IAI Corporation
X-SEL Controller

Supported version   TOP Design Studio   V1.4.9.85 or higher

CONTENTS

We want to thank our customers who use the Touch Operation Panel.

1. System configuration

The system configuration of TOP and "X-SEL Controller" is as follows:

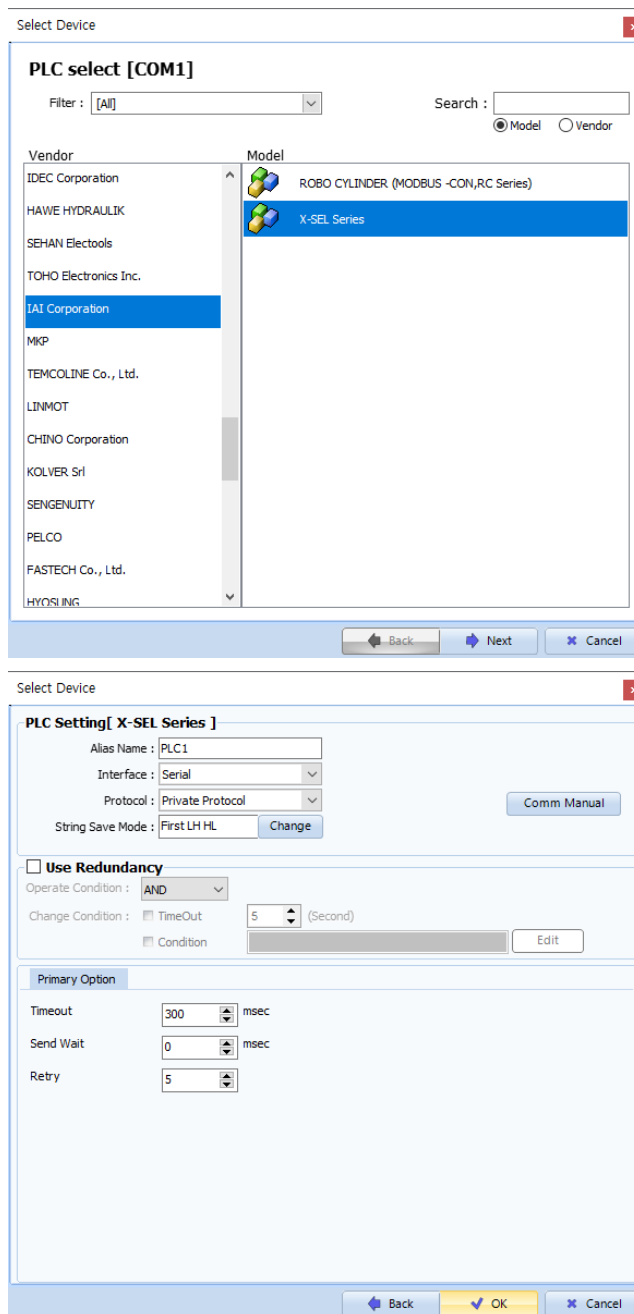| Series	CPU	Link I/F	Communication method	System setting	Cable
X-SEL Series			RS-232C	3.1 Settings example 1 (Page 4)	5.1. Cable table 1 (Page 9)

■ Connectable configuration

·1:1 connection

2. External device selection

■ Select a TOP model and a port, and then select an external device.

Settings		Contents
TOP	Model	Check the TOP display and process to select the touch model.
External device	Vendor	Select the vendor of the external device to be connected to TOP. Select "M2I Corporation".
	PLC	Select an external device to connect to TOP.

Model	Interface	Protocol
X-SEL Series	Serial	Private Protocol

Please check the system configuration in Chapter 1 to see if the external device you want to connect is a model whose system can be configured.

3. TOP communication setting

The communication can be set in TOP Design Studio or TOP main menu. The communication should be set in the same way as that of the external device.

