Toyoda Machine Works

Toyopuc Link(SIO) Driver

- This manual explains how to connect the target machine with other manufacturer devices. For information about how to use the Pro-Designer software, please refer to the Pro-Designer Online Help.

- The types of target machines that are compatible with Pro-Designer depends on the version of Pro-Designer. For information about the compatibility of target machines, please refer to the Pro-Designer Online Help.

1 System Structure

The following table describes the basic system setup for connecting the target machine to Toyoda Toyopuc PC3J Series PLCs over a serial connection.
To view a cable connection diagram for a particular communication format, see Section 2 – *Cable Diagrams*.

Series	CPU	Link I/F	Comm. Format	Diagram
Toyopuc PC3J Series	PC3J PC3JD	CPU Computer Link Port	RS-422(4-wire)	Cable Diagram 1
			RS-422(4-wire) (1:n)[*1]	Cable Diagram 2
			RS-422(2-wire)	Cable Diagram 3
			RS-422(2-wire) (1:n)[*1]	Cable Diagram 4
		PC/CMP-Link (THU-2755)	RS-422(2-wire)	Cable Diagram 5
			RS-422(2-wire) (1:n)[*1]	Cable Diagram 6

*1   Up to 32 PLCs can connect to the target machine.

2 Cable Diagrams

The illustrated cable diagrams and those recommended by Toyoda may differ. However, Pro-face recommends using the following diagrammed connections.

- Ground the PLC's FG terminal according to your country's applicable standard. For details, refer to the PLC manual.
- When making your own communication cable, be sure to connect the SG signal.

Diagram 1   RS-422(4-wire)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.
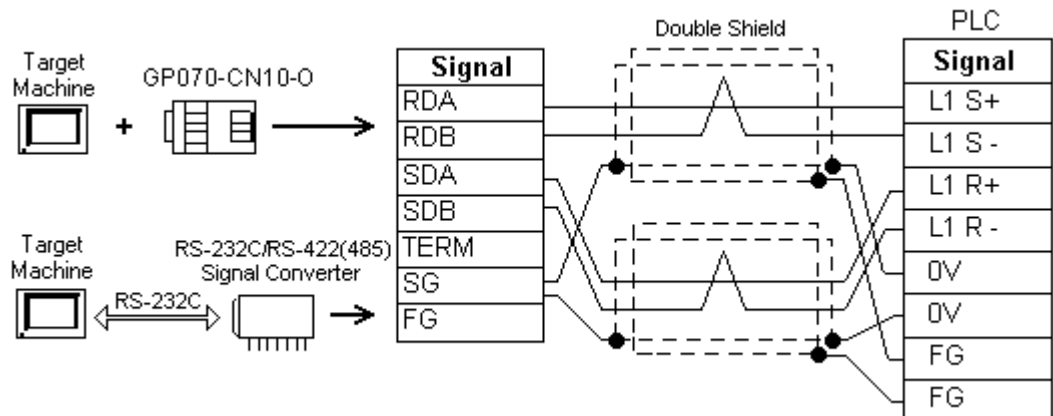
Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1   Connect to COM1.

> **MEMO**
> - Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
> - If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.
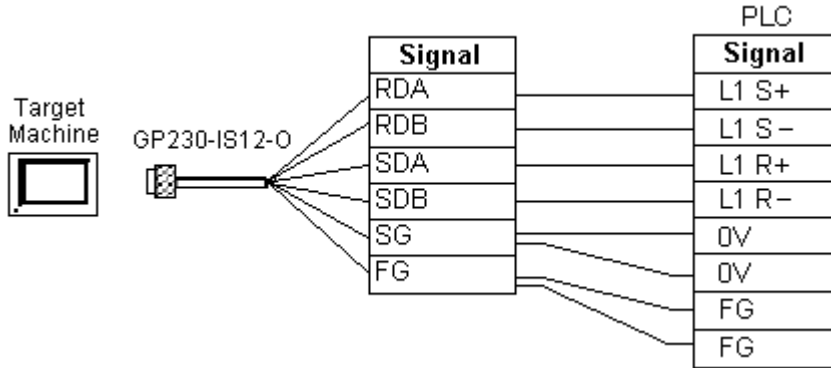
a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

> **MEMO**
> - As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
> - Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
> - The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.

