YASKAWA

AC Servo Drives Engineering Tool

SigmaWin+
ONLINE MANUAL
Σ-7 Component

MANUAL NO. SIEP S800001 48C

Safety-Related Symbols

The following symbols are used in this manual according to the safety-related content.
Be sure to observe text annotated with these safety symbols as their content is important.

⚠ WARNING	Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.
⚠ CAUTION	Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

Furthermore, items marked with ⚠ CAUTION may have important consequences depending on the situation.

Manual Outline

This manual explains the following areas for SigmaWin+ Σ-7 component users.

- Outline of SigmaWin+ Σ-7 component functions and operation
- SigmaWin+ Σ-7 component installation/removal
- Outline of SigmaWin+ Σ-7 component functions and operation when connecting through an MP2000/MP3000-series Machine Controller (hereinafter referred to as Controller).
- How a SigmaWin+ Σ-7 component connected through a Controller differs from a conventionally connected SigmaWin+ Σ-7 component.

Related Manuals

Be sure to refer to the corresponding technical materials regarding related devices, modules, and other equipment.

Use this product only with a full understanding of its specifications, service life, and other important information.

Document Number	Document Name
KAEP S800001 22	Machine Controller and Servo Drive Solutions Catalog
KAEP S800001 23	AC Servo Drives Σ-7 Series
SIEP S800001 26	Σ-7-Series AC Servo Drive Σ-7S SERVOPACK with Analog Voltage/Pulse Train References Product Manual
SIEP S800001 27	Σ-7-Series AC Servo Drive Σ-7S SERVOPACK with MECHATROLINK-II Communications References Product Manual
SIEP S800001 28	Σ-7-Series AC Servo Drive Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual
SIEP S800001 29	Σ-7-Series AC Servo Drive Σ-7W SERVOPACK with MECHATROLINK-III Communications References Product Manual
SIEP S800001 36	Σ-7-Series AC Servo Drive Rotary Servomotor Product Manual
SIEP S800001 37	Σ-7-Series AC Servo Drive Linear Servomotor Product Manual
SIEP S800001 38	Σ-7-Series AC Servo Drive Direct Drive Servomotor Product Manual
SIEP S800001 64	Σ-7-Series AC Servo Drive Σ-7S SERVOPACK with Indexer Module Product Manual
SIEP S800001 70	Σ-7-Series AC Servo Drive Σ-7S SERVOPACK with DeviceNet Module Product Manual
SIEP C720829 06	AC Servo Drives Σ-V Series/Σ-V Series for Large-Capacity Models/Σ-7 Series User's Manual Safety Module

How to Use this Manual

Meaning of Basic Terms

This manual applies the following meanings to the terms below unless otherwise specified.

Servomotor: A Σ-7-series Rotary Servomotor, Direct Drive Servomotor, or Linear Servomotor.

SERVOPACK: A Σ-7-series SERVOPACK.

Servo Drive: The combination of a Servomotor and SERVOPACK.

Servo System: A servo control system that includes the combination of a Servo Drive with a host controller and peripheral devices.

Notes on the PC Communication Function

MECHATROLINK-II/III-compatible SERVOPACK
The SERVOPACK for MECHATROLINK-II/III can perform communications with SigmaWin+ (USB) and the host controller (MECHATROLINK-II/III). If the SERVOPACK is used to communicate with two or three of these devices at the same time, note the following precautions. • When parameters are written in from two or three devices, the latest parameter settings that was written is valid. • When an operation is conducted in utility function mode (Fn□□□) from SigmaWin+ or the host controller, the operation with other communications cannot be carried out.

Regarding Software

Usage Notes

- Use this software on one specified PC. Request a separate license to use this software on another computer.
- Copying of this software for purposes other than use as backup copies is strictly prohibited.
- Carefully store the CD-ROM (original medium) upon which this software is written.
- Reverse compiling or assembly of this software is strictly prohibited.
- Use of this software in whole or in part by a third party through transfer, exchange, resale, and so forth, is strictly prohibited without the prior agreement of Yaskawa Electric Corporation.
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- Adobe Reader is a trademark or a registered trademark of Adobe Systems Incorporated.
- Pentium is a trademark or a registered trademark of Intel Corporation.
- Ethernet is a trademark of Xerox Corporation.
- InstallShield is a registered trademark of InstallShield Software Corporation.
- Other product and company names used in this manual are the trademarks or registered trademarks of their respective company. "TM" and the ® mark do not appear with product or company names in this manual.

Safety Notes

The following are important cautionary items that must be observed in the wiring and use of this product.

Notes on Wiring

⚠ CAUTION
• Insertion and removal of communication cables should be done with the power off in both the SERVOPACK and PC. Insertion and removal of cables with the power on may result in damage to both or either of the units. • Never change cables while SigmaWin+ Σ-7 component is running. Always close SigmaWin+ Σ-7 component before changing connections. The operation of both or either the PC or SERVOPACK cannot be assured if this is not observed.

Usage Notes

⚠ WARNING

- Be careful that the alarm in Table 1 may occur when the communications between the host controller and the SERVOPACK in Table 1 is performed while the SigmaWin+ or the Digital Operator is being used.

  When the alarm occurs, the process under execution may be canceled and the system may stop.

- Execute Write (Flash) while a mechanical system is stopped and not running.

  If you execute the Write (Flash) function while the system is running, the process under execution may be canceled and the system may stop.

- Be careful that an alarm listed in Table 2 may occur when using the SERVOPACK in Table 2 with the Safety Module.

  When the alarm occurs, the process under execution may be canceled and the system may stop.

- Engineers designing a mechanical system using the safety functions of the Safety Module must have complete knowledge of the relative safety standards and a full understanding of the safety functions of the Safety Module.

  Improper use may result in injury or damage to the product.

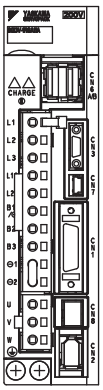
- When creating a safety design for a mechanical system using the safety functions of the Safety Module, always perform risk assessment of the system to identify residual risks.

  Improper use may result in injury or damage to the product.

- Before using the Safety Module, refer to the user's manual for the Safety Module for information on how to set or change the parameters and then always check these parameters are correctly set to the intended values before starting an operation.

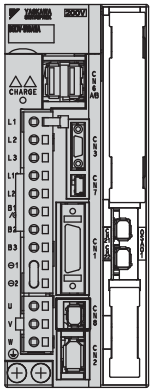
  Failure to observe this warning may result in injury or damage to the product.

Table 1 Possible Alarms

SERVOPACK Model	Tool	Digital Operator	SigmaWin+: USB Connection
SGD7□-□□□A□□ (For MECHATROLINK Communications) 		A.95A The SERVOPACK can be used with no problem when the following functions are being executed. • Monitor • Alarm displays (excluding resetting alarms and clearing the alarm history) • If an alarm occurs, the operation of the Safety Module will not proceed or cannot be accurately monitored. Clear the alarms to resume the operation. For details on how to clear the alarms, refer to the product manual for the SERVOPACK being used.	A.95A The SERVOPACK can be used with no problem when the following functions are being executed. • Editing Parameters (except for parameter initialization) • Monitor • Alarm displays (excluding resetting alarms and clearing the alarm history) • Tracing • If an alarm occurs, the operation of the Safety Module will not proceed or cannot be accurately monitored. Clear the alarms to resume the operation. For details on how to clear the alarms, refer to the product manual for the SERVOPACK being used.

Note: When a MECHATROLINK command is sent from the host controller, an alarm may occur during execution of the following command:
PRM_RD/PRM_WR/PPRM_WR/CONFIG/SENS_ON/ALM_RD/ALM_CLR (history)/ADJ/SENS_ON of SVCTRL/ID_RD

Table 2 Precautions When Using a Safety Module

SERVOPACK Model	Tool	Digital Operator	SigmaWin+: USB Connection
SGD7S+SGDV-OSA01A (Safety Module) 		A.C90/C91/C92/EB0 If an alarm occurs, the operation of the Safety Module will not proceed or cannot be accurately monitored. Clear the alarms to resume the operation. For information on resetting alarms, refer to the product manual for your SERVOPACK.	

⚠ CAUTION

- Always be sure to close SigmaWin+ Σ-7 component before turning the SERVOPACK power off or on.

  The operation of both or either the PC or SERVOPACK cannot be assured if this is not observed.

Notes on Using Windows XP

⚠ CAUTION
• If using NTFS, contact a user with administrator privileges to log on to SigmaWin+. If SigmaWin+ runs in Limited User mode with NTFS, the necessary settings cannot be read into the application program so an error may occur at start up or the program may not successfully run. If using FAT32, SigmaWin+ can be run in Limited User mode. • When using SigmaWin+, do not change the active window to another window for another application program even if using the Multi-user function. If the active window is changed while SigmaWin+ is running, the window that shows the status of the job may not be viewed and possibly result in an accident or harm to personnel or the motor.

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Revision History

1 System Outline

This section includes an outline of the SigmaWin+ Σ-7 component system, and explains its advantages and preparation prior to use.

1.1 Outline and Advantages of SigmaWin+Σ-7 Component

The SigmaWin+ Σ-7 component is an engineering tool for setup and optimum SERVOPACK tuning of Yaskawa Σ-7-series AC Servo Drives.

This product provides uniform features and functions enabling everyone from beginners to persons experienced in servo tuning to easily perform connections, test runs, and tuning that are matched to the customer’s machine right out of the box.

Main Functions

- Parameter editing and converting
- Display and release of generated alarms (displays appropriate to the cause and resolution method)
- Display of SERVOPACK data, such as I/O signals and the internal status, and product data
- Various setup functions such as those for the absolute encoder, and offset adjustment
- Graph displays for torque reference, speed feedback, and so on
- Analysis of the customer's machine such as mechanical analysis (FFT analysis), and inertia identification

1.2 Configurations

SigmaWin+ Σ-7 components can be connected to SERVOPACKs in either of the following two ways.

<USB Connection>

One SigmaWin+ Σ-7 component is connected to one SERVOPACK at a time. The communication cable has to be changed to connect the SigmaWin+ Σ-7 component to another SERVOPACK.

<When using a Controller>

One SigmaWin+ Σ-7 component can tune the connected SERVOPACKs through a Controller equipped with a MECHATROLINK communication cable.

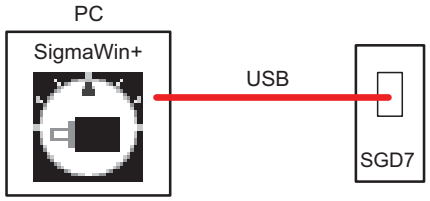
When running a SigmaWin+ Σ-7 component through a Controller that is connected to multiple SERVOPACKs, there is no need to change the connection of the communication cable when switching SERVOPACK connections.

Two connection methods are possible when using a Controller.

- Ethernet
  Connects a PC to a Controller through an Ethernet network.
- PCI bus
  Connects a PC in which a Controller board is installed.

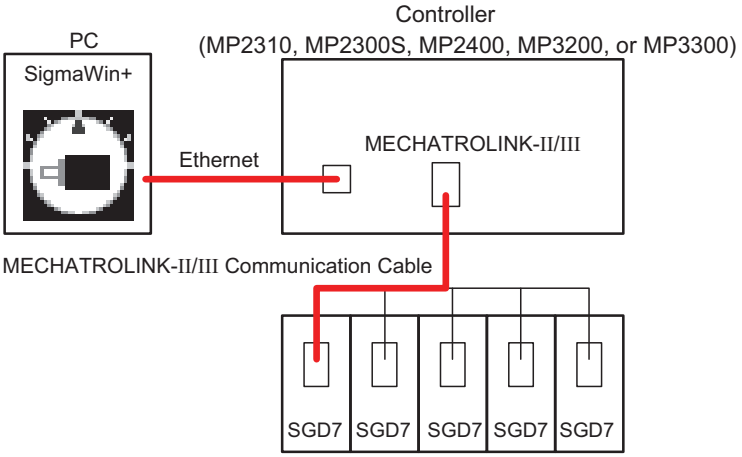
Note:Among SigmaWin+ components, only the SigmaWin+ Σ-7 component is compatible with connection of SigmaWin+ through a Controller.

■ USB Connection



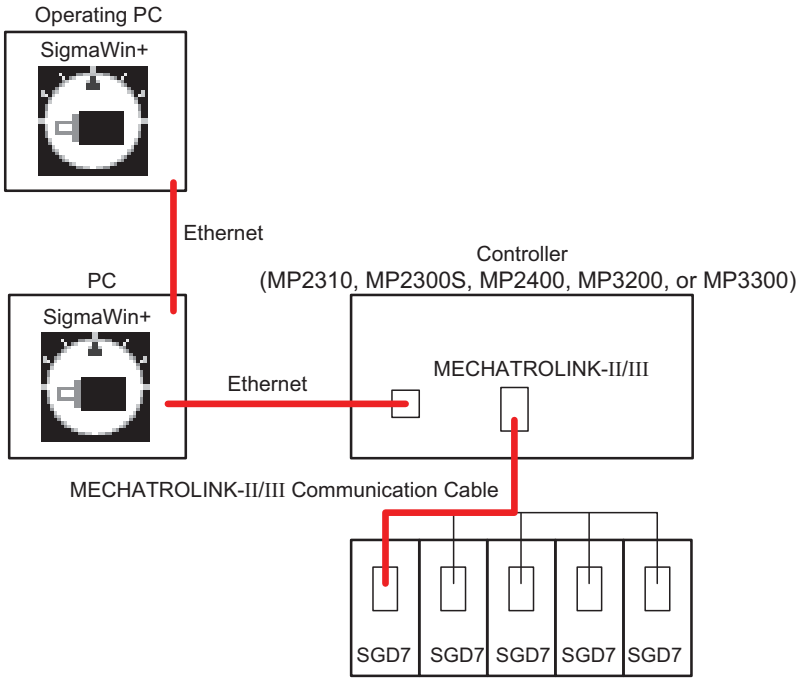
■ When using a Controller

Using Ethernet

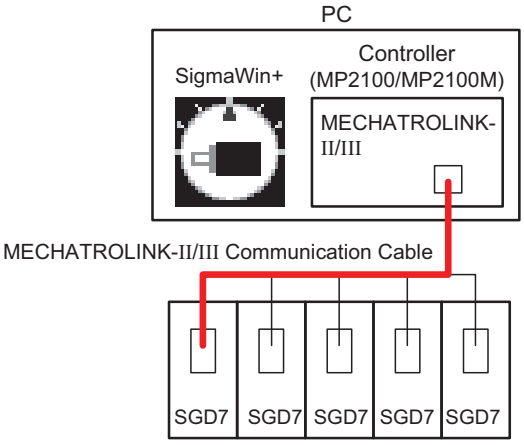


<Remote operation>

For a remote operation, the following configuration is required.

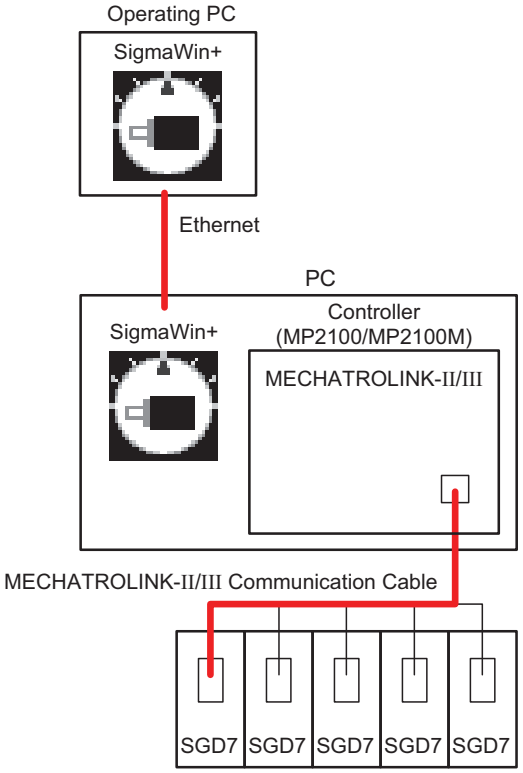


Using PCI



<Remote operation>

For a remote operation, the following configuration is required.



1.3 Compatible Devices

The SigmaWin+ Σ-7 component is compatible with the following Σ-7 SERVOPACKs.

- SGD7S-□□□A00
- SGD7S-□□□A10
- SGD7S-□□□A20
- SGD7S-□□□AE0
- SGD7W-□□□A20

NOTE

Some SigmaWin+ Σ-7 functions may be unusable depending on the SERVOPACK type. Unusable functions will appear dimmed on the selection menu.

1.4 System Requirements

■ When using USB

SigmaWin+ Σ-7 component requires the following minimum system configuration.

Personal Computer (PC)	PC/AT DOS/V-compatible device Note: Operation cannot be assured on the NEC PC9821 series.
Processor	Pentium 200MHz
Main Memory	64MB (96MB recommended)
Free Hard Disk Space	At Normal Setup • 450 MB min. (500 MB or greater recommended for installation) At Custom Setup • Σ component: 40MB • Σ-II component: 90MB • SGDS component: 70MB • SGDX component: 70MB • Σ-V component: 70 MB min. • INDEXER component: 70MB • MECHATROLINK-II component: 70MB • Σ-V-MD Component: 70 MB min. • Σ-7 component: 70 MB min. (100MB recommended at each installation)
Monitor	XVGA (1024×768 or greater using a small font)
Number of Colors	256 colors (65536 colors recommended)
Operating System (OS)	• Windows XP * • Windows Vista • Windows 7 (32 bit/64 bit)
Communication Cables for SERVOPACK to PC Connection	USB Connection The following cable is available from Yaskawa. Contact Yaskawa if necessary. JZSP-CVS06-02-E
Others	One or more USB interfaces CD-ROM drive (for installation only)

* If using HotfixQ328310, SigmaWin+ may or may not be installed. If it cannot be installed, use HotfixQ329623 instead.

■ When using a Controller

SigmaWin+ Σ-7 component connected through a Controller requires the following minimum system configuration.

Using MECHATROLINK-II

<table>
<tr><td>Communication Interface</td><td>Ethernet, PCI BUS</td></tr>
<tr><td>Controller</td><td>MP2000 or MP3000 Machine Controller
<table>
<tr><th>Controller</th><th>MECHATROLINK module</th><th>Version</th></tr>
<tr><td>MP2100</td><td>SVB (built-in CPU)</td><td>Version 2.89 or later</td></tr>
<tr><td rowspan="2">MP2100M</td><td>SVB (built-in CPU)</td><td>Version 2.89 or later</td></tr>
<tr><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td>MP2200 CPU-03</td><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td>MP2200 CPU-04</td><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td rowspan="2">MP2310</td><td>SVB (built-in CPU)</td><td>Version 2.89 or later</td></tr>
<tr><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td rowspan="2">MP2300S</td><td>SVB (built-in CPU)</td><td>Version 2.89 or later</td></tr>
<tr><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td>MP2400</td><td>SVB (built-in CPU)</td><td>Version 2.89 or later</td></tr>
<tr><td>MP3200</td><td>SVB-01</td><td>Version 1.33 or later</td></tr>
<tr><td>MP3300</td><td>SVB-01</td><td>Version 1.33 or later</td></tr>
</table>
Enable the message communication function of the MECHATROLINK master when you use SigmaWin+ Σ-7 component through a Controller.
Other required settings are as follows.
• Set the number of retry to slaves to one or more.
• The set number of retry to slaves must be greater than the number of retry processing times.
(number of retry to slaves) - (number of retry processing times) > 1</td></tr>
</table>

When Using MECHATROLINK-III Communications

<table>
<tr><td>Communication Interface</td><td>Ethernet, PCI BUS</td></tr>
<tr><td>Controller</td><td>Machine Controller MP2000/MP3000 Series
<table>
<tr><th>Controller</th><th>MECHATROLINK module</th><th>Version</th></tr>
<tr><td>MP2100M</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2101M</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2101T</td><td>SVC (built-in CPU)</td><td>Version 2.88 or later</td></tr>
<tr><td rowspan="2">MP2101TM</td><td>SVC (built-in CPU)</td><td>Version 2.88 or later</td></tr>
<tr><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2200
CPU-03</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2200
CPU-04</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2310</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td>MP2300S</td><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td rowspan="2">MP3200</td><td>SVC (built-in CPU)</td><td>Version 1.11 or later</td></tr>
<tr><td>SVC-01</td><td>Version 1.12 or later</td></tr>
<tr><td rowspan="2">MP3300</td><td>SVC (built-in CPU)</td><td>Version 1.10 or later</td></tr>
<tr><td>SVC-01</td><td>Version 1.10 or later</td></tr>
</table>
Enable the message communication function of the MECHATROLINK master when you use SigmaWin+ Σ-7 component through a Controller.
Other required settings are as follows.
• Set the number of retry to slaves to one or more.
• The set number of retry to slaves must be greater than the number of retry processing times.
(number of retry to slaves) - (number of retry processing times) > 1</td></tr>
</table>

1.5 Installing SigmaWin+ Program

To install SigmaWin+, run the setup file for SigmaWin+. And the installation process will begin. In this process, SigmaWin+ and the related files will be installed, or stored on the hard disk.

Operating conflicts may arise with the other programs during installation. Be sure to close all other programs before installing SigmaWin+.

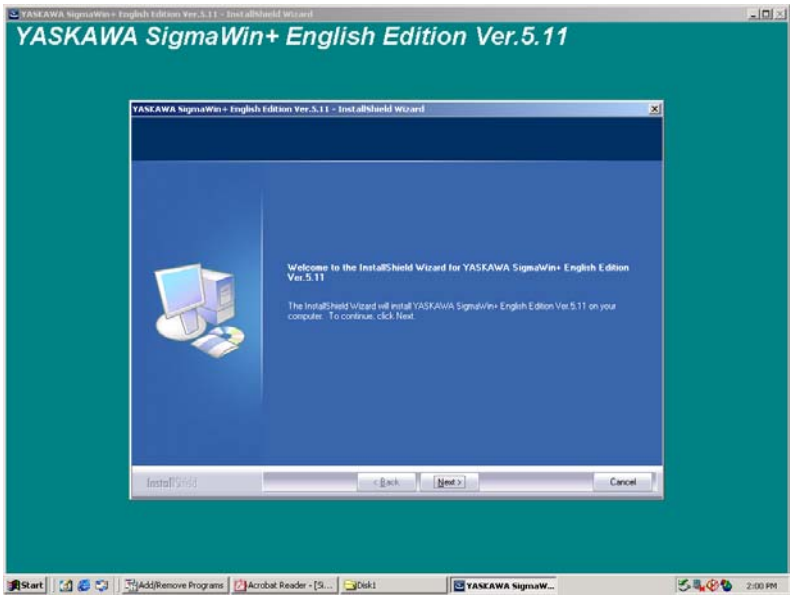
Install the program using the following procedure.

1. Insert the CD-ROM into the CD-ROM drive (the D-drive for example).
2. If "Autoplay" is enabled, the installation program will automatically start when the CD-ROM is inserted.

   If "Autoplay" is not enabled, either of the following methods may be used.

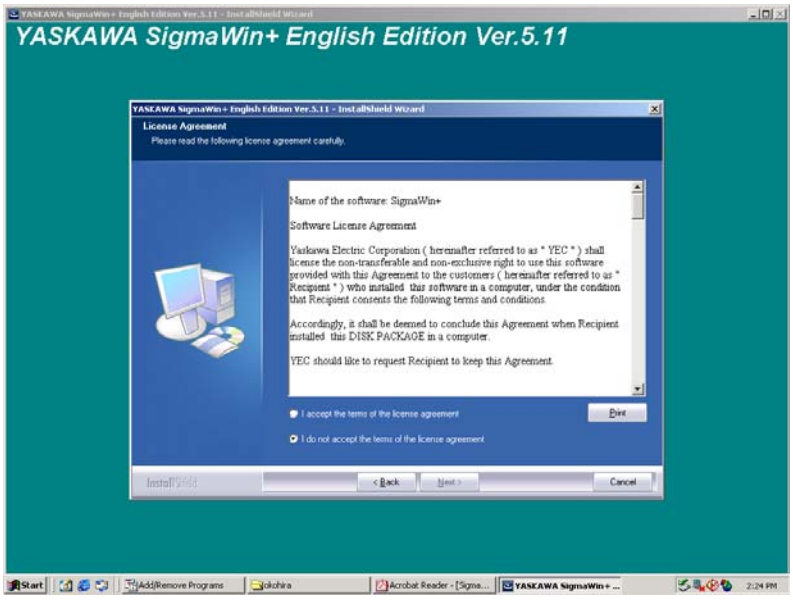
   • On the Start menu, select **Run**. Type "D:\SETUP", and then click **OK**.

   • Open the Explorer, load the CD-ROM contents, and double click "D:\SETUP.EXE".

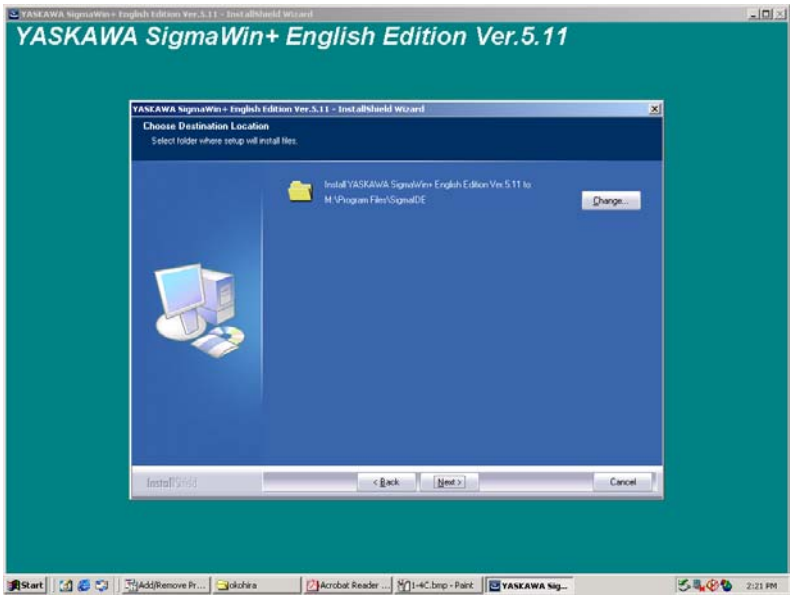


A message will appear, welcoming you to the SigmaWin+ program.

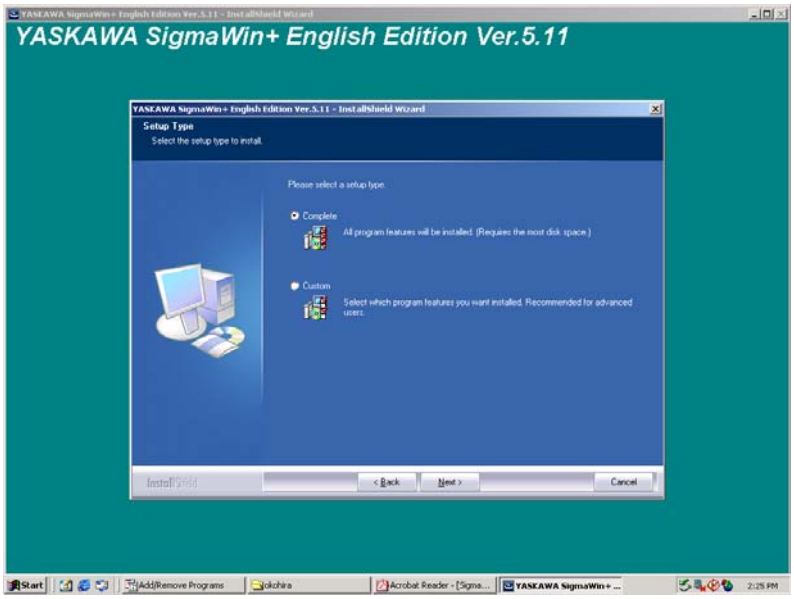
3. Click **Next** to continue. The License Agreement window will appear.



4. Read the agreement and select "I accept the terms of the license agreement" to agree. Then click **Next** to continue. The Choose Destination Location window will appear.



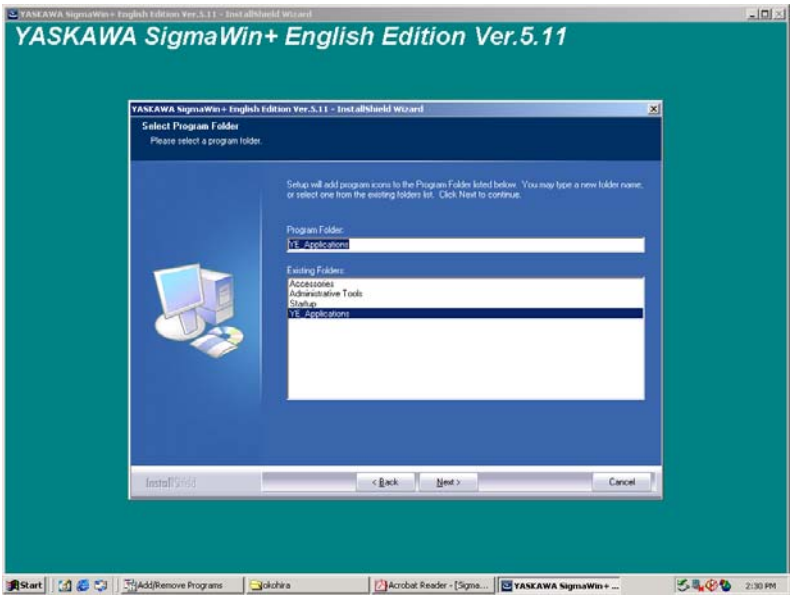
5. Follow the onscreen instructions to choose a destination folder to copy the SigmaWin+ file to, and click **Next** to continue.



6. Select the setup type.

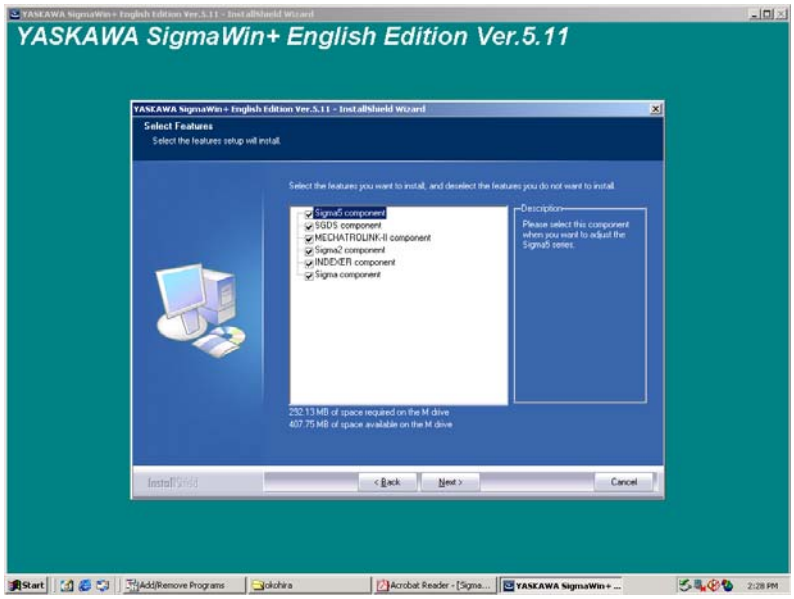
<To install all components of SigmaWin+>

Choose "Complete" and click **Next**. The Select Program Folder window will appear.

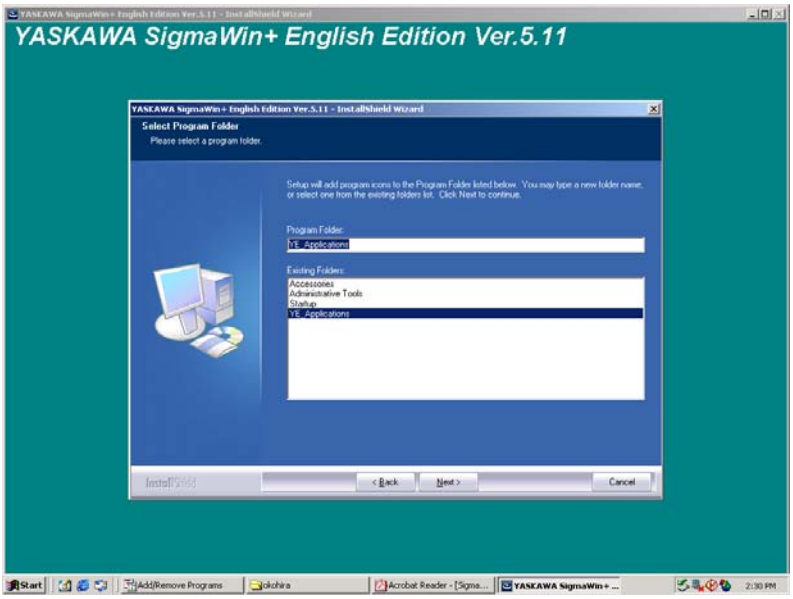


<To install selected components of SigmaWin+>

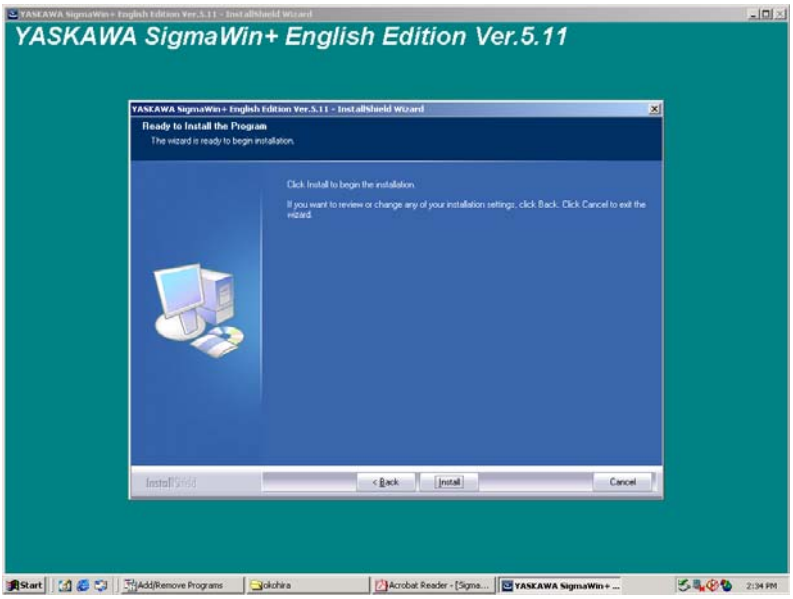
(1) Choose "Custom" and click **Next**. The Select Features window will appear.



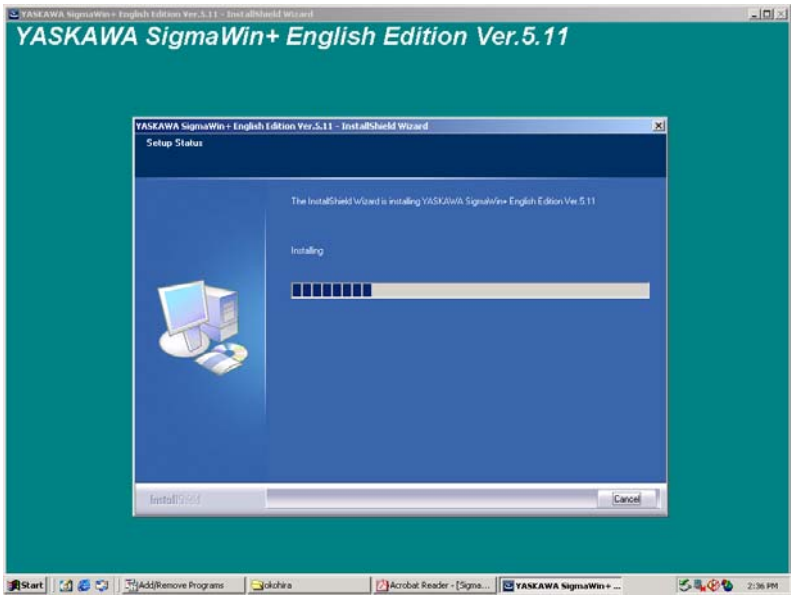
(2) Select the components to be installed, and click **Next**. The Select Program Folder window will appear.



7. Select the program group to create the SigmaWin+ icon. "YE_Applications" is the default setting. After selecting the program group or folder, click **Next** to continue. The Ready to Install Program window will appear.

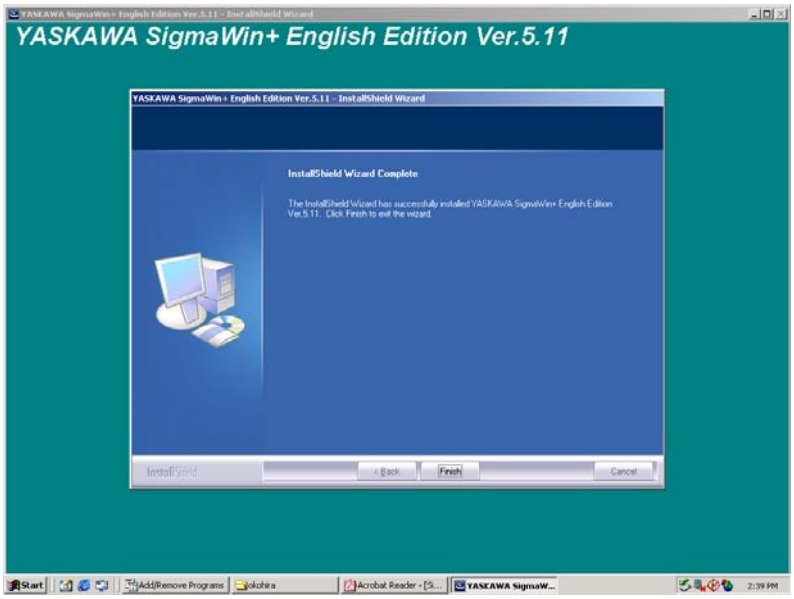


8. Click **Install**.
   The PC files will be copied to PC from the CD-ROM. The percentage of the copying that has been completed will be shown.



Note: If new versions of the PC support files are needed to install SigmaWin+, a window will appear asking whether to overwrite the current version or to cancel the installation. SigmaWin+ may not run correctly if the new versions of the support files are not installed.

If SigmaWin+ has been successfully installed, the InstallShield Wizard Complete window will appear.

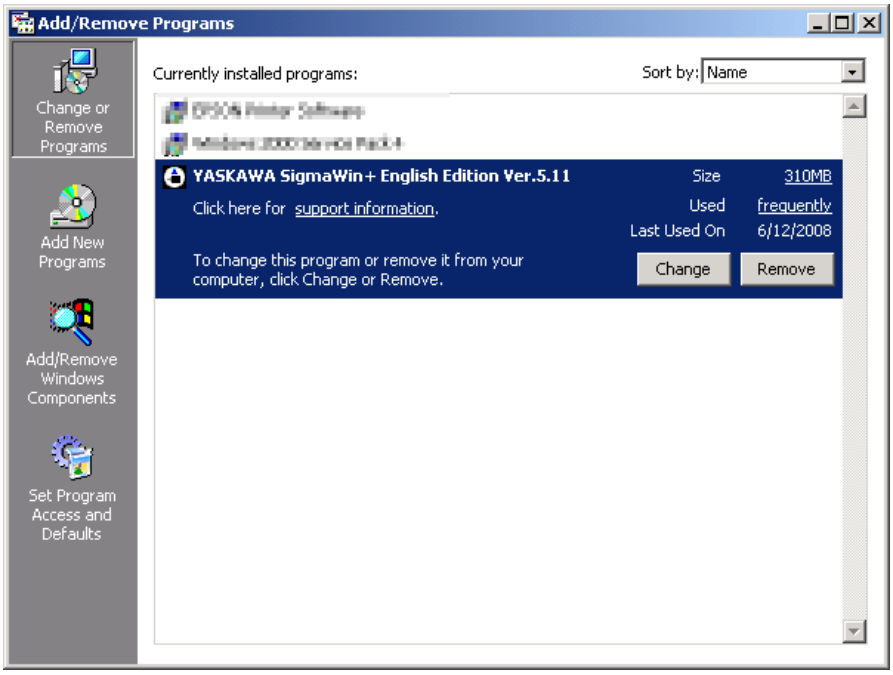


9. Click **Finish** to complete the setup.

1.6 Removing SigmaWin+ Program

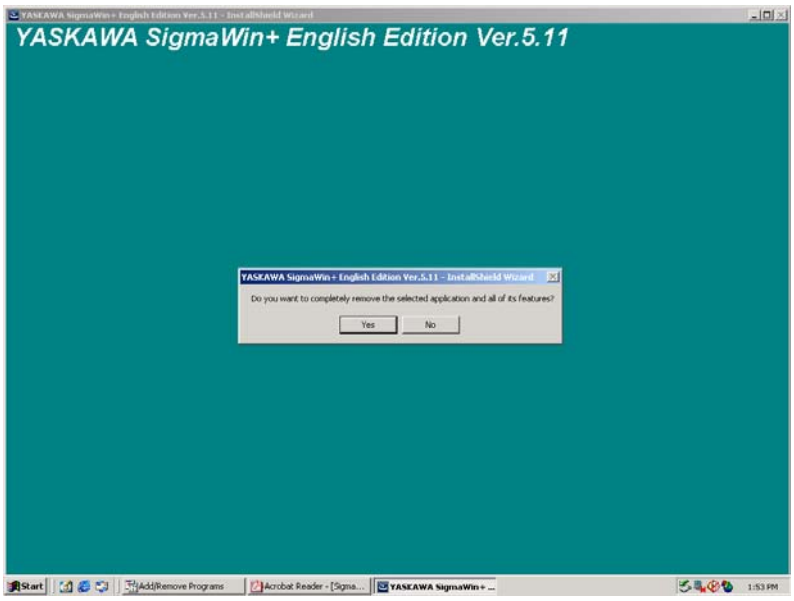
Remove the SigmaWin+ program using the following procedure.

1. Click the **Start** button, point to **Settings** and click **Control Panel**.
2. Click the **Add/Remove Programs** icon. The Add/Remove Programs Properties box appears.

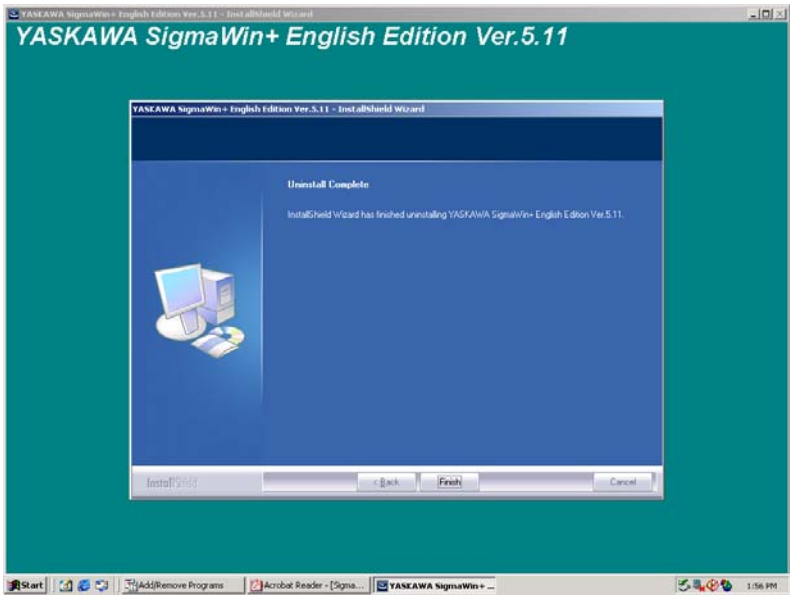


3. Click **YASKAWA SigmaWin+ English Edition** as the program to be removed, and then click **Change/Remove**.

   A confirmation message will appear asking if you are sure you want to remove the program.



4. Click **Yes** to start removing the program. When the program has been successfully removed, the following window will appear telling you that maintenance is complete.

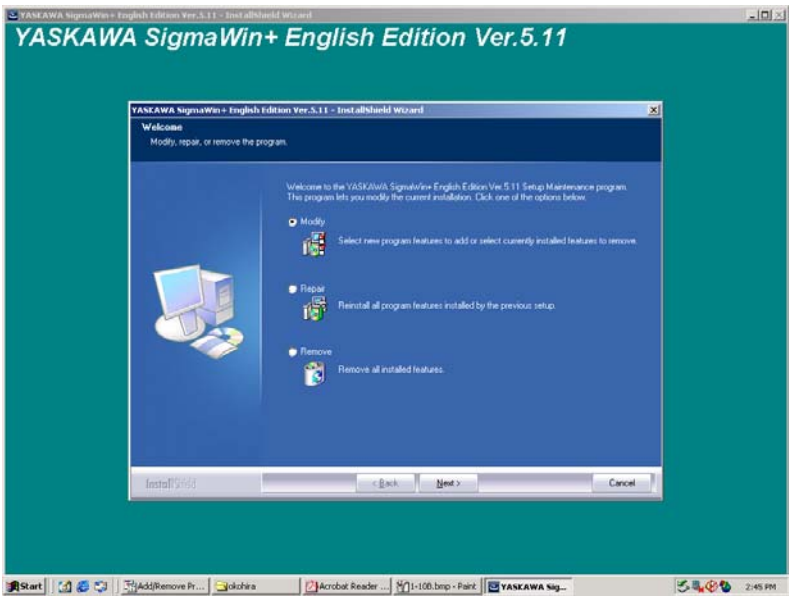


5. Click **Finish** to complete the removal process.

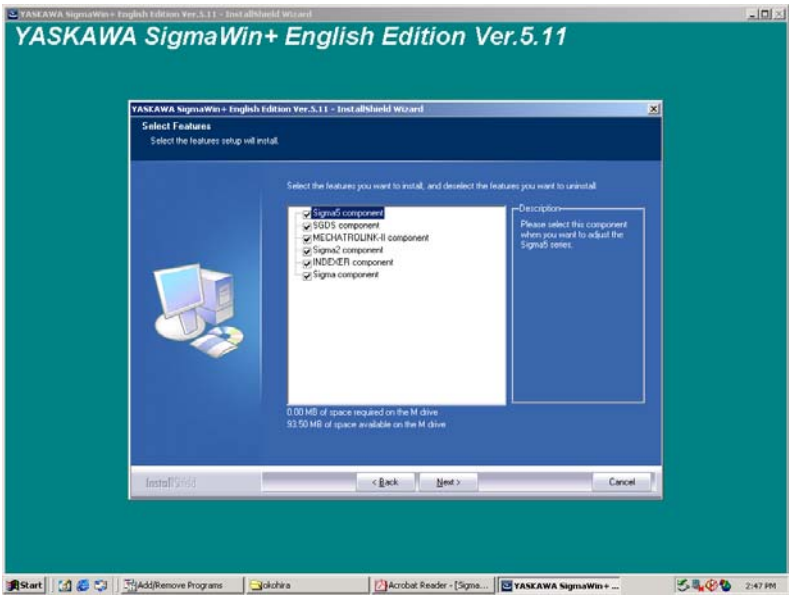
1.7 Installing and Removing Other SigmaWin+ Programs

To change the SigmaWin+ program which is now installed, use the following procedure.

1. Insert the CD-ROM into the CD-ROM drive (the D-drive for example).
   The setup maintenance program will automatically start.

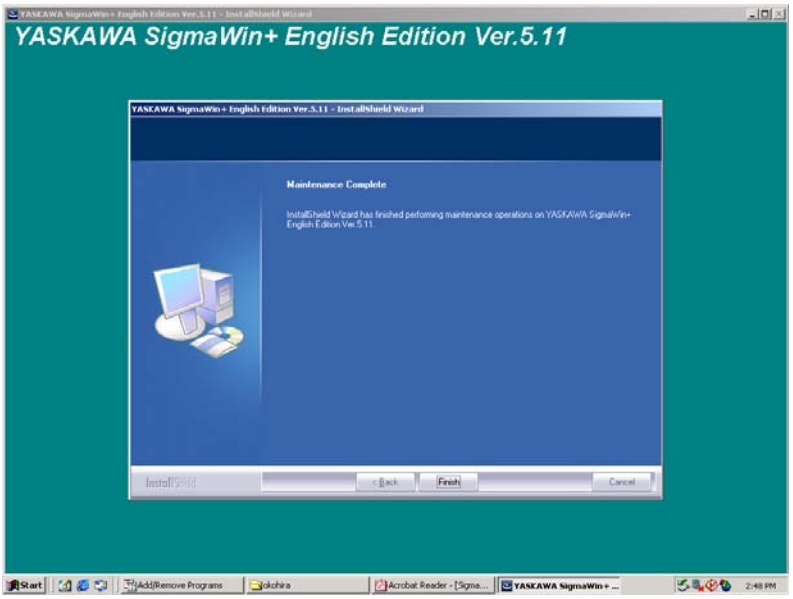


2. Choose "Modify" and click **Next**.



The components with check boxes are currently installed.

3. To remove a component, clear the check box.
   Select the components to be installed and click **Next**.



4. Click **Finish** to complete the changing process.

2 Starting SigmaWin+

Start SigmaWin+ using the following method.

2.1 Starting SigmaWin+

Start SigmaWin+:

- from the Start menu
- from a shortcut

2.1.1 From the Start Menu

To start SigmaWin+ from the **Start** menu:

1. Click the **Start** button, and point to **Programs**.
2. Open the **YE_Applications** folder.
3. Click **SigmaWin+**.

2.1.2 From a Shortcut

To start SigmaWin+ from a shortcut on the desktop:

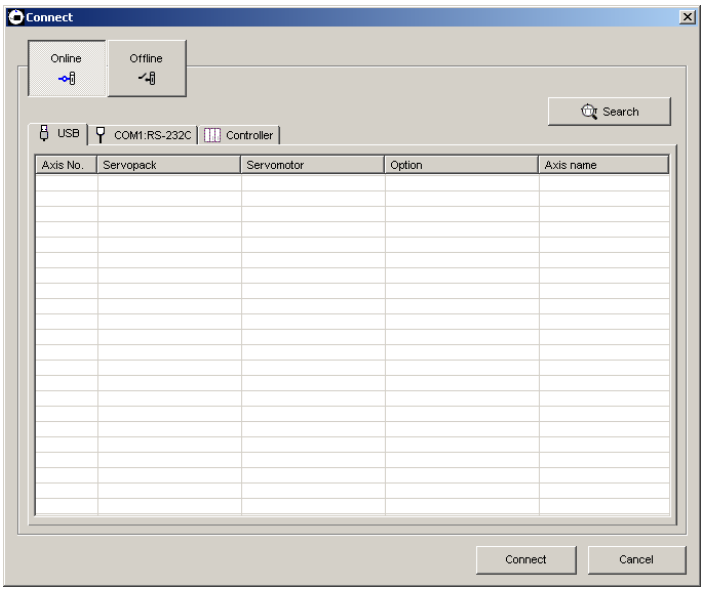
1. Open the YE_Applications folder on the desktop.
2. Click **SigmaWin+**.

SigmaWin+ Startup Screen

2.2 Selecting a SERVOPACK

2.2.1 USB Connection

When SigmaWin+ is initially started, the Connect dialog box appears. Enter the settings for communications between SigmaWin+ and the SERVOPACK by means of a communication port.

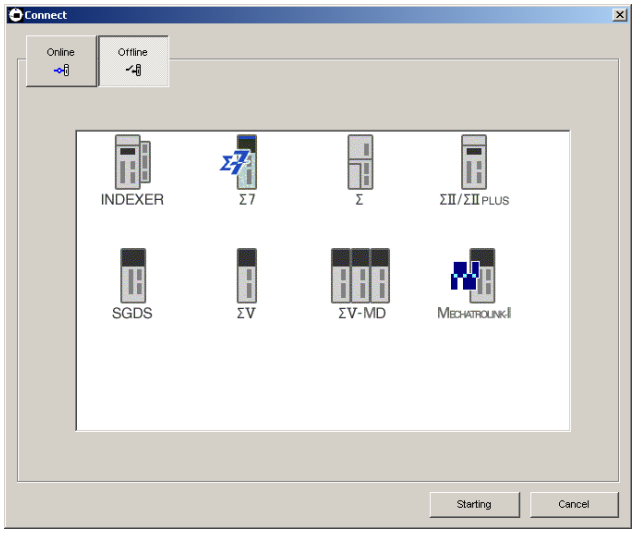


Select the method to set up the SERVOPACK: online or offline. Online is the default setting.

Online: Select when setting up or tuning the servo drive with the SERVOPACK connected

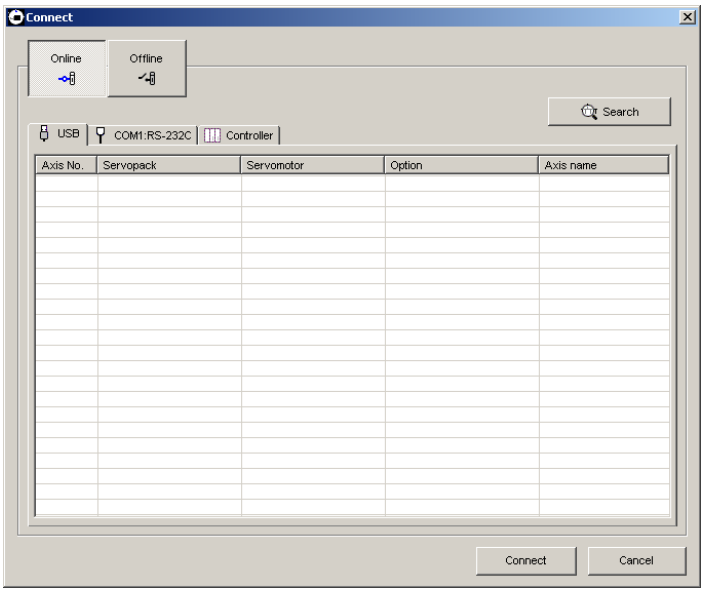
Offline: Select when editing parameters or checking screens for tracing or mechanical analysis without the SERVOPACK connected

<When Offline is selected>



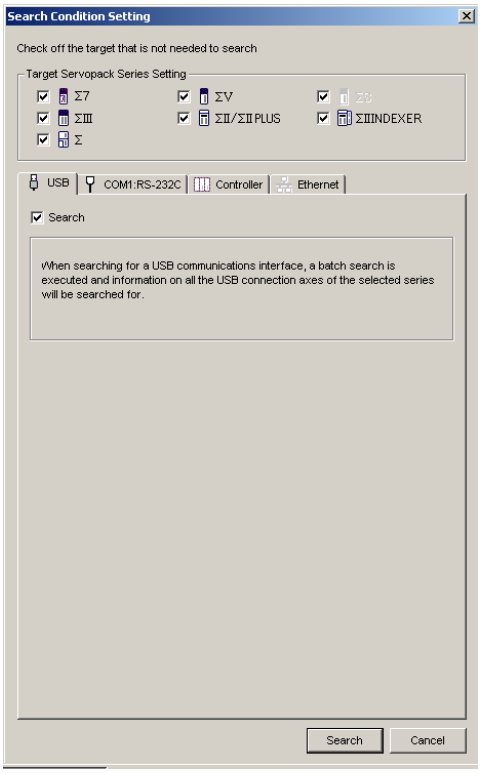
Select the SERVOPACK series and click **Starting**. The SigmaWin+ main window will appear.

<When Online is selected>



Enter the necessary settings for communication setup.

1. Click **Search**.

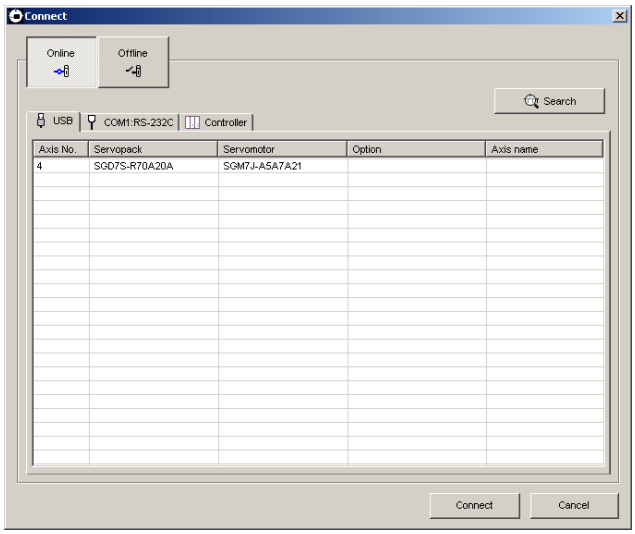


Note: SigmaWin+ is compatible with the following SERVOPACKs.

Σ-7 Series

- SGD7S-□□□A00
- SGD7S-□□□A10
- SGD7S-□□□A20
- SGD7S-□□□AE0
- SGD7W-□□□A20

2. Select SERVOPACK series and make the settings required. Click **Search**.
   After the SERVOPACKs have been successfully connected to SigmaWin+, a list of the connected SERVOPACKs will appear on the screen.



SERVOPACK Selection Box

3. Select the SERVOPACK to be connected and then click **Connect**, or just double-click the SERVOPACK to be connected. The SigmaWin+ main window will appear.
   Click **Cancel** to close the dialog box.

If the SERVOPACK is not Displayed

If the SERVOPACK is not displayed though a SERVOPACK is connected, problems may occur in communications.

Check the following items if the SERVOPACK is not displayed.

Check Item	Measure
Is the power on?	
Are the connections loose?	Fasten all communication cable connectors securely.
Was the correct communications interface (port) selected?	Make sure that the communications interface (port) connected to the communication cable is the same as the port selected during connection.
Is the axis address correct?	Check the following item for the axis address of the connected SERVOPACK. • Do not use an axis address of 0.
Is a battery being used to power the PC?	Problems in communications may occur if the PC is running on batteries. Use AC power.
Is the wiring correct?	Check the communication cable wiring. For information on wiring, refer to the product manual for your SERVOPACK.
Is the communication cable the recommended length?	Shorten the cable length as much as possible. Recommended Lengths of Communication Cables USB: Maximum 5 m (30 m in total by connecting five hubs.)

NOTE

If the SERVOPACK selection box still does not appear even after checking the above items:

Communications may be impossible due to external environmental influences such as noise.

If communications are not possible even after checking all of the above items, try using a different computer.

2.2.2 When using a Controller

■ Ethernet

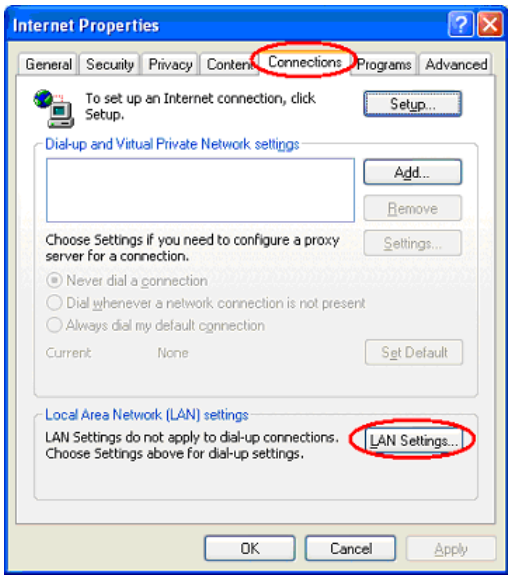
The following two connection methods are possible when using Ethernet.

- Normal Ethernet connection
- Remote Ethernet connection

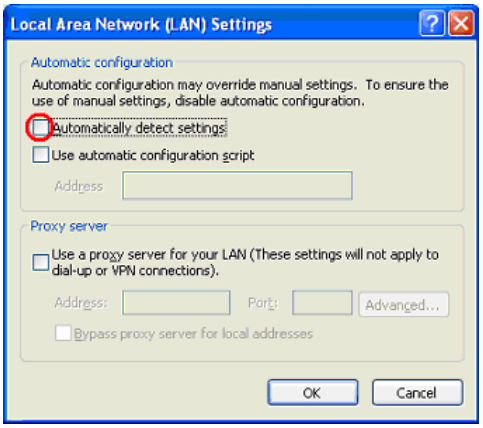
Normal Ethernet Connection

The IP address of the PC must be set before SigmaWin+ and the Controller are connected with Ethernet.

1. Click the **Start** button, and then select ***Settings - Control Panel*** from the **Start** menu. Click the **Internet Options** icon in Control Panel.
   The following dialog box will appear.

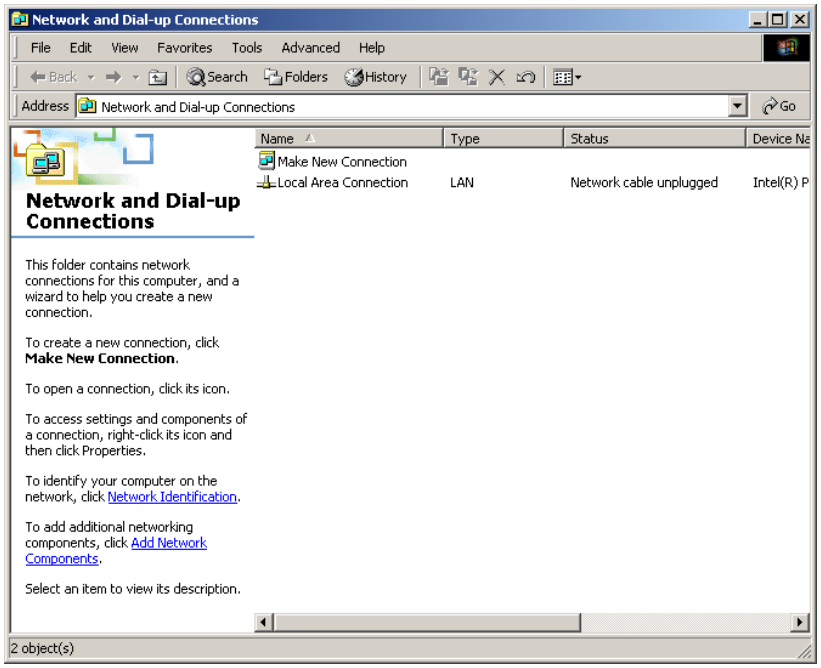


2. Select the **Connections** tab, and then click the **LAN Settings.**
   The following dialog box will appear.

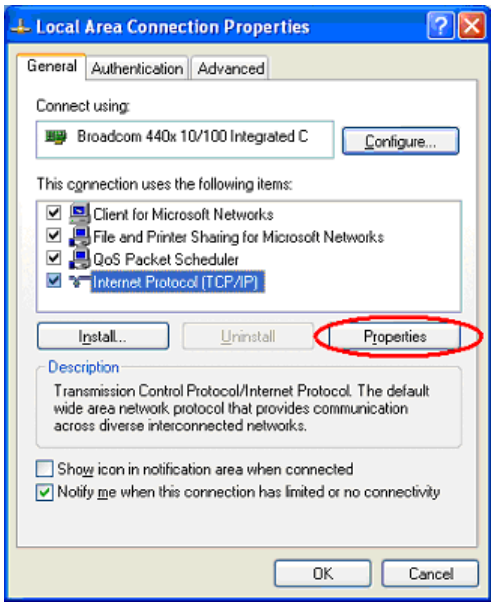


3. Confirm that the **Automatically detect settings** check box is not selected, and then click **OK** to close the dialog box.

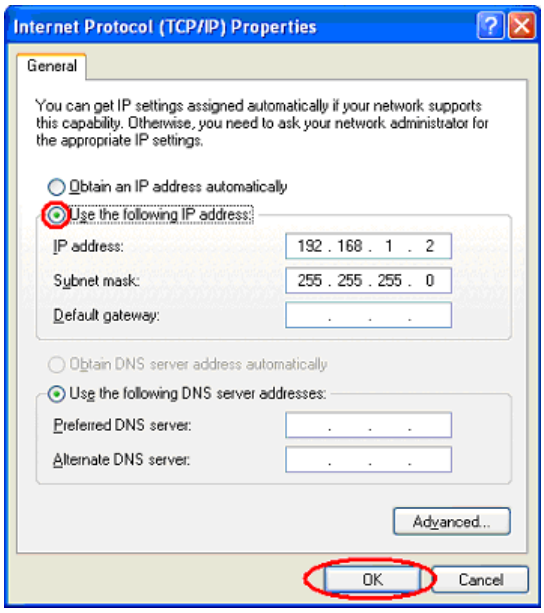
4. Click the **Start** button, and then select ***Settings - Control Panel*** from the **Start** menu. Click the **Network Connections** icon in the Control Panel.
   The following window will appear.



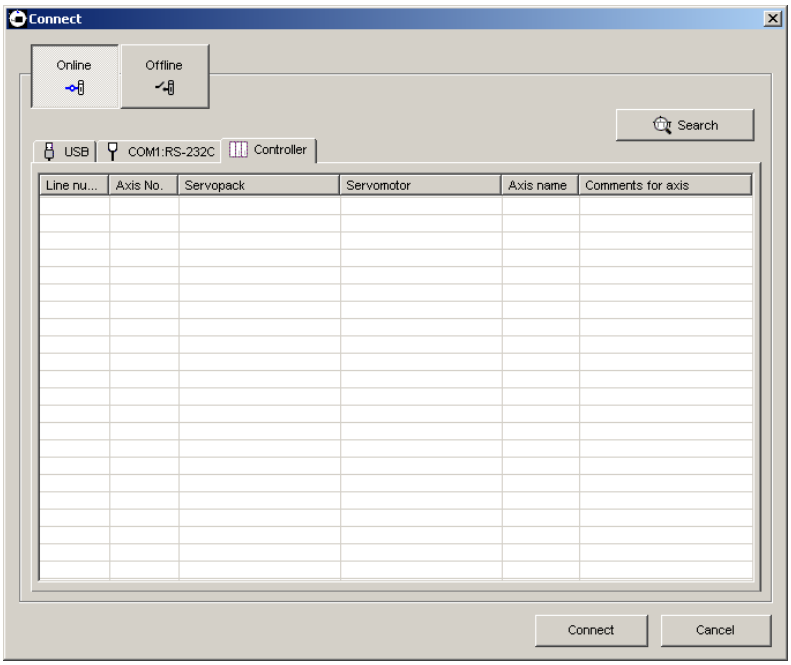
5. Select ***Local Area Connection***, and then click ***Change settings of this connection*** in the **Network Tasks** field.
   The following dialog box will appear.



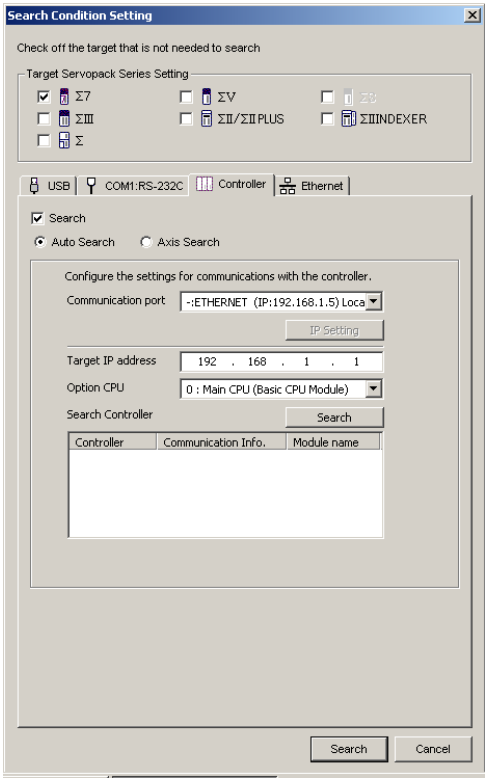
6. Select the ***Internet Protocol (TCP/IP)*** check box in the **General** tab page, and then click the **Properties.**
   The following dialog box will appear.



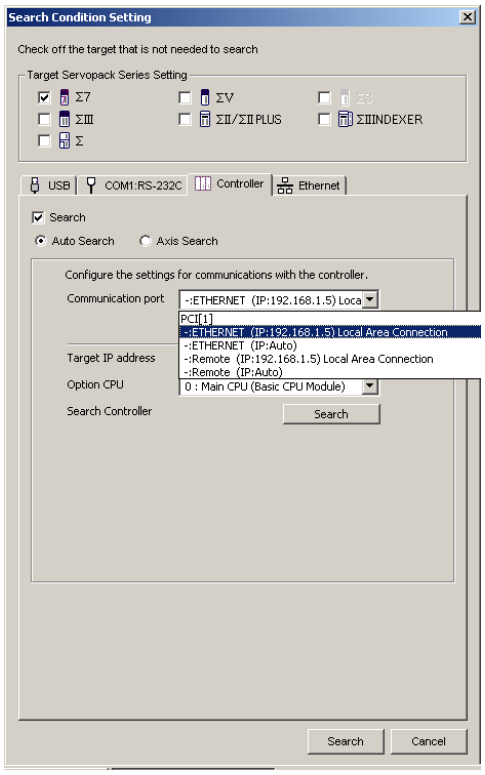
7. Select **Use the following IP address,** and then enter the IP address you wish to enter and "255 255 255 0" as the ***Subnet mask.***
   Click **OK** to close the dialog box.
8. When SigmaWin+ is initially started, the **Connect** dialog box will appear. Enter the settings for communications between SigmaWin+ and the SERVOPACK by means of a communication port.



9. Confirm that the **Controller** tab is displayed and click **Search.**
   The following window will appear.



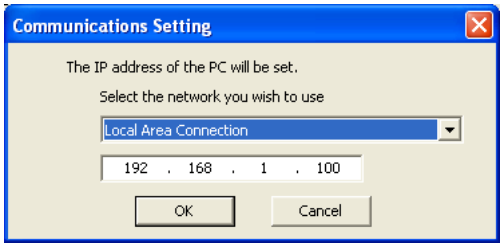
10. Select the IP address of Ethernet as the **Communication Port** for the Controller connection.



<How to customize port settings>

Use the following procedure.

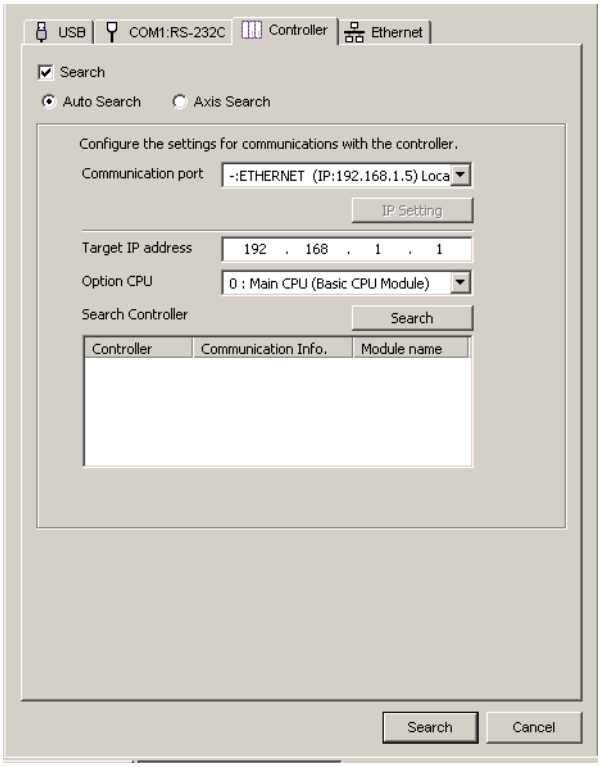
(1) Click **IP Setting**.
The following dialog box will appear.



(2) Select a network and enter the IP address.

(3) Click **OK** to close the dialog box.
The communication port is now available for selection.

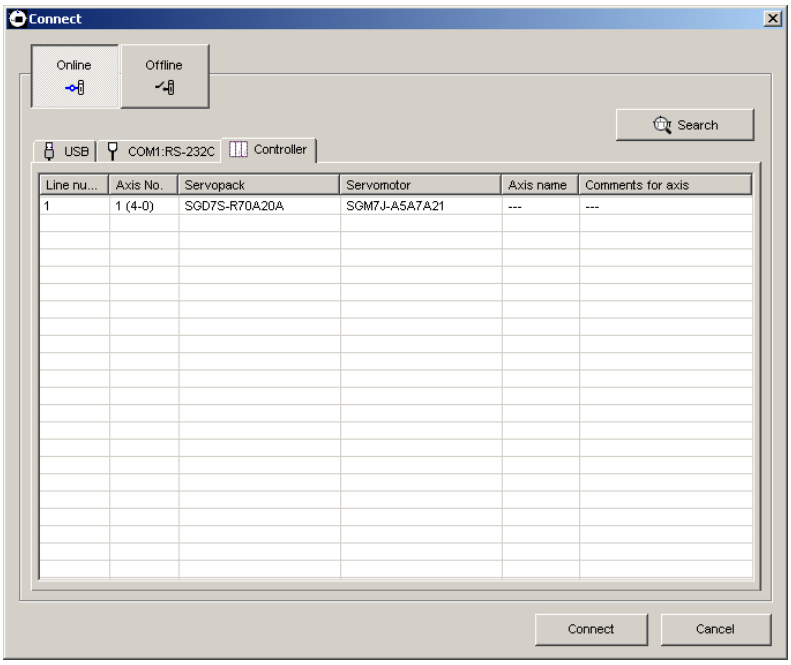
The IP address of the connectable controller can be confirmed as follows.



1. Click **Search** of **Controller** tab.
   The controller name, IP address/port, and module name will be displayed in the **Search Controller** list.
2. Confirm that the IP address selected as the **Communication port** is the same IP address shown in the **Search Controller** list.

11. Click **Search**.

    Connectable SERVOPACKs will be found through the MECHATROLINK communication cable and the result will be displayed in the **Connect** window.

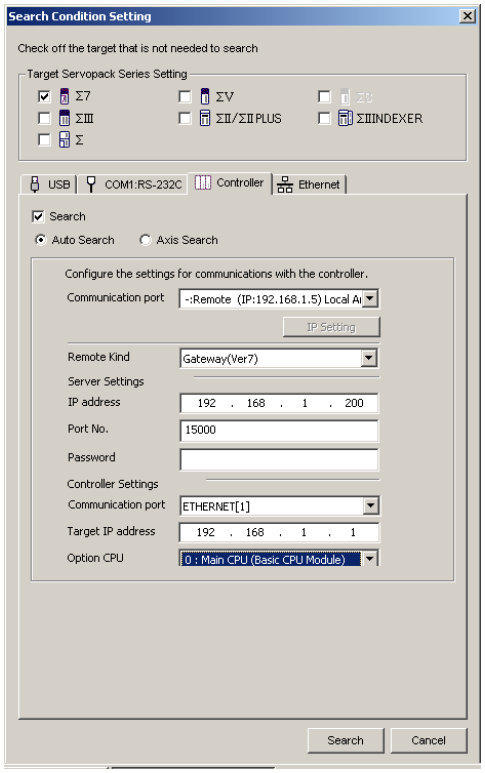


Note: Only controller modules that can be connected using MECHATROLINK communication cables are supported. "MP connection cannot be used for xxx." will be displayed when connected to an unsupported module (SVA module, PO module, and SVR module). The "xxx" represents a module name.

12. Select the SERVOPACK to be connected and then click **Connect,** or just double-click the SERVOPACK to be connected.

Remote Ethernet Connection

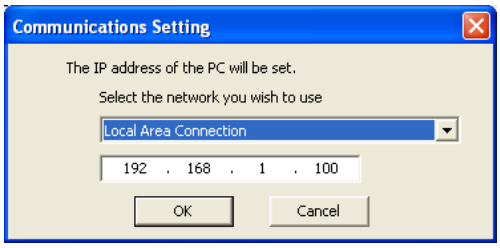
1. Perform steps 1 to 9 of the procedure for a normal Ethernet connection.
2. Select the communication port for the Controller connection.



<How to customize port settings>

Use the following procedure.

(1) Click **IP Setting**.
The following dialog box will appear.



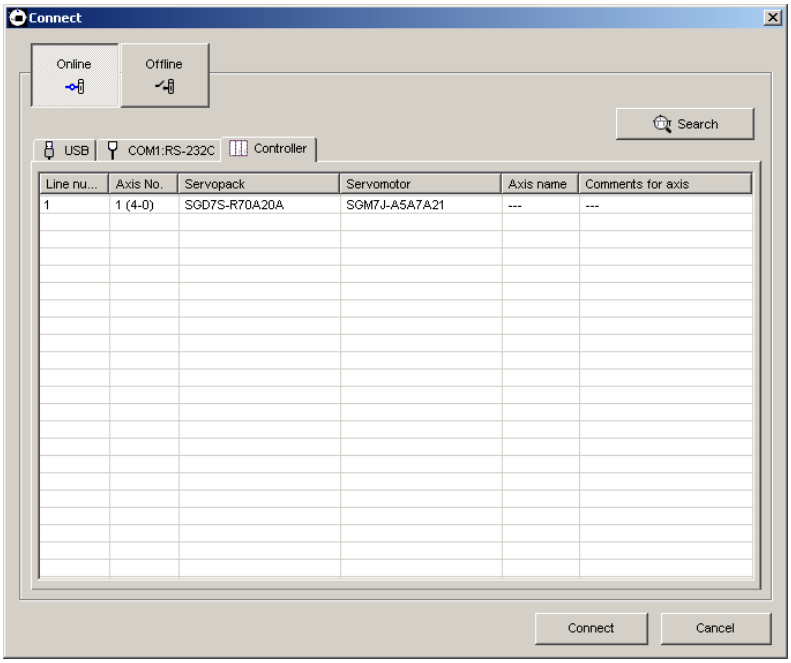
(2) Select a network and enter the IP address.

(3) Click **OK** to close the dialog box.
The communication port is now available for selection.

3. Select ***Gateway (Ver7)*** as the **Communication port**.

4. Set the IP address, port number, and other required items for the server and the Controller.
5. Click **Search**.

   Connectable SERVOPACKs will be found through the MECHATROLINK communication cable and the result will be displayed in the **Connect** window.



Note: Only controller modules that can be connected using MECHATROLINK communication cables are supported. "MP connection cannot be used for xxx." will be displayed when connected to an unsupported module (SVA module, PO module, and SVR module). The "xxx" represents a module name.

6. Select the SERVOPACK to be connected and then click **Connect**, or just double-click the SERVOPACK to be connected.

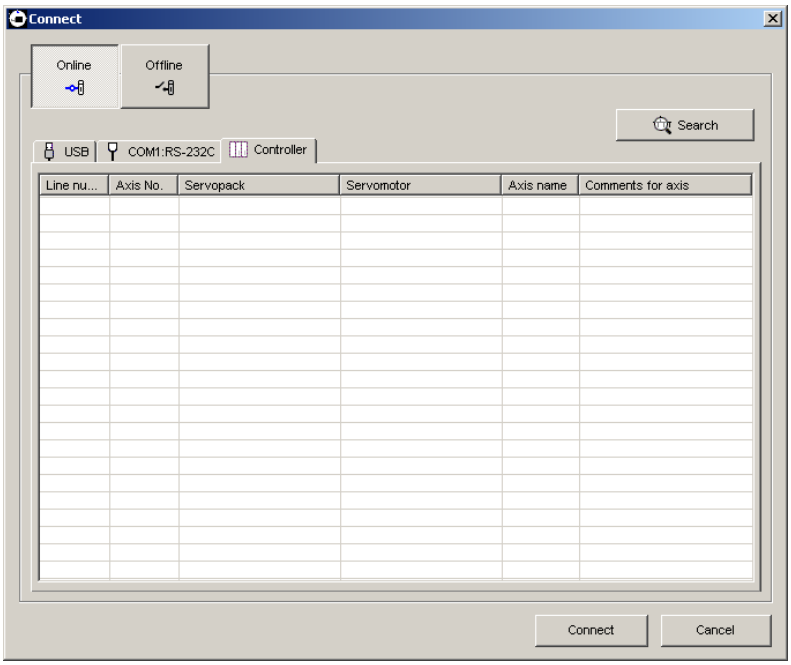
■ PCI Connections

The following two connection methods are possible when using PCI.

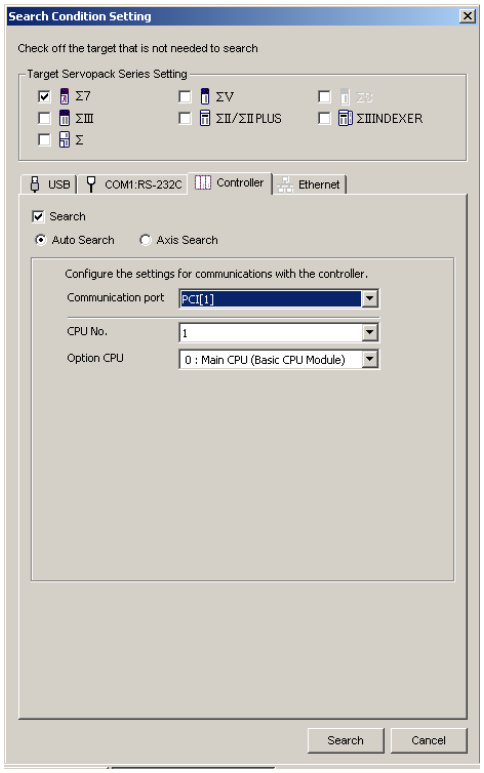
- Normal PCI Connection
- Remote PCI connection

Normal PCI Connection

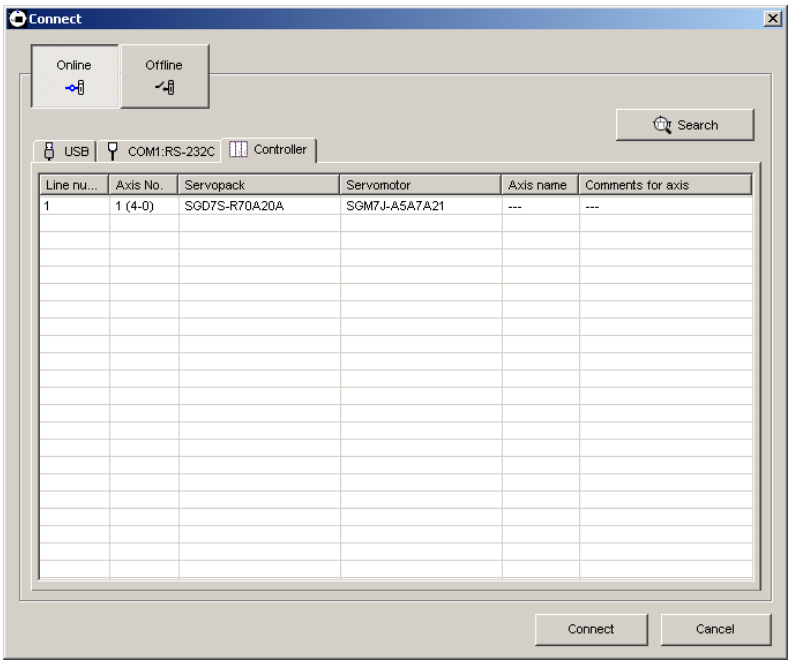
1. When SigmaWin+ is initially started, the **Connect** dialog box will appear.



2. Confirm that the **Controller** tab is displayed and click **Search.**
   The following window will appear.



3. Select the communication port for the Controller connection, and click **Search**.
   Connectable SERVOPACKs will be found through the MECHATROLINK communication cable and the result will be displayed in the **Connect** window.

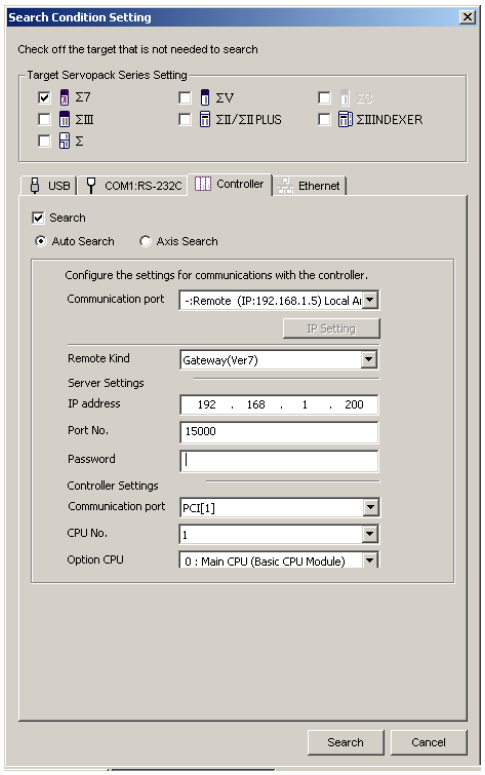


Note: Only controller modules that can be connected using MECHATROLINK communication cables are supported. "MP connection cannot be used for xxx." will be displayed when connected to an unsupported module (SVA module, PO module, and SVR module). The "xxx" represents a module name.

4. Select the SERVOPACK to be connected and then click **Connect**, or just double-click the SERVOPACK to be connected.

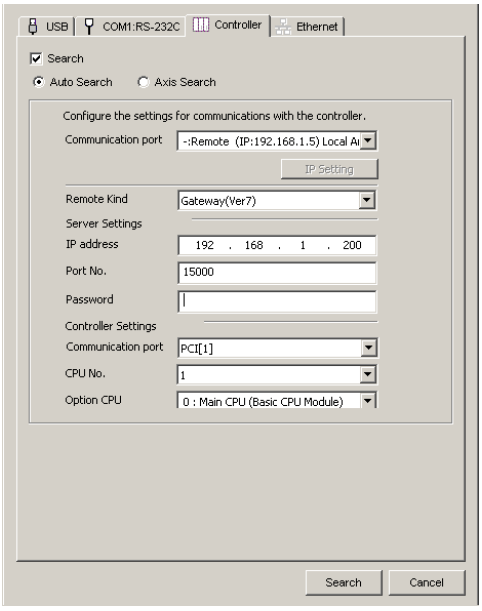
Remote PCI Connection

1. Perform steps 1 and 2 of the procedure for a normal PCI connection.
2. Select the communication port for the Controller connection.



3. Set the **Remote Kind** Box to **Gateway (Ver7).**

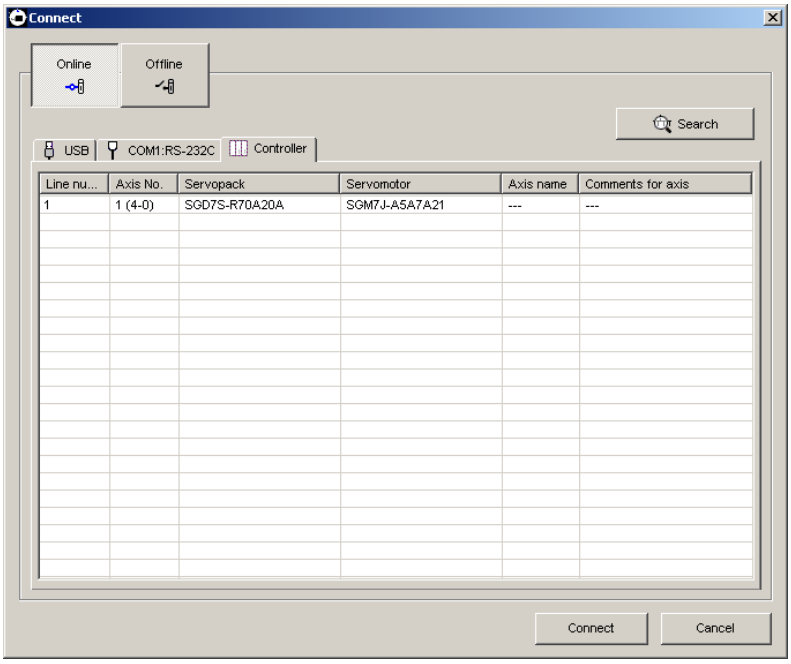
   The following dialog box will appear.



4. Set the IP address, port number, and other required items for the server and the Controller.

5. Click **Search**.

   Connectable SERVOPACKs will be found through the MECHATROLINK communication cable and the result will be displayed in the **Connect** window.

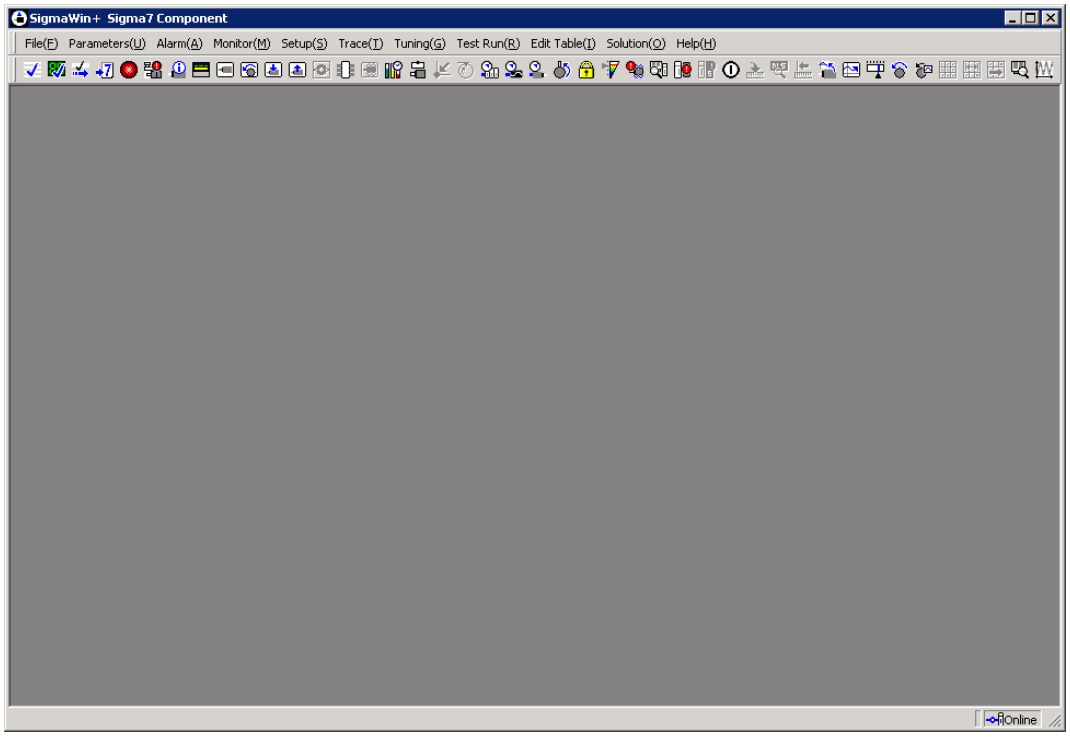


   Note: Only controller modules that can be connected using MECHATROLINK communication cables are supported. "MP connection cannot be used for xxx." will be displayed when connected to an unsupported module (SVA module, PO module, and SVR module). The "xxx" represents a module name.

6. Select the SERVOPACK to be connected and then click **Connect**, or just double-click the SERVOPACK to be connected.

3 SigmaWin+ Σ-7 Component Main Window

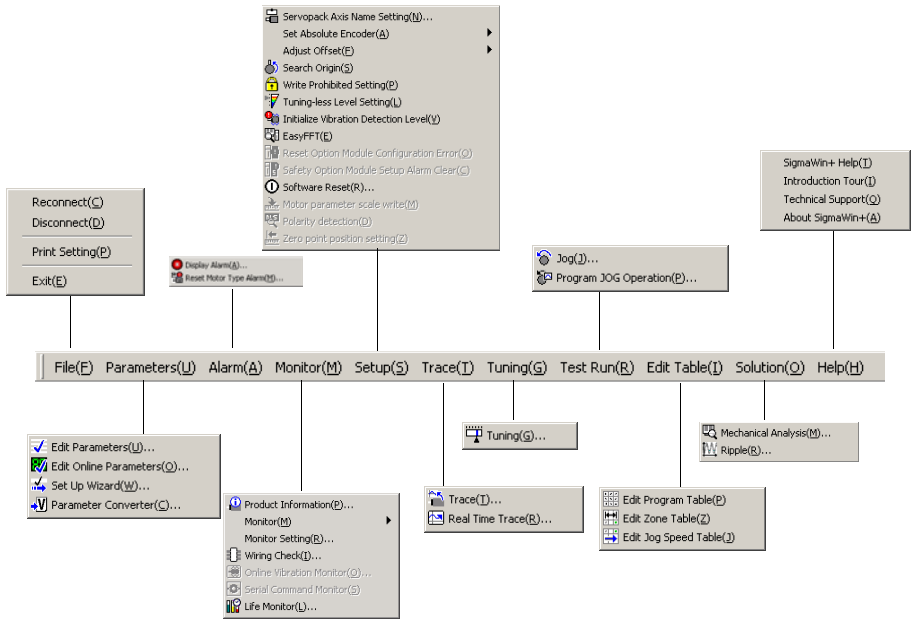
The SigmaWin+ Σ-7 component main window has a menu bar and a toolbar as shown in the following
figure.



SigmaWin+ Σ-7 Component Main Window

All application functions can be accessed from the menu bar or the toolbar.

■ Menu Bar and Menus



SigmaWin+ Σ-7 Component Menu Bar

File menu

Connect: Switches between Online and Offline modes or between the connected SERVOPACKs.

Disconnect: Switches to Offline mode.

Print Setting: Select your preferences for printing the information seen on the screen. See "Print Setting" for details on the setting method.

Exit: Quits SigmaWin+.

Help menu

SigmaWin+ Help: Displays a help window for SigmaWin + Σ-7 component.

Introduction Tour: Introduces main functions of SigmaWin+ Σ-7 component.

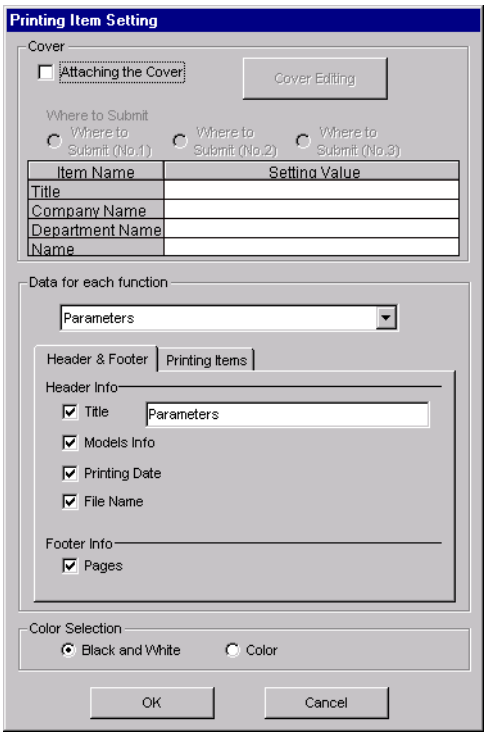
Technical Support: Lists local contacts.

About SigmaWin+: Displays version information of SigmaWin+ Σ-7 component.

There are also function menus. For details, see Chapter 4.

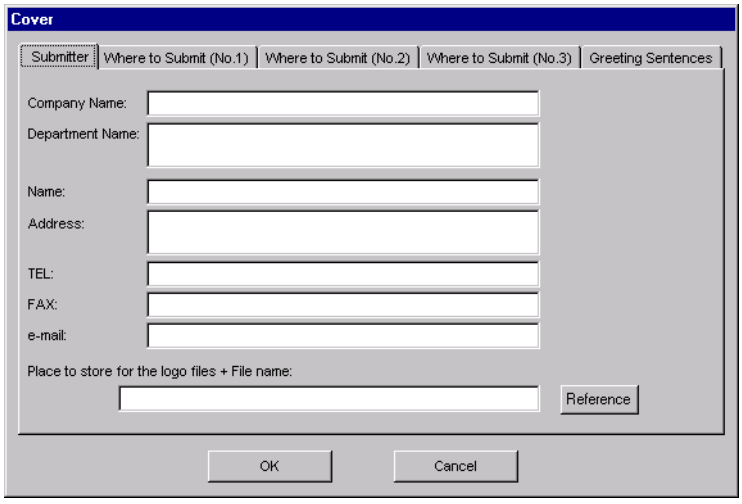
Print Setting

In the SigmaWin+ Σ-7 component main window, click **File**, and then click **Print Setting**. The Printing Item Setting box appears.

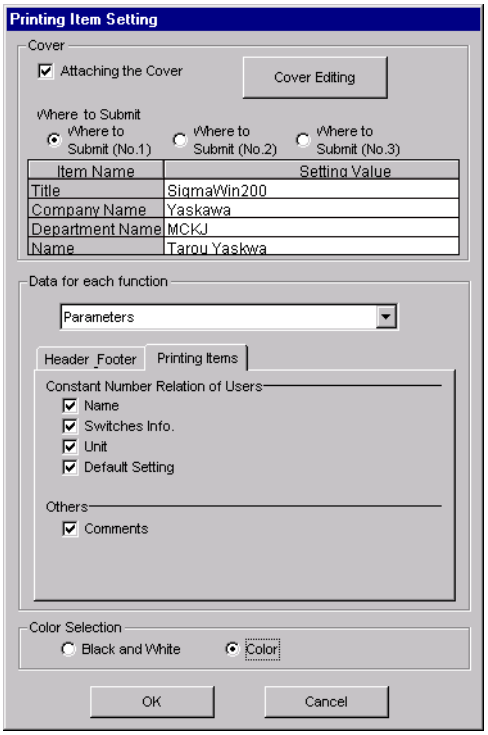


Cover

Select **Attaching the Cover**, and then click **Cover Editing**.



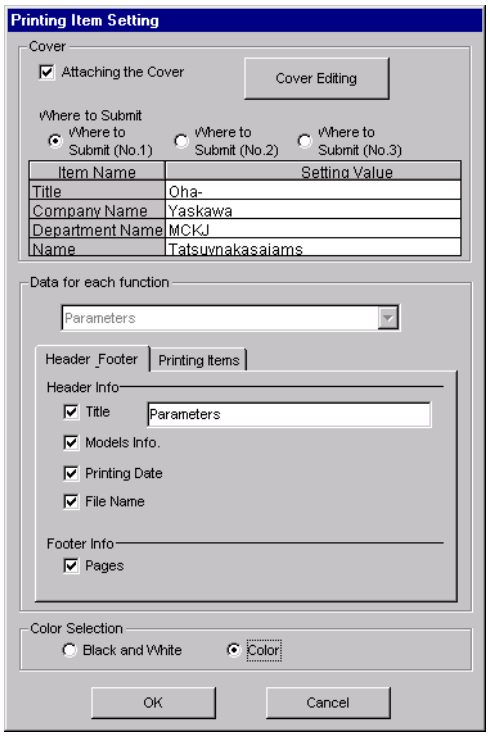
The Cover box appears, displaying the Submitter tab in front. Use the formatting options on the tabs to control the content of the cover, such as the greeting sentences and where to submit the information. After the setting is finished, click **OK**.



Data for each function

Depending on which functions you select, the items that you can print will differ. Select the functions from the list.

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.



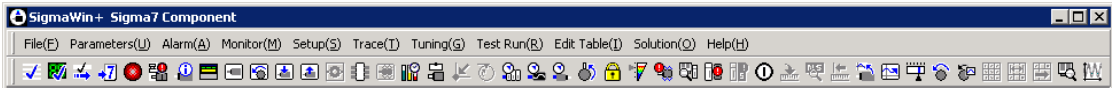
Color Selection

Documents can be printed in color or black and white. Select your preference.

Click **OK**.

■ Toolbar

Click an icon on the toolbar to directly select its corresponding function.



SigmaWin+ Σ-7 Component Toolbar

Toolbar Button	Function Name
	Parameter Editing
	Parameter Online Editing
	Setup Wizard
	Parameter Converter
	Alarm Display
	Reset Motor Type Alarm
	Product Information
	System Monitor
	Status Monitor
	Motion Monitor
	Input Signal Monitor
	Output Signal Monitor
	Wiring Check
	Service Life Monitor
	SERVOPACK Axis Name Setting
	Absolute Encoder Reset
	Multi-Turn Limit Setting

Toolbar Button	Function Name
	Speed/Torque Reference Offset Adjustment
	Analog Monitor Output Adjustment
	Motor Current Detection Offset Adjustment
	Origin Search
	Write Prohibited Setting
	Tuning-less Level Setting
	Initialize Vibration Detection Level
	Easy FFT
	Reset Option Module Configuration Error
	Safety Option Module Setup Alarm Clear
	Software Reset
	Motor Parameter Scale Write
	Polarity Detection
	Setting the Zero Point Position of the Absolute Linear Encoder
	Trace
	Real Time Trace
	Tuning
	JOG Operation
	Program JOG Operation

Toolbar Button	Function Name
	Program Table Editing
	Zone Table Editing
	Jog Speed Table Editing
	Mechanical Analysis
	Ripple Compensation

4 Operation

4.1 Changing Axes

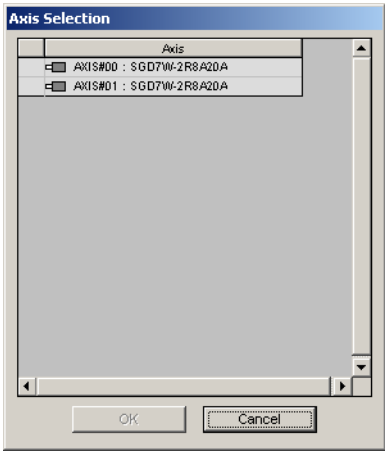
There are three different ways to edit axes. These are described in the following table.

Type	Description
Changing axes	When you start editing, you must select the axis to edit. To edit a different axis, select the axis to edit again.
Multi-axis	You can edit all of the axes on the same window.
Unit	If you edit any axis, the same changes are applied to all axes.

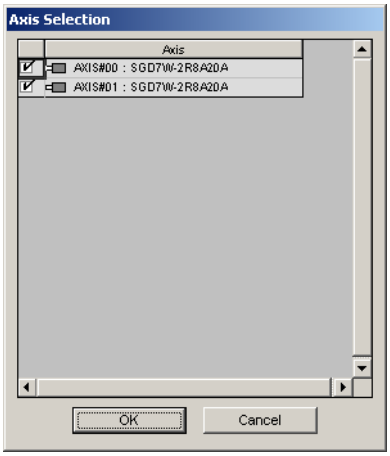
Use the following procedure to change the axis to edit.

1. Start the desired function.
   If the axis can be changed for the function, an **Axis Selection** dialog box will appear with a list of the axes that can be edited.

Single Axis Selection Mode



Multi-axis Selection Mode

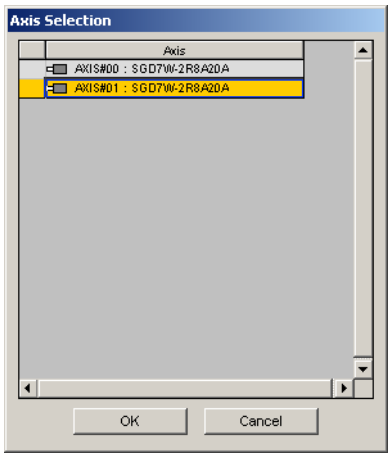


INFO

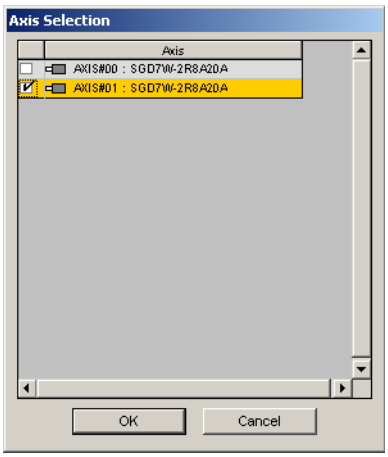
- The list will give the motors if the SigmaWin+ Σ-7 component and SERVOPACKs are connected. If a SERVOPACK and motor are connected afterward, the motor will not appear on the list. Connect the SigmaWin+ Σ-7 component to the SERVOPACKs again.
- You must be online to use the Multi-axis Selection Mode.

2. Select the axis or axes to edit.

Single Axis Selection Mode



Multi-axis Selection Mode



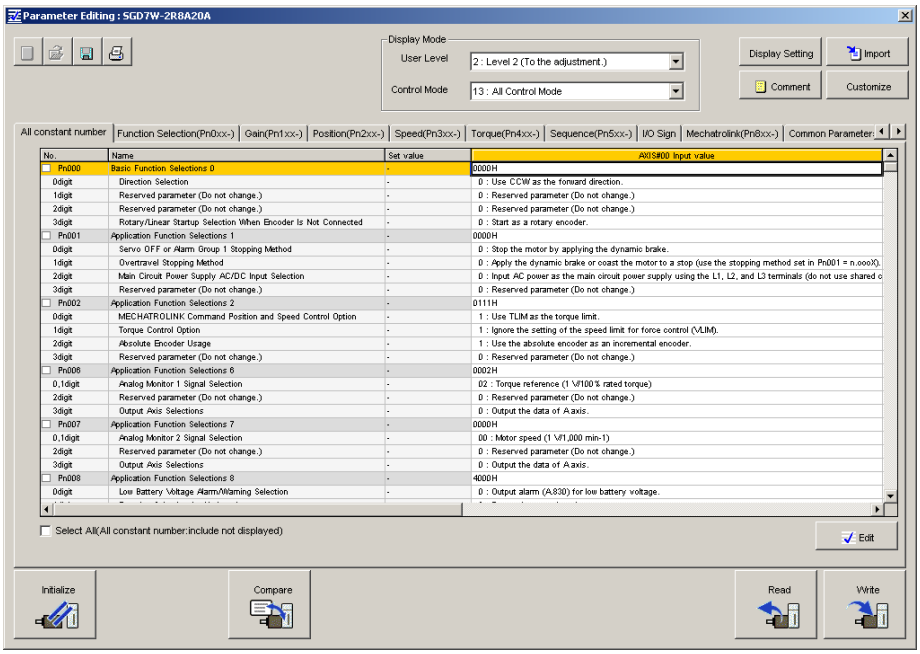
INFO

In Single Axis Selection Mode, the selected axis will be highlighted.

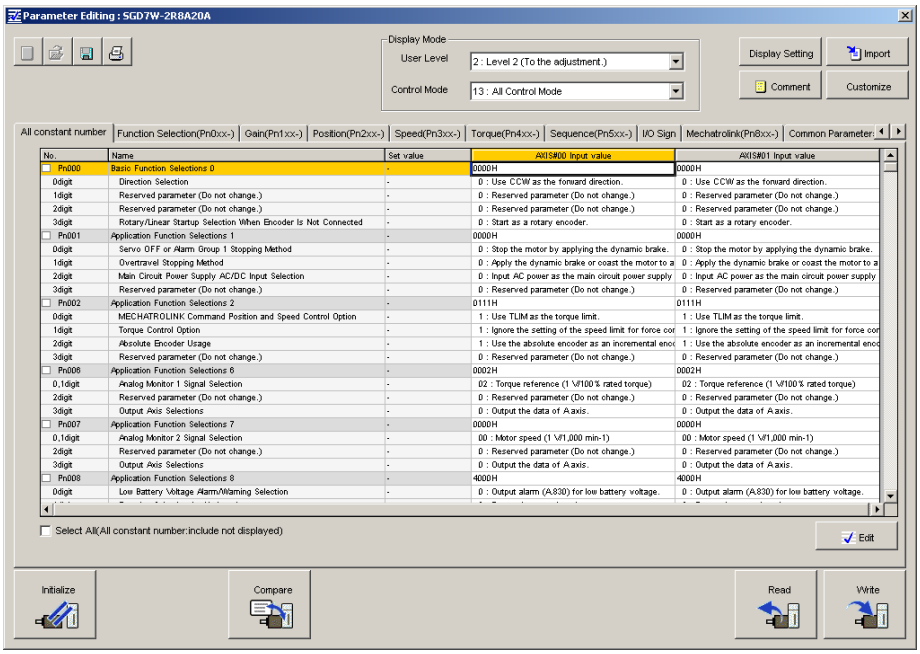
In Multi-axis Selection Mode, the check boxes for the selected axes will be selected.

3. Click the **OK** button.
   The function editing dialog box for the selected axis appears.

Single Axis Selection Mode



Multi-axis Selection Mode



4.2 Editing Parameters

The following two methods exist for editing parameters.

- Using the Parameter Editing window
- Using the Online Parameter Editing window

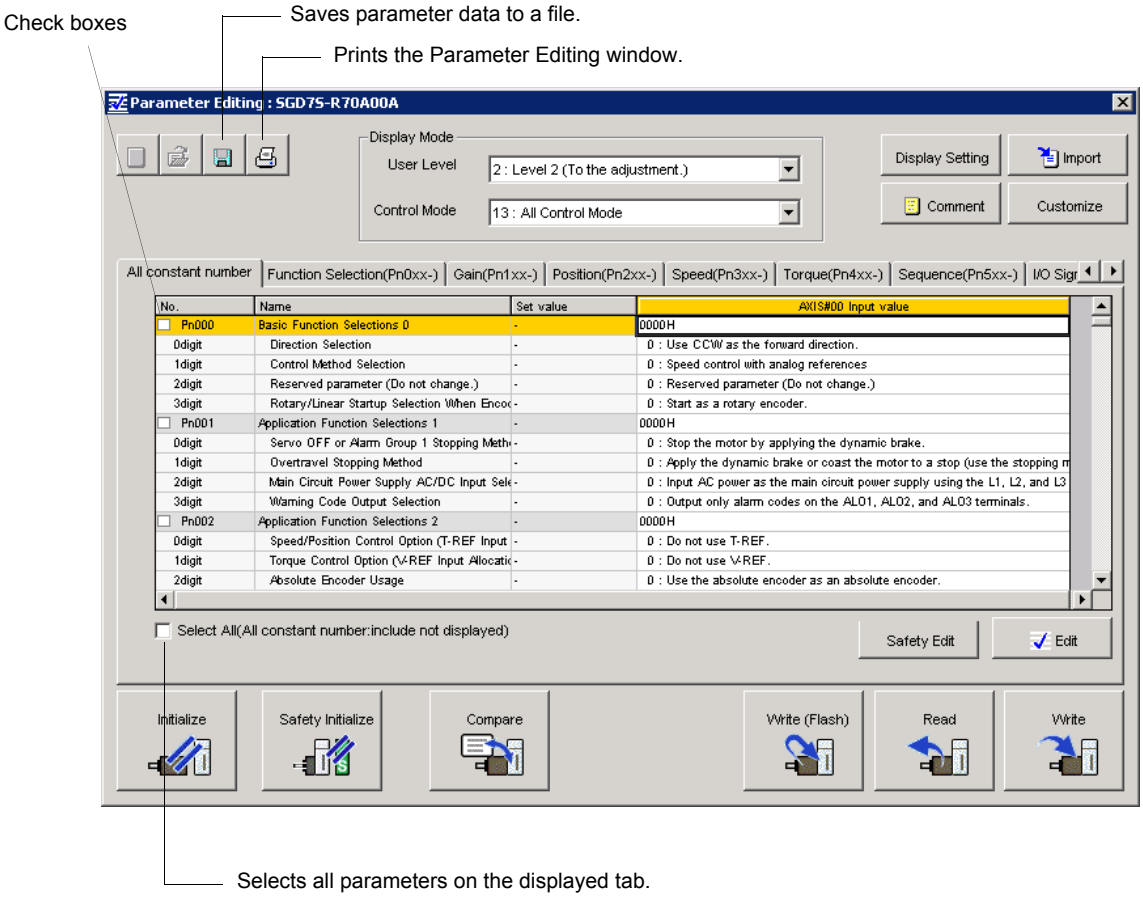
4.2.1 Editing Parameters

Parameters can be displayed or edited in the Parameter Editing window.

The windows differ in the Online and Offline modes.

Parameter Editing when Online

In the SigmaWin+ Σ-7 component main window, click **Parameters** and then click **Edit Parameters**. The Parameter Editing window for the online mode appears.



Parameter Editing Window (Online Mode)

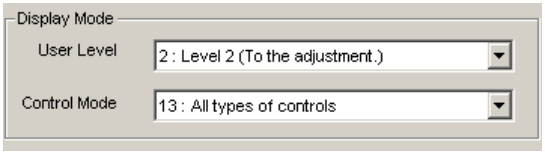
Note: 1. **Safety Edit** and **Safety Initialize** buttons are displayed only when the SERVOPACK and Safety Module are connected.

2. **Write (Flash)** button is displayed only when the SERVOPACK and DeviceNet Module are connected.

INFO

If another function is running that prevents editing the parameters, the cells will be displayed with a gray background.

Display Mode



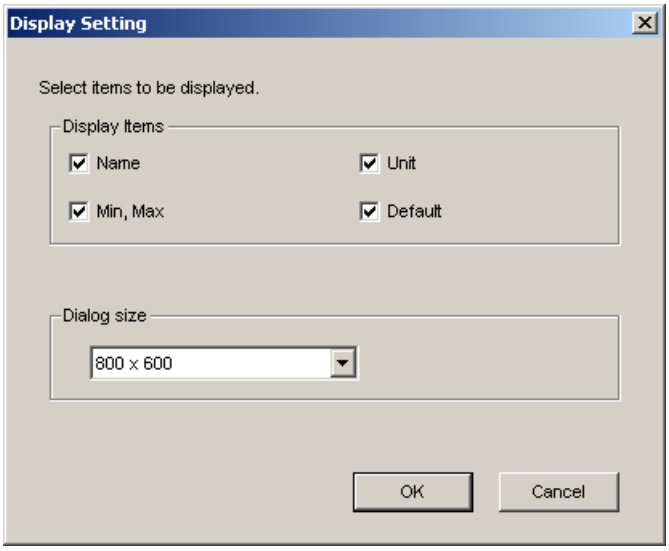
The number of parameters displayed is determined by the user level and the control mode.

User Level: 1: Level 1 (To the setup/test run.)
2: Level 2 (To the adjustment.)

Control Mode: 13 modes

Display Setting

Click **Display Setting**, and the Display setting box appears. Select the information to be displayed and the size of the Parameter Editing window.



Display Setting Box

Display Items

Select the information to be displayed.

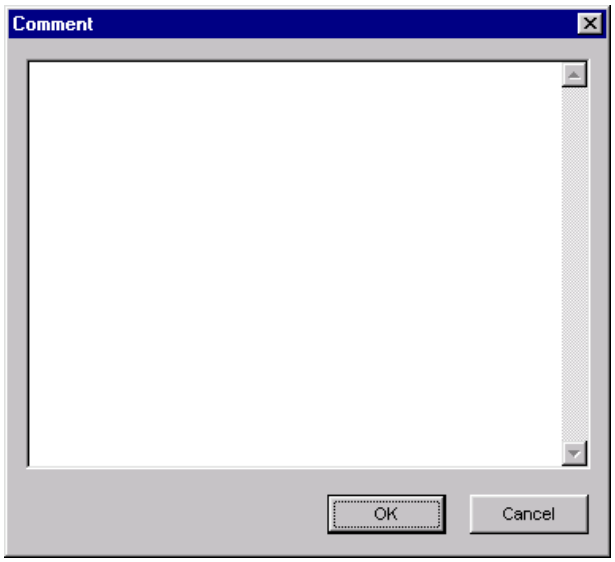
Dialog Size

Select the size of the Parameter Editing window.

Click **OK** to save the changes in the display settings and to return to the Parameter Editing window. Click **Cancel** to return to the Parameter Editing window without changing the display settings.

Comment

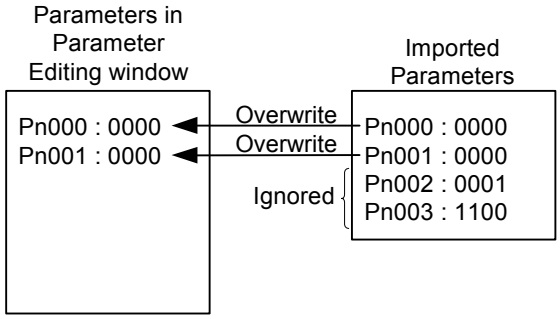
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



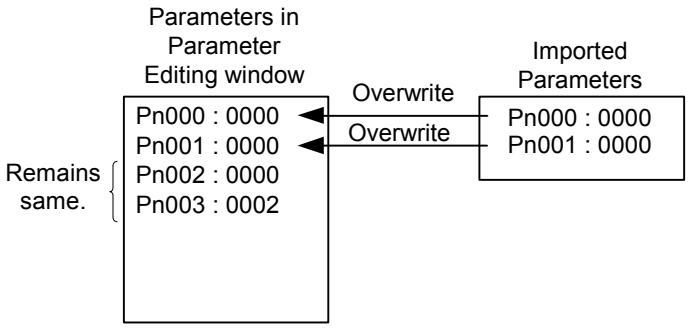
Import

Parameter settings can be transferred or imported from a stored file with the Import function. If the imported parameters differ in number from the on-screen parameters (including parameters not currently displayed), the following processing takes place.

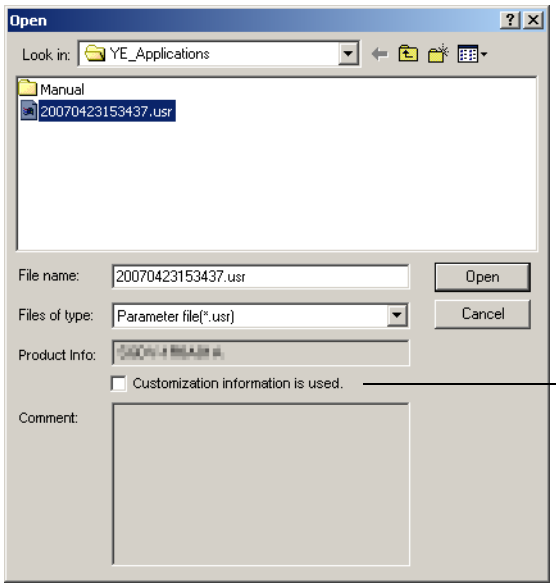
- If the number of imported parameters is greater



- If the number of imported parameters is fewer

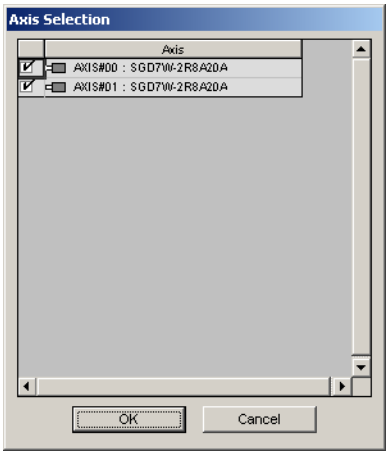


1. Click **Import**, and the Open box appears.



When the **Customization information is used**. check box is selected, the parameters set on the **Customize** tab in the Parameter Editing window are also imported. (See Customize for details.) The check box cannot be selected when the file has no parameter on the **Customize** tab.

2. Select the file to import and click the **Open** button.
   If only one axis is being used, the data will be imported.
   If more than one axis is being used, the following dialog box appears.
   Proceed to step 3.

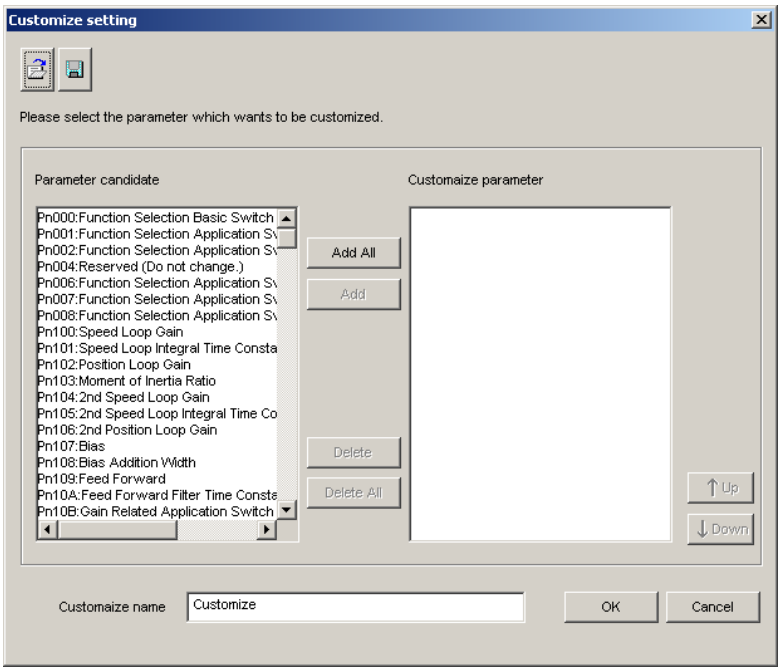


3. Select the axis for which the set values are to be imported and click the **OK** button.
   The data will be imported.

Customize

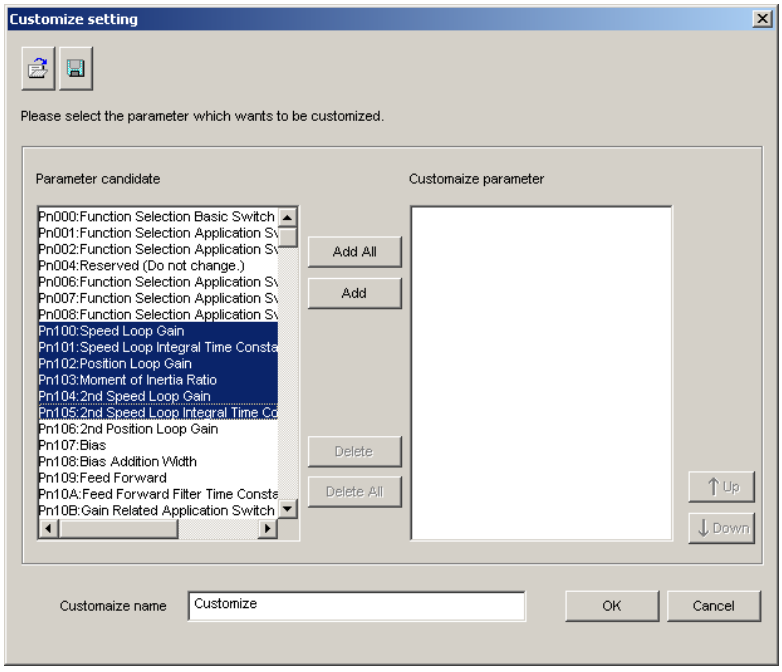
Only the selected parameters can be displayed on the **Customize** tab.

1. Click **Customize**, and the Customize setting box appears. All the parameters are displayed in the Parameter candidate list.

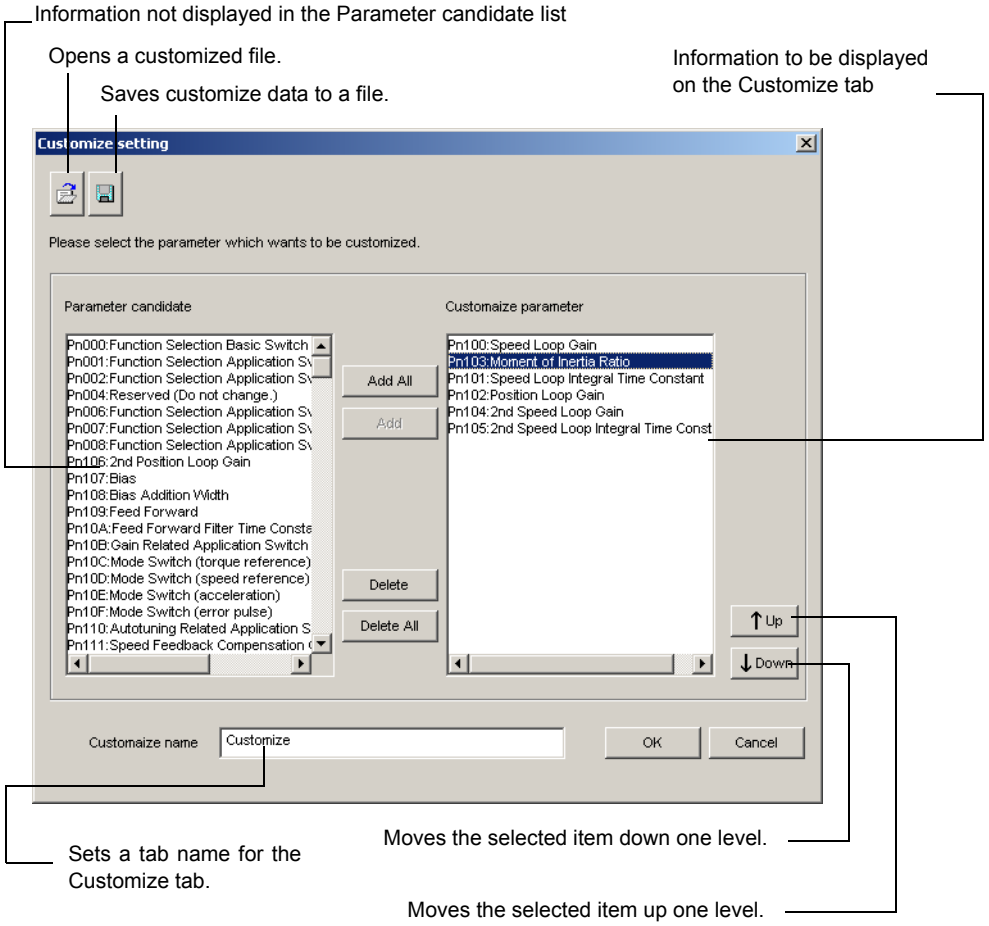


Note: If different names are given for different axes for the same parameter number, the parameter name for the axis with the lower axis address will be displayed.

2. Select parameters to be displayed on the **Customize** tab from the Parameter candidate list.



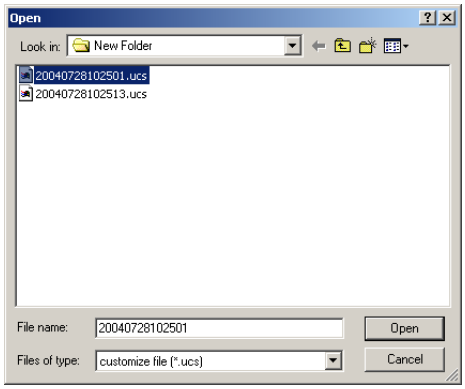
3. Click **Add**, and the selected parameters will move from the Parameter candidate list to the Customize parameter list as follows.



Select parameters in the Customize parameter list and click **Delete**. The selected parameters will move back from the Customize parameter list to the Parameter candidate list.

(Open) Button

In the Customize setting box, click the button, and the Open dialog box appears with the customized files displayed.

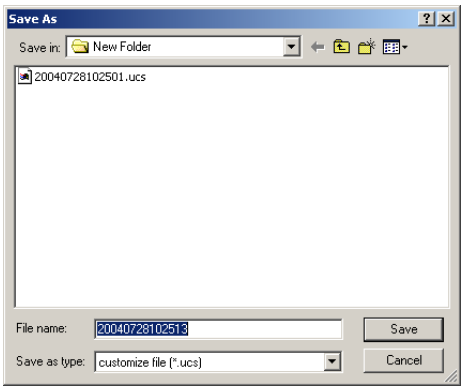


Open Dialog Box

Click **Open** to read the designated customized file. Click **Cancel** to return to the Customize setting box.

