



**X-SEL® Controller
IX SCARA Series
PC Software Operating Manual**

IAI America, Inc.

This publication was written to assist you in better understanding this part of your IAI system. If you require further assistance, please contact IAI Technical Support. For Central and East Coast Time Zones, please call our Itasca, IL office at 1-800-944-0333 or FAX 630-467-9912. For Mountain and Pacific Time Zones, please call our Torrance, CA office at 1-800-736-1712 or FAX 310-891-0815; Monday thru Friday from 8:30AM to 5:00PM.



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1. Before You Begin

1-1 Items Supplied With This Software

Please check to make sure that the following items are included in your PC software package.

- Operating manual
- 3.5-inch floppy disks containing the software (2)
- IAI RS232C communication cable

1-2 What You Will Need (Operating Requirements)

The following PC and accessories will be necessary to run this software program.

- A PC that runs under Windows and compatible keyboard.
- Enough memory to run Windows.
- A monitor compatible with the PC.
- A VGA graphic board or better.
- Mouse or other pointing device and mouse driver.
- (Windows 95, Windows 98 or Windows NT).
- A floppy disk drive unit that runs a 3.5-inch disk with 1.25 or 1.44MB capacity.
- The hard disk should have 3MB or more of free memory space. (The software is run from the hard disk).
- An RS232C serial port (25 or 9 pins).
- A printer compatible with the PC.

1-3 Software Installation

This software is run from the hard disk. In this section, we explain how to install the software.

- Insert floppy disk 1 in the floppy disk drive.
- Execute Setup.EXE in disk 1.
- The installation program will be executed, so simply follow the prompts that appear.
- When the installation program ends, an item named "X-SEL PC Software" (Iai → X_sel → X-SEL PC Software) is created in the Programs (P) list displayed from the Start menu. This software launches when "X-SEL PC Software" is selected.

Caution: Please remove any CD from your computer during software installation.

1-4 Software Start-up

Step 1: Turn off the power to the Super SEL controller, then connect the Super SEL controller to the PC with the IAI RS232C cable that comes with the software.
Turn the mode switch for the controller to the MANU side.

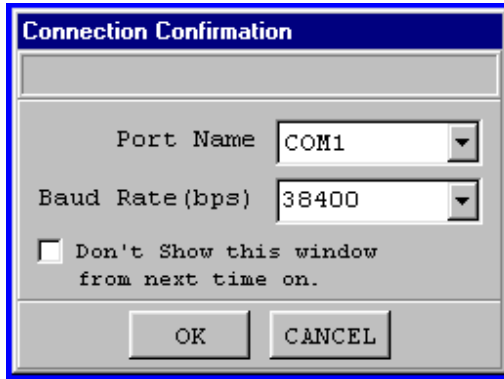
This software launches with the safety velocity function enabled. Therefore, when a program is launched from the PC software, the maximum speed during CP operation will be limited to 250 mm/sec or below (PTP operation: 3% or below). To operate the robot in accordance with the programmed speed commands, the safety velocity function must be disabled.

See 3-3, "Explanation of Tool Bar," for how to enable/disable the safety velocity function.

Step 2: Turn Super SEL controller power back on.

1. Before You Begin

Step 3: Start the software.
 Check for connection" screen (Diagram 1.1) will appear. From the column where "Communication Port" and "Baud Rate" are displayed, select the communication port (*Note1) and Baud Rate (*Note 2) that are connected to the X-SEL Controller, and then, select the "OK" button.



Check for Connection Screen (Diagram 1.1)

- (*Note 1): Selection of communication ports that are usable, is possible, during application start.
 - (*Note 2): If communication is not possible using the selected baud rate, the application will automatically test the connection and change in the order as follows: 9600 -> 19200 -> 38400.
- Step 4: Once connection is confirmed with the controller, the application will come up in the ON-line mode. In case the PC fails to recognize, or in case the "CANC" button is clicked, OFF-line mode will turn ON (if Start is done using the OFF-line mode, you can move to ON-line mode by using "reconnect" which appears later).

If "Don't show this window from next time on" is checked, the connection check will be executed automatically for the communication port and the baud rate used at the end of the last application will be the default.

Extra Caution:

While in manual mode, if "OPEN 1" is executed in a program, serial communication will be transferred to the Serial port of the controller, and communication between the PC and controller will be lost. The program in the controller will continue to run. (*Error No. A5D "SCIF Open Error during Anti AUTO mode).

Afterwards, if you wish to stop movement, press ON the Emergency Stop Button (Be especially careful during Jog operation). *In case prior to Ver 0.16 of controller main CPU firmware.

For Ver 0.16 of controller main CPU firmware, depending on servo use, channel 1 will be opened as follows:

(MANU Mode · Servo during non-use)

	Before executing "OPEN 1"	After executting "OPEN 1"
Connection with 1 channel	Connection with PC Software	Forced Move to SEL Program connection (Message error) program is executing

Error message after executing "OPEN 1": Error No. A5D "SCIF open error during non-auto mode

(MANU Mode · Servo during -use)

	Before executing "OPEN 1"	After executting "OPEN 1"
Connection with 1 channel	Connection with PC Software	Connection with PC Software (Cold start error) program is ending

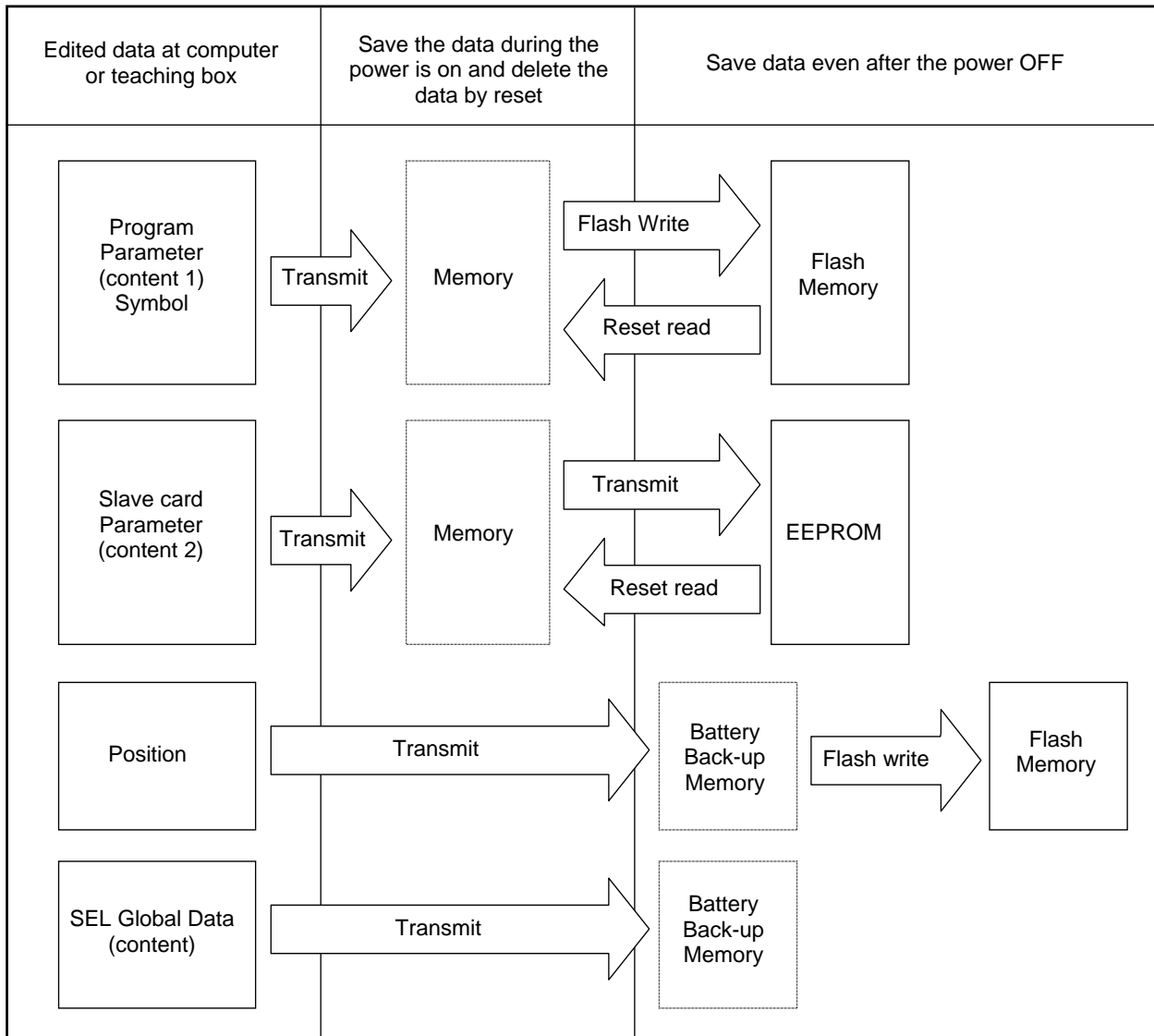
Error message after executing "OPEN 1": Error No. E89 "SCIF open error during non-auto mode (servo ON)

The above "Extra Caution" notes pertain to all other than "Manu Mode with I/O Parameter No.90=2 (IAI Protocol).

2. How to Save Data

The X-SEL Controller contains flash memory. There are two types of memory storage, battery back-up (for encoder data) and flash memory. This is true for both the PC software and the Teaching Pendant. The diagram below shows that information not written to flash memory will be lost when power is cycled on the controller. For non-volatile (permanent) data storage, please save to flash memory.

2-1 Setting At the Time of Shipment (In case of back-up battery) (Other parameter No. 020=2 (backup battery equipped))



Program · parameter · symbol will read from Flash memory when you restart. Data displayed after restart will be the data that was last saved to flash memory. The controller will always operate obeying the memory data (within the above dotted line) (excluding parameter).

Content 1: Parameter other than below content 2.

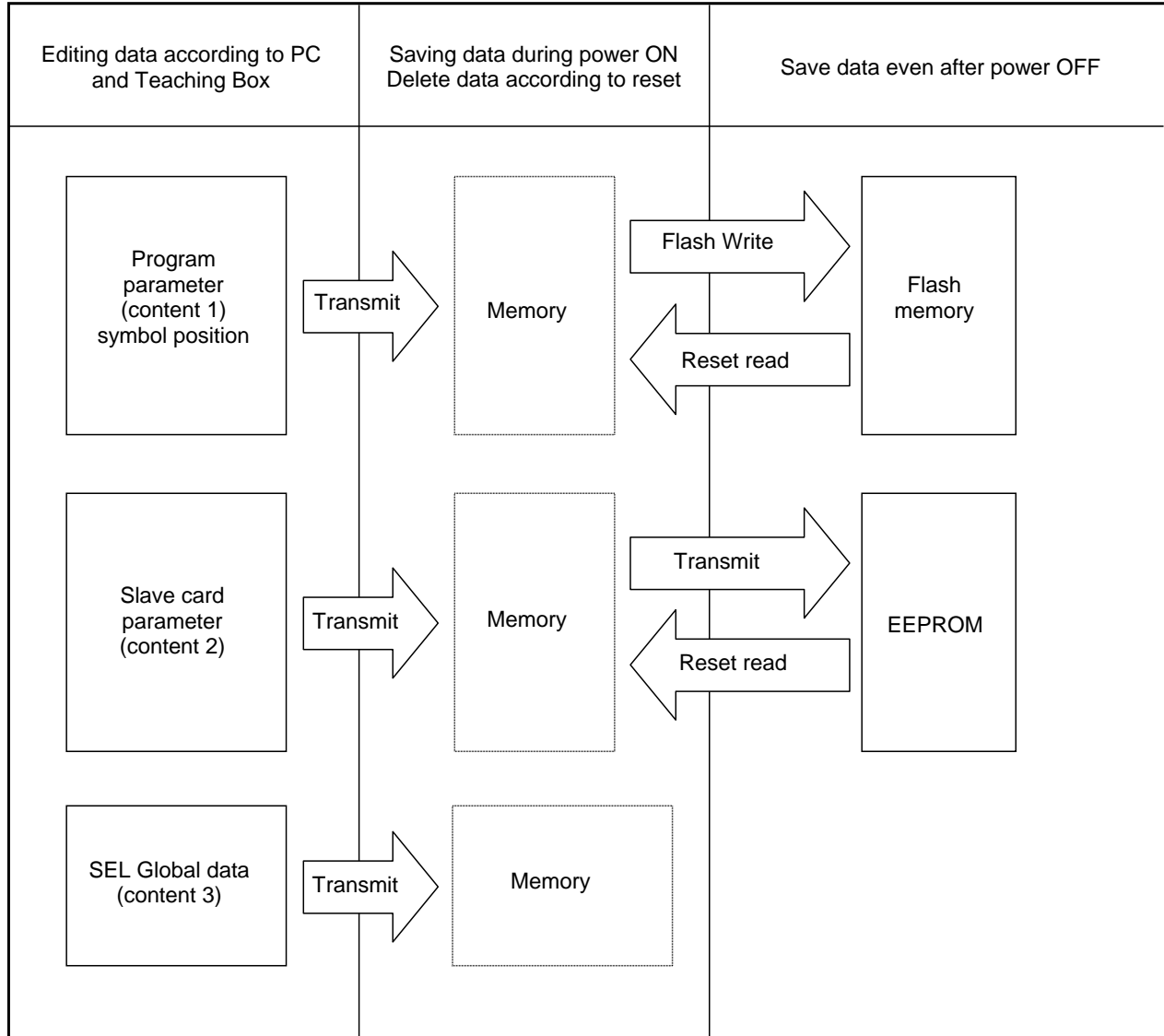
Content 2: Driver card, IO slot card encoder (electric power type card) parameter

Content 3: Flag, Variable, String and Error List

2. How to Save Data

2-2 Setting at the Time of Shipment without back-up battery

Other parameter No.20=20 (backup battery unequipped)



Program · parameter · symbol will read from flash memory during restart. Therefore, unless written into flash memory, the memory data will return to the previous data before edit. The controller will always operate obeying the memory data (within the above dotted line) (excluding parameter). SEL global data can't be saved without back-up battery.

2-3 Caution

Caution: Never shut OFF the main power while the data is transmitting and writing into flash. Data may be lost and controller may be rendered in operable.

2. How to Save Data

Note on Saving Parameters to a File

Encoder parameters are stored in the EEPROM of the actuator's encoder itself. (Unlike other types of parameters, these parameters are not stored in the EEPROM of the controller.) Encoder parameters are read from the EEPROM into the controller when the power is turned on or when the software is reset.

Therefore, if the parameters in the controller are saved to a file, and when the power to that controller has been turned on (or the software has been reset) without the actuator (encoder) connected, then the encoder parameters saved in the file will become invalid.

Note on Transferring a Parameter File to the Controller

When a parameter file is transferred to the controller, encoder parameters are transferred to the EEPROM of the encoder (except for the parameters relating to manufacturing information and functional information).

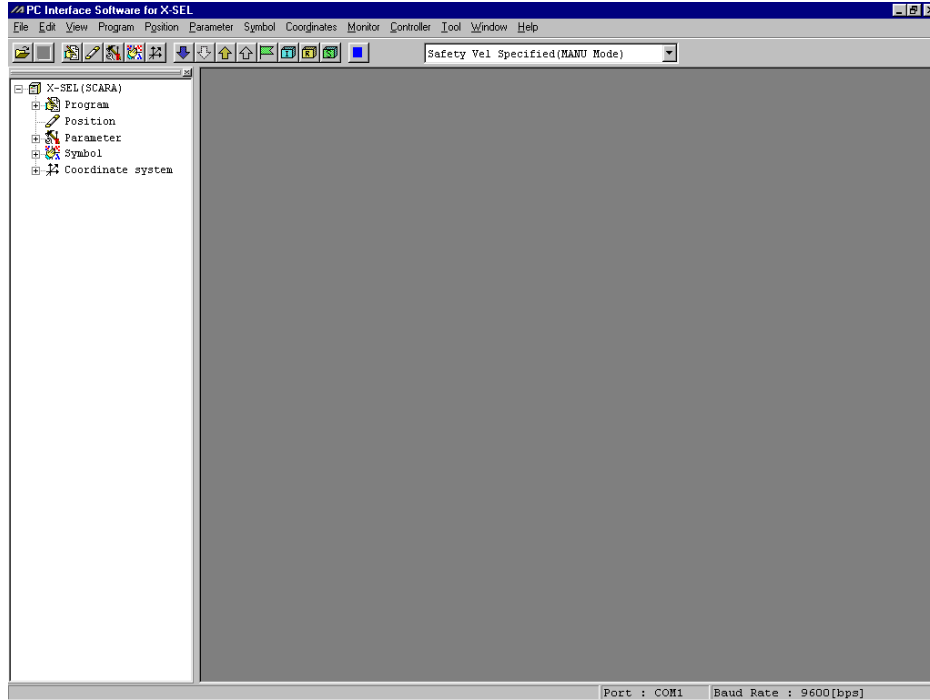
Therefore, if a parameter file is read from the controller that has been started without the actuator connected, and the file is subsequently transferred back to the controller again, invalid encoder parameters will be written to the encoder's EEPROM. (This applies when the actuator is connected to the controller when the file is transferred back.)

When saving the parameters to a file, make sure the controller has been started with the actuator connected.

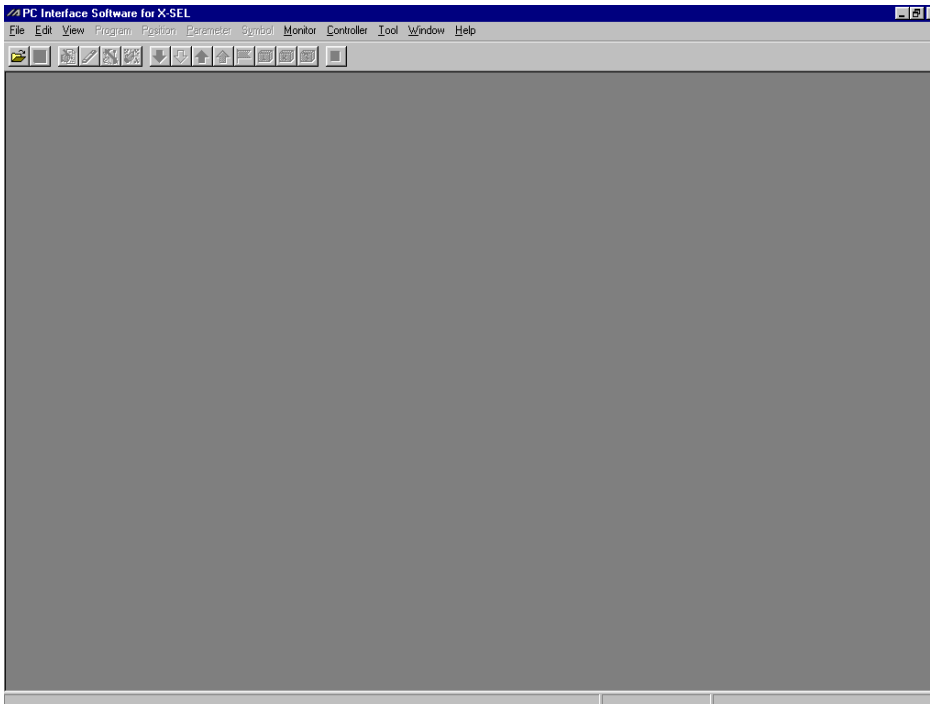
3. Menu Window

3-1 Explanation of Menu

When the software runs and opens the window, there will be 12 items and 16 icons in the menu bar with the tree view appearing on the left side of the window (The initial screen: main menu).



ON-Line Start Screen (Diagram 3.1)



OFF-Line Start Screen (Diagram 3.2)

3. Menu Window

3-2 Explanation of Command

(1) File (F)

1. New (N)
 - Program (G) Create a new SEL program.
 - Position (O) Open a new point table edit window.
 - Symbol (Y) Open a new symbol edit window.
2. Open (O) Ctrl+O Read the data which is saved in a file.
3. Close (C) Close the current active windows.
4. Save (S) Ctrl+S Save the active edit window to a file.
5. Save As (A) Assign a file name and save the active edit window.
6. Print Setup (P) Set the font and the printer.
7. Recent File (R) Show recent file history.
8. Exit (X) End the application

(2) Edit (E)

Edit auxiliary operations when editing data.