3.1 Communication setting in TOP Design Studio

(1) Communication interface setting

■ [Project > Project Property > TOP Setting] → [HMI Setup > "Use HMI Setup" Check > Edit > Serial]
  – Set the TOP communication interface in TOP Design Studio.
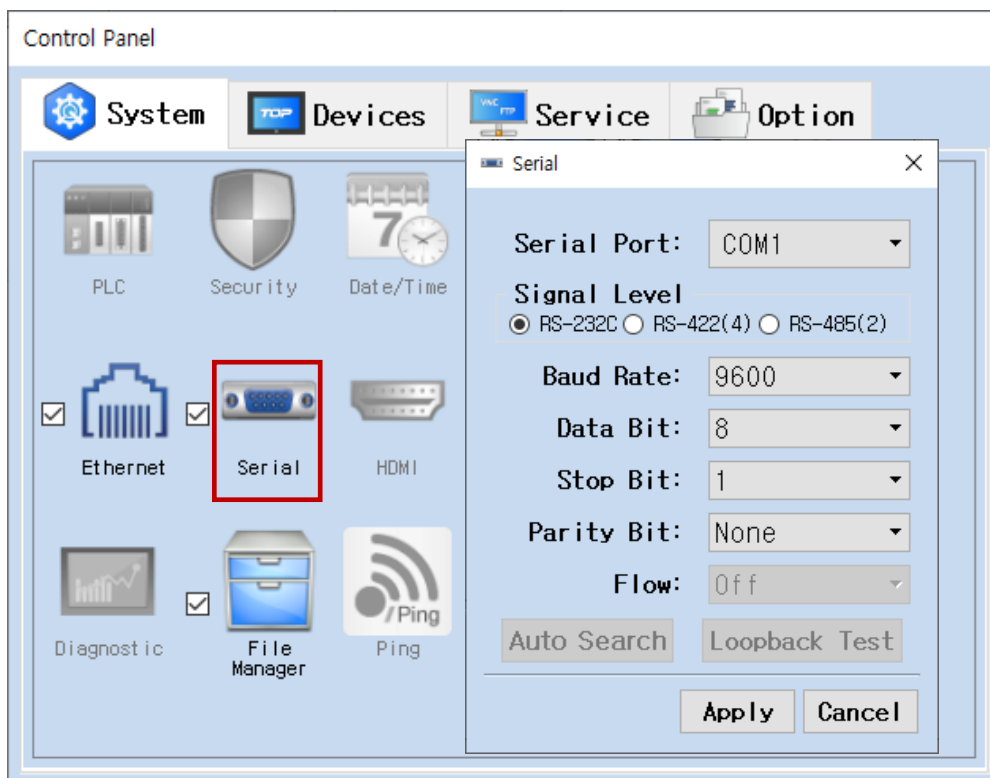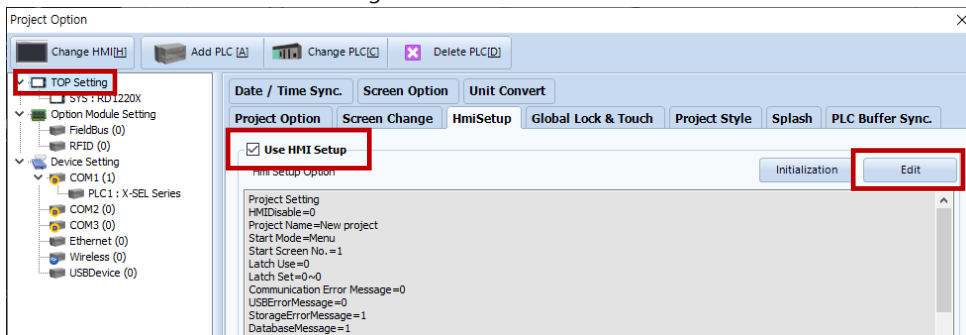
Items	TOP	External device	Remarks
Signal Level	RS-232C	RS-232C	
Baud Rate	9600		
Data Bit	8		
Stop Bit	1		
Parity Bit	none		

* The above settings are examples recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.

(2) Communication option setting

■ [Project > Project Property > Device Setting > COM > "PLC1 : X-SEL Series"]

    – Set the options of the X-SEL Series communication driver in TOP Design Studio.

