MODBUS TCP Master Driver

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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 5)
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 6)
4	Setup Items This section describes communication setup items on the display device. Set communication settings of the display with GP-Pro Ex or in off-line mode.	☞"4 Setup Items" (page 14)

Operation

1 System Configuration

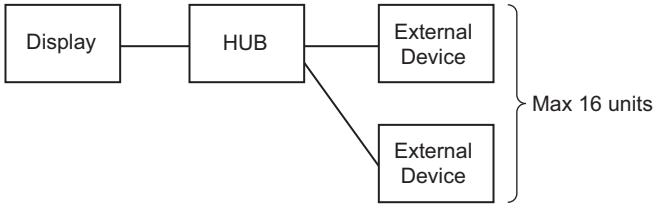
The system configuration in the case when the External Device of Schneider and the display are connected is shown.

Series	CPU	Link I/F	SIO Type	Setting Example
Premium	TSX P57 103M TSX P57 153M TSX P57 203M TSX P57 253M TSX P57 303M TSX P57 353M TSX P57 453M	TSX ETY 4102 TSX ETY 4103 TSX ETY 5102 TSX ETY 5103 TSX WMY 100 M	Ethernet (Modbus TCP)	Setting Example 1 (page 6)
	TSX P57 2623M TSX P57 2823M TSX P57 3623M TSX P57 4823M	------		Setting Example 2 (page 8)
Quantum	140 CPU 113 02 140 CPU 113 03 140 CPU 434 12A 140 CPU 534 14A	140 NOE 771 00 140 NOE 771 10 140 NWM 100 00		Setting Example 3 (page 10)
	140 CPU 651 50 140 CPU 651 60	------		Setting Example 4 (page 12)

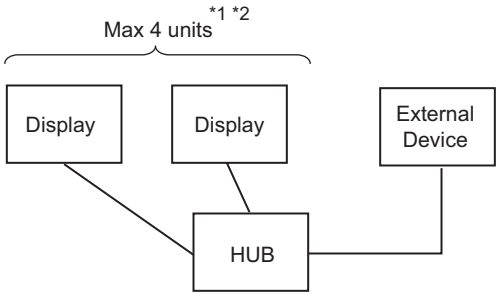
■ Connection Configuration

- 1:1 Connection

- 1:n Connection



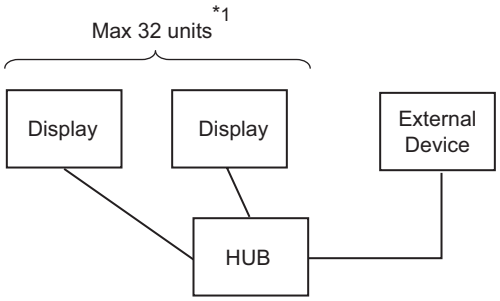
- n:1 Connection (Premium Series)



*1 You can connect max 1 unit of TSXP571**/TSXP572**, max 3 units of TSXP573**, max 4 units of TSXP574**.

*2 Number of connecting units is the unit number when connecting the display only. Number of connecting display will be limited by the number of other External Devices which is connected by Ethernet.

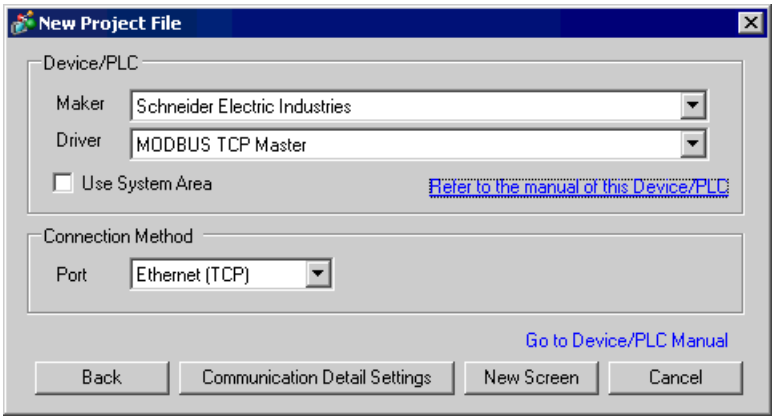
- n:1 Connection (Quantum Series)



*1 Number of connecting units is the unit number when connecting the display only. Number of connecting display will be limited by the number of other External Devices which is connected by Ethernet.

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 "Schneider Electric Industries".
Driver	Select a model (series) of the External Device to be connected and connection method. Select "MODBUS TCP Master". Check the External Device which can be connected in "MODBUS TCP Master" 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. Select "Ethernet (TCP)".

