

Technical Information

CENTUM VP Installation Guidance



TI 33J01J10-01EN

[Release 6]

Introduction

The CENTUM VP is a distributed control system (abbreviated as DCS) for small to large plants.

This manual describes the requirements for installation (control room size and power supply requirements), storage and transportation, and wiring.

Chapter 1 System Installation Requirements

This chapter describes engineering specifications covering control room design/environment, power supply system, grounding and noise prevention. For power consumption specifications and list of consumable parts, see Chapter 4.

Chapter 2 Transportation, Storage and Installation

This chapter describes precautions in transit, unpacking and storage, such as humidity, temperature change, and how to install devices.

Chapter 3 Cabling

This chapter describes how to connect power, ground, signal and bus cables to the installed devices, and how to connect optical fiber cables.

Chapter 4 Installation Specifications

This chapter covers power consumption and power dissipation, in-rush current, fuse and breaker ratings, and parts that need replacement within 10 years. Read this section when deciding power supply capacity.

Chapter 5 Post-installation Inspection and Environmental Preservation

This chapter describes items that must be checked before applying power and the precautions to be taken to safeguard the environment after installing the system.

■ Drawing Conventions

Some drawings may be partially emphasized, simplified, or omitted, for the convenience of description.

■ Trademark Acknowledgment

The names of corporations, organizations, products and logos herein are either registered trademarks or trademarks of Yokogawa Electric Corporation and their respective holders.

Safety Precautions

■ Safety, Protection, and Modification of the Product

- In order to protect the system controlled by the product and the product itself and ensure safe operation, observe the safety precautions described in this Technical Information. We assume no liability for safety if users fail to observe these instructions when operating the product.
- If this product is used in a manner not specified in this Technical Information, the protection provided by this product may be impaired.
- If any protection or safety circuit is required for the system controlled by the product or for the product itself, prepare it separately.
- Be sure to use the spare parts approved by Yokogawa Electric Corporation (hereafter simply referred to as YOKOGAWA) when replacing parts or consumables.
- Do not use the accessories (Power supply cord set, etc.) that came with the product for any other products.
- Modification of the product is strictly prohibited.
- The following symbols are used in the product and instruction manual to indicate that there are precautions for safety:



Indicates that caution is required. This symbol for the Product indicates the possibility of dangers such as electric shock on personnel and equipment, and also indicates that the user must refer to this Technical Information and the User's Manuals for necessary actions. In this Technical Information and the User's Manuals, this symbol is used together with a word "CAUTION" or "WARNING" at the locations where precautions for avoiding dangers are described.



Indicates that caution is required for hot surface. Note that the devices with this symbol become hot. The risk of burn injury or some damages exists if the devices are touched or contacted.



Identifies a protective conductor terminal. Before using the Product, you must ground the protective conductor terminal to avoid electric shock.



Identifies a functional grounding terminal. A terminal marked "FG" also has the same function. This terminal is used for grounding other than protective grounding. Before using the Product, you must ground this terminal.



Indicates an AC supply.



Indicates a DC supply.



Indicates the ON state. The state of a power on/off switch and others is indicated.



Indicates the OFF state. The state of a power on/off switch and others is indicated.

■ Symbol Marks of Installation Guidance

Throughout this Technical Information, you will find several different types of symbols are used to identify different sections of text. This section describes these icons.



WARNING

Identifies important information required to understand operations or functions.



CAUTION

Identifies instructions that must be observed in order to avoid physical injury and electric shock or death to the operator.

IMPORTANT

Identifies important information required to understand operations or functions.

TIP

Identifies additional information.

SEE ALSO

Identifies a source to be referred to.

■ Cautions for Safely Applying the Device

● Wiring Power Cable



WARNING

Connect the power cables according to the procedure in this document.
Power cables must conform to the safety standards of the country where the device is installed.

**SEE
ALSO**

For Wiring Power Cable, refer to 3.2, "Connecting Power."

● Earth Wiring



WARNING

This equipment requires a protective grounding defined by the safety standard.
Ground the device following the procedure in this document to prevent from electric shock and to minimize the noise.

**SEE
ALSO**

For Earth Wiring, refer to 3.3, "Connecting Ground Cable."

● Tightening Torque of Screws

IMPORTANT

The tightening torque that the Product recommends is showed in the following table. However, if the tightening torque of the screw is specified in the User's Manuals, follow the instructions described in the User's Manuals.

Table Table of Recommended Tightening Torque

Nominal diameter of a screw	M2.6	M3	M3.5	M4	M5	M6	M8	M10
Recommended tightening torque (N•m)	0.35	0.6	0.8	1.2	2.8	3.0	12.0	24.0

● Battery



CAUTION

- Must use Yokogawa designated batteries.
 - Mounting and changing batteries must follow the procedure in the hardware instruction manual for each device.
 - When changing batteries while the power supply is not shutdown, do not put hands inside of the device since it is danger of electric shock.
-

● Air Filter



CAUTION

Wash the air filters periodically (such as every three months). Use water and the neutral detergent to clean the filter then reuse it after drying.

- Follow the procedure in the hardware instruction manual for each device to exchange the air filter at the specified period.
-

**SEE
ALSO**

For Air Filter, refer to 4, "Installation Specification Parts Durability."

● Fan Unit



CAUTION

When changing fan unit while the power supply is not shutdown, be careful not to touch other parts so as to avoid electric shock.

**SEE
ALSO**

For Fan Unit, refer to 4, "Installation Specification Parts Durability."

● Wiring I/O Cables



CAUTION

Wiring I/O cables must follow the procedure in this document.

**SEE
ALSO**

For Wiring I/O Cables, refer to 3.5, "Connecting Signal Cable."

● Connecting Devices

IMPORTANT

To ensure this system compliance with the CSA safety standards, all devices connected to this system shall be CSA certified devices.

● Power Distribution Board



WARNING

Exchanging the fuses must follow the procedure in the hardware instruction manual for each device since it has danger of electric shock.

- The fuses for exchange must be the Yokogawa designated fuses.
 - Exchanging relay must follow the procedure in the hardware instruction manual for each device so as to avoid electric shock.
-

**SEE
ALSO**

For Power Distribution Board, refer to 3.4, "Power and Ground Cable."

● Exchanging Relay



CAUTION

Exchanging relay must follow the procedure in the hardware instruction manual for each device so as to avoid electric shock.

● Exchanging Fuse



WARNING

- The fuses for exchange must be the Yokogawa designated fuses.
 - Switch off the power supply before exchanging the fuses.
-

- **Maintenance**



CAUTION

- The maintenance work for the devices described in this manual should be performed only by the educated experts.
 - When the device becomes dusty, use a vacuum cleaner or a soft cloth to clean it.
 - During maintenance, put up wrist strap, and take other ESD (Electrostatic Discharge) measures.
 - If the existing caution label is dirty and illegible, prepare a new label (part number: T9029BX) to replace it.
-

**SEE
ALSO**

For Maintenance, refer to 1.5.2, "Countermeasures against Static Electricity."

CENTUM VP Installation Guidance

TI 33J01J10-01EN 16th Edition

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1. System Installation Requirements

This section describes installation requirements such as environmental conditions, required space and layout considerations, power consumption, cabling and grounding.

1.1 Control Room Design

The control room, in which the system control equipment is to be installed, should be designed in accordance with the following conditions:

■ General

In designing a control room, ensure adequate floor strength and air conditioning including dust, and moisture-proofing.

SEE ALSO

- | | |
|--------------------------------|---|
| • 1.1 Control Room Design | Air Conditioner |
| • 1.2 Control Room Environment | Air Purity |
| | Installation Environment Specifications |

■ Floor Strength and Space

The floor should have adequate strength, and you should design the layout in accordance with the weight and size of equipment to be installed.

SEE ALSO

- For the maintenance space required, refer to 2.4, “Servicing Area.”
- For the weight and dimensions of standard equipment, refer to “External Dimensions” (SD).

■ Floor Structure

To prevent damage to cables by operators and maintenance equipment, do not lay cables on the floor.

Lay cables under the floor as follows:

- Provide an “accessible” floor which also facilitates maintenance work.
- Make cable pits under the floor if it is concrete.

■ Flooding- & Dust-proof Floor

To protect equipment and cables, design a flooding-proof floor.

After the cabling is completed, seal all cable conduits using putty to prevent intrusion of dust, moisture, rats, and insects into the equipment.

■ Clearance From The Wall and The Floor Surface

There are ventilation holes on the front and rear doors of the cabinets (AFV40S/AFV40D, and ACB51). To ensure good air ventilation and easy maintenance, provide a clearance of at least 1000 mm (including the service areas) from the wall to the front and rear doors of the cabinets. Also make sure the height of the ceiling is at least 2400 mm from the floor.

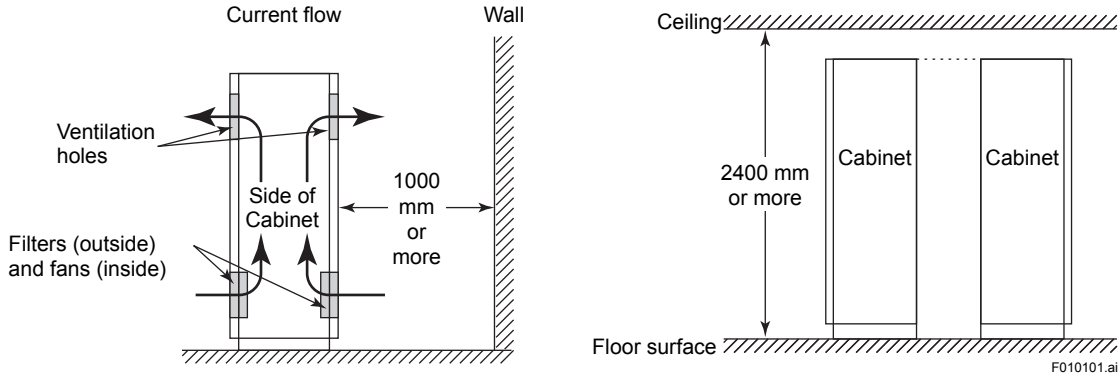


Figure Wall Clearance and Ceiling Height

■ Illumination

The illumination level around a display unit should be 700 to 1500 lux (target illumination level: 1000 lux). The illumination level inside the control room should be reasonably uniform. Select proper light fixtures and install them in positions where they don't cause glare on the LCDs.

TIP

REFERENCE (Illumination standards):

For ultra-precision work:	1500 to 3000 lux (illumination level: 2000)
For precision work:	700 to 1500 lux (illumination level: 1000)
For ordinary work:	300 to 700 lux (illumination level: 500)
For non-detail work:	150 to 300 lux (illumination level: 200)
Passages, warehouses:	30 to 150 lux (illumination level: 50 to 100)

(Source: JIS Z9110)

■ Outlets for Maintenance

Outlets (approx. 1.5 kVA) for measurement devices should be provided near the installed equipment for maintenance.

■ Telephone

Telephones should be installed for communications with related stations.

■ Air Conditioner

The air conditioner should be operated following the conditions below to prevent dew condensing on the installed equipment:

- Keep the change of temperatures within ± 10 °C/h.
- Install air conditioner away from equipment.
- Install substitute air conditioners to prevent dew condensing as a result of temperature rise or fall if an air conditioner fails.

■ Windows

Close the windows of the control room. If a draft comes in around the windows, seal around the windows.

Opening the window while air conditioning is running may result in condensation forming, or let in dust or corrosive gas, adversely affecting the installed equipment. Windows on the sea side must be closed to keep out salt air.

Install blinds, if necessary, to prevent sunlight reflecting from LCDs.

■ Side-by-Side Cabinet Installation

When cabinets are placed side by side, make sure of their ventilation system.

For cabinet ventilation system, we have air-cooling without blower and with blower. Moreover, either blast fan pressurization (door fan) or exhaust fan (ceiling fan) is used for air-cooling with blower.

As cabinets with the same ventilation system can be placed side by side, group them according to ventilation system and place them in the same group side by side with side board.

CENTUM VP, CENTUM CS 3000 and CENTUM CS cabinets get air from the bottom front and rear of the cabinet doors, and emit air from the top front and rear of the doors, using a “fan pressurization” system. On the other hand, CENTUM-XL cabinets get air from rear of the doors, and emit air from the top of the cabinets, using an “exhaust fan” system.

When cabinets with different ventilation systems are placed side by side, a special partition board (ETBP) must be placed between cabinets. For the board, please contact Yokogawa.

1.2 Control Room Environment

This section describes environmental conditions of the control room to operate the system safely, and stably over a long period of time.

It is recommended that user have the control room environment assessment. Consult Yokogawa for the assessment if necessary.

■ Temperatures and Humidity

When equipment is brought from the place out of operational temperature range to the place in operational temperature range, bring it without a package, keep it within temperature change rate and avoid condensation. Keep ambient temperature within operational temperature range and leave it for more than three hours before starting operation.

Under normal operation, the rate of change of ambient temperatures should be within 10 °C/h. All the equipment should be kept out of direct sunlight.

**SEE
ALSO**

See "Table of Equipment Installation Specifications" in this section, for the temperatures and humidity limits for operating and storing this equipment.

■ Condensation

Prevent condensation. If condensation occurs, or its trace is found on the control room equipment, contact Yokogawa.

**SEE
ALSO**

See "Section 2.3 Storage" for more information.

Vibration

Vibration in the control room should be limited as follows:

- For vibration frequency up to 14 Hz: Limit displacement amplitude to 0.25 mm or less.
- For vibration frequency over 14 Hz: Limit acceleration to 2 m/s² or less.

The following is the relationship of the vibration frequency, displacement amplitude, and acceleration:

$$\text{Acceleration (m/s}^2\text{)} = 4\pi^2 \times A \times F^2 \times 10^{-3}$$

A: Displacement amplitude (mm)
F: Frequency (Hz)

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The allowable range of displacement amplitude is shown below. Consult Yokogawa if complex vibrations are involved.

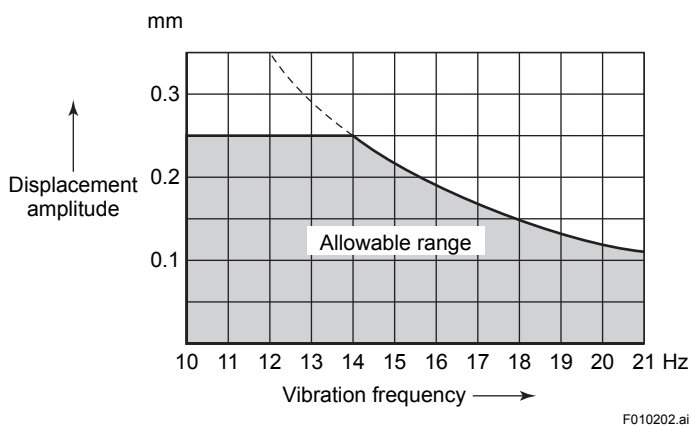


Figure Range of Allowable Displacement Amplitude

Air Purity

The dust in the control room should be kept below 0.3 mg/m³. Avoid corrosive gas such as hydrogen sulfide (H₂S), sulfur dioxide (SO₂), chlorine, and conductive dust such as iron powder and carbon.

The allowable content of H₂S, SO₂, or any other corrosive gas varies with temperatures, humidity, or existence of other corrosive gas. Consult Yokogawa if corrosive gas exists.

Magnetic Field

Do not install a magnetic disk, or the like near cables with large current flowing or in the magnetic field of a power supply. If installed in such locations, the storage medium data may be corrupted by the magnetic fields.

■ Electric field strength (Electric wave condition)

For the proper and stable operation of this system, the electric field strength of the location for the equipment should be controlled as following:

For N-IO Node (except for equipment for RIO System Upgrade (*1));

10 V/m or less (80 MHz to 1.0 GHz)

3 V/m or less (1.4 to 2.0 GHz)

1 V/m or less (2.0 to 2.7 GHz)

Other than above;

3 V/m or less (26 MHz to 1.0 GHz)

3 V/m or less (1.4 to 2.0 GHz)

1 V/m or less (2.0 to 2.7 GHz)

*1: For specification of RIO System Upgrade, refer to the GS 33J64E10-01EN.

In case of the usage of wireless equipment such as transceiver nearby this system, note as following:

- The door of this system should be closed.
- In case of the usage of transceiver with 3 W or less, the distance from this system should be kept 1 m or more, with 10 W or less, 2 m or more.
- As for the usage of wireless equipment with 1 W or less such as mobile-telephone, PHS, wireless telephone or LAN equipment, the distance should be kept 1 m or more. Attention should be paid to the micro wave radiated from mobile-telephone or PHS even out of usage.

Following formula represents the electric field strength. However, the calculated value requests ideal environment. Worse conditioned environment should be taken into consideration. In case some wireless equipment is used nearby this system, this formula would be useless. The value calculated through this formula should be considered noting other than reference.

$$E = \frac{k\sqrt{P}}{d}$$

E : Electric field strength (V/m)

k : Coefficient (0.45 to 3.35; average 3.0)

P : Radiation power (W)

d : Distance (m)

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■ Installation Specification

Installation height: N-IO node (*1) (*2): Altitude of up to 3000 m (*3)
Other than N-IO node: Altitude of up to 2000 m

Installation category based on IEC 61010-1 (*4)

Category I

- For YOKOGAWA products, category I applies to the device that receives the electric power not more than 33 V AC, 70 V DC.

Category II

- For YOKOGAWA products, category II applies to the device that receives the electric power exceeding 33 V AC or 70 V DC.

Pollution degree based on IEC 61010-1: 2 (*5)

- *1: For more information about specifications of device, refer to General Specification (GS).
*2: Except for equipment for RIO System Upgrade. For specification of RIO System Upgrade, refer to the GS 33J64E10-01EN.
*3: Up to 2000 m for A2BN4D and A2BN5D.
*4: The installation category, also referred to as an overvoltage category, defines the standard for impulse voltage. The category number from I to IV applies the devices to determine the clearance required by this standard. Category I applies to the device intended to be connected to a power supply with impulse voltage reduced to the safe level. Category II applies to the device intended to be supplied from the building wiring.
*5: Pollution degree indicates the adhesion level of foreign matter in a solid, liquid, or gaseous state that can reduce dielectric strength. Degree 2 refers to a pollution level equivalent to the general indoor environment.

**SEE
ALSO**

See "Installation Environment Specifications" at the end of this chapter.

■ Measurement Categories

Regarding the measurement inputs, the following requirements must be satisfied to meet the specifications for the device:

The category of the equipment applies to O (Other) in the following table.

The rated transient overvoltage is 1500 V.

Note: Do not use the equipment for measurements within measurement categories II, III and IV.

Table Measurement category

No.	Applicable Standard	Description
	IEC/EN 61010-2-030 CAN/CSA-C22.2 No.61010-2-030	
No.1	O (Other) (*1)	For measurements performed on circuits not directly connected to MAINS.
No.2	Measurement category II	For measurements performed on circuits directly connected to the low voltage installation.
No.3	Measurement category III	For measurements performed in the building installation.
No.4	Measurement category IV	For measurements performed at the source of the low-voltage installation.

- *1: Measurement category I defined in IEC/EN 61010-1:2001 and CAN/CSA-C22.2 No.61010-1-04 has been changed to "O (Other)" in IEC/EN 61010-2-030 and CAN/CSA-C22.2 No.61010-2-030.

■ Applied Standards

The CENTUM VP system complies with the standards shown below.

IMPORTANT

Different standards are applied according to the types of equipment. For details, refer to Integrated Production Control System CENTUM VP System Overview (GS 33J01A10-01EN).

● Safety Standards (*1) (*2) (*3) (*4)

[CSA]

CAN/CSA-C22.2 No.61010-1, No.61010-2-030
CAN/CSA-IEC 61010-2-201

[CE Marking] Low Voltage Directive

EN 61010-1, EN 61010-2-201, EN 61010-2-030
EN 60825-1

[EAC Marking]

CU TR 004

[Morocco Compliance Marking (C_⌢ Marking)] Low Voltage Directive

NM EN 61010 1
NM EN 61010 2 201
NM EN 61010 2 030
NM EN 60825 1

Note: In relation to the CE Marking, the manufacturer and the authorized representative for CENTUM in the EEA are indicated below:
Manufacturer: YOKOGAWA Electric Corporation (2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan.)
Authorised representative in the EEA: Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands.)

*1: For ensuring all the hardware devices to satisfy the safety standards, the dedicated breakers in the power supply distribution board must conform to the following specifications.

[CSA] CSA C22.2 No.5 or UL 489
[CE Marking] EN 60947-1 and EN 60947-3
[EAC Marking, C_⌢ Marking] EN 60947-1 and EN 60947-3

*2: The ground suitable for the power distribution system in the country or region has to be used for protective grounding system.

*3: For the rack mountable devices, DIN rail mountable devices, and wall mountable devices to meet the Safety Standards and EMC Standards, the devices must be installed in a lockable metal cabinet. The cabinet must conform to IEC/EN/CSA 61010-2-201 or provide degrees of protection IP3X or above and IK09 or above.

*4: CENTUM measurement input corresponds to the measurement category O (Other) based on IEC/EN 61010-2-030 and CAN/CSA-C 22.2 No. 61010-2-030. The measurement category I defined in IEC/EN 61010-1: 2001 and CAN/CSA-C 22.2 No. 61010-1-04 has been changed to O (Other).

- **EMC Conformity Standards (*1) (*2) (*3)**

[CE Marking] EMC Directive

- EN 55011 Class A Group 1 (*4)
- EN 61000-6-2
- EN 61000-3-2 (*5)
- EN 61000-3-3
- EN 61326-1 (*6)

[RCM]

- EN 55011 Class A Group 1 (*4)

[KC Marking]

Korea Electromagnetic Conformity Standard

[EAC Marking]

CU TR 020

[Morocco Compliance Marking (C_M Marking)] EMC Directive

- NM EN 55011 Class A Group 1 (*4)
- NM EN 61000 6 2
- NM EN 61000 3 2 (*5)
- NM EN 61000 3 3

Note: In relation to the CE Marking, the manufacturer and the authorized representative for CENTUM in the EEA are indicated below:
 Manufacturer: YOKOGAWA Electric Corporation (2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan.)
 Authorised representative in the EEA: Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands.)

- *1: For the rack mountable devices, DIN rail mountable devices, and wall mountable devices to meet the Safety Standards and EMC Standards, the devices must be installed in a lockable metal cabinet. The cabinet must conform to IEC/EN/CSA 61010-2-201 or provide degrees of protection IP3X or above and IK09 or above.
- *2: A lightning arrester or the like is required to meet this surge immunity standard except for A2ZN3D, A2ZN4DC, and A2ZN5DC. The length of the cable to feed the external power supply for AGS813 AO channels should not exceed 30 meters.
- *3: To the field power supply input connector of the base plate for adaptor A2BN3D and the barrier power supply input connector of the base plates for barrier A2BN4D and A2BN5D, power must not be supplied directly from a DC distribution network.
- *4: A Class A hardware device is designed for use in the industrial environment. Please use this device in the industrial environment only.
- *5: An external device such as a power unit with harmonic current neutralizer and an active harmonics conditioner must be connected to meet this harmonic current emission standard. See Section 1.3 "Power Supply System".
- *6: The base plate for barrier A2BN5D conforms to EN 61326-1. If A2BN5D is used with intrinsic safety barriers for analog input, analog output, or temperature input mounted, the accuracy under the electromagnetic immunity conditions (acceptance criteria A) is within ± 1 % of the span.

● Standards for Hazardous Location Equipment

For more information about Standard for Hazardous Locations, please refer to TI 33Q01J30-01E.

[CSA Non-Incendive] (*1)

[FM Nonincendive] (*2)

[Type n] (*3)

[Type i (Intrinsic Safety)]

[ATEX Type i]

[IECEX Type i]

[FM Intrinsic Safety]

Note: In relation to the CE Marking, the manufacturer and the authorized representative for CENTUM in the EEA are indicated below:

Manufacturer: YOKOGAWA Electric Corporation
(2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan.)
Authorised representative in the EEA: Yokogawa Europe B.V.
(Euroweg 2, 3825 HD Amersfoort, The Netherlands.)

- *1: To meet a standard for hazardous location equipment, the 19-inch rack-mounted devices must be installed in a keyed metallic cabinet approved by CSA or non-incendive regulator in your area.
Use a cabinet which is larger than the size of W600×H760×D350 (mm) to mount a FIO node unit on.
- *2: To meet a standard for hazardous location equipment, the 19-inch rack-mounted devices must be installed in a keyed metallic cabinet approved by FM or Nonincendive regulator in your area.
- *3: To be compatible with Type n, for example the requirements of cabinet must be met. For details, refer to the Explosion Protection (TI 33Q01J30-01E).

● Marine Standards

For more information about the marine standards, refer to 1.8, "Compliance with Marine Standards."

ABS (American Bureau of Shipping)

BV (Bureau Veritas)

LR (Lloyd's Register)

DNV GL

■ Installation Environment Specifications

The following table lists environmental requirements for the installation of the CENTUM VP system:

For environmental requirements for devices including PC and UPS, refer to their environmental specifications.

SEE ALSO For details, refer to the hardware general specifications (GS) for each equipment.

Table Equipment Installation Specifications (1/2)

Item		Specifications (except for ANB10□, ANB11□, and ANT10U)	Specifications (ANB10□, ANB11□ and ANT10U)	Specifications (N-IO node) (*1)	Remarks
Temperature	Normal operation	0 to 50 °C	0 to 60 °C (Temperature option: -20 to 70 °C) (*2)	0 to 60 °C (Temperature option: -40 to 70 °C) (*4) (*5)	Avoid direct sunlight.
	Transportation/storage	-20 to 60 °C	-20 to 60 °C (Temperature option: -40 to 85 °C) (*3)	-20 to 60 °C (Temperature option: -40 to 85 °C) (*5)	Avoid direct sunlight.
Humidity	Normal operation	10 to 90 %RH (In case of FIO / 5 to 95 %RH)	5 to 95 %RH	5 to 95 %RH	No condensation
	Transportation/storage	10 to 90 %RH (In case of FIO / 5 to 95 %RH)	5 to 95 %RH	5 to 95 %RH	No condensation
Temperature fluctuation	Normal operation	Within ±10 °C/h	Within ±10 °C/h	Within ±10 °C/h	-
	Transportation/storage	Within ±20 °C/h	Within ±20 °C/h	Within ±20 °C/h	-
Power source	Voltage range	100-120 V AC ±10 % 220-240 V AC ±10 % 24 V DC ±10 % (including ripple)	100-120 V AC ±10 % 220-240 V AC ±10 % 24 V DC ±10 % (including ripple)	100-120 V AC -15 % +10% 220-240 V AC -15 % +10% 24 V DC -15% +20% (*6)	-
	Frequency	50/60 ±3 Hz	50/60 ±3 Hz	50/60 ±3 Hz	-
	Distortion factor	10 % or less	10 % or less	10 % or less	-
	Peak value	125 V or larger (for 100-120 V AC) 274 V or larger (for 220-240 V AC)	125 V or larger (for 100-120 V AC) 274 V or larger (for 220-240 V AC)	118 V or larger (for 100-120 V AC) 258 V or larger (for 220-240 V AC)	-
	Momentary failure	20 ms or less (for 100-120/220-240 V AC)	20 ms or less (for 100-120/220-240 V AC)	20 ms or less (for 100-120/220-240 V AC)	With rated voltage supplied
	Withstanding voltage	1500 V AC for 1 minute (for 100-120/220-240 V AC) 500 V AC for 1 minute (for 24 V DC)	1500 V AC for 1 minute (for 100-120/220-240 V AC) 500 V AC for 1 minute (for 24 V DC)	1500 V AC for 1 minute (for 100-120/220-240 V AC) 42 V DC cobtubyiys 500 V AC for 1 minute (for 24 V DC)	Between power and grounding terminals

*1: Except for equipment for RIO System Upgrade. For specification of RIO System Upgrade, refer to the GS 33J64E10-01EN.

*2: When an AAP149, AAP849, ADV161, ADV561, ADV859, ADV159, ADV559, ADV869, ADV169, ADV569, ALR111, ALR121-□□□, ALR121-□□1, ALE111-□□□, ALE111-□□1, ALF111, ALP121, and A2LP131 is installed, the ambient temperature should range from 0 to 50 °C.

*3: When for use as a N-IO node, the installation environment must be within the temperature specification range of the communication module to be incorporated.

*4: For A2BN4D and A2BN5D, use within the range of -20 to 60°C.

*5: To use A2BN4D or A2BN5D at -20 to 0°C, specify the temperature environment support option for the I/O modules to be mounted. The environment in which A2BN4D or A2BN5D is used depends on the specifications of the barrier mounting to A2BN4D or A2BN5D. To use A2BN3D with the temperature environment support option (at -40 to 70°C), specify the temperature environment option for the I/O modules and I/O adaptor as well. For the cable connector connection of Base plate for analog digital I/O (A2BN3D-□9), the normal operation temperature is -20 to 70°C depend on the temperature specification of the dedicated cable.

To maintain A2NN30D with the temperature environment support option (at -40 to 70°C), specify the temperature environment support option for the power supply units and N-ESB bus modules as well.

*6: For A2BN3D, 24 V DC ±10%. For A2BN4D and A2BN5D, 24 V DC -14% +10%.

Table Equipment Installation Specifications (2/2)

Item		Specifications (except for ANB10□, ANB11□, and ANT10U)	Specifications (ANB10□, ANB11□ and ANT10U)	Specifications (N-IO node) (*1)	Remarks
Power source	Insulation resistance	20 Mohms at 500 V DC	20 Mohms at 500 V DC	20 Mohms at 500 V DC	Between power and grounding terminals
Grounding		Apply the grounding system which is defined by the rules and standards of the country or the region.	Apply the grounding system which is defined by the rules and standards of the country or the region.	Apply the grounding system which is defined by the rules and standards of the country or the region.	–
Noise	Electric field	3 V/m or less (26 MHz to 1.0 GHz) 3 V/m or less (1.4 to 2.0 GHz) 1 V/m or less (2.0 to 2.7 GHz)	3 V/m or less (26 MHz to 1.0 GHz) 3 V/m or less (1.4 to 2.0 GHz) 1 V/m or less (2.0 to 2.7 GHz)	10 V/m or less (80 MHz to 1.0 GHz) 3 V/m or less (1.4 to 2.0 GHz) 1 V/m or less (2.0 to 2.7 GHz)	–
	Magnetic field	30 A/m or less (AC) 400 A/m or less (DC)	30 A/m or less (AC) 400 A/m or less (DC)	30 A/m or less (AC) 400 A/m or less (DC)	Earth magnetism not included in DC magnetic field
	Static electricity	4 kV or less (direct discharge) 8 kV or less (aerial discharge)	4 kV or less (direct discharge) 8 kV or less (aerial discharge)	4 kV or less (direct discharge) 8 kV or less (aerial discharge)	In accordance with IEC 61000-4-2
Vibration	Vibration	Displacement amplitude: 0.25 mm or less (1 to 14 Hz) Acceleration: 2.0 m/s ² or less (14 to 100 Hz)	Displacement amplitude: 0.25 mm or less (1 to 14 Hz) Acceleration: 2.0 m/s ² or less (14 to 100 Hz)	Continuous tremor amplitude: 1.75 mm or less (5 to 8.4 Hz) Acceleration: 4.9 m/s ² or less (8.4 to 150 Hz) Discontinuous vibration amplitude: 3.5 mm or less (5 to 8.4 Hz) Acceleration: 9.8 m/s ² or less (8.4 to 150 Hz)	
	Quake resistance	4.9 m/s ² or less	4.9 m/s ² or less	4.9 m/s ² or less	
	Vibration during transportation	For cabinets: Horizontal: 2.9 m/s ² or less Vertical: 4.9 m/s ² or less For others: Horizontal: 4.9 m/s ² or less Vertical: 9.8 m/s ² or less	Horizontal: 4.9 m/s ² or less Vertical: 9.8 m/s ² or less	Horizontal: 4.9 m/s ² or less Vertical: 9.8 m/s ² or less	In packed condition
Impact	Transportation impact	Horizontal: 49 m/s ² or less Vertical: 98 m/s ² or less	Horizontal: 49 m/s ² or less Vertical: 98 m/s ² or less	147 m/s ² or less, 11 ms	In packed condition
Dust		0.3 mg/m ³ or less	0.3 mg/m ³ or less	0.3 mg/m ³ or less	–
Corrosive gas		Ordinary office level In case of AFF50□/ ISA S71.04.G2 (ISA G3 option: ISA S71.04.G3)	ISA S71.04 G2 (ISA G3 option: ISA S71.04 G3)	ISA S71.04 G2 (ISA G3 option: ISA S71.04 G3)	–
Altitude		2000 m or less	2000 m or less	3000 m or less (*7)	

*1: Except for equipment for RIO System Upgrade. For specification of RIO System Upgrade, refer to the GS 33J64E10-01EN.
 *7: When the Node Interface Unit (A2NN30D) with the following optical ESB bus specifications is used at an altitude of 2000 m or higher, the ambient temperature range is -40 to 60°C.
 A2NN30D- □□□□□ 01 □□ A2NN30D- □□□□□ 02 □□ A2NN30D- □□□□□ 10 □□
 A2NN30D- □□□□□ 11 □□ A2NN30D- □□□□□ 12 □□ A2NN30D- □□□□□ 20 □□
 A2NN30D- □□□□□ 21 □□ A2NN30D- □□□□□ 22 □□

SEE ALSO For the level of corrosive gases permitted in an ordinary office, refer to “Guidelines for Installation Environment” (TI 33Q01J20-01E).

1.3 Power Supply System

To stable system operation, the following conditions should be met:

- Voltage and frequency fluctuations are within the limits specified for each system component.
- Relationship between the waveform's effective values and peak value is within the specified range.
- High-frequency noise is not at a level that affects system operation.
- Use an UPS (uninterruptible power supply) if necessary.

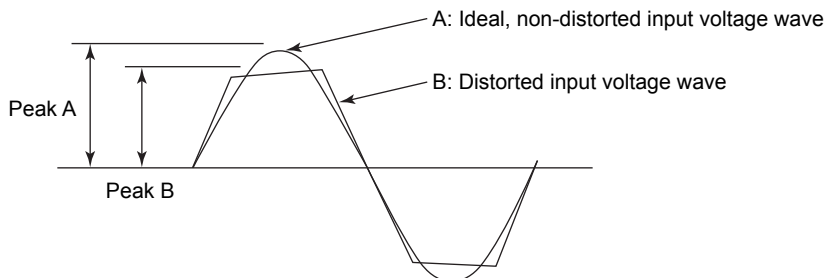
■ AC Power Specification

AC power used for the system must satisfied rated voltage and the peak value must be greater than the minimum specified (see below). DC power must satisfied 24 V DC at the power supply terminals.

IMPORTANT

If the power unit has high output impedance or high wiring impedance, the resulting voltage drop flattens the input voltage wave, forming a distorted waveform with a low peak value ("B" in the chart below).

Even if the effective value of the distorted input voltage wave is the same as that specified for a non-distorted input voltage wave, the voltage across the terminals of the smoothing capacitor in the power circuit may be so low that the system detects power failure. If input voltage waves A and B shown below, have the same effective value of 100 V AC, wave B will have a lower smoothing capacitor terminal voltage.



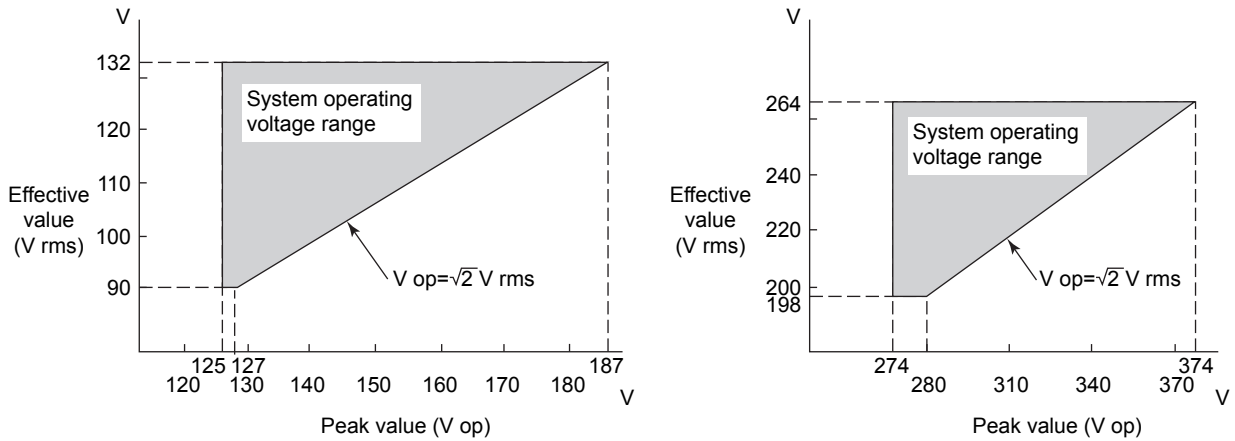
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Figure Distorted Input Voltage Waveform

The system operating voltage range is shown below based on the relationship between effective and peak values at the power input terminal of each system. Apply AC power within these ranges to operate the system.

TIP

Average rectified measuring meters such as testers cannot measure effective values accurately. Use Yokogawa's WT series power meter or an meter, which enables effective values, peak values, and waveform distortion to be measured with one unit.

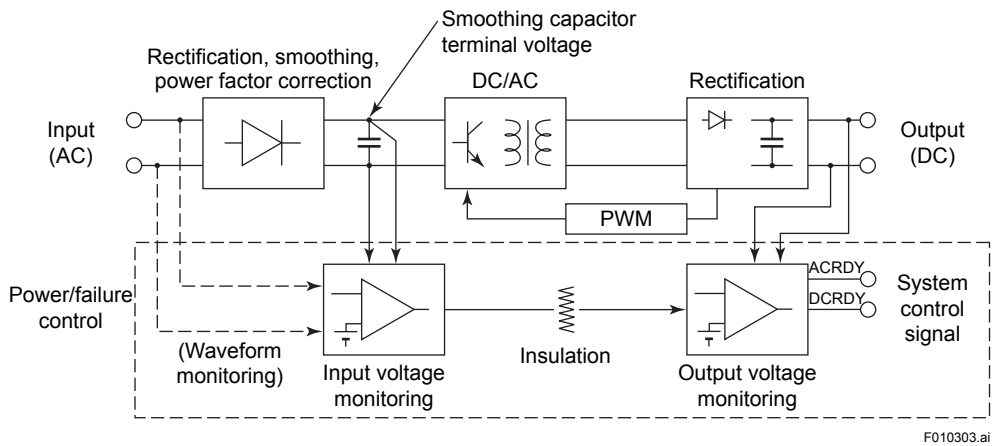


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Figure System Operating Voltage Range

The DC stabilized power supply used by Field Control Unit of the CENTUM VP uses a compact and efficient switching regulator circuit. In this circuit, output voltage cannot be maintained if the energy (terminal potential) of the smoothing capacitor falls below a predetermined value. The circuit monitors the capacitor terminal voltage and regards it as power failure if the voltage falls in the danger zone, causing the system to enter power fail mode (non-detected momentary power failure: up to 20 ms).

Current flows to the capacitor in this circuit when AC input voltage is higher than the capacitor terminal voltage. Since the capacitor is charged by the peak value of the input waveform, it is required that both the effective voltage value and the peak value conform to specifications.



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Figure FCU Power Circuit Diagram

■ Selecting a Power System

The CENTUM VP system requires a power supply that satisfies power requirements in accordance with EMC regulations. It is recommended that an external power supply unit is employed in order to prevent disruptions due to momentary or extended power failure, line noise, or lightening surges, as well as to suppress harmonic current from various devices. For selection of the power supply unit, consult with a power unit manufacturer taking the following points into consideration.

● Source Output Capacity

Take the following items into consideration when consulting with a power unit manufacturer to determine the output capacity.

Power consumption:	Both volt-ampere and watt data should be studied (refer to Chapter 4).
Device crest factor:	Ratio of the peak value to the effective value of the device input current.
Device in-rush current:	See Chapter 4 Table "In-rush Current." The method of turning on the power should also be studied.
Backup ready time after failure:	Time period required to backup the devices when power fails.
Reserve capacity:	An extra power capacity should be determined as reserve to meet any device additions.

● Crest factor

The crest factor is the ratio of the peak value to the effective value of the device input current.

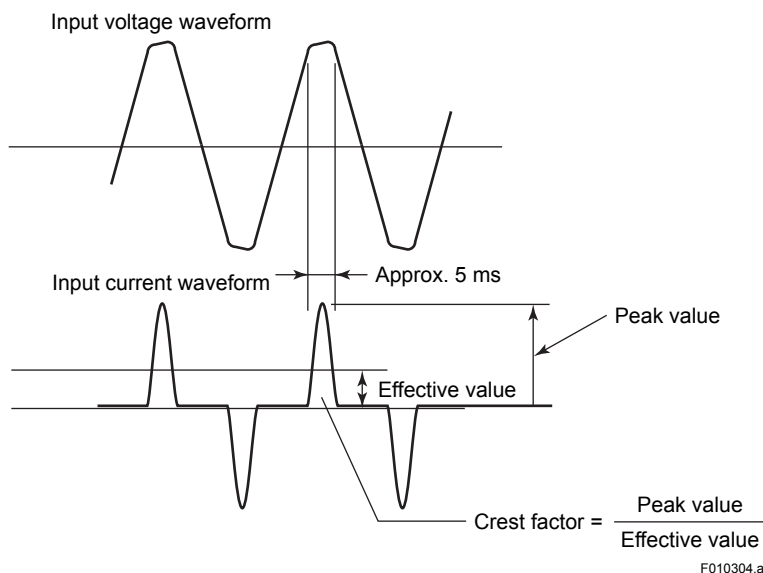


Figure Input Voltage and Input Current Waveforms

Crest factor = Peak value of device input current/Effective value of device input current

The crest factor must be considered for the input current supplied to every device connected to the system when estimating the power output capacity in selecting the power unit. Approximate device crest factors should be as follows:

100-120 V supply voltage: Crest factor About 3.

220-240 V supply voltage: Crest factor About 6.

● Common Method to Determine Power Unit Capacity

The following shows the commonly used method used to determine the power unit capacity taking the crest factor into consideration - the final determination should be made in consultation with a power unit manufacturer:

- If the specification of power unit crest factor (the peak current value allowable for the effective current value) is larger than the above device crest factor, the power unit can be used for up to full rated capacity. However, in-rush current, backup time, reserve capacity, etc., must be separately taken into consideration.
- If the power unit crest factor is smaller than the device crest factor, the power unit capacity needs to be calculated in the expression shown below. In-rush current, backup time, reserve capacity, etc., must be separately taken into consideration.

Power unit output capacity = Total device power consumption x Capacity coefficient

Capacity coefficient = Device crest factor / Power unit crest factor specification

● In-Rush Current

When the equipment is turned on, a large in-rush current flows as the capacitor is instantaneously charged and the transformer is excited. When any equipment is turned on, this should not cause any voltage fluctuation that could adversely affect other equipment. Do not turn on all equipment at the same time. Start equipment one by one.

Power may be switched to backup or AC line power if in-rush current activates the overload protection circuit on power-up. After such an overload, select an uninterruptible power unit, with automatic-recovery.

● Suppressing Harmonic Current

In order to suppress harmonic current supplied to a low-voltage distribution system, it is necessary to install a power unit or an active harmonic suppressor, such as indicated below, between a device and the distribution system:

- Power unit equipped with the harmonic suppression function (a high power-factor inverter-type uninterruptible power unit, etc.)
- Active harmonic suppressor

In Europe, a power unit should be selected so that harmonic current emissions are within the limits specified by EMC regulations.

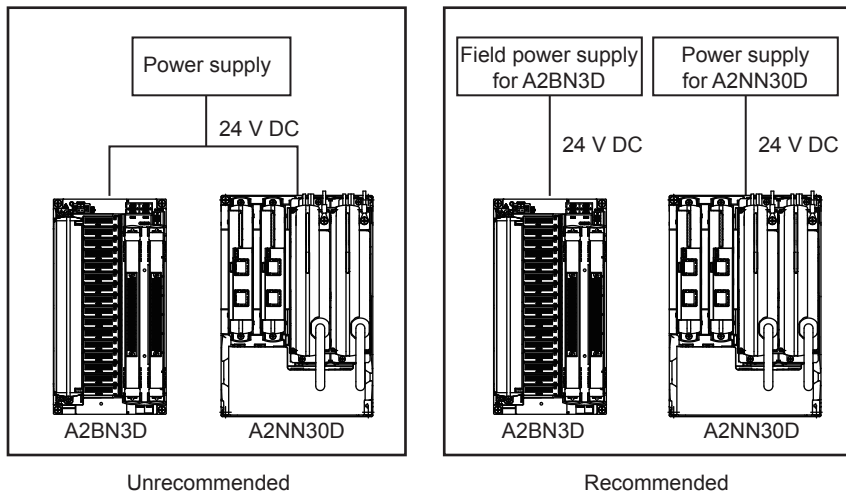
The capacity of the harmonic suppression unit should be determined in consultation with a power unit manufacturer in the same manner as the selection of power unit's output capacity previously discussed.

● Notes for the field power supply unit of N-IO

As described in GS 33J62F40-01EN “Models A2BN3D, A2BN4D, A2BN5D Base Plates (for N-IO)”, field power supply (24 V DC) is required for “Base plate for adaptor” (Model A2BN3D).

When using the node interface unit A2NN30D-□4□□□□□□□□ (24 V DC power input type) in combination with A2BN3D and the power supply unit as shown on the left side of the figure below, it is recommended to separate the power supply as shown in right.

This is because the rapid change of the field output load of A2BN3D may causes an influence on 24 V power line, it is worried that the input voltage rating of A2NN30D will not be satisfied.



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Figure Connection of the field power supply of A2BN3D

■ Cabling

Observe the following when cabling the power unit to the CENTUM VP system equipment:

- Protect signal cables from induced noise.
- Protect signal cables from induction from high-voltage power lines.
- Separate the CENTUM VP system power supply from other equipment power supplies-use a separate power distribution board.
- Provide a dedicated breaker for each power supply. Install breakers and devices they control in the same room.
- Label the breakers with the name of the connected equipment.
- Install the breakers where they can be easily operated.
- The breaker, must not interrupt connection by wiring to protective grounding system.
- Install power supply cables and high-voltage power lines in metallic conduits as much as possible.
- Use shielded cables if metallic conduits cannot be provided.

1.4 Grounding

To avoid electric shocks and minimize the influences of external noise, the installed devices must be grounded to the protective grounding system which complies with the safety standards, the electrical installations standard, and the power distribution system of the country or the region.

In the CENTUM VP cabinets, grounding bars are provided.

As for the protective grounding systems, the meshed grounding systems described in IEC 60364, IEC 62305 and IEC 61000-5-2 can be applied

A protective device is to be installed in compliance with the rules and regulations, in order to prevent electric shocks caused by a ground fault.

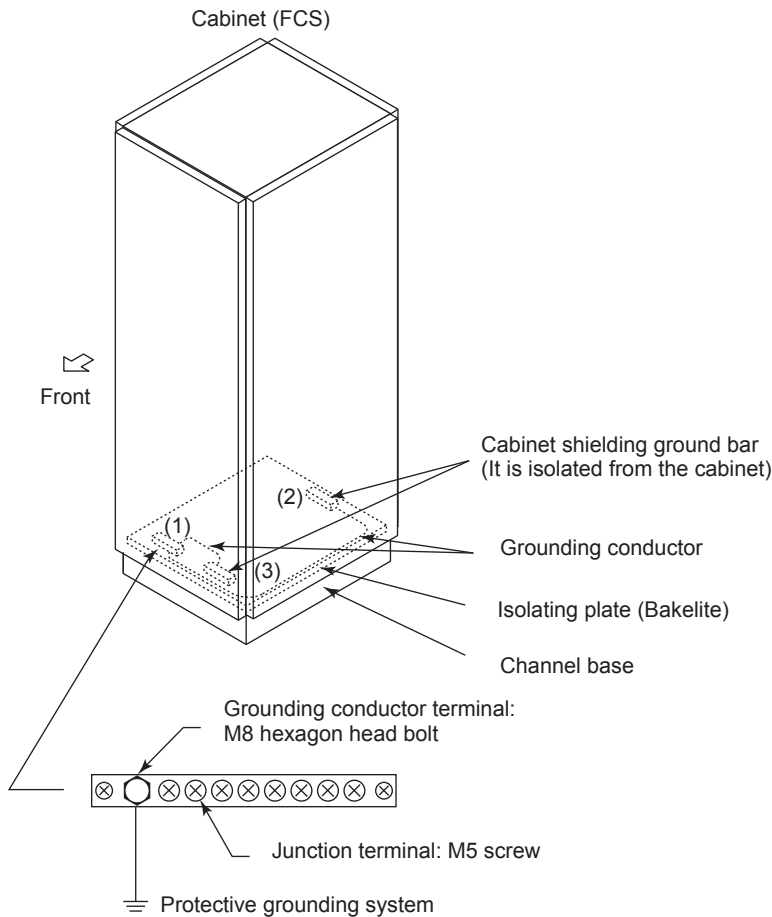
A plug type power cable has to be connected to the receptacle connected to the protective grounding system.

A functional grounding terminal of the equipment has to be connected to the grounding bar for protective grounding in a cabinet in accordance with the instructions in this document. A grounding bar for functional grounding connects to a grounding bar for protective grounding in a cabinet. A functional grounding terminal is electrically connected with a protective grounding system. In order to minimize the influence of noise a grounding cable for other system's cabinets must be connected individually to ground bus inlet.

■ Grounding

● Cabinet

- In the AFV40S/AFV40D, and ACB51, the channel base is isolated from the cabinet by a Bakelite sheet (t=5 mm) to allow one point grounding.
- The grounding bar (1) to connect a grounding cable is located at the bottom of the cabinet near the front panel and it is electrically connected to the cabinet.
- The grounding bar (2) for shielding the inside of the cabinet is on the bottom of the cabinet near the back panel, which is isolated from the cabinet. Another grounding bar (3) for shielding the inside of the cabinet is on the bottom of the cabinet near the front panel.
- The grounding bars (2) and (3) are connected to the grounding bar (1) by a cable of 5.5 mm² (This is used for grounding shields of input/output cables).
- When the grounding bars must be grounded separately depending on the purpose (for shielding and for connecting a grounding cable), disconnect the cable between the grounding bar (1) and (3) or (1) and (2), then ground separately.



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Figure Grounding Bars

■ Grounding Circuit

A cabinet must be grounded according to the grounding network topology of the building or plant for installation.

In order to connect a cabinet with a protective grounding system, the grounding topology shown in the figures “Grounding connected to single grounding bus inlet” or “Grounding connected to each grounding bus inlet” can be used.

When providing lightning arresters on power and signal lines, those arresters need to be grounded to the same bus. For details, see Section 1.5, “Noise Countermeasures.”

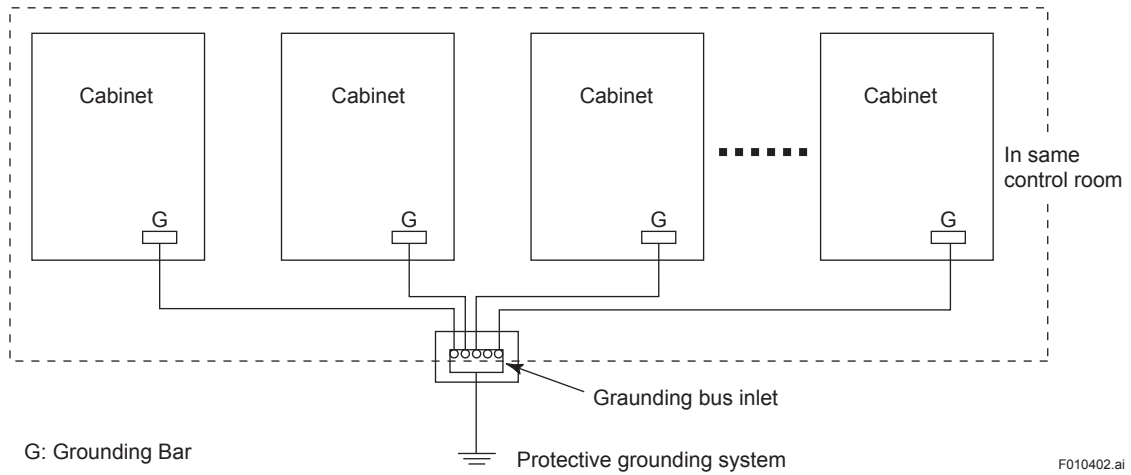


Figure Grounding connected to a single grounding bus inlet

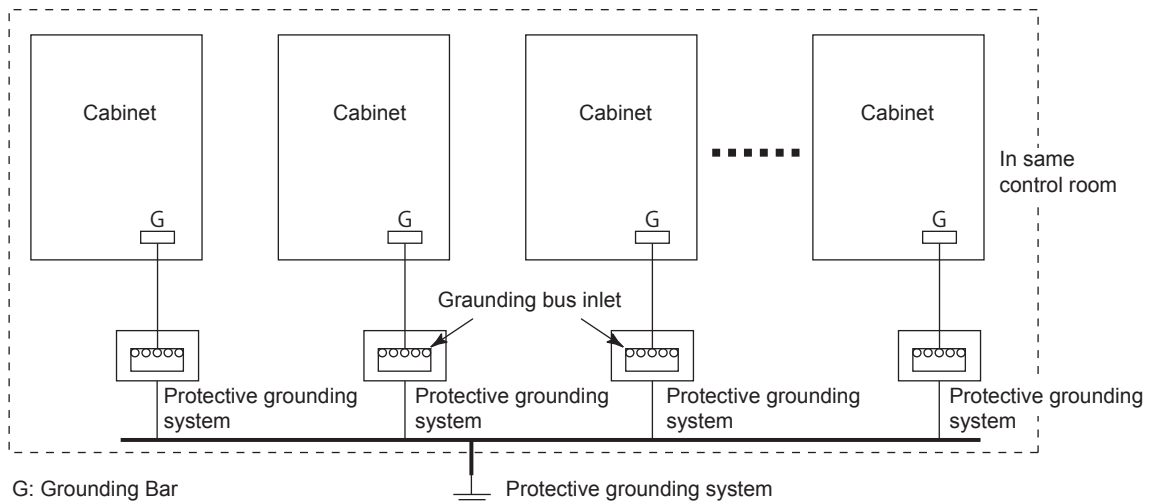


Figure Grounding connected to each grounding bus inlet

■ Grounding when joining CENTUM VP side by side with other system

Do not connect CENTUM VP's cabinet with other cabinets electrically using bolts or other connection mechanism in order to avoid unexpected electrical connection or interference.

When CENTUM VP is joining side by side with other cabinets, ensure to insert insulating sheets.

The cabinets other than CENTUM VP must be insulated from a floor and connect it to a protective grounding system using a different grounding cable.

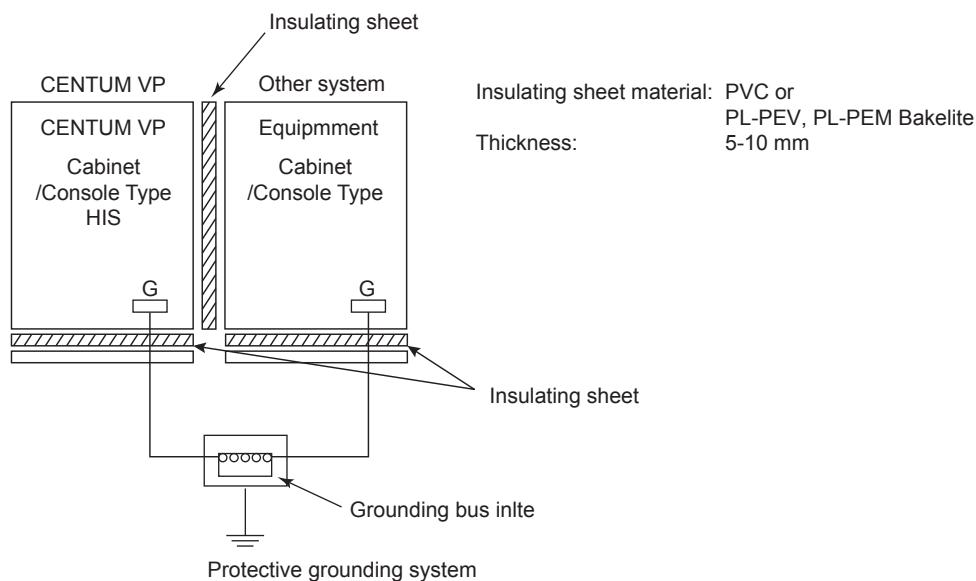
The CENTUM VP system in this page can also be read as cabinet of CENTUM CS 3000, CENTUM CS, or ProSafe-RS.



CAUTION

Do not install the following systems side-by-side with CENTUM VP:

- Systems using power supply voltages over 300 V AC.
- Systems with current consumption over 50 A.
- System containing high frequency sources.



G: Grounding Bar

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Figure Grounding Using Insulating Sheets

TIP

The CENTUM VP cabinets (e.g. AFV40S/AFV40D, and ACB51) are insulated from the floor by the insulating sheet. When other cabinets and consoles are used with CENTUM VP, insulate them from the floor using the insulating sheets.

1.5 Noise Countermeasures

Noise may be induced by electromagnetic induction, electrostatic induction, or from radio waves, lightning, inductive loads, static electricity and ground potential differences. It can be picked up by power, signal and ground cables, and devices. With computerized control systems, noise-induced errors in A/D conversion or in an instruction word may lead to malfunction.

To prevent noise and electrostatic buildup, take the measures described in this section in deciding cable type, cable routing, and grounding.

1.5.1 Noise Sources and Noise Countermeasures

It is not easy to identify the cause of any noise-triggered errors or failures due to their lack of reproducibility.

If noise problems occur, take the following countermeasures.

The following table lists typical noise sources, symptoms of noise problems, and preventive countermeasures:

Table Noise Sources & Countermeasures

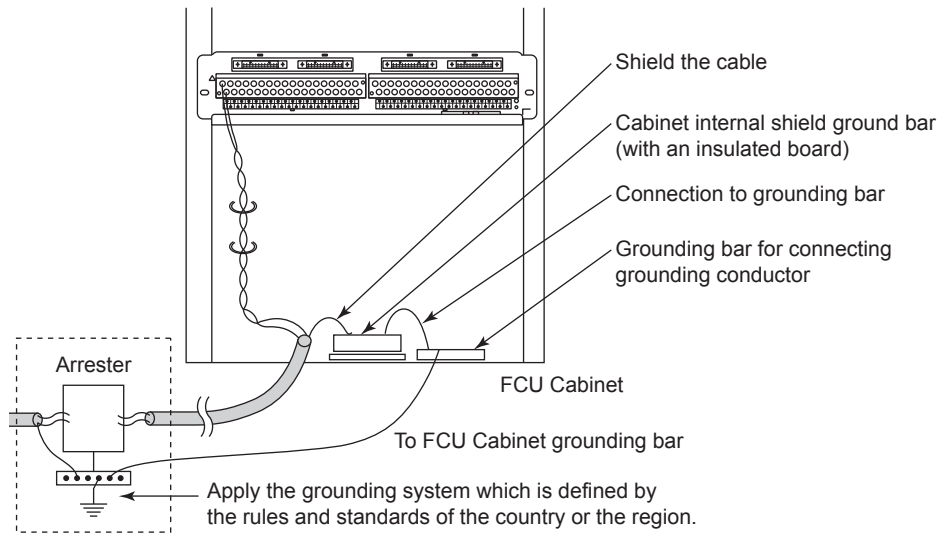
Noise sources	Effects	Countermeasures
Electromagnetic induction (magnetic field)	<ul style="list-style-type: none"> • Destroys magnetic disk data. 	<ul style="list-style-type: none"> • Maintain separation from magnetic-field source. • Shield power cables with metallic conduits. • Shield magnetic field using ferromagnetic substance (e.g. Permalloy). • Use twisted-pair cables.
Electrostatic induction	<ul style="list-style-type: none"> • Equipment maloperation. • Interference with signals. 	<ul style="list-style-type: none"> • Use shielded signal cables. • Electrically separate power and signal cables using metallic conduits and separators. • Lay power and signal cables which intersect at right angles.
Lightning	<ul style="list-style-type: none"> • Interference with signals. • Equipment maloperation. • Component damage. 	<ul style="list-style-type: none"> • Lay cables underground. • Use optical fiber cables. • Lay cables as close to ground as possible if the cables cannot be laid underground. • Install and ground arresters on field and system.
Electrostatic discharge	<ul style="list-style-type: none"> • Equipment maloperation. • Electronic component deterioration, damage. • Paper jam. 	<ul style="list-style-type: none"> • Discharge static electricity from operators. • Provide proper humidity. • Ground equipment properly. • Use antistatic floor material and clothing.
Inductive load open/close	<ul style="list-style-type: none"> • Spike noise interference to power and signal lines. 	<ul style="list-style-type: none"> • Add spark-killer to noise source. • Separate laying of cables.
Radio (electric field)	<ul style="list-style-type: none"> • Equipment maloperation. • Interference with signals. 	<ul style="list-style-type: none"> • Use devices (transceivers, mobile phones, smartphones, etc.) that transmit radio waves away from the system so as not to exceed the electric field specifications.
Ground potential difference	<ul style="list-style-type: none"> • Equipment Maloperation (noise imposed on signal lines) 	<ul style="list-style-type: none"> • Avoid multipoint grounding of signal cable.

■ Grounding with Lightning Arresters

Connect the protective grounding terminals of arresters and CENTUM VP equipment to the grounding pole as shown in the diagram below.

The grounding method must comply with the grounding system defined by rules and standards of the country or the region.

Concatenation grounding a lightning arrester and other equipment may cause high-tension in each equipment by the product of lightning current from arrester and grounding resistance. To prevent from electrification, overall connection should be equipotential including the floor and the case of other equipment.



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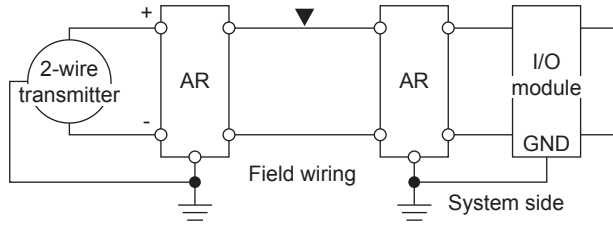
Figure Grounding with Lightning Arresters

Examples of Arrester

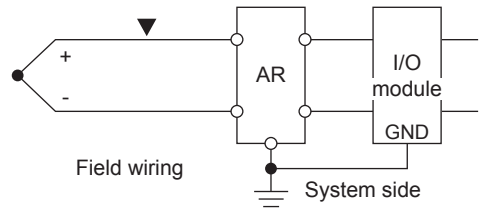
The following shows how to install an arrester as a countermeasure against lightning-induced noise :

▼ : Induced lightning strike point AR: Arrester

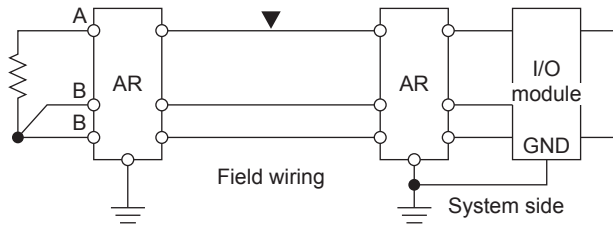
● 2-wire transmitter/analyzer



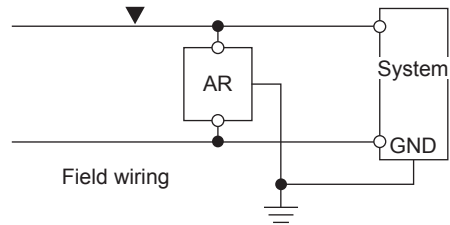
● Thermocouple



● Resistance temperature detector



● Power supply



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Figure Examples of Arrester Installation

Examples of Spark-killer and Diode Installation

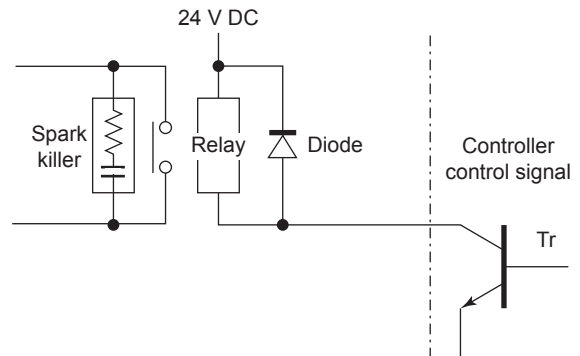
The following shows how to install a spark-killer and a diode as a countermeasure against inductive load-caused noise:

● Relay contact

The diode protects the output transistor from noise occurring during on-to-off transitions of the relay.

The spark killer protects the output relay contact.

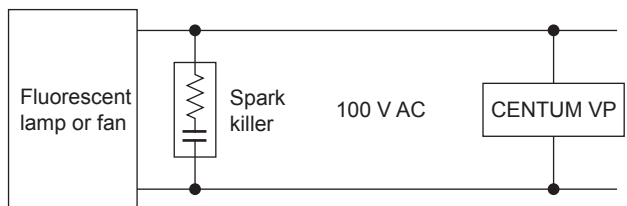
Example
R: 120 ohms
C: 0.1 to 0.3 μ F



● Power supply

The spark killer prevents noise-caused equipment failure when a fluorescent lamp or fan is turned on or off.

Example
R: 120 ohms
C: 0.1 μ F



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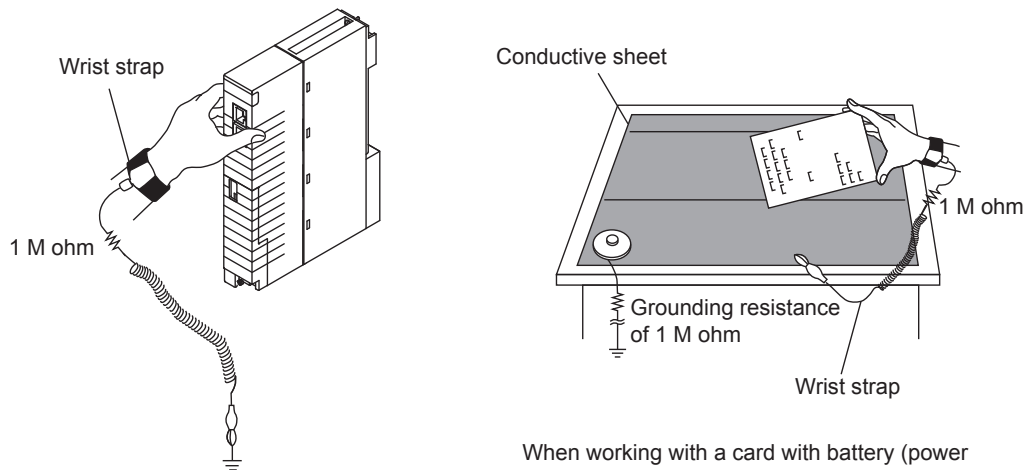
Figure Examples of Spark-killer Installation

1.5.2 Countermeasures against Static Electricity

Take countermeasures against electrostatic damage when handling cards with semi-conductor IC components, for maintenance or to change settings.

Observe the following to prevent electrostatic damage:

- When storing or carrying maintenance parts, be sure to enclose them in an antistatic bag. (For shipment these parts are enclosed in an antistatic bag labeled with precautions against electrostatic charge.)
- During maintenance work use a wrist strap with a ground wire via a grounding resistance of 1 M ohm. Be sure to ground the wrist strap.
- When performing maintenance work on a desk or a table, place a conductivity sheet grounded via a grounding resistance of 1 M ohm. The maintenance person must wear a wrist strap while performing maintenance work. Take any plastic and other materials that can easily be charged away from the work area.
- Exercise caution so as not to touch any of the maintenance parts while the wrist strap and a conductivity sheet are not being used.



Connect the wrist strap to the ground terminal or unpainted part of the frame (grounded).

When working with a card with battery (power supply unit) on a conductive sheet, set the BATTERY ON/OFF switch to the OFF position or remove the battery.

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Figure Example of Using a Wrist Strap and Conductive Sheet

1.6 Cabling Requirements

The following requirements must be fulfilled when laying power and signal cables (These are shielded cables unless specified).

Any signal cable used for high-voltage, high-frequency signals (inductive load ON/ OFF) must be separated from other signal cables.

■ Separator

Provide a separator between power and signal cables as illustrated below:

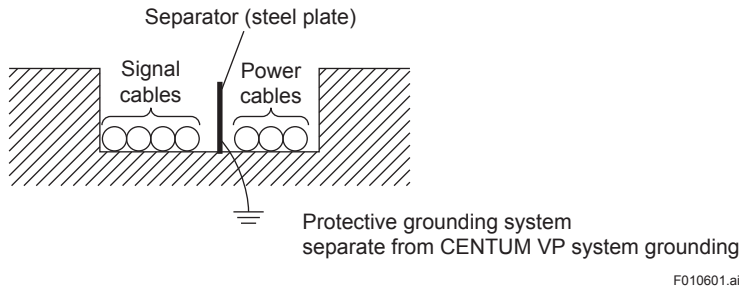


Figure Separator Used in Duct/Pit

■ Distance between Cables

If a separator cannot be used, keep a distance between signal cables and power cables. The distances between cables due to operating voltages and currents are shown below.

Table Required Distance between Power & Shielded Signal Cables

Operating voltage	Operating current	Distance
240 V AC max.	10 A max.	150 mm min.
240 V AC max.	10 A min.	600 mm min.
240 V AC min.	10 A max.	600 mm min.
240 V AC min.	10 A min.	Cannot be laid together.

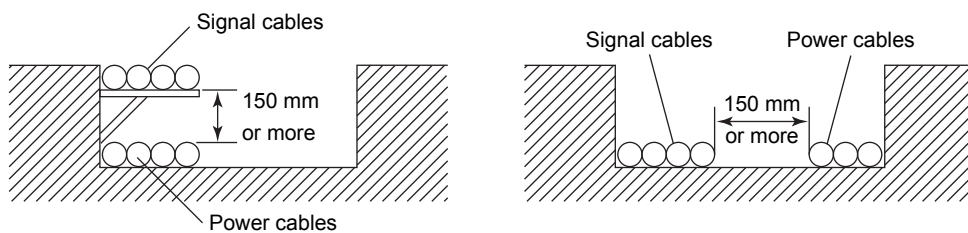
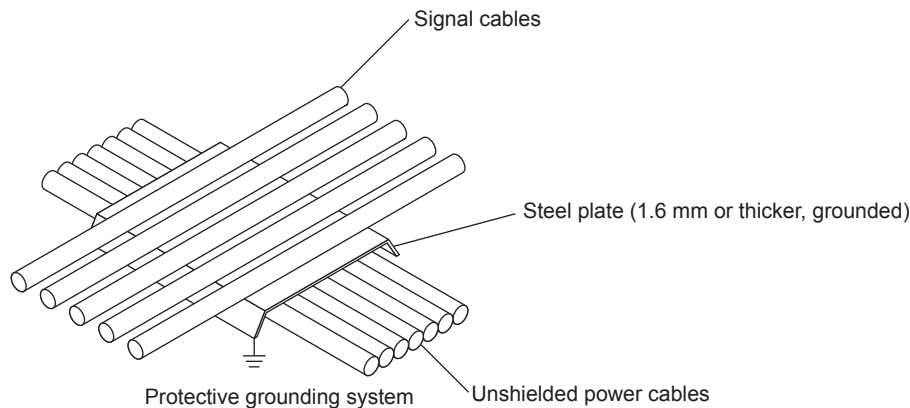


Figure Distance between Cables under Pit/Free-access Floor

■ Intersecting Cables

With unshielded power cables, place a grounded steel plate with a thickness of at least 1.6 mm over the cables where they intersect with signal cables.



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Figure Intersecting Cables under Pit/Free-access Floor

■ Ambient Temperature

The ambient temperature where signal and bus cables are laid must be within the range -10 to 60 °C.

When using Node units (ANB10S/D, ANB11S/D) and Unit (ANT10U) to conform to the temperature specification, the ambient temperature where the cables are laid must be within the range -20 to 70 °C.

When using N-IO Node (A2NN30D, A2BN3D) to conform to the temperature specification, the ambient temperature where the cables are laid must be within the range -40 to 70 °C.

When using BaesPlate Barrier (A2BN4D, A2BN5D), the ambient temperature where the cables are laid must be within the range -20 to 60 °C.

When connecting the field signal to the base plate (A2BN3D) via a dedicated cable and terminal board (A2BM4), the ambient temperature where the cables are laid must be within the range -20 to 70 °C.

■ Measures against EMI

As a rule, avoid laying the cables on the floor. However, lay them on the floor when there are no ducts and no pits. In that case, it is required to cover them with shield plates or take other measures to suit the EMC Directive.

1.7 Corrosive-gas Environment Compatibility

The CENTUM VP system employs ER bus node units, FIO input/output modules, and cables which meet the ANSI/ISA G3 environment requirements and are compatible with the corrosive gas-susceptible environment.

■ G3 Environment-compatible Products

Table G3 Environment-compatible Products (1/3)

No.	Product	Model	Description
1	Field control unit	AFV30□- □□□□6□ □□□□F□	Field Control Unit (for Vnet/IP and FIO, Rack Mountable type)
		A2FV50□-□□□□1□	Field control unit (for N-IO, 19-inch Rack Mountable)
		A2FV70□-□□□□1□	Field control unit (for RIO System Upgrade, 19-inch Rack Mountable)
2	Node unit	ANB10□ -□□6 -□□7 -□□F -□□G	Node Unit for ESB Bus
		ANB11□ -□□6 -□□F	Optical ESB Bus Node Unit
3	Unit	ANT10U -□□6 -□□F	Unit for Optical ESB Bus Repeater Module
4	Bus Interface Module	A2EN402-□□□□1	N-ESB Bus Coupler Module (2-Port)
		A2EN404-□□□□1	N-ESB Bus Coupler Module (4-Port)
		A2EN501-□□□□1□ -□□□□3□	N-ESB Bus Module
		EC401-□1	ESB Bus Coupler Module
		EC402-□1	ESB Bus Coupler Module
		ANT401-□3	Optical ESB Bus Repeater Master Module 5 km
		ANT411-□3	Optical ESB Bus Repeater Master Module 5 - 50 km
		ANT502-□3	Optical ESB Bus Repeater Slave Module 5 km
		ANT512-□3	Optical ESB Bus Repeater Slave Module 5 - 50 km
5	Analog I/O modules	A2MMM843-□□□□1□ -□□□□3□	Analog Digital I/O Module
		AAI141-□□3	Analog input module (4 to 20 mA, 16-channel, non-isolated)
		AAV141-□□3	Analog input module (1 to 5 V, 16-channel, non-isolated)
		AAB141-□□3	Analog input module (1 to 5 V / 4 to 20 mA, 16-channel, non-isolated)
		AAI841-□□3	Analog I/O module (4 to 20 mA input, 4 to 20 mA output, 8-channel/8-channel, non-isolated)
		AAB841-□□3	Analog I/O module (1 to 5 V input, 4 to 20 mA output, 8-channel/8-channel, non-isolated)
		AAB842-□□3	Analog I/O module (1 to 5 V / 4 to 20 mA input, 4 to 20 mA output, 8-channel input / 8-channel output, non-isolated)
		AAI143-□□3	Analog Input Module (4 to 20 mA, 16-Channel, Isolated)
		AAI543 -□□1 -□□3	Analog Output Module (4 to 20 mA, 16-Channel, Isolated)
		AAV144-□□3	Analog input module (-10 to +10 V, 16-channel, isolated)
		AAV544-□□3	Analog output module (-10 to +10 V, 16-channel, isolated)
		AAI135-□□3	Analog input module (4 to 20 mA, 8-channel, isolated channels)

Table G3 Environment-compatible Products (2/3)

No.	Product	Model	Description
5	Analog I/O modules	AAI835-□□3	Analog I/O module (4 to 20 mA, 4-channel/4-channel, isolated channels)
		AAT145-□□3	Thermocouple/mV input module (16-channel, isolated channels)
		AAR145-□□3	Resistance temperature detector/potentiometer input module (16-channel, isolated channels)
		AAP135-□□3	Pulse input module (8-channel, 0 to 10 kHz, isolated channels)
		AAP149-□□1	Pulse input module for compatible PM1 (16-channel, pulse count, 0 to 6 kHz, non-isolated)
		AAP849-□□1	Pulse input/Analog output module for compatible PAC (Pulse count input, 4 to 20mA output, 8-channel/8-channel, non-isolated)
6	Digital I/O modules	A2MDV843-□□□□1□ -□□□□3□	Digital IO module (16-channel, isolated)
		ADV151-□□3	Digital input module (32-channel, 24 V DC, isolated)
		ADV551-□□3	Digital output module (32-channel, 24 V DC, isolated)
		ADV161-□□1	Digital input module (64-channel, 24 V DC, isolated)
		ADV561-□□1	Digital output module (64-channel, isolated)
		ADV859-□□1	Digital I/O module for compatible ST2 (16-channel input/16-channel output, isolated channels)
		ADV159-□□1	Digital input module for compatible ST3 (32-channel, isolated channels)
		ADV559-□□1	Digital output module for compatible ST4 (32-channel, isolated channels)
		ADV869-□□1	Digital I/O module for compatible ST5 (32-channel input/32-channel output, isolated, common minus side every 16-channel)
		ADV169-□□1	Digital input module for compatible ST6 (64-channel, isolated, common minus side every 16-channel)
		ADV569-□□1	Digital output module for compatible ST7 (64-channel, isolated, common minus side every 16-channel)
7	Communication modules	ALR111-□□1	RS-232C Communication Module (2-Port, 1200 bps to 115.2 kbps)
		ALR121-□□1 -□□3	RS-422/RS-485 Communication Module (2-Port, 1200 bps to 115.2 kbps)
		ALE111-□□1 -□□3	Ethernet Communication Module (1-Port, 10 Mbps)
		ALF111-□□1	Foundation Fieldbus (FF-H1) Communication Module (4-Port, 31.25 kbps)
		ALP121-□□1	PROFIBUS-DP Communication Module (1-Port, 9600 bps to 12 Mbps)
		A2LP131-□□1	PROFINET Communication Module (1-Port, 100 Mbps)
8	Router	AVR10D-□□□□1	Duplexed V net Router
		AW810D-□□□□□6	Wide Area Communication Router
9	Turbomachinery I/O Modules	AGS813-□□1	Servo Module (Isolated)
		AGP813-□□1	High Speed Protection Module (Isolated)
10	Node Interface Unit	A2NN10D -□□□□□□□□1	Node Interface Unit (for RIO System Upgrade)
		A2NN20D -□□□□□□□□1	Node Interface Unit (for RIO System Upgrade, Cabinet Installation Type)
		A2NN30D -□□□□□□□□1 -□□□□□□□□3	Node Interface Unit
11	Base Plate	A2BN3D -□□□□1□ -□□□□3□	Base Plate for Adaptor
		A2BN4D	Base Plate for Barrier (MTL)
		A2BN5D	Base Plate for Barrier (P+F)
12	Nest	A2BA3D -□□□1□	Nest for I/O Adaptor (for RIO System Upgrade)

Table G3 Environment-compatible Products (3/3)

No.	Product	Model	Description
13	Power Supply Unit	A2PW503 -□□□□1□ -□□□□3□	24 V DC Power Supply Unit (120 W, 100 to 240 V AC Input)
		A2PW504 -□□□□1□ -□□□□3□	24 V DC Power Supply Unit (120 W, 24 V DC Input)
14	Adaptor	A2SAP105 -□□1□ -□□3□	Pulse Input Signal Adaptor
		A2EXR001 -□□□□□3□	Shunt Resistor Unit (for A2SAP105)
		A2SDV105 -□□1□ -□□3□	Digital Input Adaptor
		A2SDV505 -□□1□ -□□3□	Digital Output Adaptor
		A2SDV506 -□□1□ -□□3□	Relay Output Adaptor
		A2SMX801 -□□1□ -□□3□	Pass-through I/O Signal Adaptor
		A2SMX802 -□□1□ -□□3□	Pass-through I/O Signal Adaptor (With field power output)
		A2SAM105 -□□1□	Current Input/Voltage Input Adaptor
		A2SAM505 -□□1□	Current Output/Voltage Output Adaptor
		A2SAT105 -□□1□	mV/TC/RTD Input Adaptor
15	Terminal board	AEA3D -□6 -□F	Terminal Board for Analog (single and dual-redundant, 8-channel)
		AEA4D -□6 -□F	Terminal Board for Analog (single and dual-redundant, 16-channel)
		AET4D -□6 -□F	Terminal Board for Thermocouple (single and dual-redundant, 16-channel)
		AED5D -□6 -□F	Terminal Board for Digital (single and dual-redundant, 32-channel)
		AER4D -□6 -□F	Terminal Board for resistance temperature detectors (single and dual-redundant, 16-channel)
		AEF9D -□6 -□F	Terminal Board for Fieldbus (single and dual-redundant)
		A1BA4D -□6 -□F	Terminal Board for Analog (single and dual-redundant, 16-channel x 1 or 8-channel x 1, DIN rail mount type)
		A1BT4D -□6 -□F	Terminal Board for Thermocouple (single and dual-redundant, 16-channel x 1, DIN rail mount type)
		A1BR4D -□6 -□F	Terminal Board for RTD input (single and dual-redundant, 16-channel x 1, DIN rail mount type)
		A1BD5D -□6 -□F	Terminal Board for Digital (single and dual-redundant, 32-channel x 1, DIN rail mount type)
		A2BM4 -□1□ -□3□	Terminal board for analog digital I/O

■ Outline of G3 Environment Compatibility

The classification of the environment in which the process control equipment is installed is determined by the ANSI/ISA S71.04-1985 "Environmental Conditions for Process Control Systems" standard. The environment having an atmosphere which contains steams and mists (liquids, coded L), dusts (solids, coded S), or corrosive gases (gases, coded G) is classified into four categories according to the levels of these substances determined.

