FANUC LTD.

Power Mate Series Driver

Introduction

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

In this manual, the connection procedure will be described by following the below sections:

1	System Configuration This section shows the types of External Devices which can be connected and SIO type.	☞"1 System Configuration" (page 3)
2	Selection of External Device Select a model (series) of the External Device to be connected and connection method.	☞"2 Selection of External Device" (page 6)
3	Example of Communication Settings This section shows setting examples for communicating between the Display and the External Device.	☞"3 Example of Communication Setting" (page 7)
4	Setup Items This section describes communication setup items on the Display. Set communication settings of the Display with GP-Pro Ex or in off-line mode.	☞"4 Setup Items" (page 10)
5	Cable Diagram This section shows cables and adapters for connecting the Display and the External Device.	☞"5 Cable Diagram" (page 13)

Operation

1 System Configuration

The system configuration in the case when the External Device of FANUC LTD. and the Display are connected is shown.

IMPORTANT
- Be sure to inform the Fanuc Corporation clearly that the system will be connected with Display.

Series	CPU	Link I/F	SIO Type	Setting Example	Cable Diagram
Fanuc Power Mate Series	Power Mate-MODEL D	Port on CPU Unit*1	RS422/485 (4wire)	Setting Example 1 (page 7)	Cable Diagram 1 (page 13)
Fanuc Series	16-Model C	Port2 on CPU Unit *1	RS232C	Setting Example 2 (page 8)	Cable Diagram 2 (page 16)
	16-Model C 18-Model C 16i-Model A 16i-Model B 18i-Model A 18i-Model B 21i-Model A 21i-Model B 30i-Model A 31i-Model A 32i-Model A	Port2 on CPU Unit*1	RS232C	Setting Example 2 (page 8)	Cable Diagram 3 (page 17)

*1 The serial port used for the connection is different according to CPU. The serial port that can be used is as follows.

CPU	Serial port
PowerMate-MODEL D	JD14
16-Model C	JD5B
18-Model C 16i-Model A 16i-Model B 18i-Model A 18i-Model B 21i-Model A 21i-Model B	JD36B
30i-Model A 31i-Model A 32i-Model A	JD36A or JD54

■ Connection Configuration

- 1:1 Connection

■ COM Port of IPC

When connecting IPC with External Device, the COM port which can be used changes with series and SIO type. Please refer to the manual of IPC 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	COM1, COM2[*1*2]	COM2[*1*2]	COM2[*1*2]
PS-3650A, PS-3651A	COM1[*1]	-	-
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]
PL-3000B	COM1[*1*2], COM2[*1], COM3, COM4	COM1[*1*2]	COM1[*1*2]

*1 The RI/5V can be switched. Please switch with the change switch of IPC.

*2 It is necessary to set up the SIO type with the Dip switch. Please set up as follows according to SIO type to be used.

Dip switch setting: RS-232C

Dip switch	Setting	Description
1	OFF[*1]	Reserve (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): Does not Exist
8	OFF	Short-circuit of SDB (TXB) and RDB (RXB): Does not Exist
9	OFF	RS (RTS) Auto control mode: Disable
10	OFF	

*1 It is necessary to turn ON the set value, only when using PS-3450A and PS-3451A.

Dip switch setting: RS-422/485 (4 wire)

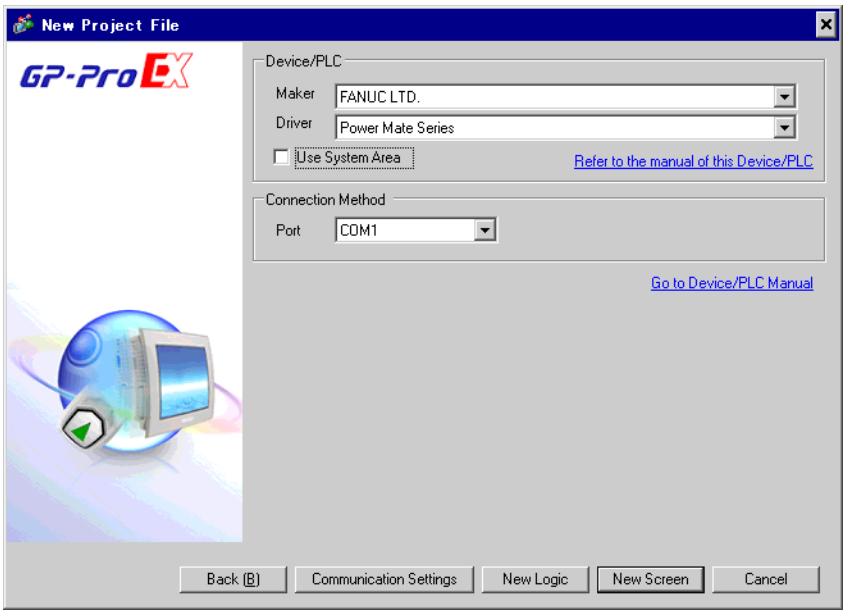
Dip switch	Setting	Description
1	OFF	Reserve (always OFF)
2	ON	SIO type: RS-422/485
3	ON	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	OFF	Short-circuit of SDA (TXA) and RDA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