3 Example of Communication Setting

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

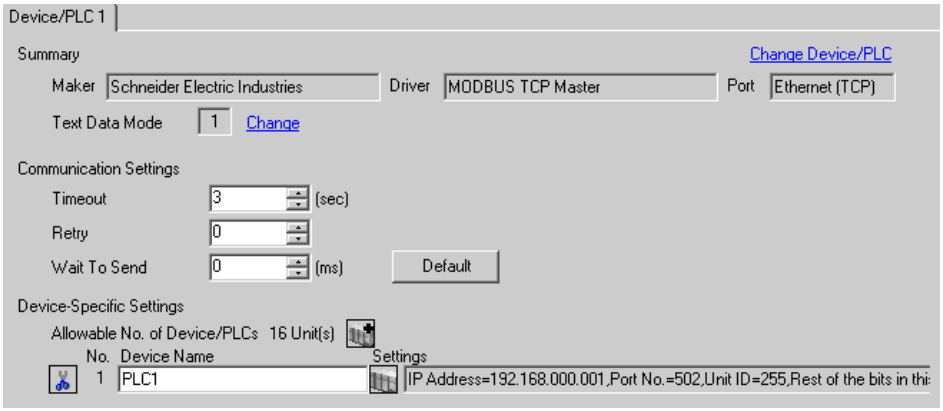
When you use the Premium/Quantum Series, use GP-Pro EX and the ladder software to set as below.

3.1 Setting Example 1

■ Settings of GP-Pro EX

◆ Communication Settings

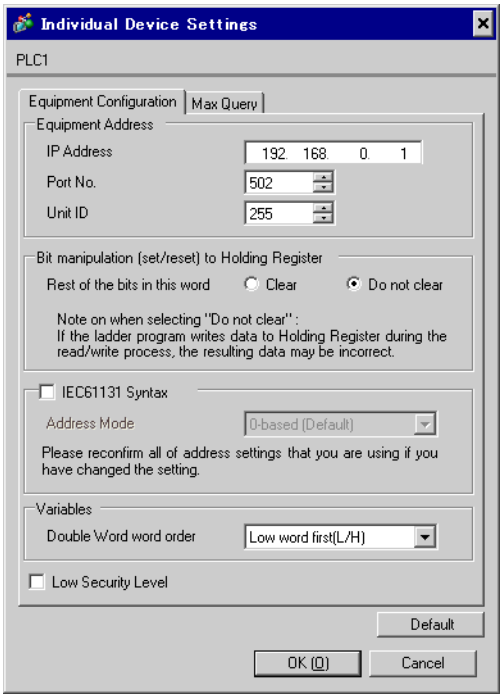
To display the setting screen, select [Device/PLC Settings] from [System setting window] in workspace.



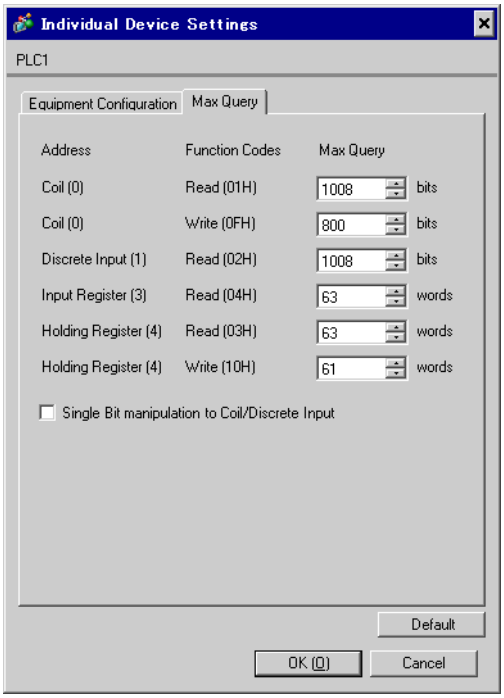
◆ Device Setting

To display the setting screen, click ([Setting]) of External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings]. When you connect multipleExternal Device, click from [Device-Specific Settings] of [Device/PLC Settings] to add another External Device.

[Equipment Configuration] tab



[Max Query] tab



◆ Notes

- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Set IP address on the External Device for IP address in Device-specific settings.
- You need to set IP address on the display in the off-line mode of the display.

■ Setting of External Device

Use the ladder software "PL7 PRO" for communication settings.

Execute "Hardware Configuration" from "Configuration" in "Application Browser" of "PL7 PRO" to display the "Configuration" dialog box. Double-click the empty slot to display the "Add Module" dialog box. Select "Communication" in the "Family" field. Then select "Link Unit" display in the "Module" field to display the screen for setting.

Setup Items	Setup Description
IP address configuration	Configured (Fixed)
IP address	Option
Ethernet configuration	Ethernet II (Fixed)

◆ Notes

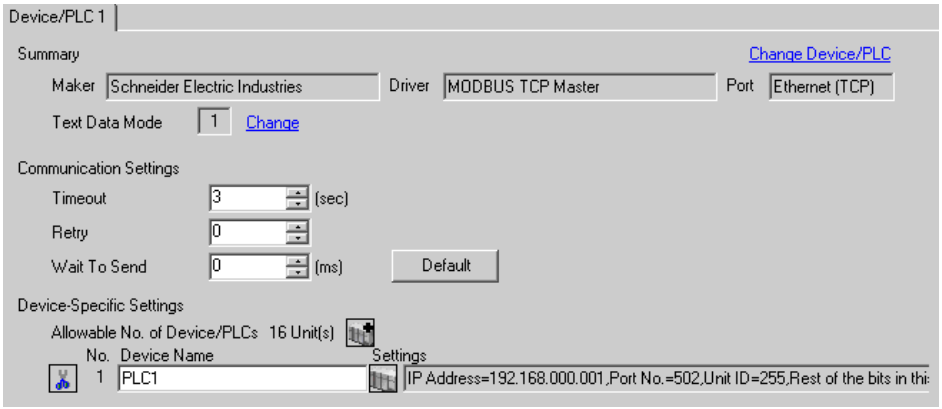
- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Please refer to the manual of the ladder software for more detail on other setting description.

