MODBUS SIO
Master Driver

Introduction

This manual describes how to connect the Display and the External Device (target PLC).

In this manual, the connection procedure is described in the sections identified below:
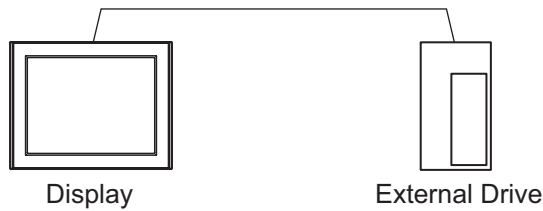
| 1 | System Configuration
This section lists the types of External Devices and SIO that you can connect. | ☞ "1 System Configuration" (page 3) |

| 2 | External Devices Selection
Select the model (series) of the External Device and its connection method. | ☞ "2 External Devices Selection" (page 7) |

| 3 | Communication Settings
This section shows setting examples for communicating between the Display and the External Device. | ☞ "3 Communication Settings" (page 8) |

| 4 | Setup Items
This section describes communication setup items on the Display.
Set the Display's communication settings in GP-Pro EX or in offline mode. | ☞ "4 Setup Items" (page 12) |

| 5 | Cable Diagrams
This section shows cables and adapters for connecting the Display and the External Device. | ☞ "5 Cable Diagrams" (page 17) |

Operation

1 System Configuration

The following table lists system configurations for connecting a MODBUS-compatible External Device and the Display.

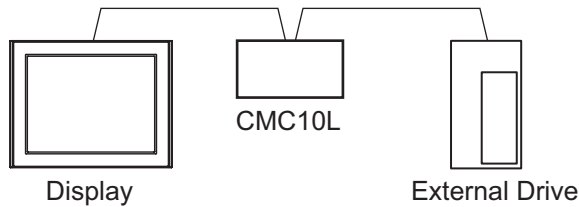| Series	CPU	Link I/F	SIO Type	Setting Example	Cable Diagrams
NX Series	NX-D15□□□□□□ NX-D25□□□□□□ NX-D35□□□□□□	RS-485 communication terminal on the base	RS-422/485 (2 wire)	Setting Example 1 (page 8)	Cable Diagram 1 (page 17)
		RS-485 communication terminal on NX-CB1□□□□□	RS-422/485 (2 wire)	Setting Example 1 (page 8)	Cable Diagram 1 (page 17)
		RS-232C connector on CMC10L	RS-232C	Setting Example 2 (page 10)	Cable Diagram 2 (page 29)

■ Connection Configuration
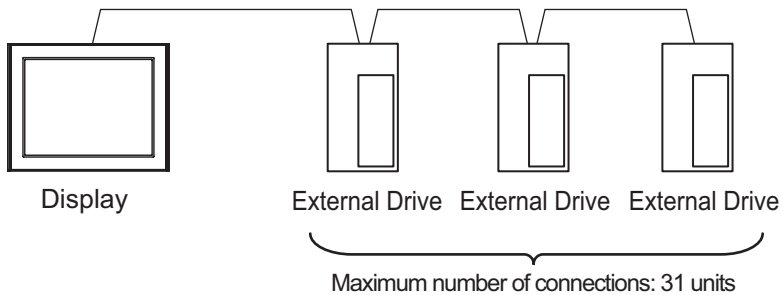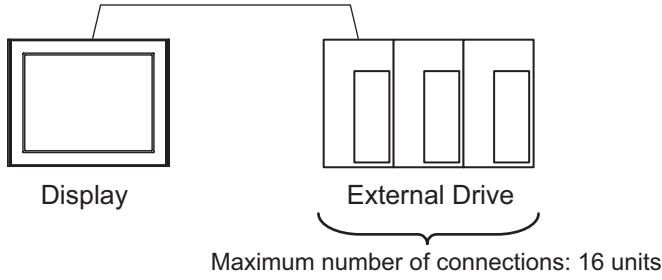
◆ 1:1 Connection

• Direct Connection

Display   External Drive

• Using CMC10L

CMC10L
Display   External Drive

◆ 1:n Connection

• Using 1 port

Display   External Drive   External Drive   External Drive

Maximum number of connections: 31 units

• Using 1 port (when connecting External Devices)

Maximum number of connections: 16 units

• Using 1 port (when using CMC10L)

Maximum number of connections: 31 units

• Using 2 or more ports
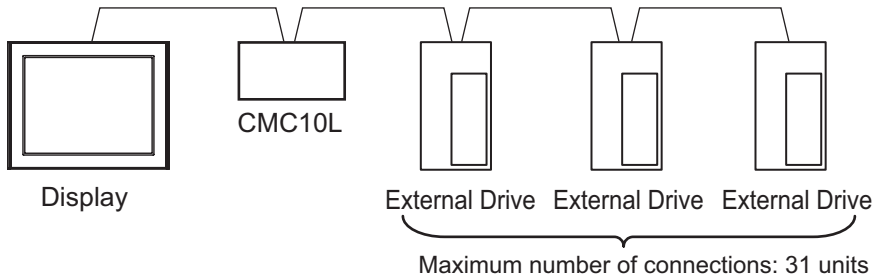
Maximum number of connections: 32 units
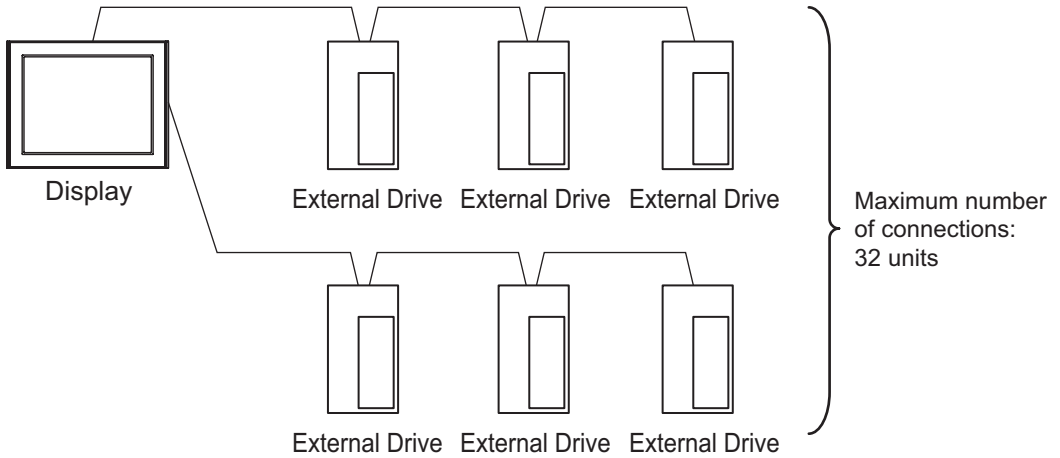
■ IPC COM Port

When connecting IPC with an External Device, the COM port used depends on the series and SIO type. Please refer to the IPC manual for details.

Usable port

Series	Usable Port		
	RS-232C	RS-422/485(4 wire)	RS-422/485(2 wire)
PS-2000B	COM1[*1], COM2, COM3[*1], COM4	-	-
PS-3450A, PS-3451A, PS3000-BA, PS3001-BD	COM1, COM2[*1*2]	COM2[*1*2]	COM2[*1*2]
PS-3650A (T41 model), PS-3651A (T41 model)	COM1[*1]	-	-
PS-3650A (T42 model), PS-3651A (T42 model)	COM1[*1*2], COM2	COM1[*1*2]	COM1[*1*2]
PS-3700A (Pentium®4-M) PS-3710A	COM1[*1], COM2[*1], COM3[*2], COM4	COM3[*2]	COM3[*2]
PS-3711A	COM1[*1], COM2[*2]	COM2[*2]	COM2[*2]
PS4000[*3]	COM1, COM2	-	-
PL3000	COM1[*1*2], COM2[*1], COM3, COM4	COM1[*1*2]	COM1[*1*2]

*1   The RI/5V can be switched. Use the IPC's switch to change if necessary.

*2   Set up the SIO type with the DIP Switch. Please set up as follows according to SIO type to be used.

