GP-PRO/PBIII

PLC CONNECTION MANUAL

ADDITIONAL MANUAL

Rockwell (Allen-Bradley)

ControlLogix 5000

Series

Pro-face
Human Machine Interface

Reading the GP-PRO/PBIII Device/PLC Connection Manual

This document is designed as an addition to the latest GP-PRO/PBIII for Windows Device/PLC Connection manual's Rockwell PLC data, and covers the Rockwell ControlLogix 5000 Series unit information.

Please refer to this data when connecting a Rockwell ControlLogix 5000 Series unit.

For information concerning general type PLC connections and this document's documentation conventions, please refer to your Device/PLC Connection manual.

The information in this document will be included in the next version of the Device/PLC Connection manual. Therefore, please consider this a provisional document.

Installation

This CD-ROM includes all the protocol files required by the GP/GLC to communicate with a Rockwell PLC. Also, you will need to have the GP Screen Editor software (GP-PRO/PBIII for Windows95 version 2.1 or higher) installed on your personal computer's hard disk. For information about the installation of the GP Screen Editor software, refer to that software's Operation Manual.

1) Be sure to Confirm that the GP Screen Editor software is installed in your PC prior to starting this driver installation.

2) To install the Rockwell protocol files, click on this CD-ROM's "abcl_df1.exe" file icon.

3) Once the setup program starts, follow the instructions given to install the protocol files.

When using the ControlLogix 5000 Series unit, select [Allen Bradley Control Logix (DF1)] for the " PLC Type" .

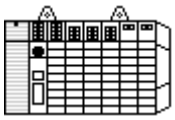
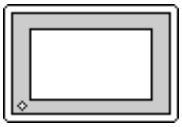
2.17 Rockwell (Allen-Bradley)

2.17.1 System Structure

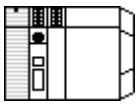
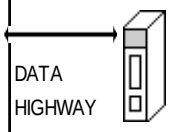
The following describes the system structure for connecting the GP to Rockwell (Allen-Bradley) PLCs.

Reference *The Cable Diagrams mentioned in the following tables are listed in the section titled "**2.17.2 Cable Diagrams**".*

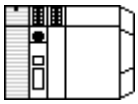
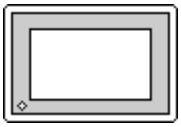
■ SLC 500 Series (using CPU unit Link I/F)

CPU	Cable Diagram	GP
		
SLC-5/03 SLC-5/04	RS-232C (Cable Diagram 1)	GP Series

■ PLC-5 Series (using Link I/F)

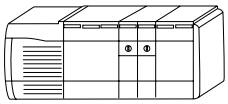
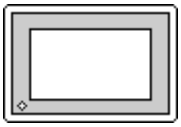
CPU	Link I/F	Cable Diagram	GP
			
All PLC-5 processors which can connect one of the link unit shown on the right.	1785-KE 1785-KE/C	RS-232C (Cable Diagram 2)	GP Series
	1770-KF2	RS-232C (Cable Diagram 3) RS-422 (Cable Diagram 4)	

■ PLC-5 Series (CPU Direct Connection)

CPU *1	Cables Diagram	GP
		
PLC-5/11 PLC-5/20 PLC-5/30 PLC-5/40 PLC-5/40L PLC-5/60 PLC-5/60L	RS-232C (Cable Diagram 3) RS-422 (Cable Diagram 5)	GP Series

**1 Connect to Channel 0 (CH0).*

■ ControlLogix 5000 Series (using CPU unit Link I/F)

CPU	Cable Diagram	GP/GLC
		
1756-L1 1756-L1M1 1756-L1M2 1756-L1M3 1756-L55M13 1756-L55M14 1756-L55M15	RS-232C <Cable Diagram 6>	GP Series *1 GLC Series

**1 This unit can be used with the GP-377 Series, GP77R Series, GP2000 Series, GLC2000 Series units.*

2.17.2 Cable Diagrams

The cable diagrams illustrated below and the cable diagrams recommended by Rockwell (Allen-Bradley) may differ; however, using these cables for your PLC operations will not cause any problems.

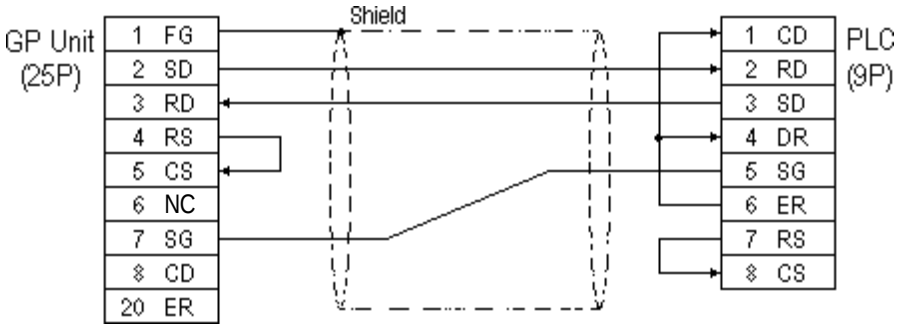
Careful!

