Using TestWorks® 4

Electromechanical
Static Hydraulic
Servohydraulic

be certain.

100-093-627 F

Copyright information

Trademark information

Proprietary information

Software validation and verification

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's 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's exacting quality standards when initially installed and will continue to perform as intended over time.

Publication information

Manual Part Number	Publication Date
7199935 B	March 2002
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100-093-627 D	March 2010
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100-093-627 F	July 2011

Contents

Technical Support

How to Get 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 software, look for online help and README files that contain additional product information.

If you cannot find answers to your technical questions from these sources, you can use the Internet, e-mail, telephone, or fax to contact MTS for assistance.

Technical support methods

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

www.mts.com

The web site provides access to our technical support staff by means of an onlineform:

> www.mts.com > Contact MTS > Service & Technical Support button

E-mail

tech.support@mts.com

Telephone

MTS Call Center 800-328-2255
Weekdays 7:00 A.M. to 5:00 P.M., Central Time

Fax

952-937-4515
Please include “Technical Support” in the subject line.

Outside the U.S.

For technical support outside the United States, contact your local sales and service office. For a list of worldwide sales and service locations and contact information, use the Global MTS link at the MTS web site:

> www.mts.com > Global MTS > (choose your region in the right-hand column) > (choose the location closest to you)

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 (such as material testing or simulation). The number is typically written on a label on your equipment before the system leaves MTS. If you do not know your MTS site number, contact your sales engineer.

Example site number: 571167

When you have more than one MTS system, the system job number identifies your system. You can find your job number in your order paperwork.

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 based on the:

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

Identify the problem

Describe the problem and know the answers to the following questions:

- How long and how often has the problem occurred?
- Can you reproduce the problem?
- Were any hardware or software changes made to the system before the problem started?
- What are the equipment model numbers?
- What is the controller model (if applicable)?
- What is the system configuration?

Know relevant computer information

For a computer problem, have the following information available:

- Manufacturer's name and model number
- Operating software type and service patch information
- Amount of system memory
- Amount of free space on the hard drive where the application resides
- Current status of hard-drive fragmentation
- Connection status to a corporate network

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 can typically be found in the About selection in the Help menu.**
- The names of other applications on your computer, such as:
  - Anti-virus software
  - Screen savers
  - Keyboard enhancers
  - Print spoolers
  - Messaging applications

If You Contact MTS by Phone

A Call Center agent registers your call before connecting you with a technical support specialist. The agent asks you for your:

- Site number
- Name
- Company name
- Company address
- Phone number where you can be reached

If your issue has a notification number, please provide that number. A new issue will be assigned a unique notification number.

Identify system type

To enable the Call Center agent to connect you with the most qualified technical support specialist available, identify your system as one of the following types:

- Electromechanical material test system
- Hydromechanical material test system
- Vehicle test system
- Vehicle component test system
- Aero test system

Be prepared to troubleshoot

Prepare to perform troubleshooting while on the phone:

- Call from a telephone close to the system so that you can implement 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

In case Technical Support must call you:

- Verify the notification number.
- Record the name of the person who helped you.
- Write down any specific instructions.

After you call

MTS logs and tracks all calls to ensure that you receive assistance for your problem or request. If you have questions about the status of your problem or have additional information to report, please contact Technical Support again and provide your original notification number.

Problem Submittal Form in MTS Manuals

Use the Problem Submittal Form to communicate problems with your software, hardware, manuals, or service that are not resolved to your satisfaction through the technical support process. The 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.

Access the Problem Submittal Form:

- In the back of many MTS manuals (postage paid form to be mailed to MTS)
- www.mts.com > Contact Us > Problem Submittal Form button (electronic form to be e-mailed to MTS)

Preface

Before You Begin

Safety first!

Before you use your MTS product or system, read and understand the *Safety* manual and any other safety information provided with your system. Improper installation, operation, or maintenance can result in hazardous conditions that can cause severe personal injury or death, or damage to your equipment and specimen. Again, read and understand the safety information provided with your system 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 manuals in paper or electronic form.

