Model 793.00 System Software

User Information and Software Reference

100-068-917 D

Copyright information

Trademark information

Software verification and validation

MTS software is developed using established quality practices in accordance with the requirements detailed in the ISO 9001 standards. Because MTS authored software is delivered in binary format, it is not user accessible. This software will not change over time. Many releases are written to be backwards compatible, creating another form of verification.

The status and validity of MTS' operating software is also checked during system verification and routine calibration of MTS hardware. These controlled calibration processes compare the final test results after statistical analysis against the predicted response of the calibration standards. With these established methods, MTS assures its customers that MTS products meet MTS' exacting quality standards when initially installed and will continue to perform as intended over time.

Publication information

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Preface

Safety first!

Before you attempt to use your MTS product or system, read and understand the *Safety* manual. Like an automobile, your test system is very useful—but if misused, it is capable of deadly force. You should always maintain a healthy respect for it.

Improper installation, operation, or maintenance of MTS equipment in your test system can result in hazardous conditions that can cause severe personal injury or death, and damage to your equipment and specimen. Again, read and understand the *Safety* manual before you continue. It is very important that you remain aware of hazards that apply to your system.

Other MTS manuals

In addition to this manual, you may receive additional MTS manuals in paper or electronic form.

If you have purchased a test system, it may include an *MTS System Documentation CD*. This CD contains an electronic copy of all MTS manuals that pertain to your test system, including controller manuals, hydraulic and mechanical component manuals, assembly drawings and parts lists, and operation and preventive maintenance manuals.

Contents

Conventions

The following paragraphs describe some of the conventions that are used in your MTS manuals.

Hazard conventions

As necessary, hazard notices may be embedded in this manual. These notices contain safety information that is specific to the task to be performed. Hazard notices immediately precede the step or procedure that may lead to an associated hazard. Read all hazard notices carefully and follow the directions that are given. Three different levels of hazard notices may appear in your manuals. Following are examples of all three levels.

Note *For general safety information, see the Safety manual included with your system.*

Danger notices

Danger notices indicate the presence of a hazard which *will* cause severe personal injury, death, or substantial property damage if the danger is ignored. For example:

DANGER

High intensity light and dangerous radiation are emitted by class 3B lasers.

Viewing a class 3b laser directly or viewing it using optical instruments will cause immediate and severe injury.

Avoid eye or skin exposure to the laser beam. Ensure that all power to the laser is off before attempting any maintenance, service, or adjustment procedures.

Warning notices

Warning notices indicate the presence of a hazard which *can* cause severe personal injury, death, or substantial property damage if the warning is ignored. For example:

WARNING

Hazardous fumes can accumulate in the test chamber as a result of testing.

Breathing hazardous fumes can cause nausea, fainting, or death.

Ensure that the chamber is properly ventilated before you open the chamber door or put your head or hands into the chamber. To do this, ensure that the temperature controller is off and allow sufficient time for the ventilation system to completely exchange the atmosphere within the chamber.

Caution notices

Caution notices indicate the presence of a hazard which *will* or *can* cause minor personal injury, cause minor equipment damage, or endanger test integrity if the caution is ignored. For example:

CAUTION

This specimen can develop sharp edges as a result of testing.

Handling the specimen with unprotected hands can result in cuts and slivers.

Always wear protective gloves when you handle the specimen.

Other conventions

Other conventions used in your manuals are described below:

Notes

Notes provide additional information about operating your system or highlight easily overlooked items. For example:

Note *Resources that are put back on the hardware lists show up at the end of the list.*

Special terms

The first occurrence of special terms is shown in *italics*.

Illustrations

Illustrations appear in this manual to clarify text. It is important for you to be aware that these illustrations are examples only and do not necessarily represent your actual system configuration, test application, or software.

Electronic manual conventions

This manual is available as an electronic document in the Portable Document File (PDF) format. It can be viewed on any computer that has Adobe Acrobat Reader installed.

Hypertext links

The electronic document has many hypertext links displayed in a blue font. All blue words in the body text, along with all contents entries and index page numbers are hypertext links. When you click a hypertext link, the application jumps to the corresponding topic.

Technical Support

Start with your manuals

The manuals supplied by MTS provide most of the information you need to use and maintain your equipment. If your equipment includes MTS software, look for README files that contain additional product information.

If you cannot find answers to your technical questions from these sources, you can use the internet, telephone, or fax to contact MTS for assistance. You can also fill out the Problem Submittal Form that is available on the MTS web site and in the back of many MTS manuals that are distributed in paper form.

Technical support numbers

MTS provides a full range of support services after your system is installed. If you have any questions about a system or product, contact MTS in one of the following ways.

MTS web site www.mts.com

The MTS web site gives you access to our technical support staff by means of a Problem Submittal Form and a Technical Support link.

- Problem Submittal Form:
  www.mts.com > Contact MTS > Problem Submittal Form
- Technical Support:
  www.mts.com > Contact MTS > Technical Support

E-mail:

info@mts.com

Telephone

HELPLine 800-328-2255
Weekdays 7:00 A.M. to 6:00 P.M.,
Central Time

Fax

952-937-4515
Please include an MTS contact name if possible.

Before you contact MTS

MTS can help you more efficiently if you have the following information available when you contact us for support.

Know your site number and system number

The site number contains your company number and identifies your equipment type (material testing, simulation, and so forth). The number is usually written on a label on your MTS equipment before the system leaves MTS. If you do not have or do not know your MTS site number, contact your MTS sales engineer.

Example site number: 571167

When you have more than one MTS system, the system number identifies which system you are calling about. You can find your job number in the papers sent to you when you ordered your system.

Example system number: US1.42460

Know information from prior technical assistance

If you have contacted MTS about this problem before, we can recall your file. You will need to tell us the:

- MTS notification number
- Name of the person who helped you

Identify the problem

Describe the problem you are experiencing and know the answers to the following questions.

- How long has the problem been occurring?
- Can you reproduce the problem?
- Were any hardware or software changes made to the system before the problem started?
- What are the model and serial numbers of the suspect equipment?

Know relevant computer information

If you are experiencing a computer problem, have the following information available.

- Manufacturer's name and model number
- Operating software type and service patch information. Examples:
  - Windows XP Service Pack 1 (SP1)
  - Windows 2000 Service Pack 3 (SP3)
  - Windows NT 4.0 Service Pack 7 (SP7)
- Amount of system memory. Example: 640 MB of RAM.
- Amount of free space on the hard drive in which the application resides. Example: 11.2 GB free space, or 72% free space.
- Current status of hard-drive fragmentation. Example: 3% total fragmentation.

Know relevant software information

For software application problems, have the following information available.

- The software application's name, version number, build number, and if available, software patch number. This information is displayed briefly when you launch the application, and can typically be found in the "About" selection in the "Help" menu.

  Example: Station Manager, Version 3.3A, Build 1190, Patch 4
- It is also helpful if the names of other non-MTS applications that are running on your computer, such as screen savers, keyboard enhancers, print spoolers, and so forth are known and available.

If you contact MTS by phone

Your call will be registered by a HELPLine agent if you are calling within the United States or Canada. Before connecting you with a technical support specialist, your agent will ask you for your site number, name, company, company address, and the phone number where you can normally be reached.

Identify system type

To assist your HELPLine agent with connecting you to the most qualified technical support specialist available, identify your system as one of the following types:

- Electromechanical materials test system
- Hydromechanical materials test system
- Vehicles test system
- Vehicles component test system
- Aero test system

Be prepared to troubleshoot

Prepare yourself for troubleshooting while on the phone.

- Call from a telephone close to the system so that you can try implementing suggestions made over the phone.
- Have the original operating and application software media available.
- If you are not familiar with all aspects of the equipment operation, have an experienced user nearby to assist you.

Write down relevant information

Prepare yourself in case we need to call you back.

- Remember to ask for the notification number.
- Record the name of the person who helped you.
- Write down any specific instructions to be followed, such as data recording or performance monitoring.

After you call

MTS logs and tracks all calls to ensure that you receive assistance and that action is taken regarding your problem or request. If you have questions about the status of your problem or have additional information to report, please contact MTS again.

Problem Submittal Form in MTS manuals

In addition to the Problem Submittal Form on the MTS web site, there is also a paper version of this form (postage paid) in the back of many MTS manuals. Use this form to communicate problems you are experiencing with your MTS software, hardware, manuals, or service. This form includes check boxes that allow you to indicate the urgency of your problem and your expectation of an acceptable response time. We guarantee a timely response—your feedback is important to us.

Chapter 1

Introduction

Model 793.00 System Software is a bundle of applications that perform various test activities for the following MTS Controllers: TestStar™ IIs, TestStar™ IIm, TestStar™ IIs AP, FlexTest™ IIm, FlexTest™ GT, FlexTest™ II CTC, FlexTest™ II CTM, and FlexTest™ SE.

Standard applications

The Model 793.00 System Software bundle consists of the following standard applications:

- **Station Builder**™—A station design application. This application allows you to allocate controller resources, such as valve drivers and conditioners, to station configuration files.
- **Station Manager**™—A sophisticated controller application. This application maintains station servo control, and allows you to perform typical test operations, such as:
  - Monitor station interlocks and control hydraulic or electromechanical station power.
  - Optimize and monitor the various analog and digital signals sent to and from your controller.
  - Run, hold, and stop tests.
  - Create parameter sets that define the operational characteristics, such as sensor ranges and conditioner gains, of the station resources in your station configuration files.
- **Basic TestWare**®—A simple test design application. This application allows you to create simple monotonic and cyclic tests and to acquire data.
- **Station Desktop Organizer**—An application management utility. This utility allows you to manage the windows and displays associated with Series 793 software applications. This utility is useful for reducing screen clutter when you work with multiple stations simultaneously.

Options

The following products are available as options with the Model 793.00 System Software bundle:

- **Model 793.10 MultiPurpose TestWare® (MPT)—**A sophisticated test design application. This application allows you to build test procedures by defining and linking modular test activities together and assigning triggering relationships between each activity.

  Note *MPT is standard with FlexTest IIm and FlexTest CTM systems.*

- **Model 793.11 Profile Editor™—**A sophisticated arbitrary waveform design application. This application allows you to create arbitrary waveforms that can be played-out with the MultiPurpose TestWare application.
- **Model 793.12 Trend Process and Trend Monitoring**—A specialized analysis application designed for use with MPT that allows you to monitor trend data that has been recorded in real time.
- **Model 793.14 Fatigue Process and Fatigue Monitoring**—A specialized analysis application that allows you to monitor fatigue data that has been recorded in real time.
- **Remote Setpoint Adjust**—An enhancement that allows you to use one or more encoders on a station to control the setpoints of control channels (available for FlexTest IIm, FlexTest II CTC, and FlexTest GT only).
- Other Series 793 applications as available.

About System Performance

The following table illustrates typical system performance values for various station/channel configurations of MTS FlexTest and TestStar Controllers:

System Rates[1]

Controller	Number of Potential Stations	Number of Potential Control Channels	System Rate (Hz)
FlexTest SE	1	1	2048
FlexTest SE[2]	1	2	6144
TestStar IIs	1	1	6144
TestStar IIm	4	3 - 4	4096
TestStar IIm	4	5 - 8	2048
TestStar IIm	2	2	6144
FlexTest IIm	4	16	1024
FlexTest GT	4	5 - 8	2048
FlexTest GT	4	3 - 4	4096
FlexTest GT	2	2	6144
FlexTest II CTC	4	4	4096
FlexTest II CTM	4	8	2048
FlexTest II CTM	4	16	1024

1. System performance is based on MTS Model 498.96 processor boards. Factors that adversely affect data acquisition rates include host computer processor speed, controller processor speed, the number of readouts displayed, and the number of channels of data acquisition.

2. Applies only to FlexTest SE Controllers equipped with MTS Model 498.96-1B/2B processor boards.

RPC Sampling Rates

For RPC systems, as the selected system rate decreases, addition sampling rates are available. The following table illustrates this relationship.

RPC Sampling Rates

SYSTEM RATE	SAMPLING RATES						
4096		204.8	409.6	512	1024	2048	
2048	102.4	204.8	409.6	512	1024	2048	
1024	102.4	128	204.8	256	409.6	512	1024

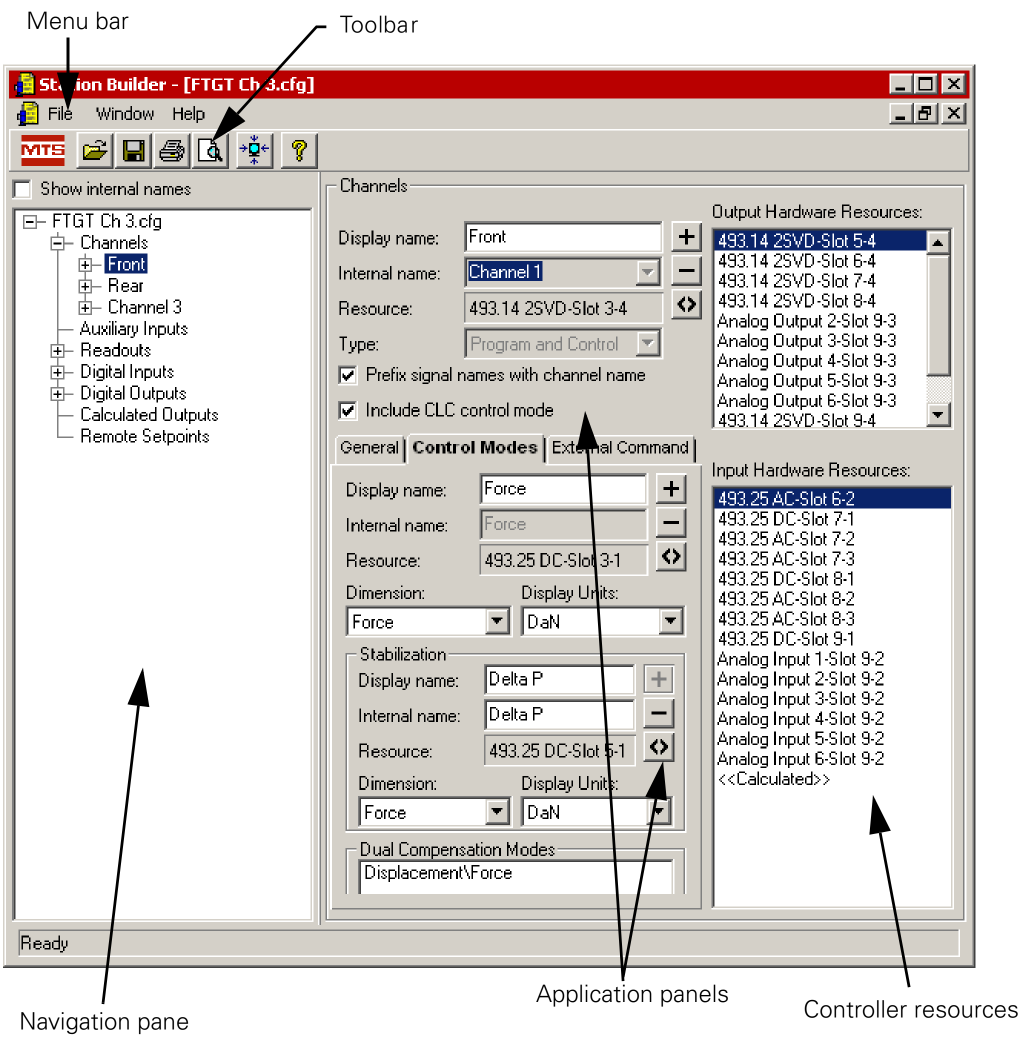
Chapter 2

Station Builder

Application Overview

The Station Builder application lets you allocate all or a portion of your controller resources to create station configuration files.

Station Builder main window



With the **Station Builder** window controls you can allocate controller resources such as valve drivers, conditioners, analog I/O, digital I/O, and hydraulic control resources to create the following *station resources*:

- **Channels**—used to send programming signals to servovalves and external controllers.
- **Auxiliary Inputs**—used to monitor signals for data acquisition or display.
- **Readouts**—used to send analog signals to external readout devices such as oscilloscopes and meters.
- **Digital Inputs**—used to receive digital logic signals from external devices.
- **Digital Outputs**—used to send digital logic signals to external devices.
- **Calculated Outputs**—used to apply user-defined, algebraic formulas to selected output signal values to generate new, calculated output signal values.
- **Calculated Inputs**—used with calculated resources to apply user-defined, algebraic formulas to selected input signal values to generate new, calculated input signal values.
- **Remote Setpoints**—used to set up the Remote Setpoint Adjust (RSA) controls (optional, stand-alone hardware controls used to control actuator setpoints).

Once you have allocated the resources you need, you save your configuration to a *station configuration file*. For more information, see “About Station Configuration Files” on page 34.

For more information on the Station Builder controls, see “Station Builder Window” on page 81.

About Station Configuration Files

A station configuration file (or *.cfg file*) is a text file that defines the controller resources allocated to a particular station.

The default location for saved configuration files is:

Application	Default configuration file path
FlexTest II CTC	c:\ftiictc\config
FlexTest II CTM	c:\ftiictm\config
FlexTest IIm	c:\ftiim\config
FlexTest GT	c:\ftiigt\config
TestStar IIs AP	c:\tsiisap\config
TestStar IIm	c:\tsiim\config
TestStar IIs	c:\tsiis\config
FlexTest SE	c:\ftse\config

If you plan to run tests that require different controller resources or if you want to run tests on multiple stations simultaneously, you will have to create multiple configuration files.

File setup

Depending on the type of test you perform, the station configuration files you create will vary in their complexity.

For example, if you want to provide simple programming to an external controller, you may need only to allocate a single analog output resource.

However, if you want to maintain closed-loop control on one or more channels, you will probably need to allocate resources for:

- Multiple outgoing program signals
- Multiple incoming feedback signals
- A hydraulic power source
- Auxiliary inputs
- Readouts

For more information on creating your station configuration files, see "Getting Started with Station Builder" on page 36. For information on opening, saving, previewing, and printing station configuration files, see "Working with Station Configuration Files" on page 76.

Available resources

The resources displayed in the Station Builder resource lists are defined by the *hardware interface file* (or *.hwi file*) installed with your system software. For more information, see "About Your Controller Resources" on page 37.

Getting Started with Station Builder

How to Start the Station Builder Application

There are two ways to start the Station Builder application.

Method 1 On the Station Manager **Applications** menu, click **Station Builder**.

Method 2 Start the Station Builder application from the Station Desktop Organizer. See "How to Start an Application from the Station Desktop Organizer" on page 675.

When you start the Station Builder application, the main window opens with a new, untitled station configuration.

How to Create Your Station Configuration File

Refer to the following sections to create your station configuration file:

- "Creating Program Channels" on page 40
- "Creating Control Modes" on page 60
- "About Signal Stabilization" on page 65
- "Creating Calculated Resources" on page 66
- "Creating Readouts" on page 69
- "Creating Digital Inputs" on page 70
- "Creating Digital Outputs" on page 71
- "Creating Auxiliary Inputs" on page 72
- "Enabling External Command Inputs" on page 74

If you are creating multiple stations that will be controlled or programmed simultaneously, see "Creating Stations to Run Concurrently" on page 79.

Allocating Controller Resources

About Your Controller Resources

The .hwi file

The resources in your Station Builder resource lists are defined by the hardware interface file (or *.hwi file*) installed with your system software. The .hwi file defines what internal components are available to your controller, which controller slots they are installed in, and which rear-panel connectors they are accessed through.

Your .hwi file is created at the factory according to the resources included with your controller. It may be necessary to edit this file if system resources are added, removed, or repositioned in the test chassis.

For detailed information on the .hwi file installed with your TestStar IIs system software, refer to manual PN 150585-XX (TestStar IIs Controller Installation and Calibration). For detailed information on the .hwi file installed with your TestStar IIm or FlexTest GT system software, refer to manual PN 100-020-488 (Model 493.10/793.00 Controller Installation and Calibration). For information on FlexTest IIm or FlexTest II CTM .hwi files, contact MTS.

WARNING

An incorrect .hwi file can result in improper system response and sudden actuator movements.

Sudden actuator movements can result in personal injury or damage to equipment.

The .hwi file is a critical system component. Only qualified personnel should edit the .hwi file. Always make a backup copy of the file before editing it.

Input and output calculations

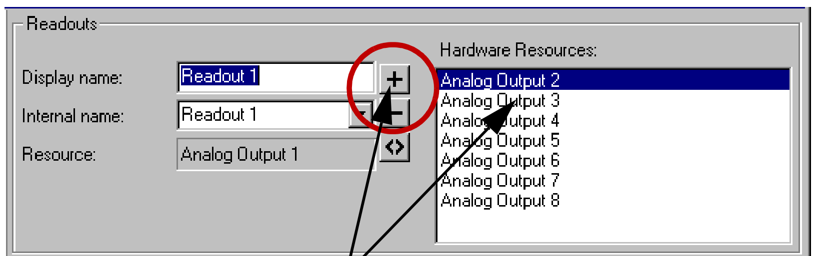
In addition to the normal input and output resources installed in your controller, you can also assign calculated inputs and outputs to be used as control feedback, as auxiliary inputs, or to drive output resources. For more information, see “About Calculated Resources” on page 66.

How to Allocate Hardware Resources

1. In the **Hardware Resources** list, select the hardware resource you want to allocate and then click **+**.
2. In the **Display Name** box, change the channel resource name as desired.

   Note *It is good practice to keep your channel resource names short, since long names may not be visible in all windows.*

3. In the **Internal Name** box, type or select an internal name for the channel resource.

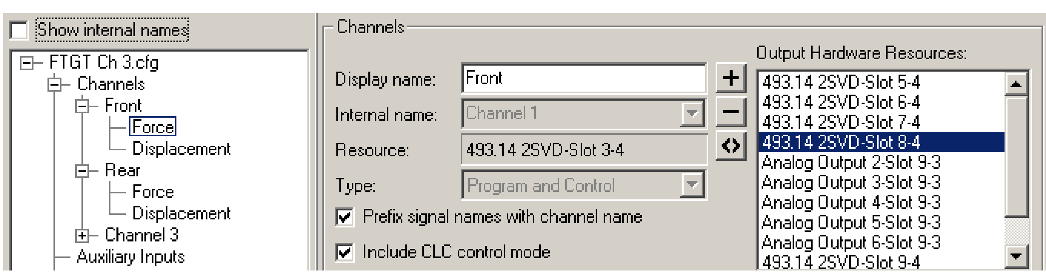


Click the desired resource and click **+** to allocate it.
Click **–** to return the selected resource to the resource list.

Display Name vs. Internal Name

The **Display Name** is the name of the channel resource as you would like it to appear in the navigation pane. Typically, this name is changed to describe a test channel more precisely.

For example, if you have a system with front and rear channels you may choose to change the display names as follows:



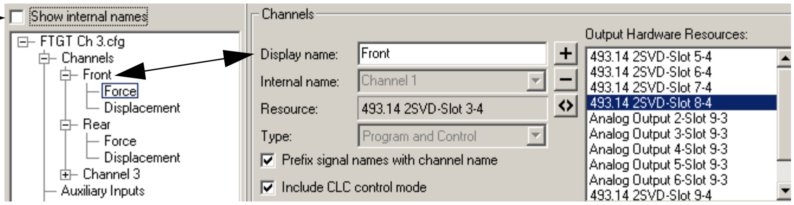
The **Internal Name** is the channel resource name that will be used internally by other software applications for channel and signal mapping. Typically, this name is not changed.

Not changing internal names allows better portability of the station configuration to other systems, especially when assigning multilingual display names.

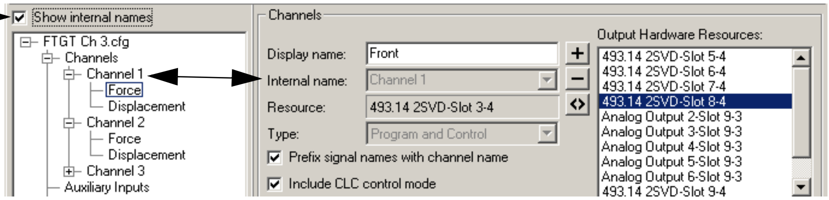
Note *If the internal name is changed it will not change your display name choice unless the internal and display name is the same.*

In the **Station Configuration** window you can select **Show Internal Names** to replace **Display Names** with **Internal Names** in the navigation pane.

Not Selected



Selected



Creating Program Channels

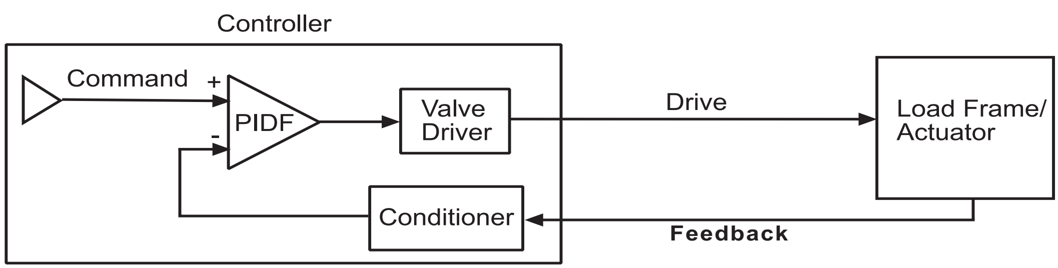
About Program Channels

You use program channels to send commands to external servovalves and controllers. The system software supports these types of program channels: Program and Control, Program with Feedback, Command Plus Error, and Program-Only channels.

Program and Control channels

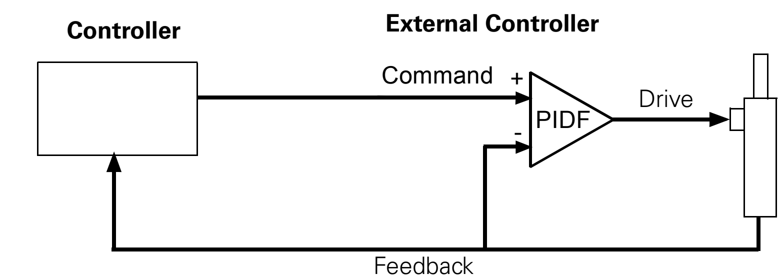
Program and Control channels are used to maintain closed-loop control of an actuator. This channel type is selected automatically when you allocate a valve driver resource. For more information, see "How to Create a Program and Control Channel" on page 44.

Note *FlexTest II CTM and TestStar II AP programmers do not typically use Program and Control channels.*



Program with Feedback channels

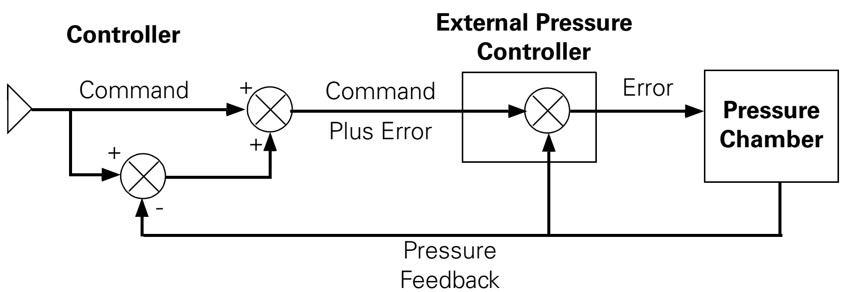
Program with Feedback channels are used to program external controllers while monitoring feedback for command compensation or data acquisition. In this channel configuration, the external controller maintains closed-loop control. For more information, see "How to Create a Program with Feedback Channel" on page 48.



Command Plus Error channels

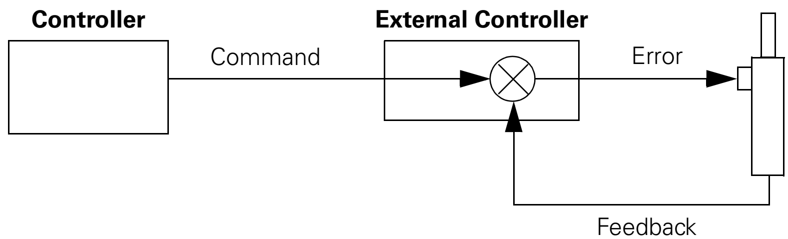
Command Plus Error channels are used to send programming to external controllers and correct the error between the command and feedback by adding the error into the command. In this channel configuration, the external controller maintains closed-loop control. For more information, see "How to Create a Command Plus Error Channel" on page 52.

Note *This type of channel is normally used to control the pressurization of aircraft chambers.*



Program-Only channels

Program-Only channels are used to send programming to an external controller. In this channel configuration, the external controller maintains closed-loop control. For more information, see “How to Create a Program-Only Channel” on page 55.



About Calculated Outputs

In addition to the regular output resources installed in your controller, you can also use a calculated output to drive a valve or other output resource. Calculated output values are determined by evaluating a user-defined mathematical expression that uses the values of other signals. For information on creating new calculations, see “Creating Calculated Resources” on page 66.

About Update Rates

You must specify the *update rate* for each program channel you define. Update rate options include **System Rate** and **Low Rate**.

System rate

The *system rate* specified in the .hwi file is the normal rate used for testing. This rate varies with the type of controller you are using. Refer to "About System Performance" on page 29 for system rate information.

Low rate

In some instances, it may be desirable to program an external controller at a *low rate* to conserve processor resources. Typically, low-rate channels are used with devices that do not require frequent setpoint updates such as temperature controllers.

Your system's low rate is defined in your .hwi file as the **Low System Rate**. The default low rate for all systems is 25.6 Hz.

Update rates using serial connectors

Serial connectors on the rear panel of the FlexTest and TestStar controllers support two-way communication with Eurotherm Model 2200 and 2400 Temperature Controllers.

When programming a Eurotherm temperature controller over a serial connection, though the actual update rate is 0.5 Hz input and 1 Hz output, **Low Rate** is automatically selected as the update rate.

For more information on programming Eurotherm temperature controllers, see "How to Program a Eurotherm Temperature Controller" on page 58.

About the Power Control

FlexTest IIm/CTC controllers

On FlexTest IIm/CTC controllers, up to four hydraulic service manifolds can be connected to **J28A–J28D** on the rear panel of the Model 497.05 Hydraulic Control Panel.

If desired, you can allocate the same HSM resource to multiple FlexTest IIm channels.

GT/TestStar IIm controllers

On GT/TestStar IIm controllers, the HSM is connected to **J28A-J28B** on the Model 493.74 HSM transition board mounted in the rear panel chassis. Each HSM transition board controls up to two stations and the chassis supports up to four stations.

TestStar IIs controllers

On TestStar IIs controllers, the HSM is connected to **J20** (proportional) or **J28** (solenoid) on the rear panel of the TestStar IIs chassis.

If your TestStar IIs system is connected directly to an HPU, select **HPU** in the **Power** list.

FlexTest SE controllers

On FlexTest SE controllers, the HSM is connected to **J28** on the Model 493.42 System I/O board mounted in the rear panel chassis. The System I/O board controls a single HSM.

How to Create a Program and Control Channel

1. "Allocate and name the output resource" on page 45.
2. "Specify the channel type" on page 46.
3. "Specify the station power source" on page 46.
4. "Specify the update rate" on page 47.
5. "Enable optional compensators" on page 47.
6. "Define the control feedbacks" on page 47.

Task 1 Allocate and name the output resource

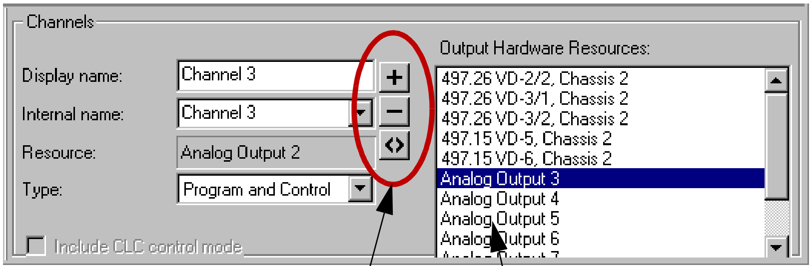
The type of controller you have determines the valve drivers and analog output resources that appear in the **Output Hardware Resources** list.

- A valve driver is an internal electronic module that controls a servovalve. (Valve drivers are not available with CTM or AP programmers.)
- Analog outputs are connectors located on the chassis rear panel. Analog output resources can be used to send commands to an external valve driver or external controller (±10 volts output).
- A calculated output is a value generated by a user-defined algebraic formula. For more information, see "About Calculated Outputs" on page 42.

To allocate a program channel resource:

1. In the Station Builder navigation pane, select **Channels**.
2. On the **Output Hardware Resources** list, select the resource you want to allocate, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.

Note *For more information on naming your hardware resources, see "How to Allocate Hardware Resources" on page 38. It is good practice to keep your resource names short, since long names may not be visible in all windows.*



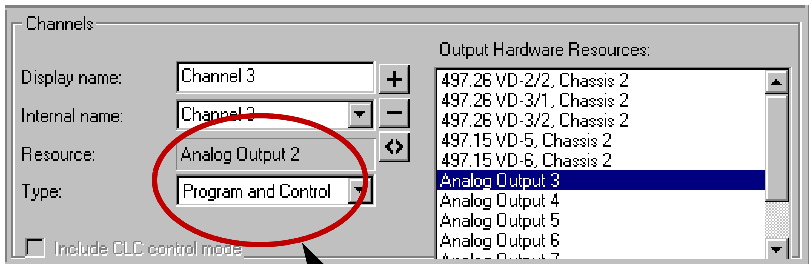
Allocate a resource by clicking **+**.
Return a resource by clicking **–**.

Available hardware resources

Task 2 Specify the channel type

In the **Type** list, select **Program and Control**.

Note *If you allocate a valve driver,* ***Program and Control*** *is selected automatically.*

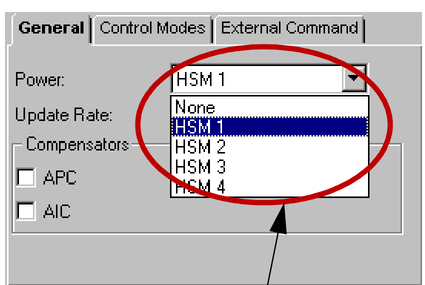


In the **Type** list, select the desired channel type.

Task 3 Specify the station power source

1. Click the **General** tab.
2. In the **Power** list, select the desired power source for this channel.

Note *For more information on Power selections, see "About the Power Control" on page 44.*

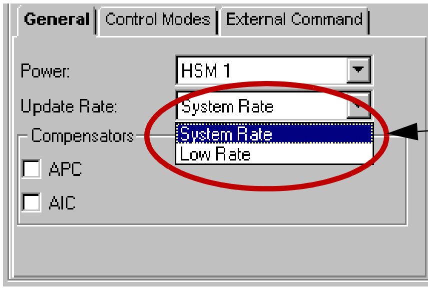


In the **Power** list, select the station power source.

Task 4 Specify the update rate

On the **General** tab, select the desired update rate in the **Update Rate** list.

Note *For more information on system rates, see "About Update Rates" on page 42.*

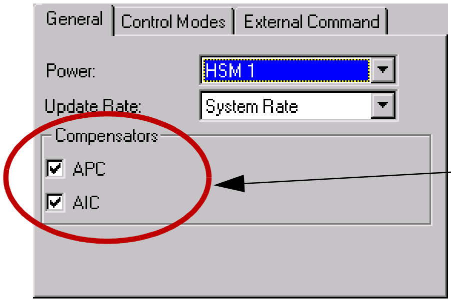


Task 5 Enable optional compensators

On the **General** tab:

- Select the **APC** check box to enable the APC (amplitude and phase control) compensator for the selected channel.
- Select the **AIC** check box to enable the AIC (adaptive inverse control) compensator for the selected channel.

Note *If you did not purchase the APC or AIC compensator options, the boxes will be unavailable.*



Task 6 Define the control feedbacks

See "Creating Control Modes" on page 60.

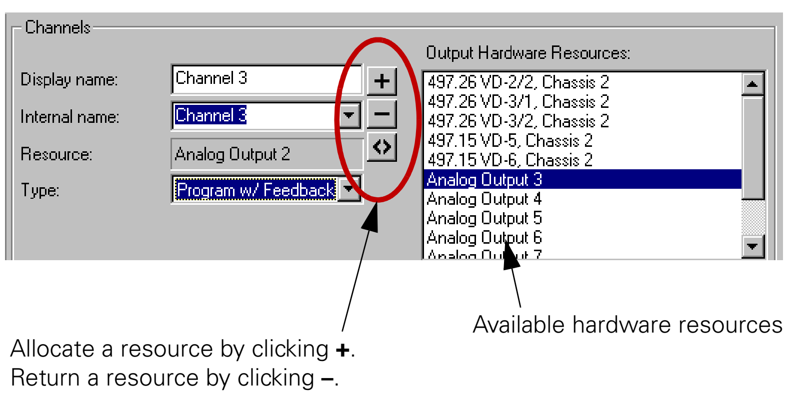
How to Create a Program with Feedback Channel

1. "Allocate and name the output resource" on page 48.
2. "Specify the channel type" on page 49.
3. "Specify the update rate" on page 49.
4. Optional—"Enable optional compensators" on page 50.
5. "Define the feedback signal" on page 51.

Task 1 Allocate and name the output resource

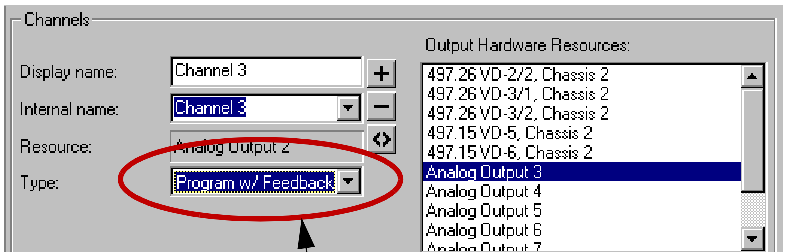
1. In the Station Builder navigation pane, select **Channels**.
2. On the **Output Hardware Resources** list, select the resource you want to allocate, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.

Note *For more information on naming your hardware resources, see "How to Allocate Hardware Resources" on page 38. It is good practice to keep your resource names short, since long names may not be visible in all windows.*



Task 2 Specify the channel type

In the **Type** list, select **Program w/Feedback**.

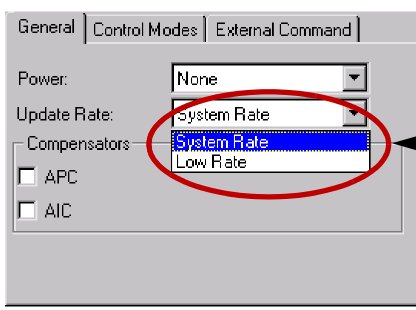


In the **Type** list, click the desired channel type.

Task 3 Specify the update rate

On the **General** tab, select the desired update rate in the **Update Rate** list.

Note *For more information on system rates, see* *"About Update Rates" on page 42.*



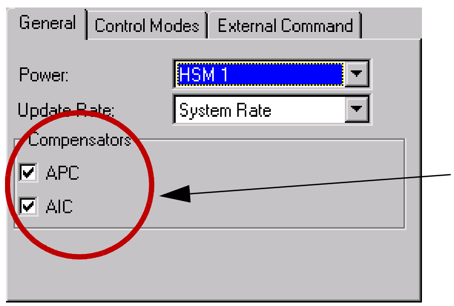
Set the **Update Rate**.

Task 4 Enable optional compensators

On the **General** tab:

- Select **APC** to enable the APC (amplitude and phase control) compensator for the selected channel.
- Select **AIC** to enable the AIC (adaptive inverse control) compensator for the selected channel.

Note *If you did not purchase the APC or AIC compensator options, the boxes will be unavailable.*



Select the compensator check box to enable it for the current channel.

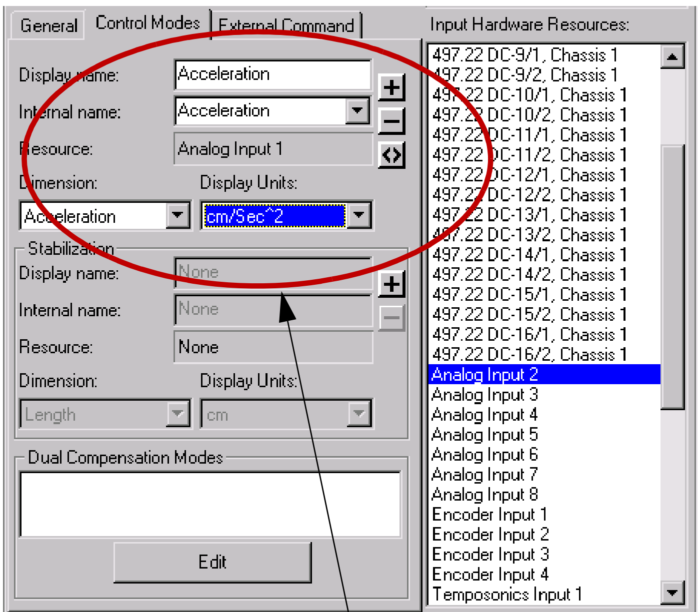
Task 5 Define the feedback signal

1. Click the **Control Modes** tab.

2. Allocate an analog input resource, rename it as desired, and define the dimension and units for the feedback signal.

Note *This feedback signal can be used for command compensation or data acquisition.*

Note *For more information on control modes, see "Creating Control Modes" on page 60.*



On the **Control Modes** tab, allocate a feedback resource, and set the dimension and units.

Station Builder

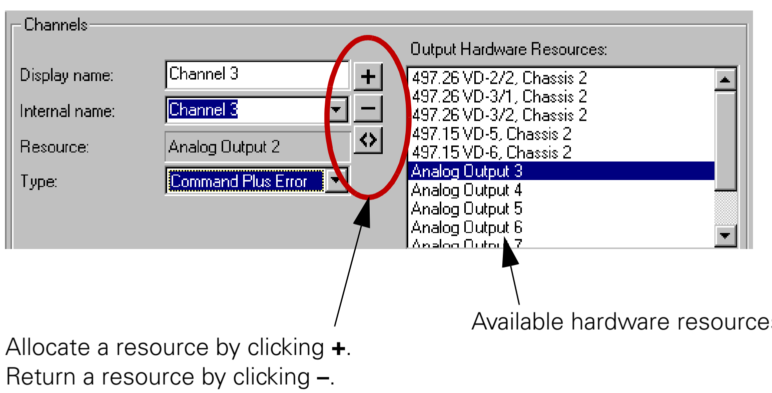
How to Create a Command Plus Error Channel

1. "Allocate and name the output resource" on page 52.
2. "Specify the channel type" on page 53.
3. "Specify the update rate" on page 53.
4. "Define the feedback signal" on page 54.

Task 1 Allocate and name the output resource

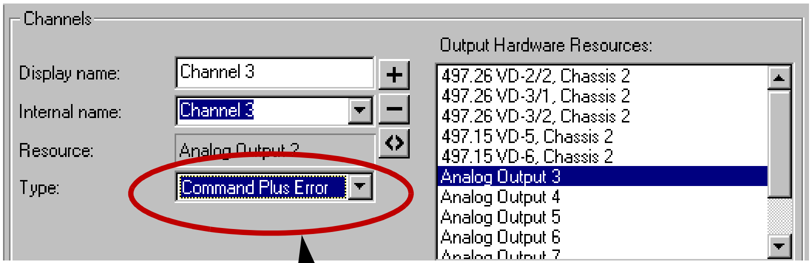
1. In the Station Builder navigation pane, select **Channels**.
2. On the **Output Hardware Resources** list, select the resource you want to allocate, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.

Note *For more information on naming your hardware resources, see "How to Allocate Hardware Resources" on page 38. It is good practice to keep your resource names short, since long names may not be visible in all windows.*



Task 2 Specify the channel type

In the **Type** list, select **Command Plus Error**.

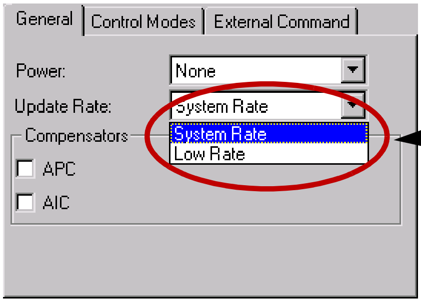


In the **Type** list, click the desired channel type.

Task 3 Specify the update rate

On the **General** tab, select the desired update rate in the **Update Rate** list.

Note *For more information on system rates, see* *"About Update Rates" on page 42.*

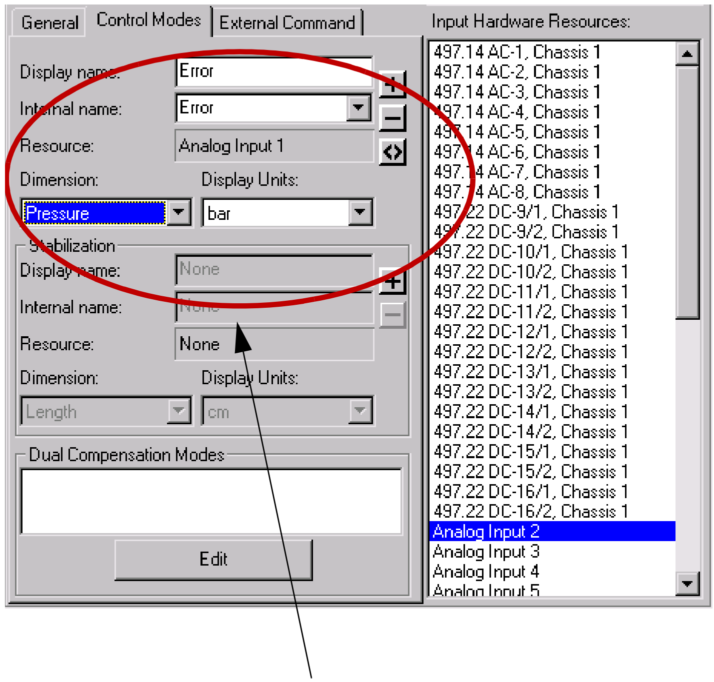


Set the **Update Rate**.

Task 4 Define the feedback signal

1. Click the **Control Modes** tab.

2. Allocate an analog input resource, rename it as desired, and define the dimension and units for the error signal.



On the **Control Modes** tab, allocate a feedback resource for the external controller error signal, and set the dimension and units.

Note *For more information on control modes, see "Creating Control Modes" on page 60*

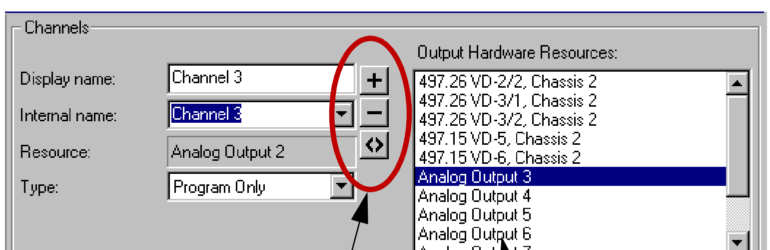
How to Create a Program-Only Channel

1. “Allocate and name the output resource” on page 55.
2. “Specify the channel type” on page 56.
3. “Specify the update rate” on page 57.
4. “Specify the dimension and units of the program signal” on page 57.

Task 1 Allocate and name the output resource

1. In the Station Builder navigation pane, select **Channels**.
2. On the **Output Hardware Resources** list, select the resource you want to allocate, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.

Note *For more information on naming your hardware resources, see “How to Allocate Hardware Resources” on page 38. It is good practice to keep your resource names short, since long names may not be visible in all windows.*



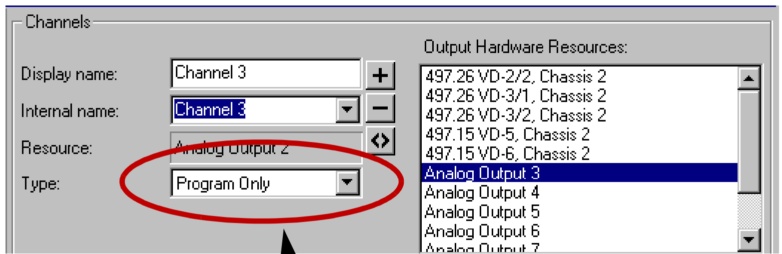
Allocate a resource by clicking **+**.
Return a resource by clicking **–**.

Available hardware resources

Station Builder

Task 2 Specify the channel type

In the **Type** list, select **Program Only**.

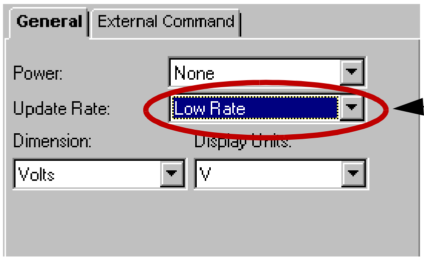


In the **Type** list, click the desired channel type.

Task 3 Specify the update rate

On the **General** tab, select the desired update rate in the **Update Rate** list.

Note *For more information on system rates, see* *"About Update Rates" on page 42.*

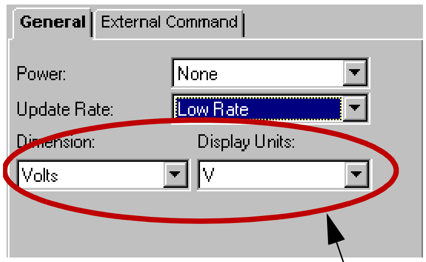


Set the **Update Rate**.

Task 4 Specify the dimension and units of the program signal

On the **General** tab, set the dimension and display units of the outgoing program signal.

Note *This control is only displayed for Program-Only channels.*



Set the dimension and display units for the outgoing program signal.

Station Builder

How to Program a Eurotherm Temperature Controller

For TestStar IIs and TestStar IIs AP controllers, the **J51** connector (on the back of the controller chassis) supports two-way communication with Eurotherm Series 2200/2400 Temperature Controllers. Special resources must be added to the .hwi file to accommodate this configuration.

For FlexTest IIm, FlexTest GT, or TestStar IIm controllers, use the **J50A–J50D** serial connectors on either the 498 RS-485 transition module (FlexTest IIm) or 493.71 transition module (FlexTest GT, TestStar IIm) to program and control one or more Series 2200/2400 Eurotherm Temperature Controllers.

For FlexTest SE controllers, use the **Debug Serial Port** on the Model 498.96 Processor module via a RS232/RS485 Converter to connect to one or more Eurotherm Temperature Controllers.

Follow these steps to program a Eurotherm controller:

1. Create a new or open an existing station configuration file.
2. In the Station Builder navigation pane, select **Channels**
3. In the **Output Hardware Resources** list, select **Temp Control 1-Output**, and then click **+**.

   Note *When you allocate this resource, the channel type will be set to* ***Program w/Feedback*** *and the update rate will be set to* ***Low Rate*** *automatically.*

4. Click the **Control Modes** tab.
5. In the **Input Hardware Resources** list, select **Temp Control 1-Input**, and then click +.
6. In the **Internal Name** box, select or type the desired resource name.

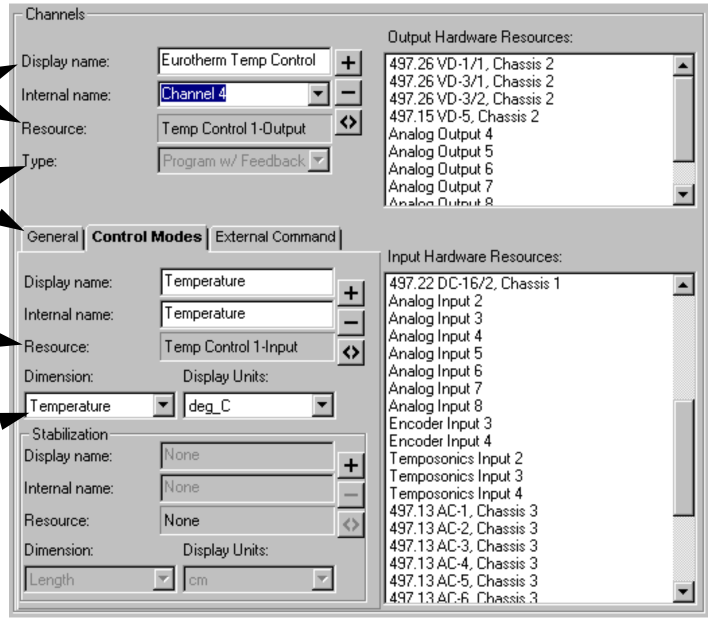
Station Builder

Add the Analog Output resource and rename it.

Channel type and update rate are selected automatically.

Allocate and rename the temperature controller input resource.

Specify the dimension and units for the program.

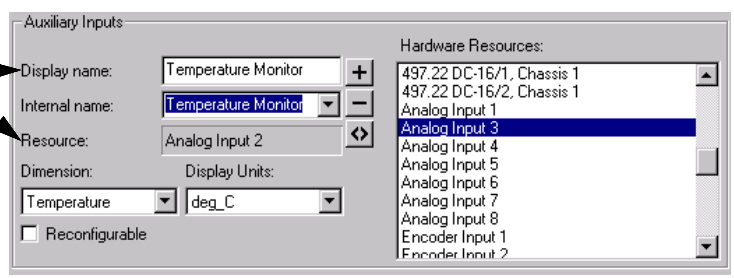


7. Optional—in the **Display Name** box, type the desired display name (example: *Temperature*).

8. Specify the **Dimension** and **Display Units** for the program signal (example: *Temperature/deg_C*).

9. Optional—If you will monitor thermocouple feedback for data acquisition, connect the external thermocouple output. Open the **Auxiliary Inputs** panel to allocate an additional auxiliary input as shown below.

To monitor an additional thermocouple feedback, allocate an additional input resource as an auxiliary data channel.



10. Save the station configuration file.

Station Builder

Creating Control Modes

About Control Modes

You must define at least one control mode for each Program and Control channel you create. The system software supports the following types of control modes:

- **PIDF** control modes

  Use *PIDF* control modes for normal testing. Proportional, integral, derivative, and feed forward gain adjustments are available to tune the servo-loop response. See "How to Create a PIDF Control Mode" on page 62.

- **CLC** (channel limited channel) control modes

  Use *CLC* control modes for specimen installation and removal. Channel limited channel modes require two feedback signals. The first one is used as the *active feedback* (it is normally displacement) and the second one is used as the *limiting feedback* (it is normally force). When you command the actuator with a channel limited channel mode, the controller will not allow the actuator to exceed limits specified on either the master or limiting channels. See "How to Create a CLC Control Mode" on page 63.

- **Dual Compensation** control modes

  Use a *dual compensation* control mode when you want to provide programming and control on a channel whose feedback is unsuitable for maintaining closed-loop control.

  Note *Sensor feedback may be unsuitable as control feedback if it is too noisy (e.g. force feedback), or if it possesses only dynamic characteristics (e.g. accelerometer feedback).*

  Dual compensation modes require two feedback signals. The *primary feedback* is a more stable signal that is used by the PIDF controller to maintain closed-loop control. The *secondary feedback* is used for command compensation, and is the dimension you actually program in. See "How to Create Dual Compensation Control Modes" on page 64.

  Note *Dual compensation is also known as "mixed-mode" compensation.*

About Calculated Inputs

In addition to the regular input resources installed in your controller, you can also assign a calculated input for control feedback or data acquisition.

Calculated input values are determined by applying a user-defined mathematical equation to the specified signal values. For information on creating new calculations, see "Creating Calculated Resources" on page 66.

License requirements

Calculated inputs and calculated outputs are optional features which require separate licenses. For example, you may have a calculated inputs license and not have a calculated outputs license.

How to Create a PIDF Control Mode

1. In the Station Builder navigation pane, expand the **Channels** list, and then select the channel this mode will be used on.
2. On the **Control Modes** tab, select the desired input hardware resource or input calculation, and then click **+**.
   - If the feedback signal will be conditioned by your controller, you should allocate an AC or DC conditioner resource.
   - If you are using an externally conditioned signal, you should allocate an analog input resource.
   - If you are using calculated inputs for control feedback or data acquisition, you should allocate a **<<Calculated>>** resource.

   When you allocate an AC conditioner feedback resource in the Station Builder application, the application automatically renames the resource **Displacement**, and sets the dimension to **Length**. When you allocate a DC conditioner resource, the application automatically renames the resource **Force**, and sets the dimension to **Force**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.

Note *For more information on naming hardware resources, see* *"How to Allocate Hardware Resources" on page 38.* *Keep your resource names short, since long may not be visible in all windows.*

5. Set the **Dimension** and **Display Units** for the feedback signal.

How to Create a CLC Control Mode

CLC control modes require two feedback signals; one from each of the first two control modes on the CLC-controlled channel. Before creating a CLC control mode, ensure that these feedbacks signals have been allocated and appropriately named.

1. In the Station Builder navigation pane, expand the **Channels** list, and then select the channel CLC control mode will be used on.
2. Select the **Include CLC control mode** check box.

CLC control mode automatically uses the feedback signals from the first two control modes on the selected channel. The first feedback selected in Station Builder is the *active feedback* (typically displacement). The second feedback selected is the *limiting feedback* (typically force).

CLC mode is automatically named, based on the name of the first two control modes. This name does not appear on the Station Builder's channel control mode list, though it is displayed in the control mode lists on Station Manager and other applications.

How to Create Dual Compensation Control Modes

Dual Compensation control modes require two feedback signals; a more stable *primary feedback* (for PIDF closed-loop control), and a *secondary feedback* (for command compensation). Before creating a dual compensation control mode, ensure that you have defined channel control mode or auxiliary input feedback signals appropriate for dual-compensation control.

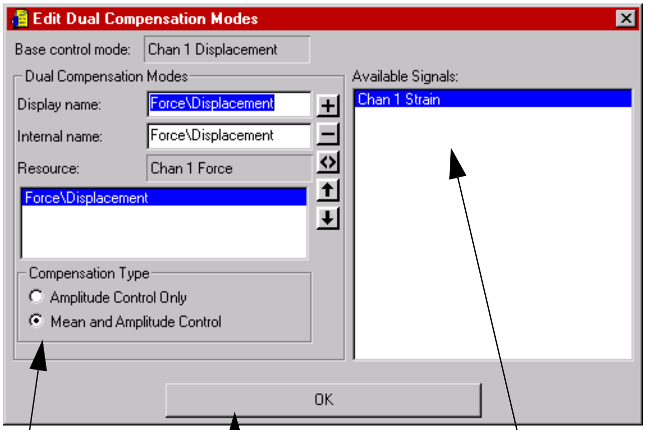
1. In the Station Builder navigation pane, expand the **Channels** list, and then select the channel this mode will be used on.
2. In the Station Builder navigation pane, select the feedback signal you want to use as the dual-compensation mode's primary feedback.

   Note *The primary feedback signal (typically displacement) is used to maintain closed-loop control. This signal will be designated as the* ***Base control mode*** *on the* **Edit Dual Compensation Modes** window.

3. On the panel, select **Edit** under **Dual Compensation Modes**.
4. In the **Available Signals** list, select the feedback signal you want to use as the dual-compensation mode's secondary feedback (this will also be the dimension you program in), and then click **+**.
5. In the **Edit Dual Compensation Modes** window:

   A. Select the **Compensation Type**, and then click **OK**.

   B. Rename the dual compensation mode as appropriate.



Select the type of compensation control.

Click **OK** to create the dual compensation mode.

Allocate the feedback signal to be used by the compensator.

About Signal Stabilization

Feedback signals can be integrated into the composite command to act as a stabilizing factor. These stabilization signals are primarily used in:

- High-mass systems equipped with Delta P (differential pressure) sensors
- High-speed systems equipped with accelerometers

How to Create a Control Mode Stabilization Signal

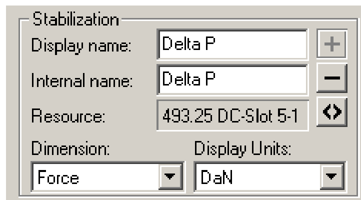
1. In the Station Builder navigation pane, select the mode you want to stabilize.
2. In the **Input Hardware Resources** list, select the analog input resource that will accommodate the stabilization signal, and then click **+** in the **Stabilization** group box.

   For example, allocate a DC conditioner for a delta P sensor input. Allocate an analog input resource for an externally-conditioned accelerometer input.

3. Rename the stabilization resource as required.

Note *If you are using stabilization feedback for more than one control mode on a channel, it is important that you assign a unique name to each stabilization signal. Doing this will avoid duplicate naming conflicts (and the resulting error messages).*

4. Set the **Dimension** and **Display Units** for the stabilization signal.



Allocate a resource for stabilization feedback.

Delta P sensors typically use DC conditioners.

Accelerometers are typically conditioned externally.

Creating Calculated Resources

About Calculated Resources

In order to use calculated inputs and outputs in your test, you must add calculated resources to your station with the Station Builder application.

Calculated inputs

A resource labeled **<<Calculated>>** appears in the hardware list for control modes, stabilization feedback, external command inputs, and auxiliary inputs. This resource is not removed from the list when it is assigned, so that it can be used as many times as necessary.

When you open the station with the Station Manager application, any input resources that are mapped to the **<<Calculated>>** resource are created as calculated input channels. Some calculated input channels will be defined relative to a control channel, while others will be in the auxiliary list.

Calculated outputs

You can create a calculated output by assigning the **<<Calculated>>** resource as your programming output resource.

Note *Control channels mapped to the <<Calculated>> resource will not have an equation, rather they will produce a signal that will be referenced in other equations.*

You can also use the Station Builder **Calculated Outputs** panel to add calculated output resources to your station.

Once you have defined the calculation resources needed to run your test, you must use the Station Manager application to specify the equation used for each calculation. For more information, see "Calculation Editor Window" on page 459.

License requirements

Calculated inputs and calculated outputs are optional features which require separate licenses. For example, you may have a calculated inputs license and not have an calculated outputs license.

How to Create a Calculated Output Resource

1. In the Station Builder navigation pane, select **Calculated Outputs**.
2. On the **Hardware Resources** list, select the resource you want to allocate, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.
5. Set the **Dimension** and **Display Units** for the calculated output signal.

You will define the calculation with the Station Manager application. For more information, see "Calculation Editor Window" on page 459.

How to Create a Calculated Input Resource

Control mode inputs

To create a calculated input resource for control modes, complete the following procedure:

1. In the Station Builder navigation pane, select **Channels**.
2. On the **Control Modes** tab, select the **<<Calculated>>** resource from the **Input Hardware Resources** list, , and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.
5. Set the **Dimension** and **Display Units** for the calculated input signal.

Auxiliary inputs

To create a calculated input resource for auxiliary inputs, complete the following procedure:

1. In the Station Builder navigation pane, select **Auxiliary Inputs**
2. On the **Hardware Resources** list, select the **<<Calculated>>** resource, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.
5. Set the **Dimension** and **Display Units** for the calculated input signal.

   You will define the calculation with the Station Manager application. For more information, see “Calculation Editor Window” on page 459.

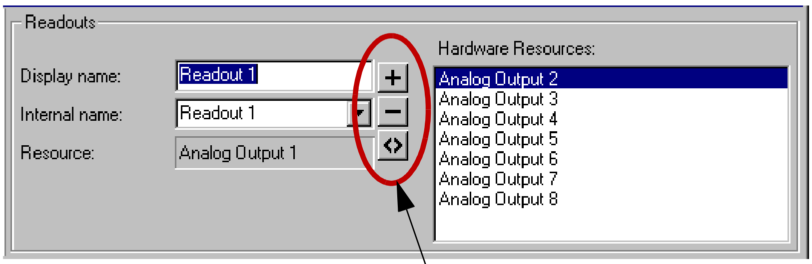
Creating Readouts

About Readouts

Readouts are used to send station signals to external readout devices such as oscilloscopes and meters.

How to Create a Readout

1. In the Station Builder navigation pane, select **Readouts**.
2. On the **Hardware Resources** list, select the resource you want to send station signals through, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.



Allocate an analog output resource.

Creating Digital Inputs

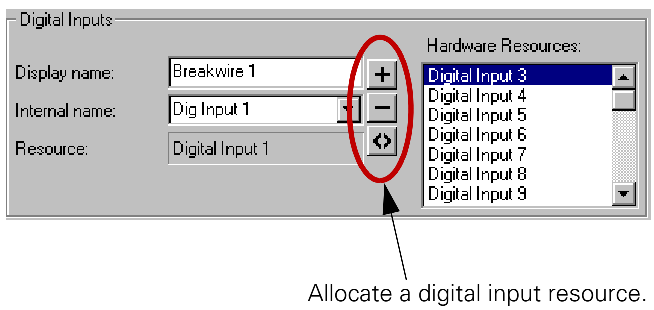
About Digital Inputs

You use digital input resources to monitor digital signals from external switches.

Digital inputs can be monitored from the Station Manager **Digital I/Os** window, or with the MPT **Digital Input** process.

How to Create Digital Inputs

1. In the Station Builder navigation pane, select **Digital Inputs**.
2. On the **Hardware Resources** list, select the resource you want to monitor digital inputs through, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.



Creating Digital Outputs

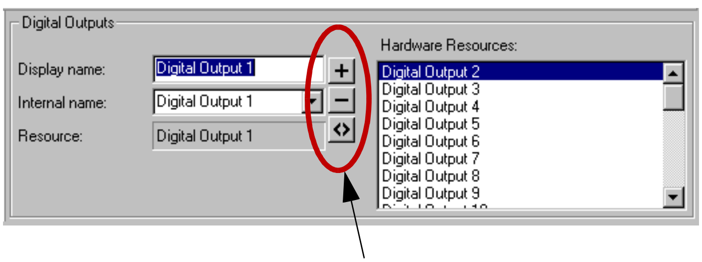
About Digital Outputs

You use digital output resources to send digital signals to external switches and logic devices.

Digital outputs can be monitored and changed from the Station Manager **Digital I/Os** window, or with the MPT **Digital Output** process.

How to Create Digital Outputs

1. In the Station Builder navigation pane, select **Digital Outputs**.
2. On the **Hardware Resources** list, select the resource you want to send digital outputs through, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.



Allocate a digital output resource.

Creating Auxiliary Inputs

About Auxiliary Inputs

Auxiliary inputs are used to monitor sensor feedback or analog inputs for readout or data acquisition.

You can monitor auxiliary input signals on the built-in Station Manager scope and meters. You can acquire data on auxiliary input signals with the Basic TestWare and MultiPurpose TestWare applications.

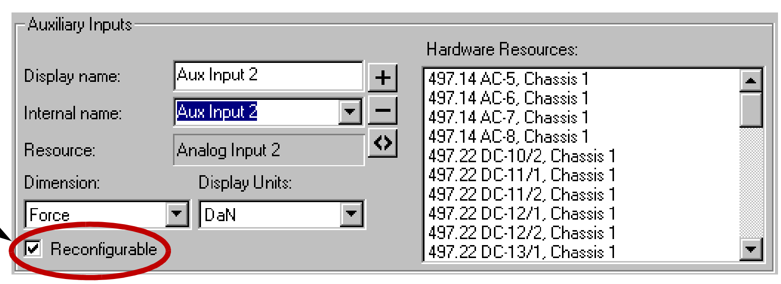
Note *On the scope and meters, auxiliary input signals that start with the same name as a control channel will be displayed in the control channel's signal list (instead of in the **Others** signal list). To ensure that your auxiliary input signals appear in the **Others** signal list, use a unique name for your auxiliary input signals.*

Reconfigurable signals

As an option, you can define certain auxiliary inputs as reconfigurable. If you check the **Reconfigurable** checkbox, the signal name and dimension can be changed in Station Manager, without returning to Station Builder. You must be at the **Configuration** access level in Station Manager to make these signal configuration changes.

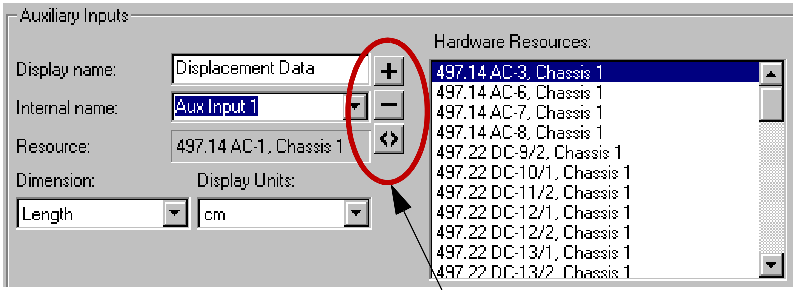
The Print Preview window, in both Station Builder and Station Manager, shows if an auxiliary input has been defined as reconfigurable.

If required, define signal as reconfigurable



How to Create an Auxiliary Input

1. In the Station Builder navigation pane, select **Auxiliary Inputs**.
2. On the **Hardware Resources** list, select the resource you want to monitor the auxiliary input signal with, and then click **+**.
3. In the **Internal Name** box, select or type the desired name.
4. Optional—in the **Display Name** box, type the desired name.
5. Set the **Dimension** and **Display Units** for the auxiliary input signal.



Allocate the analog input resources you want to use for auxiliary data.

6. For systems with the reconfigurable signal option, a **Reconfigurable** checkbox is displayed. Check this box if you will need to change the name or dimension of your signal in Station Manager.

Station Builder

Enabling External Command Inputs

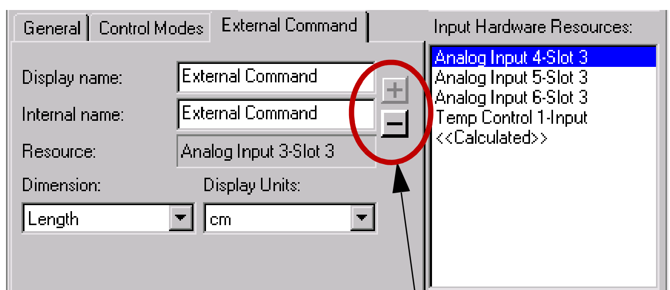
About External Command Inputs

Your controller can process programming received from an external controller or function generator while maintaining all other closed-loop control functions.

Note *Your controller cannot recognize mode switches in external program input signals.*

How to Enable an External Command Input

1. In the Station Builder navigation pane, select **Channels**.
2. Select the channel that the external input will be associated with.
3. On the **External Command** tab, allocate an analog input resource to accommodate the command signal input, and then rename it.
4. Set the **Dimension** and **Display Units** for the input signal.



Allocate an analog input resource for external command

Setting Up Remote Setpoint Adjust

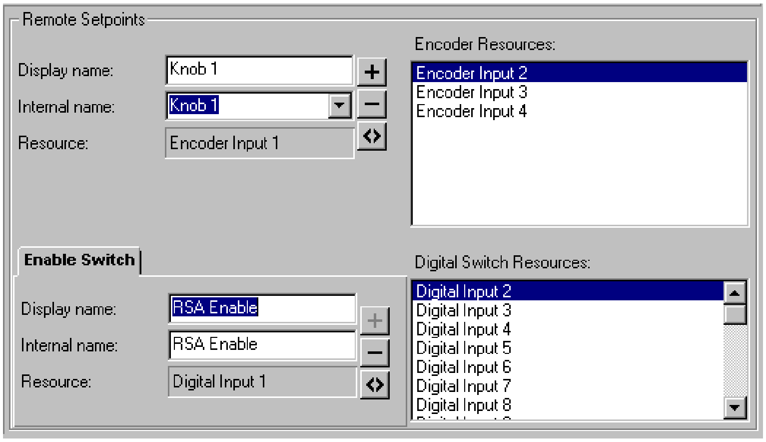
About Remote Setpoint Adjust

A Remote Setpoint Adjust (RSA) control is an optional, stand-alone hardware device that uses an encoder to control actuator setpoints. Access the **Remote Setpoints** panel to allocate an encoder resource (and its associated **RSA** control).

As an option, an **Enable Switch** tab allows you to assign a digital input for a switch to turn the RSA control on and off.

How to Set Up a Remote Setpoint Adjust Control

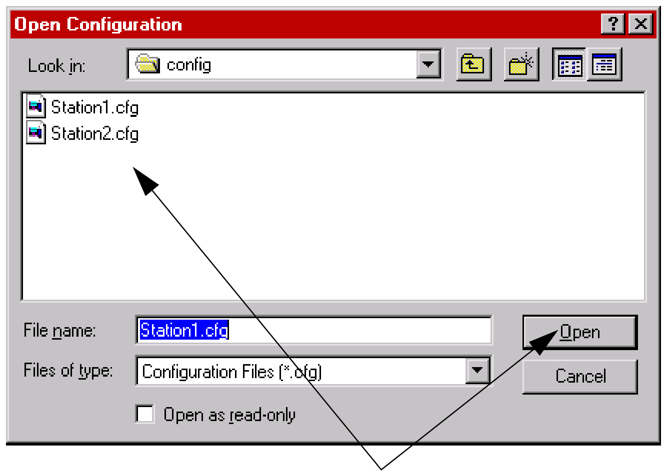
1. In the Station Builder navigation pane, select **Remote Setpoints** to display the **Remote Setpoints** panel and **Enable Switch** tab.
2. On the **Encoder Resources** list, select the encoder resource you want to use, and then click **+**.
3. In the **Internal Name** box, select or type the desired name for the RSA control knob.
4. Optional—in the **Display Name** box, type the desired name for the RSA control knob.
5. Optional—on the **Enable Switch** tab, select the **Digital Switch Resource** list to allocate a digital input for an RSA control on/off switch. As required, in the **Display Name** box, type the desired name for the RSA switch.



Working with Station Configuration Files

How to Open a Station Configuration File

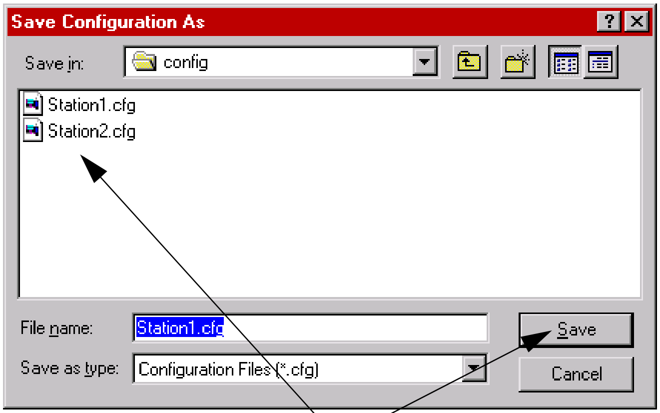
1. On the **File** menu, select **Open**.
2. In the **Open Configuration** window, select the desired .cfg file, and then click **Open**.



Click the file and then click **Open**.

How to Save a Station Configuration File

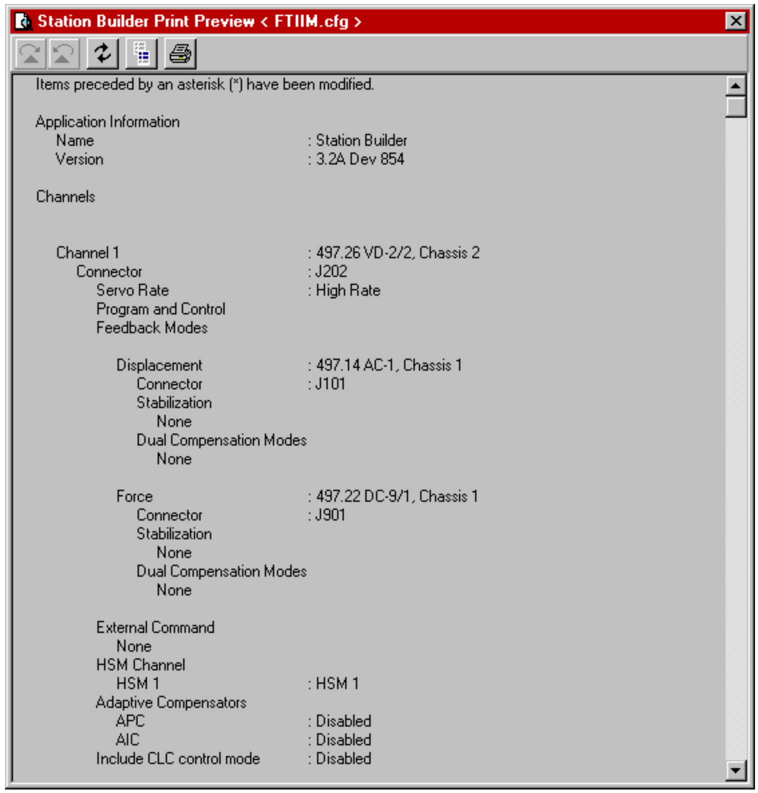
On the **File** menu, select **Save**. To save the file with a different name, select **Save As**.



Name the file and then click **Save**.

How to Preview a Station Configuration File

On the **File** menu, select **Print Preview** to view the station configuration file on-screen.A toolbar facilitates access and display of configuration file changes. See “Print Preview Toolbar” on page 88.



Print Preview window

Note *Items preceded by an asterisk (*) have been modified since the configuration file opened. In addition, you can choose to highlight these changes by selecting the **Enable Change Highlighting** icon on the Print Preview toolbar.*

How to Print a Station Configuration File

Click the **Print** icon on the **Station Builder Print Preview** window toolbar or click **Print** icon on the Station Builder toolbar, to print the current station configuration.

Click **Print to File** on the Station Builder **File** menu to save the current station configuration as a separate text file.

Creating Stations to Run Concurrently

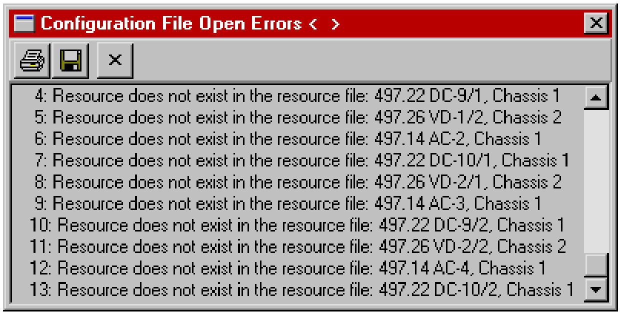
If you plan to run tests on multiple stations simultaneously, you must make sure each station allocates unique controller resources.

Note *Multi-station testing is supported by FlexTest IIm, FlexTest CTM, TestStar IIm, FlexTest CTC and FlexTest GT hardware only.*

The Station Builder application allows you to open (or create) multiple configuration files at the same time.

All open stations allocate resources from the same resource pool (.hwi file). To avoid resource conflicts, resources already allocated in one open station are removed from the resource lists of other open stations. When you close a station, the resources defined in that station are returned to the resource lists of the other open stations.

If you attempt to open a configuration file that defines resources used by another open configuration file, the Station Builder application displays an error. For example, if a station that defines the 497.15 VD-6 in chassis 2 is open, and you try to open another station that defines the same valve driver, the following error message appears:



How to Create Stations that Run Concurrently

1. Create your first station configuration file.
2. While your first station configuration file is open, select **New** on the **File** menu to create your next station.

A new configuration file will open, however, the resources allocated to the first station will be removed from the resource lists of your new station configuration file.

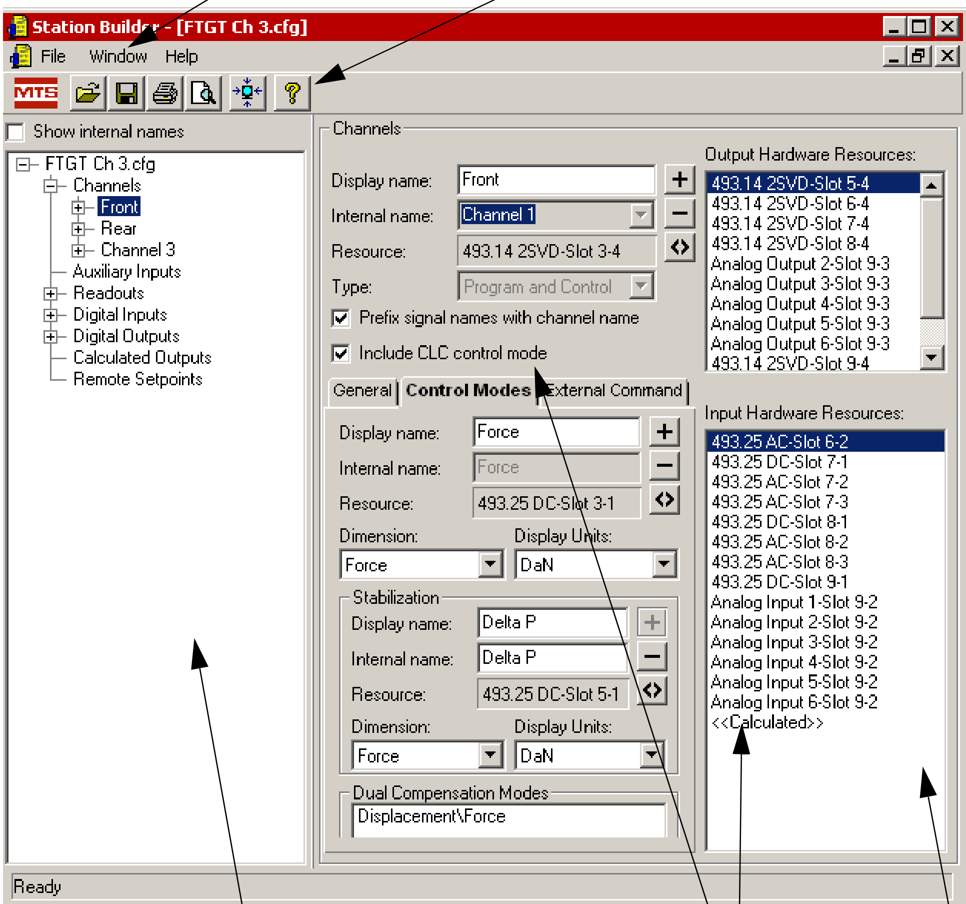
Editing concurrent stations

When editing a station that is running concurrently, it is recommended that all other concurrent station configurations be opened as "read only" files. This helps prevent you from saving accidental changes that might be made to the "read only" files during the editing process.

Station Builder Window

Main Menus—manage your configuration files with the commands on the main menus.

Toolbar—the toolbar buttons provide quick access to common commands and windows.



Navigation Pane—the station resources you create are organized here.

Panels—station resource properties are specified here.

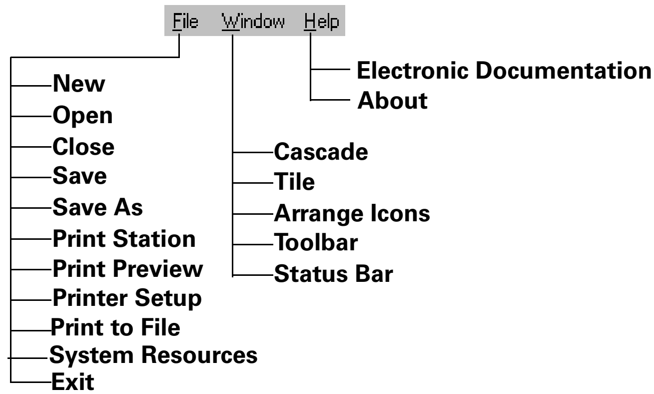
Your hardware resources.

The Station Builder window displays Station Builder Configuration windows.

Station Builder Window

ITEM	DESCRIPTION
Main Menu bar	Provides menus to manage the Station Builder application.
Toolbar	Provides quick access to common Station Builder commands.
Station Configuration Window	Displays the currently selected station configuration. Use this window to create and display station configurations.

Main Menus

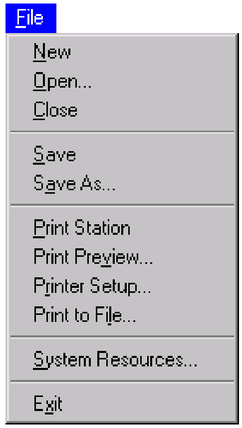


The Main Menu bar provides menus to manage the Station Builder application. The toolbar has some of the more frequently used commands.

Main Menu Bar

ITEM	DESCRIPTION
File	Has commands that open, save, and print station configurations.
Window	Has commands that change the **Station Builder** window's appearance.
Help	Has commands that access electronic documentation and application version number information.

File Menu



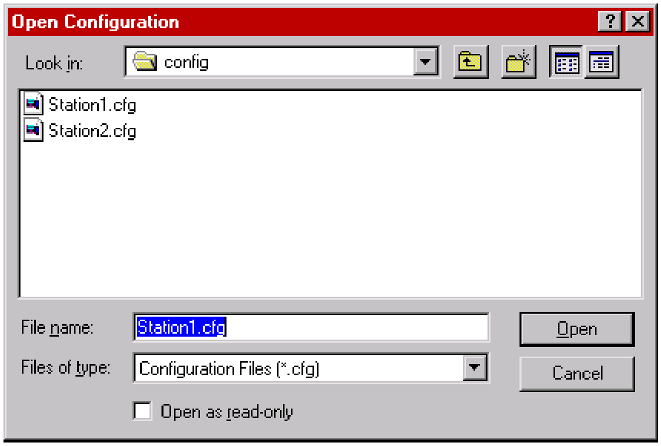
This menu's commands create, open, save, and print station configurations.

File Menu

ITEM	DESCRIPTION
New	Opens a new, untitled station configuration.
Open	Displays the **Open Configuration** window.
Close	Closes the current Station Configuration window.
Save	Saves the current station configuration file.
Save As	Displays the **Save Configuration As** window.
Print Station	Prints the station configuration.
Print Preview	Displays the **Station Builder Print Preview** window.
Printer Setup	Displays the printer setup window for your printer.
Print to File	Displays the **Print to File** window.
System Resources	Displays the **System Resources** window.
Exit	Quits the Station Builder application.

Open Configuration Window

Path **File > Open**



This window opens existing station configuration files.

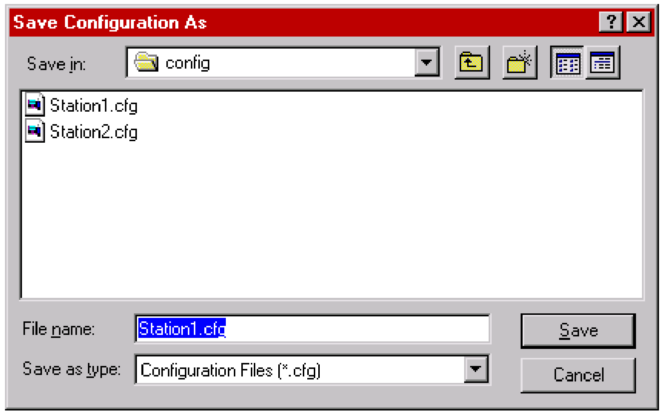
Open Configuration Window

ITEM	DESCRIPTION
Look In	Selects directories and drives where configuration files are located.
File Name	Displays the selected file’s name.
Files Of Type	Selects the type of files displayed. The extension for configuration files is (*.cfg).
Open As Read-Only	Opens a read-only copy of the selected station configuration file. A read-only file can be edited, but needs a new name to be saved.

Save Configuration As Window

Path

File > Save or **Save As**



This window specifies the file name and location of the configuration file being saved.

Selecting **Save** to save a new, unnamed station configuration also displays this window.

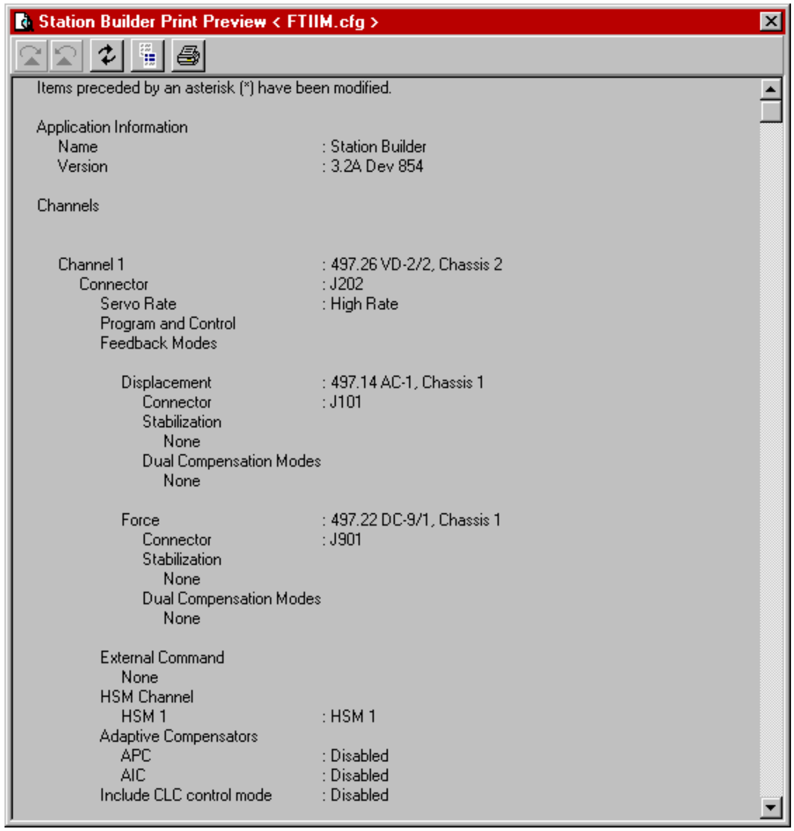
Save Configuration As Window

ITEM	DESCRIPTION
Save In	Selects the location where the configuration file is saved.
File Name	Specifies the name of the station configuration file being saved.
Save As Type	Selects the file type. The default **Configuration File (*.cfg)** selection automatically appends a .cfg extension to the file name.

Station Builder Print Preview Window

Path

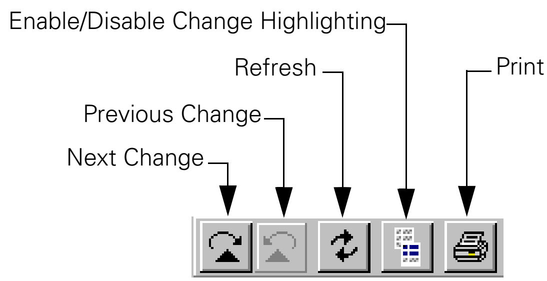
File > Print Preview



This window displays an on-screen preview of the configuration file printout. A toolbar facilitates access and display of configuration file changes.

Asterisks (*) identify items modified since the configuration file was last loaded or saved. In addition, you can choose to highlight these changes by selecting the **Enable Change Highlighting** icon on the Print Preview toolbar.

Print Preview Toolbar



Print Preview Toolbar

ITEM	DESCRIPTION
Next Change	Goes to the next change on the Print Preview window.
Previous Change	Goes to the previous change on the Print Preview window.
Refresh	Allows you to see current configuration set changes without closing and reopening the Print Preview window. If change highlighting is enabled, the current configurations changes are highlighted.
Enable/Disable Change Highlighting	Allows you to enable or disable highlighting of configuration changes.
Print	Prints the current configuration file.

Print to File Window

Path

File > Print to File

This window saves configuration files as text (*.txt) files.

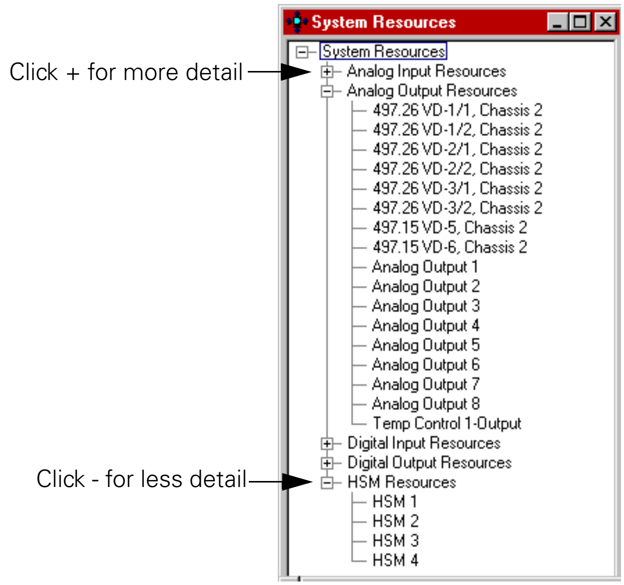
Print Configuration to File Window

ITEM	DESCRIPTION
Save In	Selects the location where the text file is saved.
File Name	Specifies the name of the text file.
Files Of Type	Selects the file type. The default **Text File (*.txt)** selection automatically appends a .txt extension to the file name.

System Resources Window

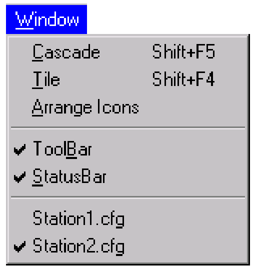
Path

File > System Resources



This window displays a tree view of all system resources.

Window Menu

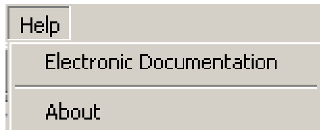


This menu's commands change the appearance of the Station Builder application.

Window Menu

ITEM	DESCRIPTION
Cascade	Cascades open Station Configuration windows.
Tile	Tiles open Station Configuration windows.
Arrange Icons	Places minimized Station Configuration windows at the bottom of the Station Builder window.
Toolbar	Displays and hides the **Station Builder** window's toolbar.
Status Bar	Displays and hides the **Station Builder** window's Status Bar.
Open Stations	Lists the file names of open station configurations. Select a name to display the file's Station Configuration window.

Help Menu

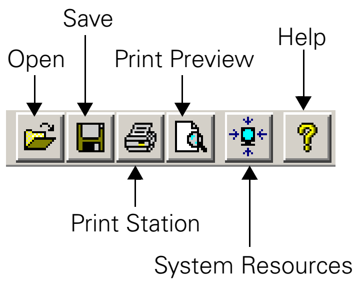


This menu's commands access electronic documentation and display general application information.

Help Menu

ITEM	DESCRIPTION
Electronic Documentation	Opens electronic documentation help.
About	Opens the **About Station Builder** window. This window displays the Station Builder application version number and copyright information.

Toolbar

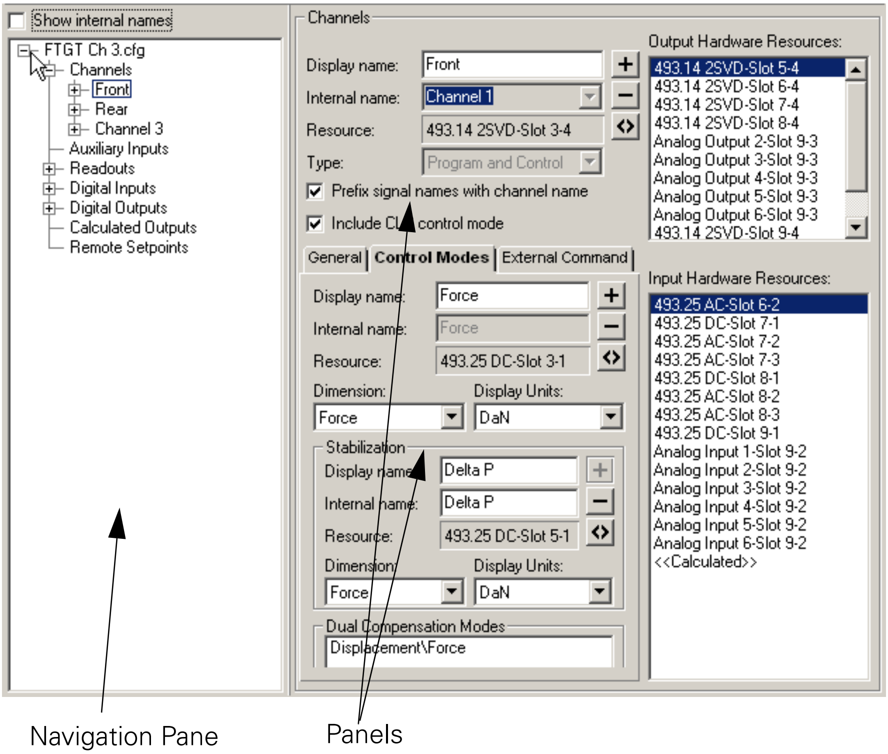


Toolbar buttons provide quick access to common commands and windows. The **Main Menu** also has these commands.

Toolbar

Item	Description
Open	Displays the **Open Configuration** window, used to open existing station builder configurations.
Save	Saves the station configuration under its current name. Opens the **Save Configuration As** window if the station is not yet named.
Print Station	Prints the station configuration.
Print Preview	Displays a print preview of the station configuration.
System Resources	Opens the **System Resources** window which displays a tree view of all system resources.
Help	Displays on-line help.

Station Configuration Window

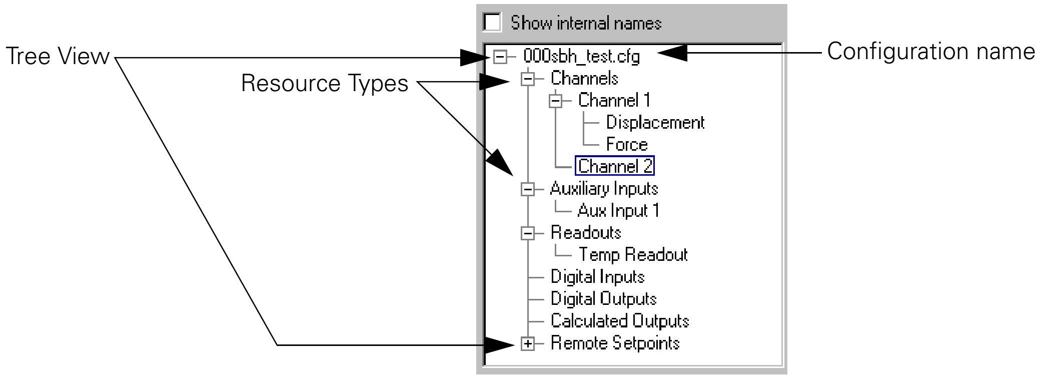


The Station Configuration window creates, displays, and modifies station configurations.

Station Configuration Window

ITEM	DESCRIPTION
Navigation Pane	Displays a tree view, by resource type, of the station configuration. Selections within the pane determine what Station Configuration panels display.
Panels	Define the resources used in the station configuration. Panels change depending on the resource type selected in the navigation pane.

Navigation Pane



The navigation pane displays a tree view of the station configuration. The view is organized by how station resources are used.

Navigation Pane (part 1 of 2)

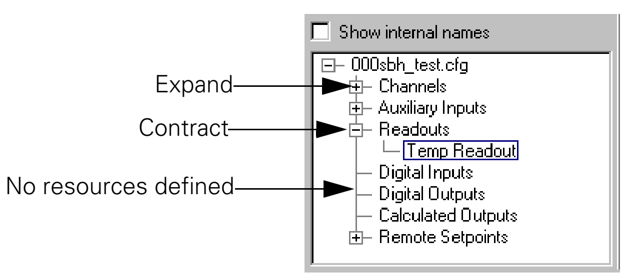
ITEM	DESCRIPTION
Show Internal Name	Identifies each assigned resource in the Tree View by its **Internal name** rather than its **Display name**. The Station Configuration panels' **Internal name** and **Display name** entries name assigned resources.
Tree View	Displays an expandable view of the station configuration, organized by how station resources are used. Selecting a resource displays Station Configuration window panels appropriate for the type of resource selected.

Navigation Pane (part 2 of 2)

Item	Description
Resource Type	Your system may not have every Resource Type listed below. **Channels**—select to display the **Channels** panel, which assigns input and output hardware resources to your station configuration. **Auxiliary Inputs**—select to display the **Auxiliary Inputs** panel, which assigns resources whose input signals supply additional test data. **Readouts**—select to display the **Readouts** panel, which assigns resources whose output signals go to external analog readout devices, typically meters and oscilloscopes. **Digital Inputs**—select to display the **Digital Inputs** panel, which assigns resources to input signals from external logic devices and switches. **Digital Outputs**—select to display the **Digital Outputs** panel, which assigns resources to output signals to external logic devices and switches. **Calculated Outputs**—select to display the **Calculated Outputs** panel, which assigns a resource to output a signal resulting from a user-defined calculation. **Remote Setpoints**—select to display the **Remote Setpoints** panel, which assigns resources to input signals from **Remote Setpoint Adjustment** (RSA) controls.

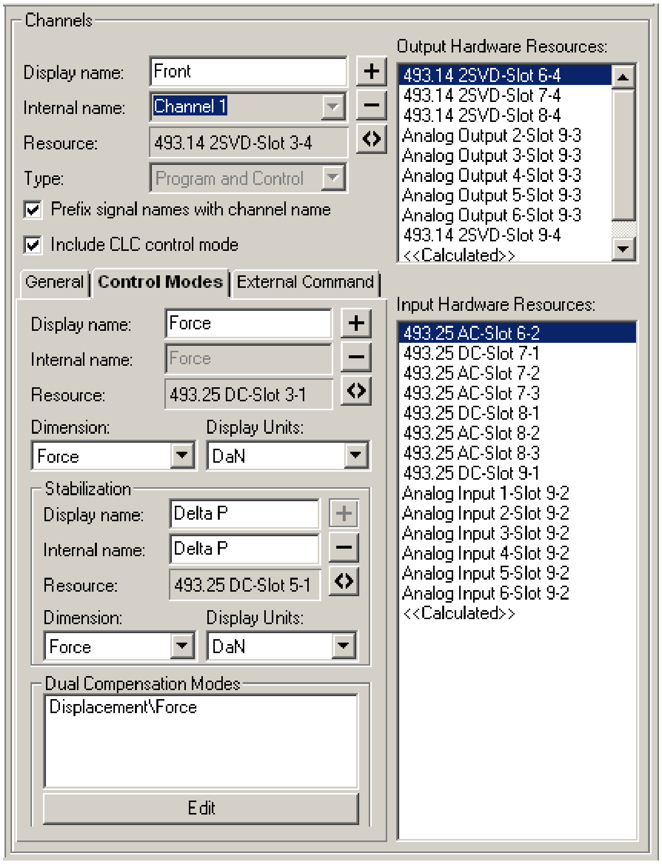
Expanding channel lists

Defining a resource places a plus (+) sign next to its Resource Type. Click on the plus sign to see the defined resources.



Channels Panel

Path Navigation pane > **Channels**

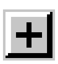
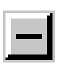
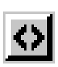


This panel assigns resources whose signals create control channels.

Channels Panel (part 1 of 2)

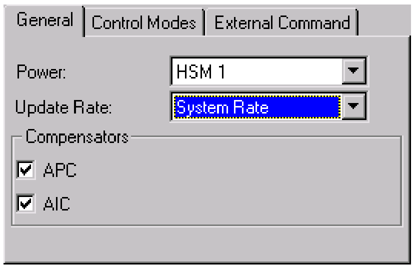
Item	Description
Display Name	Gives the channel a name used for display purposes. Names can have up to 30 characters.
Internal Name	Gives the channel a name used for internal purposes. Names can have up to 30 characters.

Channels Panel (part 2 of 2)

ITEM	DESCRIPTION
Resource	Identifies the hardware or calculated resource used to output the program or command signal.
Type	Selects the channel type. See "About Program Channels" on page 40.
Prefix signal names with channel name	**For single-channel stations**: Clearing this checkbox removes the channel name from the display name of all signals on the channel. **For multiple-channel stations**: Clearing this checkbox removes the channel name from the display name of all feedback and mode-specific signals. ***Note*** *For multiple-channel stations, the channel prefix **will not** be removed from channel-specific signals.* The default setting for this signal name attribute is "checked".
Include CLC Control Mode	Creates a Channel-Limited-Channel (CLC) control mode to be used when installing and removing specimens. CLC is for Program and Control channels only. Two control modes must be defined on the channel before this CLC control mode becomes available.
	Creates a new channel, assigning the highlighted **Output Hardware Resource** to the channel.
	Eliminates the channel and returns the **Resource** to **Output Hardware Resources**.
	Swaps the current **Resource** selection with the item highlighted in **Output Hardware Resources**.
General	This tab specifies the channel's general characteristics.
Control Modes	This tab specifies the channel's control modes.
External Command	This tab specifies an external command source for the channel.

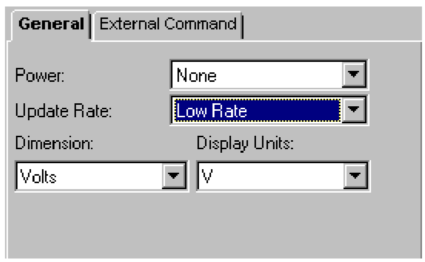
General Tab

Path Navigation pane > **Channels** > **Channels** panel > **General** tab



Tab for a **Type** selection of:

- **Program and Control**
- **Program w/ Feedback**
- **Command Plus Error**



Tab for a **Type** selection of:

- **Program Only**

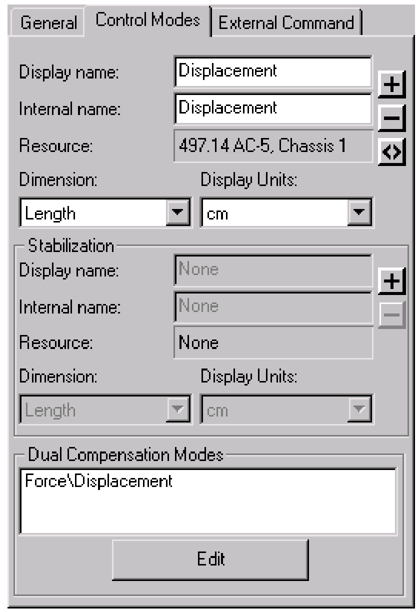
This tab specifies the general characteristics of a control channel.

General Tab

ITEM	DESCRIPTION
Power	Specifies the channel's power source. See "About the Power Control" on page 44 for more about this control.
Update Rate	Specifies the channel's update rate. see "About Update Rates" on page 42 for more about system rates.
Compensators	Makes selected compensation available on the channel. This is an option and these controls may not be available on your system.
APC	Select to enable Amplitude and Phase Control (APC).
AIC	Select to enable Adaptive Inverse Control (AIC).
Dimension	Sets the dimension represented by the program signal of a **Program Only** channel.
Display Units	Sets the display units used with the **Dimension** selection.

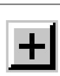
Control Modes Tab

Path Navigation pane > **Channels** > **Channels** panel > **Control Modes** tab

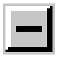
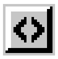
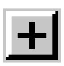
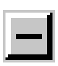


This tab assigns the resources that produce control mode, stabilization, and dual compensation signals.

Control Modes Tab (part 1 of 2)

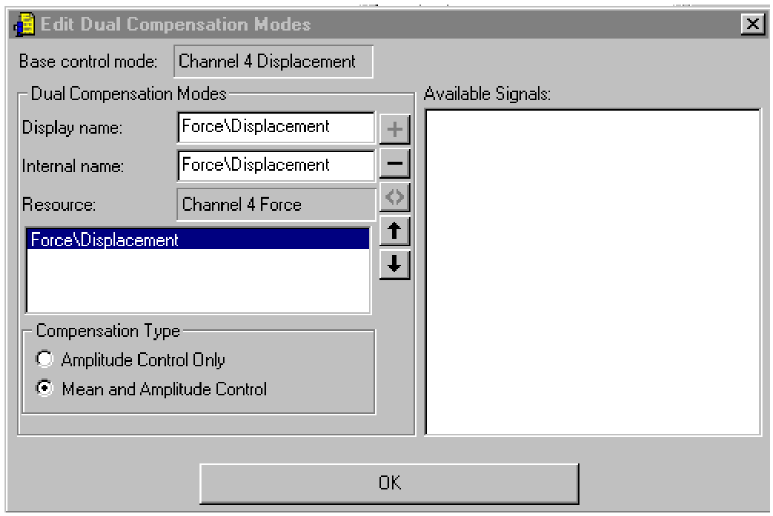
ITEM	DESCRIPTION
Display name	Gives the control mode a name used for display purposes. Names can have up to 30 characters.
Internal name	Gives the control mode a name used for internal purposes. Names can have up to 30 characters.
Resource	Identifies the input hardware resource (or calculated resource) supplying the feedback signal used in the control mode.
	Creates a new control mode, assigning the highlighted **Input Hardware Resource** as the **Resource** that inputs the control mode feedback signal.

Control Modes Tab (part 2 of 2)

ITEM	DESCRIPTION
	Eliminates the control mode, returning the **Resource** to **Input Hardware Resources**.
	Swaps the current **Resource** with the highlighted **Input Hardware Resources** selection.
Dimension	Sets the dimension represented by the feedback signal.
Display Units	Sets the display units used with the **Dimension** selection.
Stabilization	Assigns the resource that inputs a signal used by the control mode for stabilization.
Display Name	Gives the stabilization signal input by the **Resource** a name used for display purposes. Names can have up to 30 characters.
Internal Name	Gives the stabilization signal input by the **Resource** a name used for internal purposes. Names can have up to 30 characters.
Resource	Identifies the hardware or calculated resource that inputs the stabilizing signal.
	Assigns the highlighted **Input Hardware Resources** as the **Resource** for the stabilization signal.
	Returns the **Resource** to **Input Hardware Resources**.
Dimension	Sets the dimension represented by the stabilization signal.
Display Units	Sets the display units used with the **Dimension** selection.
Dual Compensation Modes	Identifies the control mode's dual compensation modes.
Edit	Opens the **Edit Dual Compensation Modes** window, used to enable dual compensation modes. ***Note*** *The **Edit** button will be inactive until at least one control mode, and either a second control mode or an auxiliary data channel is defined.*

Edit Dual Compensation Modes Window

Path Navigation pane > **Channels** > **Channels** panel > **Control Modes** tab > **Edit**

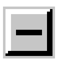
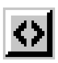
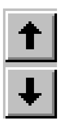


This window assigns the resources that produce dual compensation signals.

Dual Compensation Modes Window (part 1 of 2)

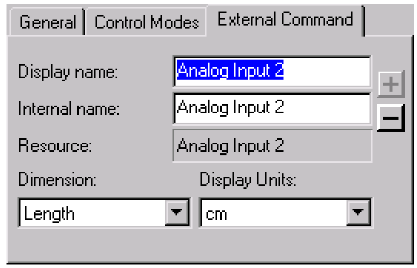
ITEM	DESCRIPTION
Base Control Mode	Identifies the channel and the feedback signal going to the PIDF controller.
Dual Compensation Modes	Defines dual compensation modes.
Display Name	Gives the control mode a name for display purposes. (In the default name, the signal supplied to the compensator comes first.) Names can have up to 30 characters.
Internal Name	Gives the control mode a name for internal purposes. (In the default name, the signal supplied to the compensator appears first.) Names can have up to 30 characters.
Resource	Identifies the feedback signal going to the compensator.
Compensation Modes (unlabeled)	Lists the defined dual compensation modes that use this base control mode.

Dual Compensation Modes Window (part 2 of 2)

ITEM	DESCRIPTION
Compensation Type	Selects the type of compensation applied by the compensator. **Amplitude Control Only**—applies only amplitude control compensation. **Mean and Amplitude Control**—applies mean and amplitude compensation.
	Creates a new mode, assigning the highlighted **Available Signals** as the **Resource** for the compensation feedback signal.
	Eliminates the current mode, returning the **Resource** to **Available Signals**.
	Swaps the currently selected **Resource** with the **Available Signals** selection.
	Moves up or down in the **Compensation Modes** list, allowing you to select one of the defined compensation modes.
Available Signals	Lists signals that can be selected to supply feedback to the compensator.

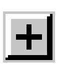
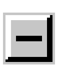
External Command Tab

Path Navigation pane > **Channels** > **Channels** panel > **External Command** tab



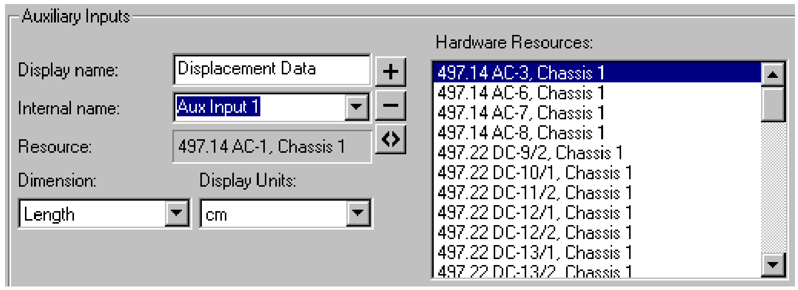
This tab assigns the resources that input external commands from an external controller or function generator. This external signal can be used to command the channel.

External Command Tab

ITEM	DESCRIPTION
Display Name	Gives the external command signal input by the **Resource** a name used for display purposes. Names can have up to 30 characters.
Internal Name	Gives the external command signal input by the **Resource** a name used for internal purposes. Names can have up to 30 characters.
Resource	Identifies the hardware or calculated resource that inputs the external command signal.
	Allocates the resource selected in **Input Hardware Resources**.
	Returns the **Resource** to **Input Hardware Resources**.
Dimension	Sets the dimension represented by the external command signal.
Display Units	Sets the display units used with the **Dimension** selection.

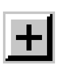
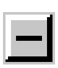
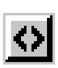
Auxiliary Inputs Panel

Path Navigation pane > **Auxiliary Inputs**



This panel assigns resources to input auxiliary signals.

Auxiliary Inputs Panel (part 1 of 2)

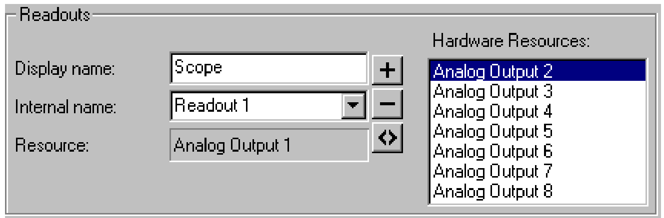
ITEM	DESCRIPTION
Display Name	Gives the auxiliary signal input by the **Resource** a name used for display purposes. Names can have 30 characters.
Internal Name	Gives the auxiliary signal input by the **Resource** a name used for internal purposes. Names can have 30 characters.
Resource	Identifies the hardware or calculated resource that inputs the auxiliary signal.
Hardware Resources	Lists hardware and calculated resources that can be selected to input auxiliary signals.
	Creates the auxiliary input, assigning the hardware or calculated resource highlighted in **Hardware Resources** as the **Resource** that inputs the auxiliary signal.
	Eliminates the auxiliary input, returning the **Resource** to **Hardware Resources**.
	Swaps the current **Resource** with the highlighted **Hardware Resources** selection.
Dimension	Selects the dimensions represented by the auxiliary input signal.

Auxiliary Inputs Panel (part 2 of 2)

ITEM	DESCRIPTION
Display Units	Selects the display units used with the **Dimension** selection.
Reconfigurable	This checkbox is displayed for systems with the reconfigurable signal option. When checked, the designated auxiliary input signal name and dimension can be changed in Station Manager. See "Reconfigurable signals" on page 72.

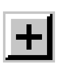
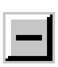
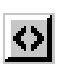
Readouts Panel

Path Navigation pane > **Readouts**



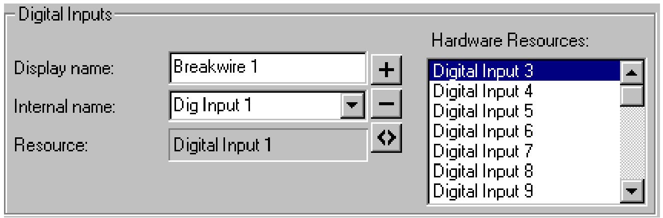
This panel defines analog readout signals.

Readouts Panel

ITEM	DESCRIPTION
Display Name	The name of the readout signal output by the selected **Resource** and used for display purposes. Signals can be given new names of up to 30 characters.
Internal Name	The name of the readout signal output by the selected **Resource** and used for internal purposes. Signals can be given new names of up to 30 characters.
Resource	Identifies the hardware that outputs the analog readout signal.
Hardware Resources	Lists available analog output hardware resources.
	Makes the **Hardware Resources** selection the **Resource** that outputs the readout signal.
	Returns the **Resource** to **Hardware Resources**.
	Swaps the current **Resource** with the highlighted **Hardware Resources** selection.

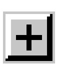
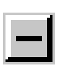
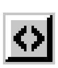
Digital Inputs Panel

Path Navigation pane > **Digital Inputs**



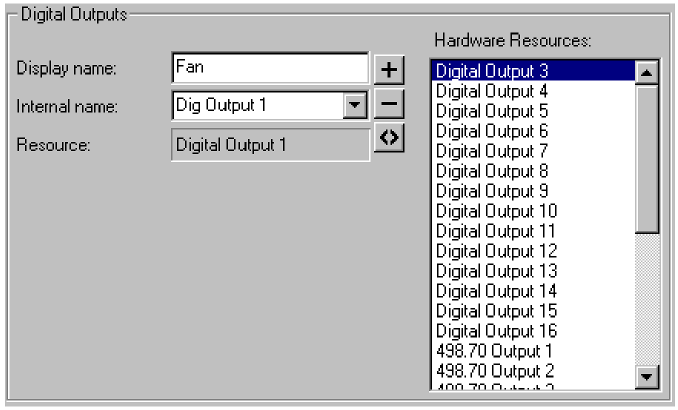
This panel defines digital input signals.

Digital Inputs Panel

ITEM	DESCRIPTION
Display Name	The name of the digital signal input by the selected **Resource** and used for display purposes. Signals can be given new names of up to 30 characters.
Internal Name	The name of the digital signal input by the selected **Resource** and used for internal purposes. Signals can be given new names of up to 30 characters.
Resource	Identifies the hardware that inputs the digital signal.
Hardware Resources	Lists available digital input hardware resources.
	Allocates the current **Hardware Resources** selection as the **Resource** that inputs the digital signal.
	Returns the selected **Resource** to **Hardware Resources**.
	Swaps the current **Resource** with the highlighted **Hardware Resources** selection.

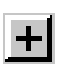
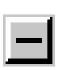
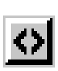
Digital Outputs Panel

Path Navigation pane > **Digital Outputs**



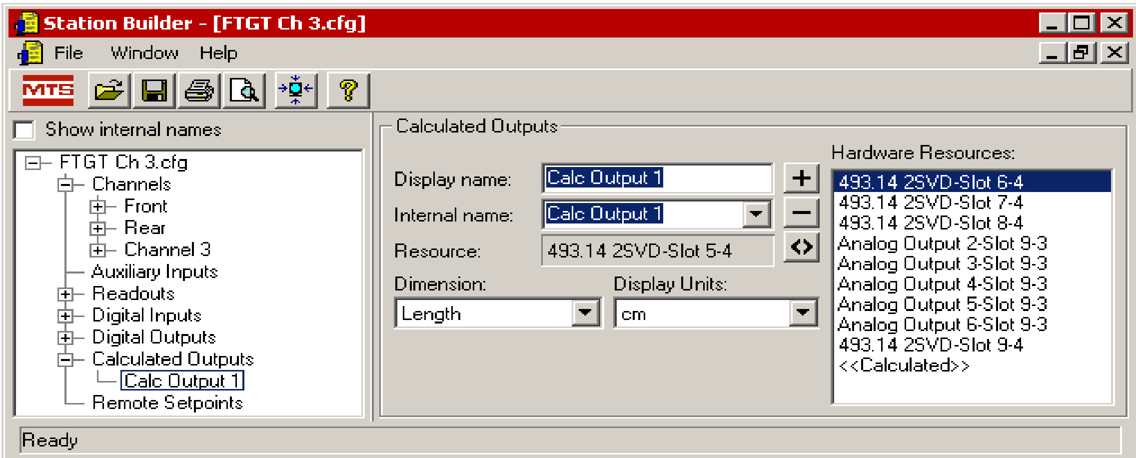
This panel defines digital output signals.

Digital Output Panel

ITEM	DESCRIPTION
Display Name	The name of the digital signal output by the selected **Resource** and used for display purposes. Signals can be given new names of up to 30 characters.
Internal Name	The name of the digital signal output by the selected **Resource** and used for internal purposes. Signals can be given new names of up to 30 characters.
Resource	Identifies the hardware that outputs the digital signal.
Hardware Resources	Lists available digital output hardware resources.
	Allocates the current **Hardware Resources** selection as the **Resource** that outputs the digital signal.
	Returns the **Resource** to **Hardware Resources**.
	Swaps the current **Resource** with the highlighted **Hardware Resources** selection.

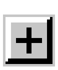
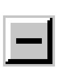
Calculated Outputs Panel

Path Navigation pane > **Calculated Outputs**

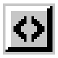


Use the Calculated Outputs panel to identify each calculated output for your test. In Station Manager, each calculated output identifies an equation which can be used to define a calculated output signal.

Calculated Outputs Panel (part 1 of 2)

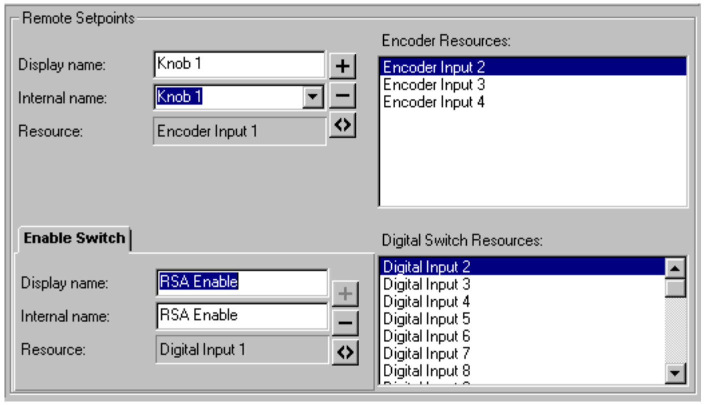
ITEM	DESCRIPTION
Display Name	The name of the calculated output used for display purposes. Signals can be given new names of up to 30 characters.
Internal Name	The name of the calculated output used for internal purposes. Signals can be given new names of up to 30 characters.
Resource	Typically used to identify the hardware that receives the calculated output signal defined by an equation created in Station Manager. A Calculated resource may also be selected.
Hardware Resources	Lists available hardware or calculated resources.
	Allocates the current **Hardware Resources** selection as the **Resource** receives the calculated output signal.
	Returns the **Resource** to **Hardware Resources**.

Calculated Outputs Panel (part 2 of 2)

Item	Description
	Swaps the current **Resource** with the highlighted **Hardware Resources** selection.
Dimension	Selects the dimensions represented by the calculated output signal.
Display Units	Selects the display units used with the **Dimension** selection.

Remote Setpoints Panel

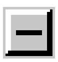
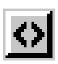
Path Navigation pane > **Remote Setpoints**



A Remote Setpoint Adjust (RSA) control is an optional, stand-alone hardware device that uses an encoder to control actuator setpoints. Access the **Remote Setpoints** panel to allocate an encoder resource (and its associated **RSA** control).

As an option, an **Enable Switch** tab allows you to assign a digital input for a switch to turn the RSA control on and off.

Remote Setpoints Panel

Item	Description
Display Name	The name of the RSA control knob for display purposes. You can use up to 30 characters.
Internal Name	The name of the RSA control knob used for internal purposes. You can use up to 30 characters.
Resource	Identifies the selected encoder resource.
Encoder Resources	Lists available encoder resources.
	Allocates the resource selected in **Encoder Resources**.
	Returns the **Resource** to **Encoder Resources**.
	Swaps the current **Resource** with the highlighted **Encoder Resources** selection.
Enable Switch tab	Opens the Enable Switch tab which allows you to allocate a digital input for an RSA on/off switch.
Display Name	The name of the RSA on/off switch for display purposes. You can use up to 30 characters.
Internal Name	The name of the RSA on/off switch used for internal purposes. You can use up to 30 characters.
Resource	Identifies the selected digital switch resource.
Encoder Resources	Lists available **Digital Switch** resources.