*3   When making communication between an External Device and COM port on the Expansion slot, only RS-232C is supported. However, ER (DTR/CTS) control cannot be executed because of the specification of COM port.
For connection with External Device, use user-created cables and disable Pin Nos. 1, 4, 6 and 9.
Please refer to the IPC manual for details of pin layout.

DIP Switch setting: RS-232C

DIP Switch	Setting	Description
1	OFF[*1]	Reserved (always OFF)
2	OFF	SIO type: RS-232C
3	OFF	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	OFF	Short-circuit of SDA (TXA) and RDA (RXA): Not available
8	OFF	Short-circuit of SDB (TXB) and RDB (RXB): Not available
9	OFF	RS (RTS) Auto control mode: Disabled
10	OFF	

*1   When using PS-3450A, PS-3451A, PS3000-BA and PS3001-BD, turn ON the set value.

DIP Switch setting: RS-422/485 (4 wire)

DIP Switch	Setting	Description
1	OFF	Reserved (always OFF)
2	ON	SIO type: RS-422/485
3	ON	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	OFF	Short-circuit of SDA (TXA) and RDA (RXA): Not available
8	OFF	Short-circuit of SDB (TXB) and RDB (RXB): Not available
9	OFF	RS (RTS) Auto control mode: Disabled
10	OFF	

DIP Switch setting: RS-422/485 (2 wire)

DIP Switch	Setting	Description
1	OFF	Reserved (always OFF)
2	ON	SIO type: RS-422/485
3	ON	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	ON	Short-circuit of SDA (TXA) and RDA (RXA): Available
8	ON	Short-circuit of SDB (TXB) and RDB (RXB): Available
9	ON	RS (RTS) Auto control mode: Enabled
10	ON	

2   External Devices Selection

Select the External Device to be connected to the Display.
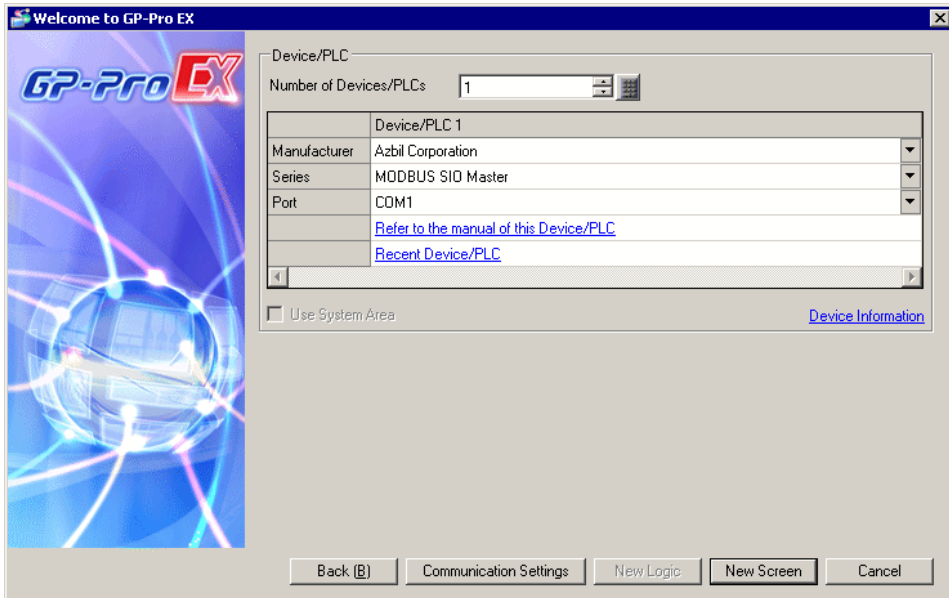
Setup Items	Setup Description
Number of Devices/ PLCs	Enter an integer from 1 to 4 to define the number of Devices/PLCs to connect to the display.
Manufacturer	Select the manufacturer of the External Device to connect. Select "Azbil Corporation".
Series	Select the External Device model (series) and the connection method. Select "MODBUS SIO Master". In System configuration, make sure the External Device you are connecting is supported by "MODBUS SIO Master".) "1 System Configuration" (page 3)
Port	Select the Display port to be connected to the External Device.
Use System Area	Not available in this driver.

3 Communication Settings

This section provides examples of communication settings recommended by Pro-face for the Display and the External Device.

3.1 Setting Example 1

■ Settings of GP-Pro EX

◆ Communication Settings

To display the setup screen, from the [Project] menu, point to [System Settings] and select [Device/PLC].

◆ Device Setting

To display the [Individual Device Settings] dialog box, from [Device-Specific Settings] in the [Device/PLC] window, select the external device and click [Settings] 📑 .

To connect multiple External Devices, from [Device-Specific Settings] in the [Device/PLC] window, click [Add Device] to add another External Device.

■ External Device Settings

Use Smart Loader Package (SLP-NX) for the External Device communication settings.

Refer to your External Device manual for details.

1 Start Smart Loader Package.

2 From the [Online] menu, select [Actual Module Configuration].

3 Click the [Edit] button on the [General] tab.

4 Click the [Communication Setting] button.

5 Select the [RS-485 Detail Settings] tab, and set as shown below:

Setup Items	Setting
RS-485 Station address	127
RS-485 CPL/MODBUS	MODBUS RTU
RS-485 Transmission Speed	19200bps
RS-485 Data Length	8 bits
RS-485 Parity	Even parity
RS-485 Stop Bit	1 Bits
RS-485 Response time-out	3

6 Click the [OK] button.

7 Click the [Write] button, and send the settings to the External Device.

3.2 Setting Example 2

### ■ Settings of GP-Pro EX

◆ Communication Settings

To display the setup screen, from the [Project] menu, point to [System Settings] and select [Device/PLC].
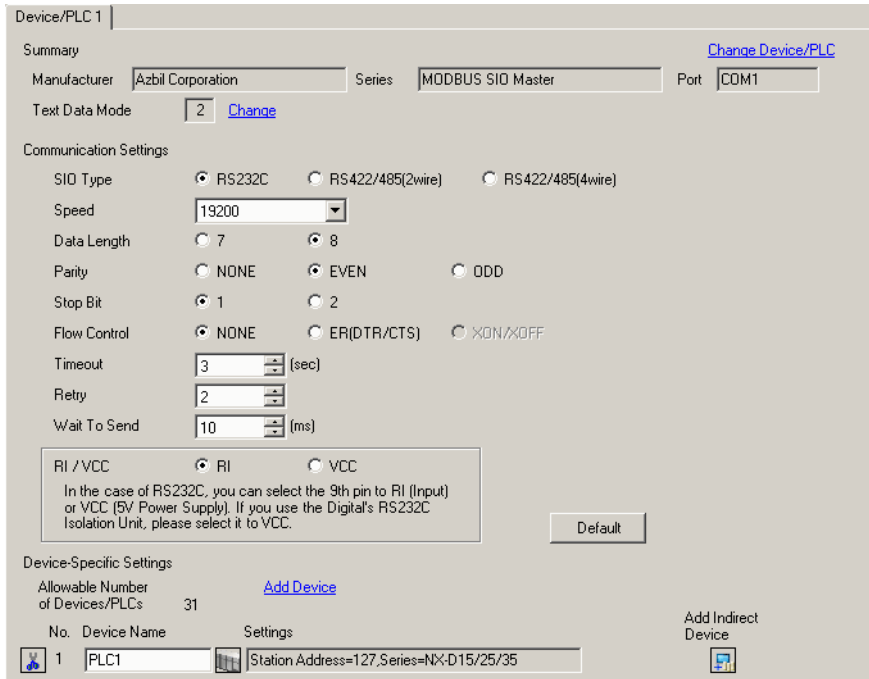
◆ Device Setting

To display the [Individual Device Settings] dialog box, from [Device-Specific Settings] in the [Device/PLC] window, select the external device and click [Settings] .

