

GP-PRO/PBIII for Windows Device/PLC CONNECTION MANUAL

ADDITIONAL MANUAL Schneider PLC Premium/Quantum Series (Ethernet Communication)



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Pro-face
Human Machine Interface

Installation

This CD-ROM includes all the protocol files required by the GP to communicate with an Schneider's Inverter. Also, you will need to have one or more of the following software applications installed. The screen and data transfer file included in the CD-ROM must be installed in each of those applications. For information about the installation of the software, refer to that software's Operation Manual.

■ Software Applications

- GP-PRO/PBIII for Windows Ver. 7.20 or later
- Pro-Server with Pro-Studio for Windows Ver. 4.1 or later ^{*1}

- 1) Be sure to confirm that GP-PRO/PBIII for Windows is installed in your PC prior to starting this driver installation.
- 2) To install the new driver, double-click on "MODBUS_E.exe" file contained in the CD-ROM.
- 3) Once the installation program starts, follow the instructions given to install the protocol files.

***1 When using the Factory Gateway unit, GP-Web Ver.1.0 or later or GP-Viewer Ver.1.0 or later, be sure to select Pro-Server with Pro-Studio for Windows as the "Destination Folder".**

1

List of Connectable PLCs

The following Inverters can be connected to a GP unit.

Manufacturer	Series Name	CPU	Link I/F	Notes	Device Type in Screen Editor
Schneider	Premium	TSX P57 103M TSX P57 153M TSX P57 203M TSX P57 253M TSX P57 303M TSX P57 353M TSX P57 453M	TSX ETY4102 TSX ETY5102		Schneider Modbus TCP (Ether)
	Quantum	140CPU11302 140CPU11303 140CPU43412 140CPU53414	140 NOE 771 00 140 NOE 771 10		

The GP/GLC series applicable for Ethernet are listed below:

Series Name		Product Name	Optional Ethernet I/F Unit	Built-in Ethernet Port
GP77R Series	GP-377R Series	GP-377RT	○ ^{*1 *2}	x
	GP-477R Series	GP-477RE	○ ^{*2}	x
	GP-577R Series	GP-577RS	○ ^{*2}	x
		GP-577RT	○ ^{*2}	x
GP2000 Series	GP-2300 Series	GP-2300L	x	○
		GP-2300S	x	○
		GP-2300T	x	○
	GP-2400 Series	GP-2400T	x	○
	GP-2500 Series	GP-2500L	○ ^{*3 *4}	○
		GP-2500S	○ ^{*3 *4}	○
		GP-2500T	○ ^{*3 *4}	○
	GP-2501 Series	GP-2501L	○ ^{*2 *3}	x
		GP-2501S	○ ^{*2 *3}	x
		GP-2501T	○ ^{*2 *3}	x
GP-2600 Series	GP-2600T	○ ^{*3 *4}	○	
GP-2601 Series	GP-2601T	○ ^{*2 *3}	x	
GLC 2000 Series	GLC-2300 Series	GLC-2300L	x	○
		GLC-2300T	x	○
	GLC-2400 Series	GLC-2400T	x	○
	GLC-2500 Series	GLC-2500T	○ ^{*3 *4}	○
	GLC-2600 Series	GLC-2600T	○ ^{*3 *4}	○
ST Series		ST403	x	○

*1 Only Multi unit can be used.

*2 The 2-Way Driver (Pro-Server, GP-Web and others) cannot be used.

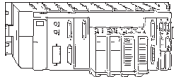
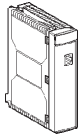
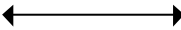
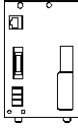
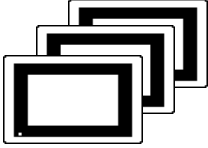
*3 When using optional Ethernet I/F unit, a bus conversion unit (PSL-CONV00) is required.

*4 Using the optional Ethernet I/F Unit allows you to set up separate Class and Net No.s for 2-Way Driver applications (Pro-Server, GP-Web and others) and the PLC. When doing this, data transfer with the PLC is performed through the optional Ethernet I/F Unit.

2 System Structure




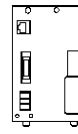
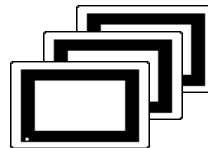
This section explains the system design for the ethernet connection between Schneider PLC units and GP/GLC units.

■ Premium Series

CPU	Link I/F	Cables	Unit	GP/GLC
				
TSX P57 103M TSX P57 153M TSX P57 203M TSX P57 253M TSX P57 303M TSX P57 353M TSX P57 453M	TSX ETY4102 TSX ETY5102	Ethernet Cable (IEEE802.3 Compatible)	Digital's GP070-ET41 GP377-MLTE11 GP377-MLTE41 GP070-MLTE41	GP/GLC Series *1

*1 Refer to the List of Compatible GP/GLC Units on the next page.

■ Quantum Series

CPU	Link I/F	Cable Diagram	Cables	GP/GLC
				
140CPU11302 140CPU11303 140CPU43412 140CPU53414	140 NOE 771 00 140 NOE 771 00	Ethernet Cable (IEEE802.3 Compatible)	Digital's GP070-ET41 GP377-MLTE11 GP377-MLTE41 GP070-MLTE41	GP/GLC Series *1

*1 Refer to the List of Compatible GP/GLC Units on the next page.