Items	Settings	Remarks
Interface	Select Serial.	
Protocol	Select Private Protocol.	
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Retry	Configure the amount of redelivery attempts made by the external device to TOP.	

3.2. Communication setting in TOP

* This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.

■ Touch the top of the TOP screen and <u>drag</u> it down. Touch "EXIT" in the pop-up window to go to the main screen.

(1) Communication interface setting
■ [Main Screen > Control Panel > Serial]

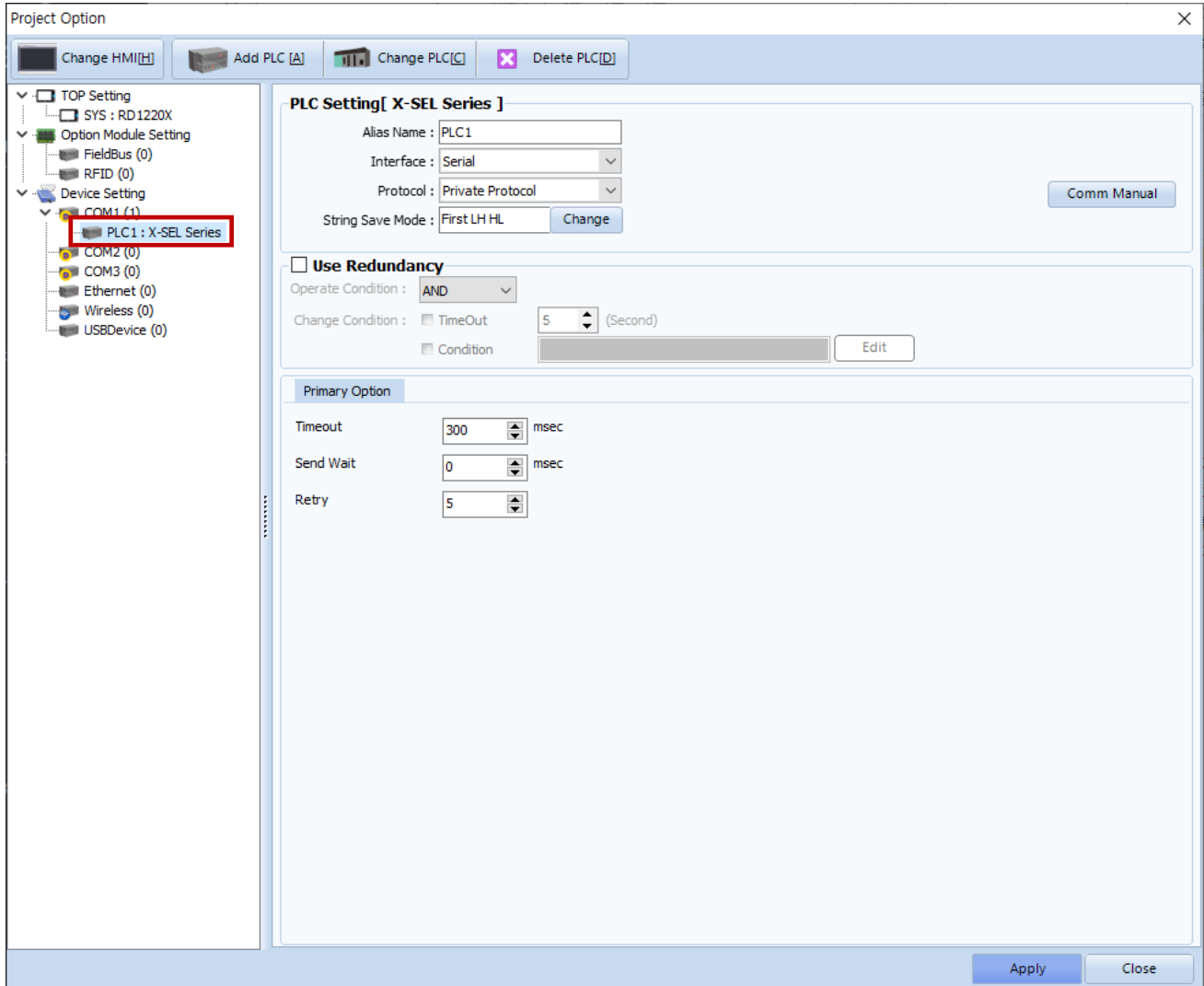| Items	TOP	External device	Remarks
Signal Level	RS-232C	RS-232C	
Baud Rate	9600		
Data Bit	8		
Stop Bit	1		
Parity Bit	none		

* The above settings are setting <u>examples</u> recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.

