General Specifications

N-IO
System Overview

CENTUM VP

GS 33J62A10-01EN

[Release 6]

■ GENERAL

The N-IO system is connected to the field control unit (for N-IO) via an N-ESB bus, optical ESB bus, or ESB bus. The N-IO system has the following nodes.

N-IO node
FIO Node Unit (for dual-redundant ESB Bus):
Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus) and ESB Bus Node Unit (for dual-redundant ESB Bus)
N-IO field enclosure

*An N-IO node consists of a node interface unit (A2NN30D) and N-IO I/O unit (system model (*1): A2ZN3D, A2ZN4DC, and A2ZN5DC). FIO Node Unit(for dual-redundant ESB Bus) consist of a power supply module, bus interface module, and base unit to which they are mounted, and only communication modules can be mounted. Each node can be connected in a chain or star topology depending on the N-ESB bus, optical ESB bus, or ESB bus configuration.The following shows a system configuration example.*
N-IO field enclosure is the remote enclosure equipped with N-IO. For details, refer to the GS "N-IO field enclosure" (GS 33J62R10-01EN).

*1: System model names A2ZN3D, A2ZN4DC, and A2ZN5DC are the regulatory compliance acquisition unit model name. For details, refer to the GS “Base plates (for N-IO)” (GS 33J62F40-01EN).

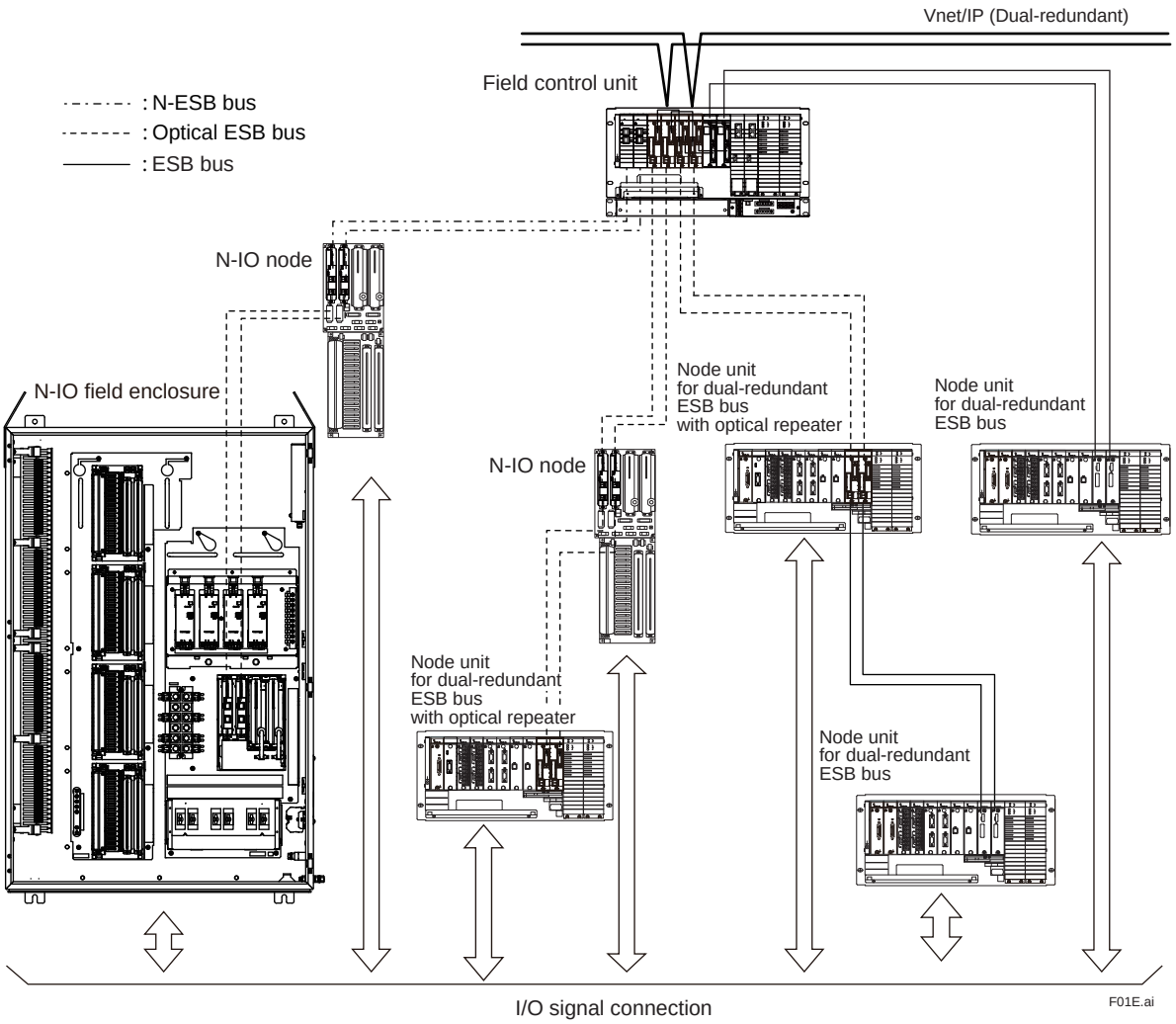


Figure N-IO system configuration example

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■ COMMON SPECIFICATIONS

● Installation environment

For A2NN70D (System model: A2ZN70D), A2NN60D (System model: A2ZN60D), and A2CB60, refer to the GS "N-IO field enclosure" (GS 32J62R10-01EN).

N-IO system (for N-IO Node)

The table below shows the main applicable products and installation environment specifications.

Base plates for N-IO I/O: A2BN3D, A2BN4D, and A2BN5D
Node Interface unit: A2NN30D
24 V DC output power supply unit: A2PW503 and A2PW504

Item		Specifications
Ambient temperature	**Normal operation**	0 to 60°C :A2BN3D, A2NN30D, A2PW503, A2PW504 -20 to 60°C :A2BN4D (*1) -20 to 70°C :A2BN5D (*1) (*2) -40 to 70°C :temperature option for A2BN3D (*3) (*4), A2NN30D (*5), A2PW503, A2PW504
	In transport/storage	-20 to 60 °C (A2BN3D, A2NN30D, A2PW503, A2PW504, avoid direct sunlight) -40 to 85 °C (A2BN4D (*1), A2BN5D (*1), temperature option for A2BN3D (*3), A2NN30D (*5), A2PW503, A2PW504, avoid direct sunlight)
Ambient humidity	**Normal operation**	5 to 95 %RH (should have no condensation)
	In transport/storage	5 to 95 %RH (should have no condensation)
Ambient temperature change rate	**Normal operating**	Within ±10 °C/h
	Transporting/storing	Within ±20 °C/h
Power supply (*6) (*7)	**Voltage range**	100 to 120 V AC -15 to +10 % 220 to 240 V AC -15 to +10 % 24 V DC -15 to +20 %
	Frequency	50/60 ±3 Hz
	Distortion factor	10 % or lower
	Peak value	118 V or higher (100 V system) 258 V or higher (220 V system)
	Instantaneous power failure	20 ms or lower (when receiving rated AC voltage)
	DC power supply ripple rate	1 % p-p or lower
Grounding		The ground suitable for the power distribution system in the country or region has to be used for protective grounding system.
Dust		0.3 mg/m^3 or less
Corrosive gas		ANSI/ISA S71.04 G2 (standard) ANSI/ISA S71.04 G3 (For A2BN4D and A2BN5D: standard) (For others: environment-proof support (temperature environment support, G3 support) options)
Vibration	**Continuous vibration**	Displacement amplitude 1.75 mm or less (5 to 8.4 Hz) Acceleration 4.9 m/s^2 or less (8.4 to 150 Hz)
	Non-continuous vibration	Displacement amplitude 3.5 mm or less (5 to 8.4 Hz) Acceleration 9.8 m/s^2 or less (8.4 to 150 Hz)
	Earthquake	Acceleration 4.9 m/s^2 or less
	Transport vibration	Horizontal 4.9 m/s^2 or less, vertical 9.8 m/s^2 or less (packed state)
Shock	**Transport shock**	147 m/s^2 or less, 11 ms
Noise	**Electric field**	10 V/m or lower (80 MHz to 1.0 GHz) 3 V/m or lower (1.4 to 2.0 GHz) 1 V/m or lower (2.0 to 2.7 GHz)
	Magnetic field	30 A/m or lower (AC), 400 A/m or lower (DC)
	Static electricity	4 kV or lower (contact discharge), 8 kV or lower (aerial discharge)
Altitude		3000 m or less (*8) 2000 m or less (A2BN4D, A2BN5D)