Dip switch setting: RS-422/485 (2 wire)

Dip switch	Setting	Description
1	OFF	Reserve (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): Exist
8	ON	Short-circuit of SDB (TXB) and RDB (RXB): Exist
9	ON	RS (RTS) Auto control mode: Enable
10	ON	

2 Selection of External Device

Select the External Device to be connected to the Display.



Setup Items	Setup Description
Maker	Select the maker of the External Device to be connected. Select "FANUC LTD.".
Driver	Select a model (series) of the External Device to be connected and connection method. Select "Power Mate Serie". Check the External Device which can be connected in "Power Mate Serie" in system configuration. ☞ "1 System Configuration" (page 3)
Use System Area	Check this option when you synchronize the system data area of Display and the device (memory) of External Device. When synchronized, you can use the ladder program of External Device to switch the display or display the window on the display. Cf. GP-Pro EX Reference Manual "Appendix 1.4 LS Area (only for direct access method)" This can be also set with GP-Pro EX or in off-line mode of Display. Cf. GP-Pro EX Reference Manual " 5.14.6 Setting Guide of [System Setting Window]■[Main Unit Settings] Settings Guide◆System Area Setting" Cf. Maintenance/Troubleshooting "2.14.1 Settings common to all Display models ◆System Area Settings"
Port	Select the Display port to be connected to the External Device.

3 Example of Communication Setting

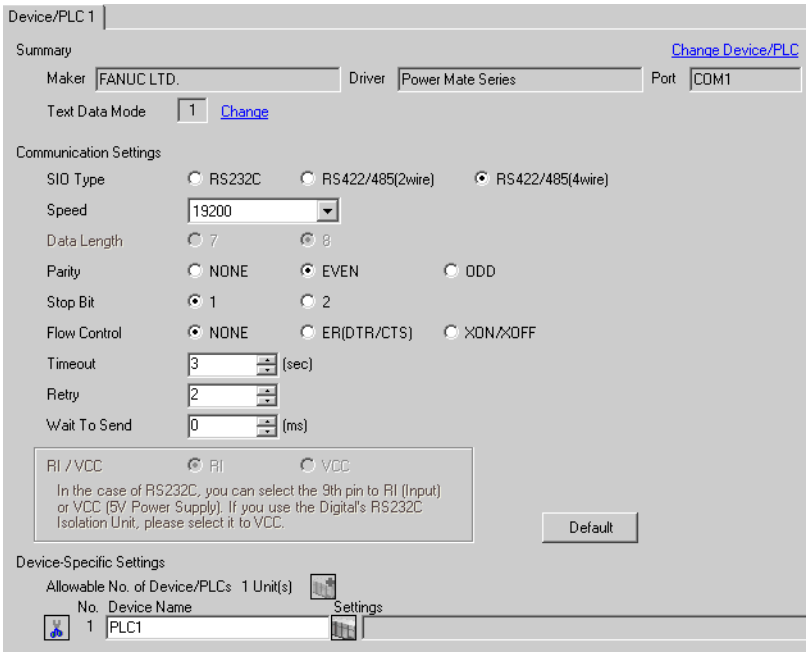
Examples of communication settings of the Display and the External Device, recommended by Pro-face, are shown.

3.1 Setting Example 1

■ Settings of GP-Pro EX

◆ Communication Settings

To display the setting screen, select [Device/PLC Settings] from [System setting window] in workspace.



■ Settings of External Device

Communication setting of External Device is as follows, and cannot be changed.

