



Soft Servo
SYSTEMS, INC

ServoWorks S-100T
Operator's Manual

Revision 1.3
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Chapter 1: Welcome to ServoWorks S-100T

1.1 Overview of ServoWorks ServoWorks S-100T

ServoWorks S-100T is a complete prepackaged CNC controller for lathes. It is offered as a PC package with one of two specially designed industrial panel PCs or panel PC workstations that operate on a Microsoft Windows operating system with an Ardence RTX real-time extension. It can also run on any desktop or panel PC that meets the PC requirements for ServoWorks S-100T.

The SSP-140 is an industrial panel PC workstation and the SPC-120 is an industrial compact panel PC. The SSP-140 has a monitor, keypad, and function keys all built into one component. The SSP-140's function keys surrounding the screen were specifically designed to work with ServoWorks S-100T. With either of these panel PCs or with any other PC, you can include an optional mouse, an optional QWERTY keyboard or an optional touch panel in your ServoWorks S-100T system.

You will use ServoWorks S-100T to manually or automatically control motion and to view the status of the overall motion control operation, including axis positions, feedrates, etc. ServoWorks S-100T controls a spindle (through an open or closed loop), and has two axes that control tool movement. ServoWorks S-100T supports indexing, all-axes simultaneous interpolation with a spindle (C axis), and live tools (cutting tools with rotating edges).

This manual will explain how to use ServoWorks S-100T or ServoWorks S-100T, Simulation Edition. You should also refer to these other documents:

- *Quick Start Guide for ServoWorks CNC Products*
- *ServoWorks CNC Setup and Integration Manual for the VersioBus Interface System*
- *ServoWorks CNC Setup and Integration Manual for the FXI-40 Interface System*
- *ServoWorks CNC Setup and Integration Manual for the MECHATROLINK Interface System*
- *ServoWorks S-100T Parameters Manual*
- *Hardware and Wiring Manual for the VersioBus Interface System*
- *Hardware and Wiring Manual for the FXI-40 PC Interface*
- *ServoWorks S-100T Part Programming Manual*
- *ServoWorks CNC Macro Programming Manual*
- *Quick Reference Guide for Soft Servo Macro Specifications*
- *Soft Servo Glossary for ServoWorks CNC Products and SMP Series General Motion Control Products*
- And all documentation for LadderWorks PLC

See the *Setup and Integration Manual for the VersioBus Interface System*, the *Setup and Integration Manual for the FXI-40 Interface System* or the *Setup and Integration Manual for the MECHATROLINK Interface System* for instructions on setting up your ServoWorks S-100T system. (**NOTE:** System setup is not required for the Simulation Edition of ServoWorks S-100T.) See the *LadderWorks PLC Manual* for instructions on integrating PLC into your ServoWorks S-100T system.

1.2 What You Can Do With ServoWorks S-100T

With ServoWorks ServoWorks S-100T, you can control motion either manually or automatically. There are seven operational modes for manual control of the lathe:

- 1) Jog Continuous Mode
- 2) Jog Incremental Mode
- 3) Rapid Mode
- 4) MDI Mode
- 5) Home Mode
- 6) HandWheel Mode
- 7) Spindle Mode

There is one operational mode for automatic control of the lathe:

- Auto Mode, in which you run G-code part programs. (You edit G-code part programs in Editor Mode – a sub mode.)

This manual explains how to operate the lathe in each of these modes, plus how to set motor, servo, NC and many other parameters relating to the configuration and operation of the lathe, and the display of information in ServoWorks S-100T.

1.3 ServoWorks S-100T Simulation Edition

ServoWorks S-100T Simulation Edition is an extremely useful version of ServoWorks S-100T in which motion control and hardware are simulated. You can "play with" the software without having hardware or motors connected to your PC. For instance, you can "jog" an axis that doesn't exist, and still be able to see the "simulated movement" reflected in the display of position data, the plot display, etc.

ServoWorks S-100T Simulation Edition does not require a VersioBus adapter board, a FireWire PCI adapter board or a MECHATROLINK adapter board to be plugged in to the host CPU. In a normal ServoWorks S-100T system, the adapter board generates the outside signal that starts each servo loop. With ServoWorks S-100T Simulation Edition, a real-time timer function replaces the interrupt service routine of the adapter board. Servo lag is set to a theoretical value, to replace actual feedback from an encoder.

ServoWorks S-100T Simulation Edition has three different purposes:

- 1) **Training.** ServoWorks S-100T Simulation Edition is the perfect vehicle to train operators to use ServoWorks S-100T. People can try out ServoWorks S-100T without worrying about damaging real (and costly) hardware.

- 2) **Software Development.** With simulated motion control, developers using ServoWorks S-100T as a basis for their own, customized ServoWorks S-100T application can quickly test applications under development, without the possibility of damaging hardware or machines.
- 3) **Program Verification / Testing.** With simulated motion control, developers can test part programs and view plots created by those part programs without the possibility of damaging hardware or machines.

1.4 Using ServoWorks S-100T with the SSP-140 User Interface

The SSP-140 has a flat, color computer screen. Surrounding the screen are twenty function keys: ten at the bottom, and ten along the right side of the screen.

The screen display of ServoWorks S-100T is set up so that all of the choices available to you at any given time are displayed as buttons on toolbars permanently anchored at the bottom and the right side of the screen. The buttons on the toolbars correspond with the hard function keys on the SSP-140. This is the case in any mode, for whatever you are doing with ServoWorks S-100T. All of the buttons on these toolbars have a corresponding hard function key. To select a button on the screen, press the corresponding function key, as shown in Figure 1-1.

This area of the screen is reserved mainly for display of information. Any options for input (such as slide bars) displayed in this part of the screen can be accessed only with a mouse (an optional feature of ServoWorks S-100T). Note that a mouse is not required, since all input can be entered using only the function keys, or the function keys and the keypad.

To select the "OFFSET" button, press the F19 function key, which corresponds to the "OFFSET" button.

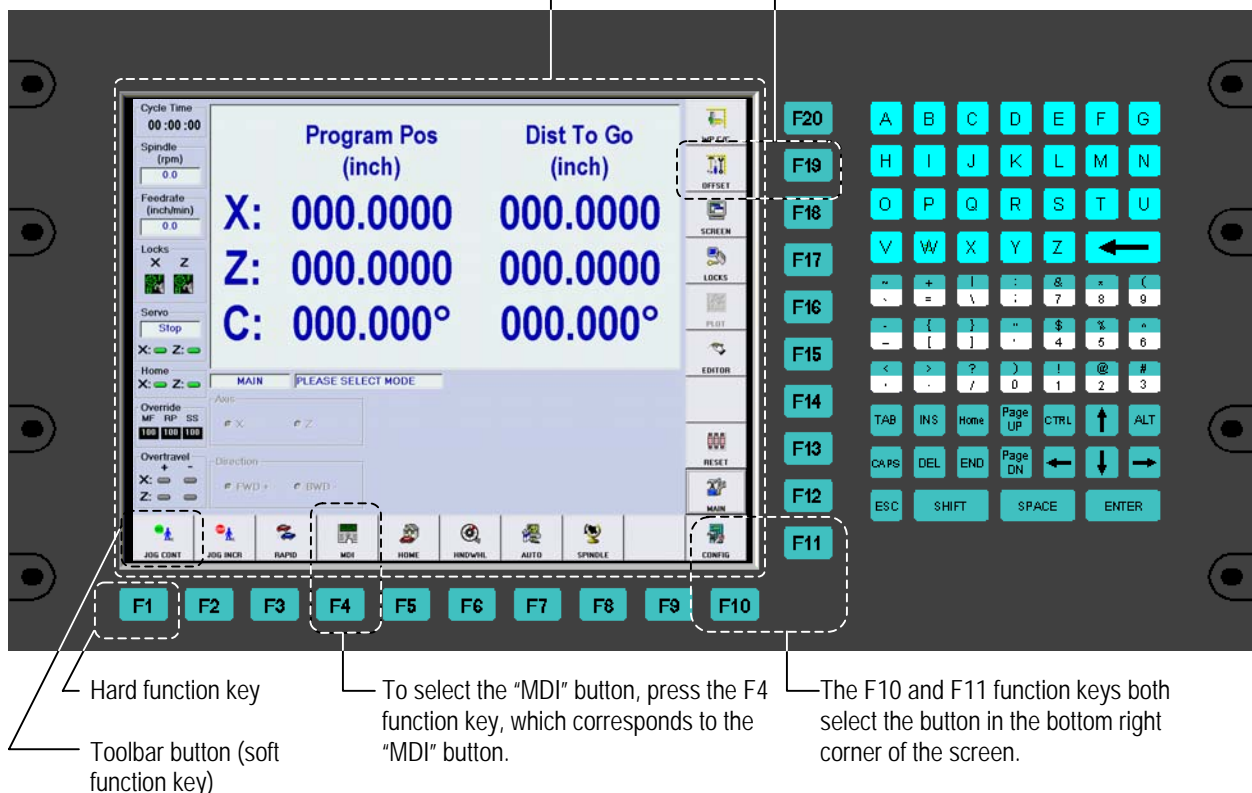


Figure 1-1: ServoWorks S-100T SSP-140 User Interface

There is also an alphanumeric keypad on the SSP-140. The keypad includes arrow keys, function keys, most symbols from a traditional keyboard, as well as keys for the entire alphabet, and for numbers 0 through 9.

Although you could solely interact with the SSP-140 through the function keys, you may want to use the keypad for entering some information directly onto the screen, such as percentages, feedrates, etc., as this will save time. If you have included a keyboard as part of your ServoWorks S-100T, you can use the keyboard for entering commands and editing part programs. If you have the optional mouse as part of your ServoWorks S-100T, you may save time by using the mouse for slide bars, etc.

NOTE: You cannot press two keys simultaneously on the SSP-140. The panel PC workstation does not support two function keys at the same time.

1.5 Selecting Toolbar Buttons

Throughout this manual, we will instruct you to “press the EXAMPLE button.” In fact, there are four ways to “press,” or select, toolbar buttons:

- 1) Press the hard function key on the SSP-140 that corresponds to the toolbar button (as shown in Figure 1-1).
- 2) If you have included a mouse as part of your ServoWorks S-100T, you can single click the toolbar button directly with the mouse.
- 3) If you have a touch screen, you can press the toolbar button on the screen with your finger.
- 4) If you have included a keyboard as part of your ServoWorks S-100T, you can use the “Shift” keys together with function keys to select buttons on the toolbar.

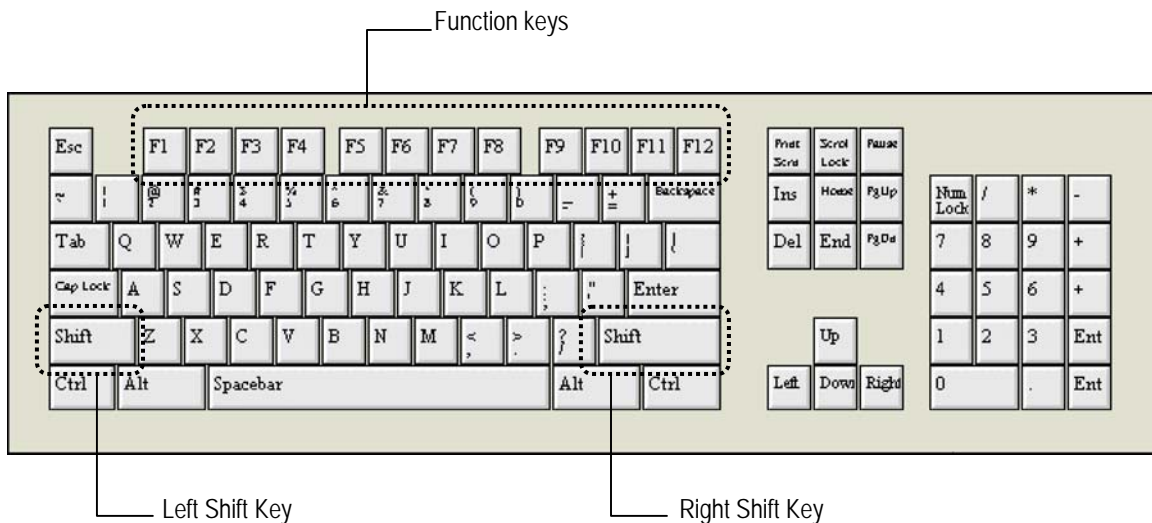


Figure 1-2: Keys Used to Selecting Toolbar Buttons – Typical QWERTY Keyboard

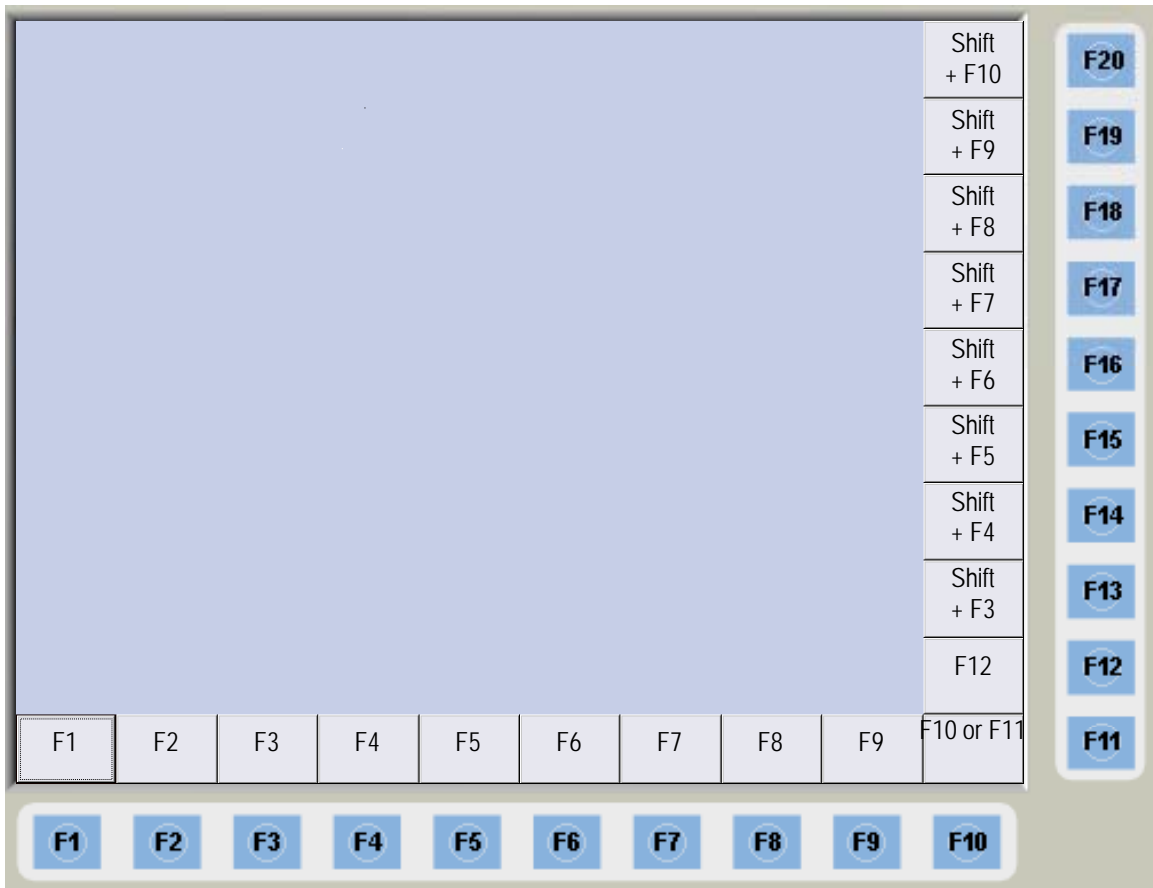


Figure 1-3: Keyboard Shortcuts for Selecting Toolbar Buttons

Function Key on the SSP-140	Equivalent Keyboard Shortcut
F1	F1
F2	F2
F3	F3
F4	F4
F5	F5
F6	F6
F7	F7
F8	F8
F9	F9
F10	F10
F11	F11
F12	F12
F13	Shift Key + F3
F14	Shift Key + F4
F15	Shift Key + F5
F16	Shift Key + F6
F17	Shift Key + F7
F18	Shift Key + F8
F19	Shift Key + F9
F20	Shift Key + F10

Table 1-1: Keyboard Shortcuts for Selecting Toolbar Buttons

Chapter 2: Installing the ServoWorks S-100T Software

2.1 Overview

If you have purchased the SSP-140 or SPC-120 panel PC from Soft Servo Systems, Inc., all software will be preinstalled for you, and you can skip this chapter in its entirety.

Before you begin installing the ServoWorks S-100T software, you must make sure that you meet the necessary PC hardware and operating system requirements. See the subsection about PC requirements in the *Do You Have the Necessary Requirements for the VersioBus Interface System?* section in the *ServoWorks CNC Setup and Integration Manual* for your servo interface system if you haven't already checked for these requirements.

The ServoWorks S-100T CD-ROM includes a registration procedure for registering your RTX product with Ardence.

The following software will be installed:

- 1) Ardence RTX RunTime
- 2) ServoWorks S-100T Engine
- 3) ServoWorks S-100T G-Code Parser
- 4) LadderWorks PLC Engine
- 5) ServoWorks RealTime DLL
- 6) ServoWorks S-100T HMI
- 7) LadderWorks PLC (refer to the LadderWorks manuals for setting up your PLC environment)

2.2 Known Compatibility Issues with RTX

2.2.1 Overview

There are two known compatibility issues with Ardence RTX, each of which can be easily resolved by changing the settings on your computer. You should read this section to see if either issue applies to you, and take the steps outlined to resolve the issue if necessary.

CHECKING YOUR SYSTEM SETTINGS NOW WILL HELP YOU TO AVOID POTENTIALLY BIG PROBLEMS LATER.

2.2.2 Physical Address Extension Enabled

There is a known compatibility issue between systems that have the Physical Address Extension (PAE) enabled, and Ardence RTX, versions 6.01 and earlier. This incompatibility issue could cause some serious system failures, such as:

- 1) Fatal application exit (i.e., "application crash")

- 2) System lock-up (or “freeze”)
- 3) System bug check (i.e., “Blue Screen of Death” or “Green Screen of Death”)

Check whether or not the PAE is enabled with the following steps:

- 1) Right-click on the “My Computer” icon on your desktop and select “Properties” from the drop-down menu that appears.
- 2) In the General tab, check to see if the words “Physical Address Extension” appear anywhere in that tab. If you don’t see “Physical Address Extension” in the General tab, the PAE is disabled, and your settings are fine. Skip the rest of this section, and go to *Section 2.2.3 Incompatible HAL Type*.

If you DO see “Physical Address Extension” in the General tab, then the PAE is enabled, and you will need to disable it.

Disable the PAE with the following steps:

- 1) Open the “boot.ini” file located in your C drive (C:\).
- 2) Add “/NoExecute=AlwaysOff” (case sensitive) to the last line of the boot.ini file. [If there is already a “/NoExecute=” line, replace it with “/NoExecute=AlwaysOff”.] For example, an acceptable line is:
“multi(0)disk(0)rdisk(0)partition(1)\WINDOWS=”OS name” /fastdetect
/NoExecute=AlwaysOff”

A typical boot file is shown as follows:

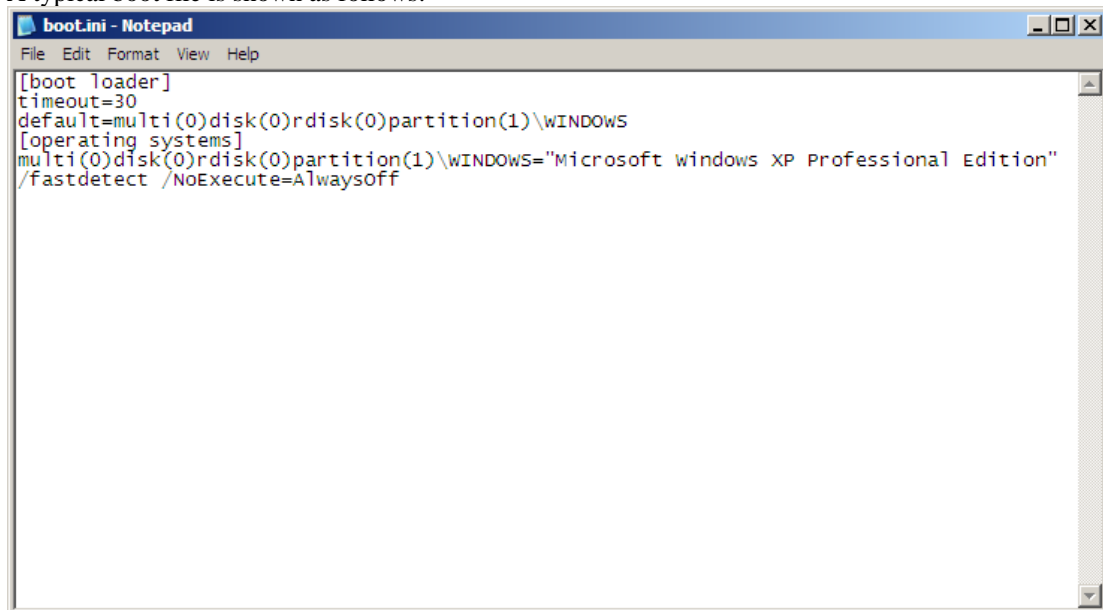


Figure 2-1: boot.ini File

- 3) Restart your PC.

For more information, please visit Ardence’s Tech Notes page on-line at https://support.vci.com/technotes/technotes_detail.asp?TechNoteID=172 (Title: *Physical Address Extension (PAE) Support in RTX*).

2.2.3 Incompatible HAL Type

2.2.3.1 Overview of Issue

There is a known compatibility issue between systems with certain Hardware Abstract Layer (HAL) types, and RTX. There are only two HAL types that are acceptable for use with RTX. There are four other HAL types that can be converted to one of the two acceptable HAL types.

2.2.3.2 Potential Problems Caused by Not Addressing This Issue

If you try to install RTX on a PC with an incompatible HAL type, you may see the following severe error:

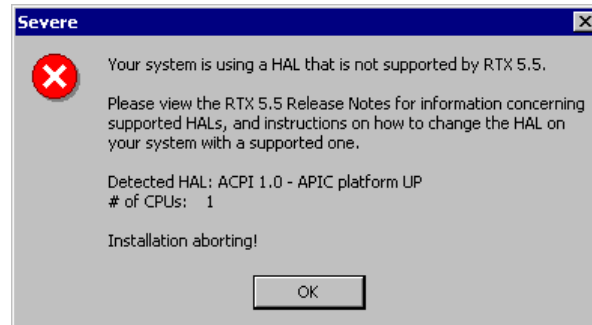


Figure 2-2: Severe HAL Error Message

It is possible that RTX will not prevent you from installing RTX on a system with a wrong HAL setting, in which case this incompatibility issue could cause some serious system failures, such as:

- 1) Fatal application exit (i.e., “application crash”)
- 2) System lock-up (or “freeze”)
- 3) System bug check (i.e., “Blue Screen of Death” or “Green Screen of Death”)

You must check to see whether or not your PC has an incompatible HAL type, and set your Windows operating system to use a standard HAL if it does.

For Windows 2000, see the following *Section 2.2.3.3 Checking/Resolving Incompatible HAL Type for Windows 2000*.

For Windows XP, skip ahead to *Section 2.2.3.4 Checking/Resolving Incompatible HAL Type for Windows XP*.

2.2.3.3 Checking/Resolving Incompatible HAL Type for Windows 2000

- 1) Update the “Emergency Recovery” disk for your system (in the event that an incompatible HAL choice leaves the system unbootable).
- 2) From the Windows “Start” menu, go to “Settings” → “Control Panel,” as shown:

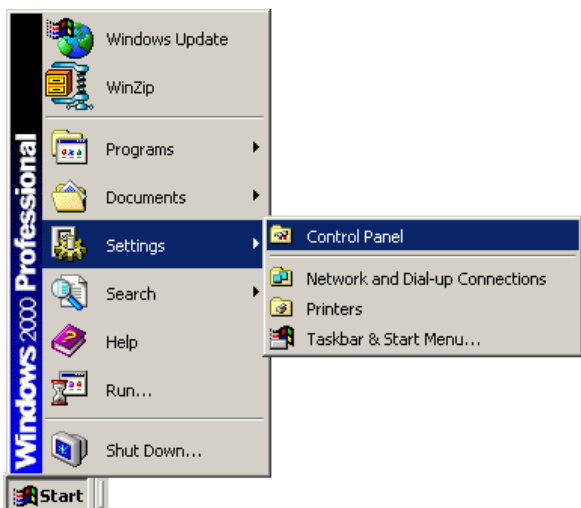


Figure 2-3: Start Menu Selection

- 3) You will see the “Control Panel” window appear, as shown:



Figure 2-4: Control Panel Window

- 4) Click on the “System” icon, and you will see the “System Properties” window appear, as shown:

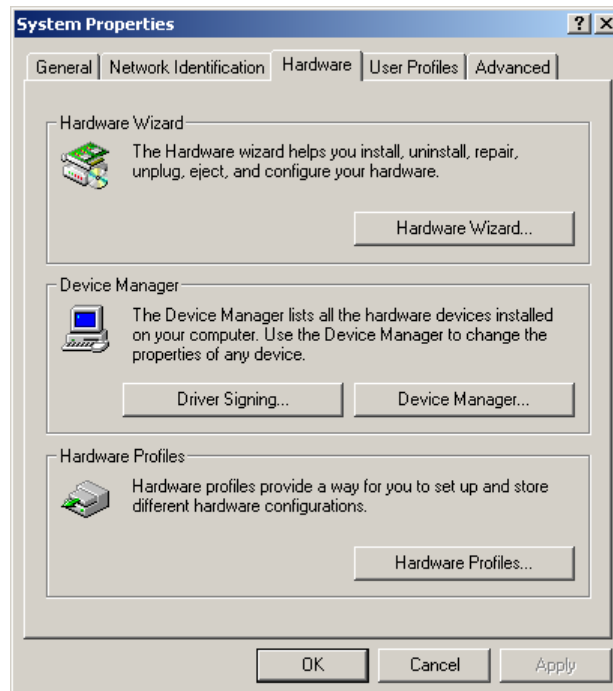


Figure 2-5: System Properties Window

- 5) Click on the “Hardware” tab.
- 6) In the “Device Manager” frame, click on the “Device Manager...” button. You will see the “Device Manager” window appear, as shown:

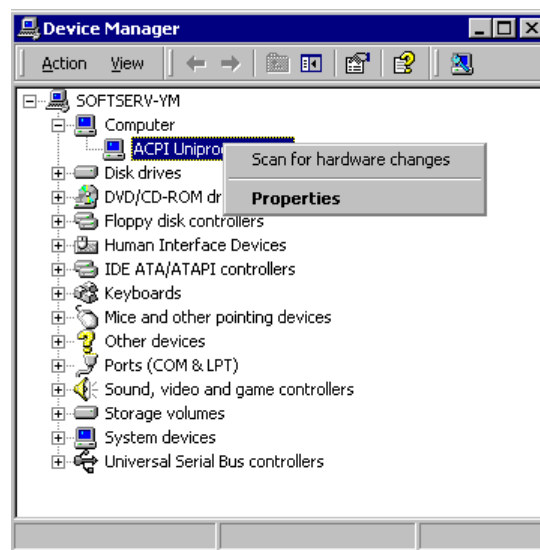


Figure 2-6: Device Manager Window

- 7) Select the “Computer” node (click on the ⊕ symbol to see the drop-down list under “Computer”). The leaf listed below “Computer” is your HAL model (“ACPI Uniprocessor PC” in the example window above). HAL models for “Standard Computers” for Windows 2000 are:

- Advanced Configuration and Power Interface (ACPI) PC
 - Standard PC
 - ACPI Multiprocessor PC
 - ACPI Uniprocessor PC
 - MPS Multiprocessor PC
 - MPS Uniprocessor PC
- } Acceptable settings
- } Unacceptable settings – need to be changed

- 8) The next step varies depending upon your HAL model.
- a) If your HAL model is NOT listed above, then RTX cannot be installed on your system. Contact Soft Servo Systems, Inc. to discuss your options.
 - b) If your HAL model is either “Advanced Configuration and Power Interface (ACPI) PC” or “Standard PC,” there is no need to change this setting. Skip the rest of this section, and proceed to *Section 2.3: Installing Operating System Patches*. You already have the correct HAL model to start installing Ardence RTX.
 - c) If your HAL model is “ACPI Multiprocessor PC,” “ACPI Uniprocessor PC,” “MPS Multiprocessor PC,” or “MPS Uniprocessor PC,” continue on to the next step.
- 9) Right click on the HAL model (the leaf listed below “Computer”), and select “Properties” from the drop-down menu, as shown in Figure 2-6. A window will appear, as shown in the following figure:



Figure 2-7: HAL Model Properties Window

- 10) Click on the “Driver” tab.
- 11) Click on the “Update Driver...” button to start the Device Driver Wizard, shown in the following figure:

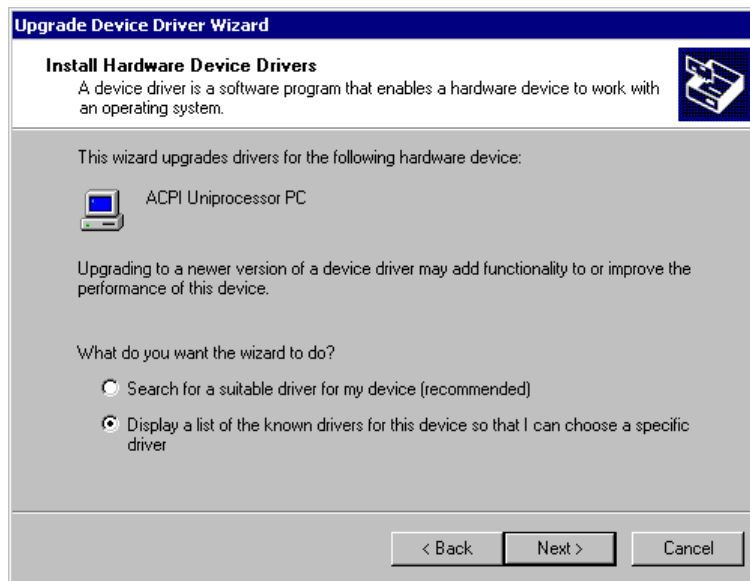


Figure 2-8: Update Device Driver Wizard – Install Hardware Device Drivers Window

- 12) Select “Display a list of the known drivers” and click the “Next” button, and you will see the following figure:

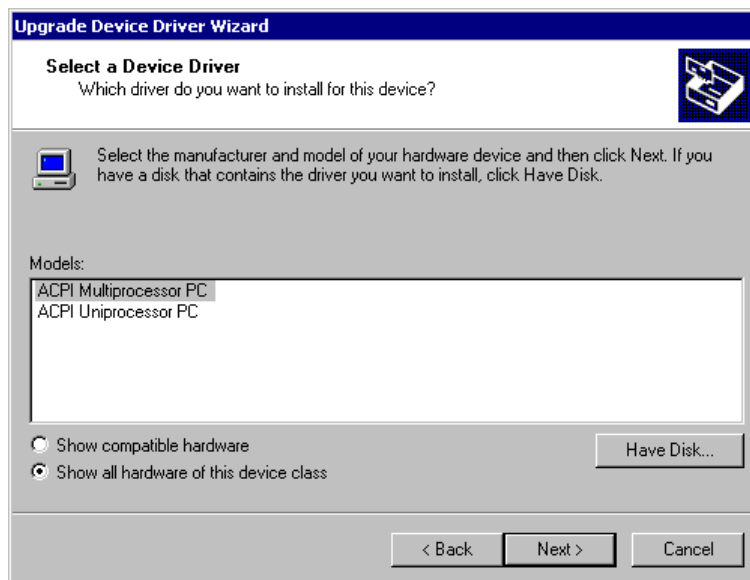


Figure 2-9: Update Device Driver Wizard – Select a Device Driver Window (1 of 2)

- 13) Select “Show all hardware of this device class,” and you will see the following figure:

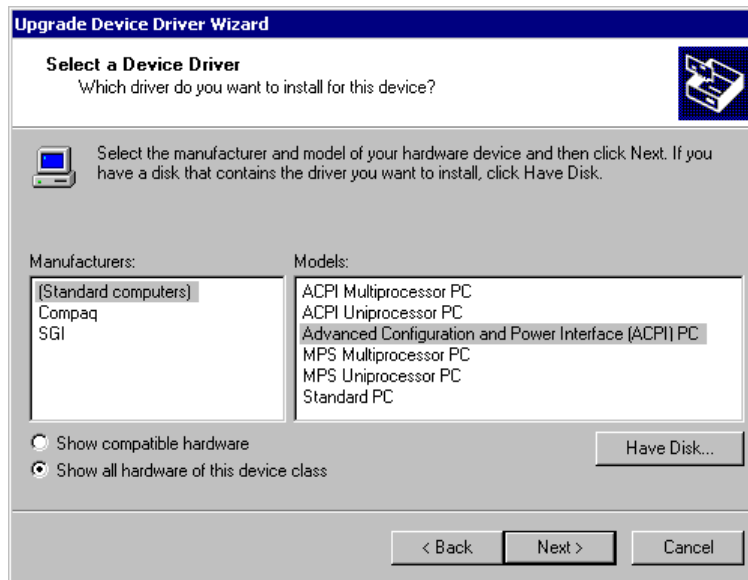


Figure 2-10: Update Device Driver Wizard – Select a Device Driver Window (2 of 2)

- 14) Select the appropriate new HAL type:
 - a) If your HAL model was “ACPI Multiprocessor PC” or “ACPI Uniprocessor PC,” choose “Advanced Configuration and Power Interface (ACPI) PC.”
 - b) If your HAL model was “MPS Multiprocessor PC,” or “MPS Uniprocessor PC,” choose “Standard PC.”
- 15) Click on the “Next” button. You will see the following warning message appear:

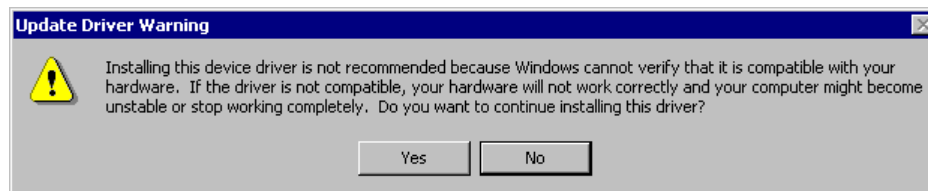


Figure 2-11: Update Driver Warning

- 16) This is an expected message. Click the “Yes” button, and the following window will appear:

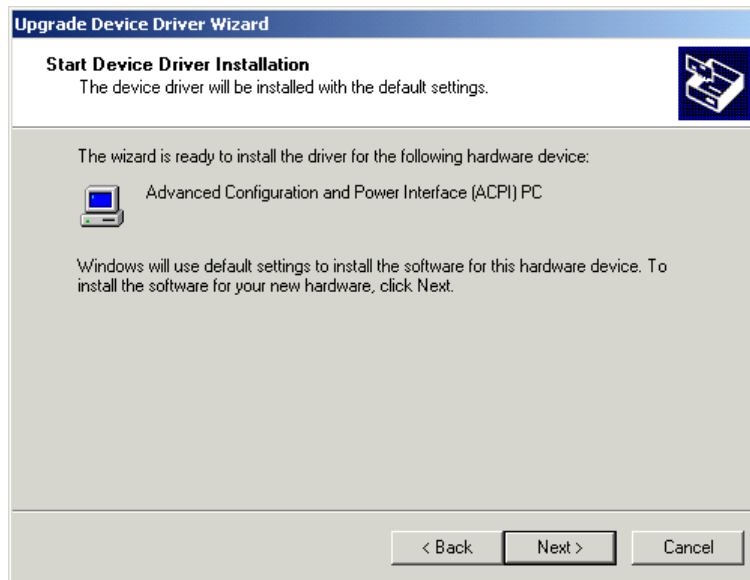


Figure 2-12: Update Device Driver Wizard – Start Device Driver Installation Window

17) Click the “Next” button, and you will see the following screen:



Figure 2-13: Update Device Driver Wizard – Completing Window

18) Click the “Finish” button, and the following screen will appear:

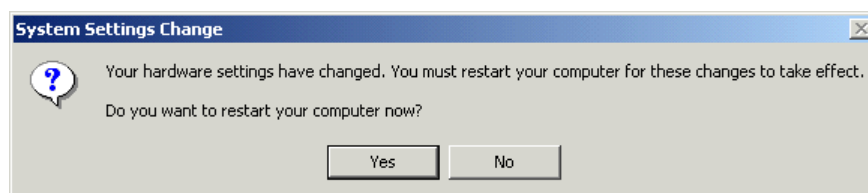


Figure 2-14: System Settings Change Dialog Box

- 19) You must click the “Yes” button to reboot your system. When your PC has restarted, you will be ready to continue to the next section (*Section 2.3: Installing Operating System Patches*), and to install Ardence RTX and the rest of the software.

2.2.3.4 Checking/Resolving Incompatible HAL Type for Windows XP

- 1) Update the “Emergency Recovery” disk for your system (in the event that an incompatible HAL choice leaves the system unbootable).
- 2) From the Windows “Start” menu, go to “Settings” → “Control Panel,” or just select “Control Panel” as shown:



Figure 2-15: Start Menu Selection

- 3) You will see the “Control Panel” window appear, as shown:

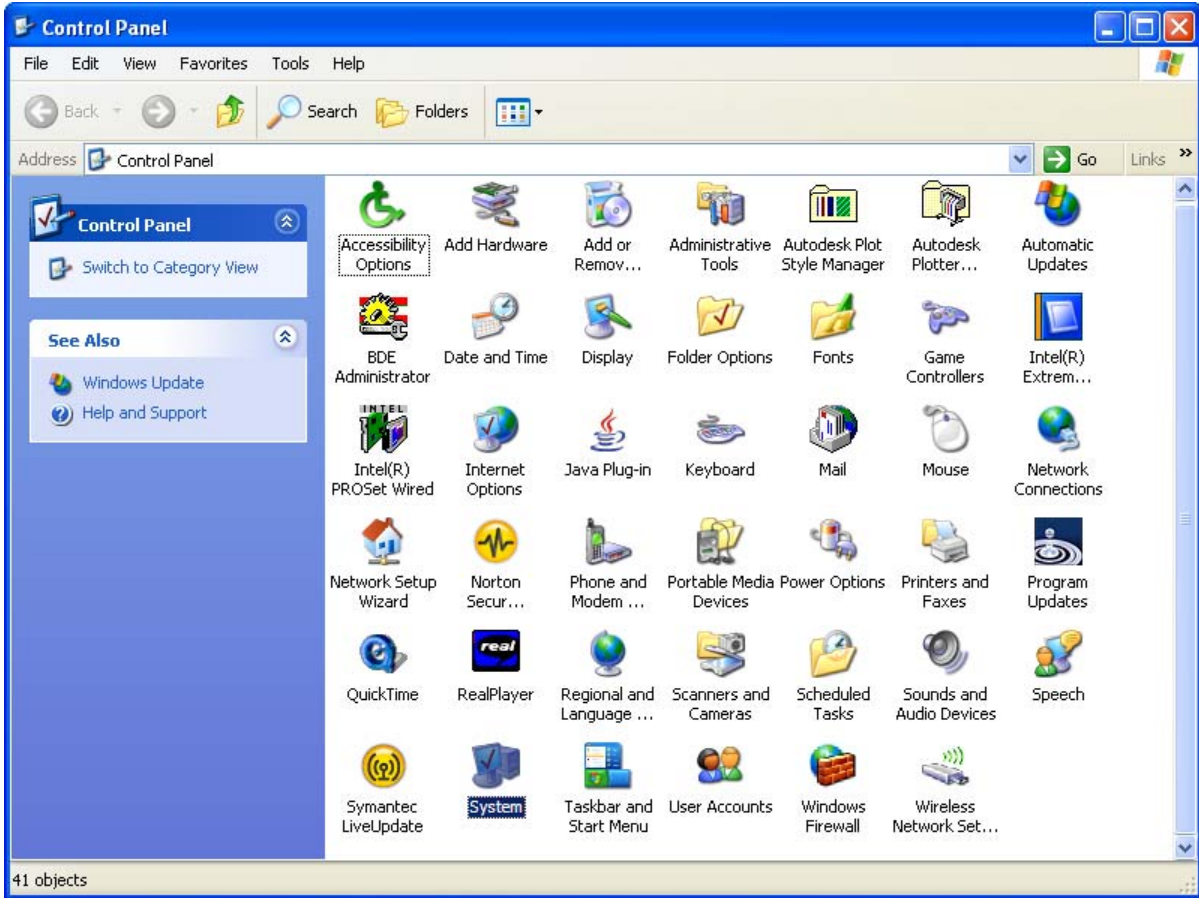


Figure 2-16: Control Panel Window

4) Click on the “System” icon, and you will see the “System Properties” window appear, as shown:

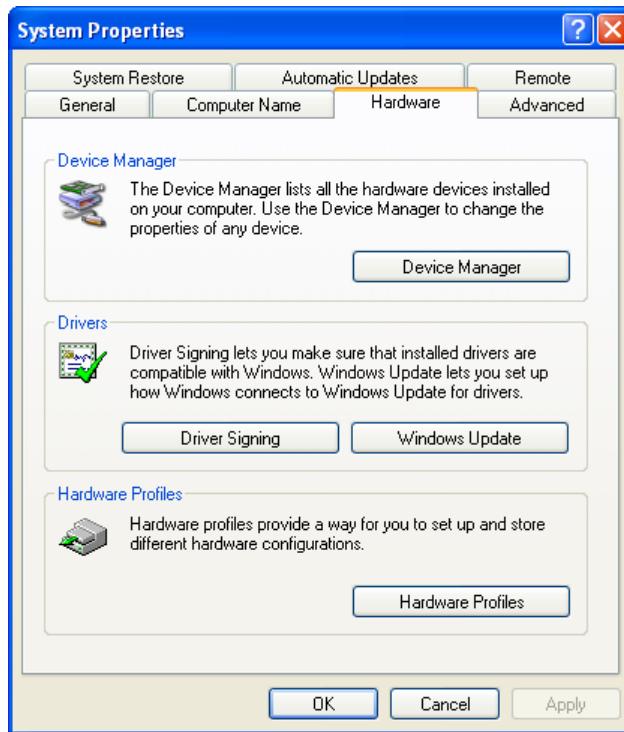


Figure 2-17: System Properties Window

- 5) Click on the “Hardware” tab.
- 6) In the “Device Manager” frame, click on the “Device Manager” button. You will see the “Device Manager” window appear, as shown:

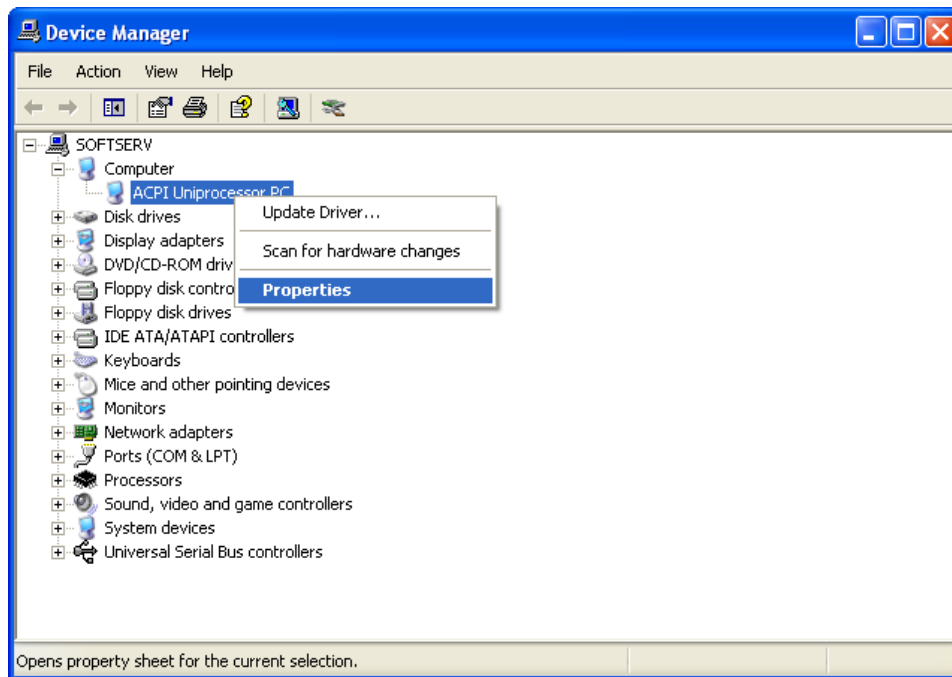


Figure 2-18: Device Manager Window

- 7) Select the “Computer” node (click on the ⊕ symbol to see the drop-down list under “Computer”). The leaf listed below “Computer” is your HAL model (“ACPI Uniprocessor PC” in the example window above). HAL models for “Standard Computers” for Windows XP are:

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> • Advanced Configuration and Power Interface (ACPI) PC • Standard PC • ACPI Multiprocessor PC • ACPI Uniprocessor PC • MPS Multiprocessor PC • MPS Uniprocessor PC | } | <p>Acceptable settings</p>

<p>Unacceptable settings – need to be changed</p> |
|---|---|---|

- 8) The next step varies depending upon your HAL model.
- a) If your HAL model is NOT listed above, then RTX cannot be installed on your system. Contact Soft Servo Systems, Inc. to discuss your options.
 - b) If your HAL model is either “Advanced Configuration and Power Interface (ACPI) PC” or “Standard PC,” there is no need to change this setting. Skip the rest of this section, and proceed to *Section 2.3: Installing Operating System Patches*. You already have the correct HAL model to start installing Ardence RTX.
 - c) If your HAL model is “ACPI Multiprocessor PC,” “ACPI Uniprocessor PC,” “MPS Multiprocessor PC,” or “MPS Uniprocessor PC,” continue on to the next step.
- 9) Right click on the HAL model (the leaf listed below “Computer”), and select “Properties” from the drop-down menu, as shown in Figure 2-18. A window will appear, as shown in the following figure:

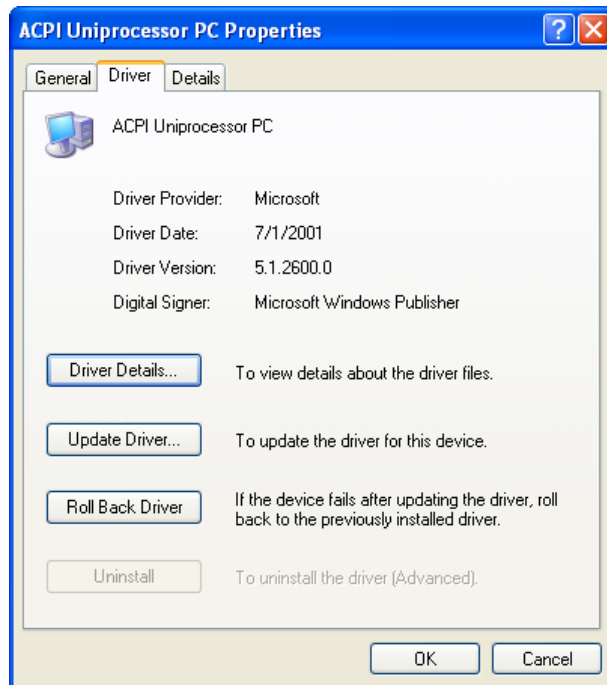


Figure 2-19: HAL Model Properties Window

- 10) Click on the "Driver" tab.
- 11) Click on the "Update Driver..." button to start the Hardware Update Wizard, shown in the following figure:

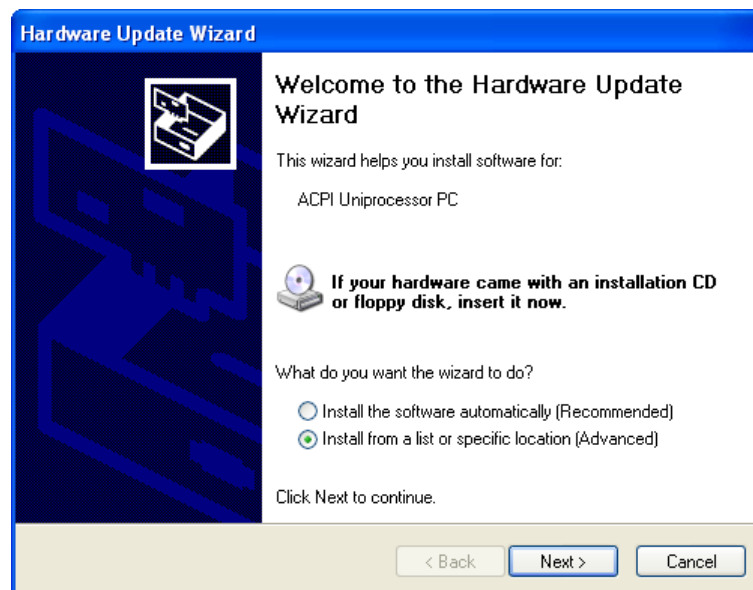


Figure 2-20: Hardware Update Wizard Welcome Window

- 12) Select "Install from a list or specific location (Advanced)," and click the "Next" button. A new Hardware Update Wizard window will appear, shown in the following figure:

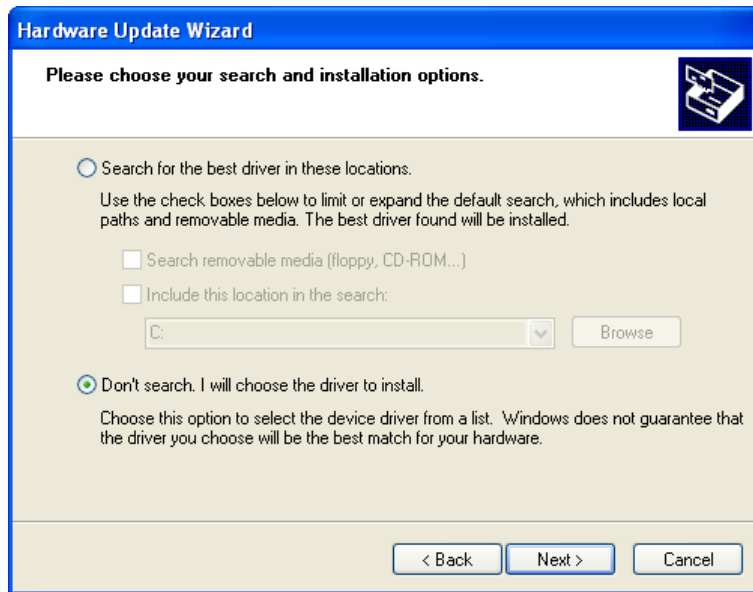


Figure 2-21: Hardware Update Wizard – Choose Search and Installation Options Window

- 13) Select “Don’t search. I will choose the driver to install,” and click the “Next” button. A new Hardware Update Wizard window will appear, as shown in the following window:

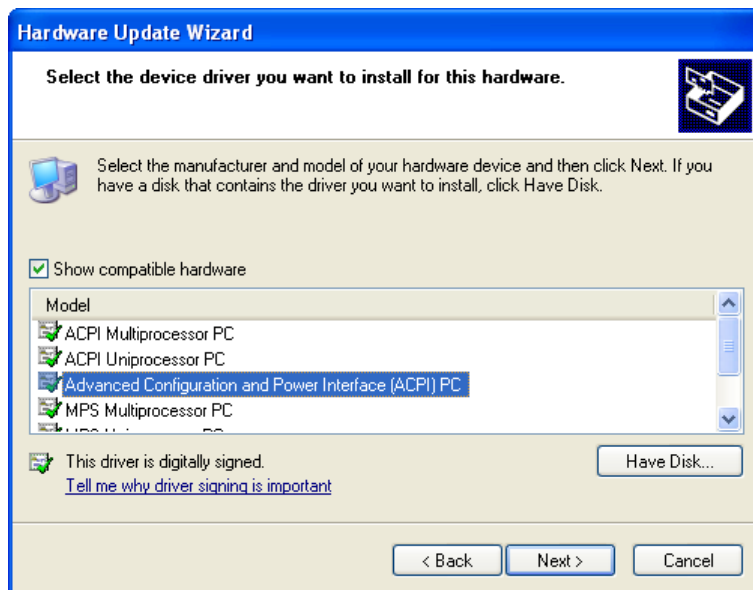


Figure 2-22: Hardware Update Wizard – Select Device Driver Window

- 14) Select the appropriate new HAL type:
 - a) If your HAL model was “ACPI Multiprocessor PC” or “ACPI Uniprocessor PC,” choose “Advanced Configuration and Power Interface (ACPI) PC.”
 - b) If your HAL model was “MPS Multiprocessor PC,” or “MPS Uniprocessor PC,” choose “Standard PC.”

- 15) Click on the “Next” button. You will see the following window, and the driver software for the new HAL type will install automatically:

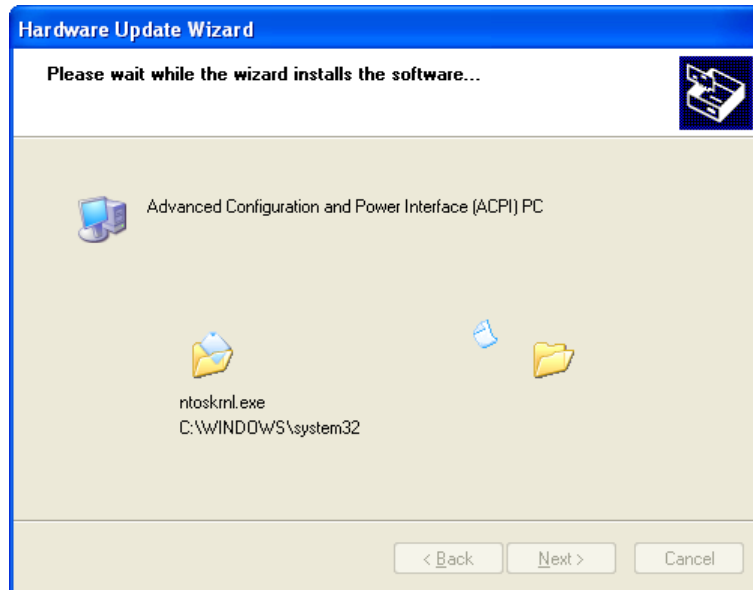


Figure 2-23: Hardware Update Wizard – Installing Window

- 16) When the installation is complete, you will see the following message appear:

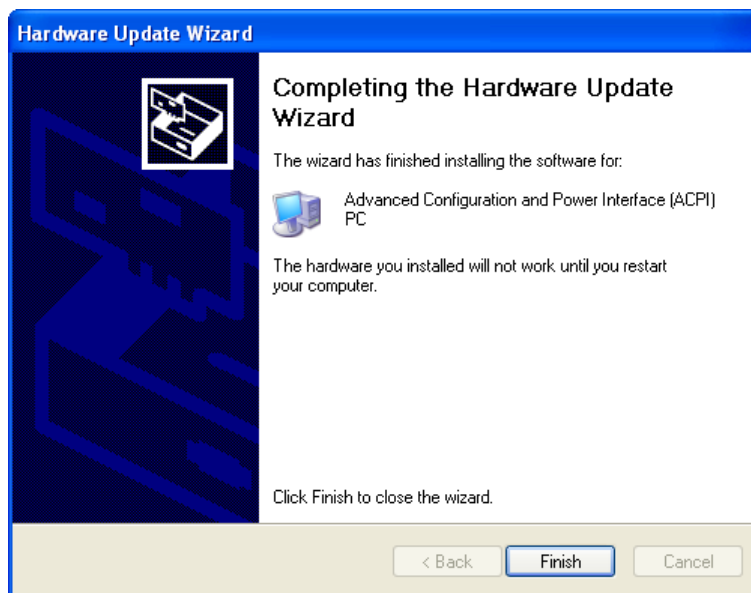


Figure 2-24: Hardware Update Wizard – Completing Window

- 17) Click the “Finish” button, and the following message will appear:

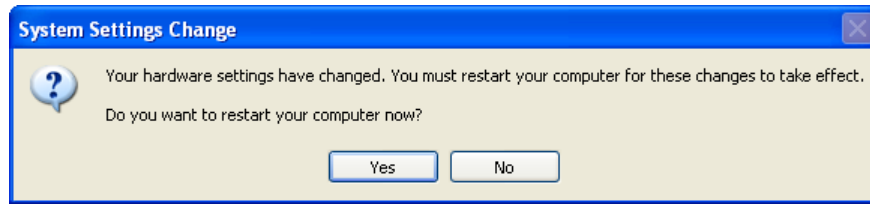


Figure 2-25: System Settings Change Dialog Box (1 of 2)

- 18) You must click the “Yes” button, and your computer will restart. When your computer has restarted, the following message will appear:

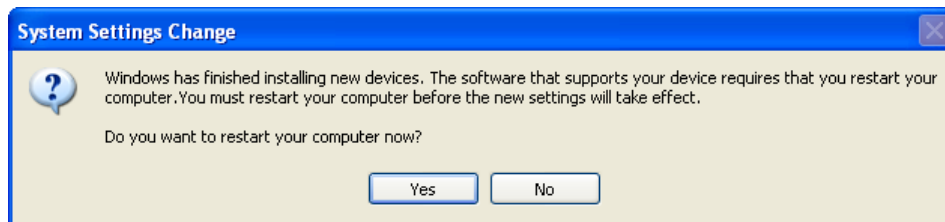



Figure 2-26: System Settings Change Dialog Box (2 of 2)

- 19) You must click the “Yes” button to reboot your system for a second time. When your PC has restarted, you will be ready to continue to the next section, and to install Ardence RTX and the rest of the software.

 CAUTION
YOU MUST REBOOT YOUR PC TWICE IN ORDER FOR THE PROPER HAL SETTINGS TO TAKE EFFECT FOR WINDOWS XP.

2.3 Installing Operating System Patches

The Microsoft Windows 2000 operating system requires Service Pack 1 for Ardence's real-time extension to function properly. [NOTE: No service pack is required for Windows XP.]

You can check to see which service packs (if any) are installed on your PC with the following procedure:

- 1) Click on the "Start" menu in the lower left corner of your PC's desktop.
- 2) Click on "Run..." and a dialog box will appear, as shown in the following figure:

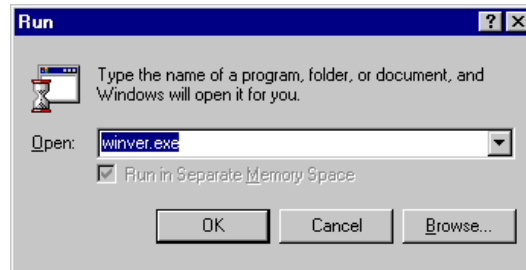


Figure 2-27: The Run Dialog Box

- 3) Type "winver.exe" in the text box, and click "OK." A window will appear (as shown in the following figure) that will tell you the latest service pack installed on your PC.



Figure 2-28: The "About Windows" Window

If the latest patches from these service packs haven't been installed, you must install them now. You can install the latest service packs by going to Microsoft's web site (www.microsoft.com), and clicking on "Windows Update" to start the procedure.

CAUTION

If you install the Ardence RTX software *before* you install the required operating system patches, there could be subtle problems with your installation. The operating system patches must be installed before you begin the ServoWorks S-100T installation.

2.4 Registering Your Ardence RTX Software and Obtaining Your License Key

If you have access to the Internet from the computer on which you are installing this software, you can skip this section, proceed to *Section 2.5: The Installation Procedure*, and obtain your RTX license key during the software installation procedure for the Ardence RTX software.

You will need to register your Ardence RTX software and obtain your license key during the software installation procedure detailed in *Section 2.5: The Installation Procedure*. Ideally, you need Internet access to obtain an Ardence RTX license key.

If you don't have Internet access from the computer on which you are installing this software, you will have to obtain your RTX license key from another computer with Internet access during the installation procedure, or you won't be able to complete the procedure. (You'll have to start the installation procedure on the computer on which you are installing the Ardence software in order to get the Machine ID number, then get the license key from another computer using that computer's Internet access, then go back to the first computer to finish the installation.) Make sure you have Internet access from some computer before you start the installation procedure.

