X-SEL Controller Driver

Introduction

This manual describes how to connect the Display and the External Device.

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

1	System Configuration This section shows the types of External Devices that can be connected and SIO type.	☞ "1 System Configuration" (page 3)

2	Selection of External Device Select the model (series) of the External Device to be connected and its connection method.	☞ "2 Selection of External Device" (page 7)

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 8)

4	Setup Items This section describes communication setup items on the Display. Set the communication settings of the Display with GP-Pro EX or in off-line mode.	☞ "4 Setup Items" (page 10)

5	Cable Diagram This section shows cables and adapters for connecting the Display and the External Device.	☞ "5 Cable Diagram" (page 15)

Operation

1 System Configuration

The following shows the system configuration in which the External Device of IAI Corporation and the Display are connected.

Series	CPU	Link I/F	SIO Type	Setting Example	Cable Diagram
X-SEL (Linear Actuator Controller)	XSEL-J	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
	XSEL-K XSEL-KE XSEL-KT XSEL-KET	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
		Serial port on the CPU unit (PC connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 2 (page 16)
	XSEL-P XSEL-Q	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
X-SEL (SCARA Robot Controller)	XSEL-JX	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
	XSEL-KX XSEL-KTX	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
		Serial port on the CPU unit (PC connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 2 (page 16)
	XSEL-PX XSEL-QX	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)
SSEL	SSEL	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 3 (page 17)
ASEL	ASEL	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 3 (page 17)
PSEL	PSEL	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 3 (page 17)
Table-Top Actuator	TT	Serial port on the CPU unit (Teaching connector)	RS232C	Setting Example 1 (page 8)	Cable Diagram 1 (page 15)

■ Connection Configuration

• 1:1 Connection

Display

External Device

| NOTE | • When using the XSEL-K/KE/KT/KET/KX/KTX, the teaching and PC connectors cannot be used simultaneously. |

■ IPC COM Port

When connecting IPC with an External Device, the COM port used depends on the series and SIO type. Please refer to the IPC manual for details.

Usable port

Series	Usable Port		
	RS-232C	RS-422/485(4 wire)	RS-422/485(2 wire)
PS-2000B	COM1[*1] , COM2, COM3[*1], COM4	-	-
PS-3450A, PS-3451A, PS3000-BA, PS3001-BD	COM1, COM2[*1*2]	COM2[*1*2]	COM2[*1*2]
PS-3650A, PS-3651A	COM1[*1]	-	-
PS-3700A (Pentium®4-M) PS-3710A	COM1[*1], COM2[*1], COM3[*2] , COM4	COM3[*2]	COM3[*2]
PS-3711A	COM1[*1], COM2[*2]	COM2[*2]	COM2[*2]
PL-3000B, PL-3600T, PL-3600K, PL-3700T, PL-3700K, PL-3900T	COM1[*1*2], COM2[*1], COM3, COM4	COM1[*1*2]	COM1[*1*2]

*1   The RI/5V can be switched. Use the IPC's switch to change if necessary.

*2   Set up the SIO type with the DIP switch. Please set up as follows according to SIO type to be used.

DIP switch setting: RS-232C

DIP switch	Setting	Description
1	OFF[*1]	Reserved (always OFF)
2	OFF	SIO type: RS-232C
3	OFF	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	OFF	Short-circuit of SDA (TXA) and RDA (RXA): Not available
8	OFF	Short-circuit of SDB (TXB) and RDB (RXB): Not available
9	OFF	RS (RTS) Auto control mode: Disabled
10	OFF	

*1   When using PS-3450A, PS-3451A, PS3000-BA and PS3001-BD, turn ON the set value.
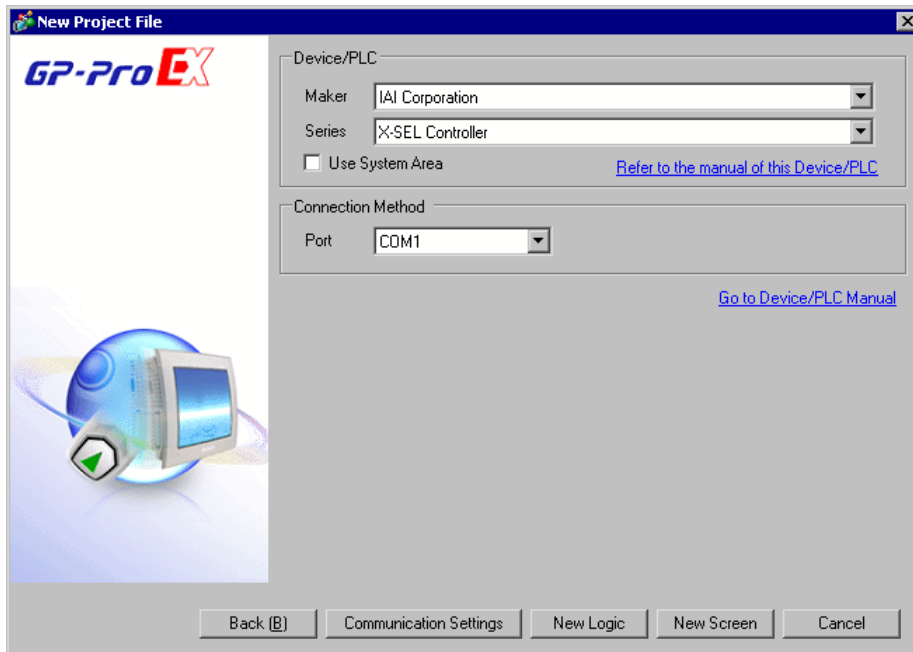
DIP switch setting: RS-422/485 (4 wire)

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

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

DIP switch	Setting	Description
1	OFF	Reserved (always OFF)
2	ON	SIO type: RS-422/485
3	ON	
4	OFF	Output mode of SD (TXD) data: Always output
5	OFF	Terminal resistance (220Ω) insertion to SD (TXD): None
6	OFF	Terminal resistance (220Ω) insertion to RD (RXD): None
7	ON	Short-circuit of SDA (TXA) and RDA (RXA): Available
8	ON	Short-circuit of SDB (TXB) and RDB (RXB): Available
9	ON	RS (RTS) Auto control mode: Enabled
10	ON	

2 Selection of External Device

Select the External Device to be connected to the Display.

Setup Items	Setup Description
Maker	Select the maker of the External Device to be connected. Select "IAI Corporation".
Series	Select the model (series) of the External Device to be connected and its connection method. Select "X-SEL Controller". Check the External Device that can be connected in "X-SEL Controller" in system configuration.)"1 System Configuration" (page 3)
Use System Area	Check this option to synchronize the system data area of the Display and the device (memory) of the External Device. When they are synchronized, you can use the ladder program of the External Device to switch the display or to display a window on the Display. Cf. GP-Pro EX Reference Manual "Appendix 1.4 LS Area (Direct Access Method)" This can also be set with GP-Pro EX or in the Display off-line mode. Cf. GP-Pro EX Reference Manual "5.17.6 Setting Guide of [System Setting Window], Setting Guide of [Main Unit Settings], System Area Setting" Cf. Maintenance/Troubleshooting Manual "2.15.1 Common to the Display", Setting Guide of [Main Unit Settings], System Area Setting"
Port	Select the port of the Display to be connected to the External Device.

3 Example of Communication Setting

The following shows examples of communication settings for the Display and the External Device, which are recommended by Pro-face.