You may also receive an MTS System Documentation CD. It contains an electronic copy of the manuals that pertain to your test system, such as:

- Hydraulic and mechanical component manuals
- Assembly drawings
- Parts lists
- Operation manual
- Preventive maintenance manual

Controller and application software manuals are typically included on the software CD distribution disc(s).

Conventions

Documentation Conventions

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

Hazard conventions

Hazard notices may be embedded in this manual. These notices contain safety information that is specific to the activity 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 all directions and recommendations. 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 information provided with your system.*

Danger notices indicate the presence of a hazard with a high level of risk which, if ignored, *will* result in death, severe personal injury, or substantial property damage.

Warning notices indicate the presence of a hazard with a medium level of risk which, if ignored, *can* result in death, severe personal injury, or substantial property damage.

Caution notices indicate the presence of a hazard with a low level of risk which, if ignored, *could* cause moderate or minor personal injury or equipment damage, or could endanger test integrity.

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. They 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.

TestWorks 4 General Information

Introduction

This manual is written and designed to get you up and running with your TestWorks 4 software package - to discover its capabilities, understand its operating requirements, and learn how to configure the software to meet your testing needs. This manual will allow you to configure methods and gain a thorough understanding of TestWorks 4 up to the Reviewing Data Section. It should be noted that the capabilities of TestWorks 4 reach beyond the Reviewing Data Section. Future manuals and sections will include advanced features within the software.

TestWorks 4 is MTS Systems Corporation's latest testing software to be used in conjunction with an MTS or compatible frame system. The premise of the manual is to guide you through the various levels and stages based on your responsibilities and privilege level.

TestWorks 4 is a versatile software program offering you a host of features that will make the material testing process fast and easy to use. Please note that what the software displays at various points in the testing process can vary depending on how the test methods and user profiles have been configured. As a result, the screens and graphs shown in the manual might be slightly different then what you see in the software. If at any time you have questions about TestWorks 4, refer to "Technical Support" on page 7.

General testing package

TestWorks 4 software has various method templates available. One of the most popular is the General Testing Package. The method templates provide a "starting point" in configuring test methods that conform with your testing needs. The General Testing Package is separated into 4 specific testing categories.

MTS Tensile

This provides five basic Tensile method templates to help you create tests that will pull your specimens apart. Included with these methods are the pre-configured 2-speed method, an extensometer tensile method, and an extensometer/crosshead (actuator rod) tensile method.

MTS Compression

Supplies three Compression method templates allowing you to configure specific compression procedures.

MTS Flex

Within MTS Flex are two 3-Point Bend and one 4-Point Bend method templates.

MTS Peel-Tear

The Peel-Tear category provides five basic method templates: (1) Peel-Tear master, (1) generic Peel method, and (3) speciality Tear and Shear by Tension methods.

Optional features

Many additional features can be purchased to meet your company's specific needs. Some of these features might already be part of the system you ordered, or they can be added to your system as your requirements change.