NOTE: If you don't have any Internet access on any computer, you can call technical support at Ardence at 1-800-334-8649 from within the United States, or at 1-781-647-3000 from outside the United States. You must provide the PAC # (the purchase authentication code number) and the machine ID# (which you can only get by starting the installation procedure), and an Ardence representative will go to the web site for you, register you, and provide your license key number over the phone. Again, you must have your machine ID # before calling, so you must have started the installation procedure to get that number before calling.

At the time of this writing, Ardence's telephone technical support is available from 8:30 AM to 5:30 PM Eastern Standard Time. If you plan to register by telephone, you should perform the ServoWorks S-100T installation during those hours.

2.5 The Installation Procedure

2.5.1 Starting the Installation

The installation procedure includes installing and registering Ardence RTX, installing LadderWorks PLC, and installing the ServoWorks S-100T base components and application.

Before starting this installation procedure, you should review *Section 2.2: Known Compatibility Issues with RTX* to check for and resolve any known compatibility issues with Ardence RTX.

IF YOU TAKE A FEW MOMENTS TO CHECK YOUR SYSTEM SETTINGS BEFORE INSTALLING RTX, YOU CAN AVOID POTENTIALLY BIG PROBLEMS.

The following steps will guide you through installing your ServoWorks S-100T software:

- 1) Close all running applications.
- 2) Place the ServoWorks S-100T CD-ROM in the CD-ROM drive. The installation software will start automatically and the “Welcome to ServoWorks Installation” window will appear, as shown in the following figure. [NOTE: If the “Welcome to ServoWorks Installation” window doesn’t appear automatically, click on S100T_Install.exe, and a window similar to the following will appear.]

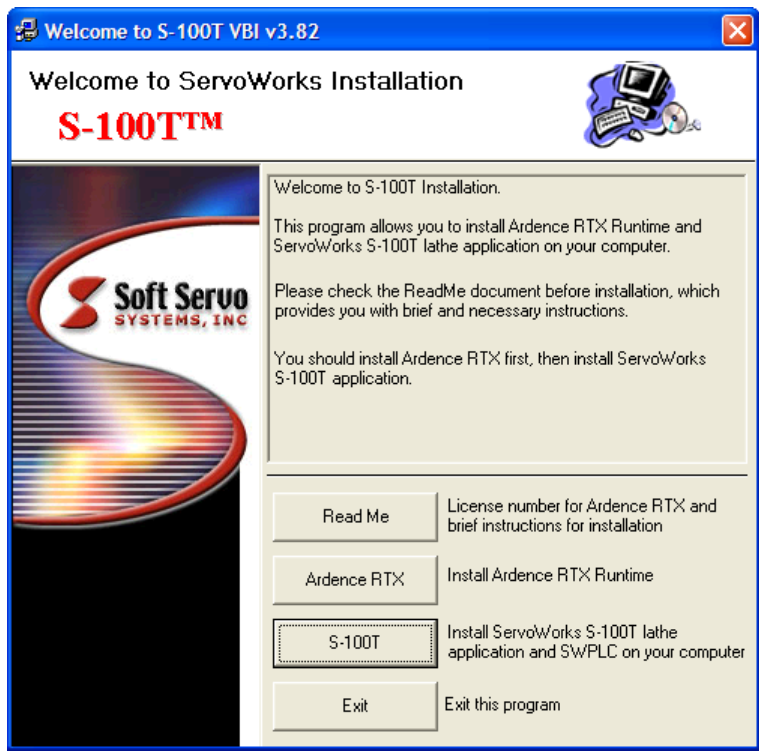


Figure 2-29: Welcome to ServoWorks Installation Window

- 3) In the “Welcome to ServoWorks Installation” window (Figure 2-29), click on the “Read Me” button. This will open up a Notepad file with installation information. We recommend that you print out this file for reference during the installation procedure and for future reference. Exit the Notepad application to continue.

2.5.2 Installing Ardence RTX

- 1) In the “Welcome to ServoWorks Installation” Window (shown in Figure 2-29), click on the “Ardence RTX” button and you will start the installation procedure for the Ardence RTX RunTime software. You will briefly see an “Unpacking RTX” dialog box, followed by a “Setup” dialog box, as shown in the following two figures:

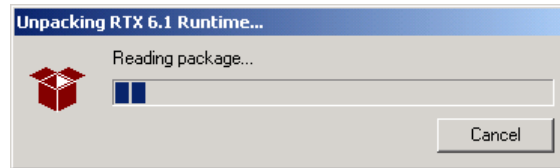


Figure 2-30: Unpacking RTX 6.1 Runtime Dialog Box

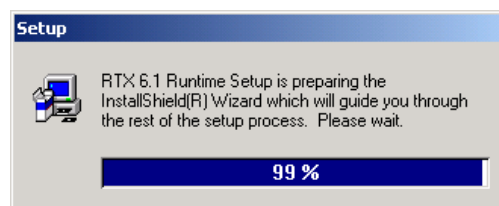


Figure 2-31: Setup Dialog Box

- 2) Then a “Welcome” window will appear, as shown in the following figure:

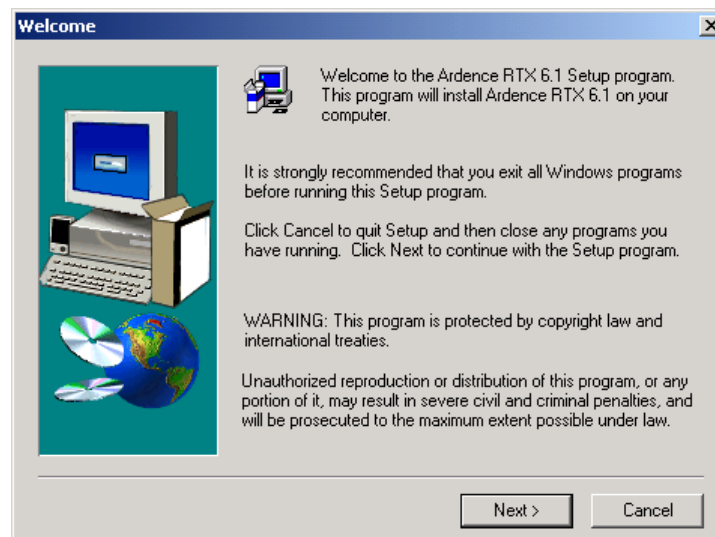


Figure 2-32: Ardence Welcome Window

- 3) Click the “Next” button, and a Software License Agreement window will appear, as shown in the following figure:

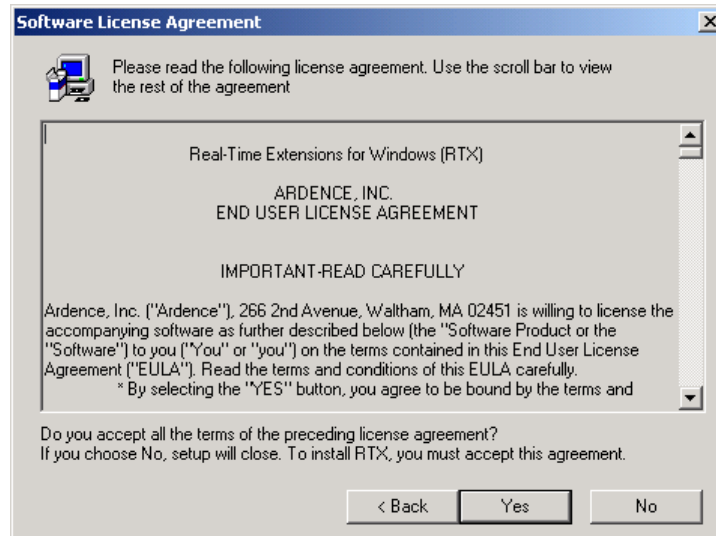


Figure 2-33: Ardence Software License Agreement Window

- 4) You should read the license agreement, then click the “Yes” button to accept the terms of the agreement. You will see the Ardence RTX Setup window, as shown in the following figure, which will ask you to fill in your name and your company’s name.

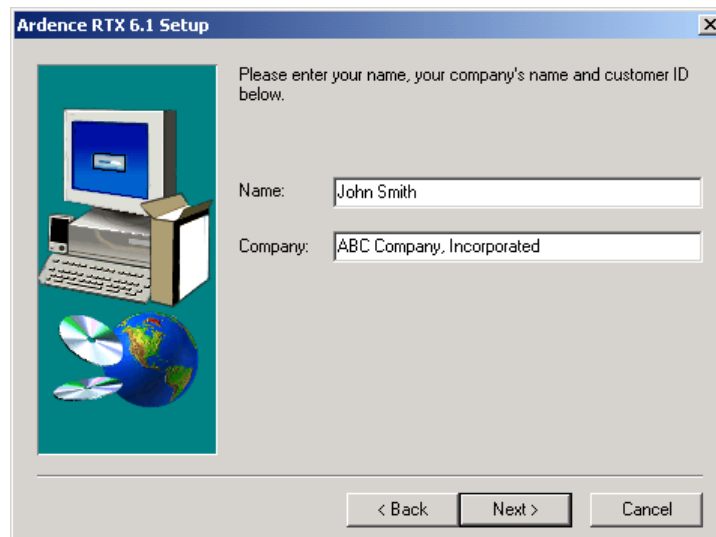


Figure 2-34: Ardence RTX Setup Window

- 5) Fill in the information, and click the “Next” button. You will see a Product Registration window appear, as shown in the following figure:

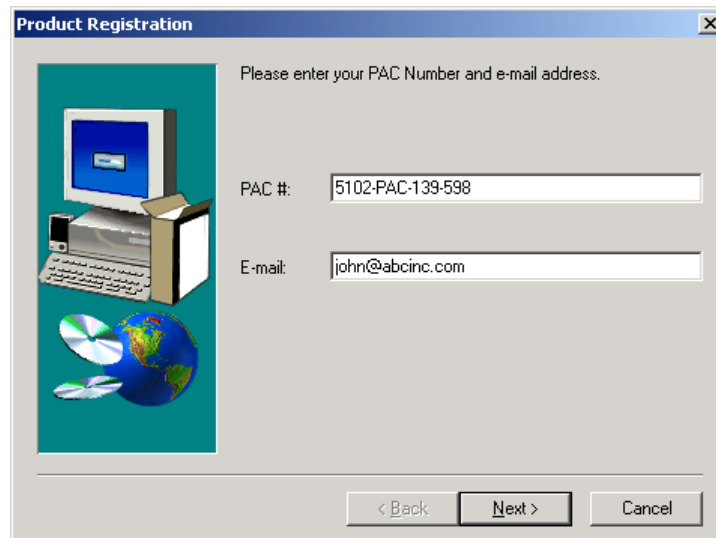


Figure 2-35: Ardence Product Registration Window

- 6) Fill in your PAC# (you can find it on a sticker on your Soft Servo Systems CD case) and your e-mail address. Then click the “Next” button. A dialog box will appear, as shown in the following figure, asking whether you have access to the Internet on this computer.

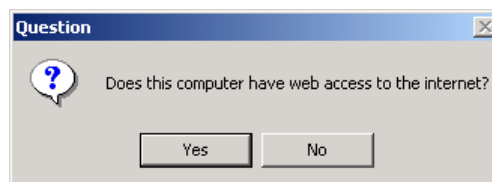


Figure 2-36: Question Dialog Box

- 7) Click “Yes” if you do have access to the Internet, and a browser will open up taking you to Ardence’s web site (similar to the web page shown in Figure 2-37). [NOTE: the browser may open up below your installation software window – you may have to click on your computer’s status bar to see it.] The web page should be automatically filled in with your PAC # (purchase authentication code number), your machine ID#, and your e-mail address.

If you don’t have access to the Internet, skip ahead to step #10.

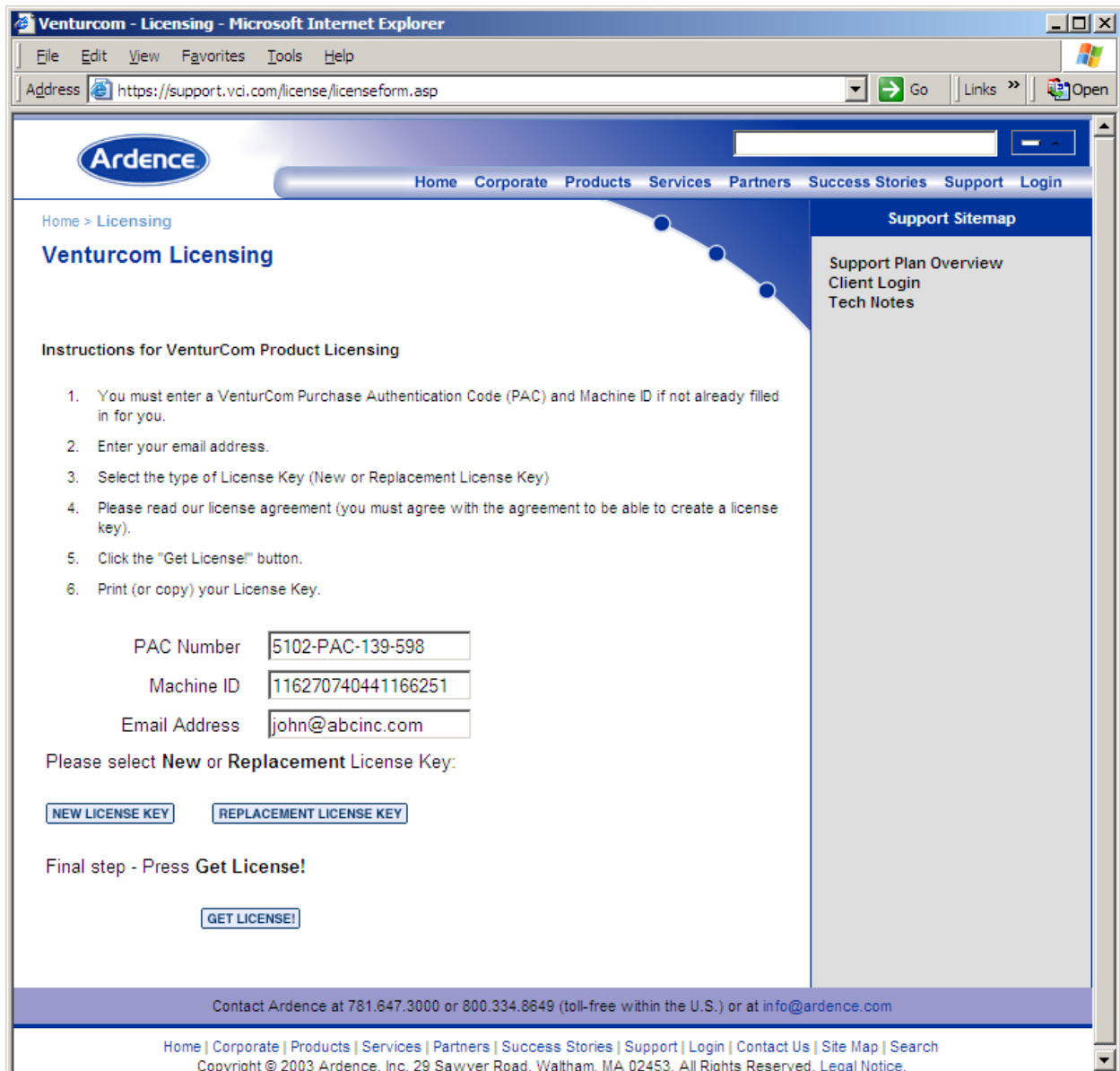


Figure 2-37: Sample Web Page for Automatic Retrieval of an Ardence License Key

- 8) Click on the “NEW LICENSE KEY” button, and a license agreement will appear, as shown in the following figure:

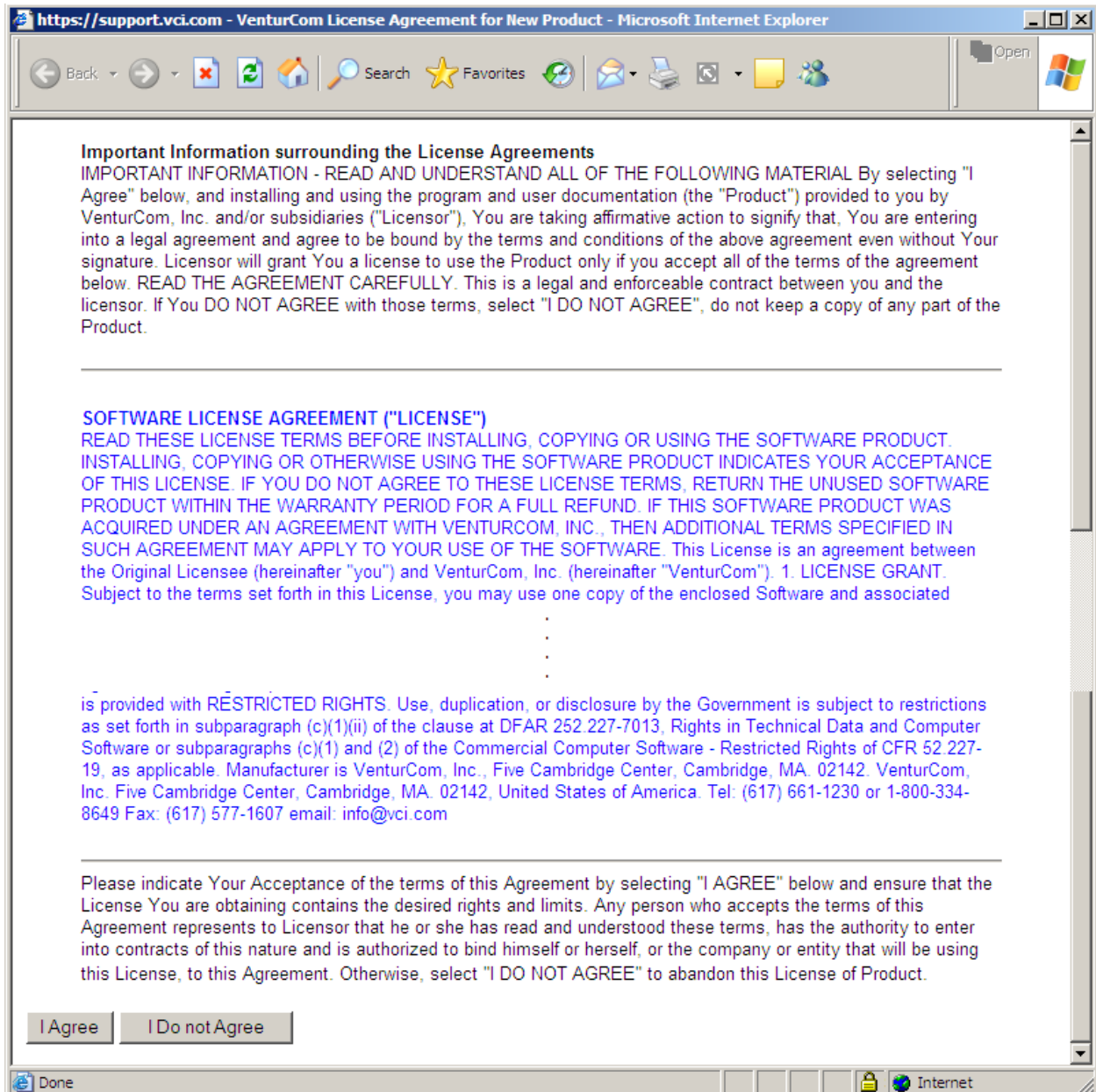


Figure 2-38: Sample Web Page for Ardence License Key Agreement

- 9) Read the software license agreement, and then click the "I Agree" button. You will be taken back to the previous web page shown in Figure 2-37. Click the "GET LICENSE!" button, and an RTX license key number will be displayed on the screen (as shown in the following figure), and will also be e-mailed to you at the e-mail address you have provided. Keep this number in a safe place. Skip ahead to Step #12.

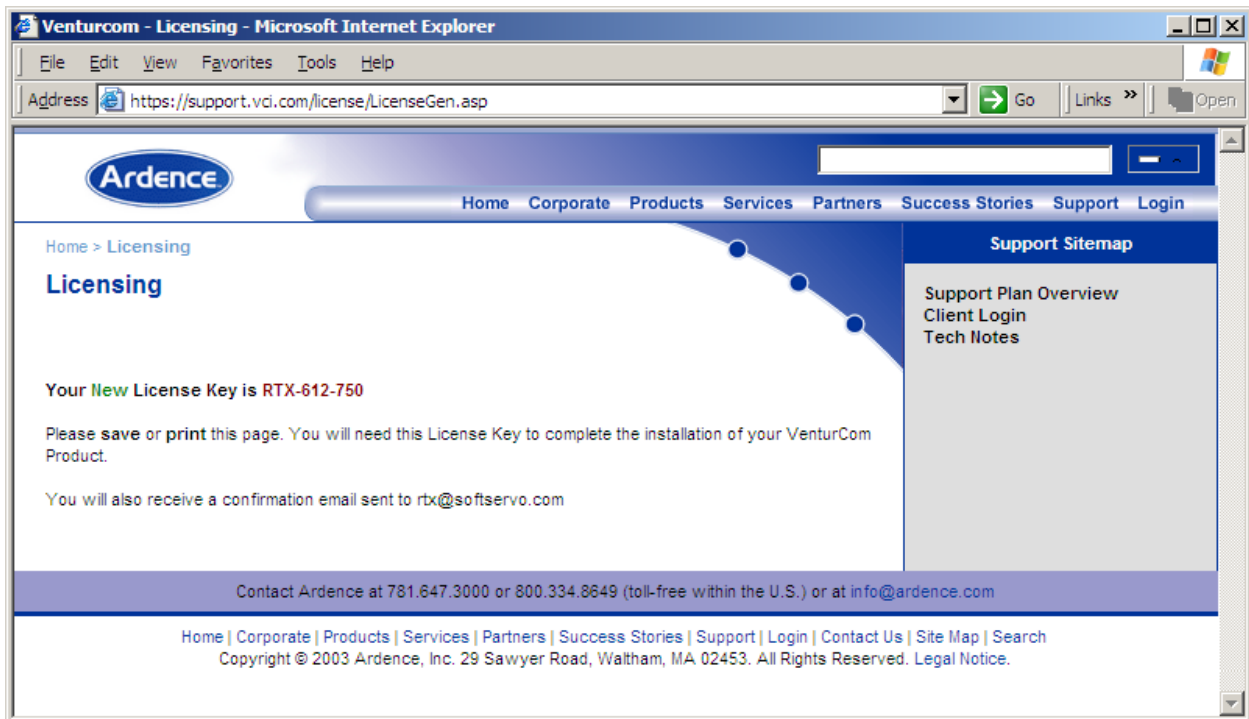


Figure 2-39: Sample Web Page for Ardenice License Key Display

- 10) If you don't have Internet access, click the "No" button in the question dialog box, and instructions will appear (as shown in the following figure) as to how you can obtain your RTX license key from another computer WITH Internet access. Also, see *Section 2.4: Registering Your Ardenice RTX Software and Obtaining Your License Key* for more information, including how to register by phone if you don't have Internet access available to you on any computer.

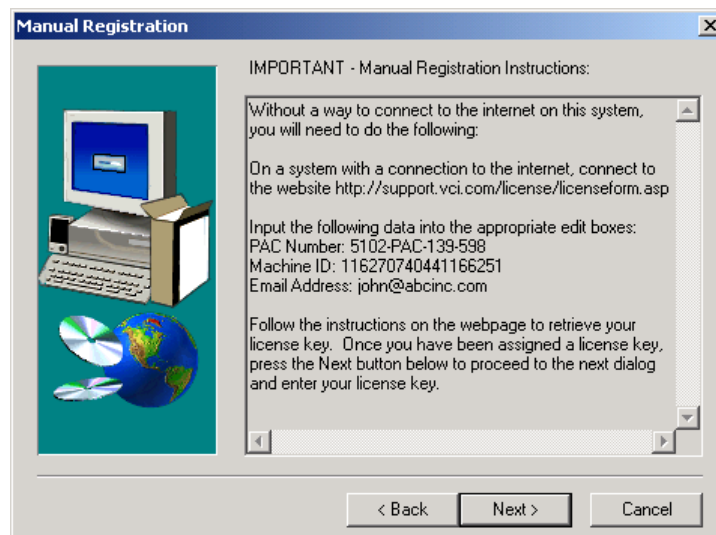


Figure 2-40: Manual Registration Window

- 11) To get an Ardence RTX license key using Internet access, use another computer to get on the Internet and go to <http://support.vci.com/license/licenseform.asp>. Input the PAC # (purchase authentication code number) provided by Soft Servo Systems, Inc. (you can find this on a sticker on the CD case for the Soft Servo Systems, Inc. CD) in the "PAC Number" text box in the web page. Input the machine ID # for your computer (which has been provided by the Ardence RTX installation procedure and is shown in the Manual Registration window in Figure 2-40) in the "Machine ID" text box in the web page. Input your e-mail address in the "Email Address" text box in the web page. Click the "NEW LICENSE KEY" button to obtain a new license, or the "REPLACEMENT LICENSE KEY" button to obtain a replacement license. A license agreement will appear – you must read the agreement and click "I Agree" at the bottom of the web page. Your RTX license key will be displayed on the screen, and e-mailed to you at the e-mail address you have provided. Write this number down, and take it back to the computer on which you are installing your ServoWorks CNC product.
- 12) After you obtain your RTX license key, click the "Next" button in the Manual Registration window to continue, and you will see the RTX License Key window appear, as follows:

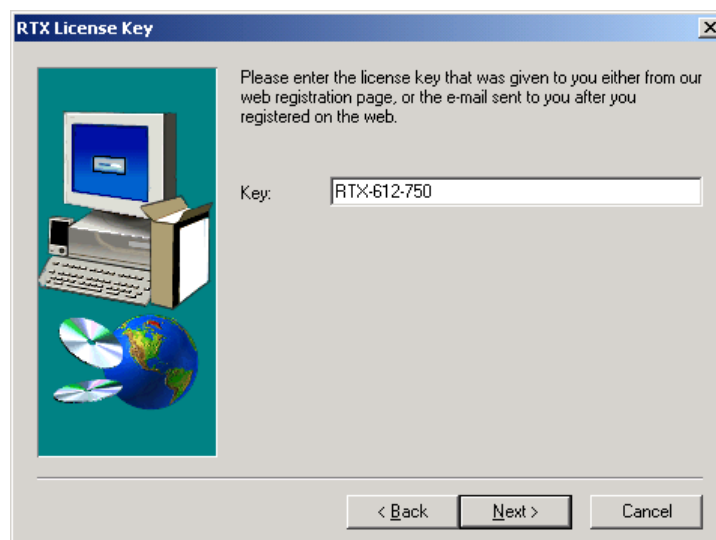


Figure 2-41: RTX License Key Window

- 13) If you have obtained your license key automatically, using Internet access on the computer on which you are installing ServoWorks S-100T, the license key number will appear automatically. If you had to go to a different computer or phone Ardence to obtain the license key, you'll need to type in your RTX license key number. Click the "Next" button to continue, and you will see the Choose Destination Location window appear, as shown in the following figure:

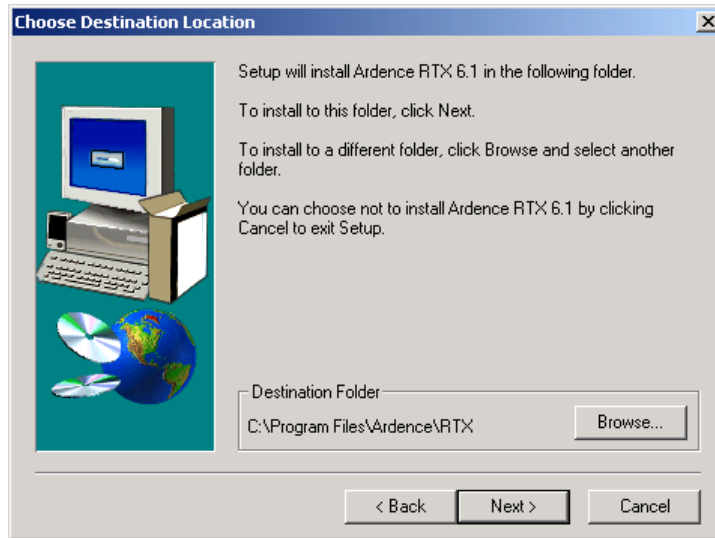


Figure 2-42: Choose Destination Location Window

- 14) This window is asking where you want to install the Ardence RTX files. If you accept the default destination folder listed, skip ahead to Step #17. Otherwise, click the “Browse” button, which brings up a “Choose Folder” dialog box, shown in the following figure:

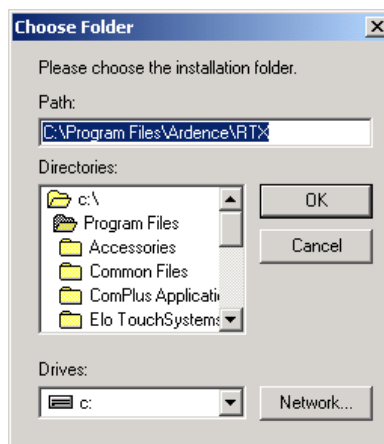


Figure 2-43: Choose Folder Window

- 15) You can choose a new destination folder by either browsing for a folder or by directly typing the path for the destination folder in the “Path” text box. If you type in a path for a new folder that doesn’t exist yet, you will get the following dialog box:

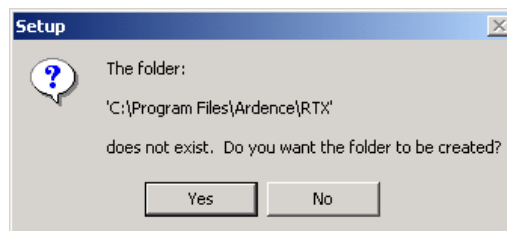


Figure 2-44: Setup Dialog Box

- 16) If you want to create a new folder, click the “Yes” button, then click the “OK” button in the Choose Folder window.
- 17) Click the “Next” button in the Choose Destination Location window, and a Select Program Folder window will appear, as shown in the following figure:

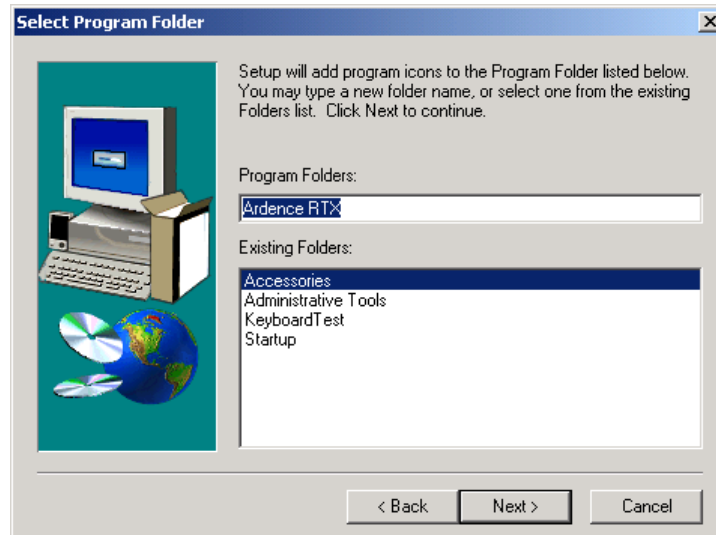


Figure 2-45: Ardence Select Program Folder Window

- 18) We recommend that you use the default program folder to add to the program list in the “Start” menu of your PC. Or, you may type a new name for the folder. When you are done, click the “Next” button, and you will see the “Start Copying Files” window appear, as shown in the following figure:

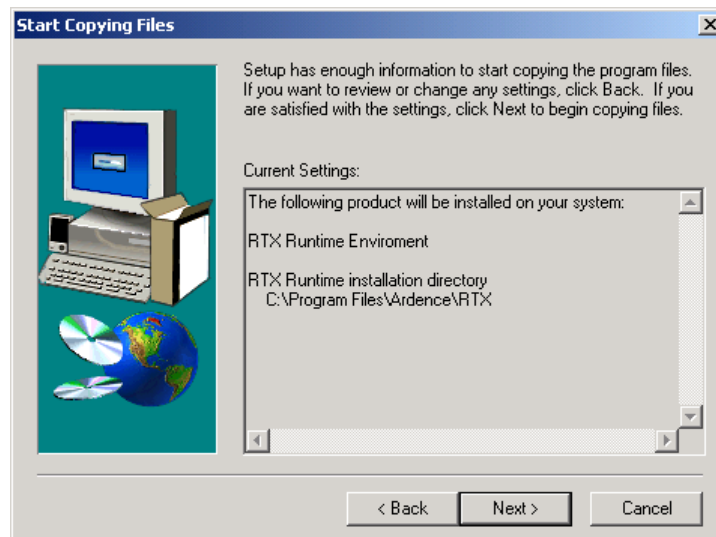


Figure 2-46: Ardence RTX Start Copying Files Window

- 19) Now is your chance to make any changes to the installation settings you have chosen. If there is any information you want to change, click the “Back” button, as many times as necessary to get to the information or settings you want to change. Otherwise, if you are satisfied, click the “Next” button, and the program will begin installing automatically. You will see the installation progress window shown as follows:

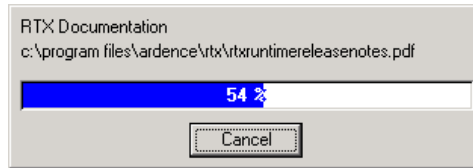


Figure 2-47: Installation Progress Window

- 20) You will see a Setup Complete window appear when the installation is complete, as shown in the following figure:

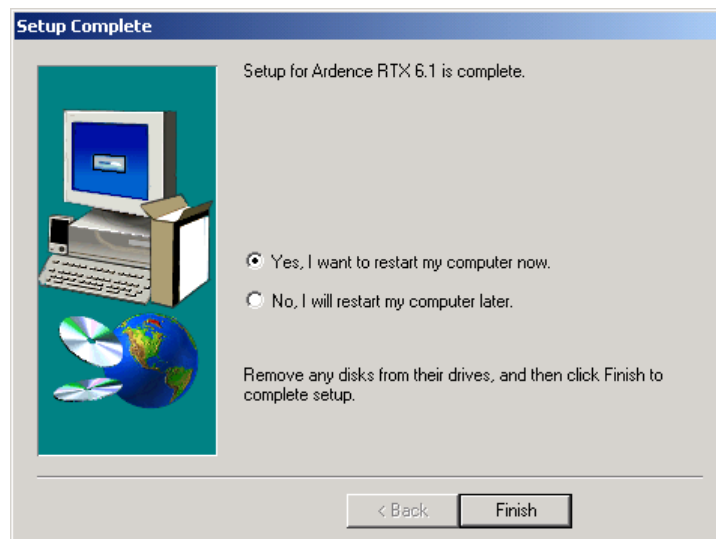


Figure 2-48: Setup Complete Window

- 21) This window is asking if you want to restart your computer now or later. You **MUST** restart your computer now. Choose “Yes, I want to restart my computer now,” and click the “Finish” button.

2.5.3 Installing LadderWorks PLC and the ServoWorks S-100T Software

- 1) When your computer has rebooted, the installation software will start automatically (if the ServoWorks ServoWorks S-100T CD-ROM is still in the CD-ROM drive) and the “Welcome to ServoWorks Installation” Window will appear again, as shown in Figure 2-29. [NOTE: If the “Welcome to ServoWorks Installation” window doesn’t appear automatically, click on the S100T_Install.exe file, and the “Welcome to ServoWorks Installation” window will appear.]
- 2) In the “Welcome to ServoWorks Installation” window (Figure 2-29), click on the “ServoWorks S-100T” button and you will see a PLC Installation window appear, as shown in the following figure:

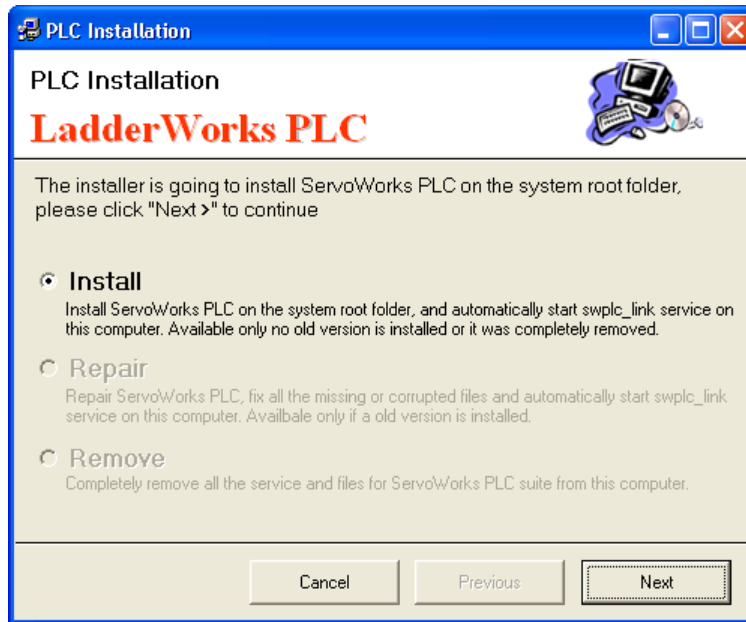


Figure 2-49: LadderWorks PLC Installation Window

- 3) Select “Install,” and click the “Next” button. LadderWorks PLC will install automatically, and a default sequence program (.lad file) will be precompiled, then the following window will appear:

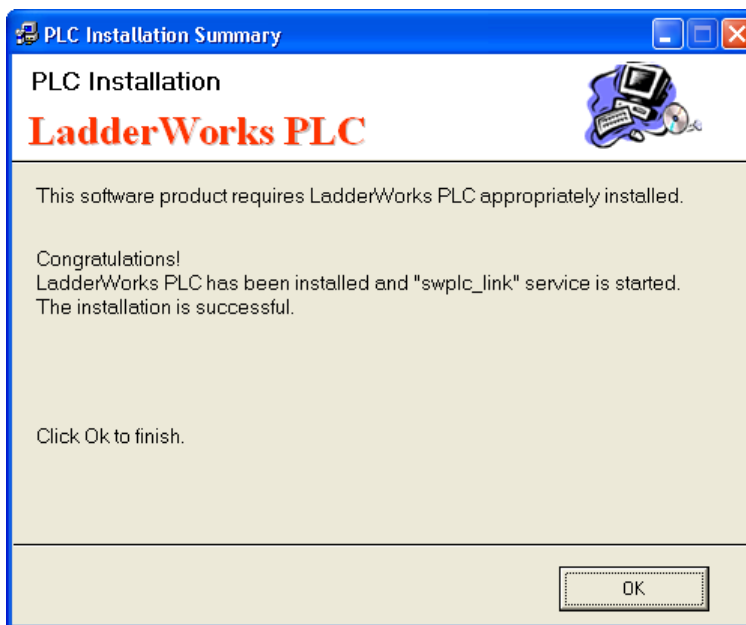


Figure 2-50: PLC Installation Summary Window

- 4) Click the “OK” button, and a Windows Installer dialog box will briefly appear, followed by a Welcome to the Setup Wizard window, shown in the following two figures:

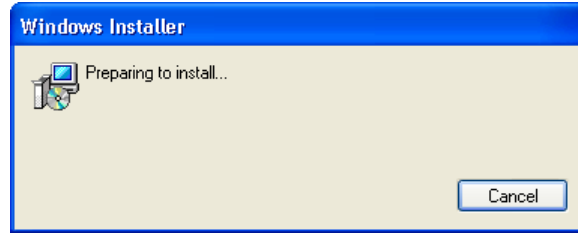


Figure 2-51: Windows Installer Dialog Box

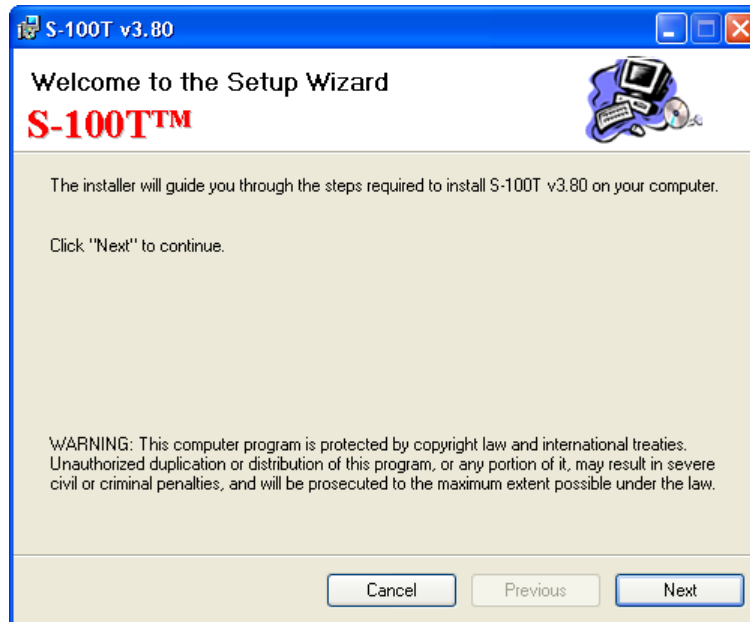


Figure 2-52: Welcome to the Setup Wizard Window

- 5) Click the “Next” button, and a Select Installation Folder window will appear, as shown in the following figure:

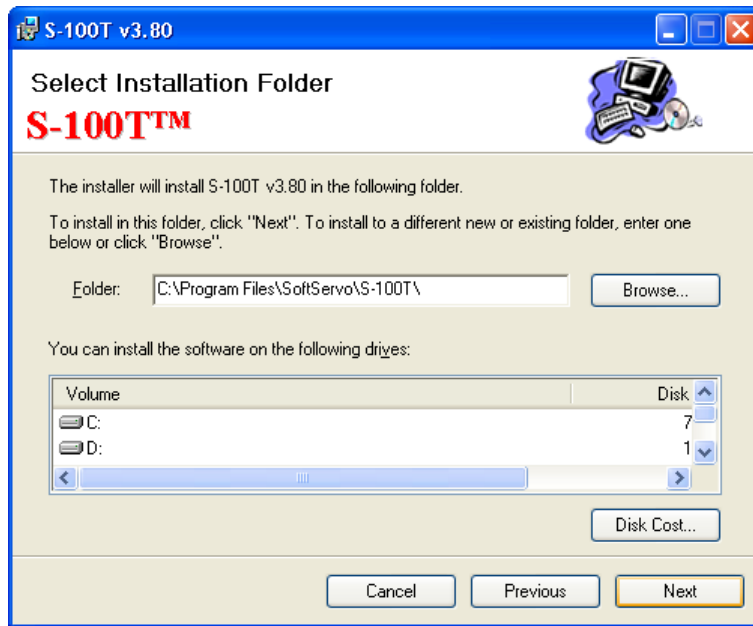


Figure 2-53: Select Installation Folder Window

- 6) This window is asking for the destination directory where you would like to install your ServoWorks S-100T product. You can accept the default destination folder listed (and skip ahead to Step #8), or click the “Browse” button, which brings up a “Browse for Folder” dialog box, shown in the following window:

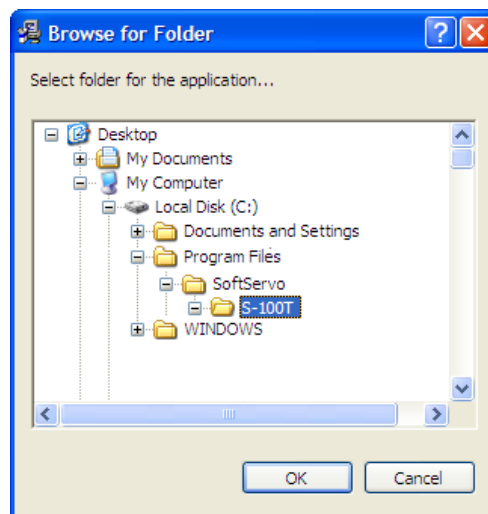


Figure 2-54: Browse For Folder Window

- 7) You can choose or create a new destination folder. When you are done, click the “OK” button.
- 8) Click the “Next” button in the Select Installation Folder Window. A Confirm Installation window will appear, as shown in the following figure:

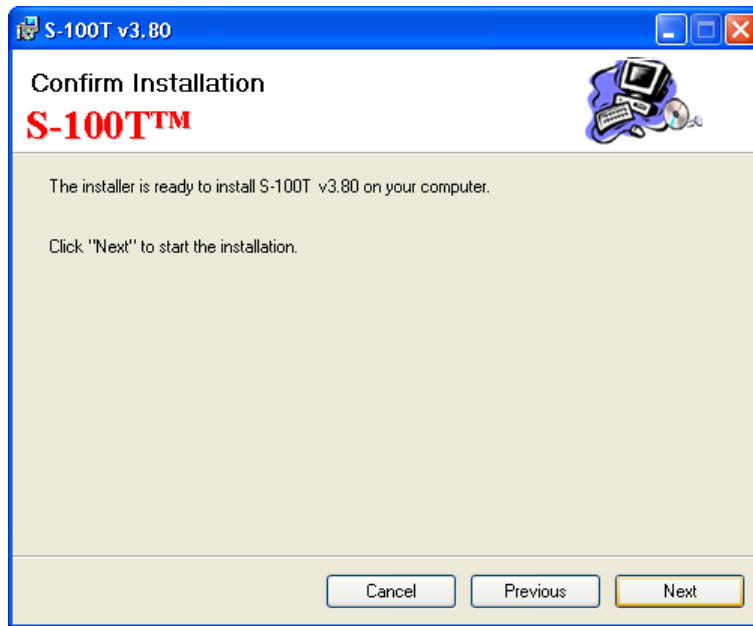


Figure 2-55: Confirm Installation Window

- 9) Click the “Next” button, and the ServoWorks S-100T installation will start automatically. The Installing window will appear and display the installation progress, as shown in the following window:

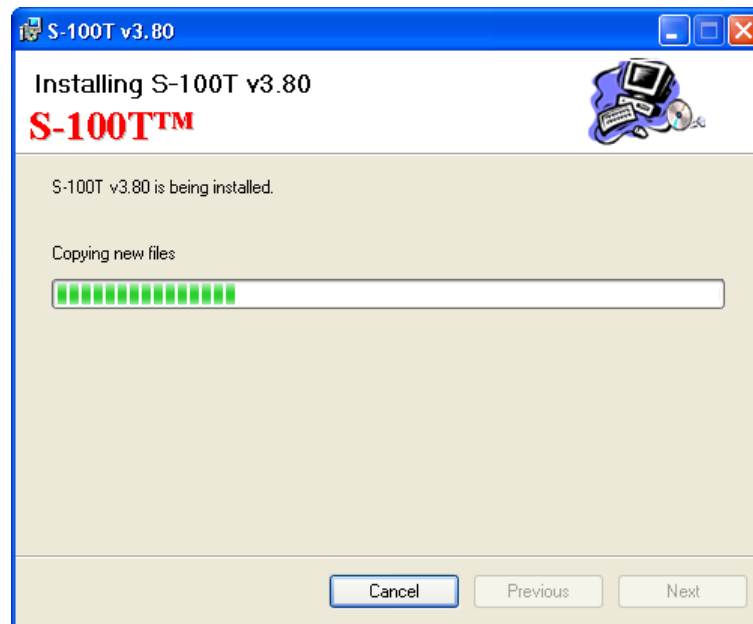


Figure 2-56: Installing Window

- 10) When the installation has completed, the following Installation Complete Window will appear:

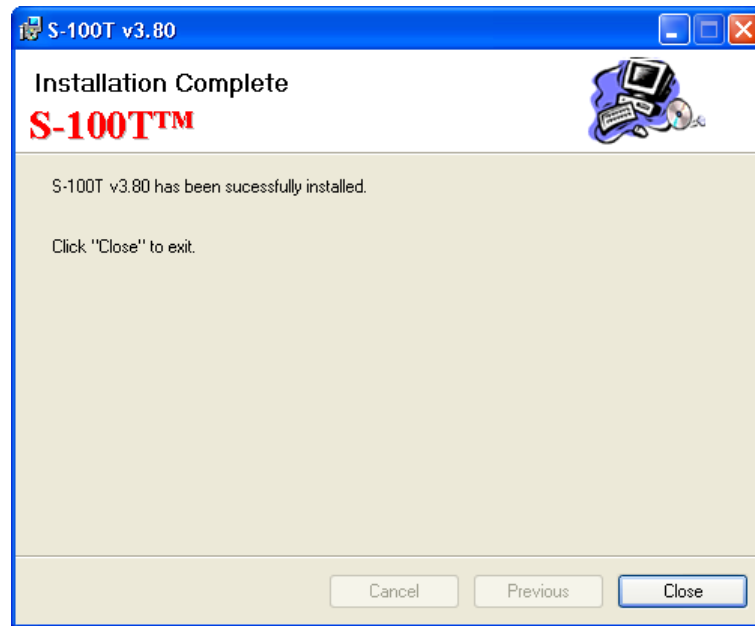


Figure 2-57: Installation Complete Window

- 11) Click the “Close” button to exit.

2.6 Finishing Your Software Installation

Click the “Exit” button in the “Welcome to ServoWorks Installation” window (Figure 2-29) to close the window.


In order to finish your software installation, see the *LadderWorks PLC User's Manual* for setting up your PLC environment, including creating and compiling a sequence program for your lathe.

Chapter 3: Starting ServoWorks S-100T

3.1 Starting ServoWorks S-100T

Upon powering up the SSP-140 or SPC-120 unit, ServoWorks S-100T should load automatically.

If you are using another PC, if for some other reason ServoWorks S-100T doesn't load, or if you need to restart the program for some reason, use the "Start" menu on the desktop of your PC to select "Programs," then "ServoWorks,"

then "ServoWorks S-100T." Alternatively, select the shortcut  on your desktop for ServoWorks S-100T, either by double clicking on the shortcut with your mouse, or with a keyboard (by pressing the "Ctrl" and "Shift" keys together, using the arrow keys to reach the icon, then pressing the "Enter" key).

When you first start ServoWorks S-100T, you will see the following welcome window appear:



Figure 3-1: ServoWorks S-100T Welcome Window

The following initialization procedure is executed automatically:

- 1) The ServoWorks S-100T Engine, the ServoWorks S-100T G-Code Parser, and the LadderWorks PLC Engine will be loaded automatically.

The ServoWorks S-100T Engine is the part of ServoWorks S-100T that actually controls the motion of the lathe, and operates in real-time. (As opposed to the ServoWorks S-100T HMI application, which is just the interface to the ServoWorks S-100T Engine, and which operates with split second delays that are transparent to the user.) The ServoWorks S-100T Engine controls the feedback control loop, performs calculations pertinent to machine motion, and sends commands to the servo drives, which control the motors, and thus control the lathe. When you start the ServoWorks S-100T Engine, you will also be starting up the Ardence RTX real-time extension that works with your operating system to make real-time motion control possible.

The ServoWorks S-100T G-Code Parser is the part of the ServoWorks S-100T system that analyzes basic G-code part program statements, and also operates in real-time.

The LadderWorks PLC Engine is a soft PLC module that is seamlessly integrated with the ServoWorks S-100T Engine into a single motion/machine control application, to provide uniform API functions. The LadderWorks PLC Engine also operates in real-time.

- 2) Parameters will be loaded from the system registry automatically (the program creates a set of default parameters if parameters are not already present).

Once ServoWorks S-100T is started, you will see the Main Window, as shown in the following figure:

Status Indicator Area: This area indicates the cycle time, the actual spindle speed, the actual feedrate, the status of axis locks, the servo loop status, the on/off status of the servo drives for each axis, whether or not the axis is at the home position, and whether or not the soft or hardware limits of the machine have been activated.

Right Toolbar: This toolbar displays sub modes available to you, whatever operational mode you are in.


Main Display Area: This area displays the axes' positions, plots of tool trajectory, the status of I/O signals, etc. (you can select what it is that you want to be displayed).

These are the eight basic motion modes available to you in ServoWorks S-100T. [NOTE: MDI Mode and Auto Mode (as well as Coordinates/Counter Mode and Offset Mode) are disabled (not available to you) until after you home all axes. See *Section 2.3: Performing a Homing Operation*.]

Mode Display Area: This area displays the mode status (current control mode) and the parameters and settings for the current mode

Bottom Toolbar

Figure 3-2: The Main Window of ServoWorks S-100T

NOTE: An “RtxServer” window will also open up on the desktop of your PC (as shown in the following figure) when the Ardence RTX real-time extension is invoked by the ServoWorks S-100T Engine. This happens automatically. You won’t need to use this window, so you can use the  button in the top right corner of the window to minimize the window. Or, you can use the “Options” menu to “Write to Log File,” rather than “Write To Screen” – this way, the RtxServer window will not appear the next time you start ServoWorks S-100T.

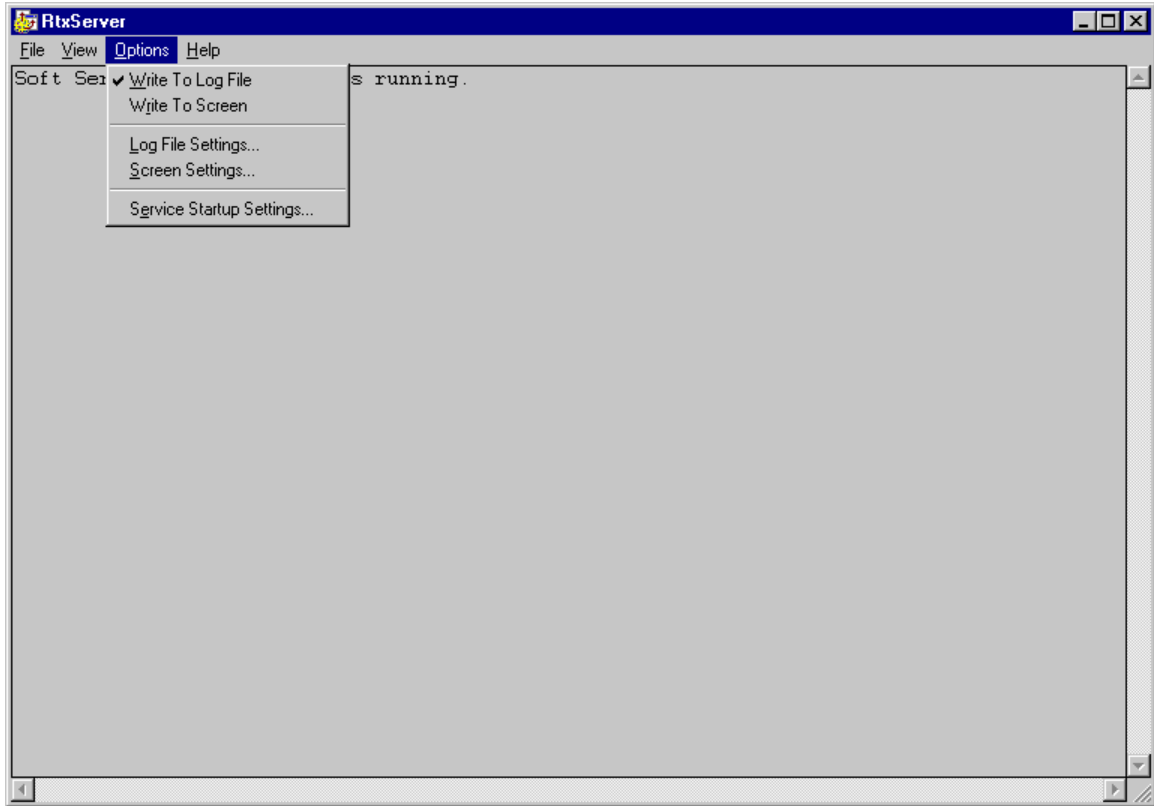




Figure 3-3: The RtxServer Window

3.2 Navigating Control Modes in ServoWorks S-100T

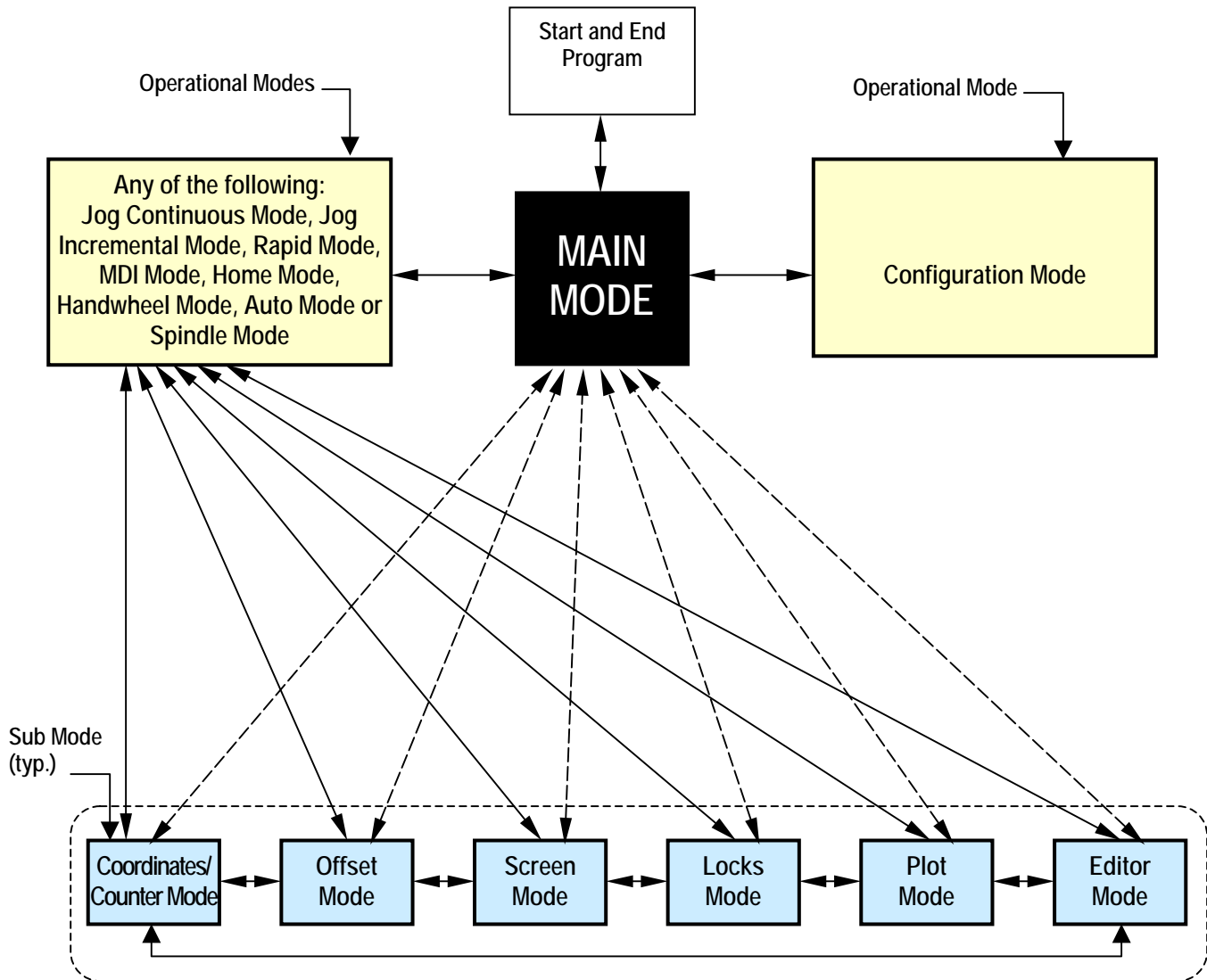
There are three types of control modes in ServoWorks S-100T:

- 1) **Main Mode** – a single mode that controls all the other modes. When you first start ServoWorks S-100T, you will be in Main Mode. Pressing the  key on the SSP-140 keypad (or the “Escape” key on your keyboard) while in Main Mode will cause you to exit ServoWorks S-100T (after the program prompts you to make certain that you *want* to exit the program).
- 2) **Operational Modes** – control modes that can be entered only from Main Mode. These include seven manual NC modes (Jog Continuous Mode, Jog Incremental Mode, Rapid Mode, MDI Mode, Home Mode, Handwheel Mode and Spindle Mode), Auto Mode (for automatic NC control) and Configuration Mode (for changing system parameters and configuration settings). Pressing the  key on the SSP-140 while in an operational mode will cause you to return to the Main Mode.