Chapter 3

Station Manager

Performing common tasks

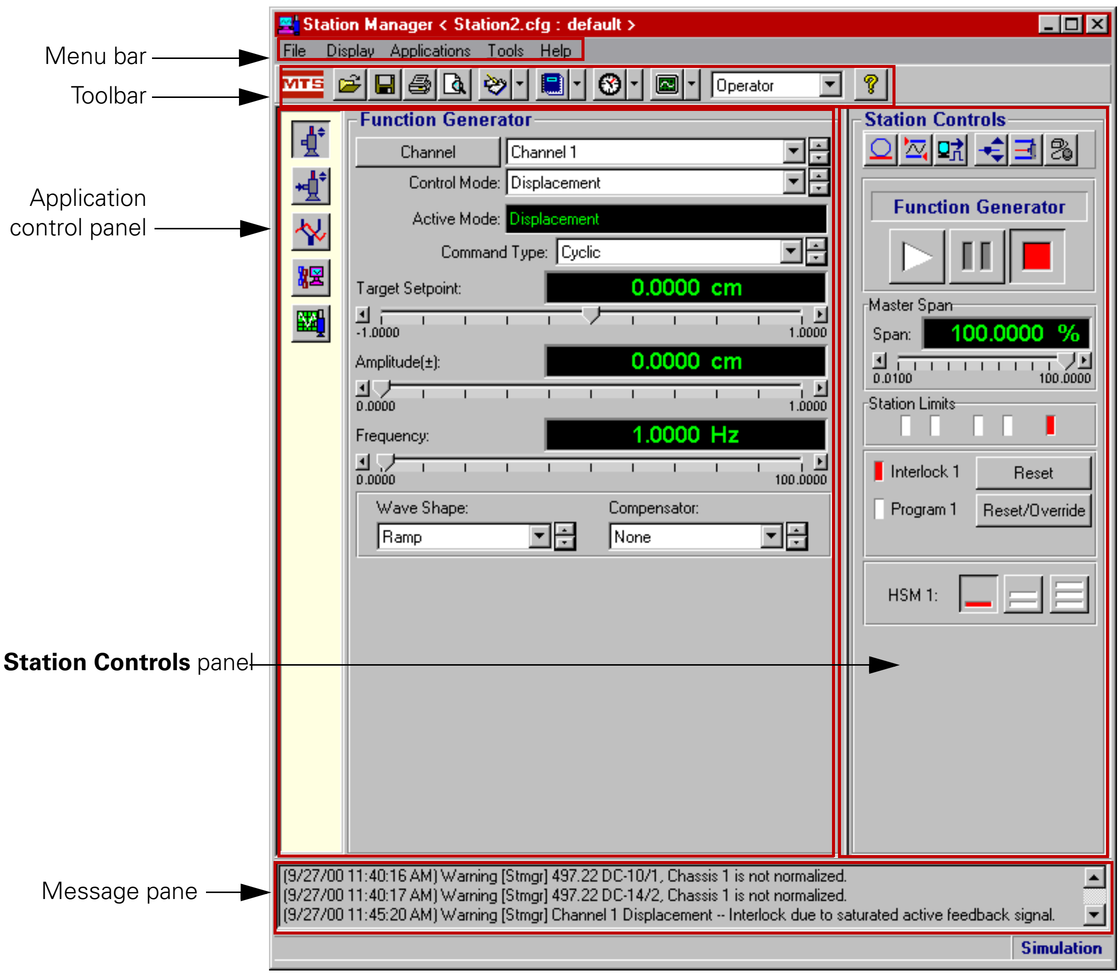
Window and control descriptions

Application Overview

The Station Manager application lets you:

- Create station parameter sets by assigning operational parameters to the controller resources defined in station configuration files.
- Perform basic testing activities such as activating drive power, gaining manual control of the actuator to install the specimen, monitoring station signals, and starting and stopping tests.

Station Manager main window



With the **Station Manager** window controls you can:

- Perform system calibration and tuning.
- Configure limit and error detectors.
- Define and apply an algebraic formula to a signal in order to generate a calculated signal value.
- Configure signal compensation and stabilization.
- Control hydraulic pressure to the test station.
- Apply simple programs with the built-in function generator.
- Manage the execution of BTW and MPT tests.
- Monitor signals on the built-in scopes and meters.

All of the Station Manager application settings can be saved to a station parameter set.

Getting Started with Station Manager

How to Start the Station Manager Application

Use the Windows **Start** menu to select the following:

Programs > **MTS FlexTest** or **TestStar** > **Station Manager**

When you first start the Station Manager application, the following happens:

1. The System Loader utility starts and establishes a real-time connection with your hardware components.

   If the System Loader utility does not connect to the controller, an error message appears and the Station Manager application quits.

Note *On FlexTest™ series controllers, the Desktop Organizer utility starts and displays the organizer taskbar.*

2. The Station Manager application starts, and displays an **Open Station** window.

   For information on how to open a .cfg file, see ““How to Open a Station Configuration File” on page 124.

About the Demonstration Mode

The demonstration mode simulates a connection with your hardware components allowing you to run the system software without applying station power.

Use the Demo System Loader utility to start the demonstration mode if you want to test a new station configuration or learn to use the system software controls.

“Simulation” appears in the window status bars when in the demonstration mode.

How to Start the Demonstration Mode

1. Start the Demo System Loader utility:

   Start > **Programs** > **MTS FlexTest** or **TestStar** > **Tools** > **Demo System Loader**

2. Start the Station Manager application:

   Start > **Programs** > **MTS FlexTest** or **TestStar** > **Station Manager**

   When the Station Manager application starts, the **Open Station** window appears automatically.

Configuration Files and Parameter Sets

About Configuration Files

Station configuration files (extension .cfg) define how the Station Manager application uses system resources in test stations. The Station Builder application defines station configurations. For more about defining station configurations, see Chapter 2, “Station Builder”.

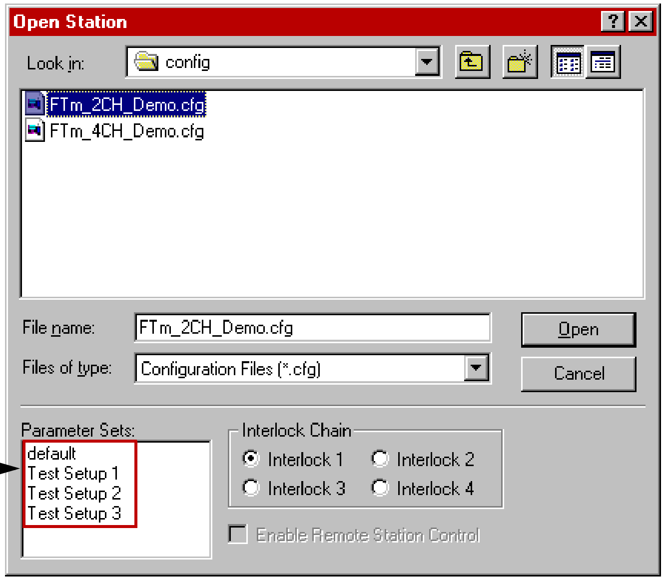
About Station Parameter Sets

A station parameter set contains the settings needed by a station configuration to run a test. These settings include everything from tuning values to detector settings.

When you close a station configuration, you are prompted to save the changes to the parameter set selected when the station opened.

The same station configuration may need different settings to run different tests. You can create and save these settings in up to 15 parameter sets. When you open the station configuration, you can select the appropriate parameter set needed to run the test.

Select the set needed for your test



How to Open a Station Configuration File

1. Start the Station Manager application.

   The Station Manager application will display the **Open Station** window.

Note *Before opening Station Manager, station power must be off and any ongoing test must be stopped. You may also need to shut down some applications connected to the station before you can open the station.*

2. In the **Open Station** window:

   A. Select the name of the desired station configuration file.

   B. In **Parameter Sets**, select the desired parameter set if available.

   C. Click to specify the station **Interlock Chain**.

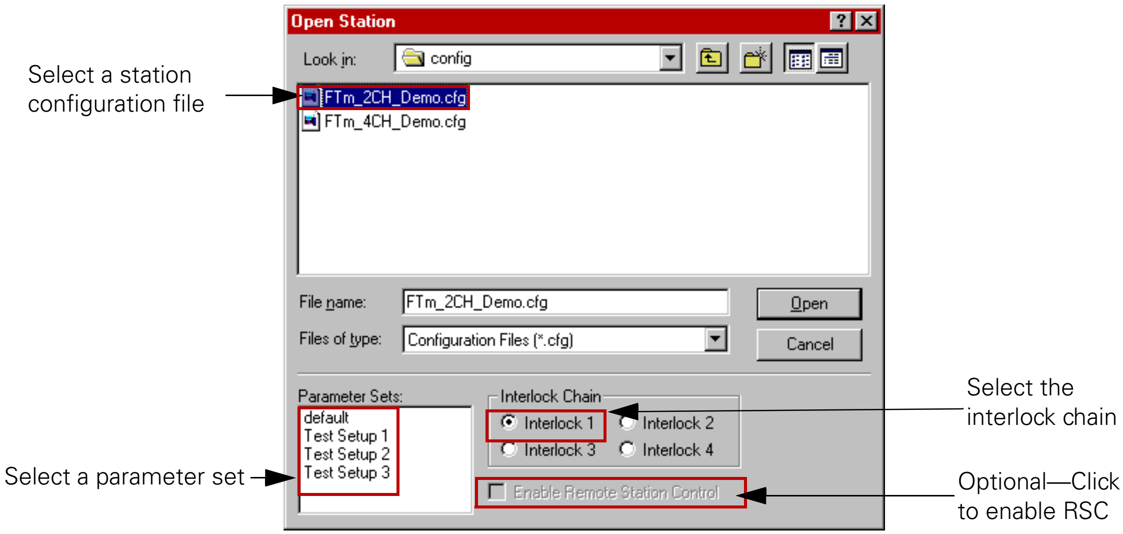
Note *Station Manager saves the last used interlock chain to the station configuration file, and will attempt to restore it if currently available.*

   D. Optional—Click to **Enable Remote Station Control** (RSC).

   For FlexTest™ series systems that include multiple RSCs, the selected **Interlock Chain** determines which RSC will be enabled.

   RSC is not available in the Demonstration mode.

   E. Click **Open** to open the configuration file.



See “Open Station Window” on page 281 for more information.

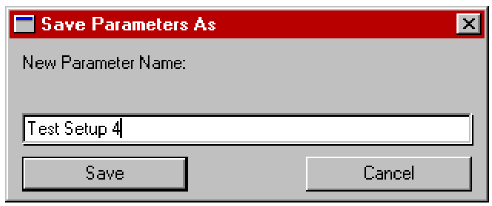
How to Save a Parameter Set Under a New Name

1. In the **Station Manager** window's **File** menu, select **Save Parameters As**.
2. In the **Save Parameters As** window:

   A. Enter the **New Parameter Name**.

   B. Click **Save**.

Note *Use the* ***Station Manager*** *window's* ***File*** *menu* ***Save Parameters*** *command to save updated parameter values without changing the parameter set's name.*

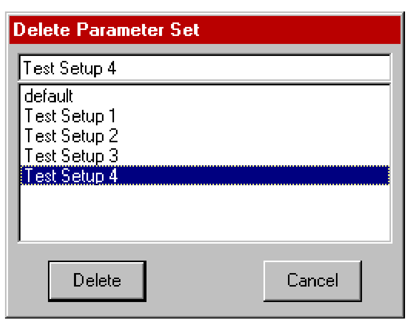


How to Delete a Parameter Set

1. In the **Station Manager** window's **File** menu, select **Delete Parameters**.
2. In the **Delete Parameter Set** window:

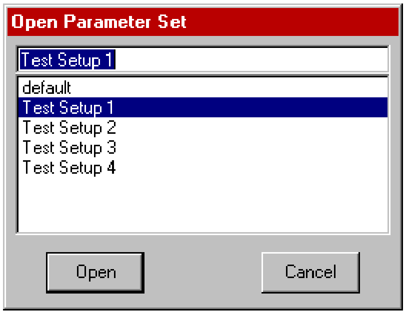
   A. Select the parameter set to be deleted.

   B. Click **Delete**.



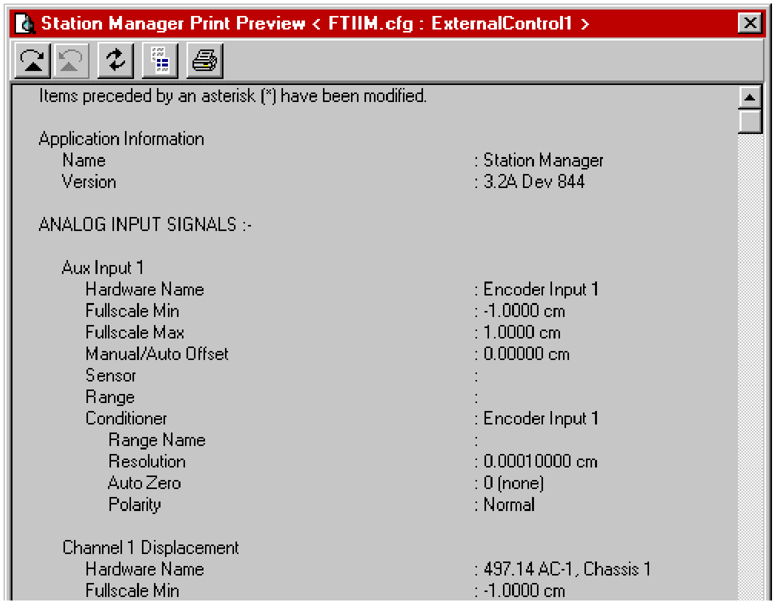
How to Open a Different Parameter Set

1. In the **Station Manager** window's **File** menu, select **Open Parameters**.
2. In the **Open Parameters Set** window:
   - A. Select the desired parameter set.
   - B. Click **Open**.



How to Preview a Parameter Set

In the **Station Manager** window's **File** menu, select **Print Preview** to display the **Station Manager Print Preview** window.



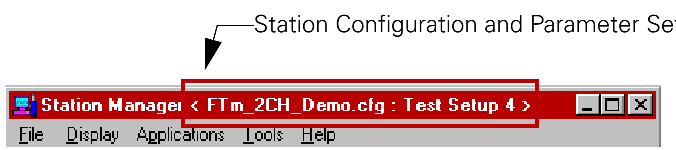
Note *Asterisks (*) identify items modified since the configuration file was last saved. You can choose to highlight these modified items. Use the **Station Manager** window's **File** menu **Save Parameters** command to save these changes.*

How to Print a Parameter Set

Click the **Print** icon on the **Station Manager Print Preview** window toolbar or select **Print Parameters** in the **Station Manager** window's **File** menu.

How to Determine What Parameter Set is Being Used

The **Station Manager** window's title bar displays both the station configuration and parameter set being used.



Setting Access Levels

About Access Levels

The access level determines what controls you can access. There are four levels:

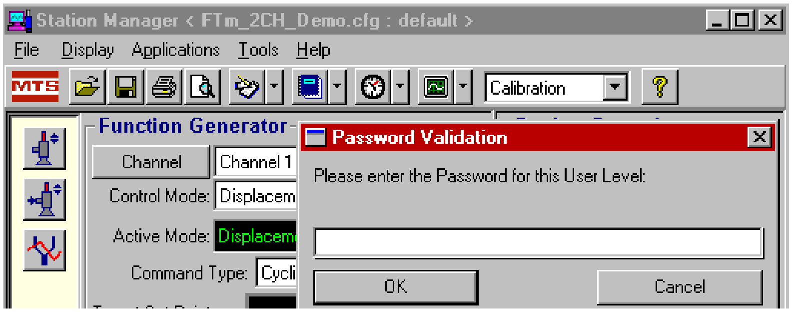
- **Operator**—Not password protected
- **Tuning**—Password protected with a default password of *Tuning*
- **Calibration**—Password protected with a default password of *Calibration*
- **Configuration**—Password protected with a default password of *Configuration*

Access to the **Tuning**, **Calibration**, and **Configuration** access levels is protected by case-sensitive passwords, which can be selected during the software installation. See "Access Level" on page 277 for more information.

Note *__Calibration__ and __Configuration__ are at the same access level. Going from __Configuration__ to __Calibration__ (or vice versa) requires a password.*

How to Go to a Higher Access Level

1. In the **Station Manager** window's toolbar, select the desired access level.
2. In the **Password Validation** window:
   A. Enter the proper access level password.
   B. Click **OK**.



Station Views

About Station Views

To avoid reopening windows and displays each time you reopen a station configuration, save the desktop layout as a station view. When you restore a saved view, the windows reposition automatically.

Each time the Station Manager application closes, it saves the current station view as the default view. When you reopen the station it appears with the windows repositioned as they were when the station was last closed. This allows a user to always revert to the last saved station.

You can also restore a default view by selecting **Restore Default View**, as described below. This function repositions the station windows to where they were the last time the station was closed.

How to Save a View

In the **Station Manager** window's **File** menu, select **Save View**.

How to Restore a Saved View

In the **Station Manager** window's **File** menu, select **Restore Saved View**.

How to Restore a Default View

In the **Station Manager** window's **File** menu, select **Restore Default View**.

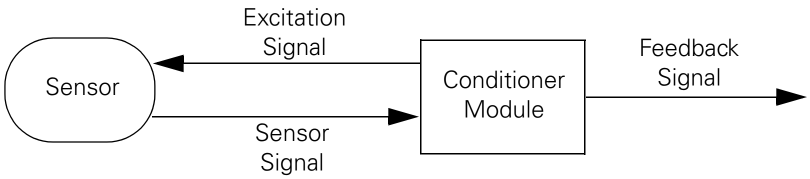
Calibrating Sensors and Configuring Feedback

About Sensors

.Your system's sensors convert measured mechanical values, such as force, displacement, and pressure, into electrical signals that after conditioning, are suitable for feedback for closed-loop control.

In the Station Builder application, you allocate the proper controller resources to allow either internal or external signal conditioning. For more about allocating resources, see "Allocating Controller Resources" on page 37.

- Signals can be conditioned internally if your controller is equipped with built-in conditioners.
- Signals must be conditioned externally if your controller does not have built-in conditioners.



Calibrating sensors

All sensors require calibration to ensure that their outputs accurately represent the physical condition they are sensing.

Sensors included with your test system are usually factory-calibrated, and the corresponding sensor calibration files are included with your system software. If you change a sensor or add a new sensor to your system, you must calibrate the new sensor/conditioner pair against a standard to ensure the sensor's accuracy.

Sensor calibration procedures are detailed in Chapter 6, Calibration of the *493.10/793.00 Controller Service Manual*.

Before You Begin

Before you start sensor calibration, *be sure* the following are true:

- The sensors are properly connected to the controller (refer to the cabling information in your Controller Service manual).
- A station configuration file has been created that includes the hardware resources associated with the sensors you want to calibrate.
- The Station Manager program is running and the appropriate station configuration file is open.
- You have completed an initial, nominal tuning of the sensor channel you are calibrating. This is especially important if you have not calibrated the sensor before.
- The hydraulics are warmed up (see System warm-up below).
- **Gain** is set to 1 on the **Drive** panel **Conditioner** tab (3-stage servovalves only).
- You know your signal polarity (see Signal polarity below).

System warm-up

Be sure that both the hydraulic fluid and the servovalve are at operating temperature before calibration. Remove any specimen and run the system in displacement control for at least 30 minutes using a 80% full-scale length command at about 0.1 Hz.

Refer to "How To Warm Up the System Hydraulics" on page 546 for a detailed warm-up procedure.

Signal polarity

Some test systems are configured to extend the actuator in response to a positive command, while other test systems are configured to retract the actuator in response to a positive command. Conditioner polarity determines feedback polarity.

You *must know* how your test system is configured so you can determine the appropriate polarity for the values used in this chapter.

See "Setting the Servovalve Polarity" on page 542 for more information

About Sensor Calibration Files

Sensor calibration files have .scf extensions and are usually stored in the “Calib” directory. A sensor calibration file includes the following information:

- Sensor model, type, serial number, and calibration date
- Calibrated range information
- Calibration equipment information
- Calibration type
- Conditioner serial number, model number, excitation voltage, and other conditioner parameters

You can use the **Sensor File Editor** window to create and save sensor calibration files for each sensor/conditioner pair in your system. For more information, see “How to Create a Sensor File” on page 135.

After you create an .scf file, you must assign it to the correct incoming sensor signal. For more information, see “How to Assign a Sensor File” on page 141.

If you are using an externally conditioned feedback signal, you can use the Station Manager application’s calibration controls to adjust the gain, full-scale values, and polarity of the incoming sensor signal. See “How to Configure an Externally Conditioned Feedback Signal” on page 148.

Additional information

See “Station Manager Controls and Displays” on page 273 for a complete description of this application’s controls and indicators.

For more about the controls referenced in this section, see:

- “Sensor File Editor Window” on page 442.
- “Station Setup Window/Inputs Panel Tabs” on page 310.
- “Manual Command Window” on page 510.

How to Create a Sensor File

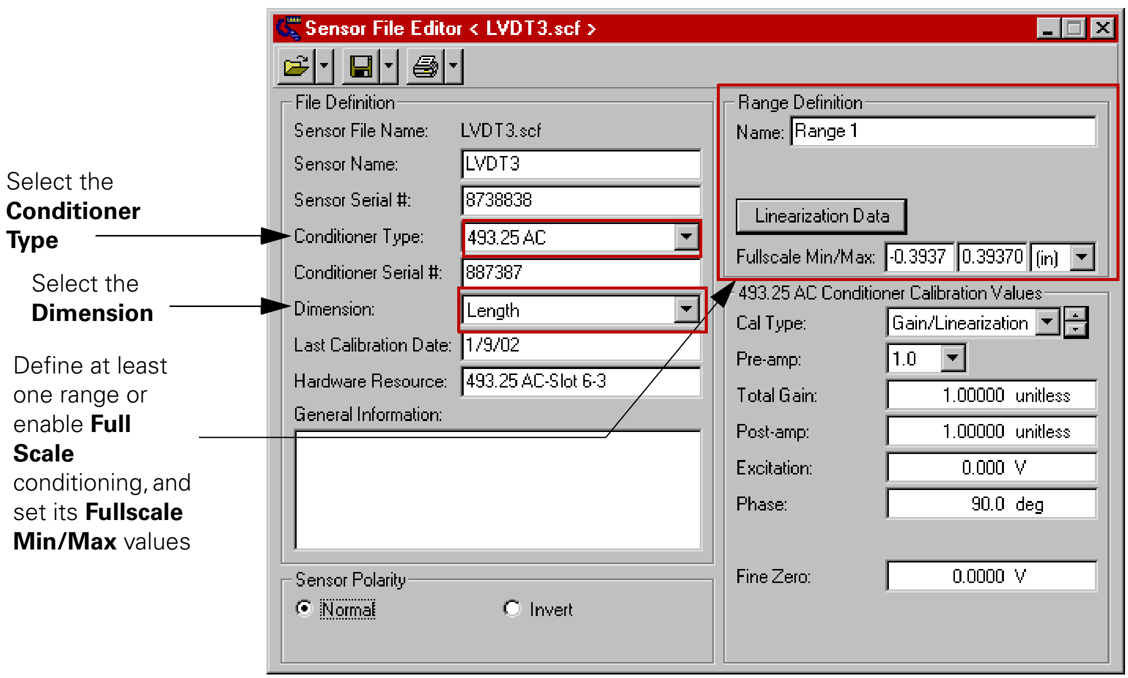
Note *You can create new sensor (.scf) files from any access level. You must be at the **Calibration** access level to edit any existing sensor file.*

This task is slightly different if you are using a full-range conditioner (e.g., Model 493.25 DUC). Note these variations in the following procedure:

1. In the **Station Manager** window's **Tools** menu, select **Sensor File Editor**.
2. On the **Sensor File Editor** toolbar, click the **Open** button, and then **New**.
3. In the **Sensor File Editor** window, set the **File Definition**:
4. Specify conditioner from the **Conditioner Type** list.

   Several conditioners may be listed. Select the type (Model #) of conditioner that is connected to the sensor you are calibrating.

Note *All conditioner entries are disabled until you select a conditioner type.*



5. Select the signal **Dimension**.

6. Enter any additional information.

   This step is optional. The sensor calibration file can include general information about the sensor and conditioner. The information helps link a specific sensor/conditioner pair to the calibration data.

   A. Enter the sensor serial number.

   B. Enter the conditioner serial number.

   C. Enter the last time the sensor was calibrated. If you are calibrating the sensor, enter today's date.

   D. Identify the hardware resource.

   E. You can enter any information you wish in the **General Information** field. For example, you may want to enter the sensor model number, its full-scale capacity, or some type of identifier you may use in your lab.

Range definition

Range definition depends on the conditioner type and calibration type selected. If you select a full-range conditioner (e.g., Model 493.25 DUC) you can only define a single range. Selecting a full-range conditioner also allows you to choose **Gain/Linearization**; in addition to **Gain/Delta K**, **mV/V Pos Tension**, or **mV/V Pos Comp** calibration types when defining your conditioner's range.

For multi-range conditioners, you can choose **Gain/Delta K** in addition to the **mV/V Pos Tension** and **mV/V Pos Comp** calibration types for each of your range definitions.

Procedures for **Gain/Linearization**, **Gain/Delta K**, **mV/V Pos Tension**, or **mV/V Pos Comp** range definition are described here.

Gain/linearization

Selecting **Gain/Linearization** for full-range conditioner allows you to define the conditioner range using a linearization data table as follows:

Important *Using linearization data requires specific conditioner zeroing practices. Ensure that **Electrical Zero Lock** on the **Offset/Zero** submenu is set to **Lock**. After completing calibration, readjustment of electrical zero will change the point at which linearization takes place, disturbing other calibration settings (especially delta k).*

1. Under Range Definition, define a range.

   By default, **Range 1** is entered. Highlight the name **Range 1** and change it to something meaningful.

2. Specify the **Fullscale Min/Max** values of the range.

   Select the units for the range, and then enter the values for the upper and lower ranges.

Note *The system software supports non symmetrical full scales. This means you do not have to center the range around zero, but the value 0.0 must be in the range. For example, you can set the full-scale maximum to +10 cm and the full-scale minimum to +3 cm.*

3. Select **Gain/Linearization** from the **Cal Type** list.

4. Locate the calibration data sheet for the appropriate full-range conditioner.

5. Click **Linearization Data** to open the **Linearization Data** window.

6. Enter **Standard** and **Conditioner** data from the conditioner's calibration data sheet.

7. Set the initial **Conditioner Calibration Values** for the full-range conditioner.

8. On the **Sensor File Editor** toolbar, click the **Save** button, and then **Save As** to display the **Save Sensor File As** window. See "Saving Sensor File Data" on page 143

9. Type an appropriate file name, and then click **OK**.

Note *If you attempt to save changes to an existing sensor file, and you are not at the **Calibration** access level, the following message will be displayed, requiring you to open the Calibration access level or save to a new file.*

10. Close the **Sensor File Editor** when you are done.

Note *If you are editing the sensor file from the **Sensor** tab on the **Station Setup** window **Inputs** panel, click the **Save** button to save your changes.*

Gain/Delta K

Gain/Delta K can be selected for range definition for both full-range and multi-range conditioners.

1. Select **Gain/Delta-K** from the **Cal Type** list.
2. Under Range Definition, define a range.

   By default **Range 1** is entered. Highlight the name **Range 1** and change it to something meaningful.

   Example: Suppose you are setting up a calibration file for a ±10 cm range. You may want to name the full-scale range “10 cm”.
3. Specify the **Fullscale Min/Max** values of the range.

   Select the units for the range, and then enter the values for the upper and lower ranges.

Note *The system software supports non symmetrical full scales. This means you do not have to center the range around zero, but the value 0.0 must be in the range. For example, you can set the full-scale maximum to +10 cm and the full-scale minimum to +3 cm.*

4. Set the initial **Conditioner Calibration Values** for the range.
5. Define any additional ranges (If applicable).

   Click **Add** to add another range to the calibration file. Up to 10 ranges can be included in a calibration file. Repeat the range definition procedure for each range you want to calibrate.
6. On the **Sensor File Editor** toolbar, click the **Save** button, and then **Save As** to display the **Save Sensor File As** window. See “Saving Sensor File Data” on page 143
7. Type an appropriate file name, and then click **OK**.

Note *If you attempt to save changes to an existing sensor file, and you are not at the* ***Calibration*** *access level, the following message will be displayed, requiring you to open the Calibration access level or save to a new file.*

8. Close the **Sensor File Editor** when you are done.

Note *If you are editing the sensor file from the* ***Sensor*** *tab on the* ***Station Setup*** *window* ***Inputs*** *panel, click the* ***Save*** *button to save your changes.*

mV/V Pos Tension or mV/V Pos Comp

For both full-range and multi-range conditioners, **mV/V Pos Tension** or **mV/V Pos Comp** can be selected for range definition.

1. Select **mV/V Pos Tension** or **mV/V Pos Comp** from the **Cal Type** list.
2. Under Range Definition, define a range.

   By default **Range 1** is entered. Highlight the name **Range 1** and change it to something meaningful.
3. Specify the **Fullscale Min/Max** values of the range.

   Select the units for the range, and then enter the values for the upper and lower ranges.

Note *The system software supports non symmetrical full scales. This means you do not have to center the range around zero, but the value 0.0 must be in the range. For example, you can set the full-scale maximum to +10 cm and the full-scale minimum to +3 cm.*

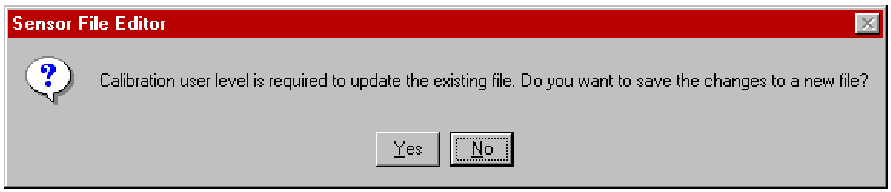
4. Set the initial **Conditioner Calibration Values** for the range.
5. Define any additional ranges (If applicable).

   Click **Add** to add another range to the calibration file. Up to 10 ranges can be included in a calibration file. Repeat the range definition procedure for each range you want to calibrate.

6. On the **Sensor File Editor** toolbar, click the **Save** button, and then **Save As** to display the **Save Sensor File As** window. See "Saving Sensor File Data" on page 143.

7. Type an appropriate file name, and then click **OK**.

Note *If you attempt to save changes to an existing sensor file, and you are not at the **Calibration** access level, the following message will be displayed, requiring you to open the Calibration access level or save to a new file.*



8. Close the **Sensor File Editor** when you are done.

Note *If you are editing the sensor file from the **Sensor** tab on the **Station Setup** window **Inputs** panel, click the **Save** button to save your changes.*

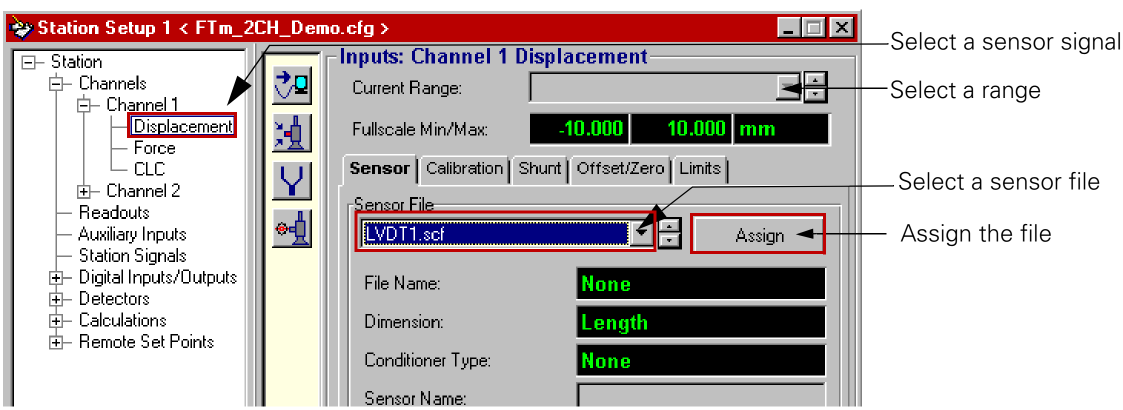
How to Assign a Sensor File

This task links a sensor calibration file to a hardware resource; assigning calibration data for the input signal definition.

1. In the **Station Manager** window's toolbar, select a **User Level** of **Calibration**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup** to display the **Station Setup** window.
3. In the **Station Setup** window's navigation pane, locate and select the signal to be assigned a sensor file.
4. In the **Station Setup**, click the **Channel Input Signals** icon, and then the **Sensor** tab.

   A. Select the desired **Sensor File**.

   B. Click **Assign**.



Note *If you assign **(None)** for a sensor file the following message is displayed:*

5. Select a range.

   Under **Current Range** on the **Sensor** tab, select the range you want to calibrate. To add a new sensor range, enter a name in **Range Name**, and then click **Add**.

Note *When you finish calibrating this range, you will want to return to this step to select another range. All ranges should be calibrated.*

Saving Sensor File Data

Depending on the type of sensor data you have modified, you can save the sensor calibration information to a sensor calibration file, to a parameter set, or to a Transducer ID.

A single range of sensor information can be saved in the parameter set. For more information, see "About Sensor Calibration Files" on page 134 and "About the Transducer ID Modules" on page 145.

When saving sensor data you should consider the type of sensor data you have modified and whether it is being saved to an assigned sensor file. There are two types of sensor calibration data:

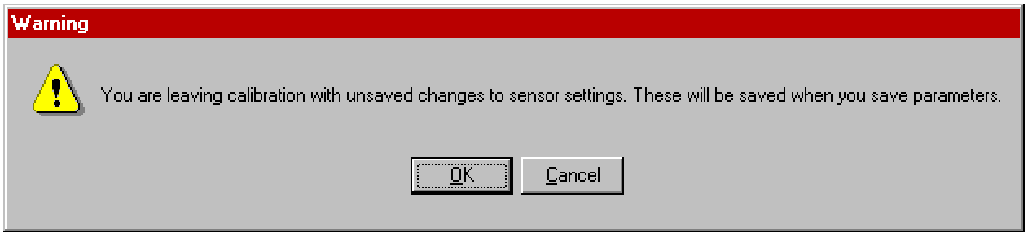
- Sensor data saved to a parameter set (such as sensor values that have been manually set to a conditioner input)
- Sensor data saved to a sensor calibration file (.scf)

If you are updating sensor data of an assigned sensor file, you must have the Calibration access level selected.

Saving data

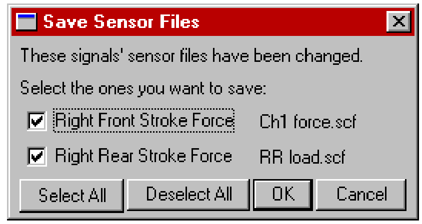
Typically, you can save sensor calibration data by pressing **Save** on the Station Setup Inputs panel (**Calibration** tab).

If you have modified calibration data that is saved to a parameter set (no sensor file assigned), exiting the **Calibration** access level before saving will display the following message:



Click **Cancel** to return to the **Calibration** access level. Clicking **OK** sets the selected access level without saving to a parameter set.

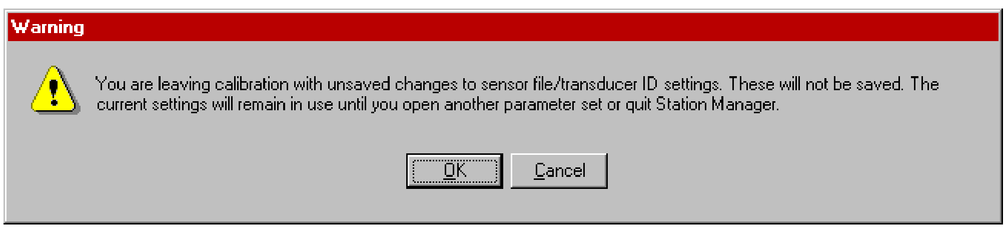
If you have modified assigned sensor data that is saved to a sensor calibration (.scf) file, exiting the **Calibration** access level before saving also opens **Save Sensor Files**.



Select All, the default setting on the **Save Sensor Files** window, allows you to save all changed sensor files. Click **OK** to save all sensor files and leave **Calibration**.

If you do not want to save changes to a particular sensor file, click that sensor file. Click **Deselect All** if you do not want to save any modified sensor files. Click **Cancel** to return to the **Calibration** access level.

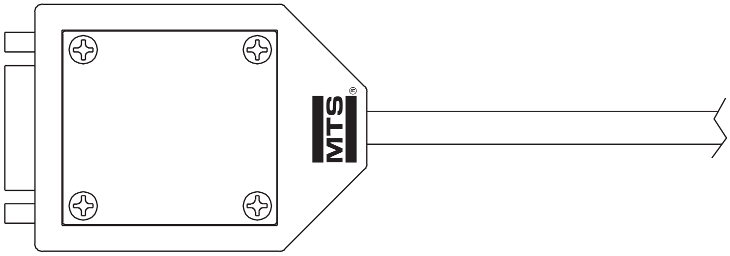
If you have not elected to save all modified sensor files, clicking **OK** on **Save Sensor Files** will display the following warning:



Clicking **OK** on this warning window will exit the **Calibration** access level without saving the modified sensor files you failed to select. Clicking **Cancel** returns you to the **Calibration** access level.

About the Transducer ID Modules

Transducer ID modules (optional), located at the ends of Series 493 Conditioner cables, can store calibration data. Transducer ID modules make it easier to change sensors since the calibration information stays with the sensors (not available for FlexTest™ IIm/CTC/CTM).

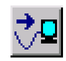


A transducer ID module includes:

- A transducer ID circuit with calibration information.
- A molded, removable cover.
- A shunt calibration resistor.
- Up to three bridge completion resistors.

How to Assign a Sensor with a Transducer ID Module

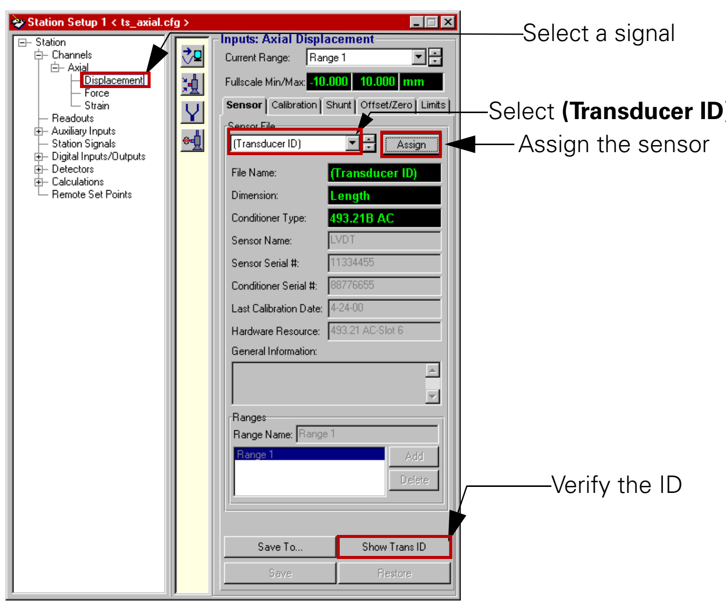
The following procedure applies to 493 Series Conditioners with Transducer ID modules.

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode resource to be assigned the sensor with the Transducer ID module.
4. In the **Station Setup** window, click .
5. In the **Inputs** panel, click the **Sensor** tab.
6. In the **Sensor** tab:

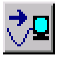
   A. Select **(Transducer ID)**.

   B. Click **Show Trans ID** to display the **Transducer ID** contents. Verify that the correct sensor is being assigned.

   C. Click **Assign**.

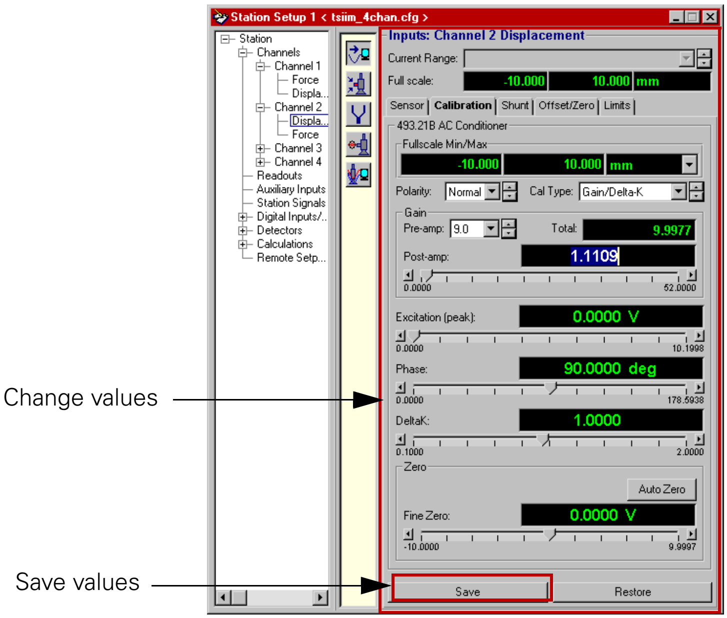


How to Save Data to a Transducer ID Module

1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. In the **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode resource with the Transducer ID module whose data you want to change.
4. In the **Station Setup** window, click .
5. In the **Inputs** panel, click the **Calibration** tab.
6. In the **Calibration** tab:

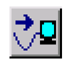
   A. Update the calibration information.

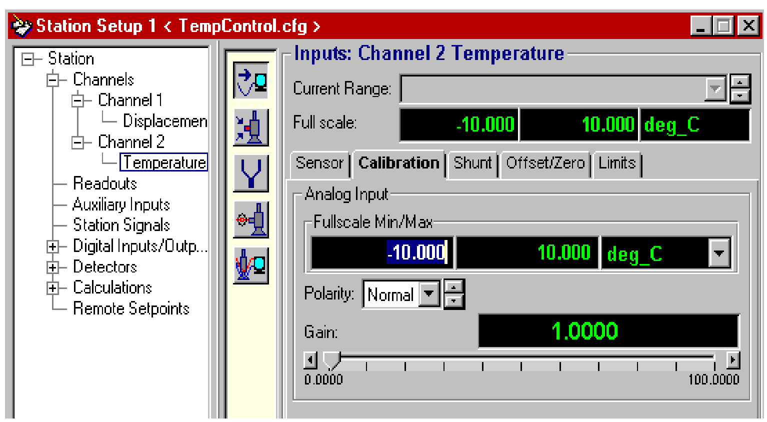
   B. Click **Save** to store the new values in the Transducer ID module.



How to Configure an Externally Conditioned Feedback Signal

A temperature controller is an example of a device that inputs an externally conditioned feedback signal.

1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** resource providing the externally conditioned feedback signal.
4. In the **Station Setup** window, click .
5. In the **Inputs** panel, click the **Calibration** tab.
6. In the **Station Setup** window's **Calibration** tab, set the signal's **Fullscale Min/Max**, **Polarity**, and **Gain**.



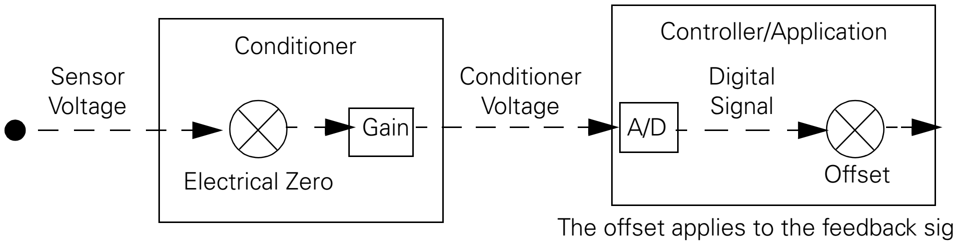
About Offset

Your calibrated sensor output may be affected by external factors such as specimen size, test component forces, and cable length. You can compensate for these external factors by offsetting the feedback signal.

For example, suppose your LVDT output is 1 cm when the actuator is at its null, midstroke position. You can compensate for this positive LVDT output by offsetting the feedback signal –1 cm.

The Station Manager application’s Offset controls zero the conditioner’s output without shifting the conditioner’s electrical zero reference. An auto offset can be applied to the current control feedback with station pressure applied.

Since the range centers around the sensor’s calibrated electrical zero, an offset limits the usable range in the direction you shift it. For example, in a ±2 cm range, offsetting the signal -1 cm from its zero position results in control ranges of +1 cm on the positive side and –3 cm on the negative side.



The offset applies to the feedback signal.
You specify the offset in engineering units.

Offset considerations

Consider these items before offsetting a feedback signal:

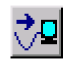
- Offset alters the feedback signal used by the digital (PIDF) controller and is included in the closed-loop control calculations.
- Offset cannot be used to clear interlocks tripped by signal saturation.
- Offset is limited to ±½ the current full-scale range.
- The usable range is limited in the direction that zero is offset.

If you want to offset the sensor signal in the conditioner, see “About Electrical Zero Offset” on page 152.

How to Offset a Feedback Signal

You can apply an auto offset or a manual offset to the feedback signal.

Auto offset

1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the resource supplying the sensor signal that needs an offset.
4. In the **Station Setup** window, click .
5. In the **Inputs** panel, click the **Offset/Zero** tab.
6. In the **Offset/Zero** tab:

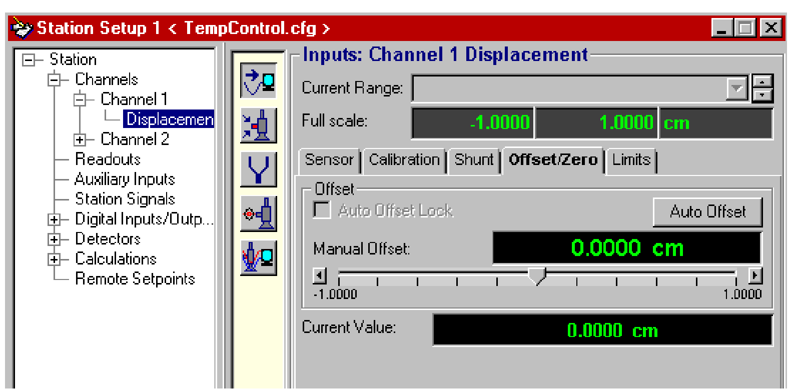
   A. If **Auto Offset Lock** is selected, clear it.

   B. Click **Auto Offset**.

   Manual Offset shows the offset applied to produce the **Current Value**.

   If the **Manual Offset** value exceeds half of the signal's full-scale range, the system interlocks and removes station power.

   C. Select the **Auto Offset Lock** to make the **Auto Offset** controls unavailable at the access levels of **Tuning** and **Operator**.



Manual offset

If the desired amount of offset is known, select it with the **Manual Offset** slider.

WARNING

Immediate and unexpected actuator response is possible when you apply a manual offset to your system.

Sudden actuator movement can cause injury and equipment damage.

If the **Current Value** displayed on the **Offset/Zero** tab is zero, a manual offset will cause the actuator to move to the new zero position.

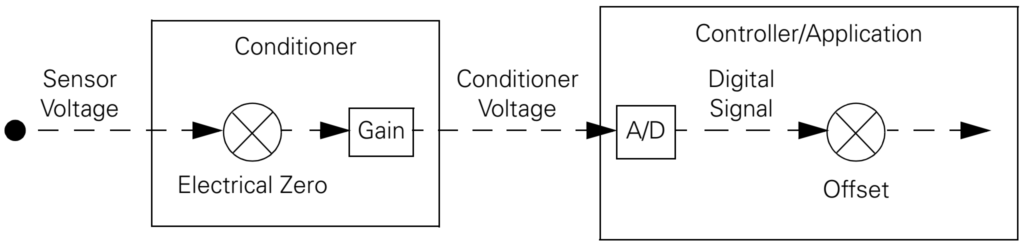
Never apply a manual offset to a sensor being used by the active control mode while station power is on.

About Electrical Zero Offset

If you want to shift a small, calibrated sensor range away from the sensor's calibrated electrical zero, you can offset the sensor's electrical output in the conditioner.

A traditional offset shifts the feedback signal and an electrical zero offset shifts the conditioner signal.

An electrical zero offset cannot be applied to a conditioner used in an active control mode with hydraulic pressure applied.



The electrical zero offset applies to the conditioner signal.
You specify electrical zero adjustments in volts.

Electrical zero considerations

Consider the following before shifting the electrical zero:

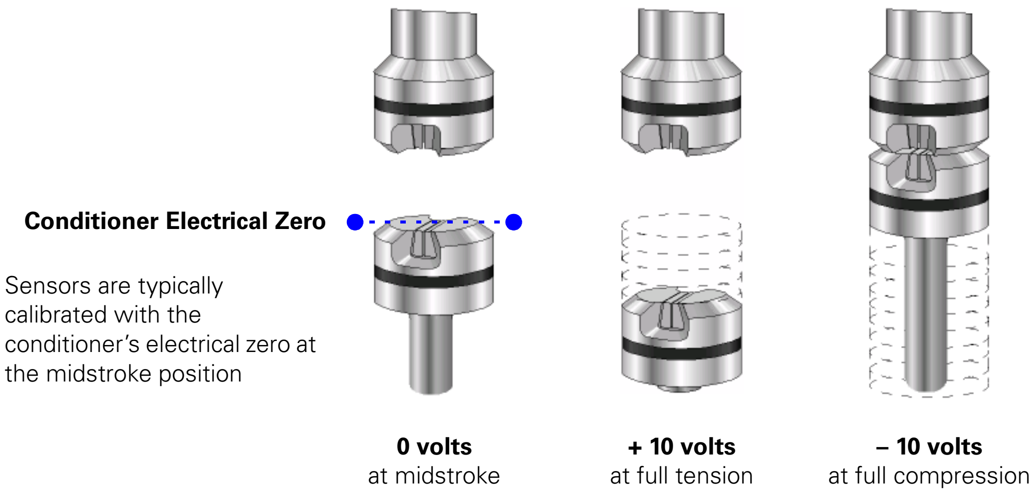
- Unlike the **Calibration** tab's conditioner Zero controls, electrical zero values are not used in the delta K calculation.
- The shifted electrical zero position is not a calibrated zero position.
- You can shift the conditioner's electrical zero to any position within the sensor's full-scale capacity, but your usable range is limited by the sensor's calibrated full-scale capacity.

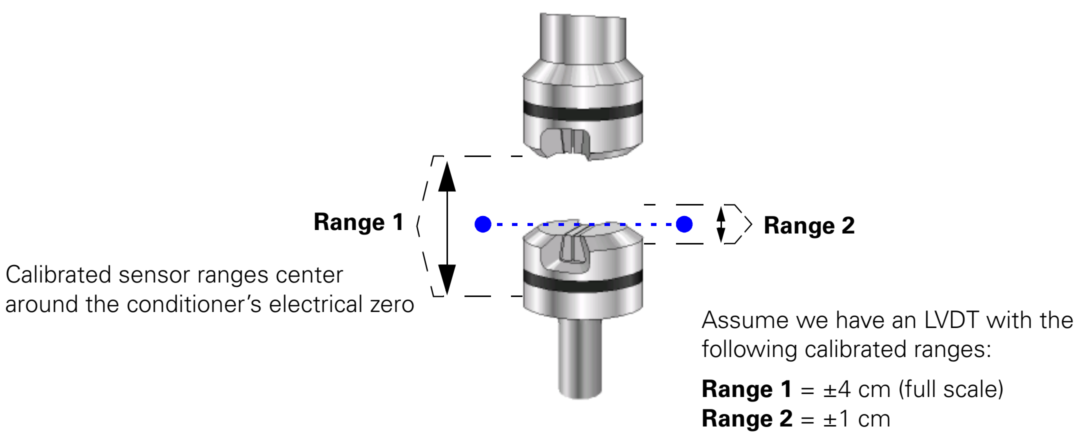
Linearization data

Using linearization data requires specific conditioner zeroing practices. Ensure that **Electrical Zero Lock** is checked on the **Offset/Zero** tab of the **Inputs** panel. Leaving electrical zero unlocked will invalidate data collected during linearization routines.

More About Electrical Zero

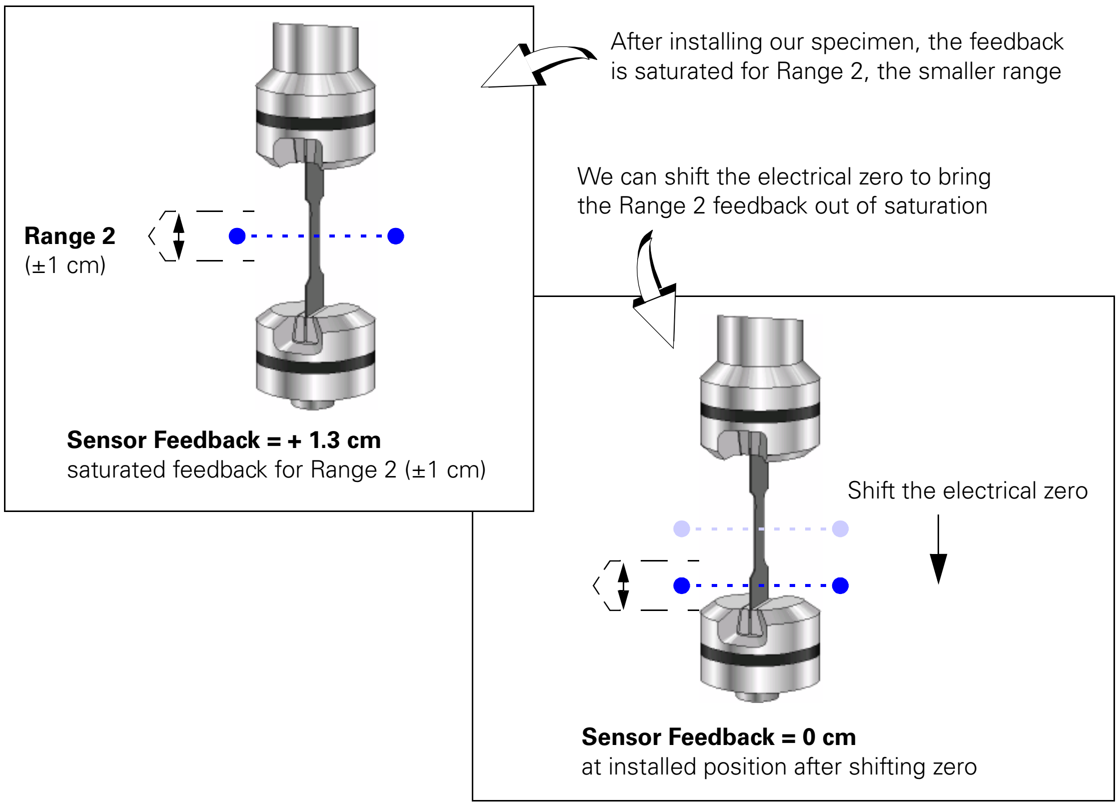
Displacement sensors and their corresponding conditioners are typically calibrated so the conditioner's feedback is zero volts at the middle of the actuator's operating range.





In some situations, you may want to shift the conditioner's electrical zero. For example, suppose after installing your specimen, the resulting feedback saturates in Range 2, the smaller sensor range. Normally, you could regain control of the saturated channel by switching to Range 1, the larger range, or by switching from a displacement to a force control mode.

However, if you wanted to use Range 2 for optimal signal resolution, you could shift the electrical zero to bring the feedback out of saturation.



How to Shift a Conditioner's Electrical Zero

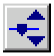
Before shifting the conditioner's electrical zero, you must first position the actuator at the desired location and disable the station power or switch to another control mode.

If it is not possible to switch to a different control mode or you cannot disable station power, use offset instead of electrical zero. See "About Offset" on page 149.

You can apply an auto zero or a manual zero to shift a conditioner's electrical zero.

Auto zero

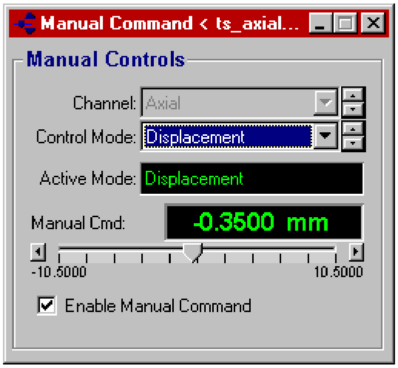
1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. Apply station power.
3. Use the **Manual Command** window to position the actuator at the desired electrical zero position:

   A. In the **Station Controls** panel toolbar, click  to display the **Manual Command** window.

   B. In this window, select the desired **Channel** and a **Control Mode** of displacement.

   C. Select **Enable Manual Command**.

   D. Use the **Manual Cmd** slider to move the actuator to the new zero position.



4. With the actuator in the new zero position, either switch to a different control mode or shut off station power.

   Leave the **Enable Manual Command** enabled and make sure that the actuator does not move.

5. Select the displacement signal that needs the electrical offset:

   A. In the **Station Manager** window's **Display** menu, select **Station Setup**.

   B. In the **Station Setup** window's navigation pane, locate and select the **Channels** or **Auxiliary Inputs** resource whose sensor signal needs the offset.

6. In the **Inputs** panel, click the **Offset/Zero** tab.

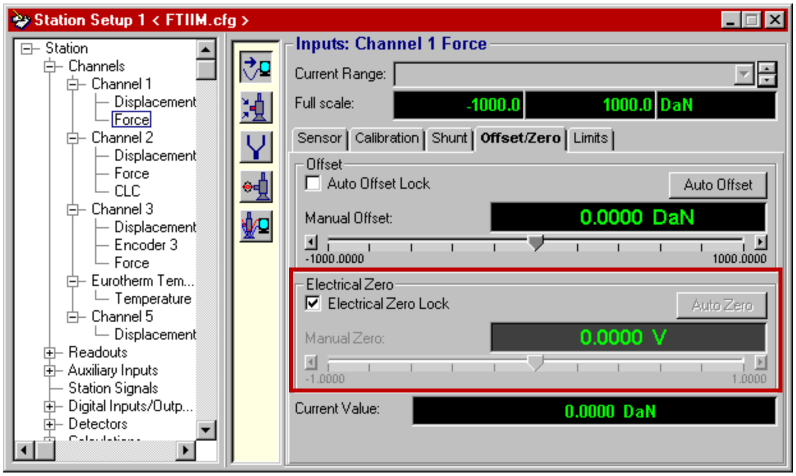
7. In the **Offset/Zero** tab, apply the electrical offset:

   A. Clear the **Electrical Zero Lock** if it is selected.

   B. Click **Auto Zero** to apply the electrical offset.

      Manual Zero shows the offset applied to produce the **Current Value**.

C. Select **Electrical Zero Lock** to make these controls unavailable at access levels of **Tuning** and **Operator**.



8. Clear the **Manual Command** window's **Enable Manual Command**.

Manual zero

Use the **Manual Zero** slider to manually shift the conditioner's electrical zero.

Working with Readout Devices

About Readout Devices

Readout options

The Station Manager application provides **Scope** and **Meters** windows and a **Signals** panel for monitoring signals.

- The **Scope** window works like an oscilloscope. See "About the Scope" on page 159.
- The **Meters** window works like a DVM meter. See "About Meters" on page 172.
- The **Station Signals** panel can display the values of all incoming and outgoing signals. See "About the Station Signals Panel" on page 176.
- The **Signal Auto Offset** window can display the values of all incoming and outgoing signals. See "Signal Auto Offset Window" on page 503.

External readout options

You can also send signals to an external readout device. See "About Monitoring Signals Using External Readout Devices" on page 179.

Additional information

See "Station Manager Controls and Displays" on page 273 for a complete description of this application's controls and indicators.

For specifics about the controls referenced in this section, see:

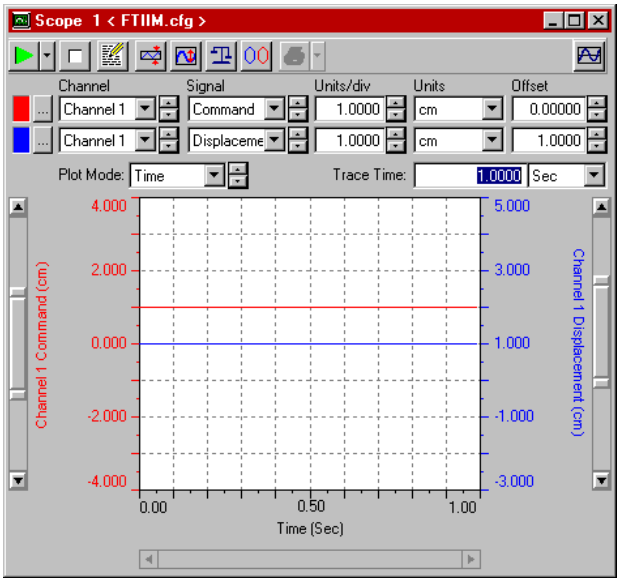
- "Station Setup Window/Readouts Panels" on page 358.
- "Meters Window" on page 392.
- "Scope Window" on page 395.
- "Setup for Scope Window" on page 398.
- "Signal Lists Tab" on page 432.

About the Scope

The Station Manager application's **Scope** window works like an oscilloscope. You can use the scope to plot signals against time, frequency, or another signal. A single station can support two scopes.

How to Set Up a Time Plot on the Scope

1. In the **Station Manager** window's toolbar, click  once to display a single **Scope** window.
2. In the **Scope** window:
   A. For **Channel**, select the channels whose signals are to be monitored.
   B. For **Signal**, select the signals you want to monitor.
   C. For **Plot Mode**, select **Time**.
   D. In the toolbar, click  .



3. In the **Setup for Scope** window, set up the scope display using the **Graph Settings** and **Trace Settings** tab controls.

How to Set Up a Frequency Plot on the Scope

1. In the **Station Manager** window's toolbar, click  .

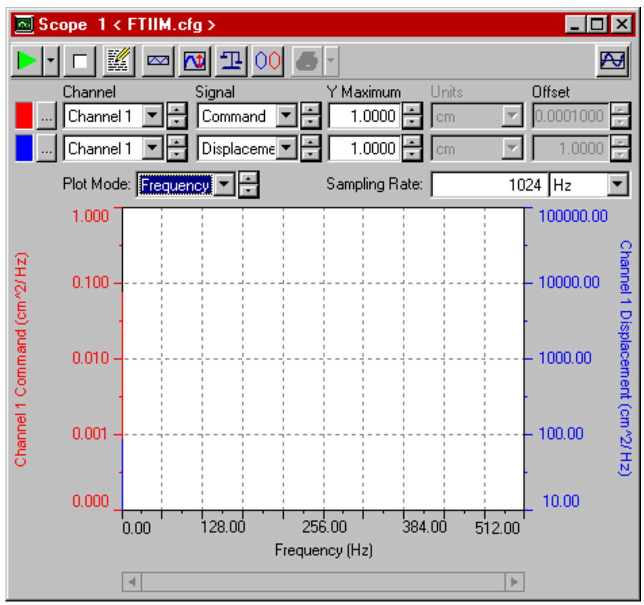
2. In the **Scope** window:

   A. For **Channel**, select the channels whose signals are to be monitored.

   B. For **Signal**, select the signals you want to monitor.

   C. For **Plot Mode**, select **Frequency**.

   D. In the toolbar, click  .



3. In the **Setup for Scope** window, set up the scope display using the **Graph Settings**, **Trace Settings**, and **Frequency Mode** tab controls.

How to Set Up an X/Y Plot on the Scope

An X/Y plot displays the first signal on the vertical axis and the second signal on the horizontal axis. A typical use for an X/Y plot is to display hysteresis by plotting a force signal against a displacement signal.

1. In the **Station Manager** window's toolbar, click  .

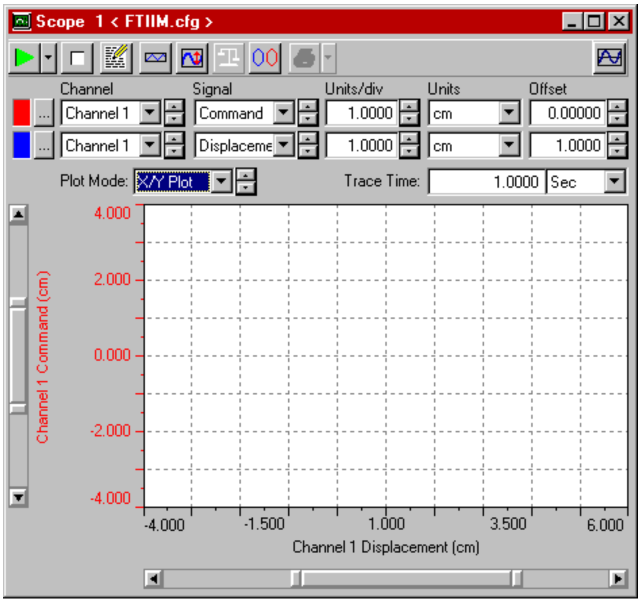
2. In the **Scope** window:

   A. For **Channel**, select the channels whose signals are to be monitored. The first **Channel** selection plots on the vertical axis; the second **Channel** selection plots on the horizontal axis.

   B. For **Signal**, select the signals you want to monitor.

   C. For **Plot Mode**, select **X/Y Plot**.

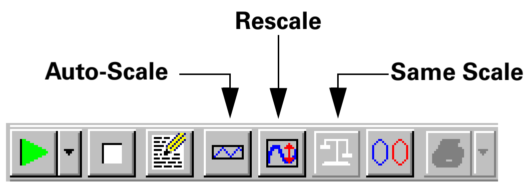
   D. In the toolbar, click  .



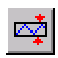
3. In the **Setup for Scope** window, set up the scope display using the **Graph Settings** and **Trace Settings** tab controls.

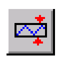
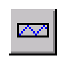
About Auto-Scale, Rescale, and Same Scale

The **Scope** window's toolbar has Auto-Scale, Rescale, and Same Scale buttons to deal with changing signal amplitudes.

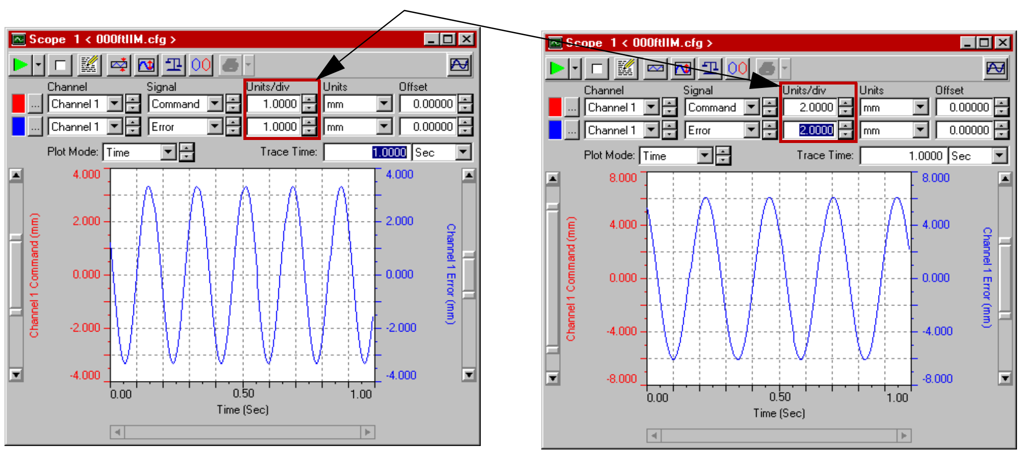


How to Auto-Scale

Click  to set the **Scope** window to automatically increase its **Units/Div** to accommodate a signal's increasing signal amplitudes.

 changes to  to indicate active auto-scaling.

Auto-Scale increases **Units/Div**

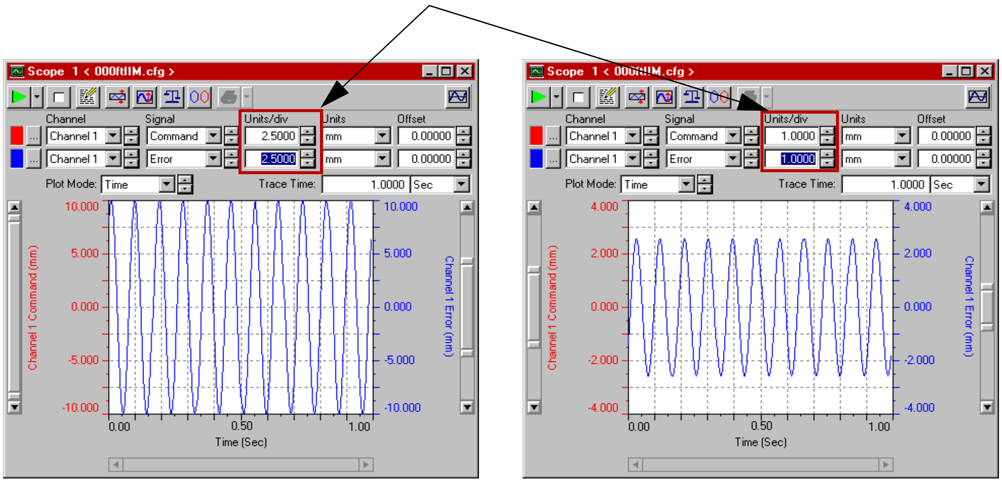


- Auto-Scale accommodates increasing signal amplitudes but does not rescale the Scope for decreasing signal amplitudes.
- Use Rescale to accommodate decreased amplitudes.
- To preserve **Offset**, click . In the **Setup for Scope** window's **Auto-Scale Modes**, select **Sensitivity**.

How to Rescale

Click [icon] whenever you need to immediately increase or decrease the **Scope** window's **Units/Div** to accommodate a signal's changed amplitudes.

Rescale increases or decreases **Units/Div** to match signal



- Once rescaled, **Unit/Div** do not change to accommodate increasing signal amplitudes except when you change the field
- Use Auto-Scale to accommodate increasing signal amplitudes

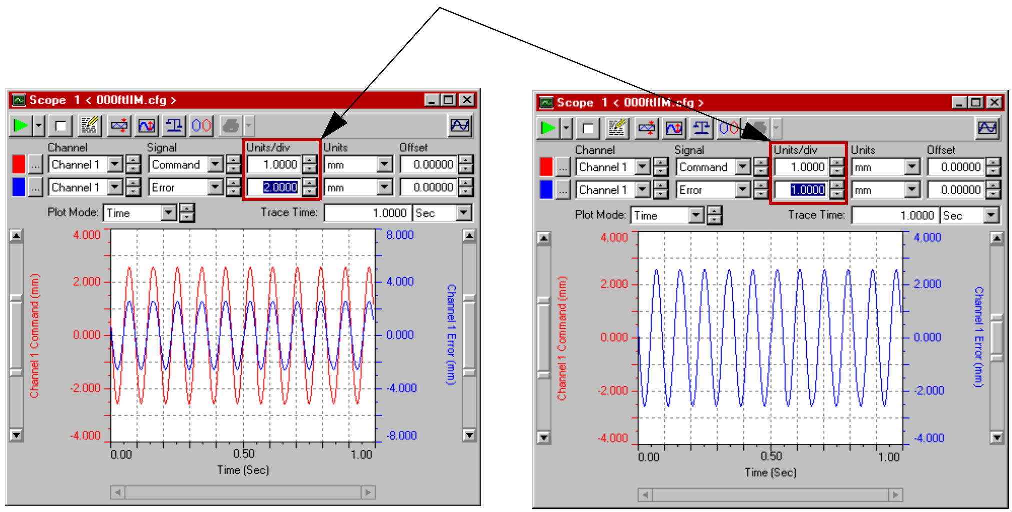
Note *Pressing **Rescale** does not turn off Auto-Scale.*

How to Same Scale

Click to apply the **Units/Div** and **Offset** used by the first channel to the second channel.

changes to to indicate the same scale has been applied.

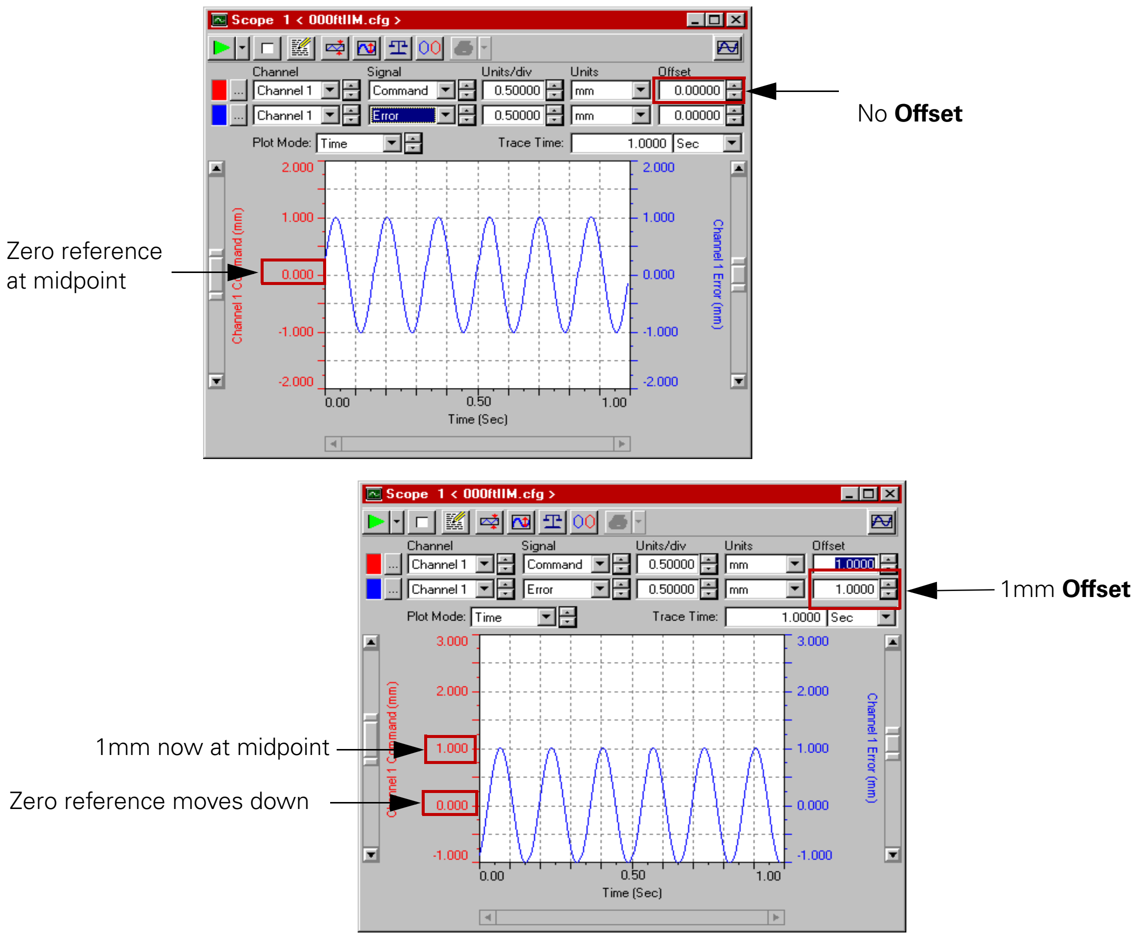
Same Scale—both **Channels** have the same **Units/Div** and **Offset**



How to Offset Scope Signals

Offset defines the **Scope** window grid's midpoints. Applying an **Offset** shifts the grid's zero reference points up and down in the **Scope** window.

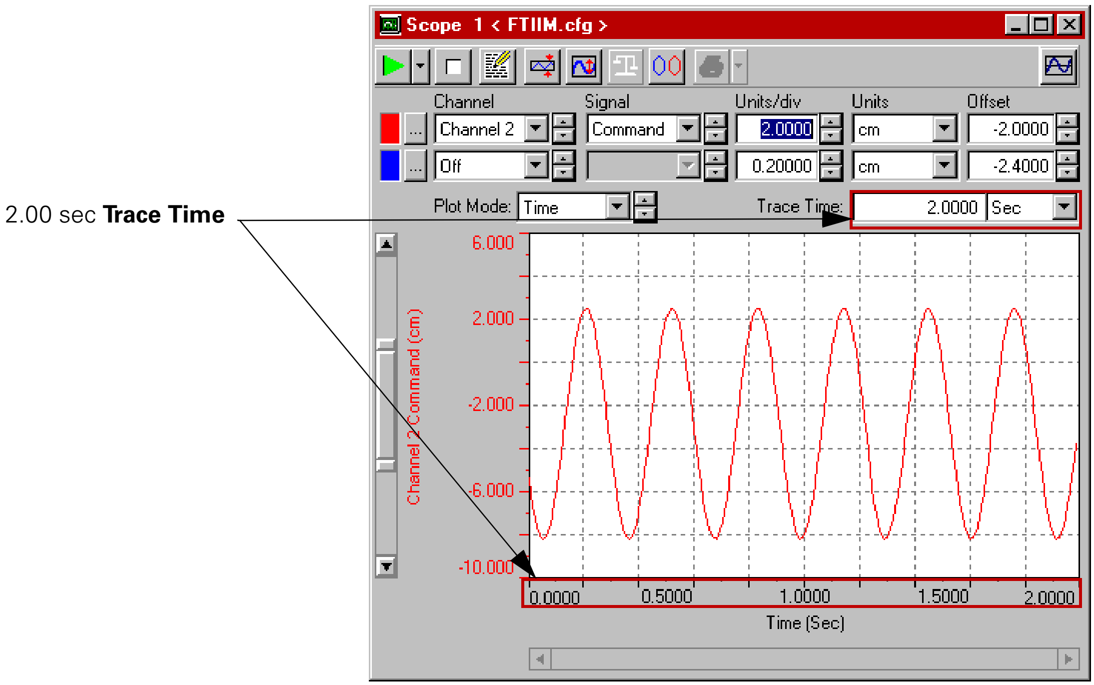
To apply an offset, type in an **Offset** value and press your PC's **Enter** key.



How to Adjust the Scope's Time Scale

When the **Scope** window displays a **Plot Mode** of **Time**, type in a **Trace Time** value to change the x-axis **Time** scale.

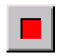
The **Time** scale can be changed with the **Scope** running or stopped.



How to Examine Stored Time Plot Signals

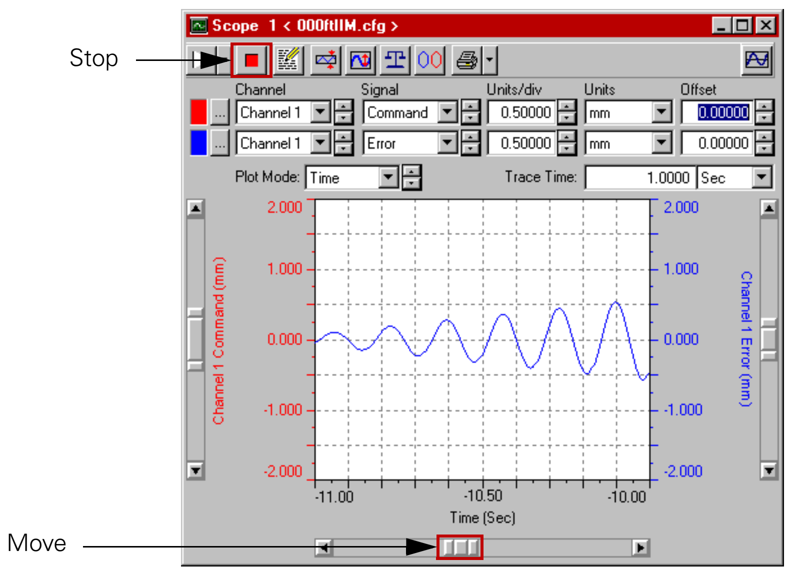
The **Scope** stores trace time history data in a temporary circular buffer. When the **Scope** stops, you can use its **Time** Slider Bar to examine this stored signal data.

To examine stored **Time Plot** signal data:

1. Click  to stop the **Scope**.

   Stopping the **Scope** makes the **Time** Slider Bar available.

2. Move the **Time** Slider Bar to the left to examine stored data.



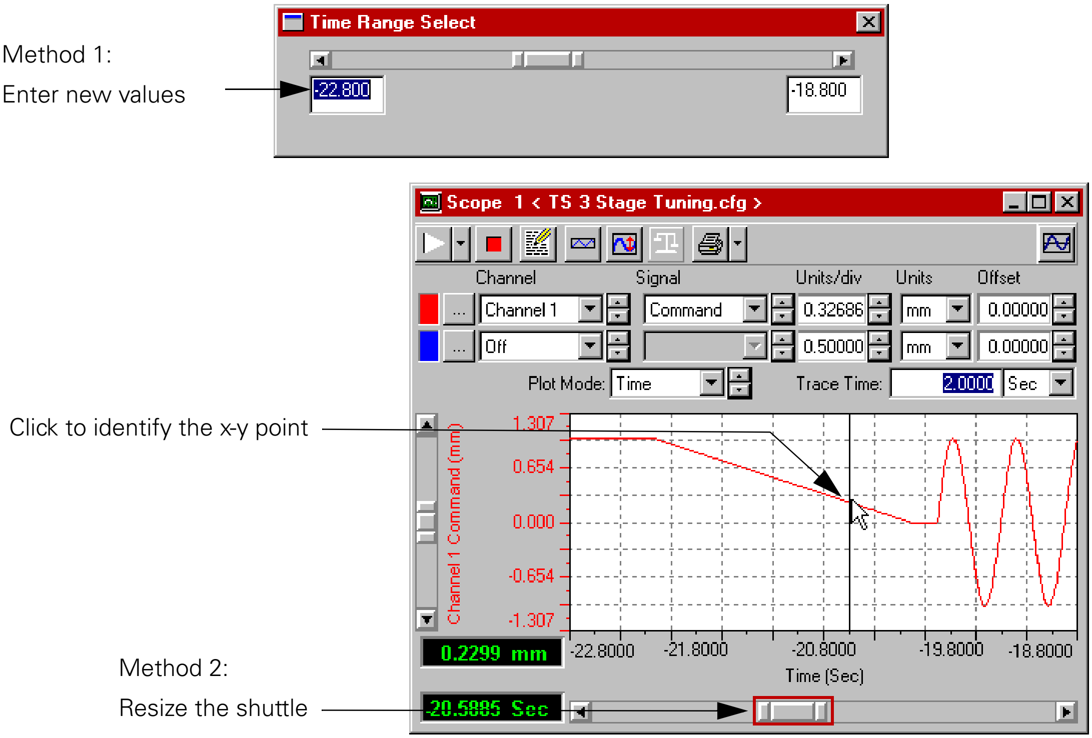
How to Change the Time Scale When Examining Time Plot Signals

Method 1

1. Double-click the **Time** Slider Bar.
2. In the **Time Range Select** window, enter new **Time** scale values.

Method 2

Adjust the shuttle size on the **Time** Slider Bar.



Note *When the **Scope** restarts, the **Time** scale resizes itself to the **Trace Time** value and the circular buffer gets erased.*

To more closely examine time plot signals you can:

- Use the scale slider bars (right side of display) to change signal scale.
- Click Rescale to immediately increase the **Scope** window's **Units/Div**.
- Use the vertical "cursor" bar for an display of exact X, Y data points.

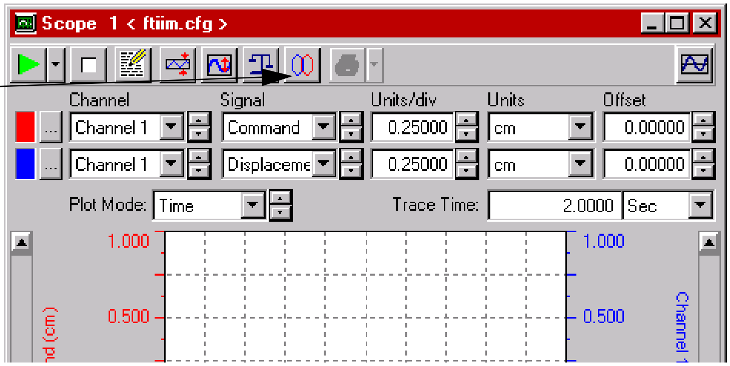
How to "Sync" Current Channel Selections on Scope

The Sync Current Channel feature effectively "synchronizes" channel selection for the function generator and scope. This feature facilitates the set up and tuning of systems with a large number of channels.

To "synchronize" channel selections for the scope and function generator:

1. Click the two-state **Sync Station Channel** button on the Scope Toolbar to set the "sync" state.

Click to set "sync" state



2. Click the Station Setup **Sync Current Channel** button on the Channel Buttons panel.

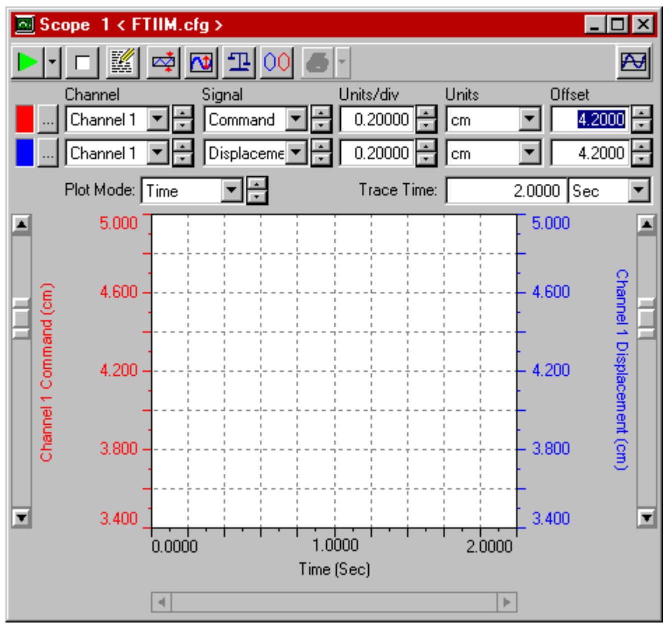
   This applies the current channel selections on the Station Setup to both **Channel** selections on a scope display and to the function generator.

Note *If the function generator is running or is in group mode, clicking the* ***Sync Current Channel*** *button will not make any changes to the function generator.*

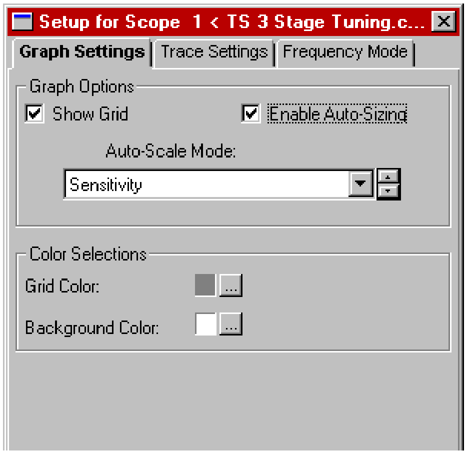
How to Change the Scope's Appearance

1. In the **Station Manager** window's toolbar, click  once to display a single **Scope** window.

Note *To display a second scope, click **Create Scope** on the **Scope** icon pull-down menu.*



2. In the **Scope** window's toolbar, click  to display the **Setup for Scope** window.



3. In the **Setup for Scope** window, click the **Graph Settings** tab and on that tab:

    A. Select **Show Grid** to display a scope grid.

    B. Select **Enable Auto-Sizing**.

    C. Use the **Color Selections** control to set the **Grid Color** and **Background Color**.

4. In the **Setup for Scope** window, click the **Trace Settings** tab and on that tab:

    A. For each **Trace**, select a **Line Style** and **Line Color**.

    B. For **Limit Lines**, select **None**, **Detector Limits** or **User Specified**.

    For **User Specified** lines, set the **Upper Limit** and the **Lower Limit**.

5. In the **Setup for Scope** window, click the **Frequency Mode** tab and on that tab:

Note *The **Frequency Mode** tab is only available when the selected **Plot Mode** is **Frequency***

    A. Select a **Sampling Rate**.

    B. Select a **Buffer Size**.

6. Close the **Setup for Scope** window.

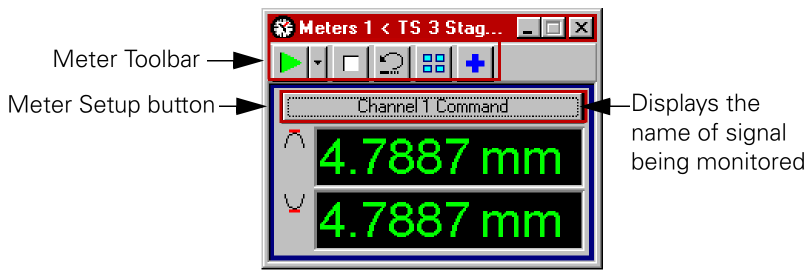
About Meters

The Station Manager application has four types of meters to monitor signal values. Up to 16 meters can be displayed in two windows, depending on the system installed.

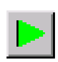
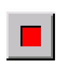
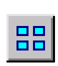
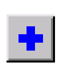
- **Timed** meters—Display signal values at timed intervals.
- **Peak/Valley** meters—Display the peak and valley values for the most recent cycle monitored.
- **Mean/Amplitude**—Display the midpoint value and the difference between the peak and valley values for the most recent cycle monitored.
- **Running Max/Min**—Display the highest and lowest values reached while the meter is running.

Meters displaying command signals use the dimension and units of the channel's active control mode.

Meter controls



All **Meter** windows have the following toolbar controls:

- Click  to start the meters in the window.
- Click  to stop the meters in the window.
- Click  to reset the meters in the window.
- Click  to arrange meters horizontally, vertically, or in a grid.
- Click  to add a meter to the window.

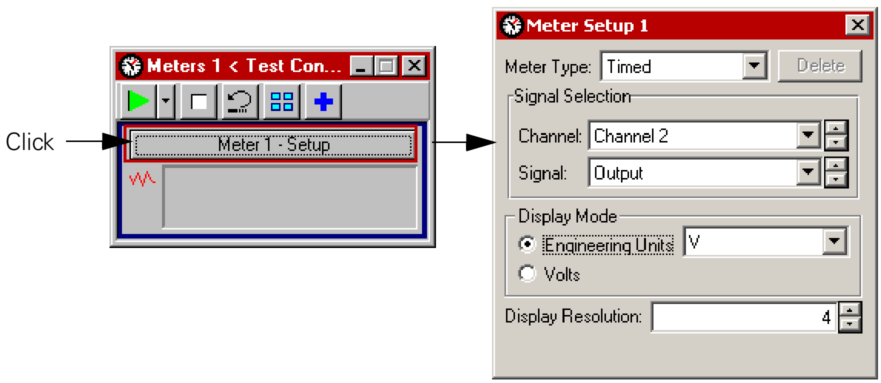
Drag the **Meter** window's corner or edge to resize the meter display.

How to Configure a Meter

1. On the **Station Manager** window's toolbar, select **Create Meters** on the **Meters** icon pull-down menu.

   Select **Create Meters** again to display a second **Meters** window.

2. In the **Meters** window, click the Meter Setup button.



3. Use the **Meter Setup** window to define the meter:

   A. For **Meter Type**, select **Timed**, **Peak/Valley**, **Mean/Amplitude**, or **Running Max/Min**.

   B. For **Signal Selection**, select the desired **Channel** name and **Signal** type.

   C. For **Display Mode**, select **Engineering Units** or **Volts**.

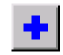
   D. Set a **Display Resolution**.

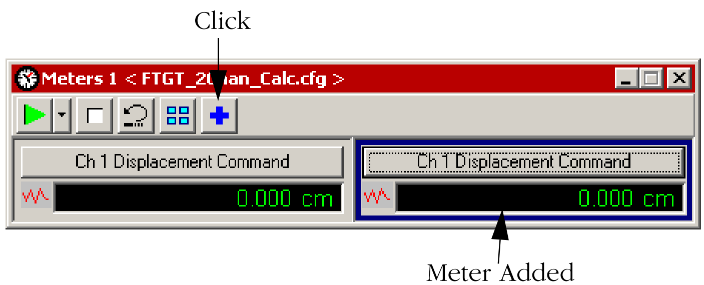
Note *The default* ***Display Resolution*** *is 4.*

   E. For **Peak/Valley** and **Mean/Amplitude** meters, set the **Sensitivity**.

How to Add a Meter

When a meter is added to the active **Meters** window it is a copy of the currently active meter, with identical setup parameters.

In the active **Meters** window, click the Add Meter  button.

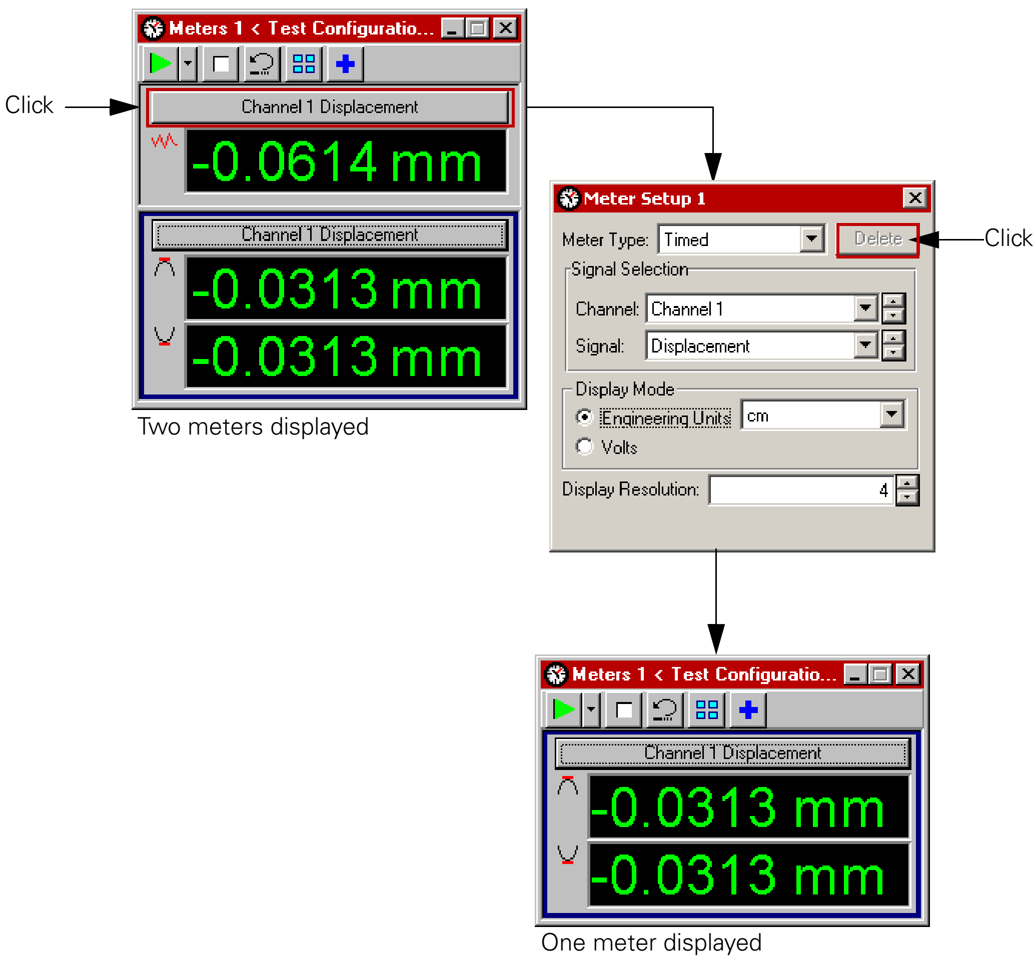


You can create up to 16 meters by successively clicking the Add Meter button. If a second **Meters** window is displayed, the total number of meters added between the two **Meters** windows is limited to 16.

How to Delete a Meter

The last meter in the **Meter** window cannot be deleted.

1. In the meter to be deleted, click the Meter Setup button.



2. In the **Meter Setup** window, click **Delete**.

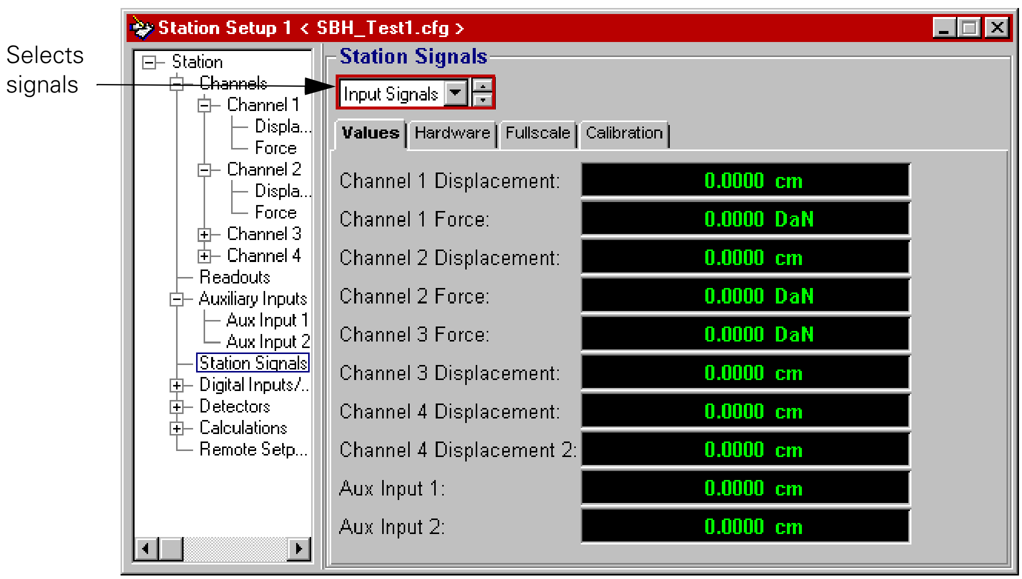
   Close the **Meter Setup** window.

About the Station Signals Panel

The **Station Setup** window has a **Station Signals** panel. Use the **Station Signals** panel to monitor controller signals.

This panel has four tabs:

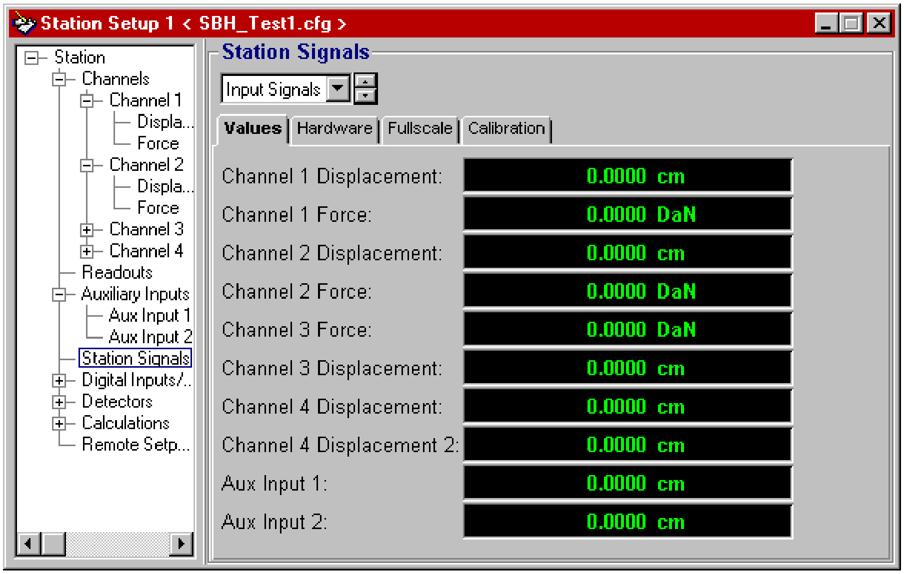
- The **Values** tab displays the current values for the selected signals.
- The **Hardware** tab displays the controller **Resource** and rear panel **Connector** used by the selected signals.
- The **Fullscale** tab displays the full scale minimum and maximum values for selected signals. Values can be edited at the **Calibration** access level.
- The **Calibration** tab displays the calibration values for the selected signals. Values can be edited at the **Calibration** access level.



Use the **Channel Option** window's **Signal Lists** tab to change the default signals that display in the **Station Signals** panel. For more information, see "How to Edit the Signal Lists" on page 178.

How to Display Station Signals

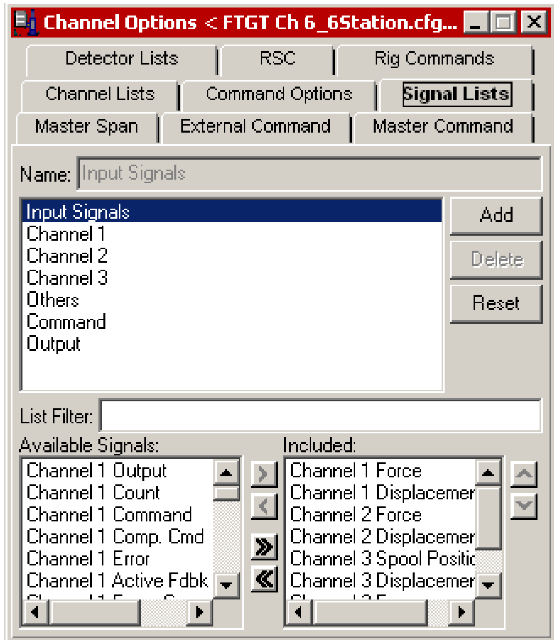
1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Station Signals**.
3. In the **Station Signals** panel:
   - In the pull-down list, select a signal list.
   - Click the **Values** tab to display current signal values.
   - Click the **Hardware** tab to display the controller **Resource** and **Connector** for each signal.
   - Click the **Fullscale** tab to display the signals' full scale minimum and maximum values. Values can be edited at the **Calibration** access level.
   - Click the **Calibration** tab to display the signals' calibration values.Values can be edited at the **Calibration** access level.



How to Edit the Signal Lists

1. In the **Station Manager** window's **Tools** menu, select **Channel Options**.

2. In the **Channel Options** window, click the **Signal Lists** tab.



3. In the **Signal Lists** tab:

   A. Create a new signal list or edit an existing signal list:

   – To create a new signals list, click **Add** and enter the new list's **Name**.

   – To edit an existing list, select its name.

   B. Use the   and   buttons to move signals between **Available Signals** and **Included**.

   C. Use the  and  buttons to change the order of signals displayed in the **Included** list.

About Monitoring Signals Using External Readout Devices

Station signals can be monitored using external scopes and meters connected to TestStar™ and FlexTest™ series controller outputs.

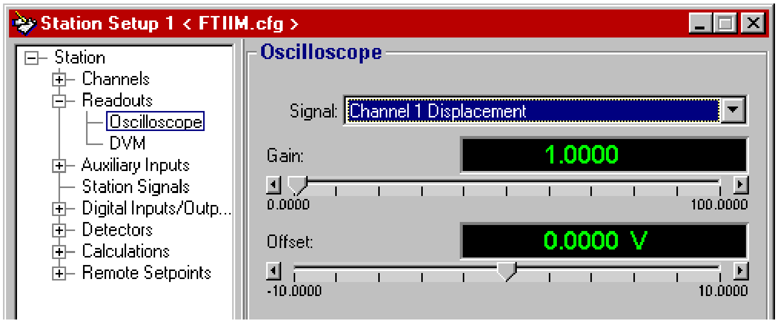
- On TestStar™ IIs and TestStar™ IIs AP controllers, monitor signals from connectors **J71** and **J72**.
- On all FlexTest™ and TestStar™ IIm controllers, monitor signals from the **Analog Output** board's **BNC** connectors.
- On automated FTSE controllers monitor signals from the **Monitor 1** and **Monitor 2** connectors on the front panel.

To externally monitor a signal, you must first use the Station Builder application to assign a resource to output signals. For more information, see "Creating Readouts" on page 69.

How to Configure a Signal for External Readout

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, locate and select the **Readouts** resource to be used to output the signal.

   Selecting a **Readouts** resource displays the **Station Setup** window's **Readout** panel.



3. In the **Readout** panel, configure a signal for readout.

   A. For **Signal**, select the signal.

   B. Set the **Gain** and **Offset** as needed.

Note *With **Gain** = 1 and **Offset** = 0 V (default values): a positive full-scale signal = +10 volts and a negative full-scale signal = -10 volts.*

4. To save signal values, in the **Station Manager** window's **File** menu, select **Save Parameters**.

Working with External Commands

About External Command Inputs

Your controller can process programming received from an external controller or function generator while maintaining all other closed-loop control functions.

Note *Your controller cannot recognize mode switches in external program input signals.*

Channels must be configured in the Station Builder application to accept external program commands. For more information, see "Enabling External Command Inputs" on page 74.

How to Enable and Run External Command Inputs

To enable an external command source, perform the following:

1. **Cable your controller to the external command source.**
2. **Allocate external command resources.**

   Use Station Builder to configure controller channels to accept external program commands. See "Enabling External Command Inputs" on page 74 for a detailed procedure.
3. **Adjust the command signal.**

   A. Open your station configuration file in Station Manager.

   B. On the Station Manager Toolbar, select **Calibration** in the User Level access box, and then enter the required password.

   C. On the Station Manager **Display** menu, select **Station Setup**.

   D. In the navigation pane, select the channel associated with the external input.

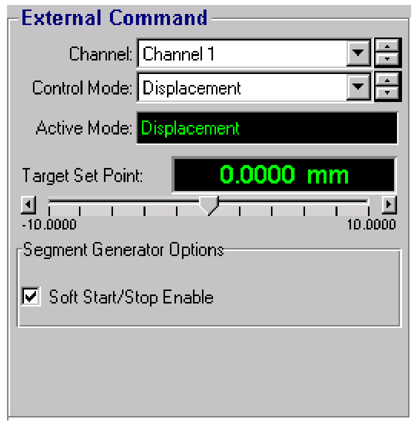
   E. Click the **Calibration** tab, and set the external command full-scale min/max values, signal polarity, and gain.

   F. On the **Limits** tab, set limits and detector actions.

   G. On the **Offset/Zero** tab, apply offset as needed.

4. Start the external command.

A. On the Station Manager application controls panel, click the External Command icon to open the External Command control panel. See “External Command Control Panel” on page 493 for more information about this control panel.



Note *Ensure that the external programmer is connected before pressing run.*

B. On the control panel **Channel** list, click the channel you will apply the external command to.

C. On the **Control Mode** list, click the control mode.

D. Set the external command **Target Setpoint**.

E. Optional—Select **Soft Start/Stop**. This option ramps the external command from 0 to 100% over two seconds when you click **Start** and tapers the command from 100 to 0% when you click **Stop**.

F. Click the **Program Run** button on the Station Controls panel.

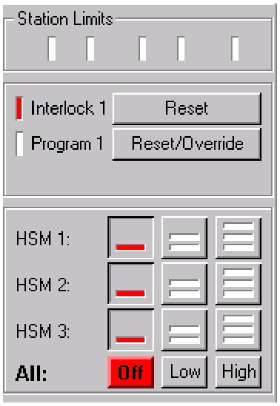
Applying Hydraulics and Clearing Interlocks

About Station Hydraulics

Typically, a hydraulic power unit (HPU) provides hydraulic pressure while a hydraulic service manifold (HSM) controls the application of HPU pressure to the test station.

Typically, the **Station Manager** window's **Station Controls** panel has both **HPU** and **HSM** controls.

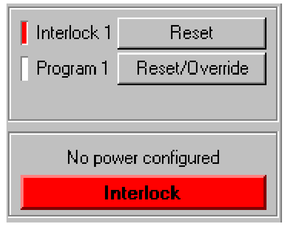
On test systems that use house hydraulic power, the **Station Controls** panel may have just **HSM** controls. On some small test systems without an HSM, the **Station Controls** panel may have just **HPU** controls.



Note *A station interlock prevents an HSM start but permits an HPU start. The HSM is a station resource and cannot start when a station interlock is active. An HPU is considered an external device and can be started with an active station interlock (even if it has caused the interlock).*

Systems without hydraulic power

On test systems that do not control hydraulic power, the **Station Controls** panel displays a "No power configured" and has an **Interlock** button to apply interlocks. A station with no HPU or HSM assigned must be interlocked before a new parameter set can be loaded. The **Interlock** button can be used to generate this required interlock.



System with calculated outputs

Systems that use calculated outputs to drive servovalves connected to multiple independent HSMs may experience control problems. For example, a road simulator with the lateral and longitudinal drive actuators connected to two different HSMs may experience unexpected motion on one corner when only one HSM is turned on.

WARNING

For systems with calculated outputs and multiple independent HSMs, turning on only one HSM can result in unexpected or exaggerated actuator motion.

Unexpected or exaggerated actuator motion can injure anyone in its path.

For these systems, always use the **All Off**, **All Low**, and **All High** buttons on the **Station Controls** panel for hydraulic control.

Additional information

See “Station Manager Controls and Displays” on page 273 for a complete description of this application’s controls and indicators.

For specifics on the controls referenced in this section, see:

- “Station Setup Window/Inputs Panel Tabs” on page 310.
- “Station Controls Panel” on page 498.
- “Manual Command Window” on page 510.

How to Apply Hydraulics

In the **Station Manager** window's **Station Controls** panel:

1. Click **Reset** to clear interlocks.

   If the interlock remains on, identify the cause of the interlock using the **Message Logs** window on the **Station Manager** window and then correct the cause.

WARNING

Applying hydraulics can result in sudden actuator motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulics.

2. Turn on the HPU, clicking **HPU Power Low** and then **HPU Power High**.

   Buttons stop flashing when pressure is reached.

Note *A station interlock prevents an HSM start but permits an HPU start. The HSM is a station resource and cannot start when a station interlock is active. An HPU is considered an external device and can be started with an active station interlock (even if it has caused the interlock).*

3. Turn on the HSM, clicking **HSM Power Low** and then **HSM Power High**.

   When possible, use low pressure to install specimens.

How to Turn Off Hydraulics

In the **Station Manager** window's **Station Controls** panel:

- To turn off the HSM, click **HSM Power Low** and then **HSM Power Off**.
- To turn off the HPU, click **HPU Power Low** and then **HPU Power Off**.
- To simultaneously turn off both the HSM and HPU, click **All Off**.

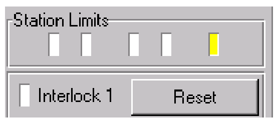
About Interlocks and Saturated Signals

Interlocks are safety features used to stop programming or disable power to a test station if certain conditions are not met.

Systems typically have mechanical, software, and hydraulic interlocks.

Out-of-range feedback

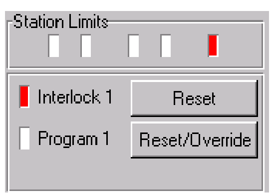
- On FlexTest™ IIm, FlexTest™ CTC, and FlexTest™ CTM systems, a feedback signal is out of range when it exceeds 100%, but is less than ±120% of its current range.
- On TestStar™ IIs, TestStar™ IIs AP, FlexTest™ GT, TestStar™ IIm, and FlexTest™ SE controllers, a feedback signal is out of range if it exceeds 100%, but is less than ±105% of its current range.



An out-of-range feedback signal lights a yellow **Station Limits** indicator in the **Station Manager** window’s **Station Controls** panel.

Saturated feedback

- On FlexTest™ IIm, FlexTest™ CTC, and FlexTest™ CTM systems, the feedback signal is saturated when it exceeds ±120% of its current range.
- On TestStar™ IIs, TestStar™ IIm, TestStar™ IIs AP, FlexTest™ GT, and FlexTest™ SE systems, the feedback signal is saturated when it exceeds ±105% of its current range.



A saturated active feedback signal lights a red **Station Limits** indicator and sets an **Interlock** in the **Station Manager** window’s **Station Controls** panel.

When a saturated active feedback signal sets an interlock, station power is removed from the station. Once that occurs, you must adjust the saturated signal within its operating range before you can apply and maintain power to the station.

Note *A saturated signal not used by active mode will not turn station power off.*

For more about dealing with saturated feedback signals, see "How to Apply Hydraulics When a Channel's Feedback is Saturated" on page 190.

When calculated input signals become saturated

Sometimes the active feedback signal used for a control mode is a calculated input. A calculated input is derived from sensor feedback that is modified by a mathematical function.

When a calculated input is used as active feedback and becomes saturated, it is because one or more of the sensor signals used to create it has become saturated.

When this occurs, the application writes a message to the log, noting that the active feedback signal has become saturated, and that an interlock has tripped. However, the message will not identify the saturated signal as a calculated input, nor will it identify the specific sensor signal component of the calculated input that is saturated. Further, the mathematical function assigned to the saturated sensor signal may make the calculated input signal appear to be operating within its normal range when viewed with the scope or meters.

So, if your system has interlocked due to the saturation of the active feedback signal, check to see if the active feedback signal is a calculated input. If it is, you must identify and resolve the saturated sensor component of the calculated input to bring the calculated input within range.

Invalid active feedback

A feedback signal can also become invalid. An invalid signal is indicated as saturated.

An invalid active feedback error can occur under the following conditions:

- If the current **Manual Offset** value for an active feedback signal exceeds ±½ its current range.
- If the feedback is a calculated input and the calculation results in an invalid number. For example—Your calculation attempts to perform $\sqrt{-1}$.

Manual offset example

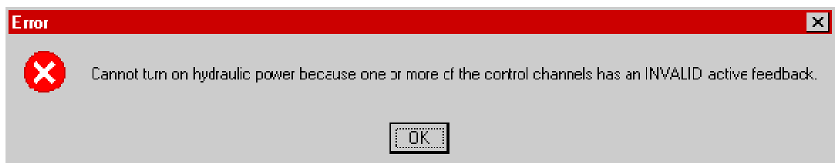
The **Manual Offset** control, on the **Inputs** panel's **Offset/Zero** tab, applies an offset to feedback signals.

A **Manual Offset** active feedback error typically occurs when you switch from a large control range with a large **Manual Offset** to a small control range without first reducing the **Manual Offset**.

For example—You apply a **Manual Offset** of **+5 mm** to your **Range 1** displacement signal of ±60 mm. You disable hydraulics. You switch to **Range 2** with a displacement signal of ±6 mm. You forget to change the **Manual Offset** of **+5 mm**. The **Manual Offset** of **+5** exceeds ½ of Range 2 (3 mm), generating an invalid active feedback interlock.

Error message

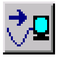
If you have an invalid feedback, the following message displays when you apply station power by overriding the interlock:

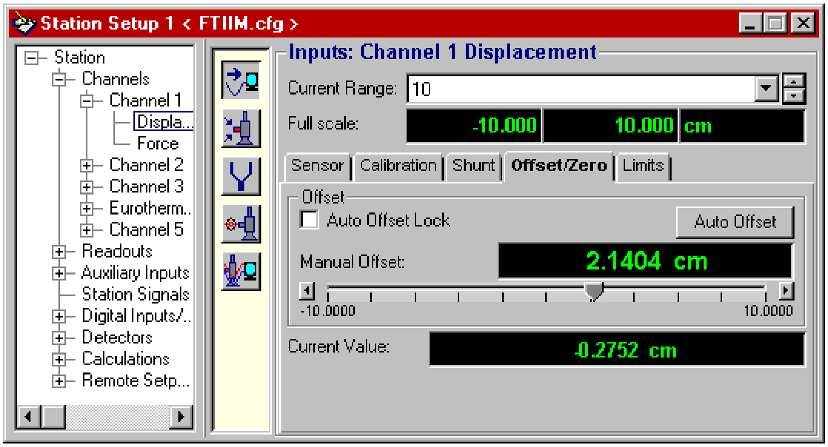


Correcting invalid active feedback

This section describes how to correct an invalid feedback caused by a **Manual Offset** that is too large.

If an incorrect calculation causes an invalid active feedback, correct the calculation.

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, locate and select the signal producing the invalid active feedback.
3. In the **Station Setup** window, click  .
4. In the **Inputs** panel's **Offset/Zero** tab, reduce the **Manual Offset** to less than half the current range.



The signal may still be saturated after reducing **Manual Offset**. For information on applying hydraulics when the feedback is saturated, see "How to Apply Hydraulics When a Channel's Feedback is Saturated" on page 190.

How to Apply Hydraulics When a Channel's Feedback is Saturated

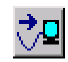
Method 1

Use this method if the feedback is saturated because the current **Control Range** is too small.

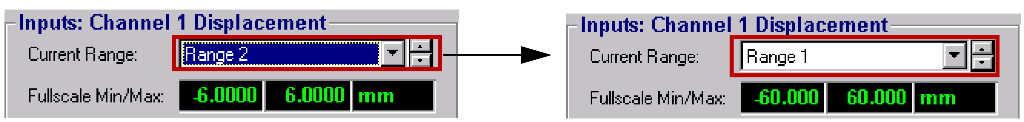
1. Change the **Current Range**:

   A. In the **Station Manager** window's **Display** menu, select **Station Setup**.

   B. In the **Station Setup** window's navigation pane, locate and select the saturated feedback signal.

   C. In the **Station Setup** window, click .

   D. In the **Inputs** panel, select a larger **Current Range**.



WARNING

Applying hydraulics can result in sudden actuator motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulics.

2. In the **Station Manager** window's **Station Controls**, reset the interlock and apply station power:

   A. Click **Reset** to remove the interlock.

   B. Apply hydraulic pressure to the station.

Method 2

Use this method if the feedback remains saturated after using **Method 1** to change the **Current Range**.

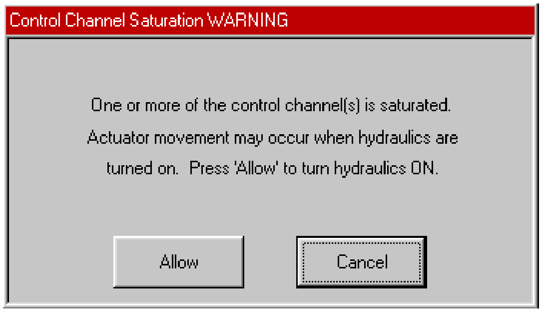
1. In the **Station Manager** window's **Station Controls** panel:

   A. Click **Reset/Override** to provide enough time to override the interlock.

   Each click provides 10 seconds of override time.

   B. Apply low hydraulic pressure.

   Applying low station power displays the **Control Channel Saturation Warning** window.



WARNING

Applying hydraulics can result in sudden actuator motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulics.

2. Allow hydraulic pressure to be turned on.

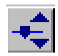
   In the **Control Channel Saturation Warning** window, click **Allow**.

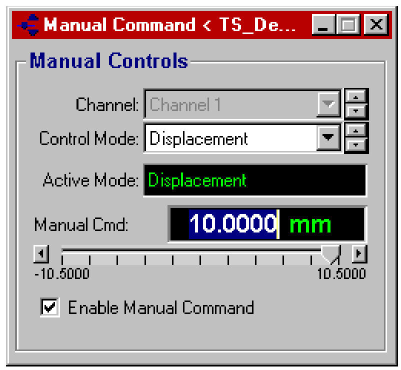
   The software turns on low pressure hydraulics and moves the actuator to the limit of its current range.

How to Manually Position the Actuator

1. Set up the **Scope** window to display the actuator's displacement and force signals.

   For more about setting up the **Scope**, see "About the Scope" on page 159.

2. In the **Station Manager** window's **Station Controls** panel toolbar, click .



3. Set up the **Manual Command** window:

   A. Select the **Channel** to be manually commanded.

   B. Select the desired **Control Mode**.

   C. Select **Enable Manual Command**.

WARNING

Applying hydraulics can result in sudden actuator motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulics.

4. In the **Station Manager** window's **Station Controls** panel:

   A. Click **Reset** to clear any interlocks.

   B. As needed, click **Reset/Override** to override interlocks.

      Each **Reset/Override** click adds 10 seconds of override time.

   C. Apply station hydraulic power.

      When possible, use low pressure.

      As soon as power is applied, the **Manual Command** window's **Manual Cmd** shows the actual actuator position.

5. In the **Manual Command** window, use the **Manual Cmd** Slider Bar to position the actuator.

Working with Compensators

About Compensators

A compensator compares your command with the corresponding sensor feedback to ensure that the command is fully applied to the specimen. If the sensor feedback indicates that the specimen is not reaching the commanded levels, the compensator alters the command until the desired result is achieved.

For example, suppose while programming a sine wave for a ±10 cm displacement, the LVDT feedback only achieves ±9 cm. A peak/valley compensator will monitor the feedback and automatically boost the initial command to ensure that the LVDT feedback reaches the commanded ±10 cm. You can view the *compensated command* with your Station Manager application's scope and meters.

Compensator types

Each type of compensator uses a different technique to achieve the commanded levels. Certain compensators work more effectively than others for specific applications.

Applying compensation

You configure compensators using the **Station Setup** window's **Compensators** panel. When using the Function Generator, Basic TestWare, and MultiPurpose TestWare applications, you use these applications' **Compensator** controls to apply a compensation method.

Additional information

See "Station Manager Controls and Displays" on page 273 for a complete description of this application's controls and indicators.

For specifics about the controls referenced in this section, see:

- "Station Setup Window/Compensators Panel Tabs" on page 343.
- "Scope Window" on page 395.
- "Setup for Scope Window" on page 398.

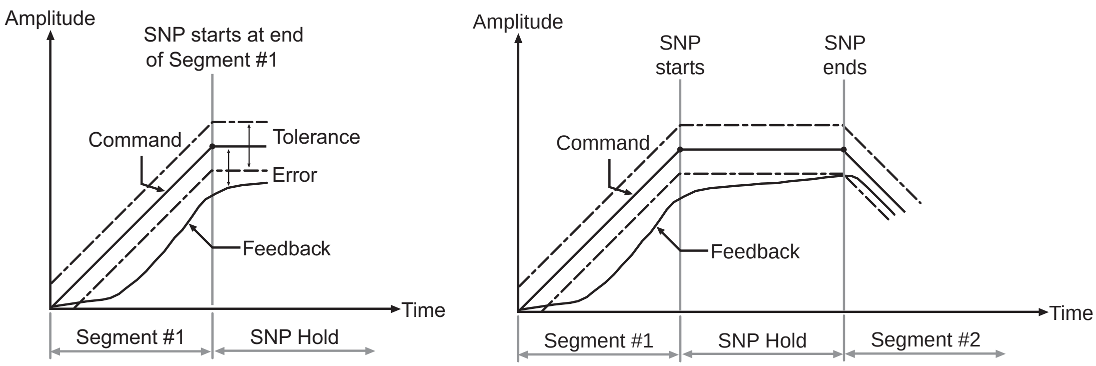
About Null Pacing

There are two types of null pacing:

- Static null pacing
- Dynamic null pacing

How static null pacing works

If the error is too large, static null pacing holds the command at its segment boundaries, allowing the sensor feedback more time to reach its target peak. As the error comes within the user-specified **Error Tolerance**, static null pacing resumes the command.



Static Null Pacing (SNP)

How dynamic null pacing works

If the error is too large, dynamic null pacing reduces the command frequency allowing the sensor feedback more time to track the command.