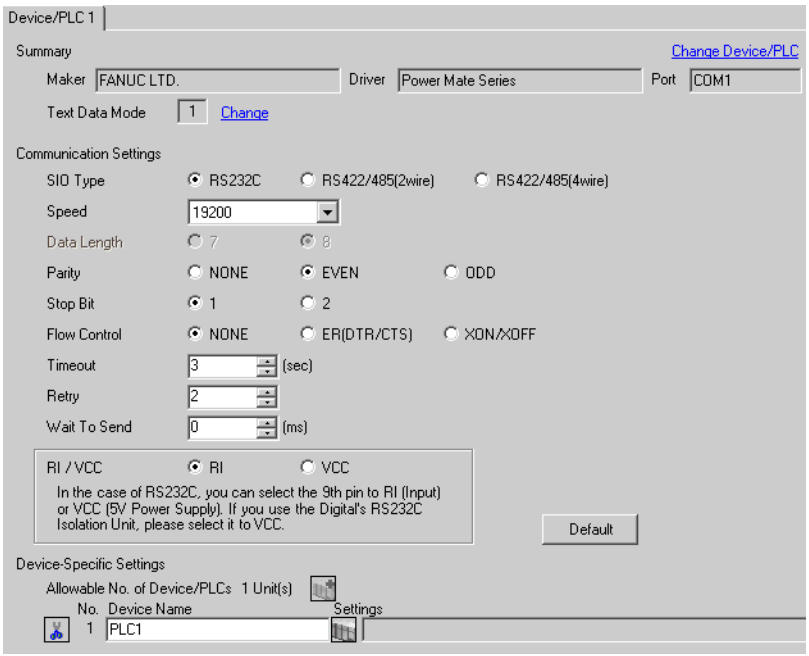
Setup Items	Setup Description
SIO Type	RS422/485 (4wire)
Data Rate	19200 bps
Data Length	8 bits
Parity	Even
Stop Bits	1 bit
Flow Control	None

3.2 Setting Example 2

■ Settings of GP-Pro EX

◆ Communication Settings

To display the setting screen, select [Device/PLC Settings] from [System setting window] in workspace.



■ Settings of External Device

Speed is set up by setting up the parameter by which a monitor is carried out by display of External Device. Other setup is fixed values and cannot be changed.

Setup Items	Setup Description
SIO Type	RS232C
Speed	Sets up with a parameter (refer to procedure).
Data Length	8 bits
Parity	Even
Stop Bits	1 bit
Flow Control	None

◆ Procedure

The setting method of speed is explained to an example for 30i-Model A.

1 Permit the parameter writing.

Press the [OFFSET] key of an External Device operation board, and select the [Stting].

Change "0" of parameter writing into "1", and press the [INPUT] key.

2 Setting the parameter for display connection.

Press the [MDI] key of External Device operation board, and shift to MDI mode.

Press the [SYSTEM] key in MDI mode and the parameter screen is displayed.

Press the [Next page] and the parameter input screen is displayed.

Input the "3119" into parameter No. and the 3rd (3119. 3) bit is set to 0.

3 Setting the speed.

Setting the 1st (13101. 1) bit of parameter No.13101 to 1, and the setting value is written in parameter No.123.

Setup Description (Dec)	Data Rate (bps)
9	2400
10	4800
11	9600
12	19200

NOTE

- When the 1st bit of parameter No.13101 is 0, a transfer rate is 19200bps fixation. When communicating by 19200bps, operation of Procedure 3 is unnecessary.

4 Turn off the power supply of External Device, and turn on the power supply again.

4 Setup Items

Set communication settings of the Display with GP-Pro EX or in off-line mode of the Display.