- 3) **Sub Modes** – control modes that can be entered from either Main Mode or from any operational mode except Configuration Mode. If you enter a sub mode from an operational mode, you can work in that sub mode while you are also in the operational mode. For instance, while executing a program in Auto Mode, you can go to Plot Mode to adjust the plot display, without stopping motion. Pressing the **ESC** key on the SSP-140 while in a sub mode will cause you to return to the mode you were in (either an operational mode or Main Mode) before you entered the sub mode.

For example, let's say you are in Auto Mode (an operational mode). While in Auto Mode, while running a part program, you decide to change the display so you can change what type of position is displayed. While the motion is still ongoing (by execution of the part program), you can enter Screen Mode (a sub mode), change the display, and then press the **ESC** key to go back to Auto Mode.

Flow charts showing how to navigate the various control modes follows:



When you enter a sub mode from an operational mode, you have three choices: 1) go to another sub mode (depending on NC/servo status, some sub modes may not be available); 2) return from the sub mode to the operational mode you were in before entering a sub mode (by pressing the **Esc** key); or, 3) going directly to Main Mode (not recommended). You cannot go directly from a sub mode to Main Mode, unless you entered the sub mode from Main Mode (see Figure 3-5).

Figure 3-4: Flow Chart for Navigating Control Modes – Option #1: Entering an Operational Mode from Main Mode

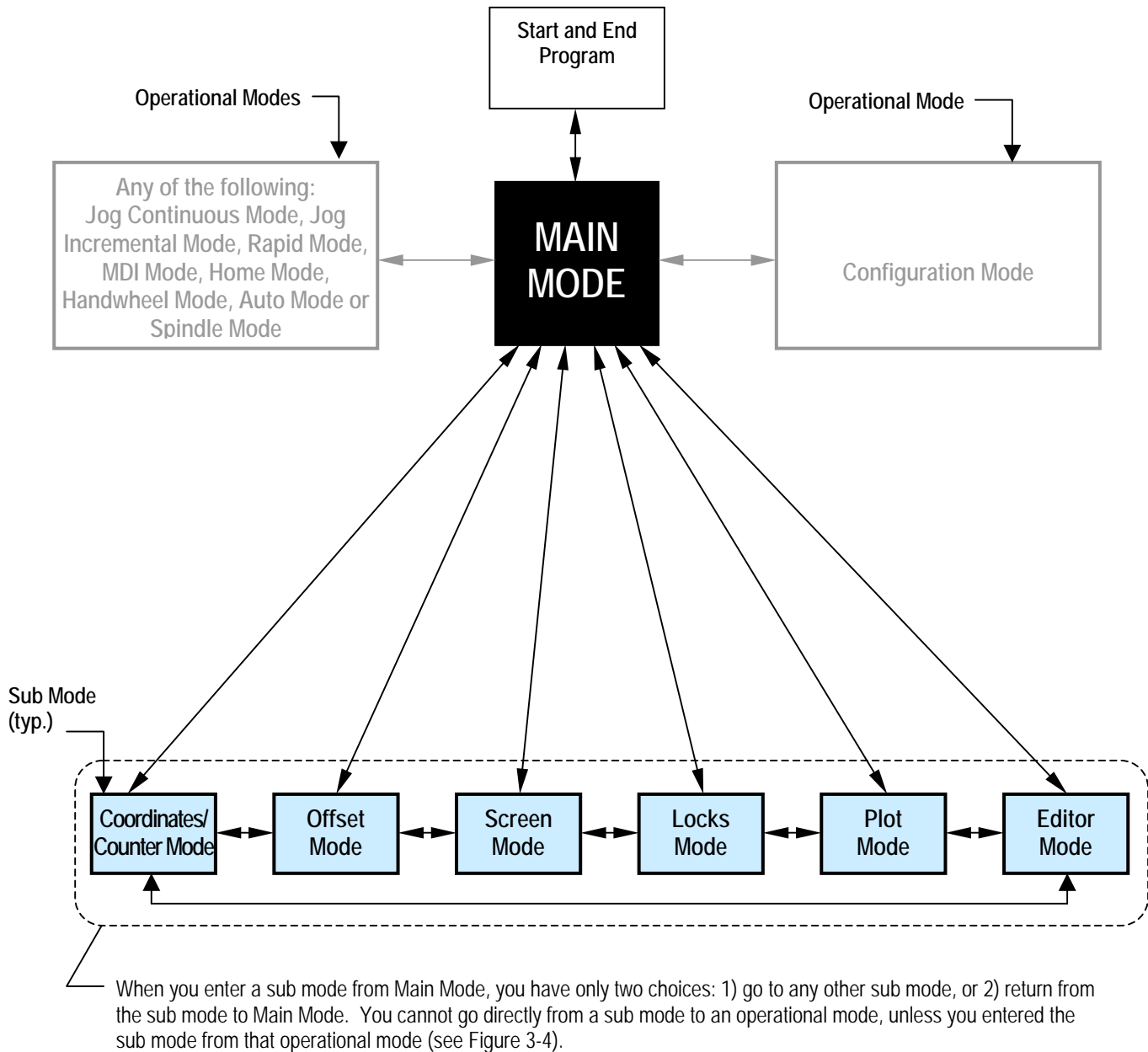
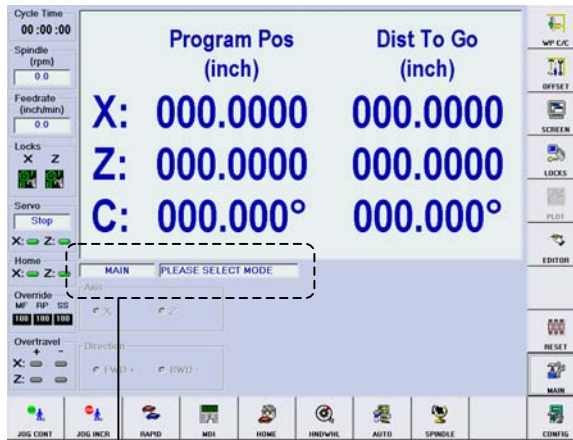


Figure 3-5: Flow Chart for Navigating Control Modes – Option #2: Entering a Sub Mode from Main Mode

ServoWorks S-100T displays which mode you are in, and whether that mode is a sub mode or an operational mode (except for Main Mode, which is neither a sub mode nor an operational mode). Mode information is displayed on-screen as shown in the following figure:



Mode information is permanently displayed in this area of the ServoWorks S-100T program window.

Figure 3-6: Mode Information Displayed in ServoWorks S-100T

For Main Mode, you will see

For an operational mode you will see something like , although the text box displaying “HOME” will vary according to which operational mode you are in.

For a sub mode, you will see something like either (which indicates that you entered the sub mode “Locks Mode” from Main Mode), or (which indicates that you entered the sub mode “Locks Mode” from the operational mode “Jog Continuous Mode.”)

3.3 Turning On and Off the Servo Drives

Turn on the servo drives for the axes you want to use. Usually, you will want to turn on the X, Z and S servo/spindle drives. The X and Z servo drives correspond to the X and Z axes, and the S servo drive controls the rotation of the spindle.

To turn an axis on, use the buttons on the operator’s panel.

3.4 Performing a Homing Operation


Once you have started ServoWorks S-100T, before doing anything else, you should perform a homing operation on the lathe. Doing so establishes the coordinate system for the lathe, establishes the machine and home positions within that coordinate system, and moves the axes to their home positions.

NOTE: If you switch between open (spindle drive type “inverter” or control type “speed”) and closed (“index/C axis”), you need to perform a homing operation. If you have activated indexing or the C-axis with the M19 code in a part program, the homing operation for the C axis will automatically be executed.



It is highly recommended that you set the home position for the X and Z axes immediately after starting ServoWorks S-100T, before you use the program for any manual or automatic motion control. You must set the home position for all axes before you can enter MDI or Auto Mode.

The following steps will guide you through setting the home position:

- 1) In the Main Window of ServoWorks S-100T, press the  button on the bottom toolbar to enter Home Mode (an operational mode that you can access only from Main Mode). You will see the following window appear:

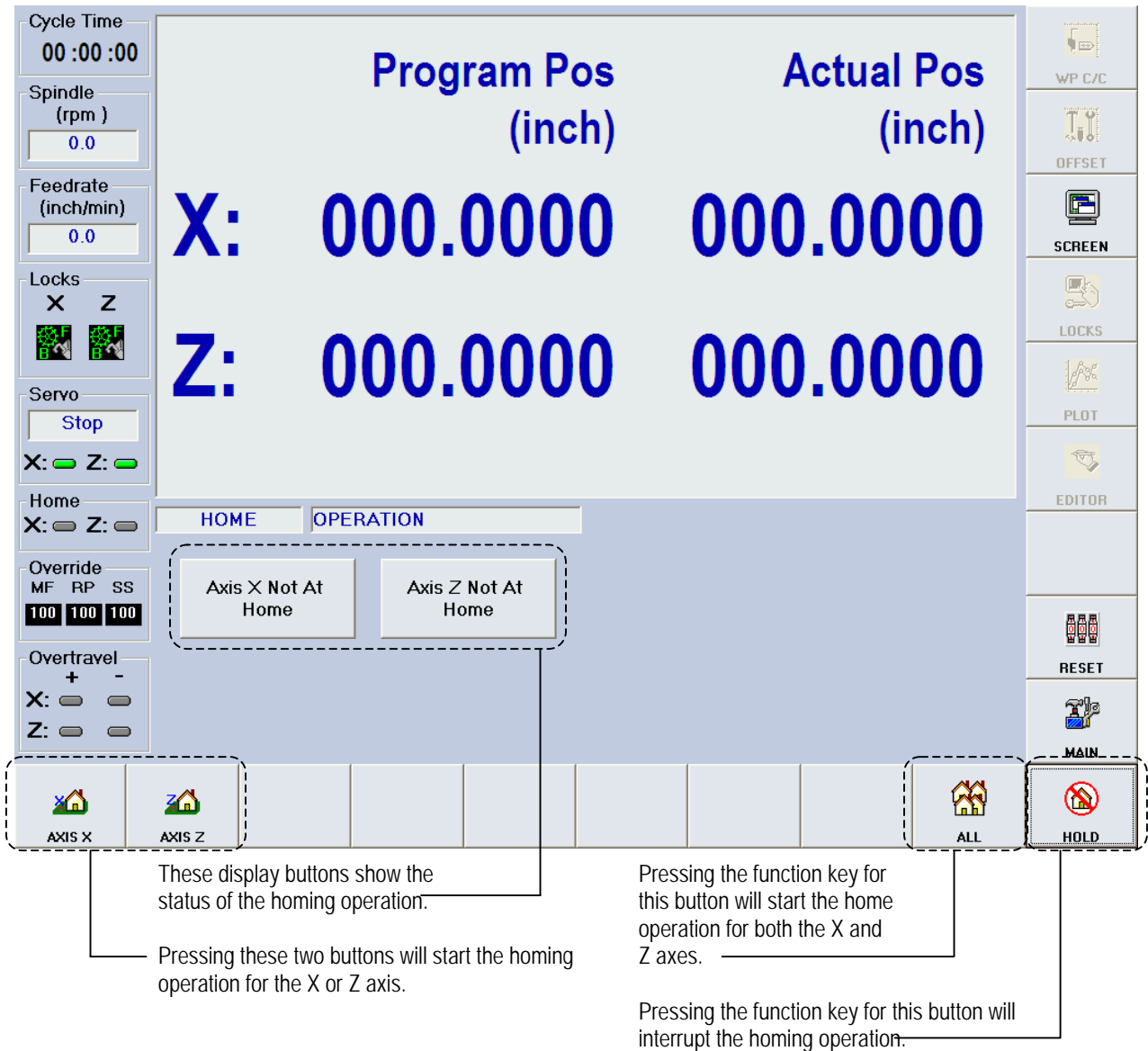



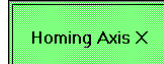
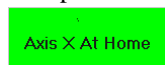


Figure 3-7: The Home Mode Window

- 2) Press the  button on the bottom toolbar (or, if you have a mouse, you can click on the  button). This will establish the coordinate system for the X axis, and move the X axis to the home position. You will see the display button change from  to , and then . Axis X will then be at the home position.

NOTE: If the servo drive for Axis X is not turned on, the button for Axis X will be disabled. This is true for Axis Z as well.

- 3) Repeat step #2 for the Z Axis.

NOTE: Alternatively, you can use the



button in the lower right corner to set both axes to their home positions at the same time.

At any point during the homing operation, you can press the



button to interrupt the homing procedure, and stop the movement of both axes.

Chapter 4: Configuring the System and Program Parameters

4.1 Overview

Before you operate the lathe, you should configure your system and program parameters. System parameters are discussed in detail in the *ServoWorks S-100T Parameters Manual*. You should refer to the *ServoWorks S-100T Parameters Manual* when setting the system parameters, as descriptions of these parameters are omitted from the following chapter. Program parameters, however, are described in this chapter.

In ServoWorks S-100T, there are parameters for the following items:


- **General.** General parameters include program parameters, operator's panel parameters, machine unit parameters, thread cutting retraction settings, shut down preferences, password settings, and tool measurer settings.
- **Servo Control.** Servo control parameters include encoder parameters, motor parameters, and servo control parameters
- **Safe Zones.** Safe zone parameters include the upper and lower bounds for a safe zone, hardware limit switches, chuck barriers and tailstock barriers.
- **Smoothing.** Smoothing parameters include selecting the smoothing mode and the time constants for cutting, rapid traverse, jogging and homing (performing a homing operation), as well as tuning the smoothing parameters for your machine.
- **Machine Error.** Machine error compensation parameters include enabling or disabling, and setting values related to, backlash compensation and leadscrew pitch error compensation for each axis. You can also choose whether or not to display compensation data.
- **Feedrate.** Feedrate parameters include feedrate speeds for jog modes, rapid traverse (for Rapid Mode and Auto Mode), and for cutting and for dry runs in Auto Mode. You can also set which type of rapid traverse you want for G00 codes executed in Auto Mode: linear or non-linear.
- **Home.** Home parameters include the home mode, home direction, enabling or disabling the home switch, the grid search speed, home shift, home position and home timeout, as well as extra home positions (reference positions).
- **HandWheel.** HandWheel parameters include enabling or disabling HandWheel Mode, and enabling or disabling handwheel direction change and handwheel encoder pulse accumulation.
- **Spindle.** Spindle settings include a choice of servo or inverter drive, the control type, maximum speed settings, speed check settings, encoder parameter settings and motor parameter settings. Spindle gear settings and spindle tuning for smoothing parameters are also included.
- **I/O.** I/O parameters include I/O settings for the VersioBus adapter boards (FP-60, FP-75, FP-80, FP-95 or FP-104), the servo interface module (the DC-120 or DC-150) and the IM-200 I/O module(s) in your system. For the IM-200, you can view digital I/O status for the 32 inputs and 32 outputs of each IM-200 general I/O module, and you can change the status of the output signals. For both the VersioBus adapter board and the servo interface module, you can view digital I/O status for 16 inputs and 16 outputs, and you can change the status of the output signals.
- **M Code.** For your convenience, you can view the default M codes, and you can set up and document new M codes for your machine by filling in a description of what each M code does.

- Parameter Manager. The parameter manager in Configuration Mode is a tool that allows you to specify the file where ServoWorks S-100T parameters should be stored and from which ServoWorks S-100T parameters will be retrieved upon program startup.
- Display. Display parameters include selecting the number of significant figures to display for position data, selecting four of the six position types to display in one display configuration, and selecting two of the six position types to display in another display configuration.
- Auto Plot. Auto plot settings include setting which position type to plot, setting the part width and diameter, the Z axis origin relative to the machine origin, the zoom factor and plot orientation, and when to start and stop plotting.
- Color. Color settings include settings for the different parts of screen elements such as the main interface, buttons, the plot area, the G code area and the data display. You can also set the colors for different types of axis movement – for those commanded with a handwheel, for those in a cutting mode and for those in a rapid mode.

4.2 Navigating in Configuration Mode

To access system parameters (of any type), you must get into Configuration Mode, an operational mode in which you can view and change machine parameters and configuration settings for ServoWorks S-100T.

The following steps will guide you in accessing any time of system or program parameter:

- 1) Get into Configuration Mode by pressing the  button in the lower right corner of the ServoWorks S-100T screen. You will be prompted for your password when the following window appears:

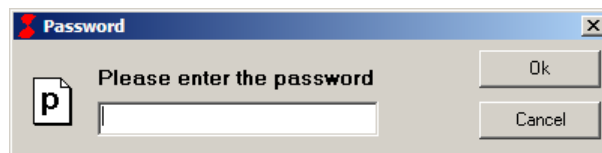



Figure 4-1: The Password Prompt Window

The first time you use ServoWorks S-100T, the default password will be “softservo.” You can change your password as shown in *Section 4.4: Setting General Parameters (Including the Unit of Measurement)*.

 **CAUTION**

NOTE: Passwords are case sensitive, so if you type “SoftServo” in the text box instead of “softservo,” you will get the following message:



- 2) Type in your password, and click the “OK” button or press the  button on the bottom toolbar.

In Configuration Mode, you have access to 15 types of machine parameters and program configuration settings. You will see the window shown in the following figure, which allows you to access any of these types of parameters and settings:

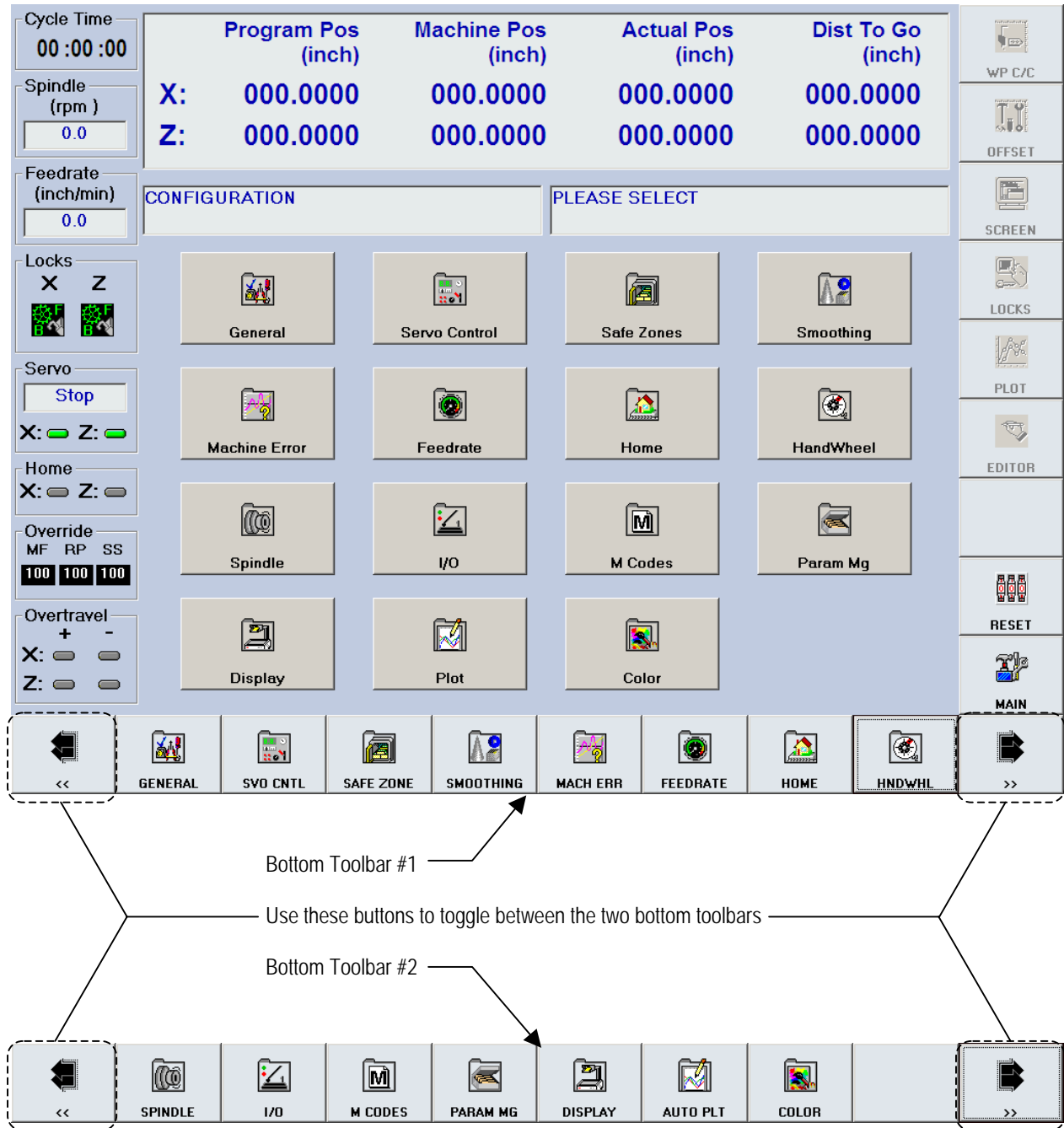



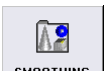
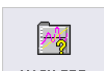

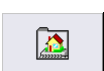












Figure 4-2: The Configuration Mode Window



- 3) Press the button on the bottom toolbar that corresponds to the parameter type to be viewed or changed:

-  GENERAL for general parameters
-  SVO CNTL for servo control parameters
-  SAFE ZONE for safe zone parameters
-  SMOOTHING for smoothing parameters
-  MACH ERR for machine error compensation parameters
-  FEEDRATE for feedrate parameters
-  HOME for home parameters
-  HNDWHL for HandWheel parameters
-  SPINDLE for spindle settings
-  I/O for I/O parameters
-  M CODE for M code settings
-  PARAM MG for parameter management
-  DISPLAY for display parameters
-  AUTO PLT for auto plot settings
-  COLOR for color settings

If you don't see the button you want, press the  or  buttons to view additional buttons on the bottom toolbar.

- 4) You will see the settings for the parameter type you have chosen in the main display area of the screen. Make the desired changes to each parameter according to *Section 4.3 Making Changes to Parameters*.
- 5) After you have made and applied your changes to the parameter type you chose in Step #3, you can press



the  key or press the  button, which will bring you back to the Configuration Mode Window. At this point, you can select another parameter type for which you want to view and/or change settings. Repeat Steps #3 – 5 until you are satisfied with the settings of each and every system parameter.





- 6) Press the  key to get back to whatever mode you were in before pressing the  button.



4.3 Making Changes to Parameters

This section will explain how to move among the different frames and text boxes for each parameter and axis, how to use the buttons on the toolbar to change the values in these text boxes, and how to apply (save) these changes. This section assumes that you have already navigated to the window displaying the parameters you want to change.


4.3.1 Navigating Among the Frames and Text Boxes

To switch between frames, or move from frame to frame, press the  or  button on the bottom toolbar.

Moving between the text boxes within a frame is very simple. The selected text box is shown with a different color background than the other text boxes. To move to a different text box, press the , , , and  buttons on the bottom toolbar to move in the desired direction.

To move between check box options within a frame, use the  and  buttons.

For settings that can vary between the X and Z axes (such as a text box or an option that can be checked or

unchecked), you can press the  button to toggle between the X and Z axis settings for the items you are currently at. See the following figure for an example.

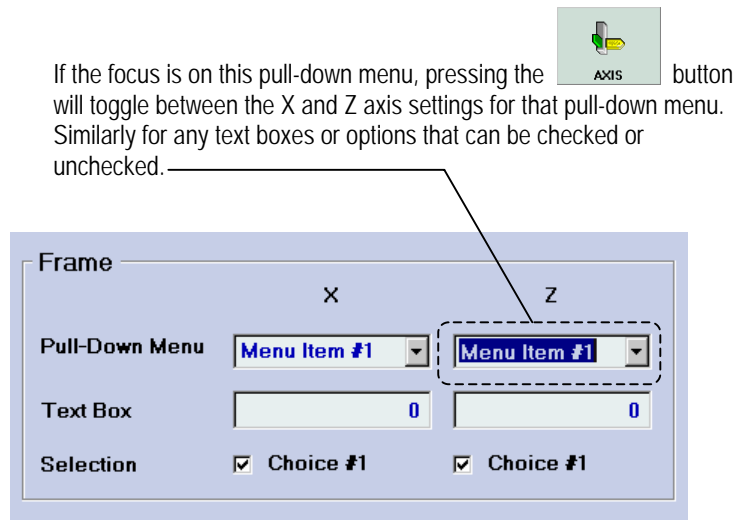


Figure 4-3: Example Frame with Settings for the X and Z Axes

NOTE: If you have a mouse, you can click on the pull-down menu, text box or selection that you want to put the focus on.

4.3.2 Selecting From Among Options in a Frame

Once you are in the desired frame (see Figure 4-3), you can change which option is selected by pressing the



and buttons. Either of these buttons will rotate you through the options (if there are only two options, it will toggle you between them).

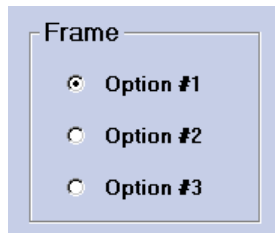
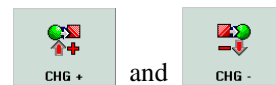


Figure 4-4: Example Frame with Options

NOTE: If you have a mouse, you can click on the option you want to select.


4.3.3 Changing Values in the Text Boxes




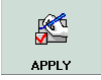
Once you have selected the text box whose value is to be changed, press the buttons on the bottom toolbar to increase and decrease the value in the chosen text box. Holding down the function key for one of these buttons causes the value to change very quickly. Quick, individual key presses cause the value to decrease or increase by a value of “1” for each key press.

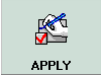
NOTE: If you have a keyboard, you can type in the new value for the text box that has the focus.


4.3.4 Saving Your Changes to Parameters

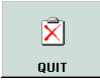


In order to save your changes, you must press the  button on the bottom toolbar. This saves your changes into a registry file in the operating system.


 **CAUTION**





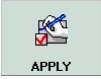

Be careful: if you leave Configuration Mode without pressing the  button, all of your changes will be lost, and you may or may not realize that your changes have not been saved.

NOTE: When you have pressed the  button, a Parameters Saved message will appear on screen to indicate that your new parameters have been saved to the system registry.

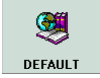
NOTE: At any time, you can press the  button to cancel any changes you have made since you last pressed the  button. Pressing the  button will take you back to the Configuration Mode Screen.

 **CAUTION**



Be careful: when you press the  button, you are not canceling changes that you have applied by pressing the  button. Once you apply your changes by pressing the  button, **YOU CANNOT CANCEL OR UNDO THOSE CHANGES.** You would have to manually change each parameter back to the way it was.

4.3.5 Setting A Set of Parameters Back to the Default Settings

If you are not satisfied with your settings for some types of parameter, you can set the entire set of parameters back to ServoWorks S-100T's default settings by simply pressing the  button.

NOTE: Some types of parameters, such as M codes and I/O, have no default settings.

4.4 Setting General Parameters (Including the Unit of Measurement)

4.4.1 Overview





Press the  button on the bottom toolbar. You will then see the General Parameters Display Area shown in the following figure:

Figure 4-5: The General Parameters Display Area (1 of 2)


As shown in the above figure, the General Parameters Display Area allows you to specify program parameters, operator's panel parameters, machine unit parameters, thread cutting retraction parameters, shut down parameters and password settings.



You can use the  button to toggle between the five frames for the five types of parameters in the General Parameters Display Area.

There is a second General Parameters Display Area that shows Tool Measurer parameters. To get to it, press the



 button, and you will see the following figure:

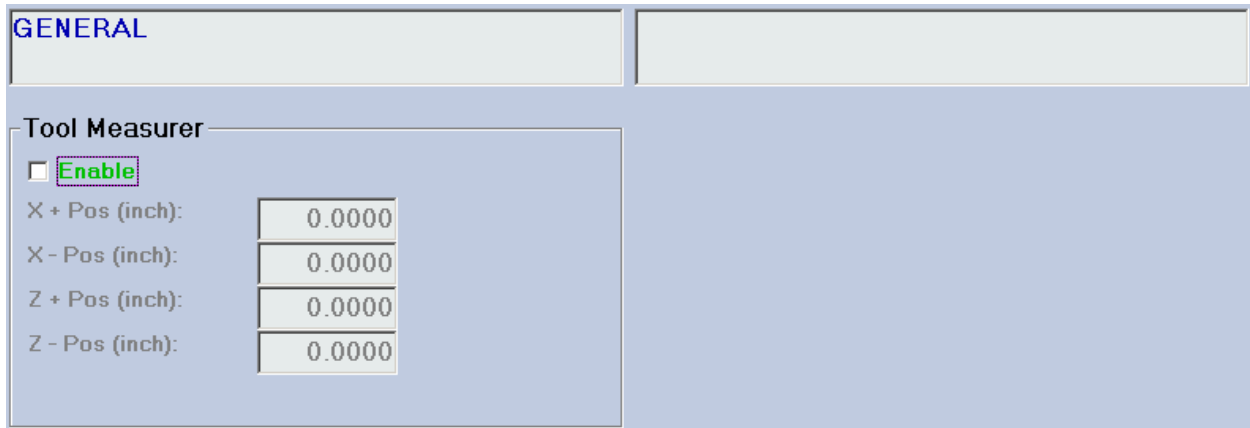


Figure 4-6: The General Parameters Display Area (2 of 2)

4.4.2 Program Parameters

Program parameters include:

- The unit of measurement – whether the unit of measurement should be in metric (millimeters) or English (inch) units.
- Program measuring – whether your measurements will be displayed and input in terms of diameter or radius.
- X+ Direction – whether the X axis is programmed and displayed in diameter or radius, and the choice of positive direction for the X axis. The positive direction of the X axis can point to or away from the operator, as shown in the following figure:

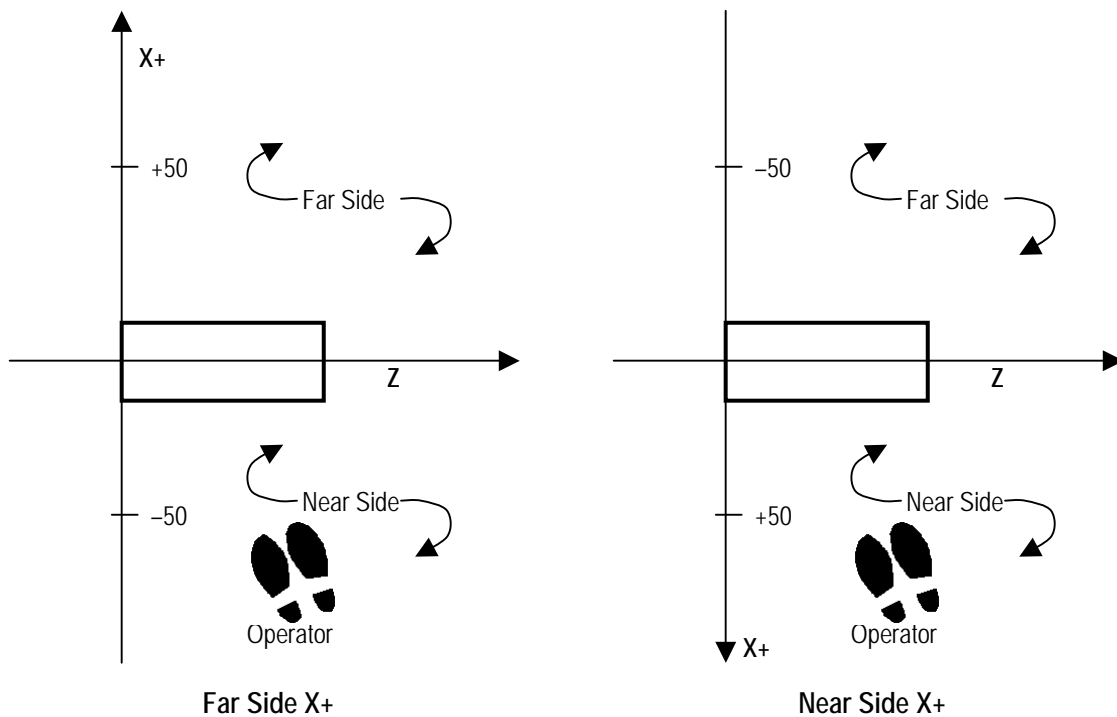


Figure 4-7: Top View of a Lathe Showing X+ Direction: Near Side and Far Side

4.4.3 Operator's Panel Parameters

The "Operator's Panel" frame allows you to avoid conflict between commands given by ServoWorks S-100T and commands given by buttons on the operator's panel.

There are three override inputs for which you can take input from either ServoWorks S-100T or from the operator's panel:

- MFO (manual feedrate override – can be set from 0% to 230%).
- SSO (spindle speed override – can be set from 50% to 120%).
- RPO (rapid positioning override – can be set to 0%, 25%, 50% or 100%).

If you check the box for an override input, that input will be taken from the switches on an operator's panel, and you will not be able to command that override input in ServoWorks S-100T (the text boxes and sliders for the relevant override input will be disabled).

If the box for an override input is unchecked, the settings of the switch for that override input on the operator's panel (if there is one) will be ignored, and the settings in ServoWorks S-100T will be in effect. You will be able to use ServoWorks S-100T to change that override input.

If you check the "IM-200" box, you are indicating that there is an IM-200 in your ServoWorks S-100T system.

4.4.4 Machine Unit Parameters

Refer to *Section 2.2: HandWheel and Incremental Jog Machine Unit* in the *ServoWorks S-100T Parameters Manual*.

4.4.5 Thread Cutting Parameters for G92 and G76

These parameters (feedrate load factor, chamfer angle and chamfer amount) are used for the retraction (thread cutting retreat) at the end of the G92 (thread cutting cycle) and G76 (multi-pass cutting cycle), so the workpiece isn't damaged by the retraction.

4.4.6 Shut Down Parameters

You can choose whether exiting ServoWorks S-100T (see *Chapter 15: Exiting ServoWorks S-100T*) quits ServoWorks S-100T only, or also shuts down the PC.

4.4.7 Password Settings


The first time you use ServoWorks S-100T, the default password will be "softservo." You can change your password by typing the current password (which will be "softservo" the first time you customize your password settings) in the "Old Password" text box, and by typing your new password into both the "New Password" and "Confirm New Password" text boxes.

4.4.8 Tool Measurer Parameters

When the "Tool Measurer" parameter is enabled, it enables the Auto Measurer feature in Offset Mode. [See *Section 14.7.6: Using the Auto Measurer Feature to Set Tool Geometry Offsets*.] Also, you need to input the coordinates of the sensor locations of the tool measurers.

4.5 Setting Servo Control Parameters



Press the  button on the bottom toolbar. You will then see the Servo Control Parameters Display Area shown in the following figure:

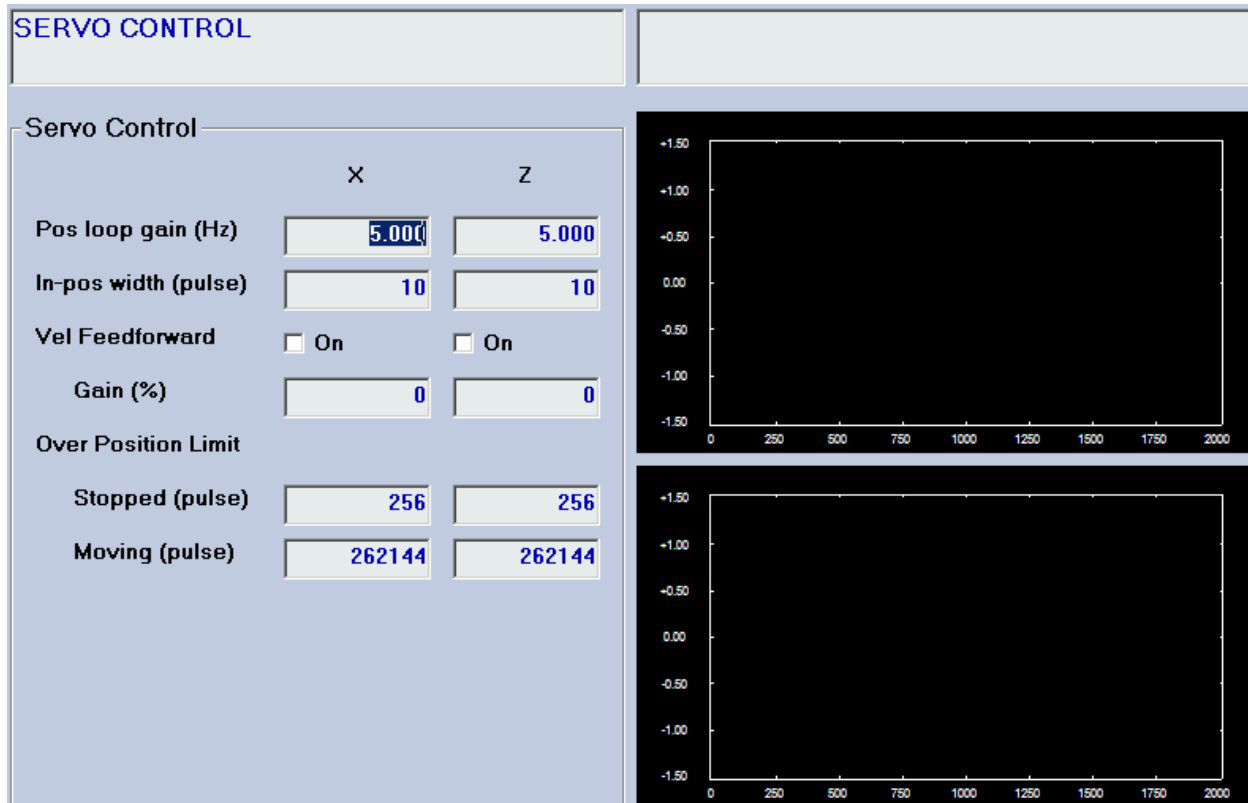



Figure 4-8: The Servo Control Parameters Display Area #1

Servo control parameters include the parameters shown above (servo specific parameters), plus encoder and motor parameters. These parameters apply to the machine tool, and you should seldom need to change them. You should refer to the *ServoWorks S-100T Parameters Manual* for a detailed discussion of each parameter: what the parameter is, its significance, its possible values, default values, etc.



You can tune your lathe, and calibrate ServoWorks S-100T. To do so, press the  button. ServoWorks S-100T tunes by recording and plotting data according to your servo control settings. Motion will occur during tuning, and actual position data will be plotted.

CAUTION

NOTE: The recording and plotting is based on the parameters that have been applied and are currently in the registry file. If you have changed what is in the text boxes for servo control parameters, but have not applied the changes, you could be misled by what is being plotted.

The upper plot is for the X axis, the lower plot is for the Z axis. The vertical axis is in voltage (velocity / position) in millivolts, and the horizontal axis represents time in milliseconds.

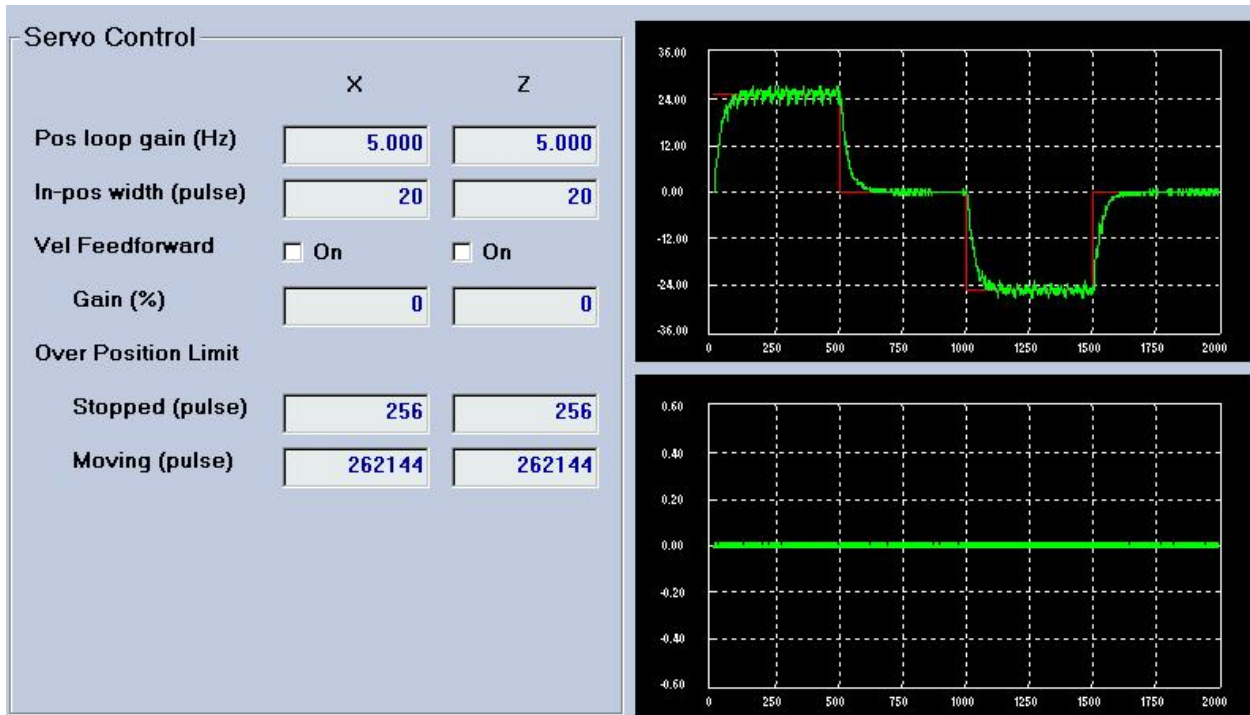


Figure 4-9: The Servo Control Parameters Display Area #1 Showing A Servo Control Plot (1 of 2)

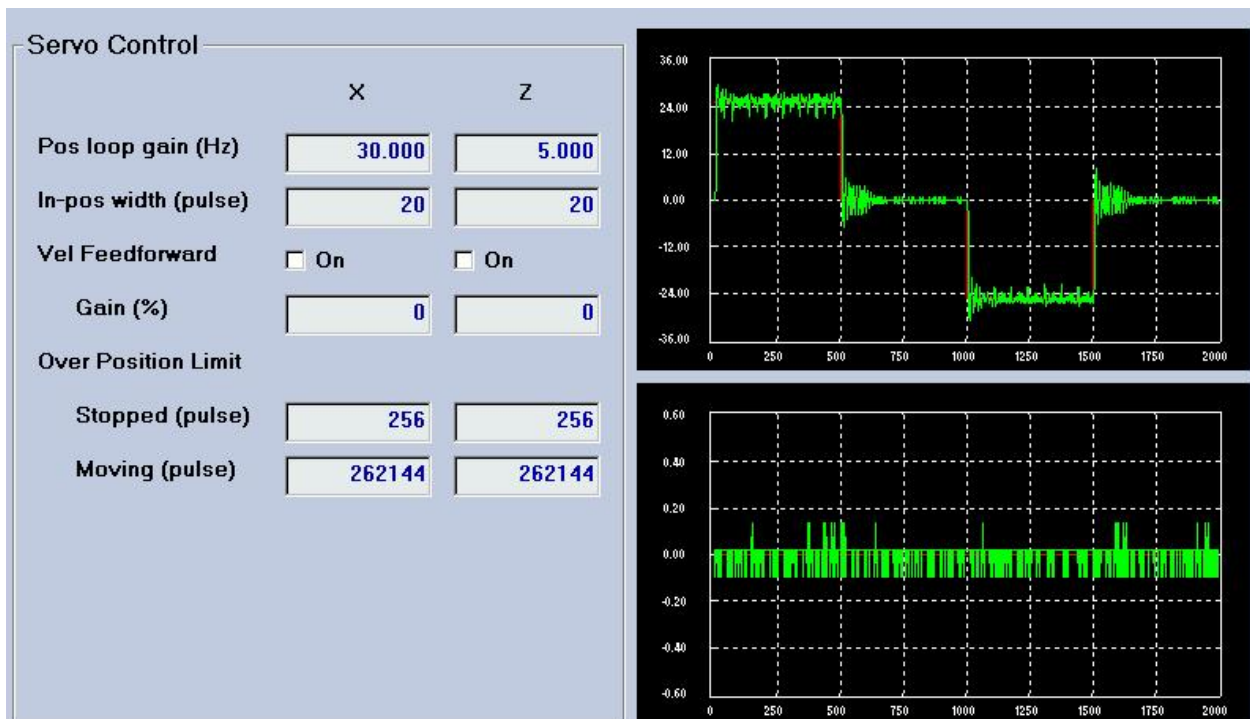

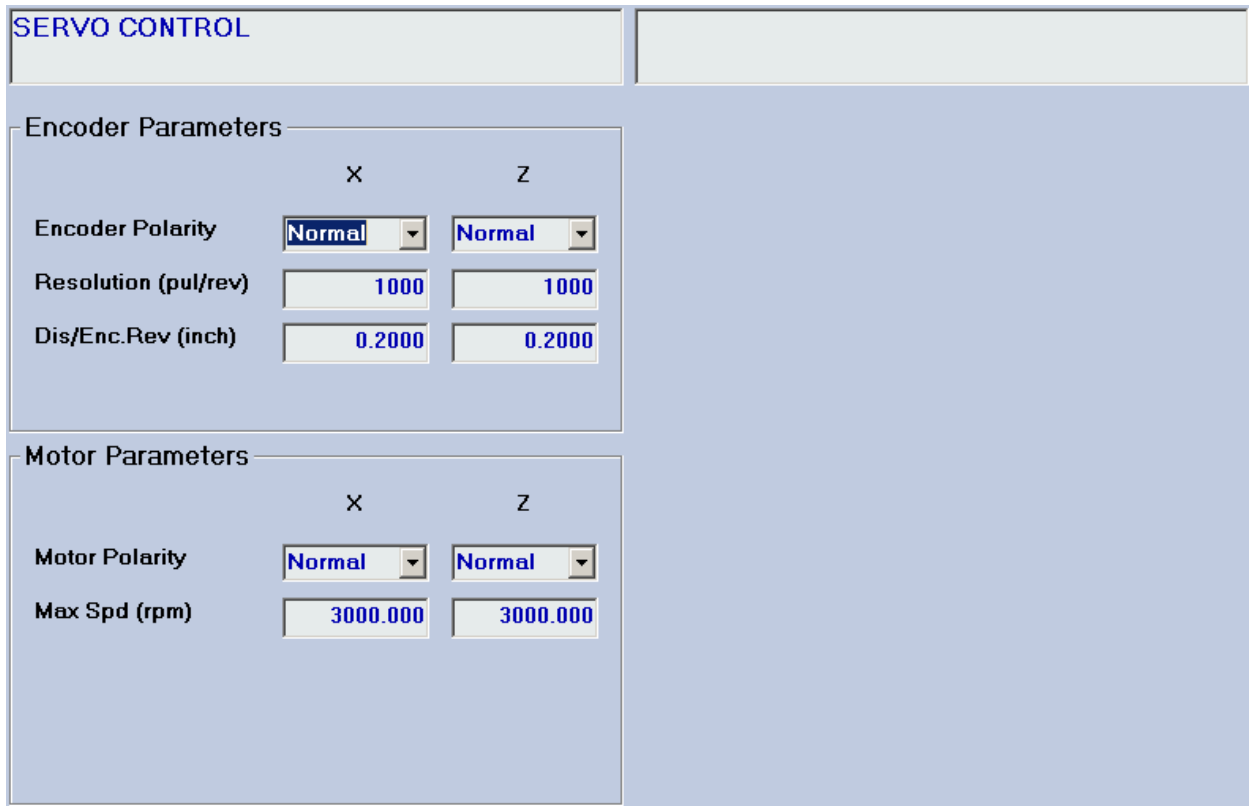


Figure 4-10: The Servo Control Parameters Display Area #1 Showing A Servo Control Plot (2 of 2)

There is a second Servo Control Parameters Display Area that shows the encoder and motor parameters. To get to

it, press the  button, and you will see the following figure:




The figure shows a software interface titled "SERVO CONTROL". It is divided into two main sections: "Encoder Parameters" and "Motor Parameters". Each section has two columns for axes labeled "X" and "Z".

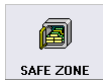
	X	Z
Encoder Polarity	Normal	Normal
Resolution (pul/rev)	1000	1000
Dis/Enc.Rev (inch)	0.2000	0.2000


	X	Z
Motor Polarity	Normal	Normal
Max Spd (rpm)	3000.000	3000.000

Figure 4-11: The Servo Control Parameters Display Area #2

To get back to the first display area, press the  button.

4.6 Setting Parameters for Safe Zones



Press the  button on the bottom toolbar. You will then see the Safe Zone Parameters Display Area shown in the following figure:

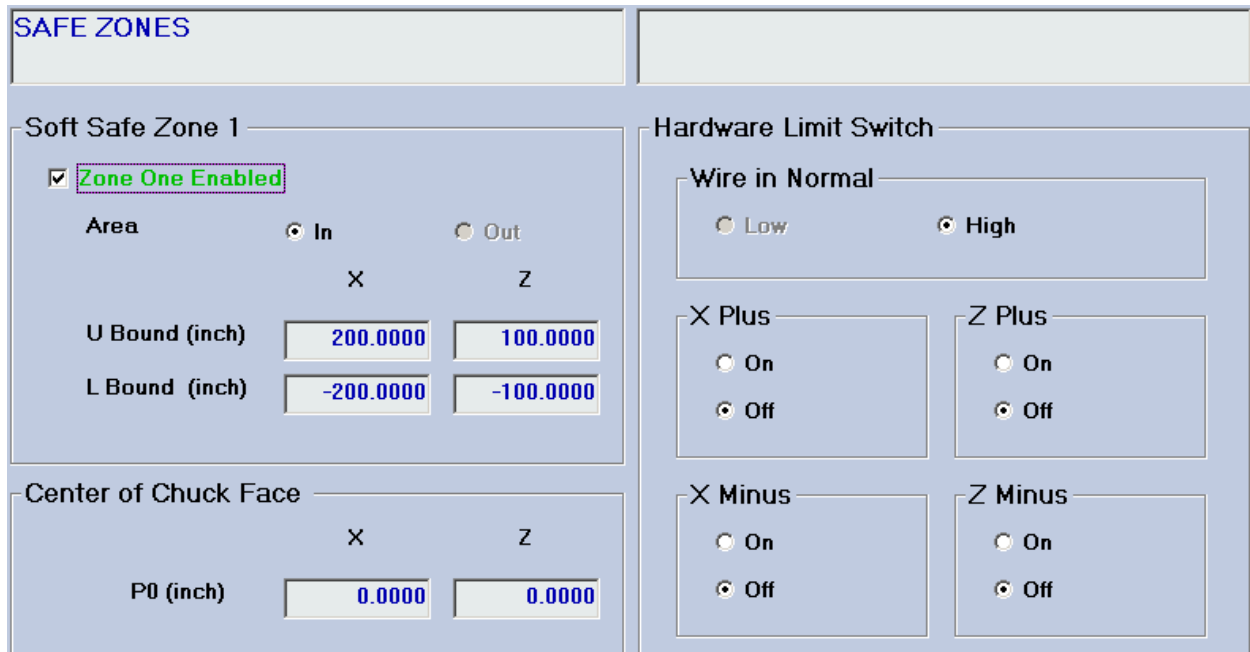


Figure 4-12: The Safe Zone Parameters Display Area #1

You can specify parameters for a software safe zone (stroke limits), and plus and minus hardware limit switches for each axis. You can also use this screen to enable or disable hardware limit switches for each axis.

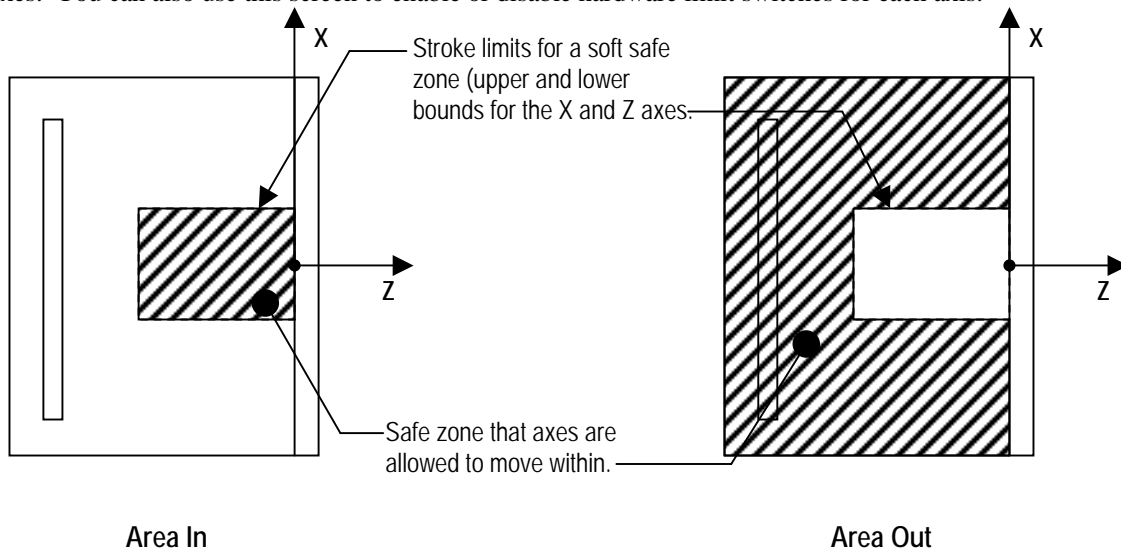



Figure 4-13: Top View of a Lathe Showing Safe Zones: Area In and Area Out

There is a second Safe Zones Parameters Display Area that shows the settings for chuck barriers and tailstock barriers.

To get to it, press the  button, and you will see the following figure:

SAFE ZONES

Chuck Barrier			Tailstock Barrier		
<input type="checkbox"/> Chuck Barrier Enabled			<input type="checkbox"/> Tailstock Barrier Enabled		
	X	Z		X	Z
P1 (inch)	0.0000	0.0000	P4 (inch)	0.0000	0.0000
P2 (inch)	0.0000	0.0000	P5 (inch)	0.0000	0.0000
P3 (inch)	0.0000	0.0000	P6 (inch)	0.0000	0.0000

Figure 4-14: The Safe Zone Parameters Display Area #2

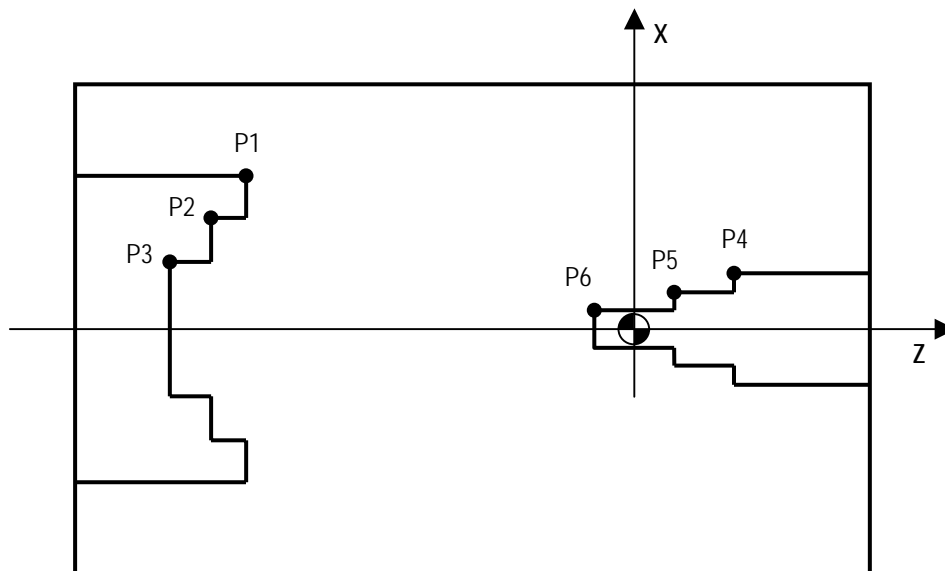

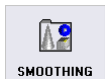


Figure 4-15: Top View of a Lathe Showing Chuck Barrier and Tailstock Barrier Points

To get back to the first display area, press the  button.

4.7 Setting Smoothing Filter Parameters



Press the  button on the bottom toolbar. You will then see the Smoothing Filter Parameters Display Area shown in the following figure:

SMOOTHING FILTER		PLEASE SELECT	
Cutting(ms)		Rapid Positioning(ms)	
	X		Z
Type	<input type="text" value="Bell-Shaped"/>	Type	<input type="text" value="Bell-Shaped"/>
Smoothing Time 1	<input type="text" value="50"/>	Smoothing Time 1	<input type="text" value="50"/>
Smoothing Time 2	<input type="text" value="50"/>	Smoothing Time 2	<input type="text" value="50"/>
Jogging(ms)		Homing(ms)	
	X		Z
Type	<input type="text" value="Bell-Shaped"/>	Type	<input type="text" value="Linear"/>
Smoothing Time 1	<input type="text" value="50"/>	Smoothing Time 1	<input type="text" value="50"/>
Smoothing Time 2	<input type="text" value="50"/>	Smoothing Time 2	<input type="text" value="50"/>

Figure 4-16: The Smoothing Filter Parameters Display Area #1

You can specify the smoothing type and the smoothing time(s) for cutting modes, for jog modes, for rapid traverse and for the homing operation.

Refer to the *ServoWorks S-100T Parameters Manual* for an explanation of homing modes and smoothing times.

There are additional Servo Control Parameters Display Areas that allow you to tune your smoothing parameters. To




get to them, press the  button, and you will toggle through the following figures:



Figure 4-17: The Smoothing Filter Parameters Display Area #2

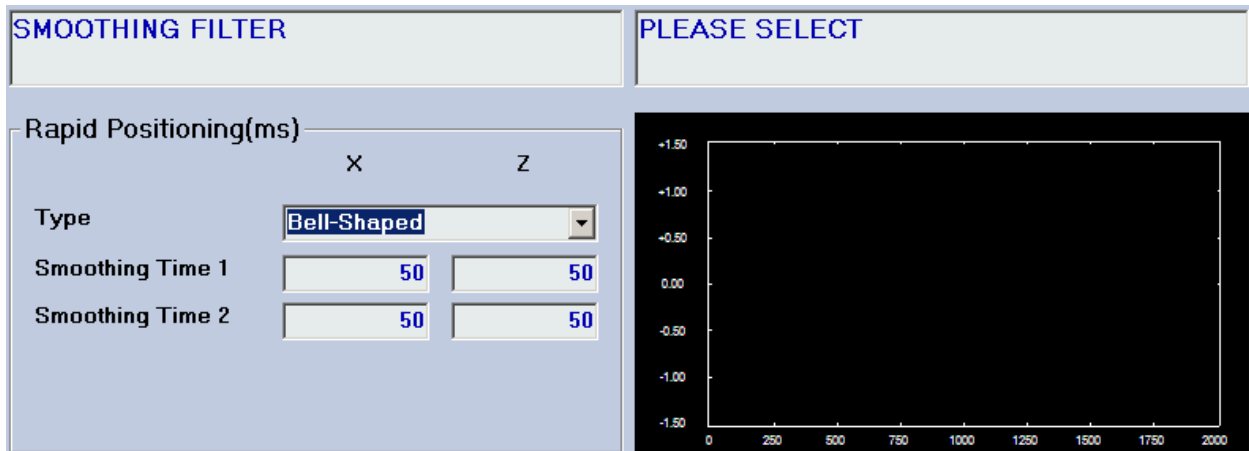


Figure 4-18: The Smoothing Filter Parameters Display Area #3

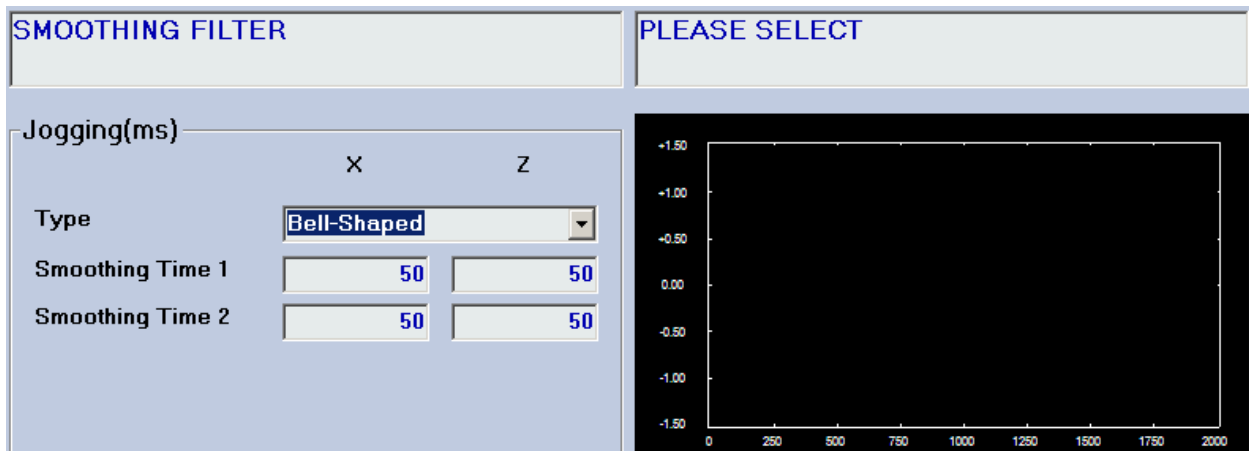



Figure 4-19: The Smoothing Filter Parameters Display Area #4



Figure 4-20: The Smoothing Filter Parameters Display Area #5

You can tune your smoothing parameters by pressing the  button. ServoWorks S-100T tunes by recording and plotting data according to your smoothing settings. Motion will occur during tuning, and actual position data will be plotted.