To connect multiple External Devices, from [Device-Specific Settings] in the [Device/PLC] window, click [Add Device] to add another External Device.
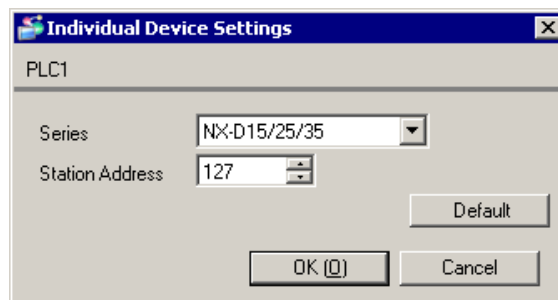
■ External Device Settings

Use Smart Loader Package (SLP-NX) and the CMC10L DIP Switch for the External Device communication settings.

Refer to your External Device manual for details.

◆ External Device Communication Settings

1 Start Smart Loader Package.

2 From the [Online] menu, select [Actual Module Configuration].

3 Click the [Edit] button on the [General] tab.

4 Click the [Communication Setting] button.

5 Select the [RS-485 Detail Settings] tab, and set as shown below:

Setup Items	Setting
RS-485 Station address	127
RS-485 CPL/MODBUS	MODBUS RTU
RS-485 Transmission Speed	19200bps
RS-485 Data Length	8 bits
RS-485 Parity	Even parity
RS-485 Stop Bit	1 Bits
RS-485 Response time-out	3

6 Click the [OK] button.

7 Click the [Write] button, and send the settings to the External Device.

◆ CMC10L (Link I/F) Communication Settings

Set the CMC10L DIP Switch as shown below.

• DIP Switch

Switch No.	Setting	Setup Description
1	OFF	
2	ON	19200
3	ON	
4	ON	
5	ON	1 character 11 bits
6	OFF	
7	ON	LED ON: Power ON
8	ON	Termination Resistance 150 Ω

• Mode selector switch

Switch	Setting
Mode selector switch	TERMINAL

4   Setup Items

Set up the Display's communication settings in GP-Pro EX or in the Display's offline mode.

The setting of each parameter must match that of the External Device.

☞"3 Communication Settings" (page 8)

4.1   Setup Items in GP-Pro EX

■ Communication Settings

To display the setup screen, from the [Project] menu, point to [System Settings] and select [Device/PLC].

Setup Items	Setup Description
SIO Type	Select the SIO type to communicate with the External Device. **IMPORTANT** In the communication settings, set [SIO Type] correctly according to the serial interface specifications of the Display. If you select an SIO type that the serial interface does not support, proper operation cannot be guaranteed. Refer to your Display manual for details on the serial interface specifications.
Speed	Select the communication speed between the External Device and the Display.
Data Length	Select the data length.
Parity	Select how to check parity.
Stop Bit	Select the stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.

Continues to the next page.

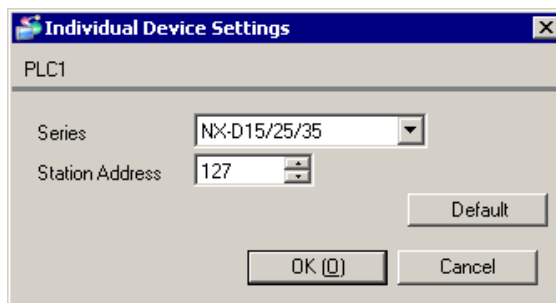| Setup Items	Setup Description
Timeout	Enter the time (seconds) for which the Display waits for the response from the External Device, from 1 to 127.
Retry	In case of no response from the External Device, enter how many times the Display retransmits the command, from 0 to 255.
Wait To Send	Enter the standby time (milliseconds) from when the Display receives packets until it transmits the next command, from 0 to 5000.
RI/VCC	When you select RS232C as the SIO Type, you can use pin 9 as either RI or VCC. When connecting to the IPC, to change between RI and 5V you need to use the IPC's changeover switch. Please refer to the IPC manual for more details.

NOTE

• Refer to the GP-Pro EX Reference Manual for Indirect Device.

Cf.   GP-Pro EX Reference Manual "Changing the Device/PLC at Runtime (Indirect Device)"

■ Device Setting

To display the [Individual Device Settings] dialog box, from [Device-Specific Settings] in the [Device/PLC] window, select the external device and click [Settings] 🔧.

To connect multiple External Devices, from [Device-Specific Settings] in the [Device/PLC] window, click [Add Device] to add another External Device.

Setup Items	Setup Description
Series	Select the series of the External Device.
Station Address	Enter the address of the External Device, from 1 to 247.

4.2　　　Setup Items in Offline Mode

NOTE

• Refer to the Maintenance/Troubleshooting guide for information on how to enter offline mode or about the operation.

Cf.　　Maintenance/Troubleshooting Guide "Offline Mode"

• In offline mode, the number of settings you can view on one screen varies depending on the Display in use. Please refer to the Reference Manual for more details.

■ Communication Settings

To display the setting screen, touch [Device/PLC Settings] from [Peripheral Settings] in offline mode. Touch the External Device you want to set from the list that appears.

Comm.	Device	Option		

MODBUS SIO Master　　　　　　　　　　　　　　　　　　　　[COM1]　　　　Page 1/1

SIO Type	RS422/485(2wire) ▼
Speed	19200 ▼
Data Length	○ 7　　　● 8
Parity	○ NONE　● EVEN　○ ODD
Stop Bit	● 1　　　○ 2
Flow Control	NONE ▼
Timeout(s)	3 ▼ ▲
Retry	2 ▼ ▲
Wait To Send(ms)	10 ▼ ▲

	Exit		Back	2010/05/11 16:16:56

Setup Items	Setup Description
SIO Type	Select the SIO type to communicate with the External Device. IMPORTANT In the communication settings, set [SIO Type] correctly according to the serial interface specifications of the Display. If you select an SIO type that the serial interface does not support, proper operation cannot be guaranteed. Refer to your Display manual for details on the serial interface specifications.
Speed	Select the communication speed between the External Device and the Display.
Data Length	Select the data length.
Parity	Select how to check parity.
Stop Bit	Select the stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.

Continues to the next page.

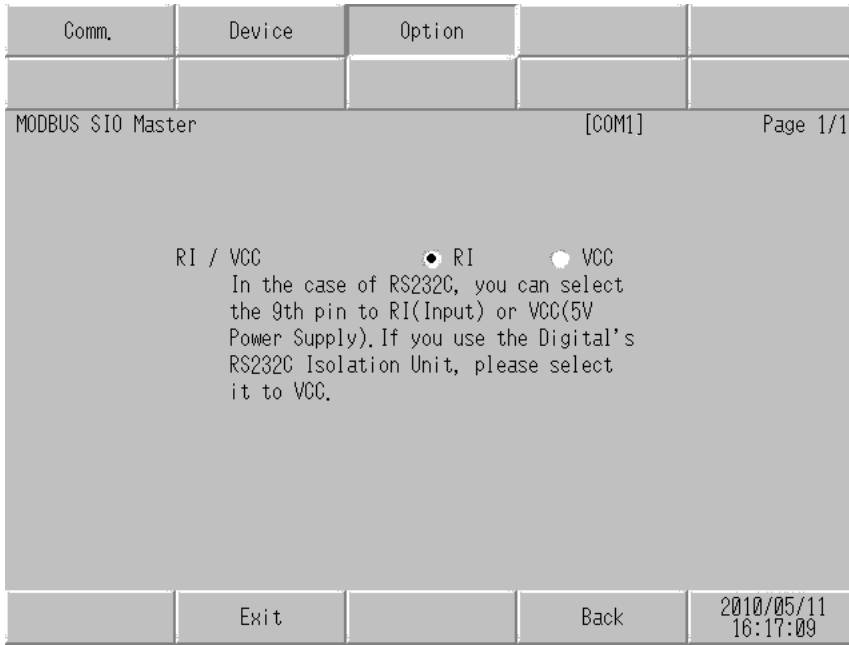| Setup Items	Setup Description
Timeout	Enter the time (seconds) for which the Display waits for the response from the External Device, from 1 to 127.
Retry	In case of no response from the External Device, enter how many times the Display retransmits the command, from 0 to 255.
Wait To Send	Enter the standby time (milliseconds) from when the Display receives packets until it transmits the next command, from 0 to 5000.

◼ Device Setting

To display the setting screen, touch [Device/PLC Settings] from [Peripheral Settings]. Touch the External Device you want to set from the displayed list, and touch [Device].