1. Cut (X) Ctrl+X Cut the high lighted lines to the clipboard.
2. Copy (C) Ctrl+C Copy the lines to the clipboard.
3. Paste (V) Ctrl+V Paste the copied or cut contents on the clipboard cursor location.
4. Find (F) Ctrl+F Find selected character string.
5. Find Next Match (N) Find the selected character string as specified above from where the
F3 cursor is located.

(3) View (V)

Functions related to View setting.

1. Tree View (T) Turn on and off the tree view on left side of main screen.
2. Font (F) Set the font.

(4) Program

Functions related to programming (This is available at ON-line mode only.)

1. Edit (E) Read the selected programs from the controller and Edit them.
2. Copy/Paste (C) Copy and paste (cut and paste) the program.
3. Clear (L) Clear the program.
4. Save as (S) Save and name the selected or all programs together.
5. Finish All Program (T) Exit all executing programs.

(5) Position (O)

Functions related to position data. (This is available at ON-line mode only)

1. Edit (E) Read the position data from the controller to edit.
2. Copy/Move (C) Copy and Move (Cut and Paste) the position data.
3. Clear (L) Clear the position data.

(6) Parameter (P)

Function related to parameter. (This is available at ON-line mode only)

1. Edit (E) Read the parameter from the controller to edit.

(7) Symbol (Y)

Functions related to symbol data. (This is available at ON-line mode only)

1. Edit (E) Read the symbol data from the controller to edit.
2. Clear All (C) Clear all the symbol data.

3. Menu Window

(8) Coordinate System (D)

Edit the coordinate system definition data. (This is available in ON-line mode only).

1. Edit (E) Read the coordinate system definition data from the controller and edit the data.
2. Clear (L) Clear the coordinate system definition data.

(9) Monitor (M)

Monitor each status, global variable, port condition, etc (This is available in ON-line mode only).

1. Task Status Open the Task status monitor window.
2. System Status Open the System status monitor window.
3. Axis Status Open the Axis status monitor window.
4. Input Port Open the Input port monitor window.
5. Virtual Input Port Open the Virtual Input port monitor window.
6. Output Port Open the Output Port monitor window.
7. Virtual Output Port Open the Virtual Output port monitor window.
8. Global Flag Open the Global Flag monitor window.
9. Global Integer Open the Global Integer Variable monitor window.
10. Global Real Open the Global Real Variable monitor window.
11. Global String Variables Open the Global String monitor window.
12. Detailed Error Information Open the Detailed Error Information window.

(10) Controller (C)

Functions related to the software reset, the error reset, the controller, etc.

1. Reconnect (C) Execute communication to reconnect with the controller.
If communication is possible, you can switch from OFF-line to ON-line.
2. Baud Rate Change (B) Change the communication baud rate between the PC and the controller.
3. Write Flash ROM (W) Saves points programs, parameters, etc. to memory.
4. Initialize Memory (I) Global Variable (V) Clear global variables.
5. Abs Encoder Reset (A) Reset the absolute position data.
6. Software Reset (R) Reset the controller's software and restart the controller.
7. Error Reset (E) Reset the controller's errors.
8. Request Driver Power Recovery (P) Request Driver Power Recovery from the controller.
9. Request Releasing Pausing Operation (L) Request Pause Release Operation from the controller.
10. ROM Version Information (V) Display the controller's ROM version information.

(11) Tool (T)

Set the application.

1. Environment Setup (S) Set the environment for the application

(12) Window (W)

Change the way of window display.

1. Cascade (C) Line up the window in an angle so they overlap.
2. Tile Vertical (V) Arrange the windows vertically without any overlap.
3. Tile Horizontal (H) Arrange the windows horizontally without any overlap.
4. Minimize All (M) Minimize all windows.
5. Arrange Icons (A) Line up the icons.

(13) Help (H)

1. About (A) Display the version of the software.
















3. Menu Window

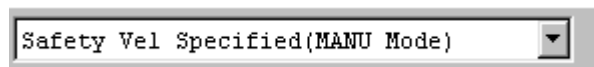
3-3 Explanation of Tool Bar

Explanation (below the menu) of the tool bar of the main menu.



Tool Bar Screen (Diagram 3.3)

	Open Files	The same function as File (F) -> Open (O)
	Save	The same function as File (F) -> Save (S)
	Edit Programs	The same function as Program (S) -> Edit (E)
	Edit Positions	The same function as Position (O) -> Edit (E)
	Edit Parameters	The same function as Parameter (P) -> Edit (E)
	Edit Symbols	The same function as Symbol (Y) -> Edit (E)
	Input Port Monitor	The same function as Monitor (M) -> Input Port (I)
	Virtual Input monitor	The same function as Monitor (M) -> Virtual Input Monitor (N)
	Output Port Monitor	The same function as Monitor (M) -> Output Port (O)
	Virtual Output Port	The same function as Monitor (M) -> Virtual Output Monitor (U)
	Global Flag Monitor	The same function as Monitor (M) -> Global Flag (F)
	Global Integral Variable Monitor	The same function as Monitor (M) -> Global Integral (L)
	Global Variable Monitor	The same function as Monitor (M) -> Global Variable (R)
	Global String Variable Monitor	The same function as Monitor (M) -> Global String (G)
	All Exit	The same function as Program (S) -> All Exit (T)



Switch Safety Velocity Specified in manual mode.

[Safety Velocity Specified] ---- There is Safety Velocity.

(The maximum speed during CP operation will be limited to 250 mm/sec or below (PTP operation: 3% or below) regardless of the program or parameter settings.)

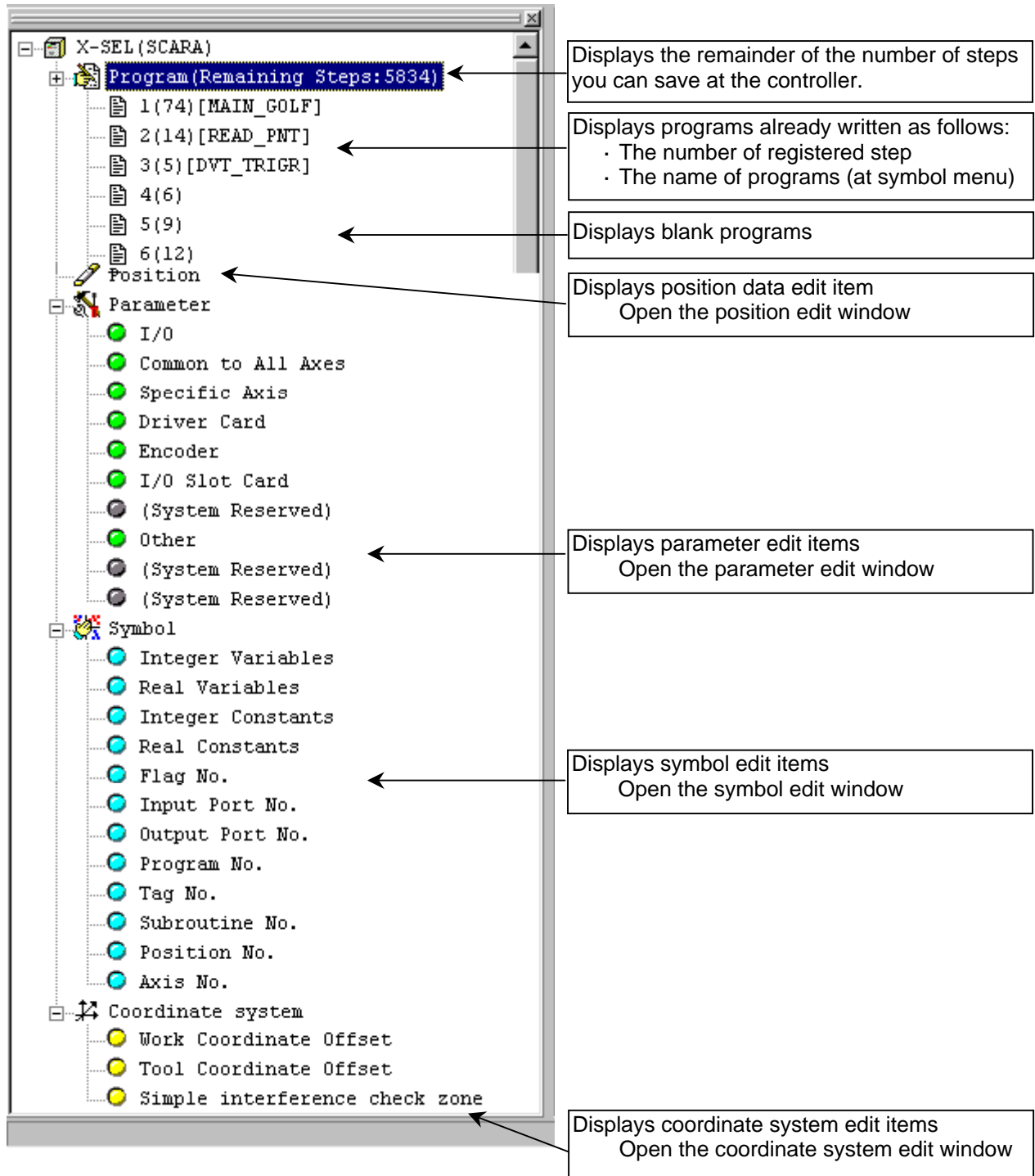
[Safety Velocity Not Specified] ---- There is no Safety Velocity.

(Moves are executed with programmed velocity.)

3. Menu Window

3-4 Tree View

By double clicking items which are displayed at the left side of the main menu, it makes operating edit windows in ON-line mode easier. You can show and hide the tree view from the menu -> View (V) -> Tree Display (T).

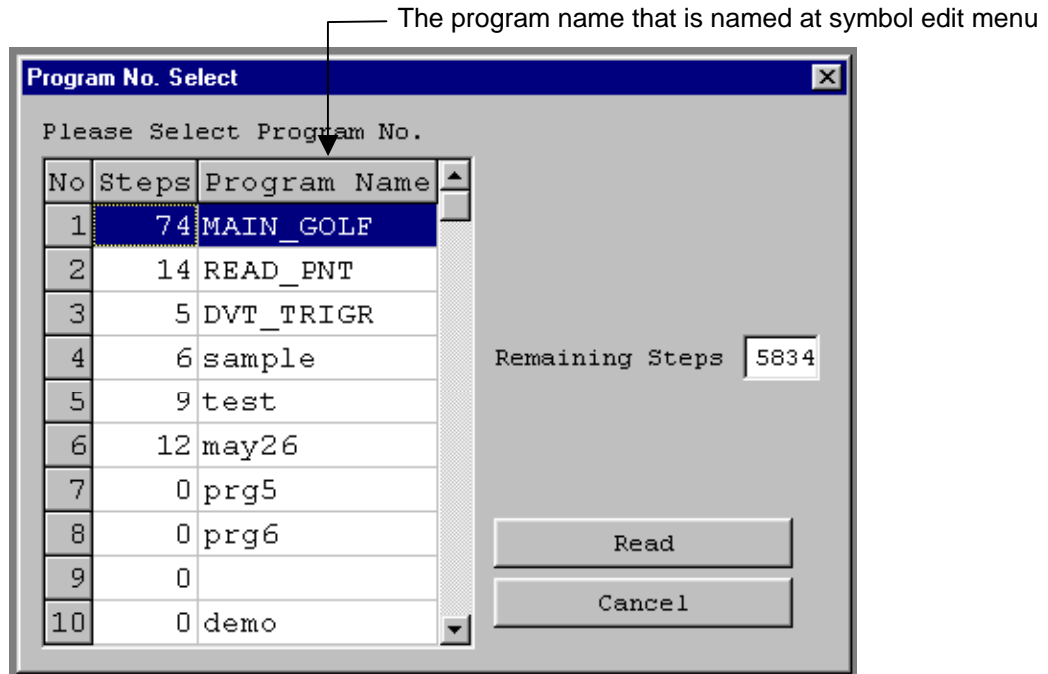


Tree View Screen (Diagram 3.4)

4. Program Edit Window

4-1 Explanation of Program Edit Window.

- (1) From the menu, select Program (S) -> Edit (E).
- (2) The Program No. Select window will be displayed, then select the program you want to edit and click Read.



Program No. Select Screen (Diagram 4.1)

- (3) The program edit window will be displayed and there are the following items on this window.

- No. ->** Shows step No.
- B ->** Set the brake point (This is available at the "On line" editing windows only).
Click B on the line you want to edit. Then "B" appears on the line that the brake point has been set.
- E ->** Input the extension condition.
- N ->** Select "N" which is the opposite input condition.
- Cnd* ->** Conditional column for input conditions using outputs, inputs, flags, etc.
- Cmnd ->** Double click or press [F1] to display the SEL command explanation window.
You can select command language and input them to step data from this window.
- Operand1* ->** Input operation 1 (Operand 1).
- Operand2* ->** Input operation 2 (Operand 2).
- Pst* ->** Post - trigger output or flag.
- Comment ->** Comment as needed (MAX 18 characters).
By double clicking, you can fix comment partially which has been entered.
- * Press F11 to search input condition and symbol which is input on Operand.

4. Program Edit Window

No.	B	E	N	Cnd	Cmd	Operand 1	Operand 2	Pst	Comment
1					VEL	100			
2					VELS	50			
3					MOVP	Z_UP			
4					MOVP	START_HIT			
5					MOVP	Z_DOWN			
6					MOVL	HIT_BALL			
7					MOVP	Z_UP			
8					BTOF	600	625		
9					*wait for ball to settle and trigger DVT				
10					TAG	1			
11					TIMW	3			
12					EXPG	2			
13					TIMW	0.5			

Program Edit Screen (Diagram 4.2)

Right click the mouse at the selected line. The pop-up menu will be displayed (Diagram 4.3).

- Cut (T) Ctrl + X ->** The same function as Menu Edit (E) -> Cut (T)
- Copy (C) Ctrl + C ->** The same function as Menu Edit (E) -> Copy (C)
Copy the whole line where the cursor is located.
- Paste (P) Ctrl + V ->** The same function as Menu Edit (E) -> Paste (P)
- Insert one Line (I) ->** Insert one line where the cursor is located.
- Delete Selected lines (D) ->** Delete the selected area.
- Set Comment (S) ->** Set comment on the line cursor is located (step will not be executed).
In case the effective step is turned into comment, using the "Release Comment" listed below, you can return to the original effective step.
- Release Comment (R) ->** Disables the comment, allowing the line of code to be executed.

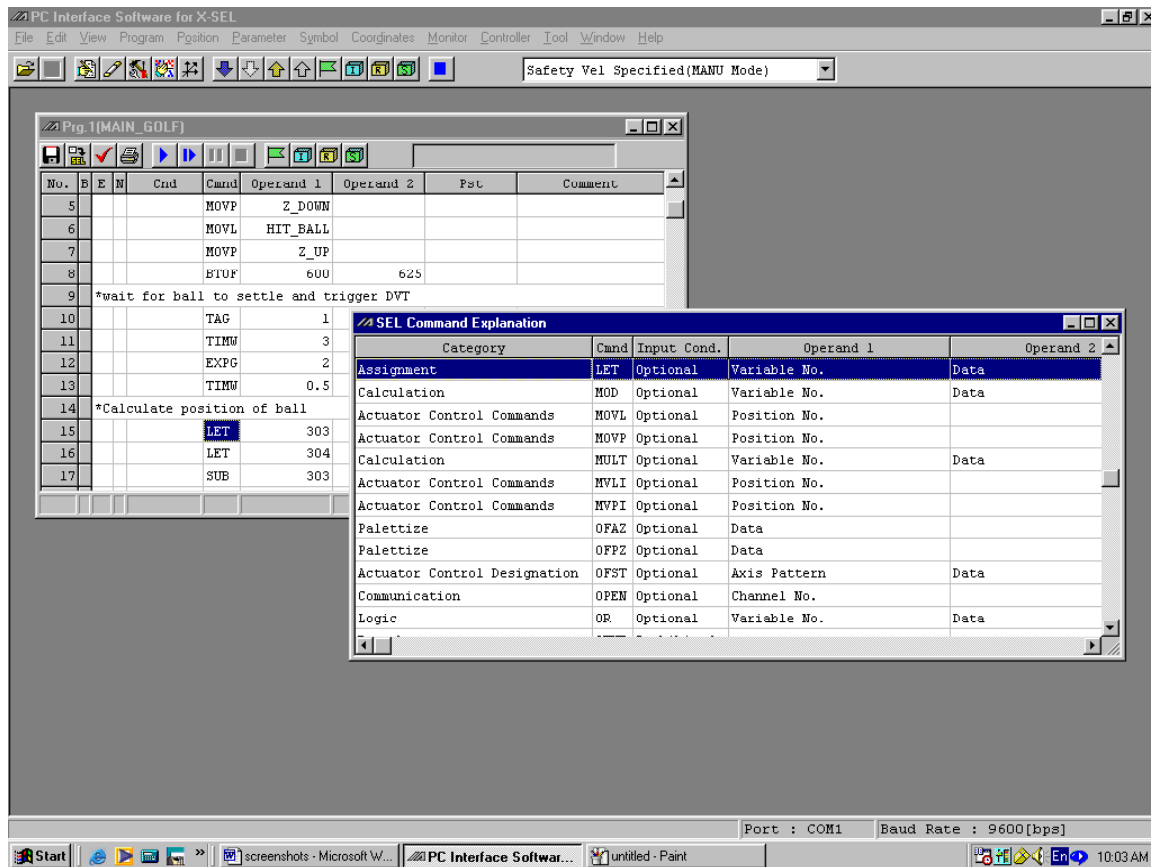
No.	B	E	N	Cnd	Cmd	Operand 1	Operand 2	Pst	Comment
1					VEL	100			
2					VELS	50			
3					MOVP	Z_UP			
4					MOVP	START_HIT			
5					MOVP	Z_DOWN			
6					MOVL	HIT_BALL			
7					MOVP	Z_UP			
8					BTOF	600	625		
9					*wait for ball to settle and trigger DVT				
10					TAG	1			
11					TIMW	3			
12					EXPG	2			
13					TIMW	0.5			
14					*Calculate position of ball				
15					LET	303	*30		
16					LET	304	*30		

Pop Up Menu Screen (Diagram 4.3)

4. Program Edit Window

The SEL command explanation window is opened by double clicking Command or pressing F1 in the “cmd” field.

Use this window as the editing reference.

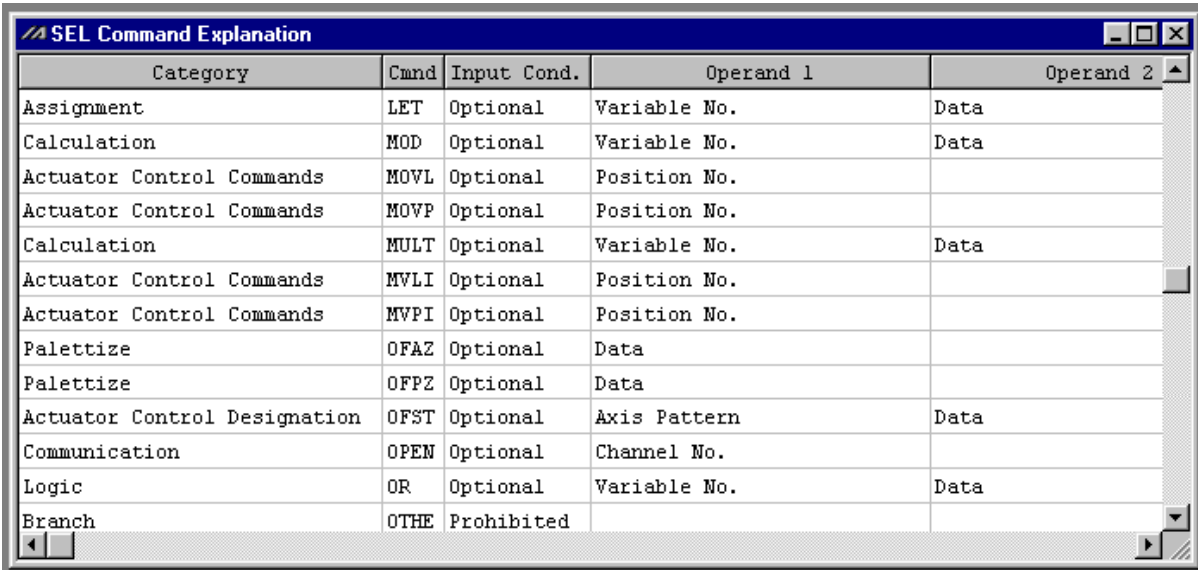


SEL Command Explanation Screen (Diagram 4.4)

4. Program Edit Window

Right click on the SEL command field. The pop-up menu will be displayed.