Ground your PLC's FG terminal according to your country's applicable standard. For details, refer to the corresponding PLC manual.

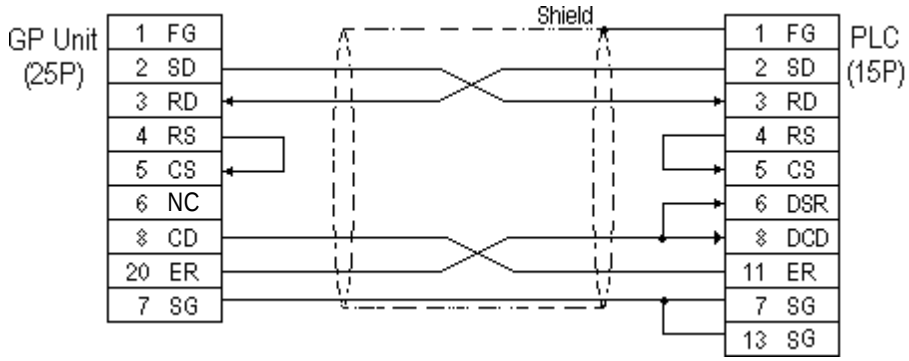
Important

- ***Connect the FG line of the Shield cable to either the GP or PLC, depending on your environment. When using a* connector hood *and grounding the FG line, be sure to use an electrical conductor.***
- ***For the RS-232C connection, use a cable length less than 15m.***
- ***If a communications cable is used, it must be connected to the SG (signal ground).***
- ***For the RS-422 connection, refer to Rockwell's PLC manual for the cable length.***

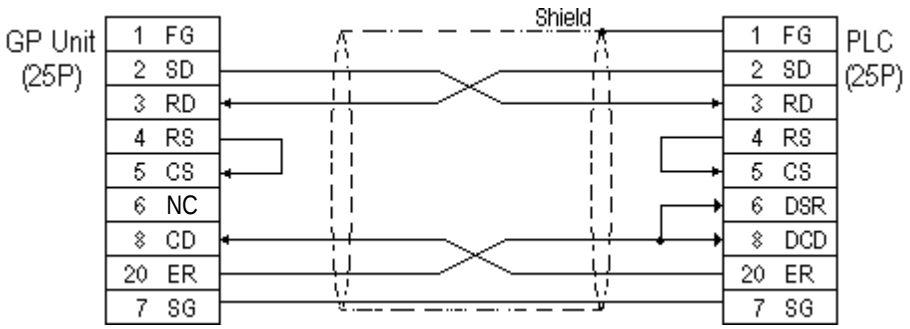
Cable Diagram 1 (RS-232C)



Cable Diagram 2 (RS-232C)

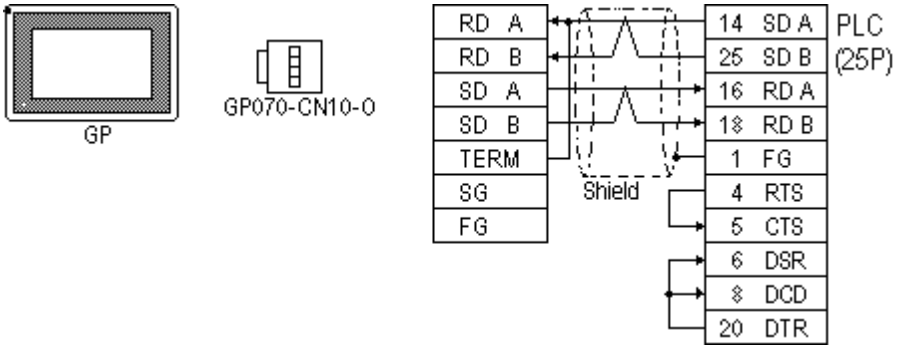


Cable Diagram 3 (RS-232C)

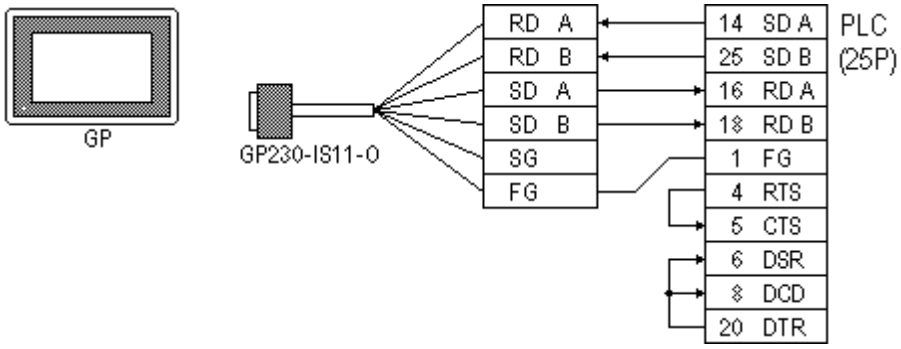


Cable Diagram 4 (RS-422)

