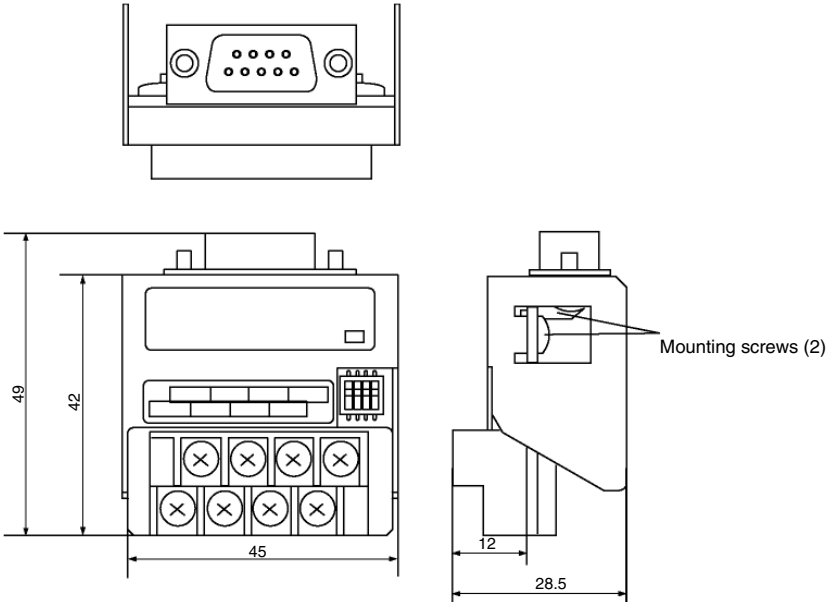


Appendix 3 Using NS-AL002 Converters

The NS-AL002 RS-232C/RS-422A Converter is connected directly to RS-232C port A or B of the PT, and converts RS-232C communications to RS-422A/RS-485. Any of the Converters listed in *Appendix 9 Standard Models* can be used. A summary of the NS-AL002 external dimensions, mounting and removal methods, and specifications is provided here. Refer to this information when designing the control panel. Refer to the *Instruction Sheet* included with the NS-AL002 for details.

Note The NS-AL002 is an uninsulated RS-232C/RS-422A Converter. Therefore, if differences in ground potential or effects from noise are concerns, it is recommended that an insulated NT-AL001 RS-232C/RS-422A Converter be used instead. For details, refer to *Appendix 4 Using NT-AL001 Converters*.

A-3-1 Dimensions



A-3-2 Mounting and Removing

Connect the NS-AL002 directly to port A or port B of the PT. Two NS-AL002 Adapters cannot be connected to ports A and B simultaneously.

Mount the Adapter by tightening and securing the mounting screws on both of the D-Sub connectors. The correct tightening torque is 0.3 N·m. The correct tightening torque for the terminal block is 0.5 N·m.

To remove the Adapter, loosen the screws and pull out the Adapter.

-
- Note**
- Always turn OFF the power to the PT before removing the Adapter.
 - Do not touch the surface or the mounted parts of the Board with bare hands. Always discharge any static electricity from your body before handling the Board.
 - Mount to the PT after securely connecting the cable to the terminal block. Be sure to tighten the mounting screws on both of the D-Sub connectors. If the screws are loose, the FG terminals of the PT and NS-AL002 will not be connected.
-

A-3-3 Specifications

The following table shows the general specifications and communications specifications of the Adapter.

● General Specifications

Item	Specifications
Dimensions	45 × 49 × 28.5 mm (W × H × D)
Weight	50 g max.
Ambient operating temperature	0 to 50°C
Storage temperature	-20 to 60°C
Ambient operating humidity	35% to 85% (without condensation)
Rated power supply	5 V ±10% (through pin 6 of the RS-232C connector)
Power consumption	150 mW max.
Operating environment	No corrosive gases.
Vibration resistance	Conforms to PT specifications.
Shock resistance	Conforms to PT specifications.

Reference NS-series RS-485 (two-wire) communications are used to connect to an OMRON Temperature Controller. The NS-AL002 cannot be used with the NT-series PTs or PLCs.

● Communications Specifications

● RS-422A Interface

Item	Specifications
Baud rate	115.2 kbps max.
Transmission distance	500 m total length (See note 1.)
Terminal block format	8-terminal terminal block, M3.0
Insulation	No insulation (See note 2.)