3.1 Setting Example 1

■ Settings ofGP-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 the External Device you want to set from [Device-Specific Settings] of [Device/PLC Settings].
To connect multiple External Devices, click from [Device-Specific Settings] of [Device/PLC Settings] to add External Devices.

■ Settings of External Device

Use the mode switch and the ladder software (PC Software for X-SEL) to configure communication settings for the External Device. Refer to your External Device manual for details.

1 Set the mode switch to "MANU", and turn on the power.

2 Start up the ladder software.

3 From the [Parameter] menu, select [Edit] to display the [Edit Parameter] dialog box.

4 Click the [I/O] tab and set the following parameters.

No	Parameter Name	Setting Value
90	Usage of SIO channel 1 opened to user (AUTO mode)	2
91	Station code of SIO channel 1 opened to user	153
92	Baud rate type of SIO channel 1 opened to user	0
93	Data length of SIO channel 1 opened to user	8
94	Stop bit length of SIO channel 1 opened to user	1
95	Parity type of SIO channel 1 opened to user	0

5 Click the [Transfer to Controller] button and transfer the communication settings.

6 Set the mode switch to "AUTO".

The communication settings are completed.

4   Setup Items

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

The setting of each parameter must match that of the External Device.

)"3 Example of Communication Setting" (page 8)

4.1   Setup Items in GP-Pro EX

■ Communication Settings

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

Setup Items	Setup Description
SIO Type	Select the SIO type for communicating with the External Device.
Speed	Select the communication speed between the External Device and the Display.
Data Length	Select a data length.
Parity	Select how to check parity.
Stop Bit	Select a stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.
Timeout	Use an integer from 1 to 127 to enter the time (s) for which the Display waits for the response from the External Device.

Setup Items	Setup Description
Retry	In case of no response from the External Device, enter how many times the Display retransmits the command, from "0 to 255".
Wait To Send	Enter the standby time (ms) from when the Display receives packets until it transmits the next command, from "0 to 255".
RI/VCC	You can switch between RI/VCC of the 9th pin when you select RS232C for the SIO type. To connect to the IPC, you need to use the IPC selector switch to switch RI/5V. Refer to your IPC manual for details.

■ Device Setting

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

To connect multiple External Devices, click ▓ from [Device-Specific Settings] of [Device/PLC Settings] to add External Devices.
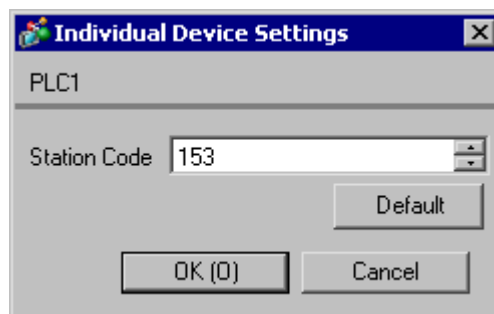
Setup Items	Setup Description
Station Code	Use an integer from 0 to 255 to enter the station code of the External Device.

4.2 Settings in Off-Line Mode

NOTE	• Refer to the Maintenance/Troubleshooting manual for information on how to enter off-line mode or about the operation.

        Cf.   Maintenance/Troubleshooting Manual "2.2 Off-line Mode"

■ Communication Settings

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

Comm.	Device	Option		

X-SEL Controller   [COM1]   Page 1/1

SIO Type   RS232C ▼
Speed   9600 ▼
Data Length   ○ 7   ● 8
Parity   ● NONE   ○ EVEN   ○ ODD
Stop Bit   ● 1   ○ 2
Flow Control   NONE ▼
Timeout(s)   3 ▼ ▲
Retry   2 ▼ ▲
Wait to Send(ms)   0 ▼ ▲

	Exit		Back	2008/02/21 02:02:58

Setup Items	Setup Description
SIO Type	Select the SIO type for communicating with the External Device. **IMPORTANT** In the communication settings, set [SIO Type] correctly according to the serial interface specifications of the Display. If you select an SIO type that the serial interface does not support, proper operation cannot be guaranteed. Refer to your Display manual for details on the serial interface specifications.
Speed	Select the communication speed between the External Device and the Display.
Data Length	Select a data length.
Parity	Select how to check parity.
Stop Bit	Select a stop bit length.
Flow Control	Select the communication control method to prevent overflow of transmission and reception data.

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, enter how many times the Display retransmits the command, from "0 to 255".
Wait To Send	Enter the standby time (ms) from when the Display receives packets until it transmits the next command, from "0 to 255".

■ Device Setting

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

Setup Items	Setup Description
Device/PLC Name	Select the External Device to set. The device name is the title of the External Device set with GP-Pro EX. (Initial value [PLC1])
Station Code	Use an integer from 0 to 255 to enter the station code of the External Device.

■ Option

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

Comm.	Device	Option		

X-SEL Controller   [COM1]   Page 1/1

                    RI / VCC   ⦿ RI   ◯ VCC
                       In the case of RS232C, you can select
                       the 9th pin to RI(Input) or VCC(5V
                       Power Supply). If you use the Digital's
                       RS232C Isolation Unit, please select
                       it to VCC.

| | Exit | | Back | 2008/02/21 02:03:07 |

Setup Items	Setup Description
RI/VCC	You can switch between RI/VCC of the 9th pin when you select RS232C for the SIO type. To connect to the IPC, you need to use the IPC selector switch to switch RI/5V. Refer to your IPC manual for details.

5   Cable Diagram

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

- The FG pin on the External Device must be D-class grounded. Refer to your External Device manual for details.
- The SG and FG are connected inside the Display. If you connect the External Device to the SG, do not form any short-circuit loop in the system design.
- If the communication is not stable because of noise or other factors, connect an isolation unit.

Cable Diagram 1

Display (Connection Port)	Cable	Remarks
GP (COM1) ST (COM1) IPC[*1] PC/AT	Connection cable by IAI Corporation CB-ST-E1MW050	

*1   Available only with a COM port that supports RS232C.
☞ ■ IPC COM Port (page 5)

Display

External Device

CB-ST-E1MW050

D-sub 9 pin
(socket)

D-sub 25 pin
(socket)
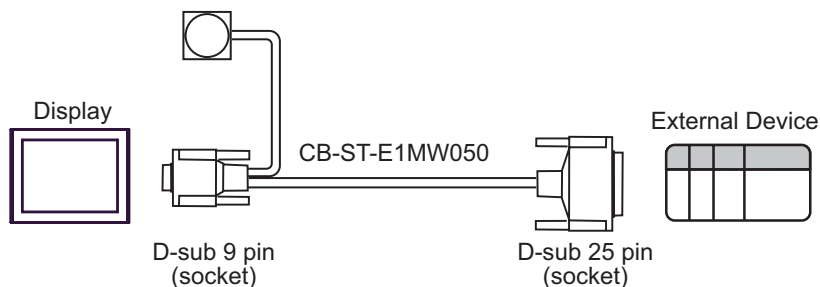
Cable Diagram 2

Display (Connection Port)	Cable	Remarks
GP (COM1) ST (COM1) IPC[*1] PC/AT	Your own cable	The cable length must be 10m or less.