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.

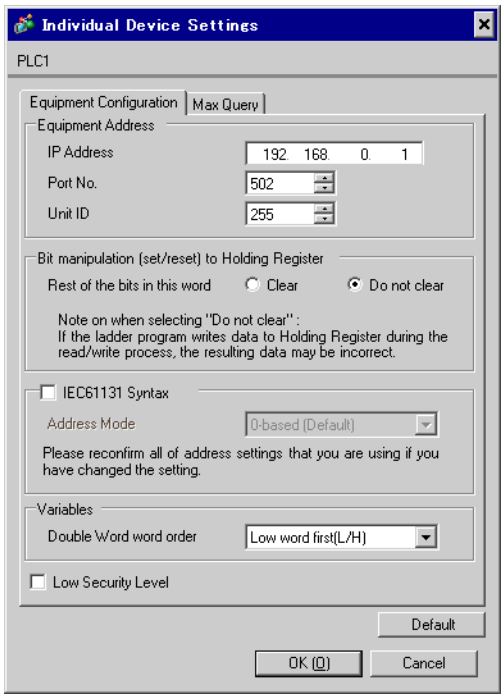


◆ Device Setting

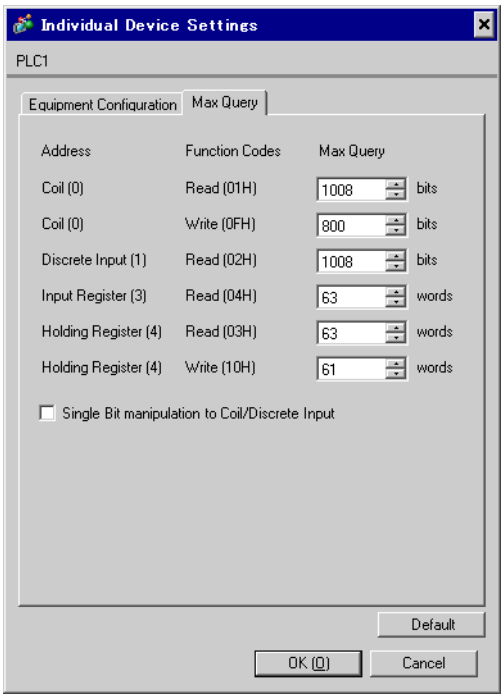
To display the setting screen, click ([Setting]) of External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings].

When you connect multipleExternal Device, click from [Device-Specific Settings] of [Device/PLC Settings] to add another External Device.

[Equipment Configuration] tab



[Max Query] tab



◆ Notes

- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Set IP address on the External Device for IP address in Device-specific settings.
- You need to set IP address on the display in the off-line mode of the display.

■ Setting of External Device

Use the ladder software "PL7 PRO" for communication settings.

For setting, go to "Configuration" in "Application Browser" of "PL7 PRO", "Hardware Configuration", and "ETY PORT" in this order.

Setup Items	Setup Description
IP address configuration	Configured (Fixed)
IP address	Option
Ethernet configuration	Ethernet II (Fixed)

◆ Notes

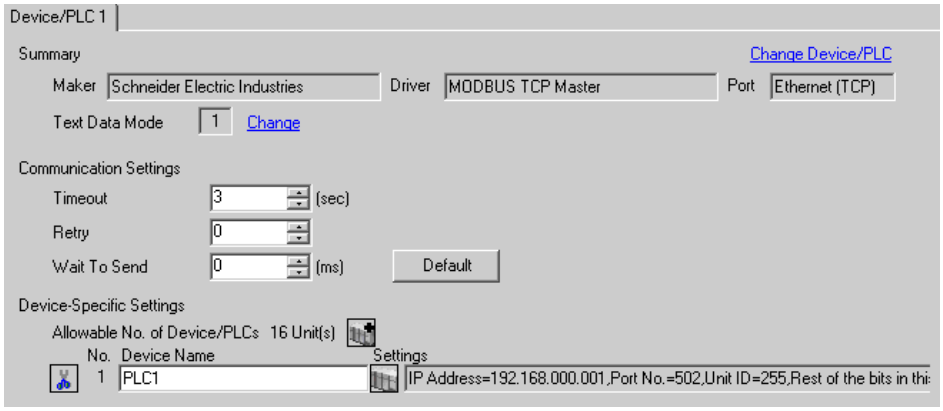
- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Please refer to the manual of the ladder software for more detail on other setting description.