*1: 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.

*2: The maximum ambient temperature specifications for A2BN5D depend on style code and compliance criteria.For details, refer to GS 33J01A10-01EN “Integrated Production Control System CENTUM VP System Overview”.

*3: 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.

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*4: The ambient temperature range of AKB cable used with A2BN3D-□9□□□ is -20 to 70°C.
*5: 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: Power supply specifications in the case of the Node Interface Unit (A2NN30D) installed in N-IO Node.
*7: For the power supply specifications for 24 V DC Output Power Supply Units (A2PW503 and A2PW504), refer to the GS "24 V DC Output Power Supply Units" (GS 33J62K51-01EN).
*8: 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 □□

N-IO system (other than N-IO node)

The following shows the main applicable products and installation environment specifications.

Field Control Unit(for N-IO) (*1)
FIO Node Unit(for dual-redundant ESB Bus) (*1)
Optical ESB Bus Repeater Unit (*1)
Power supply bus unit, vertical type: AERV7D

*1: Refer to "■ STANDARD SPECIFICATIONS" for detail.

Item		Specifications
Ambient temperature	**Normal operation**	0 to 50°C: Field Control Unit (for N-IO) 0 to 60°C: FIO Node Unit(for dual-redundant ESB Bus) (*1) -20 to 70°C: AEPV7D, temperature option for FIO Node Unit (for dual-redundant ESB Bus) and Optical ESB Bus Repeater Unit (*1) (*2)
	In transport/storage	-20 to 60°C: Field Control Unit (for N-IO), FIO Node Unit (for dual-redundant ESB Bus), Optical ESB Bus Repeater Unit -40 to 85°C: AEPV7D, temperature option for FIO Node Unit (for dual-redundant ESB Bus) and Optical ESB Bus Repeater Unit (*1)
Ambient humidity	**Normal operation**	5 to 95 %RH (should have no condensation)
	In transport/storage	5 to 95 %RH (should have no condensation)
Ambient temperature change rate	**Normal operating**	Within ±10 °C/h
	Transporting/storing	Within ±20 °C/h
Power supply	**Voltage range**	100 to 120 V AC ±10 %
		220 to 240 V AC ±10 %
		24 V DC ±10 %
	Frequency	50/60 ±3 Hz
	Distortion factor	10 % or lower
	Peak value	125 V or higher (100 V system)
		274 V or higher (220 V system)
	Instantaneous power failure	20 ms or lower (when receiving rated AC voltage)
	DC power supply ripple rate	1 % p-p or lower
Grounding		Connect the ground cable to a protective grounding system compliant with the safety standards and power distribution system in the relevant country or region.
Dust		0.3 mg/m^3 or less
Corrosive gas		ANSI/ISA S71.04 G2 (standard) ANSI/ISA S71.04 G3 (option)
Vibration	**Continuous vibration**	Displacement amplitude 0.25 mm or less (1 to 14 Hz) Acceleration 2.0 m/s^2 or less (14 to 100 Hz)
	Earthquake	Acceleration 4.9 m/s^2 or less
	Transport vibration	Horizontal 4.9 m/s^2 or less, vertical 9.8 m/s^2 or less (packed state)
Shock	**Transport shock**	Horizontal 49.0 m/s^2, vertical 98.0 m/s^2 (packed state)
Noise	**Electric field**	3 V/m or lower (26 MHz to 1.0 GHz) 3 V/m or lower (1.4 to 2.0 GHz) 1 V/m or lower (2.0 to 2.7 GHz)
	Magnetic field	30 A/m or lower (AC), 400 A/m or lower (DC)
	Static electricity	4 kV or lower (contact discharge), 8 kV or lower (aerial discharge)
Altitude		2000 m or less

*1: When mounting a communication module ALF111, ALP121, A2LP131, or ALR111 in FIO Node Unit (for dual-redundant ESB Bus), the ambient operating temperature range shall be 0 to 50°C.
*2: To use FIO Node Unit (for dual-redundant ESB Bus) or Optical ESB Bus Repeater Unit with the temperature environment support option (at -20 to 70 °C), specify the temperature environment support option for the communication modules and bus interface modules as well.

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● N-ESB bus, optical ESB bus, and ESB bus

Application

An N-ESB bus, optical ESB bus, or ESB bus is an input/output communication bus that connects the field control unit (hereinafter FCU) (for N-IO) with N-IO nodes, FIO Node Unit (for dual-redundant ESB Bus).

Connection specifications

Connection devices:

FCU (for N-IO), N-IO node, FIO Node Unit (for dual-redundant ESB Bus), and Optical ESB Bus Repeater Unit.

N-ESB bus connection:

To connect N-IO nodes to FCU, mount N-ESB bus coupler modules (A2EN402 or A2EN404) to FCU. Up to 4 pairs of N-ESB bus coupler modules (up to 8 modules) can be mounted to FCS. When mounting 4 pairs of A2EN402 or A2EN404, up to 8 or 16 lines can be connected using a dual-redundant star connection via an N-ESB bus. Dual-redundant chain connection allows up to 16 nodes per line to be connected.

Optical ESB bus connection:

To connect N-IO nodes and Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus) to FCU via an optical ESB bus, mount the ESB bus coupler module (EC401 or EC402) to slots IO7 and IO8 of FCU and then connect the nodes and node units via optical ESB bus repeater module (ANT4□1-□E, -□F). Connection of Optical ESB Bus Repeater Unit allows for star connection. Furthermore, only use of an optical ESB bus via ESB Bus Coupler Module (EC401 or EC402) allows for connecting Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus) beyond the N-IO node.

ESB Bus Connection:

To connect ESB Bus Node Unit (for dual-redundant ESB Bus) to FCU, mount the ESB bus coupler module (EC401 or EC402) to slots IO7 and IO8 of FCU. EC401 and EC402 allow for star connection of 1 and up to 2 lines, respectively, via ESB bus. Chain connection allows up to 8 units per line to be connected.

N-ESB bus, optical ESB bus and ESB bus are always configured in dual-redundancy. A single configuration is not supported.