b. RS-422 Cable (Pro-face: GP230-IS12-O)
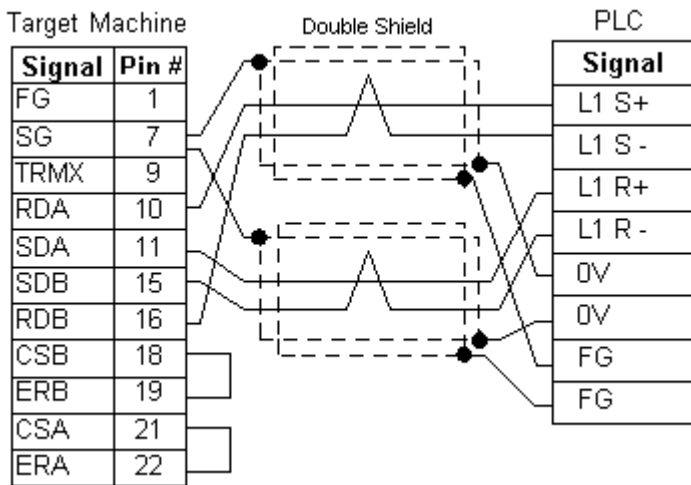

c. User-created Cable

Diagram 2   RS-422(4-wire) (1:n)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.
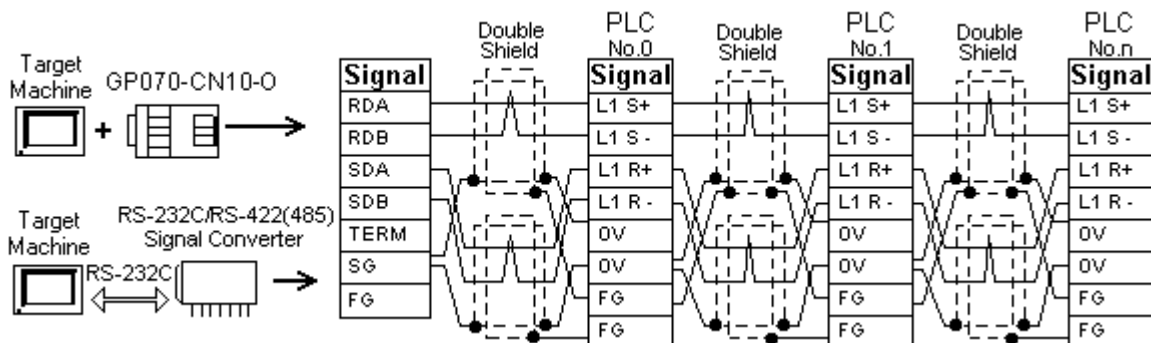
Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1   Connect to COM1.

MEMO
- Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
- If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.
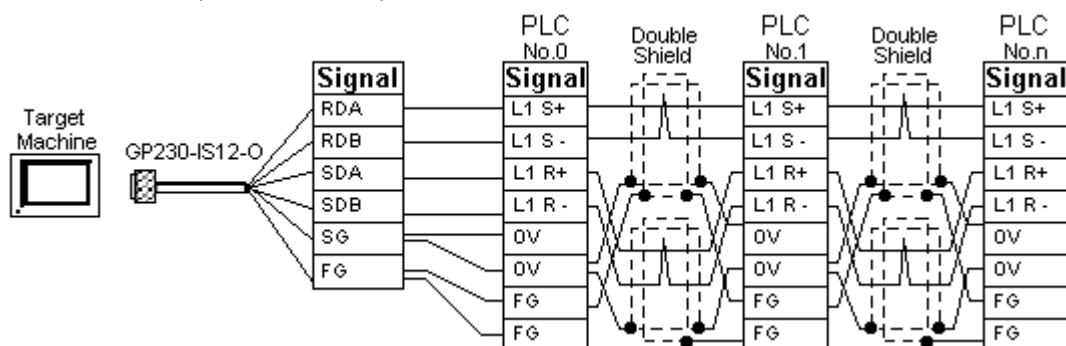
a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

MEMO
- As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
- Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
- The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.