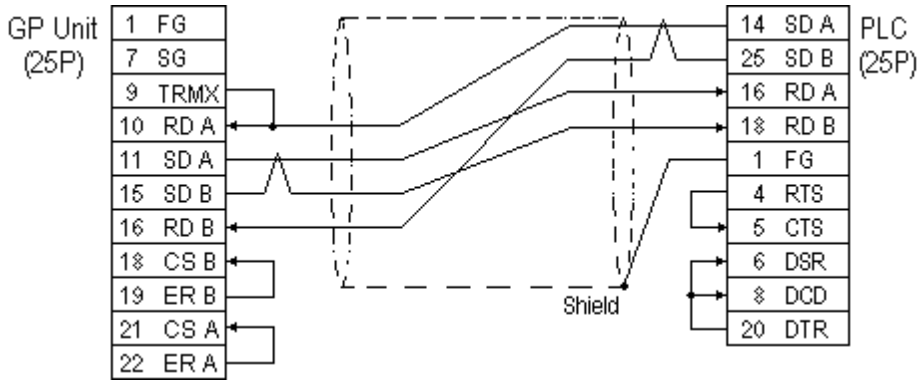
• When using Digital's RS-422 connector terminal adapter, GP070-CN10-0



• When using Digital's RS-422 Cable, GP230-IS11-0



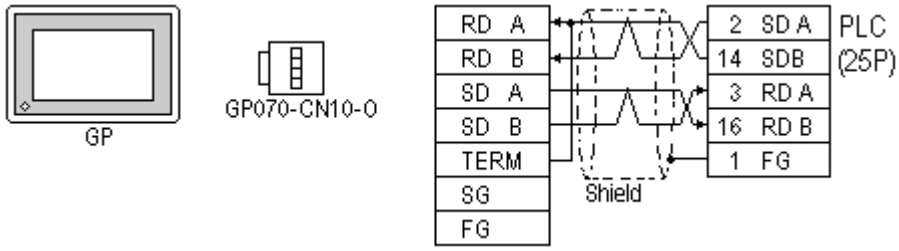
• When making your own cable connections



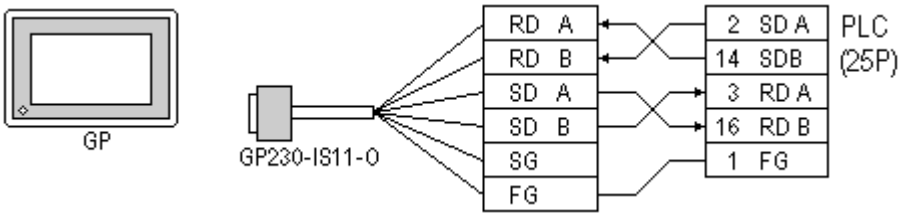
When connecting the #9 and #10 pins in the GP Serial I/F, a termination resistance of 100Ω is added between RDA and RDB.

Cable Diagram 5 (RS-422)

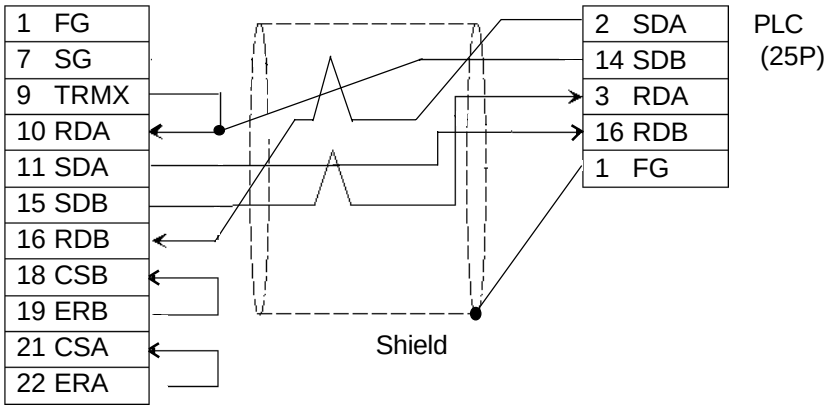
• When using Digital's RS-422 connector terminal adapter, GP070-CN10-0



• When using Digital's RS-422 Cable, GP230-IS11-0

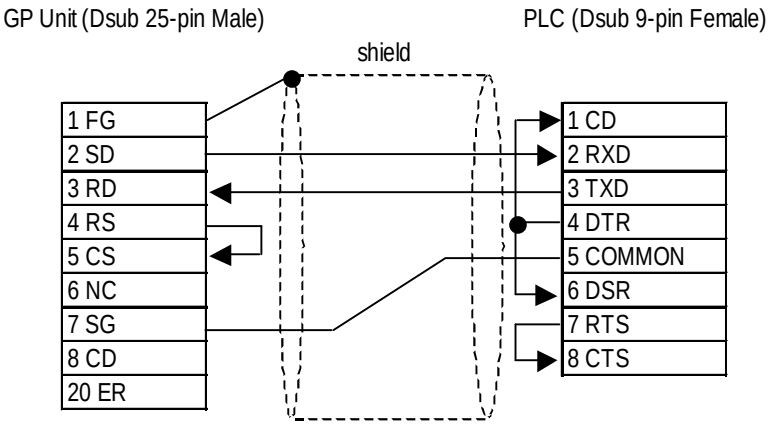


• When making your own cable connections



When connecting the #9 and #10 pins in the GP Serial I/F, a termination resistance of 100Ω is added between RDA and RDB.