The four categories of the corrosive gas environment are defined as follows:

- G1 (Mild):** A well-controlled environment in which corrosive gas is not the major cause adversely affecting the reliability of plant equipment. The corrosion level on the copper test piece is below 0.03 μm (see note below).
- G2 (Moderate):** An environment in which corrosive gas can be detected and it could be determined that the gas is the major cause adversely affecting the reliability of plant equipment. The corrosion level on the copper test piece is below 0.1 μm (see note below).
- G3 (Harsh):** An environment in which corrosive gas is frequently generated to cause corrosion and that it is necessary to provide special measures or employ specially designed or packaged plant equipment. The corrosion level on the copper test piece is below 0.2 μm (see note below).
- GX (Severe):** A corrosive gas-polluted environment that demands special protective chassis for the plant equipment, specifications of which should be seriously determined by the user and a power unit manufacturer. The corrosion level on the copper test piece is 0.2 μm or more (see note below).

Note: Copper test pieces are used to determine the level of corrosion for the classification of the plant environment. The test piece is an oxygen-free copper sheet, which is 15 cm² in area, 0.635 mm in thickness, 1/2 to 3/4 H in hardness. The test piece is placed in the plant site for one month and checked for any change before and after the test to determine the degree of corrosion (see table below). If the test period is shorter than one month, the result is calculated to obtain equivalent data using an expression defined by the standard.

Table Classification of Corrosive-gas Corrosion Levels

Environment category		G1 (Mild)	G2 (Moderate)	G3 (Harsh)	GX (Severe)	
Copper corrosion level		< 300 (< 0.03)	< 1000 (< 0.1)	< 2000 (< 0.2)	≥ 2000 (≥ 0.2)	[Å] ([μm])
Group A	H ₂ S	< 3	< 10	< 50	≥ 50	[mm ³ /m ³]
	SO ₂ , SO ₃	< 10	< 100	< 300	≥ 300	
	Cl ₂	< 1	< 2	< 10	≥ 10	
	NO _x	< 50	< 125	< 1250	≥ 1250	
Group B	HF	< 1	< 2	< 10	≥ 10	
	NH ₃	< 500	< 10000	< 25000	≥ 25000	
	O ₃	< 2	< 25	< 100	≥ 100	

Note: The gas density data indicated in the table are for reference only, with the relative humidity of 50 %RH or less. The category goes up one rank higher every time the humidity increases 10 % exceeding the 50 %RH or over 6 % per hour.

The Group-A gases shown in the table may coexist and cause inter-reaction. Inter-reaction factors are not known for the Group-B gases.

1.8 Compliance with Marine Standards

The CENTUM VP comply with the following marine standards, and installation methods.

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- LR (Lloyd's Register), ENV2
- DNV GL

■ Precaution on Selecting System Components

When building a system, use components which have already obtained type approval of marine standards. For the HISs, also use generic computers (including monitors, keyboards, mice, and other peripheral devices) which are accredited by the required marine standards.

■ Marine Standard-compliant CENTUM VP (Vnet/IP) Components

The CENTUM VP (Vnet/IP) components which comply with the marine standards, refer to the GS 33J01A10-01EN "Integrated Production Control System CENTUM VP System Overview".

When using the systems components not listed there, compliances to the marine standards and installation methods need to be confirmed individually in advance.

■ Precaution on Installing Components

In order to comply with the marine standards, the specific installation methods must be followed. Please contact "Process Automation PMK Dept., IA Systems Business Division, IA Platform Business Headquarters" for more details.

2. Transportation, Storage and Installation

This chapter describes the precautions in transporting, storing, and installing the CENTUM VP system equipment.

SEE ALSO See "Section 1.2 Control Room Environment" for the environmental requirement for each piece of equipment.

2.1 Precautions for Transportation

This section describes the precautions required to prevent accidents and damage when transporting CENTUM VP system equipment. These precautions apply when the equipment is contained in our original packing.

■ Transportation

**SEE
ALSO**

See "Table Equipment Installation Specifications" in Section 1.2 Control Room Environment for ambient temperature, humidity, vibration and impact.

● Loading

- Do not load crates on top of others or turn them on their sides.
- Keep all crates upright.
- Secure loaded crates using ropes, and cover them completely with waterproof coverings.
- Do not load crates outdoors when it is raining.

● Don't Stack Outdoors

Be sure to store cargoes inside a warehouse if they must be stored for some time.

● Transportation

Cargoes contain precision instruments. Select a company specializing in the transportation of computers and precision instruments.

Keep all products upright during air transport, freightage, or truck transport. When transporting by track, drive at low speed to avoid vibration and impact. Also, slow down to the limit on a bad road.

● Others

Do not transport equipment through areas where there may be corrosive gas, intense electric or magnetic fields.

■ Unloading

Prepare special equipment for unloading. Avoid unloading outdoor in case of rain.

● Location for Unloading

To select a location for safe unloading, check that:

- There is ample space for crane and forklift maneuvering.
- Ground is solid.
- The handrails of scaffold can be removed.
- There is enough working space for unpacking (at least 2500 mm by 4000 mm). Provide a platform if necessary.
- There is a height of at least 3000 mm under the roof.
- Outdoor-indoor temperature difference should be less than 10 °C to avoid condensation.

● Keep Upright

Keep crates upright when unloading.

● Avoid Physical Shock

Avoid physical shock. Be careful not to lose balance or swing when lifting or placing cargoes on the ground or platform. Also check scaffold strength.



CAUTION

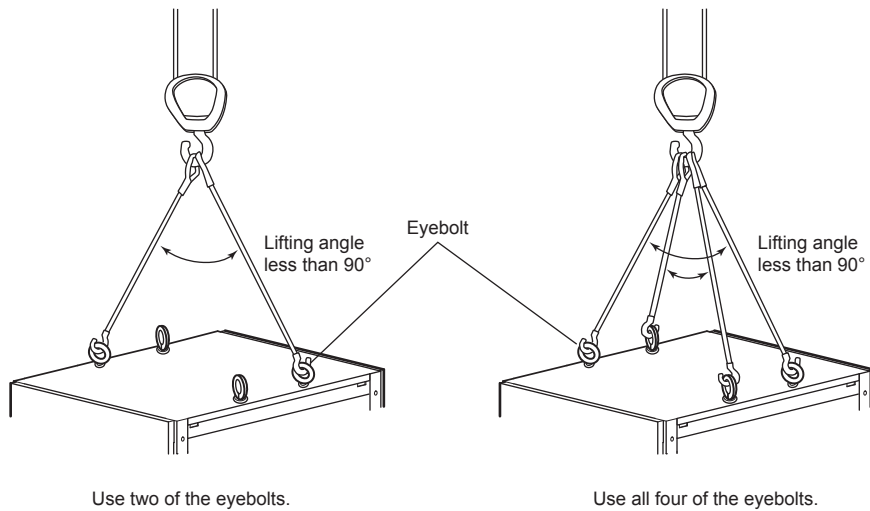
- When lifting Hardware with a crane, do not unpack it, but attach lifting bolts or wire ropes to the baseboard positions shown to lift it. Keep the distance between the crane hook and the cargo to be lifted at a minimum.
 - If it is difficult to do this, tie four belts together at a point close to the cargo to keep it from falling.
 - Unpacked items are more likely to lose their balance and fall.
-

● Craning the cabinet

When lifting a cabinet by a crane, please follow the instructions below.

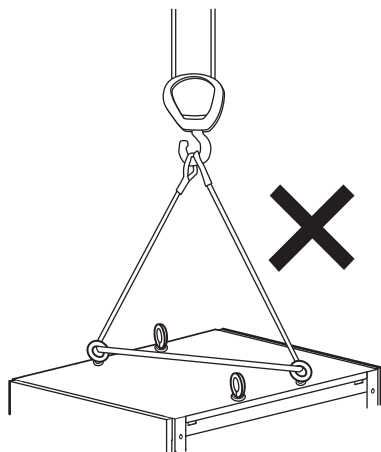
- Use two of the eyebolts in diagonal positions, or all four of the eyebolts to lift the cabinet.
- Keep the wire lifting angle of the cabinet less than 90 degrees.
- Use a wire pair each eyebolt.

When craning the cabinet, the wire or the crane must have enough strength against the cabinet weights.



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Figure How to lift of a cabinet



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Figure Wrong way of lifting

■ Carrying

This section describes how to carry cabinets.

● Carrying Space

Carry cabinets into the location of installation without unpacking.

To carry them in on the second floor or upper floors using a crane, a scaffold of about 2500 by 4000 mm is required for placing as well as unpacking.

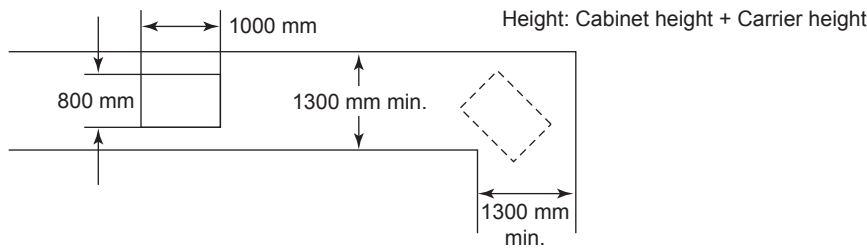
Table Required Entrance and Elevator Size

	Cabinet
Width	800 mm
Height	2400 mm
Depth	1000 mm
Max. loading capacity	400 kg

● Passage

The passage must be wide enough as shown below. It must also be strong enough to withstand the weight of the cabinet. Determine the passage according to the cabinet's and carrier's size and weight.

- Carrying cabinet in



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Figure Passage Requirements

● Carrying when Headroom is Low

The cabinet should be carried upright. If this is impossible due to low headroom,

- Remove the side boards.
- Turn the cabinet's right or left side (viewed from its front) down.
- Gently carry the cabinet with the side down.
- Turn the cabinet to its upright position as soon as the cabinet passes through a place with low headroom. Attach the side boards to the cabinet.

● Using Rollers

The cabinet should be carried in to or near the installation location without unpacking. Do not use rollers if possible. When using them, take the following precautions:

- Use wooden rollers which are long enough so that more than 200 mm remains outside of the cabinet on each side.
- Make sure that two or more rollers are always under the cabinet.
- Do not use a hammer to correct roller positions on the move.

2.2 Unpacking

In unpacking the received cargoes and equipment, inspect them according to inspection list below. It is recommended to unpack by Yokogawa engineers or in their presence.

Table Inspection List

	Inspection Items	Result		Measures Required
Exterior	• Environment of unpacking location (temperature, humidity, dust)	Suitable	Unsuitable	If unsuitable, select proper location according to specified environmental requirements.
	• Rapid temperature fluctuation (should be within ± 10 °C/h)	No	Yes	If yes, do not unpack and wait until the fluctuation remains within ± 10 °C/h.
	• Damage to equipment exterior	No	Yes	If damaged badly, inform Yokogawa.
	• Condensation or its trace on equipment exterior. (*1)	No	Yes	If yes, inform Yokogawa.
Interior	• Loose parts inside equipment.	No	Yes	If yes, remove them and check the surrounding.
	• Damage to equipment interior.	No	Yes	If damaged badly, inform Yokogawa.
	• Condensation or its trace on equipment interior. (*1)	No	Yes	If yes, inform Yokogawa.

- *1: Condensation symptoms are as follows:
- Dew patterns on PCBs.
 - Printed circuit copper trace is floating off the board.
 - Label characters on PCBs are smudged.
 - Connectors on PCBs are smudged.
 - Dew patterns or traces of droplets are found on cabinet panels.



CAUTION

Condensation may cause a fatal system failure in the CENTUM VP system. Be sure to unpack the equipment indoor under the specified environmental conditions. Strictly observe the allowable temperature fluctuation range of ± 10 °C/h. Do not bring the equipment into a heated room straight from the outside in winter. Our warranty does not cover any damage caused by condensation.



CAUTION

Be careful not to let the products fall when you handle them.

When they are hit hard, the interior of them can be damaged, although there is no damage in the exterior.

If you accidentally drop an product, stop using it immediately and report it to Yokogawa.

2.3 Storage

The delivery date should be determined in accordance with your installation schedule. Avoid storing products more than three months. If long-term storage more than three months cannot be avoided, consult Yokogawa in advance because it is necessary to provide waterproofing, condensation prevention, and dustproofing measures as well as periodical inspections.

■ Storage Condition

Store products without unpacking. Be sure to confirm that the crate is not damaged. To store them after unpacking, be sure to take the precautions described below.

■ Location of Storage

Store products in a warehouse or indoor facilities - never in an open-air location.

■ Storage Environment

- Ambient Temperature for storage: 5 to 40 °C
- Avoid direct sunlight.
- Prevent condensation.
- Do not store products where corrosive gas or salty air may be present.

**SEE
ALSO**

See "Section 1.2 Control Room Environment" for permissible temperature, humidity and temperature fluctuation of storage area.

■ Storage of Packed Equipment

- Place squared pieces of lumber with a height of 100 mm or higher on the floor. The lumber should be long enough so that more than 100 mm remain outside of the crate on every side.
- Securely place unopened crates on the lumber platform.
- Do not stack crates in piles.
- Make sure to provide good air circulation in the storage area and periodically inspect the crates to keep them under proper conditions.

■ Storage of Unpacked Equipment

To store unpacked products without power connection, follow the specified environmental requirements. If stored in a non-air-conditioned room, cover them with polyethylene or other sheets for protection against dust and moisture. For moisture-proofing, place a sufficient amount of Silica gel or other desiccating agent inside the covering and inspect replace from time to time. When using desiccating agent or corrosion inhibitor etc., please select the appropriate one. Also, please make sure that it does not affect the function and performance of the product before actually using it.

2.4 Servicing Area

Take enough space around equipment for its operation and maintenance service. This servicing area is indicated for each equipment.

The servicing area should be considered in determining the size of installation location. When installing a number of equipment side by side, take the largest service-area between them if different dimensions are indicated for different side of equipment (see below).

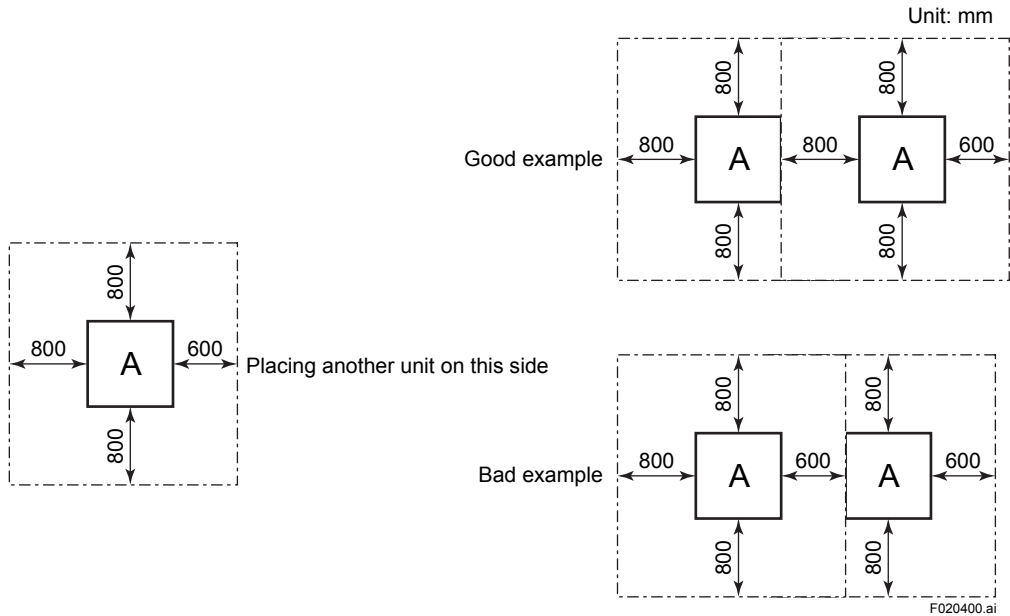


Figure Servicing Area when Installing Units Side-by-side

**SEE
ALSO**

For equipment servicing areas, refer to "External Dimensions" (SD).

2.5 Installation

Before installation, be sure that anchor bolts, pedestals, and cable holes are provided according to the customer's system configuration plans. Check that the positions of holes on the floor fit the anchor bolt holes in the channel base of each piece of equipment.

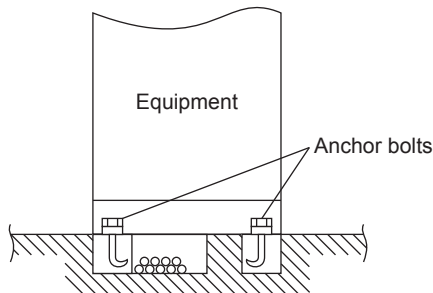
2.5.1 Installation on Floor

The installation method varies with the type of the floor and building.

- After unpacked, be careful not to put any impact until it is fixed to the floor to prevent from tip-over.
- Install devices as specified in the plans.
Check the position of front and back panels of the cabinet.
Avoid physical shock. Never use hammers.
- Fix each equipment to the floor. The explanation below shows how to fix devices on different types of floors.

■ Concrete Floor

Clamp the equipment to the floor using anchor bolts. It is recommended to use M12 bolts and 3,200 N·cm tightening torque.



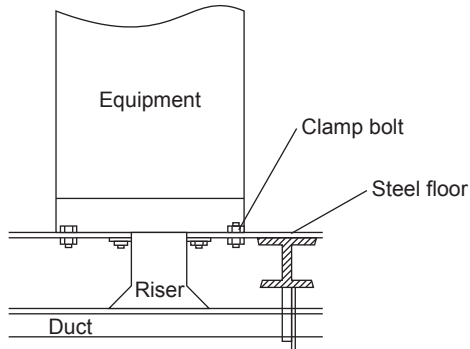
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Figure Using Anchor Bolts

■ Steel Floor

Clamp the equipment to the floor using clamp bolts.

After cabling through the riser duct, fill the duct with rubber sponges and seal the top with putty.

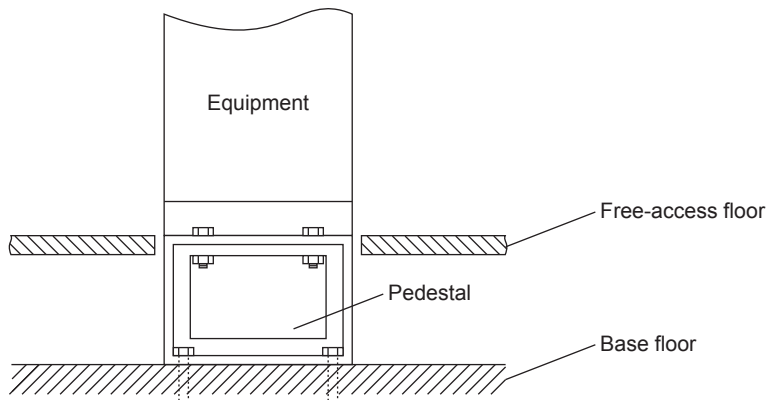


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Figure Using Clamp Bolts

■ “Free-access” Floor

Clamp the equipment to pedestals which are anchored to the base floor.

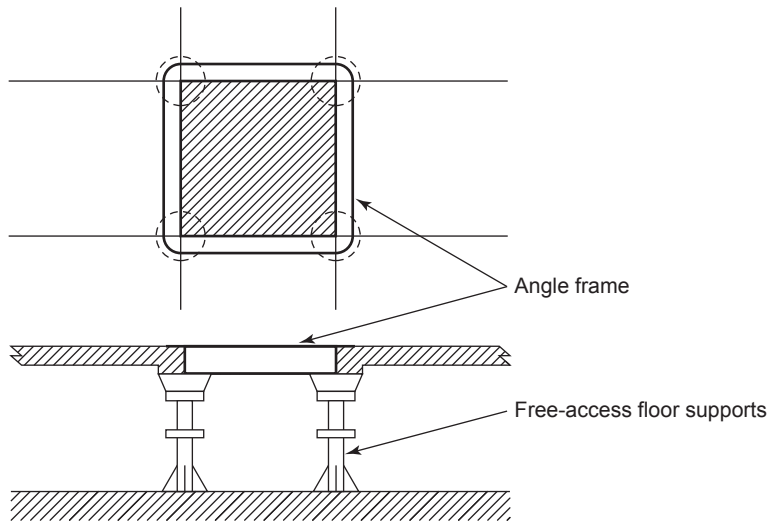


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Figure Using Pedestal

In the “free-access” floor, make holes for riser cables to connect to each piece of equipment as follows:

- If one floor tile is removed, be sure to reinforce the opening with an angle frame for floor stability.



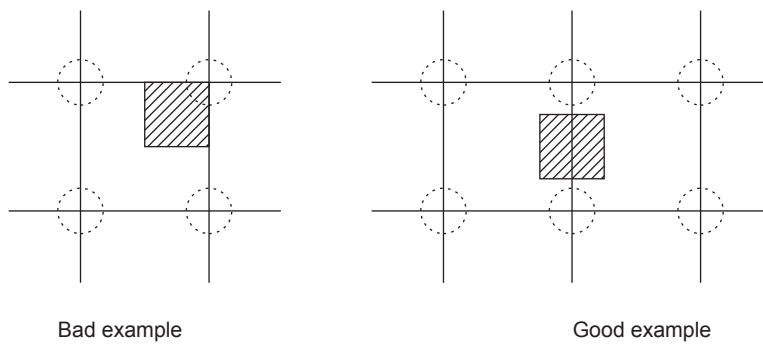
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Figure Removing One Floor Tile

- Do not make a holes near the floor supports.
- Do not cut away more than 1/3 of a floor tile.

IMPORTANT

If a number of neighboring floor tiles are removed, be sure to provide angle frames or pedestals for reinforcement.



Bad example

Good example

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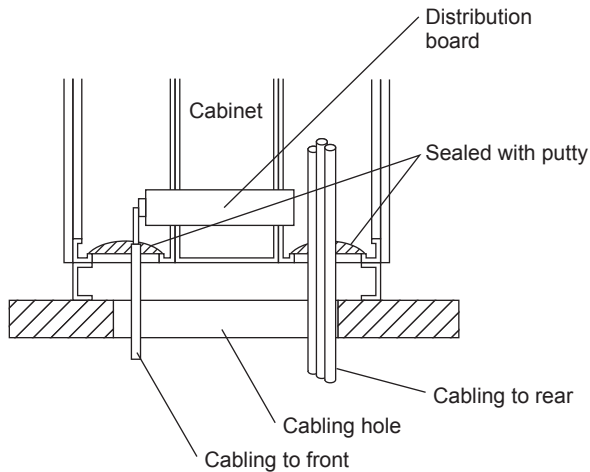
Figure Partially Cutting Floor Tile

■ Size of Cabling Holes in Floor

For ease of cabling, and for separating power cables from signal cables, it is recommended that you create holes in the floor for cabling that are the maximum size indicated in the floor plans.

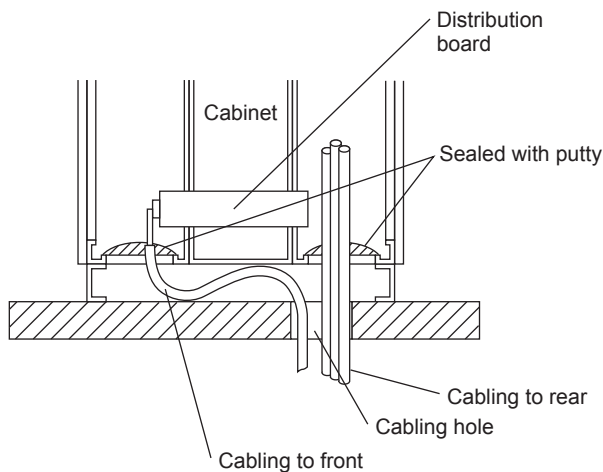
SEE ALSO Refer to “External Dimensions” (SD) for the weight and dimensions.

If the specified maximum size hole cannot be provided due to the floor construction or pit dimensions, the size may be smaller within the range indicated in the plans. If you use the specified minimum size of hole, use flexible cables that can bend inside the channel base.



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Figure Cabling through Maximum Size Hole

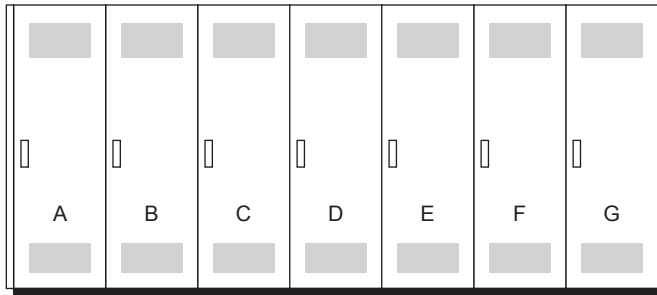


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Figure Cabling through Minimum Size Hole

2.5.2 Installing Cabinets in a Side-by-Side Arrangement

Install two or more cabinets (AFV40S/AFV40D, and ACB51) in a side-by-side arrangement as described below.

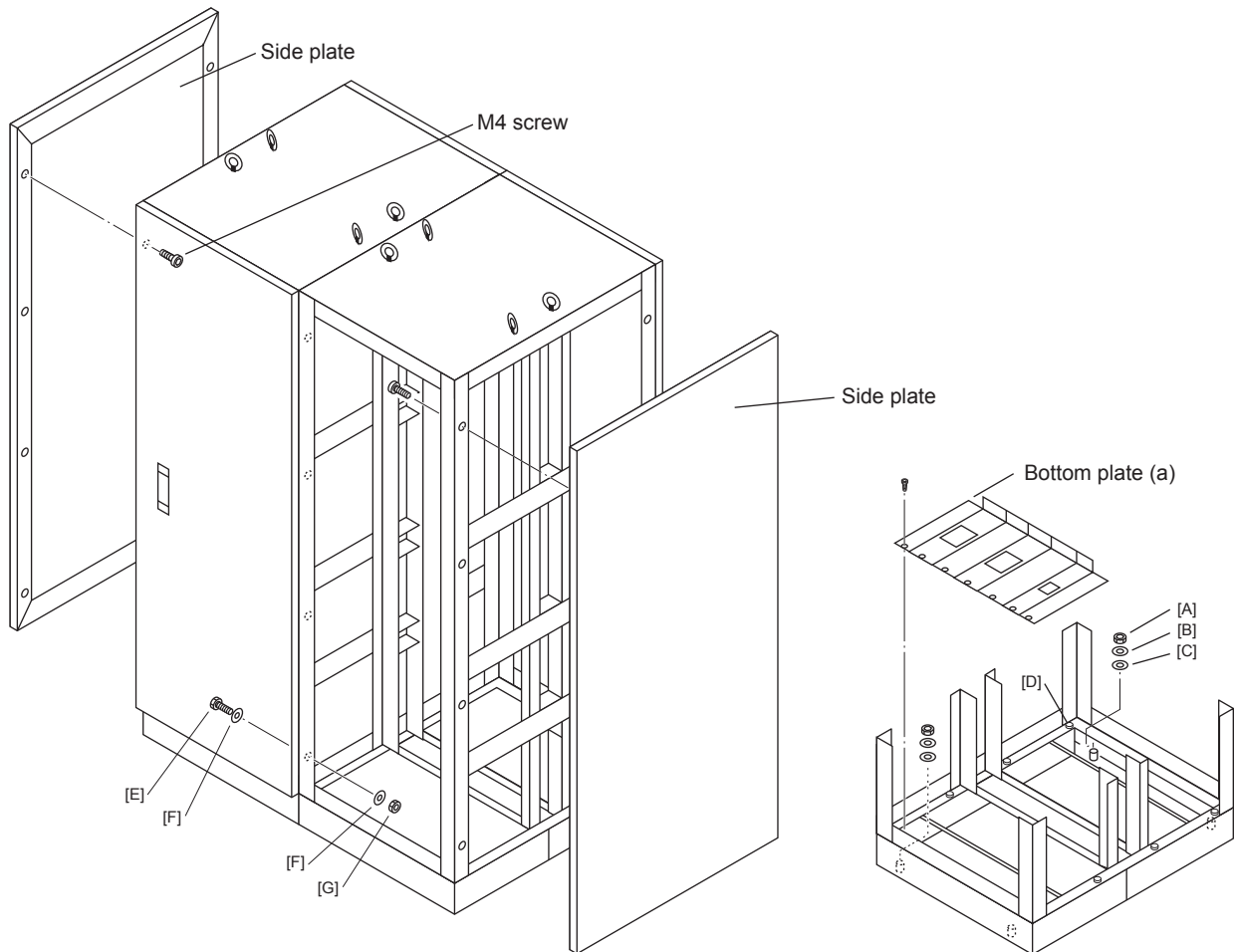


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Figure Example of Installing Cabinets in a Side-by-Side Arrangement

■ Installation

- (a) Level the floor surface on which cabinets are to be installed.
- (b) To install two or more cabinets in a line, install the central one first (D in Figure), and next ones on both sides (C→B→A, E→F→G).
- (c) With bottom plate (a) (see Figure on next page) off, install the cabinet in position, making sure that the anchor bolt position and channel base hole align with each other.
- (d) Tighten anchor bolt nut [A] (see Figure on next page) when the installation is complete. When linking many cabinets in a row, tighten the nuts only finger-tight first, fully tightening them when the cabinet interconnection is complete.



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Figure Installing Cabinets Side by Side

■ Interconnecting cabinets

- (a) Using a hexagon wrench, loosen hexagonal socket head bolts [D] (eight bolts) securing the main body and the channel base to each other.
- (b) With the front and rear doors open, clamp bolt screw [E], toothed washer [F] and nut [G] using a wrench (at eight positions on the front and rear in total).
- (c) After verifying that the cabinet is level in all orientations, clamp hexagonal socket head bolts [D] (eight bolts) securing the main body and the channel base to each other using a hexagonal wrench. If there is a gap between the main body and channel base when the hexagonal socket head bolts are clamped, insert liners into the gap for adjustment.
- (d) Replace all bottom plates that have been removed in their original position.

**SEE
ALSO**

For details on the related tools and parts for joining cabinet's side-by-side, refer to "Tools and Parts Required for Joining Cabinets."

■ Tools and Parts Required for Joining Cabinets

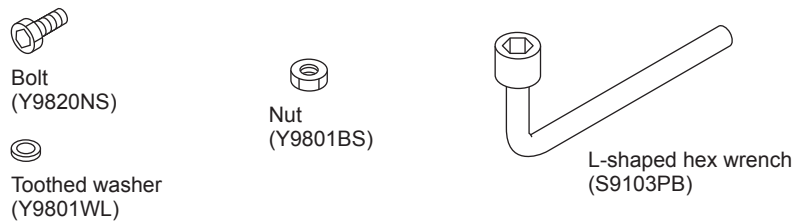
Connecting kit to install cabinets side by side. Table lists those parts needed to connect two cabinets together.

- AKT211: Connection kit for Cabinet

Table Joining Parts and Tools (required per additional station)

No.	Names	Part numbers	Quantity
a	Nut or bolt (M12) (*1)	–	4
b	Spring washer (M12) (*1)	–	4
c	Flat washer (M12) (*1)	–	4
d	Hex hole bolt (M10)	– (Cabinet accessory)	8
e	Bolt (M8)	Y9820NS	8
f	Toothed (serrated) washer (M8)	Y9801WL	16
g	Nut (M8)	Y9801BS	8
h	L-shaped hex wrench	S9103PB	2

*1: Parts "a" "b" and "c" need to be provided by the user.



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Figure Cabinet Connecting Parts

2.5.3 19-inch Rack Mount Devices

Before use, mount the following devices in a rack. AFV30S/AFV30D, A2FV50S/A2FV50D, A2FV70S/A2FV70D, ANB10S/ANB10D, ANB11S/ANB11D, and ANT10U Unit for FIO and AVR10D Duplexed V net Router and AW810D Wide Area Communication Router and A2NN10D Node Interface Unit.



CAUTION

- To meet the Safety Standards and EMC Standards, the devices must be installed in a lockable metal cabinet. The cabinet must conform to IEC/EN/CSA 61010-2-201 or provide degrees of protection IP3X or above and IK09 or above.
- Do not install the 19-inch rack mountable devices close to each other. When installing an 19-inch rack mount devices on the same rack, maintain a 3-unit spacing (*1) (1 unit: 44.45 mm) between devices.

*1: Space between devices can be smaller than 3 unit to the extent it does not interfere with device mounting and maintenance, only if Cabinet Utility Kit (ACUKT1) is used or the cabinet interior has been provided with a thermal design and the ambient temperature is within the product specifications.

■ Notes on Installation



CAUTION

For installation, secure ample working space and work in a team for safety.

Be sure to observe the following when installing in the rack or on an instrumentation panel:

● Providing Space for Heat Radiation

Leave space at the top and bottom of rack-mount equipment to permit heat radiation.

- Separate the top of the instrumentation board at least 100 mm away from the ceiling, and cut a ventilation hole of 200 cm² or larger in the ceiling or install a ventilation fan.
- Keep at least 50 mm between the back of the equipment and the instrumentation panel or wall.
- When installing an 19-inch rack mount devices on the same rack, maintain a 3-unit spacing (1 unit: 44.45 mm) between devices.
Do not use any space between equipments for cable wiring or anything.
- Do not block ventilation openings in top and bottom face of equipment.

● Providing Area for Servicing

When mounting devices in the 19-inch rack, the mounting plate cut out of instrumentation panel, and so on, leave an area for servicing.

Leave an area for servicing.

- All the work to connect cables to 19-inch rack mountable devices and I/O modules will be performed from the front.
- The work to confirm indicator lamps, configure card settings, and remove/insert cards will be performed from the front.
- The front is the area for wiring and servicing. Leave at least 1000 mm of space at the front.

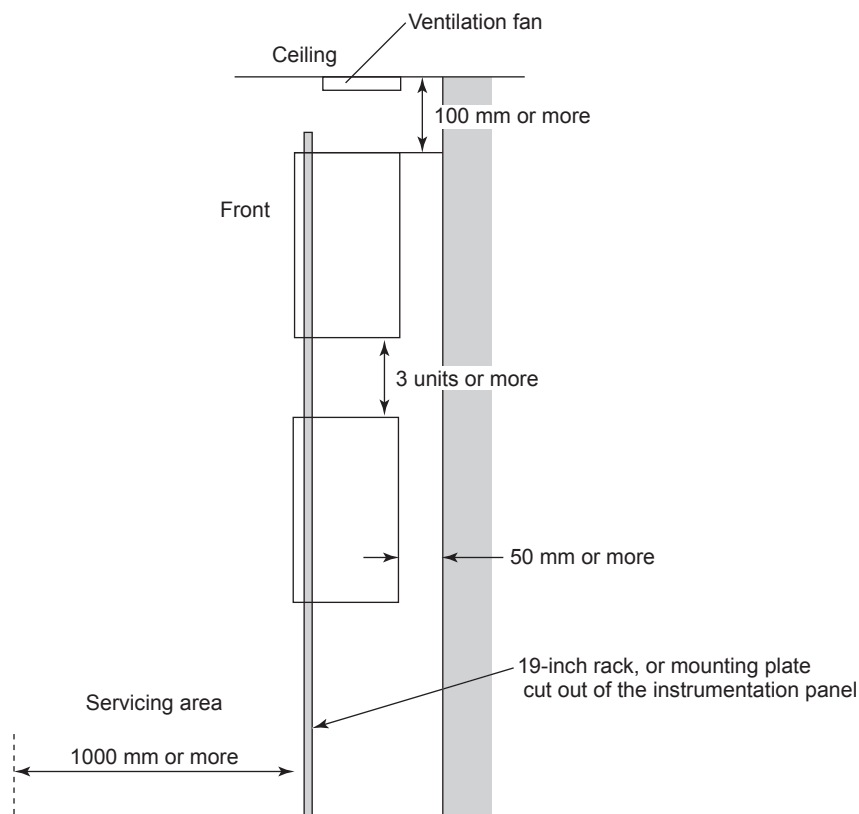


Figure Space Required for Rack-mount Equipment

● Isolation from Rack

Isolate the rack mountable devices from the rack by attaching insulating bushings. Fasten a pair of insulating bushings together to each of the screw holes on the plate or the bracket on the devices to prevent the devices from touching the rack. And then screw the devices to the rack. After screwing the devices to the rack, confirm that the devices is electrically isolated. insulating bushings are supplied with the rack mountable devices.



CAUTION

When you install the 'devices with insulating bushings attached' on a rack or an instrument panel, do not keep the devices hung on loose screws in an unstable status. Too much force may apply to the insulating bushings and cause damaged or broken insulating bushings.

● Installation Procedure

1. Fasten a pair of insulating bushings together to each of the screw holes on the plate or the bracket on the device. The tapering end of the insulating bushings must come to the front side where a screw enters.
2. Using eight M5 screws to fix the device onto the rack or the panel.

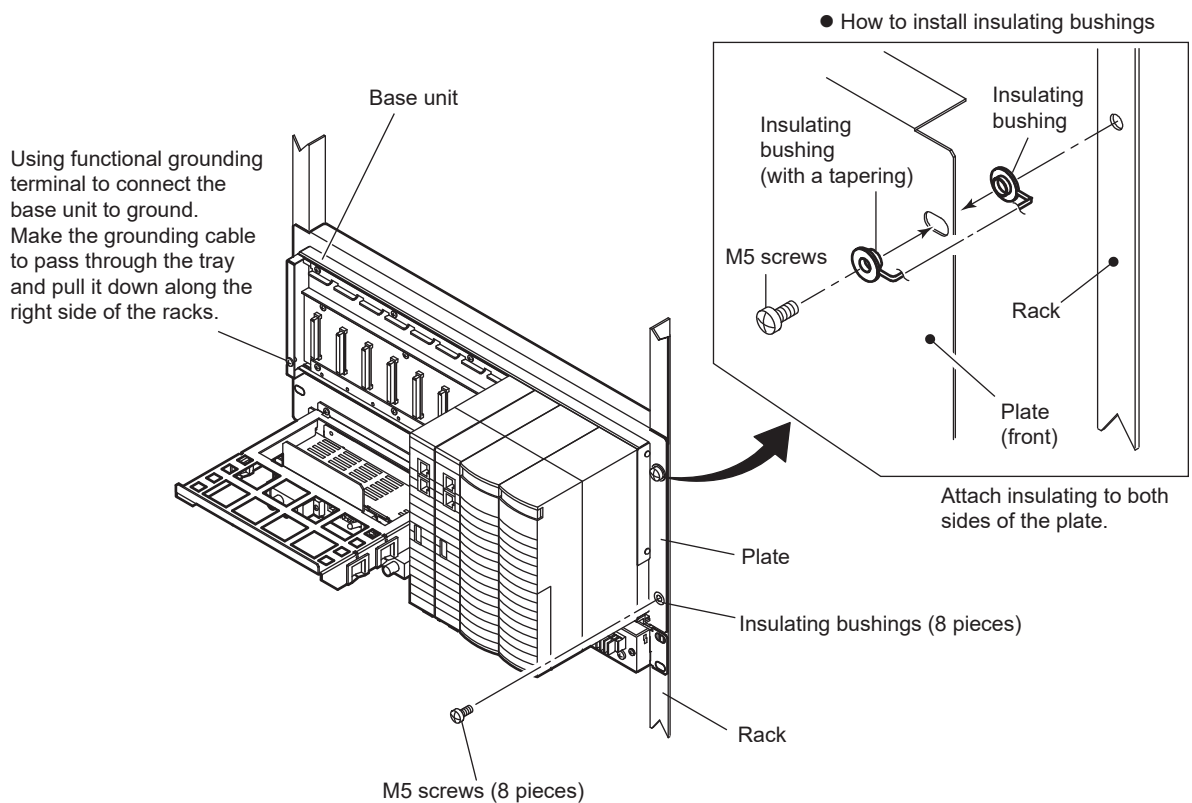


Figure Example of Mounting FCU on a Rack

● Isolation Bush

In the front of the I/O expansion cabinet (ACB51): for cabinet installation type node and the rear: for 19-inch rack mount type, the cabinet installation type node is installed in the front. For this node, the independent grounding plays an important role in the circuit systems.

Therefore, in order that the rear 19-inch rack mount devices do not pass the grounding current which is important to the node, it and devices manufactured by other companies, must be insulated with an insulation bush. As devices manufactured by Yokogawa also do not have the guarantee that it will share a common power supply or grounding with the Model ACB51 itself, make sure to insulate with an isolation bush.

TIP

The isolation bush of Yokogawa devices can be eliminated if both I/O expansion cabinet types are installing Yokogawa devices and shares a common power supply and grounding with Model ACB51 and only when other company devices are insulated with an isolation bush.

● Installation Orientation

Install the device in the rack with the screws in the vertically correct orientation.

Check the installation orientation by referring to General Specifications (GS).

TIP

When the device is supplied with power even if it is temporary, the device must be installed on the rack. Placing the device on a desk etc. and laying it on its side should be avoided. The device may become malfunction if the heat radiated from the device cannot be cooled smoothly.

2.5.4 DIN Rail Mountable Devices

The following devices can be mounted to a DIN rail.

Node interface unit: A2NN30D-□□□□0□□□□□

Adaptor base plate: A2BN3D-0□□□□□

Barrier base plate: A2BN4D-2□□□□□

A2BN5D-2□□□□□

Power supply unit: A2PW503/DN, A2PW504/DN

Terminal board: A2BM4

IMPORTANT

Install a DIN rail mountable device inside a metal cabinet.

Installation inside a metal cabinet with a lock is required to comply with standards; in particular, safety standards and EMC conformity standards.

Notes on Installation



CAUTION

For installation, secure ample working space and work in a team for safety.

Provide Space for Mounting

A2NN30D, A2BN3D, and A2BN5D need to be slide when they are mounted on the DIN rail. For that reason, provide a space shown in the following figure. Refer to the General Specifications (GS) for the external dimensions.

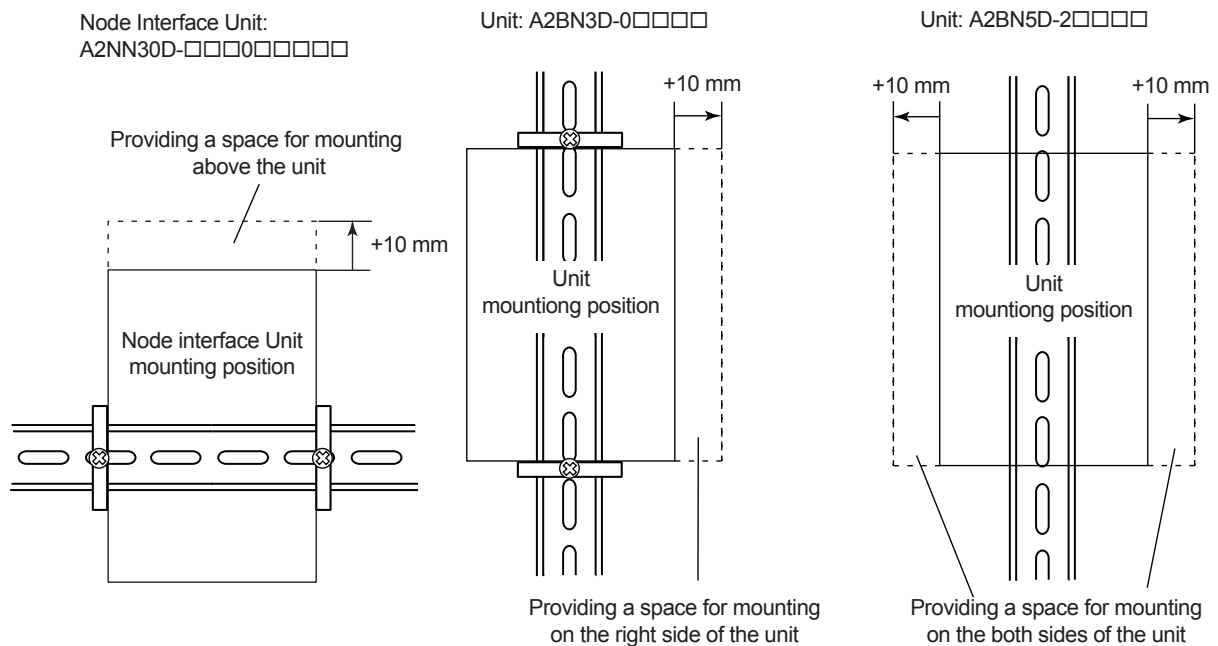


Figure Providing a Space for Mounting (Front View)

● **Mounting**

- When mounting the I/O Units (A2BN3D, A2BN4D) spaced apart from each other on the DIN rail, install the stoppers in both the top and bottom ends of each unit.

When mounting the units close to each other on the DIN rail, install the stoppers in the bottom end of each unit and in the top end of the unit in the highest position.

- When mounting the I/O Units (A2BN5D), fix the both the top and bottom ends to the DIN rail with the built-in stoppers.
- When mounting the Node Interface Unit (A2NN30D), install the stoppers in both the right and left ends of the unit.
- When mounting the Power Supply Unit (A2PW503/DN, A2PW504/DN), fix the both ends to the DIN rail with the built-in stoppers.

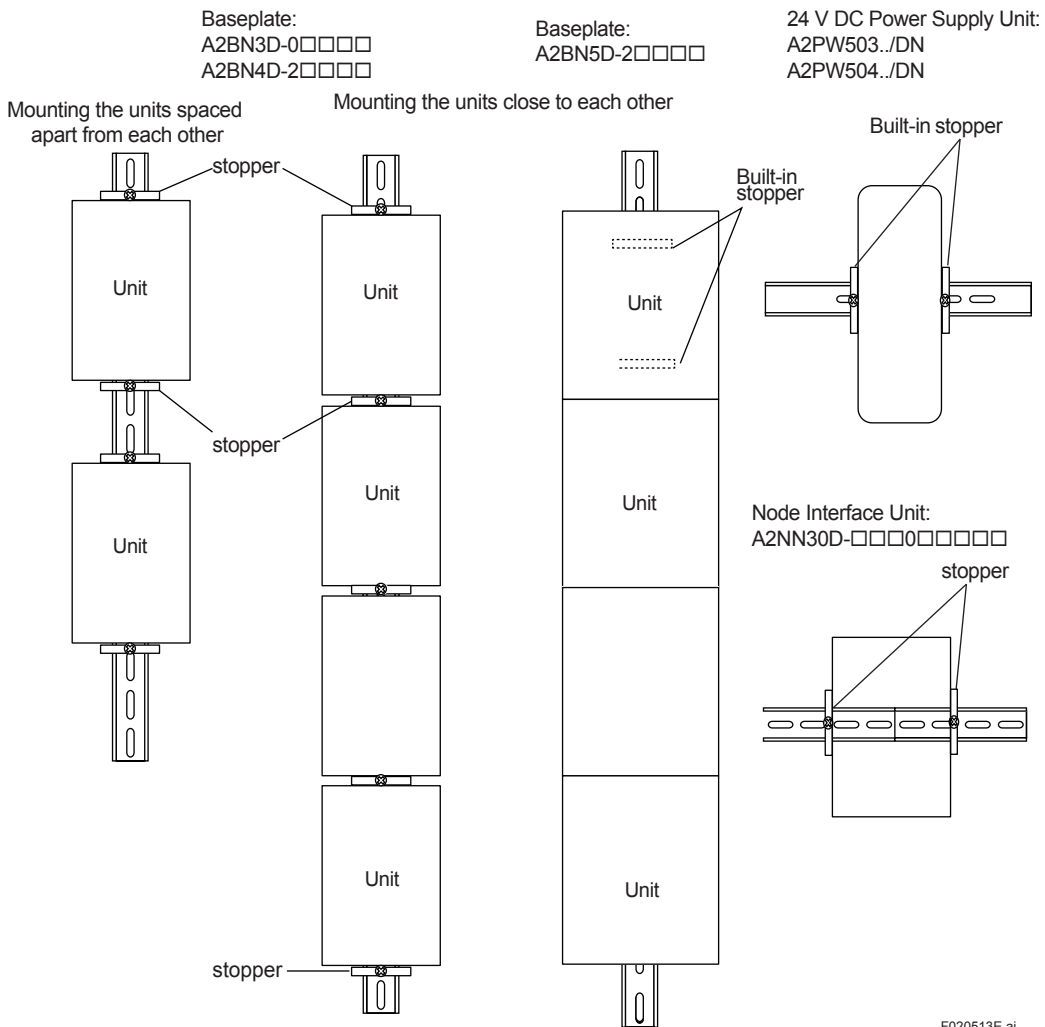


Figure Mounting stopper to the DIN rail

● Providing Space for Heat Dissipation

Leave space at the top and bottom of the device to permit heat dissipation.

- Separate the top of the instrumentation board at least 100 mm away from the ceiling, and cut a ventilation hole of 200 cm² or larger in the ceiling or install a ventilation fan.
- Do not block the openings (ventilation holes) in the top and bottom surfaces of the device.
- A 1-unit (44.45 mm) or more space shall be provided between the Node Interface Unit and other base plates.

● Providing Area for Servicing

Leave an area for servicing.

- All the work to connect cables to DIN rail mountable devices and I/O modules will be performed from the front.
- The work to confirm indicator lamps, configure card settings, and remove/insert cards will be performed from the front.
- The front is the area for wiring and servicing. Leave at least 1000 mm of space at the front.

● Compatible DIN Rail

Table Compatible DIN Rail Symbols (DIN 60715, JIS C 2812, IEC 60715, EN50022)

Cross section shapeType symbol	Width - height symbols	Material (chemical symbol)
TH	35-7.5	Fe or Al

● Installation of DIN Rail

- Install a DIN rail in a metal mounting plate with screws at 120-mm or less intervals.
- When mounting a DIN rail mountable device to a DIN rail, confirm that the device is securely fixed after the mounting.
- Be sure to bring a DIN rail into contact with a mounting plate in order that the heat generated from the DIN rail mountable device can be radiated to the mounting plate via the DIN rail.

● Grounding

Be sure to ground the equipment using the functional grounding terminal of the base plate. Even if there is electrical conduction between the base plate and wall surface via the mounting mechanism, the equipment must be grounded using the functional grounding terminal.

● Installation Orientation for base plate, node interface unit, and power unit

Mount the device to the DIN rail in the vertically correct orientation. Check the installation orientation in General Specifications (GS).

● Installation Orientation for terminal board

Mount a terminal board in the orientations as shown in the below figure. Refer to the General Specifications (GS) for the external dimensions.

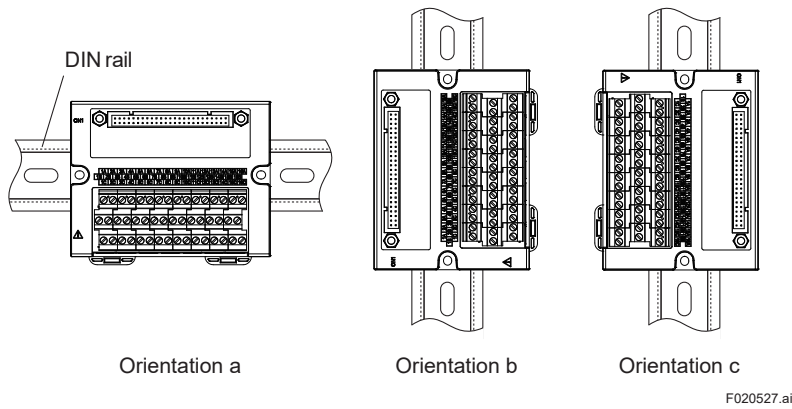


Figure Installation Orientation for terminal board

■ Remarks for Mounting on a DIN Rail

On the back of DIN rail mountable terminal board, there are two bumps (projections) for fixing screws on the wall. Be sure not to let mechanical interference happen between these bumps and screw tops from the DIN rail. The height of the shaded areas in the below figures must be kept as 2.5 mm or shorter than the DIN rail surface.

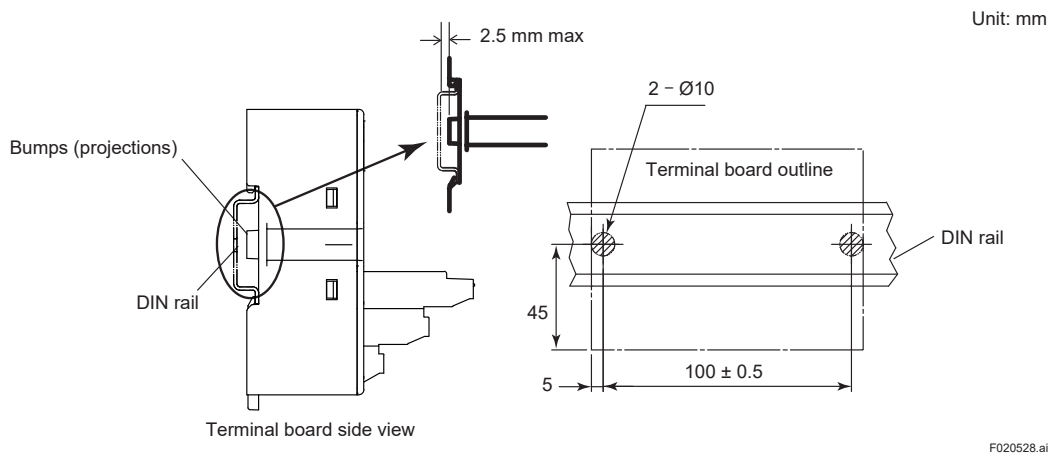


Figure Remarks for Mounting on a DIN Rail

2.5.5 Wall Mountable Devices

The following devices can be mounted to a wall with screws.

Node interface unit:	A2NN10D, A2NN30D-□□□□1□□□□
Adaptor base plate	A2BN3D-1□□□□
Barrier base plate:	A2BN4D-2□□□□
	A2BN5D-2□□□□
Terminal board:	A2BM4

IMPORTANT

Install a wall mountable device inside a metal cabinet.

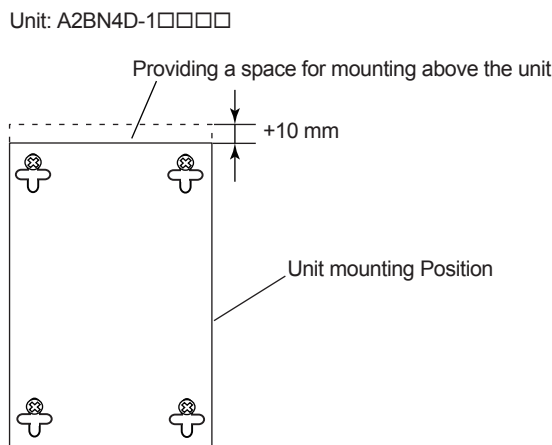
Installation inside a metal cabinet with a lock is required to comply with standards; in particular, safety standards and EMC conformity standards.

DIN rail specifications:

■ Notes on Installation

● Providing Space for Mounting

A2BN4D need to be slide when this is mounted to a wall. For this reason, provide a space shown in the following figure. Refer to the General Specifications (GS 33J62F40-01EN) for the external dimensions.



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Figure Providing a Space for Mounting (Front View)

● Providing Space for Heat Dissipation

Leave space to permit heat dissipation just as for a DIN rail mountable device.

● Providing Area for Servicing

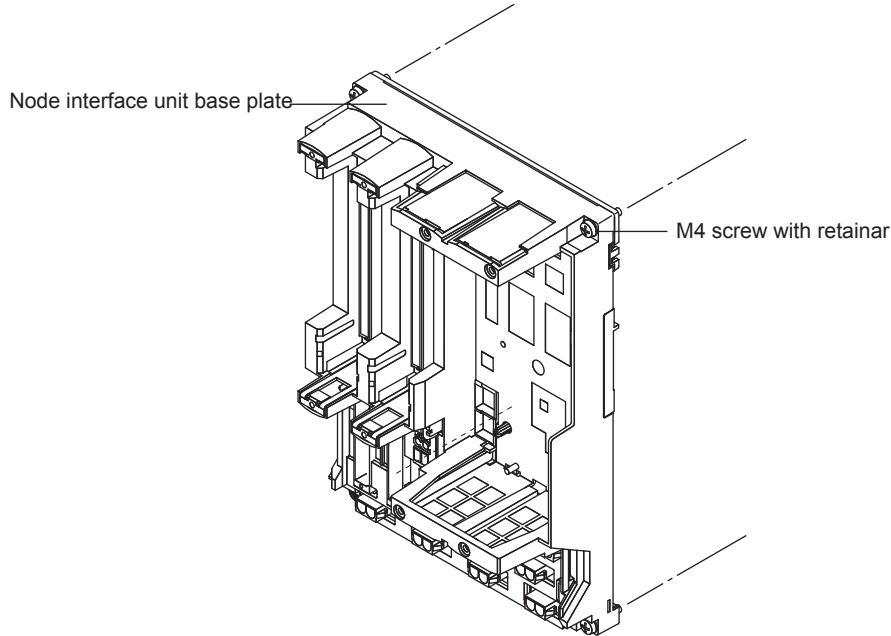
Leave an area for servicing just as for a DIN rail mountable device.

● Grounding

Be sure to ground the equipment using the functional grounding terminal provided on the base plate.

● **Mounting of Base plate**

- Mount a wall mountable device to a metal mounting plate using screws.
- Be sure to bring a device into contact with a mounting plate in order that the heat generated from the device can be radiated to the mounting plate.



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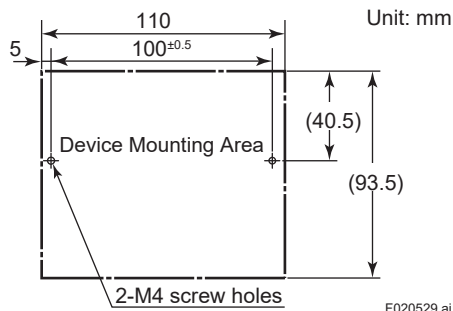
Figure Example of Mounting Node Interface Unit to Wall

Table Tightening Torque for Wall Mountable Devices

Model	Torque (N·m)
A2NN30D	0.8~1.0
A2BN3D	0.8~1.0
A2BN4D	1.2
A2BN5D	1.2

● **Remarks for Mounting terminal board on a Wall Surface**

The following figure shows the screw installation dimensions for a wall mountable terminal board. Installation screws for the terminal board are not supplied and should be purchased separately. You need two installation screws. If you are using binding heads, use M4 screws with a length of at least 10 mm. If you are using screws with washers, use M4 screws with a length of at least 12 mm. The screw tightening torque is approximately 0.8 N·m.



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Figure Screw Installation Dimensions for A2BM4

**SEE
ALSO**

For the screw mounting dimensions for wall mounting, refer to the General Specifications (GS) for the corresponding device.

- **Grounding**

Ground the equipment using the functional grounding terminal provided on the base plate. Even if there is electrical conduction between the base plate and wall surface via the mounting screws, the equipment must be grounded using the functional grounding terminal.

- **Insulation from a wall (Node Interface Unit A2NN10D)**

To prevent noise from coming into the device through the wall, attach insulating bushings to the brackets on the 19-inch rack mountable node interface unit so that the unit does not directly touch the wall. Insulating bushings are supplied as accessories.

- **Installation Orientation**

Mount the device to the DIN rail with the screws in the vertically correct orientation. Check the installation orientation in General Specifications (GS).

2.5.6 Example of Mounting to General Purpose Cabinet / Junction Box

This section describes examples of the maximum number of devices mounted in a general-purpose cabinet or a junction box. When mounting more devices than the number shown in the examples, or when changing the conditions explained later, please carry out thermal design for each device, and make sure it meets the temperature specifications for each device.

■ Cabinet for FIO System

● Mounting to Cabinet Using ACUKT1

The following describes how to mount the field control unit and node units to a Rettal TS8 cabinet using the Cabinet Utility Kit (ACUKT1).

Cabinet Specification

Cabinet Utility Kit (ACUKT1) can be used for mounting to a Rettal TS8 cabinet with the dimensions of 800 mm (W) x 800 mm (D) x 2,000 mm (+100 mm) (*1) (H).

*1: 100 mm is the height of the channel base.

Operating Temperature

- The ambient temperature of the cabinet should be 50°C or less.
- The field control unit and node units should meet the temperature range specified in the General Specifications (GS).

Mounting Conditions

- Maximum number of mounted units
Field Control Unit (AFV30S/AFV30D):
One unit can be mounted either at the front or rear of the cabinet (max. one unit).
Node unit:
Up to 7 units can be mounted each at the front and rear of the cabinet. However, up to 6 units can be mounted on the side where the field control unit is mounted.
- Use the door fan that is included in ACUKT1.
- Do not mount a heat dissipating device (e.g., power supply) in the cabinet, with the exception of the field control unit and node units.
- Provide space for one unit between the higher-level node fan unit and the node unit beneath it.
- Mount the appropriate number of node fan units in accordance with the number of units mounted. For details, refer to GS 33J60K20-01EN.

IMPORTANT

The restrictions on the I/O modules installed in the FIO node units are described in the document of "FIO System Overview" (GS 33J60F10-01EN).

Mounting Position of Devices

- Field Control Unit (AFV30□/KHU): Location 38 to 42
- Node Unit : Location 4 to 34

Mounting Position of cabinet Utility Kit (ACUKT1)

- Node fan Unit (ANFAN): Location 34, 36
- PDB: Location 1 to 3
- Door fan unit (ADFAN): To the door
- Power Supply Bus Unit, Vertical type (AEPV7D)

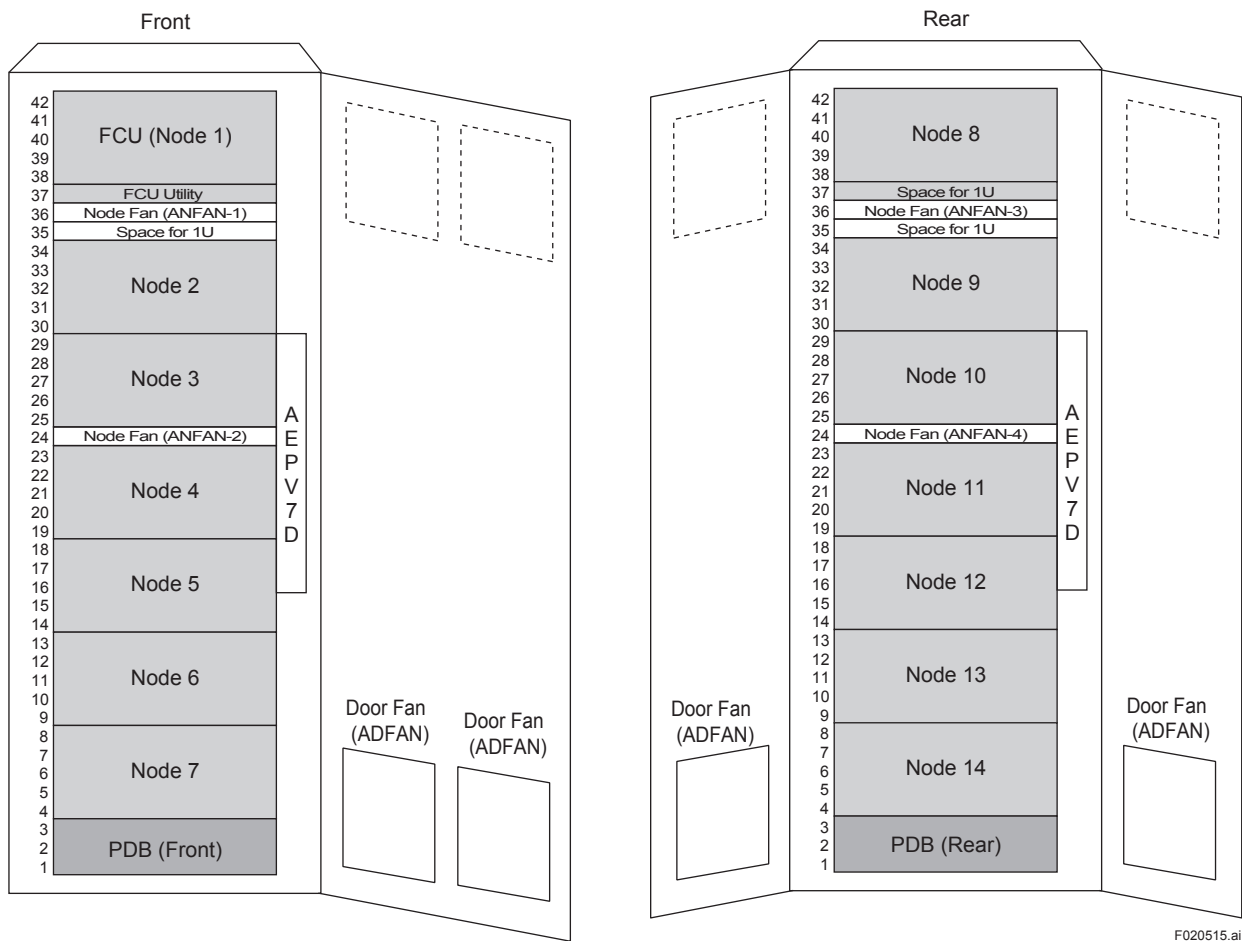


Figure Example of Closely-installed FIO Node Units (A single door is mounted at the front, A double door is mounted at the rear)

Mounting of Door Fan

Mount the door fan unit using the chassis of Rittal's standard door fan unit.

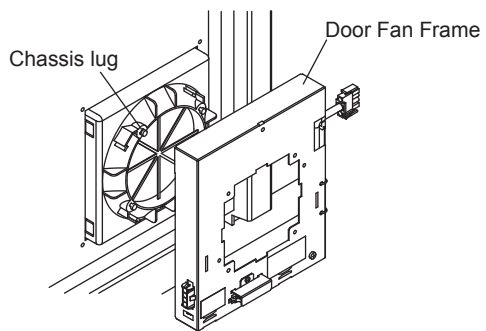


Figure Mounting of Door Fan frame

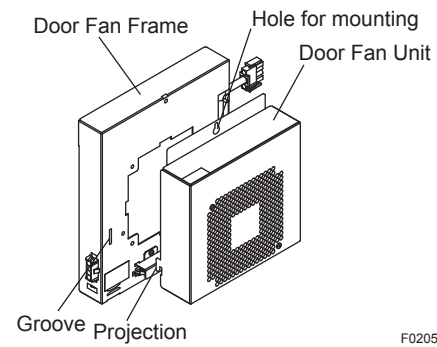


Figure Mounting of Door Fan Unit

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● Mounting to General Purpose Cabinet without ACUKT1

The following describes how to mount the field control unit and node units to a Rittal or other general purpose cabinet without using the Cabinet Utility Kit (ACUKT1).

Cabinet Specification Example

- Cabinet dimensions: 800 mm (W) x 800 mm (D) x 2,000 mm (+100 mm) (*1) (H).
*1: 100 mm is the height of the channel base.
- Door fans must be mounted on both front- and rear-door panels. (Both fans' air flow rate should be equal or greater than 230 m³/h.)

Temperature Condition

The ambient cabinet outside a cabinet must be below 40 degree Celsius.

The ambient temperature inside a cabinet where the Field Control Unit and the FIO Node Units are installed must satisfy the conditions specified in GS (General Specification) documents of the Field Control Unit and the FIO Node Units.

Installation Condition

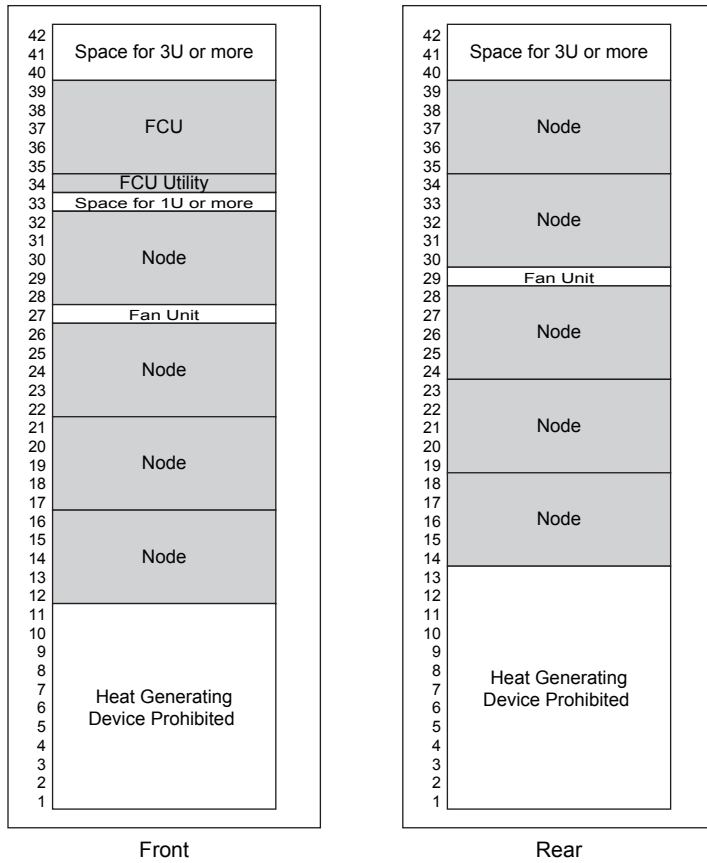
- Maximum Number of Devices
Field Control Unit: One each can be installed in front part and rear part of a cabinet.
Node Unit: Four each can be installed in front part and rear part of a cabinet.

If Field Control Unit is not installed in the part of the cabinet, up to five FIO node units can be installed.
- Any heat generating device other than Field Control Unit and FIO node unit (such as a power supply) should not be installed in the cabinet.
- A three unit mounting space (one unit mounting space equals to 44.45 mm) should be kept between the highest position of the mounting frame and the highest Field Control Unit or FIO node unit in the cabinet.
- One unit mounting space (one unit mounting space equals to 44.45 mm) should be kept between an Field Control Unit and an FIO node unit.
- Up to two FIO node units can be installed close to each other in the same cabinet.

If three FIO node units need to be installed close to each other, a circulation fan unit (with 300 m³/h or more airflow capability) should be placed at the top of the three FIO node units.

IMPORTANT

The restrictions on the I/O modules installed in the FIO node units are described in the document of "FIO System Overview" (GS 33J60A10-01EN).



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Figure Mounting Example Using General Purpose Cabinet (Without Using ACUKT1)

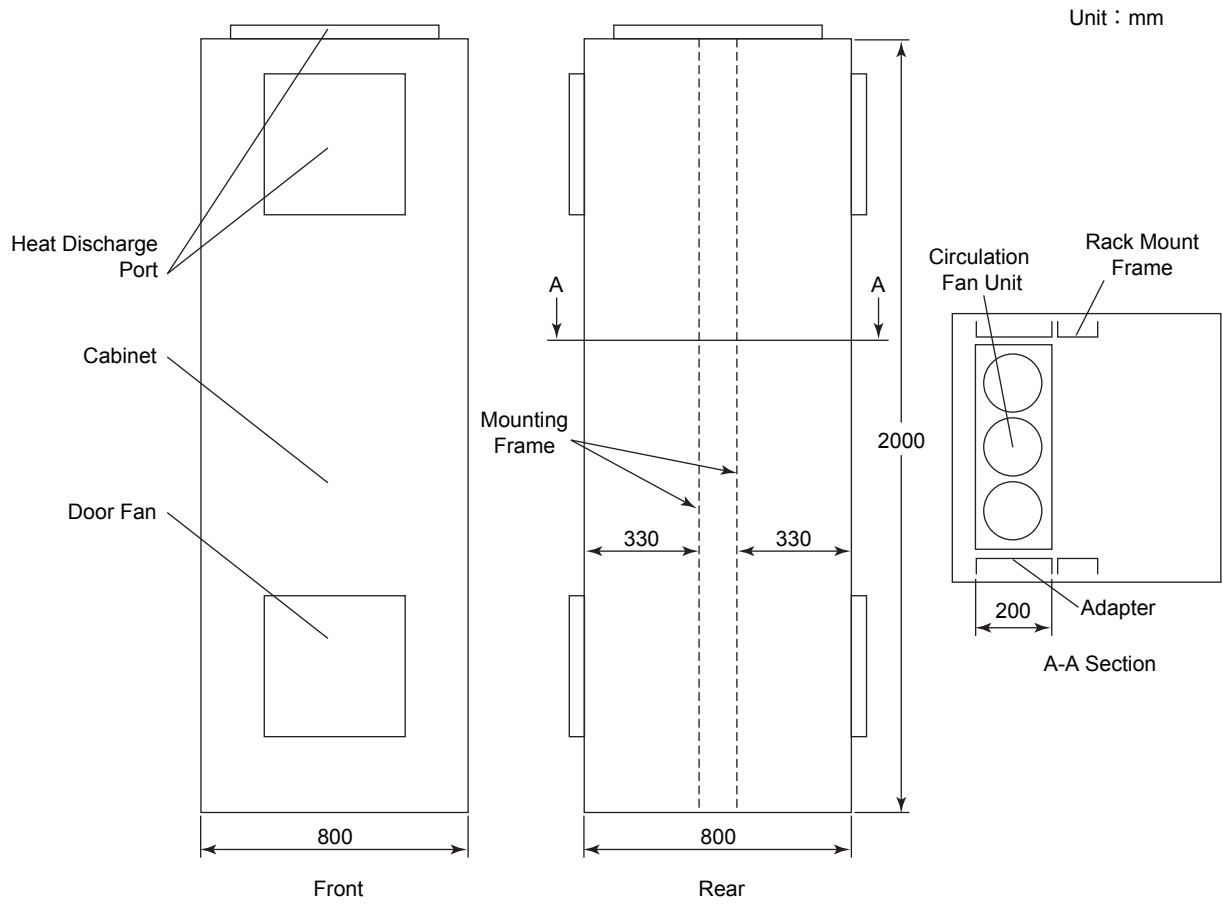


Figure An Example of Installation in Rittal Cabinet

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■ Cabinet for N-IO System

This section describes examples of the maximum number of N-IO system equipment (except for equipment for RIO System Upgrade) installed in general-purpose cabinets.

The following shows the common specifications to the examples of cabinets for N-IO system that are explained later.

Cabinet Specifications

The following cabinet is assumed to be used.

Table Cabinet Dimensions

W	D	H	Product example
800 mm	800 mm	2000 mm (+100 mm) (*1)	Rittal TS8808 series

*1: 100 mm is the height of the channel base.

Table Specifications of a cabinet ambient temperature and an air supply / air exhaust port (In case N-IO FCU is included in a cabinet.)

Cabinet ambient temperature	Air supply port	Air flow	Area of an air supply/ air exhaust port (Panel cut of a cabinet)	Product example	Remarks
40 °C or less	Fan	Door fan 230 m ³ /h or more Circulation fan 230 m ³ /h or more	Air supply port 60000 mm ² or more Air exhaust port 60000 mm ² or more	Rittal SK3239 series (Fan)	<ul style="list-style-type: none"> Be sure to mount two push-fit door fans on each side in case of a failure. The air flow and the area in the left show the total value on each side.

Table Specifications of a cabinet ambient temperature and an air supply / air exhaust port (In case only N-IO nodes (Non-Intrinsic Safety Barrier) are included in a cabinet.)

Cabinet ambient temperature	Air supply port	Air flow	Area of an air supply/ air exhaust port (Panel cut of a cabinet)	Product example	Remarks
50 °C or less	Fan	Door fan 40 m ³ /h or more	Air supply port 16000 mm ² or more Air exhaust port 60000 mm ² or more	Rittal SK3237 series (Fan)	<ul style="list-style-type: none"> It is recommended to mount two push-fit door fans on each side in case of a failure. The air flow and the area in the left show the total value on each side.
40 °C or less	Outlet filter	— (*1)	Air supply port 60000 mm ² or more Air exhaust port 60000 mm ² or more	Rittal SK3239.200 (Outlet filter)	<ul style="list-style-type: none"> Be sure to mount two outlet filters on each side in case of a failure such as filter clogging.

*1: When not mounting a fan, be sure to secure a ventilation path in the cabinet.

Table Specifications of a cabinet ambient temperature and an air supply / air exhaust port
(In case only N-IO nodes (Intrinsic Safety Barrier) are included in a cabinet.)

Cabinet ambient temperature	Air supply port	Air flow	Area of an air supply/ air exhaust port (Panel cut of a cabinet)	Product example	Remarks
50 °C or less	Fan	Door fan 230 m ³ /h or more	Air supply port 60000 mm ² or more Air exhaust port 60000 mm ² or more	Rittal SK3239 series (Fan)	<ul style="list-style-type: none"> Be sure to mount two or more push-fit door fans on each side in case of a failure. The air flow and the area in the left show the total value on each side.