Setup Items	Setup Description
Device/PLC Name	Select the External Device to set. Device/PLC name is the title of the External Device set with GP-Pro EX. (Initial value [PLC1])
Station Address	Enter the address of the External Device, from 1 to 247.

■ Options

To display the setting screen, touch [Device/PLC Settings] from [Peripheral Settings]. Touch the External Device you want to set from the list that appears, and touch [Option].

Comm.	Device	Option		

MODBUS SIO Master   [COM1]   Page 1/1

RI / VCC   ● RI   ○ VCC
In the case of RS232C, you can select
the 9th pin to RI(Input) or VCC(5V
Power Supply). If you use the Digital's
RS232C Isolation Unit, please select
it to VCC.

| | Exit | | | Back | 2010/05/11 16:17:09 |

Setup Items	Setup Description
RI/VCC	When you select RS232C as the SIO Type, you can use pin 9 as either RI or VCC. When connecting to the IPC, to change between RI and 5V you need to use the IPC's changeover switch. Please refer to the IPC manual for more details.

NOTE • GP-4100 series, GP-4*01TM and LT-4*01TMdo not have the [Option] setting in the offline mode.

5   Cable Diagrams

The following cable diagrams may be different from cable diagrams recommended by Azbil Corporation. Please be assured there is no operational problem in applying the cable diagrams shown in this manual.

- The FG pin of the External Device body must be grounded according to your country's applicable standard. Refer to your External Device manual for details.

- SG and FG are connected inside the Display. When connecting the External Device to SG, design your system to avoid short-circuit loops.

- Connect an isolation unit if the communication is not stable due to noise or other factors.

Cable Diagram 1

Display (Connection Port)		Cable	Remarks
GP3000[*1] (COM1) AGP-3302B (COM2) GP-4*01TM (COM1) ST[*2] (COM2) LT3000 (COM1)	1A	COM port conversion adapter by Pro-face CA3-ADPCOM-01 + Connector terminal block conversion adapter by Pro-face CA3-ADPTRM-01 + User created cable	Cable length: 500m or less
	1B	User created cable	
GP3000[*3] (COM2)	1C	Online adapter by Pro-face CA4-ADPONL-01 + Connector terminal block conversion adapter by Pro-face CA3-ADPTRM-01 + User created cable	Cable length: 500m or less
	1D	Online adapter by Pro-face CA4-ADPONL-01 + User created cable	
IPC[*4]	1E	COM port conversion adapter by Pro-face CA3-ADPCOM-01 + Connector terminal block conversion adapter by Pro-face CA3-ADPTRM-01 + User created cable	Cable length: 500m or less
	1F	User created cable	
GP-4106(COM1)	1G	User created cable	Cable length: 500m or less
GP-4107(COM1) GP-4*03T[*5] (COM2) GP-4203T (COM1)	1H	User created cable	Cable length: 500m or less

Display (Connection Port)	Cable		Remarks
GP4000[*6] (COM2) GP-4201T (COM1)	1I	RS-422 Terminal Block Conversion Adapter by Pro-face PFXZCBADTM1[*7] + User-created cable	Cable length: 500m or less
	1B	User-created cable	
LT-4*01TM (COM1)	1J	RJ45 RS-485 Cable (5m) by Pro-face PFXZLMCBRJR81	

*1   All GP3000 models except AGP-3302B

*2   All ST models except AST-3211A and AST-3302B

*3   All GP3000 models except the GP-3200 Series and AGP-3302B

*4   You can only use COM ports that can communicate using RS-422/485 (2 wire).

☞ ■ IPC COM Port (page 5)

*5   Except GP-4203T

*6   All GP4000 models except GP-4100 Series, GP-4*01TM, GP-4201T and GP-4*03T

*7   When using a Terminal Block Conversion Adapter (CA3-ADPTRM-01) instead of the RS-422 Terminal Block Conversion Adapter, refer to Cable Diagram 1A.

1A)

- 1:1 Connection

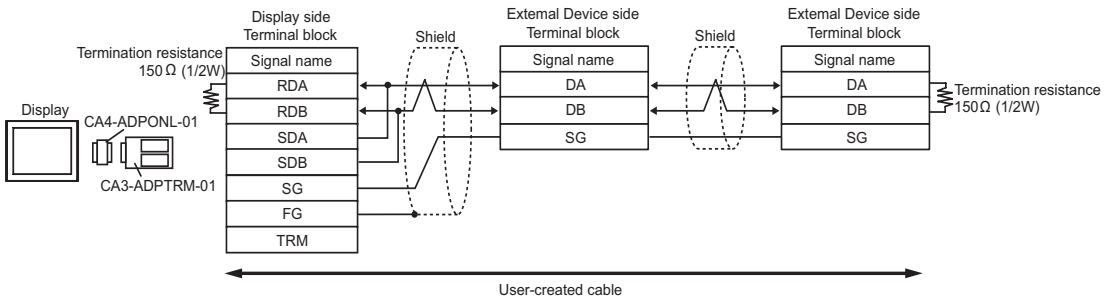- 1:n Connection

19
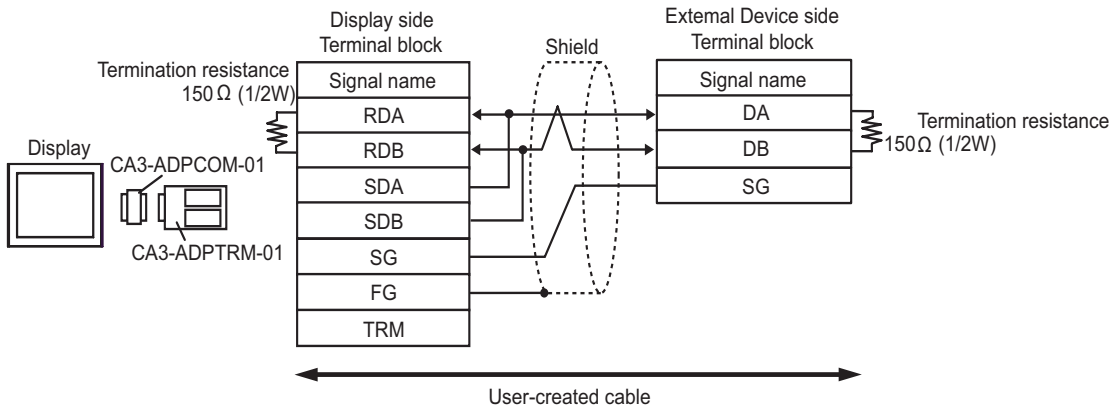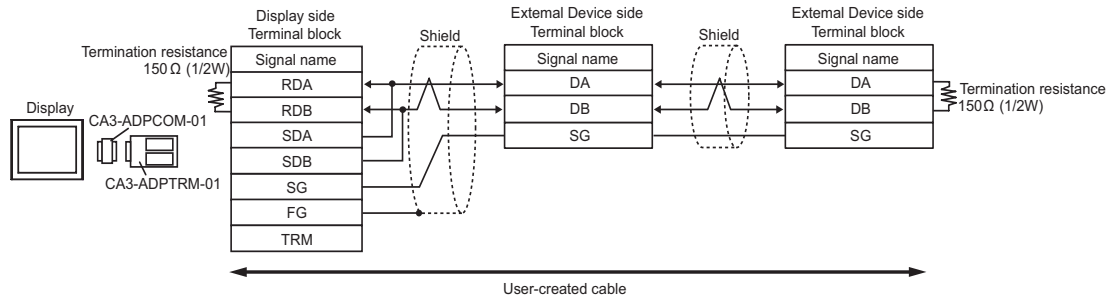
1B)
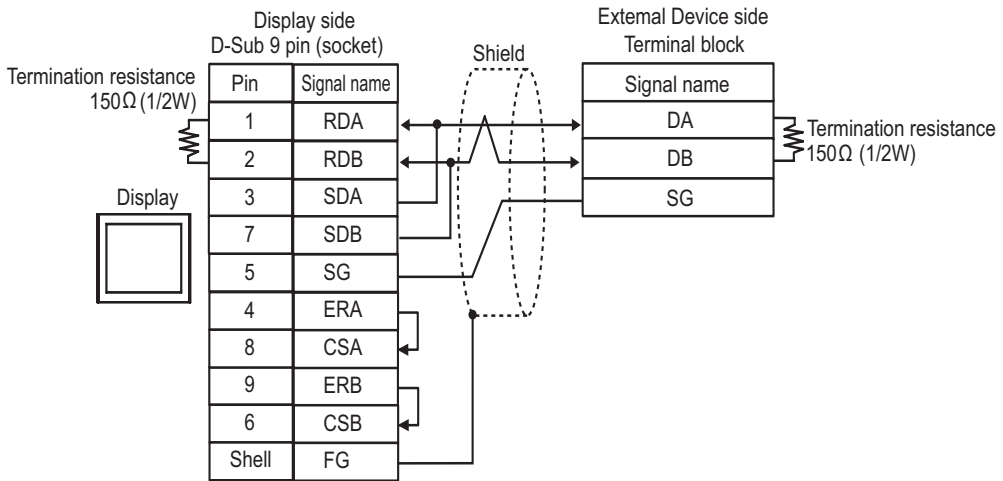
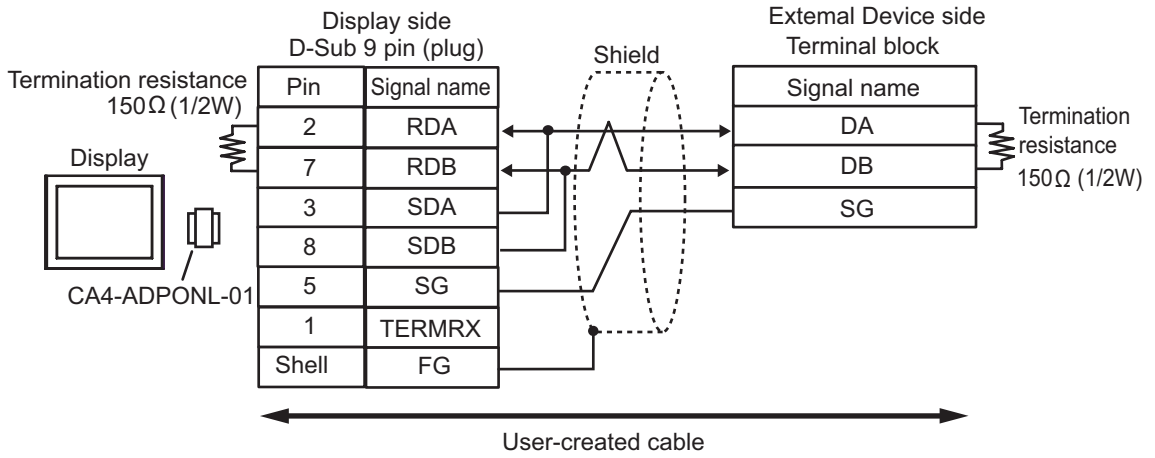- 1:1 Connection