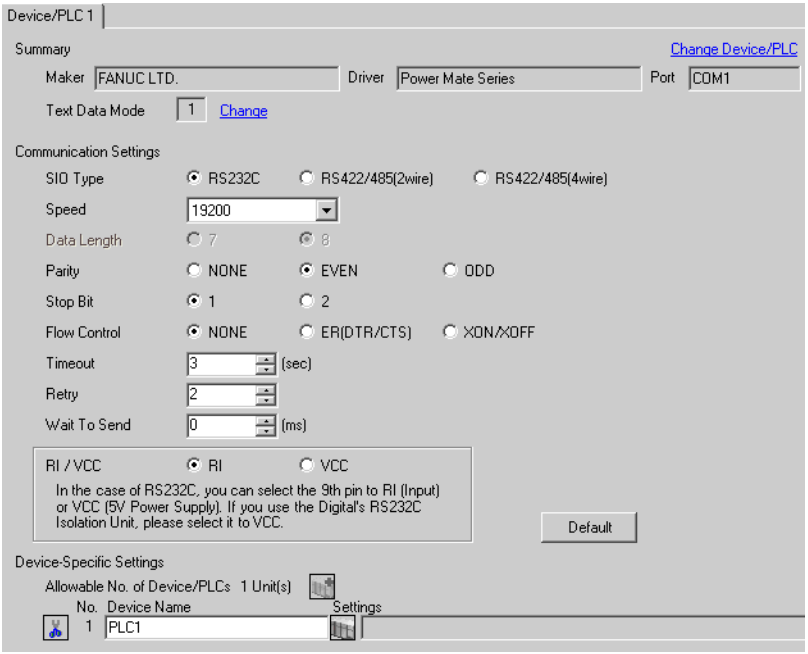
The setting of each parameter must be identical to that of External Device.

☞"3 Example of Communication Setting" (page 7)

4.1 Setup Items in GP-Pro EX

■ Communication Settings

To display the setting screen, select [Device/PLC Settings] from [System setting window] in workspace.



Setup Items	Setup Description
SIO Type	Select the SIO type to communicate with the External Device.
Speed	Select speed between the External Device and the Display.
Data Length	Display data length.
Parity	Select how to check parity.
Stop Bit	Select stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.
Timeout	Use an integer from 1 to 127 to enter the time (s) for which the Display waits for the response from the External Device.
Retry	In case of no response from the External Device, use an integer from 0 to 255 to enter how many times the Display retransmits the command.
Wait To Send	Use an integer from 0 to 255 to enter standby time (ms) for the Display from receiving packets to transmitting next commands.
RI/VCC	You can switch RI/VCC of the 9th pin when you select RS232C for SIO type. It is necessary to change RI/5V by changeover switch of IPC when connect with IPC. Please refer to the manual of the IPC for more detail.

4.2 Setup Items in Off-Line Mode

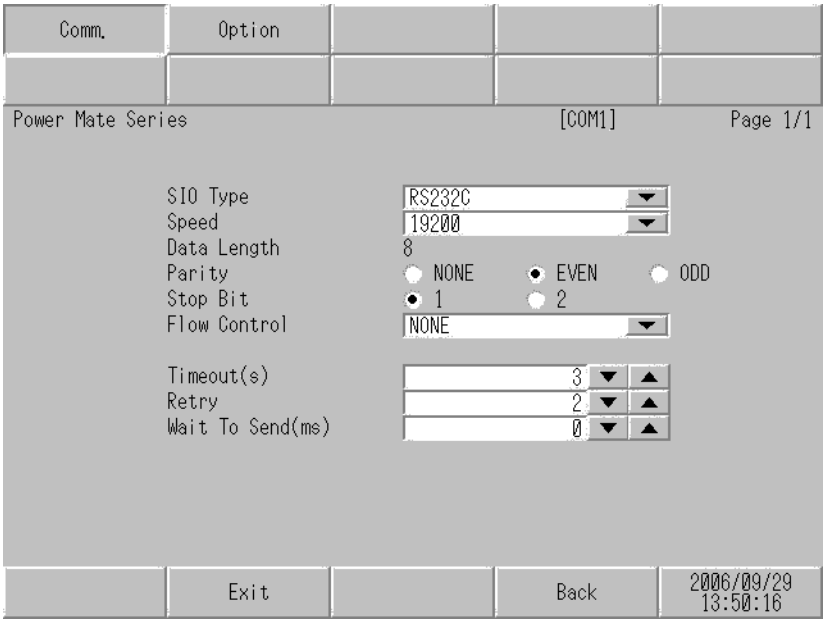
NOTE

- Please refer to Maintenance/Troubleshooting for more information on how to enter off-line mode or about operation.

