.22 ($^\circ C\cdot m^2/W$)
P : Total heat value in terminal box
S : Surface dimensions of terminal box
Ta : Ambient temperature around terminal box

4 CONNECTION

4.1 CONNECTION DIAGRAM



As for cable of I/O Link, refer to “CONNECTION·MAINTENANCE MANUAL (B–61813E) of FANUC I/O Unit–MODEL A”.

4.2 GROUND CONNECTION

Each unit of I/O Unit–B must be properly grounded. This is particularly important for the reasons listed below.

- A low resistance path from all parts of a system to earth minimizes exposure to shock in the event of short circuits or equipment malfunction.
- I/O Unit–B requires proper grounding in order to operate correctly.

If ground wire is needed, ground wire should be as short and as large as possible. Braided straps or ground cables can be used to minimize resistance. Conductors must always be large enough to carry the maximum short circuit current of the path being considered. (Ground wire must have the cross–sectional area of conductor in AC supply wire or larger. However, if the conductor of AC supply wire is narrow than $2mm^2$, the conductor in ground wire must have $2mm^2$ cross–sectional area or larger.)

4.2.1 Mounting the I/O Unit–B Directly to the Power Magnetics Cabinet

(1) When the I/O Unit–B is mounted on a properly grounded metal portion of the power magnetics cabinet, it is grounded via a “Metal support for direct installation or installation on the DIN rail” (Refer to 3.3.1 and 3.3.2.). Be sure to fix the I/O Unit–B securely.

(2) When the I/O Unit–B is mounted on a non metal or non grounded metal portion of the power magnetics cabinet, it is necessary to connect a ground wire to the “Metal support for direct installation or installation on the DIN rail” of a basic unit. It is necessary to connect a ground wire to the “Metal support for direct installation or installation on the DIN rail” of an extension unit. It is also necessary to connect the ground wires to substantial earth ground.

4.2.2 Mounting the I/O Unit–B on the DIN Rail

(1) When a metal DIN rail is attached to a properly grounded metal portion, the I/O Unit–B is grounded via a “Metal support for direct installation or installation on the DIN rail”. Be sure to fix the I/O Unit–B securely.

(2) When a nonmetal DIN rail is used, or a metal DIN rail is mounted onto a nongrounded plate, it is necessary to connect a ground wire to the “Metal support for direct installation or installation on the DIN rail” of a basic unit. It is necessary to connect a ground wire to the “Metal support for direct installation or installation on the DIN rail” of an extension unit. It is also necessary to connect the ground wires to substantial earth ground.

4.3 CONNECTION WITH THE I/O LINK

The interface unit is connected to the I/O Link. The interface unit is assumed to be group. The interface unit can be connected to any group. Up to 16 groups, namely up to 16 interface units, can be connected to a single I/O Link.

The interface unit is provided with two I/O Link connectors, JD1A and JD1B. The JD1B connector of the interface unit must be connected to the JD1A connector of the I/O Link master or that of a slave in the previous group.

The JD1A connector of the interface unit should be connected to the JD1B connector of the subsequent group. If the interface unit is connected to the last I/O Link group, keep the JD1A connector of the interface unit open.

4.3.1 Input/Output Points for the Interface Unit

The I/O Link has 1024 input points and 1024 output points, as viewed from the master. So, the total of input or output points that can be occupied by all slaves cannot exceed 1024. One I/O Link group has up to 256 input and output points. For the interface unit, however, the number of input points that can be occupied is limited to within 224, because 32 input points are already used for power on/off information. (The number of output points remains to be up to 256.)

The actual number of input/output points are:

Number of input points : Total number of input points of the input units and those of the input and output units.

Number of output points : Total number of output points of the output units and those of the input and output units.

The following tables list the number of I/O Link's input and output points occupied by an interface unit.

[Input points]

Total of actual input points usable for one interface unit	Number of occupied input points
0	32
8 to 32	64
40 to 96	128
104 to 224	256

NOTE
Even when the number of actual input points is 0, 32 input points are used for power on/off information.

[Output points]

Total of actual output points usable for one interface unit	Number of occupied output points
0 to 32	32
40 to 64	64
72 to 128	128
136 to 256	256

NOTE
When calculating the number of actual output points, assume that the BOA12A1 occupies 16 points.

If the number of input points occupied by an interface unit is less than the number of output points occupied by the same interface unit, it is assumed that the number of input points is equal to the number of output points.

4.3.2 Power On/Off Information

The number of input points occupied by a single interface unit is at least 32 more than the number of actual input points. Those 32 or more input points are used for the power on/off information. The table below gives the correspondence between the power on/off signals and unit numbers. When data is sent or received, the corresponding signal is set to 1. When the power is turned off, the corresponding signal is set to 0. When the system retries an operation and detects the predetermined number of errors or more errors than the predetermined number of errors, the error status is established and the ERINF signal is set to 1.
The detail of address assignment for power on/off information are described in “II PMC Programing 3.1 (2)” on this manual.

ADDRESS	7	6	5	4	3	2	1	0
Xn	No.8	No.7	No.6	No.5	No.4	No.3	No.2	No.1
Xn+1	No.16	No.15	No.14	No.13	No.12	No.11	No.10	No.9
Xn+2	No.24	No.23	No.22	No.21	No.20	No.19	No.18	No.17
Xn+3	ERINF		No.30	No.29	No.28	No.27	N0.26	N0.25

4.4 CONNECTING A DISTRIBUTED LINK

4.4.1 Branching the Communications Cable

The interface unit has four communications terminals, or channels, for distributed links. (See Section 4.1, “Connection Diagram.”) Two communications cables (shielded twisted pair wire) can be connected to each channel. To a single interface unit, up to eight communications cables can be connected.

4.4.2 Communications Distance

The total length of cables connected to a single channel must be 100m or less. (When two communications cables are connected to a single channel, the total length of the two cables combined must not exceed 100m.)

4.4.3 Connecting DI/DO Units

A total of 30 DI/DO units can be connected to the four channels.

Examples

When 30 units are connected to the first communications cable : No units can be connected to the second to eighth cables.

When 10 units are connected to the first communications cable, 15 units to the second, and 5 units to the third : No units can be connected to the fourth to eighth cables.

4.4.4 Installing a Terminating Resistor

When a single communications cable is connected to a single channel, install terminating resistors on both the interface unit and the basic unit on the other end of the communications cable. The terminating resistor can be connected by setting the DIP switch.

When two communications cables are connected to a single channel, install terminating resistors on both basic units connected at the end of the cables. (Do not install the terminating resistor on the interface unit.) The terminating resistor can be connected by setting the DIP switch.

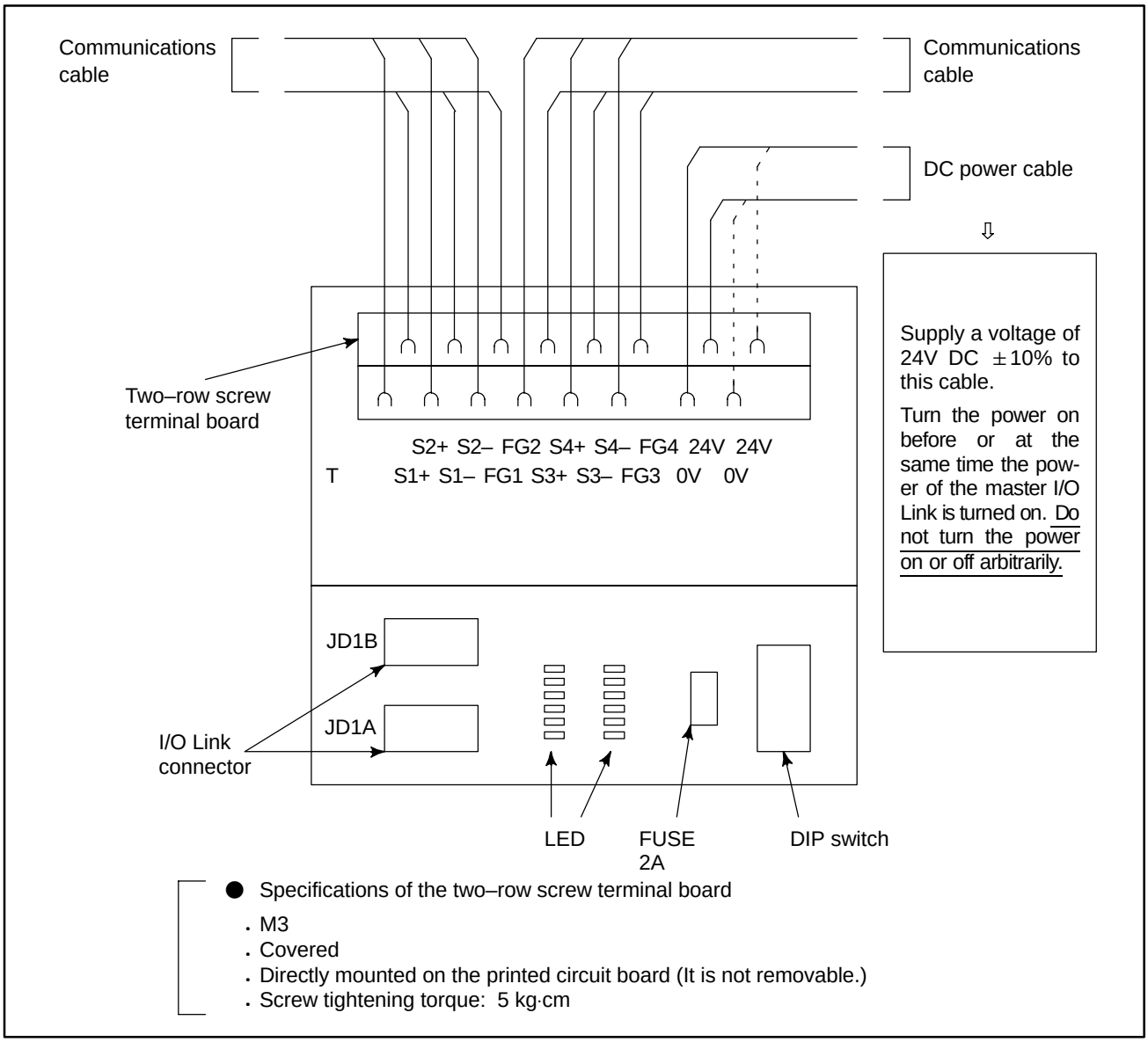
Install a terminating resistor on an unused channel.

4.4.5 Unit Number

All DI/DO units must have unique unit numbers even if they are connected to different channels.

4.5 CONNECTING THE INTERFACE UNIT

Connect the I/O Link cable from the previous group to JD1B. Connect the I/O Link cable to the next group to JD1A. (For details of the connection of the I/O Link, refer to Chapter 1, “FANUC I/O Link” of the “FANUC I/O Unit–MODEL A, Connection Maintenance Manual.”)
Connect the communications cable of a distributed link to any of the four terminal groups : S1+, S1– and FG1, S2+, S2– and FG2, S3+, S3– and FG3 and S4+, S4– and FG4. Connect the power cable to either pair of 24V and 0V terminals.



FUSE specification

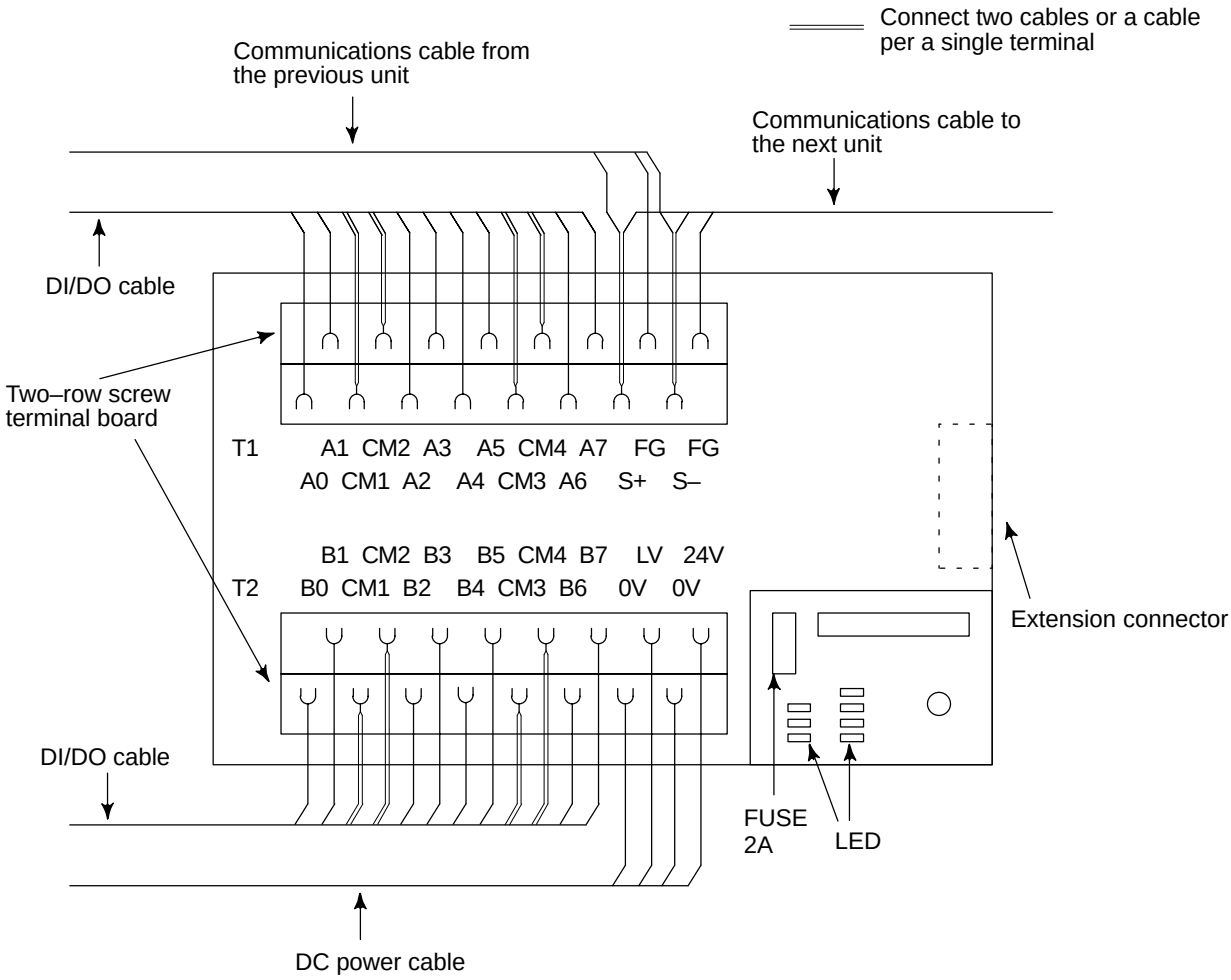
Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.

NOTE
The two–row screw terminal board has terminal numbers (starting at A1 and B1) marked on its resin portion. These numbers do not match the terminal names printed on the case.

4.6 CONNECTING THE BASIC UNIT

Connecting the basic unit:

(1) DC input and output unit, DC output unit, DC input unit.
Refer to 4.6.1, 4.6.2 and 4.6.3 as to detailed wiring.



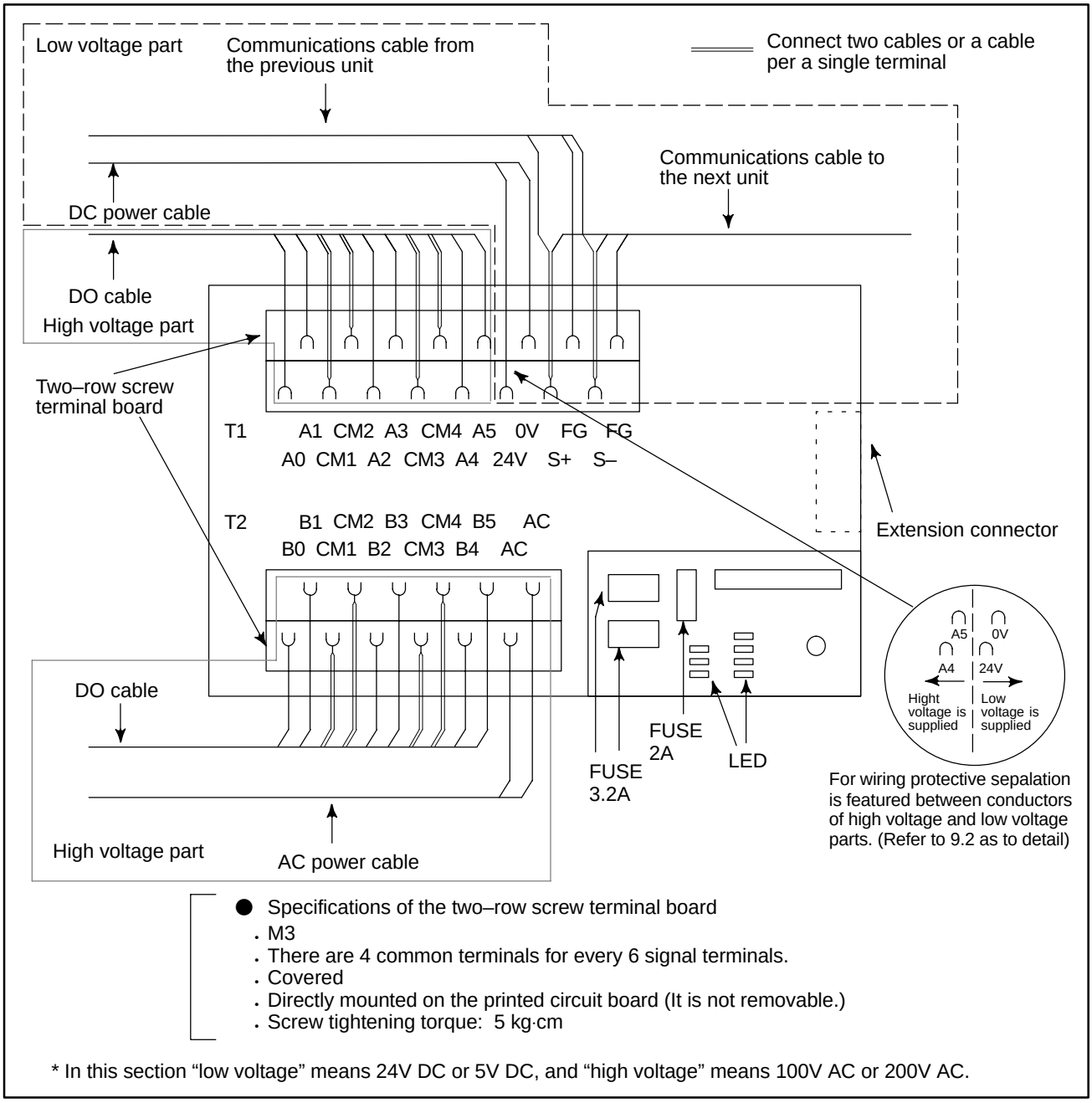
- Specifications of the two–row screw terminal board
  - M3
  - There are 4 common terminals for every 8 signal terminals.
  - Covered
  - Directly mounted on the printed circuit board (It is not removable.)
  - Screw tightening torque: 5 kg·cm

FUSE specification

Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.

NOTE
The two–row screw terminal board has terminal numbers (starting at A1 and B1) marked on its resin portion. These numbers do not match the terminal names printed on the case.

(2) AC output unit.
Refer to 4.6.1, 4.6.2, 4.6.3 and 9.2 as to detailed wiring.



● Specifications of the two–row screw terminal board
. M3
. There are 4 common terminals for every 6 signal terminals.
. Covered
. Directly mounted on the printed circuit board (It is not removable.)
. Screw tightening torque: 5 kg·cm

* In this section “low voltage” means 24V DC or 5V DC, and “high voltage” means 100V AC or 200V AC.

FUSE specification

Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.
3.2A	HM32	

NOTE
The two–row screw terminal board has terminal numbers (starting at A1 and B1) marked on its resin portion. These numbers do not match the terminal names printed on the case.

4.6.1 Connecting the DI/DO Cable

See the connection diagram of each basic unit in Section 7.2, “Specifications of the Basic and Extension Units.”