b. RS-422 Cable (GP230-IS12-O)
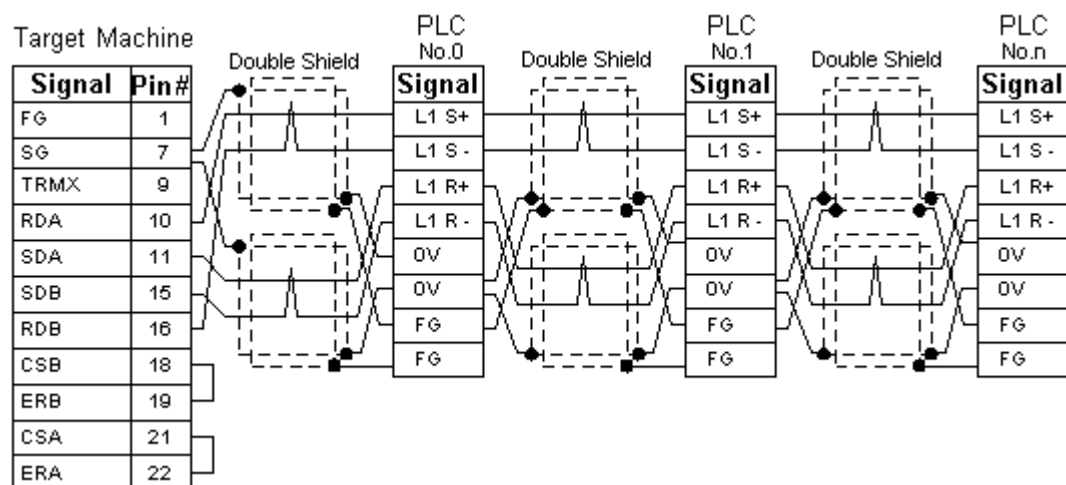

c. User-created Cable

Diagram 3   RS-422(2-wire)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.

Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1   Connect to COM1.

MEMO
- Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
- If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.

a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

MEMO
- As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
- Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
- The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.

b. RS-422 Cable (Pro-face: GP230-IS12-0)

c. User-created Cable

Diagram 4   RS-422(2-wire) (1:n)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.
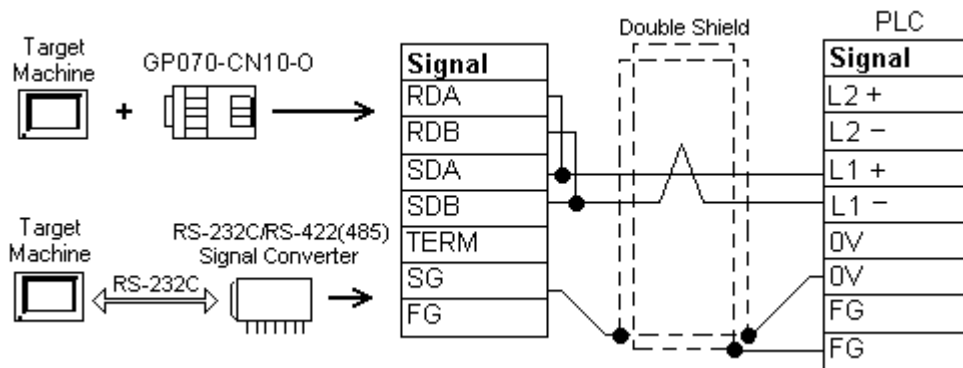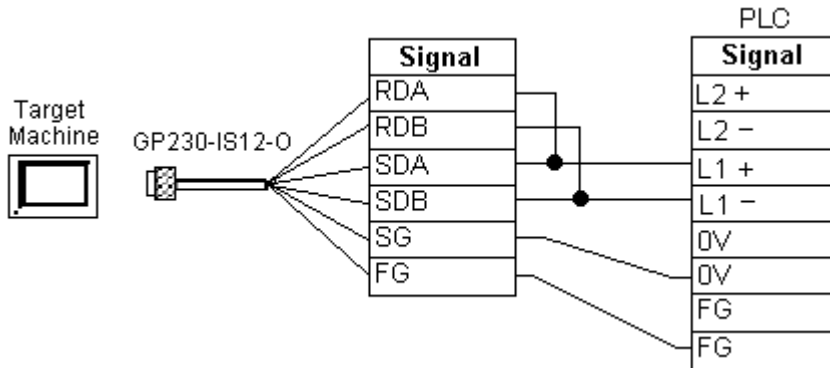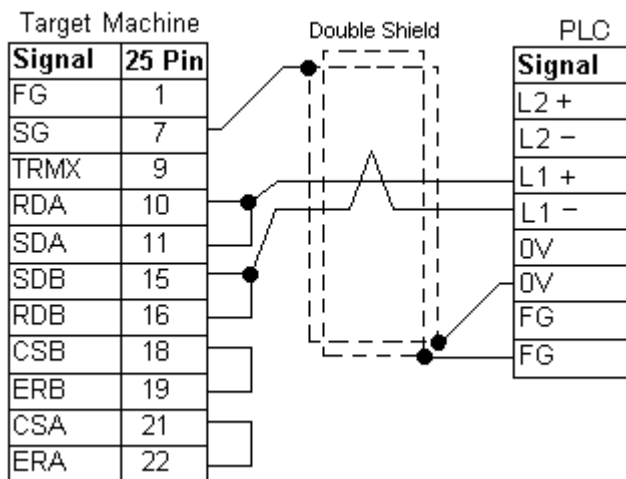
Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1   Connect to COM1.