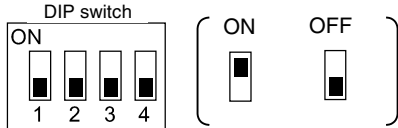
Note 1: This specification is for a configuration in which all the Adapters connected on the same transmission path are NT-AL002 Link Adapters. If a CJ1W-CIF11 Conversion Adapter is used, the total length is 50 m.

Note 2: The RS-422A and RS-232C are not insulated.

A-3-4 DIP Switch Settings

The NS-AL002 Adapter has four DIP switch pins for setting the RS-422A communications conditions.

Set the DIP switch pins before connecting the cables to the Adapter.



The factory setting for the DIP switch is all pins set to OFF.

Pin	Function	ON	OFF
Pin 1	Transmission mode	RS/CS control	Normal transmission
Pins 2 and 3	Two-wire/four-wire method selection	Two-wire method	Four-wire method
Pin 4	Terminating resistance	Yes	None

For 1:1 NT Link, set the RS-422A transmission mode to normal transmission (pin 1 OFF).
 For 1:N NT Links (normal, high speed), set the RS-422A transmission mode to RS/CS control (pin 1 ON).

Note • Use the following DIP switch settings when connecting a CJ1W-CIF11 Conversion Adapter to the PT.

Pin	Function	Setting
Pin 1	Terminating resistance selection	ON: Terminating resistance enabled OFF: Terminating resistance disabled
Pin 2	Two-wire/four-wire method selection	OFF (four-wire)
Pin 3	Two-wire/four-wire method selection	OFF (four-wire)
Pin 4	Not used.	OFF
Pin 5	Selection of RS control for RD	OFF (no RS control)
Pin 6	Selection of RS control for SD	ON (RS control)

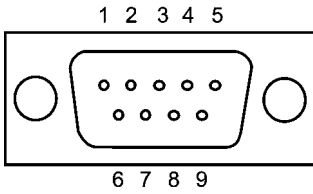
- When a CJ1W-CIF11 Conversion Adapter is used, the total transmission length is 50 m.
- If NT-001/NT-002 Link Adapters are used together with CJ1W-CIF11 Conversion Adapters on the same transmission path, the total transmission length is also 50 m.
- For details, refer to the *Appendix G* in the *SYSMAC CJ Series Operation Manual (W393)*.
- Make sure that both of the mounting screws on the D-Sub connector are tightened to a torque of 0.3 N·m.

A-3-5 Pin Arrangement

The Adapter has a connector for RS-232C interface connection and a terminal block for RS-422A/485 interface connection.

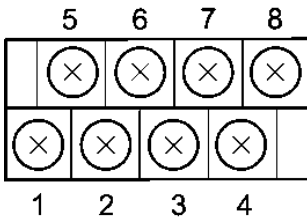
The pin arrangements for the RS-232C connector and RS-422A/485 terminal block are as follows:

● RS-232C Connector



Terminal block pin number	Signal name	Signal direction Adapter ↔ PT
1	NC	
2	RD	←
3	SD	→
4	CS	← (RS signal short-circuited internally)
5	RS	→
6	5 V (30 mA max.)	←
7 or 8	NC	(Pins 7 and 8 are short-circuited.)
9	SG	–
Connector hood	FG	Connects to functional ground terminal of PT.

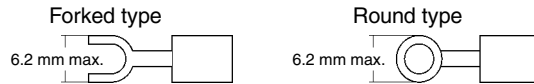
● RS-422A Terminal Block



Terminal block pin number	Signal name	Signal direction Adapter ↔ Host
1	FG	Connects to functional ground terminal of PT.
2	RDB (+)	←
3	SDB (+)	→
4	RSB (+)	→
5	NC	---
6	RDA (-)	←
7	SDA (-)	→
8	RSA (-)	→

● **Crimp Terminals**

Use M3 crimp terminals.