The recommended terminal screw tightening torque is 5 kg·cm.

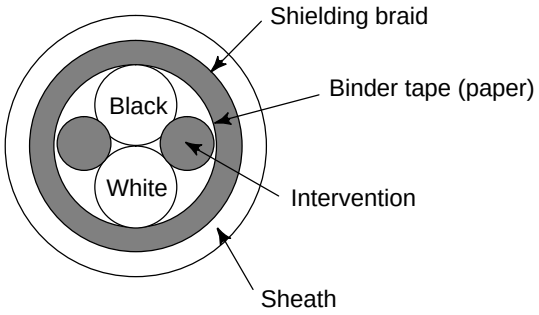
4.6.2 CommunicationCable

4.6.2.1 Communication cable specification

Use the following recommended twisted pair cable for the communication line.

Recommended cable

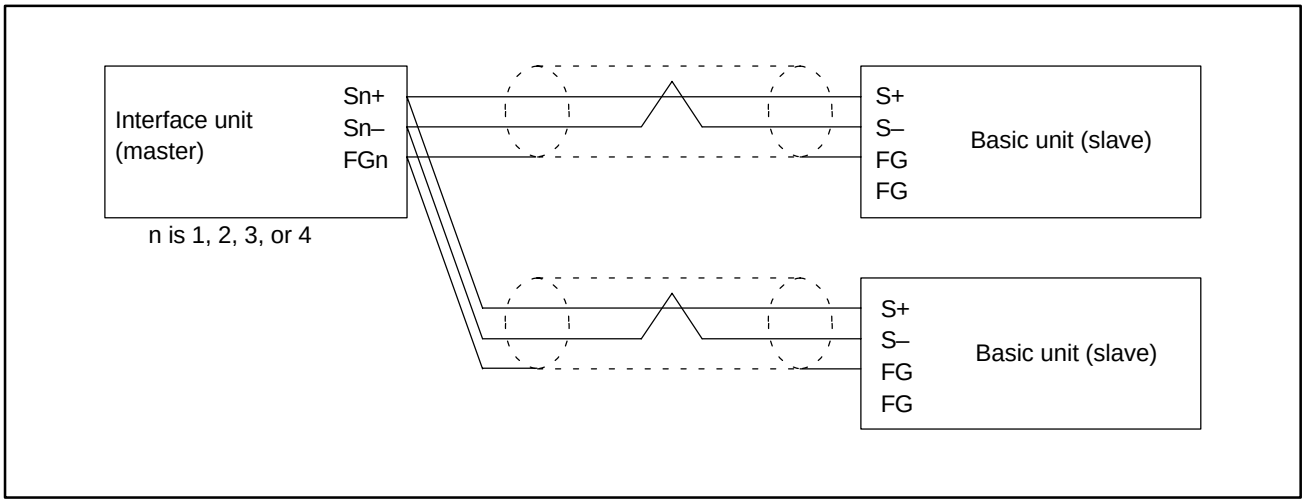
Specification code	:	A66L–0001–0344
Manufacturer	:	Oki Electric Cable Co., Ltd.
Product code	:	2 x 20/0.18A PEF40X–SV K
Remark	:	1P x 0.5 mm^2
Characteristics	:	See the following table.



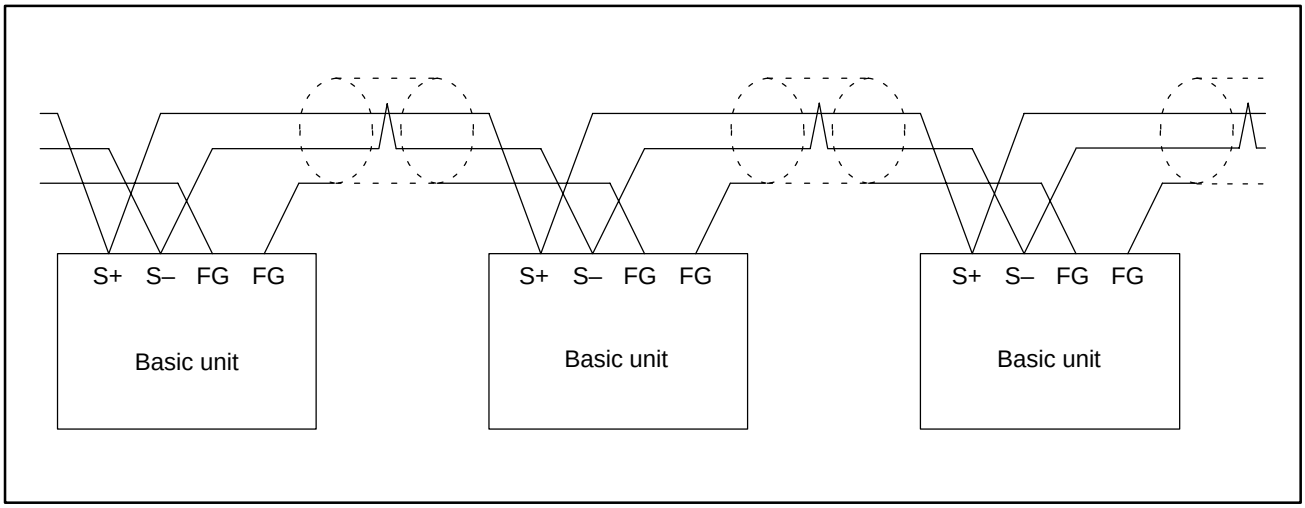
Item		Characteristic
Electrical performance	Conductor resistance	37 Ω /km or less
	Insulation resistance	1000 MΩ km or greater
	Withstand voltage	500 VAC or higher
	Characteristic impedance (typical)	105 Ω
	Capacitance (for reference only)	44pF/m
Conductor	Structure	20 conductors/0.18 mm
	External diameter (typical)	0.93 mm
Insulation	Color	White and black
	Thickness (typical)	0.58 mm
	External diameter (typical)	2.1 mm
Pair twisting	Structure	White and black
	Twisting direction	Clockwise
	Taping	Twisted pair wrapped with binder tape (paper)
	External diameter (typical)	4.2 mm
Shielding braid	Strand diameter (typical)	0.1 mm
	Braiding density (typical)	80 %
	External diameter	4.8 mm
Sheath	Color	Black
	Thickness	1.0 mm or greater
	External diameter (typical)	7 mm

4.6.2.2 Connecting the communications cable

Connect the communications cable coming from the interface unit to the S+ and S– terminals of the basic unit. Connect the FG terminal of the interface unit to one of the two FG terminals of the basic unit.



Between basic units, connect the S+ and S– terminals of a basic unit to the corresponding terminals of the next unit. Connect the FG terminal of the previous basic unit to one of the two FG terminals of the basic unit. Then, connect the other FG terminal of the basic unit to one of the two FG terminals of the next basic unit as shown below. FG should be connected at both ends to eliminate high frequency noise.



4.6.3 Connecting the Power Cable

4.6.3.1 DC input and output unit, DC output unit, DC input unit

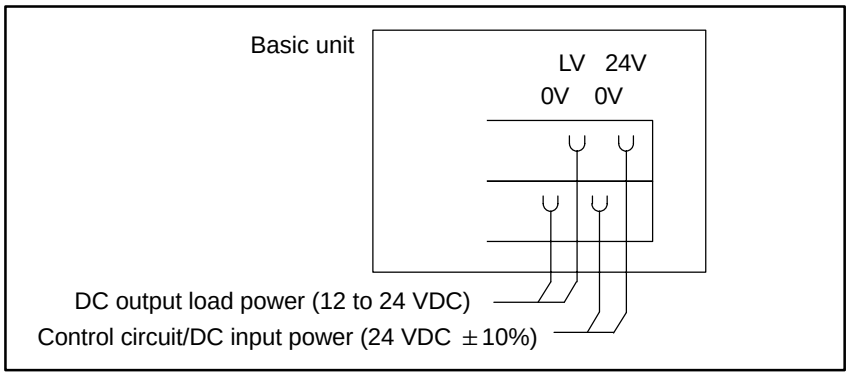
Supply power to the control circuit/DC inputs (24V/0V), and DC output loads (LV/0V).

For the control circuit/DC inputs, apply 24 VDC ±10% between 24V and 0V. The voltage applied between these terminals is fed to the control circuit (basic unit) and the DC inputs (basic and extension units). External power need not be supplied to the DC inputs, because internal power is supplied to them. (See Section 7.2.)

This power supply can be turned on and off at any time. The DI point of the PMC (Programmable Machine Control) can be used to check whether the power of each unit is on or off. (See Section 4.3.2.) If the power for the control circuit/input circuit is off, all DI points are assumed to be 0.

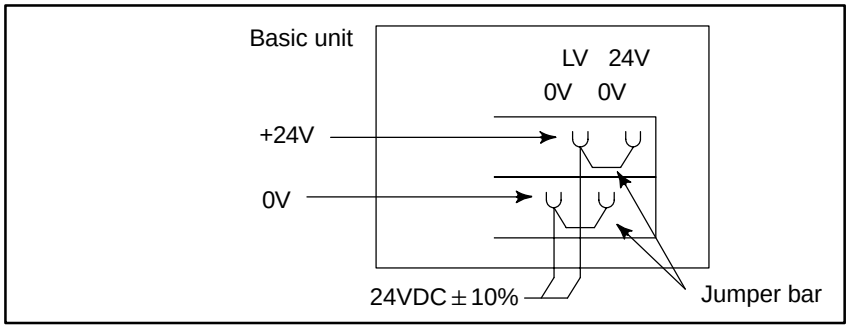
The power for the DC output load is used to drive the load connected to the DC output. For the DC input and output unit and the DC output unit, apply 12 to 24 VDC between LV and 0V. For the DC input unit, load power for LV and 0V need not be supplied.

(1) If separate power supplies are used for the control circuit/DC input and the DC output load



If the basic unit contains only DC inputs, the DC output load power need not be connected.

(2) If the same power supply is used for both the control circuit/DC input and the DC output load (Note that a sufficient power source must be provided based on load device requirements.)



Connect the control circuit/DC input power terminals to the DC output load power terminals on the terminal board by installing jumper bars.

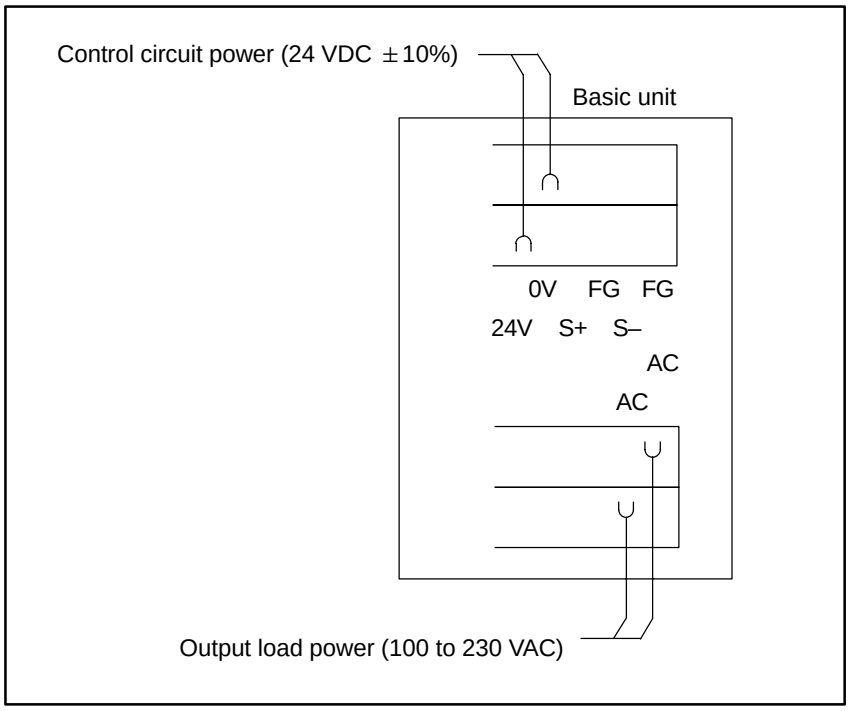
4.6.3.2 AC output unit

Supply power to the control circuit and AC output load.

For the control circuit of a unit, apply 24 VDC +10% between 24V and 0V. The voltage applied between 24V and 0V is fed to the control circuit.

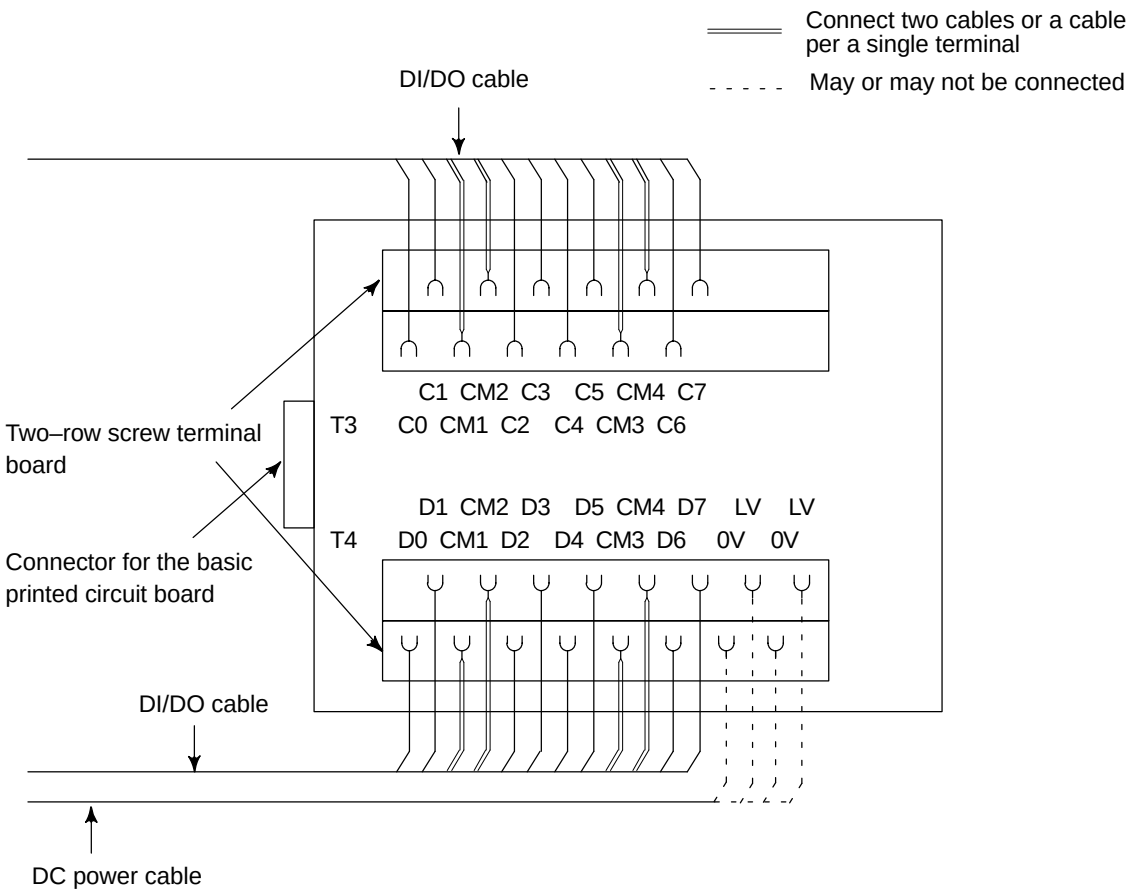
This power supply can be turned on and off at any time. The DI point of the PMC can be used to check whether the power of each unit is on or off. (See Section 4.3.2.)

The power for the AC output load is used to drive the load connected to the AC output. Apply 100 to 230 VAC between AC and AC.



4.7 CONNECTING THE EXTENSION UNIT

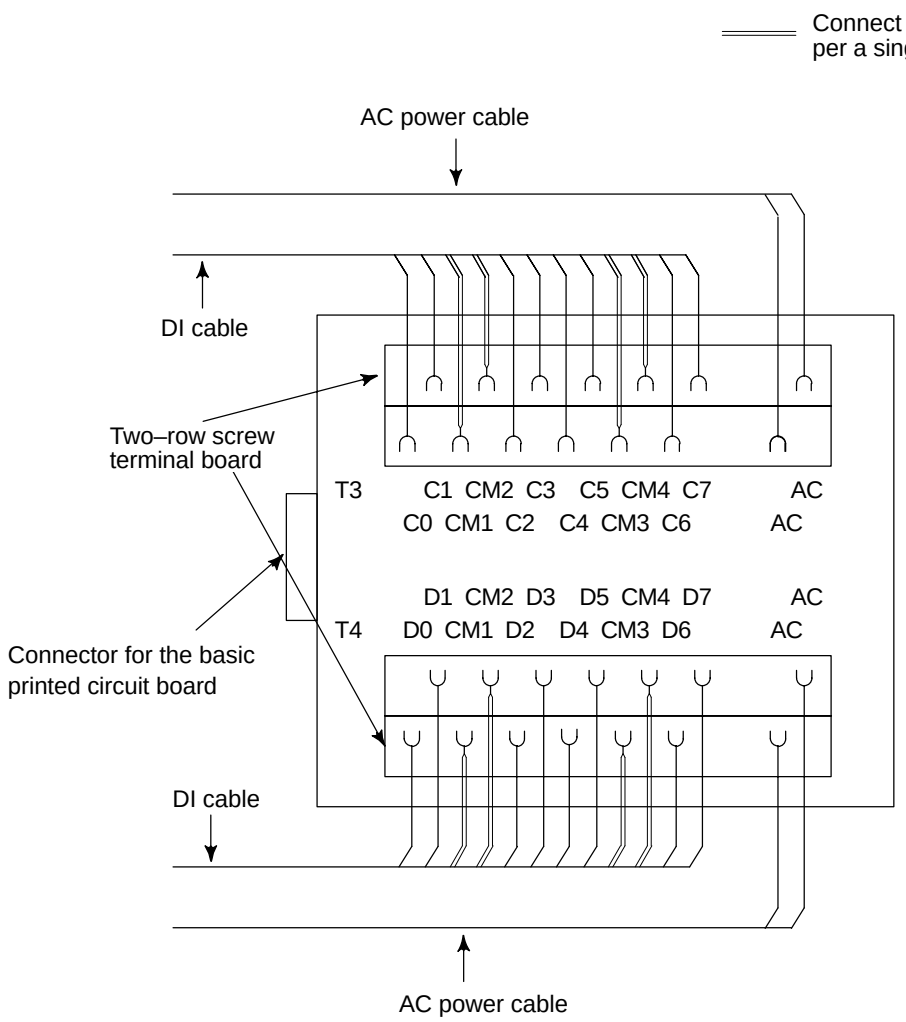
Connecting the extension unit:
(1) DC input and output unit, DC output unit, DC input unit
Refer to 4.7.1 and 4.7.2 as to detailed wiring.



● Specifications of the two–row screw terminal board
- M3
- There are 4 common terminals for every 8 signal terminals.
- Covered
- Directly mounted on the printed circuit board (It is not removable.)
- Screw tightening torque: 5 kg·cm

NOTE
The two–row screw terminal board has terminal numbers (starting at A1 and B1) marked on its resin portion. These numbers do not match the terminal names printed on the case.

(2) AC input unit.
Refer to 4.7.1 and 4.7.2 as to detailed wiring.



● Specifications of the two–row screw terminal board
- M3
- There are 4 common terminals for every 8 signal terminals.
- Covered
- Directly mounted on the printed circuit board (It is not removable.)
- Screw tightening torque: 5 kg·cm

NOTE
The two–row screw terminal board has terminal numbers (starting at A1 and B1) marked on its resin portion. These numbers do not match the terminal names printed on the case.

4.7.1 Connecting the DI/DO Cable

See the connection diagram of each extension unit in Section 7.2, “Specifications of the Basic and Extension Units.”
The recommended terminal screw tightening torque is 5kg·cm.

4.7.2 Connecting the Power Cable

4.7.2.1 DC input and output unit, DC output unit, DC input unit

The DC output load power supply is used to drive the load connected to the DC output. For the DC input and output unit and the DC output unit, apply 12 to 24 VDC between LV and 0V. For the DC input unit, power need not be supplied.