■ List of Compatible GP/GLC Units

Series Name		Product Name	Optional Ethernet I/F Unit	Built-in Ethernet Port
GP77R Series	GP-377R Series	GP-377RT	○ ^{*1*2}	x
	GP-477R Series	GP-477RE	○ ^{*2}	x
	GP-577R Series	GP-577RS	○ ^{*2}	x
		GP-577RT	○ ^{*2}	x
GP2000 Series	GP-2300 Series	GP-2300L	x	○
		GP-2300S	x	○
		GP-2300T	x	○
	GP-2400 Series	GP-2400T	x	○
	GP-2500 Series	GP-2500L	○ ^{*3*4}	○
		GP-2500S	○ ^{*3*4}	○
		GP-2500T	○ ^{*3*4}	○
	GP-2501 Series	GP-2501L	○ ^{*2*3}	x
		GP-2501S	○ ^{*2*3}	x
		GP-2501T	○ ^{*2*3}	x
	GP-2600 Series	GP-2600T	○ ^{*3*4}	○
	GP-2601 Series	GP-2601T	○ ^{*2*3}	x
	GLC2000 Series	GLC-2300 Series	GLC-2300L	x
GLC-2300T			x	○
GLC-2400 Series		GLC-2400T	x	○
GLC-2500 Series		GLC-2500T	○ ^{*3*4}	○
GLC-2600 Series		GLC-2600T	○ ^{*3*4}	○
ST Series	ST403	x	○	

*1 Only the Multi Unit can be used.

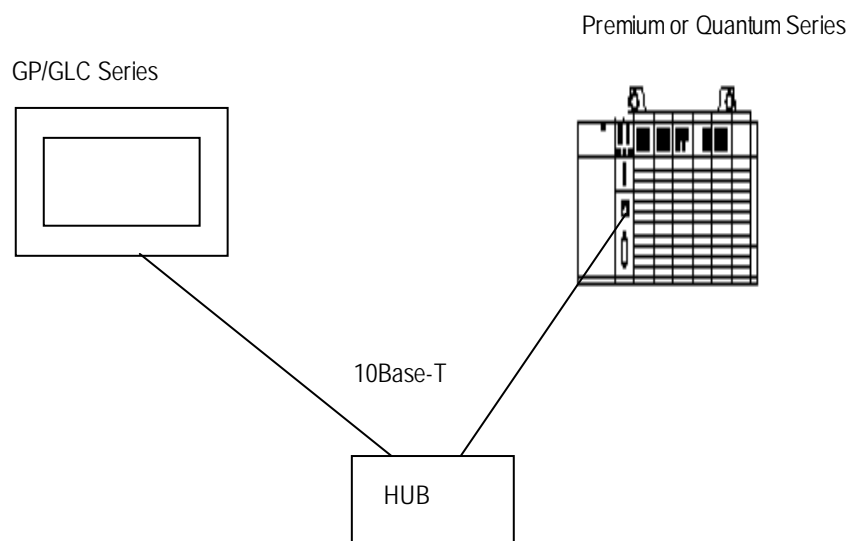
*2 The 2-Way Driver (Pro-Server, GP-Web and others) cannot be used.

*3 When using the Optional Ethernet I/F Unit, a bus conversion unit (PSL-CONV00) is required.

*4 Using the Optional Ethernet I/F Unit allows you to set up separate Class and Net Nos. for 2-Way Driver applications (Pro-Server, GP-Web and others) and the PLC. When doing this, data transfer with the PLC is performed through the Optional Ethernet I/F Unit.