Cable Diagram 6 (RS-232C)



Note:

- **Connect the shield to the GP's FG terminal.**
- **If a communications cable is used, it must be connected to the SG terminal and COMMON terminal.**

2.17.3 Supported Devices

The following describes the range of devices supported by the GP.

■ SLC 500 Series

Setup System Area here.

Device	Bit Address	Word Address	Particulars	
Bit	B0030000 ~ B003255F B0100000 ~ B255255F	B0030000 ~ B003255 B010000 ~ B255255		H/L
Timer (TT: Timing Bit)	TT0040000 ~ TT0042550 TT0100000 ~ TT2552550	---	*1	L/H
Timer (DN: Completion Bit)	TN0040000 ~ TN0042550 TN0100000 ~ TN2552550	---	*1	
Timer (PRE: Setup Value)	---	TP004000 ~ TP004255 TP010000 ~ TP255255	*2	
Timer (ACC: Current Value)	---	TA004000 ~ TA004255 TA010000 ~ TA255255	*2	
Counter (CU: Up Count)	CU0050000 ~ CU0052550 CU0100000 ~ CU2552550	---	*1	
Counter (DC: Down Count)	CD0050000 ~ CD0052550 CD0100000 ~ CD2552550	---	*1	
Counter (CN: Completion Bit)	CN0050000 ~ CN0052550 CN0100000 ~ CN2552550	---	*1	
Counter (PRE: Setup Value)	---	CP005000 ~ CP005255 CP010000~ CP255255	*2	
Counter (ACC: Current Value)	---	CA005000 ~ CA005255 CA010000 ~ CA255255	*2	
Integer	---	N007000 ~ N007255 N010000 ~ N255255	Bit	H/L

1 As in Example 4 in the following Note section, enter a **0 at the end.*

**2 When reading and writing consecutive addresses that are all two words or longer, reading will take longer than for other devices, and the overall screen refresh speed will be slower.*

Note:

- **File Numbers 0~7 are the User's default files.**
- **A PLC COM Error (02:10) develops when a device cannot be allotted into the PLC data table map.**
- **According to the SLC500 specifications, the input and output relays cannot perform direct reads and writes. As a result, perform the following procedures via the PLC:**

  When reading data; use a ladder program to move the input and output relay data either as bits or as integers, and then read out those bits or integers.

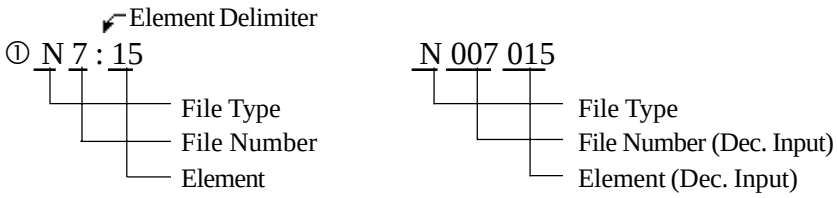
  When writing data; write the data as either bits or integers, and then use the ladder program to move the data to the input or output relays.

- **In Rockwell (Allen-Bradley) PLCs, the structure of each device data is determined from the *Element*; in GP-PRO/PBIII for Windows there is no concept called the *Element*. Use the following examples when entering device data.**

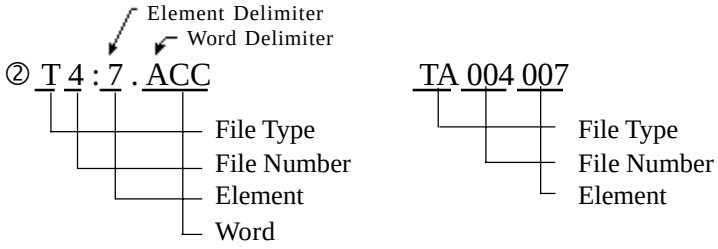
Examples

PLC Data	GP-PRO/PBIII Input

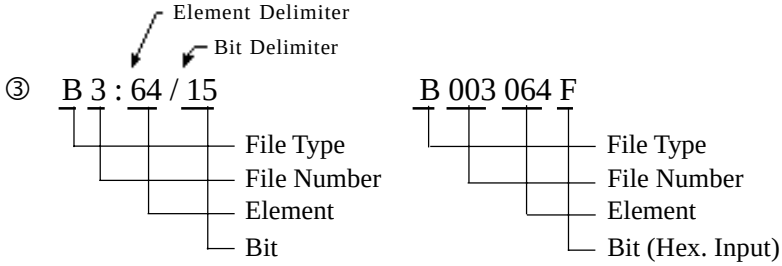
■*When Using Elements*

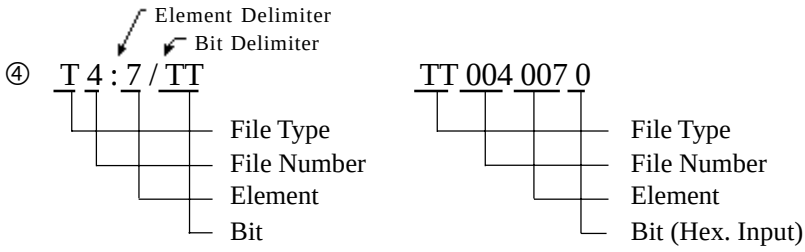


■*When Using Words*



■*When Using Bits*





■ PLC-5 Series

Setup System Area here.