If the control circuit/DC input circuit power for the basic unit is turned off, all DI points are assumed to be 0.

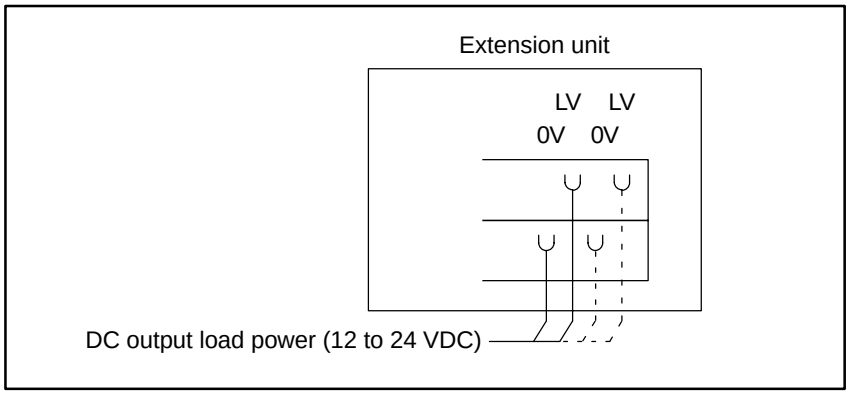
(1) When only DC input points are used

The DC output load power need not be connected.

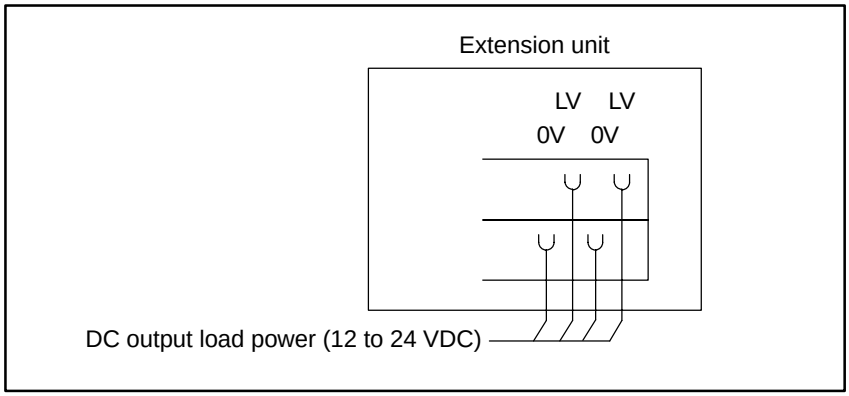
(2) When DC output points are used

Connect 12 to 24 VDC between LV and 0V as DC output load power. Use either of the following connection method according to the load current.

1) If the DC output load current is below 8 A
Connect the DC output load power to either set of LV and 0V.

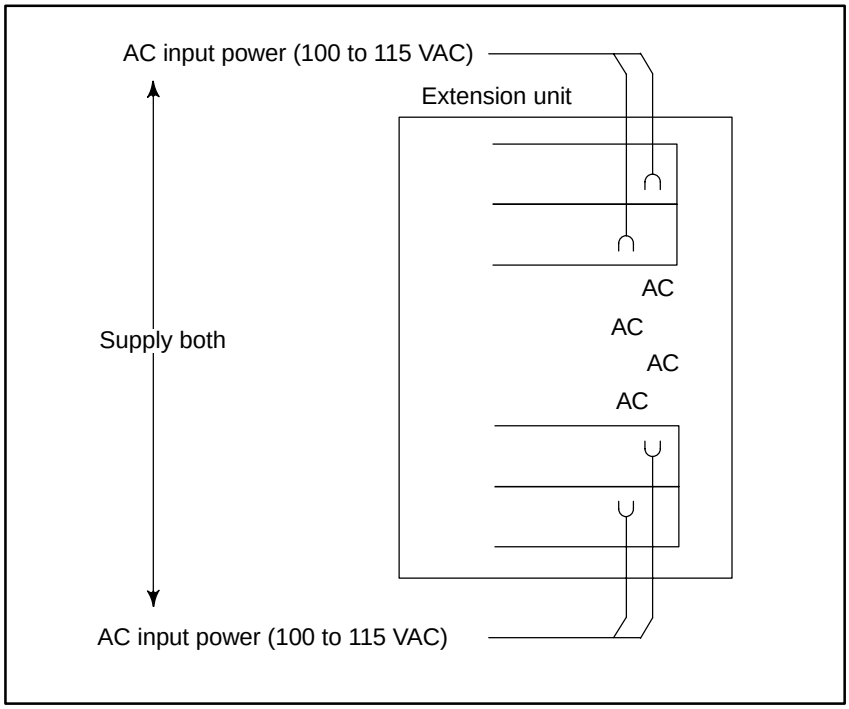


2) If the DC output load current is 8 A or above
Connect the DC output load power to both sets of LV and 0V.



4.7.2.2 AC input unit

Connect 100 to 115 VAC between AC and AC as AC input power.



4.8 POWER SUPPLY CAPACITY OF EACH UNIT

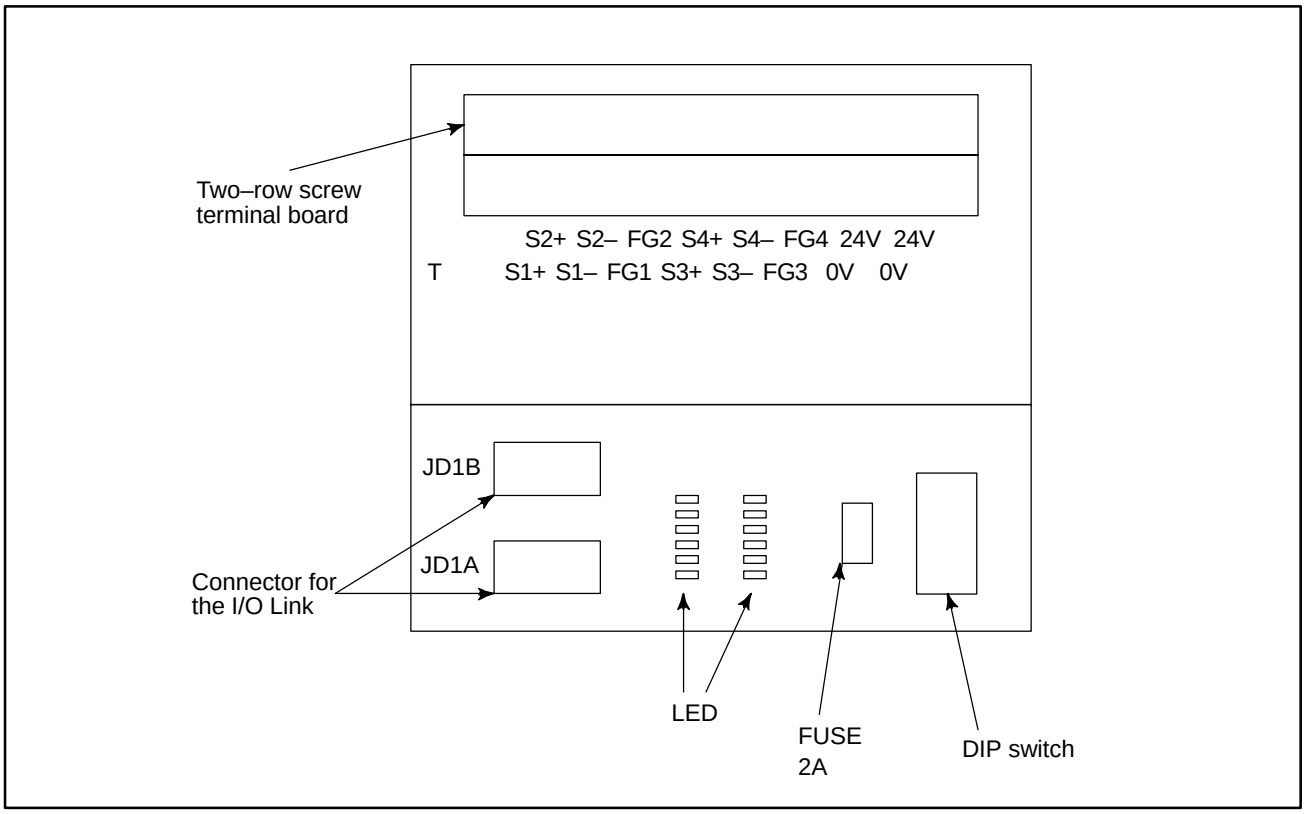
The power supply capacity (consumption current) of 24 volts supplied to each unit is shown table 4.8.

Table 4.8 Power supply capacity of each unit

Unit name	Basic current (mA)	Rated current (Input) (W/pt)	Rated current (Output) (W/pt)
BIF04A1	65	–	–
AIF02C	50	–	–
BMD88A1	55	9	5.5
BMD88B1	55	9	5.5
BID16A1	60	9	–
BID16B1	60	9	–
BOD16A1	40	–	5.5
BOD12A1	35	–	4
BMD88P1	15	9	5.5
BMD88Q1	15	9	5.5
BID16P1	25	9	–
BID16Q1	25	9	–
BOD16P1	10	–	5.5
BIA16P1	5	9	–

5 SETTING THE INTERFACE AND BASIC UNITS, AND LED INDICATIONS

5.1 INTERFACE UNIT

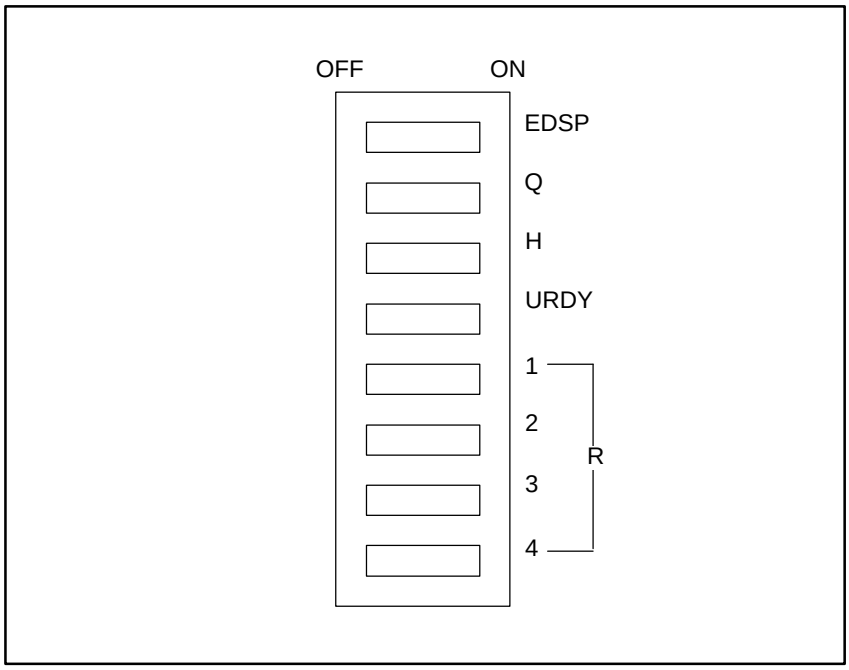


FUSE specification

Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.

5.1.1 Setting the DIP Switch

The interface unit has the DIP switch shown below. The following sections describe the functions of the switches on the DIP switch.



5.1.1.1 EDSP (selecting the error display method)

ON : Always select the ON position.
(An error LED may flash during operation.)
OFF : Do not select the OFF position.

5.1.1.2 Q and H (setting the communication speed)

The communication speed is 1.2Mbps. The same setting must be made on the interface unit and all basic units.

Q	H	Communication speed
OFF	OFF	1.2 Mbps

5.1.1.3 URDY (setting the power on/off information of each unit)

This switch is set to display the power on/off information of each basic unit with 32 DI points (four bytes).

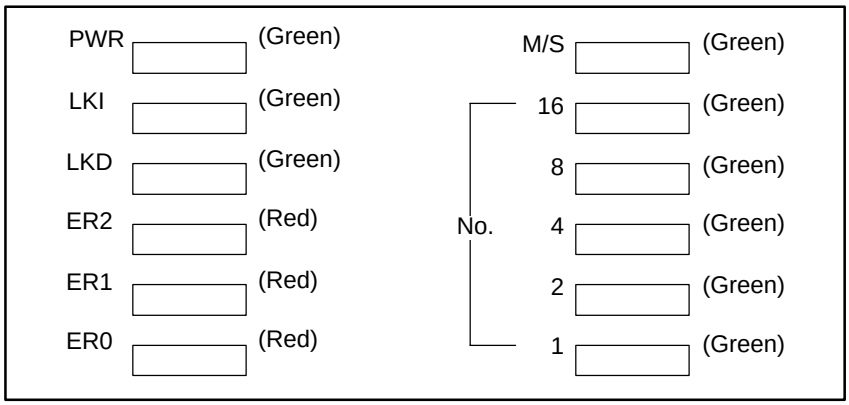
ON : Do not select the ON position.
OFF : Always select the OFF position.

5.1.1.4 R (installing a terminating resistor)

When only one communications cable is connected to a communications channel of the interface unit, a terminating resistor must be installed. The interface unit has a built–in terminating resistor, which can be selected by the R switches. For the setting conditions, see Section 4.4.4, “Installing a terminating resistor.”

Communications channel	R	
	Terminating resistor is provided	Terminating resistor is not provided
S1	(1) ON	(1) OFF
S2	(2) ON	(2) OFF
S3	(3) ON	(3) OFF
S4	(4) ON	(4) OFF

5.1.2 LED Indications



- PWR : Lights when the power is turned on.
- LKI : Lights when the unit communicates with the master I/O Link.
- LKD : Lights when the unit communicates with a basic unit. (The color of the light is dim when the interface unit is connected to a small number of basic units.)
- ER0, ER1, ER2: Lights when an error occurs.
- M/S : If an error occurs, this LED is used to indicate the unit where the error is detected. The meaning of the LED indication is as follows:

  ON : The error is detected in the interface unit.

  OFF : The error is detected in the basic unit.
- Nos. 1, 2, 4, 8, 16 : Indicate the number of the unit in which the error is detected.

Examples
○ – ON
× – OFF

No.					Unit number
16	8	4	2	1	
×	×	×	×	○	1
×	×	○	×	○	5
×	○	×	○	×	10
○	×	○	×	×	20

When unit number LEDs 1 to 16 are off (o = on, x = off) and M/S is on, it means one of the following errors detected in the Interface unit.

M/S	ER2	ER1	ER0	Error	Description	Major cause of error
○	×	×	○	Interface unit peripheral error	The interface unit is abnormal.	Interface unit defective
○	×	○	×	Interface unit RAM parity error	The interface unit is abnormal.	Interface unit defective
○	○	×	×	I/O link error reception	An error occurred in a unit connected to the I/O link.	Another unit connected to the I/O link is defective.
○	○	×	○	I/O link framing error	The communication end signal in the I/O link is abnormal.	———
○	○	○	×	I/O link CRC error	Communication data in the I/O link is abnormal.	———
○	○	○	○	Interface unit watchdog error	I/O link communication with the host was interrupted.	———

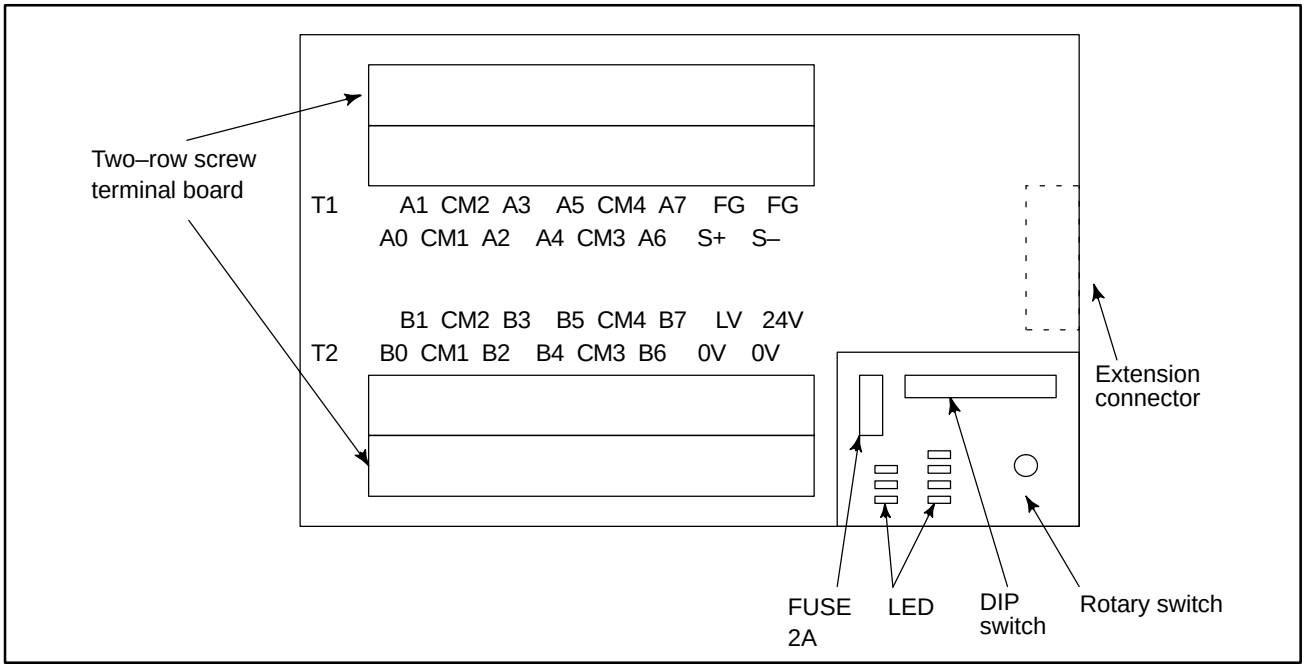
When unit number LEDs 1 to 16 are on (o = on, x = off), it means one of the following Basic unit errors.

M/S	ER2	ER1	ER0	Error	Description	Major cause of error
×	×	×	○	Basic unit peripheral error	The basic unit is abnormal.	Basic unit defective
○	×	○	×	Basic unit number error	A unit with a wrong number responded to the interface unit.	———
×	×	○	○	Basic unit reception data count error	The number of communication bytes is greater than 4.	Two or more units have the same unit number, or the terminator has not been set correctly.
×○ (*1)	○	×	×	Basic unit framing error	The communication end signal is abnormal.	Two or more units have the same unit number, or the terminator has not been set correctly.
×○ (*1)	○	×	○	Basic unit DMI error	The communication waveform was disturbed.	Two or more units have the same unit number, or the terminator has not been set correctly.
×○ (*1)	○	○	×	Basic unit CRC error	Communication data is abnormal.	Two or more units have the same unit number, or the terminator has not been set correctly.
×	○	○	○	Basic unit watchdog error	Communication with the interface unit was interrupted.	———

NOTE
*1 When the M/S LED is on, it indicates that the error was detected in the interface unit. When it is off, it indicates that the error was detected in the basic unit.