*1   Available only with a COM port that supports RS232C.
　　　☞ ■ IPC COM Port (page 5)

Display D-Sub 9 pin (socket)		Shield	External Device D-Sub 9 pin (socket)	
Pin	Signal name		Pin	Signal name
1	CD		1	NC
2	RD(RXD)		3	SD(TXD)
3	SD(TXD)		2	RD(RXD)
4	ER(DTR)		4	DR(DSR)
5	SG		5	SG
6	DR(DSR)		6	ER(DTR)
7	RS(RTS)		7	RS(RTS)
8	CS(CTS)		8	CS(CTS)
9	RI/VCC		9	NC
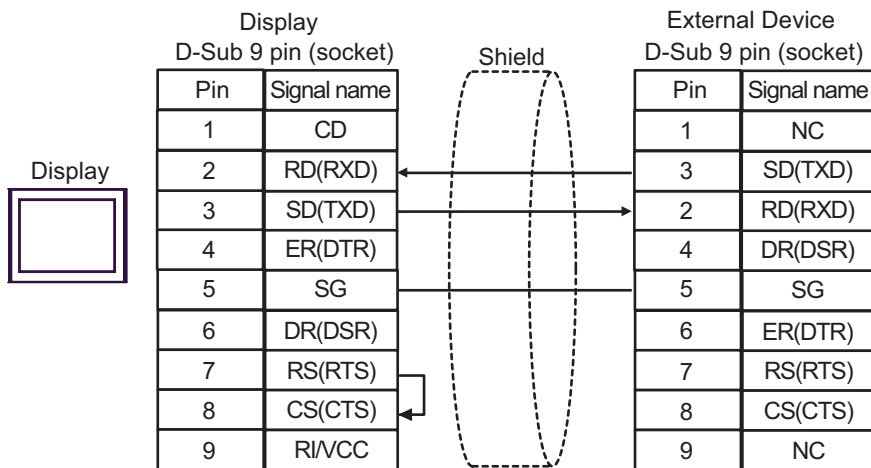
Display

Cable Diagram 3

Display (Connection Port)	Cable	Remarks
GP (COM1) ST (COM1) IPC[*1] PC/AT	Connection cable by IAI Corporation CB-ST-E1MW050 + Connector conversion cable by IAI Corporation CB-SEL-SJ002	

*1   Available only with a COM port that supports RS232C.
)■ IPC COM Port (page 5)
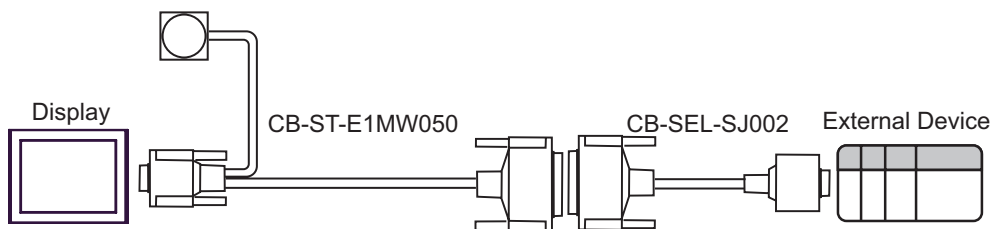
6   Supported Device

The following table shows the range of supported device addresses. Available type and range of device may vary depending on the CPU. Consult the appropriate CPU manual before use.

[▭▭▭▭] : This address can be specified as system data area.

Device	Bit Address	Word Address	Double Word Address	32 bits	Remarks
Input Port	IP000 - IP299	IP000 - IP272	------		[÷16] *1
Output Port	OP300 - OP599	OP300 - OP572	------	[L / H]	[÷16]
Flag	FG000.600 - FG000.899 FG001.900 - FG128.999	FG000.600 - FG000.872 FG001.900 - FG128.980	------		[÷16] *2
Point Data Total Count	------	PDT0	------	------	*1
Integer	------	------	INT000.0200 - INT000.1299, INT001.0001 - INT128.1099		*3
Real	------	------	RL000.0300 - RL000.1399, RL001.0100 - RL128.1199		*4
String	------	STR000.300 - STR000.998 STR001.001 - STR128.299	------		[÷2] *5
Axis Status	------	AXST00 - AXST47	------		*1 *6
Scara Axis Status	------	SAXS000 - SAXS3FF	------	[L / H]	*1 *7
Version	------	VR000 - VR3FF	------		*1 *8
Error Detail 0	------	------	ER00000000 - ER0FFFFFFF		*1 *9
Error Detail 1	------	------	ER10000000 - ER1FFFFFFF		*1 *9
Error Detail 2	------	------	ER20000000 - ER2FFFFFFF		*1 *9
Error Detail 3	------	------	ER30000000 - ER3FFFFFFF		*1 *9
Error Detail 4	------	------	ER40000000 - ER4FFFFFFF		*1 *9

Device	Bit Address	Word Address	Double Word Address	32 bits	Remarks
Error Detail 5	------	------	ER50000000 - ER5FFFFFFF	⌐L / H⌐	*1 *9
Error Detail 6	------	------	ER60000000 - ER6FFFFFFF		*1 *9
Error Detail 7	------	------	ER70000000 - ER7FFFFFFF		*1 *9
Program Status	------	PGST000 - PGST511	------		*1 *10
System Status	------	SYST0 - SYST6	------		*1 *11
Program Control	------	PRG000 - PRG128	------		*12 *13
Alarm Reset	------	AR0	------	------	*12
Software Reset	------	SR0	------		*12 *14
Drive-Source Recovery	------	DSR0	------		*12
Operation-Pause Reset	------	OPR0	------		*12
Point Data Clear	PCLR001 - PCLRFA0 PCLR0001 - PCLR4E20	PCLR001 - PCLRF91 PCLR0001 - PCLR4E11	------	⌐L / H⌐	*12 *15
Absolute Coordinate Movement	------	------	ACM0 - ACMC		*16
Relative Coordinate Movement	------	------	RCM0 - RCMC		*17
Jogging/Inching Movement	------	------	JIM0 - JIM6		*18
Point Number Movement	------	PNM0 - PNM5	------		*19
Point Data	------	------	PD00 - PD9E		*20
Servo	------	SV0 - SV2	------		*21
Return to Origin	------	RO0 - RO3	------		*22
Operation Stop/Cancel	------	OSC0 - OSC2	------		*23
Coordinate Affiliate Data	------	------	CD0000 - CD1FFF		*1 *24
Simple Interference Check Zone Data	------	------	SD010 - SDFFF		*1 *25
Scara Absolute Coordinate Movement	------	------	SACM0 - SACMD		*26

Device	Bit Address	Word Address	Double Word Address	32 bits	Remarks
Scara Relative Coordinate Movement	------	------	SRCM0 - SRCMD	⌐L / H⌐	*27
Scara Point Number Movement	------	SPNM0 - SPNM6	------		*28

*1   Write disable

*2   The flag device descriptions are shown below.

FG 000   600

                    Flag number:
                     Global area (600 to 899)
                     Local area (900 to 999)

                    Program number:
                     Global area (000)
                     Local area (001 to 128)
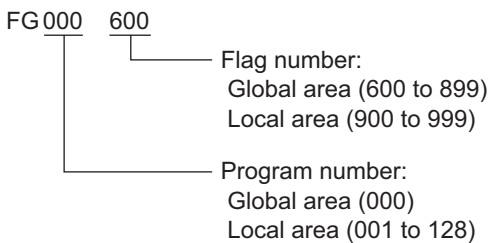
*3   The integer valuables device descriptions are shown below.