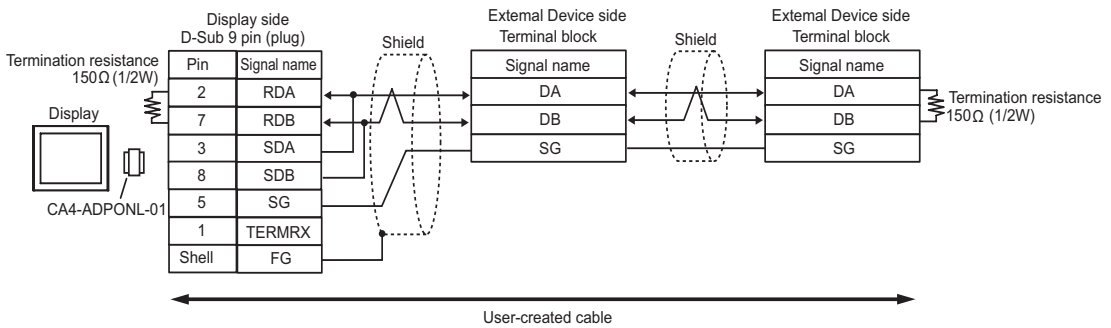

- 1:n Connection
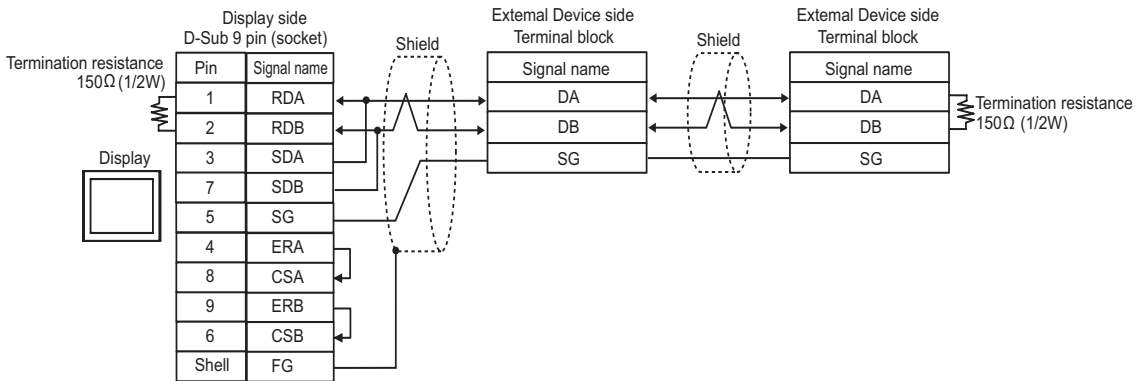
1C)
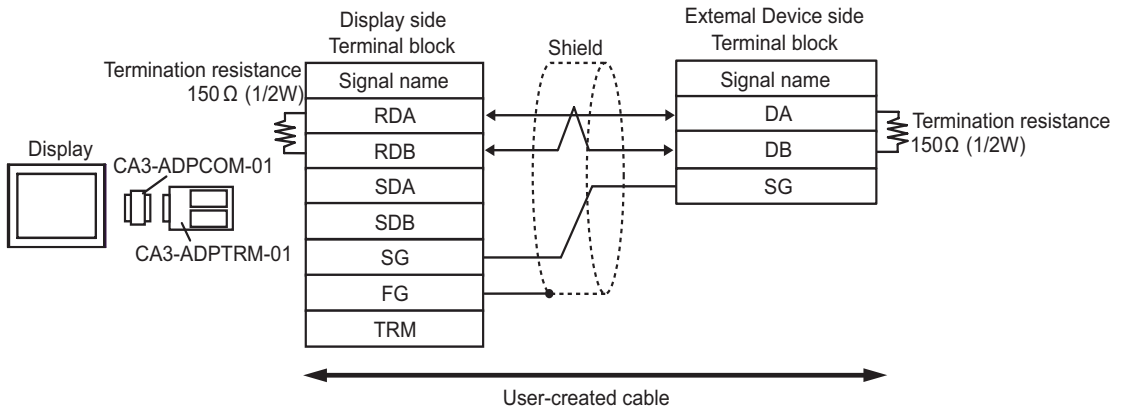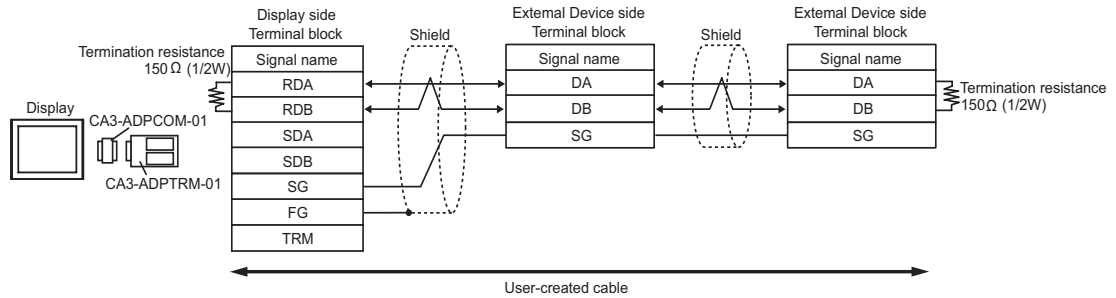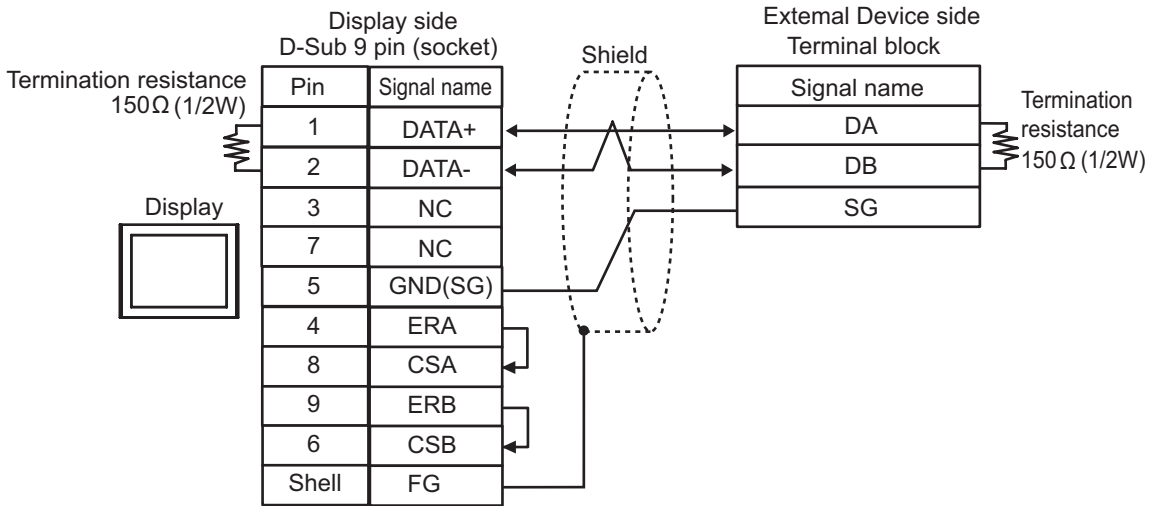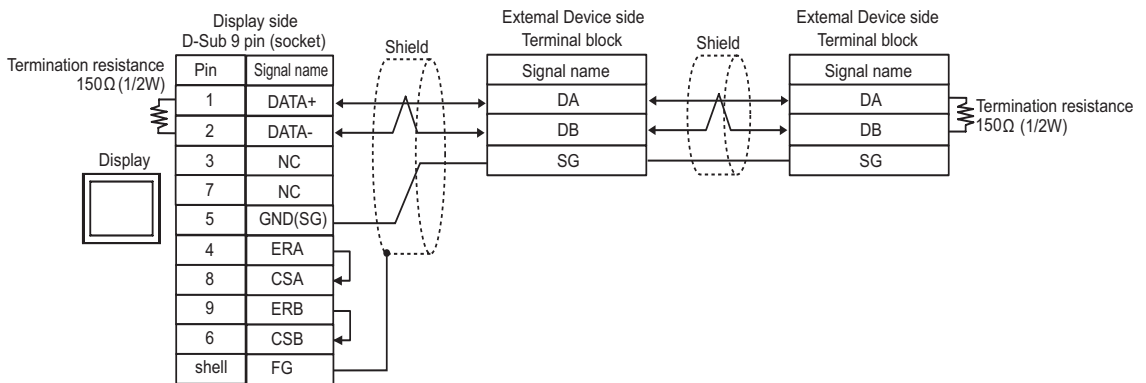
• 1:1 Connection
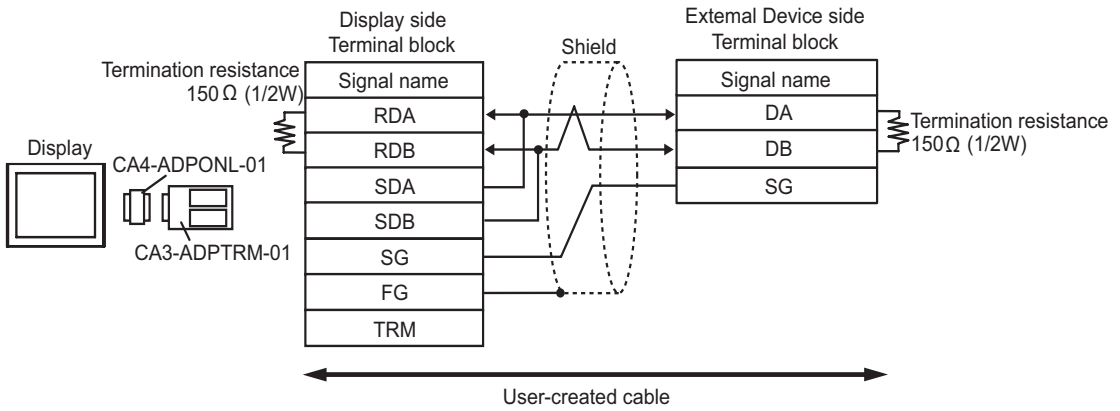
• 1:n Connection

1D)

• 1:1 Connection

Display side
D-Sub 9 pin (plug)

Shield

External Device side
Terminal block

Termination resistance
150Ω (1/2W)

Display

Pin	Signal name
2	RDA
7	RDB
3	SDA
8	SDB
5	SG
1	TERMRX
Shell	FG

Signal name
DA
DB
SG

Termination