- Input (I) ->** Input the command on the line that the cursor is located at. (the cursor line at the program edit window).
- Font (F) ->** Set the SEL command font.
- Sort (S) ->** Sort according to alphabetical order (A)
Sort according to category (C)

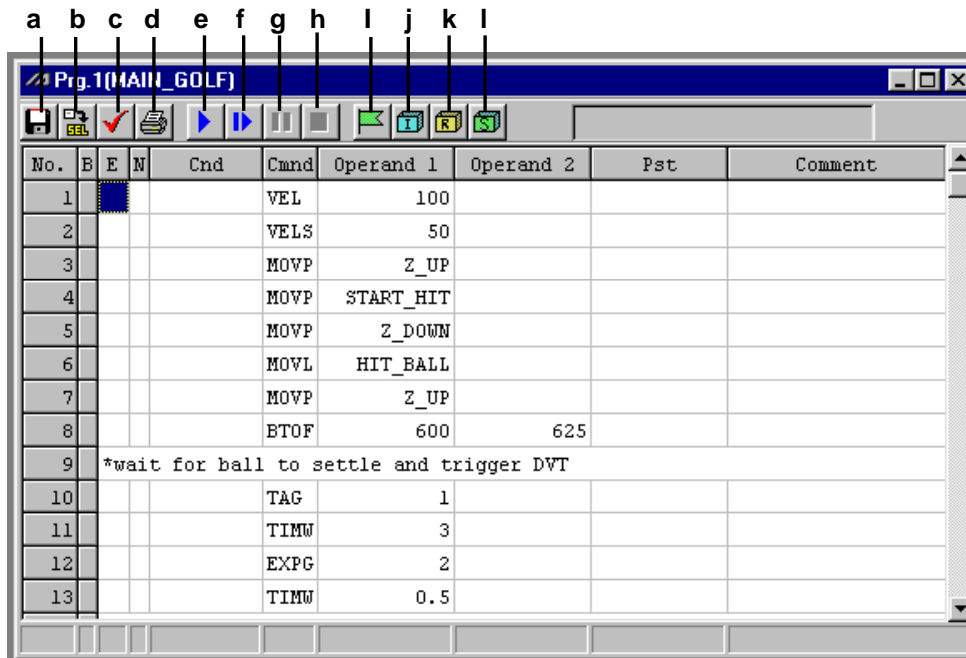


Category	Cmnd	Input Cond.	Operand 1	Operand 2
Assignment	LET	Optional	Variable No.	Data
Calculation	MOD	Optional	Variable No.	Data
Actuator Control Commands	MOVL	Optional	Position No.	
Actuator Control Commands	MOVV	Optional	Position No.	
Calculation	MULT	Optional	Variable No.	Data
Actuator Control Commands	MVLI	Optional	Position No.	
Actuator Control Commands	MVPI	Optional	Position No.	
Palettize	OFAZ	Optional	Data	
Palettize	OFPZ	Optional	Data	
Actuator Control Designation	OFST	Optional	Axis Pattern	Data
Communication	OPEN	Optional	Channel No.	
Logic	OR	Optional	Variable No.	Data
Branch	OTHE	Prohibited		

Pop-Up Menu Screen (Diagram 4.5)

4. Program Edit Window

(4) The following buttons exists in the window below.



Buttons (Diagram 4.6)

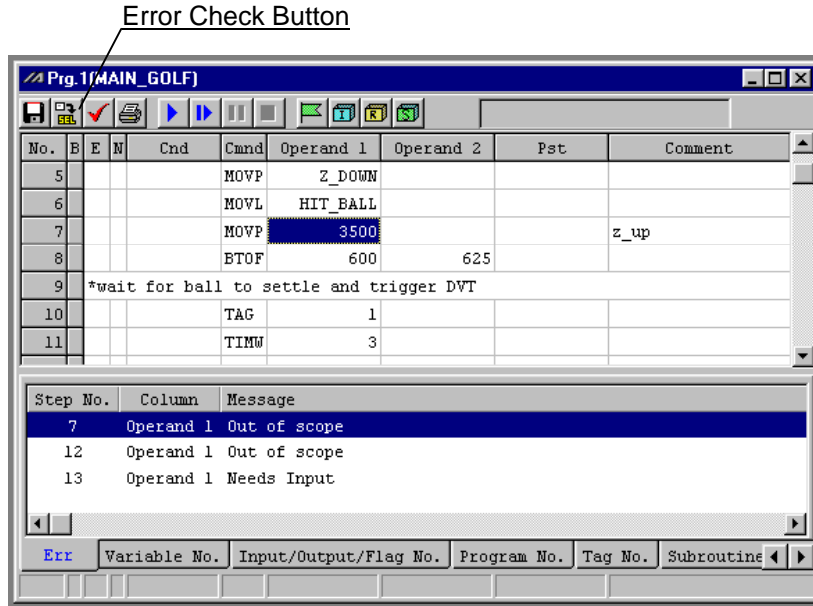
- a -> **Save As**
Save to a file.
- b -> **Transmit to Controller**
Transmits the program data to the controller after the error check is done.
- c -> **Error check**
Check errors in the program and displays the details of these errors.
- d -> **Print**
Print the program.
- e -> **Execute**
Executes (run) the program.
To execute the program during editing process, you need to transmit the program to the controller first.
- f -> **Execute Single Step**
Executes a single line of code at a time.
- g -> **Pause**
Pauses the program, if it is running.
- h -> **Finish**
Exits the program, if it is running.
- i -> **Local Flag Display**
Displays the local flag window in the executing program, if it is running.
- j -> **Local Integral Variable Display**
Displays the local integral variable window in the executing program, if it is running.
- k -> **Local Real Number Variable Display**
Displays the local real number variable window in the program that is running.
- l -> **Local String Variable Display**
Displays the local string variable window on the program that is running.

4. Program Edit Window

(5) Explanation of the Error Check

Check programming errors on SEL language in the edit menu.

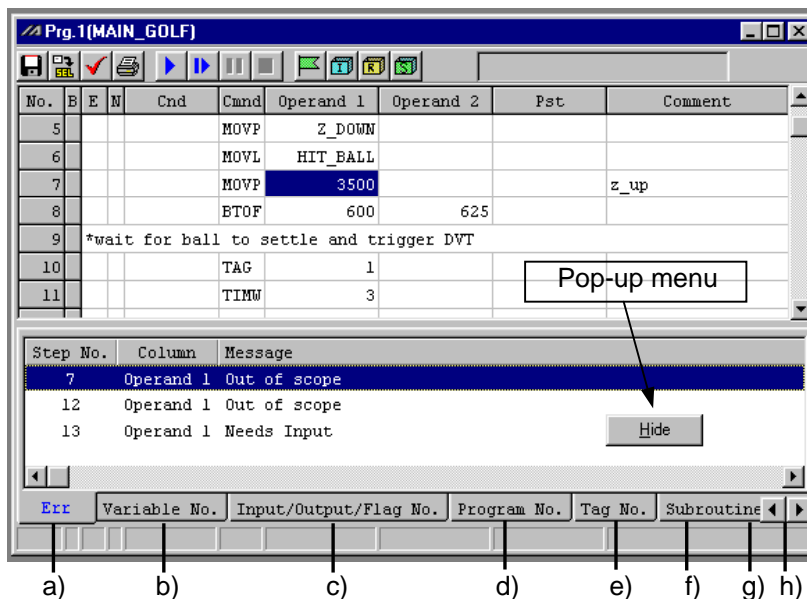
1. Click the error check button on the program edit window.
2. If there are any errors, the error list will be displayed. This list shows the number of the column & the row and the detail of the error. Double click that part and the cursor will move to the error part.



Error Check (Diagram 4.7)

The error list displays step number, operands and comment. Double-clicking a desired item moves the cursor to the corresponding error position.

3. Information relating to the operands (Cnd, Operand1, Operand2, Pst) that are used in the program currently being edited, is displayed.



Operand Information (Diagram 4.8)

4. Program Edit Window

- a) **Syntax Error**
Message (Error content)
- b) **Variable No. Use Condition**
Variable No.
Variable Type (Integer, real number)
Scope (Global, local)
* If the Variable No. is specified indirectly, "(Unknown)" is displayed under Variable Type and Scope.
- c) **I/O & Flag No. Use Condition**
Port/Flag No.
Data Type (Input port No., output port No., flag No.)
Scope (Global, local)
* If the Port/Flag No. is specified indirectly, "(Unknown)" is displayed under Data Type and Scope.
- d) **Program No. Use Condition**
Program No.
- e) **Tag No. Use Condition**
Tag No. (Tag No. being used)
Declaration/Jump
- f) **Subroutine No. Use Condition**
Subroutine No.
Declaration/Call
- g) **Position No. Use Condition**
Position No.
- h) **Axis No. Use Condition**
Axis No.

* If a symbol is used in any of the numbers in b) through h), the corresponding definition value is displayed in the margin.

The above information is displayed by item in list format below the program edit window. Double-clicking a desired item with the mouse moves the cursor to the corresponding position. When the list is clicked with the right mouse button, a pop-up menu is displayed. You can hide the list and sort records using the pop-up menu.

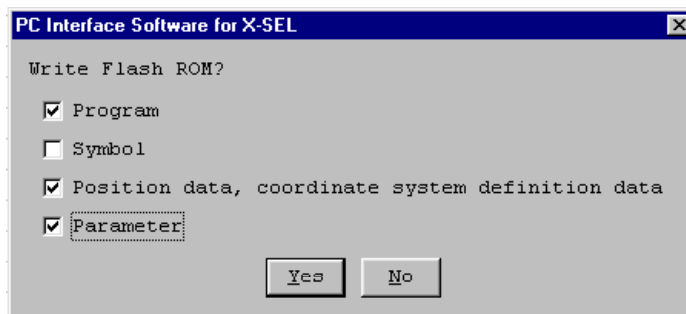
4. Program Edit Window

4-2 Program Save and Exit

- (1) Save the program data to a file.
Click Save As button on the program edit window.
The same function as File (F) -> Save as (A)
- (2) Transmit the program data to the controller.
Save it to the memory of the controller.
Click Transmit to Controller button.
(It is available at the "On line" editing only.)

Caution: If there are any errors in the program, the error content will be displayed and you will not be able to transmit data at this time.

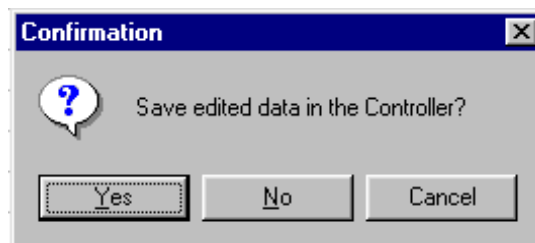
- (3) Flash ROM Writing
After transmission is complete, the confirmation message "Write Flash ROM?" will be prompted.



Confirm (Diagram 4.8)

- Yes (Y) ->** Write the data into Flash ROM
Only the checked items are written to the flash ROM.
- No (N) ->** Do not Write the data into Flash ROM
The data is deleted by resetting (power restart and software reset) and reads the data from Flash ROM (until reset, the controller using the new data).

- (4) Exit Program Edit
When you close the edit menu, the confirmation message, "Save edited data in the Controller?" will be prompted.



Confirm (Diagram 4.9)

- Yes (Y) ->** Transmit the data to the controller -> (3) Write into Flash ROM
- No (N) ->** Delete the changed data and exit.
- Cancel ->** Cancel exit and return to the edit window.

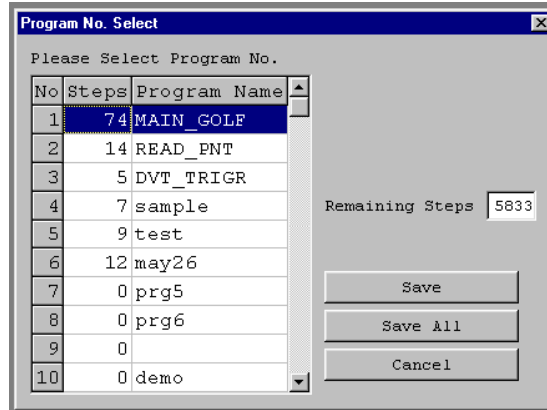
4. Program Edit Window

4-3 Batch Program Save to a File

(1) Saving all programs in batch

The programs corresponding to Nos. 1 to 64 in the controller can be saved to a single file (.spa).

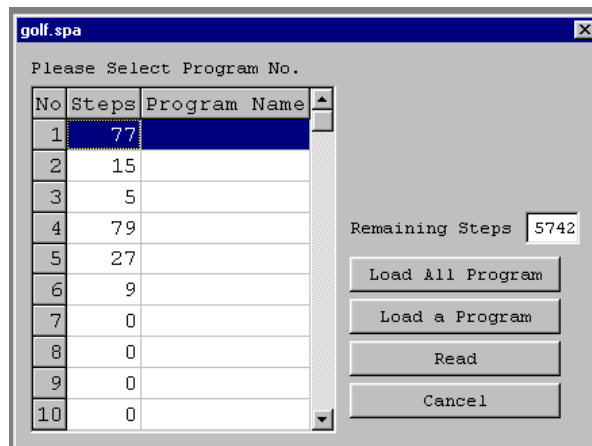
1. From the menu, select Program → Save to File.
2. Click the [Batch Save] button in the program No. selection window, and specify the file name and location to save the programs.



Program Save (Diagram 4.10)

(2) Opening the batch program file

1. From the menu, select File → Open.
2. Select the file you wish to open in the “Open File” window and click “Open.”
3. When the program No. selection window is displayed, click the [Batch Transfer to Controller] button if you wish to transfer all programs to the controller in batch. To transfer programs individually from the batch file, select the desired program No(s). and click the [Transfer to Controller] button. The selected file(s) will be transferred to the controller.



Program Transfer (Diagram 4.11)

(3) Note on transferring the batch program file to the controller

1. If the batch program file is transferred to the controller, the existing programs corresponding to Nos. 1 to 64 will all be cleared. If necessary, back up all current programs before the transfer.

4. Program Edit Window

2. If the batch program file contains a program or programs in which symbols are used, the symbol data will generate error during program transfer if they are not already defined in the controller memory. In this case, the program file will not be transferred to the controller. If the symbol data are already saved to a file, transfer that file first. If not, define the data on the symbol edit screen and transfer the definitions to the controller. Thereafter, transfer the program file again.
3. If the batch program file contains error, the error display screen is displayed and the file will not be transferred to the controller. In this case, double-click on the error shown on the error display screen to open a screen showing the portion of program file containing error. Correct the applicable error and save the file using Save As. When all errors have been corrected, transfer the program file to the controller again. This provides an important recovery procedure to be performed when the program file contains error.

4-4 Program Run

A given program can be run from the program edit window.

To run the program currently being edited, transfer the program to the controller by clicking Transfer to Controller.

Note) Once the program has been transferred to the controller via Transfer to Controller, it can be run without writing to the flash ROM. If the program is not written to the flash ROM, however, it will be erased once the power is reconnected or the software is reset.

Run: Clicking this button runs the selected program.

Run by Step: Clicking this button runs the program step by step.

Pause: Clicking this button pauses the program currently running. To resume the program operation, click Run or Run by Step.

End: Clicking this button ends the program currently running.

Breakpoint: The program can be paused at a desired step. "B" is shown/hidden each time this button is clicked.

No.	B	E	N	Cnd	Cmd	Operand 1	Operand 2	Pst	Comment
1					VELS	20			
2					VEL	30			
4	B				MOV P	1400			
5					MOV L	1401			
6					MOV P	1908			
7					EXIT				
8									
9									
10									
11									
12									
13									

Program Run (Diagram 4.12)

Cursor color

Green: Program is stopped (stopped during step operation, at a breakpoint, via the Pause button or SSPG instruction, etc.)

Red: Waiting (waiting for completion of TIMW, WTxx, WZxx, WRIT, READ, servo instruction, etc.)

Blue: Other than the above conditions indicated by a green and red cursor

Background color

Gray: Program is running

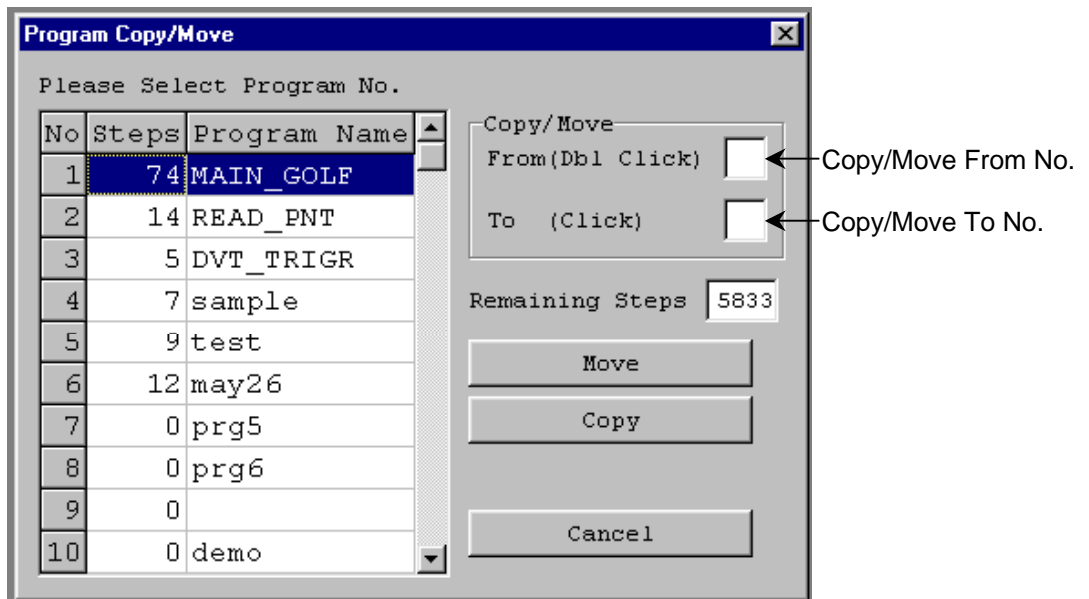
White: Program is not running

5. Program: Copy · Move · Delete

5-1 Program: Copy · Move

The following are how to copy or cut a program to another program slot.

- (1) From the menu, select Program (S) -> Copy/Move (C)
- (2) Displays the Program No. Select window.

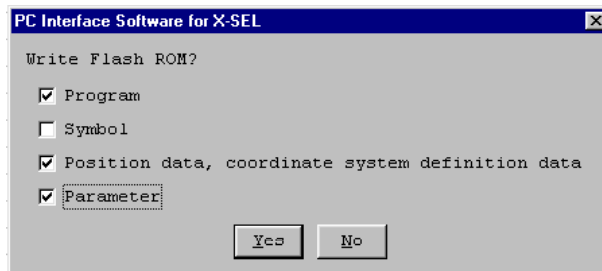


Program No. Select (Diagram 5.1)

Double click the source program.
Then, double click the destination program.

To copy, click the Copy button. To move, click the Move button.
Click the Cancel button to cancel the operation.

- (3) Flash ROM Writing:
After copying or moving, the confirmation message "Write Flash ROM?" will be displayed.



Confirm (Diagram 5.2)

Yes (Y) ->

Write the memory data into Flash ROM

No (N) ->

Do not write the memory data into Flash ROM

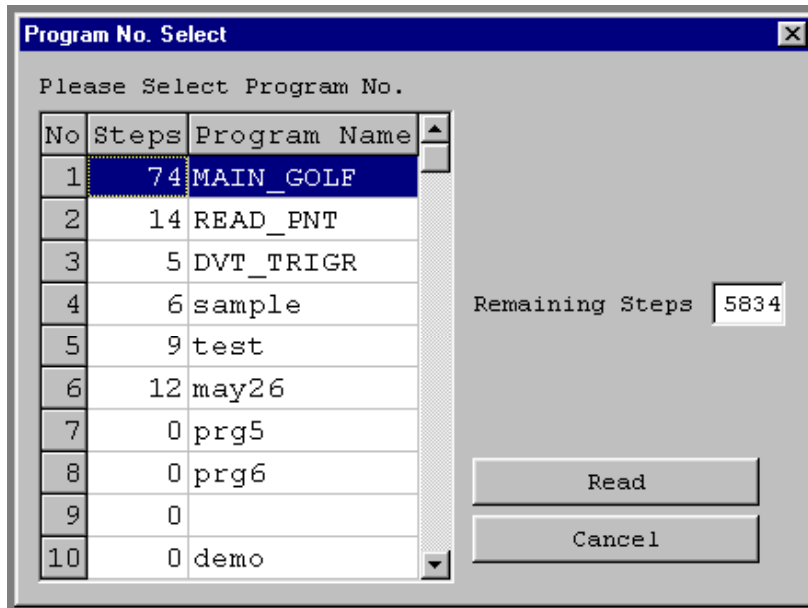
After reset (restart power, software reset), it returns to the data before copying or moving.