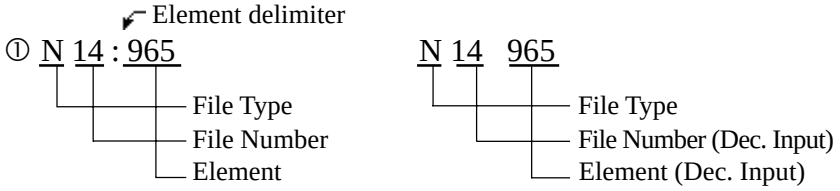
Device	Bit Address	Word Address	Particulars	
Input Relay	I00000 ~ I27717	I000 ~ I277	÷8	H/L
Output Relay	O00000 ~ O27717	O000 ~ O277	÷8	
Internal Relay	B300000 ~ B6799915	B3000 ~ B67999		
Timer (TT: Timing Bit)	TT3000 ~ TT67999	---		L/H
Timer (TD: Complete Bit)	TD3000 ~ TD67999	---		
Counter (CC: Count)	CC3000 ~ CC67999	---		
Counter (CD: Complete Bit)	CD3000 ~ CD67999	---		
Timer (ACC: Current Value)	---	TA3000 ~ TA67999		
Timer (PRE: Setup Value)	---	TP3000 ~ TP67999		
Counter (ACC: Current Value)	---	CA3000 ~ CA67999		
Counter (PRE: Setup Value)	---	CP3000 ~ CP67999		
Data Register Integer	---	N3000 ~ N67999	Bit 15	H/L
Data Register BCD	---	D3000 ~ D67999	Bit 15	
Data Register ASCII	---	A3000 ~ A67999	Bit 15	

Note:

- **The range of supported devices may be different depending on your CPU.**
- **In Rockwell (Allen-Bradley) PLCs, the structure of each device data is determined from the *Element*; in GP-PRO/PBIII for Windows there is no concept called the *Element*. Use the following examples when entering device data.**

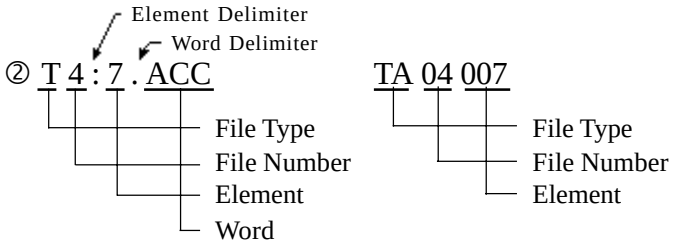
PLC Data **GP-PRO/PBIII Input**

■*When Using Elements*

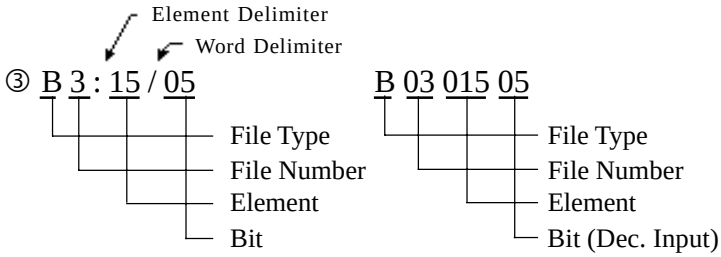


PLC Side **GP-PRO/PBIII Input**

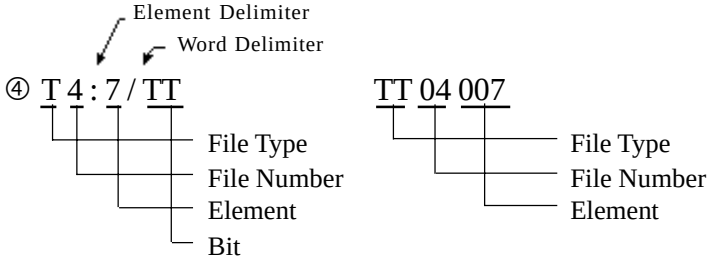
■*When Using Words*



■*When Using Bits*

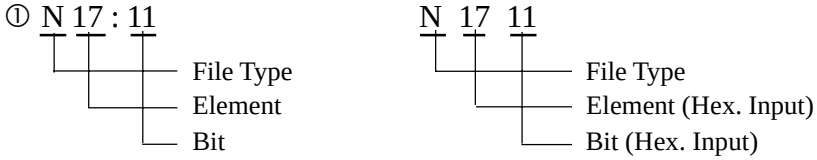


B301505 represents the same data as B3/245 (number 245 bits of file number 3). However, GP-PRO/PBIII for Windows cannot be used to input B3/245 directly.