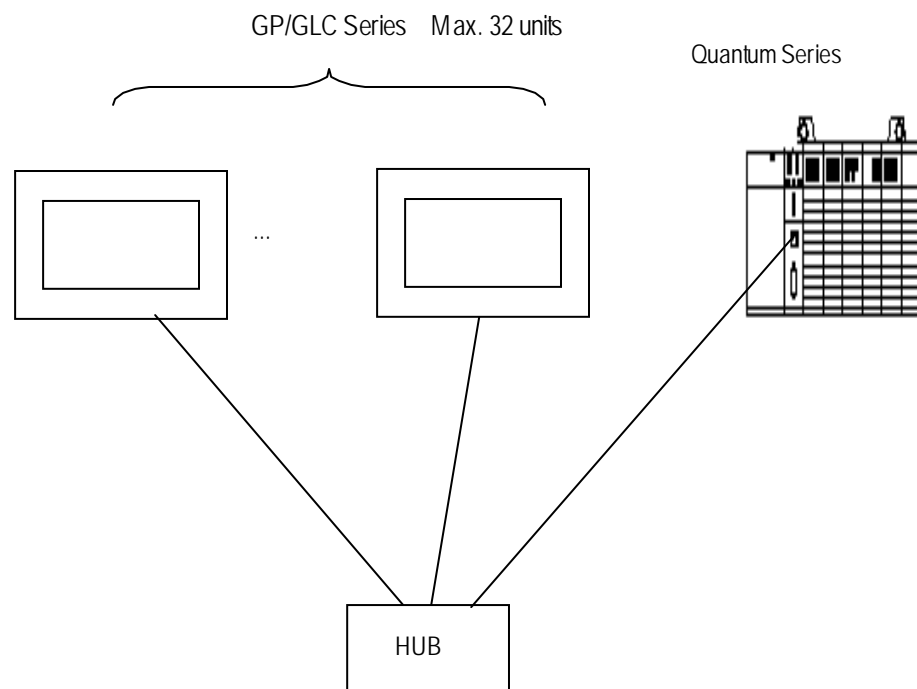
■ Connection Diagrams

◆ 1:1 Connection



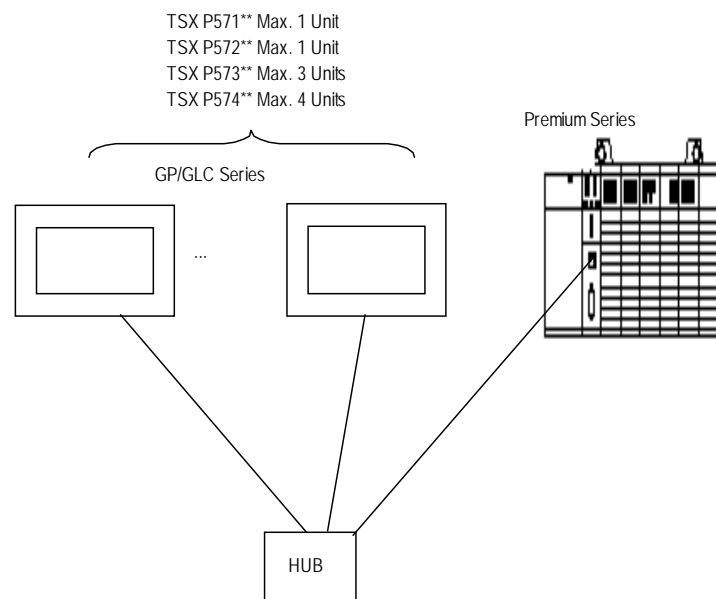
◆ n:1 Connection

- **Quantum Series**



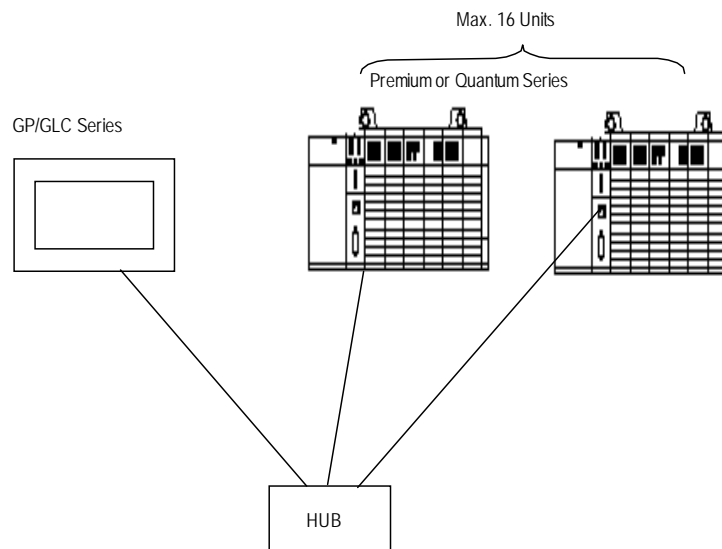
** The maximum number of units indicated is when only GP units are connected. When other devices are connected via an ethernet connection, the number of GP units that can be connected is limited.*

- **Premium Series**



* *The maximum number of units indicated is when only GP units are connected. When other devices are connected via an ethernet connection, the number of GP units that can be connected is limited.*

- **1:n Connection**



Note: When connecting the GP unit to multiple PLC units, the GP unit's display update speed may be slow, depending on operating conditions. Be sure to check the following points:

- Are many PLCs being monitored via the GP screen?
- Are discontinuous addresses used for screen parts and tags?

The following steps are recommended to increase the GP Unit Display Update Speed:

- Reduce the number of PLC units monitored.
- Use continuous setting addresses for the screen parts and tags.

3

Supported Devices

The following list shows the range of devices supported by the GP/GLC.

Setup System Area here

Device	Bit Address	Word Address	Particulars	
Output Discrete	1:000001~16:065535	1:000001~16:065521	$\div 16+1$	L/H
Input Discrete	1:100001~16:165535	1:100001~16:165521	$\div 16+1$ *1	
Output Register	1:40000100~16:46553515	1:400001~16:465535		
Input Register	_____	1:300001~16:365535	Bit 15 *1	

*1 Data cannot be written to the device. A “Higher Communication Error (02:FB)” error occurs when attempting to write data.



Note:

Device range varies depending on PLC specifications. For details, **Reference** your PLC Connection Manual



Important

- **Pro-Server Usage Restrictions:** When accessing devices from Pro-Server, be sure to symbolically define the device address you want to access. Create a screen and import the symbol to this screen via Pro-Server. For details, **Reference** your Pro-Server Operation Manual
- **When connecting to multiple GP units,** be sure to set the starting address such that no GP unit's system area overlaps with that of the other.