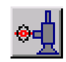
The frequency decreases until either of the following occurs:

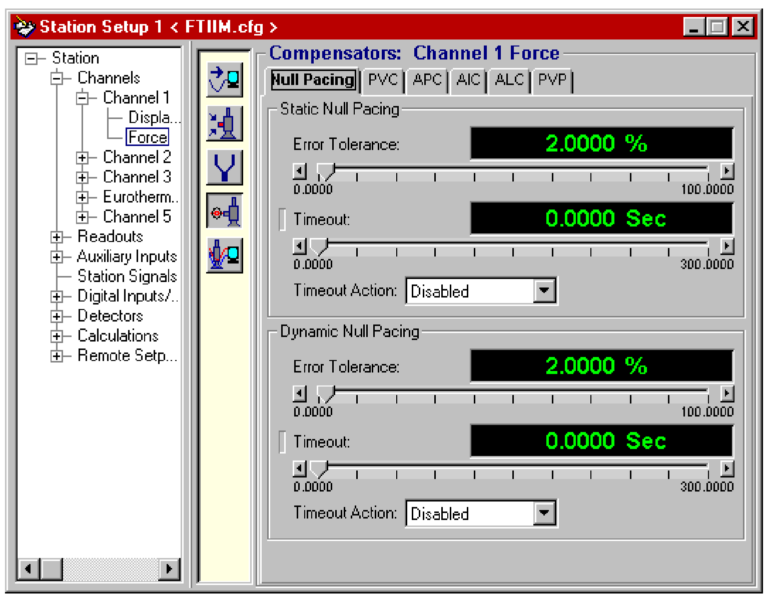
- The error comes within the user-specified **Error Tolerance**, at which time the command frequency starts increasing towards the command frequency.
- The frequency decreases to the minimum frequency value (20% of the original frequency). The command is then held at this frequency as long as the error remains out of tolerance. This condition is also known as low cycle.

How to Configure the Null Pacing Compensator

To use only **Static Null Pacing**, maximize the **Error Tolerance** values for **Dynamic Null Pacing**. To use only **Dynamic Null Pacing**, maximize the **Error Tolerance** values for **Static Null Pacing**.

For specifics about the controls referenced in this section, see: "Station Setup Window/Compensators Panel Tabs" on page 343

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode needing compensation.
4. In the **Station Setup** window, click  .
5. In the **Compensators** panel, click the **Null Pacing** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **Null Pacing** tab, define **Static Null Pacing** values:

   A. Set the **Error Tolerance**.

   B. Set the **Timeout** values.

   C. Select a **Timeout Action**.

   For more about time-out actions, see "About Detectors" on page 223.

7. In the **Null Pacing** tab, define **Dynamic Null Pacing** values:

   A. Set the **Error Tolerance**.

   B. Set the **Timeout** values.

   C. Select a **Timeout Action**.

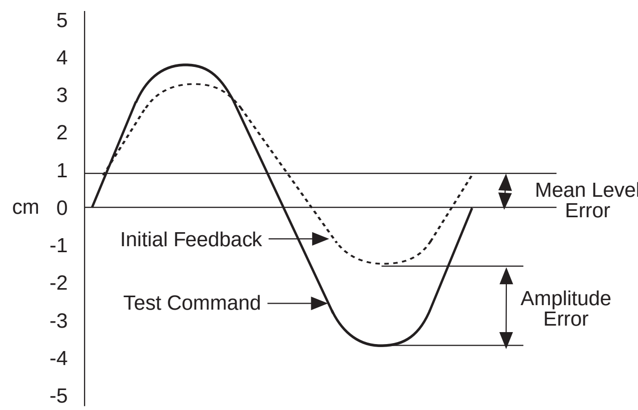
8. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

About PVC

Peak/Valley Compensation (PVC) monitors cyclic command feedback for any amplitude roll-off or mean-level divergence.

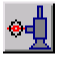
- PVC boosts the command amplitude if roll-off is detected.
- PVC adjusts the commanded mean level if mean level divergence is detected.

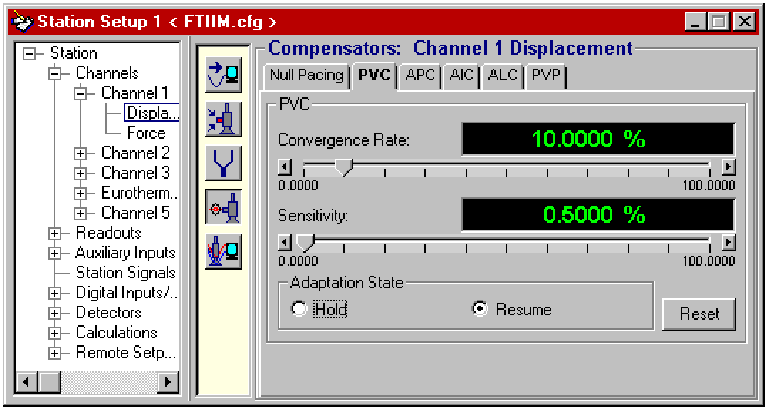
Note *For best results when using PVC, set the* ***I Gain*** *as low as possible on the control mode being compensated.*



How to Configure PVC

For specifics about the controls referenced in this section, see: "Station Setup Window/Compensators Panel Tabs" on page 343

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode needing compensation.
4. In the **Station Setup** window, click .
5. In the **Compensators** panel, click the **PVC** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **PVC** tab, define **PVC** values:
   A. Set the **Convergence Rate**.
   B. Set the **Sensitivity**.
   C. For **Adaptation State**, select **Resume**.
7. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

About APC

The Amplitude and Phase Control (APC) compensator monitors feedback from sine and sine tapered commands for amplitude roll-off and phase lag.

- APC boosts the command amplitude if roll-off is detected.
- APC alters the command phase if phase lag is detected.

APC's computational requirements may limit the sampling rate on some older multichannel systems.

For best results when using APC, you may have to adjust the **I Gain** for the control mode being compensated.

The Station Builder application must first enable APC before it can be used as a compensation method. For more about enabling APC, see "Enable optional compensators" on page 47.

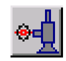
Use guidelines

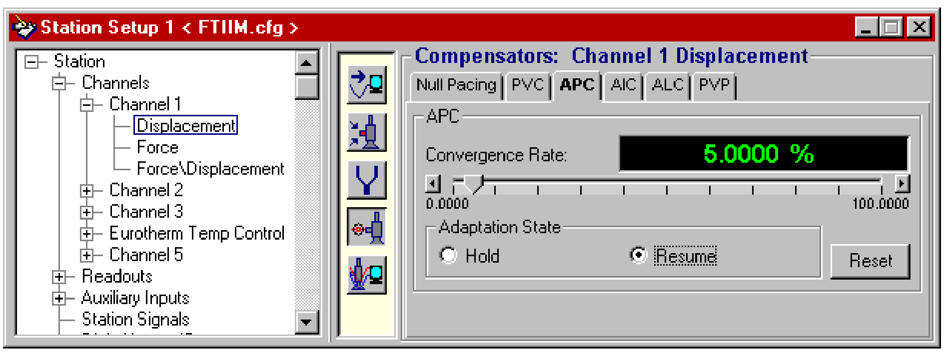
APC works well when you need to control the amplitude of the fundamental frequency component.

If you want to achieve peaks, particularly if the feedback is distorted, using APC is not a good choice

How to Configure APC

For specifics about the controls referenced in this section, see: "Station Setup Window/Compensators Panel Tabs" on page 343

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode needing compensation.
4. In the **Station Setup** window, click .
5. In the **Compensators** panel, click the **APC** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **APC** tab, define **APC** values:
   A. Set the **Convergence Rate**.
   B. For **Adaptation State**, select **Resume**.

WARNING

Changes in function generator frequency made with APC selected and hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Avoid changing frequency values while running APC. If you must change frequency, always clear the actuator area first.

7. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

About AIC

Adaptive Inverse Control (AIC) is a linear compensation technique that automatically adjusts a compensation filter that filters the command signal to achieve the desired response signal. AIC is an effective digital control technique for improving tracking accuracy in mainly linear servohydraulic test systems.

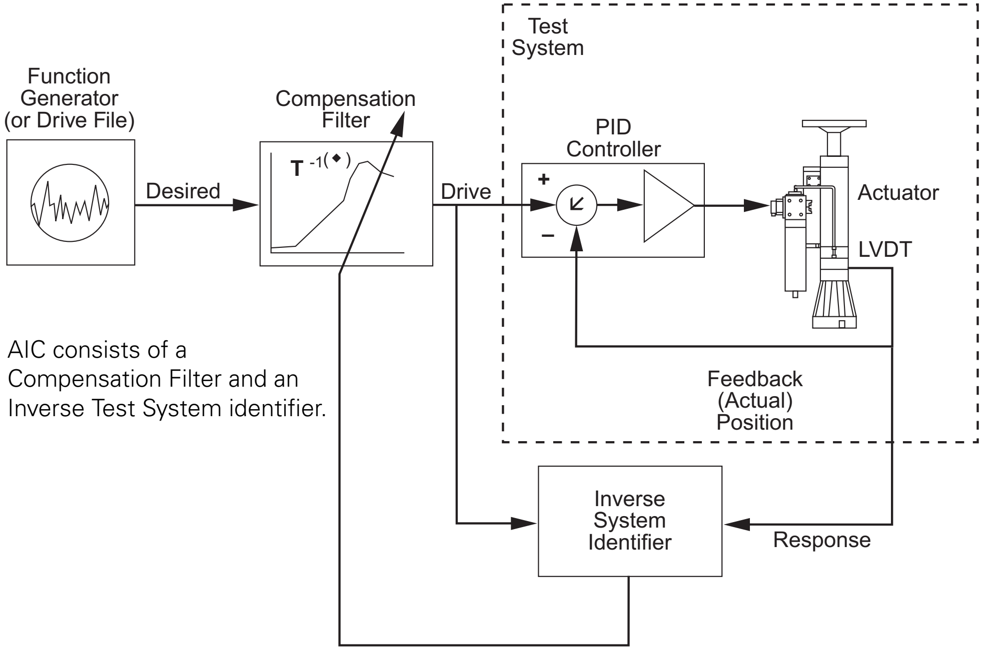
- AIC works well on signals that have a wide frequency content.
- AIC adapts quickly and automatically to changes in system dynamics.
- AIC works directly from test data created by the test.

The Station Builder application must first enable AIC before it can be used as a compensation method. For more about enabling AIC, see “Enable optional compensators” on page 47.

How AIC works

The presence of dynamics in a test system can result in large tracking errors, especially at higher frequencies. The AIC compensator identifies these dynamics and actively adjusts an inverse-dynamics compensation filter between the function generator and the test system. This active adjustment precorrects the command signal for system dynamics, resulting in optimal tracking.

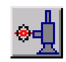
While testing, compensation filter adaptation can be switched off once the optimum filter has been determined, or left on to continue to compensate and track changes in the specimen response.

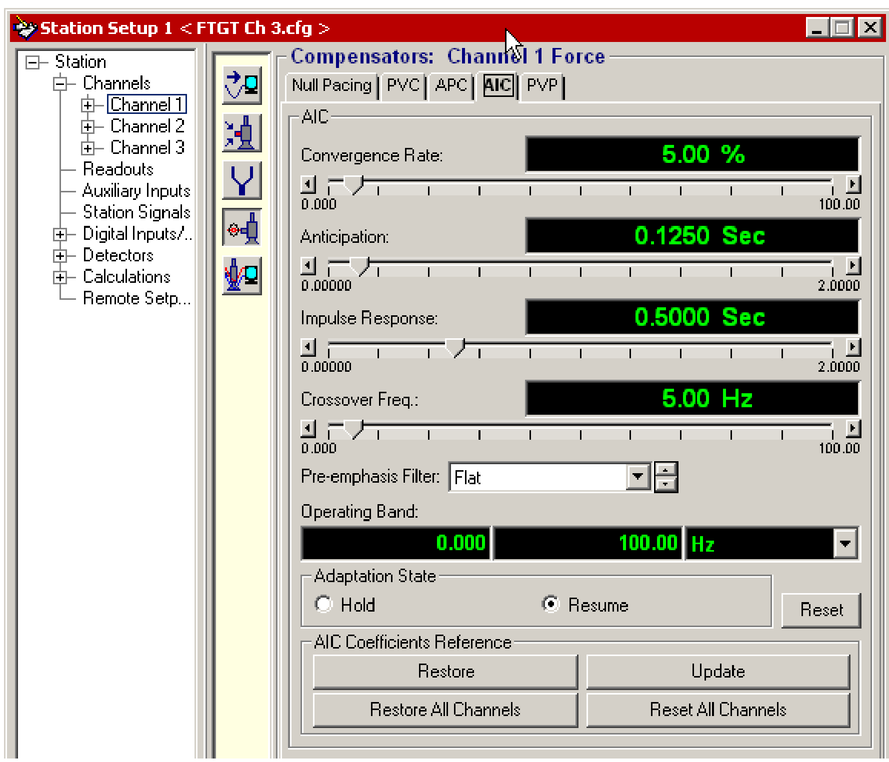


AIC consists of a Compensation Filter and an Inverse Test System identifier.

How to Configure AIC

For specifics about the controls referenced in this section, see: “Station Setup Window/Compensators Panel Tabs” on page 343

1. In the **Station Manager** window’s toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window’s **Display** menu, select **Station Setup**.
3. In the **Station Setup** window’s navigation pane, locate and select the **Channels** control mode that is to receive AIC compensation.
4. In the **Station Setup** window, click .
5. In the **Compensators** panel, click the **AIC** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **AIC** tab, define **AIC** values:

   A. Set the **Convergence Rate**.

   B. Set the **Anticipation**.

   C. Set the **Impulse Response**.

   D. Set the **Crossover Freq**.

   E. Select the required **Pre-emphasis Filter**.

Note *Stroke control systems may require selection of an **F** or **F**^{2} pre-emphasis filter to allow the compensator to adapt to a wide range of frequencies.*

   F. Set the **Operating Band**.

   G. For the **Adaptation State**, select **Resume**.

   H. For the **AIC Coefficients Reference**, select **Update**.

7. To save the tuning values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

How to Tune AIC

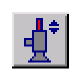
Tuning an AIC compensator involves the following procedures:

- Find the initial **Impulse Response** for the displacement control mode.
- Set up the **Scope** window to monitor frequency response.
- Set up an AIC tuning program.
- Run the AIC tuning program.

Find the initial Impulse Response

Use the following procedure to determine the initial **Impulse Response** setting for the displacement control mode.

Skip to "Set up the scope to monitor frequency response" on page 210 if you are using AIC only with the force control mode.

1. Remove any specimen.
2. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
3. In the **Station Manager** window's toolbar, click  .
4. Set up the **Scope** window to display the command and displacement feedback signals from the channel using AIC:
   A. For **Channel**, select the channel whose command and displacement signals are to be monitored.
   B. For **Signal**, select the channel's command and displacement signals.
   C. For **Plot Mode**, select **Time**.
   D. For **Trace Time**, enter **1.0 Sec**.
5. In the **Station Manager** window's navigation pane, click .

6. Set up a tuning program in the **Function Generator** panel:

   A. For **Channel**, select the channel using AIC.

   B. For **Control Mode**, select displacement.

   C. For **Command Type**, select **Cyclic**.

   D. For **Target Setpoint**, set **0 cm**.

   E. For **Amplitude (±)**, select a value appropriate for the test using the AIC compensation method.

   F. For **Frequency**, set **1 Hz**.

   G. For **Wave Shape**, select **Square**.

   H. For **Compensator**, select **None**.

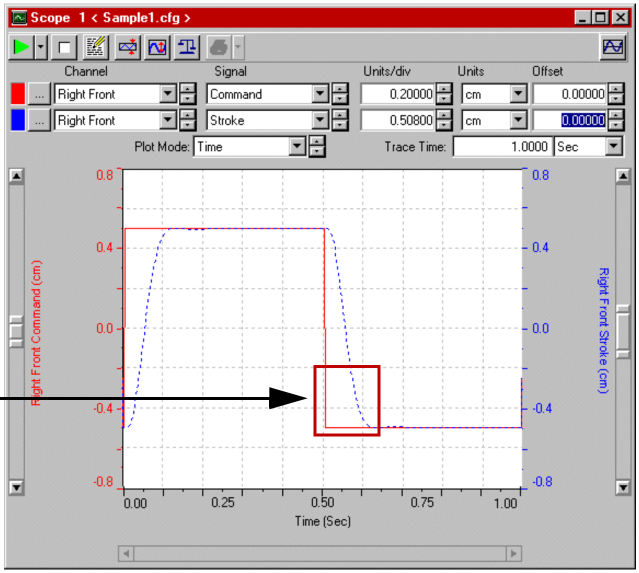
7. Apply station hydraulic pressure.

8. Start the tuning program.

9. Observe the **Scope** window to determine the initial **Impulse Response** setting.

   The initial **Impulse Response** setting is the lag time between the command and displacement signals.

This channel's initial **Impulse Response** setting is 0.1 seconds



10. In the **Station Setup** window, display the **AIC** tab for the selected channel's displacement control mode.

11. In the **AIC** tab, enter the initial **Impulse Response** setting for the channel's displacement control mode.

Set up the scope to monitor frequency response

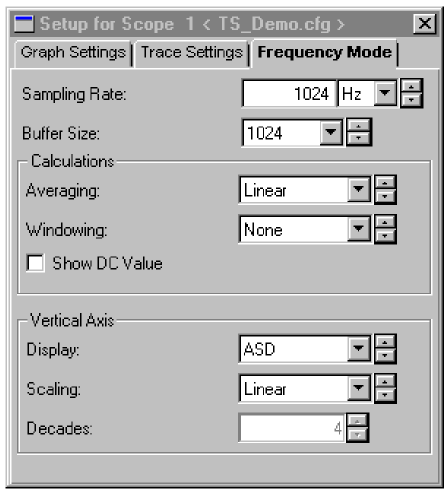
Set up the **Scope** window to monitor the command and feedback frequency response.

1. In the **Scope** window:

   A. For **Plot Mode**, select **Frequency**.

   B. In the toolbar, click .

2. In the **Setup for Scope** window, click the **Frequency Mode** tab.



3. In the **Frequency Mode** tab:

   A. For **Sampling Rate**, select **1024 Hz**.

   B. For **Buffer Size**, select **1024**.

   C. In **Calculations**:

      – For **Averaging**, select **Linear**.

      – For **Windowing**, select **None**.

      – Leave **Show DC Value** unchecked.

D. In **Vertical Axis**:

– For **Display**, select **ASD**.

– For **Scaling**, select **Linear**.

Leave the **Setup for Scope** window open to make adjustments while tuning is in progress.

Set up a tuning program

1. Install a dummy specimen.
2. Set up and enable limits to protect yourself and your equipment.
3. In the **Function Generator** panel, set up an AIC tuning program:

A. Select the desired **Channel**.

B. Select the **Control Mode** whose AIC compensation is to be tuned.

C. For **Command Type**, select **Random**.

D. For **Target Setpoint**, set a value appropriate for your specimen.

E. For **RMS Amplitude (±)**, set a value appropriate for the test using the AIC compensator.

F. For **Frequency Min/Max**, set values appropriate for the test using the AIC compensator.

G. For **Wave Shape**, select the desired **Random** function with the correct spectral pre-emphasis function.

For displacement control modes, select **Random - 1/F**.

H. For **Compensator**, select **AIC**.

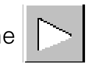
Run the AIC tuning program

1. In the **Station Setup** window, display the **AIC** tab for the selected channel's control mode.
2. In the **AIC** tab, click **Reset** to reset the filter and coefficients.

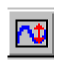
WARNING

Pressing the Station Controls panel's Run button will put actuators in motion.

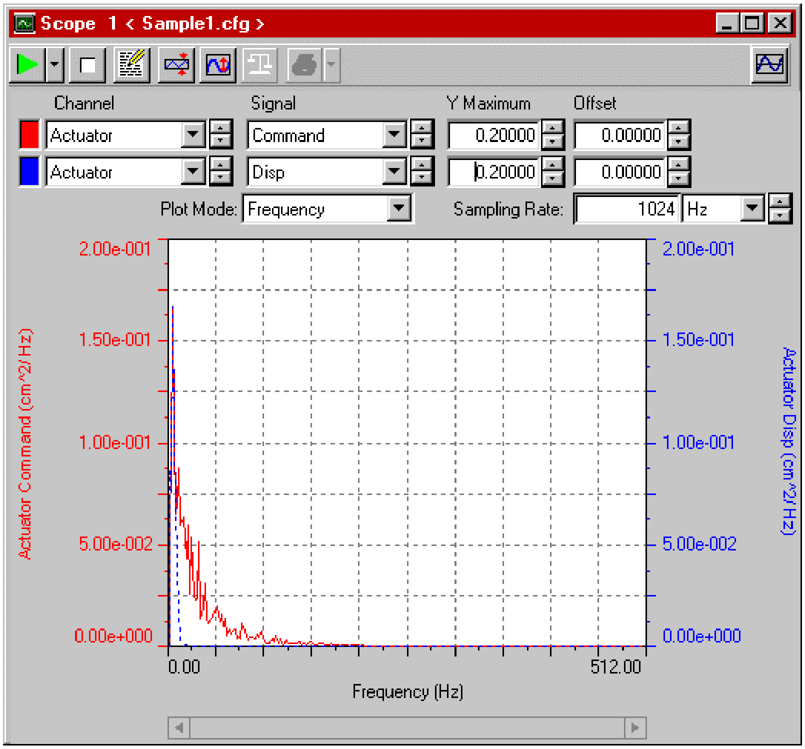
A moving actuator can injure anyone in its path.

Always clear the actuator area before pressing the  button.

3. In the **Station Manager** window's **Station Controls** panel, click  to start the AIC tuning program.
4. In the **Scope** window, observe AIC tracking accuracy.

   As needed, click  to rescale the scope.

   The signals should continue to converge as the compensator builds coefficients.


Scope 1 < Sample1.cfg >
Channel
Signal
Y Maximum
Offset
Actuator
Command
0.20000
0.00000
Actuator
Disp
0.20000
0.00000
Plot Mode:
Frequency
Sampling Rate:
1024
Hz
2.00e-001
1.50e-001
1.00e-001
5.00e-002
0.00e+000
Actuator Command (cm^2/ Hz)
Actuator Disp (cm^2/ Hz)
0.00
512.00
Frequency (Hz)

5. In the **AIC** tab, adjust the **Impulse Response**, **Anticipation**, and **Crossover Frequency** as needed.

   Adjusting the **Anticipation** or **Impulse Response** automatically resets filter coefficients.

   A. When optimum convergence is reached while in **Adaptation State**, select **Hold**.

      The controller will continue to compensate with the current coefficients, but it will not continue adapting them.

   B. Select **Update** to update the coefficient references.

6. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

Using the coefficients

The **AIC** tab's controls let you use the coefficients that were determined through tuning as a starting position for your actual test.

- Select **Restore** or **Restore All Channels** to recall coefficients from the parameter set.
- During testing, to track and compensate for changes in specimen response:
  - Set **Convergence Rate** to **10%**.
  - For **Adaptation State**, select **Resume**.

About ALC

Arbitrary End-Level Compensation (ALC) is available only in MultiPurpose TestWare application command processes. In addition, frequency compensation can be enabled on single channel configurations only.

ALC is an adaptive compensation technique that improves the tracking accuracy of spectrum profiles played out with the MultiPurpose TestWare application. This technique is also known as “from-to matrix compensation.”

The advantages of this technique are:

- ALC works well on both linear and nonlinear specimens.
- ALC adapts quickly and automatically to changes in system dynamics.

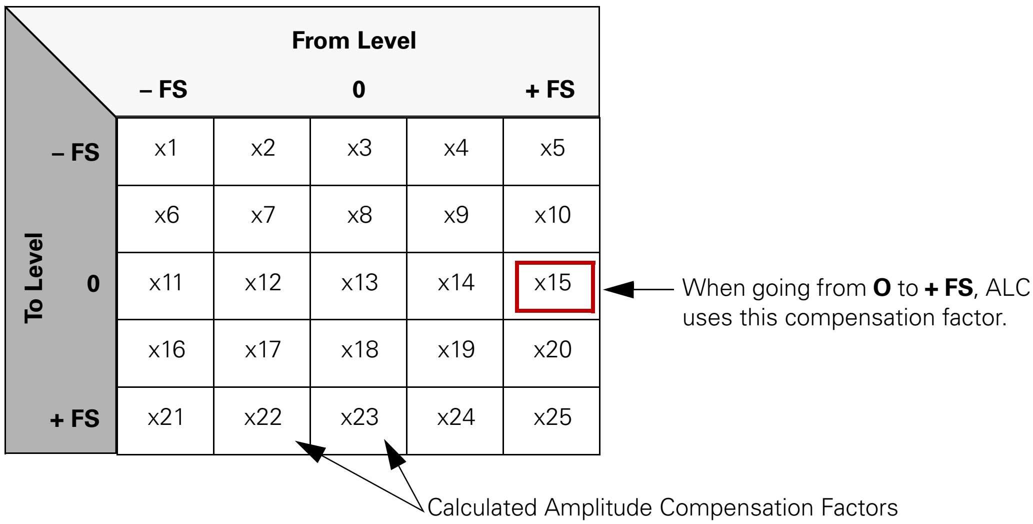
How ALC works

ALC compensates for peak and valley errors by building and continually updating a matrix of amplitude compensation factors.

The matrix is two-dimensional, with axes mapped to either plus or minus full scale or a subrange of full scale. Each axis is divided into 16, 32, or 64 equal parts, with each part representing a fraction of the defined range. The horizontal axis is labeled “From Level” and the vertical axis is labeled “To Level.”

With each pass of the spectrum, the peak/valley errors are calculated, and an estimated compensation factor is stored in the matrix. Before the command generator generates a new segment, it notes the required “From” and “To” levels, and refers to the matrix to determine how much to over-program the segment.

The following 5×5 sample matrix is for illustration only. The MultiPurpose TestWare process defines actual matrixes as either 16×16, 32×32, or 64×64. An additional diagonal row (not shown here) is added to the matrix to handle situations where the “From” and “To” levels map to the same cell.

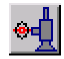


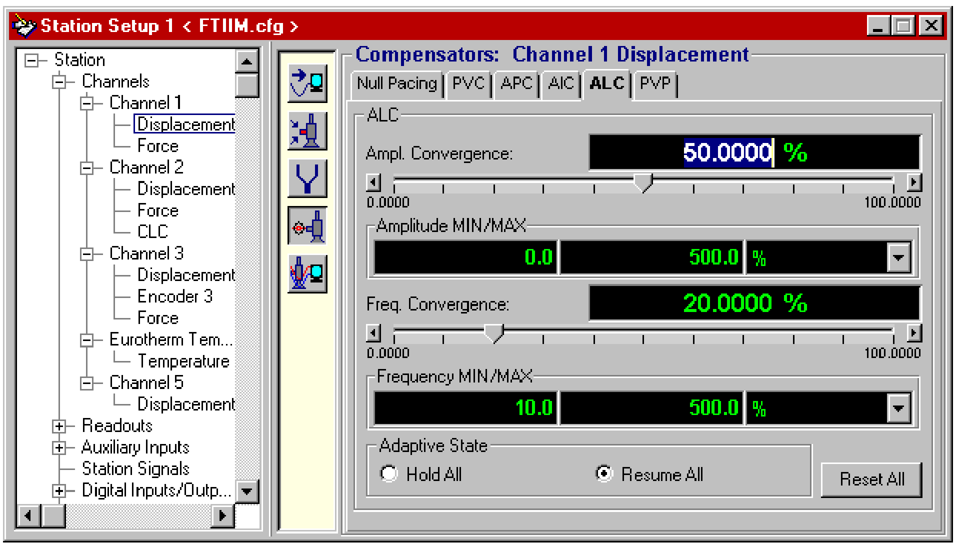
In order to run the test as fast as possible, ALC builds a second matrix to store frequency compensation factors. The command generator uses these factors to maintain the optimum spectrum play-out speed. Frequency compensation can only be enabled on single-channel tests.

The matrix compensation factors are updated during each pass of the spectrum. Depending on the convergence rate, it may take a number of cycles before the feedback amplitude tracks the command to within tolerance. To stop updating the compensation factors when the signals converge, select **Hold** in the **Station Setup** window’s **ALC** tab. The compensator will continue compensating with the current factors.

For more information on using the ALC compensator with your test, refer to the *Model 793.10 MultiPurpose TestWare* manual.

How to Configure ALC

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode to receive ALC.
4. In the **Station Setup** window, click .
5. In the **Compensators** panel, click the **ALC** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **ALC** tab, define **ALC** values:

   A. Set the **Ampl. Convergence**.

   B. Set the **Amplitude Min/Max**.

   C. Set the **Freq Convergence**.

   D. Set the **Frequency Min/Max**.

   E. For **Adaptive State**, select **Resume All**.

7. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

About PVP

The Peak/Valley Phase (PVP) compensator combines amplitude and phase (APC) with Peak/Valley Compensation (PVC) algorithms to improve the amplitude and phase tracking of the command and sensor feedback.

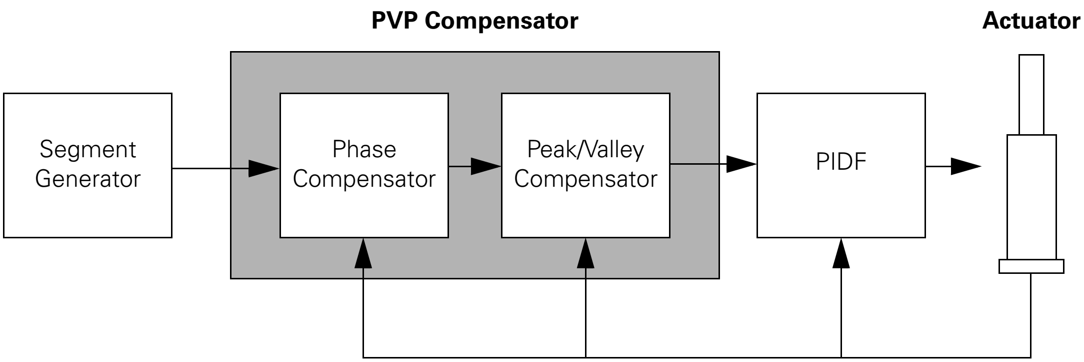
The advantages of this technique are:

- PVP compensates for phase error, unlike PVC.
- PVP provides good amplitude tracking on nonlinear specimens, unlike APC.

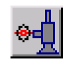
The PVP compensator's computational requirements may limit the sampling rate on multichannel systems.

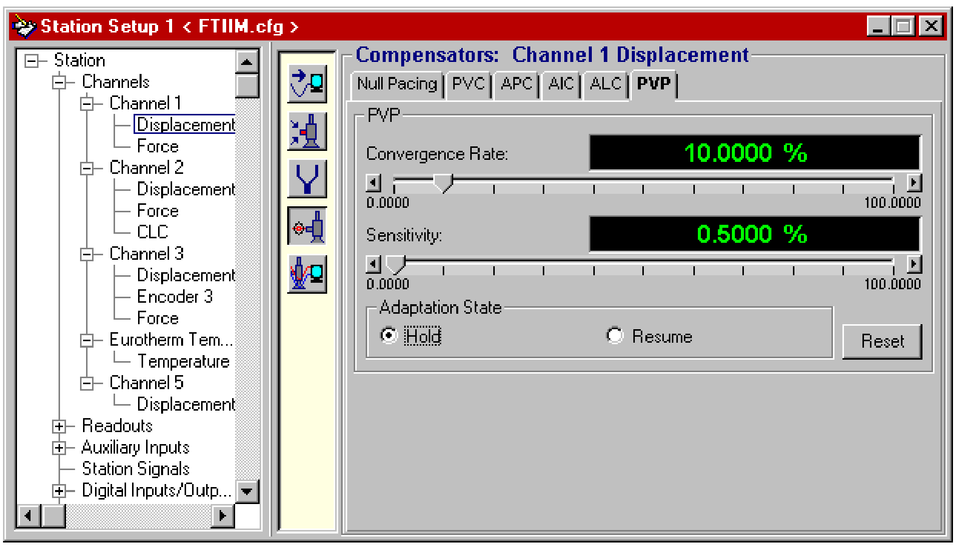
Note *The PVP compensator may have difficulty compensating command waveforms below 0.5 Hz.*

Basically, the PVP is a phase compensator cascading into a peak/valley compensator. The phase algorithm is similar to the one used by APC. The peak/valley algorithm is identical to the one used by PVC.



How to Configure PVP

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select the **Channels** control mode to receive PVP.
4. In the **Station Setup** window, click .
5. In the **Compensators** panel, click the **PVP** tab.



WARNING

Changes in compensation values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

6. In the **PVP** tab, define **PVP** values:
    A. Set the **Convergence Rate**.
    B. Set the **Sensitivity**.
    C. For **Adaptation State**, select **Resume**.
7. To save the values, go to the **Station Manager** window's **File** menu and select **Save Parameters**.

Running Tests

The Station Manager application runs a variety of tests using:

- The Basic TestWare application
- The MultiPurpose TestWare application
- External programming sources

A typical test includes the following tasks:

1. Setting up error and limit detectors.
2. Performing a shunt cal if required
3. Configuring the outgoing program signal.
4. Configuring any digital inputs and outputs.
5. Running the test.
6. Adjusting the setpoint and span during a test.

Additional information

See "Station Manager Controls and Displays" on page 273 for a complete description of this application's controls and indicators.

For specifics about the controls referenced in this section, see:

- "Station Setup Window/Inputs Panel Tabs" on page 310.
- "Station Setup Window/Drive Panel—Two Stage Valves" on page 327.
- "Station Setup Window/Drive Panel—Three Stage Valves" on page 329.
- "Station Setup Window/Detectors Panel Tabs" on page 373.
- "Station Setup Window/Digital Input/Outputs Panel Tabs" on page 367.
- "Linearization Data Window" on page 446.
- "Function Generator Control Panel" on page 485.
- "Setpoint and Span Window" on page 513.
- "Remote Setpoint Adjust Window" on page 515.

About Detectors

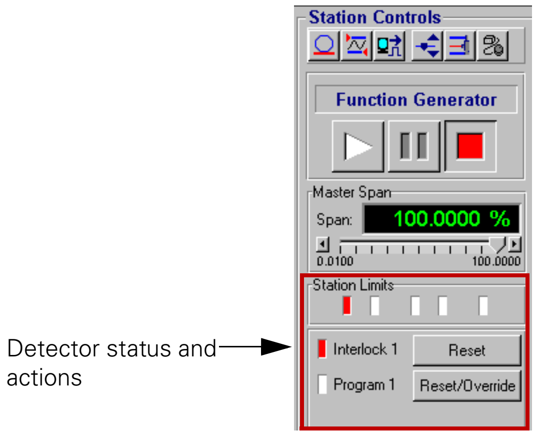
Detectors monitor various system signals and perform specific actions when user-specified conditions are met.

Limit detectors monitor sensor feedback signals. If the sensor signal exceeds specified limits, the controller triggers a detector action.

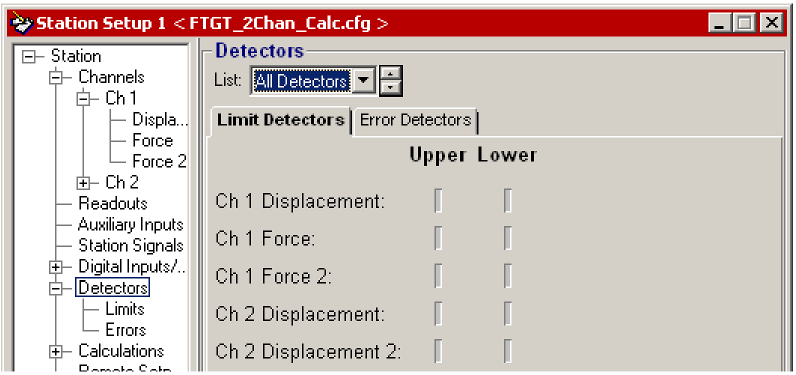
Error detectors monitor the difference between the command signal and the corresponding feedback signal. If the error exceeds specified limits, the controller triggers a detector action.

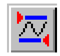
Detector summaries

The **Station Manager** window **Station Controls** panel's **Station Limits**, **Interlock**, and **Program** indicators summarize the detector status and actions.



The **Station Setup** window's **Detectors** panel displays tabs that summarize the **Limit Detectors** and **Error Detectors** status.



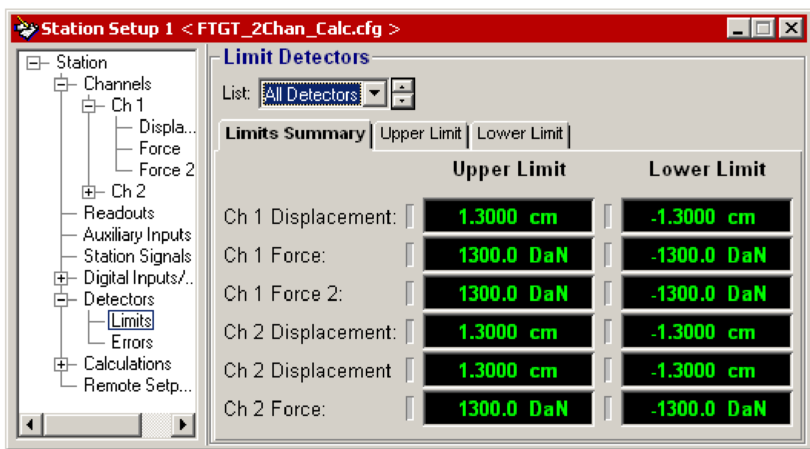
A summary of settings, actions, and status for all detectors can also be accessed by clicking  on the **Station Manager** window's **Station Controls** panel toolbar. See "Detectors Window" on page 504 for more detailed information.

Indicator colors

The detector indicators use colors to show their status:

- Gray—The detector action is set to **Disabled**.
- White—The detector action is set to **Indicate**.
- Green—The detector action is set to **Station Power Off**, **Interlock**, **Program Interlock**, **Program Stop**, **Program Hold**, or **Custom Actions**.
- Red—The detector has tripped.

The **Station Setup** window displays **Limit Detectors** and **Error Detectors** panels with tabs that define limit and error detectors' actions.



The following actions can be selected:

Disabled—No action occurs. This setting grays out the indicator.

Indicate—Writes a message to the **Message Log**. This setting turns the indicator white.

Station Power Off—Writes a message to the **Message Log**, clamps the servovalve (if enabled in the .hwi file), turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the indicator green.

Interlock—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the indicator green.

Program Interlock—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the indicator green. The **Program Interlock** needs to be reset before the test can run again.

Program Stop—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the indicator green.

Program Hold—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. This setting turns the indicator green.

Custom Action—Executes a user-defined action created in the **Event-Action Editor** window. This setting turns the indicator green. See "Event-Action Editor Window" on page 448 for more about using this window.

About Limit Detectors

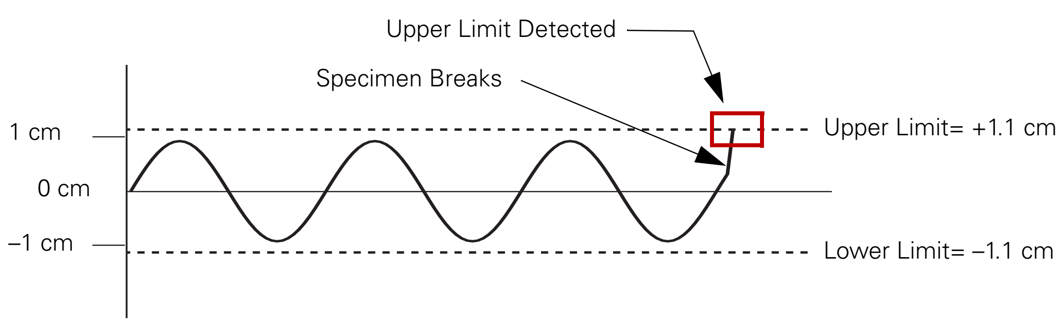
Limit detectors monitor sensor feedback signals. If the sensor output exceeds specified limits, the controller triggers a detector action.

Limit detectors can be used to:

- Reduce the risk of personal injury and equipment damage when installing specimens.
- Indicate when defined sensor levels are detected.
- Automatically stop tests when defined sensor levels are detected.

Establish limits on at least one input signal to prevent damage if closed-loop control is lost. Control can be lost if the specimen breaks or a cable gets disconnected.

The following figure shows how a limit detector can automatically stop a test. Here the limits have been set to remove station power when the displacement feedback reaches either +1.1 cm or -1.1 cm. When the specimen breaks, the +1.1 cm upper limit is reached. The limit detector then trips, stops the test, and removes station power.

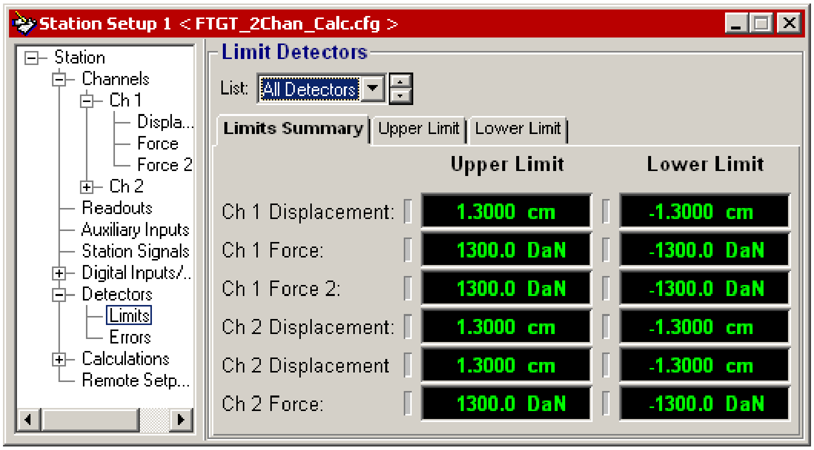


Note *If you do not know what the limit setting should be, you can run your test and monitor the sensor signal with a* ***Peak/Valley*** *or a* ***Running Max/Min*** *meter. While running the test, note the upper and lower sensor values. Set the limits to slightly more than the maximum and minimum values.*

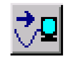
How to Set Limit Detectors

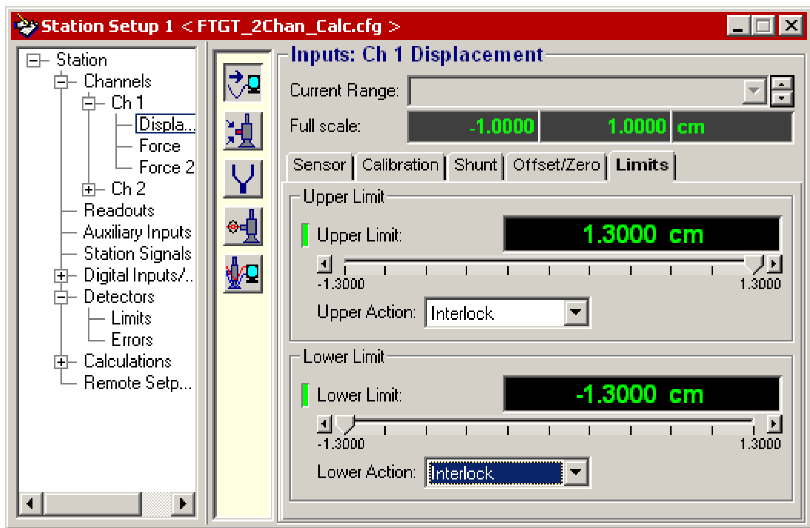
Method 1

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Limits**.
3. In the **Limit Detectors** panel:
   A. Click the **Upper Limits** tab and set **Upper Limit** and **Upper Action** as required for each signal.
   B. Click the **Lower Limits** tab and set **Lower Limit** and **Lower Action** as required for each signal.

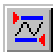


Method 2

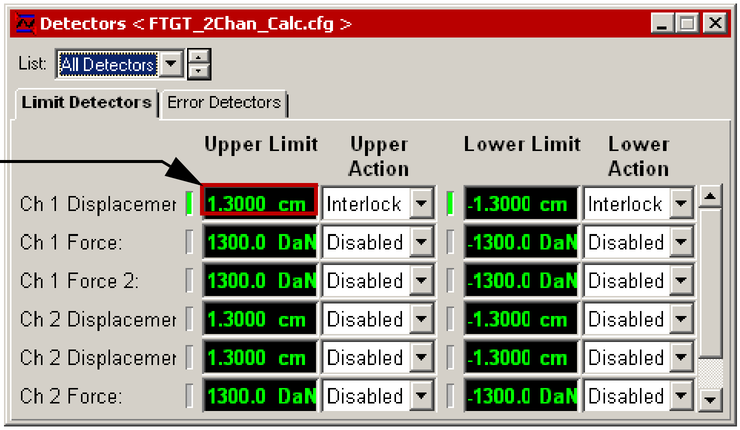
1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, locate and select the **Channels** feedback signal to be monitored for limits.
3. In the **Station Setup** window, click .
4. In the **Inputs** panel, click the **Limits** tab.
5. In the **Limits** tab, set the signal's **Upper Limit**, **Upper Action**, **Lower Limit**, and **Lower Action**.



Method 3

1. In the **Station Manager** window's **Station Controls** panel toolbar, click .
2. In the **Detectors** window, click the **Limit Detectors** tab.

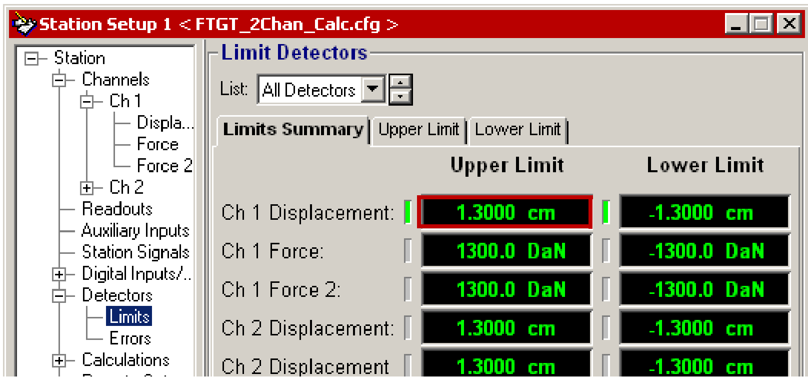
As needed, type in new values



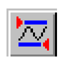
How to Monitor Limit Detectors

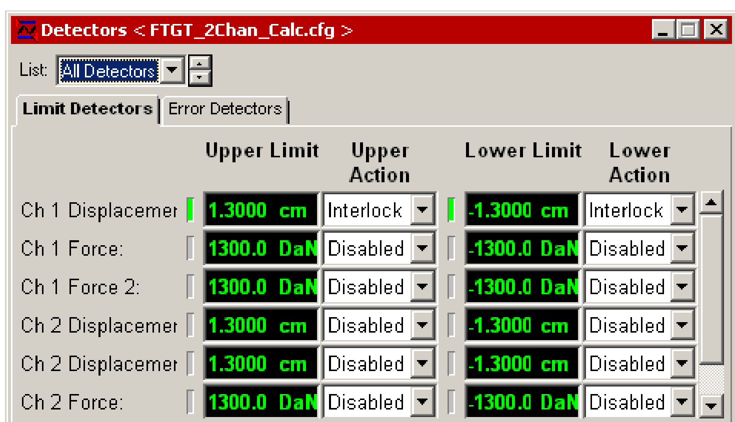
Method 1

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Limits**.
3. In the **Limit Detectors** panel, click the **Limits Summary** tab.



Method 2

1. In the **Station Manager** window's **Station Controls** panel toolbar, click  .
2. In the **Detectors** window, click the **Limit Detectors** tab.



About Hardware Limit Detectors

For FlexTest IIm systems, a limit detector on each 497 conditioner continuously compares its associated transducer output value to preset upper and lower limit values set in the **Hardware Limits** tab.

Note *Hardware limit detectors are supported as an option that must be enabled.*

When a conditioner's upper or lower limit is exceeded its limit detector is enabled, triggering an interlock.

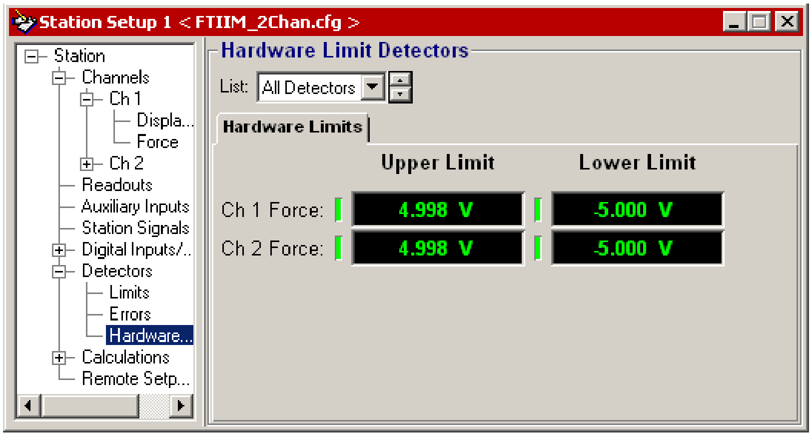
Hardware limit detectors can be used to:

- Reduce the risk of personal injury and equipment damage when installing specimens.
- Automatically stop tests when defined sensor levels are detected.

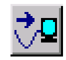
How to Set Hardware Limit Detectors

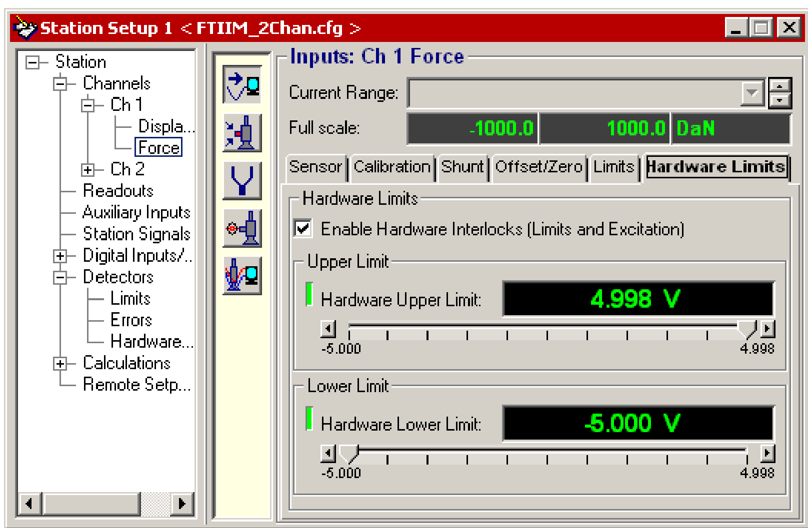
Method 1

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Hardware Limits**.
3. In the **Hardware Limit Detectors** panel:
   A. Set the **Upper Limits** value as required for each signal.
   B. Set the **Lower Limits** value as required for each signal.

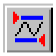


Method 2

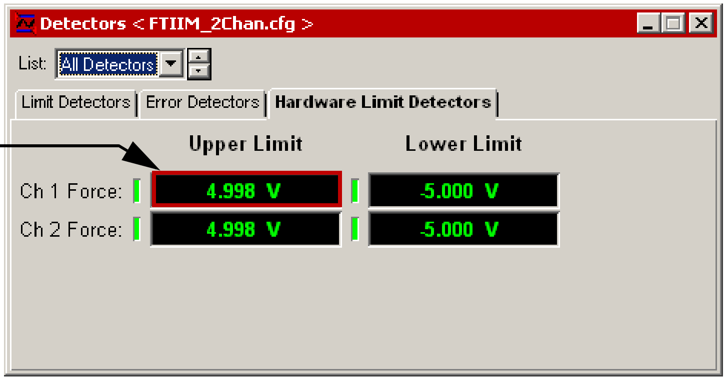
1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, locate and select the **Channels** feedback signal to be monitored for limits.
3. In the **Station Setup** window, click .
4. In the **Inputs** panel, click the **Hardware Limits** tab.
5. In the **Hardware Limits** tab, set the conditioner's **Upper Limit**, and **Lower Limit**.
6. As required, enable or disable the hardware limits and excitation interlocks by using the **Enable Hardware Interlocks (Limits and Excitation)** checkbox.



Method 3

1. In the **Station Manager** window's **Station Controls** panel toolbar, click .
2. In the **Detectors** window, click the **Hardware Limit Detectors** tab.

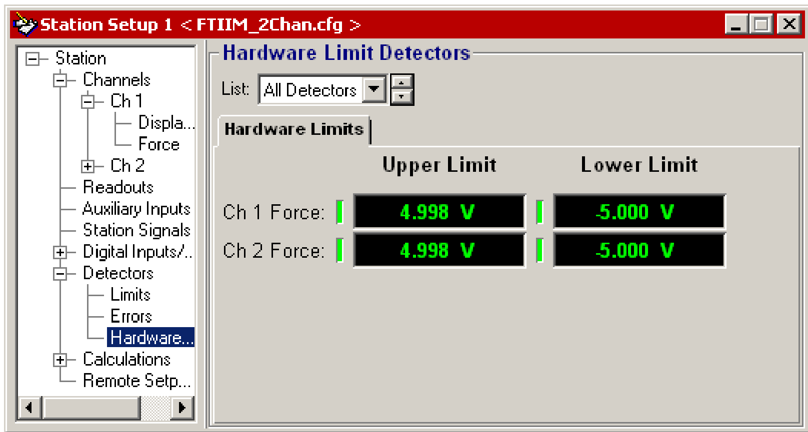
As needed,
type in new values



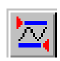
How to Monitor Hardware Limit Detectors

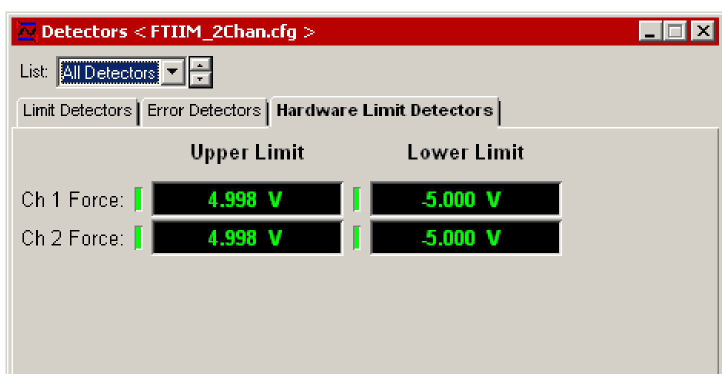
Method 1

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Hardware Limits**.



Method 2

1. In the **Station Manager** window's **Station Controls** panel toolbar, click  .
2. In the **Detectors** window, click the **Limit Detectors** tab.



About Error Detectors

Error detectors monitor the difference between a command signal and its feedback signal. If the difference exceeds set limits, the controller triggers a specified detector action.

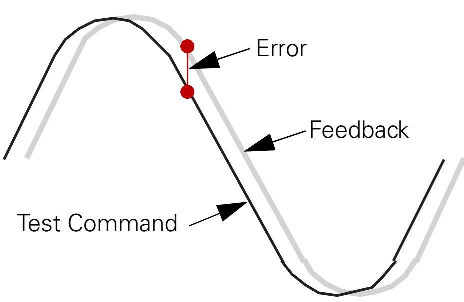
Note *Each defined control mode has an error detector, but only the error detector for the active control mode of a channel is active*

Error detectors can:

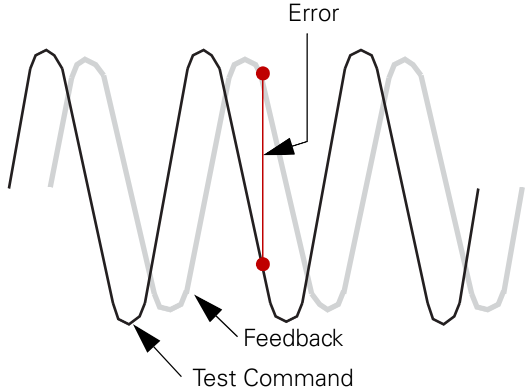
- Warn when a specimen is beginning to fail.
- Shut down the test before the specimen breaks.

When using error detectors, remember that:

- Effective error detection requires a properly tuned servoloop.
- Error limits should be set low on low frequency and static tests.
- Error limits should be set high on high frequency tests.



At lower frequencies the error level is usually smaller since the feedback can track the command more closely.



At higher frequencies the error level is usually larger since the phase lag creates a larger error.

The **Error Detectors** tab has two limits:

- **Inner Limit**—Typically set to indicate the beginning of failure.
- **Outer Limit**—Typically set to stop the test.

How to Set Error Detectors

Method 1

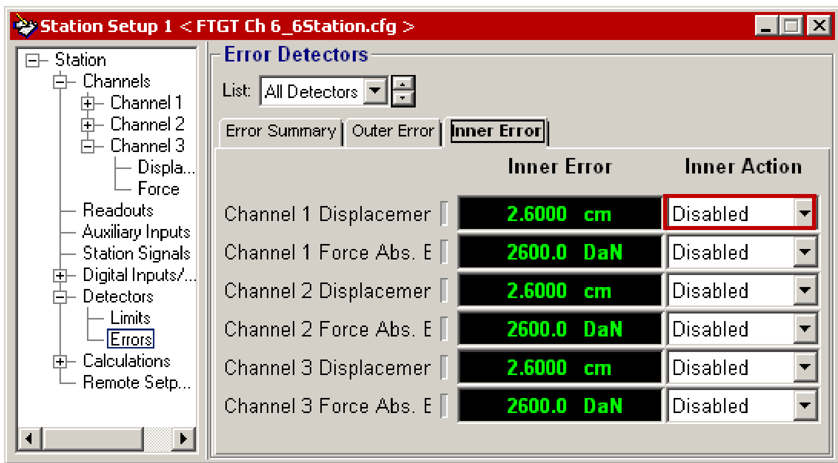
1. In the **Station Manager** window's **Display** menu, select **Station Setup**.

2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Errors**.

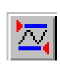
3. In the **Error Detectors** panel:

   A. Click the **Outer Error** tab and set the **Outer Error** and **Outer Action** as required for each signal.

   B. Click the **Inner Error** tab and set the **Inner Error** and **Inner Action** as required for each signal.

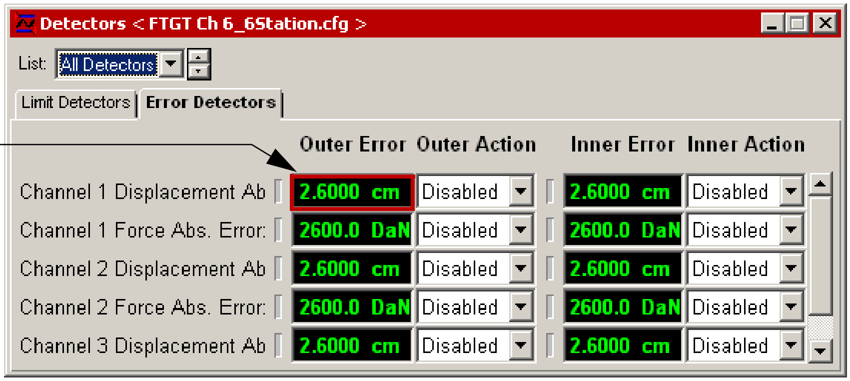


Method 2

1. In the **Station Manager** window's **Station Controls** panel toolbar, click  .

2. In the **Detectors** window, click the **Error Detectors** tab.

As needed,
enter new values

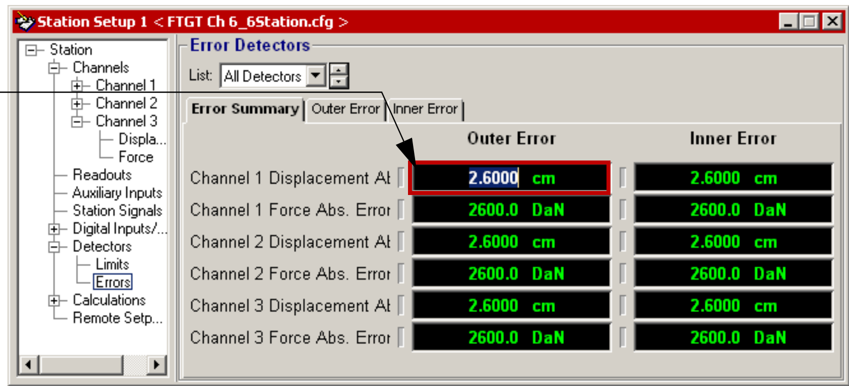


How to Monitor Error Detectors

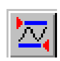
Method 1

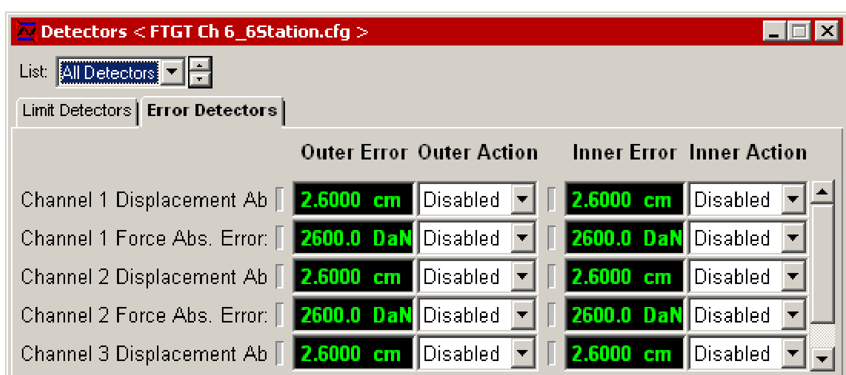
1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, click **Detectors** and then **Errors**.
3. In the **Errors Detectors** panel, click **Error Summary** tab.

As needed, enter new values



Method 2

1. In the **Station Manager** window's **Station Controls** panel toolbar, click  .
2. In the **Detectors** window, click the **Error Detectors** tab.



About Sensor Ranges and Detectors

Sensor description

Your system's sensors convert measured mechanical values, such as force, displacement, and pressure, into electrical signals that after conditioning, are suitable for feedback for closed-loop control. Sensors and sensor conditioners are calibrated together in pairs against a standard to ensure their outputs accurately represent the physical properties they are measuring.

Sensor ranges

Every sensor has a full-scale capacity that defines its maximum operating range. For example, an actuator that can extend its piston 6 cm from its fully retracted position is referred to as an actuator with a "6-cm stroke." The displacement sensor used with the actuator has a full-scale capacity of 6 cm.

Full-range conditioners

Some sensor conditioners, such as Model 493.25 Digital Universal Conditioners, are full-range conditioners. They have only one range that spans the sensor's full-scale capacity.

Ranged conditioners

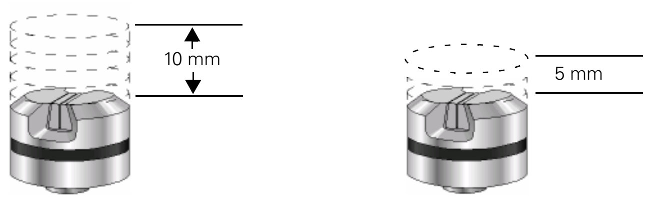
Other sensor conditioners, such as Model 493.13 AC Conditioners and Model 493.22 Dual DC Conditioners, may use two or more ranges. Each range defines the electronic amplitude of the sensor's feedback signal for the purpose of providing better signal resolution. In other words, it redefines the input channel to represent a portion of the sensor's physical capacity.

With this type of sensor conditioner, you may create a range for any portion of the sensor's capacity. Typical ranges are: Range 1, 100%; Range 2, 50%; Range 3, 20%; and Range 4, 10%.

Range example

Suppose a displacement sensor has a full-scale capacity of 10 mm. A ±5 mm range can operate across the full-scale range of the sensor (±5 mm). A ±2.5 mm range of the same sensor can operate across half the capacity of the sensor (this redefines full scale to be ±2.5 mm).

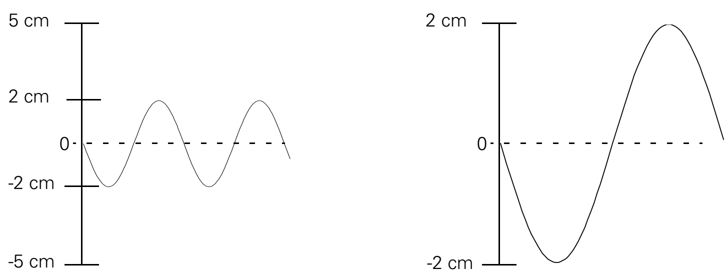
Ranges represent a portion of the sensor's full-scale capacity



Selecting ranges

Be sure you select a range large enough to accommodate the maximum sensor output expected during a test.

Select a full-scale range to optimize the maximum sensor output for a test



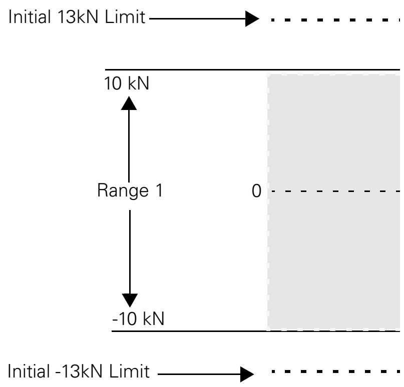
For example, suppose your test requires a ±2.0 cm displacement. A ±6 cm or ±3 cm range functions properly, but a ±2 cm range provides the best resolution.

When setting up a test, it is good practice to select a range slightly larger than the largest value expected for the test. The smaller the range, the better the resolution of the sensor's signal.

Initial limit detectors for each range

When you select a range, the initial setting of the associated limit detectors are ±130% of the range value. For example, suppose you select Range 1 of your system's force sensor, and that Range 1 is ±10 kN. In this case, the initial placement of the limit detectors will be ±13 kN.

The application places the initial limit detectors at ±130% of the selected range (as shown).



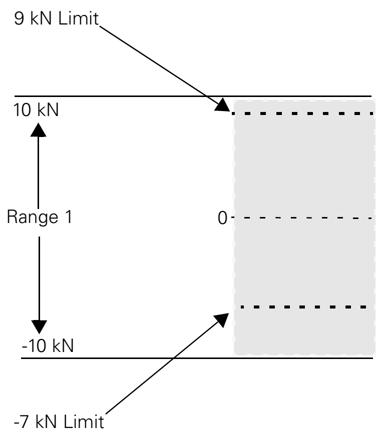
By default, limit detectors are initially disabled. So even if you enable a limit detector at its initial setting (±130% of its range value), it still will not work because the sensor conditioner's hardware will saturate before attaining ±130% of the current range.

Enabling limit detectors

To allow a limit detector to work in a given range, you must:

- Change its limit value so that it falls within ±100% of its range, and
- Enable it (change its selected action from "Disable" to the desired action)

To make a limit detector work, you must change its initial setting so that it is within ±100% of the selected range (as shown).



To set error and limit detectors, see “How to Set Limit Detectors” on page 227, and “How to Set Error Detectors” on page 236.

Be aware of detector settings when changing ranges

When you go from a larger range to a smaller range, limit detector do not automatically change, so they may not apply to your new range.

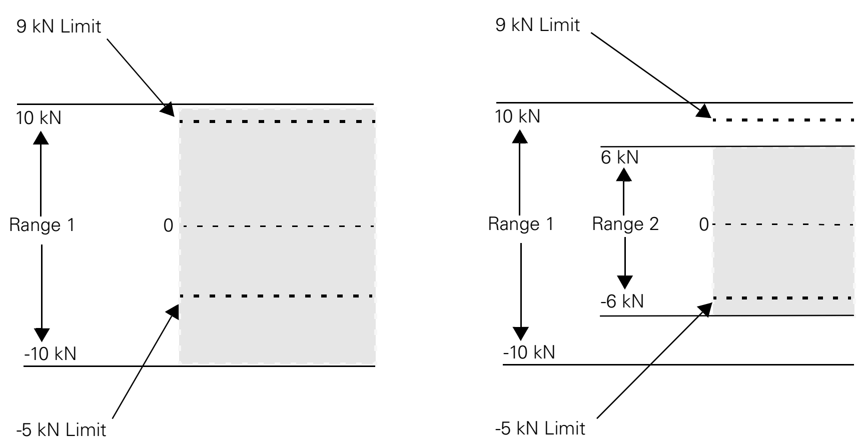
When this occurs, the controller will display the following message:

“The range selected for signal ‘signal name’ has left one or more of the signal's detectors outside of the new range.

Please verify that the detectors (limit and error) associated with this signal are adjusted as necessary.”

For example, suppose you have a configuration in which Range 1 spans ±10 kN, with limits set at 9 kN and -5 kN, as shown below in the figure to the left. Both limits are viable for Range 1.

Next, suppose you select Range 2, which spans ±6 kN, as shown below in the figure to the right. In this case, the 9 kN limit would not be applicable to Range 2, and the application would display the message. However, the -5 kN limit still falls within the span of Range 2.



When you select a new range, review the limits you have defined for the selected signal to ensure they are appropriate for your new range.

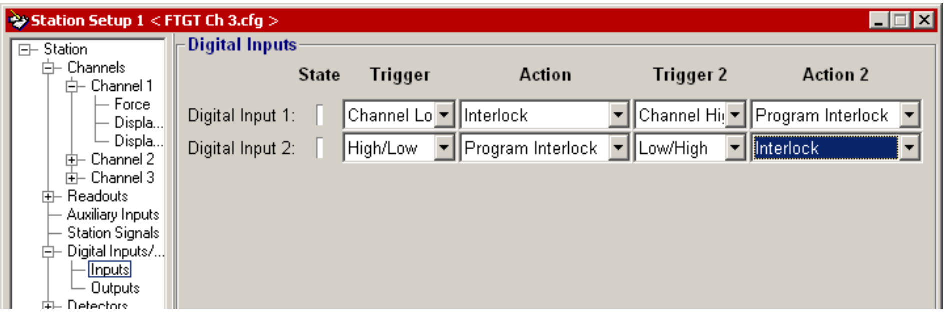
About Digital Inputs/Outputs

Digital inputs are signals sent into the station controller from external sources. Digital outputs are signals sent out from the station controller to external devices. Input and output signals can be high, low, or pulsed.

The Station Builder application must assign digital input and output resources before the Station Manager application can use them. For more about assigning digital input and output resources, see "Allocating Controller Resources" on page 37.

About Digital Inputs

The **Station Setup** window's **Digital Inputs** panel defines the incoming signal's trigger and its resulting action. Each digital input can be assigned two different trigger/action sets.



Triggers

The following input changes can trigger an action:

High/Low—Triggers when the input goes from a high state to a low state.

Low/High—Triggers when the input goes from a low state to a high state.

Either—Triggers when the input either goes from a high state to a low state or from a high state to a low state.

Channel Low—Triggers when the channel goes low and stays triggered as long as the channel remains low.

Channel High—Triggers when the channel goes high and stays triggered as long as the channel remains high.

Note *__Channel Low__ and __Channel High__ trigger modes do not support the following digital input actions: __Program Stop__, __Program Hold__, and __Custom Actions__.*

Actions

Resulting actions include:

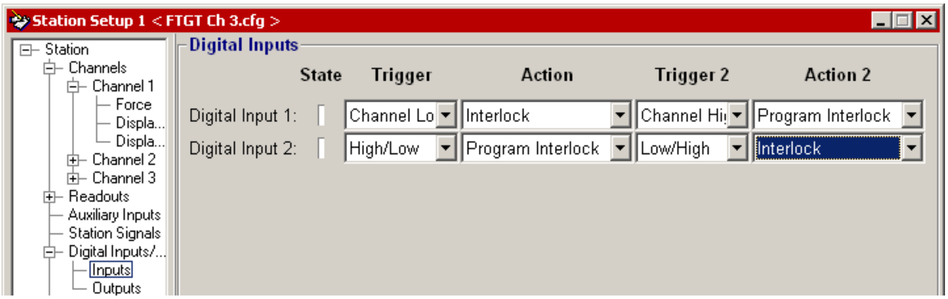
- **Disabled**—No action occurs.
- **Indicate**—Writes a message to the **Message Low**.
- **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the HSM, stops any program command.
- **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and HPU, stops any program command, and turns the **Interlock** indicator red.
- **Program Interlock**—Writes a message to the **Message Log**, stops any program command, turns the **Program** indicator red, but does not turn off station hydraulic pressure.
- **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. **Channel Low** and **Channel High** trigger modes do not support this action.
- **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. **Channel Low** and **Channel High** trigger modes do not support this action.
- **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. See “About the Event-Action Editor Window” **on page 246** for more about using this window. **Channel Low** and **Channel High** trigger modes do not support this action.

How to Configure Responses to Digital Input Signals

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, double-click **Digital Inputs/Outputs** and then click **Inputs**.
3. In the **Digital Inputs** panel:

   A. Select the appropriate trigger(s) for each input.

   B. Select the appropriate resulting action(s) for each input.

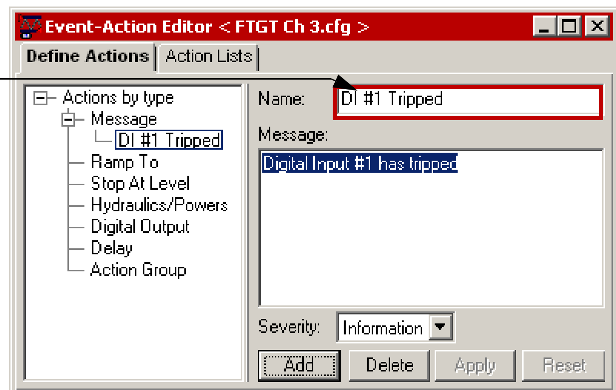


About the Event-Action Editor Window

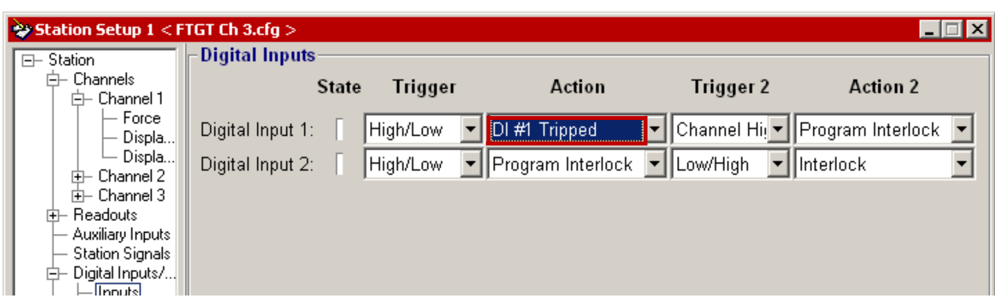
The **Event-Action Editor** window defines custom actions that can occur in response to **Limit Detector**, **Error Detector**, **Null Pacing Timeout**, and **Digital Input** events.

Important *If you are using manual command, the defined actions **Ramp To** and **Stop At Level** will not be triggered by a event (typically a tripped limit). To trigger these actions you must be in "run" mode when a limit is tripped; using either the function generator, MultiPurpose TestWare, Basic TestWare, or any other test application.*

Custom action



For example, an action defined in the **Event-Action Editor** window can be selected, in the **Station Setup** window's **Digital Input** panel, as an **Action**.



How to Define a Custom Action

1. In the **Station Manager** window's toolbar, select an access level of **Configuration**.
2. In the **Station Manager** window's **Tools** menu, select **Event-Action Editor**.
3. In the **Event-Action Editor** window's navigation pane, select **Actions by Type**.
4. In the **Event-Action Editor** window:

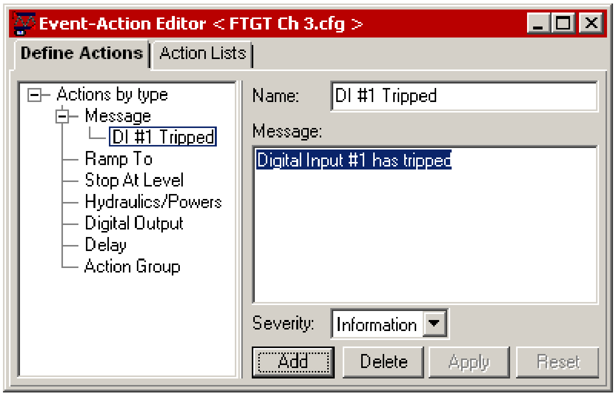
   A. Click **Add.**

   B. Enter custom action **Name**, **Message**, and **Severity**.

   C. Click **Apply**.

   The defined action is now selectable, in the **Station Setup** window's **Digital Inputs** panel, as an **Action** that occurs in response to a digital input **Trigger**.

   This action can also be selected as a response to **Limit Detector**, **Error Detector**, and **Null Pacing Timeout** events.

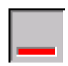


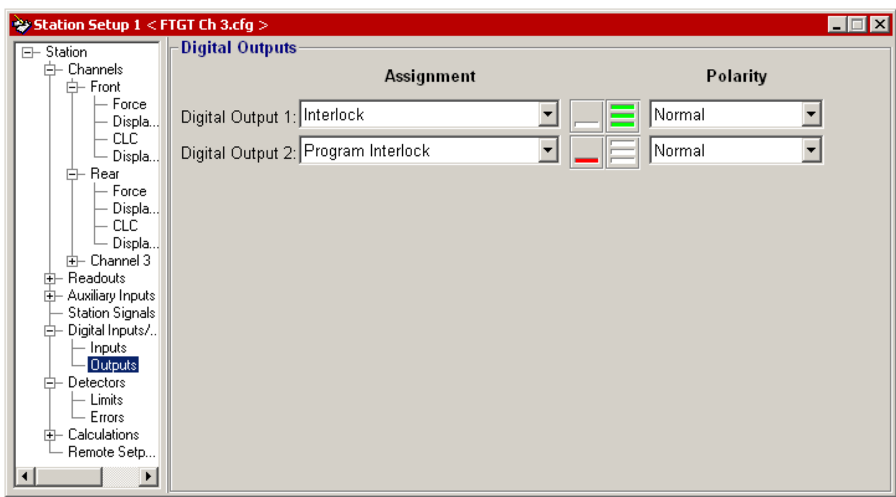
How to Manually Control Digital Output Signals

Method 1

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. In the **Station Setup** window's navigation pane, double-click **Digital Inputs/Outputs** and then click **Outputs**.
3. In the **Digital Outputs** panel:

   A.  indicates that the output is on. If the output signal resource is undefined, click this button to turn on the output signal.

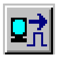
   B.  indicates that the output is off. If the output signal resource is undefined, click this button to turn off the output signal.

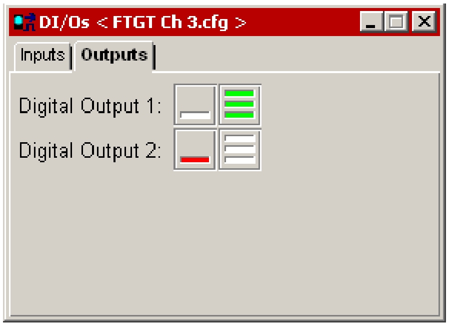


   C. Use **Assignment** to assign a resource for each signal output to external logic devices and switches.

   D. Set signal polarity if required.

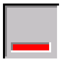
Method 2

1. In the **Station Manager** window's **Station Controls** panel toolbar, click .
2. In the **DI/Os** window, click the **Outputs** tab.



3. In the **Outputs** tab:

   A. Click  to set the **Output**.

   B. Click  to clear the **Output**.

About Shunt Calibration

Only DC conditioners require shunt calibration.

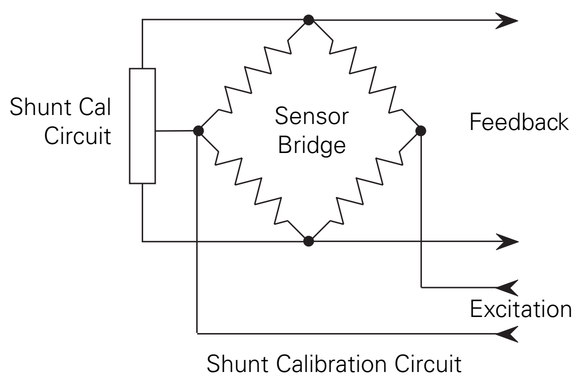
Shunt calibration verifies the calibration accuracy of a sensor/conditioner pair.

How it works

When you perform a shunt calibration, a precision resistor is placed across the transducer bridge producing a known offset. This offset is used to determine a "shunt cal voltage."

By performing a shunt calibration immediately after calibrating your sensor/conditioner pair, you can make the current shunt cal voltage your **Shunt Reference Value**.

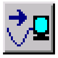
Whenever you start a new test or exchange a DC conditioner module, you can perform another shunt calibration and compare the **Current Shunt Value** to the saved **Shunt Reference Value**. Recalibrate the sensor/conditioner pair if the two values differ by more than 20 mV.



How to Perform a Shunt Calibration

1. In the **Station Manager** window's **Display** menu, select **Station Setup**.
2. *To apply a shunt calibration to a control mode:*

   A. In the **Station Setup** window's navigation pane **Channels**, locate and select the control mode needing a shunt calibration.

   B. In the **Station Setup** window, click .

   To apply a shunt calibration to an auxiliary input:

   In the navigation pane's **Auxiliary Inputs**, click the input signal needing shunt calibration.
3. In the **Inputs** panel, click the **Shunt** tab.
4. In the **Shunt** tab, perform the calibration.

   A. As required, select the **Current Range** needing calibration.

   B. In **Select Shunt Type**, select either **(+) Shunt** or **(-) Shunt**. (*FlexTest IIm systems only*).

   C. Click  to apply the shunt.
5. Compare the **Current Shunt Value** to the **Shunt Reference Value**.

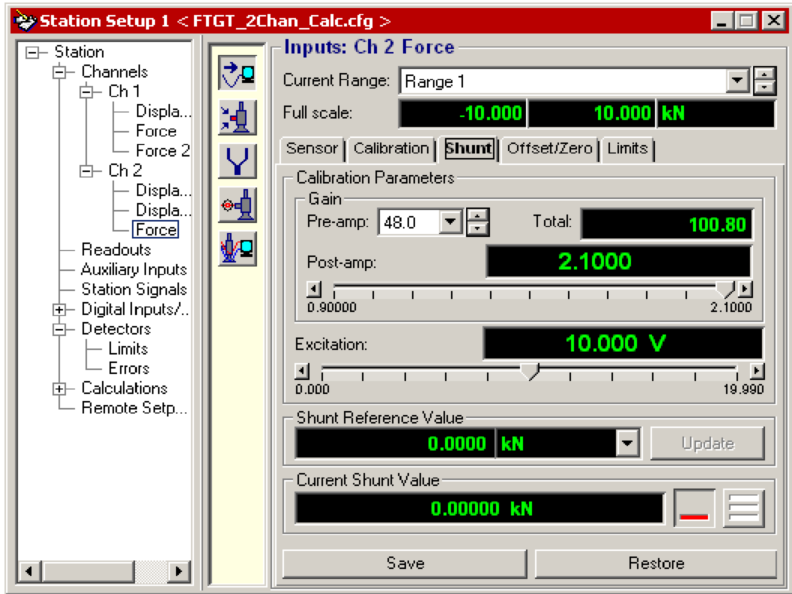
   A. In the **Station Manager** window's toolbar, select an access level of **Calibration**.

   B. For the **Shunt Reference Value** units, select **mv**.

   C. Recalibrate the sensor/conditioner pair if the values differ by more than 20 mV.

   D. To make the **Current Shunt Value** the new **Shunt Reference Value**, click **Update**.
6. Click  to remove the shunt.

Note *Leaving the **Shunt** tab or choosing another item in the navigation panel will automatically remove the shunt.*


Station Setup 1 < FTGT_2Chan_Calc.cfg >
Station
Channels
Ch 1
Displa...
Force
Force 2
Ch 2
Displa...
Displa...
Force
Readouts
Auxiliary Inputs
Station Signals
Digital Inputs/..
Detectors
Limits
Errors
Calculations
Remote Setp...
Inputs: Ch 2 Force
Current Range:
Range 1
Full scale:
-10.000
10.000
kN
Sensor
Calibration
Shunt
Offset/Zero
Limits
Calibration Parameters
Gain
Pre-amp:
48.0
Total:
100.80
Post-amp:
2.1000
0.90000
2.1000
Excitation:
10.000 V
0.000
19.990
Shunt Reference Value
0.0000
kN
Update
Current Shunt Value
0.00000 kN
Save
Restore

About Program Outputs

Program output channels send analog program commands to external controllers such as the Series 407 Controller and temperature controllers.

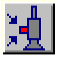
External programmers can:

- Use the Station Manager application's advanced programming resources.
- Accommodate sensors that require special conditioning.

The Station Builder application must first create a **Program Only**, **Program with Feedback**, or **Command Plus Error** program output channel using an analog output before the Station Manager application can output a program to an external programmer.

For more about using the Station Builder application to create program output channels, see "Creating Program Channels" on page 40.

How to Adjust Program Output Signals

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, locate and select in **Channels** the drive needing adjustment.
4. In the **Station Setup** window, click .
5. In the **Station Setup** window navigation pane, select the channel you want to adjust.

WARNING

Changes in drive values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

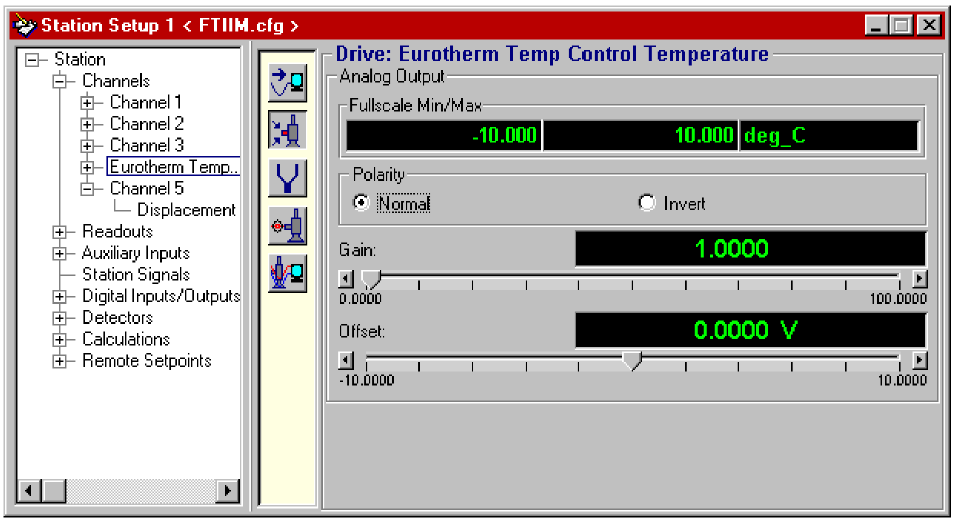
6. In the **Drive** panel:

For *Program and Control* channels, set the **Gain**, **Offset**, and **Polarity**.

For *Program w/Feedback* channels, set the **Polarity**.

For *Program Only* channels, set the **Polarity** and program output **Fullscale Min/Max** values.

Fullscale Min/Max units and values may vary from what is shown here, depending on the device being driven.

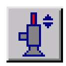


How to Program with the Function Generator

The **Station Manager** window's **Function Generator** can provide simple programming for use when tuning the system and warming up hydraulics.

Be sure to configure the compensator before starting your program. See "Working with Compensators" on page 194.

The following steps give typical settings for setting up the **Function Generator** to warm up a single-channel system that does not have an installed specimen.

1. In the **Station Manager** window's Application Controls panel, click .

WARNING

Changes in Function Generator values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

2. In the **Function Generator** panel:

   A. Select the **Channel** to be programmed.

   B. Select a **Control Mode** of displacement.

   C. Select a **Command Type** of **Cyclic**.

   D. Set a **Target Setpoint** of midstroke.

   Typically, the actuator should cycle around midpoint.

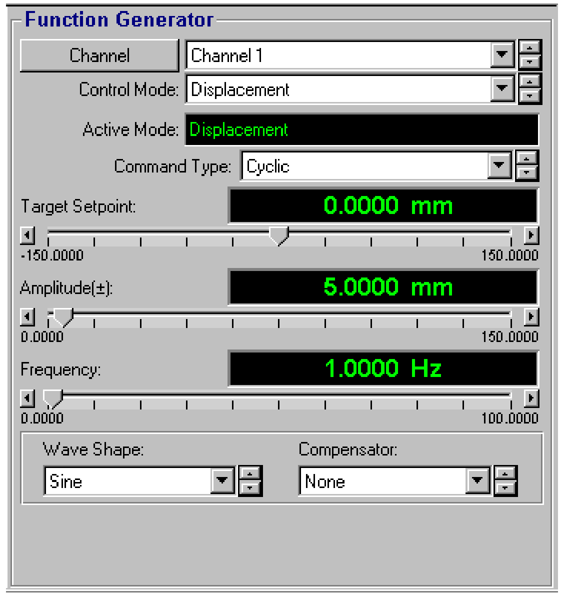
   E. Set an **Amplitude (±)** that will move the actuator through about 70% of its full displacement.

   F. Set a **Frequency** of 0.25–0.5 Hz.

Note *Displayed ranges for Target Setpoint, Amplitude, and Frequency are saved and are restored when returning to a previously programmed channel.*

G. Select a **Wave Shape** of **Sine**.

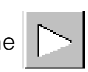
H. As needed, select a **Compensator**.



WARNING

Pressing the Station Controls panel's Run button will put actuators in motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before pressing the  button.

3. In the **Station Manager** window's **Station Controls** panel:

A. Click **Reset** to clear interlocks.

B. Apply station power.

C. Click  to start the program.

How to Adjust Setpoint and Span During a Test

Reducing the **Station Controls** panel's **Master Span** setting further reduces an individual channel's **Span** setting. For example: a **Master Span** of **50%** halves an individual channel's **Span** of **50%**, giving the channel an effective 25% span.

The **Setpoint** controls can adjust the setpoint of both single channels and multiple channels. Multiple channels are organized into a **Master Command Group**, using the **Channel Option** window's **Master Command** tab, described on page 421.

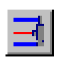
When a **Master Command Group** becomes available, the **Setpoint** and **Span** window displays a **Channel** button. Click this button to choose between single channels and a **Master Command Group**.

⚠ WARNING

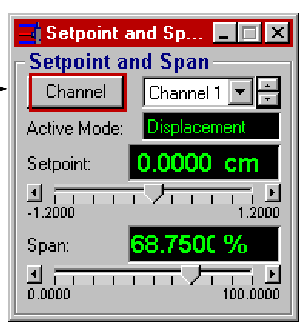
Changes in Setpoint and Span values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

1. In the **Station Manager** window **Station Controls** panel toolbar, click .
2. In the **Setpoint and Span** window:
   A. If the Channel button is available, click it to choose an individual channel or a **Master Command Group**.
   B. Set the **Setpoint**.
   C. Set the **Span**.

Click to select a single channel or a **Master Command Group**



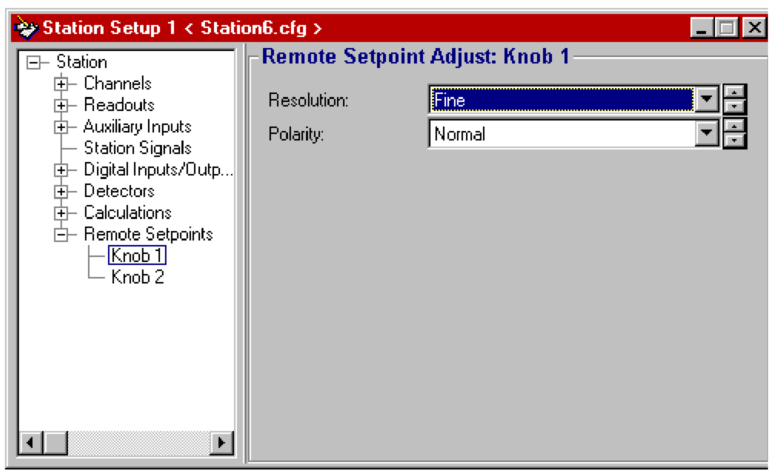
About the Optional Remote Setpoint Adjust

The optional **Remote Setpoint Adjust** (RSA) control box allows remote adjustment of actuator setpoints, away from the computer running the Station Manager application.

The Station Builder application must first allocate resources for the RSA before the Station Manager can configure its control knobs. For more about allocating resources, see “Setting Up Remote Setpoint Adjust” on page 75.

How to Configure Remote Setpoint Adjust Controls

1. In the **Station Manager** window’s toolbar, select an access level of **Calibration**.
2. In the **Station Manager** window’s **Display** menu, select **Station Setup**.
3. In the **Station Setup** window’s navigation pane’s **Remote Setpoints**, locate the knob to be configured.



4. In the **Remote Setpoint** panel, configure the knob:

   A. For **Resolution**, select **Fine**, **Medium**, or **Coarse**.

   Knob movements with a **Fine** setting produce a small actuator movement; equal knob movements with a **Coarse** setting produce a large actuator movement.

   B. Select a **Polarity** of **Normal** or **Invert**.

   Typically, turning the knob clockwise with a **Normal** setting increases the setpoint, extending the actuator.

About Channel Groups

Master Command and **Master Span** channel groups allow individual actuators in a multichannel station to be controlled as a unit.

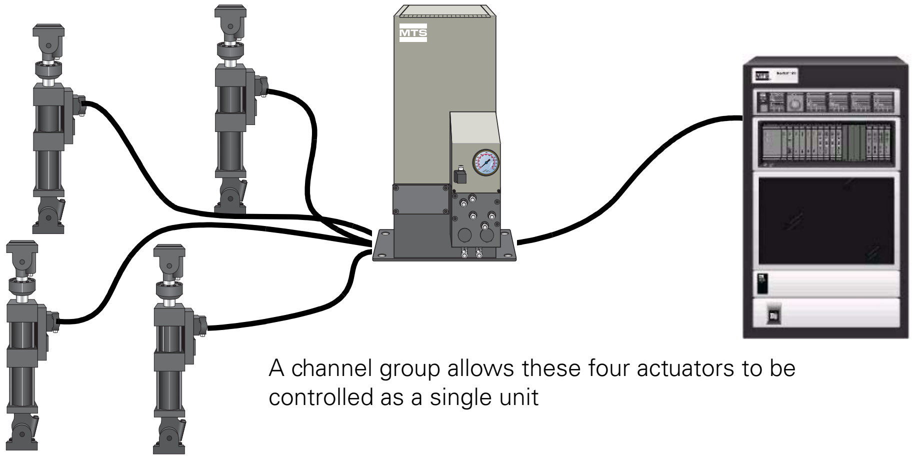
A **Master Command** channel group receives a common command signal. The **Channel Options** window's **Master Command** tab defines **Master Command** groups.

Commands are applied to a **Master Command** group through:

- The **Station Manager** window's **Function Generator** panel.
- The **Manual Command** window.
- The **Setpoint and Span** window.

A **Master Span** channel group has a common span. The **Channel Options** window's **Master Span** tab defines **Master Span** groups.

The span for a **Master Span** group is adjusted through the **Station Manager** window **Station Controls** panel's **Master Span**.



A channel group allows these four actuators to be controlled as a single unit

Additional information

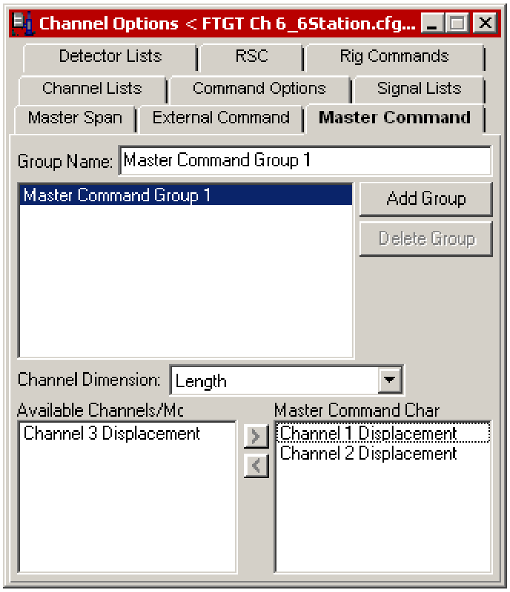
'See "Station Manager Controls and Displays" on page 273 for a complete description of this application's controls and indicators.

For specifics about the controls referenced in this section, see:

- "Master Span Tab" on page 418.
- "Master Command Tab" on page 421.

How to Create a Master Command Group

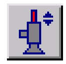
1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Tools** menu, select **Channel Options**.
3. In the **Channel Options** window, click the **Master Command** tab.



4. In the **Master Command** tab, define a **Master Command** group:
   A. Click **Add Group** and enter the new **Group Name**.
   B. Select the **Channel Dimension** to be used by the group. This selection determines the **Available Channels/Modes**.
   C. Use the **< >** buttons to move highlighted selections between **Available Channels/Modes** and **Master Command Channels**.

How to Select a Master Command Group

This section describes selecting a **Master Command** group for the **Function Generator** panel.

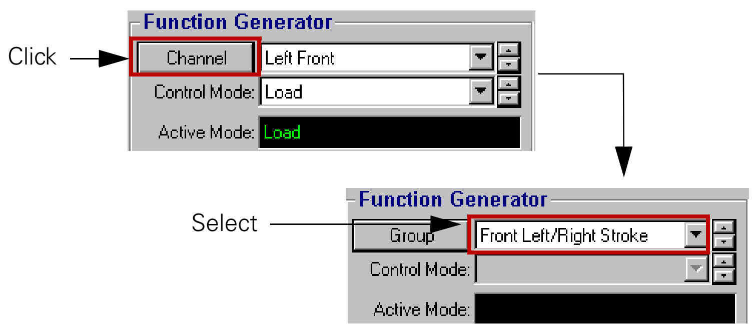
1. In the **Station Manager** window's Application Controls panel, click .
2. In the **Function Generator** panel, select a **Master Command** group.

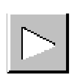
    A. Click **Channel** to change this button to **Group**.

    The **Group** button will be unavailable if no **Master Command** group has been defined.

    B. As needed, select the right **Master Command** group.

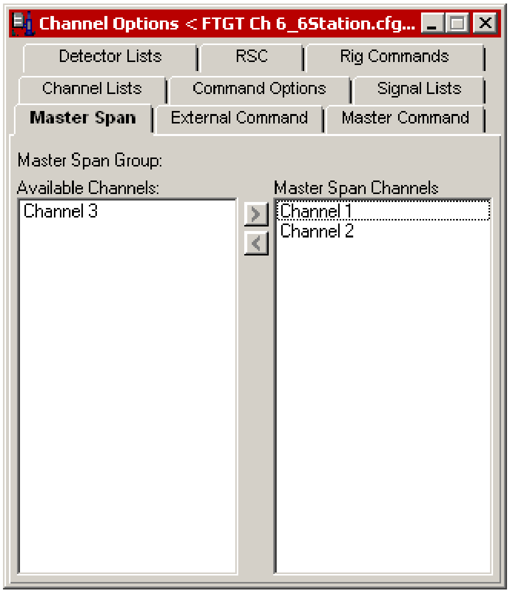
    The **Setpoint and Span** and **Manual Command** windows use a similar method for selecting a **Master Command** group.



The **Control Mode** switches to the mode(s) associated with the **Master Command** group when the **Station Controls** panel  is clicked or when the **Manual Command** window's **Enable Manual Command** is selected.

Defining a Master Span Group

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. In the **Station Manager** window's **Tools** menu, select **Channel Options**.
3. In the **Channel Options** window, click the **Master Span** tab.



4. In the **Master Span** tab, define a **Master Span** group:

   A. Click in **Available Channels** to select channels.

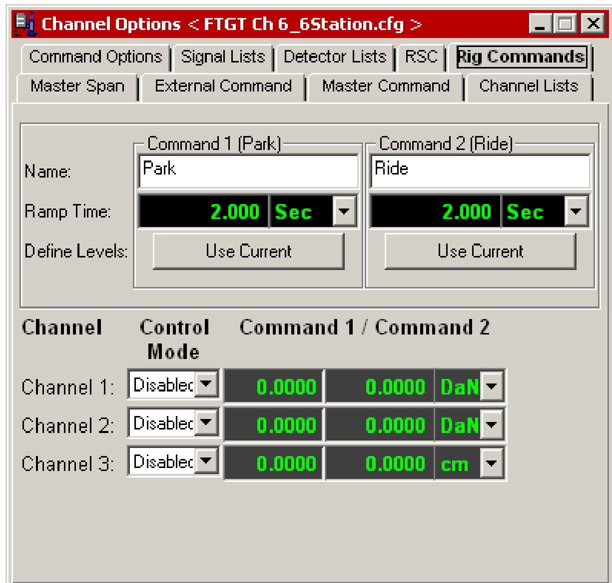
   B. Use the **< >** buttons to move highlighted selections between **Available Channels** and **Master Span Channels**.

   By default, all channels start off as **Master Span Channels**.

   The **Station Controls** panel's **Master Span** becomes unavailable if no **Master Span Channels** are selected.

Using Rig Command (Park/Ride)

The Rig Commands tab on the Channel Options window defines Park and Ride levels for vehicle testing. Park defines a level the enabled channels can move to before hydraulic shut down. Ride defines a level the enabled channels can move to before running any test.



Park and ride positioning, a system option, uses the Manual Command window to move the actuators to their specified Park or Ride levels. See “Using Manual Command Park/Ride” on page 512.

Setting Park/Ride values

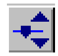
There are two different ways to set park and ride values on the Rig Commands tab:

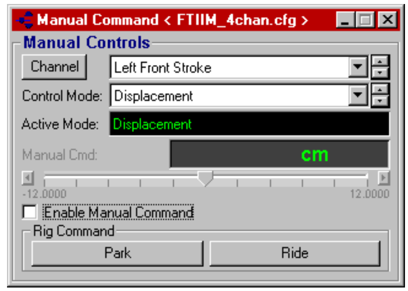
- Enter park and ride values in the **Command 1**/**Command 2** columns.
- Click the **Use Current** button in the **Command 1 (Park)** or **Command 2 (Ride)** box to use the current levels from all non-disabled control modes for the corresponding **Command 1** and **Command 2** values.

See “Rig Commands Tab” on page 438 for more information.

Setting Park/Ride channel groups

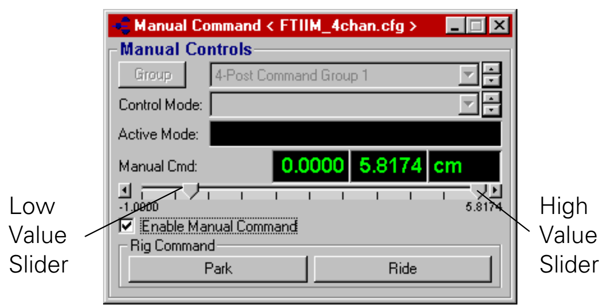
If required, park or ride positioning values can be set concurrently for a desired group of channels.

1. In the **Station Manager** window's **Station Controls** panel toolbar, click  to open the Manual Command window.



2. Click the **Channel** button to toggle to **Group.**

3. Select the desired channel group for park or ride positioning. If an appropriate channel group has not been created, see "How to Create a Master Command Group" on page 261.



4. Click the **Enable Manual Command** box to activate manual command.

5. Move the low value slider and/or the high value slider so that they meet to form a "group value" slider.

6. Set the group value slider to the required Park or Ride position for all actuators in the group.

7. Click the appropriate **Use Current** button on the **Rig Commands** tab on the Channel Options window to use these new Park or Ride position values for your actuator channel group.

See "About Channel Groups" on page 259 for more information on grouping system channel.

Working with Message Logs

About Message Logs

Message Logs record station and test events as they occur, including:

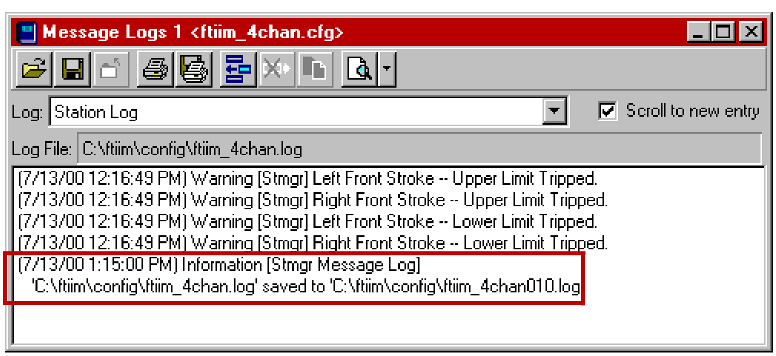
- File events
- Resource mismatches
- Hydraulic and station state changes
- Detector activity
- Over-temperature conditions
- Full-scale changes

When you open a new station configuration file, the Station Manager application automatically creates a **Message Log** file to record events that occur with the specific configuration.

The Station Manager application saves the **Message Log** file in your config folder. The Station Manager application names the **Message Log** file, using the station configuration name with a .log extension.

When the station configuration closes, the Station Manager application saves the **Message Log** file. When the configuration reopens and station activity resumes, new messages get appended to the old.

Auto-archive message



Auto-archiving

When the **Message Logs** window accumulates 1000 messages, it automatically saves these messages to an archive file and then clears them from its display.

The first archived file is named *configuration file name000.log*, the second is named *configuration file name001.log*, and so on. This continues until the last file is named *configuration file name499.log*. The system then starts again with the oldest file, which is typically *configuration file name000.log*

⚠ CAUTION

Too many messages combined with the auto-archive feature can use up all your disk space.

Running out of disk space can stop your test and result in lost data.

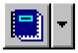
Use the **Station Options** window's **Station Log** tab to filter messages sent to the **Message Logs** window. For more information, see "Station Options Window" on page 410.

Additional information

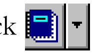
For specifics about the controls referenced in this section, see:

- "Message Logs Window" on page 403.
- "Station Log Tab" on page 410.

How to Open a Message Log

In the **Station Manager** window's toolbar, click  to display the **Message Logs** window. Up to three **Message Logs** windows can be opened.

How to Print a Message Log

1. In the **Station Manager** window's toolbar, click .

2. In the **Message Logs** window's toolbar, click .

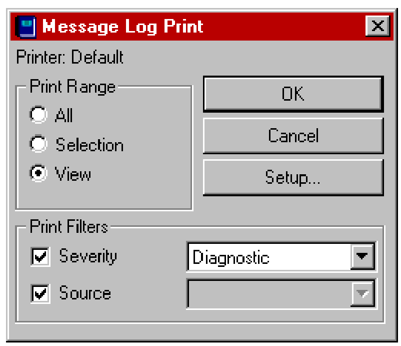
3. In the **Message Log Print** window:

   A. As needed, click **Print Range** selections to define what is printed.

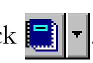
   B. As needed, click **Print Filters** to apply **Severity** and **Source** filters to what prints.

   C. Click **OK** to print the log.

:



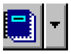
How to Print the Message Log to File

1. In the **Station Manager** window's toolbar, click .

2. In the **Message Logs** window's toolbar, click .

3. In the **Message Log Print to File** window, specify the **File Name** and its location. By default, the file is saved as a text (.txt) file.

How to Add a User Entry to the Message Log

1. In the **Station Manager** window's toolbar, click .

2. In the **Message Logs** window's toolbar, click .

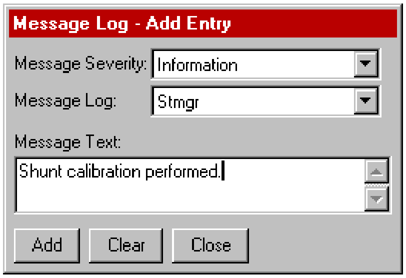
3. In the **Message Log-Add Entry** window:

   A. Select a **Message Severity** level.

   B. Select a **Message Log** source.

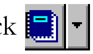
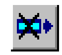
   C. Enter a **Message Text**.

   D. Click **Add** to enter the message.



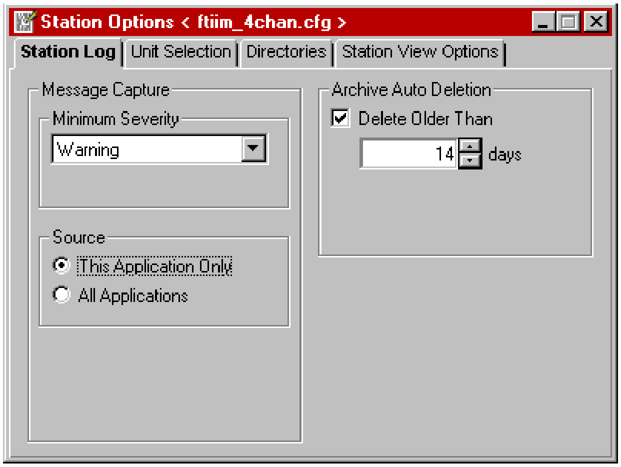
How to Delete a User Entry from the Message Log

Only user entries can be deleted.

1. In the **Station Manager** window's toolbar, click  .
2. In the **Message Logs** window, highlight the user entry to be deleted.
3. In the **Station Manager** window's toolbar, click .
4. In the **Delete Confirmation** window, click **OK** to delete the selected entry.

How to Define Which Messages Get Logged

1. In the **Station Manager** window's **Tools** menu, select S**tation Options**.
2. In the **Station Options** window, click the **Station Log** tab.



3. In the **Station Log** tab's **Message Capture**:

   A. Select a **Minimum Severity** to set the least severe message level to be logged.

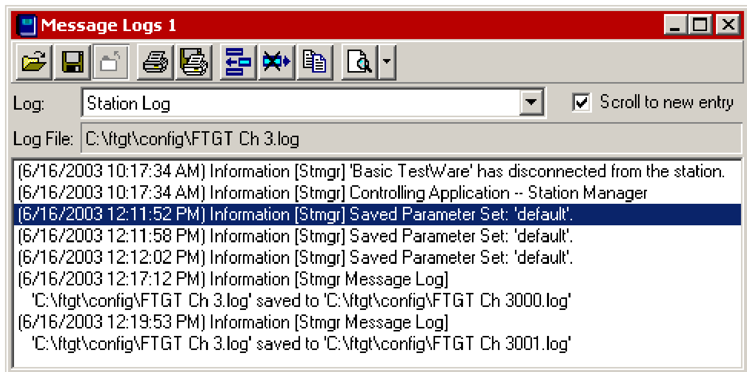
   B. Select a **Source** to log messages from just **This Application Only** or **All Applications**.

4. As needed, click **Delete Older Than** to enable automatic deletion and then enter the number of **Days**.

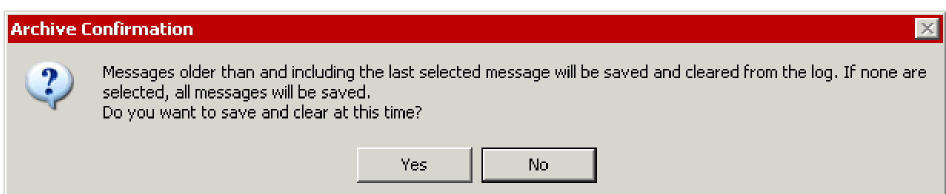
How to Manually Archive a Message Log

1. In the **Station Manager** window's toolbar, click .

2. Select a message in the **Message Logs** window, The highlighted message and all earlier messages will be saved and cleared from the log.



3. In the **Message Logs** window's toolbar, click to archive the file.



4. In the **Archive Confirmation** window, click **Yes**.

   The **Message Logs** window displays a message showing when the file was archived, and its name and location.

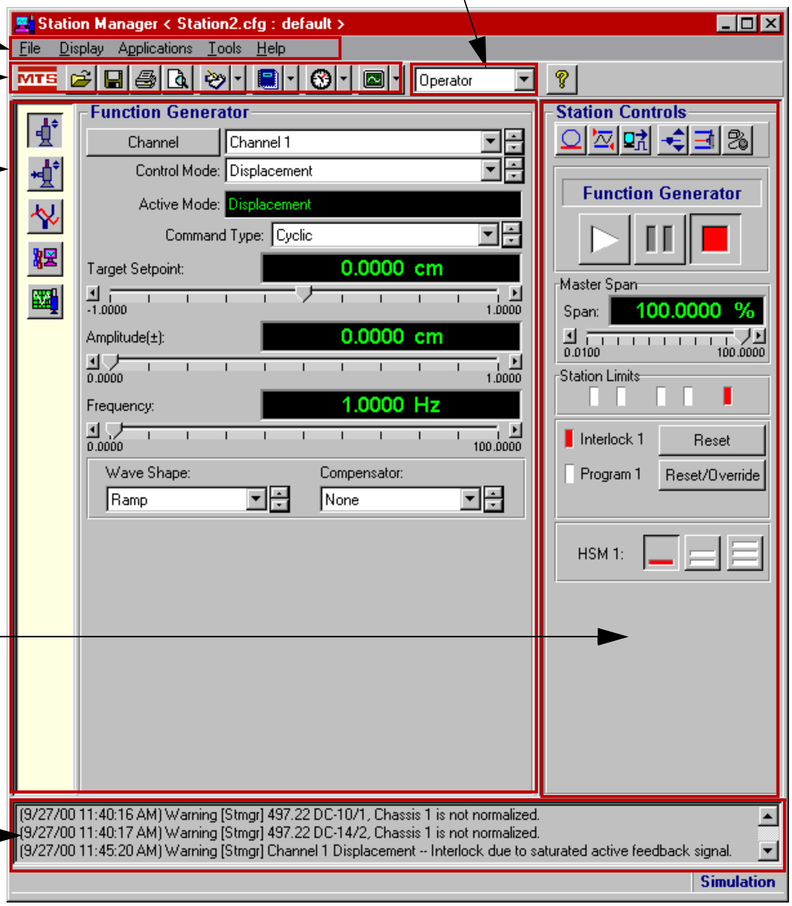
Station Manager Controls and Displays

Access Level—see page 277

Menu Bar—see page 274

Toolbar—see page 275

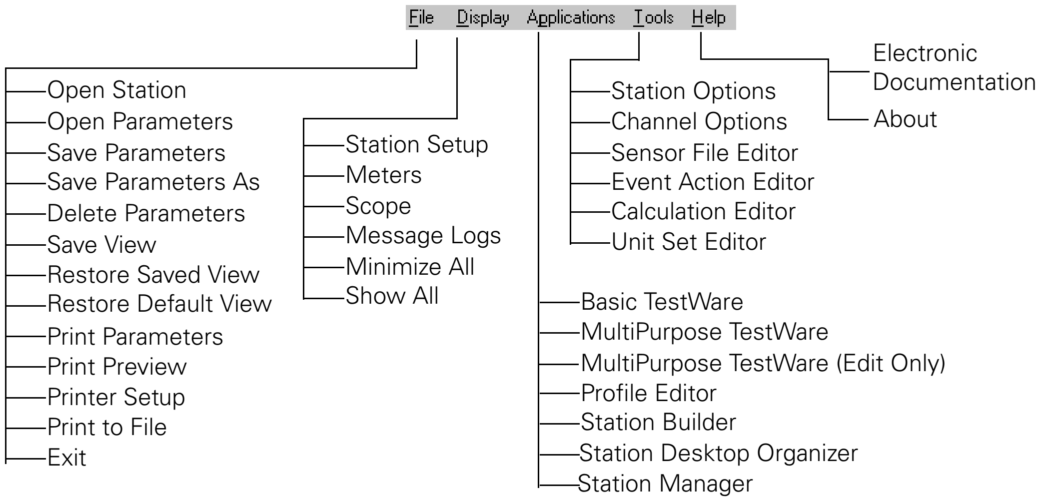
Application Controls Panel—see page 483



Station Controls Panel—see page 498

Message Pane—see page 278

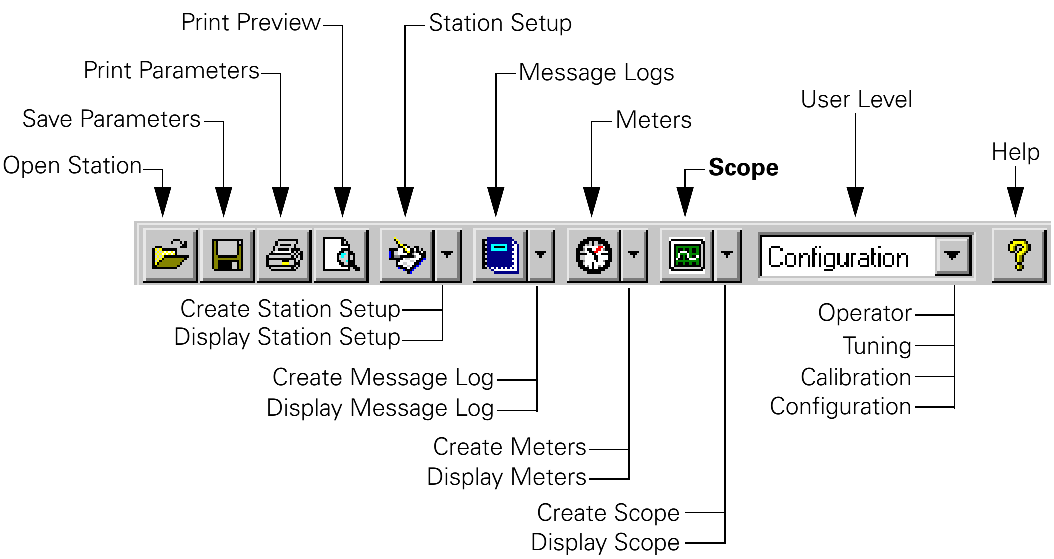
Menu Bar



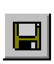
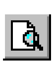
The Menu Bar has commands for managing the Station Manager application. The toolbar has some of the more frequently used commands.

- For more about the **File** menu, see "File Menu" on page 279.
- For more about the **Display** menu, see "Display Menu" on page 289.
- For more about the **Applications** menu, see "Applications Menu" on page 408.
- For more about the **Tools** menu, see "Tools Menu" on page 409.
- For more about the **Help** menu, see "Help Menu" on page 482.

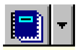
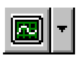
Station Manager Window Toolbar



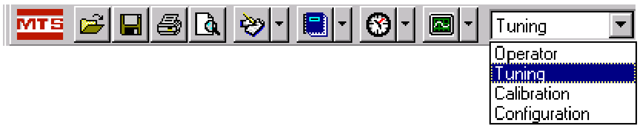
Station Manager Window Toolbar (part 1 of 2)

ITEM	DESCRIPTION
	Displays the **Open Station** window. See "Open Station Window" on page 281 for more information.
	Saves station parameters to the currently selected parameter file.
	Prints the current parameter set.
	Displays the **Print Preview** window. See "Print Preview Window" on page 286 for more information.
	**Create Station Setup**—Displays the **Station Setup** window. **Display Station Setup**—Restores a minimized **Station Setup** window. See "Station Setup Window" on page 290 for more information.

Station Manager Window Toolbar (part 2 of 2)

Item	Description
	**Create Message Log**—Displays a **Message Logs** window. **Display Message Log**—Restores minimized **Message Logs** windows. See "Message Logs Window" on page 403 for more information.
	**Create Meters**—Displays a **Meters** window. Click a second time to display a second **Meters** window. **Display Meters**—Restores minimized **Meters** windows. See "Meters Window" on page 392 for more information.
	**Create Scope**—Displays a **Scope** window. Click a second time to display a second **Scope** window. **Display Scope**—Restores minimized **Scope** windows. See "Scope Window" on page 395 for more information.
	Sets **User Access** to restricted **Tuning**, **Calibration**, and **Configuration** levels. See "Access Level" on page 277 for more information.
	Displays on-line help. See "Help Menu" on page 482 for more information.

Access Level



This control limits a user's ability to access and change tuning, calibration, and configuration settings. Access to **Tuning**, **Calibration**, and **Configuration** levels require passwords that were created during software installation.

See "Setting Access Levels" on page 129 for additional information.

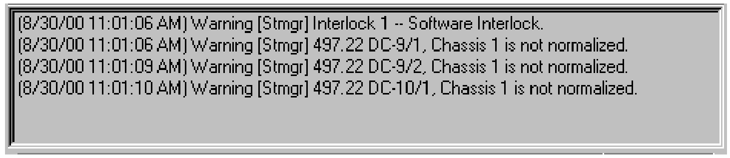
Note *__Calibration__ and __Configuration__ are at the same access level. Going from __Configuration__ to __Calibration__ (or vice versa) requires a password.*

Note *After making higher level changes, it is a good idea to always return to the __Operator__ level.*

Access Level List

ITEM	DESCRIPTION
access level	Sets user access to tuning, calibration, and configuration controls.
Operator	The default user level. This level does not need a password and has the fewest privileges.
Tuning	Enter this level to make tuning adjustments.
Calibration	Enter this level to edit all Station Manager application windows except the **Event-Action Editor** and **Calculation Editor** windows. This level allows you to modify calibration parameters for both normal and reconfigurable signals.
Configuration	Enter this level to make changes in the **Event-Action Editor** and **Calculation Editor** windows. This level allows you to change the name, dimension, or calibration parameters for reconfigurable signals. Calibration parameters for normal signals can only be changed at the **Calibration** level. Some applications may have to be closed to enter this level.

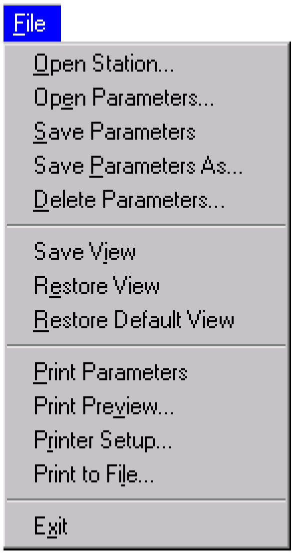
Station Manager Window Message Pane



This panel, at the bottom of the **Station Manager** window, displays **Warning**, **Error**, and **Fatal Error** messages from any application. Up to 50 messages can be displayed. New messages replace old messages.

The **Message Logs** window provides a complete listing of station events. See page 403 for more about this window.

File Menu



This menu's commands create, open, save, and print parameter sets.

File Menu (part 1 of 2)

ITEM	DESCRIPTION
Open Station	Displays the **Open Station** window. See "Open Station Window" on page 281 for more information.
Open Parameters	Displays the **Open Parameter Set** window. See "Open Parameter Set Window" on page 283 for more information.
Save Parameters	Saves station parameters to the currently selected parameter file.
Save Parameters As	Displays the **Save Parameters As** window. See "Save Parameters As Window" on page 284 for more information.
Delete Parameters	Displays the **Delete Parameters** window. See "Delete Parameter Set Window" on page 285 for more information.

File Menu (part 2 of 2)

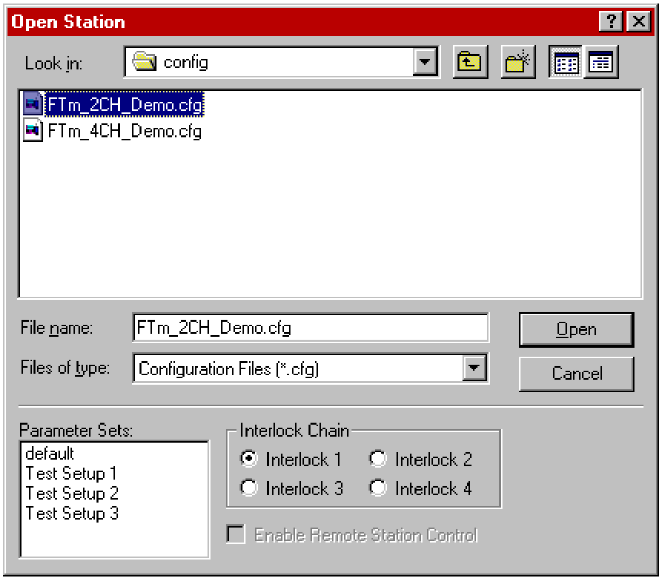
ITEM	DESCRIPTION
Save View	Saves the current positions of Station Manager application windows.
Restore View	Restores the **Save View** setting.
Restore Default View	Restores windows to the positions that they had when the station configuration was last loaded.
Print Parameters	Prints the current parameter set.
Print Preview	Displays the **Print Preview** window. See "Print Preview Window" on page 286 for more information.
Printer Setup	Displays a **Print Setup** window specific to your printer.
Print to File	Displays the **Print Parameters to File** window. See "Print Parameters to File Window" on page 288 for more information.
Exit	Quits the Station Manager application. ***Note*** *Before exiting Station Manager, station power must be off and any ongoing test must be stopped. You may also need to shut down some applications connected to the station before you can shut down the station.* ***Note*** *All 793.00 software applications connected to the station will shut down upon exiting Station Manager.*

Open Station Window

Path

File menu > **Open Station**

Station Manager window toolbar > 



This window opens station configuration files.