5. Program: Copy · Move · Delete

5-2 Program: Clear Window

How to clear the program:

- (1) From the menu, select Program (S) -> Clear (L)
- (2) The program clear window will be displayed.



Program No. Select (Diagram 5.3)

Click the program you wish to delete.

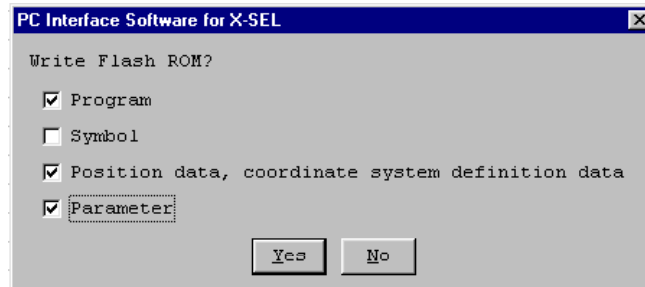
Then, click the Delete button.

You can also drag the mouse and select multiple programs to clear them at once.

Click the Cancel button to cancel the operation.

- (3) Flash ROM Writing:

After deletion, the confirmation message, "Write Flash ROM?" will be prompted.



Confirm (Diagram 5.4)

Click Yes (Y) ->

Write the memory data into Flash ROM

Click No (N) ->

Do not write the memory data into Flash ROM

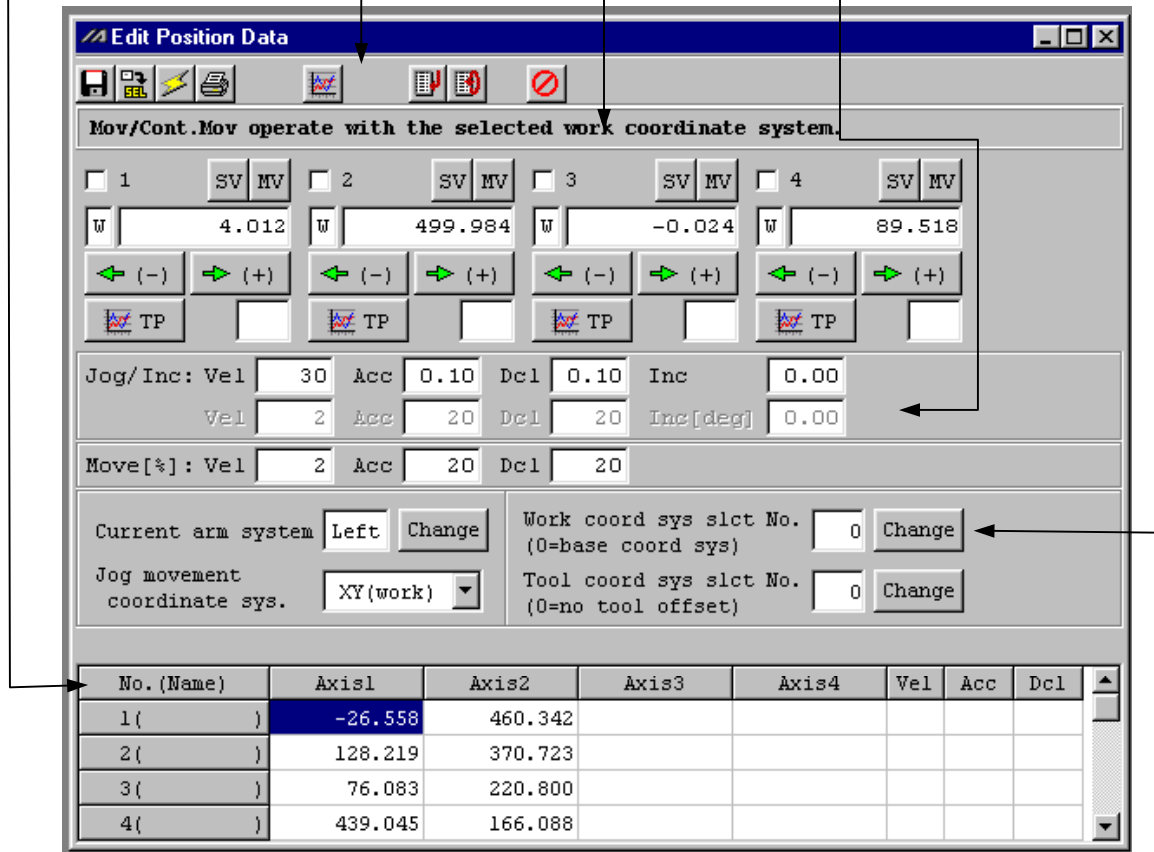
After reset (restart power and software reset), returns to the data before deleting.

6. Position Data Edit Window

6-1 Explanation of Position Data Edit Window

- (1) From the menu, select Position (O) -> Edit (E).
- (2) The position data edit window will be displayed. This window has the following items.

A. Position Data B. Common Button C. Axis Button Display D. Setting Display E. Movement Selection



Edit Position Data Screen (Diagram 6.1)

A. Position Data

No. (Name)	Axis1	Axis2	Axis3	Axis4	Vel	Acc	Dcl
------------	-------	-------	-------	-------	-----	-----	-----

Position Data Screen (Diagram 6.2)

No.

Display the position No. and position No. symbol.

Press the [F11] key to call the symbol edit window where you can edit the symbol of the corresponding position No. You can also return the input focus to the edit position of the corresponding position data by pressing the [F11] key on the symbol edit window.

* The input focus can be returned from the symbol edit window to the position data edit window using the [F11] key only when the position data edit window is currently open.

* Showing or hiding the symbols can be switched on the tool environment setting window. (See 4, "Environment Setting," for the switching method.)

6. Position Data Edit Window

Axis1~4

Set the coordinates for each axis.
The setting range is -99999.999~99999.999.

Vel

Set the velocity.
The range is from 1 to the value stored in All Axis Common parameter No.21 "Input value check drive velocity MAX."
* If all axes common parameter No. 20 (Operating speed check timing) is 0 (check during input), during Vel data is input, it will be checked by this MAX speed.

Acc

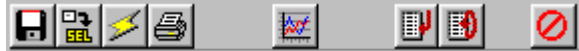
Set the acceleration.
The range is from 1 to the value stored in all axis common parameter No.22 "Acceleration MAX"

Dc1

Set the deceleration
The range is from 1 to the value stored in all axis common parameter No.23 "Deceleration MAX"

6. Position Data Edit Window

B. Common Buttons



Common Buttons (Diagram 6.3)



→ **Save as**

Saves point table to a file.



→ **Transmit to Controller**

Writes the positions to the controller.



→ **Position Data Update**

Updates the position data display when a program that rewrites position data has been executed.



→ **Print**

Prints the point table.



→ **Obtain Current Position**

Clicking this button reads the current position into the position number corresponding to the cursor position, for all axes accompanying a “check” mark. (The position data will not be transferred to the controller.)



→ **Move Specific Position**

Axis that displays “check” mark or servo ON will move to position No. where No. of the cursor is located in the point table.

*If there is written position data, transmit to the controller first.



→ **Move Specific Position Continuously**

Axis that displays “check” mark or servo On will move to position No. where the cursor is located.

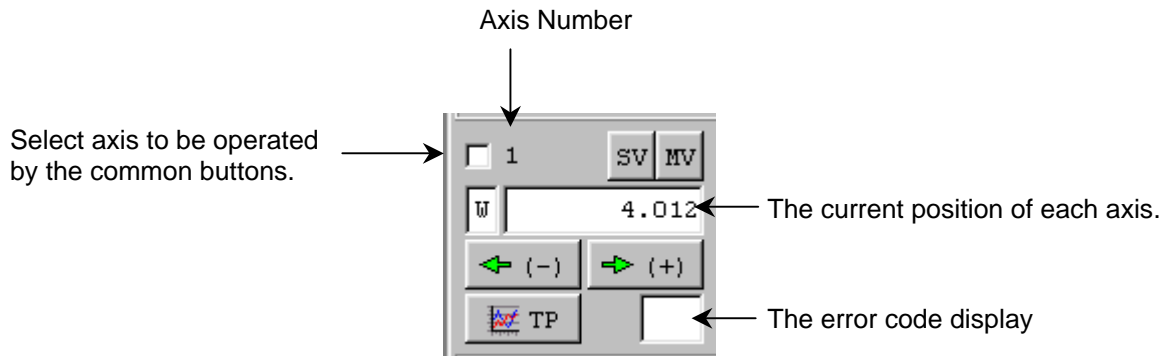


→ **Cancel Motion of All Axes**

Cancels motion of all axes.

6. Position Data Edit Window

C. Single Axis Buttons



Axis Button (Diagram 6.4)

SV → Clicking any axis button turns ON/OFF the servos for all axes.
(The button color becomes sky blue when servo is on.)

Caution

Clicking the button for an axis whose servo is currently OFF turns ON the servos for all axes. Clicking the button for an axis whose servo is currently ON turns OFF the servos for all axes.

MV → Moves to position no. where the cursor is located in the point table, if the axis servo is ON.
(The button color becomes yellow during moving).

→ (+) → Jogs forward if the axis servo is ON.
If an incremental distance is indicated (0.001mm~1mm), the axis will move forward that specified distance every time the button is pressed.

← (-) → Jogs backward if the axis servo is ON.
If an incremental distance is indicated (0.001mm~1mm), the axis will move backward that specified distance every time the button is pressed.

TP → Will read the current location of the actuator and place it into the line of the point table that is highlighted.
(It will not transmit to the controller).

6. Position Data Edit Window

D. Setting Function

Various buttons are provided to set Vel (speed), Acc (acceleration), Dcl (deceleration) and Inc (incremental distance) for actuator operation.

Separate sets of data are set for Jog/Inc and Move.
Vel, Acc, Dcl and Inc are set in two different units.

Jog/Inc: Vel	30	Acc	0.10	Dcl	0.10	Inc	0.00
Vel	2	Acc	20	Dcl	20	Inc [deg]	0.00
Move[%]: Vel	2	Acc	20	Dcl	20		

Jog/Inc

Vel [mm/sec], Acc [G], Dcl [G], Inc [mm]

The above settings are effective on both the work and tool coordinate systems.

Vel [%], Acc [%], Dcl [%], Inc [deg]

The above settings are effective only when the "Each Axis" system is selected.

The Jog button functions as the incremental button, if a numerical value (0.001 to 1.00) is entered in the Inc field under Setting Function.

Move

Vel [%], Acc [%], Dcl [%]

Set the moving speed that applies when the [MV] button is clicked.

Movement occurs in the form of PTP operation.

Each percentage setting indicates a percentage with respect to a corresponding parameter setting.

Vel [%] (percentage with respect to "Axis Parameter No. 28: PTP Speed MAX")

Acc [%] (percentage with respect to "Axis Parameter No. 134: PTP Acceleration MAX")

Dcl [%] (percentage with respect to "Axis Parameter No. 135: PTP Deceleration MAX")

6. Position Data Edit Window

E. Movement Selection

Various buttons are provided to set Current Arm, Jog Movement Coordinate System, Work Coordinate System Selection No. and Tool Coordinate System Selection No.

Current arm system	Left	Change	Work coord sys slct No. (0=base coord sys)	0	Change
Jog movement coordinate sys.	XY(work)		Tool coord sys slct No. (0=no tool offset)	0	Change

Current Arm

The arm can be changed by clicking the [Change] button.

Current arm system	Left	Change
--------------------	------	--------

Caution: If the arm is changed for a stationary axis, the newly selected arm may move occasionally.

Jog Movement Coordinate System

The coordinate system can be changed by clicking the button.

XY work coordinate system (Can be offset using Work Coordinate System Selection No.)

XY tool coordinate system

Each axis system

Jog movement coordinate sys.	XY(work)	
---------------------------------	----------	--

Work Coordinate System Selection No.

A desired work coordinate system selection No. can be selected by clicking the [Change] button.

Work coord sys slct No. (0=base coord sys)	0	Change
---	---	--------

Tool Coordinate System Selection No.

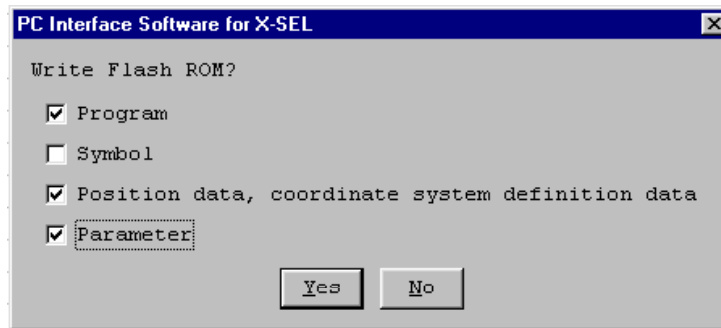
A desired tool coordinate system selection No. can be selected by clicking the [Change] button.

Tool coord sys slct No. (0=no tool offset)	0	Change
---	---	--------

6. Position Data Edit Window

6-2 Save Position and End Edit

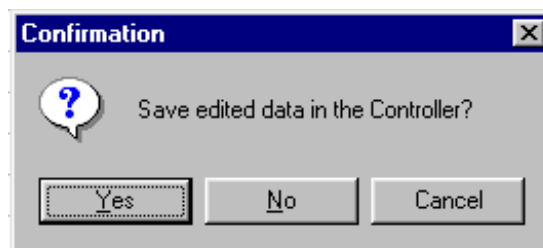
- (1) Save the edited position data to a file:
Click the Save as button at the position edit window.
This is the same function as File (F) -> Save as (A).
- (2) Transmit the edited position to the controller:
Click the Transmit to the controller button in the position edit window.
Save the edited position data into the controller memory.
This is available in the ON-line editing menu only.
- (3) Flash ROM Write:
After transmission to the controller, the confirmation message, "Write Flash ROM?" will be prompted.



Confirm (Diagram 6.7)

- Click Yes (Y) ->** Write the memory data into Flash ROM.
Click No (N) -> Do not write the memory data into Flash memory.

- (4) End point edit:
When you close the point edit window, the confirmation message, "Save edited data in the Controller?" will be prompted.



Confirm (Diagram 6.8)

- Yes (Y) ->** Transmit the edited data to the controller. -> Write into Flash ROM.
No (N) -> Delete the edited data and end operation.
Cancel -> Cancel finish, and return to position edit window.

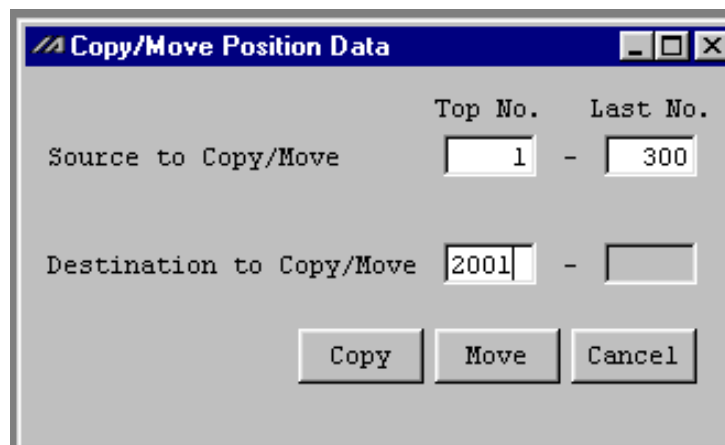
7. Position Data: Copy, Move and Delete

7-1 Position Data: Copy - Move

- (1) From the menu, select (Q) -> Copy/Move (C).
- (2) The position data copy/move window will be displayed.

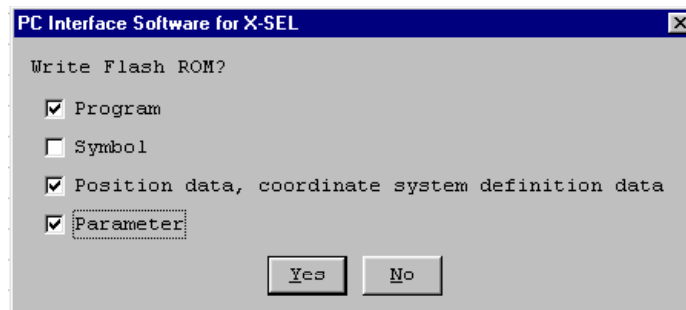
To copy: Select the Top No. and the Last No. of source and destination you wish to copy.
Click the Copy button.
Copy the selected position.

To move: Click the Move button.
Move the selected position.



Copy/Move Position Data Screen (Diagram 7.1)

- (3) Flash ROM write:
After complete copy or move, the confirmation message "Write Flash ROM?" will be prompted.



Confirm (Diagram 7.2)

Yes (Y) ->

Write the memory data into Flash ROM

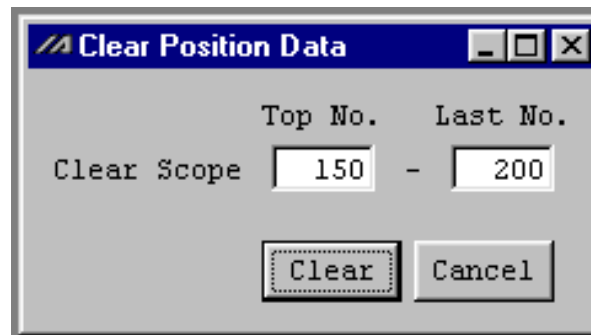
No (N) ->

Do not write the memory data into Flash ROM

7. Position Data Copy, Move and Delete

7-2 Clear Position Data

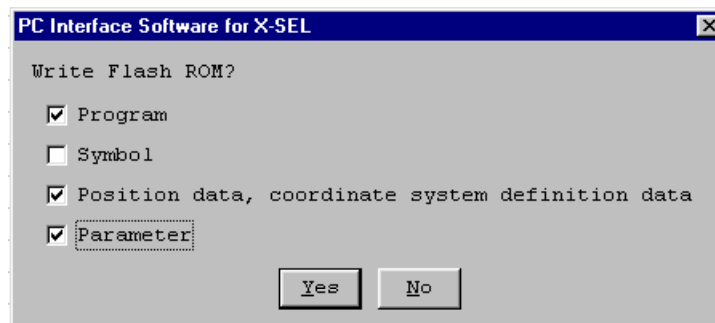
- (1) From the menu, select Position (O) -> Clear (L).
- (2) The position data clear window will be displayed.



Clear Position Data (Diagram 7.3)

Input the Top No and the Last No. you wish to clear.
Click the Clear button.
By clicking the Cancel button, the operation will be canceled.

- (3) Flash Rom write:
After completing clear, the confirmation message, "Write into Flash ROM?" will be prompted.



Confirm (Diagram 7.4)

Yes (Y) ->

Write the memory data into Flash ROM.

No (N) ->

Do not write the memory data into Flash ROM.

8. Parameter Edit Window

8-1 Explanation of Parameter Edit Window

- (1) From the menu, select Parameter (P) -> Edit (E).
- (2) The parameter edit window will be displayed.
Select the appropriate parameter and change its value.
You may not change any number that are shaded since they are values exclusive to the controller.



→ **Save As:**

Assigns a name to the program and save.



→ **Transmit to the controller:**

Transmits the parameter data to the controller.



→ **Print:**

Prints parameters.

The screenshot shows the 'Edit Parameter' window with a menu bar containing 'I/O', 'Common to All Axes', 'Specific Axis', 'Driver Card', 'Encoder', 'I/O Slot Card', and 'Other'. Below the menu bar is a table with three columns: 'No', 'Parameter Name', and 'Set Value'. The table contains 11 rows of parameters, with the first row highlighted.