- **There is no File Number for the *Input Relay* and *Output Relay*. Also, the Element and Bit Numbers are Hexadecimal.**

PLC Side **GP-PRO/PBIII Input**



■ ControlLogix 5000 Series

Setup System Area here.

Device	Bit Address	Word Address	Paticular	
Bit (BOOL)	BOOL00000000~BOOL99999931	BOOL000000~BOOL999999	*1*3	L/H
8 bit integer (SINT)		SINT000000~SINT999998	Bit 7 ÷2 *1	
16 bit integer (INT)		INT000000~INT999999	Bit 15 *1	
32 bit integer (DINT)		DINT000000~DINT999999	Bit 31 *1	
32 bit float (REAL)		REAL000000~REAL999999	*1*2	H/L

***1 When using a GP Series unit to access a ControlLogix 5000 Series unit's data memory, you must first allocate data memory's array elements. When allocating array elements, use File numbers and Element numbers. An address designation example is shown below for GP-PRO/PBIII for Windows.**

INT 123 100
Element number (0~999)
File number (0~999)

***2 This device uses Float. When this type of device is used, only the E-tag and K-tag's "32-bit Float" setting can be used.**

***3 The BOOL device descriptions used in the GP-PRO/PBIII manual and the RSLogix 5000 manual are different. Please be aware of these differences when setting up BOOL devices.**

GP-PRO/PBIII manual	000000 00~ 000000 31	000001 00~ 000001 31	000002 00~ 000002 31	~	000999 00~ 000999 31
RSLogix 5000 manual	0~31	32~63	64~95	~	31968~31999

Important

When using the GP to access a PLC device, be sure to first allocate all Tags used by PLC Data Memory to their respective devices. Use the Rockwell's RSLogix 5000 ladder logic software to allocate these devices.

If device allocation is not performed, a Host Communication Error will occur (02:D6).

Reference *2.17.5 Error Codes*

Device Setting Example

The following explanation is for the ControlLogix 5000 device allocation.

1) PLC Tag Settings

Designate the Tag Name and Type.

- Tag Name : Can be set to any value. (Not related to GP device name)
- Type : Use one of the following data types for the Element setting.

(Use the same device name as the GP)

BOOL (32-bit data type)

INT (word data type)

DINT (dword data type)

SINT (byte data type)

REAL (float data type)

Example 1

Tag Name	Type
N7	INT[200]
DINT1	DINT[100]
DATA2	SINT[50]

This example's data uses the following values.

Row1 : Tag Name "N7" uses the INT data type for a 200 element array.

Row2 : Tag Name "DINT1" uses the DINT data type for a 100 element array.

Row3 : Tag Name "DATA2" uses the SINT data type for a 50 element array.

Be sure to set the number of array elements within the GP unit's maximum usable range. (The GP can access up to 999 elements.)

Also, if array elements are not designated, only one element can be used.

Ex. Tag Name:N8, Type:INT allows only one word to be used by N8.

2) Mapping Settings

The tag name set in 1) can have any desired file number allocated to it. It is not possible to set the same file number to two tag names.

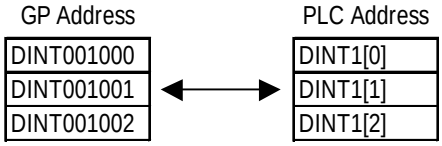
Example 2

File Number	Tag Number
2	DATA2
1	DINT1
7	N7

After setting the Tag Name, Type and File Number, you can access PLC devices from the GP unit. Using example 2's data, the addresses that can be designated are as follows:

- INT007000~INT007199
- DINT001000~DINT001099
- SINT002000~SINT002049

(GP < — > PLC Address Map Example)



2.17.4 Environment Setup

The following tables list Digital's recommended PLC and GP communication settings.

■ SLC 500 Series

GP Setup		Special Interface Module Setup	
Baud Rate	19200 bps	Baud Rate	19200 bps
Data Length	8 bits (fixed)	---	
Stop Bit	1 bit (fixed)	---	
Parity Bit	EVEN	Parity Bit	EVEN
Data Flow Control	ER Control	---	
Communication Format	RS-232C	---	
---		Communication Driver	DF1 HALF-DUPLEX SLAVE *1
---		Duplicate Packet Detection	DISABLE *1
---		Error Detection	BCC *1
---		Control Line	No Handshaking *1
Unit No. (DH GP) *2	0	Station Address *2	0

** 1 Will not operate with any other settings.*

** 2 Setup the Station Address and the GP's Unit No. (DH GP) address to the same value (address set as decimal values). It is unnecessary to setup the DH PLC address.*