(2) Communication option setting

■ [Main Screen > Control Panel > PLC]

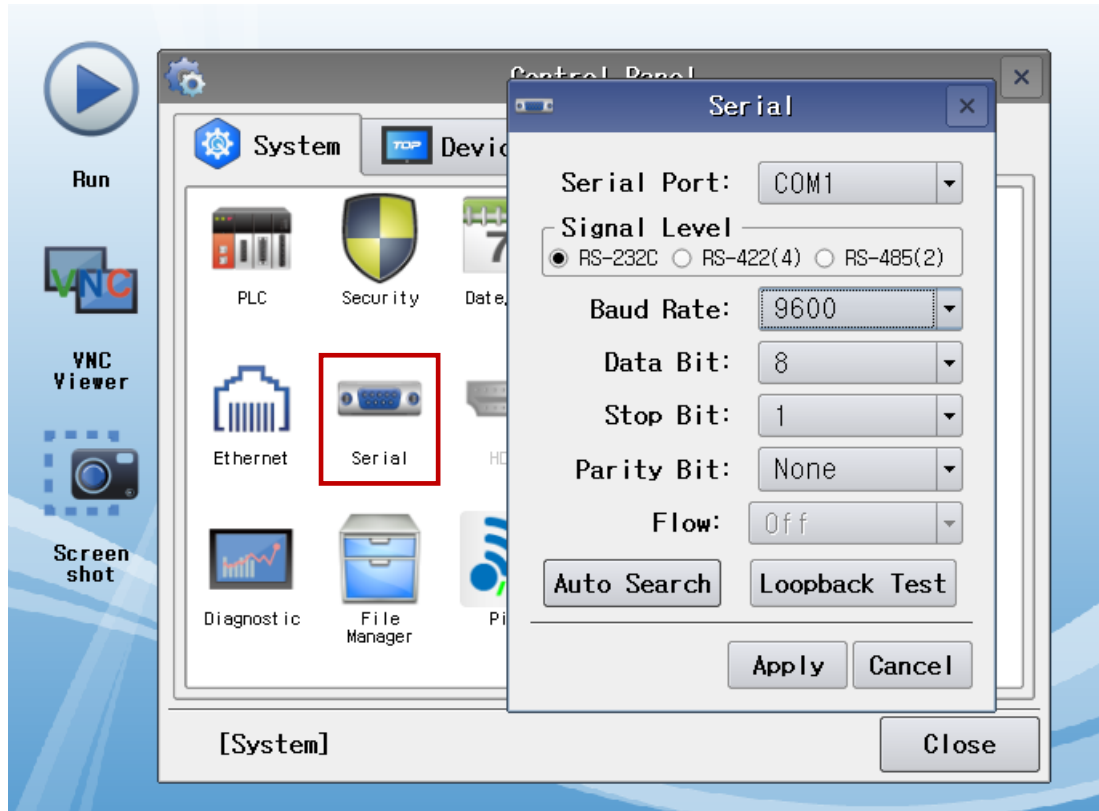| Items	Settings	Remarks
Interface	Select Serial.	
Protocol	Select Private Protocol.	
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and sending the next command request.	
Retry	Configure the amount of redelivery attempts made by the external device to TOP.	

3.3 Communication diagnostics

■ Check the interface setting status between the TOP and an external device.

- Touch the top of the TOP screen and drag it down. Touch "EXIT" in the pop-up window to go to the main screen.

- Check if the COM port settings you want to use in [Control Panel > Serial] are the same as those of the external device.

■ Diagnosis of whether the port communication is normal or not

- Touch "Communication diagnostics" in [Control Panel > PLC].