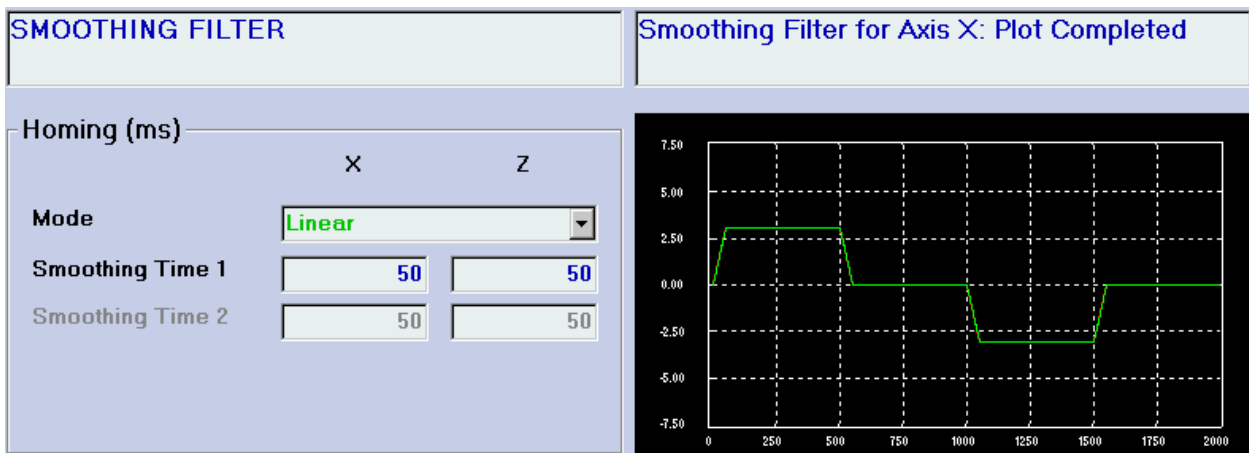


Figure 4-21: The Smoothing Filter Parameters Display Area #5 with Plot


 **CAUTION**

NOTE: The recording and plotting is based on the parameters that have been applied and are currently in the registry file. If you have changed what is in the text boxes for servo control parameters, but have not applied the changes, you could be misled by what is being plotted.

The vertical axis is in voltage (velocity / position) in millivolts, and the horizontal axis represents time in milliseconds.

4.8 Setting Parameters Related to Machine Error Compensation



Press the  button on the bottom toolbar. You will then see the Machine Error Compensation Parameters Display Area shown in the following figure:

MACHINE ERROR COMPENSATION

Display Compensation Data

Yes No

Backlash Compensation

Enable Axis X (inch) Enable Axis Z (inch)

Pitch Error Compensation

Enable Axis X

Origin

Interval (inch)

X Values (inch)

1	<input type="text" value="0.0000"/>	2	<input type="text" value="0.0000"/>
3	<input type="text" value="0.0000"/>	4	<input type="text" value="0.0000"/>
5	<input type="text" value="0.0000"/>	6	<input type="text" value="0.0000"/>
7	<input type="text" value="0.0000"/>	8	<input type="text" value="0.0000"/>

Enable Axis Z

Origin

Interval (inch)



Z Values (inch)

1	<input type="text" value="0.0000"/>	2	<input type="text" value="0.0000"/>
3	<input type="text" value="0.0000"/>	4	<input type="text" value="0.0000"/>
5	<input type="text" value="0.0000"/>	6	<input type="text" value="0.0000"/>
7	<input type="text" value="0.0000"/>	8	<input type="text" value="0.0000"/>

Figure 4-22: The Machine Error Compensation Parameters Display Area #1

Machine error parameters include enabling or disabling, and setting values related to, backlash compensation and leadscrew pitch error compensation for each axis. These parameters apply to the machine tool, and you should seldom need to change them. You should refer to the *ServoWorks S-100T Parameters Manual* for a detailed discussion of each parameter: what the parameter is, its significance, its possible values, etc. You can also choose whether or not to display compensation data.

NOTE: There are 128 pitch error values for each axis, of which only 8 are displayed at any one time. To scroll

through all the pitch error values consecutively, use the  and  buttons. These will show you more pitch error values, as shown in the following figure:

MACHINE ERROR COMPENSATION

Display Compensation Data

Yes No

Backlash Compensation

Enable Axis X (inch) Enable Axis Z (inch)

Pitch Error Compensation

Enable Axis X

Origin

Interval (inch)

Enable Axis Z

Origin

Interval (inch)

X Values (inch)

121 <input style="width: 60px;" type="text" value="0.0000"/>	122 <input style="width: 60px;" type="text" value="0.0000"/>
123 <input style="width: 60px;" type="text" value="0.0000"/>	124 <input style="width: 60px;" type="text" value="0.0000"/>
125 <input style="width: 60px;" type="text" value="0.0000"/>	126 <input style="width: 60px;" type="text" value="0.0000"/>
127 <input style="width: 60px;" type="text" value="0.0000"/>	128 <input style="width: 60px;" type="text" value="0.0000"/>


Z Values (inch)

121 <input style="width: 60px;" type="text" value="0.0000"/>	122 <input style="width: 60px;" type="text" value="0.0000"/>
123 <input style="width: 60px;" type="text" value="0.0000"/>	124 <input style="width: 60px;" type="text" value="0.0000"/>
125 <input style="width: 60px;" type="text" value="0.0000"/>	126 <input style="width: 60px;" type="text" value="0.0000"/>
127 <input style="width: 60px;" type="text" value="0.0000"/>	128 <input style="width: 60px;" type="text" value="0.0000"/>

Figure 4-23: The Machine Error Compensation Parameters Display Area #16

4.9 Setting Parameters for Feedrates



Press the  button on the bottom toolbar. You will then see the Feedrate Parameters Display Area shown in the following figure:

FEEDRATE

Feedrate Parameters

Jog(inch/min)	X	Z
Incremental	200.0000	200.0000
Cont. Low	100.0000	100.0000
Cont. Mid	200.0000	200.0000
Cont. High	300.0000	300.0000

Rapid Positioning(inch/min)

Type: Linear

Feedrate	600.0000	600.0000
----------	----------	----------

Dry Run(inch/min)

Feedrate	600.0000
----------	----------

Cutting(inch/min)


Max. Feedrate	400.0000
---------------	----------

Figure 4-24: The Feedrate Parameters Display Area

Feedrate parameters include feedrate speeds for jog modes, rapid traverse (for Rapid Mode and Auto Mode), and for cutting and for dry runs in Auto Mode. You can also set which type of rapid traverse you want for G00 codes executed in Auto Mode: linear or non-linear.

4.10 Setting Home Parameters



Press the  button on the bottom toolbar. You will then see the Home Parameters Display Area shown in the following figure:


CONFIGURATION		
Home Parameters		
	X	Z
Type	Grid	Grid
Direction	Positive	Positive
Switch	Disabled	Disabled
G.S.spd(pul/cyc)	2	2
Shift(inch)	0.0000	0.0000
Position(inch)	0.0000	0.0000
Timeout(ms)	60000	60000
Extra Home Positions		
2nd Position(inch)	0.0000	0.0000
3rd Position(inch)	0.0000	0.0000
4th Position(inch)	0.0000	0.0000

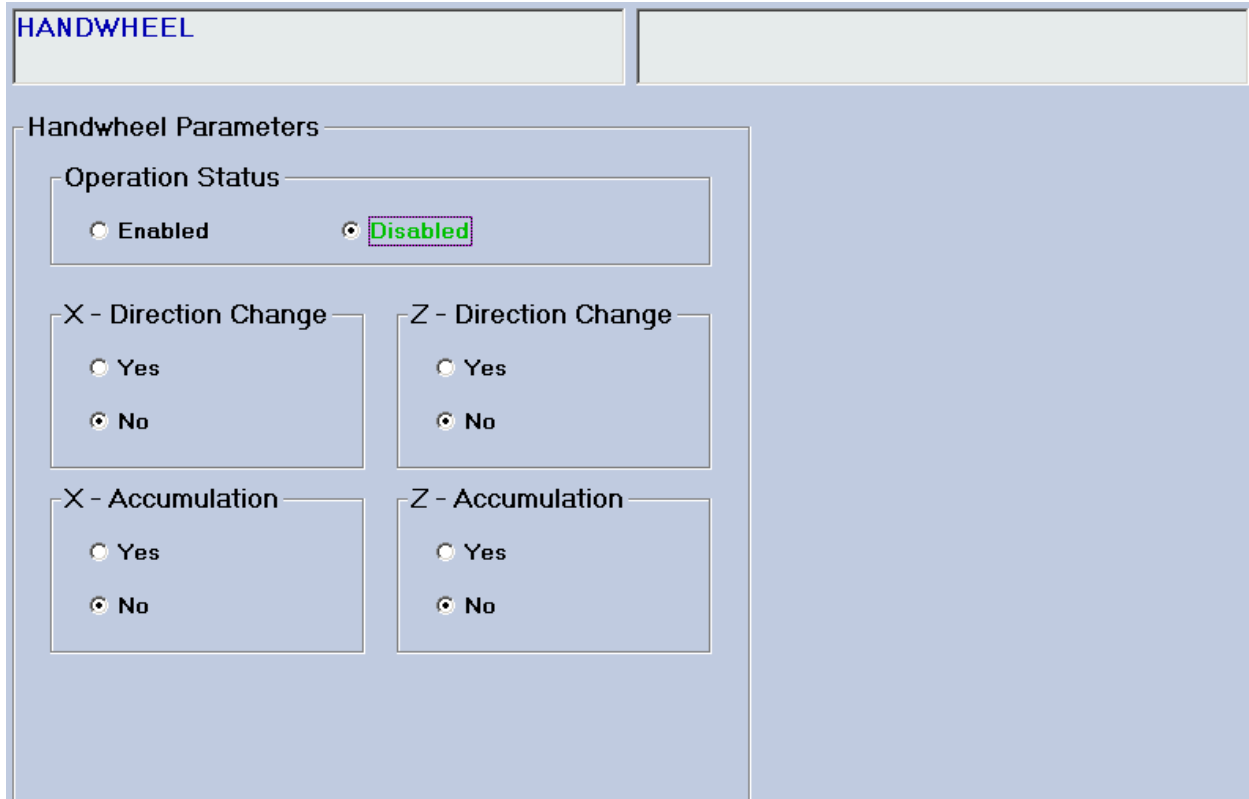
Figure 4-25: The Home Parameters Display Area

Home parameters apply to the machine tool, and you should seldom need to change them. You should refer to the *ServoWorks S-100T Parameters Manual* for a detailed discussion of each parameter: what the parameter is, its significance, its possible values, etc.

4.11 Setting HandWheel Parameters



Press the  button on the bottom toolbar. You will then see the HandWheel Parameters Screen shown in the following figure:



HANDWHEEL

Handwheel Parameters

Operation Status

Enabled Disabled

X - Direction Change

Yes No

Z - Direction Change

Yes No

X - Accumulation

Yes No

Z - Accumulation


Yes No

Figure 4-26: The HandWheel Parameters Display Area

You can specify parameters relating to the handwheel. Plus, you can disable the handwheel, so it can't be used. You should refer to the *ServoWorks S-100T Parameters Manual* for a detailed discussion of each handwheel parameter: what the parameter is, its significance, its possible values, etc.

4.12 Setting Spindle Parameters



Press the  button on the bottom toolbar. You will then see the Spindle Parameters Display Area shown in the following figure:


SPINDLE		
Spindle Drive Type <input checked="" type="radio"/> Servo <input type="radio"/> Inverter		Encoder Parameters Spindle Encoder Polarity <input type="text" value="Normal"/> Gen. Reso (pul/rev) <input type="text" value="1000"/> C Ax Reso (pul/rev) <input type="text" value="1000"/>
Control Type <input type="radio"/> Speed <input checked="" type="radio"/> Index/C Axis		
Max Spindle Speed Surf. Spd (m/min) <input type="text" value="152.400"/> Turning. Spd (rpm) <input type="text" value="3000.000"/>		
Speed Check Time Elapsed (ms) <input type="text" value="100"/> Reach Var. Ratio (%) <input type="text" value="13.600"/> Alarm Var. Ratio (%) <input type="text" value="36.800"/> Alarm Var. RPM <input type="text" value="100"/>		
		Motor Parameters Spindle Motor Polarity <input type="text" value="Normal"/> Max Spd (rpm) <input type="text" value="3000.000"/>

Figure 4-27: The Spindle Parameters Display Area #1

There are many parameters relating to the spindle. These are all explained in the *ServoWorks S-100T Parameters Manual* – refer to this manual for a detailed discussion of each parameter: what the parameter is, its significance, its possible values, etc.

NOTE: If you switch between open (spindle drive type “inverter” or control type “speed”) and closed (“index/C axis”), you need to perform a homing operation.



There are two additional Spindle Parameters Display Areas. To get to them, press the  button, and you will toggle through the following figures:

SPINDLE			
1st Spindle Gear		2nd Spindle Gear	
<input checked="" type="checkbox"/> Enable		<input checked="" type="checkbox"/> Enable	
Min. Spd (rpm)	<input type="text" value="6000.000"/>	Min. Spd (rpm)	<input type="text" value="6000.000"/>
Max. Spd (rpm)	<input type="text" value="6000.000"/>	Max. Spd (rpm)	<input type="text" value="6000.000"/>
Max. Output (rpm)	<input type="text" value="6000.000"/>	Max. Output (rpm)	<input type="text" value="6000.000"/>
3rd Spindle Gear		4th Spindle Gear	
<input checked="" type="checkbox"/> Enable		<input checked="" type="checkbox"/> Enable	
Min. Spd (rpm)	<input type="text" value="6000.000"/>	Min. Spd (rpm)	<input type="text" value="6000.000"/>
Max. Spd (rpm)	<input type="text" value="6000.000"/>	Max. Spd (rpm)	<input type="text" value="6000.000"/>
Max. Output (rpm)	<input type="text" value="6000.000"/>	Max. Output (rpm)	<input type="text" value="6000.000"/>

Figure 4-28: The Spindle Parameters Display Area #2

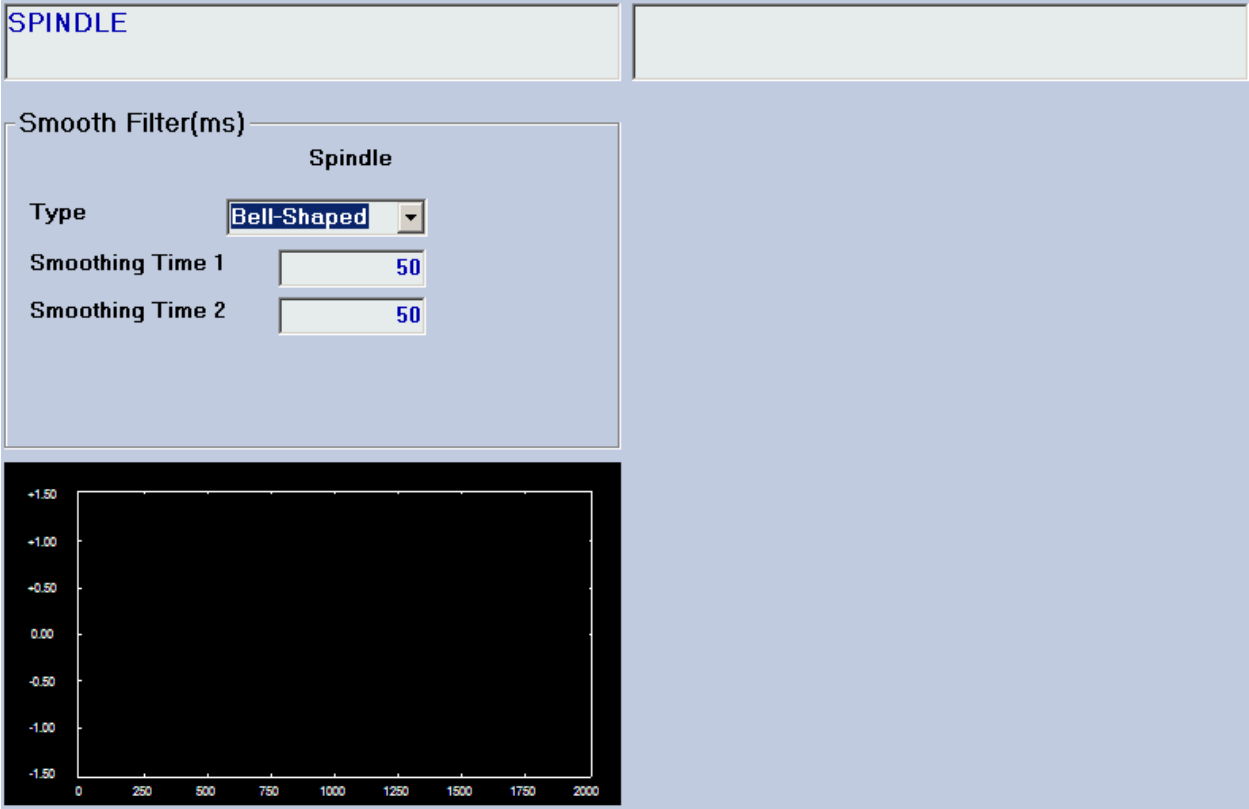



Figure 4-29: The Spindle Parameters Display Area #3

You can tune your smoothing parameters by pressing the  button. ServoWorks S-100T tunes by recording and plotting actual position data for the spindle according to your smoothing settings, as shown in the following figure:

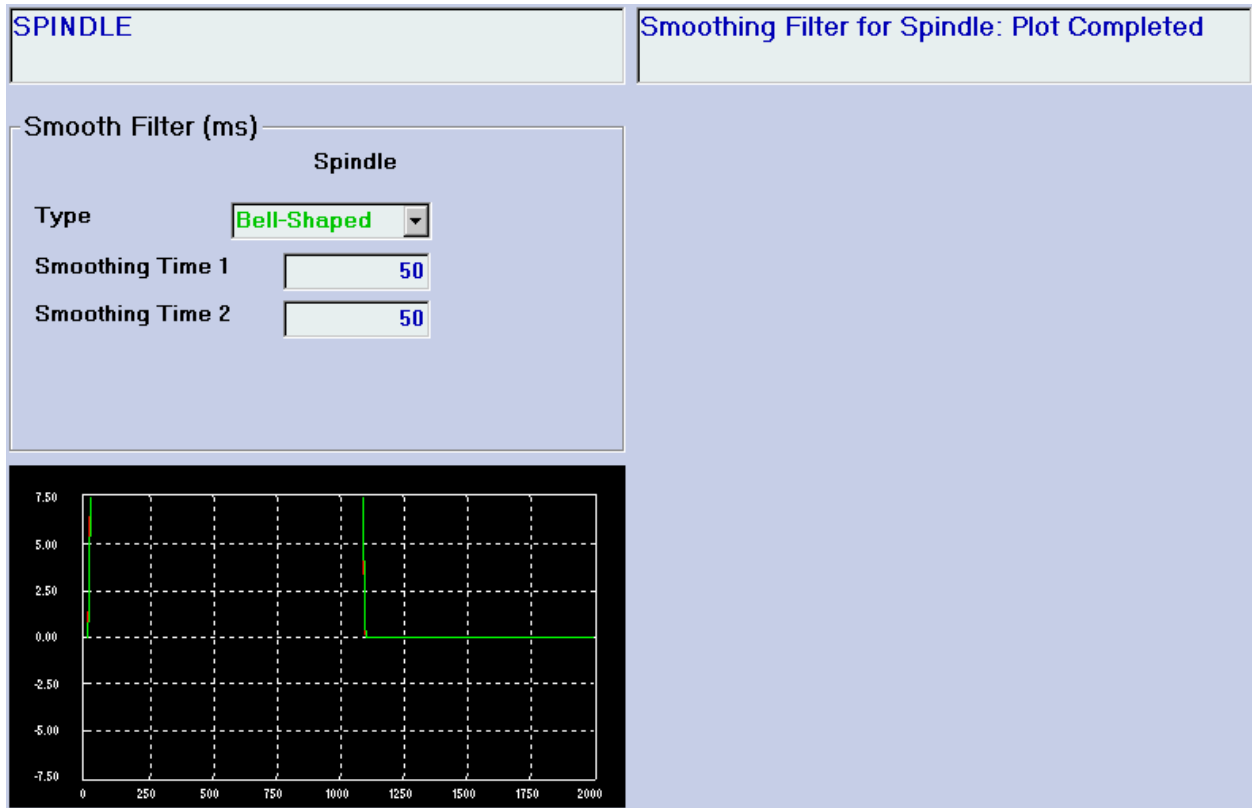


Figure 4-30: The Spindle Parameters Display Area #6 with a Plot

 **CAUTION**

NOTE: The recording and plotting is based on the parameters that have been applied and are currently in the registry file. If you have changed what is in the text boxes for servo control parameters, but have not applied the changes, you could be misled by what is being plotted.

The vertical axis is in voltage (velocity / position) in millivolts, and the horizontal axis represents time in milliseconds.

4.13 Setting I/O Parameters

4.13.1 Overview

You can view the status of digital I/O for the VersioBus adapter board (FP-60, FP-75, FP-80, FP-95 or FP-104), the servo interface module (DC-120 or DC-150) or the IM-200 I/O module(s) in two ways:


- 1) By using Configuration Mode (an operational mode)
- 2) By using Screen Mode (a sub mode)

However, you can only make changes to these signals in Configuration Mode. Screen Mode is for viewing only. (You can learn about Screen Mode and displaying input and output signals for the VersioBus adapter board, the servo interface module and/or the I/O module(s) in *Chapter 5: Monitoring the Status of Operations.*) This section focuses on using Configuration Mode to view and change the status of I/O signals.

I/O parameters include I/O settings for the VersioBus adapter board (FP-60, FP-75, FP-80, FP-95 and FP-104), the servo interface module (DC-120 or DC-150) and any optional IM-200 in your system. For both the VersioBus adapter board and the servo interface module, you can view digital I/O status for 16 inputs and 16 outputs, and you can change the status of the output signals. For IM-200 I/O module(s), you can view digital I/O status for the 32 inputs and 32 outputs of each IM-200 general I/O module, and you can change the status of the output signals.

4.13.2 Viewing I/O Signals in I/O Mode



Press the  button on the bottom toolbar. You will then see the frame for the FP-60 I/O Settings Display Area shown in the following figure (FP-75, FP-80, FP-95 and FP-104 displays are virtually identical):

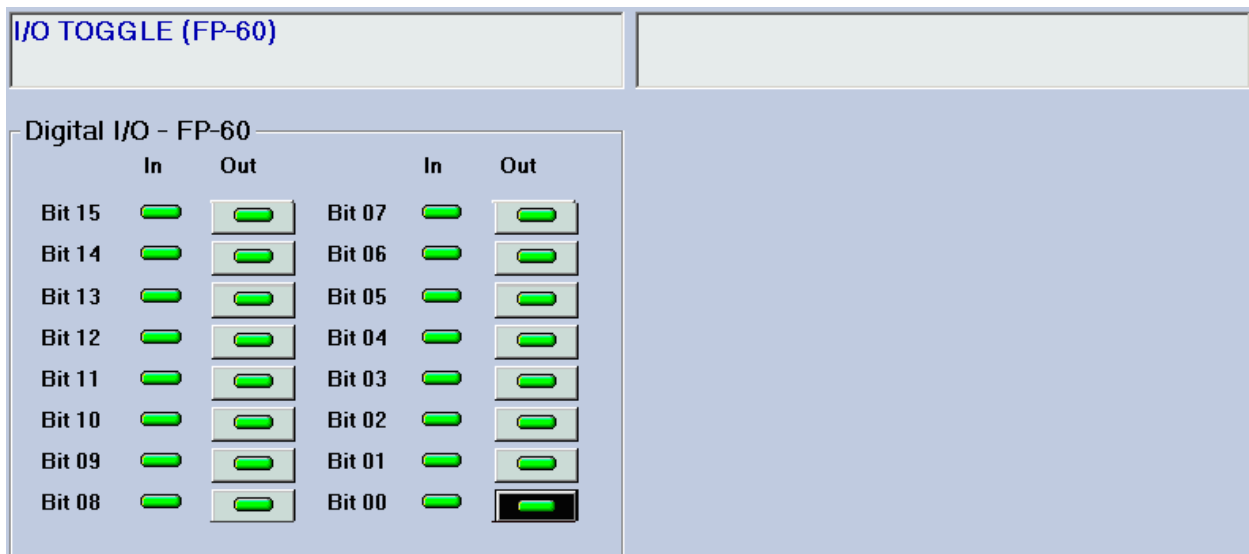





Figure 4-31: The FP-60 I/O Settings Display Area

A green LED () indicates a signal of “1” logic “high” position), and a red LED () indicates a signal of “0” (logic “low” position). The output signal can be changed, as explained in *Section 4.13.3: Changing I/O Signals.*

To get back to this screen from another I/O Settings Display Area, press the  button on the bottom toolbar.

Press the  button on the bottom toolbar to see the DC-120 I/O Settings Display Area shown in the following figure (similar for the DC-150):

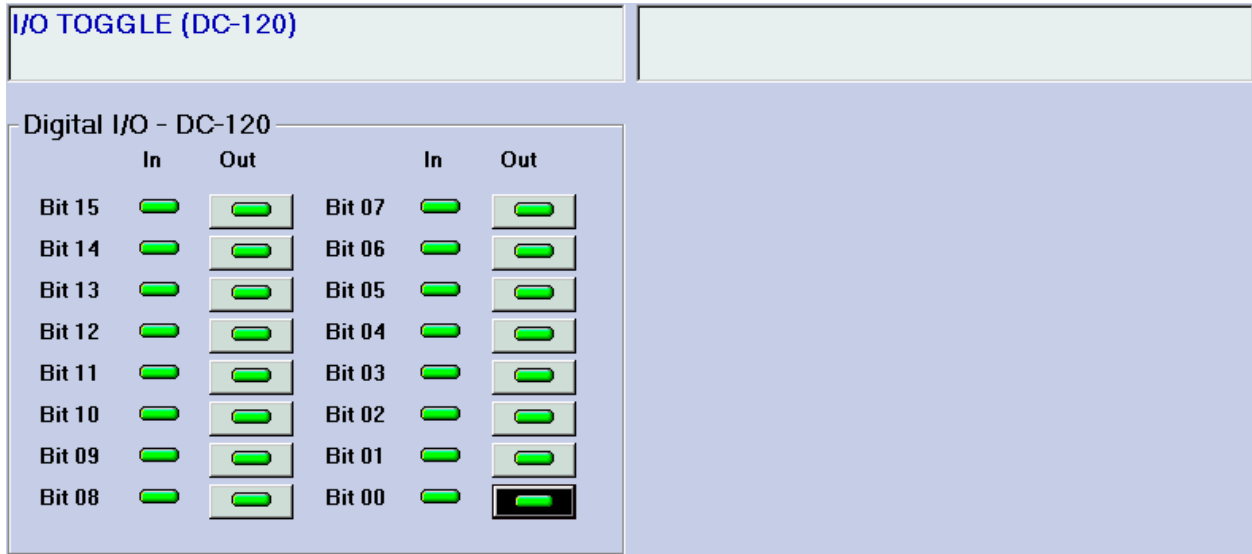



Figure 4-32: The DC-120 I/O Settings Display Area

Press the  button on the bottom toolbar to see the IM-200 I/O Settings Display Area shown in the following figure:

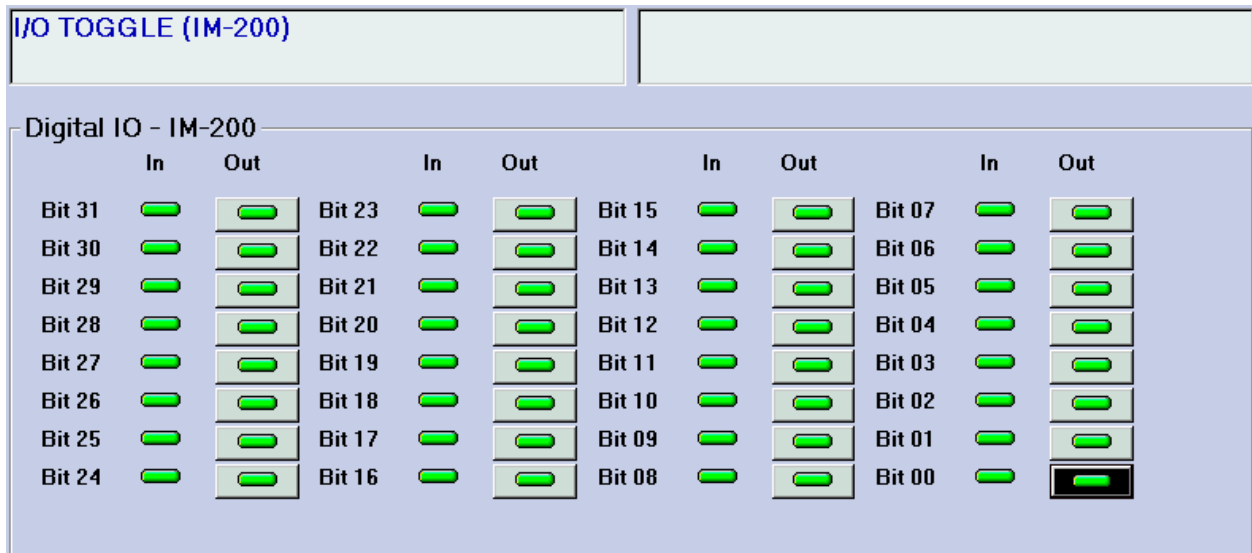








Figure 4-33: The IM-200 I/O Settings Display Area



4.13.3 Changing I/O Signals

The following steps will guide you through changing output signals:

- 1) Make sure you are in the desired window (for the VersioBus adapter board, servo interface module or I/O module).


- 2) Press the  ,  ,  , and  buttons on the bottom toolbar to select an output signal to change.

- 3) Press the  button on the bottom toolbar to change the status of the signal. Green ()

indicates a signal of "1", and red () indicates a signal of "0". The  button will toggle the digital output signal between green and red ("1" and "0").

4.14 Setting M Code Parameters



Press the  button on the bottom toolbar. You will then see the valid M Codes Parameters Display Area shown in the following figure:

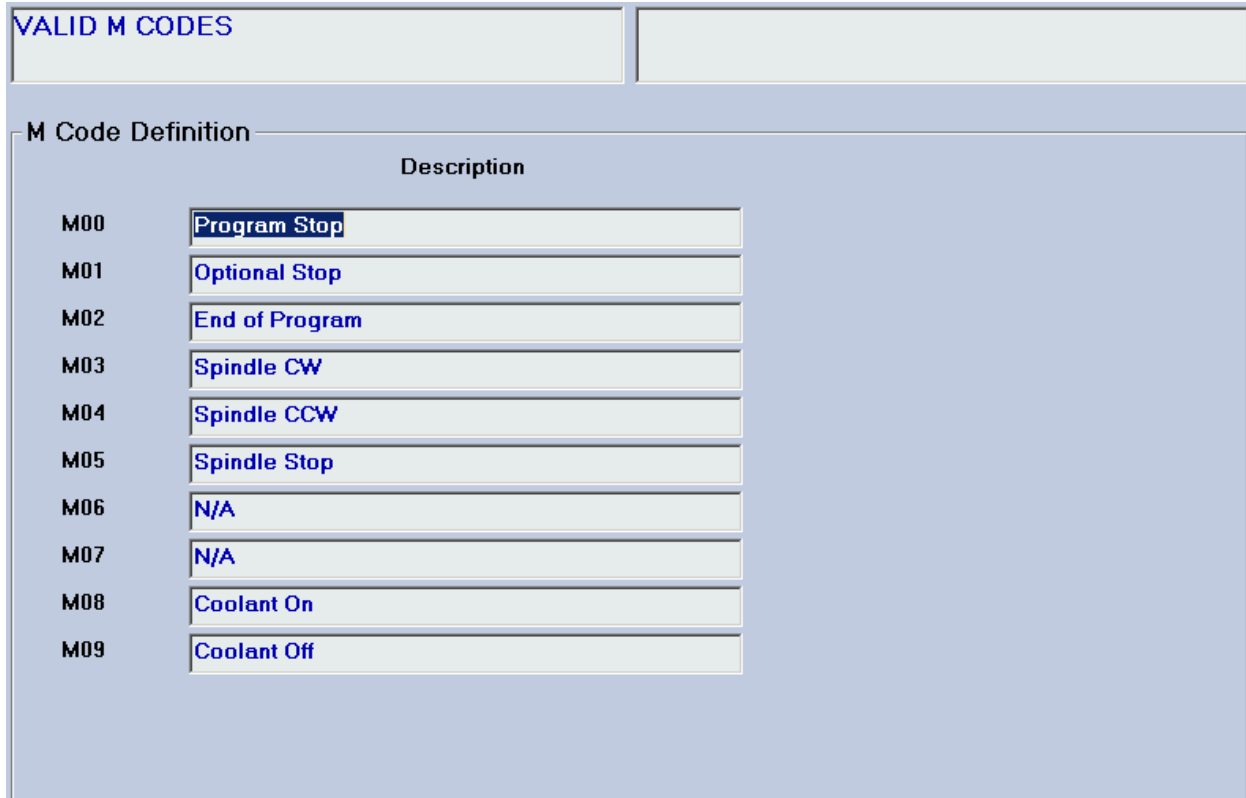




Figure 4-34: The Valid M Code Parameters Display Area #1

For your convenience, you can view the default M codes, and you can set up and document new M codes for your machine by filling in a description of what each M code does.

NOTE: There are 100 M codes, of which only 10 are displayed at any one time. To scroll through all the M codes

consecutively, use the  and  buttons. These will show you more M codes, as shown in the following figures:

VALID M CODES

M Code Definition

	Description
M10	Collet Open
M11	Collet Close
M12	N/A
M13	N/A
M14	N/A
M15	N/A
M16	N/A
M17	N/A
M18	N/A
M19	N/A

Figure 4-35: The Valid M Code Parameters Display Area #2

VALID M CODES

M Code Definition

	Description
M20	N/A
M21	N/A
M22	N/A
M23	N/A
M24	N/A
M25	N/A
M26	N/A
M27	N/A
M28	N/A
M29	N/A

Figure 4-36: The Valid M Code Parameters Display Area #3

VALID M CODES

M Code Definition

	Description
M30	Program Rewind
M31	N/A
M32	N/A
M33	N/A
M34	N/A
M35	N/A
M36	N/A
M37	N/A
M38	N/A
M39	N/A

Figure 4-37: The Valid M Code Parameters Display Area #4

VALID M CODES	
M Code Definition	
	Description
M90	N/A
M91	N/A
M92	N/A
M93	N/A
M94	N/A
M95	N/A
M96	N/A
M97	N/A
M98	Calling of subprogram
M99	End of subprogram


Figure 4-38: The Valid M Code Parameters Display Area #10

4.15 Using the Parameter Manager

4.15.1 Overview

A complete set of current ServoWorks S-100T parameters can be saved as a file, for backup or to copy to another PC to duplicate system and program settings on another computer, etc. The Parameter Manager is a tool available to you in Configuration Mode that allows you to duplicate these parameter files, move files, delete files and rename files. Only .reg files may be manipulated in this manner – all other file extensions will be “off limits” to you.



To open the File Manager, press the  button on the bottom toolbar. You will then see the Parameter Manager Display Area shown in the following figure:

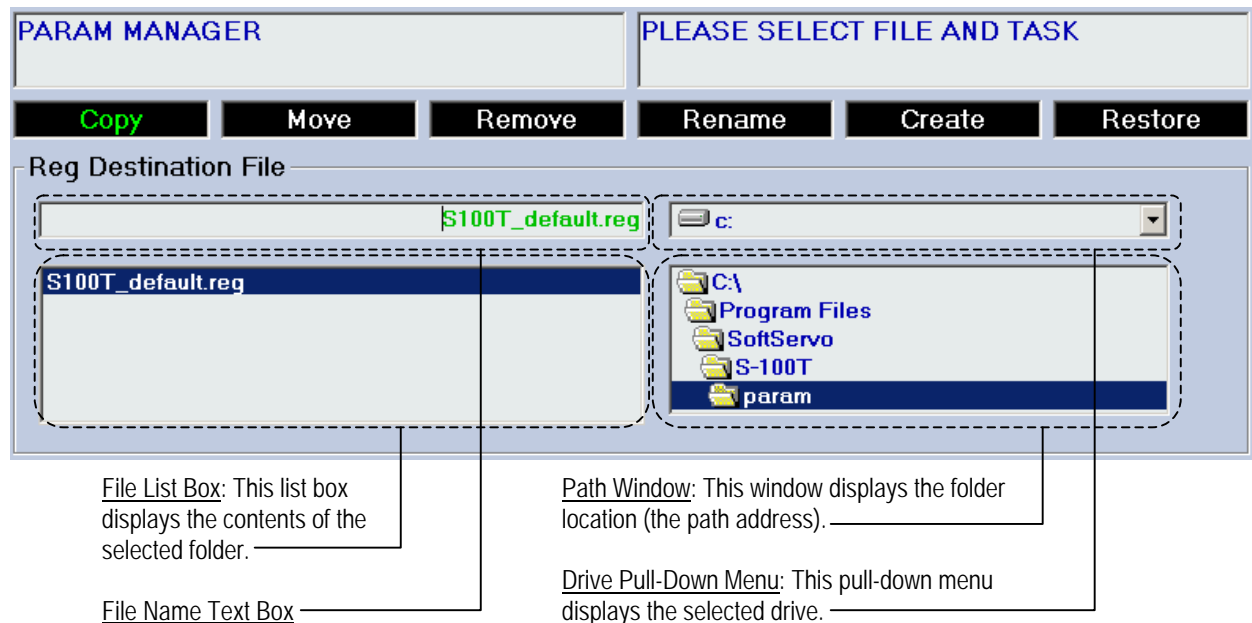



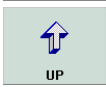


Figure 4-39: The Parameter Manager Display Area

4.15.2 Selecting a File To Copy, Move, Remove, Rename, Create or Restore

When you first open the Parameters Manager, the folder labeled “param” in your ServoWorks S-100T folder will automatically open. However, you may navigate to other folders, or even other drives in order to select the desired folder.


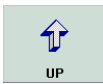


To use the Parameters Manager, you must first select a registry file (unless you are creating a new file). The procedure for selecting a file is the same whether you want to copy, move, remove, rename, create or restore that file. The following steps will guide you through selecting a file:

- 1) If you’re not in the desired drive (the drive where the file you’re trying to load is located):

- a) Press the  button on the bottom toolbar.
- b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
- c) Press the  button on the bottom toolbar to select the desired drive.



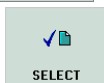
NOTE: If you have a mouse, you can click on the pull-down menu and select the desired drive directly.

- 2) Once you've selected your drive, you need to navigate to the folder where the desired file is located. If you're not in the desired folder:

- a) Press the  button on the bottom toolbar.
- b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
- c) Press the  button on the bottom toolbar to select the desired folder.
- d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be opened.



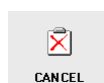
NOTE: If you have a mouse, you can click on a folder directly.

- 3) Now that you're in the right folder, press the  button to put the focus on the File List Box, as shown in Figure 4-39.

- 4) Use the  and  buttons on the bottom toolbar to navigate to the file to be opened.
- 5) Press the  button on the bottom toolbar to select the desired file. This file name will then appear in the File Name Text Box.

4.15.3 Creating a Registry File








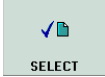

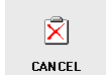
The following steps will guide you through creating a registry file:

- 1) Press the  button on the bottom toolbar to select the **Create** option.
- 2) Navigate to the desired folder. (See *Section 4.15.2: Selecting a File To Copy, Move, Remove, Rename, Create or Restore.*)
- 3) You will be prompted to enter a name for the new registry file. NOTE: You must have a keypad or a keyboard in order to rename a file.
- 4) Press the  button to complete the operation, or press the  button to cancel the operation.

4.15.4 Copying, Moving, Removing, Renaming or Restoring Registry Files


Once you have selected your registry file, it is easy to copy, move, remove, rename or restore that file. Restoring a file means restoring all ServoWorks S-100T parameters to the values in the selected parameters file.

The following steps will guide you through copying, moving, removing (deleting), renaming or restoring a registry file:

- 1) Press the  button on the bottom toolbar to toggle through the file options, and select the option you want: , , , , or .
- 2) Press the  button on the bottom toolbar to select the current file and task.
- 3) If you are removing the file, it will happen as soon as you press the  button.
- 4) If you are copying the file, moving a file or renaming a file, you will be prompted to select a destination for that file. (NOTE: When you copy a file, there is no option to select a name for the duplicate file. Instead, “_backup” is added to the original file name. For instance, if you duplicated a file called “File1.reg,” the duplicate file would be called “File1_backup.reg.”)
- 5) If you are renaming a file, you will be prompted to enter the new name of the file.
- 6) If you are restoring a file, the parameter registry settings from that file will be used for the operation of ServoWorks S-100T.
- 7) Press the  button to complete the operation, or press the  button to cancel the operation.

4.16 Setting Display Parameters



Press the  button on the bottom toolbar. You will then see the Display Parameters Display Area shown in the following figure:

DISPLAY

Data Position Format

X.XXXXXX
 XX.XXXXX
 XXX.XXXX

Display of Four Types of Position Data (select four)

Program Position
 Machine Position
 Relative Position

Actual Position
 Servo Lag
 Distance To Go

Display of Two Types of Position Data (select two)

Program Position
 Machine Position
 Relative Position


Actual Position
 Servo Lag
 Distance To Go

Figure 4-40: The Display Parameters Display Area

Display parameters include selecting the number of significant figures to display for position data, selecting four of the six position types to display in one display configuration, and selecting two of the six position types to display in another display configuration.

4.17 Setting Auto Plot Parameters



Press the  button on the bottom toolbar. You will then see the Plot Parameters Display Area shown in the following figure:

AUTO PLOT

Plot

Plot Option Mach Actual ▾

Show Part Outline

Width(inch) 400.0000

Diameter(inch) 250.0000

Z Origin(inch) -400.0000

Automatic Start

Zoom Factor 1.000

Plot Axes ZX ▾

Cycle Time Sequence No.

Start from 2

Stop at 10000

Figure 4-41: The Plot Parameters Display Area

Auto plot settings include the following:

- The selection of which position type to plot (machine actual position, machine command position, program actual position or program command position)
- The setting of the part width and diameter (so the part size is plotted correctly and correspondingly to the tool path)
- The Z axis origin relative to the machine origin
- Whether or not plotting should start automatically (if it's not automatic, you would need to go to Plot Mode to start a plot)
- The zoom factor and plot orientation (the default settings – you can always change these by using Plot Mode)
- When to start and stop plotting (which can be specified with either sequence numbers – line numbers of part programs – or with cycle time)

4.18 Setting Color Parameters

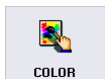
4.18.1 Overview

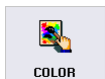
ServoWorks S-100T provides a set of default color parameters, so it isn't necessary for you make any changes at all to your color parameter settings. However, because individual preferences vary among users, these settings are available to you, so that you can customize the way your display looks by changing the colors of the text and backgrounds for all of the items on the ServoWorks S-100T screen. If you decide to customize your screen, you may have to experiment a little bit before you find the color parameters that suit you best.

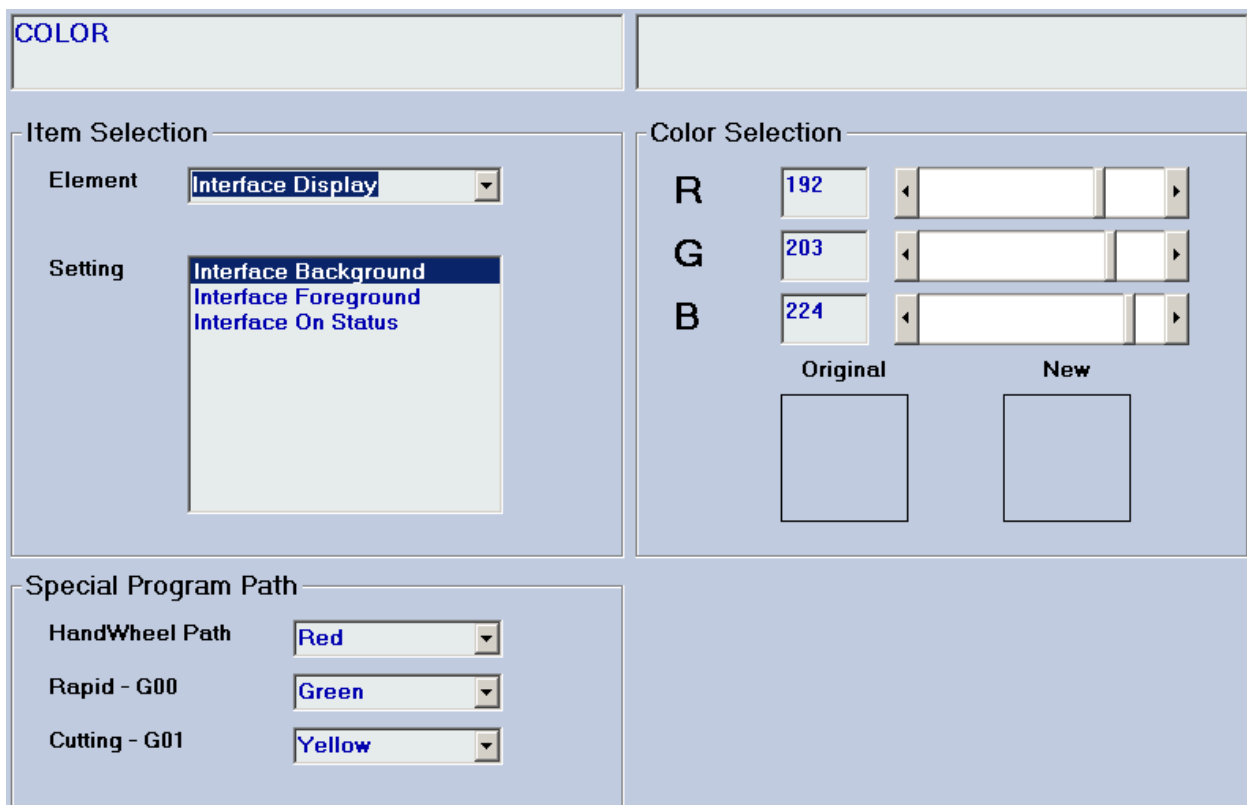
Color settings include settings for the different parts of screen elements such as the main interface, buttons, the plot area, the G code area and the data display. You can also set the colors for different types of axis movement – for those commanded with a handwheel, for those in a cutting mode and for those in a rapid mode.

If you are satisfied with the default or current color settings, you should skip this section.

4.18.2 Accessing the Color Parameters



Press the  button on the bottom toolbar. You will then see the Color Parameters Display Area shown in the following figure:



COLOR

Item Selection

Element:

Setting:

Color Selection

R:
G:
B:

Original New

Special Program Path

HandWheel Path:

Rapid - G00:

Cutting - G01:

Figure 4-42: The Color Parameters Display Area

4.18.3 What Elements of the Screen Can You Change?

You can change virtually every part of the screen. The screen is broken down into five elements:

- The Interface Display
- The Button Display
- The Plot Display
- The G-Code Display
- The Data Display

The following figure shows where you will find these five elements of the screen.

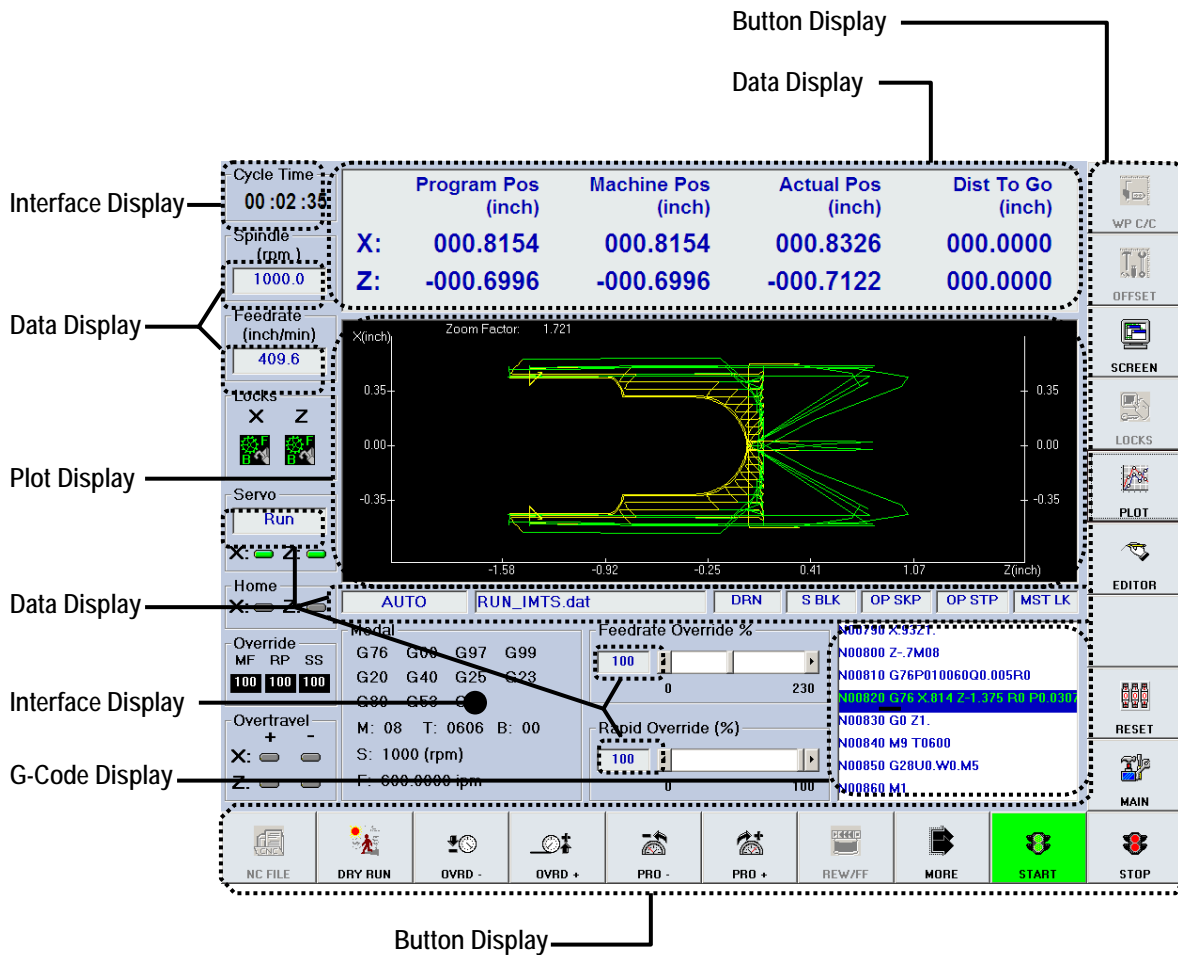


Figure 4-43: Screen Elements For Which You Can Change Color

4.18.4 The Interface Display

The interface display includes the basic screen background, and the text labels on the screen. It doesn't include any buttons on either the right toolbar or the bottom toolbar. It doesn't include any text boxes, which means it doesn't include the text boxes that display data or G code. And it doesn't include the plot display area.

The interface display has color settings for three parts of the display:

- Interface Background (the dominant color of the whole screen)
- Interface Foreground (text)
- Interface On Status (text indicating selected options)

The three parts of the display whose color settings can be changed are shown in the following figure:

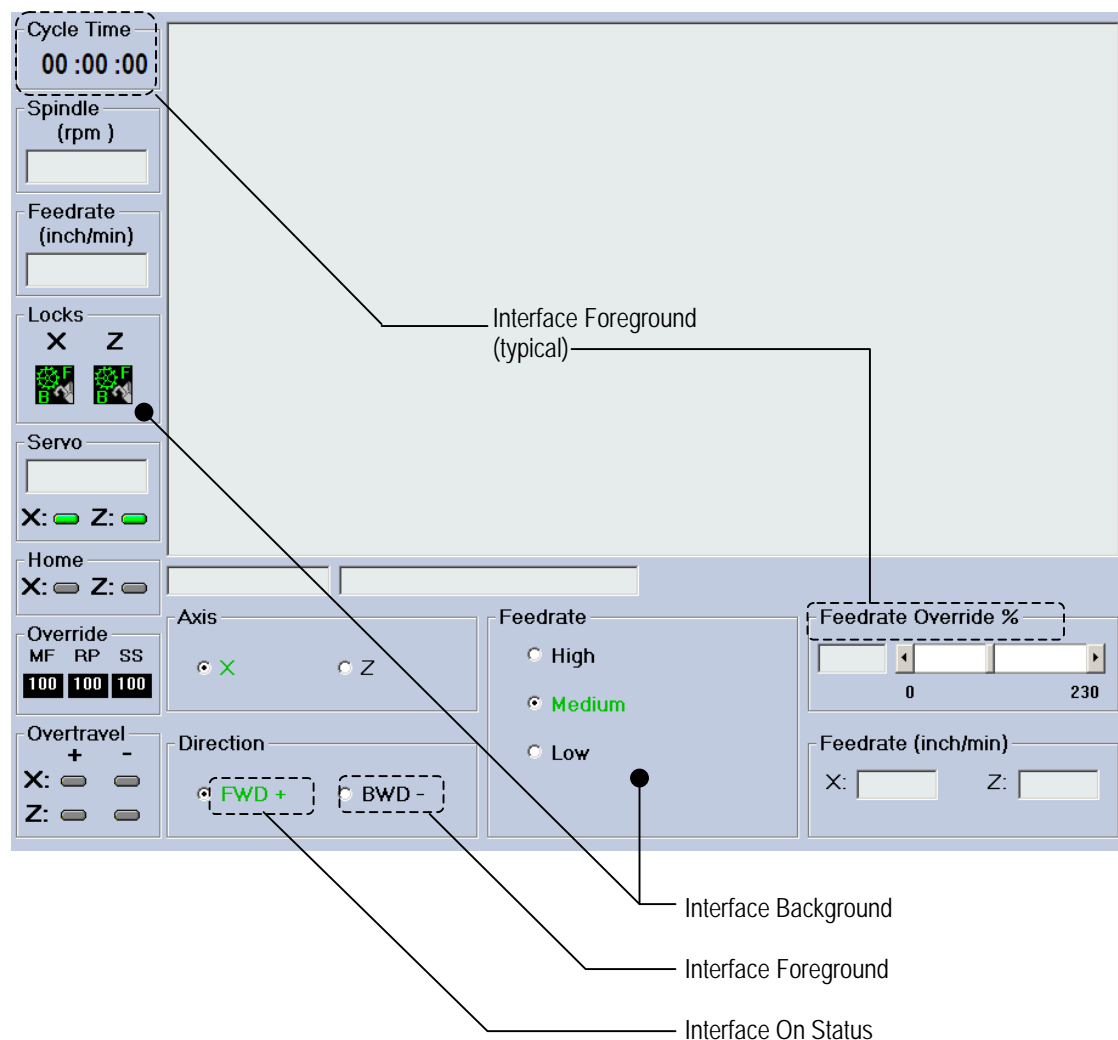


Figure 4-44: The Interface Display

4.18.5 The Button Display

The part of the screen referred to as the “button display” includes the bottom and right toolbars. You can only change the background of buttons; you cannot change the color of the text or icons on the buttons.

The button display has color settings for three parts of the display:

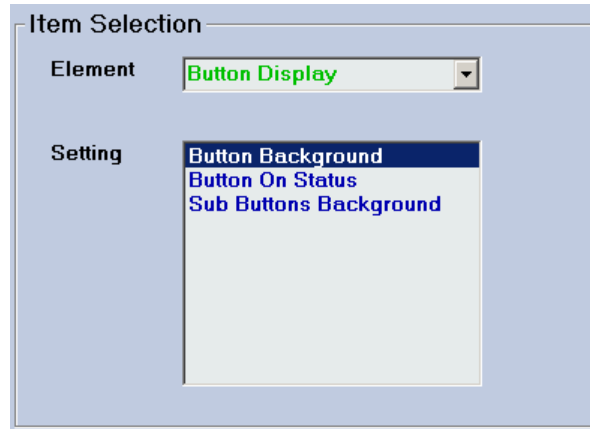


Figure 4-45: The Button Display Item Selection

- Button Background (the dominant color of the buttons for Main Mode and all operational modes)
- Button On Status (the dominant color of buttons indicating the current button selection)
- Sub Buttons Background (the dominant color of buttons for all sub modes)

These buttons are shown in the following figure:

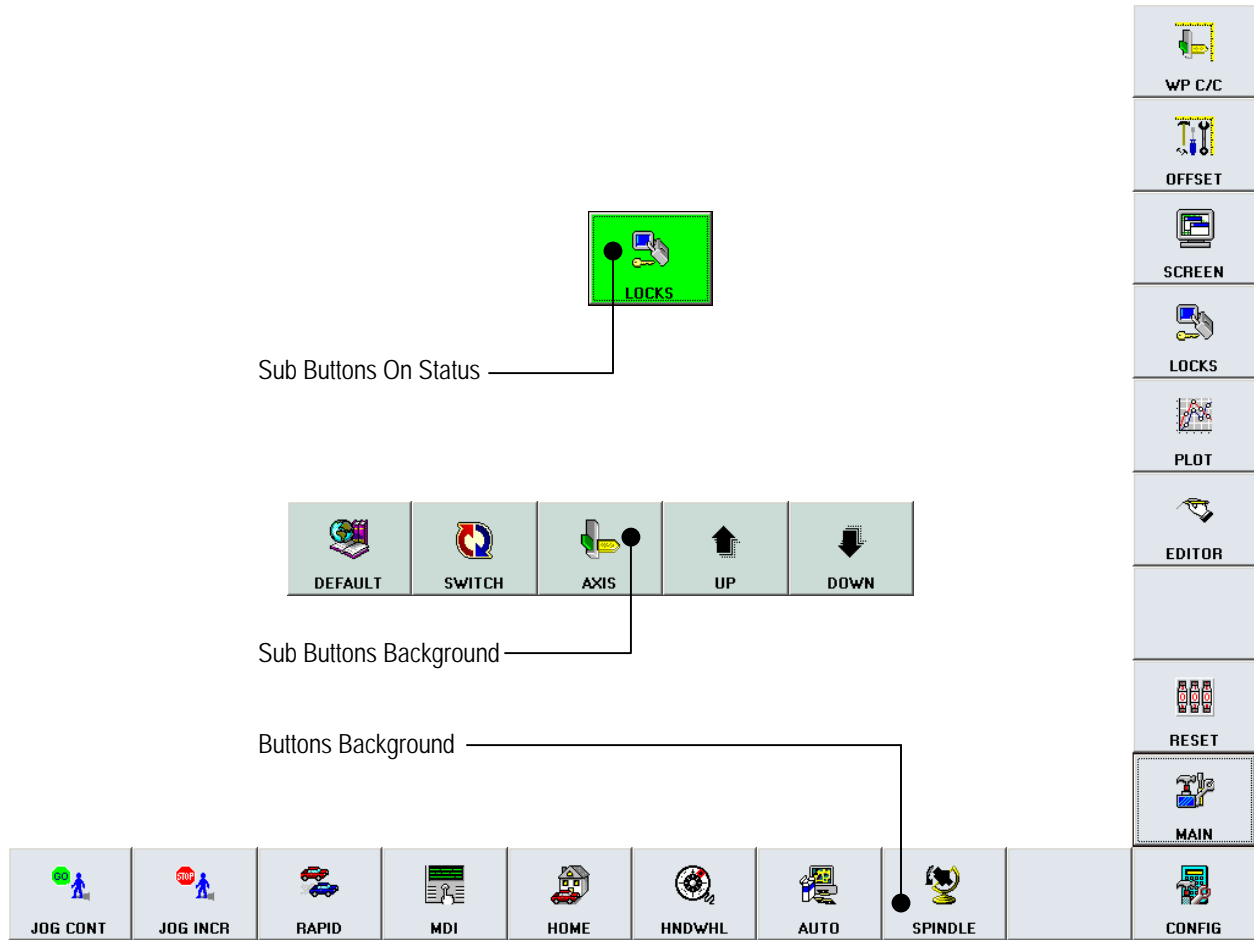


Figure 4-46: The Button Display

4.18.6 The Plot Display

The part of the screen referred to as the “plot display” is a single area of the screen where tool trajectories are plotted. The size of this area varies, depending upon which option you choose in Screen Mode. See *Section 5.2.2: Using Screen Mode to Select Information to Display in the Main Display Area*.