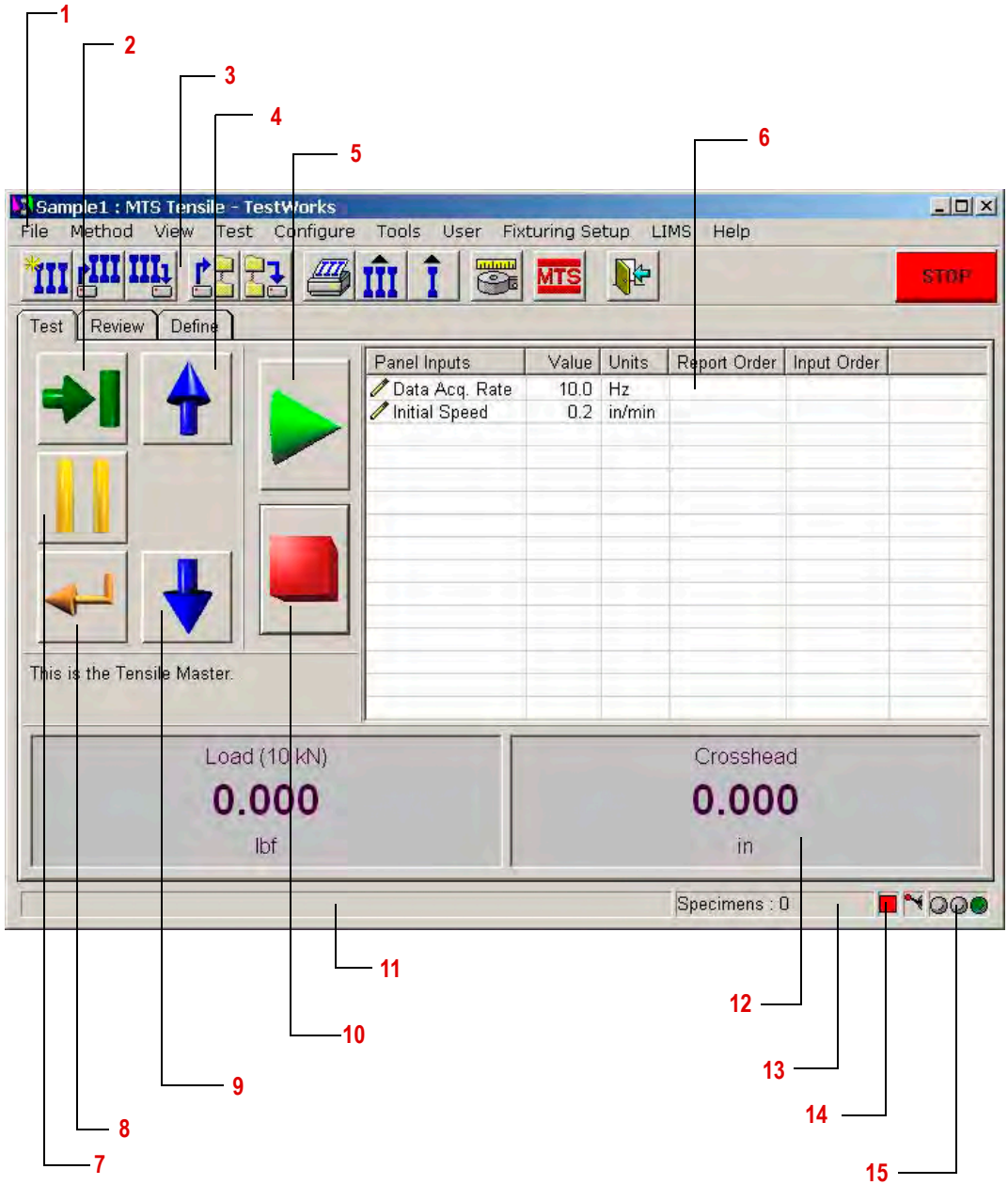
Note *In TestWorks 4 software, you can determine what options are included with your system by clicking the* ***Help*** *menu option and then selecting* ***About****.*

- Material Reference — This allows you to create target values for your results. You can specify a target, an upper and lower warning value, and an upper and lower error value. When you perform a test, informative icons will be displayed next to your results that tell you how the results compare to your targets.
- BiDirectional LIMS Interface — This adds the ability to communicate with most Laboratory Information Management Systems (LIMS). You can receive new test parameters from your LIMS, and then send the results back to the LIMS automatically.
- Advanced Rate Control — This allows you to perform closed-loop control of your machine using any data channel. It is often used to move the machine at a constant load rate or strain rate.
- MultiChannel Software — This allows you to create additional data channels that are derived from existing hardware and software channels.
- Creator Privilege Level — This provides you with the greatest flexibility to add and sequence the test segments that make up your methods. The Definer Privilege level that is part of the basic package only allows you to add test segments that do not control the machine. With the Creator Privilege level, you can add any test segment, and in any order you choose.
- SQC/SPC Package — This software option provides tools for analysis of test results in the manufacturing and quality control environments. These tools allow you to track sample data to recognize potential problems with manufacturing operations before they occur and to help fine-tune the manufacturing process to keep an acceptable level of control. Any configured test result or specimen input value can be monitored with this option.
- Additional Method Packages — MTS offers method packages specific to your testing needs - N, R, & K, Plastics, Seam Slippage, Foam, Multi-Cycle, etc. MTS can also create custom test methods based upon your needs at an additional cost.