MEMO
- Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
- If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.

a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

MEMO
- As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
- Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
- The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.

b. RS-422 Cable (GP230-IS12-O)

c. User-created Cable

Diagram 5 RS-422(2-wire)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.
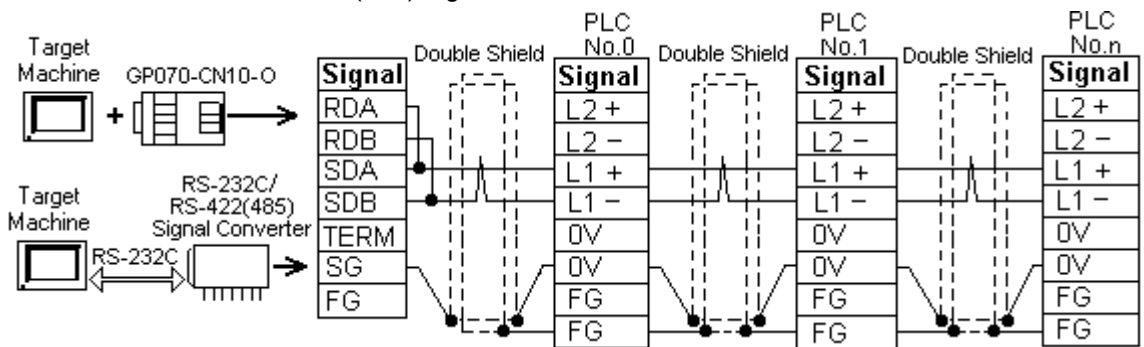
Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1 Connect to COM1.

MEMO
- Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
- If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.
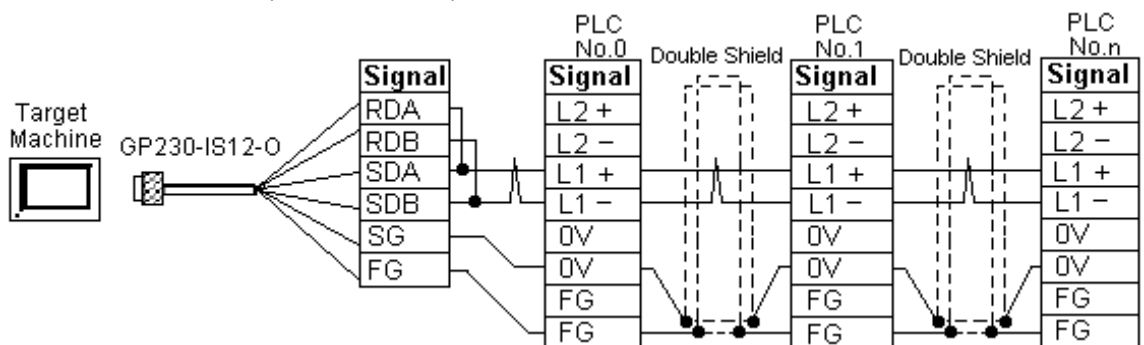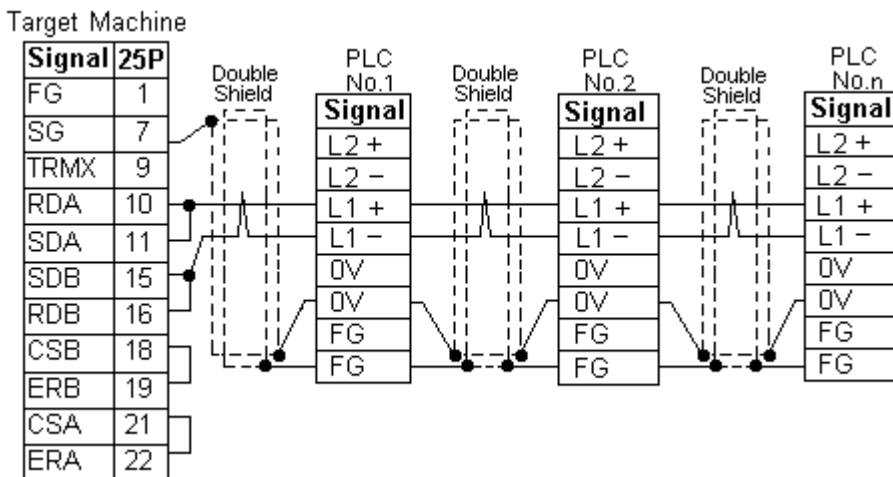
a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

MEMO
- As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
- Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
- The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.

b. RS-422 Cable (Pro-face: GP230-IS12-O)

c. User-created Cable

Diagram 6   RS-422(2-wire) (1:n)

