

Communication Devices

IM 32Q06H10-31E

vigilantplant[®]

Introduction

The optical bus repeater and the bus repeater are used to extend the transmission distance of V net.

This manual describes the communication devices used with ProSafe-RS System.

Part A describes optical bus repeater (model names: YNT511D and YNT522D) and Part B describes bus repeater (model name: YNT512D).



IMPORTANT

- In this document, 10BASE-5 and 10BASE-2, terminology of Ethernet, are used to describe the V net cables for easier understanding. Actually, V net is different from Ethernet. Yokogawa's YCB111 and YCB141 cables should be used instead of 10BASE-5 and 10BASE-2 cables, respectively.
- For the cables, connectors, T-type connectors and terminators, the models recommended by Yokogawa should be used.

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- Part A
Optical Bus Repeater

The optical bus repeater is used to replace a part of V net with fiber-optic cables instead of coaxial cables.

The use of this device with fiber-optic cables makes a long-distance transmission possible.

- Part B
Bus Repeater

The bus repeater is used to extend the communication distance of V net.

Safety Precautions for Use

■ Safety, Protection, and Modification of the Product

- To protect the system controlled by the Product and the Product itself and to ensure safe operation, please observe the safety precautions described in this Manual. Yokogawa Electric Corporation ("YOKOGAWA") assumes no liability for safety if users fail to observe the safety precautions and instructions when operating the Product.
- If the Product is used in a manner not specified in the User's Manuals, the protection provided by the Product may be impaired.
- If any protection or safety circuit is required for the system controlled by the Product or for the Product itself, please install it externally.
- Use only spare parts that are approved by YOKOGAWA when replacing parts or consumables of the Product.
- Do not use the Product and its accessories such as power cords on devices that are not approved by YOKOGAWA. Do not use the Product and its accessories for any purpose other than those intended by YOKOGAWA.
- Modification of the Product is strictly prohibited.
- The following symbols are used in the Product and User's Manuals to indicate the accompanying safety precautions:



Indicates that caution is required for operation. This symbol is labeled on the Product to refer the user to the User's Manuals for necessary actions or behaviors in order to protect the operator and the equipment against dangers such as electric shock. In the User's Manuals, you will find the precautions necessary to prevent physical injury or death, which may be caused by accidents, such as electric shock resulting from operational mistakes.



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 position of a power on/off switch.



Indicates the OFF position of a power on/off switch.

■ Notes on Handling User's Manuals

- Hand over the User's Manuals to your end users so that they can keep the User's Manuals on hand for convenient reference.
- Thoroughly read and understand the information in the User's Manuals before using the Product.
- For the avoidance of doubt, the purpose of the User's Manuals is not to warrant that the Product is suitable for any particular purpose but to describe the functional details of the Product.
- Contents of the User's Manuals are subject to change without notice.

- Every effort has been made to ensure the accuracy of contents in the User's Manuals. However, should you have any questions or find any errors, contact us or your local distributor. The User's Manuals with unordered or missing pages will be replaced.

■ Warning and Disclaimer

- Except as specified in the warranty terms, YOKOGAWA shall not provide any warranty for the Product.
- YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the Product.

■ Notes on Hardware

● Appearance and Accessories

Check the following items when you receive the Product:

- Appearance
- Standard accessories

Contact us or your local distributor in the following cases:

- The Product coating is peeling off.
- The Product itself is damaged.
- Any accessories are missing.

If the following label turns dirty and the information on it becomes illegible, or if the label is peeling off, order a new one with the part number T9029BX to replace it.



: Label attached to the Products such as the power supply module.

● Model and Suffix Codes

The name plate on the Product contains the model and suffix codes. Verify the model and suffix codes with those in the General Specifications (GS) to ensure that the Product matches the order specifications. Should you have any questions, contact us or your local distributor.

Documentation Conventions

■ Symbols

The following symbols are used in the User's Manuals.



CAUTION

Identifies instructions that must be observed to avoid physical injury, electric shock, or death.



WARNING

Identifies instructions that must be observed to prevent damage to the software or hardware, or system failures of the Product.



IMPORTANT

Identifies important information required to understand operations or functions.

TIP

Identifies additional information.

**SEE
ALSO**

Identifies referenced content.

In online manuals, you can view the referenced content by clicking the links that are in green text. However, this action does not apply to the links that are in black text.

■ Drawing Conventions

Drawings used in the User's Manuals may be partially emphasized, simplified, or omitted for the convenience of description.

Drawings of windows may be slightly different from the actual screenshots with different settings or fonts. The difference does not hamper the understanding of basic functionalities and operation and monitoring tasks.

■ Integration with CENTUM

The Product can be integrated with CENTUM VP or CENTUM CS 3000. In the User's Manuals, the integration with CENTUM VP or CENTUM CS 3000 is referred to as "Integration with CENTUM."

In the User's Manuals, the explanations for integrating the Product with CENTUM VP or CENTUM CS 3000, the glossary for various features of CENTUM VP is used instead of the glossary for CENTUM CS 3000. For example, the term "CENTUM VP System Alarm View" is used instead of "CENTUM CS 3000 System Alarm window." Nevertheless, if the features for integrating the Product with CENTUM VP and CENTUM CS 3000 are different, both features will be explained separately.

**SEE
ALSO**

For more information about the functions and usage of CENTUM VP components for integrating the Product with CENTUM VP, refer to:

User's Manuals (IM), Technical Information (TI), and General Specifications (GS) of CENTUM VP

For more information about the features and usage of CENTUM CS 3000 components for integrating the Product with CENTUM CS 3000, refer to:

User's Manuals (IM), Technical Information (TI), and General Specifications (GS) of CENTUM CS 3000

■ Explanation of Hardware and Software Behaviors in the User's Manuals

In the User's Manuals, system behaviors are explained assuming that the latest versions of YOKOGAWA software and hardware at the time of publication of the User's Manuals are installed.

If additional precise information about the safety of legacy versions of software or hardware is required, a link to the corresponding explanation is provided. Please refer to the information according to your system.

■ Station Types

A safety control station (hereafter referred to as SCS) is named according to the type of the safety control unit used in it.

Table Info-1 Names of SCS and Safety Control Unit Used

Name of SCS	Model of the safety control unit
SCSV1-S	SSC10S/SSC10D
SCSP1-S	SSC50S/SSC50D
SCSP2-S	SSC60S/SSC60D
SCSU1-S	SSC57S/SSC57D

In the User's Manuals, the following abbreviations may be used to describe functions of these SCS as a whole.

- SCSV1: Abbreviation of SCSV1-S
- SCSP1: Abbreviation of SCSP1-S
- SCSP2: Abbreviation of SCSP2-S
- SCSU1: Abbreviation of SCSU1-S

Conformity Standards and Cautions

■ Conformity Standards

The Product conforms to various standards.

**SEE
ALSO**

For more information about standards the product conforms to, refer to:

General Specifications (GS) for the Product

● Standards

The standards that the Product conforms to are described in the following table:

Table Info-2 Standards

Category	Standard
Functional safety standards (*1) (*2)	IEC 61508
Programmable controllers (*1) (*2)	IEC 61131-2
Safety Standards (*2) (*3) (*4)	[CSA] • CAN/CSA-C22.2 No.61010-1 [100-120 V AC power supply] [CE Marking] Low Voltage Directive • EN 61010-1 [100-120 V AC (*5), 220-240 V AC, and 24 V DC power supply] [EAC Marking] (*6) • CU TR 004
EMC Standards (*2)	[CE Marking] EMC Directive • EN 55011 Class A Group 1 [100-120 V AC (*5), 220-240 V AC, and 24 V DC power supply] (*7) • EN 61000-6-2 [100-120 V AC (*5), 220-240 V AC, and 24 V DC power supply] (*8) • EN 61000-3-2 [220-240 V AC power supply] (*9) • EN 61000-3-3 [220-240 V AC power supply] [RCM] • EN 55011 Class A Group 1 [220-240 V AC and 24 V DC power supply] (*7) [KC Marking] • Korea Electromagnetic Conformity Standard [100-120 V AC (*10), 220-240 V AC, and 24 V DC power supply] [EAC Marking] (*6) • CU TR 020

*1: Safety control stations comply with this standard.

*2: The devices must be installed in a metal cabinet with lock and key to meet the safety standards and EMC Standards.

*3: To ensure that all the hardware devices satisfy the safety standards, the dedicated breakers conforming to the following specifications must be installed in the power supply distribution board:

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

*4: The Product must be grounded to a protective grounding system that is suitable for the power distribution system or must conform to the safety standards of the country or region where the Product is used.

*5: SSC10S/SSC10D (100-120 V AC power supply) are excluded from CE Marking conformity.

*6: The EAC mark is as follows:



*7: Class A hardware devices are designed for use in an industrial environment.

*8: Regarding surge immunity, a lightning arrester or an equivalent equipment must be installed.

*9: Regarding the requirements on the limits for harmonic current emissions, the active filter circuitry or an external power supply unit with proper harmonic filters should be used.

*10: SSC10S/SSC10D (100-120 V AC power supply) are excluded from KC Marking conformity.

In relation to the CE Marking, the manufacturer and the authorised representative for Pro-Safe-RS 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)

**SEE
ALSO**

For more information about selecting a power supply unit that enables safe usage of the product, refer to:

“■ Guidelines for Selecting a Power Supply Unit” on page x

For more information about selecting and wiring power cables, refer to:

ProSafe-RS Installation Guidance (TI 32S01J10-01E)

■ Installation and Maintenance Notes

● Installation Method

Observe the following guidelines to ensure that devices meet safety and performance requirements:

- Install rack-mountable devices in a lockable metal cabinet to meet their respective standards.
- If devices are housed in a cabinet, keep the cabinet door closed during operation.
- Ensure that all the empty slots of the devices are covered with the covers provided. Place an order for the required covers.
- Ensure that all cables are firmly fixed with cable ties.
- Prepare a dedicated breaker in the same room as the system so that it can shut off the power supply when an abnormality occurs. Use this breaker to turn off the power supply for the devices of the system when a device abnormality occurs.

**SEE
ALSO**

For more information about installation method, refer to:

ProSafe-RS Installation Guidance (TI 32S01J10-01E)

● Requirements for Installation

When installing a device, the requirements for the device should be satisfied.

In addition, to satisfy safety standards, the device should be installed under the following conditions:

Installation height: Altitude of up to 2000 m

Installation category based on IEC 61010-1: II (*1)

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

*1: The installation category, also referred to as an overvoltage category, defines the standard for impulse withstand voltage. Category II applies to the electrical device that is directly connected to the lower-voltage power supply.

*2: 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**

For more information about installation specifications, refer to:

ProSafe-RS Installation Guidance (TI 32S01J10-01E)

● Tightening Torque of Screws



CAUTION

The recommended tightening torque for the Product is shown 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 Info-3 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

**SEE
ALSO**

For more information about the nominal diameter of each screw, refer to:
ProSafe-RS Installation Guidance (TI 32S01J10-01E)

● Power Cable Wiring



CAUTION

Connect the power cables according to the procedure specified in the User's Manuals of the device.

Power cables must conform to the safety standards of the country where the device is installed.

**SEE
ALSO**

For more information about power cables wiring, refer to:

- [A3.1, "Connecting the Power Cable" on page A3-2](#)
- ProSafe-RS Installation Guidance (TI 32S01J10-01E)
- User's manual of each device

● Grounding



CAUTION

The Product requires the protective grounding defined by the safety standards.

You must ground the Product according to the procedure specified in the User's Manuals to prevent electric shock and to minimize the effect of noise.

**SEE
ALSO**

For more information about grounding, refer to:

- [A3.2, "Connecting the Ground Cable" on page A3-3](#)
- ProSafe-RS Installation Guidance (TI 32S01J10-01E)
- User's manual of each device

- **Maintenance**

**CAUTION**

- The Product maintenance should be performed only by personnel who have undergone specialized training.
 - When a device turns dirty, use a vacuum cleaner or a soft dry cloth to clean it.
 - During maintenance, wear a wrist strap and follow Electrostatic Discharge (ESD) precautions.
 - If any existing caution label is peeling off, or is dirty and illegible, order a new one with the part number T9029BX to replace it.
-

**SEE
ALSO**

For more information about maintenance, refer to:

- [A5., "Maintenance for the Optical Bus Repeater" on page A5-1](#)
 - [B5., "Maintenance for the Bus Repeater" on page B5-1](#)
 - ProSafe-RS Installation Guidance (TI 32S01J10-01E)
 - User's manual of each device
-

- **Modules, Cards, Cables, and Connectors**

**CAUTION**

When the power is on, only modules, cards, cables, and connectors that are allowed in the User's Manuals can be replaced, removed, or installed.

**SEE
ALSO**

For more information about replacing, and removing or installing modules, cards, cables, and connectors, refer to:

- [A5.2, "Parts Replacement" on page A5-3](#)
 - [B5.2, "Parts Replacement" on page B5-3](#)
 - ProSafe-RS Installation Guidance (TI 32S01J10-01E)
 - User's manual of each device
-

● Fuses



CAUTION

- Use only YOKOGAWA-designated fuses for replacement.
 - Turn off the power supply before replacing the fuses.
-

SEE ALSO

For more information about replacing fuses, refer to:

- [A5.2.4, "Components/Parts Requiring Periodic Replacement" on page A5-8](#)
 - ProSafe-RS Installation Guidance (TI 32S01J10-01E)
 - User's manual of each device
-

■ Guidelines for Selecting a Power Supply Unit

Regarding the system of the Product, you must take note of the following precautions by using a power supply unit to satisfy the various requirements of the EMC regulations:

- Prevent power supply problems such as power failure or short interruptions.
- Protect the power supply unit against power line noise and lightning surge.
- Suppress power supply harmonic current from devices.

You must consult with the power supply unit suppliers, and then select and install a suitable power supply unit with the considerations described in the following sections.

● Notices on Deciding the Output Capacity of Power Supply Unit

Consult with the power supply unit suppliers and decide a suitable output capacity of the power supply unit with the following considerations:

- Power consumption
Power consumed in both volt-ampere (VA) and watt (W).
 - Device crest factor
Ratio of the peak value to the effective value of input current supplied to each device.
 - Device inrush current
The maximum inrush current when power is turned on.
 - Power failure backup time
Time required to back up the devices when power fails.
 - Reserve capacity
An extra power capacity for additional devices and so on.
-

SEE ALSO

For more information about power consumption (VA/W) and inrush current, refer to:

ProSafe-RS Installation Guidance (TI 32S01J10-01E)

● Crest Factor

The crest factor refers to the ratio of the peak value to the effective value of any input current of a device.

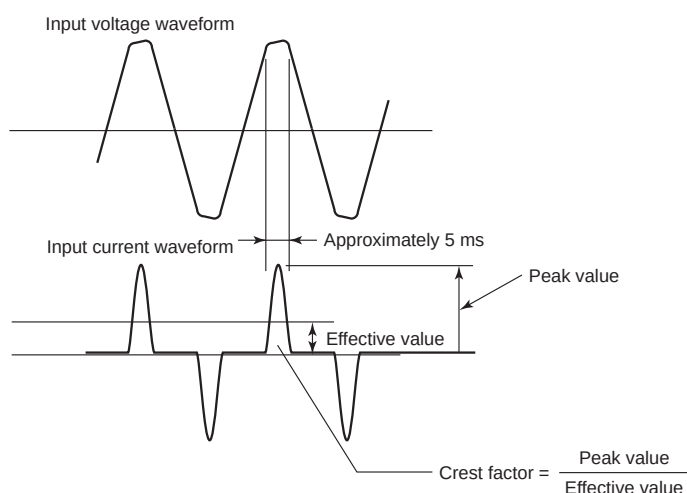


Figure Info-1 Input voltage and current waveforms

Crest Factor = Peak value of the current supplied to the device / Effective value of the current

When selecting a power supply unit, you need to estimate the power supply output capacity, based on the crest factor of the input current supplied to every connected device. Estimate the device crest factors by using the following approximate values when selecting a power supply unit:

- 100 V system: Crest factor about 3
- 220 V system: Crest factor about 6

● How to Decide the Power Supply Unit

The commonly used methods for determining the power supply unit capacity with consideration of the crest factor are shown below. Note that the power supply unit capacity should be finally decided after consulting with the power supply unit supplier:

- If the power unit crest factor is larger than the device crest factor, the power unit can be used to its full rated capacity. However, factors such as device inrush current, backup time, and reserve capacity must be taken into consideration separately.
- If the power unit crest factor is smaller than the device crest factor, the power unit capacity must be calculated using the following formula. Factors such as device inrush current, backup time, and reserve capacity must be taken into consideration separately.

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

Capacity coefficient = Device crest factor / Power unit crest factor

● Inrush Current

When a device is turned on, the large inrush current flows in because of the momentary charging current for capacitors. Therefore, the minimum requirement is that the inrush current produced by turning on some devices should not cause any voltage fluctuations that may affect other devices. For turning on all devices together, a soft start or switching to uninterruptible backup power should be required.

When the power is turned on, the inrush current can trip the overload protector, and then may switch to the backup power or commercial power supply. You should select a power supply unit that can automatically and seamlessly recover the normal power supply when overloading ends.

● **Suppressing Harmonic Current**

To suppress the power supply harmonic current that flows to a low-voltage distribution system, a power supply unit or an active filter as described below should be installed between a device and the low-voltage distribution system:

- A power supply unit that can suppress the power supply harmonic current, such as a high power factor inverter-type uninterruptible power unit
- An active filter unit for suppressing the power supply harmonic current

For Europe, you must select a power supply unit that can meet the requirements on the limits for harmonic current emissions of the EMC Directives.

Aside from determining the output capacity of the power supply unit, you should also determine the capacity of the harmonic current suppressing unit after consultation with the supplier of your power supply unit.

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A. Optical Bus Repeater

The optical bus repeater is used to replace a part of V net with fiber-optic cables instead of coaxial cables. The use of optical bus repeaters makes it possible to transmit signals through fiber-optic cables over a long distance. It is suitable for outdoor transmission, because it is free of the effects of external noise and ground potential differences.

A1. Configuration and Specifications of Optical Bus Repeater

This section describes the configuration and specifications of optical bus repeaters. The optical bus repeaters are available in two different models according to the transmission distance:

- YNT511D Dual-redundant configuration optical bus repeater (for max. 4 km)
- YNT522D Dual-redundant configuration optical bus repeater (for max. 15 km)



WARNING

Never let the laser light coming out from the connector on the optical transceiver or the end of the optical fiber plug hit your eyes directly.

A1.1 System Configuration

When system is configured with optical bus repeaters, two repeaters are used for repeating one bus.

■ Examples of System Configuration with Optical Bus Repeaters

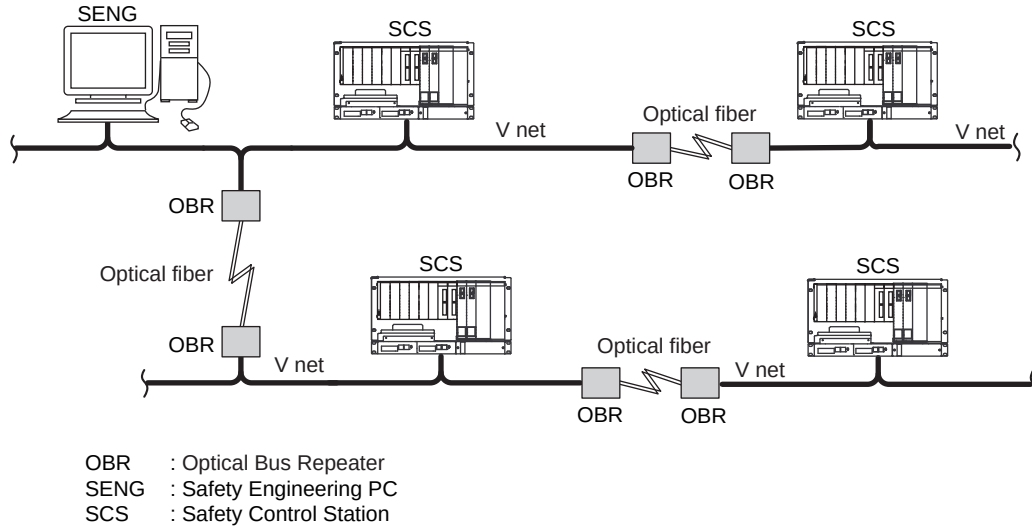


Figure A1.1-1 System Configuration

■ Configuration and Component Names

For ProSafe-RS, the optical bus repeaters are used for dual-redundant bus configuration. Component names are same for Bus 1 and Bus 2.

As shown in the following figure, the components on the left hand side are for Bus 1 and those on the right hand side are for Bus 2.