Note *Before opening Station Manager, station power must be off and any ongoing test must be stopped. You may also need to shut down some applications connected to the station before you can open the station.*

See "How to Open a Station Configuration File" on page 124 for more information.

Open Station Window (part 1 of 2)

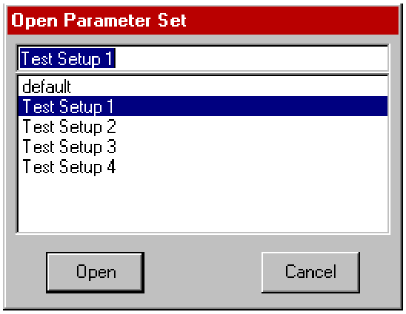
ITEM	DESCRIPTION
Look In	Selects drives and directories where configuration files are located.
Configuration Files	Displays files in the selected directory.
File Name	Displays the name of the selected configuration file.

Open Station Window (part 2 of 2)

ITEM	DESCRIPTION
Files of Type	Selects the type of file displayed. The extension for application configuration files is .cfg.
Parameter Sets	Displays parameter sets that can be used with the selected configuration. ***Note*** *Station Manager saves the last used interlock chain to the station configuration, and will attempt to restore it if currently available.*
Interlock Chain	Specifies the interlock chain for the selected station configuration. ***Note*** *Station Manager saves the last used interlock chain to the station configuration, and will attempt to restore it if currently available.*
Enable Remote Station Control	Enables the optional remote station control (RSC) on the selected interlock chain. For FlexTest™ series systems with multiple RSCs, the selected **Interlock Chain** determines which RSC gets enabled.

Open Parameter Set Window

Path **File** menu > **Open Parameters**

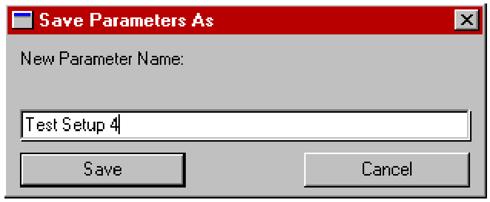


This window changes station configuration parameter sets.

Note *Before opening any parameter sets, station power must be off and any ongoing test must be stopped.*

Save Parameters As Window

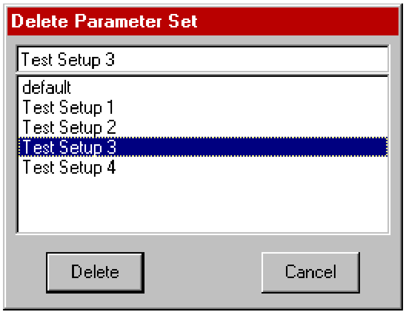
Path **File** menu > **Save Parameters As**



This window saves a parameter set under a new name.

Delete Parameter Set Window

Path **File** menu > **Delete Parameters**



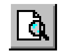
This window deletes a parameter set.

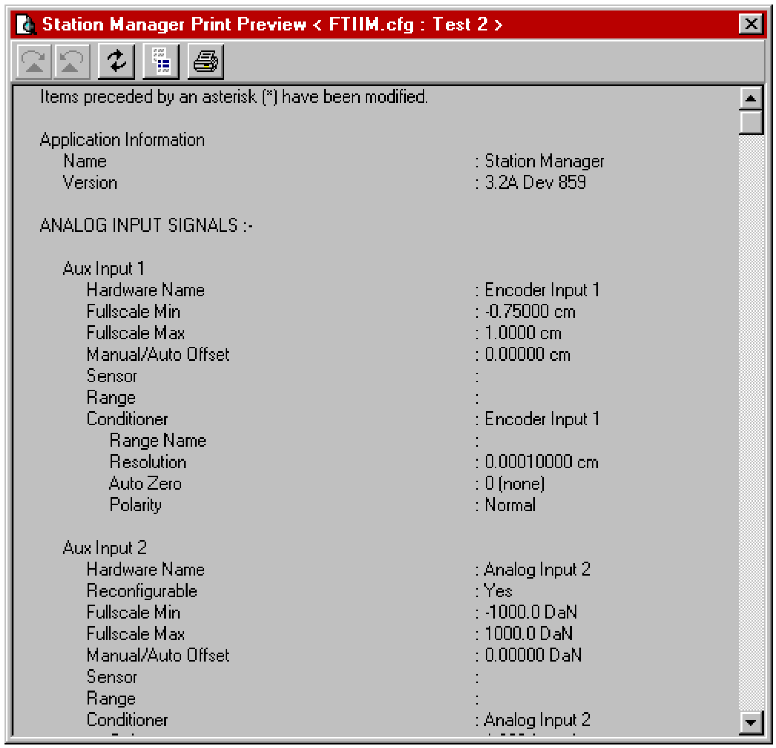
The currently loaded parameter set cannot be deleted.

Print Preview Window

Path

File menu > **Print Preview**

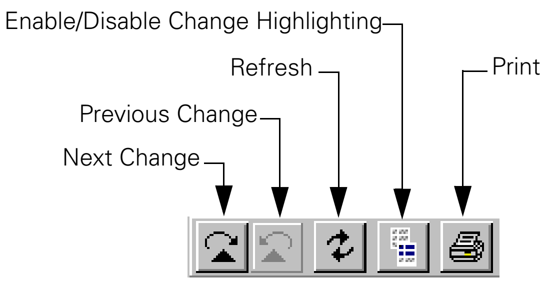
Station Manager window toolbar > 



This window displays a print preview of the parameter set. A toolbar facilitates access and display of parameter set changes.

Asterisks (*) identify items that have been changed since the file was opened. In addition, you can highlight these changes by selecting **Enable Change Highlighting** on the **Print Preview** toolbar.

Print Preview Toolbar

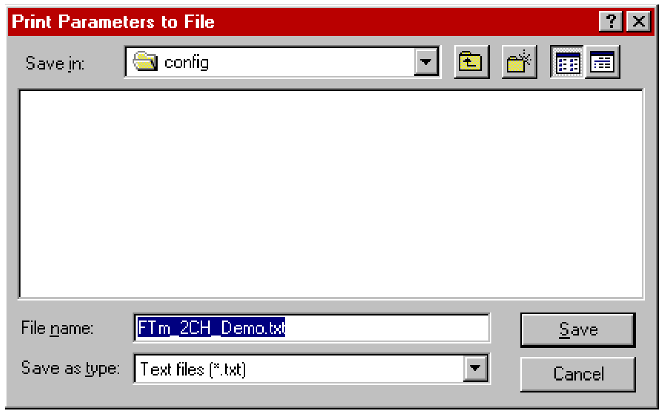


Print Preview Toolbar

ITEM	DESCRIPTION
Next Change	Goes to the next change on the Print Preview window.
Previous Change	Goes to the previous change on the Print Preview window.
Refresh	Allows you to see current parameter set changes without closing and reopening the Print Preview window. The current change(s) are highlighted.
Enable/Disable Change Highlighting	Allows you to enable or disable highlighting of parameter set changes.
Print	Prints the current parameter set.

Print Parameters to File Window

Path **File** menu > **Print to File**



This window creates a text file that contains information about the station configuration's current parameter set.

Print Parameters to File Window

ITEM	DESCRIPTION
Save In	Selects the drive and directory where the text file (extension .txt) is saved. Using the default config directory ensures that all your files end up in one place.
File Name	Specifies the text file's name.
Save as Type	Automatically appends a .txt extension to the **File Name**.

Display Menu

This menu's commands display station setup and monitoring windows.

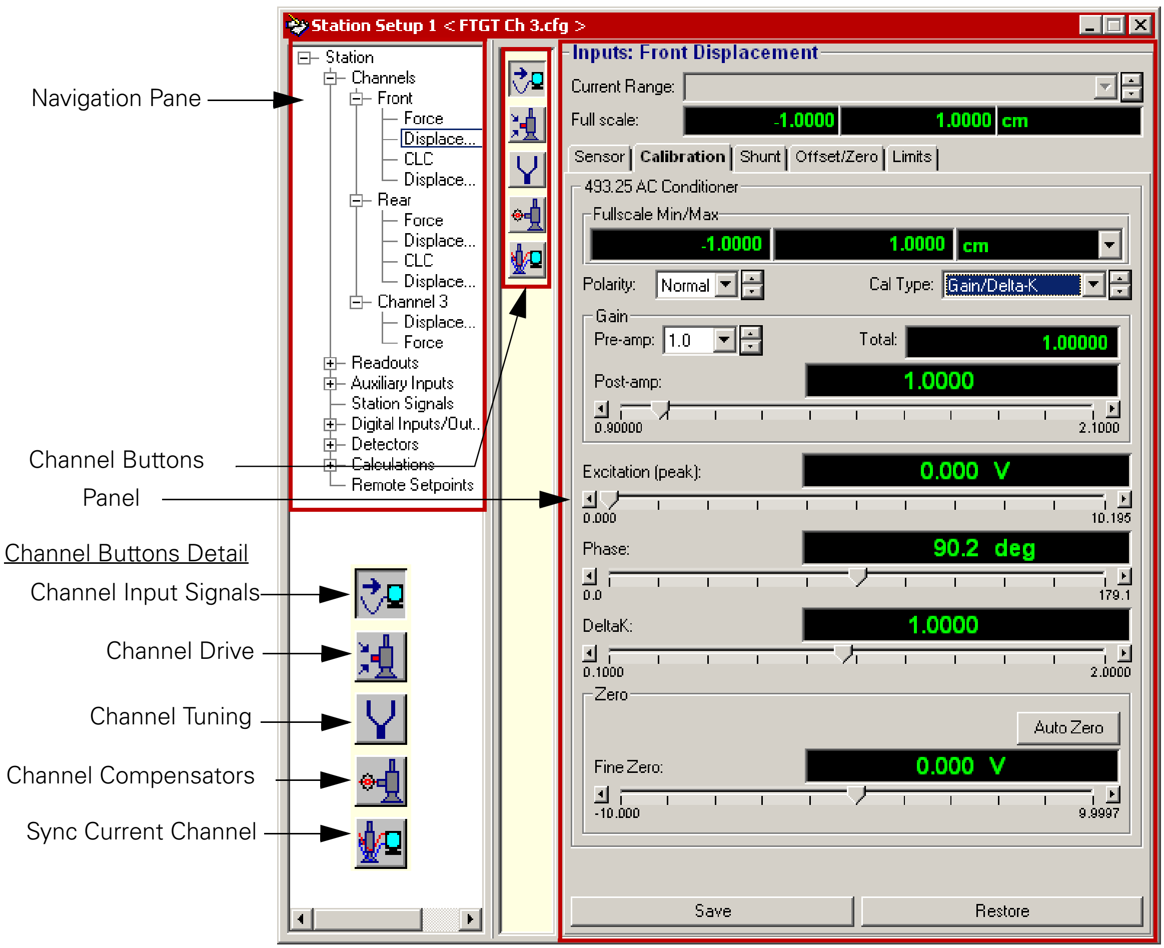
Display Menu

ITEM	DESCRIPTION
Station Setup	Displays the **Station Setup** window. See "Station Setup Window" on page 290 for more information.
Meters	Displays the **Meters** windows. See "Meters Window" on page 392 for more information.
Scope	Displays the **Scope** windows. See "Scope Window" on page 395 for more information.
Message Logs	Displays the **Message Logs** window. See "Message Logs Window" on page 403 for more information.
Minimize All	Minimizes, with the exception of the **Station Manager** window, all open Station Manager application windows.
Show All	Restores all minimized Station Manager application windows.

Station Setup Window

Path **Display** menu > **Station Setup**

Station Manager window toolbar >



This window defines the basic elements in the station configuration parameter set. It combines tuning, setup, monitoring, and status summary functions.

Additional information

For information about using the controls described in this section, see:

- "Calibrating Sensors and Configuring Feedback" on page 131.
- "Tuning Your System" on page 540.
- "Working with Readout Devices" on page 158.
- "Working with Compensators" on page 194.
- "Running Tests" on page 222.

The station configuration loaded in the Station Manager application determines the availability of some of the panels and buttons described in the following table.

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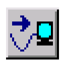
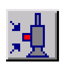
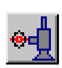
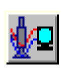
Station Setup Window (part 1 of 2)

ITEM	DESCRIPTION
navigation pane	Displays a tree view of the station configuration, organized by resource type, with control **Channels** at the top. Selections within the navigation pane determine the **Channel** buttons and right-hand pane displays. Selections within the navigation pane determine what appears in the **Station Setup** window's right-hand panels. For example, a selection within **Channels** displays **Channels** buttons and panels relevant for configuring control channels; a **Readouts** selection displays panels for defining readout signals.
Channels	Displays the **Channel Status** panel which has tabs summarizing control channel status and values. Selecting a specific control channel within **Channels** displays these Channel buttons:  Displays the **Inputs** panel tabs used to configure and calibrate the selected channel's sensor input signals. See "Station Setup Window/Inputs Panel Tabs" on page 310 for more information.  Displays the **Drive** panel used to adjust the selected channel's drive signal. See "Station Setup Window/Drive Panel—Two Stage Valves" on page 327 and "Station Setup Window/Drive Panel—Three Stage Valves" on page 329 for more information.  Displays the **Tuning** panel tabs used to tune the selected channel's PIDF control modes. See "Station Setup Window/Tuning Panel Tabs" on page 337 for more information.  Displays the **Compensators** panel tabs used to apply compensation to the selected channel's drive signal. See "Station Setup Window/Compensators Panel Tabs" on page 343 for more information.  Applies the current control channel and control mode (on Station Setup) to the function generator channel/mode and the scope. See "Station Setup Window/Sync Current Channel" on page 357.

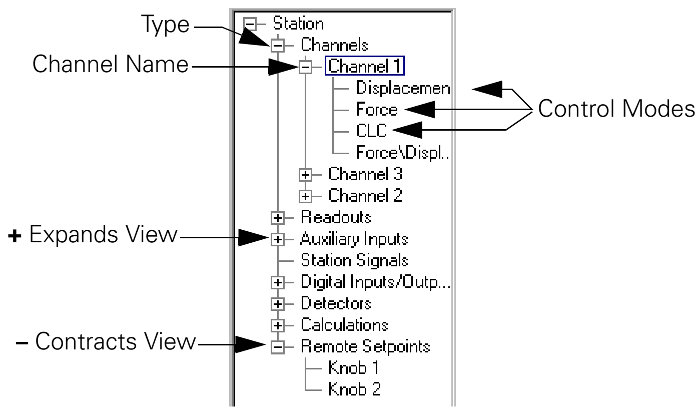
Station Setup Window (part 2 of 2)

ITEM	DESCRIPTION
Readouts	Displays the **Readouts** panels, which displays the values of all test station readout signals and configures readout signals. See "Station Setup Window/Readouts Panels" on page 358
Auxiliary Inputs	Displays **Auxiliary Inputs** panels, which configure auxiliary sensor input signals and display their values. See "Station Setup Window/Auxiliary Inputs Panels" on page 360
Station Signals	Displays the **Station Signals** panel, whose tabs display all station signal values and other signal information. See "Station Setup Window/Station Signals Panel Tabs" on page 363
Digital Inputs/Outputs	Displays **Digital Inputs/Outputs** panels, whose tabs display the status of digital inputs and outputs and configure the test station's response to digital inputs. See "Station Setup Window/Digital Input/Outputs Panel Tabs" on page 367
Detectors	Displays **Detectors** panels, which summarize detector status and configure error and limit detectors. See "Station Setup Window/Detectors Panel Tabs" on page 373
Calculations	Displays **Calculations** panels, which display calculated signals' output values, their formulas, and hardware specific controls. See "Station Setup Window/Calculations Panels" on page 384
Remote Setpoint Adjust	Displays **Remote Setpoint** panels, which summarize Remote Setpoint Adjust (RSA) knobs' channel assignments and sensitivity. See "Station Setup Window/Remote Setpoints Panels" on page 390

Navigation pane

The navigation pane shows a tree view of the station configuration, starting with control **Channels**.

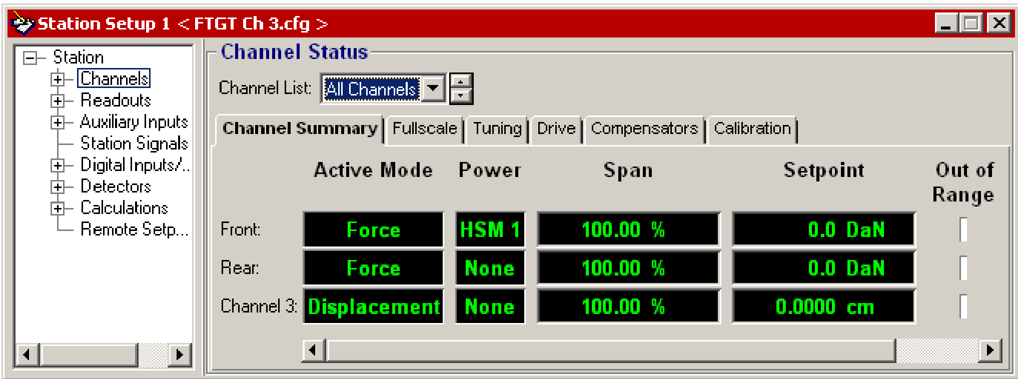
Use **+** and **-** to expand and contract the tree view.



Station Setup Window/Channel Status Panel Tabs

Channel Summary Tab

Path **Station Setup** window > navigation pane > **Channels** > **Channels Summary** tab



This tab displays the status for each channel's active control mode.

Use **Channel List** to select the channel(s) you want to display. You can choose to display the status of all system channels (**All Channels**) or a selected system channel.

You can select a group of channels for display in **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Channel Summary Tab (part 1 of 2)

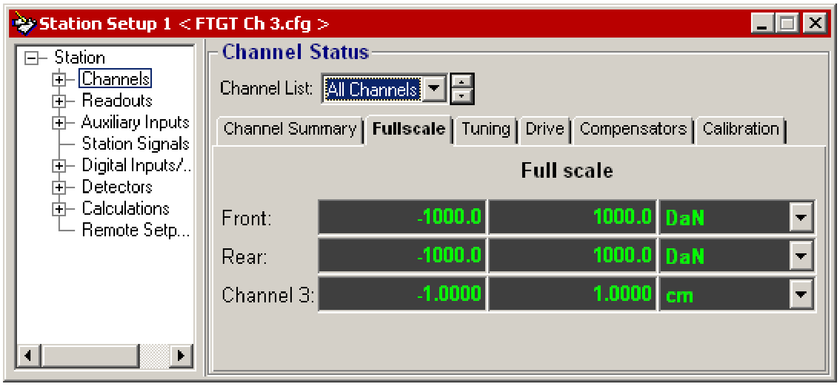
ITEM	DESCRIPTION
Active Mode	Displays each channel's active control mode.
Power	Displays each channel's power source.
Span	Displays the current Span value for each channel's active control mode. These Span values are not editable.

Channel Summary Tab (part 2 of 2)

Item	Description
Setpoint	Displays the current Setpoint value for each channel's active control mode. These Setpoint values are not editable.
Out of Range	Displays the status of each channel's feedback signal: **White**—Within range. **Yellow**—Out of Range. **Red**—Saturated.

Fullscale Tab

Path **Station Setup** window > navigation pane > **Channels** > **Fullscale** tab



This tab displays editable minimum and maximum sensor ranges for each channel's active control mode.

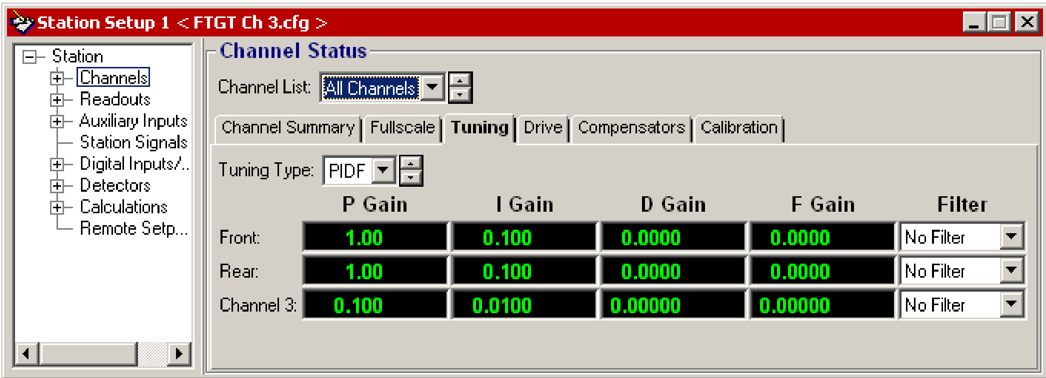
You can select a group of channels for display in **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Fullscale Tab

ITEM	DESCRIPTION
Full scale	Allows you to edit the displayed full-scale minimum and maximum range for the sensor used in each channel's active control mode.

Tuning Tab

Path **Station Setup** window > navigation pane > **Channels** > **Tuning** tab



This tab allows you to set the displayed PIDF values and filter settings for each channel's active control mode. These parameters can also be set on the Station Setup Tuning panel's **Adjustments** and **Filter** tabs.

You can select a group of channels for display in **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Tuning Tab

ITEM	DESCRIPTION
P Gain	Sets the proportional gain (**P Gain**) value for each channel's active control mode.
I Gain	Sets the integral gain (**I Gain**) value for each channel's active control mode.
D Gain	Sets the derivative gain (**D Gain**) value for each channel's active control mode.
F Gain	Sets the feed forward gain (**F Gain**) value for each channel's active control mode.
Filter	Sets the **Filter** setting for each channel's active control mode.

Drive Tab

Path

Station Setup window > navigation pane > **Channels** > **Drive** tab

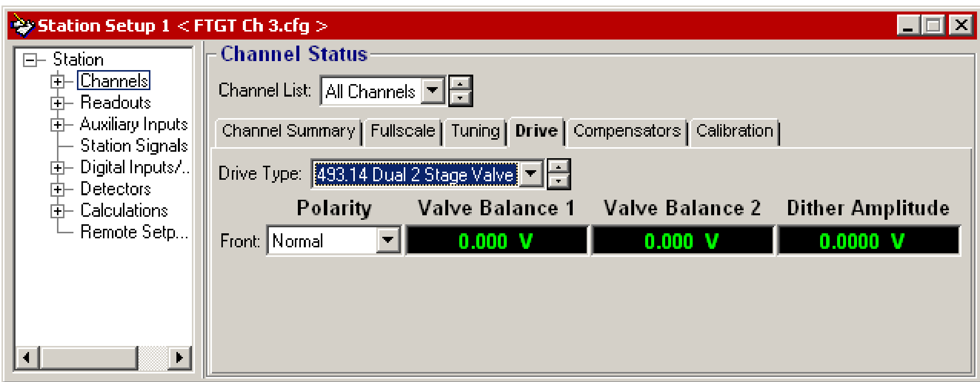
This tab displays editable servovalve drive signal parameters for each control channel based on the type of valve driver used by a channel.

You can select the channels displayed in the **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Dual Valve Driver

For each channel that uses a dual valve driver, the following editable parameters are displayed. These parameters can also be set on the Station Setup **Drive** panel.

:

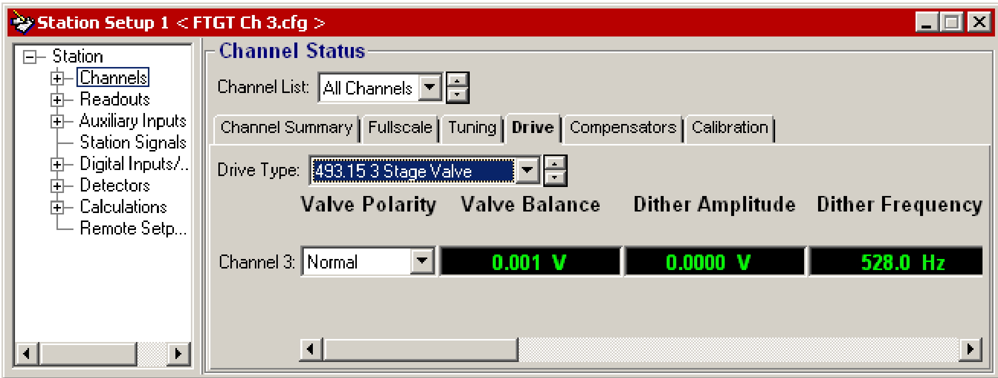


Drive Tab (Dual Valve)

ITEM	DESCRIPTION
Polarity	Sets the polarity for each dual valve control channel drive signal.
Valve Balance 1/Valve Balance 2	Sets the valve balance setting for each dual valve control channel.
Dither Amplitude	Sets the amplitude of the dither signal for each dual valve control channel.

3-Stage Valve Driver

For each channel that uses a 3-stage valve driver, the following editable parameters are displayed. These parameters can also be set on the Drive panel's **Valve**, **Inner Loop**, and **Conditioner** tabs (for 3-stage valves).



Driver Tab (3-stage valve) (part 1 of 2)

ITEM	DESCRIPTION
Valve Polarity	Sets the polarity for each 3-stage valve control channel drive signal.
Valve Balance	Sets the valve balance setting for each 3-stage valve control channel.
Dither Amplitude	Sets the amplitude of the dither signal for each 3-stage valve control channel.
Inner Loop Gain	Sets the inner loop gain value for each 3-stage valve control channel.
Inner Loop Rate	Sets the inner loop rate value for each 3-stage valve control channel.
Rate Input Selection	Allows you to select the current rate input selection setting. **Spool Position**—allows you to select the feedback from the servovalve's spool as the rate input. Most systems use this setting. **Inner Loop Error**—allows you to select the inner loop error as the rate input. This is the difference between spool position feedback and spool position command.
Excitation	Sets the AC excitation value that the conditioner is applying to the servovalve for each 3-stage valve control channel.
Phase	Sets the phase for the conditioner's demodulation circuitry that receives the sensor's output.

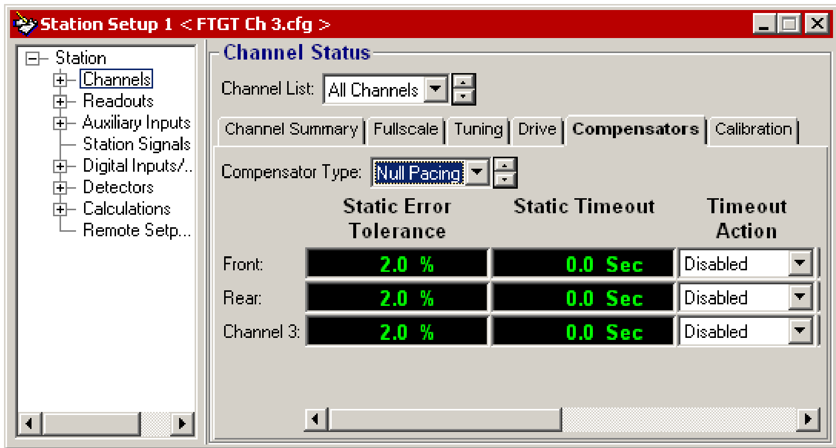
Driver Tab (3-stage valve) (part 2 of 2)

ITEM	DESCRIPTION
Offset	Sets the offset applied by the conditioner to the sensor's output signal.
Gain	Sets the amount of gain applied by the conditioner to the sensor's output signal. **Gain** values affect tuning settings and the noise sensitivity of the valve command.
Conditioner Polarity	Sets polarity setting of the spool output or inner loop output signal.
Monitor Mux Output	Allows you to select an inner loop signal for monitoring.

Compensators Tab

Path

Station Setup window > navigation pane > **Channels** > **Compensators** tab



This tab displays editable compensator parameters for each channel's active control mode based on the type of compensation method being used.

You can select a group of channels for display in **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Null Pacing

For channels using the null pacing method, the following active control mode parameters can be set.

Compensators Tab (Null Pacing)

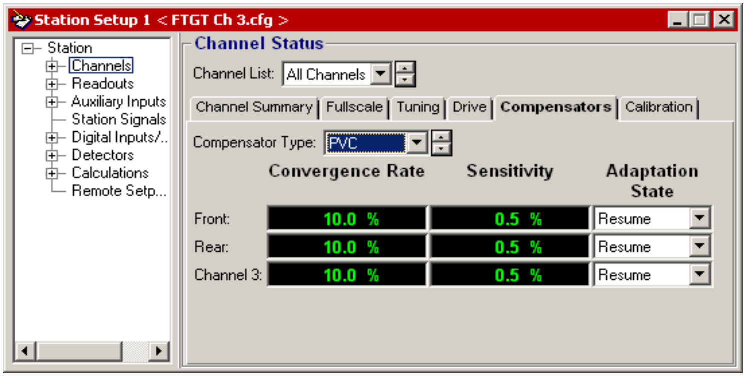
ITEM	DESCRIPTION
Static Error Tolerance	Sets the maximum error setting as a percentage of the command signal. Exceeding this error setting activates **Static Null Pacing** which holds the command.
Static Timeout	Sets the time allowed for feedback to come within tolerance.

Compensators Tab (Null Pacing)

ITEM	DESCRIPTION
Timeout Action (Static)	Sets the test station's action when the **Timeout** is exceeded.
Dynamic Error Tolerance	Sets the maximum error setting as a percentage of the command signal. Exceeding this error setting activates **Dynamic Null Pacing** which slows the command.
Dynamic Timeout	Sets the time allowed for feedback to come within tolerance.
Timeout Action (Dynamic)	Sets the test station's action when the **Timeout** is exceeded.

PVC

For channels using the Peak/Valley Compensation (PVC) method, the following active control mode parameters are displayed.

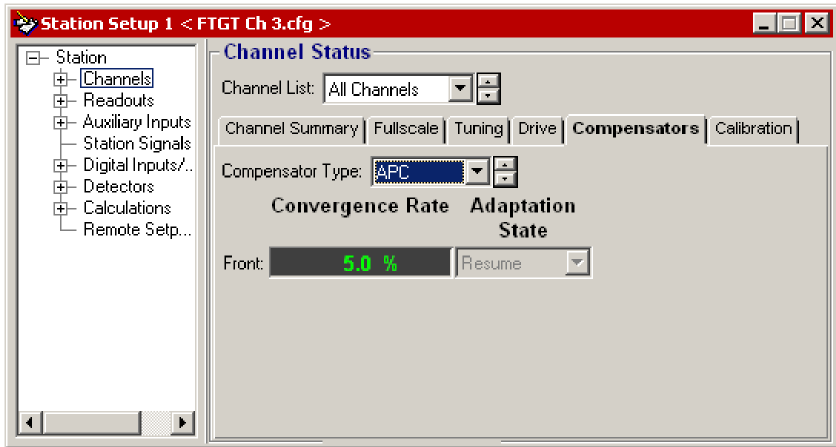


Compensators Tab (PVC)

ITEM	DESCRIPTION
Convergence Rate	This setting determines how quickly compensation values are applied to converge the feedback and command signals.
Sensitivity	This setting determines how much the feedback signal must change, as a percentage of its peak-to-peak value, before a peak or valley is detected.
Adaptation State	Allows you to select one of the following two adaptation states: **Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.

APC

For channels using the amplitude and phase control (APC) compensation method, the following active control mode parameters are displayed.

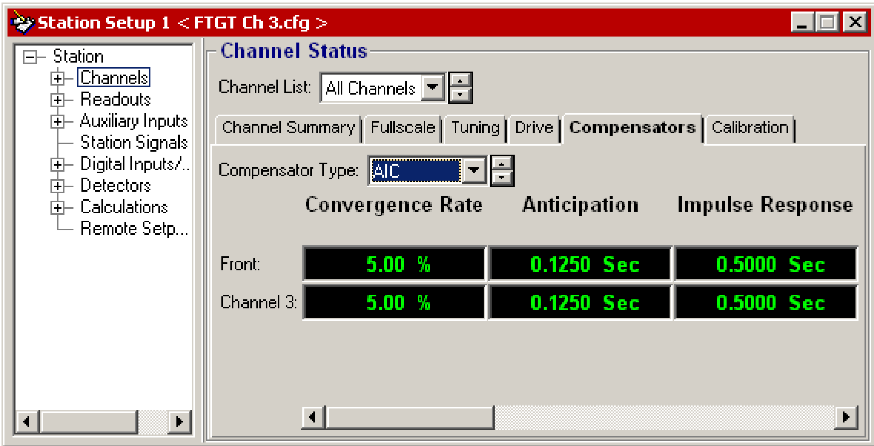


Compensators Tab (APC)

ITEM	DESCRIPTION
Convergence Rate	This setting determines how quickly compensation values are applied to converge the feedback and command signals.
Adaptation State	Allows you to select one of the following two adaptation states: **Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.

AIC

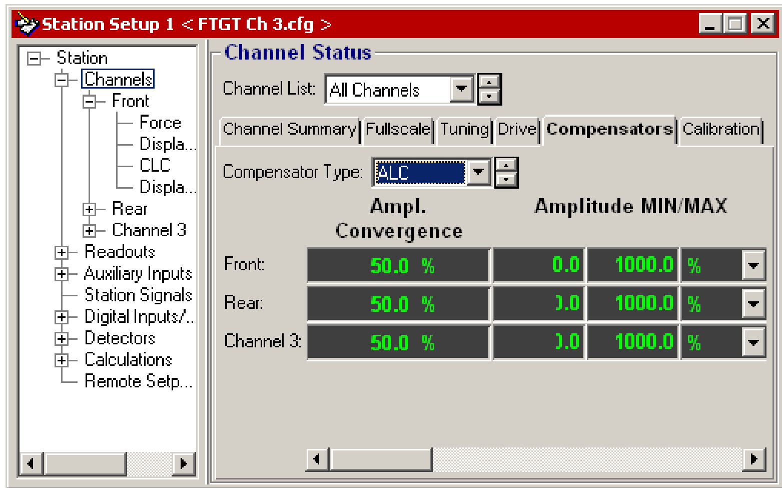
For channels using the adaptive inverse control (AIC) compensation method, the following active control mode parameters are displayed.



Compensators Tab (AIC)

ITEM	DESCRIPTION
Convergence Rate	Determines how quickly compensation values are applied to converge the feedback and command signals.
Anticipation	Sets the time delay between the desired and response signals.
Impulse Response	Sets the length of the adaptive filter, which influences how completely the dynamics of the controller/actuator/specimen combination are cancelled.
Crossover Freq.	Sets the crossover frequency. When applying AIC to a dual compensation mode configured in the Station Builder application for **Amplitude Control Only**, set this control to **0**.
Operating Band	Sets the range in which AIC operates. Frequencies outside this range are considered noise.
Adaptation State	Allows you to select one of the following two adaptation states: **Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.

ALC For channels using the Arbitrary End-Level Compensation (ALC) method, the following active control mode parameters are displayed.

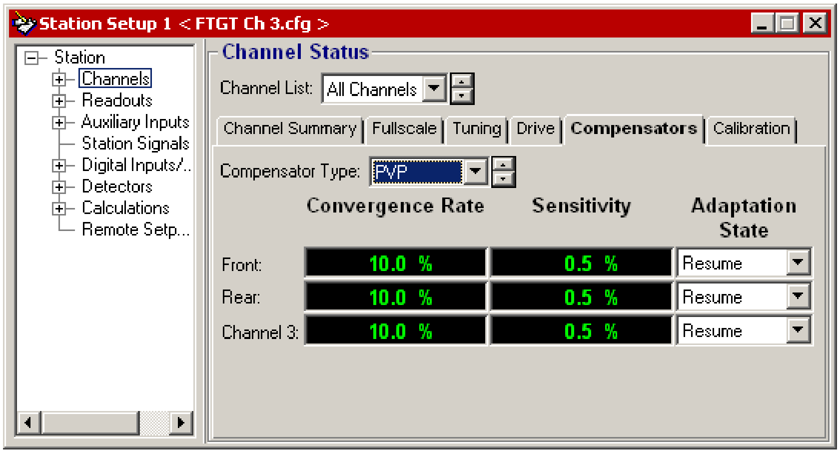


Compensators Tab (ALC)

ITEM	DESCRIPTION
Ampl. Convergence	This setting determines how quickly compensation values get applied to converge the feedback and command signal amplitudes.
Amplitude MIN/MAX	Allows you to set amplitude MIN/MAX values as follows: **Min**—Fixed at 0. **Max**—Displays the factor by which the compensated command's amplitude can exceed the original command's amplitude.
Freq Convergence	This setting determines how quickly compensation values get applied to converge the feedback and command signal frequencies.
Frequency MIN/MAX	Allow you to set frequency MIN/MAX values as follows: **Min**—Displays the minimum factor by which the compensated command's frequency can exceed the original command's frequency. **Max**—Displays the maximum factor by which the compensated command's frequency can exceed the original command's frequency.

PVP

For channels using the Peak/Valley Phase (PVP) method, the following active control mode parameters are displayed.

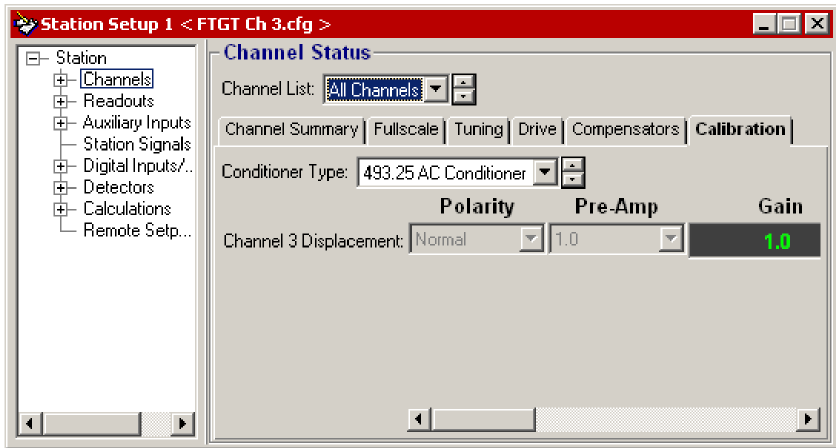


Compensators Tab (PVP)

ITEM	DESCRIPTION
Convergence Rate	This setting determines how quickly compensation values are applied to converge the feedback and command signals.
Sensitivity	This setting determines how much the feedback signal must change, as a percentage of its peak-to-peak value, before a peak or valley is detected.
Adaptation State	Allows you to select one of the following two adaptation states: **Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.

Calibration Tab

Path **Station Setup** window > navigation pane > **Channels** > **Calibration** tab



This tab displays editable calibration parameters for the active control mode of each channel. Displayed calibration parameters depend on the conditioner type and the active control mode selected.

You can select a group of channels for display in **Channel List**. See **"Channel Lists Tab"** on page 440 for more information.

Calibration Tab (part 1 of 2)

ITEM	DESCRIPTION
Polarity	Sets the polarity of the feedback signal to change how the actuator responds to commands: **Normal**—A positive command can extend or retract the actuator, depending on system conventions. **Invert**—Reverses the actuator's **Normal** response.
Pre-Amp	Sets the coarse gain applied. **Pre-Amp** gain cannot be adjusted with hydraulics on.
Gain	Sets the gain applied to the sensor's output signal. **Total** gain cannot be adjusted with hydraulics on.

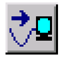
Calibration Tab (part 2 of 2)

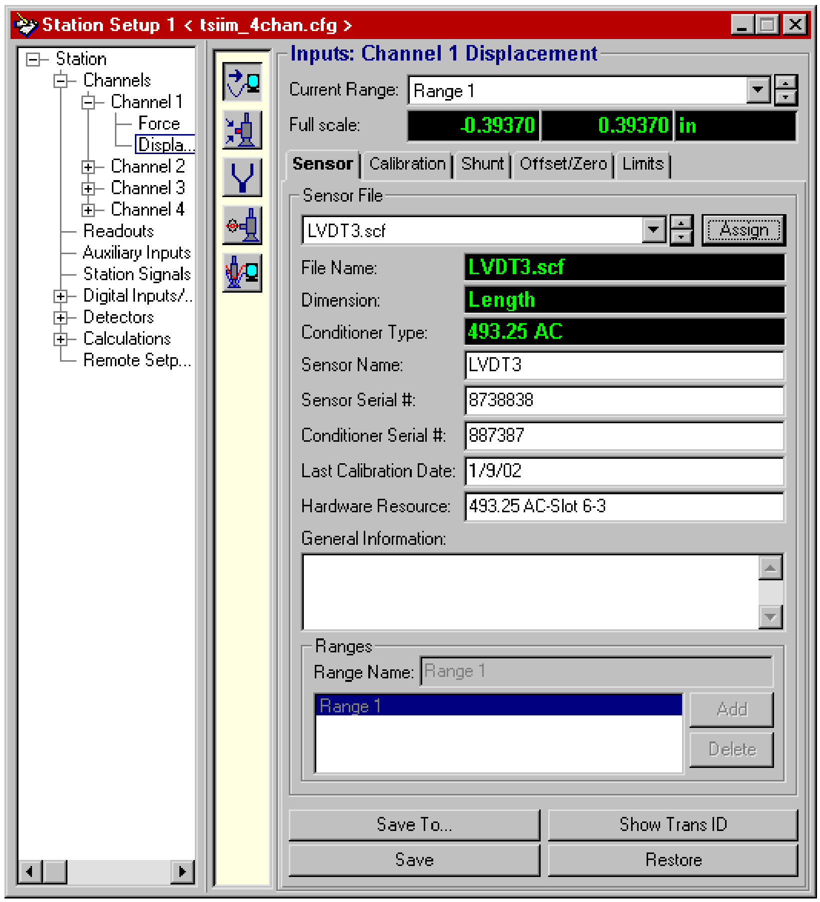
ITEM	DESCRIPTION
Post Amp	Sets the fine gain applied. This control's range is user adjustable. ***Note*** *For DUC B conditioners in AC mode the **Post Amp** gain slider has a maximum limit of 52.*
Excitation	Sets the excitation applied to the sensor. The proper excitation is usually specified by the sensor manufacturer. Typically AC sensors require a 10 V AC excitation signal and DC sensors require a 10 V DC signal.
DeltaK	Specifies the amount of delta K applied to the sensor's output signal. Equally negative and positive inputs cause asymmetry in the sensor's output signal. Delta K compensates for this asymmetry.
Zero	Adjusts the offset applied by the conditioner to the sensor's output signal to set this signal's zero point.
Fine Zero **(if available)**	Applies a fine zero offset to the sensor's output signal.
Zero/Balance **(DC Conditioners only)**	For 497.22 DC Conditioners—Provides either pre-amp offset (coarse zero) or bridge balance control, depending 497.22 DC jumpering. See the *Model 497.22 Dual DC Conditioner* manual for more information about the required jumpering.

Station Setup Window/Inputs Panel Tabs

Sensor Tab

Path **Station Setup** window > navigation pane > **Channels** control mode >

 > **Sensor** tab.

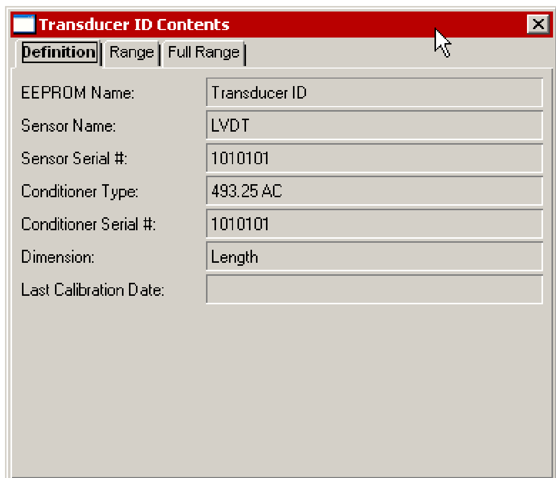


This tab assigns sensor calibration files to the internally conditioned input signals used in control modes. It also assigns Transducer IDs, used with 493 hardware, to these control mode signals.

Sensor Tab (part 1 of 2)

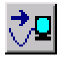
Item	Description
Current Range	Displays the current range.
Full scale	Displays the full-scale minimum and maximum values for the current range.
Sensor File	Selects available sensor calibration files. (**Transducer ID)** appears when Transducer ID modules are selected.
Assign	Assigns the selected **Sensor File** or **Transducer ID** to the current signal.
File Name	Displays the sensor calibration file name.
Dimension	Displays the dimension used in the conditioner output.
Conditioner Type	Displays the compatible conditioner type for the selected **Sensor File**.
Sensor Name	Names the sensor. Names can have up to 30 characters.
Sensor Serial #	Enters the sensor serial number.
Conditioner Serial #	Enters the conditioner serial number.
Last Calibration Date	Enters the calibration date for the sensor/conditioner pair.
Hardware Resource	Enters the sensor signal's hardware resource. The Station Builder application assigns this resource.
General Information	Enters additional information as needed.
Ranges	Displays the ranges available in the assigned sensor calibration file.
Range Name	Names the selected range. Names can have up to 30 characters. ***Note*** *You may only change the name of the currently loaded range. Ensure that the **Current Range** selection matches the **Range Name**, before renaming a range.*
Add	Adds sensor ranges. After adding a new range, use the **Calibration** tab to set the range's **Fullscale Min/Max** range.
Delete	Deletes the highlighted sensor range.
Save To	Displays the **Save Sensor File As** window. Use this window to create a sensor calibration file, containing settings from the **Sensor**, **Calibration**, and **Shunt** tabs or to save to a Transducer ID.

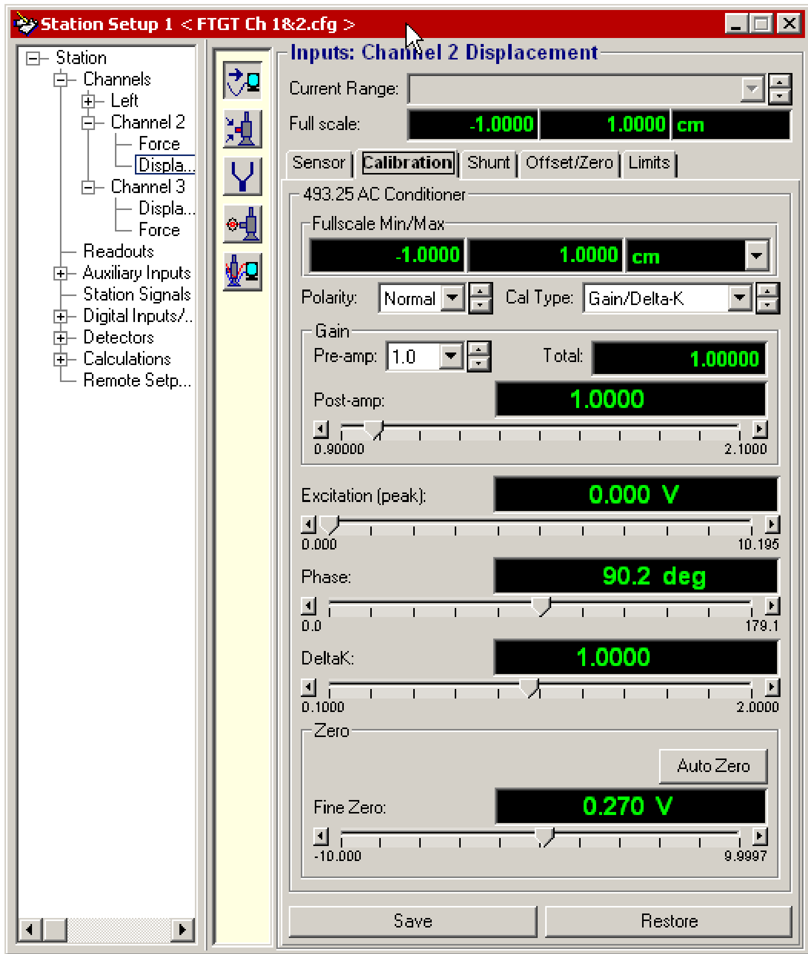
Sensor Tab (part 2 of 2)

ITEM	DESCRIPTION
Save	Saves settings from the **Sensor**, **Calibration**, and **Shunt** tabs to the current sensor calibration file. Displays the **Save Sensor File As** window if no file has been created.
Show TransID	For Series 493 Conditioners with Transducer IDs—Displays Transducer ID information. Use this information to verify that you are assigning the correct Transducer ID. 
Restore	Restores the values on the **Sensor**, **Calibration**, and **Shunt** tabs from the sensor calibration file or Transducer ID. ***Note*** ***Restore*** *is disabled if the input signal does not have a sensor file assigned or the input signal control mode is the active feedback with the system hydraulics on.*

Calibration Tab

Path **Station Setup** window > navigation pane > **Channels** control mode >

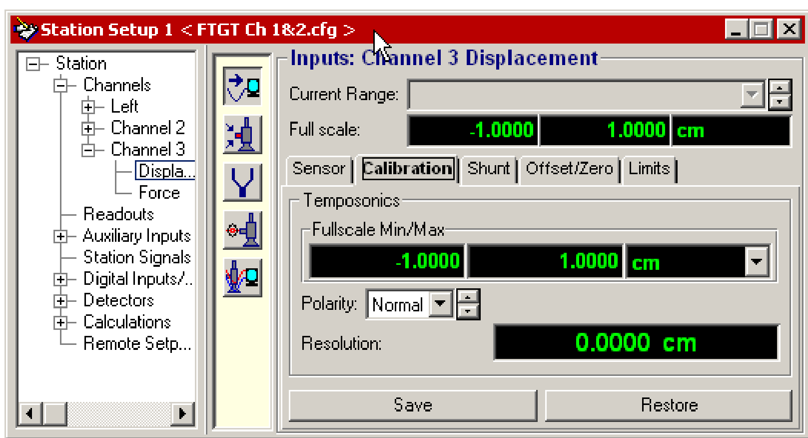
 > **Calibration** tab



This tab defines the calibration values that a conditioner applies to its sensor. This tab's controls vary with the type of conditioner used.

Calibration Tab (part 1 of 4)

ITEM	DESCRIPTION
Fullscale Min/Max	Sets the **Current Range** minimum and maximum values and the feedback signal's display units. Ranges can be asymmetrical if the **Max** is greater than or equal to zero and the **Min** is less than or equal to zero.
Polarity	Sets the polarity of the feedback signal to change how the actuator responds to commands: **Normal**—A positive command can extend or retract the actuator, depending on system conventions. **Invert**—Reverses the actuator's **Normal** response.
Resolution (Temposonics/Encoders only)	Sets the encoder or temposonics resolution value, typically the value specified in documentation supplied with the sensor. ***Note*** *If want to use units different than those supplied in the sensor documentation, enter the full scale and resolution in the supplied units first, and then switch to the desired full-scale units. The units conversion will be calculated automatically.*



Calibration Tab (part 2 of 4)

ITEM	DESCRIPTION
Cal Type	Sets the type of calibration used for the feedback signal. The calibration types displayed in this list depend on the conditioner type selected. **Gain/Delta-K**—Select to use delta K for calibration of sensors. Allows you to specify the amount of delta K applied to the sensor's output signal. Equally negative and positive inputs cause asymmetry in the sensor's output signal. Delta K compensates for this asymmetry. **Gain/Linearization**—Select to use linearization data for calibration of sensors with full-range conditioners. This type of calibration allows use of the **Linearization Data** window to precisely edit range data points. **mV/V Pos Tension**—Select when a sensor has been calibrated so that a positive output represents actuator retraction (tension). **mV/V Pos Comp**—Select when a sensor has been calibrated so that a positive output represents actuator extension (compression).
Gain	Sets the gain applied to the sensor's output signal. **Pre-Amp** and **Total** gain cannot be adjusted with hydraulics on. ***Note*** *For mV/V Pos Tension and mV/V Pos Comp calibration types,* ***Gain*** *is a read-only display.*
Pre-Amp	Set the coarse gain applied.
Post-Amp	Sets the fine gain applied. This control's range is user adjustable.
Total	Displays the total gain applied. This value is a function of Pre-Amp and Post-Amp values. Entering a total gain value here causes the Station Manager application to enter the Pre-Amp and Post-Amp values required to achieve this value.
Neg. Compression (mV/V Pos Tension only**)**	Adjust for the required -mV/V compression sensitivity value.
Pos. Tension (mV/V Pos Tension only**)**	Adjust for the required +mV/V tension sensitivity value.
Neg. Tension (mV/V Pos Compression only)	Adjust for required -mV/V tension sensitivity value.

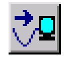
Calibration Tab (part 3 of 4)

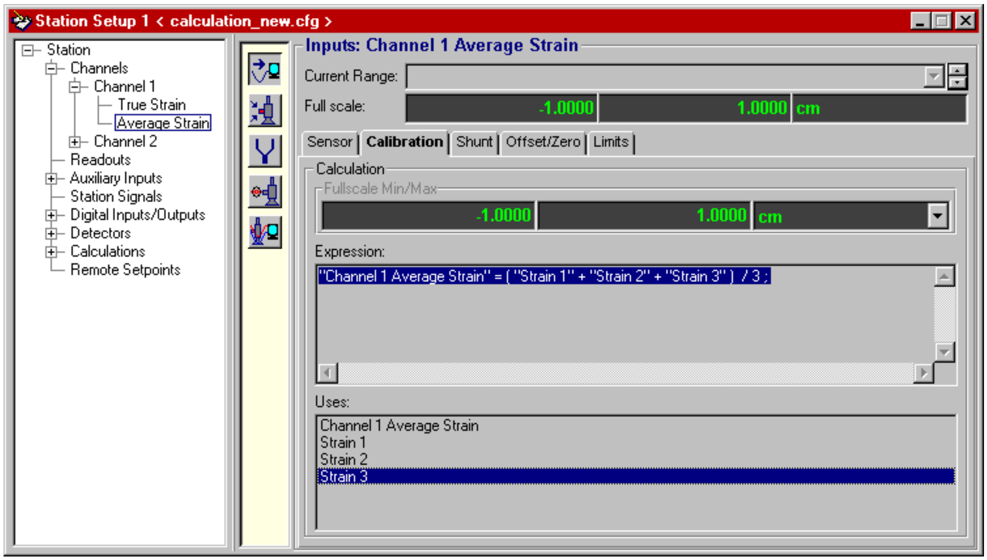
Item	Description
Pos. Compression (mV/V Pos Compression only)	Adjust for required +mV/V compression value.
Excitation	Sets the excitation applied to the sensor. The proper excitation is usually specified by the sensor manufacturer. Typically AC sensors require a 10 V AC excitation signal and DC sensors require a 10 V DC signal.
Phase (AC only)	Adjusts the phase of the feedback signal based on the excitation signal. Optimal phase adjustments produce the maximum output signal from the sensor. Phase values are usually between 30°–45°.
Delta K	Specifies the amount of delta K applied to the sensor's output signal. Equally negative and positive inputs cause asymmetry in the sensor's output signal. Delta K compensates for this asymmetry. ***Note*** *For mV/V Pos Tension and mV/V Pos Comp calibration types,* ***Delta K*** *is a read-only display.*
Zero	Adjusts the offset applied by the conditioner to the sensor's output signal to set this signal's zero point. Zero controls vary by conditioner type.
Auto Zero (DC only)	Zeroes the sensor signal to make the current output the new zero point.
Fine Zero (if available)	Applies a fine zero offset to the sensor's output signal.
Zero/Balance (DC only)	For 497.22 DC Conditioners—Provides either pre-amp offset (coarse zero) or bridge balance control, depending on 497.22 DC jumpering. See the *Model 497.22 Dual DC Conditioner* manual for more information about the required jumpering.

Calibration Tab (part 4 of 4)

ITEM	DESCRIPTION
Save	Saves settings from the **Sensor**, **Calibration**, and **Shunt** tabs to the current sensor calibration file. Displays the **Save Sensor File As** window if no file has been created.
Restore	Restores the values on the **Sensor**, **Calibration**, and **Shunt** tabs from the sensor calibration file or Transducer ID. ***Note*** ***Restore*** *is disabled if the input signal does not have a sensor file assigned or the input signal control mode is the active feedback with the system hydraulics on.*

Calibration Tab for a Calculated Input

Path **Station Setup** window > navigation pane > **Channels** control mode using calculated input >  > **Calibration** tab



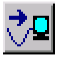
This tab displays the expression used in the selected control mode that uses a calculated input.

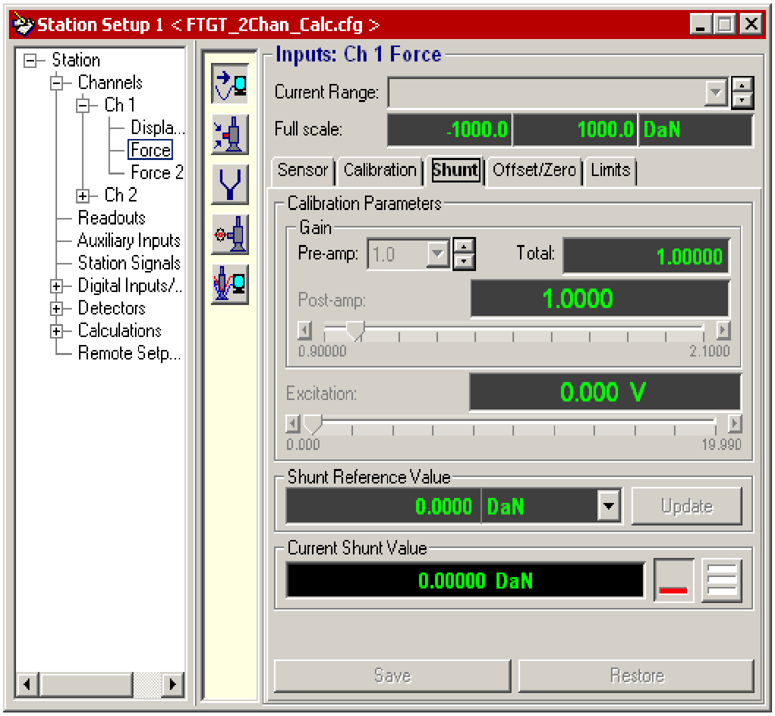
For more about defining calculations, see “Calculation Editor Window” on page 459.

Calculation Tab for a Calculated Input

ITEM	DESCRIPTION
Fullscale Min/Max	Specifies the selected inputs full-scale minimum and maximum values. The result of this calculation gets clipped to these values.
Expression	Displays the formula used to produce the input. Use the **Calculation Editor** window to define the formula.
Uses	Displays a list of the parameters and signals that are used within this expression.

Shunt Tab

Path **Station Setup** window > navigation pane > **Channels** force control mode >  > **Shunt** tab



This tab performs shunt calibrations of DC conditioner/sensor pairs. Shunt calibration verifies the current calibration accuracy of the sensor/conditioner pair.

This tab's controls vary slightly depending on the type of DC conditioner used.

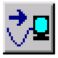
For more information about using this tab, see "About Shunt Calibration" on page 250.

Shunt Tab

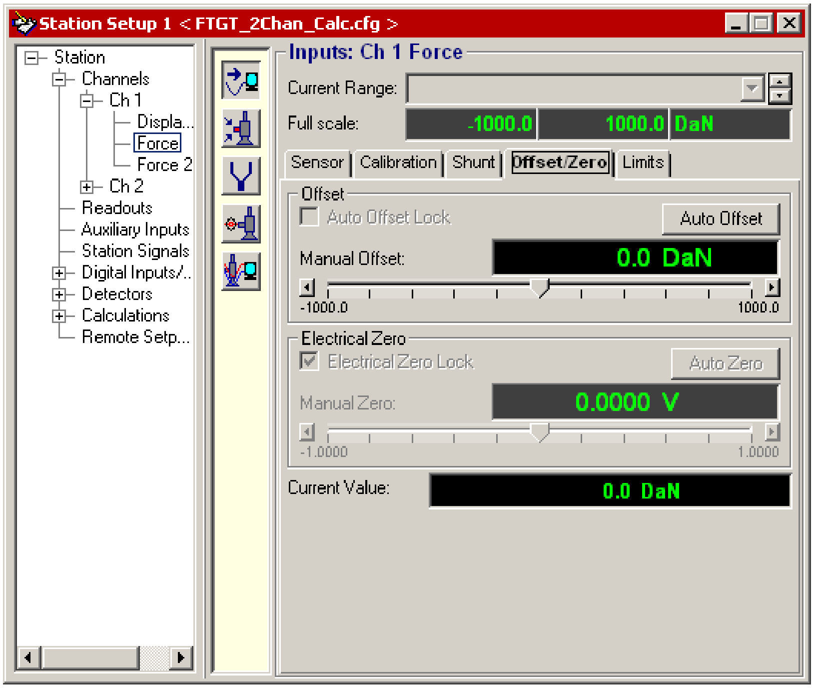
ITEM	DESCRIPTION
Gain	Sets the gain applied to the sensor's output signal. **Total and Pre-amp Gain** cannot be adjusted with hydraulics on.
Pre-Amp	Set the coarse gain applied.
Post-Amp	Sets the fine gain applied. This control's range is user adjustable.
Total	Displays the total gain applied. This value is a function of **Pre-Amp** and **Post-Amp** values. Entering a **Total** value causes the Station Manager application to enter the **Pre-Amp** and **Post-Amp** values required to achieve this value.
Excitation	Sets the excitation applied to the sensor. The proper excitation is usually specified by the sensor manufacturer. Typically DC sensors require a 10 V DC excitation signal.
Select Shunt Type (Available for FlexTest IIm only)	**(+) Shunt**—Connects the shunt resistor to a positive arm of the sensor's resistive bridge circuit. **(–) Shunt**—Connects the shunt resistor to a negative arm of the sensor's resistive bridge circuit.
Shunt Reference Value	Displays the saved shunt reference value.
Update	Makes the **Current Shunt Value** the new **Shunt Reference Value**.
Current Shunt Value	Displays the current shunt value.
On/Off	These buttons apply and remove the shunt.
Save	Saves settings from the **Sensor**, **Calibration**, and **Shunt** tabs to the current sensor calibration file. Displays the **Save Sensor File As** window if no file has been created.
Restore	Restores the values on the **Sensor**, **Calibration**, and **Shunt** tabs from the sensor calibration file or Transducer ID. ***Note*** ***Restore*** *is disabled if the input signal does not have a sensor file assigned or the input signal control mode is the active feedback with the system hydraulics on.*

Offset/Zero Tab

Path **Station Setup** window > navigation pane > **Channels** control mode >



>**Offset/Zero** tab



This tab applies a zeroing offset to feedback signals and shifts the conditioners' zero references.

For additional information on using this tab, see "About Offset" on page 149.

Offset/Zero Tab

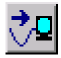
ITEM	DESCRIPTION
Offset	Applies an offset to zero the selected conditioner's feedback signal.
Auto Offset Lock	Select to disable **Auto Offset** for the **Tuning** and **Operator** user levels. Available at the **Calibration** user level.

Offset/Zero Tab

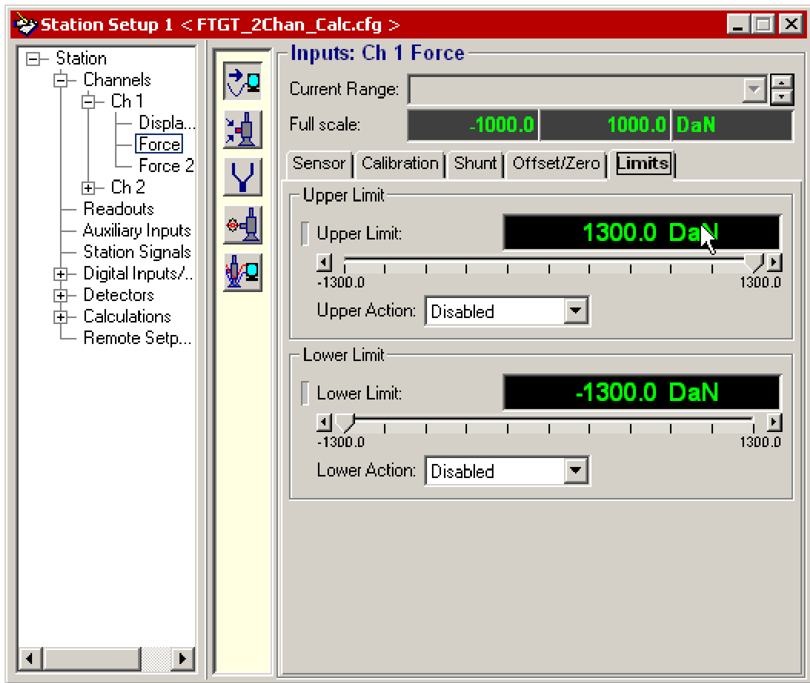
ITEM	DESCRIPTION
Auto Offset	Automatically applies a zeroing offset to the selected conditioner's feedback signal.
Manual Offset	Manually applies a zeroing offset to the selected conditioner's feedback signal. If station power is on, this control cannot be used to offset active control modes.
Electrical Zero	Applies an offset to make the selected conditioner's sensor signal zero. If station power is on, **Auto Zero** and **Manual Zero** cannot be used on active control modes.
Electrical Zero Lock	Select to disable **Auto Zero** for the **Tuning** and **Operator** user levels. Available at the **Calibration** user level.
Auto Zero	Automatically applies an offset to zero the selected conditioner's sensor signal.
Manual Zero	Manually applies an offset to make the selected conditioner's sensor signal zero.
Current Value	Displays the current output of the selected signal.

Limits Tab

Path **Station Setup** window > navigation pane > **Channels** control mode >



> **Limits** tab



This tab sets feedback signals' limit values and the test station's response if these limits are exceeded.

For additional information, see "About Limit Detectors" on page 226.

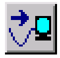
Limits Tab

ITEM	DESCRIPTION
Upper Limit	Sets the upper limit that the feedback signal must cross to trigger the **Upper Action**. The adjustment range equals 130% of the selected range's full scale.
Lower Limit	Sets the lower limit that the feedback signal must cross to trigger the **Lower Action**. The adjustment range equals 130% of the selected range's full scale.
Upper Action/ Lower Action	Adjusts the test station's response when a **Limit** trips. Actions include: **Disabled**—No action occurs. This setting grays out the **Limit** indicator. **Indicate**—Writes a message to the **Message Log**. This setting turns the **Limit** indicator white. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the **Limit** indicator green. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the **Limit** indicator green. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the **Limit** indicator green. **Program Stop—**Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Program Hold—**Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. This setting turns the **Limit** indicator green. See "Event-Action Editor Window" on page 448 for more about using this window. A tripped limit turns an enabled detector's **Limit** indicator red.

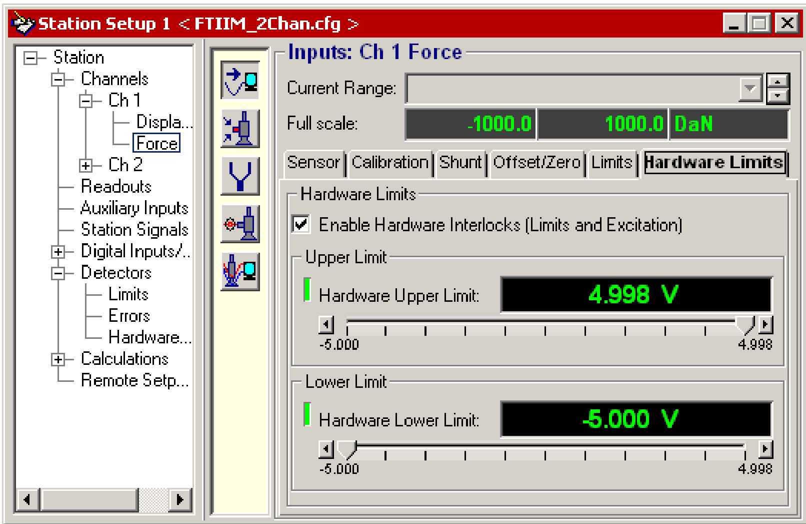
Hardware Limits Tab

Path

Station Setup window > navigation pane > **Channels** control mode >



> **Hardware Limits** tab



This tab, provided on **FlexTest IIm systems only**, allows you to set hardware limits for individual 497 conditioners in your system.

Hardware limits

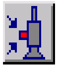
A limit detector on each 497 conditioner continuously compares its associated transducer output value to preset upper and lower limit values that you set in the **Hardware Limits** tab.

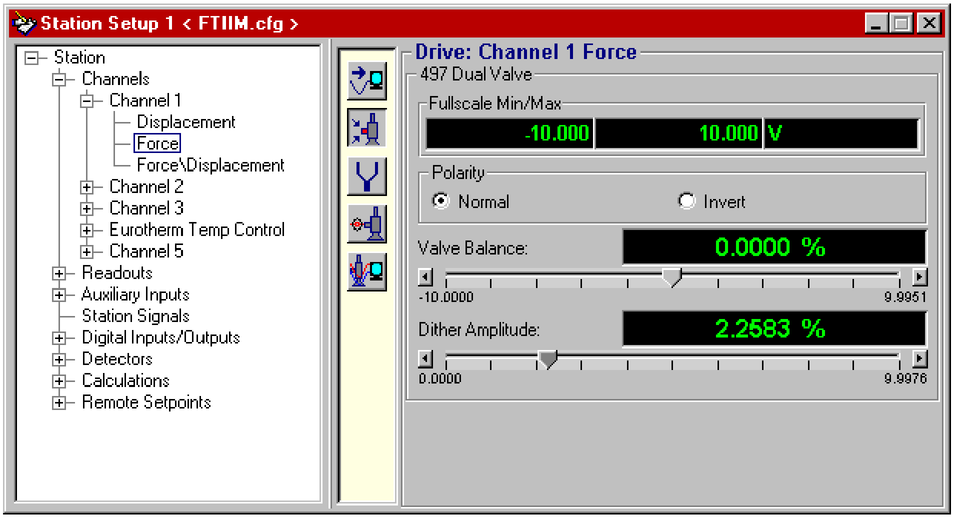
When a conditioner limit is exceeded, the limit detector is enabled. The system responds by sending a digital request to the control system for an emergency stop.

Hardware Limits Tab

ITEM	DESCRIPTION
Enable Hardware Interlocks (Limits and Excitation)	Select to enable hardware interlocks when previously set conditioner limits or excitation values are exceeded. ***Note*** *If hardware interlocks are not enabled, interlock indicators will be gray and the interlock will not occur.*
Upper Limit	Sets the upper limit that the conditioner's feedback signal voltage must exceed to trigger a hardware interlock. Exceeding an upper limit writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. The **Upper Limit** indicator turns green.
Lower Limit	Sets the lower limit that the conditioner's feedback signal voltage must exceed to trigger a hardware interlock. Exceeding an upper limit writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. The **Lower Limit** indicator turns green.

Station Setup Window/Drive Panel—Two Stage Valves

Path **Station Setup** window > navigation pane > **Channels** > *Control Channel n* > 



This panel configures control channel drive signals for two-stage valve drivers.

The panels controls vary with the type of valve driver used.

For more information about using this panel, see “About Valve Balance” on page 557 and “About Dither” on page 563.

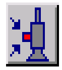
Drive Panel for Two-Stage Valve Drivers

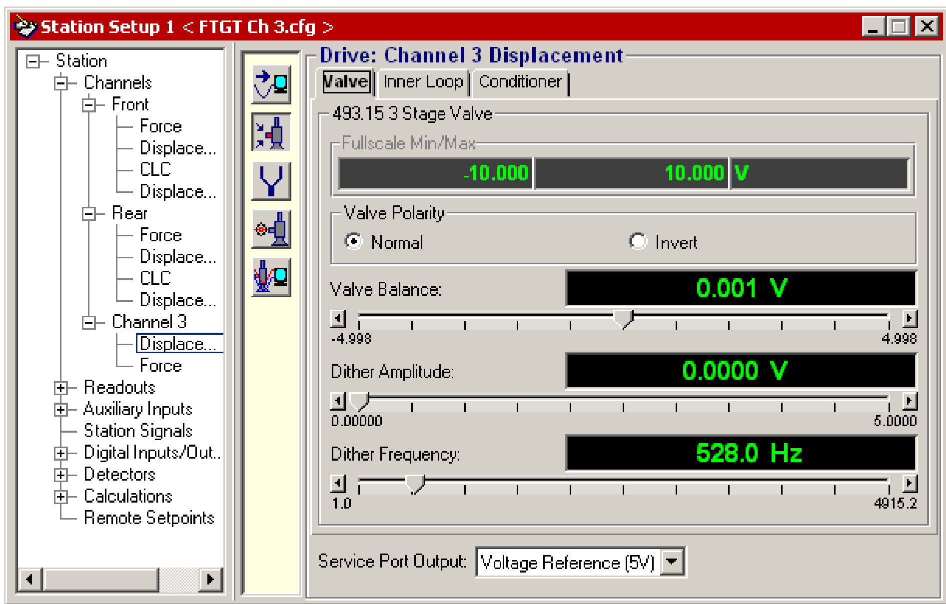
Item	Description
Fullscale Min/Max	Displays the valve driver's full minimum and maximum output values.
Polarity	Sets the polarity of the valve drive signal to **Normal** or **Invert**. The **Polarity** cannot be changed when station pressure is on.
Valve Balance	Compensates for minor mechanical imbalances in the servovalve. A second **Valve Balance** displays if you have dual valves. See "How to Balance Dual Valves" on page 559
Dither Amplitude	Adjusts the amplitude of the dither signal.
Dither Frequency	For Model 493.14 Valve Drivers—Adjusts the dither signal frequency.

Station Setup Window/Drive Panel—Three Stage Valves

For additional information on using the tabs described in this section, see "How to Tune the Inner Loop of Three-Stage Valves" on page 549.

Valve Tab for Three Stage Valve Drivers

Path **Station Setup** window > navigation pane > **Channels** > *Control Channel n* >  > **Valve** tab



This tab configures the drive signal output of three-stage valve drivers.

Valve Tab for Three-Stage Valve Drivers (part 1 of 3)

ITEM	DESCRIPTION
Fullscale Min/Max	Displays the valve driver's full minimum and maximum output values.
Polarity	Sets the polarity of the valve drive signal to **Normal** or **Invert**. **Polarity** cannot be changed with station pressure on.
Valve Balance	Compensates for minor mechanical imbalances in the servovalve.
Dither Amplitude	Adjusts the amplitude of the dither signal.
Dither Frequency	For Model 493.15 3-Stage Valve Drivers—Adjusts the dither signal frequency.

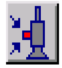
Valve Tab for Three-Stage Valve Drivers (part 2 of 3)

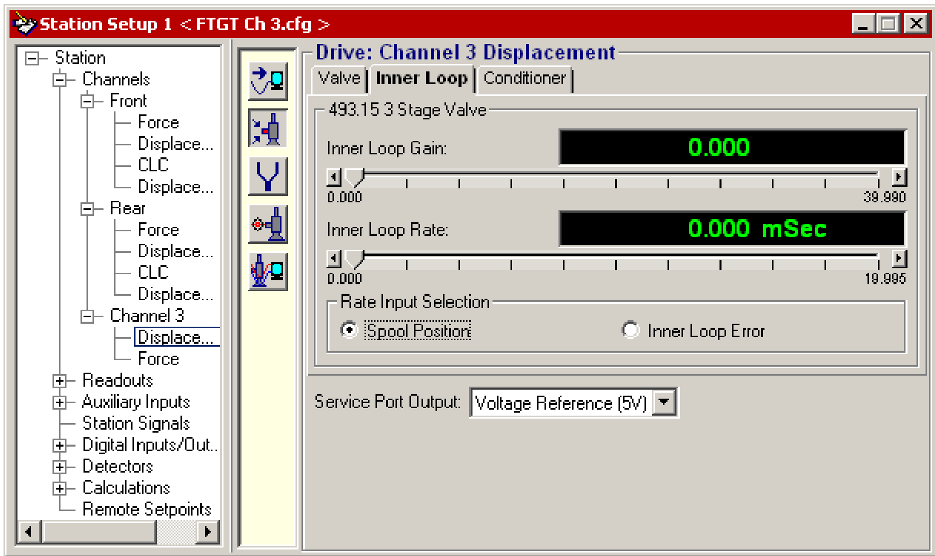
ITEM	DESCRIPTION
Service Port Output (TestStar IIs, TestStar IIm, FlexTest GT Controllers)	Select an inner loop signal to monitor: **Valve Current**—Final output to the servovalve expressed in voltage. The current-to-voltage relationship is 10 V DC = 50 mA (or 25 mA, depending on the .hwi file setting. **Inner Loop Command**—Input signal to the three-stage valve driver. **Demod Filter Output**—The analog output of the demodulator prior to gain. **Spool Offset**—Signal is summed with spool position to remove any DC offset. ±10 V represents ±4 V of zero summing. **Spool Position**—The **Conditioner Out** signal summed with the **Spool Zero** signal. **Preamp Output**—The raw AC input from the spool LVDT. **Conditioner Out**—Conditioned feedback signal from the servovalve's inner loop displacement sensor. **Voltage Reference (5V)** —Internal board reference test only. On TestStar™ IIs controllers, monitor signals through the **J48 Servic**e connector. On TestStar™ IIm and FlexTest™ GT controllers, monitor signals through the 493.40 I/O carrier card's **J3 Service Connector**.

Valve Tab for Three-Stage Valve Drivers (part 3 of 3)

ITEM	DESCRIPTION
Monitor Mux Output (FlexTest IIm and FlexTest CTC controllers)	Select an inner loop signal to monitor: **Valve Current**—Final output to the servovalve expressed in voltage. The relationship of current-to-voltage is 10 V DC = 50 mA. **Valve Balance**—Amount of valve balance command applied by the **Valve** tab's **Valve Balance** control. **Inner Loop Command**—Input signal to the three-stage valve driver. **Inner Loop Error**—**Inner Loop Command** summed with the **Conditioner Out** signal. **Spool Position**—**Conditioner Out** signal summed with the **Spool Zero** signal. **Conditioner Out**—Conditioned feedback signal from the servovalve's inner loop displacement sensor. **Spool Zero**—Amount of offset introduced by the **Conditioner** tab's **Offset** control. **Ground**—Signal common. On FlexTest™ series controllers, monitor signals through the 497.15's front panel tip jacks.

Inner Loop Tab for Three Stage Valve Drivers

Path **Station Setup** window > navigation pane > **Channels** > *Control Channel n* >  > **Inner Loop** tab

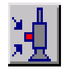


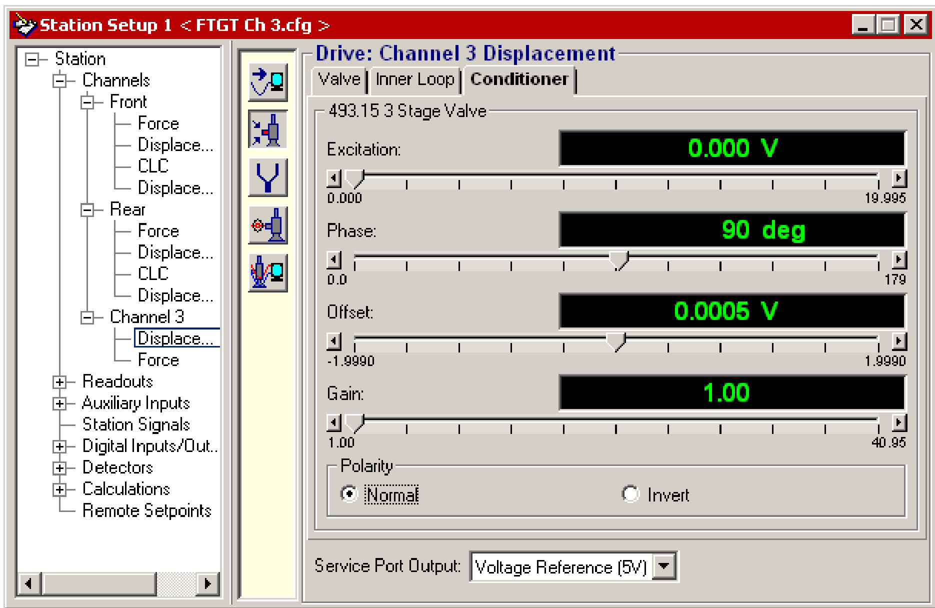
This tab defines inner loop tuning values.

Inner Loop Tab for Three-Stage Valve Drivers

Item	Description
Inner Loop Gain	Sets the inner loop's proportional gain, which affects the inner loop response of the pilot valve.
Inner Loop Rate	Sets the inner loop's derivative gain, which affects the servovalve's stability at higher inner loop gain settings.
Rate Input Selection	**Spool Position**—Sets the feedback from the servovalve's spool as the rate input. Most systems use this setting. **Inner Loop Error**—Sets the inner loop error as the rate input. This is the difference between spool position feedback and spool position command.

Conditioner Tab for Three-Stage Valve Drivers

Path **Station Setup** window > navigation pane > **Channels** > *Control Channel n* >  > **Conditioner** tab



This tab defines the inner loop conditioner values.

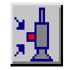
Conditioner Tab for Three-Stage Valve Drivers (part 1 of 2)

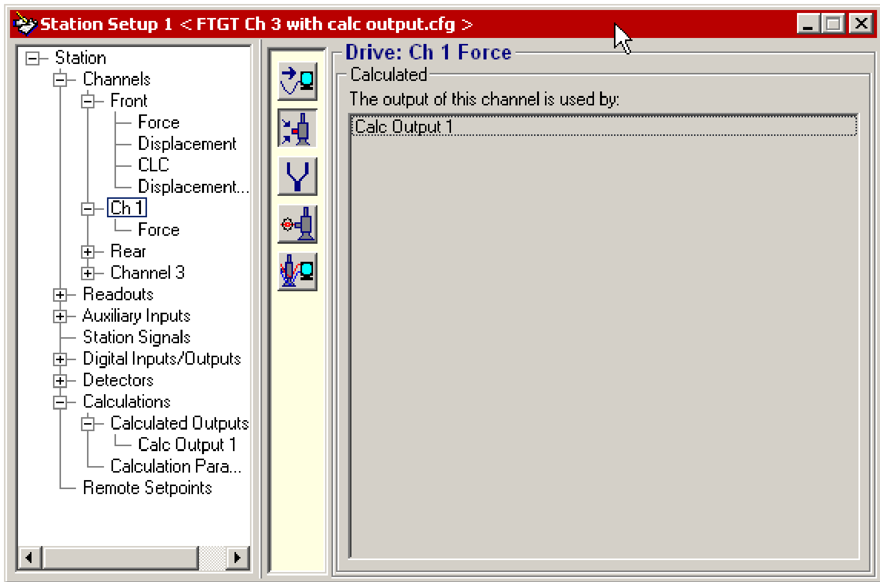
Item	Description
Excitation	Sets amount of AC excitation that the conditioner applies to the servovalve's sensor spool.
Phase	Sets the phase for the demodulation circuitry that receives the sensor's output. The sensor's output rides on the conditioner's excitation signal, which is an AC signal. An optimal phase shift yields the maximum DC output from the conditioner.
Offset	Sets the offset applied by the conditioner to the sensor's output signal.

Conditioner Tab for Three-Stage Valve Drivers (part 2 of 2)

ITEM	DESCRIPTION
Gain	Sets the amount of gain applied by the conditioner to the sensor's output signal. **Gain** values affect tuning settings and the noise sensitivity of the valve command.
Polarity	Sets the polarity of the spool output or inner loop output signal to **Normal** or **Invert**. **Polarity** cannot be changed when the station pressure is on.

Calculated Drive Signals Not Assigned Hardware

Path **Station Setup** window > navigation pane > **Channels** > *Control Channel n (with calculated output)* >  > **Calculated**

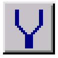


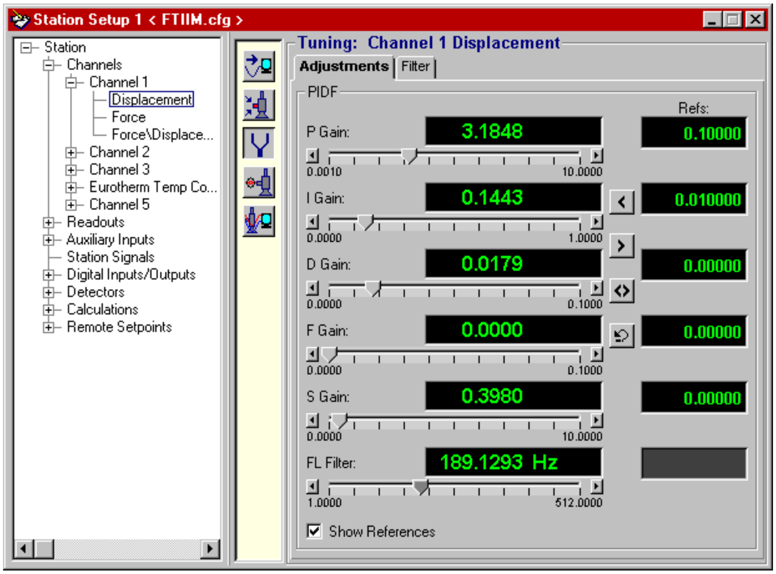
Calculated Drive Signals Not Assigned Hardware

ITEM	DESCRIPTION
Calculated	Specifies the calculated resource(s) that use the drive signal output of the selected channel.

Station Setup Window/Tuning Panel Tabs

Adjustments Tab—PIDF Control Modes

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **Adjustments** tab



This tab tunes selected PIDF control modes for stability and accurate response to commands.

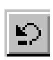
This tab's controls vary with the type of control mode being tuned.

For additional information, see "About Manual Tuning" on page 575.

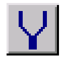
Adjustments Tab—PIDF Control Modes (part 1 of 2)

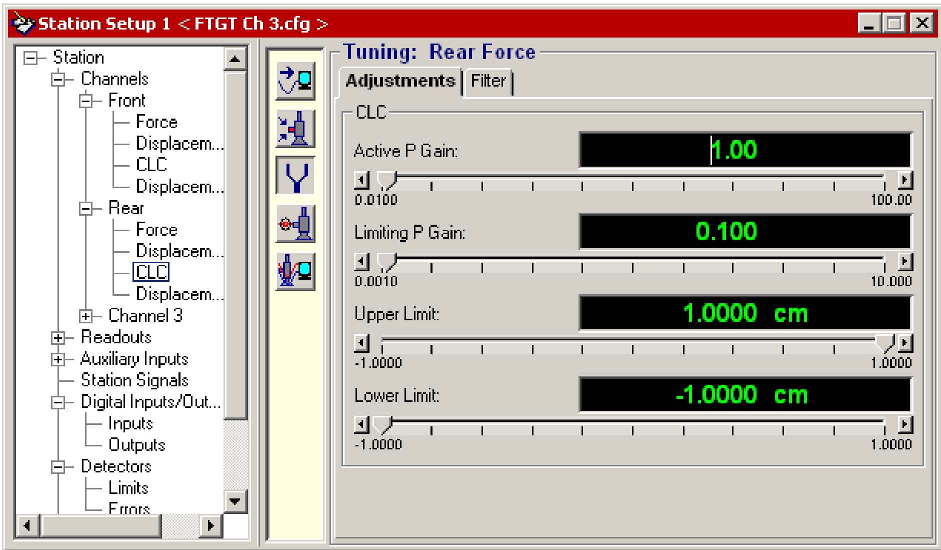
ITEM	DESCRIPTION
P Gain	Adjusts the proportional gain applied to the selected control mode.
I Gain	Adjusts the integral gain applied to the selected control mode.
D Gain	Adjusts the derivative gain applied to the selected control mode.

Adjustments Tab—PIDF Control Modes (part 2 of 2)

ITEM	DESCRIPTION
F Gain	Adjusts the feed forward gain applied to the selected control mode.
S Gain	Sets the stabilization gain applied to the selected control mode. **S Gain** enhances stability for systems that move large masses at high speeds. For **S Gain** to be available, the Station Builder application must have added a stabilization resource to the channel when it defined the configuration.
FL Filter	Adjusts the forward loop filter applied to the selected control mode.
Show References	Select to display the **Refs** column.
Refs	Displays tuning reference values. **Refs** values are saved in the parameter set. To save current PIDF values for reference, copy them to **Refs**, and then save the parameter set. > copies all PIDF values to **Refs**. < copies all **Refs** values to the current PIDF values. < > swaps all PIDF values with a **Refs** values.  — replaces the current PIDF values with saved parameter set values.

Adjustments Tab—CLC Control Modes

Path **Station Setup** window > navigation pane > **Channels** CLC control mode >  > **Adjustments** tab



This tab tunes channel limited channel control modes (CLC).

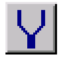
The Station Builder application creates CLC control modes. They are used in specimen installation. For more information, see “Creating Control Modes” on page 60.

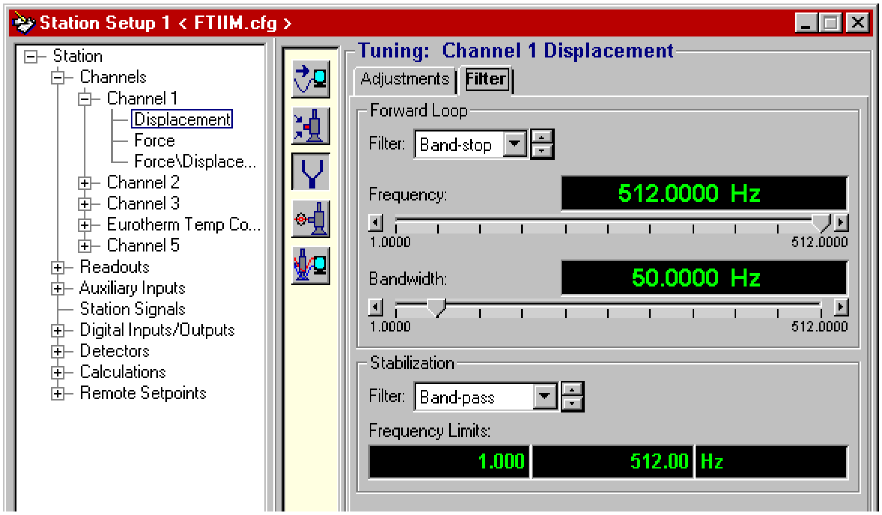
See “About Channel Limited Channel (CLC) Control Modes” on page 590 for more information.

Adjustments Tab—CLC Control Modes

ITEM	DESCRIPTION
Active P Gain	Adjusts the gain of the feedback signal used in the active control mode. The active control mode controls the actuator movement. It is typically displacement.
Limiting P Gain	Adjusts the gain of the feedback signal used in the limiting control mode. The limiting control mode puts limits on the actuator movement. It is typically force.
Upper Limit/ Lower Limit	Sets the limiting control mode's upper and lower limits. The actuator, in its movements, cannot exceed these limits.

Filter Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **Filter** tab



This tab applies filtering to the selected control mode. Filtering reduces the system’s resonance responses, allowing increased gain settings for better system response.

See “About Tuning Filters” on page 600 for more information.

Filter Tab (part 1 of 2)

ITEM	DESCRIPTION
Forward Loop	Selects filter types:
Filter	**No Filter**—Applies no filtering. **Low-pass**—Attenuates signals above a specified **Frequency**. **Band-stop**—Attenuates signals within a **Bandwidth** at a specified **Frequency**.
Frequency	For a **Low-pass** filter, attenuation occurs above this value. For a **Band-stop** filter, attenuation occurs in a **Bandwidth** around this value.

Filter Tab (part 2 of 2)

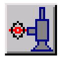
ITEM	DESCRIPTION
Bandwidth	For **Band-stop** filters only—Sets the band around the **Frequency** in which attenuation occurs. For example, setting the **Frequency** to 400 Hz and the **Bandwidth** to 100 Hz attenuates signals that have frequencies between 350 - 450 Hz.
Stabilization Filter	***Note*** *This control is available only for control modes that are equipped with stabilization. For more information, see "Stabilization" on page 101.* Selects filter types: **1 Hz High-pass**—Attenuates signals below 1 Hz. This filter is the default **Stabilization** filter selection. It is compatible with configurations created prior to Version 3.1 of MTS Series 793 software. **Band-pass**—Attenuates signals outside of the band defined by the **Frequency Limits** control. This selection provides additional tuning capability for systems with complex tuning characteristics.
Frequency Limits	For **Band-pass** filters only—Sets the upper and lower frequency limits of the band outside of which signal attenuation occurs. For example, setting the lower frequency to 10 Hz and the upper frequency to 200 Hz creates a 190 Hz band in which signals can pass without attenuation.

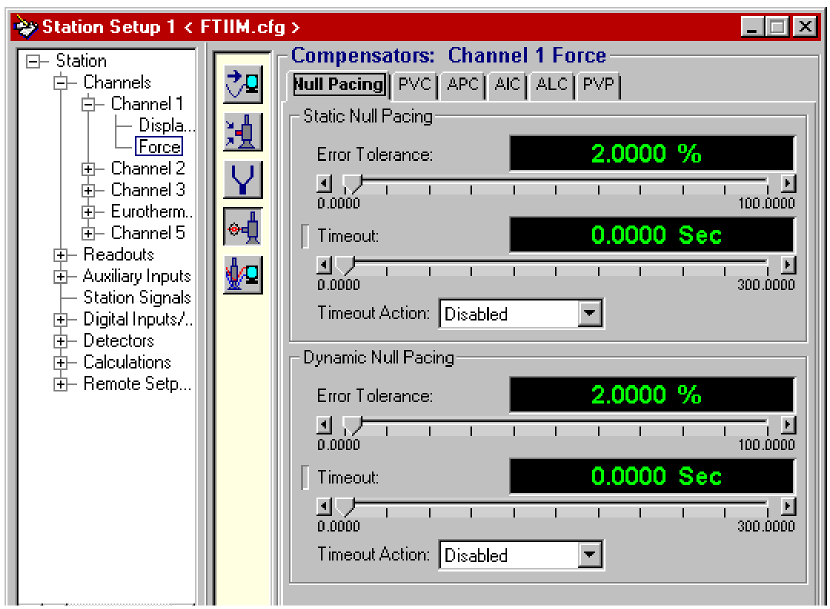
Station Setup Window/Compensators Panel Tabs

For more about the compensation methods described in this section, see “About Compensators” on page 194.

Null Pacing Tab

Path

Station Setup window > navigation pane > **Channels** PIDF control mode >  > **Null Pacing** tab



This tab defines the null pacing compensation that can be applied through the selected control mode to the command signal.

If the error becomes too large:

- Static null pacing holds the command at a steady state at the peak/valley until the feedback reaches its target peak/valley.
- Dynamic null pacing slows the command frequency to allow the feedback more time to track the command.

See "About Null Pacing" on page 195 for more about this compensation method.

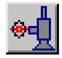
Null Pacing Tab (part 1 of 2)

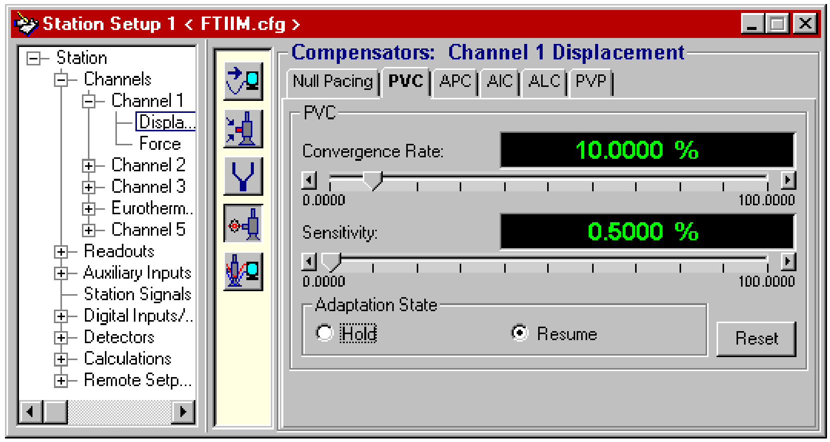
Item	Description
Static Null Pacing	Sets **Static Null Pacing** values.
Error Tolerance	Sets the maximum error, as a percentage of the command signal, allowed before **Static Null Pacing** holds the command.
Timeout	Sets the time allowed for feedback to come within tolerance.
Timeout Action	Sets the test station's action when the **Timeout** is exceeded.
Dynamic Null Pacing	Sets **Dynamic Null Pacing** values.
Error Tolerance	Sets the maximum error, as a percentage of the command signal, allowed before **Dynamic Null Pacing** slows the command.

Null Pacing Tab (part 2 of 2)

ITEM	DESCRIPTION
Timeout	Sets the time allowed for feedback to come within tolerance.
Timeout Action	Sets the test station's action when the **Timeout** is exceeded. **Timeout Actions** for **Static Null Pacing** and **Dynamic Null Pacing** include: **Disabled**—No action occurs. This setting grays out the **Timeout** indicator. **Indicate**—Writes a message to the **Message Log**. This setting turns the **Timeout** indicator white. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the **Timeout** indicator green. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the **Timeout** indicator green. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the **Timeout** indicator green. **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the **Timeout** indicator green. **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. This setting turns the **Timeout** indicator green. **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. Turns **Timeout** indicator green. See "Event-Action Editor Window" on page 448 for more about using this window. A **Timeout** turns an enabled **Timeout** indicator red.

PVC Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **PVC** tab



This tab defines the peak/valley compensation (PVC) that can be applied through the selected control mode to the command signal.

- PVC increases the command amplitude if it detects amplitude roll-off in the feedback signal.
- PVC adjusts the mean command level if it detects mean-level divergence in the feedback signal.

See "About PVC" on page 198 for more about this compensation method.

PVC Tab

ITEM	DESCRIPTION
Convergence Rate	Sets how quickly compensation values are applied to converge the feedback and command signals.
Sensitivity	Determines how much the feedback signal must change, as a percentage of its peak-to-peak value, before a peak or valley is detected.
Adaptation State	**Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.
Reset	Clears acquired compensation values and restarts the adaptation process. Clicking **Reset** with compensation applied may produce a spike in the feedback signal. Read the Warning that follows this table.

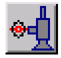
WARNING

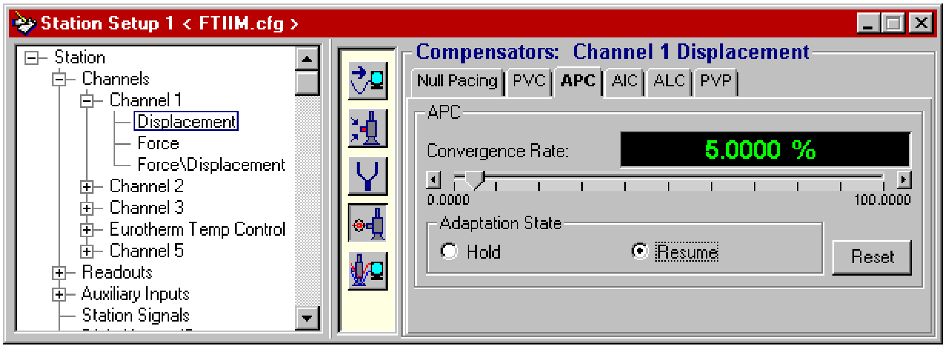
Clicking Reset in this tab with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before clicking reset.

APC Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **APC** tab



This tab defines the amplitude and phase control (APC) compensation that can be applied through the selected control mode to the command signal.

- APC increases the command amplitude if it detects roll-off in the feedback signal.
- APC alters the command phase if it detects phase lag in the feedback signal.
- The Station Builder application must enable **APC** to make it available in the Station Manager application. For more information, see "Enable optional compensators" on page 47.

See "About APC" on page 201 for more about this compensation method.

APC Tab

Item	Description
Convergence Rate	Sets how quickly compensation values are applied to converge the feedback and command signals.
Adaptation State	**Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.
Reset	Clears acquired compensation values and restarts the adaptation process. Clicking **Reset** with compensation applied may produce a spike in the feedback signal. Read the Warning that follows this table.

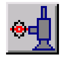
WARNING

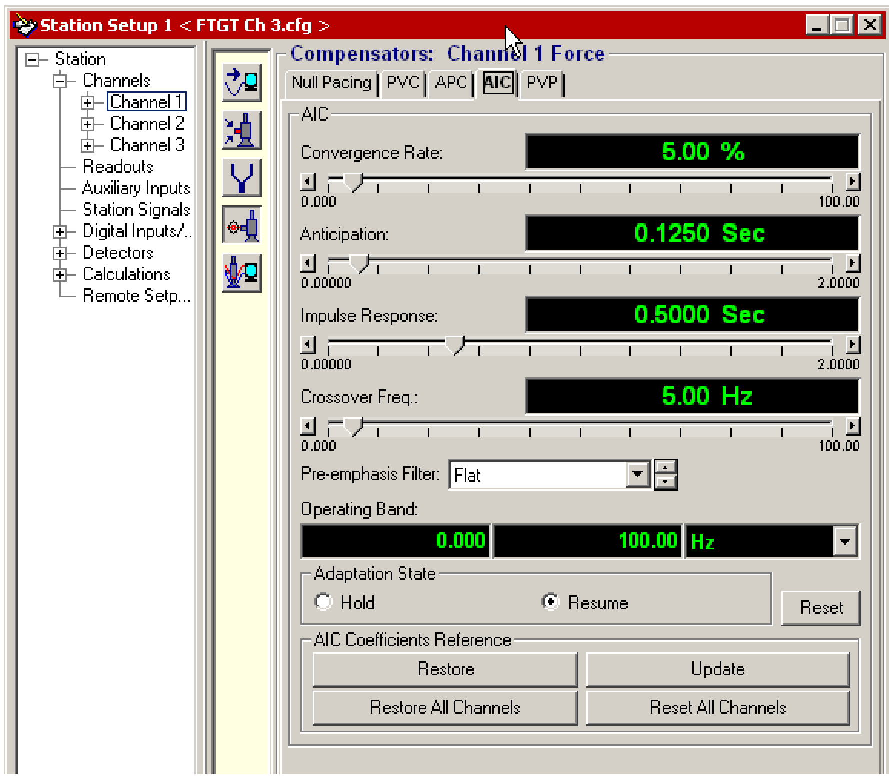
Clicking Reset in this tab with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before clicking reset.

AIC Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **AIC** tab



This tab defines the adaptive inverse control (AIC) compensation that can be applied through the selected control mode to the command signal.

- AIC is a linear compensation technique that senses the frequency content of the drive signal, automatically generates an inverse filter, and then filters the command to achieve the desired response.
- The Station Builder application must enable **AIC** to make it available in the Station Manager application. For more information, see "Enable optional compensators" on page 47.

See "About AIC" on page 204 for more about this compensation method.

AIC Tab (part 1 of 2)

ITEM	DESCRIPTION
Convergence Rate	Sets how quickly compensation values are applied to converge the feedback and command signals.
Anticipation	Sets a time delay between the desired and response signals.
Impulse Response	Sets the length of the adaptive filter, which influences how completely the dynamics of the controller/actuator/specimen combination are cancelled.
Crossover Freq	Sets the crossover frequency. When applying AIC to a dual compensation mode configured in the Station Builder application for **Amplitude Control Only**, set this control to **0**.
Pre-emphasis Filter	Allows selection of required type of pre-emphasis filter. A pre-emphasis filter is used to make the convergence rate constant over all frequencies, by boosting high frequencies and suppressing low frequencies.
Operating Band	Sets the range in which the AIC operates. Frequencies outside this range are considered noise.
Adaptation State	**Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.
Reset	Clears acquired compensation values and restarts the adaptation process. Changing **Anticipation** or **Impulse Response** when the filter is adapting automatically resets all filter coefficients. Clicking **Reset** with compensation applied may produce a spike in the feedback signal. See the Warning that follows this table.
AIC Coefficients Reference	Manages coefficients used in the compensation filter and saved in the parameter set. Coefficients do not display and do not change **AIC** tab values.
Restore	Restores the saved AIC filter coefficients for the selected channel.

AIC Tab (part 2 of 2)

ITEM	DESCRIPTION
Restore All Channels	Restores the saved AIC filter coefficients for all channels.
Update	Updates the coefficient references for the active channel. To save the coefficient references, click **Update** and then save the parameter set.
Reset All Channels	Clears acquired compensation values and restarts the adaptation process on all channels. Clicking **Reset All Channels** with compensation applied may produce a spike in the feedback signals. Read the Warning that follows this table.

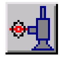
WARNING

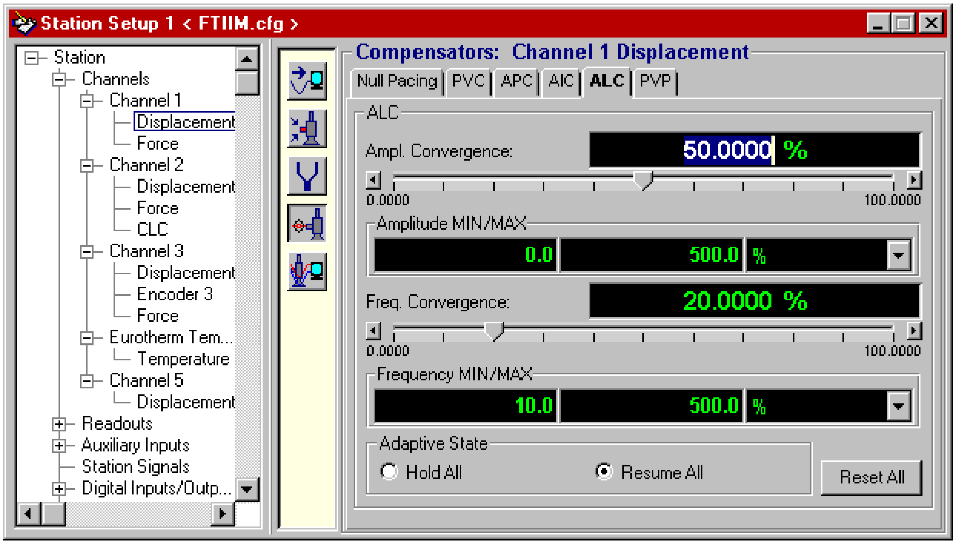
Clicking Reset or Reset All Channels in this tab with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before clicking reset.

ALC Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **ALC** tab



This tab defines the arbitrary end-level (ALC) compensation that can be applied by the selected control mode to the command signal.

- ALC is available only in MultiPurpose TestWare application processes.
- ALC uses a continuously updated matrix which stores compensation factors developed from peak/valley errors to improve the tracking accuracy of spectrum profiles.

See “About ALC” on page 215 for more about this compensation method.

ALC Tab

ITEM	DESCRIPTION
Ampl. Convergence	Sets how quickly compensation values get applied to converge the feedback and command signal amplitudes.
Amplitude MIN/MAX	**Min**—Fixed at 0. **Max**—Sets the factor by which the compensated command's amplitude can exceed the original command's amplitude.
Freq Convergence	Sets how quickly compensation values get applied to converge the feedback and command signal frequencies.
Frequency MIN/MAX	**Min**—Sets the minimum factor by which the compensated command's frequency can exceed the original command's frequency. **Max**—Sets the maximum factor by which the compensated command's frequency can exceed the original command's frequency.
Adaptive State	**Hold All**—Continues to use current values but stops adapting new values. **Resume All**—Adapts and continuously updates compensation values.
Reset All	Clears acquired compensation values and restarts the adaptation process. Clicking **Reset All** with compensation applied may produce a spike in the feedback signal. Read the Warning that follows this table.

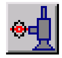
WARNING

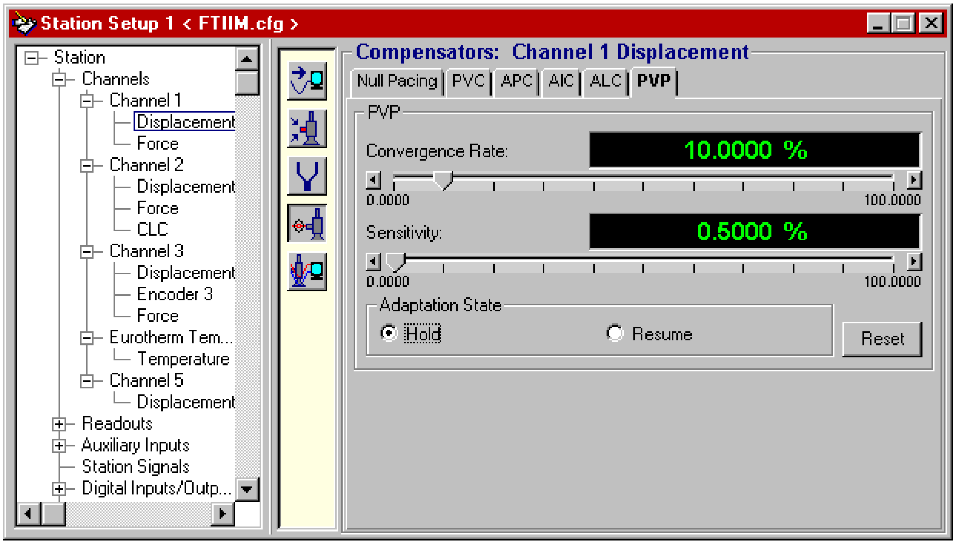
Clicking Reset All in this tab with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before clicking reset.

PVP Tab

Path **Station Setup** window > navigation pane > **Channels** PIDF control mode >  > **PVP** tab



This tab defines the peak/valley phase (PVP) compensation that can be applied by the selected control mode to the command signal.

- PVP compensation alters the command phase to correct for phase lag.
- PVP compensation increases the command amplitude to correct for amplitude roll-off.
- PVP adjusts the mean command level if it detects mean-level divergence in the feedback signal.

Note *The PVP compensator may have difficulty compensating command waveforms below 0.5 Hz.*

See “About PVP” on page 219 for more about this compensation method.

PVP Tab

ITEM	DESCRIPTION
Convergence Rate	Sets how quickly compensation values get applied to converge the feedback and command signal amplitudes.
Sensitivity	Sets how much the feedback signal must change, as a percentage of its peak-to-peak value, before a peak or valley is detected.
Adaptation State	**Hold**—Continues to use current values but stops adapting new values. **Resume**—Adapts and continuously updates compensation values.
Reset	Clears acquired compensation values and restarts the adaptation process. Clicking **Reset** with compensation applied may produce a spike in the feedback signal. Read the Warning that follows this table.

WARNING

Clicking Reset in this tab with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before clicking reset.

Station Setup Window/Sync Current Channel

Clicking the Station Setup **Sync Current Channel** button  applies the current channel and control mode selections on the Station Setup to the function generator. The **Function Generator** slider settings will be updated to reflect this selection.

If the function generator is running or is in group mode, clicking the **Sync Current Channel** button will not make any changes to the function generator.

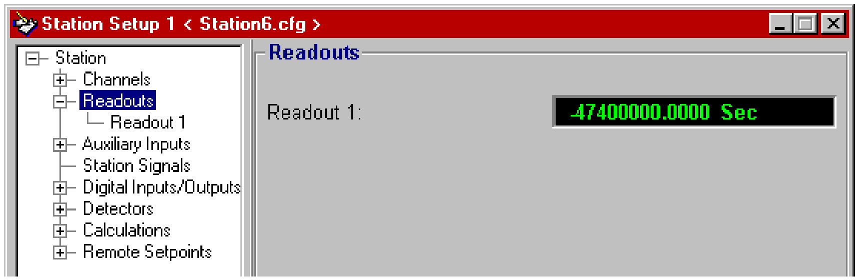
The Station Setup **Sync Current Channel** button can also apply the current Station Setup channel selection to both **Channel** selections on a scope display. First, click the two-state **Sync Station Channel** button  on the Scope Toolbar to set the "sync" state, and then click  on the Station Setup window. Control mode setting will remain the same.

The Sync Current Channel feature effectively "synchronizes" channel selection for the function generator and scope. This feature facilitates the set up and tuning of systems with a large number of channels.

Station Setup Window/Readouts Panels

Readouts Summary Panel

Path **Station Setup** window > navigation pane > **Readouts**

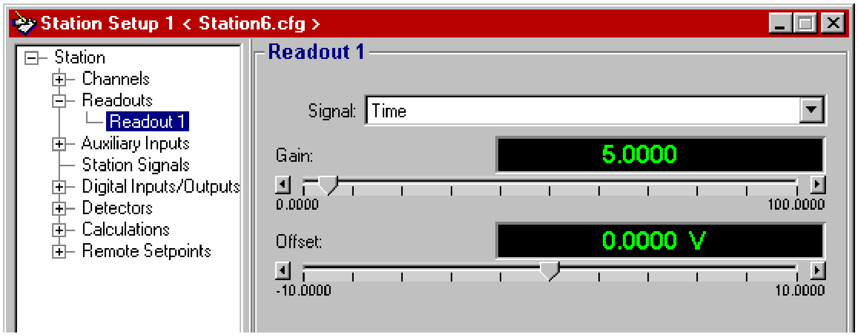


This panel displays the current values of readout signals.

The Station Builder application allocates the resources used to output these readout signals. For more information, "Creating Readouts" on page 69.

Readout Adjust Panel

Path **Station Setup** window > navigation pane > **Readouts** > *Readout n*



This panel defines the output of the selected **Readout**, displayed in the **Readouts Summary** panel shown on “Readouts Summary Panel” on page 358.

Note *With **Gain** = 1 and **Offset** = 0 V (default values): a positive full-scale signal = +10 volts and a negative full-scale signal = -10 volts.*

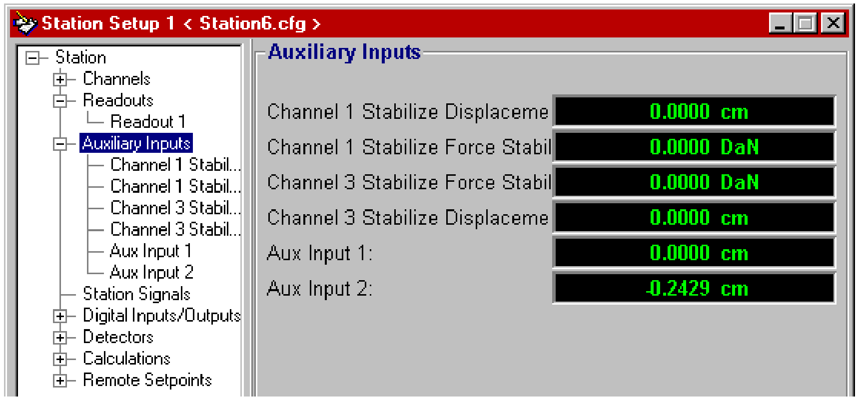
Readout Adjust Panel

ITEM	DESCRIPTION
Signal	Selects the signal to be displayed.
Gain	Sets the amplification applied to the readout signal.
Offset	Sets the offset applied to the readout signal.

Station Setup Window/Auxiliary Inputs Panels

Auxiliary Inputs Summary Panel

Path **Station Setup** window > navigation pane > **Auxiliary Inputs**



This panel displays the current values of auxiliary input signals.

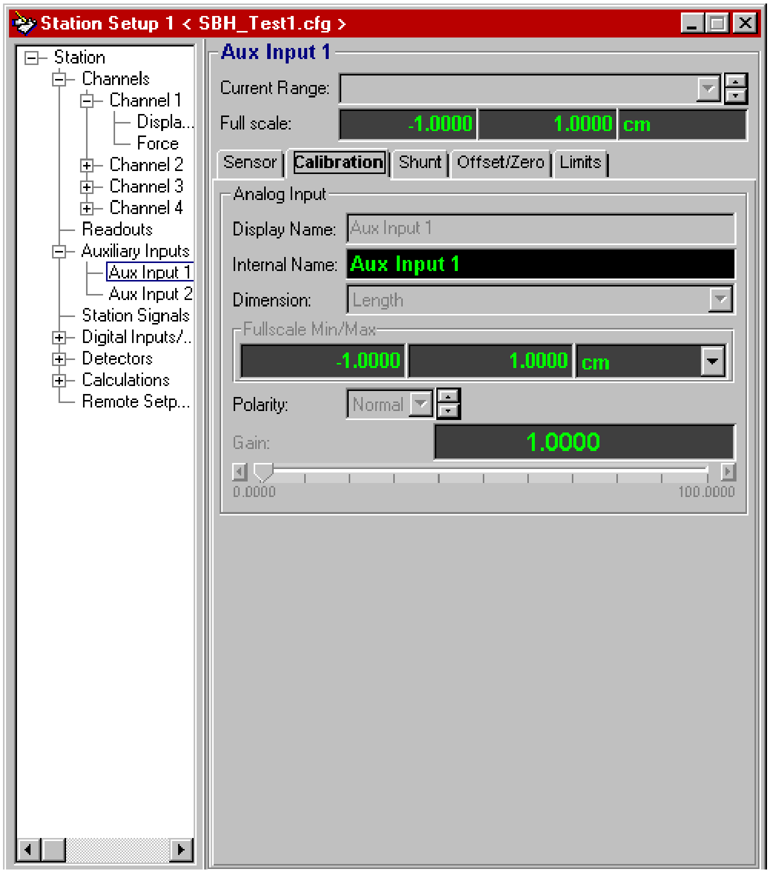
The Station Builder application allocates the resources used to input these signals, typically used for data acquisition. See “Creating Auxiliary Inputs” on page 72 for more information.

If the Station Builder application has created a control mode with stabilization, the **Auxiliary Inputs** panels displays values and controls for this mode’s stabilization signal. See “How to Create a Control Mode Stabilization Signal” on page 65 for more information.

Auxiliary Inputs also displays external command signals.

Auxiliary Inputs Panel Tabs

Path **Station Setup** window > navigation pane > **Auxiliary Inputs** > *Aux Input*



This panel's tabs configure the auxiliary input signals.

The **Auxiliary Inputs** panel tabs have the same controls as the **Inputs** panel tabs used to adjust control mode inputs.

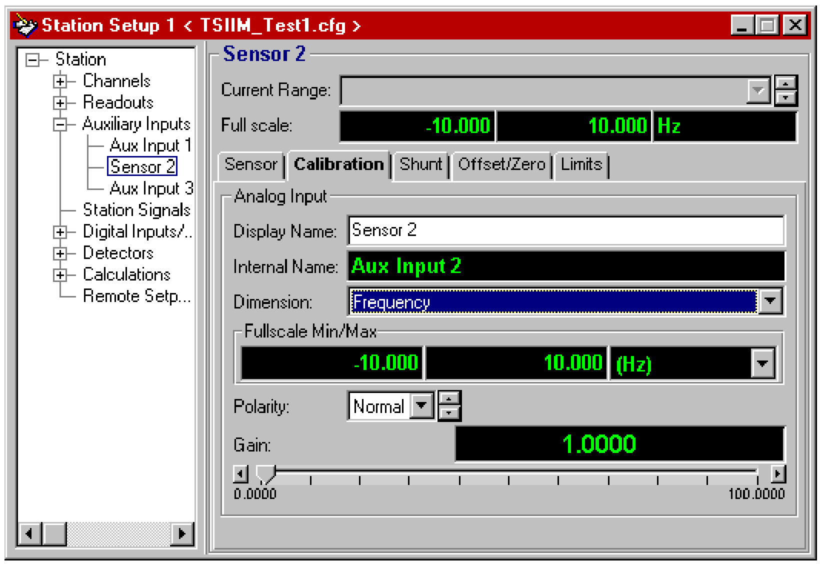
Although not used in control modes, auxiliary inputs require the same setup as control mode inputs to accurately acquire data and perform limit functions.

For more about **Inputs** panel tabs, see "Station Setup Window/Inputs Panel Tabs" on page 310.

Reconfigurable signals

As an option, you can define certain auxiliary inputs as reconfigurable. If you check the **Reconfigurable** checkbox for an auxiliary input in Station Builder, the signal name and dimension can be changed in Station Manager, without returning to Station Builder. You must be at the **Configuration** access level in Station Manager to make these signal configuration changes.

You can use the **Calibration** tab to make signal name and dimension changes for a reconfigurable signal.

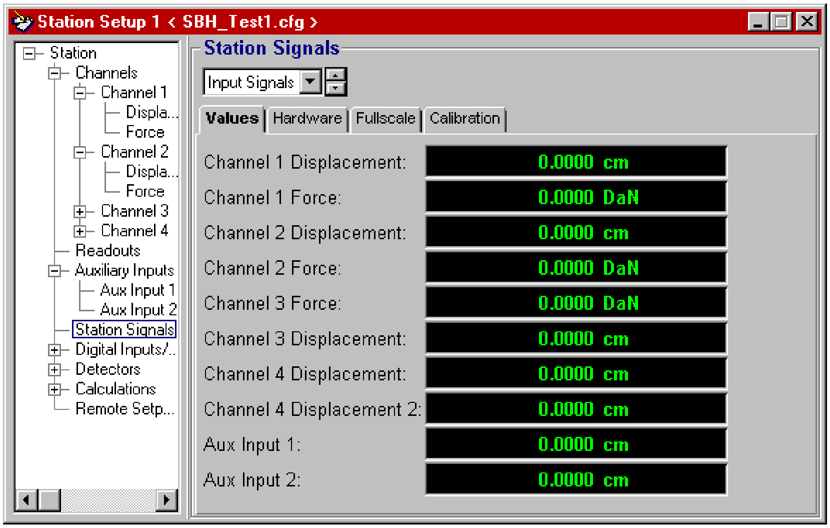


Note *When you change a signal name, an information message will be logged (e.g., "The Display Name for Aux Input 2 has been changed").*

Station Setup Window/Station Signals Panel Tabs

Values Tab

Path **Station Setup** window > navigation pane > **Station Signals** > **Values** tab



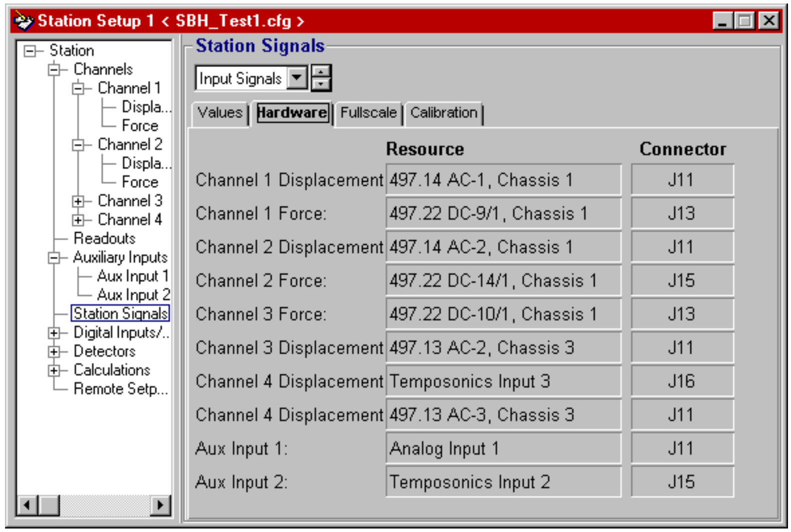
This tab displays current values for signals in the selected **Signal List**.

The Station Manager application's **Channel Options** window's **Signal Lists** tab edits the signals included in a **Signal** list. For more information, see "Signal Lists Tab" on page 432.

For more about displaying and editing signals, see "About the Station Signals Panel" on page 176.