Applicable Crimp Terminal Examples

Forked type

Manufacturer	Model	Recommended cable size
J.S.T. Mfg. Co., Ltd.	V1.25-N3A	AWG22 to 16 (0.25 to 1.65 mm ²)
Molex	VSY1.25-3.5L	AWG22 to 16 (0.3 to 1.65 mm ²)

Round type

Manufacturer	Model	Recommended cable size
J.S.T. Mfg. Co., Ltd.	V1.25-MS3	AWG22 to 16 (0.25 to 1.65 mm ²)
Molex	RAV1.25-3	AWG22 to 16 (0.3 to 1.65 mm ²)

Recommended Cable

Manufacturer	Model
Tachii Electric Wire Co., Ltd.	TKV VBS3P-03
HIRAKAWA HEWTECH CORP.	CO-HC-ESV-3P×7/0.2

A-3-6 Handling the Shield on RS-422A/485 Cables

Perform the following procedures to connect, process the shield, and connect to ground for communications systems using the NS-AL002. Incorrect connection may result in communications errors with the host.

● **Connecting the NS-AL002 D-Sub Connector**

Always securely tighten the screws on both sides of the D-Sub connector. Otherwise, the functional ground terminal (FG: ⚡) of the PT will not be properly connected to the functional ground of the NS-AL002.

● **Connecting the Ground Wire**

The PT has a functional ground terminal (FG: ⚡).

1. Ground according to *Figure (a)* for normal grounding.
 - Connect the ground terminal (GR) of the devices to the functional ground (FG: ⚡).
Make sure that each signal line is grounded at only one point and ground to 100 Ω max.
 - Short the LG terminal of the PLC to the ground terminal (GR).
 - Use a wire gauge of at least 2 mm² for the ground wire.
 - Refer to the manual for individual Communications Units for details on proper wiring procedures.
2. Do not ground the functional ground (FG: ⚡) of the PT if it is mounted to the same panel as devices that generate noise, such as motors or inverters, as shown in *Figure (b)*.

● **Preparing the Shield of RS-422A/485 Connectors**

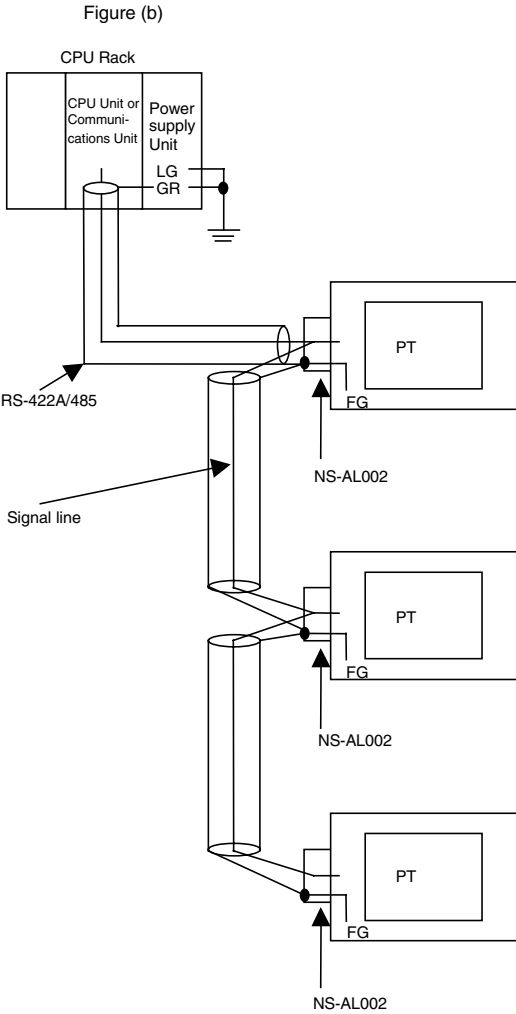
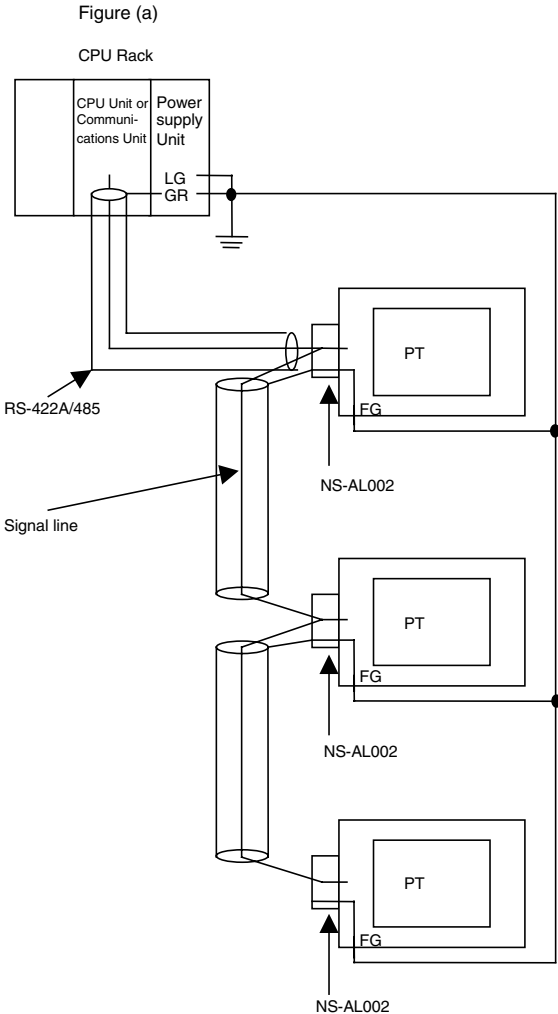
Always prepare RS-422A/485 cable shields properly. Otherwise, communications errors may occur with the host.