(Save) Button

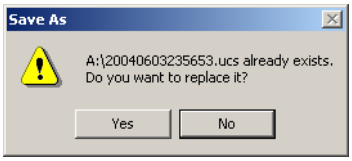
In the Customize setting box, click the button, and then select the storage location for the parameters displayed in the Customize parameter list of the Customize setting box.



Save As Dialog Box

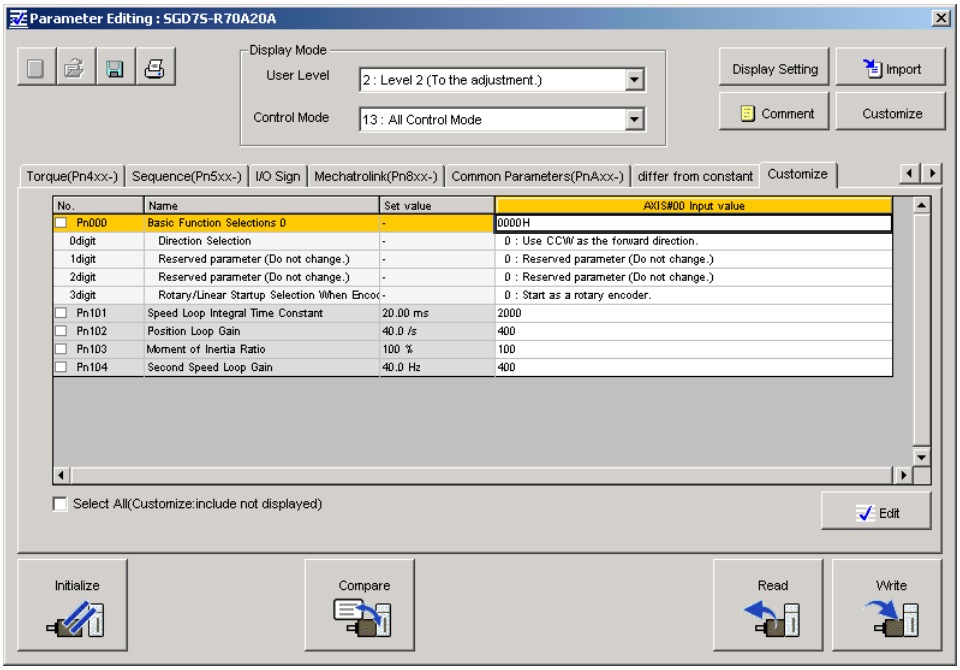
Click **Save** to store the file name designating the parameters displayed in the Customize parameter list as the customized file name. Click **Cancel** to return to the Customize setting box without saving the file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and ask if you want to replace the existing file.



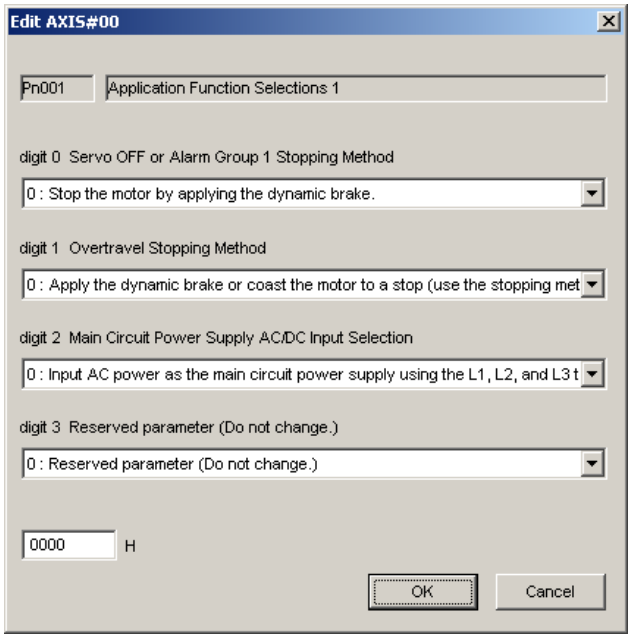
Click **Yes** to overwrite the already existing file. Click **No** to return to the Customize setting box.

4. When the selection of parameters to be displayed on the **Customize** tab is completed, click **OK**. Then the Parameter Editing window appears and the selected parameters will be displayed on the **Customize** tab.



Edit

The **Edit** dialog box appears for the selected (highlighted) parameters.
The title bar displays the extended address of the axis.
The selected parameter can be viewed and then changed in the Edit box. The Edit box differs according to the parameter selected. Click **Edit**, and the Edit box appears.

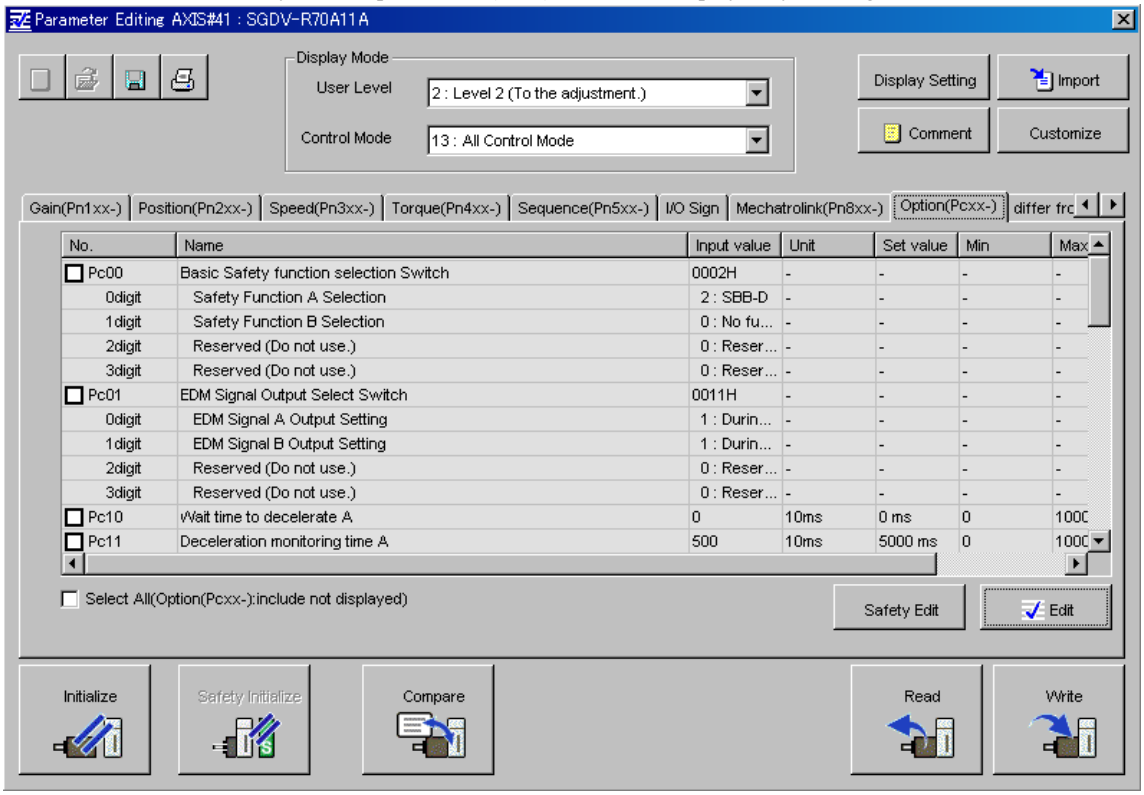


Safety Edit

The Safety Module parameters can be changed or initialized with the safety edit function.

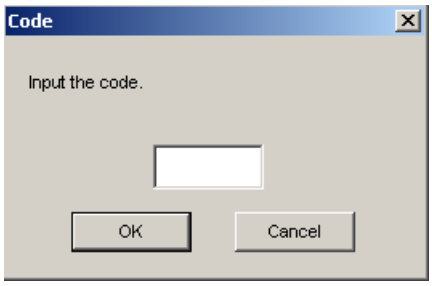
1. Click the **Option (Pcxx)** tab to display a list of Safety Module parameters.

   Note: Safety Module parameters (Pcxx) can also be displayed by clicking the **All constant number** tab.

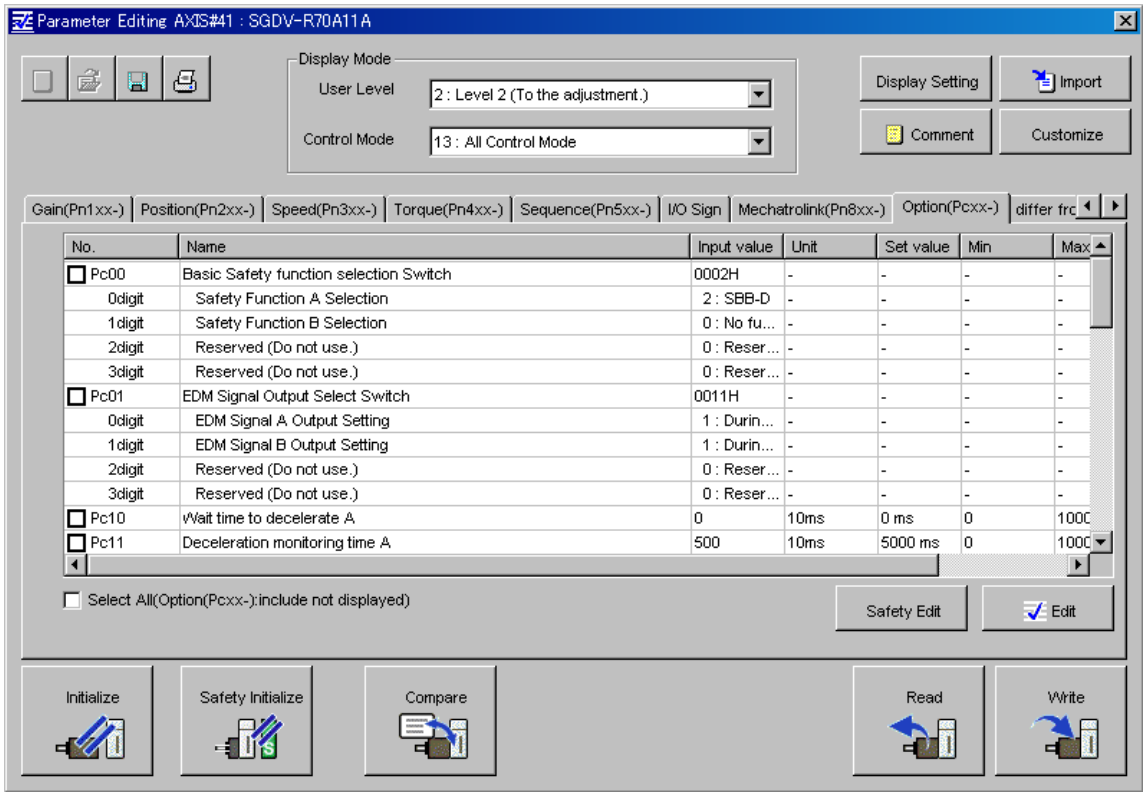


   The Safety Module Parameter list is displayed with a gray background, and **Safety Initialize** is unavailable. Safety Module parameters cannot be edited or initialized at this stage.

2. Click **Safety Edit**, and the **Code** box appears.



3. Enter “0000” and click **OK**. The following window appears.



The background of the Safety Module parameters list will change from gray to white. Safety Module parameters can now be edited. Also, **Safety Initialize** is now available.

Note: Some Safety Module parameters are still displayed with a gray background. These parameters cannot be edited.

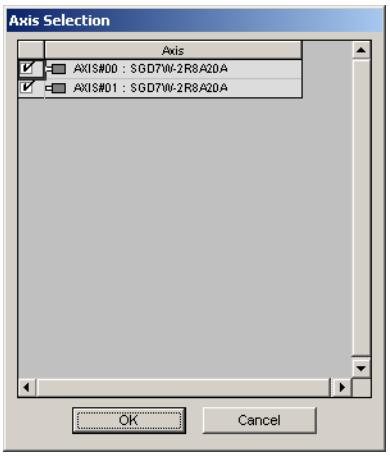
4. Select a Safety Module parameter to be edited, and then click **Edit**. The attributes of the selected parameters can be edited in the **Edit** box.

Parameter Initialization

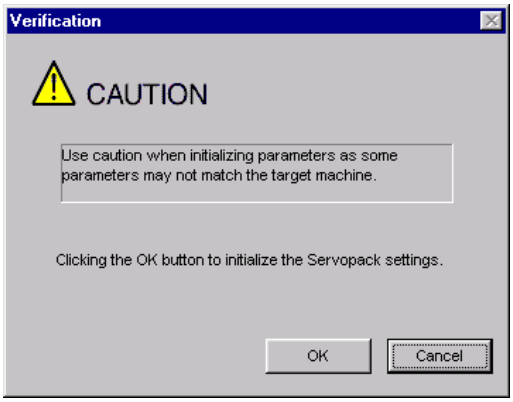
The SERVOPACK parameters (Pnxxx) can be returned to the factory settings with the Initialize function. Return to the initial settings using the following procedure.

Note: The Safety Module parameters (Pcxx) will not be returned to their factory settings by clicking **Initialize**.

1. Click **Initialize**. If more than one axis is being used, the following dialog box appears. If only one axis is being used, the dialog box that is shown in step 2 appears. Proceed to step 3.



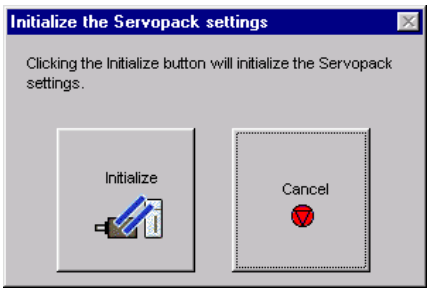
2. Select the axis to initialize and then click the **OK** button. The following dialog box appears.



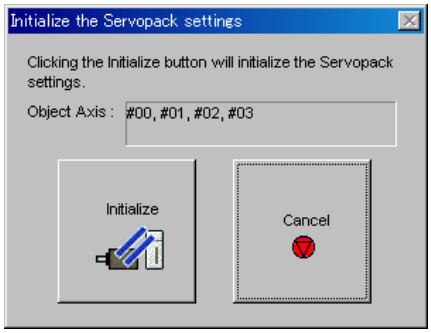
Click **Cancel** to return to the Parameter Editing window without changing the SERVOPACK settings.

3. Click **OK**, and the dialog box to initialize the SERVOPACK settings appears.

When Using Only One Axis

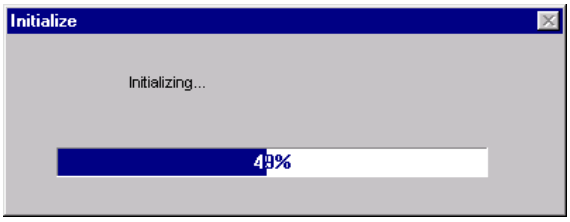


When Using More Than One Axis

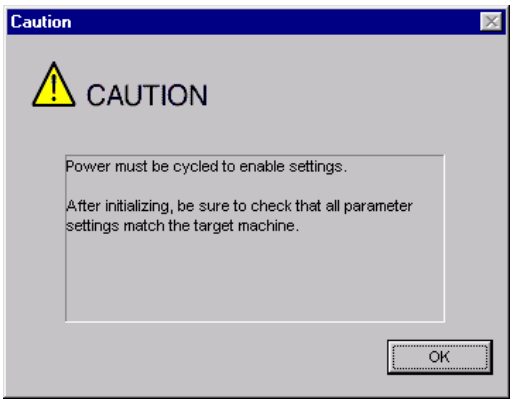


4. If more than one axis is being used, confirm that the axis to be initialized is displayed. To select a different axis or to not initialize the axis, click the **Cancel** button. The Parameter Editing dialog box will appear again.

5. Click **Initialize**, and the percentage of the progress completed is shown.



When the settings are successfully initialized, you will be prompted to verify that all parameter settings are correct for the target machine.



6. Click **OK**.

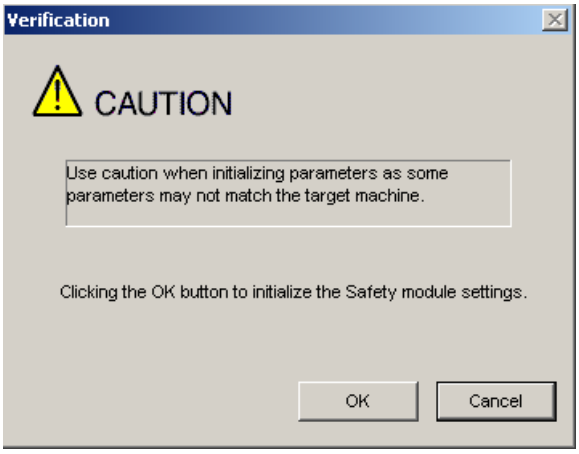
Safety Initialize

The Safety Module parameters (Pcxx) can be returned to the factory settings with the safety initialize function.

Note: SERVOPACK parameters (Pnxxx) will not be returned to their factory settings by clicking **Safety Initialize**.

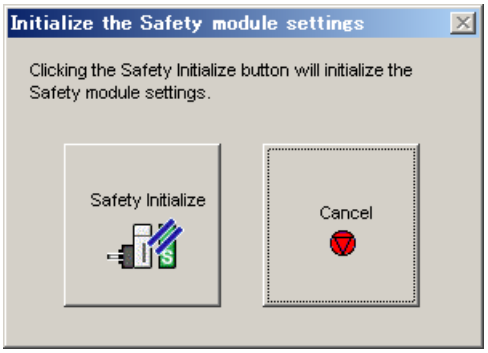
1. If **Safety Initialize** is unavailable, click **Safety Edit** and enter the code and change the settings so **Safety Initialize** can be used. For details, refer to *Safety Edit*.

2. Click **Safety Initialize**, and the Verification box appears.



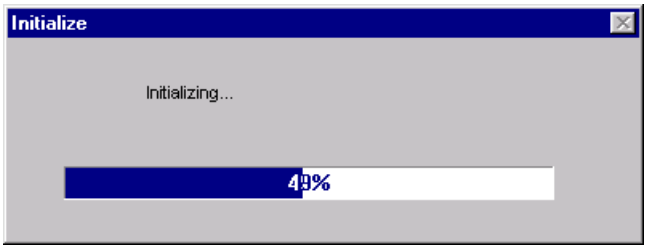
   Click **Cancel** to return to the Parameter Editing window without changing the Safety Module settings.

3. Click **OK**, and the dialog box for initializing the Safety Module parameters appears.

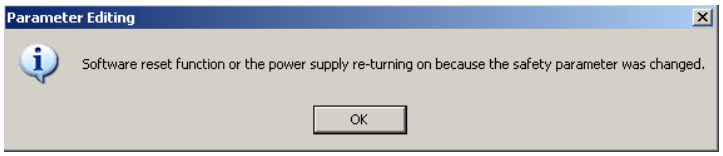


   Click **Cancel** to return to the Parameter Editing window without changing the Safety Module settings.

4. Click **Safety Initialize** to start initialization, and the percentage of the progress completed is shown.



After the parameters are successfully initialized, the following box appears.

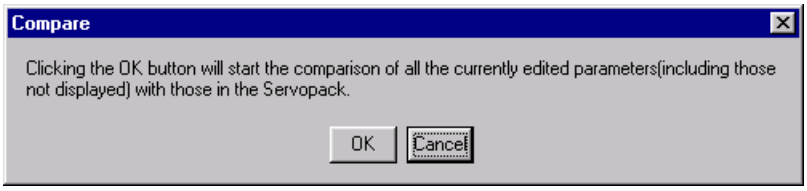


5. Click **OK**.

Compare

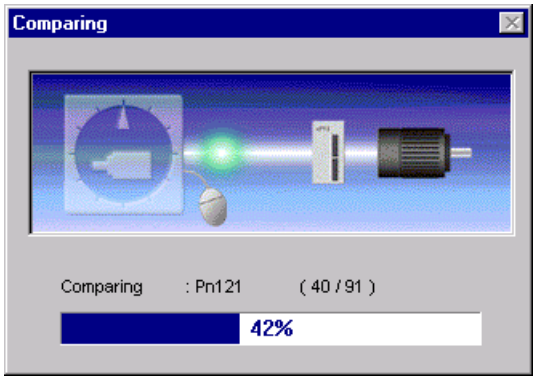
The edited parameter settings can be compared with the values in the SERVOPACK for all parameters, including those not displayed, with the Compare function. Check the settings using the following procedure.

1. Click **Compare** and a message appears, confirming if you want to compare all parameter settings.

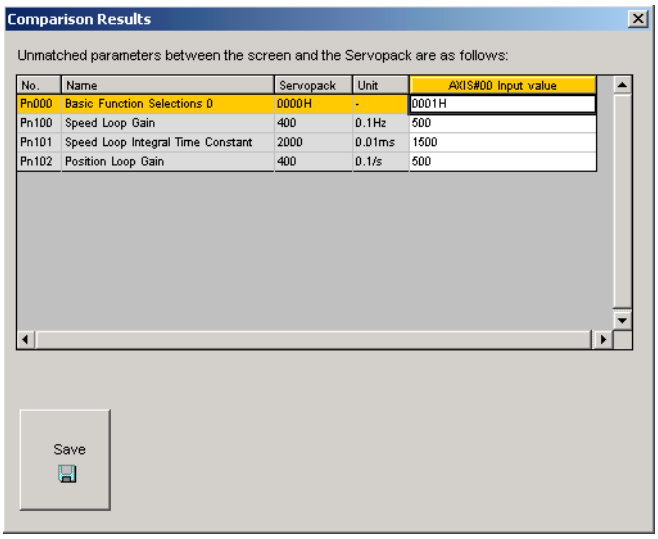


Click **Cancel** to return to the Parameter Editing window without comparing the settings.

2. Click **OK** to start the comparison, and the percentage of the progress completed is shown.



When the comparison has been successfully completed, the Comparison Results box appears.



3. Click **Save** to save the results of the comparison.

Read

Selected parameter settings from the SERVOPACK can be read and then changed by overwriting them with the Read function. Select the check boxes of the parameters to be read.

Click the **All constant number** tab and select the **Select All (All constant number: include not displayed)** check box to select all the parameters to be read, including those not currently displayed.

Read the parameters using the following procedure.

1. Click **Read** and a message appears, confirming if you want to read the parameter settings.

   Click **Cancel** to return to the Parameter Editing window without reading the settings.

2. Click **OK** to start reading and overwriting the settings.

Write

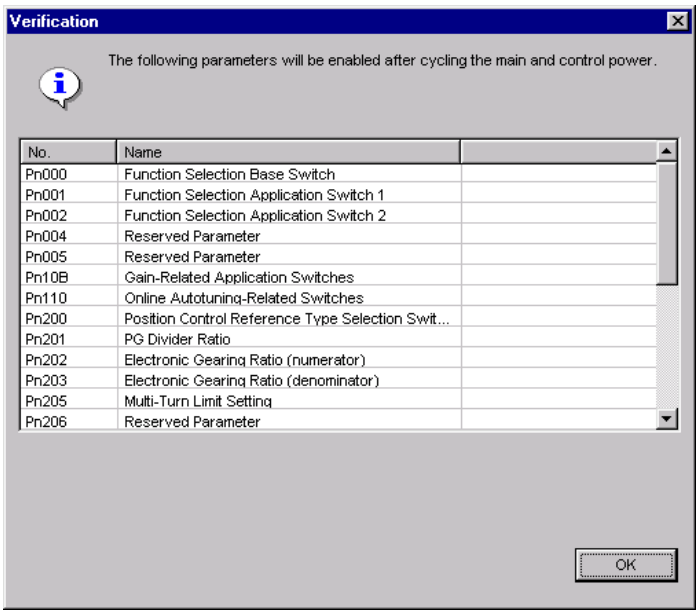
Selected parameter settings can be saved with the Write function. Select the check boxes of the parameters to be saved.

Note: Click the **All constant number** tab and select the **Select All (All constant number: include not displayed)** check box to select all the parameters to be saved, including those not currently displayed.

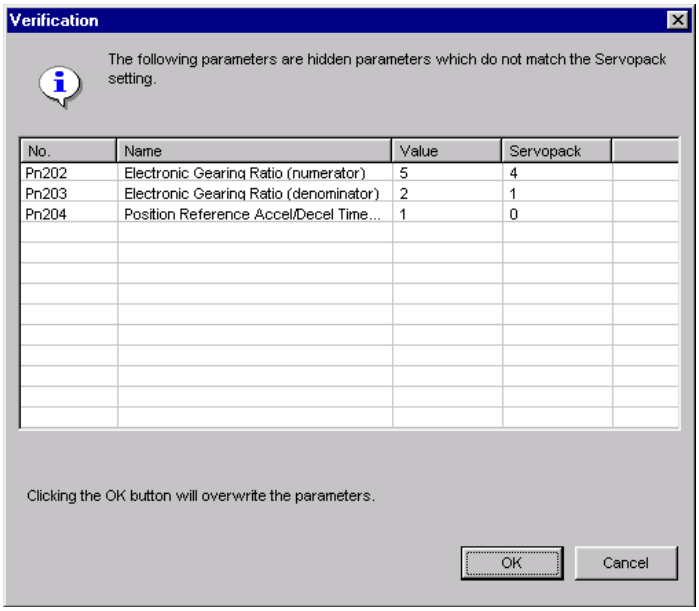
The procedures to use the Write function differ depending on whether or not you are using a Safety Module or a DeviceNet Module.

When Not Using a Safety Module or a DeviceNet Module

1. Click **Write**. A Verification box listing the saved parameters will be displayed after they have been successfully saved.



A Verification box asking you to confirm overwriting will be displayed when the settings of the non-displayed parameters differ from the settings of the current SERVOPACK.



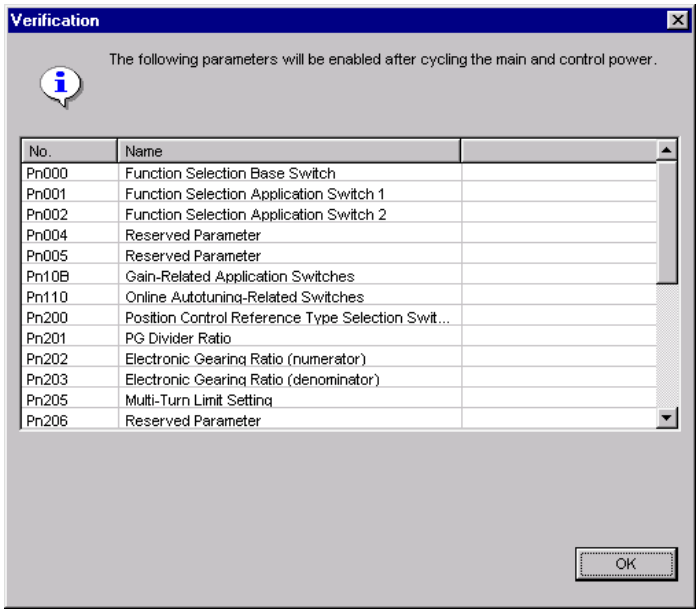
Note: Click **OK** to continue and overwrite the previous settings. Click **Cancel** to return to the Parameter Editing window without overwriting the parameters.

2. Click **OK**.
3. Restart the SERVOPACK to validate the new settings.

   All steps are completed.

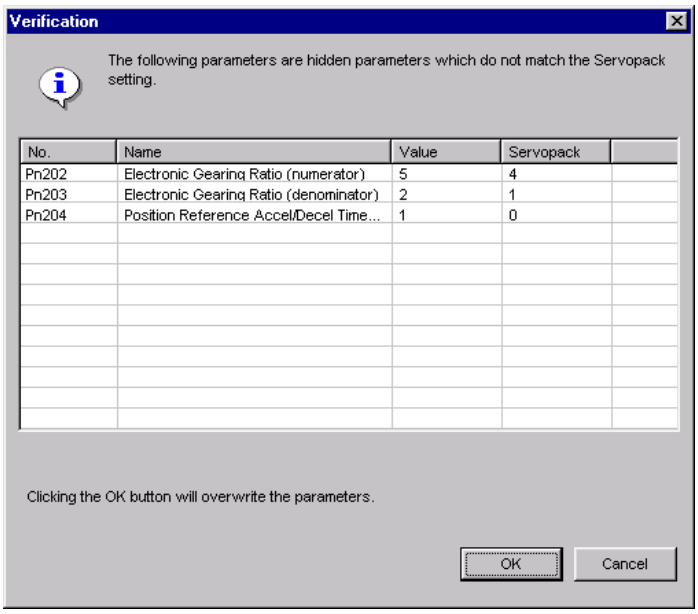
When Using a Safety Module

1. Click **Write**. A Verification box listing the saved parameters will be displayed after they have been successfully saved.



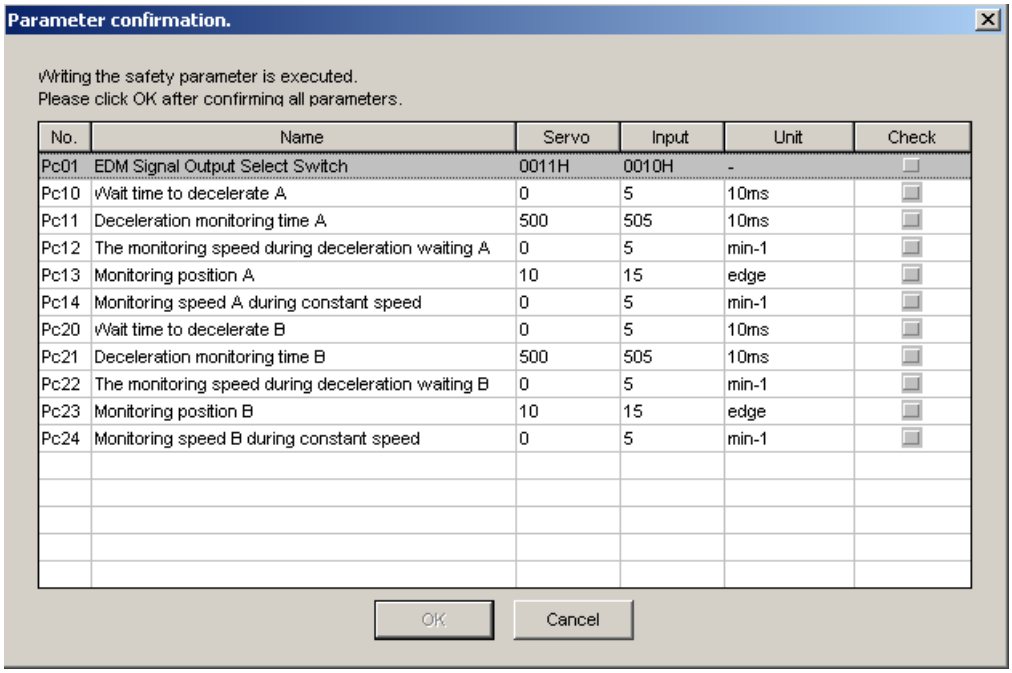
INFO

A Verification box asking you to confirm overwriting will be displayed when the settings of the non-displayed parameters differ from the settings of the current SERVOPACK.



Note: Click **OK** to continue and overwrite the previous settings. Click **Cancel** to return to the Parameter Editing window without overwriting the parameters.

2. Verify the values shown in the **Input** column, and select the check boxes of the parameters whose settings are confirmed to be correct.



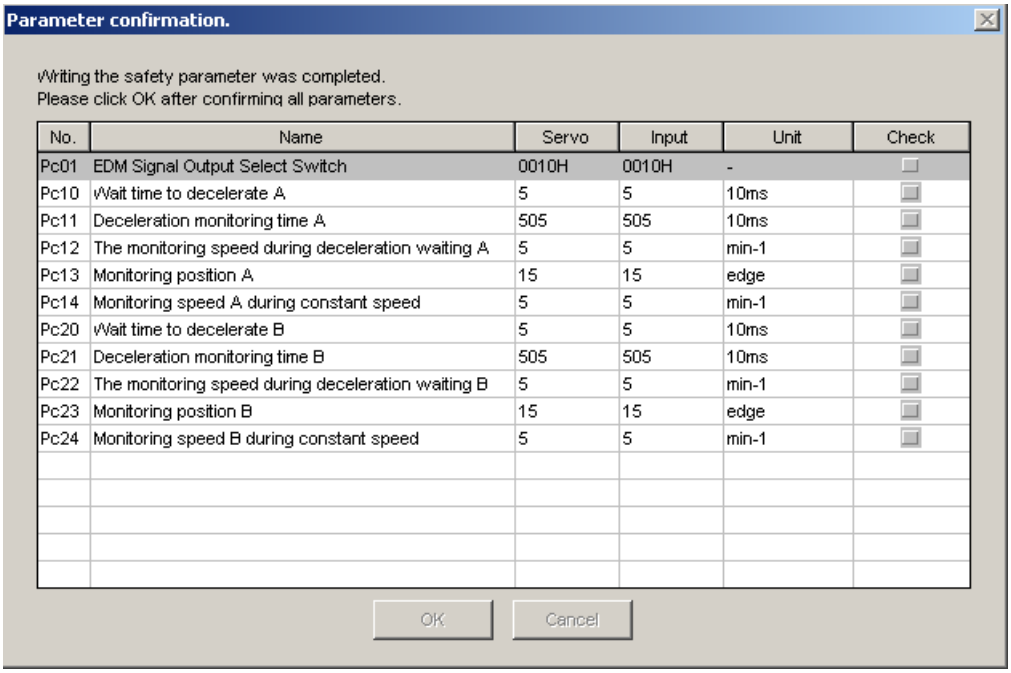
When all the check boxes of the displayed parameters are selected, the **OK** button becomes available.

3. Click **OK**.

INFO

Click **Cancel** to return to the Safety Module Parameter Editing window without overwriting the parameters.

4. Verify the values in the **Servo** column and select the check boxes of the parameters whose settings are correct.



INFO

When all the check boxes are selected, the **OK** button becomes available.

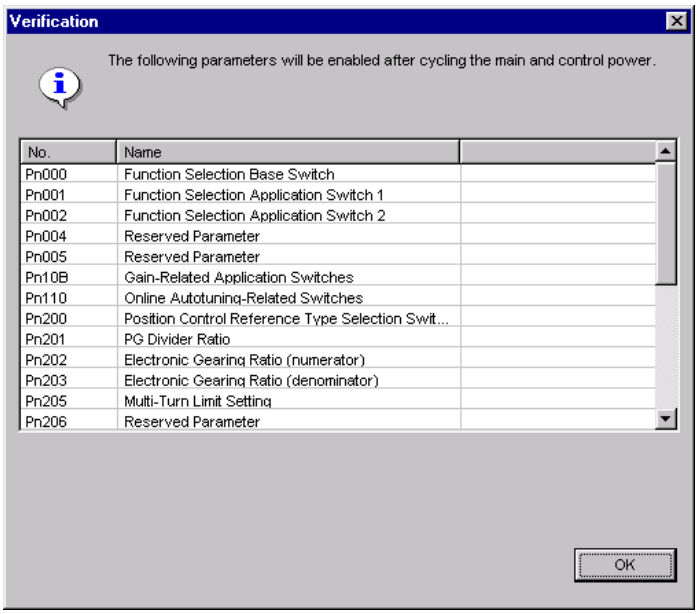
Servo: Shows the current settings for Safety Module parameters

Input: Shows the values set in the Parameter Editing window for the Safety Module.

5. Click **OK**.

INFO

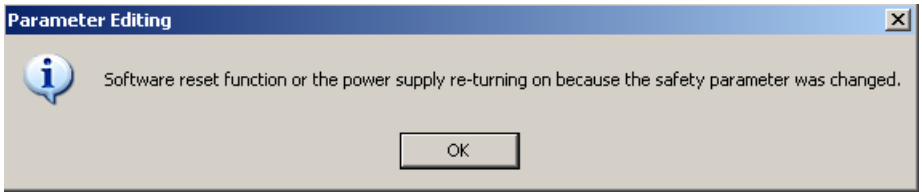
If the power needs to be restarted to enable parameter settings, a Verification box listing the saved parameters will be displayed after they have been successfully saved.



Click **OK**.

When the Safety Module parameters (Pcxx) are displayed, proceed to step 6.
When only the SERVOPACK parameters (Pnxxx) are displayed, proceed to step 7.

6. Click **OK**.



7. Restart the SERVOPACK to validate the new settings. All steps are completed.

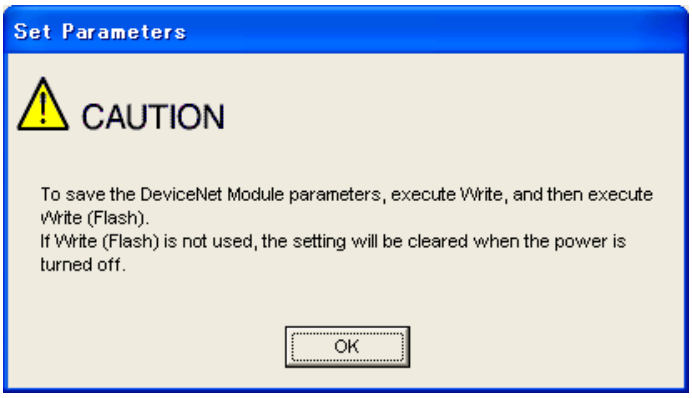
When Using a DeviceNet Module

⚠ WARNING

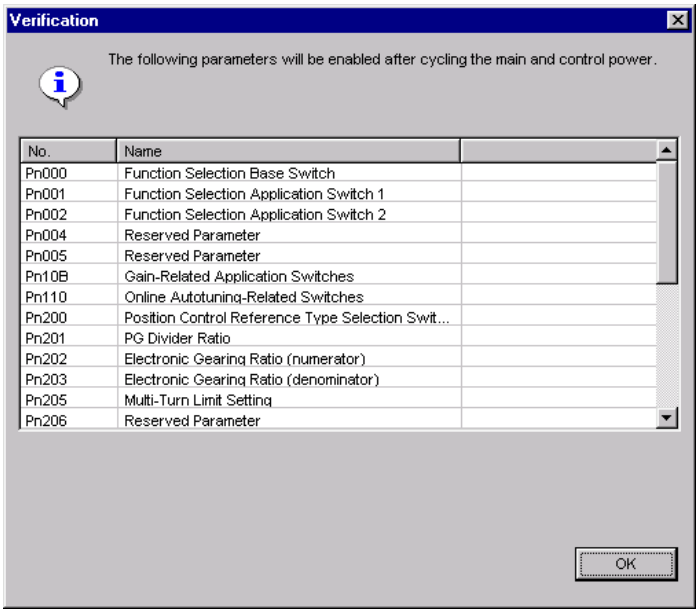
- Execute Write (Flash) while a mechanical system is stopped and not running.

  If you execute the Write (Flash) function while the system is running, the process under execution may be canceled and the system may stop.

1. Click **Write**. A caution message will be displayed reminding you of the order of operations and asking if you want to continue.

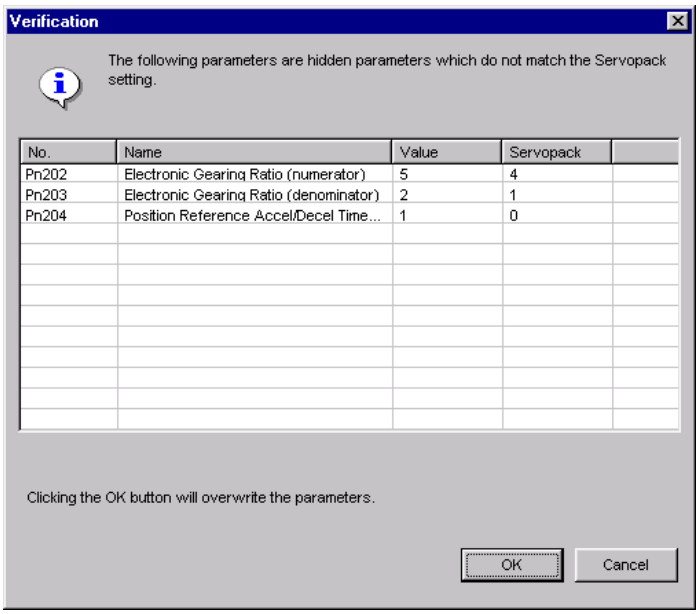


2. Click **OK**. A Verification box listing the saved parameters will be displayed after they have been successfully saved.



INFO

A Verification box asking you to confirm overwriting will be displayed when the settings of the non-displayed parameters differ from the settings of the current SERVOPACK.



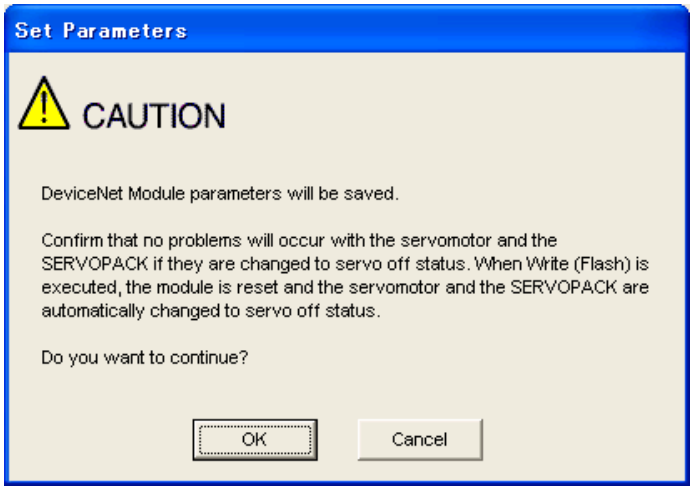
Note: Click **OK** to continue and overwrite the previous settings. Click **Cancel** to return to the Parameter Editing window without overwriting the parameters.

3. Click **OK**.

INFO

When the DeviceNet Module parameters are displayed, proceed to step 4.
When only the SERVOPACK parameters are displayed, proceed to step 6.

4. Click **Write (Flash)** in the Parameter Editing window. A caution message asking if you want to continue will be displayed.



5. Click **OK**.

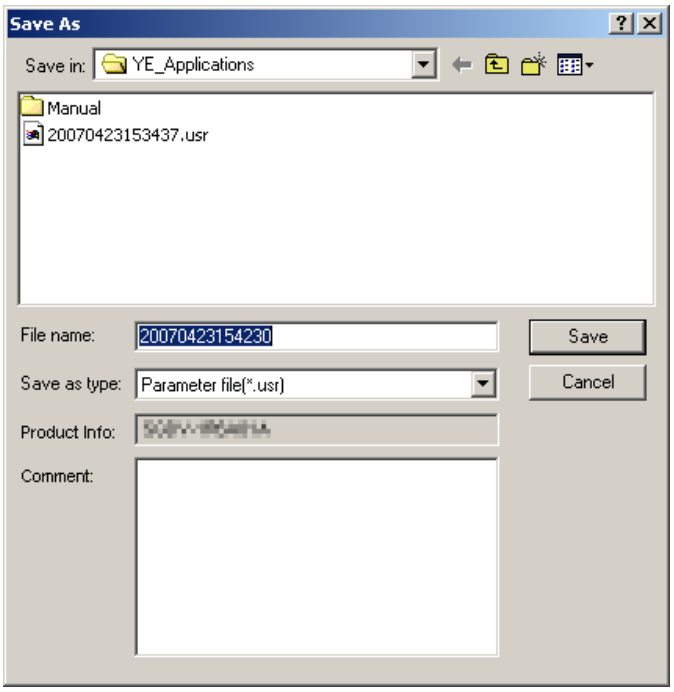
INFO

Click **Cancel** to return to the previous window without using the Write (Flash) function.

6. Restart the SERVOPACK to validate the new settings. All steps are completed.

(Save) Button

Click the button, and then select the storage location for the parameter file displayed in the Parameter Editing window.



Save As Dialog Box

Select one of the following file types: parameter file (*.usr) or BTO supported parameter file (*.usrs).

INFO

You can use parameter files that are saved as BTO supported parameter files (*usrs) with the BTO service.

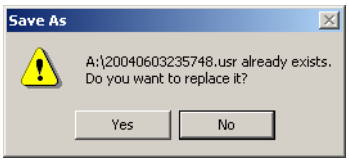
Up to 255 characters can be typed as a comment.

The default file name is the current time (yyyymmddhhmmss).

Save

Click **Save** to store the file name designating the current parameter settings. When parameters are set in the **Customize** tab, they are also saved. Click **Cancel** to return to the Parameter Editing window without saving the file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and ask if you want to replace the existing file.

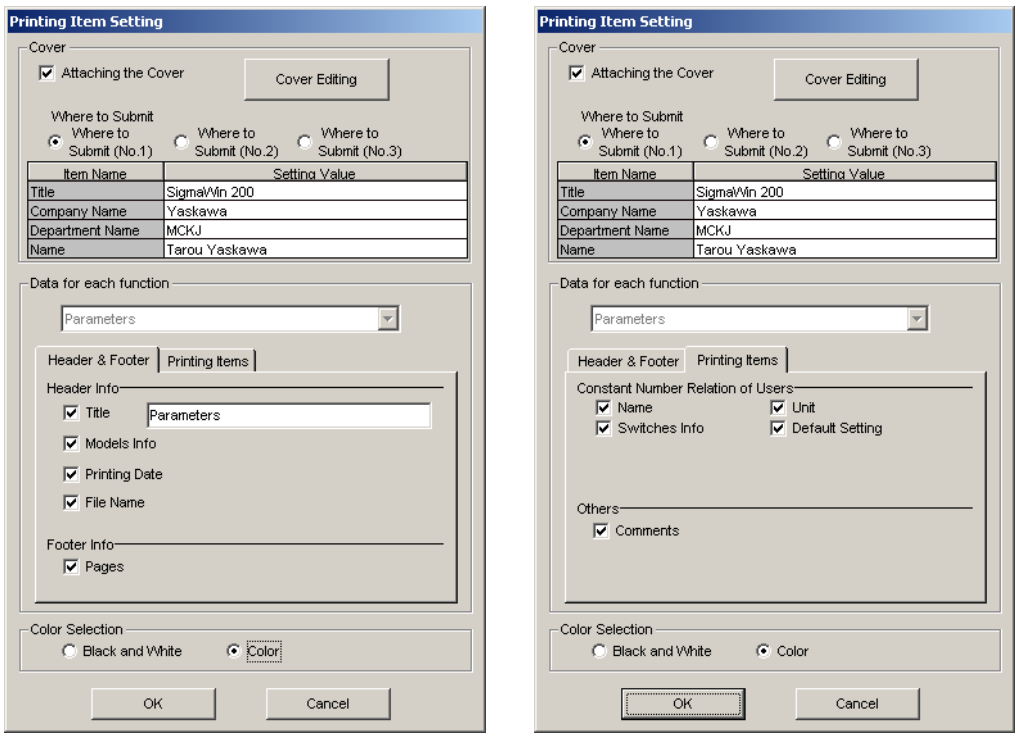


Click **Yes** to overwrite the already existing file. Click **No** to return to the Parameter Editing window.

(Print) Button

The data on the Parameter Editing window can be printed.

Click the button, and the Printing Item Setting box appears.



Header & Footer Tab　　Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3 SigmaWin+ Σ-7 Component Main Window.

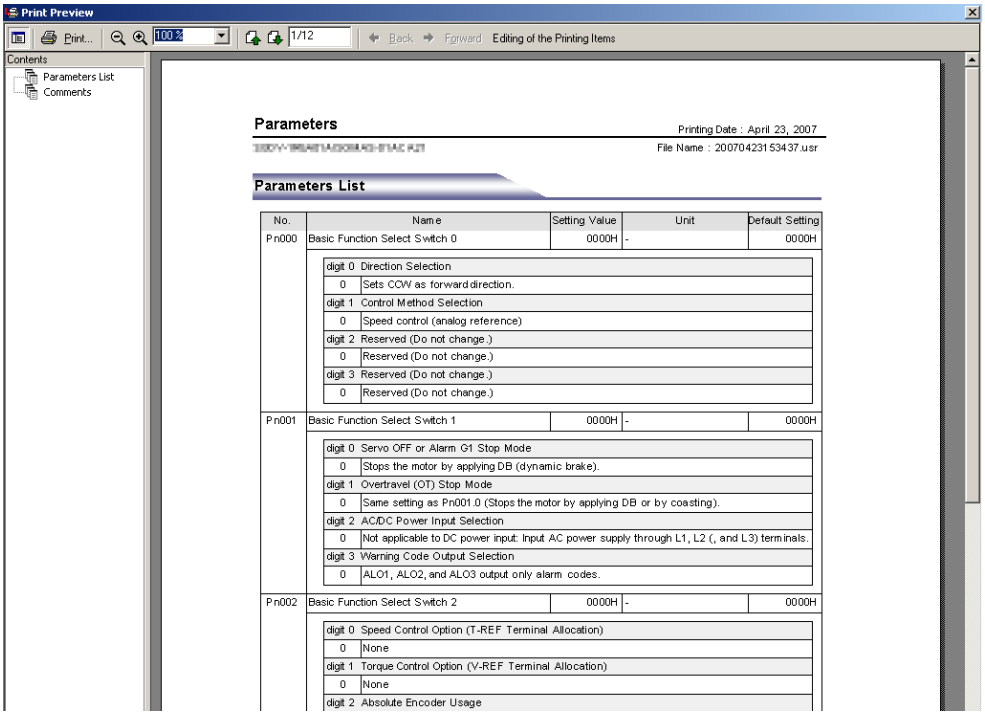
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.

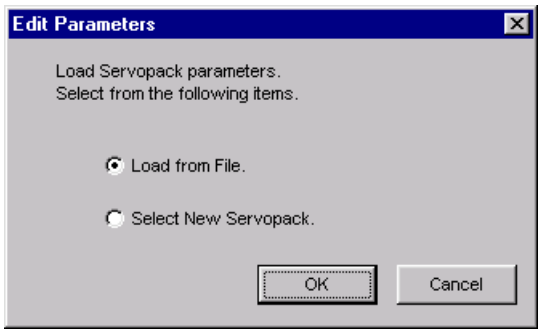


To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting box and change some settings, click **Editing of the Printing Items**.

Parameter Editing when Offline

In the SigmaWin+ Σ-7 component main window, click **Parameters** and then click **Edit Parameters**.



Load From File: Reads in existing parameters.

Select New SERVOPACK: Creates new settings for parameters.

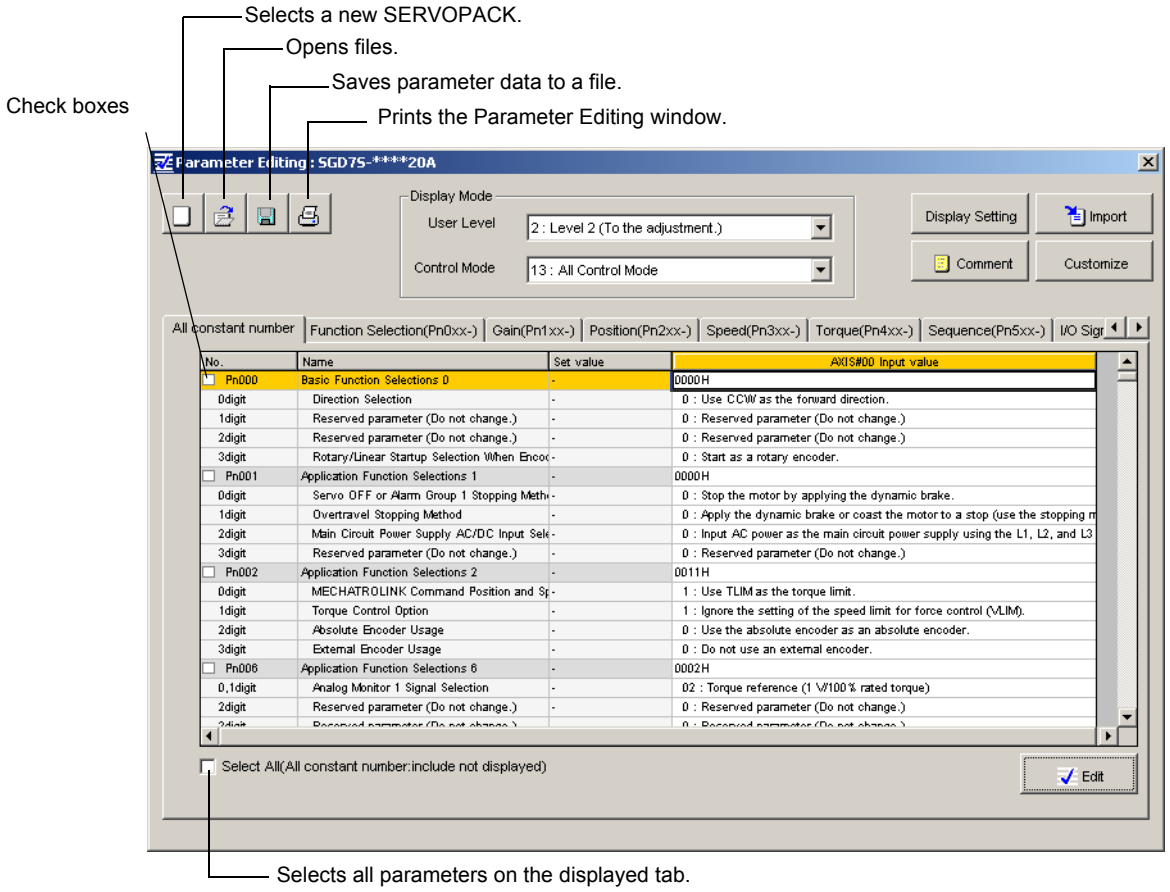
Select the desired command and click **OK**.

<When **Load from File** is Selected>

The operation is the same as when the button is clicked. See **(Open) Button**.

<When **Select New SERVOPACK** is Selected>

The operation is the same as when the button is clicked. See **(New) Button**.

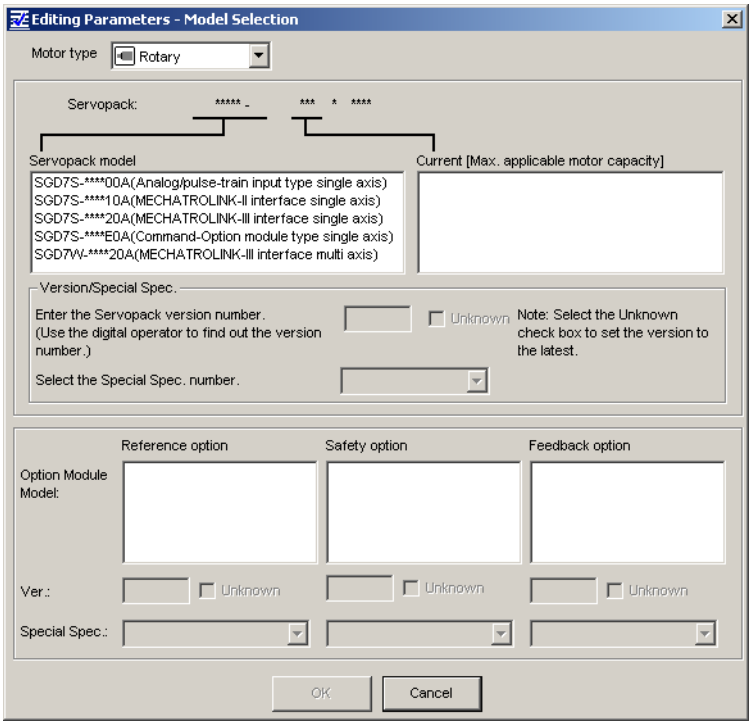


Parameter Editing Window (Offline Mode)

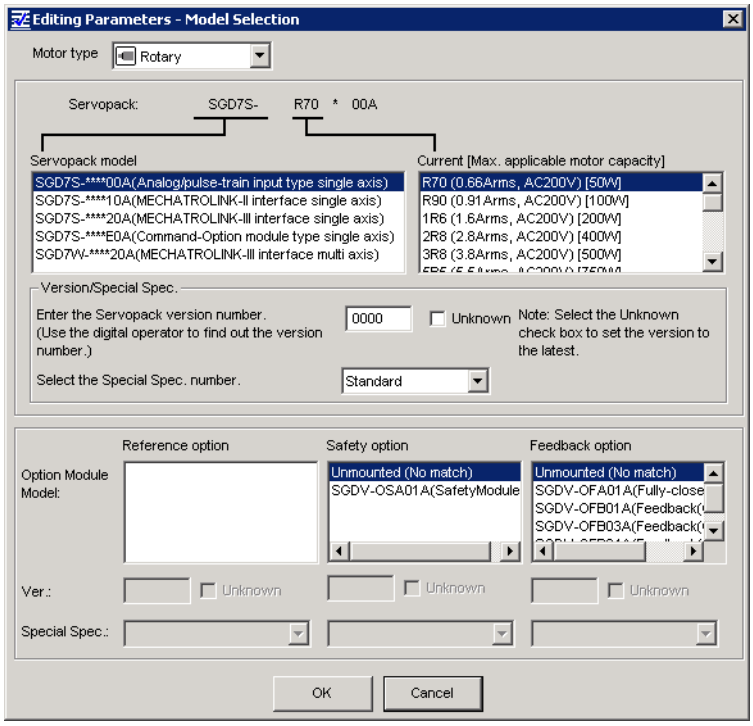
(New) Button

A new SERVOPACK can be selected in the Parameter Editing - SERVOPACK Selection box using the New command. To change to a different SERVOPACK, use the following procedure.

1. Click the button, and the Editing Parameters - Model Selection box appears.



2. Select the motor type, SERVOPACK model, current [max. applicable motor capacity], and special specification numbers from the lists, and enter the version number of the SERVOPACK.
   The option modules that can be mounted on the selected SERVOPACK are displayed in the **Option Module Model** field.
   Select the model, version number, and special specification number of each option module.



3. Click **OK**. The set data will be imported, and the Parameter Editing window will appear.

INFO

■ Option modules

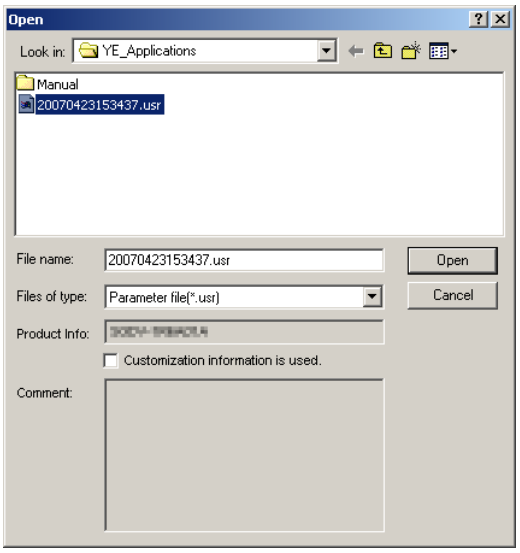
The following three option modules are available.

- Reference option module
- Safety option module
- Feedback option module

(Open) Button

The parameter file can be loaded in the Open box using the Open command. To load the file, use the following procedure.

1. Click the button, and the Open box will appear.



2. Select the parameter file to be imported, and click **Open**.
3. When **Customization information is used.** check box is selected, the parameters set on the **Customize** tab in the Parameter Editing window are also imported. (See "Customize" for details.) The check box cannot be selected when the file has no parameter on the **Customize** tab.

The other operations are the same as those for parameter editing when online. See "Parameter Editing when Online."

4.2.2 Editing Parameters Online

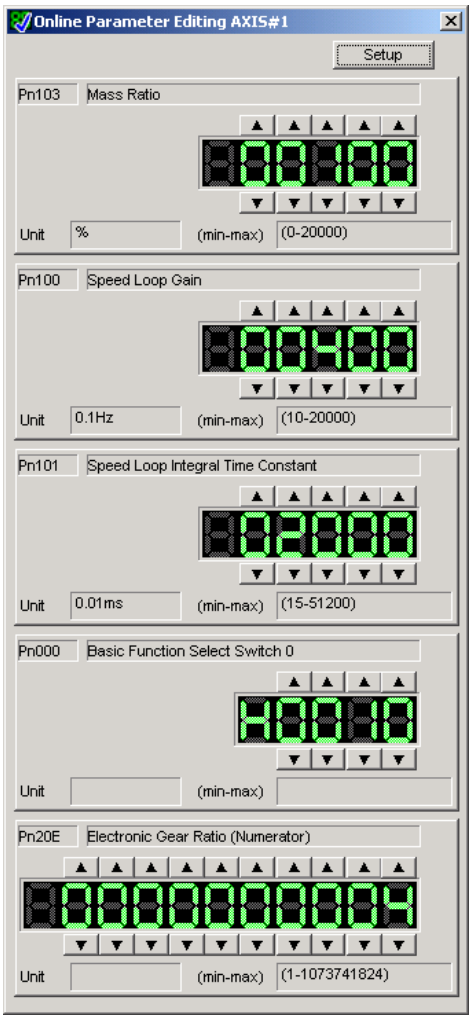
Parameters can be viewed or edited in the Online Parameter Editing window.

NOTE

- Values edited in the Online Parameter Editing box are also immediately changed in the SERVOPACK.
- If the power to the SERVOPACK is turned off or the communication between the SERVOPACK and the SigmaWin+ is interrupted while editing parameters online, the edited values will not be saved in the SERVOPACK.
- Safety Module parameters (Pcxx) cannot be set or edited in the Online Parameter Editing box.

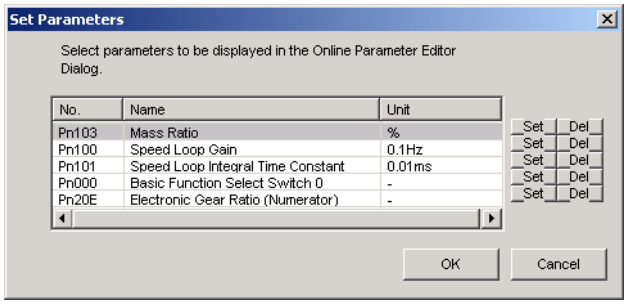
Edit parameters online using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Parameters** and then click **Edit Online Parameters**. The Online Parameter Editing box appears. The previously saved parameter settings will be displayed.

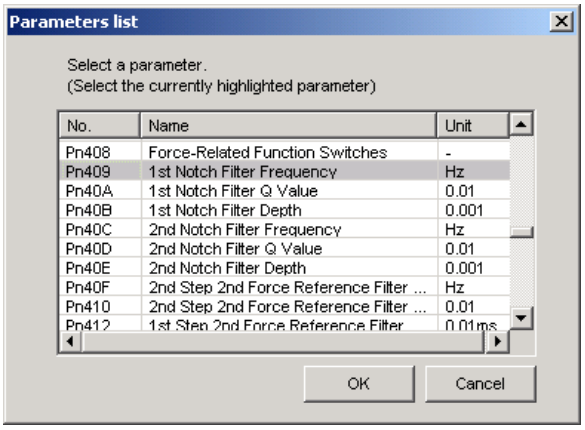


Online Parameter Editing Box

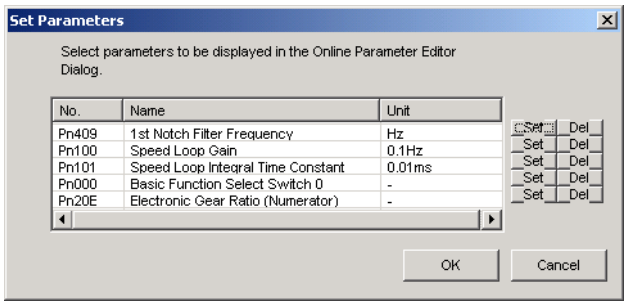
2. To change the values of the settings, click the setting arrows to raise or lower the value. If an upper or lower limit is displayed, make sure that the setting is within the limit. Modified values are also immediately changed in the SERVOPACK.
   Click **Setup** to view different parameters.



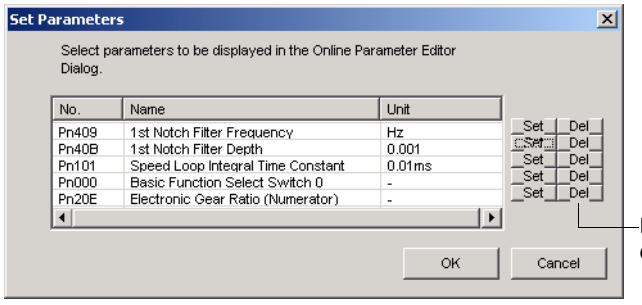
3. Click **Set** to view a parameter other than the "Moment of Inertia Ratio."



4. Select the parameter to be edited, and click **OK**.

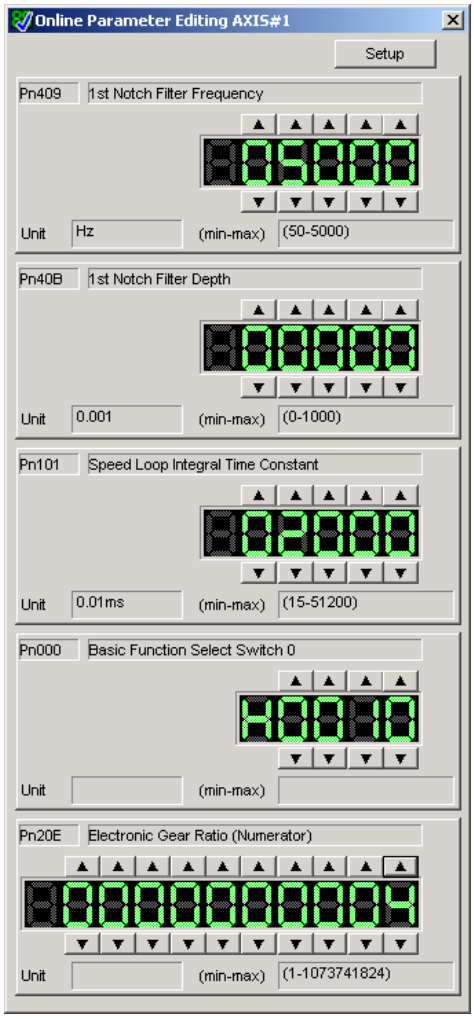


5. If there are still parameters to be edited, click **Set** for the parameter to be edited and set these in the same manner as the first parameter.



   To view other parameters, click **Del** to delete the currently displayed parameter and then click **Set**.

6. Click **OK** when parameter setting is complete.



7. To change the values of the settings, click the setting arrows to raise or lower the value. If an upper or lower limit is displayed, make sure that the setting is within the limit. Modified values are also immediately changed in the SERVOPACK.

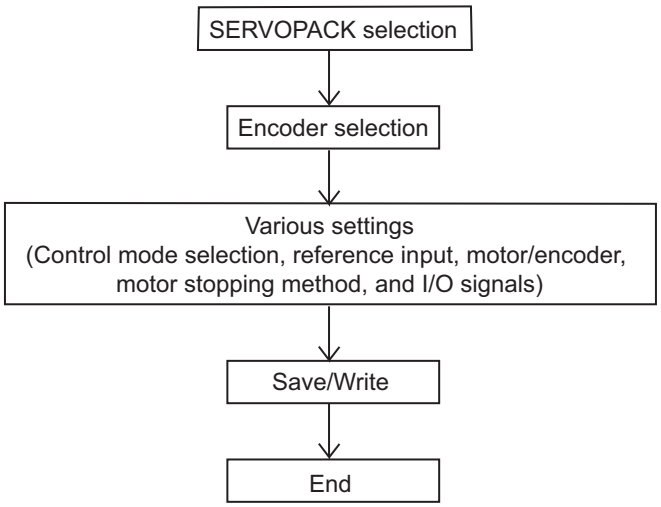
4.2.3 Setup Wizard

Setup Wizard is a function which carries out the setting of parameters using a dialog method. By following instructions on the screen to select the control mode and the I/O settings, those settings which are necessary for an operation are automatically completed.

Setup Wizard has the following features.

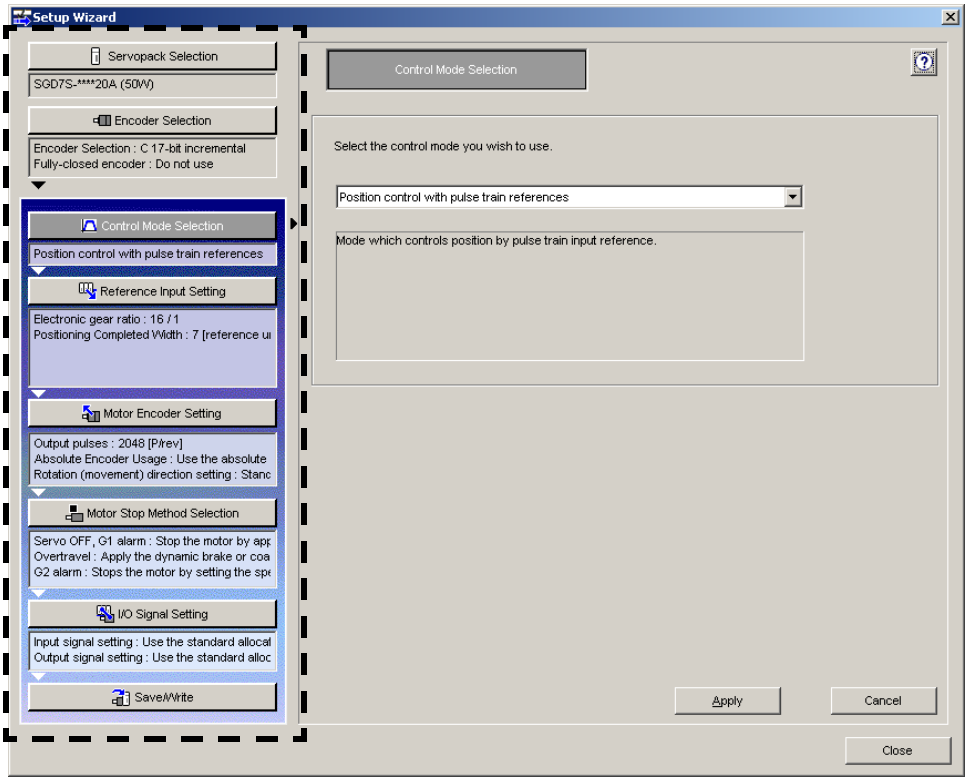
- Parameters can be set easily and quickly, even if you are using the SERVOPACK for the first time.
- It is possible to calculate the electronic gears automatically using the mechanical characteristics and the desired reference units (for position control).
- It is possible to select the I/O assignments while visually confirming them.

The following flowchart shows how Setup Wizard guides you through each step of parameter setting.



While Setup Wizard is open, the current settings and recommended procedures are displayed in the flowchart on the left side of the window.

Example



The above display shows that the control mode is being selected.

Start Setup Wizard with the following procedure.

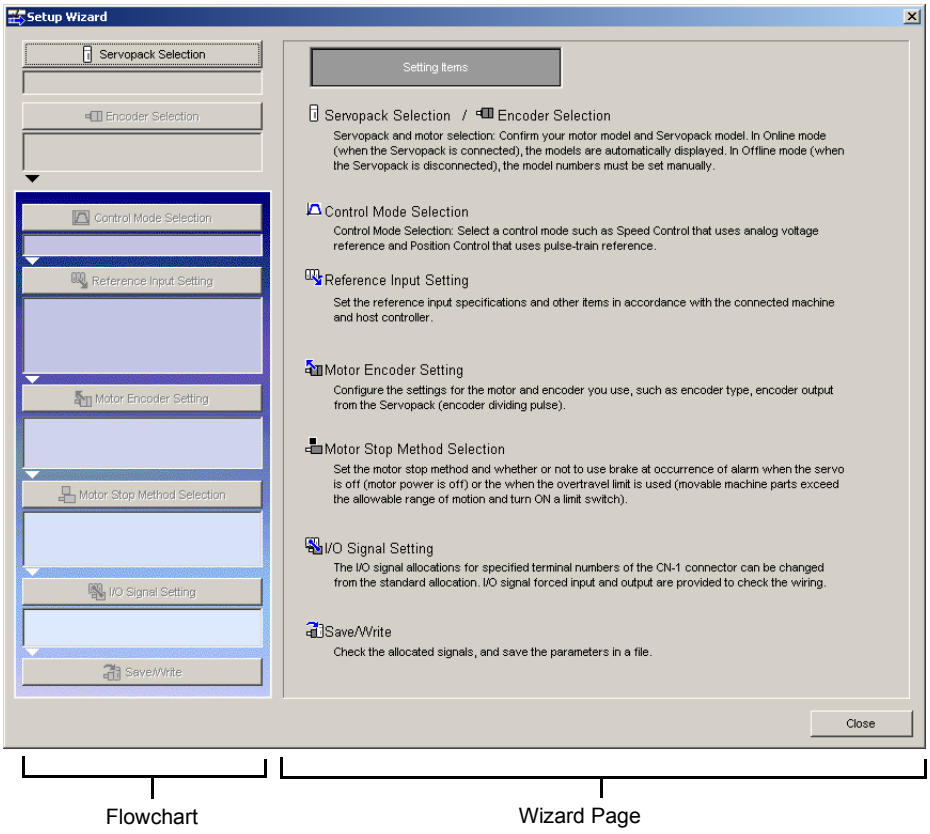
INFO

The wizard pages displayed on screen will vary in accordance with the selected SERVOPACK specifications. The wizard pages shown here are only one example.

In the SigmaWin+ Σ-7 component main window, click **Parameters** and then click **Set Up Wizard**. The Setup Wizard window will appear.

INFO

If you are online and more than one axis is being used, the following **Axis Selection** dialog box appears. First select the axes to adjust according to the **Axis Selection** dialog box. Refer to *4.1 Changing Axes* for the procedure.



Setup Wizard Window - First Wizard Page

SERVOPACK selection/Encoder selection (servomotor selection):

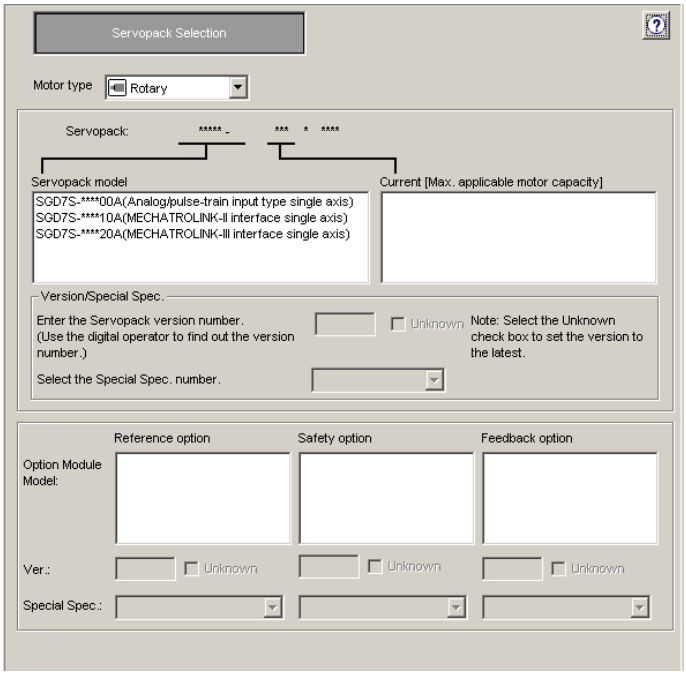
Select these items first. When offline, first select the SERVOPACK, and then select the encoder. (When online, information on the connected SERVOPACK and encoder will be automatically set.)

Setting items other than the above:

There is no required setting order. If not set, the set value (default value when offline) of the SERVOPACK will be automatically set.

■ SERVOPACK Selection (only when offline)

1. Click **Servopack Selection** in the flowchart. The Servopack Selection wizard page will appear on the right.



2. Select the motor type, SERVOPACK model, current [max. applicable motor capacity], and special specification numbers from the lists, and enter the version number of SERVOPACK.
   The option modules that can be mounted on the selected SERVOPACK are displayed in the **Option Module Model** field.
3. Select the model, version number, and special specification number of each option module.
4. Click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

INFO

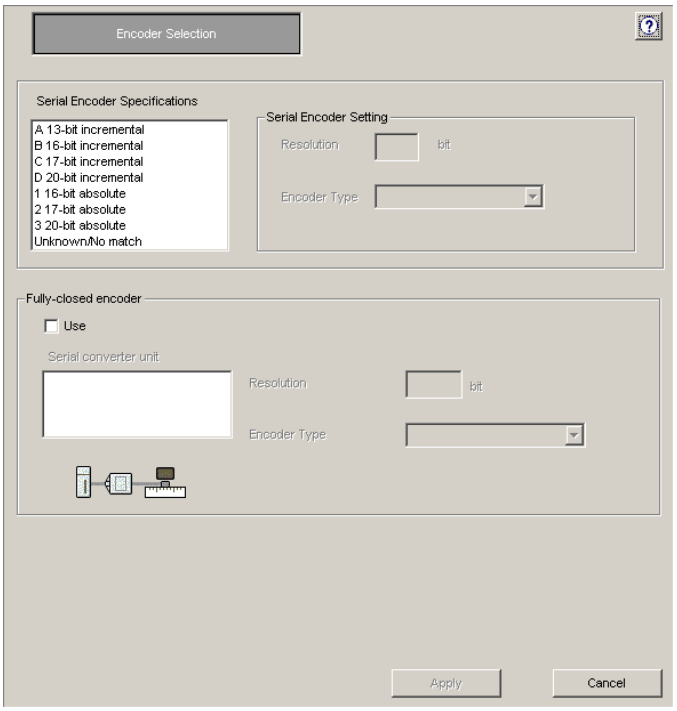
■ Option modules

The following three option modules are available.

- Reference option module
- Safety option module
- Feedback option module

■ Encoder Selection (When a rotary motor is selected)

Click **Encoder Selection** in the flowchart. The Encoder Selection wizard page will appear on the right.



Serial Encoder Specifications/Serial Encoder Setting

When online: Displayed only when no motor is connected. Not displayed when a motor is connected.

When offline: Always displayed.

Fully-closed encoder

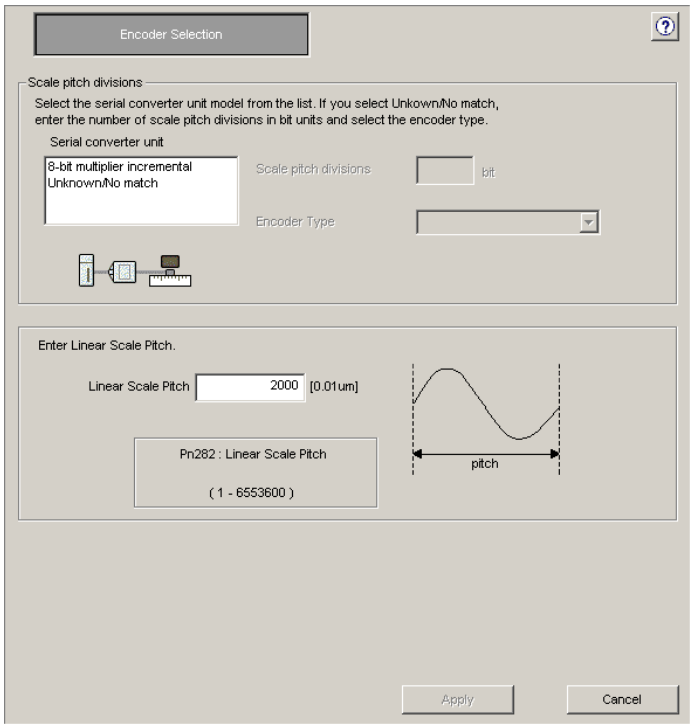
When online: Displayed only when no fully-closed encoder is connected. Only the "Use" check box is displayed when a fully-closed encoder is connected.

When offline: Displayed only when the SERVOPACK selected on the SERVOPACK selection wizard page supports fully-closed control.

1. Select the serial encoder specifications from the list. When using a special or new serial encoder that is not included in the list, select **Unknown/No match** and then enter the resolution and select the encoder type in the **Serial Encoder Setting** field.
2. When using fully-closed control, set the fully-closed encoder to be used. This setting is valid only when the **Use** check box is selected. Select the serial converter unit from the list. When using a special or new serial converter unit that is not included in the list, select **Unknown/No match** and then enter the resolution and select the encoder type in the boxes on the right.

■ Encoder Selection (When a linear motor is selected)

Click **Encoder Selection** in the flowchart. The Encoder Selection wizard page will appear on the right.



Serial converter unit

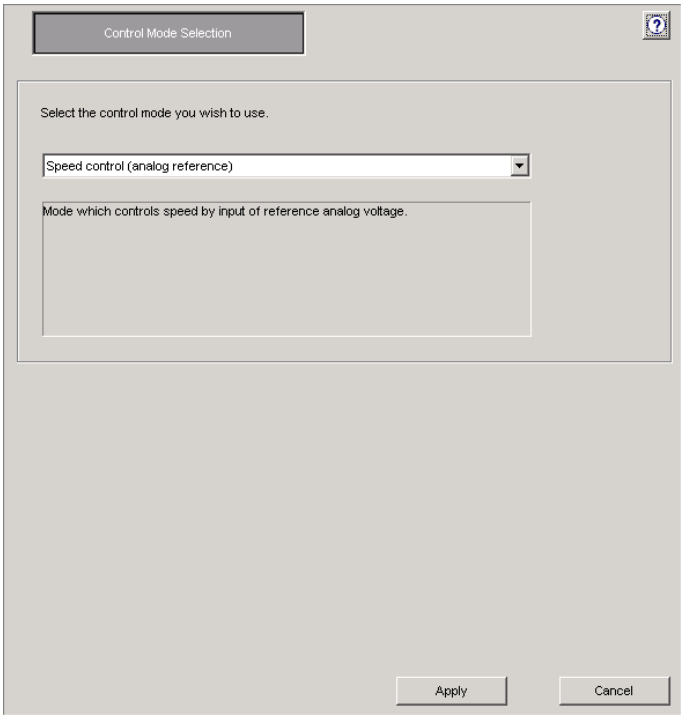
When online: Not displayed when a linear motor is connected. Displayed only when no linear motor is connected.

When offline: Always displayed.

1. Select the serial converter unit from the list. When using a special or new serial converter unit that is not included in the list, select **Unknown/No match**, enter the number of scale pitch divisions, and select the encoder type in the boxes on the right.
2. Enter the linear scale pitch.
3. Click **Apply.** The display will return to the first wizard page and the set data will be written in the flowchart.

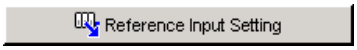
■ Control Mode Selection

Click **Control Mode Selection** in the flowchart. The Control Mode Selection wizard page will appear on the right.



Select the control mode from the list, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

■ Reference Input Setting



Click **Reference Input Setting** in the flowchart.

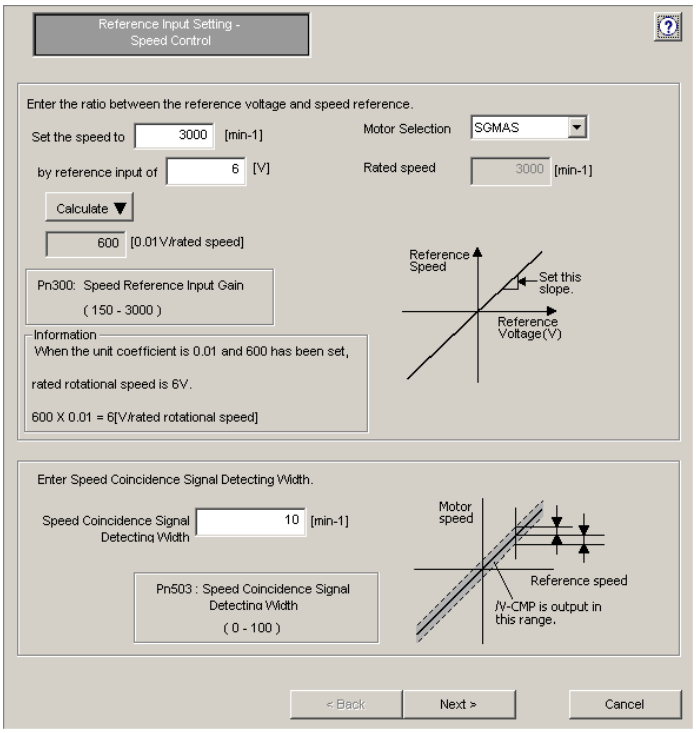
The wizard page for reference input setting will vary according to the selected control mode:

- For speed control
- For position control
- For torque (force) control
- For internal set speed control
- For zero clamp

When a control mode that includes more than one control is selected, a reference input setting for each control is required.

Control mode: Speed control

The Reference Input Setting - Speed Control wizard page appears.

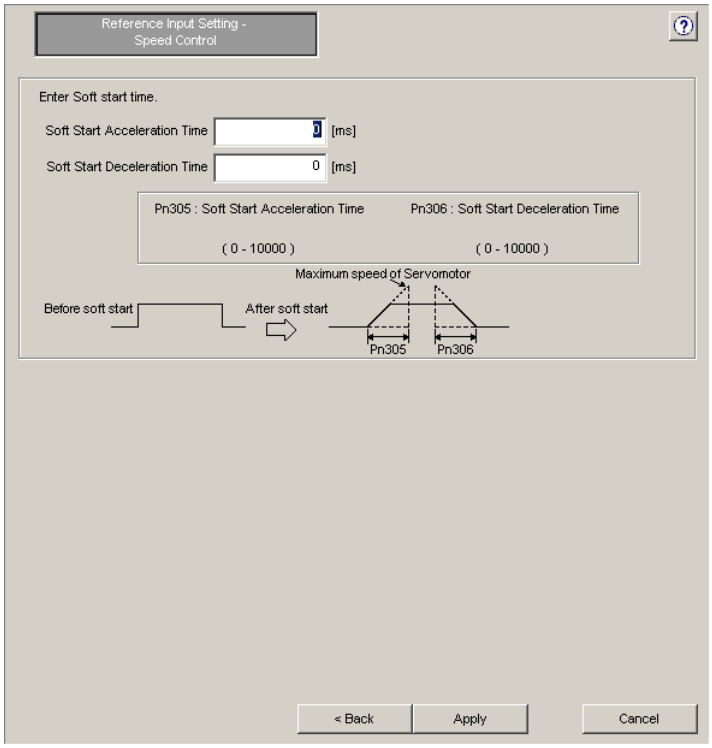


Motor Selection Rated Speed

When online: The rated speed of the connected motor is automatically set.

When offline: Select the motor model to be used from the **Motor Selection** list.
When **Unknown/No match** is selected from the list, enter the motor rated speed in the **Rated speed** box.

1. Set the ratio between the reference voltage and the speed reference by entering the values. When offline, select the motor model from the **Motor Selection** list. Enter the rated speed if **Unknown/No match** is selected from the list.
2. Click **Calculate**. The speed reference input gain will be automatically calculated and set according to the set ratio between the reference voltage [V] and the speed reference [min^{-1}].
3. Enter the speed coincidence signal detecting width and then click **Next** to continue setting.



4. Enter the soft start acceleration time and soft start deceleration time and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

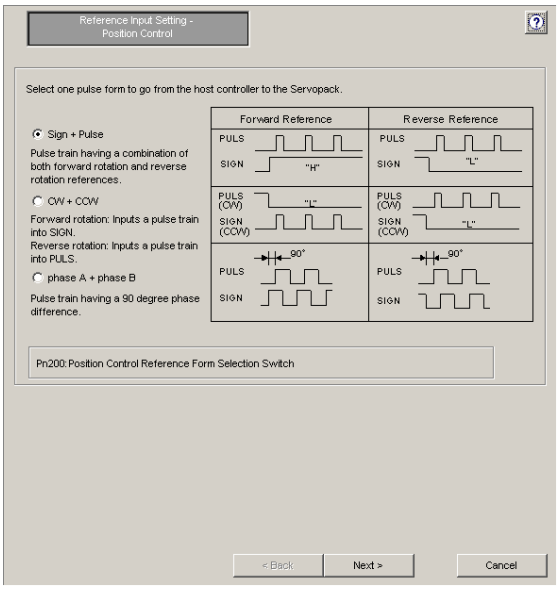
INFO

■ If Control mode settings for all the selected controls are not completed

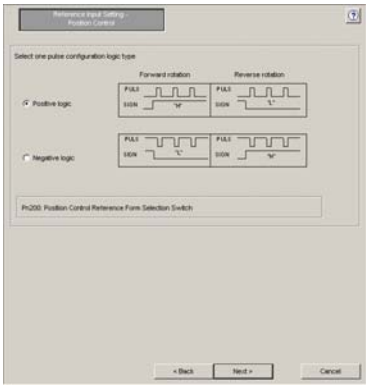
Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

Control mode: Position control

The Reference Input Setting - Position Control wizard page will appear.

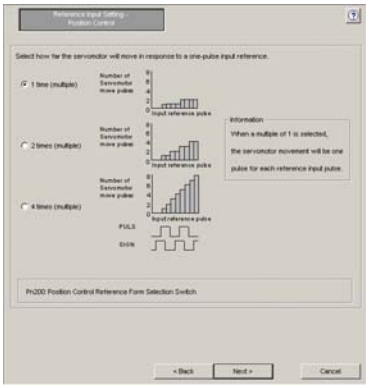


1. Select the pulse form of the SERVOPACK, and then click **Next**.
   One of the following three windows will appear, depending on the selected pulse form.



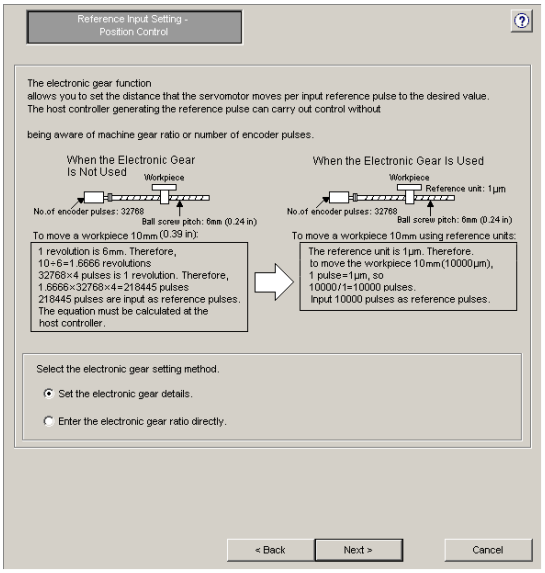
When Sign + Pulse is selected

When CW+CCW is selected

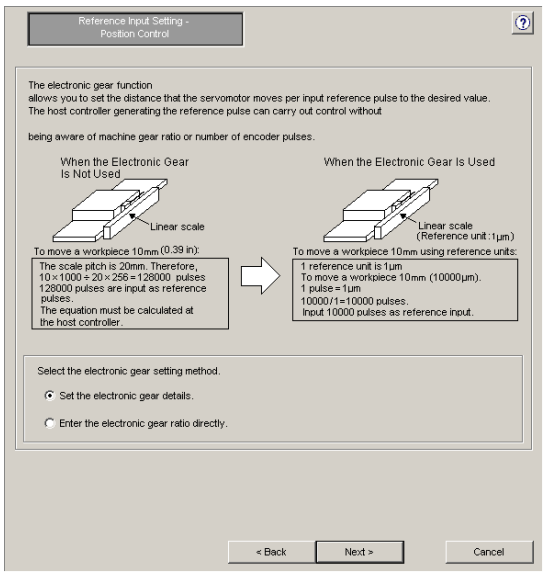


When phase A + phase B is selected

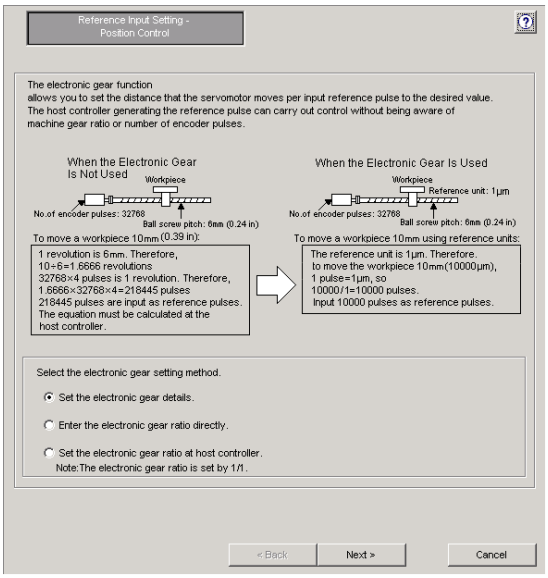
2. Select the logic type or the motor movement amount per pulse input reference, and then click **Next**.



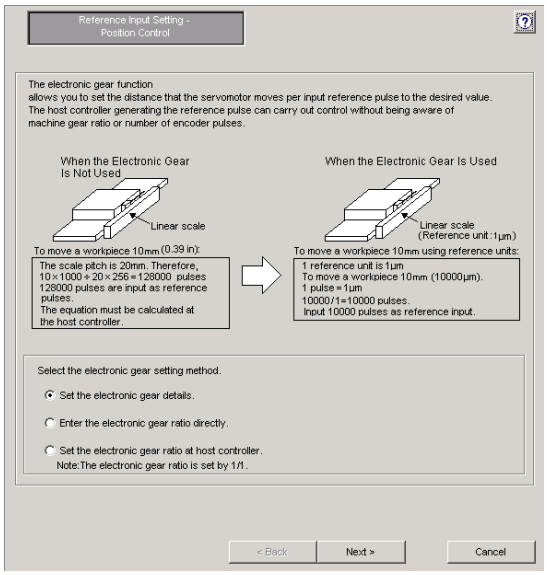
Rotary Motor/Analog Voltage and Pulse Train Reference Type SERVOPACK



Linear Motor/Analog Voltage and Pulse Train Reference Type SERVOPACK



Rotary Motor and SERVOPACK with MECHATROLINK-II/-III References

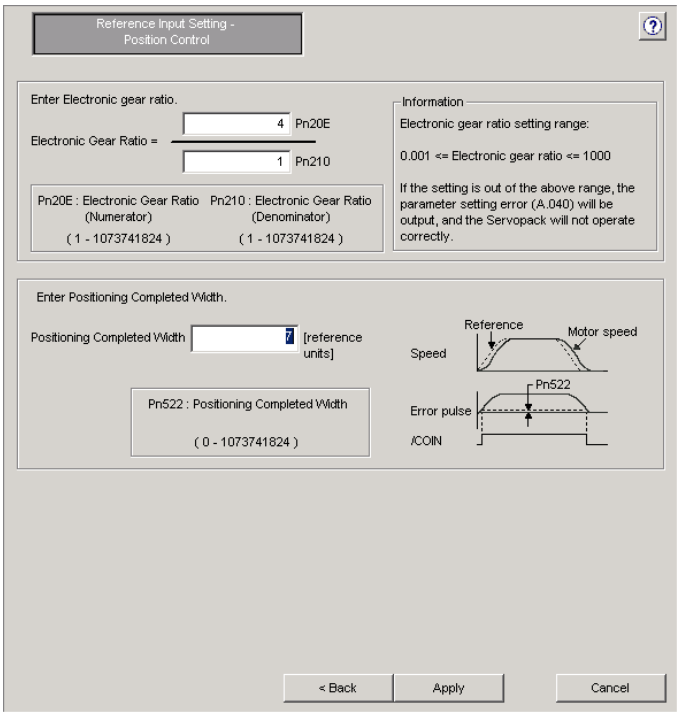


Linear Motor and SERVOPACK with MECHATROLINK-II/-III References

3. Select the electronic gear function setting method, and then click **Next**.

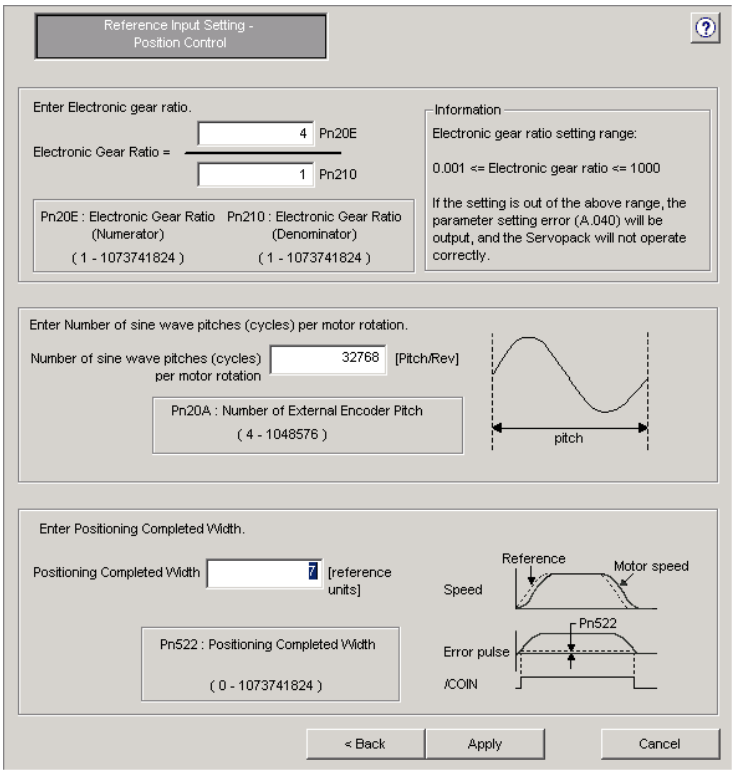
<When the **Enter the electronic gear ratio directly.** option is selected>

The following wizard page will appear.



Enter the electronic gear ratio and positioning completed width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

• When using a fully-closed encoder



Enter the electronic gear ratio, number of sine wave pitches per motor rotation, and positioning completed width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

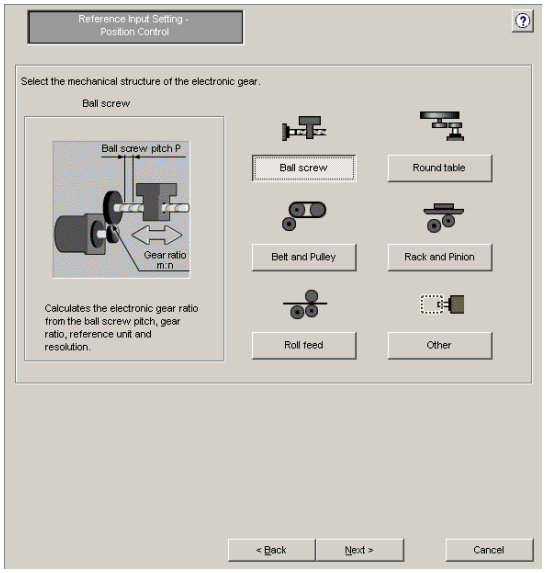
INFO

■ If Control mode settings for all the selected controls are not completed

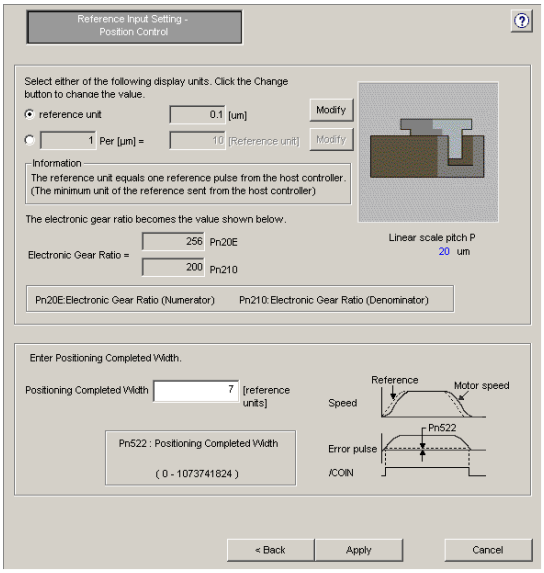
Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

<When the **Set the electronic gear details**. option is selected>

One of the following wizard pages will appear.



When Motor type is Rotary



When Motor type is Linear

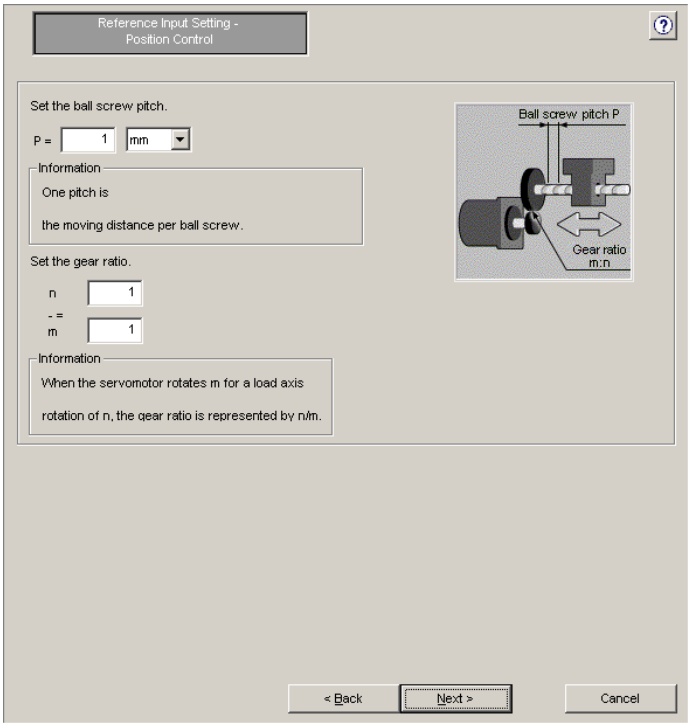
4. For rotary motors, select the electronic gear mechanical structure, and then click **Next**.

   The setting procedure when the ball screw is selected is explained here. For other mechanical structures, see "■ Supplemental Information."

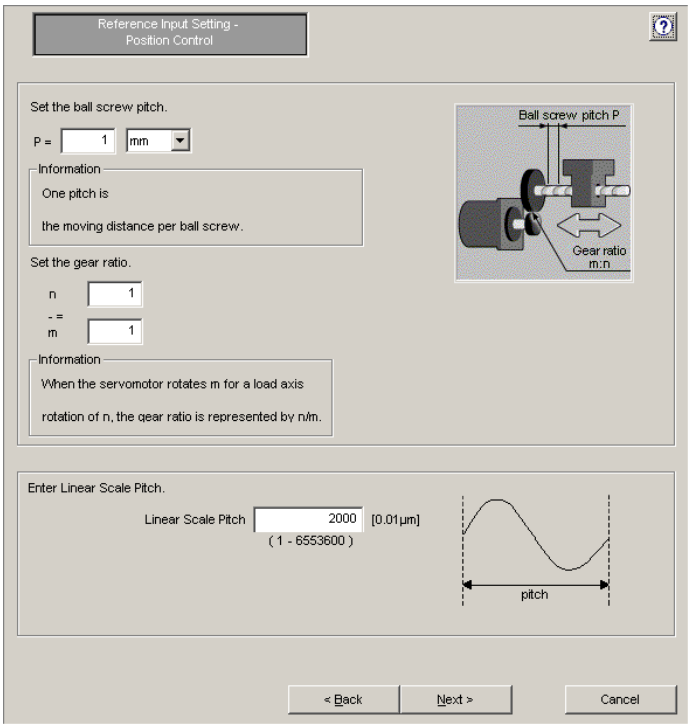
INFO

■ Difference in settings for rotary motor and linear motor

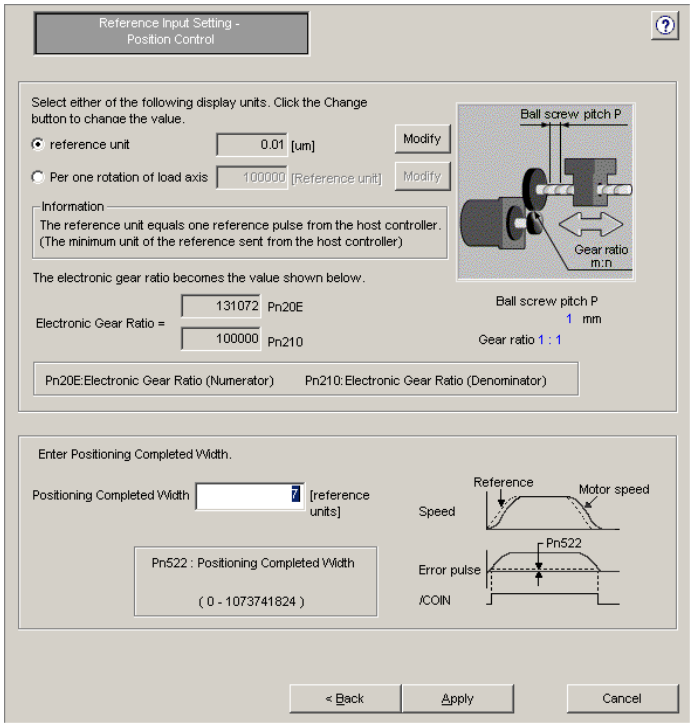
For a linear motor, the electronic gear mechanical structure selection is not required. Proceed to step 6.



- When using a fully-closed encoder

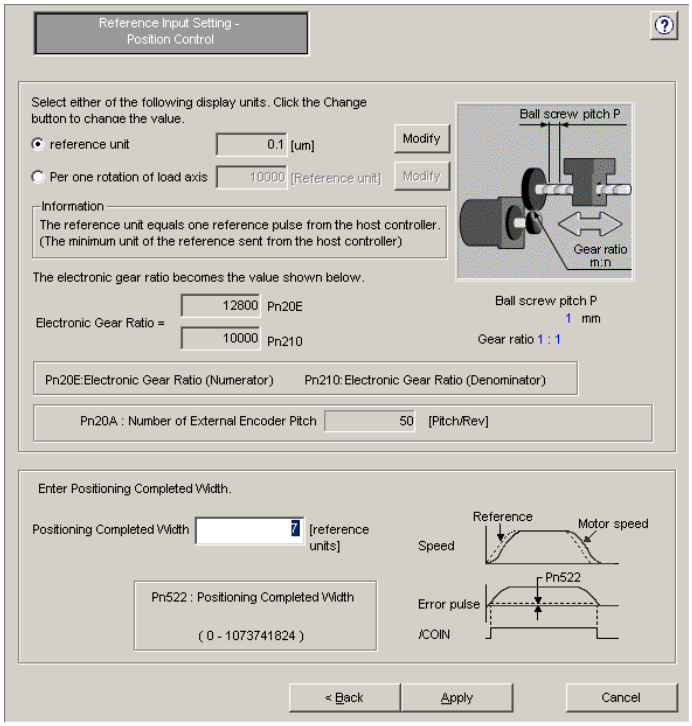


5. Enter the ball screw pitch and gear ratio, and then click **Next**.



• When using a fully-closed encoder

Enter the ball screw pitch, gear ratio, and linear scale pitch, and then click **Next.**



6. Set the reference unit or number of reference units per load axis rotation. Check the displayed electronic gear ratio to see if it is correct, enter the positioning completed width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

• When using a fully-closed encoder

Set the reference unit or number of reference units per load axis rotation. Check the displayed electronic gear ratio and number of external encoder pitches to see if they are correct, and then enter the positioning completed width. Click **Apply**.

The display will return to the first wizard page and the set data will be written in the flowchart.

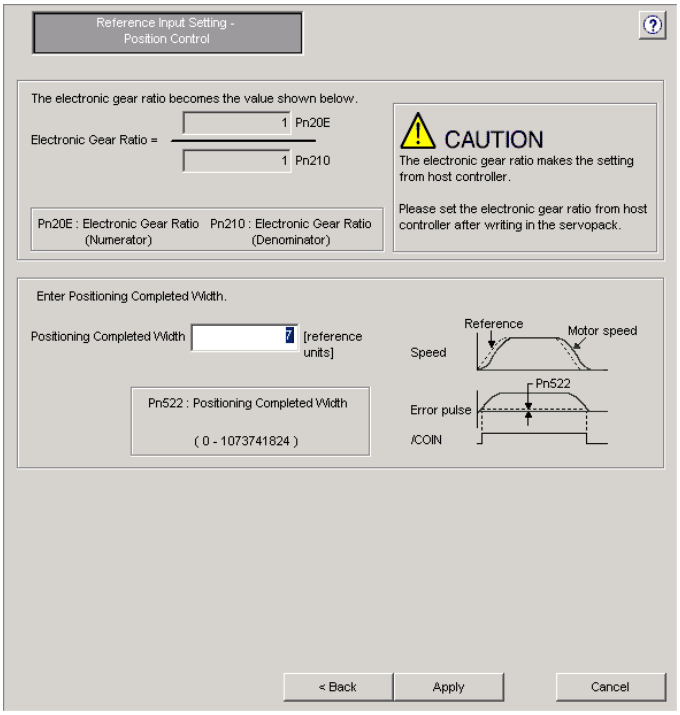
INFO

■ If Control mode settings for all the selected controls are not completed

Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

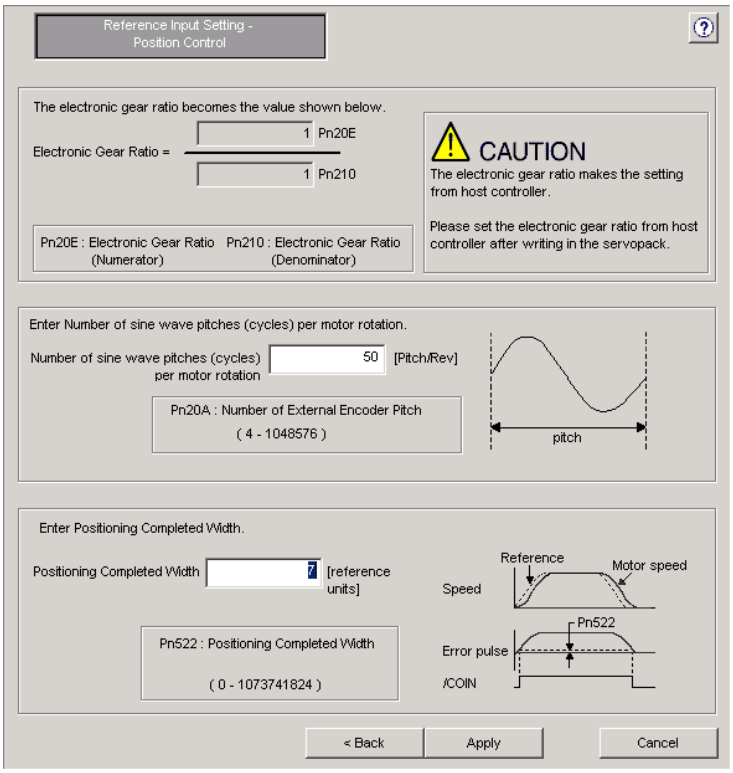
<When the **Set the electronic gear ratio at host controller.** option is selected>

The following wizard page will appear.



Enter the electronic gear ratio and positioning completed width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

• When using a fully-closed encoder



Enter the electronic gear ratio, number of sine wave pitches per motor rotation, and positioning completed width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

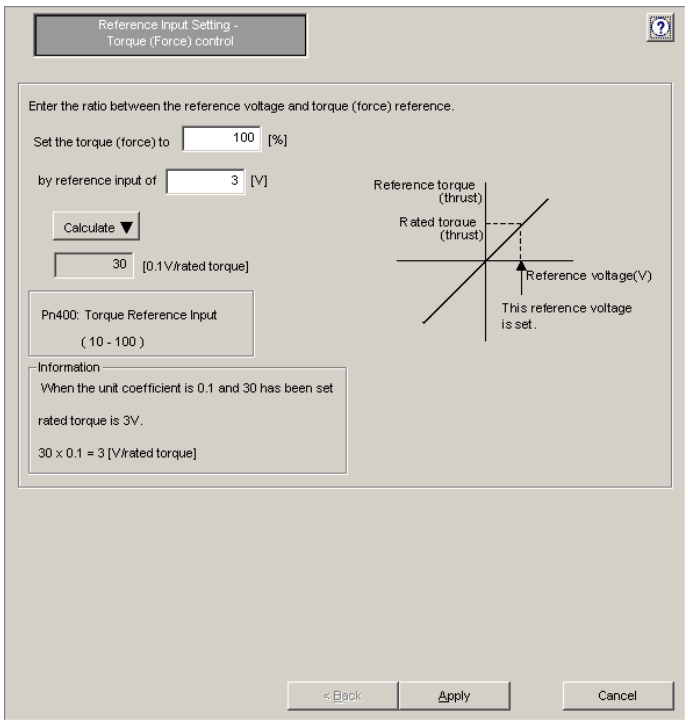
INFO

■ If Control mode settings for all the selected controls are not completed

Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

Control mode: Torque (Force) control

The Reference Input Setting - Torque (Force) Control wizard page will appear.



1. Set the ratio between the reference voltage [V] and the torque (force) reference [%] by entering the values.
2. Click **Calculate**. The torque reference input gain will automatically be calculated and set according to the set ratio between the reference voltage and the torque (force) reference.
3. Click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

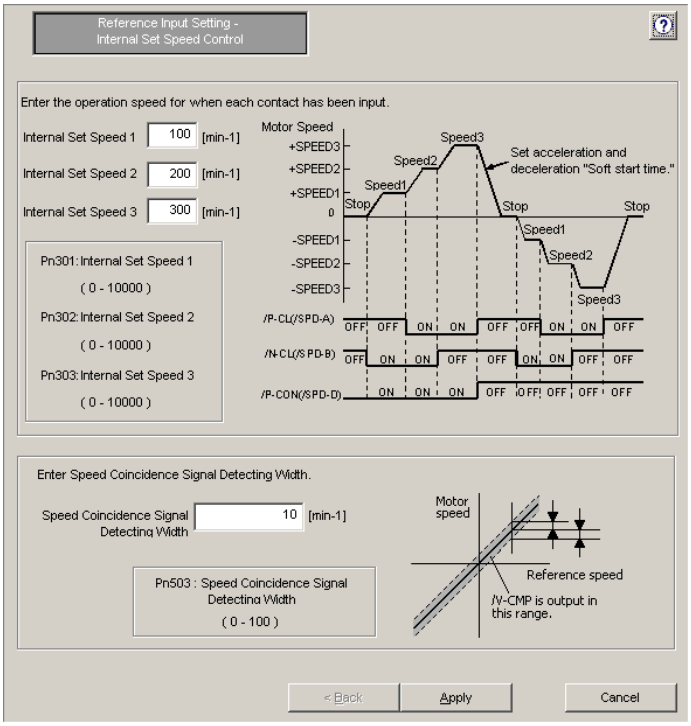
INFO

■ If Control mode settings for all the selected controls are not completed

Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

Control mode: Internal set speed control

The Reference Input Setting - Internal Set Speed Control wizard page will appear.



Enter the internal set speeds 1 to 3 and the speed coincidence signal detecting width, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

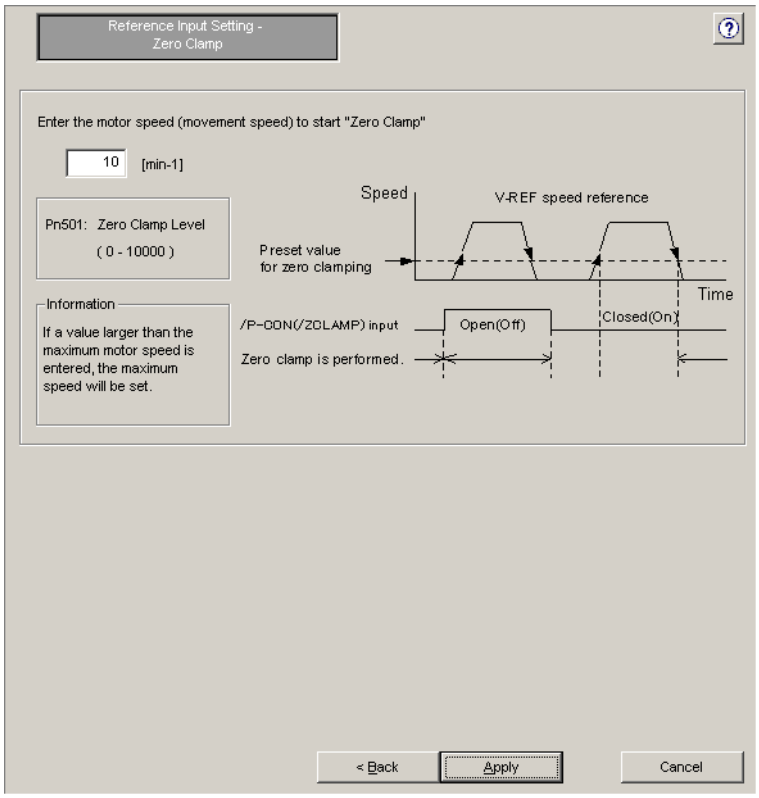
INFO

■ If Control mode settings for all the selected controls are not completed

Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

Control mode: Zero clamp control

The Reference Input Setting - Zero Clamp wizard page will appear.



Enter the zero clamp level, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

INFO

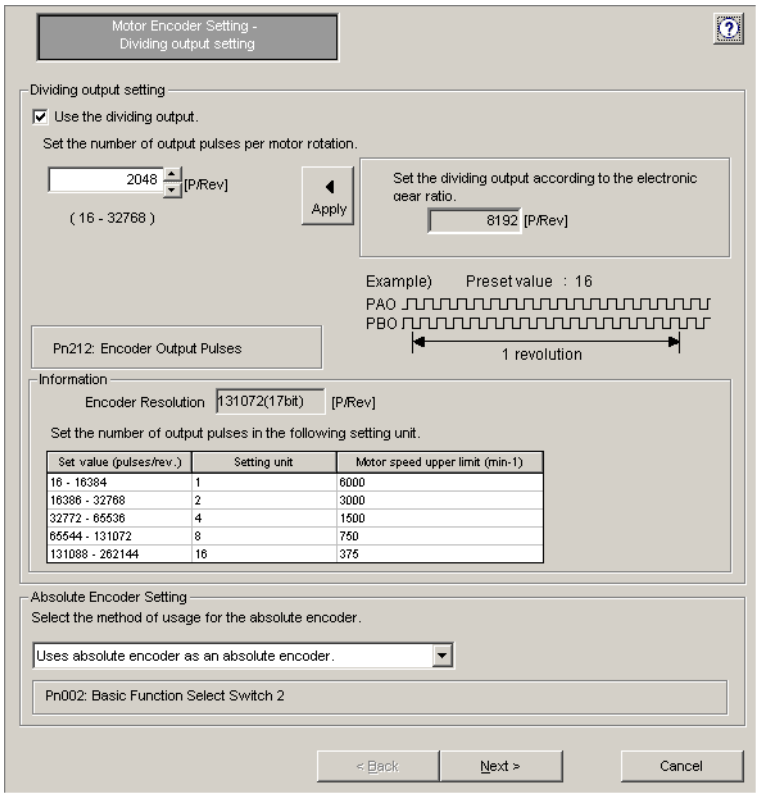
■ If Control mode settings for all the selected controls are not completed

Next will be displayed instead of **Apply**. Click **Next** to display the wizard page for the unset control. Make the required setting on the displayed wizard page.

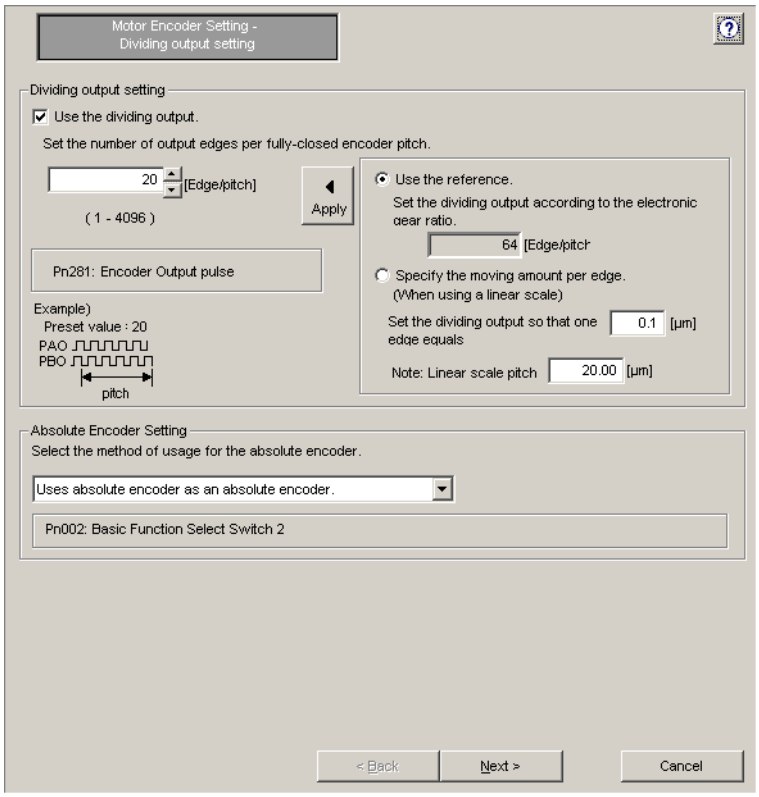
■ Motor Encoder Setting

Motor type: Rotary

1. Click **Motor Encoder Setting** in the flowchart. The Motor Encoder Setting - Dividing output setting wizard page will appear.



<When using a fully-closed encoder>



Dividing output setting

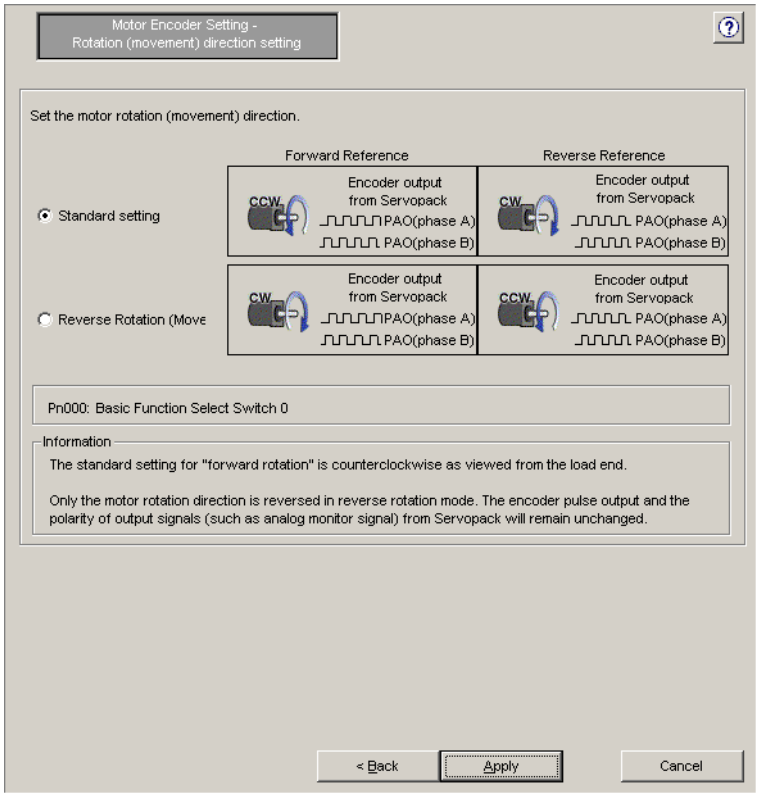
Settings in this wizard page are enabled when the **Use the dividing output.** check box is selected (the check box is selected at the initial startup). Set the number of output pulses per motor rotation from the spin box. When using a fully-closed encoder, set the number of output edges per fully-closed encoder pitch from the spin box.

Alternatively, use the following automatic settings.

- For position control: Dividing output according to the reference units calculated using the electronic gear ratio
- When using a fully-closed encoder: Dividing output according to the movement amount per edge

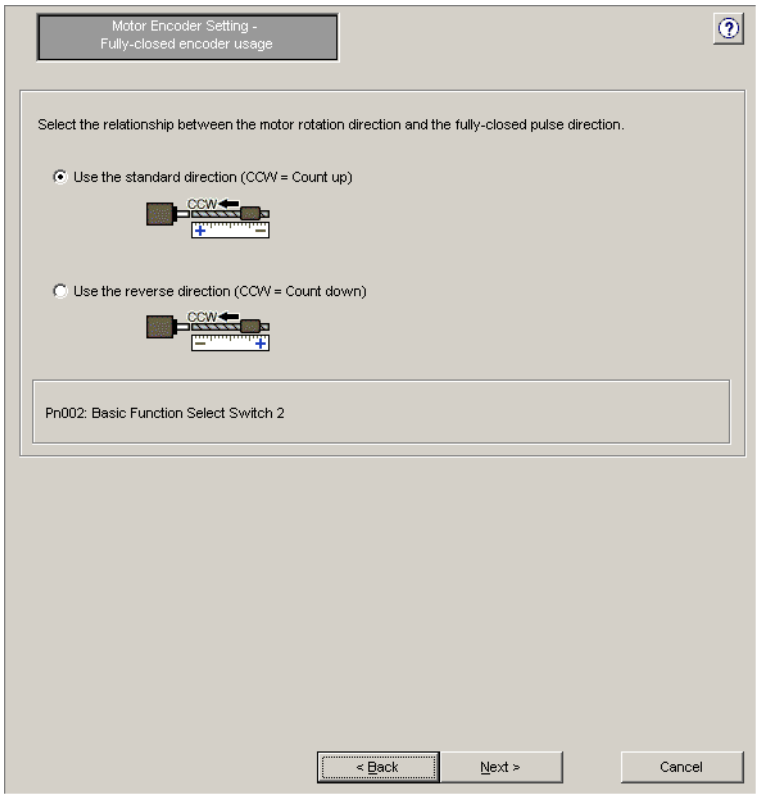
Click **Apply** and the calculated dividing output will be set.

2. Set the dividing output from the spin box, and select the absolute encoder usage from the list when using an absolute encoder. Then, click **Next**. The Motor Encoder Setting - Rotation (movement) direction setting wizard page will appear.



<When using a fully-closed encoder>

The Motor Encoder Setting - Fully-closed encoder usage wizard page will appear.