◆ Setting up Parts and Tags

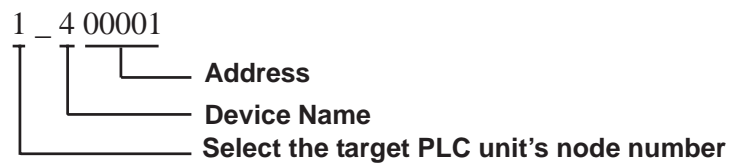
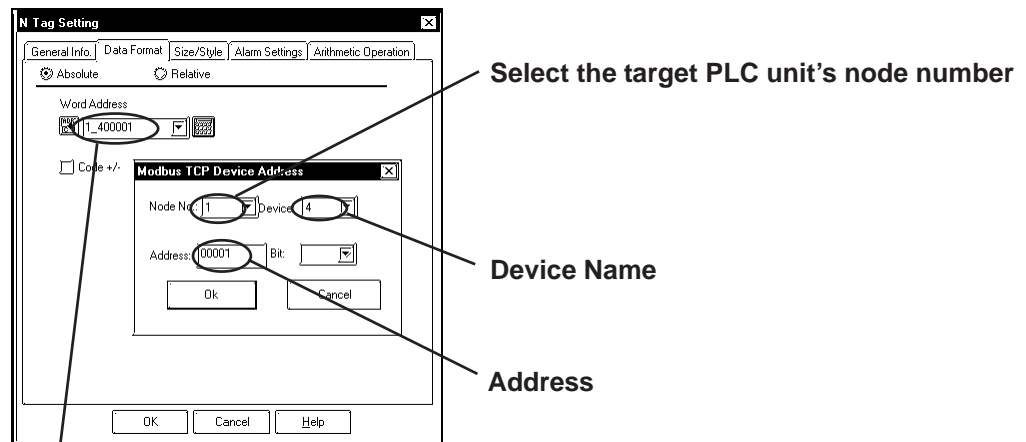
Before setting up tags and parts, it is necessary to set up network information (the partner PLC's IP address). Network information settings are performed via the [GP Setup] -> [Mode Settings] -> [Network] feature. For details,

Reference 4 Environment Setup

When setting up tags or pre-made parts, data can be read from / written to the designated PLC device by specifying the target PLC's Node No.

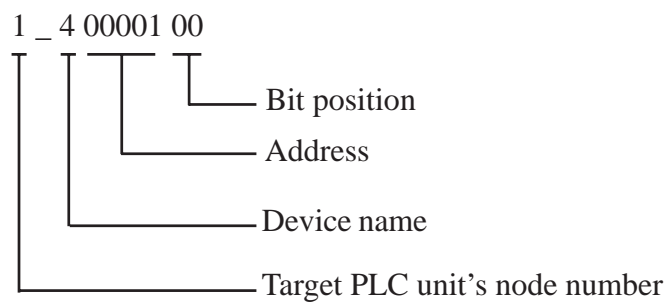
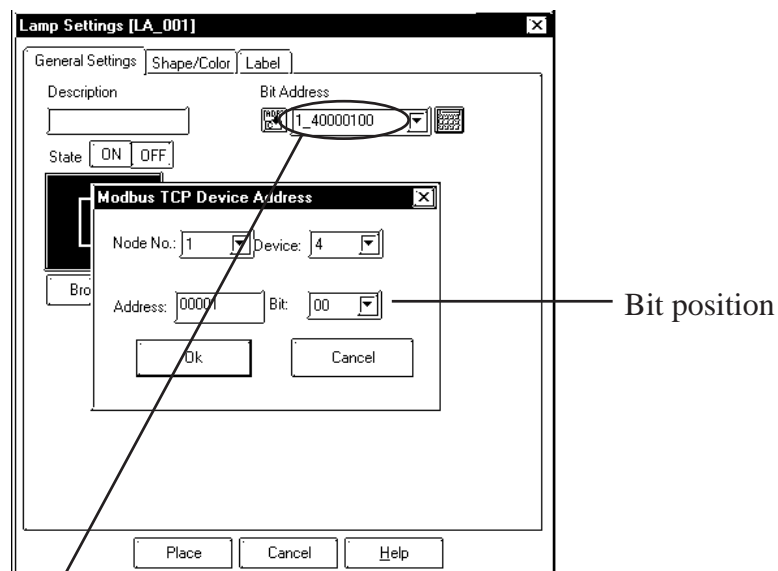
• **When designating a word address**

Be sure to perform the following selections/entries when designating a word address.



• **When designating a bit address**

Be sure to perform the following selections/entries when designating a bit address.