The plot display has color settings for three parts of the display:

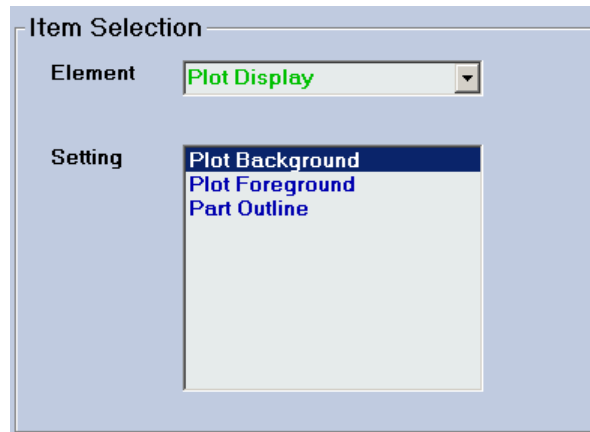


Figure 4-47: The Plot Display Item Selection

- Plot Background (the dominant color of the plot area)
- Plot Foreground (the color of the axes, and the color of the lines of the plot itself)
- Part Outline (the color of the lines outlining the part)

The three parts of the display whose color settings can be changed are shown in the following figure:

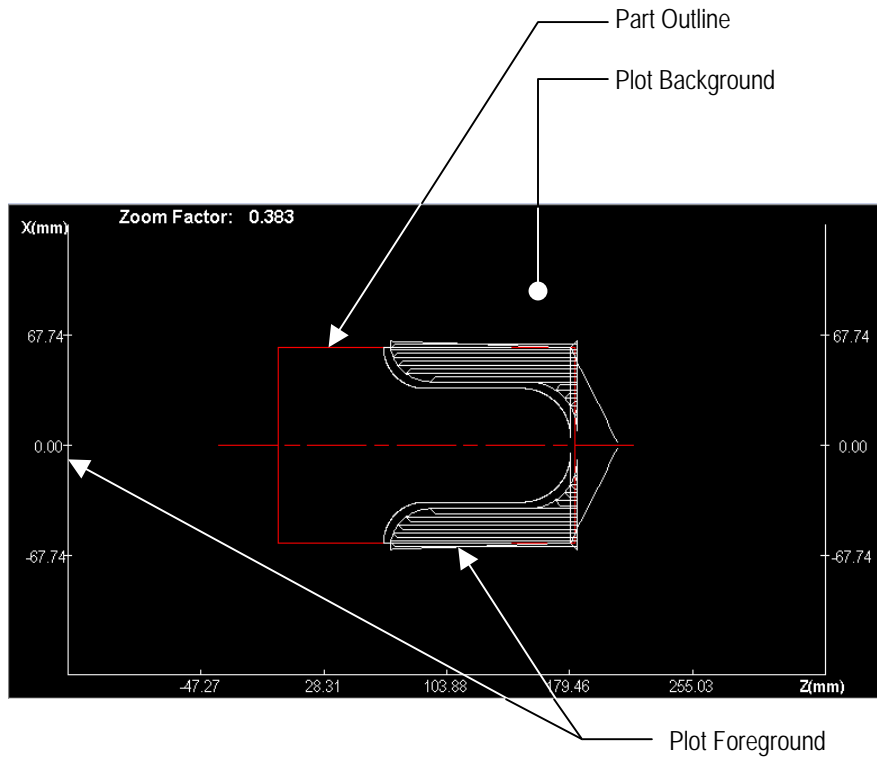


Figure 4-48: The Plot Display

4.18.7 The G-Code Display

The part of the screen referred to as the “G-code display” is a single area of the screen where blocks of code are shown. The area is only visible in Auto Mode.

The G-code display has color settings for three parts of the display:

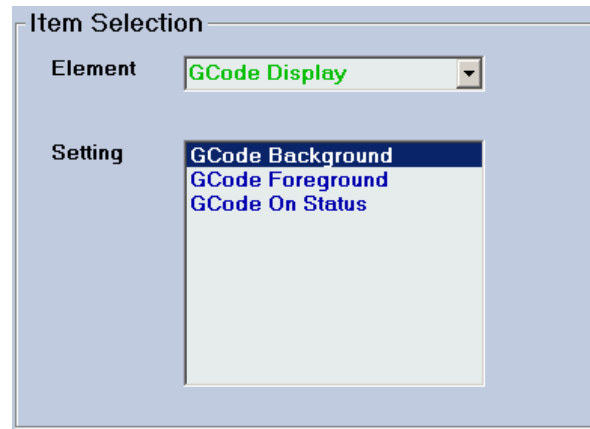


Figure 4-49 The G Code Display Item Selection

- G-Code Background (the dominant color of the G-Code area)
- G-Code Foreground (the color of the text of the G-Code)
- G-Code On Status (the color of the text for the line of code currently being executed, or that will execute when the operation begins or resumes)

The three parts of the display whose color settings can be changed are shown in the following figure:

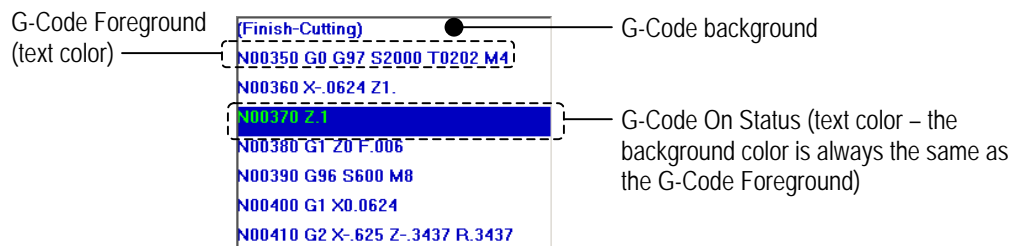


Figure 4-50: The G-Code Display

4.18.8 The Data Display

The part of the screen referred to as the “data display” encompasses many areas of the screen where current data is shown. Typically, it shows current settings, such as position information, current control mode, current settings for things like feedrate, spindle speed, rapid override percentage, etc. The data display varies for each operational and sub mode.

The data display has color settings for two parts of the display:

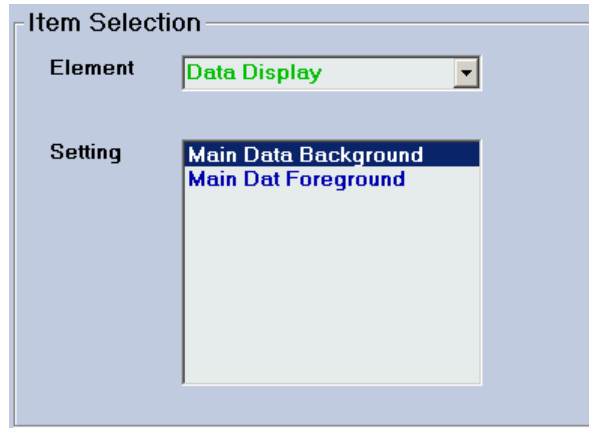


Figure 4-51: The Data Display Item Selection

- Main Data Background (the dominant color of the data areas)
- Main Data Foreground (the color of the text in the data areas)

The two parts of the display whose color settings can be changed are shown in the following figure:

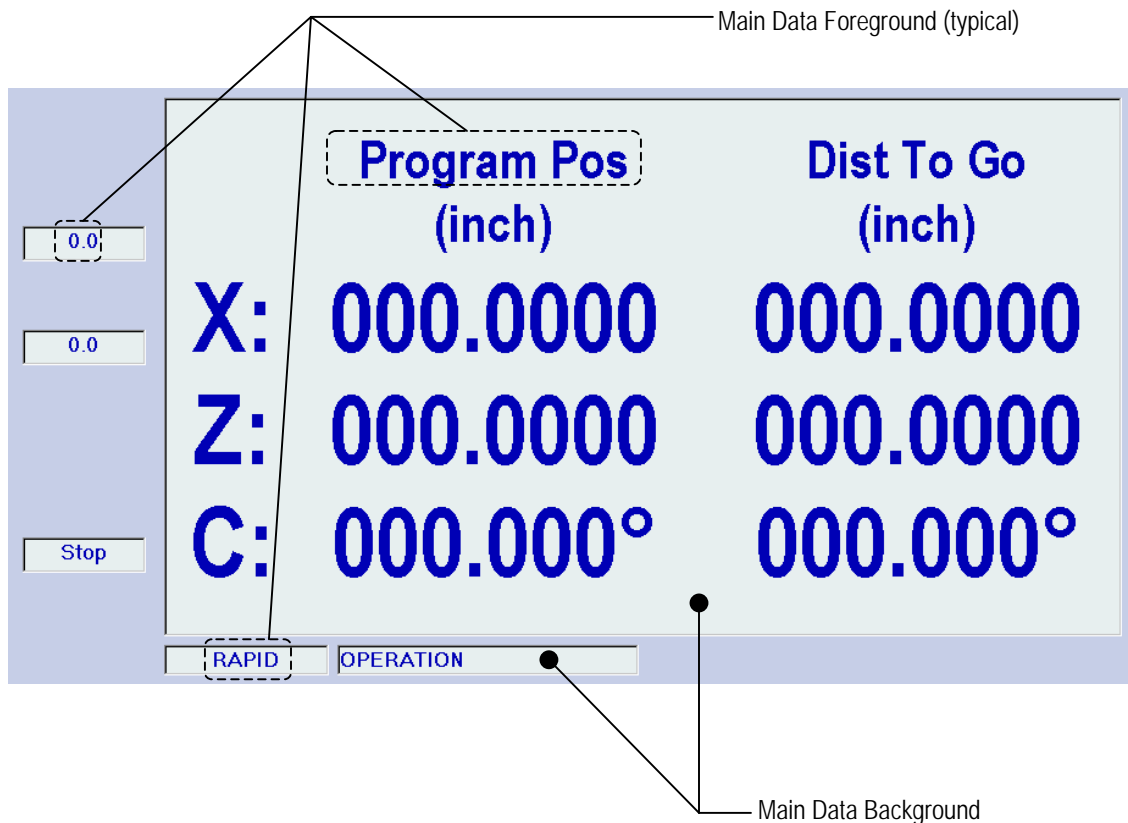



Figure 4-52: The Data Display Area

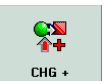

4.18.9 Selecting and Changing the Color Parameters

You must change and save one color setting at a time, for each screen element. You can do this with the following steps:

- 1) Make sure you are in the Color Settings window of Configuration Mode.





- 2) Press the  button to put the focus on (select) the “Item Selection” frame. This button also toggles you between the “Element” pull-down menu and the “Setting” list box. Use this button to select the “Element” pull-down menu within the “Item Selection” frame.

NOTE: If you have a mouse, you can click on the “Element” pull-down menu.





- 3) Use the  and  buttons to select from the pull-down menu the screen element to be changed. Your options are:

- The Interface Display
- The Button Display
- The Plot Display
- The G Code Display
- The Data Display

NOTE: If you have a mouse, you can use it to directly select your choice from the “Element” pull-down menu.


- 4) Press the  button to shift the focus from the “Element” pull-down menu to the “Setting” list box.
- 5) Use the  and  buttons to select the color settings to be changed for the screen element that you have selected.
- 6) Now that you have chosen the screen element and color settings that you want, press the  button on the bottom toolbar to switch from the “Item Selection” frame to the “Color Selection” frame.

NOTE: If you have a mouse, you can just click on the “Color Selection” frame.

- 7) Use the  button to toggle through and select which color spectrum you want to change. The  button toggles you through the “R,” “G” and “B” (red, green and blue) settings.
- 8) Use the  and  buttons to select a setting for the color spectrum you have selected. Holding down the function key for one of these buttons causes the value to change very quickly. Quick, individual key presses cause the value to decrease or increase by a value of “1” for each key press.


NOTE: If you have a mouse, you can type in the new value you want, or use the slider bar to select the value you want.

You may have to play around with these color spectrums a bit, to get a feel for it. To get a solid blue, for instance, you can set the blue to 256 and the red and green to 0. To get the color white, set all three colors to 256. To get the color black, set all three colors to 0. To get the color yellow, set red and green to 256, and blue to 0.


- 9) Press the  button on the bottom toolbar, to save your change for this color setting. This saves your changes into a registry file in the operating system, so these settings stay in effect until you change them.


CAUTION

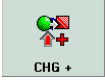

Be careful: If you continue to make more changes on another color setting without

pressing the  button,, you will lose the changes you have just made.

- 10) Repeat steps #7, 8 and 9 for the other two color spectrums.


- 11) Press the  button to put the focus on the “Special Program Path” frame.



12) Use the  button to toggle through and select which special program path setting you want to change. Your choices are “HandWheel Path” (which applies to all movements commanded using the handwheel), “Rapid – G00” (which applies to all movement commanded by G00 blocks of code in a part program, or by G00 blocks of code given in MDI Mode) and “Cutting – G01” (which applies to all movement commanded by G01 blocks of code in a part program, or by G01 blocks of code given in MDI Mode)

13) Use the  and  buttons to select a color from the pull-down menu for the special program path that you've selected. Your options are:

- Plot Forecolor (in which case the special program path is indistinguishable from the rest of the plot)
- Red
- Green
- Blue
- White
- Black
- Cyan
- Magenta
- Yellow

14) Repeat steps #11 and 12 for the other two special program paths.

15) Press the  button on the bottom toolbar, to save your changes for the special program paths. This saves your changes into a registry file in the operating system, so these settings stay in effect until you change them.

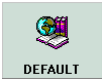
 CAUTION
<p style="text-align: center;">Be careful: If you do not press the  button, you will lose the changes you have just made.</p>

4.18.10 Saving Your Color Settings

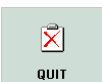

If you have significantly customized your color settings, and are very satisfied with the current settings, we strongly recommend saving your parameter settings to an .reg file (and keep this file updated as you modify other, non-color settings.) See *Section 4.15.3: Creating a Registry File.*

4.18.11 Setting All the Color Parameters Back to the Default Settings



If you don't like the changes you have made to the color settings, and would prefer to return to the default settings

that come with the ServoWorks S-100T program, press the  button on the bottom toolbar. This will cause the default settings to override any changes you may have made to the color settings.

4.18.12 Exiting the Color Parameters Display Area

To exit the Color Parameters Display Area, press the  button on the bottom toolbar, or press the  key.

4.19 Exiting Configuration Mode

To exit Configuration Mode, either press the  key or press the  button on the bottom toolbar.

Chapter 5: Monitoring the Status of Operations

5.1 Understanding the General Status of the Lathe

5.1.1 Overview

The information shown in the following figure is constantly displayed in the status indicator area at the left side of the ServoWorks S-100T window, no matter what mode you are in.

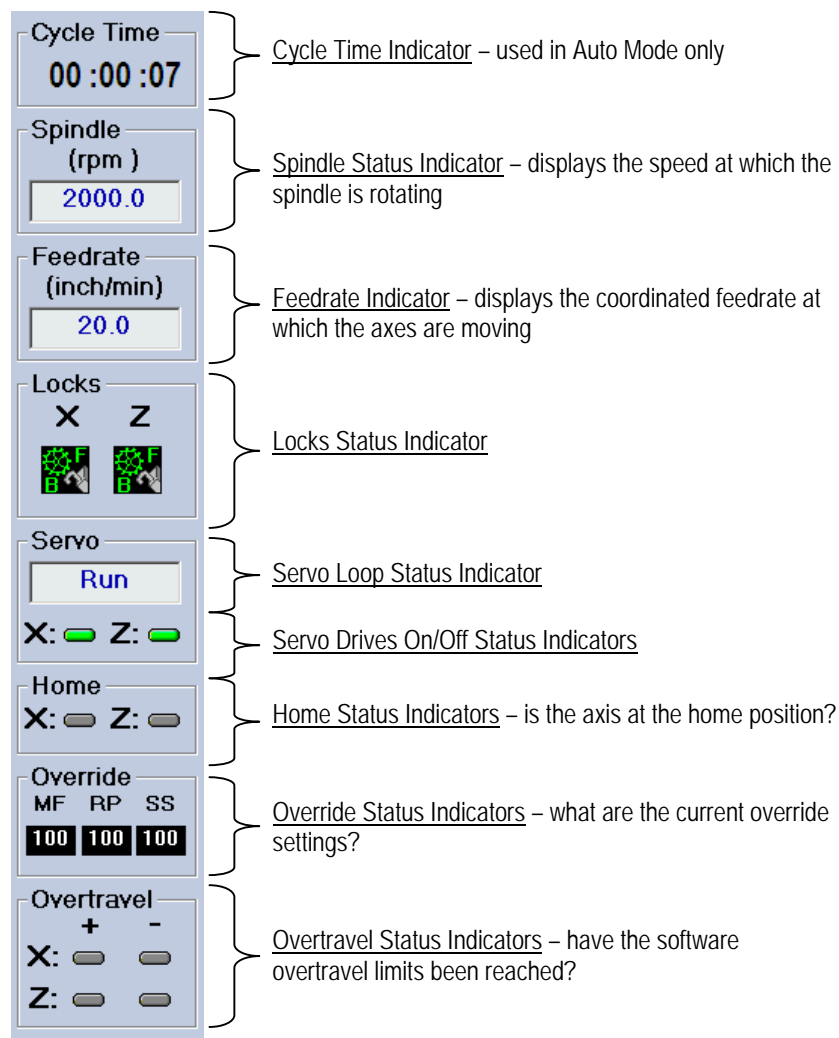


Figure 5-1: The Status Indicator Area of the ServoWorks S-100T Window

5.1.2 Cycle Time Indicator

The cycle time is used only in Auto Mode. It displays the time the G code part program has been running. You can use this cycle time to determine how long it takes to produce a particular part, and to compare different versions of part programs for the same part.

5.1.3. Spindle Status Indicator

The spindle status indicator displays the speed at which the spindle is rotating, in revolutions per minute. If the spindle status displays “0,” then the spindle is not moving.

The spindle speed is always displayed in RPMs, regardless of whether you set the spindle speed for a constant turning speed or a constant surface speed (in which case, ServoWorks S-100T calculates, monitors and adjusts the turning speed to maintain that constant surface speed.)

5.1.4 Feedrate Indicator

The feedrate displayed is the coordinated feedrate of the movements of axes X and Z. In Jog Continuous Mode, Rapid Mode and HandWheel Mode, which only allow you to operate one axis at a time, the feedrate displayed is for the selected axis only.

5.1.5 Locks Status Indicators

The locks status indicator shows the lock status of the X and Z axes in both the forward and backward directions. The letter “F” next to each axis stands for “forward,” and the letter “B” next to each axis stands for “backward.” The color red indicates “locked,” and the color green indicates “unlocked.” See the following figure:

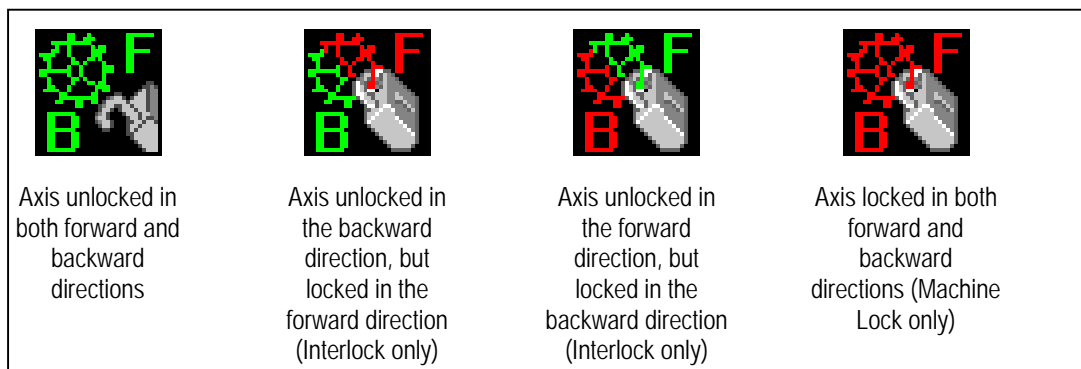




Figure 5-2: Locks Status Indicators



5.1.6 Servo Loop Status Indicator

The servo loop status indicator shows the current status of machine movement. “Run” indicates that motion is occurring. “Homing” indicates that a homing operation has been started. “Stop” means that motion is stopped – there is no motion (the axes are immobile). “Pause” also indicates that there is no motion, but that motion was interrupted (in Auto Mode and MDI Mode only).

5.1.7 Servo Drives On/Off Status Indicators

The oval LED icon next to each axis indicates the on/off status of the servo drives. Green () represents “on” and red () indicates “off.”

5.1.8 Home Status Indicators (Is the Axis at the Home Position?)

The oval LED icon next to each axis indicates whether that axis is at its home position. Gray () indicates that the axis *is not* at its home position, and green () indicates that the axis *is* at its home position.

5.1.9 Override Status Indicators (What Are the Current Override Settings?)



There are three types of overrides for which the status is displayed:

- MF (manual feedrate override – can range from 0% to 230%)
- RP (rapid positioning feedrate override – can be 0%, 25%, 50% or 100%)
- SS (spindle speed override – can range from 50% to 120%)

The number displayed under each label (“MF,” “RP,” or “SS”) indicates the current override percentage setting.

NOTE: If you have disabled the “MF,” “RP,” or “SS” switches in the Operator’s Panel frame in the “General” screen in Configuration Mode, the override percentage settings will be shown in a green text. If the MF, RP and SS switches are enabled, there will be white text, and input will be taken from the operator’s panel (the settings of the operator’s panel will be detected by the software).

5.1.10 Overtravel Status Indicators (Have the Software Limits Been Reached?)

The oval LED icons next to each axis indicate whether that axis has reached its forward or backward soft limit. The forward soft limits are indicated by a “+” over the oval LED icons, and the backward soft limits are indicated by a “-” over the oval LED icons. Gray () indicates that the soft limit for a particular axis and direction *has not* been reached, and red () indicates that the soft limit for a particular axis and direction *has* been reached.

5.2 Specifying Information to Display in the Main Display Area

5.2.1 What Information Is Available to Be Displayed?

Regardless of the current mode, you can select the information to display in the main display area. You can display status information for several types of data. Some of this information is displayed only in combination with other information. *Section 5.2.2: Using Screen Mode to Select Information to Display in the Main Display Area* explains the combinations of information available for display, and how to select what to display.


You can change the display while you are in any control mode by using Screen Mode. Going into Screen Mode only changes the buttons on the bottom toolbar, and does not change the rest of the control interface. Because of this, you can quickly go in and out of Screen Mode to change the information on display in the Main Display Area, while still monitoring whatever mode you were in before you went into Screen Mode.

The following subsections describe the information available to be displayed.

5.2.1.1 Position Information About Each Axis

The following positions are available for display in ServoWorks S-100T:


- Machine Position –the command position measured from the machine origin


- Actual Position – the feedback position of the X and Z axes – the real, current position of the axis (obtained from encoder feedback)
- Program Position – the desired position, specified by the program; the position that should have been generated by the command to the servo drive, if there were no position error. This position is with respect to the workpiece coordinate system
- Distance to Go – the distance the axis has been commanded to travel, relative to its current position (only relevant in Auto Mode, Jog Incremental Mode or MDI Mode)
- Relative Position – this position type is for your convenience. You can specify an arbitrary position to track displacement from, by clearing the relative positions (press the  button). From then on, the relative position is measured from the last cleared position.
- Servo Lag – the difference between the machine position and the real (actual feedback) position

You can set the “Display” parameters in Configuration Mode to specify which items you want to display – which four of these six (or which two of these six, depending upon which preset display configuration you choose) you want to display. (See *Section 4.16: Setting Display Parameters.*)

5.2.1.2 Clearing the Relative Positions

For the relative positions to be useful, you need to clear the relative positions (set them back to zero) occasionally,

so that you create a position from which to measure. You must be in Screen Mode (press the  button to

get into Screen Mode). To clear all relative positions (for the X, Z and C axes), press the  button.

5.2.1.3 A Plot of Tool Trajectory

A plot of the tool trajectory can be displayed with the vertical coordinates representing either the X axis or the Z axis. See *Section 5.3: Plotting Motion (Using Plot Mode)* for more information regarding all of the options available to you in viewing plots.

5.2.1.4 Statistics Information

The information included in the “Statistics” frame (see Figure 5-3) includes:

- Part Number – part number of the current workpiece being produced. (**NOTE:** This is only relevant in Auto Mode.)
- Date and Time – the current date and time
- Run Time – how long ServoWorks S-100T has been up and running
- Ave. Cutting Time – the average cutting time per part of the production being run. (**NOTE:** This is only relevant in Auto Mode.)
- Timer – shows the elapsed time since the timer was last reset. (**NOTE:** If the timer has never been set, it will display as “0:00:00.” See the following section for how to set the timer.)

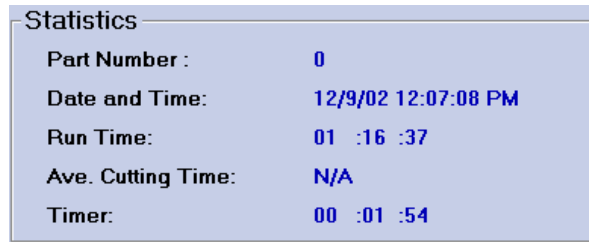




Figure 5-3: Statistics Frame

5.2.1.5 Setting the Timer

For the timer to be useful, you need to set it while in Screen Mode (press the  button to get into Screen Mode). To set the timer back to “0:00:00,” press the  button.

5.2.1.6 Switches Information

You can access relevant information from the “Switches” frame shown in the following figure:

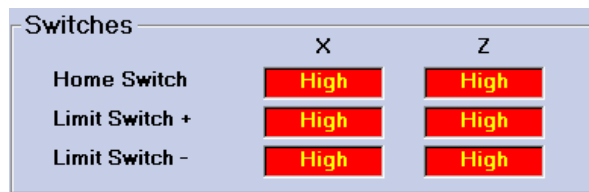


Figure 5-4: Switches Frame

For each axis, you can view the following information:

- “Home Switch” – this displays the High/Low status of the voltage corresponding to the home switch circuit
- “Limit Switch +” – this displays the High/Low status of the voltage corresponding to the high hardware limit switch circuit
- “Limit Switch -” – this displays the High/Low status of the voltage corresponding to the low hardware limit switch circuit

The normal state of the home and limit switches is “High.” When a switch is activated, it will display as “Low.” You can externally trigger the home switch, the high limit switch, or the low limit switch. If the switch is set correctly, you should see the state change briefly from “High” to “Low” to “High” again in the Axes Status window. If the state doesn’t change to “Low” when the switch is triggered, then you know the switch isn’t set correctly.

5.2.1.7 Digital Local I/O for the VersioBus Adapter Board

You can view the status of input and output signals for the VersioBus adapter board (the FP-60, FP-75, FP-80, FP-95 or FP-104) as shown in the following figure. I/O signals for the VersioBus adapter board can only be modified in Configuration Mode. (See *Section 4.13: Setting I/O Parameters.*)

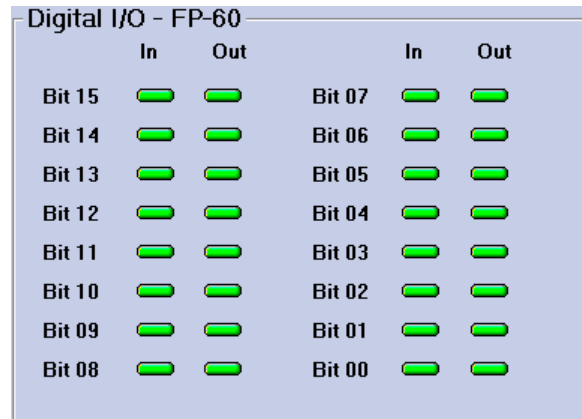




Figure 5-5: I/O Information Available for the VersioBus Adapter Board

This frame displays digital input and output signals for 16 switches of general I/O connectors. Green () indicates a signal of “1”, and red () indicates a signal of “0”.

5.2.1.8 Digital I/O for the Servo Interface Module

You can view the status of input and output signals for the DC-120 or DC-150 servo interface module, as shown in the following figure. I/O signals for the servo interface module can only be modified in Configuration Mode. (See *Section 4.13: Setting I/O Parameters.*)

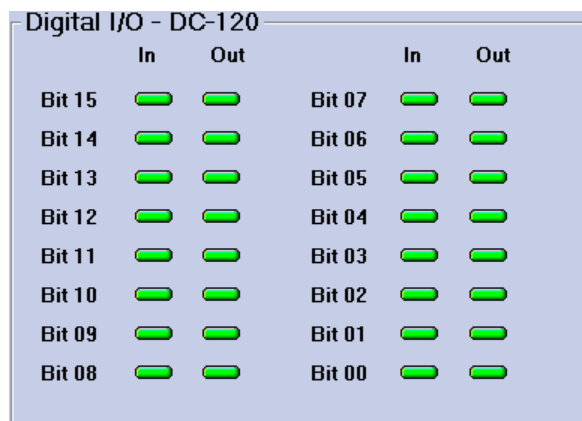




Figure 5-6: I/O Information Available for the VersioBus Servo Interface Module

This frame displays digital input and output signals for 16 switches of general I/O connectors. Green () indicates a signal of “1”, and red () indicates a signal of “0”.

5.2.1.9 Digital I/O for the IM-200

You can view the status of input and output signals for an IM-200 in your ServoWorks S-100T system, as shown in Figure 5-7. I/O signals for the IM-200 can only be modified in Configuration Mode. (See *Section 4.13: Setting I/O Parameters.*)

Digital IO - IM-200											
	In	Out		In	Out		In	Out		In	Out
Bit 31			Bit 23			Bit 15			Bit 07		
Bit 30			Bit 22			Bit 14			Bit 06		
Bit 29			Bit 21			Bit 13			Bit 05		
Bit 28			Bit 20			Bit 12			Bit 04		
Bit 27			Bit 19			Bit 11			Bit 03		
Bit 26			Bit 18			Bit 10			Bit 02		
Bit 25			Bit 17			Bit 09			Bit 01		
Bit 24			Bit 16			Bit 08			Bit 00		

Figure 5-7: I/O Information Available for the VersioBus I/O Module

This frame displays digital input and output signals for 32 switches of general I/O connectors. Green () indicates a signal of “1”, and red () indicates a signal of “0”.

5.2.2 Using Screen Mode to Select Information to Display in the Main Display Area



To specify what you want to display in the main display area, press the **SCREEN** button on the right toolbar to enter Screen Mode. Screen Mode is a sub mode, meaning you can enter Screen Mode from any operational mode (except Configuration Mode), so that you can change the display no matter what mode you are in, even when motion is occurring.

Nine buttons will appear on the bottom toolbar, as shown in the following figure:

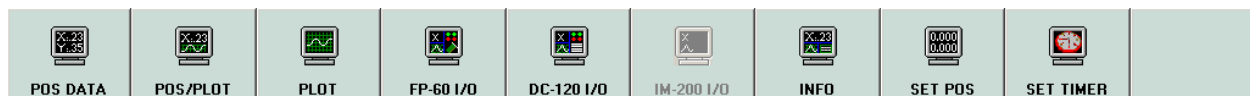


Figure 5-8: Bottom Toolbar in Screen Mode

Seven of these buttons will cause a preset combination of data to display, as shown in the following tables:



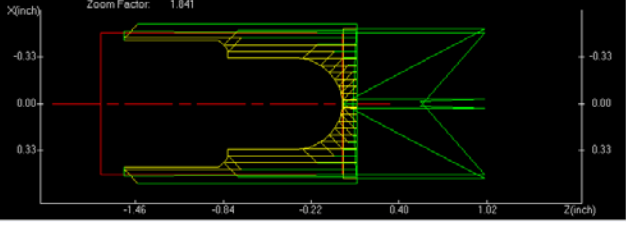

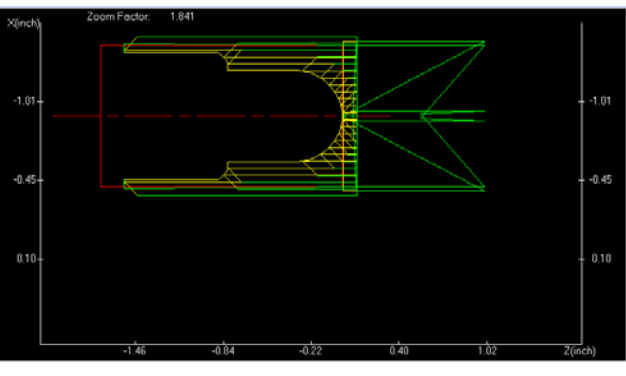

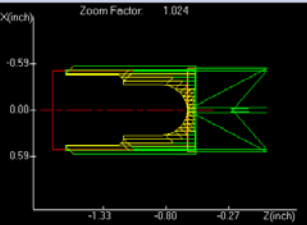
Press this button....	to display this in the Main Display Area.	Information included in display area:																																																																				
 POS DATA (This is the default display.)	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Program Pos (inch)</th> <th>Dist To Go (inch)</th> </tr> </thead> <tbody> <tr> <td>X:</td> <td>000.0000</td> <td>000.0000</td> </tr> <tr> <td>Z:</td> <td>000.0000</td> <td>000.0000</td> </tr> <tr> <td>C:</td> <td>000.000°</td> <td>000.000°</td> </tr> </tbody> </table>		Program Pos (inch)	Dist To Go (inch)	X:	000.0000	000.0000	Z:	000.0000	000.0000	C:	000.000°	000.000°	<ul style="list-style-type: none"> Position information for the X, Z and C axes 																																																								
	Program Pos (inch)	Dist To Go (inch)																																																																				
X:	000.0000	000.0000																																																																				
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C:	000.000°	000.000°																																																																				
 POS/PLOT	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Program Pos (inch)</th> <th>Machine Pos (inch)</th> <th>Actual Pos (inch)</th> <th>Dist To Go (inch)</th> </tr> </thead> <tbody> <tr> <td>X:</td> <td>-000.0624</td> <td>-000.0624</td> <td>-000.0624</td> <td>000.0000</td> </tr> <tr> <td>Z:</td> <td>000.0498</td> <td>000.0498</td> <td>000.0498</td> <td>-000.0498</td> </tr> <tr> <td>C:</td> <td>000.000°</td> <td>000.000°</td> <td>000.000°</td> <td>000.000°</td> </tr> </tbody> </table> 		Program Pos (inch)	Machine Pos (inch)	Actual Pos (inch)	Dist To Go (inch)	X:	-000.0624	-000.0624	-000.0624	000.0000	Z:	000.0498	000.0498	000.0498	-000.0498	C:	000.000°	000.000°	000.000°	000.000°	<ul style="list-style-type: none"> Position information for the X, Z and C axes Plot trajectory data 																																																
	Program Pos (inch)	Machine Pos (inch)	Actual Pos (inch)	Dist To Go (inch)																																																																		
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Table 5-1: Screen Mode Options (1 of 2)


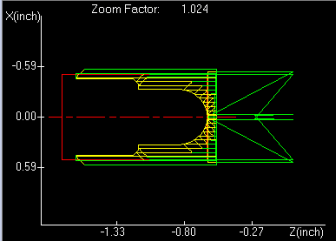


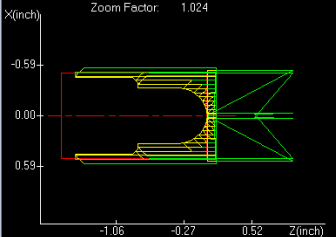



Press this button....	to display this in the Main Display Area.	Information included in display area:																																																																																																									
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Table 5-2: Screen Mode Options (2 of 2)

5.2.3 Exiting Screen Mode

To exit Screen Mode (and get back to whatever mode you were in before pressing the  button), press the

 key, OR press the  button again.

5.3 Plotting Motion (Using Plot Mode)









5.3.1 Overview

You have several different options for plotting tool trajectory coordinates: you can specify which of the X, Z and C axes will be the vertical and horizontal axes, you can change the scale of a plot by zooming in and out, and you can move the plot within the plot area by panning left, right, up and down.

You can change the way the plot looks while you are in any control mode, by using Plot Mode. Going into Plot Mode only changes the buttons on the bottom toolbar, and does not change the rest of the control interface. Because of this, you can quickly go in and out of Plot Mode to change the appearance of the plot, while still monitoring whatever mode you were in before you went into Plot Mode.

5.3.2 Viewing a Plot

To view a plot, you must first make sure that the plot area is displayed. If the plot area is not displayed:

- 1) Press the  button on the right toolbar to enter Screen Mode. Ten buttons will appear on the bottom toolbar, as shown in Figure 5-8.
- 2) Press any of the following buttons on the bottom toolbar:
 -  (will show position data and plot);
 -  (will show plot alone);
 -  or  (will show position data, I/O data and plot); or
 -  (which will show a plot along with lots of other data).
- 3) Press the  key to return to the previous mode (the mode you were in before going into Screen Mode), or press the  button again.

When you are in any manual mode (Jog Continuous Mode, Jog Incremental Mode, Rapid Mode, MDI Mode, Home Mode or HandWheel Mode), the plot will not automatically display (unless you have selected “Automatic Start” in the “Auto Plot” screen in Configuration Mode). If you want to see the tool trajectory in these modes, you must go into Plot Mode and start the plot (which will be explained shortly).

When you are in Auto Mode and you run a part program, the plot starts to display automatically, as long as the Plot Area is shown in the Main Display Area. The plot will be at the most recent zoom factor and orientation that you chose in Plot Mode. If you haven't used Plot Mode to adjust the zoom factor or orientation, then the zoom factor and the orientation that you specified in the “Auto Plot” settings in Configuration Mode will be used. If these settings are unsatisfactory, you can change them while running your part program, by using Plot Mode:

To get into Plot Mode (a sub mode that you can enter from any operational mode except Configuration Mode) and start a plot:





- 1) Press the  button on the right toolbar to enter Plot Mode. [The  button will be disabled if no plot area is displayed – see above.] Ten buttons will appear on the bottom toolbar, as shown in the following figure:





Figure 5-9: Bottom Toolbar in Plot Mode


- 2) If you are in Auto Mode, you can skip this step. Otherwise, press the  button on the bottom toolbar. You will see horizontal and vertical axes appear, labeled in either inches or millimeters. A zoom factor also appears, telling you how the plot size relates to the actual distance on the machine tool. For instance, a zoom factor of 0.3 indicates that the plot is 30% of the size of the actual tool movement and the actual part.

NOTE: If at any time your plot “disappears” due, for instance, to a dialog box that pops up in the plot display area

and leaves a “hole” in your plot when the dialog box goes away, press the  button to refresh the screen,

and the plot will reappear. You will be in Screen mode, so you will need to press the  key, or the  button again, to return to your previous mode.

5.3.3 Changing the Orientation (Plane) of a Plot

You can easily change the orientation of a plot. Pressing the  button on the bottom toolbar toggles the plot between the four possible orientations:

- 1) ZX: the X axis plotted in the vertical direction, and the Z axis plotted in the horizontal direction, as shown in the following figure:

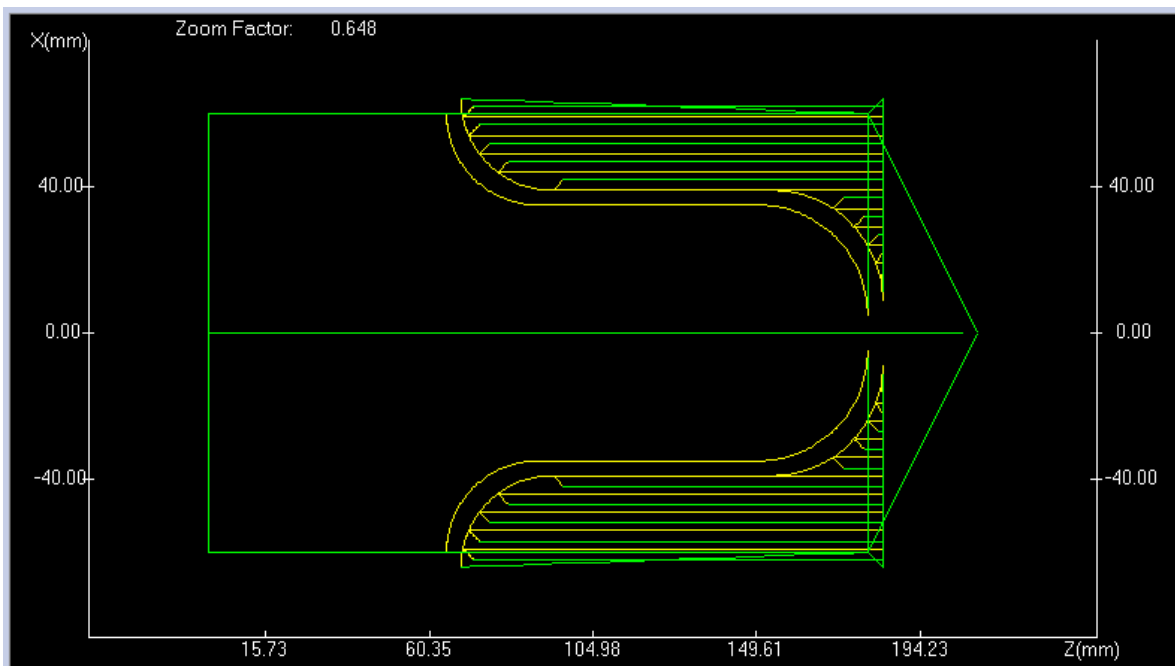


Figure 5-10: Plot with XZ Orientation

- 2) XZ: the Z axis plotted in the vertical direction, and the X axis plotted in the horizontal direction, as shown in the following figure:

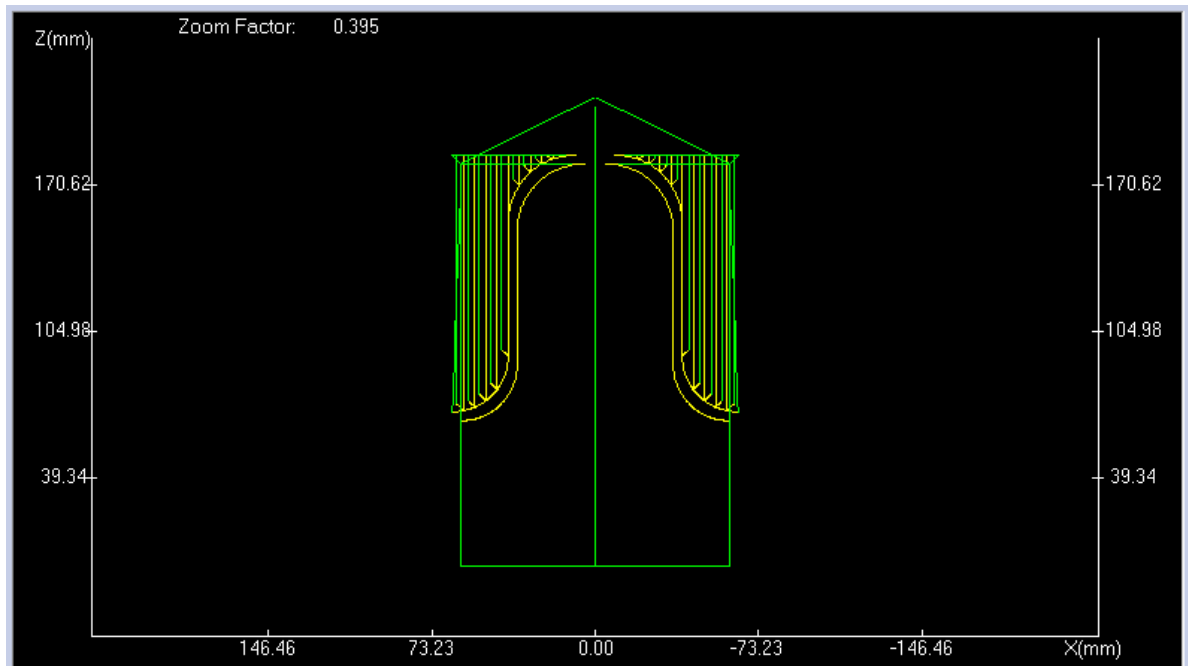





Figure 5-11: Plot with ZX Orientation

- 3) ZC
4) CX





5.3.4 Changing the Scale of a Plot (Zooming In and Out)

Changing the scale of a plot is very easy to do, by pressing the  (zoom out) and  (zoom in) buttons on the bottom toolbar. Zooming out decreases the zoom factor, and makes the plot smaller in the display area. Zooming in increases the zoom factor, and makes the plot larger in the display area. Zooming in may cause only part of the plot to fit in the plot area, in which case, you will have to move the plot around to see the parts of the plot you are interested in. (See *Section 5.3.5: Moving the Plot Within the Plot Area.*)


To make the plot as large as possible while still fitting all of the plot data in the plot area, press the  button on the bottom toolbar. ServoWorks S-100T will automatically readjust the coordinate scale so that the entire tool path can be shown. You will find this to be a very handy button, especially when the tool path exceeds the maximum plot coordinates, and you can no longer see the entire tool path. Using this button gives you a good starting place to begin zooming in to areas of interest to you.

5.3.5 Moving the Plot Within the Plot Area

You can easily move a plot within the plot area. Usually, you will want to move a plot within the plot area when you have zoomed in too close for the entire plot to display within the plot area.

Press the  ,  ,  , and  buttons on the bottom toolbar to move the plot in the desired direction.


5.3.6 Clearing a Plot

ServoWorks S-100T will continue to display tool trajectories until you clear the plot. If you want to clear the plot display so that you can start over with a new plot, press the  button on the bottom toolbar to clear (erase) the tool trajectories (the horizontal and vertical axes will still be visible).


After you clear a plot, plotting resumes immediately unless no motion is occurring.




5.3.7 Holding a Plot

“Holding a plot” means stopping ServoWorks S-100T from continuing to plot any more motion, while continuing to display what has currently plotted on the screen. This means that even though motion may continue after you hold a plot, you won’t see any new plotting occur.

To hold a plot, press the  button on the bottom toolbar. This essentially “freezes” the plot area of the screen.

5.3.8 Exiting Plot Mode

To exit Plot Mode (and get back to whatever mode you were in before pressing the  button), press the

 key, or press the  button again. If you entered Plot Mode from Main Mode, this will take you back to Main Mode. If you entered Plot Mode from an operational mode, pressing the  key will take you back to that operational mode.

Chapter 6: Manually Operating the Lathe

6.1 Overview

Performing basic motion operations by manually operating the lathe means that you are controlling the machine tool with “manual” commands to ServoWorks S-100T instead of loading and running part programs (i.e. G codes) to control the motion. It does not mean that you are operating the machine directly with your hands (except for HandWheel Mode), as the term might seem to imply.

You can perform basic motion control operations using one of six manual motion modes available to you with ServoWorks S-100T: Spindle Mode, Jog Continuous Mode, Jog Incremental Mode, Rapid Mode, MDI Mode, and HandWheel Mode. [NOTE: Another operational mode, Home Mode, is treated separately in *Chapter 3: Starting ServoWorks S-100T*. Auto Mode, another operational mode, is treated separately in *Chapter 14: Proving Part Programs and Running Production*.] A brief explanation of these six modes follows.

Spindle Mode is a control mode where you start and stop the spindle, and set the spindle direction, spindle speed and spindle override.

Jog Continuous Mode, the most basic operational mode of the lathe, is a control mode where you operate one particular axis of the machine manually. You specify the particular axis, a particular direction (forward or backward), and a particular speed (jog feedrate: low, medium or high, as defined by the “Feedrate” settings in Configuration Mode), and a feed override percentage for the motion, and you start and stop the Jog Continuous Mode cycle. You’re commanding one axis of your lathe to move in a specific direction at a specific speed for an unspecified time (continuous motion until you specifically stop that motion).

Jog Incremental Mode is a control mode where you command one axis of the machine to move a specified distance. In ServoWorks S-100T, you specify a “Distance to Go” (relative to the current axis location). The “distance to go” that you specify is not an absolute value – rather, this value is given in pulses, which is multiplied by the machine unit set for ServoWorks S-100T. The feedrate at which that axis will move is specified in the “Feedrate” screen in Configuration Mode. To move the specified distance at the specified feedrate takes a specific length of time. You can interrupt and restart motion as many times as you want while the axis is moving until the specified distance has been reached.

Rapid Mode is a control mode where you also operate one particular axis of the lathe manually. Rapid Mode is very similar to Jog Continuous Mode: you specify the axis, a particular direction (forward or backward), and a rapid override percentage (instead of the feedrate you specify with Jog Continuous Mode). The percentage you specify refers to a percentage of the maximum velocity for that axis (that you specified in the “Feedrate” settings in Configuration Mode). You’re commanding one axis of your lathe to move in a specific direction at a specific speed for an unspecified time (continuous motion until you specifically stop that motion).

MDI (Manual Data Input) Mode is a control mode where you input data for a single command, for G, M, T, B, S, and F codes, and then set that command to execute. The commands you execute are logged, and as an aid to you, the definitions of G and M codes are available for your reference.

HandWheel Mode is a control mode where you operate one axis of the lathe at a time using the handheld HW-100 HandWheel (or some other handwheel) that is an optional component of the ServoWorks S-100T system. You use ServoWorks S-100T to specify the machine unit for the handwheel pulse (under “General” settings in Configuration Mode). Then, in ServoWorks S-100T or on the HW-100 HandWheel, you specify an axis and a multiplier for that encoder count. (These settings are displayed in ServoWorks S-100T.) Turning the dial on the HW-100 HandWheel starts the motion on the selected axis.

In Jog Continuous Mode, Jog Incremental Mode, Rapid Mode, MDI Mode or Spindle Mode, you can always stop



the movement of the axis or axes you're controlling with the button in the lower right corner of the screen. There is also an Emergency Stop button on the operator's panel of the lathe (as required by law), and a second Emergency Stop button on the HW-100 HandWheel, which will work whether you are in HandWheel Mode or any other mode (unless the HandWheel is turned off).

If you hit the Emergency Stop button on the HW-100 HandWheel, you must twist this button clockwise (as indicated by the Reset arrows on the top of the button) to reset the Emergency Stop button to continue. The button will "pop up" and be ready for use again.

6.2 Using the Machine Lock and Interlock Switches

6.2.1 Using the Machine Lock Switch in a Manual Mode

We recommend that you use the Interlock switch for motion control in manual modes, rather than the Machine Lock switch. However, the Machine Lock switch is available to you in manual mode, so its use is explained here.

When you use the Machine Lock switch, you can lock either or both of the X and Z axes. When you lock an axis with the Machine Lock switch, it will be locked in both directions.

With the Machine Lock switch activated, movement in manual mode will be simulated. You can use a manual mode to move an axis that is locked with the Machine Lock switch, but ServoWorks S-100T will not send those commands to the servo drive (because that axis is locked). However, even though a locked axis will remain still, the position data and the plot area will display data *as if* the axis were moving.

The following steps will guide you in proving a part program using the machine lock switch:



- 1) Press the button on the right toolbar to enter Locks Mode (a sub mode).

Four buttons will appear on the bottom toolbar, as shown in the following figure:



Figure 6-1: Bottom Toolbar in Locks Mode



- 2) If you want to lock the X axis, press the button on the bottom toolbar. This will toggle you between two states: X axis locked and X axis unlocked. (See Figure 6-2.) The lock status indications are shown in the status indicator area to the left of the screen.

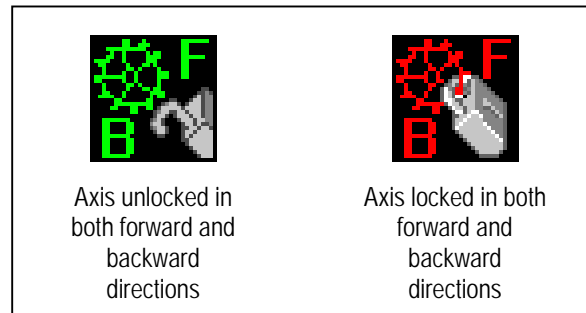







Figure 6-2: Lock Status Indications for the Machine Lock Switch


- 3) If you want to lock the Z axis, press the  button on the bottom toolbar. This will toggle you between two states: Z axis locked and Z axis unlocked.
- 4) Press the  key to return to whatever manual mode you were in.

When you are ready to deactivate the Machine Lock(s):

- 1) Press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in Figure 6-1.
- 2) Use the  and  buttons on the bottom toolbar to unlock one or both of the X and Z axes.


6.2.2 Using the Interlock Switch in a Manual Mode


When you use the Interlock Switch(es), you can lock either or both of the X and Z axes. Each axis can be locked in the forward or the backward direction, but not in both directions.

With the interlock switch activated, you can't use any manual mode that would cause the X axis or Z axis to move in a direction that is locked. For instance, if you lock the X axis in the forward direction, the  button will be disabled in Jog Continuous Mode.

The position data and the plot area will display data for the actual movement of the axes. For instance, if an axis is locked in one direction, there can be no tool movement in that direction, and only the movement of that axis in the unlocked direction would be reflected in the display of position data and in the plot.

The following steps will guide you in proving a part program using the interlock switch:

- 1) Press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in Figure 6-1.

- 2) If you want to lock the X axis, press the  button on the bottom toolbar. This will toggle you among three states, as shown in Figure 6-3. The lock status indications are shown in the status indicator area to the left of the screen.

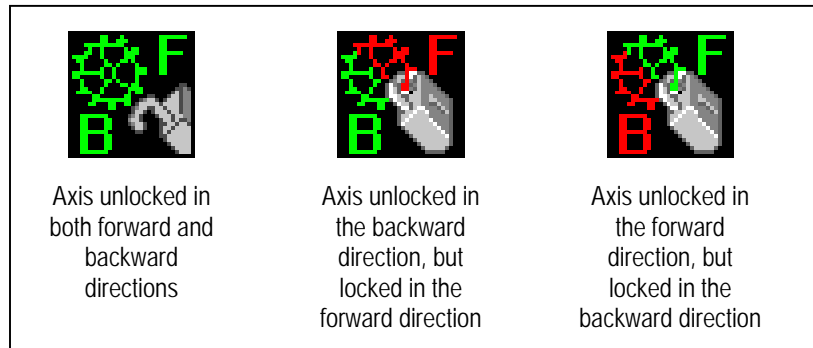




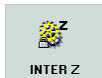


Figure 6-3: Lock Status Indications for the Interlock Switch

- 3) If you want to lock the Z axis, press the  button on the bottom toolbar.
- 4) Press the  key to return to whatever manual mode you were in.

When you are ready to deactivate the Interlock(s):

- 1) Press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in Figure 6-1.

- 2) Use the  and  buttons on the bottom toolbar to unlock one or both of the X and Z axes.

6.2.3 The Difference Between the Machine Lock and Interlock Switches

The first difference between Machine Lock and Interlock is that with Machine Lock, you can only lock an axis completely (in both directions), while with Interlock, you can lock an axis in the forward direction or the backward direction, but not in both directions.


The second, and most important difference between Machine Lock and Interlock is that the Machine Lock switch will still let you manually input movement for a locked axis, and see that movement simulated in the position data, while the Interlock switch prevents you from even inputting movement commands for a locked axis.

Chapter 7: Starting and Stopping the Spindle (Using Spindle Mode)

Before you start motion in a manual operational mode, you may want to start the spindle rotation. For that, you need to be in Spindle Mode (an operational mode).

NOTE: If the C Axis / Indexing functions have been activated by the execution of M19 and M20 codes in a part program, Spindle Mode will not be available, and the  button on the bottom toolbar of ServoWorks S-100T main program window will be disabled.

The following steps will guide you in starting and stopping the spindle:

- 1) Press the  button on the bottom toolbar of the ServoWorks S-100T main program window. You will then be in Spindle Mode, and see the following window:



	Program Pos (inch)	Machine Pos (inch)	Actual Pos (inch)	Dist To Go (inch)
X:	000.5560	000.5560	000.5560	000.0000
Z:	-000.0364	-000.0364	-000.0364	000.0000

Statistics

Part Number: 0
 Date and Time: 7/13/2006 3:02:37 PM
 Run Time: 01 :11 :12
 Ave. Cutting Time: N/A
 Timer: 00 :04 :09

Switches

	X	Z
Home Switch	Low	Low
Limit Switch +	Low	Low
Limit Switch -	Low	Low

Spindle Speed

Surf. Spd(ft/min): 152 (range 0 to 500)

Turn. Spd(rpm): 1000 (range 0 to 3000)

Spindle Direction

CW CCW

Spindle Override (%)


100 (range 50 to 120)

These are function buttons that allow you to set the parameters for the spindle rotation.





These are input frames that also allow you to set the parameters for the spindle rotation (if you have a mouse).

These "Start" and "Stop" buttons start and stop the rotation of the spindle.



Figure 7-1: The Spindle Mode Window

- 2) Choose the direction for the spindle to rotate by pressing the  button on the bottom toolbar. Pressing this function key will toggle you between the two possible directions of clockwise or counterclockwise. The selected direction is shown in the “Spindle Direction” frame.

NOTE: If you have a mouse, you can click on the direction you want in the “Spindle Direction” frame.

- 3) Choose the spindle speed by pressing the  and  buttons on the bottom toolbar. The  button will decrease the feedrate, while the  button will increase the feedrate. The selected speed is displayed in the “Spindle Speed” frame.


NOTE: If you have a mouse, you can use the slider bars for Turning Speed to set the spindle speed more quickly. Or, it may be faster for you to use the mouse to move the cursor to the text input box for Turning Speed, then use the keypad or a keyboard (if you have one) to type in the speed you want directly.

- 4) The Spindle Override percentage will be applied to the spindle speed you specified in Step #2. Choose a percentage for Spindle Override percentage by pressing the  and  buttons on the bottom toolbar. The selected spindle override percentage is displayed in the “Spindle Override (%)” frame.