5.2 BASIC UNIT

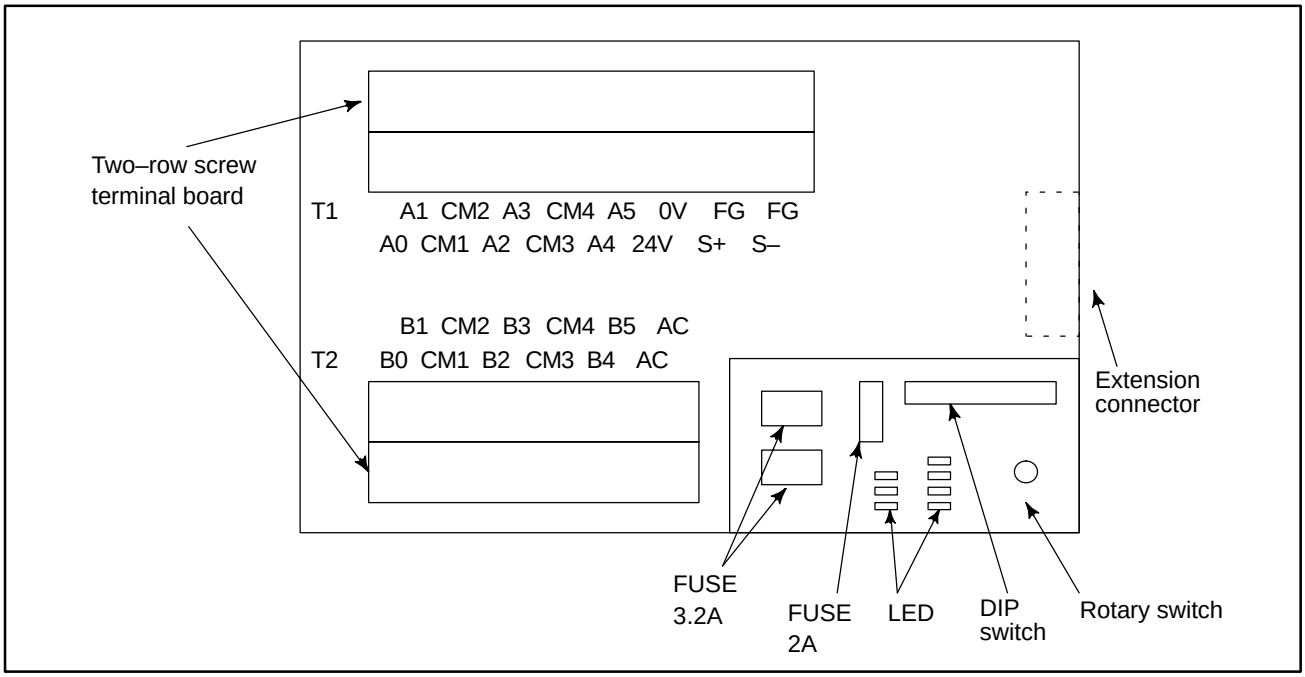
Basic Unit:
(1) DC input and output unit, DC output unit, DC input unit



FUSE specification

Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.

(2) AC output unit

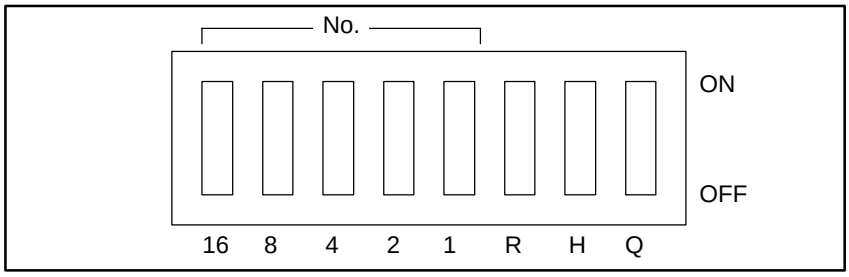


FUSE specification

Rating	Part number	Manufacturer
2A	LM20	Daito Communication Apparatus Co.
3.2A	HM32	

5.2.1 Setting the DIP Switch

The basic unit has the DIP switch shown below. The following sections describe the functions of the switches on the DIP switch.



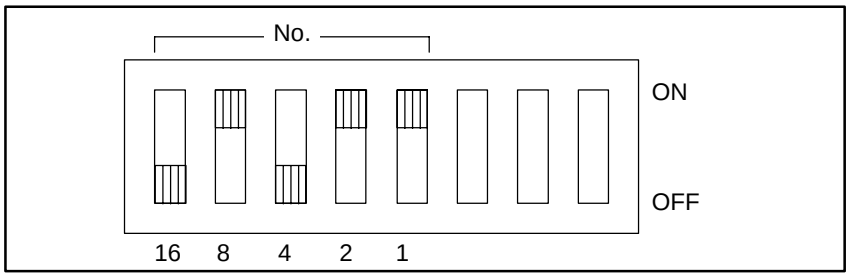
5.2.1.1 Switches 1, 2, 4, 8, and 16 (setting the unit number)

Switches 1, 2, 4, 8, and 16 set a unit number. Specify a desired unit number with these switches.

Examples

Unit number	Settings				
	16	**8**	**4**	**2**	**1**
1	OFF	OFF	OFF	OFF	ON
5	OFF	OFF	ON	OFF	ON
10	OFF	ON	OFF	ON	OFF
15	OFF	ON	ON	ON	ON
20	ON	OFF	ON	OFF	OFF
25	ON	ON	OFF	OFF	ON
30	ON	ON	ON	ON	OFF

Sample setting: To specify unit number 11, set switches 1, 2, 4, 8, and 16 switches as shown below:



5.2.1.2 R (installing a terminating resistor)

A terminating resistor must be installed on the basic unit at the end of the communications cable. The basic unit has a built–in terminating resistor, which can be connected by the R switch of the DIP switch. (Refer to section 4.4.4)

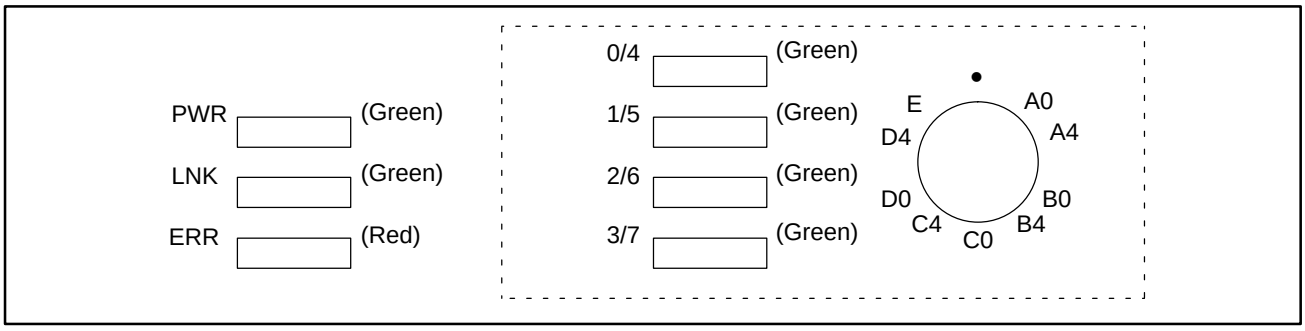
ON : The terminating resistor is provided.
OFF : The terminating resistor is not provided.

5.2.1.3 Q and H (setting the communication speed)

The communication speed is 1.2Mbps. The same setting must be made on the interface unit and all basic units.

Q	H	Communication speed
OFF	OFF	1.2 Mbps

5.2.2 LED Indications



- PWR : Lights when the power is turned on.
- LNK : Lights when the unit communicates with the interface unit.
- ERR : Lights when an error occurs.
- 0/4, 1/5, 2/6, 3/7 : Indicate the setting of the rotary switch.

(1) When the rotary switch is set to the dot (•)

The LEDs do not light.

(2) When the rotary switch is set to one of A0 to D4

The LEDs indicate whether the input or output is on or off. (On : The LED lights. Off : The LED goes off.) When the rotary switch is set to x0 (x=A–D), the LEDs indicate the states of the corresponding four points, x0 to x3. When the rotary switch is set to x4, the LEDs indicate the states of the corresponding four points, x4 to x7. See below.

Example	When A0 is selected	When A4 is selected
	The 0/4 LED corresponds to A0	The 0/4 LED corresponds to A4
	The 1/5 LED corresponds to A1	The 1/5 LED corresponds to A5
	The 2/6 LED corresponds to A2	The 2/6 LED corresponds to A6
	The 3/7 LED corresponds to A3	The 3/7 LED corresponds to A7

(3) When the rotary switch is set to E

The LEDs indicate the details of the error.
(○ : The LED is on. – : The LED is off.)

3/7	2/6	1/5	0/4	Error	Description
–	–	–	–	–	When the ERR LED is off : The unit is correct.
–	–	–	–	Watch–dog error	When the ERR LED is on : The communication with the interface unit was cut off.
–	–	–	○	Peripheral error	The basic unit is defective.
–	–	○	○	Watch–dog error	The communication with the interface unit was cut off.
–	○	–	–	CRC error	The communication data is illegal.
–	○	–	○	DMI error	The communication waveform was corrupted.
–	○	○	–	Framing error	The communication termination signal is illegal.
–	○	○	○	Illegal number of received data items	The number of communication bytes exceeds four.

6 UNITS

Type				Name	Unit specification number	PC board specification number
Interface unit (4ch.)				BIF04A1	A03B–0808–C001	A20B–8000–0820
Interface module (1ch, I/O Unit–MODEL A built–in type) (*1)				AIF02C	A03B–0807–C013	A20B–8000–0710
Basic	DC input and output	DC 8 input points and DC 8 output points	20ms, POS/0. 6A, POS	BMD88A1	A03B–0808–C010	A20B–8000–0750
			2ms, POS/0. 6A, POS	BMD88B1	A03B–0808–C011	A20B–8000–0751
	DC input	DC 16 input points	20ms, POS	BID16A1	A03B–0808–C020	A20B–8000–0740
			2ms, POS	BID16B1	A03B–0808–C021	A20B–8000–0741
	DC output	DC 16 output points	0.6A, POS	BOD16A1	A03B–0808–C030	A20B–8000–0760
	AC output	AC 12 output points	0.3A (*2)	BOA12A1	A03B–0808–C040	A20B–8000–0880
Extension	DC input and output	DC 8 input points and DC 8 output points	20ms, POS/0.6A,POS	BMD88P1	A03B–0808–C200	A20B–8000–0730
			2ms, POS/0.6A,POS	BMD88Q1	A03B–0808–C201	A20B–8000–0731
	DC input	DC 16 input points	20ms, POS	BID16P1	A03B–0808–C210	A20B–9001–0680
			2ms, POS	BID16Q1	A03B–0808–C211	A20B–9001–0681
	DC output	DC 16 output points	0.6A, POS	BOD16P1	A03B–0808–C220	A20B–8000–0780
	AC input	AC 16 input points	100 to 115 VAC	BIA16P1	A03B–0808–C230	A20B–9001–0940

Polarity

Input POS : (current sink type) – Assumed to be on when the input is high.

Output POS : (current source type) – When it is on, the output goes high.

NOTE

*1 This module (AIF02C) is a re–formed version of the AIF01A, which is the interface module of the I/O Unit–MODEL A. The re–formed version was configured by removing the base expansion function from the AIF01A and adding the function for one channel of the I/O Unit–MODEL B interface unit to the AIF01A. Therefore, the AIF02C can be used only when the I/O Unit–MODEL A is used.
As for detail of this module (AIF02C), refer to ”FANUC I/O Unit–MODEL A CONNECTION·MAINTENANCE MANUAL (B–61813E)”.

*2 When the unit is used with 0.5 A, use it with 8 points at maximum. (Among 12 points (A0 to A5 and B0 to B5), the 8 points A0, A2, A4, A5, B0, B2, B4, and B5 should be used.)

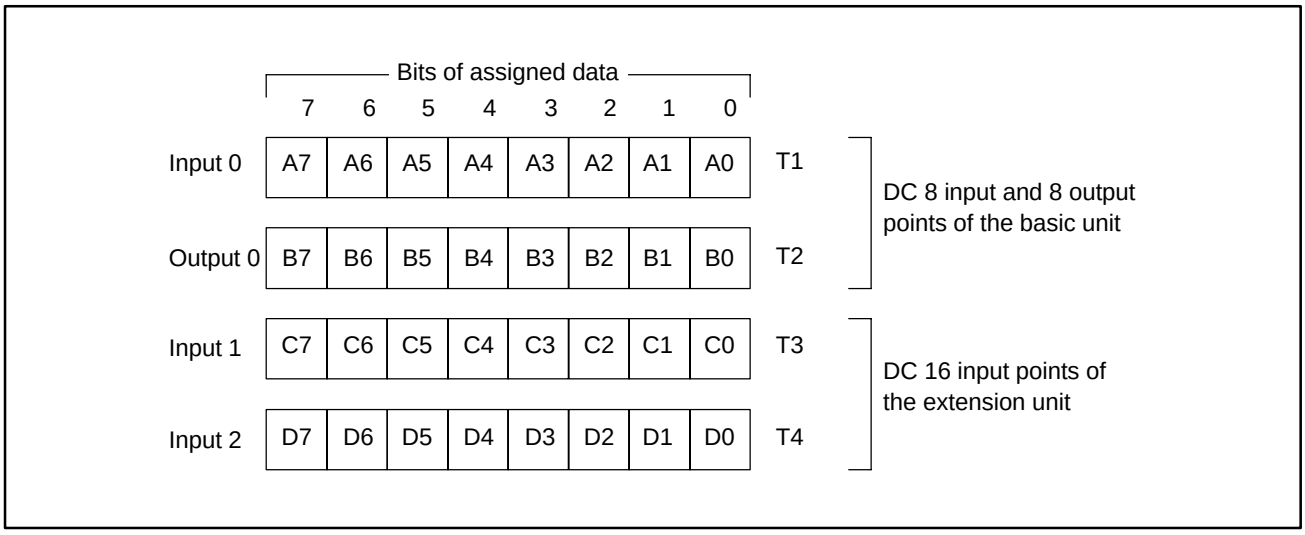
7 BASIC AND EXTENSION UNITS

7.1 INPUT AND OUTPUT SIGNALS AND THEIR ADDRESSES

This section describes the relationship between the input and output points of the DI/DO unit and the input and output data of up to four bytes assigned to them (input 0 to 3, or output 0 to 3). See the example given below:

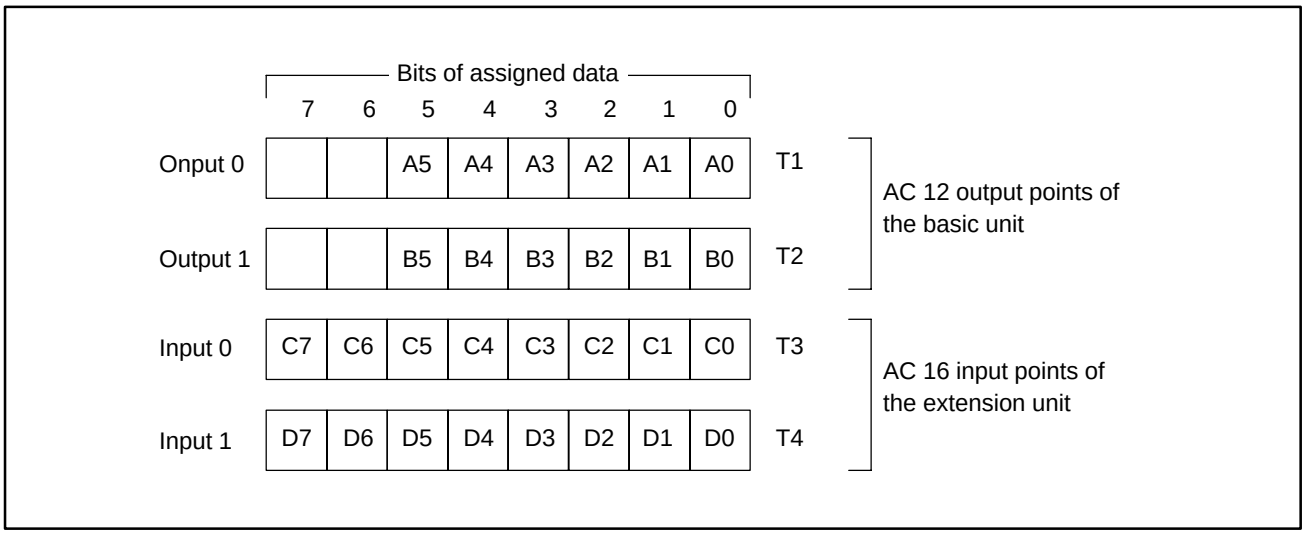
Example1

When the basic unit with DC 8 input and 8 output points, and the extension unit with DC 16 input points are installed, three bytes are used for input (input 0, 1, 2) and one byte is used for output (output 0). The figure below shows the use of the following four terminal boards: T1 (signals A0 to A7) and T2 (signals B0 to B7) of the basic unit, and T3 (signals C0 to C7) and T4 (signals D0 to D7) of the extension unit.



Example2

When the basic unit with AC 12 output points and the extension unit with AC 16 input points are installed, two bytes are used for input (input 0, 1) and two bytes are used for output (output 0, 1). The figure below shows the use of the following four terminal boards: T1 (signals A0 to A5) and T2 (signals B0 to B5) of the basic unit, and T3 (signals C0 to C7) and T4 (signals D0 to D7) of the extension unit.



The table below gives the correspondence between the combination of the basic and extension units and the use of the terminal boards.

		Terminal boards of the basic unit		Terminal boards of the extension unit	
Basic unit	**Extension unit**	**T1 A0 to A7**	**T2 B0 to B7**	**T3 C0 to C7**	**T4 D0 to D7**
8 input points and 8 output points	8 input points and 8 output points	Input 0	Output 0	Input 1	Output 1
	16 input points	Input 0	Output 0	Input 1	Input 2
	16 output points	Input 0	Output 0	Output 1	Output 2
16 input points	8 input points and 8 output points	Input 0	Input 1	Input 2	Output 0
	16 input points	Input 0	Input 1	Input 2	Input 3
	16 output points	Input 0	Input 1	Output 0	Output 1
16 output points or 12 output points	8 input points and 8 output points	Output 0	Output 1	Input 0	Output 2
	16 input points	Output 0	Output 1	Input 0	Input 1
	16 output points	Output 0	Output 1	Output 2	Output 3

7.2 SPECIFICATIONS OF THE BASIC AND EXTENSION UNITS

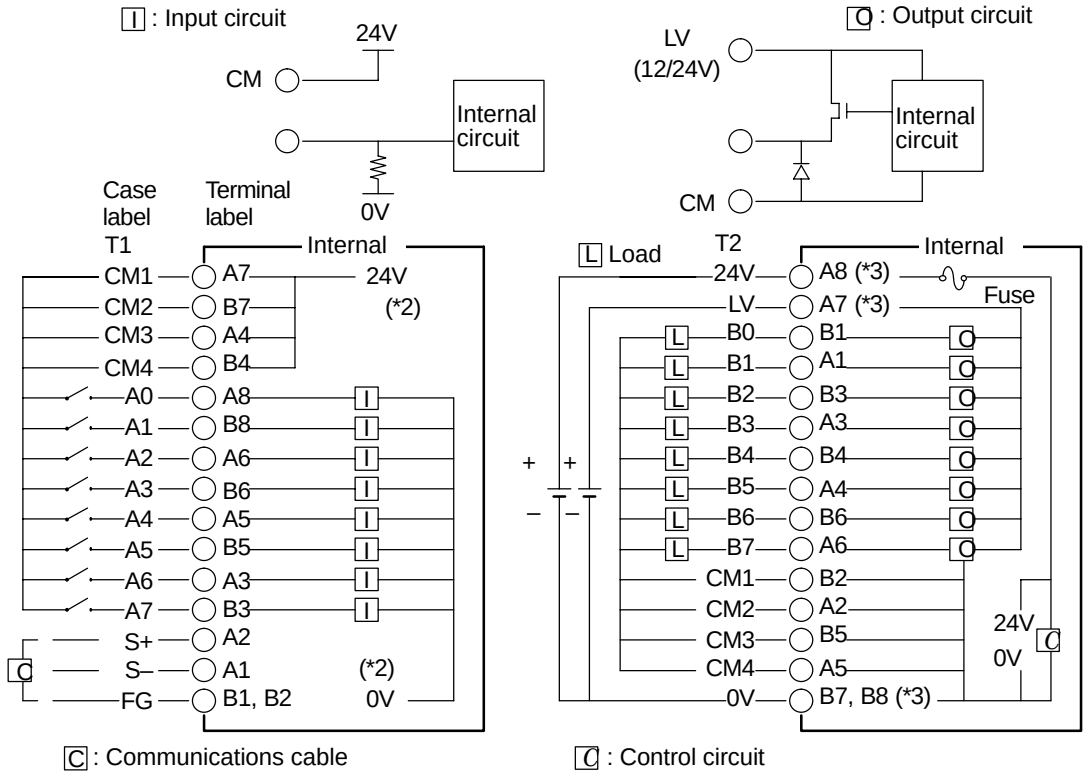
The following tables list the specifications of the basic and extension units.