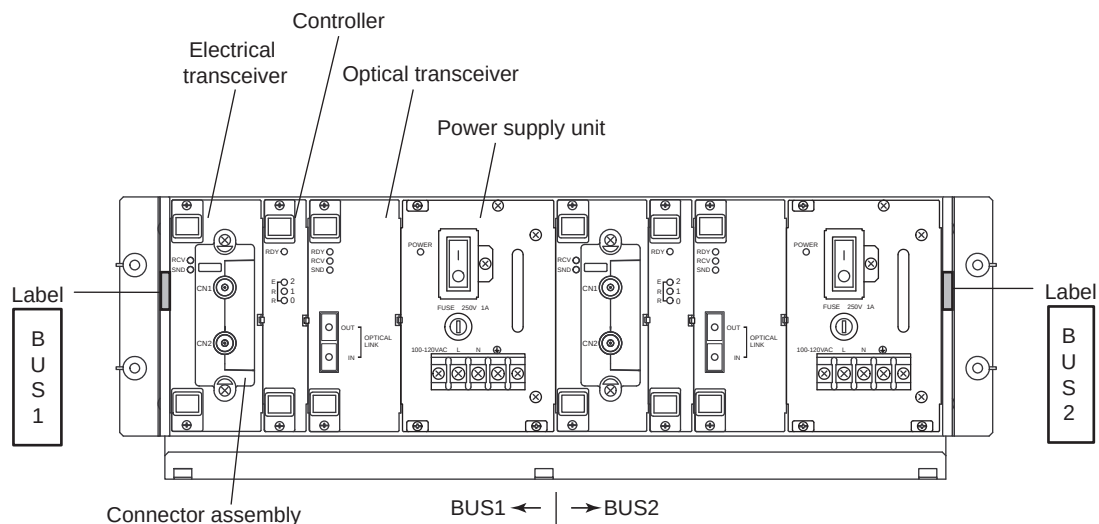


Figure A1.1-2 Configuration of Optical Bus Repeater (YNT511D)

● Names and Models of Optical Bus Repeater Component Units

The names and models of the optical bus repeater component units are listed below.

Since the repeater is for dual-redundant configuration thus each component requires two units.

Table A1.1-1 Names and Models of Optical Bus Repeater Component Units

Name of unit	Model name of unit
Power supply unit	PW501 (100-120 V AC) PW502 (220-240 V AC) PW504 (24 V DC)
Optical transceiver	AIP578 (for 4 km, max.) AIP591 (for 15 km, max.)
Controller	AIP171
Electrical transceiver	AIP571
Connector assembly	S9764UK(for 10BASE-2) S9628UK(for 10BASE-5)

A1.2 Transmission Distance

The specification of number of optical bus repeater, transmission distance, and bus cable type are shown in this section.

■ Number of Optical Bus Repeaters and Transmission Distance

Model YNT511D is used for 4 km or shorter transmission.

Model YNT522D is used for 15 km or shorter transmission.

Up to 4 pairs of optical bus repeater can be used, 2 in each. There are restrictions for transmission distance, which are listed in the following table, to avoid transmission delay.

Table A1.2-1 Number of Optical Bus Repeaters and Transmission Distance

For V net	Total transmission distance depending on No. of repeaters (km)			
	One pair (Two repeaters)	Two pairs (Four repeaters)	Three pairs (Six repeaters)	Four pairs (Eight repeaters)
4 km, max. (10BASE-2)	Max. 4.370	Max. 8.555	Max. 12.740	Max. 16
4 km, max. (10BASE-5)	Max. 5	Max. 9.5	Max. 14	Max. 16
15 km, max. (10BASE-2)	Max. 15.370	Max. 20	Max. 18	Max. 16
15 km, max. (10BASE-5)	Max. 16	Max. 20	Max. 18	Max. 16

■ Fiber-optic Cable Specifications (Reference)

Table A1.2-2 Fiber-optic Cable Specifications (Reference)

Item		YNT511D (for max. 4 km)	YNT522D (for max. 15 km)
Optical connector type		Type SC (IEC 60874-14, JIS C 5973)	Type SC (IEC 60874-14, JIS C 5973)
Max. permissible optical loss		0 to 6.0 dB @1.3 μm	0 to 18 dB @1.3 μm
Fiber-optic	Type	Quartz multimode fiber GI 50/125 (IEC 60793-2-10 A1a.1, JIS C 6832 Type SGI50/125)	Quartz single mode fiber SM 9.3/125 (IEC 60793-2-50 B1.1, JIS C 6835 Type SSMA 9.3/125)
	Numerical aperture (NA)	0.20 to 0.22 @ 1.3 μm	-
	Transmission band	- Up to 2 km transmission distance: 200 MHz·km or over @ 1.3 μm 2 to 4 km transmission distance: 400 MHz·km or over @ 1.3 μm	
	Max. length	4 km	15 km

A2. Installation of Optical Bus Repeater

The optical bus repeater is designed to install in a general-purpose rack.



CAUTION

If a device is rack-mountable, it should be mounted on a rack and put in a metal cabinet with a lock.

■ Attaching Brackets

There are 19-inch rack mountable devices that the positions of their brackets can be changed according to the front and rear space of the rack. Before attaching the devices to the instrument panel or rack, change bracket positions as shown below, if necessary: There is a choice of three bracket mounting positions.

For example, the optical bus repeaters (YNT511D, YNT522D) and bus repeater (YNT512D) can be mounted in one of three positions located depth-wise.

The mounting bracket positions of the optical bus repeater are shown below.

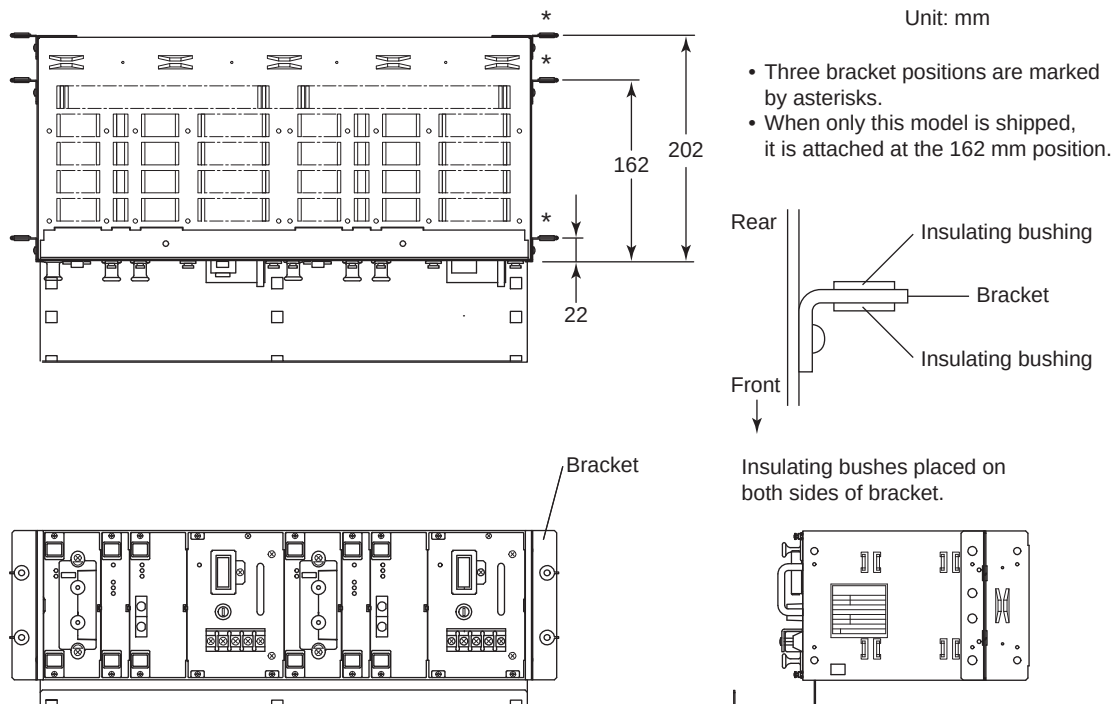


Figure A2-1 Mounting Bracket Positions of Optical Bus Repeater

■ Space for Heat Radiation

Be sure to allow space for radiation of heat at the top and bottom of the equipment.

- If the equipment is installed inside an instrument panel which has a closed top, install the equipment at least 3 UNIT (1 UNIT = 44.45 mm) away from the top panel.

**SEE
ALSO**

For more information about equipment installation environment, refer to:

ProSafe-RS Installation Guidance (TI 32S01J10-01E)

■ Maintenance Spaces

Be sure to allow spaces for maintenance.

- All cables connection for each unit is done from front of the equipment.
- The indication lamp check, setting, inspection, removal, and insertion of each card are done from the front of the equipment.
- Adequate space is required for suction and exhaust of the cooling fan equipment.
- For wiring and maintenance, allow a space of at least 1000 mm in front of the equipment.

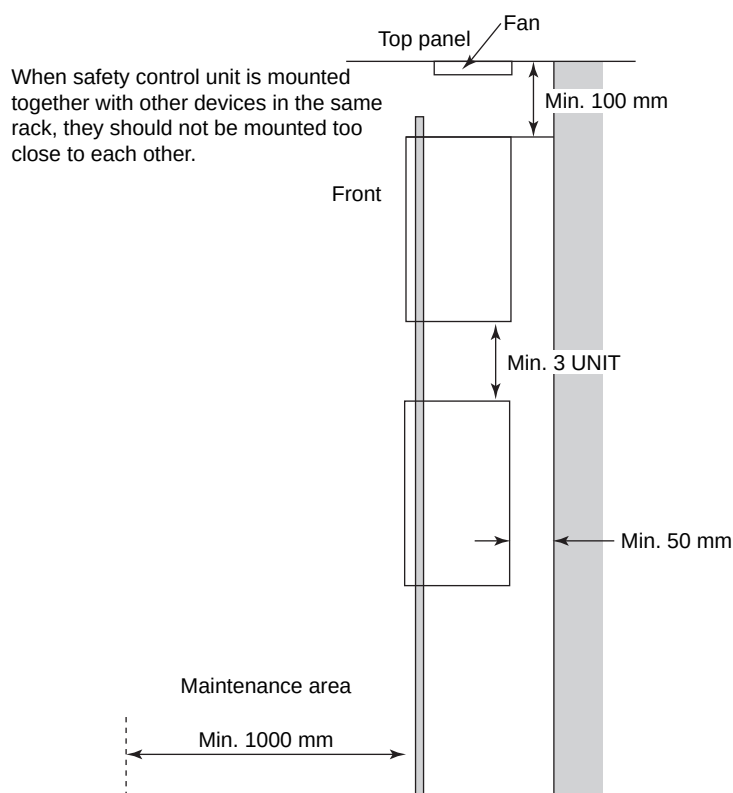


Figure A2-2 Rack Mounting Space

■ Installation of Rack Mountable Device

Take note of the following information when installing an optical bus repeater (OBR) on a rack or an instrument panel.

● Insulation from the Rack

Isolate the rack mountable OBR from the rack by attaching insulation bushings. Insulation bushings are supplied with the rack mountable OBR.



WARNING

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

● Installation Procedure

1. Fasten a pair of insulation bushings together to each of the screw holes on the plate or the bracket on the OBR.
The tapering end of the insulation bushings must come to the front side where a screw enters.
2. Using four M5 screws to fix the device onto the rack or the panel.
3. Make sure that the device is electrically isolated from the rack.

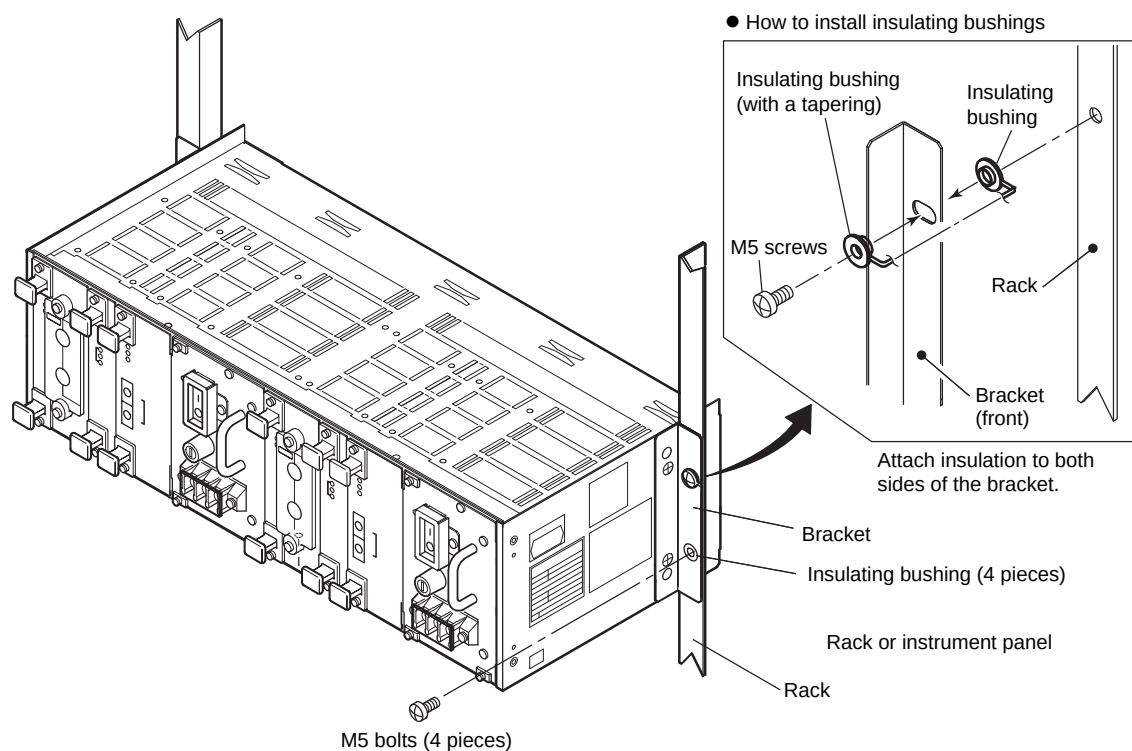


Figure A2-3 Mounting OBR on a Rack

A3. Cable Connections

This section explains the connection of power, bus and other cables to the optical bus repeater which has been installed in a rack or instrument panel. When wiring power cables, pay attention to the power unit specifications.



IMPORTANT

If the power supply to the optical bus repeater is shut off, communications which are running through that repeater will be interrupted. Be sure to review the scope of its service and provide an appropriate power source, e.g., an independent source, accordingly.

A3.1 Connecting the Power Cable

This section explains the procedures to connect the power cable to the mounted optical bus repeater.



CAUTION

- Wire the power cable through the conduit at the entrance of the cabinet for the following reasons:
 - To prevent damage to the cable due to contact with a metal plate.
 - To avoid applying excessive weight on the ring terminals or power connection terminals due to the weight of the cable.
- Turn off the main power supply and confirm with a tester that there is no power in the power cable to be connected, before performing any work.
- After the power cable has been connected, turn on the power without the breaker being turned ON in the power panel. Then, confirm with a tester that normal power is being supplied to the power connection terminal.
- Wire the power cable so that a distance of 1 cm or more is maintained from other signal lines.

The power connection terminals are illustrated in the figure below:

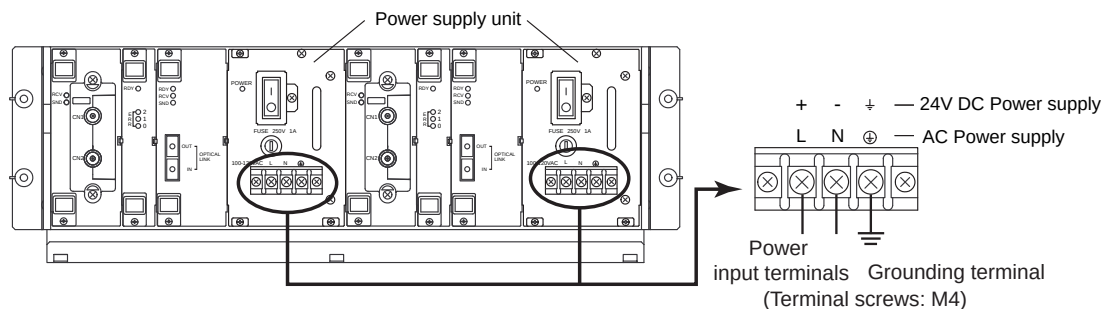


Figure A3.1-1 Connecting Power and Grounding Cables

■ Connection Methods for the Optical Bus Repeater Power Cable

1. Treat the end of the power cable and attach ring terminal for M4 screws.
 2. Turn off the power ON/OFF switch on the power supply unit.
 3. Remove the protective cover from the power connection terminals.
 4. Connect the ungrounded cable to terminal L (+), and the grounded cable to N (-).
- Proceed to the next step to connect the grounding cable.

A3.2 Connecting the Ground Cable

Be sure to ground the optical bus repeater to protect the operator and maintenance personnel from electric shock and to protect the equipment from the effects of external noise.



CAUTION

For grounding, connect cable to the grounding terminal next to the power input terminals.

Ground the grounding terminal to the protective grounding system. Provide an independent ground for the repeater.

Connect the grounding cable to the protective-grounding terminal next to the power input terminal, using ring terminal.

When the power source and ground wirings are completed, attach the protective cover.

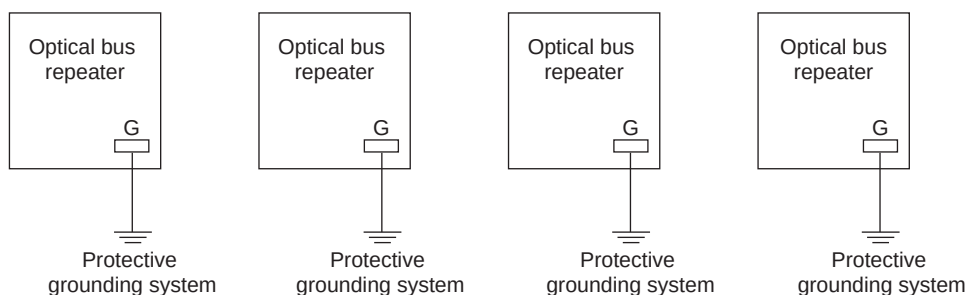


Figure A3.2-1 Independent Grounding of Optical Bus Repeater

If multiple optical bus repeaters are in the same room (same location) and independent grounding is not possible, specify a location where the ground bus leads in. Use a grounding cable with a size of 5.5 mm² or more for each optical bus repeater, and connect the cables to the grounding bus inlet (see the following figure).

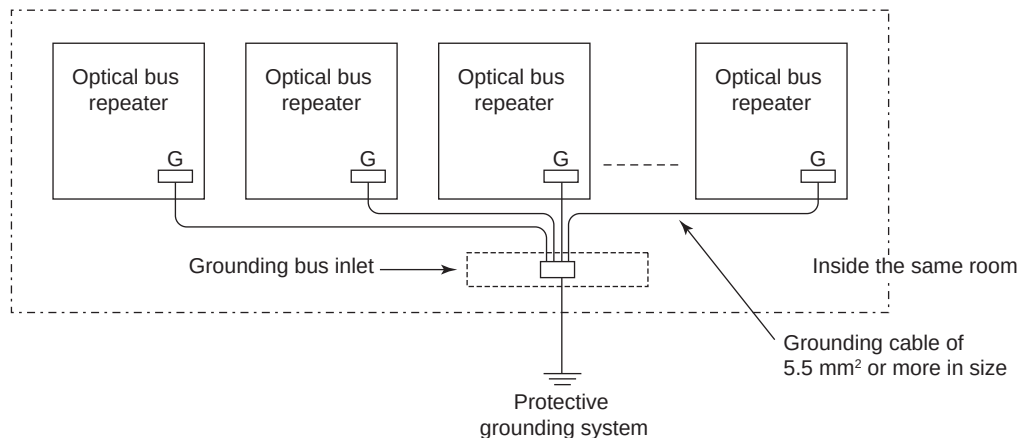


Figure A3.2-2 Grounding When Independent Grounding Cannot be Provided

A3.3 Connecting the V net Cables

This section explains the procedures to connect the V net cable to the mounted optical bus repeater.

■ V net Cable Connection

An example of connecting the V net cable is shown in the figure below.