  Cf. Maintenance/Troubleshooting "2.2 Offline Mode"

◆ Communication Settings

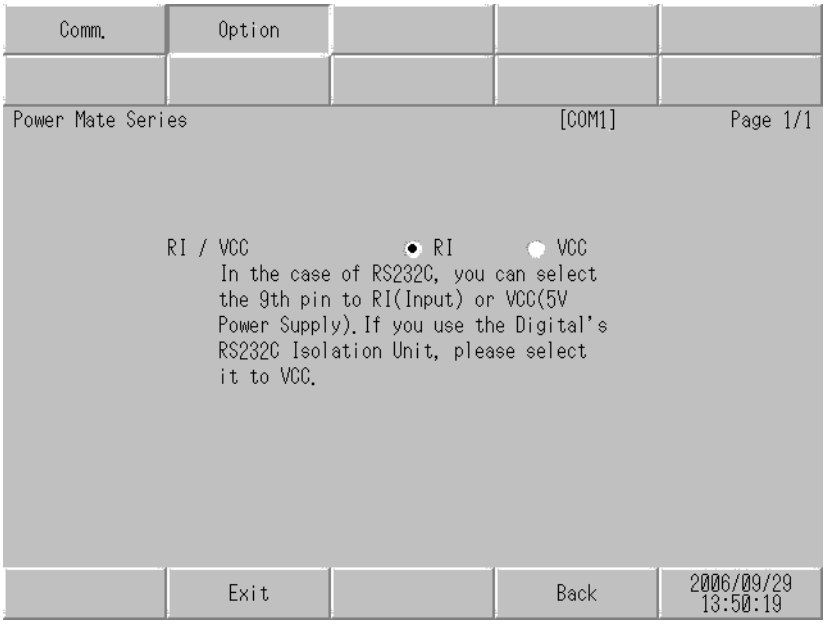
To display the setting screen, touch [Device/PLC Settings] from [Peripheral Settings] in off-line mode. Touch the External Device you want to set from the displayed list.



Setup Items	Setup Description
SIO Type	Select the SIO type to communicate with the External Device. **IMPORTANT** To make the communication settings correctly, confirm the serial interface specifications of Display unit for [SIO Type]. We cannot guarantee the operation if a communication type that the serial interface does not support is specified. For details concerning the serial interface specifications, refer to the manual for Display unit.
Speed	Select speed between the External Device and the Display.
Data Length	Display data length.
Parity	Select how to check parity.
Stop Bit	Select stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.
Timeout	Use an integer from 1 to 127 to enter the time (s) for which the Display waits for the response from the External Device.
Retry	In case of no response from the External Device, use an integer from 0 to 255 to enter how many times the Display retransmits the command.
Wait To Send	Use an integer from 0 to 255 to enter standby time (ms) for the Display from receiving packets to transmitting next commands.

■ Option

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 [Option].



Setup Items	Setup Description
RI/VCC	You can switch RI/VCC of the 9th pin when you select RS232C for SIO type. It is necessary to change RI/5V by changeover switch of IPC when connect with IPC. Please refer to the manual of the IPC for more detail.

5 Cable Diagram

The cable diagram shown below may be different from the cable diagram recommended by FANUC LTD.. Please be assured there is no operational problem in applying the cable diagram shown in this manual.

- The FG pin of the External Device body must be D-class grounded. Please refer to the manual of the External Device for more details.
- SG and FG are connected inside the Display. When connecting SG to the External Device, design the system not to form short-circuit loop.
- Connect the isolation unit, when communication is not stabilized under the influence of a noise etc..

Cable Diagram 1

Display (Connection Port)	Cable		Notes
GP[*1] (COM1) AGP-3302B (COM2) IPC[*2]	A	COM port conversion adapter by Pro-face CA3-ADPCOM-01 + Terminal block conversion adapter by Pro-face CA3-ADPTRM-01 + Your own cable	*3
	B	Your own cable	
GP[*4] (COM2)	C	Online adapter by Pro-face CA4-ADPONL-01 + Terminal block conversion adapter by Pro-face CA3-ADPTRM-01 + Your own cable	
	D	Online adapter by Pro-face CA4-ADPONL-01 + Your own cable	