3.3 Setting Example 3

■ Settings of GP-Pro EX

◆ Communication Settings

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

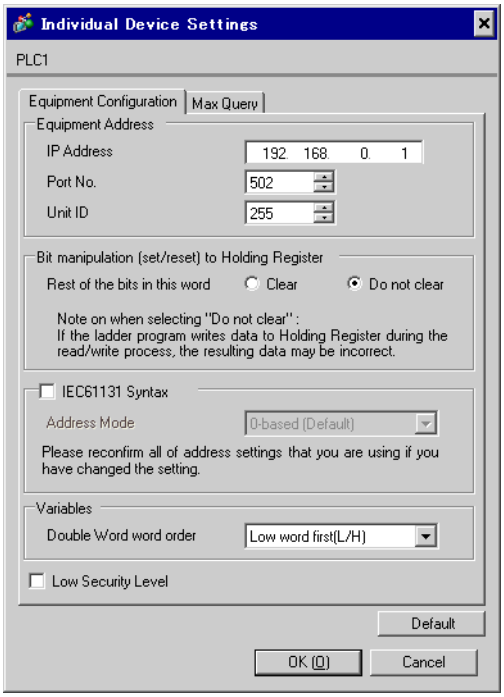


◆ Device Setting

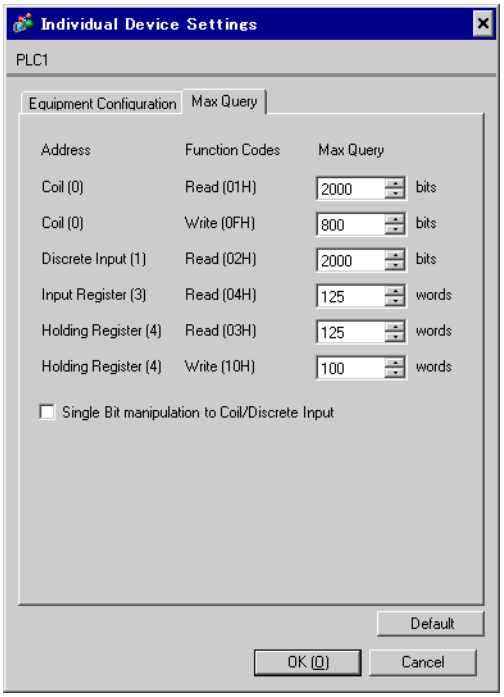
To display the setting screen, click ([Setting]) of External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings].

When you connect multipleExternal Device, click from [Device-Specific Settings] of [Device/PLC Settings] to add another External Device.

[Equipment Configuration] tab



[Max Query] tab



◆ Notes

- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Set IP address on the External Device for IP address in Device-specific settings.
- You need to set IP address on the display in the off-line mode of the display.

■ Setting of External Device

Use the ladder software "Concept" for communication settings.

After selecting PLC for the Quantum Series in "PLC Selection" of "Concept", select "Select Extensions" from "Config Extension". Set the number of Link Unit connected to "TCP/IP Ethernet" in the "Select Extensions" dialog box displayed next. Then, select "Ethernet /I/O Scanner" in "Config Extensions" and perform setting in the "Ethernet /I/O Scanner" dialog box.

Setup Items	Setup Description
Ethernet configuration	Specify IP Address (Fixed)
Internet Address	Option
Frame Type	Ethernet II (Fixed)

◆ Notes

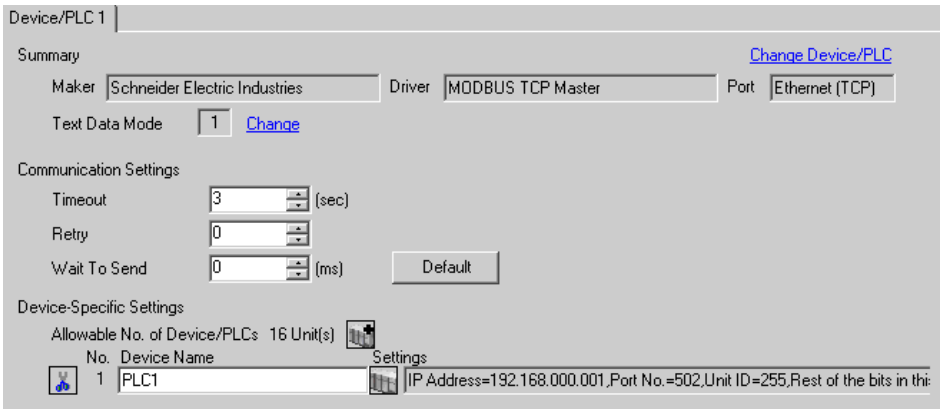
- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Please refer to the manual of the ladder software for more detail on other setting description.