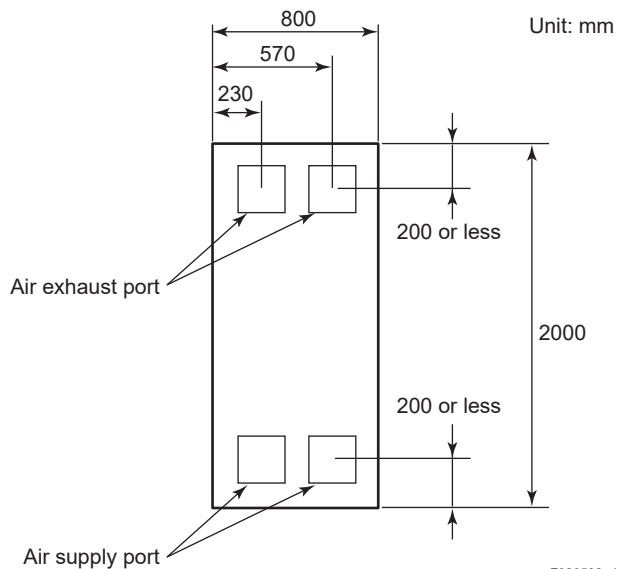
Notes

The following shows the common notes to the examples.

- The ventilation for each system shall not be blocked.
- The mounting plate for mounting the IOBP and IOBP_IS shall be made of metal, regardless of whether DIN rail or panel mounting.
- A DIN rail shall be made of metal.
- For mounting restrictions other than the above, refer to the General Specifications (GS).

Position of an air supply / air exhaust port

In this mounting example, arrange an air supply / air exhaust port as follows.



Note: This is the dimension from the end face of the cabinet. (Not the dimension from the end face of the cabinet door.)

Figure Position of an air supply/ air exhaust port

Conventions

The following shows the common abbreviations used and their explanations.

Abbreviations	Explanations
FCU	Field Control Unit
NIU	Node Interface Unit (for N-IO)
IOBP	I/O Base Plate
IOBP_IS	I/O Base Plate for Intrinsic Safety explosion protection
NIO node	Consists of NIU and IOBP/IOBP_IS.
Unit	Unit of 19 inch rack. 1 Unit = 44.45 mm
Side	One of the front and the back of a cabinet. (e.g., side, one side)

● Example of Mounting Multiple FCUs for N-IO in a Cabinet

Temperature conditions

In this example, the ambient temperature is assumed to be the following.

Cabinet ambient temperature	40 °C or less
-----------------------------	---------------

Maximum numbers of units that can be mounted

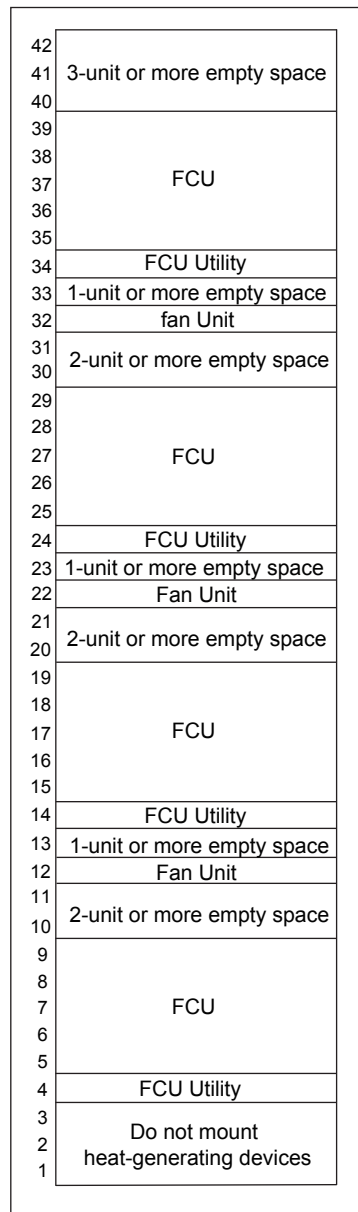
Type	Model	Number of units that can be mounted per side
FCU	A2FV50D A2FV50S	Up to 4

Heat-generating devices other than the above shall not be mounted in the cabinet.

Mounting conditions

- FCU shall be mounted with a 3-unit or more space from the top-shelf mounting position of the cabinet.
- A 2-unit or more space shall be provided between the circulation fan unit and the FCU on the bottom shelf.
- Devices that block the convective air flow from the circulation fan unit or door fans to each module shall not be mounted.

The following shows how to mount multiple FCUs for N-IO in a cabinet:



F020519.ai

Figure Example of Mounting Multiple FCUs for N-IO in a Cabinet

● Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet

Temperature conditions

In this example, the ambient temperature is assumed to be the following.

Cabinet ambient temperature	40 °C or less
-----------------------------	---------------

Maximum numbers of units that can be mounted in case of this example

Type	Model	Number of units that can be mounted per side
FCU	A2FV50D/A2FV50S	Up to 1
NIU	A2NN30D	Up to 1
IOBP	A2BN3D	Up to 6 (2 rows × 3 shelves)

Heat-generating devices other than the above shall not be mounted in the cabinet.

Exception to mounting heat-generating devices

Shunt Resistor Unit : A2EXR001 for the Pulse Input Signal Adaptor (A2SAP105) can be mounted in the same cabinet under the following conditions:

- A2EXR001 shall be mounted on the side of the cabinet or under IOBP with a distance of 200 mm from NIU.
- When 5 or more A2EXR001 units are mounted on a cabinet, the number of IOBP on the cabinet shall be reduced in accordance with the following table.

Table Example of Number of A2EXR001 Mounted and Mounting Conditions

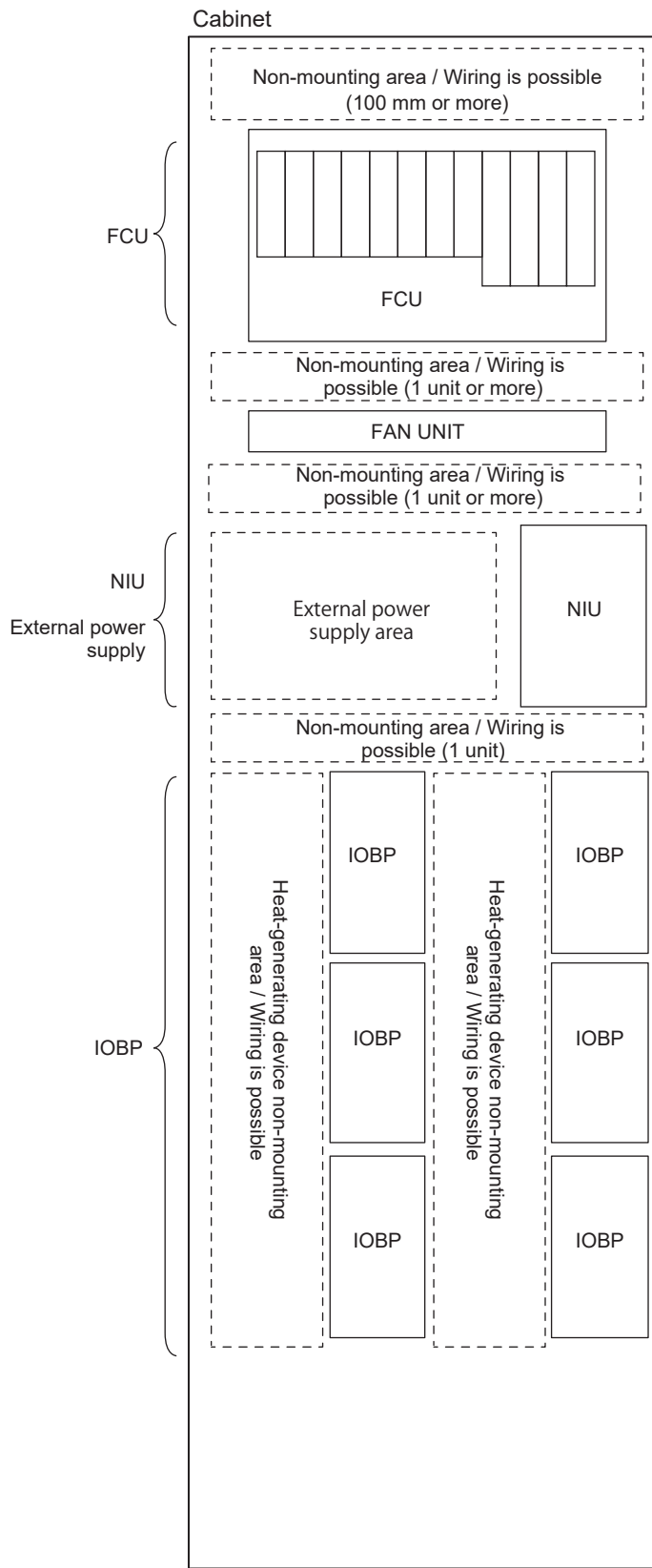
Number of A2EXR001 mounted	Mounting condition
1 to 4	Can be mounted in the same cabinet
5 to 12	Can be mounted in the same cabinet by reducing one IOBPs
13 to 20	Can be mounted in the same cabinet by reducing two IOBPs

- Further reduce one IOBP on the cabinet per 8 A2EXR001 units when 21 or more A2EXR001 units are mounted on a cabinet.

Mounting conditions

- The FCU on the top shelf shall be mounted with a 100-mm or more space from the cabinet ceiling.
- A 1-unit (=44.45 mm) or more space shall be provided between NIU and IOBP.
- A circulation fan unit shall be mounted on the shelf below the FCU with a 1-unit space. A 1-unit or more space shall be provided under the circulation fan unit.
- Suitable length of signal cables and power cables should be used.

The following shows how to mount an FCU for N-IO and N-IO nodes in a cabinet:



F020520.ai

Figure Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet

● **Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet (For field wiring via terminal board)**

Temperature conditions

In this example, the ambient temperature is assumed to be the followings.

Cabinet ambient temperature	40 °C or less
-----------------------------	---------------

Maximum numbers of units that can be mounted in case of this example

Type	Model	Number of units that can be mounted per side
FCU	A2FV50S/A2FV50D	Up to 1
NIU	A2NN30D	Up to 2
IOBP	A2BN3D	Up to 12 (3 rows × 4 shelves)

Heat-generating devices other than the above shall not be mounted in the cabinet.

Mounting conditions

- The FCU on the top shelf shall be mounted with a 100-mm or more space from the cabinet ceiling.
- A 1-unit (= 44.45 mm) or more space shall be provided between NIU and IOBP.
- A circulation fan unit shall be mounted on the shelf below the FCU with a 1-unit space.
A 1-unit or more space shall be provided under the circulation fan unit.
- Suitable length of signal cables and power cables should be used.

The following shows how to mount an FCU for N-IO and N-IO nodes in a cabinet (IOBP×3 columns mounted).

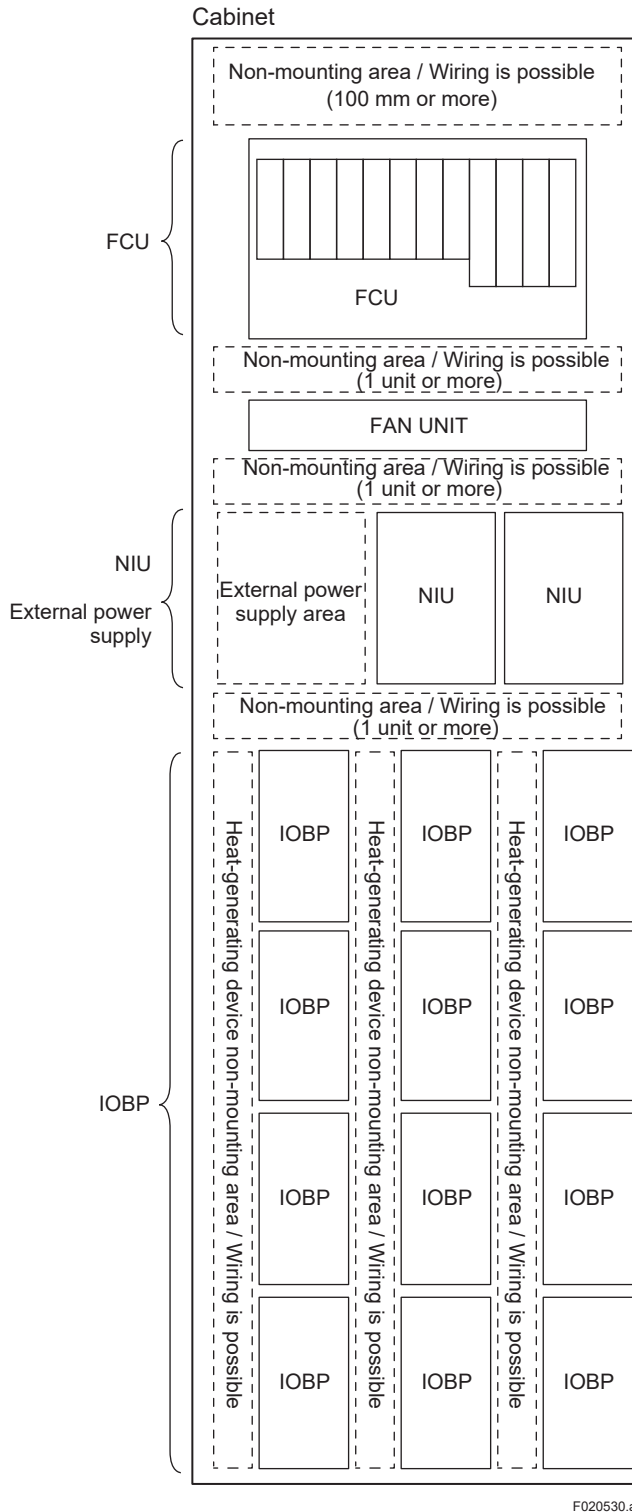


Figure Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet (IOBP×3 columns mounted)

● Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet Temperature conditions (For direct field wiring to IOBP)

In this example, the ambient temperature is assumed to be the followings.

Cabinet ambient temperature	50 °C or less (*1)
-----------------------------	--------------------

*1: The cabinet ambient temperature is 40 °C or less, when the temperature option (-40 to 70 °C) of NIU and IOBP is not specified.

Maximum numbers of units that can be mounted in case of this example

Type	Model	Number of units that can be mounted per side
NIU	A2NN30D (*1)	Up to 2
IOBP	A2BN3D (*1)	Up to 10 (2 rows × 5 shelves)

*1: Specify the temperature environment option (-40 to 70 °C).

Heat-generating devices other than the above shall not be mounted in the cabinet.

Exception to mounting heat-generating devices

Shunt Resistor Unit: A2EXR001 for the Pulse Input Signal Adaptor (A2SAP105) can be mounted in the same cabinet under the following conditions:

- A2EXR001 shall be mounted on the side of the cabinet or under IOBP with a distance of 200 mm from NIU.
- When 5 or more A2EXR001 units are mounted on a cabinet, the number of IOBP on the cabinet shall be reduced in accordance with the following table.

Table Number of Shunt Resistors Mounted and Mounting Conditions

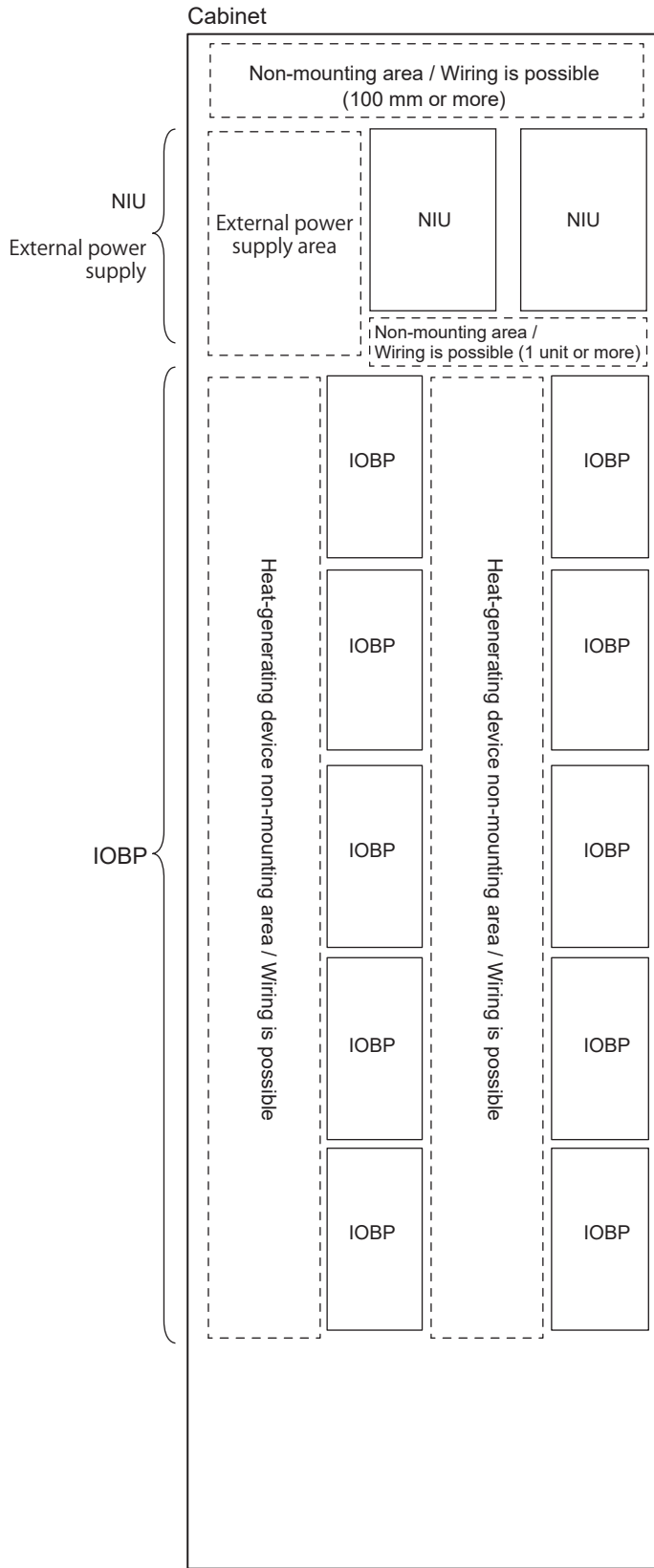
Number of shunt resistors mounted	Mounting condition
1 to 4	Can be mounted in the same cabinet
5 to 12	Can be mounted in the same cabinet by reducing one IOBPs
13 to 20	Can be mounted in the same cabinet by reducing two IOBPs

- Further reduce one IOBP on the cabinet per 8 A2EXR001 units when 21 or more A2EXR001 units are mounted on a cabinet.

Mounting conditions

- The NIU shall be mounted with a 100-mm or more space from the cabinet ceiling.
- A 1-unit (=44.45 mm) or more space shall be provided between NIU and IOBP.
- Suitable length of signal cables and power cables should be used.

The following shows how to mount N-IO nodes (Non-Intrinsic Safety barrier) in a cabinet:



F020529.ai

Figure Example of Mounting N-IO Nodes (Non-Intrinsic Safety barrier) in a Cabinet

● **Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet (For field wiring via terminal board)**

Temperature conditions

In this example, the ambient temperature is assumed to be the followings.

Cabinet ambient temperature	50 °C or less (*1)
-----------------------------	--------------------

*1: The cabinet ambient temperature is 40 °C or less, when the temperature option (-40 to 70 °C) of NIU and IOBP is not specified.

Maximum numbers of units that can be mounted in case of this example

Heat-generating devices other than the above shall not be mounted in the cabinet.

Mounting surface of cabinet	Type	Model	Number of units that can be mounted per side (*2)
Mounting surface of external power supply	NIU	A2NN30D (*1)	Up to 3
	IOBP	A2BN3D (*1)	Up to 15 (3 rows x 5 shelves)
Non-mounting surface of external power supply	NIU	A2NN30D (*1)	Up to 3
	IOBP	A2BN3D (*1)	Up to 18 (3 rows x 6 shelves)

*1: Specify the temperature environment option (-40 to 70 °C).

*2: It is subject to use of wall-mount type IOBP.

Mounting conditions

- The NIU shall be mounted with a 100-mm or more space from the cabinet ceiling.
- A 1-unit (=44.45 mm) or more space shall be provided between NIU and IOBP.
- When using a DIN rail, be sure to install a DIN rail on the mounting plate. Fixing at the both ends of a DIN rail and not fixing at the middle.
- Suitable length of signal cables and power cables should be used.

The following shows how to mount N-IO nodes (Non-Intrinsic Safety barrier) in a cabinet:

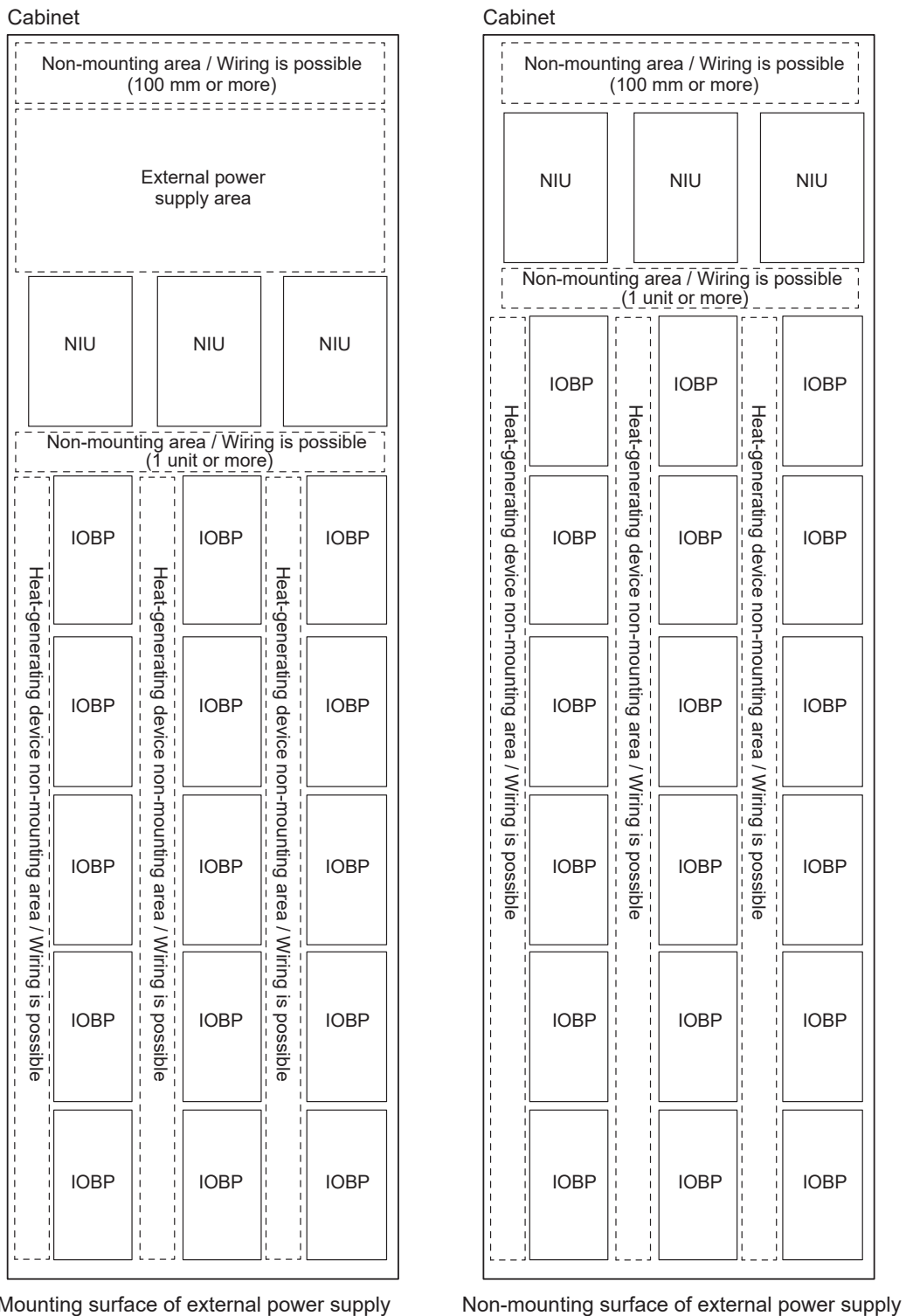


Figure Example of Mounting N-IO Nodes (Non-Intrinsic Safety barrier) in a Cabinet

F020531.ai

● **Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Cabinet**
Temperature conditions (For direct field wiring to IOBP)

In this example, the ambient temperature is assumed to be the followings.

Cabinet ambient temperature	50 °C or less
-----------------------------	---------------

Maximum numbers of units that can be mounted in case of this example

Type	Model	Number of units that can be mounted per side
NIU	A2NN30D (*1)	Up to 2
IOBP_IS	A2BN4D (*1)	8 (2 rows × 4 shelves)
	A2BN5D (*1)	10 (2 rows × 5 shelves)

*1: Specify the temperature environment option (-40 to 70 °C).

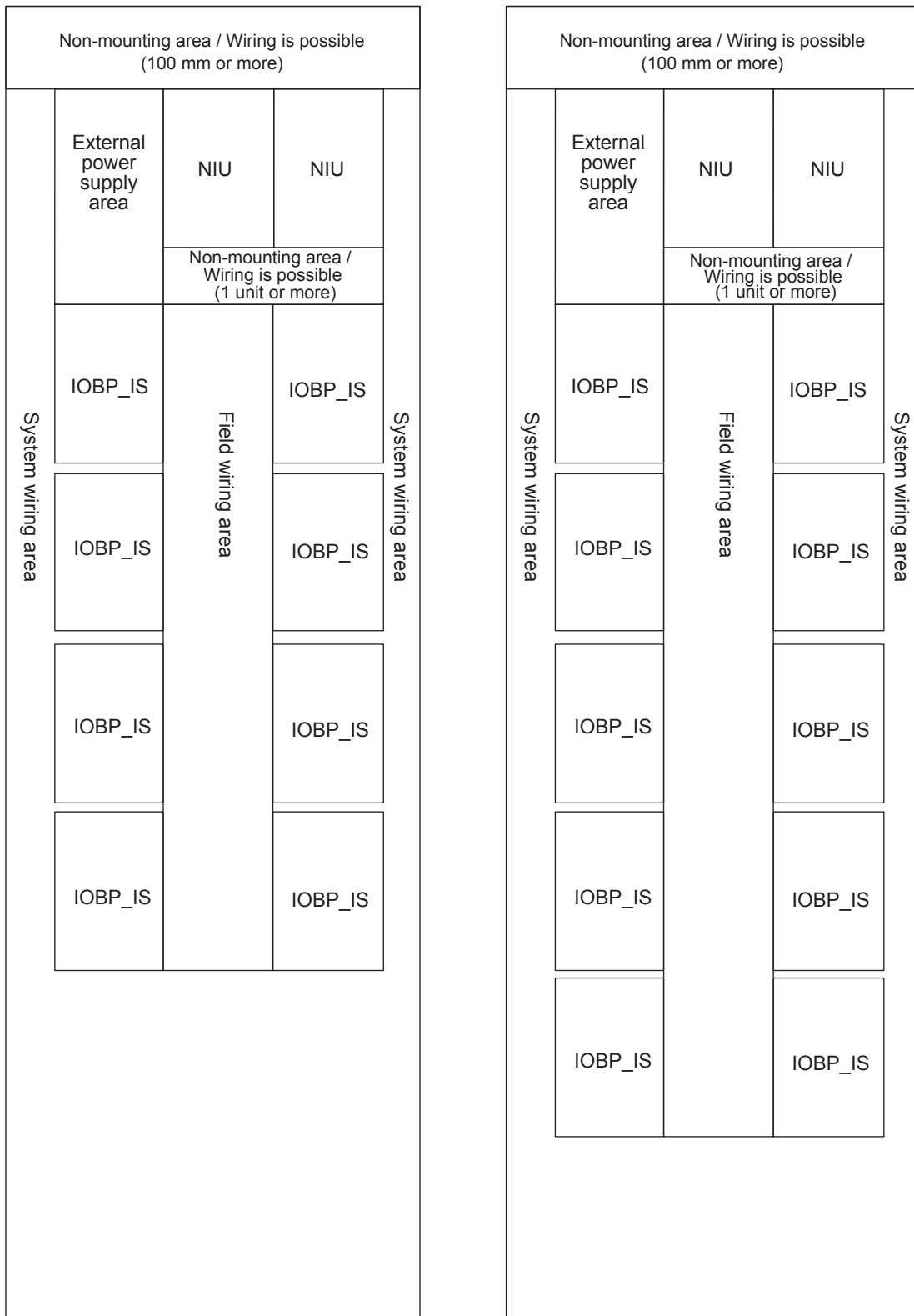
Heat-generating devices other than the above shall not be mounted in the cabinet.

IOBP cannot be mounted.

Mounting conditions

- The NIU shall be mounted with a 100-mm or more space from the cabinet ceiling.
- A 1-unit (=44.45 mm) or more space shall be provided between NIU and IOBP_IS.
- Suitable length of signal cables and power cables should be used.
- Mounting the devices in the cabinet should be in line according to the intrinsic safety standard.

The following shows how to mount N-IO nodes (Intrinsic Safety barrier) in a cabinet:



When IOBP_IS are A2BN4D

When IOBP_IS are A2BN5D

F020522.ai

Figure Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Cabinet

■ Junction Box for N-IO System

This section describes examples of the maximum number of N-IO system equipment (except for equipment for RIO System Upgrade) installed in general-purpose junction boxes.

The following shows the common specifications to the examples of junction boxes for N-IO system that are explained later.

Junction Box Specifications

The following junction box is assumed to be used.

Table Junction Box Dimensions

W	D	H
800 mm	300 mm	1000 mm

Product examples

Table Product examples

	Manufacturer	Model
Junction Box	Rittal	1180 series

Notes

The following shows the common notes to the examples.

- The ventilation for each system shall not be blocked.
- The mounting plate for mounting the IOBP and IOBP_IS shall be made of metal, regardless of whether DIN rail or panel mounting.
- A DIN rail shall be made of metal.
- For mounting restrictions other than the above, refer to the General Specifications (GS).

Conventions

The following shows the common abbreviations used and their explanations.

Abbreviations	Explanations
NIU	Node Interface Unit or Base Plate for Node Interface Unit
IOBP	Base Plate
IOBP_IS	Base Plate Intrinsic Safety explosion protection
Unit	Unit of 19 inch rack. 1 Unit = 44.45 mm

● Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Junction Box

Temperature conditions

In this example, the ambient temperature is assumed to be the followings.

Junction Box ambient temperature	50 °C or less
----------------------------------	---------------

Maximum numbers of units that can be mounted

	Type	Model	Number of units that can be mounted per side
Per junction box	NIU	A2NN30D (*1)	Up to 1
	IOBP	A2BN3D (*1)	Up to 4 (2 rows × 2 shelves)
	Other	Heat-generating device (*2)	heat generation: 40 W or less

*1: Specify the temperature environment option (-40 to 70 °C).

*2: The device to be mounted shall be selected from those that have the ambient temperature range of +15 °C or more.

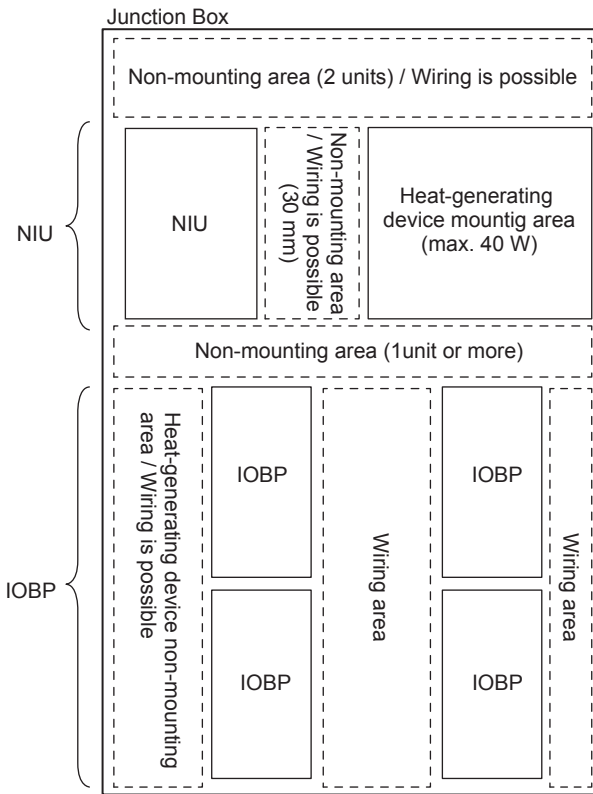
Heat-generating devices other than the above shall not be mounted in the junction box.

In this example, IOBP_IS cannot be mounted.

Mounting conditions

- Do not mount the IOBP so that its heat-generating part (adaptor or I/O) is located immediately under the N-ESB Bus module (A2EN501). The IOBP may be mounted immediately under the power supply of the NIU (A2PW50x).
- The NIU shall be mounted with a 2-unit or more space from the ceiling of the junction box.
- A 1-unit or more space shall be provided between the NIU and IOBP.
- To mount heat-generating devices other than NIU and IOBP shall be mounted with 30-mm intervals on the right of the NIU on the top shelf. The specifications of the devices shall be observed.

The following shows how to mount N-IO nodes (Non-Intrinsic Safety barrier) in a junction box:



F020523.ai

Figure Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Junction Box

● Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Junction Box

Temperature conditions

In this example, the ambient temperature is assumed to be the following.

Junction Box ambient temperature	50 °C or less
----------------------------------	---------------

Maximum numbers of units that can be mounted

	Type	Model	Number of units that can be mounted per side
Per junction box	NIU	A2NN30D (*1)	Up to 1
	IOBP_IS	A2BN4D (*1) or A2BN5D (*1)	Up to 2 (2 rows × 1 shelf)
	Other	Heat-generating device (*2)	heat generation: 20 W or less

*1: Specify the temperature environment option (-40 to 70 °C).

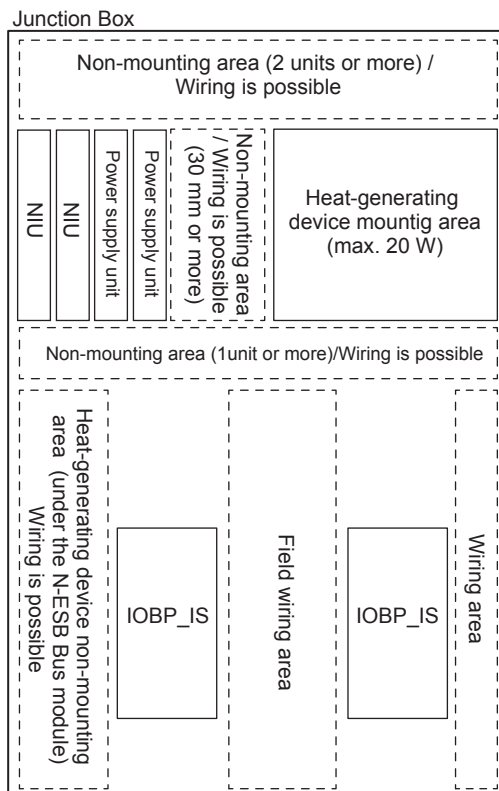
*2: The device to be mounted shall be selected from those that have the ambient temperature range of +15 °C or more.

Heat-generating devices other than the above shall not be mounted in the junction box. In this example, IOBP cannot be mounted.

Mounting conditions

- Do not mount the IOBP_IS so that its heat-generating part (Barrier or I/O) is located immediately under the N-ESB Bus module (A2EN501). The IOBP_IS may be mounted immediately under the power supply of the NIU (A2PW50x).
- The NIU shall be mounted with a 2-unit or more space from the ceiling of the junction box.
- A 1-unit or more space shall be provided between the NIU and IOBP_IS.
- To mount heat-generating devices other than NIU and IOBP_IS shall be mounted with 30-mm intervals on the right of the NIU on the top shelf. The specifications of the devices shall be observed.

The following shows how to mount N-IO nodes (Intrinsic Safety barrier) in a junction box:



F020524.ai

Figure Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Junction Box



CAUTION

The wiring that will be intrinsic safety circuits must be installed so that they are electrically separated from the wiring of non-intrinsic safety circuits, including the in-cabinet wiring. Install the wiring according to the IEC 60079-14 standards or the requirements for explosion-proof wiring of the country where the system is used.

- **Example of Mounting N-IO Nodes (Mixture of Intrinsic Safety Barrier and Non-Intrinsic Safety Barrier) in a Junction Box**

Temperature conditions

In this example, the ambient temperature is assumed to be the following.

Junction Box ambient temperature	50 °C or less
----------------------------------	---------------

Maximum numbers of units that can be mounted

	Type	Model	Number of units that can be mounted per side
Per junction box	NIU	A2NN30D (*1)	Up to 1
	IOBP	A2BN3D (*1)	Up to 2 (1 row × 2 shelves)
	IOBP_IS	A2BN4D (*1) or A2BN5D (*1)	Up to 1 (1 row × 1 shelf)
	Other	Heat-generating device (*2)	heat generation: 20 W or less

*1: Specify the temperature environment option (40 to 70 °C).

*2: The device to be mounted shall be selected from those that have the ambient temperature range of +15 °C or more.

Heat-generating devices other than the above shall not be mounted in the junction box.

Mounting conditions

- Do not mount the IOBP/IOBP_IS so that its heat-generating part (Barrier or I/O) is located immediately under the N-ESB Bus module (A2EN501). The IOBP/IOBP_IS may be mounted immediately under the power supply of the NIU (A2PW50x).
- The NIU shall be mounted with a 2-unit or more space from the ceiling of the junction box.
- A 1-unit or more space shall be provided between the NIU and IOBP/IOBP_IS.
- To mount heat-generating devices other than NIU and IOBP/IOBP_IS shall be mounted with 30-mm intervals on the right of the NIU on the top shelf. The specifications of the devices shall be observed.

The following shows how to mount N-IO nodes (mixture of Intrinsic Safety barrier and Non-Intrinsic Safety barrier) in a junction box:

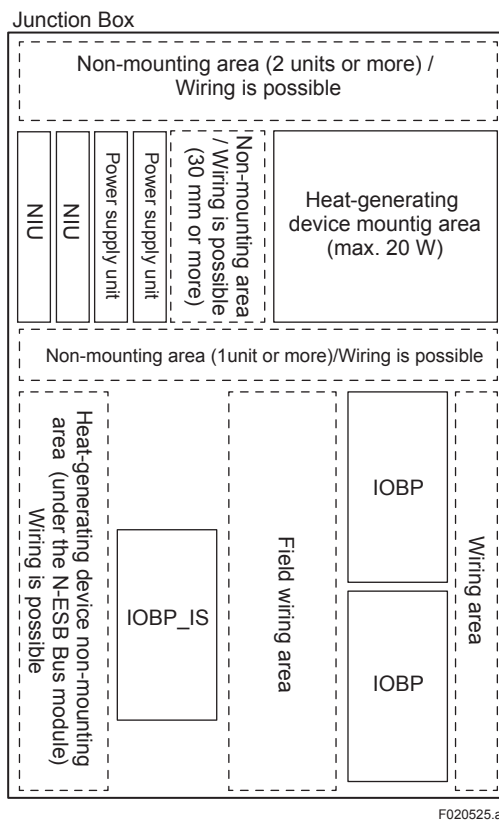


Figure Example of Mounting N-IO Nodes (Mixture of Intrinsic Safety Barrier and Non-Intrinsic Safety Barrier) in a Junction Box



CAUTION

The wiring that will be intrinsic safety circuits must be installed so that they are electrically separated from the wiring of non-intrinsic safety circuits, including the in-cabinet wiring. Install the wiring according to the IEC 60079-14 standards or the requirements for explosion-proof wiring of the country where the system is used.

2.5.7 Desktop Equipment

There are PCs, printers, etc. as the devices used on the desks.

When installing any devices on the desks, take care the followings:

- It should provide a level horizontal surface for the PC or the printer.
- A work space should be preserved to connect the cables.
- Support rising cables to prevent their weight from being applied to connectors directly. Keep a space of 100 mm radius or more around the connectors.
- Do not place the desk such as to expose the PC to direct sunlight or high humidity.

2.5.8 Installing Control Bus Interface Card

This section describes how to install VI702 Control Bus interface card. The card is installed in the PCI Express slot of a IBM PC/AT compatible PC to connect it to the Control Bus. The card permits you to use CENTUM VP system operation and monitoring functions on the PC when used with the dedicated software.

**SEE
ALSO**

- The steps described below are based on a common IBM PC/AT compatible machine. Refer to the manual of the PC to be used for precise instructions.
 - For station address setting, refer to "Peripherals Manual (A4. Control Bus Interface Card)" (IM 33J50B10-01EN).
-

● Card Installation Procedure

1. Set a station address for the Control Bus interface card.
2. Turn off the computer and unplug the power cord to ensure safety.
3. Remove the PC cover.
4. Remove the slot cover.
5. Insert the Control Bus interface card in the slot. Make certain that the card is properly set in the slot.
6. Attach the PC cover.
7. Write the station address on a seal (sticker) and attach it to the front of the PC or a similar highly-visible place.

**SEE
ALSO**

For electrostatic protection, refer to Item 1.5.2, "Countermeasures against Static Electricity."

3. Cabling

This section describes how to cable the installed system equipment.

Connecting terminals for power, grounding, and signal cables are shown in figures.

The figures also show how to connect the HIS-connected Control Bus interface card to Field Control Units, and an optical fiber cable to the optical ESB bus.

3.1 Cables and Terminals

It is recommended that you use flexible, thin, easy-to-bend, twisted-pair cables to connect the terminals of the system equipment. Use solderless (crimp-on) terminals with insulating cover, which have low contact resistance little aging.

Rigid cables make cabling work difficult and exert unnecessary force on the terminals, which may result in system failures.

Cables with the temperature rating of an ambient temperature plus 10 °C or more must be used.

As for the following models, cables with the temperature rating as shown in the below Table must be used.

Table Rating temperature of Cables

Models	Cables	Temperature rating of Cables
ARS15M, ARS55M	Signal Cables	An ambient temperature plus 20 °C or more
AEP7D (100-120 / 220-240 V AC)	Input Power Cables	An ambient temperature plus 30 °C or more
AEP7D (24 VDC)	Input Power Cables	An ambient temperature plus 50 °C or more
AEPV7D (100-120 / 220-240 V AC)	Input Power Cables	An ambient temperature plus 30 °C or more
AEPV7D (24 VDC)	Input Power Cables	An ambient temperature plus 40 °C or more
AEP9D	Input Power Cables	An ambient temperature plus 60 °C or more
A2PW50□ (When /NCBL)	Input/PE Cables	An ambient temperature plus 30 °C or more
A2BN3D	Field Power/ Grounding Cables	An ambient temperature plus 30 °C or more
A2BN3D	I/O Cables	An ambient temperature plus 20 °C or more
A2BN4D	I/O Cables	An ambient temperature plus 20 °C or more
A2BN5D	I/O Cables/ Barrier Power Cables/ Grounding Cables	An ambient temperature plus 20 °C or more
A2BM4	Terminal board	An ambient temperature plus 20 °C or more

■ Signal Cables

Nominal conductor cross-sectional area:

For FIO Node 0.75 to 2.00 mm²
For N-IO Node 0.5 to 2.50 mm² (AWG20 to 14)

Example of Suitable Cables:

600 V vinyl isolated cable (IV); JIS C 3307/IEC60227-3
Vinyl isolated wire (KIV); JIS C 3316/IEC60227-3
600 V vinyl isolated cable type 2 (HIV); JIS C 3317/IEC60227-3
Heat-proof vinyl isolated wire (UL1015/UL1007)
Vinyl isolated sheath cable for control loop (CVV); JIS C 3401

■ Alarm and Control Circuit Cables

Nominal conductor cross-sectional area:

Node Interface Unit External Alarm input terminal:
0.13 to 2.5 mm²
Other than above: 0.5 to 1.25 mm²

Example of Suitable Cables:

600 V vinyl isolated cable (IV); JIS C 3307/IEC60227-3
Vinyl isolated wire (KIV); JIS C 3316/IEC60227-3
Heat-proof vinyl-insulated wire (UL1007)

■ Power Cables

Nominal conductor cross-sectional area

For rack-mounted AC 100-120/220-240 V-driven equipment:	1.25 to 2.0 mm ²
For rack-mounted DC 24 V-driven equipment:	Minimum 2.0 mm ²
For N-IO I/O Base plates (Field Power Supply terminal):	0.5 to 1.5 mm ²
For N-IO Barrier Base plates (Barrier Power Supply terminal):	0.5 to 1.5 mm ²
For cabinets AC 100-120/220-240 V-driven:	Minimum 8.0 mm ²
For cabinets DC 24 V-driven equipment:	Minimum 14.0 mm ²
For Power Unit (A2PW50□/NCBL):	1.25 mm ² (AWG16) Double insulation structure

Example of suitable cables:

600 V vinyl isolated cable (IV); JIS C 3307/IEC60227-3
 Vinyl isolated wire (KIV); JIS C 3316/IEC60227-3

Note: Use cables capable of supplying current required by respective pieces of equipment with low voltage drop.

■ Grounding Cables

SEE ALSO

See Section 1.4, "Grounding," for wiring of grounding cables connecting grounding bars of different cabinets and/or panels to each other.

Nominal conductor cross-sectional area

For rack-mounted equipment:	Minimum 2.0 mm ²
For Power Supply Unit (A2PW50□/NCBL):	1.25 mm ² (AWG16) or 2.00 mm ² (AWG14)
For Node Interface Unit:	Minimum 2.0 mm ² (AWG14)
For N-IO I/O Base plates:	Minimum 2.0 mm ² (AWG14)
For N-IO Barrier Base plates:	Minimum 2.0 mm ² (AWG14)
Grounding cables connecting cabinets AC 100-120/220-240/V-driven to protective grounding system:	Minimum 5.5 mm ²
Grounding cables connecting cabinets DC 24 V-driven to protective grounding system:	Minimum 8.0 mm ²

Example of suitable cables:

600 V vinyl isolated cable (IV); JIS C 3307/IEC60227-3
 Vinyl insulated wire (KIV); JIS C 3316/IEC60227-3

Note: Use the cable that is defined in the rules/standards of the country or the region.

■ Cable Terminals

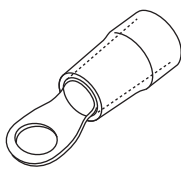
Use the specified solderless terminals and sleeves for pressure clamp terminal on the end of terminal-connected cables, providing low contact resistance, high durability, and low aging.

● Solderless Lug



CAUTION

- Be sure to use solderless terminals with insulating sheath.
- Use solderless terminals and crimp tools from the same maker.
- Use different crimp tools according to cable size.



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Figure Solderless Terminal with Insulating Sheath

● Sleeve for pressure clamp terminal and spring clamp terminal

When connecting the process I/O signal to the pressure clamp terminal of FIO and N-IO, strip the cable coating (without a sleeve) or attach a sleeve to the cable.

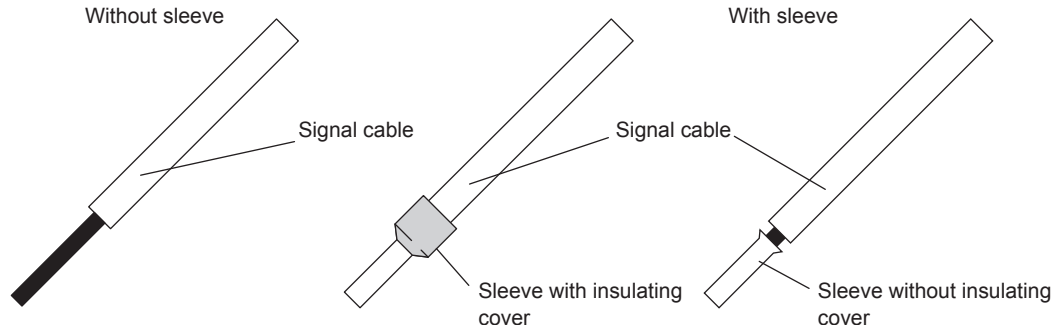


Figure Sleeve for Pressure Clamp Terminal

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CAUTION

- Use a sleeve and a clamp tool from the same manufacturer.
- Use a sleeve and a clamp tool which suit the cable thickness.
- Use a sleeve which meet the following DIN standards.
 - Sleeve without insulating cover (DIN 46 228/1)
 - Sleeve with insulating cover (DIN 46 228/4)

■ Bending radius of the cable

When connecting a cable to a system instrument, ensure to secure the minimum bending radius of the cable.

The minimum bending radius is either the value shown in the cable manufacturer's specifications or six-fold of the cable conductor diameter, whichever is bigger should be applied.

3.2 Connecting Power

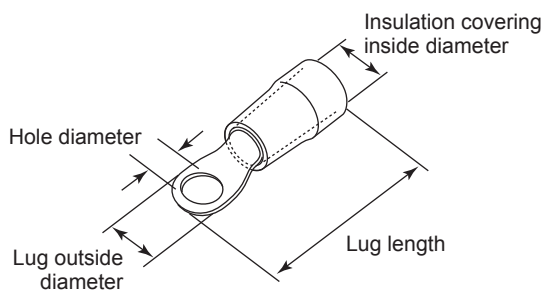
Power is connected either by using a grounding-type bipolar (three-pin) plug or by wiring to terminals.

When piece of CENTUM VP equipment has a power switch, it is recommended that you install a breaker for each piece of equipment in the same room, for maintenance and safety considerations.

■ Power Cable Termination

● Solderless (crimp-on) Lug Terminal Processing

Use solderless lugs for power cables (see Figure).



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Figure Solderless (crimp-on) Lug

● Solderless (crimp-on) Lug Specifications

The solderless lug to use must have the dimensions given in table according to the nominal cross sectional area of the power cable for which the lug is to be used.

Table Solderless Lug Dimensions

Nominal cross sectional area (mm ²)	Screw used (mm)	Hole diameter (mm)	Lug outside diameter (mm)	Lug length (mm)	Insulation covering inside diameter (mm)
1.25	4	4.3 or more	8.2 or less	approx.21	3.6 or more
2.0	4	4.3 or more	8.7 or less	approx.21	4.3 or more
5.5	5	5.3 or more	9.7 or less	approx.29	5.9 or more
8.0	6	6.3 or more	12.2 or less	approx.41	7.0 or more
22.0	8 (hexagon head bolt)	8.3 or more	16.8 or less	approx.50	11.0 or more



CAUTION

- Always use solderless lugs with insulating covering.
- Always use solderless lugs and crimp-on tool manufactured by the same manufacturer.
- The crimp-on tool must be matched to the wire thickness.

● Sleeve Terminal Processing

Perform the following terminal processing for the primary power supply input with pressure clamp terminal.

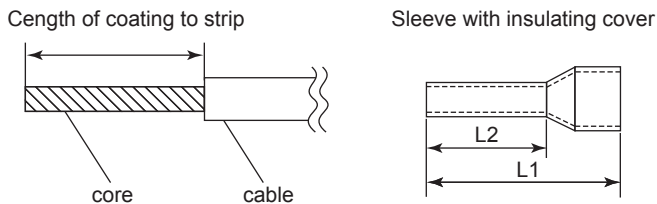
Use a sleeve with insulating cover which meet the DIN 46 228/4.



CAUTION

- Use sleeves and a tool that are from the same manufacturer.
- Use sleeves and a tool that are suitable for the cable thickness.
- Connect the cable properly by inserting the wires all the way into the pressure clamp terminals.

Strip the cable coating at the end of the cable and then attach a sleeve. The sleeve specifications differ depending on the cable thickness. The sleeve specifications are shown in the following table.



F030202.ai

Figure Terminal Processing

Table Cable termination example of Sleeve with Insulating Cover

Nominal cross sectional area (mm ²)	Length to strip (mm)	Sleeve dimensions (mm)	
		L1	L2
1.25 (AWG16)	10	14	8



CAUTION

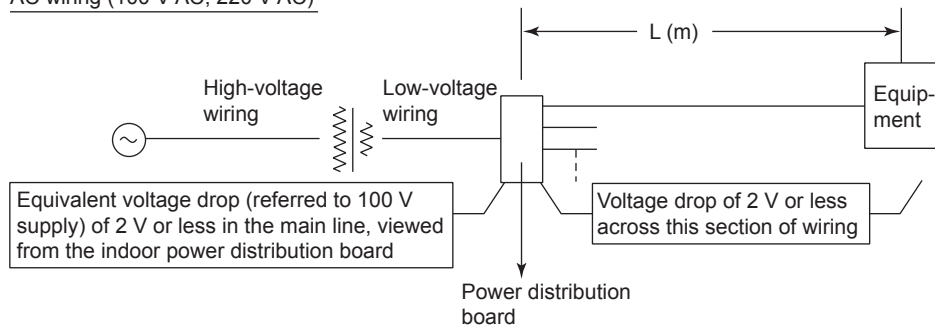
- Power cables must be laid 1 cm or further away from signal cables.
- Power and grounding cable are use power and ground cables which are in conformance with the safety standard of each country.

■ Type and Maximum Length of Power Cables

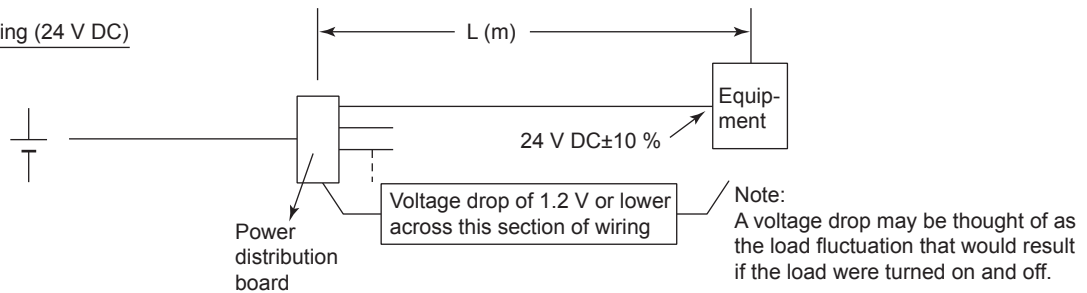
Formulas are given below for determining the type and the maximum length (m) of branch cables from an indoor low-voltage main line.

- The standard type of cable used (nominal cross sectional area) is equivalent to JIS C 3312.
- Calculate the maximum power cable length from the following conditions in Figure. However, the power cable must meet the conditions described in Section “1.3 Power Supply System”, “AC Power Specification”.

AC wiring (100 V AC, 220 V AC)



DC wiring (24 V DC)



F030203.ai

Figure Maximum Cable Length Calculation Conditions

[Maximum power cable length calculation conditions]

Use the following formula to calculate the maximum power cable length:

(a) 100 V AC and 220 V AC supply voltages

$$L \text{ (m)} = \frac{\text{Voltage drop across wiring}}{\text{Conductor resistance (ohm/km)} \times (\text{Number of cores}) \times \text{Equipment current consumption}} \times 1000$$

F030204.ai

(b) 24 V DC supply voltage

$$L \text{ (m)} = \frac{\text{Voltage drop across wiring}}{\text{Conductor resistance (ohm/km)} \times (\text{Number of cores}) \times \text{Equipment current consumption}} \times 1000$$

F030205.ai

Note: In the formulas above, the voltage drop across wiring is assumed to be 2 V for AC power supplies and 1.2 V for DC power supplies; the number of cores is two; and the conductor resistance is as specified in the table below.

Table Wire Nominal Cross Sectional Areas and Resistances

Wire nominal cross sectional area	5.5 mm ²	8 mm ²	14 mm ²	22 mm ²
Wire conductor resistance	3.37 ohm/km	2.39 ohm/km	1.36 ohm/km	0.82 ohm/km

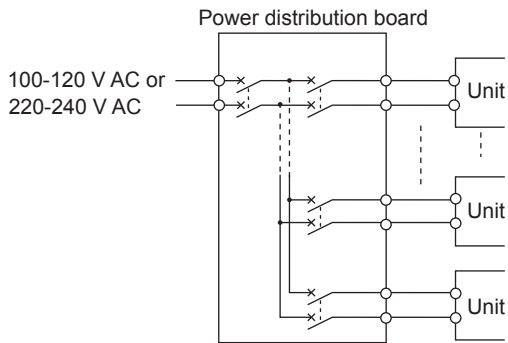
■ Power Distribution Boards

Power distribution boards are normally provided by the customer. Figures show examples of AC and DC power distribution boards.

● AC Power Distribution Board

The power cables is branched to each unit by way of a circuit breaker.

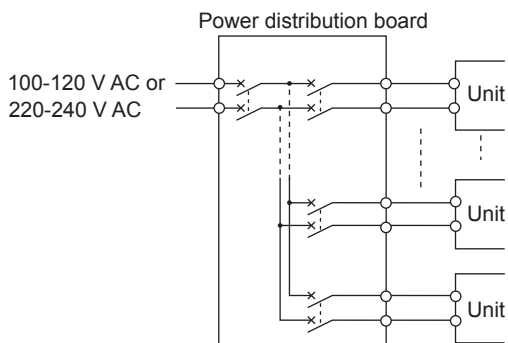
Each power system uses three terminals (AC and ground: ISO M4 to M6 screws).



F030206.ai

Figure AC Power Distribution Board

● 24 V DC Power Distribution Board



F030207.ai

Figure 24 V DC Power Distribution Board

Terminal Connection

The power supply terminals and the grounding terminals of each equipment are as follows.

Table The power supply terminals and the grounding terminals of each equipment (1/2)

Category	Model		Power supply Type	Power supply terminal	Grounding terminal	Grounding Type
Field Control Unit	AFV30S/AFV30D		Power Supply Input	M4 Screw (A cable with dedicated 5 pins connector is connected to a terminal by default.)	M4 Screw (A cable with dedicated 5 pins connector is connected to a terminal by default.)	Functional grounding
	A2FV50S/A2FV50D		Power Supply Input			
	A2FV70S/A2FV70D		Power Supply Input			
Node unit	ANB10S/ANB10D		Power Supply Input			
	ANB11S/ANB11D		Power Supply Input			
Unit	ANT10U		Power Supply Input			
Router	AVR10D		Power Supply Input			
	AW810D		Power Supply Input			
Cabinet	AFV40S/AFV40D		Power Supply Input	M6 Screw	<ul style="list-style-type: none"> • M5 Screw (On the grounding bar) • M8 Hex bolt 	<ul style="list-style-type: none"> • Functional grounding (24 V DC) • Protective grounding (Other than 24 V DC)
	ACB51		Power Supply Input			
Node Interface Unit	A2NN30D	With Power supply cable	Power Supply Input	Dedicated 5 pins connector		<ul style="list-style-type: none"> • Functional grounding (24 V DC) • Protective grounding (Other than 24 V DC)
		Without Power supply cable (/NCBL)	Power Supply Input	Plessure clamp	M4 Screw	
			Base Plate		M4 Screw	Functional grounding
	A2NN10D	Power Supply Input		M4 Screw	M4 Screw	<ul style="list-style-type: none"> • Functional grounding (24 V DC) • Protective grounding (Other than 24 V DC)
		Frame				M4 Screw
Power Supply Unit	A2PW503 A2PW504	With Power supply cable	Power Supply Input	Dedicated 5 pins connector		<ul style="list-style-type: none"> • Functional grounding (24 V DC) • Protective grounding (Other than 24 V DC)
			Power Supply Output	Dedicated 4 pins connector	—	
		Without Power supply cable (/NCBL)	Power Supply Input	Plessure clamp	M4 Screw	<ul style="list-style-type: none"> • Functional grounding (24 V DC) • Protective grounding (Other than 24 V DC)
			Power Supply Output	Dedicated 4 pins connector	—	

Table The power supply terminals and the grounding terminals of each equipment (2/2)

Category	Model	Power supply Type	Power supply terminal	Grounding terminal	Grounding Type
I/O Unit	A2BN3D	Power Supply Input	Model:A2KPB00 (Dedicated connector)	M3 Screw	Functional grounding
		Field Power Supply Input	Pressure Clamp		
	A2BN4D	Power Supply Input	Model:A2KPB00 (Dedicated connector)	M4 Screw	Grounding for explosion protection
		Barrier Power Supply Input	Pressure Clamp		
	A2BN5D	Power Supply Input	Model:A2KPB00 (Dedicated connector)	M4 Screw	Grounding for explosion protection
		Barrier Power Supply Input	Pressure Clamp		
Power supply bus unit	AEPV7D (Style 2)	Power Supply Input	M4 Screw	M4 Screw	<ul style="list-style-type: none"> • Functional grounding (24V DC) • Protective grounding (Other than 24V DC)
		Power Supply Output	Dedicated 5 pins connector		

■ Conduit Power-cabling

Conduit cabling using cable glands is recommended to lay a power cable for the cabinet and instrumentation boards. It prevents the power cable from contacting metallic plates and putting its weight on power connection terminal.

The console type HIS, or cabinet, has a conduit hole in the bottom plate directly below the terminal box, and the hole can be exposed by removing the blank plate screwed to the bottom. See figures below for conduit cabling:

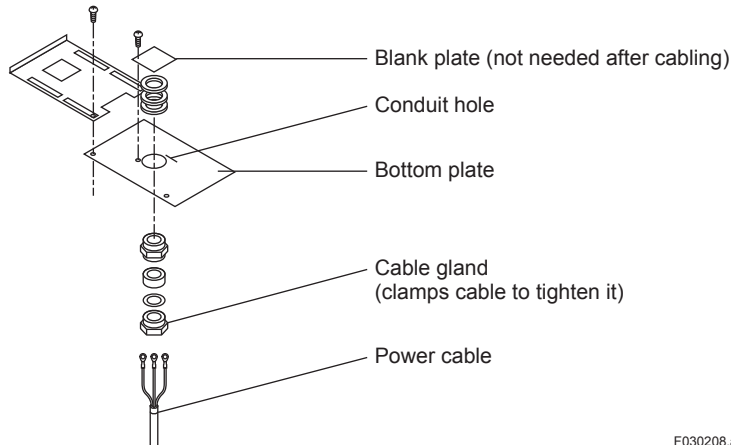


Figure Conduit Hole & Cable Gland

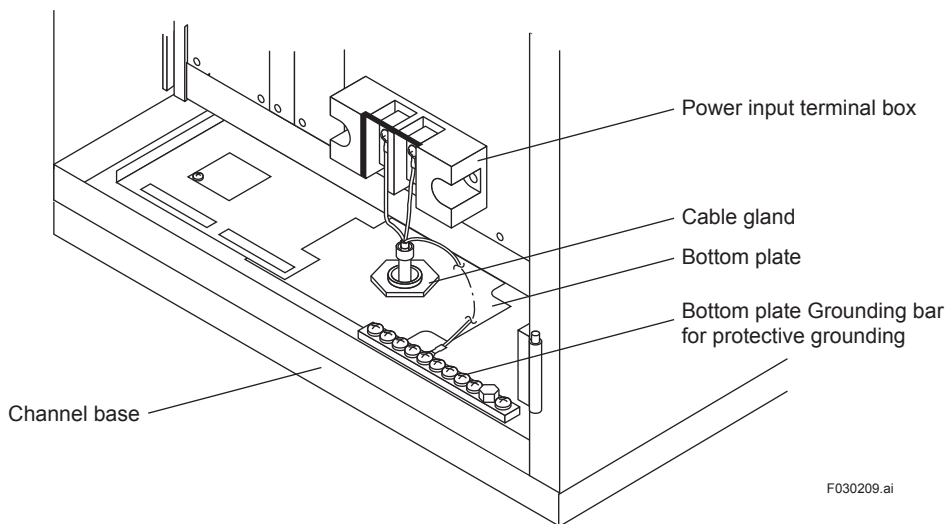


Figure Conduit Cabling

Conduit cabling is also recommended for the 19-inch rack-mount equipment, laying a power cable through a conduit hole where the cable enters the metallic cabinet.

3.3 Connecting Ground Cable

Connect ground cables as follows:



CAUTION

- Connect the terminal connection type device to the protective conductor terminal.
 - Connect AFV40S/AFV40D, and ACB51 to the relay terminal of the ground bar for protective grounding for connecting a ground cable with M5 screws.
 - Connect a power cable of the plug-in device to a grounded socket. The cabinet is grounded when the power cable is plugged in.
-

3.4 Power and Ground Cabling

The following figures illustrate how to connect a power and grounding cable with each system equipment.

■ A2NN30D Node Interface Unit

● Connecting Power Supply with NIU and IOU

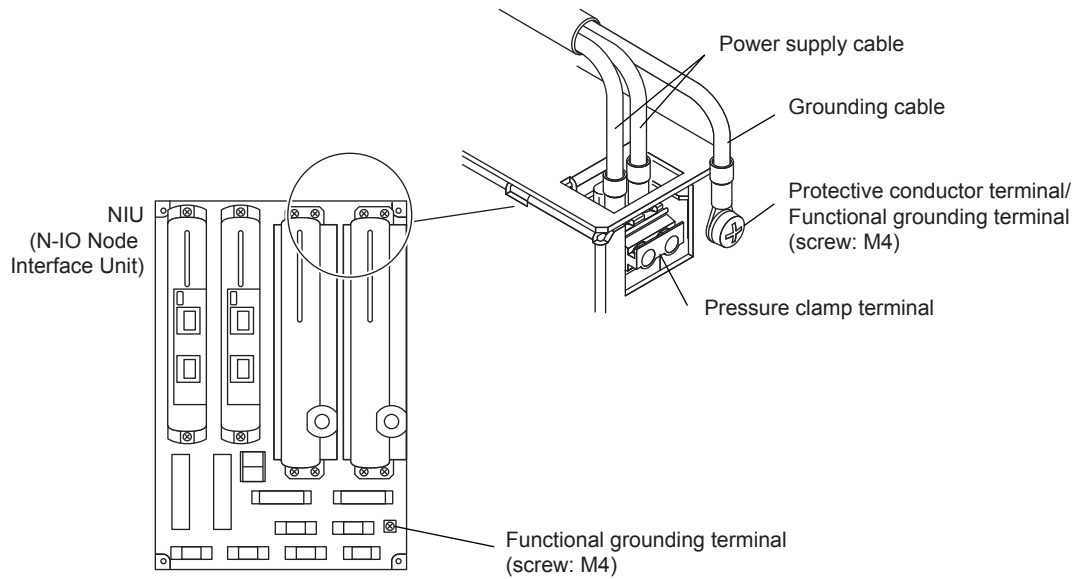
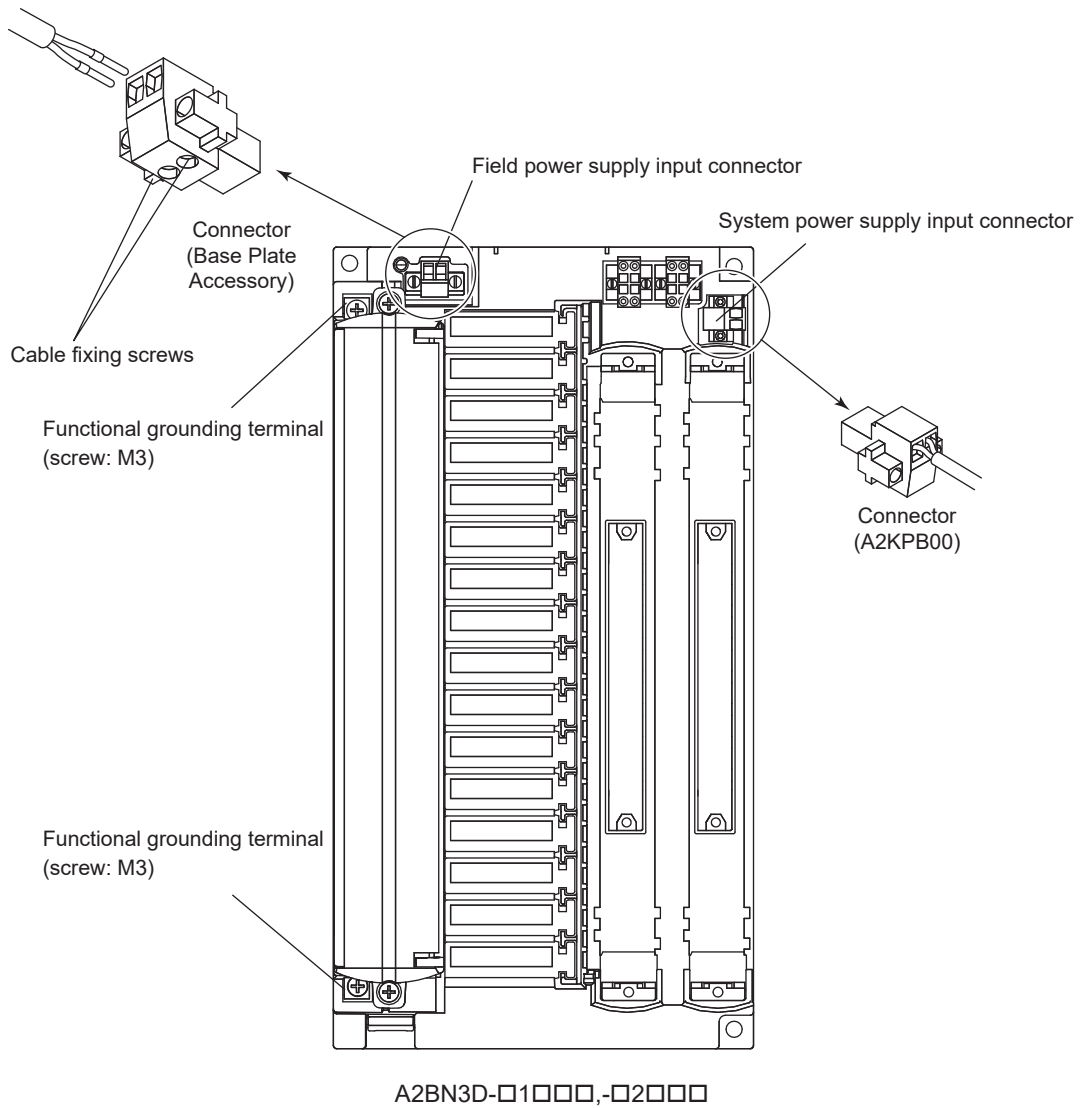


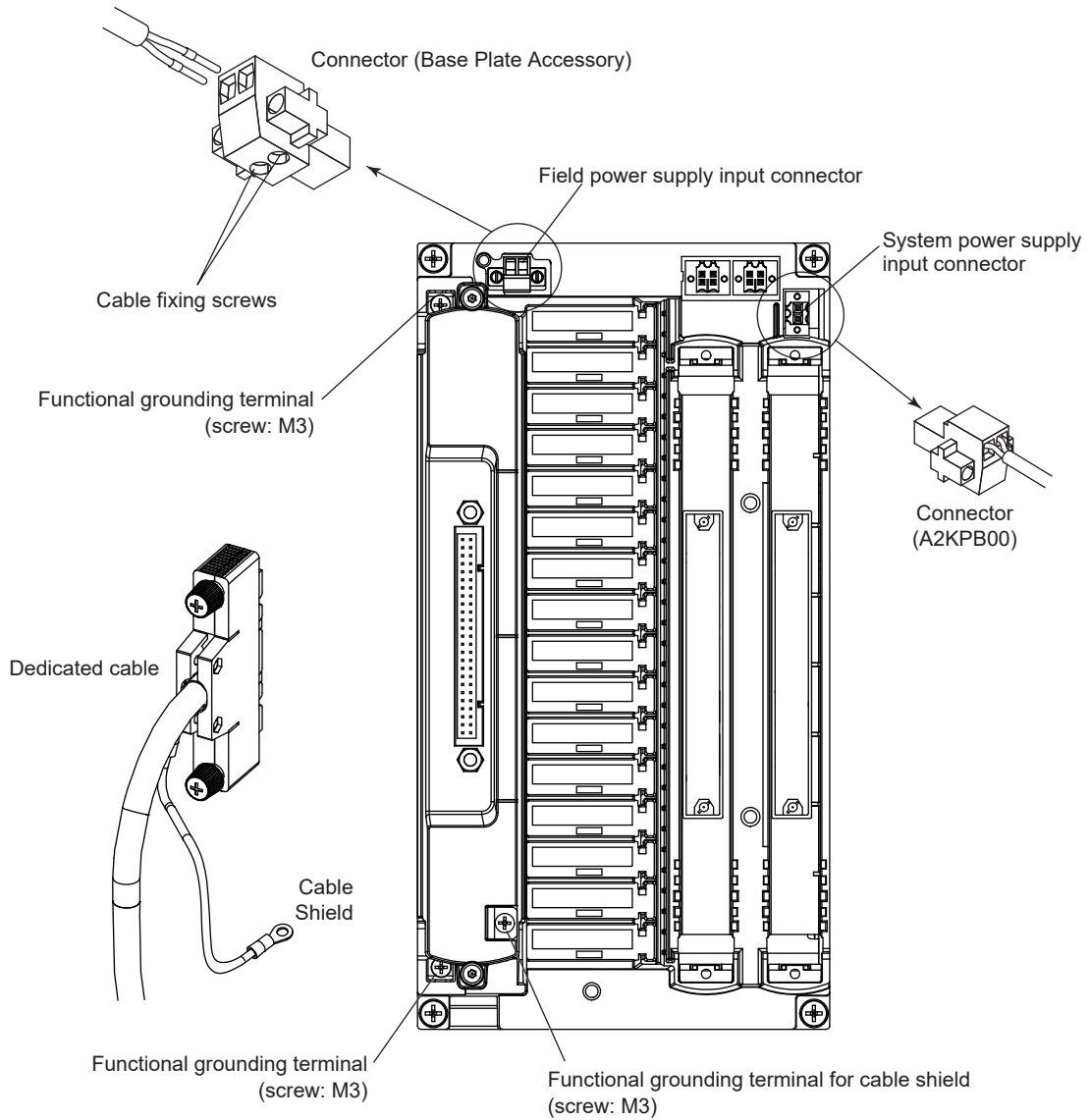
Figure Connecting Power Supply with Node Interface Unit

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■ A2BN3D Base Plate for Adaptor



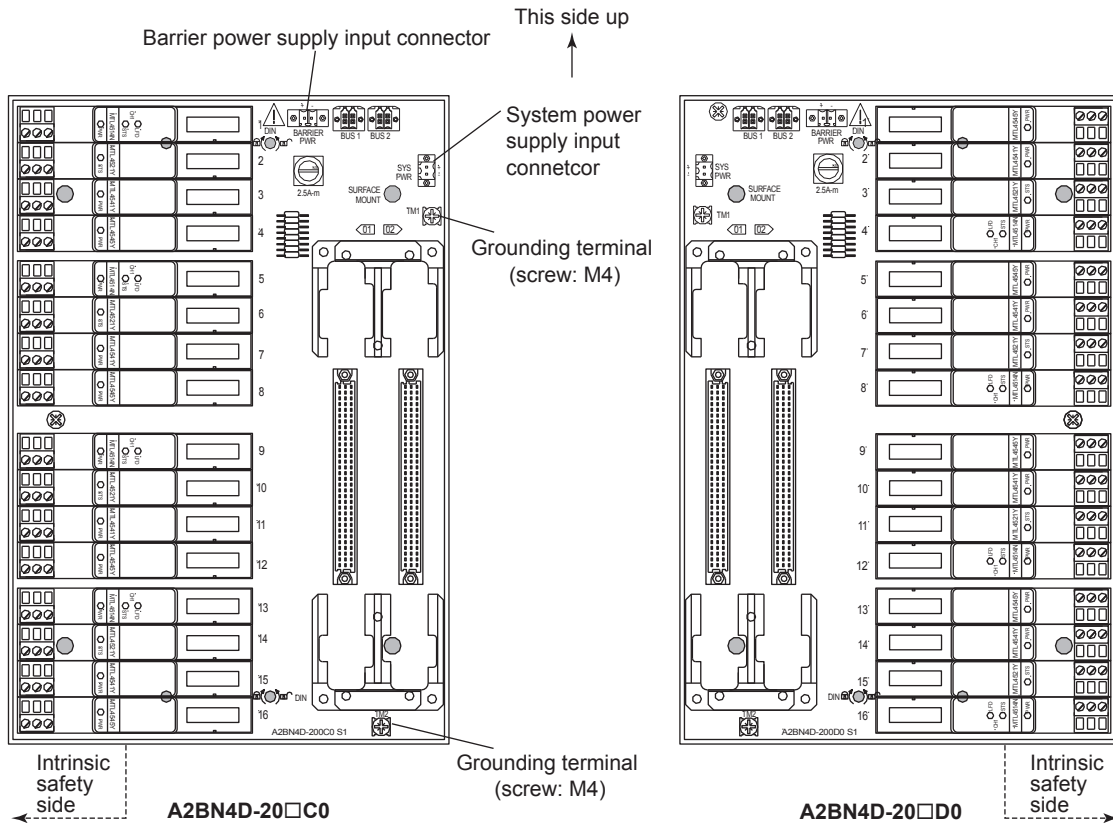
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A2BN3D-□9□□□

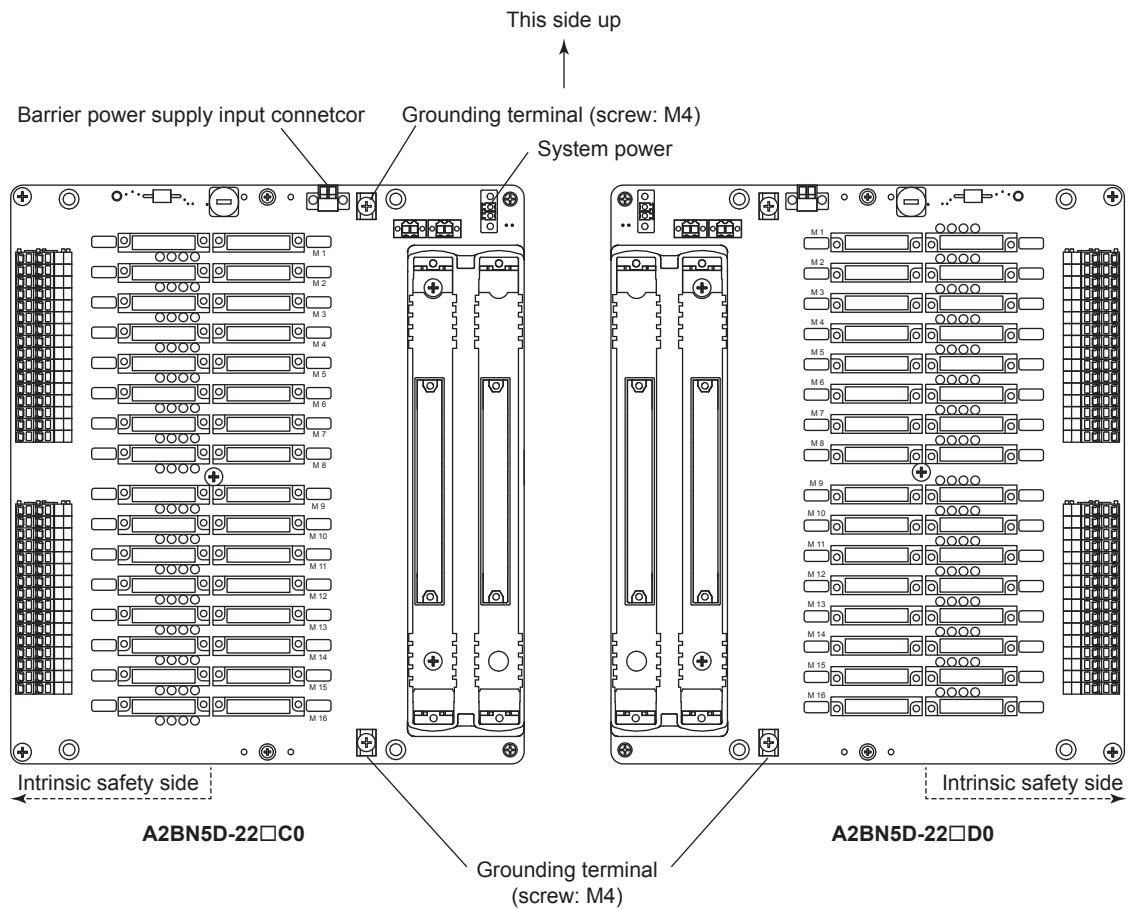
F030425.ai

A2BN4D Base Plate for Barrier (MTL)



F030403.ai

■ A2BN5D Base Plate for Barrier (P+F)



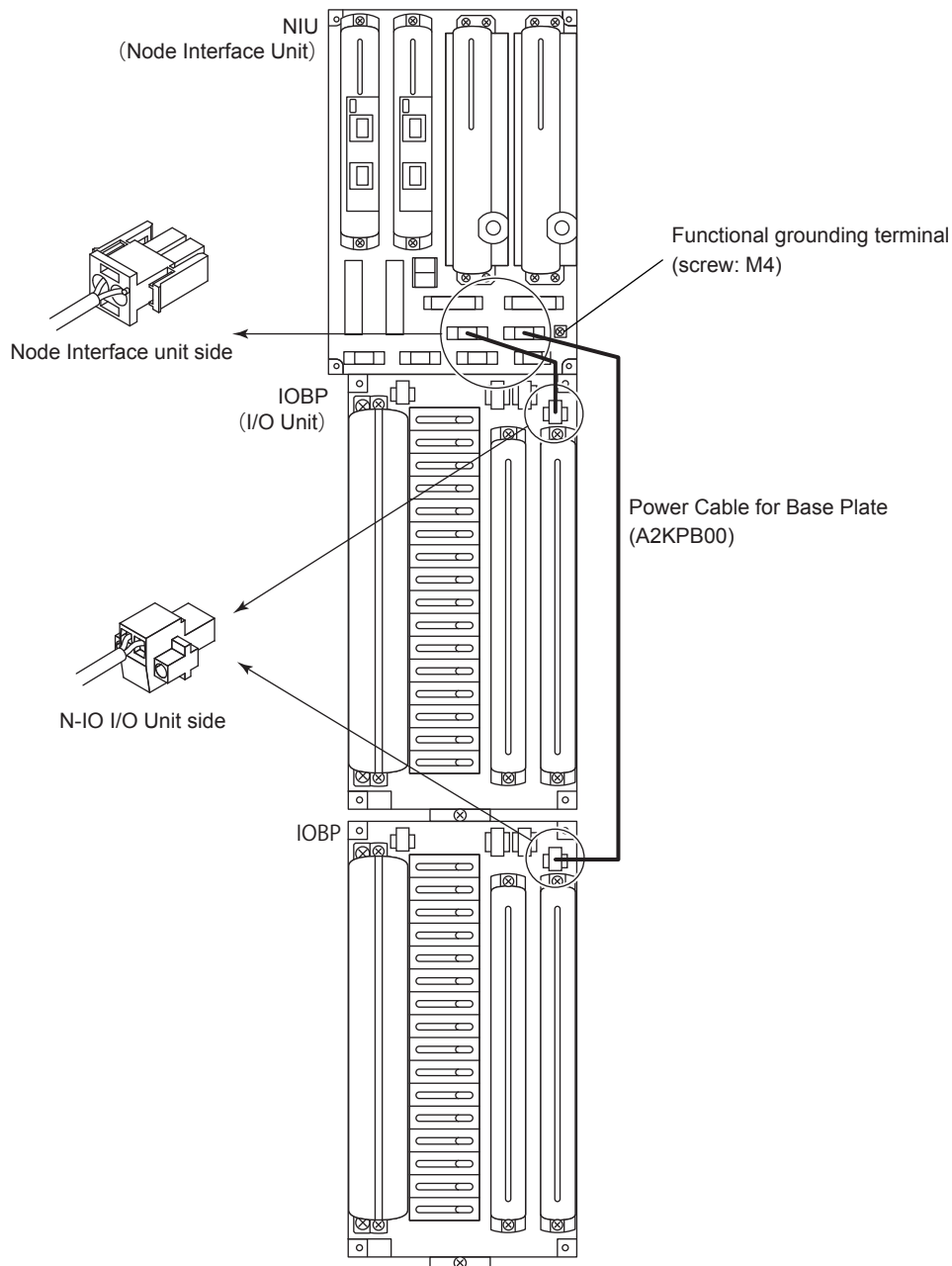
F030420.ai



CAUTION

To avoid the influences of external noise, the cable length outside the cabinet connected to Barrier power supply input connector shall be less than 3 m.