Combination of star and chain connection via N-ESB bus, optical ESB bus, and ESB bus allows for up to 32 N-IO nodes or up to 8 FIO Node Unit (for dual-redundant ESB Bus) to be connected. Optical ESB Bus Repeater Unit is not included in the number of connected units. For details on the maximum number of modules that can be mounted per FCU (for N-IO), refer to “VP6F1800 control function for field control station (for A2FV50□)” (GS 33J15C15-01EN), and for details on the number of I/Os limited by the software license, refer to “VP6F3100 Project I/O License” (GS 33J15A10-01EN).

Communication specifications

Table Network and transmission path specifications for I/O communication buses that allow for connection to FCU (for N-IO)

		N-ESB bus	Optical ESB bus		ESB bus
Connection unit		N-IO node	N-IO node	Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus)	ESB Bus Node Unit (for dual-redundant ESB Bus)
Maximum number of devices to be connected/FCU		Up to 32 nodes	Up to 32 nodes	Up to 8 nodes	Up to 8 nodes
Network topology	**Star connections**	Up to 16 lines	Up to 16 lines (*1)	Up to 16 lines (*1)	Up to 2 lines
	Chain connections	Up to16 hops (*2) (*3)	Up to 16 hops (*2) (*3) (*7)	Up to 2 hops (*2) (*3)	Up to 8 hops
Transmission path redundancy		Only dual-redundancy	Only dual-redundancy	Only dual-redundancy	Only dual-redundancy
Transmission speed		100 Mbps	192 Mbps	192 Mbps	128 Mbps
Transmission cable		UTP straight cable	Optical fiber cable	Optical fiber cable	Dedicated cable (YCB301)
Transmission distance		Up to 100 m (*4)	Up to 50 km (*5)	Up to 50 km (*5)	Up to 10 m (*6)

*1: Up to 24 lines are possible only when star connection is configured with ANT4□1 via EC402. (Supported by CENTUM VP R6.06 or later.)
*2: Up to 16 hops in total of chain connection is available when the N-ESB bus and optical ESB bus are used in combination.
*3: If the N-ESB bus / optical ESB bus communication module (relay function) stops operating due to a power failure or the like, communication with the N-IO node connected thereafter stops. If there is a possibility that power distribution to some nodes during chain connection may be lost, such as when the power supply system is different, please make a star connection.
*4: Maximum 100 m for 2 ports of A2EN402 and 4 ports of A2EN404.
*5: The distance can be extended to up to 50 km using optical ESB bus repeater modules.
*6: The distance is up to 10 m for EC401 and up to 10 m both on the upper side and lower side for EC402.
*7: Up to 2 hops for the chain connection of Optical ESB bus is available when N-ESB bus and optical ESB bus are used in combination.

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Cable specifications
UTP straight cable:
Connector: RJ45 connector (ISO/IEC8877 compliant)
Recommended cable: CAT5e (enhanced category 5) or better (ANSI standard TIA/EIA-568-B compliant)

Optical fiber cable:

		Optical fiber specifications
Optical connector type		LC (compliant with IEC61754-20)
Max. permissible optical loss	**5km**	0 to 10 dB@1.3 μm
	5-50km	3 to 16 dB at 1.55 μm (*1)
Optical fiber	**Type**	Quartz single-mode optical fiber (*2)
	Required number of cores	2
	Max. length	50 km

*1: When the optical attenuation in the following connections is less than 3 dB, use an attenuator to reduce the attenuation by 3 dB:
Between ANT411-□E and A2NN30D-□□□□□2□□□
Between ANT411-□F and A2NN30D-□□□□□2□□□
Between A2NN30D-□□□□□□2□□ and A2NN30D-□□□□□2□□□
Between A2NN30D-□□□□□□2□□ and ANT512-□E
Between A2NN30D-□□□□□□2□□ and ANT512-□F
*2: JIS C 6835 SSMA -9.3/125 or IEC 60793-2-50 B1.1 type

■ STANDARD SPECIFICATIONS

● Field control unit (for N-IO)

The following types of field control units (for N-IO) are available.
A2FV50S: Field control unit (for N-IO, 19-inch rack mountable type)
A2FV50D: Duplexed field control unit (for N-IO, 19-inch rack mountable type)

For details, refer to the GS “Field control unit, duplexed field control unit (for N/IO, 19-inch rack mountable)” (GS 33J62E10-01EN).

FCU can also be constructed by combining the following models. Apply Control Function VP6F1800 (for AFV50□) to FCU constructed by the following models, it can be used as FCU (for N-IO).

Model	Name	GS No.
A2BE1D	Base Plate (for FCU)	GS 33J60E60-01EN
A2FU1	HKU Interface Unit	GS 33J60E60-01EN
A2FU2	Primary Power Distribution Unit	GS 33J60E60-01EN
PW481, PW482, PW484	Power Supply Module	GS 33J60E70-01EN
CP471	Processor Module	GS 33J60E30-01EN

These models can be ordered individual or as a set. Refer to GS 33J01N20-01EN for details of the model for ordering multi-product. Refer to the GS of each individual model for the functions and the installation of modules on the Base Plate.

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● N-IO node

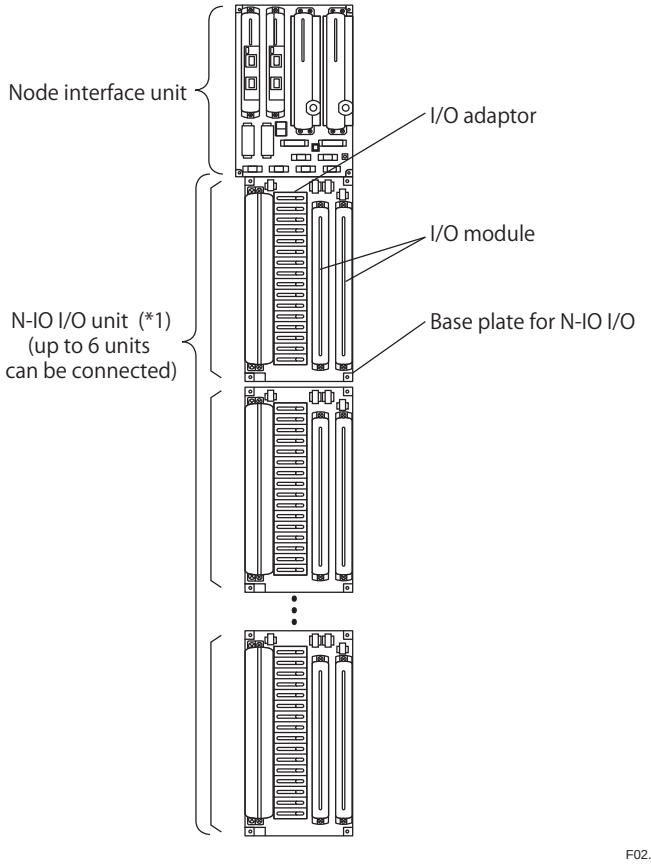
An N-IO node consists of a node interface unit (A2NN30D) and N-IO I/O unit, and communicates I/O signals to and from field devices with a field control unit (for N-IO) via an N-ESB bus or dual-redundant optical ESB bus. A DIN rail mountable type or wall mountable type can be selected for each node.