To connect the target machine and the PLC, use a recommended cable, a signal converter, or create your own cable using the following specifications.
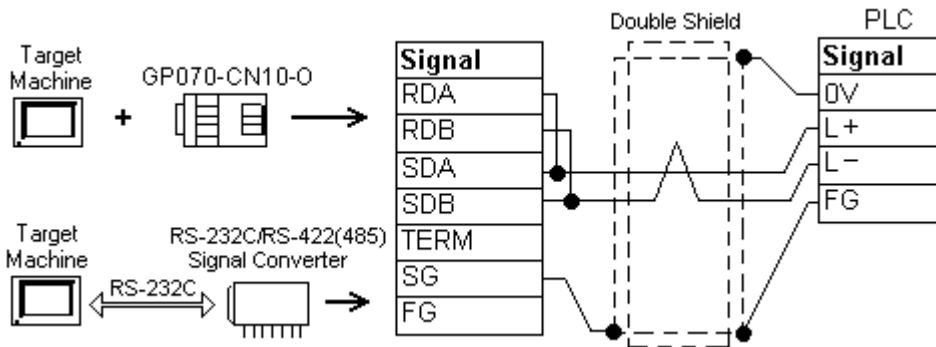
Target Machine	Cable / Adapter		Comments
GP[*1], PS-P[*1]	a	RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)	Cable length: 500m max.
	b	RS-422 Cable (Pro-face: GP230-IS12-O)	
	c	User-created Cable	
PC/AT(PL), PS-G	a	RS-232C / RS-422(485) Signal Converter	

*1   Connect to COM1.

MEMO
- Use double-shielded twisted-pair cables for noise immunity. Connect the cable shields, then connect the cable to a single-point ground.
- If you cannot establish a communication link between the target machine and PLC, you may require a termination resistor.
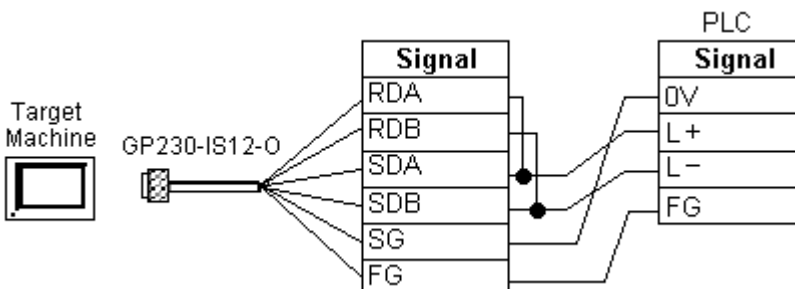
a. RS-422 Connection Terminal Adapter (Pro-face: GP070-CN10-O)
   OR: RS-232C/RS-422(485) Signal Converter

MEMO
- As the RS-422(485) side of the RS-232C/RS-422(485) signal converter is a terminal, use any external line other than the communication line for the power cable.
- Follow the specifications for your RS-232C/RS-422(485) signal converter when connecting termination resistance on the RS-422(485) terminal.
- The RS-232C connection between the RS-232C/RS-422(485) signal converter and target machine depends on the signal converter. Refer to its specifications when connecting the signal converter and target machine.
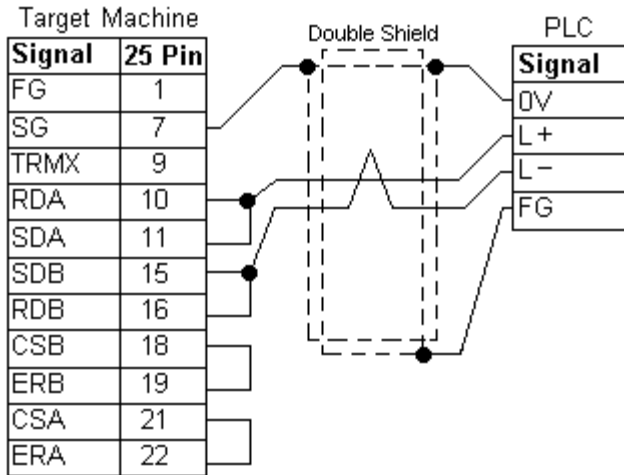
b. RS-422 Cable (GP230-IS12-O)

c. User-created Cable

3   Supported Device Addresses

The following table lists the device address ranges you can enter from the Device Address Keypad.