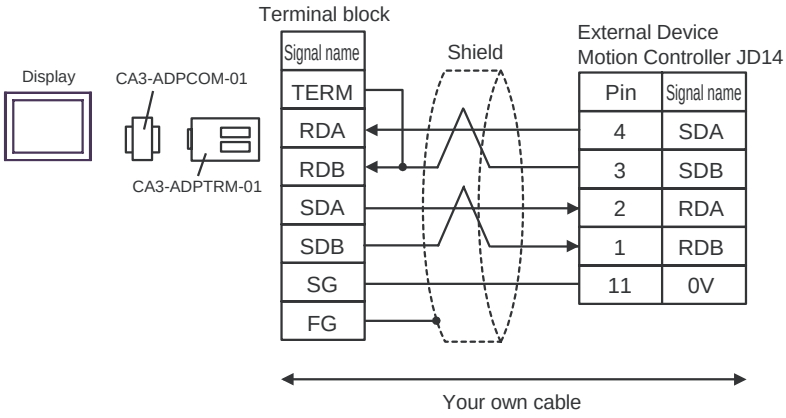
*1 All GP models except AGP-3302B

*2 Only the COM port which can communicate by RS-422/485 (4 wire) can be used.
☞■ COM Port of IPC (page 4)

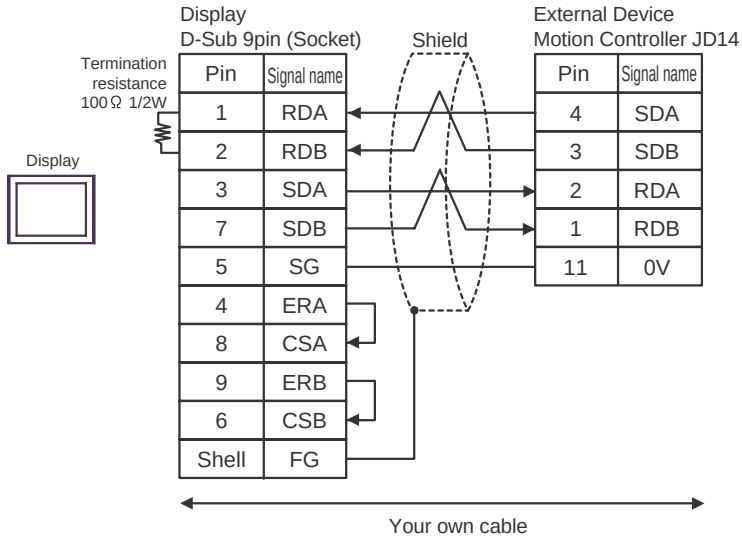
*3 Check the cable length with Fanuc Motion Controller PLC's users manual.
It is necessary to connect the terminal resistance 100 Ω in RDA and RDB of JD15 of Motion Controller.

*4 All GP models except GP-3200 series and AGP-3302B

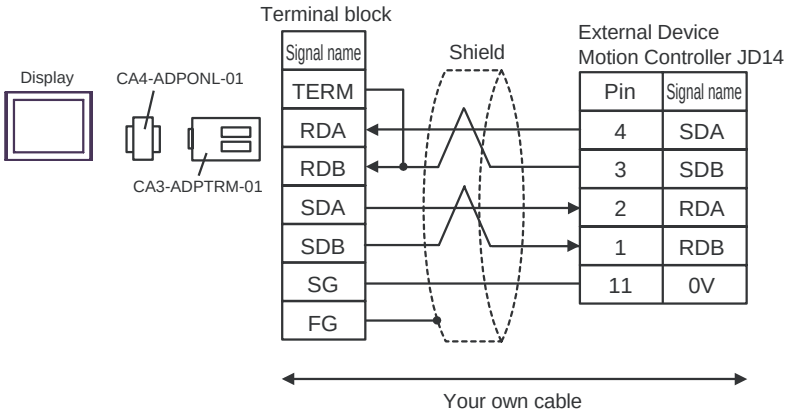
A) When using the COM port conversion adapter (CA3-ADPCOM-01), the terminal block conversion adapter (CA3-ADPTRM-01) by Pro-face and your own cable