resistance
150Ω (1/2W)

CA4-ADPONL-01

User-created cable

• 1:n Connection

Display side
D-Sub 9 pin (plug)

Shield

External Device side
Terminal block

Shield

External Device side
Terminal block

Termination resistance
150Ω (1/2W)

Display

Pin	Signal name
2	RDA
7	RDB
3	SDA
8	SDB
5	SG
1	TERMRX
Shell	FG

Signal name
DA
DB
SG

Signal name
DA
DB
SG

Termination resistance
150Ω (1/2W)

CA4-ADPONL-01

User-created cable

1E)

- 1:1 Connection
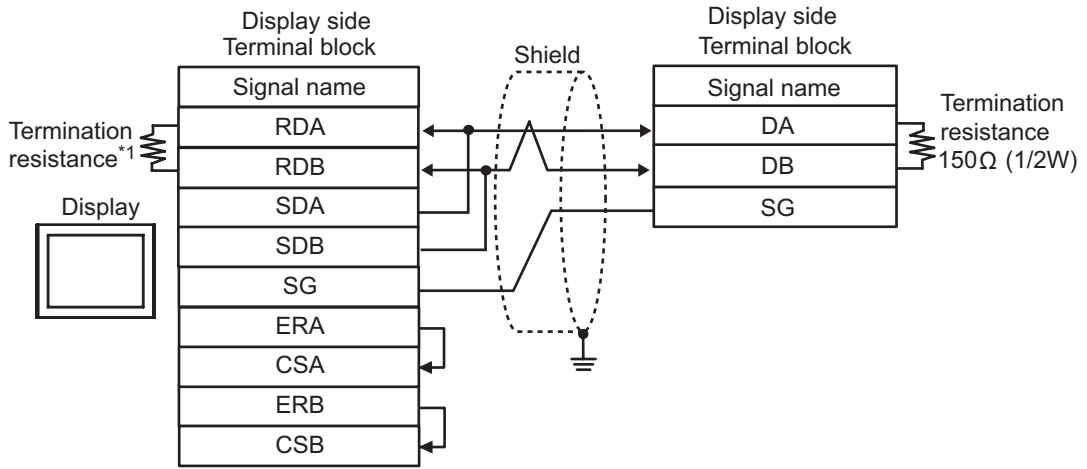

- 1:n Connection

1F)
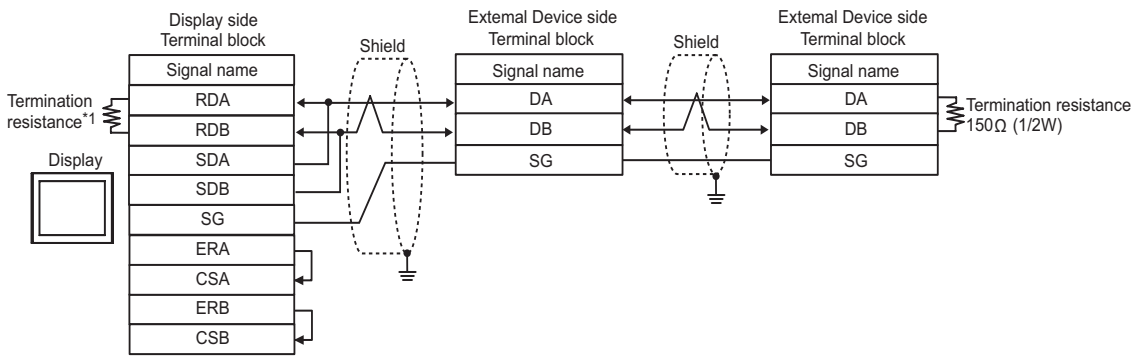
• 1:1 Connection

• 1:n Connection

1G)