Up to 6 N-IO I/O units can be connected to the node interface unit. The F-SB bus cable (A2KLF00) for communication and the power supply cable for base plate (A2KPB00) are required for connection. Select the cable configuration to suit the number of N-IO I/O units to be connected. For the cable details, refer to the GS “Cables (for N-IO)” (GS 33J62J10-01EN).

Table N-IO I/O unit cables

Model	Name	Temperature environment support
A2KLF00	F-SB bus cable	X
A2KPB00	Power supply cable for base plate	X

X: Available —: Not available



*1: Refer to the GS “Base plates (for N-IO)” (GS 33J62F40-01EN) for the regulatory compliance acquisition unit, system model names A2ZN3D, A2ZN4DC, and A2ZN5DC.

Figure N-IO node

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● Node interface unit (NIU)

A power supply module and N-ESB bus module are mounted to the node interface unit (A2NN30D) to provide it with an interface function that allows a field control unit (FCU) to communicate with an N-IO I/O unit and an interface function that allows NIUs to communicate each other. Furthermore, the NIU supplies power to the N-IO I/O unit. A DIN rail mountable type or wall mountable type can be selected, and the environment-proof support (temperature environment support, G3 support) option can be specified.

A2NN30D: Node interface unit (for N-IO)

For details, refer to the GS “Node interface unit (for N-IO)” (GS 33J62F10-01EN).

● N-IO I/O unit

An N-IO I/O unit consists of I/O modules, I/O adaptors, intrinsic safety (I.S.) barriers, and a base plate for N-IO I/O to which they are mounted depending on the type. The environment-proof support (temperature environment support, G3 support) option can be specified. For details of the regulatory compliance acquisition unit (system model: A2ZN3D, A2ZN4DC, and A2ZN5DC) of N-IO IO unit, refer to the GS “Base plates (for N-IO)” (GS 33J62F40-01EN).

Table Types of N-IO I/O units and environment-proof support

Model	Name	Base plate model for N-IO I/O			Temperature environment support	G3 support
		A2BN3D	A2BN4D	A2BN5D		
—	**I/O module**					
A2MMM843	Analog digital I/O module (16-channel, Isolated)	X Up to 2 modules (*1)	X Up to 2 modules (*1)	X Up to 2 modules (*1)	X	X
A2MDV843	Digital I/O module (16-channel, Isolated)	X Up to 2 modules (*1)	X Up to 2 modules (*1)	X Up to 2 modules (*1)	X	X
—	**I/O adaptors**					
A2SAM105	Current input/voltage input adaptor	X Total 16 (*2)	—	—	X	X
A2SAM505	Current output/voltage output adaptor		—	—	X	X
A2SAT105	mV/TC/RTD input adaptor		—	—	X	X
A2SAP105	Pulse input signal adaptor (0 to 10 kHz)		—	—	X	X
A2SDV105	Digital input adaptor (24 V DC voltage input, dry contact input)		—	—	X	X
A2SDV505	Digital output adaptor (24 V DC, current source: 0.5 A)		—	—	X	X
A2SDV506	Relay output adaptor (24 V DC, dry contact output: 0.5 A)		—	—	X	X
A2SMX801	Pass-through I/O signal adaptor		—	—	X	X
A2SMX802	Pass-through I/O signal adaptor (with field power output)		—	—	X	X
—	**Accessory for I/O adaptor**					
A2EXR001	Shunt resistor unit (For A2SAP105)	X (*3)	—	—	X	X
—	**I.S. barrier**					
(*4)		—	X Total 16 (*2)	X Total 16 (*2)	(*4)	

X: Mountable —: Not mountable

*1: Mount two modules for a dual-redundant pair and one module for a single configuration.

*2: Single configuration

*3: Only A2EXR001 can be used with A2SAP105.Refer to GS “I/O Adaptors (for N-IO)” (GS 33J62F30-01EN).

*4: Refer to the GS “Base plates (for N-IO)” (GS 33J62F40-01EN) for the I.S. barrier types and the environment-proof support (temperature environment support, G3 support) options applicable.

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Table Base plates mounting and environment-proof support for N-IO I/O

Model	Name	DIN rail mountable type/wall mountable type selectable or not	Temperature environment support	G3 support
A2BN3D	Base plate for adaptor (for N-IO, 16-channel, with adaptor, pressure clamp terminal or spring clamp terminal)	X	X	X
A2BN4D	Base plate for barrier (for N-IO, MTL barrier)	X (*1)	—	X
A2BN5D	Base plate for barrier (for N-IO, P+F barrier)	X (*1)	—	X

X: Mountable —: Not mountable
*1: The base plate for barrier supports both the DIN rail mountable type and the wall mountable type.

The following combinations are available for mounting base plates, I/O modules, and I/O adaptors for N-IO I/O units.

Table Combination of base plates, I/O modules, I/O adaptors, and I.S. barriers for mounting

Base plate (for N-IO)	I/O module (for N-IO)	Applicable I/O adaptors			Applicable I.S. barriers (*1)			
					MTL Barriers		P+F Barriers	
		A2SAM105, A2SAM505, A2SAT105, A2SAP105	A2SDV105, A2SDV505, A2SDV506	A2SMX801, A2SMX802	Analog I/O	Digital I/O	Analog I/O	Digital I/O
A2BN3D	A2MMM843	X (*2) (*3)	X (*4)	X (*5)	—	—	—	—
	A2MDV843	—	X (*4)	X (*5)	—	—	—	—
A2BN4D	A2MMM843	—	—	—	X	X	—	—
	A2MDV843	—	—	—	—	X	—	—
A2BN5D	A2MMM843	—	—	—	—	—	X	X
	A2MDV843	—	—	—	—	—	—	X

X: Supported —: Not supported
*1: For details of the I.S. barrier types, refer to the GS “Base Plates (for N-IO)” (GS 33J62F40-01EN).
*2: A2MMM843 Style S2 or later and A2BN3D Style S2 or later must be used to avoid the following functional restrictions.
- In case A2MMM843 Style S1 is used, A2SAM105, A2SAM505, and A2SAT105 are not supported.
- In case A2BN3D Style S1 is used, A2SAT105 is not supported.

*3: - In case A2BN3D-□9□□□ is used, A2SAT105 is not supported.
- In case A2BN3D-□9□□□ is used, there are restrictions on using A2SAP105.
For details, refer to the GS “Field connection specifications (for N-IO)” (GS 33J62A20-01EN).
*4: In case A2BN3D-□9□□□ is used, there are restrictions on using A2SDV105. For the restrictions, there is an alternative method using A2SMX801. For details, refer to the GS “Field connection specifications (for N-IO)” (GS 33J62A20-01EN).
*5: In case A2BN3D-□9□□□ is used, there are restrictions on using A2SMX802.
For details, refer to the GS “Field connection specifications (for N-IO)” (GS 33J62A20-01EN).

When the over voltage occurs due to wrong wiring or such, its influence can be contained within the adaptor itself and prevent other channels from failing.