INT 000   0200

                    Variable number:
                     Global area (0200 to 0299,1200 to 1299)
                     Local area (0001 to 0099,1001 to 1099)

                    Program number:
                     Global area (000)
                     Local area (001 to 128)
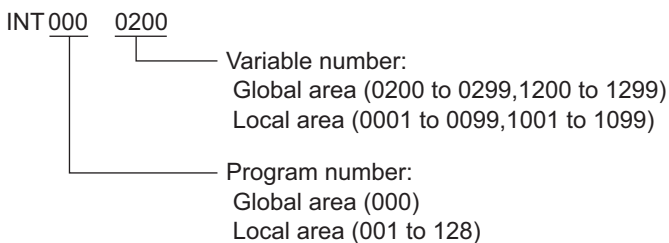
*4   The real valuables device descriptions are shown below.

RL 000   0300

                    Variable number:
                     Global area (0300 to 0399,1300 to 1399)
                     Local area (0100 to 0199,1100 to 1199)

                    Program number:
                     Global area (000)
                     Local area (001 to 128)
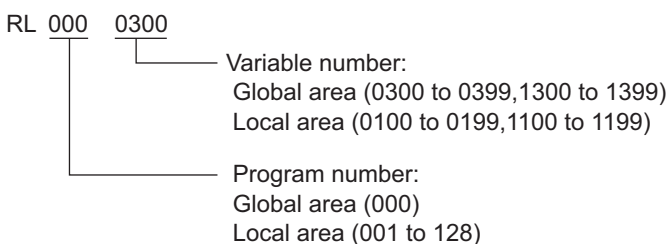
*5   The string valuables device descriptions are shown below.

STR 000   300

                    Variable number:
                     Global area (300 to 998 (only even))
                     Local area (001 to 299 (only odd))

                    Program number:
                     Global area (000)
                     Local area (001 to 128)
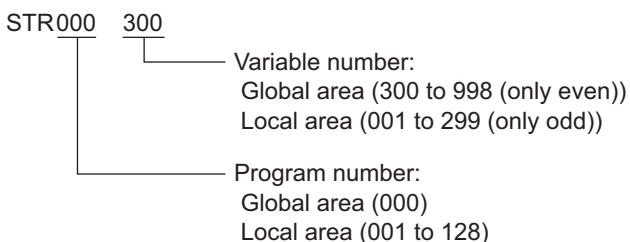
*6   The axis status device descriptions are shown below.

AXST 00
    └──────── Obtained data:
          AXST00 to AXST05: Single-axis status
          00: Axis status
             Bit 7 (Reserved for system use)
             Bit 6 (Reserved for system use)
             Bit 5 (Push error detection): 0 = Not detected / 1 = Detected
             Bit 4 (Operation command successful completion): 0 = Not yet complete
                / 1 = Completed successfully
            * Can be used only for completion check after an operation command.
             Bit 3 (Servo): 0 = OFF / 1 = ON
             Bit 1-2 (Origin return): 0 = Not yet performed / 1 = Returning to origin / 2 = Completed
             Bit 0 (Servo axis in use): 0 = Not in use / 1 = In use (moving, etc.)
            * "Servo axis in use" indicates that a given task has the right to use the applicable axis.
             Therefore, this bit will turn ON in the following conditions:
              - When an operation command involving axis movement is in progress
                (including when an axis is moving)
              - Servo is starting up from an OFF state
              - Servo is shutting down from an ON state (excluding emergency stop)
              - Operation axis is paused
          01: Axis sensor input status
             Bit 3 (Reserved for system use)
             Bit 2 (Origin sensor): 0 = OFF / 1 = ON
             Bit 1 (Overrun sensor): 0 = OFF / 1 = ON
             Bit 0 (Creep sensor): 0 = OFF / 1 = ON
          02: Axis error code
          03: Encoder status
             Bit 7 (Battery alarm (BA))
             Bit 6 (Battery error (BE))
             Bit 5 (Multi-rotation error (ME))
             Bit 4 (Reserved for system use)
             Bit 3 (Counter overflow (OF))
             Bit 2 (Count error (CE))
             Bit 1 (Full absolute status (FS))
             Bit 0 (Overspeed (OS))
          04: Current position (L) unit (0.001mm)
             Indicates the lower 16 bits of the current position in Hex.
          05: Current position (H) unit (0.001mm)
              Indicates the upper 16 bits of the current position in Hex.
         AXST06 to AXST11: Double axes status
         ...
         AXST42 to AXST47: Eight axes status

*7   The Scara axis status device descriptions are shown below.

SAXS 0   00

```
                    Obtained data:
                      00: Work coordinate system selection number
                      01: Tool coordinate system selection number
                      02: Common axis status
                        Bit 7 (Reserved for system use)
                        Bit 6 (Reserved for system use)
                        Bit 5 (Reserved for system use)
                        Bit 4 (Reserved for system use)
                        Bit 2-3 (Scara axis current position coordinate system type): 0 = Base coordinate system
                              / 1 = Selected work coordinate system / 2 = Reserved for system use / 3 = Each axis system
                        Bit 0-1: (Scara axis current arm system): 0 = Right arm system / 1 = Left arm system
                              / 2 = Indeterminable / 3 = Reserved for system use
                      03: Axis pattern
```

Bit	-	7	6	5	4	3	2	1	0

1st axis
8th axis
Reserved for system use

```
                      04 to 09: Single-axis status
                       04: Axis status
                         Bit 7 (Reserved for system use)
                         Bit 6 (Reserved for system use)
                         Bit 5 (Push error detection): 0 = Not detected / 1 = Detected
                         Bit 4 (Operation command successful completion):
                                 0 = Not yet complete / 1 = Completed successfully
                          * Can be used only for completion check after an operation command.
                           (For positioning that includes any of the X, Y and R axes, be sure to check completion
                             for all of the X, Y and R axes.)
                         Bit 3 (Servo): 0 = OFF / 1 = ON
                         Bit 1-2 (Origin return): 0 = Not yet performed / 1 = Returning to origin / 2 = Completed
                         Bit 0 (Servo axis in use): 0 = Not in use / 1 = In use (moving, etc.)
                          * "Servo axis in use" indicates that a given task has the right to use the applicable axis.
                            Therefore, this bit will turn ON in the following conditions:
                             - When an operation command involving axis movement is in progress
                               (including when an axis is moving)
                             - Servo is starting up from an OFF state
                             - Servo is shutting down from an ON state (excluding emergency stop)
                             - Operation axis is paused
                       05: Axis sensor input status
                         Bit 3 (Reserved for system use)
                         Bit 2 (Origin sensor): 0 = OFF / 1 = ON
                         Bit 1 (Overrun sensor): 0 = OFF / 1 = ON
                         Bit 0 (Creep sensor): 0 = OFF / 1 = ON
                       06: Axis error code
                       07: Encoder status
                         Bit 7 (Battery alarm (BA))
                         Bit 6 (Battery error (BE))
                         Bit 5 (Multi-rotation error (ME))
                         Bit 4 (Reserved for system use)
                         Bit 3 (Counter overflow (OF))
                         Bit 2 (Count error (CE))
                         Bit 1 (Full absolute status (FS))
                         Bit 0 (Overspeed (OS))
                       08: Current position (L) unit (0.001mm or 0.001deg)
                         Indicates the lower 16 bits of the current position in Hex.
                       09: Current position (H) unit (0.001mm or 0.001deg)
                         Indicates the upper 16 bits of the current position in Hex.
                      0A to 0E: Double axes status
                      ...
                      2E to 33: Eight axes status
                      34 to FF: Reserved for system use
                    Unit type (0 to F)
                      Bit 3 (Reserved for system use) Fixed to 0
                      Bit 2 (Reserved for system use) Fixed to 0
                      Bit 0-1 (Scara axis current position type): 0 = Base coordinate system
                            / 1 = Selected work coordinate system / 2 = Reserved for system use / 3 = Each axis system
```
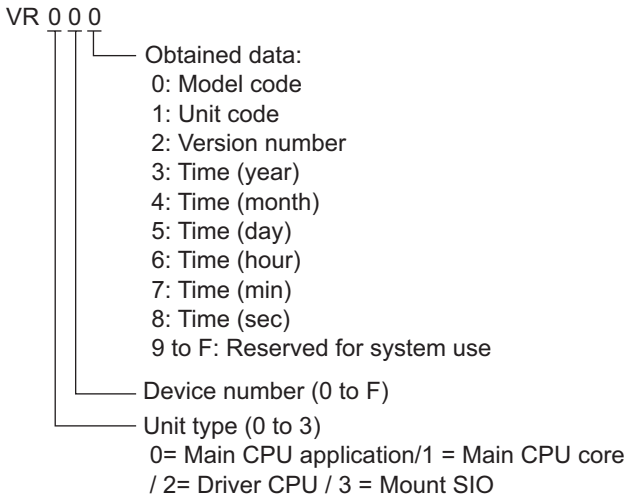
*8   The version device descriptions are shown below.

```
VR 0 0 0
      │ │ └── Obtained data:
      │ │       0: Model code
      │ │       1: Unit code
      │ │       2: Version number
      │ │       3: Time (year)
      │ │       4: Time (month)
      │ │       5: Time (day)
      │ │       6: Time (hour)
      │ │       7: Time (min)
      │ │       8: Time (sec)
      │ │       9 to F: Reserved for system use
      │ └──── Device number (0 to F)
      └────── Unit type (0 to 3)
                0= Main CPU application/1 = Main CPU core
                / 2= Driver CPU / 3 = Mount SIO
```