(1) Basic unit	BMD88A1	: DC 8 input points (20ms) and DC 8 output points
(2) Basic unit	BMD88B1	: DC 8 input points (2ms) and DC 8 output points
(3) Basic unit	BID16A1	: DC 16 input points (20ms)
(4) Basic unit	BID16B1	: DC 16 input points (2ms)
(5) Basic unit	BOD16A1	: DC 16 output points
(6) Basic unit	BOA12A1	: AC 12 output points
(7) Extension unit	BMD88P1	: DC 8 input points (20ms) and DC 8 output points
(8) Extension unit	BMD88Q1	: DC 8 input points (2ms) and DC 8 output points
(9) Extension unit	BID16P1	: DC 16 input points (20ms)
(10) Extension unit	BID16Q1	: DC 16 input points (2ms)
(11) Extension unit	BOD16P1	: DC 16 output points
(12) Extension unit	BIA16P1	: AC 16 input points

(1) Basic unit BMD88A1 (8 input points and 8 output points)

Input			Output		
Item		**Specifications**	**Item**		**Specifications**
Signal		T1 : A0 to A7	Signal		T2 : B0 to B7
Points		8	Points		8
Points/common		8/common (4 common terminals)	Points/common		8/common (4 common terminals)
Current sink or source		Current sink type	Current sink or source		Current source type
–		–	Rated load voltage		LV : 12 to 24V DC, +20%, –15%
Average input current		7.5mA	Maximum load current		0.6A
Voltage and current in the on state		18V DC or higher, 6mA or higher	Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Voltage and current in the off state		6V DC or lower, 1.5mA or lower	Maximum leakage current in the off state		0.1mA
Response time	Off –> On	20ms or less(*1)	Response time	Off –> On	1ms or less(*1)
	On –> Off	20ms or less(*1)		On –> Off	1ms or less(*1)
Input display		LED indications (selected by the rotary switch)	Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)	External connection		Terminal board (M3)
FUSE		2A (for commons/control circuit)	FUSE		Not used
————————		————————	Output protection function		With overheat and overcurrent protection functions

Terminal connection and circuitry

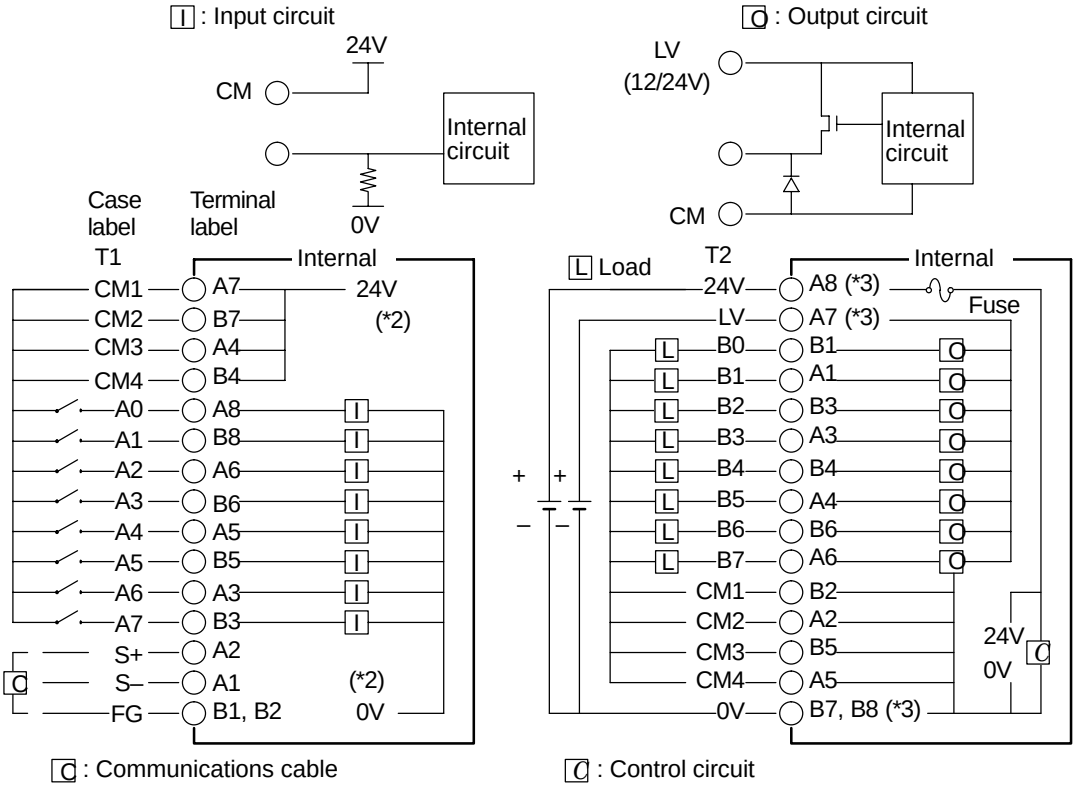


*1 The actual response time is the sum of this value and the scanning time determined by the system.
*2 24V and 0V of T2 are used.
*3 For details, see Subsec. 4.6.3, “Connecting the power cable.”

(2) Basic unit BMD88B1 (8 input points and 8 output points)

Input			Output		
Item		**Specifications**	**Item**		**Specifications**
Signal		T1 : A0 to A7	Signal		T2 : B0 to B7
Points		8	Points		8
Points/common		8/common (4 common terminals)	Points/common		8/common (4 common terminals)
Current sink or source		Current sink type	Current sink or source		Current source type
–		–	Rated load voltage		LV : 12 to 24V DC, +20%, –15%
Average input current		7.5mA	Maximum load current		0.6A
Voltage and current in the on state		18V DC or higher, 6mA or higher	Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Voltage and current in the off state		6V DC or lower, 1.5mA or lower	Maximum leakage current in the off state		0.1mA
Response time	Off –> On	2ms or less(*1)	Response time	Off –> On	1ms or less(*1)
	On –> Off	2ms or less(*1)		On –> Off	1ms or less(*1)
Input display		LED indications (selected by the rotary switch)	Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)	External connection		Terminal board (M3)
FUSE		2A (for commons/control circuit)	FUSE		Not used
————————		————————	Output protection function		With overheat and overcurrent protection functions

Terminal connection and circuitry



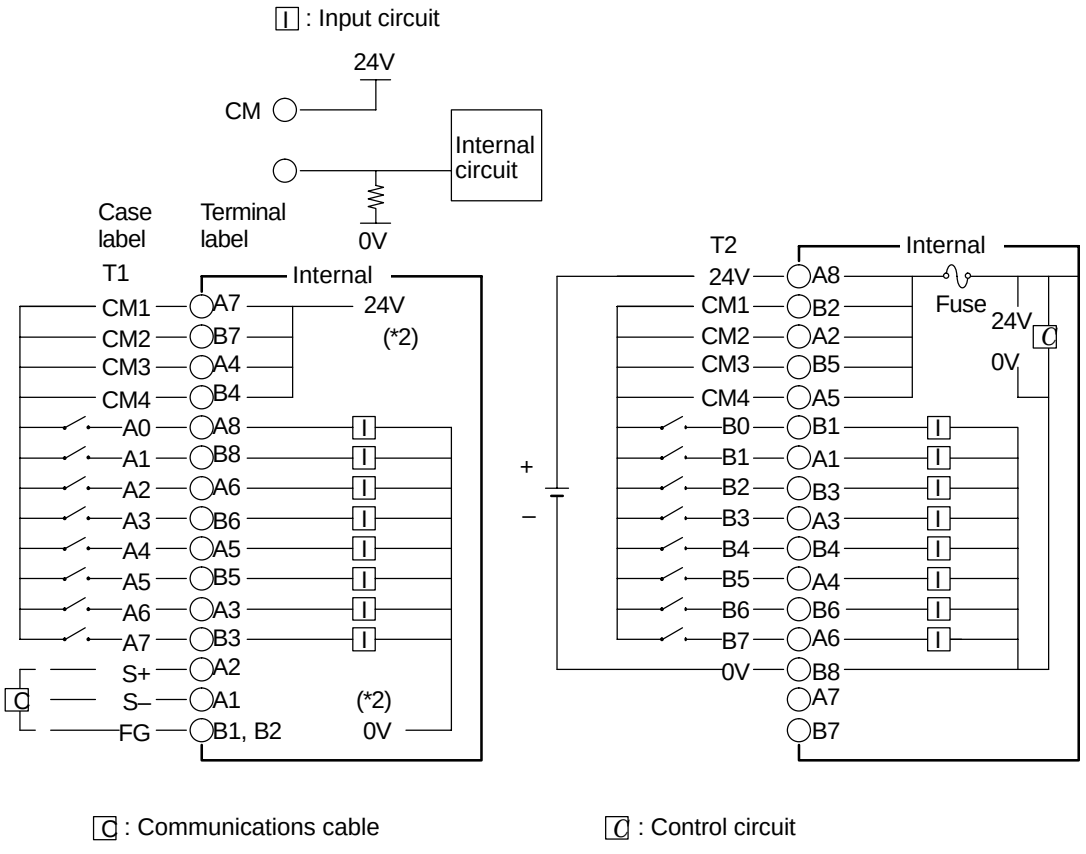
*1 The actual response time is the sum of this value and the scanning time determined by the system.

*2 24V and 0V of T2 are used.

*3 For details, see Subsec. 4.6.3, “Connecting the power cable.”

(3) Basic unit BID16A1 (16 input points)

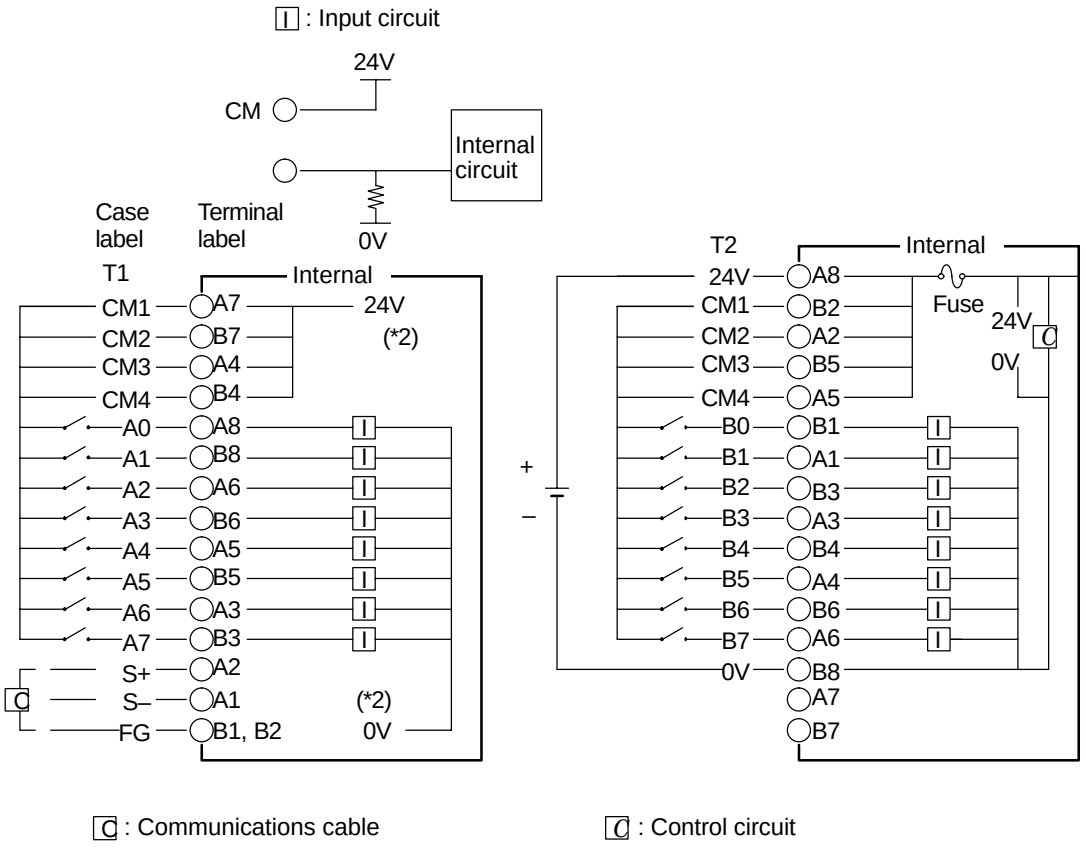
Item		Specifications
Signal		T1 : A0 to A7, T2 : B0 to B7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current sink type
Average input current		7.5mA
Voltage and current in the on state		18V DC or higher, 6mA or higher
Voltage and current in the off state		6V DC or lower, 1.5mA or lower
Response time	Off –> On	20ms or less(*1)
	On –> Off	20ms or less(*1)
Input display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		2A (for commons/control circuit)
Terminal connection and circuitry		



*1 The actual response time is the sum of this value and the scanning time determined by the system.
*2 24V and 0V of T2 are used.

(4) Basic unit BID16B1 (16 input points)

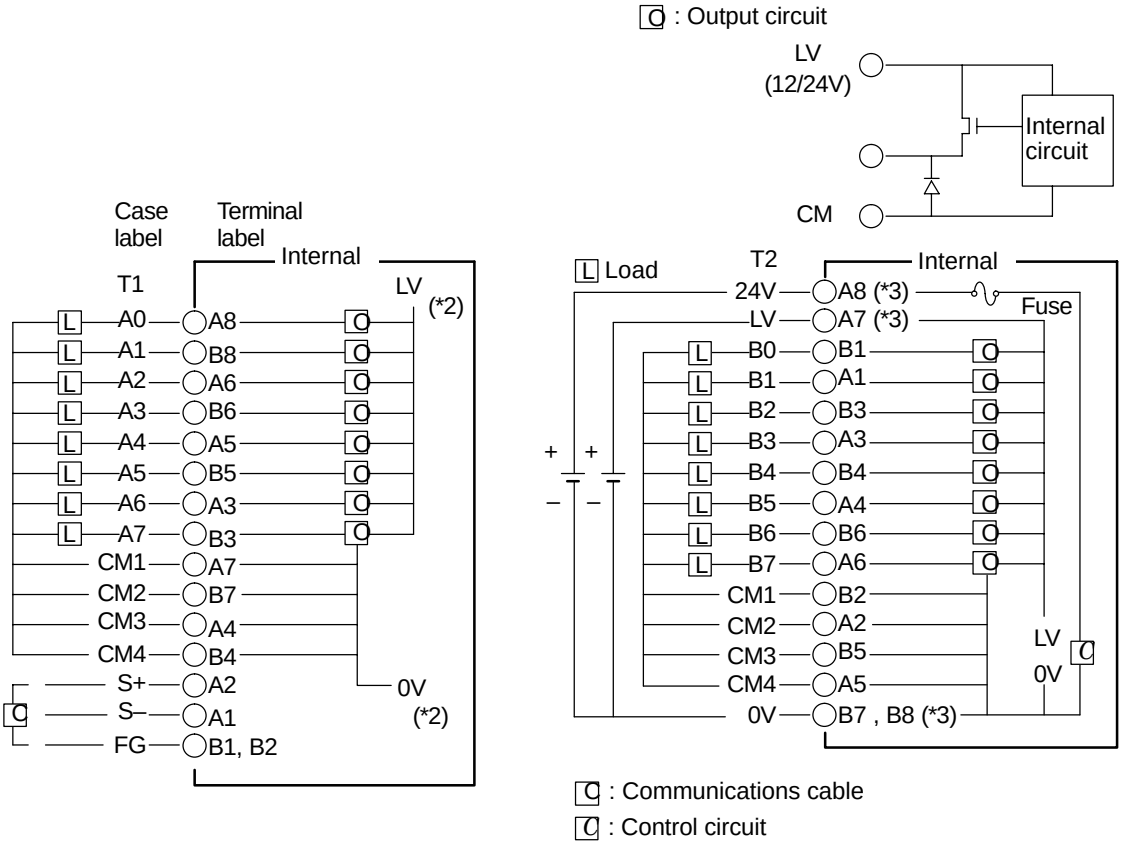
Item		Specifications
Signal		T1 : A0 to A7, T2 : B0 to B7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current sink type
Average input current		7.5mA
Voltage and current in the on state		18V DC or higher, 6mA or higher
Voltage and current in the off state		6V DC or lower, 1.5mA or lower
Response time	Off –> On	2ms or less(*1)
	On –> Off	2ms or less(*1)
Input display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		2A (for commons/control circuit)
Terminal connection and circuitry		



*1 The actual response time is the sum of this value and the scanning time determined by the system.
*2 24V and 0V of T2 are used.

(5) Basic unit BOD16A1 (16 output points)

Item		Specifications
Signal		T1 : A0 to A7, T2 : B0 to B7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current source type
Rated load voltage		LV : 12 to 24V DC, +20%, –15%
Maximum load current		0.6A
Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Maximum leakage current in the off state		0.1mA
Response time	Off –> On	1ms or less(*1)
	On –> Off	1ms or less(*1)
Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Not used (output) / 2A (for control circuit)
Output protection function		With overheat and overcurrent protection functions
Terminal connection and circuitry		

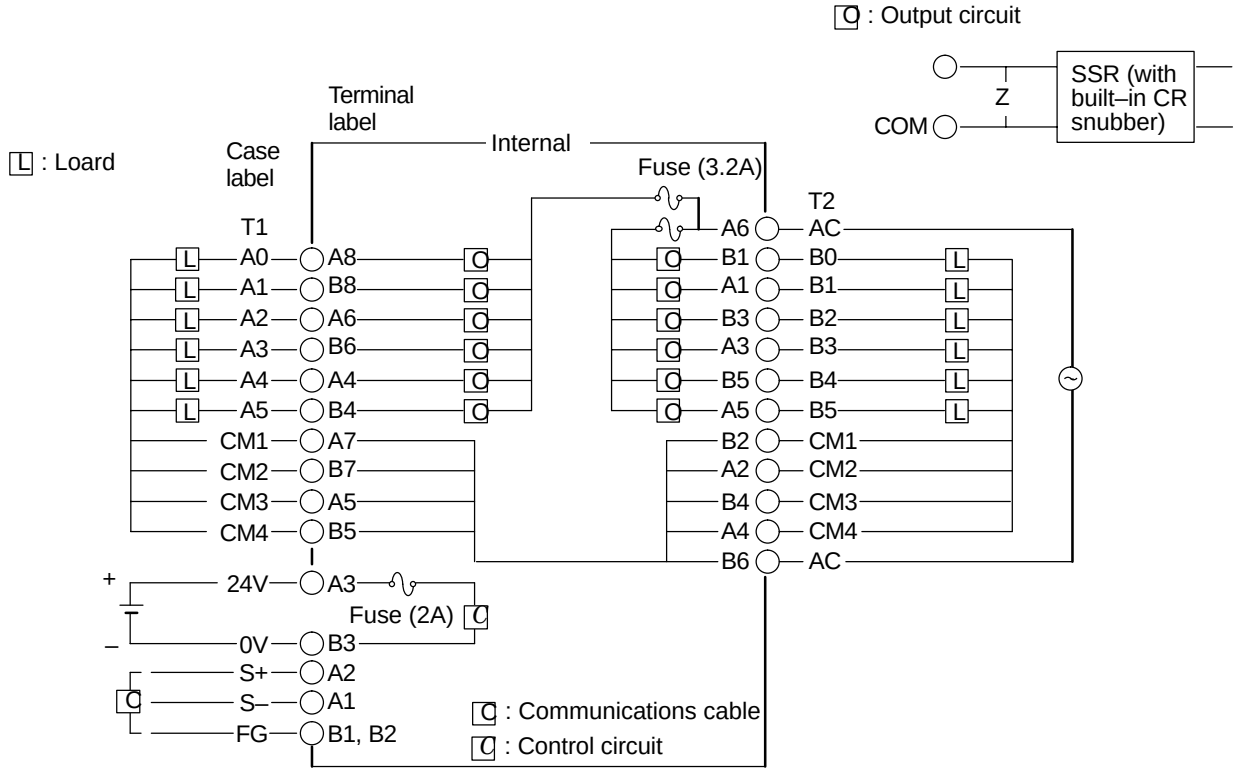


*1 The actual response time is the sum of this value and the scanning time determined by the system.
*2 LV and 0V of T2 are used.
*3 For details, see Subsec. 4.6.3, “Connecting the power cable.”