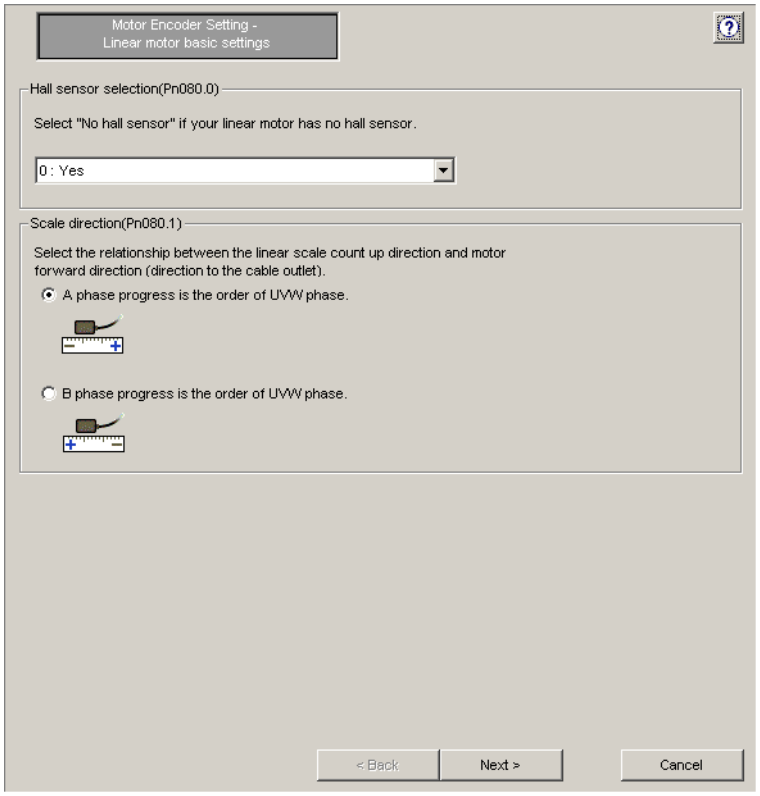


Select the relationship between the motor rotation direction and the fully-closed pulse direction, and then click **Next**. The display will return to the previous wizard page (Motor Encoder Setting - Rotation (movement) direction setting).

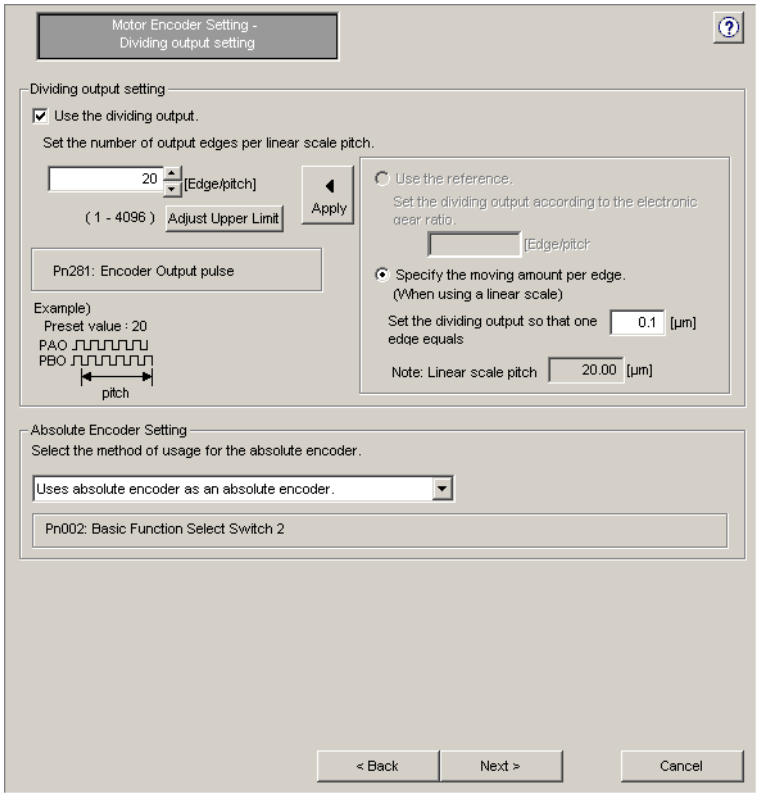
3. Select the motor rotation (movement) direction, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

Motor type: Linear

1. Click **Motor encoder setting** in the flowchart. The Motor Encoder Setting - Linear motor basic settings wizard page will appear.



2. Select whether or not the linear motor has a hall sensor from the list, and select the relationship between the linear scale count up direction and the motor forward direction. Click **Next**, and the Motor Encoder Setting - Dividing output setting wizard page will appear.



Dividing output setting

Settings in this wizard page are enabled when the **Use the dividing output.** check box is selected (the check box is selected at the initial startup). Set the number of output edges per linear scale pitch from the spin box.

Alternatively, use the following automatic settings.

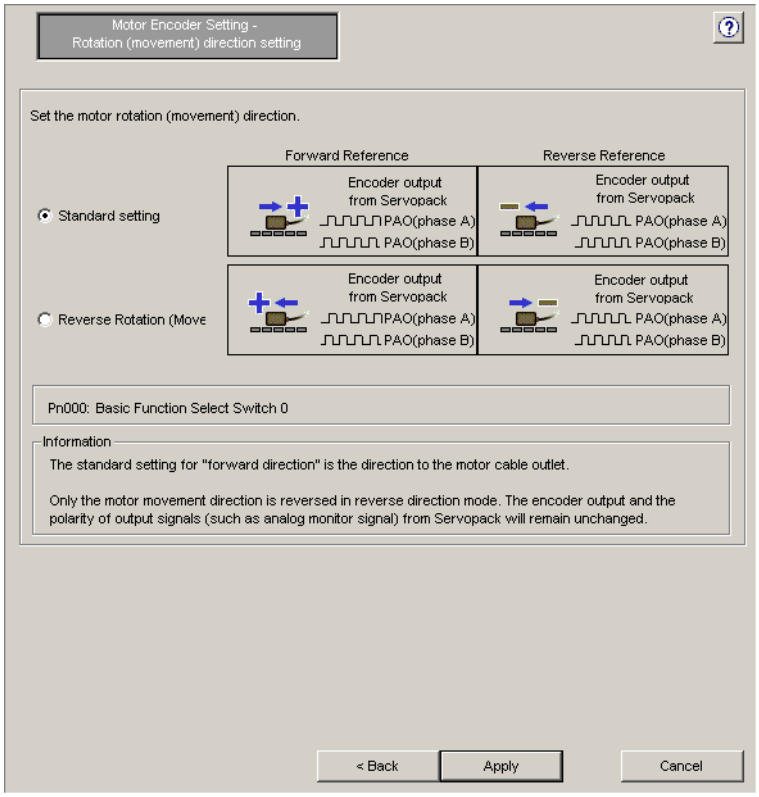
- For position control: Dividing output according to the reference units calculated using the electronic gear ratio
- Dividing output according to the movement amount per edge

Click **Apply** and the calculated dividing output will be set.

Adjust Upper Limit

Click this button to adjust the upper limit for the dividing output setting.

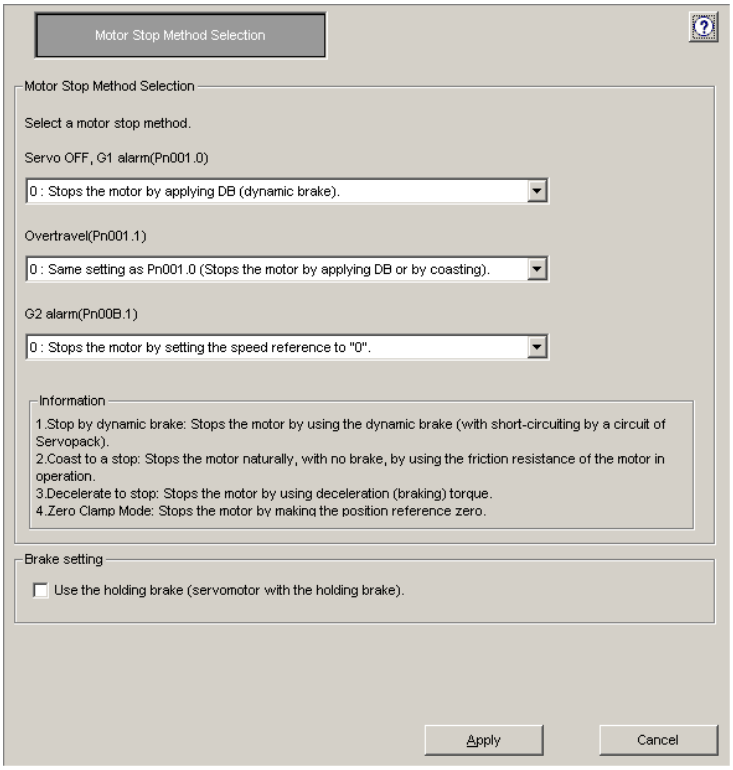
3. Set the dividing output from the spin box, and select the absolute encoder usage from the list when using an absolute encoder. Then, click **Next**. The Motor Encoder Setting - Rotation (movement) direction setting wizard page will appear.



4. Select the motor movement direction, and then click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

■ Motor Stop Method Selection

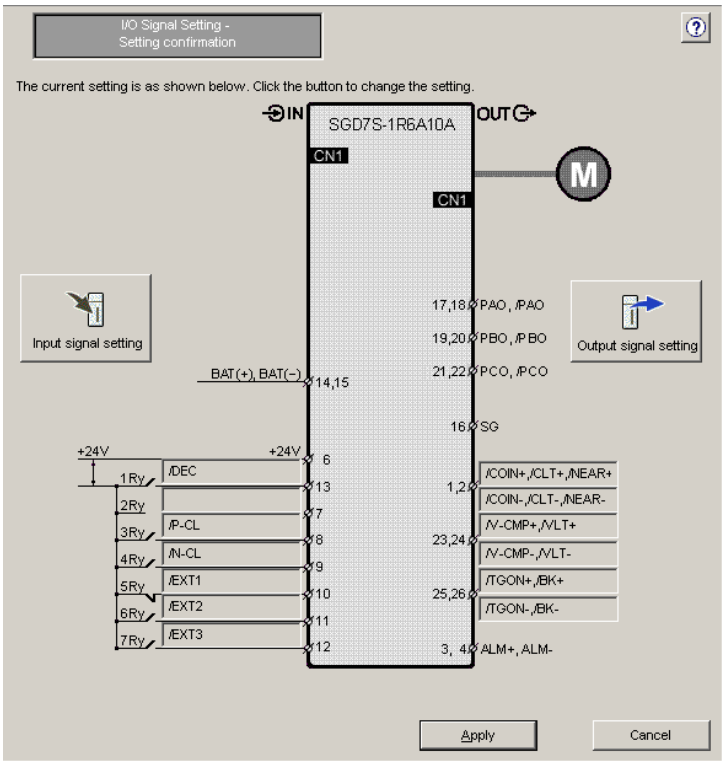
1. Click **Motor Stop Method Selection** in the flowchart. The Motor Stop Method Selection wizard page will appear.



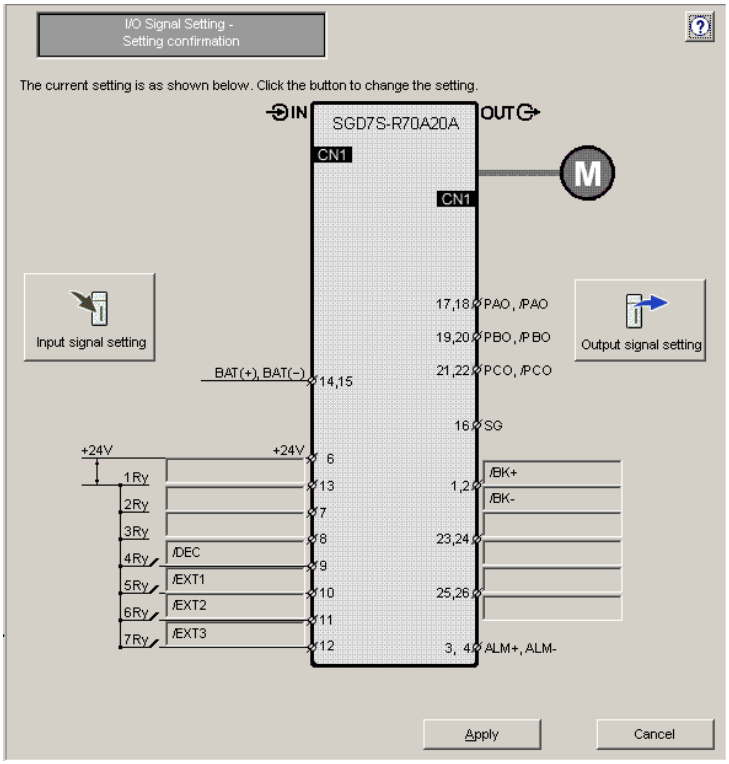
2. Select the motor stop method for each of the three conditions indicated, and select or clear the check box to set whether or not to use a holding brake. Then, click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

■ I/O Signal Setting

1. Click **I/O Signal Setting** in the flowchart. The I/O Signal Setting - Setting confirmation wizard page will appear.



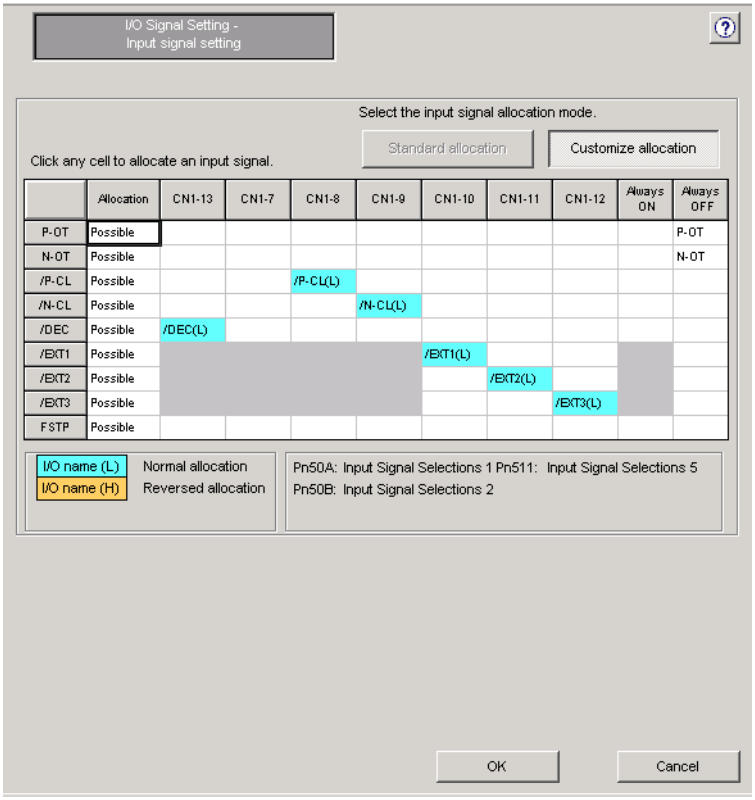
SERVOPACK with MECHATROLINK-II Communications References



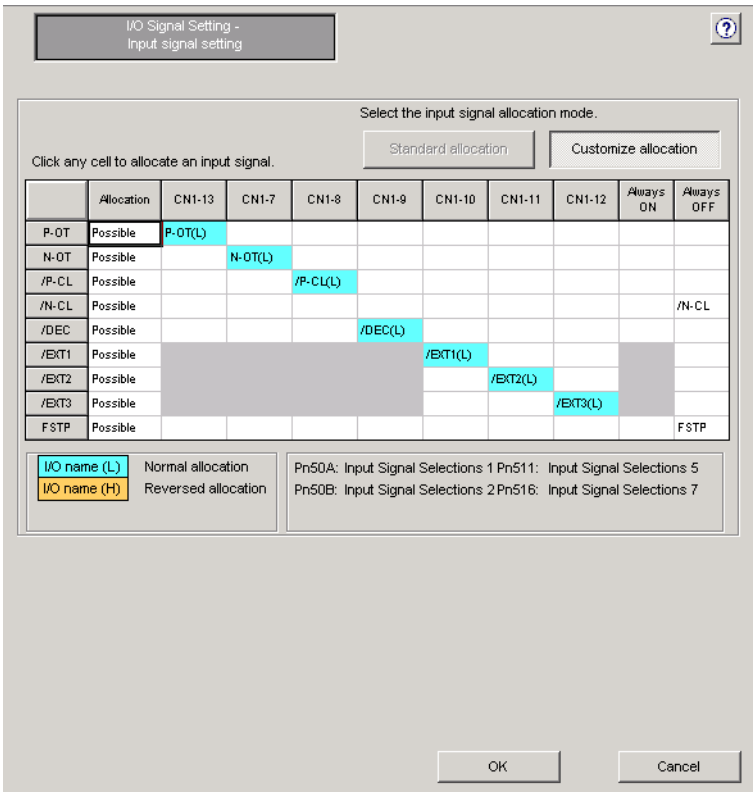
SERVOPACK with MECHATROLINK-III Communications References

2. Click **Input signal setting** to set input signals or **Output signal setting** to set output signals. The following wizard pages will appear for each case.

<Input Signal Setting Wizard Page>



SERVOPACK with MECHATROLINK-II Communications References



SERVOPACK with MECHATROLINK-III Communications References

Standard allocation

Input signals will be allocated by default.

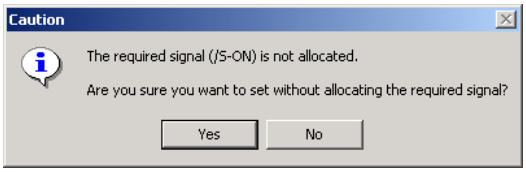
The allocation is fixed to the default setting and cannot be changed.

Customize allocation

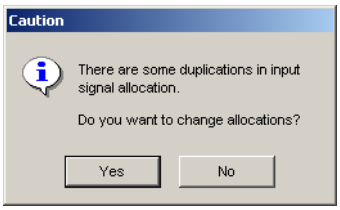
Input signals can be allocated as desired.

Click a cell and the name of the signal to be allocated will be displayed in the cell. To switch between normal allocation and reverse allocation, click the cell again. When the required input signals are allocated, click **OK**.

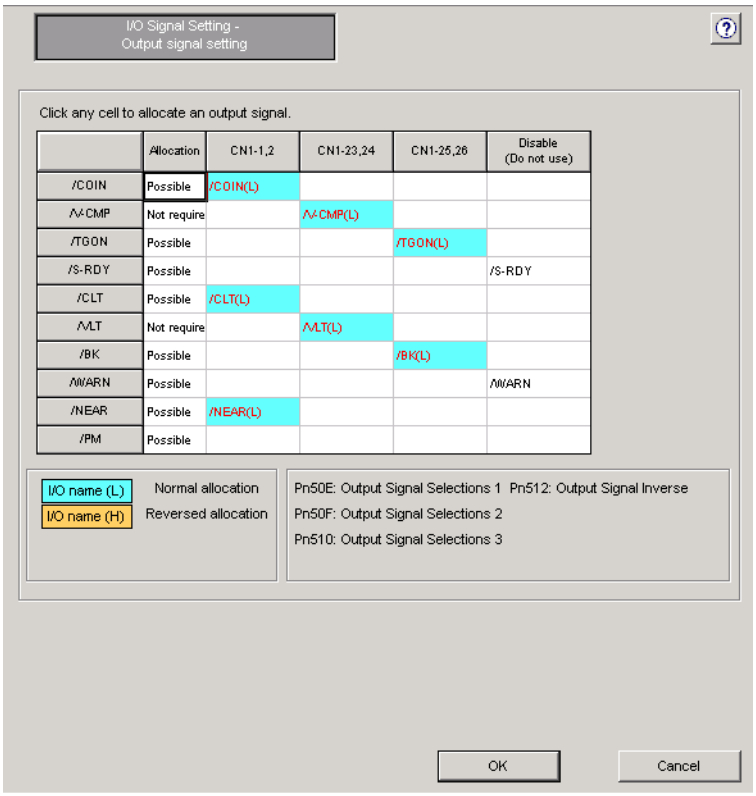
If all required input signals are not allocated, a confirmation message will appear. (The message shown below is an example.)



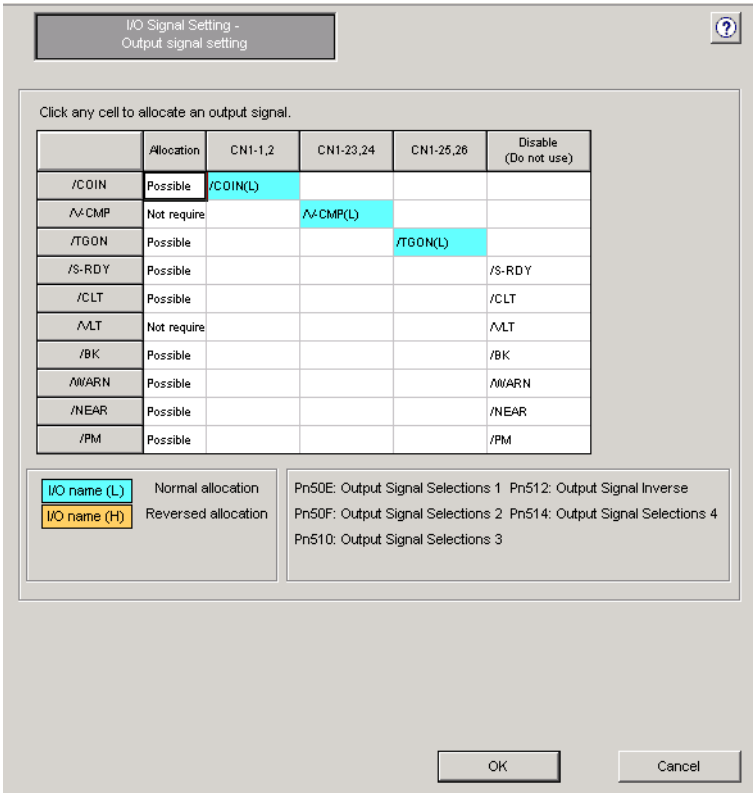
If some input signal allocations are duplicated, the following confirmation message will appear.



<Output Signal Setting Wizard Page>



SERVOPACK with MECHATROLINK-II Communications References



SERVOPACK with MECHATROLINK-III Communications References

Click a cell to allocate an output signal.

3. When all required signals are allocated, click **OK**. The display will return to the wizard page shown in step 1.
4. Click **Apply**. The display will return to the first wizard page and the set data will be written in the flowchart.

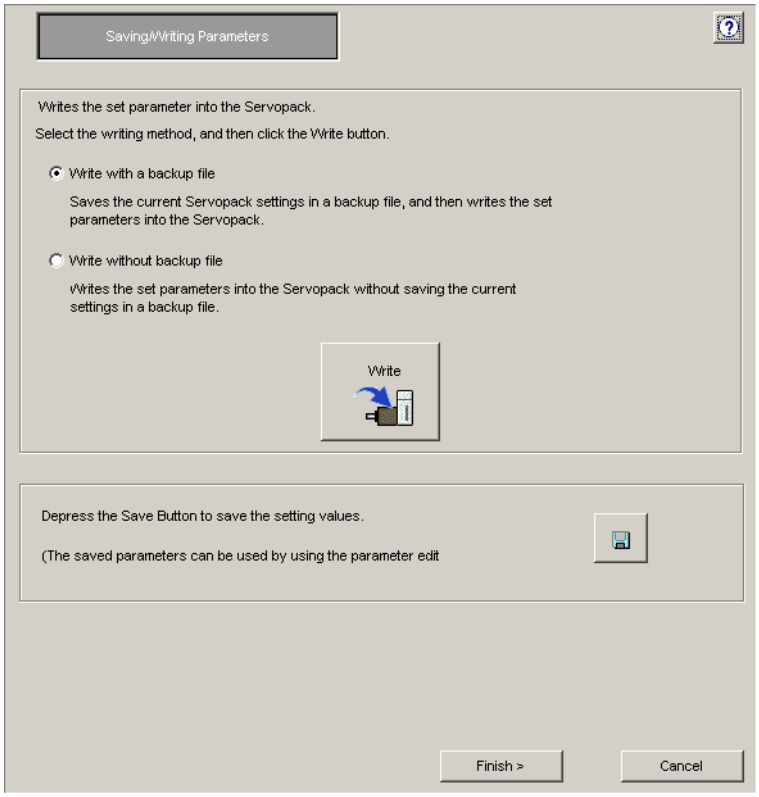
■ Save/Write

Save the settings using the following procedure.

The wizard page for saving/writing parameters into the SERVOPACK when online is different from the wizard page when offline.

<When online>

1. Click **Save/Write** in the flowchart. The Saving/Writing Parameters wizard page will appear.



2. Select the method of writing parameters into the SERVOPACK.

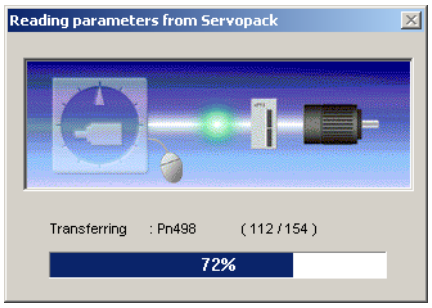
Write with a backup file

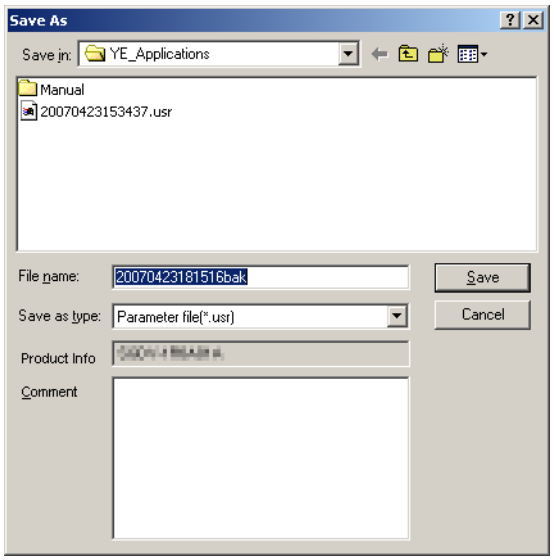
After saving the current settings of the connected SERVOPACK in a backup file, writes the parameters that have been set using the Setup Wizard in the SERVOPACK.

Write without backup file

Without saving the current settings of the connected SERVOPACK, writes the parameters that have been set using the Setup Wizard in the SERVOPACK.

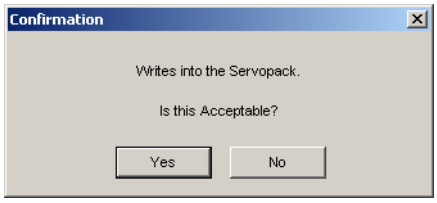
Select either the **Write with a backup file** or the **Write without backup file** option**,** and then click **Write**. When the **Write with a backup file** option is selected, the following windows will appear.



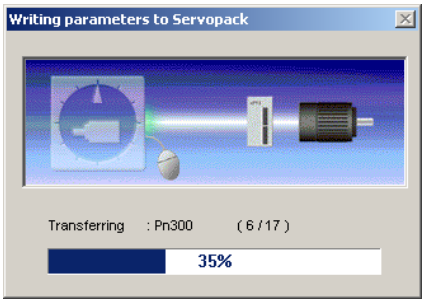


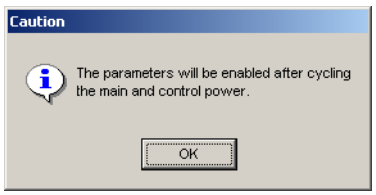
When the **Write without backup file** option is selected, the message shown in step 3 appears.

3. Select the file name and the storage location, and then click **Save**. The following message appears asking for confirmation.



4. Click **Yes.**





5. Click **OK**. The display will return to the wizard page shown in step 1.

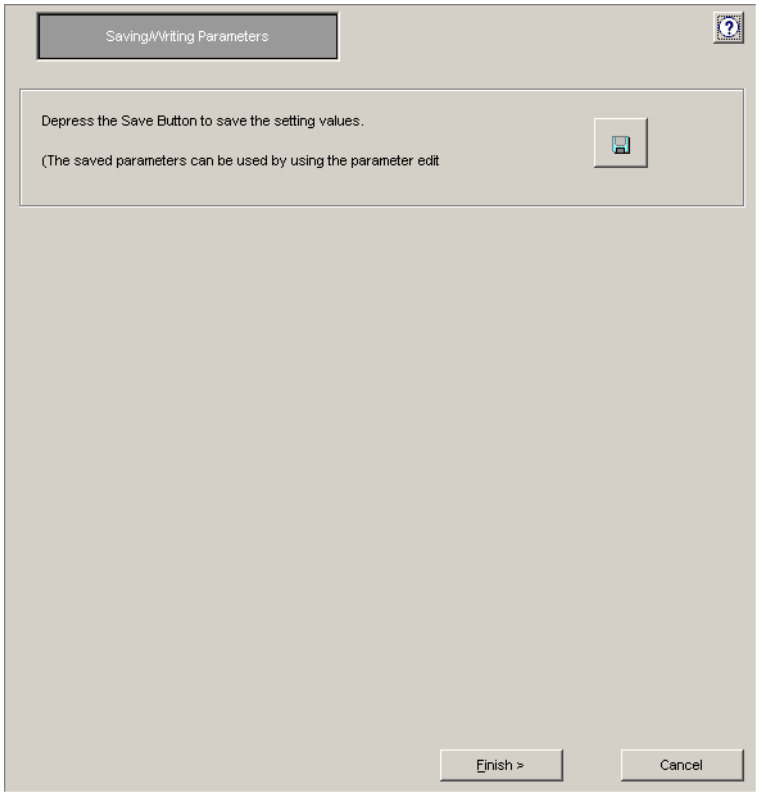
6. Click the  button to save the setting data.

7. Click **Finish** to quit the Setup Wizard. The following message appears asking for confirmation.

8. Click **Yes**.

<When offline>

1. Click **Save/Write** in the flowchart. The Saving/Writing Parameters wizard page will appear.



2. Click the  button to save the setting data.
3. Click **Finish** to quit the Setup Wizard. The following message appears asking for confirmation.

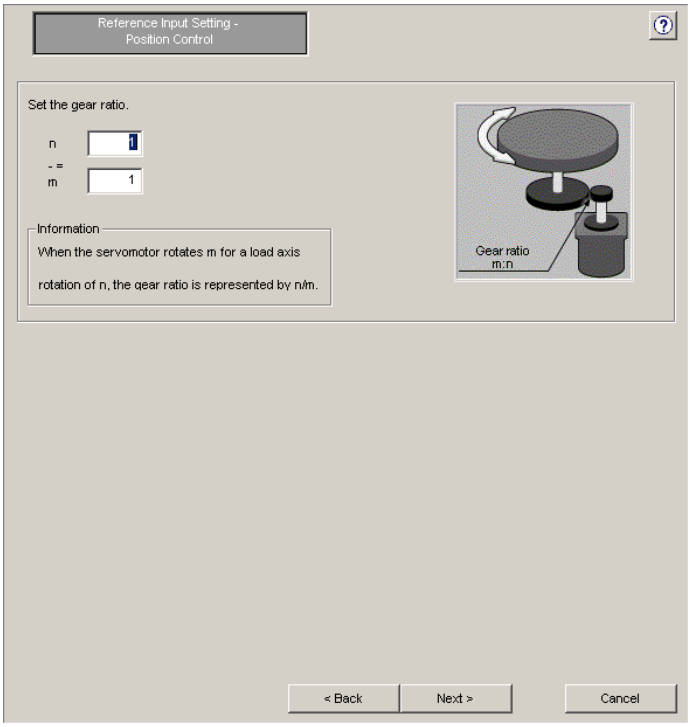
4. Click **Yes**.

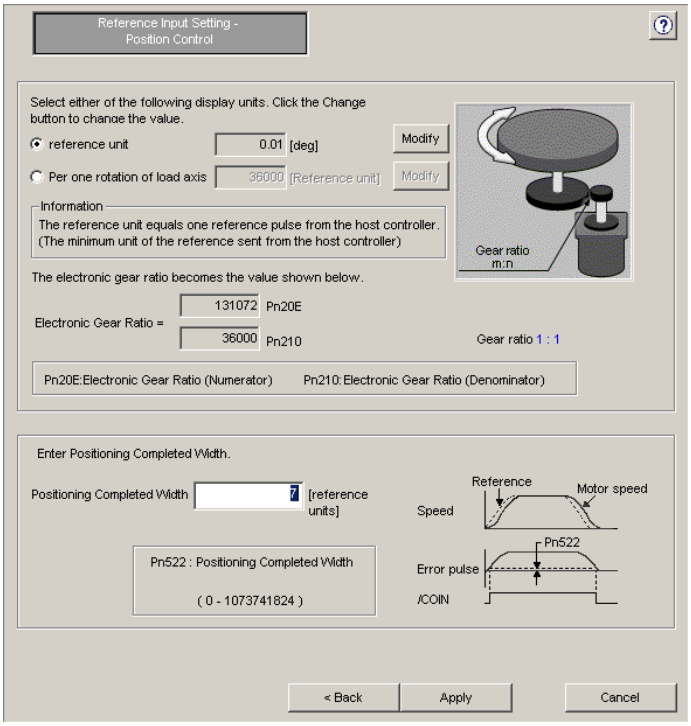
■ Supplemental Information

The Reference Input Setting - Position Control wizard page will vary depending on the electronic gear mechanical structure.

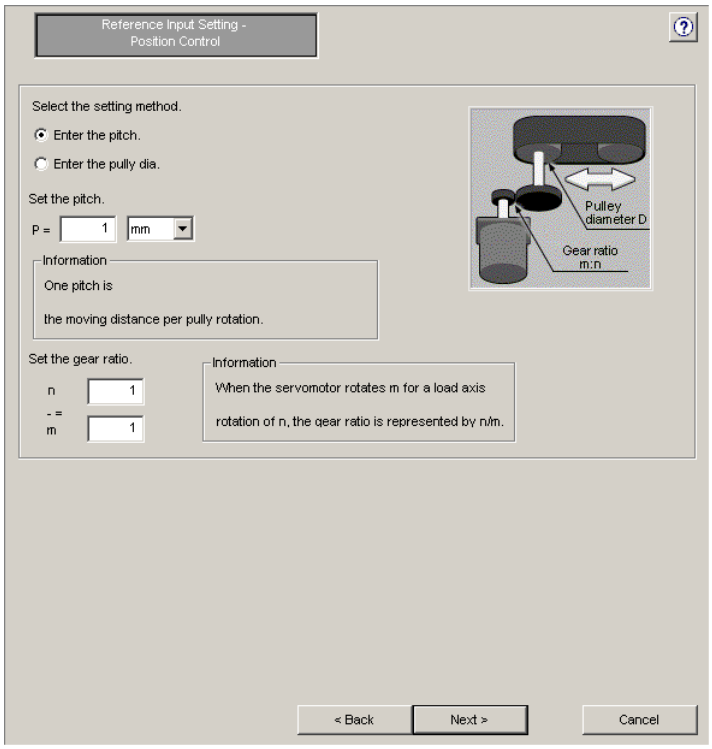
Electronic Gear Mechanical Structure

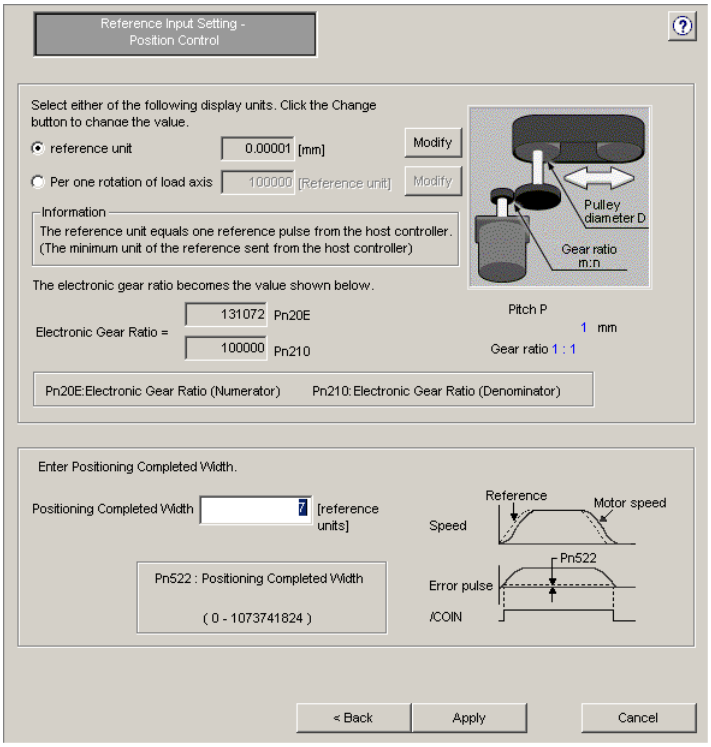
<When Round table is selected>



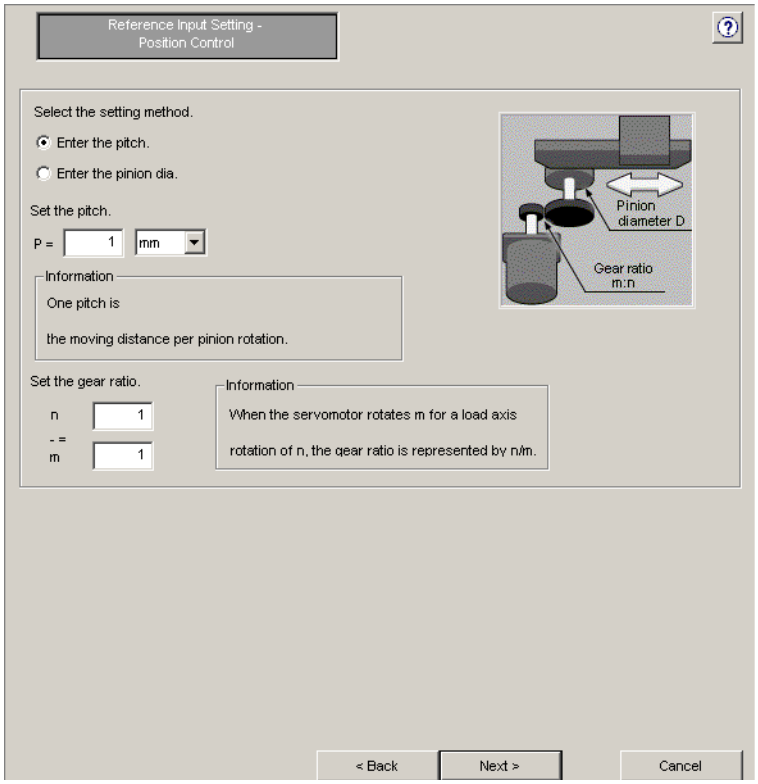


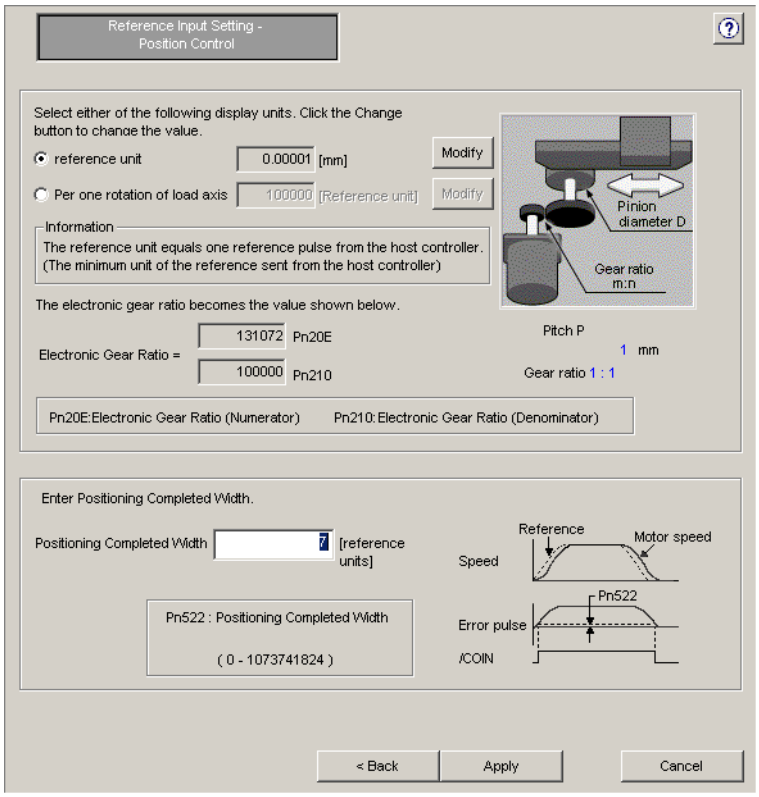
<When Belt and Pulley is selected>



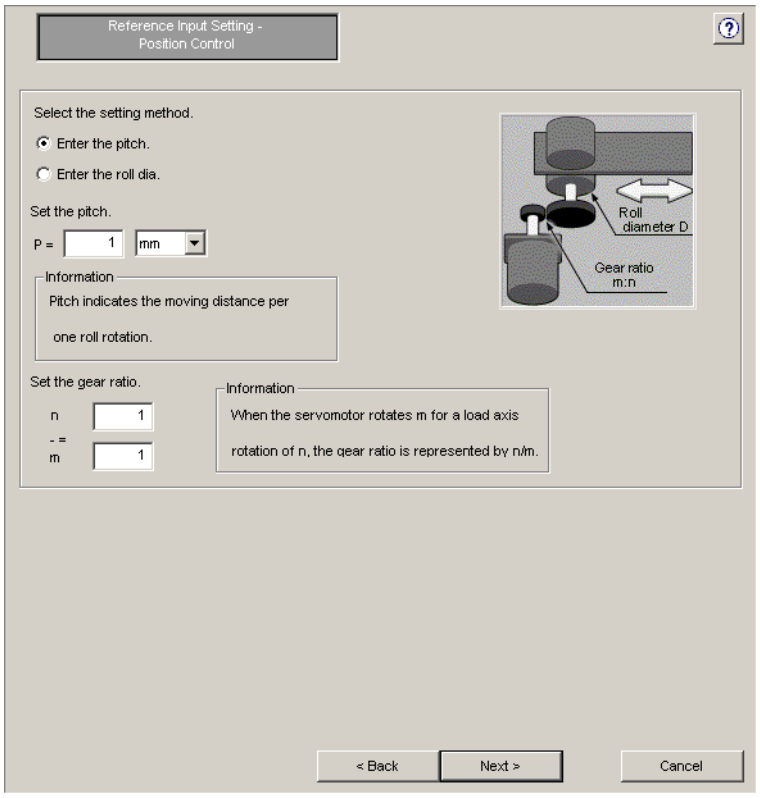


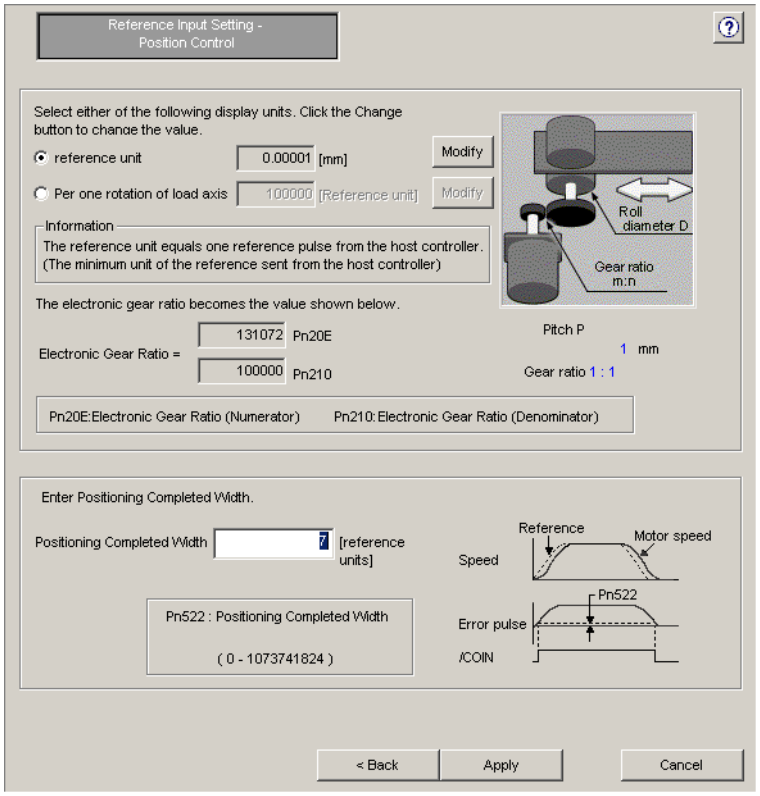
<When Rack and Pinion is selected>



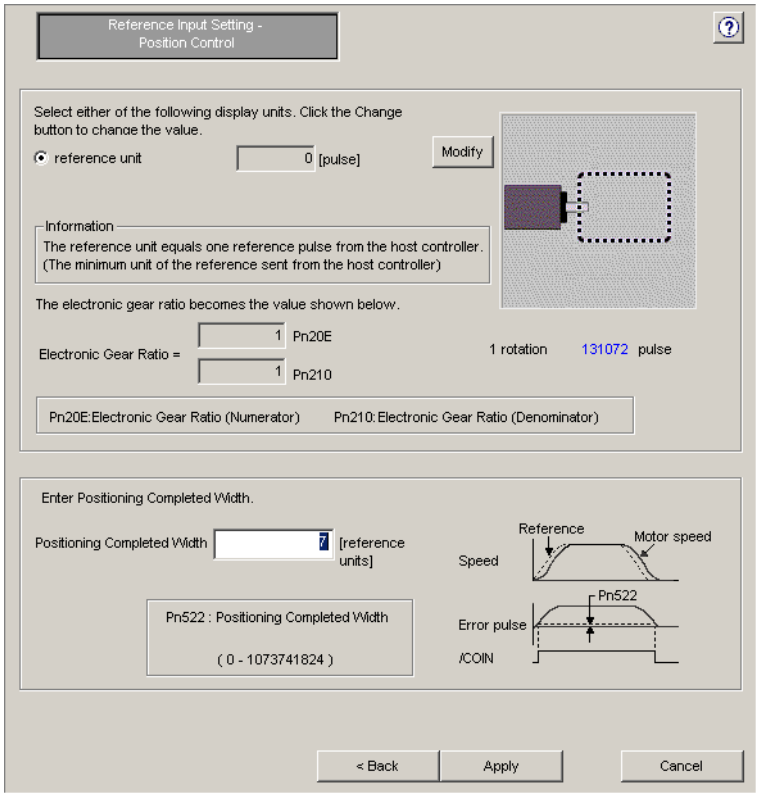


<When Roll feed is selected>





<When Other is selected>



4.2.4 Parameter Converter

The parameter converter converts the parameter data of a Σ, Σ-II, Σ-III, or Σ-V-series SERVOPACK (hereinafter referred to as a previous Σ-series SERVOPACK) to Σ-7-series SERVOPACK-compatible parameter data. The previous Σ-series SERVOPACK parameters in the specified file will be automatically converted to Σ-7-series SERVOPACK-compatible parameters and saved in a file.

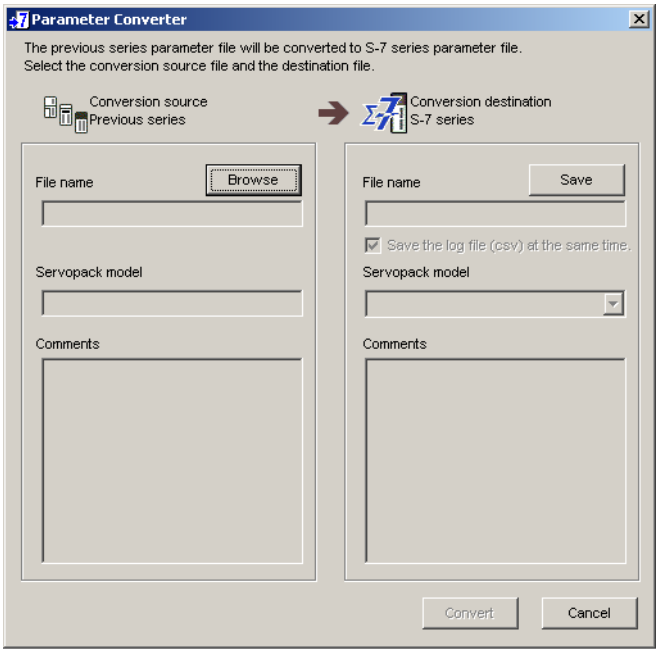
Convert parameters using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Parameters** and then click **Parameter Converter**.

INFO

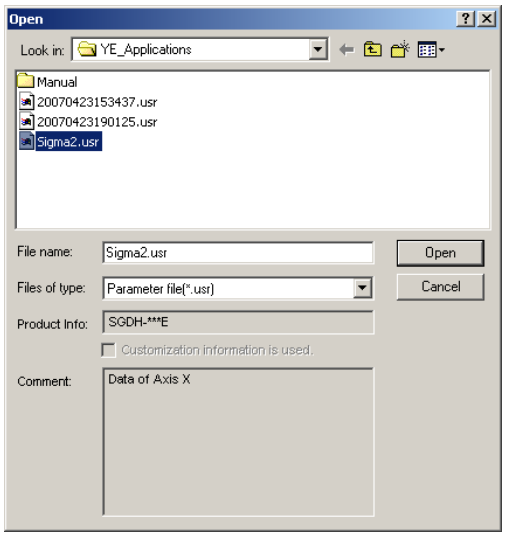
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to 4.1 Changing Axes.

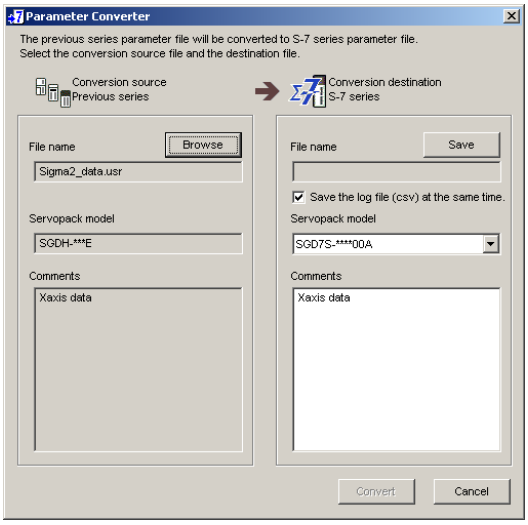


Parameter Converter Window

2. Click **Browse**. The Open box will appear.



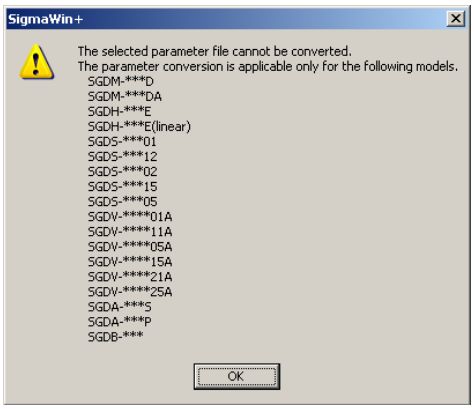
3. Select the conversion source, a parameter file of the previous Σ-series SERVOPACK, and then click **Open**.
   The selected file is imported and the imported file name, SERVOPACK model, and comments are displayed under **Conversion source**. Also, the SERVOPACK model under **Conversion destination** is automatically set.



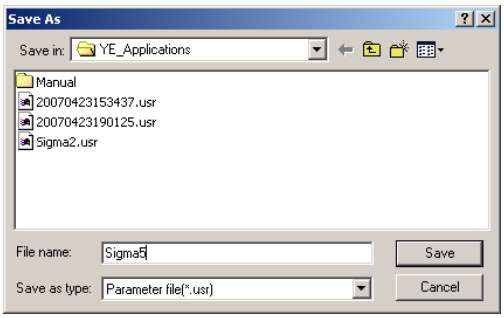
A window with the file name, SERVOPACK model,
and comments on imported data displayed

■ If a file that cannot be converted is selected

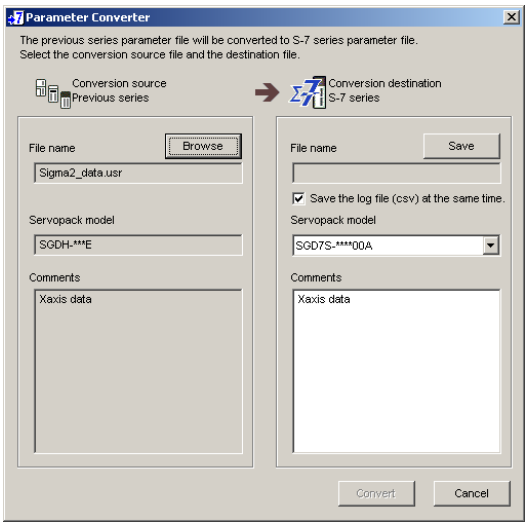
A message will appear telling you that the selected file cannot be converted.



4. Click **Save**. The Save As box will appear.

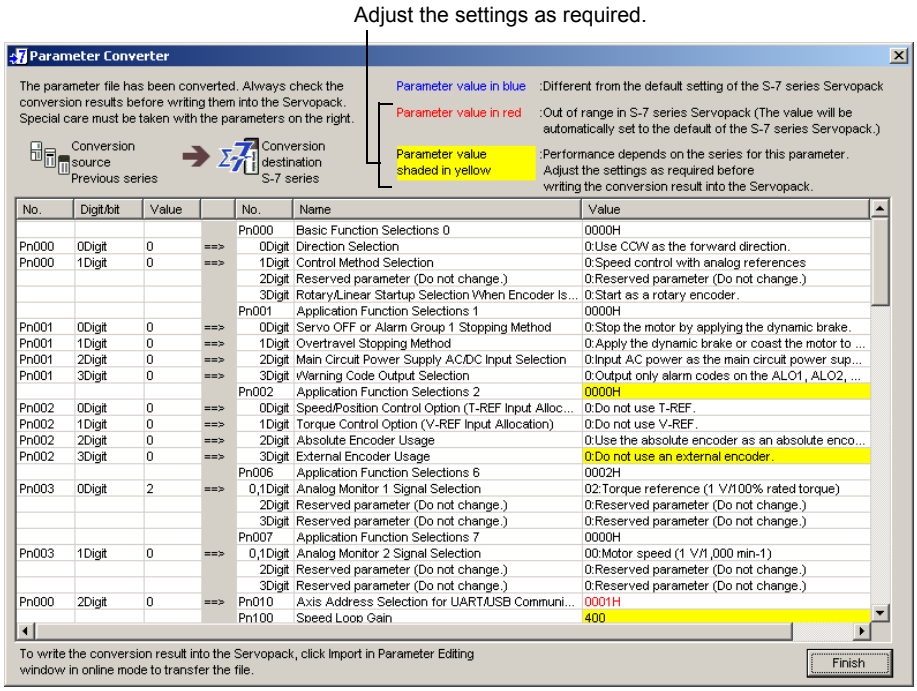


5. Select the storage location for the converted parameter file, and then click **Save**. The file name, the SERVOPACK model of the conversion destination, and the comments on the conversion source file will be displayed under **Conversion destination** in the Parameter Converter window.



Reselect the SERVOPACK model from the **Servopack Model** list as required. (A SERVOPACK model whose capacity is equal or closest to the SERVOPACK model of conversion source will be automatically set under **Conversion destination**.)

6. Click **Convert**.
   The parameter data for the previous Σ-series SERVOPACK will be converted to Σ-7-series SERVOPACK-compatible parameter data and saved in a newly created parameter file.
   When conversion is complete, the conversion results will be displayed in the Parameter Converter window.



INFO

When the **Save the log file (csv) at the same time.** check box is selected in the Parameter Converter window, a CSV formatted log file with the same name as the converted parameter file will be separately created in the same location as the converted parameter file.

Always check the conversion results before writing them into the Σ-7-series SERVOPACK.

Some parameter data is displayed in blue, red, or shaded in yellow to distinguish it:

- Blue: The converted value is different from the default setting of the Σ-7-series SERVOPACK.
- Red: The converted value is out of range in the Σ-7-series SERVOPACK. (The value will automatically be set to the default value of the Σ-7-series SERVOPACK.)
- Shaded in yellow: Performance is different between the previous Σ-series SERVOPACK and the Σ-7-series SERVOPACK.

NOTE

Adjust the settings of the parameters displayed in red and shaded in yellow in the conversion results as required.

7. Click **Finish** to quit the parameter converter function.

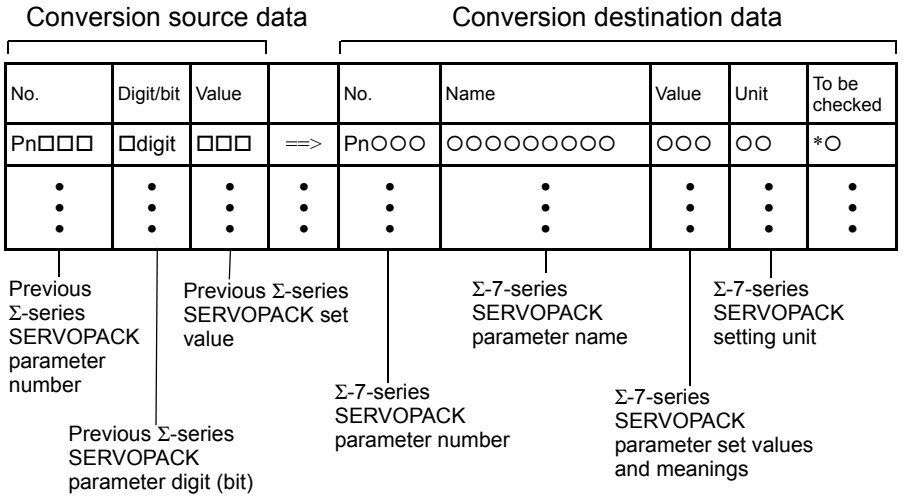
NOTE

- See "4.2 Editing Parameters" for information on how to adjust the conversion results.
- After checking and adjusting the conversion results, import the parameter settings using the parameter online editing function. See "Parameter Editing when Online" of "4.2.1 Editing Parameters" for details.

INFO

■ How to Read the Log File

When the **Save the log file (csv) at the same time.** check box is selected, the following CSV formatted log file will be created after conversion.



"*○" in the "To be checked" column indicates one of the following parameters.

*1. The converted value is different from the default setting of the Σ-7-series SERVOPACK.

*2. The converted value is out of range in the Σ-7-series SERVOPACK. (The value will automatically be set to the default value of the Σ-7-series SERVOPACK.)

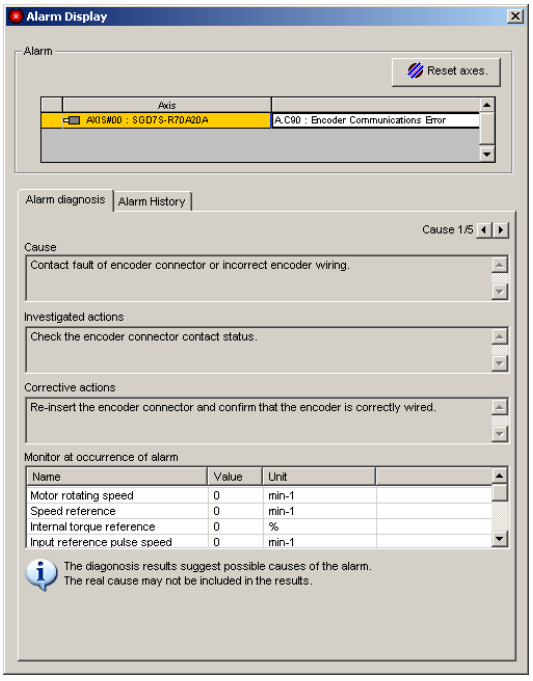
*3. The performance of the parameter is different between the previous Σ-series SERVOPACK and the Σ-7-series SERVOPACK.

4.3 Alarms

4.3.1 Displaying Alarms

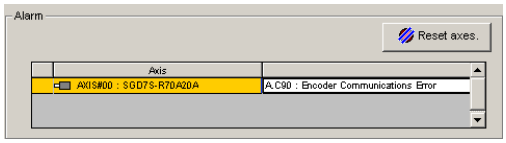
Alarms can be viewed in the Alarm Display. The alarm diagnostic function is also provided to suggest possible causes of the alarm according to diagnostic alarm latch data saved just before the alarm occurrence. It will also display suggested corrective actions.

In the SigmaWin+ Σ-7 component main window, click **Alarm** and then click **Display Alarm**.



Alarm Display

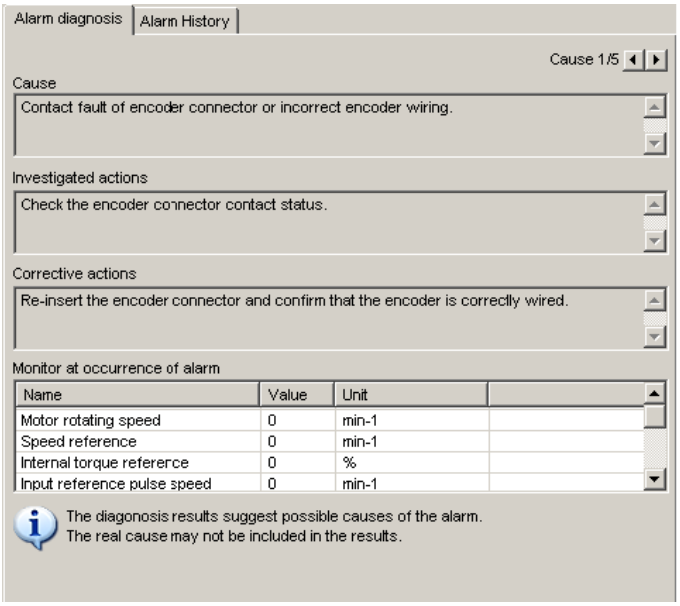
Alarm



The axis number and current alarm will be displayed

To clear an alarm, click **Reset** after removing the cause of the alarm. The alarm will continue until the cause is removed, and then the information on the screen will be subsequently updated.

Alarm Diagnosis Tab



Cause (Currently displayed page)/ (Total pages = Total of causes)

Displays the total number of possible causes of the alarm. Click the setting arrows to change the page.

Cause

Displays a possible cause of the current alarm.

Investigated actions

Displays the investigated actions of the current alarm.

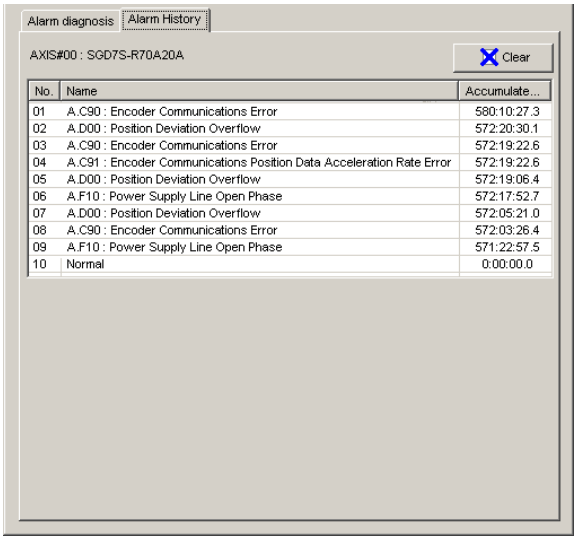
Corrective actions

Displays suggested corrective actions for the current alarm.

Monitor at occurrence of alarm

Displays the data monitored just before the alarm occurrence.

Alarm History Tab



The SERVOPACK stores a history of the 10 most recent alarms. These are shown in order of occurrence with their alarm numbers and names.

When a new alarm occurs, it is stored as number 1, and the numbers of the other alarms are raised starting from the top of the list. For example, what was alarm number 1 now becomes number 2. The last alarm is eliminated. These numbers are changed immediately when an alarm occurs.

Click **Clear** to delete or clear the alarm history.

4.3.2 Resetting Motor Type Alarms

You can use a Σ-7-series SERVOPACK to operate either a Rotary Servomotor or a Linear Servomotor.

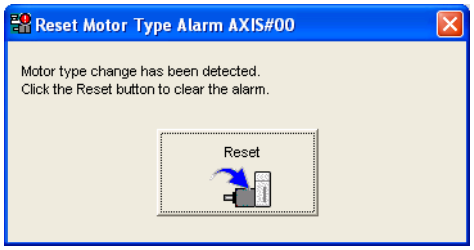
Once you connect the SERVOPACK to the Servomotor, information on the connected Servomotor is saved in the SERVOPACK.

If you then connect a different type of Servomotor, a Motor Type Change Detected (A.070) alarm will occur.

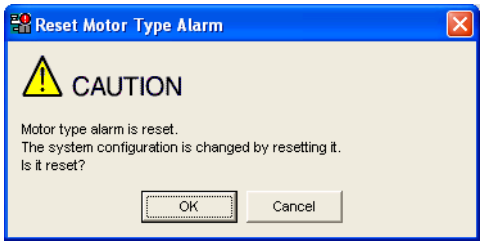
You can use the Reset Motor Type Alarm menu command to reset this alarm if it occurs.

Use the following procedure to reset the motor type alarm.

1. Select ***Alarm*** – ***Reset Motor Type Alarm*** from the menu bar of the SigmaWin+ Σ-7 component main window. The **Reset Motor Type Alarm** dialog box will be displayed.

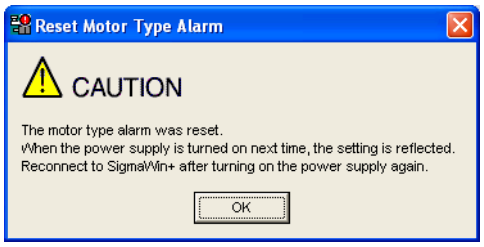


2. Click **Reset**.
   The following dialog box will be displayed.



   Click **Cancel** to cancel resetting the motor type alarm.

3. Click **OK**.



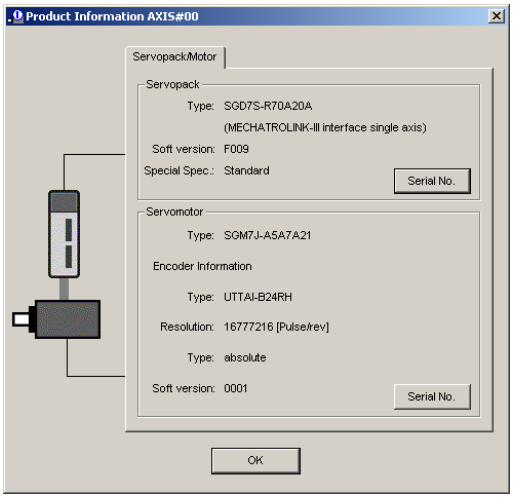
4. Click **OK** and turn the power supply to the SERVOPACK OFF and ON again.

4.4 Monitor

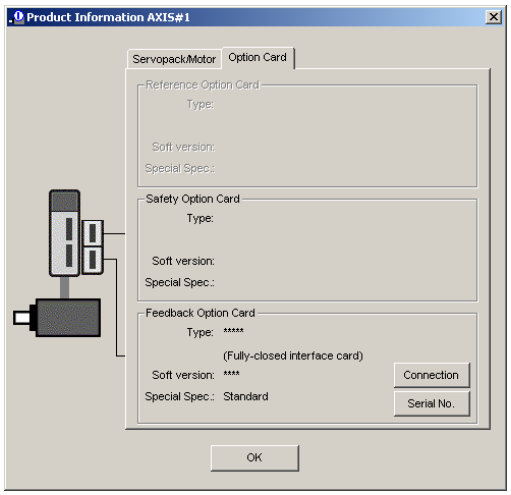
4.4.1 Product Information

Information about the SERVOPACK and the motor can be viewed in the Product Information window.

In the SigmaWin+ Σ-7 component main window, click **Monitor** and then click **Product Information**. Information about the SERVOPACK, the motor, and the option modules will be displayed.



SERVOPACK/Motor Tab



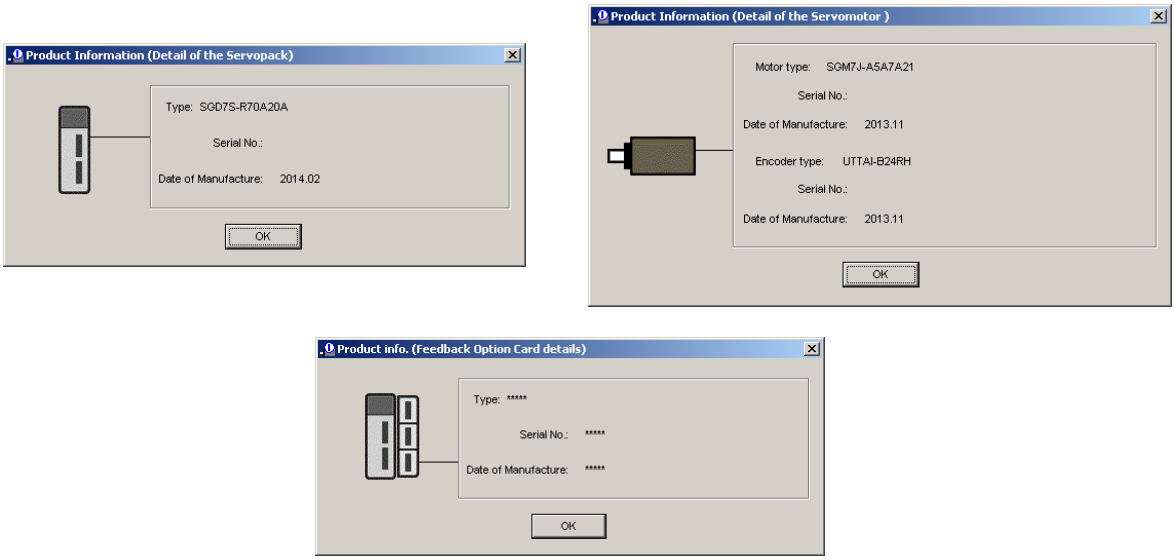
Option Card Tab

(Displayed only when option modules are mounted)

Production Information Window

Serial No.

Displays the details of the respective product information.



(Displayed only when option modules are mounted)

Production Information (Detail) Window

Click **OK** to return to the SigmaWin+ Σ-7 component main window.

4.4.2 Monitor

The servo system's status, SERVOPACK's status, movement, and I/O signal status can be monitored on the computer screen.

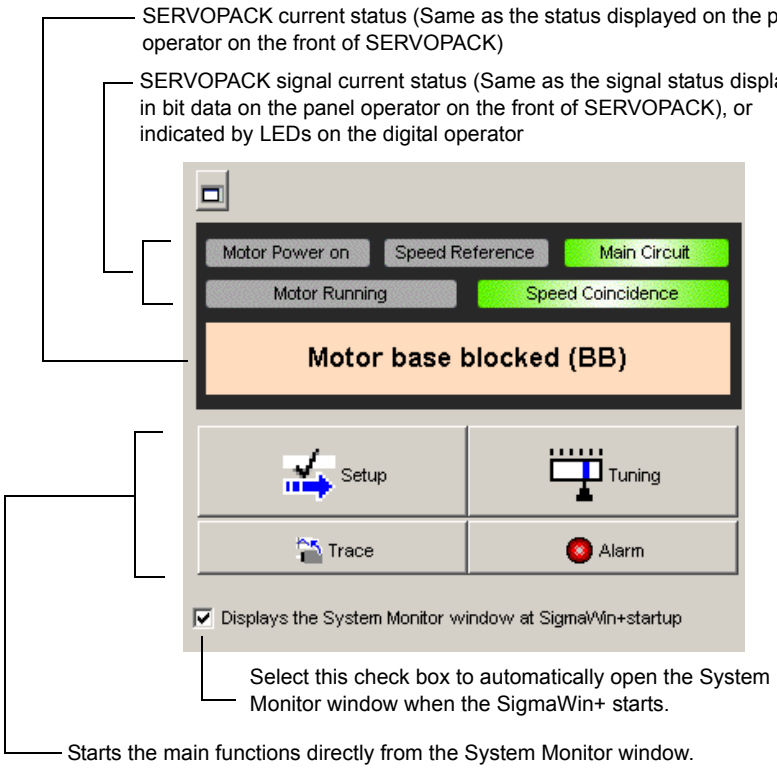
There are five types of monitor windows: System Monitor, Status Monitor, Motion Monitor, Input Signal Monitor, and the Output Signal Monitor.

The monitor windows are independent of each other, but several windows can be displayed at the same time.

Select the items to be monitored in the Monitor Item Setting Window (For System Monitor, the items to be monitored are fixed and cannot be selected.)

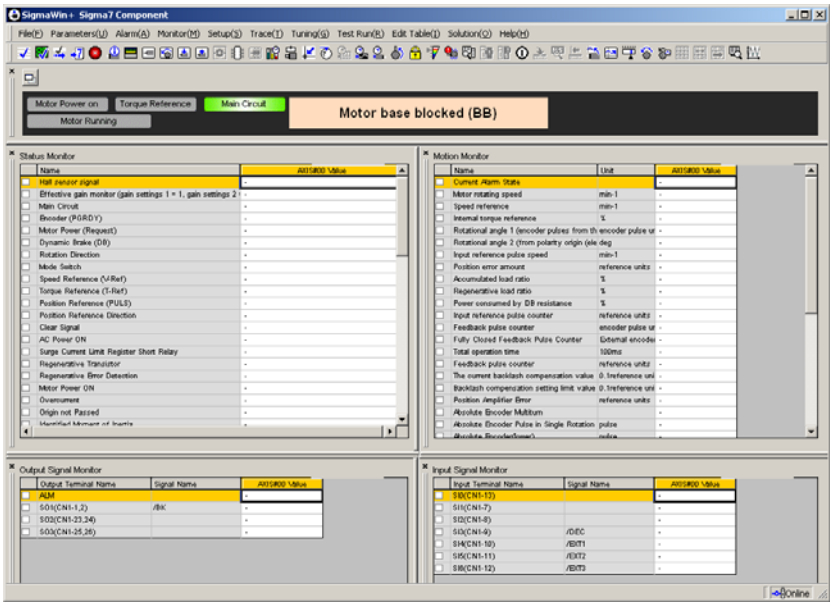
System Monitor

The System Monitor window will automatically open when the SigmaWin+ starts. Or, in the SigmaWin+ Σ-7 component window, click **Monitor**, point to **Monitor**, and then click **System Monitor**.

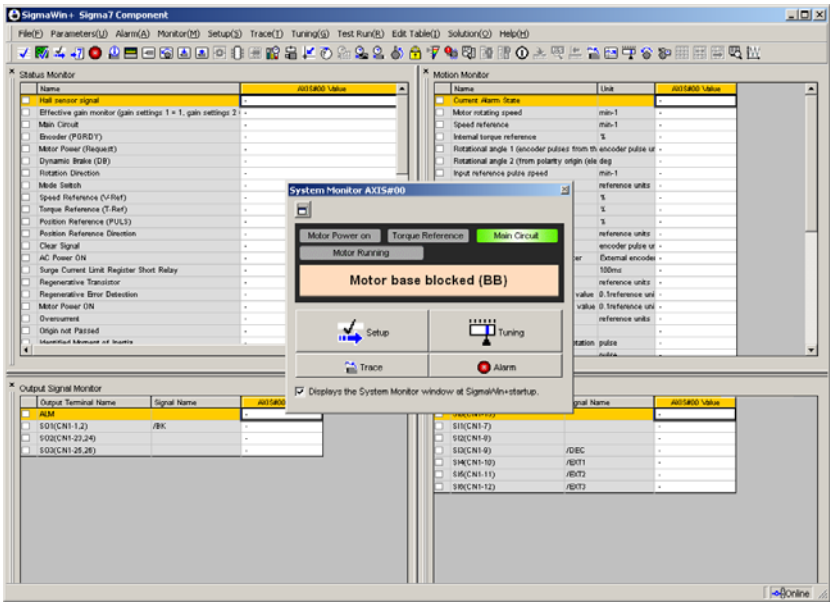


INFO

The System Monitor window is a dockable window. By clicking the button, the System Monitor window can be docked in the top frame of the application's window, or can be viewed as a floating window.



Docked System Monitor Window



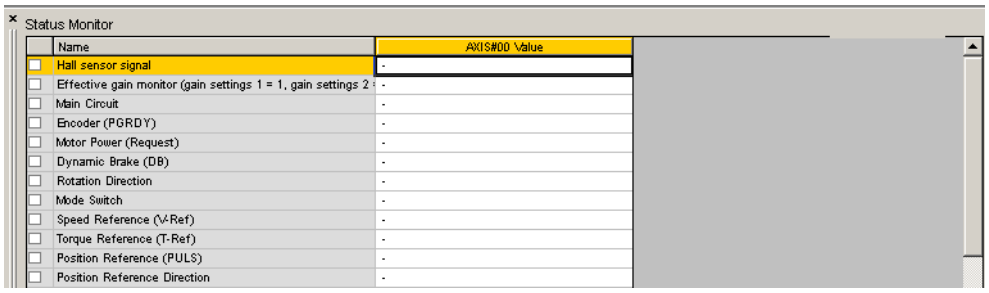
Floating System Monitor Window

Status Monitor

The status monitor function monitors the SERVOPACK status.

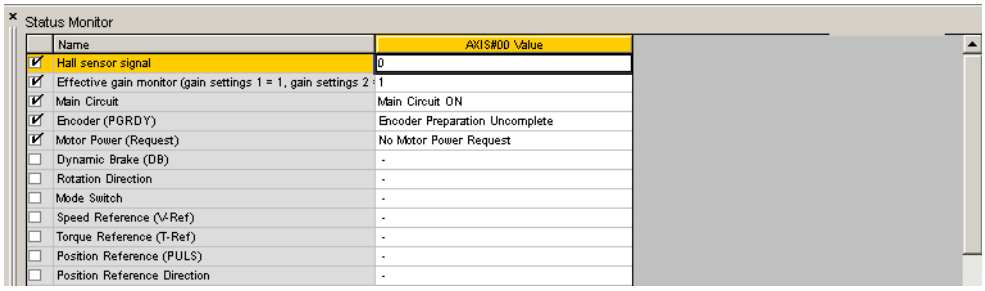
To monitor the status of the SERVOPACK, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Monitor**, point to **Monitor** and click **Status Monitor**.



   The items which can be monitored are listed.

2. Select the items to be monitored. The current status of a selected item is displayed in "Value" column.

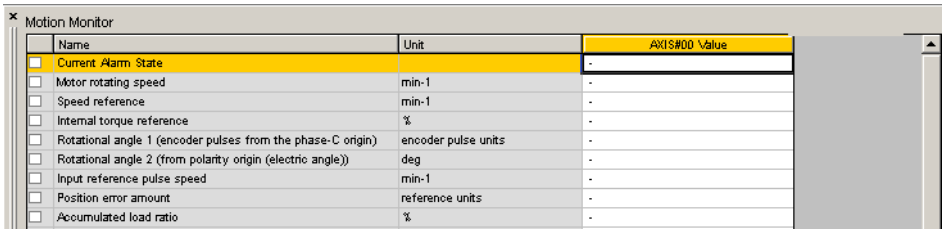


Motion Monitor

The motion monitor function monitors the SERVOPACK motion.

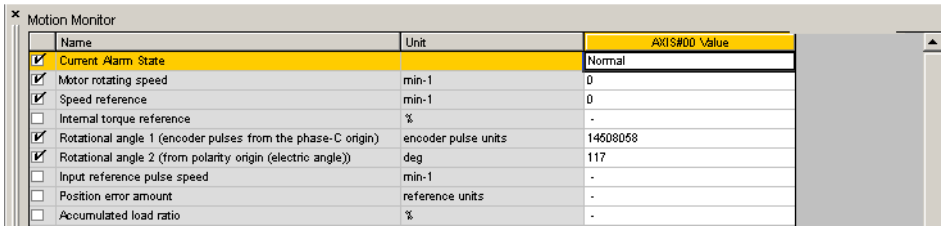
To monitor the motions of the SERVOPACK, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Monitor**, point to **Monitor** and click **Motion Monitor**.



The items which can be monitored are listed.

2. Select the items to be monitored. The current status of a selected item is displayed in the "Value" column.

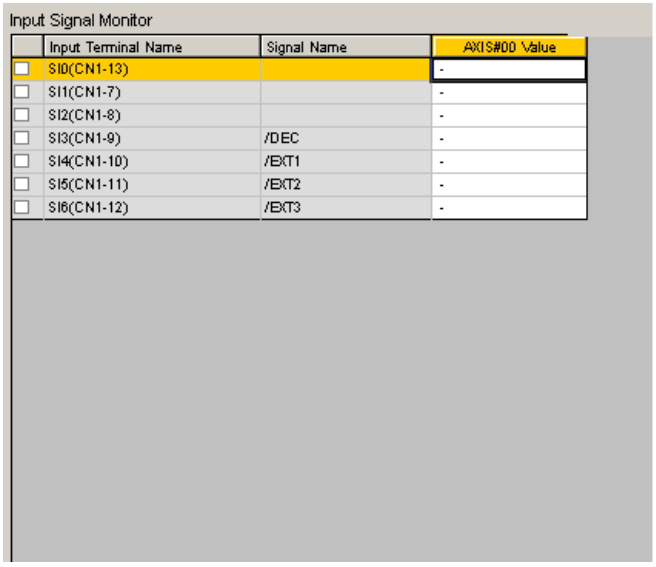


Input Signal Monitor

The input signal monitor function monitors the SERVOPACK input signals.

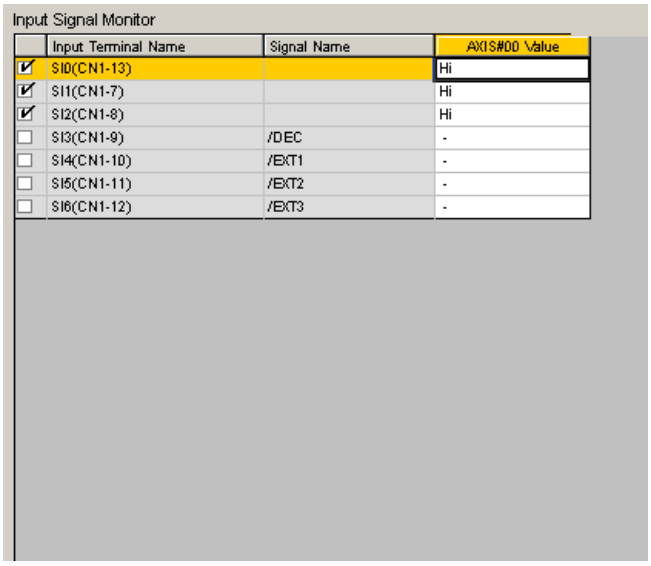
To monitor the input signals of the SERVOPACK, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Monitor**, point to **Monitor** and click **Input Signal Monitor.**



The items which can be monitored are listed.

2. Select the items to be monitored. The current status of a selected item is displayed in the "Value" column.

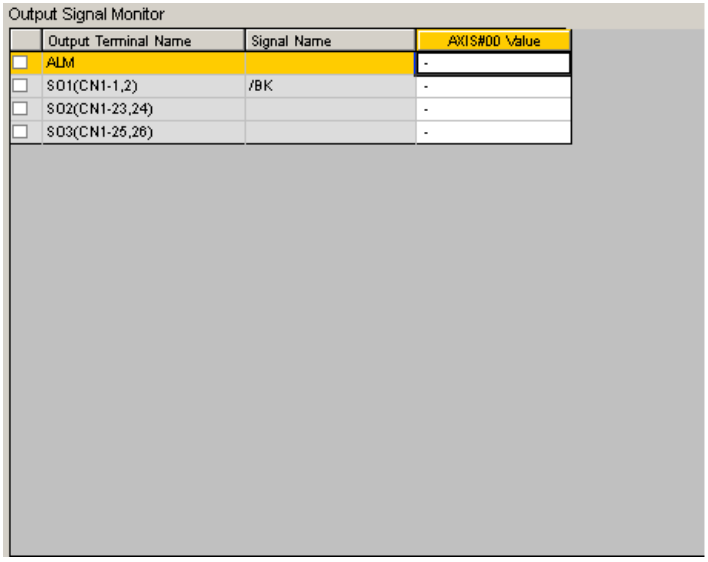


Output Signal Monitor

The output signal monitor function monitors the SERVOPACK output signals.

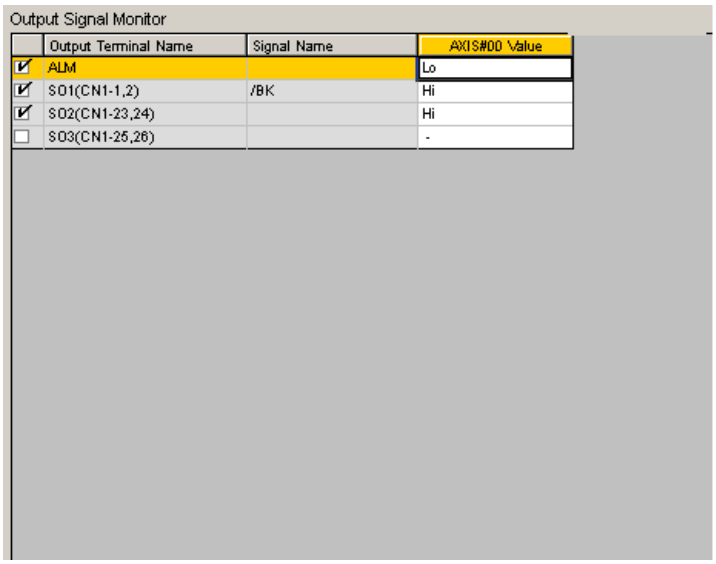
To monitor the output signals of the SERVOPACK, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Monitor**, point to **Monitor** and click **Output Signal Monitor**.



   The items which can be monitored are listed.

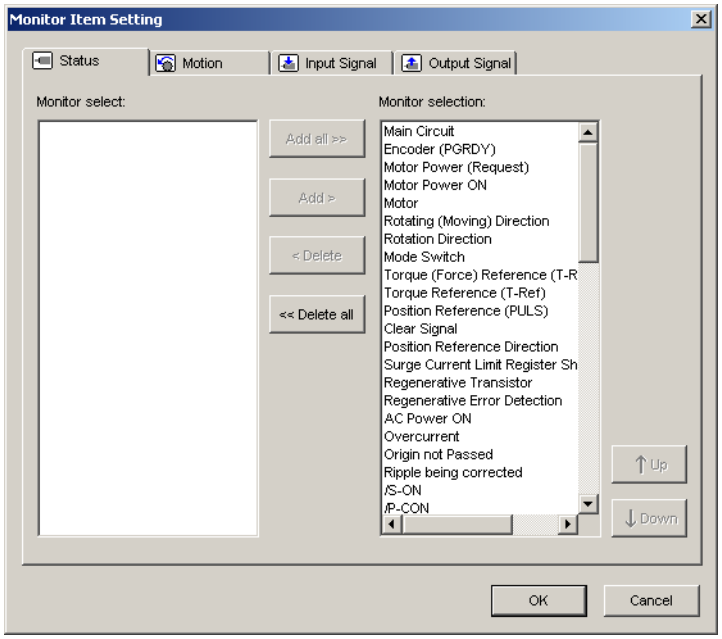
2. Select the items to be monitored. The current status of a selected item is displayed in the "Value" column.



Monitor Item Setting

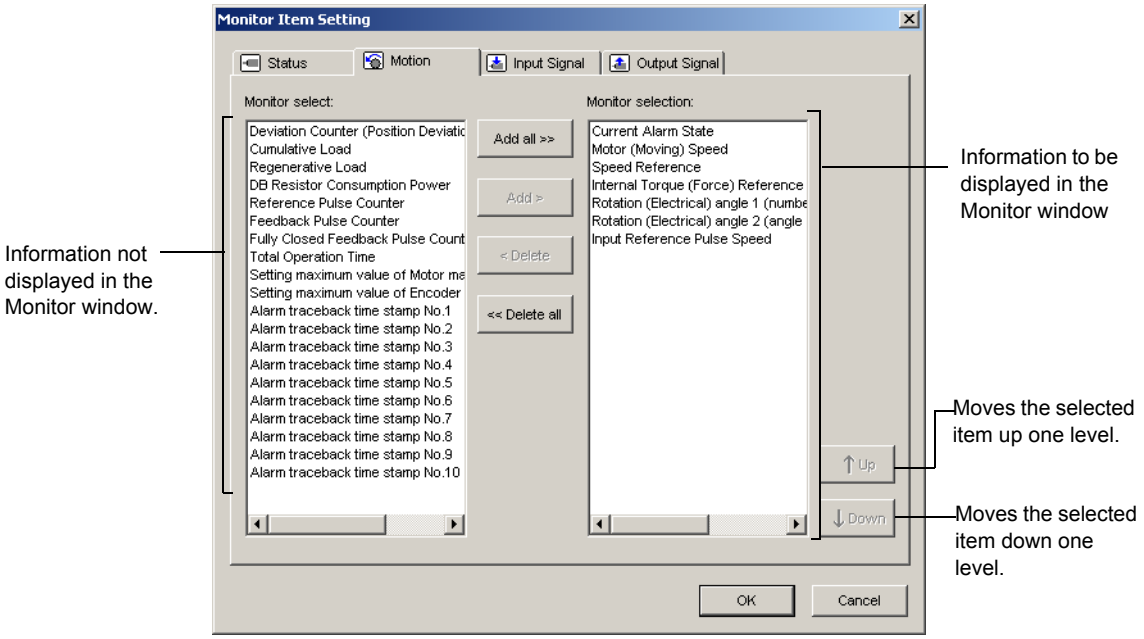
To select the information to be monitored, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Monitor**, and then click **Monitor Setting**. The Monitor Item Setting box appears.

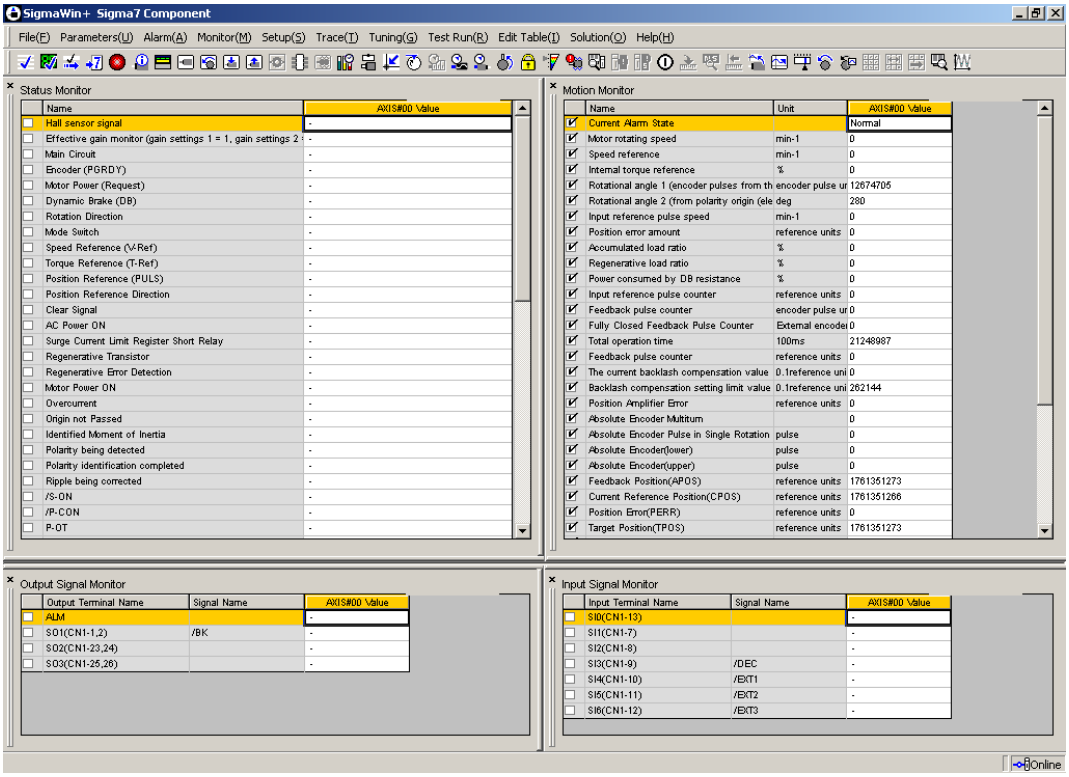


The **Monitor selection** list displays items being monitored.

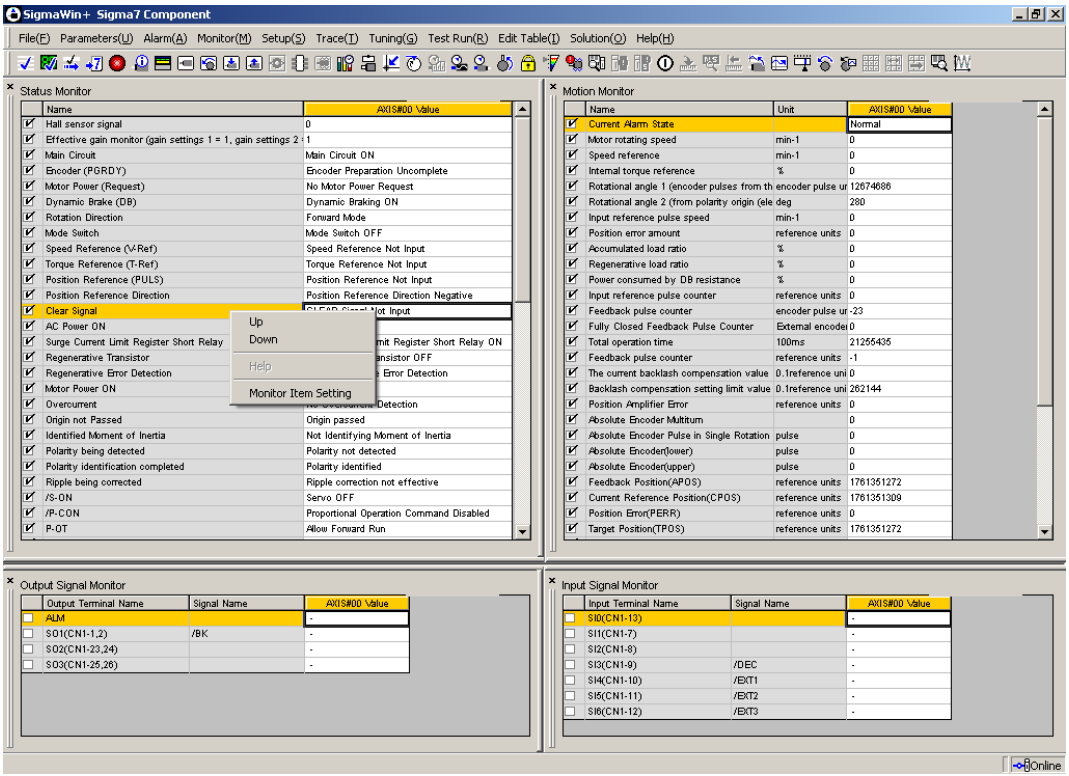
2. To hide an item, select it in the **Monitor selection** list and then click **Delete**. To display an item, select it in the **Monitor selection** list and then click **Add**.



3. Click **OK**. Monitoring of the selected items starts.



To move an item or change its settings, right-click an item and select a command.



4.4.3 Wiring Check

The wiring check function is used to check the status of I/O signals between the SERVOPACK and the host controller or peripheral devices. Changing an output signal status in Forced Output mode allows you to check the operation of the host controller and peripheral devices.

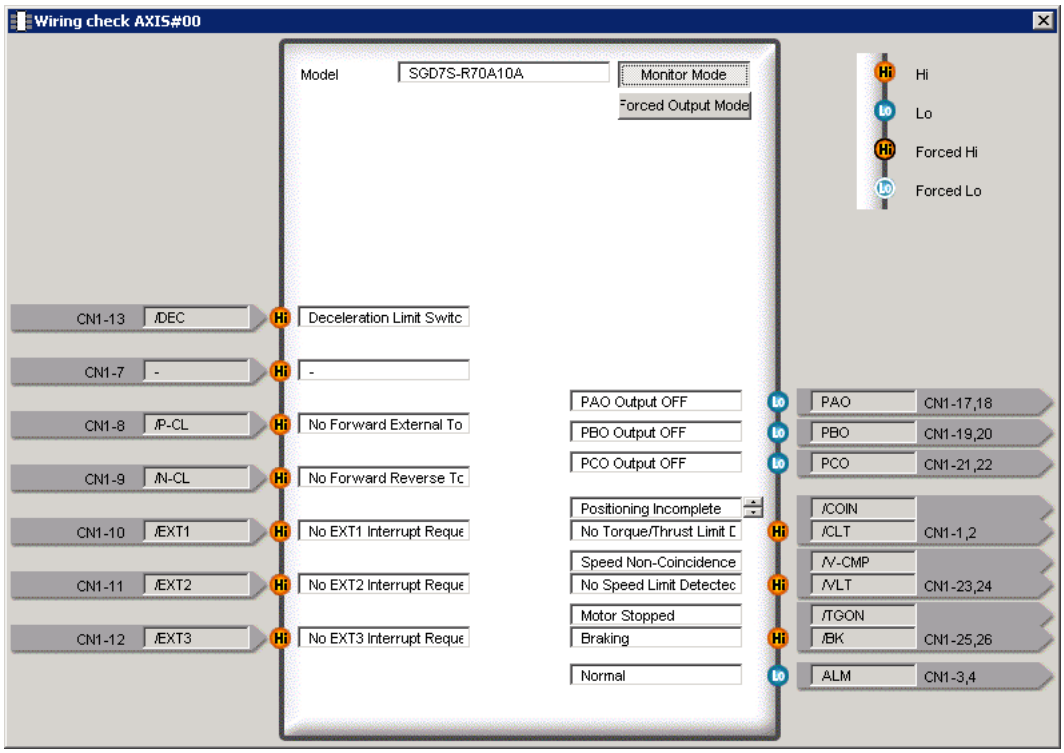
To check wiring, use the following procedure.

In the SigmaWin+ Σ-7 component main window, click **Monitor** and then **Wiring Check**.

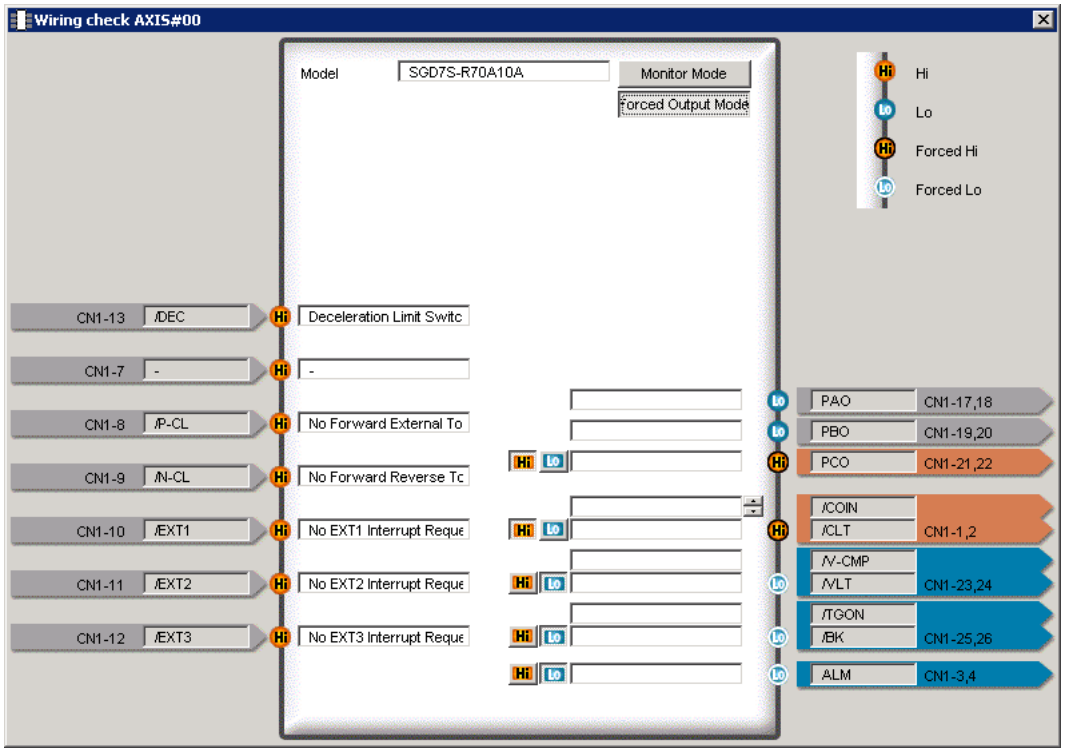
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



Wiring Check in Monitor Mode



Wiring Check in Forced Output Mode

Depending on each I/O signal status, the corresponding signal status on the screen will vary.

Monitor Mode

I/O signal status can be monitored in Monitor mode.

Input signal: Change the signal status on the host controller and check the input signal status and wiring to the SERVOPACK.

Output signal: Check the output signal status and wiring to the SERVOPACK.

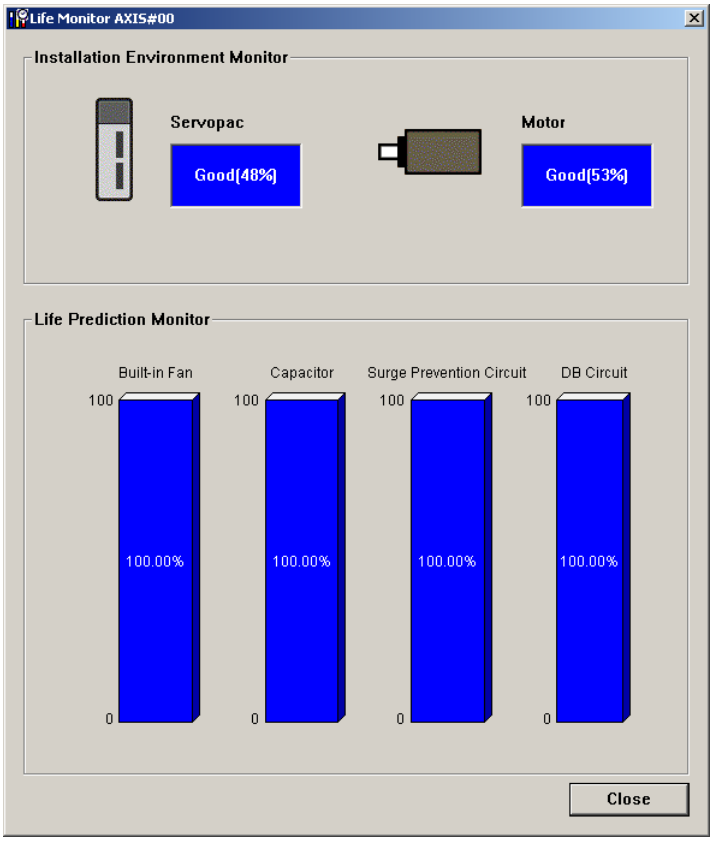
Forced Output Mode

Output signal status can be forcibly set in Forced Output mode. I/O signal status is continuously monitored also in Forced Output mode. Click **Hi** or **Lo** to set the signal status. Forced Output mode is disabled while the servo is on.

4.4.4 Service Life Monitor

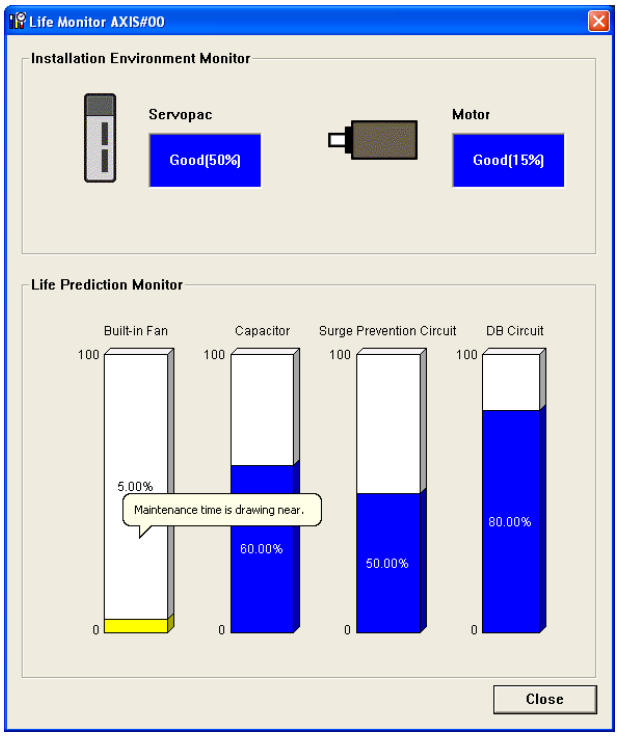
While the SigmaWin+ is online with a SERVOPACK, you can view the installation environment (product temperature) of the SERVOPACK and servomotors and the service life information for SERVOPACK parts (built-in fan, capacitor, surge-prevention circuit, and dynamic brake circuit) on the Life Monitor.

Select ***Monitor – Life Monitor*** from the menu bar of the SigmaWin+ Σ-7 component main window. The Life Monitor dialog box will be displayed.

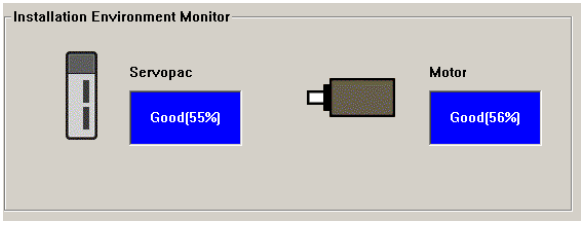


INFO

Guidance will be displayed if you move the cursor to the display position for the Installation Environment Monitor or to a bar in the graph of the Life Monitor.



Monitoring the Installation Environment



The SERVOPACK and Servomotor installation environment information is displayed.

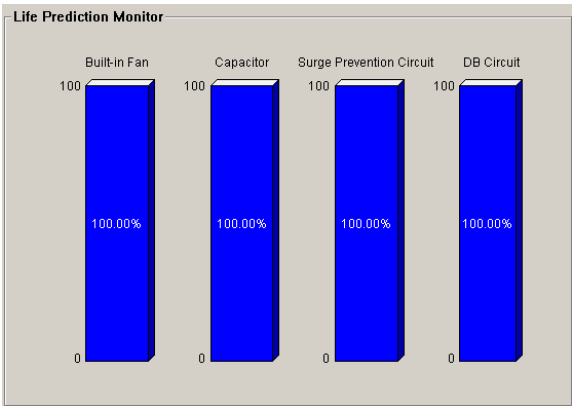
The displayed information is described in the following table.

Installation Environment Value Range	Background Color	Text Color	Description
0% to 99%	Blue	White	Normal
100% to 114%	Yellow	Black	Somewhat hazardous
115% or higher	Red	White	Error
-----	Gray	Black	An error occurred in obtaining the installation environment value.*

* An error occurred in obtaining information from the SERVOPACK. Check the communications status.

Note: The displayed installation environment values were the current values when the Live Monitor dialog box was displayed.

Service Life Diagnosis



The service life information for SERVOPACK parts (built-in fan, capacitor, surge-prevention circuit, and dynamic brake circuit) is displayed on the Life Monitor.

The displayed information is described in the following table.

Service Life Value Range	Background Color	Text Color	Description
10.00% to 100.00%	Blue	White	Normal
0.01% to 9.99%	Yellow	Black	It is almost time to replace the part.
0%*1	White	Black	It is time to replace the part.
-----	Gray	Black	An error occurred in obtaining the service life value.*2

*1. The service life values are displayed in black in the middle of the bars in the graph. The background color of the part name will change to red and the text color will change to white.

*2. An error occurred in obtaining information from the SERVOPACK. Check the communications status.

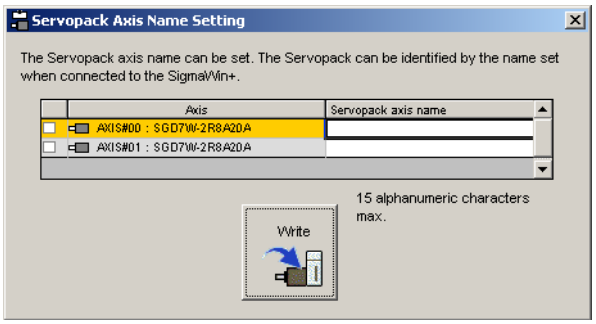
Note: The displayed service life values were the current values when the Life Monitor dialog box was displayed.

4.5 Setup

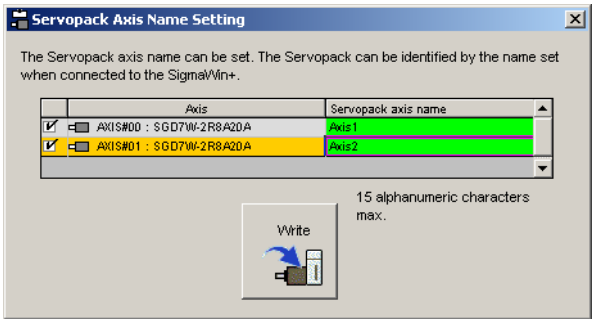
4.5.1 Setting the SERVOPACK Axis Name

The SERVOPACK axis name setting function can be used to set a SERVOPACK axis name for each SERVOPACK. The set axis name will be displayed in the search results of Connect box. (See Connect box of 2.2 Selecting a SERVOPACK.) It is easier to identify each SERVOPACK by using its axis name rather than by using its model or axis address.

1. Select ***Setup – Servopack Axis Name Setting*** from the menu bar of the SigmaWin+ Σ-7 component main window. The following dialog box appears.



2. Select the check boxes for the axis for which to change the names, enter the desired axis names in the **Servopack axis name** column, and then click the **Write** button.



The axis names that you entered in the **Servopack axis name** column will be written as the axis names.

4.5.2 Setting the Absolute Encoder

■ Initializing the Absolute Encoder

> **⚠ WARNING**
>
> The absolute encoder setup function resets the multi-turn counter and the encoder alarms for a connected serial absolute encoder.
>
> If the absolute encoder's multi-turn counter is reset to zero, the previously defined mechanical system will change to a different coordinate system.
>
> Operating the machine in this state is extremely dangerous. Failure to observe this warning may result in personal injury and/or damage to the machine. Be sure to reset the zero point for the mechanical system after the encoder has been successfully set up.

Set up the absolute encoder in the following cases:

- At initial machine startup
- When an "Encoder Backup Alarm" has occurred
- When the SERVOPACK power has been turned off, and the encoder cable removed.

The absolute encoder can only be set up while the servo is off. Turn the power back on after the encoder has been successfully set up.

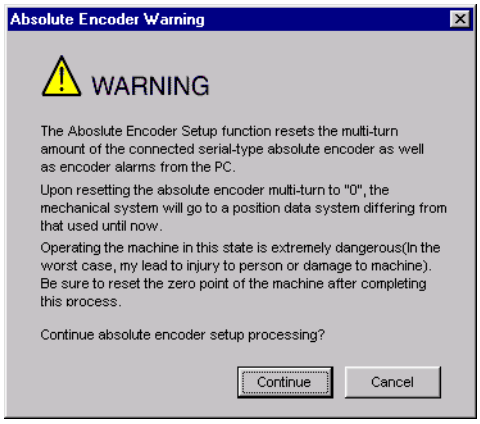
Set up the absolute encoder using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Set Absolute Encoder** and click **Reset Absolute Encoder**. A warning message appears confirming if you want to continue the processing.

INFO

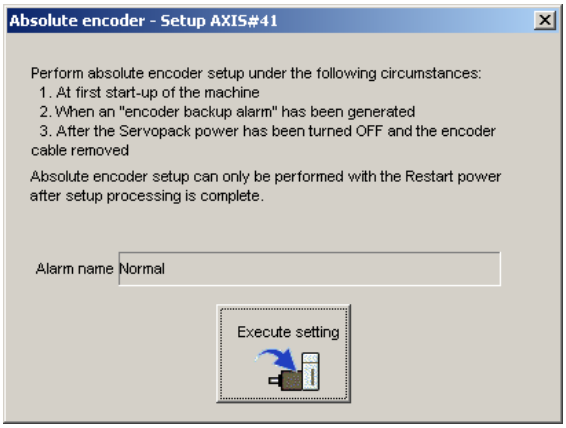
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



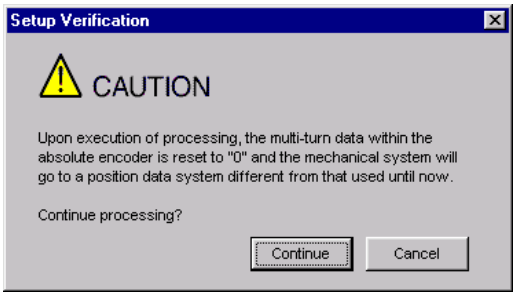
Click **Cancel** to return to the main window without resetting the absolute encoder.

2. Click **Continue**, and the Absolute encoder Setup box appears.



The Alarm Name box displays the code and name of the alarm that is occurring now.

3. Click **Execute setting**, and a verification message appears confirming if you want to continue although the coordinate system will change.



Click **Cancel** to return to the previous window without resetting the absolute encoder.

4. Click **Continue** to set up the encoder.

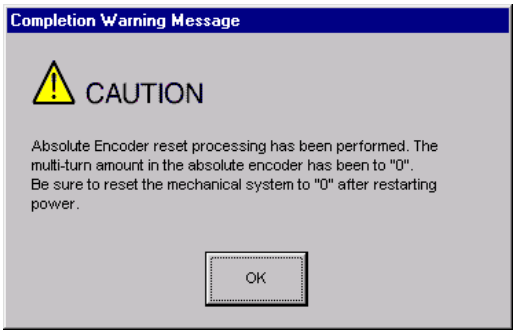
<If Setup is Unsuccessful>

If setting up is attempted with the servo ON, a reset conditions error occurs, and the processing is aborted.

Click **OK** to return to the main window.

<If Setup Completes Normally>

If the encoder is set up successfully, a warning message will appear reminding you that the coordinate system has changed and must also be reset.



5. Click **OK** to return to the main window. Restart the servo, and perform an origin search for the upper-level controller.

■ Setting the Multi-Turn Limit

f using an absolute detection system for machines, such as round tables, that turn in response to the number of times that the load shaft turns, reset the multi-turn data from the encoder to zero after a set number of rotations (referred to as "m"). The load shaft of the machine turns "n" times, and the motor turns "m" times.

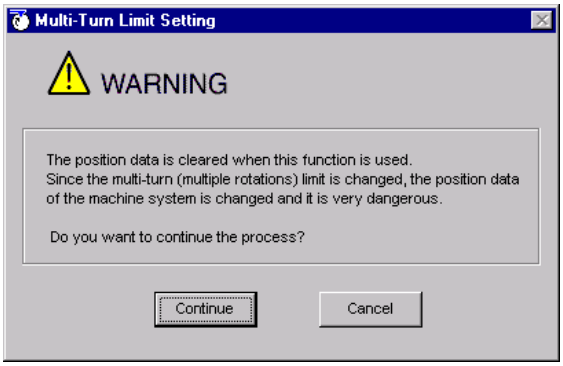
Set the multi-turn limit to the SERVOPACK and the servomotor using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, print to **Set Absolute Encoder** and click **Multi-Turn Limit Setting**. A verification message appears confirming if you want to continue although the position data will change.

INFO

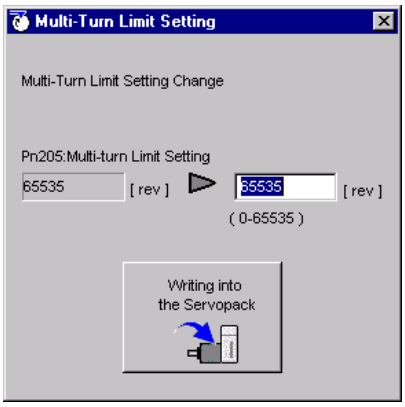
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

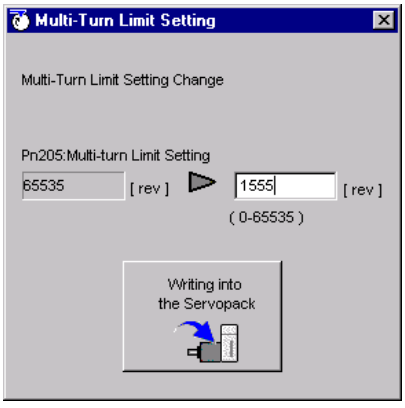


Click **Cancel** to return to the main window without setting the multi-turn limit.

2. Click **Continue**, and the Multi-Turn Limit Setting box appears.

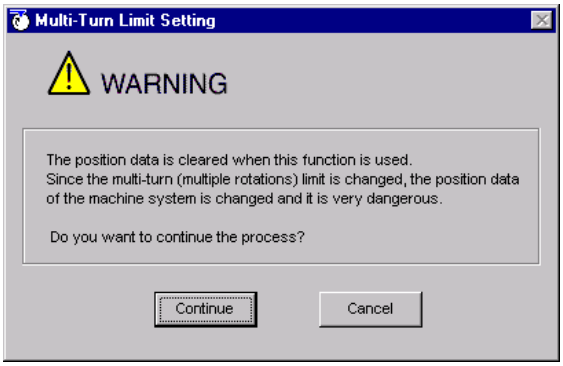


3. Change the setting to the desired number of revolutions.

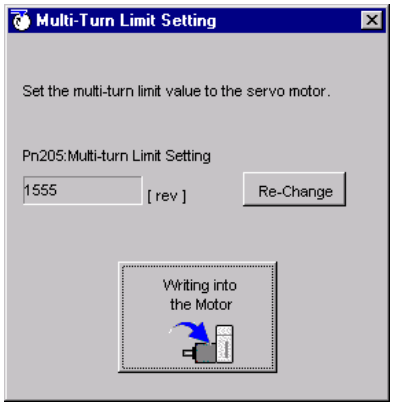


4. To save the settings, click **Writing into the Servopack**, and a warning message appears.

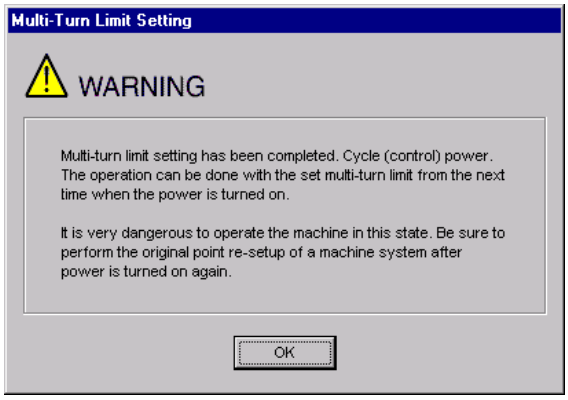
5. Click **OK** and the settings are changed to the new ones.
6. After turning off the power, restart the SERVOPACK. Because only the settings for the SERVOPACK were made, the settings for the motor are still incomplete and the alarm A.CC0 Multi-turn Value Unmatched occurs.
7. Return to the SigmaWin+ Σ-7 component main window. To make the settings for the motor, click **Setup** and then click **Multi-Turn Limit Setting** again. A verification message appears confirming if you want to continue although the position data will change.



8. Click **Continue**, and the Multi-Turn Limit Setting box appears. To change the settings, click **Re-Change**.



9. To save the settings, click **Writing into the Motor**, and a warning message appears.



10. Click **OK**.

4.5.3 Offset Adjustment

There are three types of offset adjustments.

- Speed/Torque reference offset adjustment
- Analog monitor output adjustment
- Motor current detection offset adjustment

■ Adjusting Speed and Torque Reference Offset

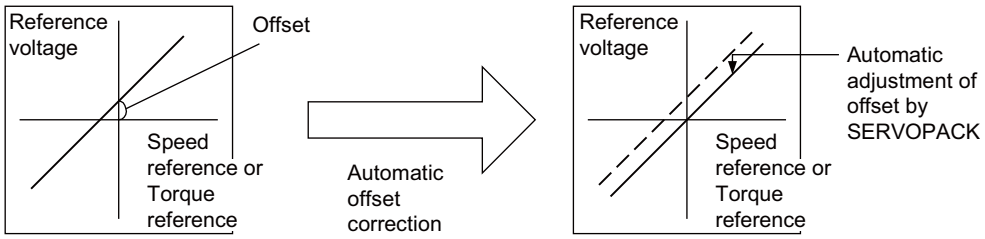
There are two types of speed/torque reference offset adjustment: Automatic and Manual.

Automatic Adjustment

When using the speed/torque control mode, the motor may turn slightly even if the analog reference voltage is set to 0V. This occurs when there is a slight (in units of mV) offset in the reference voltage of the upper-level controller or external circuit.

With this function, you can measure the offset and automatically adjust the reference voltage. Both the speed and torque references can be adjusted.

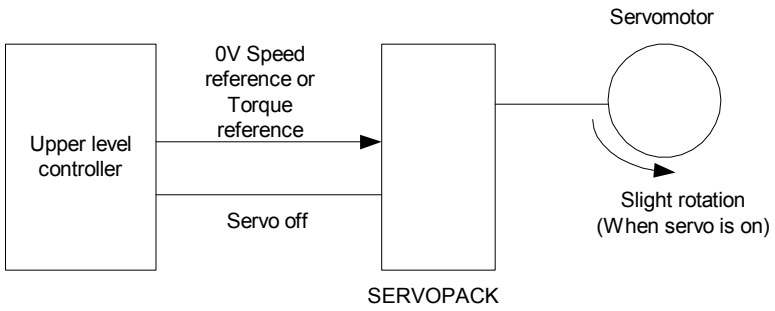
Automatically adjust the offset as follows when a voltage reference (offset) exists in either the upper-level controller or external circuit.



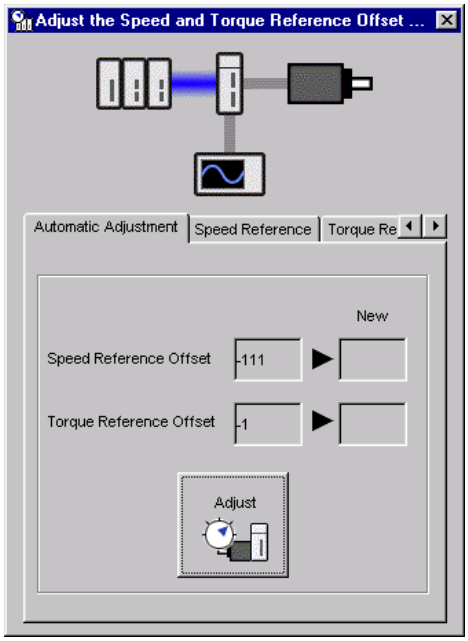
Once the offset has been automatically adjusted, the offset is recorded within the SERVOPACK.

Automatically adjust the offset using the following procedure.

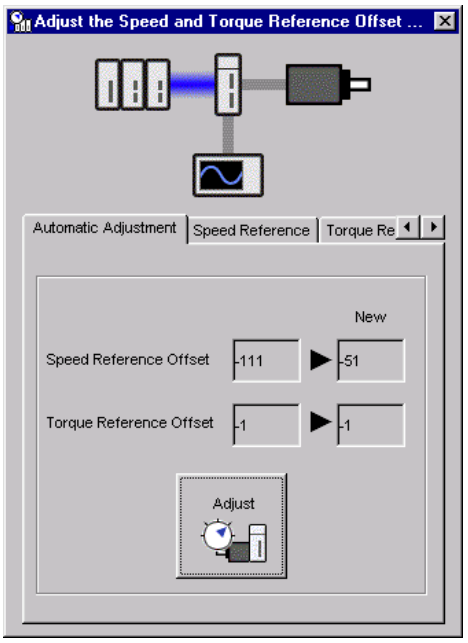
1. Check that the power of the SERVOPACK is turned off.
2. Set the reference voltage so that it will be regarded as 0V by the upper-level controller or external circuit.



3. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Speed and Torque Reference Offset**, and the Adjust the Speed and Torque Reference Offset box appears.
4. Click the **Automatic Adjustment** tab.



5. Click **Adjust**.



The automatically adjusted values are displayed in the **New** box.

Manual Adjustment

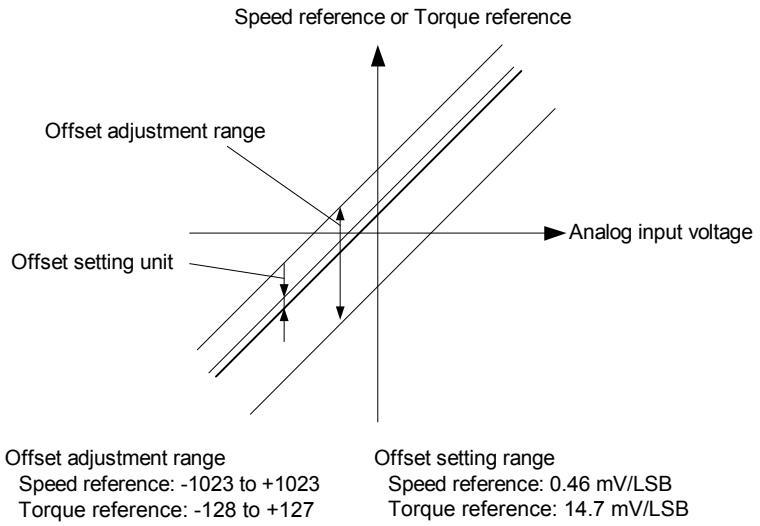
Manual adjustment of the speed/torque reference offset is a function that can be used in the speed and torque control modes. Use under the following conditions.

- When the position loop is closed in the upper-level controller and the error pulse is zero at servo lock stop
- When an offset has been purposefully set

This function may also be used when checking the offset data that had been automatically adjusted.

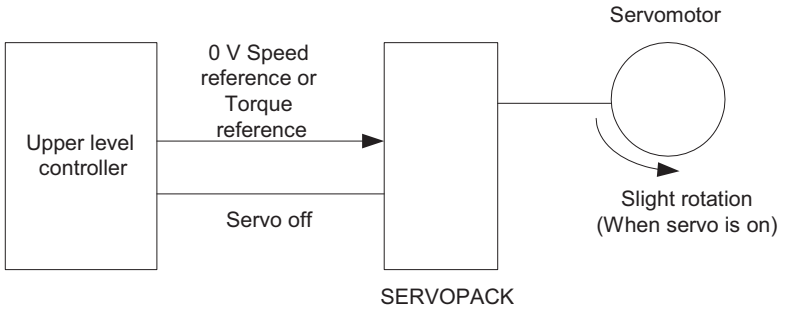
Although the basic functions are the same as those for the reference offset automatic adjustment mode, the adjustment must be done while directly inputting the offsets. Offsets can be set in both the speed reference and the torque reference.

The following diagram shows the range and setting units of the offset adjustment.