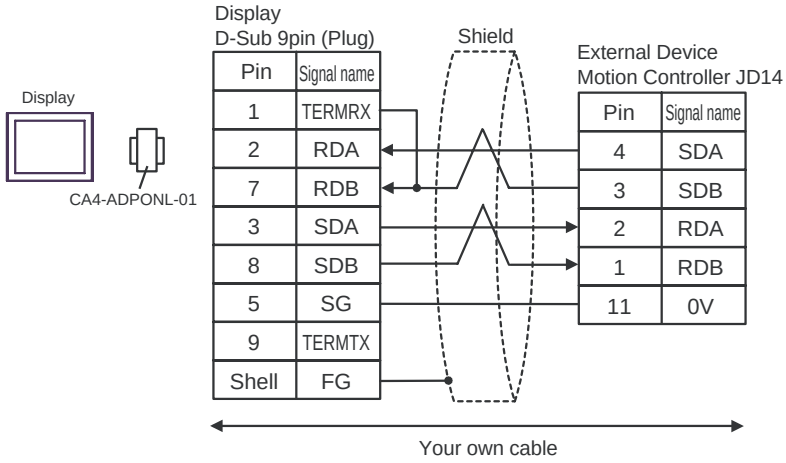
B) When using your own cable



C) When using the online adapter (CA4-ADPONL-01), the terminal block conversion adapter (CA3-ADPTRM-01) by Pro-face and your own cable



D) When using the online adapter (CA4-ADPONL-01) by Pro-face and your own cable

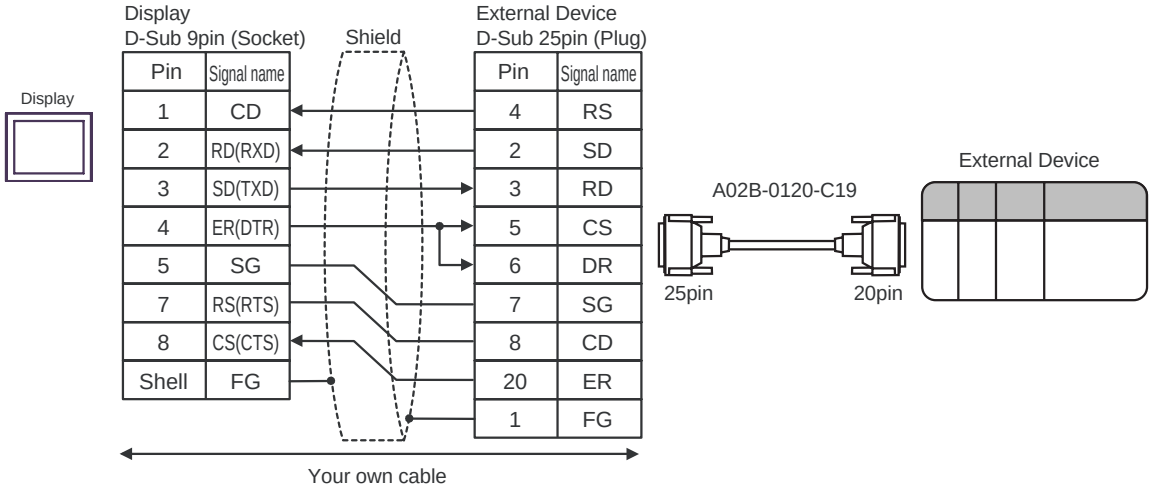


Cable Diagram 2

Display (Connection Port)	Cable	Notes
GP (COM1) IPC*1 PC/AT	Your own cable + Fanuc's converting cable A02B-0120-C19	The cable length must be 15m or less.

*1 Only the COM port which can communicate by RS-232C can be used.
☞■ COM Port of IPC (page 4)

When using your own cable and the Fanuc's converting cable A02B-0120-C19

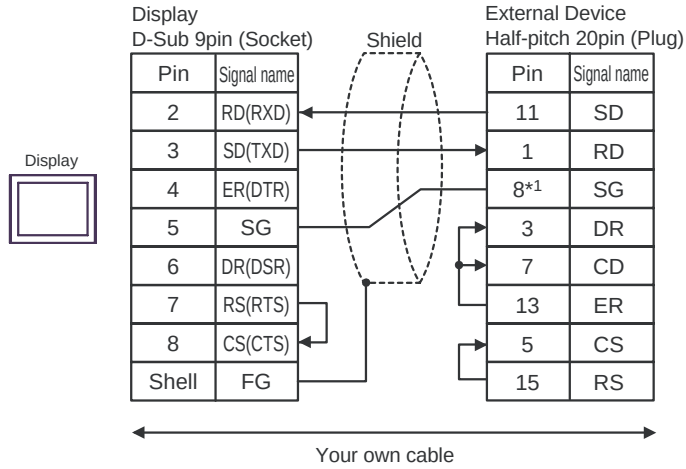


Cable Diagram 3

Display (Connection Port)	Cable	Notes
GP (COM1) IPC*1 PC/AT	Your own cable	The cable length must be 15m or less.