Hardware Tab

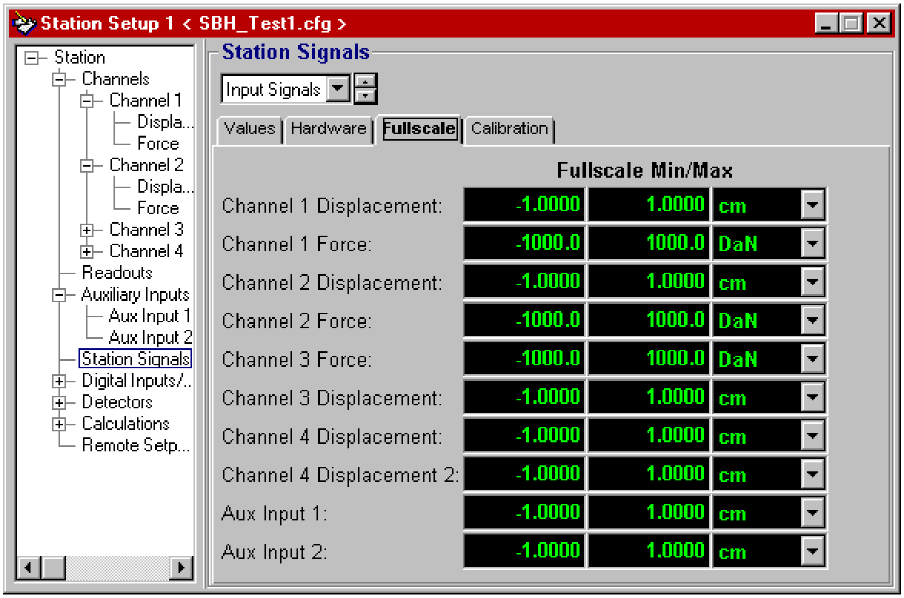
Path **Station Setup** window > navigation pane > **Station Signals** > **Hardware** tab



This tab displays **Resource** and **Connector** information for the signals in the selected **Signal List**.

Fullscale Tab

Path **Station Setup** window > navigation pane > **Station Signals** > **Fullscale** tab

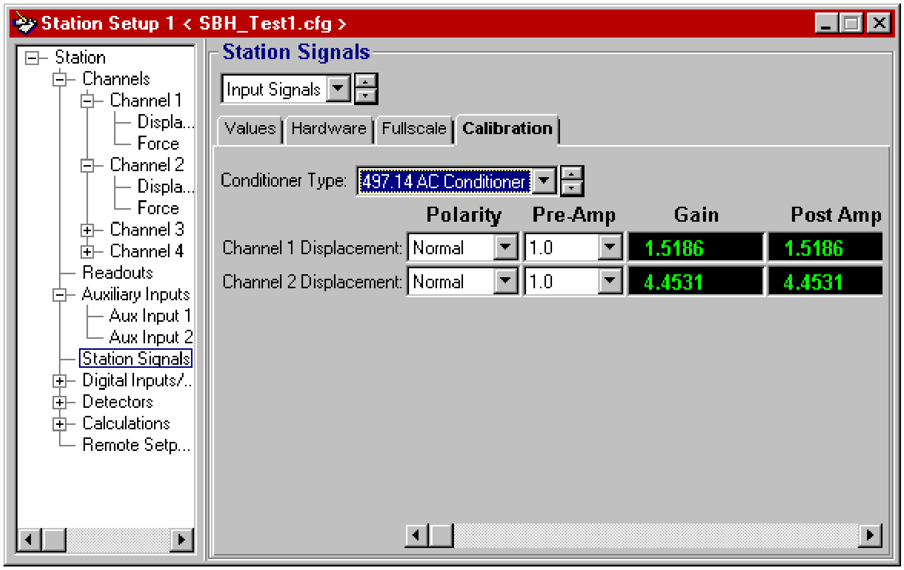


This tab displays the **Fullscale Min** and **Max** ranges for each signal in the selected Signal list.

Note *The values and dimensions on this tab are editable at the* ***Calibration*** *access level.*

Calibration Tab

Path **Station Setup** window > navigation pane > **Station Signals** > **Calibration** tab



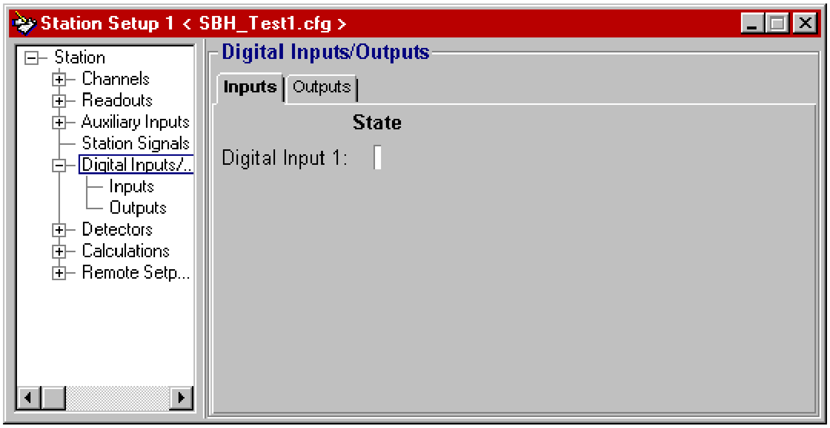
This tab displays conditioner values for each selected **Conditioner Type** in the Signal list.

Note *The values and dimensions on this tab are editable at the **Calibration** access level.*

Station Setup Window/Digital Input/Outputs Panel Tabs

Inputs Summary Tab

Station Setup window > navigation pane > **Digital Inputs/Outputs** > **Inputs** tab

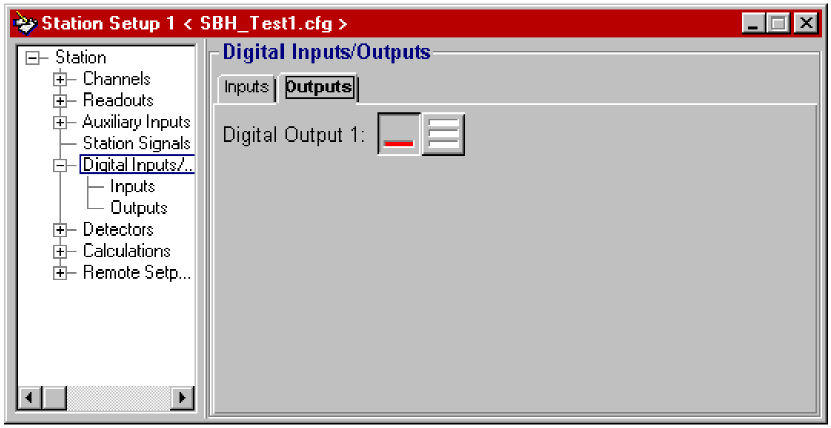


This tab summarizes digital input status. When an input triggers, its **State** indicator turns green.

The Station Builder application allocates the resources used for digital inputs. For more information. see “Creating Digital Inputs” on page 70.

Outputs Summary Tab

Station Setup window > navigation pane > **Digital Inputs/Outputs** > **Outputs** tab



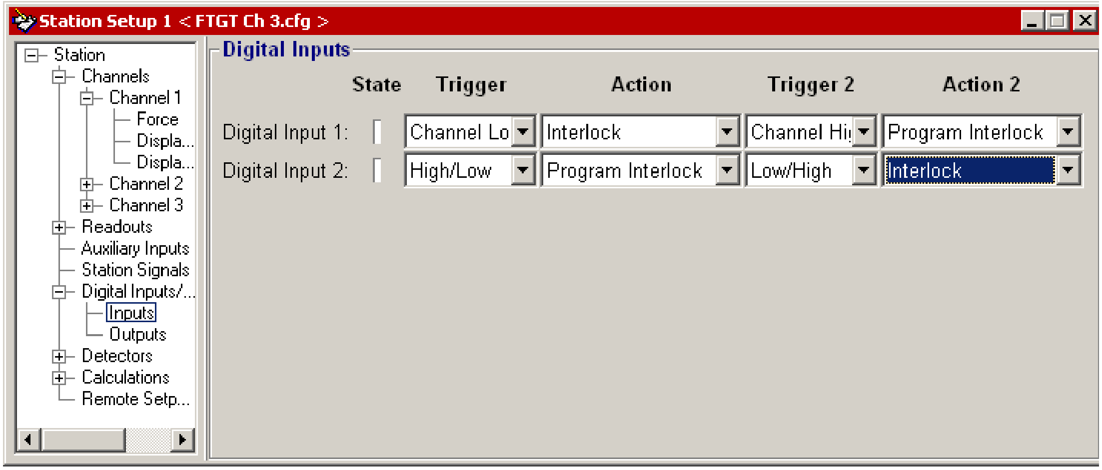
This tab displays digital output status and provides a way to test these outputs:

-  turns green if a **Digital Output** is set.
- To set a **Digital Output**, press its .

The Station Builder application allocates the resources used for digital outputs. For more information, see “Creating Digital Outputs” on page 71.

Digital Inputs Panel

Station Setup window > navigation pane > **Digital Inputs/Outputs** > **Inputs**



This panel defines each digital input's trigger(s) (**Trigger** and/or **Trigger 2**) and their resulting actions.

Note *__Channel Low__ and __Channel High__ trigger modes do not support the following digital input actions: __Program Stop__, __Program Hold,__ and all custom actions.*

Digital Inputs Panel (part 1 of 2)

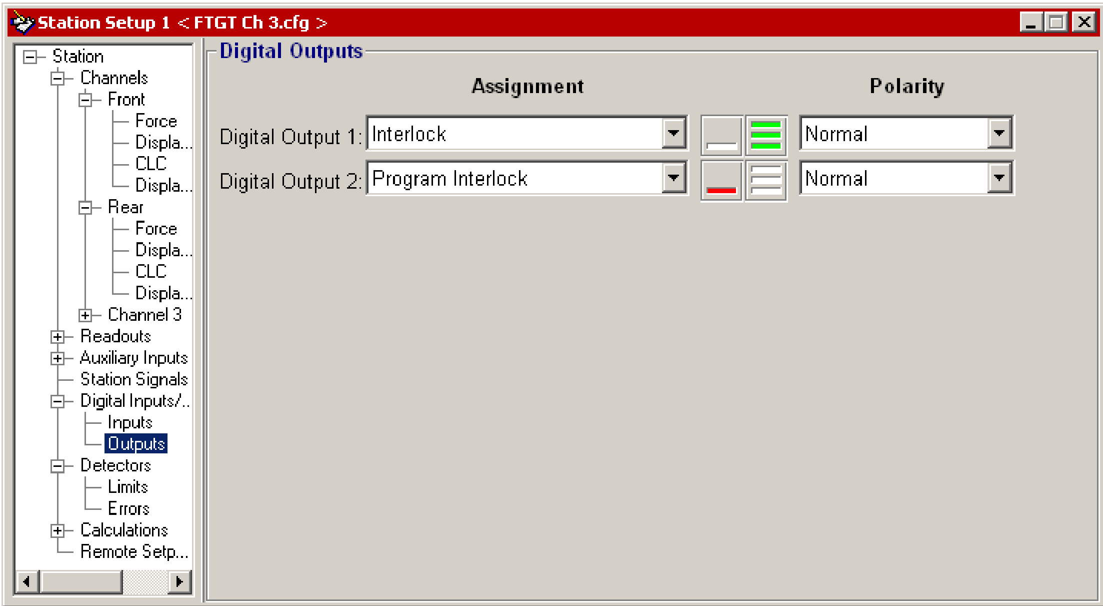
ITEM	DESCRIPTION
State	This indicator is green if the digital input is high and white if the digital input is low.
Trigger or **Trigger 2**	Sets the change in the digital input signal's state needed to trigger **Action** or **Action 2**. **High/Low**—Triggers when the input goes from a high state to a low state. **Low/High**—Triggers when the input goes from a low state to a high state. **Either**—Triggers when the input either goes from a low state to a high state or from a high state to a low state. **Channel Low**—Triggers when the channel goes low and remains triggered as long as the channel stays low. **Channel High**—Triggers when the channel goes high and remains triggered as long as the channel stays high. **None**—Disables the **Action**.

Digital Inputs Panel (part 2 of 2)

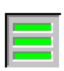
ITEM	DESCRIPTION
Action or **Action 2**	Sets a response to **Trigger** or **Trigger 2**: **Disabled**—No action occurs. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. **Channel Low** and **Channel High** trigger modes do not support this action. **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. **Channel Low** and **Channel High** trigger modes do not support this action. **Custom Action**—Executes an action defined by you in the **Event-Action Editor** window. See "Event-Action Editor Window" on page 448 for more about this window. **Channel Low** and **Channel High** trigger modes do not support this action.

Digital Outputs Panel

Station Setup window > navigation pane > **Digital Inputs/Outputs** > **Outputs**



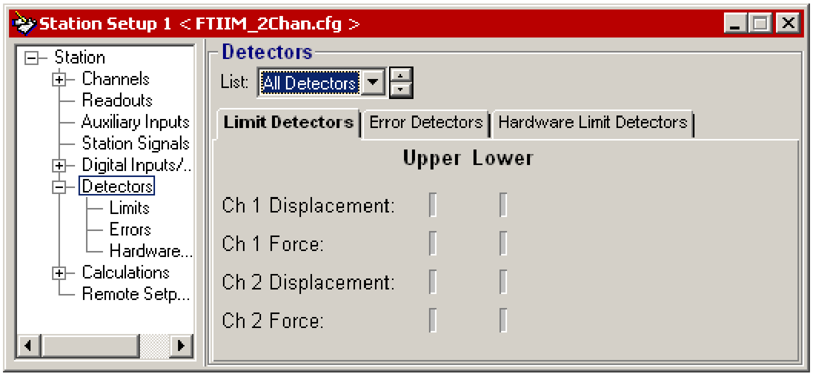
Digital Outputs Panel

ITEM	DESCRIPTION
Assignment	Displays and allows you to assign a resource for each signal output to external logic devices and switches.
Indicator/Button	 Red indicates that the output is off. If the output signal resource is undefined, click this button to turn off the output signal.  Green indicates that the output is on. If the output signal resource is undefined, click this button to turn on the output signal.
Polarity	Displays and allows you to set the polarity of the output signal.

Station Setup Window/Detectors Panel Tabs

Detectors Summary Tabs

Path **Station Setup** window > navigation pane > **Detectors** > **Limit Detectors** tab or **Error Detectors** tab



These tabs summarize limit and error detector status.

- Limit detectors monitor input feedback signals. Actions can be set to occur when signals exceed user-defined limits.
- Error detectors monitor the difference (error) between command and feedback signals. Actions can be set to occur when errors exceed user-defined limits.
- Hardware limit detectors (FlexTest IIm systems only) monitor the difference between an associated transducer output value and preset upper/lower limit values

For more information, see the following pages and "About Detectors" on page 223.

The **Limit Detectors** and **Hardware Limit Detectors** tabs have **Upper** and **Lower** indicators. The **Error Detectors** tab has **Inner** and **Outer** indicators.

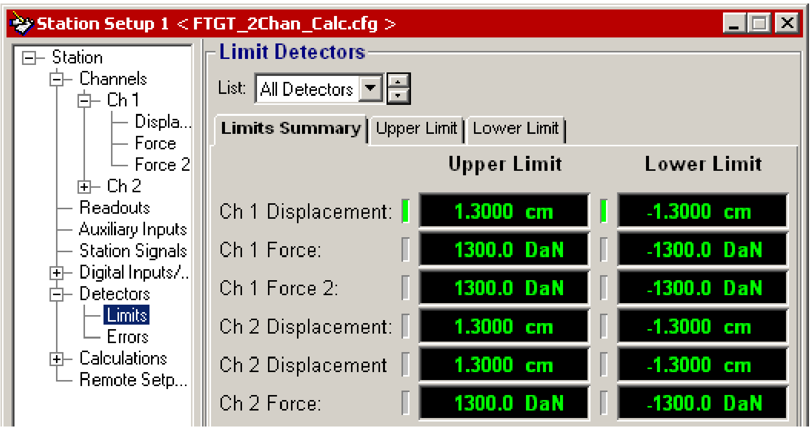
Use **List** to select the detectors you want to display. You can choose to display the status of all system detectors (**All Detectors**) or detectors on a selected system channel.

Detectors Summary Tabs

ITEM	DESCRIPTION
Upper/Lower or **Inner/Outer**	Colors indicate the detector's status. **Gray**—The detector's **Action** is set to **Disabled**. **White**—The detector's **Action** is set to **Indicate**. **Green**—The detector's **Action** is set to **Station Power Off**, **Interlock**, **Program Interlock**, **Program Stop**, **Program Hold** or a user-defined **Custom Action**. **Red**—A signal tripped the detector's limit.

Limits Summary Tab

Path **Station Setup** window > navigation pane > **Detectors** > **Limits** > **Limits Summary** tab



This tab summarizes the values and status of the selected limit detectors.

Use **List** to select the limit detectors you want to display. You can choose to display the status of all system limit detectors (**All Detectors**) or limit detectors on a selected system channel.

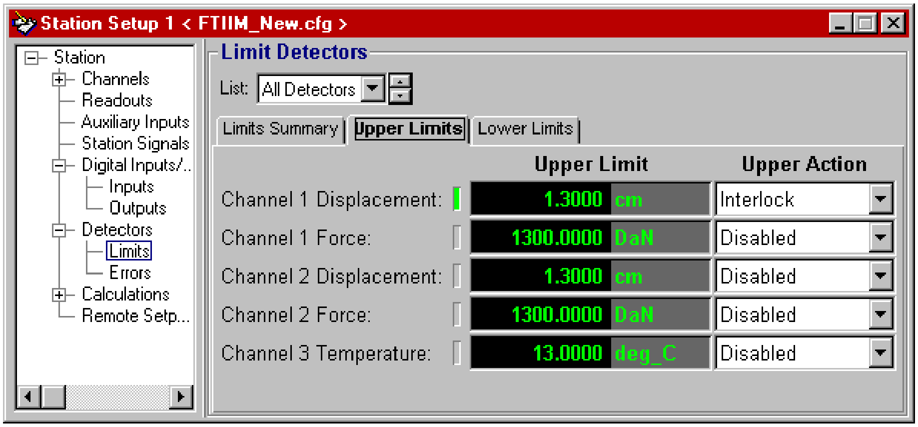
Note *The **All Detectors** list cannot be edited and is only updated when the station configuration changes.*

Limits Summary Tab

ITEM	DESCRIPTION
Upper Limit	Displays the input signal's most positive limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.
Lower Limit	Displays the input signal's most negative limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.

Upper Limits /Lower Limits Tabs

Path **Station Setup** window > navigation pane > **Detectors** > **Limits** > **Upper Limits** tab or **Lower Limits** tab



These two tabs set detector **Upper Limits** and **Lower** and also define the resulting **Action** when an input signal exceeds a limit.

These two tabs are similar so only the **Upper Limits** tab is shown.

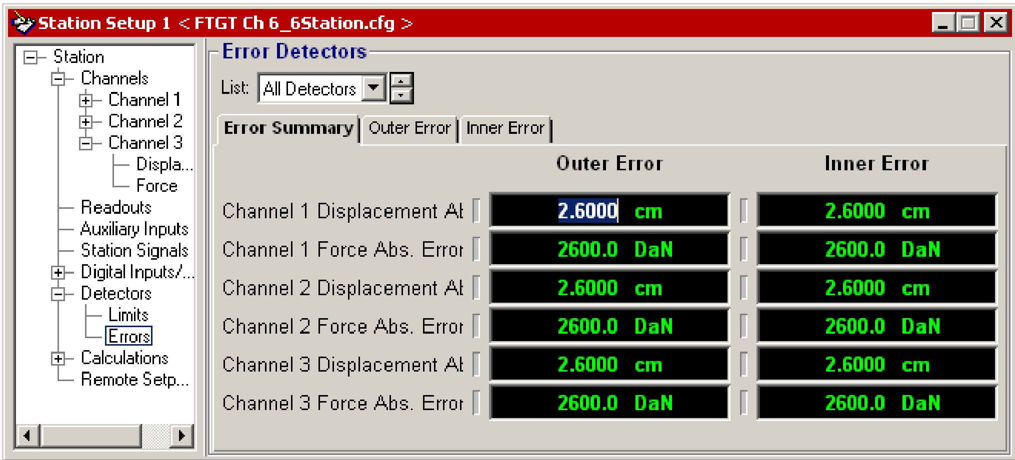
Use **List** to select the upper or lower limits you want to display. You can choose to display upper or lower limits for all system detectors (**All Detectors**) or for a selected system channel.

Upper Limits/Lower Limits Tab

ITEM	DESCRIPTION
Limits	**Upper Limit**—Sets the input signal's most positive limit. An **Action** can occur if the signal exceeds this limit. **Lower Limit**—Sets the input signal's most negative limit. An **Action** can occur if the signal exceeds this limit.
Action	Sets the test station's **Action** when an input signal exceeds a limit: **Disabled**—No action occurs. This setting grays out the **Limit** indicator. **Indicate**—Writes a message to the **Message Log**. This setting turns the **Limit** indicator white. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the **Limit** indicator green. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the **Limit** indicator green. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the **Limit** indicator green. **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. This setting turns the **Limit** indicator green. See "Event-Action Editor Window" on page 448 for more about using this window. A tripped limit turns an enabled detector's **Limit** indicator red.

Error Summary Tab

Path **Station Setup** window > navigation pane > **Detectors** > **Errors** > **Error Summary** tab



This tab summarizes the values and status of all error detectors.

Error detection uses **Absolute Error** signals. These signal values are in engineering units and are all positive.

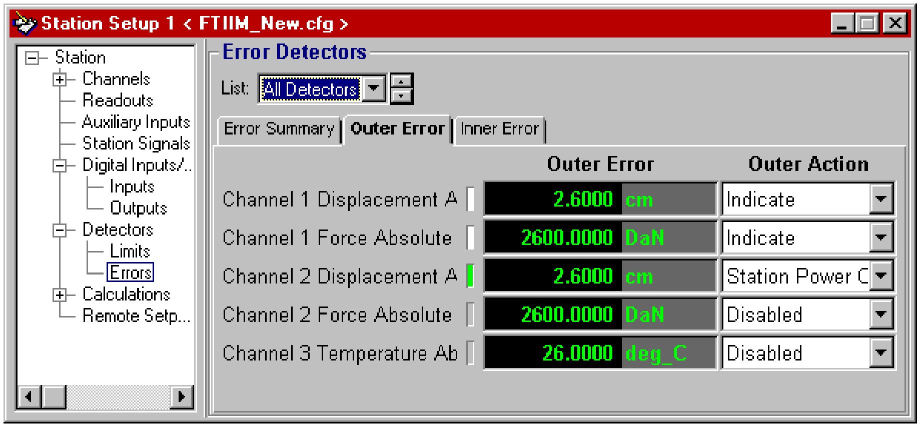
Use **List** to select the error detectors you want to display. You can choose to display the status of all system error detectors (**All Detectors**) or error detectors on a selected system channel.

Error Summary Tab

ITEM	DESCRIPTION
Outer Error	Displays the error signal's outer limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.
Inner Error	Displays the error signal's inner limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.

Outer Error/Inner Error Tabs

Path **Station Setup** window > navigation pane > **Detectors** > **Errors** > **Outer Error** tab or **Inner Error** tab



These two tabs set detector **Outer Error** and **Inner Error** limits and also define the resulting **Action** when an error signal exceeds a limit.

These two tabs are similar so only the **Outer Error** tab is shown.

Use **List** to select the outer or inner error limits you want to display. You can choose to display outer or inner error limits for all system detectors (**All Detectors**) or for a selected system channel.

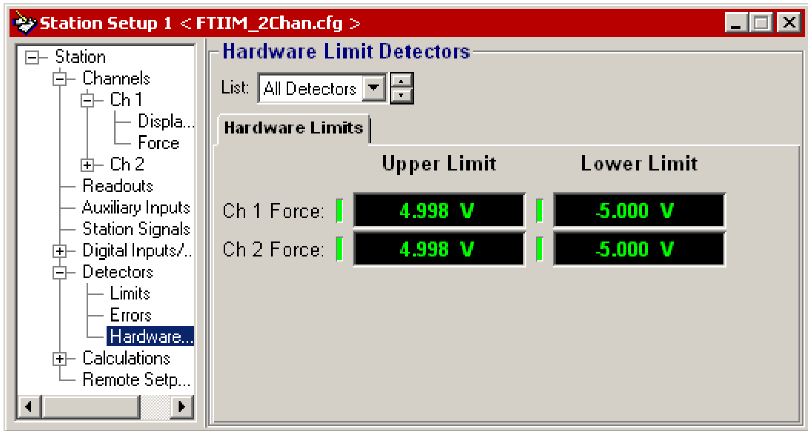
Outer Error/Inner Error Tabs

ITEM	DESCRIPTION
Limits	**Outer Error**—Sets the error signal's outer limit. An **Action** can occur if the signal exceeds this limit. **Inner Error**—Sets the error signal's most inner limit. An **Action** can occur if the signal exceeds this limit. Error detection uses the **Abs. Error** signal. This signal's values are in engineering units and all values are positive.
Action	Sets the test station's **Action** when an input signal exceeds a limit: **Disabled**—No action occurs. This setting grays out the **Limit** indicator. **Indicate**—Writes a message to the **Message Log**. This setting turns the **Limit** indicator white. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the **Limit** indicator green. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the **Limit** indicator green. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the **Limit** indicator green. **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel.This setting turns the **Limit** indicator green. **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. This setting turns the **Limit** indicator green. See "Event-Action Editor Window" on page 448 for more about using this window. A tripped limit turns an enabled detector's **Limit** indicator red.

Hardware Limits Tab

Path

Station Setup window > navigation pane > **Detectors** > **Hardware Limits** tab



This tab, provided on **FlexTest IIm systems only**, displays and allow you to set the upper and lower limit values of selected hardware limit detectors. The status of each limit detector value is also displayed here. See “About Hardware Limit Detectors” on page 231 for more information.

Use **List** to select the hardware limit detectors you want to display. You can choose to display values for all system hardware limit detectors (**All Detectors**) or hardware limit detector values on a selected system channel.

Hardware limits

A limit detector on each 497 conditioner continuously compares its associated transducer output value to preset upper and lower limit values.

When a conditioner limit is exceeded, the limit detector is enabled. The system responds by sending a digital request to the control system for an emergency stop.

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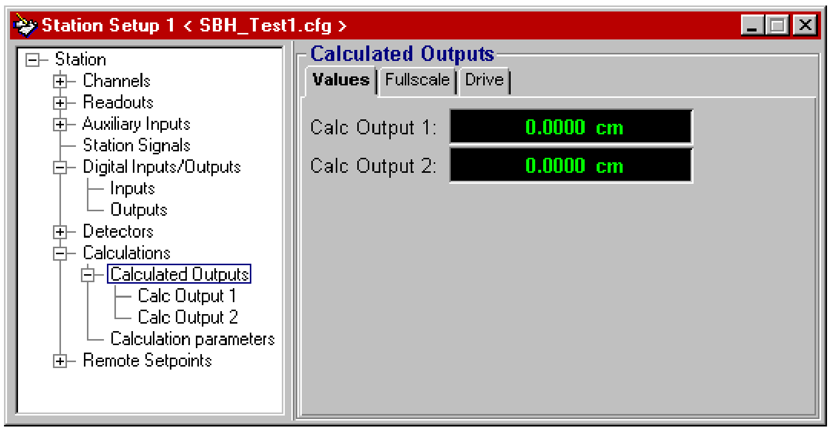
Hardware Limits Tab

ITEM	DESCRIPTION
Upper Limit	Displays the input signal's most positive limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.
Lower Limit	Displays the input signal's most negative limit. A detector action can occur if the signal exceeds this limit. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.

Station Setup Window/Calculations Panels

Calculated Outputs Panel/Values Tab

Path **Display** menu > **Station Setup** > **Station Setup** window **>** navigation pane **> Calculations** >**Calculated Outputs** > **Values** tab



This panel displays the current values of all calculated output signals.

For more about defining calculations, see "Calculation Editor Window" on page 459.

WARNING

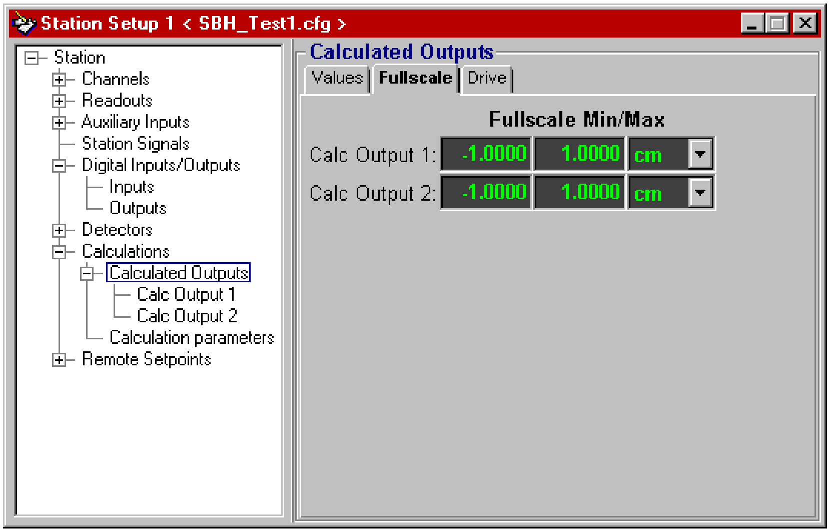
For systems with calculated outputs and multiple independent HSMs, turning on only one HSM can result in unexpected or exaggerated actuator motion.

Unexpected or exaggerated actuator motion can injure anyone in its path.

For these systems, always use the **All Off**, **All Low**, and **All High** buttons on the **Station Controls** panel for hydraulic control.

Calculated Outputs Panel/Fullscale Tab

Path **Display** menu > **Station Setup** > **Station Setup** window > navigation pane > **Calculations** > **Calculated Outputs** > **Fullscale** tab

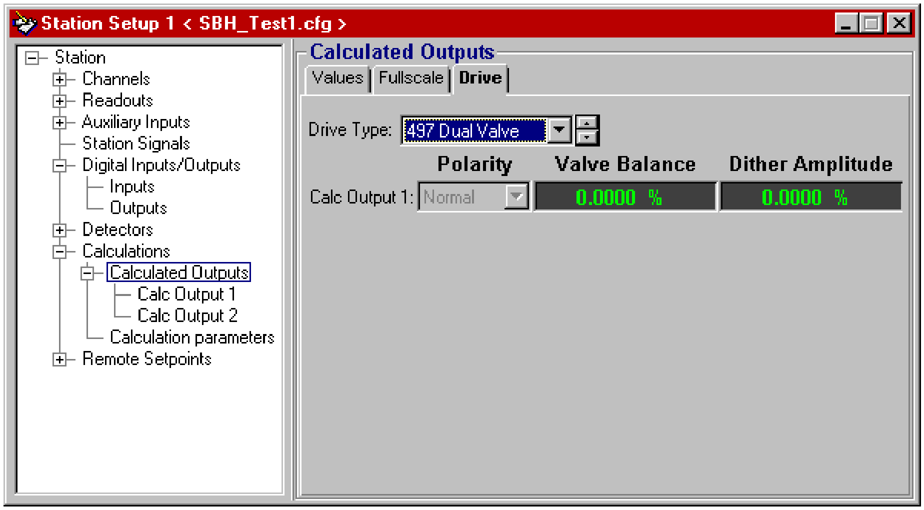


This tab displays the **Fullscale Min** and **Max** ranges for each calculated output signal.

Note *The **Fullscale Min/Max** values on this tab only editable at the **Calibration** and **Configuration** access level.*

Calculated Outputs Panel/Drive Tab

Path **Display** menu > **Station Setup** > **Station Setup** window **>** navigation pane **> Calculations** >**Calculated Outputs** > **Drive** tab



This tab displays drive signal output parameters for the selected calculated output signal(s).

Note *Drive parameter values are not editable at the* ***Operator*** *access level.*

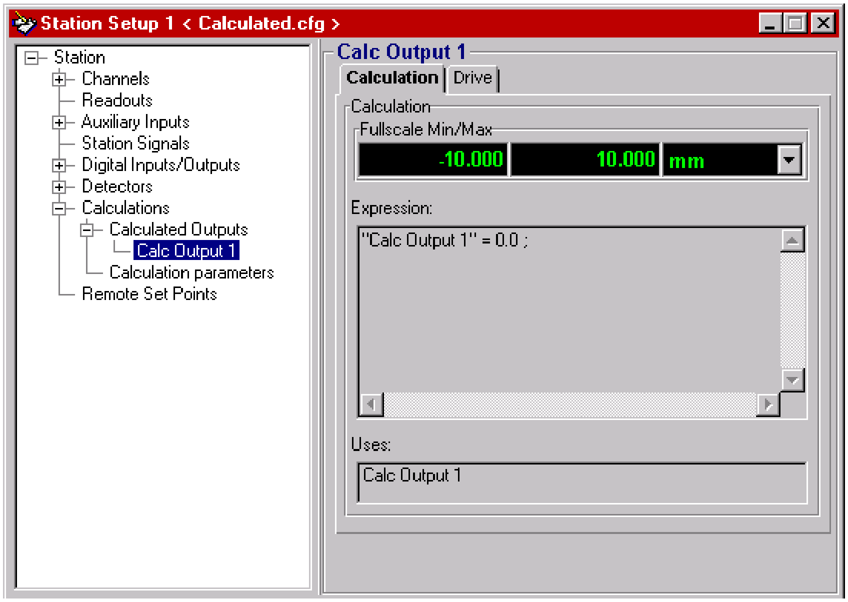
Drive Tab

ITEM	DESCRIPTION
Polarity	Sets the polarity of the valve drive signal to **Normal** or **Invert**. **Polarity** cannot be changed with station pressure on.
Valve Balance	Compensates for minor mechanical imbalances in the servovalve.
Dither Amplitude	Adjusts the amplitude of the dither signal, a small high frequency signal that keeps the servovalve from sticking.

Calculated Output/Calculation Tab

Path

Display menu > **Station Setup** > **Station Setup** window > navigation pane > **Calculations** >**Calculated Outputs** > *Calculated Output n* > **Calculation** tab



This tab displays the expression used to produce the selected calculated output's drive signal.

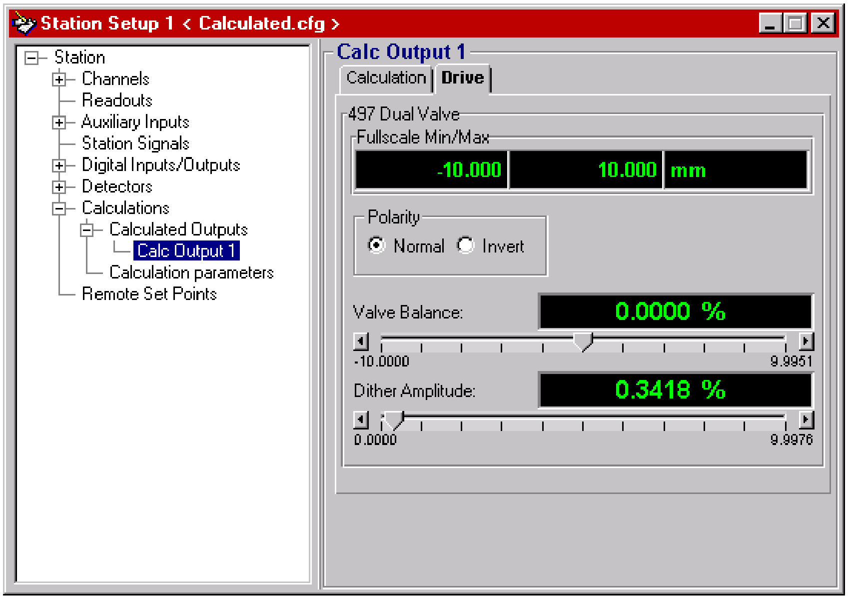
For more about defining calculations, see "Calculation Editor Window" on page 459.

Calculation Tab

ITEM	DESCRIPTION
Fullscale Min/Max	Specifies the selected output's full-scale minimum and maximum values. The result of this calculation gets clipped to these values.
Expression	Displays the formula used to produce the output. Use the **Calculation Editor** window to define the formula.
Uses	Displays a list of the parameters and signals that are used within this expression.

Calculated Output/Drive Tab

Path **Display** menu > **Station Setup** > **Station Setup** window > navigation pane > **Calculations** >**Calculated Outputs** > *Calculated Output n* > **Drive** tab



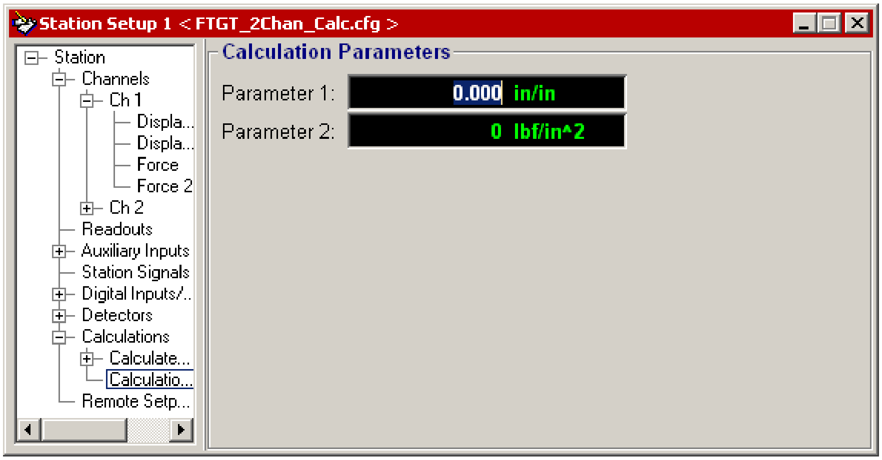
This tab configures the drive signals of a calculated output channel. This tab's contents vary with the type of hardware used. See page 327 through page 329 for additional information.

Drive Tab

ITEM	DESCRIPTION
Fullscale Min/Max	Displays the valve driver's full minimum and maximum output values.
Polarity	Sets the polarity of the valve drive signal to **Normal** or **Invert**. **Polarity** cannot be changed with station pressure on.
Valve Balance	Compensates for minor mechanical imbalances in the servovalve.
Dither Amplitude	Adjusts the amplitude of the dither signal, a small high frequency signal that keeps the servovalve from sticking.

Calculation Parameters Panel

Path **Display** menu > **Station Setup** > **Station Setup** window > navigation pane > **Calculations** > **Calculation Parameters**



This panel summarizes the current values used in calculated parameters.

The **Calculation Editor** window's access level setting determines a user's ability to change these values.

WARNING

Small parameter changes can produce large control loop changes, resulting in violent actuator actions.

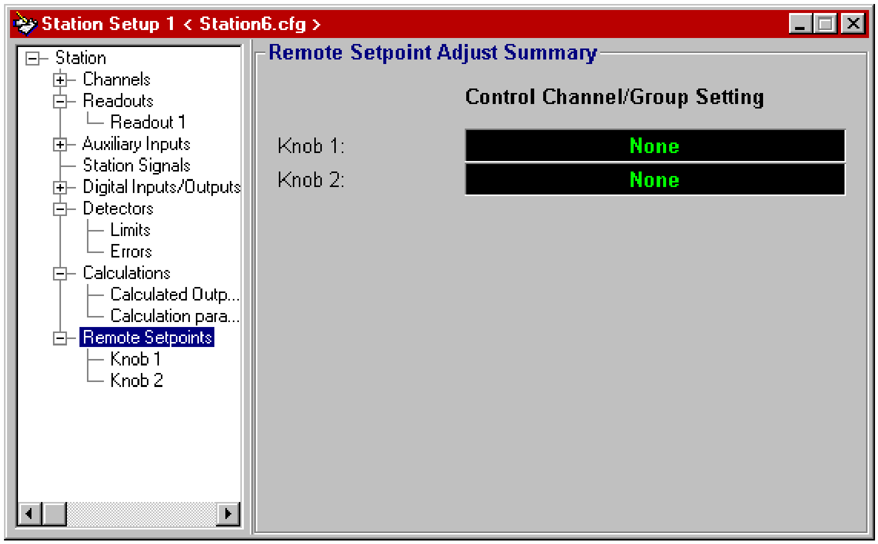
Violent actuator movement can result in injury and equipment damage.

Use care in changing parameters.

For more about defining parameters, see "Parameters Definition Panel" on page 477.

Station Setup Window/Remote Setpoints Panels

Path **Station Setup** window > navigation pane > **Remote Setpoints**



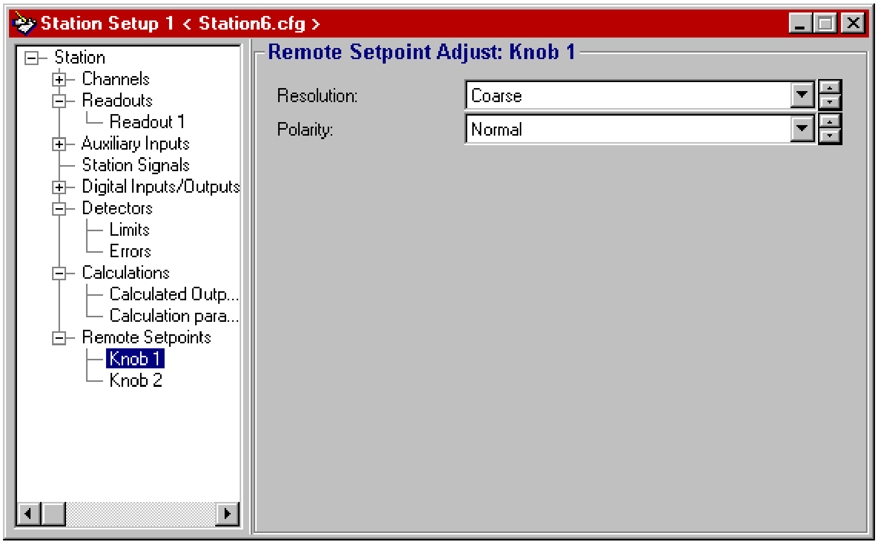
This tab summarizes the **Control Channel** or **Group Setting** assignment of knobs on the **Remote Setpoint Adjust** (RSA) box.

For more information, see "About the Optional Remote Setpoint Adjust" on page 258.

- An RSA box allows actuator setpoints to be remotely adjusted, away from the Test Station's computer screen.
- The Station Manager application's **Remote Setpoint Adjust** window assigns channel and control modes to each knob. For more about this window, see "Remote Setpoint Adjust Window" on page 515.
- The Station Builder application assigns the resources used by the RSA. See "Setting Up Remote Setpoint Adjust" on page 75.

Remote Setpoint Knob Panel

Path **Station Setup** window > navigation pane > **Remote Setpoints** > *Knob n*



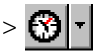
This panel sets knobs' **Resolution** and **Polarity**.

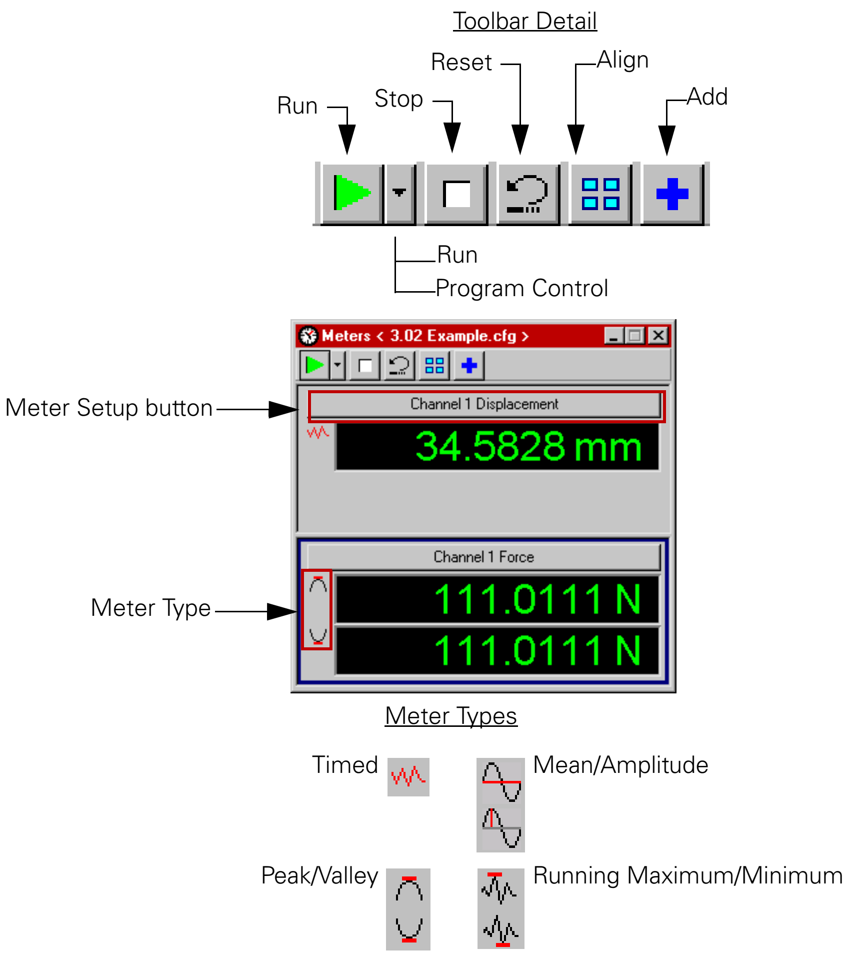
Remote Setpoint Knob Panel

ITEM	DESCRIPTION
Resolution	**Fine**—Knob movements produce small actuator movements. **Medium**—Knob movements produce moderate actuator movements. **Coarse**—Knob movements produce large actuator movements.
Polarity	**Normal**—A clockwise knob movement typically extends the actuator. **Invert**—A counterclockwise knob movement typically retracts the actuator.

Meters Window

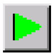
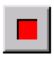
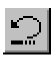
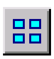
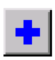
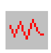
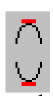
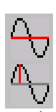
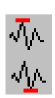
Path **Display** menu > **Meters**

Station Manager window toolbar > 



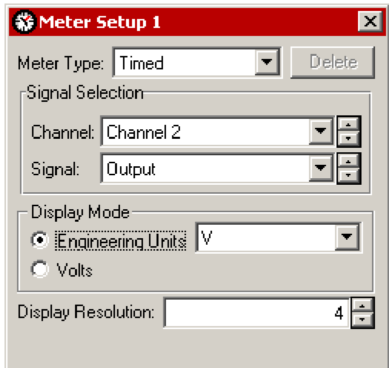
This window provides digital voltmeter displays of station signals. You can create up to 16 meters by successively clicking on the Add button on the **Meters** window toolbar. If a second **Meters** window is displayed, the total number of meters added between the two **Meters** windows is limited to 16. See “About Meters” on page 172 for more about using meters.

Meters Window

Item	Description
Meter toolbar	Controls the operation of all displayed meters.
	Run—Starts all meters. Program Control—The **Station Manager** window's **Station Controls** panel **Run** and **Stop** buttons start and stop the meters. Starting a program resets all meters.
	Stops updating all meters.
	Resets all meters.
	Switches meter alignment in the **Meters** window between various formats.
	Adds a meter to the **Meters** window. Up to 16 meters can be displayed in a **Meters** window. Very large individual meters will limit the total meters that can be displayed.
Meter Setup button	Displays the **Meter Setup** window. The button's legend identifies the signal being monitored.
Meter Types	Identifies the meter type selected.  Displays signal's current value.  Displays the highest peak value and the lowest valley value for each cycle monitored.  Displays the midpoint value and the difference between the peak and valley values for each cycle monitored.  Displays the highest and lowest values reached while the meter is running.

Meter Setup Window

Path **Meters** window > Meter Setup button



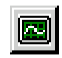
This window defines the meters displayed in the **Meters** window.

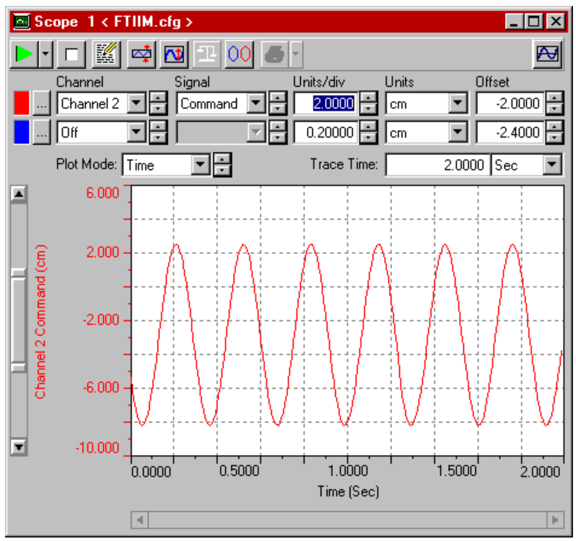
Meters Setup Window

ITEM	DESCRIPTION
Meter Type	Specifies a meter type of **Timed**, **Peak/Valley**, **Mean/Amplitude**, or **Running Max/Min**.
Delete	Deletes the current meter. This button is disabled when only one meter is left.
Signal Selection	Selects the signal monitored by the meter.
Channel	Specifies the channel whose signals can be selected for monitoring.
Signal	Specifies the channel signal selected for monitoring.
Display Mode	Selects a meter readout in **Engineering Units** or **Volts**. When **Engineering Units** is selected, the meter's display units changes to match the type of signal selected.
Display Resolution	Sets the number of digits the meter displays, from one to fifteen.
Sensitivity	Peak/Valley and Mean/Amplitude meters only—Sets the amount that the signal must change before the meter updates.

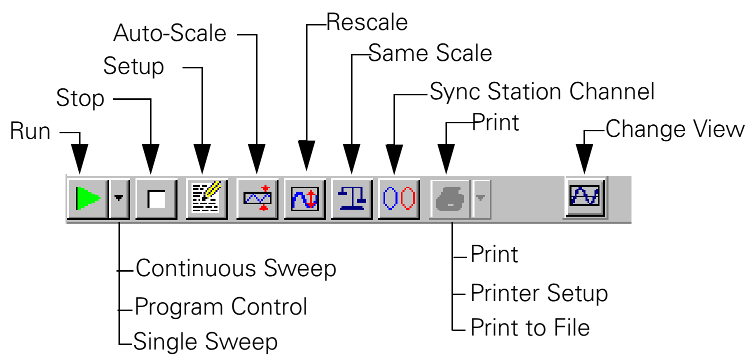
Scope Window

Path **Display** menu > **Scope**

Station Manager window toolbar > 



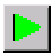
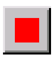
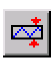
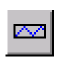
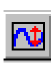
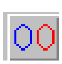
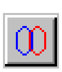
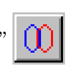
Toolbar Detail



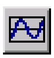
Use this window to plot signals against time, frequency, and signals against each other. You can create another scope by clicking **Create Scope** on the **Scope** icon pull-down menu. **Scope 1** identifies the first scope window; **Scope 2** identifies the second scope window.

For information about using the controls described in this section, see "About the Scope" on page 159.

Scope Window (part 1 of 2)

ITEM	DESCRIPTION
toolbar	Controls scope operation.
	Starts the scope trace. **Continuous Sweep**—The scope traces the signals continuously. This is the scope's default setting. **Program Control**—The **Station Manager** window's **Station Controls** panel **Run** and **Stop** buttons start and stop the scope. **Single Sweep**—The scope traces signals for a single pass and stops.
	Stops the scope trace.
	Displays the **Setup for Scop**e window. See "Setup for Scope Window" on page 398 for more information.
	Continuously adjusts the scope to accommodate increasing signal amplitudes.  indicates auto-scaling has been applied.
	Adjusts the scope to accommodate increased or decreased signal amplitudes.
	Applies the first Y axis **Units/Div** to the second Y axis' **Units/Div** when the **Plot Mode** is **Time**.  indicates same scale has been applied.
 	Setting this two-state button to "sync"  allows you to assign the control channel currently selected on Station Setup to both scope **Channel** selections. To assign this channel, you must click the **Sync Current Channel** button on the Station Setup window The control mode **Signal** selections will remain as currently selected. If the scope is in A/B plot mode, this button will not work. See "Station Setup Window/Sync Current Channel" on page 357 for more information.

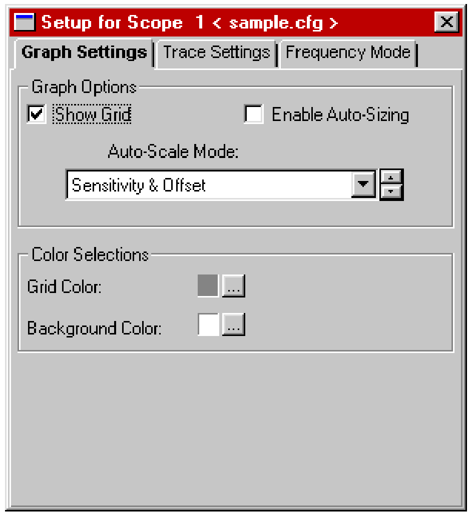
Scope Window (part 2 of 2)

ITEM	DESCRIPTION
	Stopping the scope makes the print options available. **Print**—Prints a copy of the scope trace. **Printer Setup**—Displays a **Print Setup** window specific to your printer. **Print to File**—Prints the scope trace to a Windows Enhanced Metafile file (extension .emf) which can be imported into word processing and spreadsheet applications (typically Word or Excel) by selecting **Insert-Picture-From File** from the application
	Progressively removes controls from the **Scope** window before restoring a full view with complete controls.
Channel	Selects channels with signals that can be displayed.
Signal	Selects the signals to be displayed.
Units/Div	**Plot Mode** of **Time** or **X/Y Plot**—Specifies the grid line values.
Units	**Plot Mode** of **Time** or **X/Y Plot**—Specifies the display units.
Y Maximum	Specifies the highest peak amplitude displayed during a **Frequency** plot.
Offset	Specifies how much the Y axis grid's zero references shift from the center of the display. In a **Frequency** plot, this displays the minimum value for the vertical axis.
Plot Mode	Specifies the type of plot displayed: **Time**—Plots the specified signals against time. **Frequency**—Plots the specified signals against frequency. **X/Y Plot**—Plots the specified signals against each other.
Sampling Rate	**Plot Mode** of **Frequency**—Specifies how frequently the scope acquires data. The default is 1024 Hz. This change takes affect immediately.
Trace Time	**Plot Mode** of **Time** or **X/Y Plot**—Specifies the length of time for a signal trace to cross the scope. **Plot Mode** of **Time**—Sets the grid's x-axis scale.

Setup for Scope Window

Graph Settings Tab

Path **Scope** window toolbar >  > **Graph Settings** tab



This tab sets up the **Scope** window's graph. The window title **Setup for Scope 1** identifies the setup window for **Scope 1**. **Setup for Scope 2** identifies the setup window for **Scope 2**.

Graph Settings Tab (part 1 of 2)

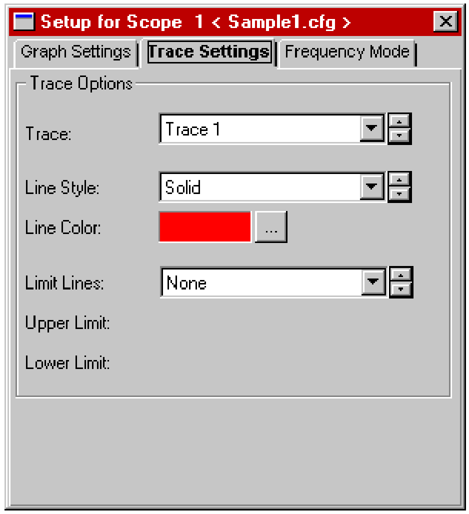
ITEM	DESCRIPTION
Graph Options	Defines the **Scope** window's graphing functions.
Show Grid	Select to display grid lines.
Enable Auto-Sizing	Select to automatically hide and display controls as you resize the **Scope** window.
Auto-Scale Mode	Specifies how **Auto-Scale** and **Rescale** affect **Units/Div** and **Offset**. **Sensitivity & Offset**—**Auto-Scale** and **Rescale** can change both **Units/Div** and **Offset**. **Sensitivity**—**Auto-Scale** and **Rescale** can only change the **Units/Div**.

Graph Settings Tab (part 2 of 2)

ITEM	DESCRIPTION
Color Selections	Selects the grid line and background colors.
Grid Color	Specifies the color of the grid lines.
Background Color	Specifies the grid's background color.

Trace Settings Tab

Path **Scope** window toolbar >  > **Trace Settings** tab



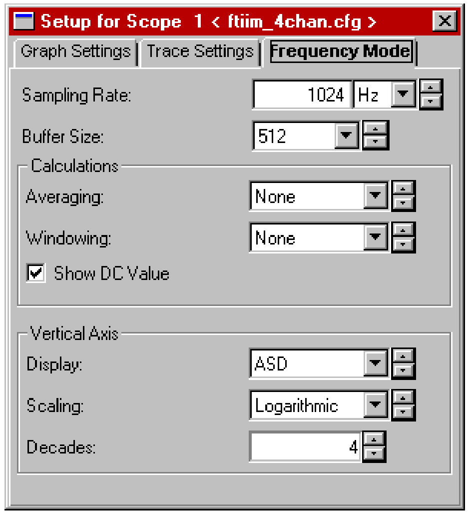
This tab defines the display of grid **Trace** and **Limit Lines**.

Trace Settings Tab

ITEM	DESCRIPTION
Trace Options	Define the display of **Trace** and **Limit Lines** in the grid.
Trace	Select **Trace 1** to define the first Y axis trace. Select **Trace 2** to define the other trace.
Line Style	Select to make the **Trace** and **Limit Lines** solid or dotted.
Line Color	Displays the **Color** window, used to set **Trace** and grid label colors.
Limit Lines	Sets the display of limit lines for the selected **Trace**: **None**—The grid displays no limit lines. **Detector Limits**—The grid displays detector limits. For more about setting limits, see "Upper Limits /Lower Limits Tabs" on page 376. **User Specified**—The grid displays the **Upper Limit** and the **Lower Limit**.

Frequency Mode Tab

Path **Scope** window toolbar >  > **Frequency Mode** tab



This tab defines the display of data when the **Scope** window's **Plot Mode** selection is **Frequency**.

Frequency Mode Tab (part 1 of 2)

Item	Description
Sampling Rate	Specifies how frequently the scope acquires data. The default rate is 1024 Hz.
Buffer Size	Specifies the number of data elements used for calculating autospectral density (ASD). The default size is 512.

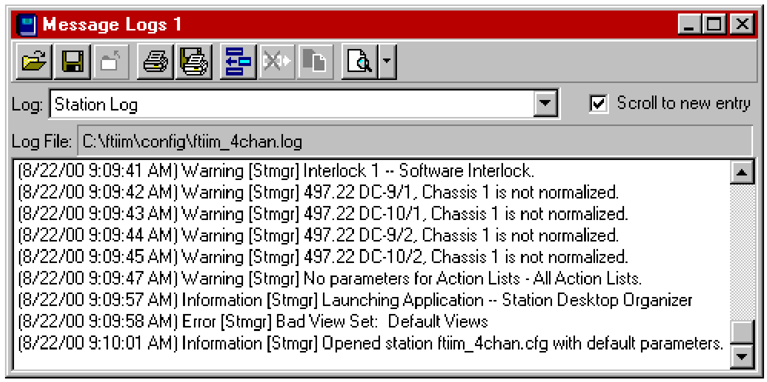
Frequency Mode Tab (part 2 of 2)

Item	Description
Calculations	Determines the calculation and display methods applied to data.
Averaging	Sets the averaging method applied after the calculation of ASD values: **None**—No averaging is applied to the ASD values. **Peak Hold**—Selects the largest value between the current and new buffer of data for each of the ASD values. **Linear**—Takes previous data into account. **Exponential**—Takes previous data into account. The factor used in calculating exponential averaging is obtained from other sources and “hard-coded” in the calculations.
Windowing	Specifies the way data displays. The selections are **None** or **Hanning**.
Show DC Value	Select this if your waveform has an offset or some other bias.
Vertical Axis	Defines the display of data on the vertical axis.
Display	Selects either an **ASD** or **Amplitude** display of data.
Scaling	Specifies vertical scaling: **Logarithmic**—Plots the log of **ASD** or **Amplitude** values. **Linear**—Plots **ASD** or **Amplitude** values on a linear scale.
Decades	Sets the vertical divisions when **Scaling** is set to **Logarithmic**.

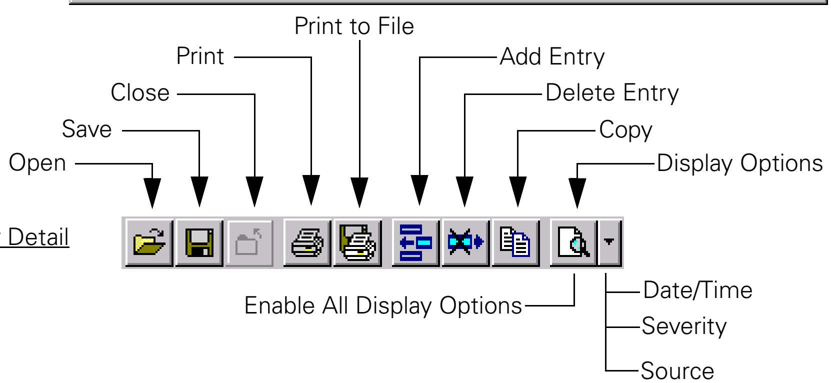
Message Logs Window

Path **Display** menu > **Message Logs**

Station Manager window > toolbar > 



Toolbar Detail



This window records station and test events as they occur, including:

- Power status changes
- Station state changes
- Detector activity
- Over-temperature conditions
- Full-scale changes

The default location for station log files is C:\ftiim\config, C:\tsiis\config, or C:\ftgt\config.

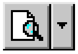
See “Working with Message Logs” on page 266 for more information.

For quick reference during testing, the **Station Manager** window’s Message Pane displays **Warning**, **Error**, and **Fatal Error** messages from all applications. See page 278 for more information.

Message Logs Window (part 1 of 2)

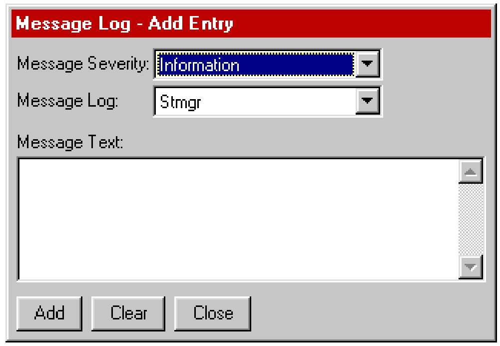
ITEM	DESCRIPTION
toolbar	Controls **Message Log** operation.
	Displays the **Open Message Log File** window. Use this window to open archived message log files (extension .log).
	Saves all messages to a new message log file and clears all messages from the **Message Log** window. To clear only some messages, highlight a message before saving. Messages that follow the highlighted message will remain in the window. The first message log saved is named configuration_file_name001.log, the second is named configuration_file_name002.log, and so on.
	Closes the current archived message log and displays the **Station Log** for the active station configuration.
	Displays the **Message Log Print** window, which specifies what messages get printed.
	Displays the **Message Log Print To File** window, which is used to save message logs as text files (extension .txt).
	Displays the **Add Entry** window, which is used to insert user-defined entries into the message log.
	Deletes the highlighted user entry from the log. Only user-defined entries can be deleted.
	Copies the highlighted entries to the clipboard.

Message Logs Window (part 2 of 2)

ITEM	DESCRIPTION
	Enables all message log display options. Control the message log's detail level by unchecking display options that are not needed **Date/Time**—Allows date and time information display when checked. **Severity**—Allows severity information display when checked. **Source**—Allows source information display when checked.
Log	Selects the message log displayed. Select **Station Log** to display the log for the station configuration. Select **MPT Specimen Log** or **Basic TestWare Log** to view logs for MultiPurpose TestWare and Basic TestWare tests. Opened archive may also be displayed.
Scroll to New Entry	Keeps the window scrolling to the last logged entry.

Message Log Add Entry Window

Path **Message Log** window > toolbar >



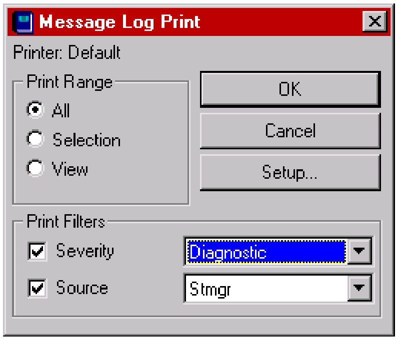
This window adds user-defined messages to the message log.

Message Log Add Entry Window

ITEM	DESCRIPTION
Message Severity	Sets a message level of **Diagnostic**, **Information**, **Warning**, or **Error**.
Message Log	Identifies the source of the log message. **Stmgr**—Sets a message source of **Stgmr User**. **MPT**—Sets a message source of **MPT User**. **Basic TestWare**—Sets a message source of **Basic TestWare User**.
Message Text	Type here the message that you want to add.
Add	Adds the message to the log.
Clear	Clears the **Message Text**.
Close	Closes the window.

Message Log Print Window

Path **Message Logs** window > toolbar > 

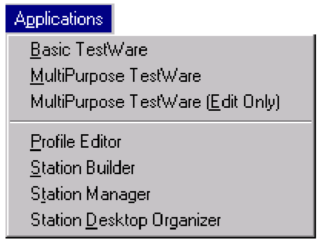


This window specifies the message log entries that are printed.

Message Log Print Window

ITEM	DESCRIPTION
Print Range	**All**—Print all the message log entries. **Selection**—Print the highlighted message log entries. **View**—Print just the visible message log entries.
Setup	Displays the **Print Setup** window specific to your printer.
Severity	Sets the lowest message severity level to be printed.
Source	Specifies the source of the messages to be printed.

Applications Menu



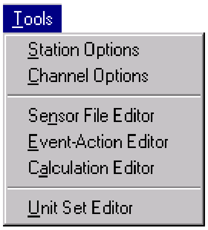
This menu's commands open applications that are used with the Station Manager application.

Operating at an access level of **Configuration** makes this menu's **Basic TestWare**, **MultiPurpose TestWare**, and **MultiPurpose TestWare (Edit Only)** selections unavailable.

Applications Menu

ITEM	DESCRIPTION
Basic TestWare	Opens the Basic TestWare application and displays its controls in the **Station Manager** window's Application Controls panel. See Chapter 4, "Basic TestWare" for more about this application.
MultiPurpose TestWare	Opens the optional MultiPurpose (MPT) application and displays its controls in the **Station Manager** window's Application Controls panel. See the *Model 793.10 MultiPurpose TestWare* manual for more information.
MultiPurpose TestWare (Edit Only)	Opens an edit-only version of MPT, leaving the Station Manager application free to run other tests and functions.
Profile Editor	Opens the optional Profile Editor application. See the *Model 793.11 Profile Editor* manual for more information.
Station Builder	Opens the Station Builder application. See Chapter 2, "Station Builder" for more information.
Station Manager	Opens another instance of the Station Manager application.
Station Desktop Organizer	Opens the Station Desktop Organizer application. See Chapter 6, "Station Desktop Organizer" for more information.

Tools Menu



This menu's commands display windows that increase the Station Manager application's effectiveness.

Tools Menu

ITEM	DESCRIPTION
Station Options	Displays the **Station Options** window, used to set viewing and file options. See "Station Options Window" on page 410 for more information.
Channel Options	Displays the **Channel Options** window, used to set channel options. See "Channel Options Window" on page 418 for more information.
Sensor File Editor	Displays the **Sensor File Editor** window, used to create and edit sensor calibration files. See "Sensor File Editor Window" on page 442 for more information.
Event-Action Editor	Displays the **Event-Action Editor** window, used to define custom actions that can occur in response to system events. See "Event-Action Editor Window" on page 448 for more information.
Calculation Editor	Displays the **Calculation Editor** window. See "Calculation Editor Window" on page 459 for more information.
Unit Set Editor	Displays the **Unit Set Editor** window. See "Unit Assignment Set Editor Window" on page 479 for more information.

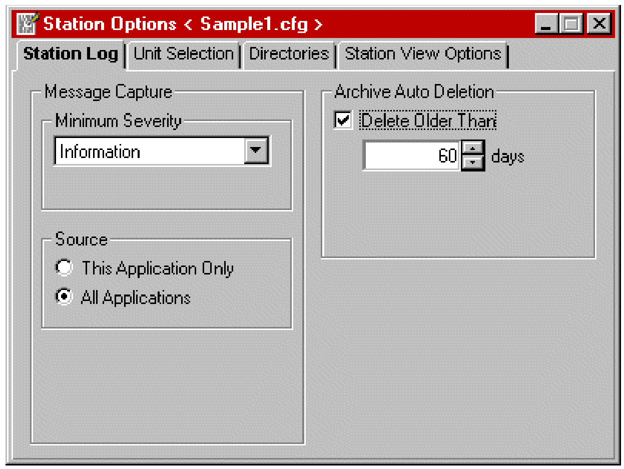
Station Options Window

This section describes the **Station Option** window's tabs.

Station Log Tab

Path

Tools menu > **Station Options** > **Station Options** window > **Station Log** tab



This tab specifies the messages written to the **Message Logs** window described on page 403.

Station Log Tab (part 1 of 2)

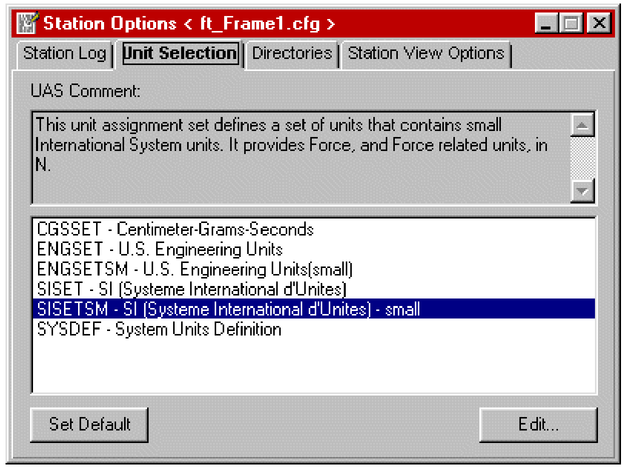
ITEM	DESCRIPTION
Message Capture	Sets the severity level and sources for messages written to the **Message Logs** window.
Minimum Severity	Sets the minimum threshold severity level for logged messages. Only messages with the selected severity level or a higher severity level get logged.

Station Log Tab (part 2 of 2)

ITEM	DESCRIPTION
Source	**This Application Only**—Only Station Manager messages get logged. **All Application**s—Station Manager and other applications' messages get logged.
Archive Auto Deletion	Sets the date when archived files are automatically deleted.

Unit Selection Tab

Path **Tools** menu > **Station Options** > **Station Options** window > **Unit Selection** tab



This tab specifies the units of measure used in test data files.

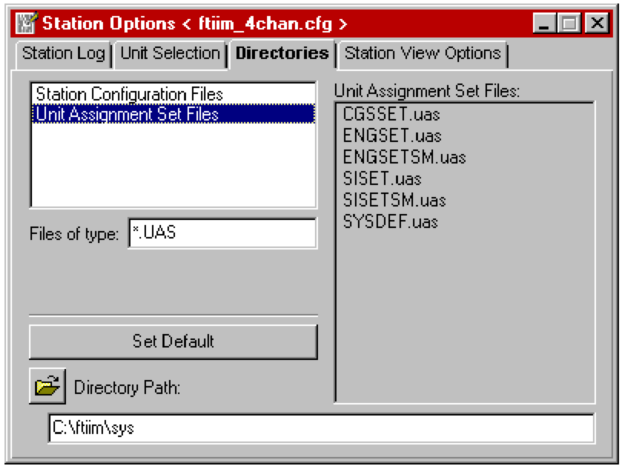
The **Directories** tab, described on page 414, specifies where unit assignment sets (UAS) are stored.

Unit Selection Tab

ITEM	DESCRIPTION
UAS Comment	Displays a brief description of the selected unit assignment set.
Unit Assignment Sets	Select from the following MTS supplied sets: **CGSSET** - **Centimeters-Grams-Seconds**—Units are based on centimeters, grams, and seconds. **ENGSET** - **U.S. Engineering Units**—Units are based on Customary U.S. engineering units with force related units in kips. **ENGSETSM** - **U.S. Engineering Units (small)**—Units are based on Customary U.S. engineering units with force related units in lbfs. **SISET** - **SI (Systeme International d'Unites)**—Units are based on Customary International (metric) units with force related units in kNs. **SISETSM** - **SI (Systeme International d'Unites) - small**—Units are based on Customary International (metric) units with force related units in Ns. **SYSDEF** - **System Units Definition**—Contains units used by the hardware. Additional user-defined sets can be selected here.
Set Default	Makes the selected unit assignment the default set for the system. Open applications such as Basic TestWare must be reopened before they adopt the new default set.
Edit	Displays the **Unit Assignment Set Editor** window, used to edit and create unit assignment sets. See "Unit Assignment Set Editor Window" on page 479 for more information.

Directories Tab

Path **Tools** menu > **Station Options** > **Station Options** window > **Directories** tab



This tab sets the default directory locations for station configuration and unit assignment set files.

For additional information, see "How to Open a Station Configuration File" on page 124 and "Unit Selection Tab" on page 412.

Directories Tab (part 1 of 2)

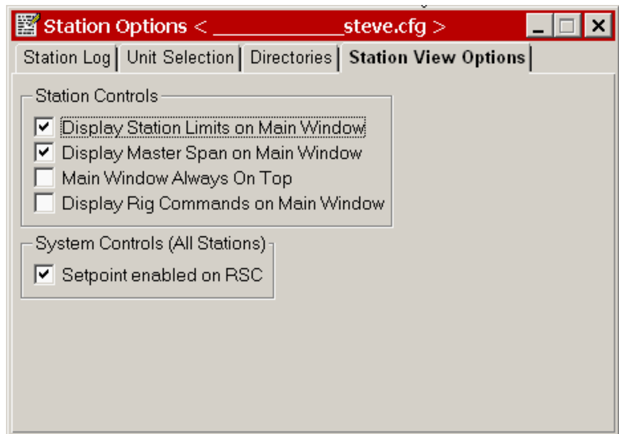
ITEM	DESCRIPTION
File Type	Select **Station Configuration Files** to display station configuration files in the **Station Configuration Files** list that are available through the **Directory Path**. Select **Unit Assignment Set Files** to display unit assignment set files in the **Unit Assignment Set Files** list that are available through the **Directory Path**.
Files of Type	Displays the .cfg or .uas extensions used by the station configuration and unit assignment set files in the selected directory.

Directories Tab (part 2 of 2)

Item	Description
Set Default	Updates the directory for **Station Configuration Files** or **Unit Assignment Set Files**. The selected path is used immediately by all station configurations. Paths must be created using Windows before they can be assigned in this window.
Directory Path	Click to select the directory path for the selected file type.

Station View Options Tab

Path **Tools** menu > **Station Options** > **Station Options** window > **Station View Options** tab



This tab controls the **Station Manager** window's display of its **Master Span** control and S**tation Limits** indicators.

Station View Options Tab (part 1 of 2)

ITEM	DESCRIPTION
Display Station Limits on Main Window	Select to display **Station Limits** status indicators on the **Station Manager** window's Control panel. See "Station Controls Panel" on page 498 for more information.
Display Master Span on Main Window	Select to display the **Master Span** controls on the **Station Manager** window's Control panel. See "Station Controls Panel" on page 498 for more information.
Main Window Always On Top	Select to always display the **Station Manager Main** window at the "on top" display level.

Station View Options Tab (part 2 of 2)

Item	Description
Display Rig Command on Main Window	Select to display Rig Command **Park** and **Ride** buttons on the **Station Manager** window's Station Controls panel. The **Park** and **Ride** buttons are also displayed on the Station Manager **Manual Command** window. Rig command display and control is an optional feature.
Setpoint enable on RSC	Select to enable setpoint control on the Remote Station Controller. You must be at the **Configuration** access level to change this control. When Manual Control is enabled on the RSC, this check box is disabled. You must disable manual control on the RSC to change this check box.

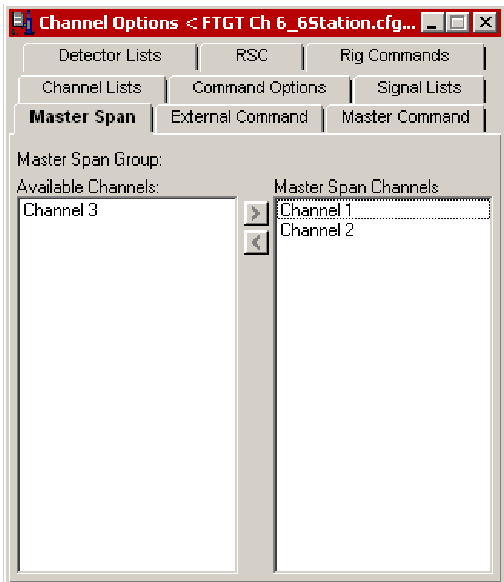
Channel Options Window

This section describes the **Channel Option** window's tabs.

Master Span Tab

Path

Tools menu > **Channel Options** > **Channel Options** window > **Master Span** tab



This tab defines the channels whose spans are adjusted through the **Station Controls** panel's **Master Span** control. These channels also have an individually adjustable **Span** whose setting is affected by the **Master Span** control. For example, a **Master Span** of **50%** halves an individual channel's **Span** of **50%**, giving the channel an effective span of 25%.

This tab's controls are unavailable for single channel systems.

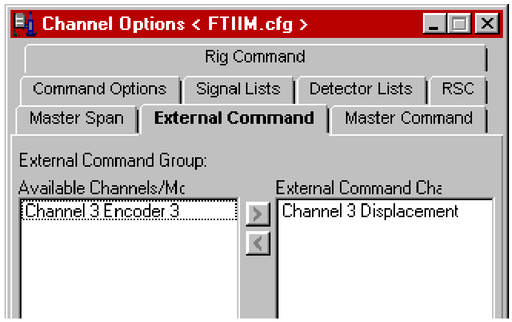
For more information, see "Station Controls Panel" on page 498.

Master Span Tab

ITEM	DESCRIPTION
Available Channels	Lists the channels whose spans are not adjusted using the **Station Manager** window's **Master Span** control.
	Moves the selected **Available Channels** item to **Master Span Channels**.
Master Span Channels	Lists the group of channels whose spans are adjusted using the **Station Manager** window's **Master Span** control. By default, new configurations place all control channels into **Master Span Channels**. These channels also have an individually adjustable **Span** whose setting is affected by the **Master Span** control. For example, a **Master Span** of **50%** halves an individual channel's **Span** of **50%**, giving the channel an effective span of 25%.
	Moves the selected **Master Span Channels** item to **Available Channels**.

External Command Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window > **External Command** tab

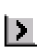


This tab defines channels that are programmed as a group through an external program source.

This tab's controls are unavailable on single channel systems.

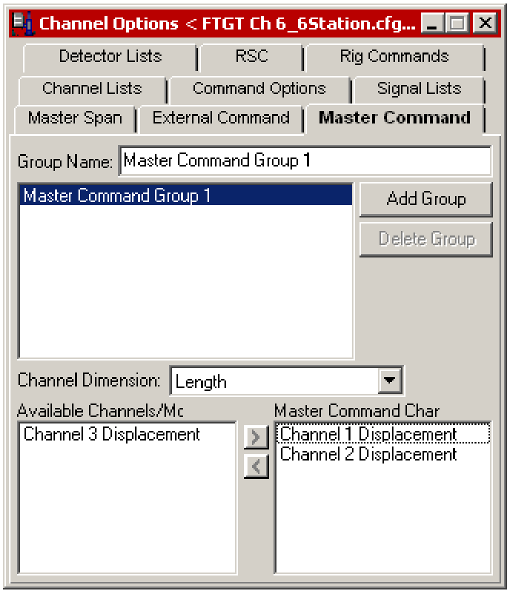
Channels must be configured in the Station Builder application to accept external program signals. For more information, see "Enabling External Command Inputs" on page 74.

External Command Tab

ITEM	DESCRIPTION
Available Channels/Modes	Lists the channels that can be added to the **External Command Channel** group. Channels appear with the control mode dimension used by the external program signal.
	Moves the selected **Available Channels/Modes** item to **External Command Channels**.
External Command Channels	Lists the channels controlled as group through an external program source. By default, new configurations place all control channels with external inputs into **External Command Channels**.
	Moves **External Command Channels** item to **Available Channels/Modes**.

Master Command Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window > **Master Command** tab



This tab defines channels that are programmed as a group through internal test station signals.

This tab's controls are unavailable for single channel systems.

The **Function Generator** panel, **Setpoint and Span** window, and **Manual Command** window provide the program signals for master command groups.

For information about using the **Master Command** controls, see "How to Create a Master Command Group" on page 261.

Master Command Tab (part 1 of 2)

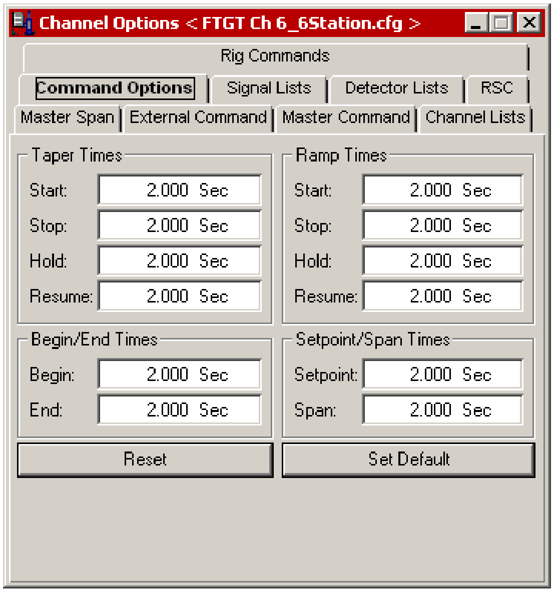
ITEM	DESCRIPTION
Group Name	Enter a name for the master command group selected below.
Master Command Groups	Lists master command groups.

Master Command Tab (part 2 of 2)

ITEM	DESCRIPTION
Add Group	Adds a new **Group Name** to the Master Command Groups.
Delete Group	Deletes the selected master command group from the Master Command Groups.
Channel Dimension	Selects the dimension to be used by the master command group. Only channels with the selected dimension will display in **Available Channels/Modes**.
Available Channels/Modes	Lists the available channels with the control modes that can be selected as **Master Command Channels**. If more than one control mode/range match exists, both display but only one can be added to the **Master Command Channels**.
	Moves the selected **Available Channels/Modes** item to **Master Command Channels**.
Master Command Channels	Lists the channels included in the selected master command group. These channels must have common control modes and must have ranges within 5% of each other.
	Moves selected **Master Command Channels** item to **Available Channels/Modes**.

Command Options Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window > **Command Options** tab



This tab sets transition times for commands. The initial default setting for all times is 2.0 seconds.

Command Options Tab (part 1 of 3)

ITEM	DESCRIPTION
Taper Times	Set the transition time, where tapers are used, between run, hold, and stop states. Taper times have different effects depending on the application.
Start	**Function Generator**—Not used. Basic TestWare (BTW)—Not used. MultiPurpose TestWare (MPT)—Sets the transition time from stop to run states. Applies in procedures where the MPT application's **Option Editor** window **Command Stop Behavior** selection is either **Taper to Mean** or **Taper to Level**.

Command Options Tab (part 2 of 3)

Item	Description
Stop	Function Generator—Sets the transition time for tapered wave shapes to go from run to stop states. BTW—Sets the transition time for tapered wave shapes to go from run to stop states. MPT—Sets the transition time from run to stop states. Applies to procedures where the MPT application's **Option Editor** window **Command Stop Behavior** selection is either **Taper to Zero** or **Taper to Mean**.
Hold	Function Generator—Not used. BTW—Sets the transition time for tapered wave shapes to go from run to hold states. MPT—Sets the transition time from run to hold states. Applies to procedures where the MPT application's **Option Editor** window **Command Hold Behavior** selection is either **Taper to Zero** or **Taper to Mean**.
Resume	Function Generator—Not used. BTW—Sets the transition time for tapered wave shapes to go from hold to run states. MPT—Sets the transition time from hold to run states. Applies to procedures where the MPT application's **Option Editor** window **Command Hold Behavior** selection is either **Taper to Zero** or **Taper to Mean**.
Ramp Times	Sets ramp times between run, hold, and stop states in MPT application procedures.
Start	Sets the ramp time from stop to run states. Applies in procedures where the MPT application's **Option Editor** window **Command Stop Behavior** selection is either **Ramp to Zero** or **Ramp to Mean**.
Stop	Sets the ramp time from run to stop states. Applies in procedures where the MPT application's **Option Editor** window **Command Stop Behavior** selection is either **Ramp to Mean** or **Ramp to Zero**.
Hold	Sets the ramp time from run to hold states. Applies to procedures where the MPT application's **Option Editor** window **Command Hold Behavior** selection is either **Ramp to Mean** or **Ramp to Zero**.

Command Options Tab (part 3 of 3)

ITEM	DESCRIPTION
Resume	Sets the ramp time from hold to run states. Applies in procedures where the MPT application's **Option Editor** window **Command Hold Behavior** selection is either **Ramp to Mean** or **Ramp to Zero**.
Begin/End Times	Sets starting and ending times for tapered wave shapes. These values also apply to the beginning and ending times of external command signals applied to controllers with a soft start/stop feature.
Begin	Function Generator—Sets the transition time for tapered wave shapes to go from stop to run. BTW—Sets the beginning taper time for tapered wave shapes. MPT—Sets the beginning taper time for tapered wave shapes.
End	Function Generator—Not used. BTW—Sets the ending taper time for tapered wave shapes as they reach the end of their counts. MPT—Sets the ending taper time for tapered wave shapes as they reach the end of their counts.
Setpoint/Span Times	
Setpoint	Sets the ramp time for commands applied with the **Setpoint (**Setpoint and Span window), **Target Setpoint** (Function Generator or BTW), or **Manual Command** (Manual Command window) controls.
Span	Sets the taper time for changes applied with the **Span** (Setpoint and Span window) or **Master Span** (Station Controls panel) controls.
Reset	Restores all **Times** to the values saved when **Set Default** was last clicked.
Set Default	Applies the **Times** to the system default settings.

Taper and Ramp Times

The **Command Options** tab's **Taper Times** and **Ramp Times** values set transition times between run, hold, and stop states.

Transitions between run, hold, and stop states can be initiated from many sources, including:

- The Station Manager window's **Program Stop**, **Program Hold**, and **Program Run** buttons
- User-defined actions
- The Remote Station Control (RSC) panel
- BTW applications
- MPT applications

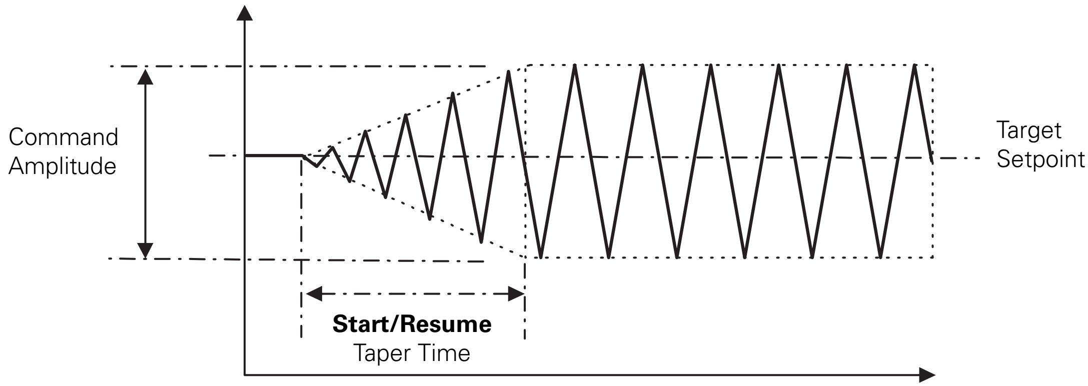
When using the Station Manager's **Program Stop**, **Program Hold**, and **Program Run** buttons, the following applies:

- Clicking **Program Run** initiates the transition to the run state.
- Clicking **Program Stop** initiates the transition to the stop state.
- Clicking **Program Hold** initiates the transition to the hold state.
- Clicking **Program Run** after **Program Hold** initiates the transition to the run state.

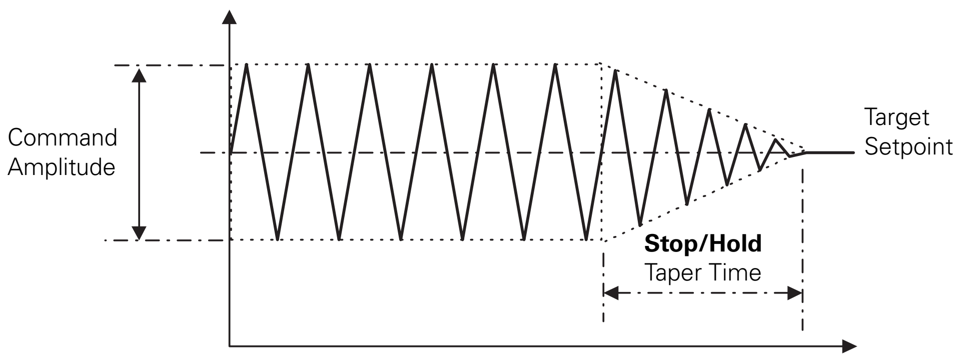
For more information, see "Station Controls Panel" on page 498.

Taper times

Taper Times specify the time it takes command waveforms to go from zero amplitude to peak amplitude or from peak amplitude to zero amplitude.



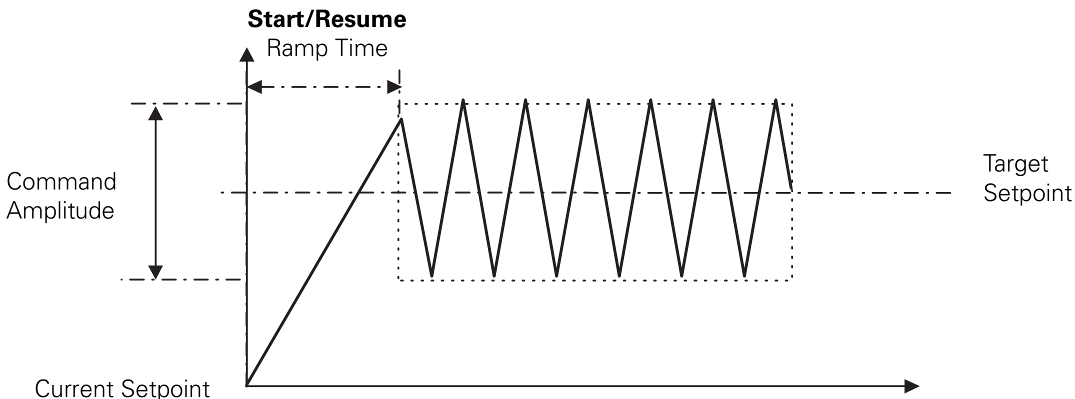
Tapered waveform starting or resuming from the mean level



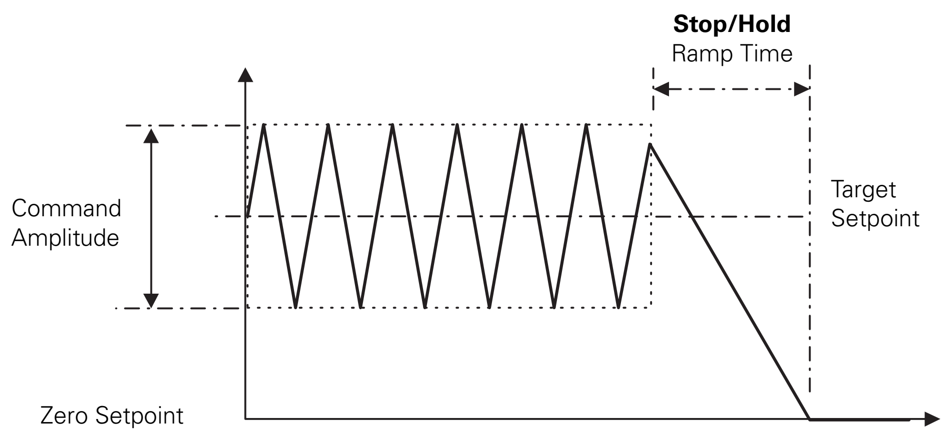
Tapered waveform stopping or holding from the command amplitude to the mean level

Ramp Times

Ramp Times set the time for MPT processes to ramp to commanded levels.



Waveform ramping from the current setpoint to the target setpoint



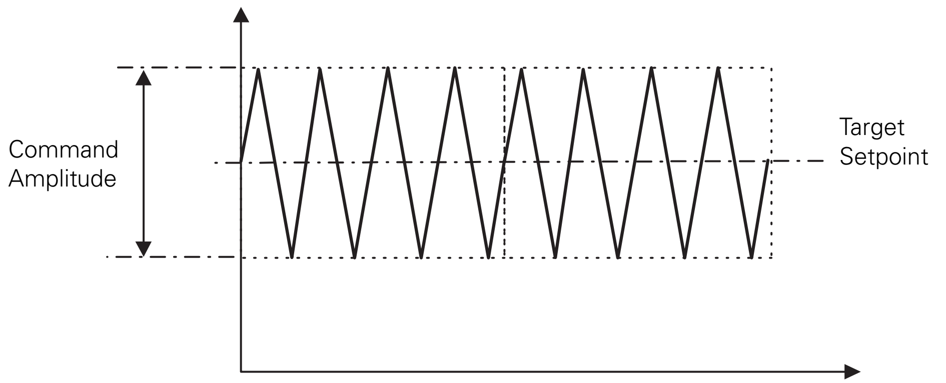
Waveform ramping from target setpoint to zero setpoint

Begin/End times

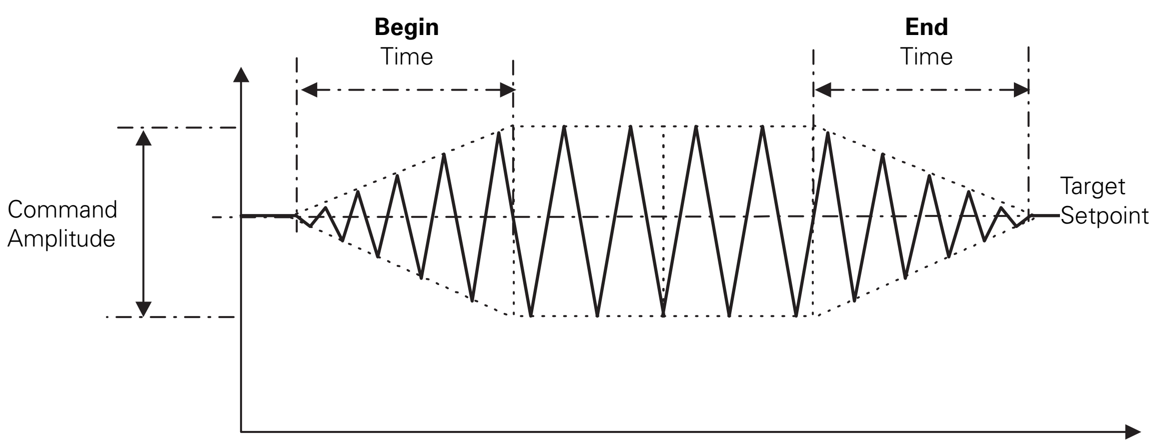
Begin Times values set the taper time at the beginning of MPT, BTW, and **Function Generator** blocks using tapered wave shapes.

End Times values set the taper time for MPT and BTW blocks using tapered wave shapes as these blocks reach the end of a predefined count.

Begin/End Times also apply to incoming external commands applied to controllers with a soft start/stop feature.



Waveform without soft start/stop—The waveform immediately begins oscillating at the full command amplitude from the target setpoint.

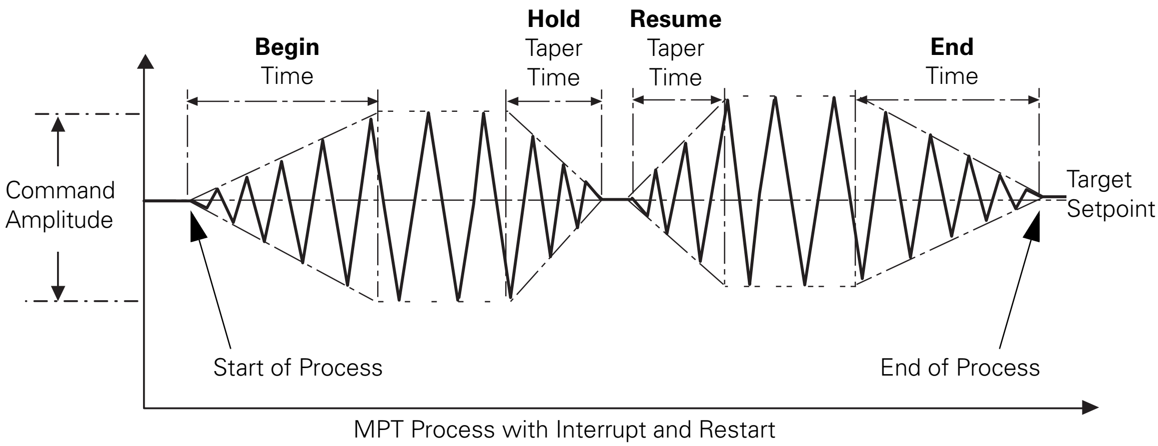


Tapered Waveform —The waveform tapers up to the full command amplitude and down to the target setpoint.

Begin/End times with a command process

For MultiPurpose TestWare blocks employing a tapered segment shape, **Begin** and **End Times** define the time it takes to taper the command at the beginning and end of each process.

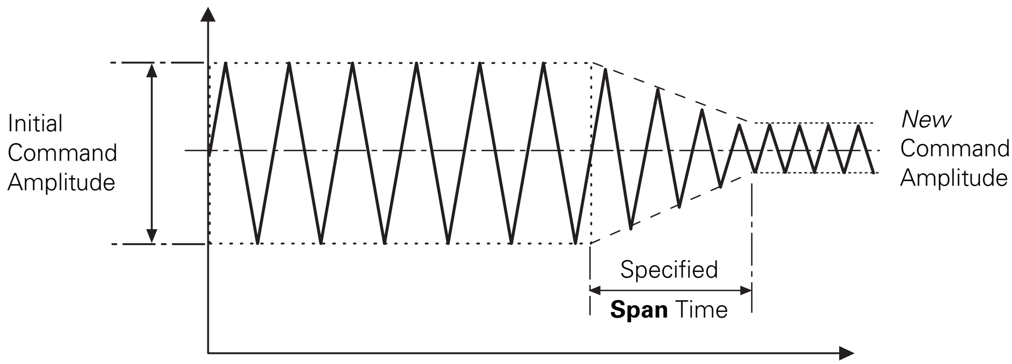
The following figure shows an MPT block using a tapered segment shape that is interrupted with a hold and subsequently restarted.

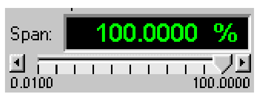


Setpoint/Span Times

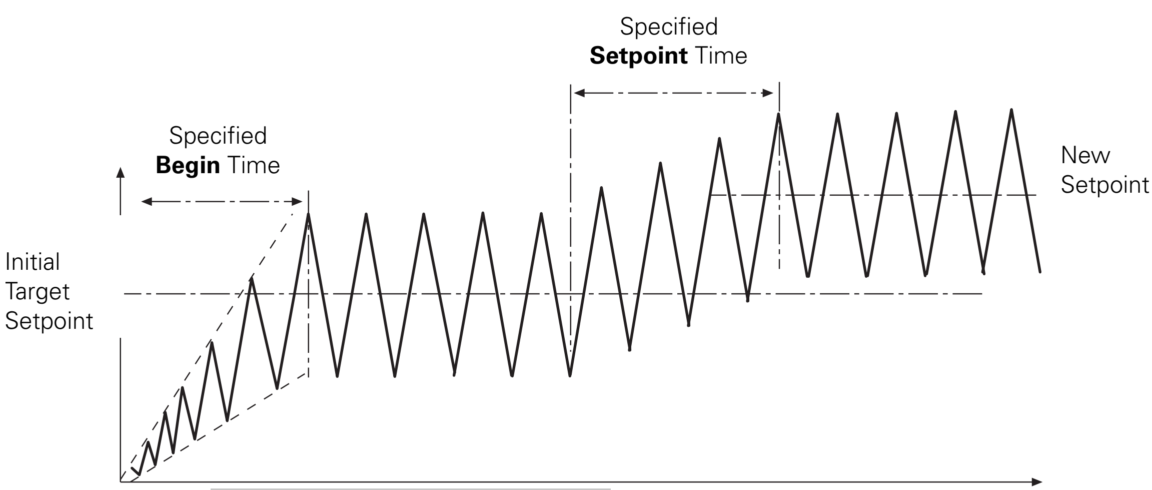
The **Setpoint/Span Times** values set the time it takes to change to a new setpoint or span.

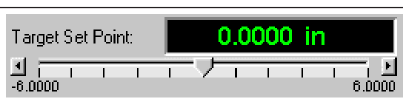
These times specify how long it takes to change the **Setpoint** from zero to full scale or the **Span** to change from 0 to 100%. If the value has less distance to travel, the time will be correspondingly less.





The Station Manager **Channel Span** or **Master Span** control reduces the waveform span.

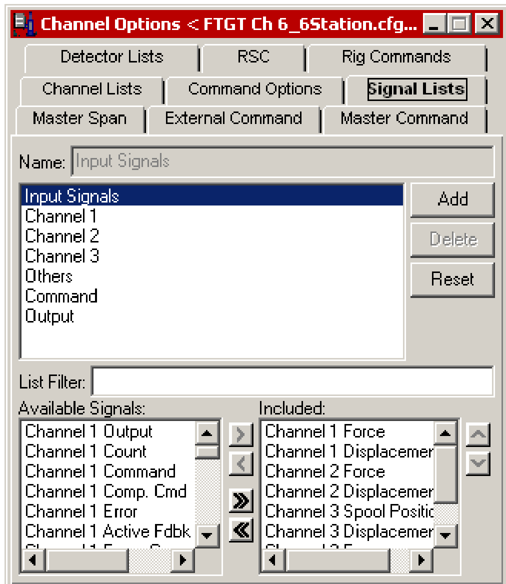




The Station Manager **Setpoint** control changes the waveform setpoint.

Signal Lists Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window > **Signal Lists** tab



This tab defines the signals displayed in the **Station Setup** window's **Station Signals** tab, in the **Auto Offset** window, and in the optional **Remote Station Control** (RSC) panel.

See "How to Edit the Signal Lists" on page 178 for more information about using this tab's controls.

Signal Lists Tab (part 1 of 2)

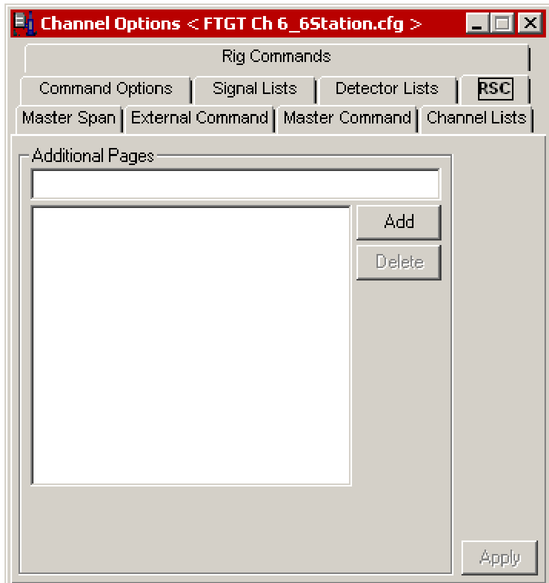
ITEM	DESCRIPTION
Name	Displays the name of the selected signal list. Predefined default signal lists are grayed out. You can name user-defined lists here.
Signal List	Displays all signal lists. Select a name to edit the signals included in its list.
Add	Creates a new signal list.

Signal Lists Tab (part 2 of 2)

ITEM	DESCRIPTION
Delete	Deletes the selected signal list. Predefined signal lists cannot be deleted.
Reset	Restores signals to predefined signal lists. This control does not work for user-defined signal lists.
List Filter	Applies a filter to predefined signal lists, displaying only **Available Signals** that are likely to be used with the list. Enter text that describes the signal(s) you want to display. For example, enter **force** to display all force signals. You can also enter part of a signal description to display a signal type. For example, enter **disp** to display all displacement signals.
Available Signals	Lists signals that can be **Included** in a signal list.
	Moves selected signals from **Available Signals** to **Included**.
	Moves all signals from **Available Signals** to **Included**.
Included	Lists the signals in the selected signal list.
	Moves selected signals from **Included** to **Available Signals**.
	Moves all selected signals from **Included** to **Available Signals**.
	Moves the selected **Included** signal one place up in the list.
	Moves the selected **Included** signal one place down in the list.

RSC Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window > **RSC** tab



This tab defines custom Remote Station Control (RSC) signal pages that display only specified signals. RSC is an option.

RSC Tab (part 1 of 2)

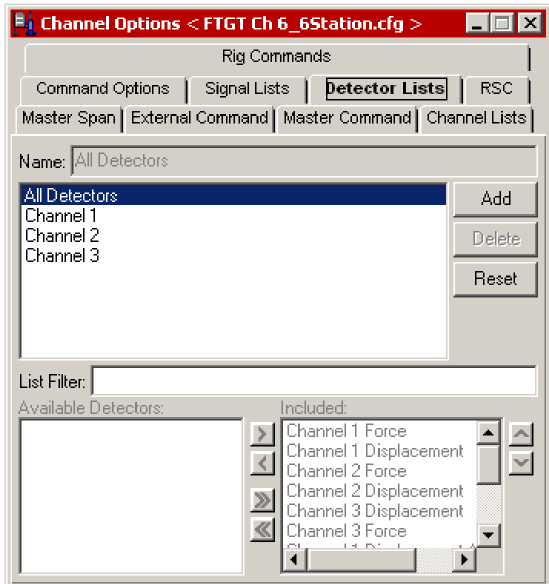
ITEM	DESCRIPTION
Additional Pages	Displays the name of the selected signal page. Rename pages here.
Pages	Lists signal pages.
Add	Creates a new signal page.
Delete	Deletes the selected signal page.
Hide Application	Select to not display controlling application names on the signal page.
Hide Channel Information	Select to not display channel information on the signal page.

RSC Tab (part 2 of 2)

ITEM	DESCRIPTION
Current Signal List	Specifies the signal list displayed on the selected signal page.
Apply	Applies the changes to the RSC immediately. The setting is saved with the current view set.

Detector Lists Tab

Path **Tools** menu > **Channel Options** > **Channel Options** window >**Detector Lists** tab



This tab defines the signals displayed in the **Station Setup** window's **Detectors** tab, in the **Detectors** window.

Detector Lists Tab (part 1 of 2)

Item	Description
Name	Displays the name of the selected detector list. Predefined default detector lists are grayed out. You can name user-defined lists here.
Detector List	Displays all detector lists. Select a name to edit the detectors included in its list. ***Note*** *The **All Detectors** list cannot be edited.*
Add	Creates a new detector list.
Delete	Deletes the selected detector list. Predefined detector lists cannot be deleted.

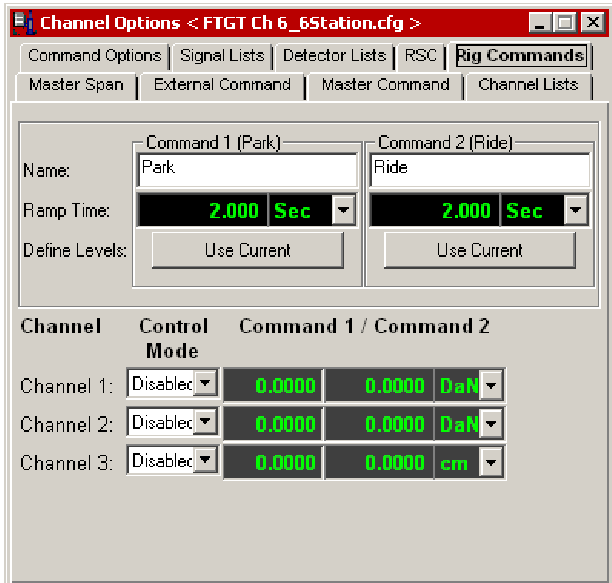
Detector Lists Tab (part 2 of 2)

ITEM	DESCRIPTION
Reset	Restores signals to predefined detector lists. This control does not work for user-defined detector lists.
List Filter	Applies a filter to predefined detector lists, displaying only **Available Detectors** that are likely to be used with the list. Enter text that describes the signals you want to display. For example, to display all force signals, enter **force**. You can also enter part of a signal description to display a signal type. For example, enter **disp** to display all displacement signals.
Available Detectors	Lists signals that can be **Included** in a detector list.
	Moves selected detectors from **Available Detectors** to **Included**.
	Moves all detectors from **Available Detectors** to **Included**.
Included	Lists the detectors in the selected detector list.
	Moves selected detectors from **Included** to **Available Detectors**.
	Moves all selected detectors from **Included** to **Available Detectors**.
	Moves the selected **Included** detector one place up in the list.
	Moves the selected **Included** detector one place down in the list.

Rig Commands Tab

Path

Tools menu > **Channel Options** > **Channel Options** window > **Rig Commands** tab



The Rig Commands tab defines Park and Ride levels for vehicle testing. Park defines a level the enabled channels can move to before hydraulic shut down. Ride defines a level the enabled channels can move to before running any test.

Use the Manual Command window to move the enabled channel(s) to its Park or Ride position. Enabled channels can be moved individually or as a group.

See **"Using Rig Command (Park/Ride)"** on page 264 and "Using Manual Command Park/Ride" on page 512 for more information about using this tab's controls.

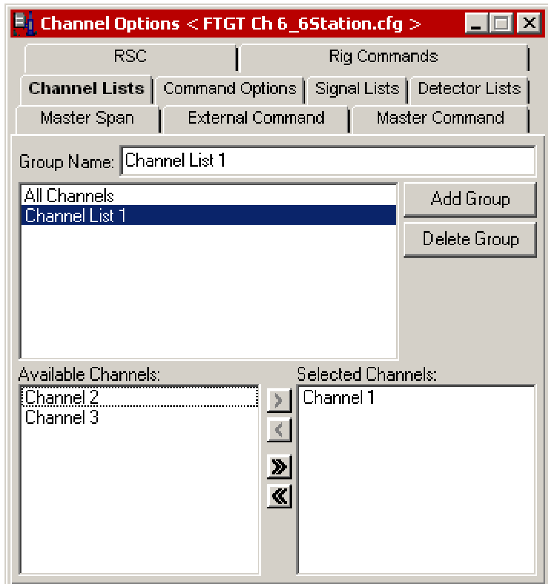
Rig Commands Tab

ITEM	DESCRIPTION
Command 1 (Park)	
Name	Defines the name of the Command 1 (Park) position.
Ramp Time	Sets the time required for the enabled channels to ramp to the Command 1 (Park) position.
Define Levels	Click **Use Current** to use the currently defined component feedback values for the corresponding **Command 1** values.
Command 2 (Ride)	
Name	Define the name of the Command 2 (Ride) position.
Ramp Time	Sets the time required for the enabled channels to ramp to the Command 2 (Ride) position.
Define Levels	Click **Use Current** to use the currently defined component feedback values for the corresponding **Command 2** values.
Channel	Displays active channels.
Control Mode	Displays the active control mode for each channel.
Command 1	Displays the current Command 1 (Park) value for the corresponding channel.
Command 2	Displays the current Command 2 (Ride) value for the corresponding channel.

Channel Lists Tab

Path

Tools menu > **Channel Options** > **Channel Options** window > **Channel Lists** tab



This tab defines channels that can be selected from the **Channel List** on the Channel Status Panel. See "Station Setup Window/Channel Status Panel Tabs" on page 295 for more information.

Note *The **All Channels** list cannot be edited and is only updated when the station configuration changes*

Channel Lists Tab (part 1 of 2)

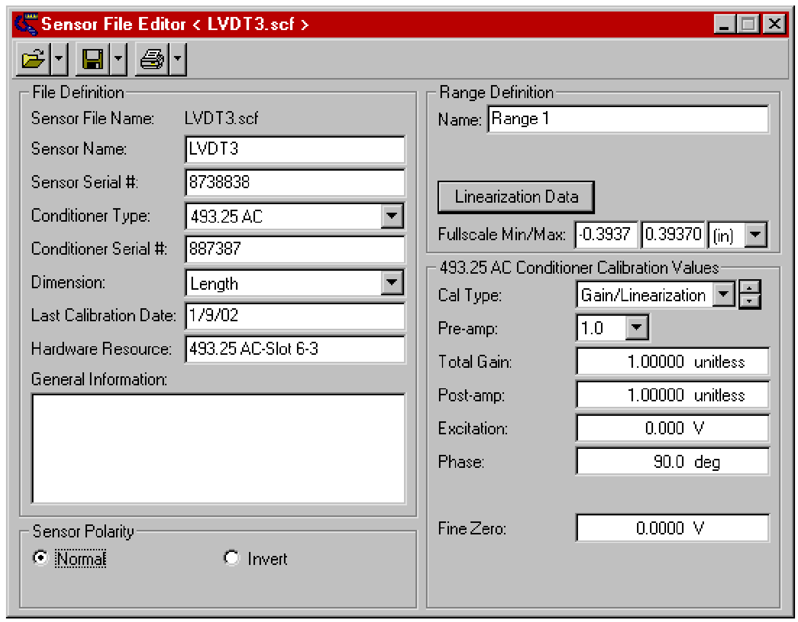
ITEM	DESCRIPTION
Group Name	Enter a name for the channel list selected below.
Channel Lists	Displays channel lists.
Add Group	Adds a new **Group Name** to the Channel Lists Groups.
Delete Group	Deletes the selected channel list from the Channel Lists Groups.
Available Channels	Lists the available channels that can be selected for Channel Lists.

Channel Lists Tab (part 2 of 2)

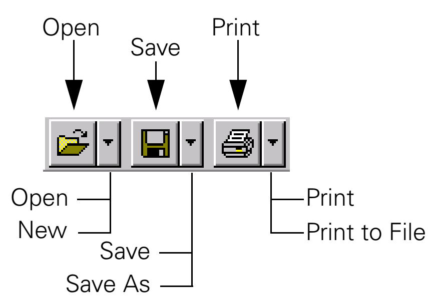
ITEM	DESCRIPTION
	Moves the selected **Available Channels** item to **Selected Channels** list.
Selected Channels	Lists the channels included in the selected Channel Lists group.
	Moves **Selected Channels** item to **Available Channels**.

Sensor File Editor Window

Path **Tools** menu > **Sensor File Editor**



Toolbar Detail

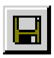


This window creates and edits sensor calibration files.

Valid sensor files require **Conditioner Type**, **Dimension**, and at least one **Range Definition**.

See "Calibrating Sensors and Configuring Feedback" on page 131 for more about using this window's controls.

Sensor File Editor Window (part 1 of 3)

ITEM	DESCRIPTION
toolbar	Manages sensor files.
	**Open**—Displays the **Open Sensor File** window. Use this box to open existing sensor calibration files (extensions .scf and .clb). **New**—Displays a **Sensor File Editor** window with default values displayed. Use this window to define new sensor files.
	**Save**—Saves the sensor file. Displays the **Save Sensor File As** window if a new sensor file is being saved. **Save As**—Displays the **Save Sensor File As** window. Use this window to name new sensor files and rename old sensor files.
	**Print**—Prints out the sensor file information. **Print to File**—Displays the **Print to File** window. Use this window to print the sensor file to a text file (extension .txt).
File Definition	Defines sensor calibration information. Information entered here also appears in the **Station Setup** window's **Sensor** tab.
Sensor File Name	Displays the sensor calibration file name.
Sensor Name	Names the sensor. Enter any name up to 30 characters.
Sensor Serial #	Specifies the sensor serial number.
Conditioner Type	Selects the compatible conditioner type for this sensor calibration file.
Conditioner Serial #	Specifies the conditioner serial number.
Dimension	Selects the conditioner output's dimension.
Last Calibration Date	Enter the most recent calibration date for the sensor/conditioner pair.
Hardware Resource	Enter the hardware resource allocated in the Station Builder application for this sensor signal.
General Information	Enter additional useful information.

Sensor File Editor Window (part 2 of 3)

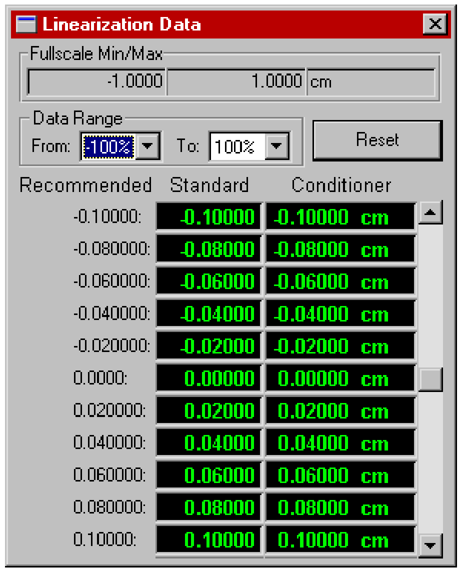
ITEM	DESCRIPTION
Sensor Polarity	Select a **Normal** or **Invert** polarity for the sensor signal.
Range Definition	Defines the sensor's ranges.
Ranges	Lists sensor ranges. This list is available only when a multi-range conditioner is selected in **Conditioner Type**.
Add	Adds a new range to the sensor calibration file. Each file can have up to four ranges. This button is available only when a multi-range conditioner is selected in **Conditioner Type**.
Delete	Deletes the selected range. This button is available only when a multi-range conditioner is selected in **Conditioner Type**.
Name	Displays the name of the selected range (multi-range conditioners) or a single range (full-range conditioners). Enter new range name(s) here.
Fullscale Min/Max	Specifies the selected range's full-scale minimum and maximum values. Ranges can be asymmetrical as long as **Min** is less than zero and **Max** is greater than zero.
Linearization Data	This button is available only when a full-range conditioner is selected in **Conditioner Type**. Click this button to display the **Linearization Data** window. See "Linearization Data Window" on page 446 Use the **Linearization Data** window to precisely edit range data points.

Sensor File Editor Window (part 3 of 3)

ITEM	DESCRIPTION
Calibration Values	The **Conditioner Type** selected determines these controls. Values entered here appear in the **Station Setup** window's **Calibration** tab. See "Calibration Tab" on page 313 for more information.
Cal Type	Sets the type of calibration used for the feedback signal. The calibration types displayed in this list depend on the conditioner type selected. **Gain/Delta-K**—Select to use delta K for calibration of sensors. Allows you to specify the amount of delta K applied to the sensor's output signal. Equally negative and positive inputs cause asymmetry in the sensor's output signal. Delta K compensates for this asymmetry. **Gain/Linearization**—Select to use linearization data for calibration of sensors with full-range conditioners. This type of calibration allows use of the **Linearization Data** window to precisely edit range data points. **mV/V Pos Tension**—Select when a sensor has been calibrated so that a positive output represents actuator retraction (tension). **mV/V Pos Comp**—Select when a sensor has been calibrated so that a positive output represents actuator extension (compression).

Linearization Data Window

Path **Tools** menu > **Sensor File Editor** > **Sensor File Editor** window > **Linearization Data** button



The test system uses the difference between this window's **Standard** and **Conditioner** values to compensate for transducer non-linearity.

Linearization Data Window (part 1 of 2)

ITEM	DESCRIPTION
Fullscale Min/Max	Displays the full scale value for the selected transducer.
Data Range	Sets the operating range over which linearization data values apply. **Range** is expressed as a percentage of the transducer's **Fullscale** value.
Reset	Resets all **Standard** and **Conditioner** values to their default values.

Linearization Data Window (part 2 of 2)

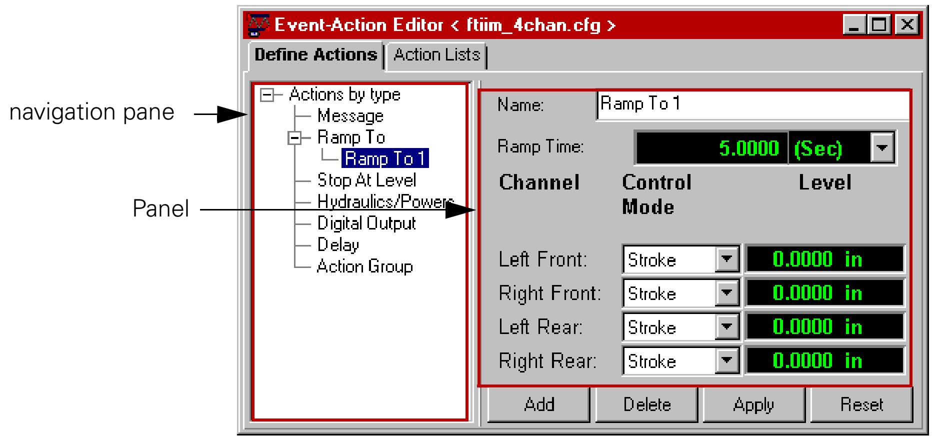
Item	Description
Standard	Displays the actual force or displacement values applied during calibration as measured by a standard such as a dial indicator gage or calibrated force sensor.
Conditioner	Displays the conditioner's output feedback in response to the applied force or displacement value as measured by the standard.

Station Manager

Event-Action Editor Window

Define Actions Tab

Path **Tools** menu > **Event-Action Editor** > **Event-Action Editor** window > **Define Actions** tab



This tab defines custom responses to **Limit Detector**, **Error Detector**, **Null Pacing Timeout**, and **Digital Input** events.

Actions must be defined in this tab before they can be selected in the **Action Lists** tab, described on page 457.

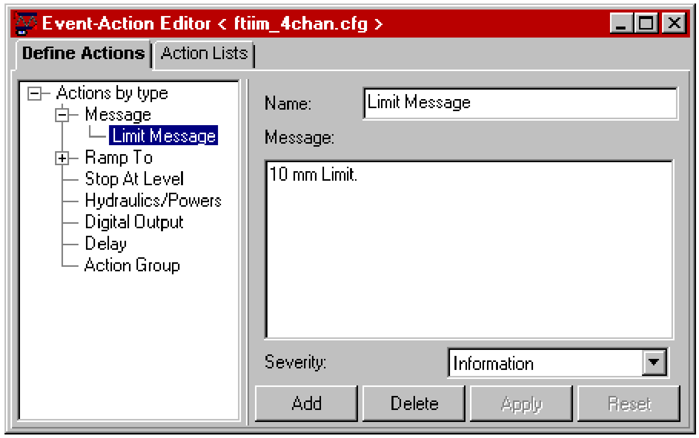
See “How to Define a Custom Action” on page 247 for more about using this tab’s controls.

Important *If you are using manual command, the defined actions **Ramp To** and **Stop At Level** will not be triggered by a event (typically a tripped limit). To trigger these actions you must be in “run” mode when a limit is tripped; using either the function generator, MultiPurpose TestWare, or Basic TestWare.*

Define Actions Tab

ITEM	DESCRIPTION
navigation pane	Displays a tree view of actions, organized by type. Selections within the navigation pane determine the tab's right-hand panel controls. For example, selecting **Message** displays panel controls for logging a message in response to an event. Click **–** to contract the tree view; click **+** to expand the tree view.
Add	Adds a new action of the type selected in the tree view.
Delete	Deletes the selected action.
Apply	Commits any changes that have been made to the current action. The changes are not effective until they have been applied. ***Note*** *If you have made changes to the current action, you cannot switch the editor to a different action without clicking **Apply** or **Reset**.*
Reset	Resets the action entries to the values set when the action was loaded or when **Apply** was last clicked.