No	Parameter Name	Set Value
1	I/O type	1
2	IO TpNo. Iprt:1	0
3	IO TpNo. Oprt:1	300
4	XI01TpNo. Iprt:2	-1
5	XI01TpNo. Oprt:2	-1
6	XI02TpNo. Iprt:3	-1
7	XI02TpNo. Oprt:3	-1
8	XI03TpNo. Iprt:4	-1
9	XI03TpNo. Oprt:4	-1
10	IO Sprvs :1	1
11	XI01 Sprvs :2	1

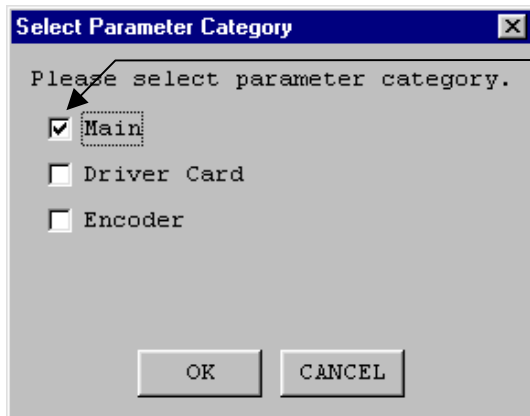
Parameter Edit (Diagram 8.1)

* The parameter above is I/O. Clicking by each items, display other parameter.

8-2 Save parameter and end edit

- (1) Save the edited parameter data to a file:
Click the Save As button at the parameter edit window.
The same function as File (F) -> Save as (A).
- (2) Transmit the edited parameter data to the controller:
Save the edited parameter data at the controller memory.
Click Transmit to Controller button at the parameter edit window.
This is available at the On-line editing menu only.

8. Parameter Edit Window



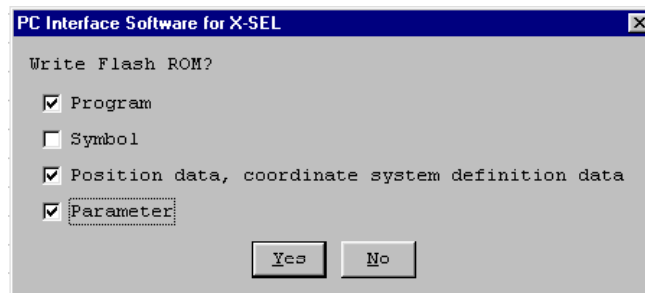
Click in the applicable box to select the type of parameters you wish to transfer.

Click the [OK] button.
Only the parameters of the selected type will be transferred to the controller.

This function is only available during online edit.

Parameter Type Selection (Diagram 8.2)

- (3) Flash ROM write:
After completing transmission, the confirmation message, "Write Flash ROM?" will be prompted.



Confirm (Diagram 8.3)

Yes (Y) ->

Write the data into Flash ROM.

No (N) ->

Do not write the data into Flash ROM.

If reset (restart the power, software reset), the memory data is deleted and data from Flash ROM will be used.

- (4) Controller Restart (software reset):
After complete writing into Flash ROM, the confirmation message, "Restart the controller?" will be prompted.

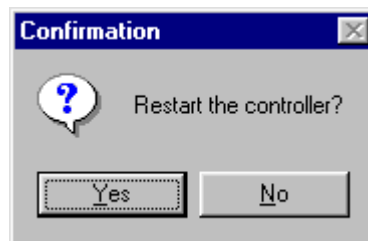
Yes (Y) ->

Restart and load changed parameters.

No (N) ->

Do not reset (current parameter remain ineffect).

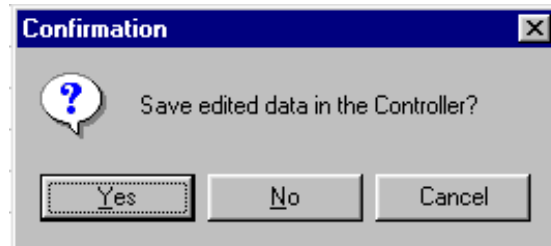
The changed parameter will used controller after restart (software reset) or power installation.



Confirm (Diagram 8.4)

8. Parameter Edit Window

- (5) End parameter edit:
When you close the parameter edit window, the confirmation message, "Save edited data in the Controller?" will be prompted.



Confirm (Diagram 8.5)

- | | |
|----------------------|---|
| Yes (Y) -> | Transmit the edited data to the controller. |
| No (N) -> | Delete the edited data and exit. |
| Cancel -> | Cancel exit and return to the edit window. |

Parameter back-up is recommended when you set up the system.

* Since there are many parameters, backing up the parameter is highly recommended.

9. Symbol Edit Window

9-1 Regarding Symbol

Names can be applied to variables, flags, tags and etc. They are considered Symbols in the X-SEL controller.

(1) Support area:

We support the following items in which to apply symbols.

Variable No., Flag No., Tag No., Subroutine No., Program No., Position No., Input Port No., Output Port No., Axis No., and Constants.

(2) Rules for writing symbols:

1. Symbol should be maximum of 9 alphanumeric characters and start with a letter or an under score.
2. Different subroutines, tags, and other functions may not share the same symbol name.
3. Flags, Inputs and Outputs may not share the same name (Exception - local flags in different program may share a name).
4. Integer and real variables may not share the same name. (Exception - local variables in different programs share a name.)

(3) Maximum defined symbols - 1,000

(4) Maximum use of all symbols, collectively - 5,000. A single line of code can use 4 symbols (as a condition, operand one, operand two and a post.)

9. Symbol Edit Window

9-2 Explanation of Symbol Edit Window

- (1) From the menu select Symbol (Y) -> (E).
- (2) The symbol edit window will be displayed.



—> Save as:

Assigns a name to the symbol and saves.



—> Transmit to Controller:

Transmits the symbol data to the controller.

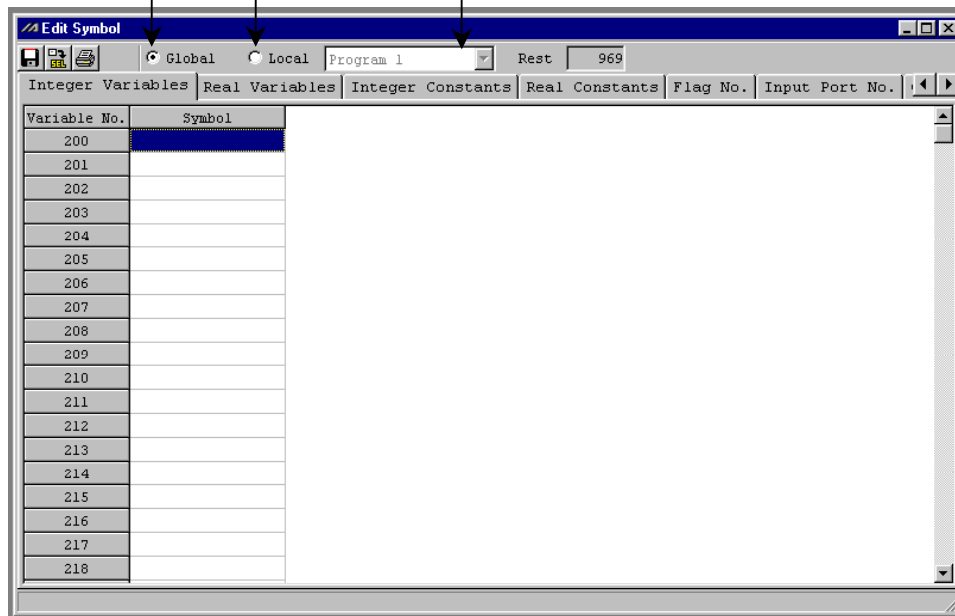


—> Print:

Prints the symbol data.

Select the global area and the local area

Designate program No. if you chose the local area



Symbol Edit (Diagram 9.1)

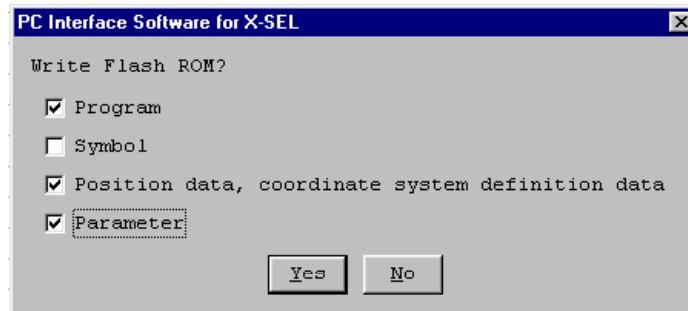
- * Although only the integral variable symbol edit window is displayed, by clicking each tab, other symbol edit windows will be displayed.

9-3 Symbol Save and Edit Completion

- (1) Save the symbol to file.
Click Save As button in the symbol edit window.
The same function as File (F) -> Save as (A).
- (2) Transmit the symbol data to the controller.
Save the symbol data to the controller memory.
This is only available at the On-line editing menu.

9. Symbol Edit Window

- (3) Writing into Flash ROM:
After transmitting to the controller, the confirmation message, "Write Flash ROM?" will be prompted.



Confirm (Diagram 9.2)

Yes (Y) ->

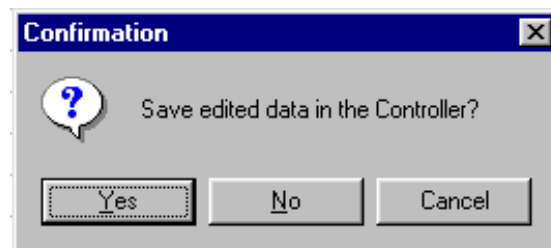
Write the memory data to Flash ROM

No (N) ->

Do not write the memory data into Flash ROM.

If reset (restart the power, software reset), the memory data is deleted and data from Flash ROM will be used.

- (4) Symbol edit completion:
When you close the symbol edit window, the confirmation message, "Save edited data in the Controller?" will be prompted.



Confirm (Diagram 9.3)

Yes (Y) ->

Transmit the edited data to the Controller.

No (N) ->

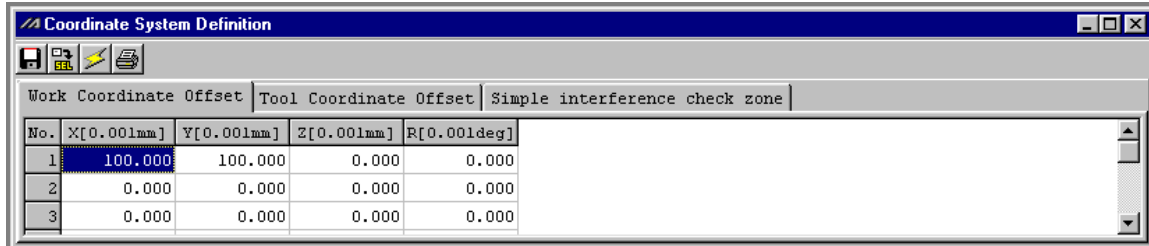
Delete the edited data and end operation.

Cancel ->

Cancel exit and return to the symbol edit window.

10. Coordinate System Definition Data Edit Window

10-1 Explanation of Coordinate System Definition Data Edit Window



- (1) From the menu, select Coordinate System (D) → Edit (E).
- (2) The coordinate system definition data edit window is displayed. This window provides the following items:

A. Work Coordinate System Offsets

No.	Indicate the work coordinate system No.
X [0.001 mm]	Enter the offset data for the X-axis.
Y [0.001 mm]	Enter the offset data for the Y-axis.
Z [0.001 mm]	Enter the offset data for the Z-axis.
R [0.001 deg.]	Enter the offset data for the R-axis.

B. Tool Coordinate System Offsets

No.	Indicate the tool coordinate system No.
X [0.001 mm]	Enter the offset data for the X-axis.
Y [0.001 mm]	Enter the offset data for the Y-axis.
Z [0.001 mm]	Enter the offset data for the Z-axis.
R [0.001 deg.]	Enter the offset data for the R-axis.

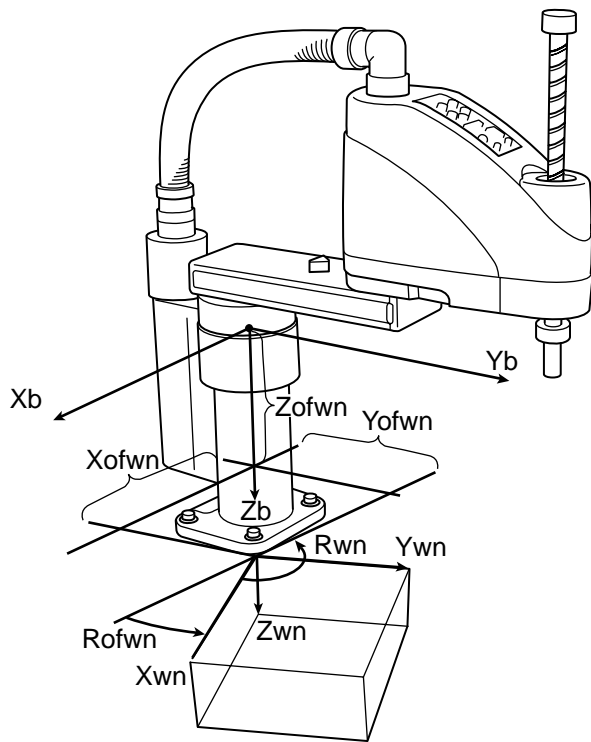
C. Simple Check Zone Definition Coordinates

Zone No.	Indicate the zone No.
Coordinates No.	Indicate the coordinates No. Coordinates 1 and Coordinates 2 are available.
X [0.001 mm]	Enter the interference range data for the X-axis.
Y [0.001 mm]	Enter the interference range data for the Y-axis.
Z [0.001 mm]	Enter the interference range data for the Z-axis.
R [0.001 deg.]	Enter the interference range data for the R-axis.
Physical output port No.	
Global flag No.	Select the output or global flag number inside the check zone.
Error type	Select the error type.
	0 = Error handling is not performed
	1 = Message level error
	2 = Operation-reset level error

10. Coordinate System Definition Data Edit Window

10-2 Work Coordinate System

A total of 32 different coordinates, provided as a combination of three-dimensional orthogonal coordinates and rotation axis coordinates, are defined by the offset of each axis with respect to the base coordinate system. Note that work coordinate system No. 0 is reserved in the system as the base coordinates (= work coordinate system offsets are 0).



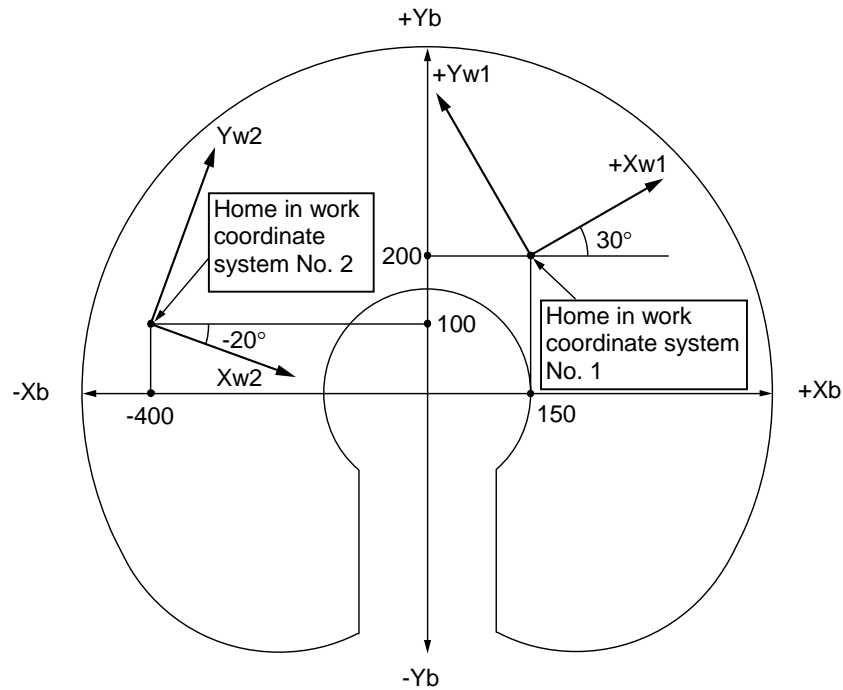
Xofwn: X work coordinate offset
Yofwn: Y work coordinate offset
Zofwn: Z work coordinate offset
Rofwn: R work coordinate offset

Xwn: Work coordinate system, X-axis
Ywn: Work coordinate system, Y-axis
Zwn: Work coordinate system, Z-axis
Rwn: Work coordinate system, R-axis

(n indicates work coordinate system No.)

10. Coordinate System Definition Data Edit Window

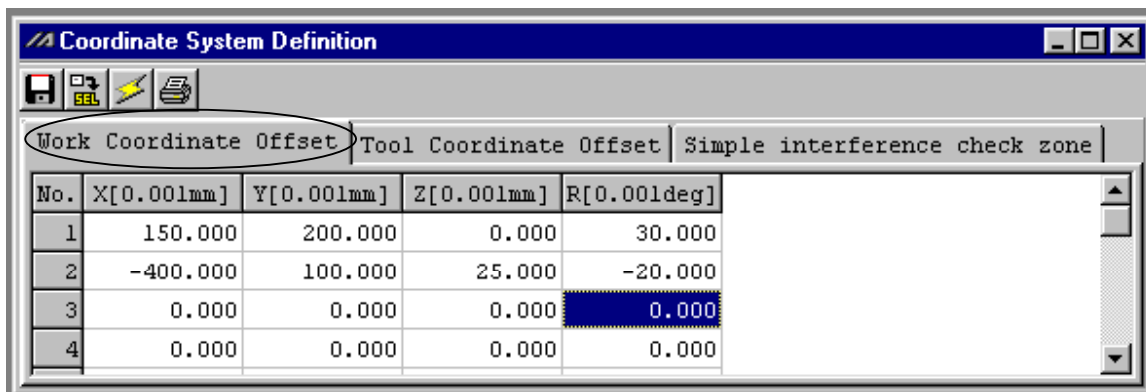
- (1) Setting of work coordinate system
Set the offsets with respect to the base coordinate system.
- Setting example of work coordinate system
When defining work coordinate system No. 1 and No. 2 as illustrated below:



Set the offsets for work coordinate system No. 1 as $X_{ofw1} = 150$, $Y_{ofw1} = 200$, $Z_{ofw1} = 0$ and $R_{ofw1} = 30$.

Set the offsets for work coordinate system No. 2 as $X_{ofw2} = -400$, $Y_{ofw2} = 100$, $Z_{ofw2} = 25$ and $R_{ofw2} = -20$.

Shown below is the work coordinate system definition data edit window of the PC Software for the IX SCARA Robot in which work coordinate system No.1 and No.2 are set.



* Use the DFWK instruction to set the work coordinate system offsets in the SEL program.

10. Coordinate System Definition Data Edit Window

(2) Positioning in a work coordinate system

Perform positioning after selecting a desired work coordinate system.

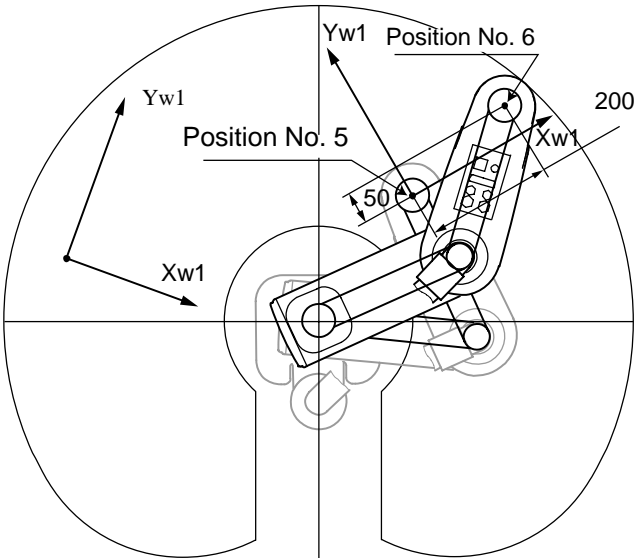
Use the SLWK instruction to select a desired work coordinate system No. in the SEL program.

Once set, the work coordinate system selection No. will remain effective after the program ends, and even after the power is reconnected if the system memory backup battery is installed.