Ground only one end of the shield when connecting the ground terminal (GR) of the devices to the functional ground (FG: ⏏), and grounding each signal line at only one point and to 100 Ω max, as shown in *Figure (a)*.

Ground both ends of the shield when not grounding the functional ground (FG: ⏏) of the PT, as shown in *Figure (b)*.

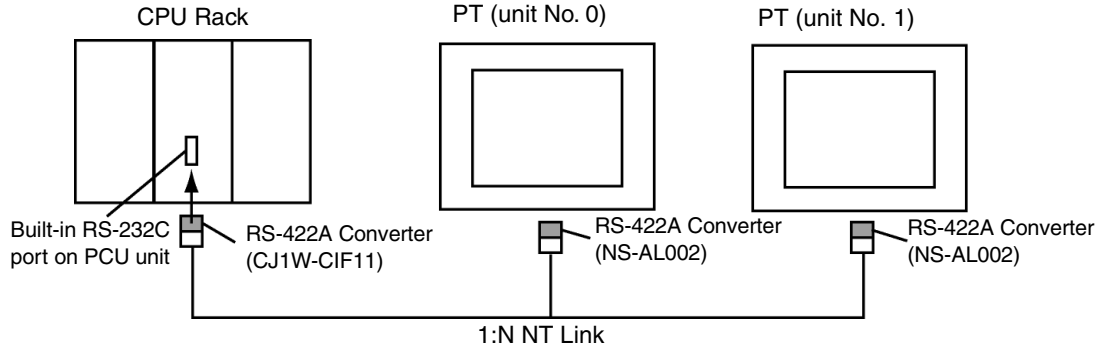
When using the CJ1W-CIF11 or when using the NT-AL001/NS-AL002 together with the CJ1W-CIF11, always performs connections, shield processing, and grounding as shown in *Figure (b)*.

● Example of Recommended Wiring

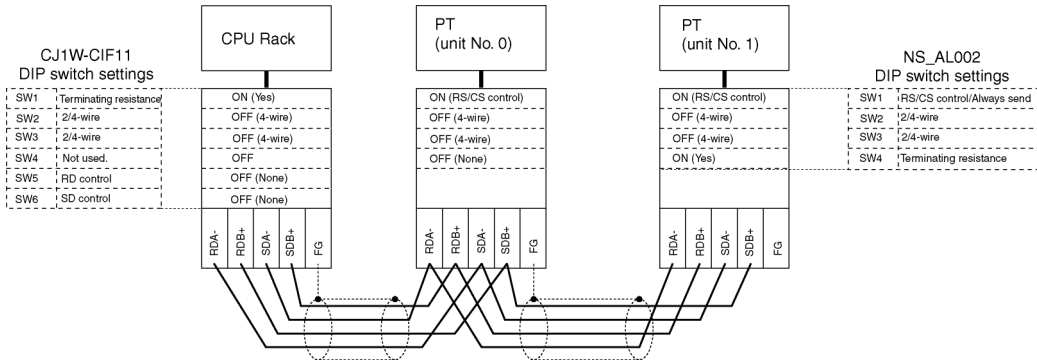


A-3-7 Connection Example

An example of connecting a PLC and a PT using an RS-232C/RS-422A Converter is shown below. Use the wiring example as reference for correct wiring.



● Wiring Example



Note: Refer to A-3-6 Handling the Shield on RS-422A/485 Cables for information on processing the shield wire on the RS-442A/485 cable.