3.4 Setting Example 4

■ Settings of GP-Pro EX

◆ Communication Settings

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

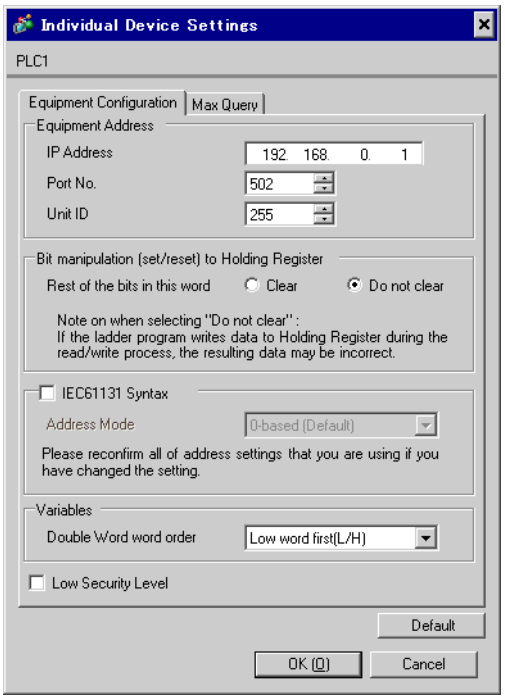


◆ Device Setting

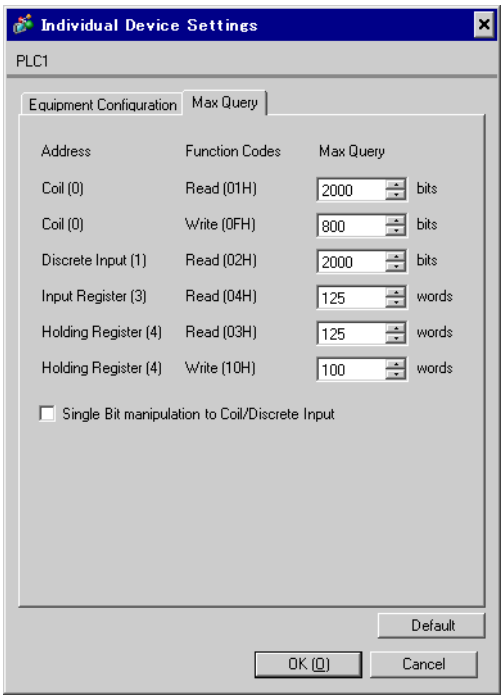
To display the setting screen, click ([Setting]) of External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings].

When you connect multipleExternal Device, click from [Device-Specific Settings] of [Device/PLC Settings] to add another External Device.

[Equipment Configuration] tab



[Max Query] tab



◆ Notes

- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Set IP address on the External Device for IP address in Device-specific settings.
- You need to set IP address on the display in the off-line mode of the display.

■ Setting of External Device

Use the ladder software "Unity Pro XL" for communication settings.

Startup "Unity Pro XL". Select "New Project" and specify CPU (Quantum Series, 140 CPU 651 *0). Go to "Communication" in "Project Browser", and right-click on "Network" to select "New Network…". Then the "Add Network" window is displayed.

Set "List of available Networks" in the "Add Network" window to "Ethernet". Put the optional name in "Change Name" and press OK.

Check that the name you put in "Change Name" is displayed under "Network", "Communication" of "Project Browser". Double-click the displayed name to display the "(Your optional name) window" for setting.

Setup Items	Setup Description
IP address configuration	Configured (Fixed)
IP address	Option
Ethernet configuration	Ethernet II (Fixed)

◆ Notes

- Check with a network administrator about IP address. Do not set the duplicate IP address.
- Please refer to the manual of the ladder software for more detail on other setting description.

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 6)

NOTE

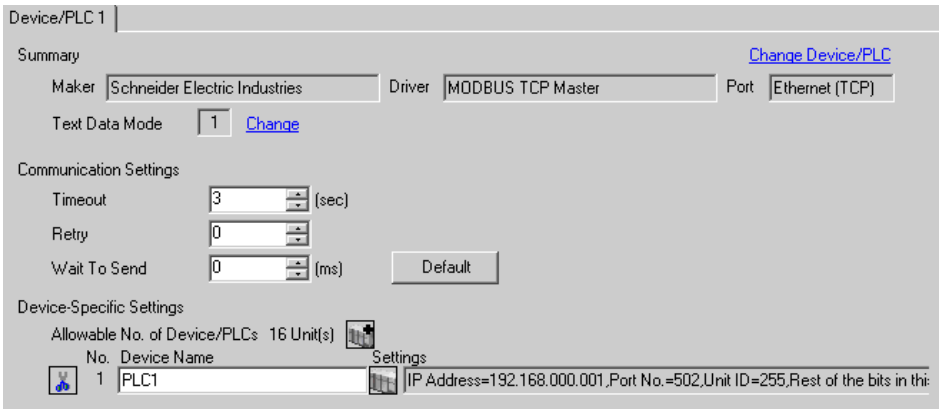
- You need to set the IP address of the Display in off-line mode of the Display.

  Cf. Maintenance/Troubleshooting "2.5 Ethernet Settings"

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.