(6) Basic unit BOA12A1 (12 output points)

Item		Specifications
Signal		T1 : A0 to A5, T2 : B0 to B5
Points		12
Points/common		12/common (8 common terminals)
Rated load voltage		100 to 230V AC, +15%, –15%, 50 to 60 Hz, +3 Hz, –3 Hz
Maximum load current		0.3A/point (Up to 12 points) 0.5A/point (Up to 8 points) Among the 12 points (A0 to A5 and B0 to B5), use the 8 points A0, A2, A4, A5, B0, B2, B4, and B5.
Maximum rush current		5A/point (1 cycle) (*1)
Maximum voltage drop in the on state		1.5 Vrms
Maximum leakage current in the off state		1.0mA (230VAC)
Response time	Off –> On	Half or below the load frequency(with zero–cross control) *2
	On –> Off	Half or below the load frequency(with zero–cross control) *2
Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Two 3.2 A. (One fuse for each of the outputs A0 to A5 and B0 to B5.) 2A (for control circuit)

Terminal connection and circuitry



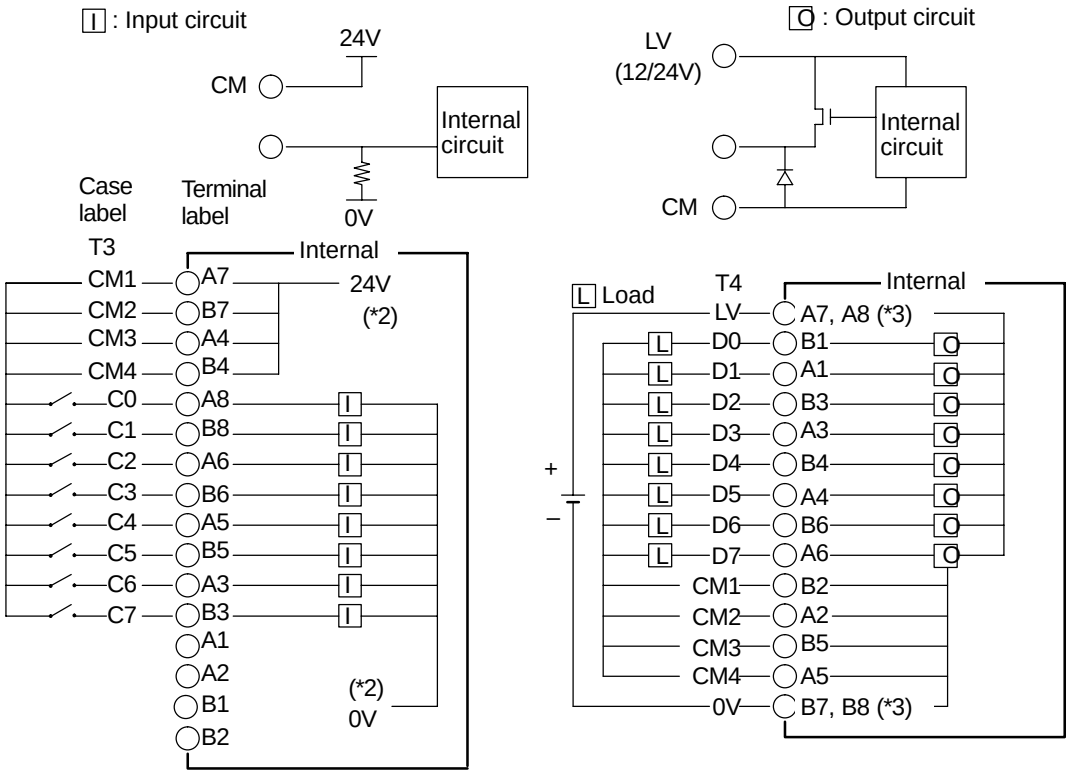
*1 Restrict the total rush current for A0 to A5 to within 15 A. Likewise, restrict the total rush current for B0 to B5 to within 15 A.

*2 The actual response time is the sum of this value and the scanning time determined by the system.

(7) Extension unit BMD88P1 (8 input points and 8 output points)

Input			Output		
Item		**Specifications**	**Item**		**Specifications**
Signal		T3 : C0 to C7	Signal		T4 : D0 to D7
Points		8	Points		8
Points/common		8/common (4 common terminals)	Points/common		8/common (4 common terminals)
Current sink or source		Current sink type	Current sink or source		Current source type
–		–	Rated load voltage		LV : 12 to 24 VDC, +20%, –15%
Average input current		7.5mA	Maximum load current		0.6A
Voltage and current in the on state		18V DC or higher, 6mA or higher	Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Voltage and current in the off state		6V DC or lower, 1.5mA or lower	Maximum leakage current in the off state		0.1mA
Response time	Off –> On	20ms or less(*1)	Response time	Off –> On	1ms or less(*1)
	On –> Off	20ms or less(*1)		On –> Off	1ms or less(*1)
Input display		LED indications (selected by the rotary switch)	Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)	External connection		Terminal board (M3)
FUSE		Basic unit fuse used	FUSE		Not used
————————		————————	Output protection function		With overheat and overcurrent protection functions

Terminal connection and circuitry



*1 The actual response time is the sum of this value and the scanning time determined by the system.

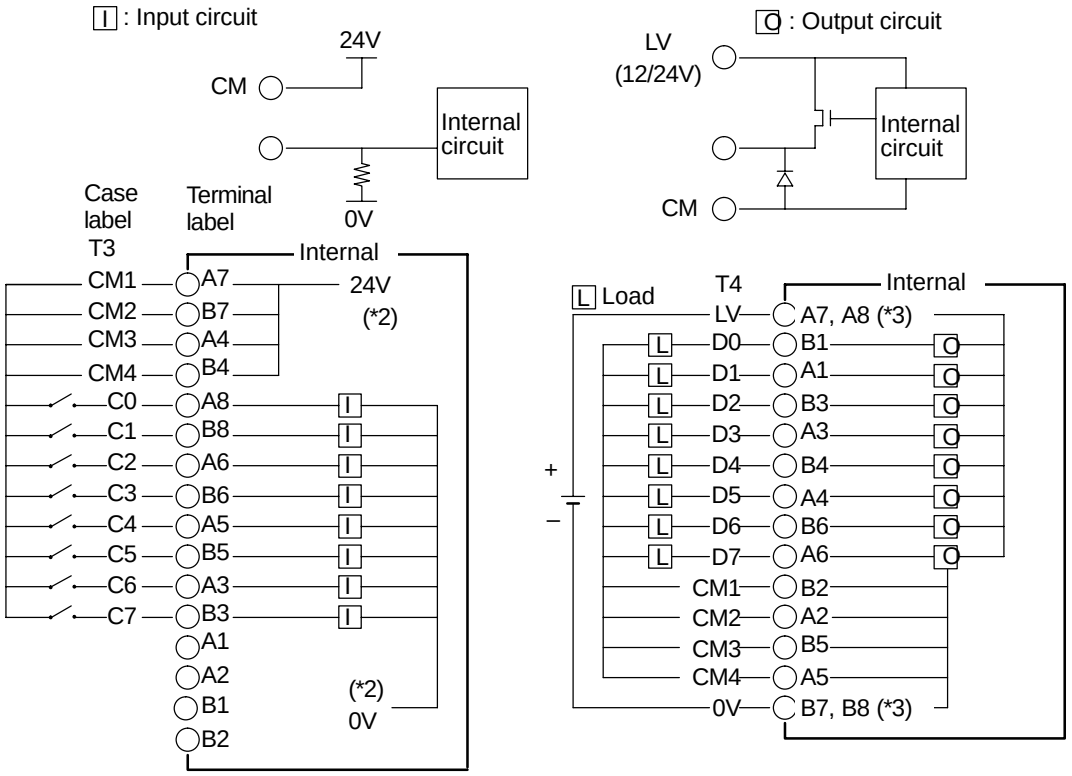
*2 As 24V and 0V of T2 are used (The basic unit supplies the power.), there is a possibility that the fuse of 2A on basic unit blows out when wiring is wrong.

*3 For details, see Subsec. 4.7.2, “Connecting the power cable.”

(8) Extension unit BMD88Q1 (8 input points and 8 output points)

Input			Output		
Item		**Specifications**	**Item**		**Specifications**
Signal		T3 : C0 to C7	Signal		T4 : D0 to D7
Points		8	Points		8
Points/common		8/common (4 common terminals)	Points/common		8/common (4 common terminals)
Current sink or source		Current sink type	Current sink or source		Current source type
–		–	Rated load voltage		LV : 12 to 24 VDC, +20%, –15%
Average input current		7.5mA	Maximum load current		0.6A
Voltage and current in the on state		18V DC or higher, 6mA or higher	Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Voltage and current in the off state		6V DC or lower, 1.5mA or lower	Maximum leakage current in the off state		0.1mA
Response time	Off –> On	2ms or less(*1)	Response time	Off –> On	1ms or less(*1)
	On –> Off	2ms or less(*1)		On –> Off	1ms or less(*1)
Input display		LED indications (selected by the rotary switch)	Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)	External connection		Terminal board (M3)
FUSE		Basic unit fuse used	FUSE		Not used
————————		————————	Output protection function		With overheat and overcurrent protection functions

Terminal connection and circuitry



*1 The actual response time is the sum of this value and the scanning time determined by the system.

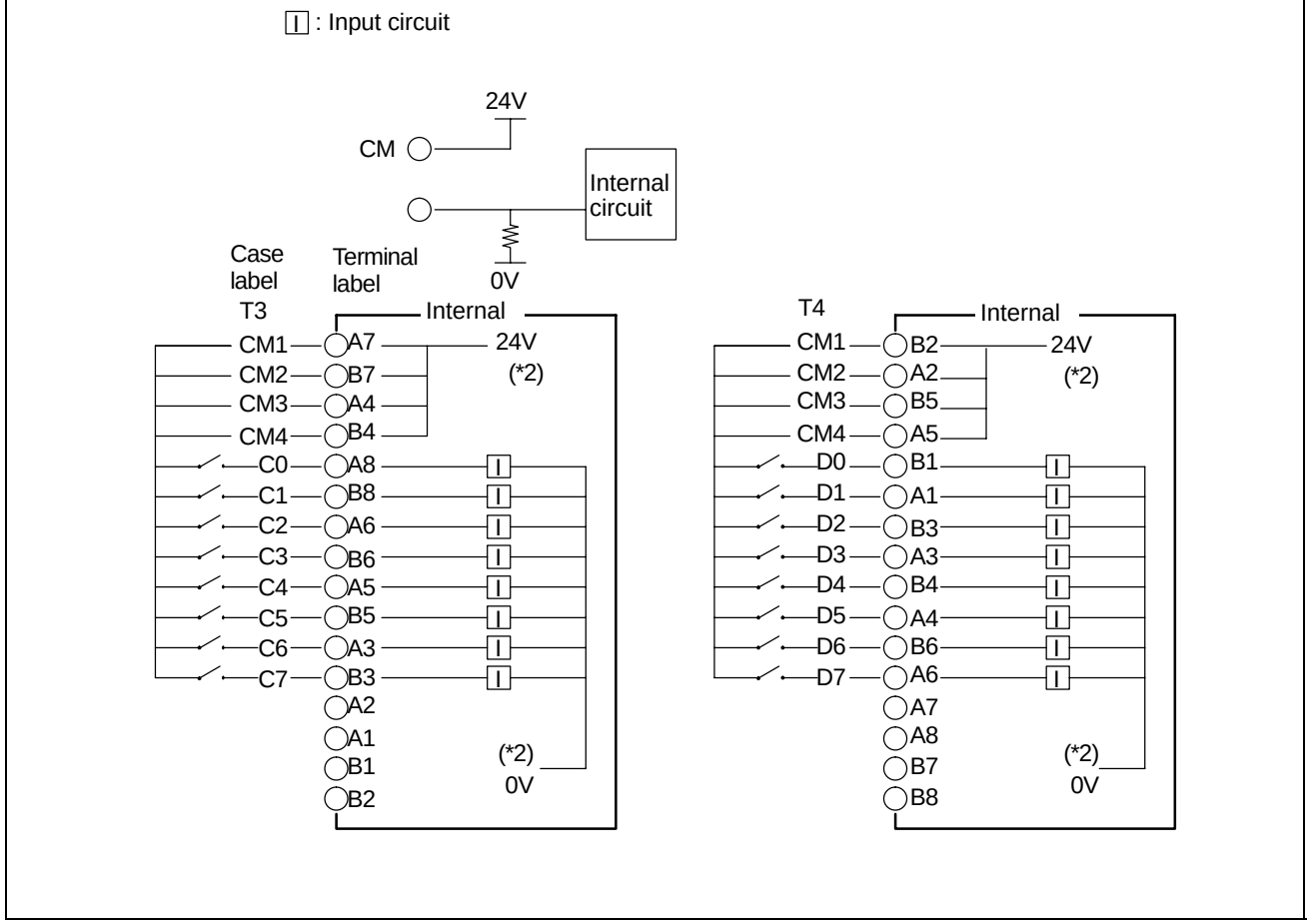
*2 As 24V and 0V of T2 are used (The basic unit supplies the power.), there is a possibility that the fuse of 2A on basic unit blows out when wiring is wrong.

*3 For details, see Subsec. 4.7.2, “Connecting the power cable.”

(9) Extension unit BID16P1 (16 input points)

Item		Specifications
Signal		T3 : C0 to C7, T4 : D0 to D7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current sink type
Average input current		7.5mA
Voltage and current in the on state		18V DC or higher, 6mA or higher
Voltage and current in the off state		6V DC or lower, 1.5mA or lower
Response time	Off –> On	20ms or less(*1)
	On –> Off	20ms or less(*1)
Input display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Basic unit fuse used

Terminal connection and circuitry



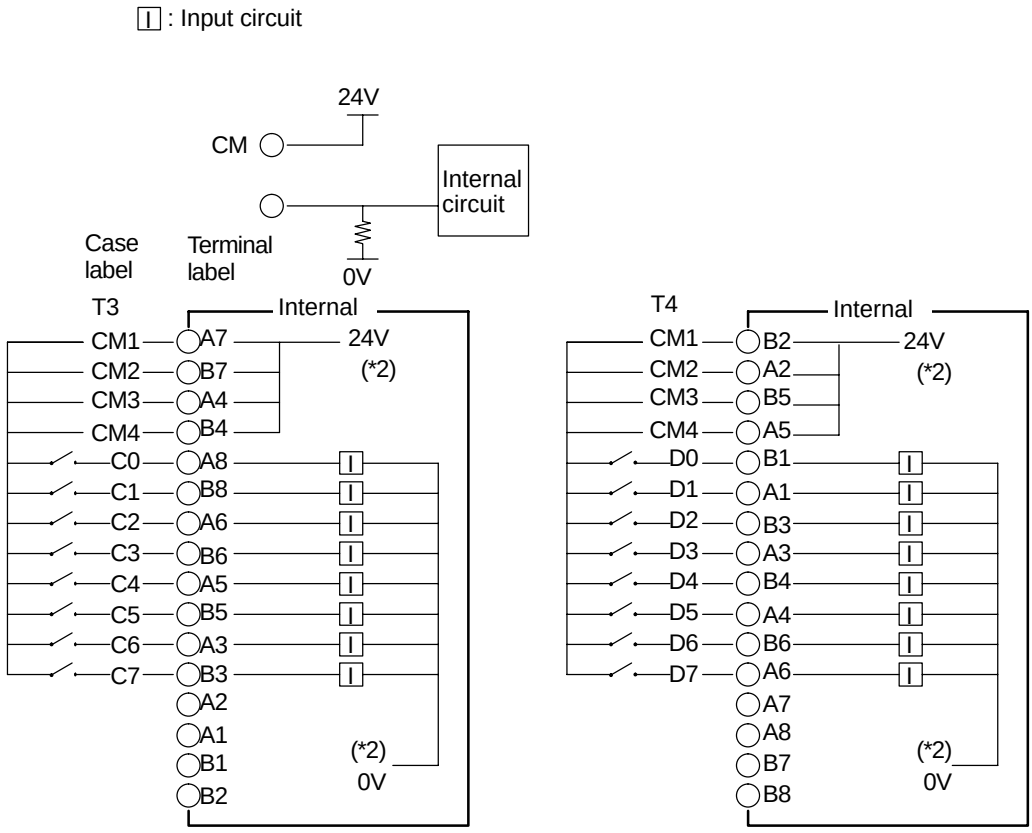
*1 The actual response time is the sum of this value and the scanning time determined by the system.

*2 As 24V and 0V of T2 are used (The basic unit supplies the power.), there is a possibility that the fuse of 2A on basic unit blows out when wiring is wrong.

(10) Extension unit BID16Q1 (16 input points)

Item		Specifications
Signal		T3 : C0 to C7, T4 : D0 to D7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current sink type
Average input current		7.5mA
Voltage and current in the on state		18V DC or higher, 6mA or higher
Voltage and current in the off state		6V DC or lower, 1.5mA or lower
Response time	Off –> On	2ms or less(*1)
	On –> Off	2ms or less(*1)
Input display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Basic unit fuse used

Terminal connection and circuitry

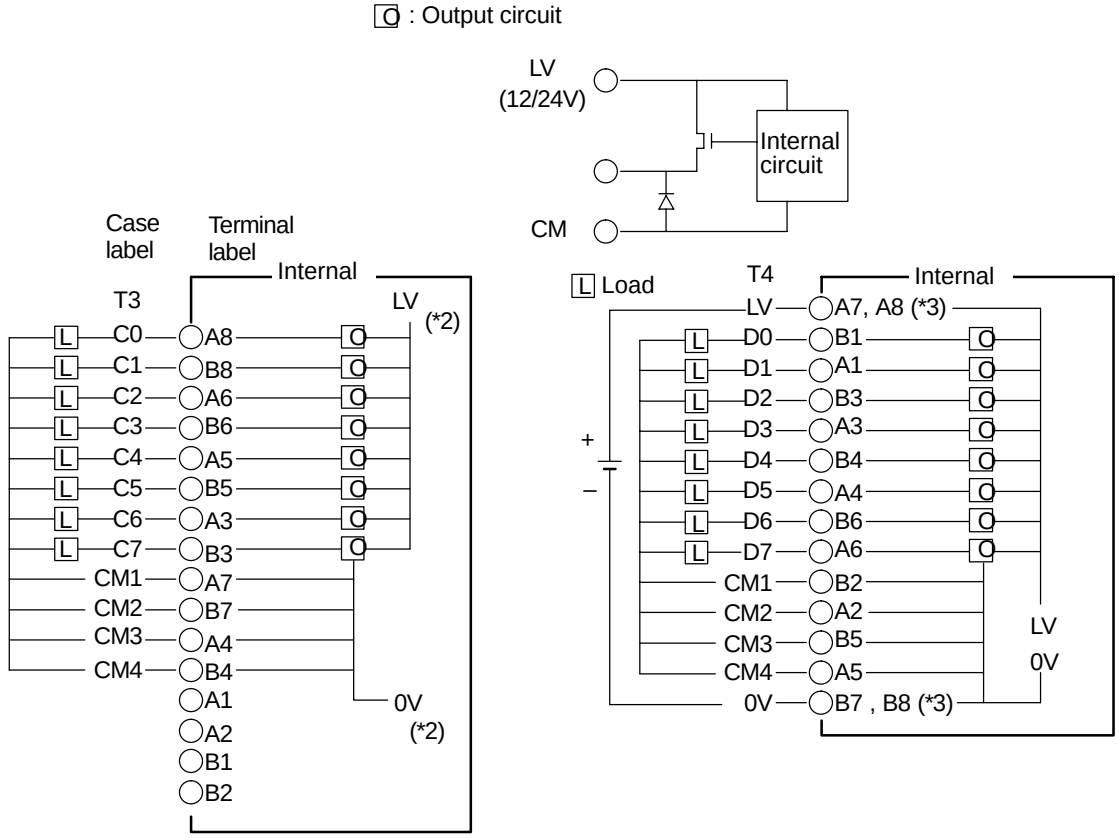


*1 The actual response time is the sum of this value and the scanning time determined by the system.

*2 As 24V and 0V of T2 are used (The basic unit supplies the power.), there is a possibility that the fuse of 2A on basic unit blows out when wiring is wrong.