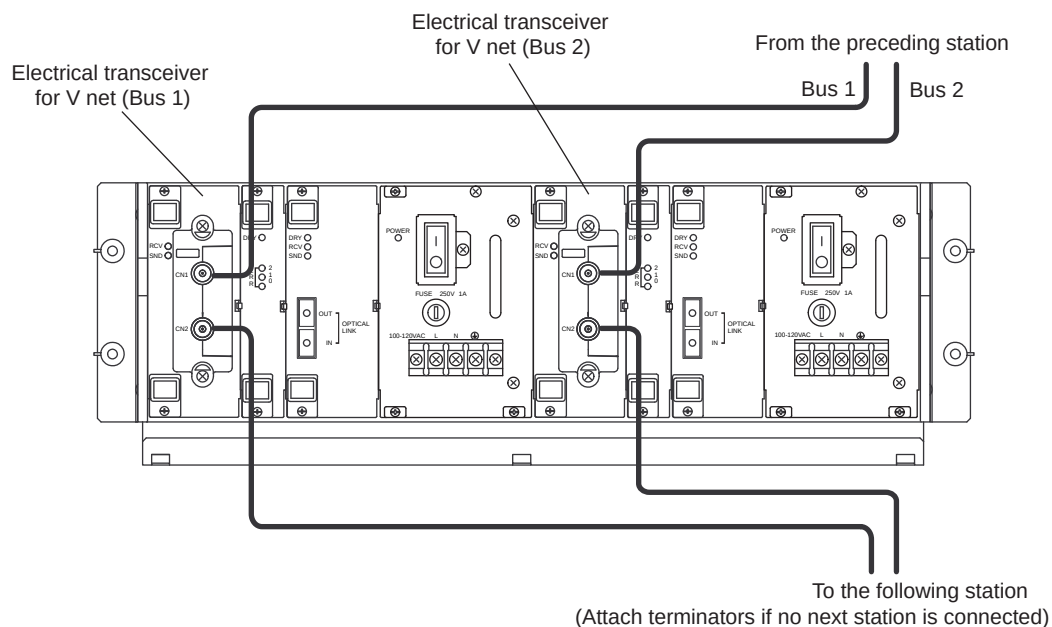


Figure A3.3-1 V net Cable Connection

A3.3.1 Connection Method for the V net Cable

Follow the procedure below to connect two V net cables to two ports (bus 1 and 2) of the electrical transceivers in the optical bus repeater.

1. Loosen both mounting screws at the top and the bottom of the connector assembly. (See the figure below.) Then pull to detach the connector assembly (60 mm deep) from the electrical transceiver.
2. Loosen the screw on the right cable cover of the connector assembly and disassemble the connector assembly as shown in the figure. Slide to separate the cable covers side-ways for easy disassembly.
3. Connect the V net cables to the V net branch connector.
Do not bend the cables at a bending radius of less than 100 mm.
4. If the V net connection ends at this device, make sure you install a terminator at the unused connector in order to match the electrical characteristics. (see the figure on the next page.)

Terminator for V net cable (10BASE-2) : Model YCB148

Terminator for V net cable (10BASE-5) : Model YCB118

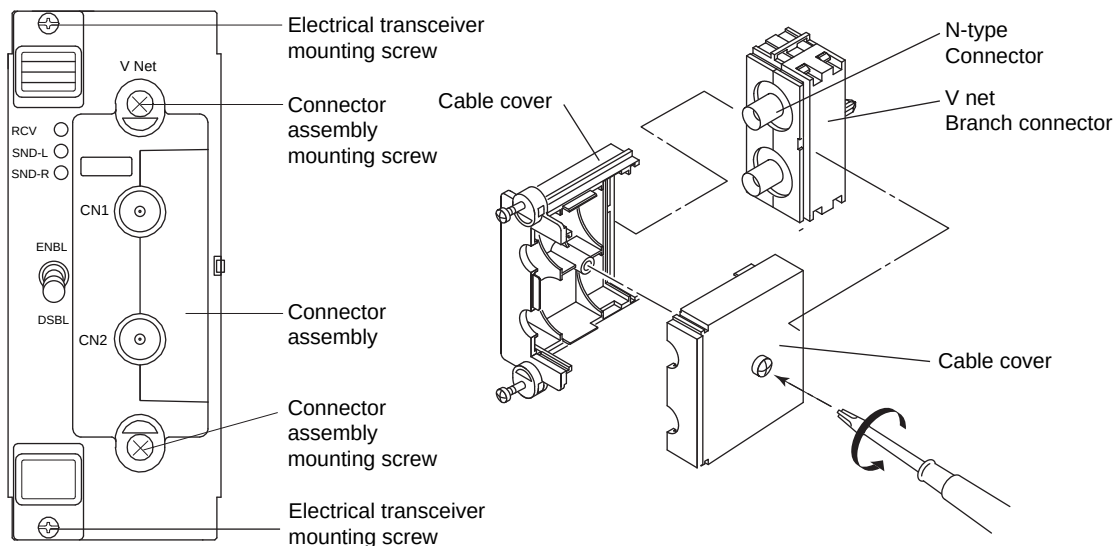


Figure A3.3.1-1 V net Electrical Transceiver and Connector Assembly

■ Connector Assembly Installation

After connecting the V net cable(s), follow the procedure below to install the connector assembly on the electrical transceiver.

1. Switch off the power supply unit.
2. Align the groove on the V net branch connector, to which V net cables are connected, with the rail on the cable cover (left), then slide the rail towards the center.
3. Similarly, align the rail on the cable cover (right) with the groove on the V net branch plug, by sandwiching the V net cable between them.
4. Tighten the screw on the right cable cover.
Tighten the screw on the right cable cover at the torque of approximately 0.6 N·m.
The re-assembly of the connector assembly is complete.
5. Align the top and bottom guide rails on the electrical transceiver with the rails on the connector assembly, and push the assembly into the unit until it stops. The connector assembly and the electrical transceiver unit are connected by the connector.

6. Tighten both mounting screws at the top and the bottom of the connector assembly. The guideline for the screw tightening torque is 0.25 N·m.

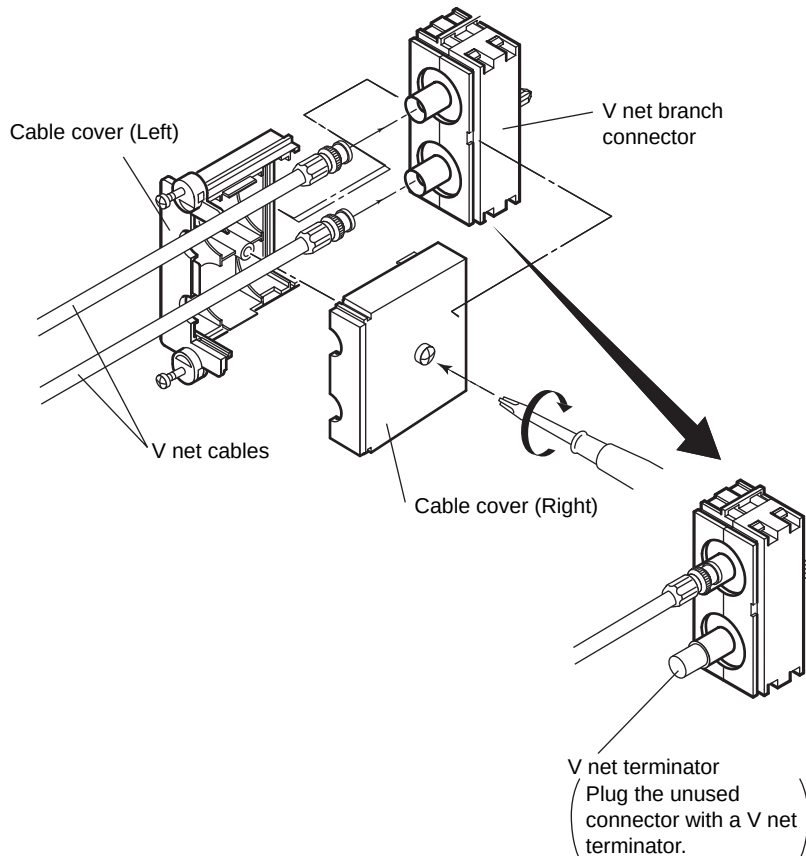


Figure A3.3.1-2 V net Cable Connection and Terminator

■ Attaching Clamp Filters (Ferrite Cores)

After completing the V net cable (10BASE-5 cable) connection, attach the clamp filters (included with the product) to the V net cables over the cable sheath in order to improve noise isolation.



IMPORTANT

The clamp filter case is made of plastic.

The clamp filter case may crack when opened and closed at a sub-zero temperature (in centigrade) or following a mechanical shock such as a fall. Maintain the applicable operating temperature range and storage temperature range for each device.

● Clamp Filter Set

Clamp filter is provided with V net cable (10BASE-5 cable).

- 6 ferrite cores (part No. A1179MN) per V net cable (10BASE-5 cable)
- Binding bands (ferrite core accessories)

● Positions to Attach Clamp Filters

Mount three clamp filters side by side starting from a point 20 cm away from the connector on each side of the V net cable. If it is difficult to mount clamp filters at 20 cm from the connector, install them at other feasible location within 1 meter.

Mount the clamp filters as close to the electrical transceiver as possible in order to prevent noise from entering through the section between the clamp filters and the electrical transceiver.

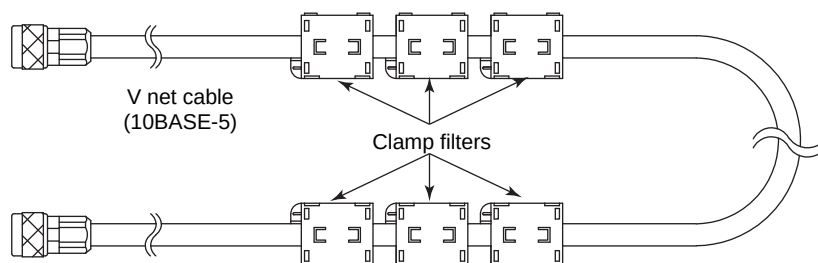


Figure A3.3.1-3 Positions to Attach Clamp Filters

● Attaching Clamp Filters

1. Release the two locking hooks of a clamp filter. The clamp filter can then be opened up to 150 degrees.

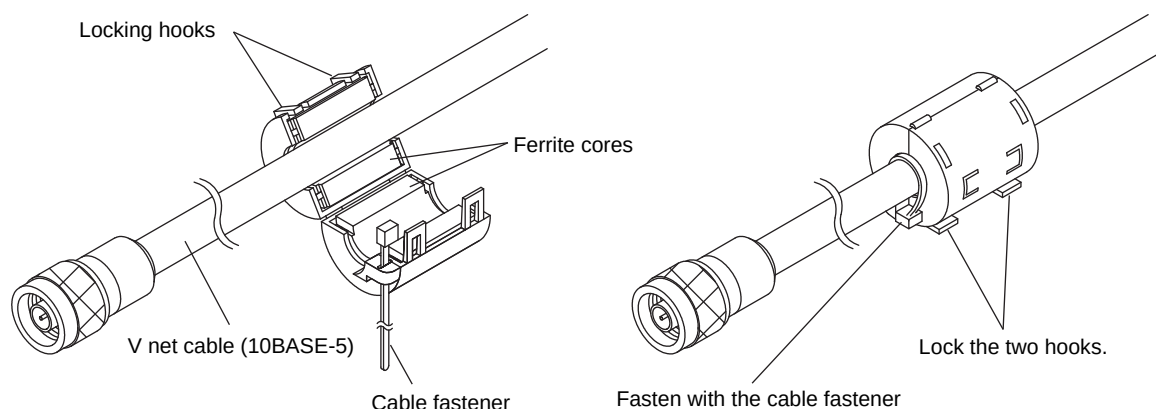


Figure A3.3.1-4 Attaching a Clamp Filter

2. Fit the V net cable into the cylindrical gap in the opened clamp filter.
3. Close the clamp filter and lock the two locking hooks.
4. Put a cable fastener through one side of the clamp filter and fasten the cable fastener over the cable sheath to fix the clamp filter.
5. In the same manner, attach three clamp filters (two more) close to each other on each side of the cable.
6. Install three clamp filters on the other end of the V net cable.

A3.3.2 Grounding the V net

The V net cables (10BASE-5) must be grounded by using a grounding unit for V net.



CAUTION

For safety reasons, the grounding unit for V net (YCB117) grounds devices connected to the V net using one grounding point. One grounding point within each segment is sufficient for V net grounding. To enhance safety, place the ground point near the center (in terms of distance) of each segment. A segment refers to the range of the V net network in which communication can be performed on the same bus without a repeater.

■ V net Grounding Unit Components

Table A3.3.2-1 V net Grounding Unit Components

Name	Component and quantity
Main body	Metallic block : 2 M4 bolt : 2 M4 washer : 2
Cable	Grounding conductor 800 mm : 1

■ Using V net Grounding Unit to Ground V net Cable

The following explains how to use the V net grounding unit to ground the V net cable.

1. Unscrew the two bolts of the grounding unit, and then separate the unit into the two metal blocks.
2. There are two types of metal blocks, built-in claw type and separate claw type. For the separate claw type metal block, insert the claw to the metal block.
3. As indicated in the figure, use the two metal blocks to clamp the V net cable. Connect the M4 ring terminal of the ground cable to a bolt. And then alternately tighten the two bolts so that the grounding unit and the grounding cable are fixed on the V net cable. Tightening the bolts makes the claw on the metal block penetrates the insulation sheath of the V net cable and contacts the conductive shield so as to electrically connect the cable shield to the metal block.

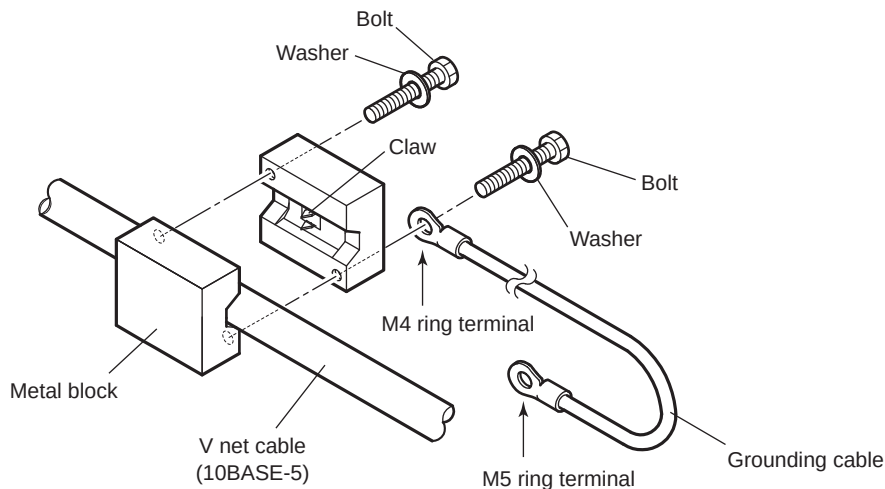


Figure A3.3.2-1 Assembly of V net Grounding Unit

4. Connect the M5 ring terminal at one end of the grounding cable to the grounding bar of the cabinet or to the grounding bar that is connected to the protective grounding system.

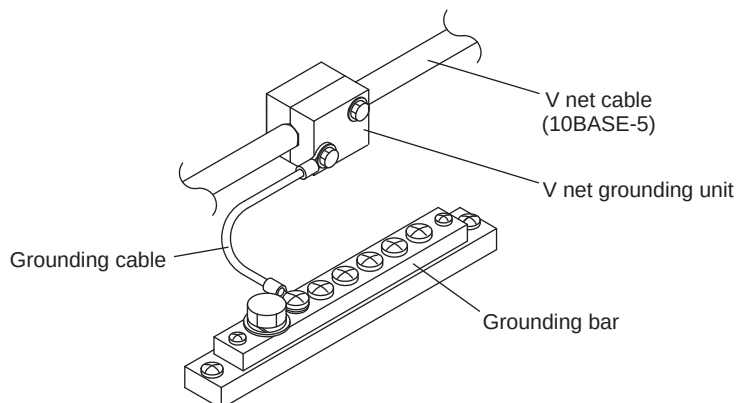


Figure A3.3.2-2 Connecting V net Grounding Unit



IMPORTANT

Make sure that the metallic blocks do not come into contact with any conductor having a potential different from that of the destination of the grounding cable.

A3.4 Connecting the Optical Cord

This section explains the procedures to connect the optical cord to the mounted optical bus repeater.



WARNING

- Before connecting or disconnecting an cord plugs, turn the power switch to off on both the local and destination optical bus repeaters. Connecting or disconnecting the cord plugs while the power is on may disrupt the entire communications bus system.
- Since the repeater is applied with dual-redundant configuration, be sure to connect bus1 and bus2 respectively to the corresponding transceivers.
- In a dusty environment, the protective caps of both the optical transceivers and the optical cords should not be removed.

■ Precautions When Connecting Cord plugs

- Remove the protective caps from the optical transceiver and cords. Before connecting an optical cord, clean the connection end with a gas-type blower (available in camera stores). If a low-temperature gas blower is used, blow several times from approximately a 10-cm distance, but only for two or three seconds at a time.
- If an optical connector has been disconnected on an occasion, such as for replacing the optical transceiver, immediately place protective caps on the optical transceiver and cords to keep dirt away.
- Store protective caps in a clean container or bag, and clean them out with a gas blower immediately before use.
- Be careful to keep the end of the optical cord from touching human bodies and other objects. If it has touched something and is suspected of being soiled, first wipe it with a gauze pad moistened with high-purity alcohol (which has been stored in a clean condition), and then clean it with a gas-type blower.
- Optical cord plug has a key and the connector has a key groove. Push the plug deeply into the connector only after the key is placed properly in the key groove.

A3.4.1 How to Connect the Push-to-Lock Type Cord Plug and Connector

The following figures show the optical connector of optical cord (SC type) and the optical transceiver unit.

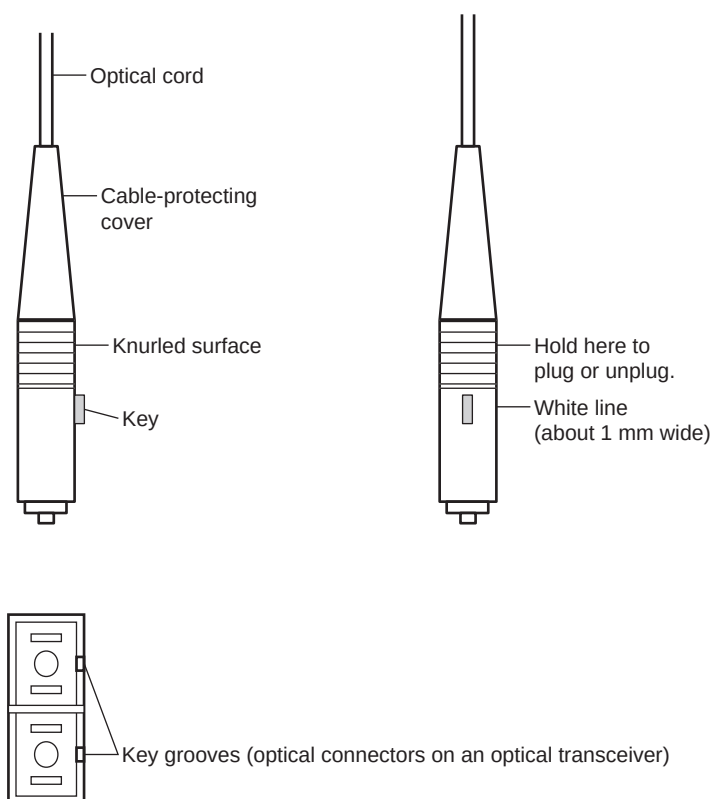


Figure A3.4.1-1 Push-to-Lock Type Cord Plug and Connector (SC Type)

■ To Connect a Plug

1. Match the key in the key groove.
2. Hold the plug at the knurled surface position and push it in.
3. When it reaches almost to the white line, it clicks and locks in.

■ To Disconnect a Plug

1. Hold the plug at the knurled surface and pull out about 1mm, and the lock will be released.
2. Then, start pulling it out slowly.

■ Verifying a Positively Locked Plug

Hold the plug by the optical cord and gently pull it. If the plug stays in, it is connected. Should it not be properly connected, it would come off easily.

A3.4.2 Connecting the Optical Cords

Interconnect the mating pair of optical transceivers in the optical bus repeaters as shown in the following figure.