Table Combinations of base plate and I/O adaptors with protection function

	A2SMX801-□□□0	A2SAM105-□□□□, A2SAM505-□□□□, A2SAT105-□□□□, A2SAP105-□□□□, A2SDV105-□□□□, A2SDV505-□□□□, A2SDV506-□□□□, A2SMX801-□□□1, A2SMX802-□□□□
A2BN3D Style S1	—	—
A2BN3D Style S2 or later	—	X

X: With Protection function —: Protection function not available

For details on each I/O module, I/O adaptor, and base plate for N-IO, refer to the following GS.
“I/O module (for N-IO)” (GS 33J62F20-01EN)
“I/O adaptors (for N-IO)” (GS 33J62F30-01EN)
“Base plates (for N-IO)” (GS 33J62F40-01EN)

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- **FIO Node Unit (for dual-redundant ESB Bus):**
  Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus)
  ESB Bus Node Unit (for dual-redundant ESB Bus)

Power supply modules, bus interface modules, and communication modules are FIO Node Unit installed in a node unit. The following types are available.

ANB11D: Optical ESB Bus Node Unit (for dual-redundant Optical ESB Bus)
ANB10D: ESB Bus Node Unit (for dual-redundant ESB Bus)

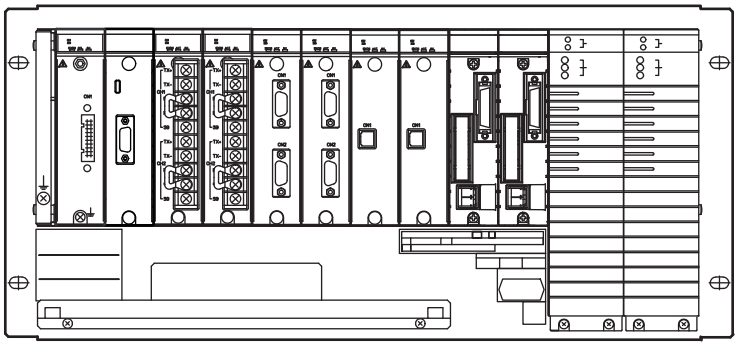
For details, refer to the GS “Optical ESB bus node units (for N-IO/FIO)” (GS 33J60F30-01EN) and the GS “ESB bus node units (for N-IO/ FIO)” (GS 33J60F20-01EN).

FIO Node Unit(for dual-redundant ESB Bus) can also be constructed by combining the following models. Power Supply Models and Bus Interface Modules (SB401, ANT502, ANT512) for slots B1-B2 must be installed as dual-redundant configuration.

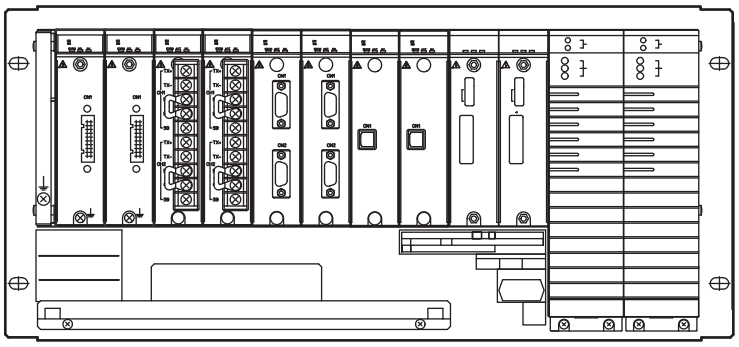
Model	Name	GS No.
A2BE2D	Base Plate (for FIO)	GS 33J60G30-01EN
PW481, PW482, PW484	Power Supply Module	GS 33J60E70-01EN
Bus Interface Module		
SB401	ESB Bus Slave Interface Module	GS 33J60G40-01EN
A2EE1A	ESB Bus Adapter (for SB401)	GS 33J60G40-01EN
ANT502	Optical ESB Bus Repeater Module (for 5km)	GS 33J60F51-01EN
ANT512	Optical ESB Bus Repeater Module (for 50km)	GS 33J60F52-01EN
A2EE3A	ESB Bus Adapter (for ANT5□2)	GS 33J60F51-01EN, GS 33J60F52-01EN

These models can be ordered individual or as a set. Refer to GS 33J01N20-01EN for details of the model for ordering multi-product. Refer to the GS of each individual model for the functions and the installation of modules on the Base Plate.

ANB11D



ANB10D



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Figure FIO Node Unit (for dual-redundant ESB Bus)

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● Optical ESB Bus Repeater Unite

Power supply modules and optical ESB bus repeater modules are installed in Optical ESB Bus Repeater Unit.
For details, refer to the GS “Unit for optical ESB bus repeater modules (for N-IO/FIO)” (GS 33J60F50-01EN).
Optical ESB Bus Repeater Unit can also be constructed by combining the following models.

Model	Name	GS No.
A2BE2D	Base Plate (for FIO)	GS 33J60G30-01EN
PW481, PW482, PW484	Power Supply Module	GS 33J60E70-01EN
Optical ESB Bus Repeater Module		
ANT401,ANT502	Optical ESB Bus Repeater Module (for 5km)	GS 33J60F51-01EN
ANT411,ANT512	Optical ESB Bus Repeater Module (for 50km)	GS 33J60F52-01EN
A2EE2A	ESB Bus Adapter (for ANT4□1)	GS 33J60F51-01EN, GS 33J60F52-01EN
A2EE3A	ESB Bus Adapter (for ANT5□2)	GS 33J60F51-01EN, GS 33J60F52-01EN

These models can be ordered individual or as a set. Refer to GS 33J01N20-01EN for details of the model for ordering multi-product. Refer to the GS of each individual model for the functions and the installation of modules on the Base Plate.

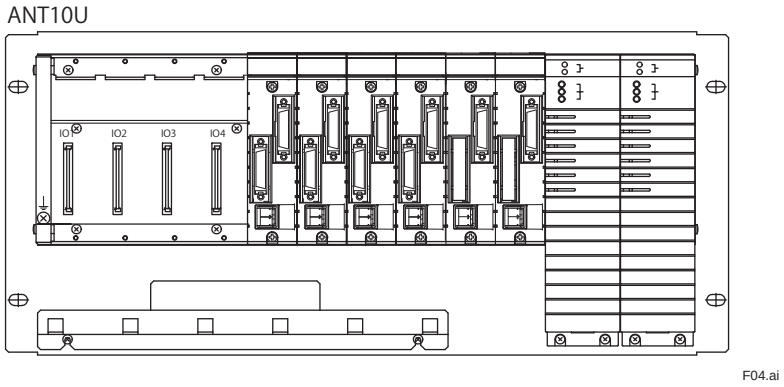


Figure Optical ESB Bus Repeater Unit

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● Communication module and bus interface module

The following communication module models are available. They can be mounted to the field control unit and FIO Node Unit (for dual-redundant ESB Bus), and the environment-proof support (temperature environment support, G3 support) option can be specified.

Table Communication module models and support for mounting to node units

Model	Name	FCU (for N-IO)	FIO Node Unit (for dual-redundant ESB Bus)	Optical ESB Bus Repeater Unit	Availability for dual-redundant configuration	Temperature environment support	G3 support
ALR111	Serial communication module (RS-232C, 2-port, for N-IO/FIO)	X	X	—	X (*1)	—	X
ALR121	Serial communication module (RS-422/RS-485, 2-port, for N-IO/FIO)	X	X	—	X (*1)	X	X
ALE111	Ethernet communication module (for N-IO/FIO)	X	X	—	X (*2)	X	X
ALF111	FOUNDATION fieldbus communication module (for N-IO/FIO)	X	X	—	X	—	X
ALP121	PROFIBUS-DP communication module (for N-IO/FIO)	X	X	—	X	—	X
A2LP131	PROFINET communication module (for N-IO/FIO)	X	X	—	—	—	X

X: Mountable —: Not mountable
*1: Dual-redundant communication is applicable according to communication function. For details, refer to the GS “Serial communication modules (for N-IO/FIO)” (GS 33J60G10-01EN).
*2: Dual-redundant communication is applicable according to communication function. For details, refer to the GS “Ethernet communication module (for N-IO/FIO)” (GS 33J60G11-01EN).