As an example, if your specified spindle speed is 2000 RPM, and your spindle override percentage is 50%, your spindle will rotate at 1000 RPM (as long as the maximum speed is set to 1000 RPM or greater). A spindle speed of 2000 RPM and a spindle override percentage of 150% will give you a spindle speed of 3000 RPM (as long as the maximum speed is set to 3000 RPM or greater).


NOTE: If you have a mouse, you can use the slider bar for Spindle Override to set the override percentage more quickly. Or, it may be faster for you to use the mouse to move the cursor to the text input box for Spindle Override, then use the keypad or the keyboard (if you have one) to type in the speed you want directly.

NOTE: If you had checked the “SSO (50-120%)” box in the “Operator’s Panel” frame of the “General” screen in Configuration Mode, these buttons would be disabled to avoid any conflict between commands given by ServoWorks S-100T and commands given by buttons on the operator’s panel.

- 5) Press the  button on the bottom toolbar to start the spindle rotation. The feedrate will be shown in the Spindle Status Indicator Area (at the top left of the screen). To stop the spindle rotation, press the



button on the right side of the bottom toolbar.

- 6) When you want to quit Spindle Mode, press the  button.

Chapter 8: Continuous Jogging (Using Jog Continuous Mode)

Jog Continuous Mode, the most basic operational mode of the lathe, is a control mode where you operate one particular axis of the machine manually. You specify the particular axis, a particular direction (forward or backward), a particular speed (jog feedrate: low, medium or high, as defined by the "Feedrate" settings in Configuration Mode), and a feed override percentage for the motion, and you start and stop the Jog Continuous Mode cycle.

In Jog Continuous Mode, you're commanding one axis of your lathe to move in a specific direction at a specific speed for an unspecified time (continuous motion until you specifically stop that motion).

The following steps will guide you in commanding continuous jogging using Jog Continuous Mode:

- 1) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the

Main window, press the

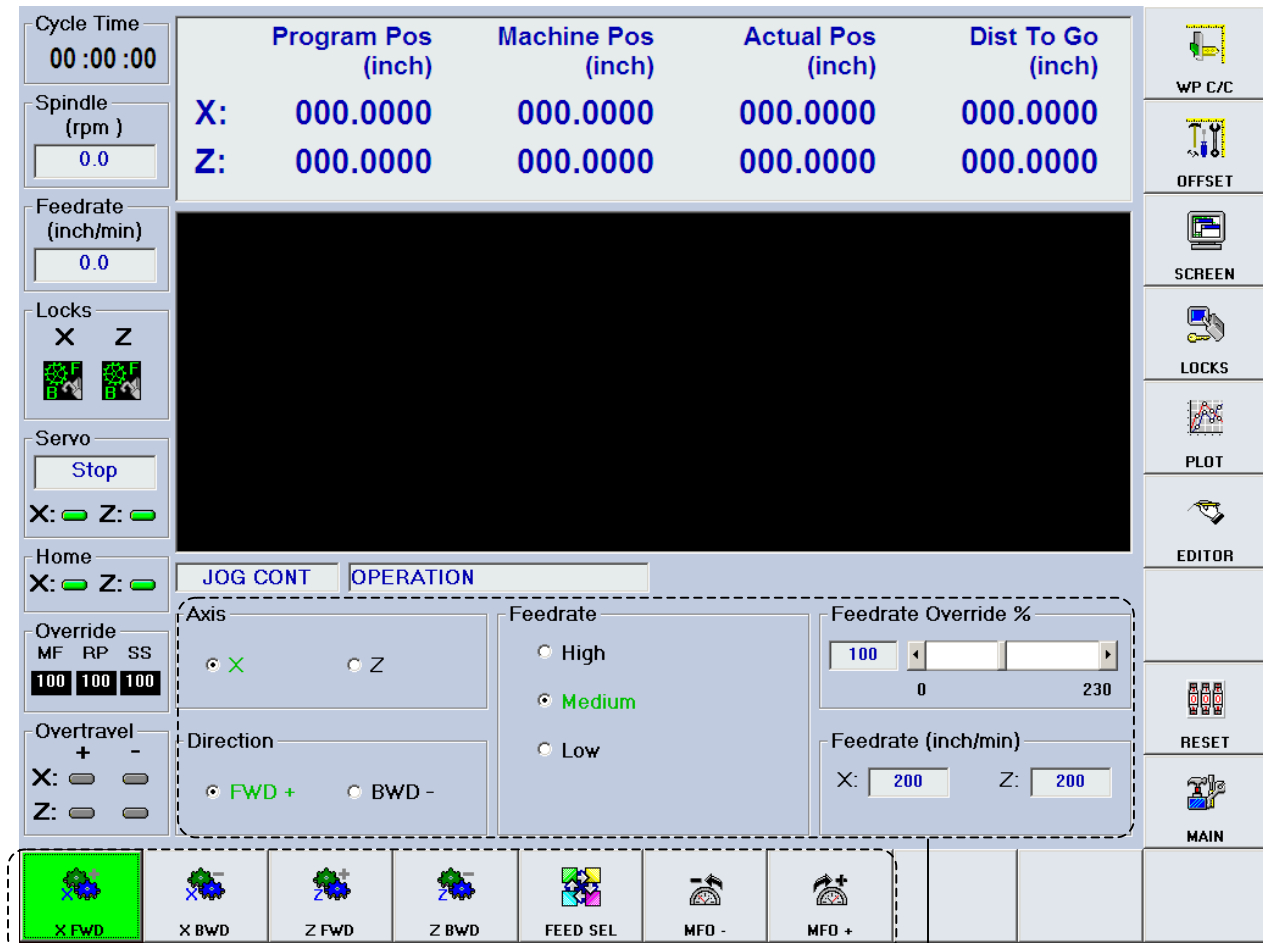


button on the right toolbar of the ServoWorks S-100T window.)

- 2) Press the




button on the bottom toolbar of the ServoWorks S-100T Main window. You will then see the following window:







These are function buttons that allow you to set the parameters for the Jog Continuous Mode motion.





These frames display the Jog Continuous Mode settings, and also allow you to set the parameters for the Jog Continuous Mode motion if you have a mouse (otherwise, you must use the function keys)





Figure 8-1: The Jog Continuous Mode Window

- 3) Select the jog feedrate for axis movement by pressing the  button on the bottom toolbar. This toggles you among three preset feedrates: “High,” “Medium,” and “Low,” as shown in the “Feedrate” selection frame. [These preset feedrates are specified in the “Feedrate” screen in Configuration Mode.]

- 4) Select the manual feedrate override percentage for axis movement by pressing the  and  buttons on the bottom toolbar. The  button will decrease the manual feedrate override percentage, while the  button will increase the manual feedrate override. The selected manual feedrate override percentage is displayed in the “Feed Override %” frame. The final feedrate (the feedrate setting multiplied by the feedrate override) is displayed in the “Feedrate (inch/min)” or “Feedrate (mm/min)” frame.

NOTE: If you have a mouse, it may be faster for you to use the mouse to move the cursor to the text input box for Feed Override %, then use the keypad (or the keyboard, if you have one) to type in the desired feedrate override directly. [You cannot type a feedrate directly in the “Feedrate (inch/min)” or “Feedrate (mm/min)” frame.]

- 5) To start and stop motion in Jog Continuous Mode, use one of the , ,  or  buttons:

- a)  selects the X axis in the forward direction
- b)  selects the X axis in the backward direction
- c)  selects the Z axis in the forward direction
- d)  selects the Z axis in the backward direction

The selected axis and direction will display in the “Axis” and “Direction” frames. You can only select one axis, because Jog Continuous Mode operates on only one axis at a time.

Press and hold down the function key for one of the above buttons to start and continue the motion.

To stop the motion, release the function key.

When you want to quit Jog Continuous Mode, press the  button. If motion is occurring when you try to quit, you will see the following window appear:

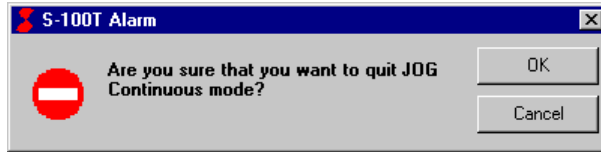
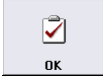


Figure 8-2: Confirmation Dialog Box for Exiting Jog Continuous Mode

Click the “OK” button or press the  button on the bottom toolbar to get back to Main Mode.

NOTE: It’s recommended that you stop all motion before quitting Jog Continuous Mode.


Chapter 9: Incremental Jogging (Using Jog Incremental Mode)


Jog Incremental Mode is a control mode where you command one axis of the machine to move a specified distance. In ServoWorks S-100T, you specify a “Distance to Go” (relative to the current axis location). The feedrate at which that axis will move is specified in the “Feedrate” screen in Configuration Mode.

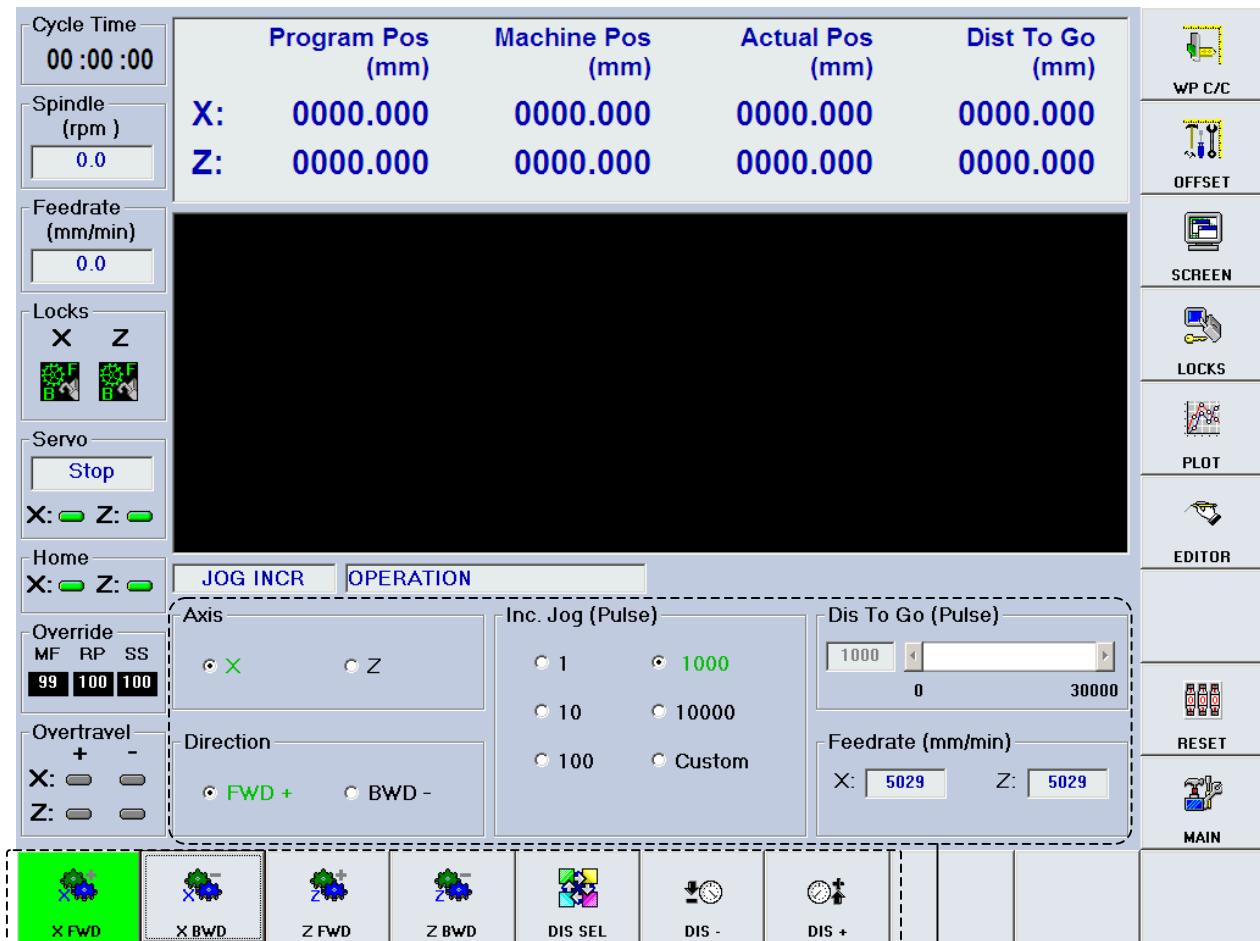
To move the specified distance at the specified feedrate takes a specific length of time. You can interrupt and restart motion as many times as you want while the axis is moving until the specified distance has been reached. If you decide that you don't want the axis to move the distance you have commanded, you need to leave Jog Incremental Mode.

The following steps will guide you in commanding incremental jogging using Jog Incremental Mode:

- 1) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the

Main window, press the  button on the right toolbar of the ServoWorks S-100T window.)

- 2) Press the  button on the bottom toolbar of the ServoWorks S-100T Main window. You will then see the following window:

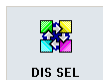


These are function buttons that allow you to set the parameters for the Jog Incremental Mode motion.

These frames display the Jog Incremental Mode settings, and also allow you to set the parameters for the Jog Incremental Mode motion if you have a mouse (otherwise, you must use the function keys)

Figure 9-1: The Jog Incremental Mode Window

- 3) Select the “Inc. Jog” (otherwise known as the “distance to go”) for axis movement by pressing the




DIS SEL button on the bottom toolbar. This toggles you among six preset incremental pulses: “1,” “10,” “100,” “1000,” “10000” and “Custom”(which lets you set values other than the six preset values) as shown in the “Inc. Jog (Pulse)” selection frame. This is the distance that you want the axis to travel, relative to its current position. You can only specify a distance to go in pulses, also known as “machine units” – you can’t specify a distance to go in either millimeters or inches directly.

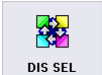
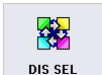
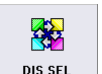
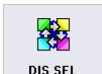
[NOTE: the feedrate is displayed in the “Feedrate” frame, and can only be changed in the “Feedrate” screen in Configuration Mode.]





In this sense, the “distance to go” that you specify is not an absolute value – rather, this value is multiplied by the machine unit set for ServoWorks S-100T. The machine unit is the least input increment for ServoWorks S-100T – the minimum unit of linear movement or distance that the actuator can be commanded to move. The machine unit can be set in the “General” screen in Configuration Mode.

For instance, if the machine unit in your system is 1.000 mm, and you specify a distance to go of 1000 pulses, you're actually commanding the distance of 1000 mm. If the machine unit in your system is 0.001 mm, and you specify a distance to go of 1000, you're actually commanding the distance of 1.000 mm.






CAUTION



Be careful: it is very important that you be aware of this distinction. This is the only mode where you are specifying a distance in terms of pulses (machine units), not in terms of absolute distance (millimeters or inches).



Use the  button to set the distance to go, or if you want a distance to go that is not one of the preset incremental jogging distances, use the  button to quickly get within range of the distance to go that you want to specify – then use the  button to select the “Custom” option. [For example, if you want to set a distance to go of 2000 pulses, first use the  button to select “1000,” and then select “Custom.” This enables the slider bar with the slider bar set to “1000,” which is the closest value to 2000, saving you time.]

If you have selected “Custom,” the “Dis To Go (Pulse)” slider bar will be enabled. To specify a precise distance to go, press the  and  buttons on the bottom toolbar. The  button will decrease the distance to go, while the  button will increase the distance to go. The selected feedrate is displayed in the “Dis To Go (Pulse)” frame.

NOTE: If you have a mouse, it may be faster for you to use the mouse to move the cursor to the text input box in the “Dis To Go (Pulse)” frame, then use the keypad (or the keyboard, if you have one) to type in the distance to go directly.

4) To start and stop motion in Jog Incremental Mode, use one of the  ,  ,  or  buttons:

- a)  selects the X axis in the forward direction
- b)  selects the X axis in the backward direction


- c)  selects the Z axis in the forward direction
- d)  selects the Z axis in the backward direction

The selected axis and direction will display in the “Axis” and “Direction” frames. You can only select one axis, because Jog Incremental Mode operates on only one axis at a time.

Press the function key for one of the above buttons to start and continue the motion. You will see the position data of the selected axis change (unless you are displaying only a plot in the Main Display Area), to reflect the status of the Jog Incremental Operation.

While the selected axis is moving, you cannot change the direction, or the distance to go.

NOTE: You cannot interrupt motion except by leaving Jog Incremental Mode.

When you want to quit Jog Incremental Mode, press the  button. If motion is occurring when you try to quit, you will see the following window appear:

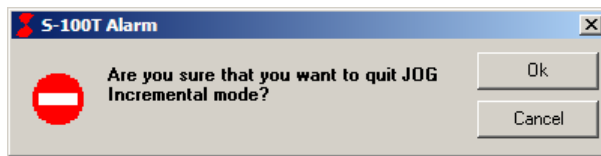



Figure 9-2: Confirmation Dialog Box for Exiting Jog Incremental Mode

Click the “OK” button or press the  button on the bottom toolbar to get back to Main Mode.

NOTE: It’s recommended that you stop all motion before quitting Jog Incremental Mode.

Chapter 10: Rapid Positioning (Using Rapid Mode)

Rapid Mode is a control mode where you also operate one particular axis of the lathe manually. Rapid Mode is very similar to Jog Continuous Mode: you specify the axis, a particular direction (forward or backward), and a rapid override percentage (instead of the feedrate you specify with Jog Continuous Mode). The percentage you specify refers to a percentage of the maximum velocity for that axis (that you specified in the “Feedrate” settings in Configuration Mode).

You’re commanding one axis of your lathe to move in a specific direction at a specific speed for an unspecified time (continuous motion until you specifically stop that motion).

The following steps will guide you in commanding rapid positioning using Rapid Mode:

- 1) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the

Main window, press the

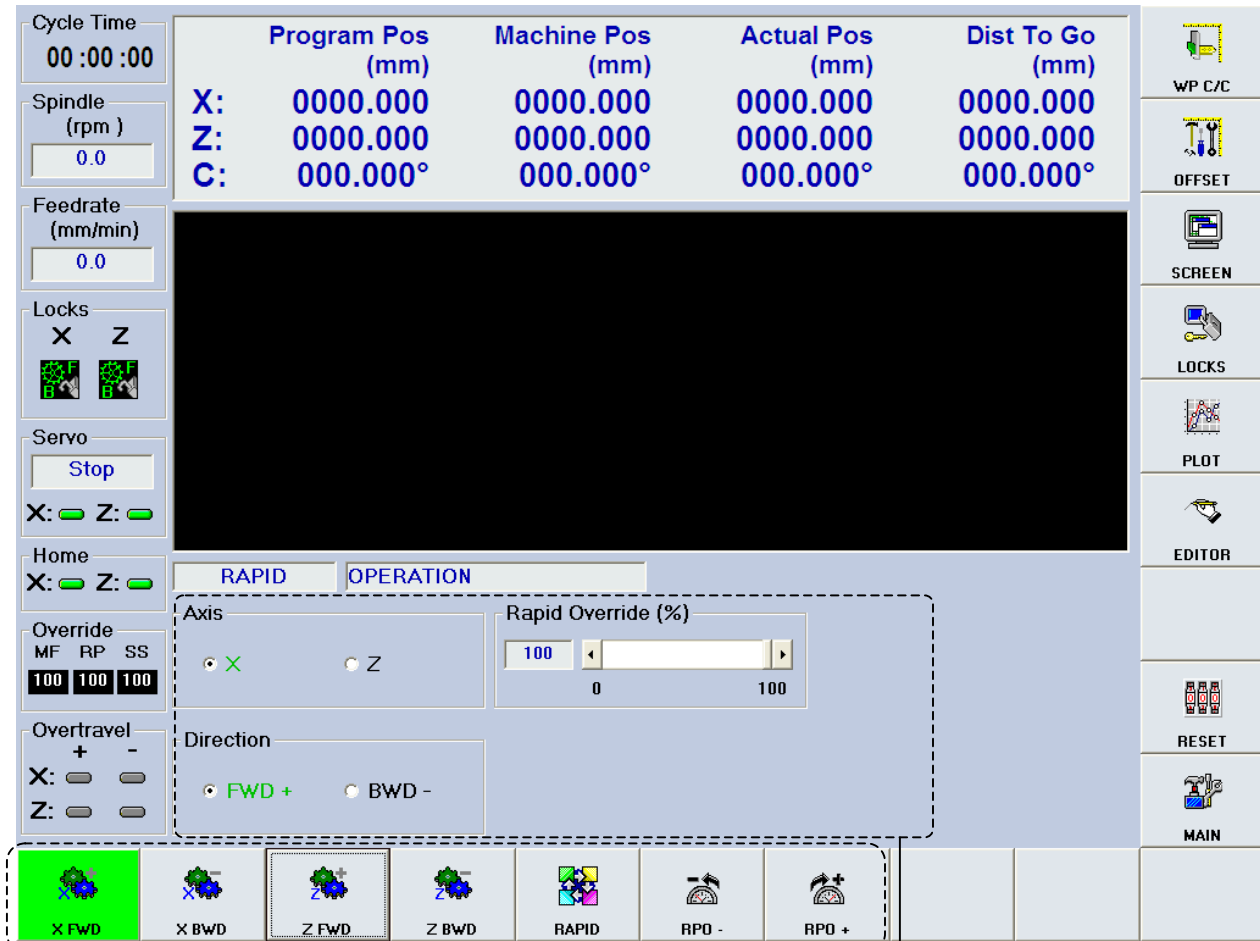


button on the right toolbar of the ServoWorks S-100T window.)

- 2) Press the






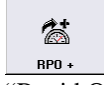
button on the bottom toolbar of the ServoWorks S-100T Main window. You will then see the following window:



These are function buttons that allow you to set the parameters for Rapid Mode motion.

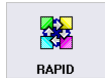
These frames display the Rapid Mode settings, and also allow you to set the parameters for the Rapid Mode motion if you have a mouse (otherwise, you must use the function keys)

Figure 10-1: The Rapid Mode Window

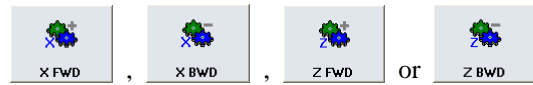
- 3) Select the rapid override percentage for the axis movement by pressing the  and  buttons on the bottom toolbar. The  button will decrease the rapid override percentage, while the  button will increase the rapid override percentage. The selected feedrate is displayed in the “Rapid Override (%)” frame.





The percentage you specify refers to a percentage of the specified system parameter of “rapid traverse feedrate” for that axis (set in the “Feedrate” screen of Configuration Mode). For instance, if you set the rapid override percentage to 100%, the machine will move the specified axis at 100% of its rapid traverse feedrate. If you specify a rapid override percentage of 50%, the machine will move the specified axis at half its rapid traverse feedrate.

NOTE: If you have a mouse and a keypad or keyboard, you can use the mouse to move the cursor to the text input box for Rapid Override %, then use a keypad or keyboard to type in the rapid override

percentage. If you have a keypad or a keyboard but NO mouse, you can press the  button to set the focus on the slider bar, and then type in the rapid override percentage more quickly, anywhere from 0 to 100%.



To start and stop motion in Rapid Mode, use one of the



- a)  selects the X axis in the forward direction
- b)  selects the X axis in the backward direction
- c)  selects the Z axis in the forward direction
- d)  selects the Z axis in the backward direction

The selected axis and direction will display in the “Axis” and “Direction” frames. You can only select one axis, because Rapid Mode operates on only one axis at a time.

Press and hold down the function key for one of the above buttons to start and continue the motion. While the selected axis is moving, you cannot change the direction, but you can dynamically change the rapid

override percentage by pressing the  and  buttons on the bottom toolbar (or with the Rapid Override % slider bar, if you have a mouse).

To stop the motion, release the function key.

When you want to quit Rapid Mode, press the  button. If motion is occurring when you try to quit, you will see the following window appear:

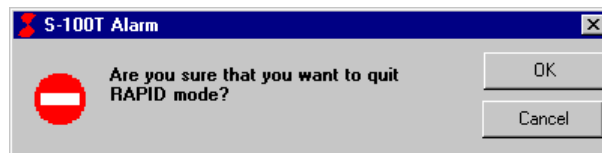
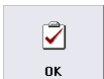


Figure 10-2: Confirmation Dialog Box for Exiting Rapid Mode

Click the “OK” button or press the  button on the bottom toolbar to get back to Main Mode.

NOTE: It’s recommended that you stop all motion before quitting Rapid Mode.

Chapter 11: Manual Data Input (Using MDI Mode)

11.1 Overview of MDI Mode

MDI Mode is a control mode where you input data for a single command, for G, M, T, B, S, and F codes, and then set that command to execute. The commands you execute are logged, and as an aid to you, the definitions of G and M codes are available for your reference.

ServoWorks S-100T uses the industry standard part programming language for CNC programming. With this language, you can input a block of code to be executed, with G, M, T, B, S, and F codes. You can only input and execute one block of code at a time. (If you want to execute more than one block of code at a time, you should be using Auto Mode.)

Refer to the *ServoWorks S-100T Part Programming Manual* for more information on the specifics of the G, M, T, B, S, and F codes used by MDI Mode.


MDI Mode can be helpful for executing one-shot blocks of codes as an aid to creating and modifying part programs, or to help you learn the part programming language.


NOTE: You must have a mouse and a keyboard or keypad in order to use MDI mode. You cannot enter blocks of code with function keys alone.



11.2 Getting into MDI Mode:


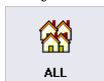
The following steps will get you into MDI Mode:

- 1) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the


Main window, press the  button on the right toolbar of the ServoWorks S-100T window.)

- 2) Press the  button on the bottom toolbar of the ServoWorks S-100T Main window. You will then see the window shown in Figure 11-1.

NOTE: If the  button is disabled (appears as ), it's probably because you have not set the home position for your axes. You must set the home position – see *Section 3.4: Performing a*

Homing Operation. [Press the  button on the bottom toolbar, then press the  button on

the bottom toolbar to set all axes to their home positions at the same time. Press the  button to

return to Main Mode. The  button should now be enabled for you to select it.]

	Program Pos (mm)	Machine Pos (mm)	Actual Pos (mm)	Dist To Go (mm)
X:	0000.000	0000.000	0000.000	0000.000
Z:	0000.000	0000.000	0000.000	0000.000
C:	000.000°	000.000°	000.000°	000.000°

Modal

G00 G97 G98

G21 G40 G25 G23

G80 G53 G64

M: 05 T: 0000 B: 00

S: 0 (rpm)

F: 0.000 mmpm

TYPE IN CLR/WR CHG SEL UP DOWN START STOP

These are function buttons that allow you to set the parameters for the MDI blocks of code.

These "Start" and "Stop" buttons start and stop the execution of the blocks of code set in MDI Mode

This frame displays the active G code in each modal group, and the current settings for the M, T, B, S and F codes.

Input text box: where you type your block of code to be executed in MDI Mode

This area of the screen displays the command log, the G Code definitions, or the M code definitions





These text boxes tell you which of the following is visible: the command log, the G code reference tool, or the M code reference tool

Figure 11-1: The MDI Mode Window

11.3 Using the G Code and M Code Reference Tools

The G code and M code reference tools are handy reference guides to quickly remind you of G code and M code definitions. For instance, if you can't remember which G code is for "Inch Input," you can use the G code reference tool to quickly view a list of G codes available to you in ServoWorks S-100T. While this is quite convenient, if you are unfamiliar with the specifics of the M codes or G codes you want to use (what parameters go with each G code, etc.), we recommend that you refer to *ServoWorks S-100T Part Programming Manual* while using MDI Mode.

The following steps will guide you in using the G code and M code reference tools:

- 1) Use the  button on the bottom toolbar to toggle you among three options:
 - a) The Command Log (shown as )
 - b) The G Code Reference Tool (shown as )
 - c) The M Code Reference Tool (shown as )

The active option will be shown with bright green text. Select either the G code reference tool, or the M code reference tool (your preference). The G code reference tool will display one G code definition at a time, as shown in the following window:

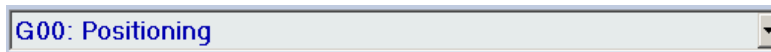


Figure 11-2: The G Code Reference Tool Pull-Down Menu in MDI Mode

The M code reference tool will display six M code definitions at a time, as shown in the following window:

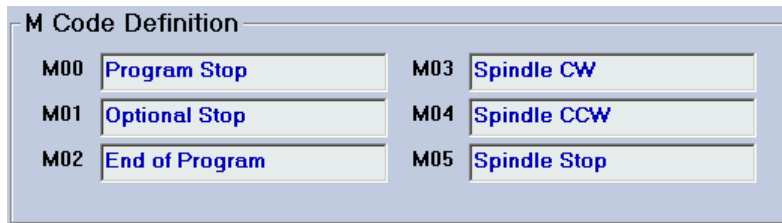
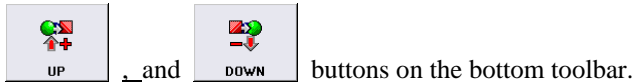


Figure 11-3: The M Code Reference Tool: M Code Definition Frame in MDI Mode


- 2) To scroll through the G codes one at a time, or to scroll through the M codes six at a time, use the





NOTE: If you have a mouse, you can click on the G code reference tool pull-down menu, view multiple G code definitions at the same time, and use the right scroll bar to more quickly scroll through the list of G code definitions.


11.4 Entering and Executing Commands in MDI Mode


The following steps will guide you in entering and executing commands in MDI Mode:

- 1) Press the  button on the bottom toolbar to clear the text box where you will be entering you block of code. Pressing this button also puts the cursor in this text box.
- 2) Type your command in the input text box. For example, “G00 X10.0 F1” or “M03.”


NOTE: If at any time you want to put the cursor back to the input text box, press the  button. This will put your cursor back to the most recent cursor position.

- 3) Press the  button on the right side of the bottom toolbar to start the execution of the block of code in your text box.

NOTE: While the current block of code is being executed, you can immediately press the  button again, and start typing in your next block of code. You do not have to wait until the execution of the current block of code completes.


- 4) To stop the motion before the block of code has been completely executed, press the  button on the right side of the bottom toolbar.

To continue or finish execution of the current block of code, press the  button again.

NOTE: The only way to cancel the execution of the current block of code is to press the  button, or to leave MDI Mode.

11.5 Viewing the Command Log

It may be helpful to view the command log, to see which blocks of code you have executed.

To view the command log, use the  button on the bottom toolbar of the ServoWorks S-100T Main program window to toggle you among three options:

- 1) The Command Log (shown as **Cmd Log**)
- 2) The G Code Reference Tool (shown as **GCode Ref**)
- 3) The M Code Reference Tool (shown as **MCode Ref**)

The active option will be shown with bright green text. Select Command Log, and you will see something similar to the following:

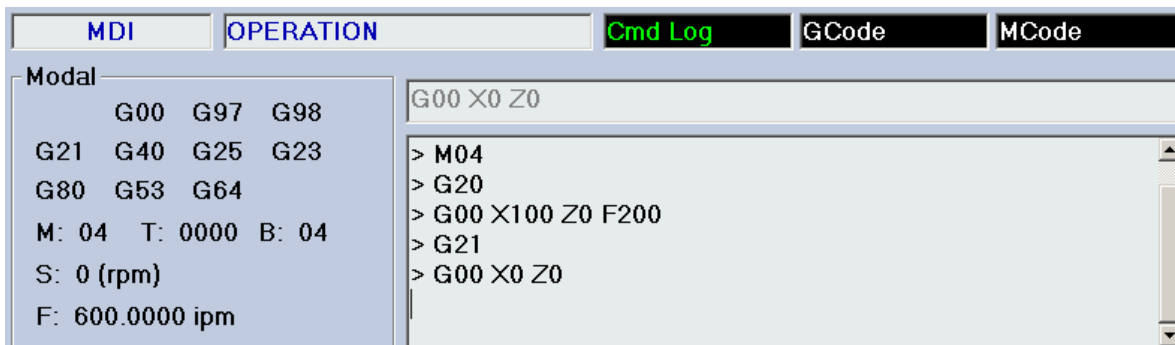


Figure 11-4: The Command Log Option in MDI Mode

Chapter 12: Using HandWheel Mode

HandWheel Mode is a control mode where you operate one axis of the lathe at a time using the handheld HW-100 HandWheel component (as shown in Figure 12-1) that is an optional component of ServoWorks S-100T (or, in fact, any handwheel you make part of your ServoWorks S-100T system).

You use ServoWorks S-100T to specify the machine unit for the handwheel pulse (under “General” settings in Configuration Mode). Then, in ServoWorks S-100T or on the HW-100 HandWheel, you specify an axis and a multiple for that handwheel pulse. (These settings are displayed in ServoWorks S-100T.) Turning the dial on the HW-100 HandWheel starts the motion on the selected axis.

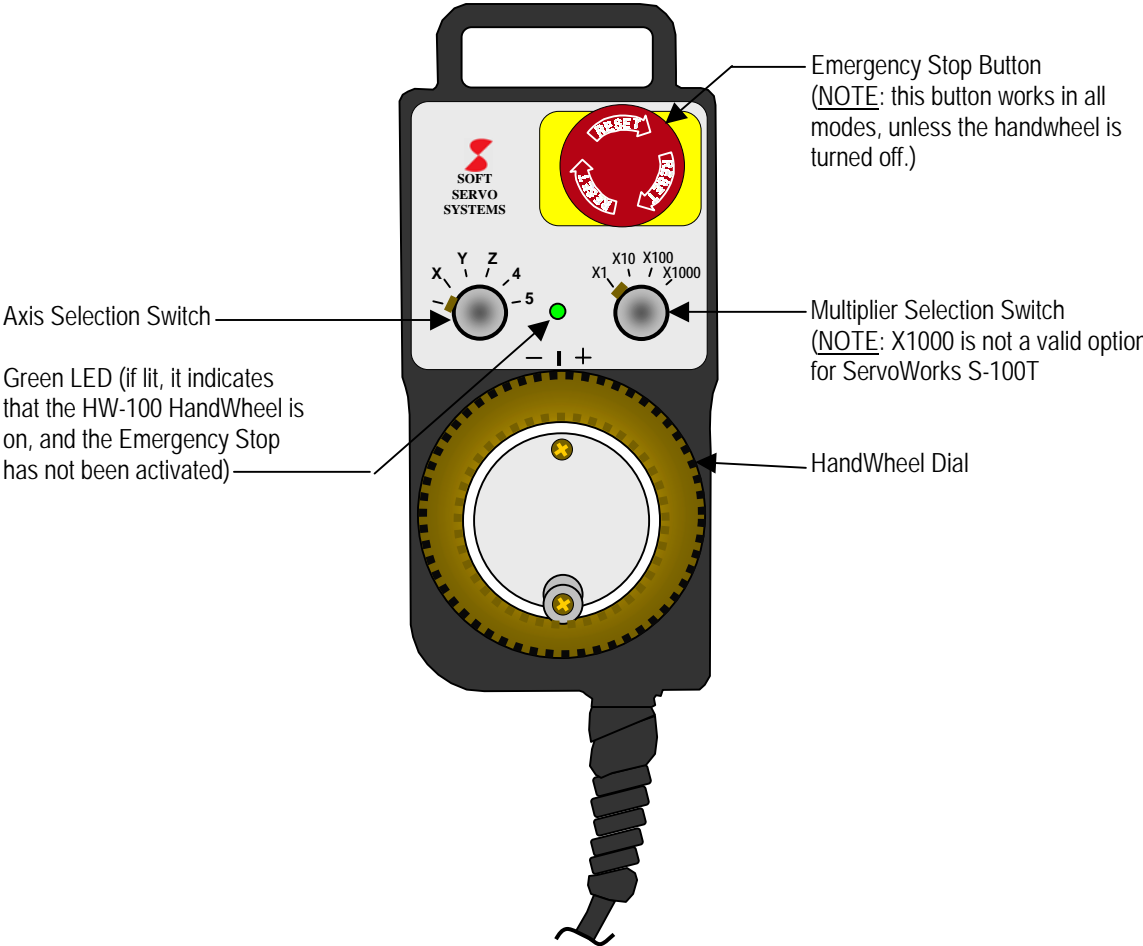



Figure 12-1: The HW-100 HandWheel Control




When you press the  button on the bottom toolbar of the ServoWorks S-100T Main program window, it puts you into HandWheel Mode. Once you are in HandWheel Mode, if the HandWheel is enabled (in the “HandWheel” screen of Configuration Mode), the HW-100 HandWheel is automatically activated (unless it is turned off, or the Emergency Stop button is depressed), and ServoWorks S-100T is ready to accept handwheel input signals. You will have instant response to any movement of the handwheel dial.


 **CAUTION**


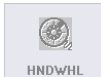


Be careful about using Handwheel Mode. Always keep the handwheel turned off when you're not using it. And try to keep the handwheel in a safe place, so if it is on, and you don't realize that you are in handwheel mode, you can't accidentally nudge or jostle the dial, and cause unintended movement of the machine.

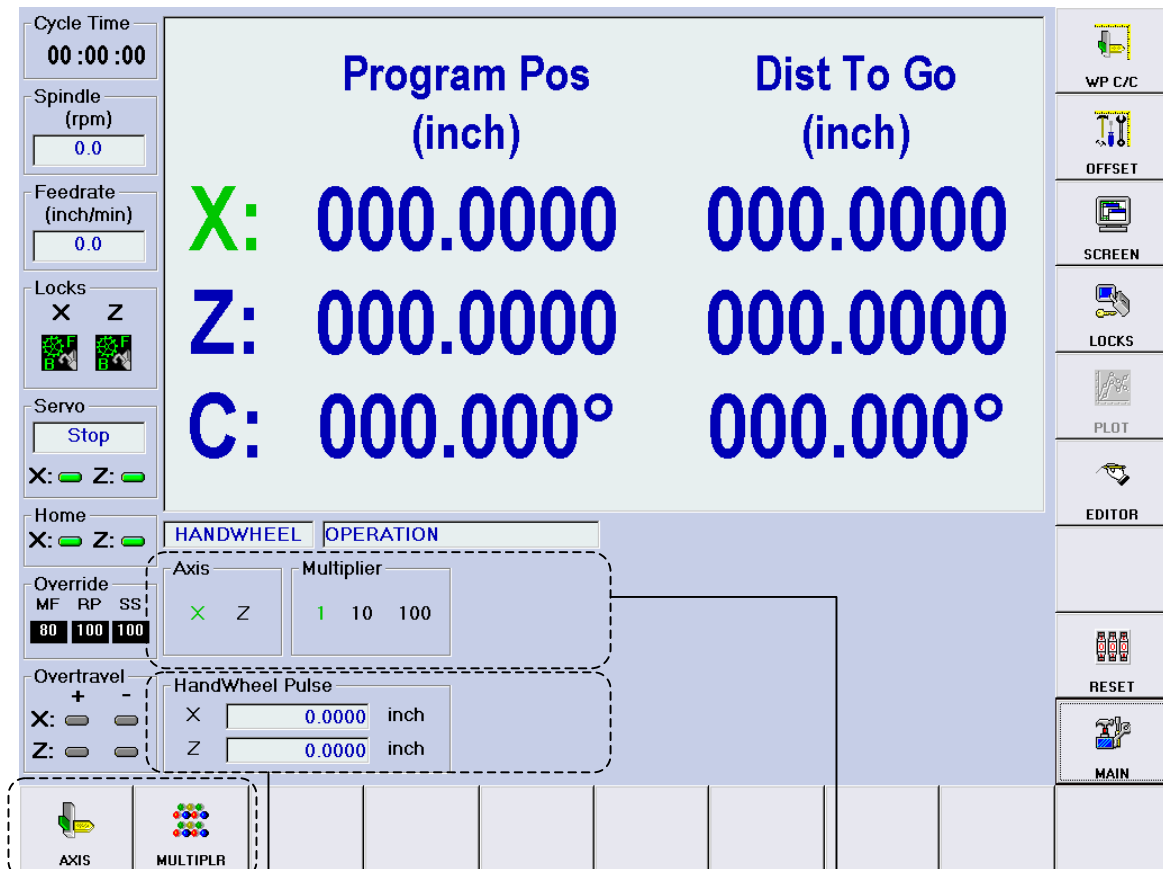
The following steps will guide you in using HandWheel Mode for the HW-100 handwheel:

- 1) If the HandWheel Axis Selection Switch on the HW-100 HandWheel is set to "OFF," turn it to one of the axes to turn the handwheel on.
- 2) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the

Main window, press the  button on the right toolbar of the ServoWorks S-100T window.)

- 3) Press the  button on the bottom toolbar of the ServoWorks S-100T Main program window. The green LED on the HW-100 HandWheel will light up, and you will then see the window shown in Figure 12-2.

NOTE: If the  button is disabled (appears as ), then you need to go to Configuration Mode and enable the handwheel. Get into Configuration Mode by pressing the  button in the lower right corner of the ServoWorks S-100T Main program window. Then press the  button in the "HandWheel" screen, and select "Enabled" in the "Operation Status" frame.



The two text boxes in this frame display the sum total of all position commands since you went into HandWheel Mode. These numbers reset to "0" every time you enter HandWheel Mode.


These frames display the current settings of the two parameters that you set using the HW-100 handwheel.


These function buttons allow you to set parameters for HandWheel Mode.

Figure 12-2: The HandWheel Mode Window

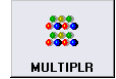
- 4) You need to select a multiplier, which will be applied to the machine unit parameter (a servo parameter) you set in the "General" screen of Configuration Mode.

There are two ways to select a multiplier. You can use the Multiplier Selection Switch on the HW-100 HandWheel, (see Figure 12-1) to select one of three multipliers (X1, X10, or X100), or you can select a

multiplier level by pressing the  button. This button toggles through the three multipliers, and overrides the settings on the HW-100 Multiplier Selection Switch until the next time you use the Multiplier Selection Switch.

 **CAUTION**

Be aware that the settings in ServoWorks S-100T override the settings on the HW-100 handwheel itself. Make sure you know which axis and which multiplier is active before using the handwheel to move an axis.



The current multiplier setting, whether selected with the Multiplier Selection Switch or with the button on the bottom toolbar, will be reflected in the “Multiple” frame of the HandWheel Window. (The selected multiplier will be highlighted.)

- “1” indicates a multiplier of “1” which will be applied to the machine unit. If the machine unit is 0.001 mm and the multiplier is “1,” then each click of the HandWheel Dial produces a movement of 0.001 mm.
- “10” indicates a multiplier of “10” which will be applied to the machine unit. If the machine unit is 0.001 mm and the multiplier is “10,” then each click of the HandWheel Dial produces a movement of 0.01 mm.
- “100” indicates a multiplier of “100” which will be applied to the machine unit. If the machine unit is 0.001 mm and the multiplier is “100,” then each click of the HandWheel Dial produces a movement of 0.10 mm.

CAUTION

The “HandWheel Pulse” frame of the HandWheel Window will display the total position command since you went into HandWheel Mode in either millimeters or inches. Don’t let this confuse you. The multiplier (1, 10, or 100) is not applied to millimeters or inches, but to the machine unit parameter specified in the “General” screen of Configuration Mode.

5) You need to specify which axis to move. There are two ways to do this. You can use the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1) to select which axis to move. Or you can press



button on the bottom to toggle through the axes and to select an axis. This overrides the settings on the HW-100 Axis Selection Switch until the next time you use the Axis Selection Switch. Whichever axis is selected will be reflected in the “Axis” frame of the HandWheel Window. (The selected axis will be highlighted.)

NOTE: you can only select either the X axis or the Z axis, because HandWheel Mode operates on only one axis at a time. If the servo drive for an axis is not turned on, the button for that axis will be disabled.



AXIS	AXIS SELECTION SWITCH
X	
Z	

Table 12-1: Axis Selection Switch Settings for Machine Axes for the HW-100 HandWheel

If you select the Y axis, or Axis 4 or 5, the handwheel will not be operational.

- 6) Turning the dial on the HW-100 HandWheel starts motion on the selected axis. Motion will occur for as long as you move the handwheel dial. You will see the position data of the selected axis change (unless you are displaying only a plot in the Main Display Area), to reflect the status of the Handwheel Operation. The text boxes in the "HandWheel Pulse" frame will display the sum total of all position commands since you went into HandWheel Mode. (Each time you go into HandWheel Mode, this number resets to "0.")

Motion will stop when you stop moving the handwheel dial. Information about the motion, such as axis position, feedrate, etc. will be displayed in the ServoWorks S-100T screen.

In HandWheel Mode, all acceleration and deceleration is performed with the exponential smoothing filter and the smoothing time constant that is selected for Jog Mode. For an explanation of exponential acceleration/deceleration, see the *ServoWorks S-100T Parameters Manual*.

Chapter 13: Creating, Editing and Manipulating Part Programs


13.1 Overview

ServoWorks S-100T uses industry standard part programming language for CNC programming. With this language, you can input a block of code to be executed, with G, M, T, B, S, and F codes. You will write part programs from part drawings using these CNC codes, to describe the shape of the part to be created. Refer to the *ServoWorks S-100T Part Programming Manual* for more information on the specifics of the CNC part programming used by ServoWorks S-100T.

You will use Auto Mode, an operational mode in ServoWorks S-100T, to prove part programs and perform automatic CNC runs using specified part program files. (See *Chapter 14: Proving Part Programs and Running Production.*)

NOTE: You must have either a keyboard or a keypad to use Editor Mode.

13.2 Getting Into Editor Mode

You can edit or create a part program file by pressing the  button on the right toolbar to enter Editor Mode (a sub mode), and you will see the window shown in Figure 13-1.

The most recent file you had open in Editor Mode (if any) will automatically open again.

These text boxes tell you which of the following is visible: the Find Tool, the G Code Reference Tool, or the M Code Reference Tool

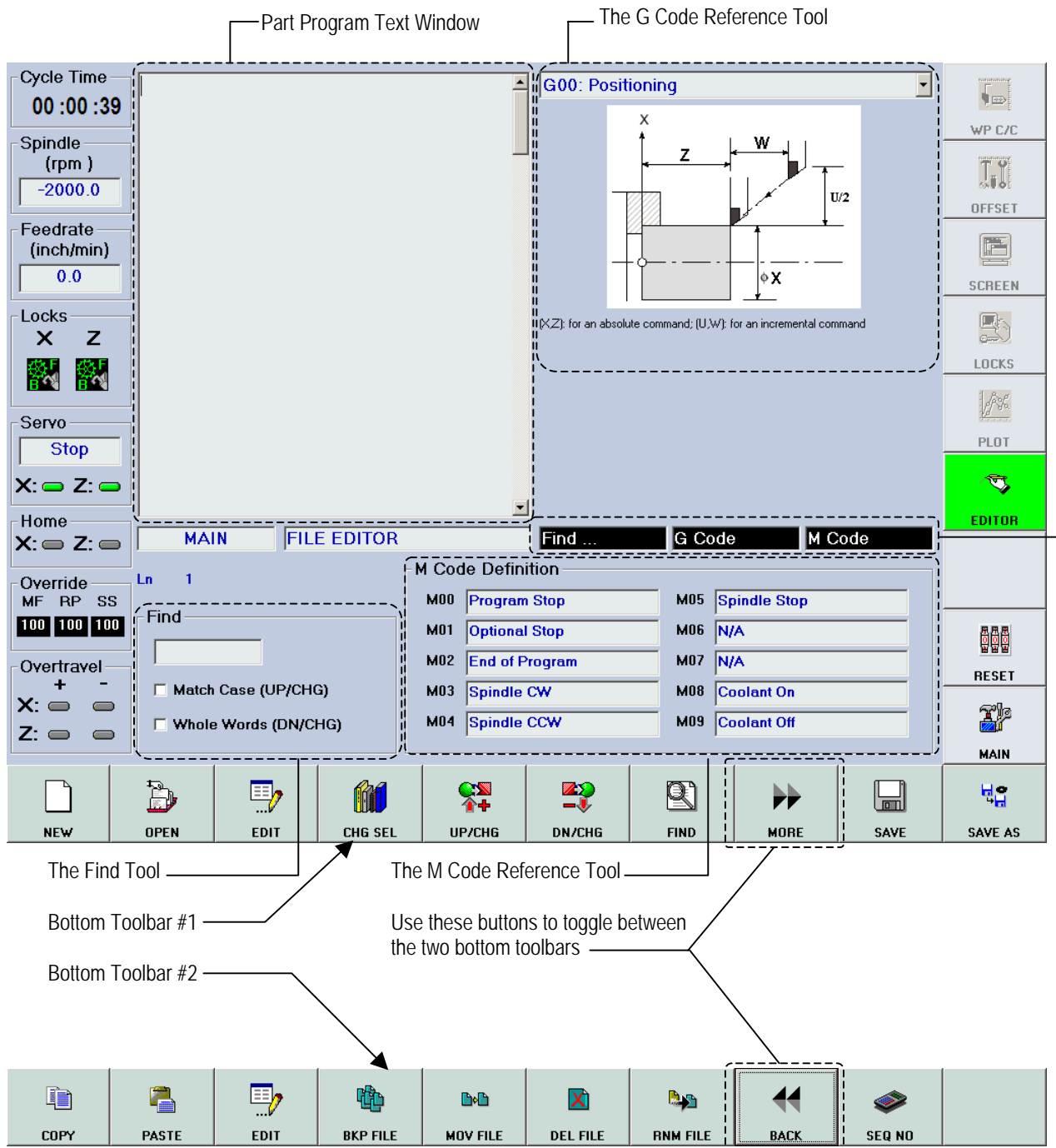
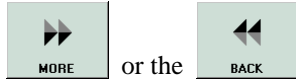


Figure 13-1: Editor Mode Window




If you press the **MORE** or the **BACK** buttons on the bottom toolbar of the Auto Window, it toggles you between the two bottom toolbars, each of which are shown in Figure 13-1.

13.3 Using the G Code and M Code Reference Tools

The G code and M code reference tools are handy reference guides to quickly remind you of G code and M code definitions. For instance, if you can't remember which G code is for "Inch Input," you can use the G code reference tool to quickly view a list of G codes available to you in ServoWorks S-100T. While this is quite convenient, if you are unfamiliar with the specifics of the M codes or G codes you want to use (what parameters go with each G code, etc.), we recommend that you refer to *ServoWorks S-100T Part Programming Manual* while using the Editor.

The following steps will guide you in using the G code and M code reference tools:

- 1) Use the  button on the bottom toolbar to toggle you among three options:
 - a) The Find Tool (shown as **Find ...**)
 - b) The G Code Reference Tool (shown as **G Code**)
 - c) The M Code Reference Tool (shown as **M Code**)

The active option will be shown with bright green text. Select either the G code reference tool, or the M code reference tool (your preference). Choosing the option makes that option "active," which means that you can scroll through the G or M codes.

The G code reference tool will display one G code definition at a time, as shown in the following window:

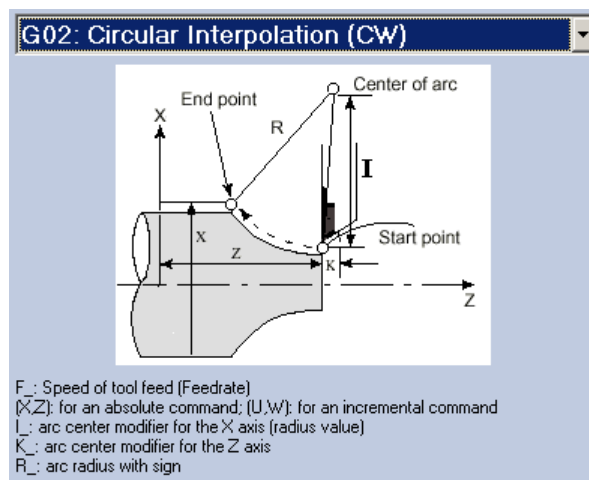


Figure 13-2: The G Code Reference Tool Pull-Down Menu in Editor Mode

For each G-Code, ServoWorks S-100T displays a helpful graphic reminding you of how that G code is to be used. Each parameter is labeled, to remind you of how to specify these parameters. The screen also displays all possible parameters you can use with that G code.

The M code reference tool will display ten M code definitions at a time, as shown in the following window:

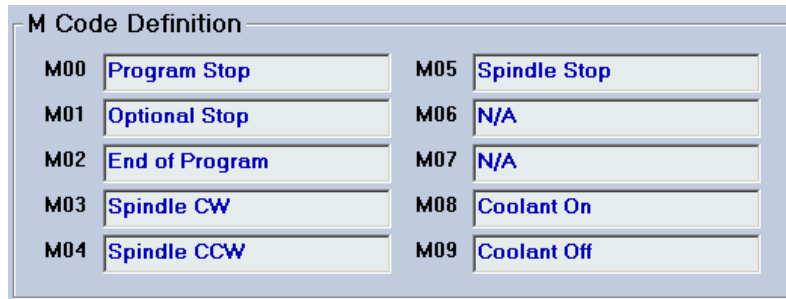


Figure 13-3: The M Code Reference Tool: M Code Definition Frame in Editor Mode


- 2) To scroll through the G codes one at a time, or to scroll through the M codes ten at a time, use the




NOTE: If you have a mouse, you can click on the G code reference tool pull-down menu, view multiple G code definitions at the same time, and use the right scroll bar to more quickly scroll through the list of G code definitions.

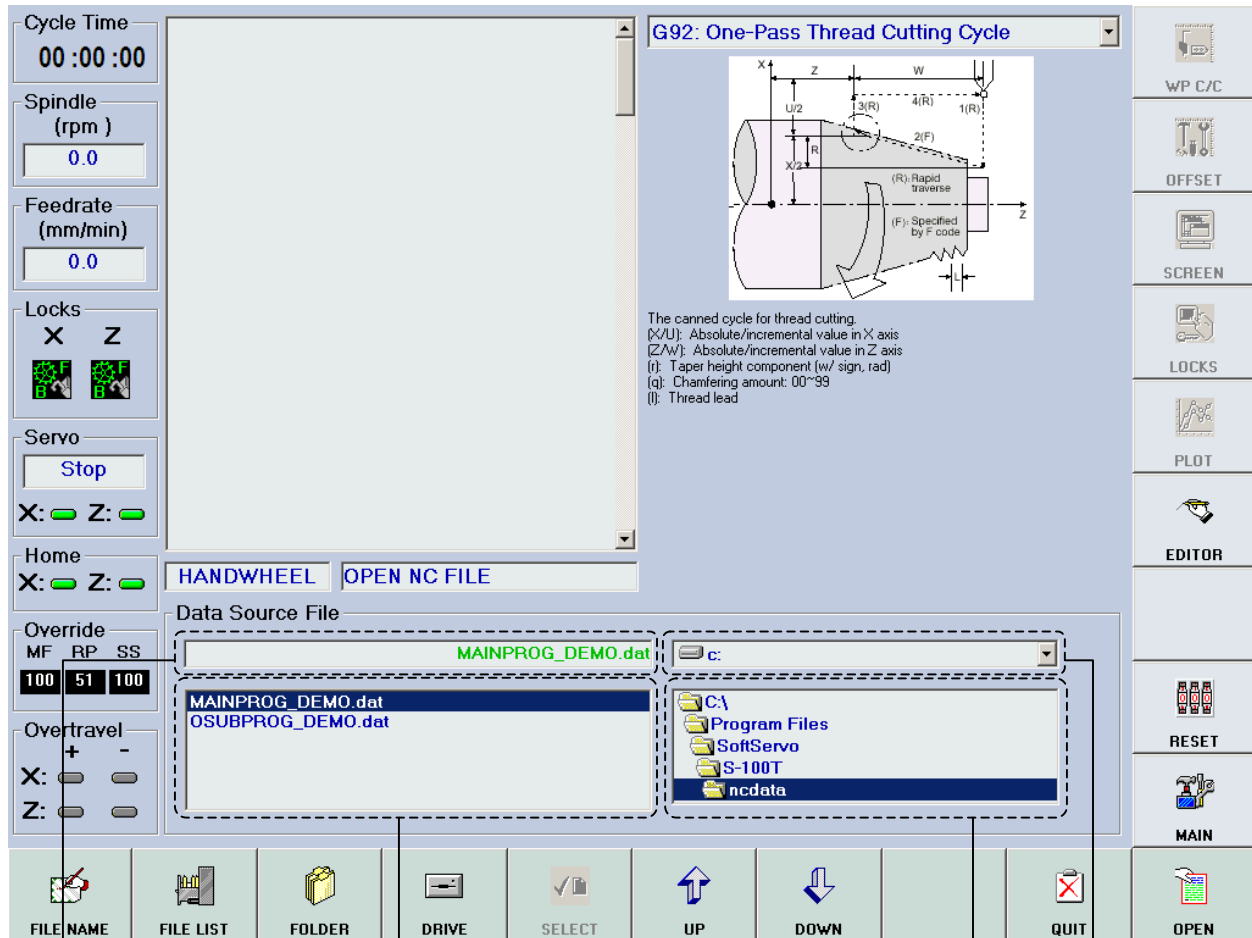
13.4 Selecting a File To Edit

The most recent file you had open in Editor Mode will be loaded and ready to edit. If this is the file you want to edit, you're all set.

If you want to create a new file for a new part program, press the  button on the bottom toolbar, and you are ready to start editing that new file.

If, however, you want to edit a different, existing file, the following steps will guide you through opening that file:

- 1) Press the  button on the bottom toolbar. This will bring up the following window:



File Name Text Box


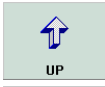


File List Box: This list box displays the contents of the selected folder.

Path Window: This window displays the folder location (the path address).

Drive Pull-Down Menu: This pull-down menu displays the selected drive.




Figure 13-4: Editor Mode Window for Opening a File

2) If you're not in the drive you want to be in (the drive where the file you're trying to load is located):



- a) Press the  button on the bottom toolbar.
- b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
- c) Press the  button on the bottom toolbar to select the drive.


3) If you're not in the folder you want to be in (the folder where the file you're trying to load is located):


- a) Press the  button on the bottom toolbar.

- b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
- c) Press the  button on the bottom toolbar to select the desired folder.
- d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the desired file to open.

- 4) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.

- 5) Use the  and  buttons on the bottom toolbar to scroll to the desired file.






- 6) Press the  button on the bottom toolbar to select the desired file.

- 7) Press the  button on the bottom toolbar to open the file.

NOTE: Press the  key to cancel at any time.

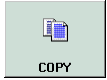
13.5 Editing Part Programs


13.5.1 Using the Editor and Keypad


You can add, delete or change blocks of code in Editor Mode. To use the Editor, press the  button on the bottom toolbar. This puts your cursor in the text window that displays the CNC code. You can then use a mouse and keyboard. If you don't have a mouse or keyboard, you can use the arrow keys on your keypad to move up and down, and the alphanumeric keys to add or change the blocks of code that make up the part program. You can also use the , ,  and  buttons on the keypad.

13.5.2 Edit Functions


There are three edit functions in Editor Mode: Copy, Paste and Sequence Number. The copy and paste functions are the same as what you would expect in any editing or word processing program. However, you must have a mouse in your ServoWorks S-100T system in order to select text to be copied.

NOTE: If you have a mouse, you can select text and copy that text using the  button on bottom toolbar

#2. (Press the  button on bottom toolbar #1 to get to bottom toolbar #2 – see Figure 13-1.) You can then

use the mouse to position the cursor where you'd like to paste that text, and press the  button on bottom toolbar #2 to paste that text at the selected location.