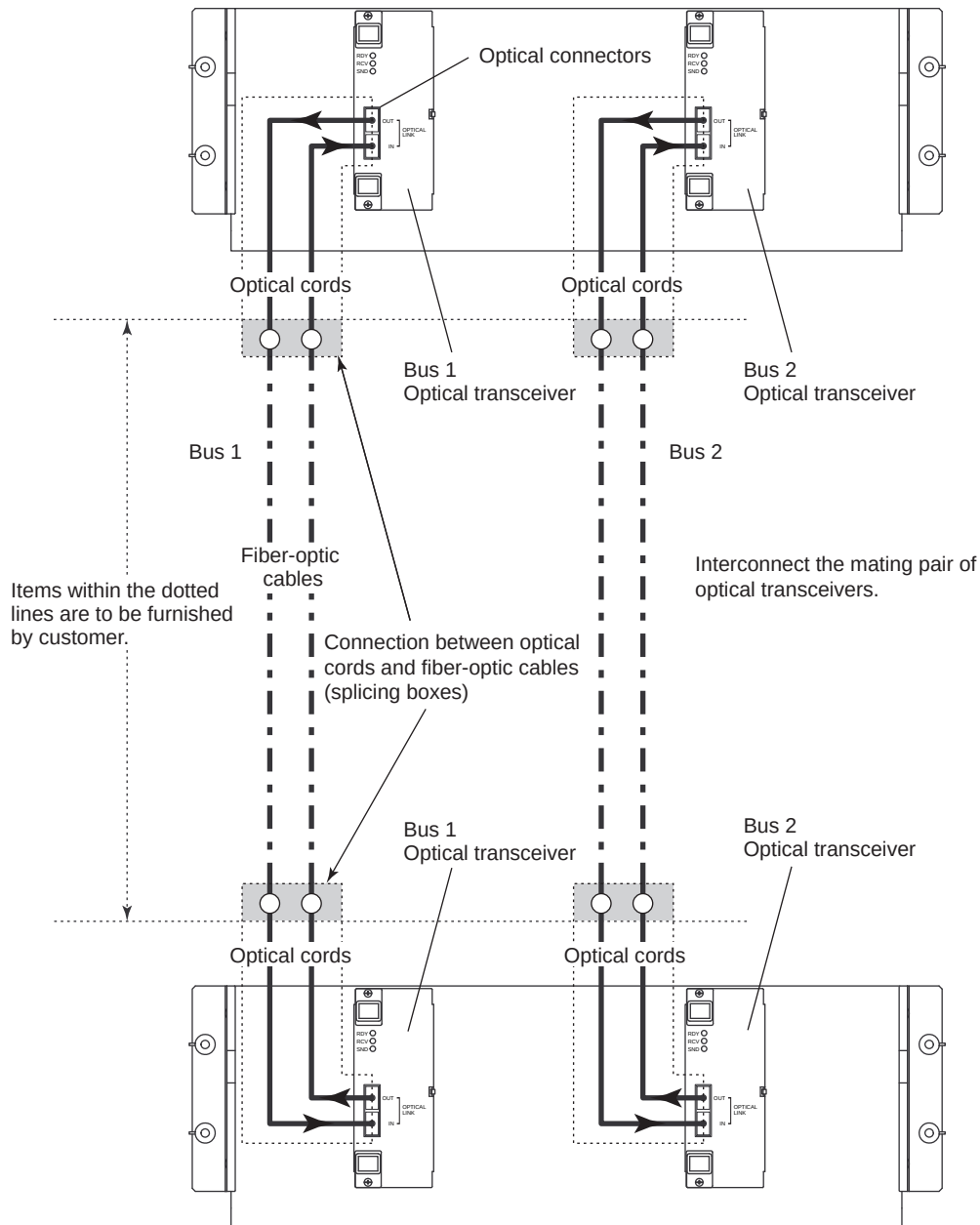


Figure A3.4.2-1 Connecting the Optical Cords

A3.4.3 Notes on Using GI 62.5/125 Fiber-optic Cables

It is recommended to use a GI 50/125 fiber-optic cables (core diameter 50 μm , clad diameter 125 μm) for an optical bus repeater. Follow the procedure below to apply a GI 62.5/125 fiber-optic cable.

Compared to a GI 50/125 fiber-optic cable, a large volume of light is emitted by connecting a GI 62.5/125 fiber-optic cable to the output connector of an optical bus repeater. If the input connector of an optical bus repeater receives a larger volume of light than the maximum volume of light which can be received, data transmission fails. Therefore, connect a GI 62.5/125 fiber-optic cable according to the procedure below.

1. To restrict a volume of light, you must insert a 10 m of GI 50/125 optical cord between the output connector of an optical bus repeater and a GI 62.5/125 fiber-optic cable in the field.
2. To connect the two types of cables, use an optical adapter inside the splicing box located under the floor near a cabinet to install an optical bus repeater.

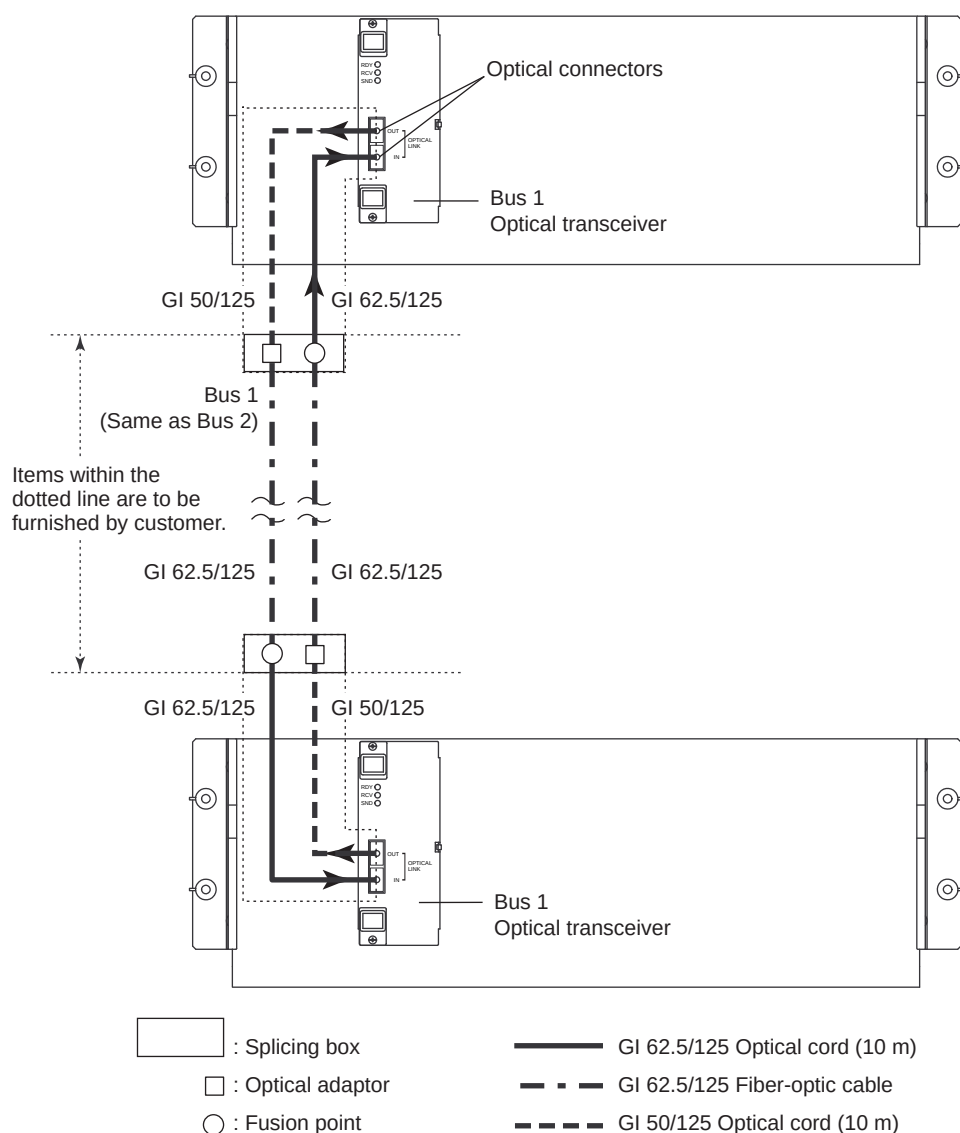


Figure A3.4.3-1 Connection of GI 62.5/125 Fiber-optic Cable

A3.4.4 Installing Fiber-optic Cables

The fiber-optic cable for field installation must be strong. Use flexible optical cords where the cable is connected to the optical bus repeater. The interconnection of the strong cable and flexible cords is generally made in the splicing box under the floor.

■ Precautions when Installing Fiber-optic Cable

The total loss in a cable installation must be 6 dB or less for 4 km, max., or 18 dB or less for 15 km, max. at the 1.3 μm wavelength. The cable system loss must be measured at the time of each installation.

Loss measurement may possibly vary by ± 0.5 dB due to the variance in the optical cord in measuring the stabilized light source output level, repeatability of connecting and disconnecting the plugs, and others, even if a calibrated light meter is used. The as-installed measurement data must allow a minimum margin on the order of 0.5 dB over the permissible loss.

■ A Sample Calculation of Loss in Optical Fiber

The following figure shows an example of estimating the loss in an optical fiber. The optical bus repeater for 4 km, max. is used. The fiber-optic cable has a loss of 1 dB/km, and is connected by fusing every 500 meters. The loss in each fused connection is generally estimated at 0.1 dB for fiber-optic cable to fiber-optic cable, and about 0.3 dB for fiber-optic cable and optical cord.

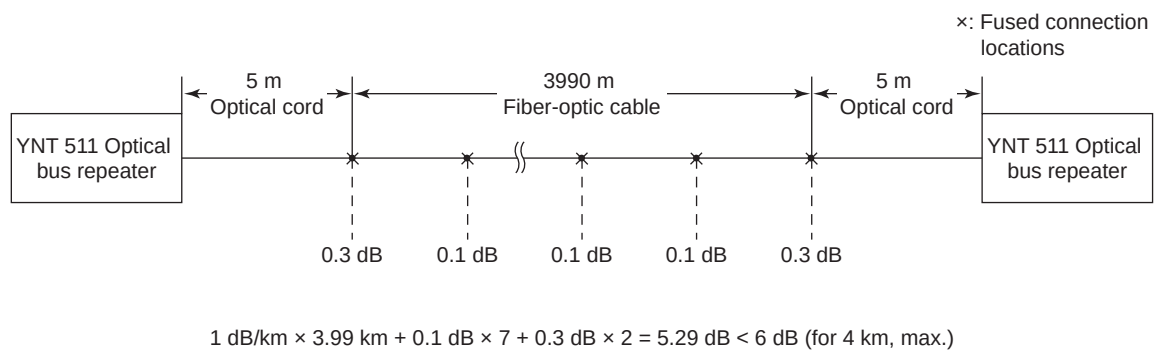


Figure A3.4.4-1 Sample of Estimating Loss in Optical Fiber

A4. Functions and Configuration of Units

Configure the optical bus repeater by inserting the required power supply and other units into the backboard.

A4.1 Power Supply Unit

The power supply unit accepts the designated power input, converts it into insulated DC power supplies then sends to various component units via the back board within the nest. The models of power supply units are shown in the following table.

Table A4.1-1 Power Supply Units

Model	Input voltage
PW501	100-120 V AC
PW502	220-240 V AC
PW504	24 V DC

■ Configuration

Connect the ungrounded cable to terminal L (+), and the grounded cable to N (–).

- **Power input terminals**
These are the terminals for the power input (M4 screws).
L (+) : Non-grounded
N (–) : Grounded
Grounding terminal: For grounding
- **Fuse**
This is a tubular fuse.
- **Power ON/OFF switch**
This switch turns power ON and OFF.
- **Power lamp**
With the power input terminals energized, the green lamp is lit when the power switch is turned to the ON position, and is unlit when the switch is turned to the OFF position.

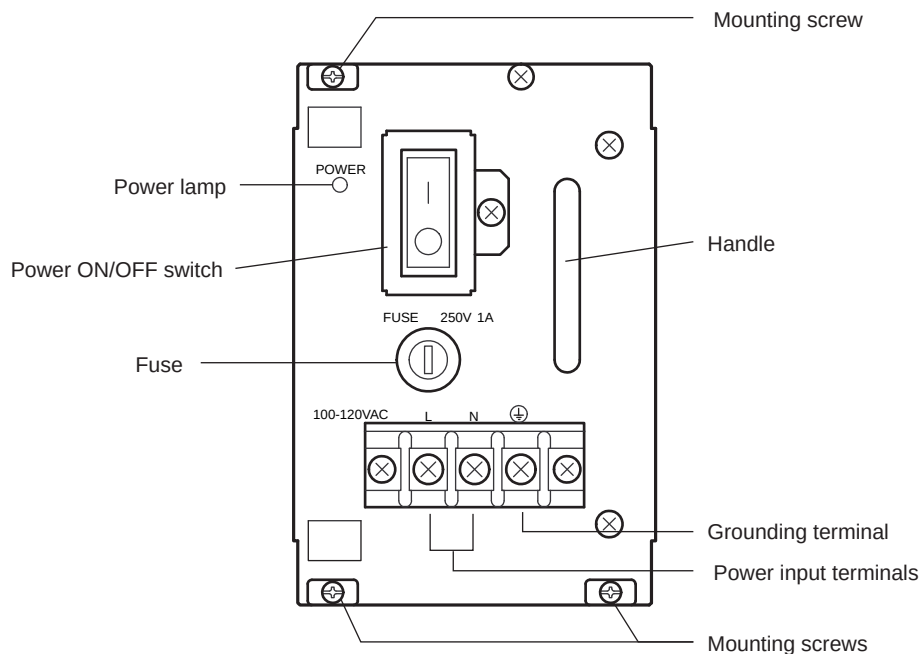


Figure A4.1-1 Power Supply Unit

**SEE
ALSO**

For more information about replacing a fuse, refer to:

[A5.2.4, "Components/Parts Requiring Periodic Replacement" on page A5-8](#)

A4.2 Optical Transceiver

Optical Transceiver is a transceiver for optical fibers. Linked to the controller, it modulates and demodulates optic, and transmits and receives optical signals to/from another connected identical unit through a pair of optical fibers, thus accomplishing transfer of a bus signal in a form of optical signal. The applicable buses and transceivers are shown in the table below.

Table A4.2-1 Optical Transceiver

Bus	Model
V net up to 4 km	AIP578
V net up to 15km	AIP591

■ Configuration

- Fiber-optic cable connector
IN: For optic receiving type which connects to the OUT connector of the mating optical bus repeater.
OUT: For optic sending type which connects to the IN connector of the mating optical bus repeater.
- RDY lamp:
The green lamp is lit when a normal optical signal is being received from the optical fiber. It is otherwise unlit.
- RCV lamp
The green lamp is lit while communications data is being received, or during a self-diagnostic test. It is otherwise unlit.
- SND lamp
The green lamp is lit while communications data is being transmitted, or during a self-diagnostic test. It is otherwise unlit.

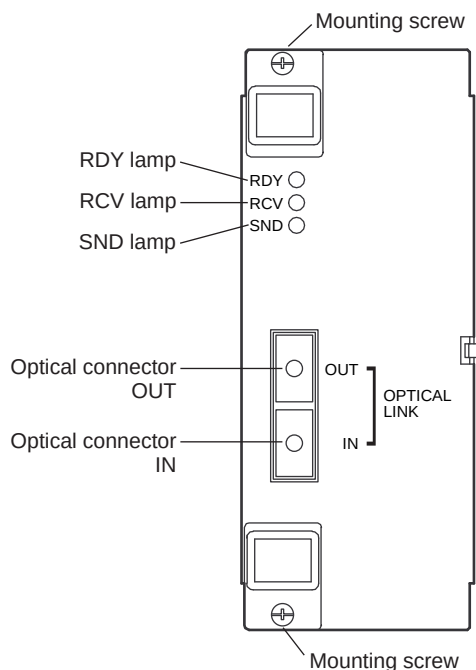


Figure A4.2-1 Optical Transceiver

■ Optical Transceiver Settings

With the jumpers inside of the transceiver, the normal operation mode and the diagnosis mode can be set.

The settings of the transceivers for either 4 km or 15 km are the same.

- For normal operation, set the jumper on NORMAL side.
- For echo-back (Self-diagnosis), set the jumper on ECB side.

The following figure indicates the position of the Jumper Socket on the printed circuit board.

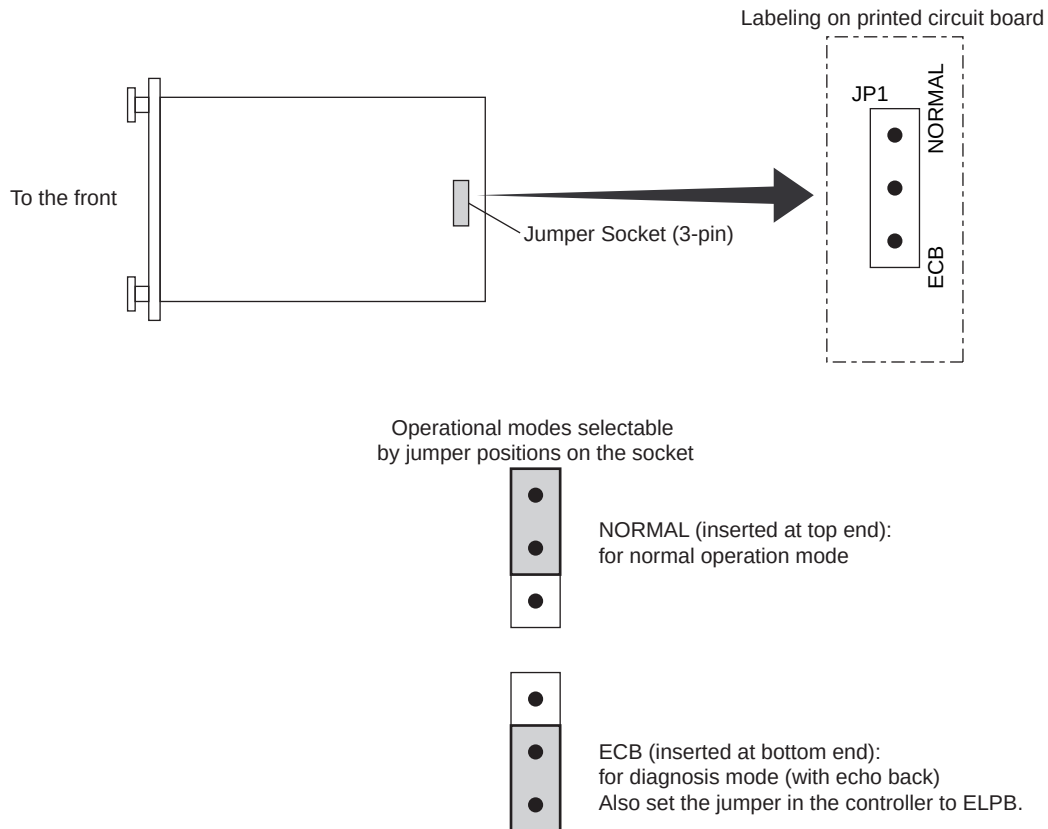


Figure A4.2-2 Jumper Positions in Optical Transceiver

SEE ALSO

For more information about the relationship between the jumper settings and lamps (RDY, RCV and SND), refer to:

A5.3.2, "How to Use the Self Diagnostic Functions by Optical Bus Repeater Jumper Settings" on page A5-14

A4.3 Controller

A controller controls optical communication.

It also performs self-diagnostic functions depending on the jumper setting inside the controller.

**SEE
ALSO**

For more information about the diagnostic functions, refer to:

[A5.3, "Self Diagnostic Functions" on page A5-11](#)

■ Configuration

- **RDY lamp**
The green lamp is lit when the controller is operating normally and is unlit when there is an error.
- **ERR lamps**
When the controller is operating normally, lamps 2, 1, and 0 all remain off.

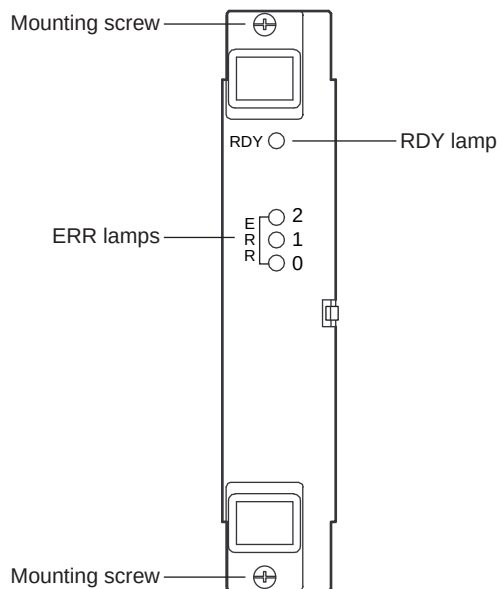


Figure A4.3-1 Controller

**SEE
ALSO**

For more information about the details of lamp indications, refer to:

[A5.3.1, "Maintenance when the Optical Bus Repeater Lamps Indicate an Error" on page A5-12](#)

■ Controller Settings

Set the operation mode (i.e., normal and self-diagnostic modes) by positioning the jumper inside the controller.

- For normal operation, set the jumper on NORMAL position.
- For external loopback or for echo-back (self-diagnosis), set the jumper on ELPB side.
- For internal loopback, set the jumper on ILPB side.