Compatible systems

Compatible systems include: MTS Criterion, MTS Insight, MTS Alliance™ Load Frames, MTS S, D, G, and M Series Systems, MTS ReNew™ Systems, MTS DY2x and DY3x Systems, MTS Synergie Systems, Instron® E/M Systems, SATEC™ E/M Systems, Zwick™ E/M Systems, and Other E/M Systems.

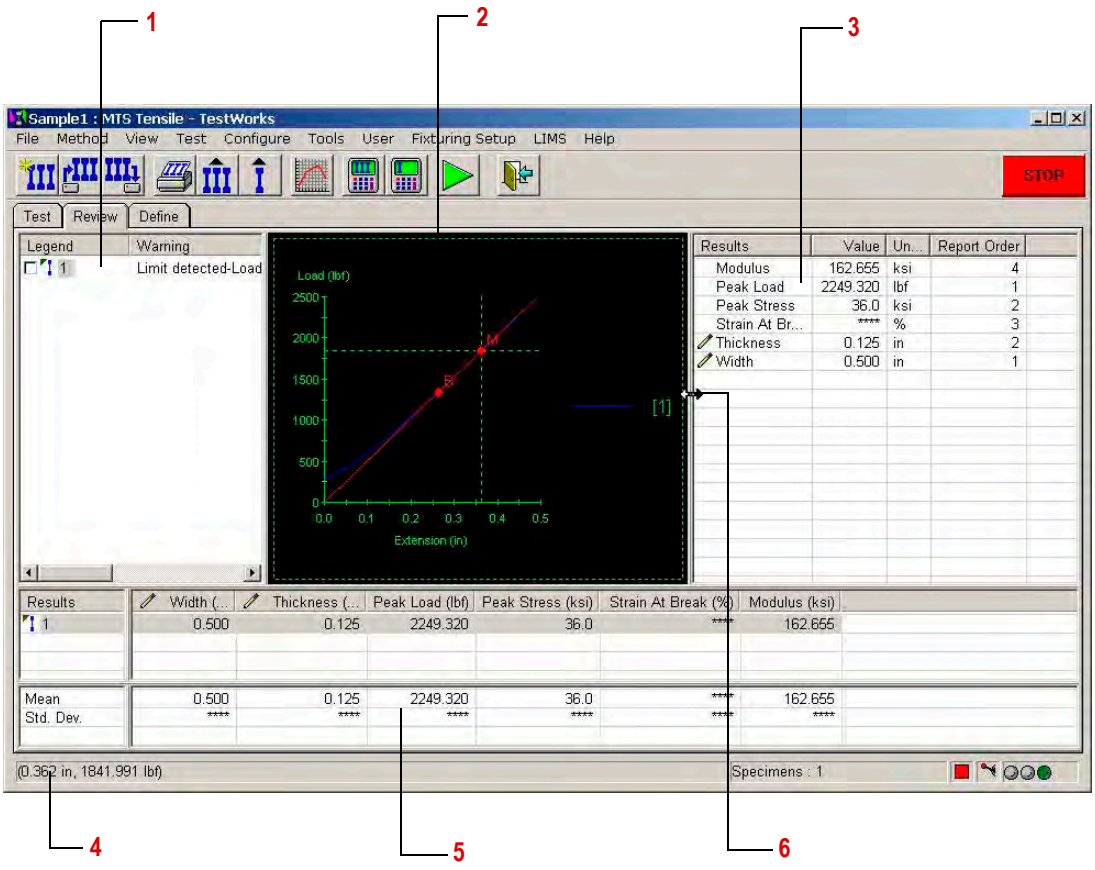
TestWorks 4 Test Window



Item	Control	Description
1	Main Menu	The Main Menu is always visible above the TestWorks 4 window and accesses many of the software features. Review each menu item in more detail with the use of the TestWorks 4 Help System. When you are viewing the Test Window or the Review Window, the main menu looks like the example on the preceding page. ***Note*** *To find out what a particular toolbar button does when using the software, simply place your mouse pointer on top of the button. A small Tool Tip window will display the name and function of the button.*
2	Move the crosshead (actuator rod) to a specified position	Prompts you to designate a new position for the crosshead (actuator rod). The crosshead (actuator rod) will then move to that position.
3	Toolbar	The toolbar contains buttons that perform common TestWorks 4 functions. Because there are three main tabs within TestWorks 4 software, your toolbar appearance can change. This is because there is a separate toolbar configuration for each of the tabs.
4	Move the crosshead up (retract the actuator rod)	Press and hold to move the crosshead in the up direction; or retract the actuator rod. Motion continues until the button is released.
5	Run	Click Run to start the test.
6	Panel input region	Allows you to view and sometimes edit the inputs that affect a test method. It contains the following five fields: Panel Inputs, Value, Units, Report Order, and Input Order.
7	Pause	Temporarily stops crosshead or actuator rod motion during a test. To resume motion, click Pause again.
8	Return	Returns the crosshead or actuator rod to its Zero Position at maximum speed.
9	Move the crosshead down (extend the actuator rod)	Press and hold to move the crosshead in the down direction; or extend the actuator rod. Motion continues until the button is released.
10	Stop	Click this button to stop the test is in progress.
11	Message region	Whenever TestWorks 4 is performing an action, it displays a message in this area. Typical messages include Loading, Analyzing, and the Method is Valid.

Item	Control	Description
12	Meter region	Digital displays of the signals coming from your data channels. Basic channels such as load and crosshead (actuator rod) position update in real-time whether or not a test is running. Formula channels only update during a test. From the Meters Region, you can change the number and type of meters displayed, zero (or tare) a data channel, configure a data channel and configure the device connected to a data channel.