*9   The device descriptions of error detail 0 through error detail 7 are shown below.

```
ER0 00 000 00
  │  │   │ └── Obtained data:
  │  │   │       00: Error number
  │  │   │       01: Detail information 1
  │  │   │         Other than system-down level error: Program number
  │  │   │         (Error source is indicated if the step number is not 0.)
  │  │   │         System-down level error: System down type
  │  │   │       02: Detail information 2
  │  │   │         Other than system-down level error: Step number (Error source)
  │  │   │         System-down level error: System down error code
  │  │   │       03: Detail information 3
  │  │   │         Other than system-down level error: Axis number
  │  │   │         System-down level error: System down information 1
  │  │   │       04: Detail information 4
  │  │   │         Other than system-down level error: Point number
  │  │   │         (Negative value at interpolation point)
  │  │   │         System-down level error: System down information 2
  │  │   │       05: Detail information 5
  │  │   │       06: Detail information 6
  │  │   │       07: Detail information 7
  │  │   │       08: Detail information 8
  │  │   │       09: Message bytes
  │  │   │       0A: Message 1 (4 bytes)
  │  │   │       10: Message 2 (4 bytes)
  │  │   │       ...
  │  │   │       49: Message 64 (4 bytes)
  │  │   │       50 to FF: Reserved for system use
  │  │   └──── Reserved for system use
  │  └──────── Type 2 (0 to FF)
  │              System error: 0 = Critical level error / 1 = Latest error
  │              Axis-specific error: Axis number
  │              Program-specific error: Program number
  │              Error in error list record: Record number (1 to )
  └─────────── Type 1
                 0 = System error /1 = Axis-specific error / 2 = Program-specific error
                 / 3 = Error in error list record / 4 or later = Reserved for system use
```

*10   The program status device descriptions are shown below.

PGST <u>000</u>

     └──── Obtained data:
           000 to 003: Program number 1 status
            000: Status
              Bit 3 (Reserved for system use)
              Bit 2 (Reserved for system use)
              Bit 1 (Reserved for system use)
              Bit 0 (Start): 0 = Not started / 1 = Started
            001: Execution program step number
            002: Program-dependent error code
            003: Error occurrence step number
           004 to 007: Program number 2 status

           ...
           508 to 511: Program number 128 status

*11   The system status device descriptions are shown below.

SYST <u>0</u>

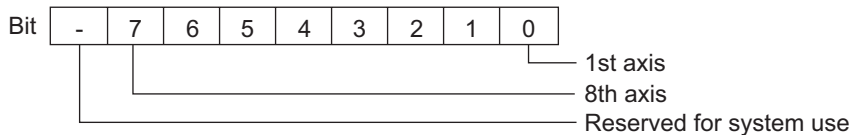   └──── Obtained data:
         0: System mode
           0 = Indeterminable / 1 = AUTO mode / 2 = MANUAL mode
           / 3 = Slave update mode / 4 = Core update mode
         1 Critical level system error number
         2: Latest system error number
         3: System status byte 1
           Bit 7 (Reserved for system use)
           Bit 6 (Battery voltage error status) : 0 = No error / 1 = Error
           Bit 5 (Battery voltage low warning status): 0 = No low / 1 = Low
           Bit 4 (Power error status): 0 = Normal / 1 = Error
           Bit 3 (Emergency stop switch status): 0 = No emergency stop / 1 = Emergency stop
           Bit 2 (Safety gate status): 0 = CLOSE / 1 = OPEN
            * X-SEL (P/Q Series) (Multi axes/Scara)/SSEL/ASEL/PSEL: Enable switch
             (Deadman switch / Enable switch) status is indicated.
           Bit 1 (TP enable switch status): 0 = ON / 1 = OFF
            * X-SEL (P/Q Series) (Multi axes/Scara)/SSEL/ASEL/PSEL: This bit is disabled (fixed to 0).
           Bit 0 (Operation mode switch status): 0 = AUTO / 1 = MANUAL
         4: System status byte 2
           Bit 7 (Reserved for system use)
           Bit 6 (Reserved for system use)
           Bit 5 (Program run status): 0 = Not run / 1 = Running
           Bit 4 (Restart wait status): 0 = Not waiting / 1 = Waiting
           Bit 3 (I/O interlock status): 0 = No interlock / 1 = Interlock
           Bit 2 (Servo interlock status): 0 = No interlock / 1 = Interlock
           Bit 1 (Slave parameter writing status): 0 = Not writing / 1 = Writing
           Bit 0 (Application data flash ROM write status): 0 = Not writing/erasing / 1 = Writing/erasing
            * When the core program is in operation (Application update mode), only Bit 0 is enabled.
             Data for System mode, Critical level system error number, Latest system error number,
             System status byte 1, System status byte 3 and System status byte 4 is disabled.
         5: System status byte 3
           Bit 7 (Reserved for system use)
           Bit 6 (Reserved for system use)
           Bit 5 (Reserved for system use)
           Bit 4 (Operation mode): 0 = Program mode / 1 = Position mode
           Bit 3 (Reserved for system use)
           Bit 2 (System ready status): 0 = Not ready / 1 = Ready
           Bit 1 (System operation status): 0 = Not operating in AUTO mode / 1 = Operating in AUTO mode
           Bit 0 (Drive-source cutoff status): 0 = Not cut off / 1 = Cut off
         6: System status byte 4
           Reserved for system use

*12   Read disable

*13   The program control device sends different commands depending to write data.
      Other write data than the following is processed Private Error (0x80) inside the Display.

      Write Data 0: Program Execution Command(0x253)
      Write Data 1: Program Exit Command(0x254)
      Write Data 2: Program Pause Command(0x255)
      Write Data 3: Program 1 Step Execution Command(0x256)
      Write Data 4: Program Restart Command(0x257)

*14   In the event of SR (Software Reset), displays no response error after no communication for 20 seconds, and
      restarts communication.