The following figure indicates the position of the Jumper socket on the printed circuit board.

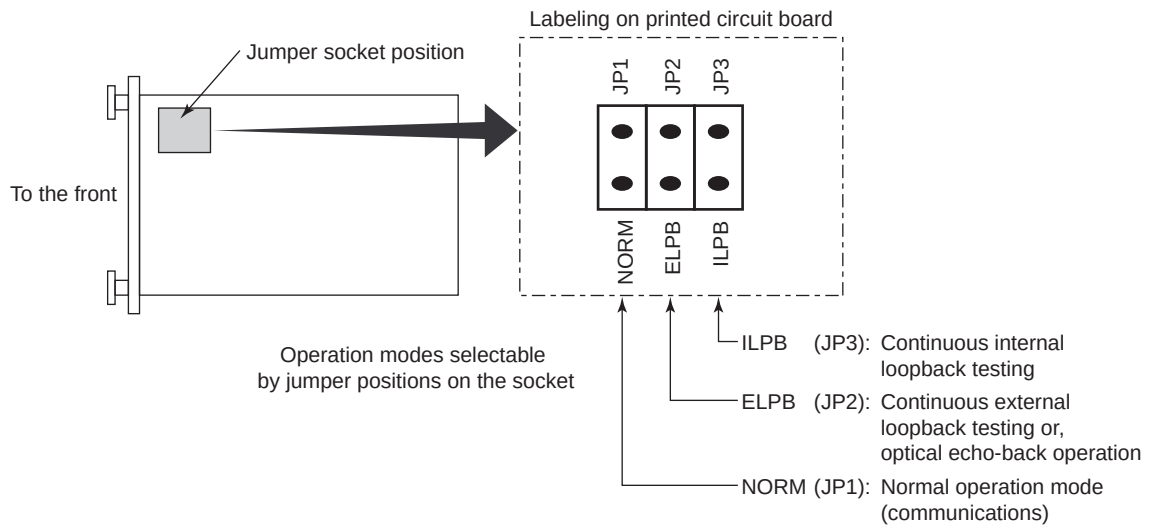


Figure A4.3-2 Jumper Positions in Controller

**SEE
ALSO**

For more information about the relationship between the jumper settings and lamps (RDY and ERR), refer to:

[A5.3.2, "How to Use the Self Diagnostic Functions by Optical Bus Repeater Jumper Settings" on page A5-14](#)

A4.4 Electrical Transceiver

An electrical transceiver is a driver and transceiver, designed to be connected on a V net. It converts the signal levels.

■ Configuration

- **Connector assembly**
It has a built-in branching connector for V net cables. In case it serves as an end on a V net, connect a V net terminator to the CN1 or CN2 connector.
- **RCV lamp**
The green lamp is lit when communications data is being received in the V net. It otherwise stays unlit.
- **SND lamp**
The green lamp is lit while communications data is being transmitted in the V net. It otherwise stays unlit.

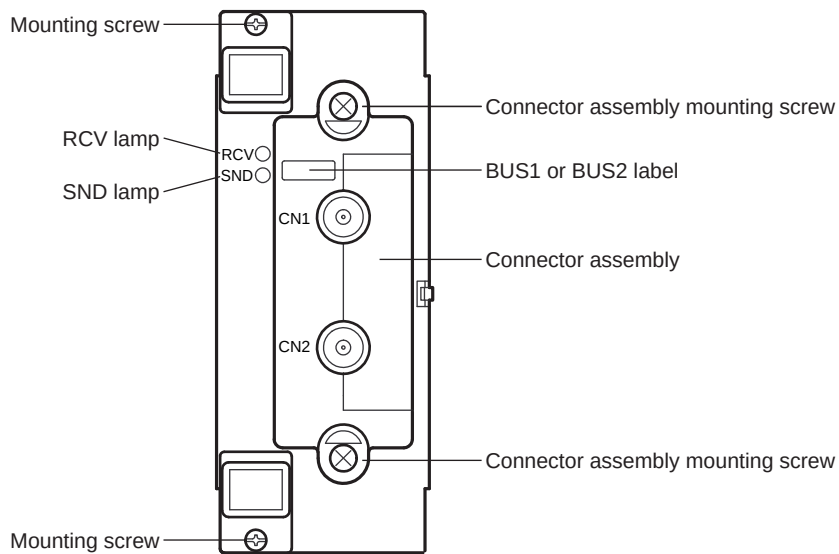


Figure A4.4-1 Electrical Transceiver

A5. Maintenance for the Optical Bus Repeater

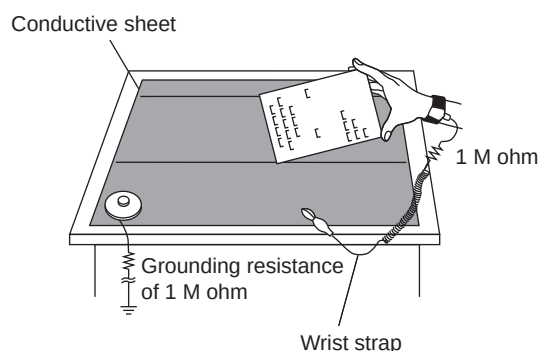
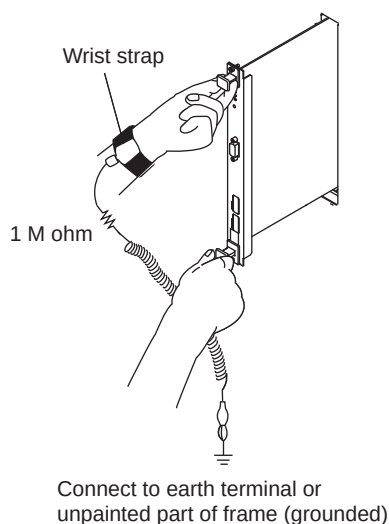
This section explains the daily inspection of the optical bus repeater and the components which have a useful life and need to be replaced periodically. It also explains how to remove and attach the parts that need periodic replacement as well as each of the units.

Also, the self diagnostic functions provided with this model are explained for reference when performing maintenance for the optical bus repeater.

■ Antistatic Precautions

When doing maintenance work, take full precautions as described below to avoid electrostatic problems.

- When storing or carrying parts for maintenance, put them in an antistatic bag. (When shipped, they are placed in an antistatic bag labeled with cautions against electric problems.)
- Wear a wrist strap with a 1 M ohm grounding resistor then ground the wrist strap.
- When working on the bench, place the parts on a conductive sheet grounded via a 1 M ohm resistor and wear wrist strap. Keep static-chargeable plastic materials away from the parts.
- Never touch the parts with bare hands, without using a wrist strap and a conductive sheet.



When working with a card with battery on a conductive sheet, set the BATTERY ON/OFF switch to the OFF position or remove the battery

Figure A5-1 Handling of Cards

A5.1 Daily Inspection

Perform the following visual inspections:

■ Status Indicator Lamps on the Front of Each Unit

The optical bus repeater is operating normally if the lamps are on or off as indicated in the following table. However, the RCV and SND lamps for the electrical transceiver and optical transceiver remain off in silent status where there is no signal transmitted.

Table A5.1-1 Lamp Indications During Normal Operation

Status indication of lamps in each unit(*1)			
Electrical transceiver	Controller	Optical transceiver	Power supply unit
RCV ● SND ●	RDY ● ERR ○ 2 ERR ○ 1 ERR ○ 0	RDY ● RCV ● SND ●	POWER ●

*1: Lamp indication statuses

●: ON

○: OFF

**SEE
ALSO**

For more information about error indications of the status indicator lamps on each unit, refer to:

[A5.3.1, "Maintenance when the Optical Bus Repeater Lamps Indicate an Error" on page A5-12](#)

A5.2 Parts Replacement

This section explains how to replace the unit and parts.



IMPORTANT

- When connecting or disconnecting an optical cord, cable or replacing a unit in the V net while the system is operating, always turn off the power for the corresponding optical bus repeater and for the mating optical bus repeater on the same bus side in order to prevent disturbance to the communication bus.
- When tightening the set screws for each unit, use a fine-tipped screwdriver. The guideline for the screw tightening torque is 0.25 N·m.

A5.2.1 How to Replace the Optical Transceiver

Optical transceiver is to be replaced according to the procedure described below.



IMPORTANT

- If the optical cord has been disconnected from the connector on an occasion, such as for replacing the optical transceiver, immediately place a protective cap on it to keep dirt away.
- Store protective caps in a clean container or bag, and clean them out with a gas blower immediately before use.
- Be sure to keep the end of the optical cord from touching human bodies and other objects. If it ever touches something and is suspected of being soiled, first wipe it with a gauze pad moistened with a high-purity alcohol (which has been stored in a clean condition), and then blow it out.

SEE ALSO

For more information about connecting and disconnecting of the optical cord, refer to:

[A3.4, "Connecting the Optical Cord" on page A3-10](#)

■ Removal Procedure

1. Turn off the power for the optical transceiver to be removed.
2. Also turn off the power for the mating optical transceiver.
3. Disconnect the optical cord from the optical transceiver. Hold the knurled surface of the optical cord and pull out for about 1mm, then the lock will be released. Then, start pulling it out slowly.
4. Handle the optical connector and optical cord for the optical transceiver carefully, observing the precautions described above.
5. Loosen the two mounting screws securing the optical transceiver to the nest. The mounting screws need not be removed.
6. Hold the handles attached at the top and bottom of the front side of the optical transceiver and remove the unit by pulling the handles forward.

■ Installation Procedure

1. Slide the optical transceiver along the guide rail of the nest, and insert it securely into the back board connector.
2. Secure the optical transceiver to the nest from the front, by using the mounting screws.
3. Connect the optical cord to the optical connector of the optical transceiver. Holding the knurled surface of the optical cord plug, align the key section with the optical connector groove and push the plug into the connector. (SC type optical cord). A click sound indicates that the plug is locked into the optical connector.
4. After turning on the power, check if the RDY lamp on the front of the optical transceiver is lit indicating that the unit is operating normally.

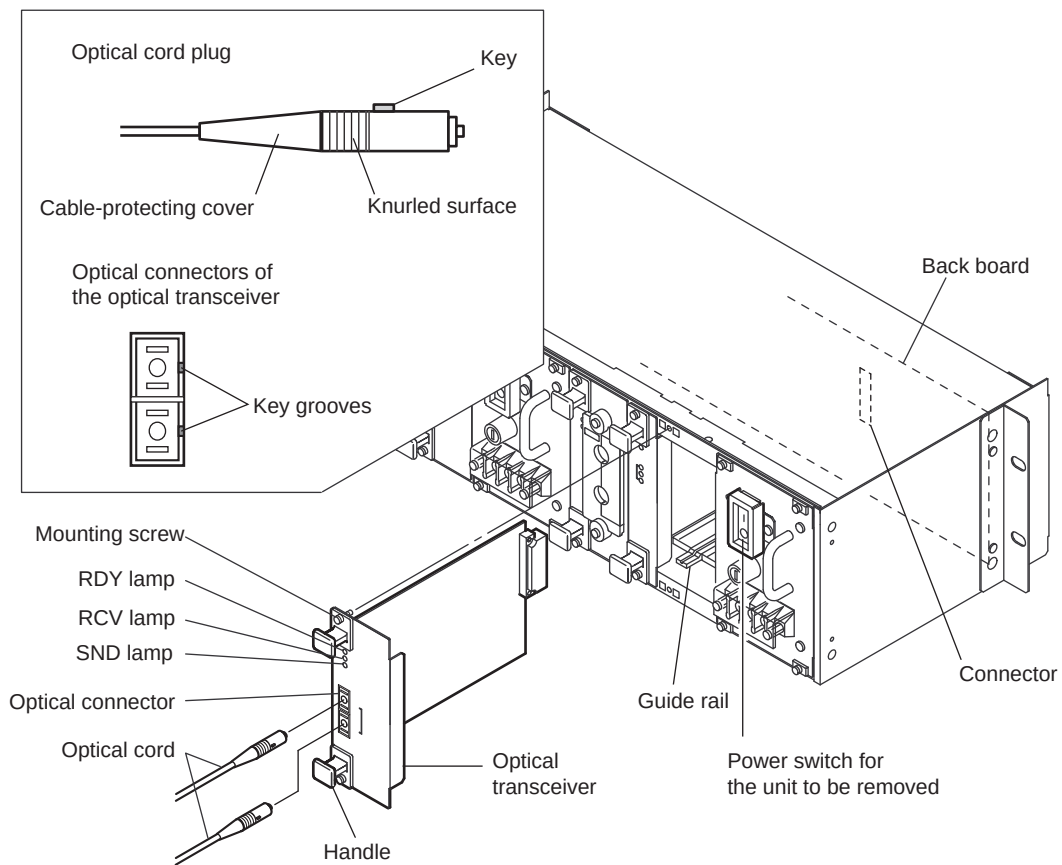


Figure A5.2.1-1 Replacing Transceiver

A5.2.2 How to Replace the Controller

Controller is to be replaced according to the procedure described below.

■ Removal Procedure

1. Turn off the power for the controller to be removed as well as the power for the mating optical bus repeater on the same bus side.
2. Loosen the two mounting screws securing the controller to the nest. The mounting screws need not be removed.
3. Hold the handles attached at the top and bottom of the front side of the controller and remove the unit by pulling the handles forward.

■ Installation Procedure

1. Place the new or inspected controller, slide it along the guide rail of the nest, and insert it securely into the back board connector.
2. Secure the controller to the nest from the front, using the mounting screws.
3. After turning on the power, check if the RDY lamp on the front of the controller is lit indicating that the unit is operating normally.

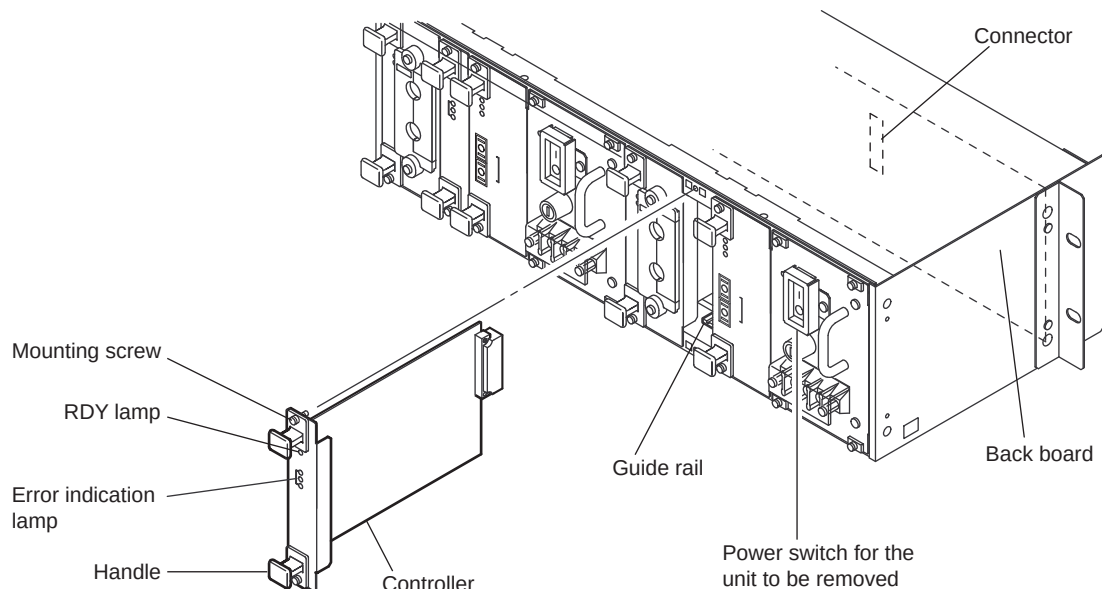


Figure A5.2.2-1 How to Replace the Controller

A5.2.3 How to Replace the Electrical Transceiver

Electrical transceiver is to be replaced according to the procedure described below.

■ Removal Procedure

1. Turn off the power for the electrical transceiver to be removed.
2. With the V net cables attached, disconnect the connector assembly from the electrical transceiver.
3. Loosen the two mounting screws securing the electrical transceiver to the nest. The mounting screws need not be removed.
4. Hold the handles attached at the top and bottom of the front of the electrical transceiver and remove the unit by pulling the handles forward.

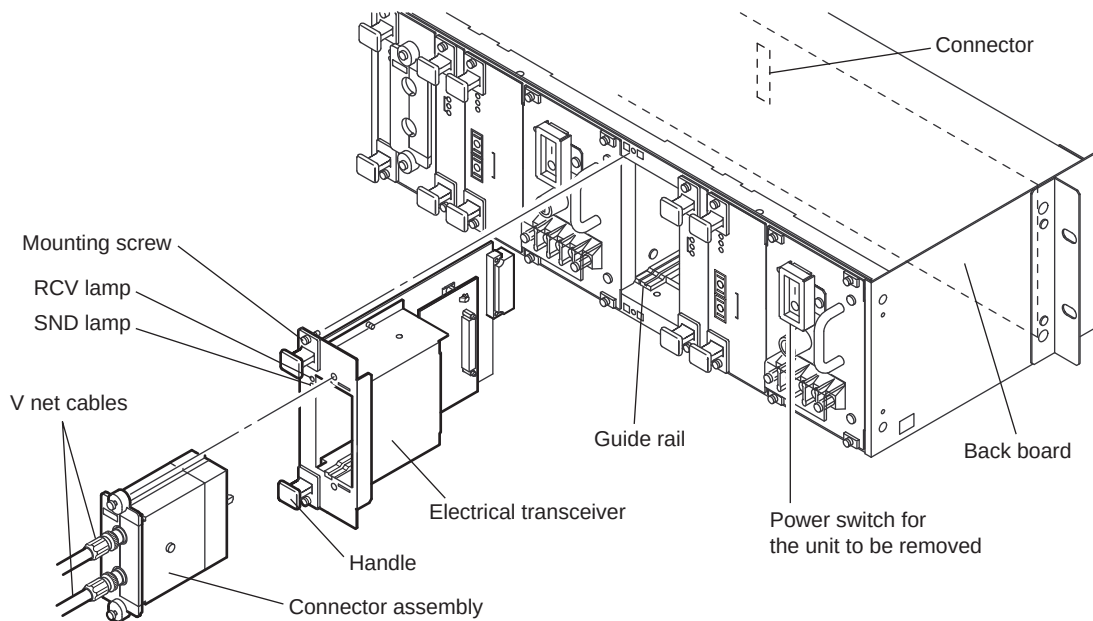


Figure A5.2.3-1 How to Replace the Electrical Transceiver

■ Installation Procedure

1. Place the new or inspected electrical transceiver, slide it along the guide rail of the nest, and insert it securely into the back board connector.
2. Secure the electrical transceiver to the nest from the front, using the mounting screws.
3. Align the rail of the connector assembly with the V net cables attached with the guide rails at the top and bottom of the electrical transceiver. Push the connector assembly all the way to the back.
4. Fasten the screws at the front of the connector assembly so as to fix the connector assembly to the electric transceiver. Thus the connector assembly and the electric transceiver are connected.
5. After turning on the power, check if the RCV and SND lamps on the front of the electrical transceiver is lit indicating that the unit is operating normally.

A5.2.4 Components/Parts Requiring Periodic Replacement

Before performing period replacement, read the following carefully.

Of the components and parts with a useful life, those that can be replaced by the user are available as spare parts. Purchase them and replace with old components/parts as necessary.



IMPORTANT

Notes on components/parts with a useful life

- Components/parts with a useful life are those expected to fail due to wear within 10 years under normal conditions of use or storage. Thus, the explanations in this section do not apply to items designed to last for 10 years or more.
- The recommended replacement period indicates the intervals at which preventative maintenance should be performed for components/parts with a useful life, and does not imply any guarantee against unexpected failure.
- The recommended replacement period serves only as a guideline, and the actual replacement period varies according to the use conditions.
- The recommended replacement period is subject to change based on field performance.

■ Periodic Replacement Parts Having Defined Life Spans

The optical bus repeater has components/parts with a useful life that need to be replaced periodically. For the purpose of preventative maintenance, the recommended replacement period for each component/part is indicated in the table below.

Table A5.2.4-1 Recommended Replacement Period for Components/Parts with Useful Life (Must be Replaced Periodically)

Name	Part Number	Recommended replacement period	User replacement (*1)	Remarks	
Power supply unit	PW501	8 years	Yes	100-120 V AC power	When ambient temperature is 40 deg.C or less
Power supply unit	PW502	8 years	Yes	220-240 V AC power	
Power supply unit	PW504	8 years	Yes	24 V DC power	
Fuse	A1361EF	3 years	Yes	For PW501 (100-120 V AC), 1 A	
Fuse	A1349EF	3 years	Yes	For PW502 (220-240 V AC), 2 A	
Fuse	A1363EF	3 years	Yes	For PW504 (24 V DC), 2 A	

*1: Yes: Replaceable by the user

■ How to Replace the Power Supply Unit

● Removal Procedure

1. Turn off the switch for the power supply unit to be removed.
2. Turn off the external power source (breaker, etc.).
3. Disconnect the power cables and grounding cable from the power input terminals.
4. Loosen the four mounting screws securing the power supply unit to the nest.