4

Environment Setup

■ Premium Series

GP Settings		PLC Settings ^{*2}	
SRC IP Address	GP Unit IP Address ^{*1}	_____	_____
DEST IP Address	PLC Unit IP Address ^{*1}	IP address	PLC Unit IP Address
Node No.	Each PLC unit's IP address information	_____	_____
_____	_____	Ethernet Configuration	ETHERNET II

**1 Contact the network administrator for setting IP Addresses.*

**2 Be sure to perform PLC settings via the ladder software.*

■ Quantum Series

GP Settings		PLC Settings ^{*2}	
SRC IP Address	GP Unit IP Address ^{*1}	_____	_____
DEST IP Address	PLC Unit IP Address ^{*1}	Internet address	PLC Unit IP Address
Node No.	Each PLC unit's IP address information	_____	_____
_____	_____	Frame Type	ETHERNET II

**1 Contact the network administrator for setting IP Addresses.*

**2 Be sure to perform PLC settings via the ladder software.*



Note:

- **Communication format is fixed to “TCP”.**
- **The PLC unit’s port number is fixed at 502.**
- **The GP unit’s factory-set port number is 1024. However, if the connection cannot be opened or is closed, when the connection is later reopened, the port number will be automatically increased by 1.**

■ GP Setup Operation Surroundings Menu (OFFLINE)

SETUP OPERATION SURROUNDINGS MENU		RETURN
1	SETUP OPERATION SURROUNDINGS	
2	SETUP ETHERNET INFORMATION	
3	SETUP ETHERNET EXT. INFORMATION	

◆ Setup Operation Surroundings (Large-sized GP)

SETUP OPERATION SURROUNDINGS									
STARTING ADDRESS OF SYSTEM DATA AREA [400000]									
NODE No. [1]									
SYSTEM AREA READING AREA SIZE (0-256) [0]									
RESET GP ON DATA WRITE ERROR NO <input type="radio"/> OFF <input checked="" type="radio"/>									
1	2	3	4	5	6	7	8	9	0

System area related and RESET GP ON DATA WRITE ERROR settings are performed via this screen. NODE No. indicates the PLC Node No. to which the system area has been allocated.

• Setup Operation Surroundings (Medium-sized GP)

SETUP OPERATION SURROUNDINGS	
SYSTEM AREA START ADR	<input type="text" value="0"/>
Node No.	<input type="text" value="1"/>
SYSTEM AREA READ SIZE	<input type="text" value="0"/>
RESET GP ON WRITE ERROR	<input type="text" value="OFF"/>

■ Ethernet Information Settings

SETUP NETWORK INFORMATION											
SRC IP ADDRESS					[0].[0].[0].[0]					SET	CANCEL
DESTINATION IP ADDRESS (READ ONLY)											
NODE1: 192.168.0.1					NODE9: 192.168.0.1						
NODE2: 192.168.0.1					NODE9: 192.168.0.1						
...					...						
NODE6: 192.168.0.1					NODE13: 192.168.0.1						
NODE7: 192.168.0.1					NODE15: 192.168.0.1						
NODE8: 192.168.0.1					NODE16: 192.168.0.1						
1	2	3	4	5	6	7	8	9	0		

- **SRC IP ADDRESS**

Enter the IP address for the GP at your station. To do this, separate the 32 bits of the IP address into four segments of eight bits each, delimit those segments with a dot, and then enter them as decimal numbers.

- **DESTINATION IP ADDRESS (READ ONLY):**

Enter the IP address of the other station (PLC). These settings can be changed only via the screen editor software.



When the GP unit's IP address is 0.0.0.0, the IP address designated via the 2-Way driver's "SETUP ETHERNET INFORMATION" will be enabled.

■ Ethernet Information Extended Settings

SETUP NETWORK EXT. INFORMATION		SET	CANCEL																				
SEND WAIT TIME	[0](ms)																						
TIMEOUT	[0](x 2sec)																						
IP ROUTER ADDRESS	[0].[0].[0].[0]																						
SUBNET MASK	[0].[0].[0].[0]																						
<table border="1"> <thead> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>0</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				1	2	3	4	5	6	7	8	9	0										
1	2	3	4	5	6	7	8	9	0														

- **SEND WAIT TIME**

Wait time can be added when a command is transferred from the GP. Use the wait time if the traffic on the communication line is heavy. If no wait time is required, enter “0”.

- **TIMEOUT**

Enter the desired timeout value. If no response is received from the other station within the specified time, a timeout occurs. If “0” is specified, the default time is 15 seconds when using TCP, and 5 seconds when using UDP.

- **IP ROUTER ADDRESS**

Enter the IP address of the router (one only). If no router is used, enter a “0” in each of the four fields.

- **SUBNET MASK**

Enter the subnet mask data. If no subnet mask is used, enter a “0” in each of the four fields.

■ Screen Editor Software Settings

Screen Editor Settings are performed via the [GP Setup] screen's [Communication Settings] and [Mode Settings] tabs. The setting menus and items are as shown below.

◆ Communication Settings

The screenshot shows a dialog box titled "GP Settings - noname.prw" with a close button (X) in the top right corner. The dialog has three main tabs: "GP Settings", "I/O Settings", and "Mode Settings". The "GP Settings" tab is active and contains three sub-tabs: "Initial Screen Settings", "Extended Settings", and "Communication Settings". The "Communication Settings" sub-tab is selected, showing the following fields and options:

- Source IP Address: 0. 0. 0. 0
- Source IP Port No.: 1024
- Destination IP Address: 0. 0. 0. 0
- Destination IP Port No.: 1024
- Protocol Type: UDP TCP
- Data Code: BINARY ASCII

At the bottom right of the dialog is an "Advanced ..." button. At the bottom of the dialog are four buttons: "OK", "Cancel", "Defaults", and "Help".