■ Connecting Power Supply with Node Interface Unit and I/O Units



F030404.ai

Figure Connecting Power Supply with Node Interface Unit and I/O Units

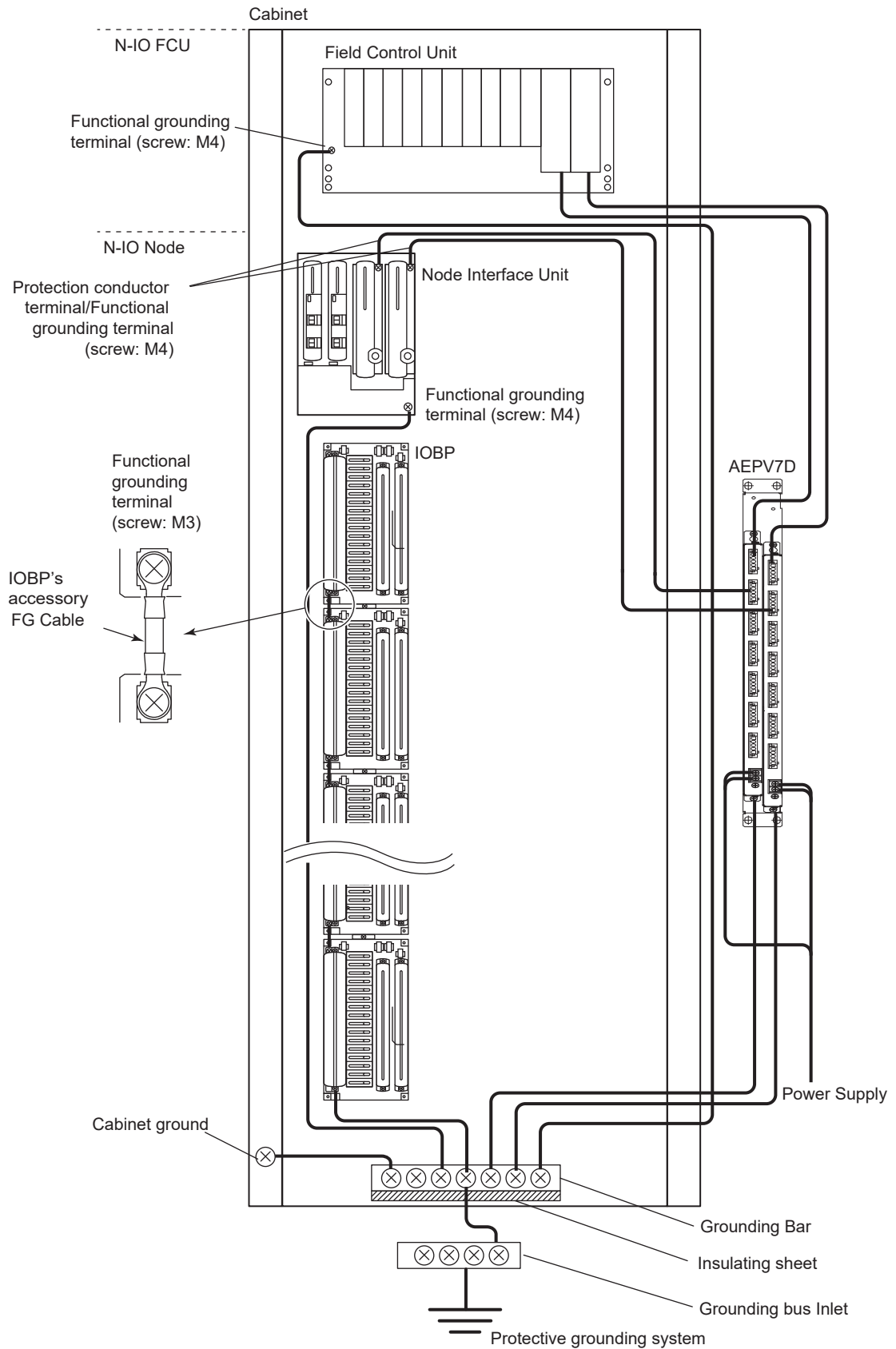


CAUTION

When connecting a Power Cable for Base Plate to a N-IO node, ensure to keep the minimum bending radius of the cable.

The minimum bending radius of the Power Cable is six-fold of the diameter of the cable.

■ Example of System Cabinet Installation and Grounding Wiring



F030405.ai

Figure N-IO system devices installation and grounding wiring (Cabinet)



WARNING

The wiring that will be intrinsic safety circuits must be installed so that they are electrically separated from the wiring of non-intrinsic safety circuits, including the in-cabinet wiring. Install the wiring according to the IEC 60079-14 standards or the requirements for explosion-proof wiring of the country where the system is used.

■ Example of Node Box Installation and Grounding Wiring

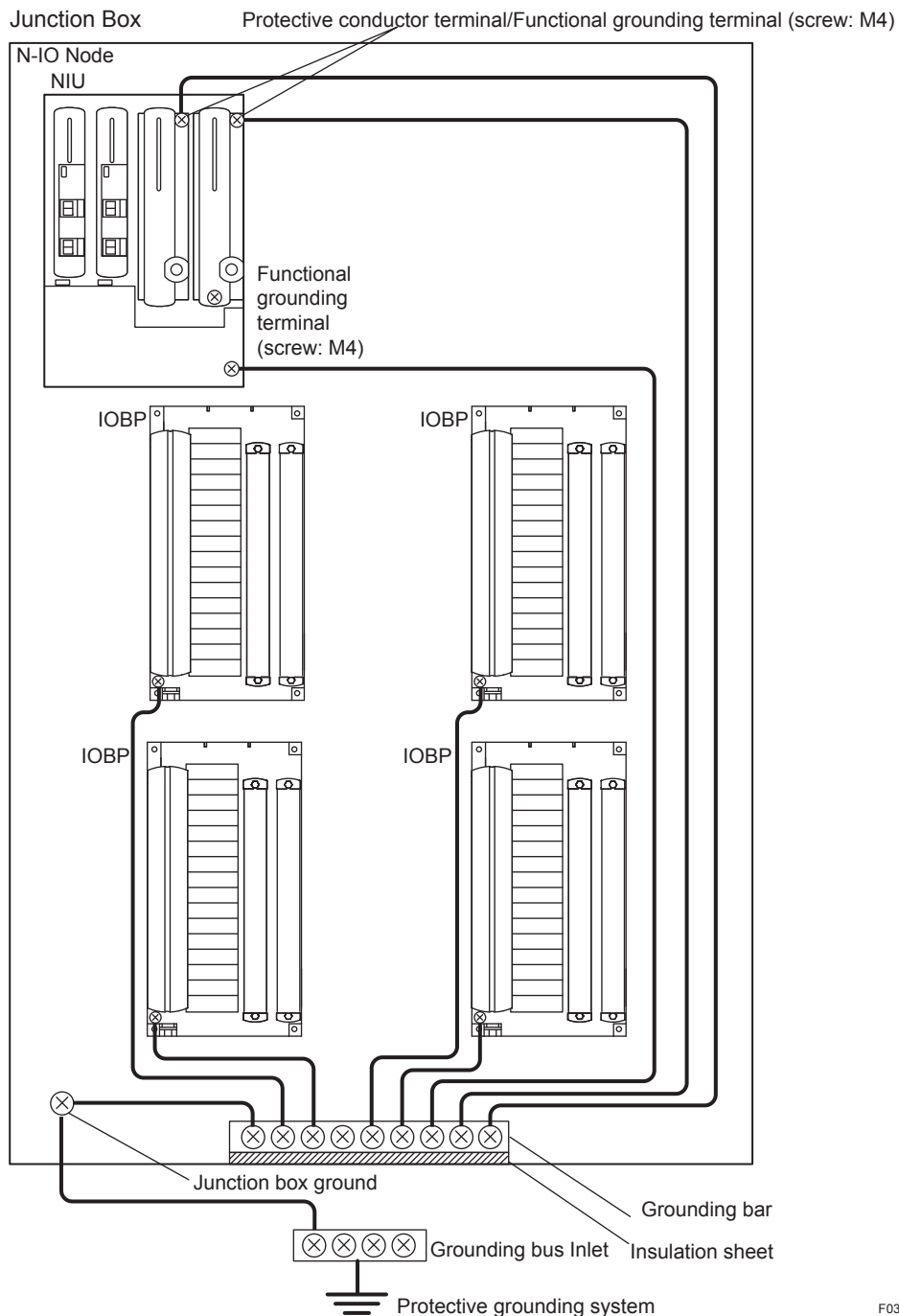


Figure Example of N-IO Node devices Installation and grounding wiring



WARNING

The wiring that will be intrinsic safety circuits must be installed so that they are electrically separated from the wiring of non-intrinsic safety circuits, including the in-cabinet wiring. Install the wiring according to the IEC 60079-14 standards or the requirements for explosion-proof wiring of the country where the system is used.

■ **AFV30S/AFV30D Field Control Unit (19-inch Rack Mountable Type)**

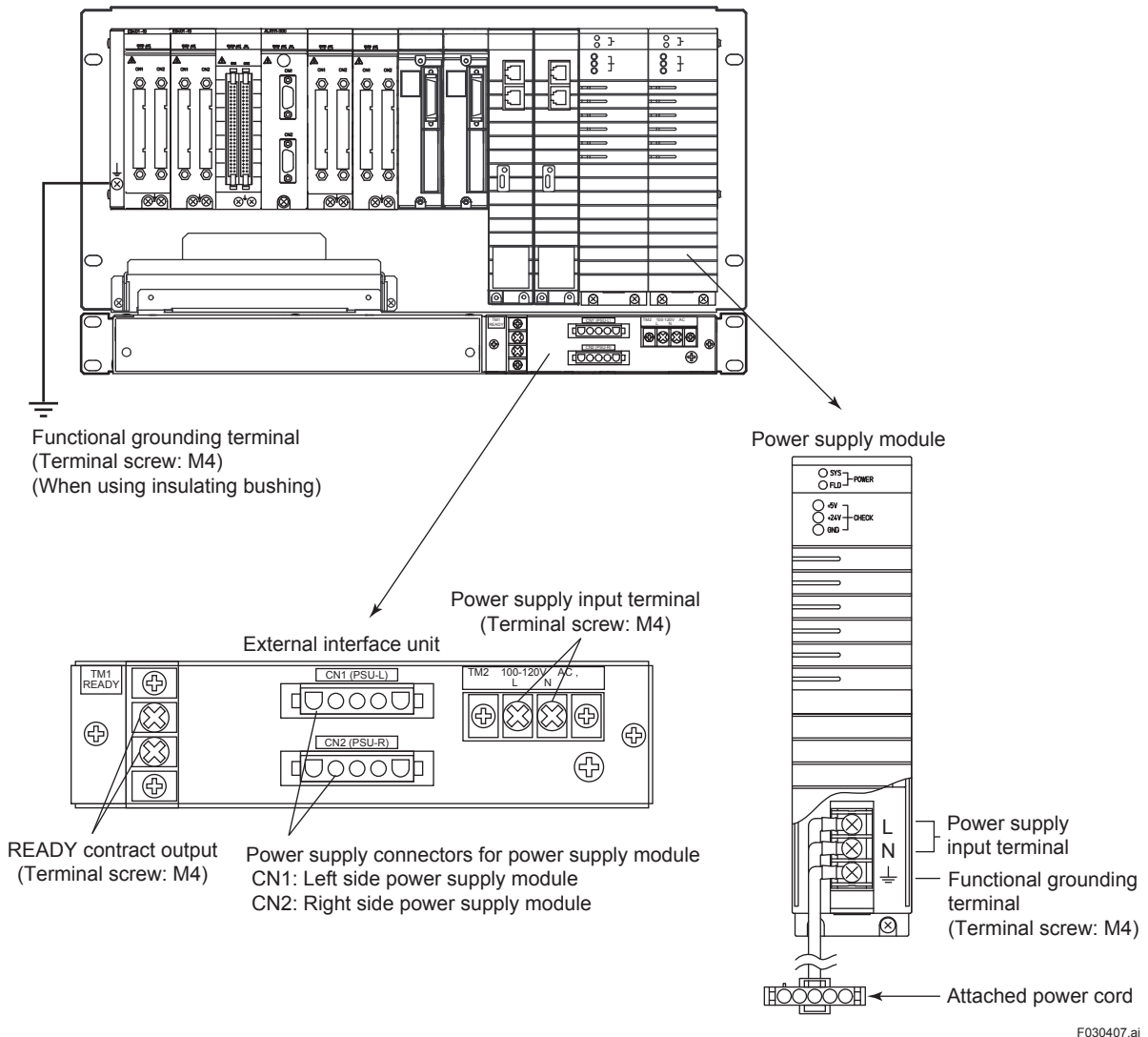
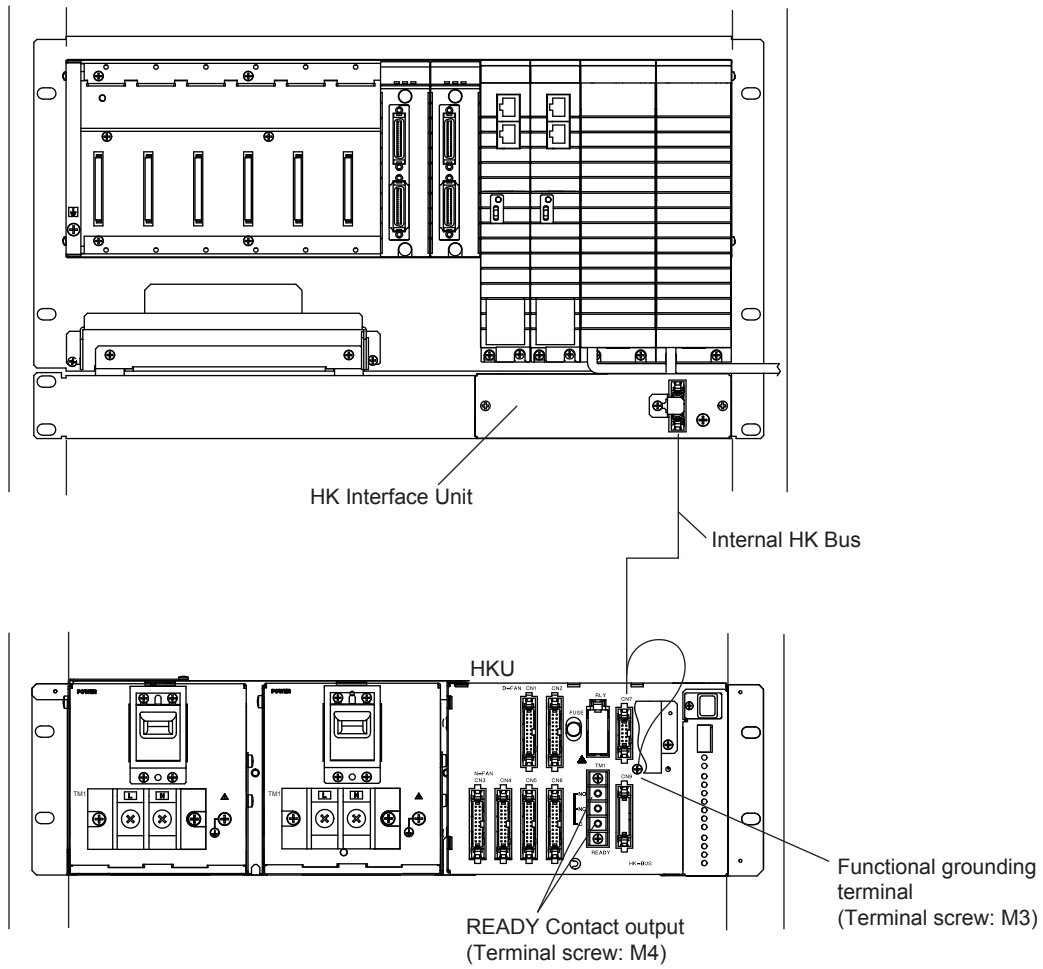


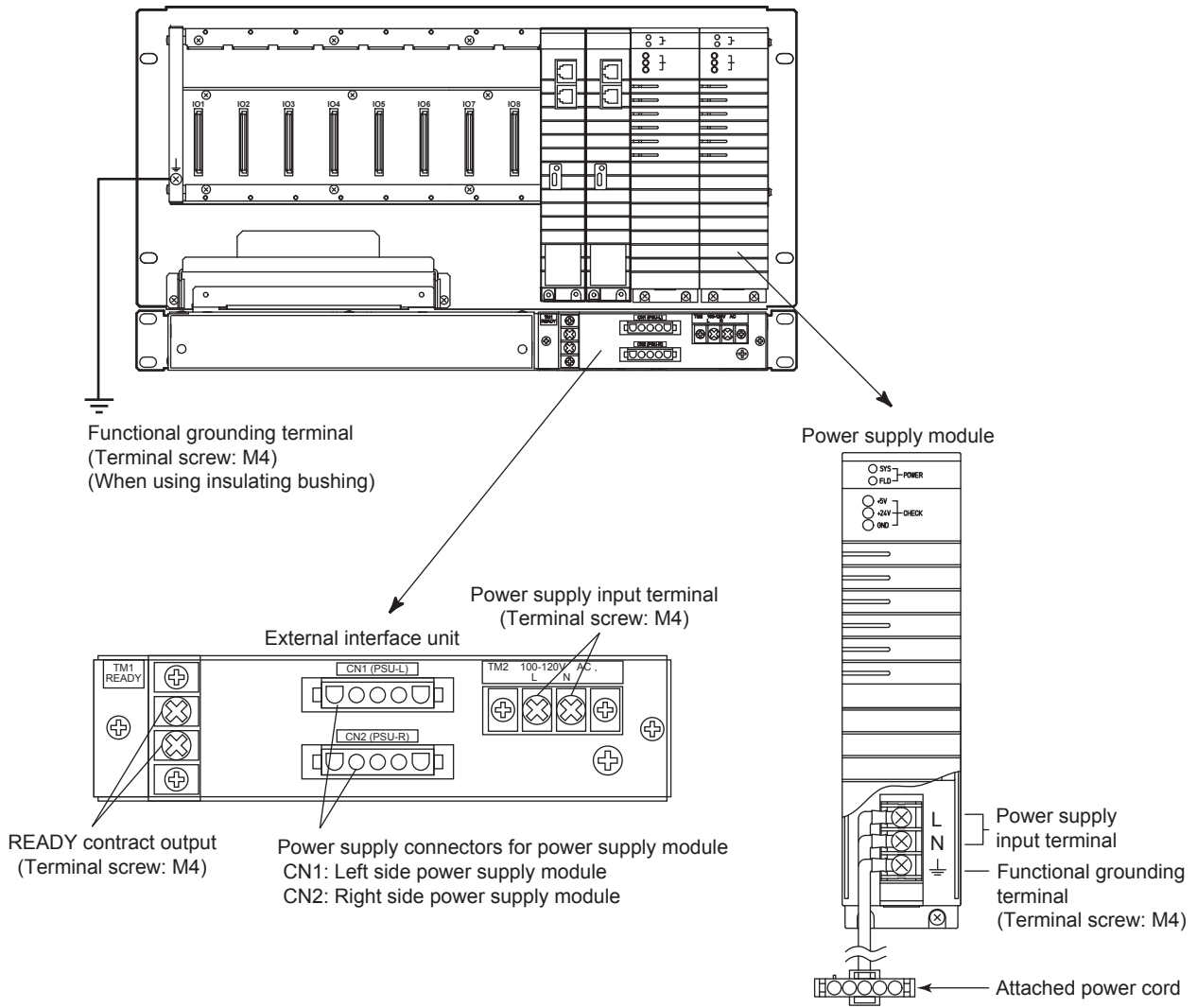
Figure AFV30S/AFV30D Power Cable Connections



F030408.ai

Figure Cable connection of AFV30S/AFV30D (When Connecting to HKU)

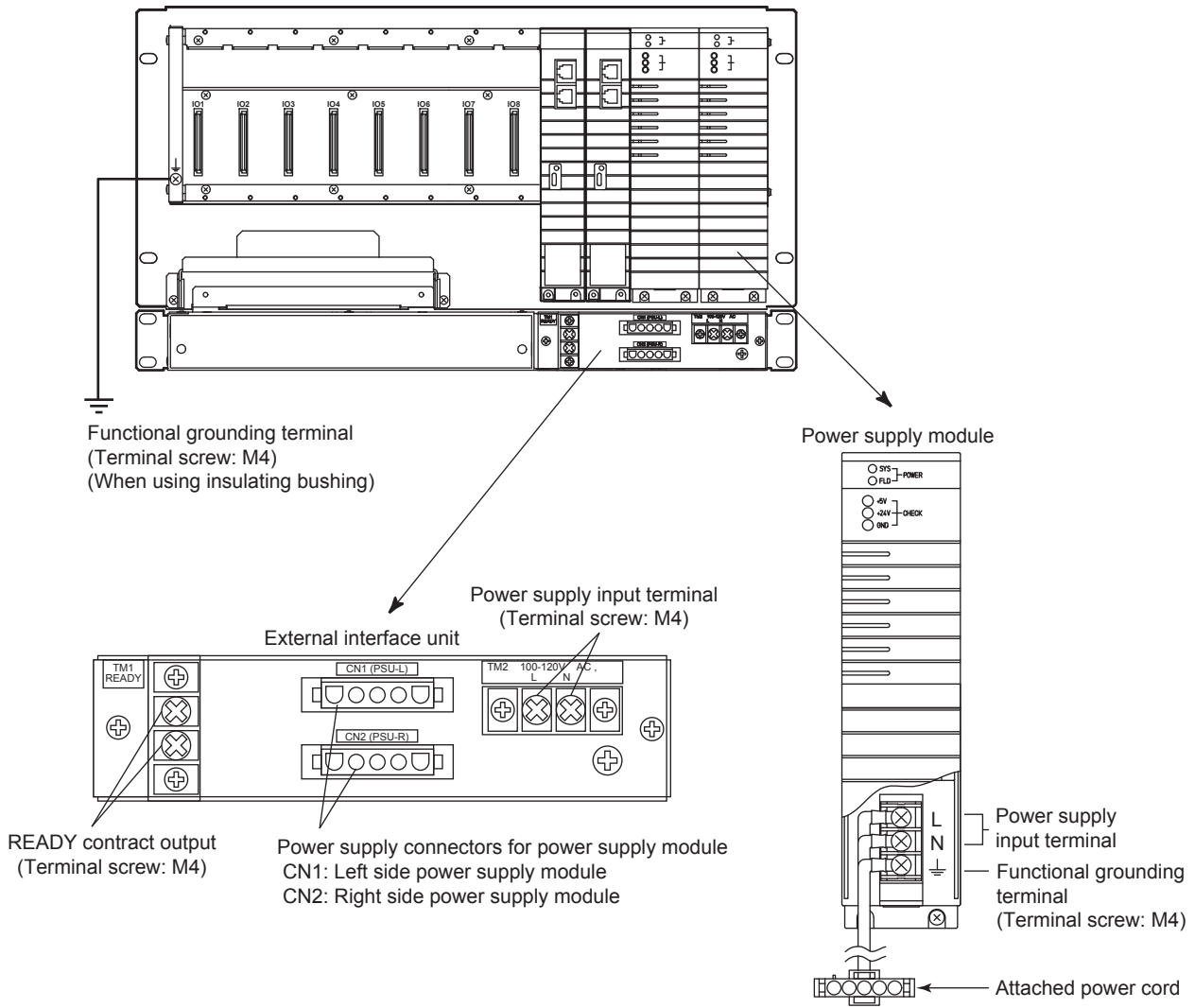
■ A2FV50S/A2FV50D Field Control Unit (19-inch Rack Mountable Type)



F030409.ai

Figure A2FV50S/A2FV50D Power Cable Connections

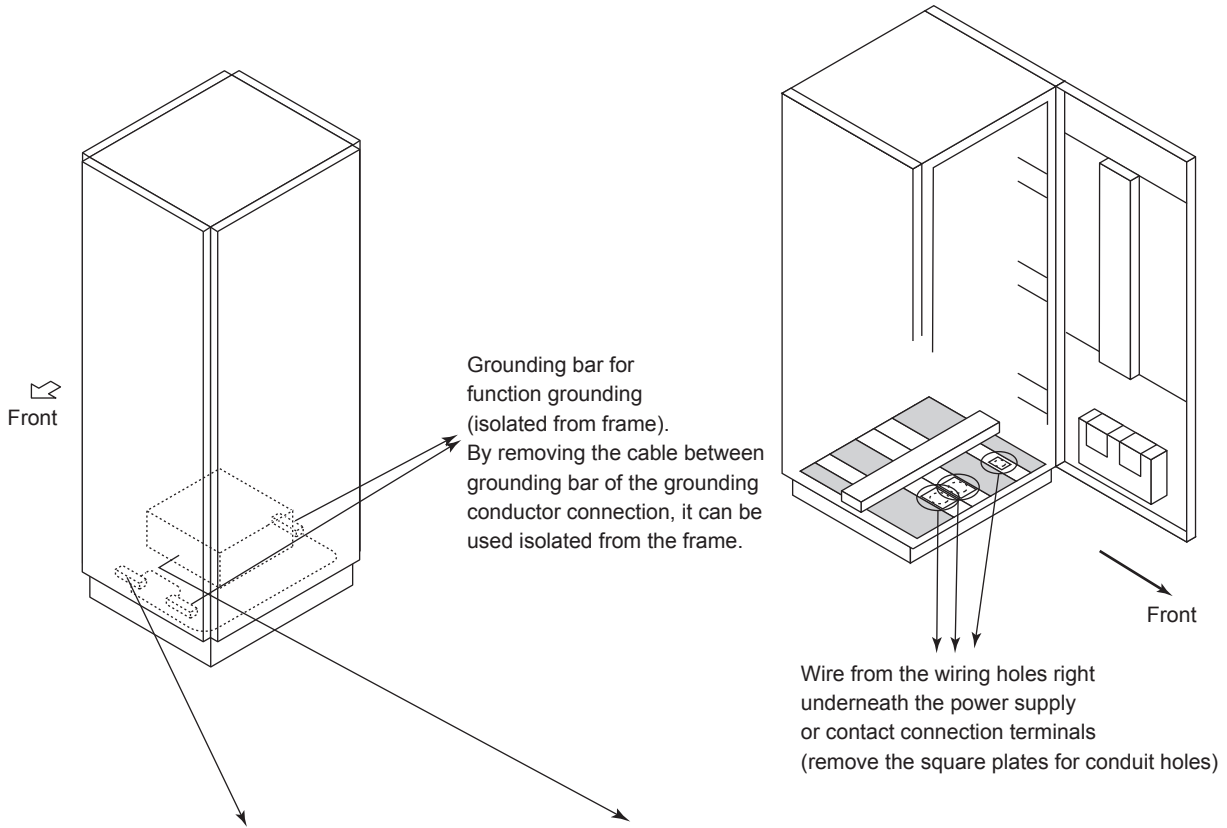
■ A2FV70S/A2FV70D Field Control Unit (19-inch Rack Mountable Type)



F030421.ai

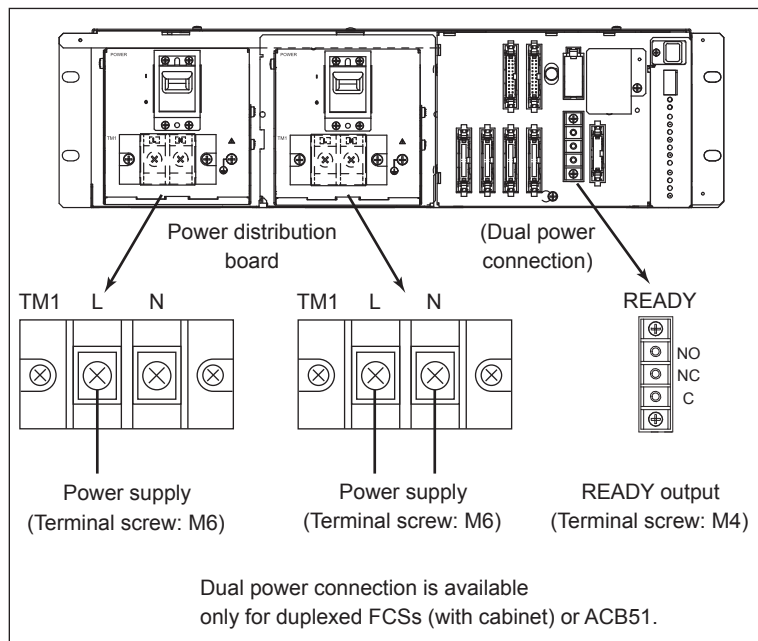
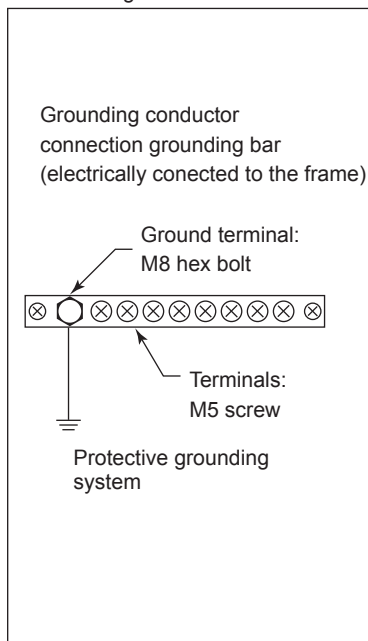
Figure A2FV70S/A2FV70D Power Cable Connections

■ AFV40S/AFV40D Field Control Unit (with Cabinet), ACB51 I/O Expansion Cabinet



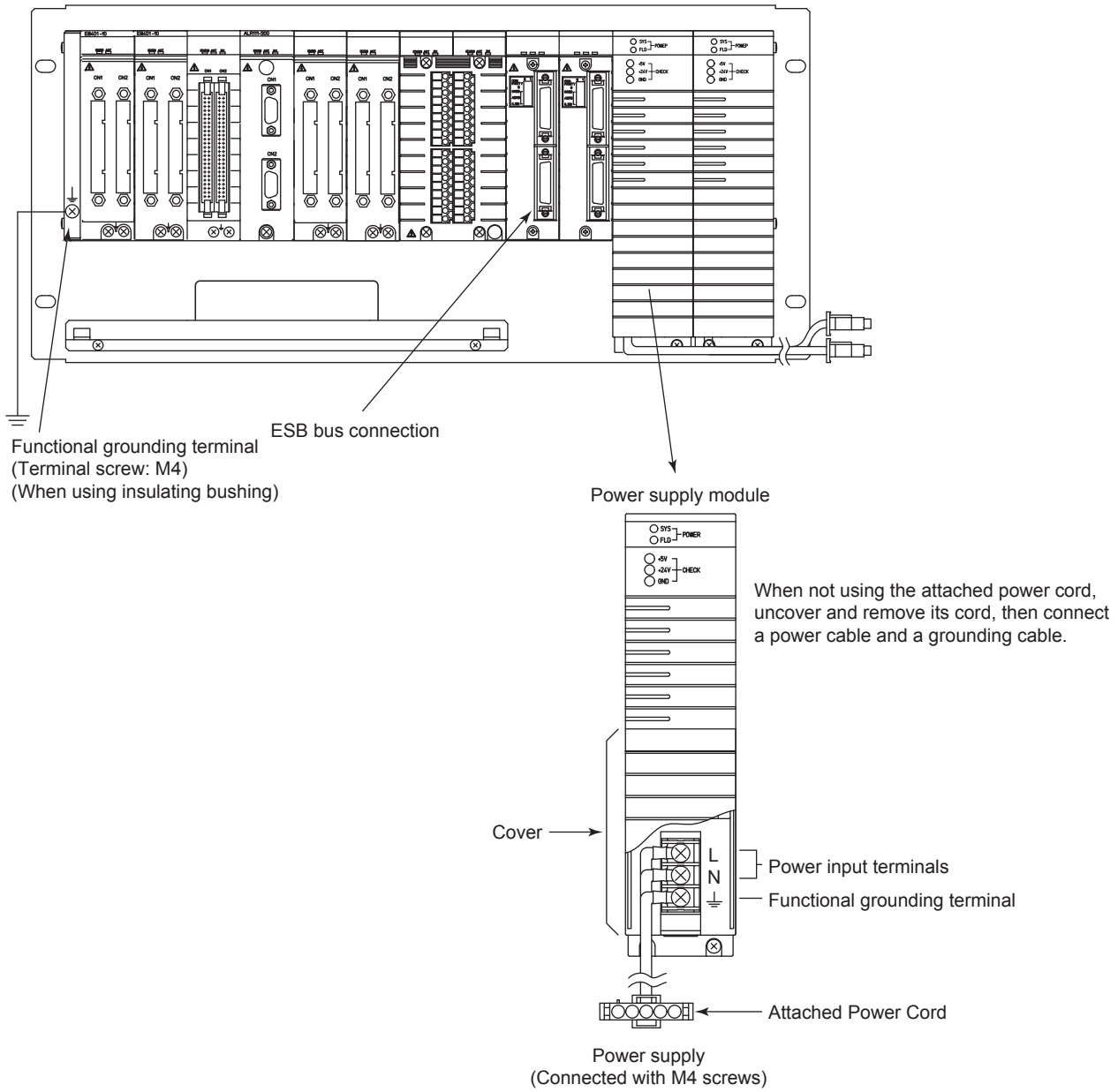
Grounding conductor connection

Power cable connection/ Status contact output connection



F030410.ai

■ ANB10S/ANB10D ESB Bus Node Unit (19-inch Rack Mountable Type)



F030411.ai

Figure ANB10S/ANB10D Power Cable Connection

■ ANB11S/ANB11D Optical ESB Bus Node Unit (for AFV30□/AFV40□/ A2FV50□)

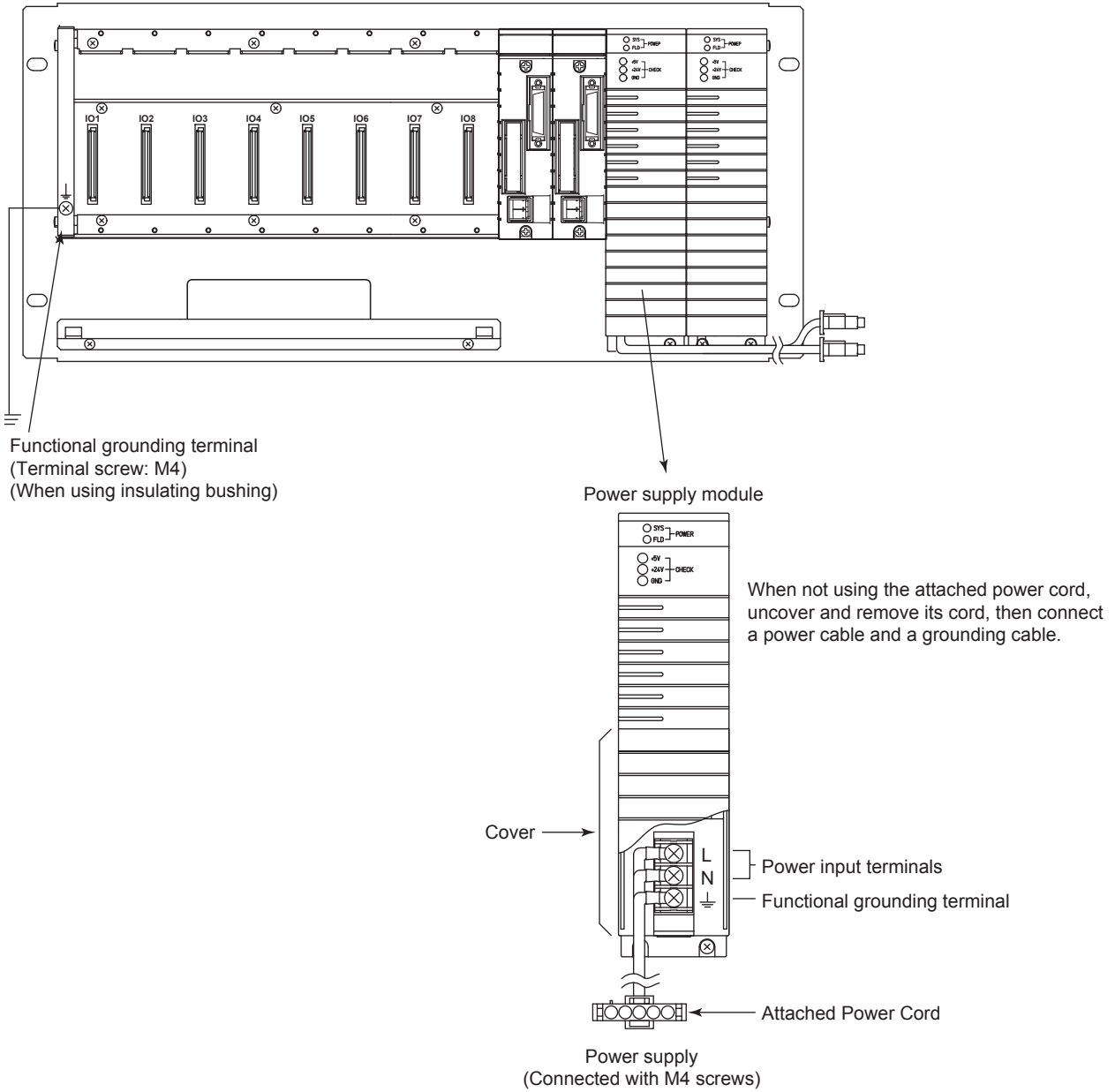
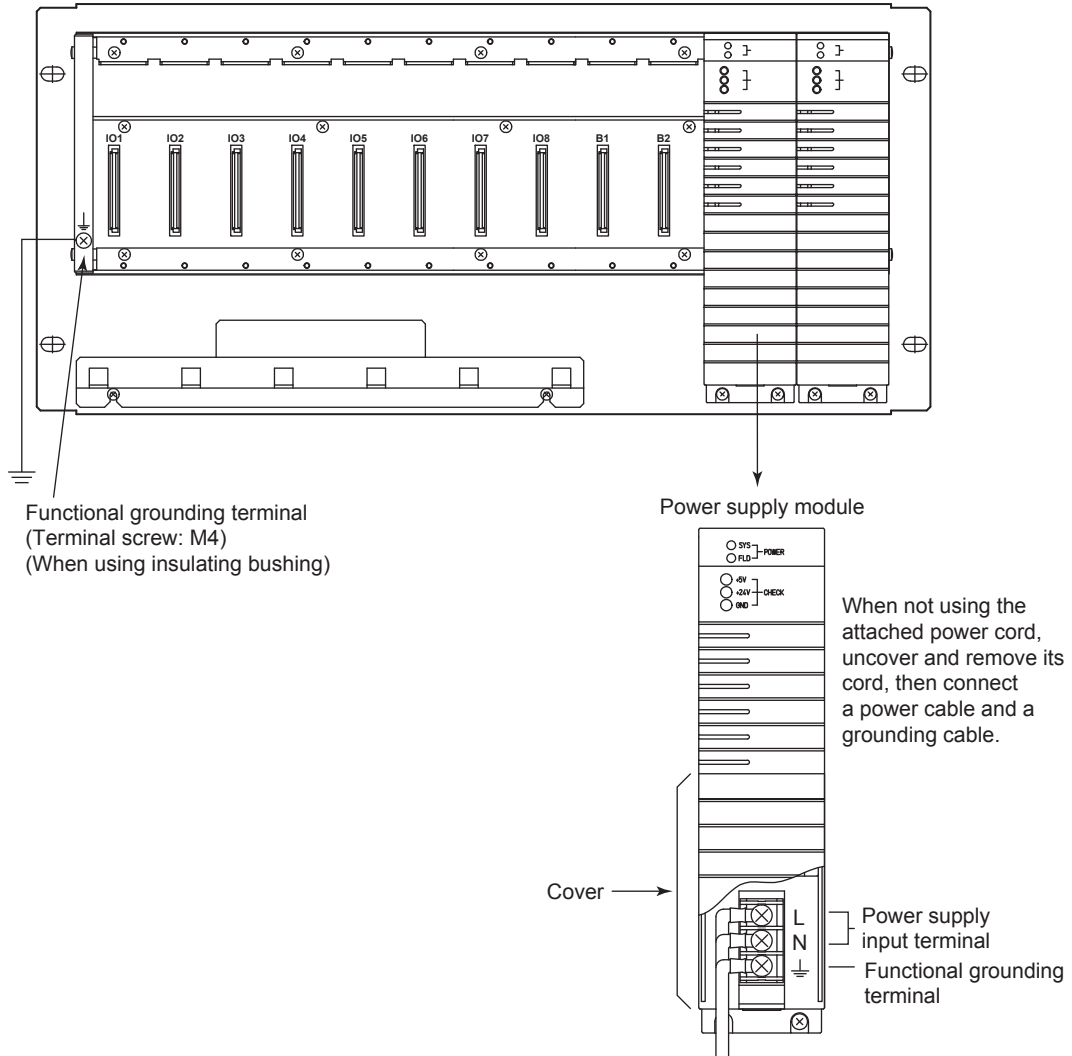


Figure ANB11S/ANB11D Power Cable Connection

F030412.ai

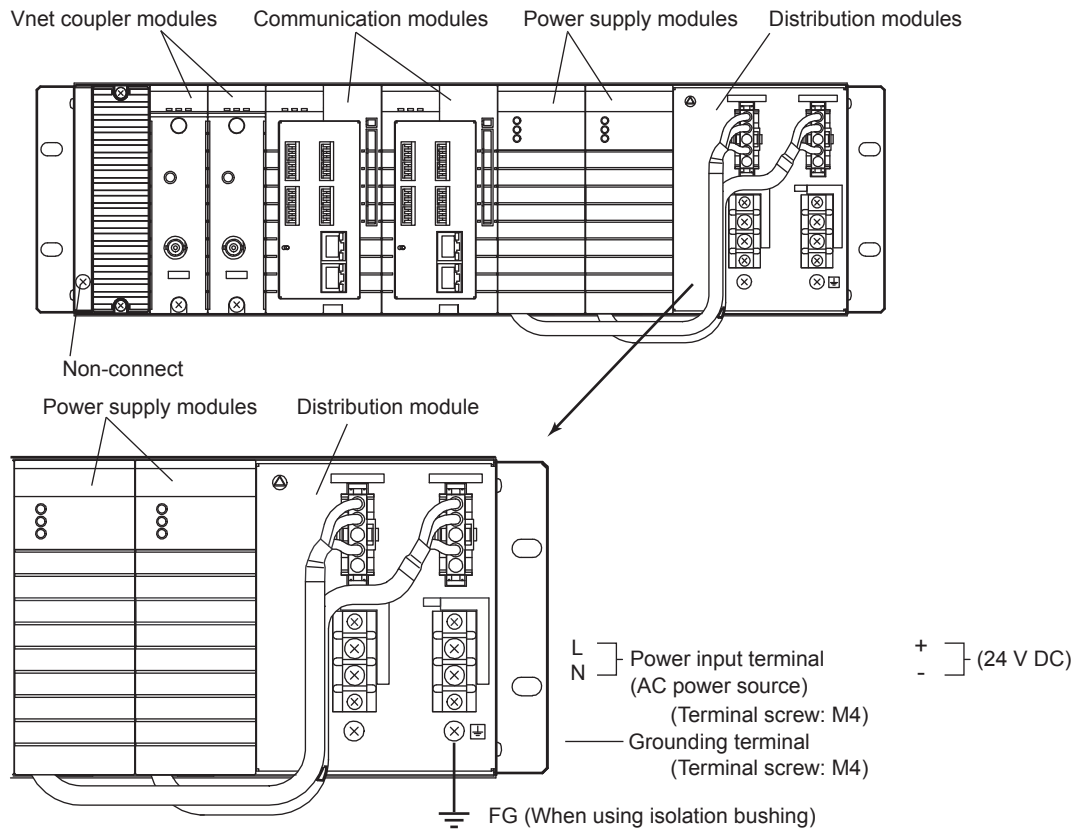
■ ANT10U Unit for Optical Bus Repeater Module (for AFV30□/AFV40□/ A2FV50□)



F030413.ai

Figure ANT10U Power Cable Connection

■ AVR10D Duplexed V net Router



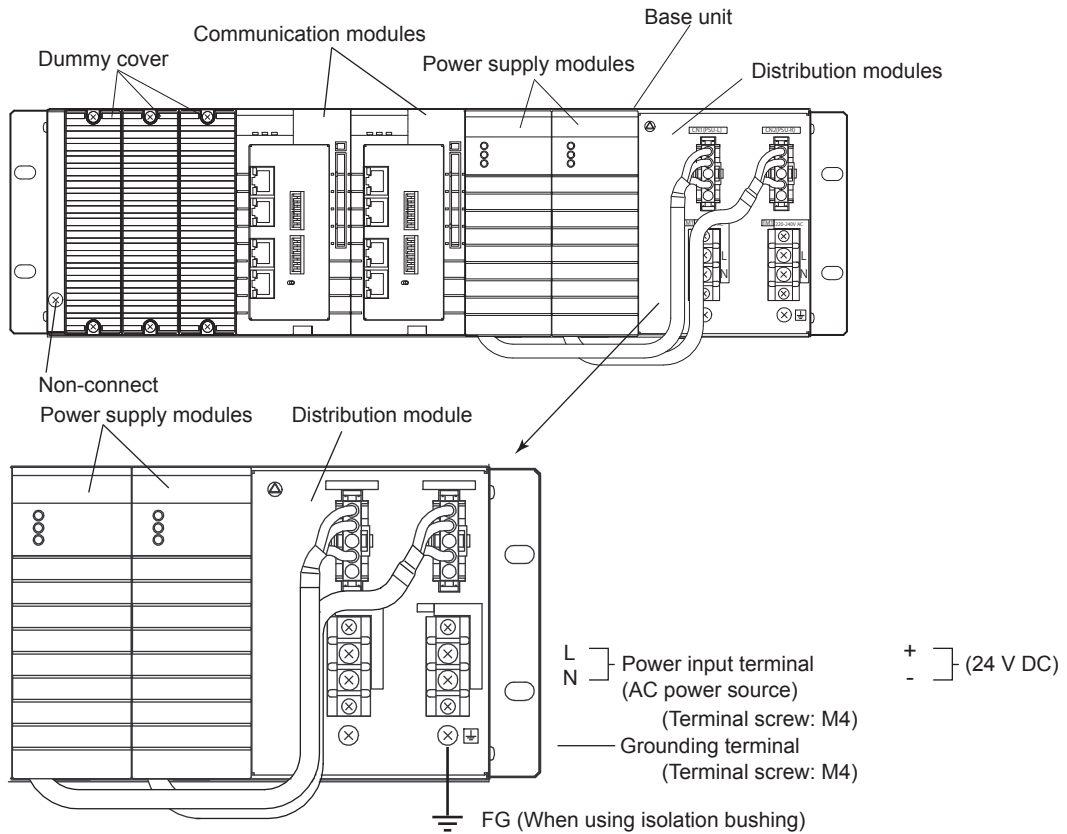
F030414.ai

Figure AVR10D V net Router Power Cable Connection

IMPORTANT

When power to the V net router is turned off, communications with the areas within the coverage of the Vnet service are disabled. The service coverage area needs to be taken into consideration when designing a system to supply power to the V net router (e.g. providing an independent power source for the V net router).

■ AW810D Wide Area Communication Router



F030415.ai

Figure AW810D Wide Area Communication Router Power Cable Connection

IMPORTANT

When power to the Wide Area Communication router is turned off, communications with the areas within the coverage of the Vnet/IP service are disabled. The service coverage area needs to be taken into consideration when designing a system to supply power to the Wide Area Communication router (e.g. providing an independent power source for the Wide Area Communication router).

■ **A2NN10D Node Interface Unit (for RIO System Upgrade)**

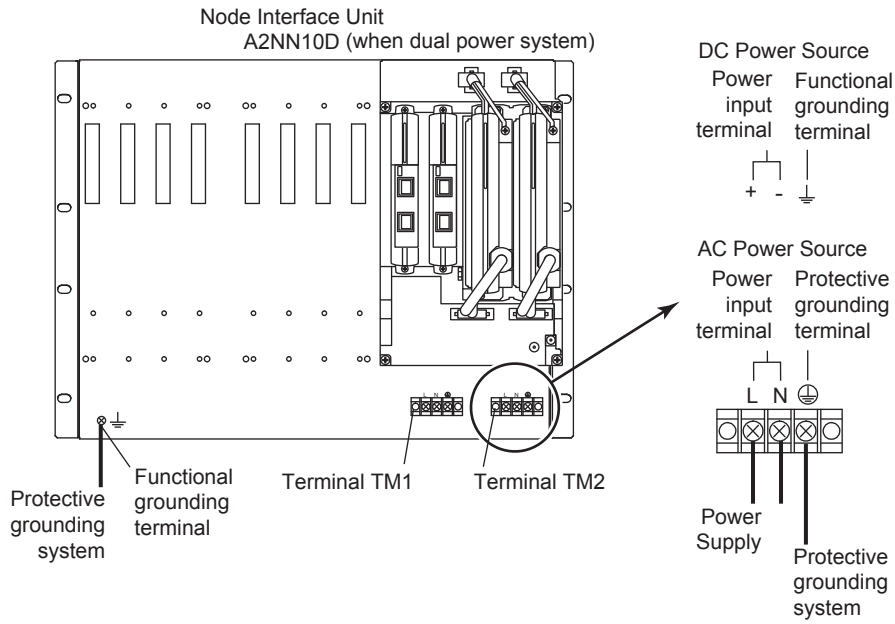
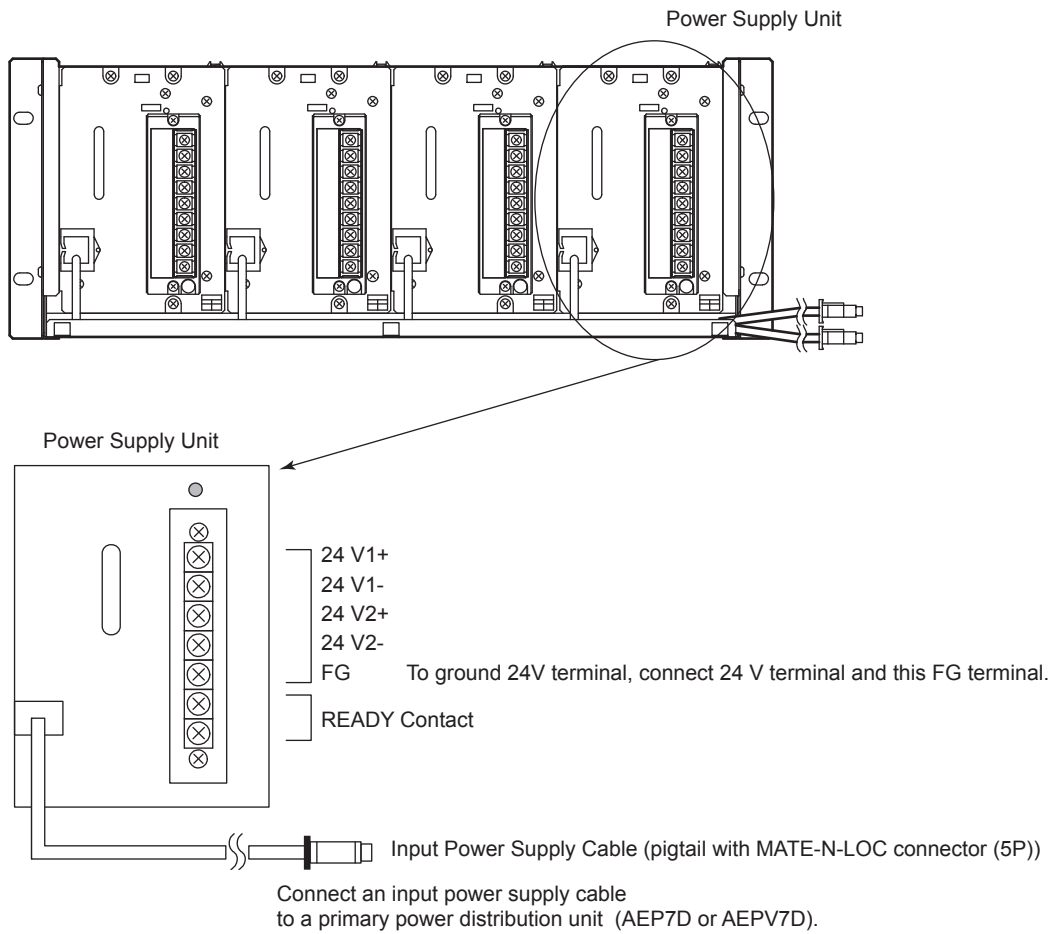


Figure A2NN10D Node Interface Unit Power Cable Connection

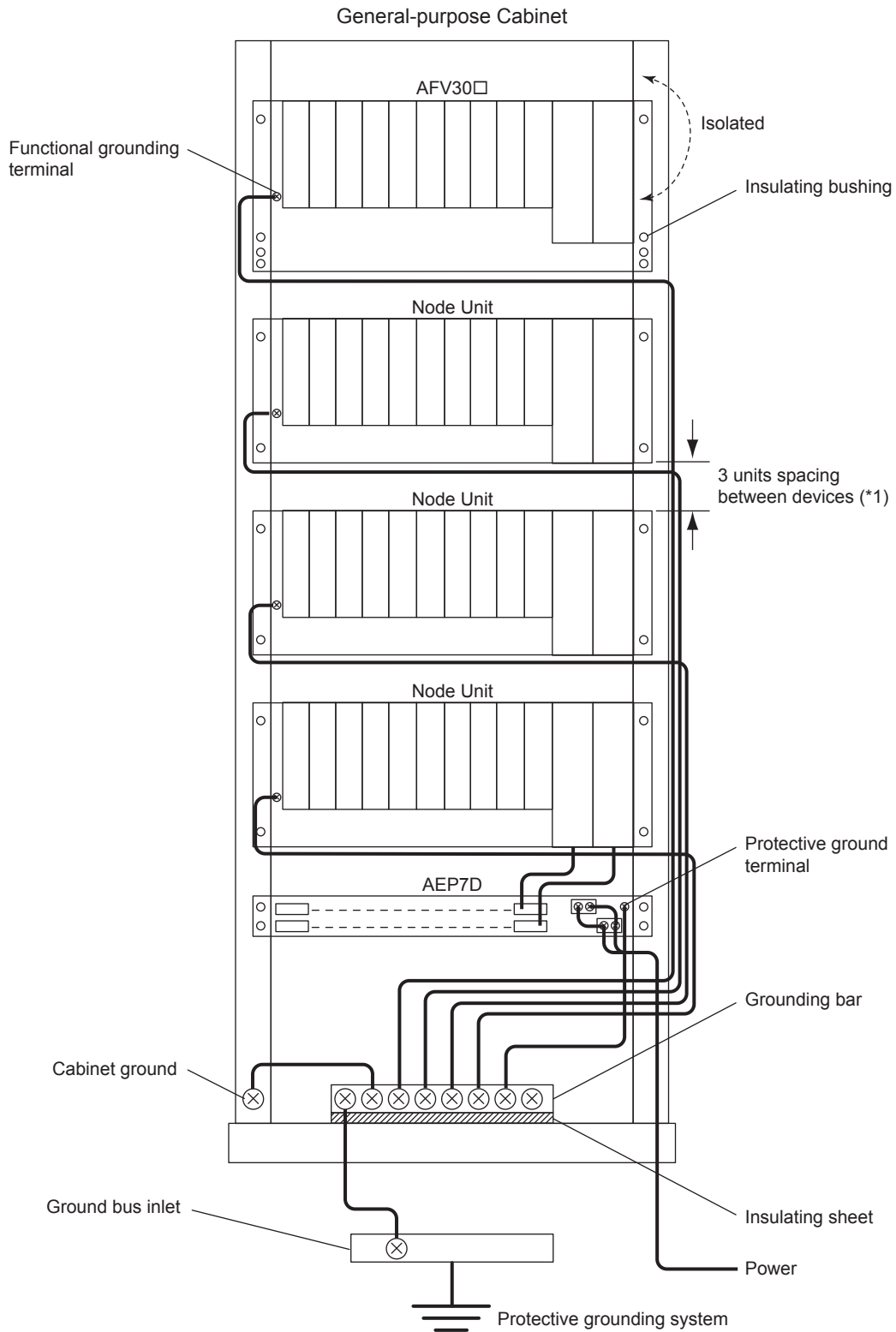
■ **PW601, PW602 24 V DC Output Power Supply**



F030424.ai

● 19-inch Rack-mount Devices and Wiring (For FIO System)

An example of wiring when AFV30□, A2FV50□, A2FV70□, ANB10□ or ANB11□ is mounted to a general-purpose cabinet in the following:

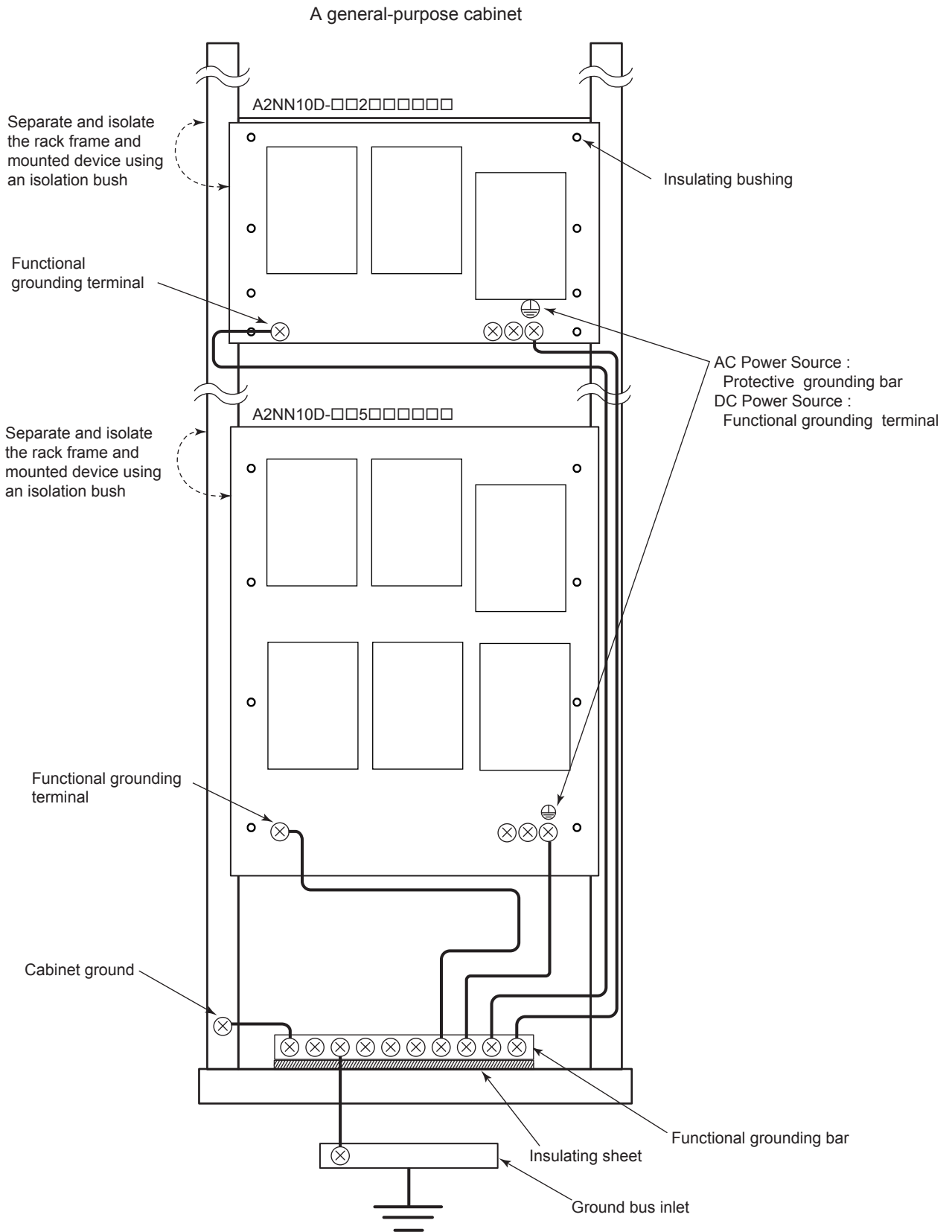


F030416.ai

*1: Keep a space of 3 units or more for heat radiation.

Figure 19-inch Rack-mount Devices and Wiring

An example of wiring when A2NN10D is mounted to a general-purp cabinet in the following:

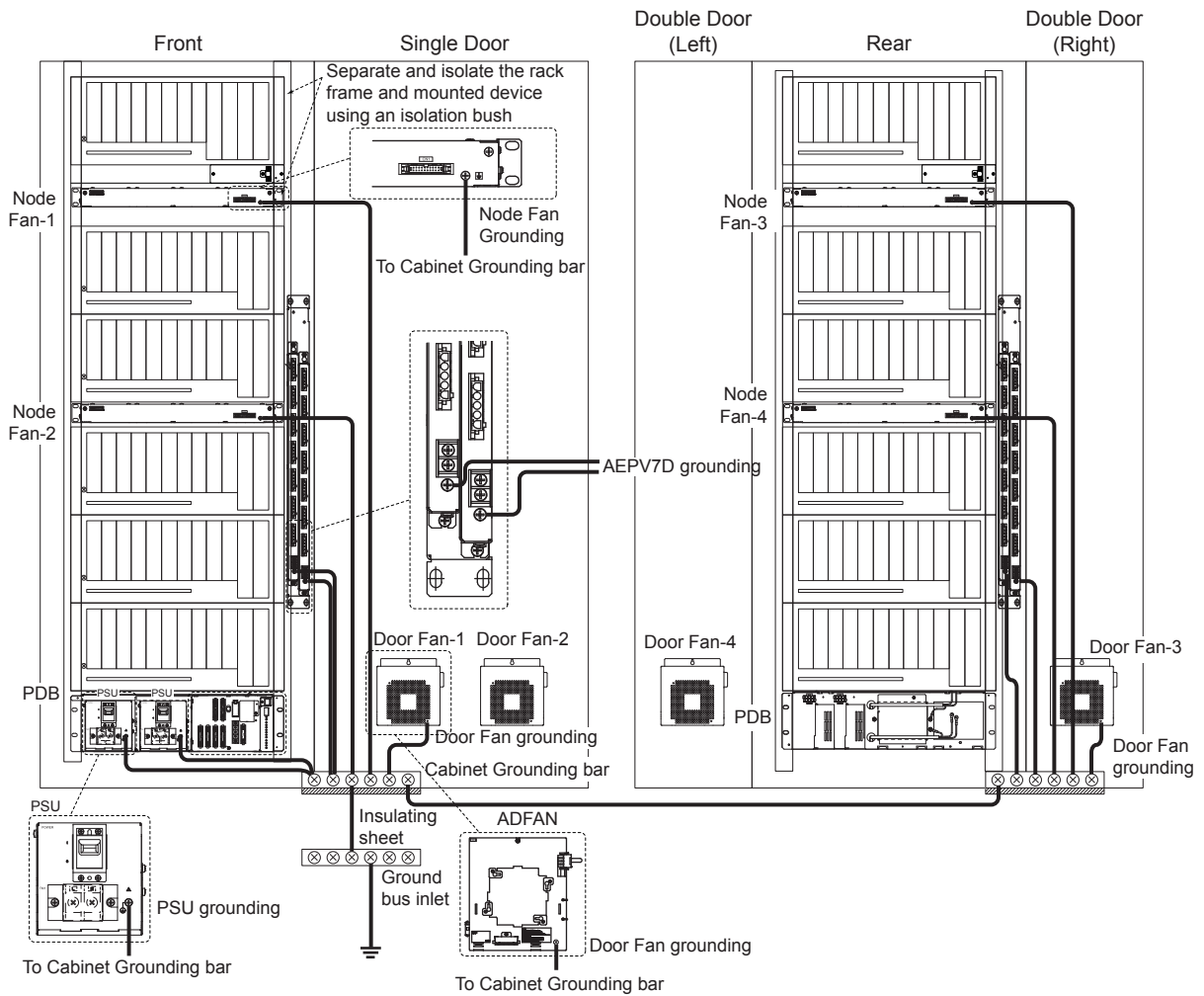


F030423.ai

■ Mounting and Wiring Example of Cabinet Utility Kit (ACUKT1)

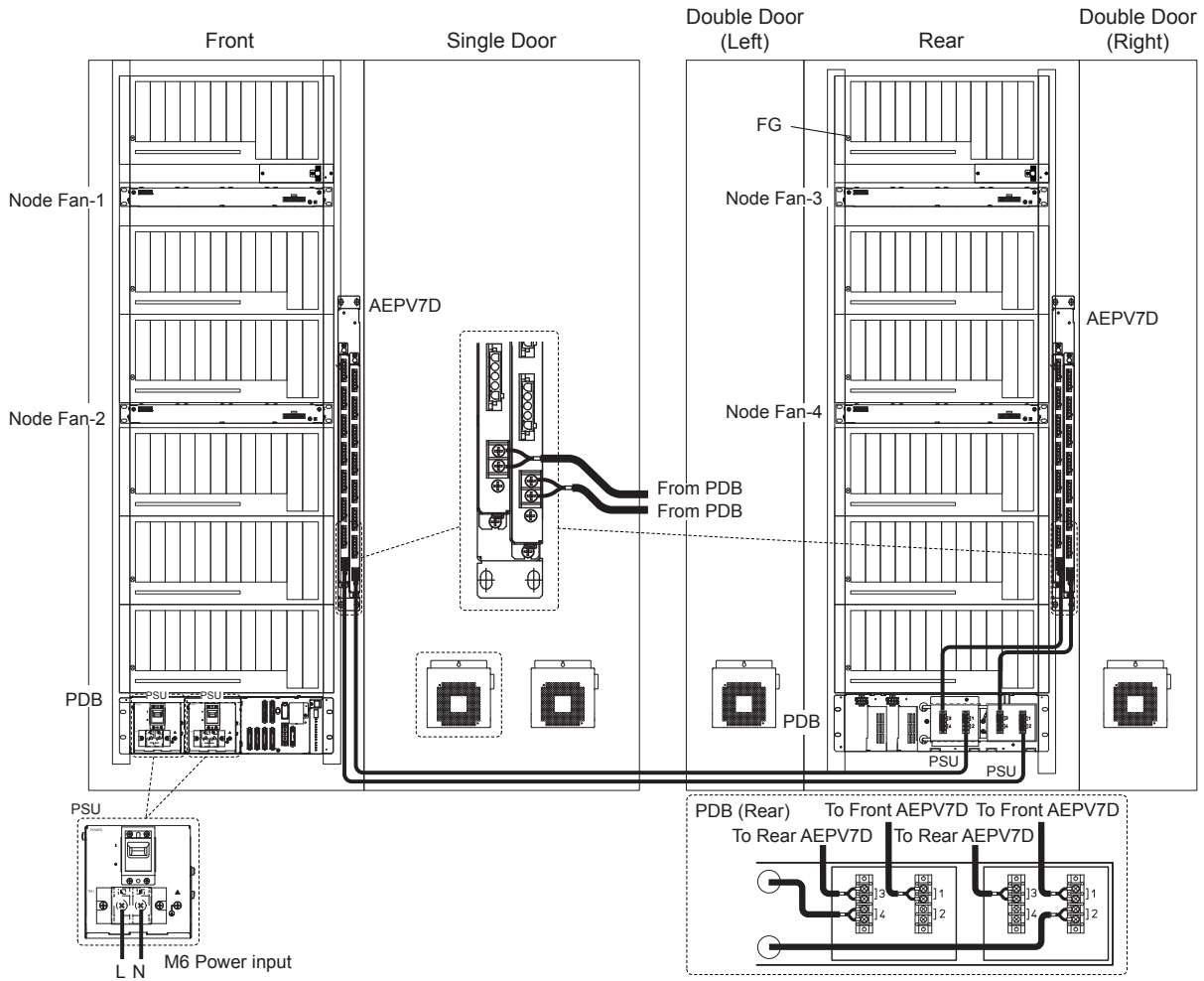
The following shows a mounting and wiring example of ACUKT1.

In this example, a single door is mounted at the front and a double door at the rear.



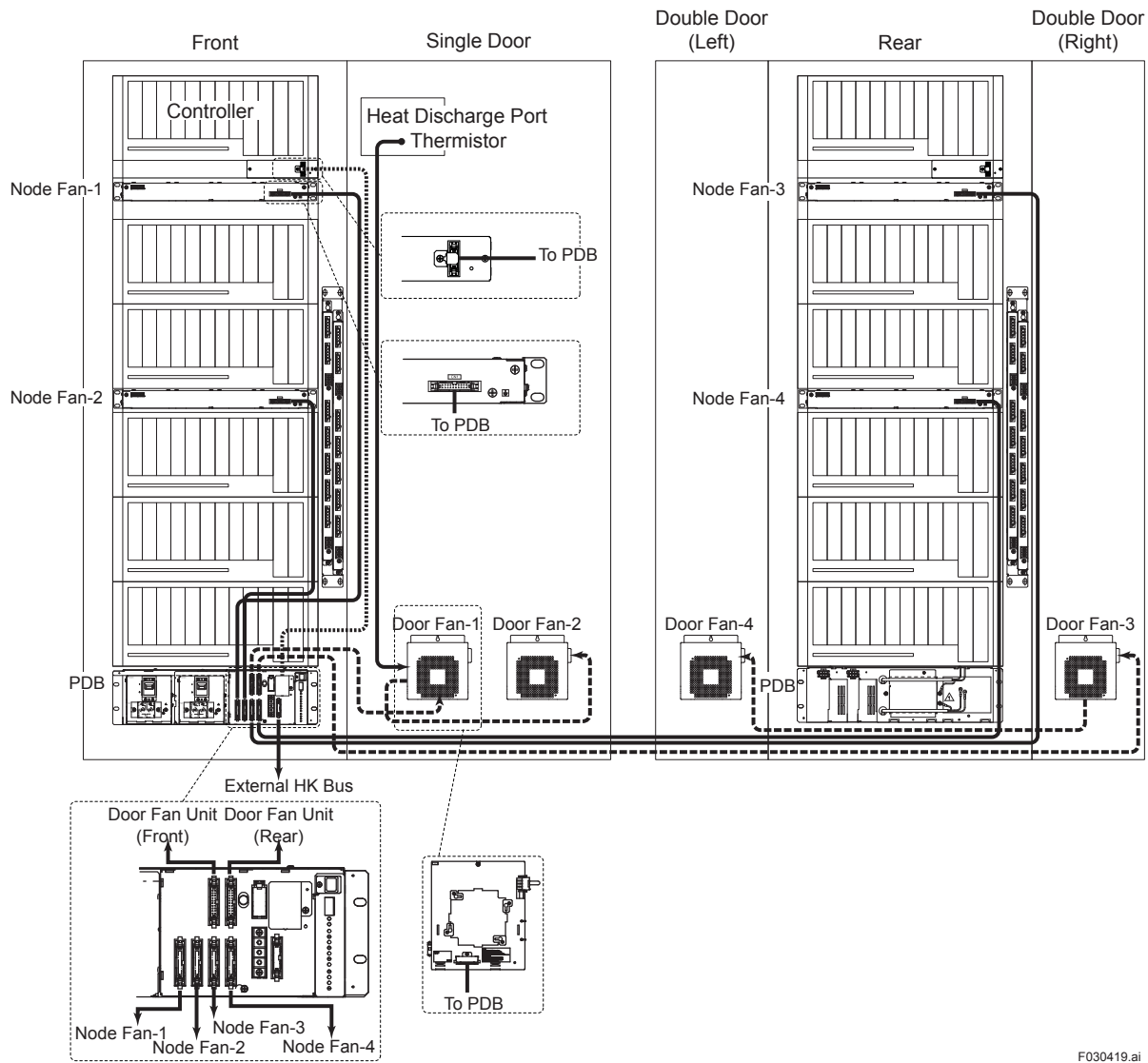
F030417.ai

Figure Example of ground wiring



F030418.ai

Figure Example of Dual AC Power Supply



F030419.ai

Figure Example of signal wiring

3.5 Connecting Signal Cable

The terminal blocks or connectors of I/O modules are the interface of the field signals. When connecting the field signals to I/O modules via a dedicated cable and a terminal board, the terminal board becomes the interface of the field signals.

■ Process I/O Signal Connection

- Power, Control Bus, and signal cables must be separately laid. Avoid laying them in parallel.
- The use of group-shielded twisted-pair cables is recommended for analog signal input specifically in order to prevent induction noise. A twisted-pair cable pitch of 50 mm or less should be used and the shielded cables must be grounded.
- The use of twisted-pair cables is also recommended for digital signals.
- The twisted-pair cable has the following advantages over a solid wire:
 - More flexible for easy curving and cabling in limited spaces.
 - With good contact and durable in using a solderless contact.
- Signal cables must be clamped so that their weight does not affect terminals.
- Use solderless lug or pressure clamp terminal contact when process I/O signals are connected with terminals.

● Solderless Lug



CAUTION

- The CENTUM VP system uses screw terminals for signal connections.
 - Use the solderless contact with an insulation covering.
 - Use the solderless contact and crimp tools of the same make.
 - Use correct-size crimp tools according to cable sizes.
 - When the door is attached or detached for cable connection, be sure to then OFF the power of the main unit before connecting or disconnecting a cable.
-

● Pressure Clamp Terminal



CAUTION

- The CENTUM VP uses a pressure clamp terminal for signal connection of FIO and N-IO.
 - For cable connection with a sleeve attached, use a sleeve and a clamp tool from the same manufacturer.
 - Use a clamp tool which suits the cable thickness.
 - When the door is attached or detached for cable connection, be sure to then OFF the power of the main unit before connecting or disconnecting a cable.
-

● Spring Clamp Terminal



CAUTION

- The CENTUM VP uses a spring clamp terminal for signal connection of N-IO.
- For cable connection with a sleeve attached, use a sleeve and a clamp tool from the same manufacturer.
- Use a clamp tool which suits the cable thickness.
- When the door is attached or detached for cable connection, be sure to then OFF the power of the main unit before connecting or disconnecting a cable.

■ Signal Cable Termination

Use the specified sleeves for pressure clamp terminal on the end of terminal - connected cables.

● Pressure Clamp Terminal (for FIO Module Pressure Clamp Terminal Block)

- Terminal processing
When connecting the process I/O signal to the pressure clamp terminal of FIO I/O Modules or N-IO, strip the cable coating (without a sleeve) or attach a sleeve to the cable. The following shows the length of the coating stripped for cases when a sleeve is not used and when it is used.

ATA4S, ATD5S, ATI3S, ATB5S, ATF9S, A1BT4D, ATA4D, ATD5D, ATI3D, and ATB5D

Table Without a sleeve

Cable thickness (mm ²)	Length of coating stripped (mm)	Remarks
0.5 to 2 (AWG20 to 14)	11	—

It is recommended to use any one of the following sleeves.