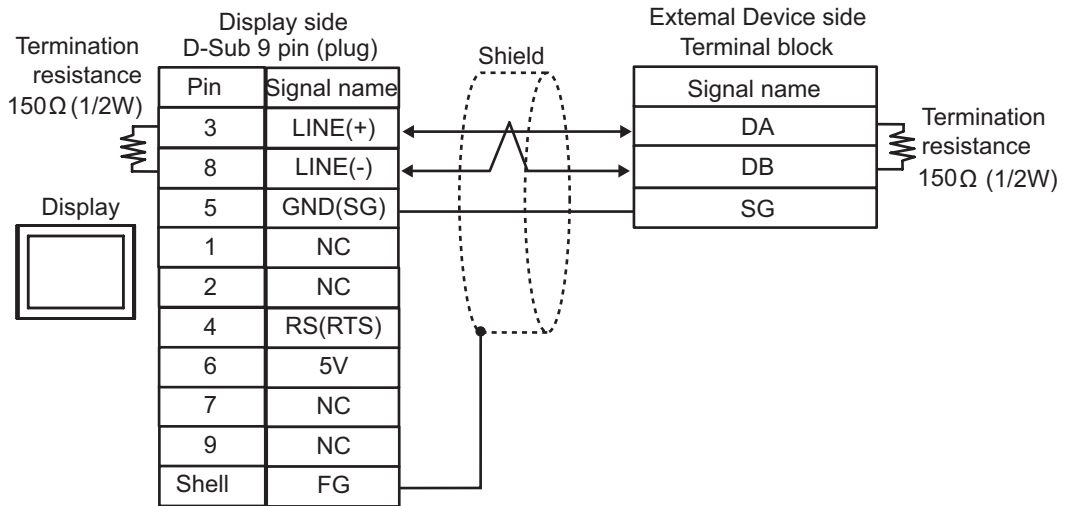- 1:1 Connection

- 1:n Connection

*1   Use a built-in resistance in the Display as termination resistance. Set the DIP Switch on the rear side of the Display as below.
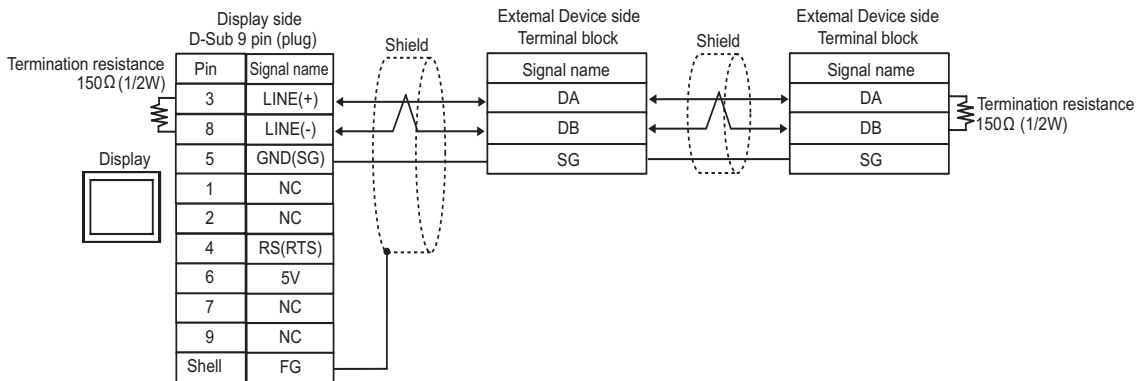
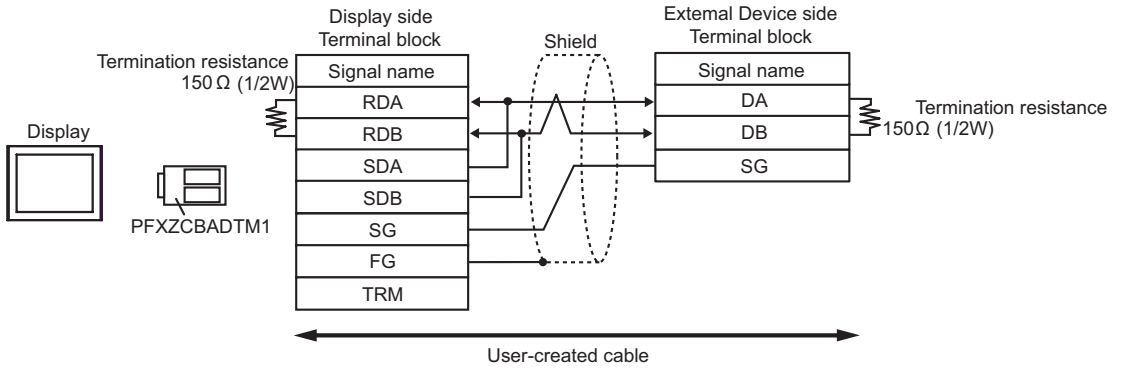| DIP Switch	Setup Description
1	OFF
2	OFF
3	ON
4	ON

1H)

• 1:1 Connection

• 1:n Connection

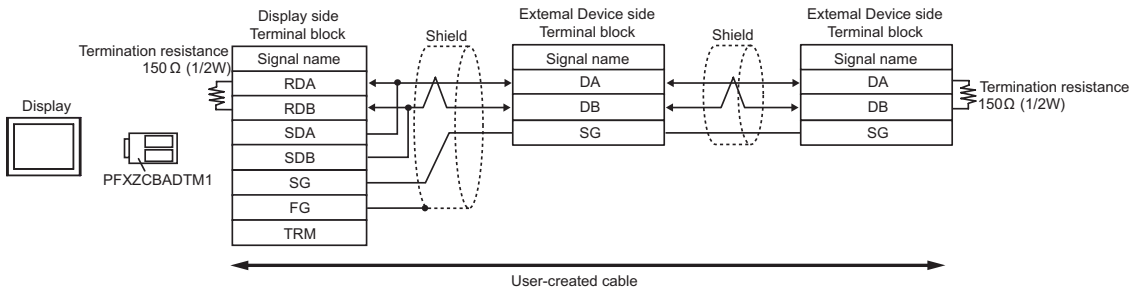| IMPORTANT	• The 5V output (Pin #6) on the Display is the power for the Siemens AG's PROFIBUS connector. Do not use it for other devices.

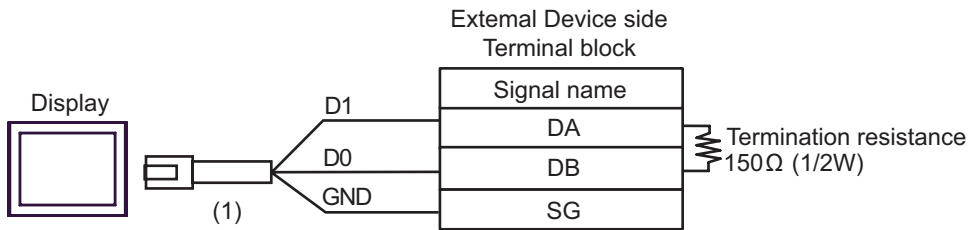| NOTE	• In COM on the GP-4107, the SG and FG terminals are isolated.