For actual device address ranges supported by the PLC, refer to the corresponding PLC manual. Supported device addresses differ from protocol to protocol and between PLC models.

| Device	Bit Address[*1][*2]	Word Address[*3]	16 bit	32 bit
Input	1X000-1XFFFF	1X00W-1XFFFW		
	2X000-2XFFFF	2X00W-2XFFFW		
	3X000-3XFFFF	3X00W-3XFFFW		
Output	1Y000-1YFFFF	1Y00W-1YFFFW		
	2Y000-2YFFFF	2Y00W-2YFFFW		
	3Y000-3YFFFF	3Y00W-3YFFFW		
Internal Relay	1M000-1MFFFF	1M00W-1MFFFW		
	2M000-2MFFFF	2M00W-2MFFFW		
	3M000-3MFFFF	3M00W-3MFFFW		
Keep Relay	1K000-1KFFFF	1K00W-1KFFFW		
	2K000-2KFFFF	2K00W-2KFFFW		
	3K000-3KFFFF	3K00W-3KFFFW		
Link Relay	1L000-1LFFFF	1L00W-1LFFFW		
	2L000-2LFFFF	2L00W-2LFFFW		
	3L000-3LFFFF	3L00W-3LFFFW		
Special Relay	1V00-1VFFFF	1V0W-1VFFFW		
	2V00-2VFFFF	2V0W-2VFFFW		
	3V00-3VFFFF	3V0W-3VFFFW		
Edge Relay	1P000-1PFFFF	--	L/H[*4]	L/H[*4]
	2P000-2PFFFF	--		
	3P000-3PFFFF	--		
Timer	1T000-1TFFFF	1T00W-1TFFFW		
	2T000-2TFFFF	2T00W-2TFFFW		
	3T000-3TFFFF	3T00W-3TFFFW		
Counter	1C000-1CFFFF	1C00W-1CFFFW		
	2C000-2CFFFF	2C00W-2CFFFW		
	3C000-3CFFFF	3C00W-3CFFFW		
Data Register	1D0000:0-1DFFFF:F	1D0000-1D2FFFF		
	2D0000:0-2DFFFF:F	2D0000-2D2FFFF		
	3D0000:0-3DFFFF:F	3D0000-3D2FFFF		
Link Register	1R000:0-1RFFFF:F	1R000-1RFFFF		
	2R000:0-2RFFFF:F	2R000-2RFFFF		
	3R000:0-3RFFFF:F	3R000-3RFFFF		
Special Register	1S000:0-1SFFFF:F	1S000-1SFFFF		
	2S000:0-2SFFFF:F	2S000-2SFFFF		
	3S000:0-3SFFFF:F	3S000-3SFFFF		
Current Value Register	1N000:0-1NFFFF:F	1N000-1NFFFF		
	2N000:0-2NFFFF:F	2N000-2NFFFF		
	3N000:0-3NFFFF:F	3N000-3NFFFF		

Device	Bit Address[*1][*2]	Word Address[*3]	16 bit	32 bit
File Register	B0000:0-BFFFF:F	B0000-BFFFF	L/H[*4]	L/H[*4]
Exp. Input	EX000-EXFFFF	EX00W-EXFFFW		
Exp. Output	EY000-EYFFFF	EY00W-EYFFFW		
Exp. Internal Relay	EM0000-EMFFFF	EM000W-EMFFFW		
Exp. Keep Relay	EK000-EKFFFF	EK00W-EKFFFW		
Exp. Link Relay	EL0000-ELFFFF	EL000W-ELFFFW		
Exp. Special Relay	EV000-EVFFFF	EV00W-EVFFFW		
Exp. Edge Relay	EP000-EPFFFF	--		
Exp. Timer	ET000-ETFFFF	ET00W-ETFFFW		
Exp. Counter	EC000-ECFFFF	EC00W-ECFFFW		
Exp. Special Register	ES000:0-ESFFFF:F	ES000-ESFFFF		
Exp. Current Register	EN000:0-ENFFFF:F	EN000-ENFFFF		
Exp. Setting Value Register	H0000:0-HFFFF:F	H000-HFFFF		
Exp. Data Register	U0000:0-UFFFF:F	U0000-UFFFF		

*1 Read-modify-write. When you write to one of these bit addresses, the target machine reads the entire word address, sets the defined bit, then returns the new word address to the PLC. If the ladder program writes data to this word address during the bit read/write process, the resulting data may be incorrect.

*2 You can use bit devices for discrete, integer, float, and string data. To use a bit device as a word address, append "W" to the bit address.

*3 You can use word devices for discrete, integer, float, and string data. To use a word device as a bit address, add a colon followed by the bit position at the end of the word. (e.g. EN0000:9)

*4 16-bit and 32-bit data, High and Low, refer to data as defined in the following examples.

	16 bit		
Byte			
0	7 ... 0	L (Low)
1	15 ... 8	H (High)

	32 bit		
Word			
0	15 ... 0	L (Low)
1	31 ... 16	H (High)
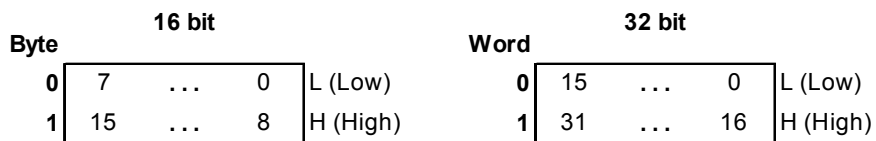
4 Consecutive Device Addresses

The following table lists the maximum number of consecutive addresses that can be read by each PLC. Refer to this table when using block transfers.