(11) Extension unit BOD16P1 (16 output points)

Item		Specifications
Signal		T3 : C0 to C7, T4 : D0 to D7
Points		16
Points/common		16/common (8 common terminals)
Current sink or source		Current source type
Rated load voltage		LV : 12 to 24 VDC, +20%, –15%
Maximum load current		0.6A
Maximum voltage drop in the on state		0.36V (load current×0.6Ω)
Maximum leakage current in the off state		0.1mA
Response time	Off –> On	1ms or less(*1)
	On –> Off	1ms or less(*1)
Output display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Not used
Output protection function		With overheat and overcurrent protection functions
Terminal connection and circuitry		

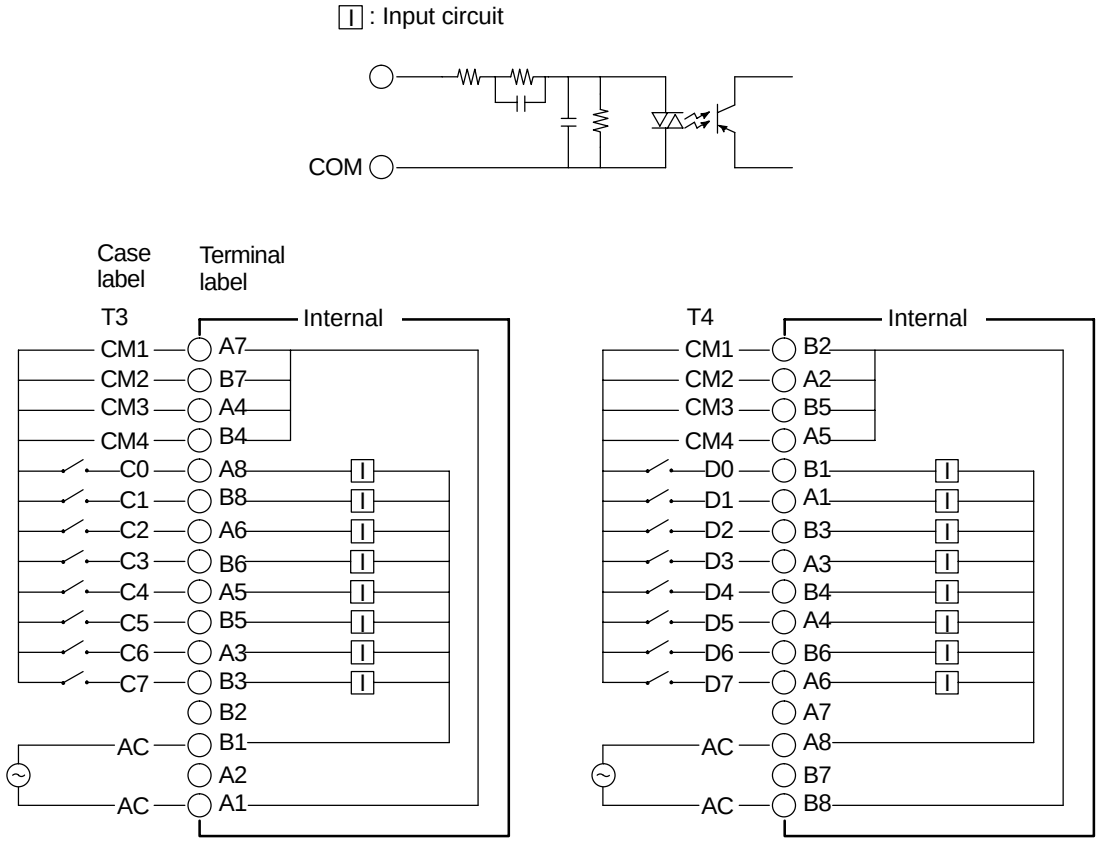


*1 The actual response time is the sum of this value and the scanning time determined by the system.
*2 LV and 0V of T2 are used.
*3 For details, see Subsec. 4.7.2, “Connecting the power cable.”

(12) Extension unit BIA16P1 (16 input points)

Item		Specifications
Signal		T3 : C0 to C7, T4 : D0 to D7
Points		16
Points/common		8/common (4 common terminals)
Rated voltage		100V to 115 VAC +15%, –15%, 50 to 60Hz +3Hz, –3Hz
Maximum rated voltage		132Vrms, 50/60Hz
Input current		8mArms (100VAC, 60Hz)
Voltage and current in the on state		80Vrms or higher, 4.5mArms or higher
Voltage and current in the off state		30Vrms DC or lower, 2mArms or lower
Response time	Off –> On	25ms or less (*1)
	On –> Off	35ms or less (*1)
Input display		LED indications (selected by the rotary switch)
External connection		Terminal board (M3)
FUSE		Not used

Terminal connection and circuitry

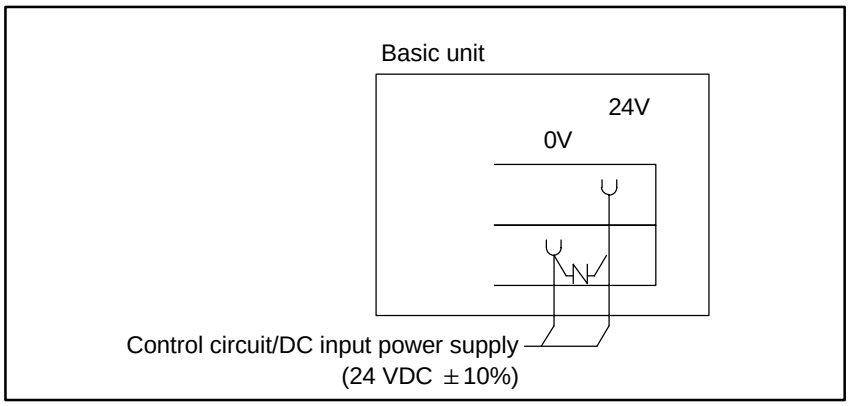


*1 The actual response time is the sum of this value and the scanning time determined by the system.

8 CAUTIONS

8.1 WHEN NOISE IS INDUCED ON DC SUPPLY VOLTAGE

If high noise voltage is induced in the DC power supply (24 V ±10%) of a unit of the I/O Unit–B, the unit may be damaged. If high noise voltage is superimposed in the DC power supply, insert a surge absorber near the terminal board to kill the noise.



8.2 DC OUTPUT PROTECTION

The DC output unit and the DC input and output unit of the I/O Unit–B are provided with output protection functions, which are overheat and overcurrent protection functions.

When the overheat protection function works, the output circuit is turned off. When the temperature in the output circuit drops, the output circuit is turned on again. If overheat occurs again, the protection function works once again, turning off the output circuit. To sum up, the output circuit is turned on and off repeatedly, if temperature in unit is excessive.

The overcurrent protection function works similarly. When it works, it turns off the output circuit. After a certain period of time elapses, the output circuit is turned on in order to enable checking for overcurrent. If there is still an overcurrent condition, the output circuit is turned off again. To sum up, the output circuit is turned on and off repeatedly until the overcurrent condition is eliminated completely.

Note that when either protection function works, it is impossible to drive the load, because the output circuit is turned off.

8.3 DC OUTPUT OVERVOLTAGE

If a rated voltage is exceeded, the internal element protection circuit works to turn off the output circuit. When the rated voltage is recovered, the output circuit is turned on again. If the internal element protection circuit works to keep the output circuit turned off, the protection circuit can overheat. Be sure to keep in mind that overheat resulting from overvoltage can lead to damage of an internal element because the overheat protection circuit does not work.

Note that similarly to the other protection functions, when the overcurrent protection function works, it is impossible to drive the load because the output circuit is turned off.

8.4 POWER ON/OFF

(1) Interface unit

Unlike the power to the basic unit, the power to the interface unit cannot necessarily be turned on and off as you like. The interface unit power should be turned on simultaneously with or before the power to the I/O Link master unit. When turning off the interface unit power, turn off both the master and slaves.

(2) Basic (+ extension) unit

The control power to the basic unit or the basic plus extension unit can be turned on and off whenever you like.

8.5 INPUT SECTION (DI) WIRING

The positive pole of the DC power (24 V ±10%) supplied to each unit is connected to the common terminals (CM1 to CM4) of the input section (DI). Be careful when wiring. Power to input devices should be wired from these common terminals (CM1 to CM4) to provide fuse protection of the input control hardware.

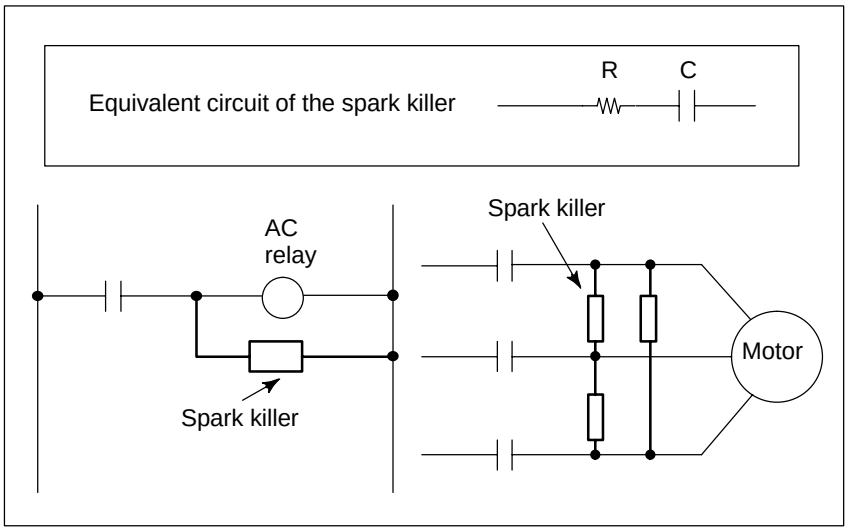
8.6 NOISE SUPPRESSOR

The AC/DC solenoids and relays are typically used in the power magnetics/control cabinet.
A high pulse voltage is caused by coil inductance when these devices are turned on or off.
This pulse voltage induced through the cable causes the electronic circuits to be disturbed.
To decrease this pulse voltage, use a spark killer for AC load such as AC motor and a diode for DC load such as DC relay.

Notes on selecting the spark killer

- Use a spark killer consisting of a resistor and capacitor in series. This type of spark killer is called a CR spark killer.(Use it for AC load)
  (A varistor is useful in clamping the peak voltage of the pulse voltage, but cannot suppress the sudden rise of the pulse voltage. FANUC therefore recommends a CR spark killer.)
- The reference capacitance and resistance of the spark killer shall conform to the following based on the current (I (A)) and DC resistance of the stationary coil:
  1) Resistance (R) : Equivalent DC resistance of the coil
  2) Capacitance (C) : $\frac{I^2}{10} \sim \frac{I^2}{20}$ (μF)

     I : Current at steady state of the coil



9 SAFETY FOR USING AC

If AC output unit or AC input unit is used, 9.1 is recommended for safety. As for AC output unit 9.2 is also recommended. If 9.1 and 9.2 must be observed for Europe.[conforming to EN50178]

9.1 INSTALLATION ENVIRONMENT

9.1.1 Installation Category (Overvoltage Category)

Install the unit in the environment of installation category (overvoltage category) II or better.
[DIN VDE 0110]

The available impulse surge level to the ground that appears in the power source is 2.5kV maximum.
(100VAC system power source is needed in AC input unit. According to the standard, the available impulse surge level to the ground is 1.5kV for this power source (voltage of which is 150VAC or less). However, for this unit, the available impulse surge level to the ground that appears in the power source is 2.5kV.)

Generally, an isolation transformer used for the main power source is regarded as an effective surge filter.

9.1.2 Pollution Degree

Install the unit in the environment of pollution degree 2 or better. [EN50178]

In terminal box of IP–54 or better (described in 3.1.2.1), it can be considered as pollution degree 2 or better usually. The IP degree required is dependent on the circumstances of machine tool, so please choose the adequate degree in accordance with such environment.

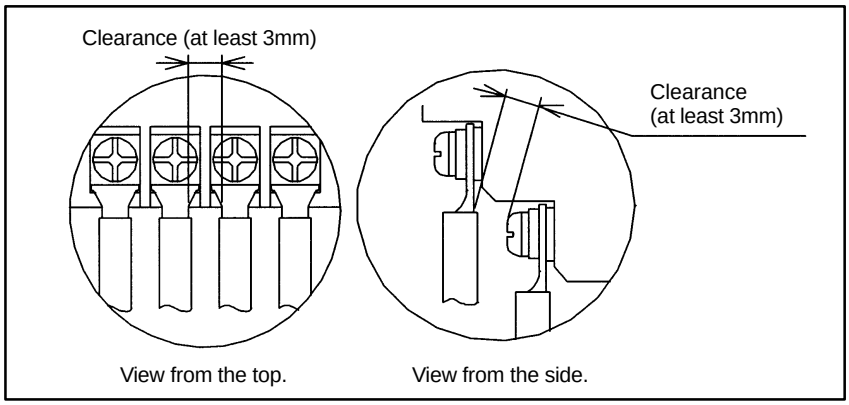
9.2 AC OUTPUT UNIT

(In this section, “low voltage” means 24VDC or 5VDC. And “high voltage” means 100VAC or 200VAC.)

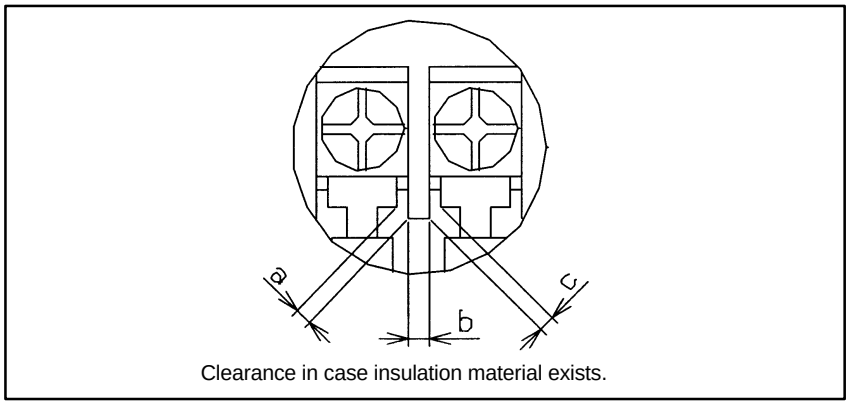
In AC output unit, there are both low voltage part and high voltage part on a terminal (T1). For safety it is important that the low voltage part must be protectively separated from high voltage.
It is necessary to maintain a clearance of at least 3mm between the incoming high voltage and low voltage parts, like the figures below. For this unit, please be careful to maintain this clearance between high voltage terminals A4 & A5 and low voltage terminals 24V & 0V(Refer to 4.6–(2)).

It is also necessary to maintain a creepage distance of at least 5mm between the incoming high voltage and low voltage parts. The creepage distance means the distance along the surface of the insulation between two conductors (Refer to IEC664 as to definition of creepage distance).

Do not use exposed wire for wiring. In order to maintain the clearance and creepage distance, it is necessary to use an insulation sleeve.



If there is insulation material between the two conductors, the clearance is considered to be the distance measured around the insulation (for example in the figure below, the clearance is the distance equal to a+b+c).



II. PMC PROGRAMMING

II. PMC PROGRAMMING

1 GENERAL

This part is concerning the address assignment when FANUC I/O Unit–MODEL B (It is abbreviated as I/O Unit–B) is used.

2 APPLIED SOFTWARE

2.1 PMC CONTROL SOFTWARE / BUILT–IN LADDER EDITING SOFTWARE

NC model	PMC model	Applied series/edition	Note
FS15–A	PMC–N	4045/09	
FS15–B	PMC–NA PMC–NB PMC–NB,NB2	4046/07 4047/01 4048/01	
FS16–A	PMC–SB,SB2 PMC–SB3 PMC–SC,SC3	B002/14, B003/15, B004/08, B102/09, B103/19, B104/06, B304/06, B005/03, B105/02 B305/01, B009/01, B109/01 4062/ 10	PMC control software 4061/17 4063/03
FS18–A	PMC–SA1,SA2 PMC–SA3	BD01/11, BD02/03, BE01/14, BE02/06, BG01/10, BG21/08 BD03/01, BE03/01, BG03/01, BG23/01, BD09/01, BE09/01	PMC control software 4070/10 4071/03
	LADDER editing module	4065/07	
FS16–B FS18–B	PMC–SB3,SB4 PMC–SC3,SC4	4066/01 4068/01	
	LADDER editing card	4073/01	
FS16–C FS18–C	PMC–SB5,SB6 PMC–SC3,SC4	4067/01 4068/01	
	LADDER editing card	4090/01	
FS20–A	PMC–SA1,SA3	D001/01 D101/01	PMC control software 4080/01
	LADDER editing card	4081/01	
FS21T–A	PMC–PA1,PA3	8866/01	PMC control software 4075/06
	LADDER editing card	4076/02	
FS21T–B	PMC–SA1,SA3	DE01/01	PMC control software 4082/01 4082/01
	LADDER editing card	4083/01	
FS21M–B	PMC–SA1,SA3	D201/01	PMC control software 4080/01
	LADDER editing card	4081/01	
FS21M–B FS210T–B	PMC–SA1,SA3	4084/01	
	LADDER editing card	4085/01	
FS210T–B loader control	PMC–SA1	4086/01	
	LADDER editing card	4087/01	
Power Mate–D	PMC–PA1,PA3	8830/14, 8831/01, 8832/01 8834/01, 8835/01, 8836/01 8837/01	PMC control software 4075/05
	LADDER editing card	4076/02	
Power Mate–H	PMC–PA1,PA3	8880/01	PMC control software 4078/01
	LADDER editing card	4079/01	
F–D Mate	PMC–QA	4050/08 4051/03	
F–D Mate mini	PMC–QC	4054/02 4055/01	

2.2 OFFLINE PROGRAMMER

To use I/O Unit–B, the following programming software is necessary.