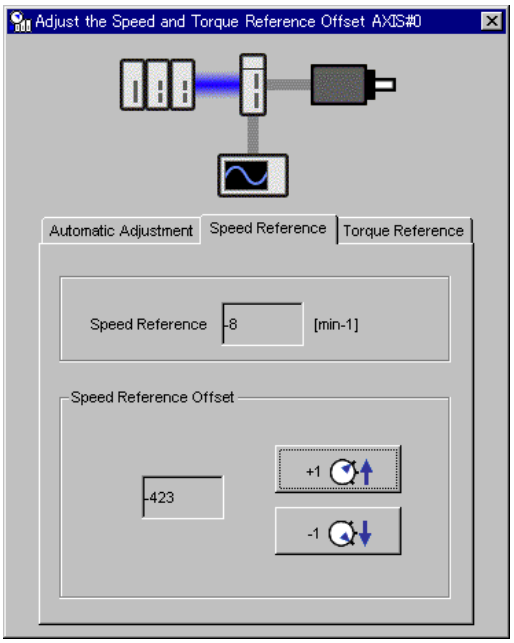


Manually adjust the offset using the following procedure.

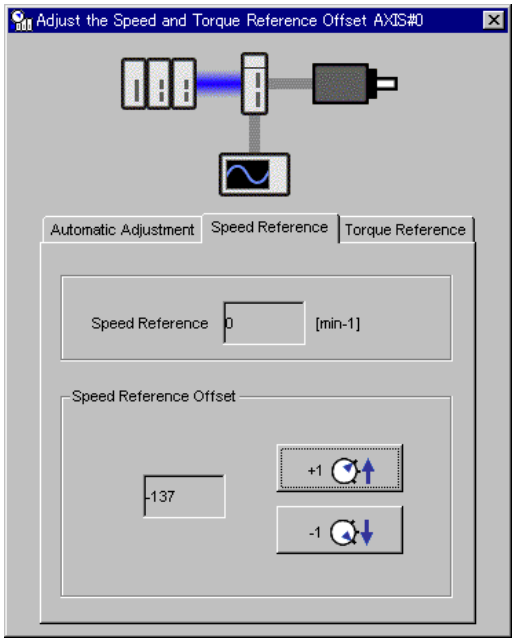
1. Set the reference voltage so that it will be regarded as 0V by the upper-level controller or external circuit.



2. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Speed and Torque Reference Offset**, and the Adjust the Speed and Torque Reference Offset box appears. Click the **Speed Reference** tab to adjust the speed reference; click the **Torque Reference** tab to adjust the torque reference. The **Speed Reference** tab is clicked, the following box appears.



3. Use the **+1** and **-1** buttons to adjust the settings so that the value in the "Speed Reference" box becomes zero.



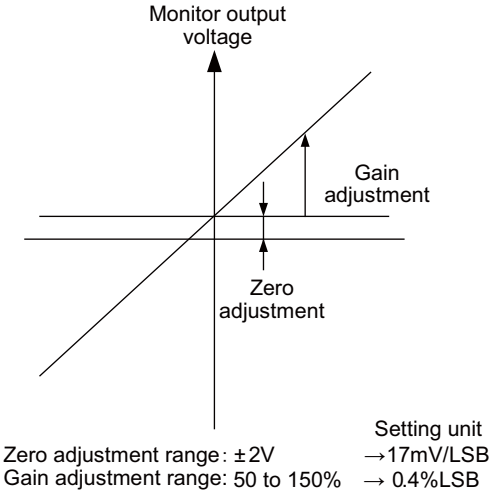
The settings for the torque reference can also be adjusted using the same procedure after clicking the **Torque Reference** tab.

■ Adjusting Analog Monitor Output

With this function, you can monitor the motor speed, torque reference, position error, and so on by the analog monitor output.

There are two types of analog monitor output adjustment: Zero Adjustment and Gain Adjustment.

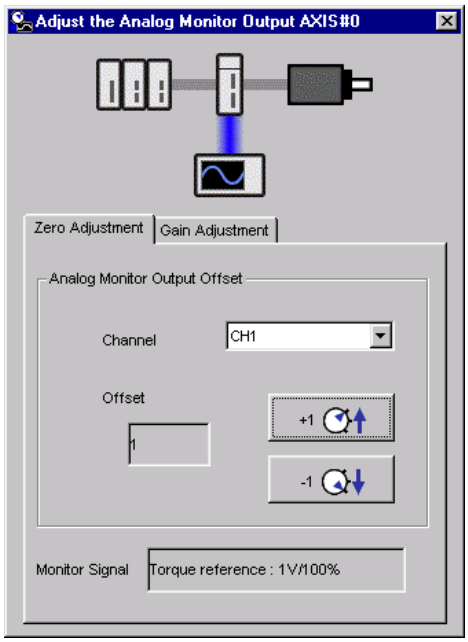
Perform zero adjustment when correcting a error in output voltage caused by drift, or a error from the zero point caused by noise on the monitoring system. Also, perform adjust the gains when matching the sensitivity to the measurement system.



Zero Adjustment

Adjust the zero position using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Analog Monitor Output**, and the Adjust the Analog Monitor Output box appears. Click the **Zero Adjustment** tab.



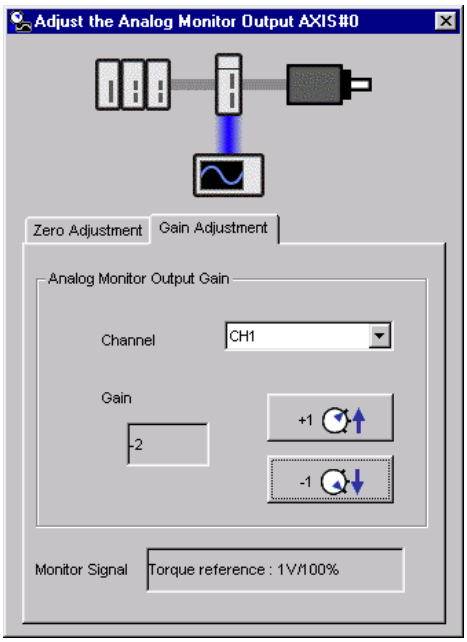
   There are two channels: CH1 and CH2.

2. While watching the analog monitor, use the **+1** and **-1** buttons to adjust the offset.

Gain Adjustment

Adjust the gain using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Analog Monitor Output**, and the Adjust the Analog Monitor Output box appears. Click the **Gain Adjustment** tab.



   There are two channels: CH1 and CH2.

2. While watching the analog monitor, use the **+1** and **-1** buttons to adjust the gain.

■ Adjusting Motor Current Detection Offset

⚠ CAUTION
The offset of the motor current detection need not usually be adjusted because it is adjusted at delivery by Yaskawa. If the offset of the detection is carelessly or incorrectly set, the performance will be degraded. Use this function only when the torque ripple is obviously much larger than that of other SERVOPACKs.

Usually, the offset of the motor current detection does not have to be adjusted because it is adjusted at delivery by Yaskawa. Adjust the offset only when higher precision is needed, such as if the torque ripple error is thought to be excessive based on the current offset or if there is a need for further reduction in torque ripple.

There are two types of motor current detection offset adjustment: Automatic and Manual.

Automatic Adjustment

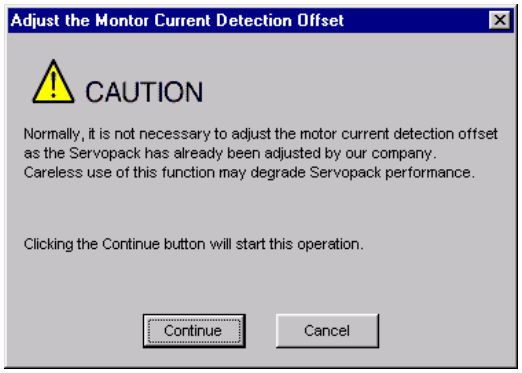
Automatically adjust the offset using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Motor Current Detection Offset**. A warning message appears confirming if you want to continue although the SERVOPACK's performance will be affected if the function is used carelessly or incorrectly.

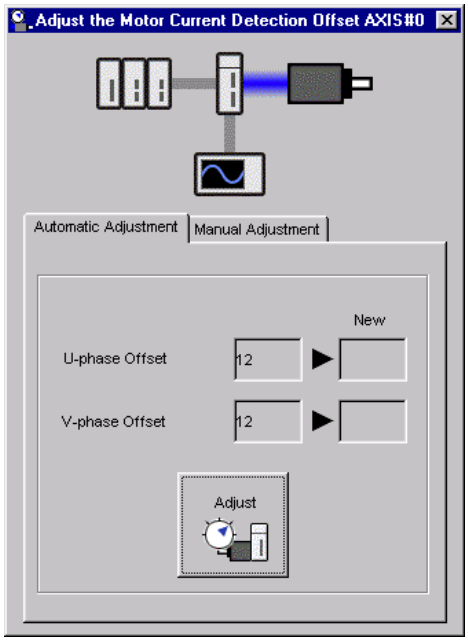
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.

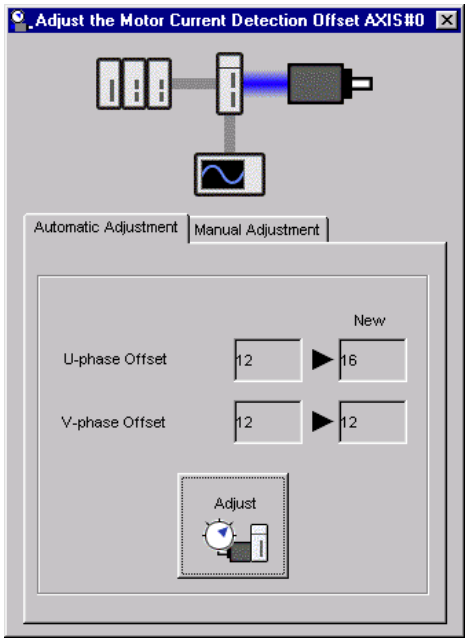
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



2. Click **Continue**, and then click the **Automatic Adjustment** tab.



3. Click **Adjust**.

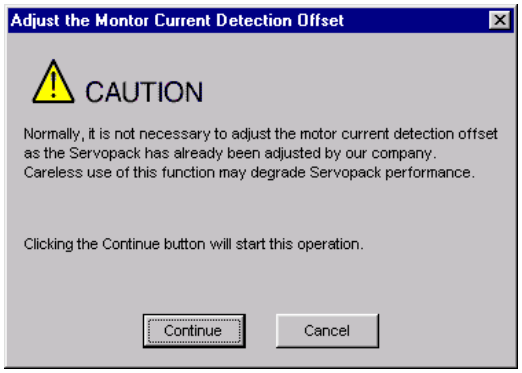


The automatically adjusted values are displayed in the **New** box.

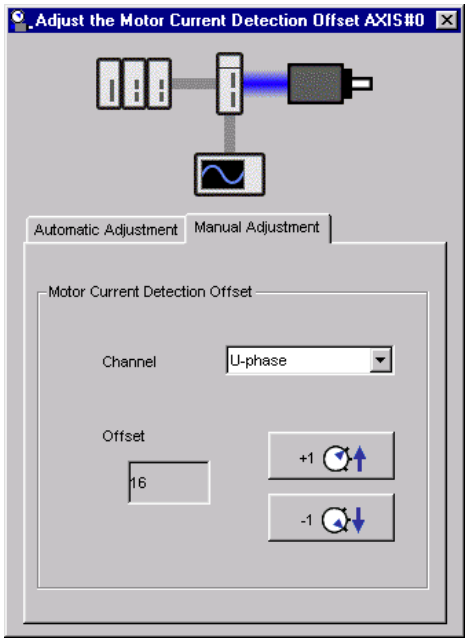
Manual Adjustment

Manually adjust the offset using the following procedure.

1. Turn the motor at 100 min^{-1}.
2. In the SigmaWin+ Σ-7 component main window, click **Setup**, point to **Adjust Offset** and click **Adjust the Motor Current Detection Offset**. A warning message appears confirming if you want to continue although the SERVOPACK's performance will be affected if the function is used carelessly or incorrectly.



3. Click **Continue**, and then click the **Manual Adjustment** tab.



4. While watching the analog monitor, use the **+1** and **-1** buttons to adjust the offset to minimize the ripple on the torque reference monitor. The U-phase and V-phase currents must be adjusted so that they balance. Repeat the adjustment alternately between them several times.

4.5.4 Origin Search

⚠ WARNING

Using the origin search function while the motor is running is dangerous.

Be sure to check related information in this manual before using this function.

Pay particular attention to the following.

- Check the safety of the area adjoining the drive unit.

  The motor runs at 60min^{-1} for about one minute, while the RUN button is pressed.

  Make sure that there is no danger in running the motor before actually using it.

- The Forward Run Prohibit (P-OT) and Reverse Run Prohibit (N-OT) signals are disabled during the origin search.

  During operation, make sure to verify the actual operation and position of the motor or machine.

This function moves the motor to the origin and clamps at the position. Use this function when the motor shaft needs to be aligned with the machine.

Perform an origin search using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, and then click **Search Origin**. A warning message appears reminding you of the dangers that are possible when using this function.

INFO

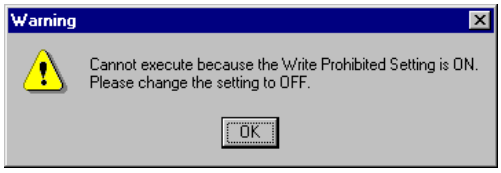
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

Click **Cancel** to return to the main window without performing origin search.

<When the Write Prohibited setting is ON>

If the write prohibited setting is on, the following message will appear.

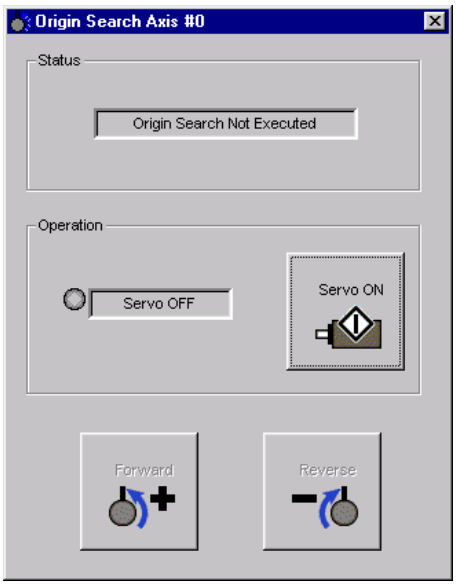


Click **OK**, and set the write prohibited setting to off.

See "4.5.5 Write Prohibited Setting" for setting method.

2. Click **OK**, and the Origin Search box appears.

   If the servo is on, an error message will appear. Make sure that the servo is off.



Origin Search Box

Status

This displays the run status.

Origin Search not Executed:	The motor has not turned.
Origin Search Executing:	Searching for the origin by turning forward or in reverse.
Origin Search Stopped:	The Forward or Reverse button has been released during the origin search, so the motor stopped.
Origin Search Completed:	Origin found, and the motor stopped (clamped) at the point.

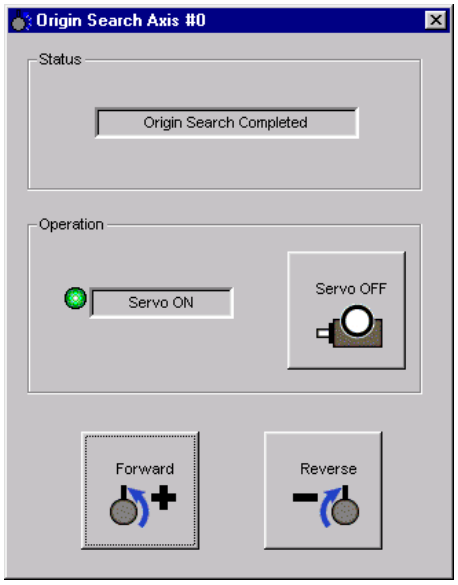
Close the Origin Search box to re-execute another origin search after a one search has been completed.

Operation

On the left, shows if the servo is on or off and the corresponding LED display.

On the right, the button changes according to the servo's status. When the servo is off, the **Servo ON** button appears; when the servo is on, the **Servo OFF** button appears.

3. Click **Servo ON**.



4. Press **Forward** or **Reverse**. The search is performed while one of these buttons is pressed. The axis stops when the search is complete.

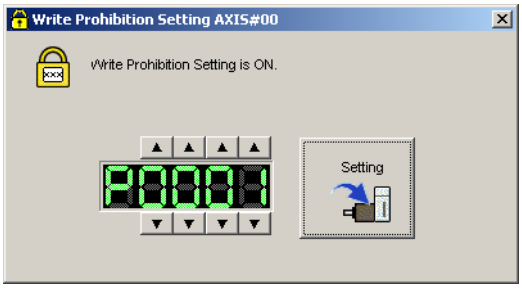
4.5.5 Write Prohibited Setting

The write-prohibited setting function is used to prevent the inadvertent rewriting of parameters from the digital operator. Rewriting parameters from the SigmaWin+ is allowed even if the write prohibited setting is on.

Set to ON or OFF the write prohibited setting using the following procedure.

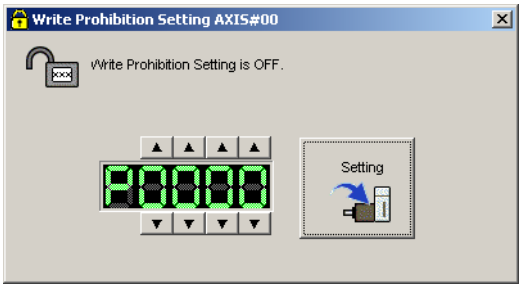
1. In the SigmaWin+ Σ-7 component main window, click **Setup**, and then click **Write Prohibited Setting**. One of the following boxes will appear.

<If the Write Prohibited Setting is ON>



Click the ▼ button to change the value to "0000" and click **Setting**. The write prohibited setting is off.

<If the Write Prohibited Setting is OFF>



Click the ▲ button to change the value to "0001" and click **Setting**. The write prohibited setting is on.

2. A message appears, telling you that the write prohibited setting has been changed and will be effective the next time the SERVOPACK is restarted.

Click **OK** and restart the SERVOPACK.

4.5.6 Tuning-less Level Setting

The tuning-less level setting is used to adjust the responsiveness when using the tuning-less function, which is a tuning function that requires no parameter settings.

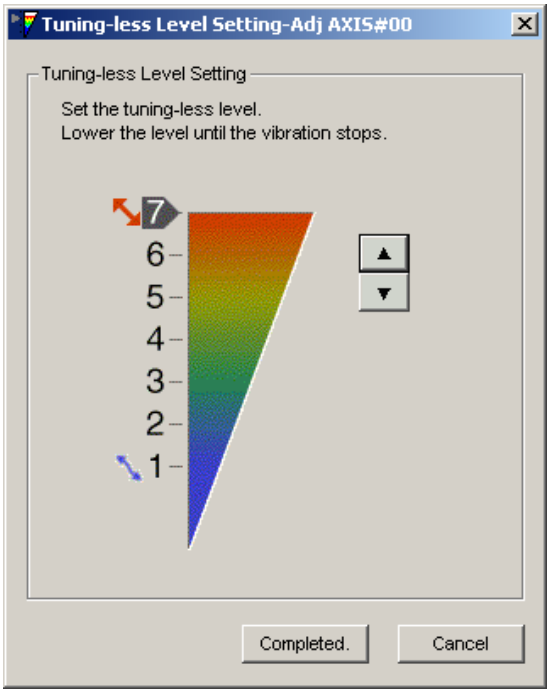
Use the following procedure to set the tuning-less level.

1. Select ***Setup - Tuning-less Level Setting*** from the menu bar of the SigmaWin+ Σ-7 component main window.

INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



2. Click the setting arrows to adjust the tuning-less level so that the machine does not vibrate.
   The default tuning-less level setting is 4.
3. After the tuning-less level has been set so that the machine does not vibrate, click **Completed**. The adjustment results will be saved in the SERVOPACK.

4.5.7 Initializing Vibration Detection Level

This function detects vibration when a servomotor is connected to a machine and automatically adjusts the level at which vibrations are detected to output more exactly the vibration alarm (A.520) and warning (A.911).

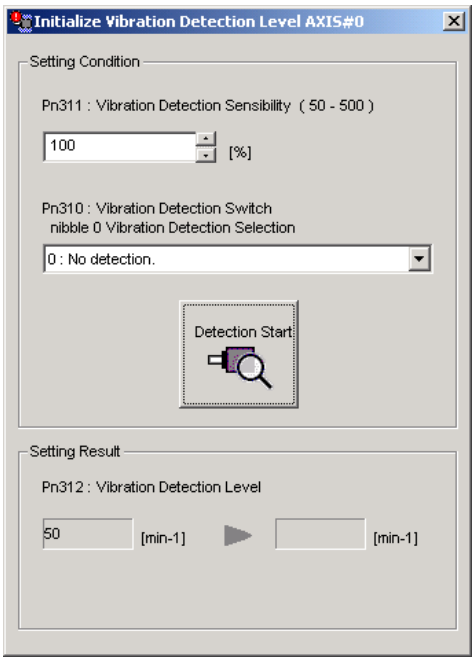
To initialize the vibration detection level, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, and then click **Initialize Vibration Detection Level**. The Initialize Vibration Detection Level box appears.

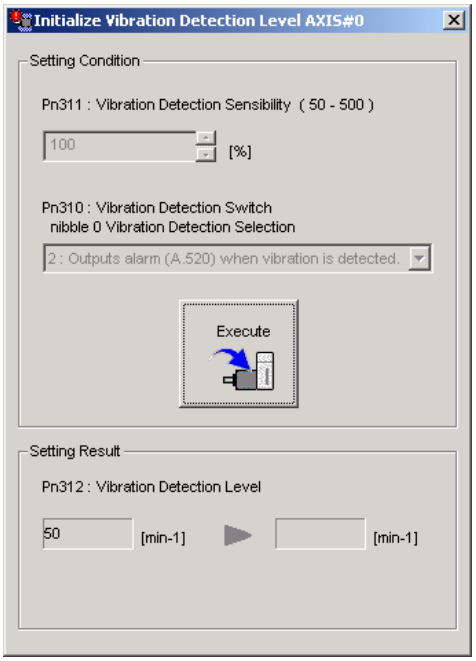
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.

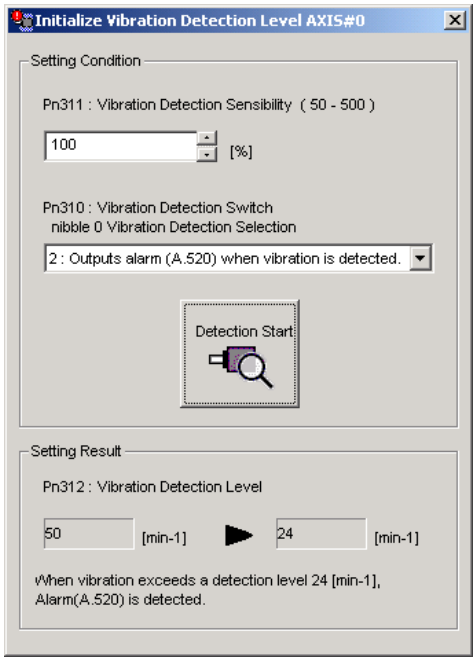
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



2. Select a percentage as the degree of vibration detection sensitivity and the vibration detection switch, and then click **Detection Start**.



3. Click **Execute**. The level at which the vibrations are detected is automatically adjusted, and the setting is displayed in the box on the right and saved in the SERVOPACK.



4.5.8 EasyFFT

⚠ WARNING

Using the EasyFFT function while the motor is running is dangerous.

Be sure to check related information in this manual before using this function.

Pay particular attention to the following items.

- Check the safety of the area adjoining the drive unit.

  The motor turns less than a quarter of a turn several times in the specified direction while using the EasyFFT function.

  Make sure that there is no danger in running the motor before actually using it.

- External instructions

  Do not enter instructions from an external source, because this function creates instructions in the SERVOPACK and sends them to the motor.

The EasyFFT function can be used for fine frequency tuning by assigning a frequency, which is based upon the machine's characteristics, to the notch filter and setting the corresponding parameter to this frequency.

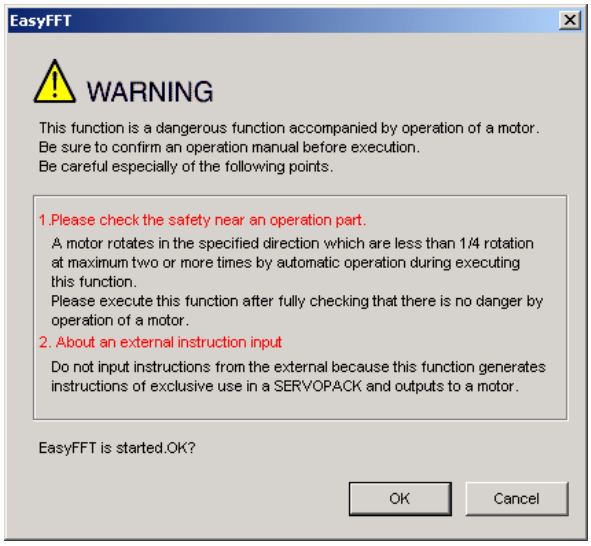
To perform an EasyFFT operation, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup** and then click **EasyFFT**. A warning message appears, reminding you of the possible dangers.

INFO

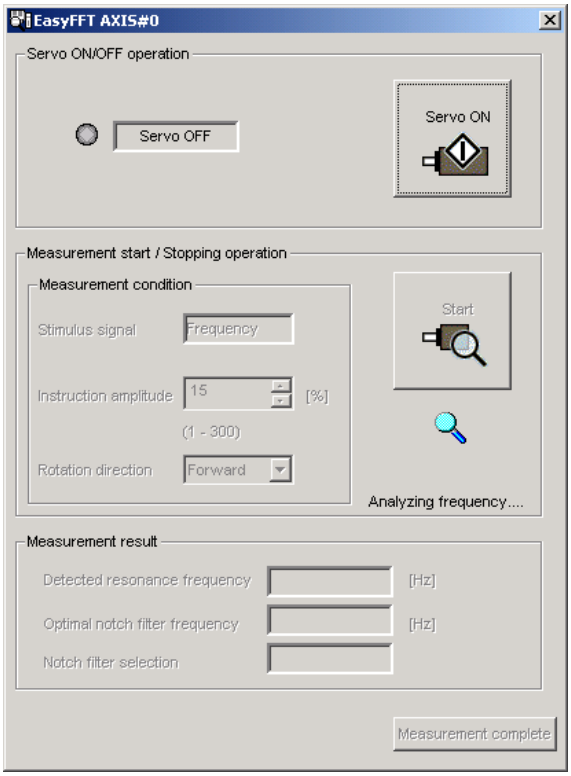
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

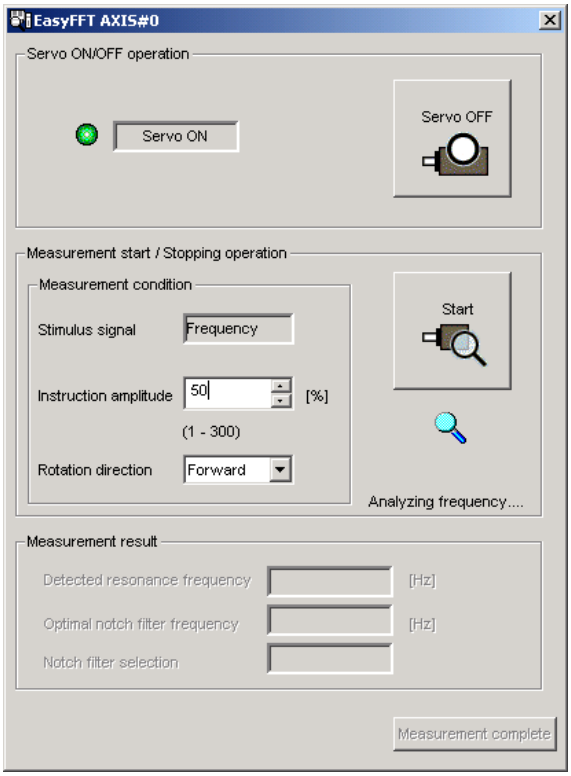


Click **Cancel** to return to the main window without performing an EasyFFT operation.

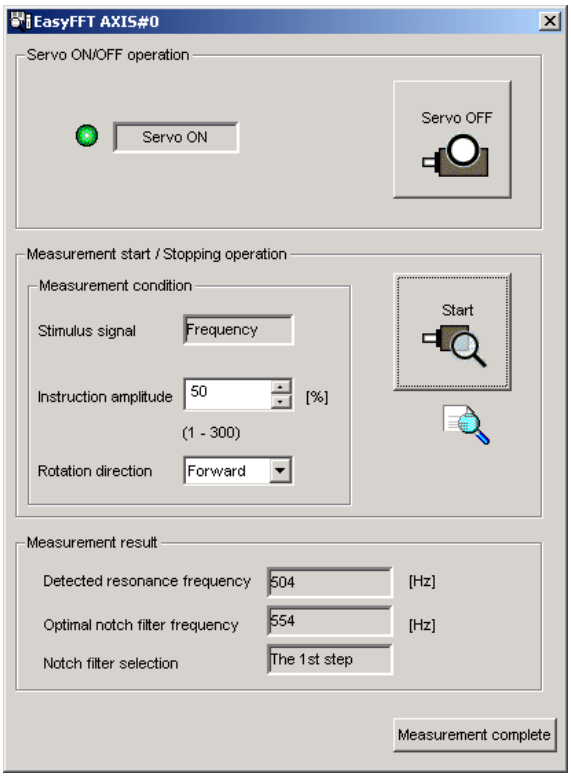
2. Click **OK**, and the EasyFFT box appears.



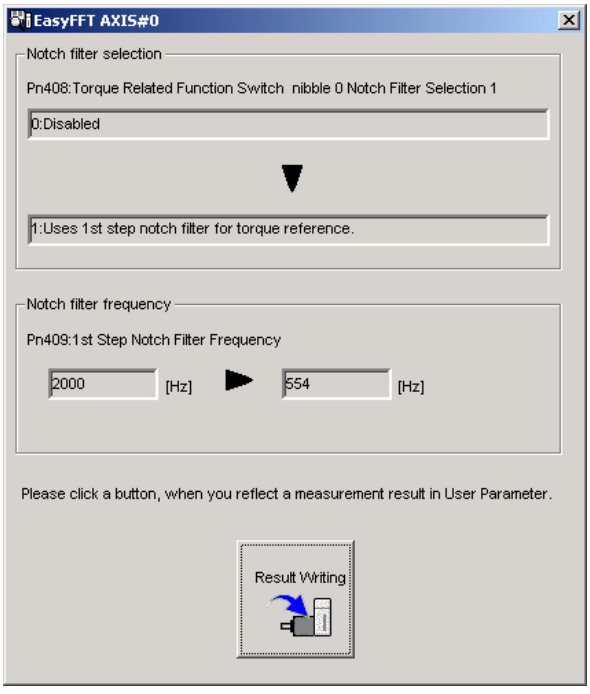
3. Click **Servo ON**.



4. Select the instruction amplitude and the rotation direction, and click **Start**. The motor begins to rotate, and the measurement of the frequency starts. After the measurements have been taken, the results are displayed in the lower section of the box.



5. Click **Measurement complete**.



6. Click **Result Writing** to assign the results as parameter settings.

4.5.9 Reset Option Module Configuration Error

When the SERVOPACK detects an option module configuration error, this function is used to reset the error.

There are three types of option modules:

- Reference module
- Safety option module
- Feedback option module

The SERVOPACK detects five kinds of option module configuration statuses: Two kinds of normal statuses as and three kinds of error statuses.

<Normal>

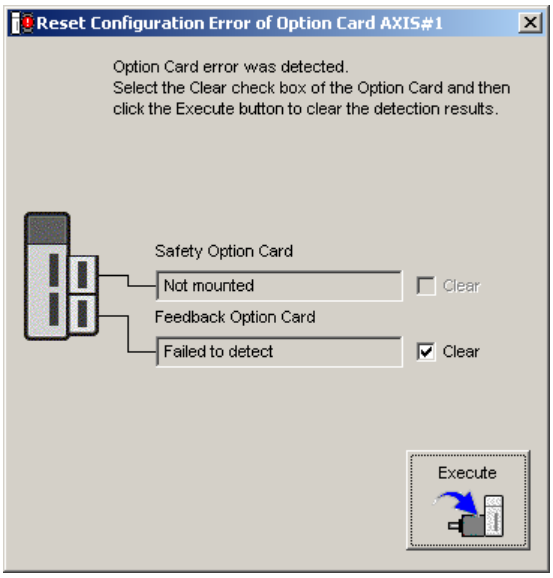
- **Normally detected**: The option module is correctly connected to the SERVOPACK.
- **Not mounted**: No option module is connected.

<Error>

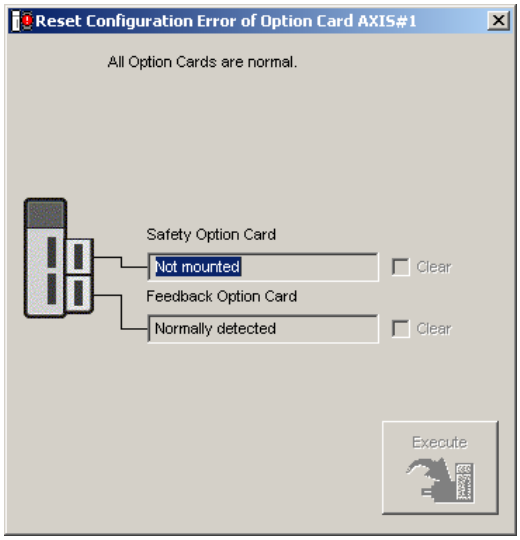
- **Failed to detect**: Cannot detect the previously connected option module.
- **Detection unmatched**: The detected option module is different from the previously connected option module.
- **Error detected**: An unsupported option module is connected. Or, an error occurred in communications with the option module.

Use the following procedure to reset the alarm detected in an option module.

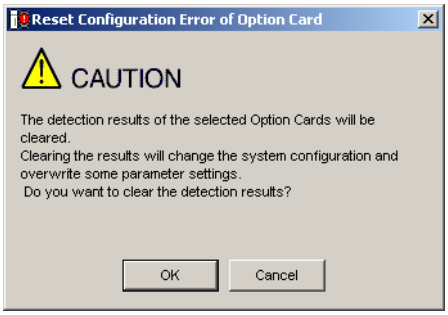
1. Select ***Setup – Reset Option Module Configuration Error*** from the menu bar of the SigmaWin+ Σ-7 component main window.
   If an option module error occurs when SigmaWin+ is started, the following box will appear.



If no error occurs when SigmaWin+ is started, the following box will appear.



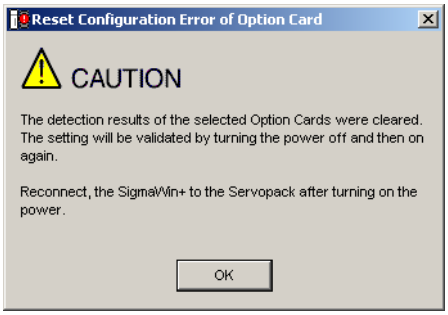
2. Check to see if the **Clear** check box of the option module whose detection result to be cleared is selected, and then click **Execute**. A message will appear inform you that clearing the results will change the system configuration and overwrite some parameter settings, asking for your confirmation to clear the results.



NOTE

The detection result **Error detected** cannot be cleared. Remove the option module, or check to see if the option module is correctly mounted.

3. Click **OK**. A message will inform you that the detection results were cleared, and prompt you to turn the power off and then on again to validate the settings.



4. Click **OK**.

4.5.10 Safety Option Module Setup Alarm Clear

The Safety Option Module Setup Alarm Clear function can be used to clear an alarm A.EC0 or A.EC1 when using a Safety Module.

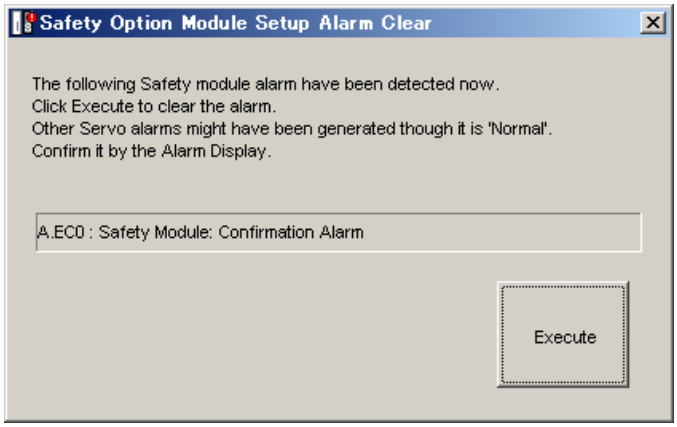
Alarm A.EC0 or A.EC1 may occur:

- At the initial startup after mounting a Safety Module
- During initialization of Safety Module parameters (Pcxx)
- After changing any of Safety Module parameter (Pcxx) settings
- After changing the Safety-related servo parameters (Pnxxx)

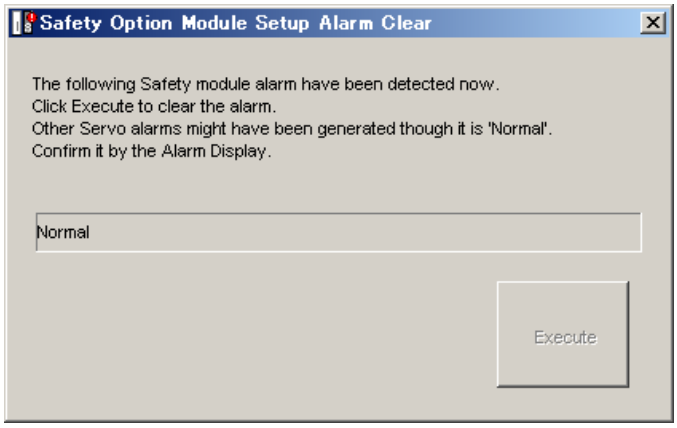
<How to Clear Alarm A.EC0>

Use the following procedure to clear an alarm A.EC0.

1. Select **Safety Option Module Setup Alarm Clear** from **Setup** menu in the SigmaWin+ Σ-7 component main window.
   The Safety Option Module Setup Alarm Clear box will appear.



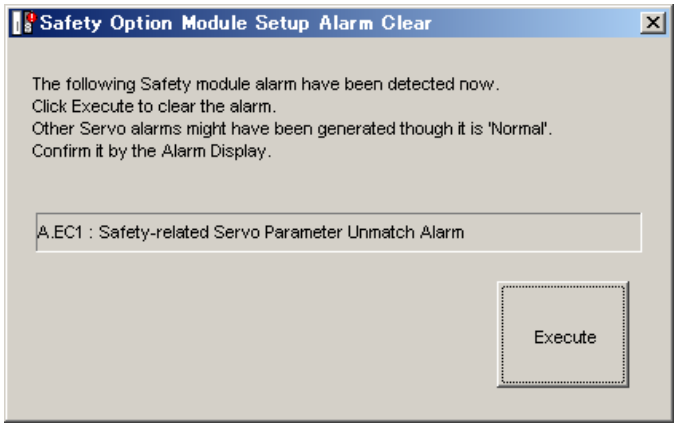
2. Click **Execute**, and the alarm clearing process starts.
   When the alarm is successfully cleared, the following message appears.



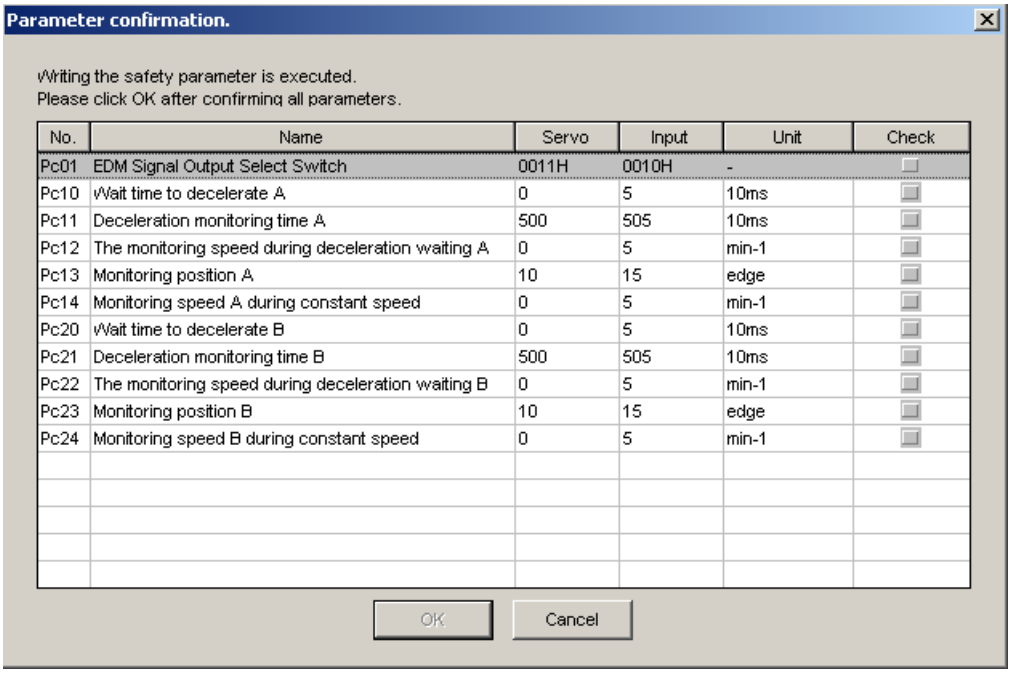
<How to Clear Alarm A.EC1>

Use the following procedure to clear an alarm A.EC1.

1. Select **Safety Option Module Setup Alarm Clear** from **Setup** menu in the SigmaWin+ Σ-7 component main window.
   The Safety Option Module Setup Alarm Clear box will appear.



2. Click **Execute**. The Parameter Confirmation box will appear.

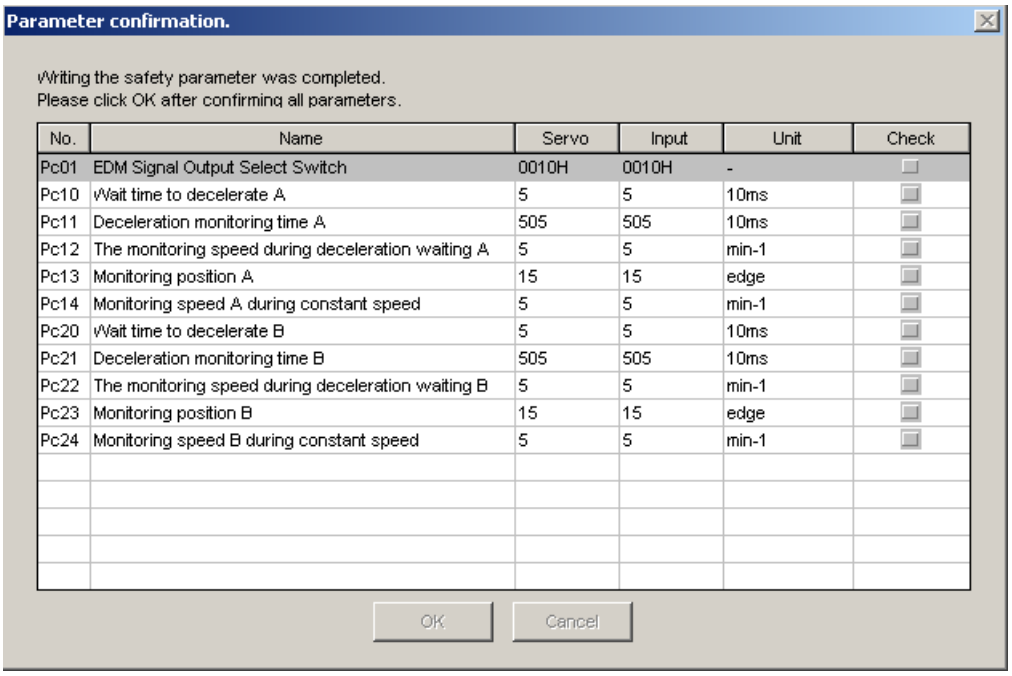


Servo: Shows the current settings for Safety Module parameters

Input: Shows the values set in the parameter editing window for the Safety Module.

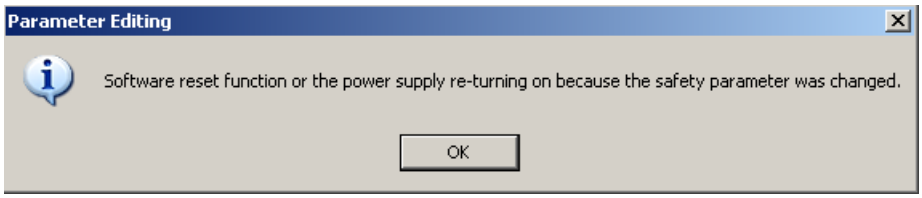
3. Verify the values shown in **the Input** column, and select the check boxes of the parameters whose settings are confirmed to be correct.

   When all the check boxes of the displayed parameters are selected, the **OK** button becomes available.



   Click **OK**.

4. The following message appears.



   Click **OK**, and restart the SERVOPACK to validate the new settings.

4.5.11 Resetting the SERVOPACK by Software

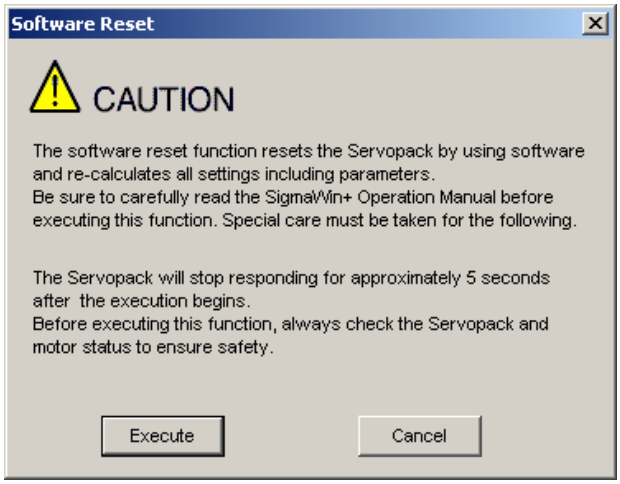
> **⚠ CAUTION**
>
> The software reset function resets the SERVOPACK by using software and re-calculates all settings including parameters.
>
> Be sure to check related information in this manual before using this function.
>
> Special care must be taken for the following.
>
> • The SERVOPACK will stop responding for approximately 5 seconds after the execution begins.
> Before executing this function, always check the SERVOPACK and motor status to ensure safety.

The software reset function turns on or off the power supply to the SERVOPACK by using software.

To execute the software reset function, use the following procedure.

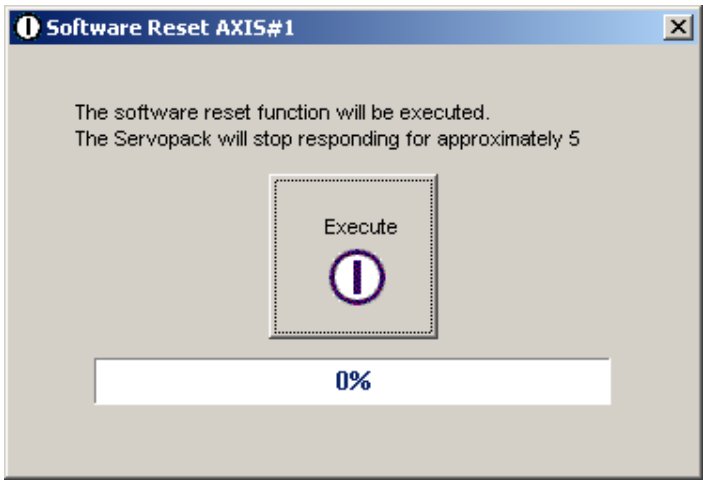
■ USB Connection

1. In the SigmaWin+ Σ-7 component main window, click **Setup** and then click **Software Reset**.
   A warning message will appear, confirming if you want to continue.
   After calculating the moment of inertia as described in "4.7 Tuning," the window shown in step 2 will appear.

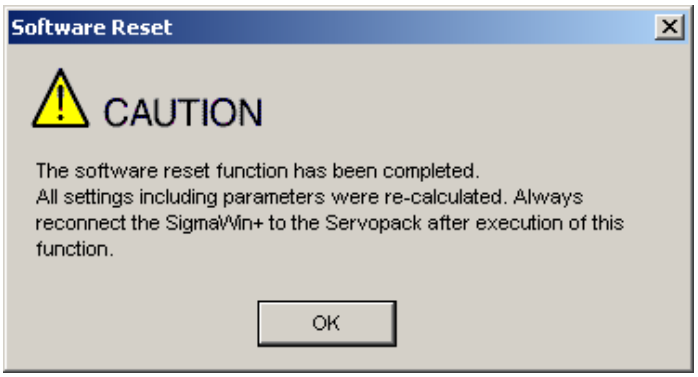


   Click **Cancel** to return to the main window without executing the software reset function.

2. Click **Execute**. The Software Reset window will appear.



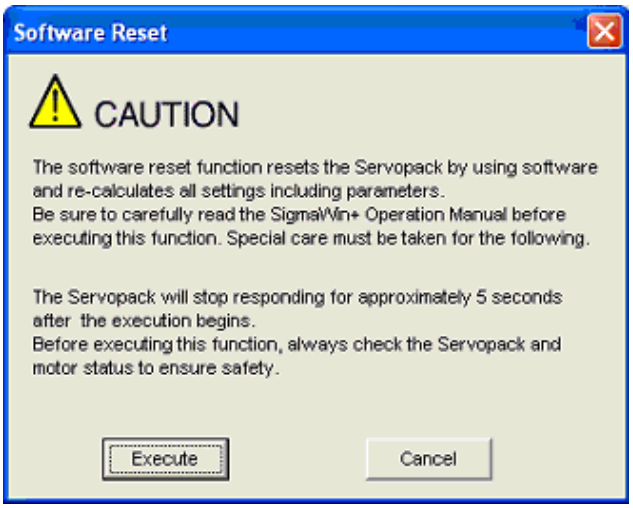
3. Click **Execute**. When execution of the software reset function is complete, a warning message will appear, asking you to reconnect the SigmaWin+ to the SERVOPACK.



4. Click **OK** to close the Software Reset window. All settings including parameters have been re-calculated. Disconnect the SigmaWin+ from the SERVOPACK, and then reconnect.

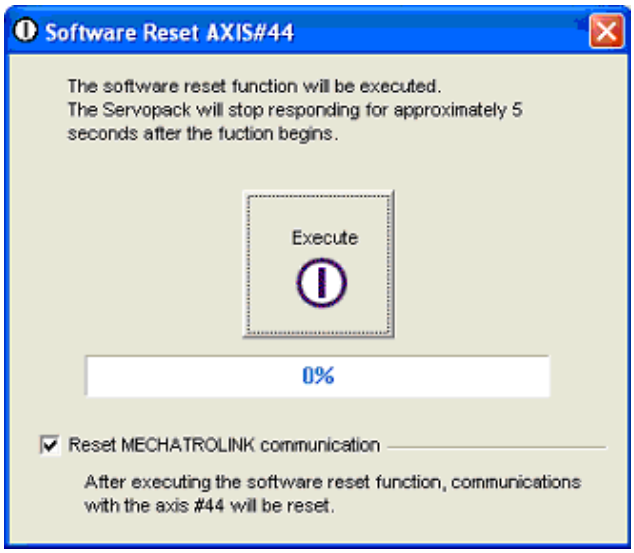
■ When using a Controller

1. In the SigmaWin+ Σ-7 component main window, click **Setup** and then click **Software Reset**.
   A warning message will appear, confirming if you want to continue. After calculating the moment of inertia as described in "4.6 Tuning," the **Software Reset** window shown in step 2 will appear.



Note: Click **Cancel** to return to the main window without executing the software reset function.

2. Click **Execute**. The following message will appear.



NOTE

When software reset is executed, communication between the Controller and the SERVOPACK is disabled, and an error is issued. MECHATROLINK communication must be reset to clear the communication error. Check ***Reset MECHATROLINK communication*** to reset the MECHATROLINK communication

3. When execution of the software reset function is complete, the following message will appear.

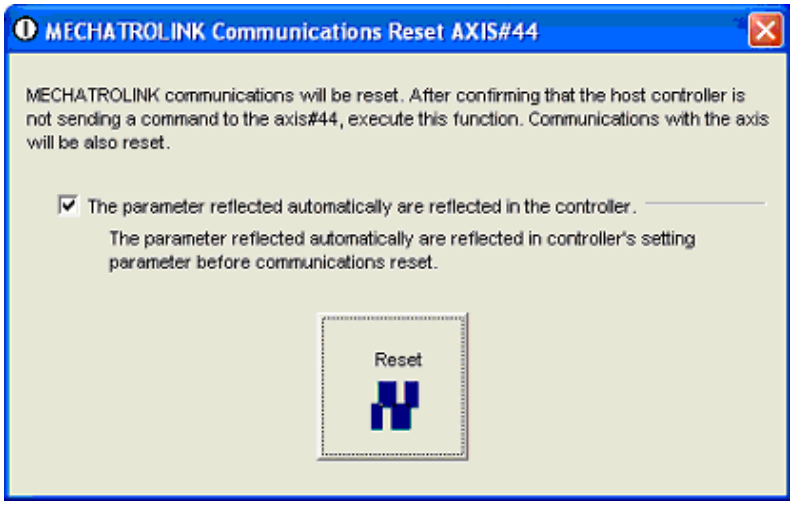
4. Click **OK** to close the **Software Reset** message. All settings including parameters have been re-calculated. Disconnect SigmaWin+ from the SERVOPACK, and then reconnect.

<MECHATROLINK Communication Reset>

MECHATROLINK Communication Reset function resets the communication with MECHATROLINK.
Only the communication of MECHATROLINK can be reset.
Communication between the Controller and the SERVOPACK can be restored by clearing the communication error that occurred between them.

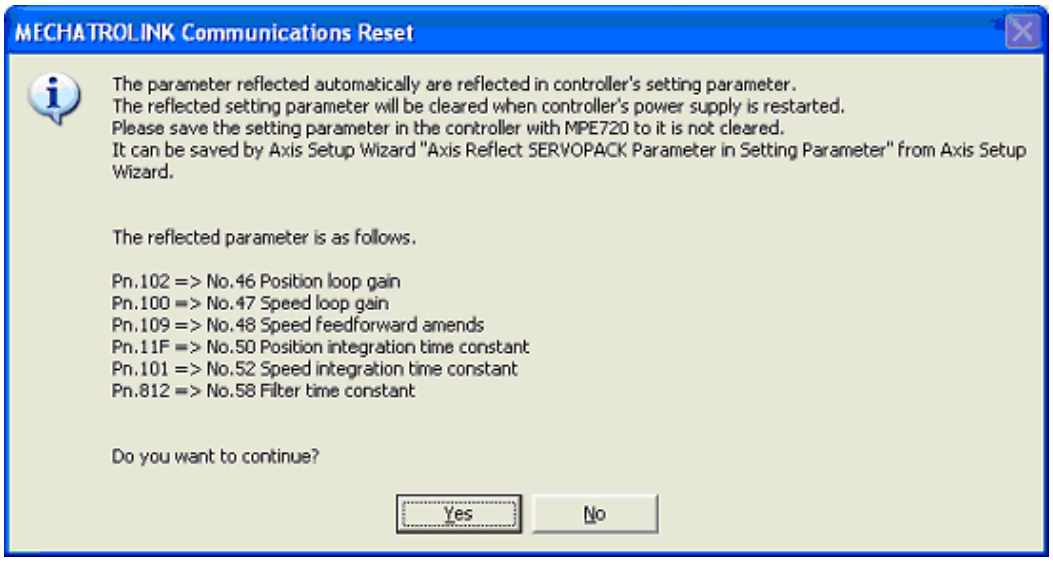
1. In the SigmaWin+Σ-7 component main window, click **Setup** and then click **MECHATROLINK Communication Reset.**

   The following message will appear.



2. Click **Reset**.

   The following message will appear.



3. Click **Yes**.

   The parameters that are automatically reflected will be reflected in Controller's setting parameters (register: OWxxxx).
   At the same time, the MECHATROLINK communication reset will be executed and the **MECHATROLINK Communication Reset** message will close.

4.5.12 Writing the Motor Parameters in the Scale

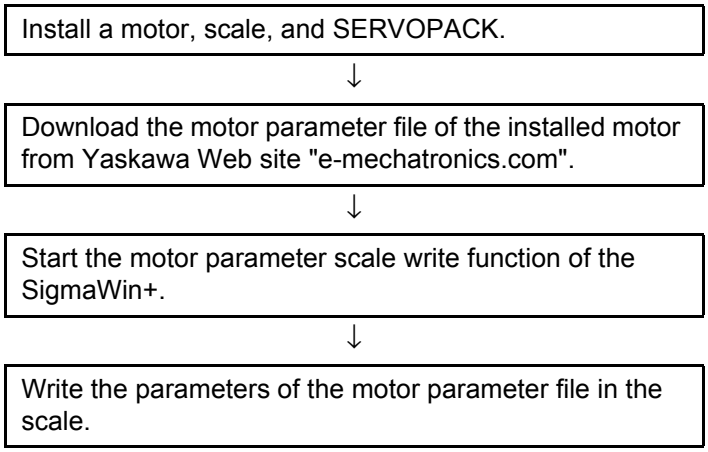
⚠ WARNING

The Motor Parameter Scale Write function rewrites data in the scale.

If the data which does not suit the connected motor is rewritten, the motor may not run normally, resulting in motor overrun, etc.

Be sure that the data written in the scale suits the connected motor.

Write the parameters of the motor parameter file in the scale:



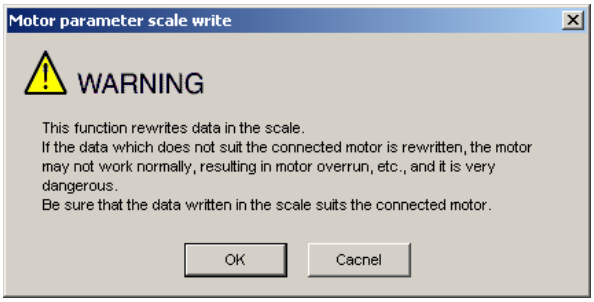
Write the motor parameters in the scale using the following procedure. Download the motor parameter file of the installed motor from Yaskawa Web site "e-mechatronics.com" in advance.

1. In the SigmaWin+ Σ-7 component main window, click **Setup**, and then click **Motor Parameter Scale Write**. A warning message appears, reminding you of the possible danger.

INFO

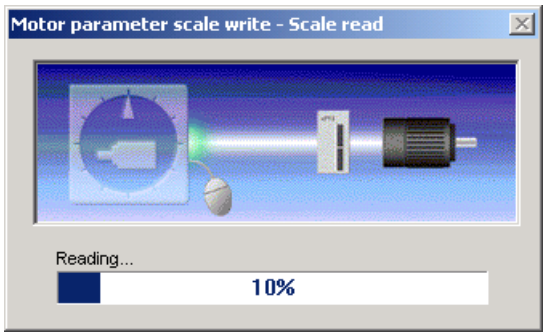
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

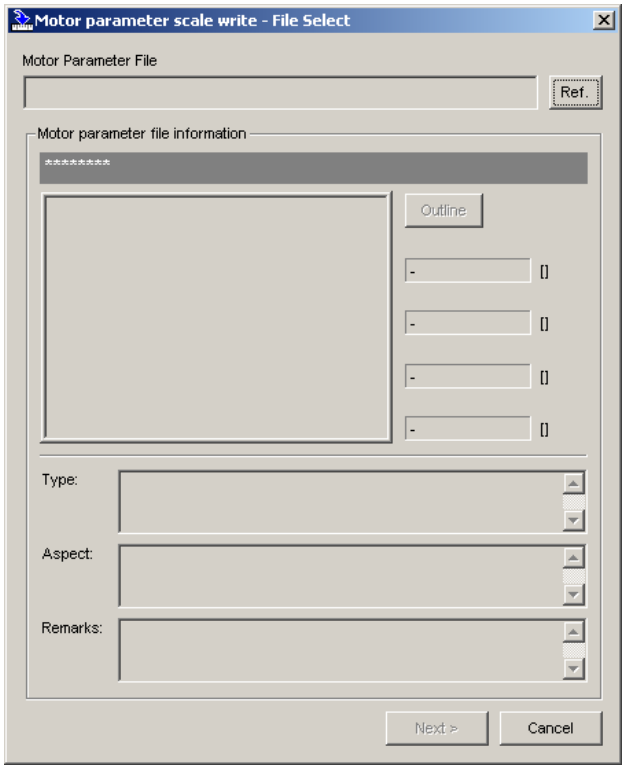


Click **Cancel** to return to the main window without writing motor parameters in the scale.

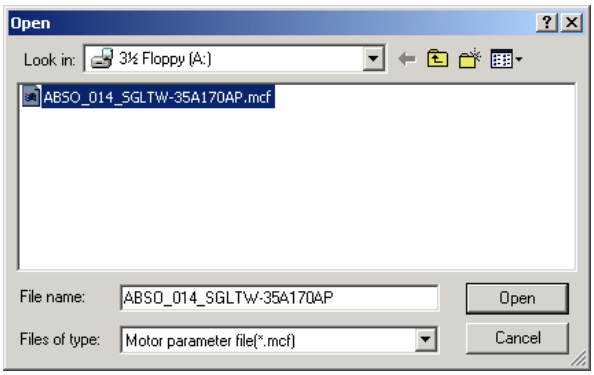
2. Click **OK**. The following box appears, and the SERVOPACK starts reading the parameter information from the scale.



When the reading was completed successfully, the following box appears.



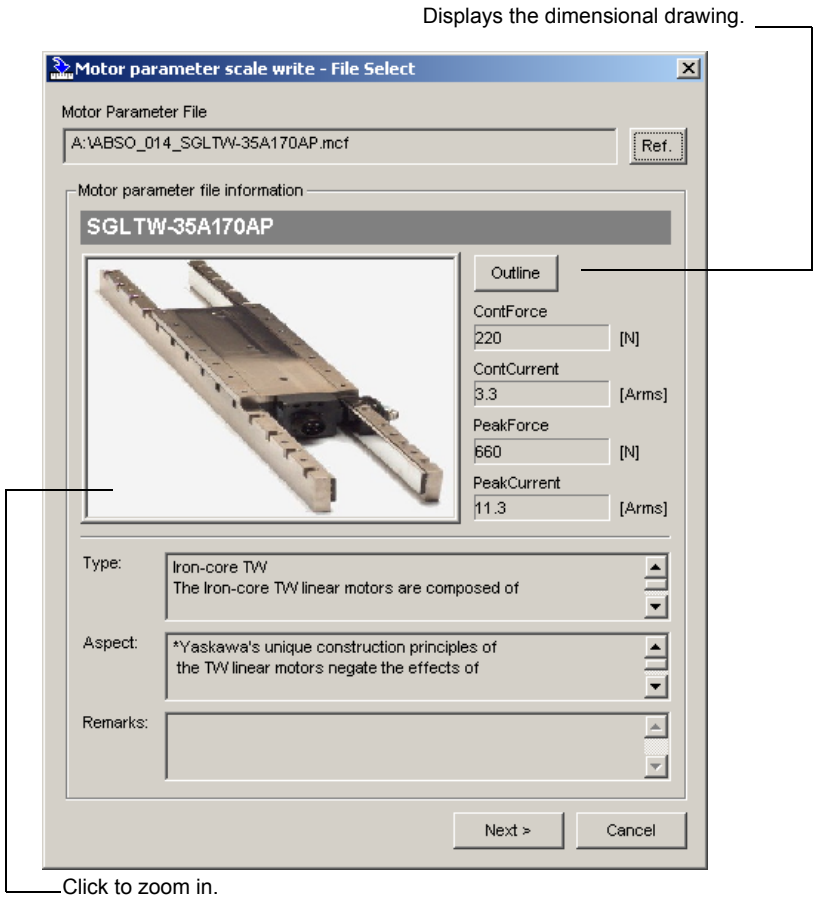
3. Click **Ref.**, and the following box appears.



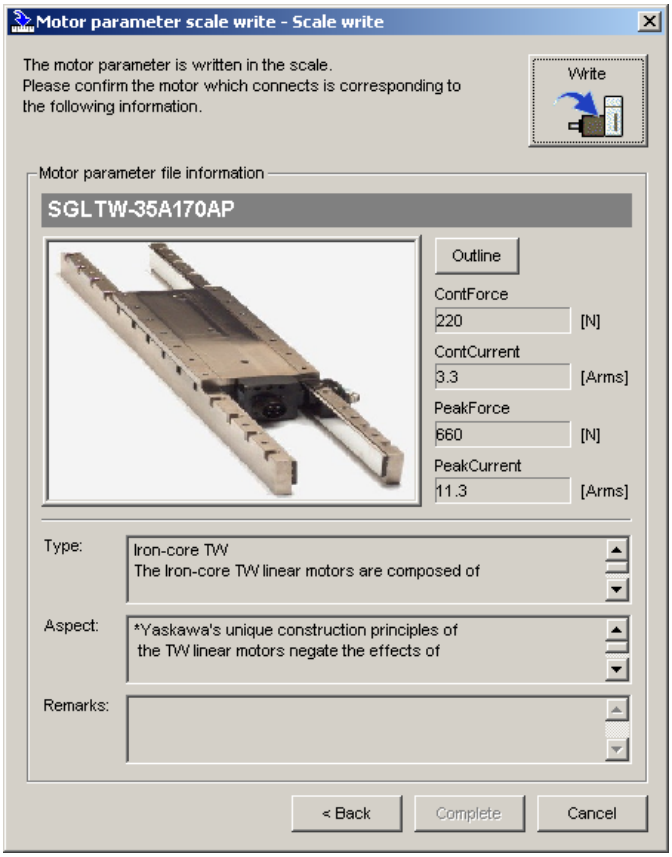
4. Select the motor parameter file downloaded from Yaskawa Web site "e-mechatronics.com," and then click **Open**. The motor parameter file information is displayed in the Motor parameter scale write - File select box.

NOTE

Make sure that the motor parameter file information of the installed motor is displayed.

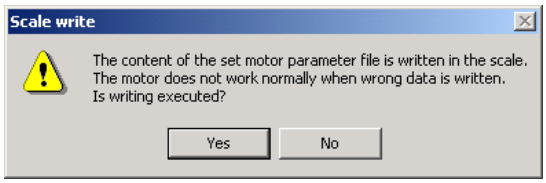


5. Click **Next**. The following box appears.



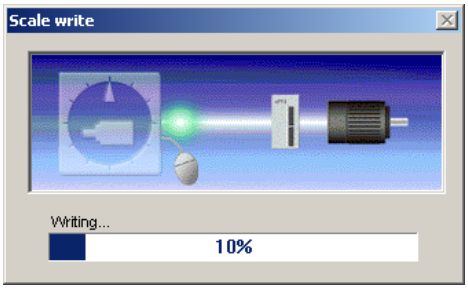
Click **Cancel** to return to the main window without writing motor parameters in the scale. Click **Back** to return to the Motor parameter scale write - File select box.

6. Click **Write**. The following message appears.



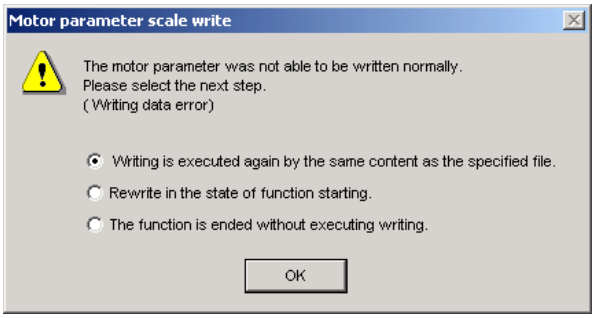
Click **No** to cancel writing.

7. Click **Yes**. The following box appears, and the motor parameter scale writing starts.

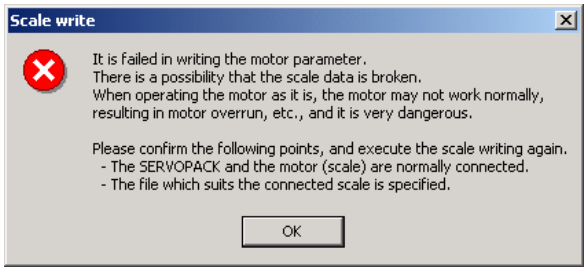


<If the Motor Parameters Were Not Written Normally>

The following box appears.



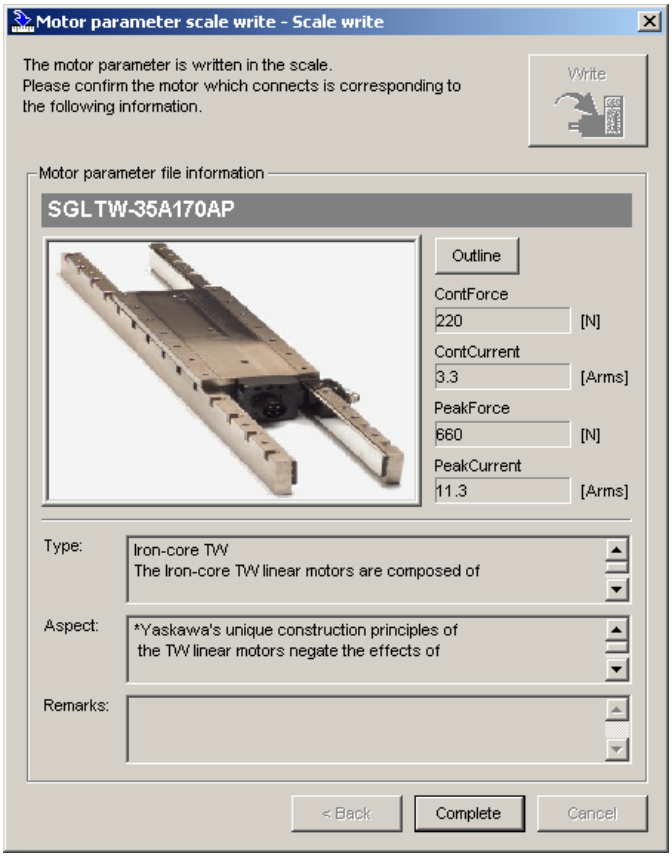
Select the next step to be executed, and then click **OK**. If "The function is ended without executing writing" is selected, the following box appears.



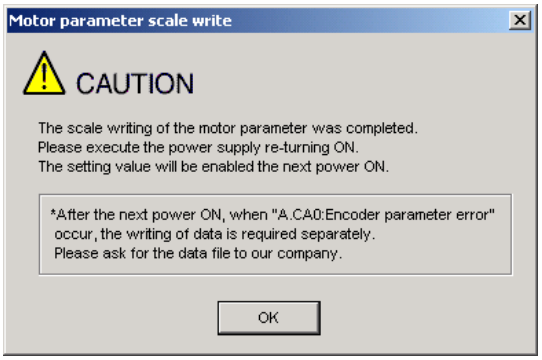
Click **OK** to return to the main window.

<If the Motor Parameters Were Written Normally>

The following box appears.



8. Click **Complete**, and the following box appears.



9. Click **OK**. Turn OFF the power and then ON again to validate the written data.

4.5.13 Detecting the Polarity

> **⚠ WARNING**
>
> During execution of this function, power will be supplied to the linear motor. Take care to avoid electric shock.
>
> The linear motor may move. Do not approach the motor movable parts.

When using a linear servomotor without hall sensor, the polarity must be detected after turning ON the power supply.

The polarity detection function is used to detect the polarity and store the phase data in the SERVOPACK and the linear scale.

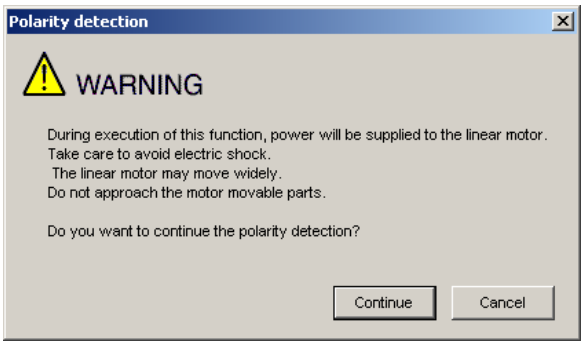
Detect the polarity using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Setup** and then **Polarity Detection**. A warning message appears, reminding you of the possible dangers.

INFO

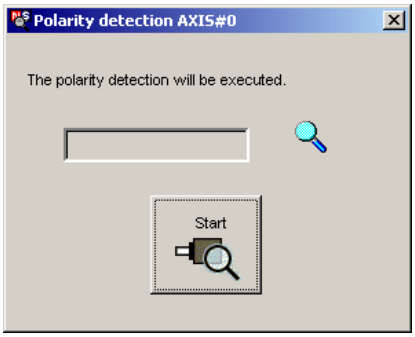
If more than one axis is being used, the **Axis Selection** dialog box appears.

First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



Click **Cancel** to return to the main window without executing the polarity detection function.

2. Click **Continue**, and the Polarity Detection box appears.



3. Click **Start**, and the polarity detection will be executed.

4.5.14 Setting the Zero Point Position of the Absolute Linear Encoder

⚠ WARNING

The zero point position setting for the absolute linear encoder sets the current position of the connected absolute linear encoder as the zero point position.
Be sure to check related information in this manual before using this function.
Note the following points:

1 Always make the settings for the mechanical system again after the zero point position setting.

Executing the zero point position setting will clear the absolute position of the connected absolute linear encoder to 0 and the previously defined mechanical system will change to a different coordinate system.

Operating the machine in this state is extremely dangerous. Failure to observe this warning may result in personal injury and/or damage to the machine.

Be sure to reset the zero point position of the mechanical system after setting the zero point position of the absolute linear encoder.

2 The following conditions must be met to set the zero point position of the absolute linear encoder.

The following conditions must be satisfied to execute the zero point position setting.

- Servo is in OFF status.
- The polarity detection has been completed.

Check the SERVOPACK status.

3 Always turn the SERVOPACK power supply OFF and ON again after setting the zero point position of the absolute linear encoder.

The new zero point position of the absolute linear encoder will be valid only after you turn the power supply OFF and ON again.

Always turn the SERVOPACK power supply OFF and ON again after setting the zero point position of the absolute linear encoder.

The zero point position of the absolute linear encoder can be set when using an absolute linear encoder supported by the SERVOPACK.

Before executing the zero point position setting of the absolute linear encoder, move the motor to the position to be set as the zero point position.

Use the following procedure to set the zero point position of the absolute linear encoder.

1. In the SigmaWin+ Σ-7 component main window, click **Setup** and then **Zero Point Position Setting**. A warning message appears, reminding you of the possible dangers.

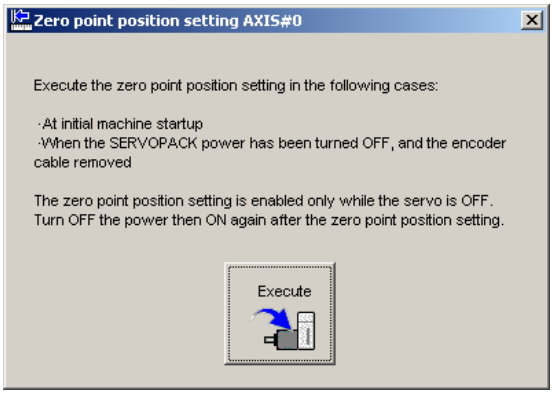
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.

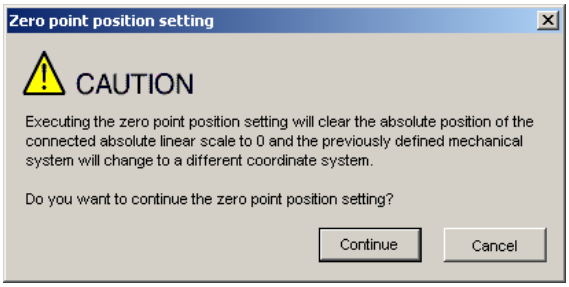
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

Click the **Cancel** to cancel setting the zero point position of the absolute linear encoder. You will return to the main window.

2. Click **Continue**, and the Zero Point Position Setting box appears.

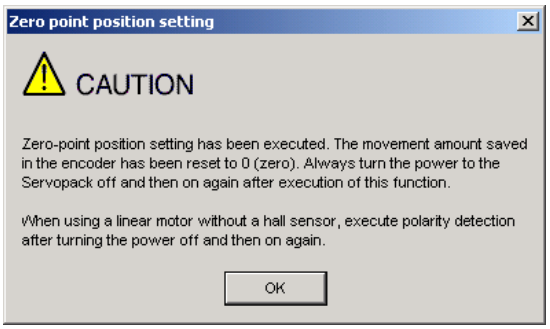


3. Click **Execute**.



Click the **Cancel** to cancel setting the zero point position of the absolute linear encoder. You will return to the previous dialog box.

4. Click **Continue**. The zero point position of the absolute linear encoder will be set and the following dialog box will be displayed.



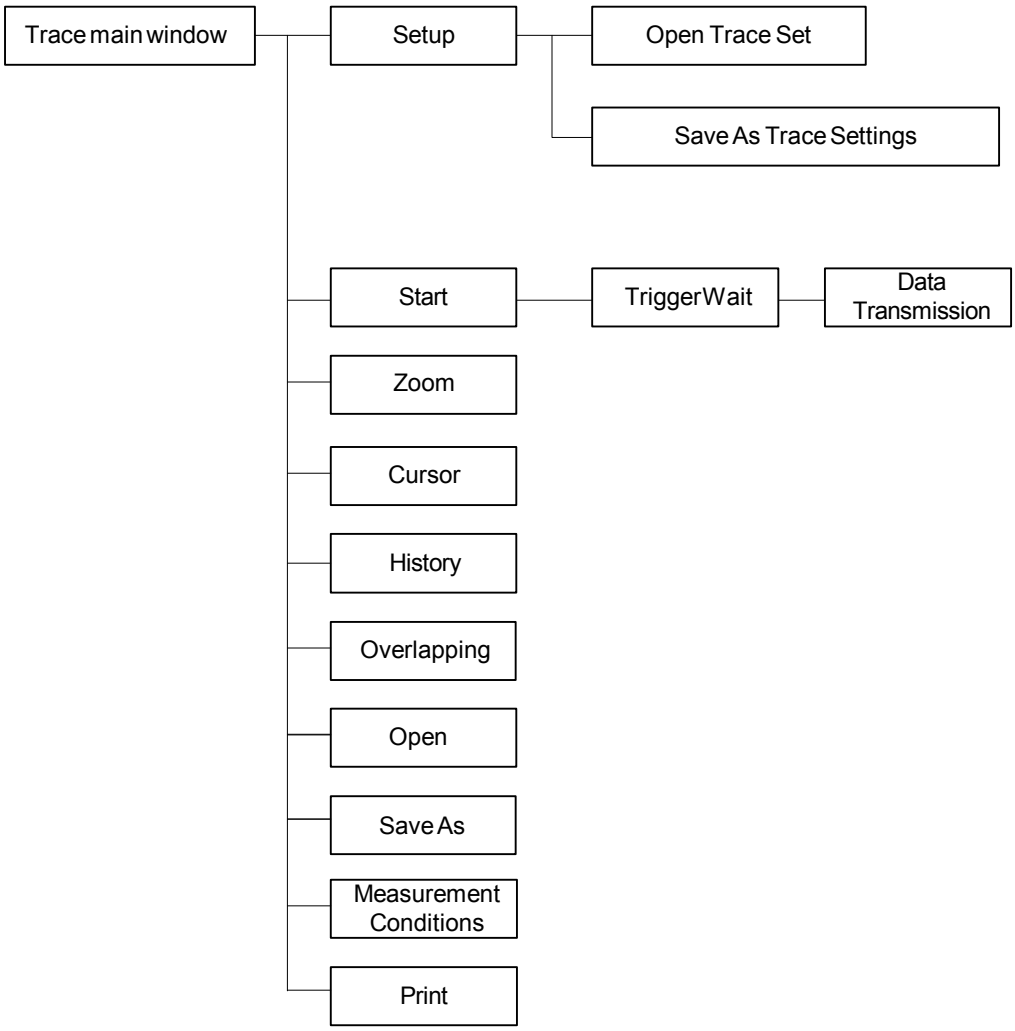
5. Click **OK**.

4.6 Tracing

4.6.1 Trace Function

■ Structure

The following flowchart shows how the trace function works.



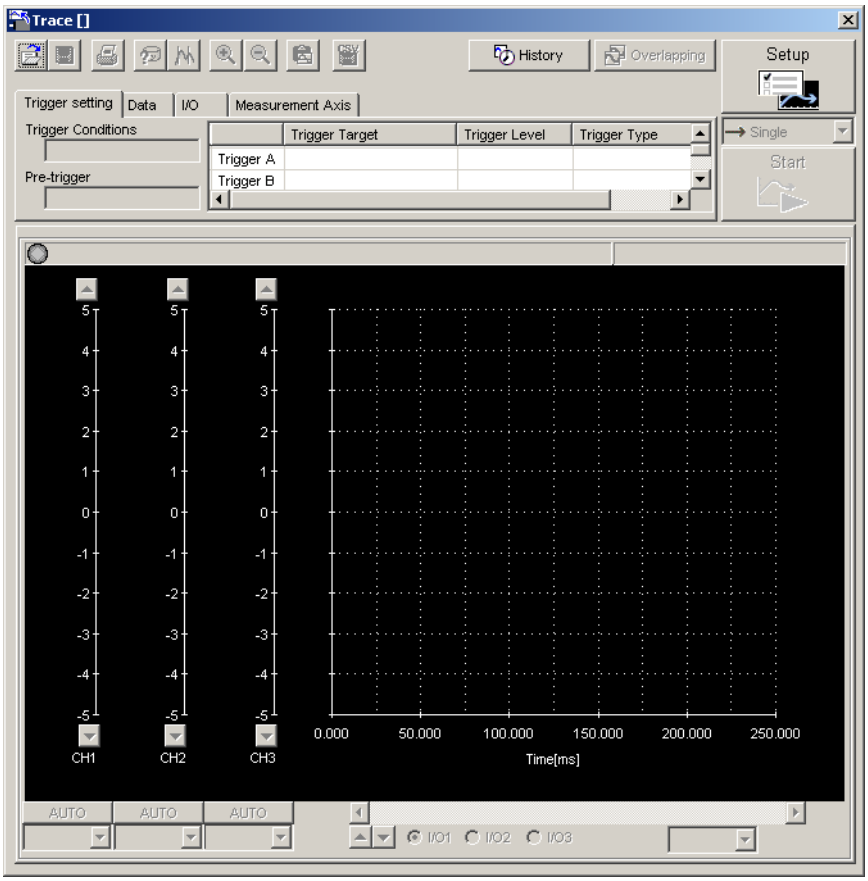
INFO

The Measurement Axis Tab Page is not shown in some of the screen captures. It will be displayed on the actual GUI.

■ Data Trace

Trace Main Window

In the SigmaWin+ Σ-7 component main window, click **Trace** and then click **Trace**. The Trace main window appears.

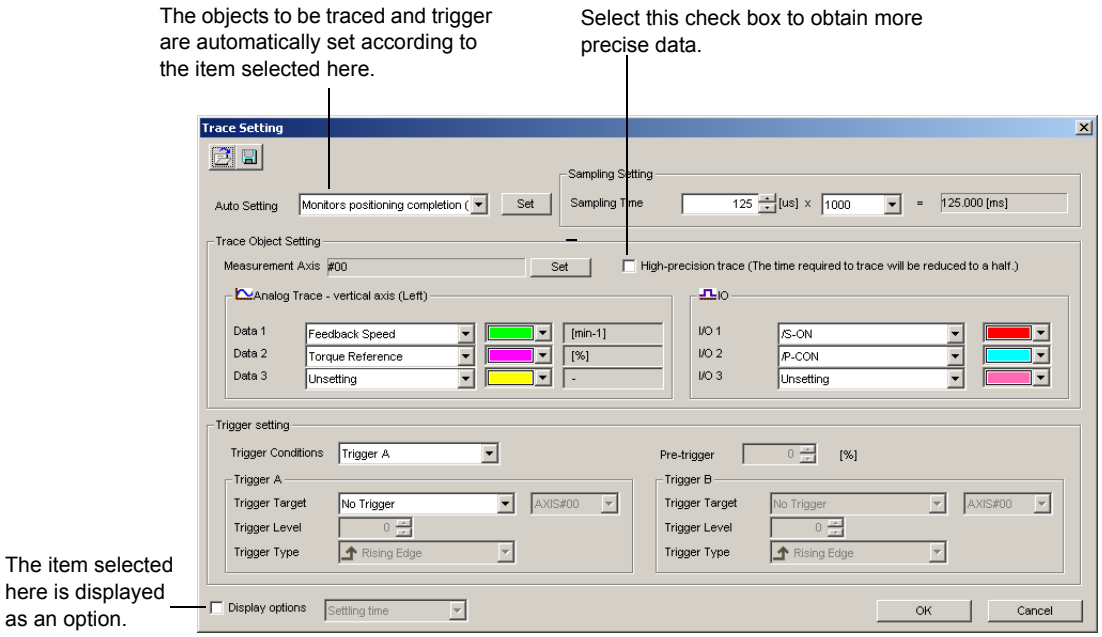


Trace Main Window

Trace Setting

In the Trace main window, click **SETUP**, and the Trace Setting box appears. Select the objects and conditions for the trace.

The settings from the previous trace, if any, are displayed.



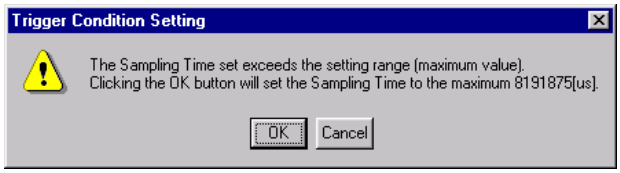
Trace Setting Box

<Sampling Setting>

The setting for the allowable interval time for getting trace data can be made here. Data will be obtained every 250 µs if the sampling time is set to 250 µs. The total trace time is the sampling time multiplied by the number of data items. Use the spin button to set the time.

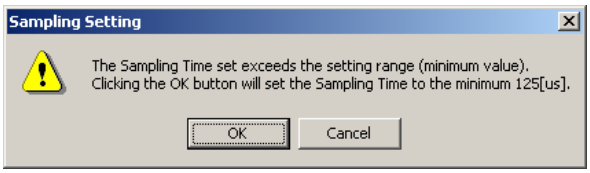
If directly typing a value and the value is outside the acceptable range, a warning message will appear telling you that the sampling time is incorrect. The warning will vary according to the error.

1. If the typed value is larger than the maximum setting time:



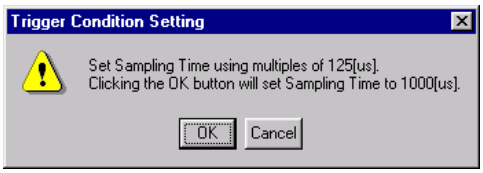
Click **OK** to automatically adjust the sampling time to the maximum setting. Click **Cancel** to return to the Trace Setting box without setting the sampling time.

2. If the typed value is smaller than the minimum setting time:



Click **OK** to automatically adjust the sampling time to the maximum setting. Click **Cancel** to return to the Trace Setting box without setting the sampling time.

3. If the typed value cannot be allocated in the time interval:



Click **OK** to automatically adjust the sampling time. Click **Cancel** to return to the Trace Setting box without setting the sampling time.

<Trace Object Setting>

Measurement Axes

Click the **Set** button by the **Measurement Axis** box. The **Axis Selection** dialog box will be displayed. You can trace up to 16 data items. The number of axes that you can select according to the number of traces that are set for analog tracing or I/O tracing is as follows:

- Number of traces set to 1: 16 axes
- Number of traces set to 2: 8 axes
- Number of traces set to 3: 5 axes

- The Axis Selection dialog box will not allow you to select more than the maximum number of axes.
- The setting of the number of traces will be the largest number for either analog tracing or I/O tracing. For example, if one analog trace is set and two I/O traces are set, the setting of the number of traces would be 2. That means that you could select up to 8 axes for analog tracing and 8 axes for I/O tracing.

Data 1/Data 2/Data 3

Select content such as "Torque Reference," "Feedback Speed," etc., identical to the analog monitor as trace objects from the data boxes. The line color for Data1/Data2/Data3 can be set here. The settings are as follows.

Name	Unit
Not set	–
Torque reference	%
Feedback speed	min^{-1}
Reference speed	min^{-1}
Position reference speed	min^{-1}
Position error	Reference unit
Position amplifier error	pulse
Position error between motor and load	Reference unit
Speed feed forward	min^{-1}
Torque feed forward	%
Effective gain	
External encoder speed	min^{-1}

Rotary Motor

Name	Unit
Not set	–
Force reference	%
Feedback speed	mm/s
Reference speed	mm/s
Position reference speed	mm/s
Position error	Reference unit
Position amplifier error	pulse
Position error between motor and load	Reference unit
Speed feed forward	mm/s
Force feed forward	%
Effective gain	

Linear Motor

I/O 1 / I/O 2 / I/O 3

Select output signals such as "/COIN" or "ALM" and input signals such as "/C-SEL," "P-OT," or "N-OT" as trace objects. The line color for I/O 1 / I/O 2 / I/O 3 can be set here.

<Trigger Setting>

A trigger is a device for designating the timing of data access. For example, it is possible to set conditions such as "After /COIN signal goes ON" or "After the speed feedback exceeds 100 min^{-1}," and thereby make detailed reference of the servo operation at the time these conditions occur.

Trigger (Trigger Conditions)

Set two trigger conditions: Trigger A and Trigger B.

By combining Trigger A and Trigger B, a total of three conditions can be set as follows.

Trigger Condition	Description
Trigger A	Trigger A is satisfied
Trigger A AND Trigger B	Both Trigger A and Trigger B are satisfied
Trigger A OR Trigger B	Either Trigger A or Trigger B is satisfied

Pre-trigger (0% to 99%)

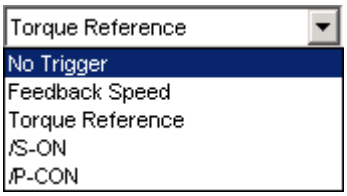
Designate to what degree data is displayed in the graph before a trigger is applied.

A trigger condition is designated by the following three items.

Trigger Target

Designate the object to which the trigger is applied. The selected objects can either be from the designated in Data 1, 2, and 3, and I/O 1, 2, and 3, or "No Trigger."

If "No Trigger" is selected, the trigger will be applied at the time the **START** button is clicked. Also the settings for "Trigger Level," "Trigger" (trigger type), and "Pre-Trigger" will be unavailable.



Trigger Target Box

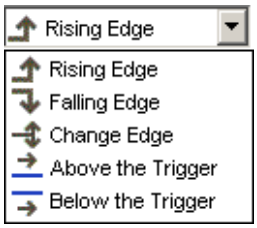
Trigger Level

Designate the standard for determining when the trigger starts. The units for the setting are the same as those of the trigger object selected.

The trigger level cannot be set if the trigger object is "I/O 1 / I/O 2 / I/O 3" or "No Trigger."

Trigger (Trigger Type)

Designate the trigger judgment method when the trigger is applied. Select **Rising Edge**, **Falling Edge**, **Change Edge**, **Above the Trigger** (above the trigger level) or **Below the Trigger** (below the trigger level).



Trigger Type Box

Rising Edge: The trigger is detected when the trigger object data rises from below the trigger level to above the trigger level.
When the change is from LO to HI in I/O

Falling Edge: The trigger is detected when the trigger object data falls from above the trigger level to below the trigger level.
When the change is from HI to LO in I/O

Change Edge: The trigger is detected if the trigger object crosses the "Trigger Level " in any way.
When the signal level changes in I/O

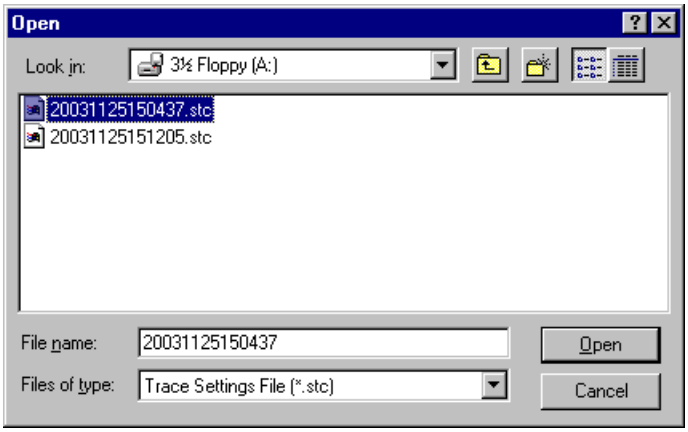
Above the Trigger: The trigger is detected when the trigger object data is above the trigger level.
Cannot be selected for I/O.

Below the Trigger: The trigger is detected when the trigger object data is below the trigger level.
Cannot be selected for I/O.

Rising Edge	Falling Edge	Change Edge	Above the Trigger Level	Below the Trigger Level
				

(Open) Button

In the Trace Setting box, click the button, and the trace setting files appear.

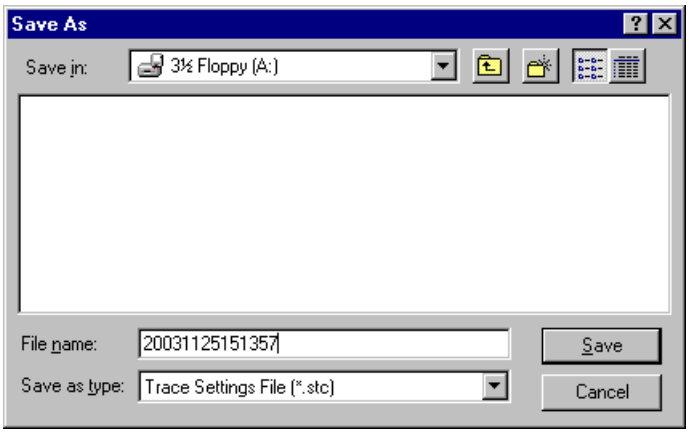


Open Dialog Box

Click **Open** to read the designated trace setting file. Click **Cancel** to return to the Trace Setting box without reading the file.

(Save) Button

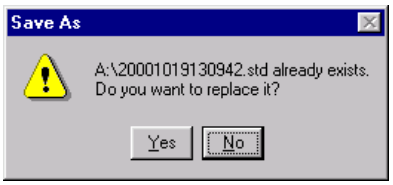
In the Trace Setting box, click the button, and then select the storage location for the setting file shown in the Trace Setting box.



Save As Dialog Box

Click **Save** to store the file name designating the current trace settings. Click **Cancel** to return to the Trace Setting box without saving the file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



Click **Yes** to overwrite the already existing file. Click **No** to return to the Save dialog box without saving the file.

OK

In the Trace Setting box, click **OK** to return to the Trace main window. The trace object and trigger are updated according to the settings.

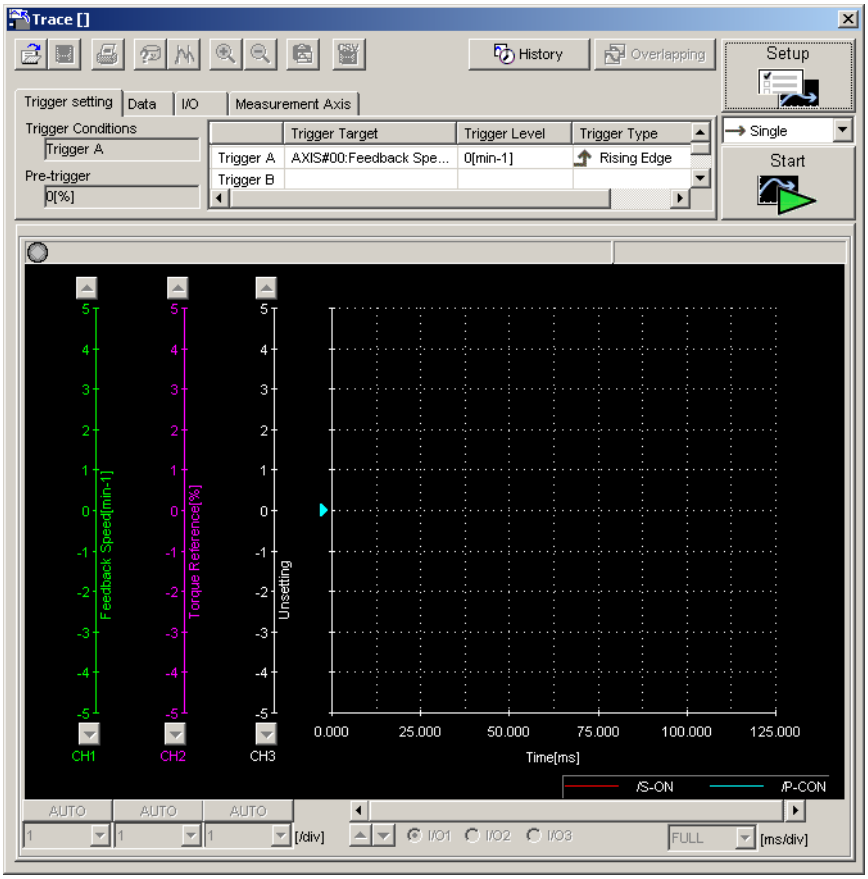
Cancel

n the Trace Setting box, click **Cancel** to return to the Trace main window without changing the settings.

INFO

If the saved file is opened using a SigmaWin+ version number that does not support Data 3 and I/O 3 for trace, the contents of only Data 1, Data 2, I/O 1 and I/O 2 are read-in.

Starting the Trace



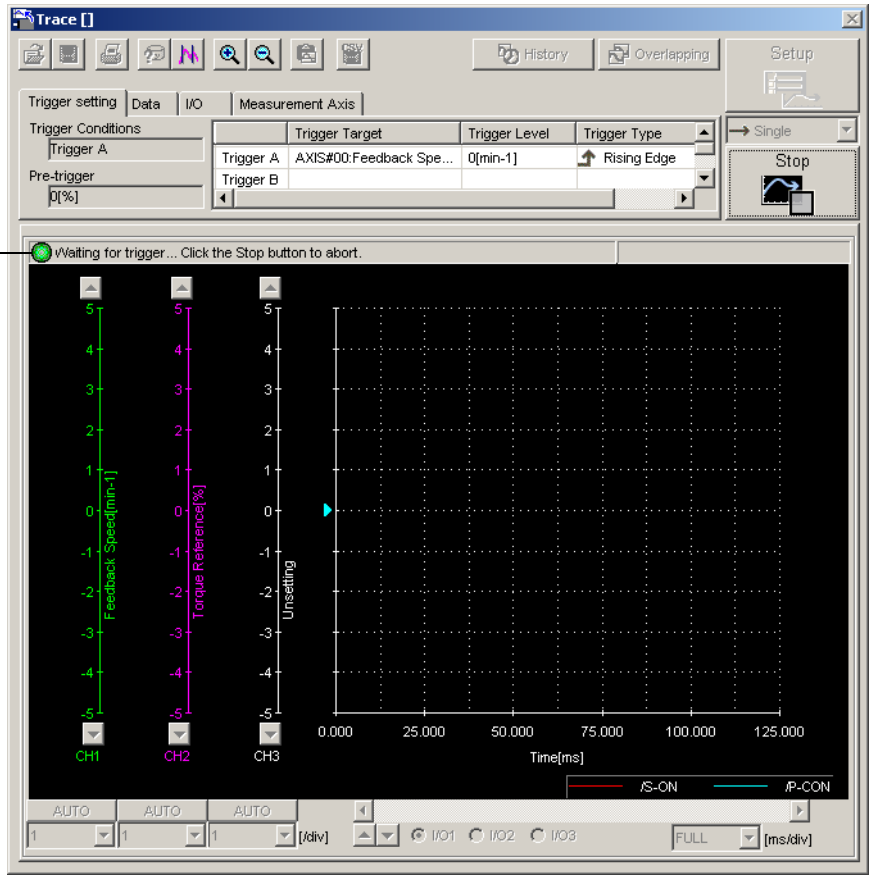
Trace Mode

Select whether to executing tracing only one time or repeatedly from the **Trace mod**e box.

Single: Executes the trace process once. Waiting for the trigger - Trigger conditions are met - Graphic display, and then ends the trace.

Continuous: Repeats the trace process until **Stop** is clicked.

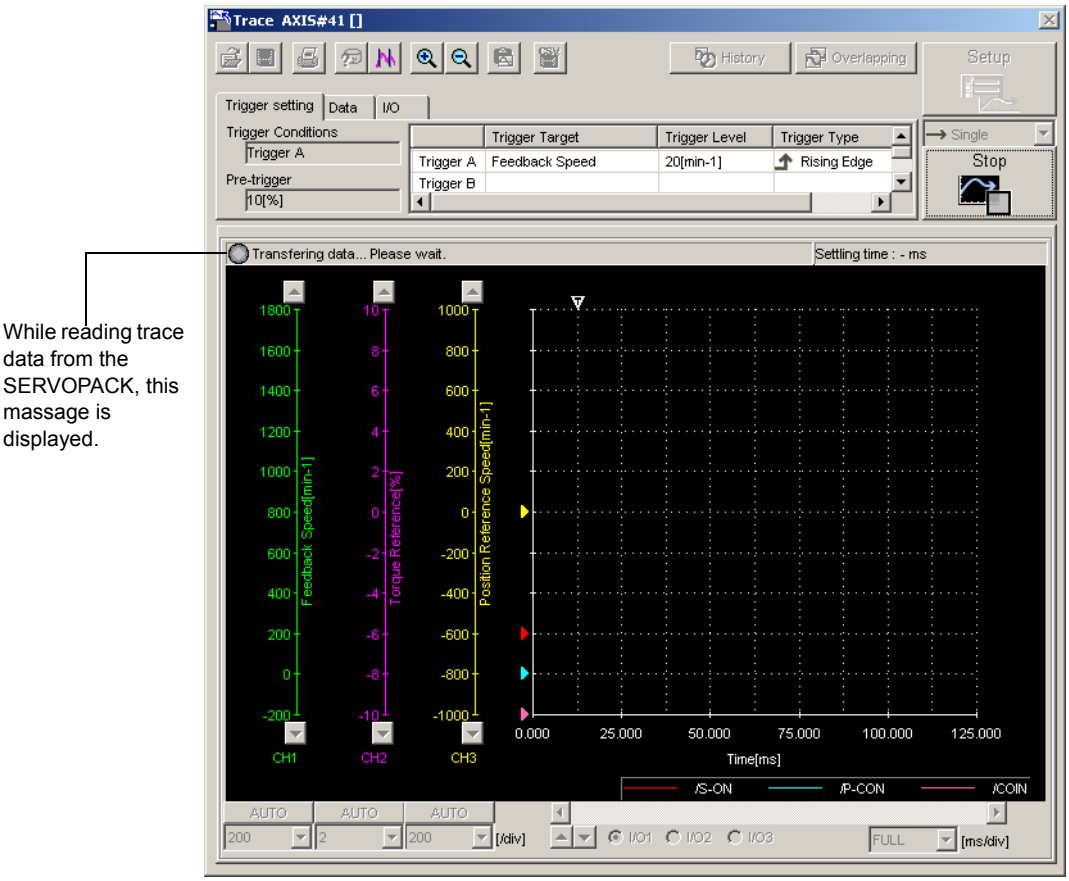
Click **Start** in the Trace main window, and the SigmaWin+ will wait for the trigger. The window below appears while waiting for the trigger.



While waiting for the trigger, this message is displayed.

Window Displayed While Waiting for the Trigger

The message remains until the set trigger conditions are met. Click **Stop** to stop waiting for the trigger.



While reading trace data from the SERVOPACK, this massage is displayed.

Window Displayed While Reading Trace Data from the SERVOPACK

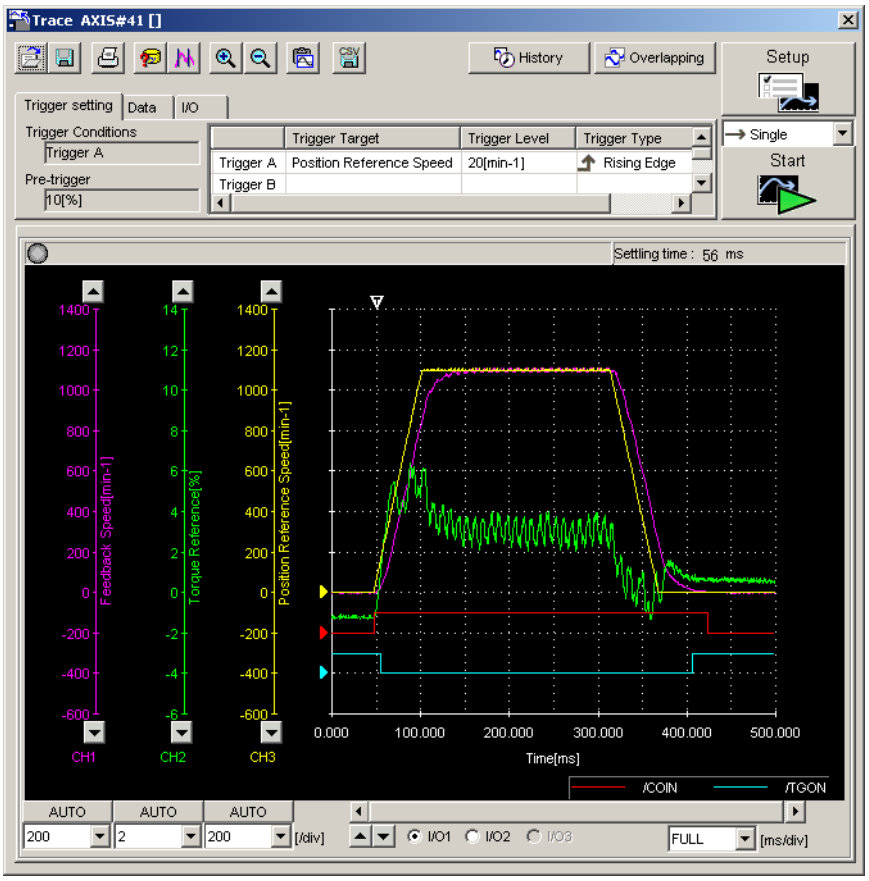
Once the trigger condition is satisfied, the SERVOPACK starts transferring data to the SigmaWin+. When the data transfer is completed, the Trace main window appears.

Notes 1. The trigger sometimes cannot be detected in less than 2ms due to the relationship of the detection period.

2. If the sampling time is lengthened, SigmaWin may continue to wait for the trigger even after the trigger has been applied. SigmaWin waits because data for the sampling time is saved in the SERVOPACK after the trigger has been applied.

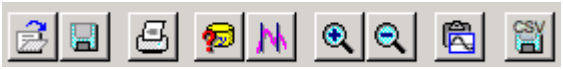
■ Trace Main Window

This Trace main window displays a graph based on the trace settings.



Trace Main Window

Toolbar



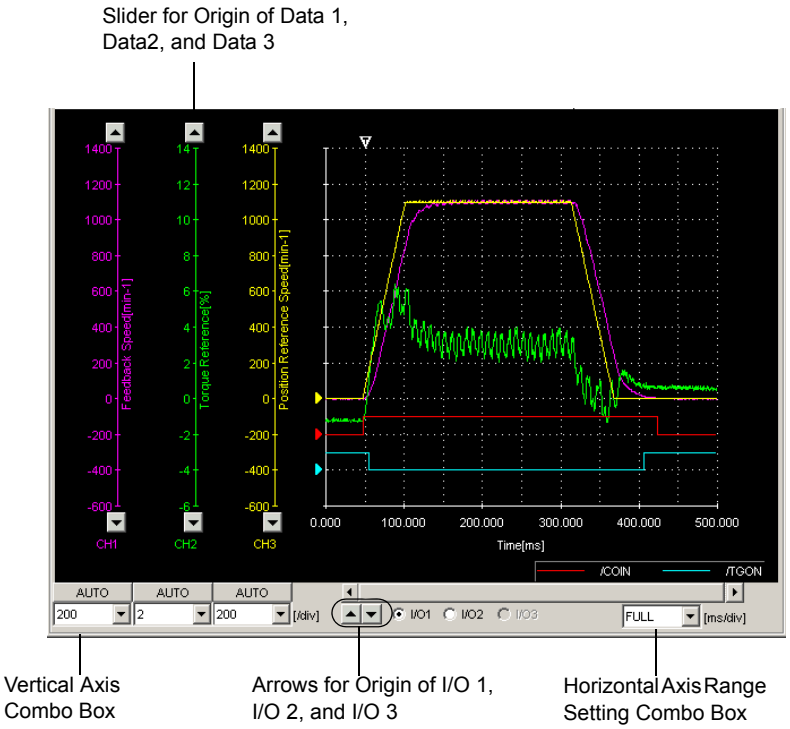
Trace Main Window Toolbar

Toolbar Button	Click this button to:
 Open	Load the trace data file.
 Save As	Save a copy of the on-screen trace graph to a specified file.
 Print	Print the Trace main window.
 Measurement Conditions	View the conditions to measure the trace.
 Cursor	View the information for the location where a cursor is shown.
 Zoom In	Enlarge the view of a selected area. Can trace with the enlarged view.
 Return	Restore the area shown in the window to its usual size.
 Clipboard Copy	Copy the displayed screen to the clipboard.
 Save As CSV	Save on-screen trace graph in CSV format.

See "■ Toolbar Details" for details on the toolbar buttons.

Trace Graph Display Field

Buttons, arrows, boxes, and sliders to control the graph display are provided on the trace graph display field.

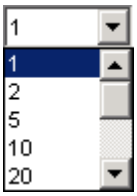


Trace Graph Display Field

Vertical Axis Scale

Select a vertical axis scale for Data 1, Data 2, and Data 3 from the vertical axis combo box. It is not possible to input a scale by typing the value.

If the **AUTO** button is clicked, a scale will be automatically selected so that all of the data can be shown in the graph.

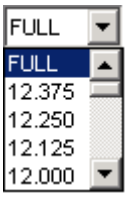


Vertical Axis Combo Box

Horizontal Axis Range

Select a horizontal axis range for the time axis from the box. The time is measured in "ms." The range must be selected from the list.

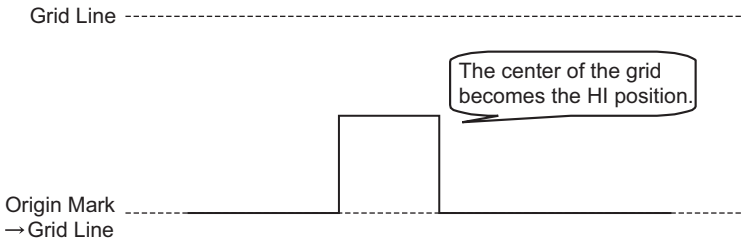
If FULL is selected, all of the data will be automatically adjusted so that the entire horizontal axis can be displayed. When the window is too small to show all of the horizontal axis, a horizontal scroll bar is displayed to allow you to view all of the axis.



Horizontal Axis Range Box

INFO

■ I/O Trace Graph



History

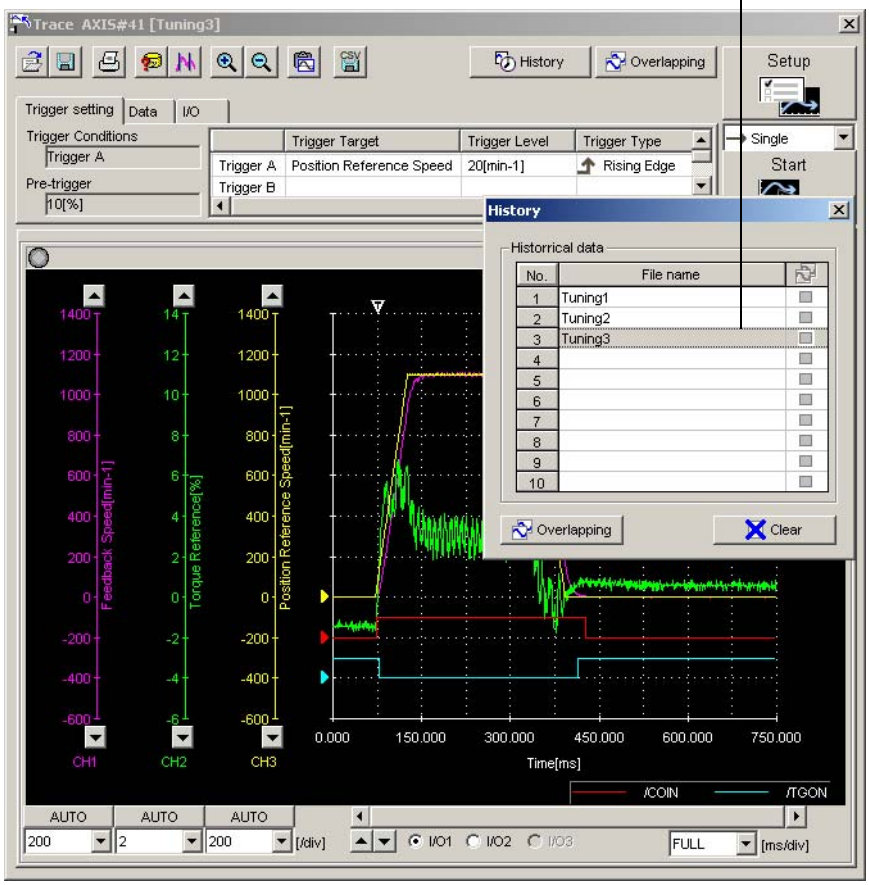
The data that had been traced and the trace data that had been called from the files are listed in order from the oldest in the History box. "Unsaved" is displayed for the trace data that have not been saved. Up to 10 data can be saved and displayed. When more than 10 data have been traced or called, the older data are cleared. The history save and display function is enabled only when the trace function is being executed. Therefore, the historical data is cleared when exiting the trace function.

Click **History** to display the History box.

If you click **History** while the overlapping function is effective, the overlapping function is canceled and the "Overlapping data" in the Overlapping box disappears.

See "Overlapping" for details on overlapping function.

The information of the file selected and highlighted here are displayed in the Trace main window.



Historical Data

The information of the file selected and highlighted here are displayed in the Trace main window.

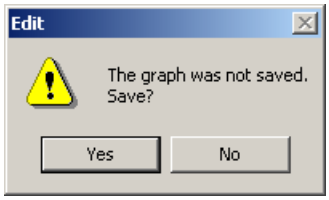
Overlapping

Click **Overlapping** so that the overlapping function is effective, and the Overlapping box appears. See "Overlapping" for details.

Clear

Clears all the historical data displayed in the History box and the data displayed in the Trace main window.

"Unsaved" is displayed in the "Historical data" of the History box for the trace data that have not been saved. When trying to select other data without saving, a message appears confirming if you want to save the trace data.



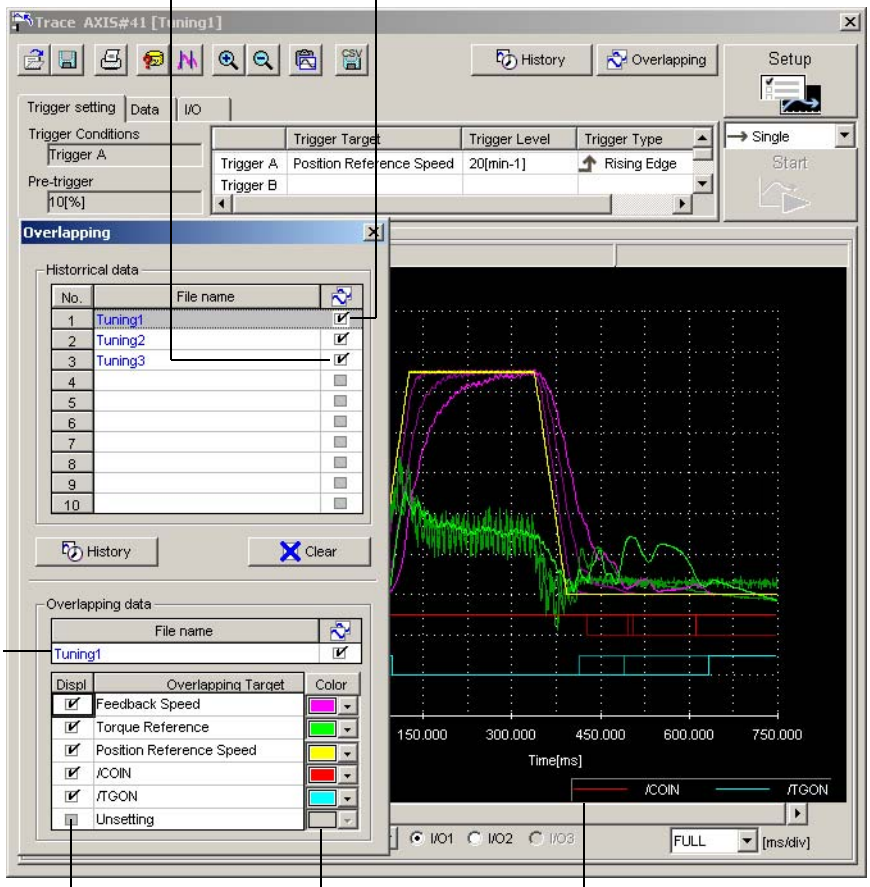
Overlapping

The graph of the trace data that have been called from the file and the data that have been traced are displayed overlapped. The trace objects of each file can be compared on the graphic display.

Click **Overlapping** in the History box to display the Overlapping box.

Select the check boxes of the files to be overlapped. The selected file names are displayed in blue.

When a file name is clicked and highlighted, the trace graph of the selected file name blinks several times.



The overlapped base file name is displayed.

Select the overlapping target.

Only the same trace objects as the overlapping target of the overlapped base file are displayed overlapped. The other objects are not displayed while the overlapping function is effective.

Set a line color for each overlapping target. (The line colors that have been set in the Trace main window becomes invalid.)

The line colors of the trace graph are as follows:

Data	Line Color of Trace Graph
Data selected and highlighted in the "Historical Data" of the Overlapping box.	Light color
Other data	Dark color

Historical Data

Select a check box of the file to overlap the graph. More than one data can be selected.

History

Click **History** to cancel the overlapping function. The Overlapping box disappears, and the History box appears.

Clear

Click **Clear** to clear all the historical data displayed in the "Historical Data" and the data displayed in the Trace main window.

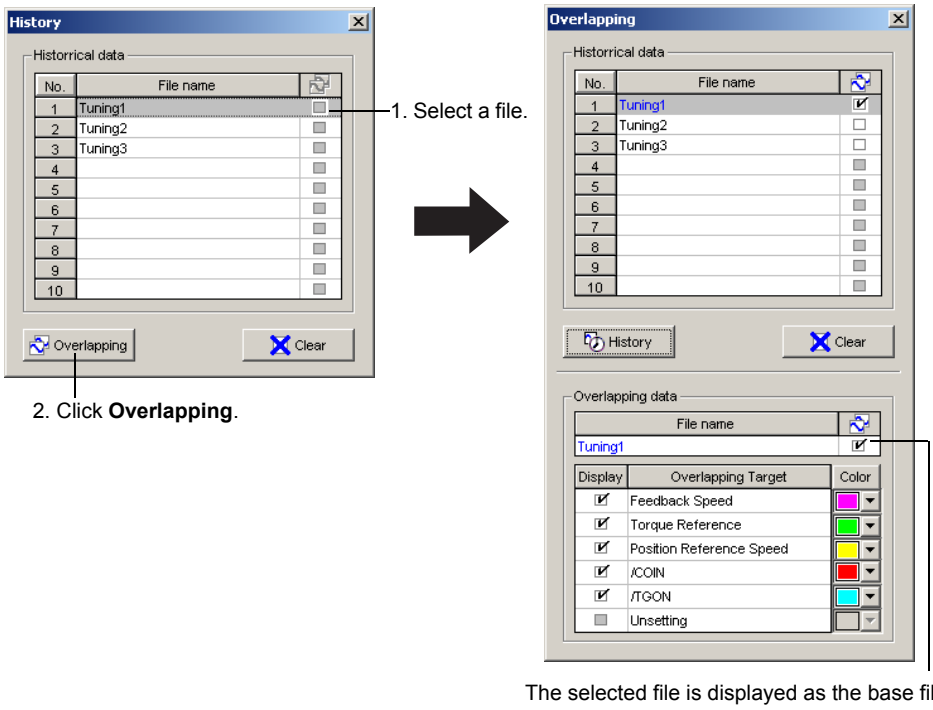
Overlapping Data

The overlapped base file in the "File name" of the "Historical data" is displayed in the "File name" of the "Overlapping data." The trace objects of the overlapped base file are displayed in the "Overlapping Target" and the relevant "Display" check boxes are selected. Select or clear the check boxes to select the objects to be displayed overlapped on the graph.
If the trace is executed by clicking **SETUP** in the Trace main window, the same objects as those of the base file are set automatically and cannot be changed.

<Basic File Setting Procedure>

- When opening the Overlapping box from the History box

1. Select a file from the "Historical data" in the History box.
2. Click **Overlapping**, and the selected file name is displayed in "File name" of the "Overlapping data" of the Overlapping box as the base file. A check mark is displayed for the base file name both in the "Historical data" and the "Overlapping data."



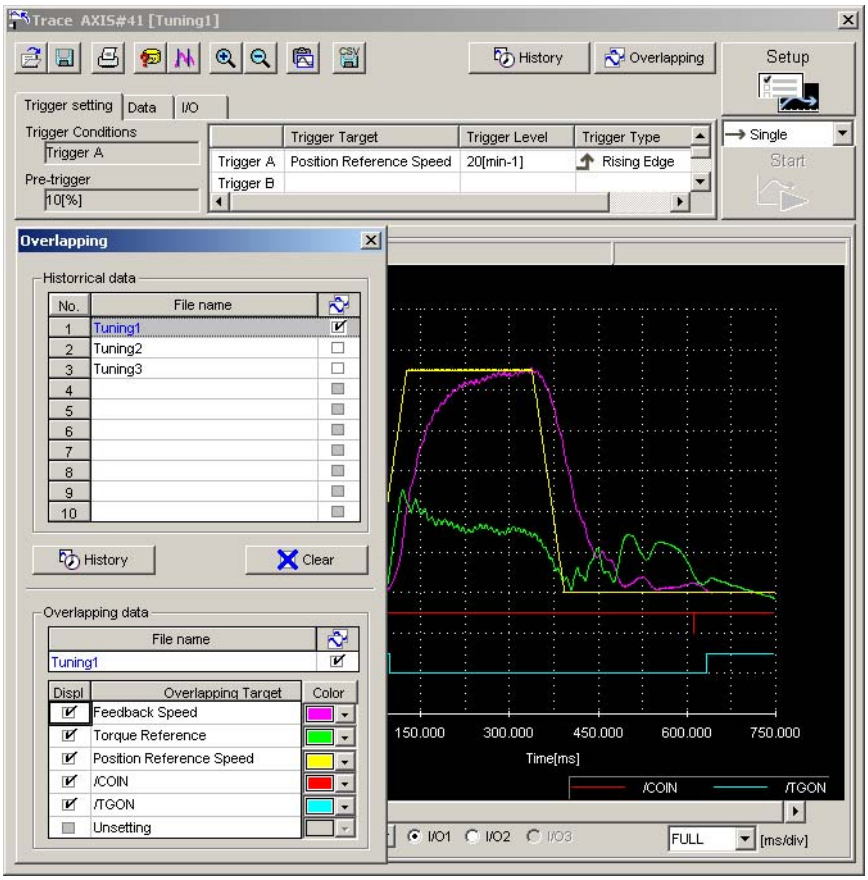
- When opening the Overlapping box by clicking **Overlapping** in the Trace main window

  The file displayed in the Trace main window is set as the base file automatically.

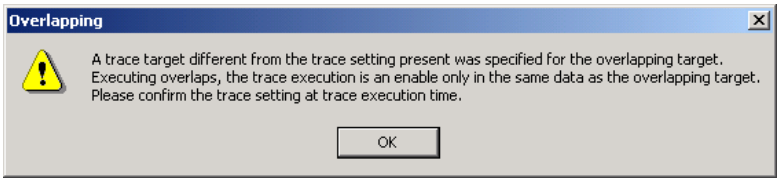
Operation Example of Overlapping Function

An operation example of overlapping function is given below.

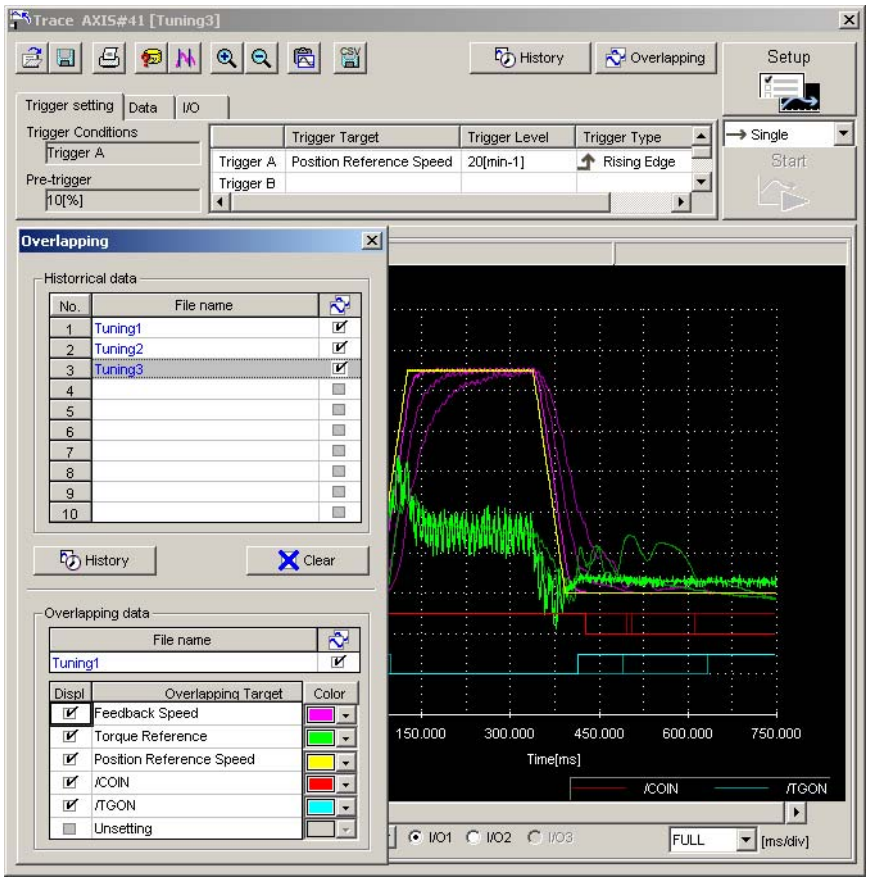
1. Select a file to be the base file from the "Historical data" in the History box, and then click **Overlapping**.
   The Overlapping box appears and the selected base file name is displayed in the "File name" of the "Overlapping data." The information of the base file are displayed in the Trace main window. The trace objects of the base file are displayed in the "Overlapping Target" of the "Overlapping data."