*15   Specifies the word address only for the value of which the last one digit is 1.

*16   The absolute coordinate movement device descriptions are shown below.

ACM 0
        └── Obtained data:
            0: Command trigger
               1 =Write / 4 =Clear
            1: Axis pattern

            Bit | - | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
                                                  └── 1st axis
                                              └────── 8th axis
                                      └────────────── Reserved for system use

            2: Acceleration unit (0.01G)
               The parameter value becomes enabled when it is zero.
            3: Deceleration unit (0.01G)
               The parameter value becomes enabled when it is zero.
            4: Speed unit (mm/sec)
               The parameter value becomes enabled when it is zero.
               (Safety limit is applied depending on the mode.)
            5 to C: Absolute coordinate data unit (0.001mm)

*17   The relative coordinate movement device descriptions are shown below.

RCM 0
        └── Obtained data:
            0: Command trigger
               1 =Write / 4 =Clear
            1: Axis pattern

            Bit | - | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
                                                  └── 1st axis
                                              └────── 8th axis
                                      └────────────── Reserved for system use
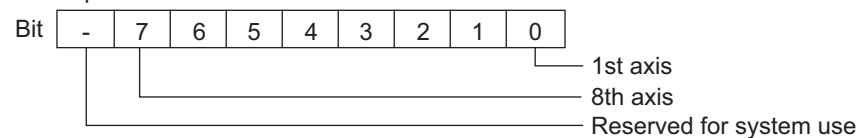
            2: Acceleration unit (0.01G)
               The parameter value becomes enabled when it is zero.
            3: Deceleration unit (0.01G)
               The parameter value becomes enabled when it is zero.
            4: Speed unit (mm/sec)
               The parameter value becomes enabled when it is zero.
               (Safety limit is applied depending on the mode.)
            5 to C: Relative coordinate data unit (0.001mm)

*18   The jogging/inching movement device descriptions are shown below.

JIM 0
└────── Obtained data:
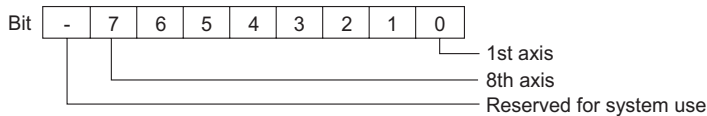 0: Command trigger
    1 =Write / 4 =Clear
  1: Axis pattern
    Only single Scara axis can be specified for the Scara type
    (Multipule axes can be specified).
    For the Scara type, a jogging/inching command can be issued only when
    none of the servo axes are operating.
    X-SEL-PX/QX Series: The Scara and translation axes cannot be specified
    simultaneously.

Bit	-	7	6	5	4	3	2	1	0

    ├── 1st axis
    ├── 8th axis
    └── Reserved for system use

  2: Acceleration unit (0.01G [for each axis, in %])
    The parameter value becomes enabled when it is zero.
  3: Deceleration unit (0.01G [for each axis, in %])
    The parameter value becomes enabled when it is zero.
  4: Speed unit (mm/sec [for each axis, in %])
    The parameter value becomes enabled when it is zero.
    (Safety limit is applied depending on the mode.)
  5: Inching distance   unit (0.001mm [for each axis, in 0.001deg])
    Specify with the absolute value. Distance is not specified if it is zero (=jogging).
  6: Operation type
    Bit 3 (Reserved for system use) Fixed to 0
    Bit 1-2 (Jogging/inching coordinate system (Scara only)): 0 = Base coordinate system
        / 1 = Selected work coordinate system / 2 = Selected tool coordinate system / 3 = Each axis system
    Bit 0 (Jogging/inching direction): 0 = Negative direction on coordinate axis / 1 = Positive direction on coordinate axis

*19   The point number movement device descriptions are shown below.

PNM 0
└────── Obtained data:
  0: Command trigger
    1 =Write / 4 =Clear
  1: Axis pattern
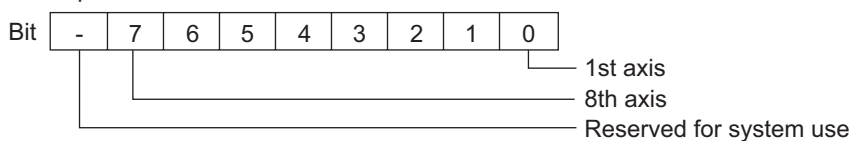
Bit	-	7	6	5	4	3	2	1	0

    ├── 1st axis
    ├── 8th axis
    └── Reserved for system use

  2: Acceleration unit (0.01G)
    The applicable setting value in the position data becomes enabled when the
    acceleration setting is zero.
    If both above setting values are zero, the parameter setting value is enabled.
  3: Deceleration unit (0.01G)
    The applicable setting value in the position data becomes enabled when the
    deceleration setting is zero.
    If both above setting values are zero, the parameter setting value is enabled.
  4: Speed unit (mm/sec)
    The applicable setting value in the position data becomes enabled when the
    speed setting is zero.
    If both above setting values are zero, the parameter setting is enabled.
    (Safety limit is applied depending on the mode.)
  5: Point number

*20   The point data device descriptions are shown below.

PD 00

Obtained data:
00: Command trigger
  1 =Write / 2 =Read / 4 =Clear
01: Starting point number
02: Number of point data
03 to 0F: Point data 1
 03: Point number
 04: Axis pattern

Bit	-	7	6	5	4	3	2	1	0

— 1st axis
— 8th axis
— Reserved for system use
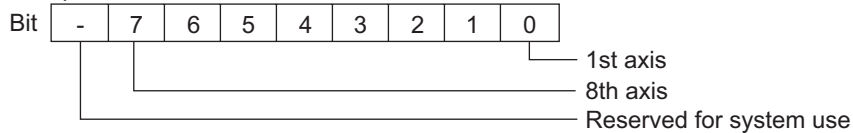
 05: Acceleration unit (0.01G)
 06: Deceleration unit (0.01G)
 07: Speed unit (mm/sec)
 08 to 0F: Position data unit (0.001 mm)
  08: 1st axis position data
  ...
  0F: 8th axis position data
10 to 1C: Point data 2
...
92 to 9E: Point data 12

*21   The servo device descriptions are shown below.

SV 0

Obtained data:
0: Command trigger
  1 =Write / 4 =Clear
1: Axis pattern

Bit	-	7	6	5	4	3	2	1	0

— 1st axis
— 8th axis
— Reserved for system use
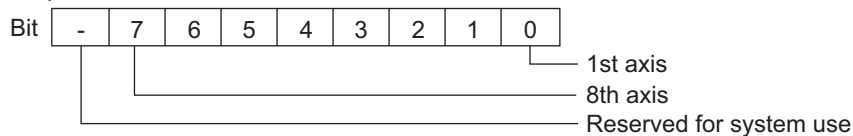
2: Operation type
  Bit 3 (Reserved for system use) Fixed to 0
  Bit 2 (Reserved for system use) Fixed to 0
  Bit 1 (Reserved for system use) Fixed to 0
  Bit 0 (Servo ON/OFF): 0 = OFF / 1 = ON

*22   The return to origin device descriptions are shown below.

RO 0
   └────── Obtained data:
         0: Command trigger
            1 =Write / 4 =Clear
         1: Axis pattern
            X-SEL-PX/QX Series: Specify the translation axis only.