<FAPT LADDER>

No	floppy disk	Model	Drawing number	Edition	Note
1	FAPT LADDER PMC–N system floppy	PC98	A08B–9200–J501#JP	06.2	PMC–NA
				06.3	PMC–QA
		PC/AT	A08B–9201–J501#JP	06.2	PMC–NA
				06.3	PMC–QA
2	FAPT LADDER PMC–SB/SC system floppy	PC98	A08B–9200–J502#JP	06.1	PMC–SA1/SA2/SA3 SB/SB2/SB3 SC/SC3 PA1/PA3
				07.1	PMC–SB4/SC4
				08.5	PMC–SB5/SB6/NB2
		PC/AT	A08B–9201–J502#JP	06.1	PMC–SA1/SA2/SA3 SB/SB2/SB3 SC/SC3 PA1/PA3
				07.1	PMC–SB4/SC4
				08.5	PMC–SB5/SB6/NB2
3	FAPT LADDER PMC–SA1/SA3 module floppy Note 1)	PC98	A08B–9200–J603#JP	04.1	PMC–SA1/SA2/SA3 PA1/PA3
		PC/AT	A08B–9201–J603#JP	04.1	PMC–SA1/SA2/SA3 PA1/PA3
4	FAPT LADDER PMC–SB/SC module floppy Note 1)	PC98	A08B–9200–J604#JP	04.7	PMC–SB/SB2/SB3
				05.0	PMC–SB4
				07.0	PMC–SB5/SB6
		PC/AT	A08B–9201–J604#JP	04.7	PMC–SB/SB2/SB3
				05.0	PMC–SB4
				07.0	PMC–SB5/SB6
5	FAPT LADDER PMC–QC module floppy Note 1)	PC98	A08B–9200–J605#JP	01.1	PMC–QC
		PC/AT	A08B–9201–J605#EN	01.1	PMC–QC
6	FAPT LADDER PMC–NB module floppy Note 1)	PC98	A08B–9200–J606#JP	01.0	PMC–NB
				03.0	PMC–NB2
		PC/AT	A08B–9201–J606#JP	01.0	PMC–NB
				03.0	PMC–NB2

<FAPT LADDER–II>

No	floppy disk	Model	Drawing number	Edition	Note
7	FAPT LADDER–II	PC/AT	A08B–9201–J503#ZZ	01.0	PMC–SA3 SB3/SB4/SB5/SB6 SC3/SC4 QC NB/NB2

<Ladder Editing Package>

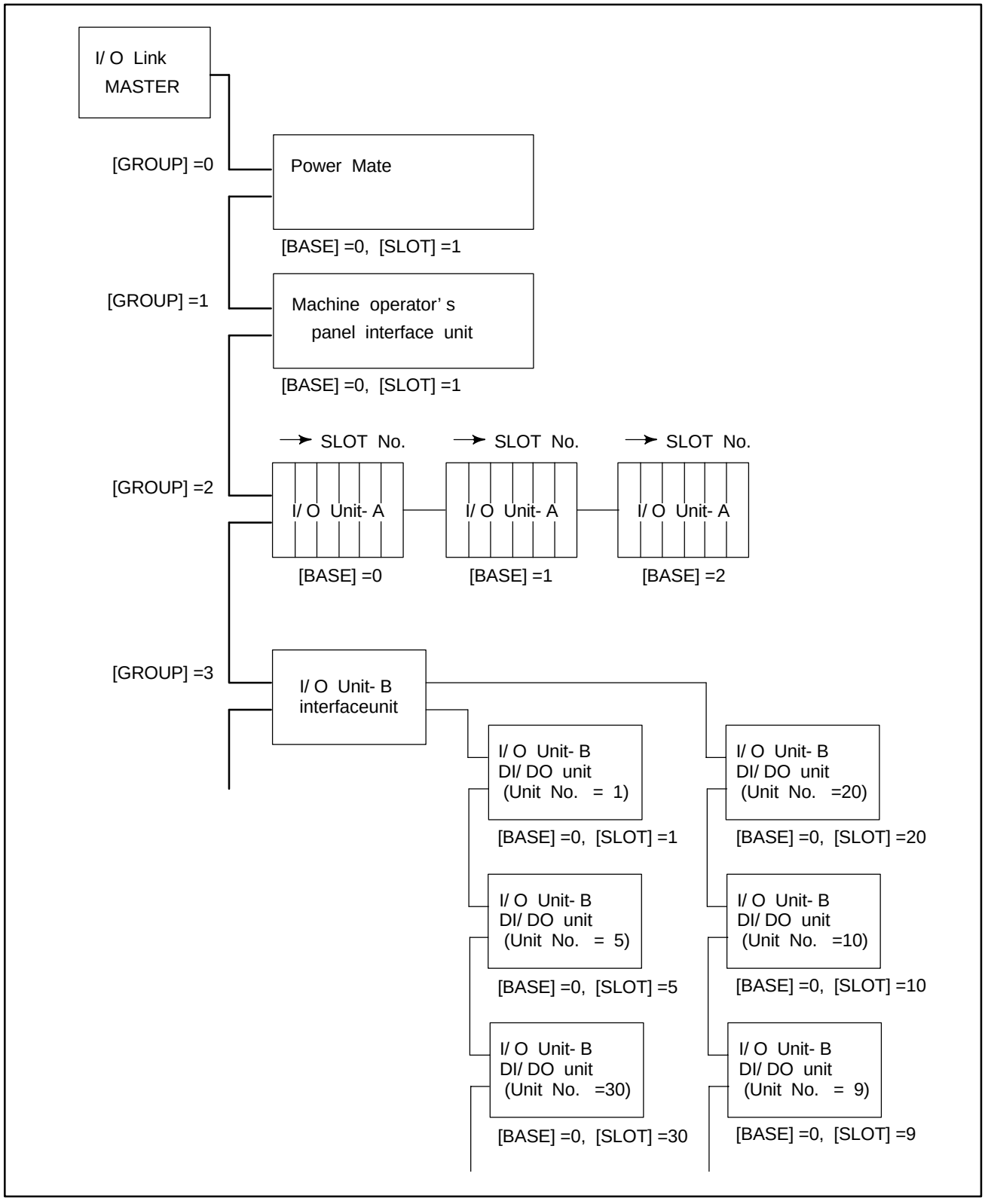
No	floppy disk	Model	Drawing number	Edition	Note
8	Ladder Editing Package	PC/AT	A08B–9201–J510#ZZ	01.0	PMC–SB3/SB4/SB5/SB6 SC3/SC4

NOTE
1 The No.1 “FAPT LADDER PMC–SB/SC system floppy” is necessary.
2 In P series, I/O Unit–B is not supported. When LADDER including assignment data for I/O Unit–B is edited by P series, the following limitations exist.
  1) The assignment data for I/O link DI/DO units cannot be edited.
  2) The assignment data is not correctly displayed.
  3) LADDER cannot be output in the source form.

3 ADDRESS ASSIGNMENT

3.1 SPECIFICATION OF CONNECTING POSITION

You can use I/O Unit–B with current I/O Link DI/DO units like Power Mate, machine operator's panel interface unit, operator's panel connection unit and I/O Unit–A, etc. In this case, I/O Unit–B occupies one group. Therefore, no other unit except I/O Unit–B can exist in the same group. The connection example is shown in the following.



The position where the I/O Link DI/DO units is connected is specified by the GROUP number, the BASE number and the SLOT number. The I/O Link DI/DO units can be classified into following three types.

(1) A type to be specified by GROUP number, BASE number and SLOT number

I/O Unit–A is of this type. The connecting position is specified by the GROUP number , the BASE number and the SLOT number. The value, which can be specified, is as follows.

GROUP = 0 – 15 ... Group number (serial number)
BASE = 0 – 3 ... Base number (serial number)
SLOT = 1 – 10 ... Slot number on I/O Unit–A base board

(2) A type to be specified by GROUP number and SLOT number

I/O Unit–B is of this type. Always set the BASE number to 0. Set the SLOT number to the unit–number of I/O Unit–B. The value, which can be specified, is as follows.

GROUP = 0 – 15 ... Group number (serial number)
BASE = 0 ... Always set to 0.
SLOT = 0 ,1 – 30... Unit number (1–30) of I/O Unit–B DI/DO unit

When I/O Unit–B is used, power on/off information on the DI/DO unit can be read.
When you read power on/off information, set the SLOT number to 0 and use "##" as module NAME. The details of signal of power supply information are described in "I. CONNECTION 4.3.2 Power On/Off Information"on this manual.

(3) A type to be specified by GROUP number

- Machine operator's panel interface unit
- Operator's panel connection unit
- I/O Link connecting unit
- Power Mate
- FS0 etc.

Any other I/O Link DI/DO units except I/O Unit–A and B are of this type. They occupy one group by one unit. When you use these units, set the BASE number to 0 and set the SLOT number to 1. The value, which can be specified, is as follows.

GROUP = 0 – 15 ... Group number (serial number)
BASE = 0 ... Always set 0.
SLOT = 1 ... Always set 1.

3.2 PMC ADDRESS

The list of the PMC address which can be assigned for I/O Unit–B is shown in the following. These addresses are the same as the one to be used with other I/O Link DI/DO units.

CNC model	PMC model	Input address	Output address
FS15–A FS15–B FS16–A FS18–A FS16,18–B FS16,18–C FS20–A FS21T–A FS21T–B FS21M–B FS210T–B FS210T–B loader control Power Mate–D Power Mate–H	PMC–N PMC–NA,NB PMC–SB,SB2,SB3, SC,SC3 PMC–SA1,SA2,SA3 PMC–SA1,SB3,SB4, SC3,SC4 PMC–SA1,SB5,SB6, SC3,SC4 PMC–SA1,SA3 PMC–PA1,PA3 PMC–SA1,SA3 PMC–SA1,SA3 PMC–SA1,SA3 PMC–SA1,SA3 PMC–PA1,PA3 PMC–PA1,PA3	X0 to 127	Y0 to 127
F–D Mate F–D Mate mini	PMC–QA PMC–QC	X0 to 127(1ch) X200 to 327(2ch)	Y0 to 127(1ch) Y200 to 327(2ch)

3.3 MODULE NAME

The module NAME of I/O Unit–B is shown in the following.

The number of byte [Basic unit]+[Extension unit]	Module NAME	The number of byte
1 byte	#1	Input or Output 1 byte
2 byte	#2	Input or Output 2 byte
3 byte	#3	Input or Output 3 byte
4 byte	#4	Input or Output 4 byte
6 byte	#6	Input or Output 6 byte
8 byte	#8	Input or Output 8 byte
10 byte	#10	Input or Output 10 byte
Power supply information	##	Input 4 byte

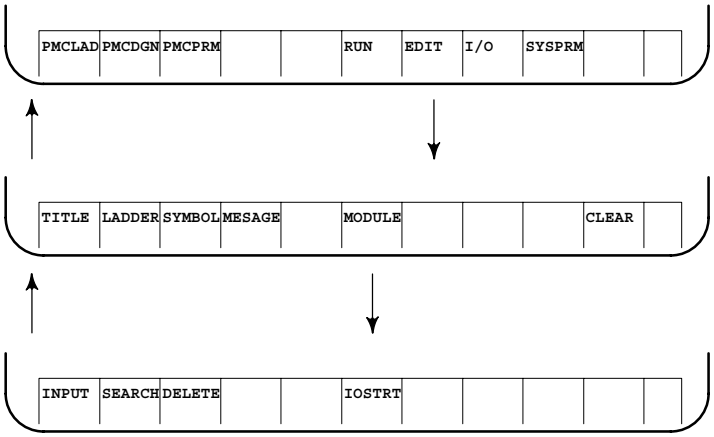
4 OPERATION

4.1 SCREEN COMPOSITION

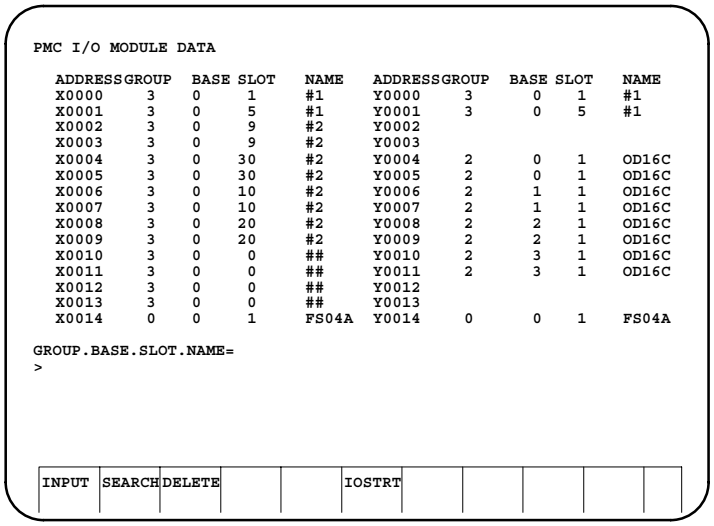
4.1.1 Built–in Editing Function

(1) PMC–NB,PMC–QC,PMC–SC,SC3,SC4
PMC–SA1,SA2,SA3,SB,SB2,SB3,SB4,SB5,SB6 with LADDER editing function
PMC–PA1,PA3 with LADDER editing function

(a) Relation of soft key

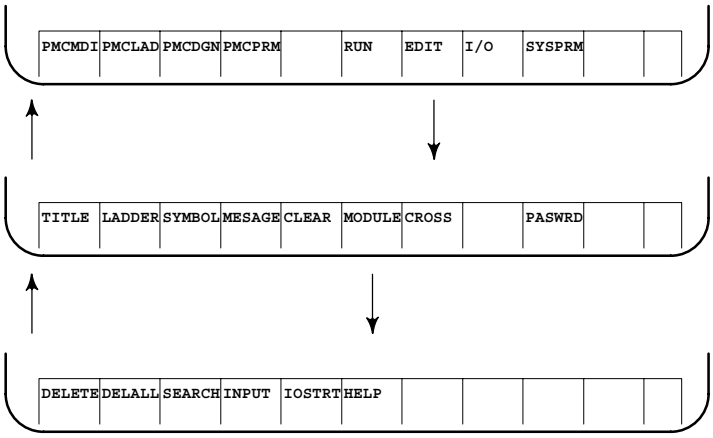


(b) Setting screen



(2) PMC–N, PMC–NA, PMC–QA

(a) Relation of soft key



(b) Setting screen

```
PMC I/O MODULE DATA

   ADDRESS GROUP  BASE SLOT   NAME   ADDRESS GROUP  BASE SLOT   NAME
   X000      3    0     1     #1     Y0000     3      0    1    #1
   X001      3    0     5     #1     Y0001     3      0    5    #1
   X002      3    0     9     #2     Y0002
   X003      3    0     9     #2     Y0003
   X004      3    0    30     #2     Y0004     2      0    1    OD16C
   X005      3    0    30     #2     Y0005     2      0    1    OD16C
   X006      3    0    10     #2     Y0006     2      1    1    OD16C
   X007      3    0    10     #2     Y0007     2      1    1    OD16C
   X008      3    0    20     #2     Y0008     2      2    1    OD16C
   X009      3    0    20     #2     Y0009     2      2    1    OD16C
   X010      3    0     0     ##     Y0010     2      3    1    OD16C
   X011      3    0     0     ##     Y0011     2      3    1    OD16C
   X012      3    0     0     ##     Y0012
   X013      3    0     0     ##     Y0013
   X014      0    0     1     FS04A  Y0014     0      0    1    FS04A

GROUP.BASE.SLOT.NAME=
>
```

DELETE DELALL SEARCH INPUT IOSTRT HELP

4.1.2 FAPT LADDER for Personal Computer

(1) Setting screen

```
    EDIT (I/O MODULE)          PMC-RB      <O>[E:¥ LADDER¥ WORK¥
   [CHANNEL 1]

   ADDRESS GROUP  BASE SLOT   NAME   ADDRESS GROUP  BASE SLOT   NAME
   X0000     3    0    01     #1     Y0000     3      0    01   #1
   X0001     3    0    05     #1     Y0001     3      0    05   #1
   X0002     3    0    09     #2     Y0002
   X0003     3    0    09     #2     Y0003
   X0004     3    0    30     #2     Y0004     2      0    01   OD16C
   X0005     3    0    30     #2     Y0005     2      0    01   OD16C
   X0006     3    0    10     #2     Y0006     2      1    01   OD16C
   X0007     3    0    10     #2     Y0007     2      1    01   OD16C
   X0008     3    0    20     #2     Y0008     2      2    01   OD16C
   X0009     3    0    20     #2     Y0009     2      2    01   OD16C
   X0010     3    0    00     ##     Y0010     2      3    01   OD16C
   X0011     3    0    00     ##     Y0011     2      3    01   OD16C
   X0012     3    0    00     ##     Y0012
   X0013     3    0    00     ##     Y0013
   X0014     0    0    01     FS04A  Y0014     0      0    01   FS04A
   X0015     0    0    01     FS04A  Y0015     0      0    01   FS04A

GROUP.BASE.SLOT.NAME=
>
```

SEARCH INPUT HELP DELETE DELALL END

4.2 OPERATION

(1) Input of assignment data (INPUT)

a) Move the cursor to the address which you want to assign. (page key, cursor key, and search function, etc.)

b) Input the GROUP number, the BASE number, the SLOT number and the module NAME of the unit which you want to assign for in format GROUP.BASE.SLOT.NAME. Use the period (.) for the delimitation between each data.

c) Press [INPUT] soft key.

d) The assignment data for the unit is automatically set at the cursor position.

(2) Deletion of the assignment data (DELETE)

a) Move the cursor to the address which you want to delete. (page key, cursor key, and search function, etc.)

b) Press the [DELETE] soft key.

c) The assignment data is automatically deleted.

(3) Address search (SEARCH)

a) Input the address which you want to search.

b) Press the [SEARCH] soft key.

c) The cursor moves to the specified address.

4.3 ERROR AND WARNING MESSAGE WHEN ASSIGNMENT DATA IS EDITED

(1) PMC–NB, PMC–QC, PMC–SC,SC3,SC4
PMC–SA1, SA2, SA3, SB, SB2, SB3, SB4, SB5, SB6 with LADDER editing function
PMC–PA1, PA3 with LADDER editing function

No	Error and warning message		Contents
	Built–in editing function	FAPT LADDER for personal computer	
1	ERR: GROUP NO.(0–15)	Appointed Group Not Exist	The GROUP number must be 0 to 15.
2	ERR: BASE NO.(0–3)	Appointed Base Not Exist	The BASE number must be 0 to 3.
3	WARN: BASE NO. MUST BE 0	Invalid data, except '0', is specified at the base of I/O Unit–B.	The BASE number of I/O Unit–B must be 0. The BASE number was compulsorily set to 0.
4	ERR: SLOT NO.(1–10)	Appointed Slot Not Exist	The SLOT number of I/O Unit–A must be 1 to 10.
5	ERR: SLOT NO.(0,1–30)		The SLOT number of I/O Unit–B must be 0 or 1 to 30.
6	ERR: SLOT NO. MUST BE 0	Invalid data, except '0', is specified at the slot of '##' as I/O Unit–B.	When you assign addresses for power on/off information on I/O Unit–B, the SLOT number must be 0.
7	ERR: ILLEGAL NAME	Appointed ID Code Not Exist	The module NAME is illegal or the module is not supported. Input a correct name.
8	INPUT INVALID	Input Data Invalid	The input character string is illegal. Input one again in a correct format.
9	IMPOSSIBLE WRITE		You tried to edit ROM data. ROM data cannot be edited.
10	ERR: ADDRESS ALREADY ASSIGNED	Address Appoint Illegal	These addresses has already been assigned. Confirm other assignment data.
11	ERR: ADDRESS OVER		The assignment data exceeded maximum address (X127,Y127). Confirm number of byte of this unit.
12	ERR: SLOT ALREADY DEFINED	The same group, base and slot are already specified.	For this SLOT, addresses has already been assigned. Confirm other assignment data.
13	WARN: SLOT ALREADY DEFINED		
14	ERR: UNIT TYPE MIS–MATCH (IN OR OUT)	Input Data Invalid	X address cannot be assigned for the output module or Y address cannot be assigned for the input module.
15	WARN: UNIT TYPE MIS– MATCH (MODEL)	Both I/O Unit–A and Unit–B are specified in the same group.	I/O Unit–A and Unit–B were set to the same GROUP. They cannot exist in the same group.

(2) PMC–N, PMC–NA, PMC–QA

No	Error and warning message		Contents
	Built–in editing function	FAPT LADDER for personal computer	
1	GROUP DATA ERROR	Appointed Group Not Exist	The GROUP number must be 0 to 15.
2	BASE DATA ERROR	Appointed Base Not Exist	The BASE number must be 0 to 3.
3	BASE NO. MUST BE 0	Invalid data, except '0', is specified at the base of I/O Unit–B.	The BASE number of I/O Unit–B must be 0. The BASE number was compul–sorily set to 0.
4	SLOT DATA ERROR	Appointed Slot Not Exist	The SLOT number of I/O Unit–A must be 1 to 10.
			The SLOT number of I/O Unit–B must be 0 or 1 to 30.
5	SLOT & BASE NO. MUST BE 0	Invalid data, except '0', is specified at the slot of '##' as I/O Unit–B.	When you assign addresses for power supply information on I/O Unit–B, the SLOT number must be 0.
6	NAME DATA ERROR	Appointed ID Code Not Exist	The module NAME is illegal or the module is not supported. Input a correct name.
7	DATA FORMAT ERROR	Input Data Invalid	The input character string is illegal. Input one again in a correct format.
8	NO DATA SPACE	Address Appoint Illegal	These addresses has already been assigned. Confirm other assignment data.
			The assignment data exceeded maximum address (X127,Y127). Confirm number of byte of this unit.
9		The same group, base and slot are already specified.	For this SLOT, addresses has already been assigned. Confirm other assignment data.
10		Input Data Invalid	X address cannot be assigned for the output module or Y address cannot be assigned for the input module.
11		Both I/O Unit–A and Unit–B are specified in the same group.	I/O Unit–A and Unit–B were set to the same GROUP. They cannot exist in the same group.

INDEX

Index

[L]

[M]

[N]

[O]

[P]

[Q]

[R]

[S]

[T]

[U]

[V]

[W]

REVISION RECORD

Revision Record

FANUC I/O Unit–MODEL B CONNECTION MANUAL (B–62163E)

Edition	Date	Contents	Edition	Date	Contents
03	Nov., ’98	“9 Safety for using AC” was added.			
02	Oct., ’97	Total revision			
01	Mar., ’93				