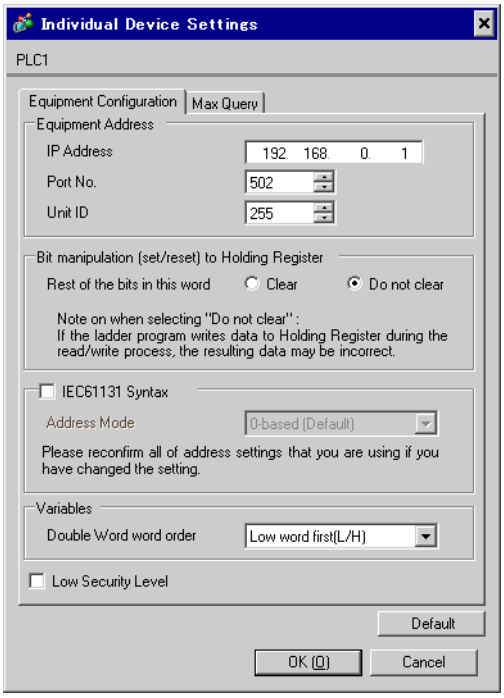
Setup Items	Setup Description
Timeout	Use an integer from 1 to 127 to enter the time (s) for which the display waits for the response from the External Device.
Retry	In case of no response from the External Device, use an integer from 0 to 255 to enter how many times the display retransmits the command.
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.

■ Device Setting

To display the setting screen, click ([Setting]) of External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings].

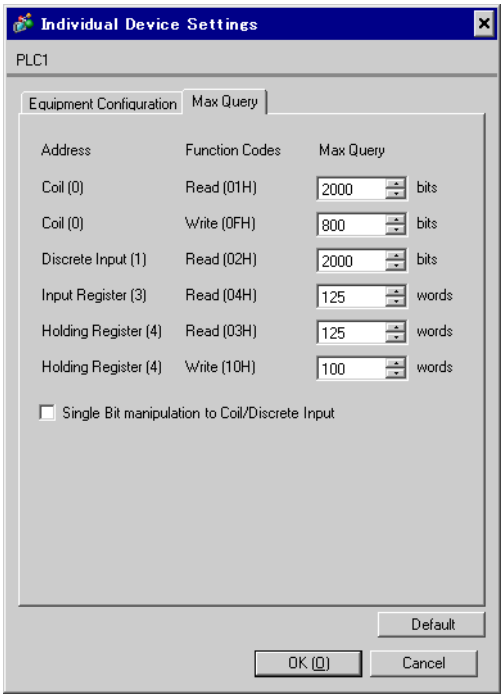
When you connect multipleExternal Device, click from [Device-Specific Settings] of [Device/PLC Settings] to add another External Device.

[Equipment Configuration] tab



Setup Items	Setup Description
IP Address	Set IP address of the External Device. **NOTE** • Check with a network administrator about IP address. Do not set the duplicate IP address.
Port No.	Use an integer from 1 to 65535 to enter the port No. of the External Device.
Unit ID	Use an integer from 1 to 247 (or 255) to enter the unit ID of the External Device.
Bit manipulation (set / reset) to Holding Resister Rest of the bits in this word	From "Clear" or "Do not clear", select treatment of the rest of the bits in the same word when the bit manipulation to Holding Register is performed.
IEC61131 Syntax	Check this item when you use the IEC61131 grammar for variables. In case that you check on, select Address Mode, [0-based] or [1-based].
Double Word word order	Select the order of checking double word data from "Low word first" or "High word first".
Low Security Level	Put a check when lowering the format check level.

[Max Query] tab



Setup Items	Setup Description
Coil Read	Set the number of max data for device [coil] which can be read for one communication, using 16 to 2000 bits. **NOTE** • When [Single Bit manipulation to Coil/Discrete Input] is checked, set the data maximum number from 1 to 2000.
Coil Write	Set the number of max data for device [coil] which can be written for one communication, using 1 to 800 bits.
Discrete Input Read	Set the number of max data for device [discrete input] which can be read for one communication, using 16 to 2000 bits. **NOTE** • When [Single Bit manipulation to Coil/Discrete Input] is checked, set the data maximum number from 1 to 2000.
Input Register Read	Set the number of max data for device [input register] which can be read for one communication, using 1 to 125 words.
Holding Register Read	Set the number of max data for device [holding register] which can be read for one communication, using 1 to 125 words.
Holding Register Write	Set the number of max data for device [holding register] which can be written for one communication, using 1 to 100 words.
Single Bit manipulation to Coil/Discrete Input	Put a check when writing in or reading out coil or discreet input in bits.