The Sequence Number function simply renumbers the N codes (blocks of code beginning with “N”) in your part

program file. Or, if your file has no N codes, it numbers each line beginning with “N.” Press the  button on bottom toolbar #2 to renumber the N codes in your part program, as shown in the following examples:

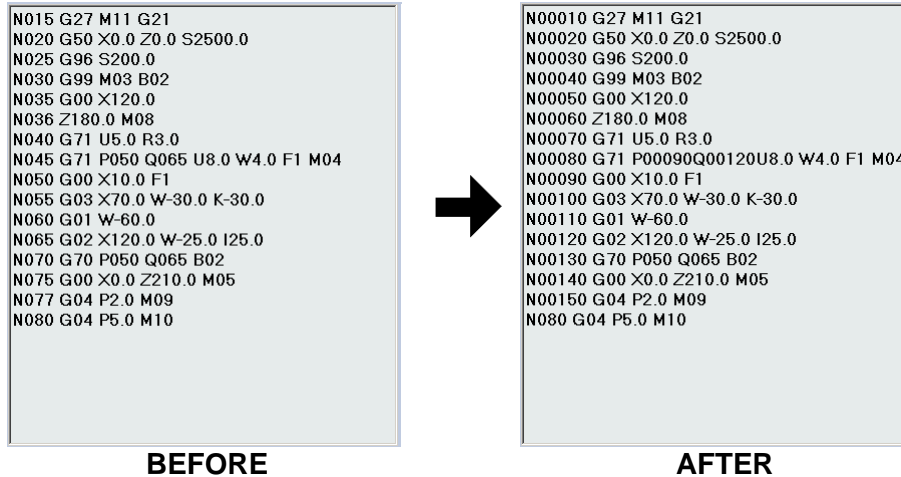


Figure 13-5: Example #1 of a Part Program Before and After the Sequence Number Function

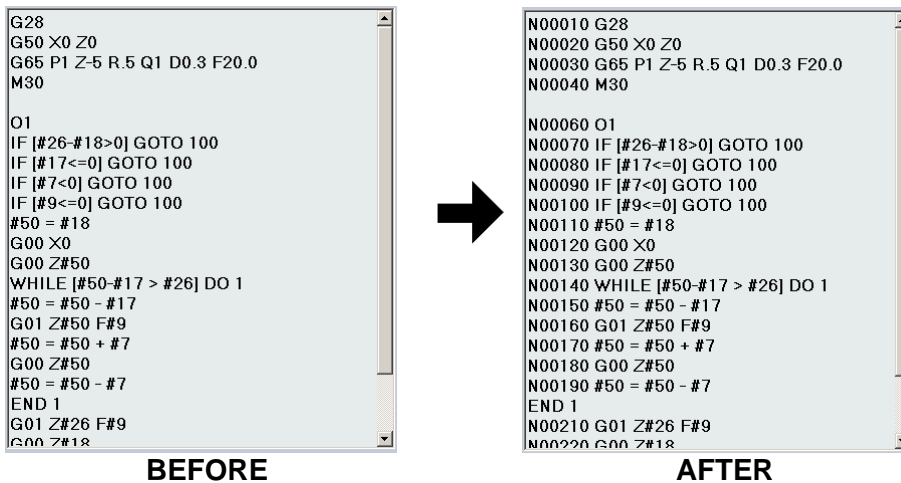







Figure 13-6: Example #2 of a Part Program Before and After the Sequence Number Function

13.6 Using the Find Tool

The Find Tool is very handy for finding specific blocks of code in large part program files. The following steps will guide you in using the Find Tool:

- 1) Use the  button on the bottom toolbar to toggle you among three options:
 - a) The Find Tool (shown as )
 - b) The G Code Reference Tool (shown as )

c) The M Code Reference Tool (shown as )

The active option will be shown with bright green text. Select the Find Tool (), which will put your cursor in the text box in the “Find” frame.

The Find Tool (specifically, the “Find” frame) is shown in the following window:

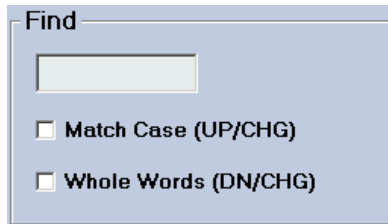
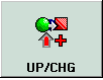
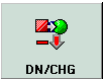
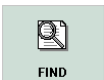
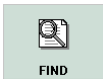
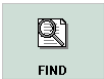




Figure 13-7: The Find Tool in Editor Mode


- 2) Once your cursor is in the text box in the “Find” frame, type in the text (code) you want to find.
- 3) Select which options to use for your “Find” operation. You have a choice of two:

a) To choose “Match Case,” press the  button. This means, for instance, that if you have typed “g00” in the text box, “G00” in the file WOULD NOT be considered a match.

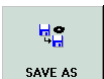
b) To choose “Whole Words,” press the  button. This means, for instance that if you have typed “F100” in the text box, “F1000” in the file WOULD NOT be considered a match.









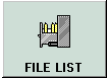





- 4) Press the  button. The cursor will jump to the first matching text in the Part Program Text window. Pressing the  button again will take you to the next instance of matching text. Keep pressing the  button until you either find the exact text you’re searching for, or until the  text box reads as “  ” (which means there are no more matches to be found).



13.7 Saving Your File After Editing

If you have edited an existing file, and want to save the file with the same name, in the same directory as the older version of the file, press the  button on the bottom toolbar.

If, however, you created a new file, or you want to save your changes in a different folder, or under a different file name, the following steps will guide you in saving your file in a new location or with a new name:

- 1) Press the  button on the bottom toolbar. Choices appear for file name, directory, drive, etc.
- 2) If you’re not in the drive you want to be in (the drive where the file you’re trying to load is located):

- a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
 - c) Press the  button on the bottom toolbar to select the desired drive.
- 3) If you're not in the right folder (the folder where the file you're trying to save to is located):
- a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
 - c) Press the  button on the bottom toolbar to select the desired folder.
 - d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder where you want to save the file.
- 4) Now that you're in the right folder, you can type a new file name from scratch, or select and edit an existing file name.
- a) To select an existing file name to change, press the  button, then use the  and  buttons on the bottom toolbar to get to the desired file. If you want to modify the name of the file you just picked, press the  button on the bottom toolbar to put the cursor in the file name text box, then use the keypad (or keyboard, if you have one) to change the file name.
 - b) To type a new file name, press the  button on the bottom toolbar. This will put the cursor in the File Name Text Box. You can then use the keypad or keyboard to type the new file name.
- 5) Press the  button on the bottom toolbar to save the contents of the file into memory.












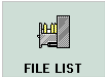



NOTE: If at any point you no longer want to save the file, press the  button, or press the  key.

13.8 Manipulating Part Program Files

You can use Editor Mode to back up part program files, move part program files from one directory to another, delete files or remove files.

13.8.1 Backing Up a Part Program File

To back up a part program file:

- 1) Press the  button on bottom toolbar #2. If you don't see the  button, press the  button on bottom toolbar #1 to get to bottom toolbar #2 (see Figure 13-1).
- 2) If you're not in the drive you want to be in (the drive where the file you're trying to back up is located):
 - a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
 - c) Press the  button on the bottom toolbar to select the desired drive.
- 3) If you're not in the desired folder (the folder where the file you're trying to back up is located):
 - a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
 - c) Press the  button on the bottom toolbar to select the desired folder.
 - d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be backed up.
- 4) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.
- 5) Use the  and  buttons on the bottom toolbar to navigate to the desired file.
- 6) Press the  button on the bottom toolbar to select the desired file. You will see the following window appear:

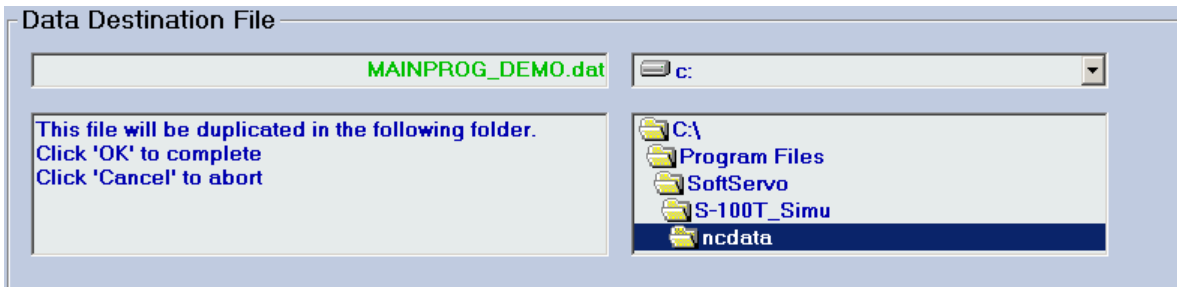
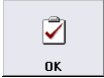




Figure 13-8: Backup Prompt Window in Editor Mode

- 7) To get to the folder where you want to place the backup file, repeat steps #2 and 3 (unless you're already in the correct folder).











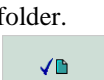
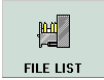


- 8) Press the  button on the bottom toolbar to complete the operation.


NOTE: If you change your mind, and no longer want to back up the file, press the  button on the bottom toolbar, or press the  key.

NOTE: When you copy a file, there is no option to select a name for the duplicate file. Instead, “_backup” is added to the original file name. For instance, if you duplicated a file called “File1.dat,” the duplicate file would be called “File1_backup.dat.”

13.8.2 Moving a Part Program File

To move a part program file:

- 1) Press the  button on bottom toolbar #2. If you don't see the  button, press the  button on bottom toolbar #1 to get to bottom toolbar #2 (see Figure 13-1).
- 2) If you're not in the desired drive (the drive where the file you're trying to move is located):
 - a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
 - c) Press the  button on the bottom toolbar to select the desired drive.
- 3) If you're not in the desired folder to be in (the folder where the file you're trying to move is located):
 - a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
 - c) Press the  button on the bottom toolbar to select the desired folder.
 - d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be moved.
- 4) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.
- 5) Use the  and  buttons on the bottom toolbar to navigate to the file to be moved.

- 6) Press the  button on the bottom toolbar to select the desired file. You will see the following window appear:

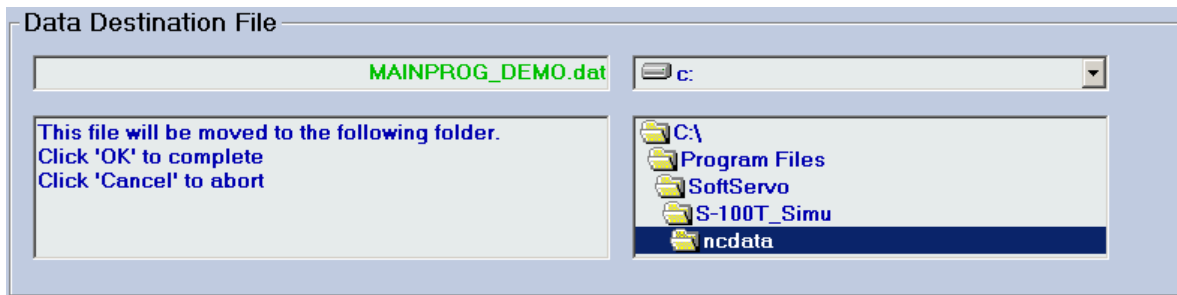

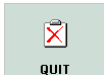



Figure 13-9: Move Prompt Window in Editor Mode








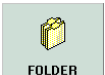
- 7) To get to the folder where you want to place the backup file, repeat steps #2 and 3 (unless you're already in the correct folder).








- 8) Press the  button on the bottom toolbar to complete the operation.

NOTE: If you change your mind, and no longer want to move the file, press the  button on the bottom toolbar, or press the  key.

13.8.3 Deleting a Part Program File

To delete a file:

- 1) Press the  button on bottom toolbar #2. If you don't see the  button, press the  button on bottom toolbar #1 to get to bottom toolbar #2 (see Figure 13-1).
- 2) If you're not in the desired drive (the drive where the file you're trying to delete is located):
 - a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
 - c) Press the  button on the bottom toolbar to select the desired drive.
- 3) If you're not in the folder you want to be in (the folder where the file you're trying to delete is located):
 - a) Press the  button on the bottom toolbar.

- b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
- c) Press the  button on the bottom toolbar to select the desired folder.
- d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be deleted.
- 4) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.
- 5) Use the  and  buttons on the bottom toolbar to navigate to the file to be deleted.
- 6) Press the  button on the bottom toolbar to select the desired file. You will see the following window appear:

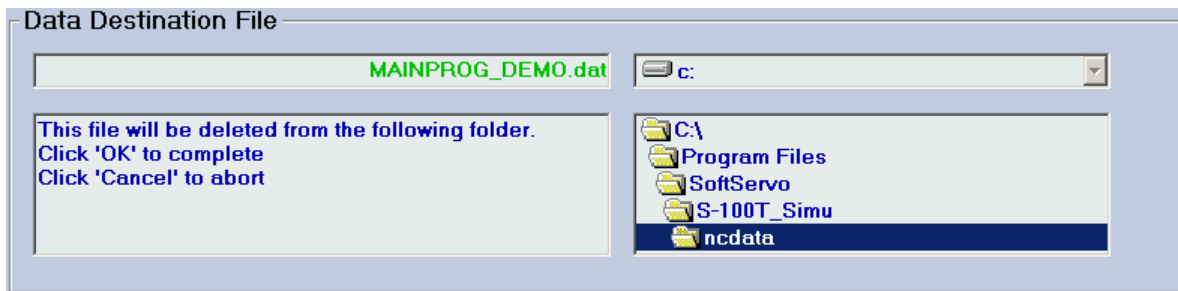





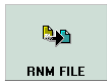
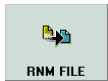

Figure 13-10: Delete Prompt Window in Editor Mode


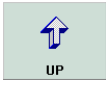



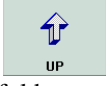






- 7) Press the  button on the bottom toolbar to complete the operation.

NOTE: If you change your mind, and no longer want to delete the file, press the  button on the bottom toolbar, or press the  key.

13.8.4 Renaming a Part Program File

To rename a part program file:

- 1) Press the  button on bottom toolbar #2. If you don't see the  button, press the  button on bottom toolbar #1 to get to bottom toolbar #2 (see Figure 13-1).
- 2) If you're not in the desired drive (the drive where the file you're trying to rename is located):

- a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
 - c) Press the  button on the bottom toolbar to select the desired drive.
- 3) If you're not in the desired folder (the folder where the file you're trying to rename is located):
- a) Press the  button on the bottom toolbar.
 - b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
 - c) Press the  button on the bottom toolbar to select the desired folder.
 - d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be opened.
- 4) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.
- 5) Use the  and  buttons on the bottom toolbar to navigate to the file to be renamed.
- 6) Press the  button on the bottom toolbar to select the desired file. You will see the following window appear:

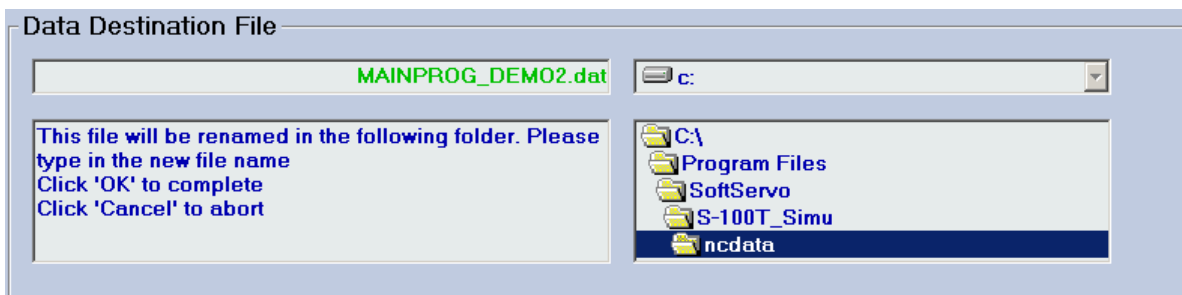
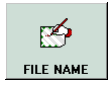








Figure 13-11: Rename Prompt Window in Editor Mode

- 7) Type in the new name for the file. Press the  button on the bottom toolbar to put the cursor in the File List Box.
- 8) Press the  button on the bottom toolbar to complete the operation.

NOTE: If you change your mind, and no longer want to rename the file, press the  button on the bottom toolbar, or press the  key.

13.9 Exiting Editor Mode

To exit Editor Mode (and get back to whatever mode you were in before pressing the  button), press the  key, OR press the  button again.


Chapter 14: Proving Part Programs and Running Production


14.1 Overview of Auto Mode and CNC Part Programming



ServoWorks S-100T uses industry standard part programming language for CNC programming, with G, M, T, B, S, and F codes. You will write part programs from part drawings using this language, to describe the shape of the part to be created. Refer to *Chapter 13: Creating, Editing and Manipulating Part Programs*.



You will use Auto Mode, an operational mode in ServoWorks S-100T, to open and prove part programs, and perform automatic CNC runs executing part programs. You can get into Auto Mode as follows:



- 1) Make sure you are in the Main window of ServoWorks S-100T (as shown in Figure 3-2). (To get to the

Main window, press the  button on the right toolbar of the ServoWorks S-100T window.)



- 2) Press the  button on the bottom toolbar of the ServoWorks S-100T Main program window. You will then be in Auto Mode and you will see the window shown in Figure 14-1.

NOTE: If the  button is disabled (appears as ), it's probably because you have not set the home position for your axes. You must set the home position first – see *Section 3.4: Performing a*

Homing Operation. [Press the  button on the bottom toolbar, then press the  button on

the bottom toolbar to set all axes to their home positions at the same time. Press the  button to return to Main Mode. The  button should now be enabled for you to select it.]

In Auto Mode, there are three bottom toolbars, to accommodate the range of settings and switches available

to you in Auto Mode. If you press the  or  buttons on the bottom toolbar of the Auto Window, it toggles you between the three bottom toolbars, each of which are shown in Figure 14-1.

Cycle Time
00 :00 :00

Spindle (rpm)
0.0

Feedrate (mm/min)
0.0

Locks
X Z

Servo
Stop
X: Z:

Home
X: Z:

Override
MF RP SS
100 100 100

Overtravel
+ -
X: Z:

Program Pos (mm) Actual Pos (mm)

X: 0000.000 0000.000

Z: 0000.000 0000.000

C: 000.000° 000.000°

Modal
G00 G97 G98
G21 G40 G25 G23
G80 G53 G64
M: 05 T: 0000 B: 00
S: 0 (rpm)
F: 0.000 mmpm

Feedrate Override %
100 0 230

Rapid Override (%)
100 0 100

NC FILE DRY RUN OVRD - OVRD + RPO - RPO + REW/FF MORE START STOP

OPT SKIP OPT STOP S. BLOCK MST LOCK HNDWHL PARS STN MORE START STOP

SPN DIR SPN TYPE SPEED - SPEED + SSO - SSO + SPN ON BACK START STOP

WP C/C
OFFSET
SCREEN
LOCKS
PLOT
EDITOR
RESET
MAIN

These function buttons allow you to set the parameters and switches for Auto Mode.

These frames and text boxes display the Auto Mode settings, and also allow you to set some parameters for Auto Mode motion if you have a mouse (otherwise, you must use the toolbar buttons)

Clicking on these buttons toggles you among the three toolbars available to you in Auto Mode

These "Start" and "Stop" buttons start and stop part program execution

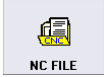
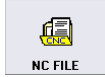


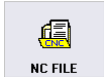
Toolbar #1
Toolbar #2
Toolbar #3

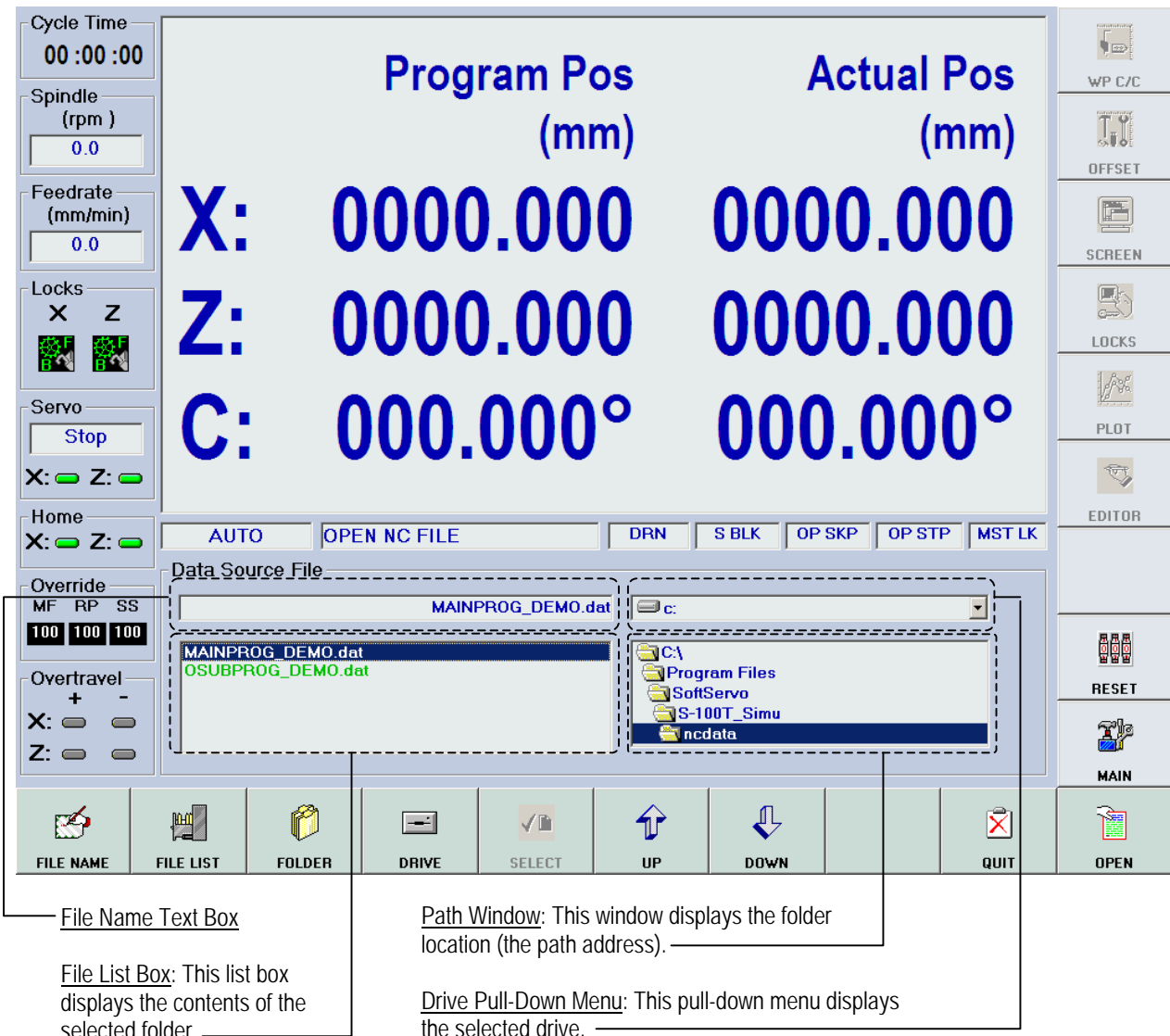
Figure 14-1: Auto Mode Window (Showing All Three Bottom Toolbars)

14.2 Opening and Closing a Part Program

When you are in Auto Mode, you must open a part program file before you do anything else. You open a part program file as follows:

- 1) Make sure you are in Auto Mode.

- 2) Press the  button on the bottom toolbar. (If you don't see the  button, press the  or  buttons on the bottom toolbar until you do see the  button.) This will bring up the following window:



	Program Pos (mm)	Actual Pos (mm)
X:	0000.000	0000.000
Z:	0000.000	0000.000
C:	000.000°	000.000°

Data Source File

MAINPROG_DEMO.dat

MAINPROG_DEMO.dat
OSUBPROG_DEMO.dat

C:\
Program Files
SoftServo
S-100T_Simu
ncdata

FILE NAME FILE LIST FOLDER DRIVE SELECT UP DOWN QUIT OPEN

File Name Text Box





File List Box: This list box displays the contents of the selected folder.

Path Window: This window displays the folder location (the path address).





Drive Pull-Down Menu: This pull-down menu displays the selected drive.

Figure 14-2: Auto Mode Window for Opening a File





3) If you're not in the desired drive (the drive where the file you're trying to load is located):

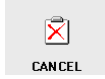

- a) Press the  button on the bottom toolbar.
- b) Press the  and  buttons on the bottom toolbar to get to the desired drive.
- c) Press the  button on the bottom toolbar to select the desired drive.

4) If you're not in the desired folder (the folder where the file you're trying to load is located):

- a) Press the  button on the bottom toolbar.
- b) Press the  and  buttons on the bottom toolbar to get to the desired directory/folder.
- c) Press the  button on the bottom toolbar to select the desired folder.
- d) Repeat steps a) through c) if you want to select a subfolder within the folder you selected in step c). Keep repeating these steps until you've navigated to the folder that contains the file to be opened.

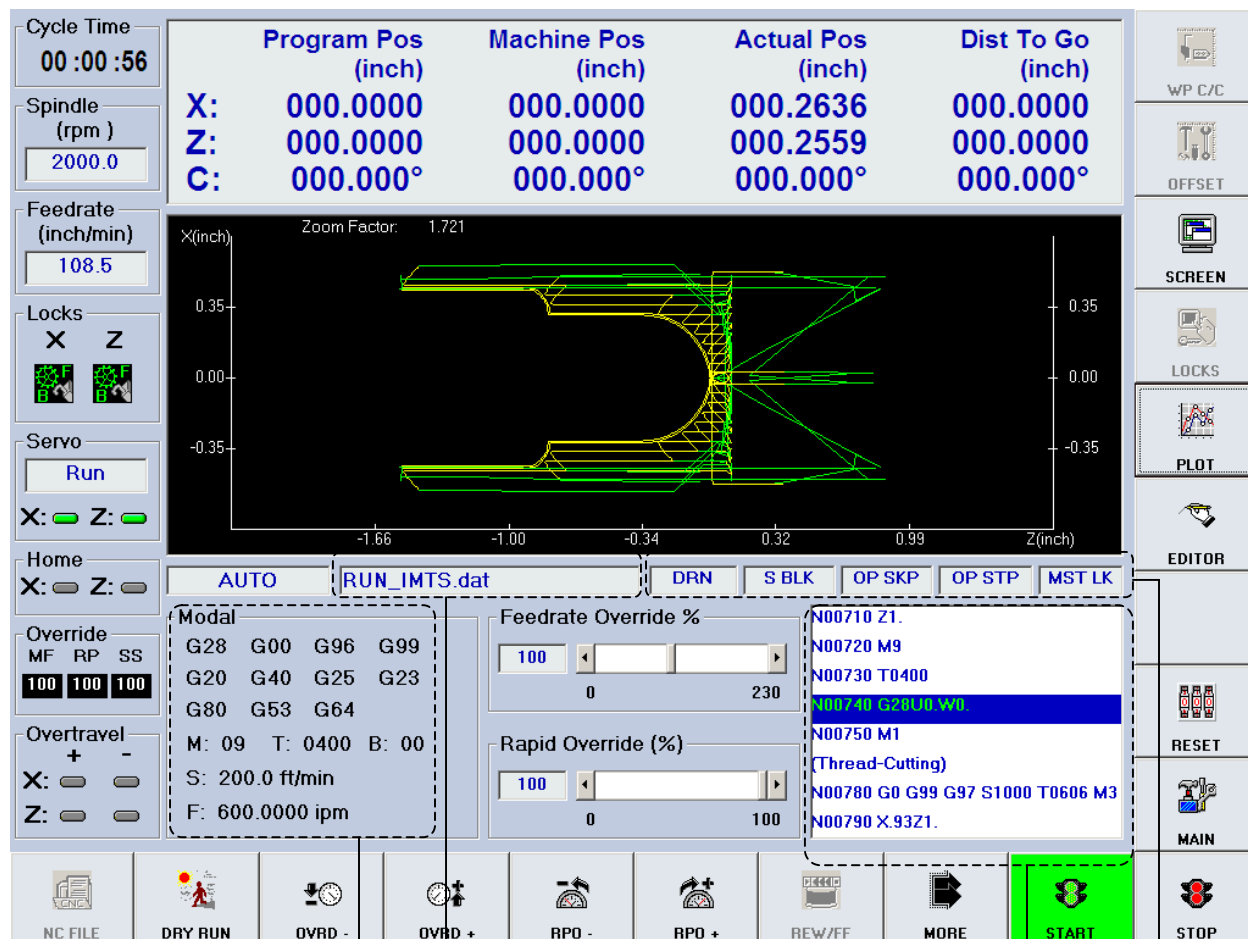
5) Now that you're in the right folder, press the  button to put the focus on the list box with the file names.

- 6) Use the  and  buttons on the bottom toolbar to navigate to the file to be opened.
- 7) Press the  button on the bottom toolbar to select the desired file.
- 8) Press the  button on the bottom toolbar to open the selected file.

NOTE: If you change your mind, and no longer want to load the file, press the  button on the bottom toolbar or the  key on the panel PC.

Once the part program file is open, the blocks of code will be displayed in the Mode Display Area, as shown in Figure 14-3.

To open another part program file, simply repeat all the steps in the previous procedure. There is no need to close the current part program file. If you leave Auto Mode and return to Auto Mode, the most recent part program file you had open will still be open.



This area displays the essential modal condition or conditions, the types of tool motions, and the modal feedrate.

The text of the open file (blocks of code) is shown in this text box. The current line (the line being executed or the line next to be executed when the operation begins or resumes) is highlighted

The name of the open file is shown in this text box

On/off status of operation support switches.

Figure 14-3: Auto Mode Window With Part Program File Executing

14.3 Setting Feed Override and Rapid Override

ServoWorks S-100T allows you to override both the feedrate programmed by the part program for linear or circular interpolation, and the rapid feedrate percentage for the X and Z axes (so for G00, the speed would be at some percentage of the rapid feedrate, rather than at the rapid feedrate itself).

You can override the feedrate for interpolation specified by the part program from 0% to 230%. Press the





and



buttons on the bottom toolbar to decrease and increase, respectively, the feedrate override percentage.

You can override the rapid feedrate from 0% to 100% – in other words, you still can't go beyond the Rapid Traverse Feedrate that you set for the Feedrate parameters in Configuration Mode. You can't increase the feedrate beyond this maximum feedrate; you can only decrease the rapid feedrate by taking a percentage of the rapid feedrate. Press

the  and  buttons on the bottom toolbar to decrease and increase, respectively, the rapid traverse feedrate override percentage.

NOTE: If you have a mouse, you can use the slide bars for “Feed Override (%)” and “Rapid Override (%)” Or, you can use the mouse to position the cursor in the text boxes for “Feed Override (%)” and “Rapid Override (%)” and type in the percentages you want to set.

14.4 Setting the Operation Support Function Switches

14.4.1 Overview

ServoWorks S-100T has five operation support function switches that provide you with various options related to running CNC code. These switches can be used alone, or in combination. These switches are often helpful for debugging part programs.




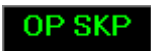

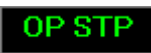

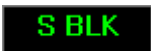



OPERATION SWITCH	OFF STATUS	ON STATUS
Dry Run		
Optional Skip		
Optional Stop		
Single Block		
MST Codes Lock		

Table 14-1: Operation Support Switches

14.4.2 Dry Run



The Dry Run switch is used only for proving part programs, and is explained in Section 14.6.4: *Proving a Part Program Using the Dry Run Switch.*

14.4.3 Optional Skip







- If you activate the Optional Skip switch by pressing the  button on the bottom toolbar, it means that CNC G code execution will skip (not execute) blocks of code marked as “Optional Skip” or “Block Delete Code” (which mean the same thing). You can specify a portion of a block as Optional Skip code by beginning such code with a “/” (forward slash.) or “\” (two backward slashes).

- If the Optional Skip switch is deactivated, the block delete code will be ignored, and all blocks of code marked as block delete code will be executed without interruption.


14.4.4 Optional Stop

- If you activate the Optional Stop switch by pressing the  button on the bottom toolbar, it means that part program execution will stop when it reaches an M01 optional stop code. In order to continue execution of the part program after it reaches an M01 in a block of code, you must press the  button on the bottom toolbar.
- If the Optional Stop switch is deactivated, the M01 code will be ignored, and execution of the part program will continue without interruption.

14.4.5 Single Block





- If you activate the Single Block switch by pressing the  button on the bottom toolbar, it means that the part program will be executed in single block operational mode. Only one block of CNC data will be executed at a time. In single block operational mode, pressing the  button on the bottom toolbar will cause only the current block of code to be executed, and then execution will stop. You will have to press the  button again to execute the next block of code, and so forth.
- While executing code in single block operational mode, when G code execution has been completed for the current line, you have the option of pressing the  button again to deactivate this switch. When the Single Block option is deselected, pressing the  button will cause normal, continuous execution of G code to begin.
- At any time during a normal, continuous execution of a part program, pressing the  button will immediately change the execution to single block operational mode.

14.4.6 MST Codes Lock

- If you activate the MST Codes Lock switch by pressing the  button on the bottom toolbar, it means that CNC code execution will skip (not execute) M codes, S codes and T codes.
- If the MST Codes Lock switch is deactivated, all M codes, S codes and T codes will be executed without interruption.

14.5 Using the Handwheel to Interrupt Program Execution

ServoWorks S-100T allows you to suspend part program execution in order to use the handwheel. You may find this function useful for using the handwheel to move a tool to another location in the middle of the execution of a part program.

To use a handwheel while in Auto Mode, press the  button on the bottom toolbar to stop part program execution (because the CNC code execution must be suspended before ServoWorks S-100T will accept input from the handwheel). Then activate the HandWheel Interrupt function by pressing the  button on the bottom toolbar. The  button will appear highlighted (), and ServoWorks S-100T will allow the motion to be controlled by the handwheel in lieu of part program execution.

When the HandWheel Interrupt button is selected, a “HandWheel” frame appears in the Mode Display Area to display the handwheel settings, as shown:

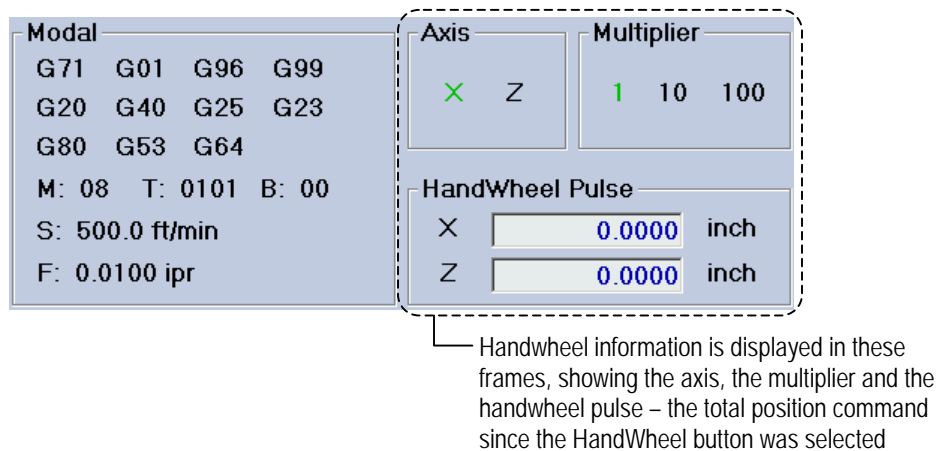







Figure 14-4: HandWheel Information in the Auto Mode Display Area When the HandWheel Interrupt Button Is On

Before resuming part program execution, you may want to return to the coordinates in effect when you suspended

part program execution to use the handwheel. To return to the original path, press the  button on the bottom toolbar. This allows you to continue part program execution from exactly where you left off before you pressed the  button. Obviously, this is a very useful button.

To deactivate the HandWheel Interrupt function and resume part program execution, press the  button on the bottom toolbar again. The  button will appear as deselected (“off”):  . Once this HandWheel Interrupt button is deselected, ServoWorks S-100T will not accept input from the handwheel in Auto Mode.

ServoWorks S-100T uses whatever smoothing parameters are in effect at the time of manual intervention. For instance, if the last block of code executed was a G00 rapid traverse command, the type of smoothing and the smoothing time constant for rapid traverse will be used for motion produced by / commanded with a handwheel.

14.6 Proving a Part Program

You should always prove (verify) your part program before you set up your lathe for production. Proving the program will check that the part program is correct and works to produce exactly the desired workpiece as efficiently as possible.

14.6.1 Proving a Part Program Using the Machine Lock Switch


When you prove a part program using the Machine Lock switch, you can lock either or both of the X and Z axes. When you lock an axis with the Machine Lock switch, it will be locked in both directions.

With the Machine Lock switch activated, the part program will be run essentially in a simulation mode. All codes (G, M, T, B, S and F codes) will actually be executed by ServoWorks S-100T. But for G codes that change the position of either or both axes, the output commands are disabled, so ServoWorks S-100T will not send commands to the servo drive (because both axes are locked). However, even though both axes will remain still, the position data and the plot area will display data *as if* the axes were moving.

When you turn on a Machine Lock switch, ServoWorks S-100T stores the machine and program positions. These positions are restored when you turn off Machine Lock.

The following steps will guide you in proving a part program using the machine lock switch:


- 1) In Auto Mode, load the part program that to be verified.

- 2) Press the  button on the right toolbar to enter Locks Mode (a sub mode).

Four buttons will appear on the bottom toolbar, as shown in the following figure:



Figure 14-5: Bottom Toolbar in Locks Mode

- 3) If you want to lock the X axis, press the  button on the bottom toolbar. This will toggle you between two states: X axis locked and X axis unlocked. (See Figure 14-6.) The lock status indications are shown in the status indicator area to the left of the screen.

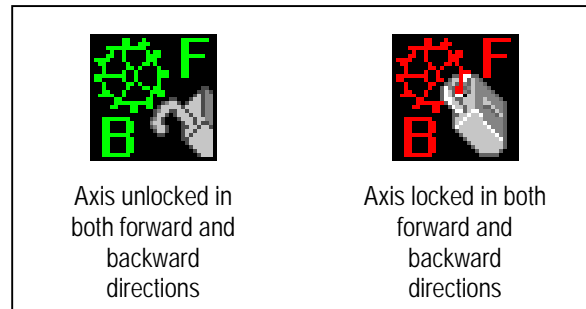





Figure 14-6: Lock Status Indications for the Machine Lock Switch

- 4) If you want to lock the Z axis, press the  button on the bottom toolbar. This will toggle you between two states: Z axis locked and Z axis unlocked. (See Figure 14-6 to see the lock status indications for an axis locked in both directions and an axis unlocked in both directions.)
- 5) Press the  key to return to Auto Mode.
- 6) Run the part program with the Machine Lock(s) activated.

When you are ready to run production, and want to deactivate the Machine Lock(s), press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in

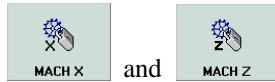




Figure 14-5. Use the  and  buttons on the bottom toolbar to unlock both the X and Z axes.

Before you run production, you must unlock the Machine Locks. This will restore the correct program position and machine position (instead of the simulated positions that were displayed when the Machine Locks were turned on). Repeat steps #2 through 5 to unlock both axes.

CAUTION

You must turn off the Machine Lock switch before you use the program for any automatic motion control, or you won't have the correct coordinate system for the lathe.

14.6.2 Proving a Part Program Using the Interlock Switch


When you prove a part program using the Interlock Switch(es), you can lock either or both of the X and Z axes. Each axis can be locked in either the forward or backward direction, but not in both directions.


With the interlock switch activated, G codes which would cause the X axis or Z axis to move in a direction that is locked will not execute. But any G codes that would cause movement in a direction that is not locked will execute.

The position data and the plot area will display data for the actual movement of the axes. For instance, if both axes are locked in the forward direction, there would be no tool movement in the forward direction, and the position of each axis would not change in the data display area, nor would movement be plotted in the plot area. If only one axis is locked, the lack of movement of that axis would be reflected in the display of position data and in the plot.

The following steps will guide you in proving a part program using the interlock switch:

- 1) In Auto Mode, load and edit the part program file to be verified.

- 2) Press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in Figure 14-5.

- 3) If you want to lock the X axis, press the  button on the bottom toolbar. This will toggle you among three states, as shown in Figure 14-7. The lock status indications are shown in the status indicator area to the left of the screen.

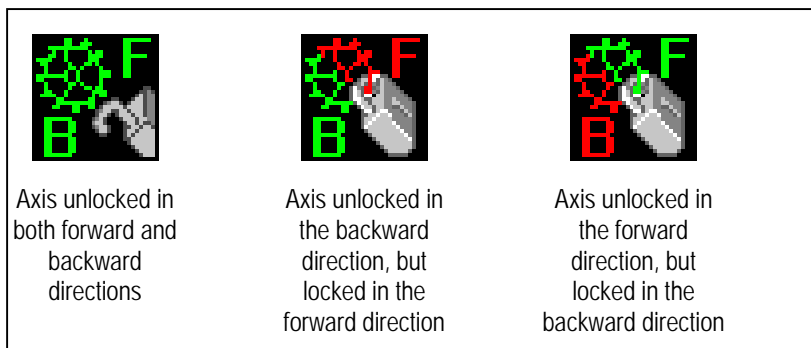
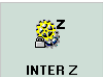







Figure 14-7: Lock Status Indications for the Interlock Switch

- 4) If you want to lock the Z axis, press the  button on the bottom toolbar. This will toggle you among three states, as shown in Figure 14-7.

- 5) Press the  button on the right toolbar again, or press the  key, to return to Auto Mode.
- 6) Run the part program with the Interlock(s) activated.

- 7) When you are ready to run production, and want to deactivate the Interlock(s):

- a) Press the  button on the right toolbar to enter Locks Mode (a sub mode). Four buttons will appear on the bottom toolbar, as shown in Figure 4-5.
- b) Use the  and  buttons on the bottom toolbar to unlock both the X and Z axes.

You can change the lock settings while you are in any control mode, not just Auto Mode. You can change the lock settings even while you are executing a part program, by using Locks Mode. Going into Locks Mode only changes the buttons on the bottom toolbar, and does not change the rest of the control interface. Because of this, you can quickly go in and out of Locks Mode to change the lock settings, while still monitoring whatever mode you were in before you went into Locks Mode.

14.6.3 The Difference Between the Machine Lock and Interlock Switches

The first difference between Machine Lock and Interlock is that with Machine Lock, you can only lock an axis completely (in both directions), while with Interlock, you can lock an axis only in one direction (the forward or backward direction).

The second, and most important difference between Machine Lock and Interlock is in how the tool movement is displayed as position data and as a plot. For instance, let's examine a G01 code (for linear interpolation) that would normally cause the axes to move from point A to point B as shown in Figure 14-8. Let's say that the Z axis is locked in both directions with Machine Lock, and the X axis is unlocked in both directions.

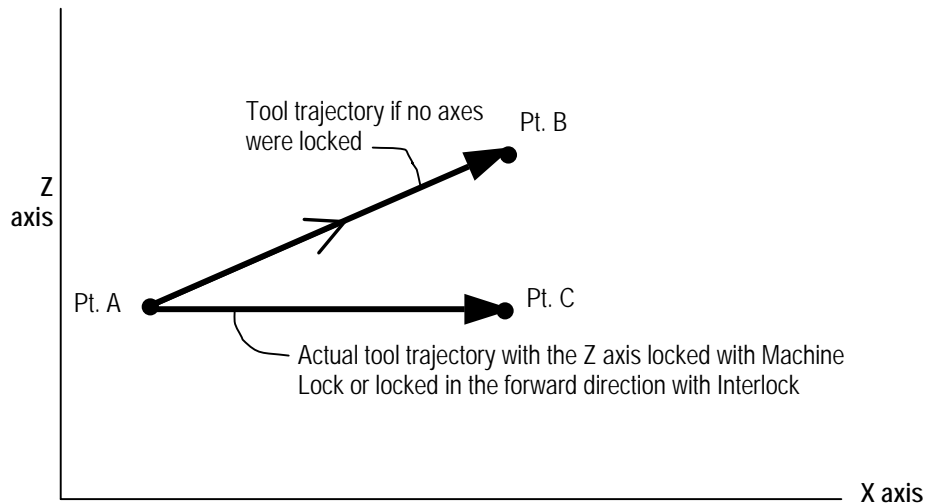


Figure 14-8: Tool Movement Comparison for Machine Lock and Interlock

With both the Machine Lock switch and the Interlock switch, this G01 code will only cause an output command to be sent to the X axis (since the Z axis is locked). No output command will be sent to the Z axis. The tool will move from point A to point C whether you use the Machine Lock switch, or the Interlock switch in the forward Z direction. In other words, the actual movement is the same whether you lock the axis with the Machine Lock switch, or the Interlock switch.

The difference between the Machine Lock switch and the Interlock switch is in how the position data and the plot are displayed on the screen as a result of this G01 code. With the Machine Lock switch, the tool trajectory is plotted as if the Z axis weren't locked...as if the Z axis had moved according to the G01 code. With the Interlock switch, the actual tool trajectory of movement along only the X axis is plotted.

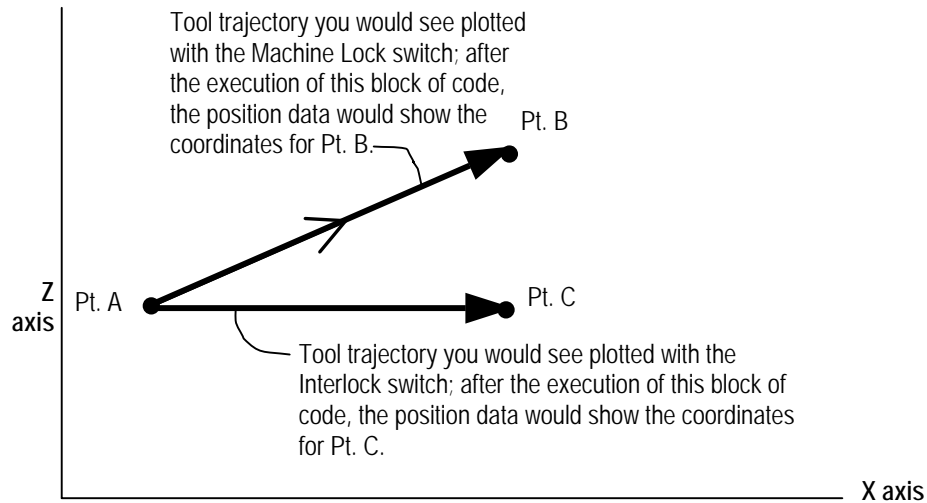


Figure 14-9: Plot and Data Display Comparison for Machine Lock and Interlock

You can change the lock settings while you are in any control mode, not just Auto Mode. You can change the lock settings even while you are executing CNC code, by using Locks Mode. Going into Locks Mode only changes the buttons on the bottom toolbar, and does not change the rest of the control interface. Because of this, you can quickly go in and out of Locks Mode to change the lock settings, while still monitoring whatever mode you were in before you went into Locks Mode.



14.6.4 Proving a Part Program Using the Dry Run Switch



When you prove a part program using the dry run switch, you can observe the tool path under the control of the part program without a workpiece loaded in the lathe, to test the part program before running production. Because there is no workpiece and you're actually not cutting, the lathe can run at a higher speed, and you can expedite your dry run process. Unlike proving a part program using machine lock, both axes will actually move through the entire tool trajectory specified by the code in the part program (i.e. "cutting air").



You execute a dry run with the following steps:

- 1) Make sure your part program file is loaded.

- 2) Press the  button.

- 3) Set the dry run speed by pressing the  and  buttons on the bottom toolbar. This dry run speed will replace any feedrates set by the blocks of code in the part program being executed.

- 4) Set the rapid traverse feedrate override percentage by pressing the  and  buttons on the bottom toolbar, to decrease and increase, respectively, the percentage. You can override the rapid traverse feedrate from 0% to 100%. Because you're doing a dry run, you probably want to set the rapid feedrate to 100%.

- 5) To start the dry run, press the  button on the bottom toolbar. During the dry run, the line of code being executed is highlighted. To stop the dry run execution, press the  button on the bottom toolbar. The dry run will be suspended immediately.

After you have stopped the execution of a dry run, you can continue from where you left off by pressing the



button again. The dry run will start again from the current, highlighted block.

At any time, you can restart a dry run from the beginning of the program or you can rewind or fast forward to begin execution from some specified block number. See *Section 14.10.3: Rewinding or Fast Forwarding a Part Program*.

14.7 Setting Tool Offsets

14.7.1 Overview

Tool offsets are the difference between the actual tool position and the theoretical tool position.

Each tool offset is a set of distances in the X and Z axes. When T codes are executed in a part program, the program position is actually shifted to account for tool offsets (as opposed to compensating each actual movement command in the part program to account for tool offsets).

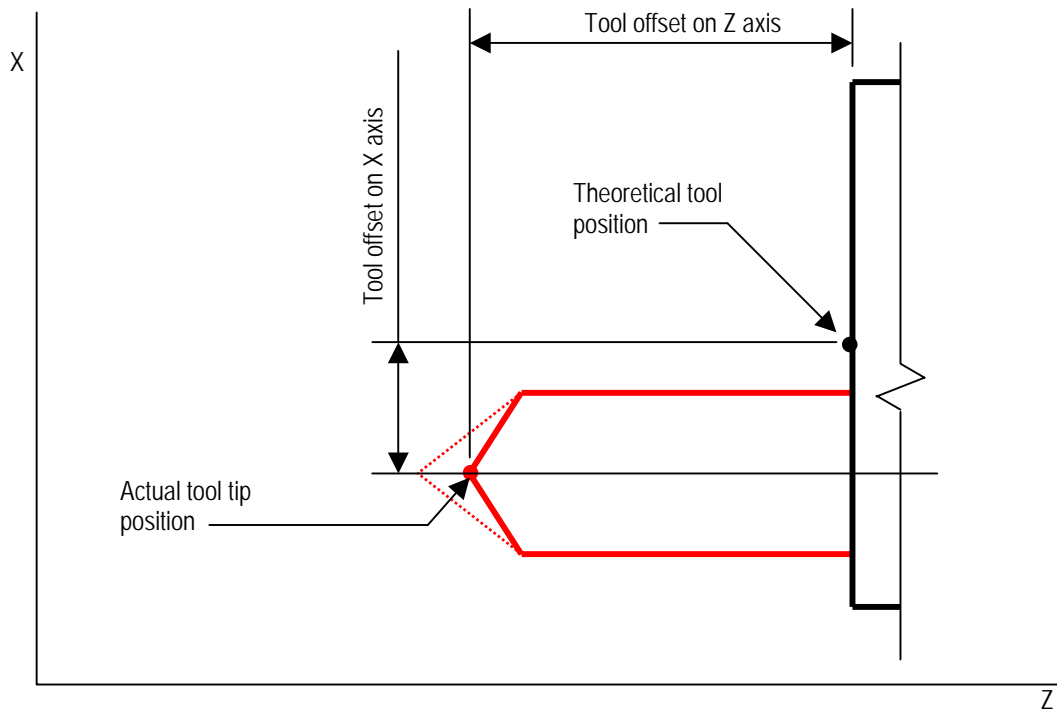


Figure 14-10: Tool Offsets

Tool offsets can be divided into two types: geometry offsets and wear offsets. The total tool offset is the sum of the geometry offset and the wear offset.

The geometry offset compensates for the tool mounting position and for the tool shape, as shown in the following figure:

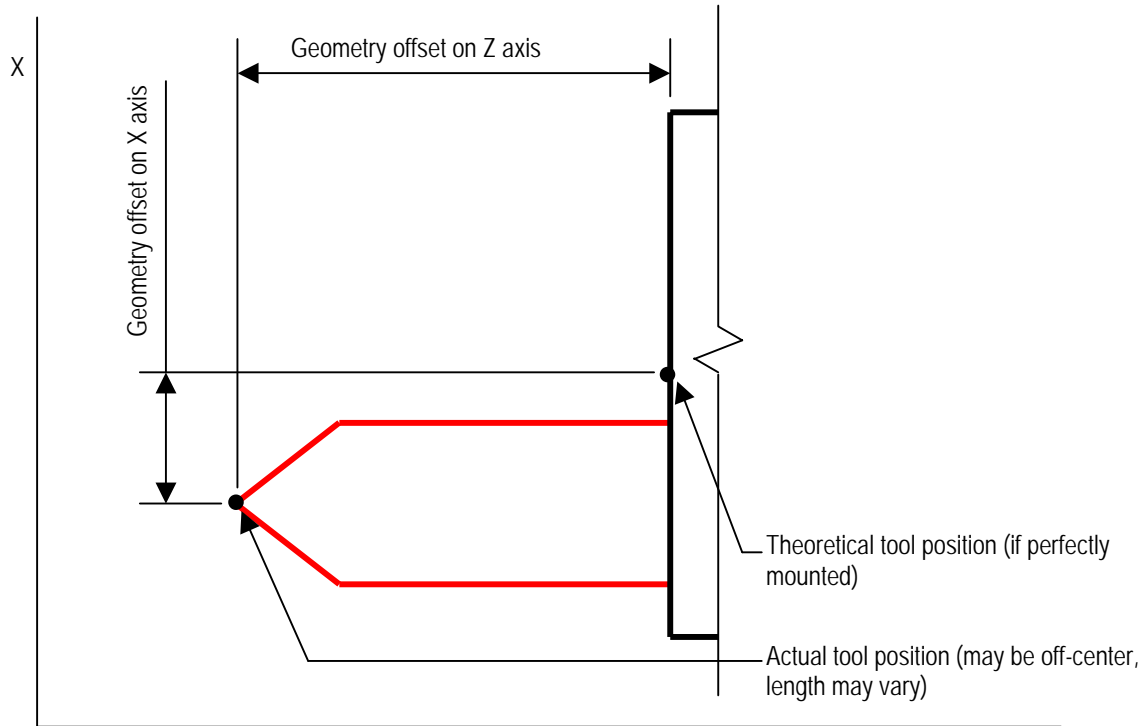


Figure 14-11: Tool Geometry Offsets

The wear offset compensates for wear to the tool tip, as shown in the following figure. Wear is continually changing as tools are used in production.

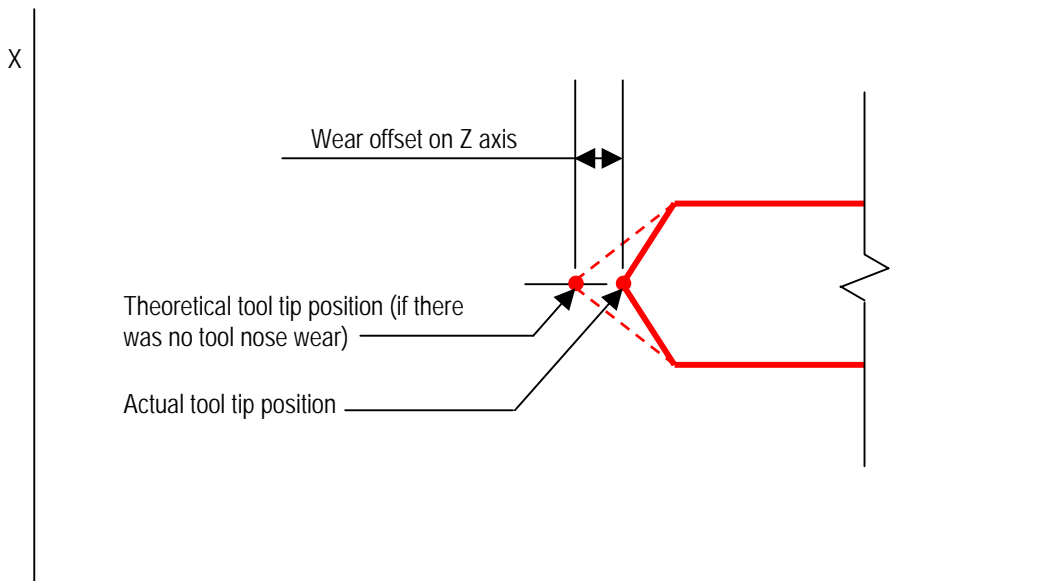


Figure 14-12: Wear Offsets

NOTE: To have ServoWorks S-100T automatically calculate geometry and wear offsets, you must include tool location codes (the rough locations of the tools) in the part programs. If you do include tool location codes in the part program, the plot will show the tool position.

You will need to set your tool offsets before you run production. Your tool offsets should be changed as cutting conditions change, to adjust for tool wear, and to maintain quality production.


You must manually set the tool wear offsets, but there are three ways to set tool geometry offsets:


- 1) You can manually set the tool geometry offsets for the X and Z axes and for the tool radius by manually calculating each geometry offset for each axis and tool radius, and then inputting that data in the “Tool Offset Compensation” frame in Offset Mode.
- 2) You can automatically set the tool geometry offset by using the HandWheel or some other manual mode to skim cut – touch off the tool to the part – and have ServoWorks S-100T record that position and automatically calculate the tool offset. We recommend using this method, to reduce the operator errors that are common with manual calculations of tool offsets. Taking advantage of ServoWorks S-100T’s Measure function will be safer and more accurate than manual measurements.
- 3) You can use the Auto Measure feature to set tool geometry offsets with tool measuring sensors on each axis.


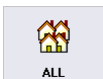


NOTE: You must have a keypad or keyboard to set tool offsets in ServoWorks S-100T.

14.7.2 Accessing the Tool Offsets

To access the tool offsets, you must get into Offset Mode (a sub mode in ServoWorks S-100T). To get into Offset

Mode, press the  button on the right toolbar of ServoWorks S-100T screen. You will see the window shown in Figure 14-13.

NOTE: If the  button is disabled (appears as ), it's probably because you have not set the home position for your axes. You must set the home position – see *Section 3.4: Performing a Homing Operation*.

[Press the  button on the bottom toolbar, then press the  button on the bottom toolbar to set all axes to their home positions at the same time. Press the  button to return to Main Mode. The  button should now be enabled for you to select it.]

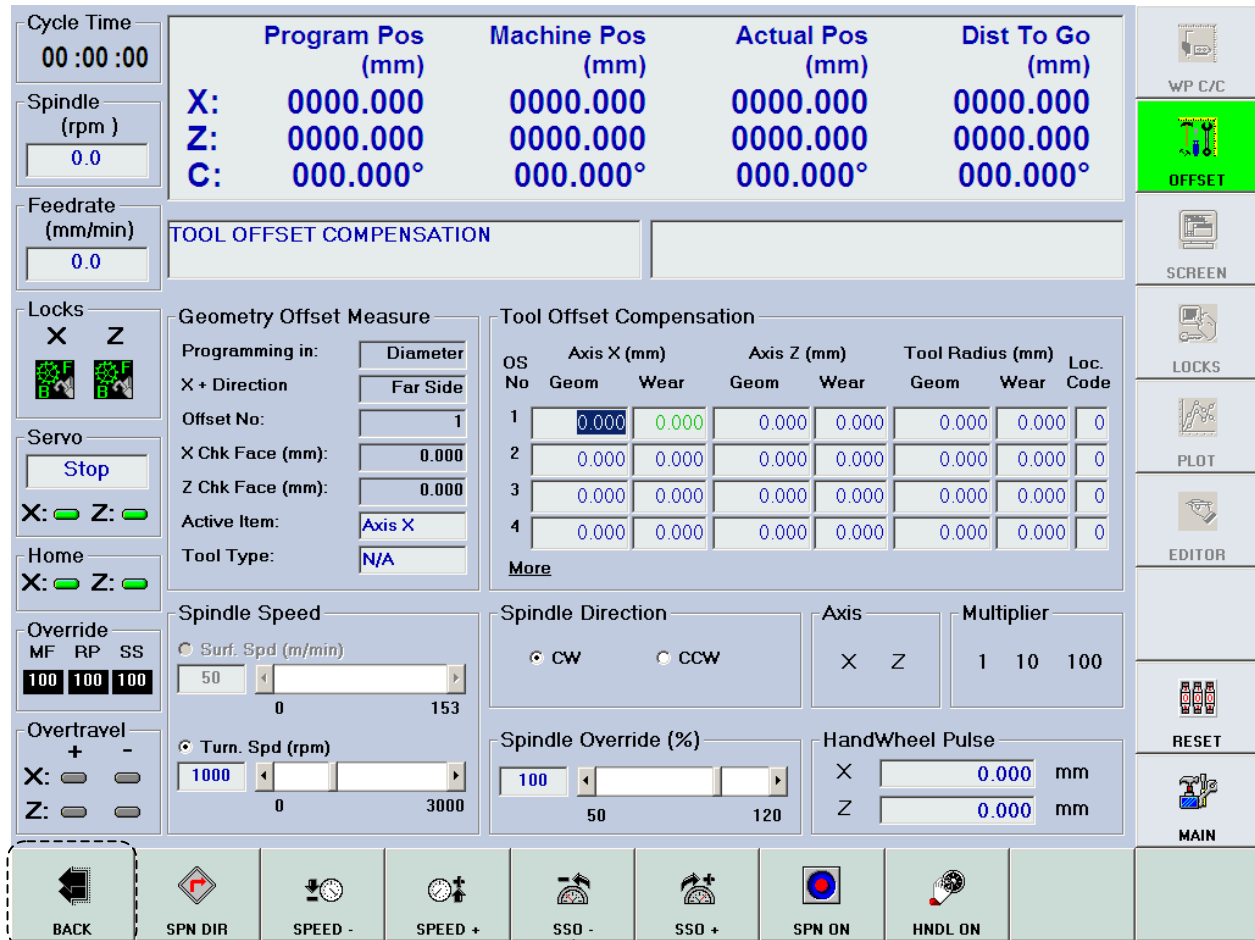
Cycle Time 00 :00 :00	Program Pos (mm)	Machine Pos (mm)	Actual Pos (mm)	Dist To Go (mm)	 WP C/C OFFSET SCREEN LOCKS PLOT EDITOR RESET MAIN APPLY																																																																																										
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Home X: Z:	X + Direction: Far Side	Axis X (mm)	Axis Z (mm)	Geom	Wear		<table border="1"> <thead> <tr> <th>OS No</th> <th>Geom</th> <th>Wear</th> <th>Geom</th> <th>Wear</th> <th>Geom</th> <th>Wear</th> <th>Loc. Code</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>2</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>3</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>4</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>5</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>6</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>7</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>8</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>9</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> <tr><td>10</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0</td></tr> </tbody> </table>	OS No	Geom	Wear	Geom	Wear	Geom	Wear	Loc. Code	1	0.000	0.000	0.000	0.000	0.000	0.000	0	2	0.000	0.000	0.000	0.000	0.000	0.000	0	3	0.000	0.000	0.000	0.000	0.000	0.000	0	4	0.000	0.000	0.000	0.000	0.000	0.000	0	5	0.000	0.000	0.000	0.000	0.000	0.000	0	6	0.000	0.000	0.000	0.000	0.000	0.000	0	7	0.000	0.000	0.000	0.000	0.000	0.000	0	8	0.000	0.000	0.000	0.000	0.000	0.000	0	9	0.000	0.000	0.000	0.000	0.000	0.000	0	10	0.000	0.000	0.000	0.000	0.000	0.000	0
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	Active Item: Axis X																																																																																														
	Tool Type: N/A																																																																																														

Bottom Toolbar #1 — Use this button to get to the second screen in Offset Mode

This button is only enabled if the "Tool Measurer" parameter in the "General" screen (see Figure 4-6) of Configuration Mode is enabled.