1. When performing PTP positioning to position No. 5 and No. 6 in work coordinate system No. 1:

Current arm system	Left	Change	Work coord sys slct No.	1	Change
			(0=base coord sys)		
Jog movement coordinate sys.	XY(work)		Tool coord sys slct No.	1	Change
			(0=no tool offset)		

No. (Name)	Axis1	Axis2	Axis3	Axis4	Vel	Acc	Dcl
4 ()							
5 ()	0.000	0.000	0.000	0.000			
6 ()	200.000	50.000	20.000	40.000			
7 ()							

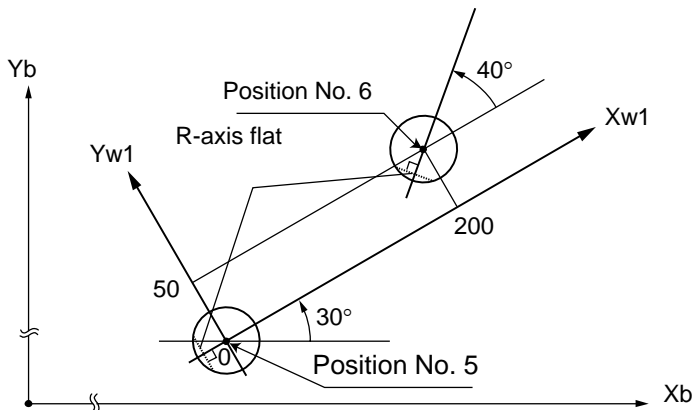


Sample program

```

:
:
:
SLWK 1 Select work coordinate
      system No. 1.
SLTL 0 Select tool coordinate
      system No. 0.
PTPR Specify right arm as the
      PTP target arm.
MOVP 5 Move to position No. 5.
MOVP 6 Move to position No. 6.
:
:
:

```



The R-axis position is shown at left (top view).

The Z-axis position is as follows:

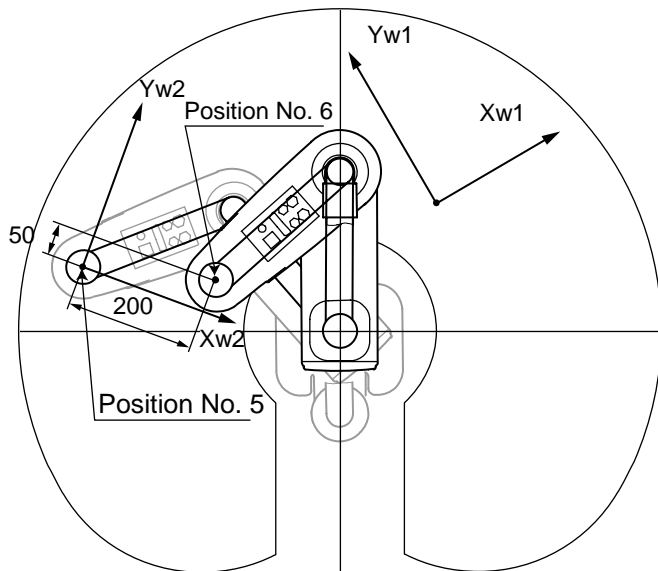
- Position No. 5 Zb = 0
- Position No. 6 Zb = 20

10. Coordinate System Definition Data Edit Window

2. When performing PTP positioning to position No. 5 and No. 6 in work coordinate system No. 2:

Current arm system	Left	Change	Work coord sys slct No.	2	Change
			(0=base coord sys)		
Jog movement coordinate sys.	XY(work)		Tool coord sys slct No.	0	Change
			(0=no tool offset)		

No. (Name)	Axis1	Axis2	Axis3	Axis4	Vel	Acc	Dcl
4()							
5()	0.000	0.000	0.000	0.000			
6()	200.000	50.000	20.000	40.000			
7()							

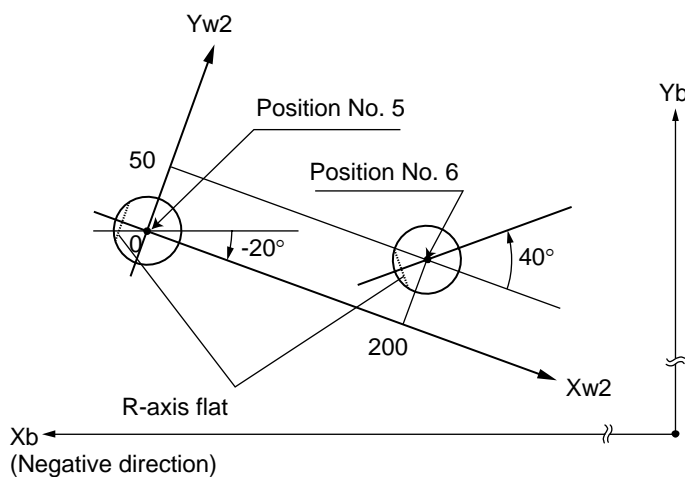


Sample program

```

:
:
:
SLWK 2 Select work coordinate
      system No. 2.
SLTL 0 Select tool coordinate
      system No. 0.
PTPR Specify right arm as the
      PTP target arm.
MOVP 5 Move to position No. 5.
MOVP 6 Move to position No. 6.
:
:
:

```



The R-axis position is shown at left (top view).

The Z-axis position is as follows:

Position No. 5 Zb = 25

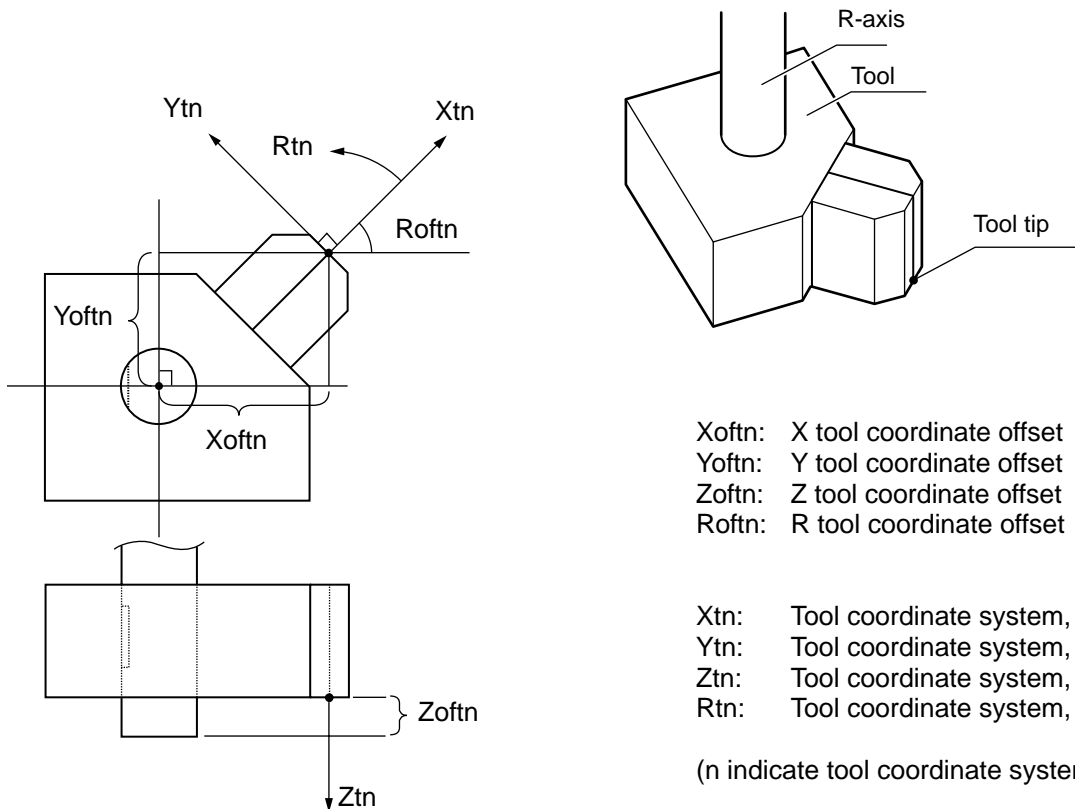
Position No. 6 Zb = 45

10. Coordinate System Definition Data Edit Window

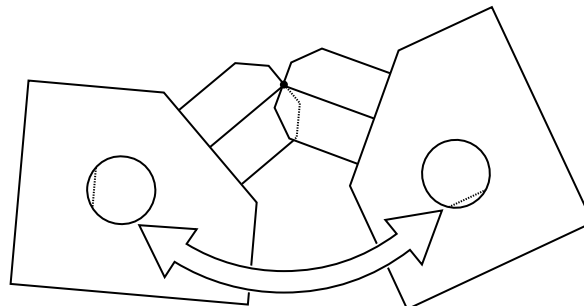
10-3 Tool Coordinate System

A total of 128 different coordinates, provided as a combination of three-dimensional orthogonal coordinates and rotation axis coordinates, are defined by the dimensions (offsets) of the tool (hand, etc.) installed on the tool installation surface. Note that tool coordinate system No. 0 is reserved in the system as the tool coordinate system with 0 offsets.

When a defined tool coordinate system No. is selected, the tool tip, not the center of tool installation surface, is used as the positioning destination.

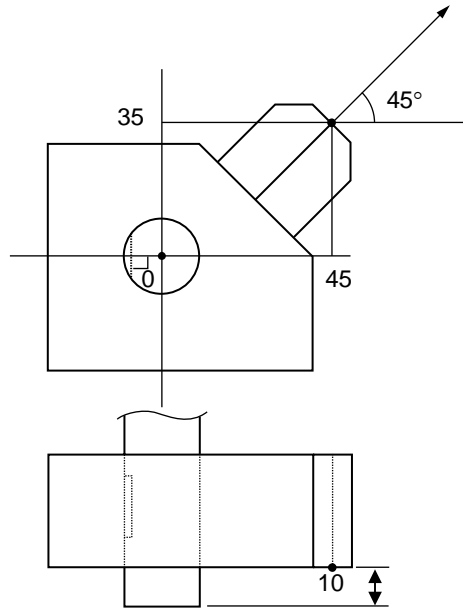


Select a defined tool coordinate system and jog the R-axis, and the machine will operate as illustrated below:



10. Coordinate System Definition Data Edit Window

- (1) Setting of tool coordinate system
Set the offsets from the center of tool installation surface to the tool tip.
- Setting example of tool coordinate system
- When defining tool coordinate system No. 1 as illustrated below:



Set the offsets for tool coordinate system No. 1 as Xoft1 = 45, Yoft1 = 35, Zoft1 = -10 and Roft1 = 45.

Shown below is the tool coordinate system definition data edit window of the PC Software for IX SCARA Robot in which tool coordinate system No.1 is set.

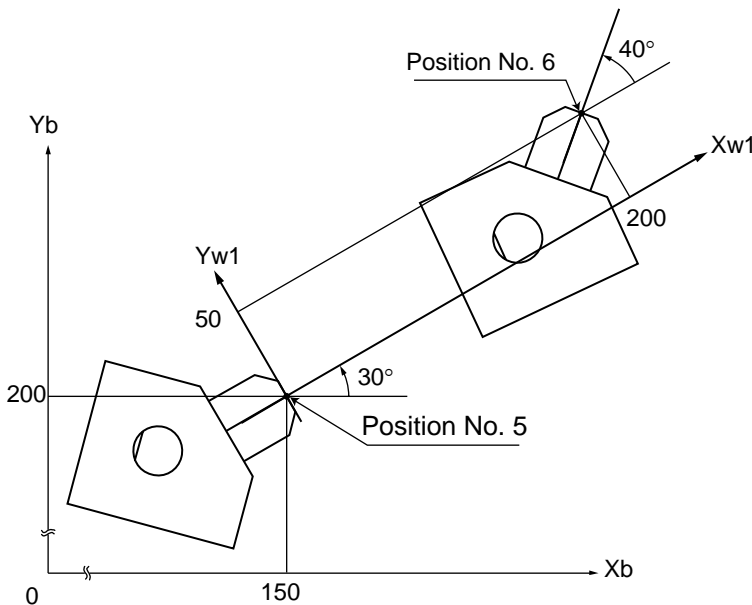
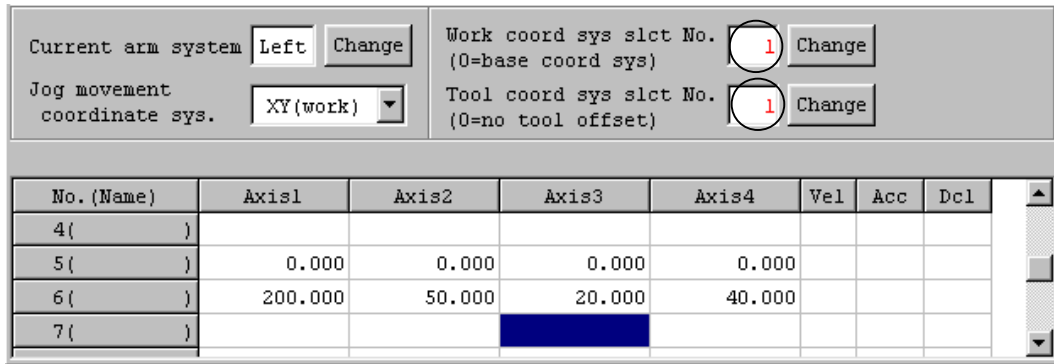
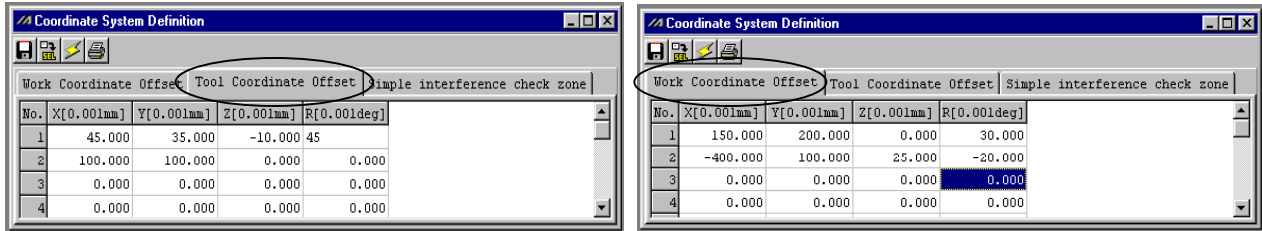
No.	X[0.001mm]	Y[0.001mm]	Z[0.001mm]	R[0.001deg]
1	45.000	35.000	-10.000	45
2	100.000	100.000	0.000	0.000
3	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000

* Use the DFTL instruction to set the tool coordinate system offsets in the SEL program.

10. Coordinate System Definition Data Edit Window

- (2) Positioning based on tool coordinate system offsets
 Perform positioning after selecting a desired tool coordinate system.
 Use the SLTL instruction to select a desired tool coordinate system No. in the SEL program.
 Once set, the tool coordinate system selection No. will remain effective after the program ends, and even after the power is reconnected if the system memory backup battery is installed.

1. When performing PTP positioning of the tool tip in tool coordinate system No. 1 to position No. 5 and No. 6 in work coordinate system No. 1:



Sample program

```

...
...
SLWK 1 Select work coordinate system No. 1.
SLTL 1 Select tool coordinate system No. 1.
PTPR Specify right arm as the PTP target arm.
MOVP 5 Move to position No. 5.
MOVP 6 Move to position No. 6.
...

```

The Z-axis position at the tool tip is as follows:

- Position No. 5 Zb = 0
- Position No. 6 Zb = 20

A top view is shown at left.

10. Coordinate System Definition Data Edit Window

2. When performing PTP positioning of the tool tip in tool coordinate system No. 1 to position No. 5 and No. 6 in work coordinate system No.2:

No.	X[0.001mm]	Y[0.001mm]	Z[0.001mm]	R[0.001deg]
1	45.000	35.000	-10.000	45
2	100.000	100.000	0.000	0.000
3	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000

No.	X[0.001mm]	Y[0.001mm]	Z[0.001mm]	R[0.001deg]
1	150.000	200.000	0.000	30.000
2	-400.000	100.000	25.000	-20.000
3	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000

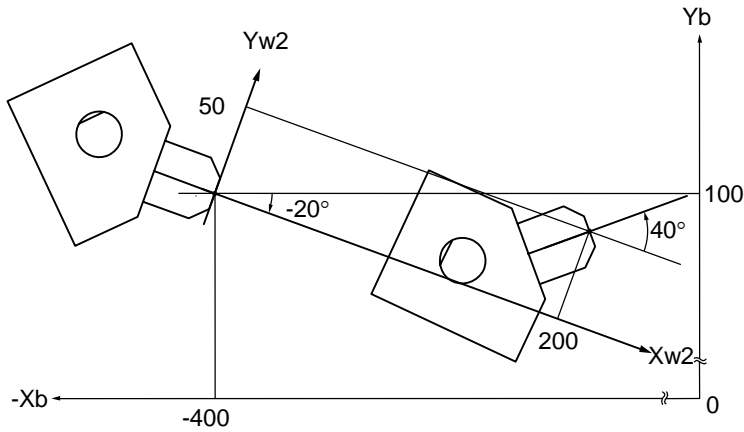
Current arm system

Work coord sys slct No.
 (0=base coord sys)

Jog movement coordinate sys.

Tool coord sys slct No.
 (0=no tool offset)

No. (Name)	Axis1	Axis2	Axis3	Axis4	Vel	Acc	Dcl
4{ }							
5{ }	0.000	0.000	0.000	0.000			
6{ }	200.000	50.000	20.000	40.000			
7{ }							



Sample program

```

:
:
:
SLWK 2 Select work coordinate
      system No. 2.
SLTL 1 Select tool coordinate
      system No. 1.
PTPR Specify right arm as the
      PTP target arm.
MOVP 5 Move to position No. 5.
MOVP 6 Move to position No. 6.
:
:
:

```

The Z-axis position at the tool tip is as follows:
 Position No. 5 Zb = 25
 Position No. 6 Zb = 45

10. Coordinate System Definition Data Edit Window

10-4 Simple Interference Check Zone

The simple interference check zone is an area set for the purpose of interference check between the robot and the peripherals. Entry of the center of tool installation surface into the simple interference check zone can be detected when tool coordinate system No. 0 (= tool coordinate system offsets are 0) is selected, while entry of the tool tip in the simple interference check zone can be detected when tool coordinate system No. 1 through 127 (= tool coordinate system offsets are other than 0) is selected.

- (1) Note on using the simple interference check zone
Entry of the center of tool installation surface (when tool coordinate system No. 0 is selected) or tool tip (when tool coordinate system No. 1 through 127 is selected) into the simple interference check zone is detected. Entry of the circumference of the R-axis or any part of the tool other than the tip is not detected.

This function does not prevent entry of the tool into the simple interference check zone. It only detects that the tool has entered the zone.

Entry cannot be detected reliably unless the applicable part of the tool remains inside the simple interference check zone for at least 5 msec. Accordingly, this function is intended as a simple check during low-speed operation.

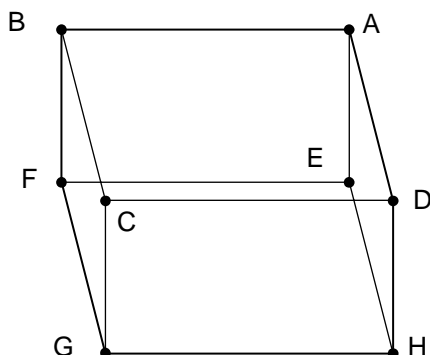
The actual motion differs between high-speed operation (actual operating condition) and low-speed operation. Provide a sufficient margin to prevent interference. (During high-speed operation, the tool tends to pass along a line further inward compared with low-speed operation.)

The defined coordinates of the simple interference check zone are always handled as data linked to the base coordinate system (work coordinate system selection No. 0). Therefore, the position of simple interference check zone does not change even when the work coordinate system is changed. Exercise caution.

If the defined coordinates of the simple interference check zone are changed, it takes 5 msec before check result reflects the new settings.

During PTP operation, the tool does not follow specified routes. When operating the tool near an obstacle (including the robot body), always perform test operation at low speed and confirm that interference does not occur. Thereafter, gradually increase the speed to an appropriate level.