When online, if the overlapping targets different from the trace objects set in the Trace Setting box are selected, the following message appears.

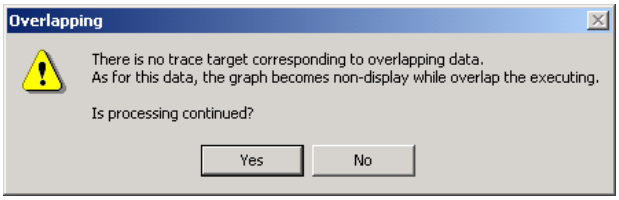


2. Select the check boxes of the files to overlap over the base file from the "Historical data." More than one check box can be selected. A check box for a file without the same overlapping targets as those of the base file cannot be selected.
The overlapped trace graphs are displayed in the Trace main window.

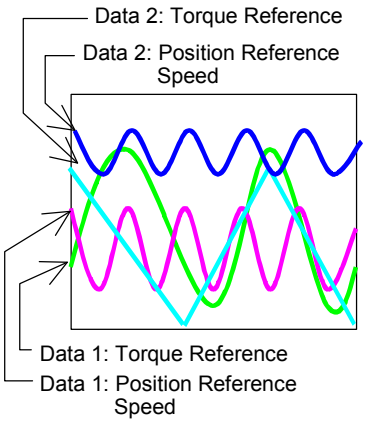
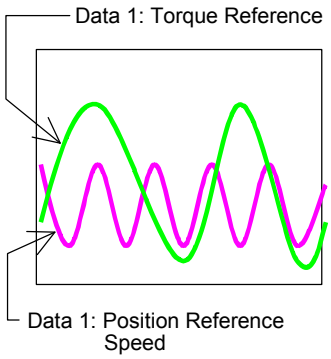
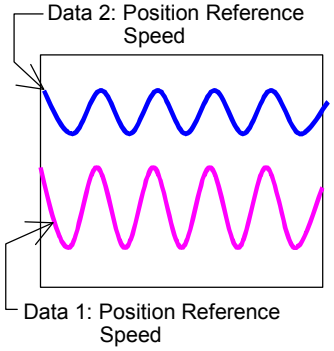
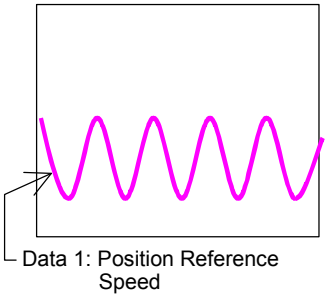


The objects to be displayed overlapped on the graph can be selected by selecting or clearing the "Display" check boxes for the "Overlapping Target" of the "Overlapping data."

When having newly loaded a file to overlap by clicking the  (Open) button, the file name is automatically displayed with the check box selected in the "File name" of the "Historical data" and the trace graph is overlapped over the graph of the base file.
If a file without the same overlapping targets as those of the base file tries to be loaded, the following message appears.



The following table shows four display examples of overlapped graphs.

<table>
<tr><td colspan="2">File/Overlapping Target Selection Examples</td><td>Historical data
<table><tr><th>No.</th><th>File name</th><th></th></tr><tr><td>1</td><td>before_tuning.</td><td>☑</td></tr><tr><td>2</td><td>after_tuning</td><td>☑</td></tr></table></td><td>
<table><tr><th>No.</th><th>File name</th><th></th></tr><tr><td>1</td><td>before_tuning</td><td>☑</td></tr><tr><td>2</td><td>after_tuning</td><td>☐</td></tr></table></td></tr>
<tr><td rowspan="2">Over-lapping data</td><td>
<table><tr><th>Display</th><th>Overlapping Target</th></tr><tr><td>☑</td><td>Position Reference Speed</td></tr><tr><td>☑</td><td>Torque Reference</td></tr></table></td><td> 
</td><td> 
</td></tr>
<tr><td>
<table><tr><th>Display</th><th>Overlapping Target</th></tr><tr><td>☑</td><td>Position Reference Speed</td></tr><tr><td>☐</td><td>Torque Reference</td></tr></table></td><td> 
</td><td> 
</td></tr>
</table>

Optional Display

When the Display options check box is selected in the Trace Setting box, an optional data is displace. When not selected, no optional data is displayed.

The following data can be optionally displayed.

Settling Time

The settling time calculated from waveform is displayed.

If the settling time could not be calculated, "–" is displayed.

NOTE

To display the settling time, set one of the data settings in the **Analog Trace - vertical axis (Left)** area to **Position Reference Speed** and set one of the I/O settings in the **I/O** area to **/COIN** in the **Trace Setting** dialog box.

If these settings are not made, the settling time will not be displayed correctly.

Data Tab

The trace objects and line colors of Data 1, Data 2, and Data 3 designated in the Trace Setting box are displayed. The line color can be changed in this tab page.

Select whether the trace graph of Data 1, Data 2, or Data 3 is to be displayed or not.

Data Tab

I/O Tab

The trace objects and line colors of I/O 1, I/O 2, and I/O 3 designated in the Trace Setting box are displayed. The line color can be changed in this tab page.

Select whether the trace graph of I/O 1, I/O 2, or I/O 3 is to be displayed or not.

I/O Tab

Measurement Axis Tab

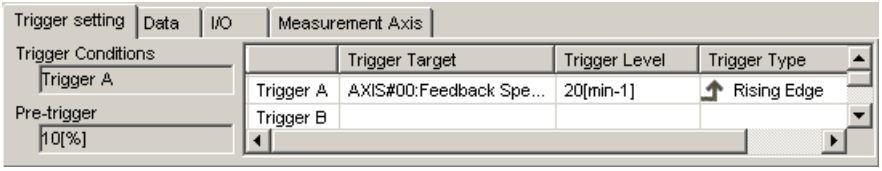
This tab page displays the axis numbers of the axes that were traced.

Select the check boxes to display the trace graphs for those axes. Clear the check boxes to hide the trace graphs for those axes.

Trigger Setting

This displays the trigger settings in the Trace Setting box.

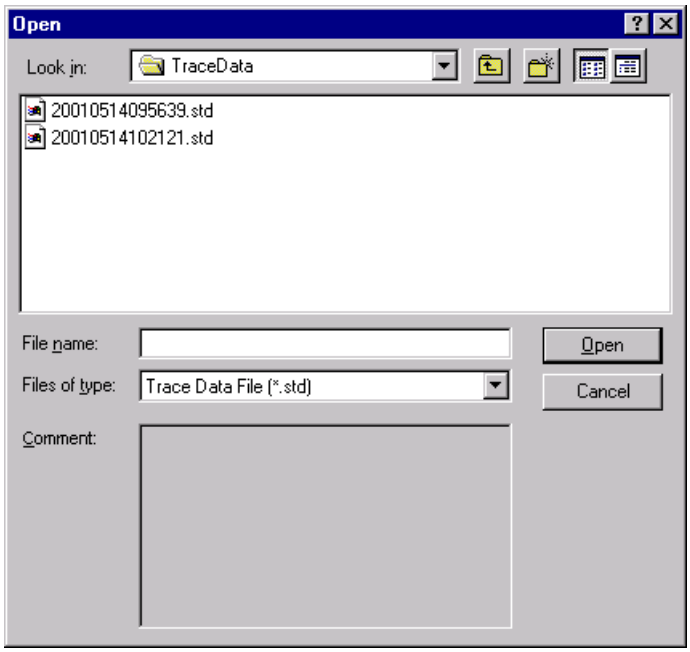
The trigger level is blank if an I/O trace is the trigger condition.



■ Toolbar Details

(Open) Button

The trace data file can be loaded in the Open dialog box. To load the file, click the button. The Open dialog box appears.



When the Button is Clicked in the Trace Main Window

Open

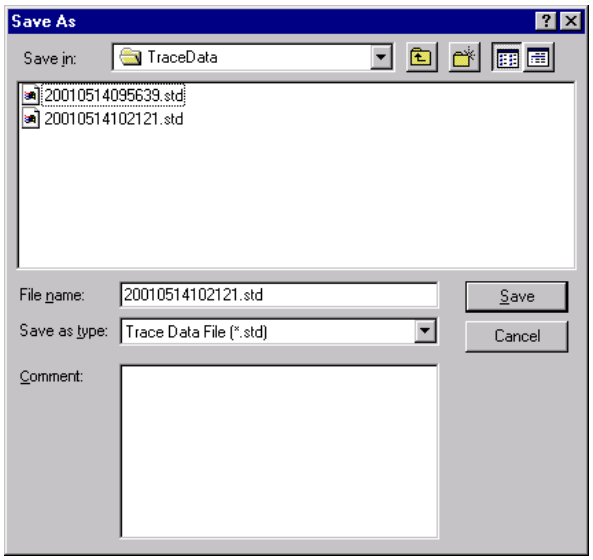
Click **Open** to load the selected trace file.

Cancel

Click **Cancel** to return to the Trace main window without loading the file.

(Save As) Button

The on-screen trace graph can be saved to a file. To save the graph, click the button. The Save As dialog box appears.



When the Button is Clicked in the Trace Main Window

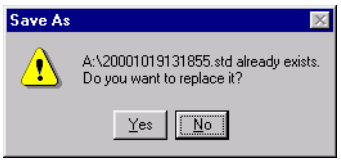
Up to 255 characters can be typed as a comment.

The default file name is the current time (yyyymmddhhmmss).

Save

Click **Save** to save the data to the selected trace file. Automatically returns to the Trace main window when no file is selected.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



Click **Yes** to overwrite the already existing file. Click **No** to return to the Save As dialog box without saving the file.

Cancel

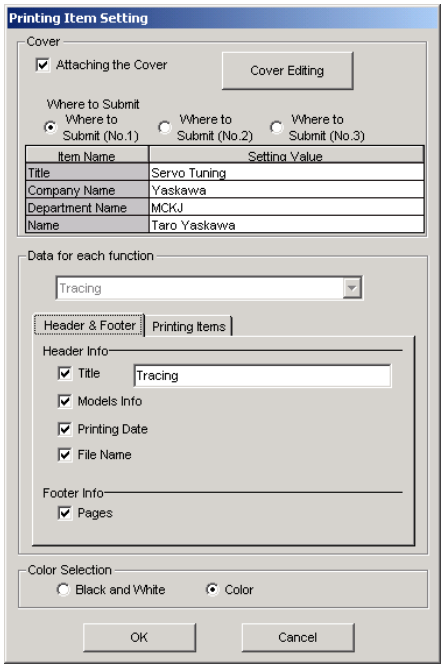
Click **Cancel** to return to the Trace main window.

INFO

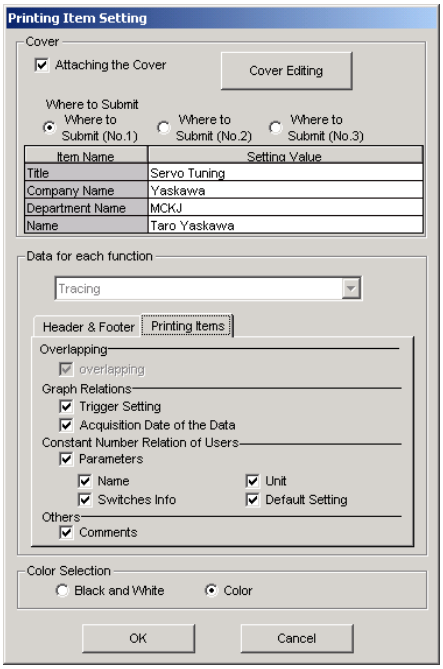
If the saved file is opened using a SigmaWin+ version number that does not support Data 3 and I/O 3 for trace, the contents of only Data 1, Data 2, I/O 1 and I/O 2 are read-in.

(Print) Button

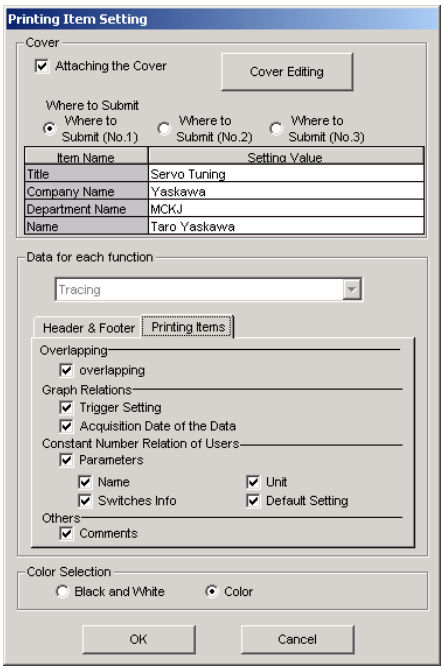
The graph and data on the Trace main window can be printed. To print the graph and data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab



Printing Items Tab When the Overlapping Function Is Not Effective



Printing Items Tab When the Overlapping Function Is Effective

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Overlapping

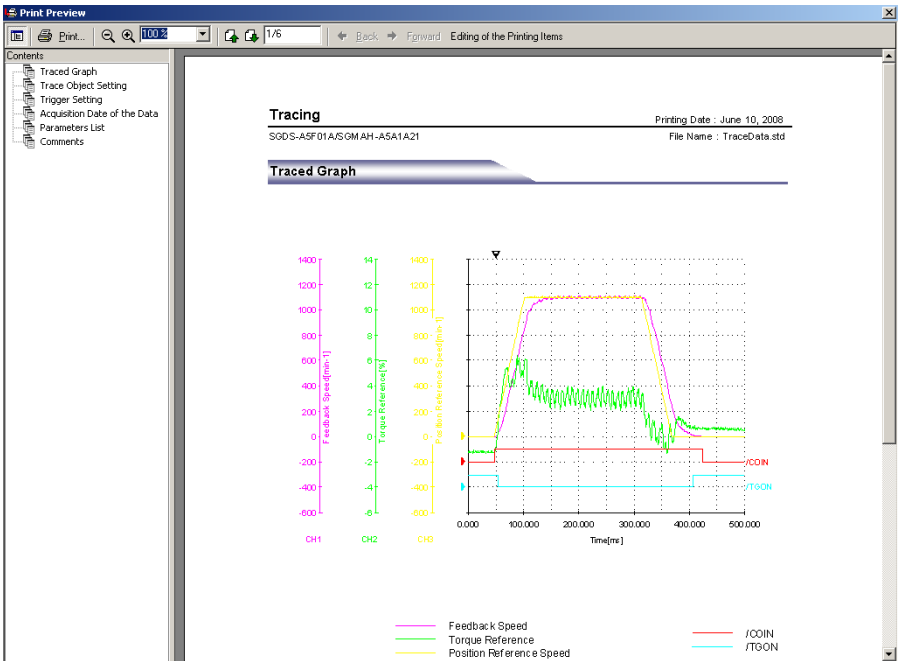
Selecting the **overlapping** check box prints not only the overlapped trace graph but also each trace graph before overlapping. Click to clear the check box and only the overlapped trace graph is printed.

Color Selection

Documents can be printed in color or black and white. Select your preference.

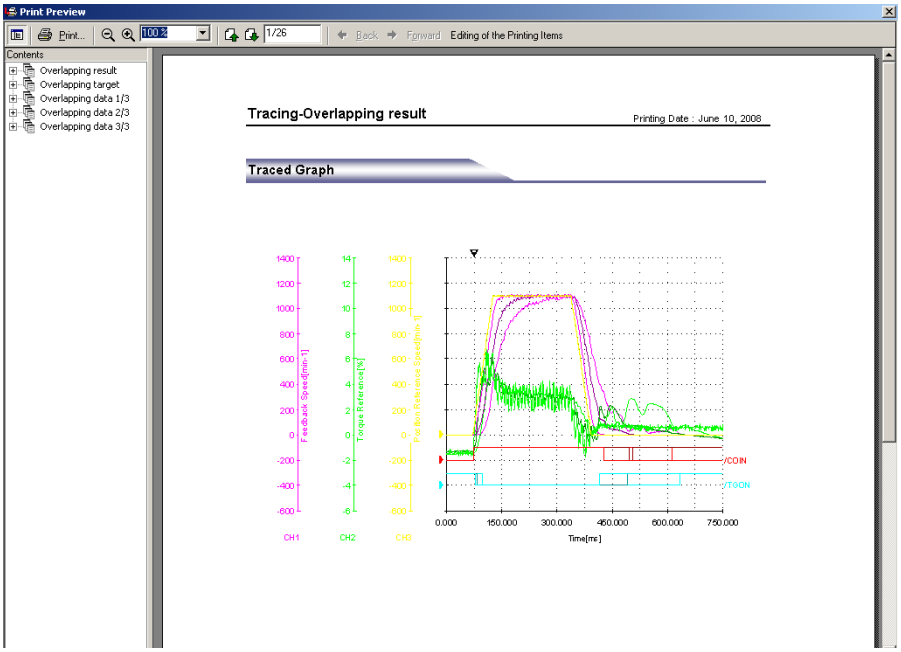
After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.

<When the Overlapping Function Is Not Effective>



<When the Overlapping Function Is Effective>

The following overlapped trace graph is displayed first, and then each trace graph before overlapping is displayed.

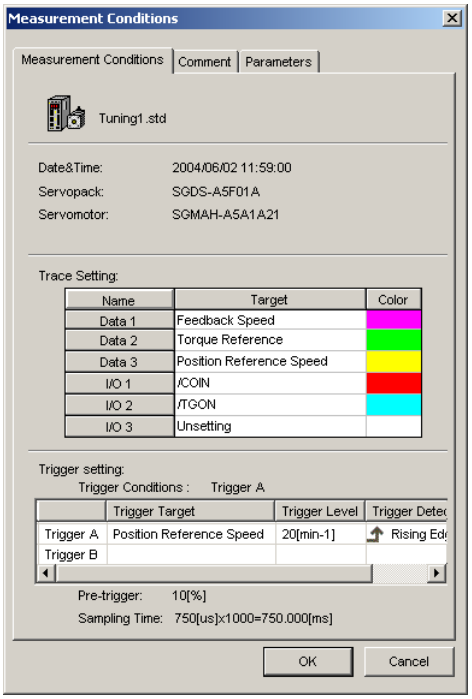


To print the document as is without any changes, click **Print**.

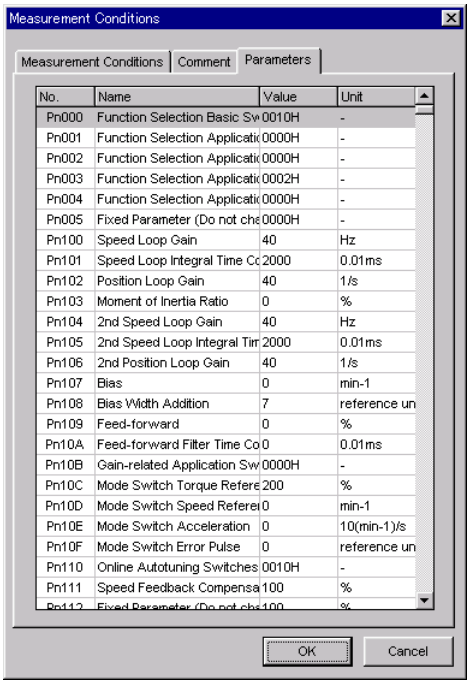
To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

(Measurement Conditions) Button

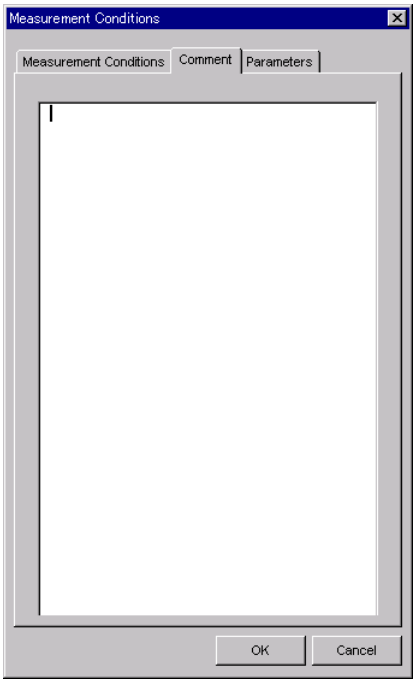
The conditions for measuring the trace can be viewed. To view the conditions, click the button. The Measurement Condition dialog box appears. If not already selected, click the **Measurement Conditions** tab to view the conditions for measuring the trace.



Measurement Conditions Tab



Parameter Tab



Comment Tab

Click the **Comment** tab and type any comments.

OK

Click **OK** to save comments and return to the Trace main window.

Cancel

Click **Cancel** to return to the Trace main window without saving the comments.

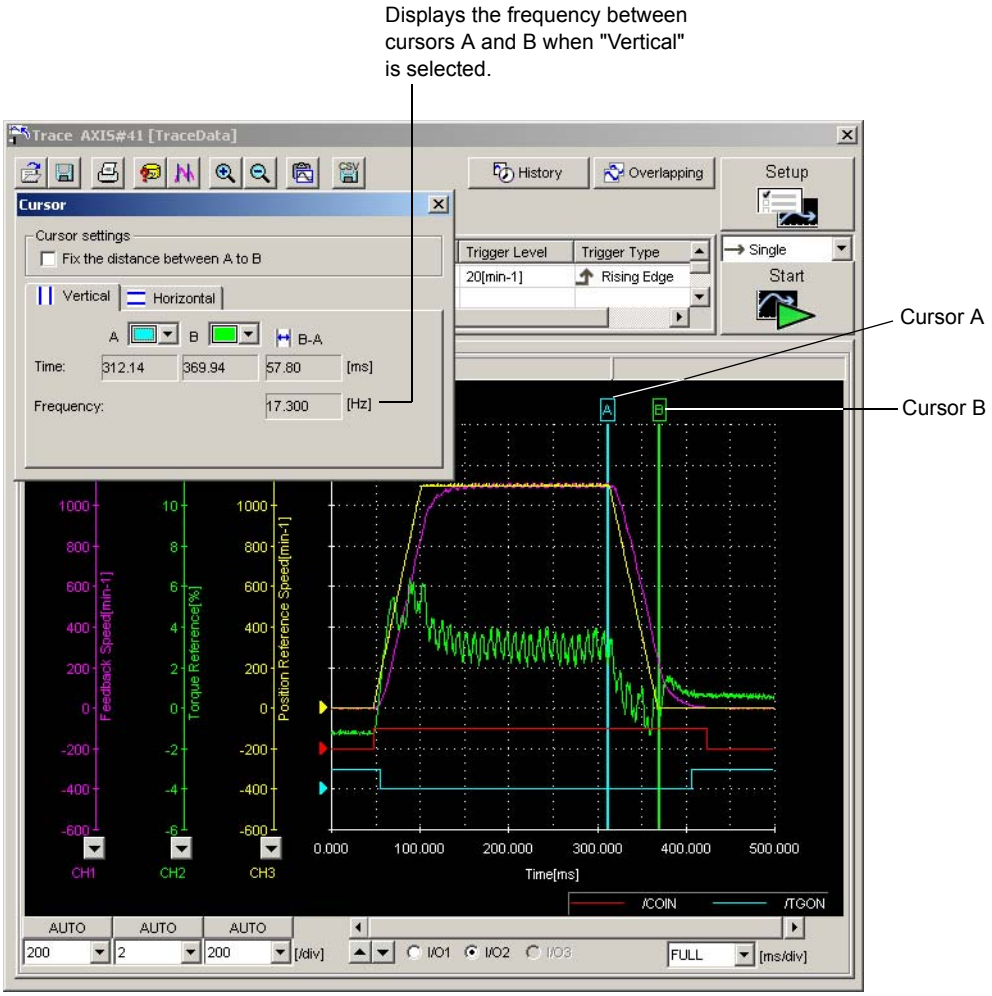
(Cursor) Button

The information for the location where a cursor is shown can be viewed. Information for the cursor locations A and B can be viewed.

The color of cursor locations A and B can be changed.

Display the data using the following procedure.

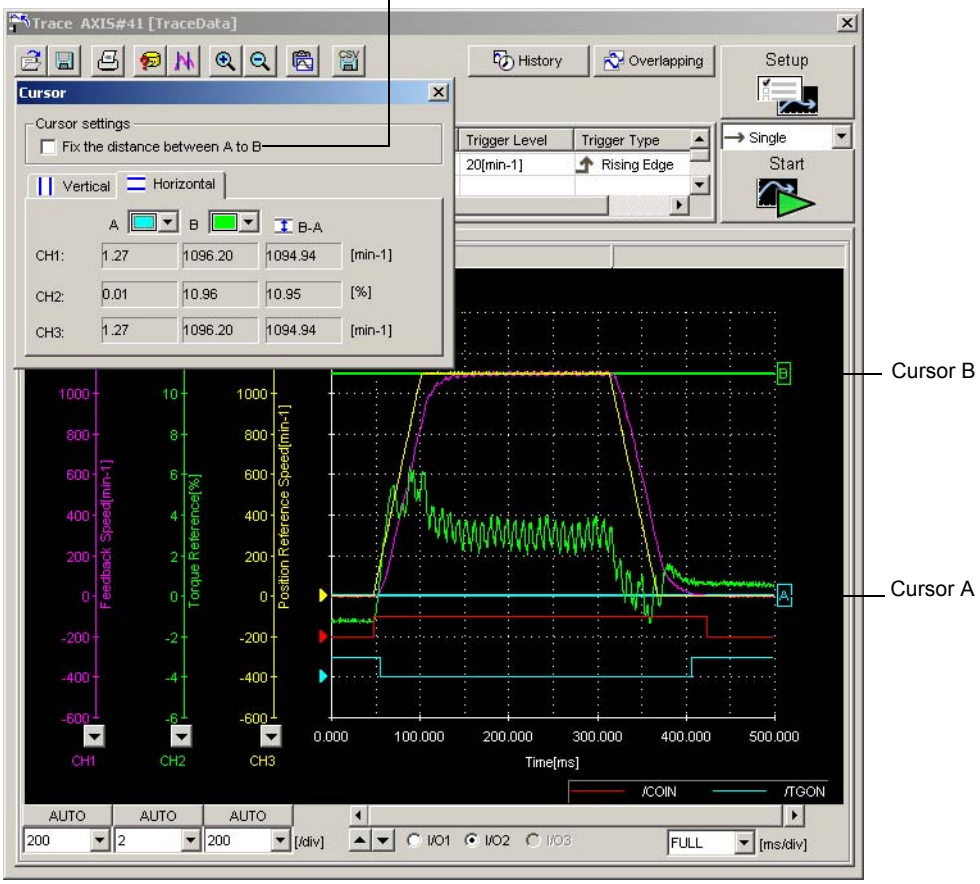
1. Click the button. The Cursor setting box appears and two vertical bars will be displayed on the trace graph.
2. Move each cursor. As you move each cursor, the data changes in the "Cursor" of the Cursor setting box.



3. To view the trace target, select **Horizontal** in the Cursor setting box. Two horizontal bars (A and B) will be displayed.

4. Move each cursor. As you move each cursor, the data changes on the Cursor setting box.

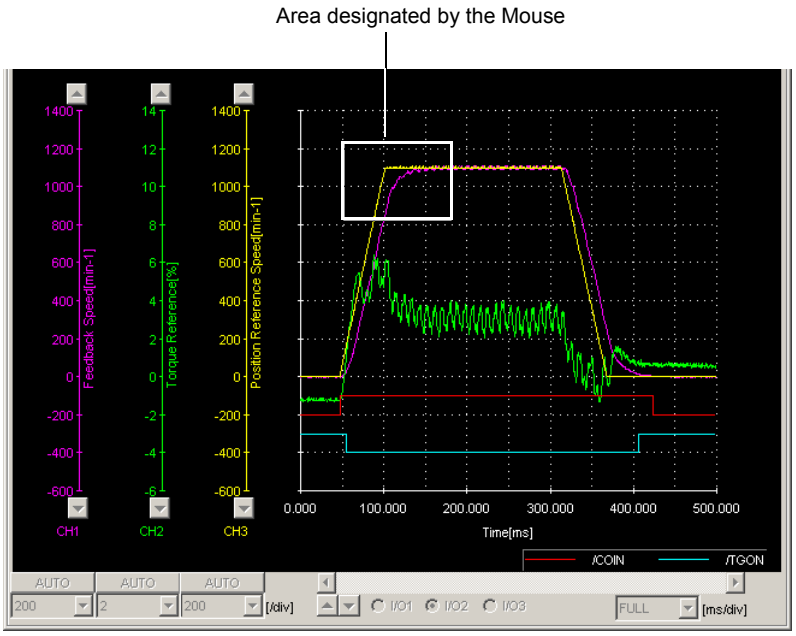
The distance between two horizontal or vertical bars can be fixed so that moving either cursor A or B moves the two horizontal or vertical bars in parallel as one unit.
Use this function for comparison of distance on the trace graph.



(Zoom) Button

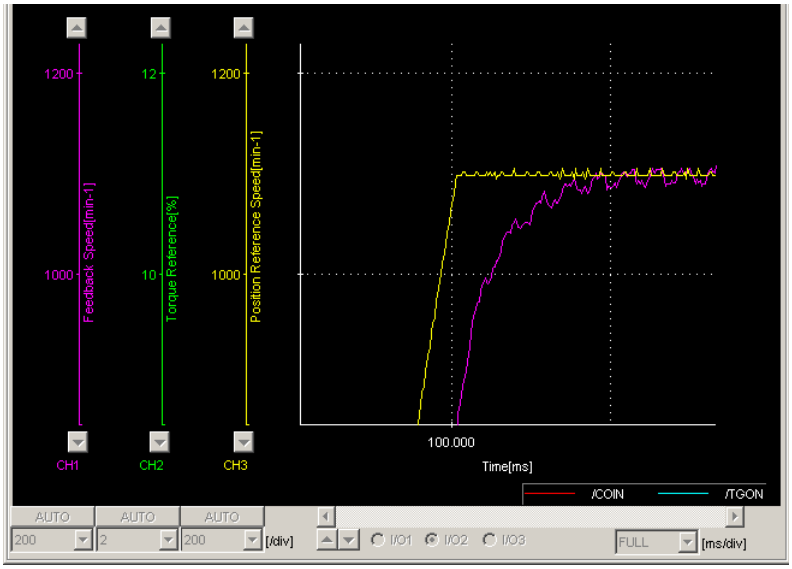
A view of an area selected by the mouse can be magnified. Zoom in on an area using the following procedure.

1. Click the button.
2. Position the mouse at one corner of the area you want to select, and drag to the opposite corner. A line will appear around the selected area.



Area to be Magnified

3. Release the left mouse button. The selected area of the graph is enlarged.



Magnified Area

4. Click the button to view the original graph.

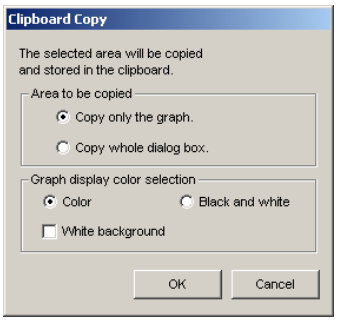
INFO

If you use the Zoom button before clicking **Start** on the Trace main window, the trace graph will be displayed while the designated area is still enlarged.
This is effective when doing a serial trace.

(Clipboard Copy) Button

The displayed screen can be copied to the clipboard. It can be exported to Word or Excel by using this button.

Click the button, and the Clipboard Copy dialog box appears.



Area to be copied

Select the area to be copied to the clipboard.

Graph display color selection

Select the graph and background color. The graph can be clearly printed when the **Black and white** option or the **White background** check box is selected.

OK

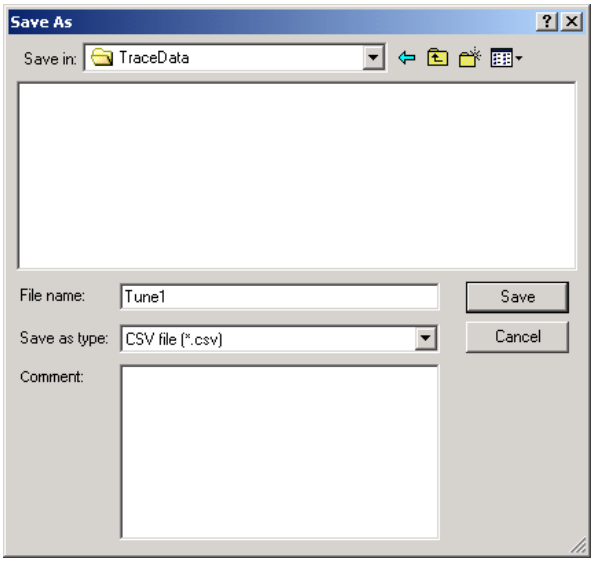
Click **OK** to copy the selected area to the clipboard.

Cancel

Click **Cancel** to return to the Trace main window.

(Save As CSV) Button

The on-screen trace graph can be saved in CSV format. The trace data can be edited by Excel. Click the button. The Save As dialog box appears.



When the Button is Clicked in the Trace Main Window

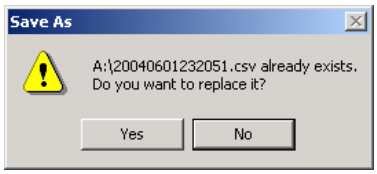
Up to 255 characters can be typed as a comment.

The default file name is the current time (yyyymmddhhmmss).

Save

Click **Save** to save the data to the selected CSV file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



Click **Yes** to overwrite the already existing file. Click **No** to return to the Save As dialog box without saving the file.

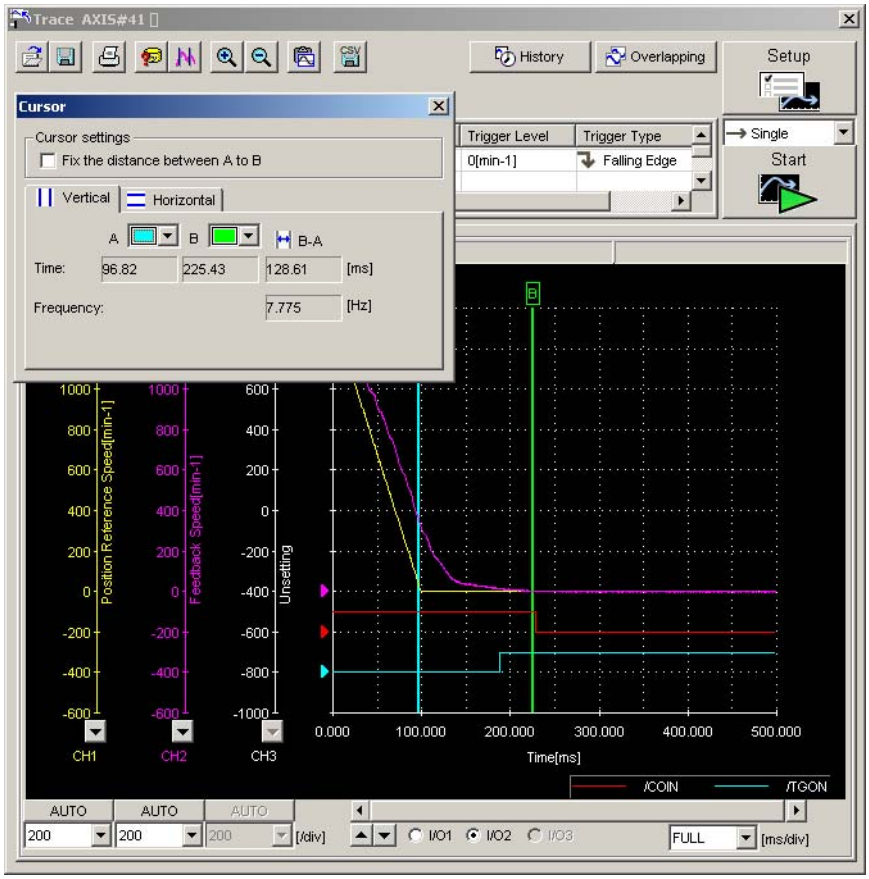
Cancel

Click **Cancel** to return to the Trace main window.

■ An Example of Using the Trace Function

In this example of how to adjust the servo using the trace function, the positioning completed time is being reduced. The positioning completed time is the time from the completion of the command until the /COIN signal is formed.

1. Click the  (Cursor) button in the Trace main window. Check the positioning completed time using the cursor.



This graph shows the results of a trace carried out using the factory settings. (Pn100: speed loop gain = 400 [0.1 Hz]; Pn101: speed loop integral time constant = 2000 [0.01 ms]; Pn102: positioning loop gain = 400 [0.1/s].

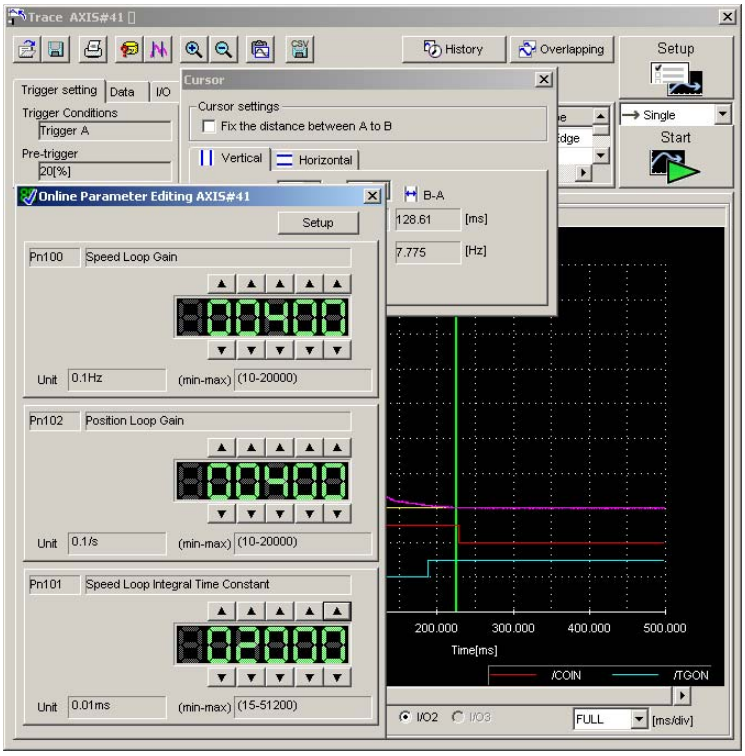
Trace object: Data 1 = Position Reference Speed
Data 2 = Speed feedback
I/O 1 = /COIN signal (positioning completed)
I/O 2 = /TGON signal (motor running)

Trigger conditions: Falling edge of reference pulse speed 0 min^{-1}
Pre-trigger: 20%
(We are using this setting to trigger the completion of the command.)

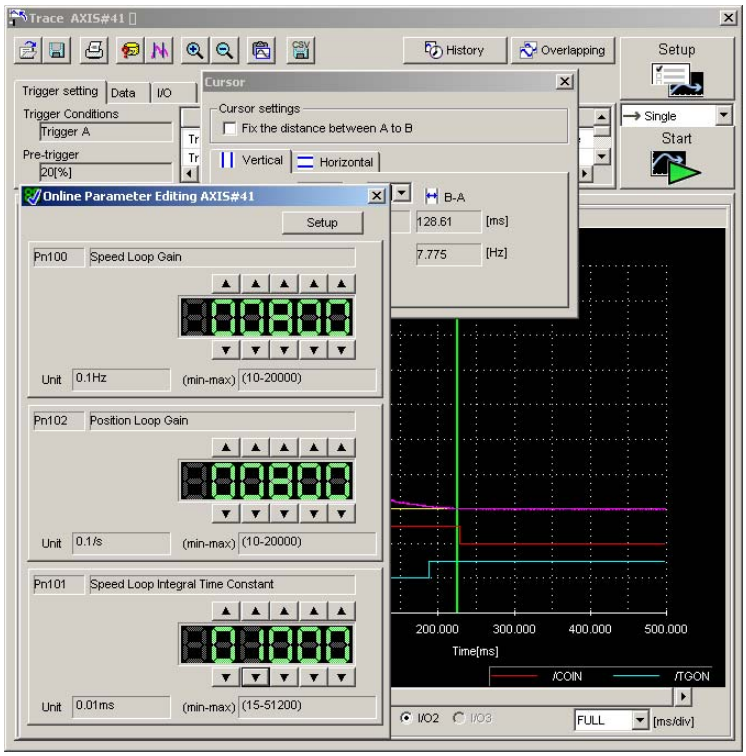
When in this condition, the positioning completed time is 128 ms

2. To adjust the positioning completed time, modify the values of the parameters.

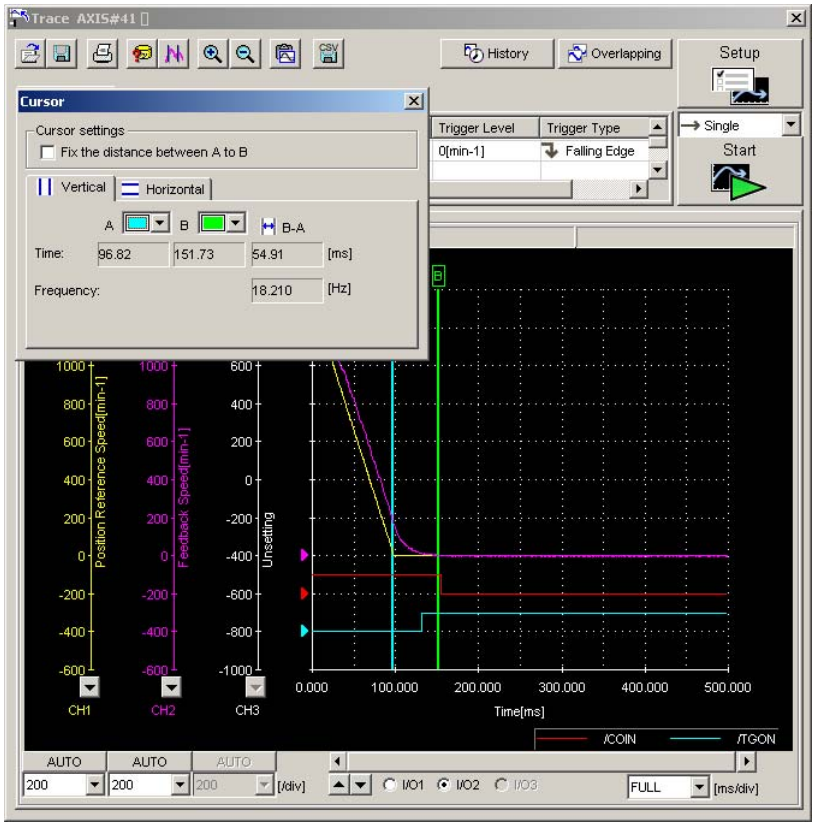
   Click the  button to view Online Parameter Editing box.



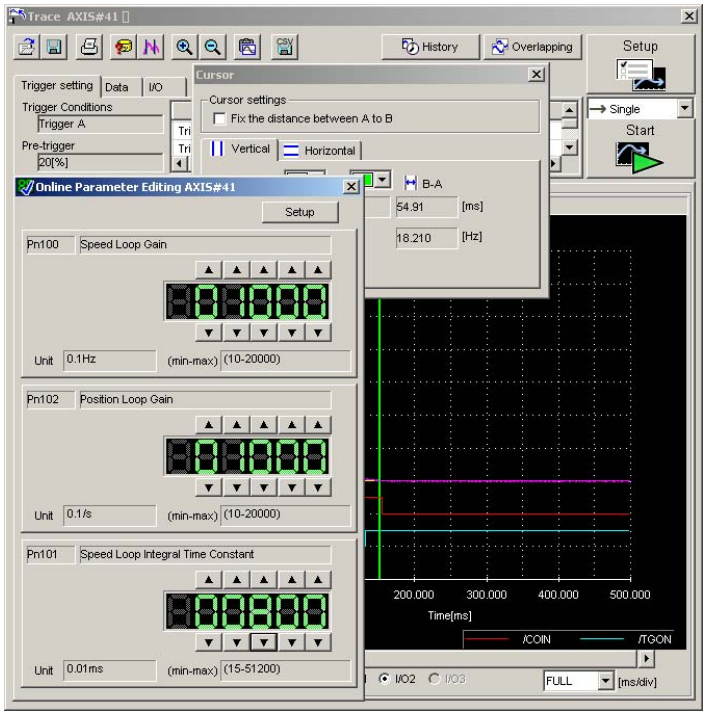
3. Click the ▲ or ▼ button to raise or lower the gain.
   (Pn100=800, Pn102=800, Pn101=1000)



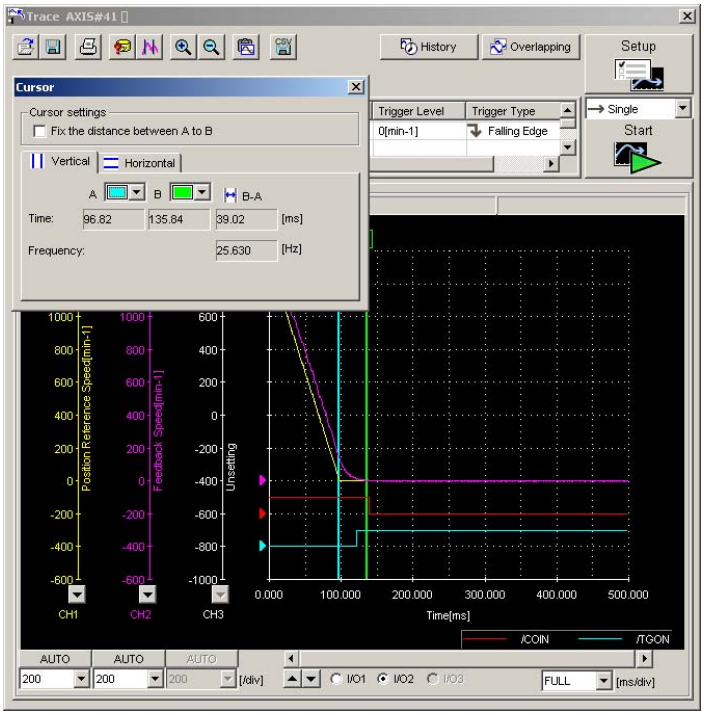
4. Check the positioning completed time on the Trace main window.
   The positioning completed time has been reduced to 55 ms.
   Because the machine is still not vibrating, increase the gain some more.



5. Click the  button to view the Online Parameter Editing box again and then change the values.
   (Pn100=1000, Pn102=1000, Pn101=800)



6. Check the positioning completed time on the Trace main window.
   The positioning completed time has been reduced to 39 ms.



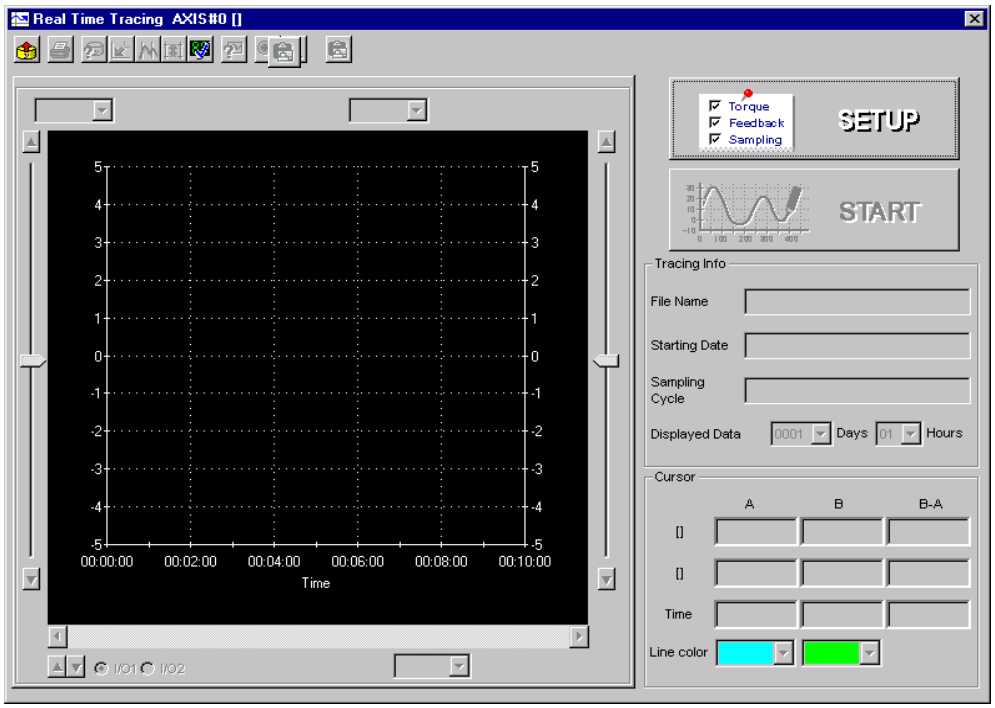
7. Repeat steps 2 to 4 until you get the target positioning completed time.

4.6.2 Real Time Trace Function

■ Data Trace

Main Window

In the SigmaWin+ Σ-7 component main window, click **Trace**, and then click **Real Time Trace**, and the Real Time Tracing main window appears.

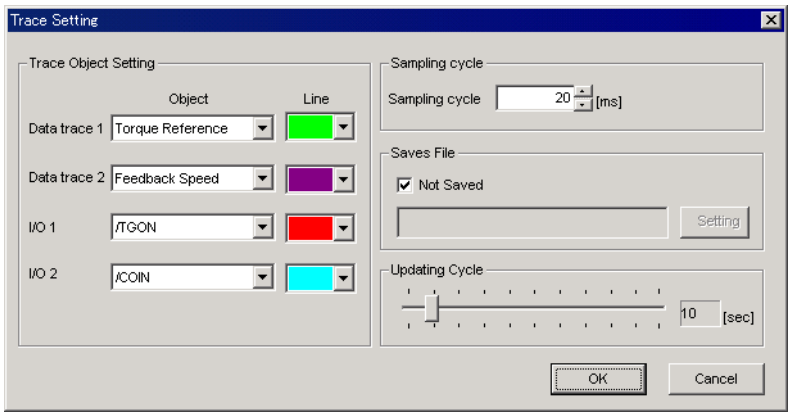


Real Time Tracing Main Window

Real Time Trace Settings

In the Real Time Tracing main window, click **SETUP**, and the Real Time Trace Setting box appears. Select the objects and conditions for the trace.

The settings from the previous trace, if any, are displayed.



Real Time Trace Setting Box

<Trace Object Settings>

The settings for the trace objects, or targets can be made here.

Data 1/Data 2

Select content such as "Torque Reference", "Speed Feedback", etc., identical to the analog monitor as trace objects from the data boxes.

I/O 1 / I/O 2

Select output signals such as "/COIN" or "ALM" and input signals such as "/C-SEL", "P-OT", or "N-OT" as trace objects.

Line

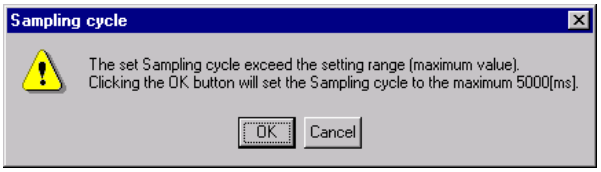
Select a line color for data 1 and 2 and I/O 1 and 2.

<Sampling Cycle>

The setting for the allowable interval time for getting trace data can be made here. Data will be obtained every 20 ms if the sampling cycle is set to 20 ms. Use the spin button to set the time.

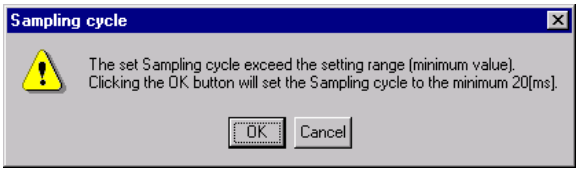
If directly typing a value, and the value is outside the acceptable range, a warning message will appear telling you that the sampling time is incorrect. The warning will vary according to the error.

1. If the typed value is larger than the setting range:



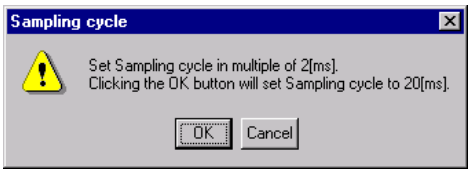
   Click **OK** to automatically adjust the sampling cycle within the setting range. Click **Cancel** to return to the Real Time Trace Setting box without setting the sampling cycle.

2. If the typed value is smaller than the setting range:



   Click **OK** to automatically adjust the sampling cycle within the setting range. Click **Cancel** to return to the Real Time Trace Setting box without setting the sampling cycle.

3. If the typed value cannot be allocated in the time interval:



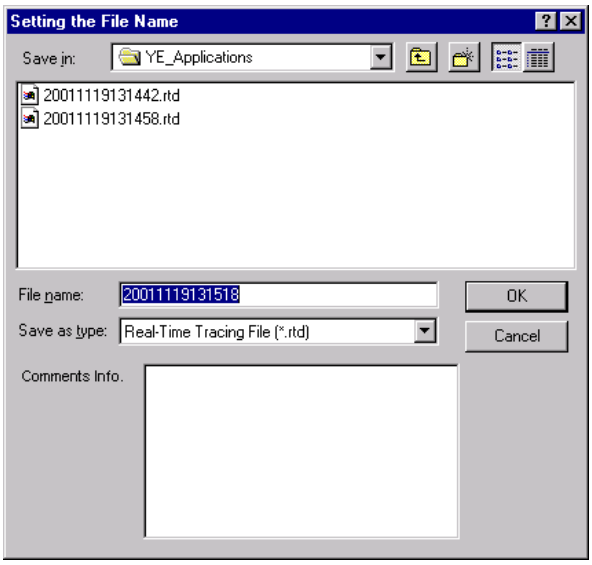
   Click **OK** to automatically adjust the sampling cycle. Click **Cancel** to return to the Real Time Trace Setting box without setting the sampling cycle.

<Saves File>

Select whether or not saves the trace data.

Not to save the data, select the **Not Saved** check box.

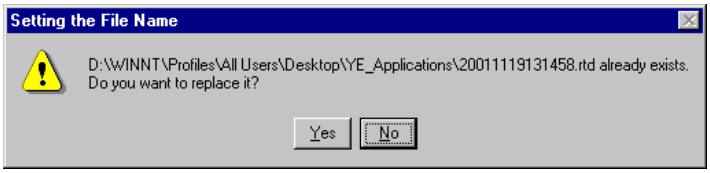
To save the data, clear the **Not Saved** check box, and click **Setting**. The Setting the File Name dialog box appears.



Setting the File Name Dialog Box

Click **OK** to store the file name designating the current trace settings. Click **Cancel** to return to the Real Time Trace Setting box without saving the file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



Click **Yes** to overwrite the already existing file. Click **No** to return to the Setting the File Name dialog box without saving the file.

OK

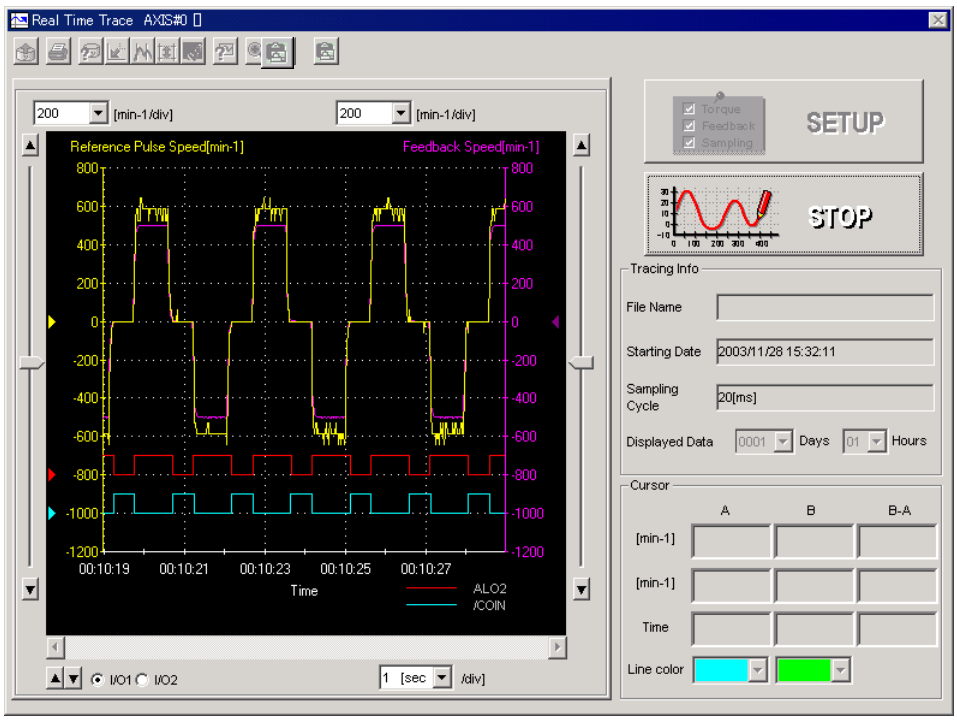
In the Real Time Trace Setting box, click **OK** to return to the Real Time Tracing main window. The trace object and trigger are updated according to the settings.

Cancel

In the Real Time Trace Setting box, click **Cancel** to return to the Real Time Tracing main window without changing the settings.

■ Starting the Trace

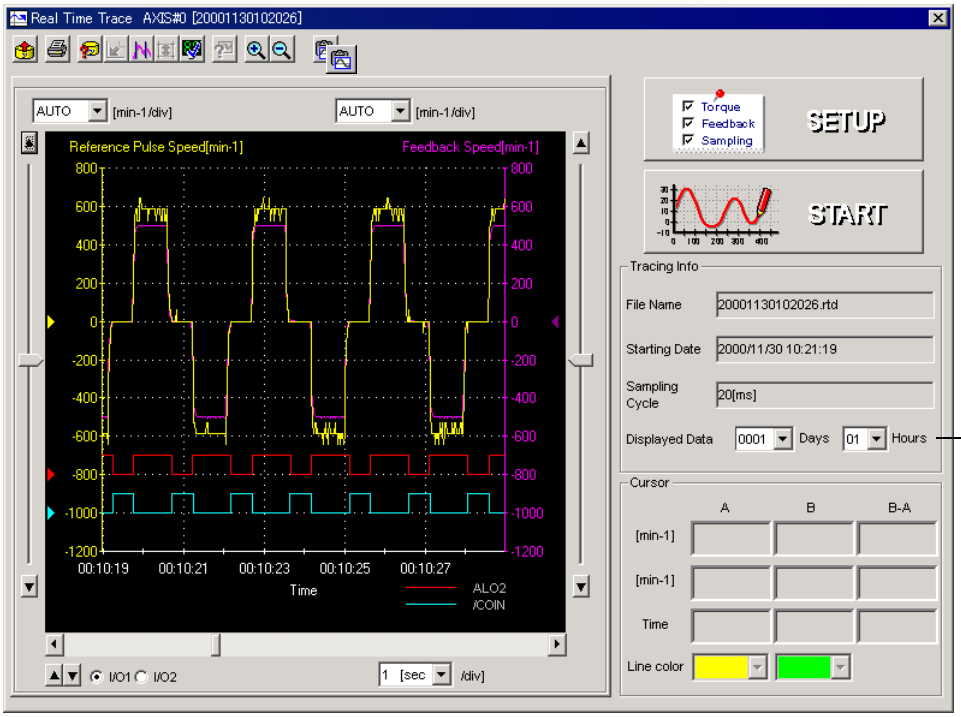
In the Real Time Tracing main window, click **START** to start trace.



To stop a trace, click **STOP**.

■ Main Window

This Real Time Tracing main window displays a graph based on the trace settings.



Displays information about when the trace started. In this example for the displayed data, "0001" means that it is the first day of the trace and "01" means that the trace has been running for its first hour.

Real Time Tracing Main Window

Toolbar

The position of the toolbar can be adjusted, and the on-screen display type selected.

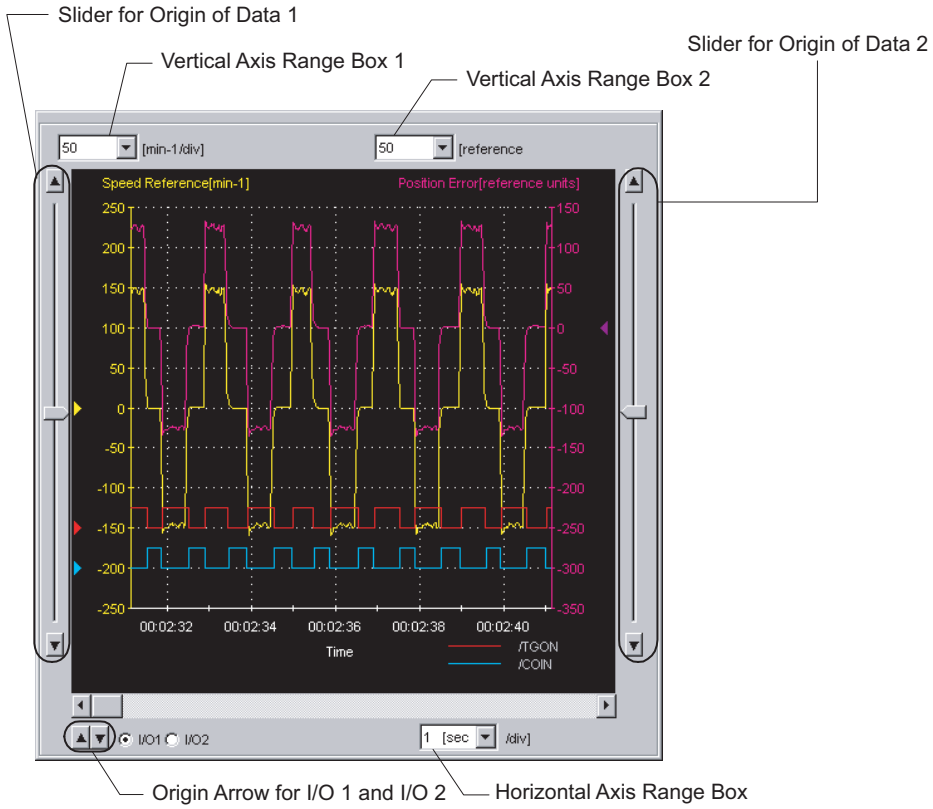
Real Time Tracing Main Window Toolbar

Toolbar Button	Click this button to:
 Open	Load the trace data file.
 Print	Print the Real Time Tracing main window.
 Measurement Conditions	View the conditions to measure the trace.
 Cursor	View the information for the location where a cursor is shown.
 Parameter Online Editing	View the Parameter Online Editing box. For details, see 4.2.2 Editing Parameters Online.
 Zoom In	Enlarge the view of a selected area.
 Return	Restore the area shown in the window to its usual size.
 Clipboard Copy	Copy the displayed screen to the clipboard.

See "■ Toolbar Details" for details on the toolbar buttons.

Trace Object Graph

In the graph, you can view the trace objects designated in the Real Time Trace Setting box.



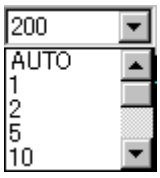
Trace Object Graph

Vertical Axis Range

Select a vertical axis range for both Data 1 and Data 2 from the corresponding box.

If AUTO is selected, the range widths will be automatically adjusted so that all of the data can be shown in the graph.

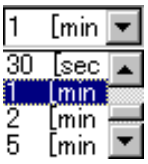
The range must be selected from the list.



Vertical Axis Range Box

Horizontal Axis Range

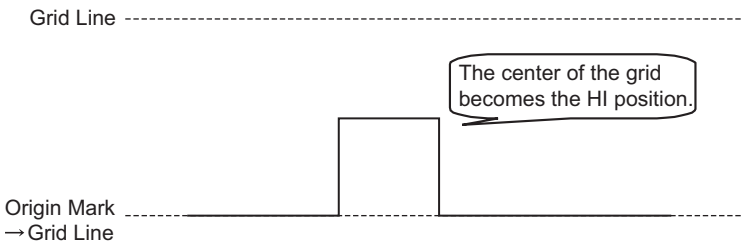
Select a horizontal axis range for the time axis from the box. The time is measured in "sec" or "min." The range must be selected from the list.



Horizontal Axis Range Box

INFO

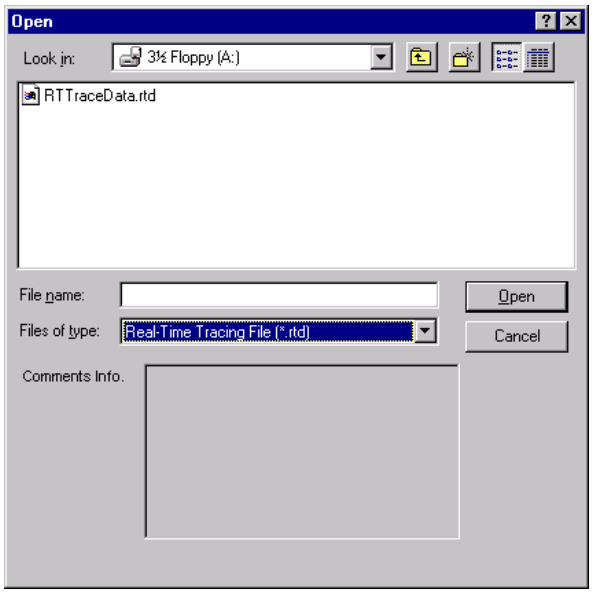
■ I/O Grace Graph



■ Toolbar Details

(Open) Button

The trace data file can be loaded in the Open dialog box. To load the file, click the button. The Open dialog box appears.



When the Button is Clicked in the Main Window

Open

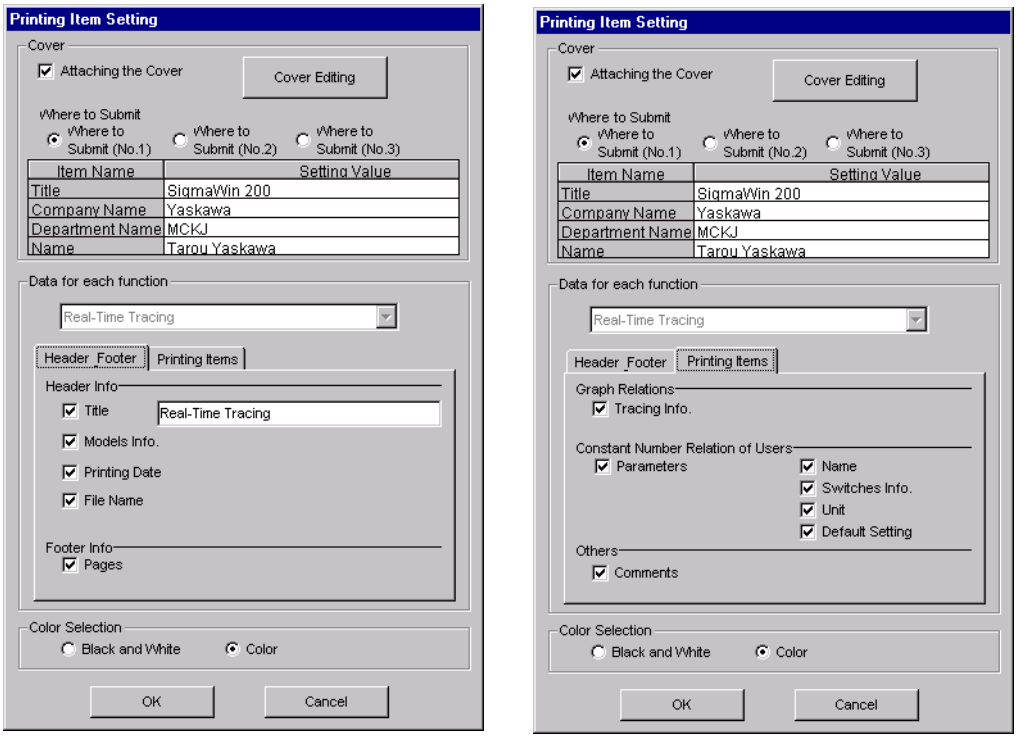
Click **Open** to load the selected trace file. Returns to the main window if nothing is selected.

Cancel

Click **Cancel** to return to the main window without loading the file.

(Print) Button

The graph and data on the Real Time Tracing main window can be printed. To print the graph and data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab Printing Item Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3 SigmaWin+ Σ-7 Component Main Window.

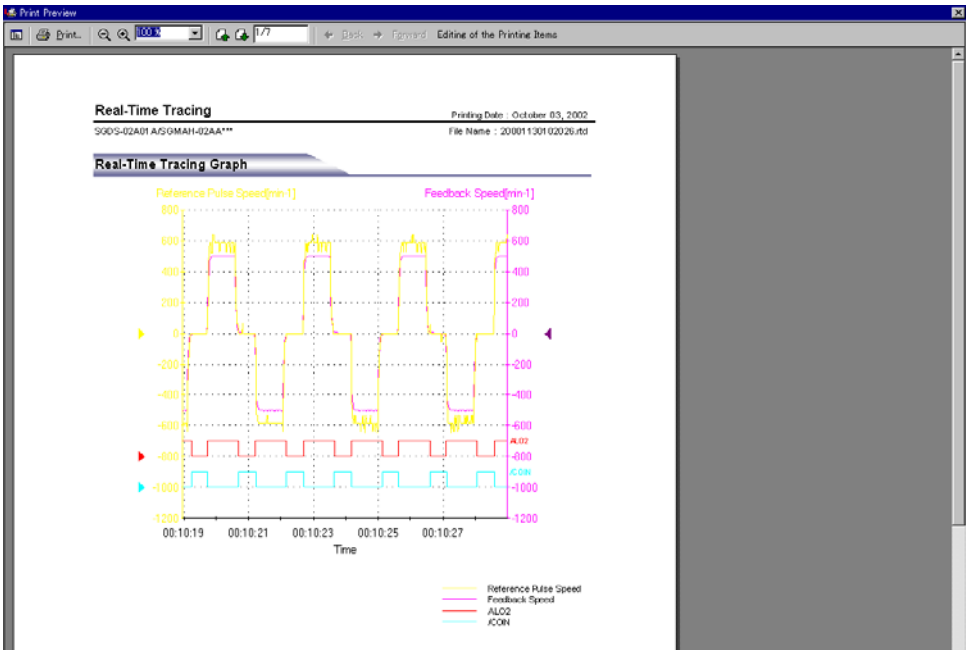
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your reference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.

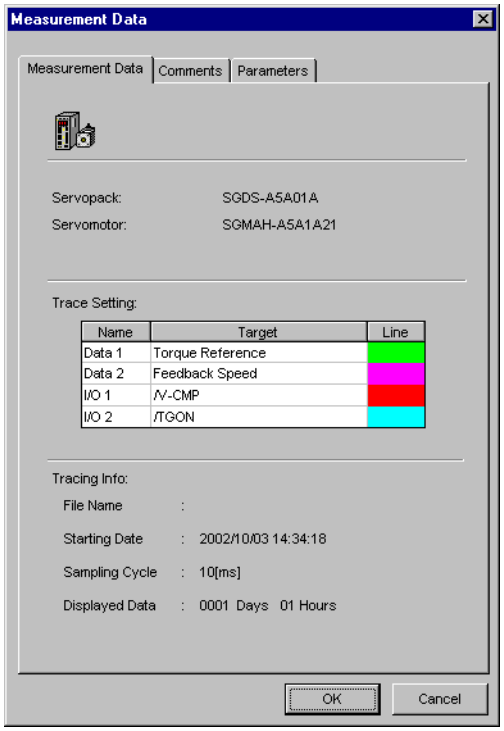


To print the document as it is without any changes, click **Print**.

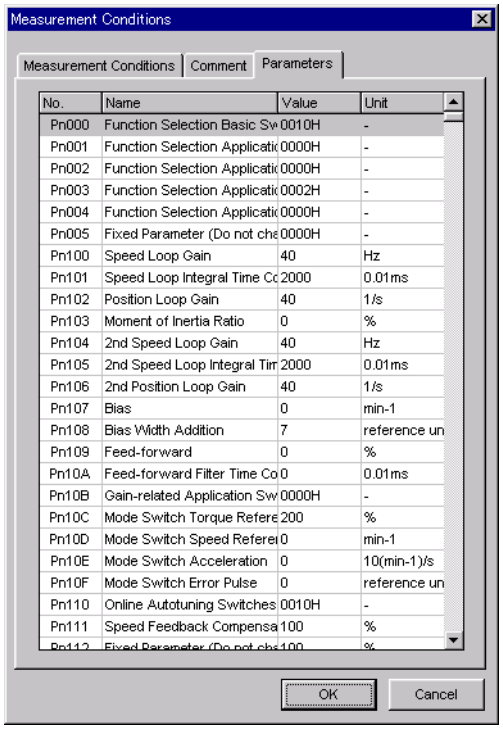
To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

(Measurement Conditions) Button

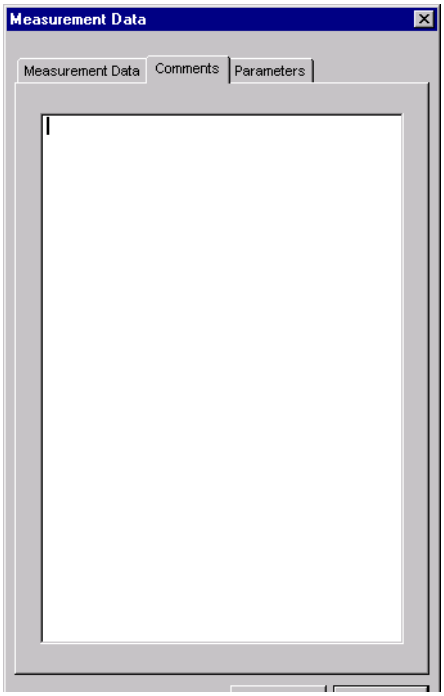
The conditions for measuring the trace can be viewed. To view the conditions, click the button. The Measurement Condition dialog box appears. The Measurement Condition dialog box appears. If not already selected, click the **Measurement Conditions** tab to view the conditions for measuring the trace.



Measurement Condition Tab



Parameter Tab



Comments Tab

Click the Comments tab and type any comments

OK

Click **OK** to save comments and return to the Real Time Tracing main window.

Cancel

Click **Cancel** to return to the Real Time Tracing main window without saving the comments.

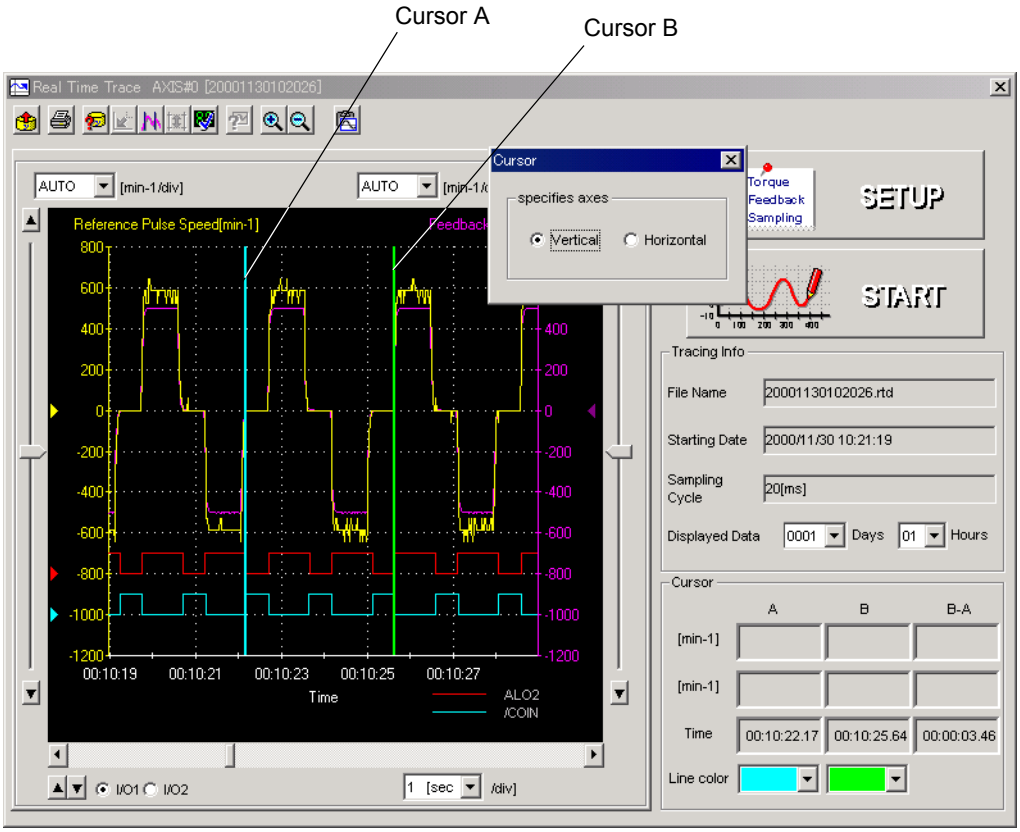
(Cursor) Button

The information for the location where a cursor is shown can be viewed. Information for the cursor locations A and B can be viewed.

The color of cursor locations A and B can be changed.

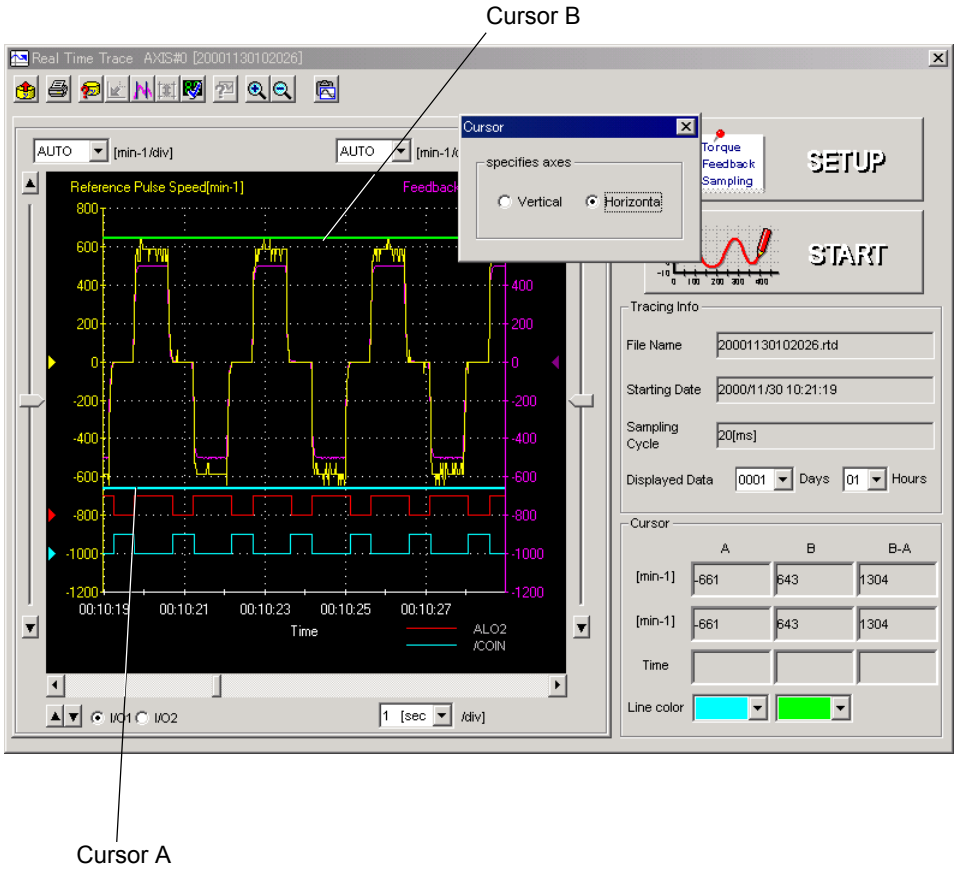
Display the data using the following procedure.

1. Click the button. Two vertical bars will be displayed.
2. Move each cursor. As you move each cursor, the data changes in the cursor box in the lower right of the window.



3. To view the speed data, select **Horizontal** in the Cursor Setting box. Two horizontal bars will be displayed.

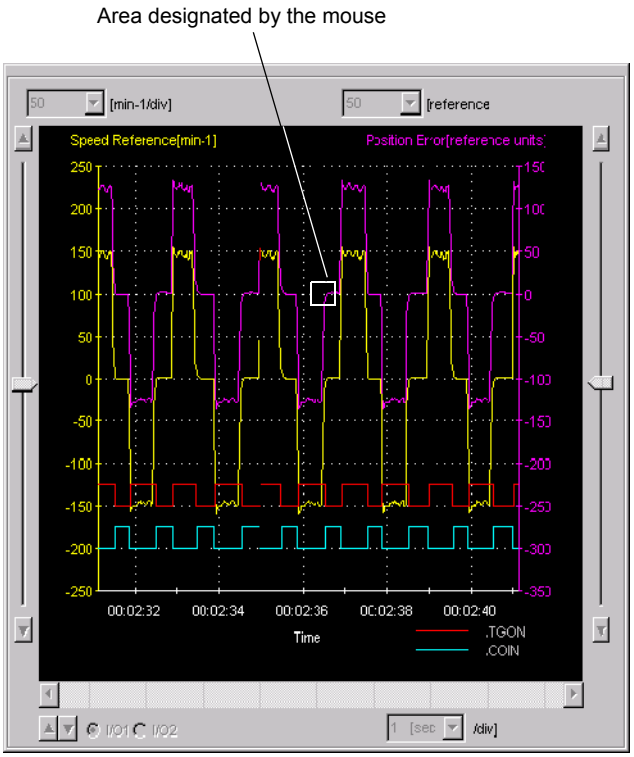
4. Move each cursor. As you move each cursor, the data changes in the cursor box in the lower right of the window.



(Zoom In) Button

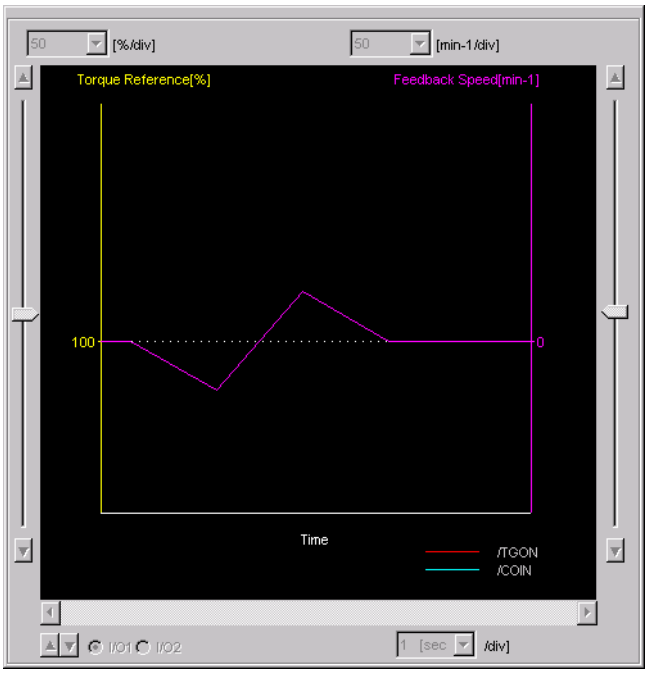
A view of an area selected by the mouse can be magnified. Zoom in on an area using the following procedure.

1. Click the button.
2. Position the mouse at one corner of the area you want to select, and drag to the opposite corner. A line will appear around the selected area.



Area to be Magnified

3. Release the left mouse button. The selected area of the graph is enlarged.



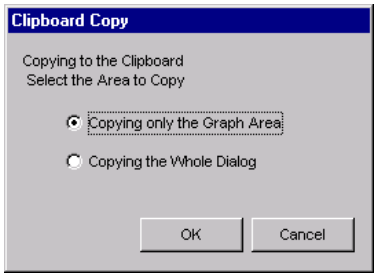
Magnified Area

4. Click the button to view the original graph.

(Clipboard Copy) Button

The displayed screen can be copied to the clipboard. It can be exported to Word or Excel by using this button.

Click the button, and the Clipboard Copy dialog box appears.



Select the area to be copied to the clipboard.

OK

Click **OK** to copy the selected area to the clipboard.

Cancel

Click **Cancel** to return to the main window.

4.7 Tuning

⚠ WARNING

The tuning function executes tuning for the SERVOPACK. The motor will operate to perform this adjustment. Be sure to check related information in this manual before using this function. Special care must be taken for the following.

- Before executing this function, make sure that the emergency stop (power off) can be activated when needed.

  The response speed may change considerably during tuning. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.

- Confirm the safety of the area adjoining the drive unit.

  Before executing this function, always confirm that the area within the motor motion range and direction is clear for safe operation.
  Provide protective devices to ensure safety in the event of overtraveling or other unexpected movement.

- Always confirm that there is no position error before running the motor.

  Be sure to return to the origin and reset the position prior to normal operation. Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.

- When this function is used for a vertical axis, check the safety of the system.

  When this function is used for a vertical axis, confirm that the axis level does not drop when the servo is turned off.

  <Tuning Precautions>

- Set the moment of inertia (mass) ratio first.

  The moment of inertia (mass) ratio must be set to achieve correct tuning.
  Be sure to set the ratio. The setting can be performed from the Tuning window.

- If vibration is generated, execute custom tuning.
  Lower the gain until there is no vibration by executing custom tuning.

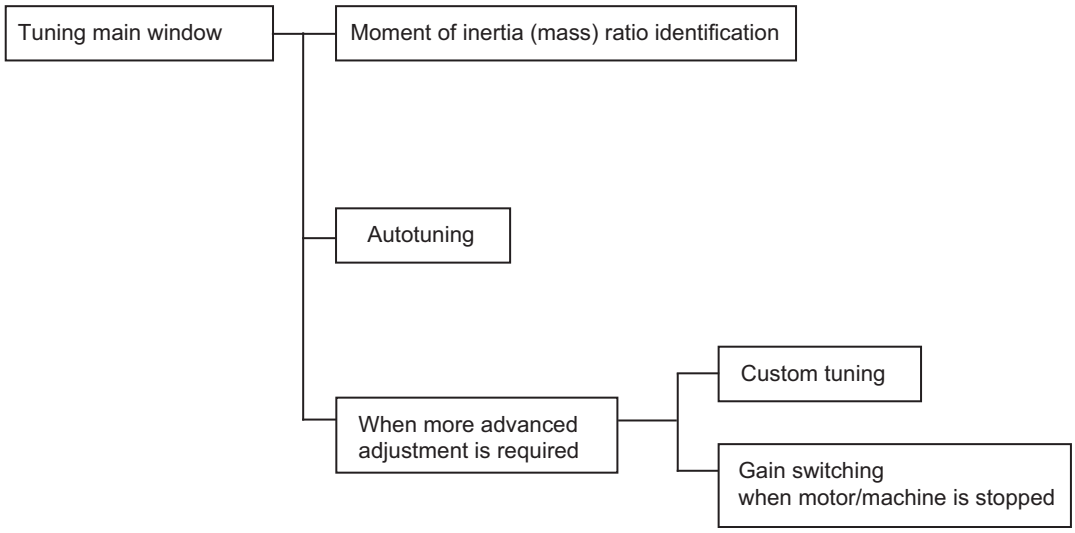
Note: While tuning, you can read the precautions related to the process. Click the **Precautions** button provided in each tuning window.

The tuning function allows you to smoothly carry out tuning of your servo system.

The tuning function calculates the moment of inertia ratio and sets a servo gain suitable for the machine characteristics. The optimal gain is set to avoid vibrations.

■ Structure

The following flowchart shows how the tuning function works.



Set the moment of inertia ratio first, and select autotuning to execute.

If more advanced adjustment is required after autotuning, execute custom tuning.

To reduce vibrations when the motor or machine is stopped, execute Gain switching while the motor/machine is stopped.

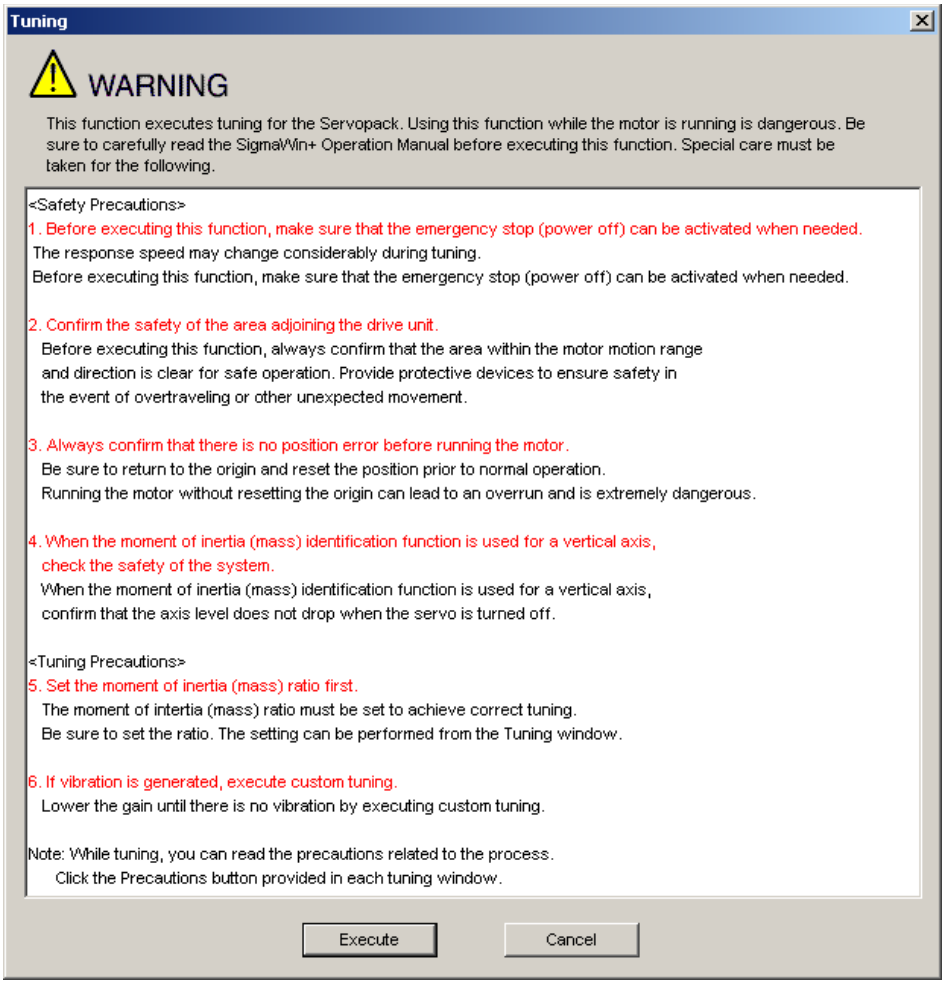
■ Tuning Main Window

Open the Tuning main window using the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Tuning** and then click **Tuning**.

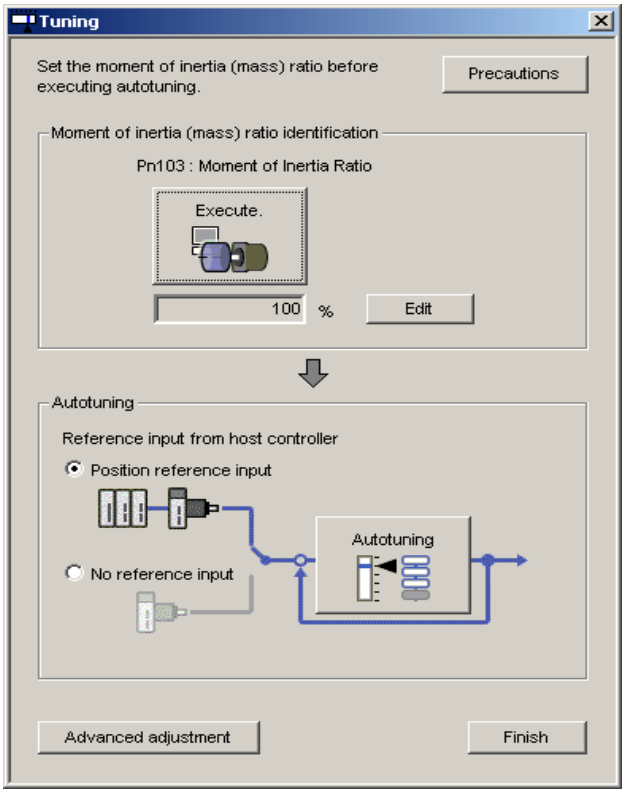
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



Click **Cancel** to return to the SigmaWin+ Σ-7 component main window without executing tuning.

2. Click **Execute**. The Tuning main window appears.



Tuning Main Window

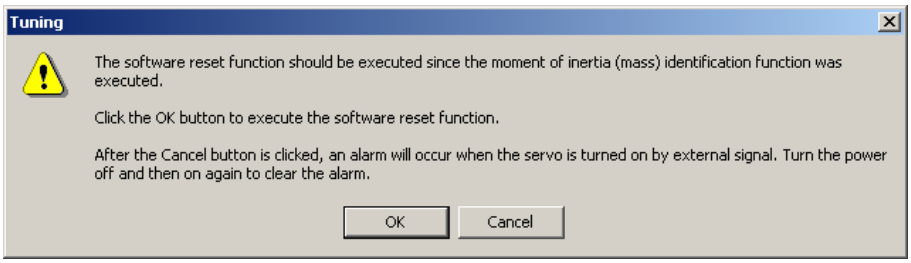
Moment of Inertia Identification

When automatically setting the moment of inertia ratio:

Click **Execute** in the main window, and the moment of inertia identification process will start.

See "4.7.1 Moment of Inertia (Mass) Identification" for details on moment of inertia identification.

When the moment of inertia is identified, a message will ask you to execute software reset.



Click **OK** to execute software reset. See "4.5.11 Resetting the SERVOPACK by Software" for the software reset function.

When manually setting the moment of inertia ratio:

Click **Edit** and enter a value in the input field. Click **OK**.

Autotuning

Select the **Position reference input** or **No reference input** option under **Reference input from host controller**, and then click **Autotuning**.

Autotuning with reference input (when the **Position reference input** option is selected):

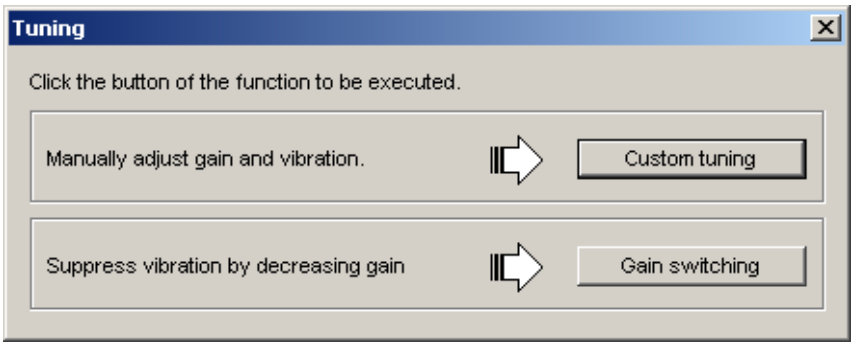
The servo gain is automatically adjusted while running the motor by the reference from the host controller. If vibration is generated during adjustment, the vibration suppression function can be used. See "4.7.2 Autotuning with Reference Input" for details.

Autotuning without reference input (When the **No reference input** option is selected):

The servo gain is automatically adjusted while running the motor by the SERVOPACK internal reference (auto-run). See "4.7.3 Autotuning without Reference Input" for details.

When More Advanced Adjustment is Required after Autotuning

Click **Advanced adjustment** when more advanced adjustment is required after autotuning. The Tuning box will appear.



Custom tuning

The gain can be manually adjusted. If vibration is generated during adjustment, the anti-resonance control adjustment function and vibration suppression function can be used. See "4.7.4 Custom Tuning" for details.

Gain switching

The settings to suppress vibration while the motor and machine are stopped can be made. See "4.7.5 Gain Switching When Motor/Machine Is Stopped" for details.

When tuning is completed, click **Finish** to quit the tuning function.

4.7.1 Moment of Inertia (Mass) Identification

⚠ WARNING

Using the moment of inertia (mass) identification function while the motor is running is dangerous.

Be sure to check related information in this manual before using this function.

Pay particular attention to the following.

- Confirm the safety of the area adjoining the drive unit.

  The motor rotates (moves for linear motor) for 0.5 sec. per running/measurement while using this function.

  Make sure that there is no danger in running the motor before executing this function.
- Confirm the safety of the area adjoining the drive unit.

  During operation of this function, the motor will rotate (move) in both the forward and reverse directions per running/measurement. Before using this function, make sure that there is sufficient area to turn (move) corresponding to the setting. If this function is used repeatedly, the starting position may shift. Check the starting position before running the motor or measuring.
- When this function is used for a vertical axis, check the safety of the system.

  When this function is used, confirm that the axis level does not drop when the servo is turned off.
- Always confirm that there is no position error after execution of this function.

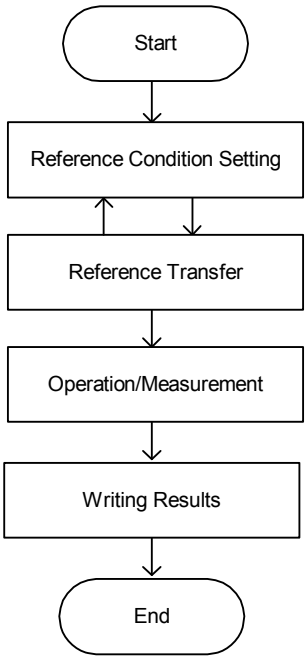
  Because the motor is driven by an internal reference, be sure to return to the origin and reset the position prior to normal operation. Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.
- Execute the software reset function or turn the power off and then on again after the completion of this function.

  An alarm will occur when the servo is turned on by a command from the host controller after execution of this function. Execute the software reset function, or turn the power off and then on again.

Load moment of inertia (mass) can be regarded as a standard parameter when adjusting control parameters. Although the load moment of inertia (mass) ratio can be derived by calculation based on the mass and structure of the machine components, this is a very cumbersome operation in which deriving correct values for the complex structures of today's machines is very difficult.

The moment of inertia (mass) identification method of SigmaWin+ Σ-7 component can obtain accurate and high-quality moment of inertia (mass) values simply by running the motor several times forward and backward.

The following flowchart shows how the moment of inertia (mass) is identified.



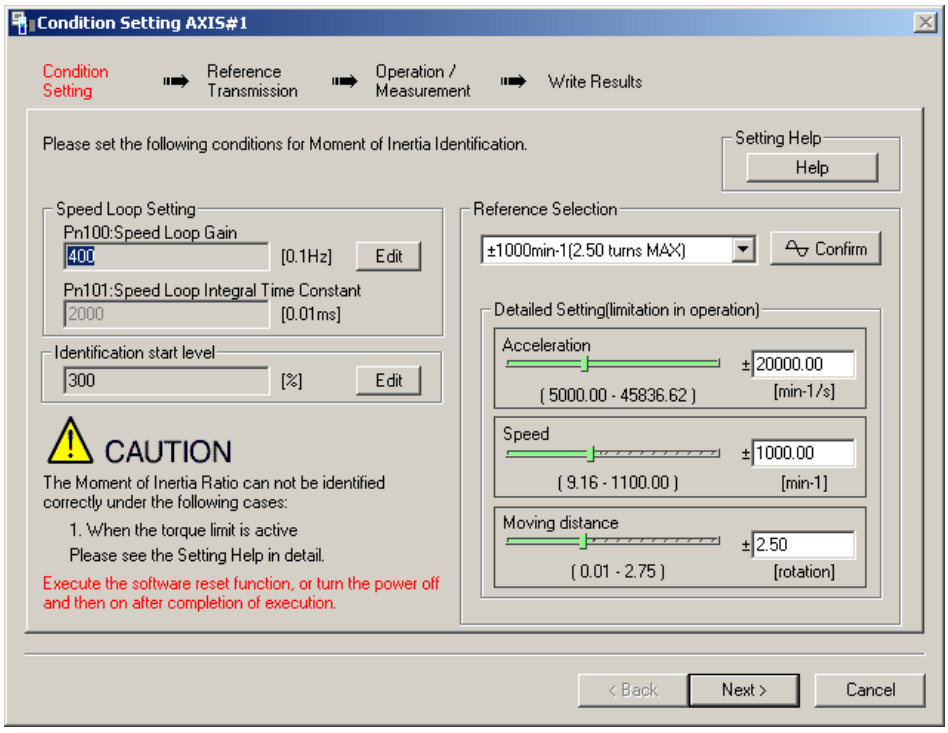
Moment of Inertia (Mass) Identification Boxes

Open the moment of inertia (mass) identification boxes using the following procedure.

Click **Execute** in the Tuning main window. The Condition Setting box will appear.
The boxes displayed here are those displayed when using a rotary motor.

Setting the Conditions

Set the conditions for identifying moment of inertia (mass) in the Condition Setting box.



Condition Setting Box

Speed Loop Setting

Set the speed loop gain and integral time constant.

Edit

Click **Edit** to view the Speed Loop-Related Setting Change box.

Identification Start Level

Set the moment of inertia (mass) identification start level.

Help

Click **Help** to open the window for guidelines on the reference condition settings.
See <Guidelines for Reference Condition Settings> for details.

Reference Selection

Select the reference pattern for identifying the moment of inertia (mass). (Recommended method.)

Detailed Setting

Create the reference pattern for setting the moment of inertia (mass) by changing the values with the slider or by directly entering the values.

Next>

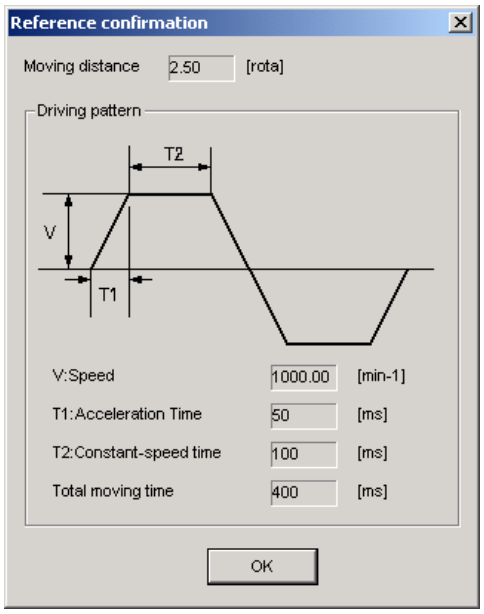
Click **Next** to view the Reference Transmission box.

Cancel

Click **Cancel** to return to the main window without changing the conditions.

Confirm

Click **Confirm** to view the reference wave.



<Guidelines for Reference Condition Settings>

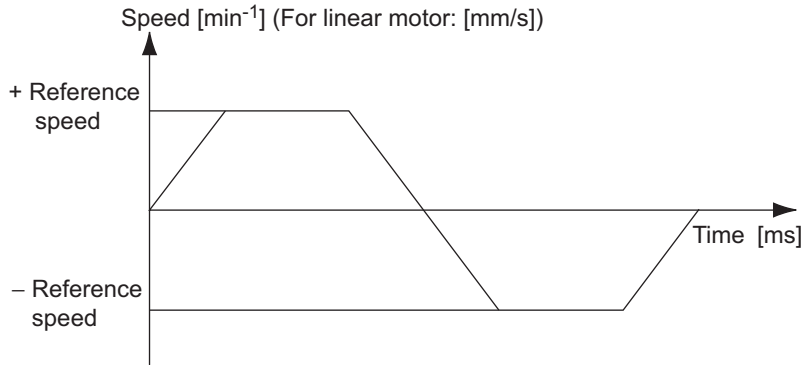
- Run the motor to measure the load's inertial moment (mass) of the mechanism to compare it with the rotor's inertial moment (coil assembly mass for linear motor) of the motor in the moment of inertia (mass) ratio.
- Set the driving mode, reference pattern (maximum acceleration, maximum speed, and maximum moving distance), and parameters related to the speed loop.
- Accurate measurement of the moment of inertia (mass) ratio depends on the settings. See the measurement results to determine the proper settings. See the following guidelines for each setting.

Reference Selection

The motor turns (moves) with the references as shown in the following graph for a forward run and a reverse run. The following references are for a rotation (movement) in a forward run. Select a reference pattern from the Reference Selection box (recommended method) or create the reference pattern by directly entering the values.

As the setting for maximum acceleration increases, the accuracy of the inertia identification tends to improve.

Consider the pulley diameter or the speed reduction ratio such as the ball screw pitches, and set the maximum acceleration within the operable range.



⚠ CAUTION

- The amount of movement is the value for each operation (a forward run or a reverse run). After several operations, the operation starting position may have moved in either direction. Confirm the operable range before each measurement and operation.
- Certain settings for the parameters or inertia size of the mechanism may result in overshooting or undershooting, and cause the speed to temporarily exceed the maximum speed. Allow a margin when making the settings.

Speed Loop Setting

If the response of the speed loop is poor, the moment of inertia (mass) ratio cannot be measured accurately.

The speed loop setting to get the required response for the moment of inertia (mass) setting is already set to the default setting. Normally, this setting does not have to be changed.

If this speed loop gain is too high, and is causing excitation in the mechanism, lower the setting. However, do not set it to a value that is higher than the default setting.

Identification Start Level

With a heavy load or low-rigidity machine, torque limit may be applied and the moment of inertia identification may fail.

In this case, double the identification start level and execute identification again.

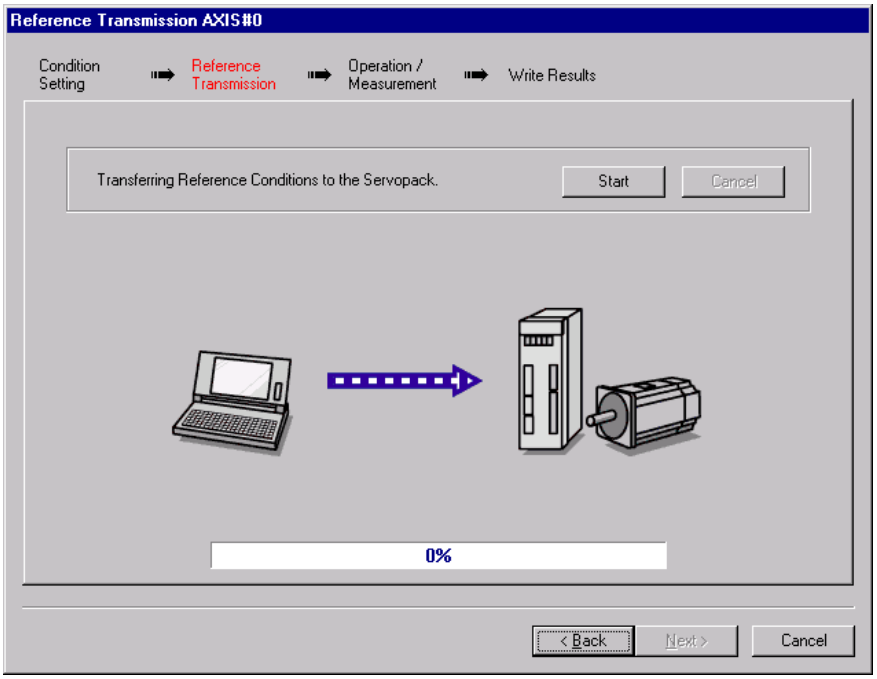
■ If the moment of inertia (mass) ratio cannot be measured accurately

If the torque (force) is limited, the moment of inertia (mass) ratio identification cannot be made correctly. Adjust the setting of the limit or decrease the acceleration in Reference Selection so that the torque (force) will not be limited.

For information on torque (force) limiting, refer to the section on torque (force) limiting in the product manual for your SERVOPACK.

Reference Transmission

Transfer the reference conditions to the SERVOPACK. Click **Start** in the Reference Transmission box to begin the transfer.



Reference Transmission Box

Start

Click to **Start** to transfer the reference conditions to the SERVOPACK. A progress bar displays the progress status of the transfer.

Cancel

The **Cancel** button is available only during the transfer to the SERVOPACK. After the transmission is finished, it is unavailable and cannot be selected.

Next>

The **Next** button is available if the data is transferred successfully. If an error occurs or if the transmission is interrupted, it is unavailable and cannot be selected.

Click **Next** to view the Operation/Measurement box.

<Back

Click **Back** to return to the Condition Setting box. The **Back** button is unavailable during a data transfer.

Cancel

Click **Cancel** to stop processing and return to the main window.

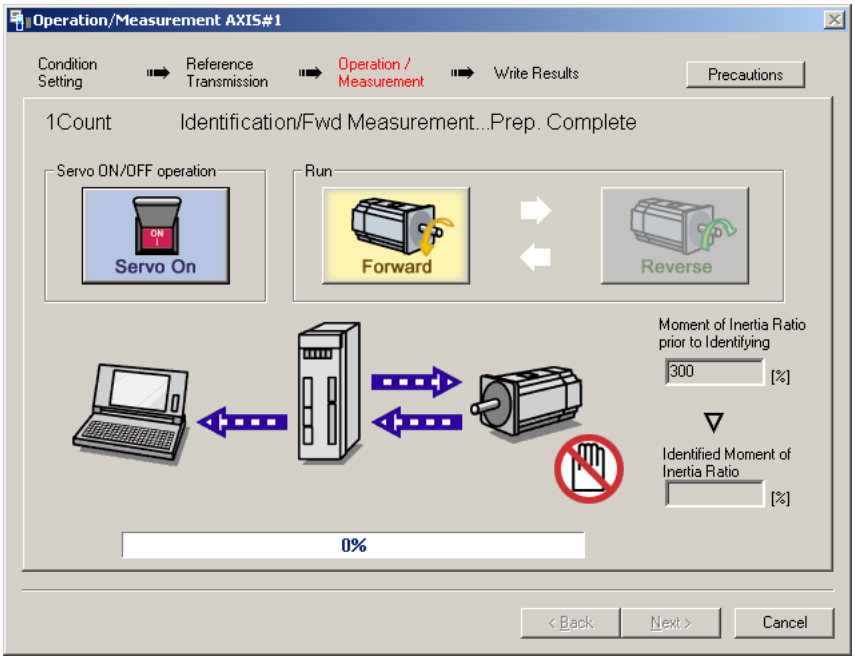
After the data has been successfully transferred, click **Next**, and the Operation/ Measurement box appears.

Operation/Measurement

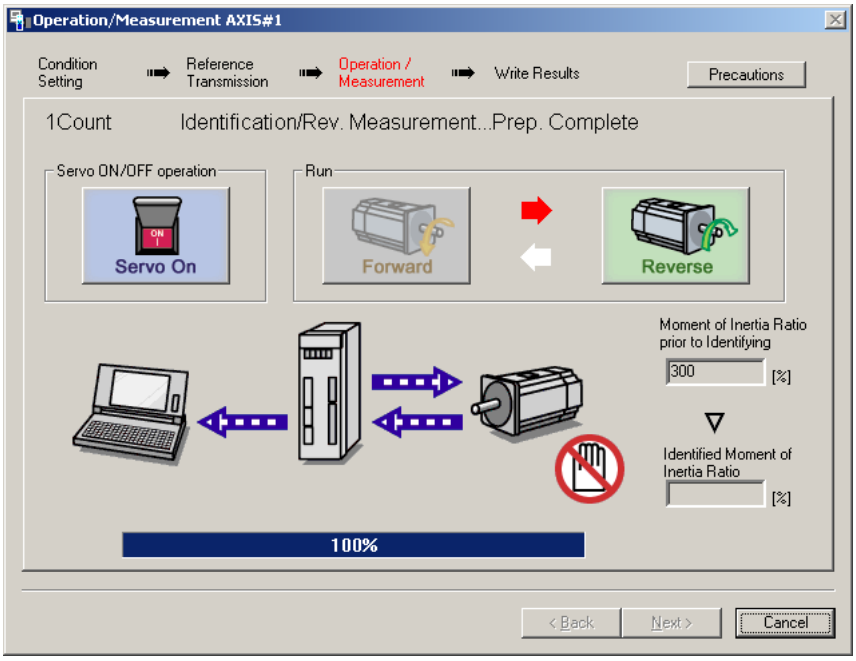
In the Operation/Measurement box, run and measure the actual motor. Measurements are taken two to seven times and then verified.

Run the motor and take measurements using the following procedure.

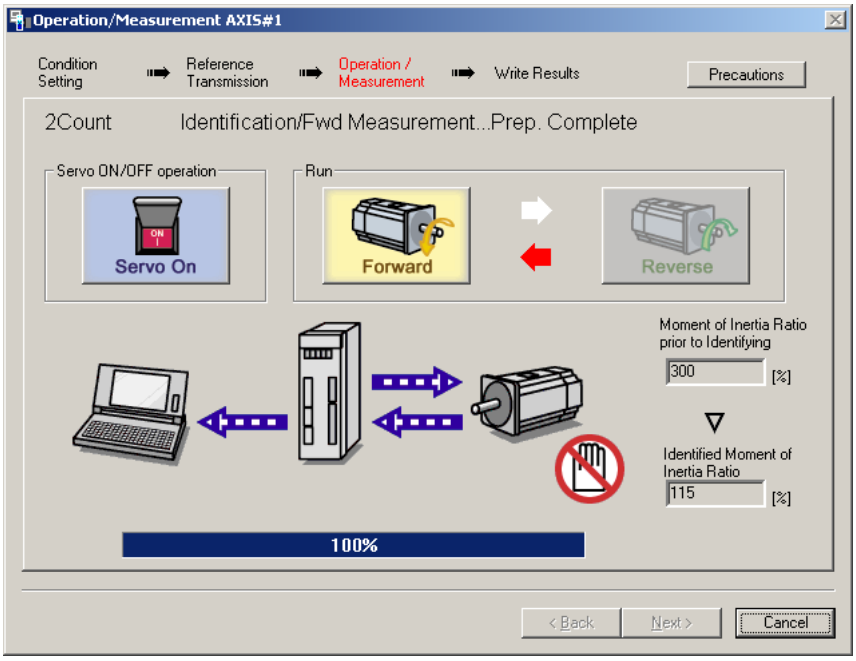
1. Click **Servo ON** to turn on the servo power.



2. Click **Forward** to take measurements by turning (moving) the motor forward. After the measurements and the data transmission are finished, the following window appears.



3. Click **Reverse** to take measurements by turning (moving) the motor in reverse. After the measurements and the data transmission are finished, the following window appears.



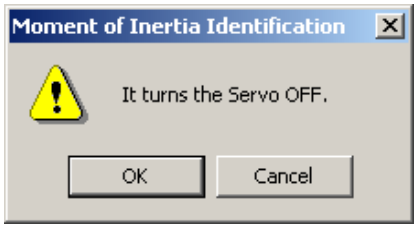
4. Repeat steps 2 through 3 until all the measurements have been taken.

   The actual number of times the measurements have been taken is displayed in the upper left part on the screen.

   The progress bar displays the percentage of data that has been transferred.1

5. After the measurement has been successfully completed, click **Servo ON** to turn to the servo OFF status.
6. Click **Next**, and the Write Results box appears.

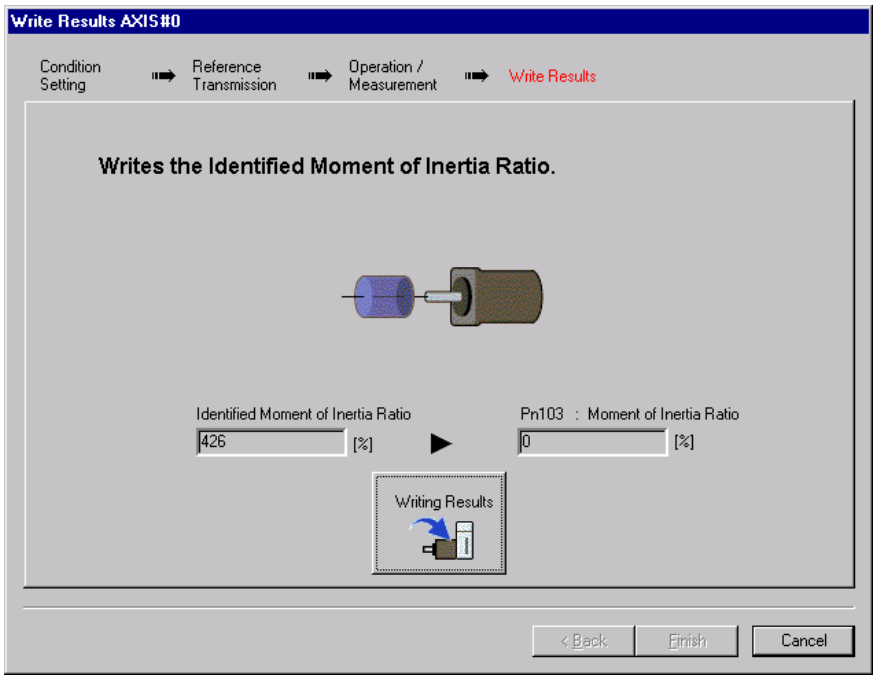
   When **Next** is clicked without turning to the servo OFF status, the following message appears.



   Click **OK** to turn to the servo OFF status.

Writing Results

In the Write Results box, set the moment of inertia (mass) ratio calculated in the operation/measurement to the parameters.



Write Results Box

Identified Moment of Inertia (Mass) Ratio

Displays the moment of inertia (mass) ratio calculated in the operation/measurement.

Writing Results

Click **Writing Results** to assign the value displayed in the identified moment of inertia (mass) ratio to SERVOPACK parameter Pn103.

Pn103: Moment of Inertia (Mass) Ratio

Displays the value assigned to the parameter.

Click **Write Results**, and the new ratio calculated from the operation/measurement will be displayed.

<Back

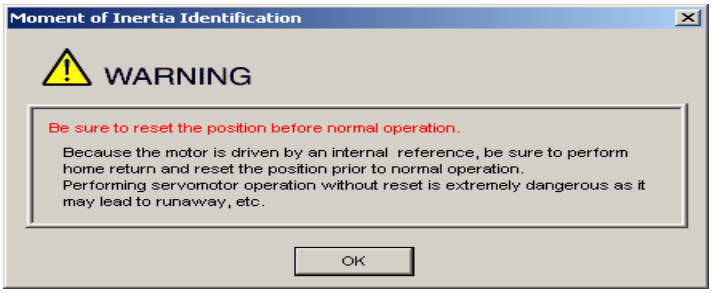
The **Back** button is unavailable.

Cancel

Click **Cancel** to return to the main window.

Finish

Click **Finish**, and a warning message appears reminding you to reset the origin position. (No warning message appears when the Write Results box has been opened from the Tuning main window.)



Click **OK** to return to the SigmaWin+ Σ-7 component Main window. If Pn103 (Moment of Inertia (Mass) Ratio) has been changed, that new value will remain.

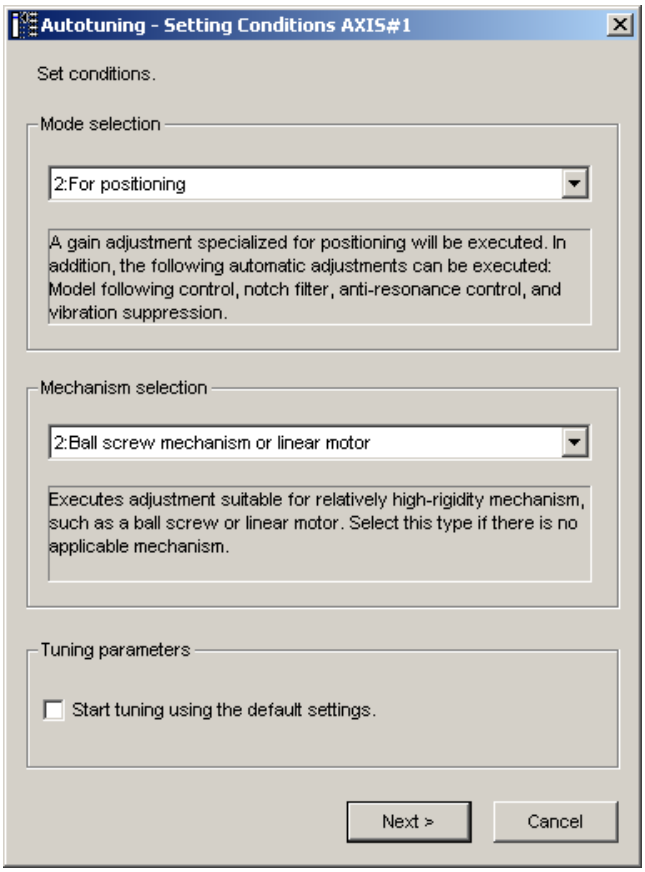
4.7.2 Autotuning with Reference Input

> **⚠ WARNING**
>
> Executing the autotuning function with reference input while the motor is running is dangerous.
>
> Be sure to check related information in this manual before using this function.
>
> Special care must be taken for the following.
>
> • Confirm the safety of the area adjoining the drive unit.
>
> Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
> And, provide protective devices to ensure safety in the event of overtraveling or other unexpected movement.
>
> • Check the position reference to be input.
>
> This function executes tuning using the position reference from the host controller. Make sure that the SERVOPACK is ready to receive the reference from the host controller before using this function. In the tuning sequence of this function, a /COIN signal is used to judge whether or not positioning is completed. Therefore, it is necessary to output a /COIN signal at every completion of positioning. If no /COIN signal is output within approx. 10 seconds after completion of position reference distribution (position reference = 0), an error will occur.

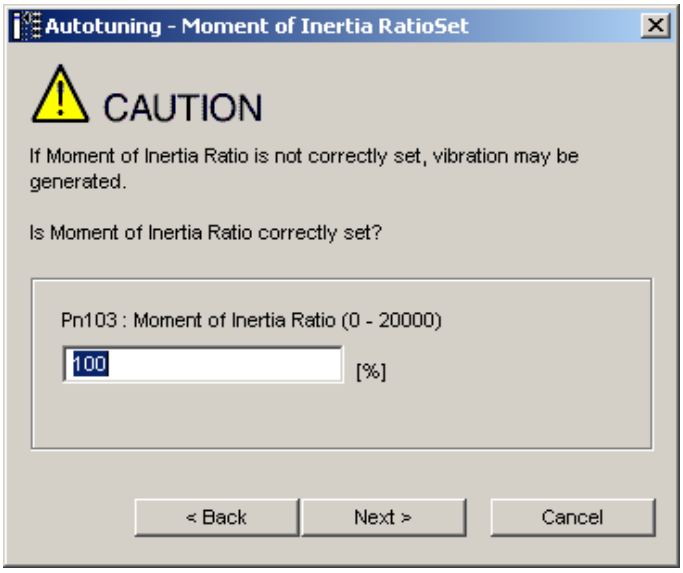
This autotuning uses reference inputs from the host controller, and sets a servo gain suitable for the machine characteristics. The gain is set as high as possible to avoid vibrations.

To execute autotuning using reference inputs from the host controller, use the following procedure.

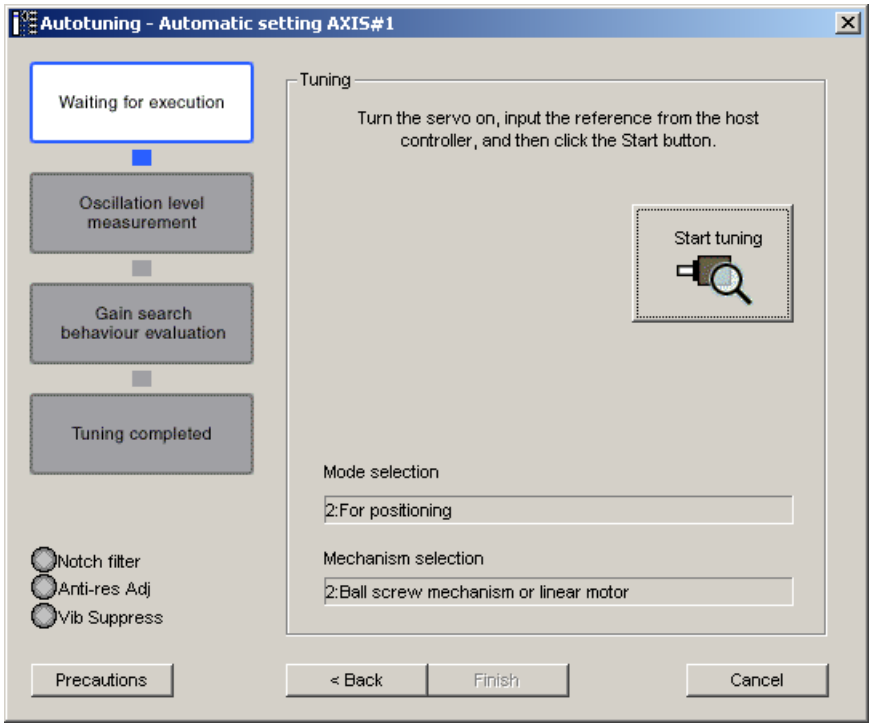
1. Select the **Position reference input** option under **Reference input from host controller** in the Tuning main window, and then click **Autotuning**. The Autotuning-Setting Conditions box will appear.



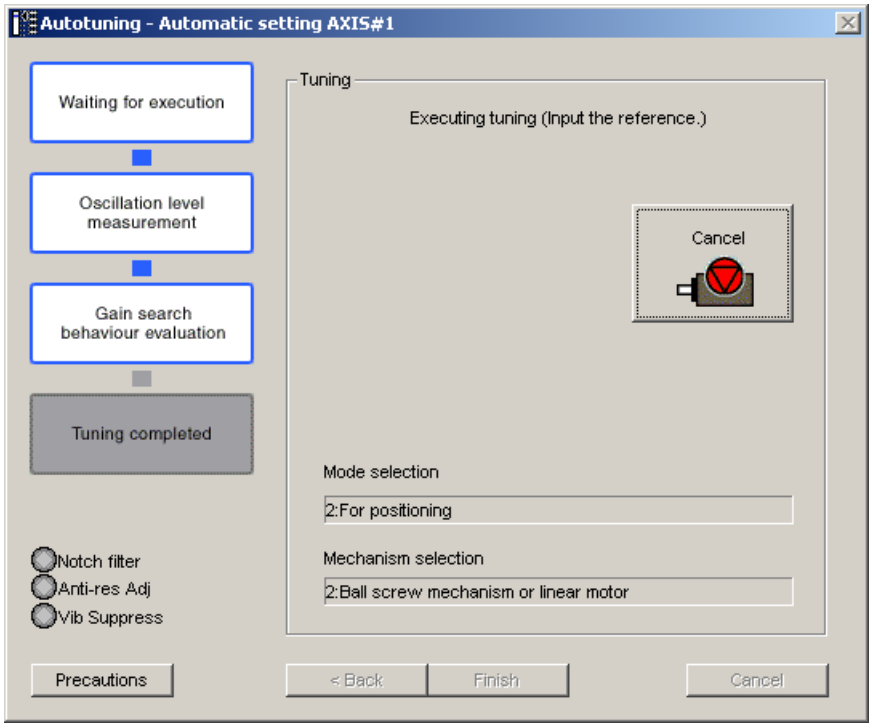
2. Select the mode from the **Mode selection** combo box and the mechanism from **Mechanism selection** combo box, and then click **Next**. The Autotuning-Moment of Inertia Ratio Setting box will appear. When the **Start tuning using the default settings.** check box is selected in the Autotuning-Setting Conditions box, tuning will be executed using tuning parameters set to the default value.