- The Diagnostics dialog box pops up on the screen and determines the diagnostic status.

OK	Communication setting normal
Time Out Error	Communication setting abnormal
	- Check the cable, TOP, and external device setting status. **(Reference: Communication diagnostics sheet)**

■ Communication diagnostics sheet

- If there is a problem with the communication connection with an external terminal, please check the settings in the sheet below.

Items	Contents		Check		Remarks
System configuration	How to connect the system		OK	NG	1. System configuration
	Connection cable name		OK	NG	
TOP	Version information		OK	NG	2. External device selection 3. Communication setting
	Port in use		OK	NG	
	Driver name		OK	NG	
	Other detailed settings		OK	NG	
	Relative prefix	Project setting	OK	NG	
		Communication diagnostics	OK	NG	
	Serial Parameter	Transmission Speed	OK	NG	
		Data Bit	OK	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
External device	CPU name		OK	NG	4. External device setting
	Communication port name (module name)		OK	NG	
	Protocol (mode)		OK	NG	
	Setup Prefix		OK	NG	
	Other detailed settings		OK	NG	
	Serial Parameter	Transmission Speed	OK	NG	
		Data Bit	OK	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
	Check address range		OK	NG	6. Supported addresses (For details, please refer to the PLC vendor's manual.)

4. External device setting
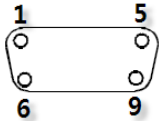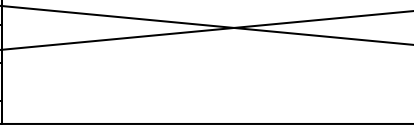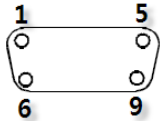
Configure the communication setting of the external device by referring to its user manual.

5. Cable table

This chapter introduces a cable diagram for normal communication between the TOP and the corresponding device.

■ 1:1 connection (RS-232C)

TOP			Cable	External device		
Pin arrangement*Note 1)	Signal name	Pin number		Pin number	Signal name	Pin arrangement*Note 1)
Based on communication cable connector front, D-SUB 9 Pin	RD	2		2	RD	Based on communication cable connector front, D-SUB 9 Pin
	SD	3		3	SD	
	SG	5		5	SG	

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.

6. Supported addresses

The devices available in TOP are as follows:

The device range (address) may differ depending on the CPU module series/type. The TOP series supports the maximum address range used by the external device series. Please refer to each CPU module user manual and be careful not to deviate from the address range supported by the device you want to use.*Detailed description for the address can be found below.

Device	Bit	Word	Double word	Description	Remarks
IP	IP000 - IP287	IP000 - IP272		Input Port	*1)
OP	OP300 - OP587	OP300 - OP572		Output Port	
FG	FG000:600 - FG000:899 FG001:900 - FG128:999	FG000:600 - FG000:872 FG001:900 - FG128:980	–	Flag Data	
PDT	–	PDT0	–	Number of Effective Point Data	*1) *3)
EPD	–	EPD0	–	Number of Effective Point Data 2	*1) *3)
INT	INT000:0200.0 - INT000:1299.31 INT001:0001.0 - INT128:1099.31	INT000:0200 - INT000:1299 INT001:0001 - INT128:1099	INT000:0200 - INT000:1299 INT001:0001 - INT128:1099	Integer Data	
RL	–	RL0000:0300 - RL0000:1399 RL0001:0100 - RL0128:1199	RL000.0300 - RL000.1399 RL001.0100 - RL128.1199	Real Data	
AXST	AXST00.00 – AXST47.15	AXST00 - AXST47		Axis Status	*1)
PGST	PGST000.00 - PGST511.15	PGST000 - PGST511		Program Status	*1)
SYST	SYST0.00 - SYST6.15	SYST0 - SYST6		System Status	*1)
PRG	–	PRG000 - PRG128		Program Control	*2)
AR		AR0	–	Alarm Reset	*2)
SR		SR0	–	Software Reset	*2)
DSR		DSR0	–	Drive-Source Recovery	*2)
OPR		OPR0	–	Operation-Pause Cancellation	*2)
SV		SV0 - SV2	–	Servo ON/OFF	*2)
RO		RO0 - RO3	–	Home Return	*2)
ACM			ACM0 - ACMC	Absolute Coordinate Specification Movement	*2)
RCM			RCM0 - RCMC	Relative Coordinate Specification Movement	*2)
JIM			JIM0 - JIM6	Jogging/Inching	*2)
PNM		PNM0 - PNM5		Point-Number Specification Movement	*2)
OSC		OSC0 - OSC2	–	Operation Stop/Cancel	*2)
PD	PD0001:00.00 - PD1500:12.31	PD0001:00 - PD1500:12	PD0001:00 - PD1500:12	Point Data	*4)
ED	ED0001:00.00 - ED1500:12.31	ED0001:00 - ED1500:12	ED0001:00 - ED1500:12	Point Data 2	*4)
PDO		PDO0 - PDO2		Effective Point Data (Operate)	
EDO		EDO0 - EDO2		Effective Point Data 2 (Operate)	
PCLR		PCLR0 - PCLR2	–	Point Data Clear	*2)
EPLR		EPLR0 - EPLR2	–	Point Data Clear2	*2)