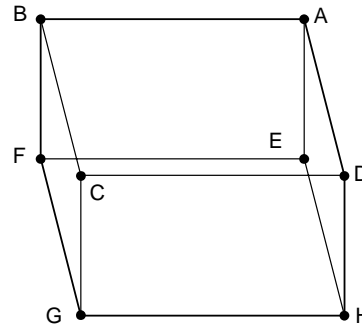
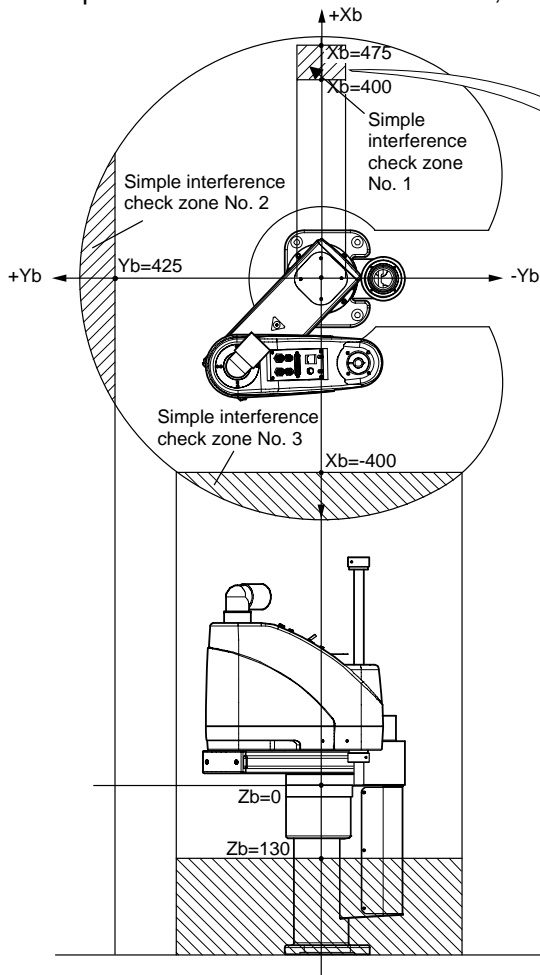
- (2) Setting of simple interference check zone
Set the simple interference check zone using position data in the base coordinate system. Enter the maximum and minimum coordinates of the simple interference check zone. Set the boundaries of the simple interference check zone in parallel with the base coordinate axes.



To set the simple interference check zone as a rectangular solid like the one shown at left, enter the coordinates of two points in any one of the four combinations of A-G, B-H, C-E and D-F.

Setting example of simple interference check zones

Define simple interference check zones No. 1, No. 2 and No. 3 as shown below:



- [1] Set simple interference check zone No. 1 as a rectangular solid.
 A: $X_b = 475$, $Y_b = -50$, $Z_b = 150$, $R_b = 0$
 G: $X_b = 400$, $Y_b = 50$, $Z_b = 200$, $R_b = 180$
 If R_b is outside the 0 to 180° range, entry into this rectangular solid is not detected.
- [2] Set simple interference check zone No. 2 as an area where Y_b is 425 mm or more.
- [3] Set simple interference check zone No. 3 as an area where X_b is -400 mm or less and Z_b is 130 mm or more.

Shown below is the data edit screen of the PC Software for IX SCARA Robot used to define simple interference check zones. In the screen, simple interference check zones No. 1, No. 2 and No. 3 are set, respectively.

Coordinate System Definition							
Work Coordinate Offset		Tool Coordinate Offset		Simple interference check zone			
<p>Caution : Please input the simple interference check zone definition coordinates by work coordinate system selection No.0(= base coordinate system)</p> <p>Error type when simple interference check zone invades : 0=No err processing, 1=Message level err, 2=Operation release level err</p>							
Zone No.	Crd No.	X[0.001mm]	Y[0.001mm]	Z[0.001mm]	R[0.001deg]	Phy. Output/Global flag	ErrType
Zone 1	Crd 1	475.000	-50.000	150.000	0.000	311	1
	Crd 2	400.000	50.000	200.000	180.000		
Zone 2	Crd 1		425.000			312	1
	Crd 2		1000.000				
Zone 3	Crd 1	-400.000		130.000		313	2
	Crd 2	-1000.000		1000.000			

10. Coordinate System Definition Data Edit Window

When simple interference check zone No. 1 is selected, entry of the tool into the rectangular solid will not be detected if Rb is outside the 0 to 180° range. To enable detection regardless of the R-axis coordinate, leave Coordinate 1 and Coordinate 2 in the R column in the Zone 1 line blank.

With simple interference check zone No. 2 or No. 3, where either the maximum or minimum coordinate can be set to any value, enter a value outside the operating range for the maximum or minimum coordinate (1000 in zone 2, 1000 or -1000 in zone 3).

The maximum/minimum coordinate can be set in either Coordinate 1 or Coordinate 2.

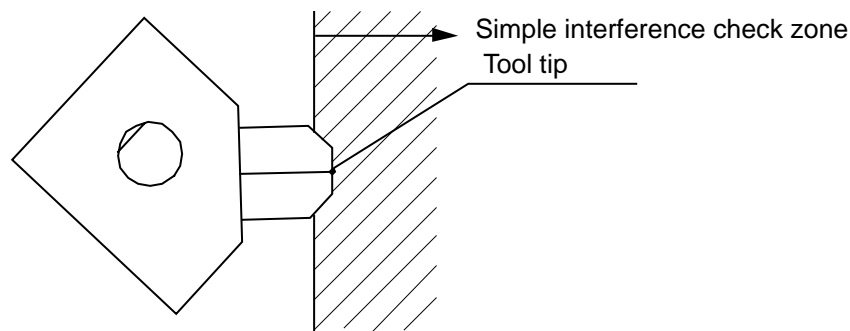
The simple interference check zones are set so that output port No. 311 turns ON when entry into simple interference check zone No. 1 is detected, port No. 312 turns ON when entry into simple interference check zone No. 2 is detected, and port No. 313 turns ON when entry into simple interference check zone No. 3 is detected.

If physical output port numbers and global flag numbers are duplicated, chattering will occur and the result will become unstable. Do not set overlapping numbers.

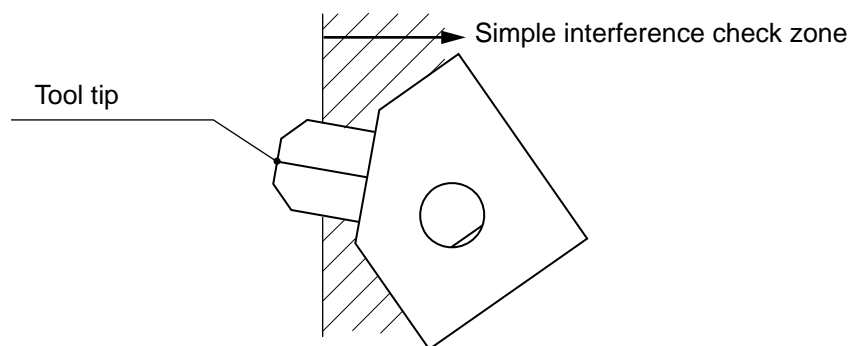
Use of the simple interference check zone function slows the CPU performance significantly. When the function is not used, set 0 in "Physical Output Port No./Global Flag No." and in "Error Type" to disable the function.

* Use the DFIF instruction to set the simple interference check zones in the SEL program.

- (3) Note on detection while a tool coordinate system is selected
While a tool coordinate system is selected, entry into the simple interference check zone is detected based on the tool tip, not the center of installation surface.



Depending on the moving track, a part of the tool other than the tip may enter the simple interference check zone, as illustrated below. In this case, detection will not occur until the tool tip enters the simple interference check zone. Exercise due caution.

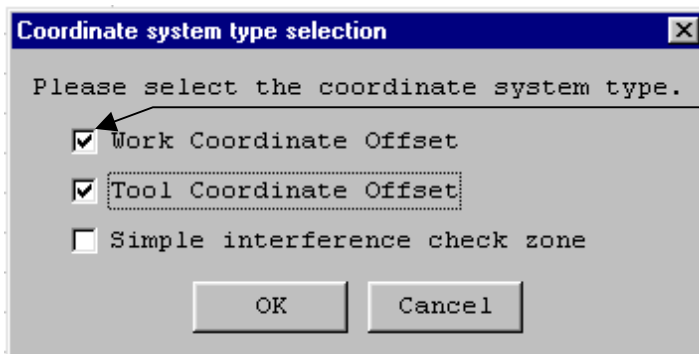


10. Coordinate System Definition Data Edit Window

10-5 Coordinate System Definition Data Clear Window

The procedure to delete coordinate system definition data is explained below:

- (1) From the menu, select Coordinate System (D) → Clear (L).
- (2) The coordinate system definition data clear window is displayed.



Click in the applicable box to select the type of data you wish to delete.

Deletion of Coordinate Definition Data

Select the type of coordinate system data you wish to delete.

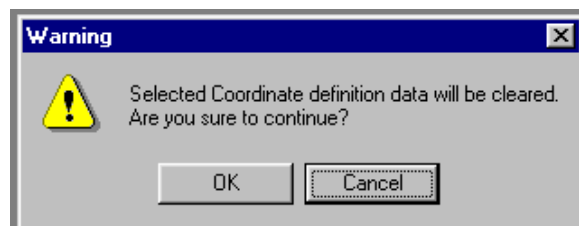
Next, click the OK button.

A warning message is displayed to confirm if you really want to delete the data.

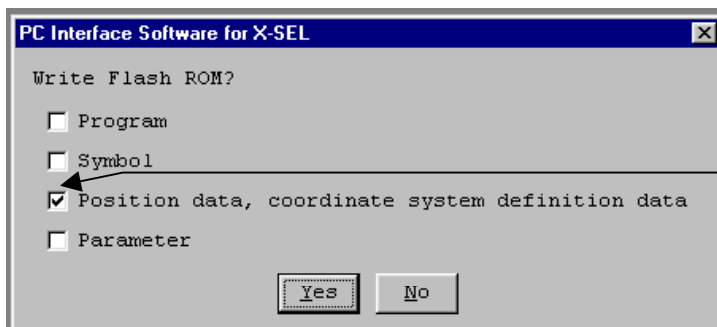
Click the OK button.

The data is transferred to the controller.

Clicking the Cancel button cancels the operation.



- (3) Write to the flash ROM.



Click in the applicable box to select the type of data you wish to write.

- Click [Yes (Y)] → The memory data will be written to the flash ROM.
- Click [No (N)] → The memory data will not be written to the flash ROM.
Perform a reset (reconnect the power or reset the software), and the robot will return to the condition before the deletion.

11. Monitor

You may view the current status of each item from the monitor of the menu.

- (1) Task Form Window:
Displays the executing program status.

No	Name	Step	Tk	Sts	L	Exec	T	W	H	C	Err
1	MAIN GOLF	74									
2	READ_PNT	14									
3	DVT_TRIGR	5									
4	sample	7									
5	test	9									
6	may26	12									
7	prg5	0									
8	prg6	0									
9		0									

Task Form (Diagram 10.1)

- No.: Program number
- Name: Symbol
- Sts: Task status
Task status used for internal OS control
(Main application: Ver. 0.14 or later)
(PC software: Ver. 0.0.7.2 or later)
- L: Task level
- Exec: Step No. of the current step
- T: Program is stopped (stopped during step operation, at a breakpoint, via the Pause button or SSPG instruction, etc.)
- W: Waiting (waiting for completion of TIMW, WTxx, WZxx, WRIT, READ, servo instruction, etc.)
(PC software: Ver. 1.1.0.5 or later)
- H: HOLD input (main application: Ver. 0.26 or later) (PC software: Ver. 1.1.0.5 or later)
- C: CANC input (main application: Ver. 0.26 or later) (PC software: Ver. 1.1.0.5 or later)
- Err: Error No.
- Prg.-: Error detail information

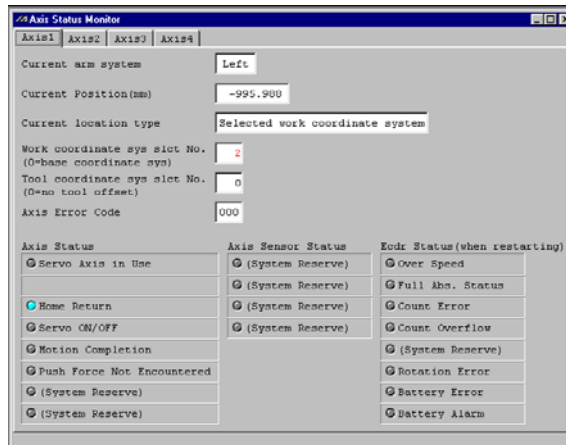
- (2) System Status Monitor Window:

System Mode	MANUAL		
Most Serious Level System Error No.	939		
Latest System Error No.	939		
Status1	Status2	Status3	Status4
Status Name	Status		
Drive Mode SW Status	MANUAL		
TP Deadman SW Status	ON		
Safety Gate Status	CLOSE		
Emergency Stop SW Status	Non Emergency-Stop		
Power Abnormality Status	NORMAL		
Battery Voltage Low Warning Status	Not Lowering		
Battery Voltage Abnormality Status	NORMAL		
(Reserved)	OFF		

System Status (Diagram 10.2)

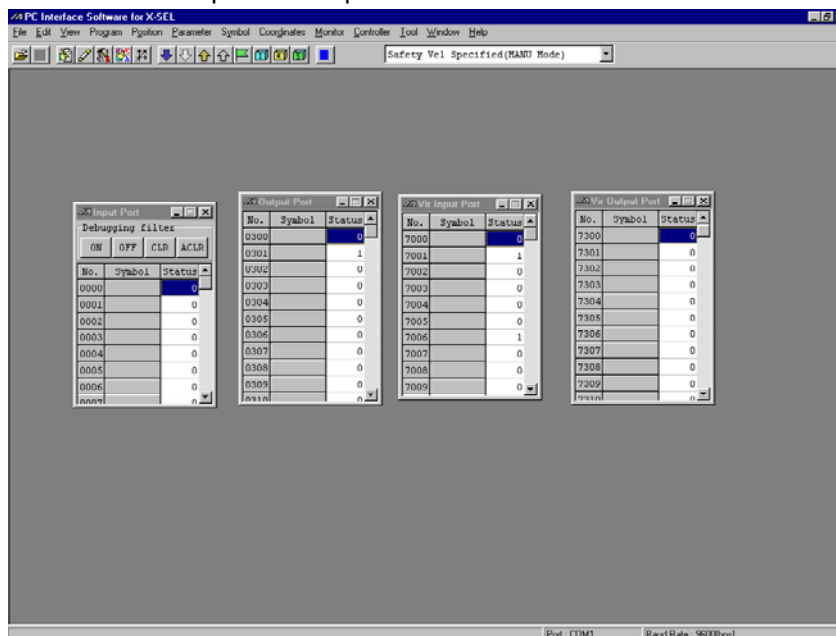
11. Monitor

- (3) Axis Status Monitor Window:
Displays the status of each axis.



Axis Status (Diagram 10.3)

- (4) Input Port Window, Virtual Input Port Window, Output Port Window, and Virtual Output Window:
Displays ON/OFF status of each input and output. 1: ON 0:OFF



Input and Output Port (Diagram 10.4)

State of output ports, virtual output ports, and global flags can be switched by double clicking.

The input ports can be forcibly turned ON or OFF.

[ON] Forcibly turns ON the input.

[OFF] Forcibly turns OFF the input.

[CLR] Revert a specified port to the actual input condition.

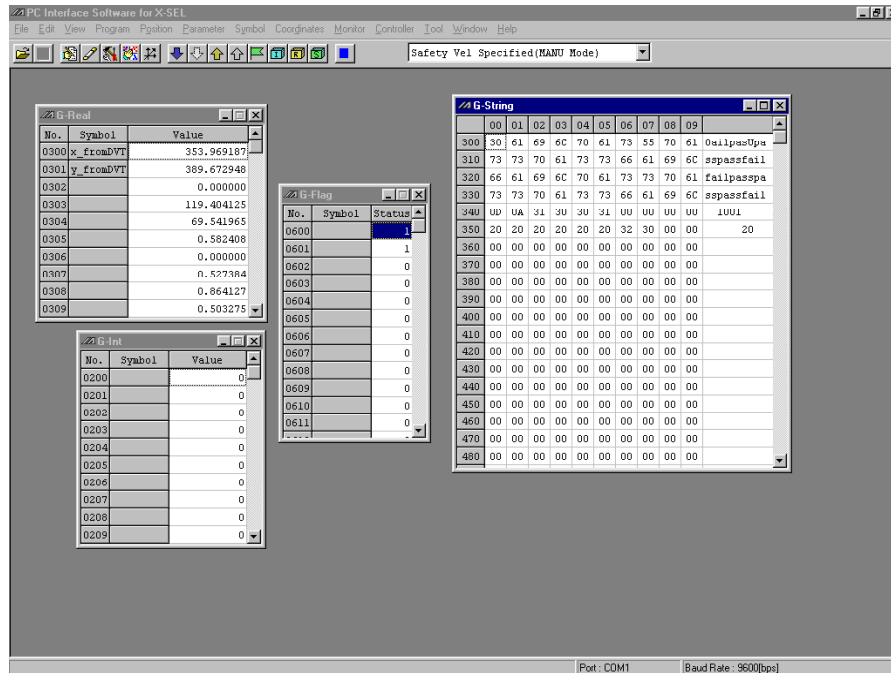
* Certain ports, such as those whose input is monitored at ON edge, will turn ON the moment [CLR] is clicked. Exercise caution.

[ACLRL] Revert all ports to the actual input condition.

* Certain ports, such as those whose input is monitored at ON edge, will turn ON the moment [CLR] is clicked. Exercise caution.

11. Monitor

- (5) Global Flag Window, Global Integer Variable Window, Global Real Variable Window, and Global String Variable:

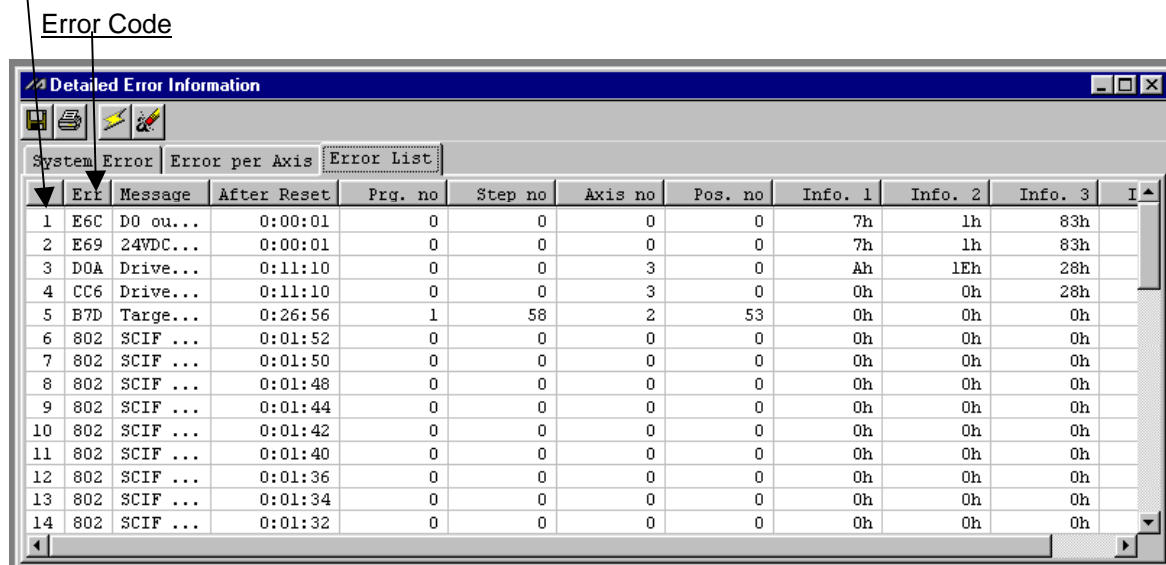


Global (Diagram 10.5)

You can change and substitute the values of global variables.
 You can also change and substitute the letters of global strings.

- (6) Error Detail Information:

When the error occurs, the error code and the message will be displayed.
 The smaller number, the most recent the error.



Error Detail Information (Diagram 10.6)

12. Supplementary Explanation of the Controller Menu

12-1 Software Reset

Restart the controller.

The data which is not written into Flash ROM will be deleted.

From the menu, click Controller (C) -> Software Reset (R).

12-2 Error Reset

Reset the message level and the operation release level error. If the error is not solved, it will occur again. From the menu, click Controller (C) -> Error Reset (R).