Reference *Specifying DH addresses*

■ PLC-5 Series

GP Setup		CPU (CH0), 1785-KE, 1770-KF2	
Baud Rate	19200 bps	Baud Rate	19200 bps
Data Length	8 bits (fixed)	Data Length	8 bits (fixed)
Stop Bit	1 bit (fixed)	Stop Bit	1 bit (fixed)
Parity Bit	EVEN	Parity Bit	EVEN
Data Flow Control	ER Control	---	
Communication Format (RS-232C)	RS-232C	Communication Format (RS-232C)	RS-232C
Communication Format (RS-422)	4-wire type	Communication Format (RS-422)	RS-422A
---		Comm. protocol	Half duplex (DF1 Slave for CH0) *1
---		Dupulicate Detect	OFF *1
---		Error Check	BCC *1
---		Control Line	NO HANDSHAKING *1
---		Other CH0 Parameters	50
---		DF1 retries	3
---		Diag file	0 (unused file)
---		RTS send delay	0
---		RTS off delay	0
---		Network link *2	Data Highway Plus
Unit No. (DH GP) *3	0	Station Address *4 *5 (1785-KE, 1770-KF2 side)	0
Unit No. (DH PLC) *3	1	Station Address *4 (CPU side)	1

**1 Will not operate with any other settings.*

**2 This is the KF2 setup*

**3 Set the DH GP to station address 1785-KE or 1770-KF2, and set the DH PLC's to the CPU's station address. When using the 1785-KE or 1770-KF2, enter different numbers for the DH GP and DH PLC addresses. With a direct CPU connection, enter the same values in the DH GP and DH PLC addresses. With the GP in Offline Mode, use the "Operating Environment Setup" area to enter the DH address (DH, GP, DH, PLC) base 10 (decimal) values.*

Reference *Specifying DH addresses*

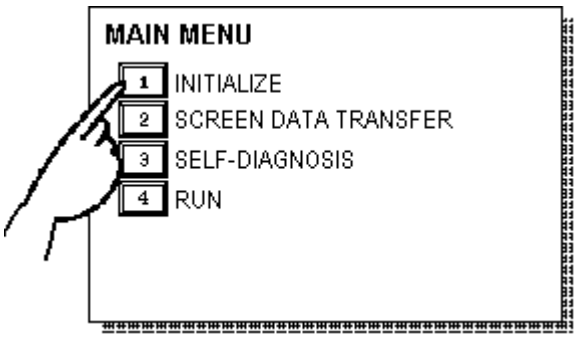
**4 When using programming equipment, make sure the Terminal Address (programming equipment address) and the Station Address do not overlap.*

**5 Unavailable for CPU Direct Connection.*

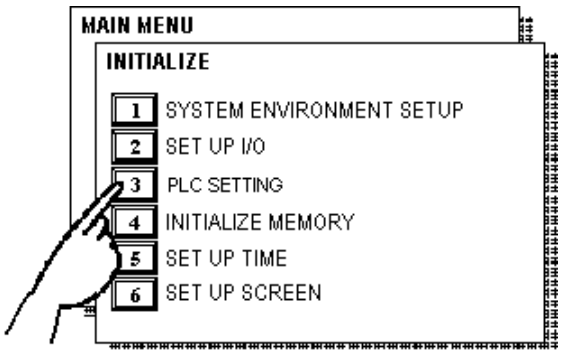
Note: **When using CH0, setup the CPU to *Slave*; do not setup as *Point to Point*.**

■ Specifying DH addresses

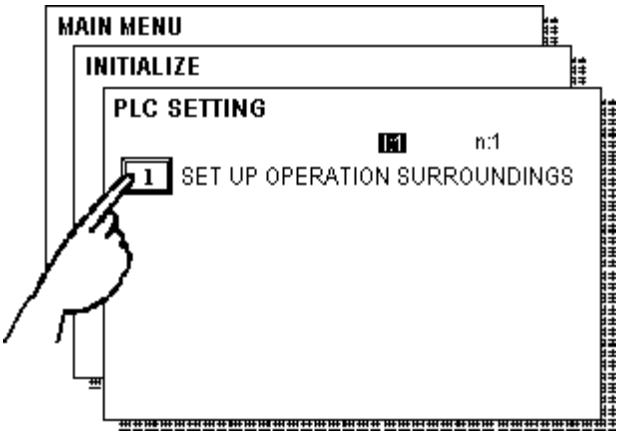
Set up the operating environment at the initial setup when the GP is in the OFFLINE mode.



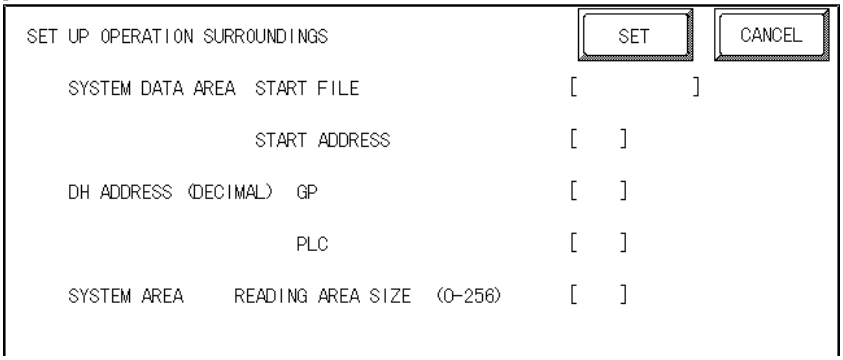
① Touch item #1, INITIALIZE. The INITIALIZE menu will appear.



② Touch item #3, PLC SETTING. The PLC SETTING menu will appear.