3. Enter the correct moment of inertia ratio and then click **Next**. The following window will appear.



4. Turn the servo on and then input the reference from the host controller. Click **Start tuning** to start tuning.



Vibration generated during tuning is automatically detected and the optimum setting for the detected vibration will be made. When setting is completed, the LED indicator lamps (bottom left of the box) of the functions used for the setting will light up.

5. When tuning is complete, click **Finish**. The results of tuning will be written in the parameters.

4.7.3 Autotuning without Reference Input

> ⚠ WARNING
>
> Executing the autotuning function without reference input while the motor is running is dangerous.
>
> Be sure to check related information in this manual before using this function.
>
> Special care must be taken for the following.
>
> • Confirm the safety of the area adjoining the drive unit.
>
> This function starts automatic operation with vibration. Before executing this function, make sure that the emergency stop (power off) can be activated when needed. Confirm that the area within the motor motion range and direction is clear for safe operation. Provide protective devices to ensure safety in the event of overtraveling or other unexpected movement, since the motor rotates in both directions within the set moving range.
>
> • Check the setting of electronic gear regardless of the control mode.
>
> With this function, the moving distance is calculated on the base of the electronic gear ratio (parameter) not only in position control mode but also in other control modes.
>
> Always make sure that the electronic gear ratio is correctly set before executing this function.

This autotuning sets a servo gain suitable for the machine characteristics. The gain is set as high as possible for auto run within the set range to avoid vibration.

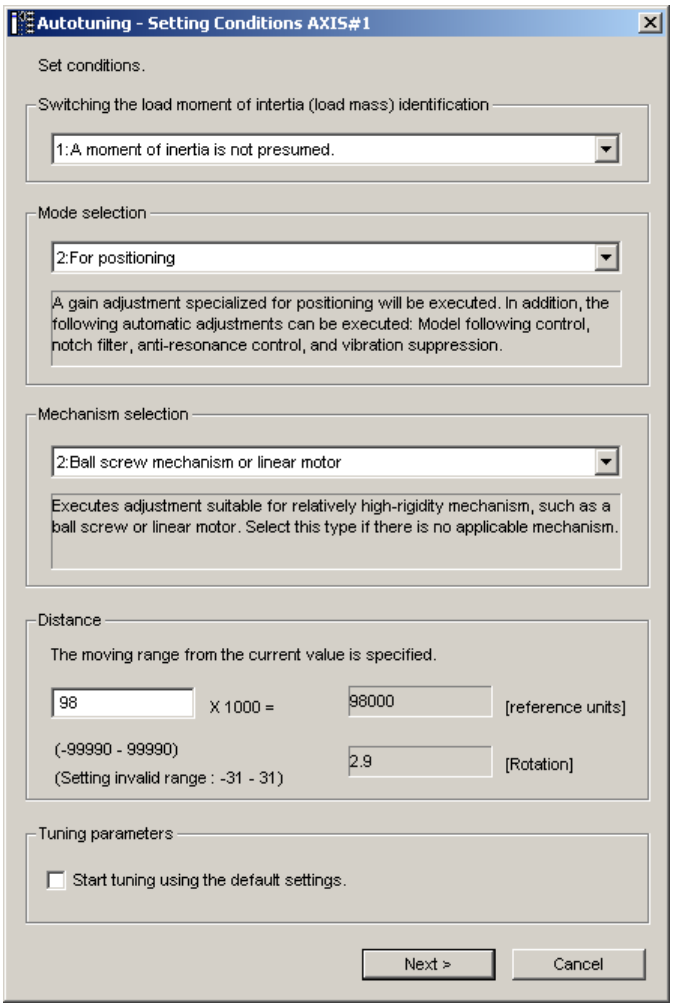
⚠ CAUTION

Two methods are available to stop autotuning without reference input while the motor is running, and the motor will stop according to the method selected. Make sure to select the best method for the situation.

- If the SERVO OFF button is used, the motor will stop according to the stopping method after servo off specified by the parameters.
- If the CANCEL button is used, the motor will decelerate to a stop and then enter a zero clamp state.
  Note: The CANCEL button may not be used with some SERVOPACKs.

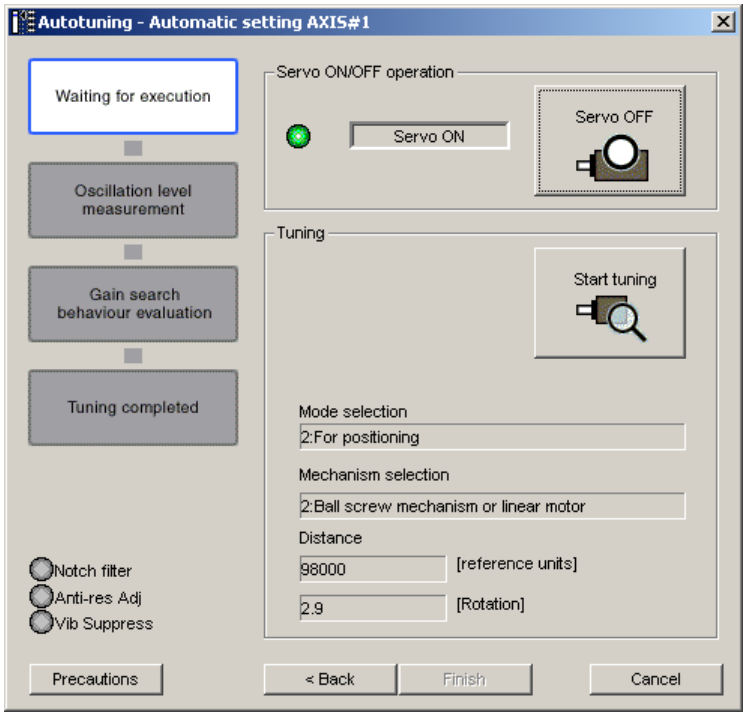
To execute autotuning without using a reference input, use the following procedure.

1. Select the **No reference input** option under **Reference input from host controller** in the Tuning main window, and then click **Autotuning**. The Autotuning-Setting Conditions box will appear.

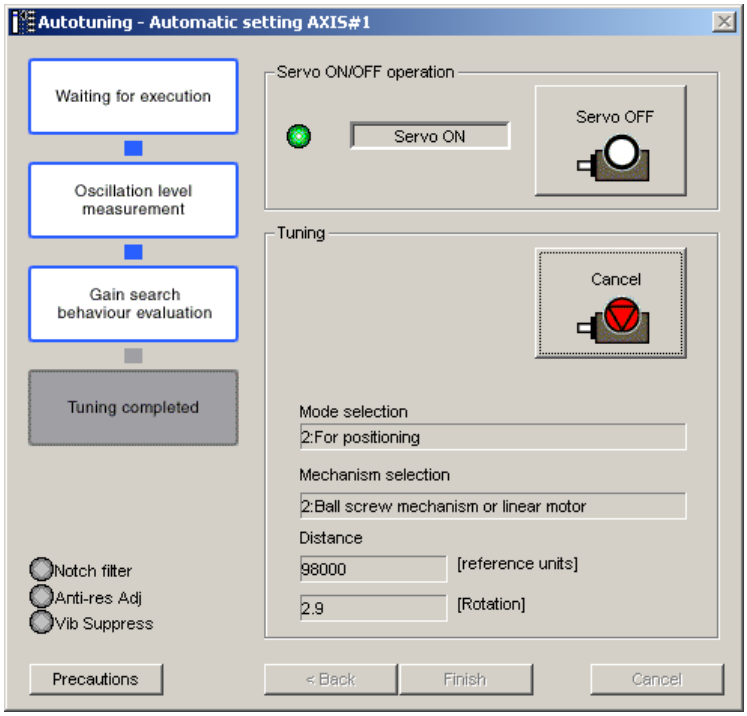


2. Select whether or not to use the load moment of inertia (load mass) identification from the **Switching the load moment of inertia (load mass) identification** box, the mode from the **Mode selection** box, the mechanism from the **Mechanism selection** box, and enter the moving distance. Then, click **Next**.
   When the **Start tuning using the default settings.** check box is selected in the Autotuning-Setting Conditions box, tuning will be executed using the tuning parameters set to the default values.

3. Click **Servo ON**. The following box will appear.



4. Click **Start tuning**. The motor will start rotating and tuning will commence.



Vibration generated during tuning is automatically detected, and the optimum setting for the detected vibration will be made. When the setting is complete, the LED indicator lamps (bottom left of the box) of the functions used for the setting will light up.

5. When tuning is completed, click **Finish**. The results of tuning will be written in the parameters.

4.7.4 Custom Tuning

> **⚠ WARNING**
>
> The custom tuning function is used to adjust servo gains.
>
> Be sure to check related information in this manual before using this function.
>
> Special care must be taken for the following.
>
> • Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
>
> When tuning is initiated by this function, some parameters will be overwritten with the recommended values. As a result, the response speeds may change considerably. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
>
> • Set a correct moment of inertia (mass) ratio to execute this function.
>
> If not correctly set, vibration may be generated.
>
> • Note the timing when the feed forward level setting is validated.
>
> The set feed forward level will not be immediately validated, but will be validated after the Positioning Completion signal (/COIN) is output.

This custom tuning adjusts servo gains by manually adjusting the feed forward level and feedback level. If vibration is detected during tuning, the anti-resonance control adjustment function and the vibration suppression function can be used. Use custom tuning for fine adjustment of gains as well as for autotuning.
Either one of the following two methods of custom tunings can be executed by selecting the tuning mode.

When the **tuning mode** is set to **0 (servo gains with priority given to stability)** or **1 (servo gains with priority given to response)**

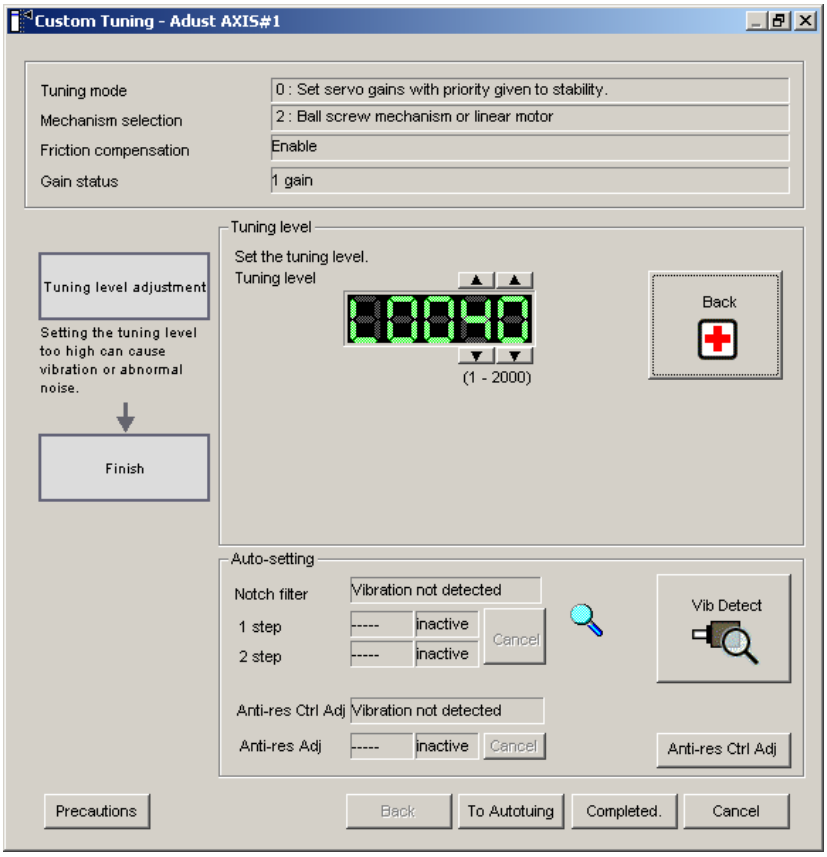
This custom tuning enables multiple servo gains to be set to stable conditions merely by manipulating one tuning level. If vibration is detected during tuning, the notch filter/anti-resonance control auto setting function is provided to suppress it. The anti-resonance control adjustment function can also be manually set during tuning.

When the **turning mode** is set to **2 (servo gains with priority given to positioning application)** or **3 (servo gains with priority given to prevention of overshooting in positioning applications)**

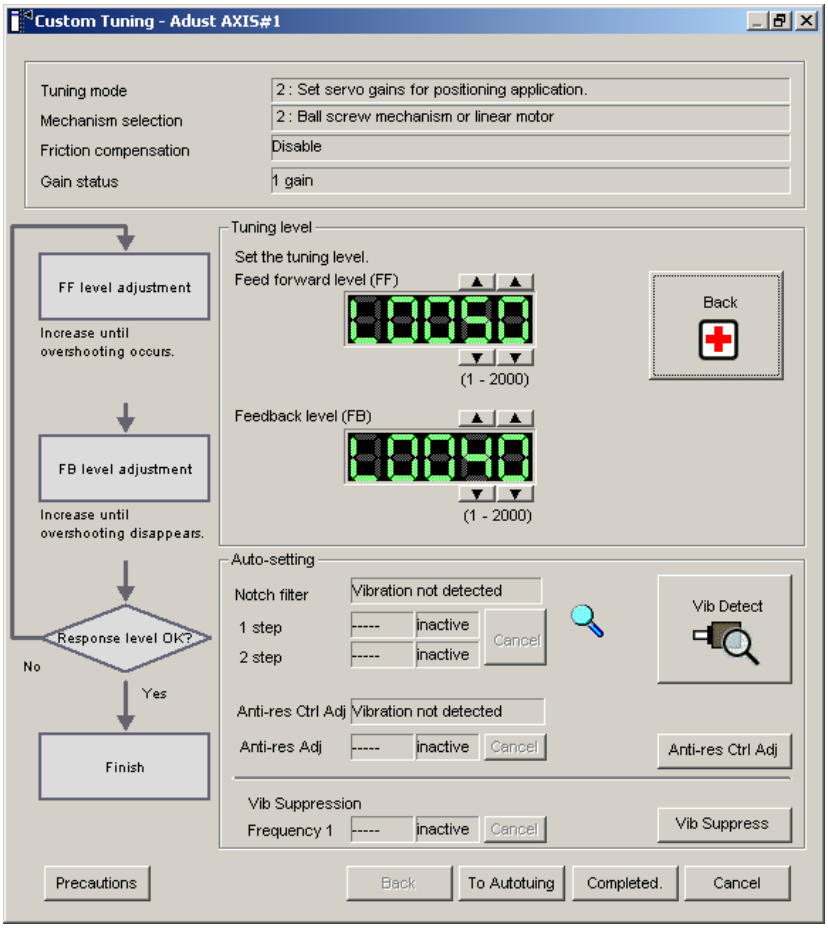
This custom tuning enables not only multiple servo gains to be set to stable conditions but also realizes reduction of positioning time by manipulating two tuning levels. This tuning uses the following-model control to reduce positioning time. In addition to the notch filter/ anti-resonance control auto setting function in case of vibration occurrence during tuning, a function to automatically set friction compensation is provided. The anti-resonance control adjustment function and the vibration suppression function can also be manually set during tuning.

INFO

Autotuning can be executed as the final step to keep balance among servo gains.



Custom Tuning - Adjust Box when Tuning Mode is Set to 0 or 1

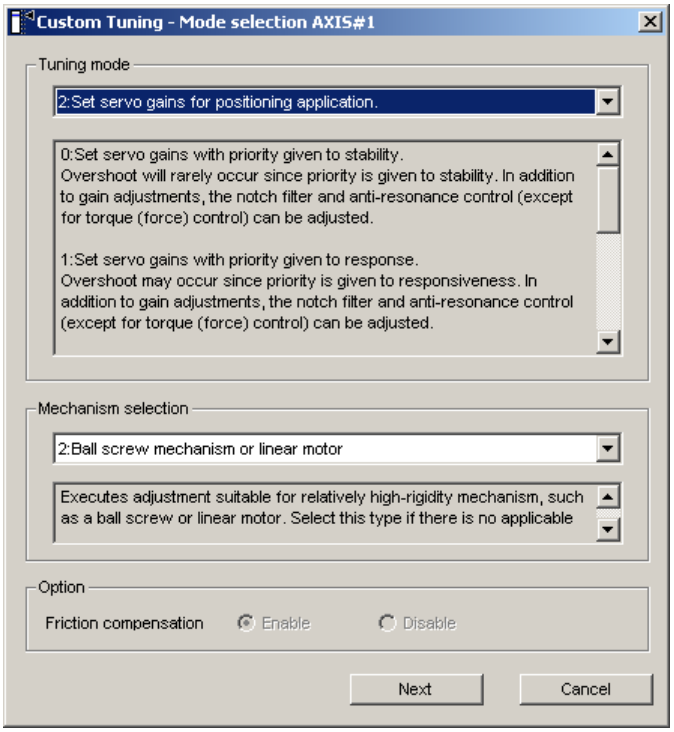


Custom Tuning - Adjust Box When Tuning Mode is Set to 2 or 3

Execute custom tuning using the following procedure.

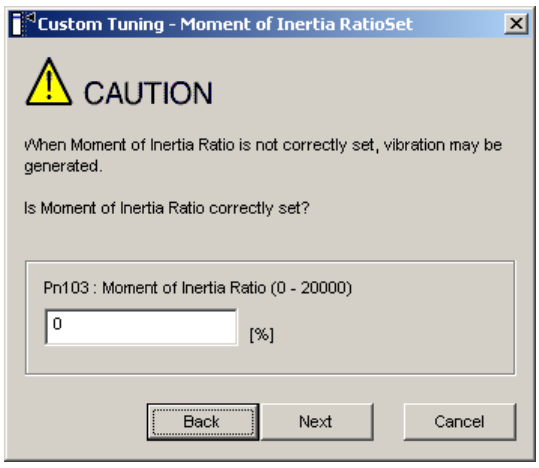
The procedure described here is for when the tuning mode is set to 2 (servo gains with priority given to positioning application).

1. Click **Advanced adjustment** in the Tuning main window, and then click **Custom tuning** in the Tuning box that will appear. The Custom Tuning - Mode selection box will appear.



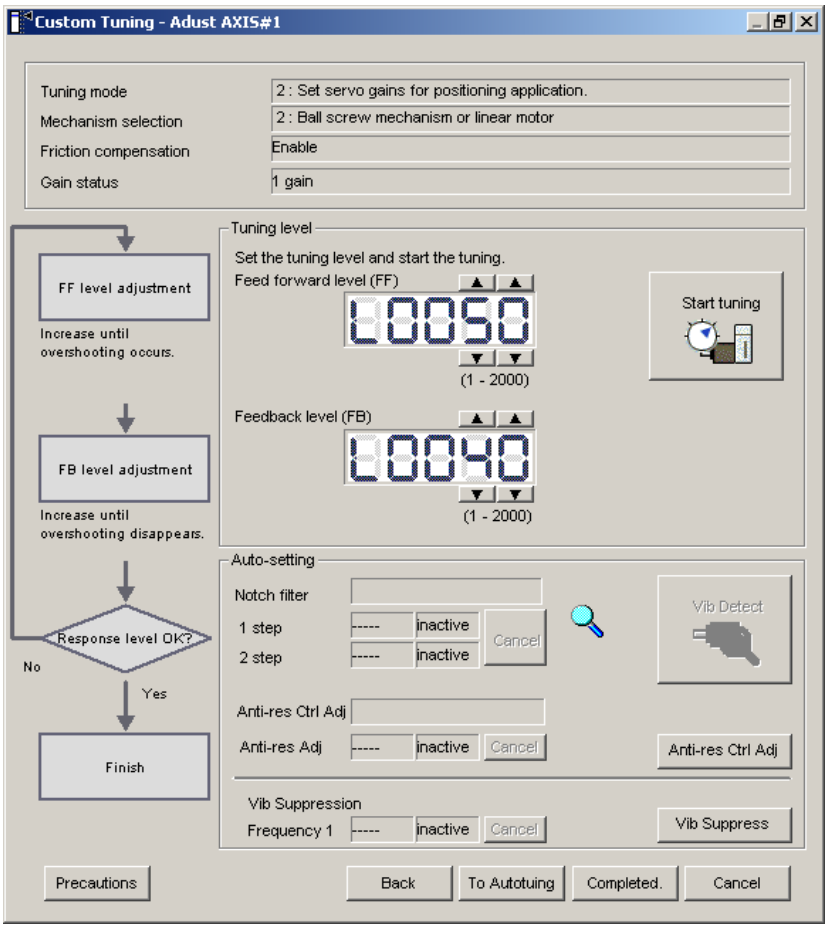
The tuning modes that can be selected will vary according to the SERVOPACK setting.

2. Select the tuning mode from the **Tuning mode** box and the mechanism from the **Mechanism selection** box, and then click **Next**. The **Friction compensation** option is available only when the tuning mode is set to 0 or 1.
   The Custom Tuning - Moment of Inertia Ratio Set box will appear.

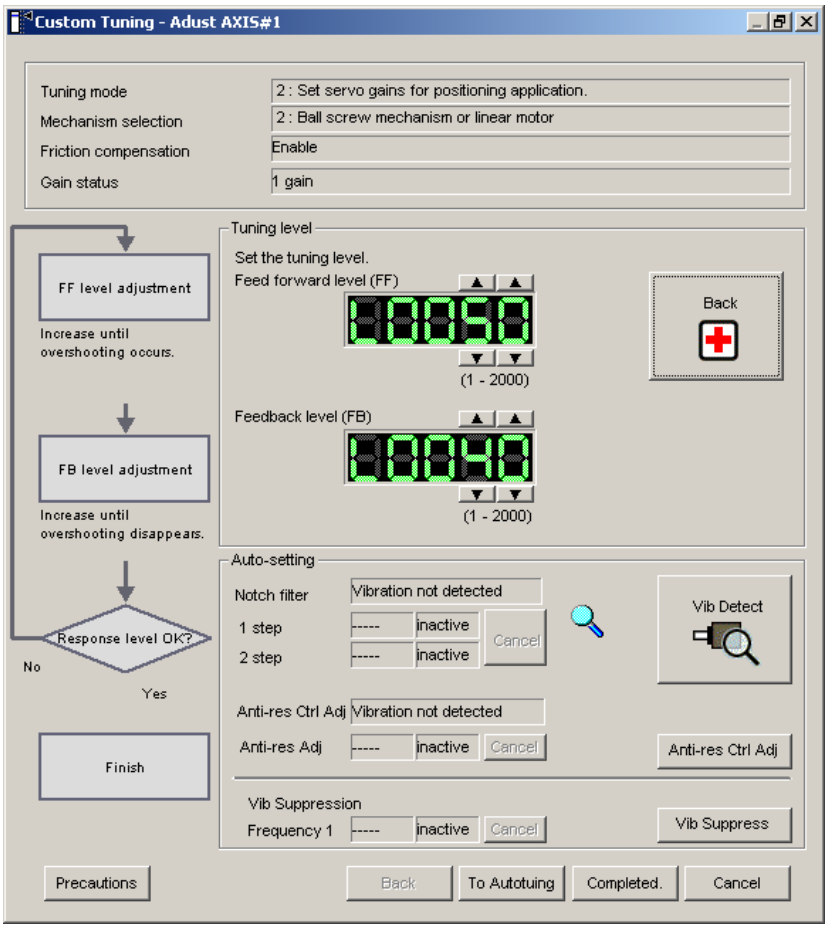


Enter the correct moment of inertia ratio.

3. Click **Next**. The Custom Tuning - Adjust box will appear.



4. Turn the servo on and input the reference from the host controller. Then, click **Start tuning** to begin tuning.

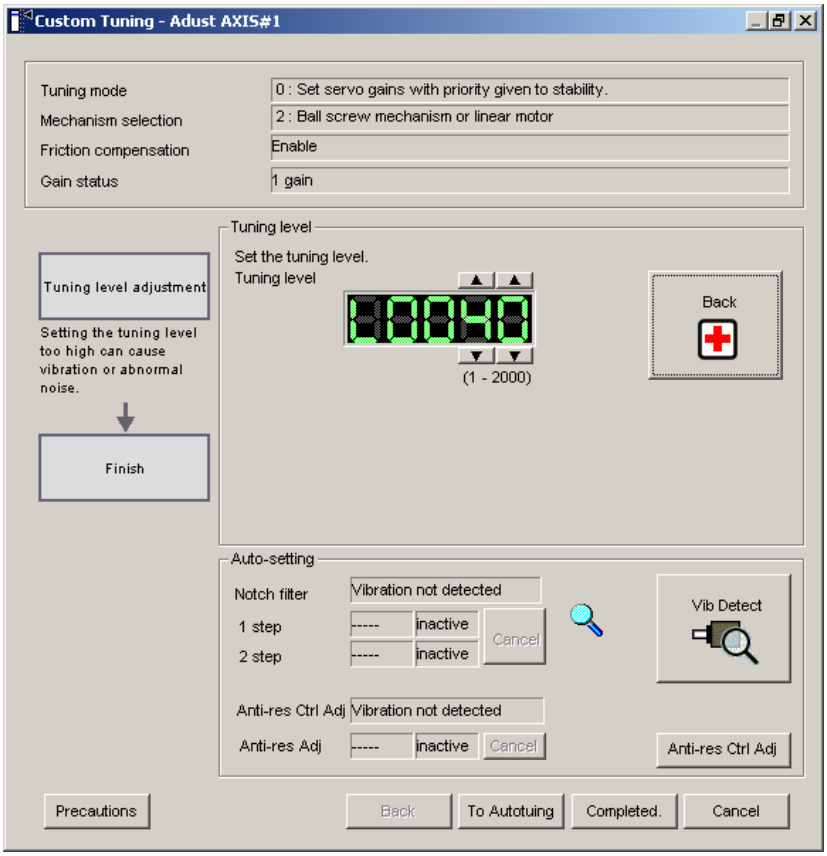


5. Change the feed forward level by clicking the setting arrows. Continue to raise the level until an overshoot occurs.

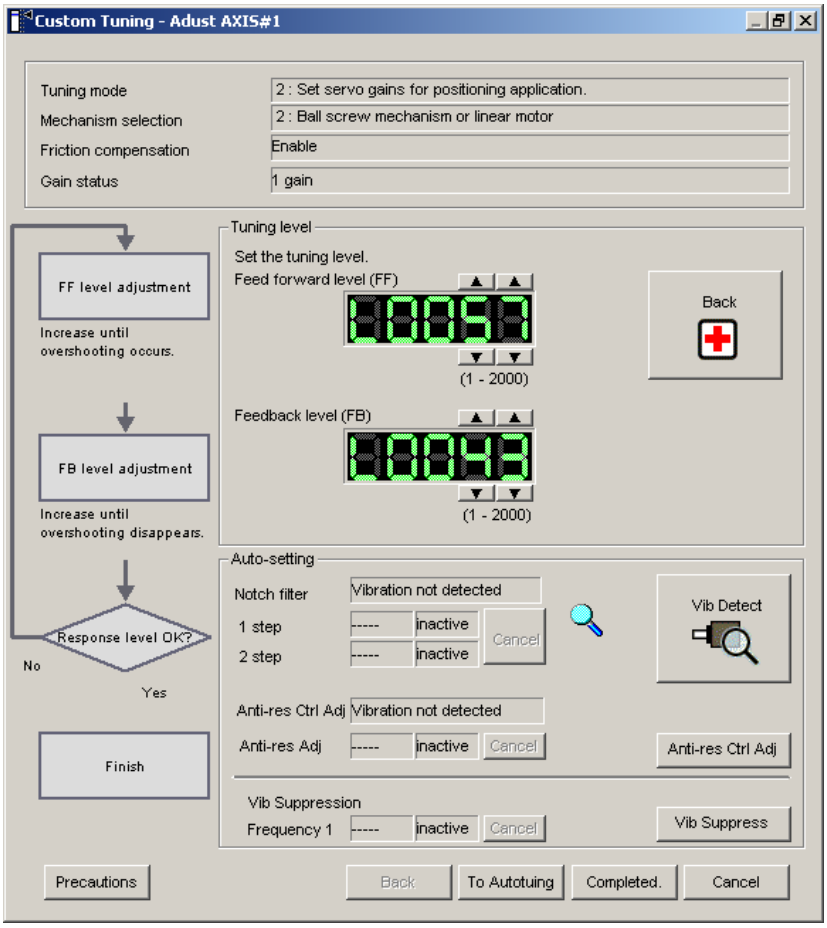
INFO

The set feed forward level will not be applied until the Positioning Completion signal /COIN is output.

When the tuning mode is set to 0 or 1, change the tuning level by clicking the setting arrows.



6. Change the feedback level by clicking the setting arrows. Continue to raise the level until no overshoot occurs.



Repeat steps 5 and 6 to continue tuning.

The notch filter/anti-resonance control auto setting function, the anti-resonance control adjustment function, the vibration suppression function, or autotuning with reference input can be used as required.

See "Functions To Suppress Vibration" for details.

To reset to the original settings and status, click **Back**.

7. When tuning is complete, click **Completed**. The settings will be written in the SERVOPACK.

Functions To Suppress Vibration

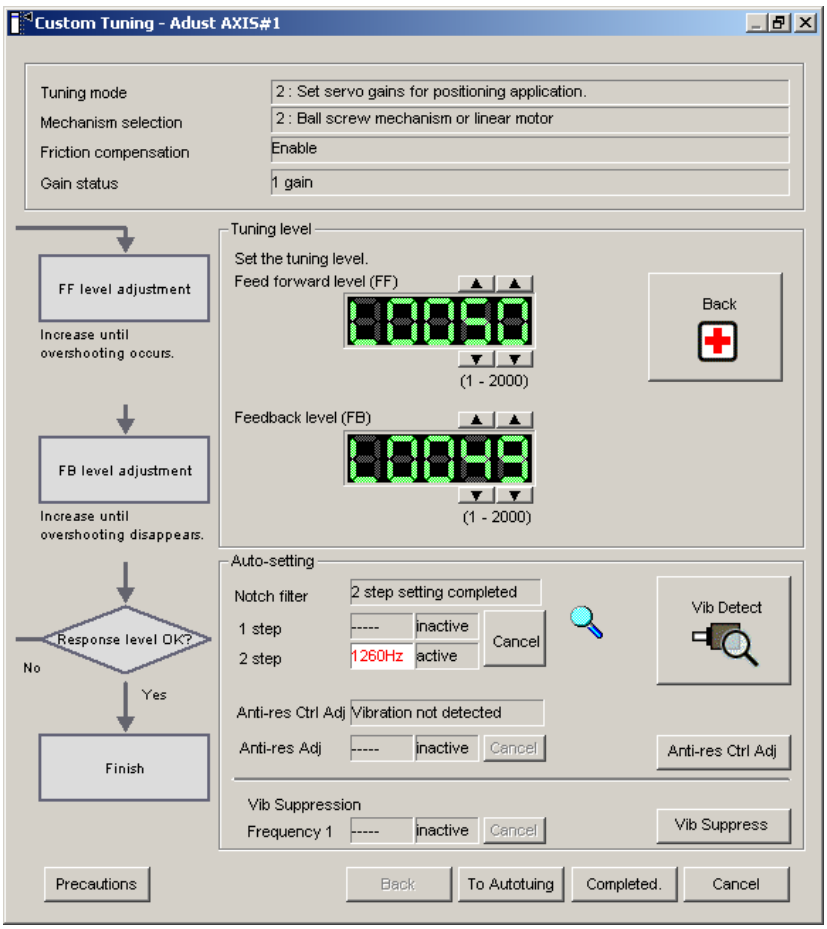
<Notch Filter/Anti-resonance Control Adjustment Auto Setting Function>

For vibration frequencies above 1,000 Hz when servo gains are increased, the notch filter auto setting function provides effective suppression. For vibration frequencies between 100 and 1,000 Hz, the anti-resonance control adjustment auto setting function is effective.

Auto Setting

To use auto setting, enable the notch filter/anti-resonance control adjustment auto setting function by using parameters.

During tuning, the notch filter frequency (anti-resonance control frequency for the anti-resonance control adjustment auto setting function) effective for the detected vibration is automatically set and displayed in **1 step** or **2 step** (in **Anti-res Adj** when using the anti-resonance control adjustment auto setting function).



Window with Notch Filter Automatically Set

Cancel

If the automatically set notch filter frequency (or anti-resonance control frequency) does not effectively suppress vibration, click **Cancel** to reset to the preceding frequency.

When the frequency is reset, vibration detection will restart.

Vib Detect (vibration detection)

While the notch filter/anti-resonance control adjustment auto setting function is enabled, click **Vib Detect** (vibration detection) to manually detect vibration. The SERVOPACK detects vibration at the moment **Vib Detect** (vibration detection) is clicked, and the notch filter frequency (or anti-resonance control frequency) effective for the detected vibration is set and displayed in **1 step** or **2 step** (or in **Anti-res Adj**). Manual vibration detection can also be executed when the SERVOPACK does not detect vibration.

Anti-res Ctrl Adj (anti-resonance control)

Click **Anti-res Ctrl Adj** (anti-resonance control) to execute the anti-resonance control function if further adjustment is required. See "4.7.6 Anti-resonance Control Adjustment Function" for details.

<Vibration Suppression Function>

This function is used to suppress low-frequency (1 to 100 Hz) vibrations for which neither the notch filter nor anti-resonance control adjustment functions are effective. When a vibration for which the vibration suppression function can be used is detected, the **Vib Suppress** (vibration suppression) button will blink.

Vib suppress (vibration suppression)

Click **Vib suppress** (vibration suppression) to execute the vibration suppression function. See "4.7.7 Vibration Suppression Function" for details.

<Autotuning with Reference Input>

To Autotuning

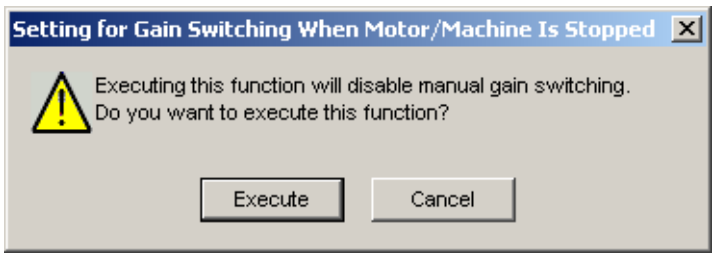
Click **To Autotuning** to execute autotuning using reference inputs from the host controller. See "4.7.2 Autotuning with Reference Input" for details.

4.7.5 Gain Switching When Motor/Machine Is Stopped

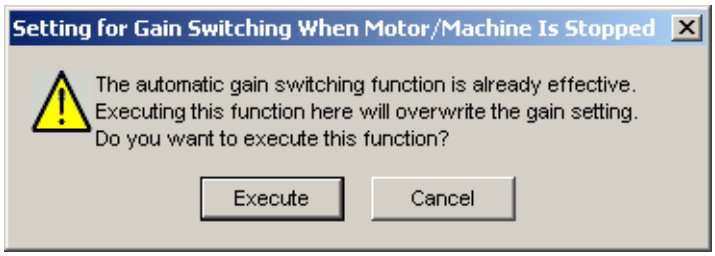
After servo gains have been increased by tuning, vibration will not be generated while the motor/machine is running. However, vibration may be generated when the motor/machine is stopped. This function suppresses vibrations generated when the motor/machine is stopped by automatically reducing internal servo gains. The reduced servo gains will automatically be reset to the original set values when the motor/machine starts running again.

To perform gain switching, use the following procedure.

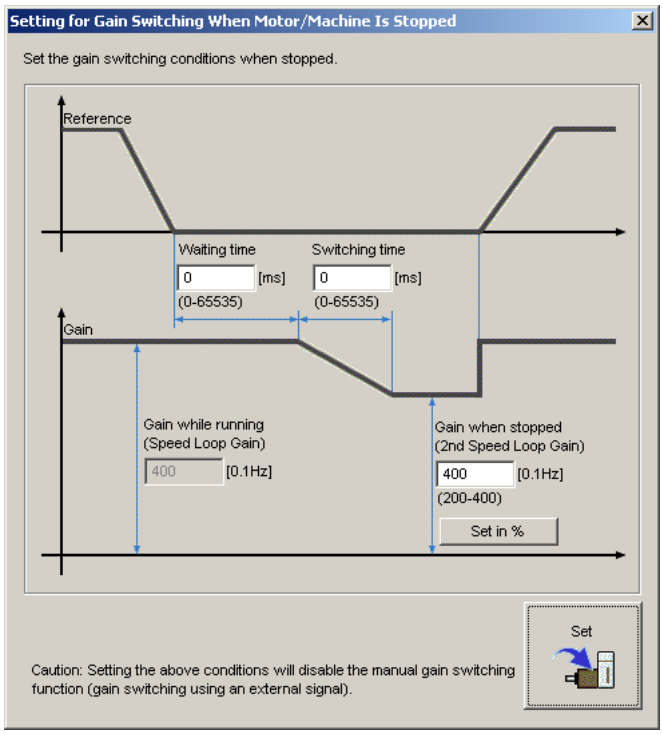
1. In the Tuning main window, click **Advanced adjustment** and then click **Gain switching**. A message will appear, asking for confirmation to execute the function.



When the gain switching function is already effective, a message will inform you that the function is already effective, and ask for confirmation to execute.



2. Click **Execute**. The Setting for Gain Switching When Motor/Machine Is Stopped box will appear.



Waiting time

Enter the period of time from the moment the position reference becomes zero until the gain switching starts.

Switching time

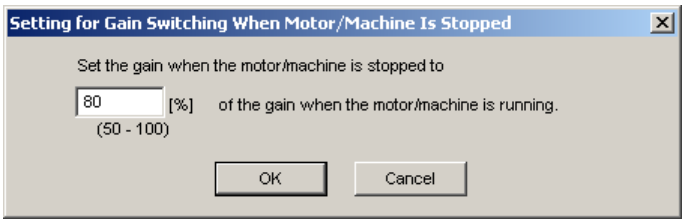
Enter the period of time required to switch the gain from the value when the motor/machine is running to the value when the motor/machine is stopped.

Gain when stopped (2nd Speed Loop Gain)

Enter a value from 50% to 100% of the gain when the motor/machine is running (speed loop gain).

Set in %

If you want to set the gain when the motor/machine is stopped (2nd speed loop gain) as a percentage of the gain when the motor/machine is running (speed loop gain), click **Set in %**. The box for setting the gain as a percentage will appear.



Enter a percentage, and then click **OK**. The gain when the motor/machine is stopped (2nd speed loop gain) will be automatically calculated according to the set percentage and displayed in the previous box.

3. When the setting is complete, click **Set**. The set values will be written in the SERVOPACK.

4.7.6 Anti-resonance Control Adjustment Function

⚠ CAUTION

The anti-resonance control adjustment function supports the adjustment of anti-resonance control effective for vibration frequencies from 100 to 1,000 Hz when servo gain is increased.

Be sure to check related information in this manual before using this function.

Special care must be taken for the following.

- Before executing this function, make sure that the emergency stop (power off) can be activated when needed.

  This function will automatically set parameters when used. As a result, the response speeds may change considerably after execution. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
- The moment of inertia (mass) must be correctly set to execute this function.

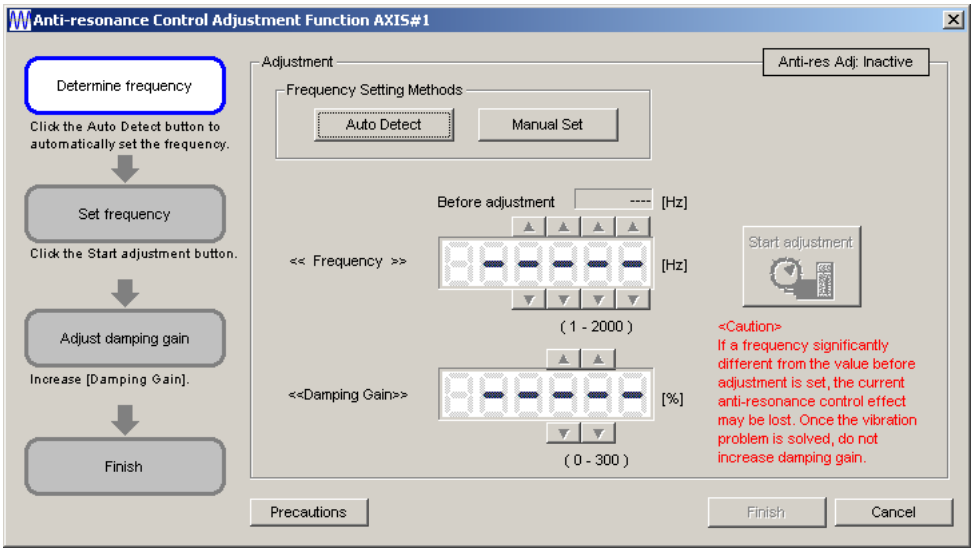
  If it is not correctly set, satisfactory anti-resonance control cannot be achieved.
- This function is generally only used to adjust the servo gain, as you should avoid considerable change in the frequency.

  If the frequency is changed while the anti-resonance control adjustment function is being used, the current anti-resonance control effect will be lost. Care must be taken when automatic frequency detection is executed in Auto Detect mode.
- If vibration cannot be suppressed by executing this function, cancel execution and reduce the servo gain by other methods such as custom tuning.
- Use an adjustment method such as custom tuning to improve response characteristics after executing this function.
  When the servo gain is increased during an adjustment such as custom tuning, vibration may be generated again. In this case, execute the anti-resonance control adjustment function again for fine adjustment.

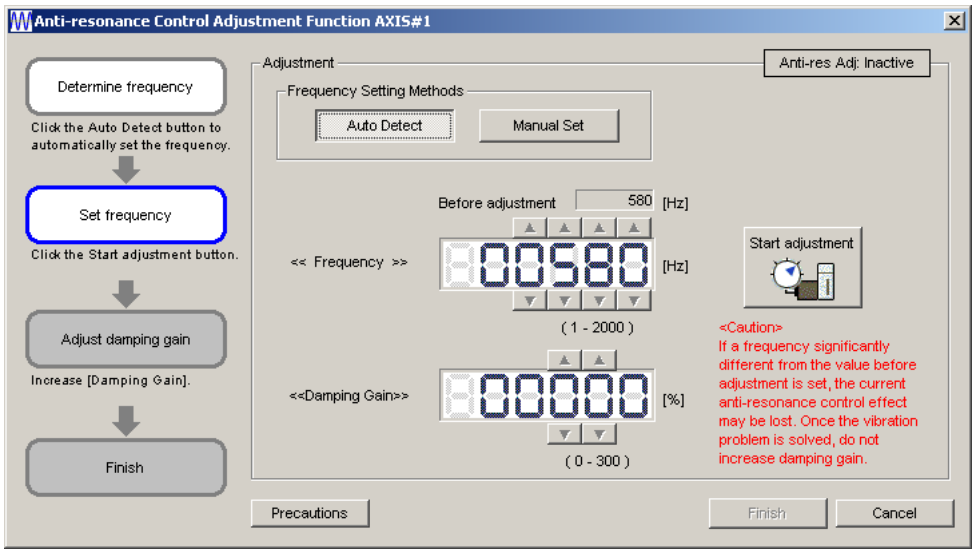
The anti-resonance control adjustment function supports the adjustment of anti-resonance control effective for vibration frequencies from 100 to 1,000 Hz when servo gain is increased. Vibration can be suppressed by setting vibration frequency by auto detection or by manual setting to adjust damping gain. Input a reference and execute this function when there is vibration.

To execute the anti-resonance control adjustment function, use the following procedure.

1. In the Tuning main window, click **Advanced adjustment, Custom tuning,** and then **Anti-resonance control.** The Anti-resonance Control Adjustment Function box will appear.



2. Click **Auto Detect** or **Manual Set** to set the frequency.



Auto Detect

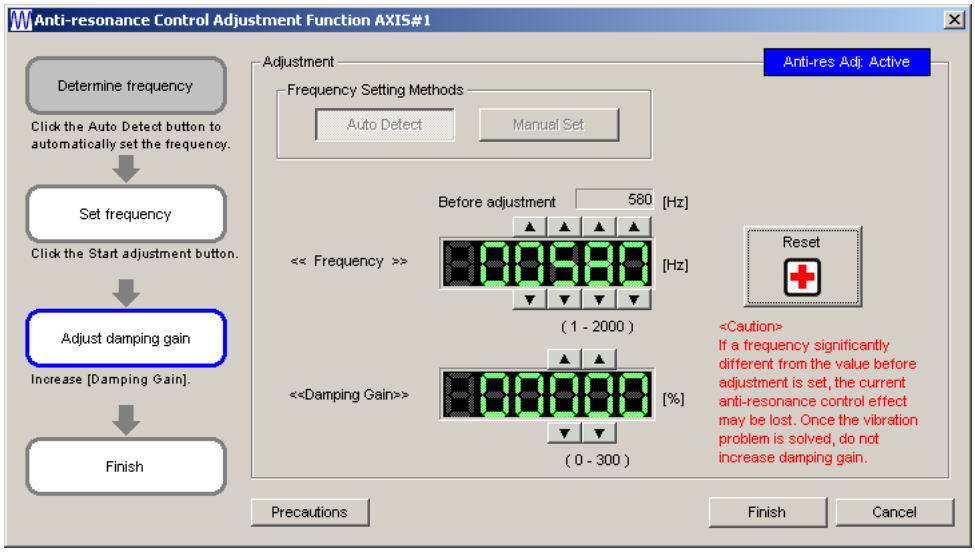
Click **Auto Detect**. The SERVOPACK will automatically analyze the frequency and set the optimum frequency.

Manual Set

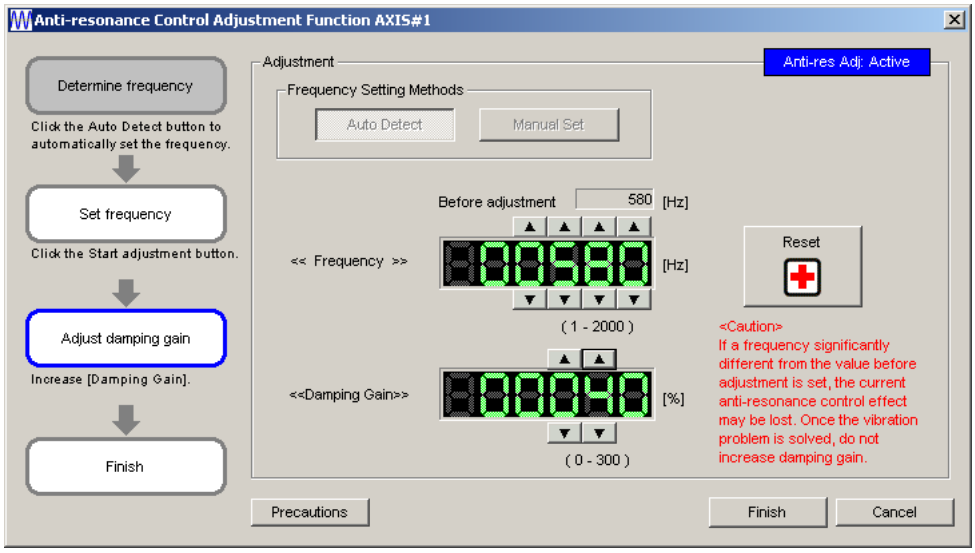
Click **Manual Set** to view the currently set frequency. When the anti-resonance control adjustment function is not effective, the displayed frequency can be manually adjusted by clicking the setting arrows.

Use this setting method if the frequency is already known.

3. Click **Start adjustment**.



4. Adjust the damping gain by clicking the setting arrows.



Click **Reset** to reset the settings to their original values during adjustment.

5. When the adjustment is complete, click **Finish**. The set values will be written in the SERVOPACK.

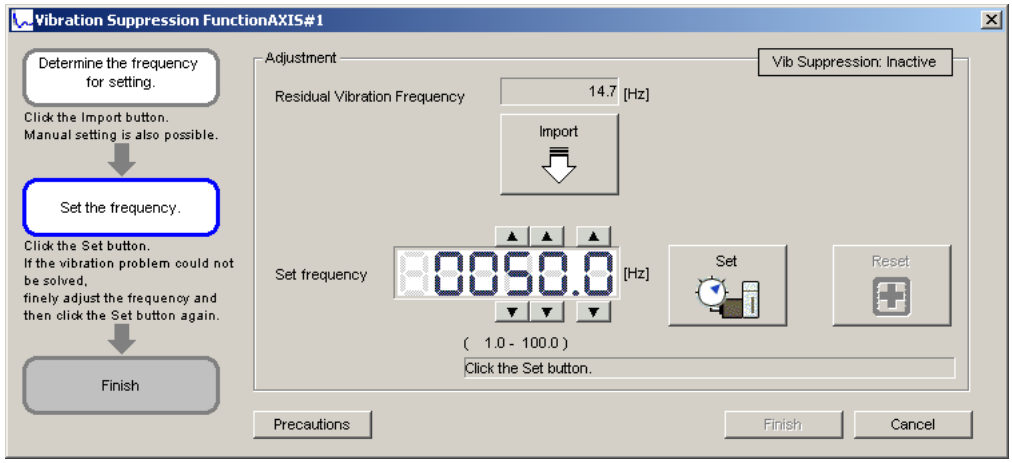
4.7.7 Vibration Suppression Function

> **⚠ CAUTION**
>
> The vibration suppression function suppresses vibration of low frequencies from 1 to 100 Hz, for which notch filter and anti-resonance control adjustment functions are not applicable.
>
> Be sure to check related information in this manual before using this function.
>
> Special care must be taken for the following.
>
> - Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
>
> When used, this function will automatically set parameters. As a result, the response speeds may change considerably after execution. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.
> - Special care must be taken because the change in the parameter settings will be validated with the following timing:
>
> When a parameter setting is changed while the motor is running, the change will be validated after the signal /COIN turns on.
> - When there is no vibration or when the vibration frequency is outside the detection range, the frequency will not be detected.
> - If vibration cannot be suppressed with the automatically detected vibration frequency, there may be a difference between the actual vibration frequency and the detected frequency.
> - Use an adjustment method such as custom tuning to improve the response characteristics after executing this function.

The vibration suppression function is a support function mainly used to suppress transitory vibration of low frequencies from 1 to 100 Hz generated by impact when the motor/ machine is stopped. This function is effective for vibration frequencies for which notch filter and anti-resonance control adjustment functions are not applicable. Input a reference and execute this function when there is vibration.

To execute the vibration suppression function, use the following procedure.

1. In the Tuning main window, click **Custom tuning,** and then **Vibration suppression.** The Vibration Suppression Function box will appear.

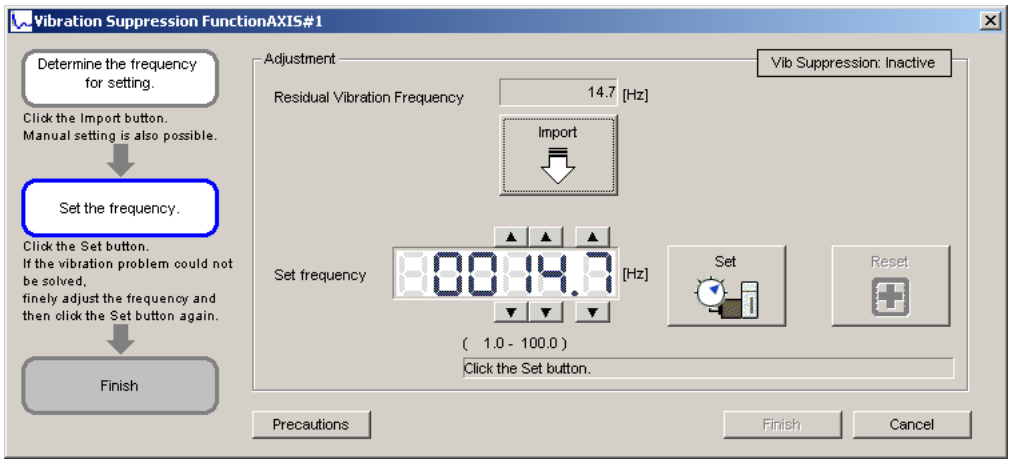


2. Click **Import**, or set the frequency by clicking the setting arrows.

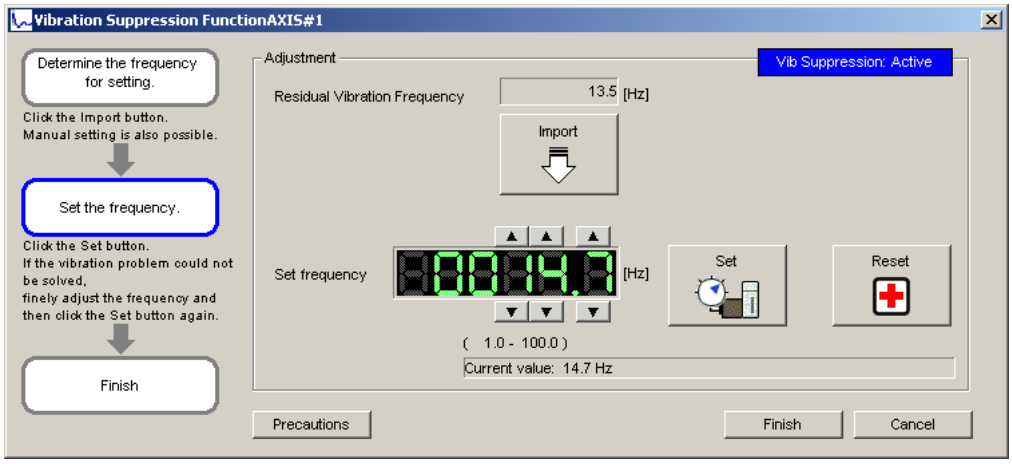
Import

Click **Import** to set the monitored residual vibration frequency as the set frequency. (This function is valid only when the residual vibration frequency is between 1.0 and 100.0.)

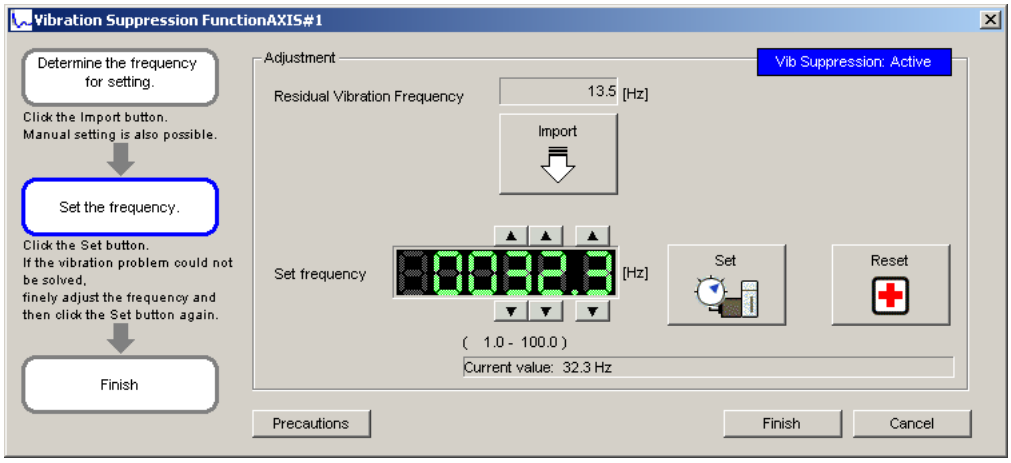
The set frequency can be manually adjusted by clicking the setting arrows.



3. Click **Set.**



If there is still vibration, fine-adjust the set frequency by clicking the setting arrows, and then click **Set** again.



Click **Reset** to reset the frequency to the original value during adjustment.

4. When vibration is suppressed, click **Finish**. The set frequency will be written in the SERVOPACK.

4.8 Test Run

4.8.1 JOG Operation

> **⚠ WARNING**
>
> The motor will operate when you perform JOG operation, and therefore presents hazards.
>
> Be sure to check related information in this manual before using this function.
>
> Pay particular attention to the following.
>
> • Check the safety of the area adjoining the drive unit.
>
> The motor runs at the JOG speed, while the Forward or Reverse button is pressed.
>
> Make sure that there is no danger in running the motor before execution.
>
> • The Forward Run Prohibit (P-OT) and Reverse Run Prohibit (N-OT) signals are disabled during JOG operation.
>
> The P-OT (Forward Drive Prohibit) signal and N-OT (Reverse Drive Prohibit) signal are disabled during JOG operation.
> Operation will not stop even if the position of the P-OT or N-OT signal is exceeded.
>
> During operation, make sure to verify the actual operation and position of the motor or machine.

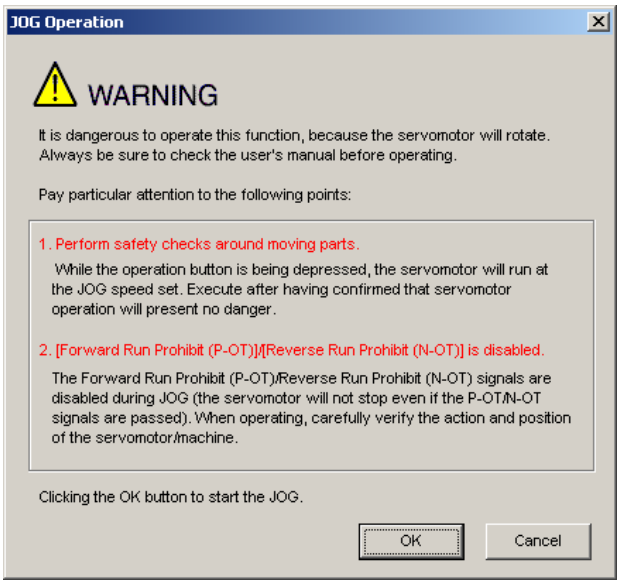
This function turns the motor at the set JOG speed. The rotational direction and the speed setting can be verified without connecting an upper-level controller.

Use the following procedure to perform JOG operation.

1. Select ***Test Run - Jog*** from the menu bar of the SigmaWin+ Σ-7 component main window. The following dialog box will be displayed.

INFO

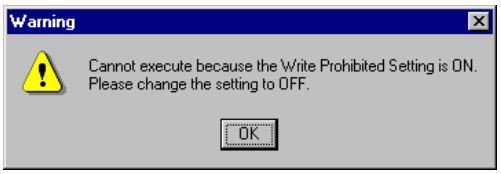
If more than one axis is being used, the **Axis Selection** dialog box appears.
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



Click **Cancel** to return to the main window without performing JOG operation. You will return to the main window.

<When the Write Prohibited Setting is ON>

If the write prohibited setting is ON, the following message will appear.

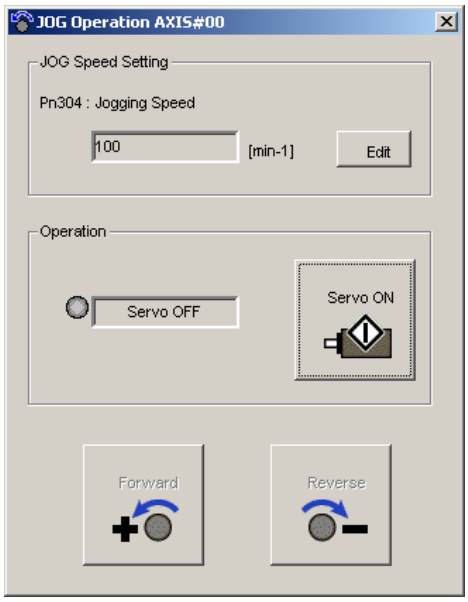


Click **OK**, and set the write prohibited setting to OFF.

See "4.5.5 Write Prohibited Setting" for setting method.

2. Click **OK**. The JOG Operation Dialog Box will be displayed.

   If the servo is on, an error message will appear. Make sure that the servo is off.



Pn304: JOG Speed

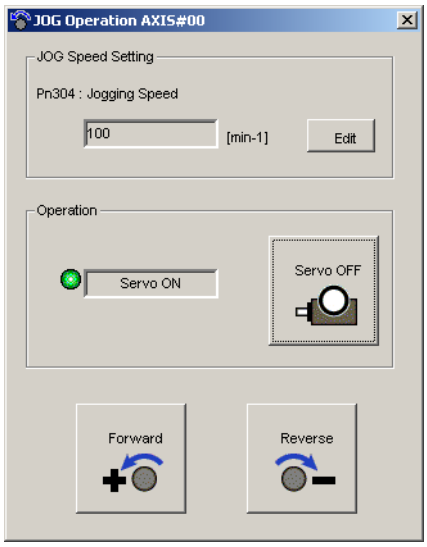
Parameter Pn304 displays the JOG speed. Click **Edit** to change the JOG speed.

Operation

On the left, shows if the servo is on or off and the corresponding LED display.

On the right, the button changes according to the servo's status. When the servo is off, the **Servo ON** button appears; when the servo is on, **Servo OFF** button appears.

3. Check the JOG speed. To change the JOG speed, click **Edit**.
4. Click **Servo ON**.



5. Press **Forward** or **Reverse**. A JOG operation is performed only while one of these buttons is pressed.

4.8.2 Program JOG Operation

> **⚠ WARNING**
>
> Using the program JOG operation function while the motor is running is dangerous.
>
> Be sure to check related information in this manual before using this function.
>
> Pay particular attention to the following items.
>
> • Check the safety of the area adjoining the drive unit.
>
> The motor actually runs based on a preset pattern when this function is used. Make sure that there is no danger in running the motor before actually using it.
>
> • Confirm the position of the machine.
>
> Reset the machine position using the Origin Return function before using the program JOG function.

This function allows automatic operation determined by the preset pattern of operation.

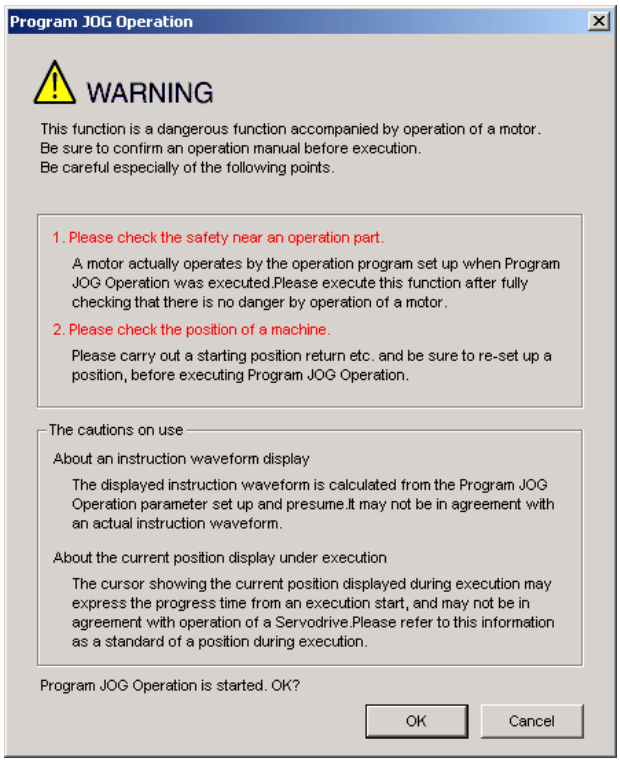
> **⚠ CAUTION**
>
> Two methods are available to stop program JOG operation while the motor is running, and the motor will stop according to the method selected. Make sure to select the best method for the situation.
>
> • If the Servo OFF button is used, the motor stops according to the stopping method after servo off specified by the parameters.
>
> • If the Cancel button is used, the motor coasts to a stop and then enters a zero clamp state.
> Note: The Cancel button may not be used with some SERVOPACKs.

To perform the JOG operation for a particular pattern, use the following procedure.

1. In the SigmaWin+ Σ-7 component main window, click **Test Run** and then click **Program JOG Operation**. A warning message appears, reminding you of the possible dangers.

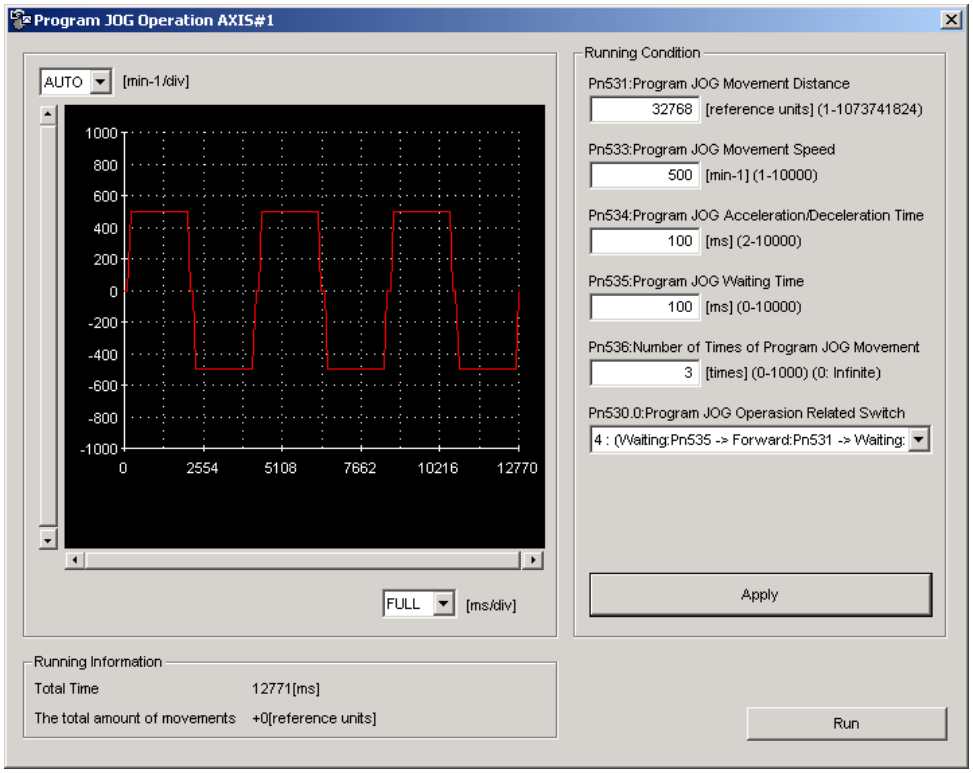
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.

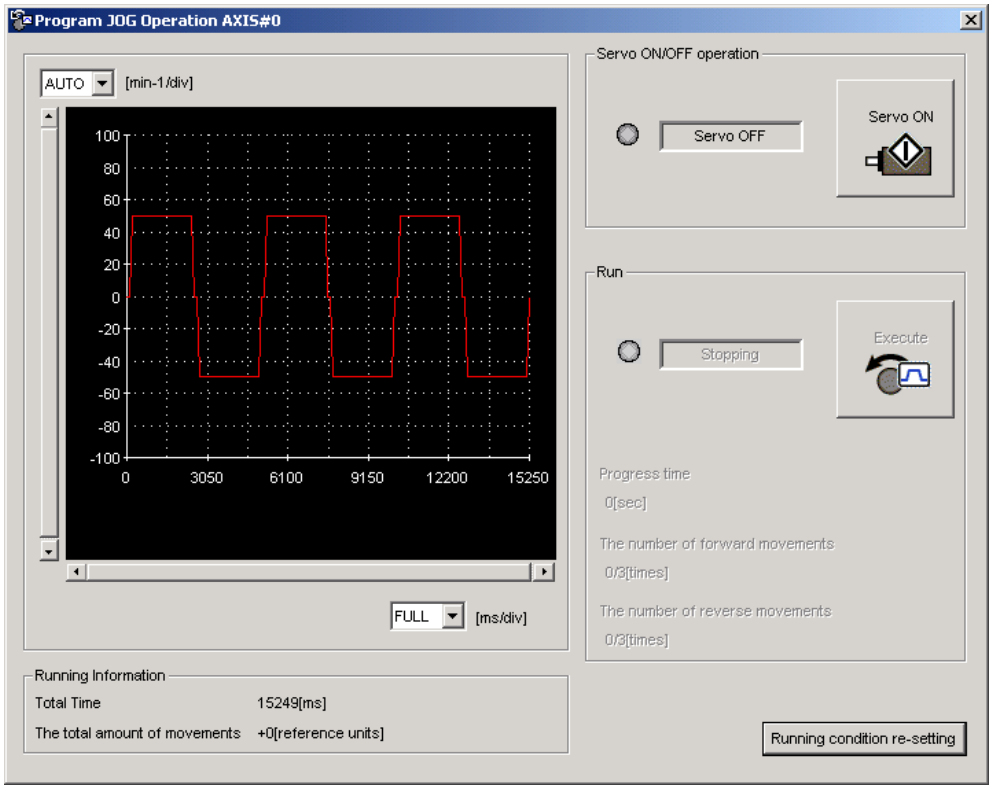


Click **Cancel** to return to the main window without performing program JOG operation.

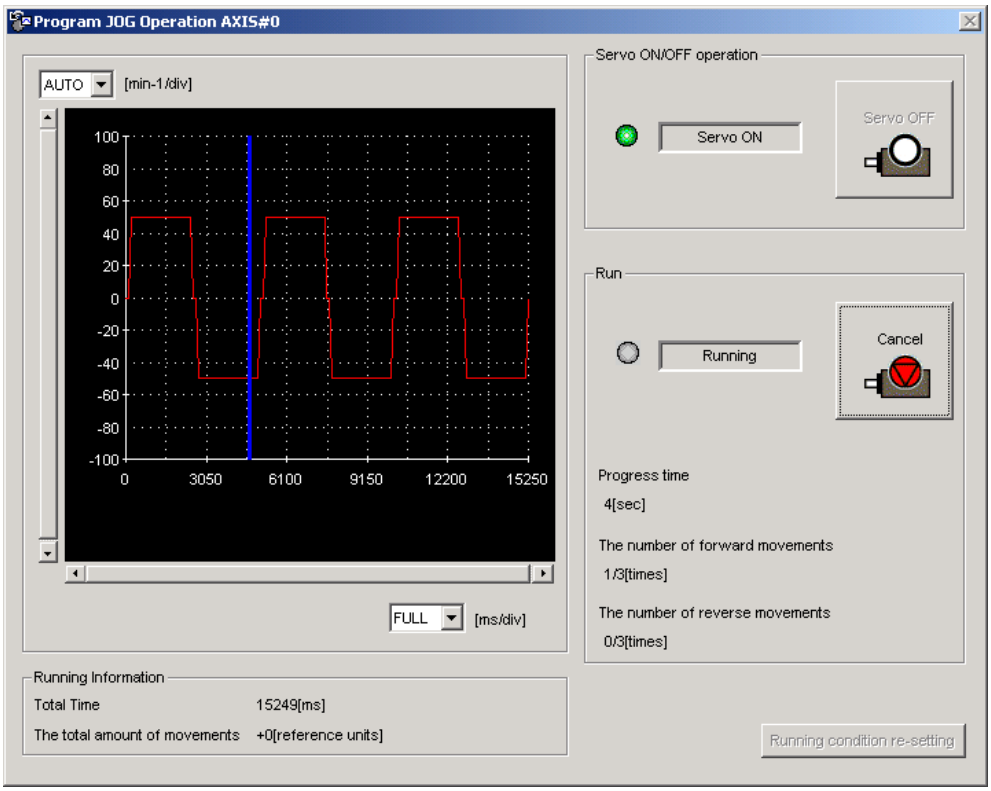
2. Click **OK**, and the Running Condition Setting box appears.



3. Set the running conditions and click **Apply**. The graph for the operation pattern is displayed.
4. Click **Run** and the Program JOG Operation box appears.



5. Click **Servo ON** and **Execute**. The program JOG operation starts.



4.9 Table Editing

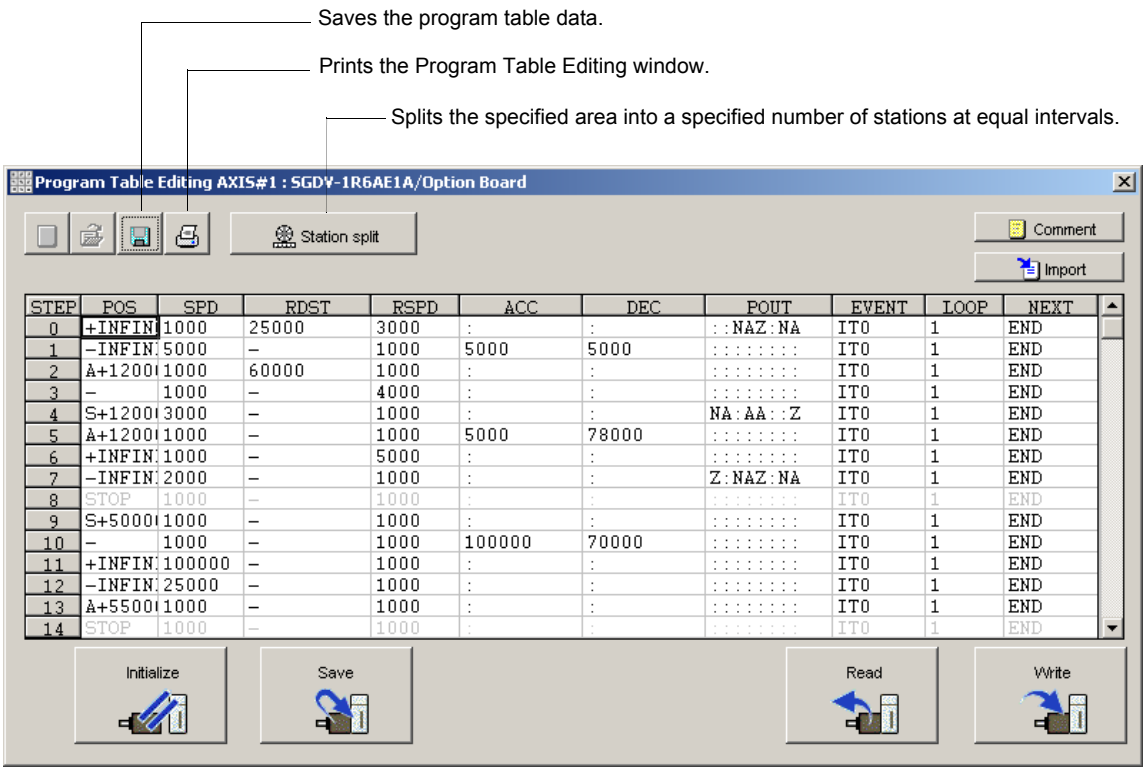
4.9.1 Program Table Editing

Programs can be viewed and edited in the Program Table Editing window. Create programs by setting the individual program steps (one row in the table is a program step). The INDEXER option module runs the program (steps) that is in the program table in accordance with a reference from the upper-level controller.

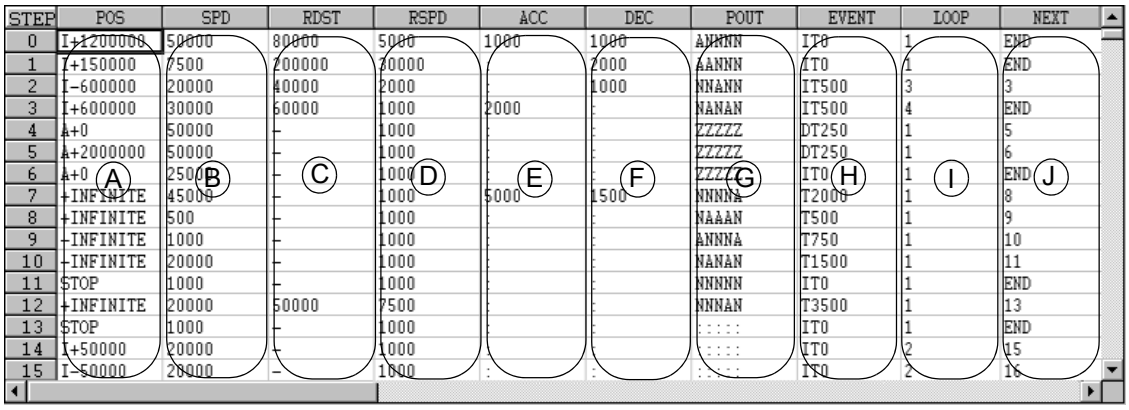
The windows differ in the Online and Offline modes.

■ When Online

In the SigmaWin+ Σ-7 component main window, click **Table** and then click **Edit Program Table**. The Program Table Editing window appears.



Program Table Editing Window (Online Mode)

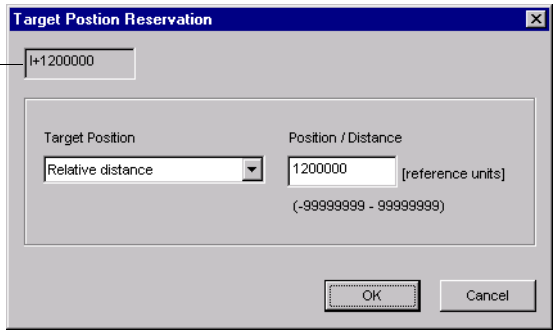


STEP	POS	SPD	RDST	RSPD	ACC	DEC	POUT	EVENT	LOOP	NEXT
0	I+1200000	50000	80000	5000	1000	1000	ANNNN	IT0	1	END
1	I+150000	7500	200000	20000	:	2000	AANNN	IT0	1	END
2	I-600000	20000	40000	2000	:	1000	NNANN	IT500	3	3
3	I+600000	30000	60000	1000	2000	:	NANAN	IT500	4	END
4	A+0	50000	-	1000	:	:	ZZZZZ	DT250	1	5
5	A+2000000	50000	-	1000	:	:	ZZZZZ	DT250	1	6
6	A+0	2500	-	1000	:	:	ZZZZZ	IT0	1	END
7	+INFINITE	45000	-	1000	5000	1500	NNNNN	T2000	1	8
8	+INFINITE	500	-	1000	:	:	NAAAN	T500	1	9
9	+INFINITE	1000	-	1000	:	:	ANNNA	T750	1	10
10	+INFINITE	20000	-	1000	:	:	NANAN	T1500	1	11
11	STOP	1000	-	1000	:	:	NNNNN	IT0	1	END
12	+INFINITE	20000	50000	7500	:	:	NNNAN	T3500	1	13
13	STOP	1000	-	1000	:	:	:::::	IT0	1	END
14	I+50000	20000	-	1000	:	:	::::	IT0	2	15
15	I-50000	20000	-	1000	:	:	:::::	IT0	2	16

Box A: POS

The positioning target position can be changed in this box. Double click any cell in the box, and the Target Position Reservation box appears.

Displays the current setting.



Select the target position. The following table shows the six items that can be selected.

Selection Items	Display
Absolute position	A ±Position
Relative distance	I ±Distance
Infinity (Positive direction)	+INFINITE
Infinity (Negative direction)	-INFINITE
Stop	STOP
Serial stop	S + Position
Without reference	-

If "Absolute position," "Relative distance," or "Serial stop" is selected, type a number in the Position/Distance column.

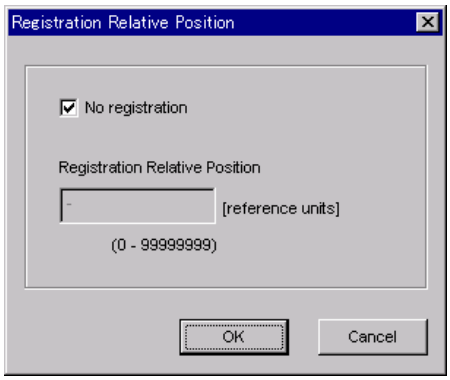
Click **OK** to save the changes and return to the Program Table Editing window.

Box B: SPD

The speed can be typed directly in this box.

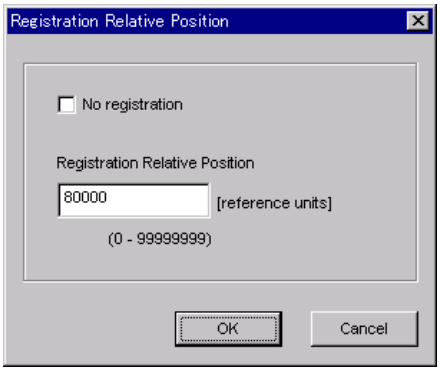
Box C: RDST

The registration relative distance can be set in this box. Double click any cell in the box, and the Registration Relative Position box appears.



Click **OK** to return to the Program Table Editing window without registration.

Do not select "No Registration" to register a relative position. Type the registration relative position.



Click **OK**.

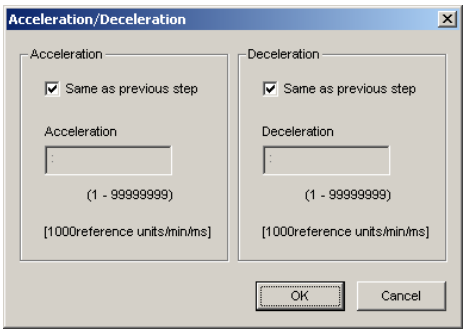
Box D: RSPD

The registration speed can be typed directly in this box.

Box E: ACC

Box F: DEC

The acceleration and deceleration speeds can be set in this box. Double click any cell in one of these boxes, and the Acceleration and Deceleration box appears.



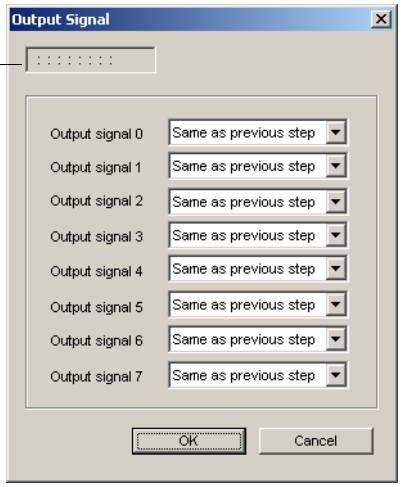
To set the same acceleration or deceleration speed as in the previous step, select "Same as previous step" and click **OK**.

To set a new speed, clear the previous setting by clicking "Same as previous step" to remove the checkmark. Then, type the new setting in the Acceleration or Deceleration box and click **OK**.

Box G: POUT

The output signals 0 to 7 can be set in this box. Double click any cell in the box, and the Output Signal box appears.

Displays the current settings. The setting for output signal 0 is shown at the far right, and that for output signal 7 at the far left.



Select the output timing for the output signals. The following table shows the four items that can be selected.

Selection Items	Description	Display
Active	Always Active.	A
Not Active	Always Inactive.	N
Same as previous step	Continues previous state.	:
Zone	Sets a zone signal (Z0 to Z4) corresponding to the column.	Z

Ex.: The "ANN : ZZ : N" display shows the following settings.

Output Signal 0: Not Active

Output Signal 1: Same as previous step

Output Signal 2: Zone Signal Z2

Output Signal 3: Zone Signal Z3

Output Signal 4: Same as previous step

Output Signal 5: Not Active

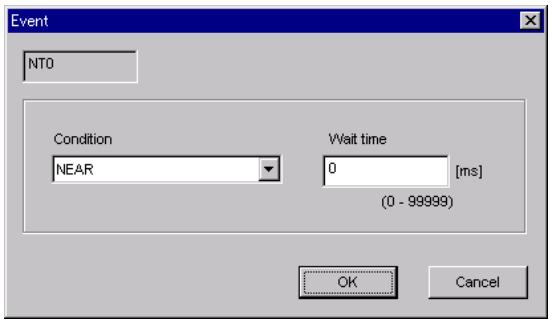
Output Signal 6: Not Active

Output Signal 7: Active

Click **OK** to save the settings and return to the Program Table Editing window.

Box H: EVENT

The conditions can be set in this box. Double click any cell in the box, and the Event box appears.



Select the conditions. The following table shows the items that can be selected.

Selection Items	Description	Display
Positioning Completion	Establish conditions for INPOSITION band	I
NEAR	Establish conditions for NEAR band	N
Command Issuance Completion	Establish conditions for command issuance completion	D
SEL0, SEL1, ...	Establish conditions at signal (SEL0, SEL1, ...) ON	SEL0, SEL1, ...
Wait Time	Establish conditions after a designated wait time	T Wait Time
Same as previous step	Use the same conditions as the previous step	:

If a item other than “same as previous step” is selected, type a wait time.

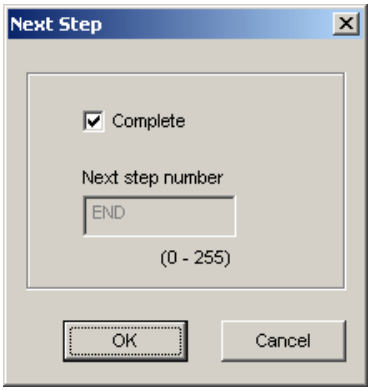
Click **OK** to save the settings and return to the Program Table Editing window.

Box I: LOOP

The number of times a step that is to be carried out can be typed directly in this box.

Box J: NEXT

The next step can be designated in this box. Double click any cell in the box, and the Next Step box appears.



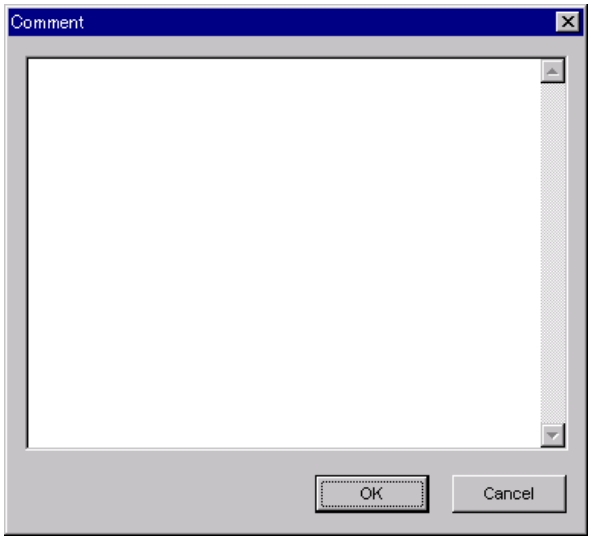
If the program ends in this step, select "Complete," and then click **OK**.

If the program continues, do not select "Complete," and type the number of the next step.

Click **OK** to save the settings and return to the Program Table Editing window.

Comment

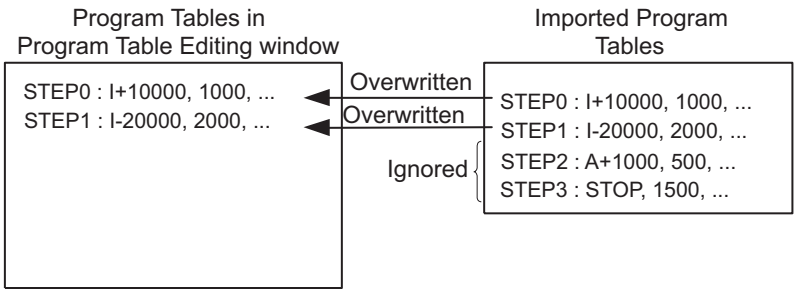
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



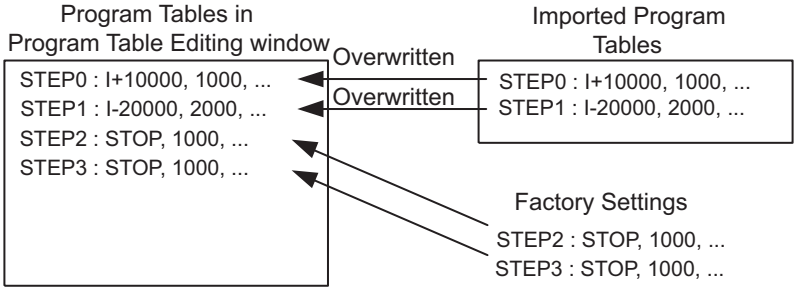
Import

Program table settings can be transferred or imported from a stored file with the Import function. If the imported program tables differ in number from the on-screen program tables, the following processing takes place.

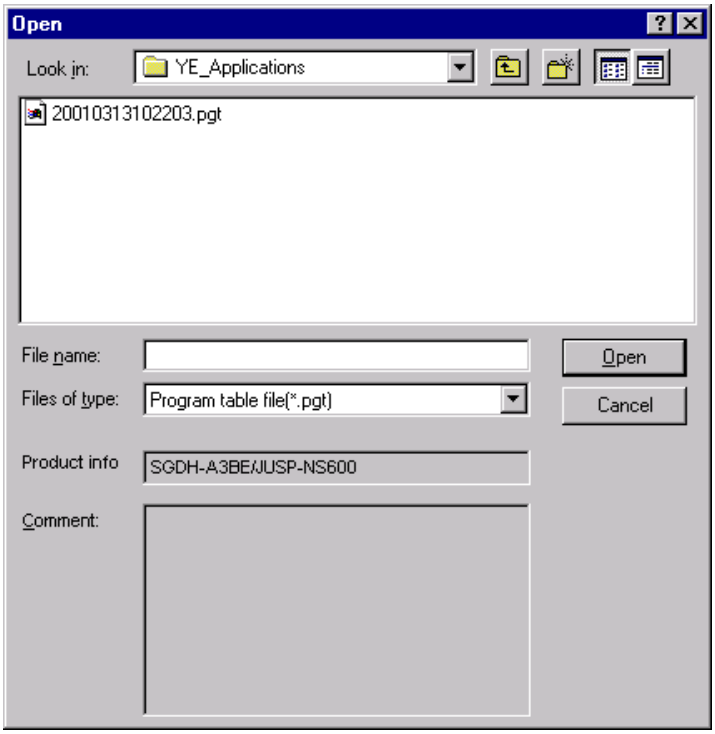
- If the number of imported program tables is greater



- If the number of imported program tables is fewer



1. Click **Import,** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

Write

The program tables can be written to the SERVOPACK with the Write function. Click **Write**, and a warning message will appear reminding you that the data erased if the power is turned off.

Click **OK** to write in the data.

Click **Cancel** to return to the Program Table Editing window without writing in the data.

<Differences Between **Write** and **Save**>

Write: Saves table data to the SERVOPACK in temporary storage. The data in the table is deleted when the power is turned OFF.

Save: Saves the data in the table that is stored in the SERVOPACK memory to the flash memory. The data for the tables remains unchanged if power is turned off.

Read

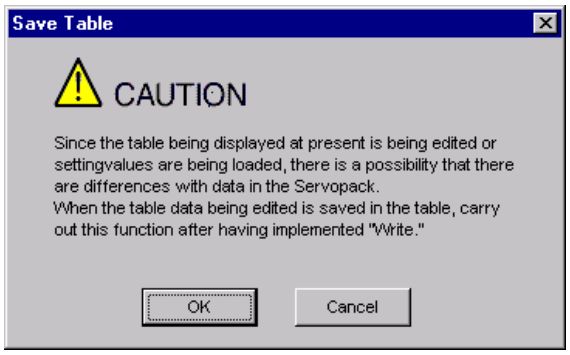
The program tables can be read within the connected SERVOPACK with the Read function. Click **Read**, and a message will appear, confirming if you want to read the table data.

Click **OK** to start reading and overwriting the table data.

Click **Cancel** to return to the Program Table Editing window without reading the table data.

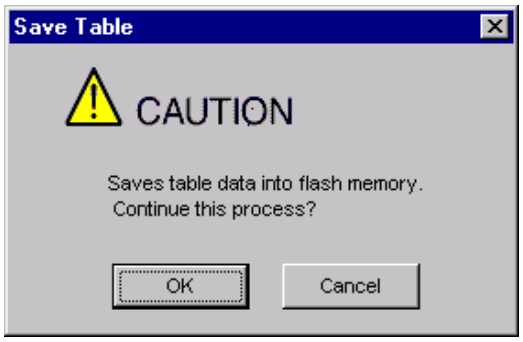
Save

The data in the table can be saved to the flash memory with the Save function. Click **Save**, and a warning message will appear reminding you that the data may different than that of the SERVOPACK.



Click **Cancel** to return to the Program Table Editing window. Then by clicking **Write**, write program table that is currently displayed but has not been stored into the SERVOPACK.

If already saved in temporary storage, click **OK**. A conformation message appears.

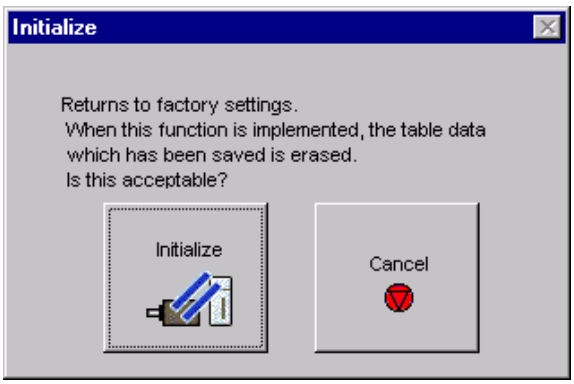


Click **OK** to save the data.

Click **Cancel** to return to the Program Table Editing window without saving the data.

Initialize

The settings of the SERVOPACK can be returned to the factory settings with the Initialize function. Click **Initialize**, and a verification message appears.



Click **Initialize** to initialize the program tables.

Click **Cancel** to return to the Program Table Editing window without changing the settings.

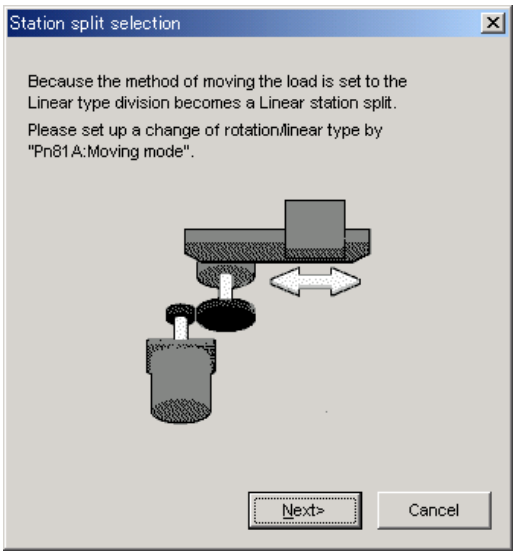
Station split Station Split Button

A specified number of stations at equal intervals can be created between specified positions. And each station position can be allocated to the program table.

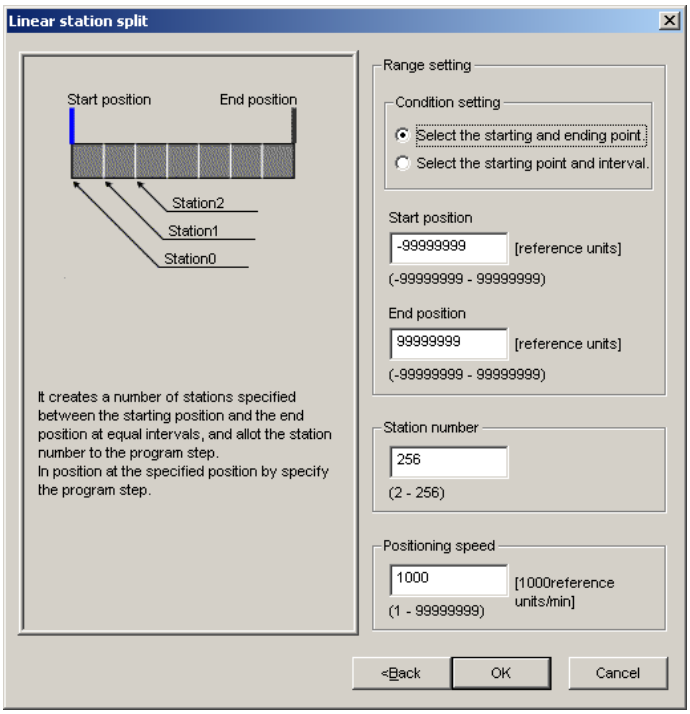
Two types of station splits are available: linear and rotation. The window differs in accordance with the method of moving the load.

Click the Station Split button, Station split , and the Station Split Selection box appears.

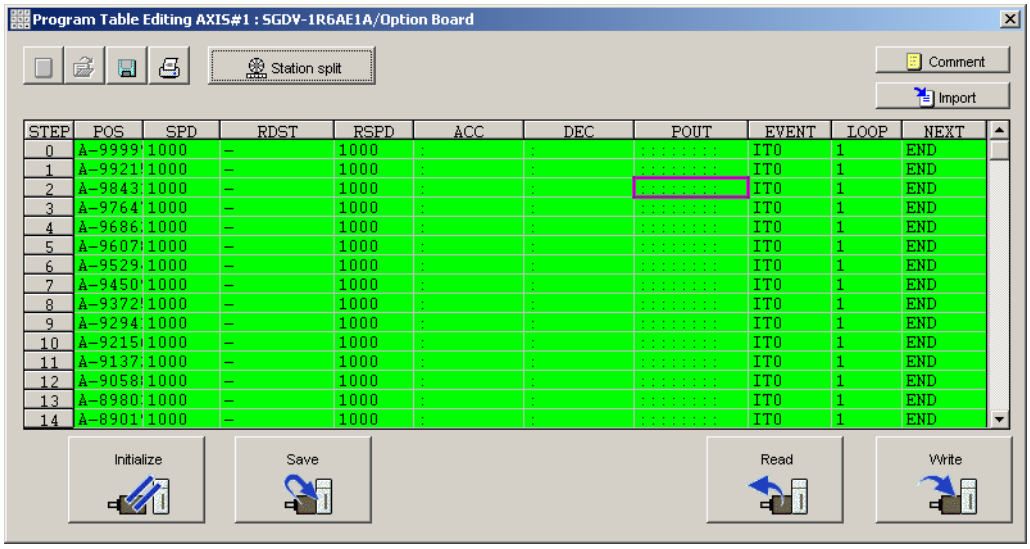
< Linear Movement of Loads >



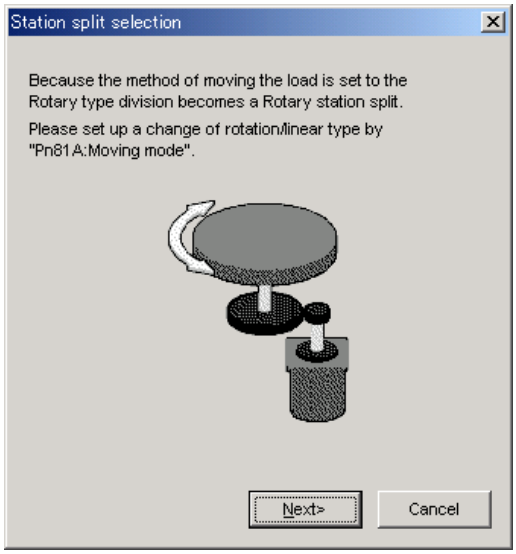
1. Click **Next**.



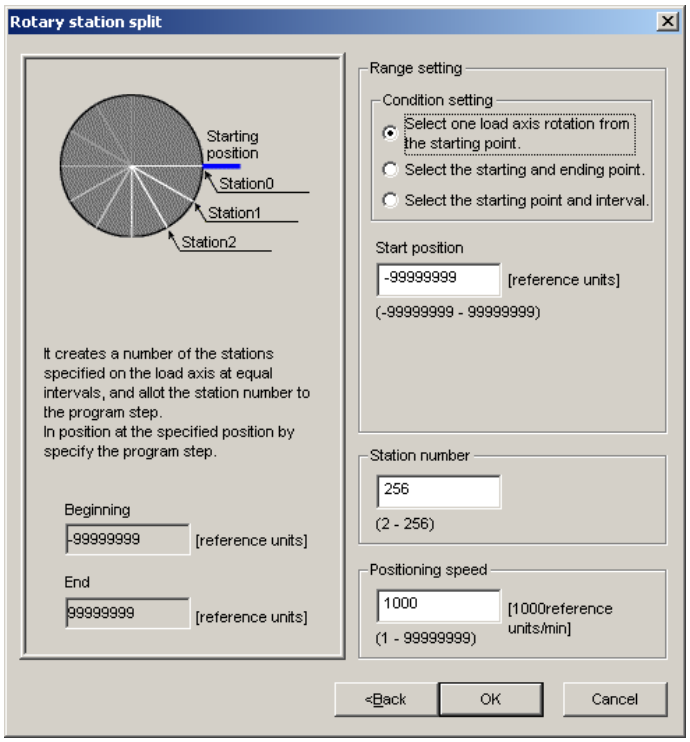
2. Type the values for the settings and click **OK**. The Program Table Editing window will appear.



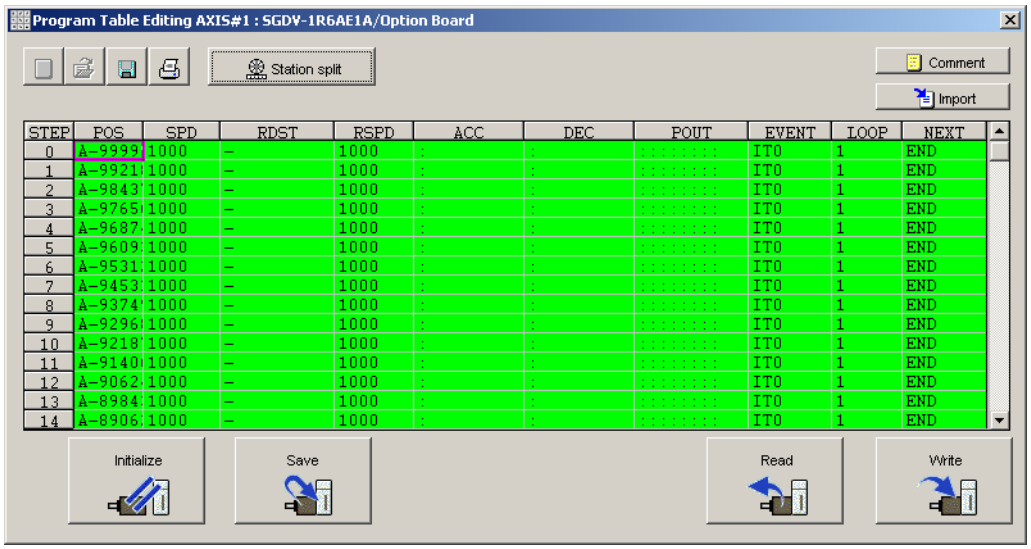
< Rotational Movement of Loads >



1. Click **Next**.

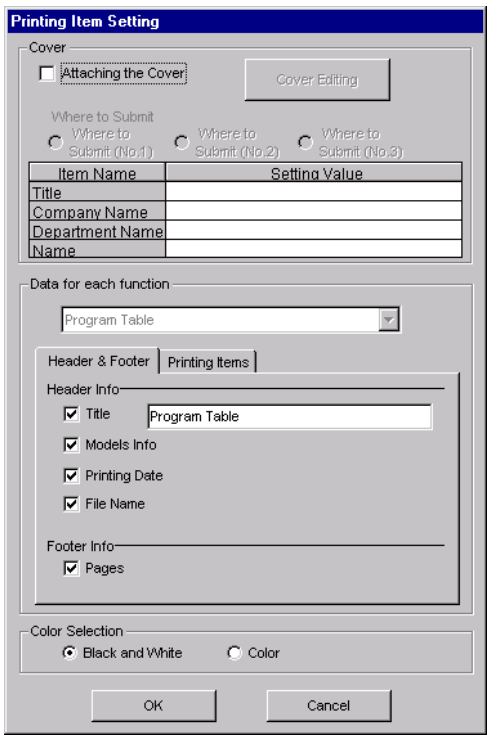


2. Type the values for the settings and click **OK**. The Program Table Editing window will appear.

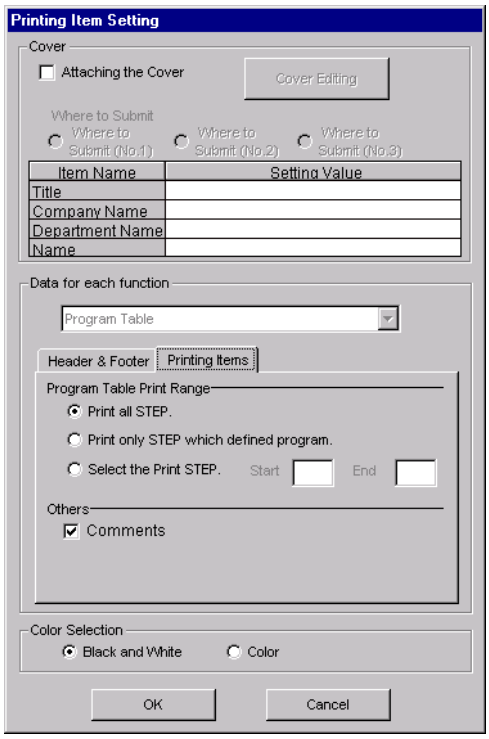


(Print) Button

The data on the Program Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab



Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

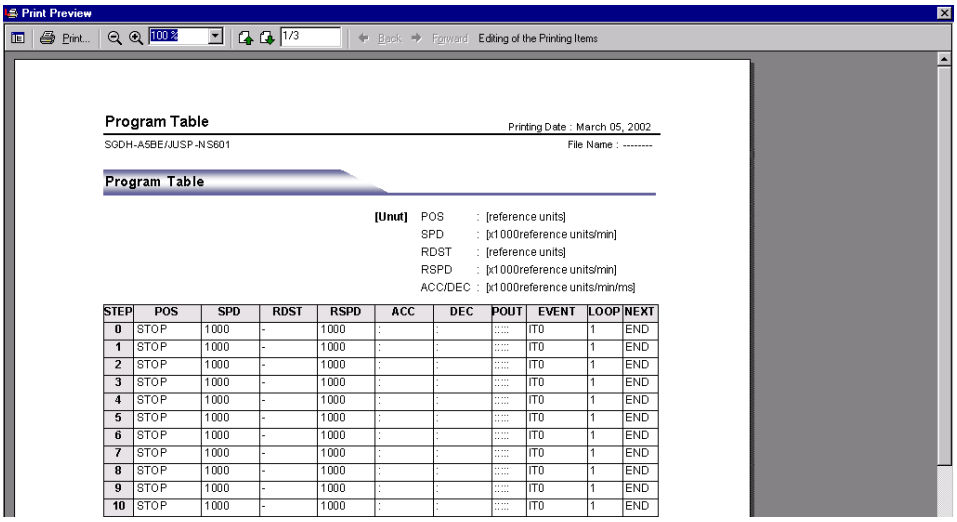
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



STEP	POS	SPD	RDST	RSPD	ACC	DEC	POUT	EVENT	LOOP	NEXT
0	STOP	1000	-	1000	:	:	:::::	IT0	1	END
1	STOP	1000	-	1000	:	:	:::::	IT0	1	END
2	STOP	1000	-	1000	:	:	:::::	IT0	1	END
3	STOP	1000	-	1000	:	:	:::::	IT0	1	END
4	STOP	1000	-	1000	:	:	:::::	IT0	1	END
5	STOP	1000	-	1000	:	:	:::::	IT0	1	END
6	STOP	1000	-	1000	:	:	:::::	IT0	1	END
7	STOP	1000	-	1000	:	:	:::::	IT0	1	END
8	STOP	1000	-	1000	:	:	:::::	IT0	1	END
9	STOP	1000	-	1000	:	:	:::::	IT0	1	END
10	STOP	1000	-	1000	:	:	:::::	IT0	1	END

To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

■ When Offline

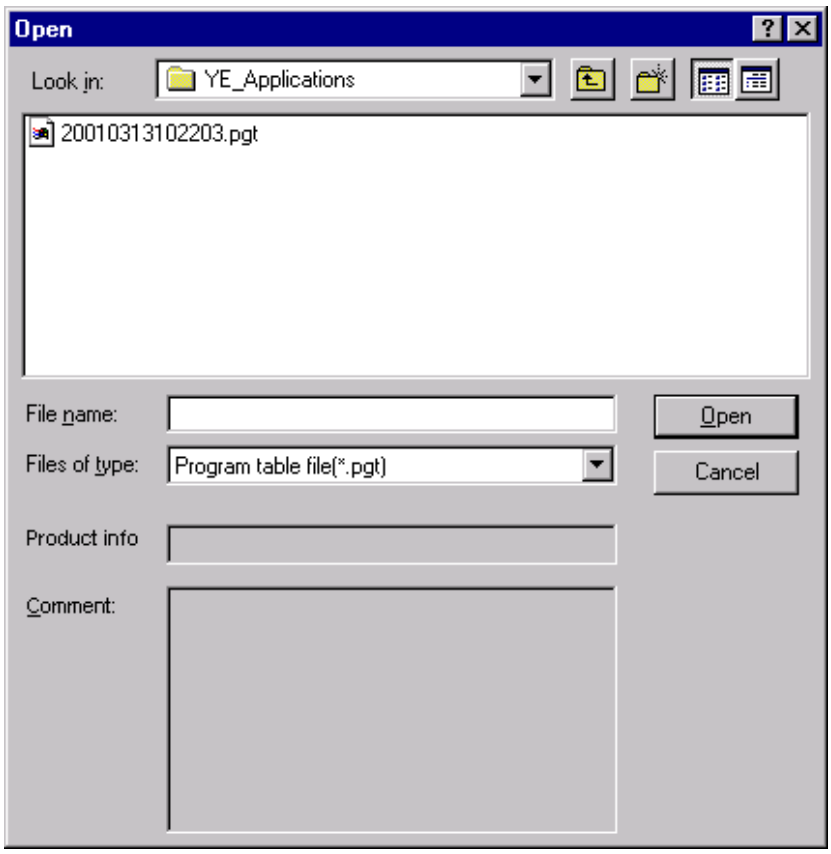
In the SigmaWin+ Σ-7 component main window, click **Table** and then click **Edit Program Table**. The Program Table Editing box appears.

Load From File: Reads existing data.
Select New SERVOPACK: Creates new data.

Select the desired command and click **OK**.

<When "Load from File" is Selected>

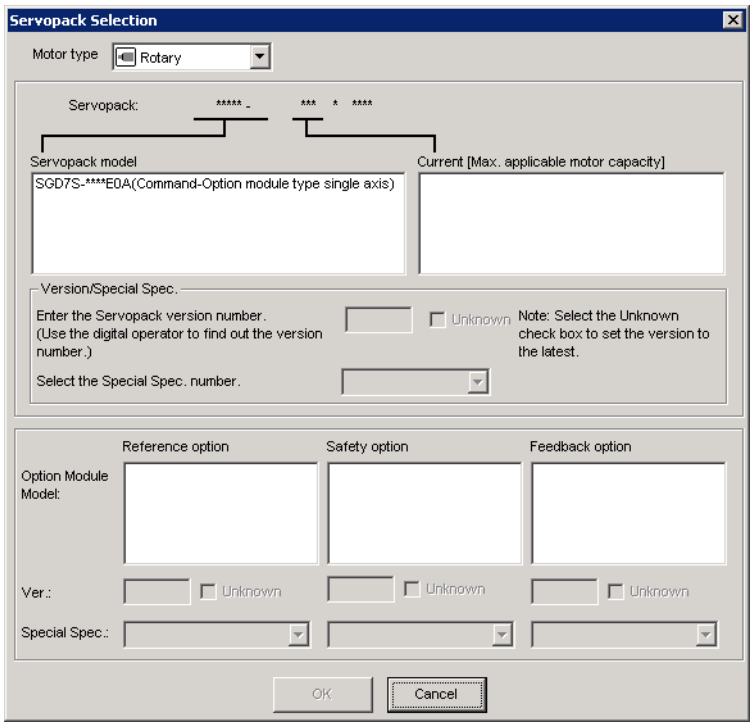
When "Load from File" is selected, the Open box appears.



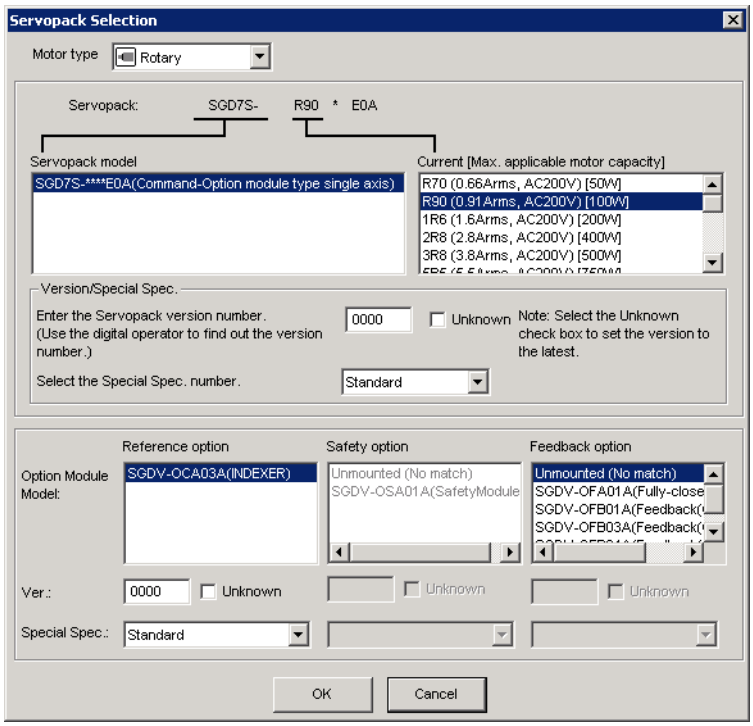
Select the data to be imported, and click **Open**.

< When "Select New SERVOPACK" is Selected >

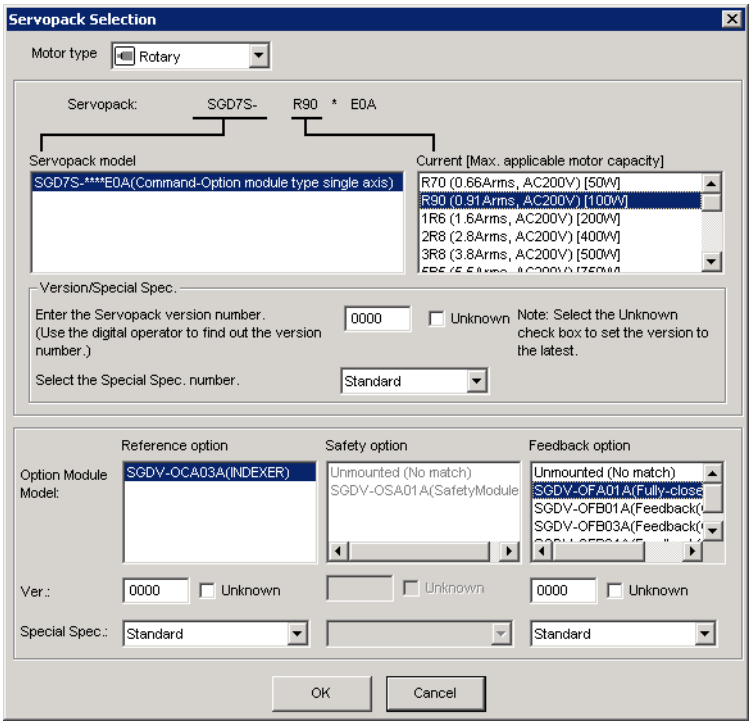
1. When "Select New SERVOPACK" is selected, the SERVOPACK Selection box appears.



2. Select the SERVOPACK model and current [max. applicable motor capacity].

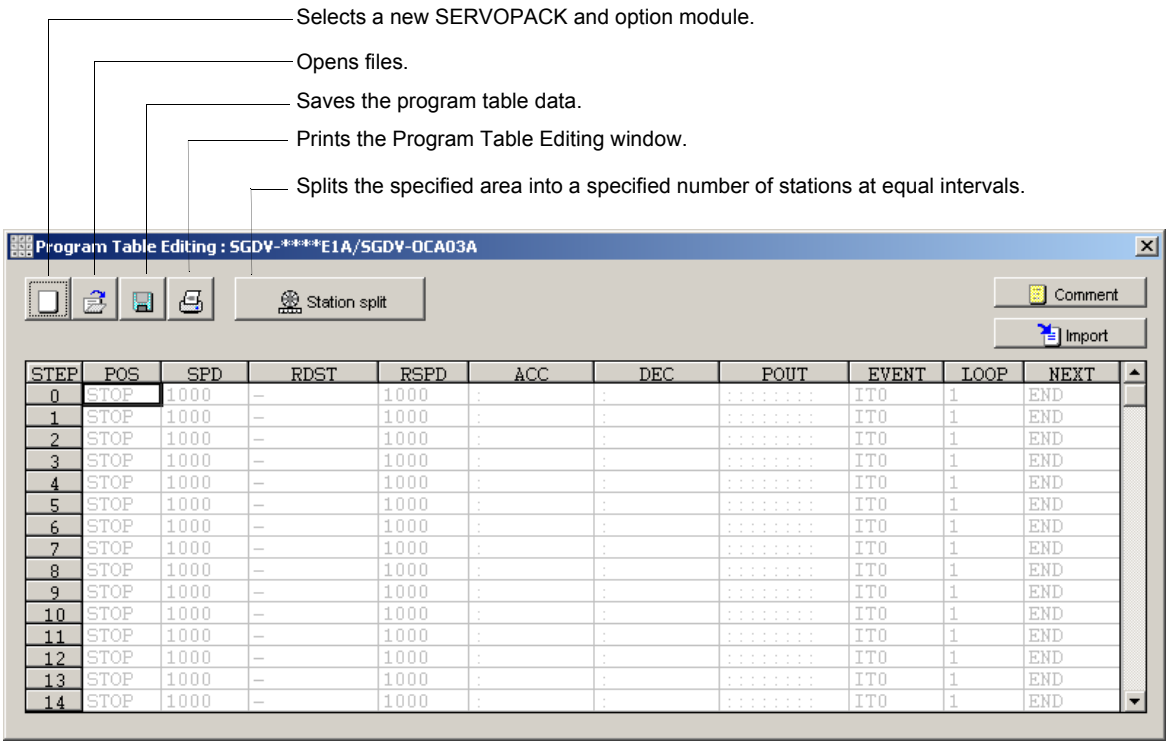


3. Type the version number of the SERVOPACK.
   If the version number is unknown, select **Unknown**.
4. Select the specifications of the SERVOPACK.
5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



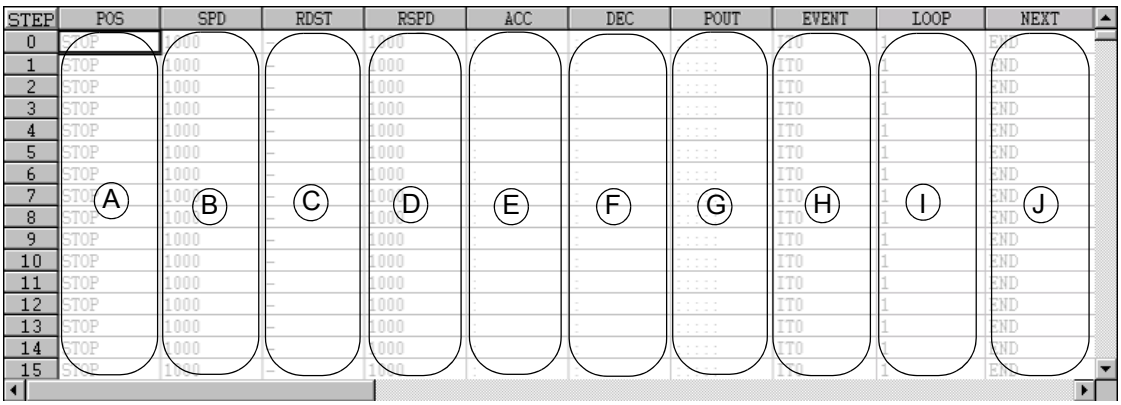
6. Type the version number of the reference option module.
   If the version number is unknown, select **Unknown**.

7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Program Table Editing window will appear.



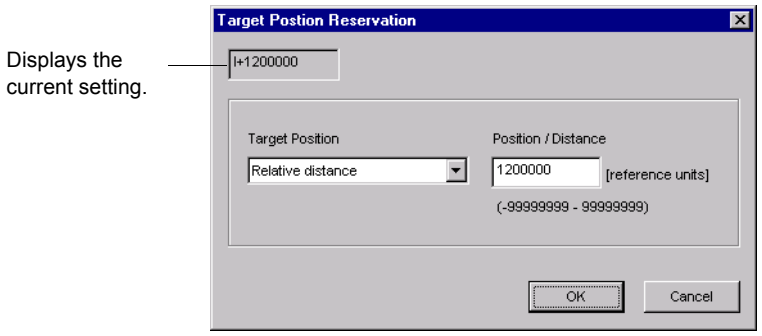
Program Table Editing Window (Offline Mode)

Default values are displayed in gray. The settings in this window are all gray as they are default settings.



Box A: POS

The positioning target position can be changed in this box. Double click any cell, and the Target Position Reservation box appears.



Select the target position. The following table shows the six items that can be selected.

Selection Items	Display
Absolute Position	A ±Position
Relative Distance	I ±Distance
Infinity (Positive direction)	+INFINITE
Infinity (Negative direction)	-INFINITE
Stop	STOP
Serial Stop	S + Position
Without reference	-

If "Absolute Position," "Relative Distance," or "Serial Stop" is selected, type a number in the Position/Distance column.

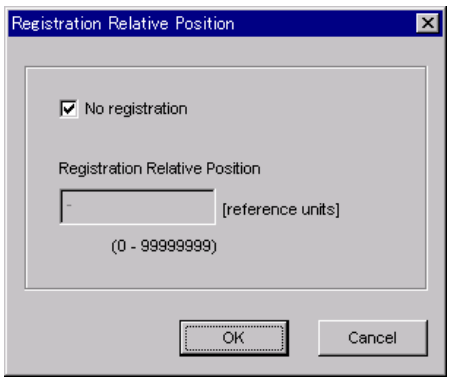
Click **OK** to save the changes and return to the Program Table Editing window.

Box B: SPD

The speed can be typed directly in this box.

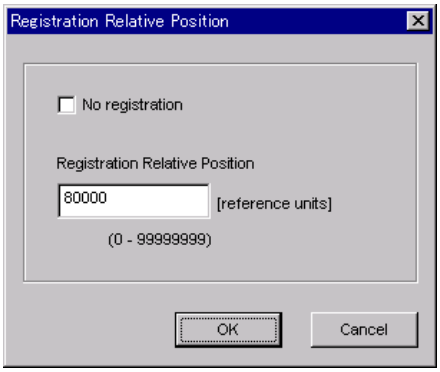
Box C: RDST

The registration relative distance can be set in this box. Double click any cell, and the Registration Relative Position box appears.



Click **OK** to return to the Program Table Editing window without registration.

Do not select “No Registration” to register a relative position. Type the registration relative position.



Click **OK**.

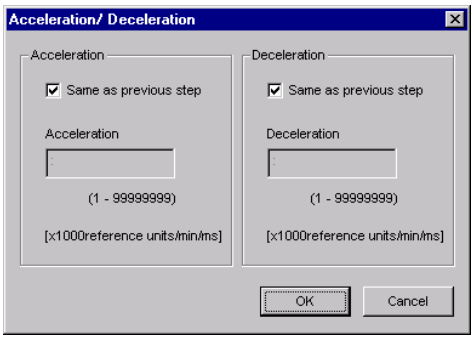
Box D: RSPD

The registration speed can be typed directly in this box.

Box E: ACC

Box F: DEC

The acceleration and deceleration speeds can be set in this box. Double click any cell in one of these boxes, and the Acceleration and Deceleration box appears.

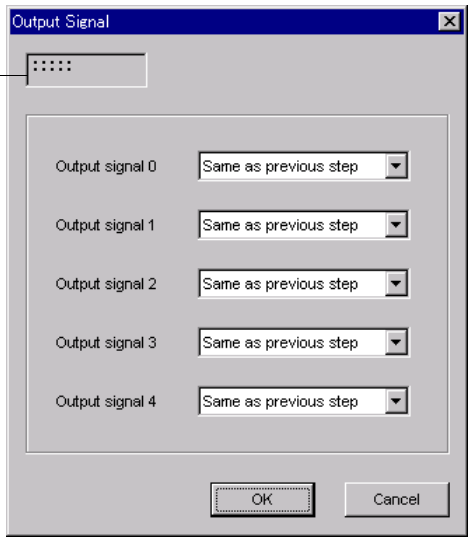


To set the same acceleration or deceleration speed as in the previous step, select “Same as previous step” and click **OK**.

To set a new speed, clear the previous setting by clicking “Same as previous step” to remove the checkmark. Then, type the new setting in the Acceleration or Deceleration box and click **OK**.

Box G: POUT

The output signals 0 to 7 can be set in this box. Double click any cell in the box, and the Output Signal box appears.



Select the output timing for the output signals. The following table shows the four items that can be selected.

Selection Items	Description	Display
Active	Always Active.	A
Not Active	Always Inactive.	N
Same as previous step	Continues previous state.	:
Zone	Sets a zone signal (Z0 to Z4) corresponding to the column.	Z

Ex.: The "ANN : ZZ : N" display shows the following settings.

Output Signal 0: Not Active

Output Signal 1: Same as previous step

Output Signal 2: Zone Signal Z2

Output Signal 3: Zone Signal Z3

Output Signal 4: Same as previous step

Output Signal 5: Not Active

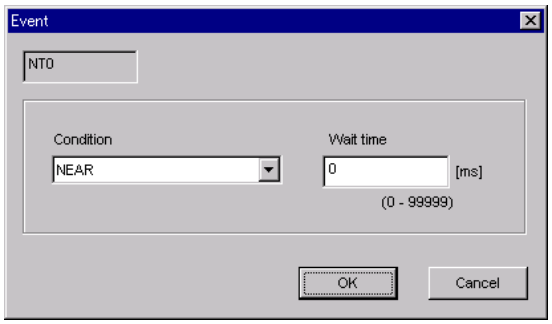
Output Signal 6: Not Active

Output Signal 7: Active

Click **OK** to save the settings and return to the Program Table Editing window.

Box H: EVENT

The conditions can be set in this box. Double click any cell in the box, and the Event box appears.