12. Supplementary Explanation of the Controller Menu

12-3 Request Driver Power Recovery and Request Releasing Pausing Operation

(1) Request Driver Power Recovery Method:

1. How to execute Request Driver Power Recovery:
Execute in Request Driver Power Recovery by any of the following.
 - * Set 1 in I/O parameter No.44 (Input Select Function 014 = Driver Power Cut-off Release Input) and ON edge input on Input port No.14.
 - * From the software menu, execute Controller -> Request Driver Power Recovery.
 - * From the mode select window of the teaching pendant, select Ctl (Controller operation) -> R Pwr (Request Power Drive Recovery) and execute.
2. Case which requires executing Request Power Drive Recovery:
Only the following case requires executing Request Power Drive Recovery.
 - * When you set 1 on I/O parameter No.44, Driver Power Cut-off occurs. -> Recover after the main cause of cut-off is solved.

(2) Operation Hold Release Request:

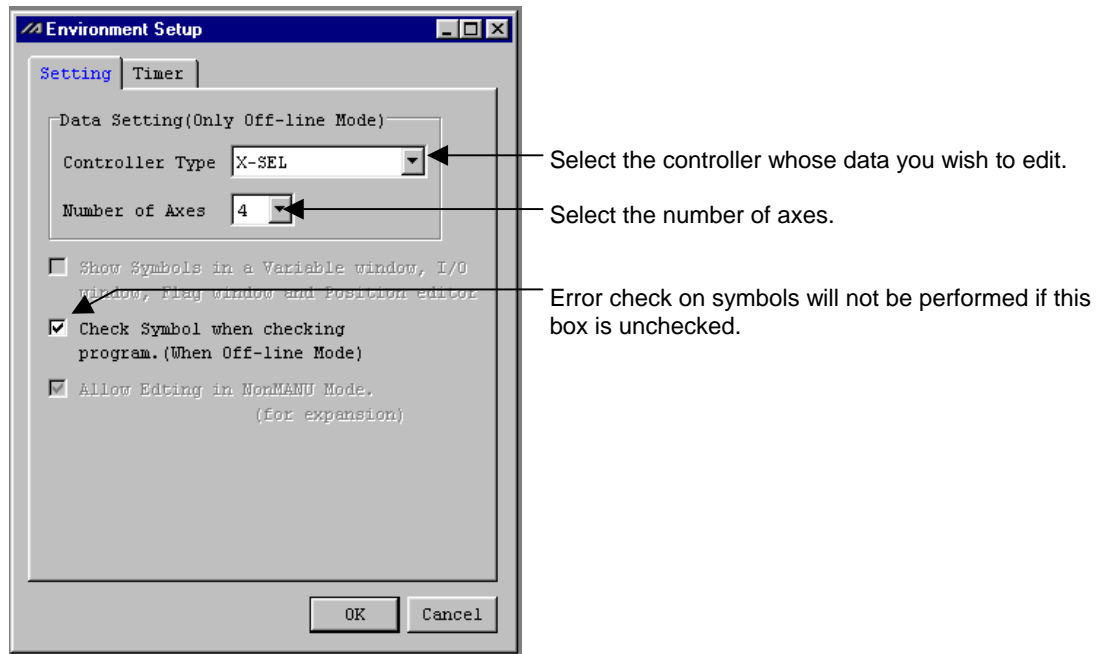
1. How to execute Request Release Pausing Operation:
Execute Request Releasing Pausing Operation by any of the following
 - * Set 1 on I/O parameter No. 35 (input select function 005 = Operation Hold Release Signal) and ON edge input on input port No.5.
 - * From the software menu, execute Controller (C) -> Operation Hold Release Signal.
 - * From the mode select window of the teaching pendant, select Ctl -> RAct and execute.
2. Case which requires Operation Hold Release Request:
Each of the following cases require executing Request Releasing Pausing Operation.
 - * When you set 2 on other parameter No.9, (Dead man SW recovery release according to type = continuous operation release [during automatic operation only]), stop according to dead man SW during automatic operation -> recover after releasing stop (Operation Hold Release).
 - * When you set 2 on other parameter No.9, (emergency stop recovery according to type = continuous operation recovery during automatic operation only), emergency stop during automatic operation -> recover after emergency stop release (operation hold release).
 - * When you set 2 on other parameter No.11, (according to recovery type during safety gate open recovery = continuous operation recovery (during automatic operation only) safety gate OPEN during automatic operation -> recovery after safety gate CLOSE (operation hold release).
 - * When you set 1 on I/O parameter No.36, (input selective function 006 = pausing operation signal), OFF level input on input port No.6 at automatic operation (pausing operation) -> recover after ON level input on Input port No.6 (operation hold release).

* If the case (1) 2. and (2) 2 occur at the same time, you need to first execute Request Driver Power Recovery. After complete it, execute Operation Hold Release Request.

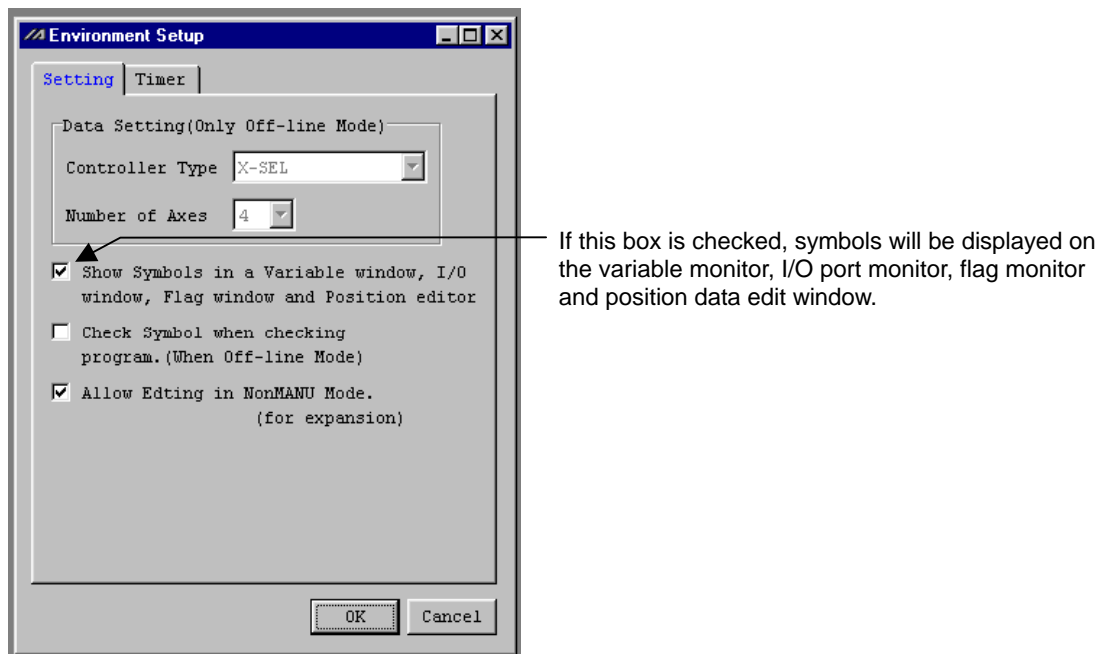
13. Tool

Setting and Timer exist in Tool.

- (1) When you create a new program and position ON-line, you can choose the type of controller. Besides X-SEL controller, you can edit the program and position of SEL-E/G, DS, and SEL-H controllers as well. This is only available at on-line editing.



Setting (Diagram 13.1)

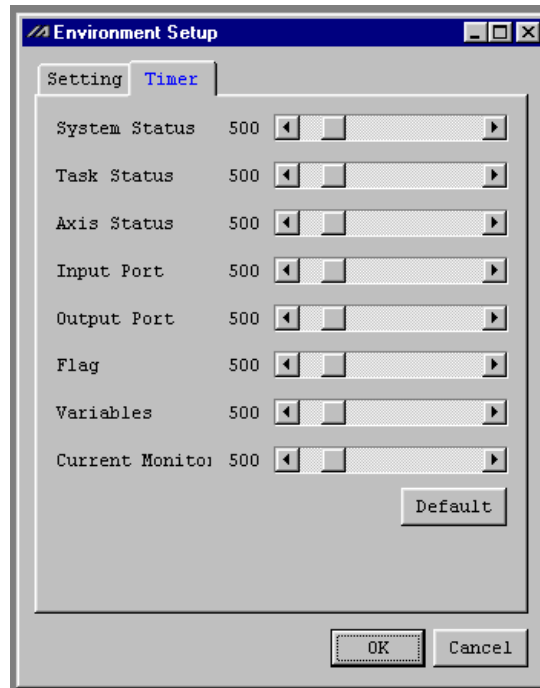


Setting (Diagram 13.2)

13. Tool

(2) Timer

Set the timings at which the controller references various data. Normally, the default timer settings need not be changed.



Timer (Diagram 13.3)

◎ Error Level Control

Error level	System error source	Error No. (HEX)	Display (7-segment display, etc.)	Error list	Error LED output	Program operation		Error reset	Remarks
						Other Parameter No.4 = 0	Other Parameter No.4 = 1		
Secret level	Main application	800 ~ 88F		○					Special error used for maintenance purpose
	Main core	890 ~ 8AF							
	PC	8B0 ~ 8DF							
	TP	8E0 ~ 8FF							
Message level	Main application	900 ~ 93F	○	△ (Errors relating to battery or fieldbus are registered in the error list.)				Allowed	Status display, input error, etc.
	Main core	940 ~ 97F							
	PC	980 ~ 9AF							
	PC (update tool)	9B0 ~ 9BF							
	TP	9C0 ~ 9FF							
	Flash ACK timeout	A00 ~ A6F							
	Main core	A70 ~ A9F							
	PC	AA0 ~ ACF							
	TP	AD0 ~ AFF							
Operation reset level	Main application	B00 ~ B9F	○	○		The program generating error is reset. (Except for axis errors, cause of reset only generates the moment the error occurs.)	All programs are reset, other than the "I/O processing program activated upon operation interruption." (Except for axis errors, cause of reset only generates the moment the error occurs.)	Allowed	Errors that affect operation. As for minor errors below this level, a reset attempt will be made by the auto-reset function upon reception of an external active command (SIO/PIO).
	Main core	BA0 ~ BBF							
	PC	BC0 ~ BDF							
	TP	BE0 ~ BFF							
	Main application	C00 ~ CCF							
	Main core	CD0 ~ CDF							
	PC	CE0 ~ CEF							
	TP	CF0 ~ CFF							
Cold start level	Main application	D00 ~ D8F	○	○		The program generating error is reset. * However, all programs will be reset, other than the "I/O processing program activated upon operation interruption," if the error requires cutoff of the drive source (initialization error, power-supply error, etc.).	All programs are reset, other than the "I/O processing program activated upon operation interruption."	Not allowed	Power must be reconnected. (CPU-OS runs normally.)
	Main core	D90 ~ DAF							
	PC	DB0 ~ DCF							
	PC (update tool)	DD0 ~ DDF							
	TP	DE0 ~ DFF							
	Main application	E00 ~ E8F							
	Main core	E90 ~ EBF							
	PC	EC0 ~ EDF							
	TP	EE0 ~ EFF							
System down level	Main application	FF0 ~ FBF	○	○	○		All reset	Not allowed	Power must be reconnected. (CPU-OS cannot be run.)
	Main core	FC0 ~ FCF							
	PC	FD0 ~ FDF							
	TP	FE0 ~ FFF							

PC: PC Software, TP: Teaching Pendant

X-SEL PC Software Error Table

(Errors specific to the PC Software are listed below. See the X-SEL Controller Operation Manual for controller errors.)

Error No.	Error name	Special note
980	Can not Copy, Move, Clear Program being edited on-line.	Program copy/move/clear was performed while the online program edit window was open. Close the online program edit window first.
981	Can not transmit the program file being edited on-line.	Program file transfer was performed to/from the program being edited online. Close the online edit window for the target program first.
982	Can not Copy, Move, Clear Position data being edited on-line.	Position data copy/move/clear was performed while the online position data edit window was open. Close the online position data edit window first.
983	Can not transmit the Position data being edited on-line.	Position data file transfer was performed while the online position data edit window was open. Close the online position data edit window first.
984	Can not transmit the Parameter file being edited on-line.	Parameter file transfer was performed while the online parameter edit window was open. Close the online parameter edit window first.
985	Can not Clear Symbol data being edited on-line.	Symbol data clear was performed while the online symbol data edit window was open. Close the online symbol data edit window first.
986	Can not transmit Symbol data file being edited on-line.	Symbol data file transfer was performed while the online symbol data edit window was open. Close the online symbol data edit window first.
987	Can not initialize memory being edited on-line.	Memory initialization was performed while the program/symbol/position data online edit window was open. Close the applicable online edit window first.
988	Can not Jog when Servo OFF.	Jogging was performed for an axis whose servo was OFF. Turn ON the servo first.
989	Acceleration Specification Error.	The specified acceleration during jog, move or continuous move exceeds the allowable range or is invalid. Check the specified acceleration.
98A	Deceleration Specification Error.	The specified deceleration during jog, move or continuous move exceeds the allowable range or is invalid. Check the specified deceleration.
98B	Can not edit while running program. (PC)	Write, copy, move, clear or other edit operation was performed for the program currently running. End the program you wish to edit, and then try again.
98C	Lacking Empty Step (PC)	There are not enough empty steps in the controller.
98D	Can not Edit Data in NON-MANUAL Mode.	Data edit operation (write, copy, move, clear, etc.) was performed in non-manual mode.
98E	Can not read so many data from the file.	The number of data sets saved in the file (number of steps, number of positions, etc.) exceeds the allowable value.
98F	Can not write so many data to the file.	The number of data sets written to the file (number of steps, number of positions, etc.) exceeds the allowable value.
990	Invalid baudrate specified	The specified baud rate is invalid (at connection check, when changing the baud rate, etc.)
991	Can not transmit the data file while sending data	Data read from a file cannot be transferred to the controller during data transmission (i.e. while data is being read or written).
992	Can not Clear Coordinate System Definition data being edited on-line.	Coordinate system definition data cannot be cleared while the online edit window for coordinate system definition data is open. Close the online edit window first.
993	Can not Change Arm when Servo OFF	Arm cannot be changed while the servo is OFF (SCARA only).

Error No.	Error name	Special note
994	Can not transmit Coordinate system definition data file being edited on-line.	The coordinate system definition data file was transferred while the online edit window for coordinate system definition data was open. Close the online edit window first.
995	'Crd1' and 'Crd2' don't have consistency.	The specified axis patterns for Coordinate 1 and Coordinate 2 of the simple interference check zone definition data do not match (SCARA only).
996	No effective data in 'Crd1' and 'Crd2'.	Coordinate values are not entered in the simple interference check zone definition data (SCARA only).
997	Can't select so many axes.	
998	Can't read the protected data.	Certain operations, such as read, copy and move, cannot be performed for read-protected data.
999	Can't write to the protection area.	Certain operations, such as write, copy, move and clear, cannot be performed for write-protected data.
99A	Protection setting parameter is abnormal.	An invalid value is set in the protection setting parameters (Other Parameter Nos. 36 to 39).
AA0	Input data error	A value outside the allowable range or invalid character has been input.
AA1	Password Error.	The entered password is invalid. Enter the correct password.
AA2	Failed in writing file.	
AA3	Data edit prohibited in operating mode	Data edit was performed in operating mode. Check the type of manual operation (Other Parameter No. 21 and the type of manual PC Software operation currently selected).
AA4	Data write prohibited during flash ROM write	Data write was performed while the flash ROM was written. Data edit cannot be performed while the flash ROM is written.
AA5	File data error	The data read from a file is abnormal.
AA6	Jog/move/continuous move speed too low	
AA7	Jog/move/continuous move speed too high	
AA8	Data transmission not possible offline	Data transmission cannot be performed while the communication with the controller is cut off. Try again after starting the application in online mode.
AA9	Teaching prohibited before completion of homing	Teaching operation (current position capture) was performed for an axis whose homing was not yet complete. Complete homing first.
AAA	Memory initialization prohibited in operating mode	Memory initialization was performed in operating mode. Check the type of manual operation (Other Parameter No. 21 and the type of manual PC Software operation currently selected).
AAB	Flash ROM write prohibited in operating mode	The flash ROM was written in operating mode. Check the type of manual operation (Other Parameter No. 21 and the type of manual PC Software operation currently selected).
AAC	Error list clear prohibited in operating mode	The error list was cleared in operating mode. Check the type of manual operation (Other Parameter No. 21 and the type of manual PC Software operation currently selected).
AAD	Slave unit type not entered	
AAE	Slave unit type error	
AAF	Slave device No. not entered	

Error No.	Error name	Special note
AB0	Slave device No. error	
AB1	Slave command ID not entered	
AB2	Slave command ID error	
AB3	Prohibited slave command issued	
AB4	Prohibited slave command issued before completion of homing	A slave command was issued whose use is prohibited before completion of homing.
AB5	Prohibited slave command issued during servo ON	A slave command was issued whose use is prohibited when the servo is ON.
AB6	Move/continuous move prohibited before completion of homing	Move/continuous move was performed for an axis whose homing was not yet complete. Complete homing first.
AB7	Re-homing not complete	The absolute encoder rotation data was reset when re-homing was not yet complete. Regardless of whether or not a prior homing had been completed, fresh homing operation must always be performed when resetting the absolute encoder rotation data.
AB8	File read error	The file format is wrong or abnormal data is contained.
AB9	Too many breakpoints	The number of breakpoints exceeds the settable range. Cancel unnecessary breakpoints and then try again.
ABA	File open error	The file cannot be opened. Check if the file is being used by other application.
ABB	File type error	The file type is invalid. Check the file type (extension).
ABC	Data not entered	Data is not entered in a mandatory field or fields. Enter data.
ABD	Symbol first character error	The first character of the symbol is invalid.
ABE	Symbol character string error	The symbol character string contains an invalid character or characters.
ABF	Symbol multiple definition error	The same symbol is defined more than once.
AC0	Program name multiple definition error	The same program name is defined more than once.
AC1	Encoder type error	Check the encoder ABS/INC type (Axis Parameter No. 38), etc. of the target axis.
AC2	Monitoring axis not selected	
AC3	Date entry error	(For future extension)
AC4	Time entry error	(For future extension)
AC5	Inching distance excessive	
AC6	Window closing prohibited during data transmission	The edit window whose data is being transmitted cannot be closed. Close the window after the transmission is complete.
AC7	Too many symbol definitions	The number of symbol definitions exceeds the allowable range. Create empty area by deleting unnecessary symbols, and then try again.
AC8	Entered value too large	
AC9	Entered value too small	

Error No.	Error name	Special note
ACA	Parameter initialization prohibited during online edit	Parameter initialization was performed while the online parameter edit window was open. Close the online parameter edit window first.
ACB	SEL program/symbol/position data initialization prohibited during online edit	SEL program/symbol/position data initialization was performed while the program/symbol/position data online edit window was open. Close the applicable online edit window first.
ACC	Symbol not defined	An undefined symbol or symbols is/are used in the program step data.
ACD	File not found	The specified file cannot be found. Check the file name.
ACE	File not supported	The specified file format is not supported by the application. Check the file type.
ACF	No available axis	There is no available axis that can be edited/operated. Check the available axis pattern (All-Axis Common Parameter No. 1).
EC0	Received message string error (PC)	The received message contains error. If the error persists after reconnection, contact IAI.
EC1	Controller not connected	Communication may not yet be established or the connected controller may not be supported. Check the physical connection with the controller and then perform "reconnection."
EC2	Receive time out. (PC)	Communication error. Check the cable connection, short, noise, etc.
EC3	Receive Length Error. (PC)	Communication error. Check the cable connection, short, noise, etc.
EC5	Com Port Open Error.	The COM port cannot be opened. Check if the COM port is available.
EC6	Sum Check Error. (PC)	Communication error. Check the cable connection, short, noise, etc.
EC7	Receive Buffer Overflow. (PC)	The receive buffer (PC) overflowed. Perform "reconnection."
EC8	Receive Buffer Overflow (PC) (OS)	The receive buffer overflowed. Perform "reconnection."
EC9	Receive Overrun Error (PC)	Receive overrun occurred. Perform "reconnection."
ECA	Framing Error (PC)	Framing error occurred. Perform "reconnection."
ECB	Communication Error (PC) (OS)	Communication error occurred. Perform "reconnection."
ECC	Unsupported controller is connected.	The connected controller is not supported.



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