The following bus interface module models are available. They can be mounted only in a dual-redundant configuration to the field control unit, FIO Node Unit (for dual-redundant ESB Bus), and Optical ESB Bus Repeater Unit. The environment-proof support (temperature environment support, G3 support) option can be specified.

Table Bus Interface module models and support for mounting to node units

Model	Name	FCU (for N-IO)	FIO Node Unit (for dual-redundant ESB Bus)	Optical ESB Bus Repeater Unit	Availability for dual-redundant configuration	Temperature environment support	G3 support
EC401	ESB bus coupler module (for N-IO/FIO, 1-port)	X	—	—	X (*1)	—	X
EC402	ESB bus coupler module (for N-IO/FIO, 2-port)	X	—	—	X (*1)	—	X
A2EN402	N-ESB bus coupler module (for N-IO, 2-port)	X	—	—	X (*1)	—	X
A2EN404	N-ESB bus coupler module (for N-IO, 4-port)	X	—	—	X (*1)	—	X
ANT401-□E, -□F	Optical ESB bus repeater master module for 5 km	X	X	X	X (*1)	X (*2)	X (*2)
ANT502-□E, -□F	Optical ESB bus repeater slave module for 5 km	—	X (*3)	X	X (*1)	X (*2)	X (*2)
ANT411-□E, -□F	Optical ESB bus repeater master module for 5 km to 50 km	X	X	X	X (*1)	X (*2)	X (*2)
ANT512-□E, -□F	Optical ESB bus repeater slave module for 5 km to 50 km	—	X (*3)	X	X (*1)	X (*2)	X (*2)

X: Mountable —: Not mountable
*1: Dual-redundant configuration only
*2: The environment-proof support (temperature environment support, G3 support) option can be specified only for ANT4□1-□F and ANT5□1-□F.
*3: ANT502 or ANT512 is mounted to ANB11D as standard.

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● Field connection

An N-IO I/O unit can be connected to the field device directly from the pressure clamp terminal or the spring clamp terminal on the base plate via the field cable or relaying the terminal board via a dedicated cable. The following shows the signal connections of the N-IO I/O unit and communication module.

Table Signal connections of N-IO I/O units

Model	Name	Number of I/O channels per module	Signal coneection			Terminal board connection		Field cable specifications
			Pressure clamp terminal	Spring clamp terminal	Cable connector	Cable	Terminal board	
A2BN3D -□1□□□	Base plate for adaptor (for N-IO, 16-channel, with adaptor, pressure clamp terminal or spring clamp terminal)	16	X	—	—	—	—	(*1)
A2BN3D -□2□□□		16	—	X	—	—	—	(*1)
A2BN3D -□9□□□		16	—	—	X	AKB331 AKB651 (*3)	A2BM4 (*4)	(*1)
A2BN4D	Base plate for barrier (for N-IO, MTL barrier)	16	(*2)			—	—	(*2)
A2BN5D	Base plate for barrier (for N-IO, P+F barrier)	16	(*2)			—	—	(*2)

X: Connectable —: Not connectable
*1: For cables used and cable termination process, refer to the GS “Field connection specifications (for N-IO)” (GS 33J62A20-01EN).
*2: For details, refer to the GS “Base plates (for N-IO)” (GS 33J62F40-01EN).
*3: For details, refer to the GS “Cables (for FIO)” (GS 33J60J10-01EN).
*4: For details, refer to the GS “Terminal Board (for N-IO)” (GS 33J62H50-01EN).

The communication module can be connected to a field device with the dedicated cable or pressure clamp terminal depending on the application.

The following shows the signal connections of the N-IO I/O unit and communication module.

Table Signal connections of communication module

Model	Name	Number of communication ports per module	Field-side signal connection		Field cable specifications
			Pressure clamp terminal	Spring clamp terminal	
ALR111	Serial communication module (RS-232C, 2-port, for N-IO/FIO)	2-port	—	—	(*1)
ALR121	Serial communication module (RS-422/RS-485, 2-port, for N-IO/ FIO)	2-port	—	—	(*1)
ALE111	Ethernet communication module (for N-IO/FIO)	1-port	—	—	(*2)
ALF111	FOUNDATION fieldbus communication module (for N-IO/ FIO)	1-port	X (*3)	—	(*4)
ALP121	PROFIBUS-DP communication module (for N-IO/FIO)	1-port	—	—	(*5)
A2LP131	PROFINET communication module (for N-IO/FIO)	1-port	—	—	(*6)

X: Connectable —: Not connectable
*1: Yokogawa’s genuine serial communication cable is also available.
For the model, refer to the GS “Serial communication modules (for N-IO/FIO)” (GS 33J60G10-01EN).
*2: General ethernet crossover cable (connector: RJ-45)
*3: A pressure clamp terminal can be used for connection by attaching a terminal block ATF9S.
*4: The dedicated cable (AKB336) can be used to connect to the terminal board (AFE9D).
*5: Compliant with IEC61158-2 type 3 (PROFIBUS).
*6: Compliant with IEC61158-2 type 10 (PROFINET).

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● Power consumption

Table Power consumption of I/O module

Model	Name	24 V DC system power supply (*1) Max. current consumption (mA)
A2MMM843	Analog digital I/O module (16-channel, isolated)	700
A2MDV843	Digital I/O module (16-channel, isolated)	700

*1: System power supply means a power supply that draws power from the Node Interface Unit (A2NN30D).

Table Power consumption of I/O adaptors

Model	Name	Max. current consumption (mA)	
		24 V DC system power supply (*1)	5 V DC internal power supply (*2)
A2SAM105	Current input/voltage input adaptor	42	10
A2SAM505	Current output/voltage output adaptor	38	10
A2SAT105	mV/TC/RTD input adaptor	12	10
A2SAP105	Pulse input signal adaptor (0 to 10kHz)	50 (*3)	10
A2SDV105	Digital input adaptor (24 V DC voltage input, dry contact input)	—	14
A2SDV505	Digital output adaptor (24 V DC, current source: 0.5 A)	—	18
A2SDV506	Relay output adaptor (24 V DC, dry contact output: 0.5 A)	—	8
A2SMX801	Pass-through I/O signal adaptor (Pass-through I/O signal)	—	—
A2SMX802	Pass-through I/O signal adaptor (with field power output)	—	—

*1: System power supply means a power supply that draws power from the node interface unit (A2NN30D).
*2: Internal power supply means a power supply that draws power from I/O module.
The current consumption is included in that of I/O module.
*3: When A2EXR001 is used in combination with A2SAP105, the power consumption of A2EXR001 is included in A2SAP105.