The mounting screws need not be removed.

5. Hold the handle at the center of the power supply unit and pull it forward to remove the unit.

● Installation Procedure

Make sure that the switch of the power supply unit to be installed is at the off position.

1. Place the new or inspected power supply unit, slide it along the guide rail of the nest, and insert it securely into the back board connector.
2. Secure the power supply unit to the nest from the front, using the mounting screws.
3. Connect the power cables and grounding cable to the power input terminals.
4. Turn on the external power source (breaker, etc.).
5. Turn on the switch for the power supply unit and check if the POWER lamp is lit.

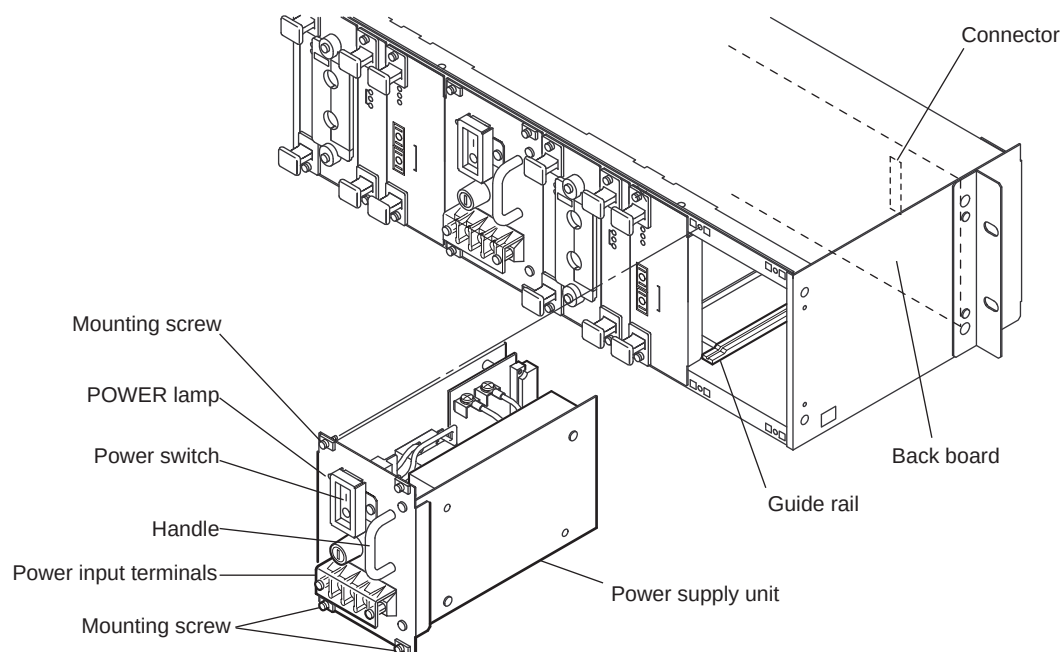


Figure A5.2.4-1 How to Replace the Power Supply Unit

■ How to Replace the Fuse

A fuse is installed in the power supply line.

Fuses have a useful life. The recommended replacement period for the fuses is 3 years.

The following figure shows the position where the fuse is attached:

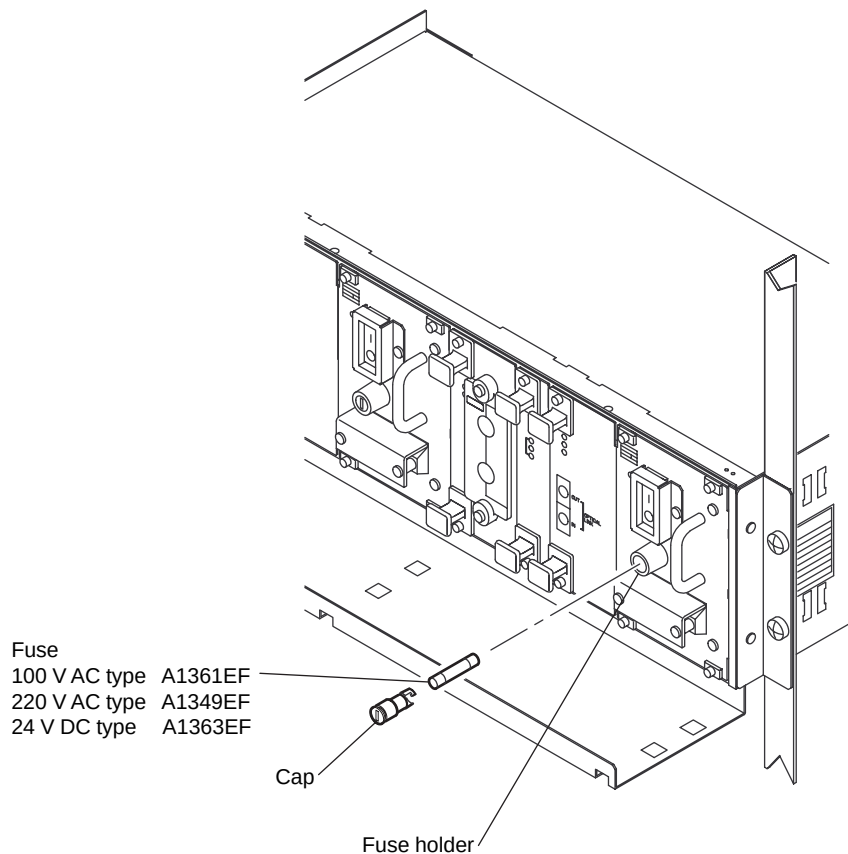


Figure A5.2.4-2 Replacing Fuse

● Replacement Procedure

Replace the power supply fuse according to the following procedure:

1. Turn off the power switch of the power supply unit.
2. Turn off the external power source (breaker, etc.).
3. Turn the fuse cap about 90 degrees in counterclockwise direction (there is a mark on the cap) using a slotted screwdriver. The fuse is attached to the tip of the cap and will come out a little. Pull it out with your fingers.
4. Attach the specified fuse to the tip of the cap and insert it into the fuse holder.
5. Turn the cap about 90 degrees in clockwise direction with a slotted screwdriver.
6. Turn on the external power source (breaker, etc.).
7. Turn on the power switch of the power supply unit.

The fuse has been replaced.

Check if the POWER lamp is lit.

A5.3 Self Diagnostic Functions

In addition to normal communication, the optical bus repeater has the following self diagnostic functions that operate according to the jumper settings inside the optical transceiver and controller:

- Controller internal loopback diagnosis
- Electrical transceiver internal loopback diagnosis
- Optical transceiver internal loopback diagnosis
- Electrical transceiver external loopback diagnosis
- Optical transceiver external loopback diagnosis
- Echo back

The status of the diagnostic functions is indicated by the lamps. These functions are useful when maintaining the optical bus repeater and fiber-optic cables. This section explains these functions.

**SEE
ALSO**

For more information about controller error codes, refer to:

“■ ERR Lamp Indications and Modes” on page A5-16

A5.3.1 Maintenance when the Optical Bus Repeater Lamps Indicate an Error

The following table shows in which unit the error occurred as indicated by the lamp indication for each of the units comprising the optical bus repeater. See this table when replacing or performing maintenance for any unit.

Table A5.3.1-1 Lamp Indication Statuses and Maintenance

Status indication of lamps in each unit(*1)				Possible causes and measures
Electrical transceiver	Controller	Optical transceiver	Power supply unit	
RCV ● SND ●	RDY ● ERR ○2 ERR ○1 ERR ○0	RDY ● RCV ● SND ●	POWER ●	Normal status However, the RCV and SND lamps are not lit in silent status in which there is no signal transmitted.
RCV ○ SND ○	RDY ○ ERR ○2 ERR ○1 ERR ○0	RDY ○ RCV ○ SND ○	POWER ○	Fault in the power supply unit If there is no error in the external power supply, there may be a fault in the power supply unit. • Check the fuse. • Check the wiring. • If these are normal, replace the power supply unit.
RCV △ SND △	RDY ○ ERR △2 ERR △1 ERR △0	RDY △ RCV △ SND △	POWER ●	Communication status is not normal • When the lamp indication statuses match those shown below (4th and 5th rows of the table), also see the corresponding explanation on the causes and measures. • Pull out the controller and optical transceiver to visually check that the jumper settings are correct. • If the error code is indicating a diagnostic status even though the jumper settings are correct (Normal position), there may be a problem with the units. • If both the jumper settings and power supply are normal, perform internal and external loopback diagnoses using the controller jumper settings. If the controller error code indicates an error, the unit needing replacement can be identified.

Continues on the next page

Table A5.3.1-1 Lamp Indication Statuses and Maintenance (Table continued)

Status indication of lamps in each unit(*1)				Possible causes and measures
Electrical transceiver	Controller	Optical transceiver	Power supply unit	
RCV △ SND △	RDY ● ERR ○ 2 ERR ○ 1 ERR ○ 0	RDY ○ RCV △ SND △	POWER ●	- A condition in which a correct signal is not received by the optical transceiver receive section from the mating optical bus repeater. There may be an error in the optical transceiver or the mating optical bus repeater. - Check if the communication status of the mating optical bus repeater is normal. - Using the controller jumper settings, perform internal and external loopback diagnoses for both of the optical bus repeaters interconnected by fiber-optic cables. If the error code indicates an error, the unit needing replacement can be identified. - If the loopback diagnoses show no error, there may be a problem of optical loss, abnormal optical output level or abnormal optical receive sensitivity. Inspect or try replacing the optical transceiver or fiber-optic cable.
RCV ▲ SND ○	RDY ○ ERR ○ 2 ERR ○ 1 ERR ○ 0	RDY ● RCV ▲ SND ○	POWER ●	- If the optical bus repeater is operating normally, it is possible that the unit whose RCV lamp is lit is receiving an abnormally long signal. - When the RCV lamp of the optical transceiver is lit, there may be an error in the mating bus repeater. If the RCV lamp for the electrical transceiver is lit, there may be an error in another communication device on the V net cable.

*1: Lamp indication statuses

●: ON

○: OFF

△: ON or OFF

▲: One RCV lamp is ON and the other is OFF

A5.3.2 How to Use the Self Diagnostic Functions by Optical Bus Repeater Jumper Settings

The optical bus repeater performs self diagnosis tests in accordance with the jumper settings inside the controller and optical transceiver. The source of the problem can be identified with certain probability from the status of the ERR lamp indications.

SEE ALSO

For more information about jumper positions, refer to:

- A4.2, "Optical Transceiver" on page A4-4
- A4.3, "Controller" on page A4-6

■ Wiring for External LoopBack

● Independent External LoopBack Only

Always perform an external loopback and echo back after providing the corresponding external wiring as shown in the figure below. Set the controller jumper to the ELPB position.

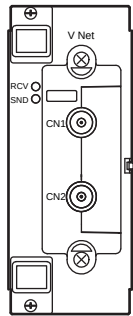
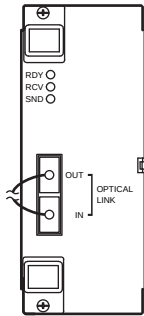
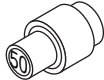
	Electrical transceiver	Optical transceiver
		
External connection	V net terminator (2 pcs)  (YCB148 : 10BASE-2) (YCB118 : 10BASE-5)	Optical cord (10 m or longer)
Transceiver jumper settings	None	NORMAL
Controller jumper settings	ELPB	ELPB

Figure A5.3.2-1 External Wiring for External LoopBack (Independent External LoopBack)

● LoopBack Combined with Echo-Back

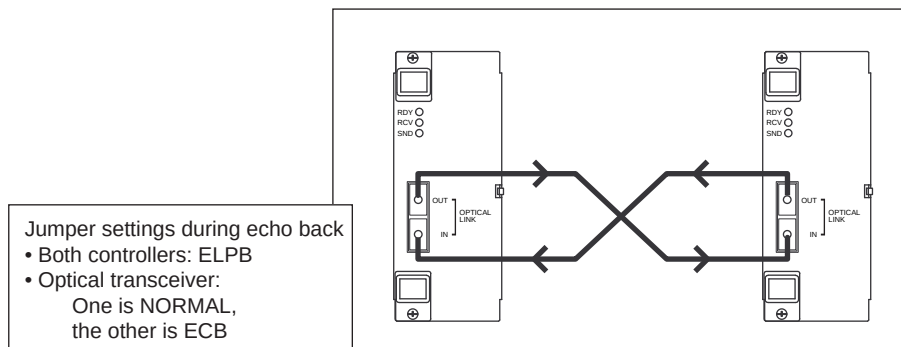


Figure A5.3.2-2 External Wiring for External LoopBack (Combined with Echo-Back)

● Operation Modes and Jumper Settings

The operation modes and jumper settings are shown in the following table.

Table A5.3.2-1 Operation Modes and Jumper Settings (1/2)

Operation mode specification	Jumper settings		Description
	Control-ler	Optical transceiv-er	
Normal operation	NORM	NORMAL	• When the power is turned on with the settings at left, loopback diagnoses are performed in the following order while the controller RDY lamp remains off: 1. Controller internal loopback 2. Electrical transceiver internal loopback 3. Optical transceiver internal loopback If no error is found, the controller RDY lamp lights up and the mode changes to communication status. • If an error is found by the loopback diagnoses, the controller RDY lamp remains off but an error code is indicated by the error code lamps. The diagnoses are repeated from the start, and the mode changes to communication status when the diagnoses end successfully.
Internal loop-back(*1)	ILPB	NORMAL	• In this test, no test signal is output to the cable. Thus, it does not matter whether or not the V net cable is connected to the electrical transceiver branch connector and the optical cord to the optical transceiver. • In this mode, the controller RDY lamp remains off. • When the power is turned on with the settings on the left, the following loopbacks start and repeat. 1. Controller internal loopback 2. Electrical transceiver internal loopback 3. Optical transceiver internal loopback During the above loopbacks, all the error-code lamps are ON. • While this mode is executed normally, the statuses of the RCV and SND lamps for both transceivers are as follows: (both optical and electrical) - RCV lamp: ON - SND lamp: undefined • If an error is found at any stage, the error code is indicated and the test stops.

*1: When performing an internal loopback, it is recommended that the cable be disconnected from the V net currently operating, in order to prevent a system shutdown due to malfunction and mis-operation.

Table A5.3.2-2 Operating Modes and Jumper Settings (2/2)

Operation mode specification	Jumper settings		Description
	Controller	Optical transceiver	
External loopback(*1)	ELPB	NORMAL	- If this mode is executed, a test signal is output from the transceiver to the cable. Thus, when starting this diagnosis in a system currently running, it is necessary to disconnect from the V net currently operating. - When executing this mode, disconnect the V net cable from the electrical transceiver and install two terminators to the branch connector. For the optical transceiver, connect IN and OUT using an optical cord of 10 m or longer, or connect them to the optical bus repeater set for echo back and turn on the power for that unit first. - In this mode, the controller RDY lamp remains off. - While this test is executed continuously and properly, the SND and RCV lamps for both transceivers remain on. - When the power is turned on, one each of the following diagnoses are performed in this order: 1. Controller internal loopback 2. Electrical transceiver internal loopback 3. Optical transceiver internal loopback If no error is found, the following are repeated: Electrical transceiver external loopback Optical transceiver external loopback While the external loopbacks are being repeated, all error code lamps remain on. - If an error is found at any stage, the error code is indicated and the test stops.
Echo back(*2)	ELPB	ECB	- This is a diagnostic mode that can be used in conjunction with another optical bus repeater set for external loopback. - In this mode, the controller RDY lamp is off. - When the power is turned on, one each of the following diagnoses are performed in this order: 1. Controller internal loopback 2. Electrical transceiver internal loopback 3. Optical transceiver internal loopback If no error is found, the echo back status is indicated by the error code lamps (error code: 1) and echo back is performed. - Echo back is a service in which the signal received by an optical transceiver is echoed back from the same optical transceiver. If the power is turned on for a optical bus repeater set for echo back, then the power is turned on for the mating optical bus repeater set for external loopback, checking of optical transmission between the two can be performed without a device other than the optical bus repeaters. - If an error is found at any stage of the controller or transceiver internal loopbacks, the error code is indicated and the test stops.

*1: When performing an external loopback, a test signal is output from the transceiver to the cable. Thus, be sure to disconnect the cable from the V net currently operating.

*2: When performing an echo back, it is recommended that the cable be disconnected from the V net currently operating in order to prevent a system shutdown due to malfunctioning or mis-operation.

■ ERR Lamp Indications and Modes

The table below shows the indications of the controller ERR lamps and corresponding diagnoses:

Table A5.3.2-3 ERR Lamp Indications and Modes

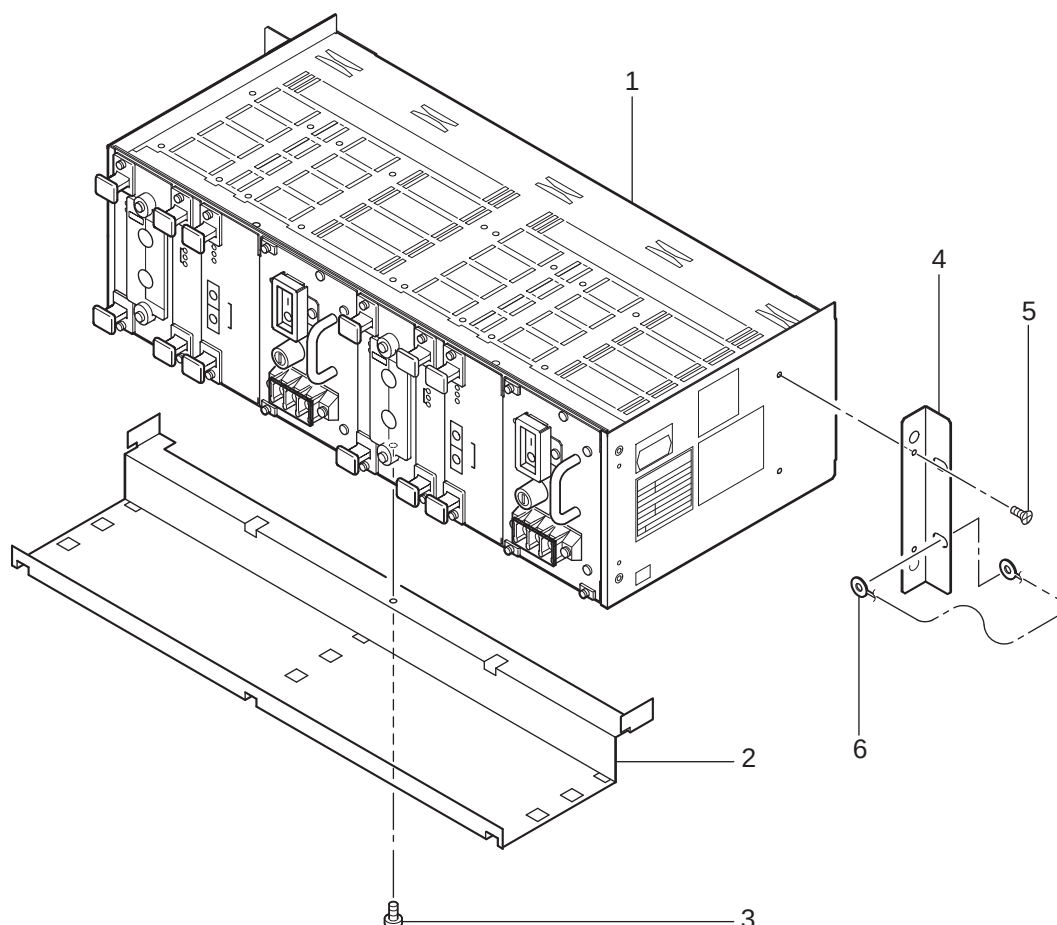
ERR lamps			ERR code number and meaning of the lamp indication (*1)
2	1	0	
OFF	OFF	OFF	(0) Communicating normally
OFF	OFF	ON	(1) During echo back Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Electrical transceiver, internal • Optical transceiver, internal
OFF	ON	OFF	(2) Error during the controller internal loopback
OFF	ON	ON	(3) Error during the electrical transceiver internal loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal
ON	OFF	OFF	(4) Error during the optical transceiver internal loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Electrical transceiver, internal
ON	OFF	ON	(5) Error during the electrical transceiver external loopback Indicates that no error was found at least by the following loopbacks when the power was turned on: • Controller, internal • Electrical transceiver, internal • Optical transceiver, internal
ON	ON	OFF	(6) Error during the optical transceiver external loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Electrical transceiver, internal • Optical transceiver, internal • Electrical transceiver, external
ON	ON	ON	(7) Loopbacks being repeated This is not an error.