- **Source IP Address**

Enter the GP unit's Source IP Address. Input a dot between every 8 bits to divide the IP Address (32 bits all together) into four groups, and enter decimal numbers in each group.



The other station (PLC)'s settings are performed via the [Mode Settings] tab.

◆ Advanced Communication Settings

The screenshot shows a dialog box titled "Advanced Communication Setup". It contains the following fields and controls:

- Send Wait Time:** A text box containing "0", followed by a spinner control and the unit "msec".
- Time Out:** A text box containing "0", followed by a spinner control and the unit "x2 sec".
- IP Router Address:** A text box containing "0. 0. 0. 0".
- Subnet Mask:** A text box containing "0. 0. 0. 0".
- UDP Retry Count:** A text box containing "2", followed by a spinner control.
- Buttons:** Three buttons are located on the right side: "OK", "Cancel", and "Help".

- **Send Wait Time**

Wait time can be added when a command is transferred from the GP. Use the wait time if the traffic on the communication line is heavy. If no wait time is required, enter "0".

- **Time Out**

Enter the desired timeout value. If no response is received from the other station within the specified time, a timeout occurs. If "0" is specified, the default time is 15 seconds when using TCP, and 5 seconds when using UDP.

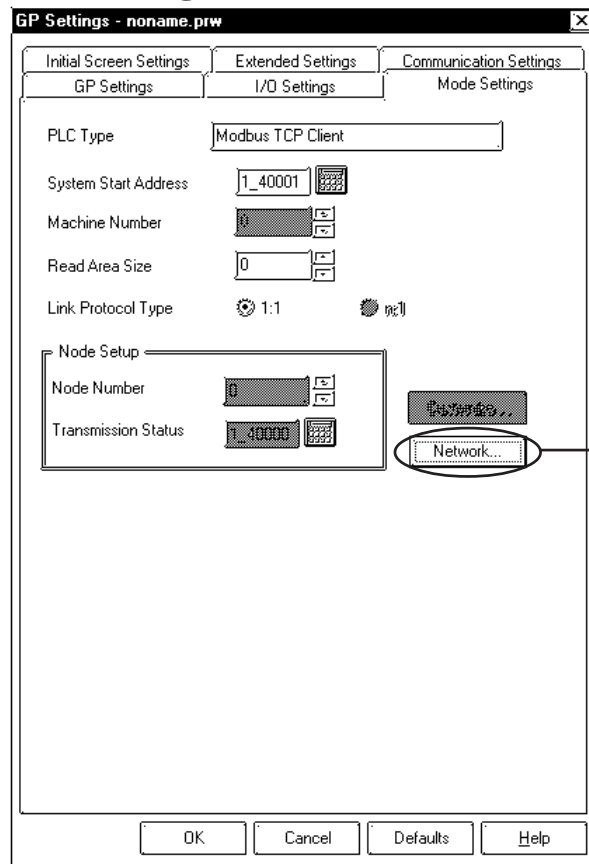
- **IP Router Address**

Enter the IP address of the router (one only). If no router is used, enter a "0" in each of the four fields.

- **Subnet Mask**

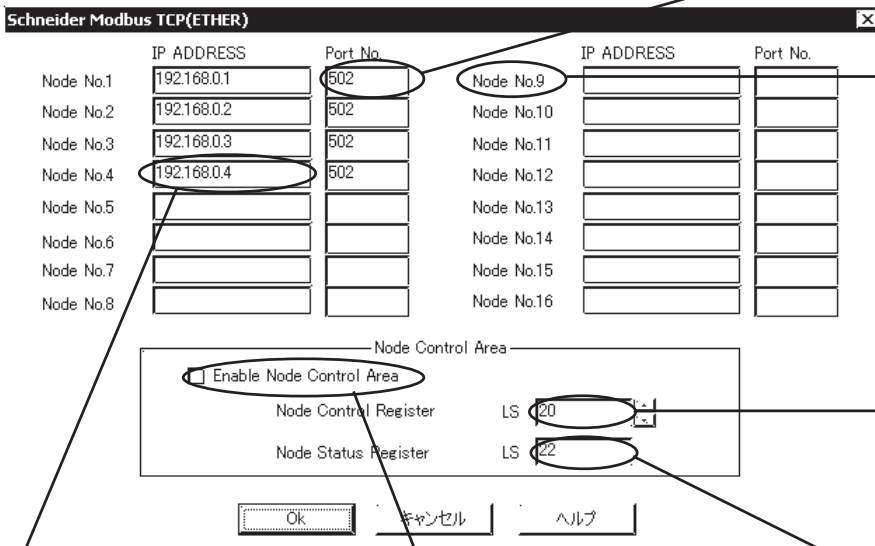
Enter the subnet mask data. If no subnet mask is used, enter a "0" in each of the four fields.

Mode Settings



Click here to set up other GP unit PLC settings.

Enter the PLC unit's Port number (502 or 1024 to 65535) Default: 502



Node Nos. are designated when setting up tag addresses. The IP ADDRESS(es) entered here allow you to access PLCs. This number is not related to the PLC unit's Slave Address Number.

Enter the Node Control Register's address (Range: from LS20 to LS8188) Default: 20

Enter the PLC unit's IP address (Range: from 0 to 255) Default: 0.0.0.0

Check [Enable Node Control Area], and the Area will get enabled. For details of the settings, refer to "Node Control Area".