*1 Only the COM port which can communicate by RS-232C can be used.
☞■ COM Port of IPC (page 4)

When using your own cable



*1 When connecting with 30i-Model A, 31i-Model A or 32i-Model A, The pin number of SG changes with ports to be used.

Use port	Pin No. of SG
JD36A	8
JD54	4

6 Supported Device

Range of supported device address is shown in the table below. Please note that the actually supported range of the devices varies depending on the External Device to be used. Please check the actual range in the manual of your connecting equipment.

6.1 Fanuc Power Mate Series

This address can be specified as system data area.

Device	Bit Address	Word Address	32 bits	Notes
Input relay	X00000.0-X00127.7 X01000.0-X01063.7	X00000-X00126 X01000-X01062	L/H	÷2
Output relay	Y00000.0-Y00127.7 Y01000.0-Y01063.7	Y00000-Y00126 Y01000-Y01062		÷2
Internal relay	R00000.0-R00999.7	R00000-R00998		÷2
Keep relay	K0000.0-K0019.7	K0000-K0018		÷2
Timer	-----	T0000-T0078		÷2
Counter	-----	C0000-C0078		÷2
Data table	-----	D00000-D01858		÷2 Bit7 *1

*1 The maximum address available for bit access is D01859.7.

NOTE

- Please refer to the GP-Pro EX Reference Manual for system data area.
  Cf. GP-Pro EX Reference Manual "Appendix 1.4 LS Area (only for direct access method)"
- Please refer to the precautions on manual notation for icons in the table.
  ☞ "Manual Symbols and Terminology"

6.2 Fanuc Series

This address can be specified as system data area.

Device	Bit Address	Word Address	32 bits	Notes
Input relay	X00000.0-X00127.7 X00200.0-X00327.7 X00400.0-X00527.7 X00600.0-X00727.7 X01000.0-X01127.7	X00000-X00126 X00200-X00326 X00400-X00526 X00600-X00726 X01000-X01126	L/H	÷2 *1
Output relay	Y00000.0-Y00127.7 Y00200.0-Y00327.7 Y00400.0-Y00527.7 Y00600.0-Y00727.7 Y01000.0-Y01127.7	Y00000-Y00126 Y00200-Y00326 Y00400-Y00526 Y00600-Y00726 Y01000-Y01126		÷2
Internal relay	R00000.0-R07999.7	R00000-R07998		÷2
Keep relay	K00000.0-K00099.7	K0000-K00098		÷2
Timer	-----	T0000-T0498		÷2
Counter	-----	C0000-C0398 C5000-C5198		÷2
Data table	-----	D00000-D09998		÷2 Bit 7 *2

*1 Write disable

*2 The maximum address available for bit access is D09999.7.

NOTE

- Please refer to the GP-Pro EX Reference Manual for system data area.
  Cf. GP-Pro EX Reference Manual "Appendix 1.4 LS Area (only for direct access method)"
- Please refer to the precautions on manual notation for icons in the table.
  ☞ "Manual Symbols and Terminology"

7 Device Code and Address Code

Use device code and address code when you select "Device Type & Address" for the address type in data displays.

Device	Device Name	Device Code (HEX)	Address Code
Input relay	X	0080	Word address / 2
Output relay	Y	0081	Word address / 2
Internal relay	R	0082	Word address / 2
Keep relay	K	0083	Word address / 2
Timer	T	0060	Word address / 2
Counter	C	0061	Word address / 2
Data table	D	0000	Word address / 2

8 Error Messages

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

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

Display Examples of Error Messages

"RHAA036: PLC1: Error has been responded for device write command (Error Code: 2 [02H])"

NOTE

- Please refer to the manual of External Device for more detail of received error codes.
- Please refer to "When an error message is displayed (Error code list)" of "Maintenance/ Troubleshooting" for a common error message to the driver.

■ Error Message Peculiar to External Device

Message ID	Error Message	Description
RHxx128	(Node Name): Error has been responded for device read command (Major: [Hex], Minor: [Hex])	Error has been responded for device read command.
RHxx129	(Node Name): Error has been responded for device write command (Major: [Hex], Minor: [Hex])	Error has been responded for device write command.