4.2 Setup Items in Off-Line Mode

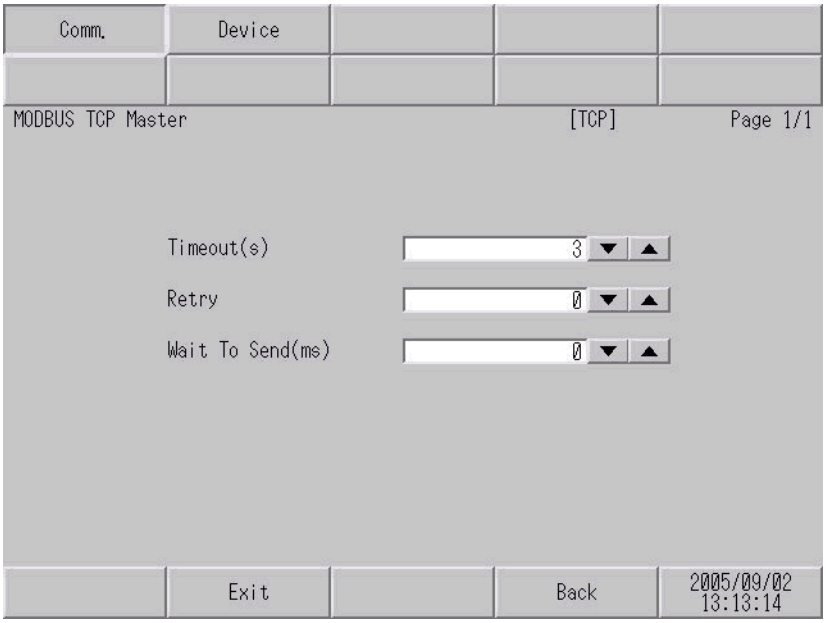
NOTE

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

  Cf. Maintenance/Troubleshooting "2.2 Off-line 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.

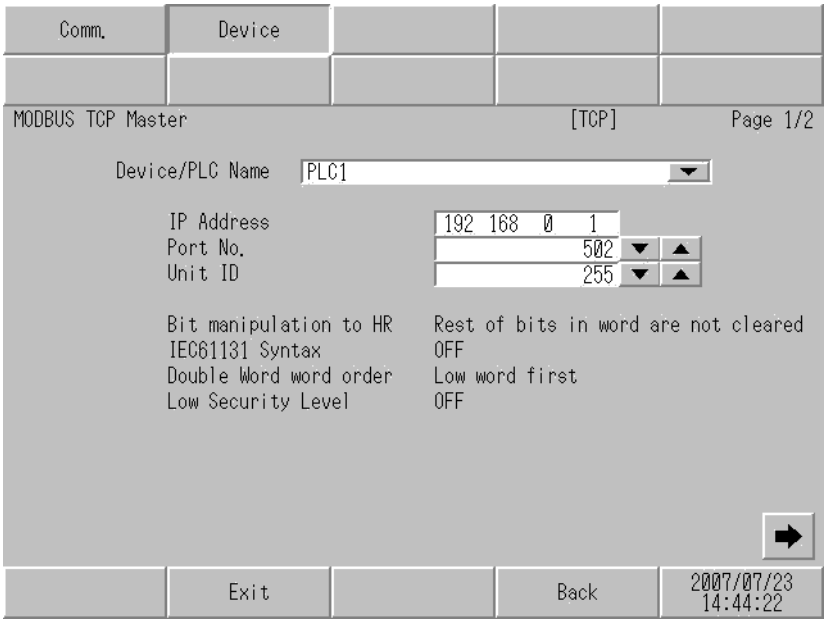


Setup Items	Setup Description
Timeout	Use an integer from 1 to 127 to enter the time (s) for which the display waits for the response from the External Device.
Retry	In case of no response from the External Device, use an integer from 0 to 255 to enter how many times the display retransmits the command.
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.

■ Device Setting

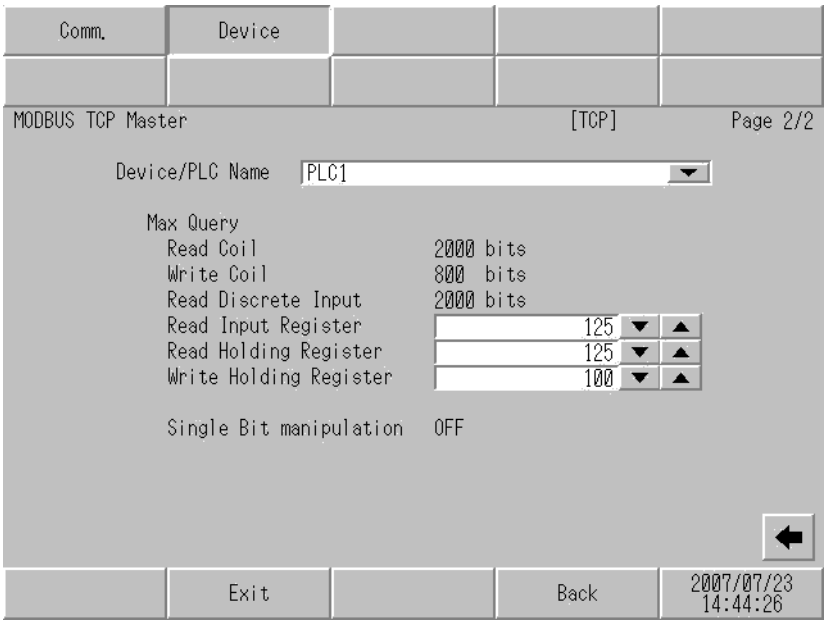
To display the setting screen, touch [Device/PLC Settings] from [Peripheral Settings]. Touch the External Device you want to set from the displayed list, and touch [Device].