Table Current consumption of bus Interface modules and communication modules

Model	Name	Max. current consumption 5 V DC (mA)
—	**Bus interface module**	
EC401	ESB bus coupler module (for N-IO/FIO, 1-port)	500
EC402	ESB bus coupler module (for N-IO/FIO, 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 -☐E, -☐F	Optical ESB bus repeater master module for 5 km	500
ANT502 -☐E, -☐F	Optical ESB bus repeater slave module for 5 km	500
ANT411 -☐E, -☐F	Optical ESB bus repeater master module for 5 km to 50 km	500
ANT512 -☐E, -☐F	Optical ESB bus repeater slave module for 5 km to 50 km	500
—	**Communication module**	
ALR111	Serial communication module (RS-232C, 2-port, for N-IO/FIO)	500
ALR121	Serial communication module (RS-422/RS-485, 2-port, for N-IO/FIO)	500
ALE111	Ethernet communication module (for N-IO/FIO)	500
ALF111	FOUNDATION fieldbus communication module (for N-IO/FIO)	500
ALP121	PROFIBUS-DP communication module (for N-IO/FIO)	700
A2LP131	PROFINET communication module (for N-IO/FIO)	800

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■ LIMITATIONS AND PRECAUTIONS FOR INSTALLATION

● Restrictions when using the I/O adaptor (A2SAM105, A2SAM505, or A2SAP105)

The power supply capacity restricts the combination of I/O modules and I/O adaptors to be mounted to the N/IO node. To mount the I/O adaptor (A2SAM105, A2SAM505, or A2SAP105), meet the following limit. There is no mounting limitation when A2SAM105, A2SAM505, or A2SAP105 is not used.

Obtain the total number of the power consumption points for the N-IO nodes (up to 96 channels) from the number of the points per I/O channel in the following table and add it to that of the power consumption points of the node interface unit (A2NN30D). The total number of the points must be 100 or less. Assign the points of “Unused” in the table to the unused channels of the I/O modules (A2MMM843). The total number of points cannot be calculated accurately if a zero point is assigned to an unused channel.

$$\sum (\text{Points/channel}) + (\text{Points of node interface unit}) \leq 100$$

Table Power consumption points per I/O channel

I/O adaptor		Operation function of I/O module (A2MMM843)		Point/channel
Model	Name			
A2SMX801	Pass-through I/O Signal adaptor (Pass-through I/O signal)	Analog input	2-wire	0.79
			4-wire	0.23
		Analog output		0.95
		Digital input		0.49
		Digital input (NAMUR compatible)		0.35
		Digital output	Current sink	0.34
			Current source	0.96
		Unused		0.22
A2SAM105	Current input/voltage input adaptor	—		1.06
A2SAM505	Current output/voltage output adaptor	—		0.98
A2SAT105	mV/TC/RTD input adaptor	—		0.46
A2SAP105	Pulse input signal adaptor	—		1.22
A2SDV105	Digital input adaptor	—		0.42
A2SDV505	Digital output adaptor	—		0.70
A2SDV506	Relay output adaptor	—		0.83
A2SMX802	Pass-through I/O signal adaptor (with field power output)	Analog input	3/4-wire	0.23
		Digital output	Current sink	0.34

Table Power consumption points for node interface unit

Model	Name	Suffix codes		Point
A2NN30D	Node interface unit (for N-IO)	-□□□□□00□□	N-ESB bus	5.00
		-□□□□□01□□	Optical ESB bus	6.67
		-□□□□□02□□		
		-□□□□□10□□		
		-□□□□□11□□		
		-□□□□□12□□		
		-□□□□□20□□		
		-□□□□□21□□		
		-□□□□□22□□		

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● Restrictions when using the I/O adaptor (A2SDV505, or A2SDV506) and when using the field power output of A2SMX802

A load current can cause generation of a voltage drop due to the resistance components of terminal board, N-IO I/O unit, and AKB cable to connect them. The following tables show the voltage drop value (* 1) at each length of AKB cable.

* 1: This includes the voltage drop at terminal board, AKB cable, base plate, and I/O adaptors.

When using AKB331, do not use it under the condition of " Prohibited " in the following table. When the load current is high and the cable length is long, use AKB651.

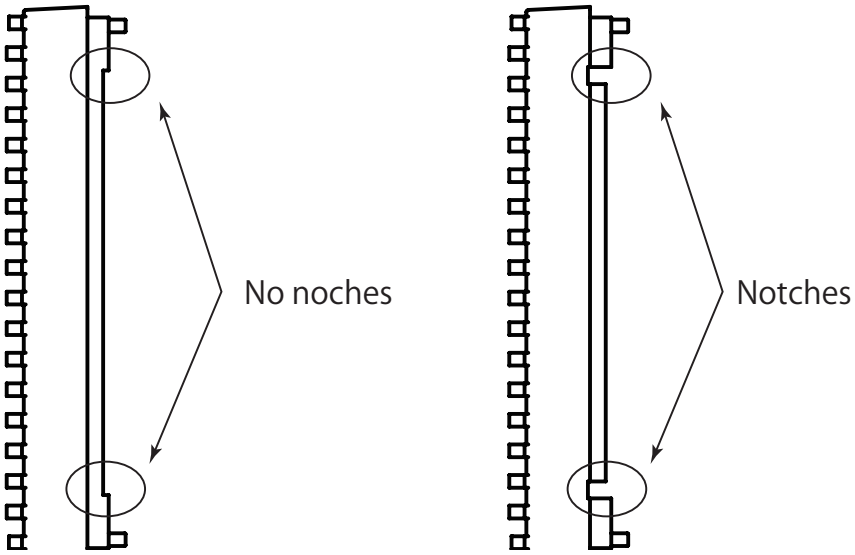


Figure Voltage drop caused by wiring resistance

Table Voltage drop value when using AKB331

	Voltage drop value at each length of AKB331 [V max]			
Load current [A] (*1)	**1 to 10 [m]**	**15, 20 [m]**	**25, 30 [m]**	**35 to 50 [m]**
0 to 0.1	1.5	2.0	2.4	3.3
0.1 to 0.2	1.9	2.9	3.7	Prohibited
0.2 to 0.3	2.4	3.8	Prohibited	Prohibited
0.3 to 0.4	2.9	Prohibited	Prohibited	Prohibited
0.4 to 0.5	3.3	Prohibited	Prohibited	Prohibited

*1: Current flowing through each channel.

Table Voltage drop value when using AKB651

	Voltage drop value at each length of AKB651 [V max]		
Load current [A] (*1)	**1 to 10 [m]**	**15, 20 [m]**	**25, 30 [m]**
0 to 0.1	1.2	1.3	1.4
0.1 to 0.2	1.3	1.5	1.8
0.2 to 0.3	1.4	1.8	2.1
0.3 to 0.4	1.6	2.0	2.5
0.4 to 0.5	1.7	2.3	2.9

*1: Current flowing through each channel.

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● Influences on voltage drop caused by wiring resistance when using the voltage output function of the I/O adaptor (A2SAM505)

A load current can cause generation of a voltage drop due to the resistance components of terminal board, N-IO I/O unit, and AKB cable to connect them. The following tables show the resistance value (* 1) at each length of AKB cable. When calculating the resistance value of field wiring, it is necessary to take into account this resistance value.

* 1: This includes the voltage drop at terminal board, AKB cable, and base plate.