Device	Bit	Word	Double word	Description	Remarks
SAXS		SAXS00 - SAXS1B		SCARA Axis Status (WORK)	*1)
SAXSD		SAXSD00 - SAXSD1B		SCARA Axis Status (TOOL)	*1)
CD			CD0:00:0 - CD1:31:3	Coordinate System Definition Data	*1)
SD		SD01:00 - SD255:10		Simple Interference Check Zone Data	*1)
SACM			SACM00 - SACM0D	SCARA Absolute Coordinate Movement	*2)
SRCM			SRCM00 - SRCM0D	SCARA Relative Coordinate Movement	*2)
SPNM		SPNM0 - SPNM6		SCARA Point Number Movement	*2)

***1) read only**
***2) write only**
***3) TAG must be on screen during PROG RUN or valid point inquiry**
***4) buffer**

*Detailed description for device address

Device	Description
FG	FG000:600
	000　>> Progam number　Global area(000), Local area(001~128)
	600　>> Flag number　Global area(600), Local area(900~999)
INT	INT000:0200
	000　>> Progam number　Global area(000), Local area(001~128)
	200　>> Variable number　Global area(200~299,1200~1299), Local area(0001~0099,1001~1099)
RL	RL000:0300
	000　>> Progam number　Global area(000), Local area(001~128)
	300　>> Variable number　Global area(300~399,1300~1399), Local area(0100~0199,1101~1199)
AXST	AXST00 - 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
	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.)
	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 - AXST11: Double axes status
	...
	AXST42 - AXST47: Eight axes status
PGST	PGST000 - PGST003: 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
	PGST004 - PGST007: Program number 2 status
	...
	PGST508 - PGST511: Program number 128 status

Device	Description

SYST	SYST0: 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
	   Bit 1 (TP enable switch status): 0 = ON / 1 = OFF
	   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
	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

PRG	PRG '000' - **Program number** Write Data 0: Program Run Command Write Data 1: Program End Command Write Data 2: Program Pause Command Write Data 3: Program One-Step Run Command Write Data other: Program Resume Command
SV	SV0: Command trigger / 1 = Write 1: Axis pattern 2: Operation type Bit 0 (Servo ON/OFF): 0 = OFF / 1 = ON
RO	RO0: Command trigger / 1 = Write 1: Axis pattern 2: End search speed at home return 3: Creep speed at home return
ACM	ACM0: Command trigger / 1 = Write 1: Axis pattern 2: Acceleration unit (0.01G) 3: Deceleration unit (0.01G) 4: Speed unit (mm/sec) 5 - C: Absolute coordinate data unit (0.001mm)

Device	Description
RCM	RCM0: Command trigger / 1 = Write 1: Axis pattern 2: Acceleration unit (0.01G) 3: Deceleration unit (0.01G) 4: Speed unit (mm/sec) 5 - C: Relative coordinate data unit (0.001mm)