Enter the Node Status Register's address. Set the address of Node Status Register which is the address of Node Control Register + 2. (Range: from LS22 to LS8190) Default: 22

■ Node Control Area

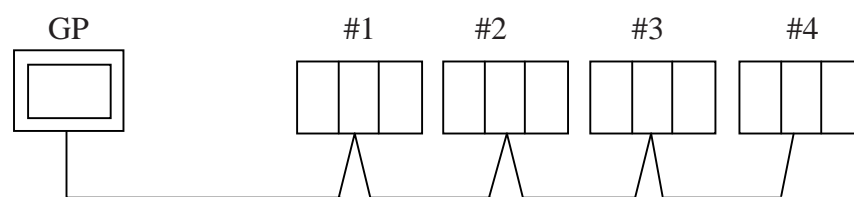
When multiple nodes (PLCs) are connected, the Node Control feature allows you to control the GP unit's access of multiple nodes (PLCs).

<System Design>

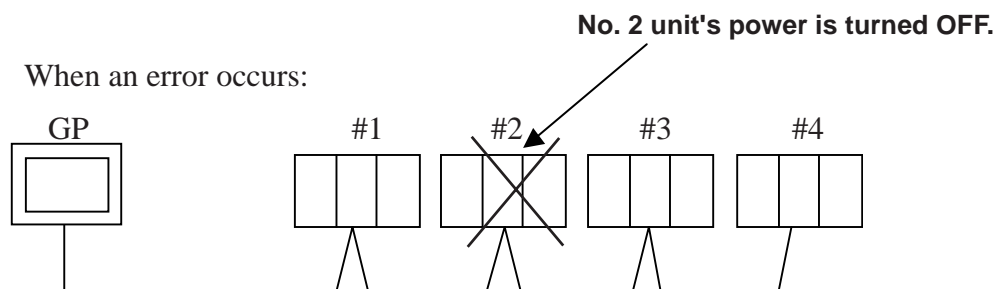
In the following example 4 PLCs are connected to a single GP. If the PLC units all operate normally, data transfer is carried out smoothly.

However, if one or more of the PLC units develops an error and is taken out of the network, any read/write tags used on the GP unit's screen will create a communication error. The resulting connection retries will then slow the performance of the network.

When all PLC units are operating normally:



Here readout processing is performed in order - #1 -> #2 -> #3 -> #4 -> #1 -> #2 , etc.



When an error occurs:

When unit #2's power is turned OFF, a communication error will occur. After the error occurs, the GP unit's communication retries will begin.

The processing pattern will then become #1 -> error processing -> #3 -> #4 -> #1 -> error processing, etc.

The error processing is continually trying to read out data, which will delay the overall speed by 1 cycle.

Using the Node Control feature, the Node Control Register's bit is used to control communication while the PLC is online.

When the above type of system is used, D-Script can be used to detect errors and turn the Node Control Area's bit OFF to stop communication with unit #2.

This, in turn, creates a readout pattern of #1 -> #3 -> #4 -> #1 -> #3, and so on that skips Node #2 completely and prevents the overall cycle time from slowing.

◆ **Node Control Area Settings**

Control of each Node is possible using the following LS bit operation allocated to the Node Control Area.

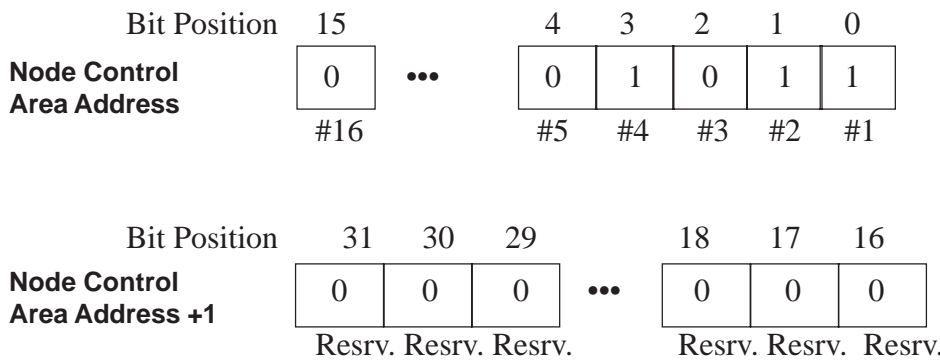
Also, in the Node Status Area the communication error's status can be checked.

- Node Control Area Bit: 0: No communication 1: Performing communication
- Node Status Area Bit: 0: No error 1: Error occurred

Node Control Area

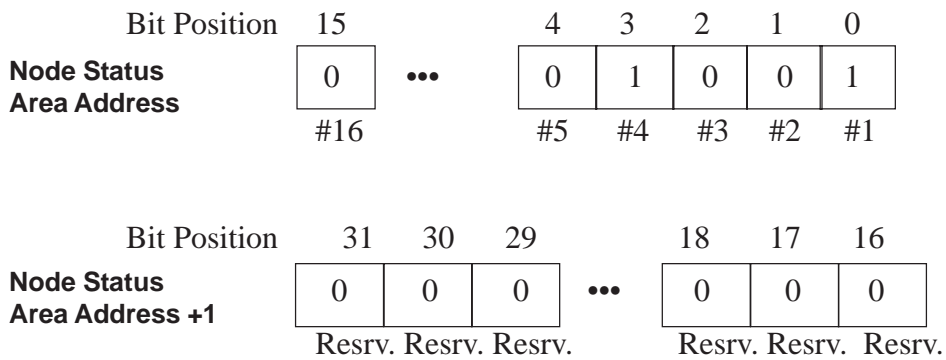
Each bit is allocated to each Node.