13	Specimen count	This region displays the total number of specimens that have been tested within the sample.
14	Motion indicator	This indicator tells you the current state of the crosshead or actuator rod. The indicator appears asicons indicating that the crosshead is moving up (the actuator rod is retracting), the crosshead is moving down (the actuator rod is extending) or motion has stopped.
15	Frame/Hardware Status Toolbar	This area displays the Workspace Indicator, Clutch Setting, and Frame Status icons. Workspace Indicator - this indicator tells you whether the test method is configured to test above or below the crosshead. Clutch Setting - This only applies to systems with a clutch; some EM systems and all servohydraulic and ststic hydraulic systems do not have a clutch. This indicator indicates the clutch that your frame/machine is currently using. If the lever is pointed up, the machine is in high clutch. If the lever is pointed down, the machine is in low clutch. Frame Status - there are three machine status indicators. Place your mouse over the top of each of them and the Tool Tip will display the name of the indicator. The Upper Limit indicator refers to the upper crosshead limit; red means that the crosshead has reached this limit. The Lower Limit indicator refers to the lower crosshead limit; red means that the crosshead has reached this limit. The Connected indicator means that the software is connected to the test frame; red means that it is not connected.

TestWorks 4 Review Page Window



Item	Control	Description
1	Graph legend	This area displays specimen icons beside each specimen. The appearance will change according to the characteristics of the specimen. To make a specimen active, highlight the specimen inside the legend. The curve of the active specimen is displayed in the Review Graph and its results appear in the Result Panel.
2	Review graph	Plots your specimen data after the data has been collected and the test has ended. The Review Graph is displayed according to the settings made within the Review Graph Setup. The active curve appears in its own color and line style and contains a crosshair that is used to locate individual data points.
3	Results/input panel	Displays the results of the active specimen but can also display the raw channel data, required inputs, inputs for preallocated specimens or editable post-test inputs.
4	Data point indicator	Gives you the data point of the crosshair position on the Review Graph and the units of the extension and load.
5	Statistics table	Displays a statistical comparison of the specimen results for a specified sample.
6	Movable sash	Allows you to adjust the size of the window to your specifications.