*1: The number in () is the error code number.

Customer Maintenance Parts List

CMPL 32S06H10-01E

Model YNT511D (for Max. 4 km)
Model YNT522D (for Max. 15 km)
Optical Bus Repeater for V net

ProSafe-RS


Item	Part No.	Qty	Description
1	—	1	Optical Bus Repeater
2	T9080SK	1	Cable Tray
3	Y9306LB	1	B.H.Screw, M3 × 6
4	T9080VF	2	Bracket
5	Y9306TY	4	Tapping Screw, M3 × 6
6	S9049PM	4	Insulating Bushing

} Option
(option code:/KT)

Figure CMPL A1-1

CAUTION

- The Customer Maintenance Parts List (CMPL) is provided as a reference for ordering maintenance parts. Customers should not assemble or disassemble the products by themselves using this CMPL, but should contact Yokogawa's sales agents for parts replacement. YOKOGAWA assumes no liability to any party for damages caused through disassembly or assembly.
- Parts numbers on Parts Lists are subjected to change.

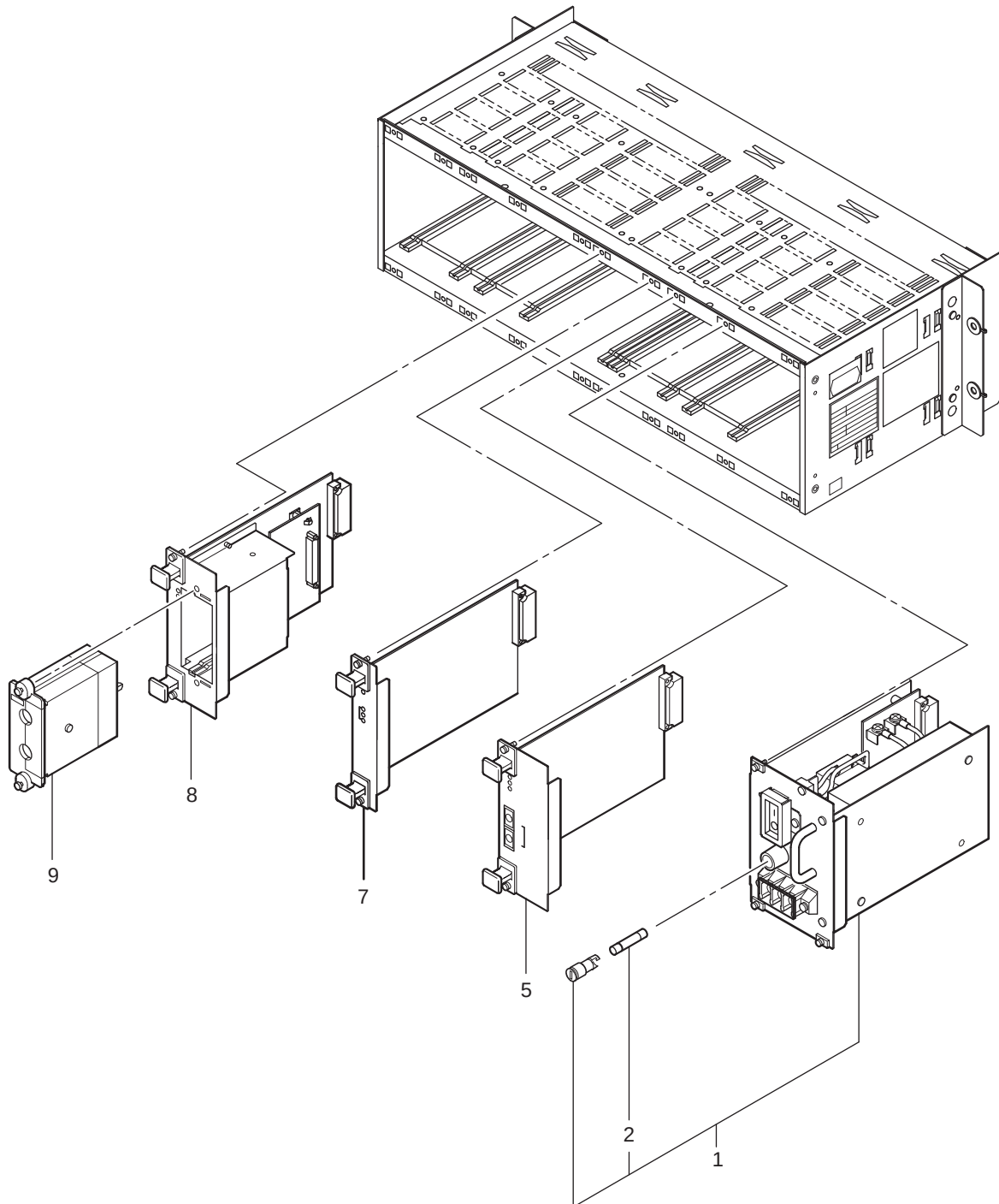


Figure CMPL A1-2

Item	Model or Part No.	Model	Qty				Description
			YNT511D-V	YNT511D-P	YNT522D-V	YNT522D-P	
1	Below PW501 PW502 PW504		2	2	2	2	Power Supply Unit for 100 to 120 V AC Power Supply for 220 to 240 V AC Power Supply for 24 V DC Power Supply
2	Below		1	1	1	1	Fuse (for one power supply unit)
	A1361EF A1349EF A1363EF						for PW501 (1 A) for PW502 (2 A) for PW504 (2 A)
5	AIP578		2	2			Optical Transceiver Unit for V net Repeater (for Max. 4 km transmission distance)
	AIP591				2	2	Optical Transceiver Unit for V net Repeater (for Max. 15 km transmission distance)
7	AIP171		2	2	2	2	Transceiver Control Unit for V net Repeater
8	AIP571		2	2	2	2	Electrical Transceiver Unit for V net Repeater
9	S9628UK		2		2		Connector Unit for V net (10BASE-5)
	S9764UK			2		2	Connector Unit for V net (10BASE-2)

Figure CMPL A1-3

B. Bus Repeater

The bus repeater is used to extend the transmission distance of V net. Bus repeaters are available in different models for 10BASE-2 and 10BASE-5.

B1. Configuration and Specification of Bus Repeater

The use of bus repeaters extends the transmission distance to 185 meters (10BASE-2) or 500 meters (10BASE-5) per bus repeater. Up to 8 repeaters can be applied between any two stations on the V net (10BASE-2). Up to 8 repeaters can be applied between any two stations on the V net (10BASE-5).

The bus repeater is comprised of almost the same units as those in the optical bus repeater, as already described in Part A. The only difference between the two is whether the communication buses are interconnected directly to each other or extended by the optical cables.

**SEE
ALSO**

For more information about installing to the bus repeater, refer to:

[A2., "Installation of Optical Bus Repeater" on page A2-1](#)

For more information about connecting cables to the bus repeater, refer to:

[A3., "Cable Connections" on page A3-1](#)

For more information about the functions and configuration of bus repeater component units, refer to:

[A4., "Functions and Configuration of Units" on page A4-1](#)

B1.1 System Configuration

An example of a system configuration including bus repeaters is shown below.

■ Examples of System Configuration with Bus Repeater

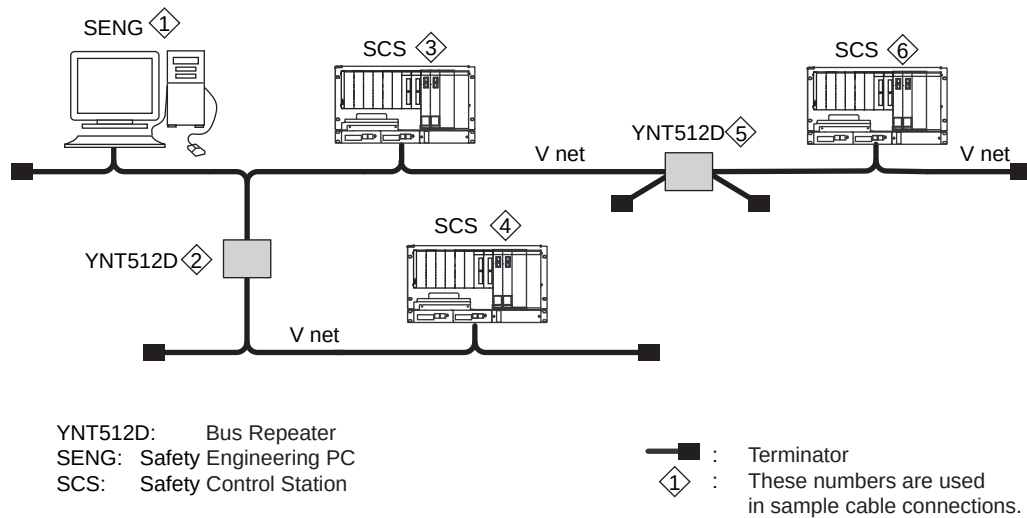


Figure B1.1-1 System Configuration

■ Configuration and the Names of the Components of the Bus Repeater

For ProSafe-RS, the bus repeaters are used for dual-redundant bus configuration.

Component names are same for Bus 1 and Bus 2.

As shown in the following figure, the components on the left hand side are for Bus 1 and those on the right hand side are for Bus 2.

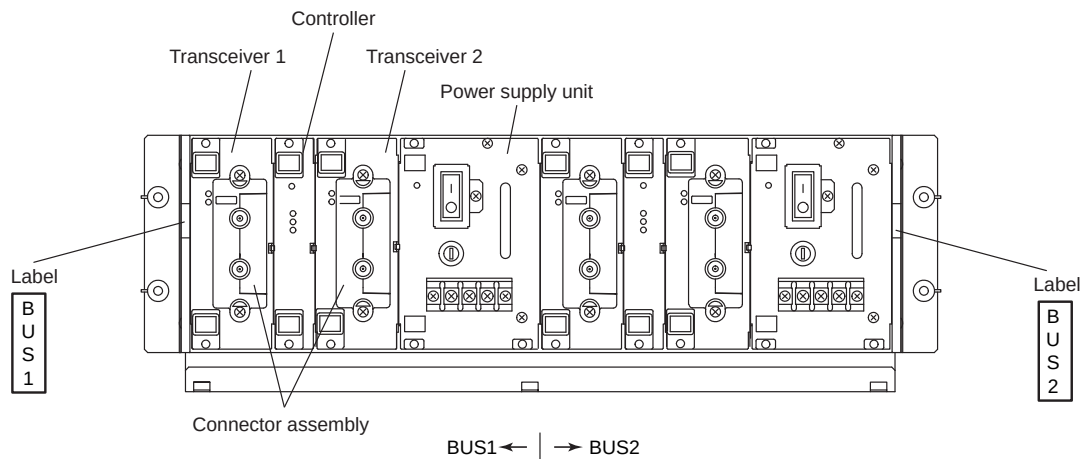


Figure B1.1-2 Configuration of Bus Repeater

● Names and Models of Bus Repeater Component Units

In the table below, the names and the models of the bus repeater component units are listed.

Since the repeater is for dual-redundant configuration thus each component requires two units.

Table B1.1-1 Names and Models of Bus Repeater Component Units

Name of unit	Model name of unit
Power supply	PW501 (100-120 V AC) PW502 (220-240 V AC) PW504 (24 V DC)
Transceiver 1	AIP571
Transceiver 2	AIP571
Connector assembly	S9764UK (for 10BASE-2) S9628UK (for 10BASE-5)
Controller	AIP171

B1.2 Transmission Distance

The number of repeaters to be applied and the transmission distance are explained below.

■ Number of Repeaters and Transmission Distance

With one repeater, the transmission distance for V net (10BASE-2) can be extended for 185 meters while for V net (10BASE-5) can be extended for 500 meters.

For 10BASE-2, up to 8 repeaters can be applied between any two stations on the V net.

For 10BASE-5, up to 8 repeaters can be applied between any two stations on the V net.

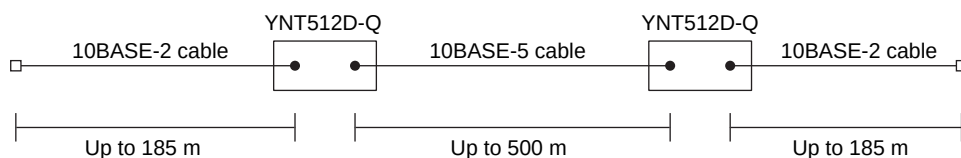
Models and suffix codes are as follows:

- YNT512D-V : For dual-redundant V net (10BASE-5)
- YNT512D-P : For dual-redundant V net (10BASE-2)
- YNT512D-Q : For dual-redundant V net (conversion between 10BASE-2 and 10BASE-5)

■ Using a Model YNT512D-Q

The cable with the specification code of YNT512D-Q is used for extending the bus from 10BASE-2 to 10BASE-5 bus. An example is shown below.

[Example1]



[Example2]

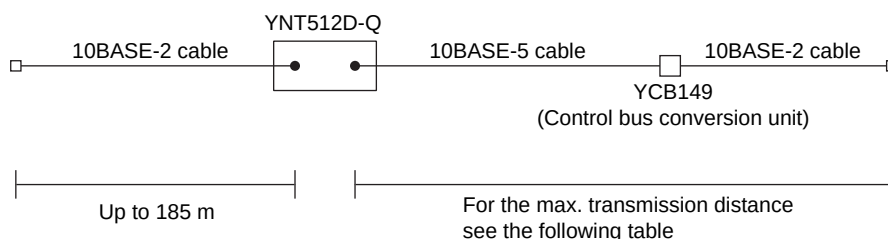


Figure B1.2-1 Example of Using a Model YNT512D-Q

■ Total Transmission Distance

The total transmission distance and the number of repeaters used are shown in the table below.

Table B1.2-1 Total Transmission Distance and Number of Repeaters

	Total transmission distance depending on No. of repeaters (km)							
	1	2	3	4	5	6	7	8
YNT512D-P (for 10BASE-2)	Max. 0.37	Max. 0.555	Max. 0.74	Max. 0.925	Max. 1.11	Max. 1.295	Max. 1.48	Max. 1.6
YNT512D-V (for 10BASE-5)	Max. 1	Max. 1.5	Max. 2	Max. 2.5	-	-	-	-

Continues on the next page

Table B1.2-1 Total Transmission Distance and Number of Repeaters (Table continued)

	Total transmission distance depending on No. of repeaters (km)							
	1	2	3	4	5	6	7	8
YNT512D-Q (for max. 500 m)	Max. 0.685	Max. 0.87	Max. 1.37	Max. 1.555	-	-	-	-

B2. Installation of Bus Repeater

**SEE
ALSO**

For more information about installing to the bus repeater, refer to:

[A2., "Installation of Optical Bus Repeater" on page A2-1](#)

B3. Cable Connections

**SEE
ALSO**

For more information about connecting cables to the bus repeater, refer to:

[A3., "Cable Connections" on page A3-1](#)

B3.1 Connecting the V net Cables

The following figure shows an example of connecting the V net cables.

■ Example of Connecting V net Cables

The following figure illustrates the V net cable connections. This is the sample wiring diagram used for V net explanation of "Figure System Configuration" in chapter B1, "Configuration and Specification of Bus Repeater". The models of the devices are indicated by the numbers at the right-hand side. To make the complicated wiring diagram simple, the following is only a wiring diagram for single bus.

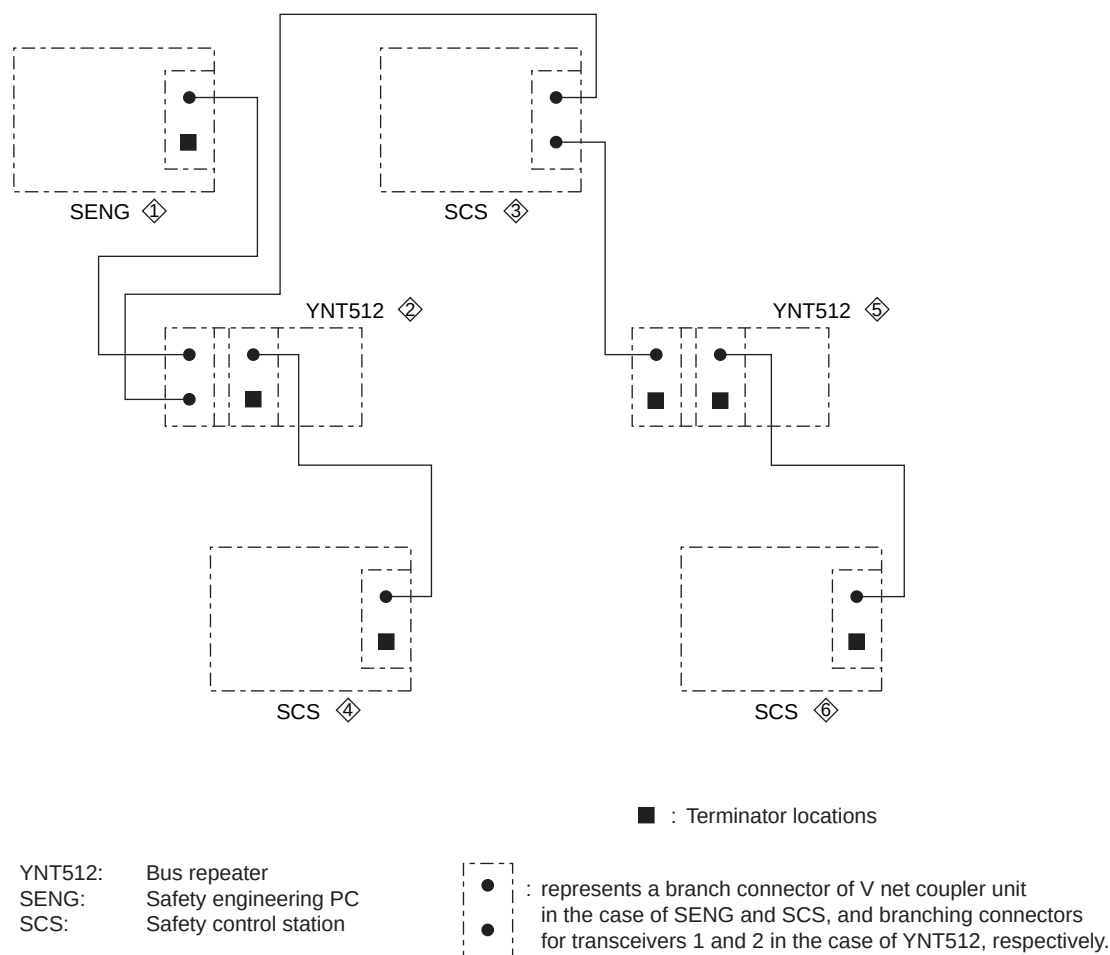


Figure B3.1-1 Example of Connecting V net Cables

B3.2 Using V net (10BASE-5) Cable

V net (10BASE-2) is limited for the distance within 185 meters. If the distance of the connected devices is beyond 185 meters, one more bus repeater is required. One bus repeater may extend connection for another 185 meters. Using V net (10BASE-5) cable to replace a part of V net (10BASE-2) may reduce the number of repeaters used in the V net (10BASE-2) connection.