MEMO

- To speed up data communication, use consecutive device addresses on the same panel screen.
- The following situations increase the number of times that the device is read, and reduces the data communication speed between the target machine and the PLC:
  - when the number of consecutive addresses exceeds the maximum
  - when an address is designated for division
  - when different device types are used

Device	Max. Consecutive Addresses	Gap Span
Input (X)	128 bits	12 bits
Output (Y)		
Internal Relay (M)		
Keep Relay (K)		
Link Relay (L)		
Special Relay (V)		
Edge Relay (P)		
Timer (T)		
Counter (C)		
Data Register (D)	128 words	12 words
Link Register (R)		
Special Register (S)		
Current Value Register (N)		
File Register (B)		
Exp. Input (EX)		
Exp. Output (EY)		
Exp. Internal Relay (EM)		
Exp. Keep Relay (EK)		
Exp. Link Relay (EL)		
Exp. Special Relay (EV)		
Exp. Edge Relay (EP)		
Exp. Timer (ET)		
Exp. Counter (EC)		
Exp. Special Register (ES)		
Exp. Current Value Register (EN)		
Exp. Setting Value Register (H)		
Exp. Data Register (U)		

5   Environment Setup

The following table lists the communication settings, recommended by Pro-face, for the target machine and Toyoda Toyopuc PC3J Series PLCs. The following describes the settings when connecting one target machine to one PLC.

For details, see Section 7 – *Driver Configuration,* and Section 8 – *Protocol Configuration*.

Computer Link Port (1:1 or 1:n)

		Target Machine Settings		PLC Settings	
		GP, PS-P	PC/AT(PL), PS-G		
Driver Interface	Serial Interface	RS-422(2-wire) or RS-422(4-wire)	RS-232C[*1]	RS-422 Port	2-wire or 4-wire
	Flow Control	None	DTR(ER)/CTS	—	
	Transmission Speed[*2]	19200 bps		Baud Rate[*2]	19200 bps
	Retry Count	2		—	
	Parity Bit	Even		Parity Bit	Even
	Stop Bit	1 bit		Stop Bit	1 bit
	Data Length	8 bit		Data Length	8 bit
	Rcv Time Out	10 s		—	
	TX Wait Time	0 ms		—	
Protocol	Unit No.	0		Station No.[*3]	0

*1   By using a RS-232C/RS-422(485) signal converter, you can use RS-422 connections with PC/AT (PL Series) and PS Series Type G target machines. In such a configuration, make sure you set the Driver's Serial Interface to RS-232C.

*2   The maximum baud rate on the CPU link port is 57600 bps (does not support 115.2 kbps).

*3   When using a 1:n connection, set up a different Station No. for each PLC. You can connect a maximum 32 PLCs.

PC/CMP-Link (THU-2755) (1:1 or 1:n)

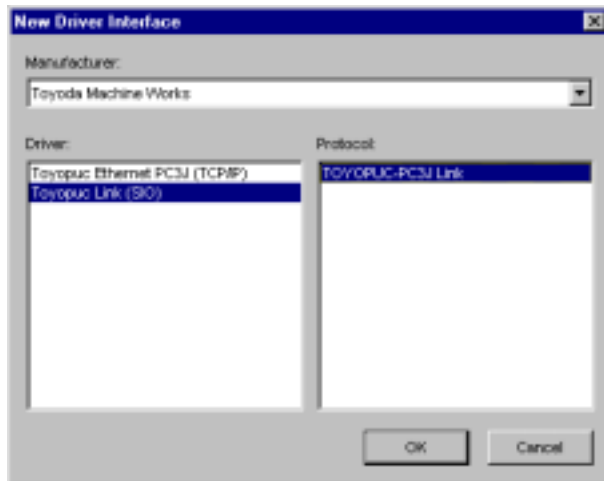|		Target Machine Settings		PLC Settings	
		GP, PS-P	PC/AT(PL), PS-G		
Driver Interface	Serial Interface	RS-422(2-wire)	RS-232C[*1]	RS-422 Port[*2]	2-wire
	Flow Control	None	DTR(ER)/CTS	—	
	Transmission Speed[*3]	19200 bps		Baud Rate[*3]	19200 bps
	Retry Count	2		—	
	Parity Bit	Even		Parity Bit	Even
	Stop Bit	1 bit		Stop Bit	1 bit
	Data Length	8 bit		Data Length	8 bit
	Rcv Time Out	10 s		—	
	TX Wait Time	0 ms		—	
		—		Internal Switch	SW4-1 OFF
					SW4-2 ON
Protocol	Unit No.	0		Station No.[*4]	0

*1   By using a RS-232C/RS-422(485) signal converter, you can use RS-422 connections with PC/AT (PL Series) and PS Series Type G target machines. In such a configuration, make sure you set the Driver's Serial Interface to RS-232C.