③ Touch selection [1:1] and then item #1, SET UP OPERATION SURROUNDINGS. The selected option is then highlighted.



④ Specify the DH addresses.

■ ControlLogix 5000 Series

GP Setup		PLC Setup	
Baud Rate	19200 bps	Baud Rate *1	19200 bps
Data Length	8 bit	Data Bits *1	8 bit
Stop Bit	1 bit	Stop Bit *1	1 bit
Parity Bit	Even	Parity *1	Even
Data Flow Control	ER	————	————
Communication Format	RS-232C	————	————
Unit No.	0	Station Address *2	0
————		Mode *1	System
————		Control Line *1	No Handshake
————		RTS Send Delay *1	0
————		RTS Off Delay *1	0
————		Protocol *2	DF1 Slave
————		Transmit Retries *2	3
————		Slave Poll Timeout *2	3000
————		EOT Suppression *2	No Check
————		Error Detection *2	BCC
————		Enable Duplicate Detection *2	No Check (Disable)

**1 Set via the Rockwell Ladder Logic Software RSLogix 5000 "Serial Port" menu.*

**2 Set via the Rockwell Ladder Logic Software RSLogix 5000 "System Protocol" menu.*

2.17.5 Error Codes

■PLC Error Codes

Controller error codes are represented by the "Host communication error (02:**)", and indicated in the left lower corner of the GP screen. (** stands for an error code.)

Host Communication Error (02:**)

PLC Error Code

*** There are two types of PLC error codes - STS and EXT STS.**

EXT STS error codes have the characters "0xD0" attached to them, to prevent them from overlapping with STS error codes. Thus, all error codes with the last characters of "0xCF" or earlier are STS error codes.

Ex.

When a (02:D2) Host Communication Error occurs, it becomes the EXT STS error code of "0x02".

When a (02:C0) Host Communication Error occurs, it becomes the STS error code of "0xC0".

A1 Maximum Number of Consecutive PLC Addresses

The following lists the maximum number of consecutive addresses that can be read by each PLC. Refer to these tables to utilize *Block Transfer*.

ControlLogix 5000 Series (using CPU unit Link I/F)

Device	Max No. of Consecutive Address
Bit (BOOL)	122 Words
8 bit integer (SINT)	
16 bit integer (INT)	
32 bit integer (DINT)	
32 bit float (REAL)	

A2 Device Codes and Address Codes

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

ControlLogix 5000 Series (using CPU unit Link I/F)

	Device	Word Address	Device Code	Address Code
Bit Device	Bit (BOOL)	BOOL000000~	8000	Double Word Address
		BOOL065000~	8200	
		BOOL130000~	8400	
		BOOL195000~	8600	
		BOOL260000~	8800	
		BOOL325000~	8A00	
		BOOL390000~	8C00	
		BOOL455000~	8E00	
		BOOL520000~	9000	
		BOOL585000~	9200	
		BOOL650000~	9400	
		BOOL715000~	9600	
		BOOL780000~	9800	
		BOOL845000~	9A00	
		BOOL910000~	9C00	
		BOOL975000~	9E00	
Word Device	8 bit integer (SINT)	SINT000000~	4C00	Word Address
		SINT100000~	4E00	
		SINT200000~	5000	
		SINT300000~	5200	
		SINT400000~	8400	
		SINT500000~	5600	
		SINT600000~	5800	
		SINT700000~	5A00	
		SINT800000~	5C00	
		SINT900000~	5E00	

	Device	Word Address	Device Code	Address Code
Word Device	16 bit integer (INT)	INT000000~	0000	Word Address
		INT065000~	0200	
		INT130000~	0400	
		INT195000~	0600	
		INT260000~	0800	
		INT325000~	0A00	
		INT390000~	0C00	
		INT455000~	0E00	
		INT520000~	1000	
		INT585000~	1200	
		INT650000~	1400	
		INT715000~	1600	
		INT780000~	1800	
		INT845000~	1A00	
		INT910000~	1C00	
		INT975000~	1E00	
	32 bit integer (DINT)	DINT000000~	2000	Double Word Address
		DINT065000~	2200	
		DINT130000~	2400	
		DINT195000~	2600	
		DINT260000~	2800	
		DINT325000~	2A00	
		DINT390000	2C00	
		DINT455000~	2E00	
		DINT520000~	3000	
		DINT585000~	3200	
		DINT650000~	3400	
		DINT715000~	3600	
		DINT780000~	3800	
		DINT845000~	3A00	
		DINT910000~	3C00	
		DINT975000~	3E00	
	32 bit float (REAL)	REAL000000~	6000	Double Word Address
		REAL065000	6200	
		REAL130000~	6400	
		REAL195000~	6600	
		REAL260000~	6800	
		REAL325000~	6A00	
		REAL390000~	6C00	
		REAL455000~	6E00	
		REAL520000~	7000	
		REAL585000~	7200	
		REAL650000~	7400	
		REAL715000~	7600	
		REAL780000~	7800	
		REAL845000~	7A00	
		REAL910000~	7C00	
		REAL975000~	7E00	
	LS area (LS)	LS0000~	4000	Word Address