Table Total resistance value at each length of AKB cable

Model	Cable length [m]	Total resistance value [Ω max]
AKB331	L ≤ 10	5.0
	10 < L ≤ 30	15.0
	30 < L ≤ 50	25.0
AKB651	L ≤ 30	5.0

● Mounting restrictions by application capacity limitations

Basic control functions (VP6F1800)

Number of N-IO nodes	Up to 32 nodes per FCU
Number of N-IO I/O units	Up to 108 units per FCU
Total number of FIO Node Unit (for dual-redundant ESB Bus)	Up to 8 units per FCU
Total number of ALR111/ALR121/ALE111/ALP121/A2LP131 modules	Up to 32 modules (16 pairs in dual-redundant configuration) per FCU
Total number of ALF111 modules	Up to 64 modules (32 pairs in dual-redundant configuration) per FCU
Total number of communication modules to be mounted (*1)	Up to 64 modules (*1) per FCU

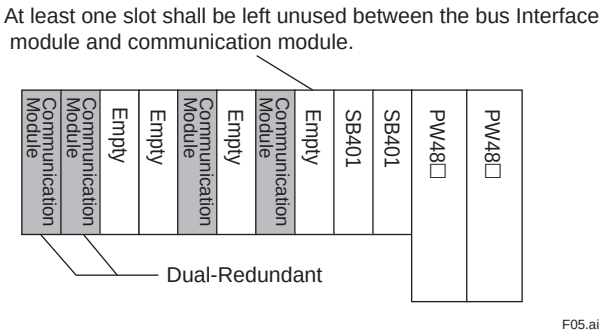
Note: As for the number of N-IO I/O node units and N-IO I/O units constituting the N-IO field enclosure, Refer to the GS "N-IO field enclosure" (GS 33J62R10-01EN).
*1: This is the total number of ALR111, ALR121, ALE111, ALF111, ALP121, and A2LP131 modules.

For details, refer to the GS “VP6F1800 control function for field control station (for A2FV50□)” (GS 33J15C15-01EN) and the GS “VP6F3100 project I/O license” (GS 33J15A10-01EN).

● Limitations of installation under the ambient operating temperature conditions

When a communication module ALR121 or ALE111 is mounted to FIO Node Unit (for dual-redundant ESB Bus) (temperature environment support (-20 to 70 ˚C) option) in the ambient temperature condition of 60 to 70°C, observe the following restrictions. Optical ESB Bus Repeater Unit can be used at temperature from 60 to 70°C without any additional restrictions in the same way as at temperature from -20 to 50°C.

- The maximum number of communication modules to be mounted shall be 4 modules per node.
- At least one slot shall be left unused between the bus interface modules (SB401, ANT401-□E, -□F or ANT5□2-□E, -□F) and communication modules (ALR121 or ALE111).
- At least one slot shall be left unused between communication modules. At least two slots shall be unused between dual-redundant pairs of modules.



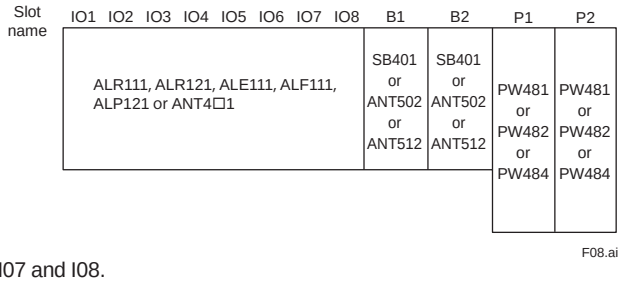
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To mount a communication module ALR111, ALF111, ALP121, or A2LP131 to FIO Node Unit (for dual-redundant ESB Bus) , the operation temperature range shall be 0 to 50°C.

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● Restrictions for mounting communication module and bus interface module

To mount communication modules in dual-redundant configuration, mount them at the slot positions named IO1-IO2, IO3-IO4, IO5-IO6, and IO7-IO8 in the figure below. The bus interface module supports the dual-redundant configuration only. Be sure to mount a pair of modules (in dual-module configuration).



*1: Mount EC40□ to slots I07 and I08.
*2: A dual-redundant configuration is enabled by using 2 identical modules with same model code (CP461 or CP471).

Figure Field control unit (for N-IO)

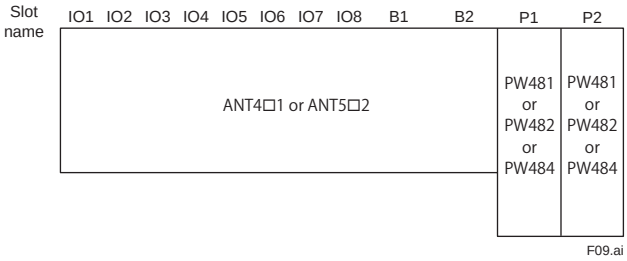


Figure FIO Node Unit (for dual-redundant ESB Bus)

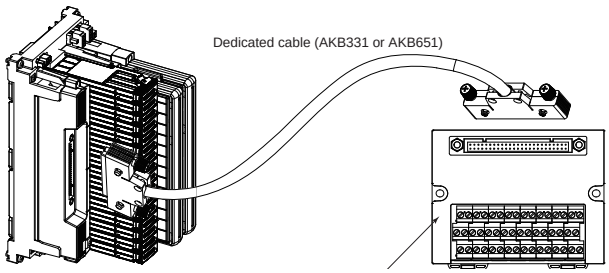


Figure Optical ESB Bus Repeater Unit

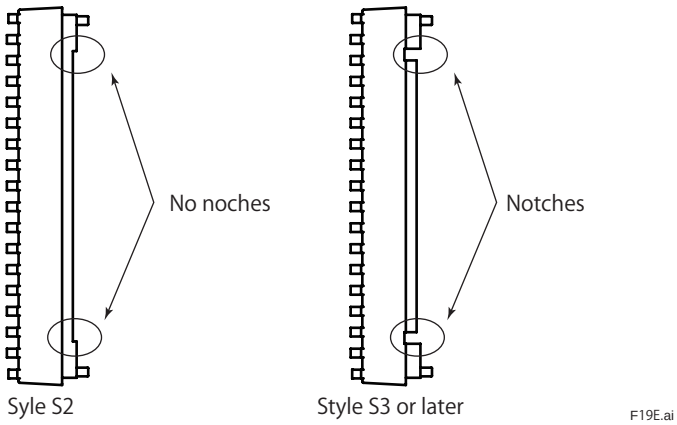
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● Protection of unused slots

Be sure to attach the dummy cover to any unused slot to which a module is not mounted.

	Dummy cover model
I/O module (for N-IO)	A2DCV01
Bus interface module,Communication module, Processor Module (*2), Power Supply Module	ADCV01
I/O adaptor (for N-IO)	A2SMX801 (*1)

*1: Mount a pass-through I/O signal adaptor (A2SMX801) to the unused slot of the I/O adaptor.
*2: Style S2 cannot be used for Processor Module. For details about the differences of style, refer to the following drawings.



● Remarks when removing the through adaptor (A2SMX801)

When removing a I/O adaptor other than the through adaptor (A2SMX801) during system operation, the value at the time of removal is held. However, A2SMX801 cannot hold the value at the time of removal when the digital input function of I/O module is used, because the A2SMX801 functions as a disconnecting terminal.

Upon removal of the A2SMX801, a system alarm (No. 0495/0496) occurs and the operation state of the channel is displayed as same as the other I/O adaptors.

■ APPLICABLE STANDARDS

Refer to the GS “Integrated production control system CENTUM VP system overview (GS 33J01A10-01EN).”

■ TRADEMARK ACKNOWLEDGMENT

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