1I)

- 1:1 Connection

- 1:n Connection

1J)

• 1:1 Connection

• 1:n Connection

User-created cable
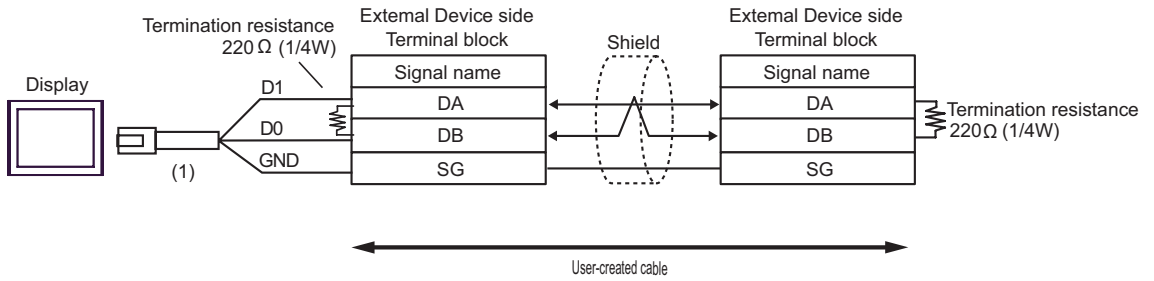
Legend	Name	Notes
(1)	RJ45 RS-485 Cable (5m) by Pro-face PFXZLMCBRJR81	

Cable Diagram 2

Display (Connection Port)		Cable	Remarks
GP3000 (COM1) GP4000[*1] (COM1) ST (COM1) LT3000 (COM1) IPC[*2] PC/AT	2A	User created cable	Cable length: 15m or less
GP-4105 (COM1)	2B	User created cable	Cable length: 15m or less
LT-4*01TM (COM1)	2C	RJ45 RS-232C Cable (5m) by Pro-face PFXZLMCBRJR21	

*1   All GP4000 models except GP-4100 Series and GP-4203T
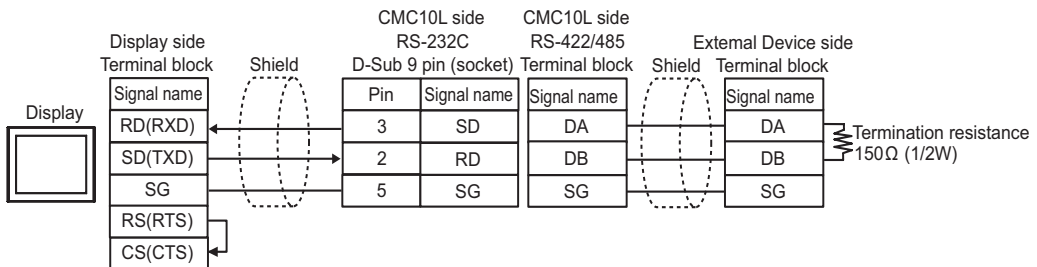
*2   Only a COM port that can communicate with RS-232C can be used.
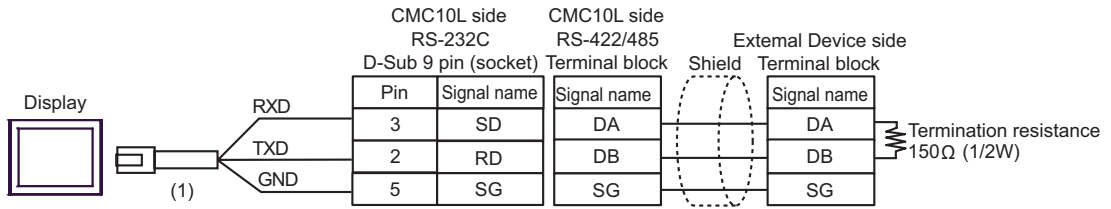   ☞ ■ IPC COM Port (page 5)

2A)
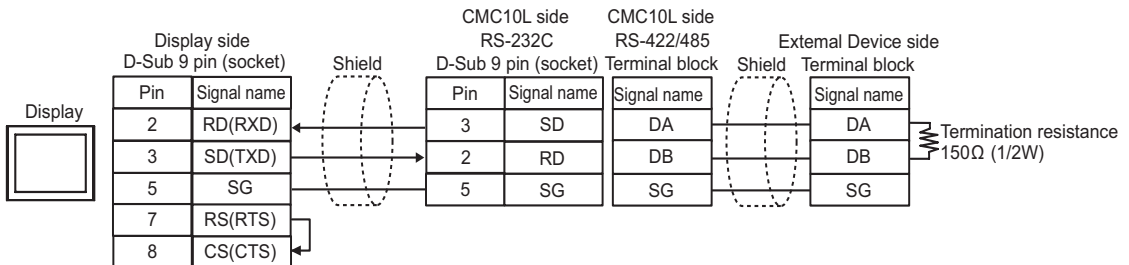
2B)

2C)

Legend	Name	Notes
(1)	RJ45 RS-232C Cable (5m) by Pro-face PFXZLMCBRJR21	

6   Supported Devices

The following table shows the range of supported device addresses. Please note that the actual supported range of the devices varies depending on the External Device to be used. Please check the actual range in the manual of your External Device.

Enter the External Device address in the dialog box below.
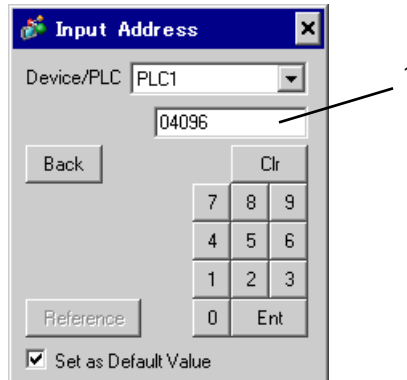
1. Address   Enter the address.

⬜⬜⬜⬜⬜ : This address can be specified as system data area.

Device	Bit Address	Word Address	32 bits	Remarks
Data	04096.00 - 36678.15	04096 - 36678	[L / H]	*1 *2

*1   When you write to the bit address, the Display reads the entire word, sets the defined bit, then returns the new word value to the External Device. If the External Device writes data to this word address during the bit write process, the resulting data may be incorrect.

*2   If the address is out of the system area, an error occurs.

NOTE
- There are read-only addresses. Refer to your External Device manual on precautions when reading and writing to device addresses.
- You can only set the Read Area Size for the system area available to use in the External Device. Please refer to the GP-Pro EX Reference Manual for Read Area Size.

  Cf.   GP-Pro EX Reference Manual "LS Area (Direct Access Method Area)"

- Refer to the precautions on manual notation for icons in the table.

)☞ "Manual Symbols and Terminology"

- When you use a non-existent address, a read error may not display. In this case, "0" is returned as the read data. Note, however, that write errors are displayed.

7   Device Code and Address Code

Use device code and address code when you set "Device Type & Address" for the address type of the data display or other devices.

Device	Device Name	Device Code (HEX)	Address Code
Data	-	0000	Word Address

8   Error Messages

Error messages are displayed on the screen of the Display as follows: "No.: Device Name: Error Message (Error Occurrence Area)". Each description is shown below.

Item	Description
No.	Error number.
Device Name	Name of the External Device where an error has occurred. Device/PLC name is the title of the External Device set with GP-Pro EX. (Initial value [PLC1])
Error Message	Displays messages related to an error that has occurred.
Error Occurrence Area	Displays the IP address or device address of the External Device where an error has occurred, or error codes received from the External Device. **NOTE** • IP addresses are displayed as "IP address (Decimal): MAC address (Hex)". • Device addresses are displayed as "Address: Device address". • Received error codes are displayed as "Decimal [Hex]".

Example of an Error Message

"RHAA035: PLC1: Error has been responded for device write command (Error Code: 2[02H])"

NOTE
• Refer to your External Device manual for details on received error codes.
• Refer to "Display-related errors" in "Maintenance/Troubleshooting Guide" for details on the error messages common to the driver.

■ Error Codes Unique to External Device

Error Code (HEX)	Description
01	Does not support the corresponding Function Code.
02	The specified data address does not exist.
03	Data value error.