Ex. As shown below, Nodes #1, #2 and #4 are communicating normally with the GP. Node #3 is not communicating.



Node Status Area

Ex. As shown below, Nodes #1 and #4 developed a communication error.



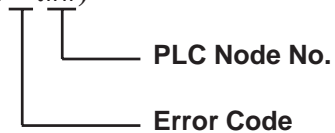
5

Error Codes

■ PLC SPECIFIC ERROR CODES

PLC error codes are displayed in the left lower corner of GP screen in the format shown below. ** indicates PLC specific error codes, and ## indicates the node number of the PLC where the error occurred.

Host Communication Error (02::##)**



Error Code	Description
02	Attempted to read data from / write data to a non-existing device or address

6 Protocol Stack Error Codes

Protocol Stack Error Codes are displayed on the GP as follows.

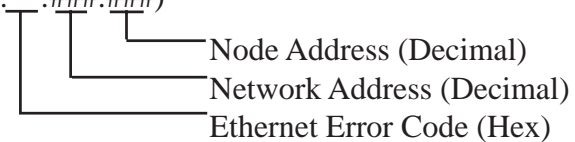
Host communication error (02:FE:**)

** represents one of the following error codes, from 00 to F0.

Error Code	Description	Notes
00	There is a setup error related to the IP address of your station at initialization.	
05	Initialization has failed.	
06	Cancelling of communications has failed.	
07	An attempt was made to establish a connection before initialization was successfully completed.	
08	Your station's port number is incorrect	
09	The destination station's port number is incorrect.	
0A	The IP address of the other station is incorrect.	
0B	The same port number is already being used by UDP for establishing the connection.	
0C	The same port number is already being used by TCP for establishing the connection.	
0D	Protocol stack has refused connection establishment.	
0E	Protocol stack has returned the unsuccessful establishment of a connection.	
0F	The connection has been shut down.	
10	All connections are busy. No connection is available.	
13	Your station was aborted by a different station.	
30	There was no reply from the protocol stack.	
32	There was no reply from the other station.	*1 *2
40	No network information exists for the designated node.	*1
41	I/O memory type of the random read-out response data is incorrect.	*1
42	Network information does not exist.	
F0	Undefined error.	

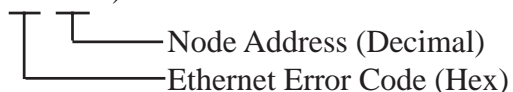
*1 When using an OMRON Corporation CS1/CJ/CJ1M Series unit, the error code will appear on the GP screen as shown below. Also, behind the Ethernet error code will appear the designated Network and Node addresses.

Host Communication Error (02:FE:**:###:###)



*2 When using a Hitachi Industrial Equipment Corporation's HIDIC H Series or a Schneider Corporation MODBUS TCP unit, the error code will appear on the GP screen as shown below. Also, behind the Ethernet error code will appear the designated Node address.

Host Communication Error (02:FE:**:###:###)



7**Maximum No. of Consecutive Addresses**

The following lists the maximum number of consecutive addresses that can be read.

Device	Max. No. of Consecutive Addresses
Output Discrete	80 Words
Input Discrete	
Output Register	
Input Register	

8

Device Codes and Address Codes

Device codes and address codes are used to specify indirect addresses for the E-tags or K-tags.

The word addresses of data to be displayed are coded and stored in the word address specified by the E-tags and K-tags. (Code storage is done either by the PLC, or with T-tag and K-tags)

Device	Word Address	Device Code	Address Code
Output Discrete	1:000001 ~	B000	(Word Address - 1) / 16
	2:000001 ~	B200	
	:	:	
	16:000001 ~	CE00	
Input Discrete	1:100001 ~	9000	(Word Address - 1) / 16
	2:100001 ~	9200	
	:	:	
	16:100001 ~	AE00	
Output Register	1:400001 ~	D200	Word Address - 1
	2:400001 ~	D400	
	:	:	
	16:400001 ~	F000	
Input Register	1:300001 ~	2000	Word Address - 1
	2:300001 ~	2200	
	:	:	
	16:300001 ~	3E00	
LS Area	LS000 ~	4000	Word Address

9

Address Conversion Table

The symbols used in the table have the following meanings:

- : When the address conversion device type is set to [Word], the system converts both word and bit devices. When the [Bit] setting is used, only bit device addresses are changed.

■ Schneider Electric Modbus TCP Ethernet

		After Conversion				
		0	1	4	3	LS
Before Conversion	Output Discrete 0	○	○	○	○	○
	Input Discrete 1	○	○	○	○	○
	Output Register 4	○	○	○	○	○
	Input Register 3	○	○	○	○	○
	System Area (LS)	○	○	○	○	○