Select the conditions. The following table shows the ten items that can be selected.

Selection Items	Description	Display
Positioning Completion	Establish conditions for INPOSITION band	I
NEAR	Establish conditions for NEAR band	N
Command Issuance Completion	Establish conditions for command issuance completion	D
SEL0, SEL1, ...	Establish conditions at signal (SEL0, SEL1, ...) ON	SEL0, SEL1, ...
Wait Time	Establish conditions after a designated wait time	T Wait Time
Same as previous step	Use the same conditions as the previous step	:

If a item other than "same as previous step" is selected, type a wait time.

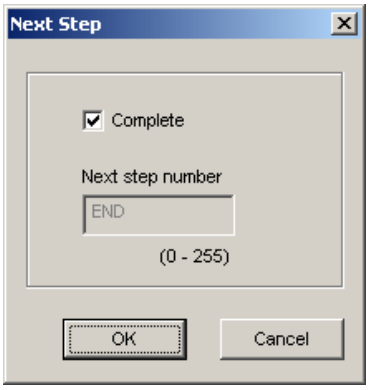
Click **OK** to save the settings and return to the Program Table Editing window.

Box I: LOOP

The number of times a step that is to be carried out can be typed directly in this box.

Box J: NEXT

The next step can be designated in this box. Double click any cell in the box, and the Next Step box appears.



If the program ends in this step, select "Complete," and then click **OK**.

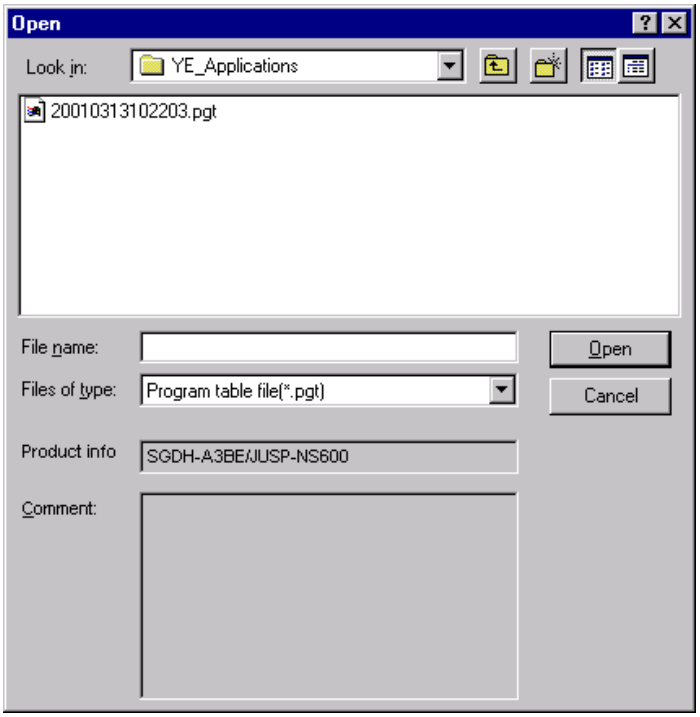
If the program continues, do not select "Complete," and type the number of the next step.

Click **OK** to save the settings and return to the Program Table Editing window.

(Open) Button

The parameters file can be loaded in the Open box. To load the file, use the following procedure.

1. Click the button, and the Open box appears.

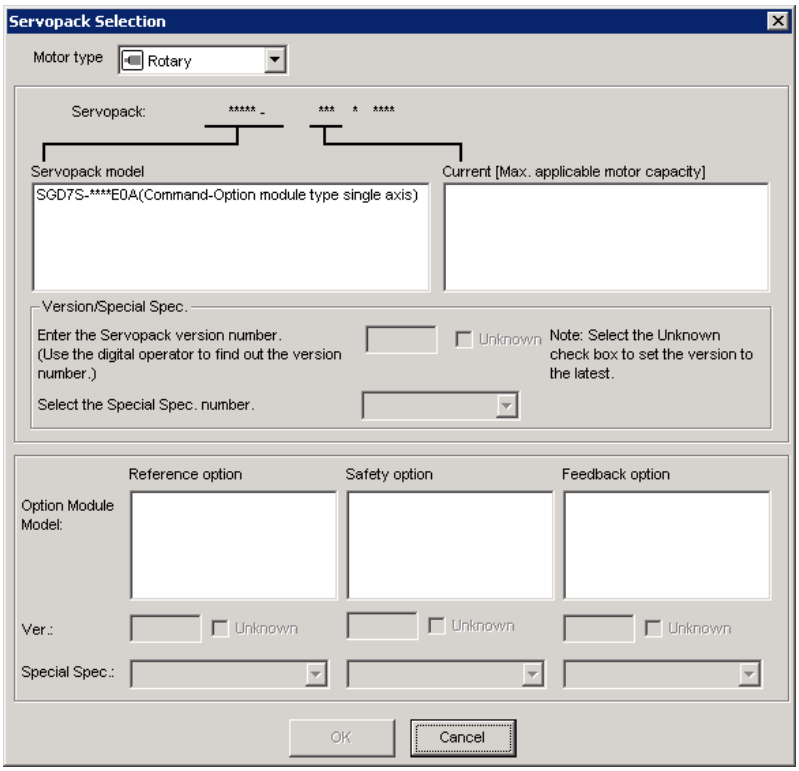


2. Select the name of the file to be imported, and click **Open**.

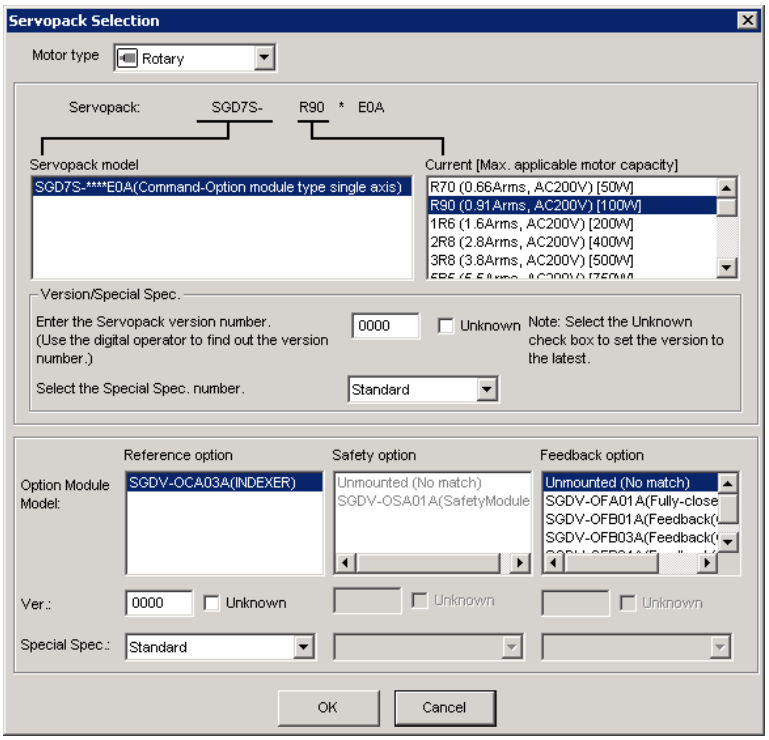
(New) Button

A new SERVOPACK and option module can be selected in the SERVOPACK Selection box using the New command. To change to a different SERVOPACK or option module, use the following procedure.

1. Click the button, and the SERVOPACK Selection box appears.



2. Select the SERVOPACK model and current [max. applicable motor capacity].

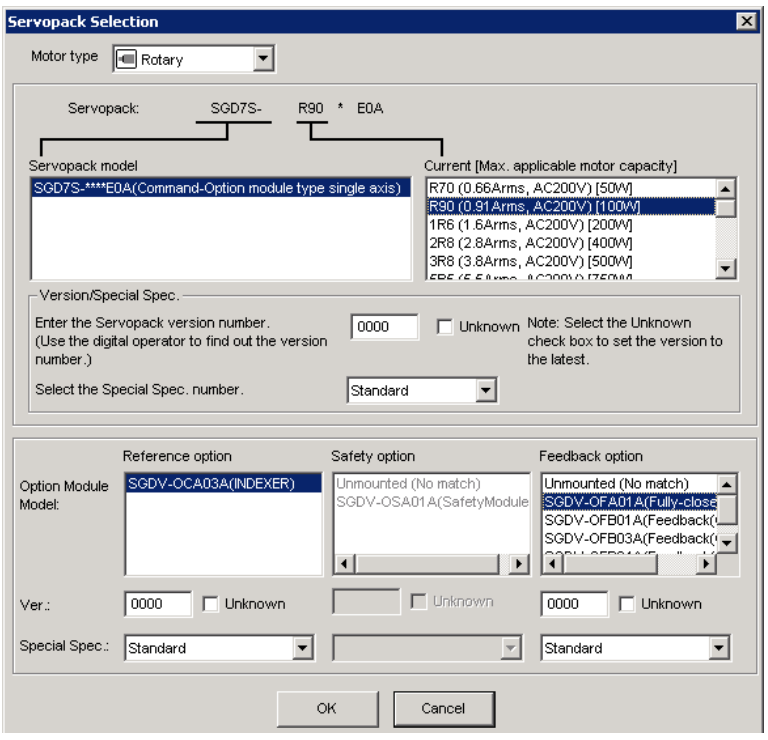


3. Type the version number of the SERVOPACK.

   If the version number is unknown, select **Unknown**.

4. Select the specifications of the SERVOPACK.

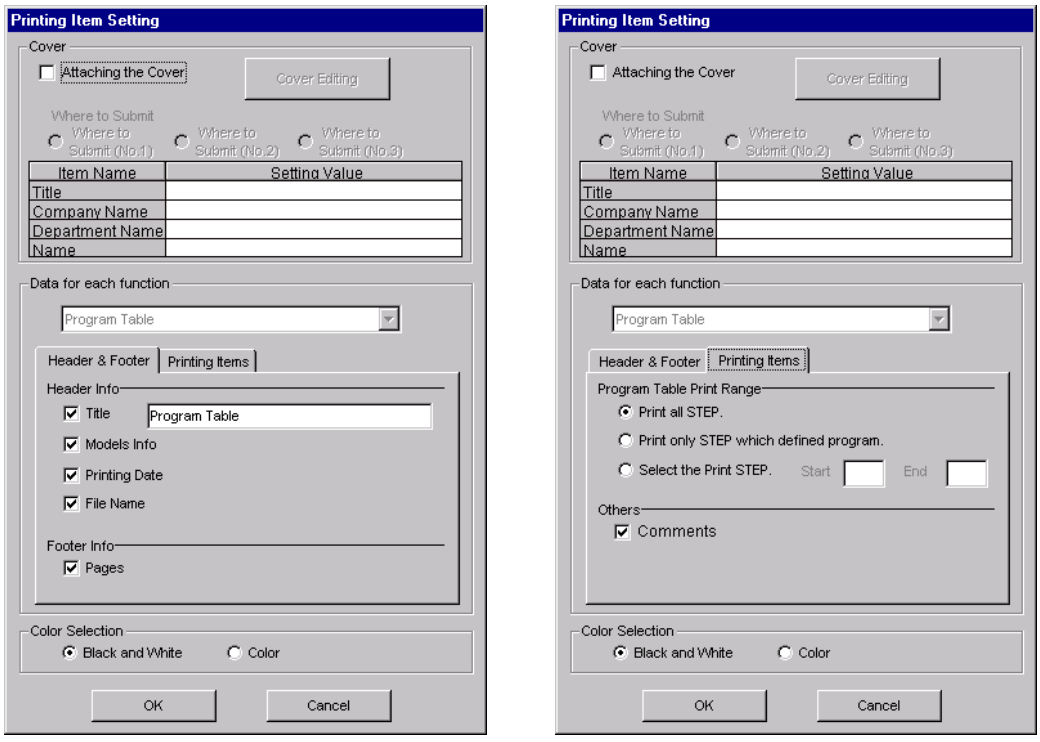
5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



6. Type the version number of the reference option module.
   If the version number is unknown, select **Unknown**.
7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Program Table Editing window will appear.

(Print) Button

The data on the Program Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab　　Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

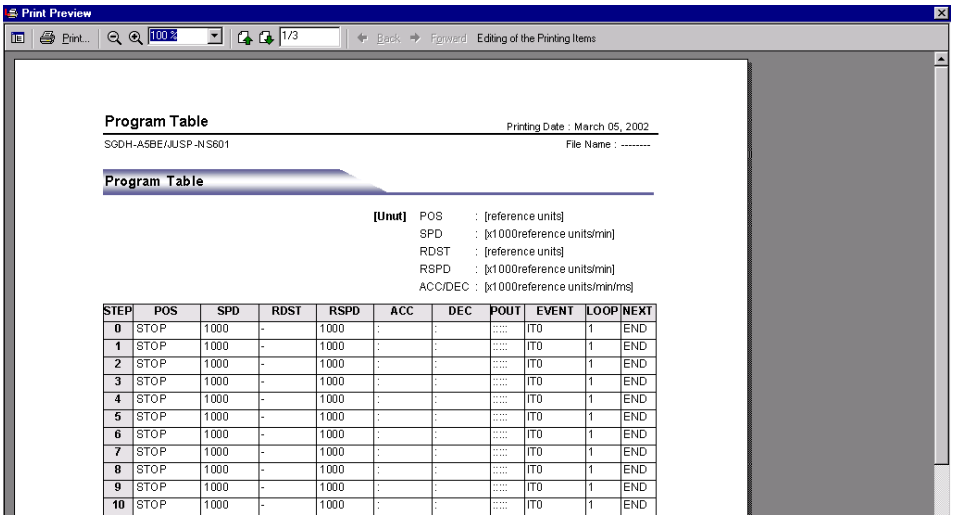
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



STEP	POS	SPD	RDST	RSPD	ACC	DEC	POUT	EVENT	LOOP	NEXT
0	STOP	1000	-	1000	:	:	:::::	IT0	1	END
1	STOP	1000	-	1000	:	:	:::::	IT0	1	END
2	STOP	1000	-	1000	:	:	:::::	IT0	1	END
3	STOP	1000	-	1000	:	:	:::::	IT0	1	END
4	STOP	1000	-	1000	:	:	:::::	IT0	1	END
5	STOP	1000	-	1000	:	:	:::::	IT0	1	END
6	STOP	1000	-	1000	:	:	:::::	IT0	1	END
7	STOP	1000	-	1000	:	:	:::::	IT0	1	END
8	STOP	1000	-	1000	:	:	:::::	IT0	1	END
9	STOP	1000	-	1000	:	:	:::::	IT0	1	END
10	STOP	1000	-	1000	:	:	:::::	IT0	1	END

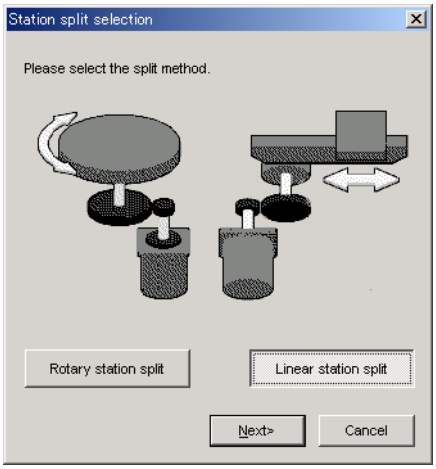
To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

Station split Station Split Button

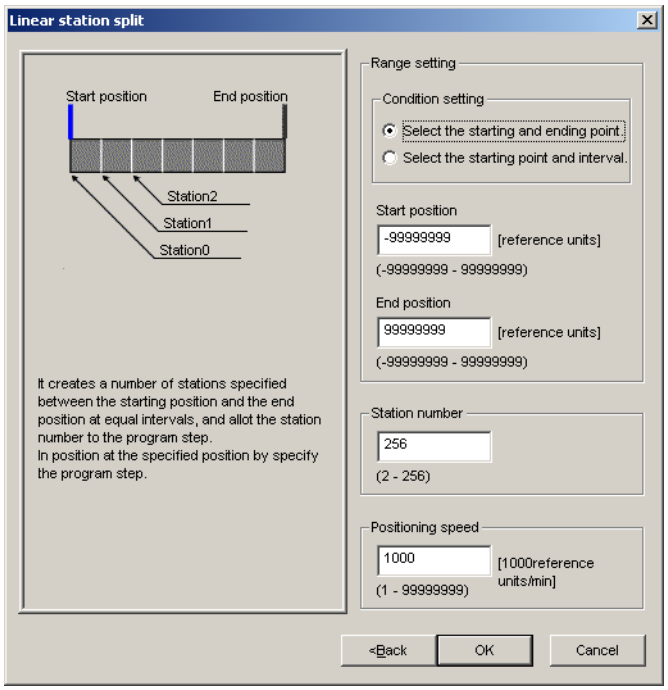
A specified number of stations at equal intervals can be created between specified positions. And each station position can be allocated to the program table.

Click the Station Split button, Station split , and the Station Split Selection box appears.

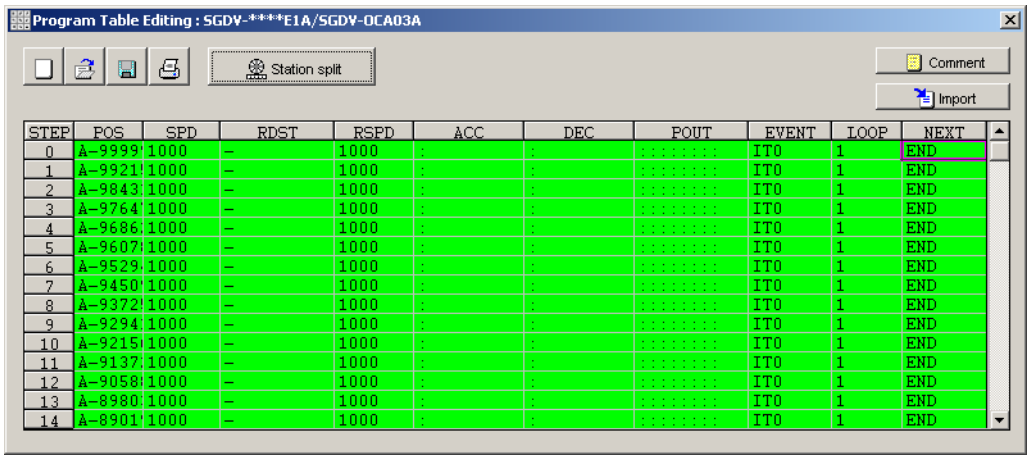


Select the split method, and click **OK**.

< When Linear is selected >

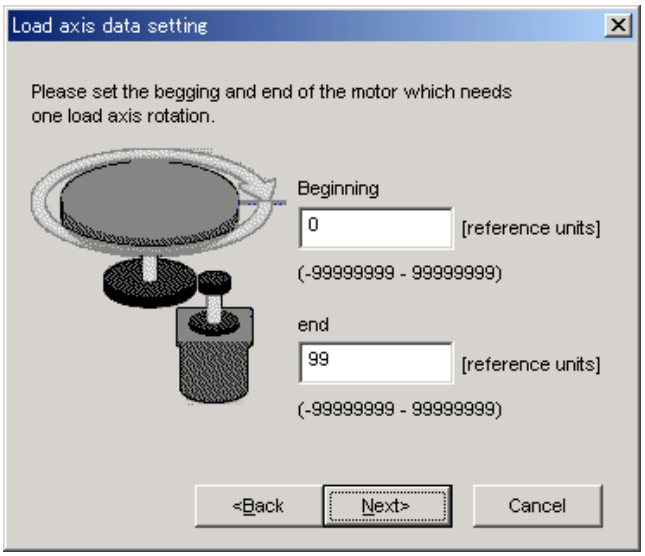


Type the values for the settings and click **OK**. The Program Table Editing window will appear.

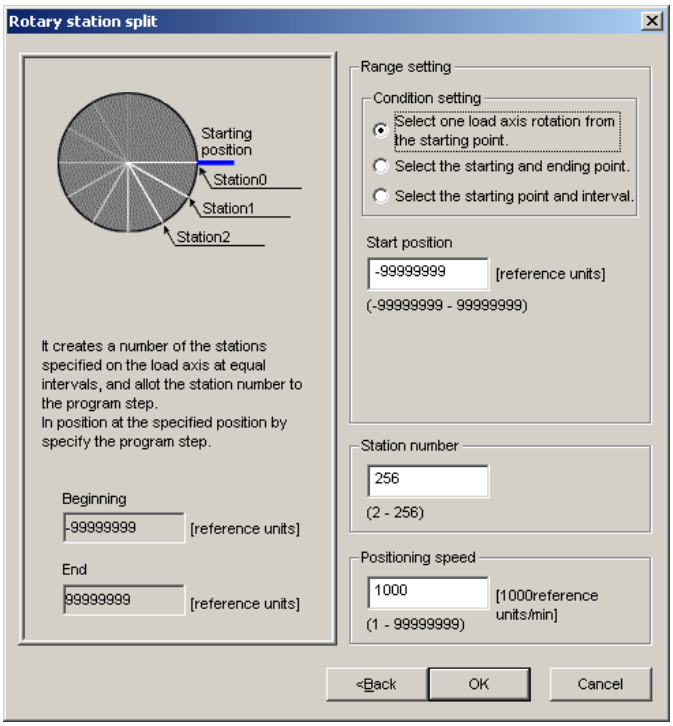


STEP	POS	SPD	RDST	RSPD	ACC	DEC	POUT	EVENT	LOOP	NEXT
0	A-9999	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
1	A-9921	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
2	A-9843	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
3	A-9764	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
4	A-9686	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
5	A-9607	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
6	A-9529	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
7	A-9450	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
8	A-9372	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
9	A-9294	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
10	A-9215	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
11	A-9137	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
12	A-9058	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
13	A-8980	1000	–	1000	:	:	: : : : : : : :	ITO	1	END
14	A-8901	1000	–	1000	:	:	: : : : : : : :	ITO	1	END

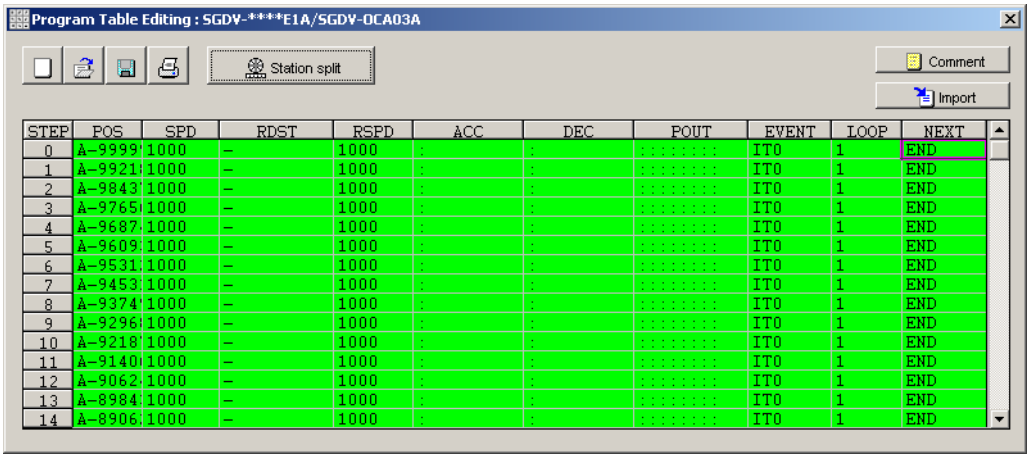
< When Rotary is selected >



1. Type the beginning and end of the motor which needs one rotation of load axis, and click **Next**.



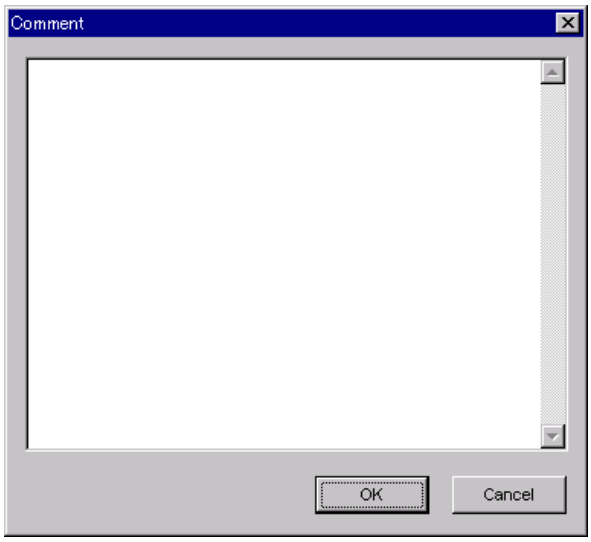
2. Type the values for the settings and click **OK**. The Program Table Editing window will appear.



STEP	POS	SPD	RDST	RSPD	ACC	DEC	POUT	EVENT	LOOP	NEXT
0	A-9999	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
1	A-9921	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
2	A-9843	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
3	A-9765	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
4	A-9687	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
5	A-9609	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
6	A-9531	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
7	A-9453	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
8	A-9374	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
9	A-9296	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
10	A-9218	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
11	A-9140	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
12	A-9062	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
13	A-8984	1000	–	1000	:	:	: : : : : : : :	IT0	1	END
14	A-8906	1000	–	1000	:	:	: : : : : : : :	IT0	1	END

Comment

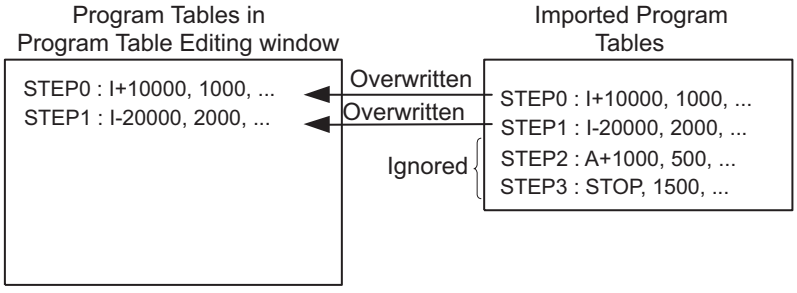
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



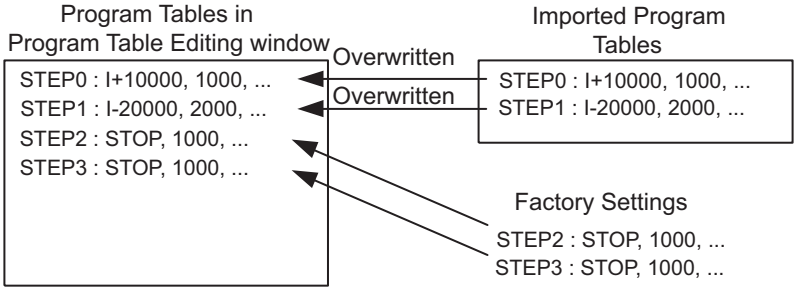
Import

Program table settings can be transferred or imported from a stored file with the Import function. If the imported program tables differ in number from the on-screen program tables, the following processing takes place.

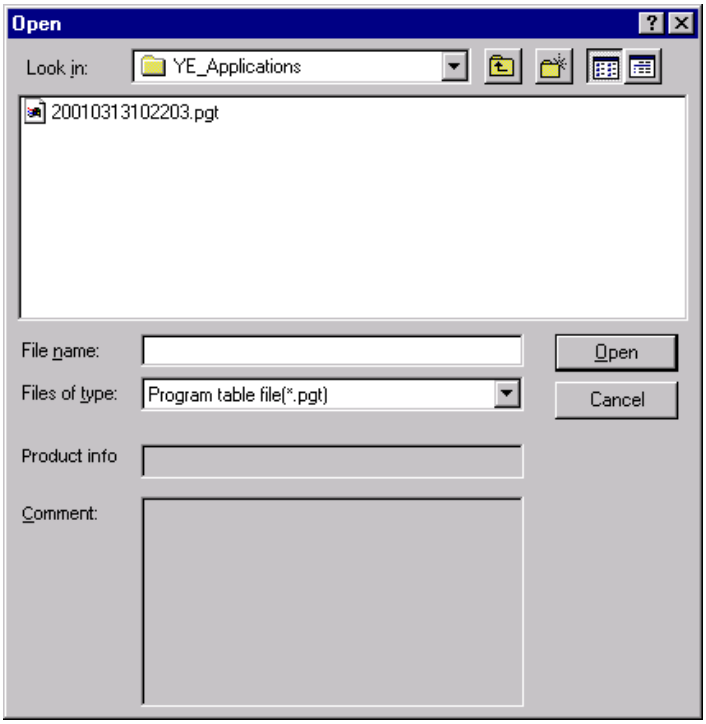
- If the number of imported program tables is greater



- If the number of imported program tables is fewer



1. Click **Import,** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

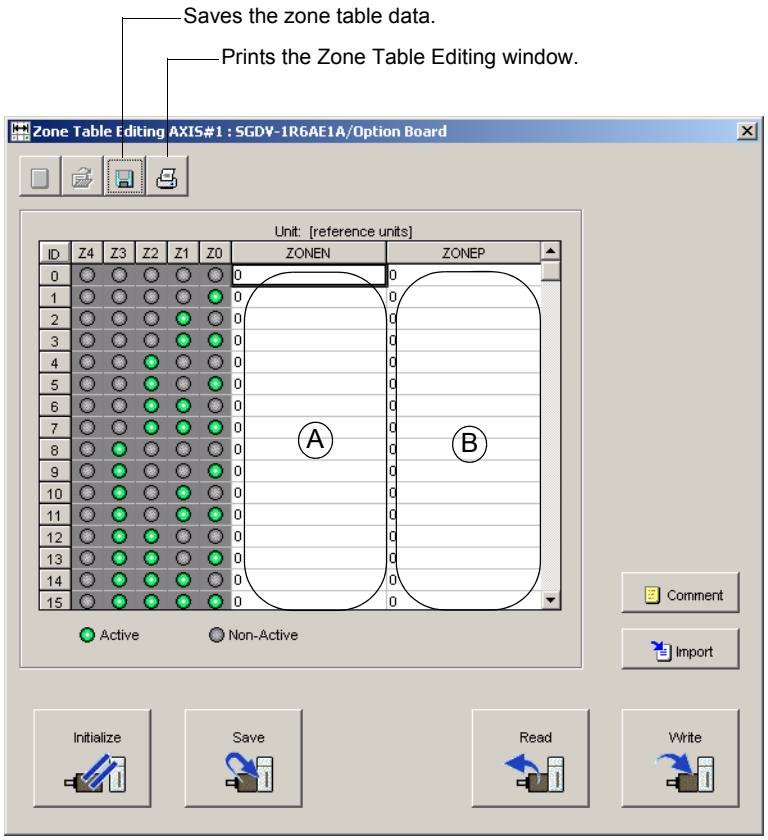
4.9.2 Zone Table Editing

Zones can be viewed and edited in the Zone Table Editing window. Designate a zone by setting the starting and ending positions of the zone. The INDEXER option module will send five output signals (/POUT0 to /POUT4) corresponding to the zone of the current position according to the zone table.

The windows differ in the Online and Offline modes.

■ When Online

In the SigmaWin+ Σ-7 component main window, click **Table** and then click **Edit Zone Table**. The Zone Table Editing window appears.



Zone Table Editing Window (Online Mode)

Thirty-two types of zones can be set. The five signals (Z0 to Z4) correspond to the following: Z0 = /POUT0, Z1 = /POUT1, Z2 = /POUT2, Z3 = /POUT3, Z4 = /POUT4.

Box A: ZONEN

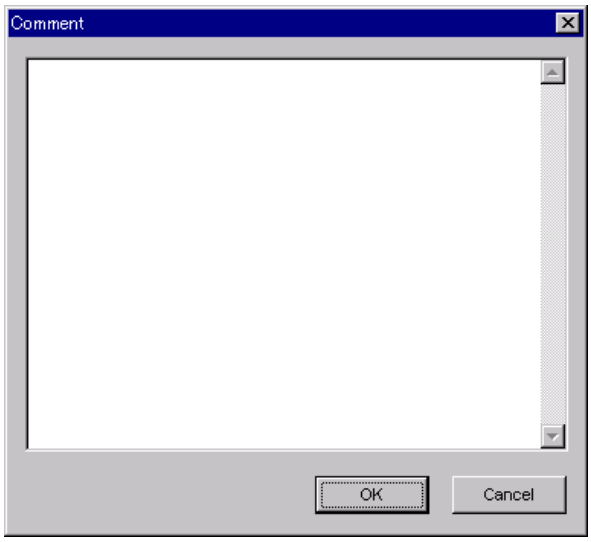
The zone starting position (ZONEN) can be designated directly in this box.

Box B: ZONEP

The zone ending position (ZONEP) can be designated directly in this box.

Comment

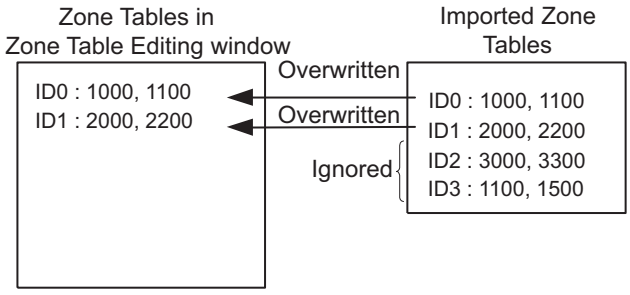
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



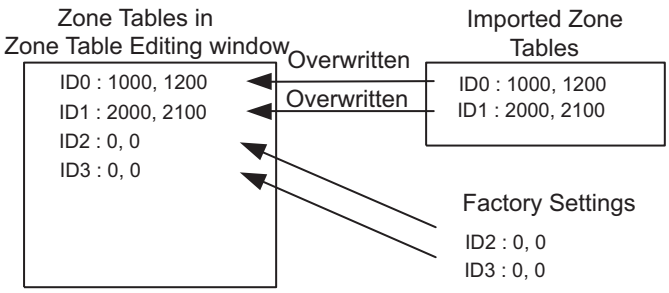
Import

Zone table settings can be transferred or imported from a stored file with the Import function. If the imported zone tables differ in number from the on-screen zone tables, the following processing takes place.

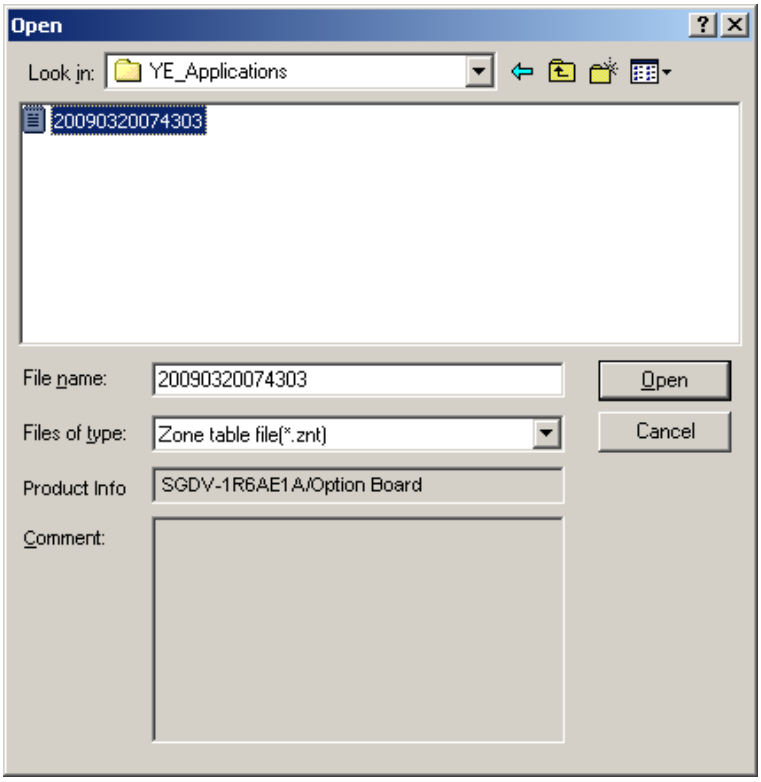
- If the number of imported zone tables is greater



- If the number of imported zone tables is fewer



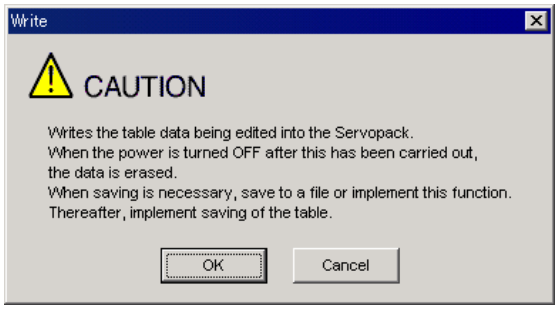
1. Click **Import** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

Write

The program tables can be written to the SERVOPACK with the Write function. Click **Write**, and a warning message will appear reminding you that the data erased if the power is turned off.



Click **OK** to write in the data.

Click **Cancel** to return to the Zone Table Editing window without writing in the data.

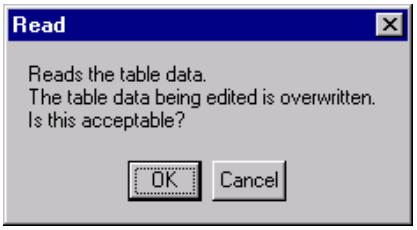
<Differences Between **Write** and **Save**>

Write: Saves table data to the SERVOPACK in temporary storage. The data in the table is deleted when the power is turned OFF.

Save: Saves the data in the table that is stored in the SERVOPACK memory to the flash memory. The data for the tables remains unchanged if power is turned off.

Read

The zone tables can be read within the connected SERVOPACK with the Read function. Click **Read**, and a message will appear, confirming if you want to read the table data.

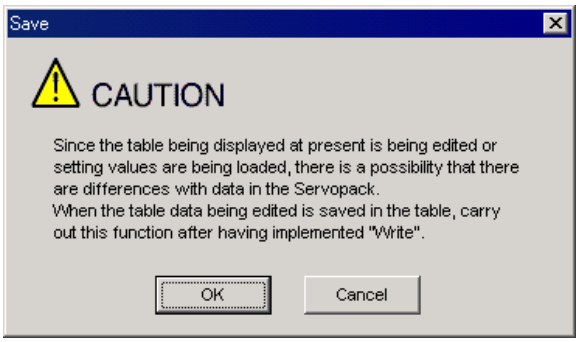


Click **OK** to start reading and overwriting the table data.

Click **Cancel** to return to the Zone Table Editing window without reading the table data.

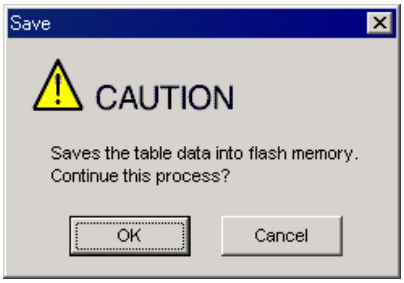
Save

The data in the table can be saved to the flash memory with the Save function. Click **Save**, and a warning message will appear reminding you that the data may different than that of the SERVOPACK.



Click **Cancel** to return to the Zone Table Editing window. Then by clicking **Write**, write zone table that is currently displayed but has not been stored into the SERVOPACK.

If already saved in temporary storage, click **OK**. A conformation message appears.

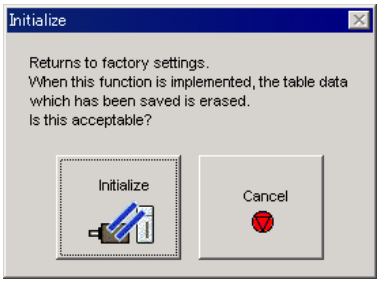


Click **OK** to save the data.

Click **Cancel** to return to the Zone Table Editing window without saving the data.

Initialize

The settings of the SERVOPACK can be returned to the factory settings with the Initialize function. Click **Initialize**, and a verification message appears.

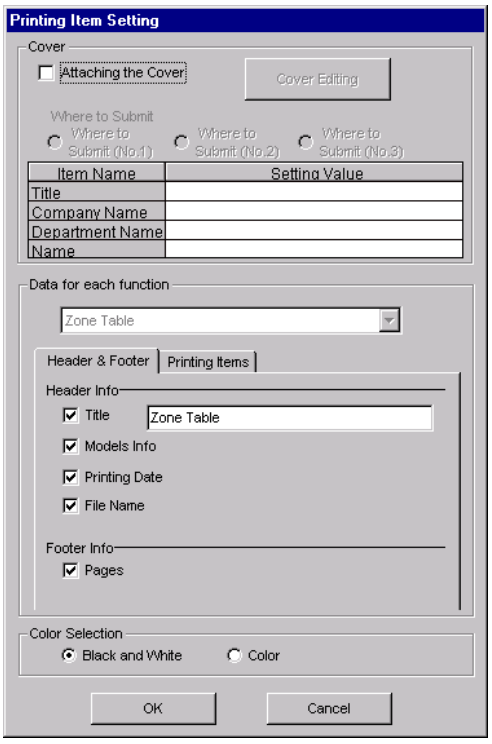


Click **Initialize** to initialize the zone tables.

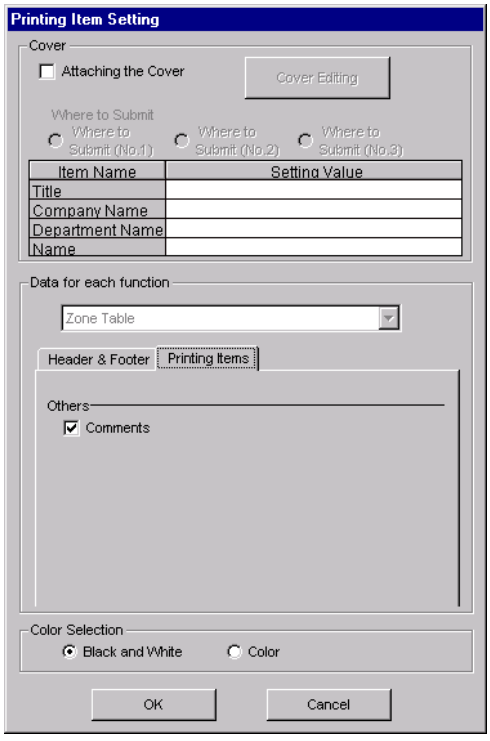
Click **Cancel** to return to the Zone Table Editing window without changing the settings.

(Print) Button

The data on the Zone Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab



Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

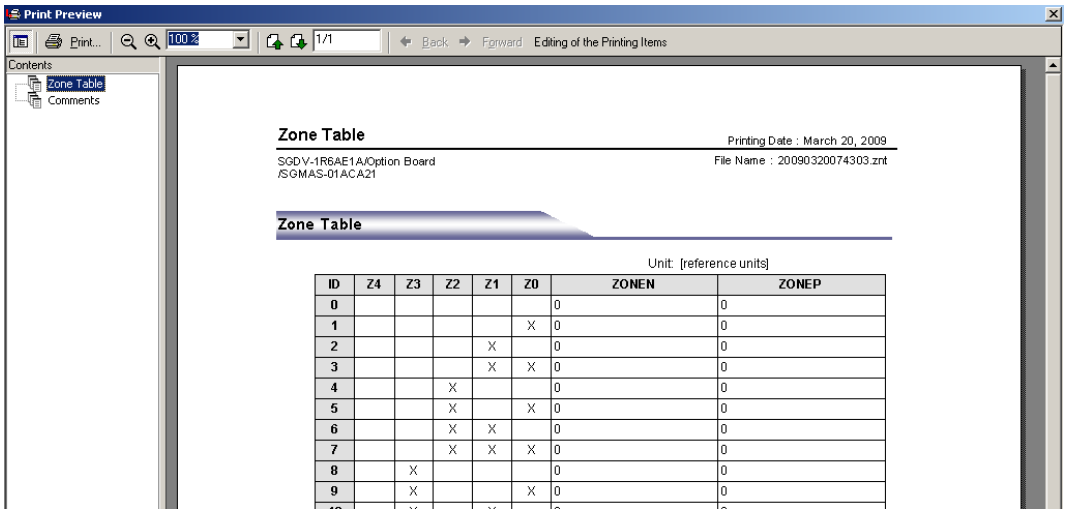
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



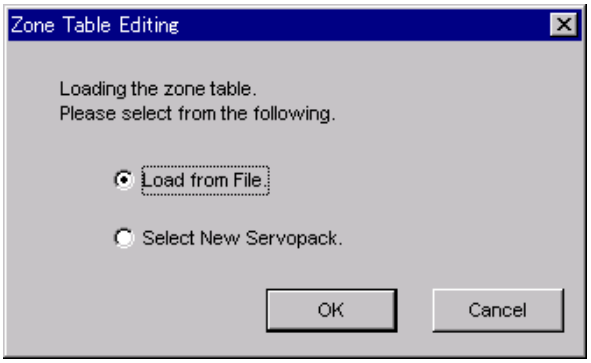
ID	Z4	Z3	Z2	Z1	Z0	ZONEN	ZONEP
0						0	0
1					X	0	0
2				X		0	0
3				X	X	0	0
4			X			0	0
5			X		X	0	0
6			X	X		0	0
7			X	X	X	0	0
8		X				0	0
9		X			X	0	0

To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

■ When Offline

In the SigmaWin+ Σ-7 component main window, click **Table** and then click **Edit Zone Table**. The Zone Table Editing box appears.

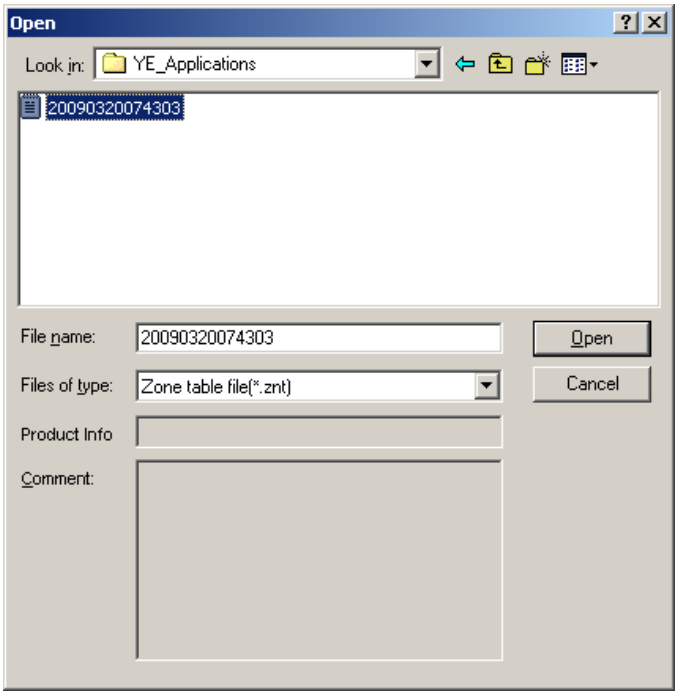


Load From File: Reads existing data.
Select New SERVOPACK: Creates new data.

Select the desired command and click **OK**.

<When "Load from File" is Selected>

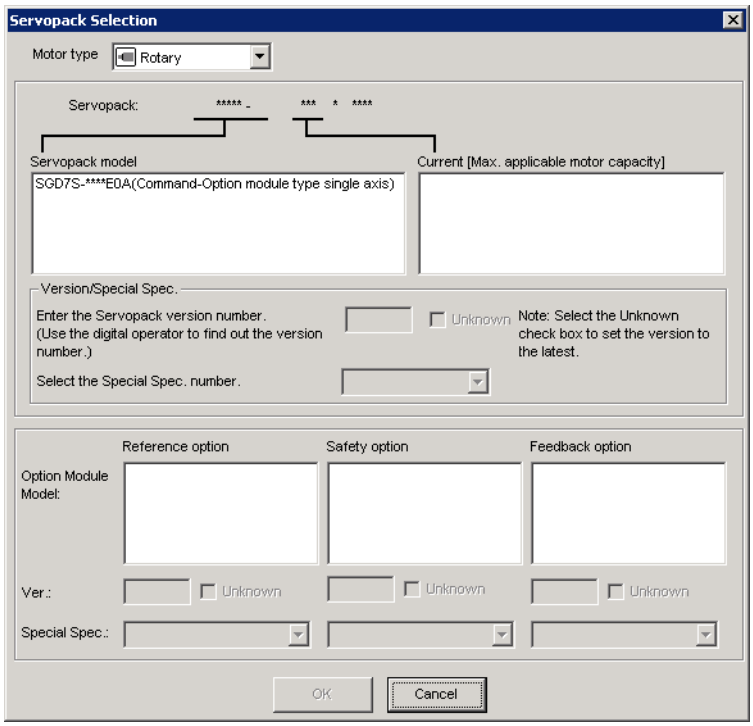
When "Load from File" is selected, the Open box appears.



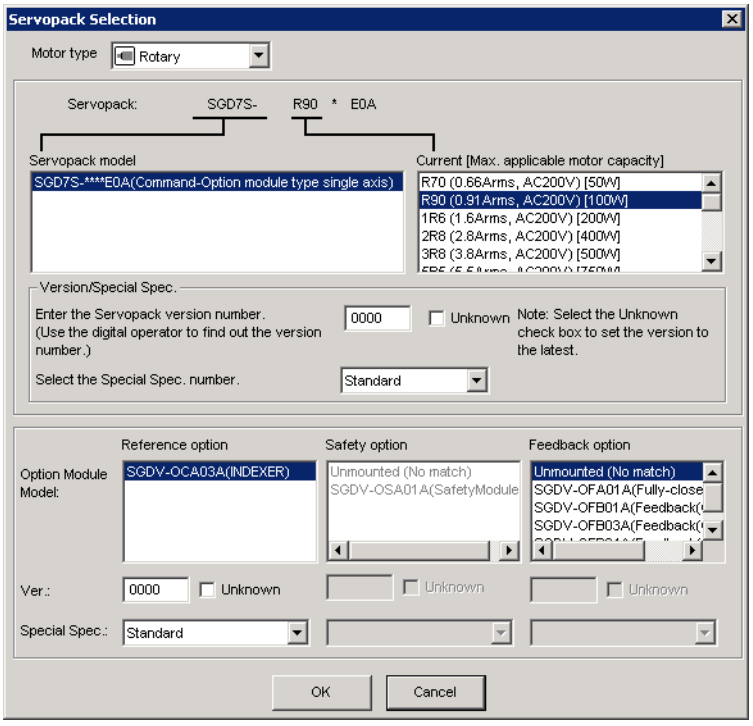
Select the data to be imported, and click **Open**.

< When "Select New SERVOPACK" is Selected >

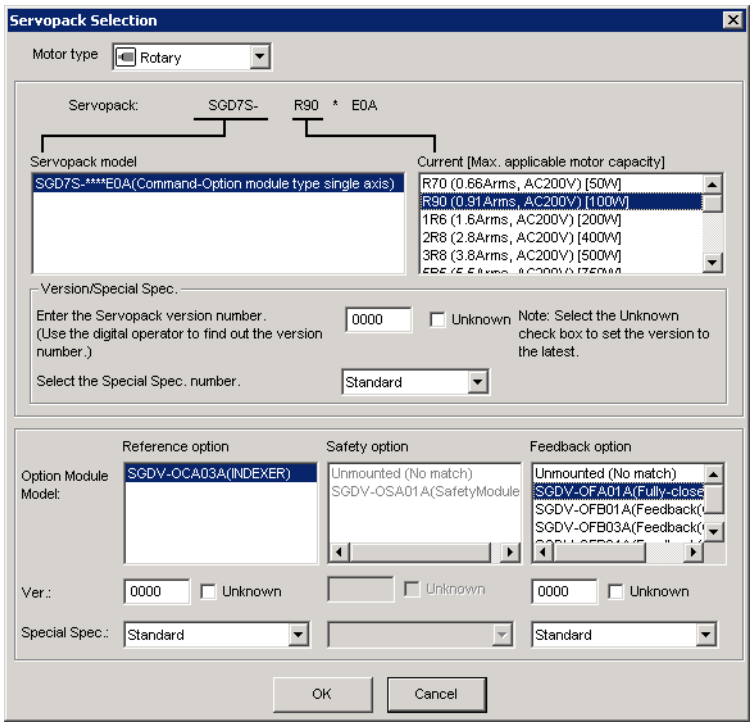
1. When "Select New SERVOPACK" is selected, the SERVOPACK Selection box appears.



2. Select the SERVOPACK model and current [max. applicable motor capacity].

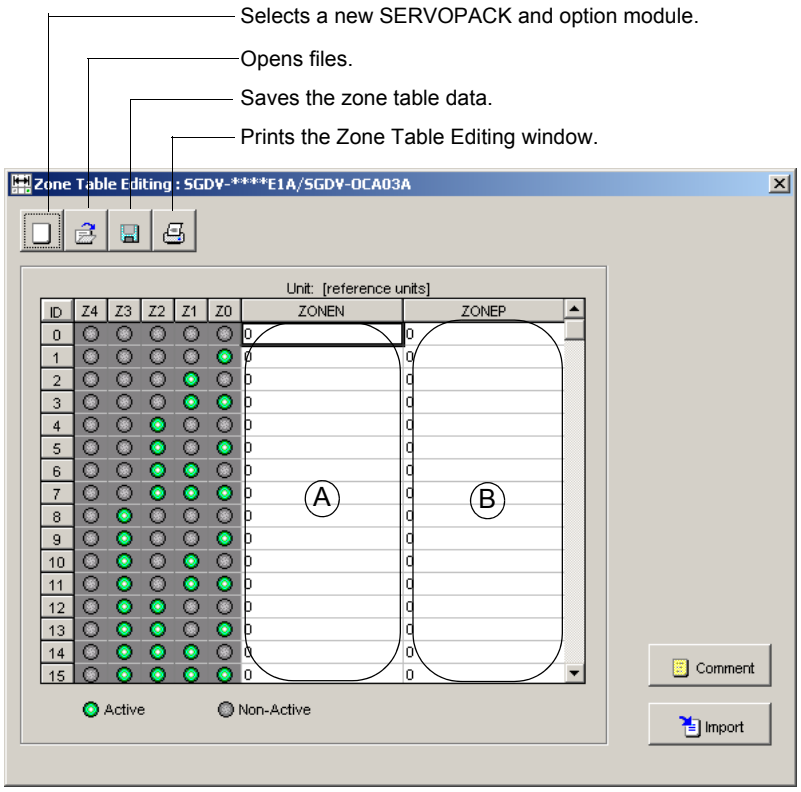


3. Type the version number of the SERVOPACK.
   If the version number is unknown, select **Unknown**.
4. Select the specifications of the SERVOPACK.
5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



6. Type the version number of the reference option module.
   If the version number is unknown, select **Unknown**.

7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Zone Table Editing window will appear.



Zone Table Editing Window (Offline Mode)

Box A: ZONEN

The zone starting position (ZONEN) can be designated directly in this box.

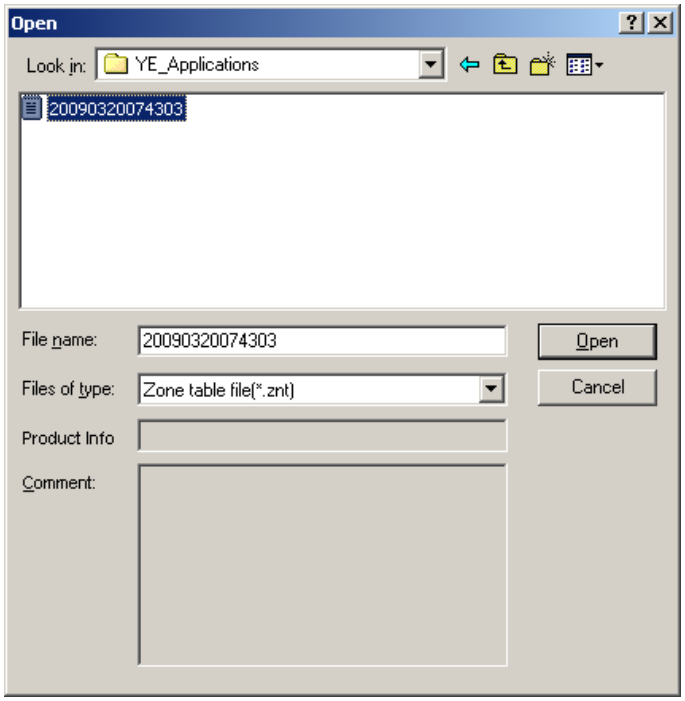
Box B: ZONEP

The zone ending position (ZONEP) can be designated directly in this box.

 (Open) Button

The parameter file can be loaded in the Open box. To load the file, use the following procedure.

1. Click the  button, and the Open box appears.

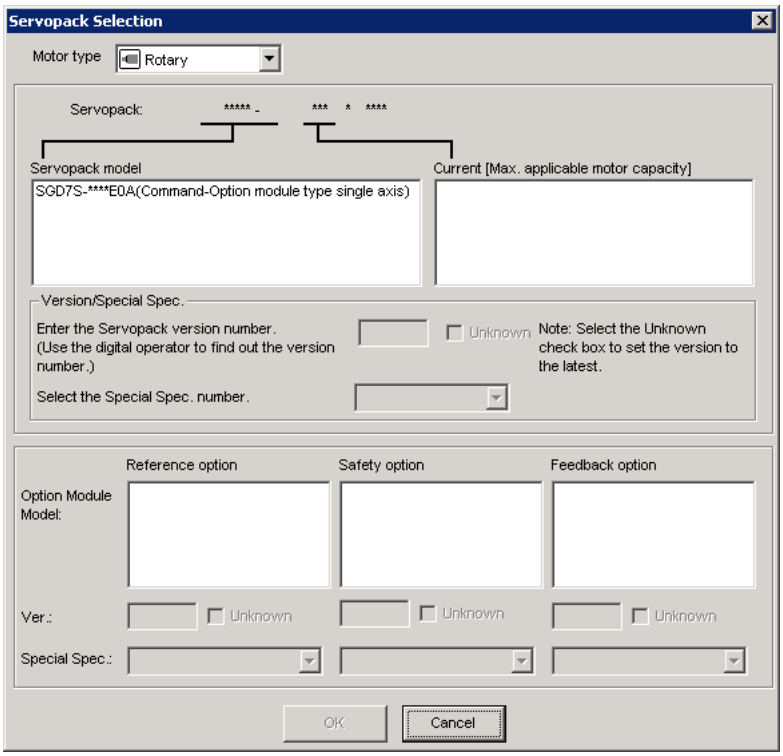


2. Select the name of the file to be imported, and click **Open**.

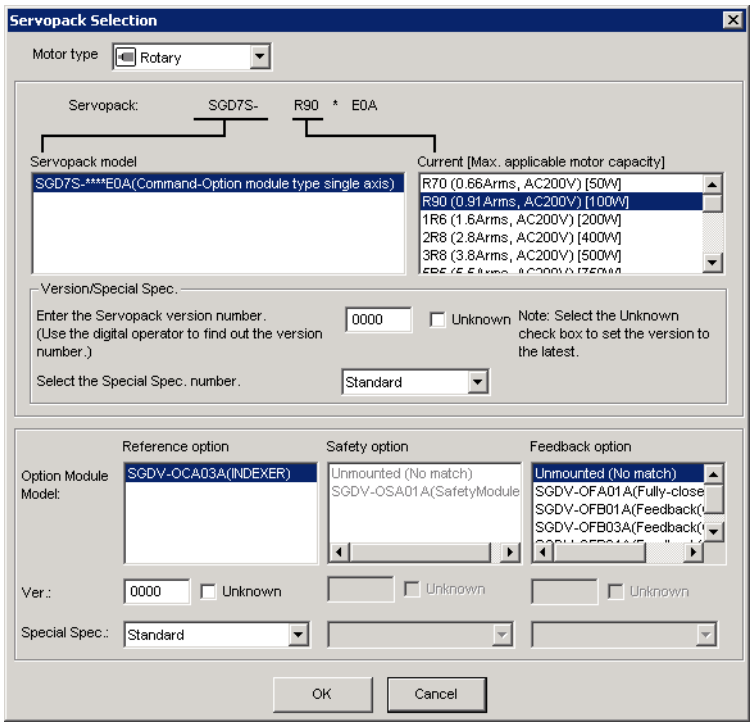
(New) Button

A new SERVOPACK and option module can be selected in the SERVOPACK Selection box using the New command. To change to a different SERVOPACK or option module, use the following procedure.

1. Click the button, and the SERVOPACK Selection box appears.



2. Select the SERVOPACK model and current [max. applicable motor capacity].

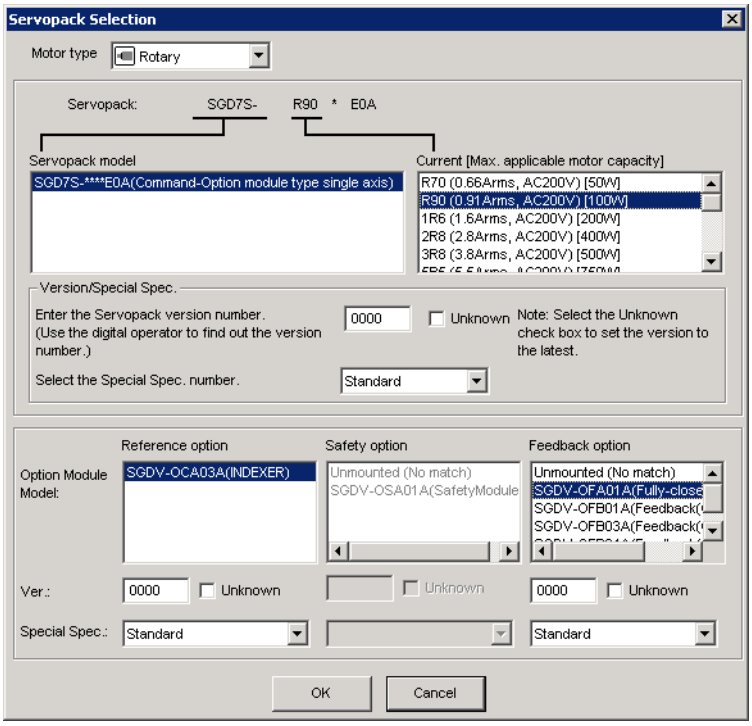


3. Type the version number of the SERVOPACK.

   If the version number is unknown, select **Unknown**.

4. Select the specifications of the SERVOPACK.

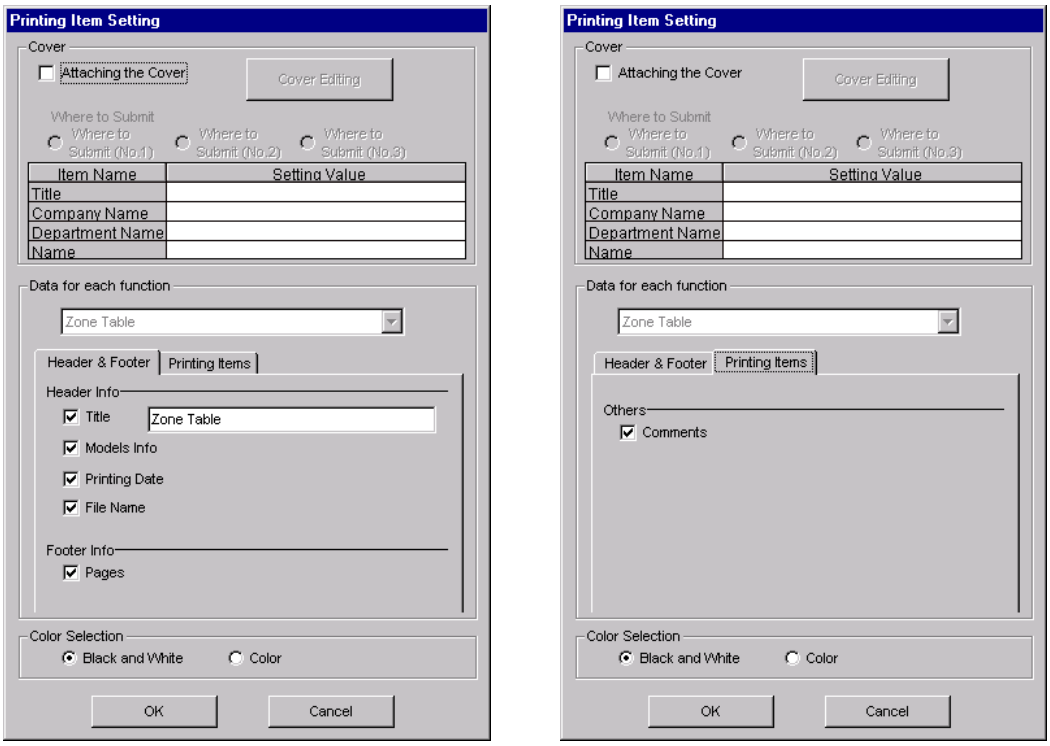
5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



6. Type the version number of the reference option module.
   If the version number is unknown, select **Unknown**.
7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Zone Table Editing window will appear.

(Print) Button

The data on the Zone Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab　　Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

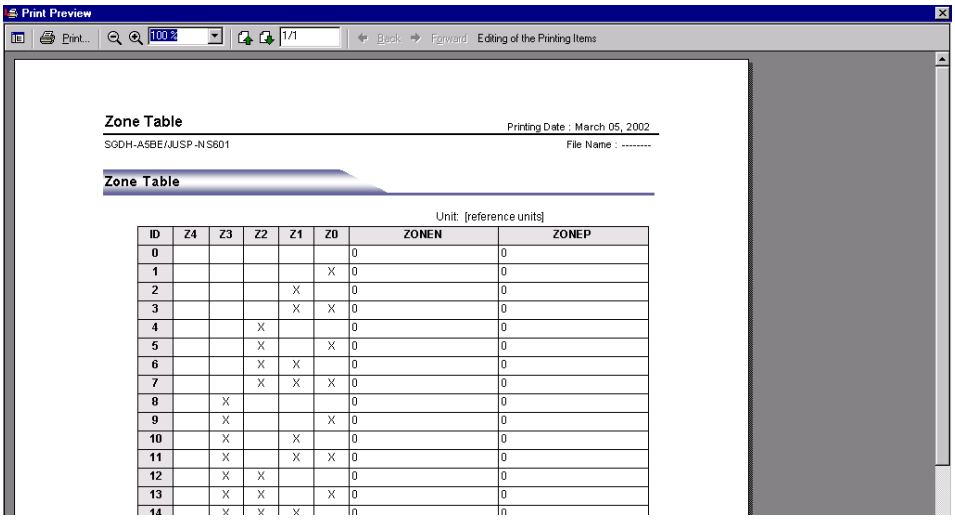
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



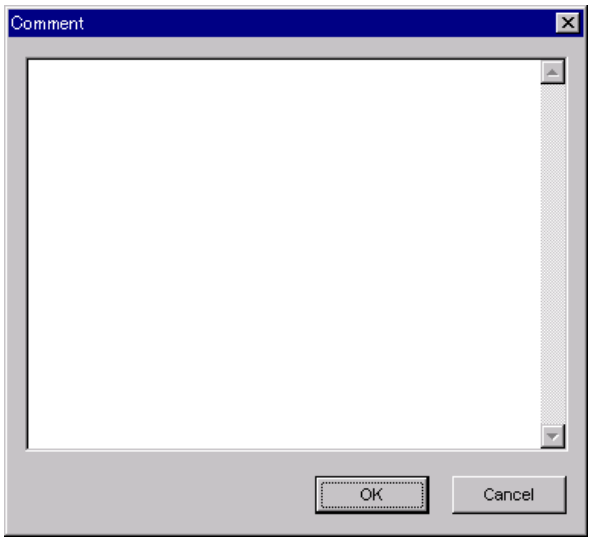
ID	Z4	Z3	Z2	Z1	Z0	ZONEN	ZONEP
0						0	0
1					X	0	0
2				X		0	0
3				X	X	0	0
4			X			0	0
5			X		X	0	0
6			X	X		0	0
7			X	X	X	0	0
8		X				0	0
9		X			X	0	0
10		X		X		0	0
11		X		X	X	0	0
12		X	X			0	0
13		X	X		X	0	0
14		X	X	X		0	0

To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

Comment

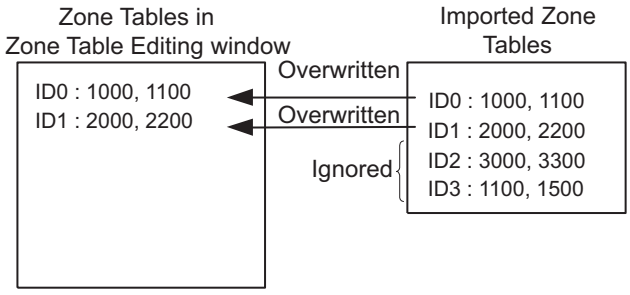
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



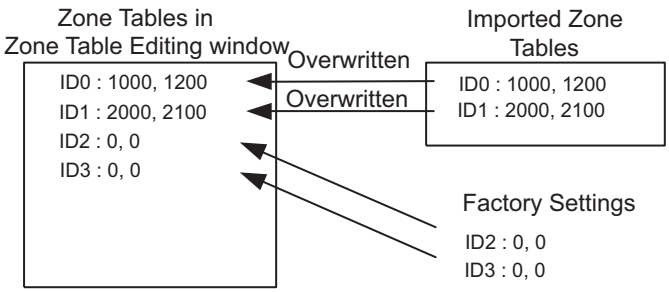
Import

Zone table settings can be transferred or imported from a stored file with the Import function. If the imported zone tables differ in number from the on-screen zone tables, the following processing takes place.

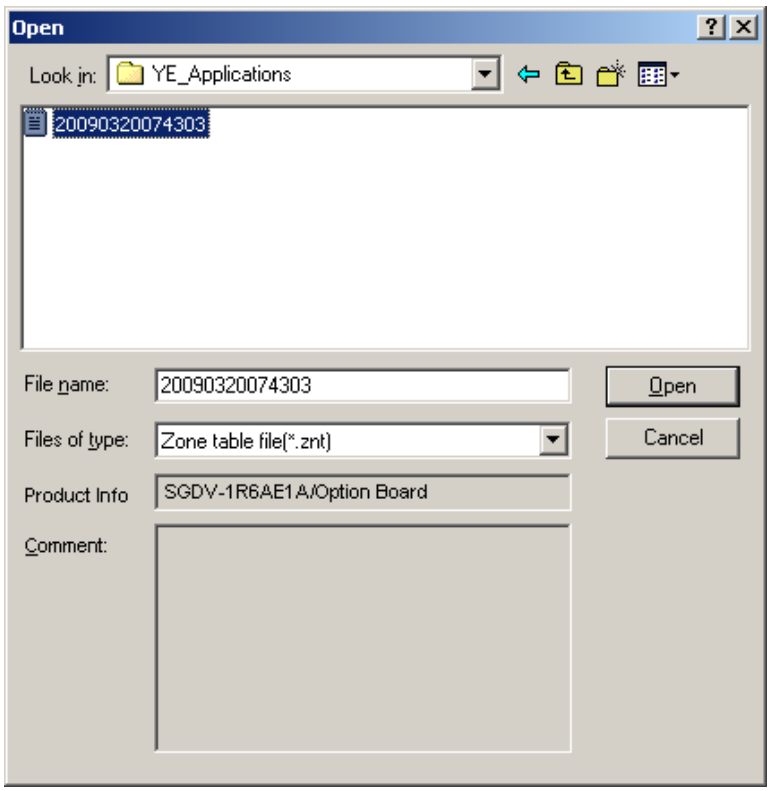
- If the number of imported zone tables is greater



- If the number of imported zone tables is fewer



1. Click **Import** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

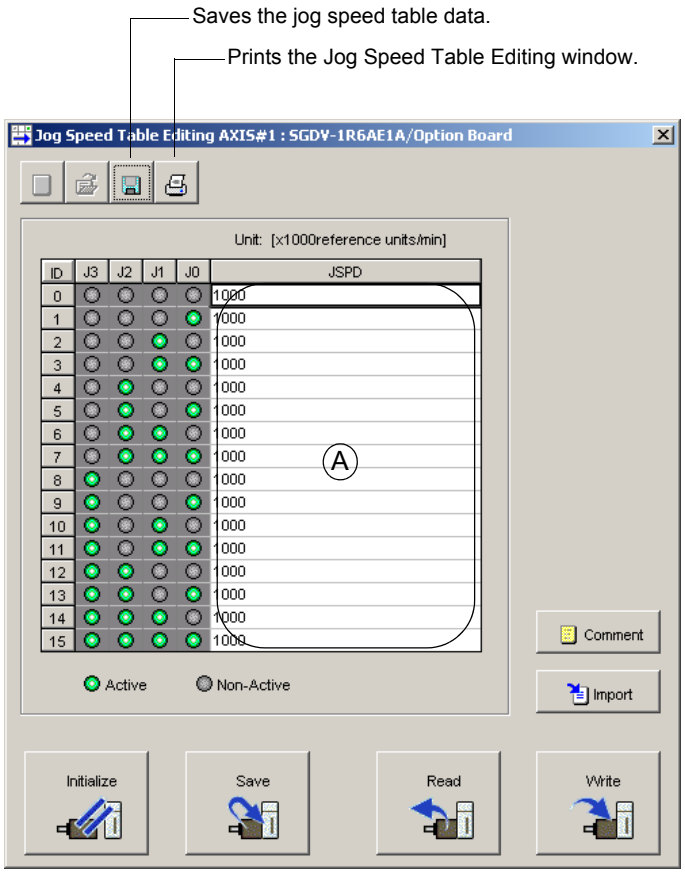
4.9.3 Jog Speed Table Editing

The jog speeds can be viewed and edited in the Jog Speed Table Editing window. The INDEXER option module changes the speed to the corresponding jog speed in the jog speed table in accordance with the combination of input signals, /JOG0 to /JOG3.

The windows differ in the Online and Offline modes.

■ When Online

In the SigmaWin+ Σ-7 component main window, click **Table** and then click **Edit Jog Speed Table**. The Jog Speed Table Editing window appears.



Jog Speed Table Editing Window (Online Mode)

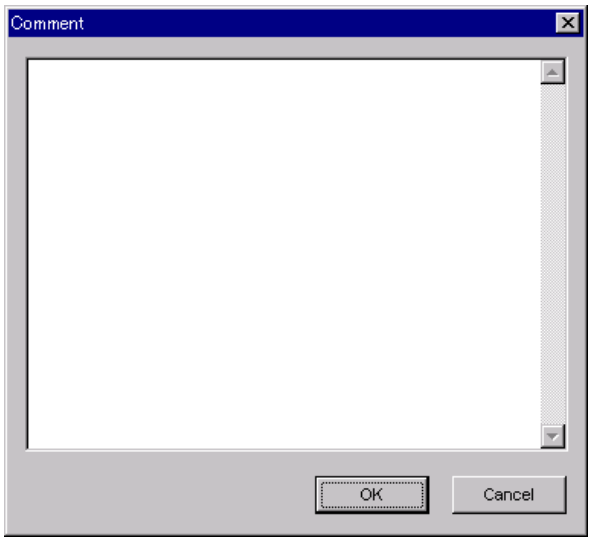
Sixteen types of jog speed can be set. The four signals (J0 to J3) correspond to the following: J0 = /JOG0, J1 = /JOG1, J2 = /JOG2, J3 = /JOG3.

Box A: JSPD

The jog speed can be typed directly in this box.

Comment

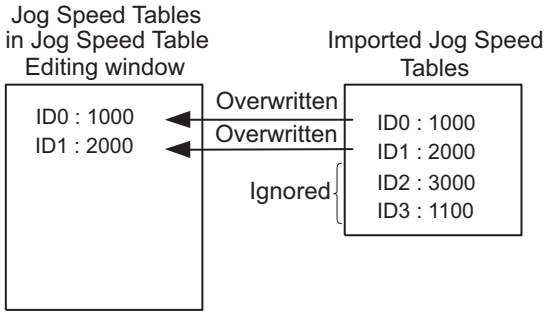
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



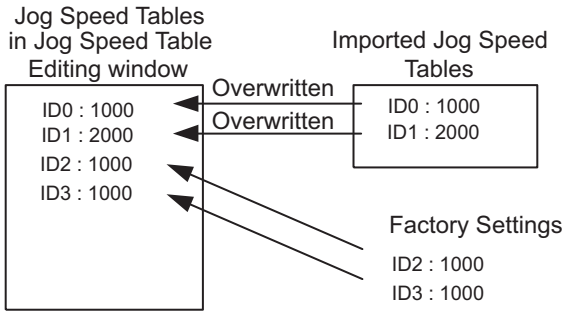
Import

Jog speed table settings can be transferred or imported from a stored file with the Import function. If the imported jog speed tables differ in number from the on-screen jog speed tables, the following processing takes place.

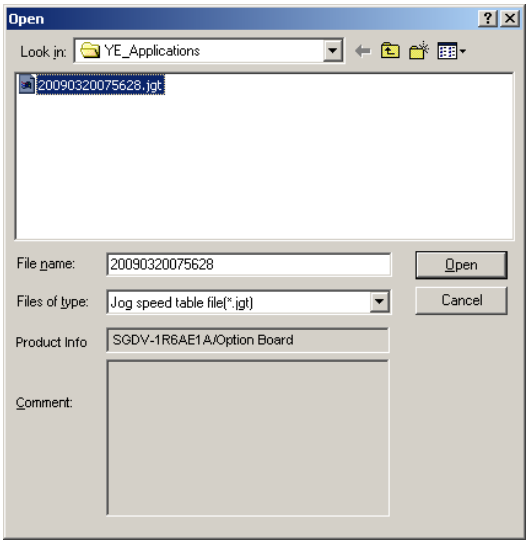
- If the number of imported jog speed tables is greater



- If the number of imported jog speed tables is fewer



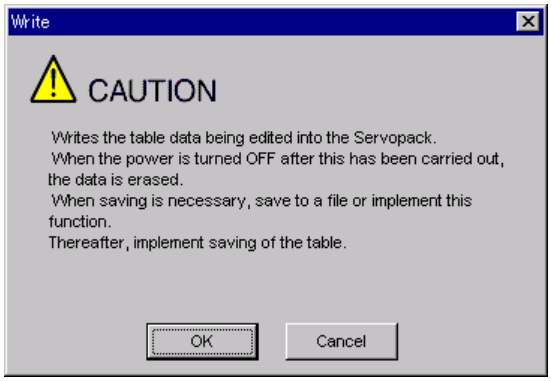
1. Clicking **Import** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

Write

The program tables can be written to the SERVOPACK with the Write function. Click **Write**, and a warning message will appear reminding you that the data erased if the power is turned off.



Click **OK** to write in the data.

Click **Cancel** to return to the Jog Speed Table Editing window without writing in the data.

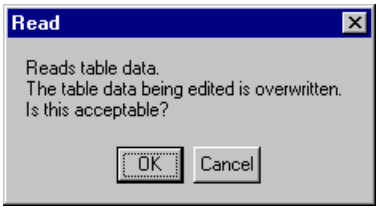
<Differences Between **Write** and **Save**>

Write: Saves table data to the SERVOPACK in temporary storage. The data in the table is deleted when the power is turned OFF.

Save: Saves the data in the table that is stored in the SERVOPACK memory to the flash memory. The data for the tables remains unchanged if power is turned off.

Read

The jog speed tables can be read within the connected SERVOPACK with the Read function. Click **Read**, and a message will appear, confirming if you want to read the table data.

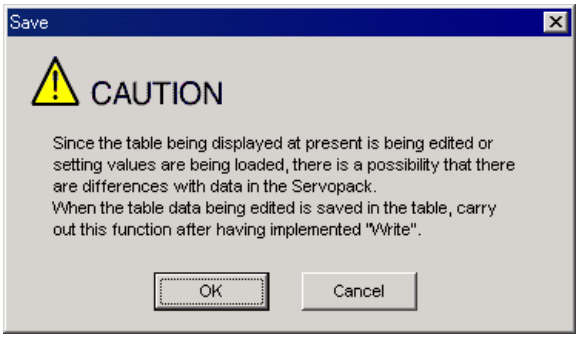


Click **OK** to start reading and overwriting the table data.

Click **Cancel** to return to the Jog Speed Table Editing window without reading the table data.

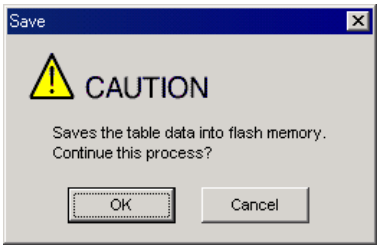
Save

The data in the table can be saved to the flash memory with the Save function. Click **Save**, and a warning message will appear reminding you that the data may different than that of the SERVOPACK.



Click **Cancel** to return to the Jog Speed Table Editing window. Then by clicking **Write**, write jog speed table that is currently displayed but has not been stored into the SERVOPACK.

If already saved in temporary storage, click **OK**. A conformation message appears.

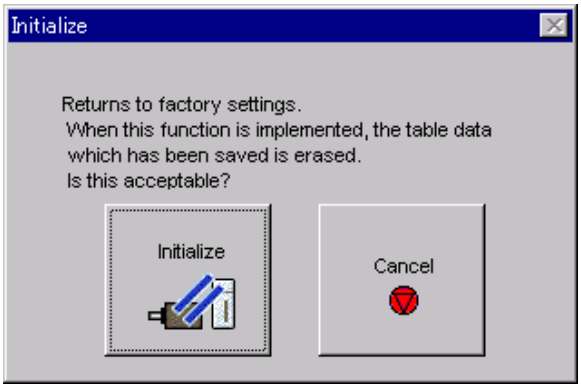


Click **OK** to save the data.

Click **Cancel** to return to the Jog Speed Table Editing window without saving the data.

Initialize

The settings of the SERVOPACK can be returned to the factory settings with the Initialize function. Click **Initialize**, and a verification message appears.

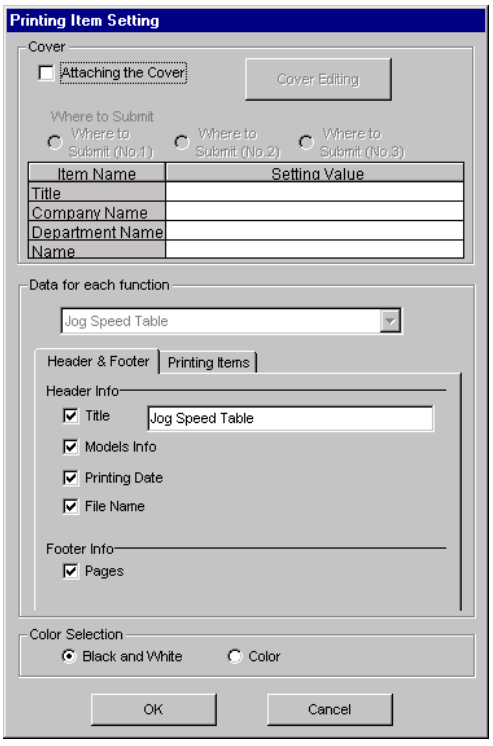


Click **Initialize** to initialize the jog speed tables.

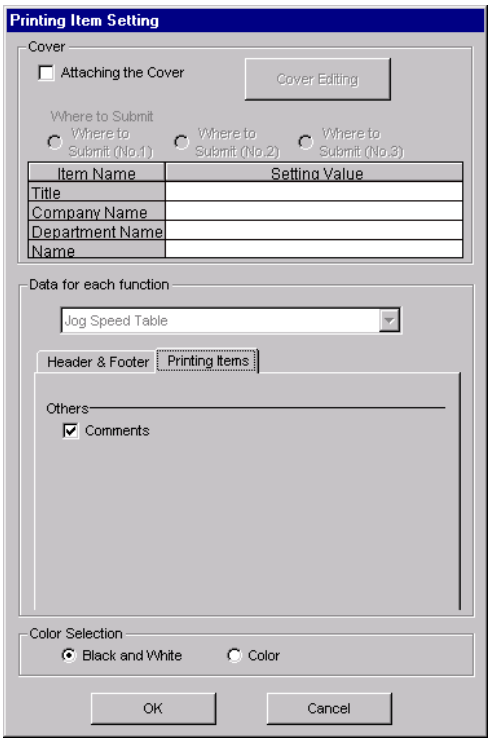
Click **Cancel** to return to the Jog Speed Table Editing window without changing the settings.

(Print) Button

The data on the Jog Speed Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab



Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

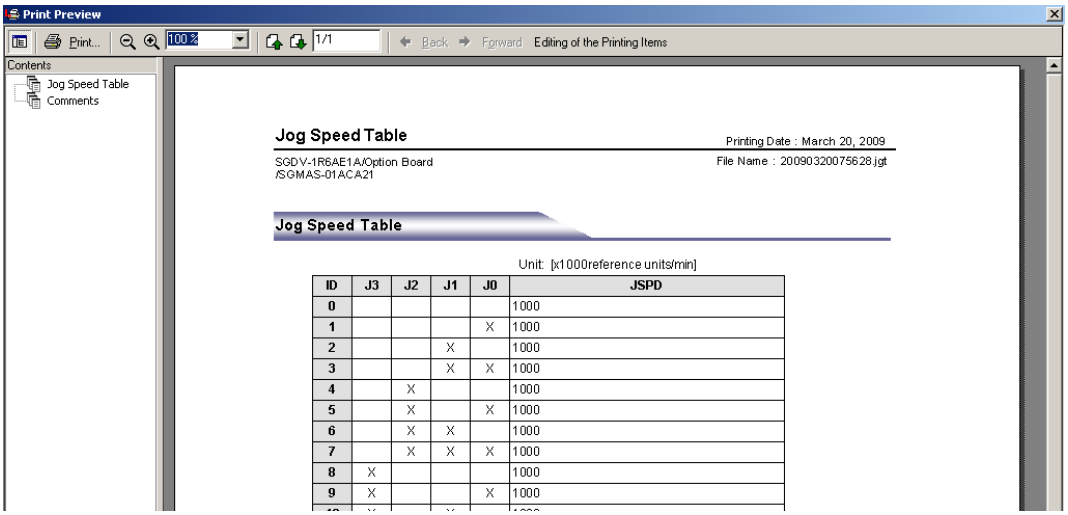
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



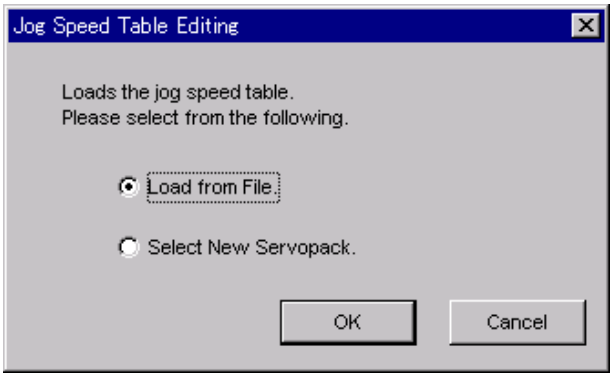
ID	J3	J2	J1	J0	JSPD
0					1000
1				X	1000
2			X		1000
3			X	X	1000
4		X			1000
5		X		X	1000
6		X	X		1000
7		X	X	X	1000
8	X				1000
9	X			X	1000

To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

■ When Offline

In the SigmaWin+ INDEXER component main window, click **Table** and then click **Edit Jog Speed Table**. The Jog Speed Table Editing box appears.

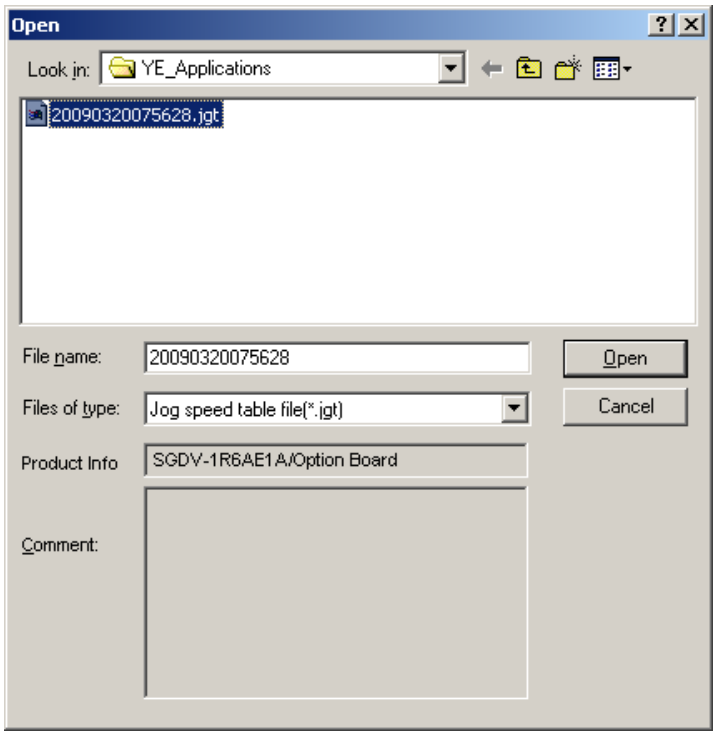


Load From File: Reads existing data.
Select New SERVOPACK: Creates new data.

Select the desired command and click **OK**.

<When "Load from File" is Selected>

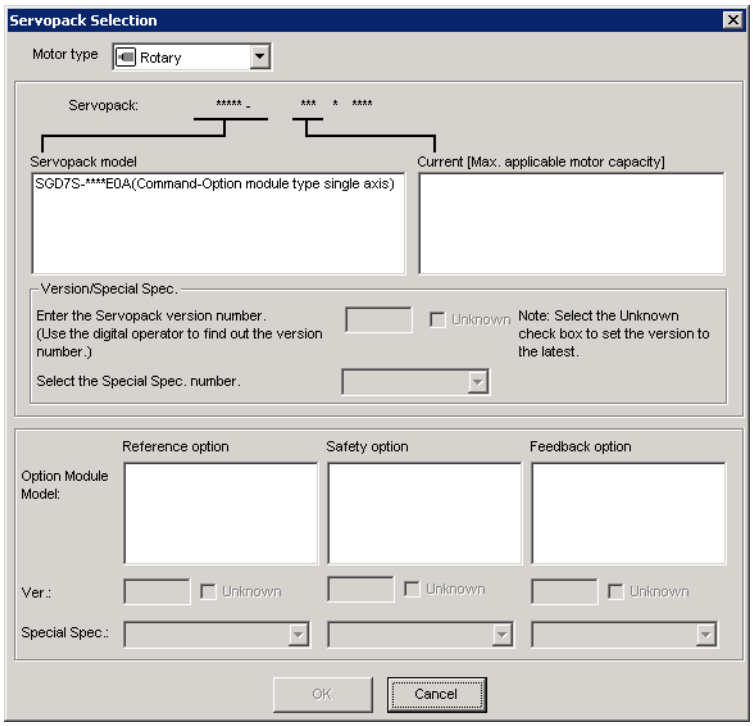
When "Load from File" is selected, the Open box appears.



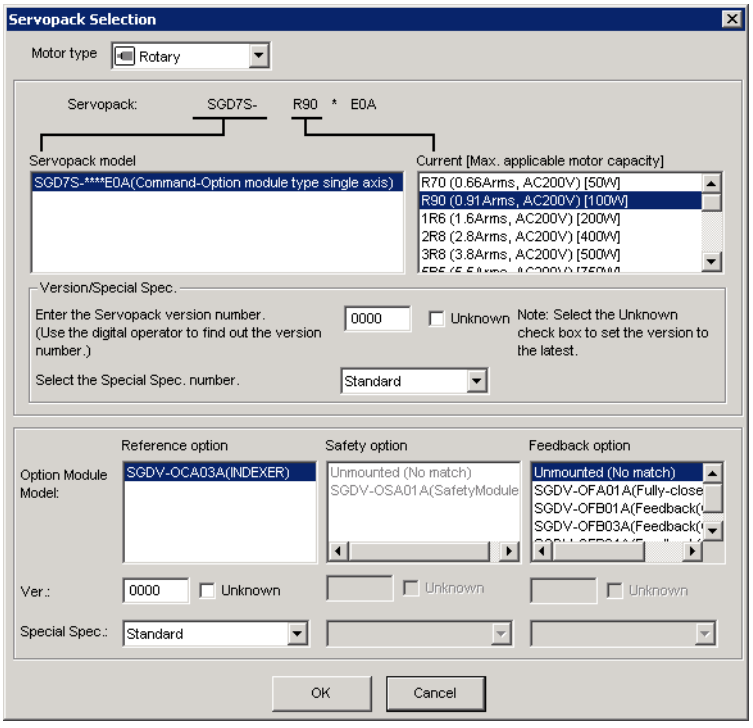
Select the data to be imported, and click **Open**.

< When "Select New SERVOPACK" is Selected >

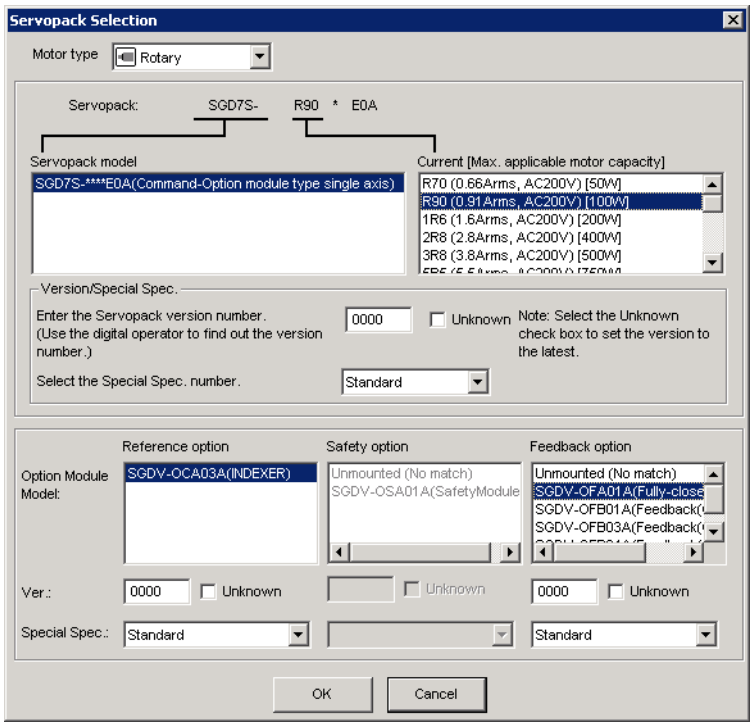
1. When "Select New SERVOPACK" is selected, the SERVOPACK Selection box appears.



2. Select the SERVOPACK model and current [max. applicable motor capacity].

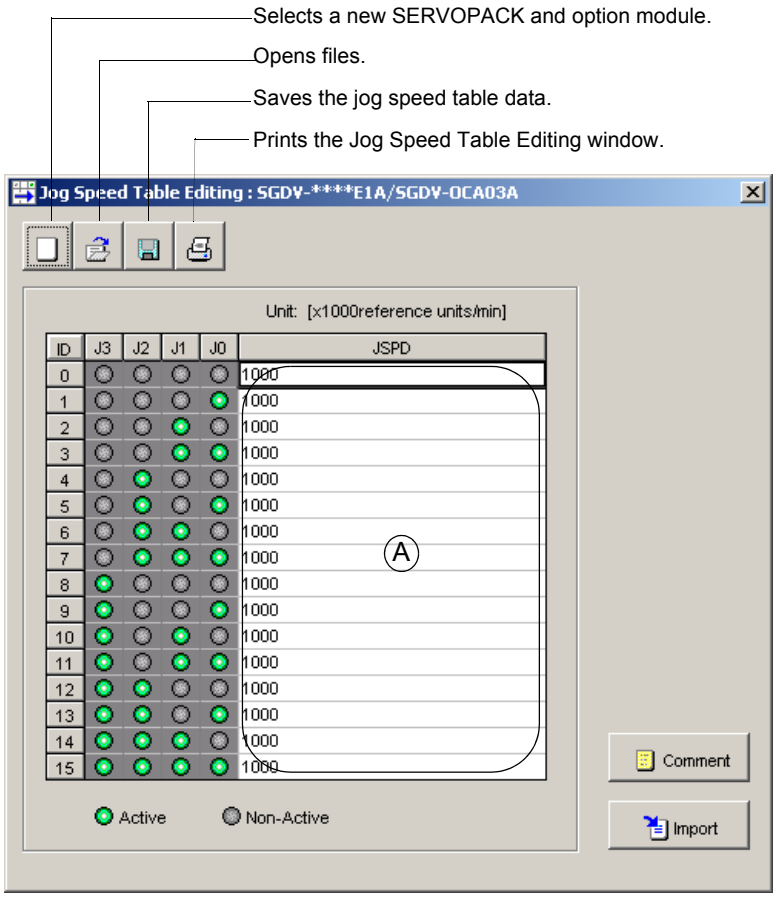


3. Type the version number of the SERVOPACK.
   If the version number is unknown, select **Unknown**.
4. Select the specifications of the SERVOPACK.
5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



6. Type the version number of the reference option module.
   If the version number is unknown, select **Unknown**.

7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Jog Speed Table Editing window will appear.



Jog Speed Table Editing Window (Offline Mode)

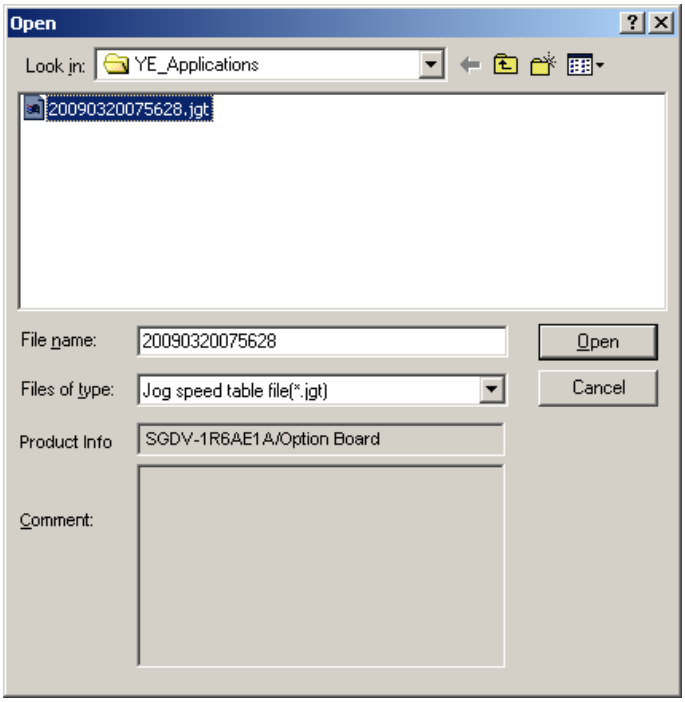
Box A: JSPD

The jog speed can be typed directly in this box.

(Open) Button

The parameter file can be loaded in the Open box. To load the file, use the following procedure.

1. Click the button, and the Open box appears.

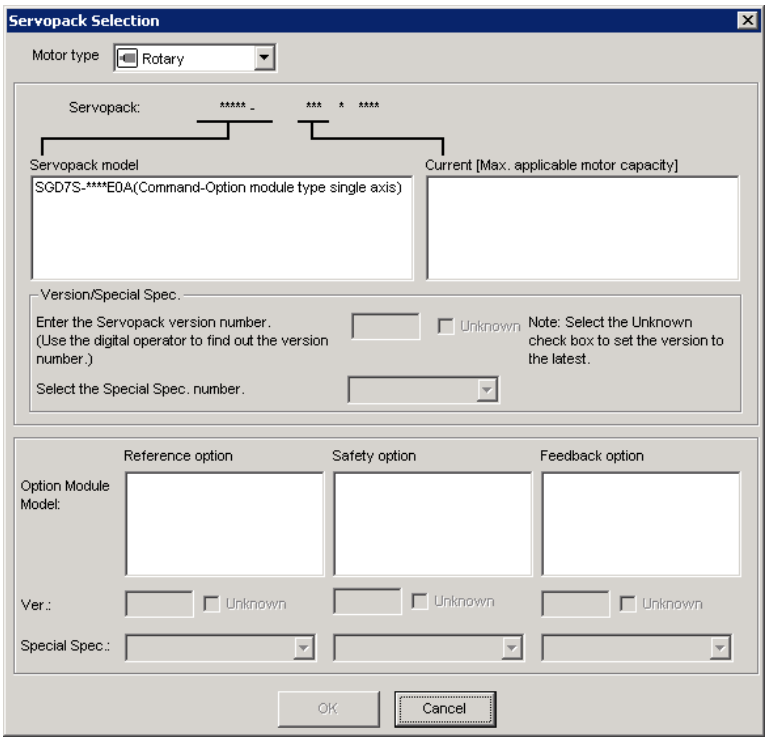


2. Select the name of the file to be imported, and click **Open**.

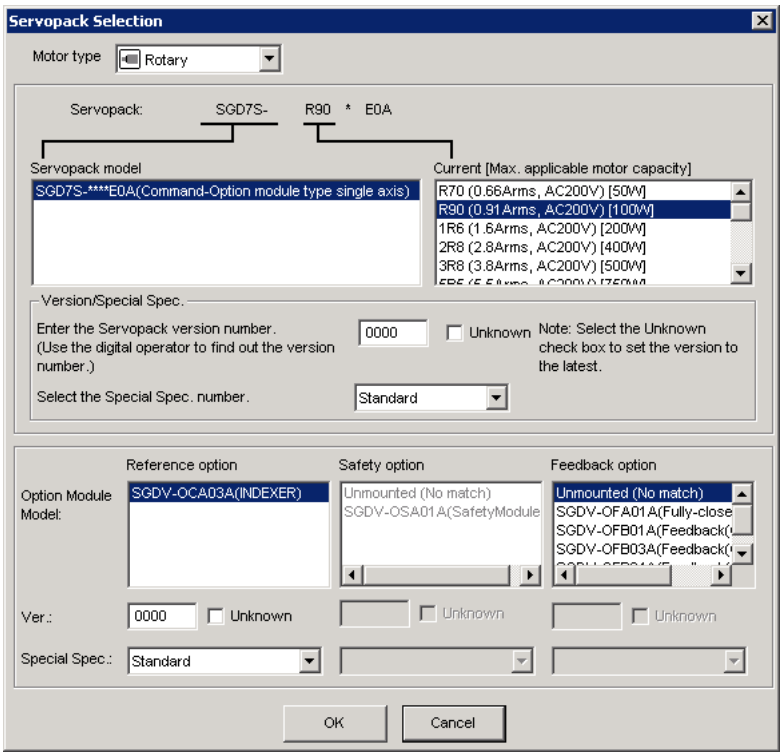
(New) Button

A new SERVOPACK and option module can be selected in the SERVOPACK Selection box using the New command. To change to a different SERVOPACK or option module, use the following procedure.

1. Click the button, and the SERVOPACK Selection box appears.

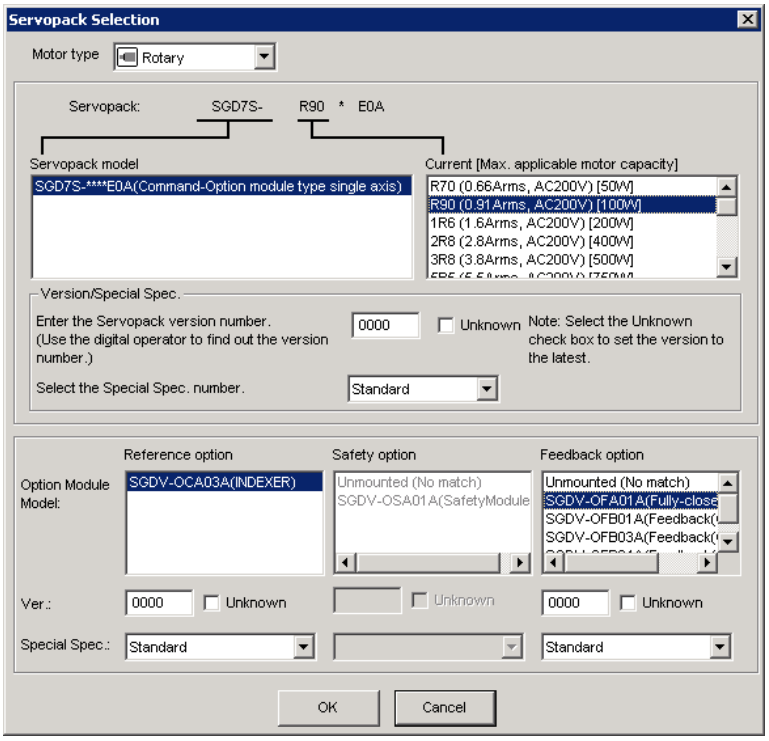


2. Select the SERVOPACK model and current [max. applicable motor capacity].



3. Type the version number of the SERVOPACK.
   If the version number is unknown, select **Unknown**.
4. Select the specifications of the SERVOPACK.

5. Select the reference option module. Select ***SGDV-OCA03A (INDEXER)***.



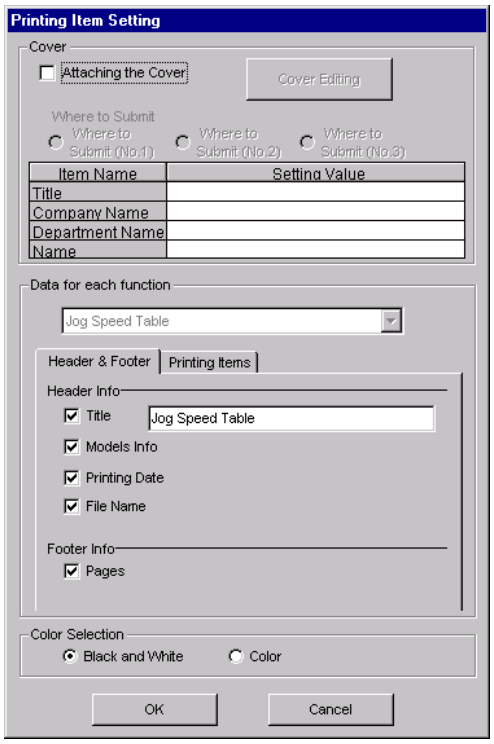
6. Type the version number of the reference option module.

   If the version number is unknown, select **Unknown**.

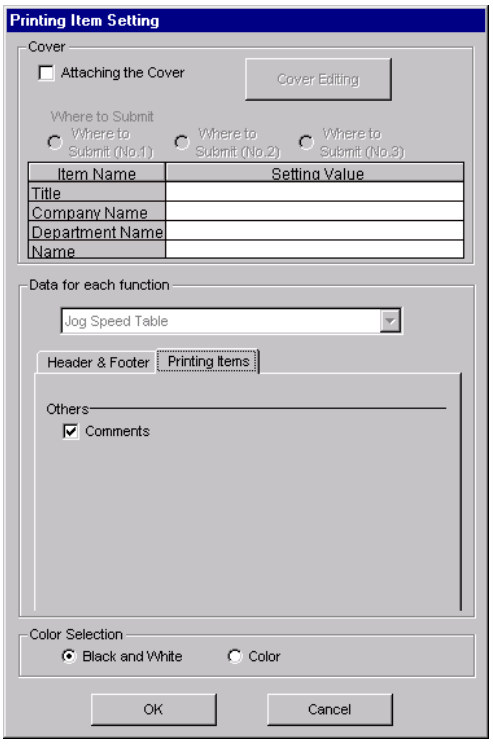
7. Select the specifications of the reference option module, and then click **OK**. The data will be imported, and the Jog Speed Editing window will appear.

(Print) Button

The data on the Jog Speed Table Editing window can be printed. To print the data, click the button. The Printing Item Setting dialog box appears.



Header & Footer Tab



Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

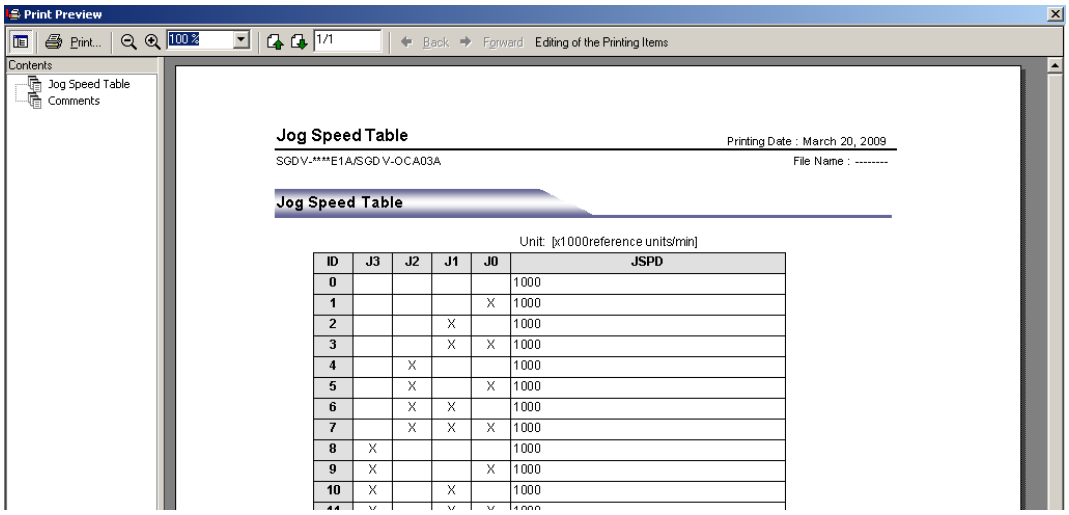
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.



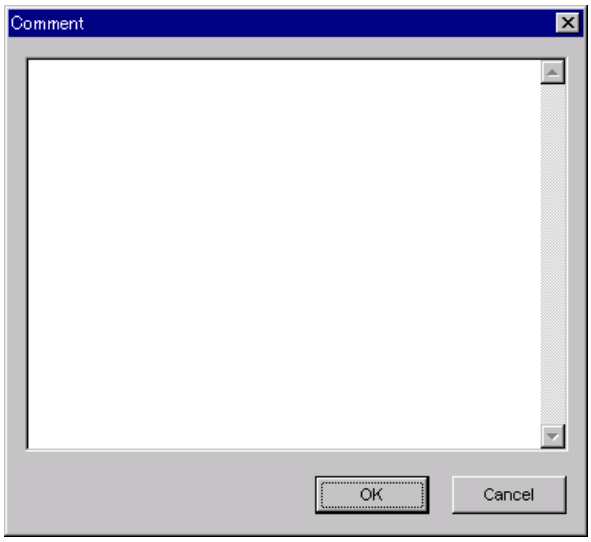
ID	J3	J2	J1	J0	JSPD
0					1000
1				X	1000
2			X		1000
3			X	X	1000
4		X			1000
5		X		X	1000
6		X	X		1000
7		X	X	X	1000
8	X				1000
9	X			X	1000
10	X		X		1000

To print the document as is without any changes, click **Print**.

To return to the Printing Item Setting dialog box and change some settings, click **Editing of the Printing Items**.

Comment

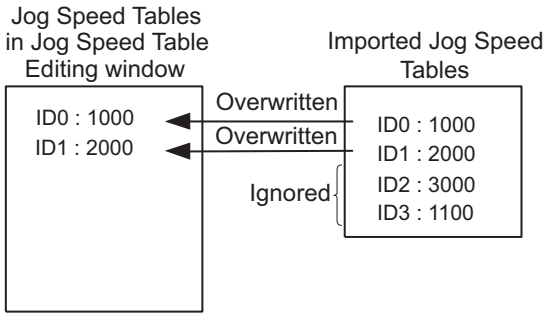
Comments can be typed or edited in the Comment box. Click **Comment**, and the Comment box appears.



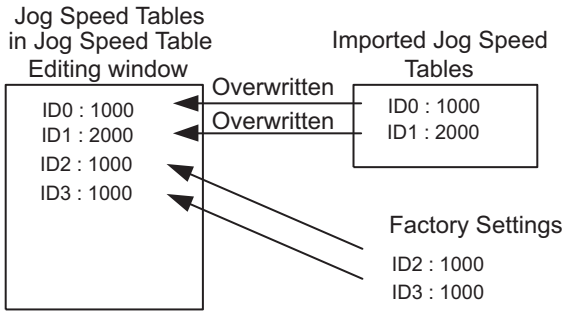
Import

Jog speed table settings can be transferred or imported from a stored file with the Import function. If the imported jog speed tables differ in number from the on-screen jog speed tables, the following processing takes place.

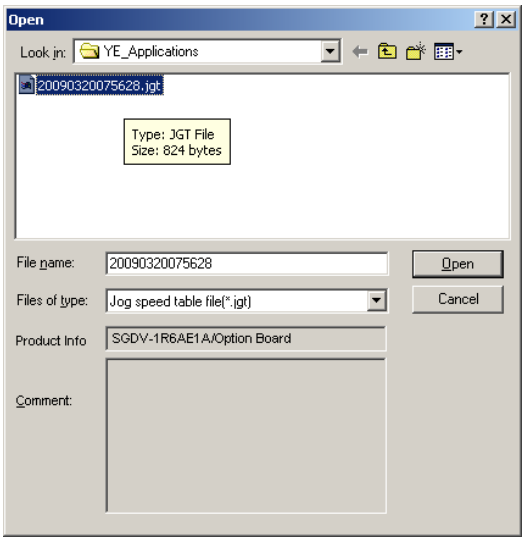
• If the number of imported jog speed tables is greater



• If the number of imported jog speed tables is fewer



1. Click **Import** and the Open box appears.



2. Select the file to be transferred, and click **Open**.

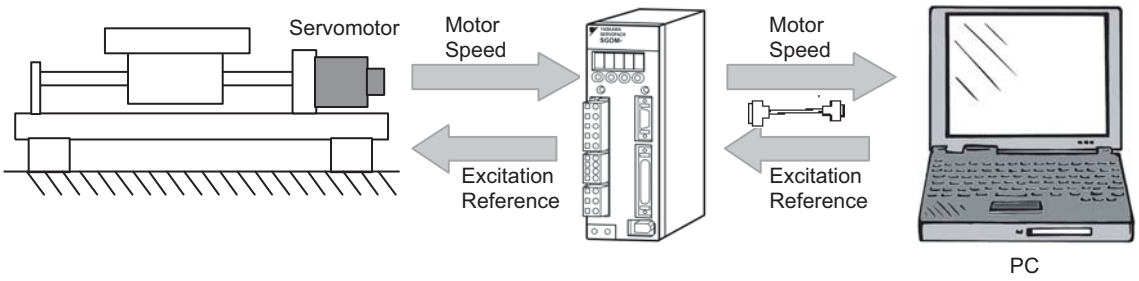
4.10 Solutions

4.10.1 Mechanical Analysis Function

■ Function Outline

Mechanical Analysis

This function measures the frequency characteristics of a mechanical system where a SERVOPACK is connected to a PC. It enables the measurement of mechanical frequency characteristics without the use of special equipment.



The function applies a mechanical excitation from the motor and measures the speed frequency characteristics in relation to the motor torque (force for linear motor). This allows the function to ascertain the resonance of the mechanical system from the measured frequency characteristics.

This function ascertains the mechanical resonance and uses it as a reference for servo tuning and mechanical changes. Study of mechanical changes is necessary because the servo performance cannot be fully realized according to the machine rigidity. This will become a direction (reference value) for adjustment of parameters such as those for servo rigidity, and the torque (force) filter time constant, in servo tuning.
Also, it will be used for the notch filter setting and parameter inputs (Pn110 and later) used in high-speed machine positioning such as the machine control functions.
For specific application procedures, refer to the product manual for your SERVOPACK.

⚠ WARNING

Using the mechanical analysis function while the motor is running is dangerous.

Be sure to check related information in this manual before using this function.

Pay particular attention to the following.

- Check the safety of the area adjoining the drive units.

  The motor runs for 2 sec. maximum per excitation/measurement while using this function.

  Make sure that there is no danger in running the motor before execution.

- Correctly set the allowable rotation (movement).

  Damage to the machine due to overrun, etc., may result if this is not set properly.

  Also, there is a limit to the allowable rotation (movement) per excitation/measurement. The excitation starting position may deviate if excitation is performed multiple times. Be sure to check this before excitation/measurement.

- When the mechanical analysis function is used for a vertical axis, check the safety of the system.

  When the mechanical analysis function is used for a vertical axis, select **Vertical mode** from Driving Mode Selection and confirm that the axis level does not drop when the servo is turned off.

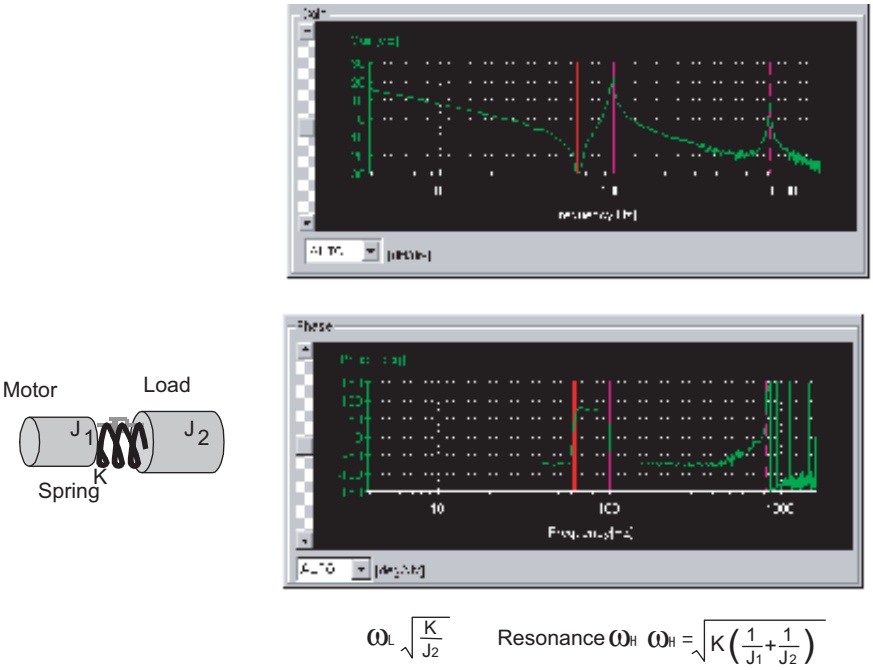
- Always reset the origin after quitting the mechanical analysis function.

  The mechanical analysis function causes the position to deviate because it executes motor excitation by the torque (force) reference. After quitting this function, be sure to return to the origin and reset the position before regular operation of the motor. Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.

Frequency Characteristics

The analysis function ascertains machine characteristics by applying an excitation to the machine using the motor, and measuring the frequency characteristics from the torque (force) to the motor speed. In a typical machine the resonance frequency becomes clear if the gain and phase are graphed (Bode Plot) as shown in Figure below. The Bode Plots show the size of the response of the machine to which the torque (force) is applied (gain), and the phase delay (phase) of the response for each frequency. The machine resonance frequency can be ascertained from the maximum frequency of the valleys (anti-resonance) and peaks (resonance) of the gain and the phase delay.

In a motor unit and rigid machine the gain and phase change gradually in the board line.

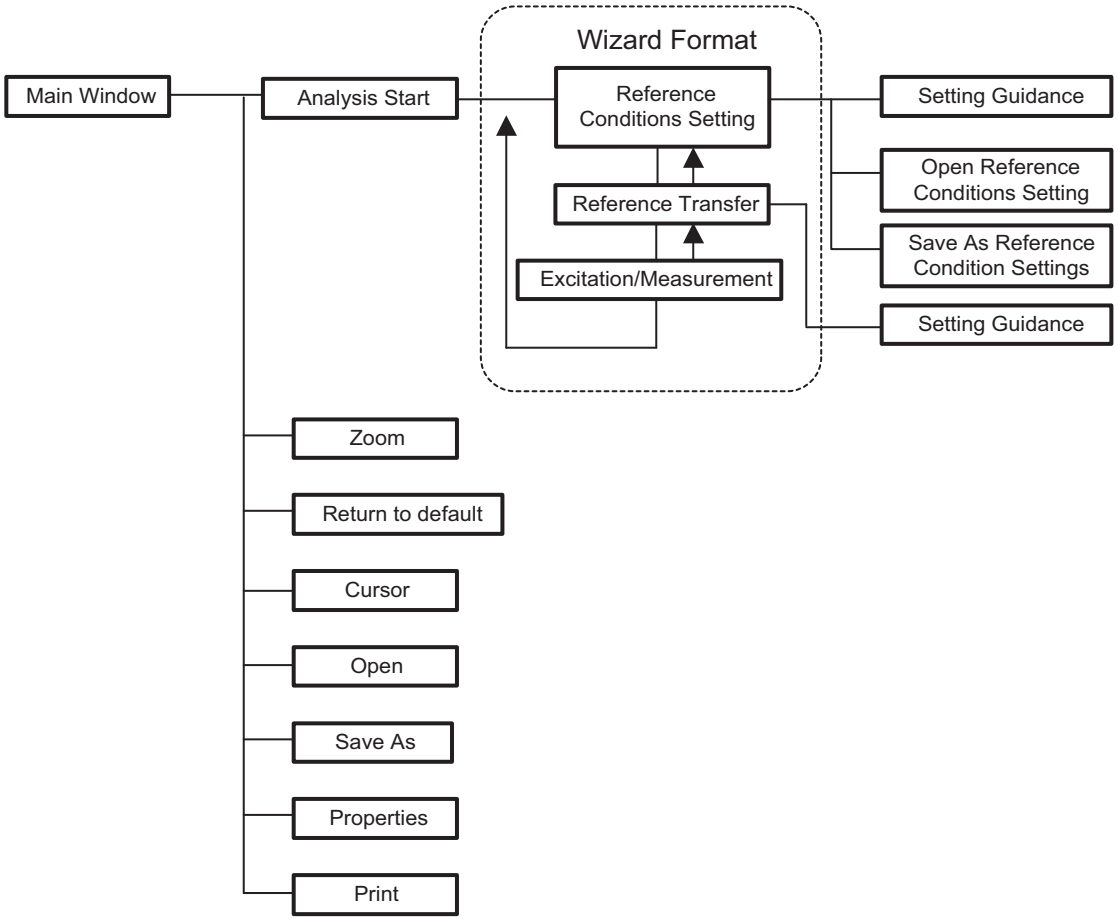


$\omega_L \sqrt{\frac{K}{J_2}}$ Resonance ω_H $\omega_H = \sqrt{K\left(\frac{1}{J_1}+\frac{1}{J_2}\right)}$

Frequency Characteristics of the Inertia Model

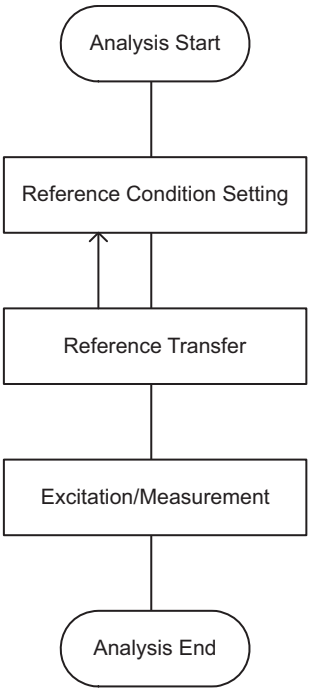
■ Structure

The following flowchart shows how the mechanical analysis function works.



■ Analysis

A mechanical analysis wizard will lead you through the steps of analyzing a connected SERVOPACK. The following flowchart shows the steps involved in analyzing the frequency characteristics.



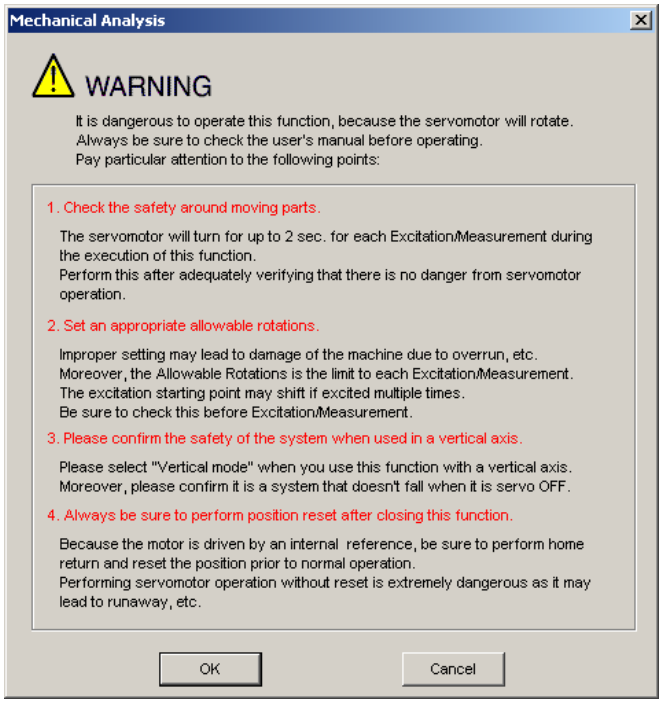
Main Window

Open the main window of the mechanical analysis function using the following procedure.

In the SigmaWin+ Σ-7 component main window, click **Solution**, and then click **Mechanical Analysis**. A warning message appears reminding you of the dangers that are possible when using this operation.
(Although the following windows describe the rotary motor, all instructions, warnings etc. apply to both rotary and linear motors.)

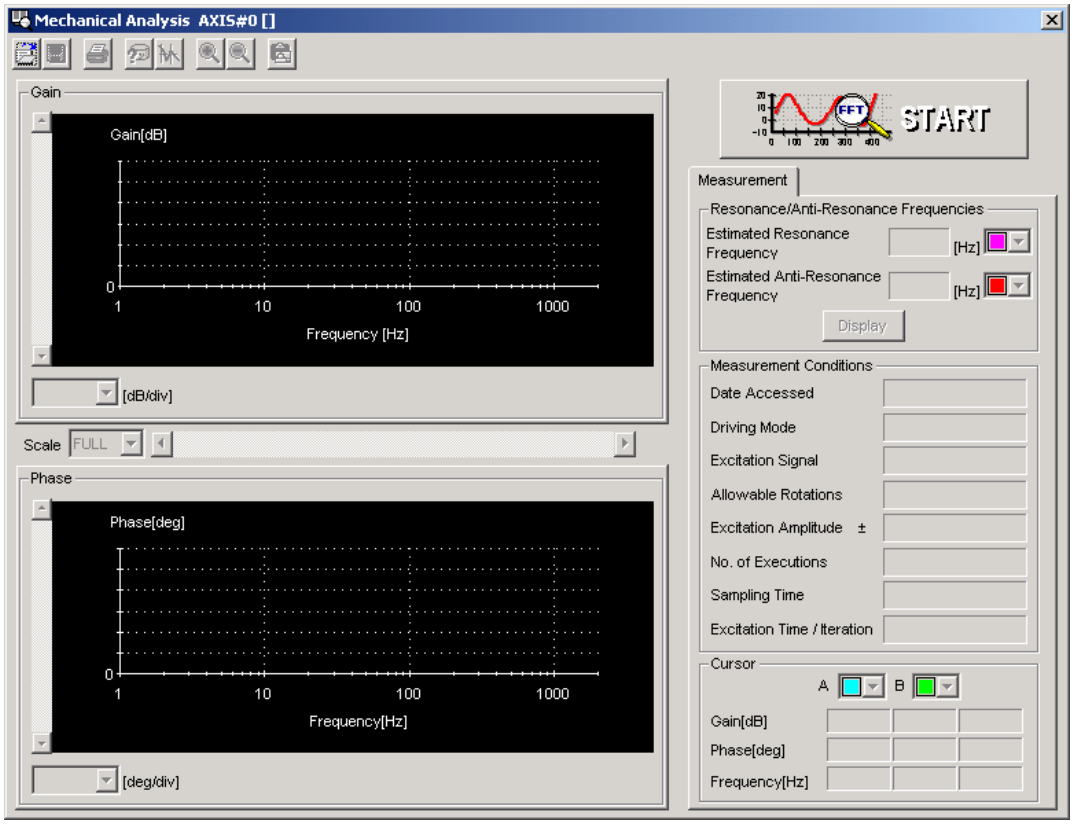
INFO

If more than one axis is being used, the **Axis Selection** dialog box appears.
First select the axes to adjust according to the **Axis Selection** dialog box. For the procedure, refer to *4.1 Changing Axes*.