Sleeve without insulating cover (DIN 46 228/1)

Sleeve with insulating cover (DIN 46 228/4)

Table With a sleeve

Nominal cross sectional area (mm ²)	When using a sleeve with an isolation cover			When using a sleeve without an isolation cover	
	Length of coating stripped (mm)	Sleeve size		Length of coating stripped (mm)	Sleeve size
		Total length (mm)	Contact section length (mm)		Total length (mm)
0.5	12	16	10	10	10
0.75	12	16	10	10	10
1	12	16	10	10	10
1.25 to 1.5	12	16	10	10	10

● Pressure Clamp Terminal (for ARS□□M)

For both signal line and power line of the Solid State Relay Board ARS□□M, pressure clamp terminals are used.

- Terminal processing
When connecting the signal and power line to the pressure clamp terminal, strip the cable coating (without a sleeve) or attach a sleeve to the cable. The following shows the length of the coating stripped for cases when a sleeve is not used and when it is used.

Table Terminal treatment for pressure clamp terminal signal line

	Cable thickness (mm ²)	Length of coating stripped (mm)	Inserting length of sleeve (mm)
Without sleeve	0.5 to 2 (AWG20 to 14)	8	–
With sleeve	0.5 to 2 (AWG20 to 14)	8	8

Table Terminal treatment for pressure clamp terminal power line

	Cable thickness (mm ²)	Length of coating stripped (mm)	Inserting length of sleeve (mm)
Without sleeve	0.5 to 2 (AWG20 to 14)	9	–
With sleeve	0.5 to 1.5 (AWG20 to 16)	9	8

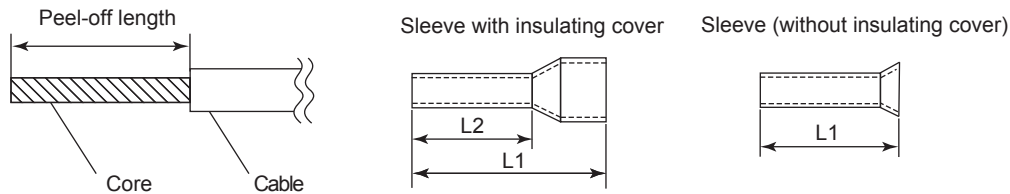
● **Pressure Clamp Terminal, Spring Clamp Terminal (for N-IO)**

At the end of the signal cables to the following applicable interface, provide the following cable termination:

Table Applicable Interface

Products	Models	Interface	Sleeve Normal cross sectional area (mm ²)
Node Interface Unit	A2NN30D	External alarm input terminal	0.5 ~ 2.5
I/O Unit	A2BN3D	I/O signal terminal (Pressure clamp terminal)	0.5 ~ 2.5
		I/O signal terminal (Spring clamp terminal)	0.5 ~ 1.5
		Field power supply input terminal	0.5 ~ 1.5
	A2BN5D	I/O signal terminal	0.5 ~ 1.5
Barrier power supply input terminal		0.5 ~ 1.5	
Terminal board	A2BM4	I/O signal terminal	0.5 ~ 2.5
Shunt resistor unit (For A2SAP105)	A2EXR001	Input terminal	0.5 ~ 2.5

- When using a sleeve
At the cable end, peel off the coating and attach a sleeve. The specifications of the sleeve differ, depending on the cable thickness. Provide cable termination according to the following figure and tables:



F030501.ai

Figure Cable termination (for pressure clamp terminals)

It is recommended to use any one of the following sleeves.

- Sleeve without insulating cover (DIN 46 228/1)
- Sleeve with insulating cover (DIN 46 228/4)

Table When sleeves with insulating cover are used

Nominal cross sectional area (mm ²)	Peel-off length (mm)	Sleeve dimensions (mm)	
		L1	L2
0.5	10	14	8
0.75	10	14	8
1.0	10	14	8
1.5	10	14	8
2.5	10	14	8

Table When sleeves without insulating cover are used

Nominal cross sectional area (mm ²)	Peel-off length (mm)	Sleeve dimensions (mm)
		L1
0.5	6	6
0.75	6	6
1.0	6	6
1.5	7	7
2.5	7	7

- When not using a sleeve
The peel-off length should be 7 mm. (*1)
- For I/O Unit Model A2BN4D
The pressure clamp terminal is on the MTL I.S. barrier. A cable must be prepared separately. Cable specification of field signal depends on the requirements specification of MTL's I.S. barriers. Refer to the instruction manual of I.S. barriers provided by the vendor.

*1: In case of A2EXR001, the peel-off length should be 8 mm for pressure clamp terminals and 7 mm for spring clamp terminals.

● Solderless Lug

- Solderless lug specifications

The specifications of the solderless lug to use are determined by the nominal cross sectional area of the power cable for which the lug is to be used, the lug screw, dimensions and so on.

Table Solderless Lug Dimensions

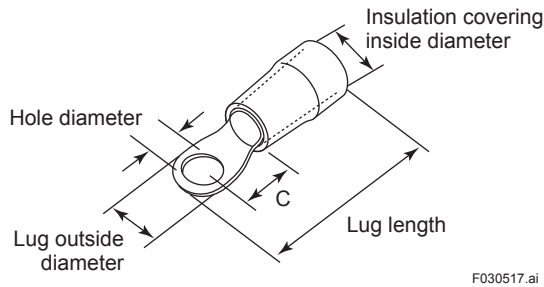
Nominal cross sectional area (mm ²)	Screw used (mm)	Hole diameter (mm)	Lug outside diameter (mm)	Lug length (mm)	Insulation covering inside diameter (mm)	Dimension "C" (mm)
0.75 ~ 1.25	4 (*1)	4.3 or more	8.2 or less	Approx.21	3.6 or more	7.0 or more
2.0	4 (*1)	4.3 or more	8.7 or less	Approx.21	4.3 or more	7.1 or more

*1: Recommended tightening torque is 1.2 N•m.



CAUTION

- For CENTUM VP, spring lugs are used for connecting signals for equipment for RIO System Upgrade.
- Always use solderless lugs with insulated covering.
- Always use solderless lugs and crimp-on tool manufactured by the same manufacturer.
- The crimp-on tool must be matched to the wire thickness.



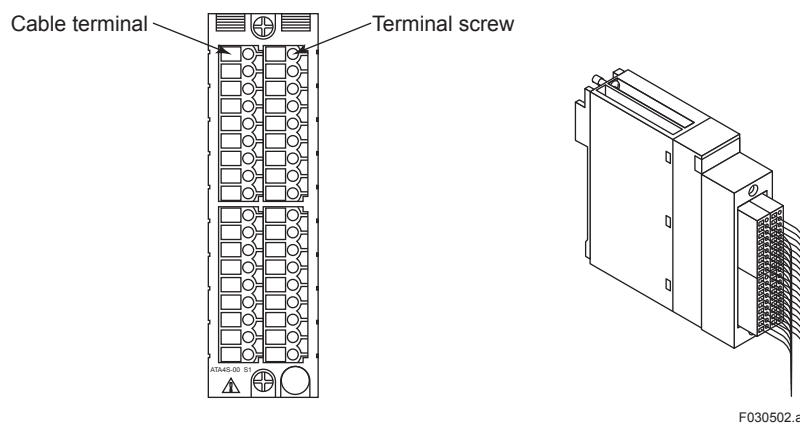
F030517.ai

Figure Solderless Lug

■ Connecting Signal Cables to Terminals (for FIO)

● Connecting to Pressure-clamp Terminal

1. Loosen the cable connecting terminal screw.
2. Strip the cable coating (without a sleeve) or attach a sleeve to the cable, then insert the tip of the cable into the connecting section of the pressure clamp terminal.
3. Fasten the screw using the special tool (a screw driver conforming to the DIN 5264B standard with a tip width of 0.6 mm and a shaft diameter of 3.5 mm) with a fastening torque of 0.5 N•m.



F030502.ai

Figure Connecting Signal Cable to Terminal (for FIO)



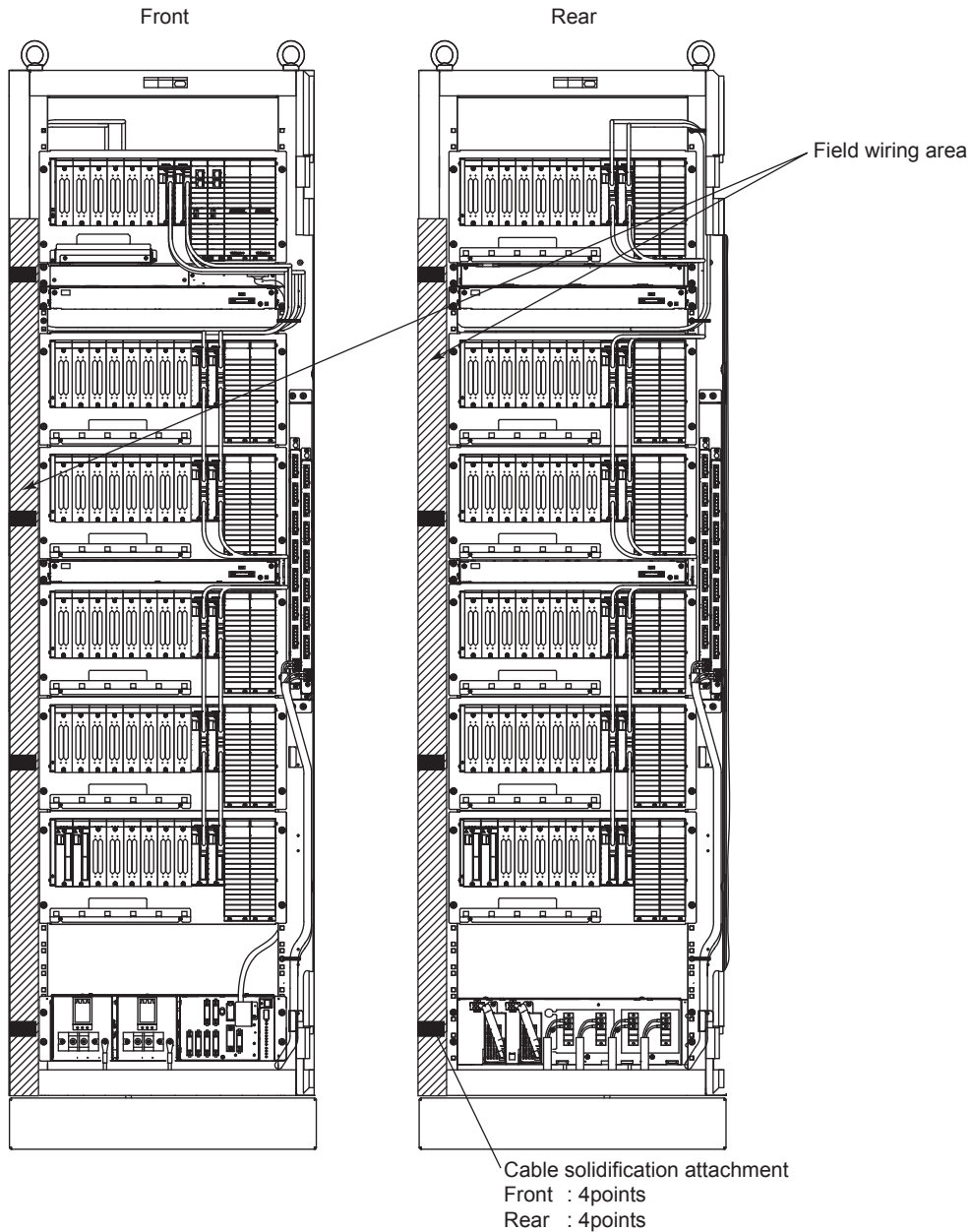
CAUTION

Do not use non-standard signal cable or sleeve; using them could cause improper connection. Be sure to remove the cable sheath just as much as specified, fit the sleeve, and clamp the cable firmly to the terminal.

■ Routing Signal Cables (for FIO)

● Areas for Signal Cables from Field

Signal cables from the field enter the FCS at the bottom and connect to individual node units in the routes shown in Figure below.

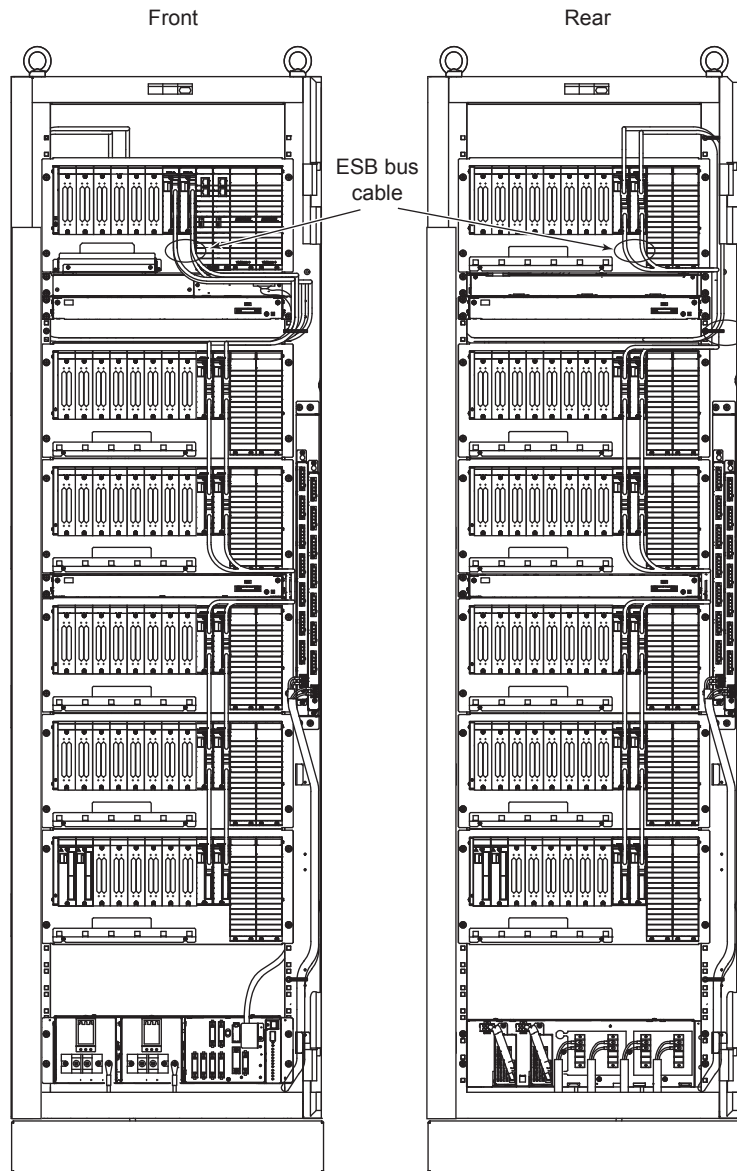


F030503.ai

Figure Areas for Signal Cables from Field

- **FIO Node Unit Wiring in FCU with Cabinet**

The figure shows a dual-redundant ESB bus example.



F030504.ai

Figure FIO Node Unit Wiring in FCU with Cabinet

- **FIO Node Unit Wiring in I/O Expansion Cabinet**

The figure shows a dual-redundant ESB bus example, the ESB bus node units installed in the front of the cabinet and the terminal boards in the rear.

Avoid using ESB bus cable with other cables and also avoid wiring its cable in parallel with others.

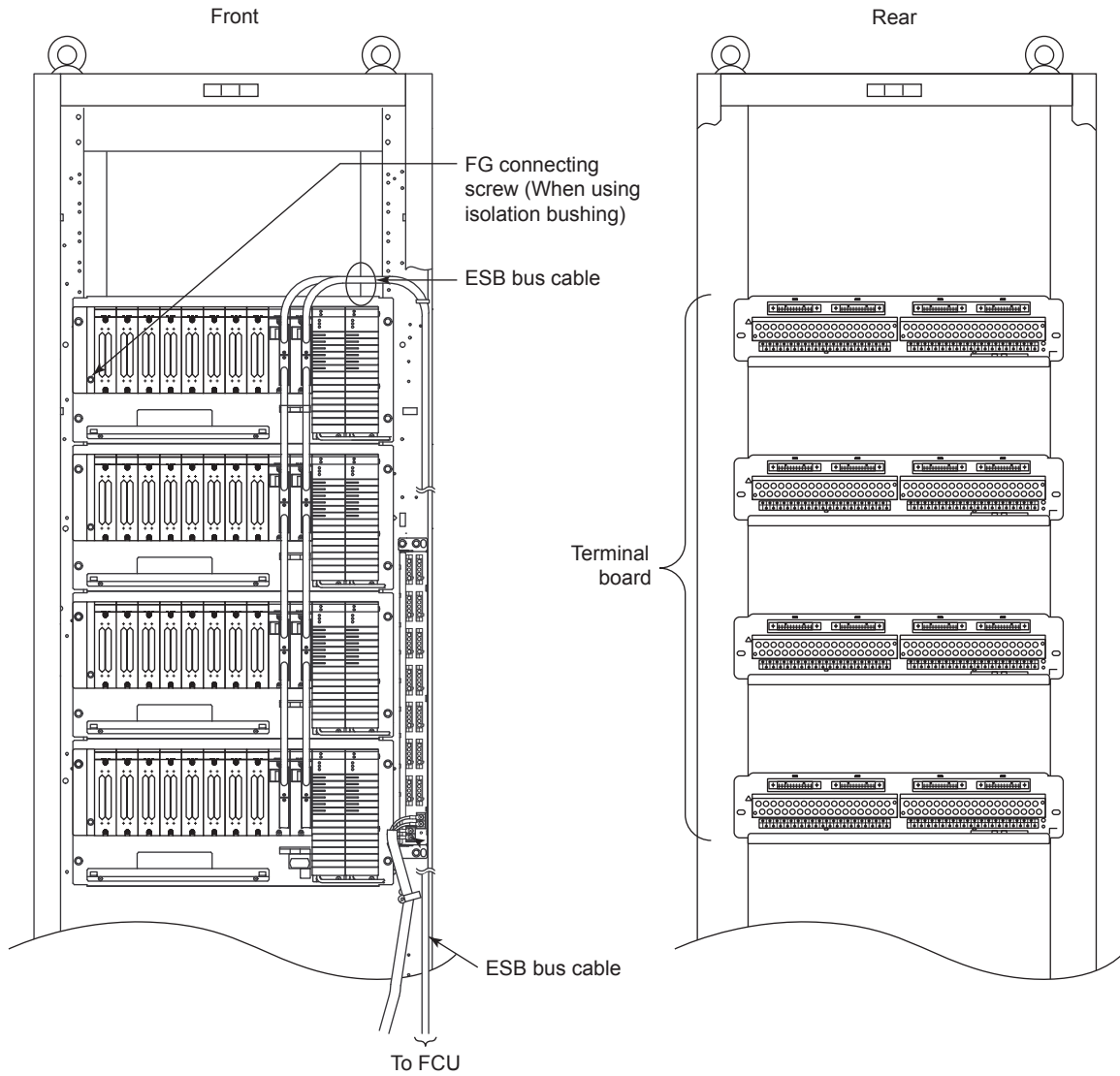


Figure FIO Node Unit Wiring in I/O Expansion Cabinet

F030505.ai

● AFV30S/AFV30D, ANB10S/ANB10D Wiring



CAUTION

To reserve the ventilation for I/O module, the signal cable should not exceed the separator at the center of cable tray.

The following shows a dual-redundant ESB bus example.

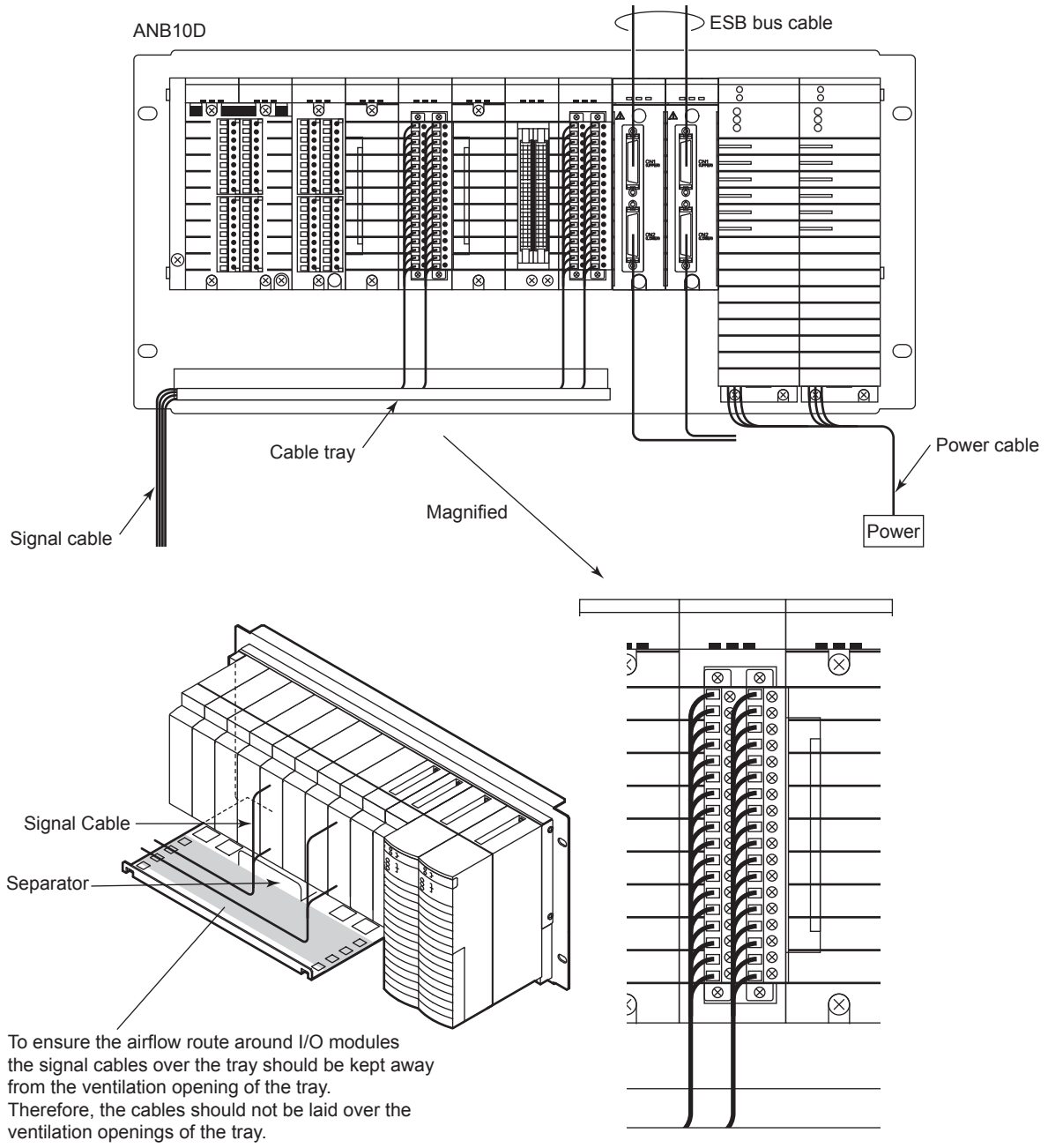


Figure ANB10D Wiring

F030506.ai

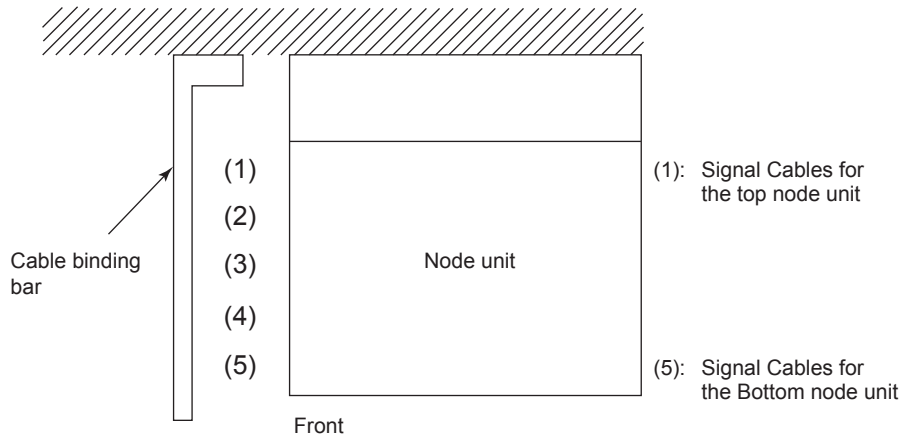
● FIO Signal Cabling

IMPORTANT

The signal cable for the top node unit must be wired at the innermost part in the field control area as the figure shows.

When fixing cables to a clamp, allow enough space so that the cards can be maintained. Bind the bottom cables to the clamp bar on the channel base.

Push in the signal cables for the top node unit as far as they will go.



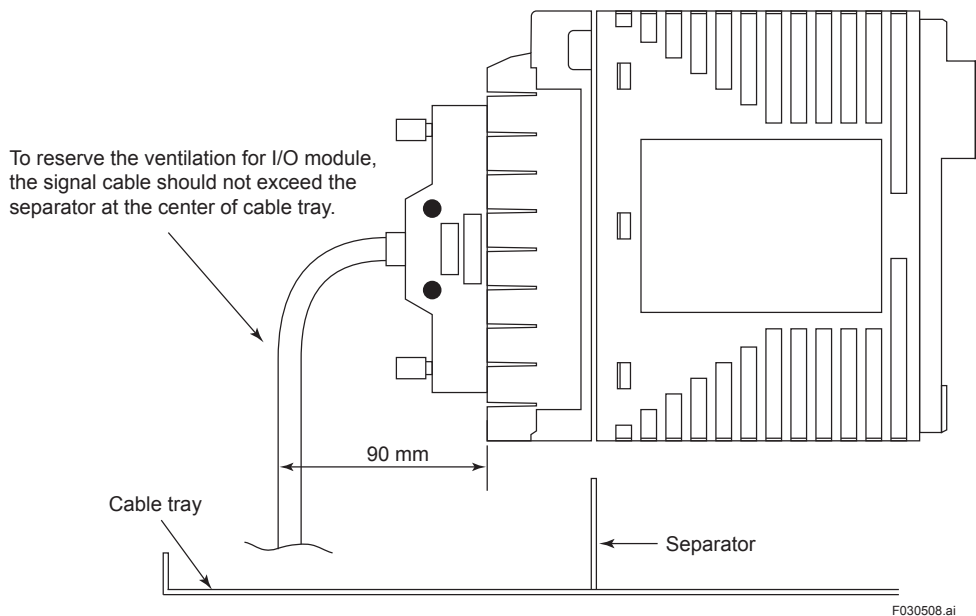
F030507.ai

Figure Signal Cabling

● FIO with KS Cable Interface Adaptor Cabling

When connecting a dedicated cable to an FIO module, ensure to keep the minimum bending radius of the cable.

Place the cable in front of the separator on the cable tray for ventilation.

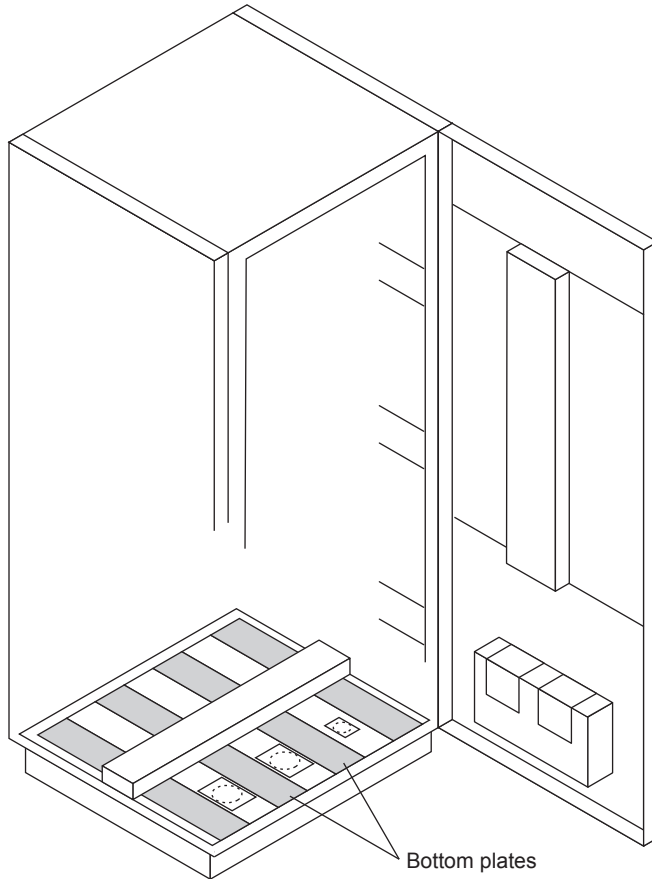


F030508.ai

Figure FIO with KS Cable Interface Adaptor Cabling

■ Modifying the Cabinet Bottom Plates for Cable Wiring

Cables are passed through the holes in the bottom plates of the cabinet. The diameters of these holes can be changed to match the diameter of the cables. There are four bottom plates two each for AFV40□/ACB51 specifically for signal cable wiring.

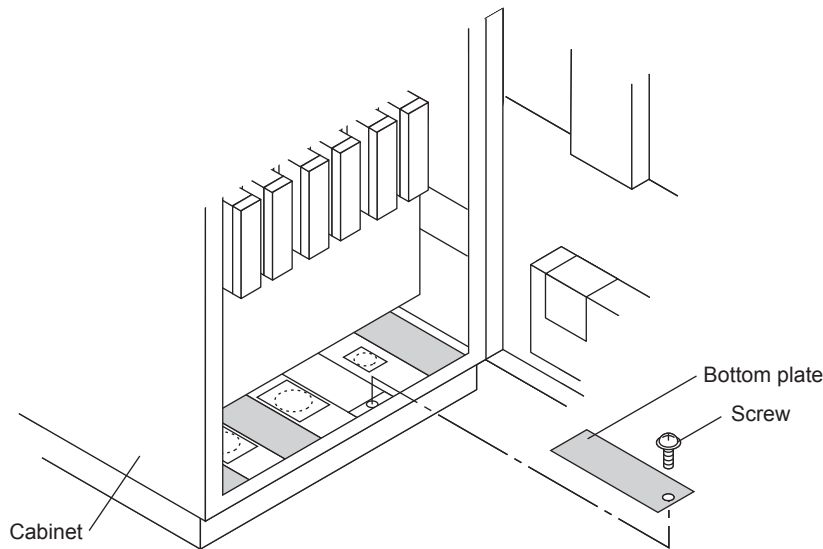


F030509.ai

Figure Bottom Plates of AF□20□/ACB21

To modify the bottom plates, follow these steps.

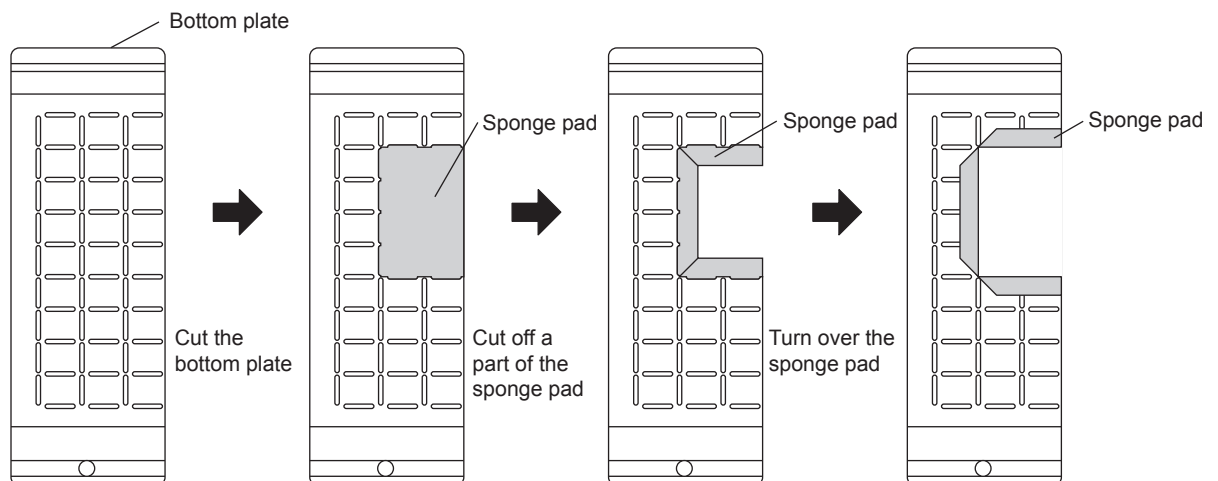
1. Remove the bottom plate to be modified.



F030510.ai

Figure Removing the Bottom Plate

2. Turn the bottom plate upside down so that the bottom faces upwards.
3. Use a wire cutter or another appropriate tool to remove sections of the bottom plate so that a hole large enough for the cable to pass through is made. Do not cut the sponge pad on the reverse side of the plate.
4. Cut and remove the area protective padding approximately 20 mm inside the opening made in the preceding step.
5. Turn the rim of the protective padding (width: 320 mm) inside out. This will protect the cable from the rough edges of the plate. The sponge pad has an adhesive surface. Peel the paper from the surface and stick the sponge pad to the plate.



F030511.ai

Figure Modifying the Bottom Plate

6. Replace the bottom plate.

■ Routing Signal Cables (for N-IO)

● Field Cable Area

Signal cables from the field enter the Cabinet at the bottom and connected to individual IOBP units in the routes shown in Figure below.



NIU: Node Interface Unit
 IOBP: N-IO I/O Base Plate
 IOU: I/O Unit (for RIO System Upgrade)

Figure Area for Signal Cable from Field

F030512.ai

■ Connecting Signal Cables to Terminals (for N-IO)

● Connecting cables to pressure clamp terminals (A2BN3D-□1□□□)

Follow these steps to connect cables to pressure clamp terminals:

1. Open the cover of the terminal block of the base plate for N-IO I/O.
2. Confirming the cable polarity, insert the cable to the pressure clamp terminal and tighten the screw. The tightening torque of the screws should be 0.5 to 0.6 N·m.
3. Pull the cable gently to check that it is fixed securely.
4. Close the cover of the terminal block of the base plate for N-IO I/O.

● Connecting cables to spring clamp terminals (A2BN3D-□2□□□)

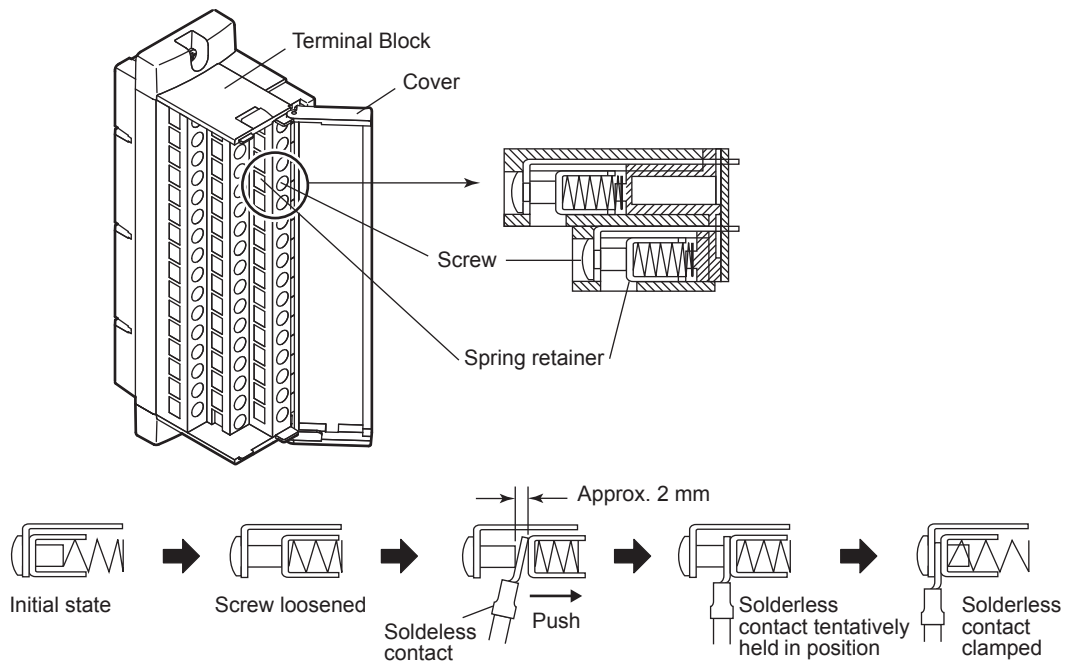
Follow these steps to connect cables to spring clamp terminals:

1. Open the cover of the terminal block of the base plate for N-IO I/O.
2. Pressingly expand the spring clamp terminal with a flat-blade screwdriver.
3. Insert a cable without pulling out the screwdriver.
4. Pull out the flat-blade screwdriver.
5. Pull the cable gently to check that it is fixed securely.
6. Close the cover of the terminal block of the base plate for N-IO I/O.

● Connecting Signal Cables to Terminals (for RIO System Upgrade)

Follow these steps to connect cables to terminal Block for RIO System Upgrade:

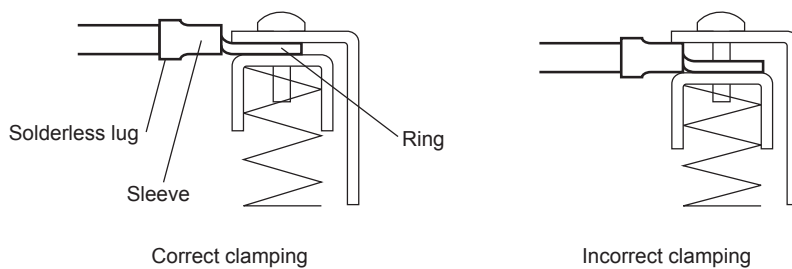
1. Open the terminal block cover.
2. Loosen the terminal screws.
3. Insert the tip of the cable's solderless contact between the screw and the spring retainer, and press the retainer to make a gap of about 2 mm between them.
4. Insert the solderless contact further in the gap until the screw enters in the hole of the solderless contact.
5. Tighten the terminal screw.
6. Close the terminal block cover.



F030519.ai

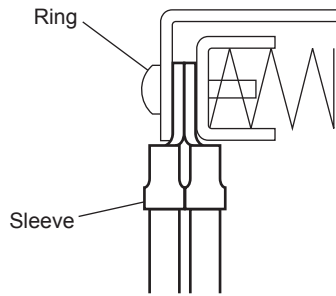
IMPORTANT

- When connecting solderless lug, be sure to clamp its ring only.
- Using non-standard solderless lug may crush its sleeve, causing a connection failure.



F030518.ai

Figure Connect Clamping of Solderless Lug



F030520.ai

Figure Connecting two cables with single terminal

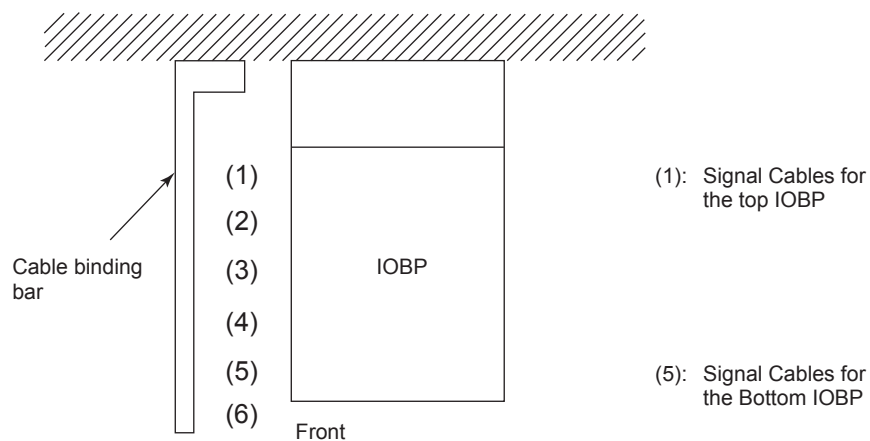
● N-IO Signal Cabling

IMPORTANT

The signal cable for the top IOBP must be wired at the innermost part in the field control area as the figure shows.

When fixing cables to a clamp, allow enough space so that the cards can be maintained. Bind the bottom cables to the clamp bar on the channel base.

Push in the signal cables for the top IOBP as far as they will go.



F030513.ai

Figure Cabling

● Example of Node Interface Unit A2NN30D and I/O Unit cable wiring (Cabinet)

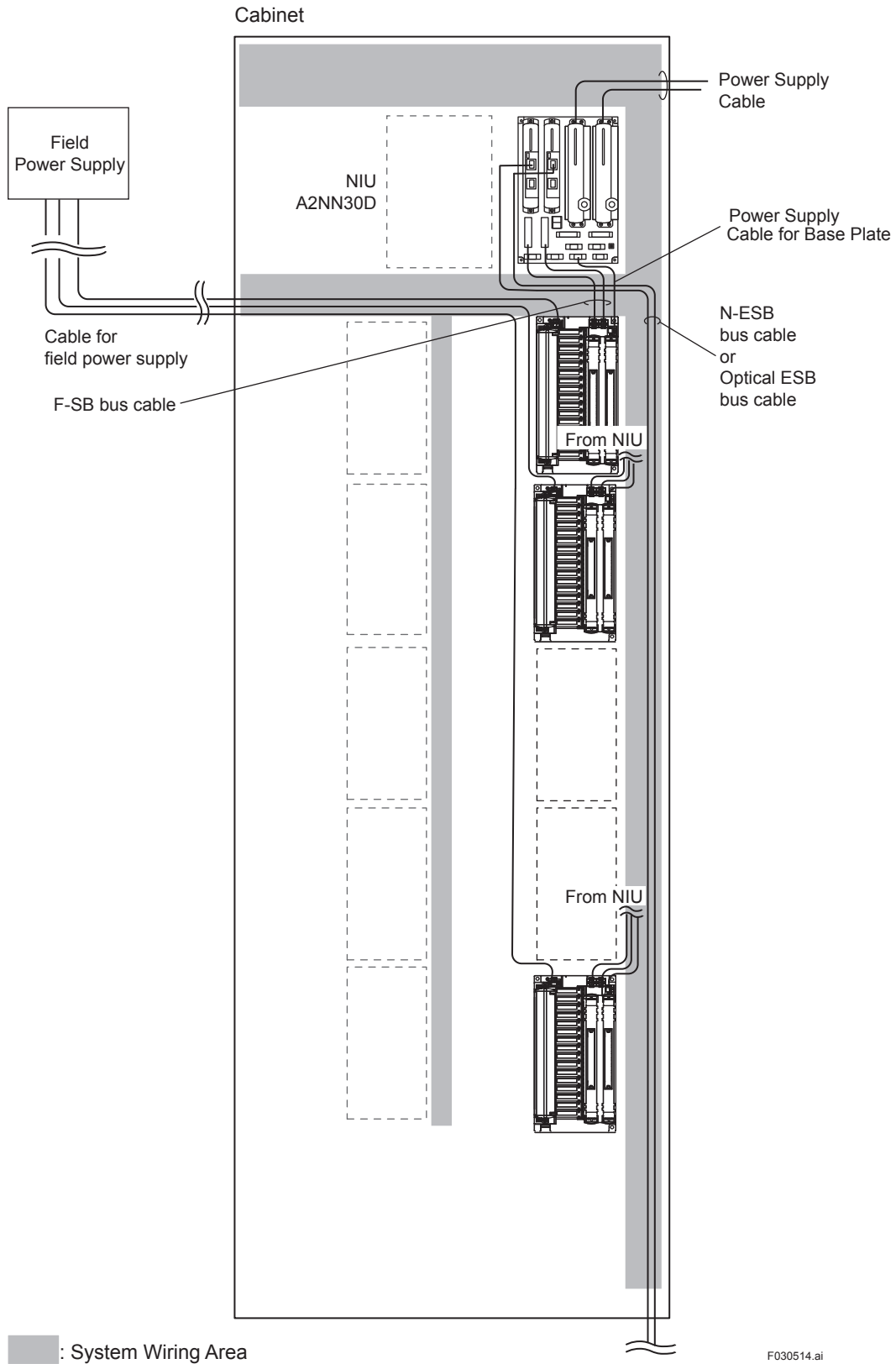
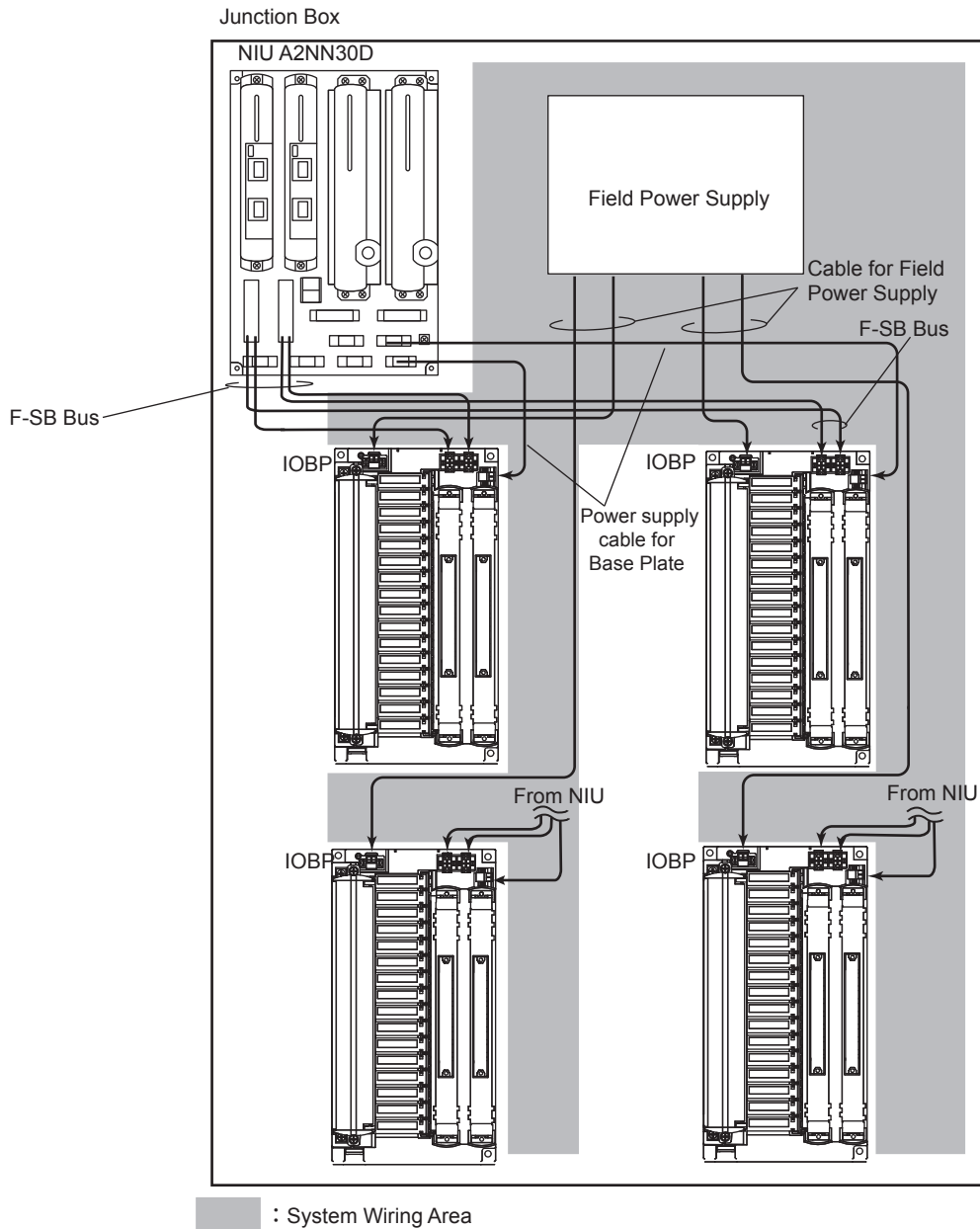


Figure Example of Node Interface Unit and I/O Unit Cable Wiring (Cabinet)

- Example of Node Interface Unit A2NN30D and I/O Unit Cable Wiring (Junction Box)



F030515.ai

NIU: Node Interface Unit (A2NN30D)
 IOBP: N-IO I/O Unit

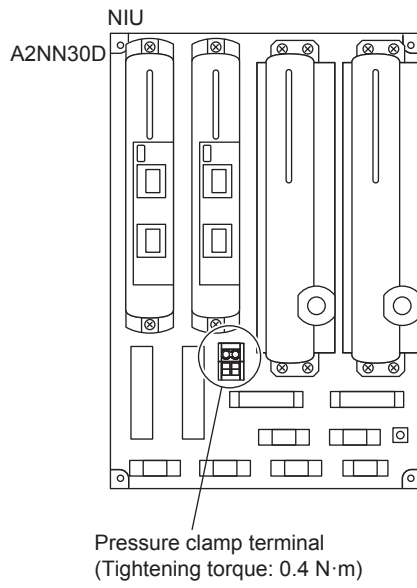
Figure Example of Node Interface Unit and I/O Unit



WARNING

The wiring that will be intrinsic safety circuits must be installed so that they are electrically separated from the wiring of non-intrinsic safety circuits, including the in-cabinet wiring. Install the wiring according to the IEC 60079-14 standards or the requirements for explosion-proof wiring of the country where the system is used.

- **Connecting external alarm input terminal with Node Interface Unit**



F030516.ai

Figure Connecting external alarm input terminal with Node Interface Unit

3.6 Connecting Signal Cables with Fieldnetwork I/O (FIO)

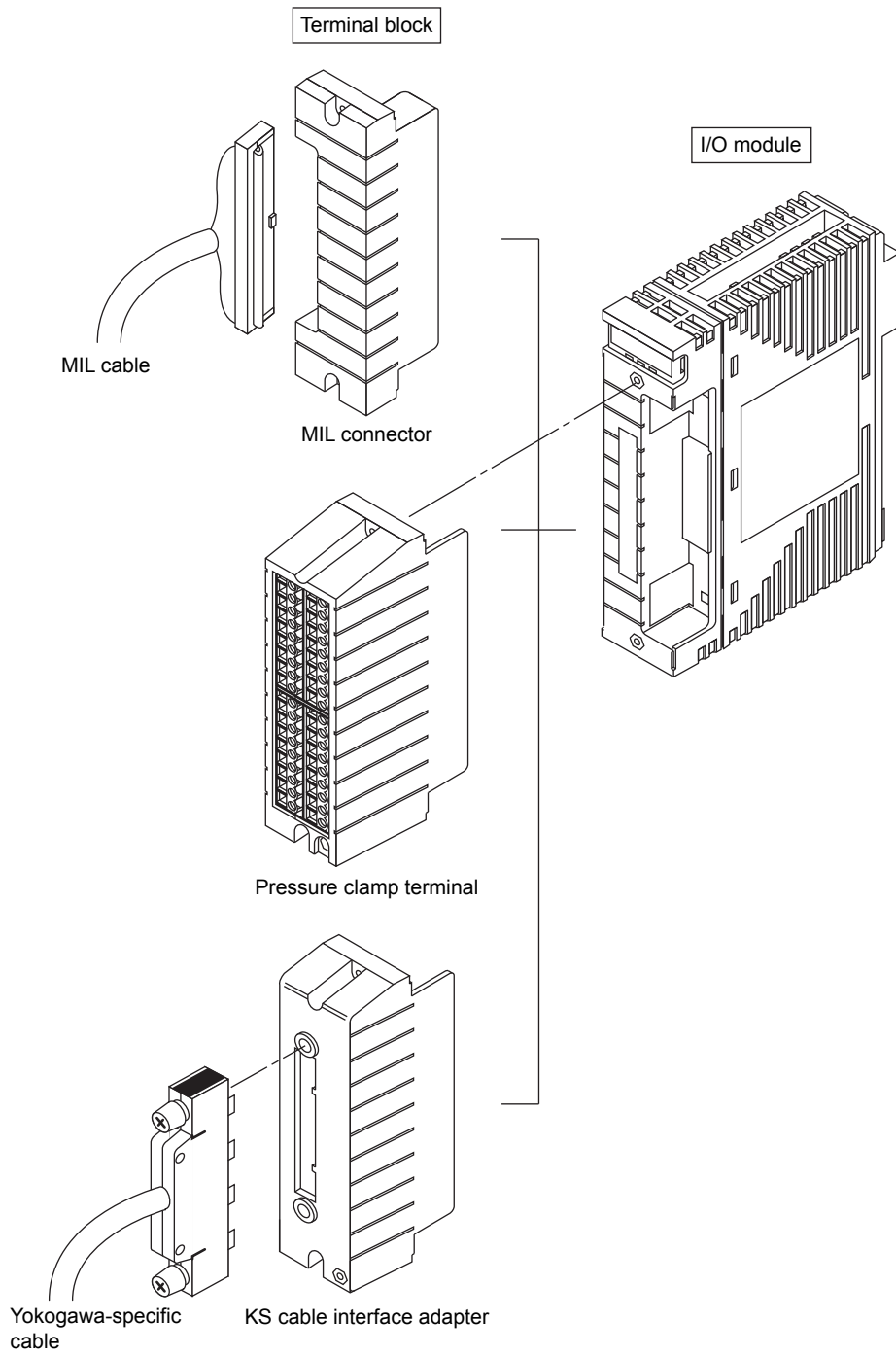
This section describes the signal connections with Fieldnetwork I/O (FIO) used on the AFV30S/AFV30D, or AFV40S/AFV40D.

3.6.1 Combination of Fieldnetwork I/O (FIO) and Terminal Blocks

A pressure clamp terminal block or KS cable (also called a “Yokogawa-specific cable”) interface adaptor is available for field-wiring, or an MIL cable provided by the user may be used.

**SEE
ALSO**

For the terminal arrangement of the pressure clamp terminals and terminal board, and the pin arrangement of the MIL connector, refer to “Field Connection Specifications (for FIO)” (GS 33J60A20-01EN).



F030601.ai

Figure FIO Terminals

3.6.2 List of Signal Cables for Connection with FIO

The following table shows the list of signal cables connections with FIO.

Table Signal Cables for Connection with FIO (1/3)

Module	Name	I/O channels per Module	Connection Signal		
			Pressure Clamp Terminal	Yokogawa-specific Cable (*1)	MIL Cable
Analog I/O Modules					
AAI141	Analog Input Module (4 to 20 mA, Non-Isolated)	16	x	x	x
AAV141	Analog Input Module (1 to 5 V, Non-Isolated)	16	x	x	x
AAB141	Analog Input Module (1 to 5 V / 4 to 20 mA, Non-Isolated)	16	–	x	–
AAI841	Analog I/O Module (4 to 20 mA Input, 4 to 20 mA Output, Non-Isolated)	8 input/8 output	x	x	x
AAB841	Analog I/O Module (1 to 5 V Input, 4 to 20 mA Output, Non-Isolated)	8 input/8 output	x	x	x
AAB842	Analog I/O Module (1 to 5 V / 4 to 20 mA Input, 4 to 20 mA Output, Non-Isolated)	8 input/8 output	–	x	–
AAI143	Analog Input Module (4 to 20 mA, Isolated)	16	x	x	x
AAI543	Analog Output Module (4 to 20 mA, Isolated)	16	x	x	x
AAV144	Analog Input Module (-10 to +10 V, Non-Isolated)	16	x	x	x
AAV544	Analog Output Module (-10 to +10 V, Non-Isolated)	16	x	x	x
AAI135	Analog Input Module (4 to 20 mA, Isolated Channels)	8	x	x	x
AAI835	Analog I/O Module (4 to 20 mA, Isolated Channels)	4 input/4 output	x	x	x
AAT145	TC/mV Input Module (TC: R, J, K, E, T, B, S, N /mV: -100 to 150 mV, Isolated Channels)	16	–	x (*2)	–
AAR145	RTD/POT Input Module (RTD: Pt100 Ω / POT: 0 to 10 kΩ, Isolated Channels)	16	–	x (*2)	–
AAP135	Pulse Input Module (Pulse Count, 0 to 10 kHz, Isolated Channels)	8	x	x	x
AAP149	Pulse Input Module for compatible PM1 (Pulse Count, 0 to 6 kHz, Non-Isolated)	16	–	x	–
AAP849	Pulse Input/Analog Output module for compatible PAC (Pulse Count input, 4 to 20 mA output, Non-Isolated)	8 input/8 output	–	x	–

x : Can be connected.

– : Cannot be connected.

*1: Yokogawa-specific cable for connecting I/O Module and a terminal board, etc.

*2: Can be connected directly with a Yokogawa-specific cable, without a terminal block.

Table Signal Cables for Connection with FIO (2/3)

Module	Name	I/O channels per Module	Connection Signal		
			Pressure Clamp Terminal	Yokogawa-specific Cable (*1)	MIL Cable
Digital I/O Modules					
ADV151	Digital Input Module (24 V DC, 4.1 mA)	32	x	x	x
ADV551	Digital Output Module (24 V DC, 100 mA)	32	x	x	x
ADV161	Digital Input Module (24 V DC, 2.5 mA)	64	–	x (*2)	x
ADV561	Digital Output Module (24 V DC, 100 mA)	64	–	x (*2)	x
ADV859	Digital I/O Module for Compatible ST2 (Isolated Channels)	16 input /16 output	–	x (*2)	–
ADV159	Digital Input Module for Compatible ST3 (Isolated Channels)	32	–	x (*2)	–
ADV559	Digital Output Module for Compatible ST4 (Isolated Channels)	32	–	x (*2)	–
ADV869	Digital I/O Module for Compatible ST5 (Common Minus Side Every 16-Channel)	32 input /32 output	–	x (*2)	–
ADV169	Digital Input Module for Compatible ST6 (Common Minus Side Every 16-Channel)	64	–	x (*2)	–
ADV569	Digital Output Module for Compatible ST7 (Common Minus Side Every 16-Channel)	64	–	x (*2)	–
Communication Modules					
ALR111	RS-232C Communication Module (1200 bps to 115.2 kbps)	2 port	–	x (D-SUB9 pin) (*2)	–
ALR121	RS-422/RS-485 Communication Module (1200 bps to 115.2 kbps)	2 port	–	x (M4 terminal block 5-pole) (*2)	–
ALE111	Ethernet Communication Module (10 Mbps)	1 port	–	x (RJ-45) (*2)	–
ALF111	Foundation Fieldbus (FF-H1) Communication Module (31.25 kbps)	4 port	x	x (*2)	–
ALP121	PROFIBUS-DP Communication Module (for FIO)	1 port	–	x (*2)	–
A2LP131	PROFINET Communication Module (for N-IO/FIO)	1 port	–	X (RJ-45) (*2)	–

x : Can be connected.

– : Cannot be connected.

*1: Yokogawa-specific cable for connecting I/O Module and a terminal board, etc.

*2: Can be connected directly with a Yokogawa-specific cable, without a terminal block.

Table Signal Cables for Connection with FIO (3/3)

Module	Name	I/O channels per Module	Connection Signal		
			Pressure Clamp Terminal	Yokogawa-specific Cable (*1)	MIL Cable
Analog I/O Modules with Built-in Barrier					
ASI133	Analog Input Module (4 to 20 mA, Isolated)	8	x	–	–
ASI533	Analog Output Module (4 to 20 mA, Isolated)	8	x	–	–
AST143	TC/mV Input Module (TC: B, E, J, K, N, R, S, T / mV: -100 to 150 mV, -50 to 75 mV, Isolated)	16	x	–	–
ASR133	RTD/POT Input Module (RTD: Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni200, Ni120 / POT: 0 to 10 kΩ, Isolated)	8	x	–	–
Digital I/O Modules with Built-in Barrier					
ASD143	Digital Input Module (NAMUR compatible, Isolated)	16	x	–	–
ASD533	Digital Output Module (Isolated)	8	x	–	–
Turbomachinery I/O Modules					
AGS813	Servo Module (Isolated)	12	–	x (*4)	–
AGP813	High Speed Protection Module (Isolated)	26	–	x (*4)	–

x : Can be connected.

– : Cannot be connected.

*1: Yokogawa-specific cable for connecting I/O Module and a terminal board, etc.

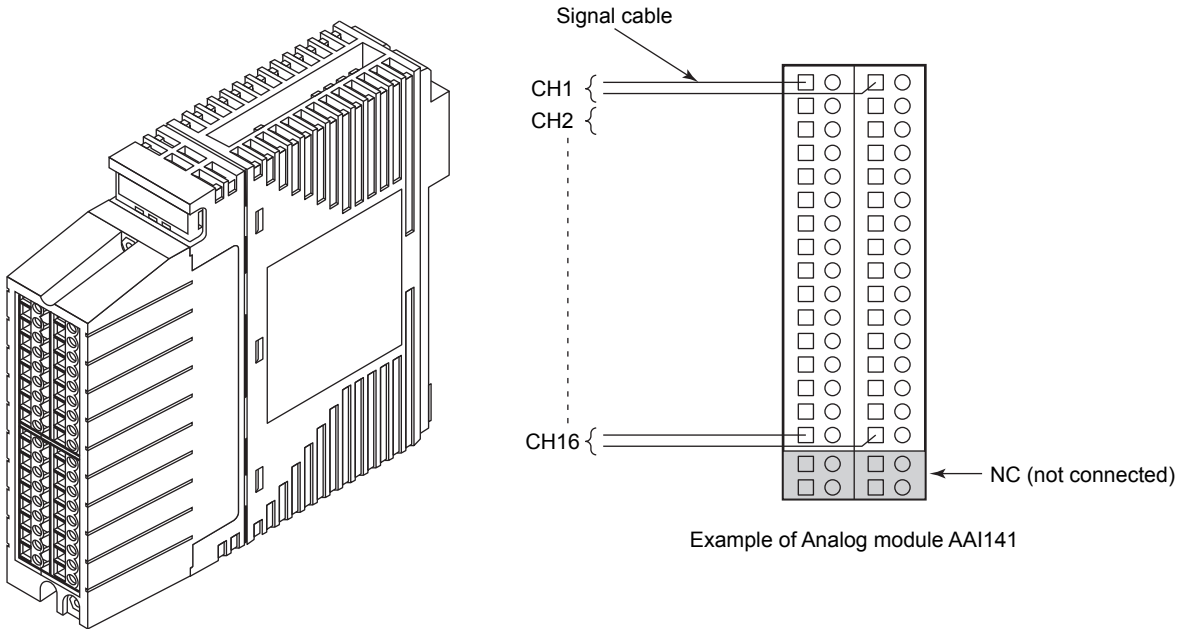
*4: Available cables are AKB337-M005, M007 and M010.

**CAUTION**

When connecting a Yokogawa-specific cable to an FIO module, ensure to keep the minimum bending radius of the cable. The minimum bending radius of the Yokogawa specific cable is six-fold of the diameter of the cable.

3.6.3 Connecting Signal Cables with FIO

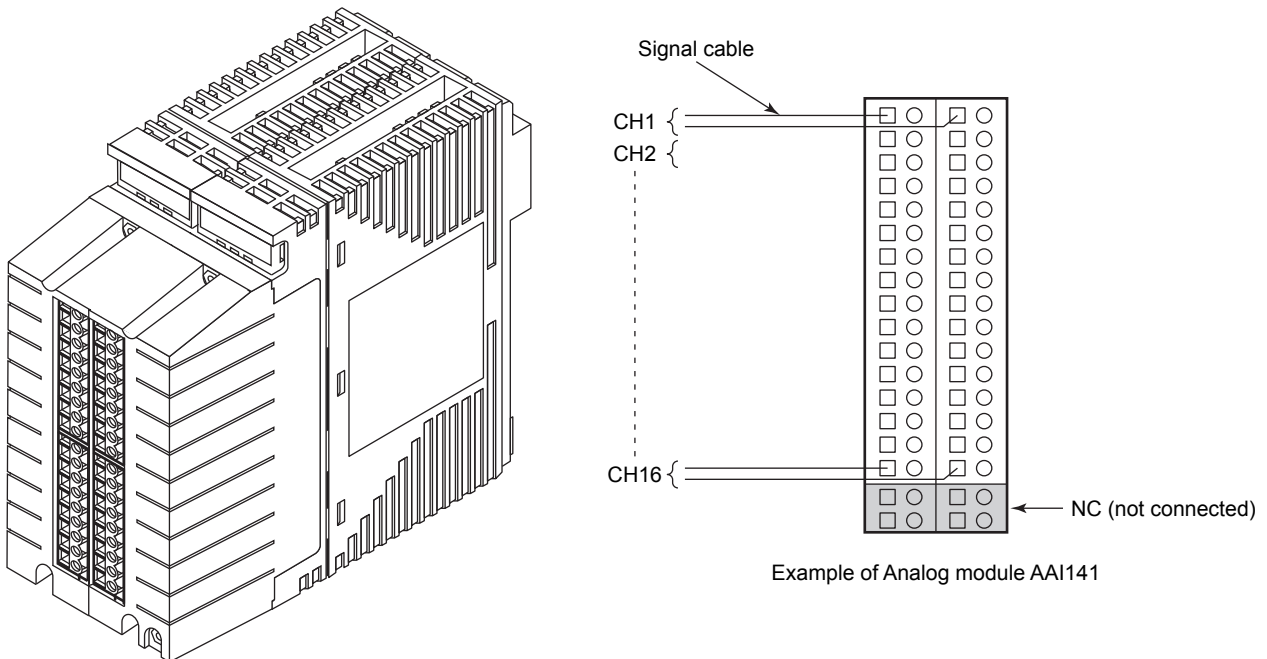
■ Pressure Clamp Terminal



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Figure I/O Module with Pressure Clamp Terminal

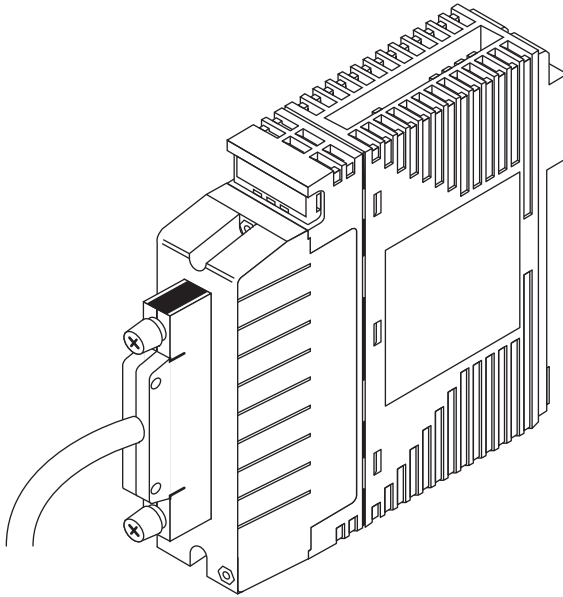
■ Dual-redundant Pressure Clamp Terminal



F030603.ai

Figure I/O Module with Dual-redundant Pressure Clamp Terminal

■ KS Cable Interface Adaptor



F030604.ai

Figure I/O Module with KS Cable Interface Adaptor

The I/O modules are arranged in a dual-redundant configuration on the terminal board.

■ Connecting Signal Cables with Analog I/O Module

Signal cables are connected to different terminals according to the devices to be connected as listed below:

Table Signal Names and I/O Signals of Analog I/O Module

Model Name	Single Name	I/O Signal		
AAI141 AAI841 AAI143	IN□A	2-wire transmitter input +	Current input -	-
	IN□B	2-wire transmitter input -	Current input +	
AAI135 AAI835 (*1)	IN□A	2-wire transmitter input +	-	-
	IN□B	2-wire transmitter input -	Current input +	
	IN□C	-	Current input -	
AAR145 (*2)	IN□A	Resistance temperature detector input A	Potentiometer input, 100%	-
	IN□B	Resistance temperature detector input B	Potentiometer input, 0%	
	IN□C	Resistance temperature detector input B	Potentiometer input, variable	
AAP135	IN□A	2-wire power supply source	-	3-wire power supply source
	IN□B	2-wire power supply signal	2-wire voltage, contact +	3-wire power supply +
	IN□C	-	2-wire voltage, contact -	3-wire power supply -

□ is channel number.

*1: If the power to models AAI141, AAI841, AAI135 and AAI835 is off or abnormal, the current input loop is in the open state. Do not use current signals with other receiving devices. When in use, also use an external receiver resistance in the voltage mode (Shunt resistor module part no. A1080RZ 250 ohm).

*2: Wiring resistance for the signal cables of IN□A and IN□B must be identical.

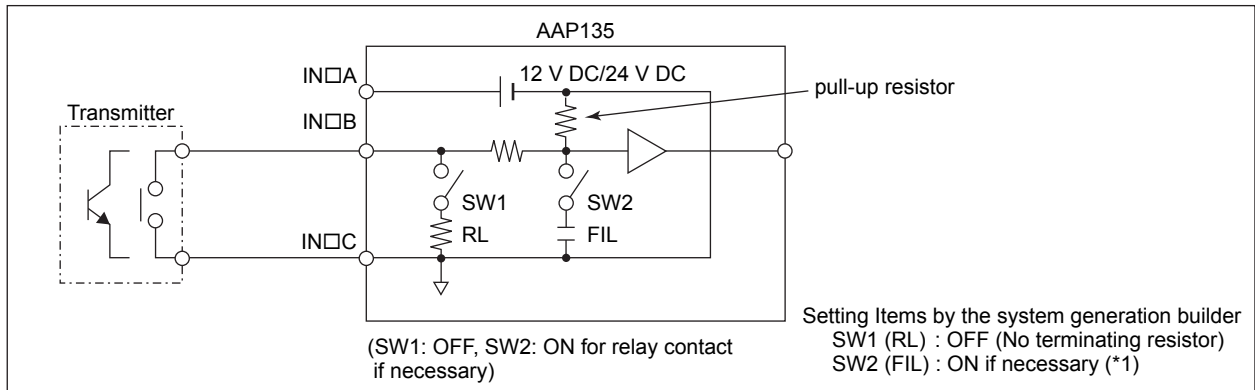
■ Connecting Signal Cables with Pulse Input Module AAP135

The AAP135 receives contact ON/OFF, voltage pulse and current pulse. Refer to the figures below for details on how to connect signal cables since the items to be set by the system generation builder depend on the input pulse types.

● When Receiving No-Voltage Contact Signals (1)

For the relay contacts or transistor contacts, connect as follows.

Pulse input frequency should be 0 to 800 Hz. Max. frequency differs due to the wiring effect, etc.



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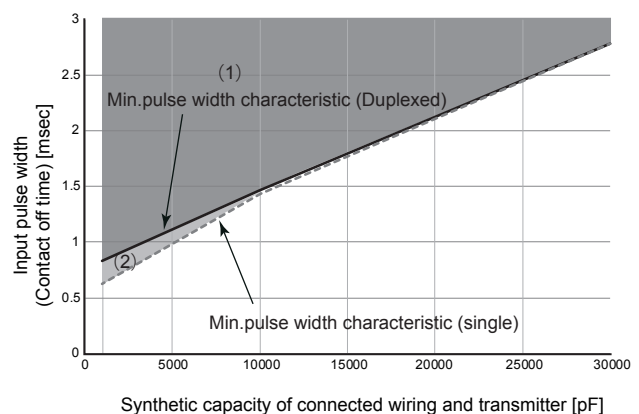
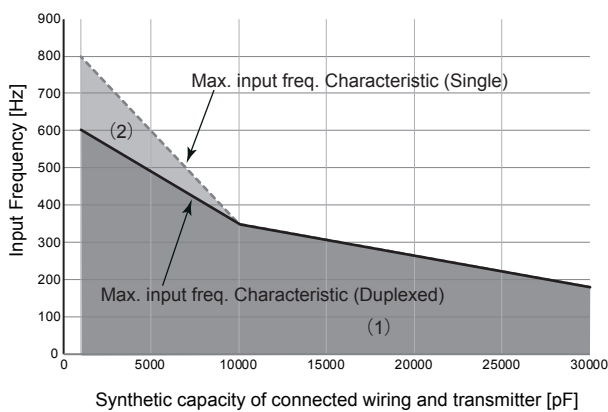
*1: When there is a chattering noise at a mechanical relay, set the SW2 to ON to eliminate the noise.

Figure No-Voltage contact Input (1)

A receivable maximum frequency and minimum pulse width of AAP135 depend on redundancy configuration of AAP135.

Table Receivable minimum pulse width (when synthetic capacity of connected wiring and transmitter is less or equal than 1000 pF)

I/O module redundancy	Input frequency	Minimum input pulse width (Contact off time)
Single	0 to 800 Hz	625 μs
Duplexed	0 to 600 Hz	833 μs



	I/O module redundancy	
	Single	Duplexed
(1)	Receivable	Receivable
(2)	Receivable	Not receivable

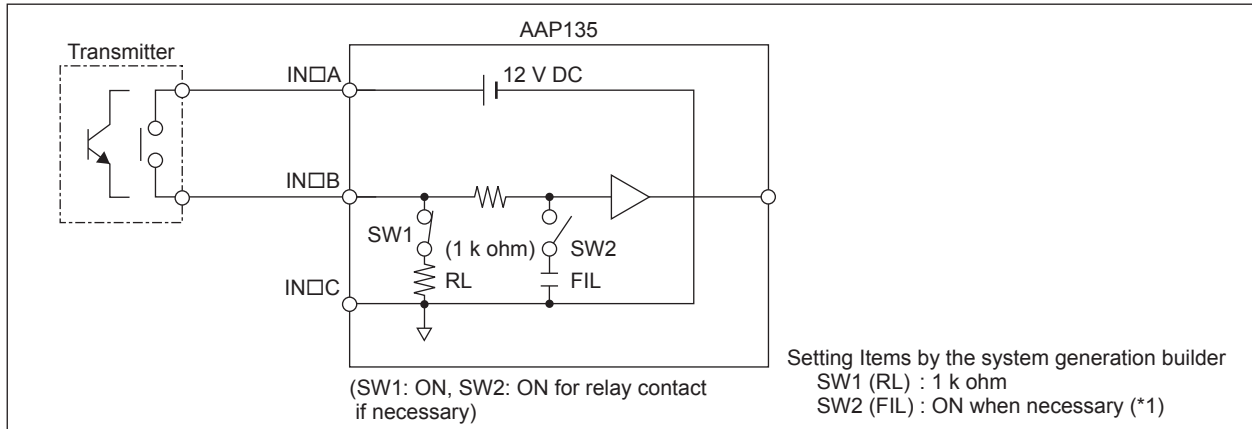
F030617.ai

Figure Receivable minimum pulse width (when synthetic capacity of connected wiring and transmitter is more than 1000pF)

● **When Receiving No-Voltage Contact Signals (2)**

Carry out connection as follows if a current is needed to flow to the relay contacts or transistor contacts.

When receiving transistor contact signal of more than 800 Hz frequency, connect as follows.

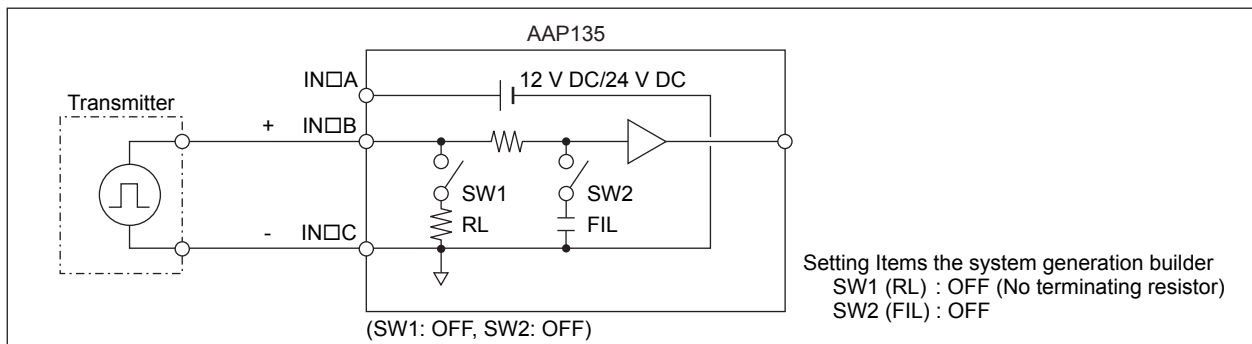


F030606.ai

*1: When there is a chattering noise at a mechanical relay, set the SW2 to ON to eliminate the noise.

Figure No-Voltage contact Input (2)

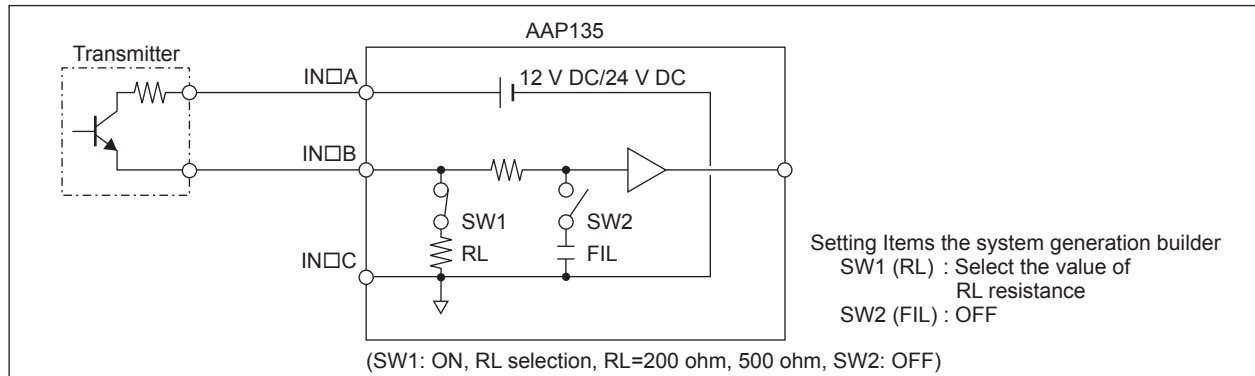
● **When Receiving Voltage Pulse Signals**



F030607.ai

Figure Voltage Pulse Input

- **When Receiving Current Pulse By Using the Internal Power to Drive the Transmitter (2-wire power supply type)**

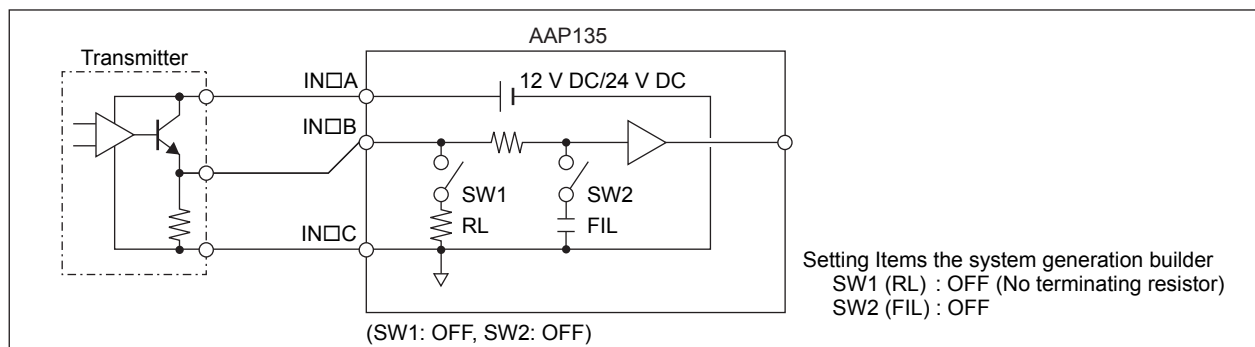


F030608.ai

Figure 2-Wire Power Supply Type

This method supplies power to the transmitter, and receives the transmitter output signals as the current pulse signals. By using the input load resistance (select from None, 200 ohm, 500 ohm), the current signal is converted to the voltage level pulse and receives it.