(1/2)



Setup Items	Setup Description
Device/PLC Name	Select the External Device for device setting. Device name is a title of External Device set with GP-Pro EX.(Initial value [PLC1])
IP Address	Set IP address of the External Device. **NOTE** • Check with a network administrator about IP address. Do not set the duplicate IP address.
Port No.	Use an integer from 1 to 65535 to enter the port No. of the External Device.
Unit ID	Use an integer from 1 to 247 (or 255) to enter the unit ID of the External Device.
Bit manipulation to HR	From "Rest of bits in word are cleared" or "Rest of bits in word are not cleared", select treatment of the rest of the bits in the same word when the bit manipulation to Holding Register is performed. (Not available to set in off-line mode.)
IEC61131 Syntax	Displays the usage status of the currently set IEC61131 syntax in ON/OFF. (Not available to set in off-line mode.)
Double Word word order	Displays the currently set order of storing double word data from "Low word first" or "High word first". (Not available to set in off-line mode.)
Low Security Level	When an format check level is lowered, ON/OFF is displayed. When the level is lowered, ON is displayed. (Not available to set in off-line mode.)

(2/2)



Setup Items	Setup Description
Device/PLC Name	Select the External Device for device setting. Device name is a title of External Device set with GP-Pro EX.(Initial value [PLC1])
Read Coil	Display the number of max data for device [coil] which can be read for one communication. (Not available to set in off-line mode.)
Write Coil	Display the number of max data for device [coil] which can be written for one communication. (Not available to set in off-line mode.)
Read Discrete Input	Diaplsy the number of max data for device [discrete input] which can be read for one communication. (Not available to set in off-line mode.)
Read Input Register	Set the number of max data for device [input register] which can be read for one communication, using 1 to 125 words.
Read Holding Register	Set the number of max data for device [holding register] which can be read for one communication, using 1 to 125 words.
Write Holding Register	Set the number of max data for device [holding register] which can be written for one communication, using 1 to 100 words.
Single Bit manipulation	ON/OFF display shows whether the coil or discreet input is written or read out in bits. If ON is displayed, writing or reading can be executed in bits. (Not available to set in off-line mode.)

5 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 External Device.

This address can be specified as system data area.

Device	Bit Address	Word Address	32 bits	Notes
Coil	000001 - 065536	000001 - 065521		1
Discrete Input	100001 - 165536	100001 - 165521	L / H or H / L	1 *2
Input Register	------	300001 - 365536		Bit 15 *2
Holding Register	400001,00 - 465536,15*3	400001 - 465536	*1	Bit 15

*1 You can set the data storing order in word unit of 32-bit data in the Device Setting dialog box.

*2 Write disable

*3 An access method at the time of Bit Set varies depending on the [Rest of the bits in this word] setting of [Device Setting].

- Clear..... Bit 15
- Do not clear .... 400001,00 - 465536,15

■ Supported Function Code

Below is the list of Supported Function Code.

Function Code (Hex)	Description
FC01 (0x01)	Reads the ON/OFF status of coils (0X references) in the slave.
FC02 (0x02)	Reads the ON/OFF status of discrete inputs (1X references) in the slave.
FC03 (0x03)	Reads the binary content of holding registers (4X references) in the slave.
FC04 (0x04)	Reads the binary content of input registers (3X references) in the slave.
FC05 (0x05)	Forces a single coil (0X reference) to either ON or OFF
FC06 (0x06)	Presets a value into a single holding register (4X reference).
FC15 (0x0F)	Forces each coil (0X references) in a sequence of coils to either ON or OFF.
FC16 (0x10)	Presets values into a sequence of holding registers (4X references).

NOTE

- FC15 / FC16 will be used for writing. In case if the connected controller do not support these function codes, then FC05 / FC06 will be used.

■ IEC61131 address syntax

The following table gives the equivalences between the Modbus syntax and the IEC61131 syntax.

Device	Modbus address syntax			IEC61131syntax				
				Format	0-based		1-based	
	Format	Range	First element		Range	First element	Range	First element
Coil	000001+i	i=0 to 65535	000001	%Mi	i=0 to 65535	%M00000	i=1 to 65536	%M00001
Discrete Input	100001+i	i=0 to 65535	100001	-	-	-	-	-
Input register (word)	300001+i	i=0 to 65535	300001	-	-	-	-	-
Input register (word bit)	300001+i,j	i=0 to 65535 j=0 to15	300001,00	-	-	-	-	-
Holding register (word)	400001+i	i=0 to 65535	400001	%MWi	i=0 to 65535	%MW00000	i=1 to 65536	%MW00001
Holding register (word bit)	400001+i,j	i=0 to 65535 j=0 to15	400001,00	%MWi: Xj	i=0 to 65535 j=0 to 15	%MW00000: X00	i=1 to 65535 j=0 to15	%MW00001 :X00

NOTE

- The two areas 100000 and 300000 are not accessible with the IEC syntax.
- Once you change the project which you have setup Discrete Input Register to IEC 61131 Syntax, the address will be undefined.

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 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
Coil	0	0080	Value of (word address -1) divided by 16
Discrete Input	1	0081	Value of (word address -1) divided by 16
Input Register	3	0001	Value of word address from which 1 is deducted
Holding Register	4	0000	Value of word address from which 1 is deducted

7 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. Name of External Device 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 • Received error codes are displayed such as "Decimal [Hex]". • IP address is displayed such as "IP address (Decimal): MAC address (Hex)".

Display Examples of Error Messages

"RHAA035: 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.