Bit	-	7	6	5	4	3	2	1	0

            └──── 1st axis
            └──── 8th axis
            └──── Reserved for system use

         2: End search speed unit (mm/sec)
            The parameter value becomes enabled when it is zero.
         3: Creap speed unit (mm/sec)
            The parameter value becomes enabled when it is zero.

*23   The operation stop/cancel device descriptions are shown below.

OSC 0
   └────── Obtained data:
         0: Command trigger
            1 =Write / 4 =Clear
         1: Stop axis pattern
            * Including servo command cancellation while interlock is pending.
         2: Appended command byte
            Bit 7 (Reserved for system use) Fixed to 0
            Bit 6 (Reserved for system use) Fixed to 0
            Bit 5 (Reserved for system use) Fixed to 0
            Bit 4 (Reserved for system use) Fixed to 0
            Bit 3 (Reserved for system use) Fixed to 0
            Bit 2 (Reserved for system use) Fixed to 0
            Bit 1 (Reserved for system use) Fixed to 0
            Bit 0 (Specification of output cancellation while interlock is pending (OUT port)
                 (when all operations are paused))
                 :0 = Not canceled / 1 = Canceled tentatively

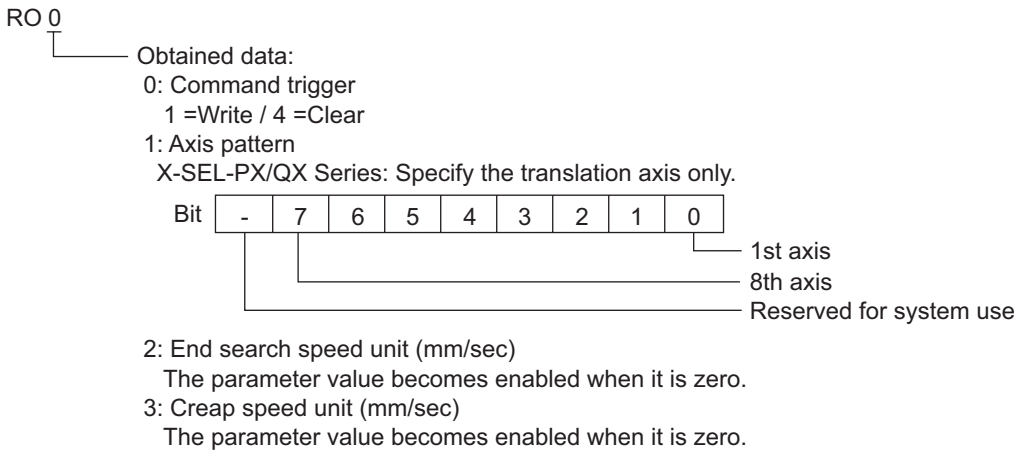*24   The coordinate affiliate data device descriptions are shown below.

CD 0 00 0
   │   │   └── Obtained data:
   │   │   0: X axis coordinate offset
   │   │   1: Y axis coordinate offset
   │   │   2: Z axis coordinate offset
   │   │   3: R axis coordinate offset
   │   │   4 to F: Reserved for system use
   │   │
   │   └────── Coordinate system definition data number (00 to FF)
   │   Work/tool coordinate system definition data number (0 to)
   │
   └────── Type 1 (0 to 1)
              0 = Work coordinate system definition data
              / 1 = Tool coordinate system definition data

*25   The device descriptions of simple interference check zone data are shown below.

SD 01 0

                Obtained data:
                    0: Effective axis pattern
                    1 to 4: Simple interference check zone definition coordinate 1 unit
                                (0.001 mm (R axis: 0.001 deg))
                     1: X-axis definition coordinate
                     2: Y-axis definition coordinate
                     3: Z-axis definition coordinate
                     4: R-axis definition coordinate
                    5 to 8: Simple interference check zone definition coordinate 2 unit
                                (0.001 mm (R axis: 0.001 deg))
                    9: Physical output port number or global flag number for output upon entry
                    A: Entry error type specification
                     0 = No error handling / 1 = Message-level error
                     / 2 = Operation-cancellation level error
                    B to F: Reserved for system use
              Definition data number (1 to FF)

*26   The device descriptions of Scara absolute coordinate movement are shown below.

SACM 0

         Obtained data:
           0: Command trigger
            1 =Write / 4 =Clear
           1: Axis pattern
            X-SEL-PX/QX Series: The Scara and translation axes cannot be specified simultaneously
            (the translation axis can be specified).

Bit	-	7	6	5	4	3	2	1	0

                        1st axis
                        8th axis
                        Reserved for system use

           2: Acceleration unit (% or 0.01G)
            The parameter value becomes enabled when it is zero.
            * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
           3: Deceleration unit (% or 0.01G)
            The parameter value becomes enabled when it is zero.
            * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
           4: Speed unit (% or mm/sec)
            The parameter value becomes enabled when it is zero.
            (Safety limit is applied depending on the mode.)
            * Unit: Movement control = PTP: [%] / Movement control = CP: [mm/sec]
           5: Positioning operation type (No Scara axis disabled)
                Bit 7 (Reserved for system use) Fixed to 0
                Bit 6 (Reserved for system use) Fixed to 0
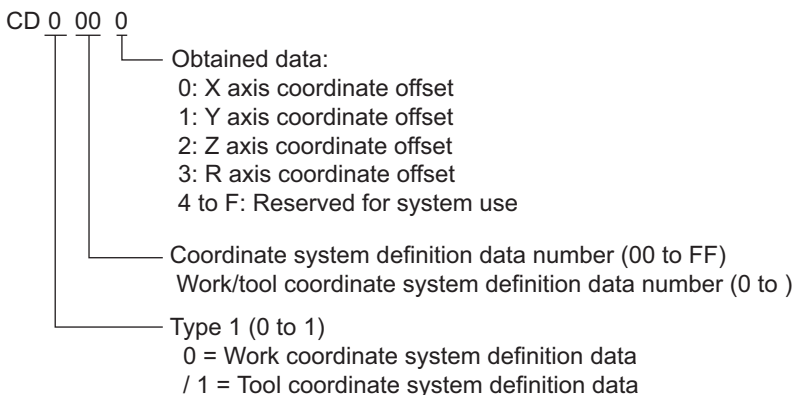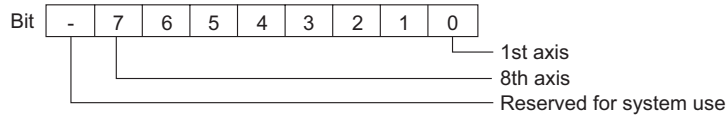   Bit 5 (Reserved for system use) Fixed to 0
                Bit 3-4 (PTP target arm system specification type (Always move current arm system if CP))
                  : 0 = Current arm system (Movement of opposite arm system prohibited if unfeasible)
                    / 1 = Current arm system (Movement of opposite arm system permitted if unfeasible)
                    / 2 = Right arm system (Movement of opposite arm system prohibited if unfeasible)
                    / 3 = Left arm system (Movement of opposite arm system prohibited if unfeasible)
                Bit 1-2 (Movement coordinate system): 0 = Reserved for system use / 1 = Selected work coordinate system
                  / 2= Reserved for system use / 3 = Reserved for system use
                Bit 0 (Movement control): 0 = PTP / 1 = CP
           6 to D: Absolute coordinate data unit (0.001mm)

*27   The device descriptions of Scara relative coordinate movement are shown below.