JIM	JIM0: Command trigger / 1 = Write
	1: Axis pattern
	2: Acceleration unit (0.01G [for each axis, in %])
	3: Deceleration unit (0.01G [for each axis, in %])
	4: Speed unit (mm/sec [for each axis, in %])
	5: Inching distance unit (0.001mm [for each axis, in 0.001deg])
	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

PNM	PNM0: Command trigger / 1 = Write 1: Axis pattern 2: Acceleration unit (0.01G) 3: Deceleration unit (0.01G) 4: Speed unit (mm/sec) 5: Point number

OSC	OSC0: Command trigger / 1 = Write / 4 = Clear
	1: Stop axis pattern
	2: Appended command byte
	  Bit 1-7 (Reserved for system use)
	  Bit 0 (Specification of output cancellation during interlock on-hold (OUT port) (when all operations are paused)
	  / 0 = Not canceled / 1 = Canceled tentatively

PD,
ED
	PD0001:00
	0001 >> Index of point data (0001~1500)
	00 >> Point Data (00~12)
	  00: Point number
	  01: Axis pattern
	  02: Acceleration unit (0.01G)
	  03: Deceleration unit (0.01G)
	  04: Speed unit (mm/sec)
	  05: 1st axis position data
	  ...
	  12: 8th axis position data

PDO, EDO	PDO0: Command trigger / 1 = Write / 2 = Read 1: Starting point number 2: Number of point data
PCLR, EPLR	PCLR0: Command trigger / 1 = Write 1: Clear starting point number 2: Number of clear point data

Device	Description
SAXS	Type : Base coordinate system (WORK) SAXS00: Work coordinate system selection number 01: Tool coordinate system selection number 02: Common axis status 03: Axis pattern 04: Axis status 05: Axis sensor input status 06: Axis error code 07: Encoder status 08: Current position (L) unit (0.001mm or 0.001deg) 09: Current position (H) unit (0.001mm or 0.001deg) SAXS0A - SAXS0F: Double axes status ... SAXS16 - SAXS1B: Four axes status
SAXSD	Type : Selected work coordinate system (TOOL) SAXSD00: Work coordinate system selection number 01: Tool coordinate system selection number 02: Common axis status 03: Axis pattern 04: Axis status 05: Axis sensor input status 06: Axis error code 07: Encoder status 08: Current position (L) unit (0.001mm or 0.001deg) 09: Current position (H) unit (0.001mm or 0.001deg) SAXSD0A - SAXSD0F: Double axes status ... SAXSD16 - SAXSD1B: Four axes status

CD	CD1:31:3
	1 >> Type (0~1) 0 = WORK / 1 = TOOL
	31 >> Coordination system definition data number (0~31)
	3 >> Coordinate offset (0~3)
	  0: X-axis data
	  1: Y-axis data
	  2: Z-axis data
	  3: R-axis data

SD	SD01:00
	01 >> Simple interference check zone data number (01~255)
	00 >> Simple interference check zone data (00~10)
	  00 – 08: Simple interference check zone definition coordinate
	  09: Physical output port number or global flag number for output upon entry
	  10: Entry error type specification

SACM	00: Command trigger / 1 = Write 01: Axis pattern 02: Acceleration unit (% or 0.01G) 03: Deceleration unit (% or 0.01G) 04: Speed unit (% or mm/sec) 05: Positioning operation type (No SCARA axis disabled) 06 - 0D: Absolute coordinate data unit (0.001mm)

Device	Description
SRCM	00: Command trigger / 1 =Write
	01: Axis pattern
	02: Acceleration unit (% or 0.01G)
	03: Deceleration unit (% or 0.01G)
	04: Speed unit (% or mm/sec)
	05: Positioning operation type (No SCARA axis disabled)
	06 - 0D: Absolute coordinate data unit (0.001mm)
SPNM	0: Command trigger / 1 = Write
	1: Axis pattern
	2: Acceleration unit (0.01G)
	3: Deceleration unit (0.01G)
	4: Speed unit (mm/sec)
	5: Positioning operation type (No SCARA axis disabled)
	6: Point number