Message Panel

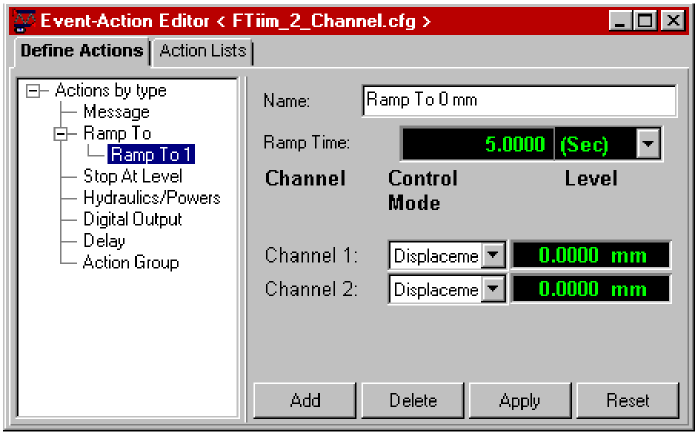


Select **Message** in the navigation pane to display controls to define messages written to the **Message Logs** window, described on page 403.

Message Panel

ITEM	DESCRIPTION
Name	Enter the action's name. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Message	Type the message text that will be written to the **Message Logs** window.
Severity	Select a severity level associated with the message.

Ramp To Panel



Select **Ramp To** in the navigation pane to define a controlled ramp to a specific level. The program stops at the end of the ramp.

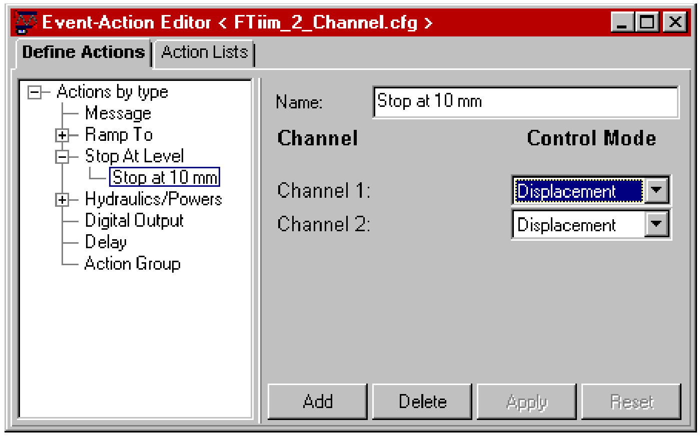
You can have a total of seven **Ramp To** and **Stop At Level** actions.

For more about ramps, see "Command Options Tab" on page 423.

Ramp To Panel

ITEM	DESCRIPTION
Name	Enter the action's name. This name appears the navigation pane and in the **Action Lists** tab's **Included** list.
Ramp Time	Sets the ramp time.
Channel	Identifies the channels where the ramp occurs.
Control Mode	Sets each ramp's control mode.
Level	Sets each ramp's ending level.

Stop At Level Panel



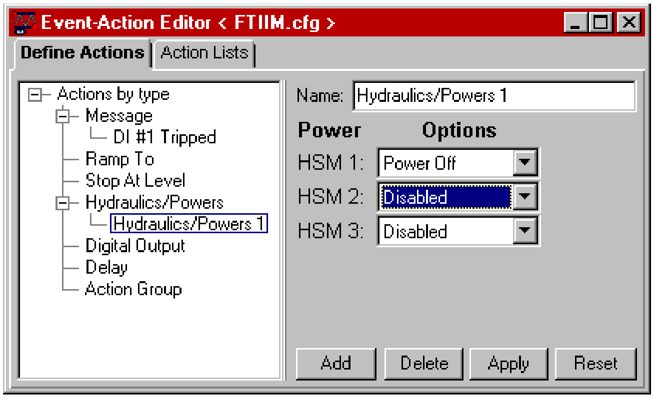
Select **Stop At Level** in the navigation pane to display controls for defining program stop actions.

You can have a total of seven **Stop At Level** and **Ramp To** actions.

Stop At Level Panel

ITEM	DESCRIPTION
Name	Enter the action's name. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Channel	Identifies the channels where the stop occurs.
Control Mode	Sets each stop's control mode.

Hydraulics/Powers Panel

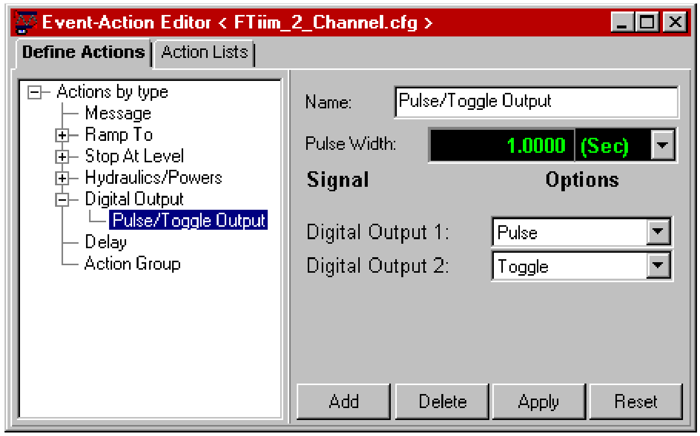


Select **Hydraulics/Powers** in the navigation pane to display controls for defining station hydraulic and power actions.

Hydraulics/Powers Panel

ITEM	DESCRIPTION
Name	Enter the action's name. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Power	Identifies the power source affected by the action.
Options	Defines what each action does. For hydraulic service manifolds (HSMs), the choices are **Disabled** and **Power Off**.

Digital Output Panel

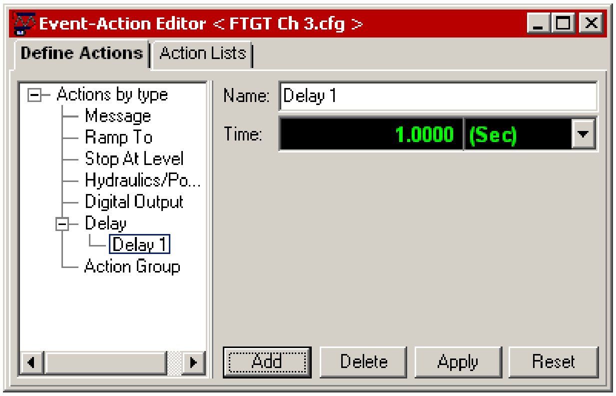


Select **Digital Output** in the navigation pane to display controls for defining digital output actions.

Digital Output Panel

ITEM	DESCRIPTION
Name	Enter the action's name. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Pulse Width	Sets the pulse duration time for digital outputs with a pulse option.
Signal	Identifies the digital output.
Options	Defines the digital output signal's behavior: **Disabled**—No signal. **Set**—The signal goes high. **Clear**—The signal goes low. **Toggle**—The signal changes state. **Pulse**—The signal changes state for the **Pulse Width** time and then returns to its initial state.

Delay Panel

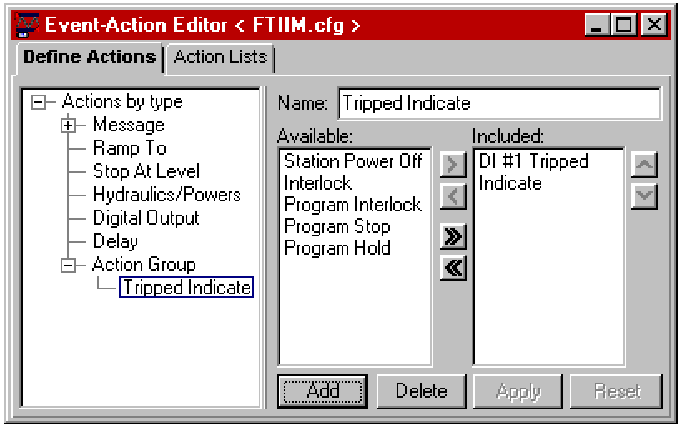


Select **Delay** in the navigation pane to display controls to define a delaying action. Delay actions are only useful in an **Action Group**, so they must be added to a group.

Delay Panel

ITEM	DESCRIPTION
Name	Type the action name in this field. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Time	Sets the delay time.

Action Group Panel

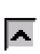


Select **Action Group** in the navigation pane to display controls to create a single action that combines individual actions.

An **Action Group** can include the standard **Indicate**, **Station Power Off**, **Interlock**, **Program Interlock**, **Program Stop**, and **Program Hold** actions.

The timing of actions in a group is set by the order in which they appear in **Included**. It is not necessary for one action to complete before the following action starts. Use **Delay** to sequence actions in a group.

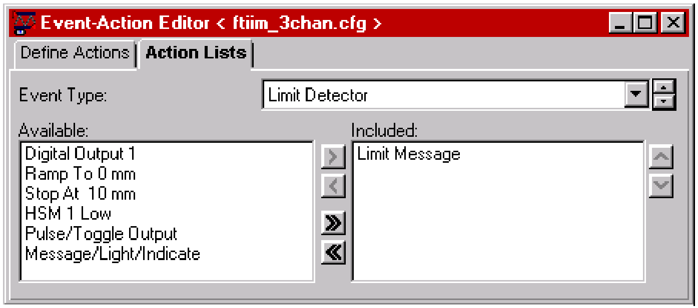
Action Group Panel

ITEM	DESCRIPTION
Name	Type the action name in this field. This name appears in the navigation pane and in the **Action Lists** tab's **Included** list.
Available	Lists the user-defined and standard actions that can be combined into an **Action Group**.
Included	Lists the actions that have been added to the **Action Group**.
	Moves the selected **Included** action up one place in the list.
	Moves the selected **Included** action down one place in the list.

Action Lists Tab

Path

Tools menu > **Event-Action Editor** > **Event-Action Editor** window > **Action Lists** tab



This tab's selections determines if custom actions can be selected as **Action** responses to **Limit Detector**, **Error Detector**, **Null Pacing Timeout**, or **Digital Input** events.

See "About Detectors" on page 223, "About Null Pacing" on page 195, and "About Digital Inputs" on page 243 for more information.

Action Lists Tab (part 1 of 2)

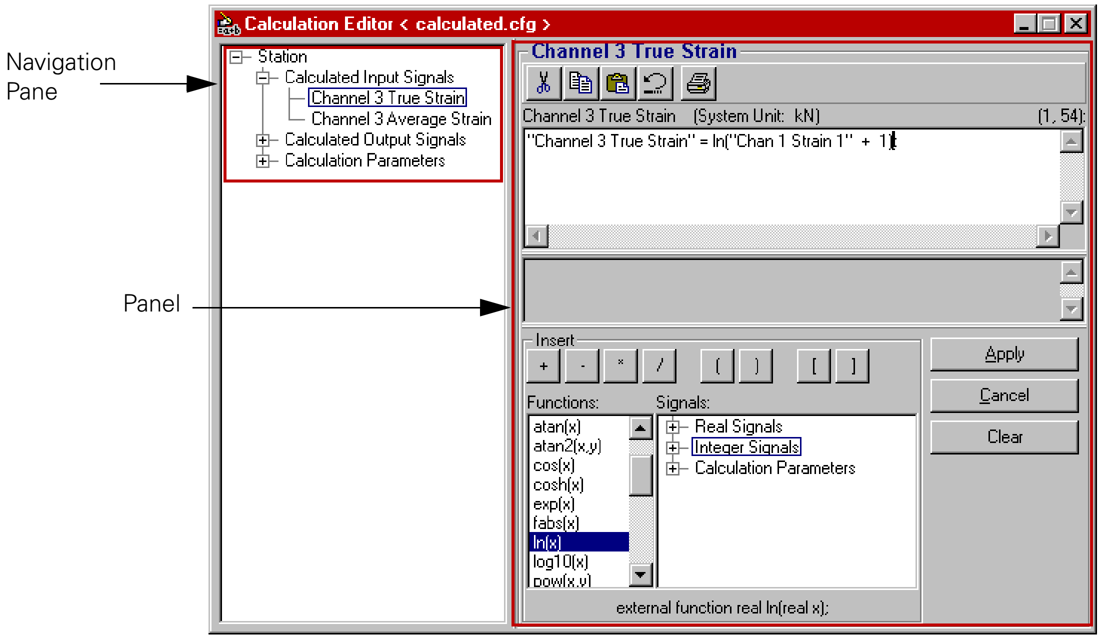
ITEM	DESCRIPTION
Event Type	**Limit Detector**—An **Included** action can be selected as the **Action** triggered by a limit detection event. **Error Detector**—An **Included** action can be selected as the **Action** triggered by an error detection event. **Null Pacing Timeout**—An **Included** action can be selected as the **Action** triggered by a static or dynamic null pacing timeout. **Digital Input**—An **Included** action can be selected as the **Action** triggered by a digital input. **All Actions List**—An **Included** action can be selected as the **Action** triggered by any of the above events.
Available	Lists actions that can be **Included** as an **Action** in response to the selected **Event Type**.
	Moves selected actions from **Available** to **Included**.

Action Lists Tab (part 2 of 2)

ITEM	DESCRIPTION
	Moves all actions from **Available** to **Included**.
Included	Lists the actions available for the selected **Event Type**. By default, all new custom actions go here.
	Moves selected actions from **Included** to **Available**.
	Moves all actions from **Included** to **Available**.
	Moves the selected **Included** action up one place in the list.
	Moves the selected **Included** action down one place in the list.

Calculation Editor Window

Path **Tools** menu > **Calculation Editor**



This window defines the formulas used to produce a calculated signal. Signals resulting from these formulas can be output as drive signals, input for use in control modes, and saved as data.

The Station Builder application assigns resources for actual station signals and creates calculated resources. The formulas defined in this window tie together actual signals with calculated resources to produce usable inputs and outputs. For more information, see Use care when applying the results of an expression.

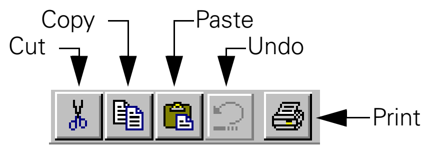
Calculation Editor Window

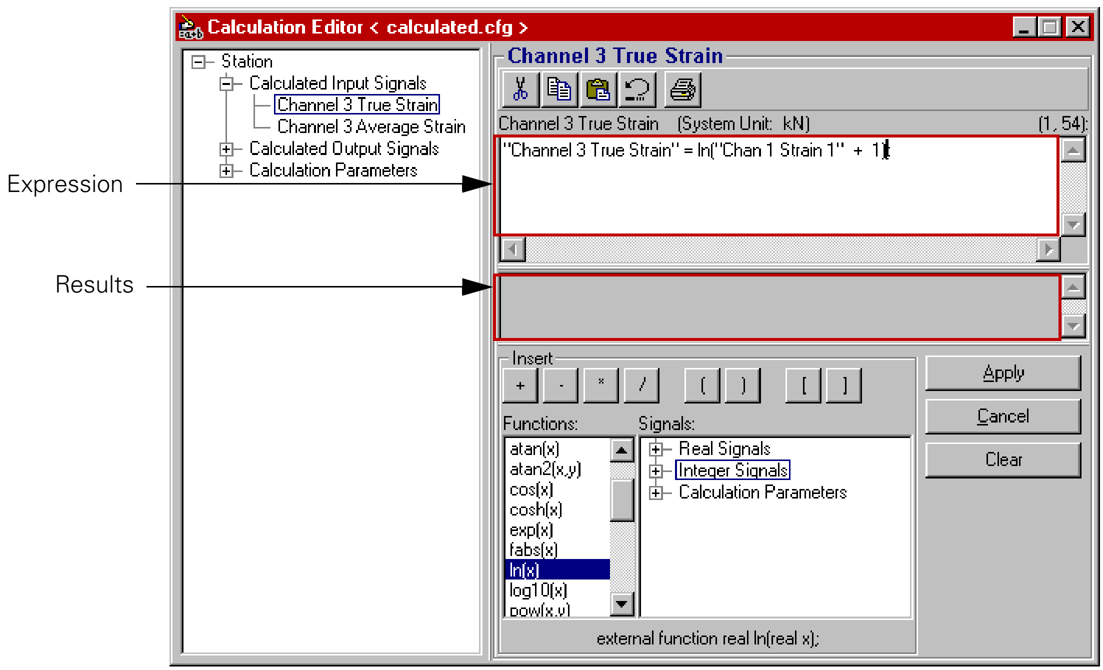
Item	Description
navigation pane	Displays a tree view of calculated signals, organized by type. Selections within the navigation pane determine the tab's right-hand **Panel** controls. For example, selecting **Calculation Parameters** displays the **Parameter** panel, with controls to define parameters used in formulas. The following pages describe these controls. Click **–** to contract the tree view; click **+** to expand the tree view.

Calculation Definition Panels

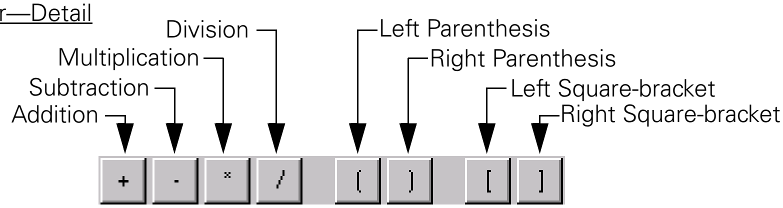
Path **Tools** menu > **Calculation Editor** > **Calculation Editor** window > navigation pane > **Calculated Input Signals** or **Calculated Output Signals**

Expression Toolbar—Detail





Arithmetic Operators Toolbar—Detail



These panels define the formulas used to produce calculated inputs and outputs. The panels that define inputs and outputs are identical.

WARNING

Small formula changes can produce large control loop changes, resulting in violent actuator actions.

Violent actuator movement can result in injury and equipment damage.

Use care when changing formulas.

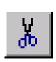
WARNING

Expressions use SI (Systeme International d'Unites) units, such millimeters and Newtons. The Station Manager can be calibrated and programmed using U.S. Customary units, such as inches and pounds. Applying the results of an SI based expression in a control loop using U.S. Customary Units can produce violent actuator movement.

Violent actuator movement can result in injury and equipment damage.

Use care when applying the results of an expression.

Calculation Definition Panels (part 1 of 2)

Item	Description
Expression toolbar	Use to edit the formula in the Expression box.
	Cuts selected text.
	Copies selected text to the clipboard.
	Pastes in the clipboard contents at the cursor position.
	Undo the last typed change.
	Prints the expression.
Expression	Create and edit formulas here for **Calculated Input Signals** and **Calculated Output Signals** selected in the navigation pane. Create and edit expressions using the Expression toolbar and Arithmetic Operator buttons, as well as by direct typing.

Calculation Definition Panels (part 2 of 2)

ITEM	DESCRIPTION
Results	Displays the results of clicking **Apply** to compile the formula. **Success** indicates a successful compilation. Error messages identify errors by row and column, which may not always be accurate. Undefined variable errors produce messages that point to the end of the formula.
Insert	Use to insert common **Operators**, **Functions**, and **Signals** into the **Expression** box's formula.
Arithmetic Operators toolbar	Use this toolbar's buttons to insert common operators into the Expression box's formula.
Functions	Select and then double-click to insert these common functions into the Expression box's formula.
Signals	Displays a tree view of signals that can be used in formulas. ***Note*** *Signals designated as "reconfigurable" are removed from this lost of available signals.* Double-click to insert signals into the **Expression** box's formula. The following signal types are available: **Real Signals**—These are actual station signals, such as **Command**. **Integer Signals**—These signals use an integer representation, such as **Count**. **Calculation Parameters**—Parameters defined using the **Calculation Editor** window's **Parameter Definition** panel, described on page 477.
Apply	Compiles and saves the formula. The Results box shows the success or failure of a compilation. ***Note*** *You must **Apply** or **Cancel** edits before switching to a different calculation.*
Cancel	Cancels any changes made in the formula and returns formula values to where they were when **Apply** was last clicked or the calculation initially loaded.
Clear	Removes the formula from the Expression box.

Functions

The following **Functions** are available:

int abs(int x)	real cosh(real x)	real sin(real x)
real acos(real x)	real exp(real x)	real sinh(real x)
real asin(real x)	real fabs(real x)	real sqrt(real x)
real atan(real xy)	real ln(real x)	real tan(real x)
real atan2(real x, real y)	real log10(real x)	real tanh(real x)
real cos(real x)	real pow(real x, real y)	real pi ( )
real rate ( )	int size(real x[ ])	int isize(int x[ ])
real avg(real x[ ], int y)	real shift(real x[ ], real y)	int ishift(int x[ ], int y)

Calculation Grammar

Simple Expression

The simplest form of an expression for a calculated signal is an equation that assigns the signal to some equation of other signals and calculation parameters.

For example:

"Axial Stress" = "Axial Force" / "Area";

If the names contain spaces or other special characters, they must be enclosed in quotation marks. In the preceding example, the quotation marks could have been left off of *Area*. However, it is typical to always put them in.

Names are case sensitive in the **Calculation Editor** window.

The expression can span multiple lines, and spaces or tabs can be inserted to improve readability. However, the names in quotation marks must not contain extra spaces or line terminators.

Comments

C-style comment delimiters can be used to insert comments in the expression, or temporarily comment out portions of the code. There are two types of comments—bracketing comments and end-of-line comments.

Bracketing comments are delimited by character sequences /* and */ that can span multiple lines. For example:

/ . . .*
...my comment...
. . ./*

End of line comments start with a double-slash, and end at the end of the line. For example:

"Axial Stress" = "Axial Force" / "Area";   //my comment

Data types

In simple situations, the calculation designer can think of all the data in calculations as being numbers. However, the calculation engine actually handles different kinds of data. A value is an IEEE 32-bit floating point, an IEEE 64-bit floating point, or a 32-bit integer.

- All calculation parameters are stored in IEEE 32-bit floating-point format.
- All floating point signals are 32-bit floating points.
- All integer signals are 32-bit integers.
- Floating point data within the calculation engine are 64-bit floating points.
- Integer data within the calculation engine are 32-bit integers.

Data values are converted as necessary, so you generally do not need to be concerned with them.

Literal numbers and dimensions

Expressions are evaluated in system units. System units are based on millimeters, kilo newtons, and seconds. The **Calculation Editor** window displays the **System Units** used by all selected **Signals**. Look in the file SYSDEF.UAS for a full list of the system units. The values that the expression reads from signals and calculation parameters will be in these units. The value assigned to the result signal must be in the appropriate signal unit.

If literal values are put into the expression, they must be interpreted in system units.

The calculation engine does not do any unit conversion or dimensional analysis.

Operators

The language understands the normal plus, minus, multiply, and divide operators. The default precedence of these operators matches most programming and mathematical languages. It evaluates all multiplication and division (left to right) and then all addition and subtraction (left to right). To change the order of evaluation, you use parenthesis operators.

For example:

"Axial Force" = ("Axial Force 1" + "Axial Force 2") / 2;

The following table shows all the recognized operators organized by group and listed in order of precedence. Within a group, all operators have the same precedence.

Calculation Editor Window Operators (part 1 of 2)

Precedence	Operator	Function	Operand type	Result type	Direction
1	[ ] ( )	Array index Function call	Int Int or real	Int or real (same as operand)	Left-to-right
2	!	Logical NOT	Int or real	(same as operand)	Right-to-left
3	–	Unary minus	Int or real	(same as operand)	Right-to-left
4	* /	Multiply Divide	Int or real	(same as operands)	Left-to-right
5	+ –	Addition Subtraction	Int or real	(same as operands)	Left-to-right

Calculation Editor Window Operators (part 2 of 2)

Precedence	Operator	Function	Operand type	Result type	Direction
6	<	Less than	Int or real	Int	Left-to-right
	<=	Less than or equal			
	>	Greater than			
	>=	Greater than or equal			
	==	Is equal			
	!=	Not equal			
7	||	Logical OR	Int	Int	Left-to-right
	&&	Logical AND			Left-to-right

The compiler will automatically provide conversions to get to the proper types. For example, if you add a real number and an integer number, the code will convert the integer number to a real number before doing the addition.

Built-in arithmetic functions

The language understands the following built-in arithmetic functions:

int abs(int x)	real cosh(real x)	real sin(real x)
real acos(real x)	real exp(real x)	real sinh(real x)
real asin(real x)	real fabs(real x)	real sqrt(real x)
real atan(real x)	real ln(real x)	real tan(real x)
real atan2(real x, real y)	real log10(real x)	real tanh(real x)
real cos(real x)	real pow(real x, real y)	real sin(real x)
real rate()	real pi( )	

Multiple statements and variables

There is only so much that you can do in a single equation. It can be convenient or necessary to break the calculation equation into multiple statements. This requires variables to store intermediate results. Variables can also be used to remember data from one clock tick to the next.

Using variables for intermediate results

You can declare variables by specifying the data type, and following it with a comma-separated list of variable names. For example, the following defines three floating-point variables (*x*, *y*, and *z*) and an integer variable (*count*):

real x, y, z;
int count;

The names of variables follow the same rules as other names. If they contain spaces or other special characters, they must be put in quotes.

By using variables, intermediate results can be evaluated and used in the main equation. For example:

real x;
*x = "Axial Force 1" * Area;*
*"Axial Stress" = p0 + (p1 + (p2 + p3 * x)* x) * x;*

The variables *p0, p1, p2, p3* and *Area* are calculated parameters.

While this could have been done in a single expression, it would have required that the multiplication *x* to be done three times and that would have been much less readable.

Variables are local to a particular signal's expression. Multiple signals can use the same name in their expressions without any conflict.

Using variables to remember history

Variables that are defined as shown in the preceding example remember their value from one pass to the next. The following expression does a two-point running average:

real oldValue;
"My Average Signal" = ("My Signal" + oldValue)/2;
oldValue = "My Signal";   //Remember the previous value.

When an expression is loaded into the machine (either when the configuration is loaded, or when a new expression is applied), the values of all variables are set to zero. Thereafter, they keep the last value that was set into them.

Arrays

An array is a variable that holds multiple values of the same data type. Arrays are declared in much the same way as normal variables. The only difference is that a size is specified.

For example, the following declares an array *"A"* of 10 elements:

real A[10];

The elements of an array are indexed from zero.

The array in the preceding example contains elements:

A[0], A[1], A[2], A[3], A[4], A[5], A[6], A[7], A[8], and *A[9]*

One declaration statement can declare multiple array and non-array variables. For example:

real A[100], a, B[20], x;
int counts[10], i;

The elements of an array can be individually referenced or assigned. Arrays can be used to conveniently store more history.

For example, here is a four-point running average:

```
real old[4];
old[3] = old[2];
old[2] = old[1];
old[1] = old[0];
old[0] = "My Signal";          //Remember the previous value.
"My Average Signal" = (old[0] + old[1] + old[2] + old[3])/4;
```

The language supports the following built-in array functions:

int size(real x[ ])	int ishift(int x[ ], int y)
int isize(int x[ ])	real avg(real x[ ], int y)
real shift(real x[ ], real y)	

The function *shift (Array, value)* performs the same operation as shown in the preceding example (the function *ishift(iarray, value)*) works the same for integer arrays). The *shift* function shifts every element up to the next higher index and puts the specified value into element zero. It returns the value that shifted out of the last element in the array.

With this function, the preceding four-point running average can be written as:

```
real old[4];
shift(old, "My Signal");          //just discard oldest value.
"My Average Signal" = avg (old, 4);
```

The *shift* function does not really have to move all the values. It is as efficient on large arrays as it is on small ones.

The other useful function is *size(array)*. It returns the allocated size of a real array (*isize(array)* works with integer arrays). This is useful when writing loops, which is the next topic. Here is a more general implementation of the running average expression:

```
real oldValues[50];          //keeps the last 50 values.
real currentSum;             //assume all values start out 0.
real discardedValue;         //temporary
discardedValue = shift(oldValues, "My Signal");
current Sum = currentSum + "My Signal" – discardedValue;
"My Average Signal" = currentSum/size(oldValues);
```

Indexing outside the bounds of an array is an error. The signal will be set to invalid. See "Error handling" on page 475 for more information.

Control structures (if, while)

Expressions support two control structures—The *if* statement, and the *while* statement.

if

if statements work similar to their equivalents in the C language:

```
if (expression)
    trueStatement;

if (expression)
    trueStatement;
else
    falseStatement;

if (expression)
{
    statements;
}
```

The expression is something that evaluates to an integer. Zero means false, and non-zero means true. Most often, this expression will involve relational operators, and logical operators.

For example, the following code, where *Maximum* and *Minimum* are calculation parameters, clips the data on *"My Signal"* and puts the result on *"My clipped signal"*

```
if ("My Signal" > Maximum)
    "My clipped signal" = Maximum;
else if ("My Signal" < Minimum)
    "My clipped signal" = Minimum;
else
    "My clipped signal" = "My Signal"
```

To put more than one statement into the true or false conditional, you can use a compound statement. A compound statement is a series of statements enclosed with { } (called curly brackets or braces).

while

The while loop has a similar form:

```
while (expression)        while (expression)
    statement             {
                              statements;
                          }
```

The following example implements a 50-tick delay. It also contains logic that will initialize the array the first time it is called. After the first time, the variable “i” will contain 50, so the logic will not be repeated.

```
real oldValues[50];
int i;
while (i < 50)
{
    oldValues[i] = “My Signal”;
    i = i + 1;
}
“Delayed Signal” = shift(oldValues, “My Signal”);
```

When using while loops, it is very easy to implement a loop that will run forever. If this happens, the system will start missing interrupts. This will cause a watchdog timer to fire, causing an interlock. The expression evaluator will detect this, and stop executing the expression. The signal will be set to invalid, and will remain that way until **Interlock Reset** is pressed. See “Error handling” on page 475 for more information.

User-defined functions

Within the expression of a calculated signal, the user can define new functions. These are only available in that particular expression.

The syntax is:

```
function returnType fcnName ( arguments )
{
    variable declarations;
    statements;
}
```

This is best shown with the following examples:

```
function int factorial(int value)
{
    if (value > 1)
        return factorial(value – 1) * value;
    else
        return 1;
}

function real PI()
    {return 3.14159;}

function real sum(real A[])
{
    int index;
    real temp;

    temp = 0;
    index = 0;
    while (index < size(A))
 {
        temp = temp + A[index];
        index = index + 1;
    }
     return temp;
}
```

Functions must always have a return type. If the body of the function does not execute a return statement, it will return a zero.

User-defined functions are called just like other functions.

Some examples:

```
real myArray[50];
shift(myArray, “My Signal”);
“My Average Signal” = sum(myArray)/size(myArray);
```

Arrays that are passed to functions are passed by reference, that means that the function can modify the contents of the array.

Variables declared at the start of the function are created when the function is invoked, and destroyed when the function exits. This is different than variables declared in the main body of the code. The value of variables and arrays declared in a function is unpredictable when the function is called. The function body must initialize them before they are used.

Functions can access variables declared in the main routine. However, if a variable or parameter is declared within the function by the same name, then the function can only see this local variable.

Error handling

The following describes the handling of compiler, mathematical, and unrecoverable errors.

Compiler errors

The system will not load a calculation containing compilation errors (syntax errors, undefined variables, mismatched types, etc.). The compiler lists the errors it finds, and includes a (line, column) indication where the error is detected.

However, currently, some errors are not detected until after the code is parsed, and the (line, column) will point at the end of the code or the function.

Mathematical errors

Arithmetic errors like divide-by-zero, or the square-root of a negative number set the resulting value to infinity, or “Not-a-Number.” These values continue to propagate through the calculations, and will probably result in a limit detector tripping.

Unrecoverable errors

Certain errors cannot allow the evaluation of the calculation to continue.

These errors include:

- Watch-dog timeout caused by overloading the processor
- Array index out of bounds
- Stack overflow
- Invalid number generated (NAN—not-a-number)

When one of these happens, execution of the calculation is terminated, and the signal is set to an “invalid” state. A message is sent to the log.

If the calculated signal is used by a control mode, then this will cause an interlock. The watch-dog timeout will cause an interlock anyway.

The result of a calculation will get clipped to the **Fullscale Min/Max** value, set in the **Calibration** tab described on page 336.

If not-a-number occurs, the signal is set to invalid.

The user can try to recover by pressing **Interlock Reset**. However, if the error is not intermittent, it will just trip again.

Helpful hints

Remember that:

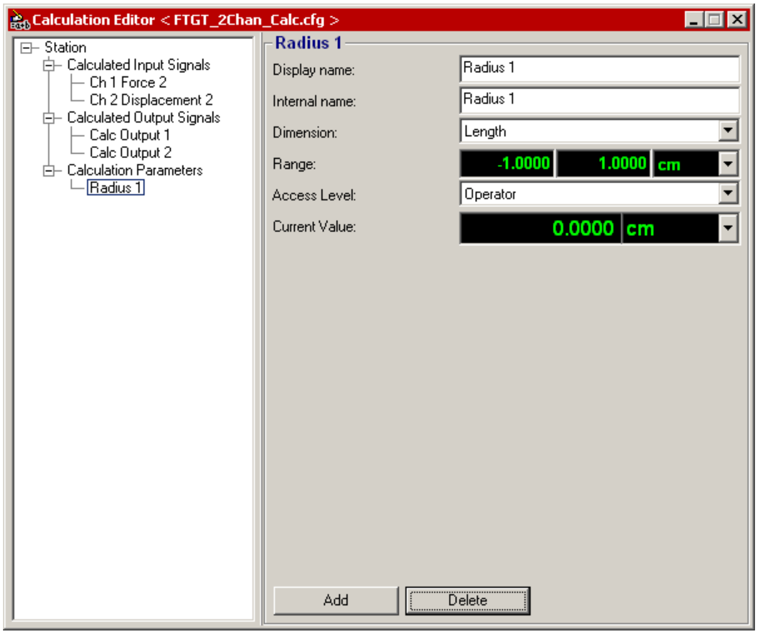
- All calculations are performed in system units.
- The current compiler does not do any optimization. All operations that are specified will be executed. This includes implicit conversions. For example, in the following code, the second assignment is more efficient than the first, because the first one needs to convert the integer zero into floating-point. Code is generated to do this:

```
real x;
x = 0;
x = 0.0;
```

- If you have several calculated signals that need the same expression, except that they operate on different input signals, then declare a variable at the beginning that is assigned to the input signal. Use this variable within the rest of the code. Then you can copy the expression to the other calculation signals, and just change the one line to point to the different signal.
- Use variable names that help document their use. By convention, use quotes around signal and parameter names, but define internal variables so they do not need quotes.
- Put comments, white space, and line terminators in the code to make it more readable for the next person. These have no impact on performance.
- Make sure you initialize any variables defined in user-defined functions. The compiler will not find this error for you.

Parameters Definition Panel

Path **Tools** menu > **Calculation Editor** > **Calculation Editor** window > navigation pane > **Calculation Parameters**



This panel defines parameters that can be used in calculated signals' formulas.

Parameters values display and can be changed in the **Station Setup** window's **Calculation Parameters** panel, described on page 389.

WARNING

Small parameter changes can produce large control loop changes, resulting in violent actuator actions.

Violent actuator movement can result in injury and equipment damage.

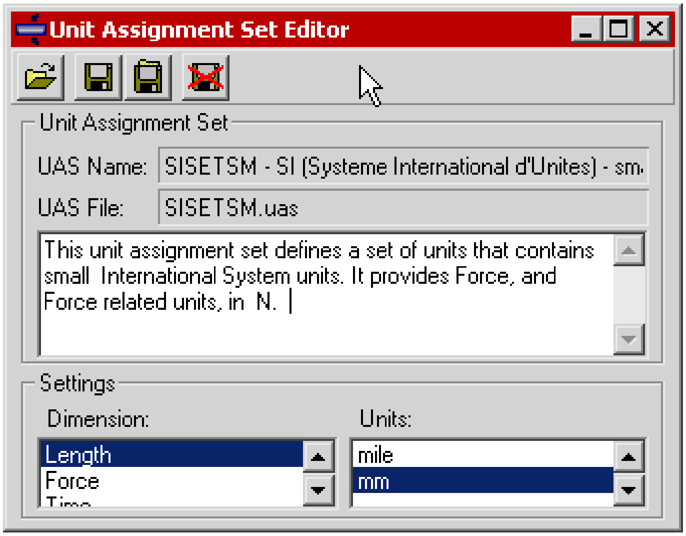
Use care in changing parameters and in setting the access level required to change parameters.

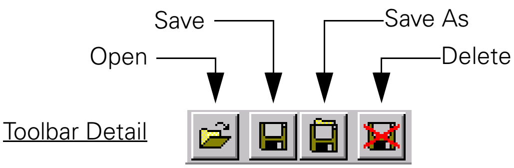
Parameters Definition Panel

ITEM	DESCRIPTION
navigation pane	Displays a tree view of calculated signals and calculation parameters. Selections within the navigation pane determine the tab's right-hand **Panel** controls. Click **–** to contract the tree view; click **+** to expand the tree view. Click and drag to rearrange the parameter order.
Display Name	Identifies the calculation parameter. This name entered here appears in formulas, in the **Station Setup** window's **Calculation Parameters** panel, and in the **Channel Option** window's **Signal Lists**. Enter a name that is meaningful to users.
Internal Name	Identifies the calculation name for internal purposes. Typically, this name is not changed.
Dimension	Selects the parameter's dimension. This selection affects available **Current Value** selections.
Range	Sets a range in which the parameter value can be changed.
Access Level	Sets the access level required to change the **Current Value**. See "Setting Access Levels" on page 129 for more information.
Current Value	Sets the current parameter value. Parameter values are changed here and in the **Station Setup** window's Calculation **Parameters** tab, described on page 389.
Add	Adds a new **Parameter** to the navigation pane list of **Calculation Parameters**.
Delete	Removes the selected **Parameter** from the navigation pane list of **Calculation Parameters**.

Unit Assignment Set Editor Window

Path **Tools** menu > **Unit Set Editor**

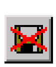




This window creates and modifies the unit assignment sets (UAS) used in test data files and the default unit set used by MultiPurpose TestWare (MPT) and Basic TestWare (BTW).

Normally, unit assignment sets are selected when installing software. However, the **Station Option** window's **Unit Selection** tab, described on page 412, can change UAS assignments at any time.

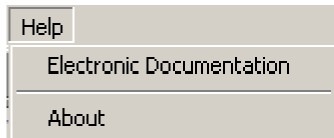
Unit Assignment Set Editor Window (part 1 of 2)

Item	Description
toolbar	Manages UAS files. The standard **CGSET**, **ENGSET**, **ENGSETSM**, **SISET - SI**, **SISET- SM**, and **SYSDEF** UAS files cannot be changed or deleted.
	Displays the **Unit Assignment Set Open** window. Use this box to open unit assignment sets. Select from the following MTS supplied sets: **CGSSET** - **Centimeters-Grams-Seconds**—Units are based on centimeters, grams, and seconds. **ENGSET** - **U.S. Engineering Units**—Units are based on Customary U.S. engineering units with force related units in kips. **ENGSETSM** - **U.S. Engineering Units (small)**—Units are based on Customary U.S. engineering units with force related units in lbf. **SISET** - **SI (Systeme International d'Unites)**—Units are based on Customary International (metric) units with force related units in kN. **SISETSM** - **SI (Systeme International d'Unites) - small**—Units are based on Customary International (metric) units with force related units in N. **SYSDEF** - **System Units Definition**—Contains units used by the hardware. Additional user-defined sets can be selected here.
	Saves changes to custom unit assignment sets.
	Displays the **Unit Assignment Set Save As** window. Use this box to name and save custom unit assignment sets.
	Deletes the selected custom unit assignment set.
UAS Name	Displays the name of the UAS currently selected.
UAS File	Displays the file name of the UAS currently selected.
Comment	Enter comments about a custom UAS.

Unit Assignment Set Editor Window (part 2 of 2)

ITEM	DESCRIPTION
Settings	Displays UAS Dimension and Units values.
Dimension and **Units**	For standard sets, clicking a **Dimension** highlights its default **Units**. For custom sets, click a **Dimension** and then click the **Units** to be used as the default.

Help Menu

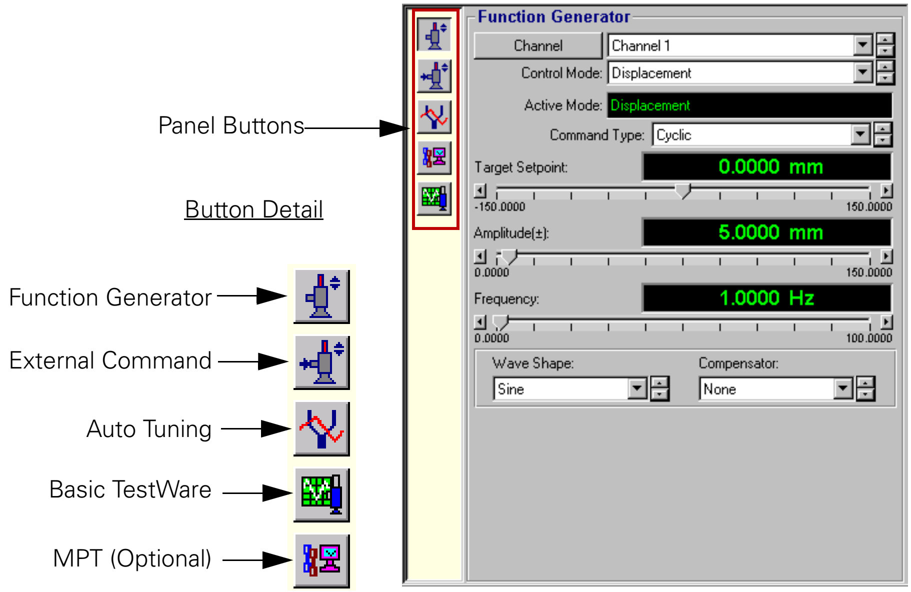


This menu’s commands access electronic documentation and display general application information.

Help Menu

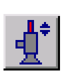
ITEM	DESCRIPTION
Electronic Documentation	Opens electronic documentation help.
About	Displays the **About Station Manager** window. This window displays the Station Manager application version number and copyright information.

Application Controls Panels

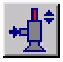
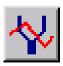
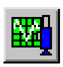
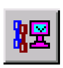


These panels display the controls for the application that is run at the test station.

Application Controls Panels (part 1 of 2)

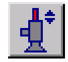
ITEM	DESCRIPTION
Panel Buttons	Change the test station's controlling application panels. The Station Manager application will display an error message if you try to change an active control panel.
	Displays the **Function Generator** control panel. Use this panel to generate simple commands. For more about this control panel, see "Function Generator Control Panel" on page 485.

Application Controls Panels (part 2 of 2)

ITEM	DESCRIPTION
	Displays the **External Command** control panel. Use this panel to adjust an incoming program signal. The Station Builder application must have assigned an external input to a channel in the station configuration for this panel to display. See "Enabling External Command Inputs" on page 74 for more information. For more about this control panel, see "External Command Control Panel" on page 493.
	Displays the **Auto Tuning** control panel. Use this panel to automatically calculate PIDF tuning values. For more about this control panel, see "Auto-Tuning Control Panel" on page 495.
	Displays the **Basic TestWare** (BTW) control panel. This button displays only if the BTW application has been opened through the **Applications** menu.
	Displays the **MultiPurpose TestWare** (MPT) control panel. MPT is an option which your system may not have. This button displays only after the MPT application has been opened.

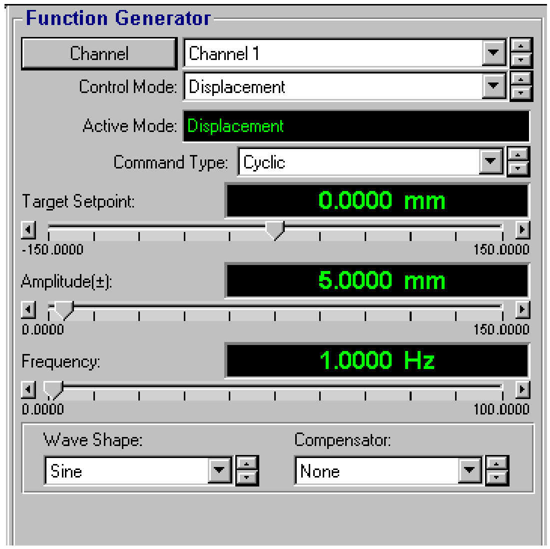
Function Generator Control Panel

Path

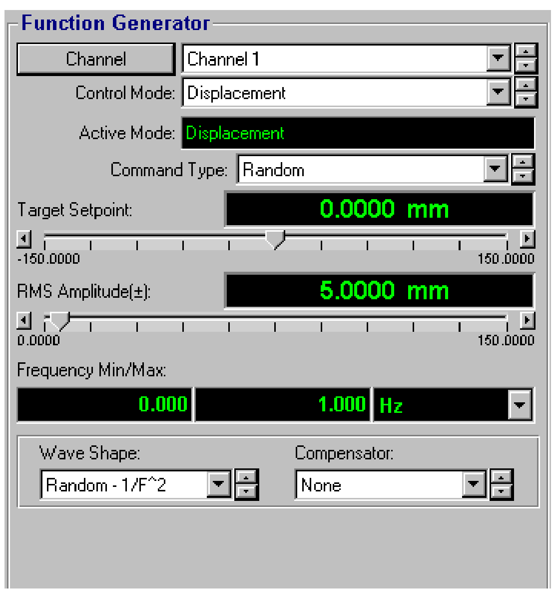
Panel Buttons > 

Note *The **Command Type** selected defines this panel's controls.*

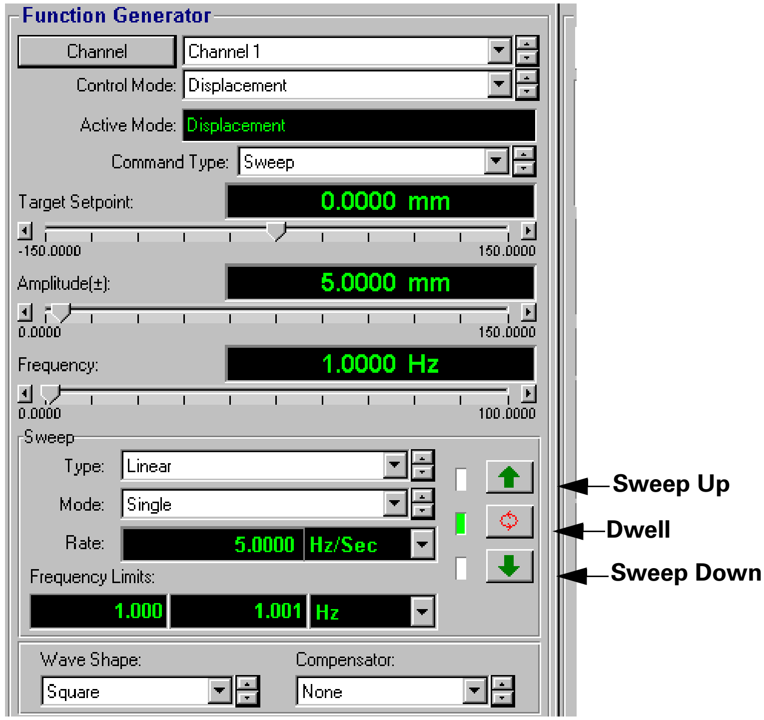
Command Type—Cyclic



Command Type—Random



Command Type—Sweep



This control panel generates commands that can be used to warm up a system or tune actuators.

See “How to Program with the Function Generator” on page 255 for more about using this panel’s controls.

WARNING

Changes in Function Generator values made with hydraulic pressure on can result in unexpected actuator movement.

A moving actuator can injure anyone in its path.

Always clear the actuator area before changing values.

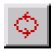
Function Generator Control Panel (part 1 of 3)

ITEM	DESCRIPTION
Channel	Selects the control channel. Click the **Channel** button to toggle between individual channels and a **Master Command Group**. See “About Channel Groups” on page 259 for more information. Selecting a **Master Command Group** blanks out the **Control Mode** and **Active Mode** entries.
Control Mode	Sets the control mode used when the **Function Generator** starts.
Active Mode	Displays the current control mode.
Command Type	Selects the type of command: **Cyclic**—The function cycles at the specified amplitude and frequency. **Sweep**—The function sweeps the command signal between the specified frequency limits at the rate specified. **Random**—The function sweeps randomly according to the RMS amplitude and frequency limits you specify. Descriptions of each command type follow this table.
Target Setpoint	Specifies the setpoint that the signal’s amplitude centers on.
Amplitude (±)	Displays for a **Command Type** of **Cyclic** and **Sweep**. Specifies the signal’s amplitude. The specified amplitude applies equally to both sides of the **Target Setpoint**.
RMS Amplitude (±)	Displays for a **Command Type** of **Random**. Specifies the signal’s RMS amplitude. ***Note*** *RMS (Root Mean Square) amplitude is always smaller than peak amplitude. The maximum display range of the RMS amplitude is set to 20% full-scale.*

Function Generator Control Panel (part 2 of 3)

Item	Description
Frequency	Displays for a **Command Type** of **Cyclic** and **Sweep**. Specifies the signal's frequency. The maximum frequency is limited to 20% of the high system clock rate. During a **Sweep**, this control's pointer tracks the sweep frequency.
Frequency Min/Max	Displays for a **Command Type** of **Random**. Sets the minimum and maximum frequencies of the random signal. Click on the label to view the allowable minimum and maximum limits.
Sweep	These controls display for a **Command Type** of **Sweep**. Defines the signal's sweep.
Type	Defines the sweep type: **Linear**—Steps the sweep linearly by the **Rate** between **Frequency Limits**. **Logarithmic**—Steps the sweep logarithmically by the **Rate** between **Frequency Limits**. Running the **Function Generator** makes this control unavailable.
Mode	Defines the duration of the sweep. **Single**—Sweeps until it reaches a frequency limit and then dwells at that limit. **Continuous**—Sweeps continuously between frequency limits until stopped. Running the **Function Generator** makes this control unavailable.
Rate	Sets the change per step and how often the change occurs.
Frequency Limits	Sets the sweep command's upper and lower frequency limits. Click on the label to view the **Frequency Limits** range.

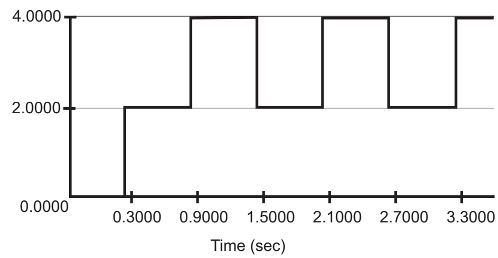
Function Generator Control Panel (part 3 of 3)

ITEM	DESCRIPTION
Sweep Control	 Starts an upward sweep.  Holds the sweep at its current frequency.  Starts a downward sweep.
Wave Shape	Specifies the signal's wave shape of **Square**, **Ramp**, **Sine**, **Square Tapered**, **Ramp Tapered**, or **Sine Tapered**. See the discussion that follows this table.
Compensator	Specifies the compensator used by the **Function Generator**. The Station Builder application must have enabled adaptive inverse control (**AIC**) and amplitude and phase control (**APC**) in the station configuration for these compensation methods to be available. See "Creating Control Modes" on page 60 for more information.

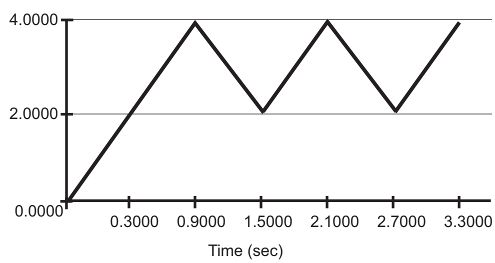
About Wave Shapes

The **Function Generator** provides the following wave shapes.

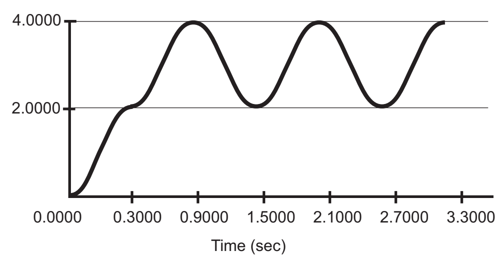
Square



Ramp

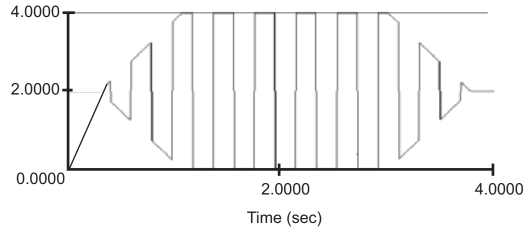


Sine



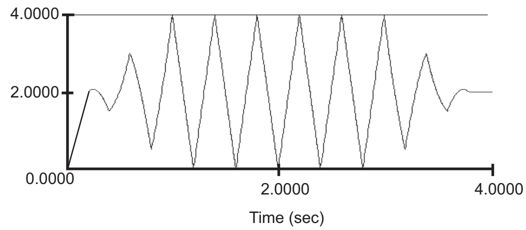
Square tapered

Tapered square waves taper from 0% to 100% amplitude at the beginning of execution, and from 100% to 0% at the end of execution.



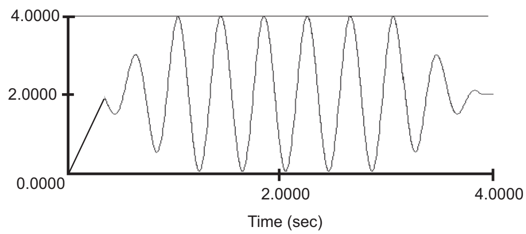
Ramp tapered

Tapered triangle waves taper from 0% to 100% amplitude at the beginning of execution and from 100% to 0% at the end of execution.



Sine tapered

Sine waves taper from 0% to 100% amplitude at the beginning of execution, and from 100% to 0% at the end of execution.



Random functions

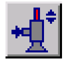
The **Command Type** selection of **Random** provides random functions with various pre-emphasis filters. Typically, these random wave shapes are used to train adaptive compensators such as AIC and APC.

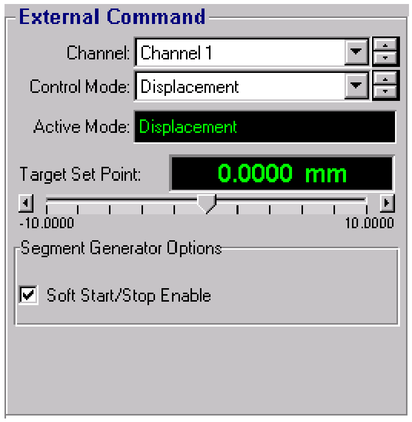
The convergence rate is typically slower at high frequencies. The random function pre-emphasis filter is used to make the convergence rate constant over all frequencies, by boosting high frequencies and suppressing low frequencies. When training an adaptive compensator, choose a shape that is roughly an inverse of the shape of the signal spectrum.

The options are:

- **Random - 1/F^2**
- **Random - 1/F**
- **Random - Flat (no pre-emphasis filter)**
- **Random - F**
- **Random - F^2**

External Command Control Panel

Path Panel buttons > 



This control panel selects and adjusts external program commands.

Channels must be configured in the Station Builder application to accept external program commands. For more information, see "Enabling External Command Inputs" on page 74.

The external programmer should be supplying commands before adjustments are made in this panel.

See "Working with External Commands" on page 181.

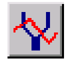
External Command Control Panel (part 1 of 2)

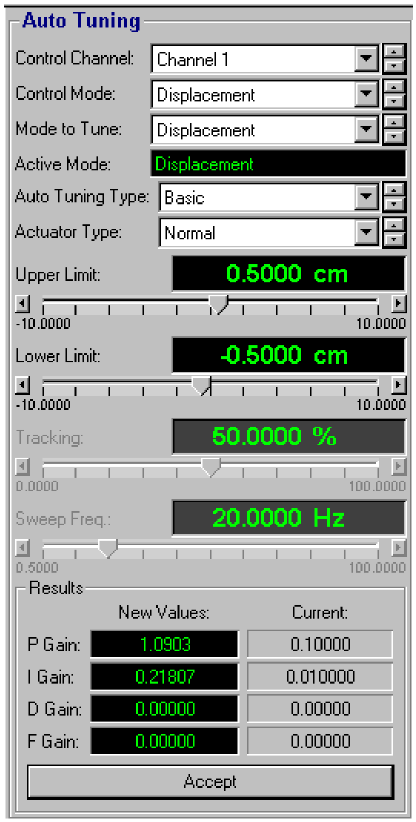
ITEM	DESCRIPTION
Channel	Selects the control channel that receives the external command. Click the **Channel** button to toggle between individual channels and an **External Command Group**. Selecting an **External Command Group** blanks out the **Control Mode** and **Active Mode** boxes and disables **Target Setpoint**.
Control Mode	Displays the external command's control mode, assigned in the Station Builder application.

External Command Control Panel (part 2 of 2)

ITEM	DESCRIPTION
Active Mode	Displays the channel's current active control mode, assigned in the Station Builder application.
Target Setpoint	Specifies the setpoint on which the external command's amplitude centers (only for "Channel" type, not "Group" type).
Segment Generator Options	Select **Soft Start/Stop Enable** to taper the start and stop of the external command. The **Channel Option** window's **Command Options** tab, described on page 423, defines beginning and ending taper times.

Auto-Tuning Control Panel

Path **Panel Buttons >** 



This control panel automatically calculates tuning values for PIDF control modes.

See “About Auto-Tuning” on page 569 for more about using this panel’s controls.

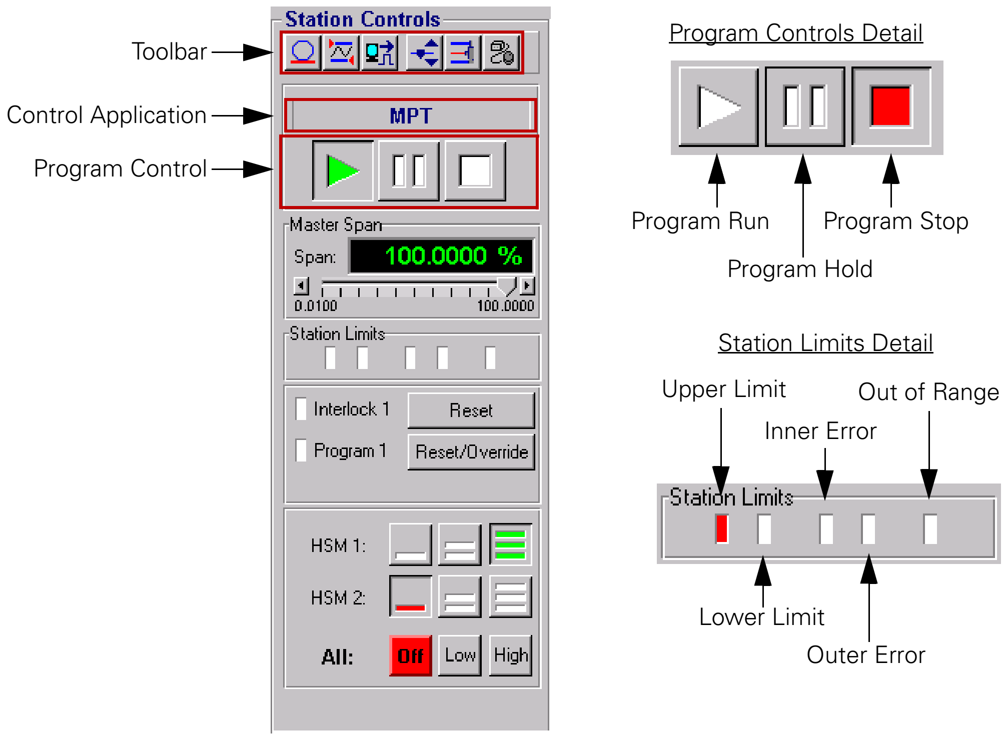
Auto-Tuning Control Panel (part 1 of 2)

ITEM	DESCRIPTION
Control Channel	Selects the control channel to auto-tune.
Control Mode	Selects the control mode to be in when auto-tuning. This mode setting can different than the “Mode to Tune” setting.
Mode to Tune	Selects the mode that is to be tuned.
Active Mode	Displays the active control mode.
Auto-Tuning Type	Selects an auto-tuning type. **Basic**—When you run **Basic** auto-tuning, the auto-tuner disregards your current PIDF gain settings and exercises the actuator to within 80% of the **Upper Limit** and the **Lower Limit**. **Advanced**—When you run **Advanced** auto-tuning, the auto-tuner first does basic auto-tuning. It then runs a sine sweep to exercise the actuator to within 20% of the **Upper Limit** and the **Lower Limit**. This selection enables **Tracking** and **Sweep Freq**.
Actuator Type	**Normal**—Uses tuning algorithms for non-hydrostatic actuators. **Hydrostatic**—Uses tuning algorithms for hydrostatic actuators.
Upper Limit/ Lower Limit	Sets the limits within which the actuator moves. The Station Manager application stops auto-tuning and trips an interlock if the actuator exceeds these limits.
Tracking	Enabled by an **Auto-Tuning Type** selection of **Advanced**. Sets how aggressively **Advanced** tuning tunes the actuator. The default setting is 50%. Set the **Tracking** higher to tune the system “hotter” and lower to tune the system “cooler.” Tracking values that are too high may produce tuning values that result in system instability.
Sweep Freq	Enabled by an **Auto-Tuning Type** selection of **Advanced**. Sets the upper frequency limit of the **Advanced** sweep function. The default setting is 20 Hz. For successful **Advanced** auto-tuning, set the sweep frequency to create a phase shift greater than 90° for 0% tracking and 135° for 100% tracking between the command and compensated command.

Auto-Tuning Control Panel (part 2 of 2)

ITEM	DESCRIPTION
Results	Displays tuning results.
New Values	Displays the new calculated auto-tuning values.
Current	Displays the current tuning values used for this control mode. The **Station Setup** window's **Adjustments** tab, described on page 337, also displays these values.
Accept	Transfers **New Values** to **Current** values and enters these values in the **Station Setup** window's **Adjustments** tab.

Station Controls Panel

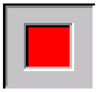
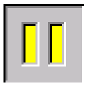
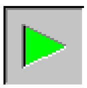


This panel starts, stops, and provides general controls for the test station application's program.

Station Controls Panel (part 1 of 3)

ITEM	DESCRIPTION
toolbar	Displays windows used to control station functions. See "Station Controls Panel Toolbar" on page 501 for more information.
Control Application	Identifies the application or function being run at the test station.

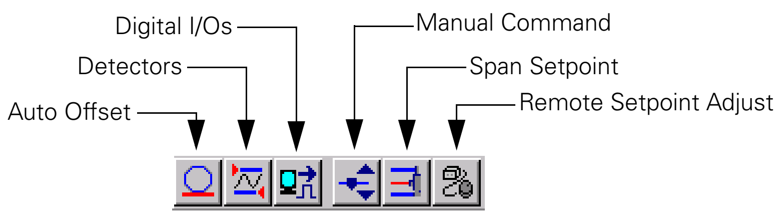
Station Controls Panel (part 2 of 3)

Item	Description
Program Control	Stops, holds, and starts the test station program.
	Stops the program. Red indicates a stopped program.
	Holds the program. The application being run determines this button's availability. Yellow indicates a hold.
	Starts the program. Flashing green indicates that ramping is in progress. Solid green indicates a running program.
Master Span	Sets the master span for all channels included in a master span group. MPT procedures where the **MPT Option Editor** window's **Span** control is set to **Disable and Reset** makes this control unavailable. The **Channel Options** window's **Master Span** tab, described on page 418, defines master span groups. The **Station Option** window's **Display Master Span on Main Window** control, described on page 416, must be selected to display this control. If this selection is not made, **Master Span** will be displayed on the **Setpoint and Span** window. See **"Setpoint and Span Window"** on page 513.
Master Gain (Option)	Sets the master gain for all station channels. Master gain is a multiplier of the gains for all the PID control loops in your station. This optional feature is used primarily for complex systems.
Station Limits	Provides a quick view of **Error**, **Limit**, and **Out of Range** detector status. **White**—Detectors within limits. **Red**—Detectors out of limits. Sensors saturated. **Yellow**—Sensors out of range. The **Station Option** window's **Display Station Limits on Main Window** control, described on page 416, must be selected to display this control.

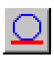
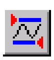
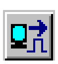
Station Controls Panel (part 3 of 3)

Item	Description
Rig Commands	As an option, the Rig Command **Park** and **Ride** buttons can be displayed. The **Station Option** window's **Display Rig Command on Main Window** control, described on page 416, must be selected to display these buttons.
Interlock	A **Interlock** condition lights this indicator. This type of interlock stops the program and removes station power. The number following **Interlock** and **Program** indicates which interlock chain the station is using. This assignment is made in the **Open Station** window, described on page 281, when opening the station configuration. ***Note*** *Station Manager saves the last used interlock chain to the station configuration, and will attempt to restore it if currently available.*
Program	A **Program Interlock** condition lights this indicator. This type of interlock stops the program without removing station power.
Reset	Resets the interlocks.
Reset/Override	Temporarily overrides interlocks. Each click provides 10 seconds of override. Use this button where station power is required to clear interlock conditions.
Station Power	The station configuration determines these controls. **HPU**—Controls hydraulic power units (HPU), through **Power Off**, **Power Low**, and **Power High** buttons. **HSM**—Controls hydraulic service manifolds through **Power Off**, **Power Low**, and **Power High** buttons.

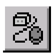
Station Controls Panel Toolbar



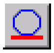
Station Controls Panel Toolbar (part 1 of 2)

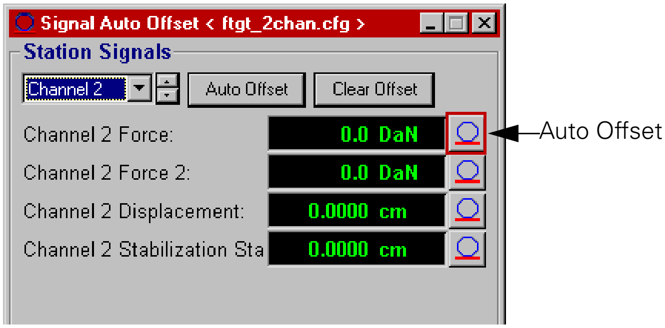
ITEM	DESCRIPTION
	Displays the **Signal Auto Offset** window. Use this window to monitor station signals and apply auto-offsets as needed. See “Signal Auto Offset Window” on page 503 for more information about this window.
	Displays the **Detectors** window. Use this window to view **Limit** status and change **Limit** values. See “Detectors Window” on page 504 for more information about this window.
	Displays the **Digital I/Os** window. Use this window to test digital outputs and view digital input and output status. See “Digital I/Os Window” on page 508 for more information about this window.
	Displays the **Manual Command** window. Use this window to manually command channels. See “Manual Command Window” on page 510 more information about this window.

Station Controls Panel Toolbar (part 2 of 2)

ITEM	DESCRIPTION
	Displays the **Setpoint and Span** window. Use this window to adjust channels' setpoints and span. See "Setpoint and Span Window" on page 513 more information about this window.
	Displays the **Remote Setpoint Adjust** (RSA) window. Use this window to make channel and control mode assignments to RSA knobs. See "Remote Setpoint Adjust Window" on page 515 more information about this window.

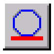
Signal Auto Offset Window

Path **Station Controls** panel toolbar > 

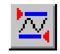


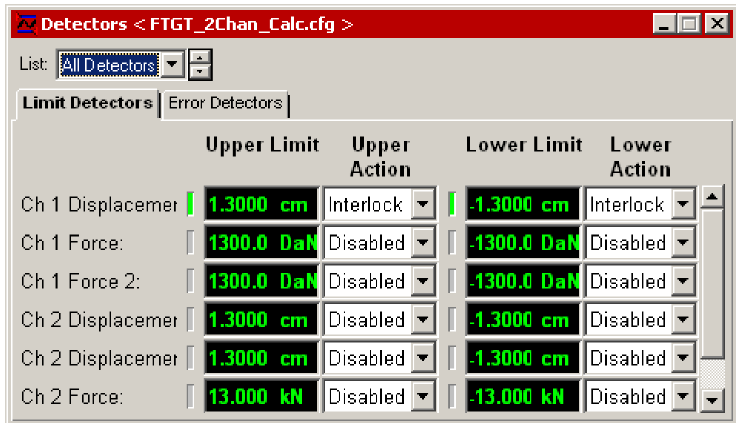
Use this window to monitor station signals and apply a software-based offset to zero signals input by conditioners.

Signal Auto Offset Window

ITEM	DESCRIPTION
Signal List	Select to display lists of signals. The **Channel Option** window's **Signal List** tab, described on page 432, defines the content of each list.
Signal Value	Displays each signal's current value.
Auto Offset	Performs auto offset for all signals currently displayed in the window. ***Note*** *If a signal has Auto Offset Lock checked on its* ***Offset/Zero*** *tab on the* ***Station Setup*** *window* ***Inputs*** *panel it will not be auto offset.*
Clear Offset	Sets the value to zero for all signals currently displayed in the window.
	Displays only next to conditioner input signals that can be auto offset. Click to apply a zeroing offset to the signal. ***Note*** *If a signal is the active feedback and the channel is running, the auto offset icon will be greyed out.*

Detectors Window

Path **Station Controls** panel toolbar >  > **Detectors** window > **Limit Detectors** tab or **Error Detectors** tab



This window summarizes the status and values of **Limit Detectors** and **Error Detectors**. The **Limit Detectors** and **Error Detectors** tabs are similar.

For FlexTest IIm systems, a **Hardware Limit Detectors** tab displays the upper and lower limits of each 497 conditioner.

See "About Detectors" on page 223 for more information.

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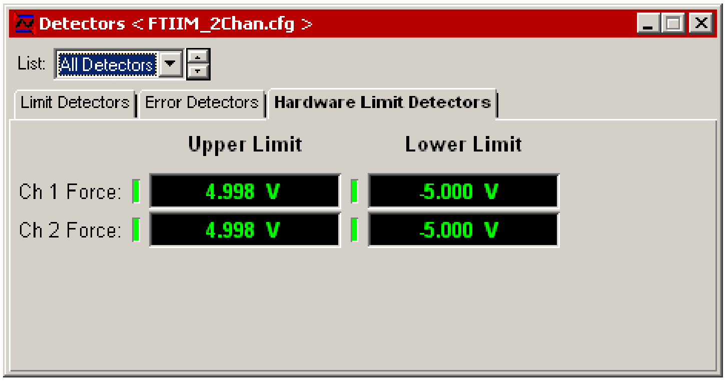
Detectors Window (part 1 of 3)

ITEM	DESCRIPTION
Limit Detectors tab	Displays the values and status for upper and lower limits.
Upper Limit	Displays the input signal's most positive limit. A detector action can occur if the signal exceeds this limit.
Lower Limit	Displays the input signal's most negative limit. A detector action can occur if the signal exceeds this limit. New values can be entered in the display boxes. Indicator colors show each detector's status. **Gray**—The detector action is set to **Disabled**. **White**—The detector action is set to **Indicate**. **Green**—The detector action is set to **Station Power Off**, **Interlock**, **Program Interlock**, **Program Stop**, **Program Hold**, or a custom action. **Red**—The detector has tripped.
Error Detectors tab	Displays the values and status for the error signal's outer and inner limits.
Outer Limit	Displays the error signal's outer limit. A detector action can occur if the signal exceeds this limit.
Inner Limit	Displays the error signal's inner limit. A detector action can occur if the signal exceeds this limit. New values can be entered in the display boxes. Indicator colors show each detector's status.

Detectors Window (part 2 of 3)

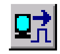
Item	Description
Upper Action/ Lower Action	Adjusts the test station's response when a **Limit** trips. Actions include: **Disabled**—No action occurs. This setting grays out the **Limit** indicator. **Indicate**—Writes a message to the **Message Log**. This setting turns the **Limit** indicator white. **Station Power Off**—Writes a message to the **Message Log**, clamps the servovalve, turns off pressure at the hydraulic service manifold (HSM), and stops any program. This setting turns the **Limit** indicator green. **Interlock**—Writes a message to the **Message Log**, turns off pressure at both the HSM and hydraulic power unit (HPU), and stops any program command. This setting turns the **Limit** indicator green. **Program Interlock**—Writes a message to the **Message Log**, stops any program command, but does not turn off station hydraulic pressure. This setting turns the **Limit** indicator green. **Program Stop**—Writes a message to the **Message Log** and stops any program command. Produces the same action as clicking the **Program Stop** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Program Hold**—Writes a message to the **Message Log** and places a hold on any program command. Produces the same action as clicking the **Program Hold** button on the Station Controls panel. This setting turns the **Limit** indicator green. **Custom Action**—Executes a user-defined action created in the **Event-Action Editor** window. This setting turns the **Limit** indicator green.See "Event-Action Editor Window" on page 448 for more about using this window. A tripped limit turns an enabled detector's **Limit** indicator red.

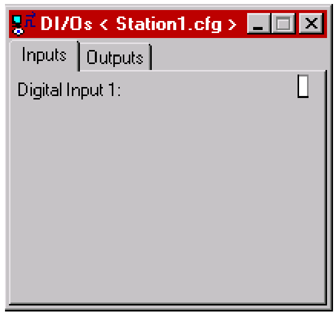
Detectors Window (part 3 of 3)

ITEM	DESCRIPTION
Hardware Limit Detectors tab (FlexTest IIm systems only)	Displays the upper and lower limit values for each 497 conditioner and the status of each limit.
	
Upper Limit	Displays the upper limit that the conditioner's feedback signal voltage must exceed to trigger a hardware interlock. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.
Lower Limit	Displays the lower limit that the conditioner's feedback signal voltage must exceed to trigger a hardware interlock. Indicator colors show the detector's status. For more about the colors, see "Detectors Summary Tabs" on page 373. New values can be entered in the display boxes.

Digital I/Os Window

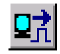
Inputs Tab

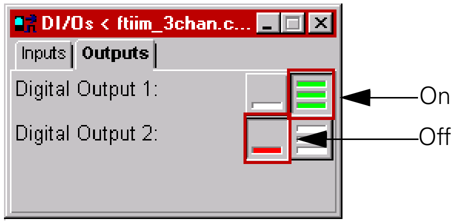
Path **Station Controls** panel toolbar >  > **DI/Os** window > **Inputs** tab



This tab displays the status of digital inputs. The indicator lights when a digital input is high or on. The **Digital Inputs Summary** tab, described on page 367, also shows this information.

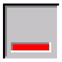
Outputs Tab

Path **Station Controls** panel toolbar >  > **DI/Os** window > **Outputs** tab

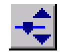


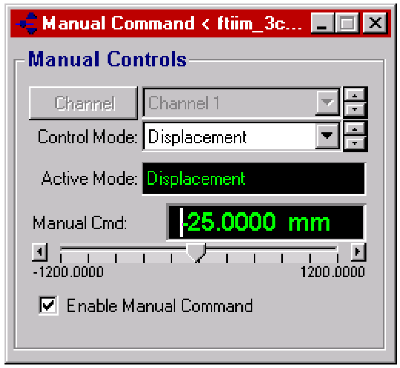
This tab's buttons combine status indicators with manual on and off functions. The Digital Outputs Summary tab, described on page 368, provides the same functions.

Outputs Tab

ITEM	DESCRIPTION
Buttons/Indicators	 Click to turn the output off. Red indicates that the output is off.  Click to turn the output on. Green indicates that the output is on.

Manual Command Window

Path **Station Controls** panel toolbar > 



This window provides manual control of channels.

Manual Command Window (part 1 of 2)

ITEM	DESCRIPTION
Channel	Selects the control channel. Click the **Channel** button to toggle between individual channels and a **Master Command Group**. See "About Channel Groups" on page 259 for more information. Selecting a **Master Command Group** blanks out the **Control Mode** and **Active Mode** boxes.
Control Mode	Selects a control mode. Check **Enable Manual Command** to make a selected **Control Mode** the **Active Mode**. If **Enable Manual Command** is checked when selecting a **Control Mode**, the selected mode immediately becomes the **Active Mode**.
Active Mode	Displays the current control mode.

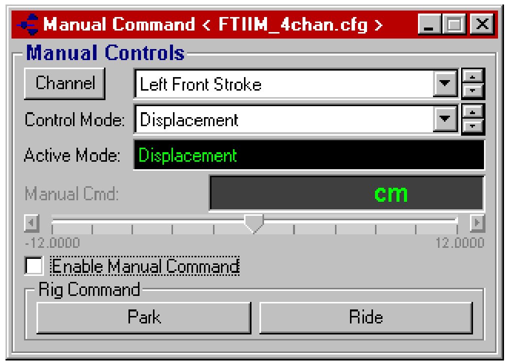
Manual Command Window (part 2 of 2)

ITEM	DESCRIPTION
Manual Cmd	Applies the manual command to the actuator. Selecting a **Master Command Group** that has individual channels at different **Manual Cmd** values changes this control. It displays the highest and lowest **Manual Cmd** values for the **Group**. It also displays pointers that indicate the highest and lowest **Manual Cmd** values. Pointers lock together once they have been used to move the **Group** to a common **Manual Cmd** value.
Enable Manual Command	Enables the manual command. Closing the **Manual Command** window disables this command.
Rig Commands (Option)	
Park	Moves enabled channels to a predefined Park level prior to hydraulic shutdown.
Ride	Moves enabled channels to a predefined Ride level prior to test startup.

Using Manual Command Park/Ride

The optional Rig Command **Park** and **Ride** buttons on the Manual Command window allows you to move enabled channels to a predefined Park or Ride level (e.g., actuator position, torque).

Press **Park** to move a specified component to a predefined level prior to hydraulic shutdown. Press **Ride** to move a specified component to a predefined level prior to test startup.



Use the Rig Commands tab on the Channel Options window to define Park and Ride levels. See “Using Rig Command (Park/Ride)” on page 264.

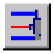
Important Note

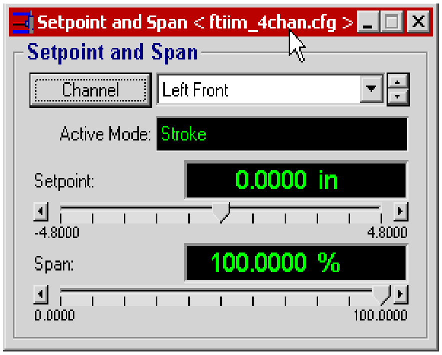
The **Park** and **Ride** buttons are deactivated under the following conditions:

- The Setpoint is disabled.
- The test program is in a RUN state.
- The segment generator is in use and the control mode needed to move to a Park or Ride level is not the active mode.
- When using MPT, if the Setpoint control (in the Execution tab of the MPT Options Editor) is not set to **Enable** while the test is locked down. The Park and Ride functions are deactivated because they work by ramping each channel’s setpoint between preset levels.

  Also, if the Command Stop and Hold Behavior’s (on the same tab) are not set to taper or ramp to zero, the command will not be zeroed on a stop or hold.

Setpoint and Span Window

Path **Station Controls** panel toolbar > 



This window adjusts channels' setpoints and spans.

See "How to Adjust Setpoint and Span During a Test" on page 257 for more about using this window's controls.

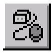
Setpoint and Span Window (part 1 of 2)

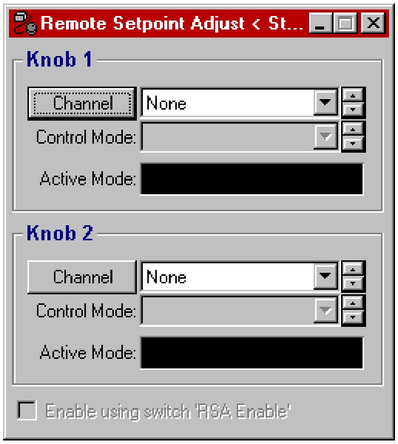
ITEM	DESCRIPTION
Channel	Selects the control channel. Click the **Channel** button to toggle between individual channels and a **Master Command Group**. Selecting a **Master Command Group** blanks out the **Active Mode** entry.
Active Mode	Displays the control mode that is being adjusted.

Setpoint and Span Window (part 2 of 2)

ITEM	DESCRIPTION
Setpoint	Adjusts the program's signal's mean (setpoint). When a **Master Command Group** is selected, this control changes the setpoints of channels selected in the **Channel Options** window's **Master Command** tab, described on page 421. Selecting a **Master Command Group** that has individual channels at different **Setpoint** values changes this control. It displays the highest and lowest **Setpoint** values for the **Group**. It also displays pointers that indicate the highest and lowest **Setpoint** values. Pointers lock together once they have been used to move the **Group** to a common **Setpoint** value.
Span	Adjusts the program signal's span. When a **Master Command Group** is selected, this control changes the spans of channels selected in the **Channel Options** window's **Master Span** tab, described on page 418. Selecting a **Master Command Group** that has individual channels at different **Span** values changes this control. It displays the highest and lowest **Span** values for the **Group**. It also displays pointers that indicate the highest and lowest **Span** values. Pointers lock together once they have been used to move the **Group** to a common **Span** value.

Remote Setpoint Adjust Window

Path **Station Controls** panel toolbar > 



This window assigns channels and control modes to the **Remote Setpoint Adjust** (RSA) box’s control knobs. The RSA allows you to remotely adjust actuators’ setpoints, away from the computer screen.

See “About the Optional Remote Setpoint Adjust” on page 258 for more about using this window’s controls.

Remote Setpoint Adjust Window (part 1 of 2)

ITEM	DESCRIPTION
Channel/Group	Assigns a control channel to a knob. Click the **Channel** button to toggle between individual channels and a **Master Command Group**. When a **Master Command Group** is selected, the RSA knob changes the setpoints of channels selected in the **Channel Options** window’s **Master Command** tab, described on page 421. Selecting a **Master Command Group** blanks out the **Control Mode** and **Active Mode** boxes.
Control Mode	Selects the control mode.

Remote Setpoint Adjust Window (part 2 of 2)

Item	Description
Active Mode	Displays the current control mode.
Enable using switch “RSA Enable”	Click to use the **RSA Enable** switch to turn on and off the RSA box. Closing the **Remote Setpoint Adjust** window disables this control.

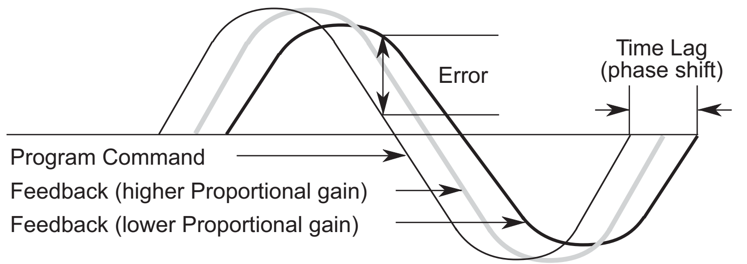
Chapter 5

Tuning

About Tuning

When you tune, you are setting the stability and response of the servo control loop. Proper tuning improves the performance of the test system.

Proper tuning reduces error and phase lag.



Inaccurate tuning increases the error and phase lag between the program command and the sensor feedback. Large error reduces control accuracy and repeatability, and keeps the full program command from being applied to the specimen.

Compensating for specimen changes

Optimal system operation may require a level of detuning to compensate for specimen changes during a test.

- A highly tuned system provides the greatest level of response, but this places the system near the point of oscillation or instability.
- As a specimen changes characteristics during testing, the response of the system also changes. This can cause unstable operation.
- You may need to retune the system response when the characteristics of the specimen change during a test.
- For the greatest control accuracy, use a compensator. For more information, see “Working with Compensators” on page 194.

If You've Never Tuned Before

If you are unfamiliar with the tuning controls, review the following guidelines. Before you start tuning you should:

- Define upper and lower limits for the displacement and force sensor before you start tuning.
- Tune the displacement control mode first since no specimen is needed.
- Note the value of the tuning control before adjusting it so you can return it to that value if necessary.
- Make small initial tuning adjustments. If the waveform does not appear to change, increase the adjustments.

provides a moderate level of tuning for PIDF control modes automatically. For more information, see "About Auto-Tuning" on page 569.

What if you adjust something wrong?

If you make an inappropriate adjustment, the system will go unstable or shut down. An unstable system produces humming or screeching sound. A system shutdown displays an error.

- If an adjustment causes the system to go unstable, quickly readjust the control until the noise stops. If you cannot eliminate the sound, shut down the system by pressing the **Station Stop** or **Emergency Stop** switch.

Important ***In multi-station configurations, pressing Emergency Stop will shut down the HPU and all stations in the interlock chain. Pressing Station Stop on your Remote Station Controller shuts down the HSM for the specific station only.***

- If an adjustment causes the system to shut down, readjust the control to the level where the system was last stable. Then reset the system and continue tuning.

Saving the tuning parameters

The tuning values are saved as part of the controller parameter set. The parameter set can save one set of tuning values for each control mode.

When to Tune

Tuning is needed whenever any of the following events occurs:

- A gross change in the compliance or size of the test specimen. *For example*, you were testing steel and change to rubber.
- The servohydraulic configuration has changed. *For example*, a servovalve is replaced or changed to a different capacity.
- The system is sluggish (slow to react or not reaching the desired peaks). However, this is not always a tuning problem; it could be insufficient velocity capability such as a low-capacity servovalve.
- If a control channel or sensor is recalibrated.
- The system is unstable (indicated by a humming or screeching sound).
- When you observe poorly controlled accuracy.
- When you create a new control mode, or, if the sensor for a control mode is changed.
- The end levels or frequencies are significantly different from those observed earlier in the test. *For example*, you notice that the specimen characteristics change during the test (this could also mean the specimen is failing).

Checklist

Use this checklist when you tune a system. You need to determine the following:

- What type of control mode do you wish to tune?
  Read "Control Mode Characteristics" on page 522.
- What controls should you use?
  Read "How the Tuning Controls Work" on page 524.
- What kind of a tuning program should you use?
  Read "Creating a Tuning Program" on page 532.
- Do you have a dummy specimen?
  Read "Other Considerations" on page 535.
- Where do you connect the oscilloscope and what signal do you monitor? Read "Monitoring Waveforms" on page 536.

What to do first

The following are tasks that should be completed before you tune. It is not necessary to perform every task each time you tune. The condition of your system dictates which of the following tasks you must perform.

For example, a new system or a system under complete recalibration requires all of the following to be completed. If you are performing periodic or fine-tuning, review the following and determine which tasks you need to complete.

- Connect an oscilloscope to your system or use the controller scope. You need to monitor the sensor signal or error signal for the control mode you intend to tune. Go to "Monitoring Waveforms" on page 536 for help.
- Balance the servovalve. The electrical valve balance adjustment compensates for minor mechanical imbalance—it is an intermediate adjustment. Go to "How to Check and Adjust Valve Balance" on page 557 and perform the electrical valve balance adjustment procedure.
- Calibrate each sensor used for a control mode or data acquisition. Perform the appropriate calibration procedure.
- If your sensor calibration schedule does not require calibration at this time, perform a shunt calibration check to determine if your DC sensor/DC conditioner is within tolerance. See "How to Perform a Shunt Calibration" on page 251.
- If you have a three-stage (Series 256 or 257) servovalve, tune the inner loop (gain and rate) before tuning the outer loop. The rules for inner loop tuning are similar to those of the outer loop. Go to "How to Tune the Inner Loop of Three-Stage Valves" on page 549 for help.

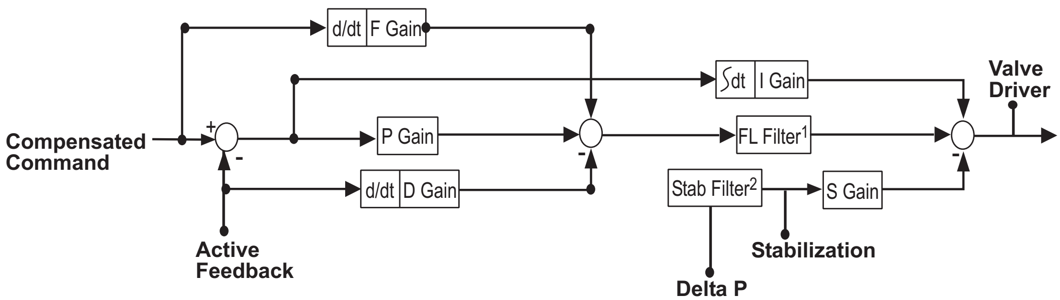
Getting started

When you set out to tune your system, it is best to run auto-tuning first. Auto-tuning establishes reasonable tuning levels that will be adequate for most control modes. See "About Auto-Tuning" on page 569 for more information.

If the results from auto-tuning are not satisfactory, you should create a tuning function, and then manually tune each control mode.

Control Mode Characteristics

A control mode uses a program command and sensor feedback to control the servovalve. The controller uses a group of gain controls—proportional, integral, derivative, and feed forward gain. These controls are called PIDF. The PIDF controller can also incorporate stabilization gain and an adjustable forward loop filter.



1 FL Filter on the Tuning Menu
Set filter frequency and select filter type.

2 Stabilization Filter on the Tuning Menu
Set filter frequency and select filter type.

Each control mode has different tuning characteristics. This section describes the characteristics of the following control modes:

- Displacement control
- Force control
- Strain control

Command sources

The program command source can come from an internal source (such as the **Function Generator** or the **MultiPurpose TestWare** application) or from an external device (such as an external profiler or function generator).

CLC control mode

Channel limited channel (CLC) control modes are used for specimen installation and removal. Channel limited channels require two feedback signals. See "How to Tune a CLC Control Mode" on page 592 for a detailed CLC tuning procedure.

Displacement control

A length control mode (also called displacement or stroke control) uses the LVDT sensor in the actuator as the controlling feedback source.

- The length control mode only needs to be tuned once.
- Does not need a specimen installed for tuning.
- Displacement control uses a square wave when tuning an LVDT but not when tuning a displacement gage.
- If gain is too low, there may not be any actuator movement.
- If gain is too high, the actuator will move quickly and noisily.

Force control

Force control uses a force sensor (also called a load cell) as the controlling feedback source.

- Tune for each type of specimen or any changes in the force train.
- Force control requires a specimen to be installed.
- Force control uses a ramp waveform for initial tuning. If the required results cannot be achieved, change to a square waveform.
- If gain is too low, the system may be sluggish or unresponsive with large static offsets.

Strain control

Strain control uses an extensometer or strain gage bonded to the specimen as the controlling feedback source.

- Tune for each type of specimen or any changes in the force train.
- Strain control requires a specimen to be installed (you may choose to use a broken specimen).
- Use a ramp waveform for the initial tuning.
- Do not use a square waveform for tuning. A square wave can cause the extensometer to move or fall off the specimen, which can cause the system to go unstable.
- If gain is too low, the system may be sluggish or unresponsive with large static offsets. Or, it may be uncontrollable.

How the Tuning Controls Work

The controller system software includes five tuning controls. You do not need to use all of the controls to properly tune your system. *In fact, most testing can be accomplished with just the proportional gain adjustment*. The other adjustments introduce a signal to the command to compensate for specific situations.

Note *Throughout this chapter the terms gain, rate, and reset represent proportional gain, rate derivative, and reset integration respectively.*

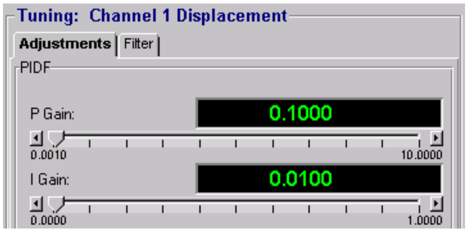
The five available tuning controls have the following functions:

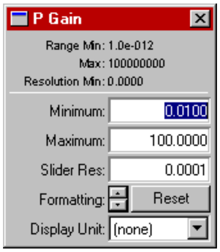
- Proportional gain (P Gain) increases system response.
- Integral gain (I Gain) increases system accuracy during static or low-frequency operation and maintains the mean level at high frequency operation.
- Derivative gain (D Gain) improves the dynamic stability when high proportional gain is applied.
- Feed forward gain (F Gain) increases system accuracy during high-frequency operation.
- Forward loop filter (FL Filter) adjustments establish a frequency bandwidth for the servoloop command signal.

Changing adjustment ranges

It is possible that the amount of adjustment for a control is too coarse or inadequate. Click the adjustment button (such as **P Gain**) and use the **Range Select** window to change the range of the adjustment. Reducing the range produces smaller steps between values (higher resolution) while increasing the range produces larger steps between values.

Example: Suppose the default range for the Proportional Gain adjustment is 50. Assume you are adjusting the gain and you reach the maximum adjustment (50). Clicking the **P Gain** slider label displays the **P Gain** range window where you can change the range of the adjustment. Change the range by typing a new value in the maximum entry field.

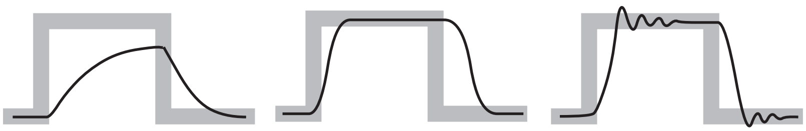




Proportional Gain (P Gain)

Proportional gain (**P Gain**) increases the effect of the error signal on the servovalve to improve system response. Proportional gain is used in all tuning situations.

The following figures show the tuning command in grey and the feedback in black



P Gain Too Low | Optimum P Gain | P Gain Too High

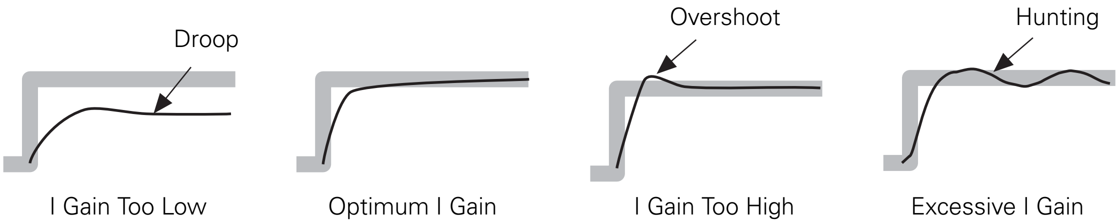
- As **P Gain** increases, the error decreases and the feedback signal tracks the command signal more closely.
- Higher **P Gain** increases the speed of the system response.
- Too high a **P Gain** can cause the system to become unstable.
- Too low a **P Gain** can cause the system to become sluggish.

Integral Gain (I Gain)

Integral gain (**I Gain**) introduces “an integral of the error signal” that gradually, over time, boosts the low-frequency response of the servovalve command.

I Gain increases system response during static or low-frequency operation and maintains the mean level during high-frequency operation. It can offset a DC or steady-state error, such as that caused by valve imbalance.

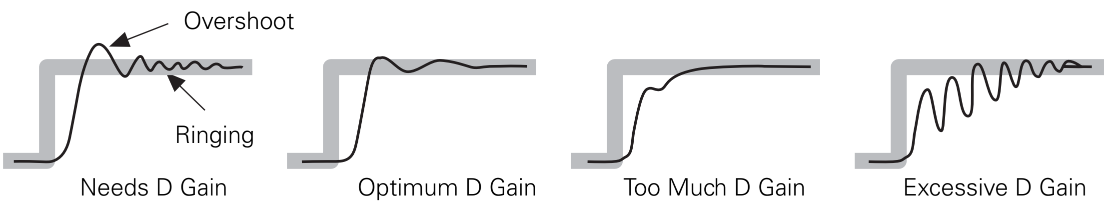
The following ramp and hold waveforms illustrate different levels of reset. The **I Gain** determines how much time it takes to improve the mean level accuracy.



- **I Gain** improves the mean level response during dynamic operations.
- **I Gain** corrects the feedback droop caused by servovalve spring characteristics during static and very low-frequency tests.
- **I Gain** minimizes the amount of time that the system needs to recover from transitions or transients.
- For best performance, set **I Gain** as low as possible when using compensation methods that provide mean correction. These methods include peak/valley phase (PVP), peak/valley compensation (PVC), and arbitrary end-level compensation (ALC).
- Higher **I Gain** settings increase system response.
- Excessive **I Gain** can cause a slow oscillation or hunting.
- Readings in the **Max/Min Meter** window can be useful when adjusting **I Gain**.

Derivative Gain (D Gain)

Derivative gain (**D Gain**) is used with dynamic test programs. It introduces a derivative of the feedback signal. This means that it anticipates the feedback signal's rate of change and slows the system's response at high rates of change.

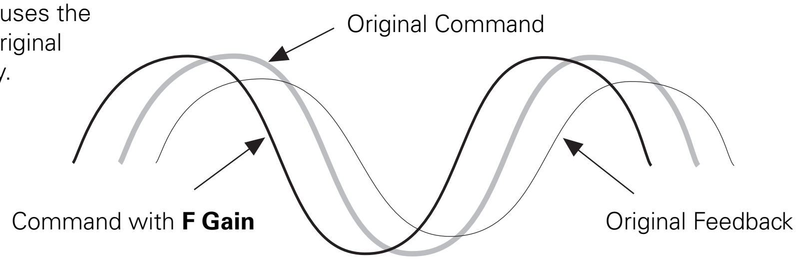


- **D Gain** reduces ringing.
- **D Gain** provides stability and reduces noise at higher **P Gain** settings.
- **D Gain** tends to amplify noise from sensors.
- **D Gain** tends to decrease system response when set too high.
- Too much **D Gain** can create instability at high frequencies.
- Excessive **D Gain** may cause a ringing or screeching sound.
- Too little **D Gain** can make a rumbling sound. The correct amount of **D Gain** results in the system running quietly.
- Series 256 and 257 Servovalves may require **D Gain** adjustment on both the inner and outer control loops.

Feed Forward Gain (F Gain)

Feed forward (**F Gain**) introduces a derivative of the command signal. It anticipates how large a valve opening is needed to reach the required response and adds that to the valve command—like compensating for phase lag.

Adjusting **F Gain** causes the command signal to start sooner. This causes the feedback signal to track the original command signal more closely.



- **F Gain** does not compensate for normal changes during testing, such as temperature changes, and servovalve droop.
- **F Gain** can be used to minimize phase lag.
- **F Gain** should be used like **D Gain**. However, **F Gain** applies to the test command signal while **D Gain** applies to the feedback signal.
- **F Gain** gain helps the servocontrol loop react quickly to an abrupt change in the command signal.
- **F Gain** is needed when testing a soft specimen in force control.

Stabilization Gain (S Gain)

Stabilization gain (**S Gain**) is available only if the Station Builder application defined stabilization for the station configuration. Most systems do not need stabilization gain.

S Gain allows a second signal to be integrated into the composite command signal as a stabilizing factor. The **S Gain** enhances stability for systems that move large masses at high speeds. The input to the gain is usually a dynamic input signal such as:

- Delta P (differential pressure)
- Acceleration

Delta P stabilization

Delta P stabilization uses a differential pressure sensor to measure the difference in pressure at each end of the actuator. It compensates for hydraulic compliance when compressed hydraulic fluid acts like a spring. **Delta P** improves displacement control of heavy mass loaded systems.

Delta P is typically used on systems with large hydraulic fluid flow rates. This adjustment is usually needed when the natural frequency of the actuator is less than the 90° phase lag frequency of the servovalve. The servovalve 90° phase lag frequency can be found in the servovalve product literature. The natural frequency can be approximated with the following formula.

$$\text{Actuator Frequency} = \frac{CA}{WV}$$

Where:

C = constant for SI (1060) or U.S. Customary (2500) units

A = actuator piston area in cm^2 or in^2

W = any directly coupled mass including the actuator piston mass in kg or lbs

V = fluid volume contained inside the actuator and manifold in cm^3 or in^3

- If adding **Delta P** decreases the system's response, change the polarity of the signal. If changing polarity does not improve system response, change the stabilization filter setting. See "How to Enable a Tuning Filter" on page 601.
- When using **Delta P**, check all amplitudes for overshoot. No overshoot is preferable. Do not allow more than 10% overshoot at any amplitude of a square-wave response.

- **Delta P** will not compensate for additional compliance from swivels, linkages, and test tables. Use a mass accelerometer signal from an accelerometer for this type of stabilization.

Acceleration stabilization

Test systems with specimens affected by acceleration resonances can use a mass accelerometer signal for stabilization. Acceleration stabilization dampens the resonances affecting the specimen. (Do not confuse acceleration stabilization with acceleration compensation, which corrects the signal from a moving load cell.)

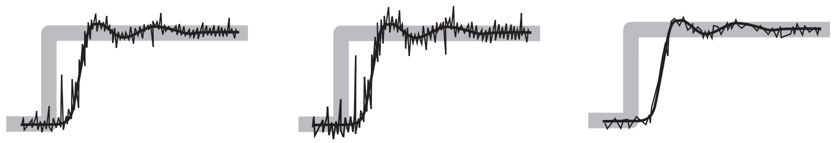
Typical systems that benefit from acceleration stabilization include:

- Load units that operate at high frequencies with massive grips.
- Test systems that employ swivels, linkages, and test tables.

Sensor feedback is provided by an accelerometer attached to or near the specimen. The controller converts this feedback into a stabilization signal that is combined with the composite command signal (post-PIDF correction). The "stabilized" command signal is then sent to the valve driver.

Forward Loop Filter (FL Filter)

Forward loop filter (**FL Filter**) adjustments compensate for noise in the servoloop, which usually comes from sensor feedback. **FL Filter** adjustments establish a frequency bandwidth for the servoloop command signal.



Needs FL Filter | D Gain Amplifies Noise | FL Filter Removes Most Noise

- By default, the **FL Filter** is set to one-half the system rate, typically 512 Hz for FTIIm/CTC and either 2048 or 3072 Hz for TSIIs.
- The minimum **FL Filter** setting is 0.01.
- Ensure the **FL Filter** is set higher than any frequency in the test program.
- Systems with moving load cells or heavy grips can produce a noisy force signal.
- If you observe a noisy sensor feedback signal, reduce the **FL Filter** setting to about 100, provided your test does not reach 100 Hz. If additional adjustment is needed, reduce the setting in five to ten Hz increments.

Stabilization Filter

Some systems with a higher actuator frequency may benefit from changing the filter setting for the stabilization signal.

See "How to Enable a Tuning Filter" on page 601 for a detailed procedure for changing the stabilization filter setting.

Creating a Tuning Program

The purpose of a tuning program is to produce a command that reflects the most demanding system response expected from a test.

Note *The **Function Generator** is very useful for quickly setting up a tuning program. If you use the same tuning program on a regular basis you may wish to create and save your tuning procedure using Basic TestWare™ or by using the optional MultiPurpose TestWare™ application.*

Initial tuning is best done with a waveform that has abrupt changes. This excites the system at frequencies likely to be unstable with excessive gain. Square and ramp waveforms are preferred. Final tuning can be done with the actual program command for the test.

Note *Always monitor the sensor feedback or error signal to evaluate the control accuracy. See* *"Monitoring Waveforms" on page 536.*

A typical tuning program is a low-amplitude (5% to 10% of full-scale), low-frequency (1 Hz to 2 Hz) square waveform.

This section describes how the amplitude, frequency, and waveform type of a tuning program can be selected to reflect the capabilities of the testing system or the testing requirements.

Auto-tuning

Auto-tuning provides a moderate level of tuning for PIDF control modes.

Auto-tuning exercises the actuator (with a sweep function) while monitoring the feedback of the control mode being tuned. The response of the control mode is determined and the appropriate tuning parameters are calculated.

For more information, refer to "About Auto-Tuning" on page 569.

Command waveforms

A tuning program produces a cyclic program command to exercise the system while you make the initial tuning adjustments. A square wave is best because it demands the maximum response of the servo hydraulic system. The square wave tuning program may not be suitable for all systems. The following describe the different waveform characteristics:

Square/Tapered Square

A square waveform requires the servovalve to open rapidly to a large opening. It is the most demanding waveform because it requires the maximum response from the servoloop system. It also places a large acceleration on the test system and specimen.

Tapered square waves taper from 0% to 100% amplitude at the beginning of execution, and from 100% to 0% at the end of execution.

- A square waveform is most useful for tuning displacement.
- A square waveform has an infinite velocity command.
- Do not use a square waveform when tuning a control mode that uses an extensometer. The large accelerations can cause the extensometer to move or fall off the specimen, which can cause the system to go unstable.
- Monitor the feedback or error signal to evaluate the system stability.

Ramp/Tapered Ramp

A ramp waveform (also called a triangle waveform) requires the actuator to move at a constant rate. This requires the servovalve to move quickly between two discrete openings. Cycling a ramp waveform produces a triangle waveform.

Tapered ramp waves taper from 0% to 100% amplitude at the beginning of execution, and from 100% to 0% at the end of execution.

- A ramp waveform is useful for all levels of tuning.
- Use a ramp waveform if a square waveform creates excessive velocities or acceleration for the type of specimen being tested.
- Monitor the feedback or error signal to evaluate the system stability.

Sine/Tapered Sine

A sine waveform (also called sinusoidal or haversine) requires the servovalve to move at a variety of rates.

Tapered sine waves taper from 0% to 100% amplitude at the beginning of execution, and from 100% to 0% at the end of execution.

- Monitor the feedback or error signal to evaluate the system stability.

Random function generator

When tuning AIC compensator configurations, it is necessary to generate random functions to properly simulate typical test conditions.

Random functions employ a pre-emphasis filter to make the convergence rate constant over all frequencies. The random function options include:

- Random - $1/F^2$
- Random - 1/F
- Random - Flat (none)
- Random - F
- Random - F^2

Frequency

A low-frequency waveform is adequate for most testing. Tests at higher frequencies cause a frequency shift that cannot be completely corrected with the PIDF adjustments.

- Do your initial tuning at a low frequency, and then fine tune at the highest frequency in your test program. Common values are 1–2 Hz.
- Servo adjustments that do not improve performance at high frequencies generally indicate that the servovalve is running at 100% capacity or the HPU is running at 100% capacity.

This characteristic can easily be seen when tuning with a sine waveform. The feedback waveform appears to be more like a ramp waveform when running at 100% capacity.

Amplitude

A system tuned at a low amplitude may become unstable at high amplitudes. Tuning should be accomplished under conditions similar to the anticipated usage.

- Use a moderate amplitude (5% to 10% full scale) for initial tuning.
- Be sure the maximum velocity of the tuning command is 10% to 50% of the maximum velocity of the system.
- Increase the amplitude for fine tuning.
- You may find it helpful to check tuning over a variety of amplitudes by creating a test that cycles once at each of the target amplitudes. If you have the optional MultiPurpose TestWare™ application, run the test to acquire timed data so you can evaluate the results for each amplitude.

Other Considerations

Servovalves

Most of the servovalve adjustments are performed during the system installation and do not require periodic adjustment. There are two types of servovalves:

- Three-stage servovalves, such as the MTS Series 256 and 257 Servovalves, have an inner loop control system which must be tuned before the outer loop can be tuned.
- Two-stage servovalves, such as the MTS Series 252 Servovalves, do not have inner loop tuning requirements.

After initial system tuning and before final tuning, the valve balance should be checked and adjusted if necessary.

Using specimens

Specimens can be very expensive. A dummy specimen is an inexpensive material that has similar characteristics to the specimen selected for testing. The most important specimen characteristic is its spring rate.

The advantage of a dummy specimen is that it can simulate how your testing system reacts to real specimen. You can establish a more precise level of tuning with a dummy specimen.

Tuning without dummy specimens

If you do not have a dummy specimen or if a dummy specimen is not practical, review the following recommendations if you must use a real specimen:

- Start your PIDF controls at minimum settings.
- Do not use a square waveform for a massive specimen or a specimen prone to vibrations.
- Adjust rate to minimize any oscillation, overshoot, or ringing in the waveform.
- Be very conservative by beginning with a ramp waveform to establish initial control. Then use a waveform that resembles the test waveform to provide a precise level of control.

Tuning without a specimen

A specimen is required to tune force and strain control modes. Initial force tuning may be accomplished with the actuator up against the force sensor. The actuator acts as a specimen reacting against the force sensor.

1. If you are using a load frame, adjust the load unit crosshead so the actuator can reach the force sensor.
2. Carefully adjust the actuator using a tuned length control mode so it contacts the force sensor.
3. You can now switch to force control and proceed with initial tuning.

Monitoring Waveforms

When you tune the servoloop you need to monitor the results of your adjustments. There are two ways to monitor a waveform during tuning.

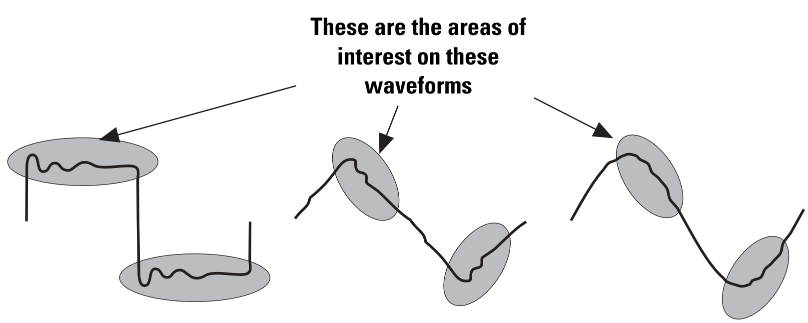
- An oscilloscope is preferred.
- The controller scope is adequate if you do not have an oscilloscope.

Note *Set up your scope to monitor the area of the waveform that shows characteristics useful for tuning. You can monitor the sensor feedback or the error signal of the control mode.*

What to monitor

The accuracy of the waveform represents how well it reaches the amplitude of the command or how repeatable the end levels are. The peaks and valleys of triangle and sine waveforms should be consistent. Use the area of the square wave after the ringing settles to monitor the end levels.

You do not need to monitor the entire waveform. Instead, zoom in on the area of interest.



Tuning

If the amplitude of the feedback cannot be achieved without going unstable, and the end levels are repeatable, simply increase the command to achieve the desired end levels.

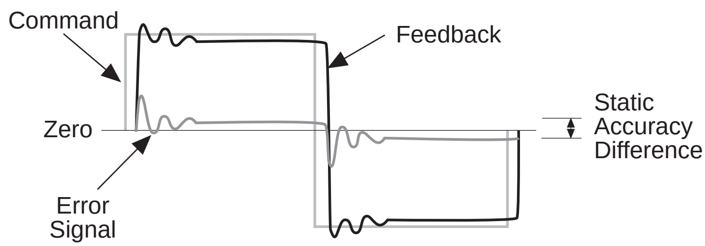
Monitoring the error signal

The error signal shows similar characteristics as a feedback signal. The error signal represents the difference between the command and sensor feedback. The following diagrams show the error signal characteristics for each type of waveform.

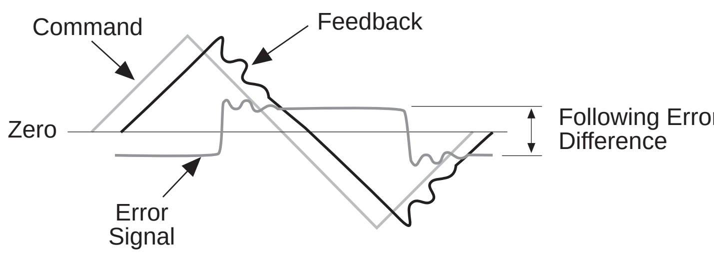
A square waveform is best suited to view the overshoot and ringing characteristics that occur when tuning a system. Review the following waveforms to determine the kind of characteristics that can be found in an error signal.

The error signal from a square wave should show the feedback ringing centered on the zero reference.

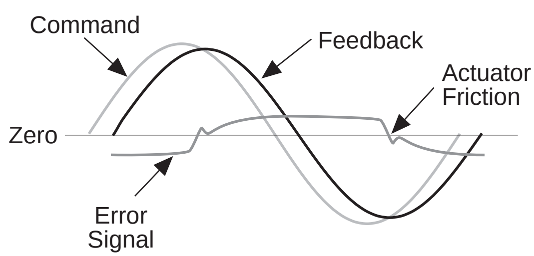
A static accuracy difference in the error signal can be corrected with reset.



The square wave shape of the error signal represents the phase lag of the feedback signal.



The error signal from a sine should be a small amplitude sine waveform that looks like a rounded square waveform.



Using the controller scope

If you do not have an oscilloscope, use the controller scope feature for tuning control modes. Review the following:

- On the **Display** menu to select **Scope**.
- Select a continuous sweep.
- Enter the minimum and maximum ranges on the Y axis to zoom into the area of interest.

For more information on the controller scope, see "About the Scope" on page 159

Using an oscilloscope

An oscilloscope has a higher resolution and is faster than the software controller scope. Review the following:

- You must have a Readout channel defined in the Station Builder.
- Set up the Readout channel in the Station Manager program to monitor the sensor signal of the control mode you intend to tune.
- Or, you could monitor the error signal. You can tune using either signal.
- Connect the oscilloscope to the appropriate BNC connector on the Analog Out transition module (**Ch 1 - Ch 6**) located at the rear panel of the Model 493.10 Chassis.

Tuning Your System

About Tuning

A properly tuned system responds smoothly and accurately to commands. Before you run tests on your system, you should tune each control mode that you intend to use.

Setting servovalve polarity

All servovalves must have their polarity determined and set appropriately before you start system tuning. This polarity setting, in conjunction with the sensor input polarity establishes actuator movement to a positive or negative command. For more information see "Setting the Servovalve Polarity" on page 542.

Warm up hydraulics

You should run a small program to warm up the system hydraulic fluid and servovalve before you adjust the valve balance, dither, inner loop, or outer loop. For more information on warming up system hydraulics, see "How To Warm Up the System Hydraulics" on page 546.

Inner loop

If your system is equipped with a three-stage valve, first tune the inner servoloop to make sure your three-stage valve spool responds correctly to your valve commands.

For more information on tuning the inner servoloop, see "How to Tune the Inner Loop of Three-Stage Valves" on page 549.

Outer loop

When you tune your system, you are basically configuring how quickly the outer servoloop responds to changes in the command signal.

For more information on tuning the outer servoloop, see "About Tuning the Outer Loop" on page 568.

Additional information

See "Station Manager Controls and Displays" on page 273 for a complete description of this application's controls and indicators.

For specifics about the controls referenced in this section, see:

- "Station Setup Window/Drive Panel—Two Stage Valves" on page 327.
- "Station Setup Window/Drive Panel—Three Stage Valves" on page 329.
- "Station Setup Window/Tuning Panel Tabs" on page 337.
- "Station Setup Window/Compensators Panel Tabs" on page 343.
- "Scope Window" on page 395.
- "Function Generator Control Panel" on page 485.
- "Auto-Tuning Control Panel" on page 495.
- "Manual Command Window" on page 510.

Setting the Servovalve Polarity

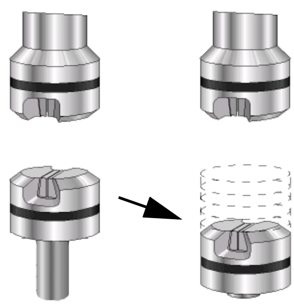
The valve polarity is set during system installation. Normally, you will not need to change the valve polarity unless you replace a hydraulic component.

Note *The combination of the conditioner polarity and the valve polarity affect the final output signal. The conditioner polarity should be set before the valve polarity.*

About valve polarity

There are two polarity settings, **Normal** and **Inverted**.

The procedures in this section assume you are using normal polarity. This results in a positive command retracting the piston.



Normal Valve Polarity

A positive valve command (+ 10 cm) retracts the actuator and results in a positive feedback.

LVDT Feedback = + 10 cm

If you do not know your valve polarity, refer to "How to Set Servovalve Polarity" on page 543 to verify your current valve polarity.

How to Set Servovalve Polarity

Servovalve polarity determines the direction the servovalve moves the actuator in response to a positive command. It can be set to normal or invert.

Typically, a servovalve set to normal polarity extends the actuator in response to a positive command. Conversely, a servovalve with an inverted polarity retracts the actuator in response to a positive actuator command.

Before you can set servovalve polarity, you must determine if the current servovalve polarity follows the normal convention.

Please note the following:

- The polarity of the servovalve must be checked before sensor calibration begins and before hydraulic pressure is applied for the first time.
- The polarity of any servovalve is generally set when the valve is installed.

Important *The combination of the conditioner polarity and the servovalve polarity affects the final output signal. The conditioner polarities should be set before the servovalve polarity because they do not need hydraulics to be turned on. In general, you will set the conditioner and servovalve polarity the same.*

Procedure

This procedure allows you to determine servovalve polarity by observing actuator movements while applying a positive Setpoint command to the actuator.

1. Get things ready.

   This step establishes the required conditions for the remaining steps.

   A. You need displacement control mode. If you have not created this type of a control mode, create it now.

   B. Ensure that the actuator can be fully extended without contacting anything. You may need to remove any obstructions.

   C. On the **Station Manager** Toolbar, select **Tuning** in the User Level access box.

2. Enter an initial tuning value (first time only).

   The actuator cannot move unless an adequate gain tuning value is set. If you already have a gain setting for the displacement control mode, skip this step.

   A. On the Station Manager **Display** menu, select **Station Setup**,

   B. Ensure that the correct displacement control channel is selected in the navigation panel.

   C. Click the Channel Tuning icon to open the **Tuning** panel.

   D. In the **P Gain** box, type **1**. No other tuning controls need to be set.

Note *For three-stage servovalves, the initial maximum P Gain setting is 0.8, so enter an initial value 0.5.*

3. Select the polarity of the servovalve signal.

   A. Ensure that the correct displacement control channel is selected in the navigation panel.

   B. Click the **Channel Drive** icon to open the **Channel Drive** panel, and then click the **Valve** tab.

   C. Set the valve polarity. If you do not know which polarity to use for your servovalve, click **Normal** (default).

4. On the **Station Controls** panel perform the following setup.

   A. Click the **Manual Command** button to open the **Manual Command** window.

   B. In the **Channel** selection box, select the desired control channel.

   C. In the **Control Mode** selection box, ensure that displacement control mode is selected.

   D. Click on the **Enable Manual Command** check box to enable manual command.

   E. On the **Station Controls** panel, ensure that the **Master Span** is set for 100%.

F. If the **Interlock** indicator is lit, determine the cause, correct it, and then click **Reset**.

G. If it lights again, you will need to determine the cause of the interlock and correct it before proceeding.

H. In the power selection box, click the **Power Low** button, and then **Power High** for the appropriate hydraulic service manifold (HSM).

5. Check the movement of the actuator.

Perform this step to verify that the actuator moves as you want.

A. On the **Manual Command** window, increase the **Manual Cmd** adjustment for a positive command.

Note *The following conditions assume you want a positive command to retract the actuator.*

Actuator fully retracted or extended

B. If the actuator is fully retracted and applying a negative **Manual Cmd** does not extend it, zero the command, remove hydraulic pressure, and change the servovalve polarity. Then retry this test. If it still does not move, return to Step 2 and increase the gain setting.

- If the actuator is fully extended and applying a positive **Manual Cmd** does not retract it, zero the command, remove hydraulic pressure, and change the servovalve polarity. Then retry this test. If it still does not move, return to Step 2 and increase the gain setting.

Actuator not fully retracted or extended

- If the actuator does not move at all, return to Step 2 and increase the gain setting.
- If the actuator retracts, the servovalve polarity is correct.
- If the actuator extends, the servovalve polarity must be reversed. Check the **Polarity** setting (on the **Valve** tab of the **Drive** panel) and change it (from **Normal** to **Inverted** or vice versa).

C. Check the movement of the actuator. Adjust the **Manual Cmd** slider to extend the actuator, and then adjust the **Manual Cmd** slider to retract the actuator.

6. Disable manual command.

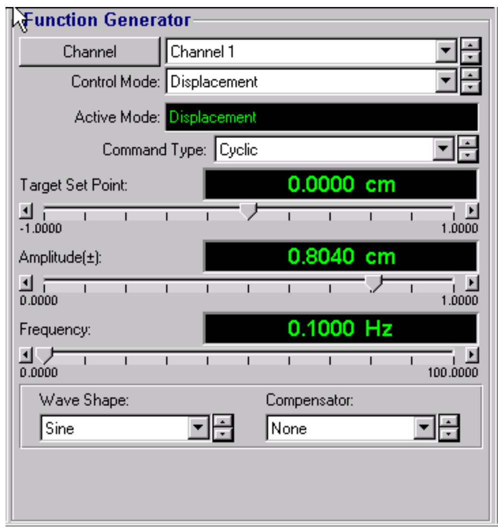
   A. On the **Station Controls** Toolbar, click the **Manual Command** button to open the **Manual Command** window.

   B. Click on the **Enable Manual Command** check box to disable manual command.

How To Warm Up the System Hydraulics

Remove any specimen and run the system in displacement control for at least 30 minutes using a 80% full-scale length command at about 0.1 Hz.

1. In the **Station Manager** navigation pane, click the **Function Generator** icon to display the **Function Generator** panel.



2. Enter the following settings in the **Function Generator** panel

CONTROL	SETTING
Control Channel	The control channel associated with the valve you are adjusting.
Control Mode	Displacement
Adaptive Compensator	None
Target Setpoint	0

Control	**Setting**
Amplitude	80% of the full-scale actuator displacement
Frequency	0.1 Hz
Wave Shape	Sine

3. In the **Station Manager** window’s **Station Controls** panel:

   A. Click **Reset** to clear interlocks.

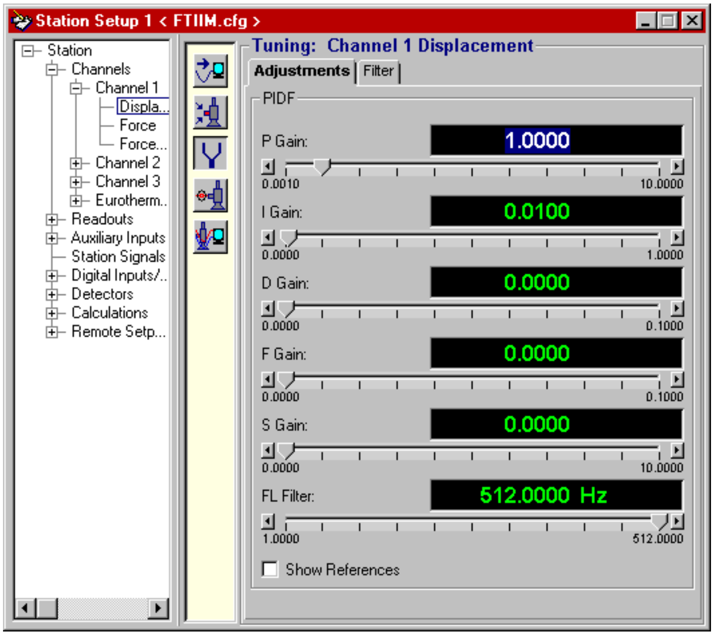
   B. Apply station power.

   C. Click **Program Run** to start the function generator.

4. If necessary, correct **P Gain** during warm up.

   A. On the **Station Manager** window’s **Display** menu, select **Station Setup**.

   B. Click the **Channel Tuning** icon to open the **Tuning** panel, and then click the **Adjustments** tab.



C. If the actuator does not move very well, increase the **P Gain** setting on the **Adjustments** tab.

D. If you hear a unusual or unexpected sound, decrease the **P Gain** setting on the **Adjustments** tab.

5. After 30 minutes, click **Stop** on the **Station Controls** panel (under **Function Generator)** to stop the command.