SRCM 0
└─── Obtained data:
   0: Command trigger
      1 =Write / 4 =Clear
   1: Axis pattern
      X-SEL-PX/QX Series: The Scara and translation axes cannot be specified simultaneously
      (the translation axis can be specified).

Bit	-	7	6	5	4	3	2	1	0

      └─────────────────────────── 1st axis
        └───────────────────────── 8th axis
          └─────────────────────── Reserved for system use

   2: Acceleration unit (% or 0.01G)
      The parameter value becomes enabled when it is zero.
      * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
   3: Deceleration unit (% or 0.01G)
      The parameter value becomes enabled when it is zero.
      * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
   4: Speed unit (% or mm/sec)
      The parameter value becomes enabled when it is zero. (Safety limit is applied depending on the mode.)
      * Unit: Movement control = PTP: [%] / Movement control = CP: [mm/sec]
   5: Positioning operation type (No Scara axis disabled)
      Bit 7 (Reserved for system use) Fixed to 0
      Bit 6 (Reserved for system use) Fixed to 0
      Bit 5 (Reserved for system use) Fixed to 0
      Bit 3-4 (PTP target arm system specification type (Always move current arm system if CP))
            : 0 = Current arm system (Movement of opposite arm system prohibited if unfeasible)
            / 1 = Current arm system (Movement of opposite arm system permitted if unfeasible)
            / 2 = Right arm system (Movement of opposite arm system prohibited if unfeasible)
            / 3 = Left arm system (Movement of opposite arm system prohibited if unfeasible)
      Bit 1-2 (Movement coordinate system): 0 = Reserved for system use / 1 = Selected work coordinate system
            / 2= Reserved for system use / 3 = Reserved for system use
      Bit 0 (Movement control): 0 = PTP / 1 = CP
   6 to D: Relative coordinate data unit (0.001mm)

*28   The device descriptions of Scara point number movement are shown below.

SPNM 0
        └── Obtained data:
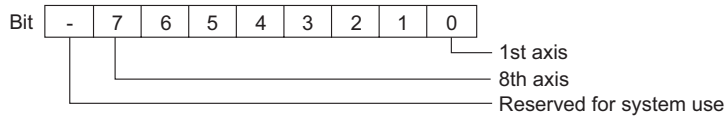   0: Command trigger
          1 =Write / 4 =Clear
         1: Axis pattern
          Used under an AND conditions with the axis pattern of the point number
           X-SEL-PX/QX Series: The Scara and translation axes cannot be specified simultaneously
           (the translation axis can be specified).

Bit	-	7	6	5	4	3	2	1	0

                1st axis
                8th axis
                Reserved for system use

         2: Acceleration unit (% or 0.01G)
          The applicable setting value in the position data becomes enabled when the acceleration setting is zero.
          If both above setting values are zero, the parameter setting is enabled.
          * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
         3: Deceleration unit (% or 0.01G)
          The applicable setting value in the position data becomes enabled when the deceleration setting is zero.
          If both above setting values are zero, the parameter setting is enabled.
          * Unit: Movement control = PTP: [%] / Movement control = CP: [0.01G]
         4: Speed unit (% or mm/sec)
          The applicable setting value in the position data becomes enabled when the speed setting is zero.
          If both above setting values are zero, the parameter setting is enabled.
          (Safety limit is applied depending on the mode.)
          * Unit: Movement control = PTP: [%] / Movement control = CP: [mm/sec]
         5: Positioning operation type (No Scara axis disabled)
          Bit 7 (Reserved for system use) Fixed to 0
          Bit 6 (Reserved for system use) Fixed to 0
          Bit 5 (Reserved for system use) Fixed to 0
          Bit 3-4 (PTP target arm system specification type (Always move current arm system if CP))
              : 0 = Current arm system (Movement of opposite arm system prohibited if unfeasible)
              / 1 = Current arm system (Movement of opposite arm system permitted if unfeasible)
              / 2 = Right arm system (Movement of opposite arm system prohibited if unfeasible)
              / 3 = Left arm system (Movement of opposite arm system profibited if unfeasible)
          Bit 1-2 (Movement coordinate system): 0 = Reserved for system use / 1 = Selected work coordinate system
             / 2= Reserved for system use / 3 = Reserved for system use
          Bit 0 (Movement control): 0 = PTP / 1 = CP
         6: Point number

NOTE

• Refer to the GP-Pro EX Reference Manual for system data area.

    Cf.   GP-Pro EX Reference Manual "Appendix 1.4 LS Area (Direct Access Method)"

• Refer to the precautions on manual notation for icons in the table.

    ☞ "Manual Symbols and Terminology"

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7 Device Code and Address Code

Use device code and address code when you set "Device Type & Address" for the address type of the data display or other devices.

Device	Device Name	Device Code (HEX)	Address Code
Input Port	IP	0080	Value of word address divided by 16
Output Port	OP	0081	Value of (word address - 300) divided by 16
Flag	FG	0082	Global Area Value of (flag number - 600) divided by 16 Local Area Value of (flag number - 900) divided by 16
Point Data Total Count	PDT	0060	Word Address
Integer	INT	0000	Double Word Address
Real	RL	0001	Double Word Address
String	STR	0002	Global Area Value of (variable number - 300) divided by 2 Local Area Value of (variable number - 1) divided by 2
Axis Status	AXST	0061	Word Address
Scara Axis Status	SAXS	0062	Word Address
Version	VR	0063	Word Address
Error Detail 0	ER0	0020	Double Word Address
Error Detail 1	ER1	0021	Double Word Address
Error Detail 2	ER2	0022	Double Word Address
Error Detail 3	ER3	0023	Double Word Address
Error Detail 4	ER4	0024	Double Word Address
Error Detail 5	ER5	0025	Double Word Address
Error Detail 6	ER6	0026	Double Word Address
Error Detail 7	ER7	0027	Double Word Address
Program Status	PGST	0064	Word Address
System Status	SYST	0065	Word Address

Continued to next page.

Device	Device Name	Device Code (HEX)	Address Code
Program Control	PRG	0066	Word Address
Alarm Reset	AR	0067	Word Address
Software Reset	SR	0068	Word Address
Drive-Source Recovery	DSR	0069	Word Address
Operation-Pause Reset	OPR	006A	Word Address
Point Data Clear	PCLR	0083	Value of word address from which 1 is deducted
Absolute Coordinate Movement	ACM	006B	Double Word Address
Relative Coordinate Movement	RCM	006C	Double Word Address
Jogging/Inching Movement	JIM	006D	Double Word Address
Point Number Movement	PNM	006E	Word Address
Point Data	PD	006F	Double Word Address
Servo	SV	0070	Word Address
Return to Origin	RO	0071	Word Address
Operation Stop/Cancel	OSC	0072	Word Address
Coordinate Affiliate Data	CD	0073	Double Word Address
Simple Interference Check Zone Data	SD	0074	Double Word Address
Scara Absolute Coordinate Movement	SACM	0075	Double Word Address
Scara Relative Coordinate Movement	SRCM	0076	Double Word Address
Scara Point Number Movement	SPNM	0077	Word Address

8 Error Messages

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

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

Display Examples of Error Messages

"RHAA035: PLC1: Error has been responded for device write command (Error Code: 1[01H])"

NOTE
- Refer to your External Device manual for details on received error codes.
- Refer to "When an error is displayed (Error Code List)" in "Maintenance/Troubleshooting manual" for details on the error messages common to the driver.

■ Error Messages Specific to the External Device

Error No.	Message	Description
RHxx128	(Node Name): It was not possible to execute it by out of range data.	Data write beyond the data range was requested.