**SEE
ALSO**

For more information about the number of bus repeaters and the total transmission distance, refer to:

[B1.2, "Transmission Distance" on page B1-4](#)

■ Example of V net (10BASE-2) and V net (10BASE-5) Connection

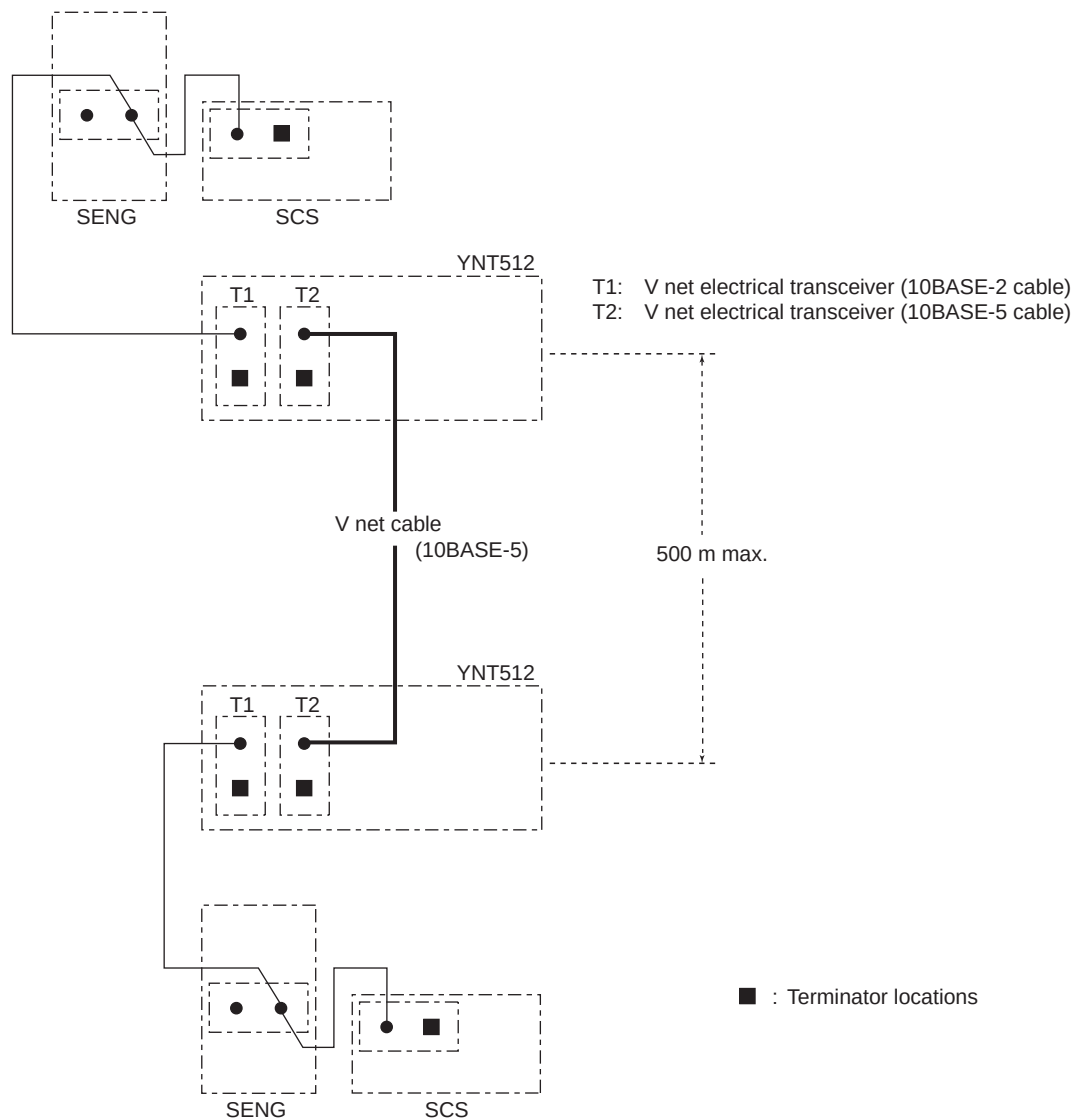


Figure B3.2-1 Example of V net Cable Connection

B4. Functions and Configuration of Units

**SEE
ALSO**

For more information about the functions and configuration of bus repeater component units, refer to:

[A4., "Functions and Configuration of Units" on page A4-1](#)

B5. Maintenance for the Bus Repeater

This section explains the daily inspection of the bus repeater and the self diagnostic functions provided with this model for reference when performing maintenance for the bus repeater.

**SEE
ALSO**

For more information about electrostatic charge, refer to:

“■ Antistatic Precautions” on page A5-1

B5.1 Daily Inspection

Perform the following visual inspections:

■ Status Indicator Lamps on the Front of Each Unit

The bus repeater is operating normally if the lamps are on or off as indicated in the following table. However, the RCV and SND lamps for transceiver 1 and transceiver 2 remain off in silent status where there is no signal transmitted.

Table B5.1-1 Lamp Indications During Normal Operation

Status indication of lamps on each unit (*1)			
Transceiver 1	Controller	Transceiver 2	Power supply unit
RCV ● SND ●	RDY ● ERR ○ 2 ERR ○ 1 ERR ○ 0	RCV ● SND ●	POWER ●

*1: Lamp indication statuses

●: ON

○: OFF

**SEE
ALSO**

For more information about error indications of the status indicator lamps on each unit, refer to:

[B5.3.1, "Maintenance when the Bus Repeater Lamps Indicate an Error" on page B5-5](#)

B5.2 Parts Replacement

**SEE
ALSO**

For more information about replacing the components in the bus repeater, refer to:

[A5.2, "Parts Replacement" on page A5-3](#)

B5.3 Self Diagnostic Functions

In addition to normal communication, the bus repeater has the following self diagnostic functions that operate according to the jumper settings inside the controller:

- Controller internal loopback diagnosis
- Transceiver internal loopback diagnosis
- Transceiver external loopback diagnosis

The status of the diagnostic functions is indicated by the lamps. These functions are useful when maintaining the bus repeater. This section explains these functions.

**SEE
ALSO**

For more information about controller error codes, refer to:

“■ ERR Lamp Indications and Modes” on page B5-7

B5.3.1 Maintenance when the Bus Repeater Lamps Indicate an Error

The following table shows in which unit the error occurred as indicated by the lamp indication for each of the units comprising the bus repeater. See this table when replacing or performing maintenance for any unit.

Table B5.3.1-1 Lamp Indication Statuses and Maintenance

Status indication of lamps in each unit(*1)				Possible causes and measures
Transceiver 1	Controller	Transceiver 2	Power supply unit	
RCV ● SND ●	RDY ● ERR ○2 ERR ○1 ERR ○0	RCV ● SND ●	POWER ●	Normal status However, the RCV and SND lamps are not lit in silent status in which there is no signal transmitted.
RCV ○ SND ○	RDY ○ ERR ○2 ERR ○1 ERR ○0	RCV ○ SND ○	POWER ○	Fault in the power supply unit If there is no error in the external power supply, there may be a fault in the power supply unit. - Check the fuse. - Check the wiring. - If these are normal, replace the power supply unit.
RCV △ SND △	RDY ○ ERR △2 ERR △1 ERR △0	RCV △ SND △	POWER ●	Communication status is not normal - When the lamp indication statuses match those shown below (last row of the table), also see the corresponding explanation on the causes and measures. - Pull out the controller to visually check that the jumper settings are correct. If the error code is indicating a diagnostic status even though the jumper settings are correct (Normal position), there may be a problem with the units. - If both the jumper settings and power supply are normal, perform internal and external loopback diagnoses using the controller jumper settings. If the controller error code indicates an error, the unit needing replacement can be identified.
RCV ▲ SND ○	RDY ○ ERR ○2 ERR ○1 ERR ○0	RCV ▲ SND ○	POWER ●	- If the bus repeater is operating normally, it is possible that the unit whose RCV lamp is lit is receiving an abnormally long signal. - There may be an error in another communication device on the V net cable.

*1: Lamp indication statuses

●: ON

○: OFF

△: ON or OFF

▲: One RCV lamp is ON and the other is OFF

B5.3.2 How to Use the Self Diagnostic Functions by Bus Repeater Jumper Settings

The bus repeater performs self diagnosis tests in accordance with the jumper settings inside the controller. The source of the problem can be identified with certain probability from the status of the ERR lamp indications.

SEE ALSO

For more information about jumper positions, refer to:

- A4.2, "Optical Transceiver" on page A4-4
- A4.3, "Controller" on page A4-6

■ Wiring for External Loopback

When performing external loopback, put terminators on connectors CN1 and CN2 of the transceiver and set the jumper for the controller to the ELPB position.

Independent external loopback

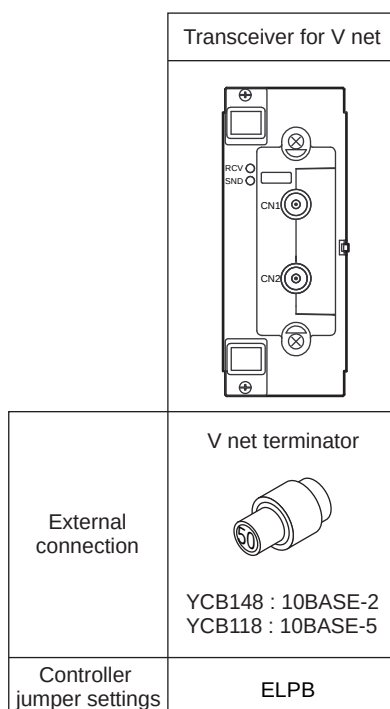


Figure B5.3.2-1 External Wiring for External Loopback

■ Operation Modes and Jumper Settings

The following table indicates the jumper settings and the Description of diagnosis of controller.

Table B5.3.2-1 Operation Modes and Jumper Settings

Operation mode specification	Controller jumper settings	Description
Normal operation	NORM	- When the power is turned on with the settings at left, loopback diagnoses are performed in the following order while the controller RDY lamp remains off: 1. Controller internal loopback 2. Transceiver 1 internal loopback 3. Transceiver 2 internal loopback If no error is found, the controller RDY lamp lights up and the mode changes to communication status. - If an error is found by the loopback diagnoses, the controller RDY lamp remains off but an error code is indicated by the error code lamps. The diagnoses are repeated from the start, and the mode changes to communication status when the diagnoses end successfully.
Internal loopback specification(*1)	ILPB	- In this test, no test signal is output to the cable. However, it is recommended that the transceiver branch connector be disconnected from the V net cable. - In this mode, the controller RDY lamp remains off. - When the power is turned on with the setting at left, the controller internal loopback is performed once, then the transceiver 1 and transceiver 2 internal loopbacks are repeated. While the internal loopbacks are being repeated, all error code lamps remain on. - While this mode is executed normally, the statuses of the RCV and SND lamps for both transceivers are as follows: The electrical transceivers (both transceivers 1 and 2) RCV lamp: ON SND lamp: undefined - If an error is found at any stage, the error code is indicated and the test stops.
External loopback specification(*2)	ELPB	- If this mode is executed, a test signal is output from the transceiver to the cable. Thus, when starting this diagnosis in a system currently running, it is necessary to disconnect from the V net currently operating. - When executing this mode, disconnect the V net cables from both transceivers 1 and 2 and install four terminators to the branch connector. - In this mode, the controller RDY lamp is off. - While this test is executed continuously and properly, the SND and RCV lamps for both transceivers remain on. - When the power is turned on, one each of the following diagnoses are performed in this order: 1. Controller internal loopback 2. Transceiver 1 internal loopback 3. Transceiver 2 internal loopback If no error is found, the following are repeated: Transceiver 1 external loopback Transceiver 2 external loopback While the external loopbacks are being repeated, all error code lamps remain on. - If an error is found at any stage, the error code is indicated and the test stops.

*1: When performing an internal loopback, it is recommended that the cable be disconnected from the V net currently operating in order to prevent a system shutdown due to malfunctioning or mis-operation.

*2: When performing an external loopback, a test signal is output from the transceiver to the cable. Thus, be sure to disconnect the cable from the V net currently operating.

■ ERR Lamp Indications and Modes

The table below shows the indications of the controller ERR lamps and corresponding diagnoses:

Table B5.3.2-2 ERR Lamp Indications and Modes

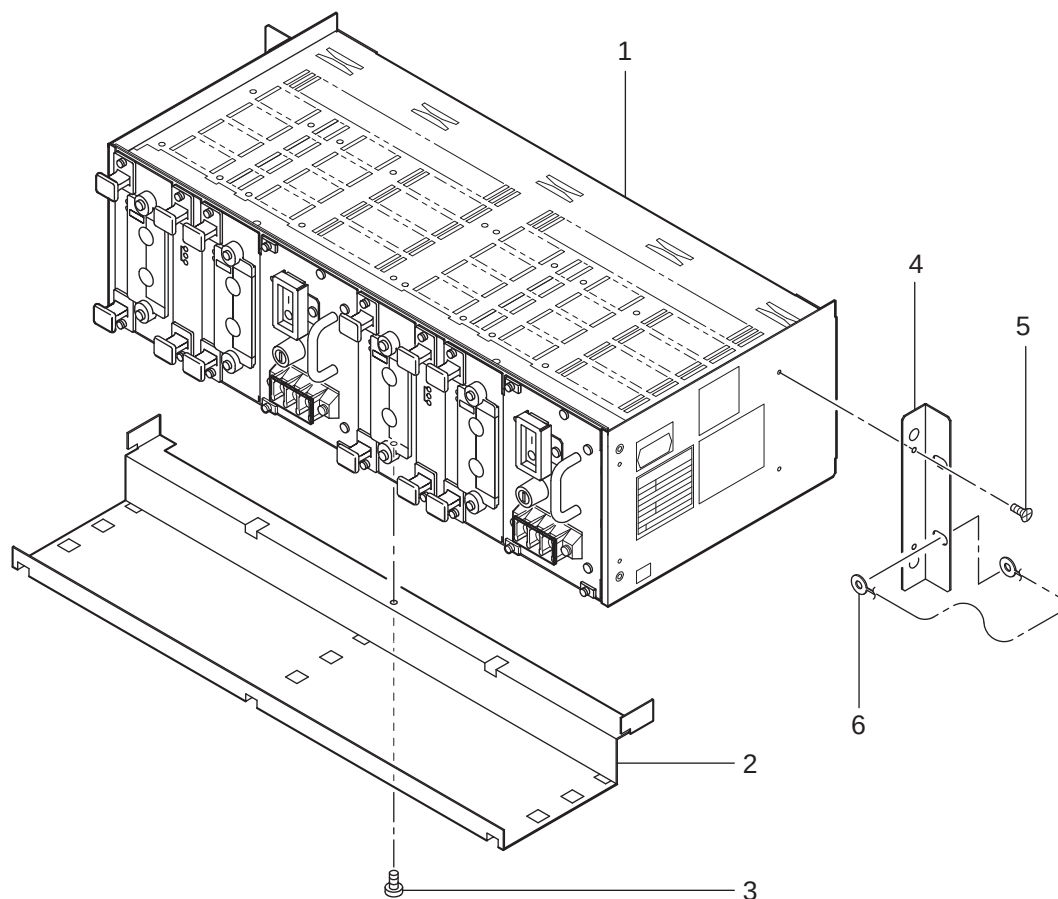
ERR lamps			ERR code number and meaning of the lamp indication(*1)
2	1	0	
OFF	OFF	OFF	(0) Communicating normally
OFF	OFF	ON	(1) Failure status in which the controller is erroneously assuming that a request for echo back service (external loopback diagnosis including external bus cables) was received from the transceiver. (Echo back service cannot be requested from the transceiver.)
OFF	ON	OFF	(2) Error during the controller internal loopback
OFF	ON	ON	(3) Error during the transceiver 1 internal loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal
ON	OFF	OFF	(4) Error during the transceiver 2 internal loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Transceiver 1, internal
ON	OFF	ON	(5) Error during the transceiver 1 external loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Transceiver 1, internal • Transceiver 2, internal
ON	ON	OFF	(6) Error during the transceiver 2 external loopback Indicates that no error was found at least in the following loopback diagnoses when the power was turned on: • Controller, internal • Transceiver 1, internal • Transceiver 2, internal • Transceiver 1, external
ON	ON	ON	(7) Loopbacks being repeated This is not an error.

*1: The number in () is the error code number.

Customer Maintenance Parts List

CMPL 32S06H20-01E

Model YNT512D
Bus Repeater for V net

ProSafe^{RS}


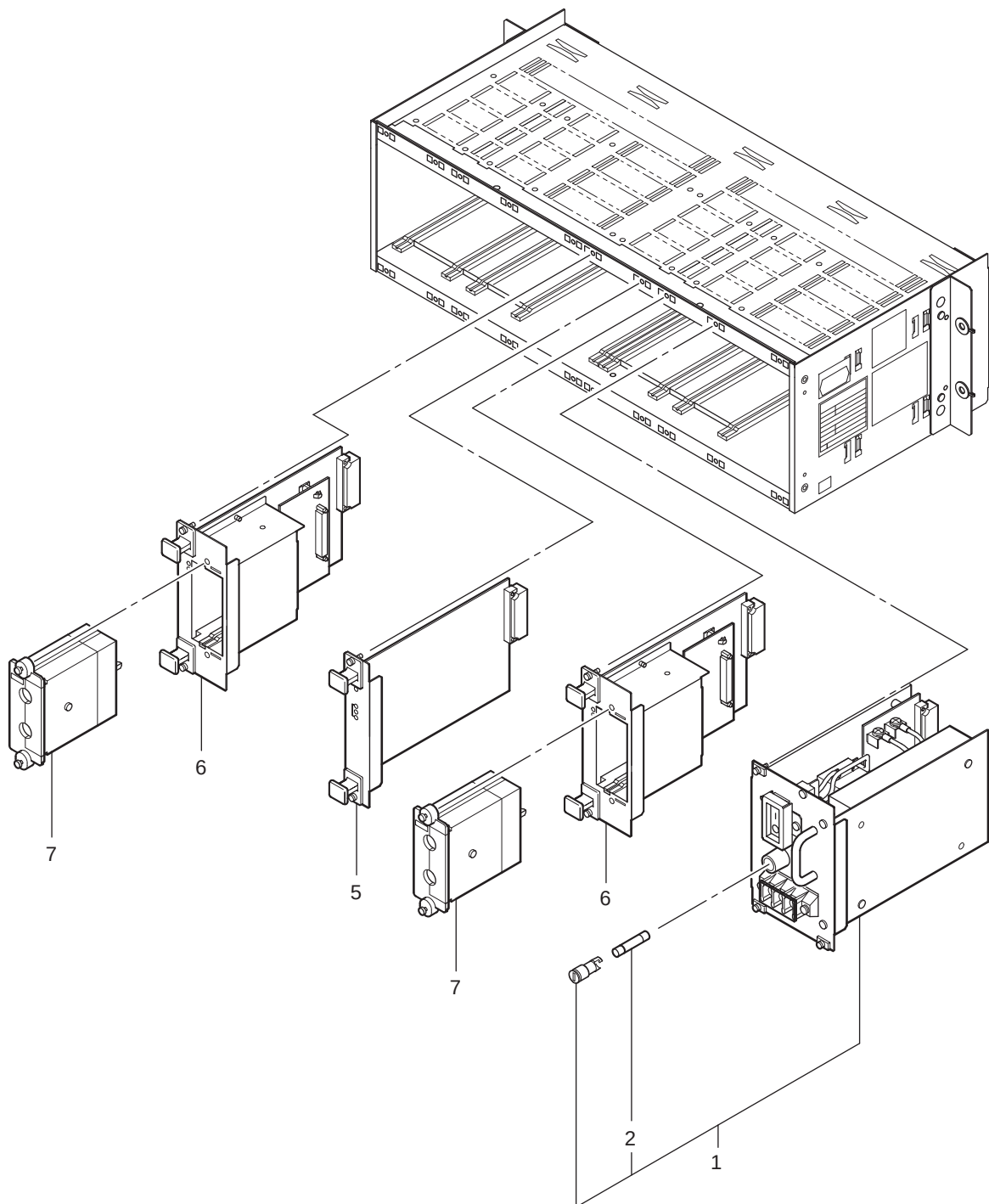
Item	Part No.	Qty	Description
1	—	1	Bus Repeater
2	T9080SK	1	Cable Tray
3	Y9306LB	1	B.H.Screw, M3 × 6
4	T9080VF	2	Bracket
5	Y9306TY	4	Tapping Screw, M3 × 6
6	S9049PM	4	Insulating Bushing

} Option
(option code: /KT)

Figure CMPL B1-1

CAUTION

- The Customer Maintenance Parts List (CMPL) is provided as a reference for ordering maintenance parts. Customers should not assemble or disassemble the products by themselves using this CMPL, but should contact Yokogawa's sales agents for parts replacement. YOKOGAWA assumes no liability to any party for damages caused through disassembly or assembly.
- Parts numbers on Parts Lists are subjected to change.

**Figure CMPL B1-2**

Item	Model or Part No.	Model	Qty			Description
			YNT512D-V	YNT512D-P	YNT512D-Q	
1	Below PW501 PW502 PW504	2	2	2		Power Supply Unit for 100 to 120 V AC Power Supply for 220 to 240 V AC Power Supply for 24 V DC Power Supply
2	Below A1361EF A1349EF A1363EF	1	1	1		Fuse for PW501 (1 A) for PW502 (2 A) for PW504 (2 A)
5	AIP171	2	2	2		Transceiver Control Unit for V net Repeater
6	AIP571	4	4	4		Electrical Transceiver Unit for V net Repeater
7	S9628UK S9764UK	4		2	2	Connector Unit for V net (10BASE-5) Connector Unit for V net (10BASE-2)

Figure CMPL B1-3

Communication Devices

IM 32Q06H10-31E 4th Edition

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Introduction Description of station types has been changed.

Description of conformity standards has been modified.

A3.3.2 Description of V net grounding unit components has been modified.

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