*2   PC/CMP-Link (THU-2755) supports 2-wire communications only. When using PC3J commands, make sure the link unit is version 5.0 or higher.

*3   The maximum baud rate on the CPU link interface is 57600 bps (does not support 115.2 kbps).

*4   When using a 1:n connection, set up a different Station No. for each PLC. You can connect a maximum 32 PLCs.

6 I/O Manager Configuration

The driver and protocol, which enable communication between the target machine and the PLC, depends on the PLC type.

MEMO For information on how to display the [New Driver Interface] dialog box, see the online help.

7 Driver Configuration

To configure the communication settings of the serial driver in the target machine, use the [Driver Configuration] dialog box. Make sure the settings match those of the PLC.
For an overview of the driver and protocol settings, see Section 5 – *Environment Setup*.

MEMO   For information on how to display the [Driver Configuration] dialog box, see the online help.
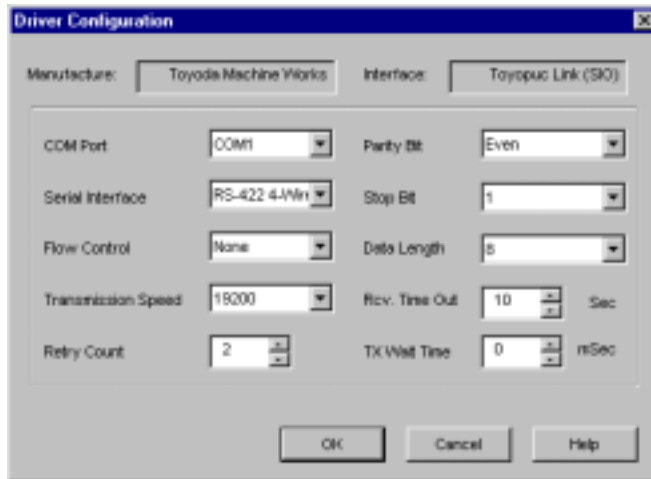
Manufacturer
Displays the name of the PLC manufacturer.

Interface
Displays the type of serial connection used to connect the target machine to the PLC.

COM Port
Defines which COM port to use on the target machine, for connecting to the PLC.

MEMO   Select COM1 for PS Series Type G target machines. Connection is not possible using COM2.

Serial Interface
Defines the serial connection: RS-232C, RS-422 (2-wire), or RS-422 (4-wire).
For details about the supported connections, see Section 2 – *Cable Diagrams*.

Flow Control
Defines the signals that control the data flow.

Transmission Speed
Sets the communication speed in bits per second. This setting must match the PLC baud rate.

Retry Count
Defines the number of times the driver tries to send or receive data when there is an error.

Parity Bit
Sets either a parity bit [Even or Odd] for use in detecting communication errors, or [None] at all.

Stop Bit
Defines the stop bit: 1, 1.5, or 2 bits.

Data Length

Defines the length of each unit of data: 7 bit or 8 bit.

Rcv. Timeout

Defines the length of time the target machine waits for a response before it outputs a timeout error or sends another communication.

TX Wait Time

Defines the number of milliseconds that the target machine waits, after receiving a communication packet, before sending a response.

8 Protocol Configuration

To set up details about the communication process between the target machine and the PLC, use the [Protocol Configuration] dialog box.

For an overview of the driver and protocol settings, see Section 5 – *Environment Setup.*

| MEMO | For information on how to display the [Protocol Configuration] dialog box, see the online help. |

Station No.

Enter the octal number that identifies the PLC. This setting is especially relevant when using multi-drop connections (1:n).

Up to 32 PLCs can connect to the target machine.

Write Commands: Force write mode

The PLC prevents write commands by a Pro-Designer Runtime user application when Write Mode is OFF. Select Force write mode so the PLC changes to Write Mode when Pro-Designer Runtime attempts a write operation.

9   Device Address Configuration

To set up a PLC variable in the Variable List, use the Device Address Keypad from the variable properties.
See Section 3 – *Supported Device Addresses.*

| MEMO | For information on how to display the Device Address Keypad, see the online help. |

Device

Lists the PLC's discrete and word device types.

Address

Enter the device address for the PLC variable. The keypad ensures that you enter the correct format for bit and word devices.