6. Turn off hydraulic pressure.

How to Tune the Inner Loop of Three-Stage Valves

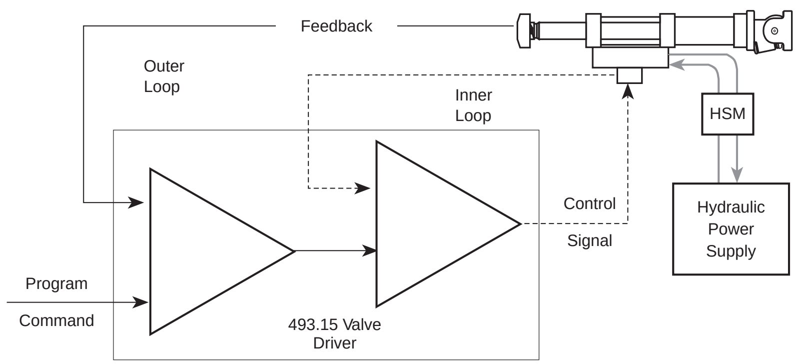
This section applies only to systems using three-stage servovalves such as the Model 497.15 or 493.15 Servovalve.

Perform inner loop tuning when initially installing a system or fine-tuning a system that employs 3-stage valve drivers. The inner loop proportional gain and rate derivative adjustments are the same types of adjustments as used with the PIDF tuning controls.

Note *During initial system installation, inner loop gain and rate adjustments must be performed before tuning the servo outer loop. For fine tuning, an initial inner loop gain adjustment may be needed if the outer loop is sluggish.*

The inner control loop is similar to a displacement control mode for the outer loop. The Model 493.15 Three-Stage Valve Driver module includes the electronics necessary to support the inner control loop.

The innerloop (proportional) gain and rate (derivative) adjustments are the same types of adjustments as the proportional and derivative gain adjustments of the outerloop tuning controls.



Important *Always tune the inner loop without the hydraulics applied to the actuator. Perform the inner loop gain adjustments with hydraulic pressure removed from the main spool while maintaining pressure at the pilot stage. This prevents interaction between the inner and outer loops.*

Prerequisites

- The hydraulic fluid and the servovalve are at operating temperature. See “How To Warm Up the System Hydraulics” on page 546.
- Command compensators are turned off.
- The specimen should be removed.

Prepare to tune

Perform the following procedure to prepare to tune the inner loop:

1. Turn off hydraulic pressure.
2. Disconnect the hydraulic service manifold (HSM) control cable from the controller.

   TestStar™ IIm and FlexTest™ GT controllers—At the back of the controller chassis, disconnect the cable from connector **J28**.

   TestStar™ IIs controllers—At the back of the controller chassis, disconnect the cable from connector **J20** (proportional HSM's only) or **J28**.

   FlexTest™ IIm and FlexTest™ CTC controllers—At the 497.05 Hydraulic Control module's rear panel, disconnect the cable from connector **J28**.

   Disconnecting this cable disables pressure to the main spool, but leaves pressure applied to the pilot stage of the servovalve.

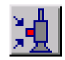
   On systems with multiple HSMs, be sure to disconnect the correct cables.

Note ***On systems with no HSM****, remove the outer loop LVDT cable from the actuator to disable the outer loop.*

3. Apply system hydraulic pressure.

Tuning

Tune the inner loop

1. Perform the steps listed in "Prepare to tune" on page 550.
2. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
3. In the **Station Manager** window's **Display** menu, select **Station Setup**.
4. In the **Station Setup** window navigation pane's **Channels**, locate and select the channel you want to tune.
5. In the **Station Setup** window, click  to display the **Drive** panel.
6. In the **Drive** panel, click the **Conditioner** tab.
7. In the **Conditioner** tab, set these LVDT conditioner parameters for the channel's displacement control mode:

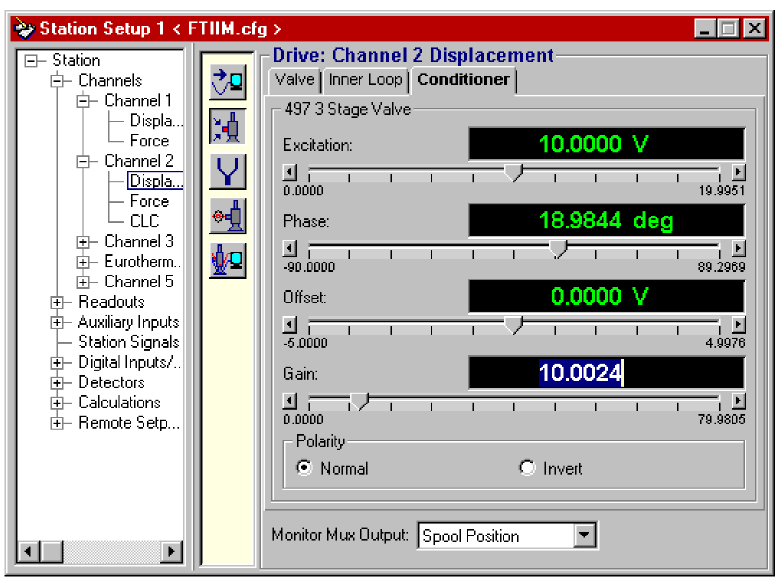
   A. Set **Excitation** to **10V**.

   B. Set **Phase** to between **10** and **30 deg**.

   C. Set **Offset** to **0 V**.

   D. Set **Gain** to **10**.

   E. Set **Polarity** to **Normal**.



8. Configure a meter to monitor the spool position signal. Refer to "How to Configure a Meter" on page 173.

   A. On the **Station Manager** window's toolbar, select **Create Meters** on the **Meters** icon pull-down menu.

   B. Select **Create Meters** again to display a second **Meters** window.

   C. In the **Meters** window, click the Meter Setup button. Use the **Meter Setup** window to define the meter.

   D. For **Meter Type**, select **Timed**.

   E. For **Signal Selection**, select the desired **Channel** name and **Spool Position** for **Signal** type.

   F. For **Display Mode**, select **Volts**.

   G. Set a **Display Resolution**.

9. Produce a **Spool Position** output signal of -10 V DC with the spool driven into the end cap.

   In the **Drive** panel **Conditioner** tab:

   A. Reverse the **Polarity** setting to drive the inner loop spool into one of the end caps.

   B. Adjust **Gain** until the meter reads approximately -8 V DC.

   C. Adjust **Phase** until the meter displays maximum voltage.

   The phase adjustment matches the phase of the inner loop LVDT feedback with the 10 kHz demodulator reference signal. This adjustment provides a maximum output for the maximum LVDT spool position offset.

Note *This adjustment must be set for the initial calibration, servovalve replacement, cable replacement, or valve driver replacement. Once the phase is correctly set, readjustment is not necessary during routine calibration.*

   D. Readjust **Gain** until the meter reads -10 V DC.

   E. Return **Polarity** to its original setting.

10. In the **Drive** panel, click the **Valve** tab.

    In the **Valve** tab, produce a **Spool Position** output signal of +10 V DC with the spool driven into the opposite end cap.

    A. Reverse the **Polarity** setting to drive the inner loop spool into the other end cap.

    B. Check the meter. It should read +10 V DC (±0.5 V DC).

       If the voltage is correct, proceed to the next step in this procedure.

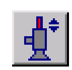
       If the voltage is off by more than 0.5 V, you may need to mechanically center the pilot spool. Refer to “Zero the Spool Position Signal” in your Controller Service manual for a detailed procedure. Complete this procedure, then recheck spool position voltages at each endcap before you resume inner loop tuning.

    C. Return **Polarity** to its original setting.

11. Open a **Scope** window and set up to monitor the spool position signal. Refer to “About the Scope” on page 159 for detailed information about scope window setup

    A. In the **Station Manager** window’s toolbar, click  once to display a single **Scope** window.

    B. In the **Scope** window’s toolbar, click  to open the **Setup for Scope** window.

12. In the **Station Manager** window’s navigation pane, click .

13. In the **Function Generator** panel, set up a tuning program:

    A. In **Channel**, select the channel controlling the servovalve.

    B. In **Control Mode**, select a displacement control mode.

    C. In **Command Type**, select **Cyclic**.

    D. For **Target Setpoint**, select **0 cm**.

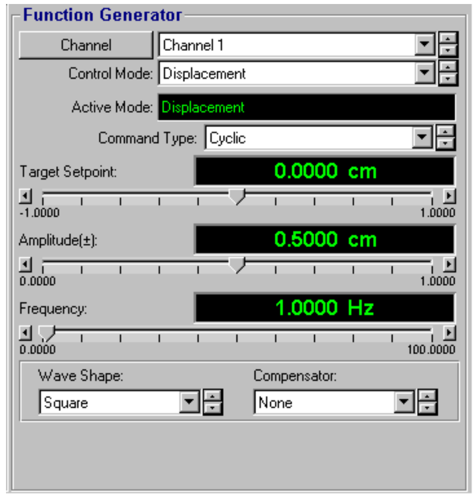
    E. For **Amplitude**, select 50% of full scale.

       You may have to increase **Amplitude** while tuning.

F. For **Frequency**, select **1 Hz**.

G. For **Wave Shape**, select **Square**.

H. For **Compensator**, select **None**.

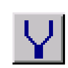


14. In the **Station Controls** panel, click  to start the **Function Generator**.

15. Display the spool position signal.

    If the **Spool Position** signal is too small to be properly displayed on the **Scope** window during tuning, increase the **Function Generator** panel's **Amplitude**.

    If the **Amplitude** setting does not amplify the spool signal as expected:

    A. In **Station Setup** window's navigation pane click .

    B. In the **Inputs** panel, click the **Adjustment** tab.

    C. In the **Adjustment** tab, increase the **P Gain**.

16. Tune the inner loop.

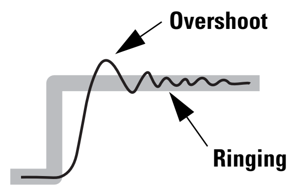
    For optimal system response, tune the inner loop to be relatively less responsive and more stable than a typical outer loop.

    In the **Station Setup** window's **Drive** panel, click the **Inner Loop** tab.

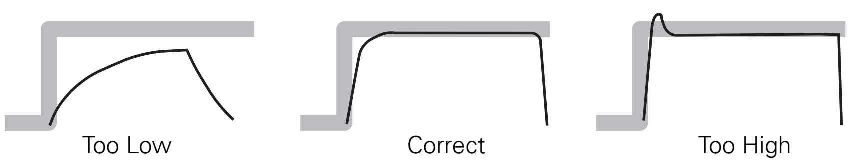
    In the **Inner Loop** tab:

    A. For **Rate Input Selection**, select **Spool Position**.

    B. Increase **Inner Loop Gain** until you see a little overshoot on the oscilloscope.



    C. Slightly increase the **Inner Loop Rate** to eliminate this overshoot. When properly tuned, the waveform should be a square wave with rounded corners, having no overshoot.



Inner Loop Signals

To monitor inner loop signals on TestStar™ IIm and FlexTest™ GT Controllers:

1. Connect a service calibration cable package (MTS part number 100-026-213) to connector **J3 Service** on the I/O carrier module.
2. Connect a DVM or oscilloscope to the appropriate **BNC Output Channel** on the service cable, depending on which slot the valve driver occupies in the I/O Carrier module.
3. In **Station Setup,** click the **Channel Drive** icon to display the **Drive** panel, and then click the **Conditioner** tab.
4. From the **Service Port Output**, select one of signals described in the following Service Port Output Signals list.

Note *Only the **Spool Position** signal is available to the digital meters or software scope.*

Service Port Output Signals

Signal	Description
Valve Current	The final output to the servovalve. The voltage represents the current output [10 V (DC) = 50 mA; standard].
Demod Filter Output	The analog output of the demodulator prior to gain.
Innerloop Command	The input signal to the 3-Stage Valve Driver (the test program command).
Spool Position	The **Conditioner Out** signal summed with the **Spool Zero** signal.
Spool Offset	Signal that is summed with spool position to remove any DC offset. ±10 V represents ±4 V of zero summing.
Preamp Output	The raw AC input from the spool LVDT.
Conditioner Out	The conditioned feedback signal from the servovalve LVDT.
Voltage Reference (5V)	Internal board reference test only.

About Valve Balance

The valve balance control electrically compensates for minor electrical and mechanical imbalances in the servoloop. Valve balancing adjusts the electrical input to the servovalve so that the feedback and command signals are equal.

How to Check and Adjust Valve Balance

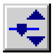
1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. Remove any specimen.
3. Apply hydraulic pressure.

WARNING

Selecting the Enable Manual Command allows you to manually position actuators.

A moving actuator can injure anyone in its path.

Always clear the actuator area before selecting **Enable Manual Command**.

4. In the **Station Controls** panel's toolbar, click  .

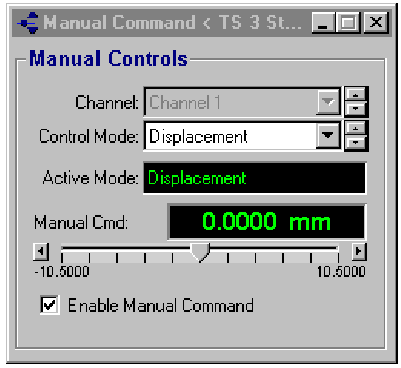
   In the **Manual Command** window:

   A. Select the **Channel** whose valve balance needs checking.

   B. For the **Control Mode**, select a displacement control mode.

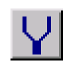
   C. Select **Enable Manual Command**.

   D. Use the **Manual Cmd** to position the actuator at or near its midstroke position.



5. In the **Station Manager** window's **Display** menu, select **Station Setup**.

6. In the **Station Setup** window navigation pane's **Channels**, select the channel whose valve balance needs checking.

7. In the **Station Setup** window, click .

   In the **Tuning** panel, click the **Adjustments** tab. In this tab:

   A. Write down the current **I Gain**.

   B. Zero the **I Gain**.

8. Set up a meter to view displacement error.

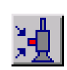
   A. Select the Meters icon on the Station Manager tool bar.

   B. Select the **Meter 1 - Setup** button.

   C. For **Meter Type**, select **Timed**.

   D. In **Signal Selection**, select the channel whose valve balance needs checking. For **Signal**, select **Displacement Abs. Error**.

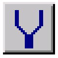
9. Zero the displacement error with the **Valve Balance** control.

   A. In the **Station Setup** window, click .

   Three-stage valves: In the **Drive** panel, click the **Valve** tab.

Tuning

B. While observing **Displacement Abs. Error** on the Meters panel, adjust the **Valve Balance** control until **Displacement Abs. Error** is zero.

10. In the **Station Setup** window, click .

    In the **Tuning** panel, click the **Adjustments** tab.

    In this tab, return **I Gain** to its original setting.

How to Balance Dual Valves

Use the following procedure if you need to balance dual servovalves.

1. In the **Station Manager** window's toolbar, select an access level of **Calibration**.
2. Remove any specimen.
3. Determine which servovalve of the dual valve pair you want to balance first, then mount a blocking plate on the port of the other servovalve.

Note *When installing the blocking plate ensure that its holes are aligned with the servovalve port holes and a gasket is used.*

4. Apply hydraulic pressure.

⚠ WARNING

Selecting the Enable Manual Command allows you to manually position actuators.

A moving actuator can injure anyone in its path.

Always clear the actuator area before selecting **Enable Manual Command**.

5. In the **Station Controls** panel's toolbar, click .

   In the **Manual Command** window:

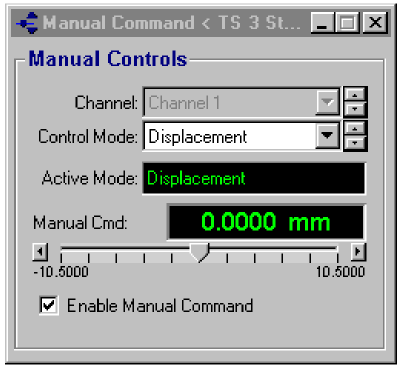
   A. Select the **Channel** with the dual valves that need balancing.

   B. For the **Control Mode**, select a displacement control mode.

   C. Select **Enable Manual Command**.

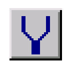
Tuning

D. Use the **Manual Cmd** to position the actuator at or near its midstroke position.



6. In the **Station Manager** window's **Display** menu, select **Station Setup**.

7. In the **Station Setup** window navigation pane's **Channels**, select the channel with the dual valves that need balancing.

8. In the **Station Setup** window, click .

   In the **Tuning** panel, click the **Adjustments** tab. In this tab:

   A. Write down the current **I Gain**.

   B. Zero the **I Gain**.

9. Set up a meter to view displacement error.

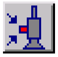
   A. Select the Meters icon on the Station Manager tool bar.

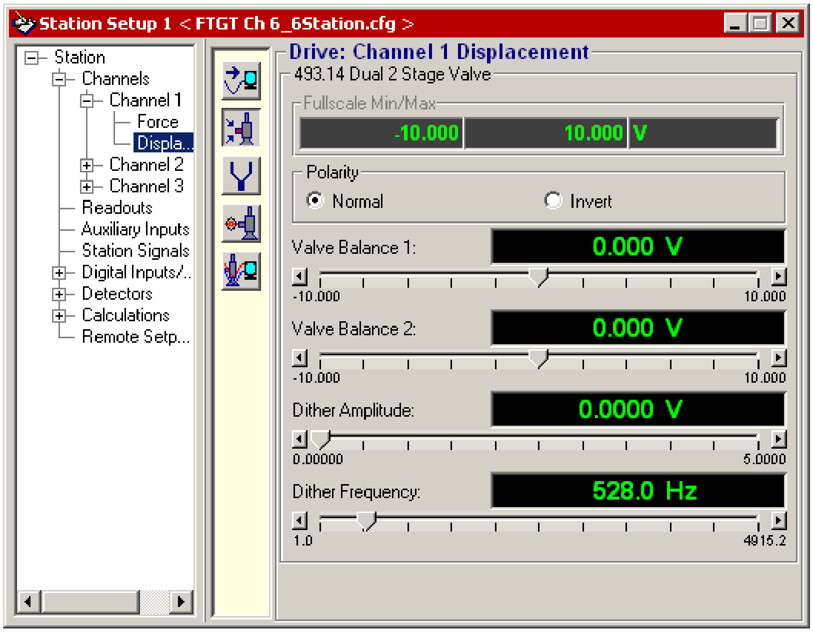
   B. Select the **Meter 1 - Setup** button.

   C. For **Meter Type**, select **Timed**.

   D. In **Signal Selection**, select the channel whose valve balance needs checking. For **Signal**, select **Displacement Abs. Error**.

10. Zero the displacement error with the appropriate valve balance control.

    A. In the **Station Setup** window, click .



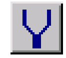
    B. While observing **Displacement Abs. Error** on the Meters panel, adjust the valve balance control for the non-blocked servovalve (**Valve Balance 1** or **Valve Balance 2**) until **Displacement Abs. Error** is zero.

11. Balance the other servovalve of the dual valve pair.

    A. Remove the blocking plate from the port of the other servovalve.

    B. Reinstall the servovalve.

    C. While observing **Displacement Abs. Error** on the Meters panel, adjust the valve balance control for the other servovalve (**Valve Balance 1** or **Valve Balance 2**) until **Displacement Abs. Error** is zero.

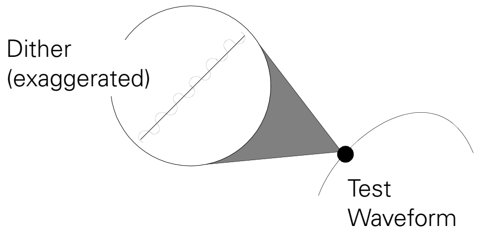
12. In the **Station Setup** window, click .

    In the **Tuning** panel, click the **Adjustments** tab.

    In this tab, return **I Gain** to its original setting.

About Dither

Dither is a small, high frequency sine wave applied to a servovalve's spool to improve the valve's response to low amplitude signals by reducing sticking.



The following are signs of an improper dither adjustment:

- **Dither amplitude is too low**—While running a sinusoidal test on a properly tuned system, you notice that the waveform distorts at its maximum and minimum points. This will normally be more apparent during a test that has either a low frequency or a low amplitude test waveform.
- **Dither amplitude is too high**—You hear unusual sounds, such as hammering, squealing, or pounding coming from the test system.

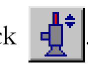
How to Check and Adjust Dither Amplitude

There are two methods for checking and adjusting dither. **Method 1** uses an oscilloscope. **Method 2** uses your hearing.

Method 1

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.

2. Remove any specimen.

3. In the **Station Manager** window's navigation pane, click .

4. In the **Function Generator** panel, set up a tuning program.

   These are typical **Function Generator** settings:

   A. For **Channel**, select a channel whose dither needs checking.

   B. For **Control Mode**, select a displacement mode.

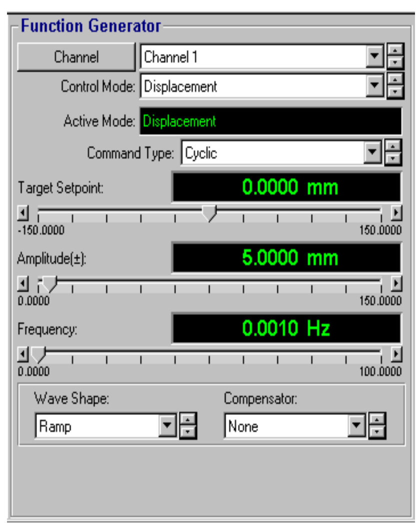
   C. For **Target Setpoint**, select **0 mm**.

   D. For **Amplitude**, select **5 mm**.

   E. For **Frequency**, select **0.001 Hz**.

   F. For **Wave Shape**, select **Ramp**.

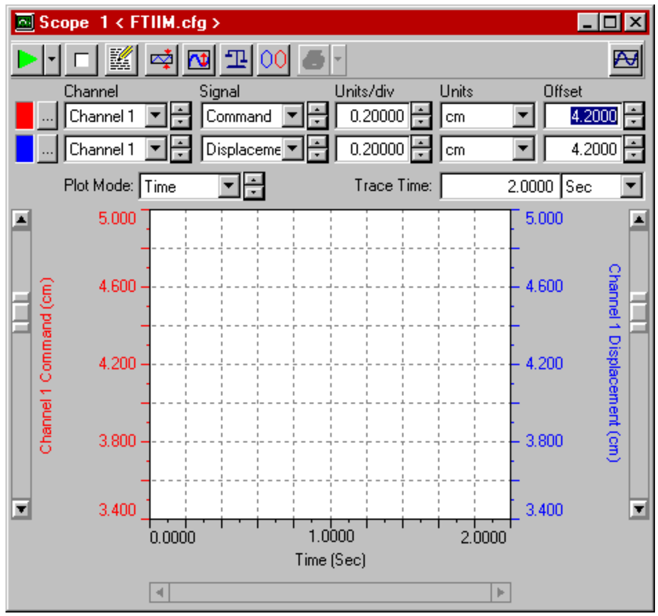
   G. For **Compensator**, select **None**.



5. Set up the **Station Manager** window's **Scope** to display the channel's command and feedback signals.

   A. In the **Station Manager** window's toolbar, click .

   B. Set up the **Scope** window to display the channel's command and feedback signals. The following shows a typical setup.



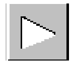
⚠ WARNING

Applying station hydraulic pressure can put actuators in motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulic pressure.

6. Apply station hydraulic power.

7. In the **Station Manager** window's **Station Controls** panel, click  to start the displacement command.

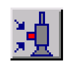
8. Use the scope to observe the feedback signal.

   If the feedback signal shows a smooth ramp, you do not need to adjust the dither amplitude.

   If the feedback signal shows a jagged ramp—caused by the actuator sticking before moving—continue on to the next step to adjust the dither amplitude.

9. In the **Station Manager** window's **Display** menu, select **Station Setup**.

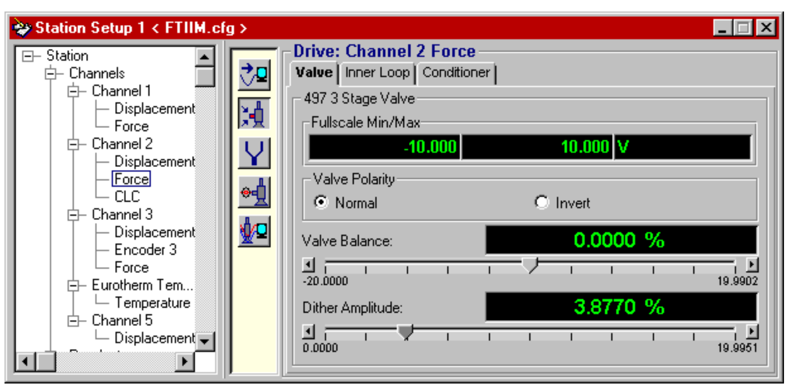
10. In the **Station Setup** window navigation pane's **Channels**, locate and select the channel whose servovalve dither you want to adjust.

11. In the **Station Setup** window, click .

    Three-stage valves: In the **Drive** panel, click the **Valve** tab.

    Increase **Dither Amplitude** until the feedback is smooth.

    If you hear an unusual sound coming from the servovalve, the dither amplitude is set too high.



Method 2

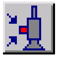
1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.

2. Remove any specimen.

3. Apply station hydraulic power.

4. In the **Station Manager** window's **Display** menu, select **Station Setup**.

5. In the **Station Setup** window navigation pane's **Channels**, locate and select the channel whose servovalve dither you want to adjust.

6. In the **Station Setup** window, click .

   Three-stage valves: In the **Drive** panel, click the **Valve** tab.

   Increase **Dither Amplitude** until you can hear the dither and then decrease **Dither Amplitude** until the noise goes away.

Dither Frequency Adjustment

In addition to **Dither Amplitude**, TestStar IIm, TestStar IIs, and FlexTest GT controllers have a **Dither Frequency** control.

For most applications, the dither frequency should never have to be adjusted. Dither frequency may need to be adjusted if the dither frequency interacts with the test and sets up resonances.

About Tuning the Outer Loop

Proper outer-loop tuning improves the stability of your servocontrol loop, ensuring that each command is fully applied to your specimen.

Before you tune the outer loop, always set limit detectors to prevent equipment and specimen damage. See "About Limit Detectors" on page 226.

When to tune

Tune the system when:

- There is a change in the compliance or size of the test specimen.
- There is a change in the servohydraulic configuration.
- System performance is sluggish.
- A sensor is recalibrated.
- You create a new control mode or change sensors.
- There is system instability, typically indicated by abnormal humming or squealing sounds.

Getting started

It is best to auto-tune your PIDF control modes first. Auto-tuning establishes adequate tuning levels for most control modes.

If the results from auto-tuning are not satisfactory, you should manually tune each control mode.

See the following sections for more tuning information:

- "About Auto-Tuning" on page 569 provides more information about automatically tuning PIDF control modes.
- "About Manual Tuning" on page 575 provides more information about manually tuning PIDF control modes.
- "About Channel Limited Channel (CLC) Control Modes" on page 590 provides more information about tuning CLC control modes.
- "About Dual Compensation Control Modes" on page 594 provides more information about tuning dual compensation control modes.
- "About Tuning Filters" on page 600 provides more information about using notch filters to filter out control feedback signal noise.

About Auto-Tuning

Auto-tuning is available for PIDF control modes only. The Station Manager application supports **Basic** and **Advanced** auto-tuning.

Basic auto-tuning

When you run **Basic** auto-tuning, the auto-tuner disregards your current PIDF gain settings. It applies the minimum required drive signal to ramp the feedback to 80% of the auto-tuning limits. It then measures the relationship between the feedback velocity and the valve opening signal and then derives the minimum PIDF gains required to track the command.

The majority of tests will run adequately with the settings calculated through basic auto tuning, however, advanced auto tuning may be used to optimize the results obtained through basic auto tuning.

Advanced auto-tuning

When you run **Advanced** auto-tuning, the auto-tuner first does basic auto-tuning. It then runs a sine sweep to exercise the actuator to 20% of the auto-tuning limits with frequencies between 0.5 Hz and a user set maximum of 100 Hz.

Note *The advanced auto tuner will reduce the sweep amplitude if it detects a valve opening that is more than 50% of full scale.*

Advanced auto-tuning controls

Selecting an **Auto-Tuning Type** of **Advanced** displays **Tracking** and **Sweep Freq** controls in the **Auto-Tuning** applications control panel.

Tracking

Tracking specifies how closely the advanced tuner attempts to track the command. **Tracking** values should be appropriate for the test to be performed. Too high **Tracking** values may produce tuning values that are unstable for some systems and can cause auto-tuning to fail. The 50% default setting is usually a good starting point. If auto-tuning fails with this default setting, lower the **Tracking** value.

Sweep Freq

Sweep Freq specifies the upper frequency limit of the sine sweep used by the **Advanced** auto-tuner. The 20 Hz default setting is usually a good starting point.

For **Advanced** auto-tuning, you should change the sweep frequency to create a phase shift greater than 90° for 0% tracking (or 135° for 100% tracking) between the command and compensated command.

You can monitor the advanced tuner command and compensated command on the scope.

How to Auto-Tune Control Modes

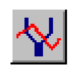
This section covers how to perform basic auto-tuning.

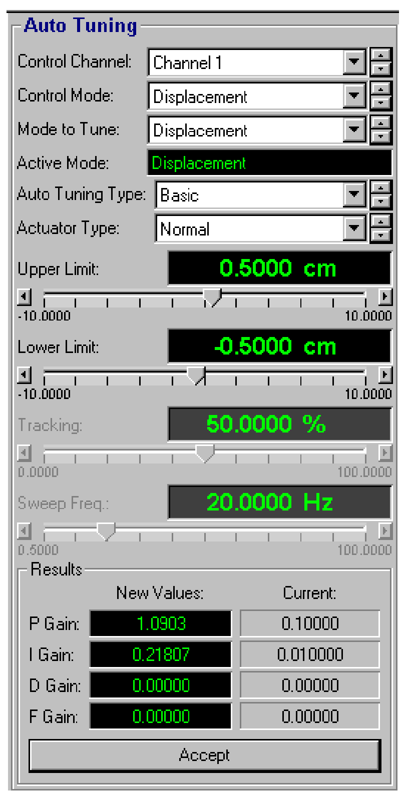
First auto-tune the displacement control mode. Then install a dummy specimen and auto-tune the force control mode.

Auto-tune the displacement control mode

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
2. Remove any specimen.
3. Use the **Station Setup** window's **Limits** tab to set and enable the displacement feedback signal's limits. Set the limits just outside the signal's full-scale range.

   See "How to Set Limit Detectors" on page 227 for more about setting limit detectors.

4. In the **Station Manager** window, click  .



In the **Auto-Tuning** control panel:

A. For **Control Channel**, select the channel to be auto-tuned.

B. For **Control Mode**, select a displacement control mode.

C. For **Mode to Tune**, select the displacement mode.

D. For **Auto-Tuning Type**, select **Basic** or **Advanced**.

Basic provides an adequate level of tuning for most control modes.

Advanced provides a higher level of tuning based on **Tracking%** values.

E. For **Actuator Type**, select **Normal** or **Hydrostatic**.

For most cases select **Normal**. If you receive a "Feedback is not responding to drive signal" message during tuning, select **Hydrostatic**. This setting allows more and faster valve movements, which results in more actuator movement.

F. For **Upper Limit** and **Lower Limit**, set the upper and lower limits for actuator travel during auto-tuning.

Basic auto-tuning exercises within 80% of these limits.

Advanced auto-tuning function exercises within 20% of these limits. If the limits are exceeded, the auto-tuner will quit and trip an interlock.

G. **For Advanced** auto-tuning—Set the **Tracking%** value.

The 50% default setting is appropriate for most systems.

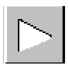
H. **For Advanced** auto-tuning—Set the **Sweep Freq**.

The **Sweep Freq** sets the upper frequency limit of the sine sweep. The 20 Hz default setting is a good starting point.

WARNING

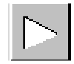
Pressing the Station Controls panel's Run button will put actuators in motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before pressing the  button.

5. Auto-tune the displacement control mode.

Note *While auto-tuning is in process you cannot changes channels or control modes. Also, the active and auto-tuning signal's tuning parameters will be disabled.*

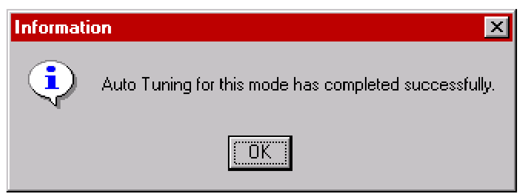
A. In the **Station Controls** panel, click  to start the auto-tuning process.

B. Auto-tuning displays the following message:

Click **OK** to dismiss this message.

6. Accept and save the auto-tuning values.

A. If tuning is successful, auto-tuning displays this message:



Click **OK** to dismiss this message.

The **Auto-Tuning** panel's **Results** shows **Current** tuning values and **New Values**.

B. In the **Auto-Tuning** panel, click **Accept** to apply the **New Values**.

C. In the **Station Manager** window's **File** menu, select **Save Parameters** to save these **New Values**.

7. Continue on to "**Auto-tune the force control mode**."

Auto-tune the force control mode

1. Install a dummy specimen.
2. Use the **Station Setup** window's **Limits** tab to set and enable the force feedback signal's limits. Set the limits just outside the signal's full-scale range.

   See "How to Set Limit Detectors" on page 227 for more about setting limit detectors.
3. In the **Auto-Tuning** control panel's **Control Mode**, select a displacement control mode.
4. In the **Auto-Tuning** control panel's **Mode to Tune**, select the force control mode.

WARNING

Pressing the Station Controls panel's Run button will put actuators in motion.

A moving actuator can injure anyone in its path.

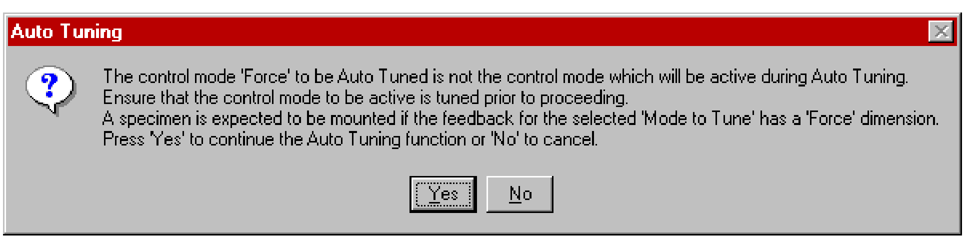
Always clear the actuator area before pressing the button.

5. Auto-tune the force control mode.

Note *While auto-tuning is in process you cannot changes channels or control modes. Also, the active and auto-tuning signal's tuning parameters will be disabled.*

   A. In the **Station Controls** panel, click to start the auto-tuning process.

   B. Auto-tuning will display the following message:



Click **Yes** if you have tuned the channel's displacement mode and installed a specimen.

C. Auto-tuning displays the following message:

Click **OK** to dismiss this message.

6. Accept and save the auto-tuning values.

A. If tuning is successful, auto-tuning displays this message:

Click **OK** to dismiss this message.

The **Auto-Tuning** panel's **Results** show both **Current** tuning values and **New Values**.

B. In the **Auto-Tuning** panel, click **Accept** to apply the **New Values**.

C. In the **Station Manager** window's **File** menu, select **Save Parameters** to save the **New Values**.

How to improve auto-tuning results

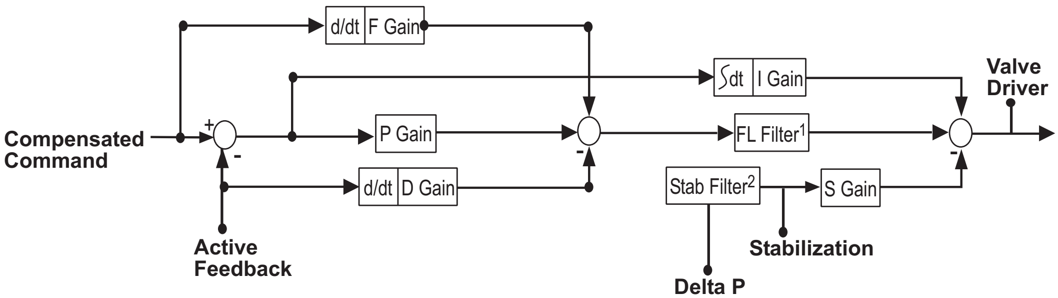
You can attempt to further improve tuning using the following techniques:

- Use the auto-tuning settings as a starting point when manually tuning each control mode.
- If your feedback signal is noisy, use a tuning filter (see "About Tuning Filters" on page 600).

About Manual Tuning

PIDF tuning controls

The following block diagram shows how the manual tuning controls interact.



1 FL Filter on the Tuning Menu
Set filter frequency and select filter type.

2 Stabilization Filter on the Tuning Menu
Set filter frequency and select filter type.

For more information on tuning controls, see the following:

- "Proportional Gain (P Gain)" on page 525
- "Integral Gain (I Gain)" on page 525
- "Derivative Gain (D Gain)" on page 527
- "Feed Forward Gain (F Gain)" on page 528
- "Stabilization Gain (S Gain)" on page 529
- "Forward Loop Filter (FL Filter)" on page 531

Manual Tuning Guidelines

While it is impossible to provide precise tuning guidelines since tuning procedures depend on both the specimen type and test system response, here are some general guidelines:

- Set limits to protect you, your equipment, and your specimen. See "About Limit Detectors" on page 226 for more information.
- Tune a channel's displacement control mode first, without a specimen installed.
- Tune a channel's force control mode second, with a dummy specimen installed.
- If possible, re-tune the force and displacement control modes with a dummy specimen installed.
- Make small changes to tuning values and monitor the results in the **Scope** and **Meters** windows.

Tuning Displacement

A displacement control mode uses the feedback signal from an LVDT (linear variable differential transformer). You do not need a specimen to tune a displacement control mode.

When to tune

A displacement control mode usually only needs to be tuned once.

However, you may want to retune a displacement control mode if:

- The fixtures attached to the actuator have changed (such as grips). The main tuning factor is a change in the mass attached to the actuator.
- Any time hydraulic system potential has changed, such as after servovalve, hose, or pump replacement.
- You want to fine tune the control mode.
- The LVDT ranges are changed.
- You deem it necessary as a result of scheduled system calibration or you feel system response should be improved or reduced.

Prerequisites

Be sure the following items are completed before you begin tuning the displacement control mode:

- Hydraulic pressure is off.
- The specimen is not installed.
- You have created a station configuration file.
- You have created a station parameter set.

Tuning procedure

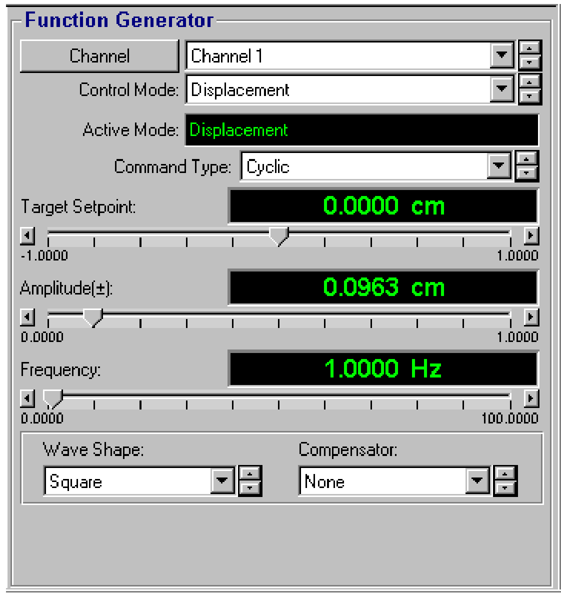
This basic displacement tuning procedure should work for most applications—consider it a guideline. You should be familiar with the background information presented in this chapter so you can modify the following procedure for your specific system.

1. Define the displacement command.

   This step defines the tuning command using the **function generator**.

   A. Click  on **Station Manager**.

B. Select the **Channel** that uses the displacement signal you want to tune.



C. On the **Control Mode** selection list, select a **Displacement** control mode.

D. Set the **Target Setpoint** to zero.

E. Set the **Amplitude** to about 10% of full scale.

F. Set the **Frequency** to 1 Hz.

G. Under **Wave Shape**, select **Square**.

2. Set up the Scope.

Note *You can use an oscilloscope instead of the software scope if you want. To do that you must define a Readout channel to connect the oscilloscope.*

A. On the **Display** menu select **Scope**.

B. Select the displacement feedback signal for Channel A.

C. Set the **Trace Time** to 5 seconds.

D. Ensure **Auto-Scale** is on (the default position is ON).

Note *To improve your view of the waveform, click the **Rescale** button to maximize the waveform on the display.*

⚠ WARNING

Do not place any part of your body in the path of a moving actuator.

A crush zone exists between the actuator and any equipment in the path of its movement. Immediate and unexpected actuator response is possible when you apply hydraulic pressure to your system.

Stay clear of the actuators when applying hydraulic pressure.

3. Turn on hydraulic pressure.

   A. In the power selection box, click (Low) and then (High) for the HPU. If an HPU is not listed, start the HPU at the pump.

Note *The HPU can be configured for "first on." If this is the case, start the appropriate HSM.*

   B. If an HSM is present, click (Low) and then (High) for the appropriate HSM.

4. On the Station Manager **Display** menu, select **Station Setup**.

5. In the **Station Setup** window navigation pane, locate and select the channel associated with the displacement sensor signal you are tuning.

6. In the **Station Controls** panel toolbar, click to display the **Manual Command** window.

   In the **Manual Command** window:

   A. Select the appropriate **Channel** associated with the displacement sensor signal you are tuning.

   B. For the **Control Mode**, select displacement associated with the displacement sensor signal you are tuning.

   C. Click **Enable Manual Command**.

7. Install a dummy specimen.

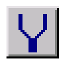
   Adjust the **Manual Command** window slider to position the actuator during specimen installation.

8. On the **Station Controls** panel, ensure the **Master Span** is set for 100%.

9. If the **Interlock** indicator is lit, click **Reset**. If the indicator lights again, you must determine the cause and correct it before proceeding.

10. Set up the Tuning panel.

    A. In the **Station Setup** window navigation pane, select the channel that uses the displacement signal you intend to tune.

    B. Click  to display the **Tuning** panel.

    C. In the **Tuning** panel, click the **Adjustments** tab.

    D. Select the **Show References** check box.

    Notice the **Reference** column on the right side of the window. This column shows the current set of tuning parameters. Use the buttons to update reference settings with new values or replace the current values with the last set that worked properly.

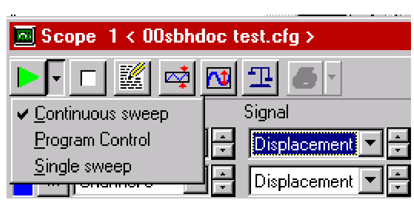
Note *The **Reference** settings are saved with the parameter set.*

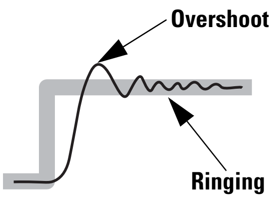
11. Adjust the P and D tuning controls.

    For most systems, you can adjust the controls as described below. Not all of the adjustments are used. You should be familiar with “About Manual Tuning” on page 575 to use all of the controls.

    A. Click  on the **Station Controls** panel to start the function generator.

    B. On the **Scope** toolbar, select **Continuous Sweep**.



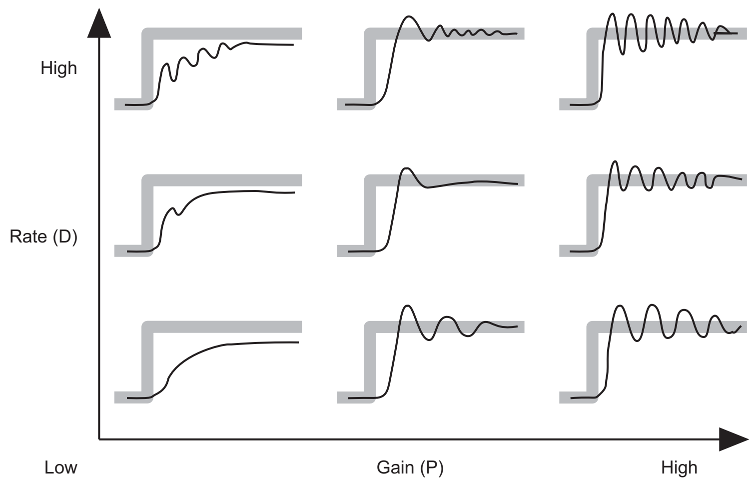


C. On the **Adjustments** tab, increase the **P Gain** adjustment until you see a little overshoot and a little ringing.

D. Increase the **D Gain** adjustment to reduce the overshoot and ringing.

E. Repeat C and D until you achieve a optimum waveform.

The middle waveform is a optimum waveform. In some cases the optimum waveform will have no overshoot or ringing, and the waveform will look more like a square waveform with rounded corners.



Unstable sounds

For actual testing, if your system goes unstable it will sound unstable—that is, it will emit an annoying high-pitched sound that is quite different from the usual tuning sound ("ka-chunk, ka-chunk"). If your system begins to go unstable, quickly readjust the control that caused the instability or click the **<** button on the **Adjustments** tab to return the control to its previous setting.

Rule-of-thumb

Adjust the **P Gain** and **D Gain** controls as high as possible without going unstable.

12. Adjust the **I Gain** tuning control.

To adjust reset (**I Gain**) you may want to set up a peak/valley software meter, or you could monitor the error waveform with the oscilloscope.

Peak/valley meter

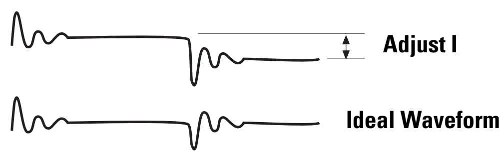
Monitor the peaks and valleys of the sensor signal. The peaks and valleys should be balanced. Before adjusting reset (**I Gain**), be sure the feedback signal is repeatable (that is, the same peaks and valleys are achieved).

For example, assume the test command is centered on zero and the meter displays +3 mm and -5 mm. You want to adjust the reset (**I Gain**) control to achieve ±4 mm.

If the command is not centered on zero, monitor the difference between peaks and valleys of the sensor feedback to the upper and lower levels of the test command. Any difference should be the same.

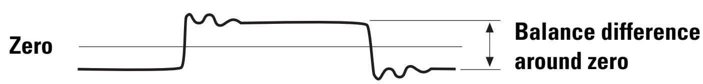
Square wave error signal

Monitor the amplitude of the settled portion of the error signal. The settled portion of the error signal should be the same level for both segments.



Triangle wave error signal

Monitor the amplitude of the settled portion of the error signal. The settled portion of the error signal should be balanced.



Upset recovery method

This is the best method for adjusting the reset integration gain. You need to monitor the error signal (use the scope or meter). Then you need to disrupt the system by changing the command—simply adjust the **Manual Cmd** control on the **Manual Command** window to a different value. The error should return to zero within 5–10 seconds. If not, increase the reset (**I Gain**) setting and repeat the procedure until the error zeros itself within a reasonable time period.

13. Save your tuning settings.

    It is important that you save your parameter set as you complete the various parts that make up a parameter set. Throughout this manual you will be performing discrete procedures while building a single parameter set.

Tuning

On the Station Manger **File** menu, select **Save Parameters As**.

- If this is the first time you are working with the Station Manager program and are optimizing the initial set of station parameters for a station configuration, save the tuning parameters under the name **station1_params**.
- If you have already established your default parameter set for the current station and you are creating a new parameter set for a specific test or a different station, save the parameters with a different name (do not use station1_params).
- Different tests and/or specimens may require different parameter sets.

Tuning Force

To complete this task, you will make sure the force tuning values established in your station parameter set are appropriate for the test you are about to run. To do this, you will:

- Create and apply a simple tuning program.
- Evaluate the current force tuning values by comparing command and feedback signals.

The displacement tuning values established in the station parameter set are unlikely to require adjustment. Optimal force tuning values, however, are a function of your specimen's compliance, which may change over time, or from test-to-test. You should also tune force whenever you make any change to the force train (such as changing fixtures).

Prerequisites

Be sure the following items are done before you begin tuning the force control mode:

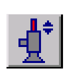
- Hydraulic pressure is off.
- The specimen is not installed.
- You have created a station configuration file.
- You have created a station parameter set.

Tuning procedure

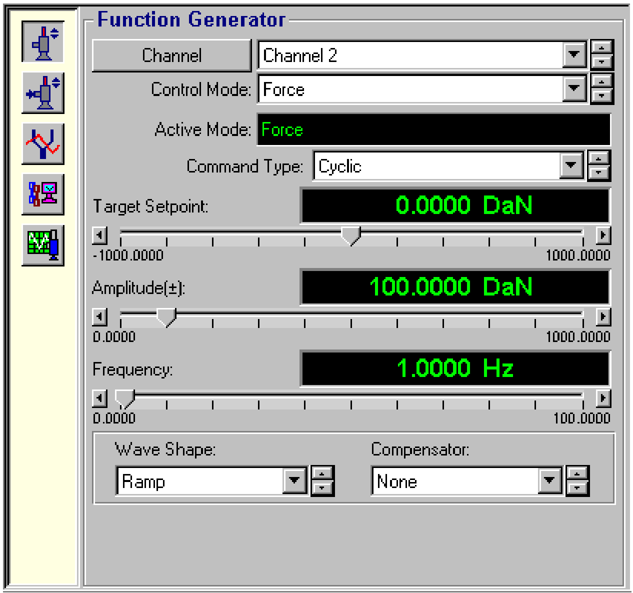
The following is a step-by-step tuning procedure for a force control mode. It is a basic procedure that should work for most applications. However, you should consider it a guideline. The background information presented in this chapter should help you modify the following procedure for your specific system.

1. Define the force command.

   This step defines the tuning command using the **Function Generator**.

   A. Click  on **Station Manager**.

   B. Select the **Channel** that uses the force signal you want to tune.



C. On the **Control Mode** selection list, select the force control mode associated with the force sensor signal you are tuning.

D. Set the **Target Setpoint** to zero.

E. Set the **Amplitude** to about 10% of full scale.

F. Set the **Frequency** to 1 Hz.

G. Under **Wave Shape**, select **Ramp**.

2. Set up the Scope.

Note *You can use an oscilloscope instead of the software scope if you want. To do that you must define a Readout channel to connect the oscilloscope.*

A. On the **Display** menu, select **Scope**.

B. Select the **Force Abs. Error** signal for Channel A.

C. Set the **Trace Time** to 2 seconds.

D. Ensure **Auto Scaling** is on (the default position is ON).

Note *To improve your view of the waveform, click the **Rescale** button to maximize the waveform on the display.*

WARNING

Do not place any part of your body in the path of a moving actuator.

A crush zone exists between the actuator and any equipment in the path of its movement. Immediate and unexpected actuator response is possible when you apply hydraulic pressure to your system.

Stay clear of the actuators when applying hydraulic pressure.

3. Turn on hydraulic pressure.

   A. In the power selection box, click (Low) and then (High) for the HPU. If an HPU is not listed, start the HPU at the pump.

Note *The HPU can be configured for "first on." If this is the case, start the appropriate HSM.*

   B. If an HSM is present, click (Low) and then (High) for the appropriate HSM.

4. On the Station Manager **Display** menu, select **Station Setup**.

5. In the **Station Setup** window navigation pane, locate and select the channel associated with the force sensor signal you are tuning.

6. In the **Station Controls** panel toolbar, click to display the **Manual Command** window.

   In the **Manual Command** window:

   A. Select the appropriate **Channel** associated with the force sensor signal you are tuning.

   B. For the **Control Mode**, select displacement.

   C. Click **Enable Manual Command**.

7. Install a dummy specimen.

   Adjust the **Manual Command** window slider to position the actuator during specimen installation.

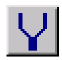
8. In the **Manual Command** window, select force for **Control Mode**.

9. On the **Station Controls** panel, ensure the **Master Span** is set for 100%.

10. If the **Interlock** indicator is lit, click **Reset**. If the indicator lights again, you must determine the cause and correct it before proceeding.

11. Set up the Tuning tab

    A. In the **Station Setup** window navigation pane, select the channel that uses the force signal you intend to tune.

    B. Click  to display the **Tuning** panel.

    C. In the **Tuning** panel, click the **Adjustments** tab.

    D. Select the **Show References** check box.

    Notice the **Reference** column on the right side of the window. This column shows the current set of tuning parameters. Use the buttons to update reference settings with new values or replace the current values with the last set that worked properly.

Note *The **Reference** settings are saved with the parameter set.*

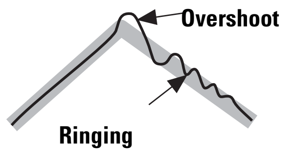
12. Adjust the P and D tuning controls.

    A. Click  on the **Station Controls** panel to start the function generator.

    B. On the **Scope** toolbar, select **Continuous Sweep**.

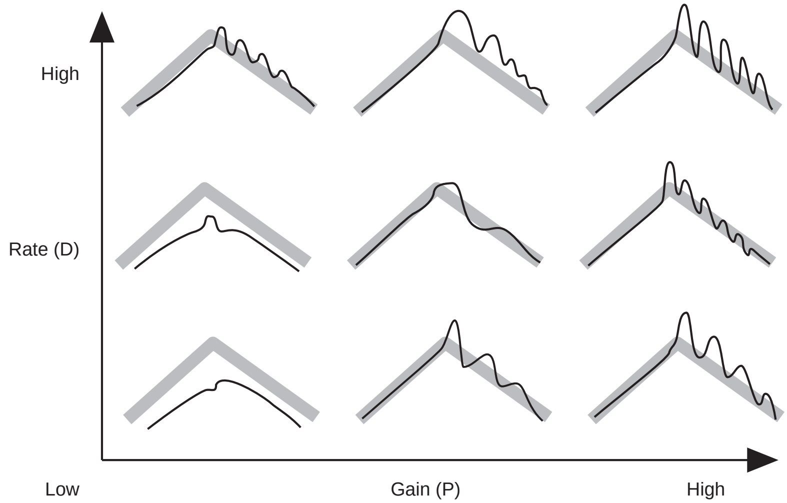
    C. On the **Adjustments** tab, increase the **P Gain** adjustment until you see a little overshoot and a little ringing.

Tuning



D. Slowly increase the **D Gain** adjustment to reduce the overshoot and ringing. Small adjustments of D can have large effects on the system.

E. Repeat C and D until you achieve a optimum waveform.



The middle waveform is the optimum waveform. In some cases the waveform will have no overshoot or ringing.

Tuning

Unstable sounds

For actual testing, if your system goes unstable it will sound unstable—that is, it will emit an annoying high-pitched sound that is quite different from the usual tuning sound (“ka-chunk, ka-chunk”). If your system begins to go unstable, quickly readjust the control that caused the instability or click the reset button (<) on the **Adjustments** tab.

Rule-of-thumb

Adjust the **P gain** and **D gain** controls as high as possible without going unstable or causing excessive overshoot or ringing.

13. Adjust the I tuning control.

    To adjust reset (**I Gain**) you may want to set up a peak/valley meter, or you could monitor the error waveform with the oscilloscope.

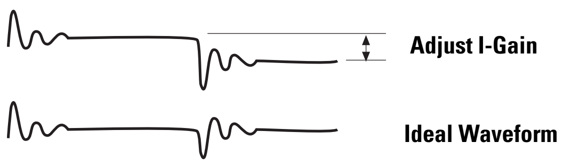
Peak/valley meter

Monitor the peaks and valleys of the sensor signal. The peaks and valleys should be balanced. Before adjusting reset (**I Gain**), be sure the feedback signal is repeatable (that is, the same peaks and valleys are achieved).

If the command is not centered on zero, monitor the difference between peaks and valleys of the sensor feedback to the upper and lower levels of the test command. Any difference should be the same.

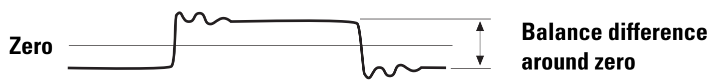
Square wave error signal

Monitor the amplitude of the settled portion of the error signal. The settled portion of the error signal should be at the same level.



Ramp error signal

Monitor the amplitude of the settled portion of the error signal. The settled portion of the error signal should be balanced.



Upset recovery method

This is the best method for adjusting the reset integration gain. You need to monitor the error signal (use the scope or meter). Then you need to disrupt the system by changing the command. Simply adjust the manual command control to a different value. The DC error should return to zero within 5–10 seconds. If not, increase the reset (**I Gain**) setting and repeat the procedure until the DC error zeros itself within a reasonable time period.

Tuning

About Channel Limited Channel (CLC) Control Modes

Use a channel limited channels (CLC) control mode for specimen installation and removal.

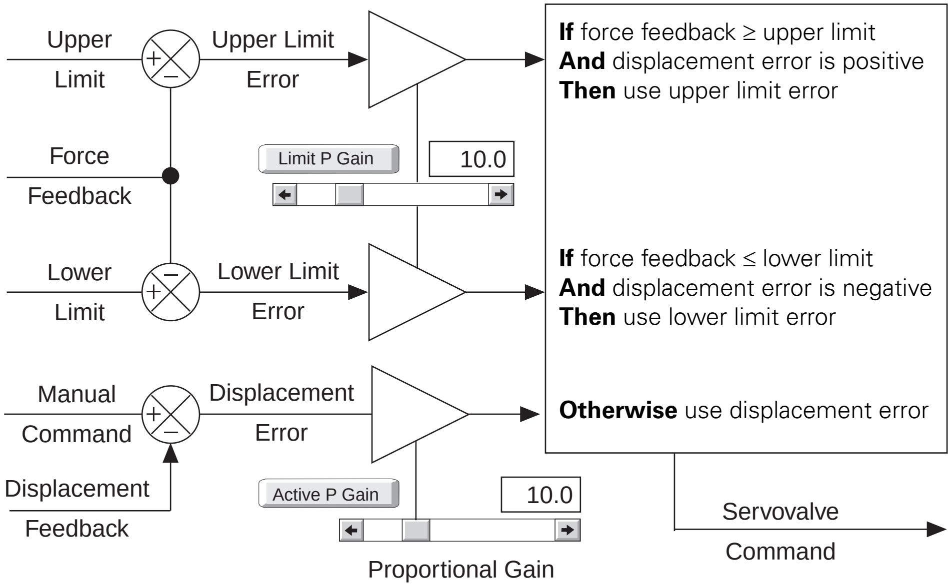
Before CLC control modes can be tuned, they must first be defined in the Station Builder application. See "Creating Control Modes" on page 60 for more information.

A CLC control mode requires an active and a limiting feedback signal:

- The active feedback signal controls the actuator's movement. It is normally the channel's displacement feedback signal.
- The limiting feedback signal limits the actuator's force. It is normally the channel's force feedback signal.

When CLC is used as the control mode, the controller will not allow the actuator to exceed limits set for either the active or limiting feedback signals:

- Interlocks can trip if the actuator's active (displacement) feedback signal exceeds limits set for it in the **Station Setup** window's **Limits** tab.
- The actuator's limiting (force) feedback signal cannot exceed limits set for it in the **Station Setup** window's **Adjustment** tab.



The CLC control mode uses one of three error signals. The **Limiting P Gain** adjustment acts as a conversion factor to scale the limit feedback to similar units as the active P feedback.

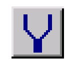
How to Tune a CLC Control Mode

Tune the control modes that will supply the active and limiting feedback signals.

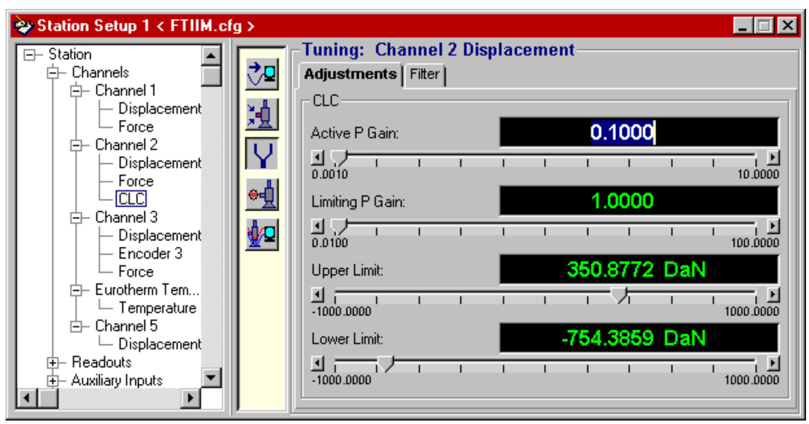
1. In the **Station Manager** window’s toolbar, select an access level of **Tuning**.
2. Display the **Adjustments** tab for the CLC control mode to be tuned.

   A. In the **Station Manager** window’s **Display** menu, select **Station Setup**.

   B. In the **Station Setup** window navigation pane’s **Channels**, locate and select the CLC control mode you are tuning.

   C. In the **Station Setup** window, click .

   D. In the **Tuning** panel, click the **Adjustments** tab.



3. In the **Adjustment** tab, set the gain for the active and limiting feedback signals.

   A. For **Active P Gain**, enter the value used for the displacement control mode’s **P Gain**.

   B. For **Limiting P Gain**, enter the value used for the force control mode’s **P Gain**.

4. Select the CLC control mode to test system response.

   Adjust the **Active P Gain** if the actuator's displacement response is sluggish.

   Adjust the **Limiting P Gain** if the actuator's force response is sluggish.

Note *If actuator response to a command is sluggish, increasing* ***Limiting P Gain*** *from its initial value can improve actuator performance.*

5. To save tuning values, in the **Station Manager** window's **File** menu, select **Save Parameters**.

About Dual Compensation Control Modes

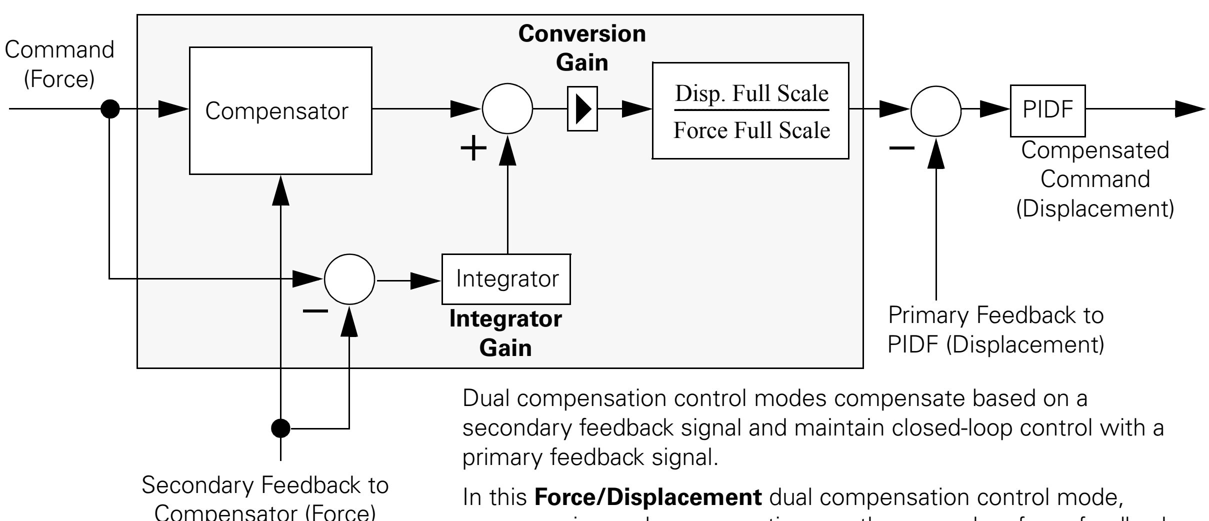
Before dual compensation modes can be tuned, they must first be defined in the Station Builder application. For more information, see "Creating Control Modes" on page 60.

Sometimes force feedback signals may be too noisy or otherwise unsuitable for use in control modes. For example, accelerometer feedback signals have only dynamic characteristics, making them unsuitable for use in a control mode.

Select a dual compensation control mode for a channel when the feedback for the desired control mode is unsuitable for maintaining closed-loop control.

A dual compensation mode requires a primary and a secondary feedback signal:

- The more stable primary feedback signal is used by the PIDF controller to maintain closed-loop control.
- The less stable secondary feedback signal is used for command compensation in command programs provided by the **Function Generator** and other applications.



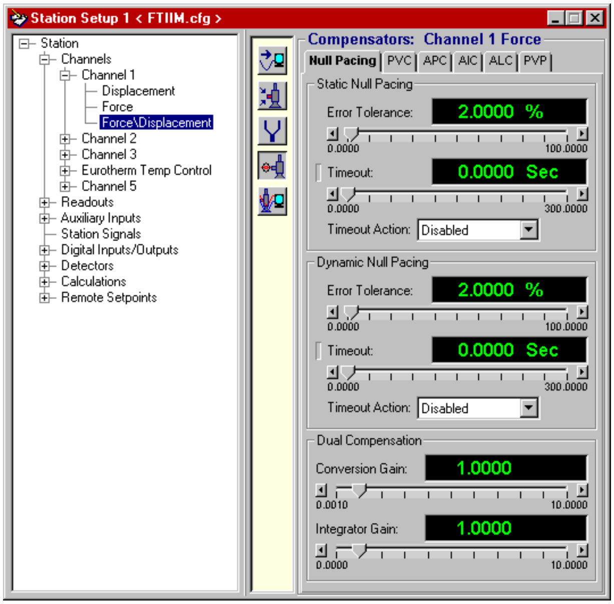
Dual compensation control modes compensate based on a secondary feedback signal and maintain closed-loop control with a primary feedback signal.

In this **Force/Displacement** dual compensation control mode, programming and compensation use the secondary force feedback signal. The PIDF controller maintains closed-loop control using the primary displacement feedback signal.

Tuning

Dual compensation controls

Dual Compensation controls display at the bottom of the **Station Setup** window's **Compensators** panel tabs when the a dual compensation mode is selected in the navigation pane.



The **Integrator Gain** control becomes available by selecting, in the Station Builder application, the **Edit Dual Compensation Modes** window's **Mean and Amplitude Control**. For more information, see "Creating Control Modes" on page 60.

About compensation gain settings

When reading this section, assume that the Station Builder application has defined a **Force/Displacement** dual compensation control mode and that:

- The force signal is the less stable secondary feedback signal, used for command compensation. Command programs produced by the **Function Generator** and other applications use this signal's dimension.
- The displacement signal is the more stable primary feedback signal, used by the PIDF controller to maintain closed-loop control.

Conversion Gain

Conversion Gain applies the gain that converts the force command to a displacement command for a PIDF or external controller.

The force signal provided by the compensator is multiplied by the following equation to create the displacement signal used to program the PIDF or external controller.

$$\text{Conversion Gain Value x}\left(\frac{\text{Full Scale Displacement}}{\text{Full Scale Force}}\right)$$

The **Conversion Gain** setting depends on the specimen stiffness. See “Calculating conversion gain.”

Integrator Gain

The **Integrator Gain** improves the static accuracy when the command is paused or stopped.

I Gain

For best performance, set **I Gain** as low as possible when using compensation methods that provide mean correction. These methods include peak/valley phase (PVP), peak/valley compensation (PVC), and arbitrary end-level compensation (ALC).

Calculating conversion gain

Use this method to calculate the proper **Conversion Gain** setting. Assume a **Force/Displacement** dual compensation control mode.

1. Using the **Station Manager** window’s **Function Generator**, excite the specimen in displacement control using a small amplitude sine wave.
2. Configure two **Peak/Valley** meters to measure force feedback and displacement feedback signals.
3. Calculate the specimen stiffness (K):

$$K = \frac{(\text{Force Peak} - \text{Force Valley})}{(\text{Displacement Peak} - \text{Displacement Valley})}$$

4. Calculate the **Conversion Gain** value:

$$\text{Conversion Gain} = \left(\frac{1}{K}\right) \times \left(\frac{\text{Full Scale Force}}{\text{Full Scale Displacement}}\right)$$

Note *For a more conservative estimate, use 80% of the calculated* ***Conversion Gain*** *value.*

When using asymmetrical ***Fullscale*** *values enter the difference between the values.*

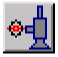
Tuning

How to Tune a Dual Compensation Control Mode

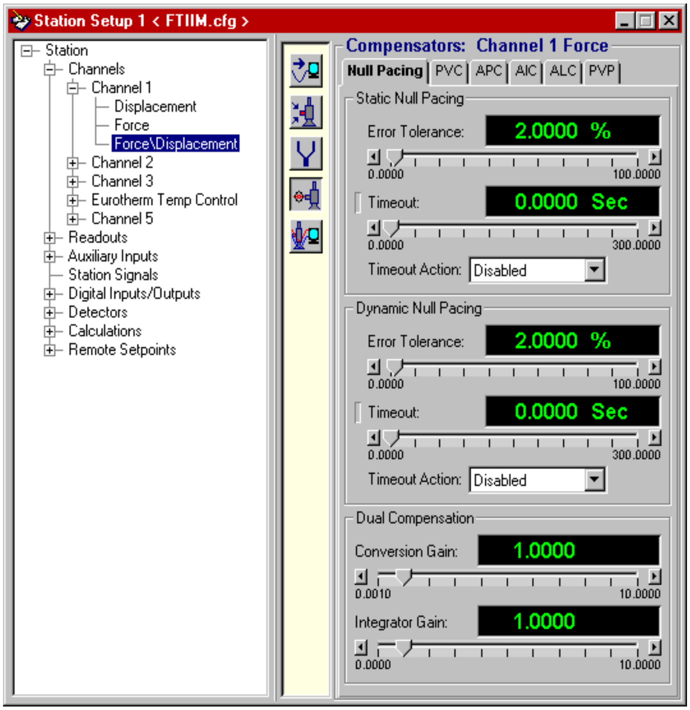
1. Tune the control mode that supplies the primary feedback signal.
2. In the **Station Manager** window's toolbar, select an access level of **Tuning**.
3. Display the **Compensation** tab for the dual compensation control mode being tuned.

   A. In the **Station Manager** window's **Display** menu, select **Station Setup**.

   B. In the **Station Setup** window's navigation pane, locate and select the dual compensation control mode being tuned.

   C. In the **Station Setup** window, click .

   D. In the **Compensators** panel, click the tab for the compensation method being used.



4. In the selected **Compensation** tab, set the **Conversion Gain** and **Integrator Gain**.

   A. Set **Conversion Gain** to either:

      – The calculated conversion gain value. (See "Calculating conversion gain" on page 596 for the calculation formula.)

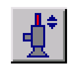
      – A value between **0.8** and **1.0**. (The stiffer the specimen, the smaller the value.)

   B. Set **Integrator Gain** to **0**.

5. Install a dummy specimen.

6. Set **Limits** to protect you, your equipment, and your specimen. See "About Limit Detectors" on page 226 for more information.

7. Set up a simple test program using the Station Manager application's **Function Generator**.

   A. In the **Station Manager** window, click .

   B. In the **Function Generator** panel, for **Control Mode**, select the dual compensation control mode to be tuned.

   C. For **Command Type**, select **Cyclic**.

   D. Create a command with an amplitude and frequency appropriate for the specimen.

   E. For **Wave Shape**, select **Sine**.

   F. Select a **Compensator** method.

8. Configure the **Scope** window to monitor command and secondary (force) feedback signals.

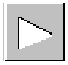
   A. In the **Station Manager** window's toolbar, click .

   B. Configure the **Scope** window to monitor the program command and force feedback for the dual compensation mode. See "About the Scope" on page 159 for more information.

WARNING

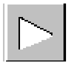
Pressing the Station Controls panel's Run button will put actuators in motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before pressing the  button.

9. Start the test program.

   A. Apply station hydraulic power.

   B. In the **Station Manager** window's **Station Controls** panel, click  to start the tuning program.

10. Adjust the **Conversion Gain** and **Integrator Gain**.

    In the **Station Setup** window's selected **Compensators** tab:

    A. For **Adaptation State**, select **Hold** and **Reset** or **Reset All**.

    B. Gradually increase the **Conversion Gain** until the scope shows that the secondary (force) feedback is approximately 80% of its commanded value.

       During normal operation, the compensator will increase the feedback amplitude until it matches the command amplitude.

    C. Increase the **Integrator Gain** if the scope shows that the primary and secondary signals are offset.

11. To save tuning values, in the **Station Manager** window's **File** menu, select **Save Parameters**.

About Tuning Filters

Some systems experience mechanical resonances that effectively limit the amount of controller gain you can use before the system becomes unstable.

A filter may be used in the forward path of the controller to reduce the system response at the resonance frequency. This makes it possible to increase the controller gain to improve command and feedback tracking while maintaining system stability.

The Station Manager application has two types of filters:

- Forward loop filters
- Stabilization filters

Forward loop filters are available for all control modes, and include:

- A **Low-Pass** filter that attenuates signals above a specified frequency.
- A **Band-Stop** filter that attenuates signals in a specified band around a specified frequency.

Stabilization filters are available for control modes equipped with stabilization resources (see "Stabilization" on page 101) and include:

- A **1 Hz High-pass** filter that attenuates signals below 1 Hz.
- A **Band-pass** filter that attenuates signals outside of a user-definable band.

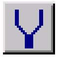
How to Enable a Tuning Filter

1. In the **Station Manager** window's toolbar, select an access level of **Tuning**.

2. Display the **Filter** tab for the control mode being tuned.

   A. In the **Station Manager** window's **Display** menu, select **Station Setup**.

   B. In the **Station Setup** window's navigation pane, locate and select the control mode being filtered.

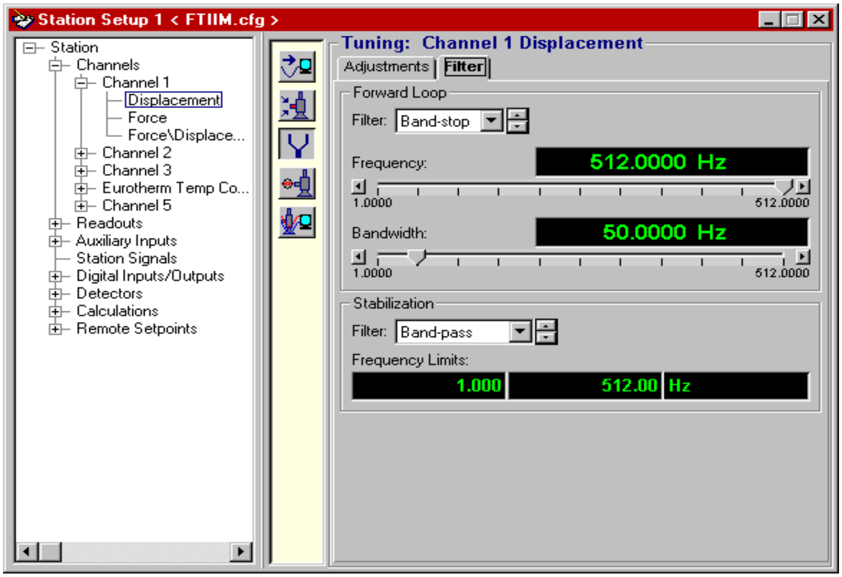
   C. In the **Station Setup** window, click .

   D. In the **Tuning** panel, click the **Filter** tab.

3. To select a **Forward Loop** filter, select and set up the desired filter type of **None**, **Low-Pass**, or **Band-Stop**.

   – For **Low-Pass** filters, set the **Frequency**.

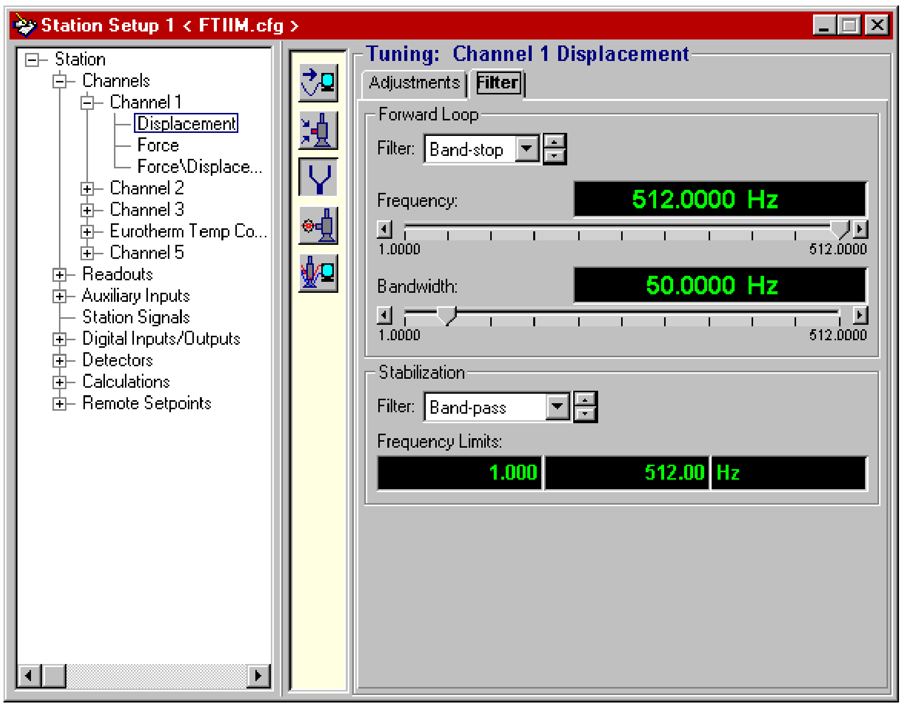
   – For **Band-Stop** filters, set the **Frequency** and **Bandwidth**.



4. To select a **Stabilization** filter, select and set up the desired filter type of **1 Hz High-pass** or **Band-pass**.

   – For **Band-pass** filters, set the frequency band with the **Frequency Limits** control.

Note *Some systems with a higher actuator frequency may benefit by selecting the following* ***Frequency Limits****: a low cut-off frequency that is approximately the actuator frequency and a high cut-off frequency approximately 5-10 times the actuator frequency.*



5. To save filter values, in the **Station Manager** window's **File** menu, select **Save Parameters**.

Chapter 4

Basic TestWare

Learning about Basic TestWare

Performing common tasks

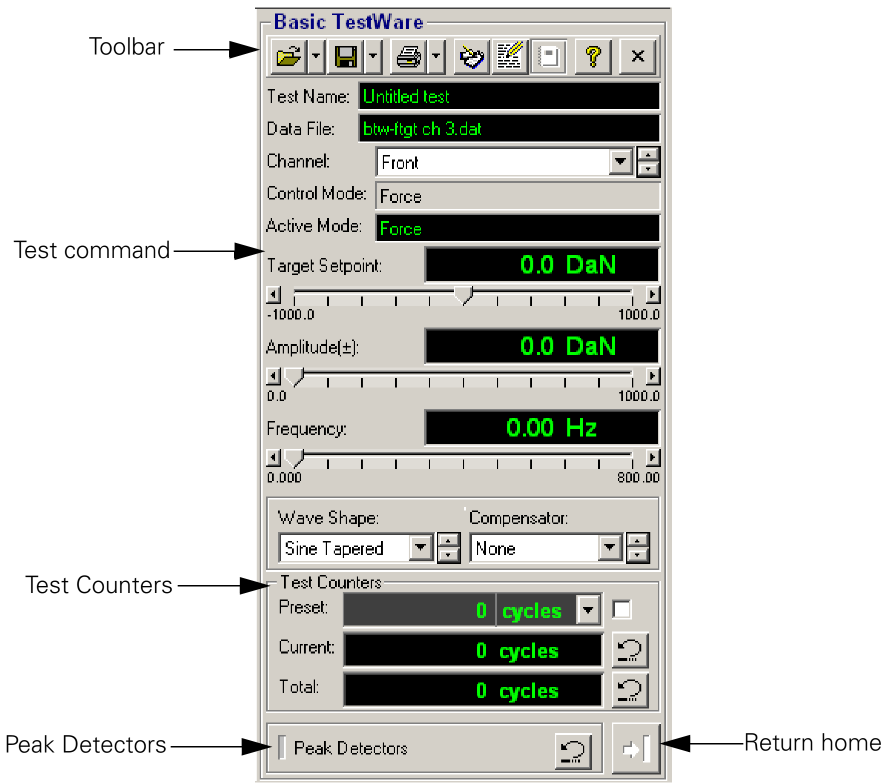
Window and control descriptions

Application Overview

The Basic TestWare application allows you to create simple test programs that do not require complex signal management or mode switches for station configuration files. This application is included with Series 793 System Software.

To create more sophisticated test programs use the optional Model 793.10 MultiPurpose TestWare application.

Basic TestWare main window



With the **Basic TestWare** window controls, you can:

- Define a basic test command
- Configure data acquisition
- Configure peak detectors
- Configure home control
- Configure test counters.

After you configure your test, you can save it to a Basic TestWare *test file* (or *.tst file*). For more information, see "About Test Files" on page 606.

About Test Files

Basic TestWare

You can save each test configuration (including all detector and data acquisition settings) to a Basic TestWare *test file* (or *.tst file*).

Test File Information

A test file typically includes the following types of test configuration information:

- Test command (command type, test channel definition)
- Data acquisition definition (type, signals, buffer size/type)
- Data file definition (file name, data header, file format)

Default Location

The default location for saved Basic TestWare test files is:

- C:\ftiim\btw (for FlexTest IIm, CTM, and CTC controllers)
- C:\tsiis\btw (for TestStar IIs and AP controllers)
- C:\ftgt\btw (for FlexTest GT)
- C:\tsiim\btw (for TestStar IIm)

For more information on creating your test files, see “Getting Started with Basic TestWare” on page 607. For information on opening, saving, previewing, and printing test files, see “Working with Test Files” on page 628.

Getting Started with Basic TestWare

How to Start the Basic TestWare Application

In order to start the Basic TestWare application, you must first start the Station Manager application and open your station configuration file.

Once the configuration file is open, there are two ways to start the Basic TestWare application.

Method 1 On the Station Manager **Applications** menu, click **Basic TestWare**.

Method 2 Start the Basic TestWare application from the Station Desktop Organizer. See "How to Start an Application from the Station Desktop Organizer" on page 675

How to Create a Basic TestWare Test

Refer to the following sections to create your Basic TestWare test:

- "Defining the Test Command" on page 608
- "Configuring Data Acquisition" on page 611
- "Configuring Peak Detectors" on page 619
- "Configuring Return Home" on page 622
- "Configuring Test Counters" on page 624
- "Working with Test Files" on page 628

Defining the Test Command

About Test Commands

The Basic TestWare application can generate both cyclic and monotonic commands.

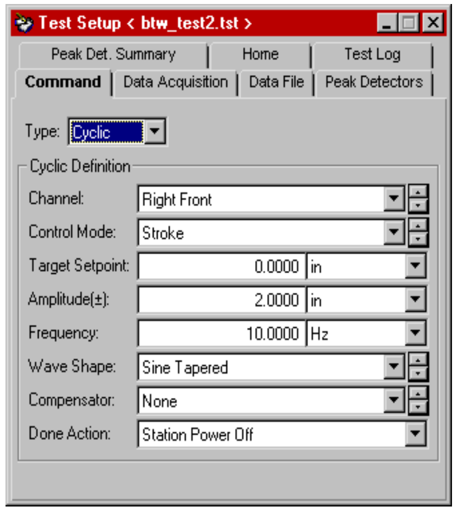
Cyclic commands include wave shapes such as sine, square, and ramp. Monotonic commands start at a level and end at a different level. Basically, a monotonic command is a ramp command from one level to another.

For information on how to define these commands, see:

- "How to Define a Cyclic Command" on page 609
- "How to Define a Monotonic Command" on page 610

How to Define a Cyclic Command

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.



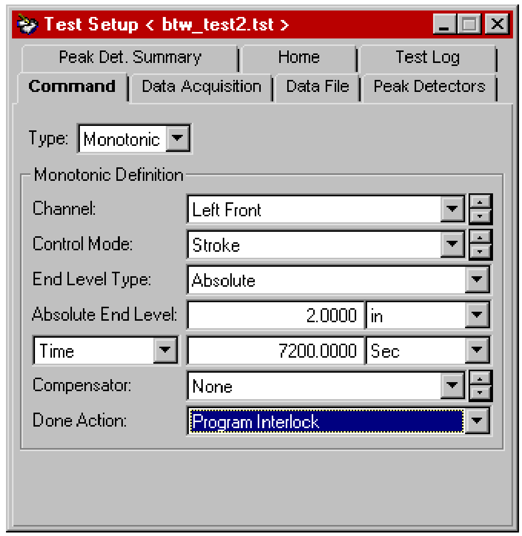
2. In the **Test Setup** window, click the **Command** tab.
3. In the **Type** list, click **Cyclic**.
4. In the **Channel** list, click the desired channel.
5. In the **Control Mode** list, click the desired control mode.
6. Set the remaining command attributes.
7. Repeat steps 4 through 6 for all other channels.

After the initial command definition is set you can change the setpoint, amplitude, and frequency controls on the main **Basic TestWare** panel while the test is running.

Note *The maximum frequency for a cyclic command is 20% of the system rate. See* *"About Update Rates" on page 42* *for more information about system rate.*

How to Define a Monotonic Command

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.



2. In the **Test Setup** window, click the **Command** tab.
3. In the **Type** list, click **Monotonic**.
4. Select the **End Level Type**.
5. In the **Channel** list, click the desired channel.
6. In the **Control Mode** list, click the desired control mode.
7. Set the remaining ramp attributes.
8. Repeat steps 5 through 7 for all other channels.

After the initial command definition is set you can change the end level and test time/rate controls on the **Basic TestWare** display while the test is running.

Configuring Data Acquisition

About Data Acquisition

With the Basic TestWare data acquisition controls, you can collect the following types of test data:

- **Timed** data acquisition—records the output of all selected signals at a specified time interval.
- **Peak/Valley** data acquisition—records the output of all selected signals when the software detects a peak or valley in the master signal that you specify.
- **Running Max/Min** data acquisition—records the highest peak and lowest valley for all selected signals during a test.
- **Level Crossing** data acquisition—records the output of all selected signals each time the defined master signal changes by a specified amount.

Data collected during your test is written to a buffer. When the buffer gets full, the data is saved to your specified data file. For more information on data files and buffers, see “More About Data Files and Buffers” on page 612.

For information on configuring data acquisition, see:

- “How to Configure Timed Data Acquisition” on page 614
- “How to Configure Peak/Valley Data Acquisition” on page 616
- “How to Configure Running Max/Min Data Acquisition” on page 617
- “How to Configure Level Crossing Data Acquisition” on page 618

Basic TestWare

More About Data Files and Buffers

When you set up data acquisition, you specify the signals for which data is acquired and the method of buffering data before it is recorded in a file.

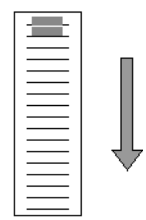
Buffers

Each type of buffer offers different operational characteristics:

- The buffer size specifies the maximum number of data elements that the buffer will store before data is written to disk. (A data element includes the data from each selected signal.) You can set the buffer size between 1 and 16,000 data elements (the default is 2048).
- Acquiring and saving data at fast rates can cause the computer to become sluggish (slow to respond to selections). If the acquisition rates are too fast, data over-run can occur. If this happens, a message will be displayed.

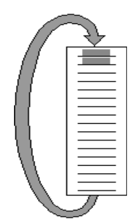
Linear buffer

A linear buffer records data until it is full, and then saves the data to disk. The size of the buffer determines how much data is acquired before it is written to disk. Data is continuously saved to disk until the test ends or is stopped. When the test ends, any data in the buffer is sent to disk. The only limit is the amount of space available on your hard drive.



Circular buffer

A circular buffer records data continuously. When the buffer is full, new data overwrites the oldest data. This type of buffering saves data to disk when the test is stopped, when the test reaches its preset count, or when the test ends. The circular buffer is useful for acquiring data just before some crucial event (such as specimen failure), while data is not required for the whole test.



Data File Header

The first line of a data file includes information like the decimal separator, column separator, time formats, and date formats. The format of this header line is as follows:

MTS793|progName|sLanguage|version|iDelim|sDecimal|sDate|sTime|iCountry|iDate|iTime|sCode

Where:

progName=	MPT or BTW
sLanguage=	Natural language (standard three-character abbreviation)
version=	Version of this format string
iDelim=	Data delimiter: 0 for space (plain), 1 for comma (Lotus), 2 for tab (Excel)
sDecimal=	International decimal separator
sDate=	International date separator
sTime=	International time separator
iCountry=	International country value
iDate=	International date format
iTime=	International time format
sCode=	Character Set Code: A for ANSI, O for OEM (currently always A)

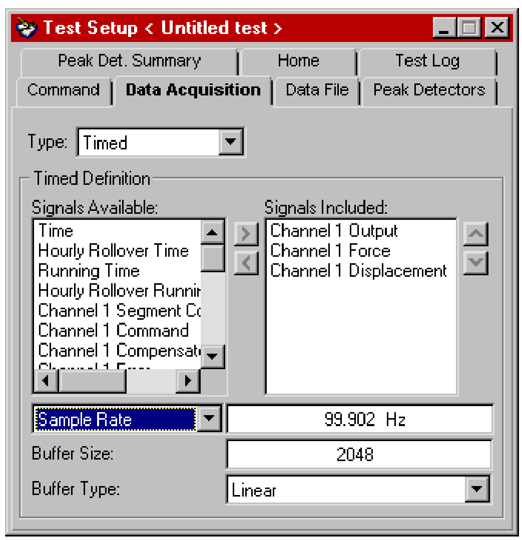
A typical header looks like this:

MTS793|BTW|ENU|1|0|.|/|:|1|0|0|0|A

Basic TestWare

How to Configure Timed Data Acquisition

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Data Acquisition** tab.
3. In the **Type** list, click **Timed**.
4. Double-click on each signal name that you want to collect data on. The selected signal name will move to the **Signals Included** list. You can also click on the signal name, and then click the **>** button.
5. Set the timed data acquisition interval and units using **Time Between Points** or enter a **Sample Rate** frequency.
6. Set **Buffer Size** parameters and select the **Buffer Type** used.

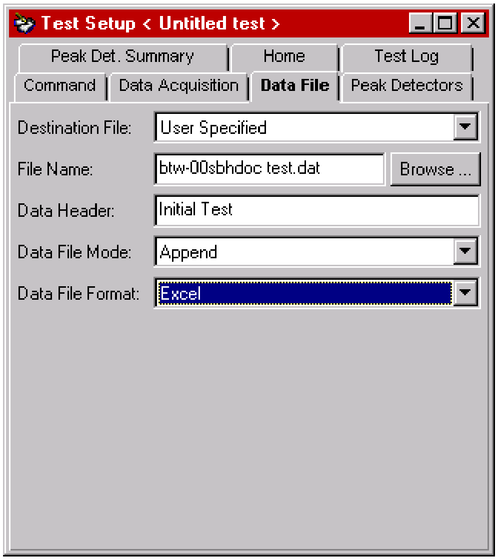


See “Timed data acquisition” on page 649 for more detailed information.

Data file options

To specify data file options for the acquired data:

1. Click the **Data File** tab.
2. Select the data **Destination File**. If you select **User Specified**, enter a name for the data file in the **File Name** box.
3. In the **Data Header** box, type a brief description of your test.
4. Select the **Data File Mode** and the **Data File Format**.



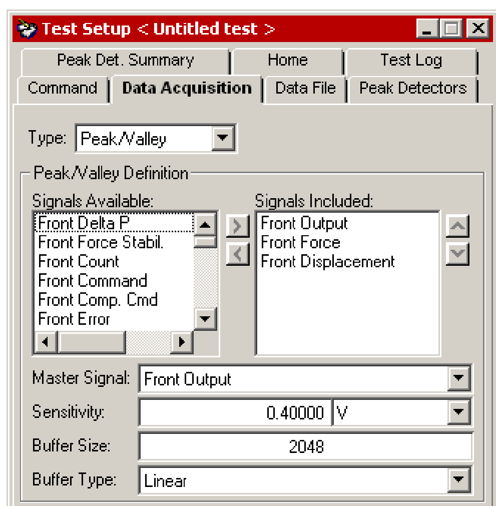
See "Data File tab" on page 656.

Basic TestWare

How to Configure Peak/Valley Data Acquisition

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Data Acquisition** tab.
3. In the **Type** list, click **Peak/Valley**.
4. Double-click on each signal name that you want to collect data on. The selected signal name will move to the **Signals Included** list. You can also click on the signal name, and then click the **>** button.
5. In the **Master Signal** list, click the signal name that will be monitored for peaks and valleys.
6. Set the **Sensitivity** and **Buffer Size** parameters.

   Sensitivity specifies how much the signal must increase or decrease before a peak or valley is recorded. Sensitivity settings should be used to prevent signal noise from being misinterpreted as peaks or valleys.
7. Select the **Buffer Type** used.

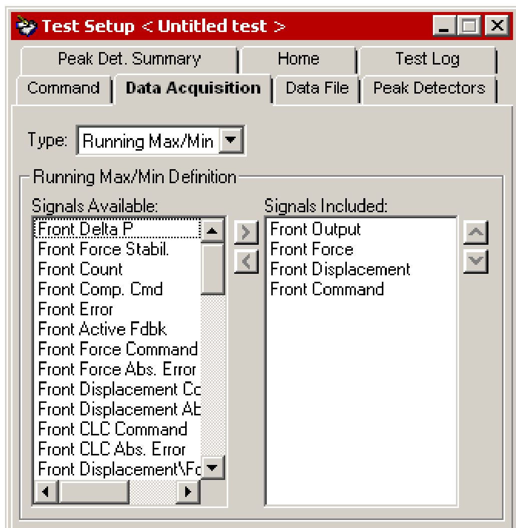


To specify data file options for the acquired data see "Data file options" on page 615.

For more information, see "Peak/Valley data acquisition" on page 651.

How to Configure Running Max/Min Data Acquisition

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Data Acquisition** tab.
3. In the **Type** list, click **Running Max/Min**.
4. Double-click on each signal name that you want to collect data on. The selected signal name will move to the **Signals Included** list. You can also click on the signal name, and then click the **>** button.

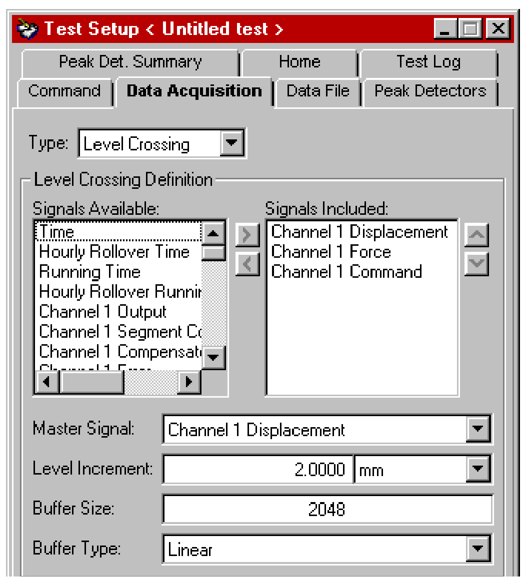


5. To specify data file options for the acquired data see “Data file options” on page 615.

See “Running Max/Min data acquisition” on page 653 for more detailed information.

How to Configure Level Crossing Data Acquisition

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Data Acquisition** tab.
3. In the **Type** list, click **Level Crossing**.
4. Double-click on each signal name that you want to collect data on. The selected signal name will move to the **Signals Included** list. You can also click on the signal name, and then click the **>** button.
5. Select the **Master Signal** that will be monitored for level crossing.
6. Set the **Level Increment** and **Buffer Size** parameters.
7. Select the **Buffer Type** used.



To specify data file options for the acquired data "Data file options" on page 615.

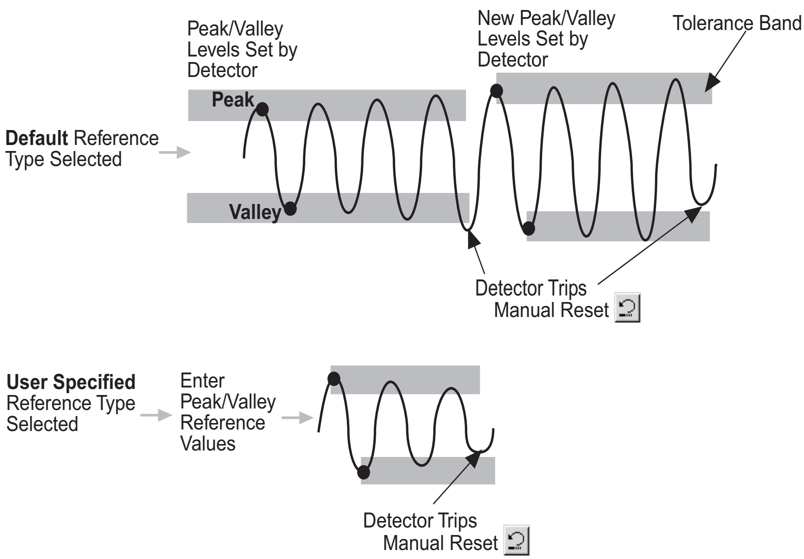
For more information on level crossing data acquisition, see "Level crossing data acquisition" on page 654.

Configuring Peak Detectors

About Peak Detectors

You can use peak detectors to ensure that your feedback signal reaches the programmed peaks and valleys within a specified tolerance range. If your feedback falls outside the tolerance range, the detector will trigger a specific detector action.

When you configure a peak detector, you must specify the reference values that the detector will use to establish the tolerance range. If you select the **Default** reference type, the detector will use the first peak and first valley as its initial reference values. Reference values will change during a test. If you select the **User-specified** reference type, the detector will use the reference values that you enter.



If a peak or valley occurs outside of the specified tolerance range, Basic TestWare will trigger the detector action. Only the first peak or valley outside tolerance will be reported. To clear the detector action, click the Peak Detectors reset button on the main **Basic TestWare** window.

For information on detector actions, see “About Detectors” on page 223.

Detector Indicator Colors

The **Basic TestWare** main window provides a **Peak Detectors** indicator to monitor the detector actions that you have set for a channel.

The indicator colors are as follows:

Grey indicates that all detectors are set to **Disabled**.

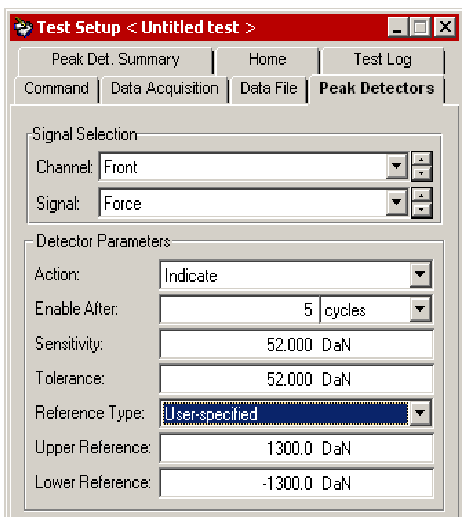
Green indicates that one or more detectors are enabled and defined.

White indicates that one or more detectors are set to **Indicate**.

Red indicates that a detector has been tripped.

How to Configure Peak Detectors

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Peak Detectors** tab. See “Peak Detectors tab” on page 659.



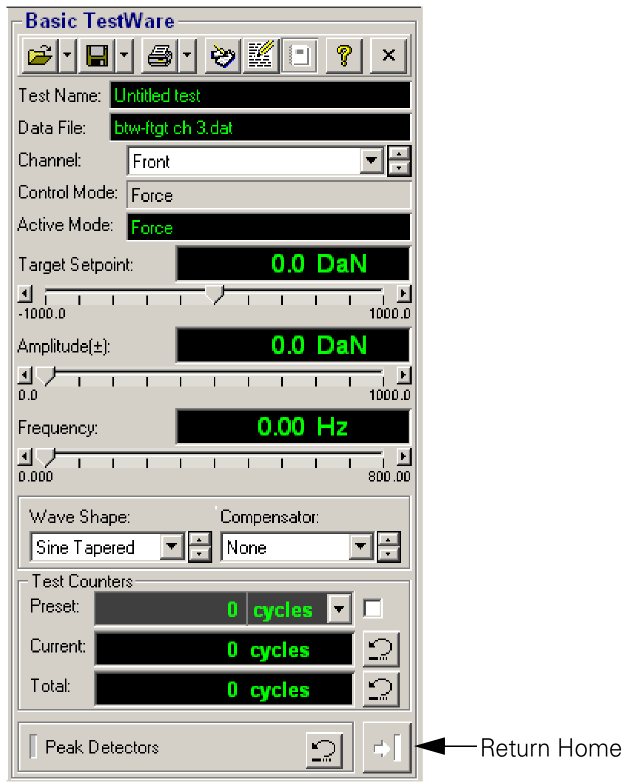
3. In the **Channel** and **Signal** lists, select the channel and signal that you want to monitor with a peak detector.
4. Under **Detector Parameters**, specify the detector settings. See “Peak Detectors tab” on page 659 for a description of detector parameters.

5. Set the **Reference Type**:
   - **Default** will use the first peak and valley as the reference for the tolerance range.
   - **User-specified** will use the values you enter as the reference for the tolerance range.
6. Set the **Upper Reference** and **Lower Reference** values.
7. Repeat steps 3 through 6 for additional detectors.

Configuring Return Home

About Return Home

You can configure the Return Home button (shown below) to make it easier to return your actuators to a default or starting position. When the hydraulics are active, clicking the Return Home button returns the actuator to the defined home position.

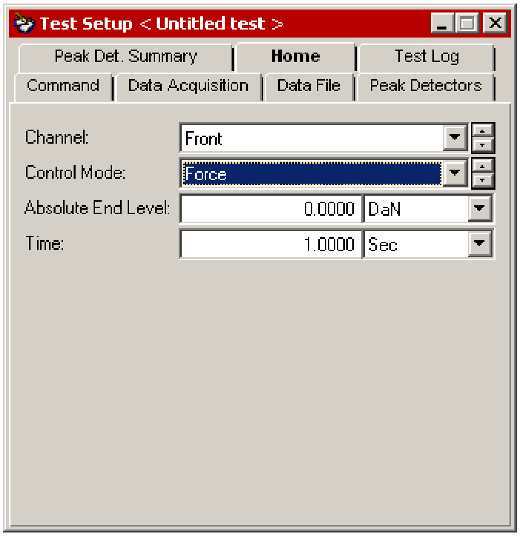


Note *The Return Home button is not available while a test is running. When you click Return Home, the* ***Run*** *indicator on the Basic TestWare display blinks.*

Note *If one or more of the channels is saturated when you click Return Home, a window appears that allows you to override the saturation detectors. Allowing the override causes the command to step to 110% of full scale and ramp to the defined end level in the defined time interval.*

How to Define the Home Position

1. On the **Basic TestWare** toolbar, click  to open the **Test Setup** window.
2. In the **Test Setup** window, click the **Home** tab. See "Home tab" on page 658.



3. In the **Channel** list, click the desired channel.
4. In the **Control Mode** list, click the desired control mode.
5. In the **Absolute End Level** box, type the desired end level.
6. In the **Time** box, type the desired home command ramp time.
7. Repeat steps 3 through 6 for other channels.

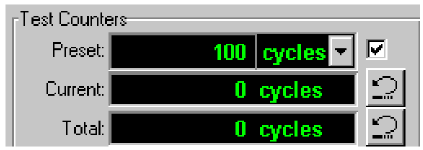
How to Use the Home Control

When hydraulics are active, click **Home** on the **Basic TestWare** main panel to ramp to the home position.

Configuring Test Counters

About Test Counters

You can use the **Test Counters** panel to run a test that requires a preset number of cycles or segments. The **Test Counters** panel can also be used to run your test for a limited cycle or segment count to help you evaluate your test settings before running a longer test.



The **Test Counters** panel on the **Basic TestWare** window displays the following controls:

Item	Description
Preset	Specifies the number of cycles (or segments) your test will run. There is a checkbox that enables or disables this counter. The checkbox is greyed out until a cyclic command type is specified. ***Note*** *The counter only works with cyclic commands. You cannot enter half cycles or an odd number of segments in the **Preset** counter box.*
Current	Displays the number of cycles (or segments) that passed since you clicked the Run button. When this counter reaches the **Preset** count, the test stops. ***Note*** ***Current** cycle count is not automatically reset when you click the Run button on the **Station Controls** panel. Click the **Current** reset button  to reset the current count.*
Total	Displays a second counter that can be used to monitor the total number of cycles or segments.

Logging counter events

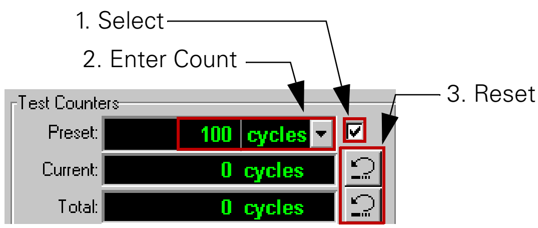
The following counter actions are written to the message log:

- Resetting the **Current** or **Total** counters.

In each case, the **Total** counters, **Current** counters, and **Preset** counter values are logged with a time and date stamp.

How to Configure a Test Counter

1. Select the **Enable** check box on the **Test Counters** panel.



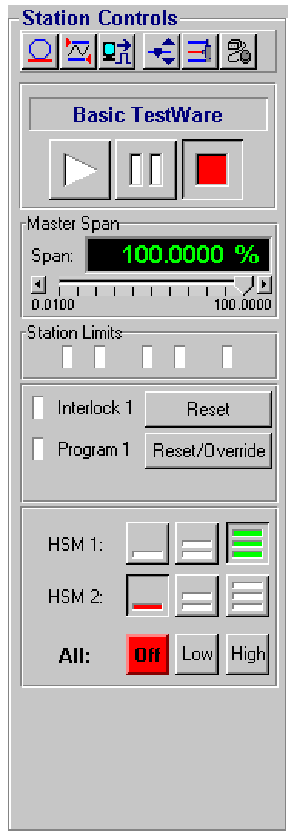
2. Type a preset count in the **Preset** box, and then set the units. (This is the number of cycles or segments that your test will run.)
3. Click the **Reset** buttons for both the **Current** and **Total** counters.

When the **Current** counter reaches the **Preset** count, the test stops. (At this point you can evaluate your test, perform any required maintenance, or change your test parameters.) If desired, you can reset the **Current** counter and run the test again. The **Total** counter can be used to maintain the ongoing count.

Running Your Test

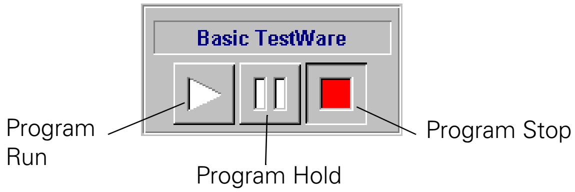
Use the controls in the Station Manager **Station Controls** panel to start, stop, and hold your test.

Note *Reset the interlocks and apply station power before starting your test.*



How to Start a Basic TestWare Test

Click the Program Run button on the **Station Controls** panel to start the command and counters, and begin acquiring data.



Note *If a tapered wave shape is selected for "Cyclic" command generation, the segment generator will soft start the segment generator as specified in* ***Begin/End Times*** *(Taper Times) on the* ***Command Options*** *tab on the* ***Channel Options*** *window (Station Manager). See* *"Command Options Tab" on page 423.*

How to Hold a Basic TestWare Test

Click the Program Hold button on the Station Controls panel to pause the test command generator and stop data acquisition.

How to Stop a Basic TestWare Test

Click the Program Stop on the **Station Controls** panel to stop the test command generator, stop data acquisition, and stop the segment counters.

Note *If a tapered wave shape is selected for "Cyclic" command generation, the segment generator will soft stop the segment generator as specified in* ***Begin/End Times*** *(Taper Times) on the* ***Command Options*** *tab on the* ***Channel Options*** *window (Station Manager). See* *"Command Options Tab" on page 423.*

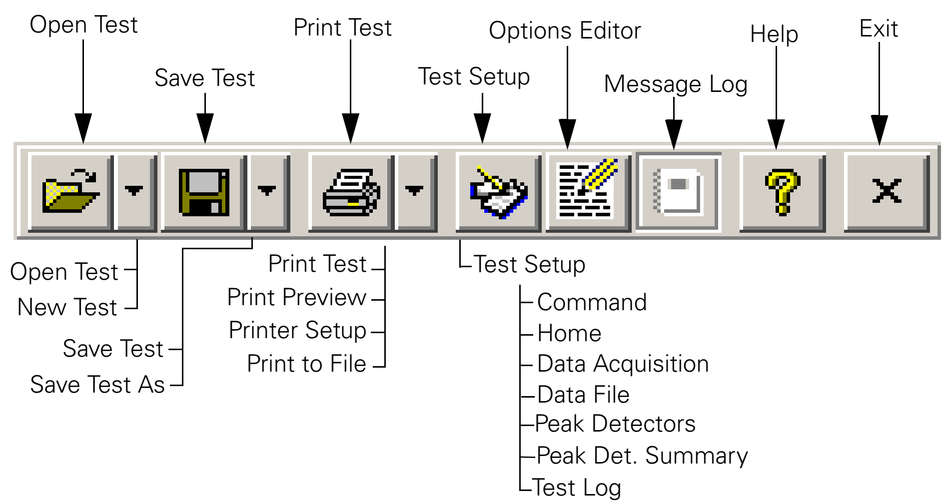
Working with Test Files

Use Basic TestWare *test files* (or *.tst file*) to save each test configuration. A test file typically includes the following types of test configuration information:

- Test command (command type, test channel definition)
- Data acquisition definition (type, signals, buffer size/type)
- Data file definition (file name, data header, file format)

Basic TestWare Toolbar

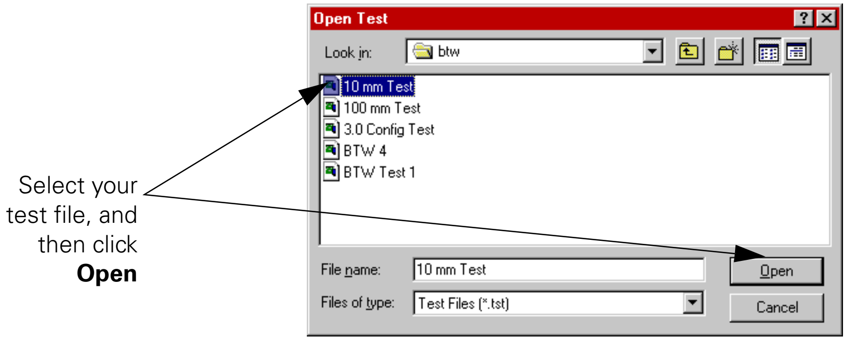
Use the buttons on the **Basic Testware** toolbar to work with test files and message logs.



How to Open a Test File

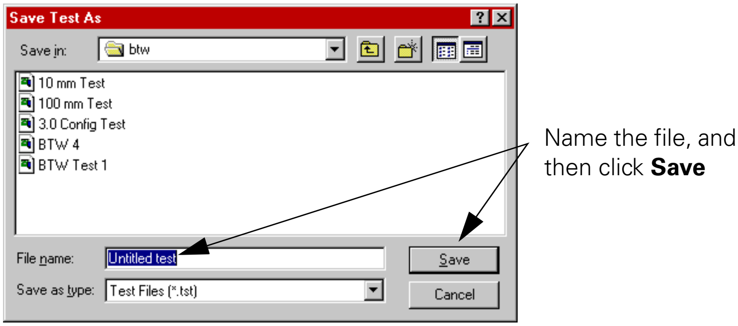
1. On the **Open Test** button, click **Open Test** to display the **Open Test** window.

2. Select the test file you want, and then click **Open** to open the file.



How to Save a Test File

On the **Save Test** button, click **Save** to save your test file. To save the file with a different name, click **Save As**.



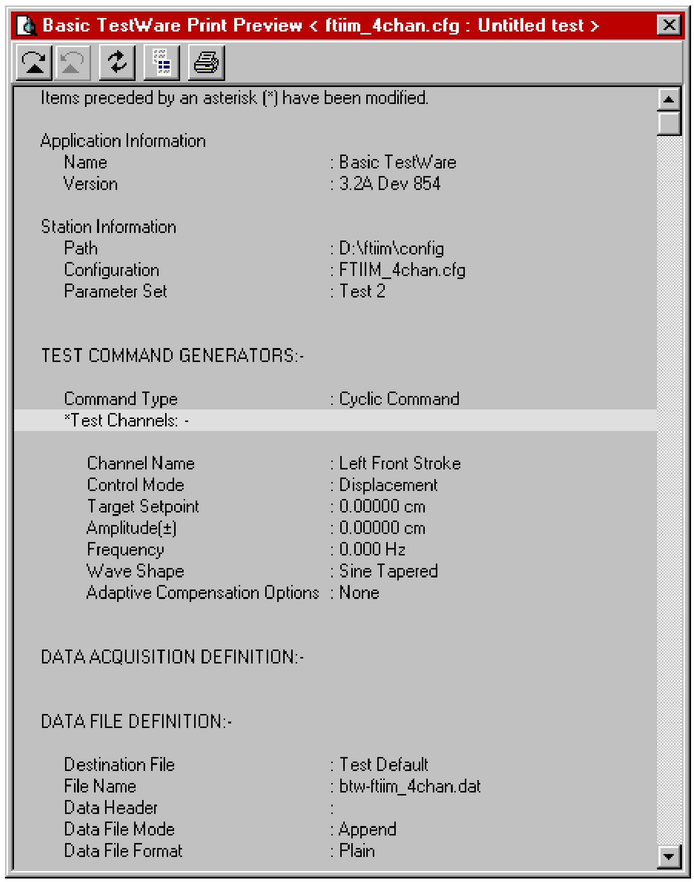
Note *Basic TestWare automatically appends ".tst" to the file name you enter. If you do not want to include the .tst extension, type a period (.) at the end of your file name.*

Basic TestWare

How to Preview a Test

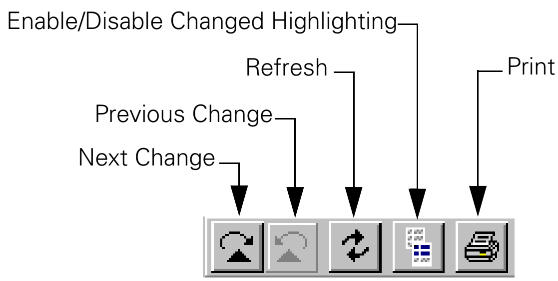
On the **Print Test** button, click **Print Preview** for an on-screen view of the current test configuration. A toolbar facilitates access and display of test changes.

Note ***Print Preview*** *allows you to preview the test configuration currently in memory, but this configuration may not have been saved to a test file.*



Items preceded by an asterisk (*) have been modified since the configuration file was open or after the last save. In addition, you can choose to highlight these changes by clicking the **Enable Change Highlighting** button on the **Print Preview** toolbar.

Print Preview Toolbar



Print Preview Toolbar

ITEM	DESCRIPTION
Next Change	Goes to the next change on the Print Preview window.
Previous Change	Goes to the previous change on the Print Preview window.
Refresh	Allows you to see current test configuration changes without closing and reopening the Print Preview window. The current change(s) are highlighted.
Enable/Disable Changed Highlighting	Allows you to enable or disable highlighting of test configuration changes.
Print	Prints the current test configuration.

How to Print a Test

Click the **Print** icon on the **Basic TestWare Print Preview** window toolbar or click **Print Test** on the **Print Test** icon on the Basic TestWare toolbar, to print the current test configuration.

Click **Print to File** on the Basic TestWare toolbar **Print Test** button to save the current test configuration as a separate text file.

Using the Message Logs Window

About Message Logs

Message Logs record test events as they occur, including:

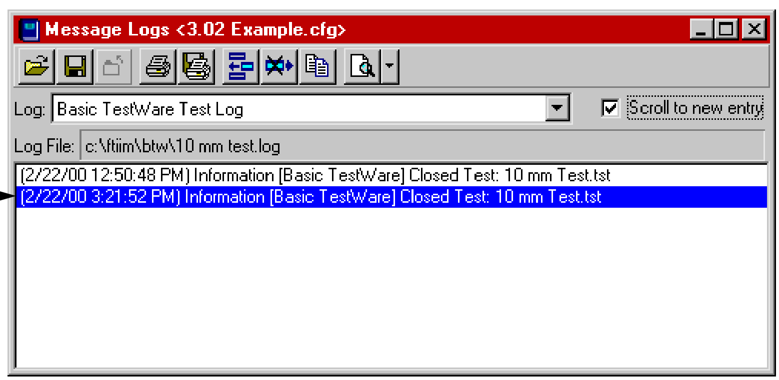
- File events
- Resource mismatches
- Hydraulic and station state changes
- Detector activity

When you save a new station test file, the Basic TestWare application automatically creates a **Message Log** file to record events that occur during the current test.

The Basic TestWare application saves the **Message Log** file in your Basic TestWare folder. The Basic TestWare application names the **Message Log** file, using the *station test name* with a *.log* extension.

Closing the Basic TestWare application closes the Basic TestWare **Message Log** file. When the test reopens and station activity resumes, new messages are appended to the old.

Auto-archive message



Auto-archiving

When the **Message Logs** window accumulates 1000 messages, it automatically saves these messages to an archive file and then clears them from the **Message Logs** window.

Message log file naming

The first archived file is named *test file name000.log*, the second is named *test file name001.log*, and so on. This continues until a file is named *test file name499.log*, and then it starts again with *test file name000.log*

Note *The maximum number of archive log files that can be saved for a particular test is 500.*

Once you reach 500 archive log files, additional log files overwrite the oldest log files in order (typically archiving restarts at *test file name*000.log).

When a log file is saved (either manually or automatically), a log entry is made noting the archive file. This entry includes a time/date stamp and information on where the file was saved. This entry becomes the first entry in the current log.

CAUTION

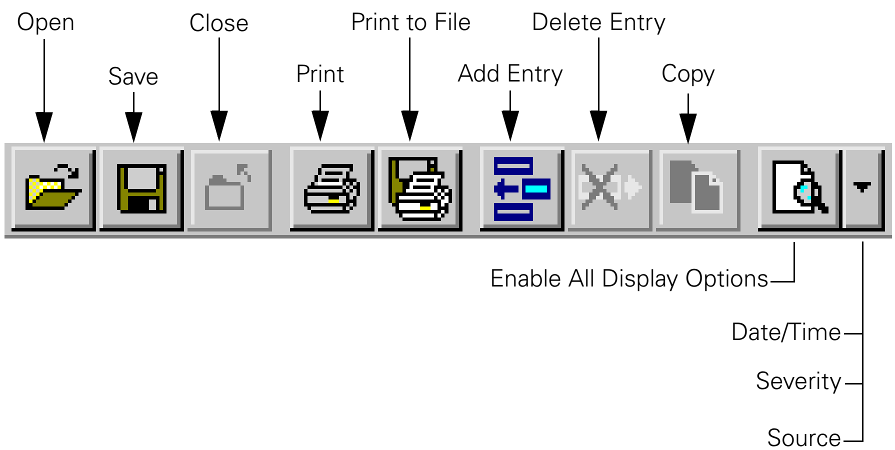
Too many messages combined with the auto-archive feature can use up all disk space.

Running out of disk space can stop your test and result in data loss.

If you think your test may generate an excessive number of message log entries, you should filter the messages written to the Basic TestWare message log with the **Test Log** tab in the **Test Setup** window. For information on filtering message log entries, see "Test Log tab" on page 662.

Working With Message Logs

The **Message Logs** window toolbar has graphic buttons to control its operations.

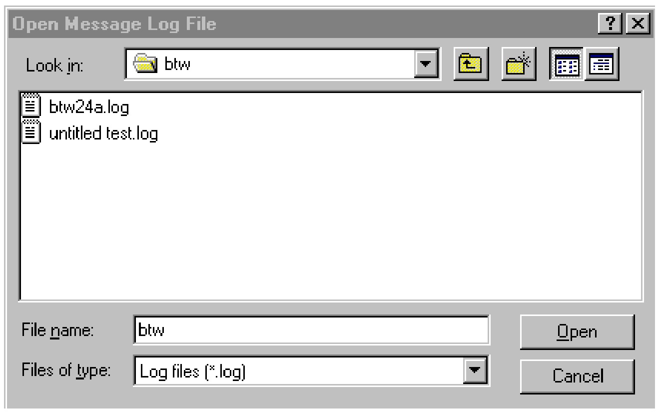


How to Open a Message Log

On the **Basic TestWare** Toolbar, click to display the **Message Logs** window.

Note *The **Message Logs** window is disabled if no test file is loaded or a newly created test file has not been saved.*

On the **Message Logs** window toolbar, click to open an archived message log. On the **Open Message Log File** window, select the required archived message log file, then click **Open**.



How to Print a Message Log

1. In the **Basic TestWare** Toolbar, click .

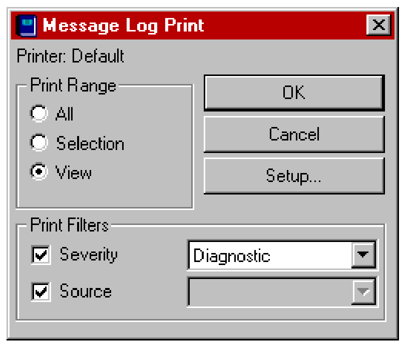
2. In the **Message Logs** window, click .

3. In the **Message Log Print** window box:

   A. As needed, click **Print Range** selections to define what is printed.

   B. As needed, click **Print Filters** to apply **Severity** and **Source** filters to what is printed.

   C. Click **OK** to print the log.



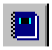
How to Print the Message Log to File

1. In the **Basic TestWare** Toolbar, click .

2. In the **Message Logs** Toolbar, click .

3. In the **Message Log Print to File** window, specify the **File Name** and its location. By default, the file is saved as a text (*.txt*) file.

How to Add a User Entry to the Message Log

1. In the **Basic TestWare** Toolbar, click .

2. In the **Message Logs** Toolbar, click .

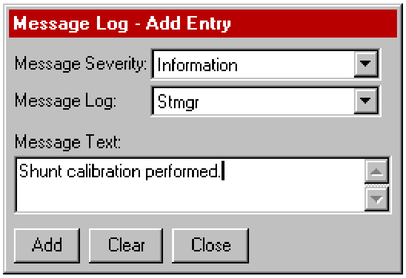
3. In the **Message Log-Add Entry** window:

   A. Select a **Message Severity** level.

   B. Select a **Message Log** source to specify an existing log file.

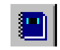
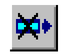
   C. Enter the required message in **Message Text**.

   D. Click **Add** to enter the message.



How to Delete a User Entry from the Message Log

Only user entries can be deleted.

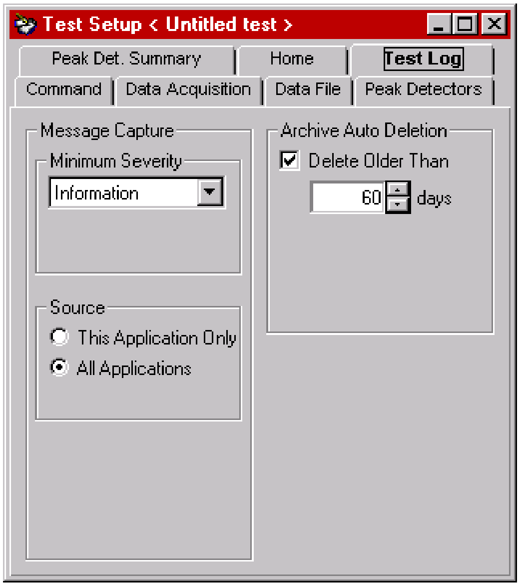
1. In the **Basic TestWare** Toolbar, click .
2. In the **Message Logs** window, highlight the user entry to be deleted.
3. In the **Message Logs** Toolbar, click .
4. In the **Delete Confirmation** window, click **OK** to delete the selected entry.