Click **Cancel** to return to the SigmaWin+ Σ-7 component main window without carrying out mechanical analysis.

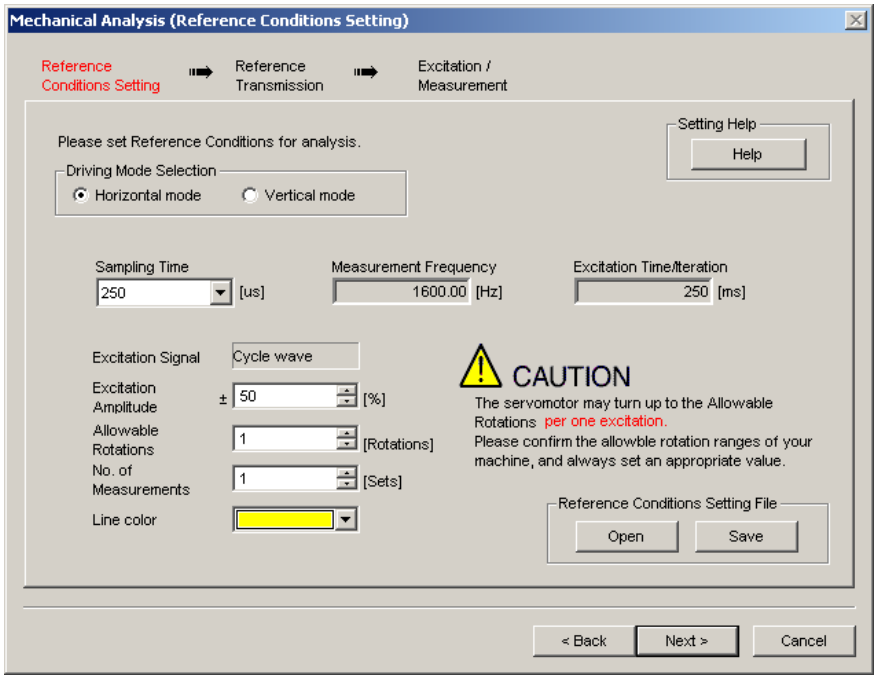
Click **OK**, and the Mechanical Analysis main window appears.



Mechanical Analysis Main Window

Reference Condition Setting

In the Mechanical Analysis main window, click **START**, and the Reference Conditions Setting box appears. Select the conditions for exciting the machine with the motor and measuring the frequency characteristics.



Reference Conditions Setting Box

Driving Mode Selection

Horizontal mode: Excite the motor with the torque control.
Do not use this mode for the vertical axis. The load may droop.

Vertical mode: Excite the motor with the position control.
The servo ON status is maintained during the motor run/measurement. The SERVOPACK will not turn to servo OFF status automatically.
Use this mode for the vertical axis. A control such as notch filter is applied to this mode, so the characteristics differ from those of the horizontal mode.

⚠ CAUTION

- Always confirm that the gain setting is stable before starting operation in vertical mode. Because position control is applied in vertical mode, the motor may vibrate if not stable.

Sampling Time/Measurement Frequency/Excitation Time

Select a sampling time. The sampling time must be selected from the list. The shorter the sampling time, the higher the measurable frequency and the shorter the excitation time will be. If the sampling time is shortened, however, the frequency resolution will be degraded and the measurement accuracy, particularly at low frequencies, will be lowered. The sampling time determines the measured frequency and excitation time. First, select a short sampling time, and then determine the best sampling time while checking the measurement results.

Excitation Signal

The type of excitation signal is assumed to be only cycle wave.

Excitation Amplitude (1 to 300%)

Select the size of the reference amplitude applying excitation to the motor as a percentage of the ratio of size to rated torque (force). A larger excitation amplitude tends to give more correct measurements, but an excessively large amplitude can cause overspeed (A.510) and overcurrent (A.100) alarms. Problems with the load inertia (mass for linear motor) and the balance would cause the alarms to occur, and accurate measurements would be impossible. Also, the excitation amplitude must be set to a value below the "Torque (Force) Limit". Remember that the accurate measurement is not possible if the torque (force) is restricted during excitation.

For information on torque (force) limiting, refer to the product manual for your SERVOPACK.

Allowable Rotations (1 to 1000)
(Allowable Movements (1 to 1000 mm) for linear motor)

Select the limit of motor rotations (movements) during measurement. If the allowable number of rotations (movements) is exceeded, the motor will stop by zero clamp function and measurements will be halted. Consider the deceleration ratios for the pulley radius, ball screws, and so on, and then select a number of motor rotations (movements). When reducing the number of motor rotations (movements), also reduce the excitation amplitude and the sampling time.

⚠ CAUTION

- The allowable rotations (movements) is a restriction for each excitation period. In multiple excitation applications, the excitation start position might shift. Check the range of motion each time excitation is applied.

- Detection of the allowable rotation (movement) in the SERVOPACK may be delayed by a maximum of 2 ms. If so, operation may exceed the settings due to factors such as inertia (mass) size and interference from speed. Include a margin when setting the allowable number of rotations (movements).

No. of Measurements (1 to 5 sets)

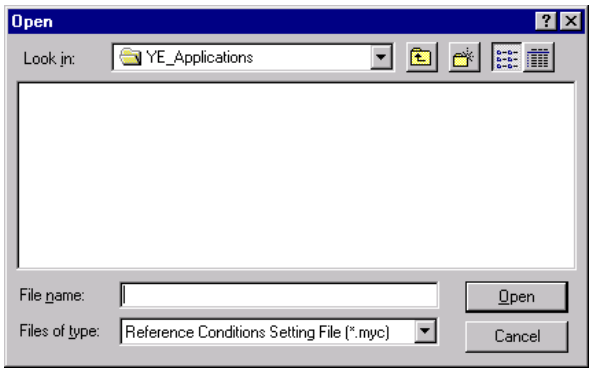
Select the number of times that the measurements should be taken to get an average of the measurements. One set is a back-and-forth operation that starts excitation or measurement from the forward side and excitation/measurement from the reverse side. More measurement iterations tends to yield more accurate measurements, but the time required for measurement increases.

Line Color

Select the colors of the lines used in the graph of the measurement results.

Open

In the Reference Conditions Setting box, click **Open**, and the reference conditions files are displayed.

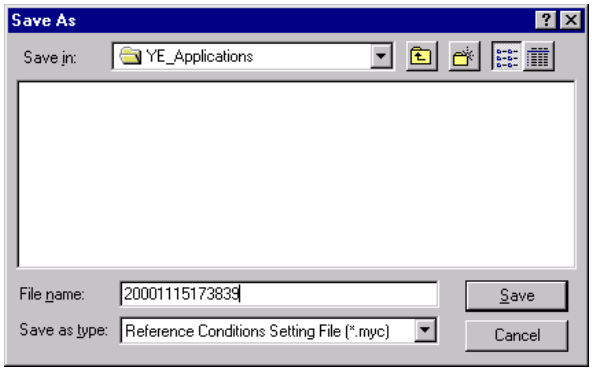


Open Dialog Box

Click **Open** to read the designated reference conditions setting file. Click **Cancel** to return to the Reference Conditions Setting box without reading the file.

Save

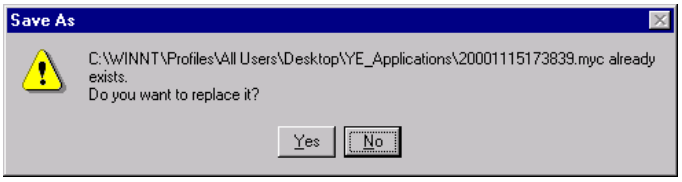
In the Reference Conditions Setting box, click **Save**, and then select the storage location for the setting file shown in the Reference Conditions Setting box.



Save As Dialog Box

Click **Save** to store the file name designating the current reference conditions. Click **Cancel** to return to the Reference Conditions Setting box without saving the file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



Click **Yes** to overwrite the already existing file. Click **No** to return to the Save As dialog box without saving the file.

Help

Click **Help** to open the window for guidelines on the reference condition settings.
See <Guidelines for Reference Condition Settings> for details.

Next>

Click **Next** to view the Reference Transmission box.

<Back/Cancel

Click **Back** or **Cancel** to return to the Mechanical Analysis main window.

After the setup has been successfully completed, click **Next**, and the Reference Transmission box appears.

<Guidelines for Reference Condition Settings>

- Run the motor to excite the machine and measure the frequency characteristics.
- Set **Driving Mode**, **Sampling Time**, **Excitation Amplitude**, and **No. of Measurements**.
- Accurate measurement of the frequency characteristics depends on the settings. See the measurement results to determine the proper settings. See the guidelines for each setting.
- The number of **Allowable Rotations (Movements)** must be set so that measurements can be taken safely. Set the motor revolutions (movements) so the setting is within the operable range.

Driving Mode Selection

Horizontal mode is used to run a motor with torque control, and Vertical mode is used with position control.

Use Vertical mode for a vertical axis to prevent the load from dropping (shifting).

A control such as notch filter is applied to Vertical mode, so the characteristics differ from those of Horizontal mode.

Sampling Time [μs] (Measurement Frequency [Hz], Excitation Time [ms])

As sampling time is shortened, the higher the frequencies are that can be measured and the shorter the excitation time becomes. However, frequency resolution will deteriorate.
Measurement accuracy becomes especially poor at low measuring frequencies.
Measuring frequency and excitation time depend on the sampling time.
First, set the sampling time to a certain small value. Then see the results of the measurement and determine the proper sampling time.

Excitation Signal: Cycle Wave (fixed)

Excites the machine with a cycle wave.

Excitation Amplitude [±%/Rated torque (force)] Range: 1% to 300%

Select the size of the reference amplitude applying excitation to the machine as a percentage of the ratio of size to rated torque (force).
A larger excitation amplitude tends to give more accurate measurements, but an excessively large amplitude can cause overspeed (A.510) and overcurrent (A.100) alarms. Problems with the load inertia (mass) and the balance would cause the alarms to occur, and accurate measurements would be impossible.
Also, the excitation amplitude must be set to a value below the "Torque (Force) Limit." Remember that accurate measurement is not possible if the torque (force) is restricted during excitation.

For information on torque (force) limiting, refer to the product manual for your SERVOPACK.

Allowable Rotations [Rotation] Range: ±1 to 1000 Rotations
Allowable Movements [mm] Range: ±1 to 1000 mm (for linear motors)

Select the limit for motor rotations (movements) during measurement. If the allowable number of rotations (movements) is exceeded, the motor will stop by zero clamp function and measurement will be halted.
Consider the deceleration ratios for the pulley radius, ball screws, and so on, and then select a number of motor rotations (movements).
When reducing the number of motor rotations (movements), also reduce the excitation amplitude and the sampling time.

⚠ CAUTION

- The allowable rotations (movements) is a restriction for each excitation period. In multiple excitation applications, the excitation start position might shift. Check the range of motion each time excitation is applied.

- Detection of the allowable rotation (movement) in the SERVOPACK may be delayed by a maximum of 2 ms. If so, operation may exceed the settings due to factors such as inertia (mass) size and interference from speed. Include a margin when setting the allowable number of rotations (movements).

No. of Measurements [Set] Range: 1 to 5

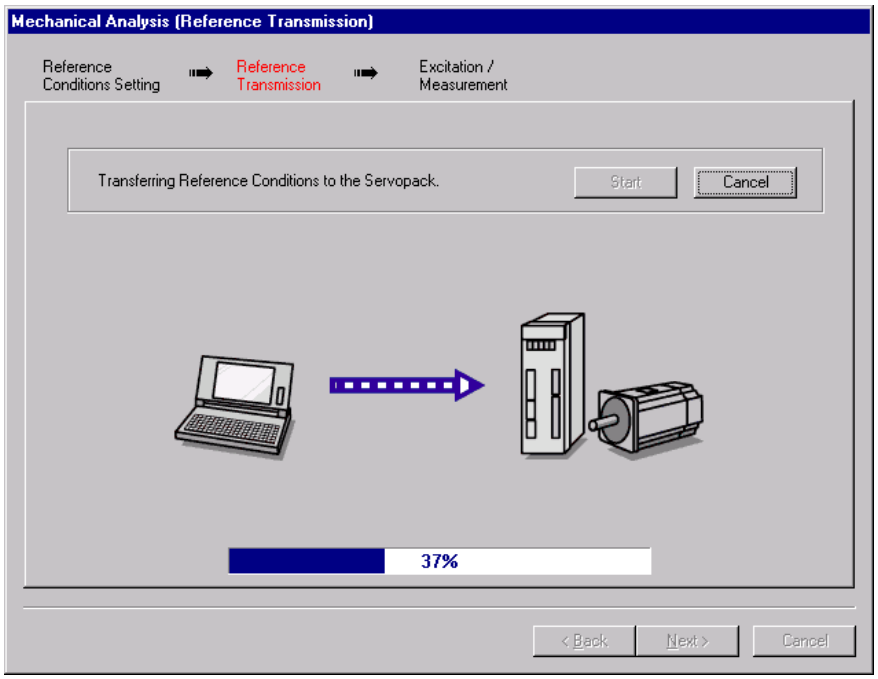
Select the number of times that the measurements should be taken to get an average of the measurements. One set is a back-and-forth operation that starts excitation or measurement from the forward side and excitation/measurement from the reverse side. More measurement repetitions tend to yield more accurate measurements, but the time required for measurement will increase.

Line Color

Select the colors of the lines used in the graph of the measurement results.

Reference Transmission

In the Reference Transmission box, transfer the reference conditions to the SERVOPACK. Click **Start** to begin the transfer.



Reference Transmission Box

Start

Click Start to transfer the reference conditions to the SERVOPACK. A progress bar displays the progress status of the transfer.

Cancel

The Cancel button is available only during the transfer to the SERVOPACK. After the transmission is finished, it is unavailable and cannot be selected.

Next>

The Next button is available if the data is transferred successfully. If an error occurs or if the transmission is interrupted, it is unavailable and cannot be selected.

Click **Next** to view the Excitation/Measurement box.

<Back

Click **Back** to return to the Reference Conditions Setting box. The Back button is unavailable during a data transfer.

Cancel

Click **Cancel** to stop processing and return to the main window without transferring the reference conditions.

After the data has been successfully transferred, click **Next**, and the Excitation/ Measurement box appears.

Excitation/Measurement

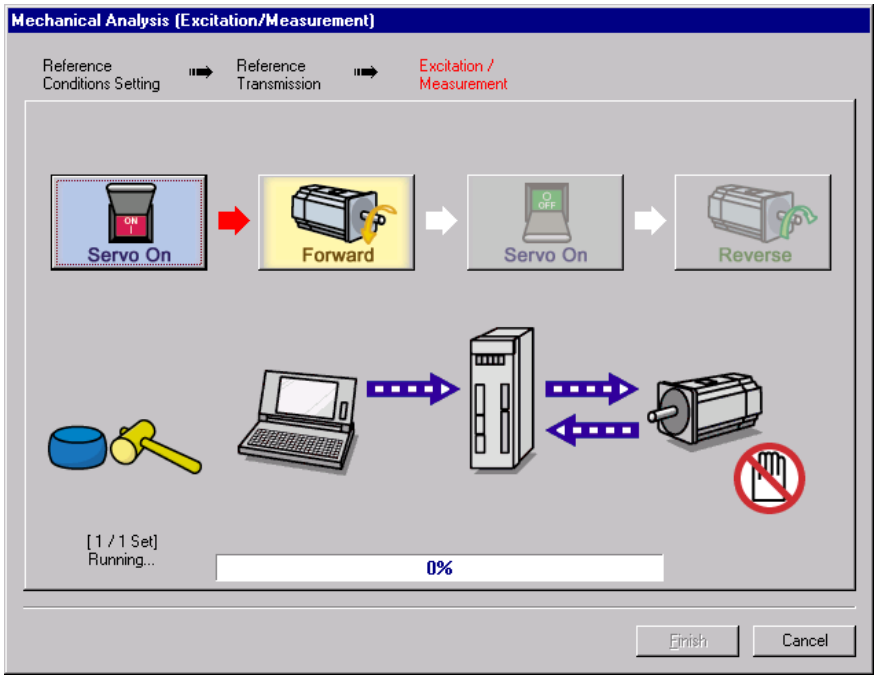
> Note: Strange noises may be made by the motor during excitation or measurement, but this is not unusual and it is not a mechanical error.

In the Excitation/Measurement box, excite the actual motor and take measurements. The measurement will be taken the number of times designated in the Reference Conditions Setting box.

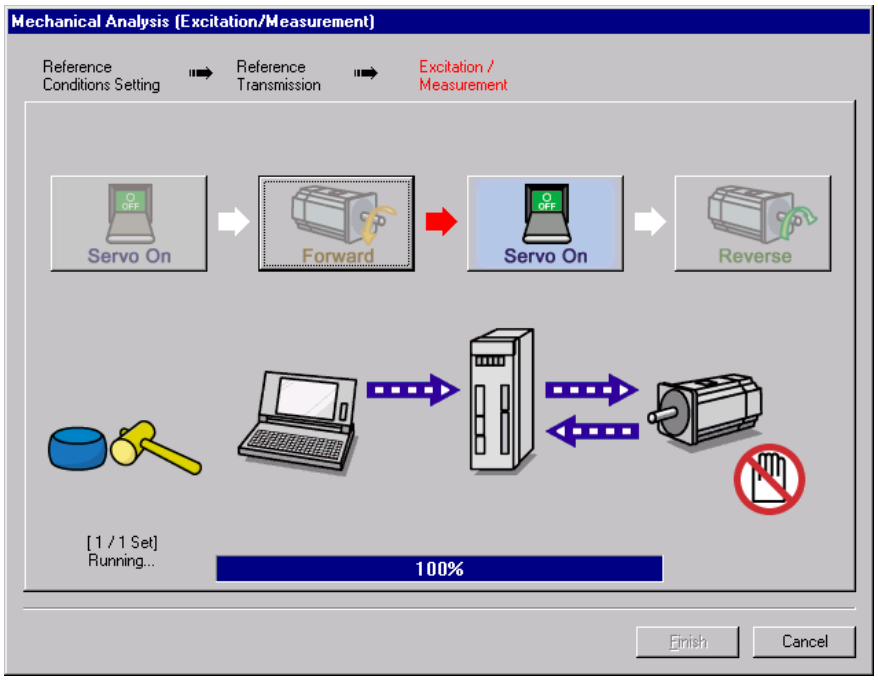
Excite the motor and take measurements using the following procedure.

<For horizontal mode>

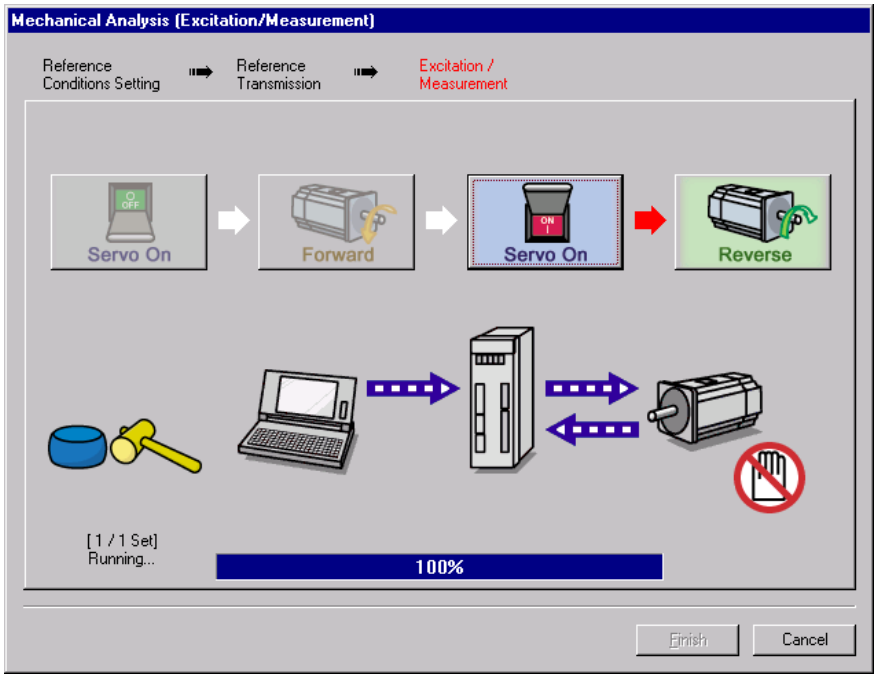
1. Click **Servo ON** to turn on the servo power.



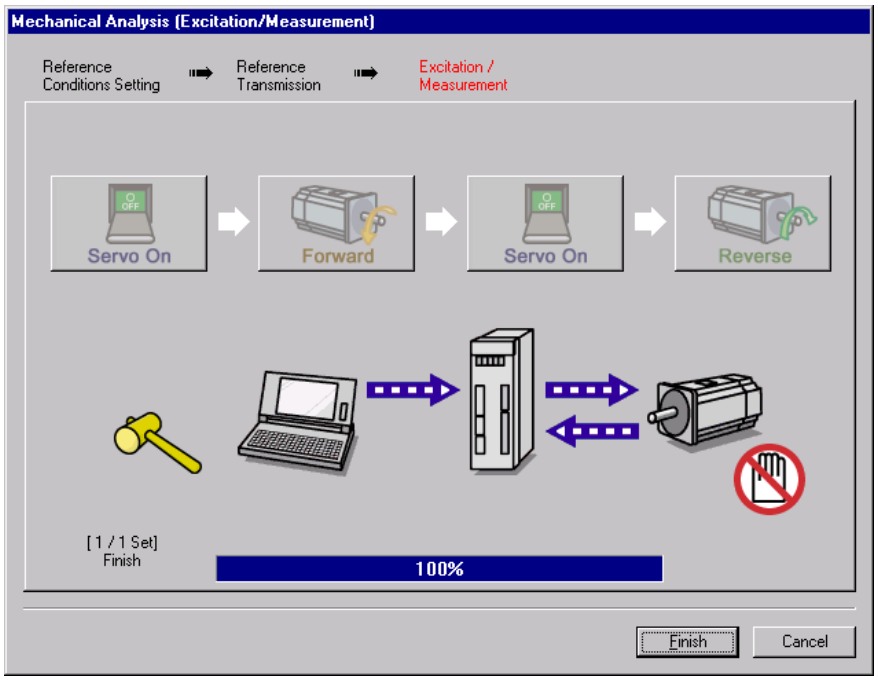
2. Click **Forward** to take measurements by turning (moving) the motor forward. After the measurements and the data transmission are finished, the following window appears.



3. Click **Servo ON** to turn on the servo power.



4. Click **Reverse** to take measurements by turning (moving) the motor in reverse. After the measurements and the data transmission are finished, the following window appears.



5. Repeat steps 1 through 4 until all the measurements have been taken the specified number of times.

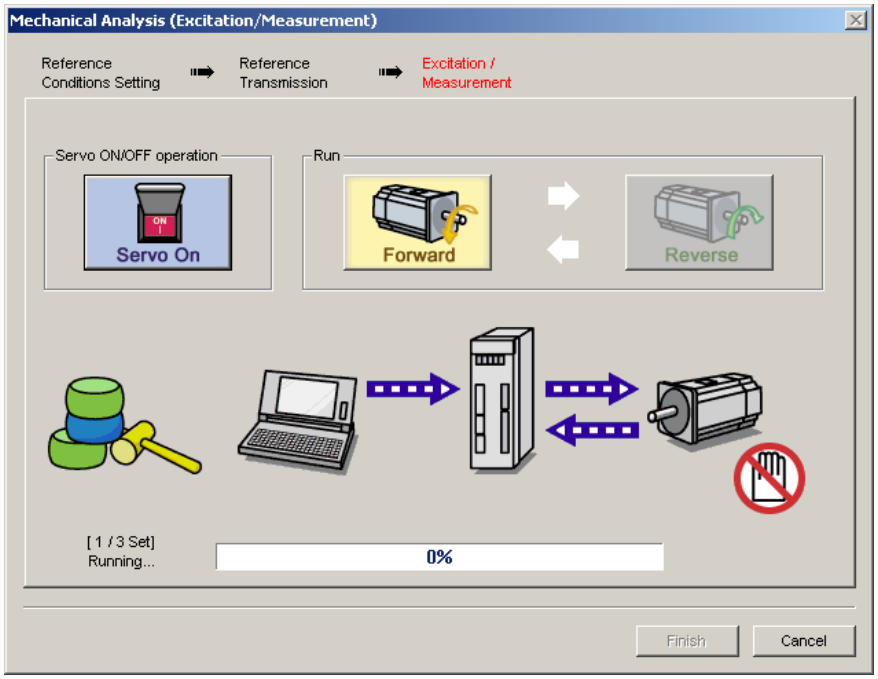
   The actual number of times the measurements have been taken is displayed in the lower left part on the screen.

   The progress bar displays the transfer status of the current batch.

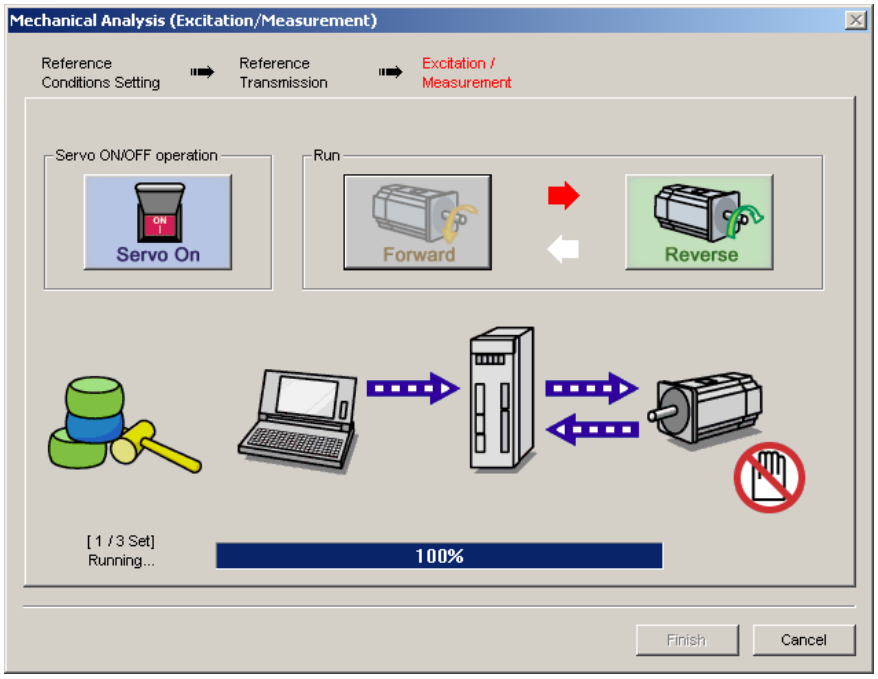
6. After the measurement has been successfully completed, click **Finish** to return to the main window.

<For vertical mode>

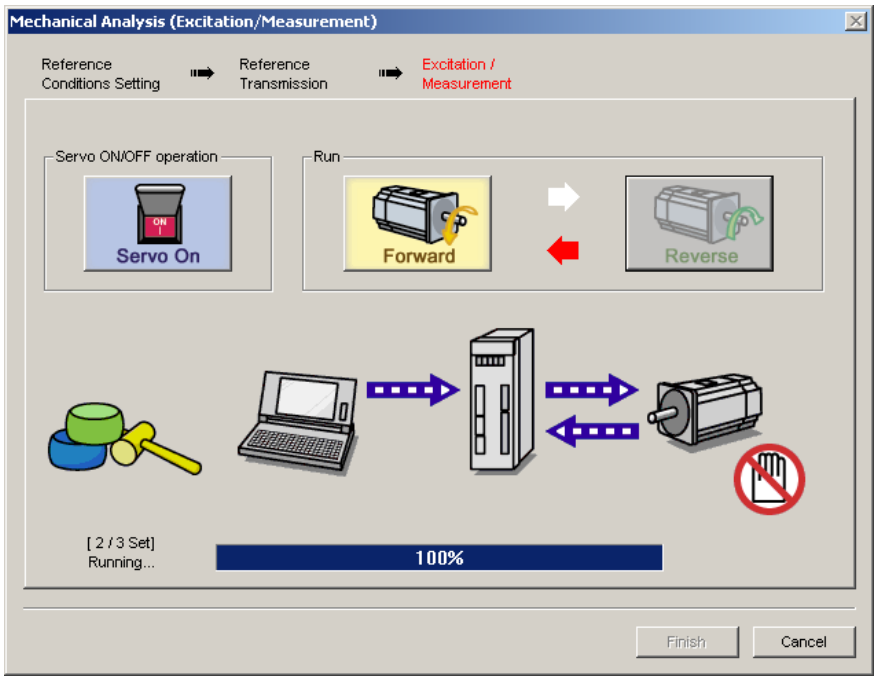
1. Click **Servo ON** to turn on the servo power.



2. Click **Forward** to take measurements by turning (moving) the motor forward. After the measurements and the data transmission are finished, the following window appears.



3. Click **Reverse** to take measurements by turning (moving) the motor in reverse. After the measurements and the data transmission are finished, the following window appears.



4. Repeat steps 1 through 3 until all the measurements have been taken.

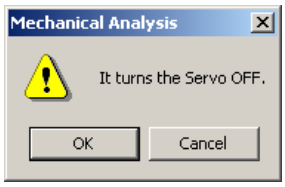
   The actual number of times the measurements have been taken is displayed in the lower left part on the screen.

   The progress bar displays the transfer status of the current batch.

5. After the measurement has been successfully completed, click **Servo ON** to turn to the servo OFF status.

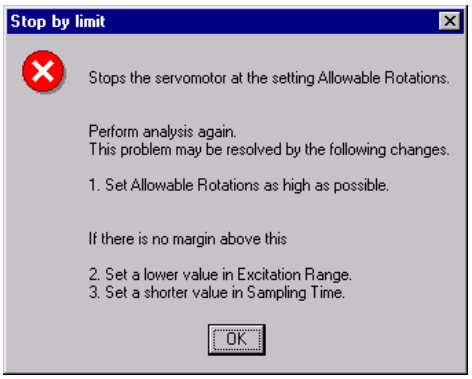
6. Click **Finish** to return to the main window.

   When **Finish** is clicked without turning to servo OFF status, the following window appears.



   Click **OK** to turn to servo OFF status.

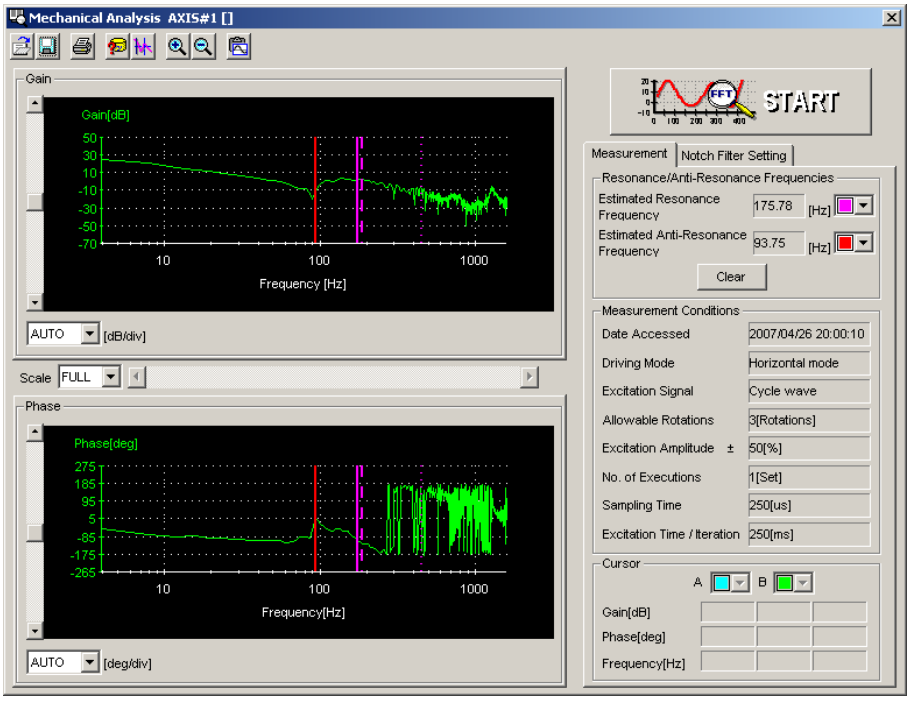
For both the horizontal and vertical modes, if the motor stops because the excitation was excessive, an error message appears prompting you to change the settings.



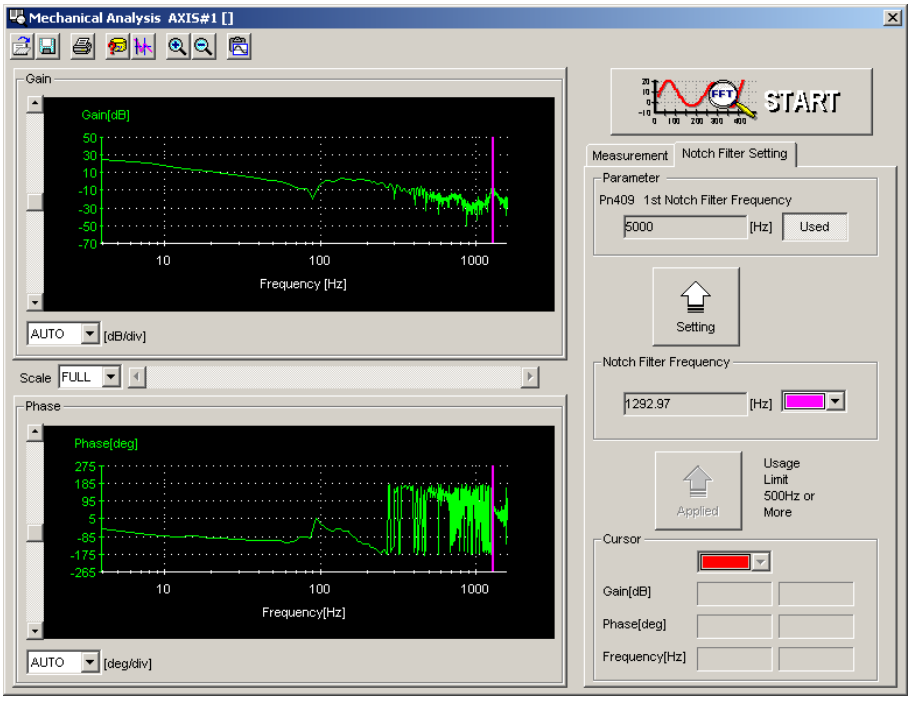
Click **OK** to stop taking measurements and return to the main window.

■ Main Window

The Mechanical Analysis main window displays the analysis results. To view the conditions in which the analysis was done, click the Measurement tab or the Notch Filter Setting tab.

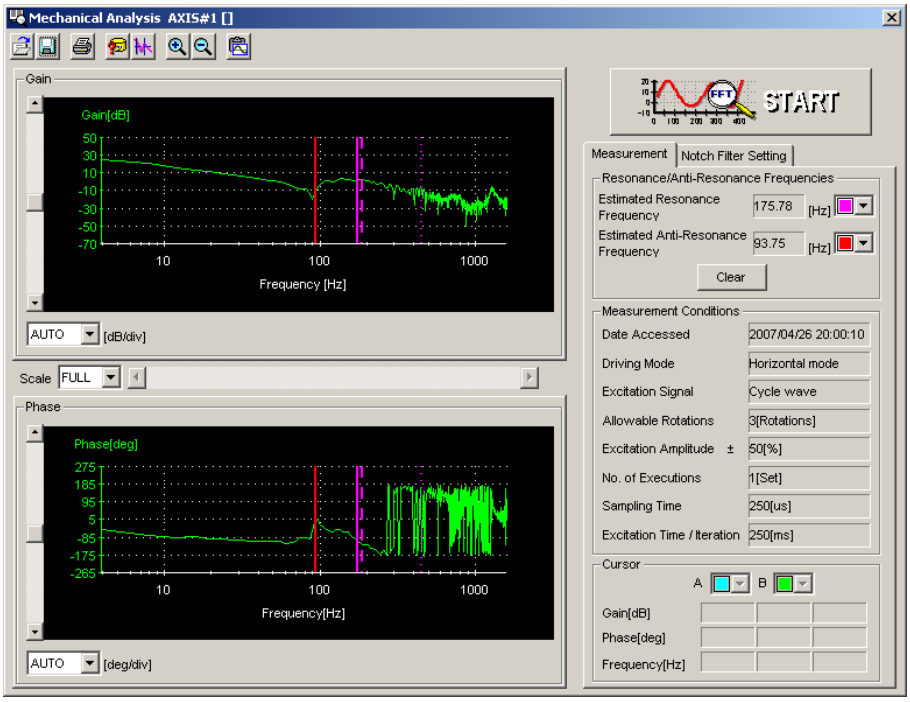


Mechanical Analysis Main Window (Measurement Tab)

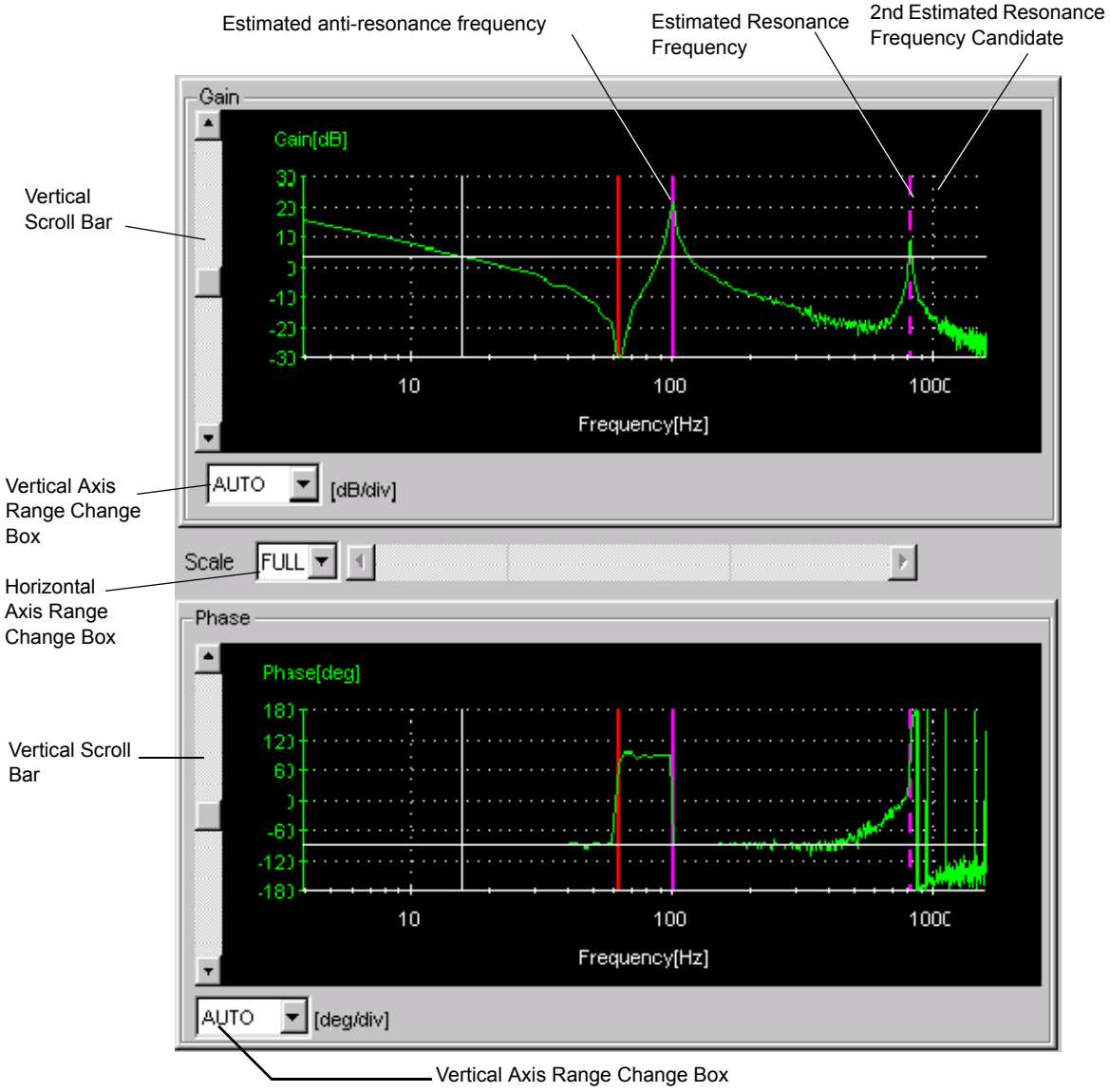


Mechanical Analysis Main Window (Notch Filter Setting Tab)

Measurement Tab



Gain Graph/Phase Graph



Gain Graph and Phase Graph

Vertical Axis Range Change Box/Vertical Scroll Bar

The individual range for the vertical axis for both the gain graph and the phase graph can be set.

Select the range from the corresponding box. The units for the gain graph are "dB" and the units for the phase graph are "deg."

If AUTO is selected, the range widths will be automatically adjusted so that all of the data can be shown in the graph. When the window is too small to show all of the vertical axis, a vertical scroll bar is displayed to allow you to view all of the axis.

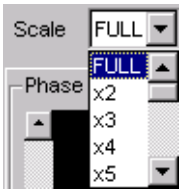
The range must be selected from the list.

Vertical Axis Range Change Box

Horizontal Axis Range Change Box/Horizontal Scroll Bar

The horizontal axis range is for both the gain graph and the phase graph, and so is displayed with a multiple. The unit of both the gain and phase graph is "Hz."

If FULL is selected, all of the data will be automatically adjusted so that the entire horizontal axis can be displayed. When the window is too small to show all of the horizontal axis, a horizontal scroll bar is displayed to allow you to view all of the axis



Horizontal Axis Range Change Box

Resonance/Anti-Resonance

In case that the estimated model is double inertia model, the corresponding text boxes display the estimated resonance and anti-resonance frequencies. The cursor shows the positions of the estimated resonance and anti-resonance frequencies on the graph.

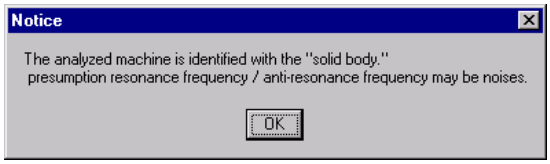
If the estimated candidate differs from the resonance point, a maximum of two can be displayed. The candidates are displayed with various lines to identify them.

2nd Estimated resonance frequency candidate: Long dotted line (— — — —)

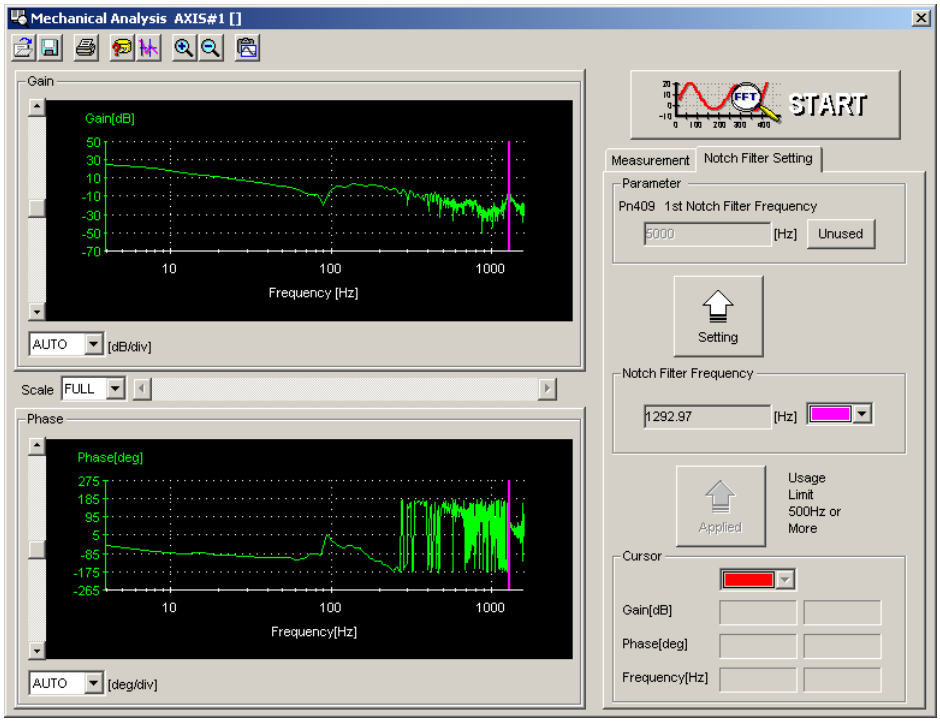
3rd Estimated resonance frequency candidate: Dash-dot line (- - - - - - - - - - - - -)

Click **Clear** to delete the values for the estimated resonance and anti-resonance frequencies. When the frequencies are deleted, the cursors representing their values on the graphs are also deleted. The 2nd and 3rd candidates for the estimated resonance frequency are also deleted.

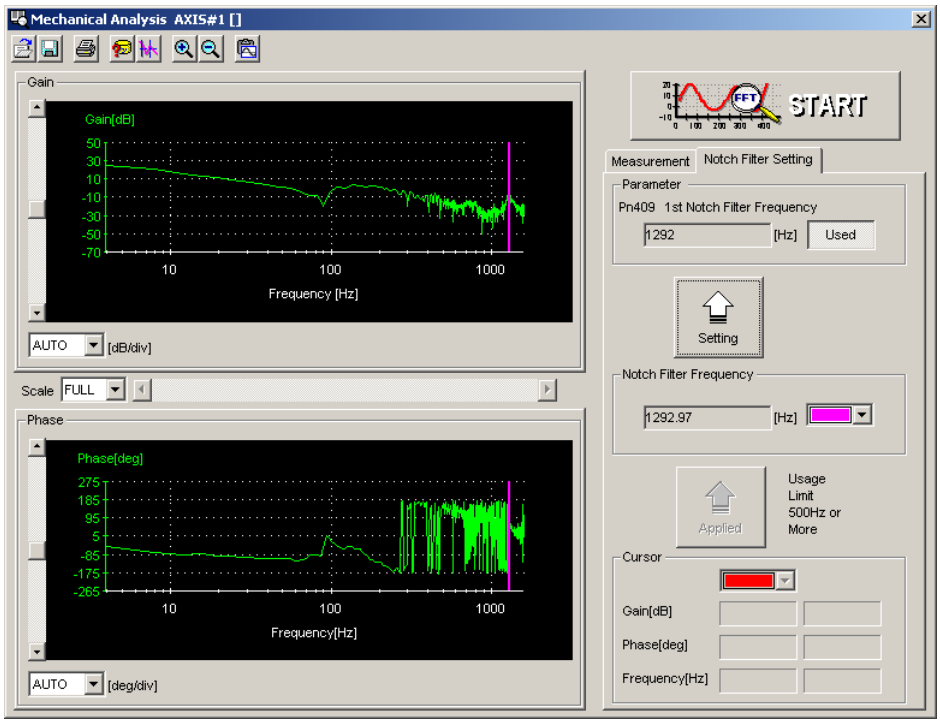
In case that the estimated model is rigid model, the estimated resonance and anti-resonance frequencies are not displayed. In this case, the following message appears when **Display** is clicked.



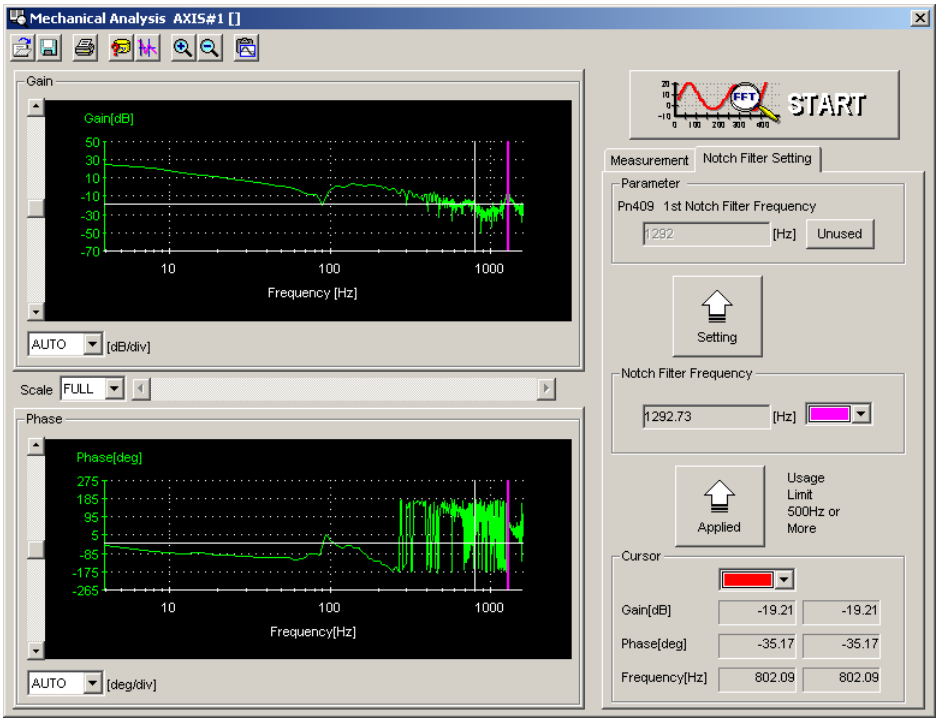
Notch Filter Setting Tab



The notch filter frequency is calculated automatically and displayed in the column of the "Notch Filter Frequency." Click **Setting** and new frequency, which is compensated for digitalization, is displayed in the column of the "Pn409: Notch Filter Frequency."



The notch filter frequency can also be set by using the cursor. See "■ Toolbar Details" for details on the cursor.



Toolbar

Mechanical Analysis Window Toolbar

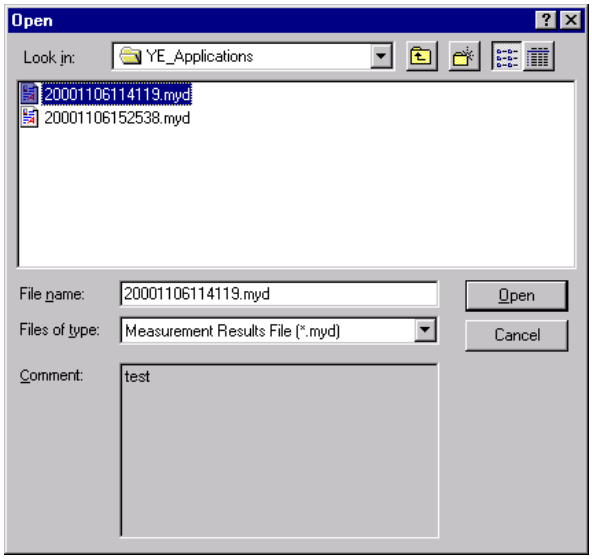
Toolbar Button	Click this button to:
 Open	Load the mechanical analysis data file.
 Save As	Save a copy of the on-screen gain graph and phase graph to a specified file.
 Print	Print the Mechanical Analysis main window.
 Measurement Conditions	View the conditions to measure the mechanical analysis.
 Cursor	View the information for the location where a cursor is shown.
 Zoom In	Enlarge the view of a selected area.
 Return	Restore the area shown in the window to its usual size.
 Clipboard Copy	Copy the displayed screen to the clipboard.

See "■ Toolbar Details" for details on the toolbar buttons.

■ Toolbar Details

(Open) Button

The mechanical analysis data file can be loaded in the Open dialog box. To load the file, click the button. The Open dialog box appears.



When the Button is Clicked in the Main Window

Open

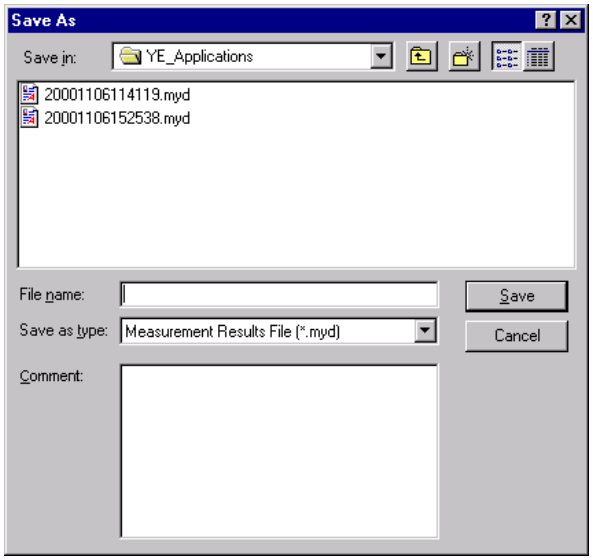
Click **Open** to load the selected measurement results data file.

Cancel

Click **Cancel** to return to the main window without loading the file.

(Save As) Button

he on-screen measurement results gain graph and phase graph can be saved to a file. To save the graph, click the button. The Save As dialog box appears.



When the Button is Clicked in the Main Window

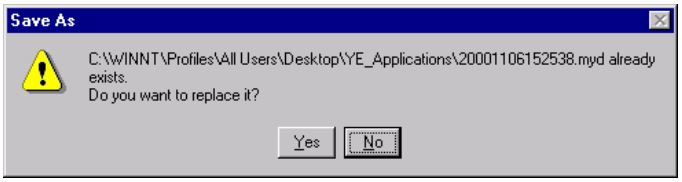
Up to 256 characters can be typed as a comment.

The default file name is the current time (yyyymmddhhmmss).

Save

lick **Save** to save the data to a designated measurement results data file.

If the file name already exists or if an already existing file is loaded and then re-saved, a warning message appears, telling you that the file name already exists, and asks if you want to replace the existing file.



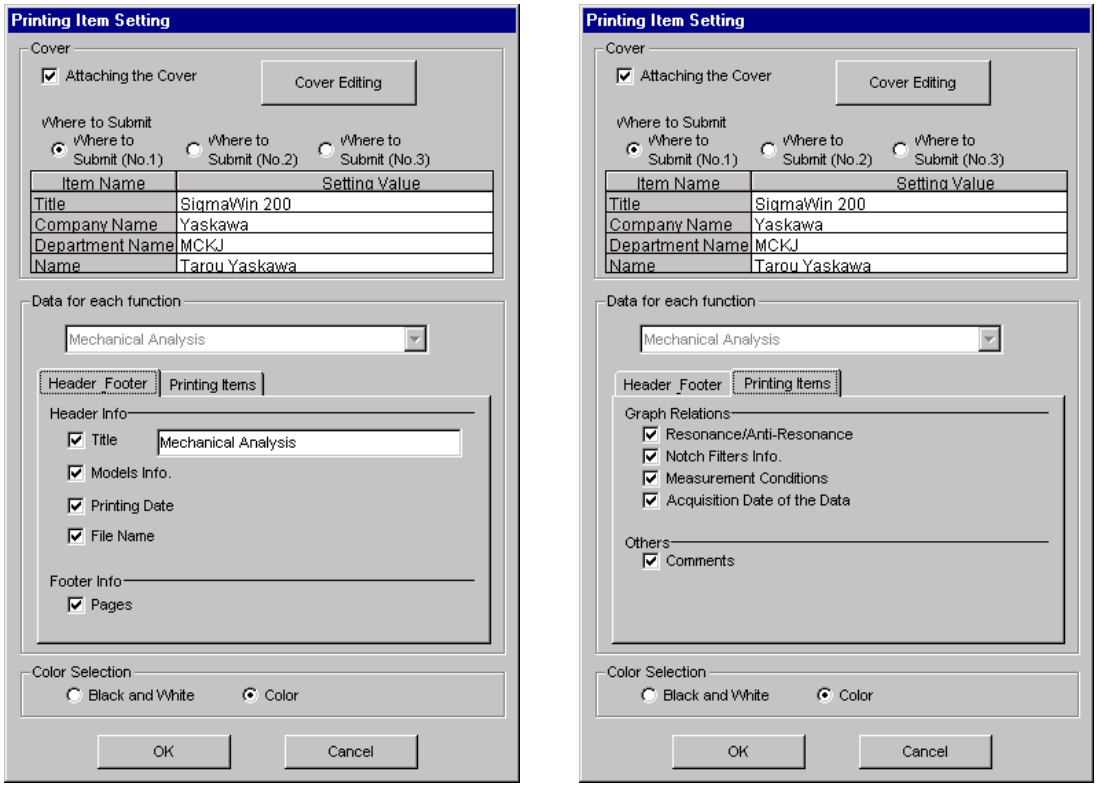
Click **Yes** to overwrite the already existing file. Click **No** to return to the Save As dialog box without saving the file.

Cancel

Click to **Cancel** to return to the main window.

(Print) Button

The graph and data on the Mechanical Analysis main window can be printed. To print the graph and data, click the button. The Printing Item Setting dialog box appears.



Header Footer Tab　　Printing Items Tab

Printing Item Setting Box

Cover

Select **Attaching the Cover**, and the click **Cover Editing**. For details, see Chapter 3.

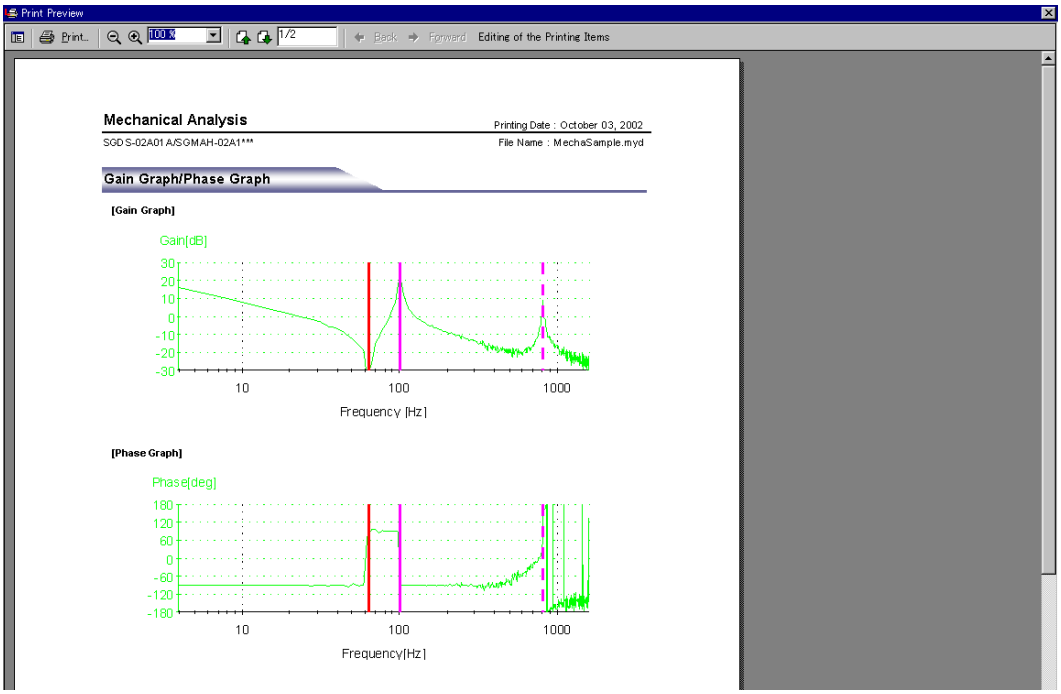
Data for each function

To enter your printing preferences or specifications, click the tab whose options you want to enter or change, and enter the desired settings.

Color Selection

Documents can be printed in color or black and white. Select your preference.

After setting is finished, click **OK**. The document appears on the screen the way it will appear in print.

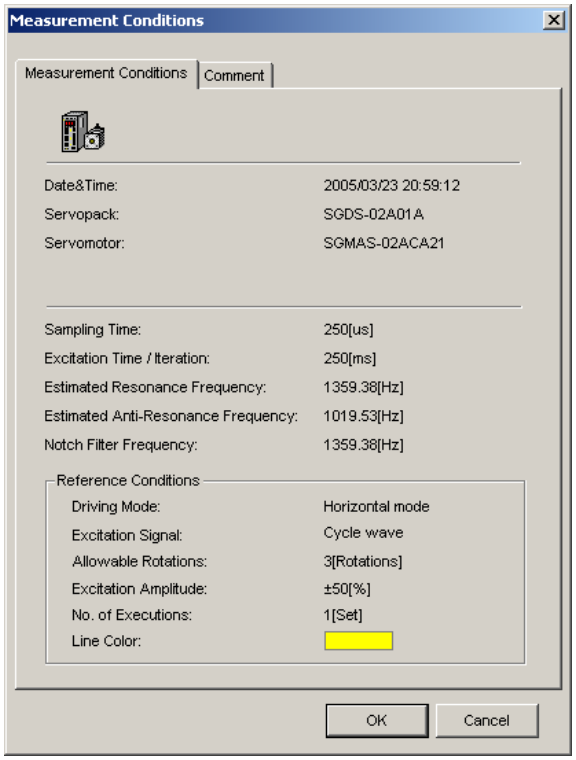


To print the document as is without any changes, click **Print**.

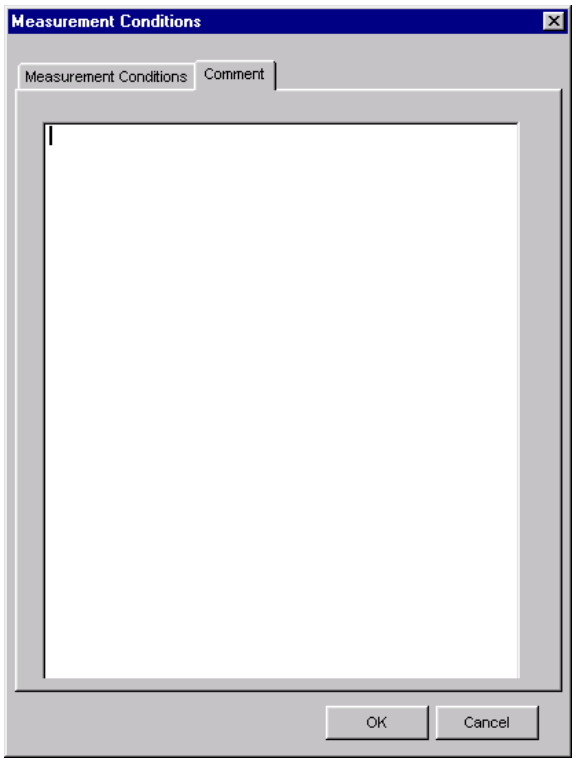
To return to the Printing Item Setting box and change some settings, click **Editing of the Printing Items**.

(Measurement Conditions) Button

The conditions for measuring the mechanical analysis can be viewed. To view the conditions, click the button. The Measurement Conditions dialog box appears. If not already selected, click the **Measurement Conditions** tab to view the conditions for measuring the mechanical analysis.



Measurement Conditions Tab



Comments Tab

Click the **Comments** tab and type any comments.

OK

Click **OK** to save comments and return to the Mechanical Analysis main window.

Cancel

Click **Cancel** to return to the Mechanical Analysis main window without saving the comments.

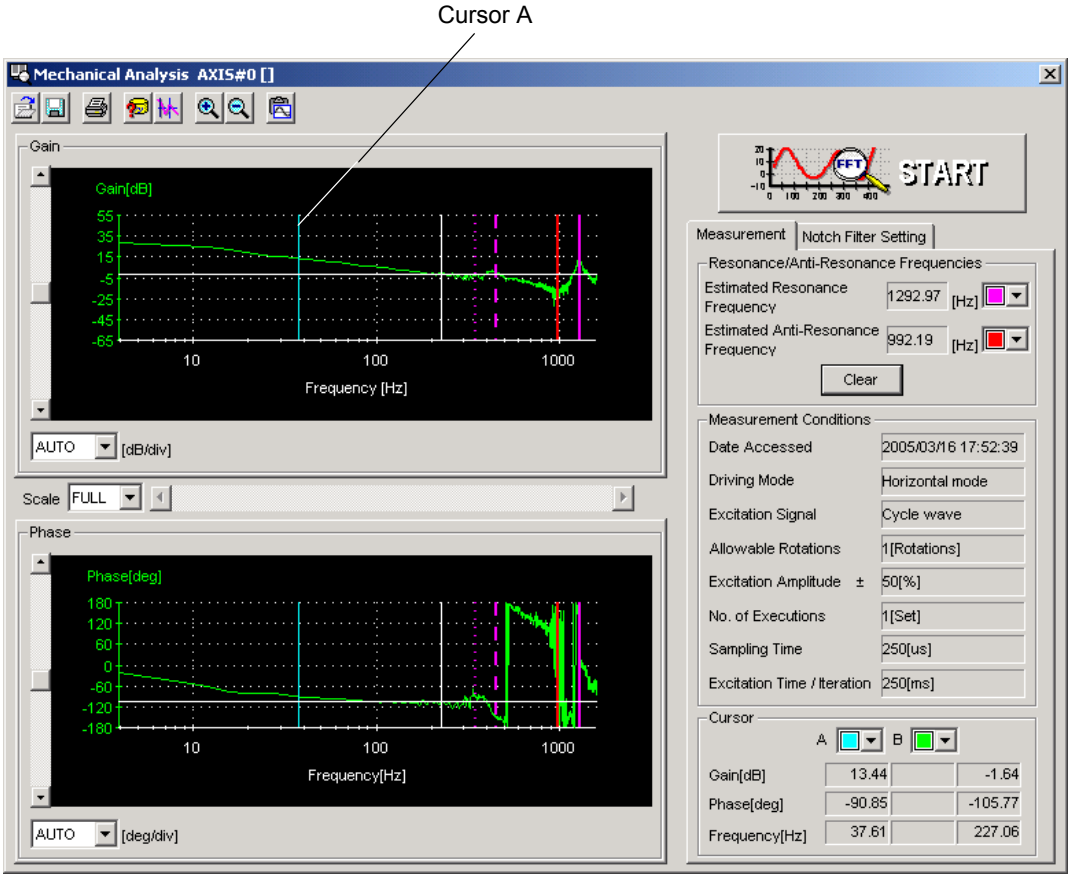
(Cursor) Button

The information for the location where the vertical and horizontal cursor bars intersect can be viewed. Information for the cursor locations A and B can be viewed.

The color of cursor location A and cursor location B can be changed.

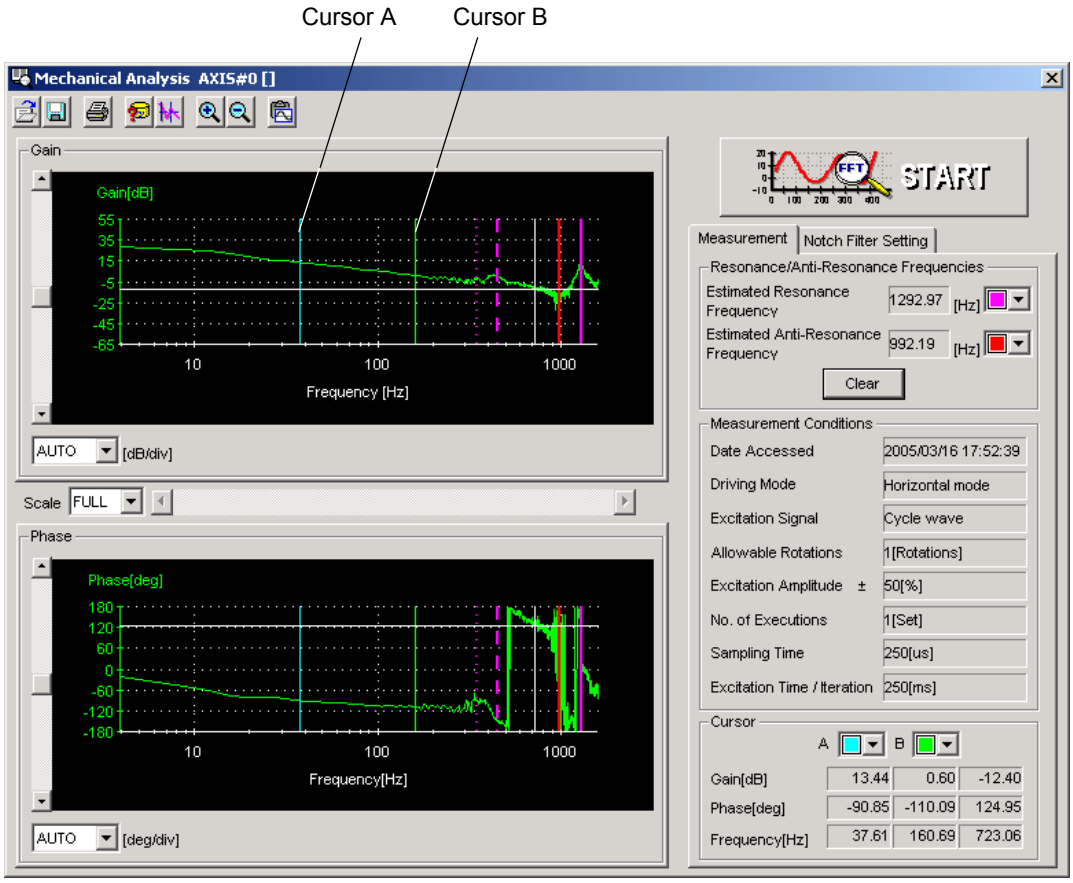
Display the data using the following procedure.

1. Click the button. The cursor changes into a crosshairs pointer.
2. To confirm the location of the cursor, click the intersection point of the cursor bars and the information related to its location is shown in the cursor location A box in the lower right of the window.



Cursor A Selection Mode

3. Next, confirm the cursor location B. Click the intersection point and the information related to its location is shown in cursor location B box in the lower right of the window.



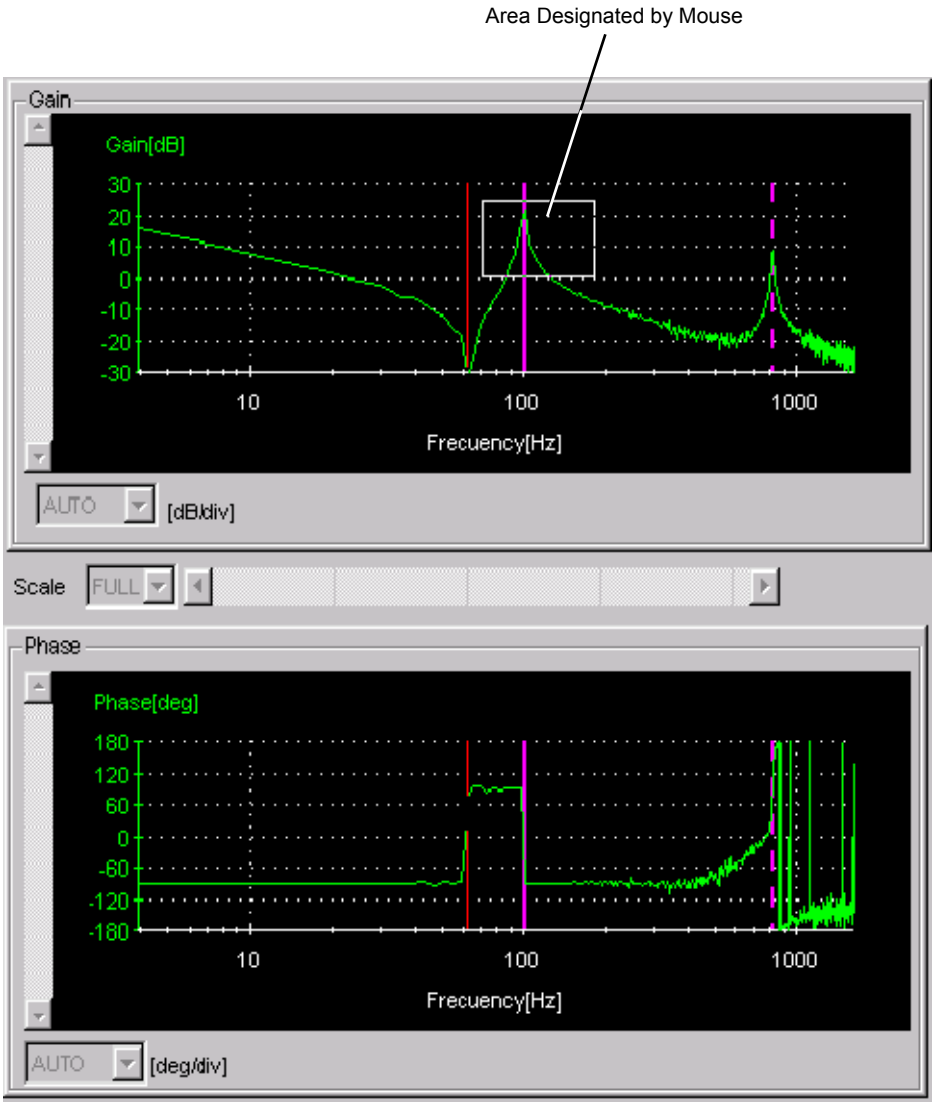
Cursor B Selection Mode

4. If you move the cursor bar with the mouse to another location and then click the intersection point, the information in the cursor location A box changes to represent the new location.
5. The next time you move the cursor bar and click the intersection point, the information in the cursor location B box changes and so on every time the location changes.

(Zoom) Button

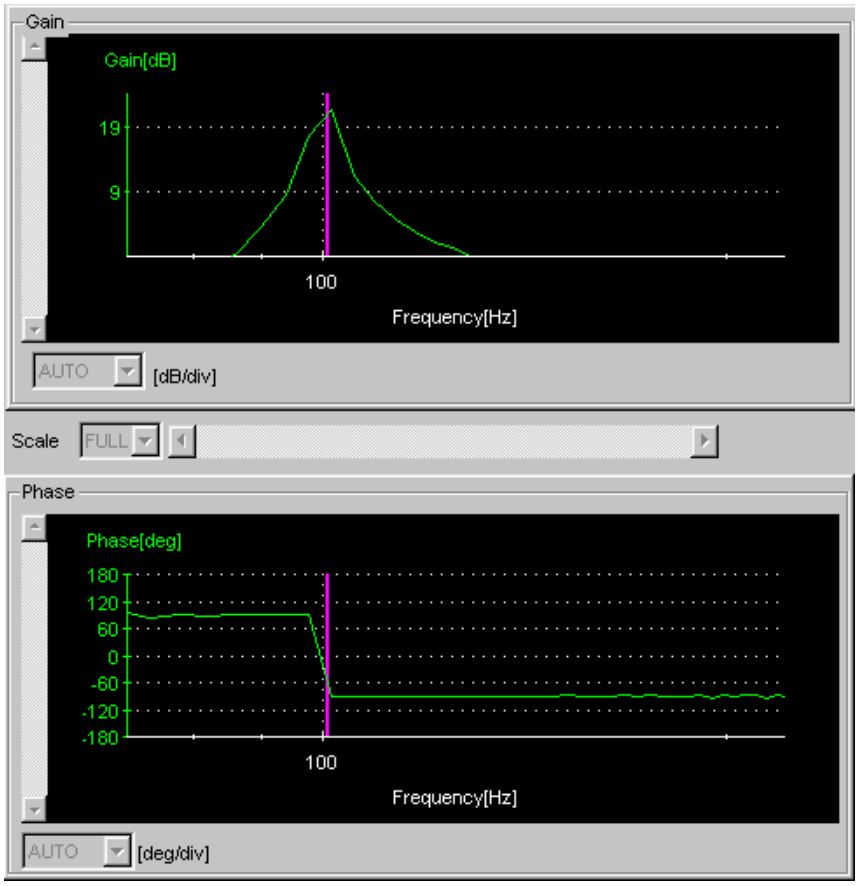
A view of an area selected by the mouse can be magnified. Zoom in on an area using the following procedure.

1. Click the button.
2. Position the mouse at one corner of the area you want to select, and drag to the opposite corner. A line will appear around the selected area.



Area to be Magnified

3. Release the left mouse button. The selected area of the phase graph as well as the gain graph are enlarged.



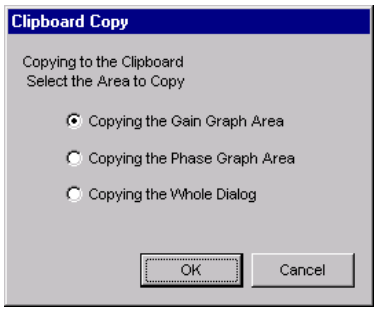
Magnified Area

4. Click the  button to view the original graph.

(Clipboard Copy) Button

The displayed screen can be copied to the clipboard. It can be exported to Word or Excel by using this button.

Click the button, and the Clipboard Copy dialog box appears.



Select the area to be copied to the clipboard.

OK

Click **OK** to copy the selected area to the clipboard.

Cancel

Click **Cancel** to return to the main window.

4.10.2 Ripple Compensation

⚠ WARNING

JOG operation is used to measure the ripple and verify ripple compensation.

The motor will operate when you perform JOG operation, and therefore presents hazards.

Pay particular attention to the following.

- Check the safety of the area adjoining the drive unit.

  The motor runs at the JOG speed, while the Forward or Reverse button is pressed.

  Make sure that there is no danger in running the motor before execution.

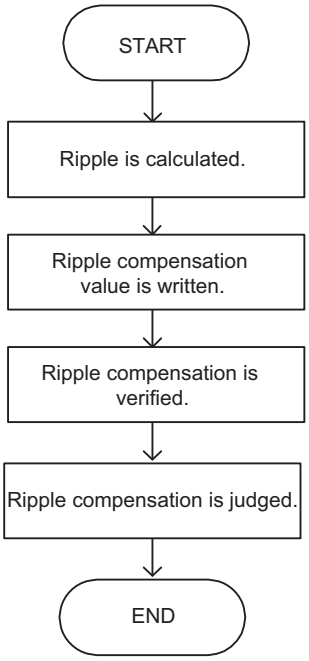
- The Forward Run Prohibit (P-OT) and Reverse Run Prohibit (N-OT) signals are disabled during JOG operation.

  The P-OT (Forward Drive Prohibit) signal and N-OT (Reverse Drive Prohibit) signal are disabled during JOG operation.
  Operation will not stop even if the position of the P-OT or N-OT signal is exceeded.

  During operation, make sure to verify the actual operation and position of the motor or machine.

There is a small amount of ripple (variation) in the motor speed. You can use the ripple compensation to suppress motor speed ripple.

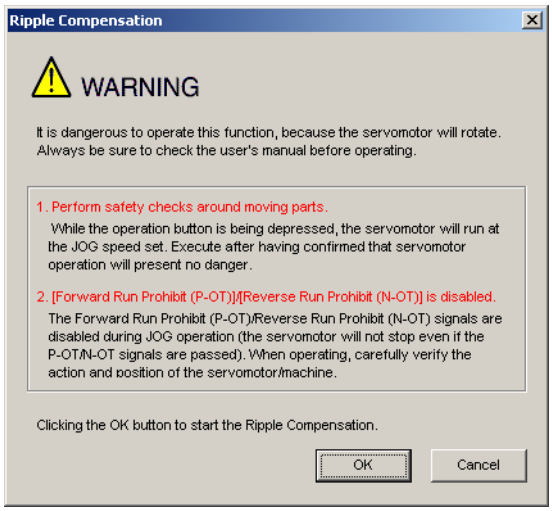
An outline of the ripple compensation procedure is given below.



Use the following procedure to perform ripple compensation.

1. Select ***Solution - Ripple*** from the menu bar of the SigmaWin+ Σ-7 component main window.

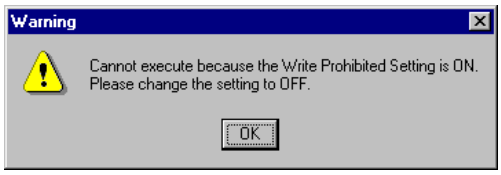
   The following window will be displayed.



   Click **Cancel** to return to the main window without performing ripple compensation. You will return to the main window.

Parameter Write Prohibition

If writing the parameters has been prohibited, the following dialog box will be displayed.

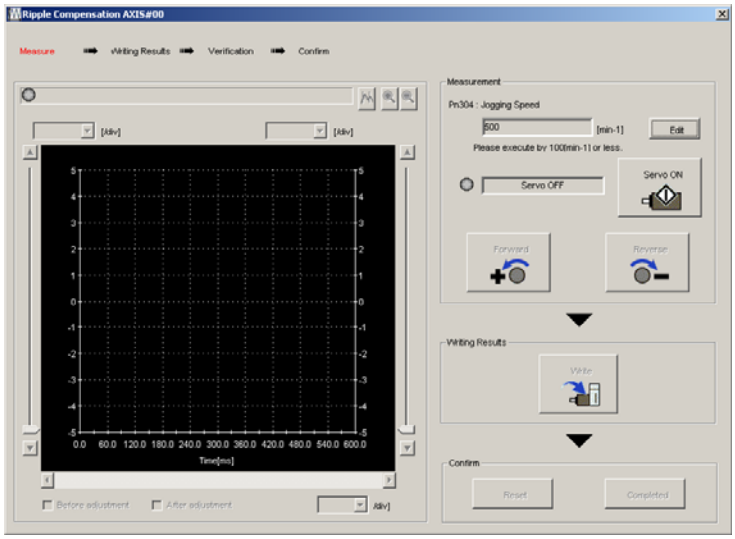


Click **OK** to clear the parameter write prohibition.

Refer to *4.5.5 Write Prohibited Setting* for details on clearing the parameter write prohibition.

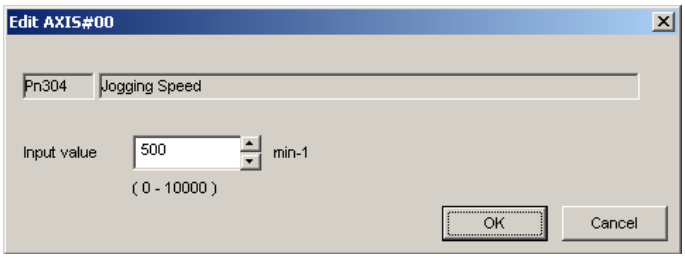
2. Click **OK**.

   The following Ripple Compensation dialog box will be displayed.



3. Click **Edit**.

   The following dialog box will be displayed.

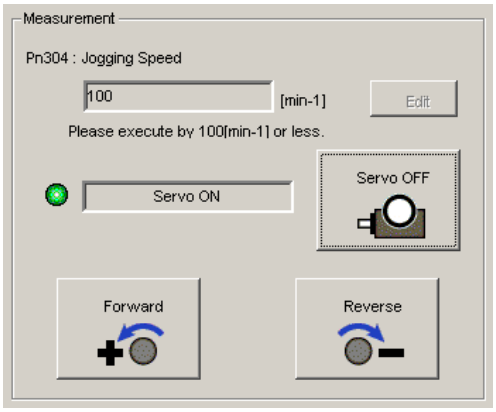


4. Set the JOG speed in the **Input value** Box.
5. Click **OK**.

   The Ripple Compensation dialog box will be displayed again.

6. Click **Servo ON**.

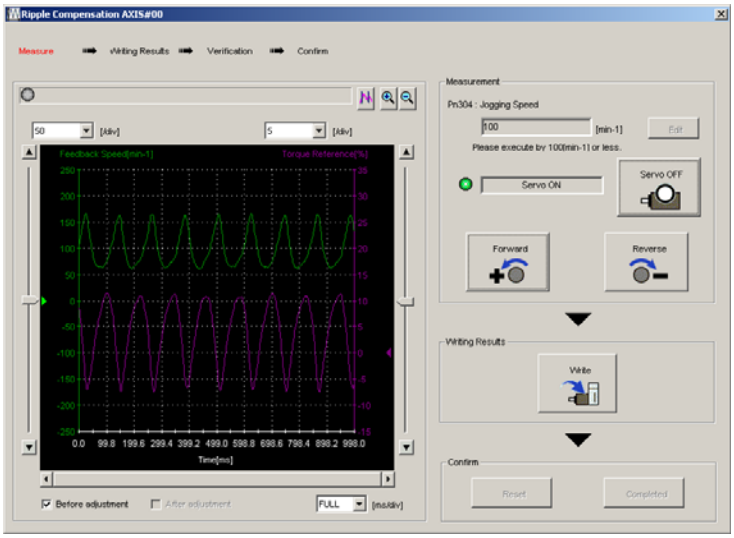
The Measurement Area will be displayed as shown below.



7. Click **Forward** or **Reverse**.

   The motor will operate at the JOG speed while the button is clicked.

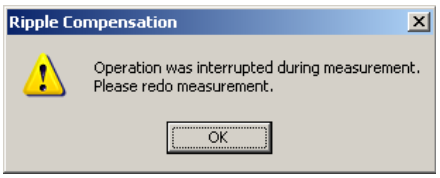
   The feedback speed and torque reference graph will be displayed in the trace area during JOG operation.



NOTE

If the ripple measurement time (i.e., the JOG operation time) is too short, ripple measurement will not be completed. If the measurement is not completed, the following message dialog box will be displayed.

Click **OK** and redo the measurement.

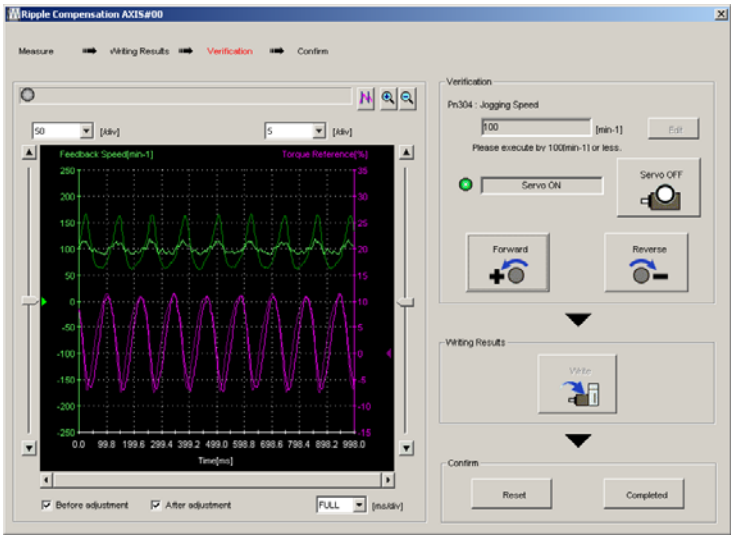


8. Click **Write**.

The following dialog box will be displayed.

9. Click **OK**.

   The following dialog box will be displayed.

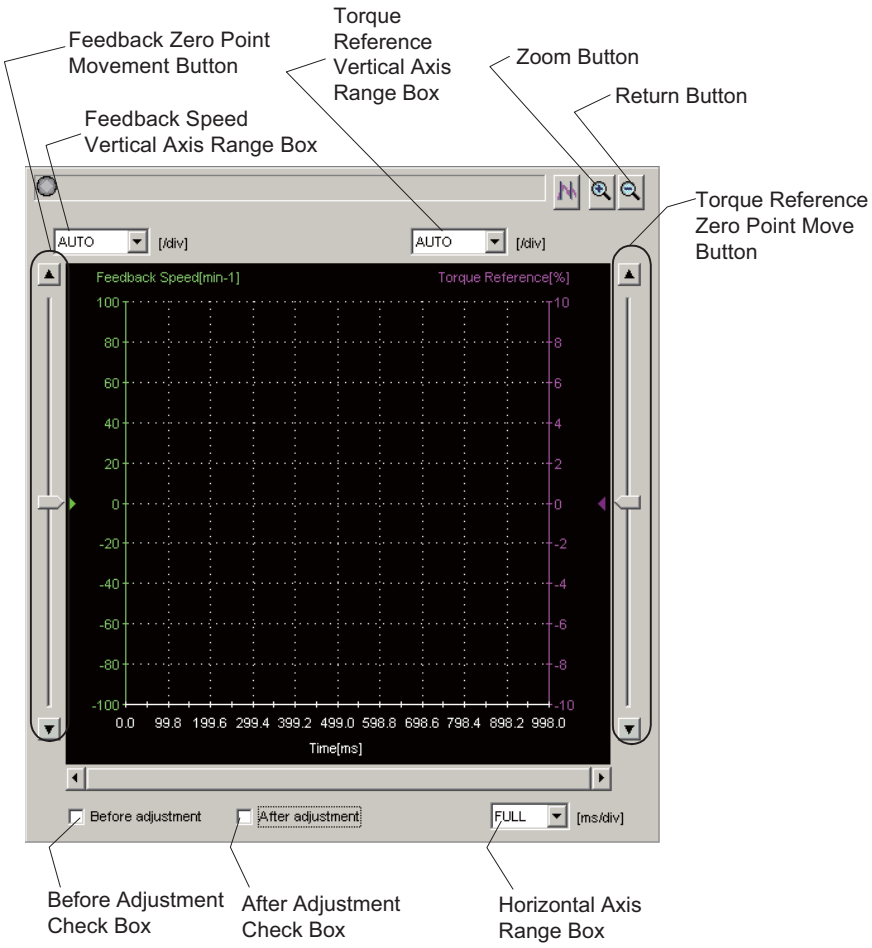


10. Click **Forward** or **Reverse**.

    The motor will operate at the JOG speed while the button is clicked.

    The feedback speed and torque reference graph after ripple compensation will be displayed in the trace area.

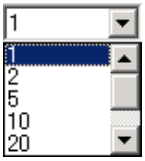
You can use the following origin movement buttons and range boxes to change the graph displayed in the trace area.



■ Vertical Axis Ranges

You can set the scales for the feedback speed and torque reference. Select the desired ranges from the boxes. You cannot enter numeric values directly.

If you select **AUTO**, the optimum value will be selected in the box so that all of the data fits within the display area of the graph and the range width will be adjusted.



Vertical Axis Range Box

■ Horizontal Axis (Time Axis) Range

Select the horizontal axis range from the box. The unit is milliseconds. You cannot enter numeric values directly.

If you select **FULL**, the value will be adjusted automatically so that all of the data fills the display on the horizontal axis.

Horizontal Axis Range Box

■ Before Adjustment Check Box

If you select this check box, the graph from before ripple compensation adjustment will be displayed.

If you clear the selection, the graph from before ripple compensation adjustment will be hidden.

■ After Adjustment Check Box

If you select this check box, the graph from after ripple compensation adjustment will be displayed.

If you clear the selection, the graph from after ripple compensation adjustment will be hidden.

■  (Zoom) Button

Click the  Button and then specific an area with the mouse to enlarge that area.

Click the  Button to return to the original display.

11. If the results of ripple compensation verification are acceptable, click **Completed** to end verification of the ripple compensation.

NOTE

If the results of ripple compensation verification are not acceptable, click **Reset** to return the ripple compensation that is written in the SERVOPACK to the original set value.

If ripple compensation is necessary, repeat the procedure from step 7.

Appendix A Cable Between the PC and SERVOPACK

Use a USB cable to connect the computer to the SERVOPACK.

USB Cable

The following cable is available from Yaskawa. Contact Yaskawa if necessary.

JZSP-CVS06-02-E

Communications Specifications

The communication specifications are as follows:

Item	Specifications	Remarks
Complied Standards	USB2.0 full-speed function	
Bus Speed	Full speed (12 Mbps)	
Format	Asynchronous serial	
Communications Type	Half-duplex communications	
No. of Connectable Devices	USB host: 1, slaves: 127	Including hubs
Cable Length	5 m at full speed (30 m max. at full speed by connecting five hubs)	
Connector Type	Series mini B plug	
Power Supply	Self-powered method	Supplied from the SERVO-PACK power supply

Appendix B Install File List

SigmaWin+ Σ-7 component installs the following files into two directories on the PC. The application default installation directories are as follows.

Main application file	C:\Program Files\SigmaIDE\SigmaWinPlus\SigmaWinF7
Microsoft foundation support file	
DAO support file	
Tool OCX	
Electronic manual	
VisualBasic runtime library	
Others	
USB driver	C:\Program Files\SigmaIDE\SigmaWinPlus\Driver

Main Application Files

File Name	Function	Installation Directory
SIGMAFUNCEXECUTOR.exe	Executable Module (EXE)	Application Directory\Bin
SIGMAWINF7.exe	Executable Module (EXE)	Application Directory\Bin
YEPRN.exe	Executable Module (EXE)	Application Directory\Bin
BASELIB.dll	Executable Module (DLL)	Application Directory\Bin
CMIF.dll	Executable Module (DLL)	Application Directory\Bin
COMMMBUS.dll	Executable Module (DLL)	Application Directory\Bin
CYELIB.dll	Executable Module (DLL)	Application Directory\Bin
IFDCM.dll	Executable Module (DLL)	Application Directory\Bin
IFDCOM.dll	Executable Module (DLL)	Application Directory\Bin
IFDUSB.dll	Executable Module (DLL)	Application Directory\Bin
SVAATEX.dll	Executable Module (DLL)	Application Directory\Bin
SVADJUST.dll	Executable Module (DLL)	Application Directory\Bin
SVADVTUNE2.dll	Executable Module (DLL)	Application Directory\Bin
SVALARM.dll	Executable Module (DLL)	Application Directory\Bin
SVAXISNAME.dll	Executable Module (DLL)	Application Directory\Bin
SVBASE.dll	Executable Module (DLL)	Application Directory\Bin
SVCHART.dll	Executable Module (DLL)	Application Directory\Bin
SVCONNECT.dll	Executable Module (DLL)	Application Directory\Bin

Main Application Files (cont'd)

File Name	Function	Installation Directory
SVDAMPING1.dll	Executable Module (DLL)	Application Directory\Bin
SVDAMPING2.dll	Executable Module (DLL)	Application Directory\Bin
SVDETVIB.dll	Executable Module (DLL)	Application Directory\Bin
SVEASYFFT.dll	Executable Module (DLL)	Application Directory\Bin
SVENCABS.dll	Executable Module (DLL)	Application Directory\Bin
SVGAINSW.dll	Executable Module (DLL)	Application Directory\Bin
SVGRAPH.dll	Executable Module (DLL)	Application Directory\Bin
SVINERTIA.dll	Executable Module (DLL)	Application Directory\Bin
SVINFO.dll	Executable Module (DLL)	Application Directory\Bin
SVJOG.dll	Executable Module (DLL)	Application Directory\Bin
SVLIB.dll	Executable Module (DLL)	Application Directory\Bin
SVLIBC.dll	Executable Module (DLL)	Application Directory\Bin
SVMECHA.dll	Executable Module (DLL)	Application Directory\Bin
SVMON.dll	Executable Module (DLL)	Application Directory\Bin
SVMONIO.dll	Executable Module (DLL)	Application Directory\Bin
SVMOTORSCALE.dll	Executable Module (DLL)	Application Directory\Bin
SVMONSETTING.dll	Executable Module (DLL)	Application Directory\Bin
SVMULTITURN.dll	Executable Module (DLL)	Application Directory\Bin
SVONEPARA.dll	Executable Module (DLL)	Application Directory\Bin
SVOPCARD.dll	Executable Module (DLL)	Application Directory\Bin
SVPASSWORD.dll	Executable Module (DLL)	Application Directory\Bin
SVPOLEDETECT.dll	Executable Module (DLL)	Application Directory\Bin
SVPRGJOG.dll	Executable Module (DLL)	Application Directory\Bin
SVPLUSRES.dll	Executable Module (DLL)	Application Directory\Bin
SVPRN.dll	Executable Module (DLL)	Application Directory\Bin
SVREALTRACE.dll	Executable Module (DLL)	Application Directory\Bin
SVRESPONSE LEVELSET.dll	Executable Module (DLL)	Application Directory\Bin
SVRIPPLE.dll	Executable Module (DLL)	Application Directory\Bin

Main Application Files (cont'd)

File Name	Function	Installation Directory
SVSRESET.dll	Executable Module (DLL)	Application Directory\Bin
SVTRACE.dll	Executable Module (DLL)	Application Directory\Bin
SVTUNINGGUIDE.dll	Executable Module (DLL)	Application Directory\Bin
SVUPWIZARD.dll	Executable Module (DLL)	Application Directory\Bin
SVUSER.dll	Executable Module (DLL)	Application Directory\Bin
SVUSERCONVERT.dll	Executable Module (DLL)	Application Directory\Bin
SVUSERDIRECT.dll	Executable Module (DLL)	Application Directory\Bin
SVUSERLIB.dll	Executable Module (DLL)	Application Directory\Bin
SVVIBMON.dll	Executable Module (DLL)	Application Directory\Bin
SVZEROPOS.dll	Executable Module (DLL)	Application Directory\Bin
YECIPHER.dll	Executable Module (DLL)	Application Directory\Bin
YECMLIB.dll	Executable Module (DLL)	Application Directory\Bin
YEDBASE.dll	Executable Module (DLL)	Application Directory\Bin
YESIGMA.dll	Executable Module (DLL)	Application Directory\Bin
IDEINFOJ.mdb	Database File	Application Directory\Bin
SIGMAIDE.atb	SigmaWin+ Σ-7 Component Menu File	Application Directory\Bin\Dat\ ToolBar
SIGMAFUNCINFO.swi	Component Information File	Application Directory\Bin\Dat
SIGMATOUR.chm	Help File	Application Directory\Help
BASEORIGINL.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
BASEORIGINR.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
BASEOVERLAP.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
BASETARGETLINE.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
BASETRIGGER.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_BLUE_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_BLUE_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_BLUE_RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_BLUE_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp

Main Application Files (cont'd)

File Name	Function	Installation Directory
ORG_DARKGREEN_ LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_DARKGREEN_ LEFT_PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_DARKGREEN_ RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_DARKGREEN_ RIGHT_PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_GREEN_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_GREEN_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_GREEN_RIGHT. bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_GREEN_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PERPLE_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PERPLE_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PERPLE_RIGHT. bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PERPLE_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PINK_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PINK_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PINK_RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PINK_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PRINT_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_PRINT_RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_RED_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_RED_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_RED_RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp

Main Application Files (cont'd)

File Name	Function	Installation Directory
ORG_RED_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_SYAN_LEFT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_SYAN_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_SYAN_RIGHT.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_SYAN_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_YELLOW_LEFT. bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_YELLOW_LEFT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_YELLOW_RIGHT. bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp
ORG_YELLOW_RIGHT_ PRINTC.bmp	Bitmap File for SvTrace	Application Directory\Bin\Dat\Bmp

Microsoft Foundation Support File

File Name	Function	Installation Directory
MFC71.dll	MFC Core Code	Application Directory\Bin Windows System Directory
MSVCP71.dll	C Runtime Library	Application Directory\Bin Windows System Directory
MSVCR71.dll	C Runtime Library	Application Directory\Bin Windows System Directory
MFC71LOC.dll	MFC locale DLL	Application Directory\Bin
ODBC32.dll	MFC DLL	Application Directory\Bin
OLEPRO32.dll	Microsoft OLE Property Support DLL	Windows System Directory
OLEAUT32.dll	Automation Support DLL	Windows System Directory

DAO Support File

File Name	Function	Installation Directory
DAO360.dll	DAO DLL	DAO Directory

Tool OCX

File Name	Function	Installation Directory
SPR32X30.ocx	Spreadsheet OCX *1	Windows System Directory
OLCH2X32.ocx	Olectrachart 2D *2	Windows System Directory
SSTBARS2.ocx	Active Tool Bar *3	Windows System Directory
ACTRPT15J.dll	Active Report DLL*4	Windows System Directory
FPSPR30.ocx	Spreadsheet OCX *1	Windows System Directory

*1. SPREAD
Copyright (C) 1999 FarPoint Technologies, Inc.
*2. Olectra Chart
Copyright (C) APEX Software Corporation
*3. ActiveToolBar Plus
Copyright (C) 2000 Sheridan Software Systems, Inc.
*4. ActiveReports
Copyright (C) 2000 Data Dynamics, Ltd.

Electronic Manual

File Name	Function	Installation Directory
SIGMAWINF7.pdf	Electronic Manual	Application Directory\Help

VisualBasic Runtime Library and Others

File Name	Function	Installation Directory
MSVBVM60.dll	Visual Basic Runtime Library	Windows System Directory
VB6JP.dll	Visual Basic locale DLL	Windows System Directory
TABCTL32.ocx	Tab Control OCX	Windows System Directory
COMDLG32.ocx	Common Dialog OCX	Windows System Directory
7-ZIP32.dll	Archiver DLL	Windows System Directory

USB Driver

File Name	Function	Installation Directory
CPUSB.sys	USB Driver (for x86)	Driver Directory\USB
CPUSB2K.inf	USB Driver (for x86)	Driver Directory\USB
CPUSB.sys	USB Driver (for x64)	Driver Directory\USB\x64
CPUSB2K.inf	USB Driver (for x64)	Driver Directory\USB\x64
CPUSB.cat	USB Driver (for x64)	Driver Directory\USB\x64

Appendix C USB Driver Installation

This section describes how to install the USB driver software for SERVOPACK.

The SERVOPACK USB driver cannot be installed by using the SigmaWin+ installer.

When a SigmaWin+ equipped PC is connected to the SERVOPACK through a USB connection, use the following procedure to install the USB driver.

The installation method will vary depending on the operating system (hereinafter referred to as OS). Use the correct procedure for your OS.

The installation procedure is explained assuming that the SigmaWin+ installed folder directory is "C:\Program Files\SigmaIDE" and that the CD-ROM drive is D drive. Use the folder directory and drive according to the settings of your PC.

C.1 Installing the Driver

- For Windows 7/Vista
- For Windows XP

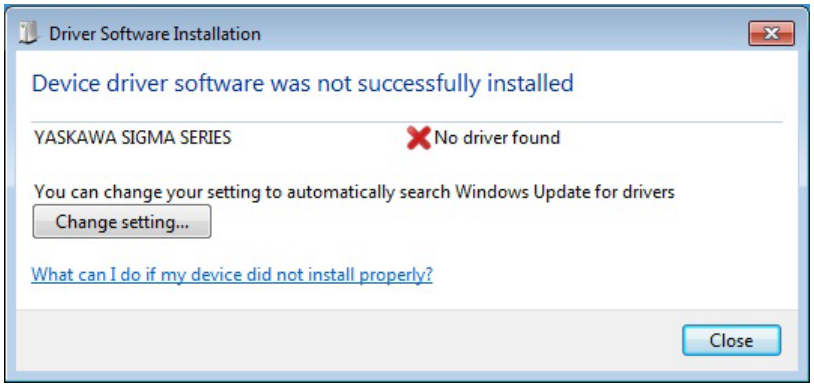
C.2 Confirming the Installation Status

C.3 Removing a USB Device

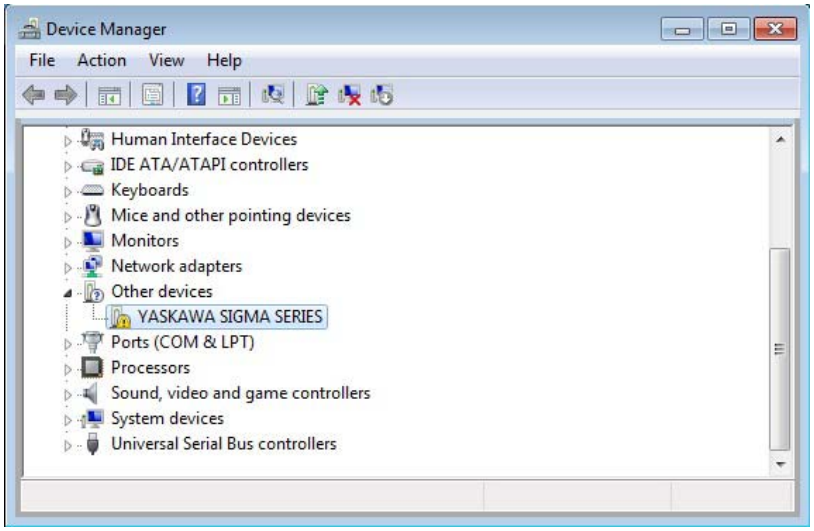
C.1 Installing the Driver

■ For Windows 7/Vista

1. Turn on the power to the PC to start Windows 7 or Vista.
2. Confirm that SigmaWin+ has been installed. If it has not yet been installed, follow the procedures described in "1.5 Installing SigmaWin+ Program".
3. Connect the SERVOPACK to the PC using a USB cable, and then turn on the power to the SERVOPACK. The following message will appear.

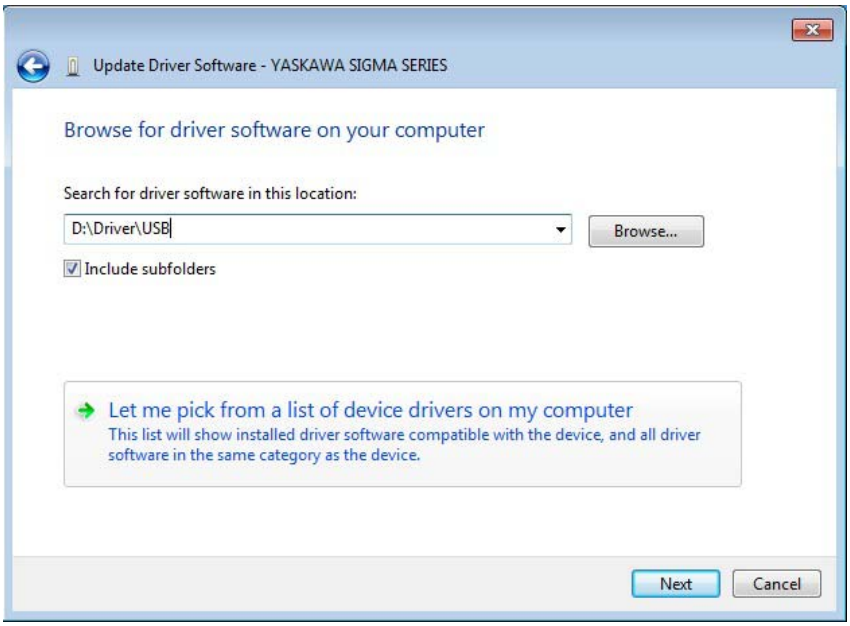


4. Click **Close**.
5. On the **Start** menu, right-click **Computer** and select **Properties**. The property window will appear.
6. Select **Device Manager**. The following window will appear.



7. Right-click **YASKAWA SIGMA SERIES** and select **Update Drive Software...**

8. Select **Browse my computer for driver software**.
   The following window will appear.



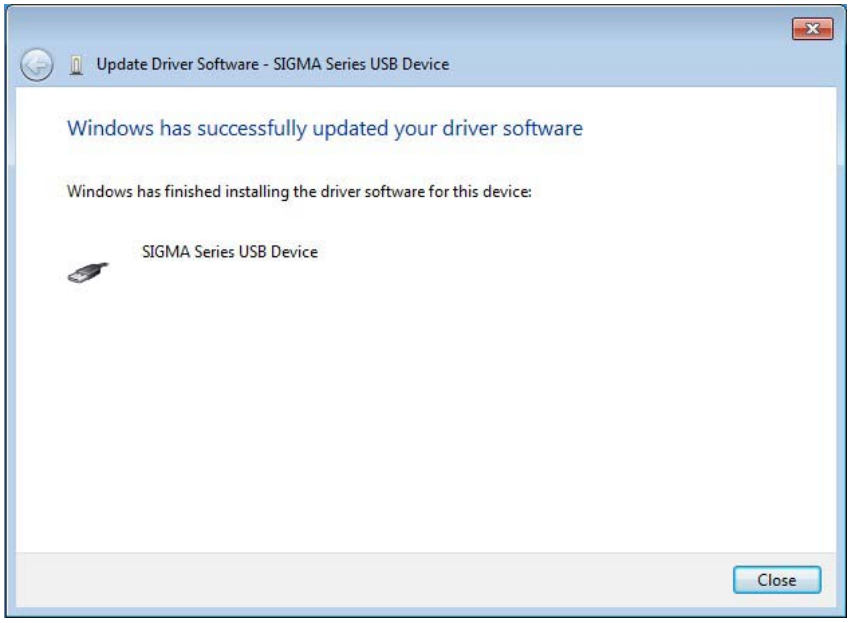
9. Select the **Include subfolders** check box. Click **Browse** to select the folder.
   < For Windows 7 (32 bit) or Windows Vista >
   "C:\Program Files\SigmaIDE\SigmaWinPlus\Driver\USB"
   < For Windows 7 (64 bit) >
   "C:\Program Files (x86)\SigmaIDE\SigmaWinPlus\Driver\USB\x64"

10. Click **Next**.

    Installation starts by copying the necessary files. Wait until a message appears informing you that the installation is finished.

    < If a Security Error Message is Displayed >

    Select **Install this driver software anyway**.

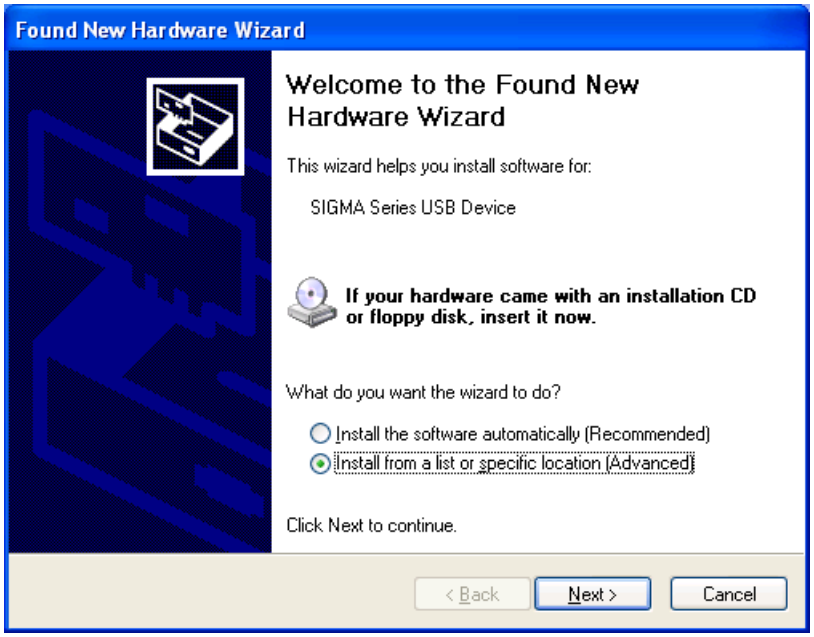


11. When the installation is finished, click **Close**.

    This completes the driver installation.

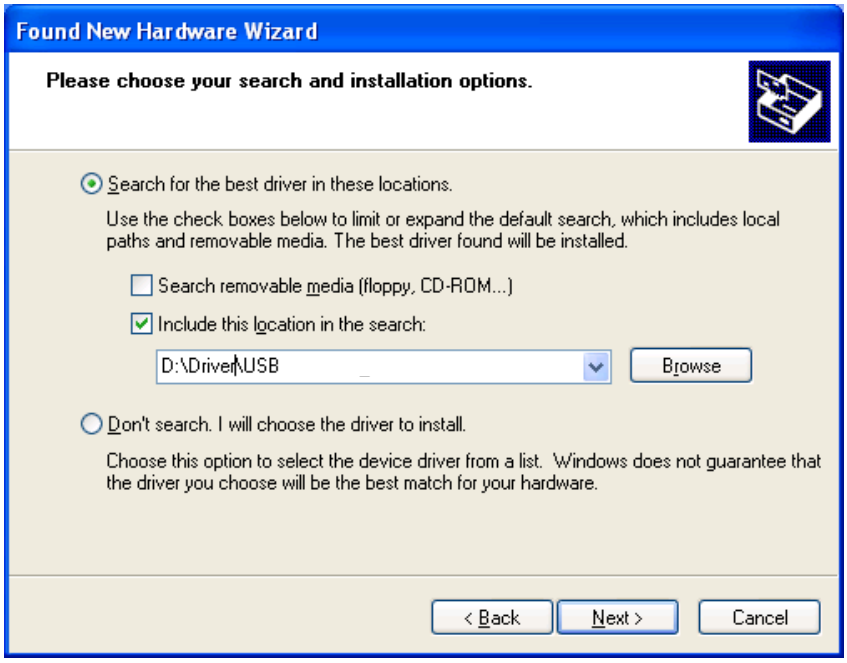
■ For Windows XP

1. Turn on the power to the PC to start Windows XP.
2. Confirm that SigmaWin+ has been installed. If it has not yet been installed, follow the procedures described in "1.5 Installing SigmaWin+ Program."
3. Connect the SERVOPACK to the PC using a USB cable, and then turn on the power to the SERVOPACK. The Found New Hardware Wizard will appear.



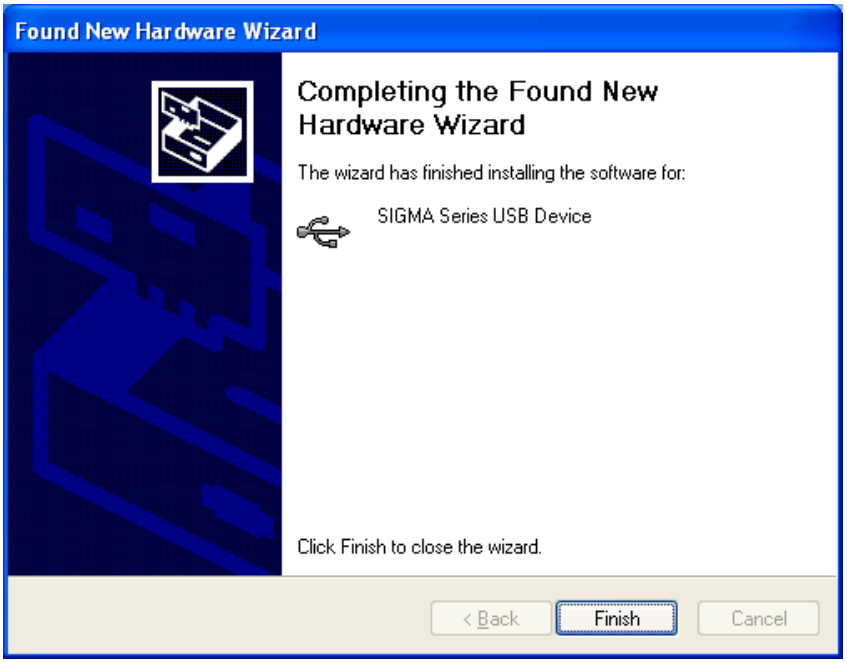
4. Confirm that the **Install from a list or specified location [Advanced]** option is selected, and then click **Next**.

The next Wizard will appear.



5. Select the **Search for the best driver in these locations.** option and then select the **Include this location in the search:** check box. Click **Browse** to select the folder "C:\Program Files\SigmaIDE\SigmaWinPlus\Driver\USB."
6. Click **Next**.

   The Wizard starts installation by copying the necessary files. Wait until a message appears informing you that the installation is finished.

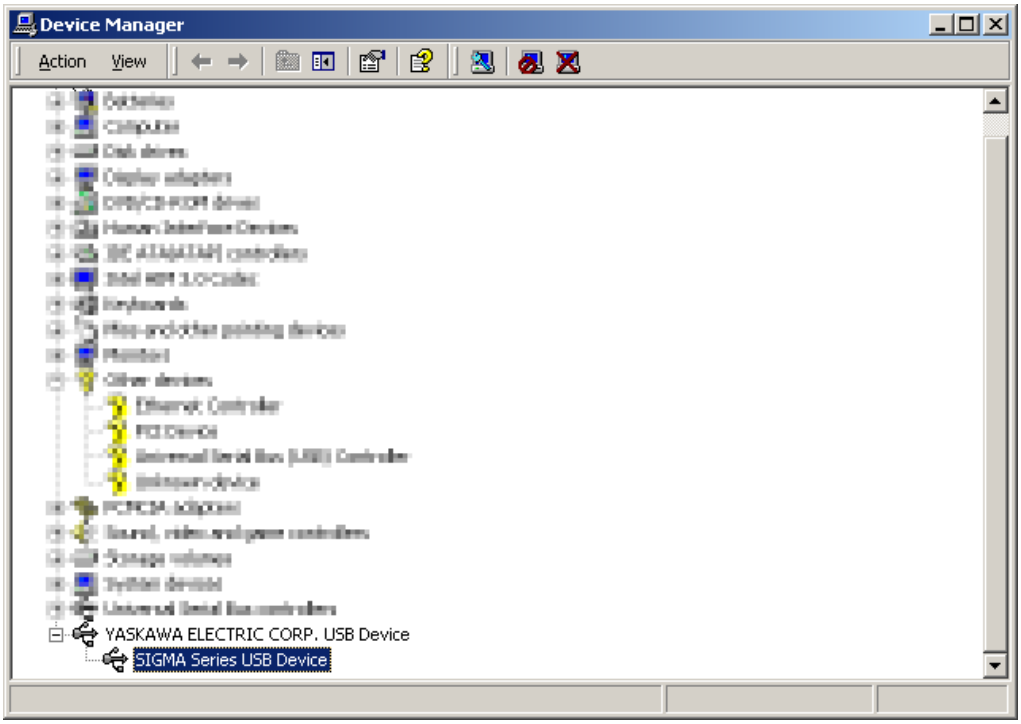


7. When the installation is finished, click **Finish**.
   This completes the driver installation.

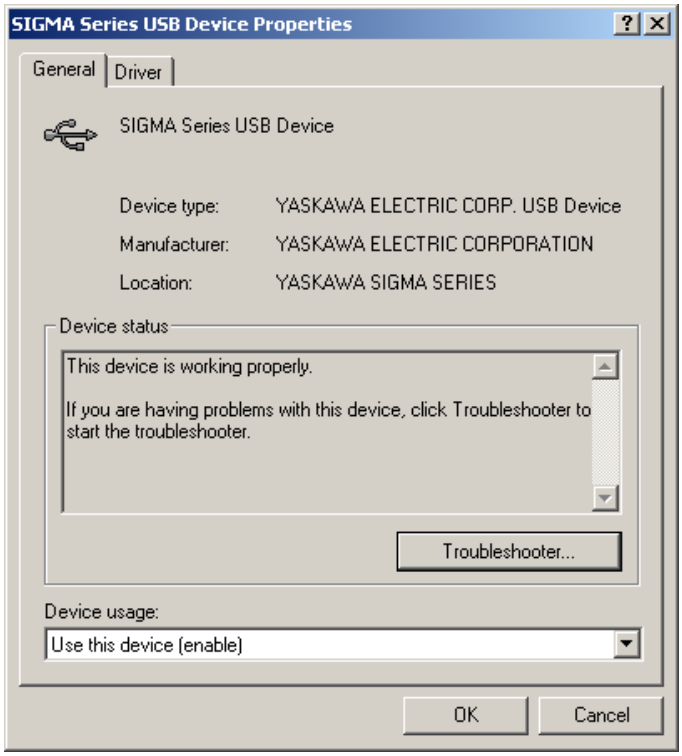
C.2 Confirming the Installation Status

Use the following procedure to make sure that the system recognizes the SERVOPACK as a USB device and that the USB driver is installed correctly.

1. Click the **Start** button, point to **Settings,** and click **Control Panel**.
2. Double-click the **System** icon. The System Properties window will appear.
3. Click the **Hardware** tab and then click **Device Manager.** The Device Manager window will appear.



4. Double-click **SIGMA Series USB Device** in the **YASKAWA ELECTRIC CORP. USB Device** folder. The SIGMA Series USB Device Properties window will appear.



5. Make sure "This device is working properly." is displayed in the **Device status** field.

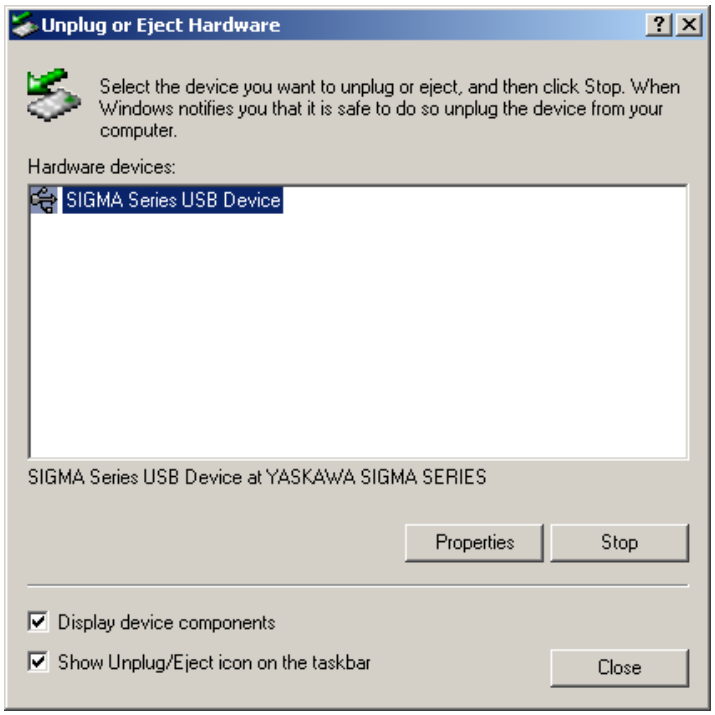
   When "This device is working properly." is displayed, the SERVOPACK is ready to be used through a USB connection. If it is not displayed, reinstall the USB driver.

C.3 Removing a USB Device

While the power supply to the PC is on, remove the USB cable from the USB port on either the PC or the SERVOPACK. Or, turn off the power to the SERVOPACK. On the screen of Windows XP, an external device disconnection confirmation will appear. Safely remove the device using the following procedure.

1. Double-click the **Safely Remove Hardware** icon in the taskbar in the bottom right corner.

The Unplug or Eject Hardware window will appear.



2. Select "SIGMA Series USB Device" in the **Hardware devices:** field, and then click **Stop.**

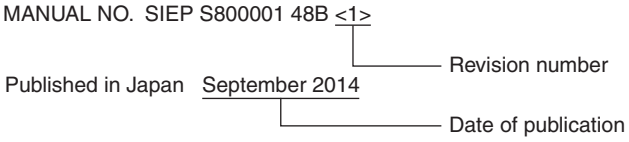
3. Confirm that the "SIGMA Series USB Device" is selected, and then click **OK**.

4. The processing to remove the selected device will be carried out and a message will appear informing you that the device can be safely removed.

   The cable can then be safely removed or the power to the SERVOPACK can be safely turned off.

Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.



Date of Publication	Rev. No.	Section	Revised Content
November 2015	<2>	Front cover	Revision: Format
		1.4	Revision: Information on Machine Controllers that support MECHATROLINK-II communications
		Back cover	Revision: Format and address
September 2014	<1>	Preface	Addition: Related manuals
		All chapters	Addition: Information on Σ-7S Command Option Attachable-type SERVOPACKs, Indexer Module, DeviceNet Module, and Safety Module.
		4.9	Addition of section: Editing Tables
		Back cover	Change: Address
May 2014	–	–	First edition

AC Servo Drives Engineering Tool

SigmaWin+
ONLINE MANUAL
Σ-7 Component

IRUMA BUSINESS CENTER (SOLUTION CENTER)
480, Kamifujisawa, Iruma, Saitama, 358-8555, Japan
Phone 81-4-2962-5151 Fax 81-4-2962-6138
http://www.yaskawa.co.jp

YASKAWA AMERICA, INC.
2121, Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone 1-800-YASKAWA (927-5292) or 1-847-887-7000 Fax 1-847-887-7310
http://www.yaskawa.com

YASKAWA ELÉTRICO DO BRASIL LTDA.
777, Avenida Piraporinha, Diadema, São Paulo, 09950-000, Brasil
Phone 55-11-3585-1100 Fax 55-11-3585-1187
http://www.yaskawa.com.br

YASKAWA EUROPE GmbH
185, Hauptstraβe, Eschborn, 65760, Germany
Phone 49-6196-569-300 Fax 49-6196-569-398
http://www.yaskawa.eu.com

YASKAWA ELECTRIC KOREA CORPORATION
9F, Kyobo Securities Bldg. 26-4, Yeouido-dong, Yeongdeungpo-gu, Seoul, 150-737, Korea
Phone 82-2-784-7844 Fax 82-2-784-8495
http://www.yaskawa.co.kr

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
151, Lorong Chuan, #04-02A, New Tech Park, 556741, Singapore
Phone 65-6282-3003 Fax 65-6289-3003
http://www.yaskawa.com.sg

YASKAWA ELECTRIC (THAILAND) CO., LTD.
59, 1st-5th Floor, Flourish Building, Soi Ratchadapisek 18, Ratchadapisek Road, Huaykwang, Bangkok, 10310, Thailand
Phone 66-2-017-0099 Fax 66-2-017-0799
http://www.yaskawa.co.th

YASKAWA ELECTRIC (CHINA) CO., LTD.
22F, One Corporate Avenue, No.222, Hubin Road, Shanghai, 200021, China
Phone 86-21-5385-2200 Fax 86-21-5385-3299
http://www.yaskawa.com.cn

YASKAWA ELECTRIC (CHINA) CO., LTD. BEIJING OFFICE
Room 1011, Tower W3 Oriental Plaza, No.1, East Chang An Ave.,
Dong Cheng District, Beijing, 100738, China
Phone 86-10-8518-4086 Fax 86-10-8518-4082

YASKAWA ELECTRIC TAIWAN CORPORATION
9F, 16, Nanking E. Rd., Sec. 3, Taipei, 104, Taiwan
Phone 886-2-2502-5003 Fax 886-2-2505-1280

YASKAWA

YASKAWA ELECTRIC CORPORATION

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