Figure 14-13: The Offset Mode Window (Screen 1 of 2)

There are two screens in Offset Mode. Press the  button to get to the second screen, shown in the following figure:



Bottom Toolbar #2 — Use this button to get to back to the first screen in Offset Mode


Figure 14-14: The Offset Mode Window (Screen 2 of 2)

14.7.3 Manually Setting Tool Offsets

14.7.3.1 Moving Between the Text Boxes

Moving between the text boxes is actually very simple. The selected text box is shown with a different color

background than the other text boxes. To move to a different text box, press the

, and  buttons on the bottom toolbar to move to the desired text box.





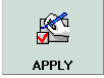
NOTE: If you have a mouse, you can click on the text box you want to select.

14.7.3.2 Changing Values in the Text Boxes

Once you have selected the text box whose value is to be changed, use your keypad or keyboard to type in the new value.


14.7.3.3 Saving Your Changes

In order to save your changes, you must press the  button on the bottom toolbar. This saves your changes into a registry file in the operating system.

 CAUTION	
Be careful: if you leave Offset Mode without pressing the  button, all of your changes will be lost, and you may or may not realize that your changes have not been saved.	

14.7.4 Inputting Part Dimensions and Gauge Template Thickness

In order for ServoWorks S-100T to have the correct data to automatically calculate tool geometry offsets, you must input the part dimensions and gauge template thickness as follows:

- 1) In Offset Mode, go to screen #1 shown in Figure 14-13. (Press the  button to get to the first screen).

- 2) Press the  button to make the “Part Dimension” and “Gauge Template Thickness” frames

appear. The  button toggles you between the two views shown in the following figure:

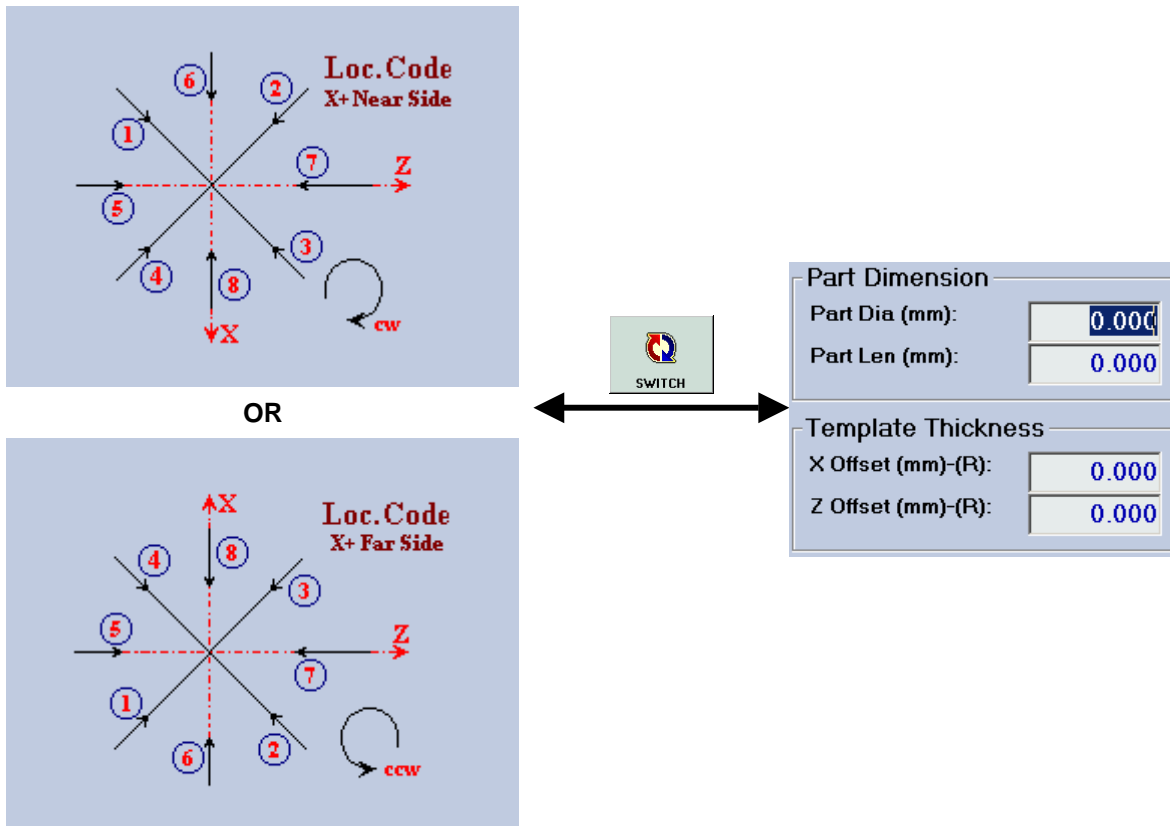


Figure 14-15: Switching Between Tool Location Code Diagram and Part Dimension and Gauge Template Thickness Frames

The location code refers to the direction/angle of the tool tip – the rough location of the tool.

- 3) Input the part dimensions where shown. You may want to use a thin template between the cutting tool and the part, to protect the part surface during measuring. If this is the case, input the gauge template thickness of that template. If you don't use a template, set the gauge template thickness to 0 0.000.

14.7.5 Automatically Setting Tool Geometry Offsets Using Touch Offs

ServoWorks S-100T has the ability to automatically calculate the tool geometry offsets for you, saving you a lot of time.


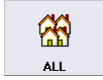





Usually the tool numbers (of the tools in the tool turret) are the same as the tool offset number. For example, tool offset number 1 would be for tool #1, and would be called in a part program with the code "T0101." However, it is not required that the tool code numbers be the same as the tool number. You can have tool number one corresponding to tool offset 21 (which would be called in a part program with the code "T0121."

NOTE: Whenever you use ServoWorks S-100T to automatically calculate geometry offsets, the wear offsets automatically reset to zero.

The easiest way to automatically set tool geometry offsets is to use the handwheel to touch off the tool to the part.

The following steps will guide you through automatically setting a tool geometry offset for the X and Z directions:


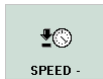

14.7.5.1 Starting the Process of Setting Tool Geometry Offsets


- 1) If you haven't already done a homing operation, press the  button on the bottom toolbar, then press the  button on the bottom toolbar to set all axes to their home positions. Press the  button to return to Main Mode (the  button should now be enabled).
- 2) Make sure the spindle is stopped. If it is not, press the  button on the bottom toolbar of ServoWorks S-100T main program window. You will then be in Spindle Mode. To stop the spindle rotation, press the  button on the right side of the bottom toolbar.
- 3) Make sure the collet is open. If the collet is closed, open it by pushing the "COLLET" button on the operator's panel.
- 4) Insert a raw material bar into your lathe. Then pull the bar out to the proper length (part length plus some allowance in the Z direction for skim-cutting).
- 5) Close the collet by pushing the "COLLET" button on the operator's panel. Now you have set up the tool offset with respect to the workpiece zero point.
- 6) Press the  button on the right toolbar of ServoWorks S-100T screen to get into Offset Mode. You will see the window shown in Figure 14-13.

14.7.5.2 Selecting the Tool Offset


- 1) To select the tool offset you want to calculate, click on (select) any text box for that tool offset number. For example, to enable Tool Offset #1, click on (select) any of the text boxes in Tool Offset #1.
- 2) Input the proper tool location codes for each tool offset number, based on tool direction / location of tool tip (angle of tool nose). (If Tool #1 has a direction of 3 – see Figure 14-15 – then its tool code would be 3.)

14.7.5.3 Starting the Spindle Rotation


- 1) Press the  button on the bottom toolbar to get to the second screen, shown in Figure 14-14.
- 2) Press the  button or the  button on the bottom toolbar to put the cursor in the input box of "Spindle Turning Speed." Type in the desired turning speed (for example, 1,000 RPMs).

NOTE: If you have a mouse, you can click on the "Spindle Turning Speed" text box, and type in it directly.
- 3) Press the  button on the bottom toolbar to select either "CW" (M03) or "CCW" (M04). Spindle direction should match the tool direction, or the way the tool is mounted.



NOTE: If you have a mouse, you can click on the preferred direction directly.


- 4) Press the  button to start the spindle rotation. This button will then appear highlighted

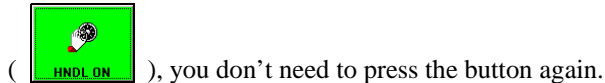


NOTE: If you have a mouse, you can click on the  button directly.

14.7.5.4 Turning on the HandWheel and Touching Off the Z and X Axes

- 1) Press the  button on the bottom toolbar to turn the handwheel on. This button will then appear highlighted (), to indicate that HandWheel Mode is enabled.

NOTE: If HandWheel Mode is already enabled, and the  button is already highlighted



- 2) If the HandWheel Axis Selection Switch on the HW-100 HandWheel (or other handwheel) is set to "OFF," turn it to one of the axes to turn the handwheel on.
- 3) Specify the Z axis by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1) to "Z" to select axis Z.
- 4) Use the Multiplier Selection Switch on the HW-100 HandWheel, (see Figure 12-1) to select one of three multipliers:
 - "1" indicates a multiplier of "1" which will be applied to the handwheel or incremental jog machine unit. If the machine unit is 0.001 mm and the multiplier is "1," then each click of the HandWheel Dial produces a movement of 0.001 mm.
 - "10" indicates a multiplier of "10" which will be applied to the handwheel or incremental jog machine unit. If the machine unit is 0.001 mm and the multiplier is "10," then each click of the HandWheel Dial produces a movement of 0.01 mm.
 - "100" indicates a multiplier of "100" which will be applied to the handwheel or incremental jog machine unit. If the machine unit is 0.001 mm and the multiplier is "100," then each click of the HandWheel Dial produces a movement of 0.10 mm.
- 5) Do a skim cut on the Z axis. A Z skim-cut is face cutting, which is used to measure the Z offset.

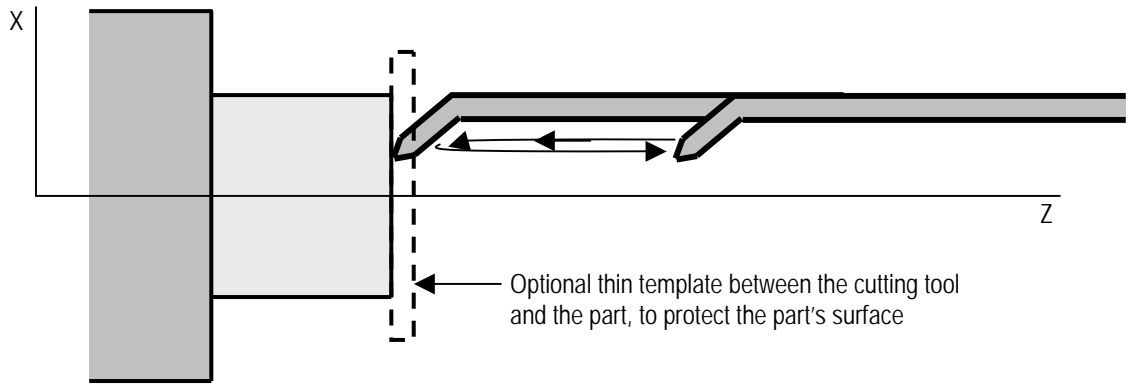




Figure 14-16: Touching Off to Set the Z Axis Geometry Offset


NOTE: After the skim cut is done, DO NOT MOVE THE Z AXIS.

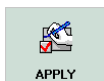
- 6) Now specify the X axis by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1)

to "X," or use the  on the bottom toolbar to select axis X. Then retract the X axis to a safe position.

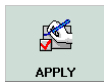
- 7) Press the  button to get to the first screen in Offset Mode.


- 8) Specify the Z axis again by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1) to "Z."

- 9) Press the  button to have the Z geometry offset internally calculated. You will see that the Z Geometry Offset data value is updated, and the Z Wear Offset data value is set to zero, for the tool offset number you specified in *Section 14.7.5.2: Selecting the Tool Offset*.


- 10) Press the  button on the bottom toolbar in order to save your changes. This saves your changes into a registry file in the operating system.

CAUTION

Be careful: if you leave Offset Mode without pressing the  button, all of your changes will be lost, and you may or may not realize that your changes have not been saved.

- 11) Press the  button on the bottom toolbar to get to the second screen, shown in Figure 14-14.

12) Specify the X axis by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1) to

“X,” or use the  on the bottom toolbar to select axis X.

13) Do a skim cut on the X axis. An X skim-cut is turn cutting, which is used to measure the X offset.

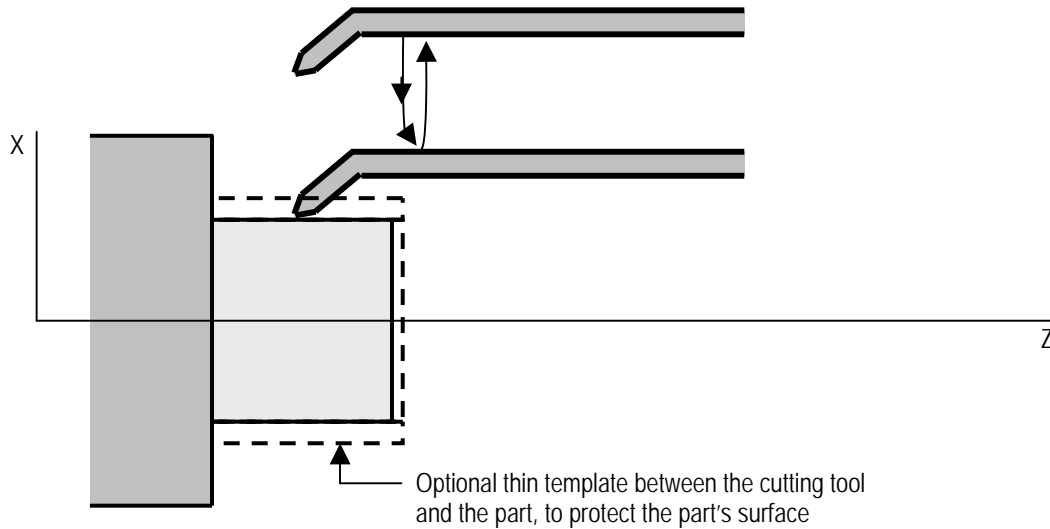





Figure 14-17: Touching Off to Set the X Axis Geometry Offset


NOTE: After the skim cut is done, do not move the X axis.


14) Now specify the Z axis by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1)


to “Z,” or use the  on the bottom toolbar to select axis Z. Then retract the Z axis to a safe position.

14.7.5.5 Finishing the Setting of the Tool Geometry Offsets


1) Stop the spindle rotation by pressing the  button on the bottom toolbar. This button will then appear gray ().


2) Press the  button to get to the first screen in Offset Mode.

3) Press the  button to on the bottom toolbar to make the “Part Dimension” and “Gauge Template


Thickness” frames appear. (The  button toggles you between the two views shown in Figure 14-15.)

- 4) Measure the part diameter (in inches) and type that data in the text frame labeled “Part Dia:”.
- 5) Specify the X axis by turning the Axis Selection Switch on the HW-100 HandWheel (see Figure 12-1) to

“X,” or use the  on the bottom toolbar to select axis X.

- 6) Press the  button to have the X geometry offset internally calculated based on the X axis position and the part diameter. You will see that the X Geometry Offset data value is updated, and the X Wear Offset data value is set to zero, for the tool offset number you specified in *Section 14.7.5.2: Selecting the Tool Offset*.

NOTE: If the “program measuring” parameter is set to “diameter,” the X offset data is shown as a diameter value. If the “program measuring” parameter is set to “radius,” the X offset data is shown as a radius value.


- 7) Press the  button on the bottom toolbar in order to save your changes. This saves your changes into a registry file in the operating system.

You must repeat the steps in Sections 14.7.5.2 through 14.7.5.5 for each tool / tool offset. However, since the workpiece zero point Z and the turning surface X have been set, you should do touch-offs instead of skim cutting for the X and Z axes. You will need to type the corresponding template thickness for each axis.

NOTE: The X offset of the gauge template should be radius (thickness) value.

14.7.6 Automatically Setting Tool Geometry Offsets Using Tool Measuring Sensors

In lieu of moving the tool to touch off the part (as described in *Section 14.7.5: Automatically Setting Tool Geometry Offsets Using Touch Offs*), you would use a tool measurer, and touch the part to the tool measurer sensors. The tool offset values are filled in automatically through PLC when the tool touches the measuring sensors.

Press the  button on the bottom toolbar to use the Auto Measurer feature while in Offset Mode.

14.7.7 Calculating Tool Wear Offsets

The easiest way to calculate tool wear offsets is to measure the parts your lathe is producing. The more often you recalculate tool wear offsets, the more accurate the parts you will cut.

For example: If the program was designed to create a part with a diameter of 1.000”, and it’s now producing parts that have a diameter of 1.002”, it’s off by 0.002” in diameter. Therefore, the tool wear offset is half of this difference, or 0.001”, for radius programming (or 0.002” for diameter programming).

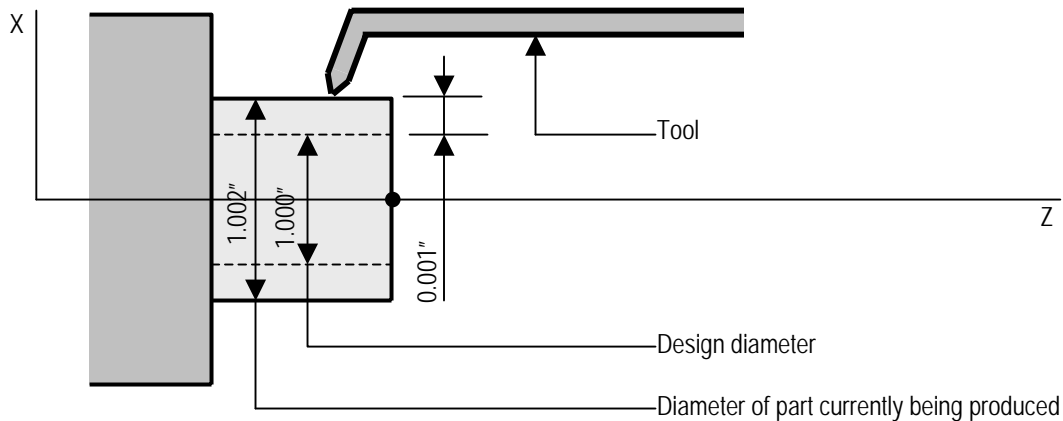


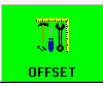


Figure 14-18: Calculating Tool Wear Offsets: Top View of a Lathe

14.7.8 Exiting Offset Mode

To exit Offset Mode (and get back to whatever mode you were in before pressing the  button), press the

 key on your panel PC, or press the  button again.

14.8 Setting the External Zero Offset and Workpiece Zero Point Offsets

14.8.1 What Is An External Zero Offset?

The external zero offset is the offset value of the external workpiece coordinate system used for shifting the machine origin, as shown in the following figure:

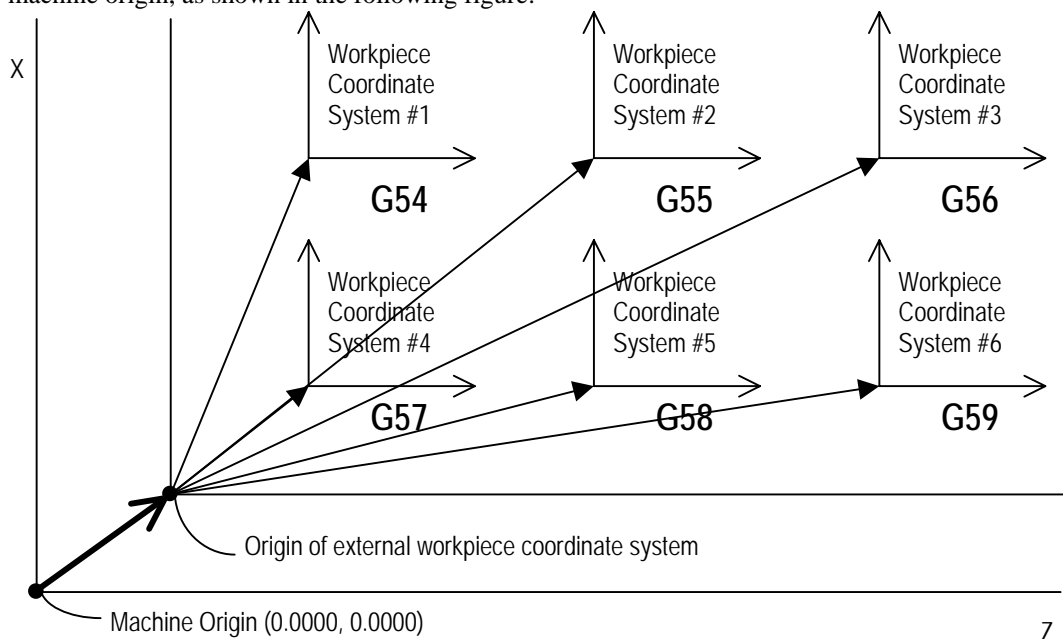


Figure 14-19: The External Workpiece Coordinate System


14.8.2 What Are Workpiece Zero Point Offsets (Workpiece Coordinates)?



Workpiece zero point offsets (workpiece coordinates) allow you to assign multiple part origins in one program, to produce a number of identical workpieces from one part program. You will need to set your workpiece coordinates before you run production. You should change your workpiece coordinates every time you open a new part program to run.


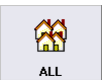
The workpiece coordinate systems are selectable with G codes G54 – G59 (which are called from within the part programs with no parameters – the parameters, or arguments, are taken from the settings in the Coordinates/Counter Mode Window).



14.8.3 Accessing the External Zero Offset and the Work Point Coordinates

To access the work point parameters, you must get into Coordinates/Counter Mode (a sub mode in ServoWorks

S-100T). To get into Coordinates/Counter Mode, press the  button on the right toolbar of ServoWorks S-100T screen. You will see the shown in Figure 14-20.

NOTE: If the  button is disabled (appears as ), it's probably because you have not set the home position for your axes. You must set the home position – see *Section 3.4: Performing a Homing Operation*.

[Press the  button on the bottom toolbar, then press the  button on the bottom toolbar to set all

axes to their home positions at the same time. Press the  button to return to Main Mode. The  button should now be enabled for you to select it.]

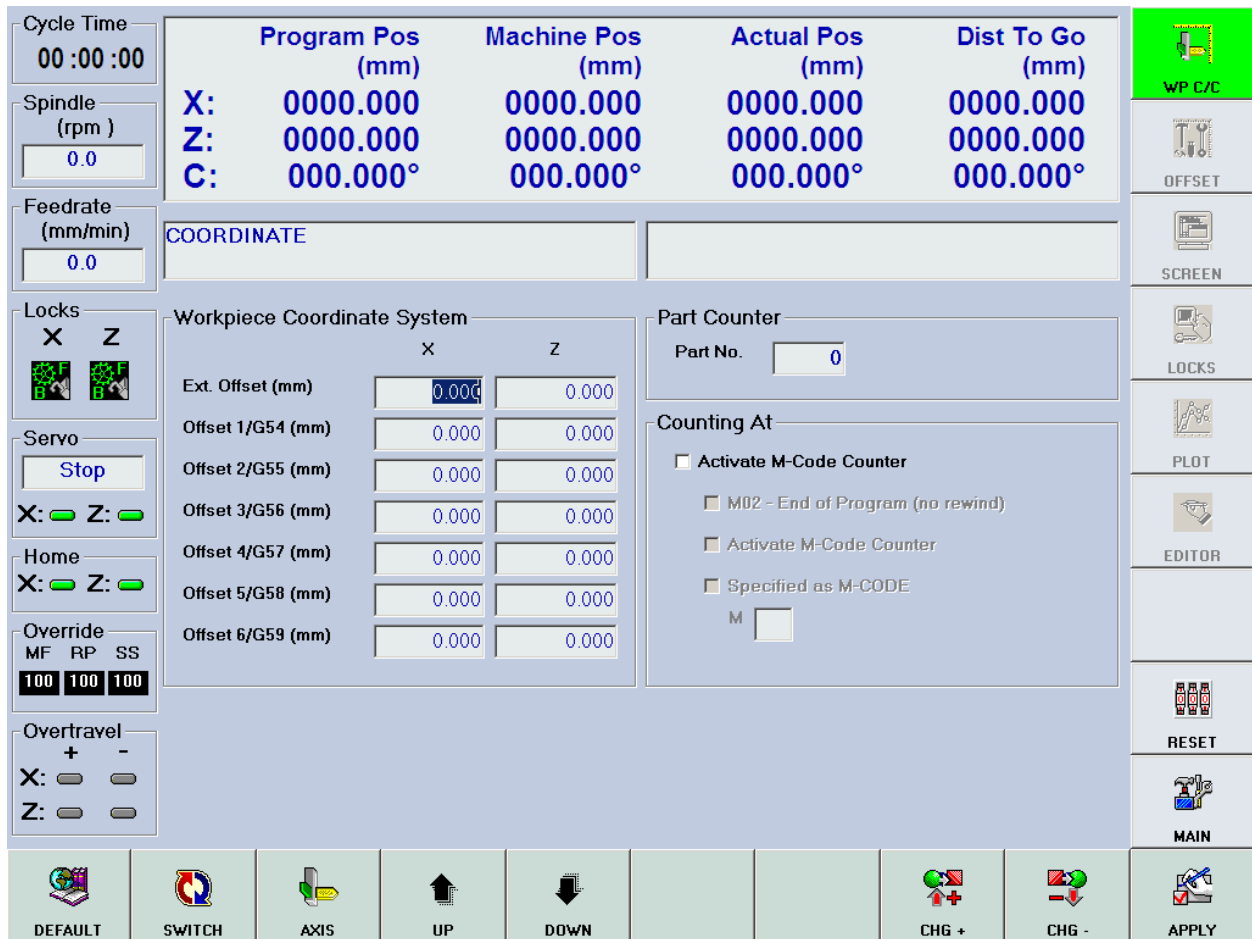




Figure 14-20: The Coordinates/Counter Mode Window




You may need to press the  to put the focus on the “Workpiece Coordinate System” frame. (The  button toggles you between the “Workpiece Coordinate System” frame and the “Part Counter” frame.)

If you don't want to use the external zero offset (you don't need an external workpiece coordinate system), make sure the values in these text boxes are “0.”

14.8.4 Selecting and Changing the Input for the Work Point Parameters


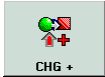
14.8.4.1 Moving Between the Text Boxes

Moving between the text boxes is actually very simple. The selected text box is shown with a different color

background than the other text boxes. To move up and down between text boxes, press the  and  buttons on the bottom toolbar to move in the desired direction. To move between the text boxes for the X and Z axes, press the  button.


NOTE: If you have a mouse, you can click on the text box you want to select.


14.8.4.2 Changing Values in the Text Boxes

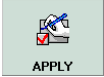
Once you have selected the text box whose value is to be changed, press the  and  buttons on the bottom toolbar to decrease and increase the value in the chosen text box. Holding down the function key for one of these buttons causes the value to change very quickly. Quick, individual key presses cause the value to decrease or increase by a value of "1" for each key press.

NOTE: If you have a mouse, you can type in the new value you want to input.


14.8.4.3 Saving Your Changes

In order to save your changes, you must press the  button on the bottom toolbar. This saves your changes into a registry file in the operating system.



 **CAUTION**

Be careful: if you leave the Coordinates/Counter Mode without pressing the  button, all of your changes will be lost, and you may or may not realize that your changes have not been saved.

14.8.4.4 Setting the Workpiece Coordinates Back to the Default Settings

To reset the tool offsets back to their default settings of 0.000, press the  button.

14.8.4.5 Exiting Coordinates/Counter Mode


To exit Coordinates/Counter Mode (and get back to whatever mode you were in before pressing the button), press the  key, or press the  button again.








14.9 Setting the Part Counter Options


14.9.1 Accessing the Part Counter Frames



To access the part counter options, you must get into Coordinates/Counter Mode (a sub mode in ServoWorks

S-100T). To get into Coordinates/Counter Mode, press the  button on the right toolbar of ServoWorks S-100T screen. You will see the shown in Figure 14-20.

NOTE: If the  button is disabled (appears as ), it's probably because you have not set the home position for your axes. You must set the home position – see *Section 3.4: Performing a Homing Operation*.

[Press the  button on the bottom toolbar, then press the  button on the bottom toolbar to set all four axes to their home positions at the same time. Press the  button to return to Main Mode. The

 button should now be enabled for you to select it.]

You may need to press the  to put the focus on the “Part Counter” frame. (The  button toggles you between the “Workpiece Coordinate System” frame and the “Part Counter” frame.)

14.9.2 Specifying Counter Options

You should specify a number for the part counter to count from. You can also activate an M code counter, instead of a part code counter. You can count how many times the M02 code is executed, or the M30 code is executed, or you can specify some other M code to be counted.

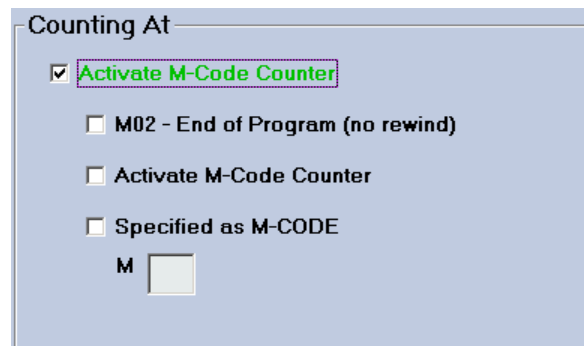



Figure 14-21: Counting At Frame (M Code Counter Options)


In order to save your changes, you must press the



button on the bottom toolbar. This saves your changes into a registry file in the operating system.

 **CAUTION**

Be careful: if you leave the Coordinates/Counter Mode without pressing the





button, all of your changes will be lost, and you may or may not realize that your changes have not been saved.

14.9.3 Exiting Counter/Coordinates Mode

To exit Coordinates/Counter Mode (and get back to whatever mode you were in before pressing the



button), press the  key, or press the  button again.

14.10 Running Production

14.10.1 Production Run Checklist

Before you start a production run, you should make sure of the following:

- Your part program file is loaded, and you have proved the program
- You have set the operation support function switches (Dry Run, Optional Skip, Optional Stop, Single Block and MST Codes Lock)
- You have set the feed override percentage and rapid override percentage to the desired settings
- You have set the general parameters (unit of measurement, program measuring) in Configuration Mode
- You have set your Auto Plot parameters (in Configuration Mode) to the correct part size for the part program you will be running, so that your plot displays correctly
- You have set your tool offsets
- You have set your work coordinates
- You have set your part counters

14.10.2 Executing a Part Program

To start the execution of a part program, press the




button on the bottom toolbar. During execution, the line of code being executed is highlighted and appears with an asterisk beside it.



To stop the part program execution, press the  button on the bottom toolbar. The operation will be suspended immediately.

When you have stopped the execution of a part program, you can continue from where you left off by pressing the



 button again. The program will start again from where it left off (the current, highlighted block).


Or, you can restart the program from the beginning, which is explained in the next section.

14.10.3 Rewinding or Fast Forwarding a Part Program


At any time, you can restart a part program from the beginning of the program or you can rewind or fast forward to begin execution from some specified block number. Restarting the program also resets the modal codes to the default modal codes, cancels the local coordinate system, and resets the Cycle Time to 0:00:00.

To restart the program from the beginning (the first line of code):



- 1) Press the  button on the bottom toolbar. The buttons on the bottom toolbar will change.



- 2) Press the  button. The “Program FF/BW” frame will show the “Rewind Program” selected, as shown in the following figure:

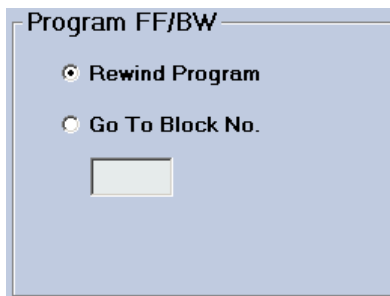
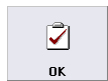
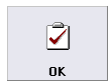


Figure 14-22: Program FF/BW Frame (1 of 2)




- 3) Press the  button on the bottom toolbar. This will set the first line of your program as the current line (the line that will execute once you resume operations). This also resets the Cycle Time to 0:00:00.




- 4) To restart the program, press the  button on the bottom toolbar.

To start the program from a specific line of code (either rewinding back to a specific line of code or fast forwarding ahead to a specific line of code):



- 1) Press the  button on the bottom toolbar. The buttons on the bottom toolbar will change.

- 2) Press the  button. The “Program FF/BW” frame will show the “Go To Block No.” selected, as shown in the following figure:

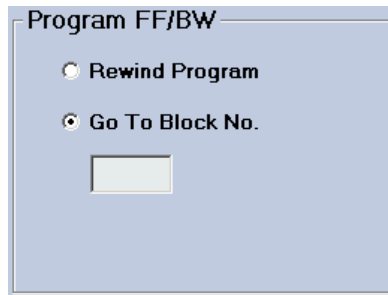



Figure 14-23: Program FF/BW Frame (2 of 2)

- 3) Type in a block number in the text box in the “Program FF/BW” frame.

- 4) Press the  button on the bottom toolbar. This will set the first line of your program to be the line you specified in the “Program FF/BW” frame (the line that will execute once you resume operations). This also resets the Cycle Time to 0:00:00.

NOTE: If you type in a block number that doesn't exist, you will get the following error message:

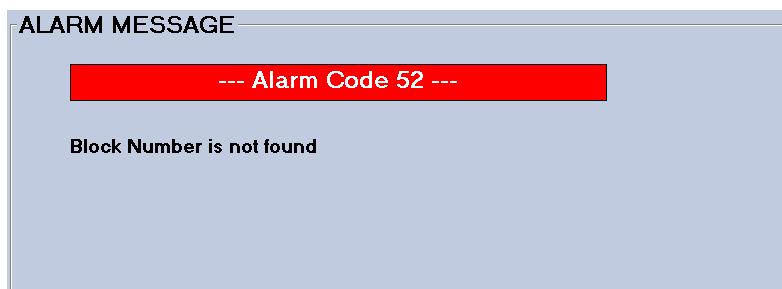





Figure 14-24: ALARM MESSAGE: Alarm Code 52

You will need to press the  button to acknowledge and erase this message.

14.11 Exiting Auto Mode

To exit Auto Mode, either press the  key or press the  button on the bottom toolbar. If you had used Auto Mode to run a part program file, you will see the following dialog box appear:

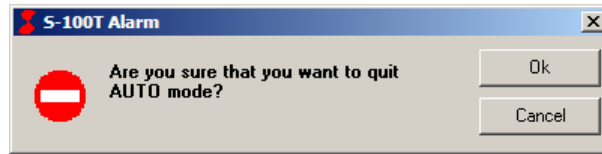





Figure 14-25: Confirmation Dialog Box for Exiting Auto Mode

Press the  button on the bottom toolbar to confirm that you want to exit Auto Mode.

NOTE: If you have changed your mind about exiting Auto Mode, press the  button on the bottom toolbar.

Chapter 15: Exiting ServoWorks S-100T

15.1 Exiting from Main Mode

To exit ServoWorks S-100T from Main Mode, you must press the  key on your panel PC (if you are using a panel PC) or the “Esc” key on your keyboard (if you are using a keyboard).

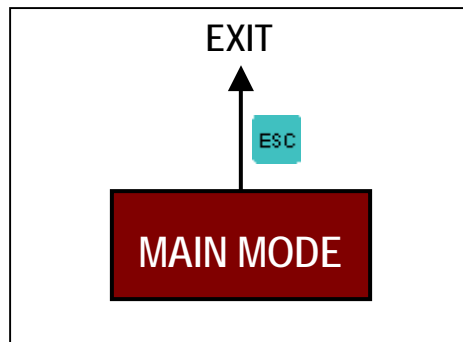


Figure 15-1: Exiting from Main Mode

When you give the command to exit, a dialog box will appear, as shown in the following figure.

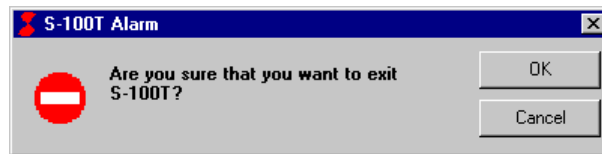





Figure 15-2: Dialog Box to Confirm Exiting ServoWorks S-100T

Press the  button to exit, or press the  button if you decide that you don't want to exit.

NOTE: If you have selected “Quit S-100T and shut down PC” from the “General” screen of Configuration Mode, exiting ServoWorks S-100T will also invoke the shut down process for your PC.

15.2 Exiting from an Operational Mode

If you are in an operational mode, you should stop all motion, then press the  button to get to Main Mode, and then press the  key on your panel PC (if you are using a panel PC) or the “Esc” key on your keyboard (if you are using a keyboard) to exit.

Alternatively, if you are in an operational mode, you can press the  key on your panel PC twice (if you are using a panel PC) or the “Esc” key on your keyboard twice (if you are using a keyboard). The first press of the “Esc” key takes you to Main Mode, the second press causes ServoWorks S-100T to exit.

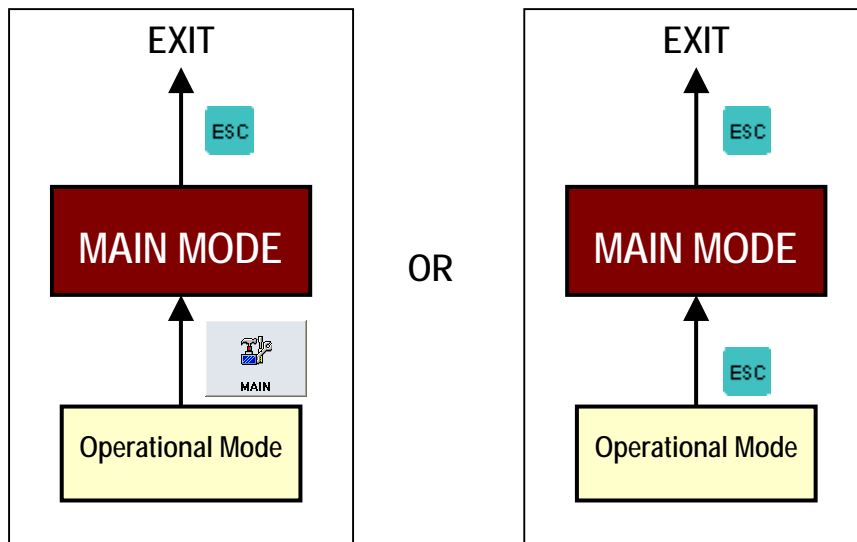

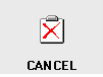




Figure 15-3: Exiting from an Operational Mode


When you give the command to exit, a dialog box will appear, as shown in Figure 15-2. Press the  button to exit, or press the  button if you decide that you don't want to exit.

NOTE: If you have selected “Quit S-100T and shut down PC” from the “General” screen of Configuration Mode, exiting ServoWorks S-100T will also invoke the shut down process for your PC.

15.3 Exiting from a Sub Mode

15.3.1 If You Entered the Sub Mode From Main Mode

You can press the  button or press the sub button again to get to Main Mode, and then press the  key on your panel PC (if you are using a panel PC) or the “Esc” key on your keyboard (if you are using a keyboard) to exit ServoWorks S-100T.

Alternatively, you can press the  key on your panel PC twice (if you are using a panel PC) or the “Esc” key on your keyboard twice (if you are using a keyboard). The first press of the “Esc” key takes you to Main Mode, the second press causes ServoWorks S-100T to exit.

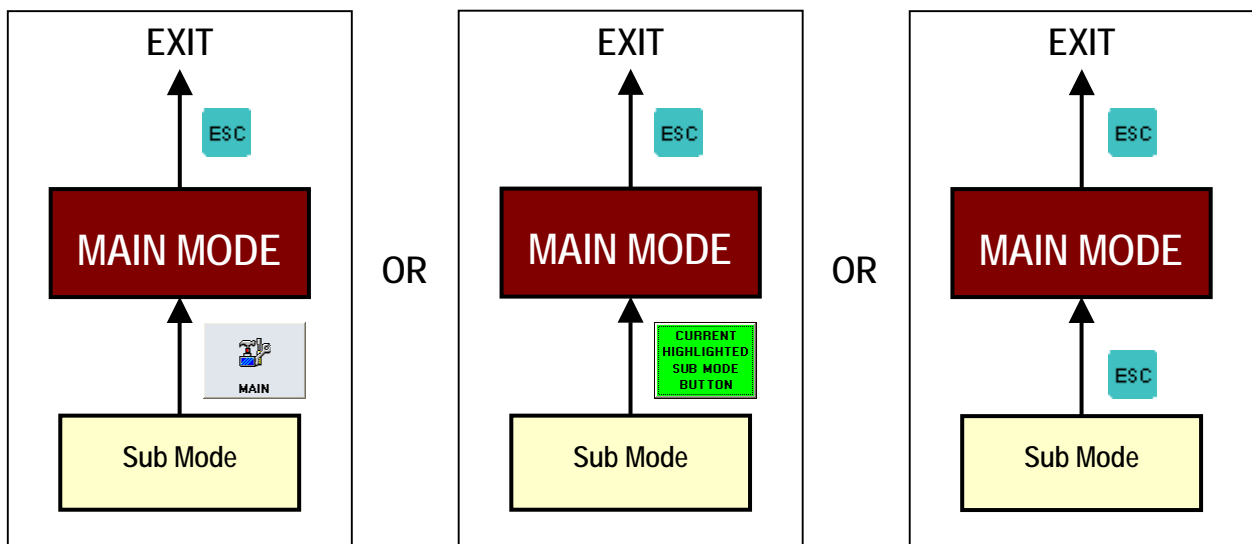






Figure 15-4: Exiting from a Sub Mode – Option #1


When you give the command to exit, a dialog box will appear, as shown in Figure 15-2. Press the  button

to exit, or press the  button if you decide that you don't want to exit.

NOTE: If you have selected “Quit S-100T and shut down PC” from the “General” screen of Configuration Mode, exiting ServoWorks S-100T will also invoke the shut down process for your PC.

15.3.2 If You Entered the Sub Mode From An Operational Mode

You must make sure no motion is occurring, then press the  button to get to Main Mode, and then press the  key on your panel PC (if you are using a panel PC) or the “Esc” key on your keyboard (if you are using a keyboard) to exit ServoWorks S-100T.

Alternatively, you can press the  key on your panel PC three times (if you are using a panel PC) or the “Esc” key on your keyboard three times (if you are using a keyboard). The first press of the “Esc” key takes you to the operational mode from which you entered the sub mode; the second press of the “Esc” key takes you to Main Mode; and the third press causes ServoWorks S-100T to exit.

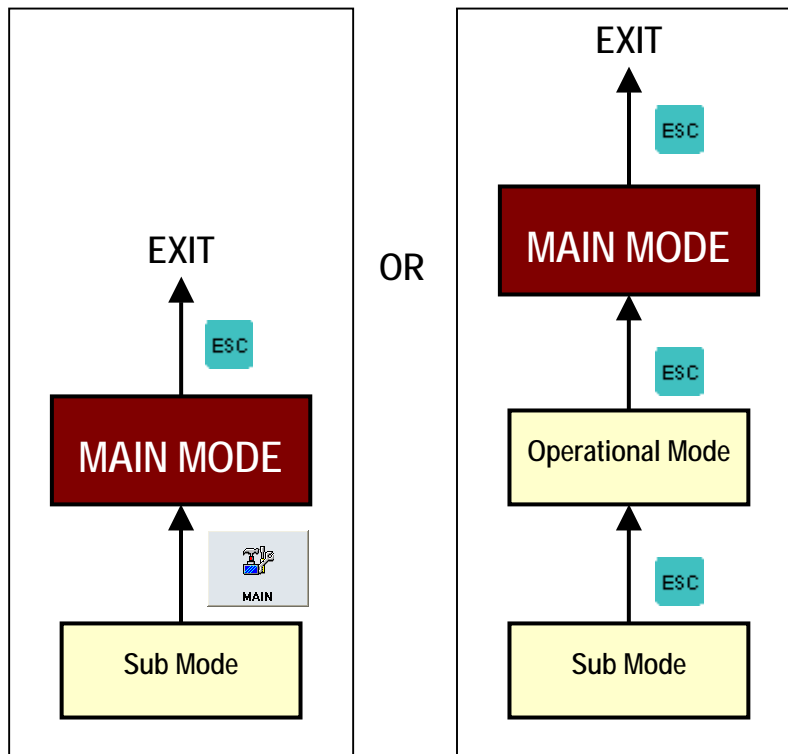

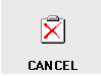


Figure 15-5: Exiting from a Sub Mode – Option #2

When you give the command to exit, a dialog box will appear, as shown in Figure 15-2. Press the  button to exit, or press the  button if you decide that you don't want to exit.

NOTE: If you have selected “Quit S-100T and shut down PC” from the “General” screen of Configuration Mode, exiting ServoWorks S-100T will also invoke the shut down process for your PC.

Chapter 16: Troubleshooting

While using ServoWorks S-100T, it is possible that you may come across some problems. Several common scenarios are listed here, with tips on how to solve the difficulty.

16.1 Resetting ServoWorks S-100T If E-STOP Is Activated

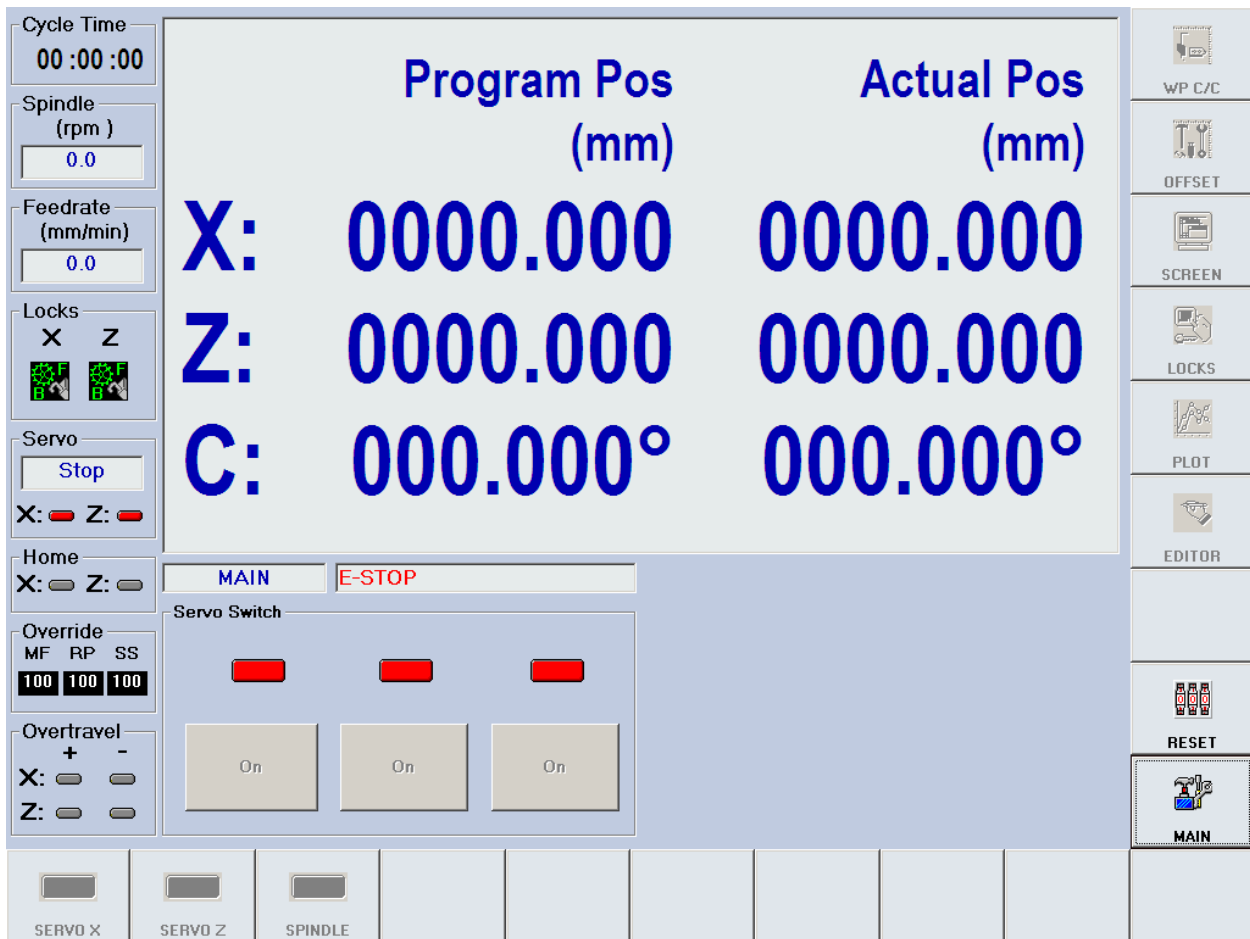



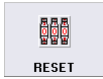


Figure 16-1: Window Showing Alarms When E-STOP Has Been Activated

Use the  button if the computer behaves unexpectedly. The  button does the following:

- Resets all variables back to their default values.
- Clears memory, clears internal control flags or status, clears alarms (and alarm signals).
- If the spindle is running before you press the  button, then the spindle will be stopped.

- All the servo / spindle drives will be off, regardless of whether or not they were on before pressing the



button.



Then you need to turn each servo drive on, by clicking the “ON” button () for each drive, or clicking on any or all of the buttons on the bottom toolbar:

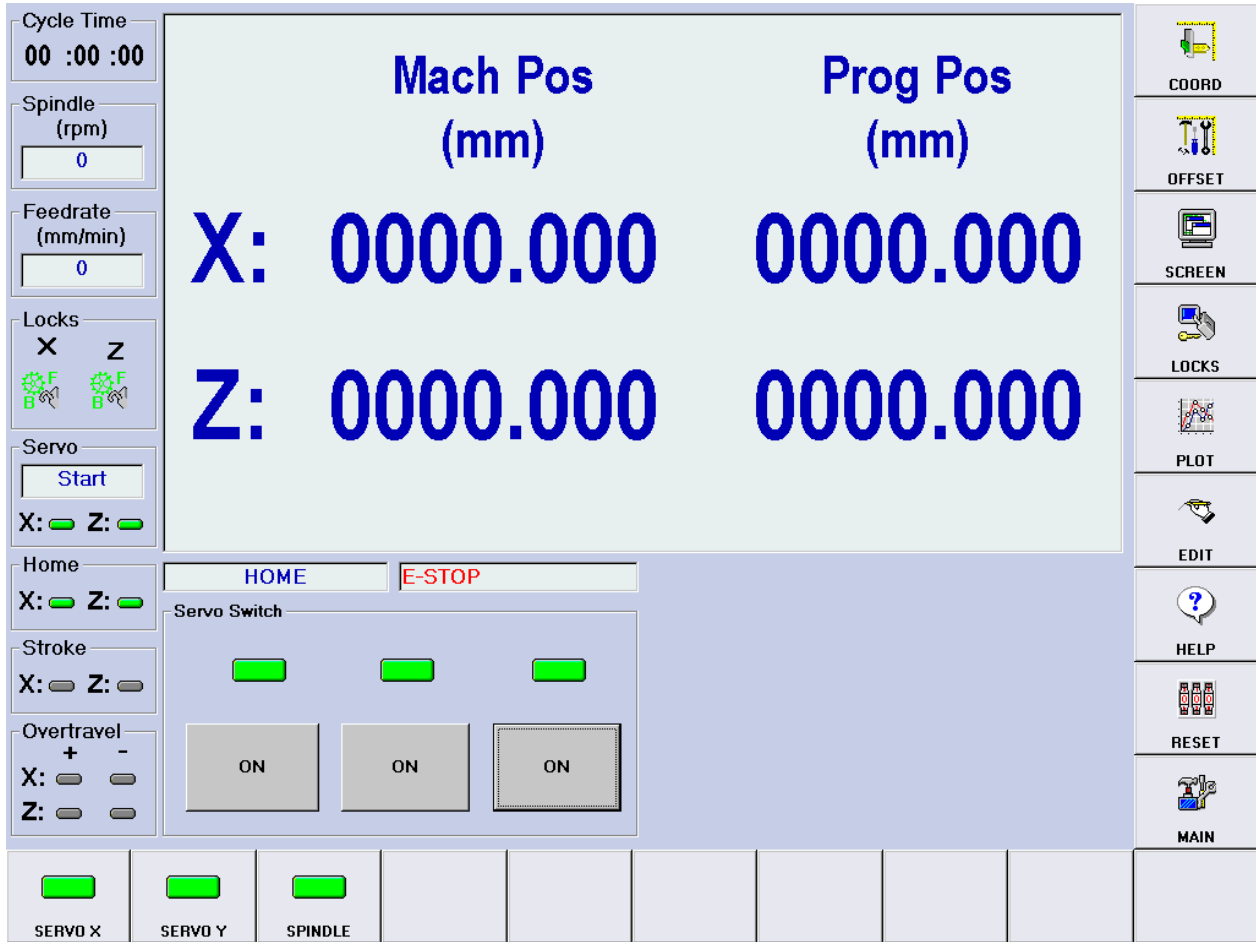


Figure 16-2: Window Showing Servo Drive Controls

16.2 Using the Flight Recorder for Debugging

ServoWorks S-100T provides a flight recorder function to use in debugging, and determining why an Emergency Stop has occurred.

When an Emergency Stop is triggered, ServoWorks S-100T will save the last 20 seconds of data (prior to the Emergency Stop) to the hard drive at C:\Program Files\SoftServo\ServoWorks S-100T\data\default, as shown:

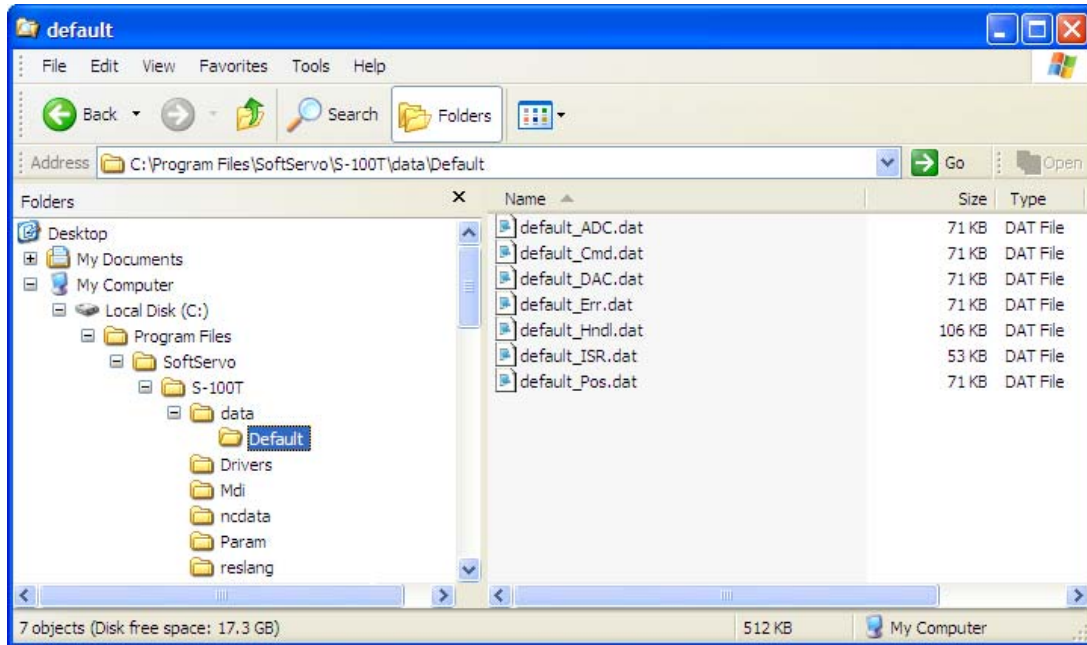


Figure 16-3: Flight Recorder Files in Default Data Folder

The data is saved in seven files, for the last 20 seconds of information related to:

- Analog to Digital Conversion (ADC)
- Position command data
- Digital to Analog Conversion (DAC)
- Position error
- Handwheel data
- The Interrupt Service Routine (ISR)
- Position feedback (actual position)

For an ISR of 1 millisecond (like the VersioBus interface system), this results in 20,000 values for each data type.

These files can be sent to Soft Servo Systems, Inc. for debugging.

A sample data file for the ISR follows:

ISR Count	ISR Duration	ISR Interval
50	101.500	0.000
51	99.800	999.200
52	99.000	1000.000
53	99.800	1000.000
54	100.700	1000.800
55	106.500	1000.900
56	99.800	998.300
57	104.000	1000.000
58	99.800	1000.000
59	100.700	1000.800
60	99.800	999.200
61	99.800	1000.000
62	99.000	1000.000
63	99.800	1000.000
64	99.000	1000.000
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
1144	100.700	1000.000
1145	107.400	1000.000
1146	100.700	1000.000
1147	109.100	1002.500

Abnormal ISR samples:
 ISR Count: 1238 Interval: 1650.200

VersioBus DC module timeout: None
 VersioBus IM module timeout: None

Figure 16-4: Sample default_ISR.dat File

16.3 If the Homing Operation Does Not Seem to Work....

If Home Mode does not seem to work (does not set the axes to their home positions), it could be that the “position loop gain” is too small, and needs to be reset.

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