- **When Receiving Voltage Pulse By Using the Internal Power to Drive the Transmitter (3-wire power supply type)**

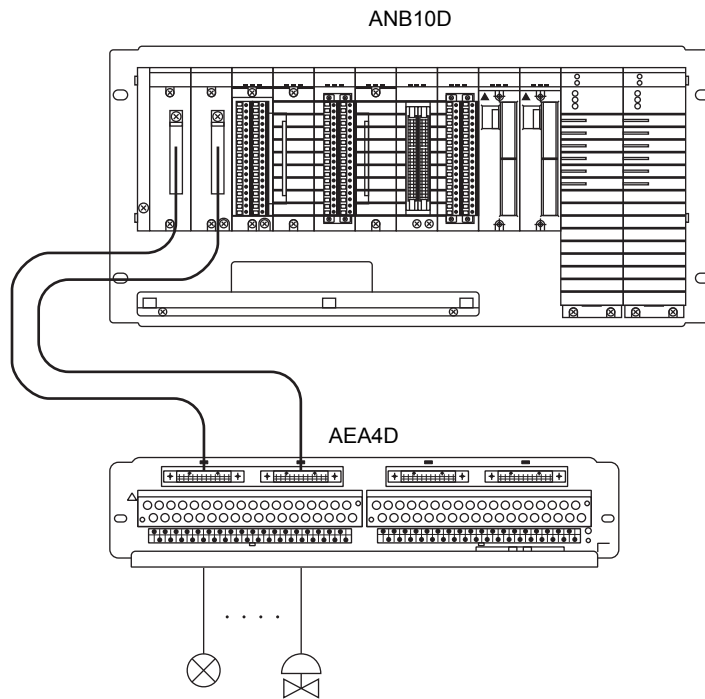


F030609.ai

Figure 3-Wire Power Supply Type

■ Connecting Terminal Board with FIO

The I/O module equipped with a KS cable interface adaptor can be connected to the terminal board using a Yokogawa-specific cable. Field signals are connected using the terminal board.



F030610.ai

Figure Example of Terminal Board Connection with Dual-redundant I/O Module

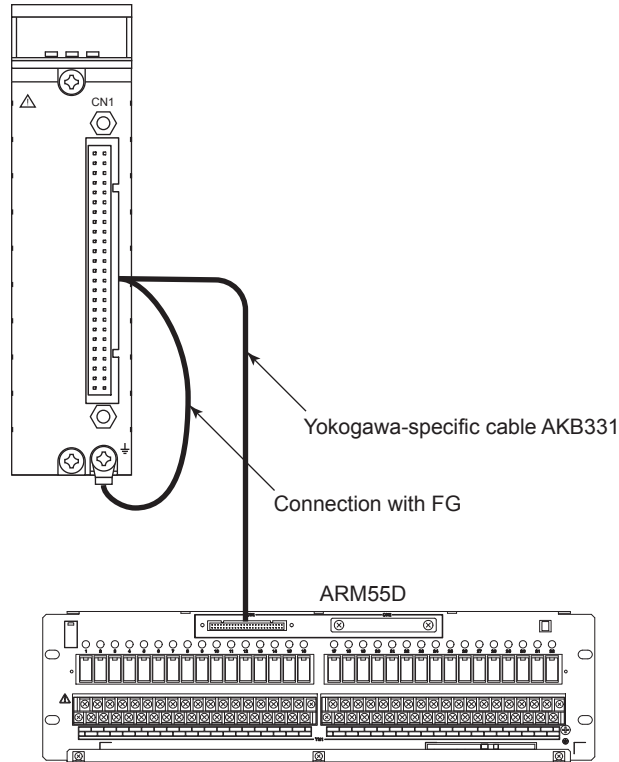
**SEE
ALSO**

For details of the KS cable interface adaptor model and the cable model, refer to “Field Connection Specifications (for FIO)” (GS 33M50H10-40E).

■ Connecting Relay Board with Digital I/O Module

An example of the connection of the mechanical relay board ARM55D with the Digital I/O Module ADV551 is shown below.

ADV551+ATD5A adaptor



F030611.ai

Figure Example of Relay Board Connection with Digital I/O Module

3.6.4 Implementation and Cable Connection of Fieldbus Communication Module ALF111

This section describes the implementation and cable connection of the Foundation Fieldbus Communication Module ALF111.

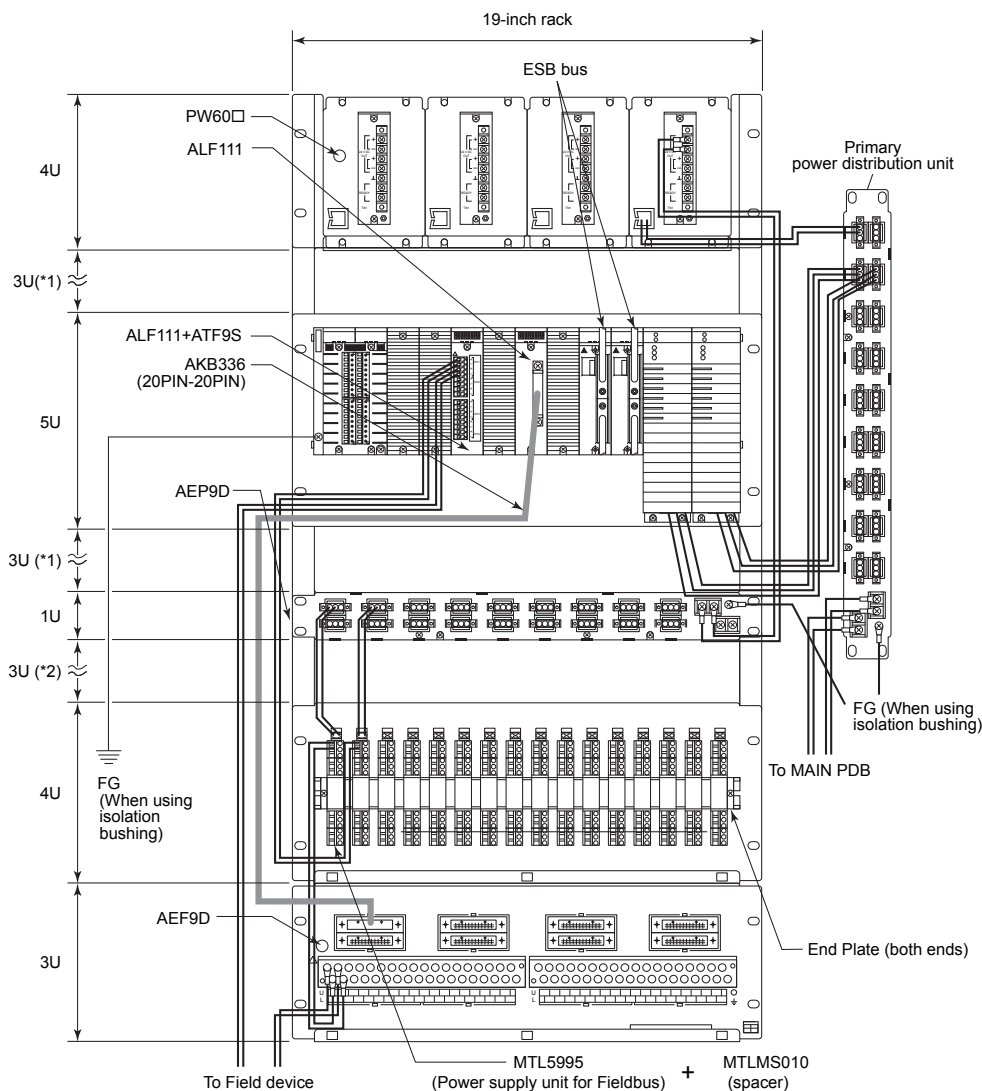
Foundation fieldbus H1 (Low Speed Voltage Mode) is called Foundation fieldbus, Fieldbus, H1 Fieldbus, FF, or FF-H1 in this manual.

■ Example of Implementation of Fieldbus Communication Module ALF111

To connect Fieldbus using the ALF111, the power supply unit for the Fieldbus must be prepared as shown below.

The example of the implementation and the wiring of the ALF111 is shown below.

For the implementation of the ALF111 and the relevant devices, follow the implementation conditions for the devices. 1 U (unit) = 44.45 mm.



- *1: Reserve a space of 3U for heat radiation.
 *2: Reserve a space of 3U for heat radiation and wiring.

Figure Example of ALF111 Implementation

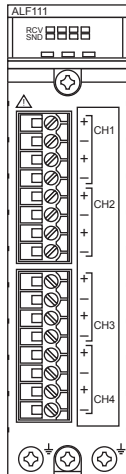
F030612.ai

■ Connection of Fieldbus Communication Module ALF111

The Fieldbus can be connected by attaching a pressure clamp terminal block or by using a Yokogawa-specific cable for connection to the terminal board (M4 screw).

Connection with a pressure clamp terminal

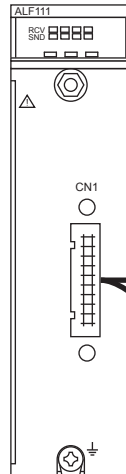
ALF111 and ATF9S



The ON/OFF setting of terminating resistor can be made on the pressure clamp terminal.

Connection with a terminal board

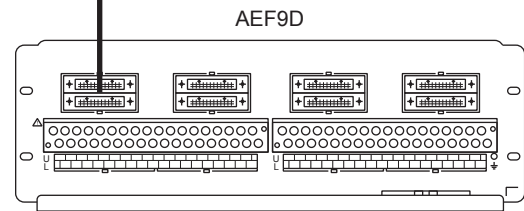
ALF111



A terminating resistor is necessary.

Yokogawa-specific cable (AKB336)(*1)

Connection with functional grounding terminal



F030613.ai

*1: If Type A cables are used for Fieldbus wiring, double the length of the AKB336 cable and include its length in with the total length of the branch cables. Keep the trunk cable length (trunk line cable length) within 1900 m (total branch length).

Figure Fieldbus Wiring for ALF111

**SEE
ALSO**

For details of the Fieldbus connection and wiring work, refer to "Fieldbus Technical Information" (TI 38K03A01-01E).

Fieldbus Wiring for ALF111 with Pressure Clamp Terminal Block

The signal cables from the field device should be connected to the + and - terminals of the pressure clamp terminal block (ATF9S).

Do not connect anything to the terminals of channels that are not used.

When installing the node unit mounted with the ALF111 on the 19-inch rack, connect the shield lines of Fieldbus cables from the field devices to the Functional grounding terminal of the ATF9S. If two or more channels are used, no more than two shield lines can be connected to one Functional grounding terminal.

When installing the node unit mounted with the ALF111 in the control station cabinet, connect the shield lines of Fieldbus cables to the shield ground bar within the cabinet (insulated from the cabinet itself), not to the Functional grounding terminal of the ATF9S.

The length of the connection cable between the power supply unit and the ALF111 should be less than one meter. Use a type A cable and connect the cable shield to the same potential as the Functional grounding terminal of the node if the cable length exceeds one meter.

Note that, when installing wiring within the cabinet, the shield line should be connected to the shield ground bar within the cabinet as well. For details about example of wiring, see section 3.7.11.

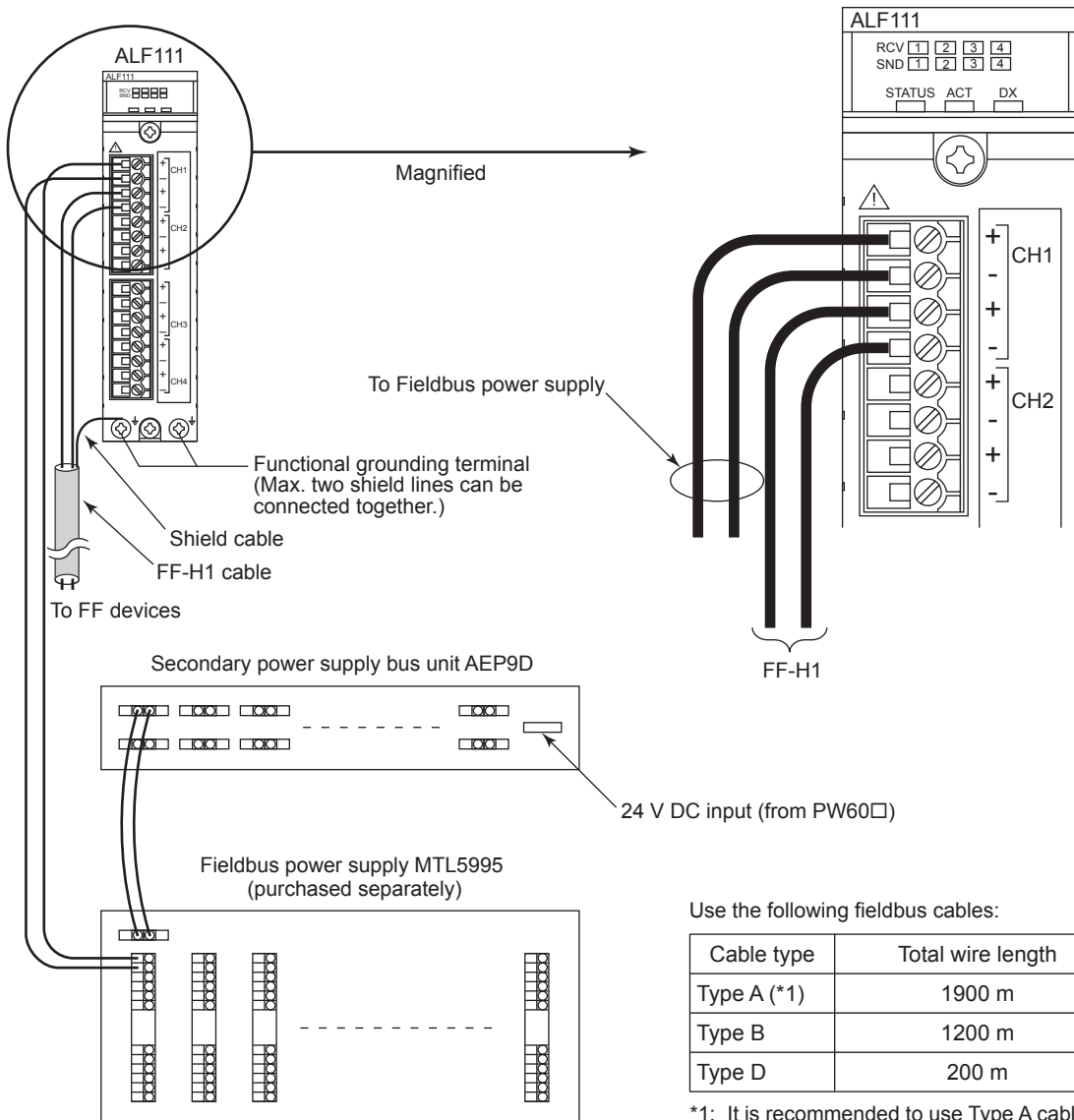
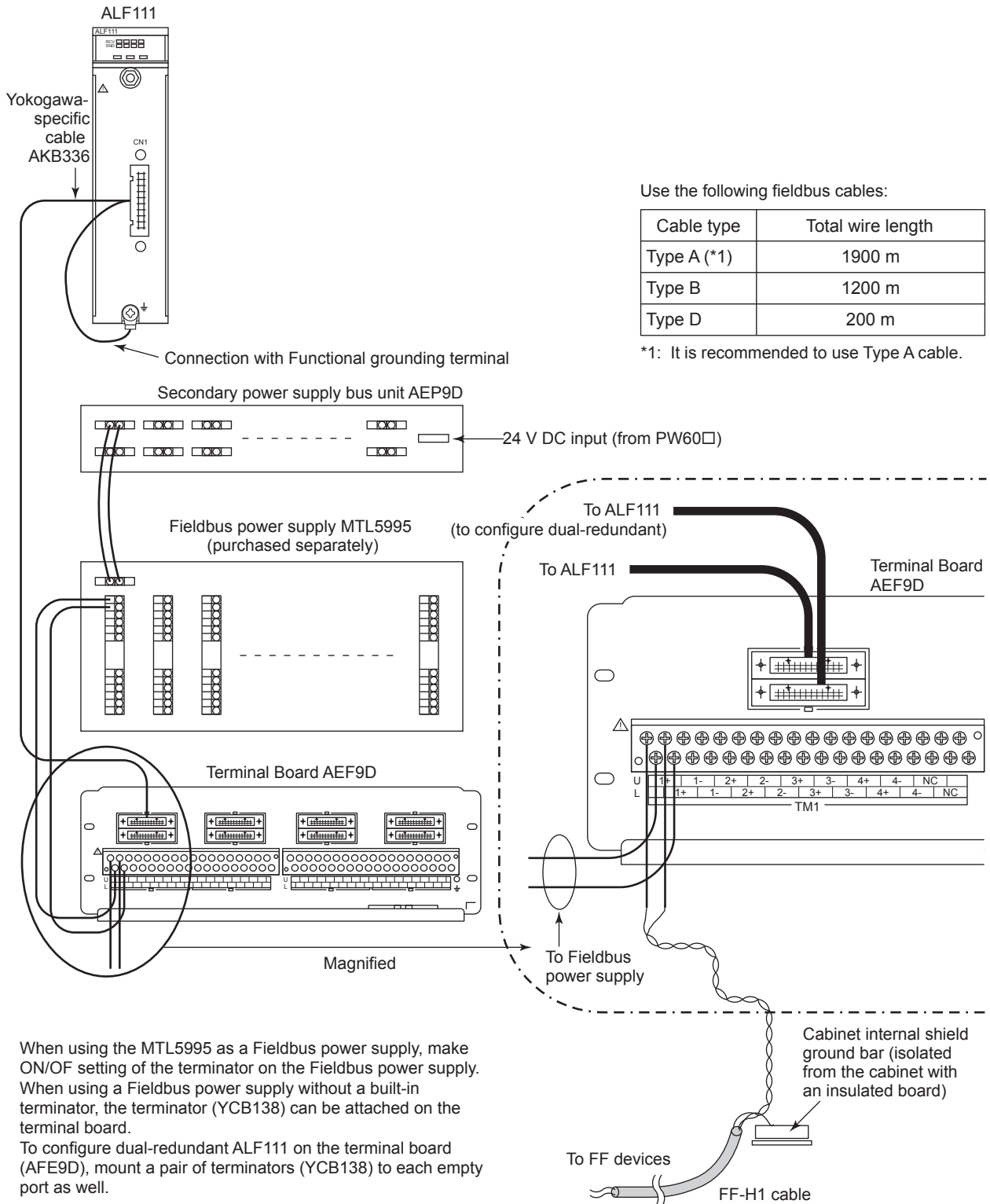


Figure Fieldbus Wiring for ALF111 with Pressure Clamp Terminal

F030614.ai

■ Fieldbus Wiring for ALF111 with Terminal Board



When using the MTL5995 as a Fieldbus power supply, make ON/OFF setting of the terminator on the Fieldbus power supply. When using a Fieldbus power supply without a built-in terminator, the terminator (YCB138) can be attached on the terminal board.

To configure dual-redundant ALF111 on the terminal board (AFE9D), mount a pair of terminators (YCB138) to each empty port as well.

Figure Fieldbus Wiring for ALF111 with Terminal Board

F030615.ai

● Installation of Terminator to Terminal Board AEF9D

Make sure to install a terminator (YCB138) if the ALF111 (terminal board AEF9D) terminates the network, in other words, if the network is not terminated by a terminator in the power supply unit.

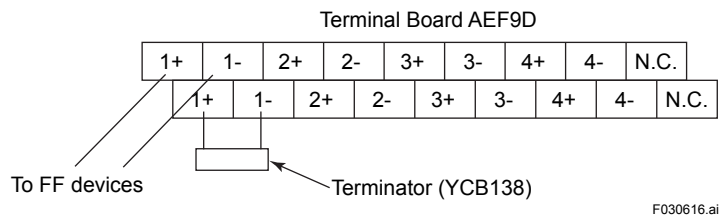


Figure Installation of Terminator to Terminal Board AEF9D

IMPORTANT

In the following condition, the vacant port should be terminated with a pair of terminators: The AEF9D terminal board is used, the ALF111 is in a dual-redundant configuration, and any of the four ports is vacant.

3.7 Signal Connections of N-IO I/O Unit

This section describes connecting to the N-IO I/O unit.

3.7.1 N-IO I/O Unit Types

■ I/O Modules that can be used with Base Plate

The following table shows I/O Modules installable with Base Plate.

Table I/O Modules Installable with Base Plate

Base plate model	Description	I/O module model
A2BN3D	Base Plate for Adaptor	A2MMM843 Analog Digital I/O Module
A2BN4D	Base Plate for Barrier (MTL)	
A2BN5D	Base Plate for Barrier (P+F)	
A2BN3D	Base Plate for Adaptor	A2MDV843 Digital I/O Module
A2BN4D	Base Plate for Barrier (MTL)	
A2BN5D	Base Plate for Barrier (P+F)	

3.7.2 Base Plate for Adaptor

■ Adaptors Installable with Base Plate for Adaptor

The following table shows adaptors installable with A2BN3D Base Plate for Adaptor.

Table Adaptors Installable with A2BN3D Base Plate for Adaptor

Base plate model	Compatible adaptor models
A2BN3D (Base Plate for Adaptor)	A2SAP105 Pulse Input Signal Adaptor
	A2SDV105 Digital Input Adaptor
	A2SDV505 Digital Output Adaptor
	A2SDV506 Relay Output Adaptor
	A2SMX801 Pass-through I/O signal Adaptor
	A2SAM105 Current Input/Voltage Input Adaptor
	A2SAM505 Current Output/Voltage Output Adaptor
	A2SAT105 mV/TC/RTD input Adaptor
	A2SMX802 Pass-through I/O Signal Adaptor

■ Terminal type that can be select with Base Plate for Adaptor

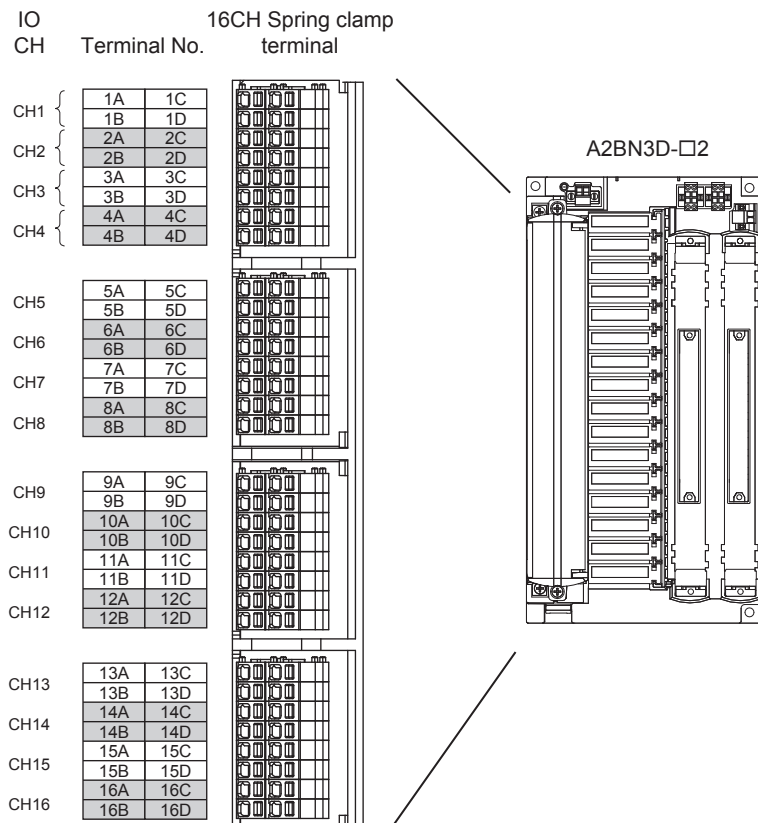
The following table shows terminal types can be select with A2BN3D Base Plate for Adaptor.

Table Terminal type Compatible with A2BN3D Base Plate for Adaptor

Base plate model	Suffix code	Terminal type
A2BN3D (Base Plate for Adaptor)	-□1□□□	Pressure clamp terminal
	-□2□□□	Spring clamp terminal
	-□9□□□	Cable connector interface (*1)

*1: Connect the field from the A2BN3D to the pressure clamp terminal on the terminal board (A2BM4) via a dedicated cable.

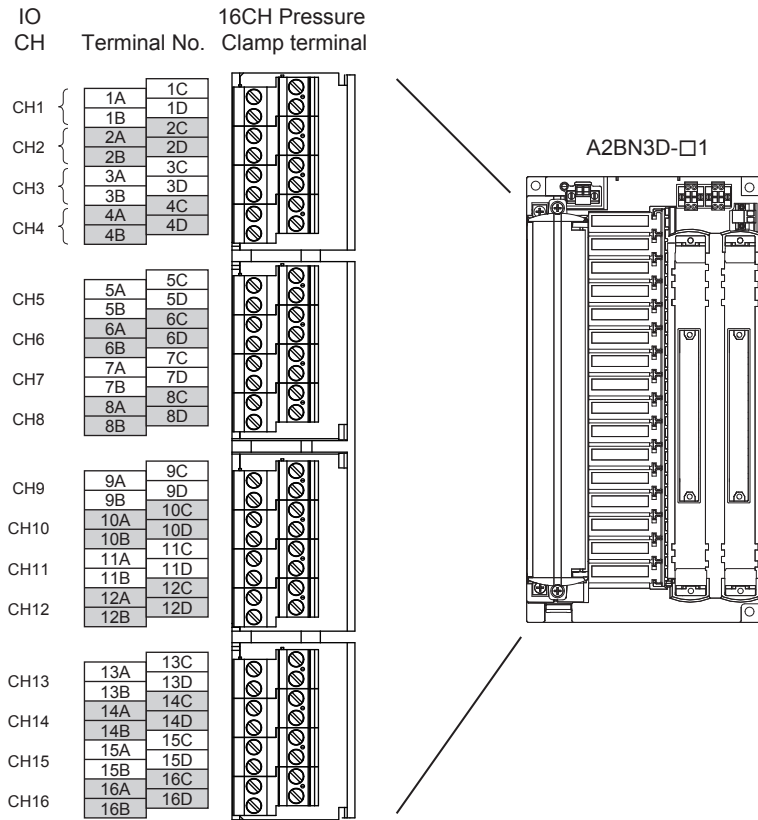
■ Base Plate for Adaptor Terminal Numbers (Spring Clamp Terminals)



F030704.ai

Figure A2BN3D-□2 Base Plate for Adaptor

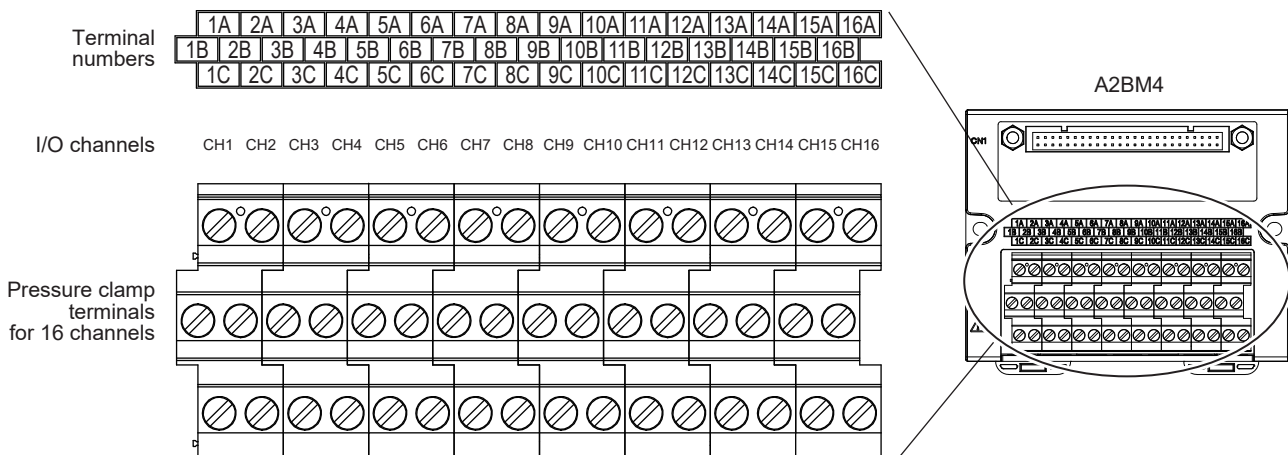
■ Base Plate for Adaptor Terminal Numbers (Pressure Clamp Terminals)



F030705.ai

Figure A2BN3D-□1 Base Plate for Adaptor

■ Terminal board for analog digital I/O (Pressure Clamp Terminals)



F030725.ai

■ Connecting Signal Cables with A2BN3D

The signal connections of the base plate for adaptor (model: A2BN3D) differ depending on the signal type. There are two ways of the direct field wiring to the terminal block on A2BN3D and the field wiring via the dedicated cable and terminal board (A2BM4). The following table shows the terminal numbers and signal types.

Table Terminal Numbers and Signal Types (A2BN3D) (1/2)

Adaptor Name (Model)	Signal Name (*1)	IO Signal (*2)				
		Case 1	Case 2	Case 3	Case 4	Case 5
Pulse Input Signal Adaptor (A2SAP105) (*3)	□A	—	Power Supply type 2-wire power supply	Power Supply type 3-wire power supply	Dry contact input + (*5) (*6)	—
	□B	2-wire (voltage) +	Power Supply type 2-wire signal	Power supply type 3-wire +	Dry contact input - (*5) (*6)	Dry contact input + (*7)
	□C	2-wire (voltage) -	Connect to A2EXR001	Power supply type 3-wire -	Connect to A2EXR001 (*6)	Dry contact input - (*7)
	□D	—	Connect to A2EXR001	—	Connect to A2EXR001 (*6)	—
Current input/voltage input Adaptor (A2SAM105) (*3) (*4)	□A	2-wire transmitter input +	4-wire transmitter current input +	Voltage input +	—	—
	□B	2-wire transmitter input -	4-wire transmitter current input -	Voltage input -	—	—
	□C	—	—	—	—	—
	□D	—	—	—	—	—
Current output/voltage output Adaptor (A2SAM505) (*3)	□A	Current output +	Voltage output +	—	—	—
	□B	Current output -	Voltage output -	—	—	—
	□C	—	—	—	—	—
	□D	—	—	—	—	—
mV/TC/RTD input Adaptor (A2SAT105) (*3) (*13)	□A	TC/mV input +	RTD input A (*8)	Potentiometer input 100 % (*8)	—	—
	□B	TC/mV input -	RTD input B	Potentiometer input variable	—	—
	□C	—	RTD input B (*8)	Potentiometer input 0 % (*8)	—	—
	□D	—	—	—	—	—
Digital Input Adaptor (A2SDV105)	□A	Voltage input +	—	—	—	—
	□B	Voltage input -	—	—	—	—
	□C	—	Dry contact input + (*9)	—	—	—
	□D	—	Dry contact input - (*9)	—	—	—

Table Terminal Numbers and Signal Types (A2BN3D) (2/2)

Adaptor Name (Model)	Signal Name (*1)	IO Signal (*2)				
		Case 1	Case 2	Case 3	Case 4	Case 5
Digital Output Adaptor (A2SDV505)	□A	Digital output + (*9)	—	—	—	—
	□B	Digital output - (*9)	—	—	—	—
	□C	—	—	—	—	—
	□D	—	—	—	—	—
Relay Output Adaptor (A2SDV506)	□A	Digital output (NO) + (*10)	—	—	—	—
	□B	Digital output (COM) -	Digital output (COM) -	—	—	—
	□C	—	Digital output (NC) + (*10)	—	—	—
	□D	—	—	—	—	—
Pass-through I/O signal Adaptor (A2SMX801)	□A	Signal + (*11)	—	—	—	—
	□B	Signal - (*11)	—	—	—	—
	□C	—	—	—	—	—
	□D	—	—	—	—	—
Pass-through I/O signal adaptor (A2SMX802)	□A	3-wire transmitter current input + (*3)	4-wire transmitter current input + (*3)	Open drain (DO sink)	—	—
	□B	3-wire transmitter current input - (*3) (*9)	4-wire transmitter current input - (*3) (*12)	—	—	—
	□C	Field power supply + (*3) (*9)	Field power supply + (*3) (*9)	Field power supply + (*9)	—	—
	□D	—	Field power supply - (*3) (*9) (*12)	—	—	—

*1: □ = 1 to 16

Terminal-A, B, C, and D are for A2BN3D-□1□□□, -□2□□□.

Terminal-A, B, and C are for A2BN3D-□9□□□. (Terminal-D is unused for A2BN3D-□9□□□.)

*2: "—" denotes that the terminal is not used. Do not connect any signal because the terminal is connected to internal circuits.

*3: This adaptor can be used in combination with the A2MMM843 only.

*4: When the power supply is turned off or overcurrent is detected, the current input loop enters a high impedance state.

*5: Used when the input frequency is 0 to 5 kHz.

*6: Used when the input frequency is 0 to 10 kHz.

*7: Used when the input frequency is 0 to 800 Hz.

*8: The resistance values of the connecting cables must match.

*9: Connect the field power supply to the base plate.

*10: Normal state, the status output is OFF.

*11: The signal type is set by software.

*12: In the internal circuit, terminals B and D have a common potential.

*13: A2SAT105 is available for A2BN3D-□1□□□, -□2□□□. (Unavailable for A2BN3D-□9□□□)

IMPORTANT

The pass-through I/O signals adaptor A2SMX802 is not isolated from the pass-through I/O signal adaptor A2SMX801, digital output adaptor that are mounted on the same base plate for adaptor.

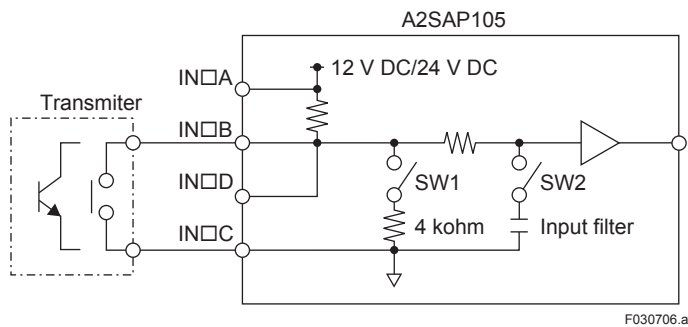
3.7.3 Adaptors (for A2BN3D)

■ A2SAP105 Pulse Input Signal Adaptor

When the pulse input signal adaptor is used, signal connections to the base plate and shunt resistor usage depend on the type of the pulse signal that is input. When receiving dry contact signals, you can remove mechanical chattering noise by selecting the pulse input filtering option in the IOM builder. However, the input filter passes a limited range of frequencies. When connecting the field signal via the terminal board (A2BM4), the terminal-A, B, and C can be used for the following circuit diagrams but the terminal-D cannot be used.

● When receiving dry contact signals (Input frequency: 0 to 800 Hz)

Select “Without Shunt Resistor” (SW1: OFF) in the IOM builder. The following figure shows the circuit diagram.

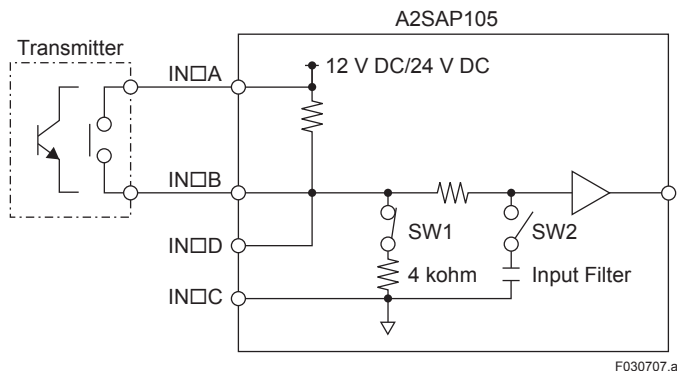


□: 1 to 16

Figure When receiving dry contact signals (Input frequency: 0 to 800 Hz)

● When receiving dry contact signals (Input frequency: 0 to 5 kHz)

Select “Shunt Resistor 4000 ohm” (SW1: ON) in the IOM builder. The following figure shows the circuit diagram.



□: 1 to 16

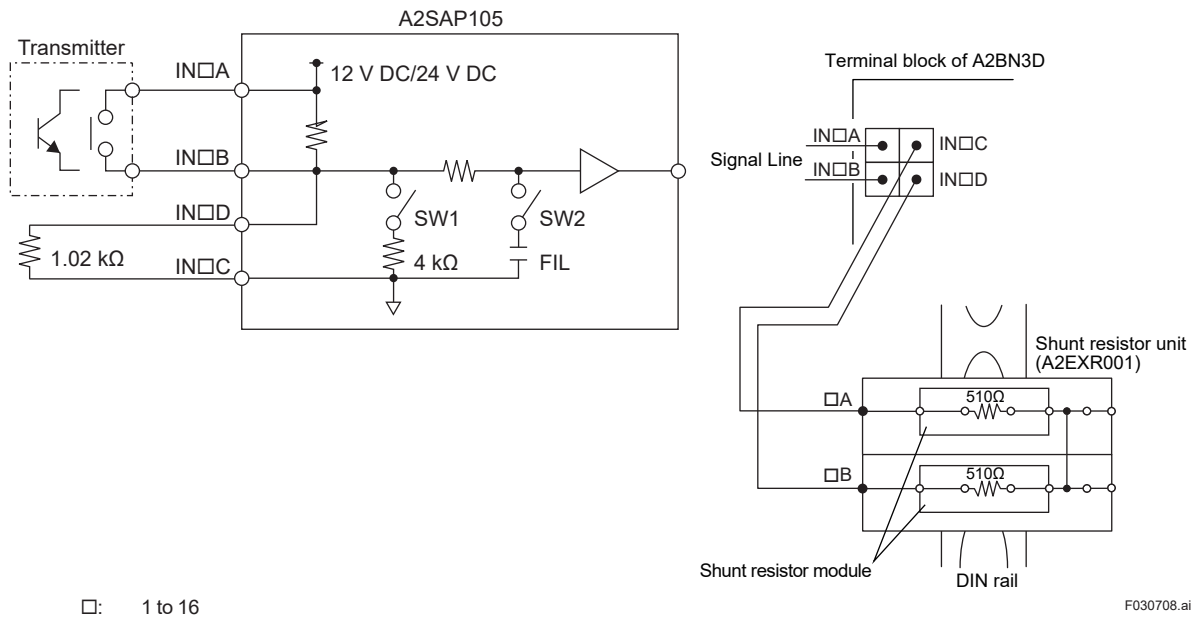
Figure When receiving dry contact signals (Input frequency: 0 to 5 kHz)

● **When receiving dry contact signals (Input frequency: 0 to 10 kHz)**

Select “Without Shunt Resistor” (SW1: OFF) in the IOM builder. Also install two 510 Ω shunt resistor modules on the shunt resistor unit (Model:A2EXR001). The total resistance value will be 1.02 kΩ.

When connecting the field signal via the terminal board (A2BM4), it can be substituted by connecting a shunt resistor unit between terminal-B and C of the external terminal block. The following figure shows the circuit diagram.

Direct field wiring to base plate



Field wiring via terminal board

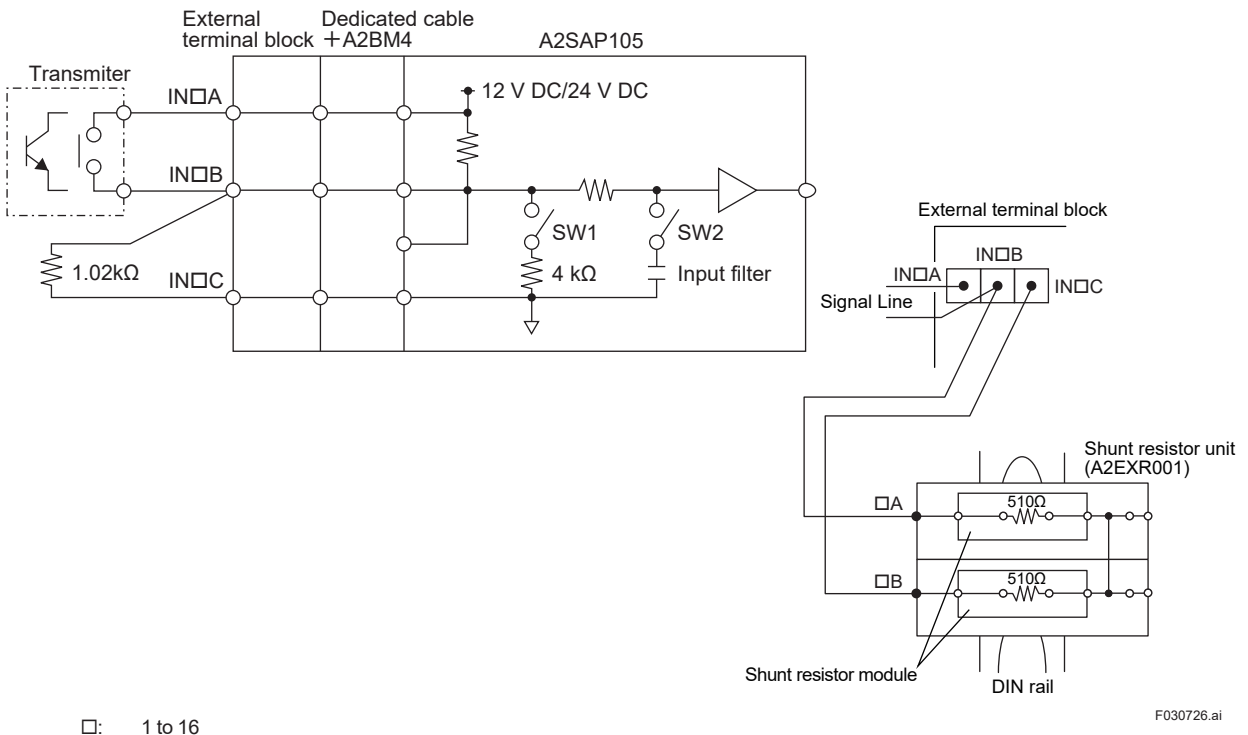


Figure When receiving dry contact signals (Input frequency: 0 to 10 kHz)

• Shunt Resistor Unit (A2EXR001)

**SEE
ALSO**

For more information about the specifications of A2EXR001, refer to :I/O Adaptors (for N-IO) (GS 33J62F30-01EN)

The shunt resistor unit (Model: A2EXR001) converts the current signals of the internal circuit of the pulse input signal adaptor into voltage signals and is capable of converting four points of signals. It is used when receiving dry contact signal inputs with 0 to 10 kHz input frequencies or current pulse signal inputs.

Structure and parts of the shunt resistor unit

The shunt resistor unit has terminal blocks with either pressure clamp terminals or spring clamp terminals.

The following figure shows the structure and parts of the shunt resistor unit, using an example of the model with pressure clamp terminal-type terminal blocks.

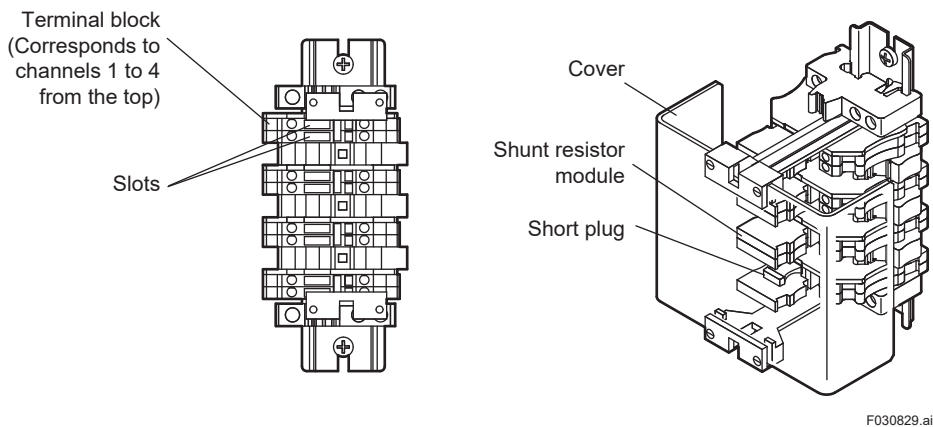


Figure Shunt resistor unit

The shunt resistor unit has terminal blocks for channel numbers 1 to 4. Each terminal block is provided with two slots that are used to install a shunt resistor module or a short plug. Short plugs are installed on these slots when the unit is shipped from the factory. The shunt resistor modules are accessories.

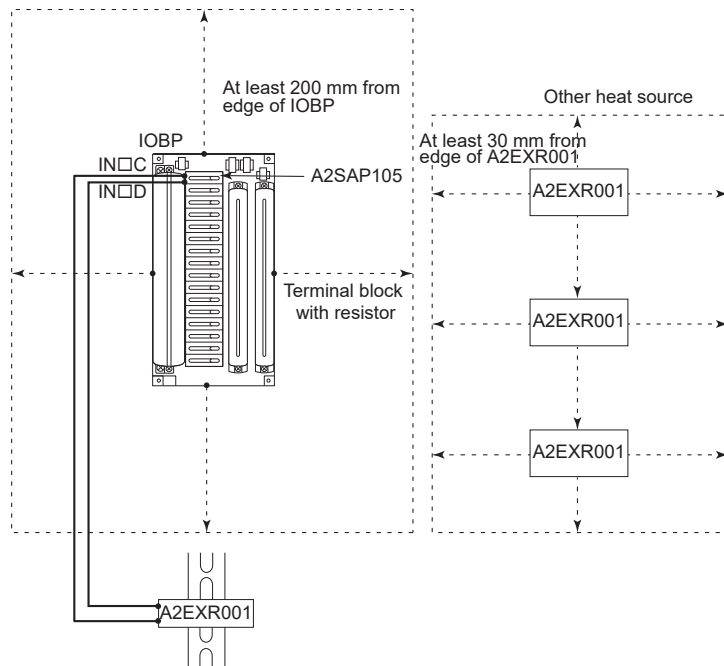
Installation and wiring for the shunt resistor unit

Install A2EXR001 at least 200 mm away from edge of the IOBP.
A2EXR001 should be installed with the distance of 30mm or more from other heat source.



CAUTION

Handle an shunt resistor module in A2EXR001 with care as it may become high in temperature.
Use a cover to prevent from touching the resistor directly to avoid being burned.

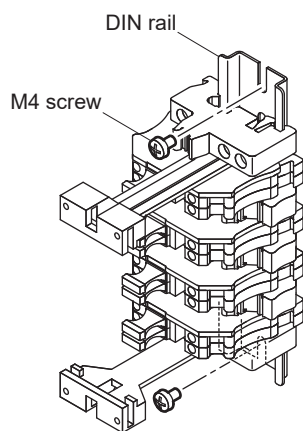


F030711.ai

Figure Distance to Separate A2EXR001 and IOBP

Installing the shunt resistor unit

The following figure shows how to install the shunt resistor unit on the inner wall surface of the cabinet.



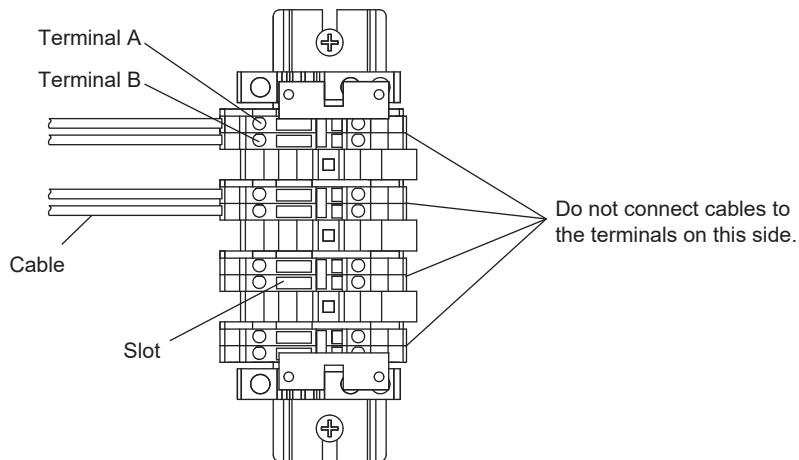
F030830.ai

Figure Installing the shunt resistor unit on the wall

Using two M4 screws, fix the DIN rail of the shunt resistor unit on the wall.
The M4 screws are accessories.

Wiring for the shunt resistor unit

Connect the signal cables to the shunt resistor unit for the required number of signals. The following figure shows the cable connections to the shunt resistor unit.



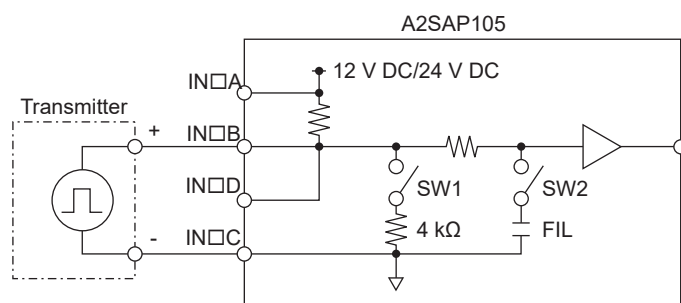
F030838.ai

Figure Cable connections to the shunt resistor unit

● When receiving voltage pulse signals

In the IOM builder, select “Without Shunt Resistor” (SW1: OFF) and clear the “Input Filtering” (SW2: OFF) option.

The following figure shows the circuit diagram.



F030709.ai

□: 1 to 16

Figure When Receiving Voltage Pulse Signals

● **When receiving current pulse signals (2-wire power supply type)**

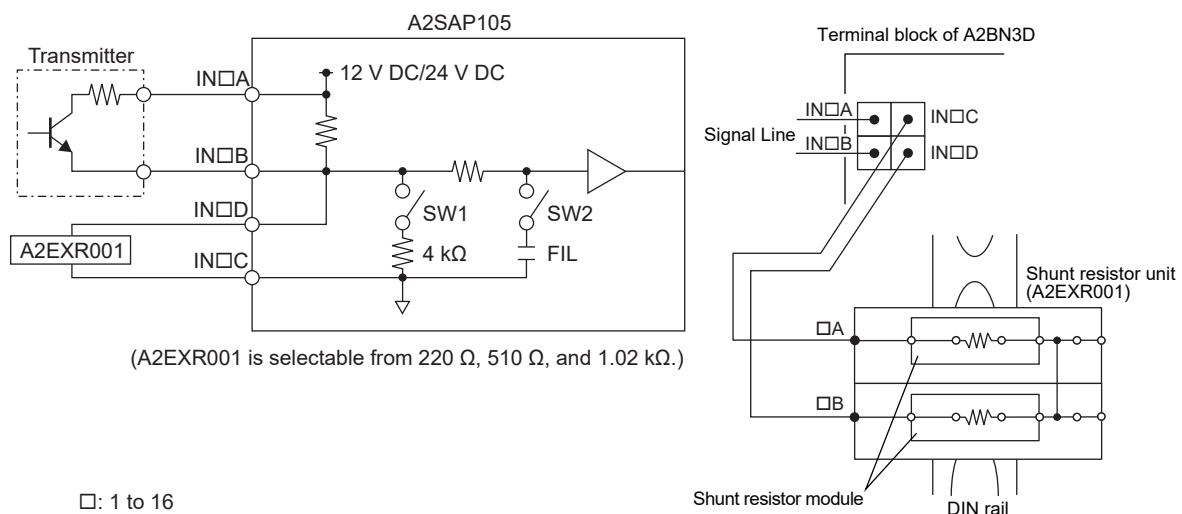
According to the input signal level, connect the shunt resistor unit (A2EXR001) of which resistor value is selected by the combination of the shunt resistor module and short plug. The resistor value of A2EXR001 can be selected to the following values.

- 220 Ω
- 510 Ω
- 1.02 kΩ

In the IOM builder, select "Without Shunt Resistor" (SW1: OFF) and clear the "Input Filtering" (SW2: OFF) option. When connecting the field via the terminal board (A2BM4), it can be substituted by connecting a shunt resistor unit between terminal-B and C on the external terminal block.

The following figure shows the circuit diagram.

Direct field wiring to base plate



Field wiring via terminal board

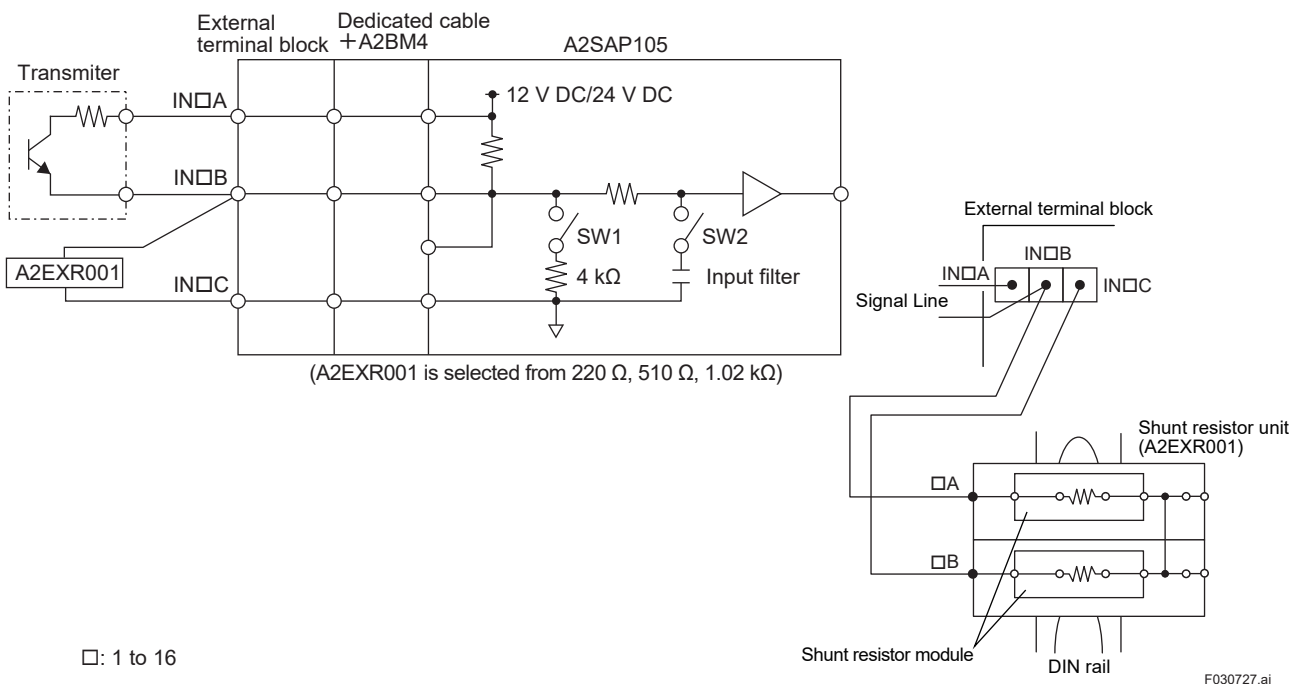
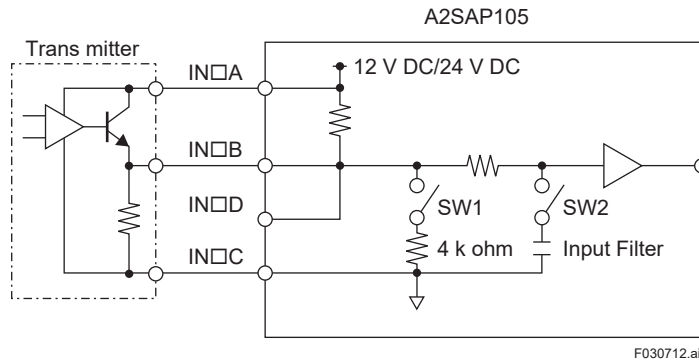


Figure When receiving current pulse signals (2-wire power supply type)

- **When receiving voltage pulse signals by using the internal power to drive the transmitter (3-wire power supply type)**

In the IOM builder, select “Without Shunt Resistor” (SW1: OFF) and clear the “Input Filtering” (SW2: OFF) option.

The following figure shows the circuit diagram.

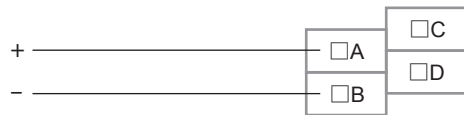


□: 1 to 16

Figure When receiving voltage pulse signals by using the internal power to drive the transmitter (3-wire power supply type)

- **A2SAM105 Current input/voltage input adaptor**

The following figure shows the signal wiring when using the current input/voltage input adaptor



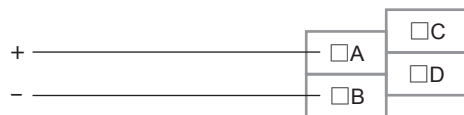
F030718.ai

□: 1 to 16

Figure When using the current output/voltage output adaptor

- **A2SAM505 Current output/voltage output adaptor**

The following figure shows the signal wiring when using the current output/voltage output adaptor



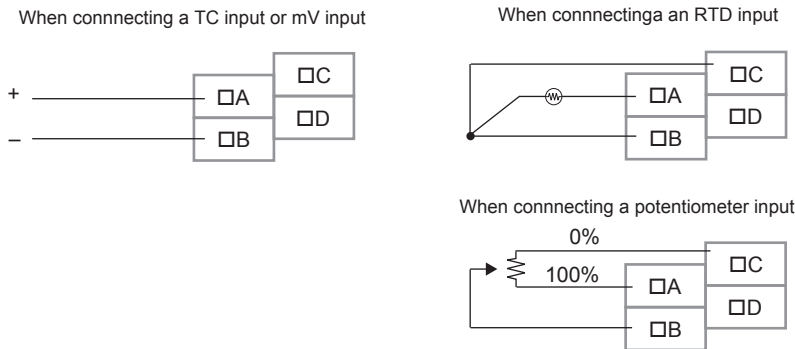
F030719.ai

□: 1 to 16

Figure when using the current input/voltage input adaptor

A2SAT105 mV/TC/RTD input adaptor

The following figure shows the signal wiring when using the mV/TC/RTD input adaptor. A2SAT105 is unavailable for A2BN3D-□9□□□.



F030721.ai

Figure When using the mv/TC/RTD input adaptor

For thermocouple signal input, mount the mV/TC/RTD input adaptor on the base plate for adaptor with RJC.

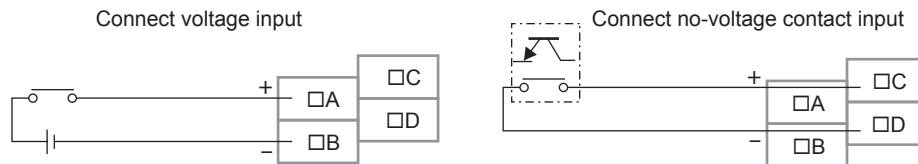
SEE ALSO

For more information about the types of TC and RTD that can be connected to the mV/TC/RTD input adaptor and the standards they must conform to, refer to: "I/O Adaptors (for N-IO)" (GS 33J62F30-01EN).

A2SDV105 Digital input adaptor

The following figure shows the signal wiring for the base plate when you use the digital input adaptor. The dry contact input is not supported for A2BN3D-□9□□□. For the dry contact input, it is necessary to change the adaptor to A2SMX801 and set the DI mode by software for the connection between terminal-A and B. In that case, it becomes non-isolated from an I/O module.

If you connect a dry contact input, connect the field power supply to the base plate.



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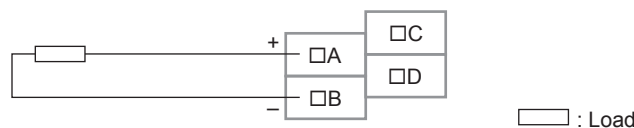
□: 1 to 16

Figure When Using the digital Input Adaptor

A2SDV505 Digital output adaptor

The following figure shows the signal wiring to the base plate when you use the digital output adaptor.

When you use the digital output adaptor, connect the field power supply to the base plate.



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□: 1 to 16

Figure When Using the digital output adaptor

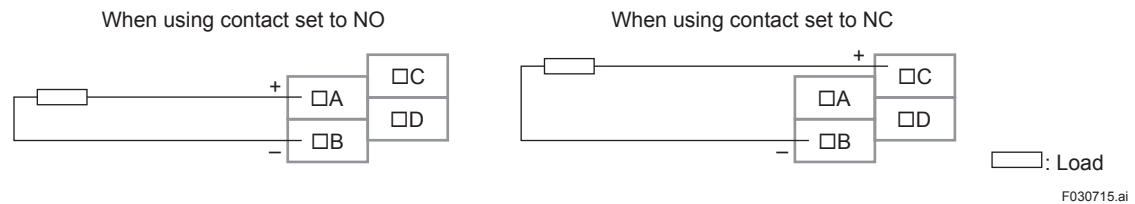
IMPORTANT

When you connect an inductive load, connect a diode in parallel with the load.

■ A2SDV506 Relay output adaptor

When you use the relay output adaptor, signal connections to the base plate differ, depending on whether the contact output is NC or NO.

The following figure shows the signal connection to the base plate.



□: 1 to 16

Figure When using the relay output adaptor

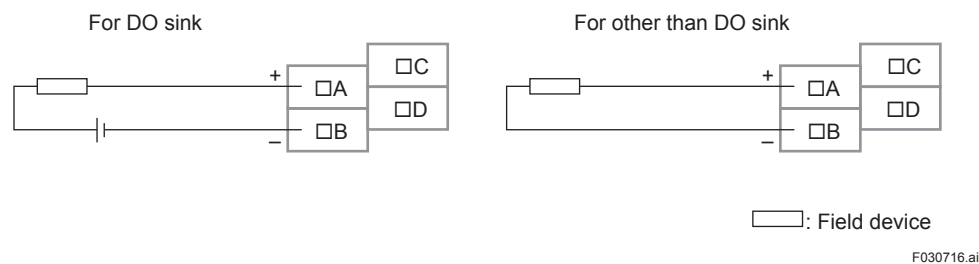
IMPORTANT

When you connect an inductive load, connect a diode in parallel with the load.

■ A2SMX801 Pass-through I/O signal adaptor

When you use the pass-through I/O signal adaptor, you need to set the signal type by software.

The following figure shows the signal wiring to the base plate.



□: 1 to 16

Figure When using the pass-through I/O signal adaptor

A2SMX802 Pass-through I/O signal adaptor



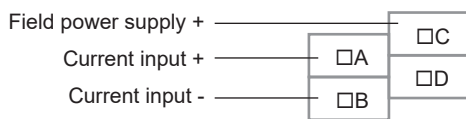
CAUTION

When you connect an inductive load, connect a diode in parallel with the load.

For current input from a 4-wire transmitter, when connecting the field signals via the terminal board, it is necessary to connect the field power supply - to the terminal-B on the external terminal block.

The following figure shows the signal wiring to the base plate when you use the pass-through I/O signal adaptor

When connecting a current input from a 3-wire transmitter

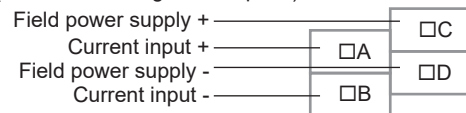


When connecting an open drain (DO sink)

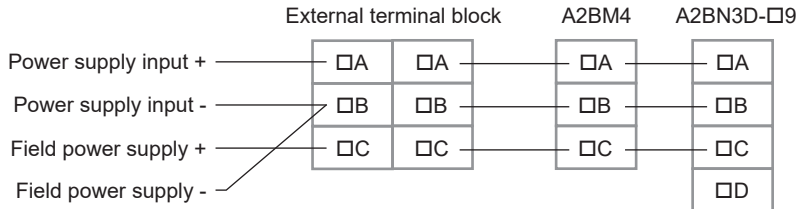


□: Load

When connecting a current input from a 4-wire transmitter (Direct field wiring to base plate)



When connecting a current input from a 4-wire transmitter (Field connection via the terminal board)



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□: 1 to 16

Figure When using the pass-through i/o signal adaptor A2SMX 802

TIP

When using A2SMX802, connect the field power supply to the base plate. When mounting A2SMX802 to the base plate, each channel between A2SDV105, A2SDV505, and A2SMX801 is not insulated. For details of the Fieldbus connection and wiring work, refer to "Fieldbus Technical Information" (TI 38K03A01-01E).

3.7.4 Base Plate for Barrier

■ Base Plate for Barrier Types and Terminal Types

The following table shows relation between Base Plate for Barrier Types and Terminal Types.

Table Base Plate for Barrier Types and Terminal Types

Base plate model	Suffix code	Field wiring orientation	Terminal type	Terminal position
A2BN4D Base Plate for Barrier (MTL)	-□□□C□	Left	Pressure clamp terminal	On barrier module
	-□□□D□	Right		
A2BN5D Base Plate for Barrier (P+F)	-□□□C□	Left	Spring clamp terminal	On base plate
	-□□□D□	Right		

■ Modules Installable with Base Plate for Barrier

The following table shows Modules installable with Base Plate for Barrier.

Table Modules Installable with Base Plate for Barrier

Base plate model	Model of installable barrier
A2BN4D Base Plate for Barrier (MTL)	Refer to the General Specifications (GS).
A2BN5D Base Plate for Barrier (P+F)	Refer to the General Specifications (GS).

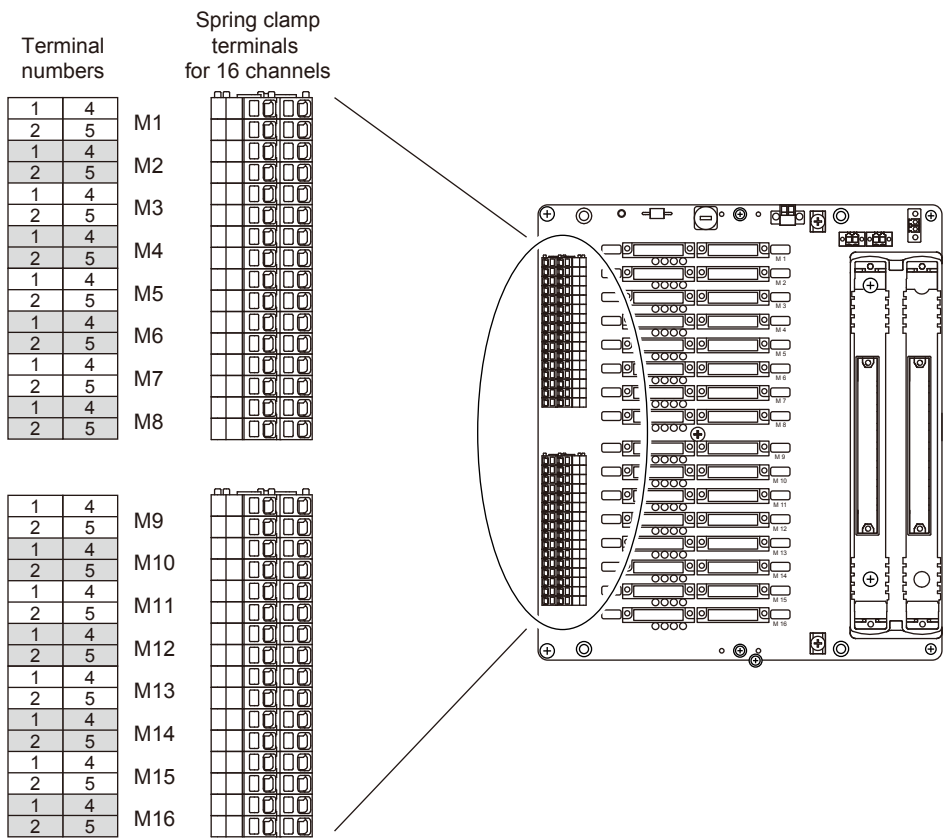
■ Base Plate for Barrier Terminal Numbers

● A2BN4D (Pressure Clamp Terminals)

The A2BN4D Base Plate for Barrier do not have signal terminals because signal terminals are provided on intrinsic safety barriers.

Information about the terminal numbers of the signal terminals provided on the intrinsic safety barriers, refer to the manufacture's catalog.

● A2BN5D (Spring Clamp Terminals)



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■ Connecting Signal Cables with Base Plate for Barrier (A2BN5D)

The signal connections of the base plate for barrier (model:A2BN5D) differ depending on the signal type. The following table shows the terminal numbers and signal types.

Table Terminal Numbers and Signal Types (A2BN5D)

Intrinsic safety barriers	Terminal number (*1)	IO Signal					
		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Analog Input (*3)	M□1	2-wire transmitter input +	Current input +	—	—	—	—
	M□2	—	—	—	—	—	—
	M□4	2-wire transmitter input -	—	—	—	—	—
	M□5	—	Current input -	—	—	—	—
Analog Output (*3)	M□1	Analog output +	—	—	—	—	—
	M□2	—	—	—	—	—	—
	M□4	Analog output -	—	—	—	—	—
	M□5	—	—	—	—	—	—
Digital Input	M□1	Digital input+	—	—	—	—	—
	M□2	—	—	—	—	—	—
	M□4	Digital input -	—	—	—	—	—
	M□5	—	—	—	—	—	—
Digital Output	M□1	Digital output +	—	—	—	—	—
	M□2	—	—	—	—	—	—
	M□4	Digital output -	—	—	—	—	—
	M□5	—	—	—	—	—	—
Temperature Input (*3)	M□1	RJC	—	RTD 4-wire source +	RTD 3-wire source +	RTD 2-wire source +	Potentiometer source +
	M□2	Thermocouple input +	Voltage input +	RTD 4-wire input +	—	—	—
	M□4	RJC	—	RTD 4-wire source -	RTD 3-wire source -	RTD 2-wire source -	Potentiometer source -
	M□5	Thermocouple input -	Voltage input -	RTD 4-wire input -	RTD 3-wire input -	—	Potentiometer input -

*1: □ = 1 to 16

*2: "—" is a terminal that is not used. Do not connect anything to it.

*3: This barrier can be used in combination with the A2MMM843 only.

3.8 Signal Connections of N-IO I/O Unit (For RIO System Upgrade)

This section describes the signal connection with the N-IO I/O units for RIO System Upgrade.

3.8.1 N-IO I/O Unit Types

■ I/O Modules installed into the Nest for I/O Adaptor

The following table shows the I/O Modules installed into the A2BA3D Nest for I/O Adaptor.

Table I/O Modules installed into the A2BA3D Nest for I/O Adaptor

Nest for I/O Adaptor model	I/O module model
A2BA3D (Nest for I/O Adaptor)	A2MME041

Note: A2BA3D (Nest for I/O Adaptor) includes the A2MME041 (Redundant I/O Module for A2BA3D).

3.8.2 Nest for I/O Adaptor

■ Adaptors installed into the Nest for I/O Adaptor

Table Adaptors installed into the A2BA3D Nest for I/O Adaptor

Nest for I/O Adaptor model	Adaptor model
A2BA3D (Nest for I/O Adaptor)	A2SAP105 Pulse Input Signal Adaptor
	A2SAM105 Current Input/Voltage Input Adaptor
	A2SAM505 Current Output/Voltage Output Adaptor
	A2SAT105 mV/TC/RTD Input Adaptor

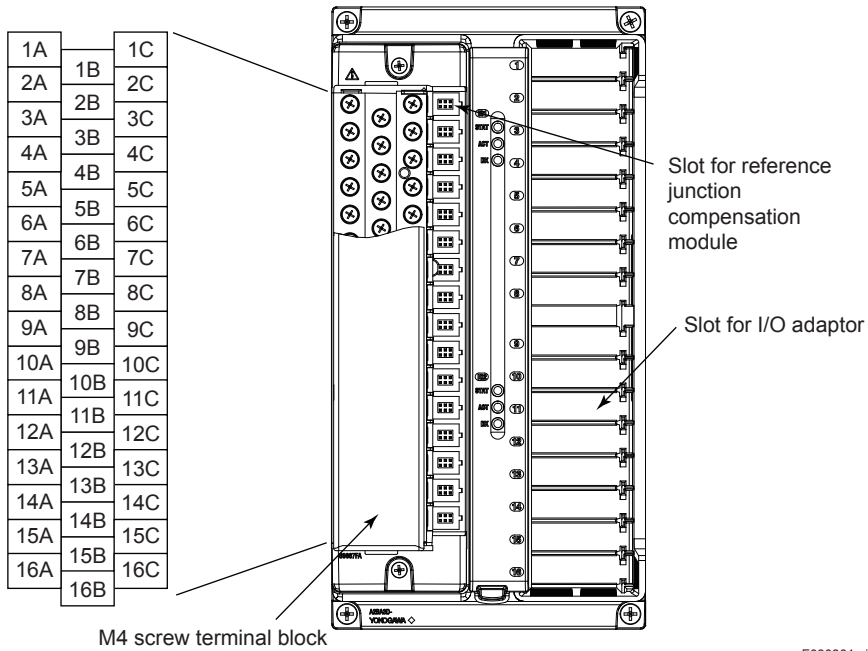
■ Terminal type that can be select with Nest for I/O Adaptor

Table Terminal type Compatible with A2BA3D Nest for I/O Adaptor

Model	Suffix code	Terminal type
A2BA3D (Nest for I/O Adaptor)	-□3□□□	M4 Screw
	-□4□□□	ELCO Connector

A2BA3D Terminal assignment of M4 screw terminal block

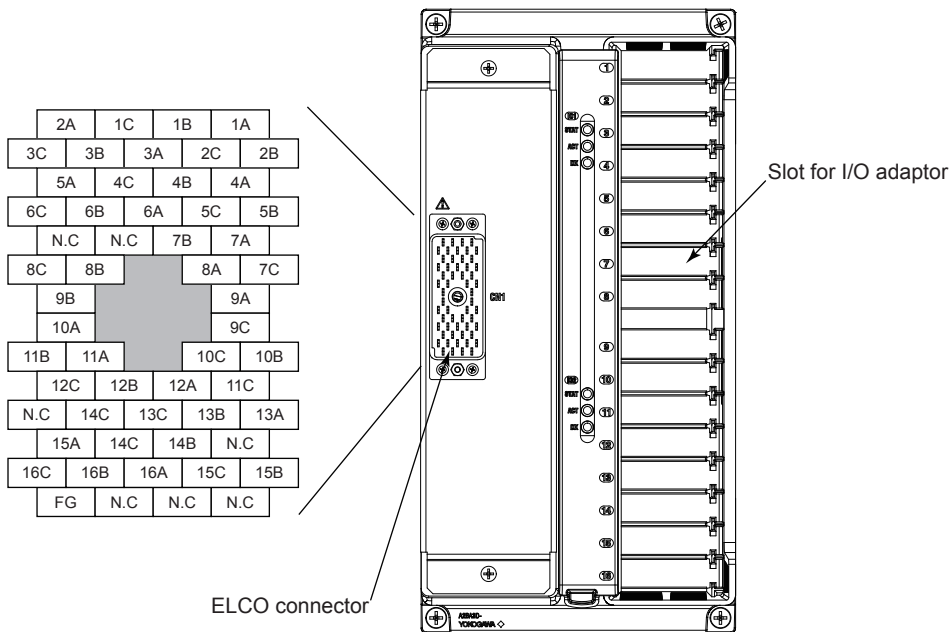
A2BA3D-□3□□□



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A2BA3D Pin assignment of ELCO connector

A2BA3D-□4□□□



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■ Signal connection of the terminal block of the nest for I/O adaptor A2BA3D

The signal cables of the field devices to the terminal block that is mounted on the nest for I/O adaptor must be connected to different terminals depending on the types of signals. To prevent damage to the devices, connect signal cables to the appropriate terminals according to the type of signals.

The following table shows the relationship between signal types and terminal numbers of channels.

Table Terminal numbers and signal types

Adaptor (model)	Terminal number (*1)	Signal type (*2)				
		Case 1	Case 2	Case 3	Case 4	Case 5
Current input/voltage input adaptor (A2SAM105) (*3)	□A (*4)	2-wire transmitter input +	—	—	—	—
	□B	2-wire transmitter input -	4-wire transmitter current input +	Voltage input +	—	—
	□C	—	4-wire transmitter current input -	Voltage input -	—	—
Current output/voltage output adaptor (A2SAM505)	□A	Current output +	Voltage output +	—	—	—
	□B	—	—	—	—	—
	□C	Current output -	Voltage output -	—	—	—
mV/TC/RTD input adaptor (A2SAT105)	□A	—	RTD input A (*5)	Potentiometer input, 100% (*5)	—	—
	□B	TC/mV input +	RTD input B	Potentiometer input, variable	—	—
	□C	TC/mV input -	RTD input B (*5)	Potentiometer input, 0% (*5)	—	—
Pulse input signal adaptor (A2SAP105) (*6)	□A	—	Dry contact input + (*7) (*8)	—	2-wire power supply type, power	3-wire power supply type, power
	□B	2-wire contact + (*9)	Dry contact input - (*7) (*8) Connect to A2EXR001 (*8)	2-wire, voltage +	2-wire power supply type, signal Connect to A2EXR001	3-wire power supply type +
	□C	2-wire contact - (*9)	Connect to A2EXR001 (*8)	2-wire, voltage -	Connect to A2EXR001	3-wire power supply type -

*1: □: 1 to 16

*2: "—" denotes that the terminal is not used. Do not connect any signal because the terminal is connected to internal circuits.

*3: When the power supply is turned off or overcurrent is detected, the current input loop enters a high impedance state. Do not share the current signal with other receiving devices. If the signals are shared, you must convert the signals into voltage signals by using an external shunt resistor or shunt resistor module (Part:A1080RZ) to receive the signals.

*4: Power for transmitter is supplied from the A terminal. If an overcurrent is detected, the A terminal enters an open state.

*5: The resistance values of the connecting cables must match.

*6: When the power supply is turned off or overcurrent is detected, the transmitter power supply terminal enters an open state.

*7: Used when the input frequency is 0 to 5 kHz.

*8: Used when the input frequency is 0 to 10 kHz.

*9: Used when the input frequency is 0 to 800 Hz.

3.8.3 Adaptors (for A2BA3D)

■ A2SAP105 Pulse input signal adaptor

When the pulse input signal adaptor (Model: A2SAP105) is used, signal connections and shunt resistor usage depend on the type of the pulse signal that is input.

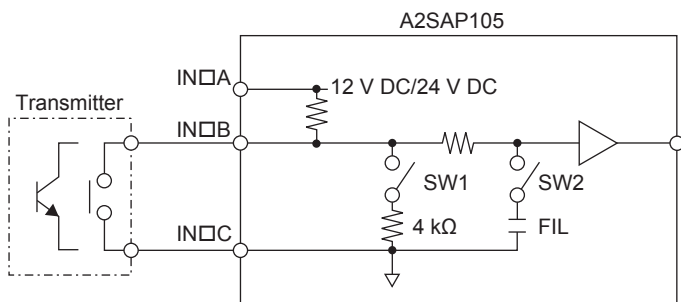
When receiving dry contact signals, you can remove mechanical chattering noise by selecting the pulse input filtering option in the IOM builder. However, the input filter passes a limited range of frequencies.

SEE ALSO

For more information about removing the mechanical chattering noise, refer to: N-IO Node (for RIO System Upgrade) (GS 33J64F10-01EN)

● When receiving dry contact signals (Input frequency: 0 to 800 Hz)

Select "Without Shunt Resistor" (SW1: OFF) in the IOM builder. The following figure shows the circuit diagram.