How to Define What Messages Are Logged

Use the following procedure to specify the types of messages that are logged into the Basic TestWare test log:

1. On the **Basic TestWare** toolbar, click **Test Setup**.

2. Click the **Test Log** tab on the **Test Setup** window.



3. Under **Minimum Severity**, select the least severe level of messages logged.

4. Under **Source**:

   - Select **This Application Only** to log only Basic TestWare messages.

   - Select **All Applications** to log both Basic TestWare and Station Manager messages.

5. If needed, under **Archive Auto Deletion**, click **Delete Older Than** to enable automatic deletion and then enter the number of **Days**.

How to Manually Archive All of the Messages in the Message Log

1. In the **Basic TestWare** Toolbar, click .

2. In the **Message Logs** Toolbar, click to archive the file.

3. In the **Archive Confirmation** window, click **Yes**.

   The **Message Logs** window displays a message showing when the file was archived and its name and location.

How to Manually Archive Part of the Messages in the Message Log

1. In the **Basic TestWare** Toolbar, click .

2. In the **Message Log** window, select a message you wish to archive, so that it is highlighted. In the next step, the highlighted message—and all messages that precede it—will be archived.

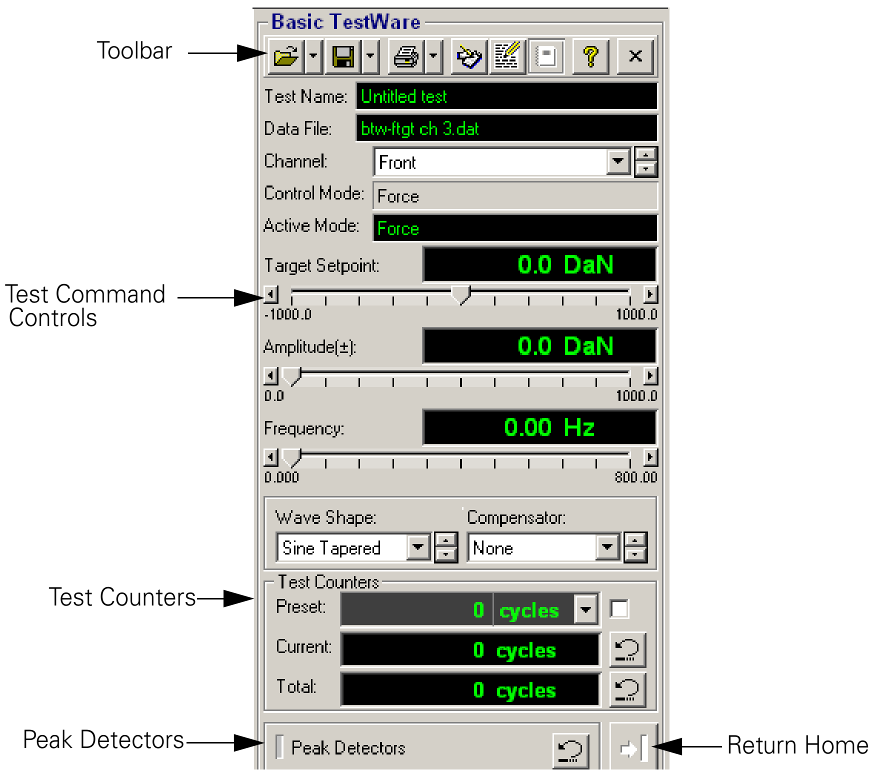
3. In the **Message Logs** Toolbar, click to archive the file.

4. In the **Archive Confirmation** window, click **Yes**.

   The **Message Logs** window displays a message showing when the file was archived and its name and location.

Basic TestWare Windows

When you start the Basic TestWare application within Station Manager, the Basic TestWare main display opens with an untitled test configuration.



Basic TestWare - Main Display (part 1 of 2)

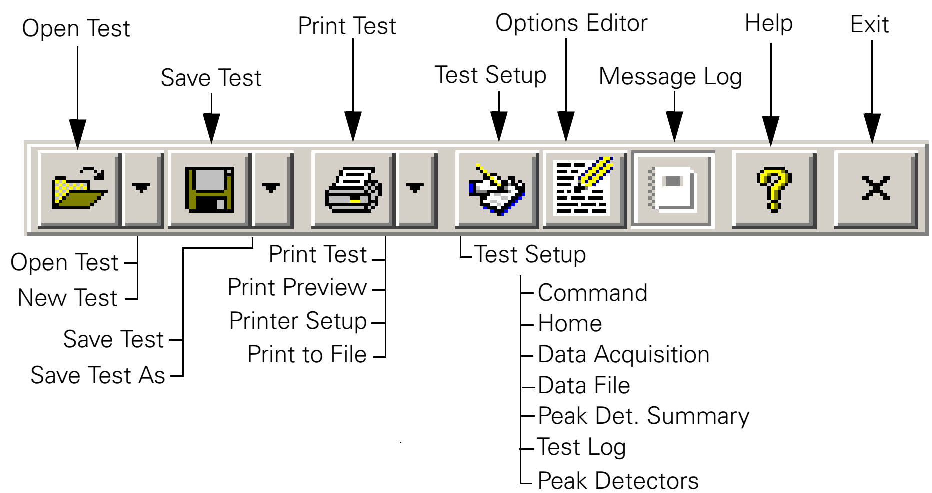
ITEM	DESCRIPTION
Toolbar	Provides quick access to frequently used commands and displays. See"Basic TestWare Toolbar" on page 644.
Test Name:	Displays the name of the currently opened test.
Data File:	Displays the name of the data file currently in use.
Test Command Controls	Provides controls to set up a test command. After the initial command is defined, you can adjust the slider controls on the display while the test is running as follows: • For cyclic commands you can adjust the target setpoint, amplitude, and frequency. • For monotonic commands you can adjust the end level and ramp time. See "Defining the Test Command" on page 608.
Wave Shape	Allows you to select the required wave shape for the test command.
Compensator	Allows you to activate a compensator for the test command. See "Working with Compensators" on page 194.
Test Counters	Establishes a preset count that can be repeated, while maintaining two counters that monitor the current count and the total count for the test. See "Configuring Test Counters" on page 624.

Basic TestWare - Main Display (part 2 of 2)

ITEM	DESCRIPTION
Peak Detectors	Provides an indicator to monitor the detector actions you have set for a channel. Indicator colors are as follows: **Grey** indicates that all detectors are set to **Disabled**. **Green** indicates that all detectors are set to **Station Power Off**, **Interlock**, **Program Interlock**, **Program Stop**, **Program Hold**, or **Custom Actions**. **White** indicates that one or more detectors are set to **Indicate.** **Red** indicates that a detector has been tripped. A peak detector reset button is provided to clear the detector action after the detector trips. See “Configuring Peak Detectors” on page 619.
Return Home button	Click the **Return Home** button to return your actuators to a default or starting position. This button is not available while a test is running. See “Configuring Return Home” on page 622.

Basic TestWare Toolbar

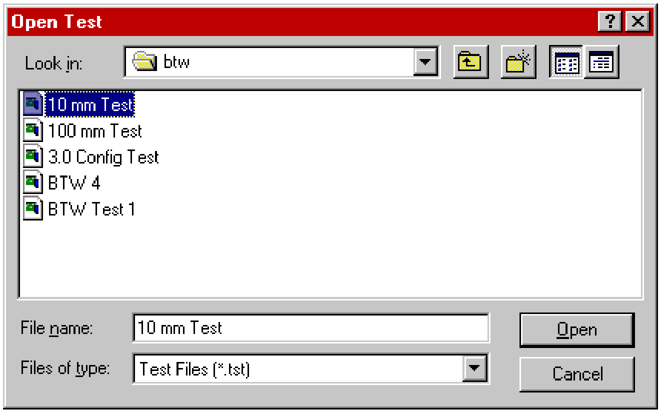
Clicking the **Basic Testware** toolbar buttons display the Basic TestWare windows and tabs described in the following pages.



Open Test Window

Path **Basic TestWare** toolbar > > **Open Test**.

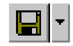
Use the **Open Test** window to open existing, previously saved Basic TestWare test files.



Open Test Window

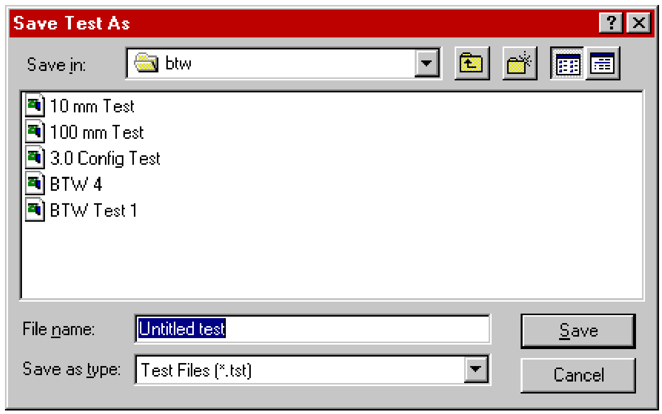
ITEM	DESCRIPTION
Look in	Lists the available drives and directories.
File name	Displays the file name of the selected file.
Files of type	Lists the types of files available. The extension for test files is (*.tst).

Save Test/Save Test As Window

Path **Basic TestWare** toolbar >  > **Save Test**.

Use the **Save Test** command to save your current test.

If you have not saved the test previously, the **Save Test As** window prompts you to specify a name and location.



Save Test As Window

Item	Description
Save in	Lists the available drives and directories.
File name	Sets the name of your test file.
Save as type	Lists the types of files available. The extension for test files is (*.tst).

Test Setup Window

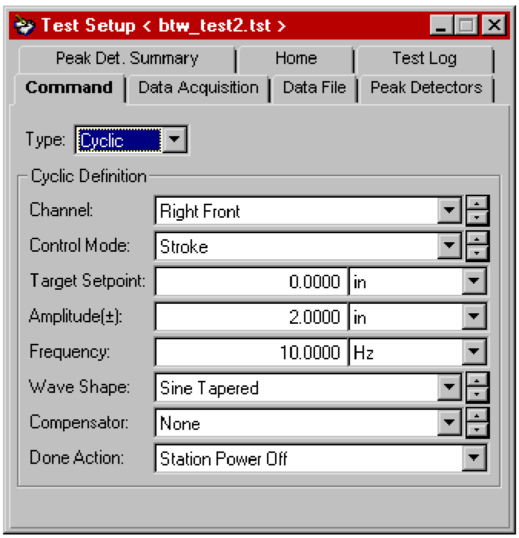
Path

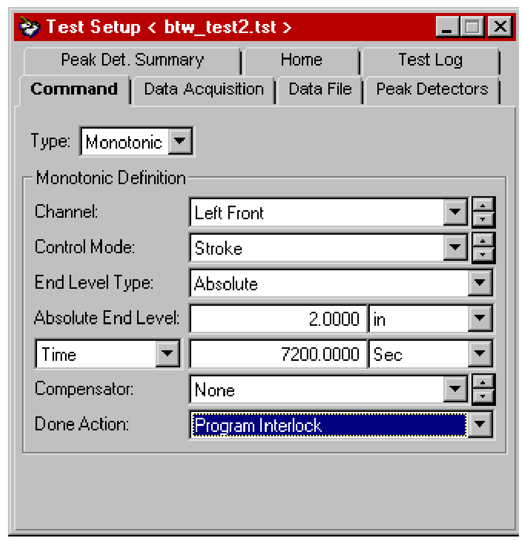
Basic TestWare toolbar > .

Use the **Test Setup** window's tabs to define Basic TestWare tests.

Command tab

Use the **Command** tab to define the program attributes for your test command. The controls in this window change depending on whether you select a cyclic or monotonic command.





Command Tab

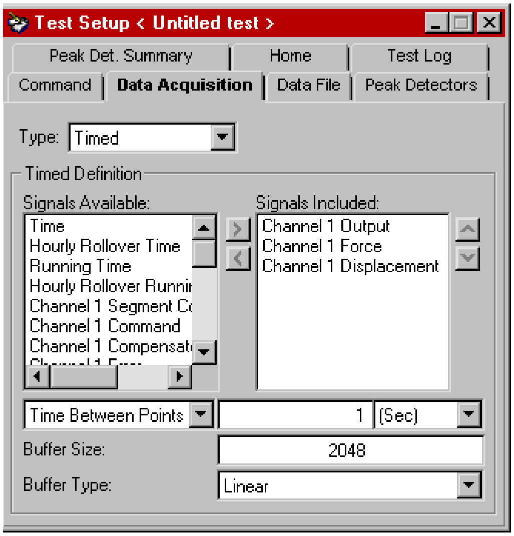
Item	Description
Type	Specifies the command type (**Monotonic** or **Cyclic**).
Channel	Allows you to select a control channel for the test command from a list of all station channels.
Control Mode	Specifies the control mode for the selected control channel.
Target Setpoint	*Cyclic commands only*—Sets the target mean level.
Amplitude	*Cyclic commands only*—Sets the command amplitude.
Frequency	*Cyclic commands only*—Sets the command frequency. ***Note*** *The maximum frequency is limited to 20% of the system rate.*
Wave Shape	*Cyclic commands only*—Sets the command wave shape.
End Level Type: **Absolute or Relative**	*Monotonic commands only*—Sets the end level of the command. Each channel can have a different end level. The end level value depends on the end level type selection (absolute or relative). Absolute values are relative to zero. Relative values are relative to the current output. The end level value can be changed while a test is running, but the end level type cannot.
Time/Rate	*Monotonic commands only*—Defines the ramp of the command. The command ramp can be defined in terms of time or as a ramp rate. The ramp starts at the current actuator position and ends at the specified end level. Each channel can have a different time/rate. The time/rate value can be changed while a test is running, but the end level type cannot.
Compensator	Specifies a compensator for your command signal. See"Working with Compensators" on page 194.
Done Action	Specifies a system action at the end of a test. ***Note*** *The specified action is completed only if a predefined test endpoint is reached, as defined by a preset cycle count, or the end levels for each monotonic channel have been reached.*

Data Acquisition tab

Use the **Data Acquisition** tab to configure how data is acquired during your test. The Basic TestWare application supports four types of data acquisition: timed, peak/valley, running max/min, and level crossing. For more information, see “About Data Acquisition” on page 611.

Timed data acquisition

Timed data acquisition records the values of selected signals at user-specified time intervals as **Time Between Points** or as a frequency (**Sample Rate**). For example, if you want to acquire data for the selected signals every second, set the **Time Between Points** value to 1 second.



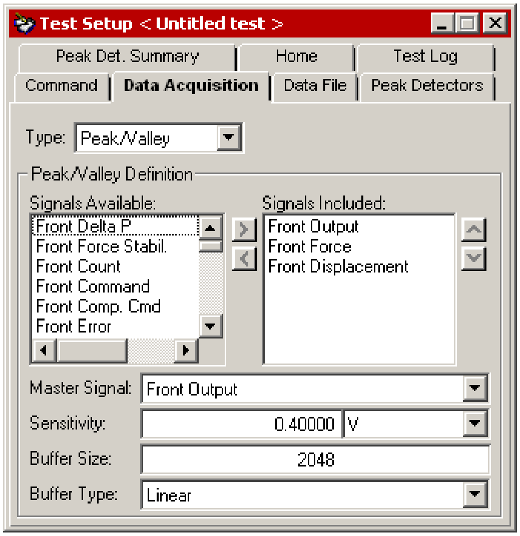
Timed Data Acquisition Tab

Item	Description
Type	**Timed** (selected for this description)
Signals Available/ Signals Included	The **Signals Available** list displays the names of signals that are accessed using the current station. Highlight each signal in the list that you want to acquire data from. Click the > button to move the signal to the **Signals Included** list. To remove signal names from the **Signals Included** list, highlight the name of each signal that you want to remove, and then click the < button. ***Note*** *The order of the signal names in the* ***Signals Included*** *list determines the order in which the signals are recorded in the data file.*
Time Between Points	Specifies the time interval between data acquisitions. ***Note*** *When you enter a time increment, the Basic TestWare application may change your entry slightly to reflect your controller's system clock rate.*
Sample Rate	Specifies the sample rate frequency for data acquisitions. ***Note*** *Basic TestWare may change the entered frequency slightly to reflect the resolution of your controller's system clock rate. For instance, if you type in "1000 Hz" and press the enter key, BTW may change the number to 1024 Hz.*
Buffer Size	Specifies the maximum number of data elements the buffer will store (1 to 16000).
Buffer Type	Specifies a buffer type: **Linear** or **Circular**. See "Buffers" on page 612.

Peak/Valley data acquisition

Peak/Valley data acquisition records the values of selected signals when Basic TestWare detects a peak or valley in the master signal you specify.

The sensitivity value specifies the amount the signal must change to be considered a peak or valley. Adjusting the sensitivity lets you ignore signal noise and still detect low amplitude signals. The output of a selected master signal is monitored until the master signal reverses by the amount defined by the **Sensitivity** parameter. The highest or lowest value is remembered (along with the signal data) until the change in the master signal amplitude exceeds the specified **Sensitivity** value. See "How to Configure Peak/Valley Data Acquisition" on page 616.

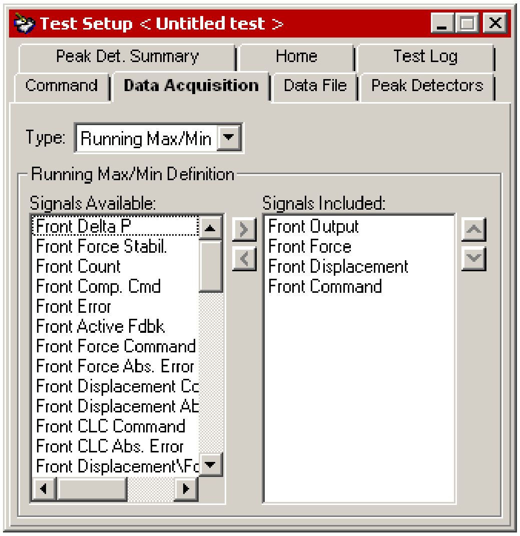


Peak/Valley Data Acquisition Tab

ITEM	DESCRIPTION
Type	**Peak/Valley**
Signals Available/ Signals Included	The **Signals Available** list displays the names of signals that are accessed using the current station. Highlight each signal in the list that you want to acquire data from. Click the > button to move the signal to the **Signals Included** list. To remove signal names from the **Signals Included** list, highlight the name of each signal that you want to remove, and then click the < button. ***Note*** *The order of the signal names in the **Signals Included** list determines the order in which the signals are recorded in the data file.*
Master Signal	Specifies the signal that is monitored for peak/valley changes.
Sensitivity	Defines how much the signal must change before a peak or valley is detected and data is acquired.
Buffer Size	Specifies the maximum number of data elements the buffer will store.
Buffer Type	Specifies a buffer type: **Linear** or **Circular**. See “Buffers” on page 612.

Running Max/Min data acquisition

When **Running Max/Min** data acquisition is active, Basic TestWare monitors the selected signals for maximum and minimum values achieved. When Basic TestWare is stopped, it writes these maximum/minimum values to the data file. See "How to Configure Running Max/Min Data Acquisition" on page 617.



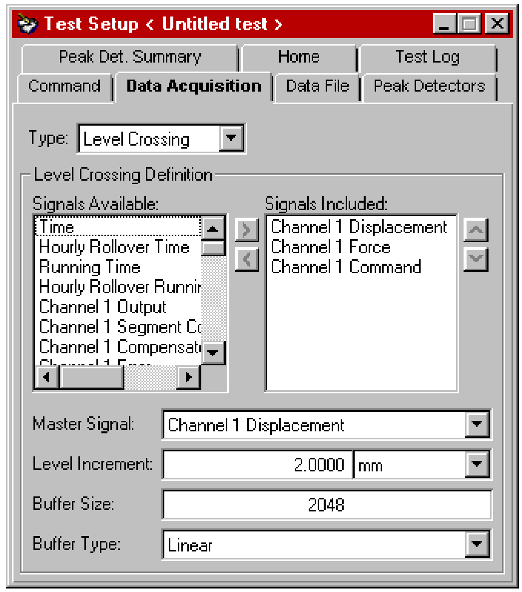
Running Max/Min Data Acquisition Tab

ITEM	DESCRIPTION
Type	**Running Max/Min**
Signals Available/ Signals Included	The **Signals Available** list displays the names of signals that are accessed using the current station. Highlight each signal in the list that you want to acquire data from. Click the > button to move the signal to the **Signals Included** list. To remove signal names from the **Signals Included** list, highlight the name of each signal that you want to remove, and then click the < button. ***Note*** *The order of the signal names in the* ***Signals Included*** *list determines the order in which the signals are recorded in the data file.*

Basic TestWare

Level crossing data acquisition

Level Crossing data acquisition records the selected signal values when the master signal changes by the level increment you specify. See“How to Configure Level Crossing Data Acquisition” on page 618.



For example, suppose you want to acquire data every time the displacement signal moves 2 millimeters:

1. First, you would make the desired displacement feedback signal the **Master Signal**.
2. Then you would set the **Level Increment** to two millimeters.
3. Select signals to be stored in the data file. The **Master Signal** need not be one of them.

Now, when the master signal reaches 2, 4, 6, etc. millimeters, signal values will be recorded for all of the selected signals.

Note *Do not set the level increment below the level of any signal noise.*

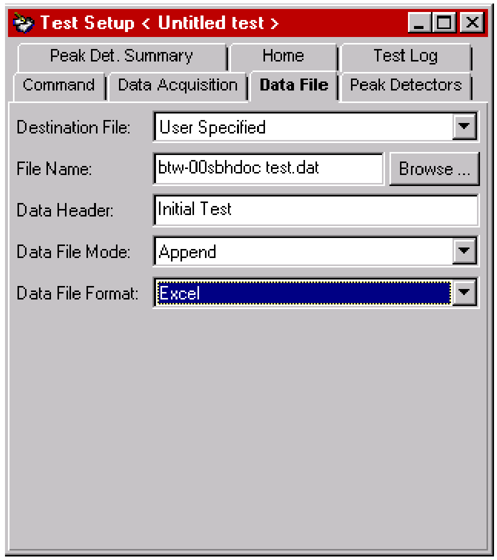
Level Crossing Data Acquisition Tab

Item	Description
Type	**Level Crossing**
Signals Available/ Signals Included	The **Signals Available** list displays the names of signals that are accessed using the current station. Highlight each signal in the list that you want to acquire data from. Click the > button to move the signal to the **Signals Included** list. To remove signal names from the **Signals Included** list, highlight the name of each signal that you want to remove, and then click the < button. ***Note*** *The order of the signal names in the* ***Signals Included*** *list determines the order in which the signals are recorded in the data file.*
Master Signal	Specifies the signal that is monitored for level changes.
Level Increment	Defines how much the signal must change before acquiring data.
Buffer Size	Specifies the maximum number of data elements the buffer will store.
Buffer Type	Specifies a buffer type: **Linear** or **Circular**. See “Buffers” on page 612.

Basic TestWare

Data File tab

Use the **Data File** tab to specify where to save the data that is acquired during your test.



Data File Tab (part 1 of 2)

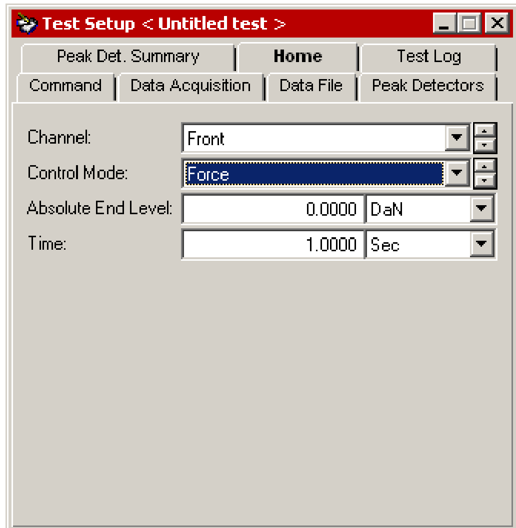
ITEM	DESCRIPTION
Destination File	Specifies whether data is saved to the default data file or a user-specified data file. The default data file name is “btw-default.dat” and it is saved in the default directory (see “Options Editor Window” on page 663).
File Name	Enter the **File Name** of the test file for which you are acquiring data. The default file is the currently selected file. Click the **Browse** button for a list of available test files. You can also create a new data file by entering a new file name.
Data Header	This header is written at the top of every buffer. You should provide a brief description of your test in the data header.

Data File Tab (part 2 of 2)

ITEM	DESCRIPTION
Data File Mode	Specifies if new data is appended to or overwrites the old data.
Data File Format	Specifies the format of the data file: **Plain**, **Excel**, or **Lotus**. **Plain** results in space-delimited test data. This is most useful for direct printouts. **Lotus** results in comma-delimited test data, with text strings in double quotes (sometimes referred to as the CSV format). Use this format when importing data files into Lotus 1-2-3. **Excel** results in tab-delimited test data. Use this format when importing data files into Microsoft Excel.

Home tab

Use the **Home** tab to define a home position and transition time for your station actuator(s). For more information on the Home control, see "About Return Home" on page 622.

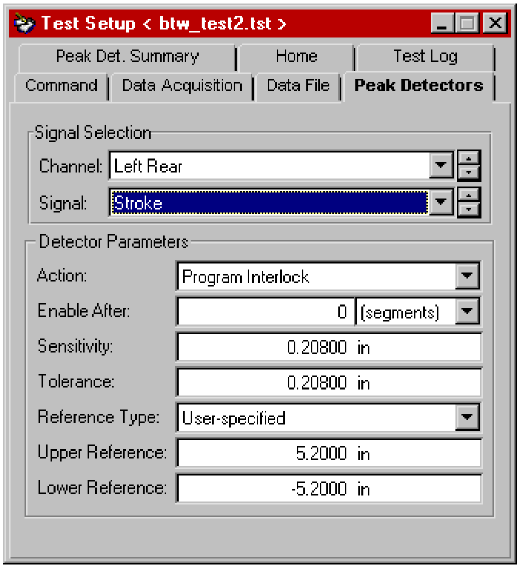


Home Tab

ITEM	DESCRIPTION
Channel	Specifies the actuator drive channel that the Home command is programmed to control.
Control Mode	Specifies the control mode for the channel.
Absolute End Level	Specifies the value and units of the channel.
Time	Specifies the amount of time it takes the actuator to move from the current position to the specified **Absolute End Level** for the channel.

Peak Detectors tab

Use the **Peak Detectors** tab to define peak detectors that can monitor an input signal for peak/valley changes. For information on peak detectors, see "About Peak Detectors" on page 619.



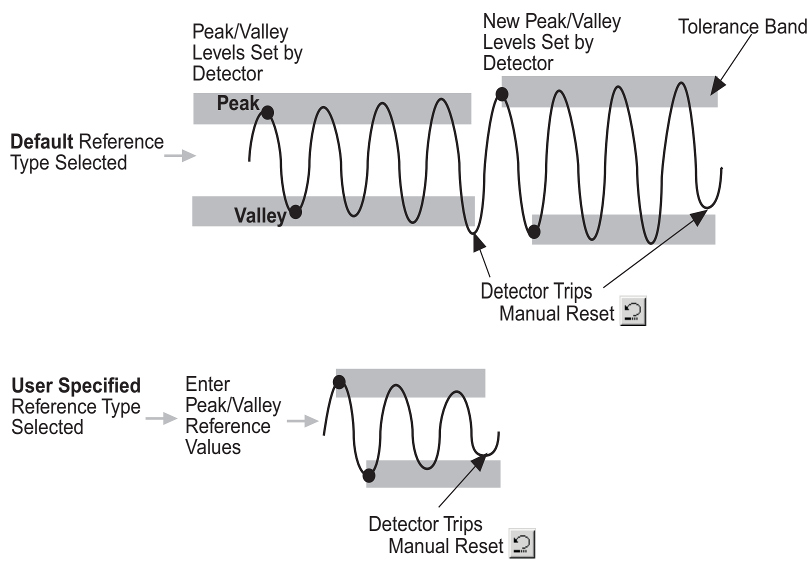
Peak Detectors Tab (part 1 of 2)

ITEM	DESCRIPTION
Signal Selection	
Channel	Specifies the channel that will be monitored by the peak detector.
Signal	Specifies the signal that will be monitored by the peak detector.
Detector Parameters	
Action	Specifies the action that occurs when the detector is tripped. For information on detector actions, see "About Detectors" on page 223.
Enable After	Specifies how many cycles will be executed before the detector begins to monitor the selected signals. This allows the signals to stabilize before they are monitored.
Sensitivity	Specifies how much the signal must increase or decrease before a peak or valley is determined. Sensitivity settings should be used to prevent signal noise from being misinterpreted as peaks or valleys.

Peak Detectors Tab (part 2 of 2)

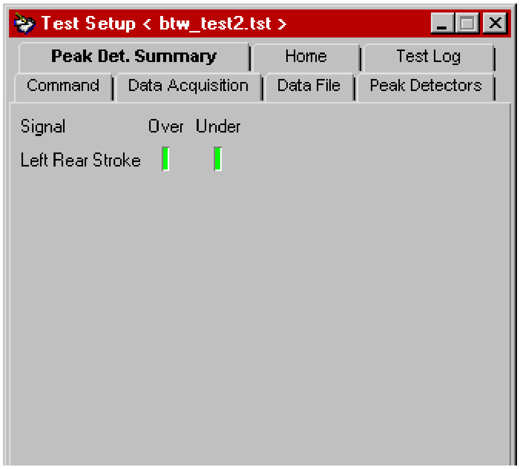
ITEM	DESCRIPTION
Tolerance	Specifies a tolerance band for the peaks and valleys. If a peak or valley occurs outside the tolerance band, the action (specified in the **Action** list) occurs. See the figure below.
Reference Type	Specifies how the upper and lower reference values are established. The selections are **Default** and **User-specified**. See the figure below **Default**—Basic TestWare uses the first peak and valley values as the reference. **User-specified**—The user specifies the upper and lower reference values which are kept unchanged until the test stops.
Upper Reference	Specifies the upper (peak) reference value (reference type must be user-specified).
Lower Reference	Specifies the lower (valley) reference value (reference type must be user-specified).

Examples

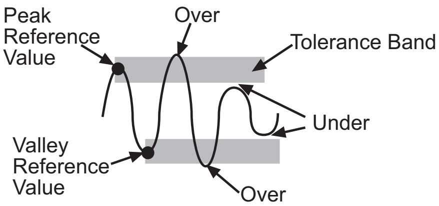


Peak Det. Summary tab

Use the **Peak Det. Summary** tab to determine the current status of each sensor signal.

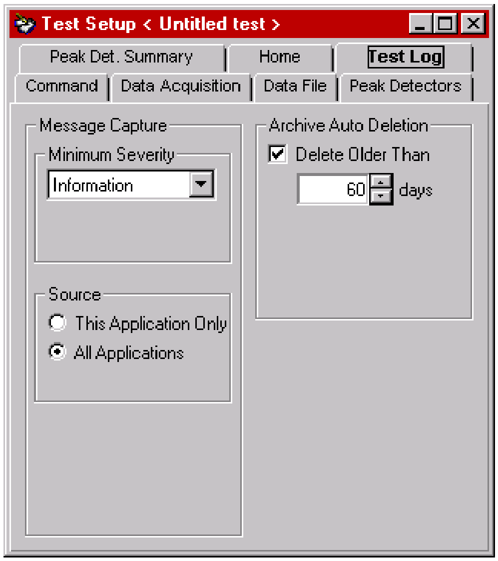


Peak Det. Summary Tab

ITEM	DESCRIPTION
Signal	Specifies the sensor feedback signal monitored by a limit detector.
Over	Indicates when a signal peak is above its "peak reference" tolerance band or a signal valley is below its "valley reference" tolerance band. 
Under	Indicates when a signal peak is below its "peak reference" tolerance band or a signal valley is above its "valley reference" tolerance band.

Test Log tab

Use the **Test Log** tab to select the level and source of the messages that are logged to the Basic TestWare test log. Automatic deletion of archived log files of a specified age can also be selected here.



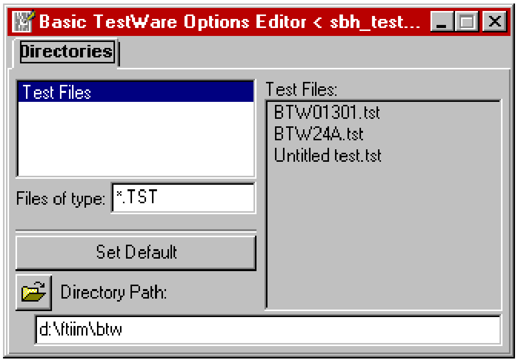
Test Log Tab

ITEM	DESCRIPTION
Message Capture	
Minimum Severity	Allows you to select the level of messages logged.
Source	Allows you to select the source of your logged messages. Select **This Application Only** to log only Basic TestWare messages. Select **All Applications** to log messages from both Basic TestWare and Station Manager.
Archive Auto Deletion	Allows you to automatically delete old archived log files. Click the **Delete Older Than** check box and select the age (days) of the archive log file required for automatic deletion.

Options Editor Window

Path — **Basic TestWare** toolbar > .

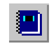
Directories tab — Use the **Options Editor** window's **Directories** tab to establish default directory paths for the test files. These selections are system-wide and are not saved with any configuration.



Directories Tab

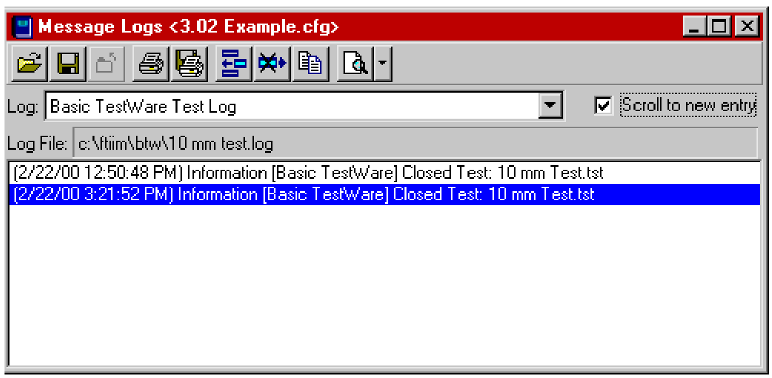
ITEM	DESCRIPTION
Set Default	Updates the directory path in the registry file to match the current directory path. ***Note*** *If you click **Set Default**, the registry is changed immediately. The changes will apply when Basic TestWare is opened again.*
Directory Path	Displays the directory path for the selected file type.
Test Files	Displays the files in the selected directory according to the extension shown.
Files of type	Displays the extension of the type of file selected.

Message Logs Window

Path **Basic TestWare** toolbar > .

The **Message Logs** window records station and test events as they occur. Events that can be logged include file events, resource mismatches, hydraulic status changes, station state changes, and detector activity.

For information on defining what level of messages are logged, see "How to Define What Messages Are Logged" on page 639.



Message Log (part 1 of 2)

Item	Description
Toolbar	Controls basic Message Logs window functions.
 **Open**	Displays the **Open Message Log File** window, used to open an archived message log.
 **Save**	Saves the current message log. You are given the option to clear the current message log or save it as is. See "How to Manually Archive All of the Messages in the Message Log" on page 640.
 **Close**	Closes any open archived message logs.
 **Print**	Prints the current message log. See "How to Print a Message Log" on page 636.

Message Log (part 2 of 2)

ITEM	DESCRIPTION
Print to File	Displays the **Message Log Print To File** window where you can save your log as a text (*.txt) file. See "How to Print the Message Log to File" on page 636.
Add Entry	Displays the **Message Log-Add Entry** window used to add your own messages to the message log. See "How to Add a User Entry to the Message Log" on page 637.
Delete Entry	Deletes selected messages that were added by the user.
Copy	Copies the selected entries to the clipboard.
Display Options	**Enable All Display Options**, **Date/Time**, **Severity**, and **Source** selections control the details displayed in the message log.
Log	Select to display the Station Manager, the Basic TestWare log, open archive logs.
Scroll to new entry	Check this box to automatically scroll to the newest Message Log entry.

Chapter 6

Station Desktop Organizer

Overview

The Station Desktop Organizer is a convenient utility that helps you manage and navigate the numerous software windows required to operate each station. It is especially useful for reducing screen clutter when you manage multiple stations at the same time.

With the Station Desktop Organizer controls you can:

- Show or hide all station windows with a single mouse click.
- Monitor critical information for multiple stations on a single taskbar.
- Start other MTS applications including MultiPurpose TestWare, Basic TestWare, Profile Editor, and Station Builder.

Starting the Station Desktop Organizer

How to Start the Station Desktop Organizer Manually

If the Station Desktop Organizer did not start automatically when you started the Station Manager application, you can start it manually from the **Start** menu or from **Applications** on the Station Manager File Menu.

To start the Station Desktop Organizer manually, follow either of these two paths:

From the Station Manager File menu:

File Menu > Applications > Station Desktop Organizer

From the **Start** menu:

Start > Programs > MTS FlexTest (or TestStar) > Applications > Station Desktop Organizer

When you start the Station Desktop Organizer, it automatically loads any open stations in the organizer taskbar. If no stations are currently open, a button labeled **Start Station Manager** appears on the organizer taskbar. Click this button to start the Station Manager application.

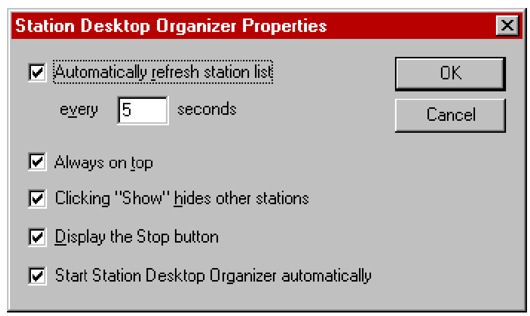
How to Start the Station Desktop Organizer Automatically

FlexTest IIm, FlexTest CTC, FlexTest CTM, and FlexTest GT systems are configured (by default) to start automatically when you start the Station Manager application.

For TestStar IIs, TestStar IIs AP, and TestStar IIm systems, you can configure the Station Desktop Organizer utility to start automatically when you start the Station Manager application as follows:

1. Right-click the taskbar handle, title bar, or open task bar area to access the Station Desktop Organizer.

2. Select **Properties** on the Station Desktop Organizer menu.



3. Click on the **Start Station Desktop Organizer automatically** checkbox to enable auto startup.

Positioning the Station Desktop Organizer

The first time you start the Station Desktop Organizer, it docks on the bottom of your Windows desktop.

The organizer taskbar can be docked on the upper, lower, right, or left edge of the desktop, or it can be placed in a *floating* position anywhere on your screen.

Docked Taskbar

Floating Taskbar

How to Move the Station Desktop Organizer Taskbar

Click the taskbar handle, the title bar, or on an open taskbar area, and then drag it to the desired location.

When you move the Station Desktop Organizer to a floating position, a title bar is added above the first station. When you move the taskbar towards the edge of the desktop, it docks on that edge.

Note *If you want to position the taskbar near the desktop edge without docking it, press and hold **Ctrl** while dragging the taskbar.*

To resize the floating taskbar horizontally, drag the right or left edge of the taskbar.

Setting Up the Station Desktop Organizer

You can perform commands and configure Station Desktop Organizer properties from the organizer menu.

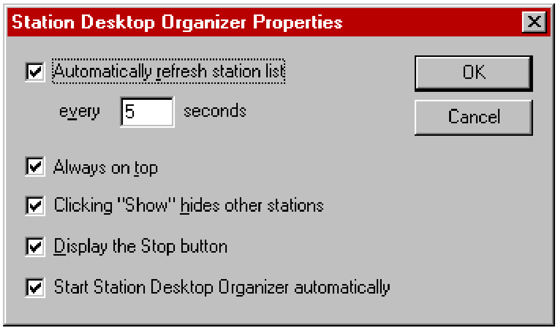
How to Access the Station Desktop Organizer Menu

Right-click the taskbar handle, title bar, or open taskbar area to access the Station Desktop Organizer menu.

Station Desktop Organizer Menu (part 1 of 2)

<table>
<tr><th>ITEM</th><th>DESCRIPTION</th></tr>
<tr><td>Refresh Station List</td><td>Loads any new stations into the Station Desktop Organizer.

Note In the Properties window, you can set the organizer to refresh the station list automatically. By default, the organizer will refresh every five seconds.</td></tr>
<tr><td>Properties</td><td>Opens the Properties window. Use this window to edit, enable, or disable the following taskbar properties:



• Automatically refresh station list every 5 seconds allows you to set the Station Desktop Organizer to refresh the station list automatically. By default, this property is enabled and set to refresh the station list every five seconds.

• Always on top is enabled by default to ensure that the Station Desktop Organizer taskbar is displayed on top of any other windows you have open.

• Clicking “Show” hides other stations is enabled by default to hide all station windows except the windows for the current station when you click .

• Display the Stop button is enabled by default to display on the Station Desktop Organizer.

• Start Station Desktop Organizer Automatically is enabled by default (FlexTest systems only) to automatically start Station Desktop Organizer when Station Manager is started.
For TestStar systems, you must enable this property if desired.</td></tr>
</table>

Station Desktop Organizer Menu (part 2 of 2)

ITEM	DESCRIPTION
About Station Desktop Organizer	Displays version and copyright information.
Exit Station Desktop Organizer	Quits the Desktop Organizer.

Using the Station Desktop Organizer

Use the buttons on the Station Desktop Organizer taskbar to hide and display your station windows, and to start other MTS applications.

How to Hide Station Windows

Click the **Hide** button to hide all of the station windows for that station.

When you click **Hide**, all windows for the current station are hidden and their related icons are removed from the Windows taskbar.

How to Display Hidden Station Windows

Click the **Show** button to display all of the station windows for that station.

When you click , all the windows for the current station are restored to their last locations and their related icons are returned to the Windows taskbar. If the window was minimized when the station was hidden, the window will restore to a minimized position when you click .

Note *If **Clicking "Show" hides other stations** is enabled on **Station Desktop Organizer Properties**, all station windows except windows for the current station will be hidden.*

If you only want to display a particular station window, click the station button, and then select the name of the window you want to display.

Note *An indicator next to each window name displays whether the window is currently hidden.*

How to Start an Application from the Station Desktop Organizer

If no stations are currently open, click **Start Station Manager** to start the Station Manager application. If a station is currently loaded in the organizer taskbar, click the station button, and point to **Start Application** to access a list of available applications.

How to Quit the Station Desktop Organizer

There are three ways to quit the Station Desktop Organizer:

- Click on the organizer taskbar, press Alt+F4, and then click **Yes** on the exit window.
- Right-click the taskbar handle, title bar, or open taskbar area to access the organizer menu, and then left-click **Exit Station Desktop Organizer**.
- Click the **Close** button.

  Note *The close button appears on floating taskbars only.*

How to Refresh the Station Desktop Organizer Display

Right-click the taskbar handle, title bar, or open taskbar area to access the organizer menu, and then left-click **Refresh Station List**.

Note *In the* ***Properties*** *window, you can set the organizer to refresh the station list automatically. By default, the organizer will refresh every five seconds*

Station Desktop Organizer Controls and Indicators

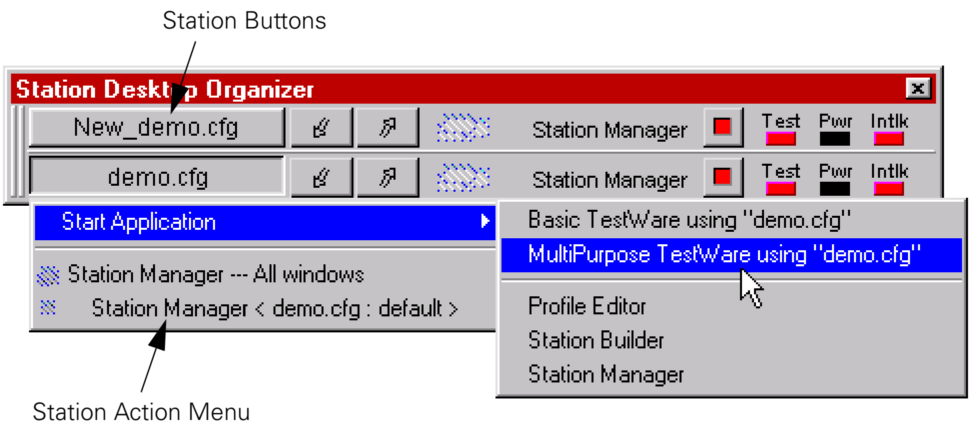
The Station Desktop Organizer is equipped with the following controls and indicators:

- Station Buttons and Action Menus
- Hide and Show Buttons
- Stop Button
- Status Indicators

To set your organizer taskbar preferences, see "Setting Up the Station Desktop Organizer" on page 672.

Station Buttons and Action Menus

The name of each open station appears on a station button. Click the button to access a station-specific action menu.

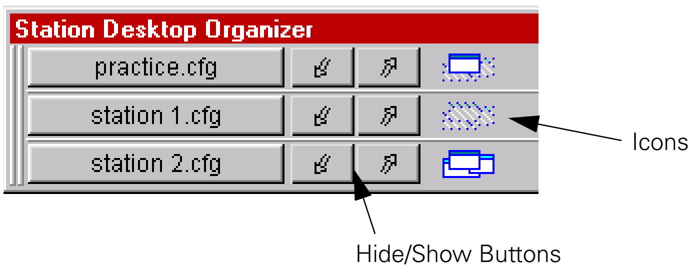


From the station action menu you can:

- Navigate through the windows that are open for each station.
- Start other MTS applications such as Station Manager, Station Builder, Profile Editor, MultiPurpose TestWare, and Basic TestWare. When applicable, the current configuration will be loaded into the application as required.

Hide and Show Buttons

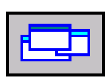
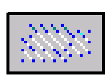
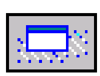
You can use the hide and show buttons to hide or show all station windows with a single click.



Desktop organizer icons

Icons (to the right of the hide/show buttons) indicate whether windows are currently hidden for that station. Refer to the following table for icon descriptions.

Display Icon Descriptions

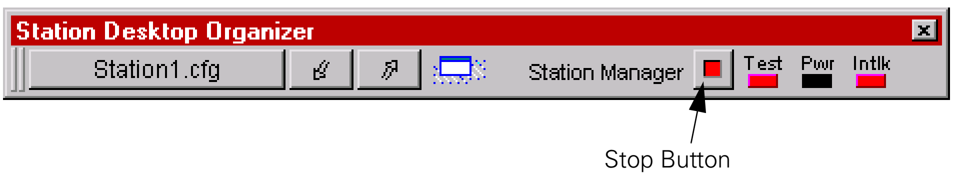
Icon	Description
	When the station windows are all visible, the display shows a solid outline of several windows.
	When the station windows are all hidden, the display appears dimmed.
	If a station has some windows displayed and some windows hidden, the display shows a combination of solid and dimmed images. This display results when: • You start another application for a station that is hidden. • A pop-up status window appears for a hidden station. • You use the station action menu to show particular windows for a hidden station.

Stop Button

The stop button can be used to stop any program currently running on the station.

Note *In the Station Desktop Organizer* ***Properties*** *window, you can specify whether or not the* ***Stop*** *button is displayed on the organizer taskbar.*

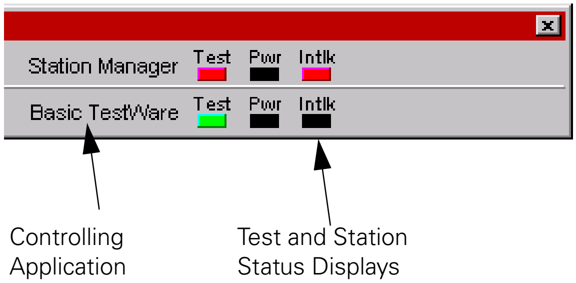
Clicking on the organizer taskbar has the same effect as clicking on the Station Manager **Station Controls** or the **Stop** button on the remote station controller (RSC).



Status Indicators

This portion of the Station Desktop Organizer taskbar indicates the following items:

- The application actively in control of the station
- The test state
- The station hydraulics status
- The station interlock status



Test indicator

The **Test** LED displays the current program status.

INDICATOR COLOR	STATUS
Red	Stopped
Yellow	Holding
Green	Running

Power indicator

The **Pwr** LED displays the highest power setting for any HSM or servomotor on the station. If the station is configured with an HPU only, the LED displays the greatest HPU power setting.

INDICATOR COLOR	HIGHEST POWER SETTING
Green	High
Yellow	Low
Black	Off

Note *If a station has no HSMs and you have not assigned an HPS to any channel, the **Pwr** LED will be disabled (gray).*

Interlock indicator

The **Intlk** LED indicates the interlock status for the station. This includes station interlocks and software interlocks.

INDICATOR COLOR	INTERLOCK STATUS
Red	Interlock is tripped (Open)
Black	No interlock (Closed)

Chapter 7

Remote Station Controller (RSC)

About the Remote Station Controller

The Remote Station Controller (RSC) is a portable device that can be used to:

- Reset interlocks.
- Activate and disable system hydraulics.
- Manually control your actuator.
- Start and stop tests.
- Monitor and zero sensor inputs.
- Shut down the station in an emergency.

Typically, the RSC is placed on a table or stand near your load frame or test table.

Defining the RSC (.HWI File)

In order to use an RSC with your station, it must be defined in your .hwi file. When you start the system loader utility, each RSC defined in the .hwi file is reset and made ready to communicate with your station.

FTIIm/CTC/CTM/GT/ TSIIm

The .hwi file entry for an RSC (shown below) defines which port the RSC should be connected to, which firmware file is used, and which interlock chain the RSC is on. Contact MTS for information on editing the .hwi file to accommodate RSCs for the following controllers: FlexTest IIm, FlexTest II CTM, FlexTest II CTC, FlexTest GT, and TestStar IIm.

GRES III connector

Interlock Chain

RSC

NAME="RSC 1" HOST PORT="GRES COM 1" FILENAME="POD.HEX" INTERLOCK="1"

RSC name

Identifies the RSC firmware

TSIIs/TSIIs AP

The .hwi file entry for an RSC defines which port the RSC should be connected to and which firmware file is used. For information on editing the .hwi file to accommodate RSCs with these controllers (as shown below), see the *TestStar IIs Controller Installation and Calibration Manual* that accompanied your test system.

Europa Board

RSC

NAME="RSC 1" HOST PORT="EUROPA COM 1" FILENAME="POD.HEX"

RSC name

Identifies the RSC firmware

Cabling the RSC to the Controller

TestStar IIs/AP

For TestStar IIs and TestStar IIs AP controllers, you can connect a single RSC to connector **J50**. The proper connectors must be defined in the .hwi file. For more cabling information, refer to the *TestStar IIs Controller Installation and Calibration Manual.*

TestStar IIm

For TestStar IIm controllers, you can connect one or more RSCs (up to four) to connector **J50A–J50D** on the 498 RS-485 transition module. The proper connectors must be defined in the .hwi file. For more cabling information, refer to the *Model 493.10/793.00 Controller Installation and Calibration* manual.

Note *This controller requires a Model 498.71B Global Resources III module.*

FlexTest Controllers

For the following FlexTest controllers, you can connect one or more RSCs (up to four) to connector **J50A–J50D** on the 498 RS-485 transition module: FlexTest IIm, FlexTest II CTM, FlexTest II CTC, and FlexTest GT. The proper connectors must be defined in the .hwi file. For more cabling information, refer to the appropriate controller setup manual.

Note *All of these controllers require a Model 498.71B Global Resources III module.*

Enabling a Remote Station Controller

You must enable your RSC when you open your station configuration file in Station Manager.

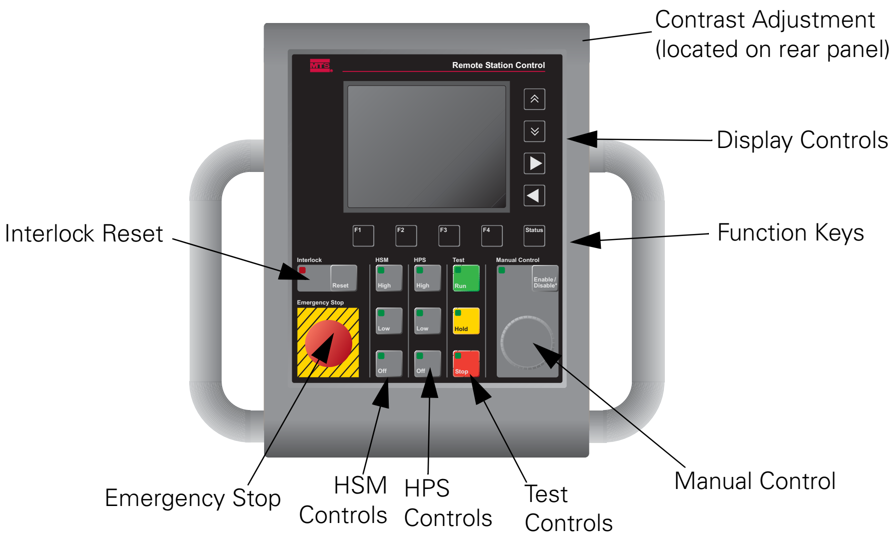
How To Enable an RSC

In the **Open Station** window, select **Enable Remote Station Control** to enable the RSC connected to the selected interlock chain.

If a Remote Station Controller is not available on the interlock chain, the **Enable Remote Station Control** checkbox is “greyed out.”

RSC Controls and Indicators

This section describes the various Remote Station Controller (RSC) controls and indicators. The RSC control panel is available in two configurations; one provides an E-Stop and HPS control, and the other provides a Station Stop with no HPS control. Your system may have one or both of these panel configurations.

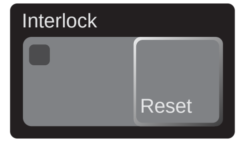


For descriptions of the RSC controls and indicators, see the following:

- "Interlock indicator and Reset button" on page 690
- "Emergency Stop" on page 691
- "HSM controls" on page 690
- "HPS controls" on page 691
- "Emergency Stop" on page 691
- "Station Stop" on page 691
- "Test controls" on page 691
- "Manual Control" on page 693
- "Display Controls" on page 694
- "Function keys" on page 696

Interlock indicator and Reset button

The **Interlock** indicator lights when an interlock has been triggered.



To reset the interlock and clear the indicator, press the **Reset** button.

To override the interlock, press and hold the **Reset** button. While holding the **Reset** button, you can apply hydraulic pressure and bring the actuator back into range with the **Manual Control** dial. The interlock will reset when you release the **Reset** button.

HSM controls

The HSM controls manage the pressure to the hydraulic service manifold. If there is more than one HSM, the controls affect the HSM currently selected on the RSC Station Manager page.

Changing channels on the RSC changes which HSM is selected.

- **Off**—turns off the HSM.
- **Low**—applies low pressure, typically 2 MPa (300 psi).
- **High**—applies high pressure, typically 21 MPa (3000 psi).

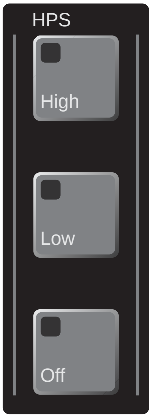
Note *The HPS must be on before the HSM can be turned on.*

Group mode

Selecting Group Mode on the RSC allows control of all HSMs in the group. Indicators show the current state of each HSM. Press an HSM control button to bring all HSMs in the group to the selected level.

HPS controls

The HPS controls manage the pressure from the hydraulic power unit. Turning the HPS off also turns off all HSMs.



- **Off**—turns off the HPS.
- **Low**—applies low hydraulic pressure, typically 2 MPa (300 psi).
- **High**—applies high hydraulic pressure, typically 21 MPa (3000 psi).

Emergency Stop

To immediately stop the test and disable station hydraulics, press the **Emergency Stop** button.

To restore normal operation:

1. Reset the **Emergency Stop** button by twisting the dial as indicated by the arrows on the dial.
2. Press the **Reset** button to clear the interlock indicator.
3. Activate hydraulic pressure.

Station Stop

To stop a test on a specific test station and turn off the test station HSM, press the **Station Stop** button.

To restore normal operation of the test station:

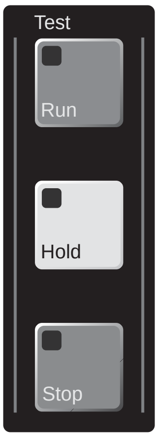
1. Reset the **Station Stop** button by pressing once.
2. Press the **Reset** button to clear the interlock indicator.
3. Use the HSM controls to turn on the test station HSM.

Test controls

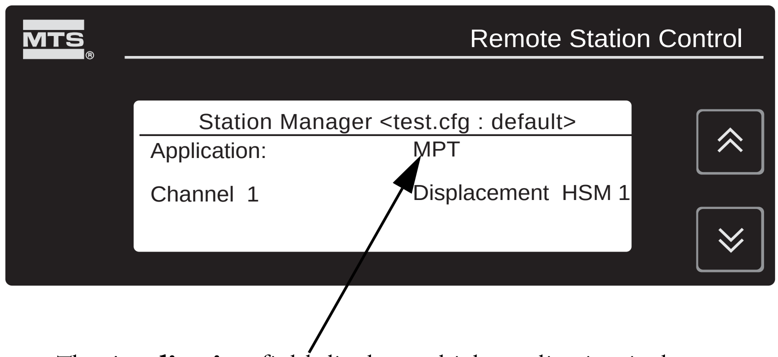
The **Test** buttons work similarly to the test buttons on the Station Controls Panel for the **Function Generator**, **External Command**, **Basic TestWare**, and **MultiPurpose TestWare** applications.

Depending on the application that currently has control of the system, the **Test** buttons have a different function.

- When you select a specimen in MultiPurpose TestWare, the controlling application shown on the RSC is automatically switched to MultiPurpose TestWare control. For example, if Basic TestWare is the controlling application shown on the RSC and then you select a specimen in MultiPurpose TestWare, the RSC is automatically switched to MultiPurpose TestWare control.



Remote Station Control buttons



- The **Application** field displays which application is the source of the test program.
- You can change the controlling application while it is stopped. Use the or button to highlight the application field and use the F4 key to scroll through the list box and select an application.
- Only one application can have control at a time.

Manual Control

Use the **Manual Control** dial to position the actuator. With hydraulic power on, adjusting the manual control causes the actuator to extend or retract.

You can use the **Manual Control** adjustment to:

- Install or remove a specimen
- Calibrate a sensor

The control mode for the **Manual Control** dial is selected in the **Station Manager** page of the Remote Station Control module.

1. Use the **F2** and **F3** buttons to select the channel or channel group you want to control.
2. Use the up and down buttons to select the **Manual Ctrl** field.
3. Press **F4** to select the available control modes (setpoint, span, manual command, or master span) until you find the one you want.

Note *Setpoint must be enabled on the* ***Station View Options*** *tab to be available as a control mode selection here. See* ***"RSC Setpoint control"*** *on page 694.*

4. Press **Enable** to activate the manual control mode and **Manual Control** dial. The **Manual Control** indicator should be lit.

Note *If you have selected* ***Command*** *(manual command) for* ***Manual Ctrl****, enabling* ***Manual Control*** *disables the function generator. Also, both Manual Command and Setpoint on the system controller PC are disabled.*

5. Use the **Manual Control** dial to position the actuator.

Velocity limiter

A 10 mm/sec velocity limit, required for CE compliance, can be enabled in the .hwi file. Removing the comment symbols (/* and */) from the VELOCITY LIMITER statement in the .hwi file enables the feature. See the .hwi file appendix in the appropriate Service manual.

When enabled, CE velocity limitation is performed on manual command or setpoint adjustments made from the RSC Manual Control dial only.

RSC Setpoint control

You can enable RSC control of setpoint by selecting the **Setpoint enabled on RSC** checkbox on the **Station View Options** tab in the Station Options window.

When **Setpoint enabled on RSC** is checked, you can select setpoint for Manual Control on the RSC Station Manager page. See "Station View Options Tab" on page 416 for more information.

Enabling Setpoint on the RSC does not disable Setpoint on the system controller PC. If having Setpoint active on both devices is a concern, disable RSC Setpoint control by unchecking **Setpoint enable on RSC**.

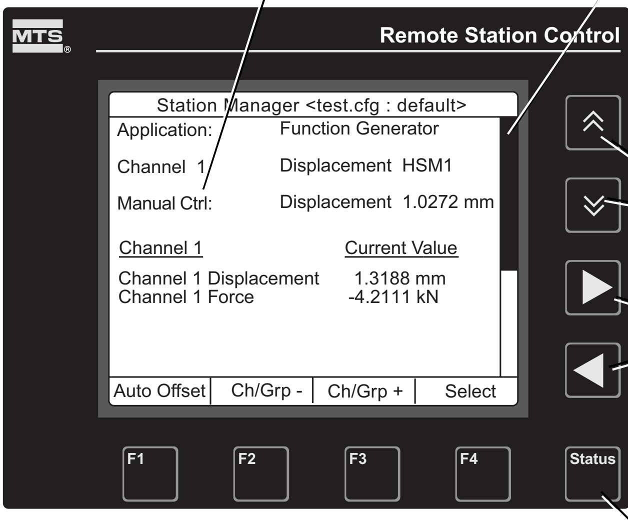
Display Controls

Use the RSC display controls to move the cursor and navigate through the pages on the RSC display.

The cursor highlights the field you want to change or adjust.

This bar indicates if all of the information is displayed:

- If the bar reaches the bottom of the display, all information is shown.
- If the bar does not reach the top or bottom of the display, more information is available. Use the up and down buttons to reveal the hidden information.



Up and down buttons move the cursor around the display.

Left and right arrow buttons step between pages that show Station Manager, MultiPurpose TestWare, and Signal List information. Signal lists reside on Signal Pages created in Station Manager (Channel Options window).

The function buttons have appropriate functions for the page being displayed.

The **Status** button brings the Station Manager page to the top.

Changing what is displayed

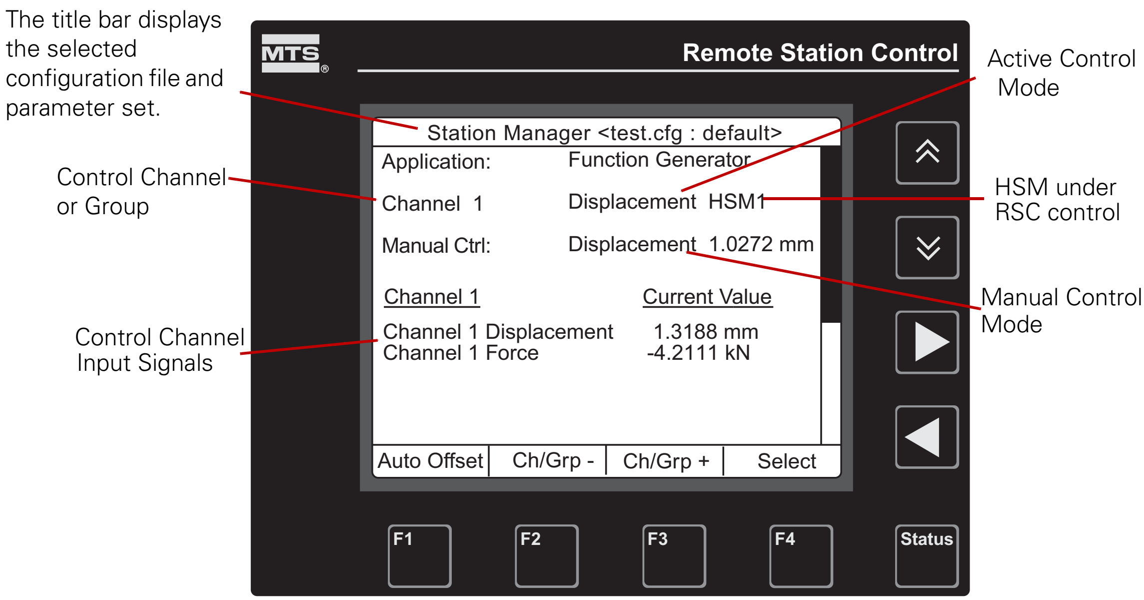
You can change what is shown in the display. Use the left and right arrow buttons (along the right side of the RSC) to step between the following available page displays.

- The Station Manager page shows the selected control channel, control modes, and the current value of each input signal. See the "Station Manager Page" on page 697.
- The MultiPurpose TestWare page (only available when MultiPurpose TestWare™ is running) shows the selected specimen, test procedure, and the current state of the test. See the "MultiPurpose TestWare Page" on page 700.
- Signal pages are defined for RSC display in Station Manager. Each signal page contains a created signal list, which is a group of signals and their current values. See "Signal Lists and Pages" on page 702.

Function keys

The function of the F1–F4 keys changes depending on what application is controlling the station.

Station Manager Page



Function Key Descriptions (part 1 of 2)

FUNCTION KEY	DESCRIPTION
F1 Auto Offset	Press **F1** to zero the output of the selected sensor signal. You can use the Auto Offset feature if: • The selected signal has the cursor on its output value. • The selected signal offset must not be locked. Check the **Offset/ Zero** tab in **Station Setup** for the selected signal to ensure that **Auto Offset Lock** is not enabled.

Function Key Descriptions (part 2 of 2)

FUNCTION KEY	DESCRIPTION
F2 Ch/Grp- **F3 Ch/Grp+**	Press **F2** or **F3** to step up or down through different channel/input signal groups.
F4 Select	Press **F4** to step through a list of selections for the selected parameter. • The selectable field has the cursor on its current selection. • Each time you press **F4**, the highlighted selection changes, stepping through the possible selections.

Changing control modes

Perform the following procedure to change the control mode for the manual control on the RSC module.

1. Ensure that the **Manual Control** indicator is not lit.
2. Use the **F2** and **F3** buttons to select the desired channel or group.
3. Press the  or  button until the manual control mode name is highlighted (next to the **Manual Ctrl** label on the RSC display).
4. The display above the **F4** button should show **Select**. Press **F4** repeatedly until the required manual control mode is displayed.
5. Press the Manual Control **Enable/Disable** button to light the indicator.

Zeroing a sensor signal

You can zero a sensor's output from the RSC module when the Station Manager page is displayed. This performs the same function as the **Auto Offset** button found on the **Offset/Zero** tab on the **Inputs** panel in **Station Setup**.

1. Press the  or  button until the signal value you want to zero is highlighted.
2. The display above the **F1** button should show **Auto Offset**. Press **F1** to zero the highlighted value.

Active control application

The name of the application that is actively controlling the station is displayed on the RSC display title bar and next to the **Application** label on the display.

The available applications are:

- Station Manager (External Command, Function Generator, or Auto Tuning)
- MultiPurpose TestWare (when running)
- Basic TestWare (when running)

The **Run/Hold/Stop** buttons in all other applications are disabled until the active application stops the test. When a test is stopped, clicking **Run** from any application locks out all other applications. See "Test controls" on page 691.

HSM display

The Station Manager page displays the current HSM under RSC control.

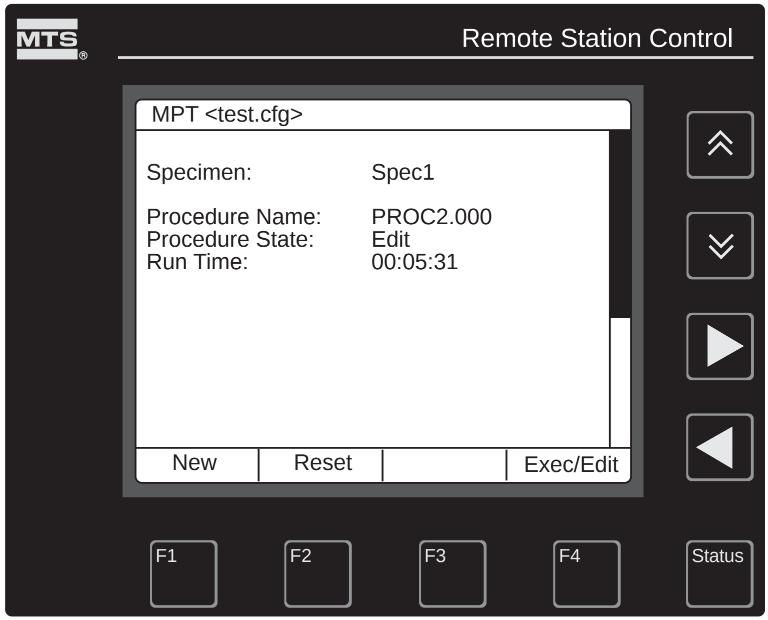
Note *If the RSC is controlling the setpoint of a group of channels, the HSM under control will not be displayed. In its place, the upper value of the setpoint will be displayed.*

Channel groups

Channel groups for RSC control are defined on the **Master Command** tab in the **Channel Options** window. See **"About Channel Groups"** on page 259 for more detailed information.

MultiPurpose TestWare Page

The title bar displays the selected application for the display along with the selected configuration file.

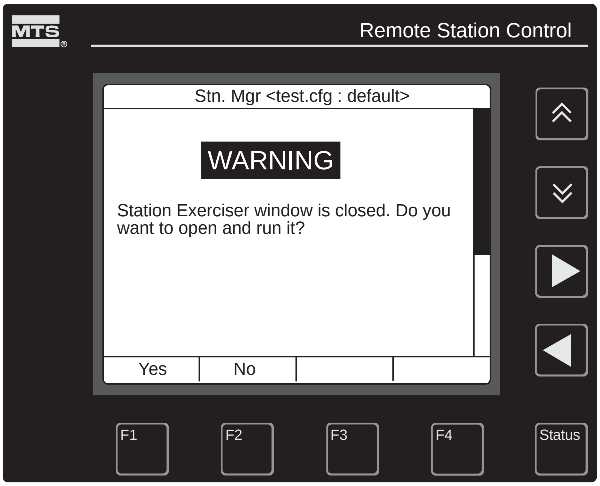


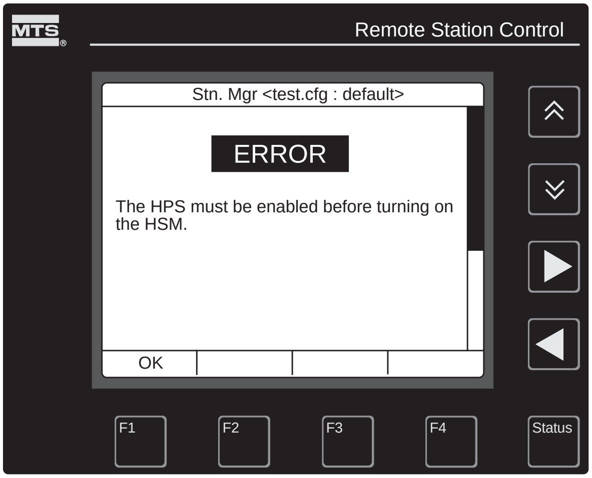
Function Key Descriptions

Function Key	Description
F1 New	Press **F1** to create a new test (specimen).
F2 Reset	Press **F2** to reset the current test so another test can be started.
F4 Execute/Edit	Press **F4** to toggle between the Execute and Edit modes of the procedure.

Message Window Displays

Note *While using the RSC, Warning and Error windows will appear on the display as they do on a PC. Always acknowledge the message before issuing another command from the software.*





Warning messages

A warning message will appear when the system detects a potential problem with executing the current command. Press the **F1** key to dismiss the window if “OK” is the only selection. If there is a “Yes” and “No” selection, answer the question by pressing the corresponding **F1** or **F2** button.

Error messages

An error message will appear when the system detects an error and cannot execute the requested command. The message tells you the cause of the error. Press the **F1** key to dismiss the window.

Signal Lists and Pages

Signal lists are convenient for reducing the number of signals displayed on the RSC or Station Manager **Station Signals** window. This section describes signal list creation and editing, and the creation of signal pages.

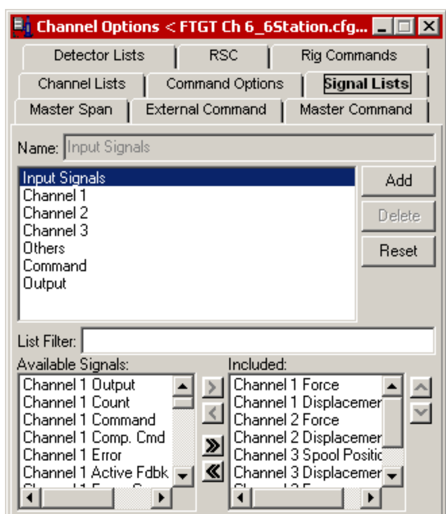
On the RSC, this feature helps you avoid scrolling through long lists of signals on the small display. By limiting each RSC signal list to five signals, you can avoid scrolling to find the desired signal.

Note *When you change control channels on the RSC, the corresponding input signal list for the selected control channel will be displayed. This signal list corresponds to the **Included** list for this channel on **Signal Lists** in the **Channel Options** window.*

How to Create Signal Lists

You can create custom signals lists for use on the RSC display or **Station Signals** window as follows:

1. On the Station Manager **Tools** menu, select **Channel Options** to open the **Channel Options** window.



2. Click the **Signal Lists** tab, and then click **Add** to create a new signal list. In the **Name** box, rename the signal list (initially named “Signal List 1”) as desired.

3. From the **Available Signals** list, choose the signals for your signal list. Hold down the **Ctrl** key, and then select each required signal.

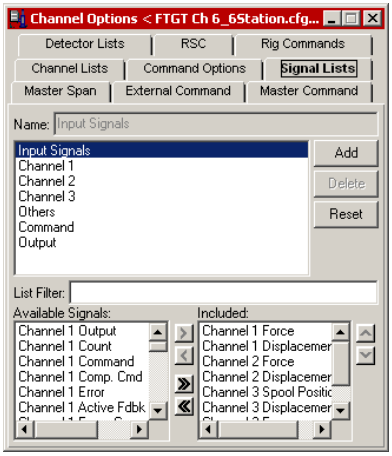
4. Click the **>** button to move the selected signals to the **Included** list.

Note *Each signal list can include up to 10 signals.*

How to Edit Signal Lists

1. In the **Station Manager** window's **Tools** menu, select **Channel Options** to display the **Channel Options** window.

2. In the **Channel Option**s window, click the **Signal Lists** tab.



3. In the **Signal Lists** tab:

   A. Create a new signal list or edit an existing signal list:

   To create a new signals list, click **Add** and enter the new list's **Name**.

   To edit an existing list, select its name.

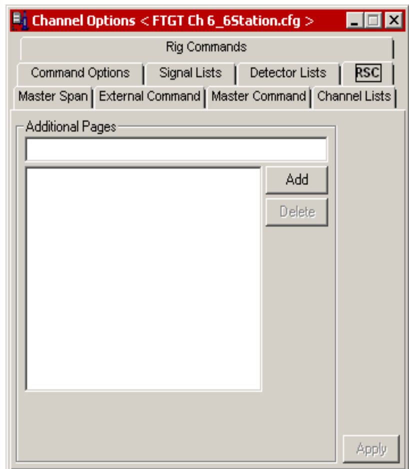
Note ***List Filter*** *applies a filter to predefined signal lists, displaying only* ***Available Signals*** *that are likely to be used with the list. Enter a whole or partial text description of the type of signal(s) you want to display. See* *"Signal Lists Tab" on page 432.*

   B. Use the **< >** and **<< >>** buttons to move signals between **Available Signals** and **Included**.

How to Create Signal Pages

You can create custom signal pages for display on the RSC up to a maximum of three. Each signal page contains a created signal list, which is a group of signals and their current values.

1. On the Station Manager **Tools** menu, select **Channel Options**.
2. Click the **RSC** tab.



3. In the **Additional Pages** panel, click **Add** to create a new signal page. Rename the signal page (initially named "Signal Page 1") as desired.
4. In the **Current Signal List:** selection box highlight and select the desired signal list for display on your newly created RSC signal page.

Note *You have the option of hiding the application name and/or channel information lines on the added page. Click the **Hide Application** or **Hide Channel Information** checkboxes as desired.*

5. Press the **Apply** button to add this new signal page (and its assigned signal list) to the RSC display.

Note *If you forget to click **Apply** after making RSC display changes, closing **Channel Options** displays a window that allows you to save your changes.*

Appendix A
Acceleration Compensation

About Acceleration Compensation

Acceleration compensation is an option, typically used in:

- Tests that have a moving force transducer
- Tests that apply loads at high frequencies
- Tests that apply loads using massive grips or fixturing
- Tests that use a load washer for feedback

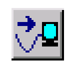
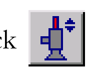
Your system may not have acceleration compensation.

The acceleration compensation applied to force input signals minimizes unwanted feedback from vibrations caused by a mass attached to the force transducer. The unwanted effects of this vibration increase exponentially as the test frequency increases.

The acceleration compensation option requires an accelerometer mounted to the load cell and additional conditioning hardware. During a typical operation, the conditioned accelerometer signal is inverted and summed with the feedback signal to null out any false load feedback.

How to Configure Acceleration Compensation

Acceleration compensation must be optimized whenever you change fixturing or make other major mechanical changes.

1. Remove any installed specimen.
2. In the **Station Manager** window's Toolbar, select an Access Level of **Tuning**.
3. In the **Station Manager** window's **Display** menu, click **Station Setup** to display the **Station Setup** window.
4. In the **Station Setup** window's Navigation pane, locate and click the **Channels** control mode that will use acceleration compensation.
5. In the **Station Setup** window, click .
6. In the **Inputs** panel, click the **Accel** tab.
7. In the **Station Manager** window's Toolbar, click .
8. Set up the **Scope** window to display the command and force feedback signals for the channel using acceleration compensation.
9. In the **Station Manager** window's Navigation pane, click .
10. Set up a tuning program in the **Function Generator** panel.

    A. For **Channel**, click the channel using acceleration compensation.

    B. For **Control Mode**, select a displacement control mode.

    C. For **Command Type**, click **Cyclic**.

    D. For **Target Setpoint**, set **0 cm**.

    E. For **Amplitude (±)**, select an amplitude appropriate for the test.

    F. Set **Frequency** to approximately 80% of the test frequency.

    G. For **Wave Shape**, click **Sine**.

    H. For **Compensator**, click **APC** or **PVC**.

WARNING

Applying station hydraulic pressure can put actuators in motion.

A moving actuator can injure anyone in its path.

Always clear the actuator area before applying hydraulic pressure.

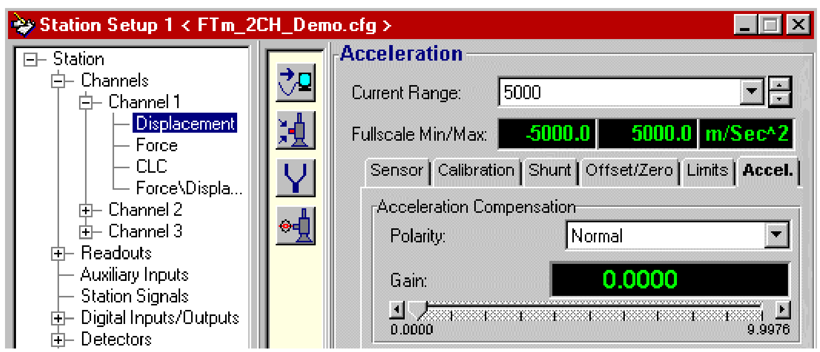
11. Apply station hydraulic pressure.

12. Start the tuning program.

13. Adjust the acceleration compensation.

    In the **Station Setu**p window's **Accel** tab, adjust **Acceleration Compensation** to minimize feedback.

    If **Acceleration Compensation** has an additive or no effect on the feedback signal, for **Polarity** click **Invert**.



14. To save the values, go to the **Station Manager** window's **File** menu and click **Save Parameters**.

Appendix B

Command Line Options and Shortcuts

Station Manager Shortcuts

Creating command line shortcuts greatly reduce the number of steps it takes to get your station open and running. For Station Manager, you can use a shortcut to automatically specify the following station parameters:

- Configuration file name
- Parameter set
- Interlock chain
- Station views
- RSC (remote station control)—optional, not available on all systems
- User level and password
- .HWI file name
- Test system name

Shortcut command line

To create a Station Manager shortcut command line, first specify the application (**stmgr**), then the desired station options.

The syntax of the shortcut command line is critical. If you do not use a supported command-line format, the shortcut will not work.

To view a list of available Station Manager command-line options, enter **stmgr /H** from the command line. These options are also described in the following table.

Note If the parameter name contains spaces (for example, *test 257.000*), the name must be enclosed in quotation marks ("test 257.000").

The Station Manager application supports two command-line formats: decorator-based and precedence based. See "Decorator-Based vs. Precedence-Based Formats" on page 717 for more information about these formats.

Station Manager Command-Line Options

Description	Option	Abbreviation[1]	Default Value	Example
Configuration file name	/Station	/St	None	/St practice.cfg
Parameter set name	/ParameterSet	/Par	Parameter set last used by configuration	/Par "set 1"
Interlock number	/Interlock	/I	Interlock last used by configuration	/I 1
RSC name[2]	/RSC	/R	RSC detected	/R RSC-1
Restore view	/View	/V	Default view	/V default /V saved /V no
User level	/Userlevel	/U	Operator	/U Tuning
Password[3]	/Password	/Pas	None	/Pas Tuning
.HWI file name	/hwi	/Hw	None	/Hw tsiis.hwi
System name	/System	/Sy	None	/Sy "810 mat test"
Controller name (to connect to)	/Controller	/Cont	None	/Cont "Control A"
Import parameters file	/Import	None	None	/Import Aero1.txt
Launch application	/Launch	None	None	/Launch BTW
No Restart (saved applications)	/NoRestart	None	None	
Display the Station Manager command-line options	? or /Help	/H		

1. Option names can be abbreviated to anything that is unique.
2. Optional—not available on all systems.
3. The password parameter is case-sensitive.

Command line example

Stmgr /St **test.cfg** /Par **"param set 1"** /I **1** /V **saved** U/ **tuning** /Pas **Tuning**

Station Builder Shortcuts

For Station Builder, you can use a shortcut to automatically specify the following parameters:

- Configuration file name
- Controller name (to connect to)
- .HWI file name

Shortcut command line

To create a Station Builder shortcut command line, first specify the application (**stbd**), then the desired station options.

The syntax of the shortcut command line is critical. If you do not use a supported command-line format, the shortcut will not work.

To view a list of available Station Builder command-line options, enter **stbd /H**. These options are also described in the following table.

Note *If the parameter name contains spaces (for example, test 257.000), the name must be enclosed in quotation marks ("test 257.000").*

The Station Builder application supports two command-line formats: decorator-based and precedence based. See "Decorator-Based vs. Precedence-Based Formats" on page 717 for more information about these formats.

Station Builder Command-Line Options

Parameter	Prefix	Abbreviation[1]	Default Value	Example
Configuration file	/Station	/St	None	/St practice.cfg
.HWI file name	/hwi	/Hw	None	/Hw tsiis.hwi
Controller name (to connect to)	/Controller	Cont	None	/Cont "Control A"
Display the Station Builder command-line options	? or /Help	/H		

1. Option names can be abbreviated to anything that is unique.

Command line example

Stbd /St **stat1.cfg**

System Loader Shortcuts

For System Loader, you can use a shortcut to automatically launch a simulated DSP or supervisor, load/unload a simulated system, and specify the following parameters:

- Controller name
- .HWI file name
- Test system name

Shortcut command line

To create a System Loader shortcut command line, first specify the application (**sysload**), then the desired station options.

The syntax of the shortcut command line is critical. If you do not use a supported command-line format, the shortcut will not work.

To view a list of available Station Builder command-line options, enter **sysload /H**. These options are also described in the following table.

Note *If the parameter name contains spaces (for example, test 257.000), the name must be enclosed in quotation marks ("test 257.000").*

The System Loader application only supports the decorator-based command-line format. See "Decorator-Based vs. Precedence-Based Formats" on page 717 for more information about this format..

System Loader Command-Line Options (part 1 of 2)

Description	Option	Abbreviation[1]	Default Value	Example
Launch simulated DSP	/DSP	/DSP	None	
Launch simulated Supervisor	/Sup	/Sup	None	
Minimize launch applications	/Minimize	/Min	None	
Load simulated system	/Simulation	/Sim	None	
System name	/System	/Sy	None	
.HWI	/Hwi	/Hw	None	/Hwi tsiis.hwi

System Loader Command-Line Options (part 2 of 2)

Description	Option	Abbreviation[1]	Default value	Example
Controller name (to connect to)	/Controller	/Cont	None	/Cont “Control A”
Unload simulated system	/UnloadSimulation	/Un	None	
Sysload open after load completed	/NoExit	/NoE	None	
Display the System Loader command-line options	? or /Help	/H	None	

1. Option names can be abbreviated to anything that is unique.

Command line example

Sysload /Cont “Control A”

Basic TestWare Shortcuts

For Basic TestWare you can use a shortcut to automatically specify the following parameters:

- Test name
- Station name
- System name
- Controller name (to connect to)

Shortcut command line

To create a Basic TestWare shortcut command line, first specify the application (**btw**), then the desired station options.

The syntax of the shortcut command line is critical. If you do not use a supported command-line format, the shortcut will not work.

To view a list of available Station Builder command-line options, enter **btw /H**. These options are also described in the following table.

Note *If the parameter name contains spaces (for example, test 257.000), the name must be enclosed in quotation marks ("test 257.000").*

The Basic TestWare application supports two command-line formats: decorator-based and precedence based. See "Decorator-Based vs. Precedence-Based Formats" on page 717 for more information about these formats.

Basic TestWare Command-Line Options (part 1 of 2)

Description	Option	Abbreviation[1]	Default Value	Example
Test name	/Test Name	/T	None	/T FirstTest
Station (to connect to)	/Station	/St	None	/St practice.cfg
System name	/System	/Sy	None	/Sy "810 mat test"

Basic TestWare Command-Line Options (part 2 of 2)

DESCRIPTION	OPTION	ABBREVIATION[1]	DEFAULT VALUE	EXAMPLE
Controller name (to connect to)	/Controller	/Cont	None	/Cont 001
Display the BTW command-line options	? or /Help	/H		

1. Option names can be abbreviated to anything that is unique.

Command line example

btw /Cont 001

Decorator-Based vs. Precedence-Based Formats

The Station Manager, Station Builder, and Basic TestWare applications support two command-line formats. The System Loader application supports the decorator-based format only.

- **Decorator-Based Command Line Format**

  This command line format requires a prefix for each parameter in the command line.

- **Precedence-Based Command Line Format**

  This command line format does not require prefixes, but parameters must be listed in a specific order.

Decorator-Based Command Line Format

The decorator-based command line format requires a prefix to identify each station parameter.

When you are creating a decorator-based command line, keep in mind:

- The order of the parameters is not important.
- Prefixes can be spelled out or abbreviated in the command line.
- The prefix and the parameter must be separated by a space.
- If the parameter name contains a space (for example, **parameter set 2**), it must be enclosed in quotation marks.

Decorator-based command line example

Use the following example as a reference when you create your decorator-based command line.

Assume you want to start Station Manager with the following command-line options:

- Configuration file name = **test.cfg**
- Parameter set name = **parm set 1**
- Interlock chain = **1**
- Restore views = **saved**
- User level = **tuning**
- Password = **Tuning** (case-sensitive)

The decorator-based command line should look like this:

C:\tsiis\ntbin\Stmgr.exe **/St test.cfg /Par "parm set 1" /I 1 /V saved /U tuning /Pas Tuning**

Keep in mind:

- There must be a space between the original command line entry and your first prefix.
- Each parameter must be preceded by the correct prefix.
- If the parameter name contains a space, the parameter name must be enclosed in quotation marks.
- Password is the only parameter that is case-sensitive.

Command Line Options and Shortcuts

Precedence-Based Command Line Format

The precedence-based command line format does not require prefixes. This format is simpler, however, parameters must be listed in a specific order.

When you are creating a precedence-based command line, keep in mind:

- Parameters must be defined in the proper order (see “Command-line parameter order” on page 719).
- The parameters must be separated by a space.
- You do not have to define all parameters, but if you want to specify a parameter that is recognized later in the order, you have to define all of the preceding parameters.
- If the parameter name contains a space (for example, *parm set 2*), it must be enclosed in quotation marks.

Command-line parameter order

In a shortcut command line, options are recognized in the following order:

Station Manager

1. Configuration file name
2. Parameter set name
3. Interlock number
4. RSC name—optional, not available on some systems
5. Restore view option
6. User level
7. User-level password
8. .HWI file name
9. System name
10. Controller name
11. Import parameters file name
12. Application to launch

Station Builder

1. Configuration file name
2. .HWI file name
3. Controller name

Basic TestWare

1. Test name
2. Station name
3. System name
4. Controller name

Precedence format example

Use the following example as a reference when you create your precedence-based command line.

Assume you want to start Station Manager with the following command-line options:

- Configuration file = **test.cfg**
- Parameter set = **parm set 1**
- Interlock chain = **1**
- RSC = **rsc-1**
- Restore views = **no**
- User level = **tuning**
- Password = **Tuning** (case-sensitive)

The precedence-based command line with these options should look like this:

C:\tsiis\ntbin\Stmgr.exe **test.cfg "parm set 1" 1 rsc-1 no tuning Tuning**

Keep in mind:

- There must be a space between the original command line entry and your first parameter.
- If the parameter name contains a space, the parameter name must be enclosed in quotation marks.

- Password is the only parameter that is case-sensitive.

Omitting parameters

Since precedence-based parameters are recognized in a specific order, the command line will not work if you omit parameters. However, you can omit one or more parameters in your precedence-based command line if you include prefixes for each parameter listed after the omitted parameter.

For example, if you want to omit the interlock chain, RSC, and restore view parameters in the above example, you must use the user level and password prefixes (/U, /Pas) to complete the command line.

C:\tsiis\ntbin\Stmgr.exe **test.cfg "parm set 1" /U Tuning /Pas Tuning**

Creating a Shortcut

Before you can create the shortcut command line, you need to create a shortcut.

How to Create a Shortcut

1. On any folder: Right-click, then select **New**/**Shortcut**.
2. Using the displayed Create Shortcut wizard, browse to the folder where your system software is installed. The default location is **C:\ftiim** (for FlexTest IIm), **C:\tsiis** (for TestStar IIs), or **C:\ftgt** (for FlexTest GT).
3. Continue browsing to the **ntbin** folder, then click on the application for which you are creating a shortcut (e.g., **Stmgr**). Click **OK**.
4. Add the desired options to the command line displayed on the wizard using the required syntax and format. Click **Next**.
5. If you want a shortcut name different than the one selected by the wizard, enter it now, then click **Finish**.

Editing the Shortcut Command Line

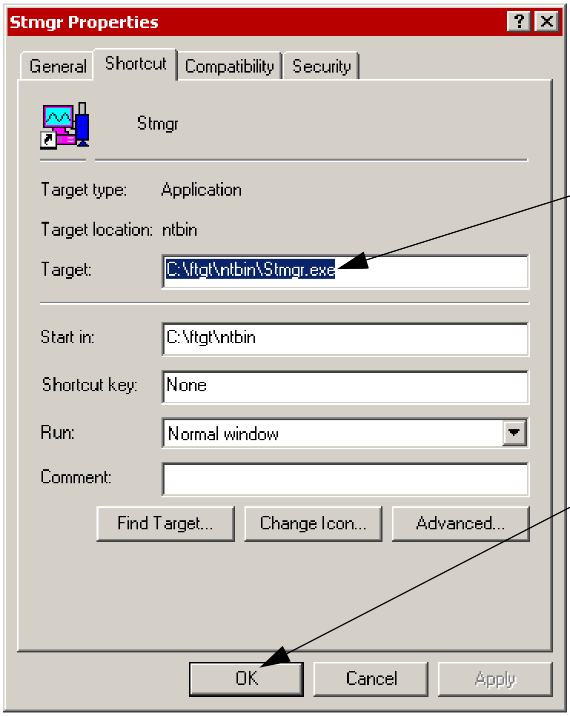
Edit the shortcut command line to define your desired station settings. For information on command line formats, see "Shortcut command line" on page 710.

How to Edit the Shortcut Command Line

1. Right-click the shortcut icon you created, and then click **Properties**.
2. In the **Properties** window, click the **Shortcut** tab.
3. In the **Target** box, type your command line.

   Note *There must be a space between the application file name (e.g., **Stmgr.exe**) and your command line addition.*

4. Click **OK**.



Test your shortcut

To test your shortcut command line, double-click the shortcut icon you created.

Appendix C

793.00 Aero Options

This section describes options unique to the Aero version of 793.00 System Software. These options include:

- **A/B Compare**— This option allows the user to link two signals for comparison. The user can set a limit value on the difference of these two linked signals (A and B).
- **Group Detector Mode**— Enabling this option puts all main control mode input signals into four groups: Limits, Extended Limits, A/B Compare, and Error. Limit actions can only be set for each group of signals, not for individual signals within a group.
- **Extended Limits**— Enabling this option allows the user to set both an upper and lower extended limit for each channel.
- **Persistence**— Enabling persistence allows the user to set a time interval that an over limit condition can exist before the limit is tripped.
- **Import/Export Support**— Allows import and export of system settings via text files.

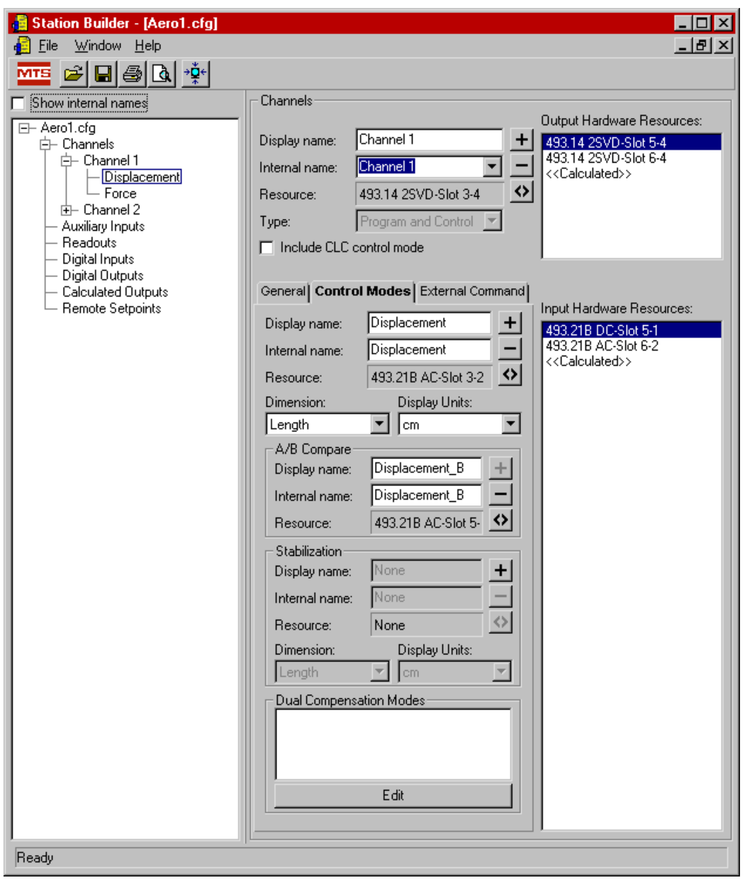
A/B Compare

The **A/B Compare** option allows you to link two signals for comparison. The Station Builder interface provides this signal linking capability.

Signal definition

The optional **A/B Compare** signal is defined on the **Control Modes** tab of the Station Builder **Channels** panel and can only be added on non-calculated primary modes. The **A/B Compare** signal name defaults to the “A” signal name appended with **_B** (e.g., Channel 2 Force_B), but this name can be edited. Signals A and B must have the same dimension and default display units. The display units may be changed in Station Manager and may differ.

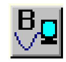
.



A/B Compare limits

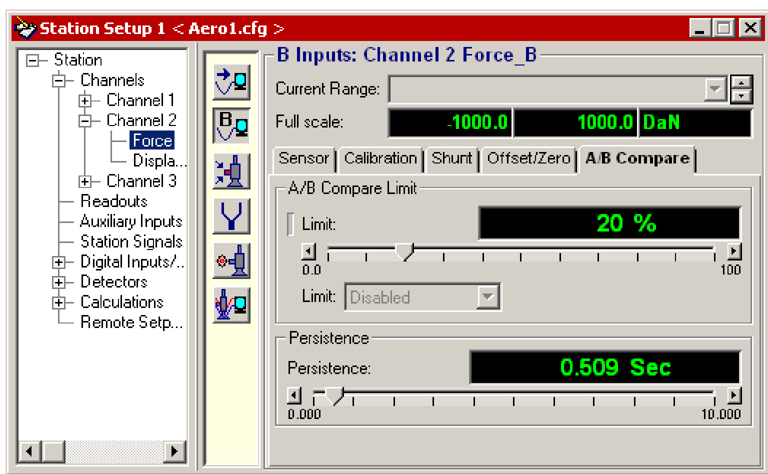
With the A/B Compare option enabled you can set a limit value for the difference of two linked signals (A and B).

For example, when using dual bridge load cells each bridge is connected to a separate conditioner. The bridge “A” input is used for control and bridge “B” input is a monitor. After linking these two signals using Station Builder, you can set an A/B compare limit that will trigger a specified action when the difference between the two signals exceeds the set limit.

Enabling A/B Compare adds a **B Inputs** icon  to the Station Setup window of Station Manager. Clicking the B input icon opens the **B Inputs** panel which displays tabs for calibrating the “B inputs” signal.

Click the **A/B Compare** tab to set the A/B Compare limit for a control mode. Select a limit value as a percentage of full scale. If the full scale range differs for signal A and B, the full scale range of signal A will be used for the limit value.

Note *If an A/B Compare signal is not defined for a control channel, clicking the **B Input** icon displays the message: There are no Input Signals for this Control Channel.*



Group detector

If the group detector option is enabled, the limit action displayed on the **B Inputs** panel is common to all A/B compare signals, and cannot be set on the **A/B Compare** tab. You can set the group mode limit action on the **Limit Detectors** panel. See **"Setting limit actions"** on page 732.

A/B Compare limit persistence

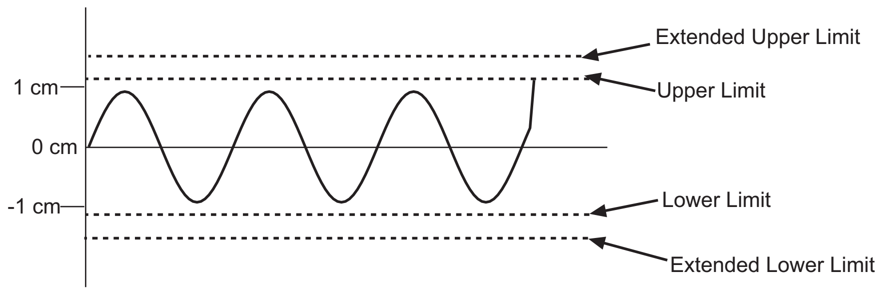
Persistence is the time interval that an over limit condition can exist before a limit is tripped. In this case, when the difference between the two signals exceeds the set A/B Compare limit for a specified persistence time, the limit is tripped.

If the persistence option is enabled, the **Persistence Value** slider is displayed on the **B Inputs** panel. To disable persistence, set the persistence value to zero.

Extended Limits

Model 793.00 system software provides only one limit detector for each input signal. This level of limit detection is not enough to meet the safety and data acquisition needs of Aero testing. AeroPro software needs at least two sets of limit detectors (inner and outer) to fire actions when a limit is tripped.

The set of inner limits correspond to the Upper Limit and Lower Limit provided with all 793.00 software. The set of outer limits are the Extended Upper and Lower Limits available for Aero applications. The Extended Limits option is selected automatically when installing 793 for Aero software.



With the Extended Limits option enabled, the Inputs panel **Limits** tab will display **Extended Upper Limit** and **Extended Lower Limits**. Set all limits and limit actions.

Note *If A/B Compare is being used, the **Limits** tab will not be available on the **B Inputs** panel.*

Group detector

If the group detector option is enabled, you cannot set any limit actions on the Inputs panel **Limits** tab. You can set the group mode limit action on the **Limit Detectors** panel. See **"Setting limit actions"** on page 732.

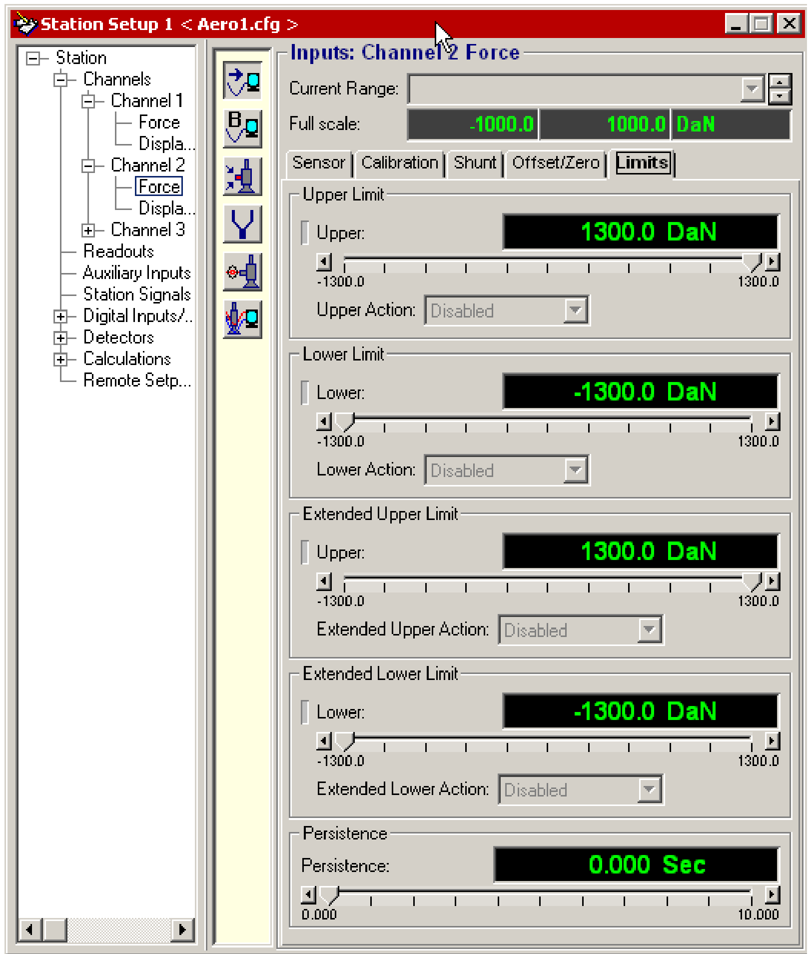
Limit persistence

Persistence is the time during which an over limit condition can exist before a limit is tripped.

One common use of persistence is for static structure testing which can produce spikes as test specimen and structure linkages "snap" into place. Setting a persistence value allows the system to overlook these short duration spikes and not shut down.

To disable persistence, set the persistence value to zero.

The set persistence value applies to all limit detectors displayed on the **Inputs** panel.



Group Detector Option

Limits

When a configuration has the group detector option enabled, Station Manager will put all main control mode input signals in four groups: Limits, Extended Limits, A/B Compare, and Error groups.

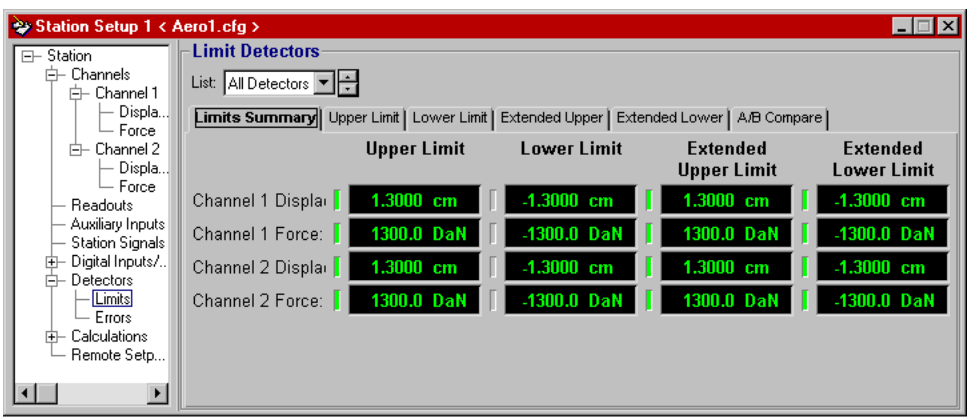
In group mode, when limits are tripped, the group action will be fired for each signal that exceeds its limit, but no more than once per clock tick.

Limits Summary

The **Limits Summary** tab on the Limit Detectors panel summarizes the upper/lower limit values and status of the selected limit detectors. With the extended limits option enabled for Aero applications, this tab also displays extended upper/lower limits.

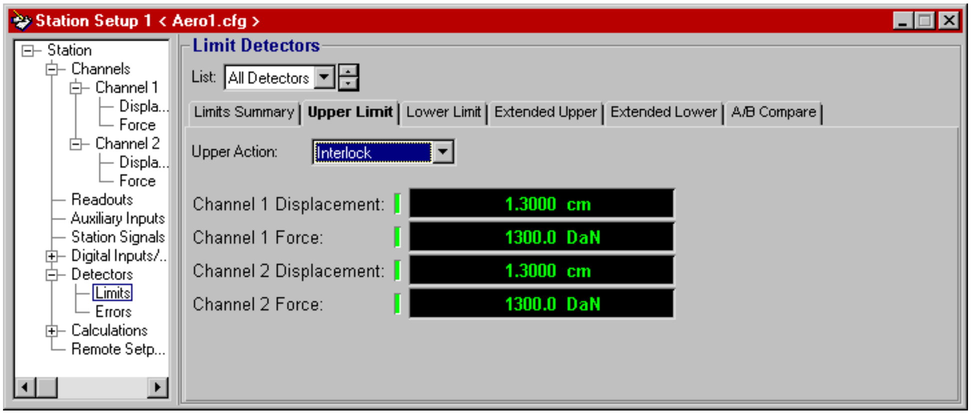
Use **List** to select the limit detectors you want to display. You can choose to display the status of all system limit detectors (**All Detectors**) or limit detectors on a selected system channel.

See "Limits Summary Tab" on page 375 for a description of this tab for 793.00 system software applications.



Setting limit actions

When group detector mode is enabled, all of the individual channel limit actions cannot be set on the **Limits** tab of the **Inputs** or **B Inputs** panel. You can set a common limit action for a group using the **Limit Detectors** panel as shown below. This example shows the **Upper Limit** action setting for a group.



Import/Export Support

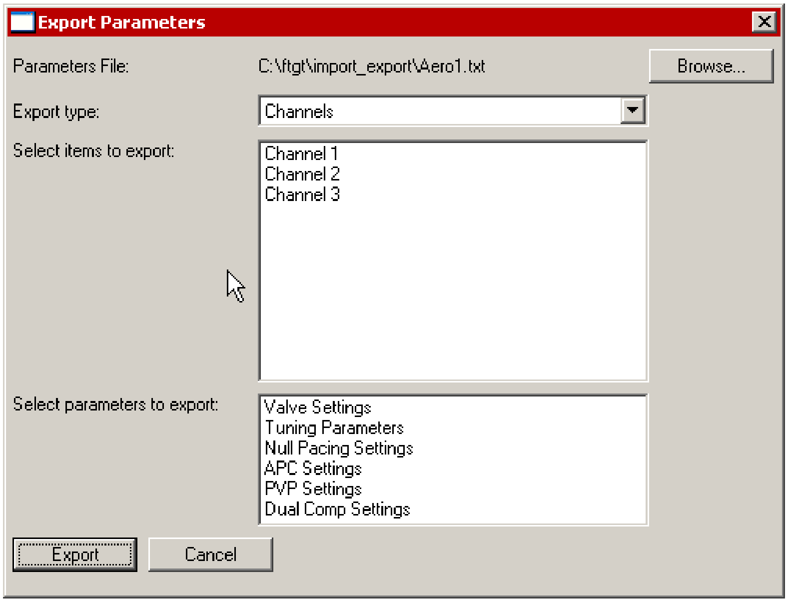
AeroPro software can now import and export system settings via text files. Some of the features of import/export support include:

- Calibration, PIDF tuning, and limits data can be imported into or exported from Station Manager.
- Data is transferred via an ASCII file format that can be easily read into Excel.
- Data import/export can be implemented for a few or all channels.
- Data import/export is not possible when system hydraulics are on.

Exporting Data

Use the **Export Parameters** window to complete the following data export procedure:

1. Ensure that system hydraulics is off.
2. On the **File** menu in Station Manager, select **Export Parameters...** to open the **Export Parameters** window.



3. Ensure that the **Parameters File** name is correct.

   The default parameters file name is name of the station with a .txt extension located in the default import/export directory (e.g., C:\ftgt\import_export\Aero1.txt).

   To change the parameters file, click the **Browse** button, then use the standard "file save" window to enter the required parameters file name.

4. Select an export type.

   Select **channels**, **channel groups**, or **signals** from the **Export type:** list.

5. Select the items to export on the **Select items to export** list. List items vary based on the export type selected.

Note *If you choose to export signals, **Select items to export** lists all signals that have "real" hardware attached or that are calculated inputs.*

6. Select parameters to export from the **Select parameters to export** list.

   Parameters are grouped in categories (e.g., valve settings or tuning parameters when exporting channel data).

7. Click the **Export** button to export the selected parameters to the parameters file.

Export Parameters (part 1 of 2)

ITEM	DESCRIPTION
Parameters File:	Displays file name to which the selected information will be exported. The default parameters file name is name of the station with a .txt extension located in the default import/export directory (e.g., E:\tsiim\import_export\Aero1.txt).
Browse	This button allows you to change the parameters file. Click **Browse** to open the standard "file save" window, and then select the required parameters file name.
Export type:	Allows selection of the type of data you need to export. Select **channels**, **channel groups**, or **signals** from the displayed list.

Export Parameters (part 2 of 2)

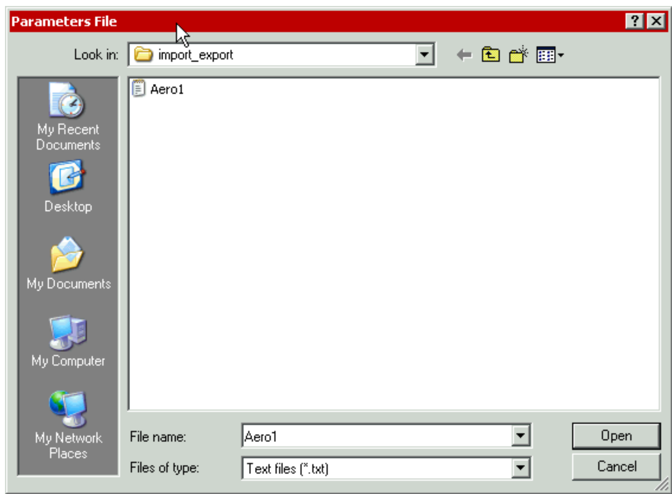
ITEM	DESCRIPTION
Select items to export	Allows selection of data items to export from a list that varies with the export type selected.
Select parameters to export	Allows selection of parameter categories to export from a list that varies with the export type selected. When exporting channel or channel group data, select from the following parameter categories: Valve Settings, Tuning Parameters, Null Pacing Settings, APC Settings, PVP Settings, and Dual Comp Settings. When exporting signals, select from the following parameter categories: Limits Settings, Fullscale Settings, Conditioner Settings, and Shunt Information.
Export	This button initiates export of the selected parameters to the parameters file.
Cancel	This button cancels the export parameter selection process.

Importing Data

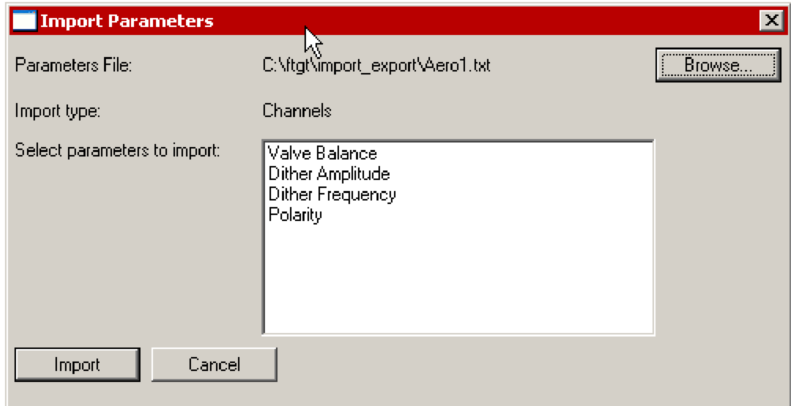
Note *Before importing data ensure that system hydraulics are off and Calibration access level is selected.*

Note *When importing an input signal with multiple ranges, the name of the range in the input file must match the currently selected range on the input signal.*

1. On the **File** menu in Station Manager, select **Import Parameters...** to open a **Parameters File** window.



2. Select the input file from the Parameters File window. An Import Parameters window will open which displays the type of information to be imported (channels or signals) and list of parameters found in the selected input file.


Import Parameters
Parameters File:
C:\ftgt\import_export\Aero1.txt
Browse...
Import type:
Channels
Select parameters to import:
Valve Balance
Dither Amplitude
Dither Frequency
Polarity
Import
Cancel

3. Ensure that the **Parameters File** name is correct.

   The default parameters file name is name of the station with a .txt extension located in the default import/export directory (e.g., C:\ftgt\import_export\Aero1.txt).

   To change the parameters file, click the **Browse** button, then use the **Parameters File** window to enter the required parameters file name.

4. Select parameters to import from the **Select parameters to import** list.

5. Click the **Import** button to import the selected parameters to the parameters file.

Import Parameters

ITEM	DESCRIPTION
Parameters File:	Displays file name to which the selected information will be imported. The default parameters file name is name of the station with a .txt extension located in the default import/export directory (e.g., C:\ftgt\import_export\Aero1.txt).
Browse	This button allows you to change the parameters file. Click **Browse** to open the **Parameters File** window, and then select the required parameters file name.
Import type:	Displays the type of information to be imported (channels or signals).
Select parameters to import	Allows selection from a list of parameters found in the selected input file.
Import	This button initiates import of the selected parameters from the selected input file to the current system settings.
Cancel	This button cancels the import parameter selection process.

File Format

Each import or export file contains a single table. A typical table begins with three comment and/or empty lines, followed by a line with table type and version number. The next two lines contain table headings that specify which parameters are stored in the file. The remaining lines of the file contain the parameter data.

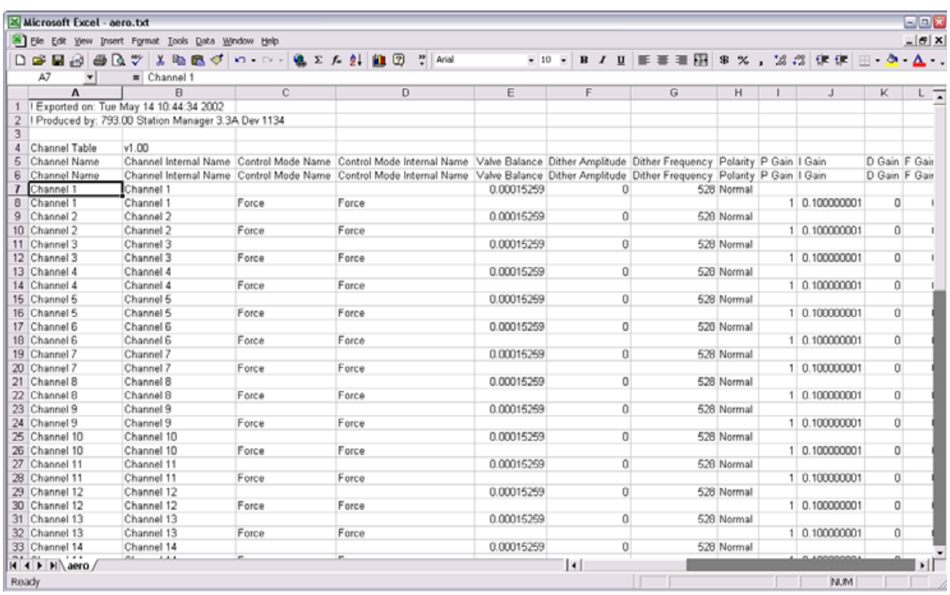
All channels, signals, or parameters are described using both their display name and internal name. Channel, mode, and signal names cannot be changed in an imported file.

A specific parameter may not have meaning for a particular channel or signal. For example, **Phase** is not used for all signals. When a parameter has no meaning for a channel or signal, the entry in the export file is left blank. On import, the contents of unused parameters should be empty.

Channel format

The first four columns of a channel table are: Channel Name, Channel Internal Name, Control Mode Name, and Control Mode Internal Name.

Each exported channel has one line with the channel name and any channel-specific parameters. This is followed by lines with the channel and mode names that contain mode-specific parameters. A typical exported channel table is shown below.

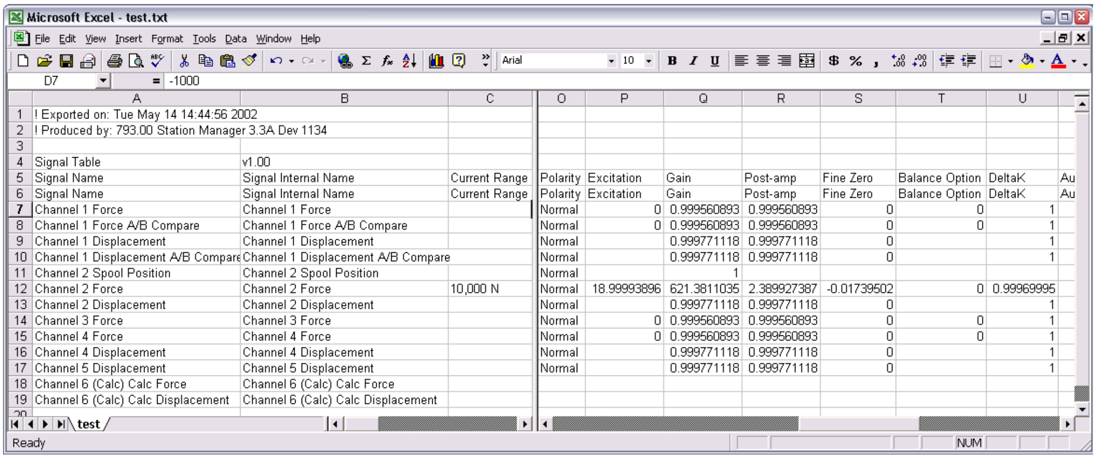


	A	B	C	D	E	F	G	H	I	J	K	L
1	! Exported on: Tue May 14 10:44:34 2002											
2	! Produced by: 793.00 Station Manager 3.3A Dev 1134											
3												
4	Channel Table	v1.00										
5	Channel Name	Channel Internal Name	Control Mode Name	Control Mode Internal Name	Valve Balance	Dither Amplitude	Dither Frequency	Polarity	P Gain	I Gain	D Gain	F Gai
6	Channel Name	Channel Internal Name	Control Mode Name	Control Mode Internal Name	Valve Balance	Dither Amplitude	Dither Frequency	Polarity	P Gain	I Gain	D Gain	F Gain
7	Channel 1	Channel 1			0.00015259	0	528	Normal				
8	Channel 1	Channel 1	Force	Force					1	0.100000001	0	
9	Channel 2	Channel 2			0.00015259	0	528	Normal				
10	Channel 2	Channel 2	Force	Force					1	0.100000001	0	
11	Channel 3	Channel 3			0.00015259	0	528	Normal				
12	Channel 3	Channel 3	Force	Force					1	0.100000001	0	
13	Channel 4	Channel 4			0.00015259	0	528	Normal				
14	Channel 4	Channel 4	Force	Force					1	0.100000001	0	
15	Channel 5	Channel 5			0.00015259	0	528	Normal				
16	Channel 5	Channel 5	Force	Force					1	0.100000001	0	
17	Channel 6	Channel 6			0.00015259	0	528	Normal				
18	Channel 6	Channel 6	Force	Force					1	0.100000001	0	
19	Channel 7	Channel 7			0.00015259	0	528	Normal				
20	Channel 7	Channel 7	Force	Force					1	0.100000001	0	
21	Channel 8	Channel 8			0.00015259	0	528	Normal				
22	Channel 8	Channel 8	Force	Force					1	0.100000001	0	
23	Channel 9	Channel 9			0.00015259	0	528	Normal				
24	Channel 9	Channel 9	Force	Force					1	0.100000001	0	
25	Channel 10	Channel 10			0.00015259	0	528	Normal				
26	Channel 10	Channel 10	Force	Force					1	0.100000001	0	
27	Channel 11	Channel 11			0.00015259	0	528	Normal				
28	Channel 11	Channel 11	Force	Force					1	0.100000001	0	
29	Channel 12	Channel 12			0.00015259	0	528	Normal				
30	Channel 12	Channel 12	Force	Force					1	0.100000001	0	
31	Channel 13	Channel 13			0.00015259	0	528	Normal				
32	Channel 13	Channel 13	Force	Force					1	0.100000001	0	
33	Channel 14	Channel 14			0.00015259	0	528	Normal				

793.00 Aero Options

Signal format

The first two columns of a signal table are: Signal Name and Signal Internal Name. The remaining columns display signal parameters. A typical exported signal table is shown below.



	A	B	C	O	P	Q	R	S	T	U	
1	! Exported on: Tue May 14 14:44:56 2002										
2	! Produced by: 793.00 Station Manager 3.3A Dev 1134										
3											
4	Signal Table	v1.00									
5	Signal Name	Signal Internal Name	Current Range	Polarity	Excitation	Gain	Post-amp	Fine Zero	Balance Option	DeltaK	Au
6	Signal Name	Signal Internal Name	Current Range	Polarity	Excitation	Gain	Post-amp	Fine Zero	Balance Option	DeltaK	Au
7	Channel 1 Force	Channel 1 Force		Normal	0	0.999560893	0.999560893	0	0	1	
8	Channel 1 Force A/B Compare	Channel 1 Force A/B Compare		Normal	0	0.999560893	0.999560893	0	0	1	
9	Channel 1 Displacement	Channel 1 Displacement		Normal		0.999771118	0.999771118	0		1	
10	Channel 1 Displacement A/B Compare	Channel 1 Displacement A/B Compare		Normal		0.999771118	0.999771118	0		1	
11	Channel 2 Spool Position	Channel 2 Spool Position		Normal		1					
12	Channel 2 Force	Channel 2 Force	10,000 N	Normal	18.99993896	621.3811035	2.389927387	-0.01739502	0	0.99969995	
13	Channel 2 Displacement	Channel 2 Displacement		Normal		0.999771118	0.999771118	0		1	
14	Channel 3 Force	Channel 3 Force		Normal	0	0.999560893	0.999560893	0	0	1	
15	Channel 4 Force	Channel 4 Force		Normal	0	0.999560893	0.999560893	0	0	1	
16	Channel 4 Displacement	Channel 4 Displacement		Normal		0.999771118	0.999771118	0		1	
17	Channel 5 Displacement	Channel 5 Displacement		Normal		0.999771118	0.999771118	0		1	
18	Channel 6 (Calc) Calc Force	Channel 6 (Calc) Calc Force									
19	Channel 6 (Calc) Calc Displacement	Channel 6 (Calc) Calc Displacement									

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