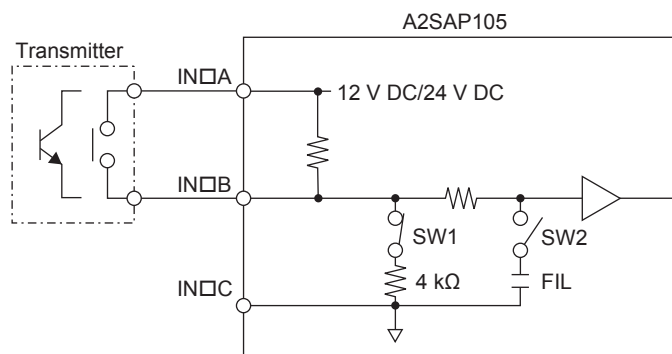
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□: 1 to 16

Figure When receiving dry contact signals (Input frequency: 0 to 800 Hz)

● When receiving dry contact signals (Input frequency: 0 to 5 kHz)

Select "Shunt Resistor 4000 ohm" (SW1: ON) in the IOM builder. The following figure shows the circuit diagram.



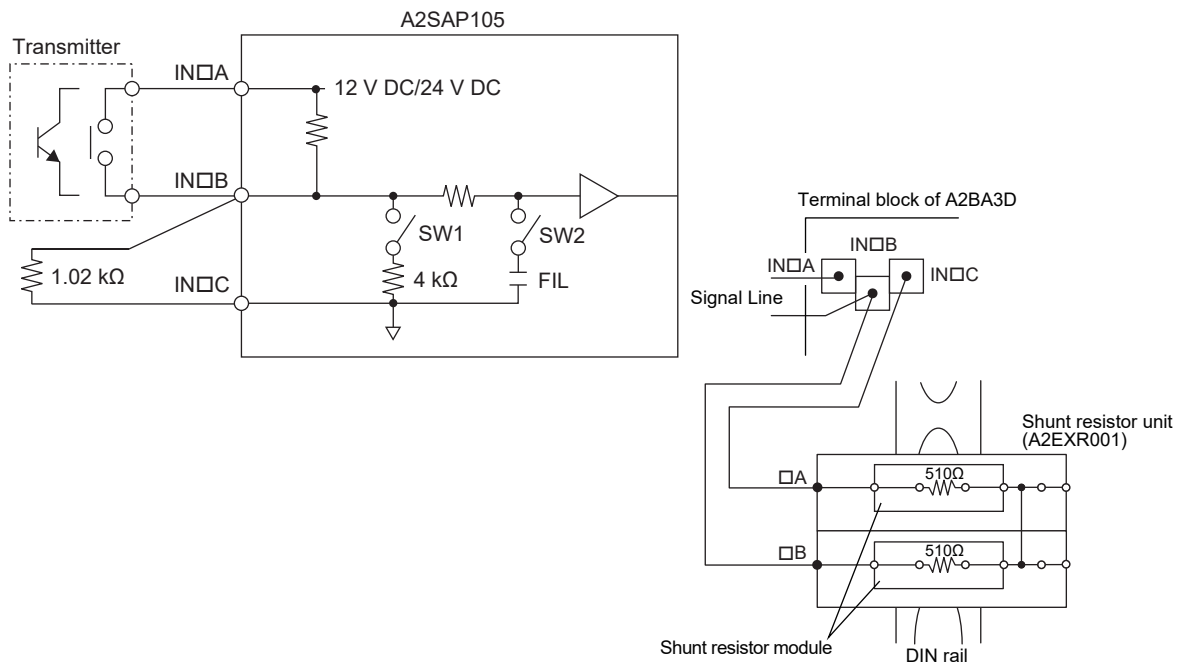
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□: 1 to 16

Figure When receiving dry contact signals (Input frequency: 0 to 5 kHz)

- **When receiving dry contact signals (Input frequency: 0 to 10 kHz)**

Select "Without Shunt Resistor" (SW1: OFF) in the IOM builder. Also install two 510 Ω shunt resistor modules on the shunt resistor unit. The total resistance value will be 1.02 k Ω . The following figure shows the circuit diagram.



□: 1 to 16

Figure When receiving dry contact signals (Input frequency: 0 to 10 kHz)

- **Shunt Resistor Unit (A2EXR001)**

**SEE
ALSO**

For the General specifications of A2EXR001, refer to N-IO Node (For RIO System Upgrade) (GS 33J64F10-01EN)

The shunt resistor unit (Model: A2EXR001-S000030/KFR) converts the current signals of the pulse input signal adaptor into voltage signals and is capable of converting four points of signals. It is used when receiving dry contact signal inputs with 0 to 10 kHz input frequencies or current pulse signal inputs.

Elements of the shunt resistor unit

The following figure shows the elements of the shunt resistor unit.

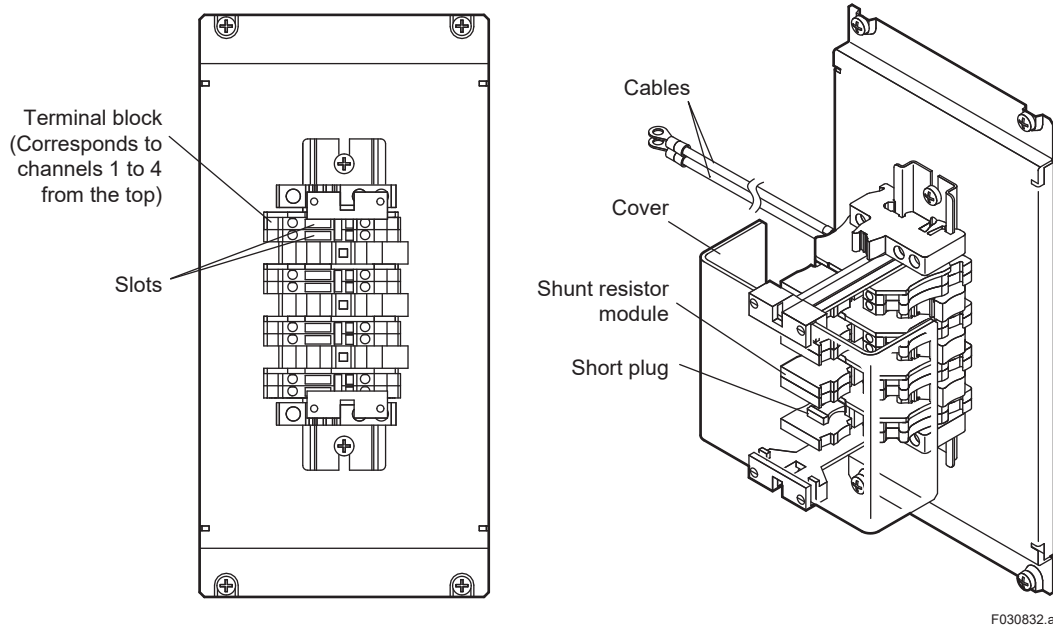


Figure Shunt resistor unit

The shunt resistor unit has terminal blocks for channel numbers 1 to 4. Each terminal block is provided with two slots that are used to install a shunt resistor module or a short plug. Short plugs are installed on these slots when the unit is shipped from the factory. The shunt resistor unit comes with shunt resistor modules and cables for connecting the shunt resistor unit and the nest for I/O adaptor as accessories.

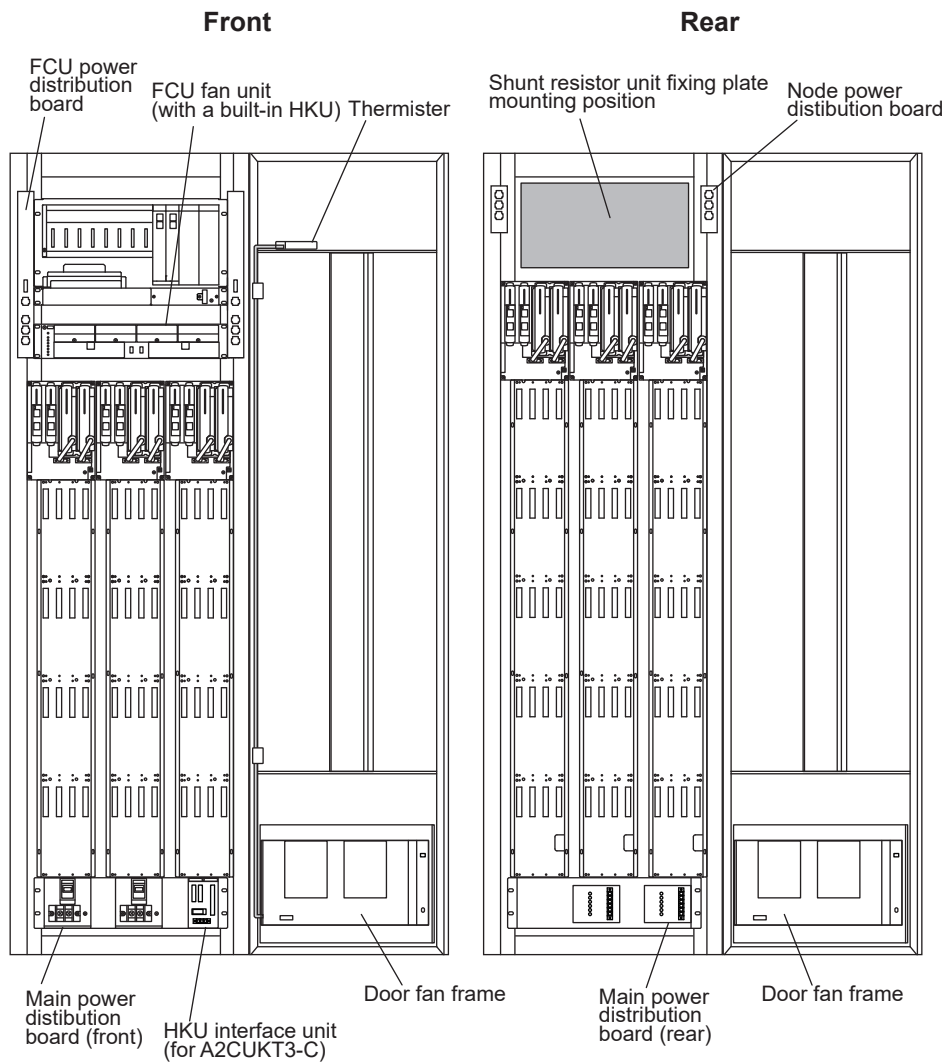
Installation and wiring for the shunt resistor unit



CAUTION

Handle shunt resistor module in A2EXR001 with care as it may become high in temperature. Use a cover to prevent from touching the resistor directly to avoid being burned.

The shunt resistor unit fixing plate can be mounted on the upper rear of the RIO system upgrade application cabinet.



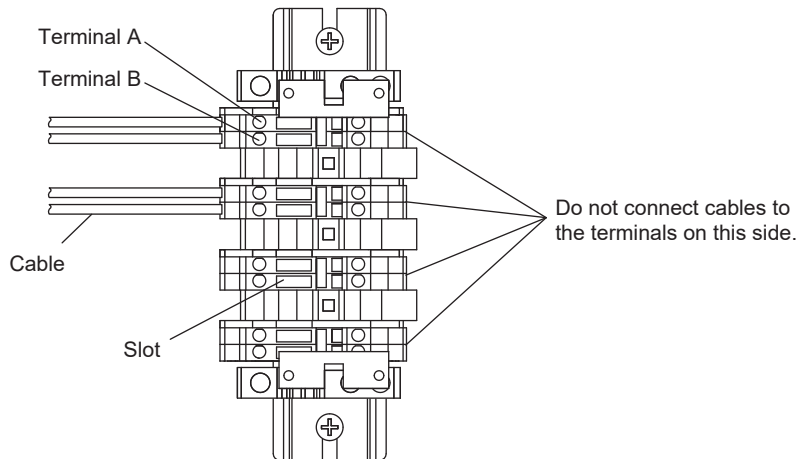
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Figure Shunt resistor unit fixing plate mounting position

Wiring for the shunt resistor unit

For the wiring between the shunt resistor unit and the nest for I/O adaptor, use the cables that are provided as accessories of the shunt resistor unit. The cables have a sleeve at one end for connection to the shunt resistor unit and a ring terminal for M4 screw at the other end for connection to the nest for I/O adaptor.

Connect the cables to the shunt resistor unit for the required number of signals. The following figure shows the cable connections to the shunt resistor unit.



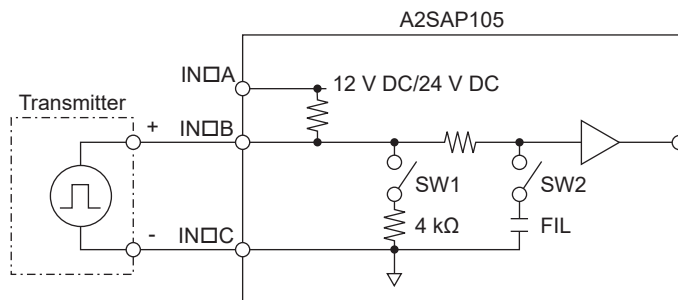
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Figure Cable connections to the shunt resistor unit

• When receiving voltage pulse signals

In the IOM builder, select "Without Shunt Resistor" (SW1: OFF) and clear the "Input Filtering" (SW2: OFF) option.

The following figure shows the circuit diagram.



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□: 1 to 16

Figure When receiving voltage pulse signals

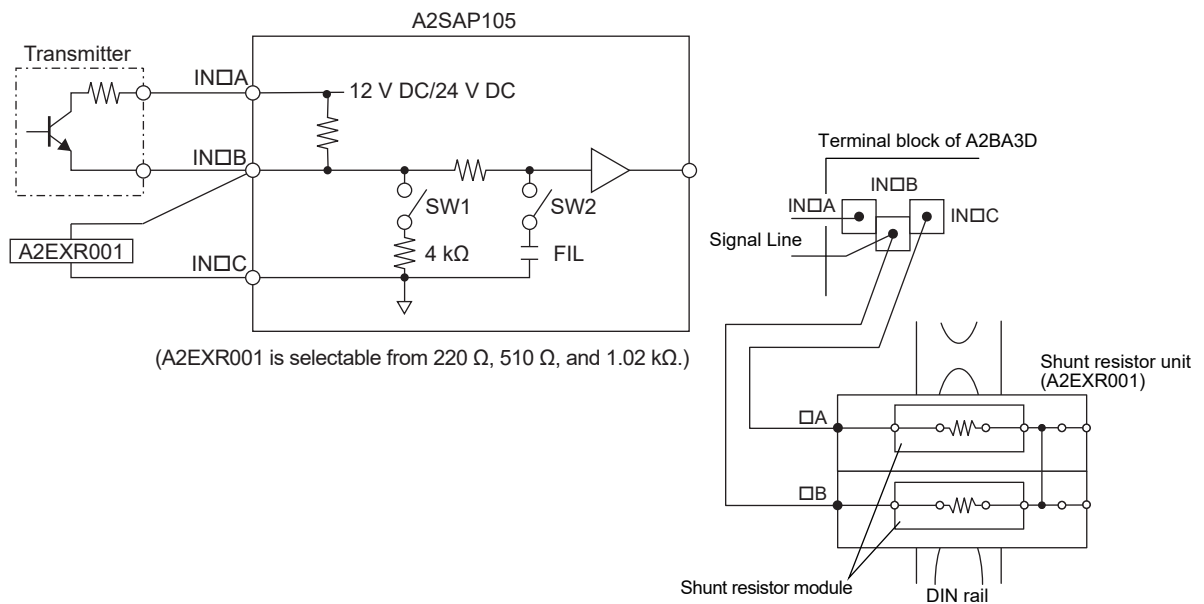
● When receiving current pulse signals (2-wire power supply type)

According to the input signal level, install the shunt resistor module and short plug onto the shunt resistor unit so that the total resistance value becomes one of the following values:

- 220 Ω
- 510 Ω
- 1.02 k Ω

In the IOM builder, select "Without Shunt Resistor" (SW1: OFF) and clear the "Input Filtering" (SW2: OFF) option.

The following figure shows the circuit diagram.



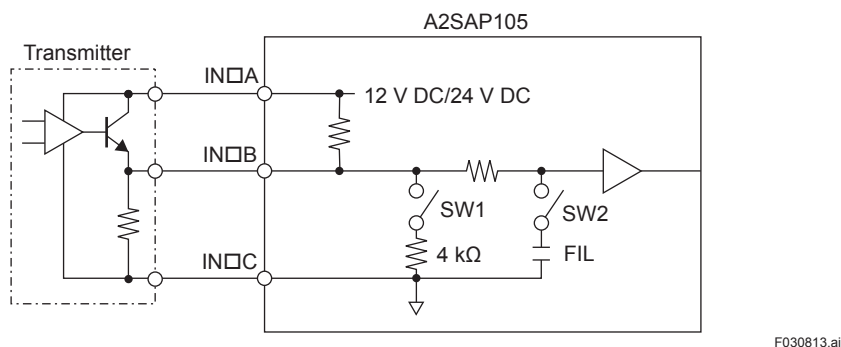
□: 1 to 16

Figure When receiving current pulse signals (2-wire power supply type)

● When receiving voltage pulse signals by using the internal power to drive the transmitter (3-wire power supply type)

In the IOM builder, select "Without Shunt Resistor" (SW1: OFF) and clear the "Input Filtering" (SW2: OFF) option.

The following figure shows the circuit diagram.



□: 1 to 16

Figure When receiving voltage pulse signals by using the internal power to drive the transmitter (3-wire power supply type)

● When attaching a shunt resistor to the M4 screw terminal block of A2BA3D

If there is no empty space in the node interface unit and it is difficult to install the shunt resistor unit (Model: A2EXR001) in the cabinet, it is possible to prepare the shunt resistor separately and attach it to the M4 screw terminal block of the nest for I/O adaptor (Model: A2BA3D). However, the following (1) to (4) implementation conditions must be met.

(1) Cabinet ambient Temperature Conditions

Check the cabinet ambient temperature considering the temperature rise in the cabinet caused by the shunt resistor. Check that the cabinet is installed in an air-conditioned control room and that the operating cabinet ambient temperature is 30 °C or less.

(2) Protection from the heat generated by the shunt resistor

Select a shunt resistor from 220 Ω, 510 Ω, 1.0 kΩ (accuracy ± 5 %, rated 2 W) according to the type of signal, and install it between the B and C terminals of the M4 screw terminal block. At this time, terminal B is tightened together with the input signal. The shunt resistor generates heat depending on the operating conditions, so protect it with a heat resistant tube etc. and use it. The following figure shows the connection diagram and example of the shunt resistor assembly.

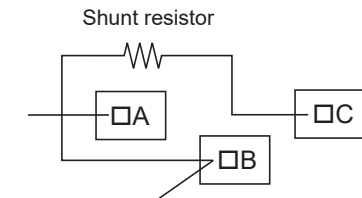
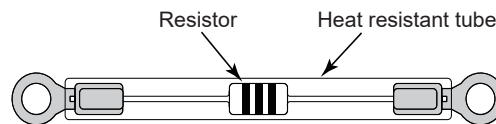


Figure Shunt resistor connection diagram



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Figure Example of shunt resistor assembly

(3) Signal cable temperature rating conditions

The heat generated by the shunt resistor affects to the insulation performance of the signal cable coating. Especially when operating under conditions of large heat generation (Category B and Category C in the table below), please check the temperature rating of the signal cable. If the temperature rating of the signal cable is less than 75 °C (Category B in the table below), avoid using it on adjacent channels to prevent the heat generated by the shunt resistor. Keep one or more channels apart from the channels where resistors are installed. If an adjacent installation is unavoidable, add 1m of signal cables with a temperature rating of 75 °C or higher to the existing signal cables before connecting them (Category C in the table below).

Table Signal cable temperature rating classification

		Transmitter power supply	Shunt resistor value	Signal cable temperature rating	Installation on adjacent channel
Category A	Current pulse	12 V or 24 V	220 Ω	60 °C or less	available
	Dry contact pulse	12 V	510 Ω		
Category B	Current pulse	24 V	1.0 KΩ	Less than 75 °C	not available (At least one channel away)
	Dry contact pulse				
Category C	Current pulse	24 V	1.0 KΩ	75 °C or higher	available
	Dry contact pulse				

(4) A2SAT105 (TC input) mounting conditions

The heat generated by the shunt resistor affects the TC input measurement accuracy of the mV/TC/RTD input adaptor (Model: A2SAT105). When attaching a shunt resistor to an M4 screw terminal block, do not mix it with the TC input in “Nest for I/O adaptor” (Model: A2BA3D). If mixing is happened, mount the TC input channel more than 7 channels away from the pulse input channel connected with the shunt resistor. Other input signals such as mV input and RTD input can be used in the adjacent channel of pulse input.

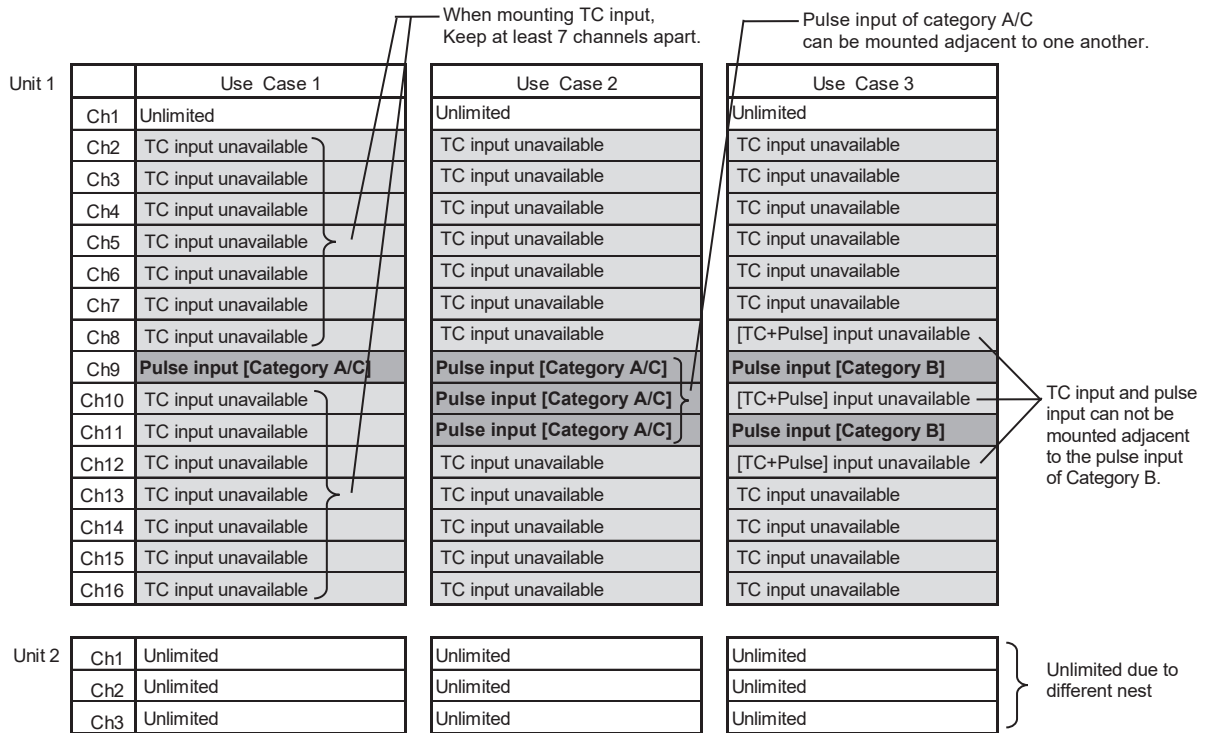


Figure I/O Adaptor Implementation Example 1

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Unit 1	Use Case 1	Use Case 2	Use Case 3
Ch1	Unlimited	Unlimited	Unlimited
Ch2	Unlimited	Unlimited	Unlimited
Ch3	Unlimited	Unlimited	Unlimited
Ch4	Unlimited	Unlimited	TC input unavailable
Ch5	Unlimited	Unlimited	TC input unavailable
Ch6	Unlimited	Unlimited	TC input unavailable
Ch7	Unlimited	TC input unavailable	TC input unavailable
Ch8	Unlimited	TC input unavailable	TC input unavailable
Ch9	TC input unavailable	TC input unavailable	TC input unavailable
Ch10	TC input unavailable	TC input unavailable	TC input unavailable
Ch11	TC input unavailable	TC input unavailable	Pulse input [Category A/C]
Ch12	TC input unavailable	TC input unavailable	Pulse input [Category A/C]
Ch13	TC input unavailable	[TC+Pulse] input unavailable	[TC+Pulse] input unavailable
Ch14	TC input unavailable	Pulse input [Category B]	Pulse input [Category B]
Ch15	TC input unavailable	[TC+Pulse] input unavailable	[TC+Pulse] input unavailable
Ch16	Pulse input [Category A/C]	Pulse input [Category B]	Pulse input [Category B]

Unit 2	Use Case 1	Use Case 2	Use Case 3
Ch1	Unlimited	Unlimited	Unlimited
Ch2	Unlimited	Unlimited	Unlimited
Ch3	Unlimited	Unlimited	Unlimited

Annotations:

- Pulse input of category A/C can be mounted adjacent to one another.
- TC input and pulse input can not be mounted adjacent to the pulse input of Category B.
- Unlimited due to different nest

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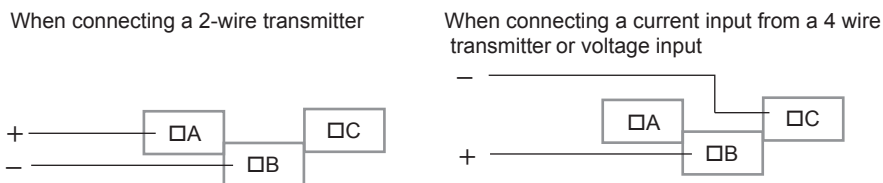
Figure I/O Adaptor Implementation Example 2

■ A2SAM105 Current input/voltage input adaptor

IMPORTANT

Do not share the current signal with other receiving devices. If the signals are shared, you must convert the signals into voltage signals by using an external shunt resistor or shunt resistor module to receive the signals.

The following figure shows the signal wiring when using the current input/voltage input adaptor (Model: A2SAM105).



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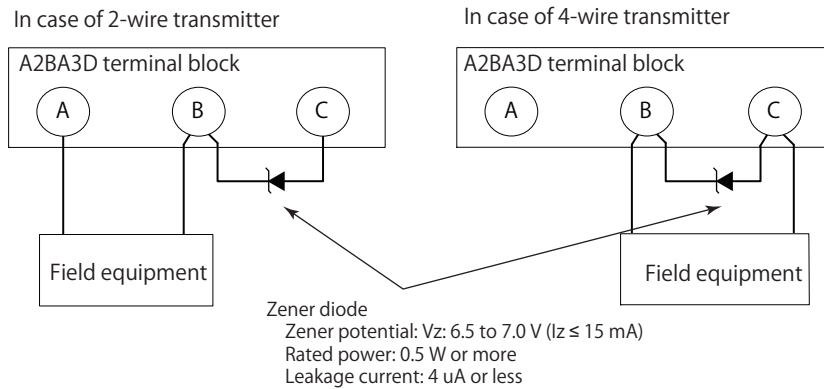
□: 1 to 16

Figure When using the current input/voltage input adaptor

- **When the input current value exceeds 25 m A**

When the input current exceeds 25 mA due to the inrush current of the connected equipment etc. (eg, NOHKEN ultrasonic level meter, etc.), the inrush current exceeds the allowable input current of the adapter, so startup failure of the connected equipment may occur. As a measure, by connecting a zener diode for bypassing the inrush current to the B - C terminal of the A2BA3D, the input current value can be used from 25 to 40 mA.

Connection example



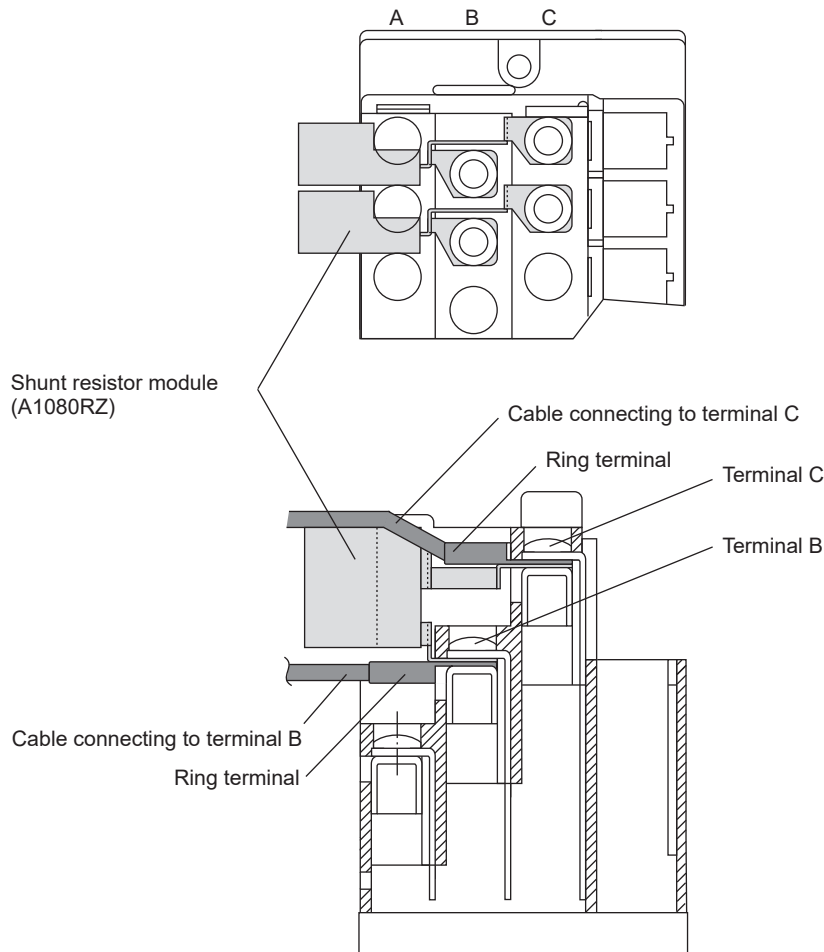
- **When sharing the current signal with another receiving device**

When receiving 4-20 mA current signals from the four-wire transmitter by converting them into 1-5 V DC voltage signals, you must install the shunt resistor module (Part: A1080RZ, 250 Ω) on the receiving terminals of the terminal block.

IMPORTANT

Do not share the current signal with other receiving devices. If the signals are shared, you must convert the signals into voltage signals by using an external shunt resistor or shunt resistor module to receive the signals.

The following figure shows how to install the shunt resistor module.



F030804.ai

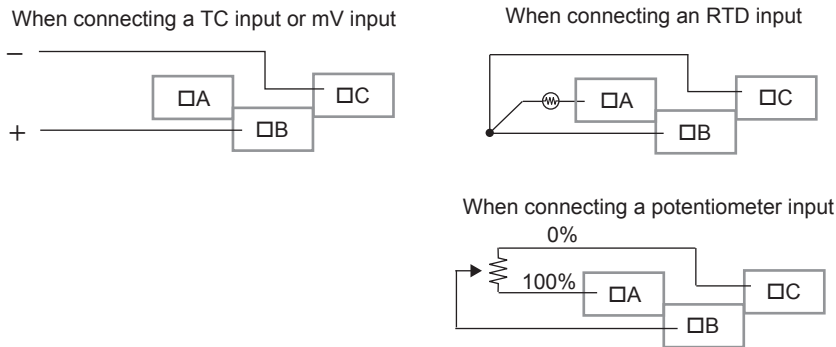
Figure Installing the shunt resistor module

Follow these steps to install the shunt resistor module on the terminal block:

1. Open the cover of the terminal block.
2. Loosen the M4 screws of terminals B and C.
3. Insert the ring of the ring terminal of the cable that connects to terminal B into the gap. Be sure to insert it with the convex side of the crimping part of the ring terminal being oriented to the terminal block side.
4. Orient the shunt resistor module as shown in the figure and insert it into each gap of terminals B and C. The screw goes into the screw hole of the ring terminal and is secured temporarily.
5. Insert the ring of the ring terminal of the cable that connects to terminal C into the gap. Be sure to insert it with the convex side of the crimping part of the ring terminal being oriented in the opposite orientation of the shunt resistor module.
6. Tighten the M4 screws on terminals B and C.
7. Close the cover of the terminal block.

■ A2SAT105 mV/TC/RTD input adaptor

The following figure shows the signal wiring when using the mV/TC/RTD input adaptor (Model: A2SAT105).



F030821.ai

□: 1 to 16

Figure When using the mV/TC/RTD input adaptor

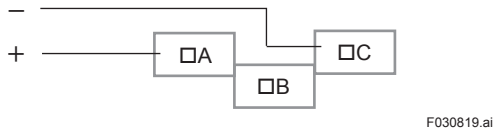
For thermocouple signal input, mount the reference junction compensation module (Part number: S9393UK) on the terminal block.

SEE ALSO

For more information about the types of TC and RTD that can be connected to the mV/TC/RTD input adaptor and the standards they must conform to, refer to: "N-IO Node (for RIO System Upgrade)" (GS 33J64F10-01EN)

■ A2SAM505 Current output/voltage output adaptor

The following figure shows the signal wiring when using the current output/voltage output adaptor (Model: A2SAM505).



□: 1 to 16

Figure When using the current output/voltage output adaptor

● Dual-redundant current output

For current signal output, adaptors can be configured for redundancy. Mount the adaptors in the slots that are vertically next to one another, and set the signal setting of the adaptors in the odd-numbered slot and the even-numbered slot to dual-redundant.

To also match the output, connect terminal A to terminal A, and terminal C to terminal C on the terminal blocks by using short-bars (Part number: A1534JT).

The following figure shows how to attach short-bars by using an example of a dual-redundant configuration of adaptors in slots 3 and 4.

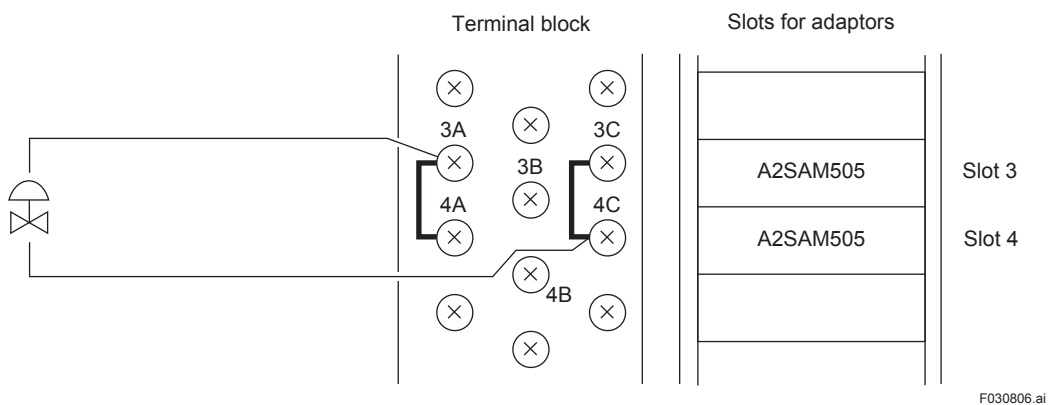


Figure Example of attaching short-bars

TIP

When using the ELCO connector, short the pins that correspond to terminal A on a terminal block, and the pins that correspond to terminal C.

SEE ALSO

For more information about the ELCO connector pin assignment, refer to: "N-IO Node (for RIO System Upgrade)" (GS 33J64F10-01EN)

■ Signal connection of a terminal block for the multichannel I/O module

The signal cables of the field devices to the terminal blocks for the multi-channel I/O module must be connected to different terminals depending on the types of signals. To prevent damage to devices, connect signal cables to the appropriate terminals according to the type of signals. The following table shows the relationship between signal types and terminal numbers of channels.

Table Terminal numbers and signal types - Analog I/O module

I/O modules		Terminal number (*1)	Signal types
Device	Model and suffix code		
Analog input module	AAI143-HM□	□A	Current input +
		□B	Current input -
Analog output module	AAI543-HM□	□A	Current output +
		□B	Current output -
RTD/POT input module(*2)	AAR145-SM□	□A	RTD input A (*3)
		□B	RTD input B
		□B	RTD input B (*3)
TC/mV input module	AAT145-SM□	□A	TC/mV input +
		□B	TC/mV input -
Analog input module	AAV144-SM□	□A	Voltage input +
		□B	Voltage input -

*1: □: 1 to 16

*2: POT input is not supported.

*3: The resistance values of the connecting cables must match.

Table Terminal numbers and signal types - Digital I/O module

I/O modules		Terminal number (*1)	Signal types	
Device	Model and suffix code			
ST3-compatible digital input module	ADV159-PM□	□A	Status input +	Push button input +
		□B	Status input -	Push button input -
	ADV159-PY□	□A	Relay status input +	Relay push button input +
		□B	Relay status input -	Relay push button input -
		□C	—	—
ST6-compatible digital input module	ADV169-PM□	□A	Status input +	Push button input +
		□B	Status input -	Push button input -

I/O modules		Terminal number (*1)	Signal types	
Device	Model and suffix code			
ST4-compatible digital input module	ADV559-PM□	□A	Status output +	Pulse width output +
		□B	Status output -	Pulse width output -
	ADV559-PY□	□A	Relay status output Contact closed when energized	Relay pulse width output Contact closed when energized
		□B	Relay status output Contact close when not energized	Relay pulse width output Contact close when not energized
		□C	Relay status output Common	Relay pulse width output Common
	ST7-compatible digital input module	ADV569-PM□	□A	Status output +
□B			Status output -	Pulse width output -

*1: For ADV169-PM□ and ADV569-PM□, □ ranges from 1 to 32, for all others, □ ranges from 1 to 16.

*2: "—" denotes that the terminal is not used. Do not connect any signal to it.

Connect the signal cables to the terminal blocks.

■ Analog I/O

This section describes the signal wiring when the following signals are received or sent:

- Voltage signals are received on AAV144-SM□.
- Thermocouple or mV signals are received on AAT145-SM□.
- Signals from the 2-wire transmitter are received on AAI143-HM□.
- Current signals are sent by AAI543-HM□.

The following figure shows the signal wiring for the preceding signals.

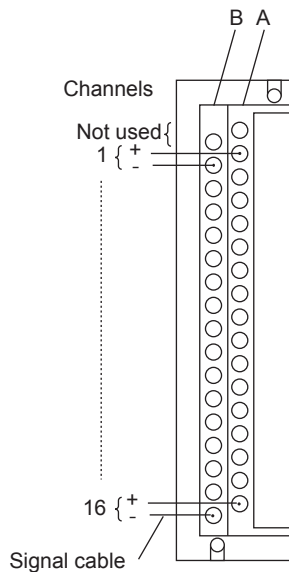


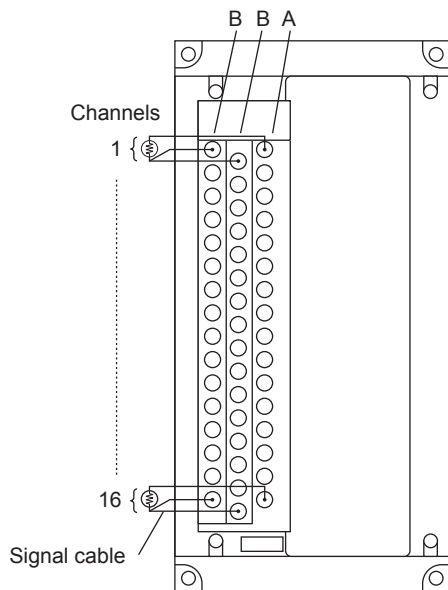
Figure For voltage input, thermocouple input, mV input, 2-wire transmitter input, or current output

IMPORTANT

When using I/O module AAI143-HM□, do not share the current signals with other receiving devices.

■ RTD input

The following figure shows the signal wiring when receiving RTD signal input on AAR145- SM□.



F030831.ai

Figure For RTD Input

SEE ALSO

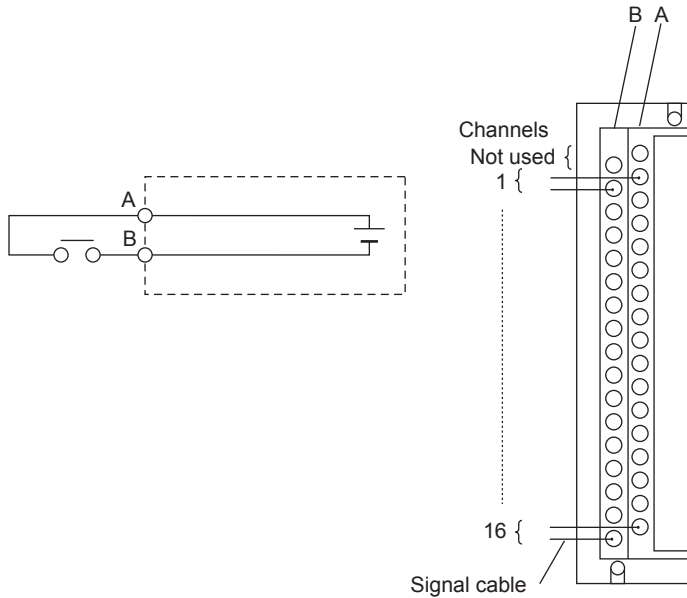
For more information about the types of RTD that can be connected to AAR145-SM□ and the standards the RTD must conform to, refer to:
"N-IO Node (for RIO System Upgrade)" (GS 33J64F10-01EN)

■ Contact input or output of isolated channels

This section describes the signal wiring when the following signals are received or sent:

- When receiving contact signals on ADV159-PM□
- When sending contact signals by ADV559-PM□

The following figure shows the wiring for the preceding cases.



F030832.ai

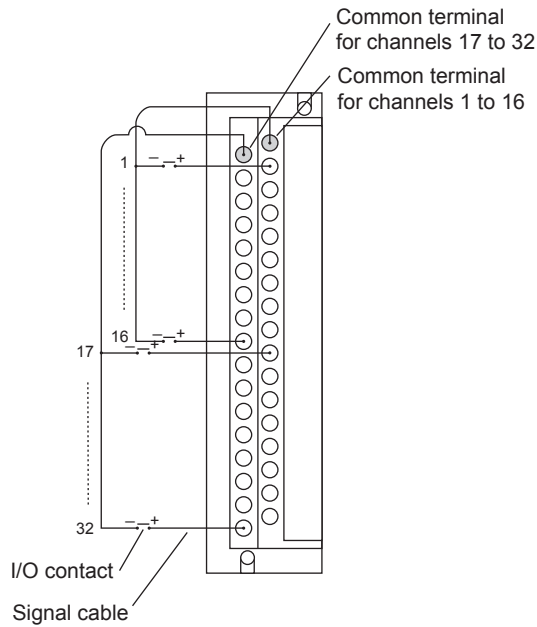
Figure For contact input or output of isolated channels

■ Isolated contact input or output

This section describes the signal wiring when the following signals are received or sent:

- When receiving contact signals on ADV169-PM□
- When sending contact signals by ADV569-PM□

The following figure shows the signal wiring for the preceding signals.

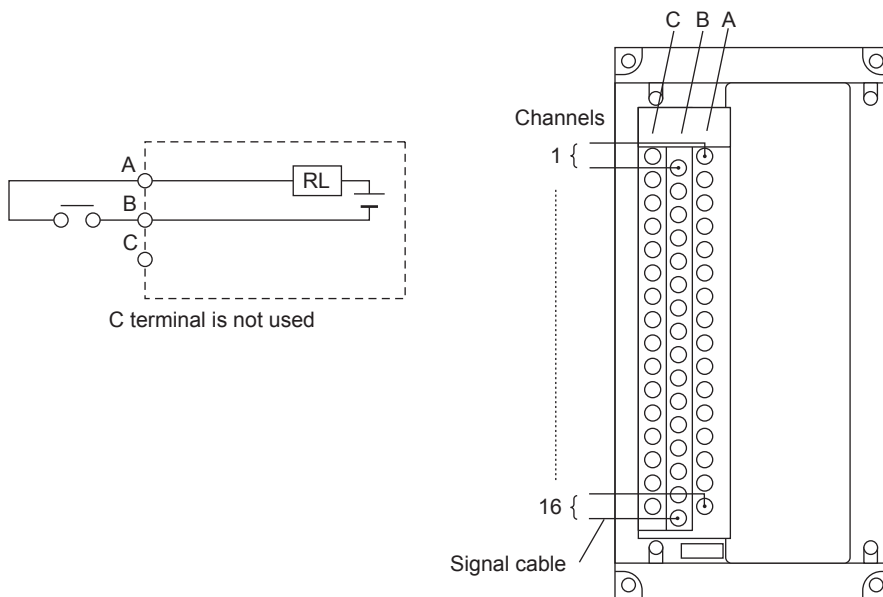


F030818.ai

Figure For isolated contact input or output

■ Relay input

The following figure shows the signal wiring when receiving relay signal input on ADV159-PY□.

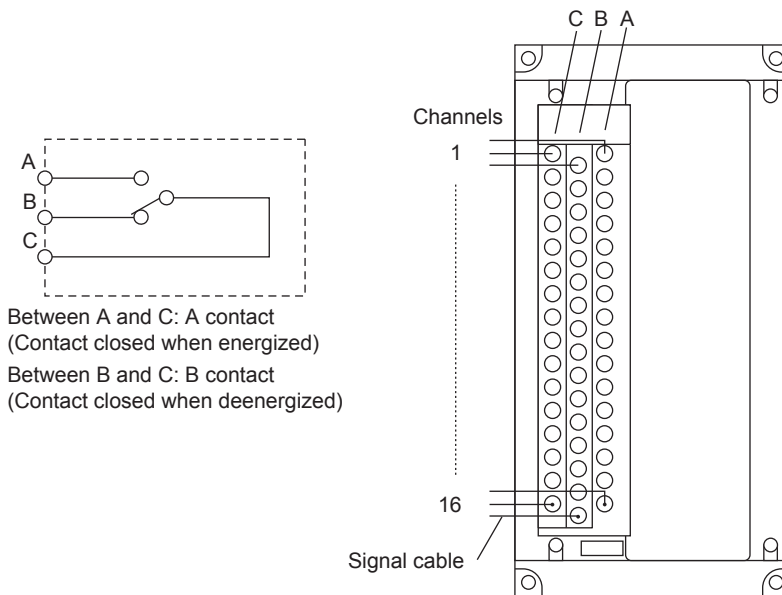


F030819.ai

Figure For relay input

■ Relay output

The following figure shows the signal wiring when sending relay signal output by ADV559-PY□.



F030820.ai

Figure For relay output



CAUTION

High voltage signals can be connected to ADV559-PY□.
To prevent electrical shock, shut off the power to the field devices before you install wiring for ADV559-PY□.

SEE
ALSO

For more information about the output rating of ADV559-PY□, refer to:
"N-IO Node (for RIO System Upgrade)" (GS 33J64F10-01EN)

3.9 Connecting Bus Cable

■ Control Bus (Vnet/IP)

Information on Vnet/IP interface connection and an example of Human Interface Station (HIS) and AFV30D connection are shown below:

● Vnet/IP Interface

- Topology : tree connection
- Configuration : dual redundancy only
- Connector : RJ45 connector
- Intra-domain connection : Layer 2 switch (L2SW) used
- Inter-domain connection : Layer 3 switch (L3SW) used
- Recommended cable : UTP cable of CAT5e or above (optical cable for outdoor use)

● HIS and AFV30D Connection

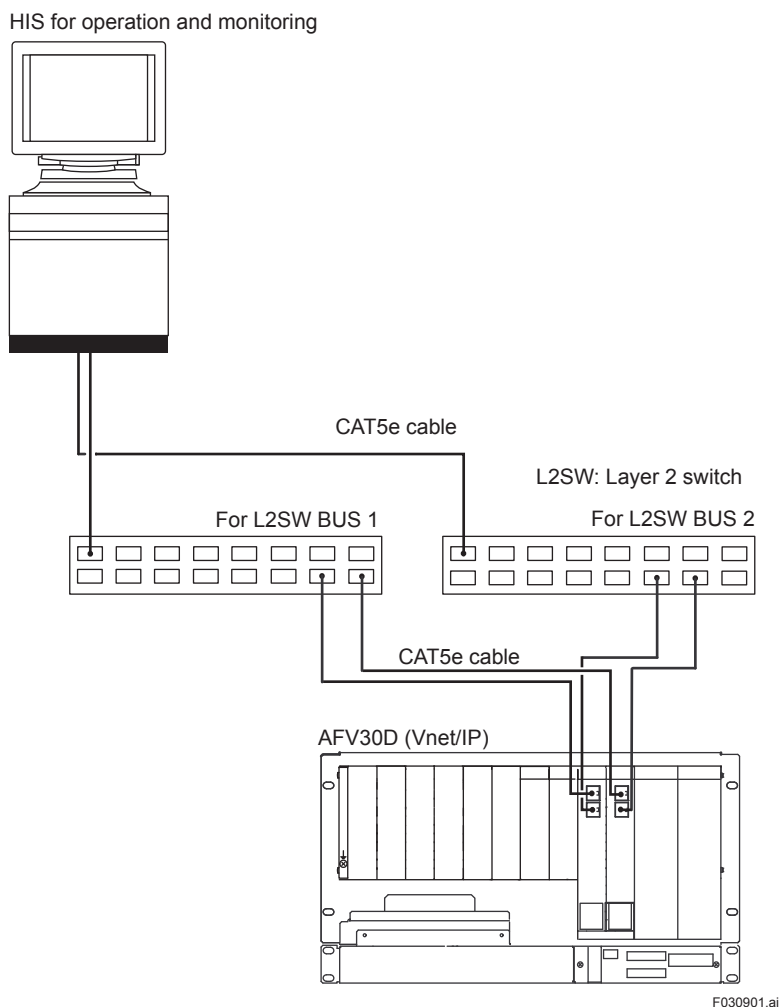
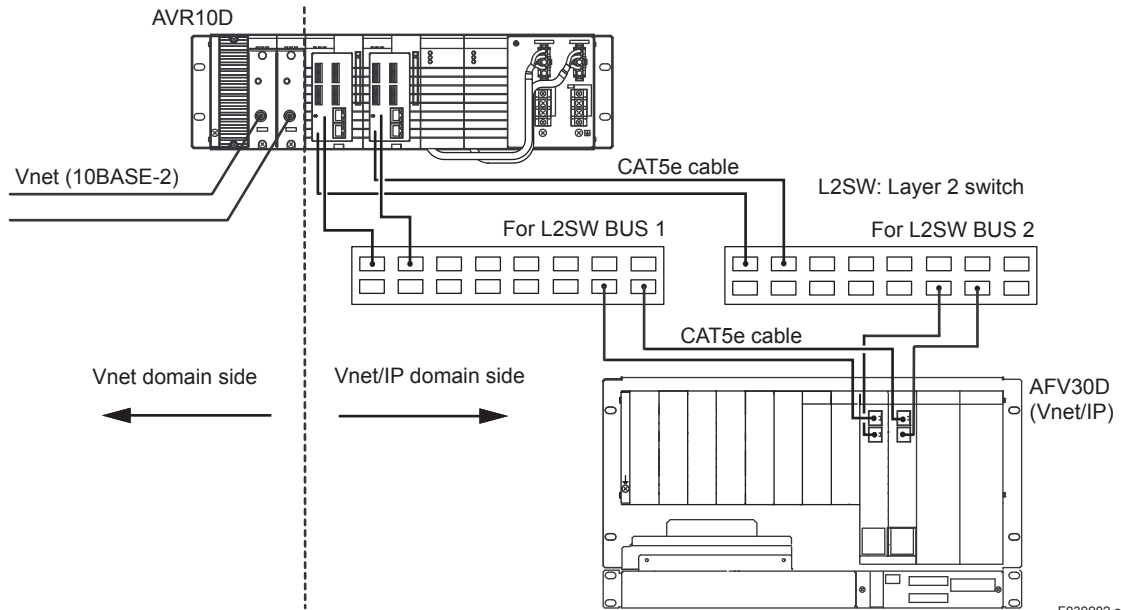


Figure Example of HIS and AFV30D Connection

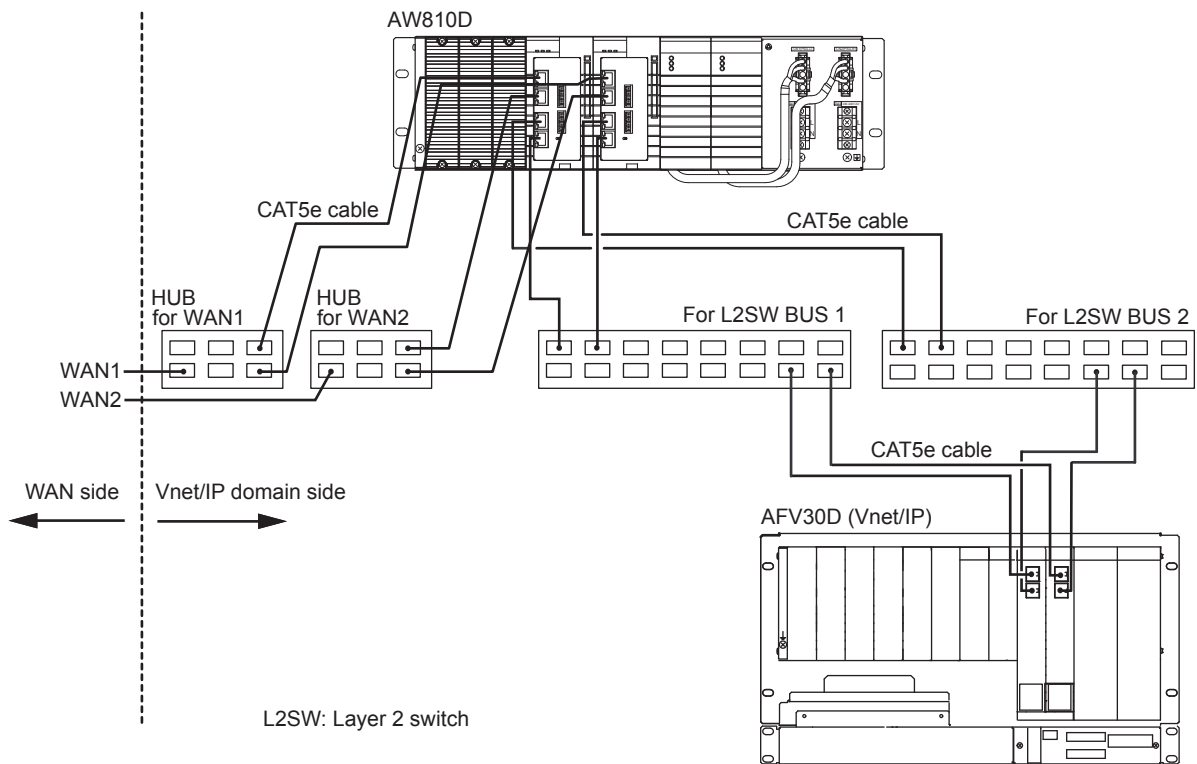
● Example of Connection between AVR10D and AFV30D



F030902.ai

Figure Example of Connection between AVR10D and AFV30D

● Example of Connection between AW810D and AFV30D



F030903E.ai

Figure Example of Connection between AW810D and AFV30D

- **Differentiation between BUS 1 and BUS 2 (WAN 1 and WAN 2)**

Use different colors, etc., to differentiate between BUS 1 and BUS 2 (WAN 1 and WAN 2).

- **Destination Display**

Attach a display tag at the tip of cables to indicate the station number, switch number, and port number of the destination.

- **Cable Fixing**

Fix cables securely so that their connectors are not exposed to undue stress.

- **Handling of Vnet/IP Cables Connected to the Processor Module (CP461 or CP471)**

- Turn the power on after connecting the cables to the CP4□1.
- When removing the CP4□1 on-line, remove it with the cable connected to it.
- Before installing the CP4□1 on-line, connect a cable to it.

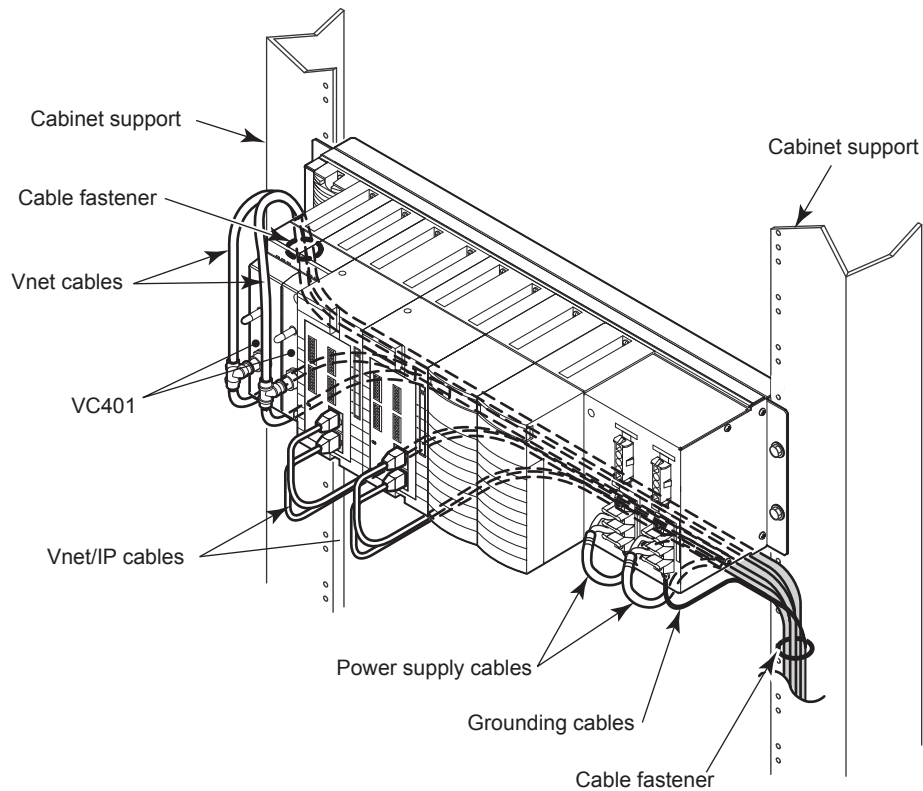
- **Handling of Cables Connected to the AVR10D/AW810D**

- The power supply should not be turned on unless the cables are connected.
- When online removing the module, the module should be removed together with the connected cables.
- When online installing the module, the cable should be connected to the module first.

- **Handling of Cables Connected to the VI702**

- The power of the PC should not be turned on until the cables are connected.
- When disconnecting the cables, the power of the PC must be turned off.

● Cabling for AVR10D System

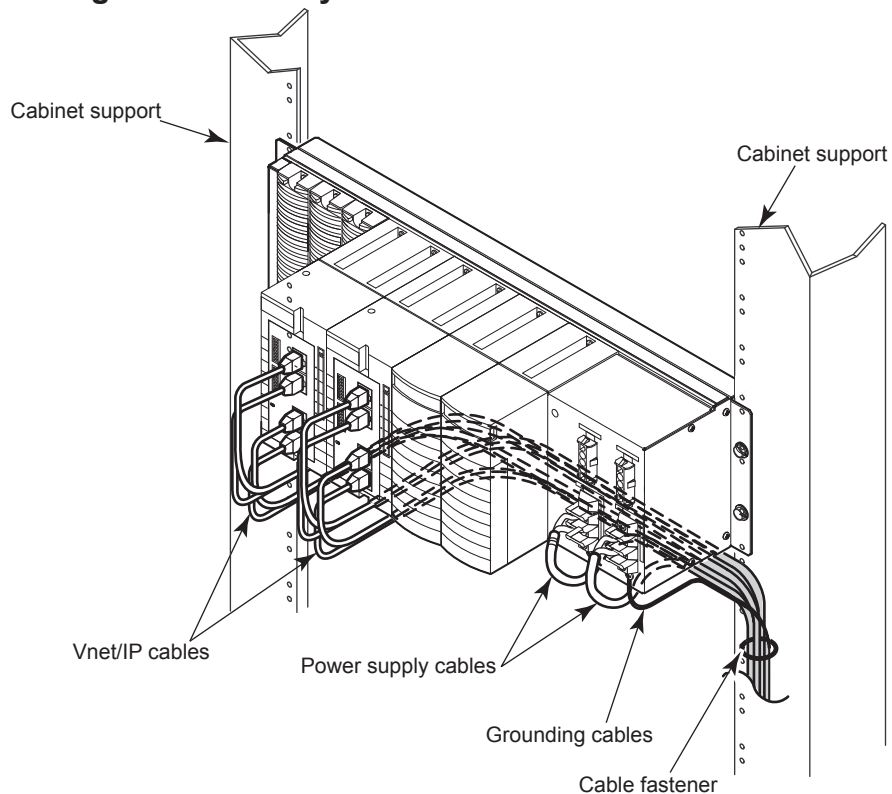


Use a cable fastener to fix the Vnet cable onto the support on the left side of the VC401.

F030904.ai

Figure Cabling Diagram of the AVR10D System

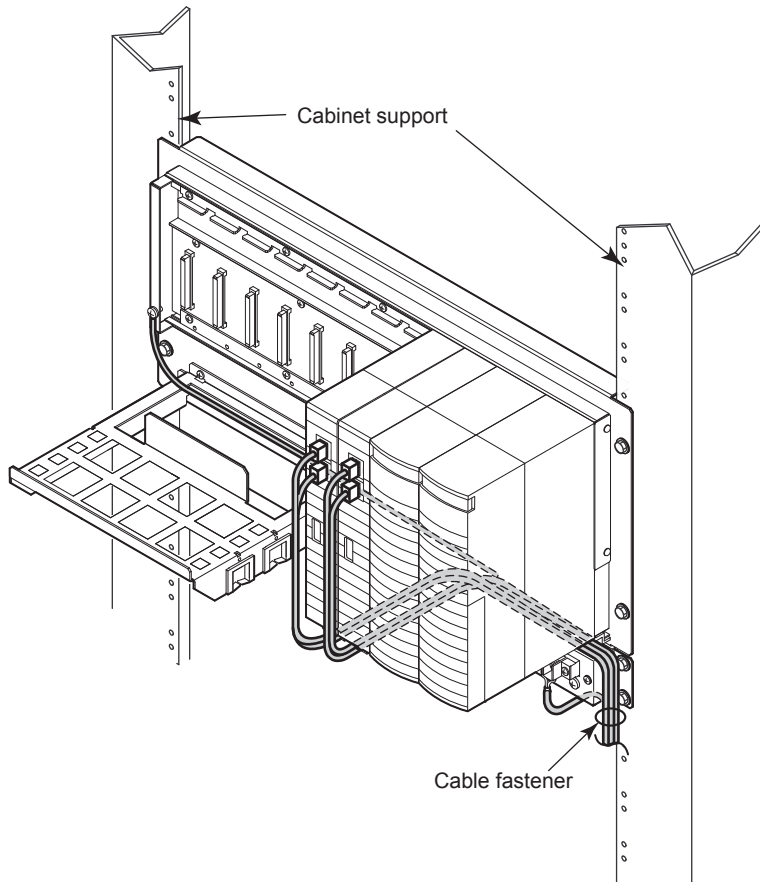
● Cabling for AW810D System



F030905.ai

Figure Cabling Diagram of the AW810D System

- Cabling for AFV30□, A2FV50□, A2FV70□ System

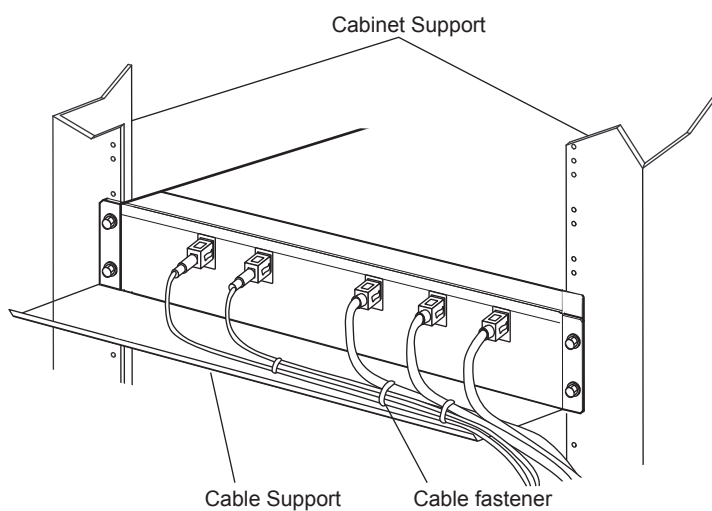


Use a cable fastener to fix cables onto the support.

F030906.ai

Figure Cabling Diagram for the AFV30□, A2FV50□, A2FV70□ System

- Cabling for L2SW/L3SW



Fix cables to cable support by using cable fastener so that their connectors are not exposed to undue stress.

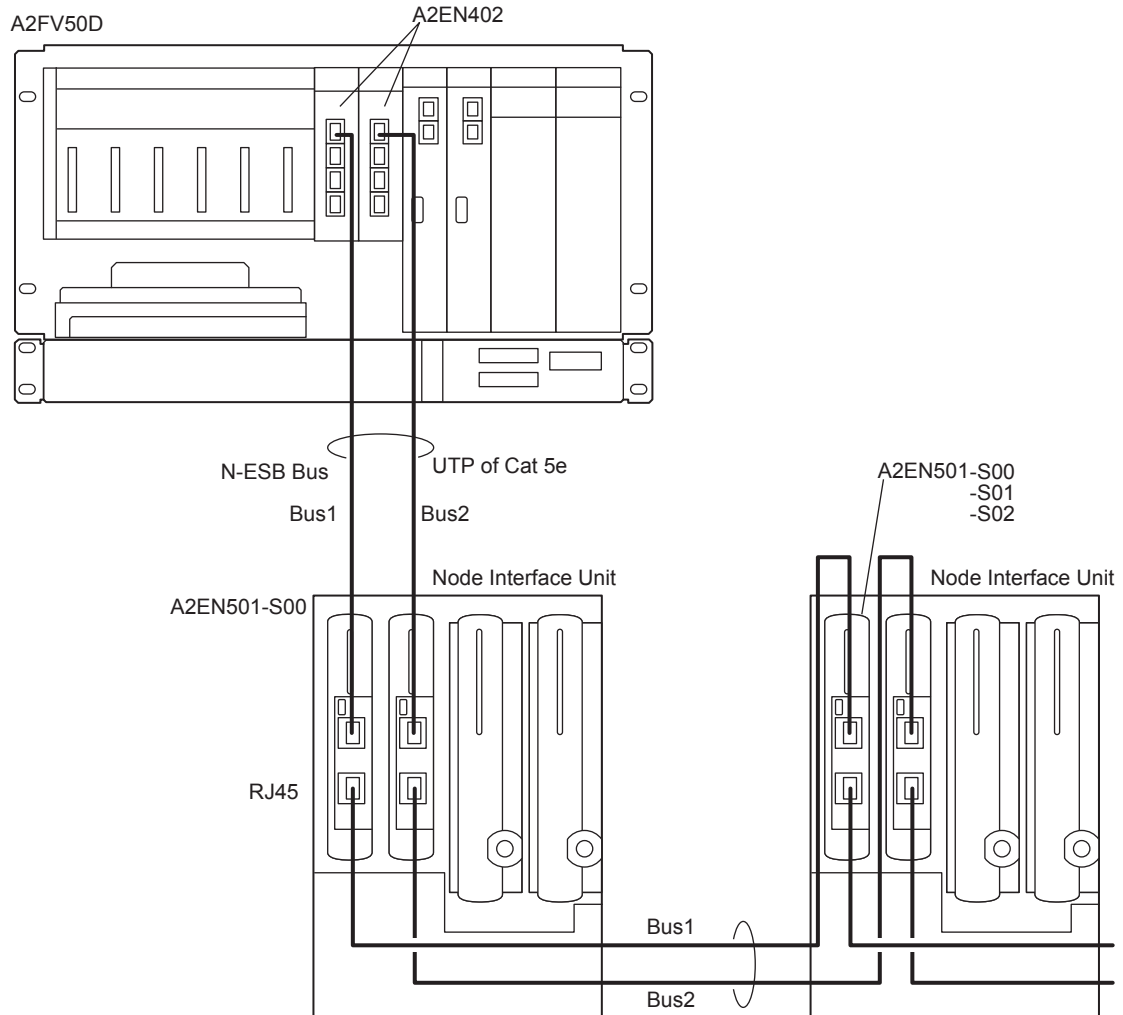
F030907.ai

Figure Vnet/IP Cabling Diagram for the L2SW/L3SW

■ N-ESB Bus (N-IO System)

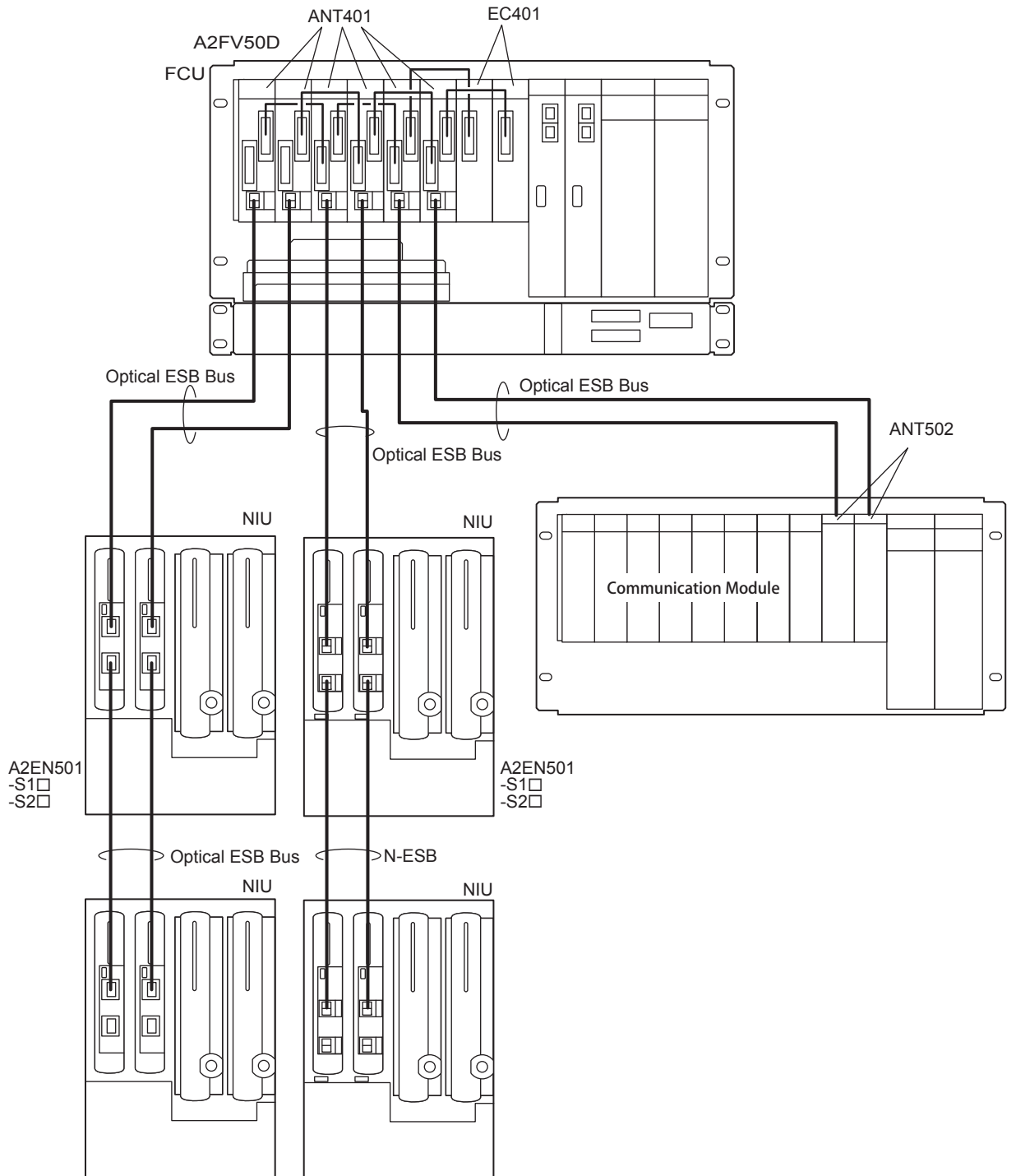
The following figure shows a connection example of the N-ESB bus.

Connect UTP Cable of Cat5e (two) from N-ESB Bus Coupler Module (A2EN402, A2EN404) to N-ESB Bus Module (A2EN501).



F030908.ai

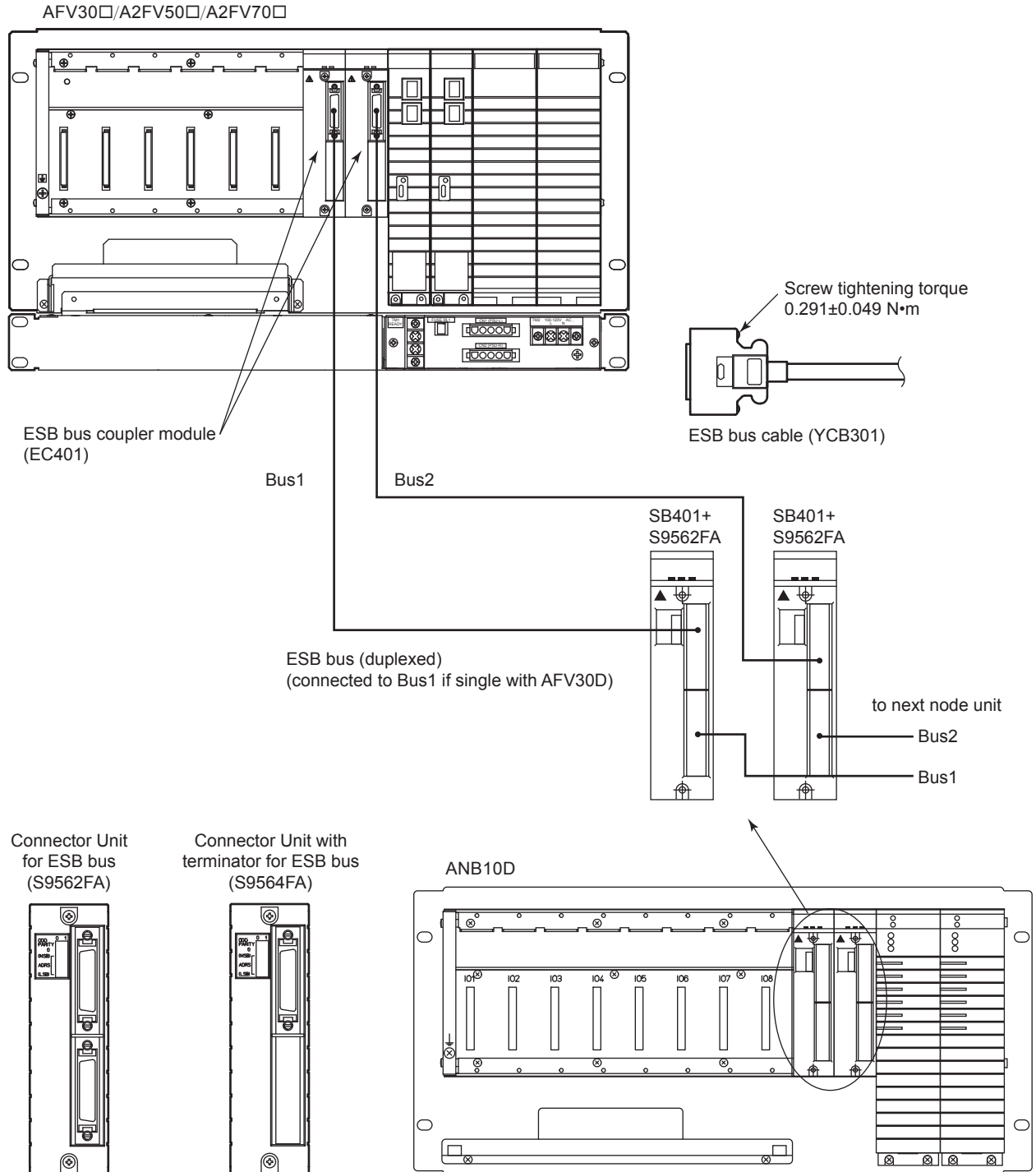
Figure Example of N-ESB Bus Connection



F030909.ai

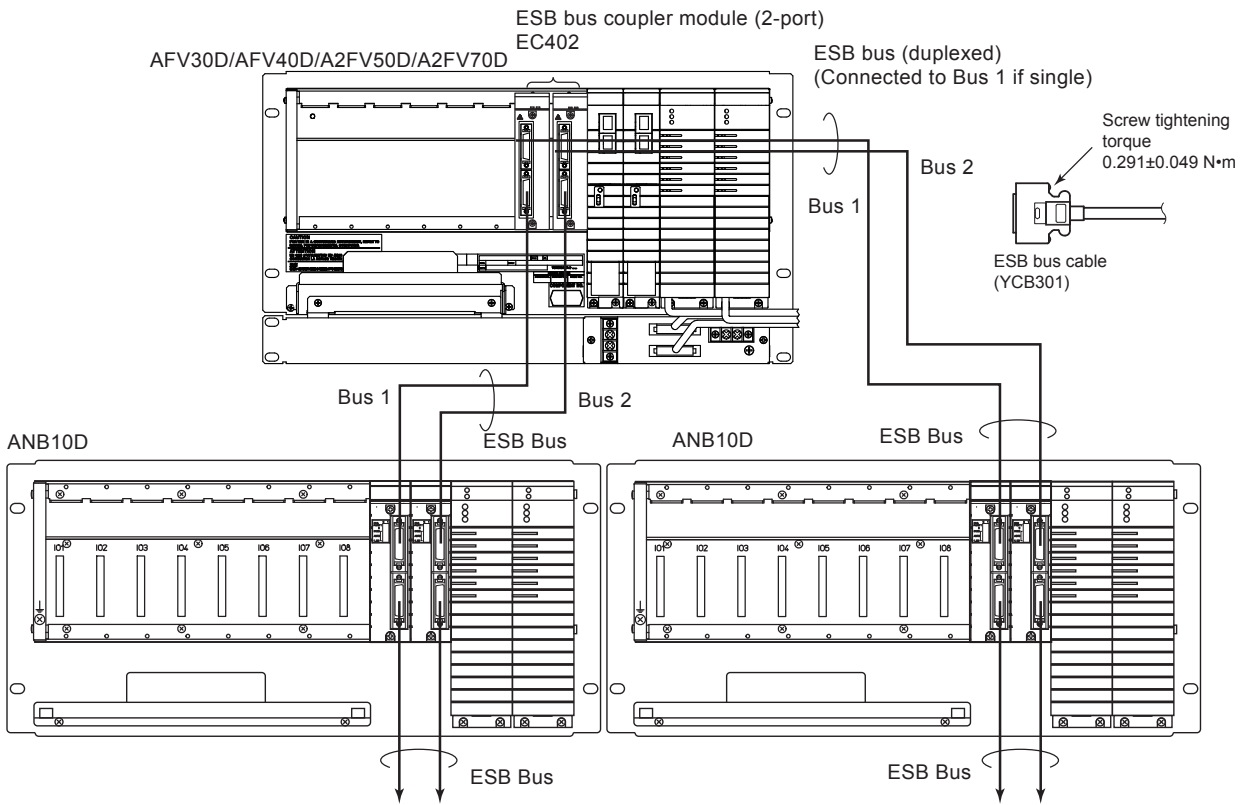
■ ESB Bus

The following is an example of connecting an ESB bus.
 Either ESB bus branching connector or the branching connector that has a built-in ESB bus terminator must be mounted to SB401 installed in ESB bus node unit. If a node unit is connected next, select ESB bus branching connector. If the node unit is the last one, select the branching connector that has a built-in ESB bus terminator.



F030910.ai

Figure ESB bus Connection (Example of FIO Node Expansion /N-IO Communication Node Expansion)

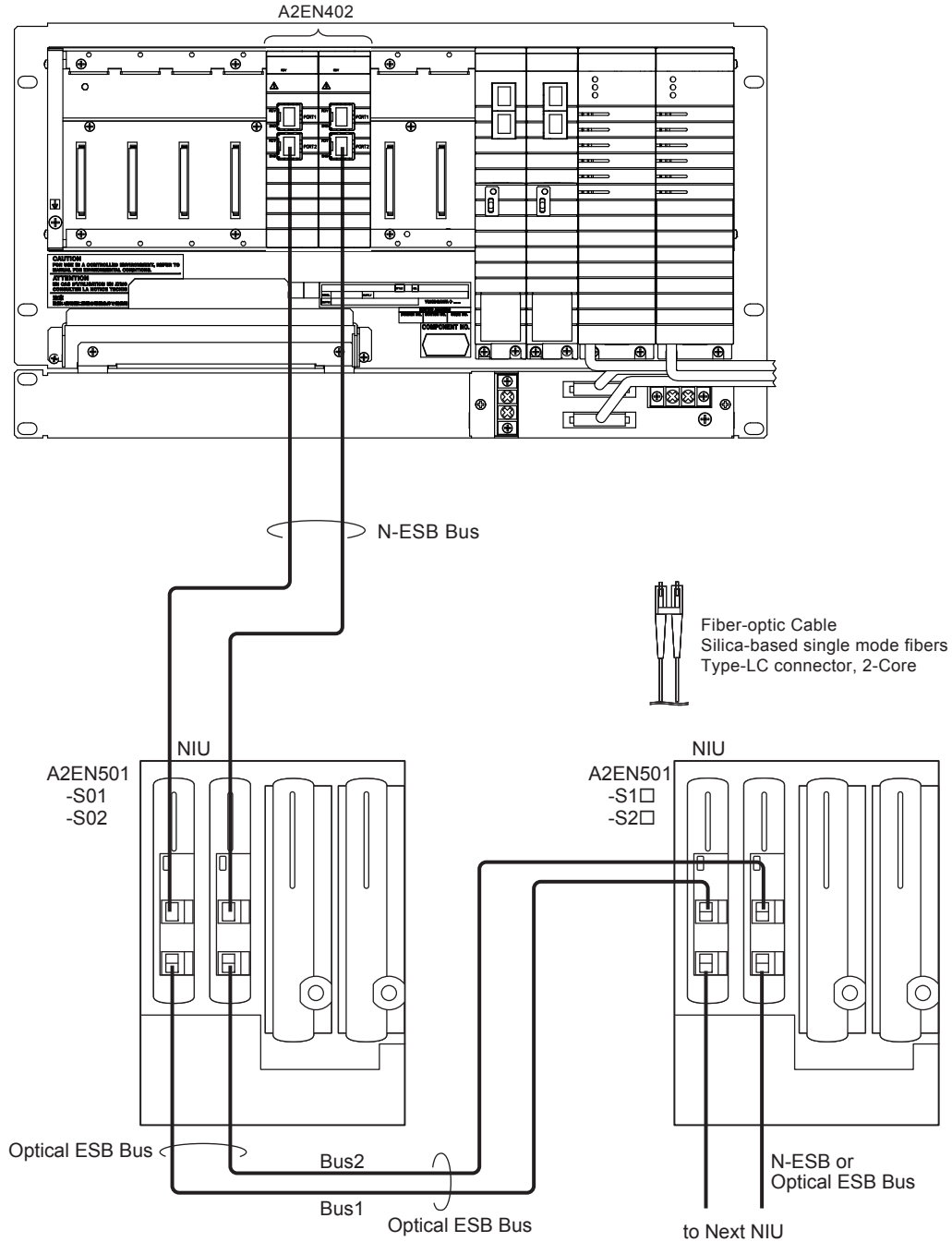


F030911.ai

Figure ESB bus connection (When FIO Node Expansion N-IO Communication Node Expansion)

Optical ESB Bus (N-IO System)

The following figure shows a connection example of the optical ESB Bus of the N-IO system. Use a N-ESB Bus Module (A2EN501) equipped with an optical module to connect between an NIU and NIU

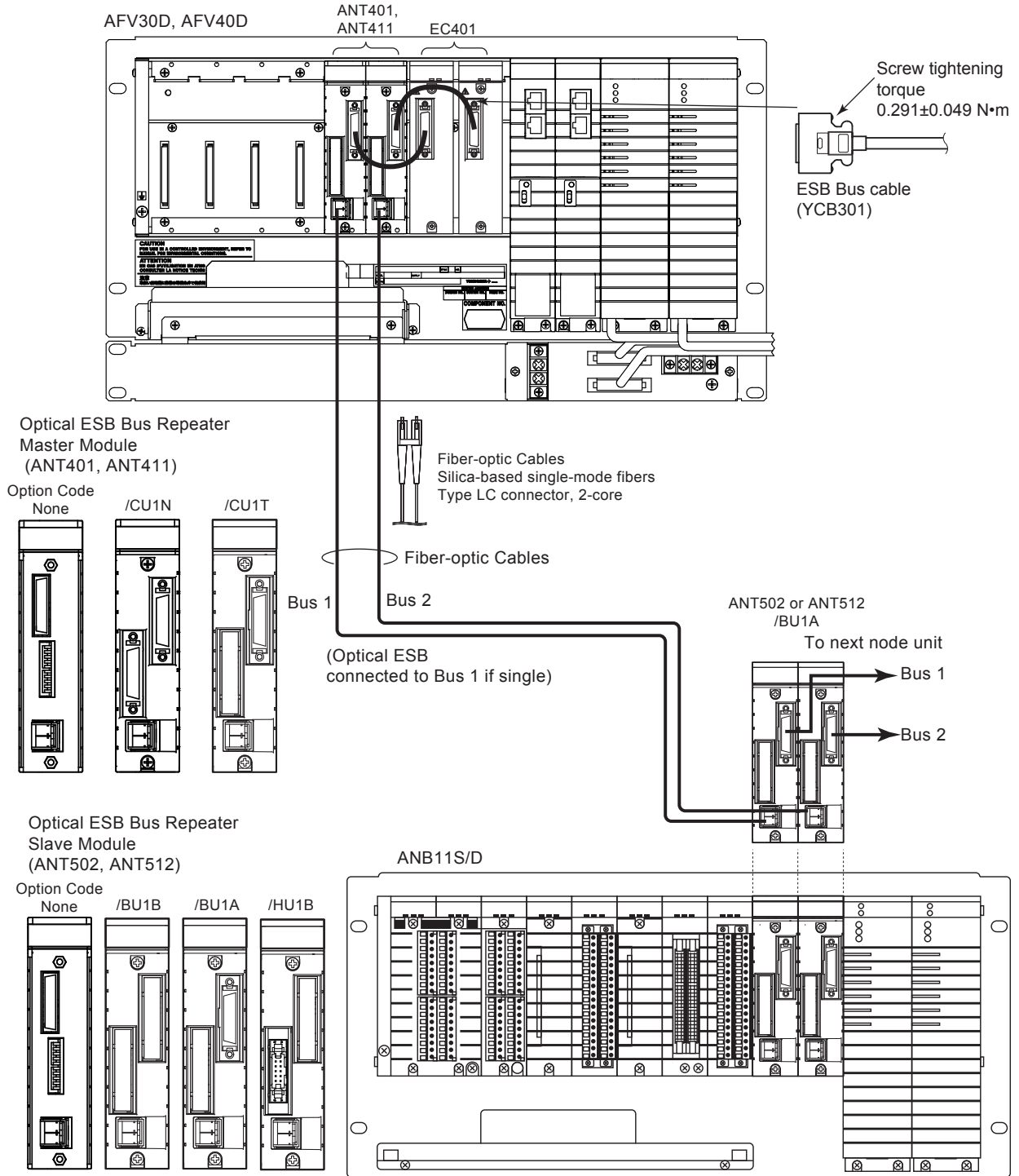


F030912.ai

Figure Optical ESB Bus (N-IO) Connection (When Chain Connection)

Optical ESB Bus (FIO system)

The following figure shows a connection example of the optical ESB bus repeater. The optical ESB bus repeater master module (ANT401/ANT411) is connected to the optical ESB bus repeater slave module (ANT502/ANT512) using a 2-core optical fiber cable. Two 2-core cables are used for dual redundancy.



F030913.ai

Figure Optical ESB bus repeater connection (AFV30D, AFV40D)

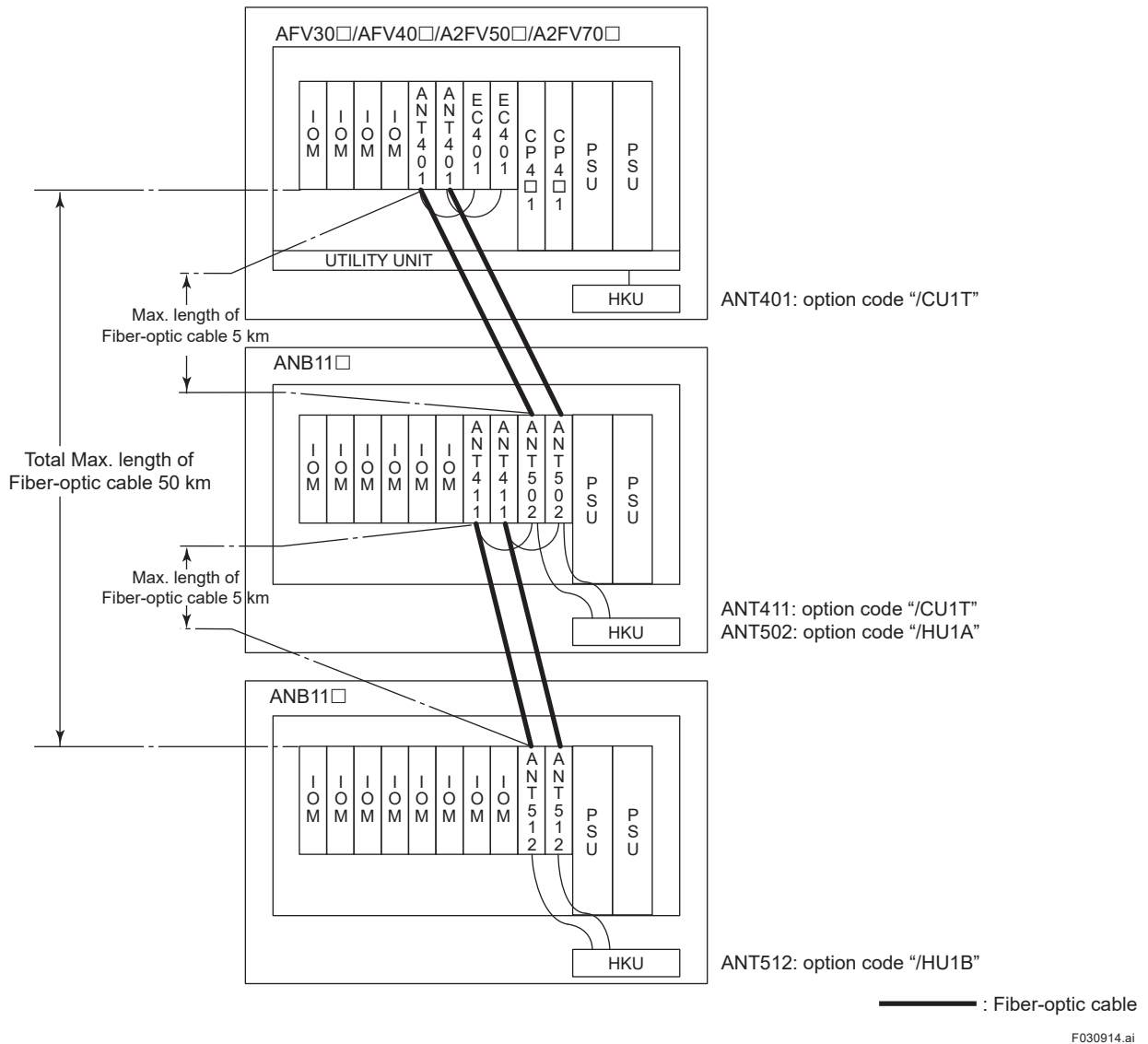
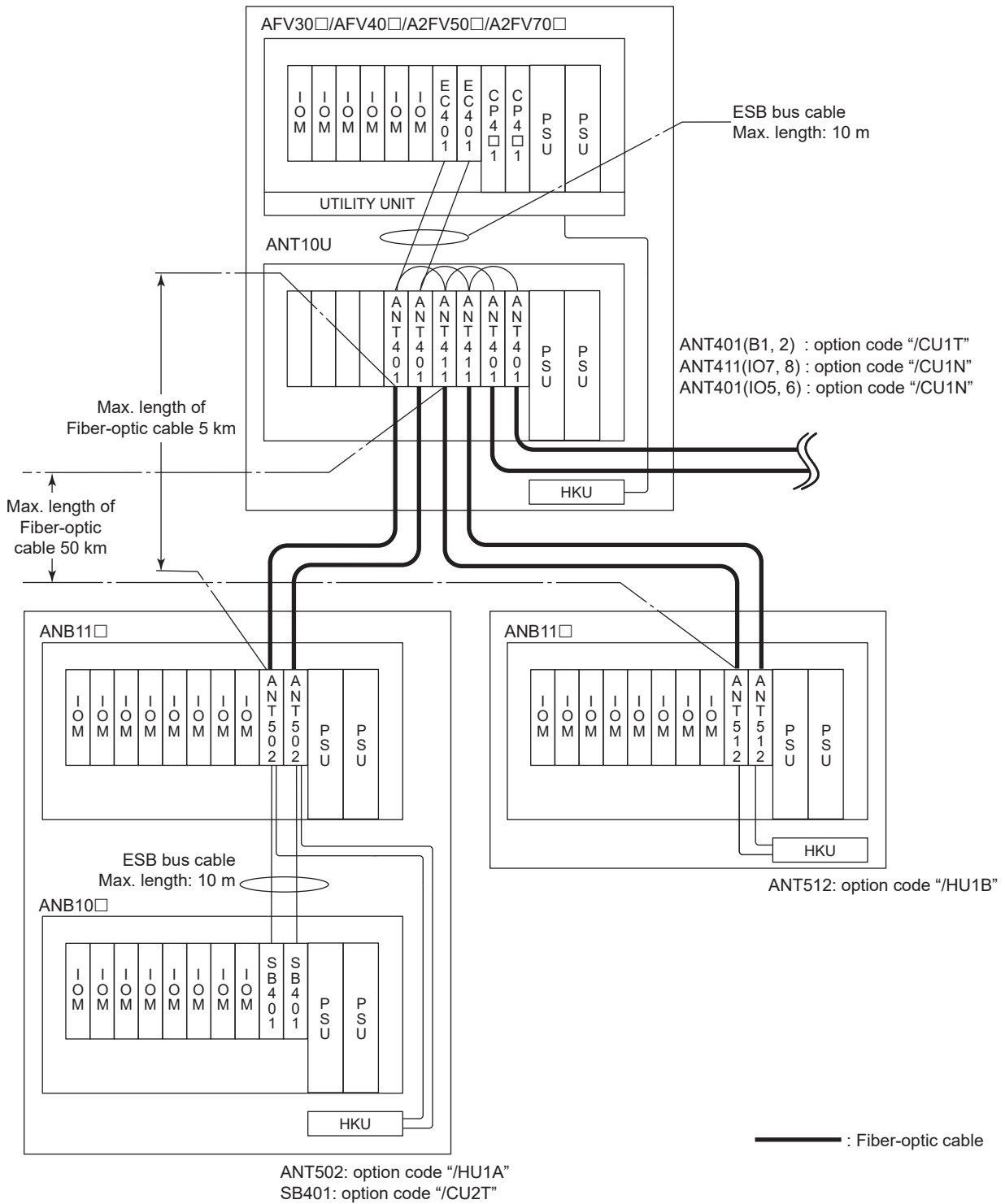


Figure Example of Optical ESB Bus Chain Connection Using HK Function



F030915.ai

Figure Example of Optical ESB Bus Star Connection Using HK Function

● Specifications of Fiber-optic Cables Used in Optical ESB Bus Repeater Modules

The table below shows the specifications of the fiber-optic cables used in optical ESB bus repeater modules.

Table Specifications of Fiber-optic Cables Used in Optical ESB Bus Repeater Modules

Item	Specification
Connector	Type LC connector (IEC 61754-20-compliant product)
Cable	Silica-based single-mode fibers (JIS C6835 SSMA-9.3/125, IEC 60793-2-50B1.1)
Number of cores used	Two

Note: If light attenuation between ANT411 and ANT512 is less than 3 dB, increase attenuation by 3 dB using an attenuator.

The fiber-optic cables should be selected what the rating temperature is the ambient temperature plus 20 °C or more.

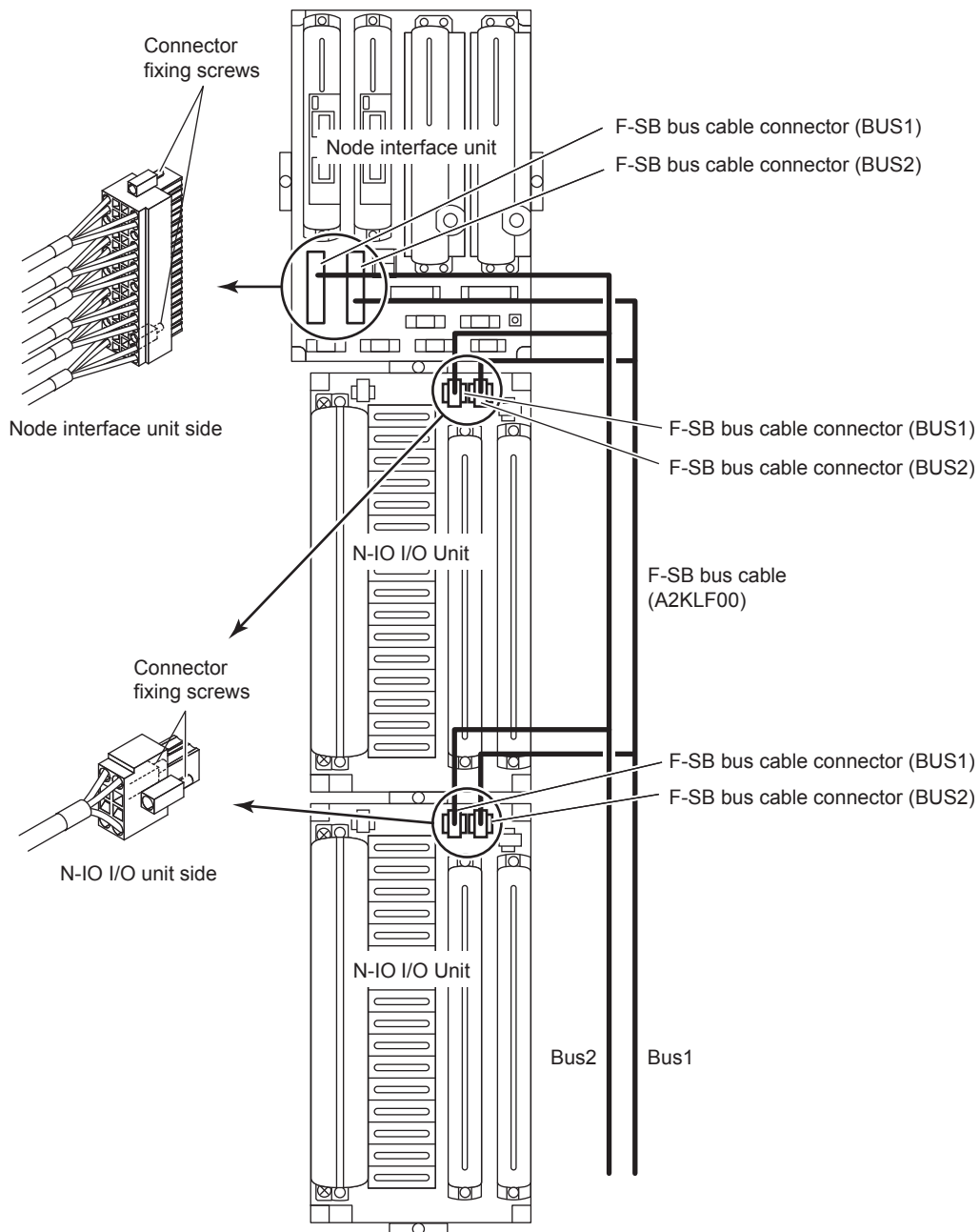
Lay fiber-optic cables according to the manufacturer's cable handling precautions such as allowable bending radius.

Secure and wire the fiber-optic cables so as not to put extra stress on the cable trays in the units listed below:

- Field control unit
- Node Unit
- Unit for optical bus repeater module

■ F-SB Bus (for N-IO Node)

The following figure shows a conne



F030916.ai

Figure F-SB Bus Connection

IMPORTANT

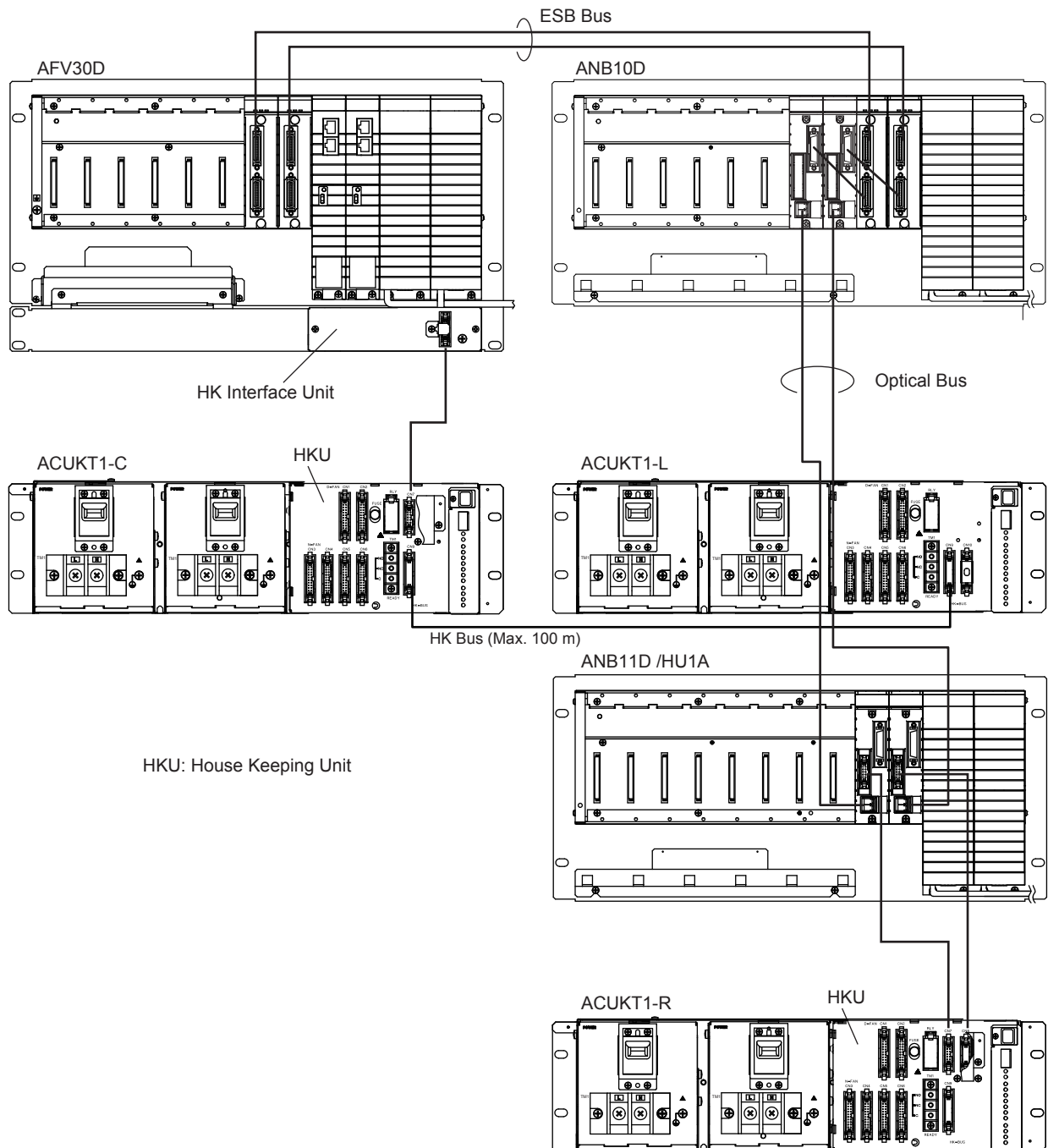
When connecting a F-SB bus cable to N-IO node, ensure to keep the minimum bending radius of the cable.

The minimum bending radius of the F-SB bus cable is six-fold of the diameter of the cable.

3.10 House Keeping Unit Connection (FIO system)

■ Cabinet Utility Kit (ACUKT1)

The following shows an HKU wiring example of the Cabinet Utility Kit (ACUKT1).



F031001.ai

Figure HKU Connection of ACUKT1

3.11 Alarm and Contact Output Cabling

IMPORTANT

To ensure this system compliance with the CSA safety standards, all devices connected to this system shall be CSA certified devices.

■ Status Contact Output Connection

Each CENTUM VP device is provided with a terminal which makes contact output to external if a power failure or processor failure is detected. The output contact rating of each device is shown below.

Table Status Contact Output

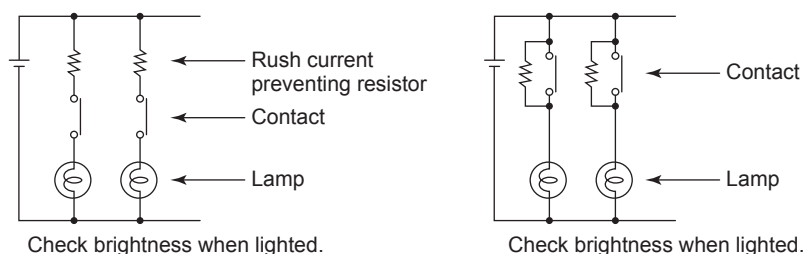
Device	Status Contact Output	Contact Rating
AFV30S/AFV30D (19-inch Rock Mountable Type)	Power and processor failure	30 V DC, 0.3 A
AFV40S/AFV40D (with Cabinet)	Power and processor failure	250 V AC/30 V DC, 2 A, 125 VA
A2FV50S/A2FV50D	Power and processor failure	30 V DC, 0.3 A
A2FV70S/A2FV70D	Power and processor failure	30 V DC, 0.3 A
MHM/MHC	Power	30 V DC, 0.3 A
ACB51	Fan failure	250 V AC/30 V DC, 2 A, 125 VA
ACUKT1 (with AFV30□)	Power and processor failure	250 V AC/30 V DC, 2 A, 125 VA
ACUKT1 (without AFV30□)	Power and processor failure	

■ Use of Lamps

When you want to turn on lamps using contacts, use the following lamps:

- The rated voltage of lamp does not exceed the rated contact voltage.
- When using incandescent lamps, their rush current does not exceed the rated contact current. It is considered to be 10 to 15 times the rated current. If the rush current exceed the rated contact current, use a dim lamp resistor or a rush current preventing resistor. It is recommended to use a dim lamp resistor using 40 to 50 % of the lamp current rating, or a rush current preventing resistor using 80 to 90 % of the lamp current rating. A dim lamp resistor permits detection of lamp failure.

Be sure to test the lamp before installation.



F031101.ai

Figure Examples of Using Lamps

■ Use of Relays

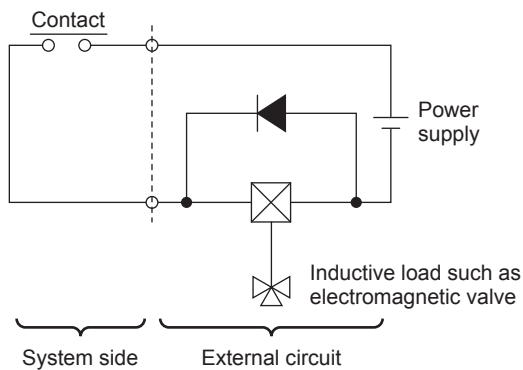
Contact protection and surge absorption can be provided in various manners. When using contacts output to drive relays and solenoids, the following precautions should be taken:

- Install a diode in parallel to induction load for noise prevention and contact protection.
- Use a relay circuit with voltage rating as low as possible for increased reliability.
- Select a diode having a reverse withstand voltage which is 10 times or larger than a circuit voltage and a forward current which exceeds a load current.

IMPORTANT

Relays and solenoids cause reverse electromotive voltages at both coil ends due to inductive load. This phenomenon causes contact damage or noise, leading to device errors and adversely affecting the entire system.

● When a DC Power Supply Is Used

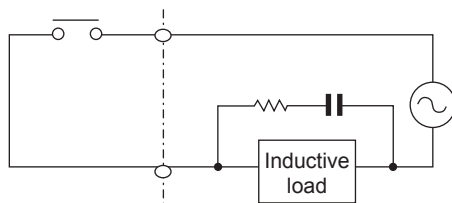


F031102.ai

Figure Example of Using Diode for Contact Protection

● When a AC (or DC) Power Supply Is Used

- Shunt the load with a resistor (R) and a capacitor (C).
- The recovery time increases when using relays or solenoid valves.



F031103.ai

Note: Avoid direct AC voltage input to the contact output terminal on 19-inch rack mountable type.

Figure Example of Capacitor/Resistor-protected Circuit

3.12 Connecting input devices such as operation keyboard

When connecting the input devices such as an operation keyboard, a mouse, or a keyboard, please note the following instructions for wiring.

- Keep signal cables of the input devices and power cables of PCs or LCD monitors physically segregated (do not bundle cables together).
- Do not pull the unlocked type connector with excess strength, or it may get loose.
- When the connector is pulled off for cleaning or something, put it back in to the same port.
- Pulling off an USB connector while it is powered on for replacing the operation keyboard, please note that the system operation and monitoring functions may be interrupted.

4. Installation Specifications

This section summarizes power consumption, in-rush current, breaker ratings, parts durability and other data for the installation of CENTUM VP system.

■ Electrical Specifications

Power consumption (current) and other electrical data are shown below:

Table Electrical Specifications (1/2)

Equipment	Input-voltage range		Max. power consumption (VA, A) (*1)	Heating value J/h (*2)
	Voltage (V AC)	Frequency (Hz)		
AFV30S Field Control Unit	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
AFV30D Duplexed Field Control Unit	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
AFV40S Field Control Unit (at maximum installation of FIO)	100-120	50/60±3	2500 VA	5400 × 10 ³ (1500 W)
	220-240		2860 VA	
	24 V DC		71 A	
AFV40D Duplexed Field Control Unit (at maximum installation of FIO)	100-120	50/60±3	2500 VA	5400 × 10 ³ (1500 W)
	220-240		2860 VA	
	24 V DC		71 A	
A2FV50S 19-inch Rack Mountable Type Field Control Unit for FIO (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
A2FV50D 19-inch Rack Mountable Type Duplexed Field Control Unit for FIO (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
A2FV70S Field Control Unit (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
A2FV70D Field Control Unit (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
ANB10S ESB Bus Node Unit (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
ANB10D Duplexed ESB Bus Node Unit (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
ANB11S Node Unit for Single ESB Bus with Optical Repeater (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	

*1: Power consumption in steady operation is indicated in VA (AC) or A (DC). When power consumption varies according to the installed number of equipment, power consumption by the maximum number of units installed is listed.

*2: Heating value in steady operation is indicated in Joule/hour. When heating value varies according to the installed number of equipment, heating value by the maximum number of units installed is listed.

Table Electrical Specifications (2/2)

Equipment	Input-voltage range		Max. power consumption (VA, A) (*1)	Heating value J/h (*2)
	Voltage (V AC)	Frequency (Hz)		
ANB11D Node Unit for Dual-Redundant ESB Bus with Optical Repeater (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
ANT10U Unit for Optical ESB Bus Repeater Module (at maximum installation of FIO)	100-120	50/60±3	200 VA	432 × 10 ³ (120 W)
	220-240		230 VA	
	24 V DC		5.5 A	
ACB51 I/O Expansion Cabinet (at maximum installation of FIO)	100-120	50/60±3	2500 VA	5400 × 10 ³ (1500 W)
	220-240		2860 VA	
	24 V DC		71 A	
AVR10D Duplexed Vnet Router	100-120	50/60±3	80 VA	158 × 10 ³ (44 W)
	220-240		110 VA	
	24 V DC		1.7 A	
ACUKT1 Cabinet Utility Kit (at maximum installation of FIO)	100-120	50/60±3	2900 VA	6264 × 10 ³ (1740 W)
	220-240		3320 VA	
	24 V DC		82 A	
ACUKT1 Cabinet Utility Kit (excluding node)	100-120	50/60±3	100 VA	216 × 10 ³ (60 W)
	220-240		100 VA	
	24 V DC		5 A	
AW810D Wide Area Communication Router	100-120	50/60±3	80 VA	158 × 10 ³ (44 W)
	220-240		110 VA	
	24 V DC		1.7 A	
A2NN10D Node Interface Unit	100-240	50/60±3	VA	98 × 10 ³ (27 W)
	24 V DC		W	
A2NN30D Node Interface Unit	100-240	50/60±3	190 VA	98 × 10 ³ (27 W)
	24 V DC		150 W	
A2PW503 Power Supply Unit	100-240	50/60±3	165 VA	54 × 10 ³ (15 W)
A2PW504 Power Supply Unit	24 V DC		150 W	
A2BN3D Base Plate for Adaptor	24 V DC		8 A	51 × 10 ³ (14 W)
A2BN4D Base Plate for Barrier (MTL) System Power	24 V DC		24 W	51 × 10 ³ (14 W)
A2BN4D Base Plate for Barrier (MTL) Barrier Power	24 V DC		38.4 W	83 × 10 ³ (23 W)
A2BN5D Base Plate for Barrier (P+F) System Power	24 V DC		24 W	51 × 10 ³ (14 W)
A2BN5D Base Plate for Barrier (P+F) Barrier Power	24 V DC		28.8 W	58 × 10 ³ (16 W)

*1: Power consumption in steady operation is indicated in VA (AC), A (DC) or W (DC). When power consumption varies according to the installed number of equipment, power consumption by the maximum number of units installed is listed.

*2: Heating value in steady operation is indicated in Joule/hour. When heating value varies according to the installed number of equipment, heating value by the maximum number of units installed is listed.

■ Actual Power-On In-Rush Current of Each Component

Actual in-rush current data measured for each component is listed below:

Table System Equipment Power-On In-Rush Current

Model		In-Rush current (A)		In-Rush current (A)		In-Rush current (A)	
		100 V AC		220 V AC		24 V DC	
		Primary	Secondary	Primary	Secondary	Primary	Secondary
AFV30S	FCU (rack mountable type)	62	5	124	5	30	23
AFV30D	Duplexed FCU (rack mountable type)	62	5	124	5	30	23
AFV40S	FCU with Cabinet (with Maximum no. of node units installed)	344	180	540	132	120	170
AFV40D	FCU with Cabinet (with Maximum no. of node units installed)	344	180	540	132	120	170
A2FV50S	FCU (19-inch rack mountable type)	62	5	124	5	30	23
A2FV50D	Duplexed FCU (19-inch rack mountable type)	62	5	124	5	30	23
A2FV70S/D	FCU (rack mountable type)	62	5	124	5	30	23
AVR10D	Duplexed V net router	47	1	48	0.5	10	2
ACB51	I/O Expansion Cabinet (With maximum no. of node units installed)	344	180	540	132	120	170
ANB10S/D	Node Unit for ESB Bus	62	5	124	5	30	23
ANB11S/D	Optical ESB Bus Node Unit	62	5	124	5	30	23
AVR10D	Duplexed V net Router	47	1	48	0.5	10	2
AW810D	Wide Area Communication Router	47	1	48	0.5	10	2
A2NN10D	Node Interface Unit	40	—	80	—	60	—
A2NN30D	Node Interface Unit	40	—	80	—	60	—
A2PW503	Power Supply Unit (100-240 V AC)	20	—	40	—	—	—
A2PW504	Power Supply Unit (24 V DC)	—	—	—	—	30	—

—: There are no specifications.

Input current peak values and waveforms, influenced by input impedance, varies with system configurations, line sharing with other systems, and other factors. The rush current data shown above were measured under predetermined conditions (see below). Please note that the values are subject to change.

The power input circuit, with an in-rush current limiting circuit, restrains primary in-rush current, turning any current exceeding the limit to secondary and successive rush current.

● Measurement Conditions

Input voltage: 132/264 V AC, 50 Hz, and 24 V DC

Power line impedance: Approx. 0.4 ohms (external line and internal impedance)

Turn-on timing: At 50 Hz, 90° or 5 ms after the AC zero-crossing point

(60 Hz data are almost identical to the 50 Hz data shown above.)

Measurement: The primary peak and secondary peak are measured after turn-on.

● Note

- The timing of the maximum primary/secondary in-rush current varies with devices.
- The restart in-rush current after a momentary power failure exceeds the above data and its timing is also different.
- For a system composed of multiple pieces of equipment, the in-rush current is normally smaller than the total of the in-rush currents by individual pieces of equipment.

■ Maximum Power Consumption of FIO

Table Maximum Power Consumption of FIO (1/3)

Model name	Name	Max. current consumption 5 V DC (mA)	Max. current consumption 24 V DC (mA)
Bus Interface Module (FIO system) (N-IO system)			
EB401	ER Bus Interface Master Module	700	–
EC401	ESB Bus Coupler Module	500	–
EC402	ESB Bus Coupler Module (for AFV30□/AFV40□, 2-Port)	500	–
A2EN402	N-ESB Bus Coupler Module (for N-IO, 2-Port)	500	–
A2EN404	N-ESB Bus Coupler Module (for N-IO, 4-Port)	500	–
ANT401	Optical ESB Bus Repeater Master Module 5 km (for AFV30□/AFV40□)	500	–
ANT411	Optical ESB Bus Repeater Master Module 5 - 50 km (for AFV30□/AFV40□)	500	–
ANT502	Optical ESB Bus Repeater Slave Module 5 km (for AFV30□/AFV40□)	500	–
ANT512	Optical ESB Bus Repeater Slave Module 5 - 50 km (for AFV30□/AFV40□)	500	–
Analog I/O Modules (FIO system) (*1)			
AAI141	Analog Input Module (4 to 20 mA, 16-channel, Non-Isolated)	310	450
AAV141	Analog Input Module (1 to 5 V, 16-channel, Non-Isolated)	350	–
AAB141	Analog Input Module (1 to 5 V / 4 to 20 mA, 16-channel, Non-Isolated)	480	120
AAI841	Analog I/O Module (4 to 20 mA, 8-channel Input / 8-channel Output, Non-Isolated)	310	500
AAB841	Analog I/O Module (1 to 5 V Input, 4 to 20 mA Output, 8-channel Input / 8-channel Output, Non-Isolated)	310	250
AAB842	Analog I/O Module (1 to 5 V / 4 to 20 mA Input, 4 to 20 mA Output, 8-channel Input / 8-channel Output, Non-Isolated)	410	290
AAI143	Analog Input Module (4 to 20 mA, 16-channel, Isolated)	230	540
AAI543	Analog Output Module (4 to 20 mA, 16-channel, Isolated)	230	540
AAV144	Analog Input Module (-10 to +10 V, 16-channel, Isolated)	500	–
AAV544	Analog Output Module (-10 to +10 V, 16-channel, Isolated)	860	–
AAI135	Analog Input Module (4 to 20 mA, 8-channel, Isolated Channels)	360	450
AAI835	Analog I/O Module (4 to 20 mA, 4-channel Input/4-channel Output, Isolated Channels)	360	450
AAT145	TC/mV Input Module (TC: R, J, K, E, T, B, S, N/mV: -100 to 150 mV, 16-channel, Isolated Channels)	350	–
AAR145	RTD/POT Input Module (RTD: Pt100 ohm/POT: 0 to 10 kohm, 16-channel, Isolated Channels)	350	–
AAP135	Pulse Input Module (8-channel, Pulse Count, 0 to 10 kHz, Isolated Channels)	300	400
AAP149	Pulse Input Module for Compatible PM1 (16-channel, Pulse Count, 0 to 6 kHz, Non-Isolated)	400	–
AAP849	Pulse Input/Analog Output Module for compatible PAC (Pulse count Input, 4 to 20mA Output, 8-channel Input/8-channel Output, Non-Isolated)	310	250

*1: Except for suffix code of -□□□, and -□□□.

Table Maximum Power Consumption of FIO (2/3)

Model name	Name	Max. current consumption 5 V DC (mA)	Max. current consumption 24 V DC (mA)
Digital I/O Modules (FIO system) (*1)			
ADV151	Digital Input Module (32-channel, 24 V DC)	500	–
ADV551	Digital Output Module (32-channel, 24 V DC)	700	–
ADV161	Digital Input Module (64-channel, 24 V DC)	550	–
ADV561	Digital Output Module (64-channel, 24 V DC)	780	–
ADV859	Digital I/O Module for Compatible ST2 (16-channel Input/16-channel Output, Isolated Channels)	450	–
ADV159	Digital Input Module for Compatible ST3 (32-channel Input, Isolated Channels)	330	–
ADV559	Digital Output Module for Compatible ST4 (32-channel Output, Isolated Channels)	570	–
ADV869	Digital I/O Module for Compatible ST5 (32-channel Input/32-channel Output, Common Minus Side Every 16-channel)	800	–
ADV169	Digital Input Module for Compatible ST6 (64-channel Input, Common Minus Side Every 16-channel)	800	–
ADV569	Digital Output Module for Compatible ST7 (64-channel Output, Common Minus Side Every 16-channel)	800	–
Communication Modules (FIO system) (N-IO system)			
ALR111	RS-232C Communication Module (2-Port, 1200 bps to 115.2 kbps)	500	–
ALR121	RS-422/RS-485 Communication Module (2-Port, 1200 bps to 115.2 kbps)	500	–
ALE111	Ethernet Communication Module (1-Port, 10 Mbps)	500	–
ALF111	Foundation Fieldbus (FF-H1) Communication Module (4-Ports, 31.25 kbps)	500	–
ALP121	PROFIBUS-DP Communication Module (1-Port, 9600 bps to 12 Mbps)	700	–
A2LP131	PROFINET Communication Module (1-Port, 100 Mbps)	800	–
Analog I/O Modules with Built-in Barrier			
ASI133	Analog Input Module (4 to 20 mA, 8-channel, Isolated)	150	450
ASI533	Analog Output Module (4 to 20 mA, 8-channel, Isolated)	150	350
AST143	TC/mV Input Module (TC: B, E, J, K, N, R, S, T / mV: -100 to 150 mV, -50 to 75 mV, 16-channel, Isolated)	150	80
ASR133	RTD/POT Input Module (RTD: Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni200, Ni120 / POT: 0 to 10 kΩ, 8-channel, Isolated)	150	60
Digital I/O Modules with Built-in Barrier			
ASD143	Digital Input Module (16-channel, NAMUR compatible, Isolated)	150	110
ASD533	Digital Output Module (8-channel, Isolated)	150	500
Turbomachinery I/O Modules			
AGS813	Servo Module (Isolated)	500	–
AGP813	High Speed Protection Module (Isolated)	900	–

*1: Except for suffix code of -□K□, -□M□, and -□Y□.

Table Maximum Power Consumption of FIO (3/3)

Model name		Name	Max. current consumption 5 V DC (mA)	Max. current consumption 24 V DC (mA)
Analog I/O Modules (for RIO System Upgrade)				
AAB841	-□K□	Analog I/O Module (1 to 5 V Input, 4 to 20 mA Output, 8-channel Input / 8-channel Output, Non-Isolated)	–	330
AAI143	-□M□	Analog Input Module (4 to 20 mA, 16-channel, Isolated)	–	600
AAI543	-□M□	Analog Output Module (4 to 20 mA, 16-channel, Isolated)	–	680
AAV144	-□K□ -□M□	Analog Input Module (-10 to +10 V, 16-channel, Isolated)	–	130
AAT145	-□K□ -□M□	Analog Input Module (-10 to +10 V, 16-channel, Isolated)	–	130
AAR145	-□K□ -□M□	RTD/POT Input Module (RTD: Pt100 ohm/POT: 0 to 10 kohm, 16-channel, Isolated Channels)	–	120
Digital I/O Modules (for RIO System Upgrade)				
ADV159	-□K□	Digital Input Module for Compatible ST3 (16-channel Input, Isolated Channels)	–	120
	-□M□		–	300
	-□Y□		–	300
ADV559	-□K□	Digital Output Module for Compatible ST4 (32-channel Output, Isolated Channels)	–	130
	-□M□		–	410
	-□Y□		–	410
ADV169	-□K□ -□M□	Digital Input Module for Compatible ST6 (32-channel Input, Common Minus Side Every 16-channel)	–	170
ADV569	-□K□ -□M□	Digital Output Module for Compatible ST7 (64-channel Output, Common Minus Side Every 16-channel)	–	190

■ Maximum Power Consumption of N-IO

Mode	Name	Max current consumption 24 V DC (A)
A2BN3D	Base Plate for Adaptor (Field Power Supply)	8 A
A2BN4D	Base Plate for Barrier (Barrier Power Supply)	1.6 A
A2BN5D	Base Plate for Barrier (Barrier Power Supply)	1.2 A

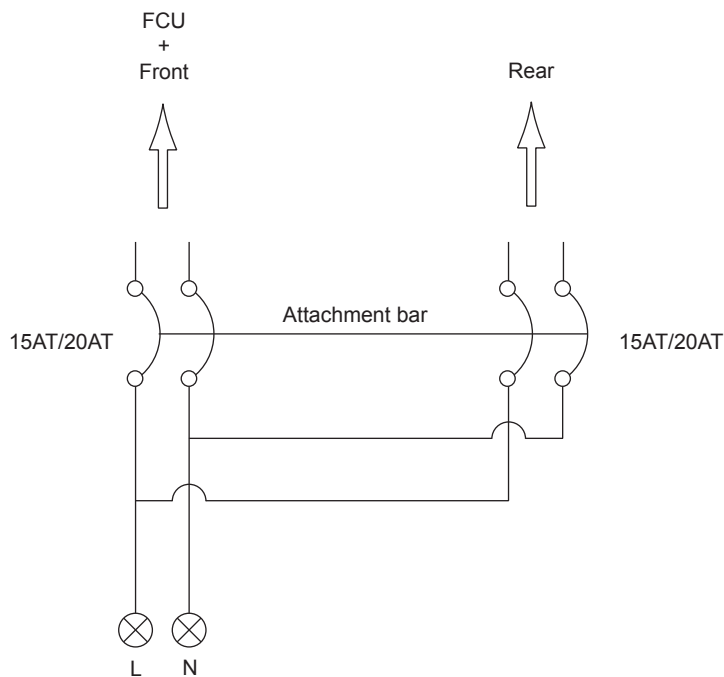
■ Breaker Specifications

Breaker ratings are listed below:

Table Breaker Ratings

Equipment	Built-in breaker rating (A/V)	External breaker rating (Recommend) (A/V) (*1)
A2FV50S/A2FV50D field control unit (100 V AC, 220 V AC)	6.3/250 (fuse)	15/250
A2FV50S/A2FV50D field control unit (24 V DC)	10/250 (fuse)	20/250
A2FV70S/A2FV70D field control unit (100 V AC, 220 V AC)	6.3/250 (fuse)	15/250
A2FV70S/A2FV70D field control unit (24 V DC)	10/250 (fuse)	20/250
ANB10S/10D ESB bus node unit (100 V,220 V AC)	6.3/250 (fuse)	15/250
ANB10S/10D ESB bus node unit (24 V DC)	10/250 (fuse)	20/250
AFV30S/D field control unit (100 V AC system)	6.3/250 (fuse)	15/250
AFV30S/D field control unit (220 V AC system)	6.3/250 (fuse)	15/250
AFV30S/D field control unit (24 V DC)	10/250 (fuse)	20/250
AFV40S/D field control unit (100 V AC system)	20/250 (two)	50/250
AFV40S/D field control unit (220 V AC system)	20/250 (two)	50/250
AFV40S/D field control unit (24 V DC)	30/24 (three)	100/24
ACB51 I/O expansion cabinet (100 V AC system)	20/250 (two)	50/250
ACB51 I/O expansion cabinet (220 V AC system)	20/250 (two)	50/250
ACB51 I/O expansion cabinet (24 V DC)	30/24 (three)	100/24
ANB11S/D Optical ESB bus node unit (100 V AC system)	6.3/250 (fuse)	15/250
ANB11S/D Optical ESB bus node unit (220 V AC system)	6.3/250 (fuse)	15/250
ANB11S/D Optical ESB bus node unit (24 V DC)	10/250 (fuse)	20/250
ANT10U Unit for optical ESB bus repeater module (100 V AC system)	6.3/250 (fuse)	15/250
ANT10U Unit for optical ESB bus repeater module (220 V AC system)	6.3/250 (fuse)	15/250
ANT10U Unit for optical ESB bus repeater module (24 V DC)	10/250 (fuse)	20/250
ACUKT1 Cabinet utility kit (100 V AC system)	20/250 (fuse)	50/250
ACUKT1 Cabinet utility kit (220 V AC system)	20/250 (fuse)	50/250
ACUKT1 Cabinet utility kit (24 V DC)	30/24 (three)	100/24
AVR10D Duplexed V net router (100 V AC system)	3.15/250 (fuse)	10/250
AVR10D Duplexed V net router (220 V AC system)	3.15/250 (fuse)	10/250
AVR10D Duplexed V net router (24 V DC)	6.3/250 (fuse)	15/250
AW810D Wide Area Communication Router (100 V AC system)	3.15/250 (fuse)	10/250
AW810D Wide Area Communication Router (220 V AC system)	3.15/250 (fuse)	10/250
AW810D Wide Area Communication Router (24 V DC)	6.3/250 (fuse)	15/250
A2NN10D Node Interface Unit (100-240 V AC system)	5/250 (fuse)	15/250
A2NN10D Node interface Unit (24 V DC)	12/250 (fuse)	30/24
A2NN30D Node Interface Unit (100-240 V AC system)	5/250 (fuse)	15/250
A2NN30D Node interface Unit (24 V DC)	12/250 (fuse)	30/24
A2PW503 Power Supply Unit (100-240 V AC system)	5/250	15/250
A2PW504 Power Supply Unit (24 V DC)	12/250	30/24
A2BN4D Base Plate for Barrier (MTL): Barrier Power Input (24 V DC)	2.5/250 (fuse)	—
A2BN5D Base Plate for Barrier (P+F): Barrier Power Input (24 V DC)	2/250 (fuse)	—

*1: Recommended.



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Figure Breaker

■ Parts Durability

Some parts require periodical replacements. For preventative maintenance, the recommended intervals to replace parts with life span of less than 10 years are shown in the table below.

Users can replace parts indicated by “Yes” in the “user replacement”. For other parts, contact Yokogawa for replacement.

There can be some parts having defined life spans in resale material mounted to a console kit. If that is the case, replace the parts according to a manual of resale material.

The average ambient temperature shown in the table is the average temperature surrounding the corresponding parts.

When the parts are installed in a cabinet of Yokogawa product, though varies with actual installations, in general, the temperature inside of the cabinet is about 10 °C higher than the temperature outside the cabinet.

Note: Random failures within the recommended replacement intervals may occur in some parts.

IMPORTANT

The reliability and life span of electronic equipment greatly depend on the operating environment. It is essential for ensuring reliable operation and prolonged life span that the equipment is used not only within the range of environment resistance standards but also in a more satisfactory environment. For instance, if a piece of equipment is always used at 35 °C when its operating temperature ranges from 5 to 40 °C, generally its resulting in a reduced life span compared with operation at 25 °C.

If corrosive gas is present in the environment, the corrosion of the equipment’s contacts and printed circuit boards is accelerated more than in a cleaner environment, resulting in a reduced life span. Moreover, if dust can be easily generated in the environment, filters must be cleaned and replaced more often.

- **AIP830, AIP831**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
AIP830	AIP830	–	Yes	Depends on frequency of use.
AIP831	AIP831	–	Yes	Depends on frequency of use.

- **AFV30□**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power supply module	PW481	8 years	Yes	100 - 120 V AC: Average ambient temperature 40 °C or less
	PW482	8 years	Yes	220 - 240 V AC: Average ambient temperature 40 °C or less
	PW484	8 years	Yes	24 V DC: Average ambient temperature 40 °C or less
Battery Pack	S9548FA	3 years	Yes	Average ambient temperature 30 °C or less
		1.5 years	Yes	Average ambient temperature 40 °C or less
		9 months	Yes	Average ambient temperature 50 °C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	No	100 V AC: Average ambient temperature 40 °C or less
	(PW482)	8 years	No	220 V AC: Average ambient temperature 40 °C or less
	(PW484)	8 years	No	24 V DC: Average ambient temperature 40 °C or less
Built-in power fuse	—	8 years	No	For PW481, PW482, PW484

- **A2FV50□**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power supply module	PW481	8 years	Yes	100 - 120 V AC: Average ambient temperature 40 °C or less
	PW482	8 years	Yes	220 - 240 V AC: Average ambient temperature 40 °C or less
	PW484	8 years	Yes	24 V DC: Average ambient temperature 40 °C or less
Battery Pack	S9548FA	3 years	Yes	Average ambient temperature 30 °C or less
		1.5 years	Yes	Average ambient temperature 40 °C or less
		9 months	Yes	Average ambient temperature 50 °C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	No	100 V AC: Average ambient temperature 40 °C or less
	(PW482)	8 years	No	220 V AC: Average ambient temperature 40 °C or less
	(PW484)	8 years	No	24 V DC: Average ambient temperature 40 °C or less
Built-in power fuse	—	8 years	No	For PW481, PW482, PW484

- **A2FV70□**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power supply module	PW481	8 years	Yes	100 - 120 V AC: Average ambient temperature 40 °C or less
	PW482	8 years	Yes	220 - 240 V AC: Average ambient temperature 40 °C or less
	PW484	8 years	Yes	24 V DC: Average ambient temperature 40 °C or less
Battery Pack	S9548FA	3 years	Yes	Average ambient temperature 30 °C or less
		1.5 years	Yes	Average ambient temperature 40 °C or less
		9 months	Yes	Average ambient temperature 50 °C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	No	100 V AC: Average ambient temperature 40 °C or less
	(PW482)	8 years	No	220 V AC: Average ambient temperature 40 °C or less
	(PW484)	8 years	No	24 V DC: Average ambient temperature 40 °C or less
Built-in power fuse	—	8 years	No	For PW481, PW482, PW484

- **AVR10D, AW810D**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power supply module	PW441	8 years	Yes	100 - 120 V AC: Average ambient temperature 40 °C or less
	PW442	8 years	Yes	220 - 240 V AC: Average ambient temperature 40 °C or less
	PW444	8 years	Yes	24 V DC: Average ambient temperature 40 °C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW441)	8 years	No	100 V AC: Average ambient temperature 40 °C or less
	(PW442)	8 years	No	220 V AC: Average ambient temperature 40 °C or less
	(PW444)	8 years	No	24 V DC: Average ambient temperature 40 °C or less
Built-in power fuse	—	8 years	No	For PW441, PW442, PW444

● AFV40□, ACB51

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Used in:		Replacement by user	Remarks
			AFV40□	ACB51		
Power Supply Module (100-120 V AC)	PW481	8 years	x	x	Yes	Average ambient temperature 40°C or less
Power Supply Module (220-240 V AC)	PW482	8 years	x	x	Yes	Average ambient temperature 40°C or less
Power Supply Module (24 V DC)	PW484	8 years	x	x	Yes	Average ambient temperature 40°C or less
Power Supply Unit for Fan (100-120 V AC, 220-240 V AC)	S9618FA	8 years	x	x	Yes	Average ambient temperature 40°C or less
Power Supply Unit for Fan (24 V DC)	S9619FA	8 years	x	x	Yes	Average ambient temperature 40°C or less
Battery Pack	S9548FA	3 years	x		Yes	Average ambient temperature 30°C or less
		1.5 years	x		Yes	Average ambient temperature 40°C or less
		9 months	x		Yes	Average ambient temperature 50°C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	x	x	No	100 V AC:Average ambient temperature 40°C or less
	(PW482)	8 years	x	x	No	220 V AC:Average ambient temperature 40°C or less
	(PW484)	8 years	x	x	No	24 V DC:Average ambient temperature 40°C or less
Air Filter	T9070CB	1 years	x	x	Yes	For Door fan unit
Fan Unit	AIP601	4 years	x	x	Yes	For Door fan unit
	AIP611	4 years	x	x	Yes	For Node fan unit
Built-in power fuse	—	8 years	x	x	No	For PW481, PW482, PW484

- ANB10□

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power Supply Module (100-120 V AC)	PW481	8 years	Yes	Average ambient temperature 40°C or less
Power Supply Module (220-240 V AC)	PW482	8 years	Yes	Average ambient temperature 40°C or less
Power Supply Module (24 V DC)	PW484	8 years	Yes	Average ambient temperature 40°C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	No	100 V AC:Average ambient temperature 40°C or less
	(PW482)	8 years	No	220 V AC:Average ambient temperature 40°C or less
	(PW484)	8 years	No	24 V DC:Average ambient temperature 40°C or less
Built-in power fuse	—	8 years	No	For PW481, PW482, PW484

- ANB11□, ANT10U

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power Supply Module (100-120 V AC)	PW481	8 years	Yes	Average ambient temperature 40°C or less
Power Supply Module (220-240 V AC)	PW482	8 years	Yes	Average ambient temperature 40°C or less
Power Supply Module (24 V DC)	PW484	8 years	Yes	Average ambient temperature 40°C or less
Aluminium Electrolytic Capacitor (in power supply module)	(PW481)	8 years	No	100 V AC:Average ambient temperature 40°C or less
	(PW482)	8 years	No	220 V AC:Average ambient temperature 40°C or less
	(PW484)	8 years	No	24 V DC:Average ambient temperature 40°C or less
Built-in power fuse	—	8 years	No	For PW481, PW482, PW484
Optical ESB Bus Repeater Module	ANT502	4 years	No	In the G3 environment, replacement is recommended due to corrosion of the SFP and SFP connectors.
	ANT512	4 years	No	

● ACUKT1

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended replacement cycle	Replacement by user	Remarks
Power Supply Unit for Fan (100-120 V AC, 220-240 V AC)	S9618FA	8 years	Yes	Average ambient temperature 40°C or less
Power Supply Unit for Fan (24 V DC)	S9619FA	8 years	Yes	Average ambient temperature 40°C or less
Fan Unit	ADFAN	4 years	Yes	For Door fan unit
	AIP611	4 years	Yes	For Node fan unit

● A2NN10D

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended Replacement Interval	Replacement by user	Remarks
Power Supply Unit (100-120 V AC)	A2PW503-S□□□1	8 years	Yes	Average ambient temperature 40 °C or less
Power Supply Unit (24 V DC)	A2PW504-S□□□1	8 years	Yes	Average ambient temperature 40 °C or less
Bus Module	A2EN501-S1□□□□ A2EN501-S2□□□□ A2EN501-S□1□□□ A2EN501-S□2□□□	4 years	Yes	In the G3 environment, replacement is recommended due to corrosion of the SFP and SFP connectors.

● A2NN30D

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended Replacement Interval	Replacement by user	Remarks
Power Supply Unit (100-120 V AC)	A2PW503-S□□□0	8 years	Yes	Average ambient temperature 40 °C or less
Power Supply Unit (24 V DC)	A2PW504-S□□□0	8 years	Yes	Average ambient temperature 40 °C or less
Bus Module	A2EN501-S1□□□□ A2EN501-S2□□□□ A2EN501-S□1□□□ A2EN501-S□2□□□	4 years	Yes	In the G3 environment, replacement is recommended due to corrosion of the SFP and SFP connectors.

● A2SDV506

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended Replacement cycle	Replacement by user	Remarks
Built-in relay	(A2SDV506)	10 ⁵ times	Yes	A2SDV506 is the unit of the replacement.

- **PW601, PW602**

Table Periodic Replacement Parts Having Defined Life Spans

Part names	Part numbers	Recommended Replacement Interval	Replacement by user	Remarks
Power Supply Unit for PW601 (100-120 V AC)	S9889UK	8 years	Yes	Average ambient temperature 40 °C or less
Power Supply Unit for PW602 (220-240 V AC)	S9890UK	8 years	Yes	Average ambient temperature 40 °C or less

- **Paint Colors**

Table Paint Colors

Painted section	Paint color (Reference Munsell values in parentheses)	Major unit types
Basic color	Frosty white (2.5Y8.4/1.2)	LPCKIT, YPCKIT, AFV40S/AFV40D, YAX801, AFS20S/AFS20D, AFS40S/AFS40D, AFG20S/AFG20D, AFG40S/AFG40D
Channel base	Spring Black (3.3PB2.5/0.5)	LPCKIT, YPCKIT, AFV40S/AFV40D, YAX801, AFS20S/AFS20D, AFS40S/AFS40D, AFG20S/AFG20D, AFG40S/AFG40D

5. Post-installation Inspection and Environmental Preservation

● Post-installation Inspection

Upon the completion of installation of instrumentation, before turning on the power inspect the following items in the list below to avoid system contamination by dust and moisture dust and condensation.

Table Inspection before Power On

	Inspection items (daily inspection/maintenance items)
Environment	<input type="checkbox"/> No water intrusion from cable ducts. <input type="checkbox"/> No wind/rain blow-in <input type="checkbox"/> Air-conditioned <input type="checkbox"/> Cable ducts and cabinet bottoms covered to prevent entry of wind, dust, moisture <input type="checkbox"/> Cabinets and surroundings cleaned <input type="checkbox"/> No dust entering from air vents <input type="checkbox"/> Free of salty, ferrous, corrosive gas <input type="checkbox"/> No direct sunlight on equipment
Equipment	<input type="checkbox"/> No condensation or traces on cabinet interior/exterior <input type="checkbox"/> No discoloration or rust on cabinet interior/exterior <input type="checkbox"/> No condensation or traces on cards (disconnect cards on the upper, middle, and lower stands, and left and right sides of the cabinet to check that there is no condensation on the cards or defects anywhere in the cabinet.) <input type="checkbox"/> No dust remaining inside cabinet

It is recommended that you turn on the power in the presence of Yokogawa when turning it on first.

● Post-installation Environment Preservation

The following precautions should be taken to preserve the proper operating environment after the system has been installed:

- Seal the pits if they are shared by equipment in other rooms, preventing entry of dust and moisture from the other rooms.
- Seal all cable ducts of equipment and building with putty upon completion of cabling.
- Always turn on air conditioner. Turning it on/off may cause condensation inside equipment. If you turn on the power of an air conditioner after a long stop, turn on the air conditioner first and the system. Otherwise condensation may occur.
- Monitor and record ambient temperature and humidity. To maintain the reliability of the equipment be sure to remove the cause if they fluctuate violently.
- Note that leaving exits and entrances open during installation, or leaving open cable ducts while pulling cables, may result in condensation.

Revision Information

- Title : CENTUM VP Installation Guidance
- Manual No. : TI 33J01J10-01EN

Mar. 2020 /16th Edition

- 3.2 Connecting Power
 - Sleeve Terminal Processing [Table for sleeves was revised.]
- 3.5 Connecting Signal Cable
 - Pressure Clamp Terminal (for FIO Module Pressure Clamp Terminal Block) [Table for sleeves was revised.]
 - Pressure Clamp Terminal, Spring Clamp Terminal (for N-IO) [Table for sleeves was revised. Description for A2BN4D was added.]

Jan. 2020 /15th Edition

- Introduction Updated descriptions of trademark.
- 1.2 Control Room Environment
 - Applied Standards[Added Cp Marking]

Aug. 2019 /14th Edition

- 1.7 Corrosive-gas Environment Compatibility
 - Table G3 Environment-compatible Products [Added A2MDV843, A2NN20D, A2SMX802]
- 3.4 Power and Ground Cabling
 - A2BN5D Base Plate for Barrier (P+F) [Added CAUTION]
- 3.8.3 Adaptors (for A2BA3D) [Added shunt resistor unit fixing plate mounting specifications]
 - When attaching a shunt resistor to the M4 screw terminal block of A2BA3D [Added newly]

July 2019 /13th Edition

- 1.2 Table Equipment Installation Specifications (1/2) [remark *2 was revised]
- 1.7 Table G3 Environment-compatible Products (2/3) [ALP111 was deleted, A2LP131 was added]
- 3.4 Power and Ground Cabling
 - A2BN4D Base Plate for Barrier (MTL) [CAUTION was deleted]
 - A2BN5D Base Plate for Barrier (P+F) [CAUTION was deleted]
- 3.6.2 Table Signal Cables for Connection with FIO (2/3) [ALP111 was deleted, A2LP131 was added]
- 4. Table Maximum Power Consumption of FIO (2/3) [ALP111 was deleted, A2LP131 was added]
 - Installation Specifications ■ Parts Durability [Revised the description of IMPORTANT]

Mar. 2019 /12th Edition

- 1.2 ■ Measurement Categories [Updated the description of safety standard.]
- Applied Standards [Updated the description of safety standard.]
- 2.5.6 ■ Cabinet for N-IO System [Updated the specification for cabinet.]
- 4. Table Breaker Ratings [Correction of clerical error]

Jan. 2019 /11th Edition

- 1.1 Control Room Design
 - Side-by-Side Cabinet Installation [Contact information was changed]
- 1.2 Control Room Environment [Contact information was changed]
 - Vibration [Contact information was changed]
- 1.5.2 Countermeasures against Static Electricity [Arrangement Information of wrist straps and conductive sheets were deleted]
- 2.2 Unpacking
 - Caution [Contact information for Condensation was deleted]
 - Caution [Contact information at product fall was changed]
- 2.3 Storage [Contact information was changed]

Oct. 2018 /10th Edition

- Front page Changed logo mark
- Safety Precautions Changed symbol mark description
- 1.2 ■ Applied Standards [Corrected the target GS]
 - Table Equipment Installation Specifications [Added the note of temperature specification]

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- 1.4 Grounding Table [Corrected the target grounding]
 - 1.6 ■ Measures against EMI [Added the note for ambient temperature]
 - 1.7 ■ Table G3 Environment-compatible Products [Added terminal boards]
 - 2.3 ■ Storage of Unpacked Equipment [Added the note for desiccating agent or corrosion inhibitor]
 - 2.5.4 DIN Rail Mountable Devices [Added A2BM4]
 - Notes on Installation [Revised the terms, Added notes for A2BM4]
 - 2.5.5 Wall Mountable Devices [Added the notes for mounting A2BM4]
 - 2.5.6 Example of Mounting to General Purpose Cabinet / Junction Box
 - Table Cabinet Dimensions [Changed the dimension]
 - [Added “Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet (For field wiring via terminal board)”]
 - [Added the notes of cabinet ambient temperature for mounting N-IO nodes]
 - [Added “Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet (For field wiring via terminal board)”]
 - 3.1 Table Rating temperature of Cables [Added A2BM4]
 - 3.4 ■ A2BN3D Base Plate for Adaptor [Added figure of power and ground cabling for A2BN3D]
 - Example of System Cabinet Installation and Grounding Wiring [Clerical corrections]
 - 3.5 Connecting Signal Cable [Revised the description]
 - Table Applicable Interface [Added A2BM4]
 - Connecting Signal Cables to Terminals (for N-IO) [Added supplementary information]
 - 3.7.2 Table Terminal type Compatible with A2BN3D Base Plate for Adaptor [Added new suffix code and note]
 - [Added “■ Terminal board for analog digital I/O (Pressure Clamp Terminals)”]
 - Connecting Signal Cables with A2BN3D [Added description]
 - Table Terminal Numbers and Signal Types (A2BN3D) [Added notes]
 - 3.7.3 ■ A2SAP105 Pulse Input Signal Adaptor [Added description for connecting field signals to A2BM4]
 - [Added the figure for connecting field signals to A2SAP105 via A2BM4]
 - When receiving dry contact signals (Input frequency: 0 to 10 kHz) [Figure were added]
 - A2EXR001 Shunt Resistor Unit [Changing position described]
 - A2SAT105 mV/TC/RTD input adaptor [Added notes for using A2SAT105]
 - A2SDV105 Digital input adaptor [Added description for A2SDV105]
 - A2SMX802 Pass-through I/O signal adaptor [Added description for A2SMX802]
 - 3.8.2 Table Terminal numbers and signal types [revised]
 - 3.8.3 ● When receiving dry contact signals (Input frequency: 0 to 10 kHz) [Figure were added]
 - A2EXR001 Shunt Resistor Unit [Changing position described]
 - A2SAM105 Current input/voltage input adaptor [Revised description for installing the shunt resistor module]
 - When the input current value exceeds 25 m A [Added]
 - When sharing the current signal with another receiving device. [Title added]

June 2018 /9th Edition

- 3.1 Cables and Terminals
 - Table Rating temperature of Cables [Revised A2BN5D cable requirements]
- 3.7.1 N-IO I/O Unit Types
 - I/O Modules that can be used with Base Plate
 - Table I/O Modules Installable with Base Plate [Correction of clerical error]
- 3.7.3 Table Terminal Numbers and Signal Types (A2BN5D) [P+F I.S. barrier models are deleted]

Mar. 2018 /8th Edition

- 1.3 Notes for the field power supply unit of N-IO is added.
- 1.5.1 Examples of Spark-Killer and Diode Installation [Title is changed.]
- 2.5.4 Figure Mounting stopper to the DIN rail is revised.
- 2.5.6 Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet
 - [Mounting conditions are corrected.]
 - Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet
 - [Mounting conditions are corrected.]
 - Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Cabinet
 - [Mounting conditions are corrected.]
- 3.5 Figure Area for Signal Cable from Field is revised.
 - Figure Example of Node Interface Unit and I/O Unit Cable Wiring (Cabinet) is revised.
 - Figure Example of Node Interface Unit and I/O Unit Cable Wiring (Junction Box) is revised
- 3.7.3 ■ A2SDV505, ■ A2SDV506, ■ A2SMX802, [Errors in writing are corrected]

Jan. 2018 /7th Edition

- N-IO product A2EXR001 was added.

1. System Installation Requirements
 - 1.7 Corrosive-gas Environment Compatibility [A2EXR001 was added]
2. Transportation, Storage and Installation
 - 2.5 Installation
 - 2.5.6 Example of Mounting to General Purpose Cabinet/Junction Box
 - Example of Mounting an FCU for N-IO and N-IO Nodes in a Cabinet [A2EXR001 was added]
 - Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet [A2EXR001 was added]
 - Figure Example of Mounting an FCU for N-IO Nodes in a Cabinet [CP461 is changed to CP4□1]
3. Cabling
 - 3.7.2 Base Plate for Adaptor
 - Connecting Signal Cables with A2BN3D [A2EXR001 was added]
 - 3.7.3 Adaptor (for A2BN3D)
 - A2SAP105 Pulse Input Signal Adaptor [A2EXR001 was added]
 - 3.8.2 Nest for I/O Adaptor
 - Signal connection of the terminal block of the nest for I/O adaptor A2BA3D [A2EXR001 was added]
 - 3.8.3 Adaptor (for A2BA3D)
 - A2SAP105 Pulse Input Signal Adaptor [A2EXR001 was added]
 - 3.9 Connecting Bus Cable
 - Handling of Vnet/IP cables Connected to the Processor Module [CP471 was added]

June 2017/6th Edition

1. System Installation Requirements
 - 1.2 Control Room Environment
 - Applied Standards [Remark *6 was added]
 - Safety Standards [CSA standard number was added]
 - EMC Conformity Standards [Position of remark *5 was changed]
 - Installation Environment Specifications
 - Table Equipment Installation Specifications (1/2) (2/2) [ANR10□ was deleted]
3. Cabling
 - 3.4 Power and Ground Cabling
 - A2FV50S/A2FV50D Field Control Unit (19-inch Rack Mountable Type) [Correction of clerical errors]
 - A2FV70S/A2FV70D Field Control Unit (19-inch Rack Mountable Type) [Correction of clerical errors]

Apr. 2017/5th Edition**Summary**

-N-IO product line-ups A2SAM105, A2SAM505, A2SAT105, A2SMX802, and A2MDV843 were added.

-FIO product line-ups ADR541, ADV141, ADV142, ADV157, ADV557, and ADV851 were deleted.

Safety Precautions [Symbol definitions were revised]

Symbol Marks of this Technical Information [Symbol marks were changed]

1. System Installation Requirements
 - 1.2 Control Room Environment
 - Applied Standards
 - EMC Conformity Standards EN61000-6-2 [Note was revised]
2. Transportation, Storage and Installation
 - 2.5 Installation
 - 2.5.6 Example of Mounting to General Purpose Cabinet/Junction Box [Note was added]
 - Cabinet for N-IO System
 - Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Cabinet [Note was added]
 - Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Cabinet [Note was added]
 - Junction Box for N-IO System
 - Example of Mounting N-IO Nodes (Non-Intrinsic Safety Barrier) in a Junction Box [Note was added]
 - Example of Mounting N-IO Nodes (Intrinsic Safety Barrier) in a Junction Box [Note was added]
 - Example of Mounting N-IO Nodes (Mixture of Intrinsic Safety Barrier and Non-Intrinsic Safety Barrier) in a Junction Box [Note was added]

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- 3. Cabling
 - 3.1 Cables and Terminals
 - 3.4 Power and Ground Cabling
 - A2NN10D
 - 19-inch Rack-mount Devices and Wiring (For A2NN10D) [Figure was revised]
 - PW601, PW602 [Figure was added]
 - 3.6 Connecting Signal Cables with Fieldnetwork I/O (FIO)
 - 3.6.3 Connecting Signal Cables with FIO
 - Connecting Signal Cables with Pulse Input Module AAP135
 - When Receiving No-Voltage Contact Signals (1) [Table and figure were added]
 - 3.7.3 Adaptors (for A2BN3D)
 - A2SAP105
 - When receiving current pulse signals (2-wire power supply type)
 - Table useable external resistors [Description was revised]
 - Table Recommended terminal blocks [WAGO was deleted]
 - Figure Distance to Separate External Receiving Resistor and IOBP [Figure was revised]
 - 3.8 Signal Connections of N-IO I/O Unit (For RIO System Upgrade)
 - 3.8.3 Adaptors (for A2BA3D)
 - Specifications and installation of external shunt resistors
 - Table useable external resistors [Description was revised]
 - Table Recommended terminal blocks [WAGO was deleted]
 - Figure The external shunt resistors should not be located into this area [Figure was revised]
 - 3.9 Connecting Bus Cable
 - Figure Example of Optical ESB Bus Chain Connection Using HK Function [A2FV50□ and A2FV70□ were deleted]
 - Figure Example of Optical ESB Bus Star Connection Using HK Function [A2FV50□ and A2FV70□ were deleted]

4. Installation Specifications

- Parts Durability [PW601 and PW602 were added]

June 2016/4th Edition

Summery - NIU (A2NN10D) and I/O Unit for RIO System Upgrade were added.

3. Cabling

- 3.6 Connecting Signal Cables with Field network I/O (FIO)
 - 3.6.3 Connecting Signal Cables with FIO
 - Connecting Signal Cables with Pulse Input Module AAP135
 - When Receiving No-Voltage Contact Signals (2)
 - Figure No-Voltage contact Input (2) [24 V DC was deleted]
 - Connecting Signal Cables with Pulse Input Module AAP135
 - When Receiving Current Pulse By Using the Internal Power to Drive the Transmitter (2-wire power supply type) [1k ohm was deleted]
 - 3.7 Signal Connections of N-IO I/O Unit
 - 3.7.2 Base Plate for Adaptor
 - Connecting Signal Cables with A2BN3D
 - Table Terminal Numbers and Signal Types (A2BN3D) [(*)4] were added to A2SAP105 and Case 4]
 - 3.7.3 Adaptors
 - When receiving current pulse signals (2-wire power supply type)
 - Figure Distance to Separate External Receiving Resistor and A2SAP105 [Area was revised]

4. Installation Specifications

- Parts Durability[ANB10□ was added]

Dec. 2015/3rd Edition

1. System Installation Requirements

1.2 Control Room Environment

■ Applied Standards

- EMC Conformity Standards [EAC Marking] [Standard No. was corrected]
- Standards for Hazardus Location Equipment [Standard Nos. were deleted]
- Marine Standards [Added newly]

1.7 Corrosive-gas Environment-Compatibility

- G3 Environment-compatible Products
Table G3 Environment-compatible Products [An error was corrected]
- 1.8 Compliance with Marine Standards [DNV GL was added]
 - Marine Standard-compliant CENTUM VP (Vnet/IP) Components
Table Marine Standard-compliant CENTUM VP (Vnet/IP) Components [Tables are deleted]
- 3. Cabling
 - 3.5 Connecting Signal cable
Connecting Signal Cable to Terminals(for FIO)
 - Connecting to Pressure-clamp Terminal [The standard number of the screwdriver was corrected.]
- 4. Installation Specifications
 - Parts Durability [Part No. of the built-in power fuses are deleted]
 - AFV30□
 - A2FV50□
 - AVR10D,AW810D
 - AFV40□,ACB51
 - ANB11□,ANT10U

June 2015/2nd Edition

Summery - A2BN5D was added.

- Requirements of EN61010-2-201 were reflected.
- Errata was corrected.
- Descriptions were revised.

- 1. System Installation Requirements
 - Installation Specification [Description was revised] [A2BN5D was added]
[Temperature Transportation/storage of N-IO node was corrected]
 - 1.2 Control Room Environment
 - Applied Standards
 - Safety Standards [EN 61010-2-201 and EN 61326-1 were added] [Note was revised]
 - EMC Conformity Standards [EN 61326-1 was added][Note was revised]
 - Standards for Hazardous Location Equipment [ATEX TypeI and IECEx were added]
 - Installation Environment Specifications
Table Equipment Installation Specifications [A2BN5D was added] [Electric field of N-IO was corrected]
 - 1.6 Cabling Requirements
 - Ambient Temperature [A2BN5D was added]
 - 1.7 Corrosive-gas Environment Compatibility
Table G3 Environment-compatible Products [A2BN5D was added]
- 2. Transportation, Storage and Installation
 - 2.5 Installation
 - 2.5.3 19-inch Rack Mount Devices [CAUTION was revised]
 - 2.5.4 DIN Rail Mountable Devices [A2BN5D was added]
 - 2.5.5 Wall Mountable Devices [A2BN5D was added]
 - 2.5.6 Example of Mounting to General Purpose Cabinet/Junction Box [A2BN5D was added]
- 3. Cabling
 - 3.1 Cables and Terminals [A2BN5D was added] [■ Bending radius of cable was added]
 - Signal Cables [An error of "For N-IO Node" was corrected]
 - Power Cables [Barrier for Base Plates were added][Value was corrected]
 - Grounding Cables [Barrier Base Plates were added]
 - 3.2 Connecting Power
 - Terminal Connection [A2BN5D was added] [Base Plate of A2BN3D was revised]
 - 3.4 Power and Ground Cabling [A2BN5D was added]
 - A2NN30D Node Interface Unit
Figure Connecting Power Supply with Node Interface Unit [An error of the size of the screw was corrected] [A2BN5D was added]
 - A2BN3D Base Plate for Adaptor [The caption was added]
 - A2BN4D Base Plate for Barrier [The cable length restriction was added]
 - Connecting Power Supply with Node Interface Unit and I/O Units
[A Screw size of NIU was corrected] [Important information was added]

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