TestWorks 4 Review Page Window

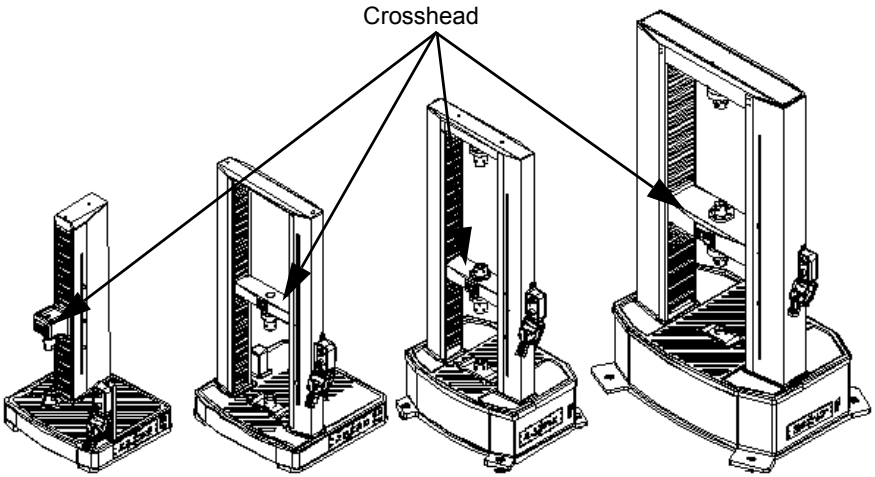
Systems Using TestWorks 4

TestWorks 4 can be used to control a wide variety of systems. Although TestWorks 4 can run on older systems and other non-MTS systems, this section details the various MTS systems that are currently shipping as of the publication date. You should be familiar with your system's components and the operation of system machinery.

Electromechanical (EM) Systems

The electromechanical (EM) load frames have a rectangular shape and include a base unit and one or two vertical columns. The two-column models have a fixed upper transverse beam. The moving crosshead is driven by precision ball screws on the load frame.

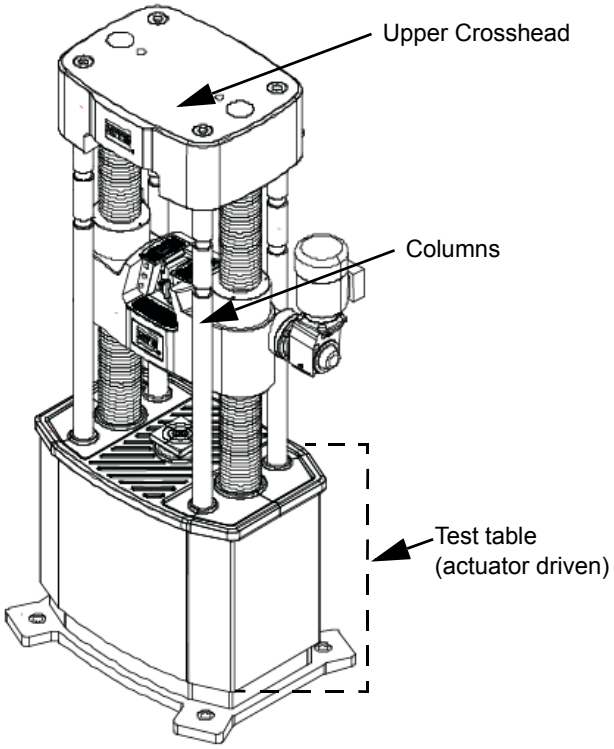
Important *The crosshead is the moving and force generating component during setup and testing.*



Static Hydraulic (StH) Systems

The static hydraulic (StH) frame is composed of base, test table, lower crosshead, upper crosshead, feeding rod, lead screw, etc. The test table is connected to the upper crosshead by the columns to form a stiff frame, and the test table is connected to the actuator rod through a load cell. There are two testing spaces in the frame: the tension space is between the upper and lower crossheads and the compression space is between the lower crosshead and the test table. Both the tension and compression spaces can be adjusted by moving the lower crosshead up and down according to your testing needs.

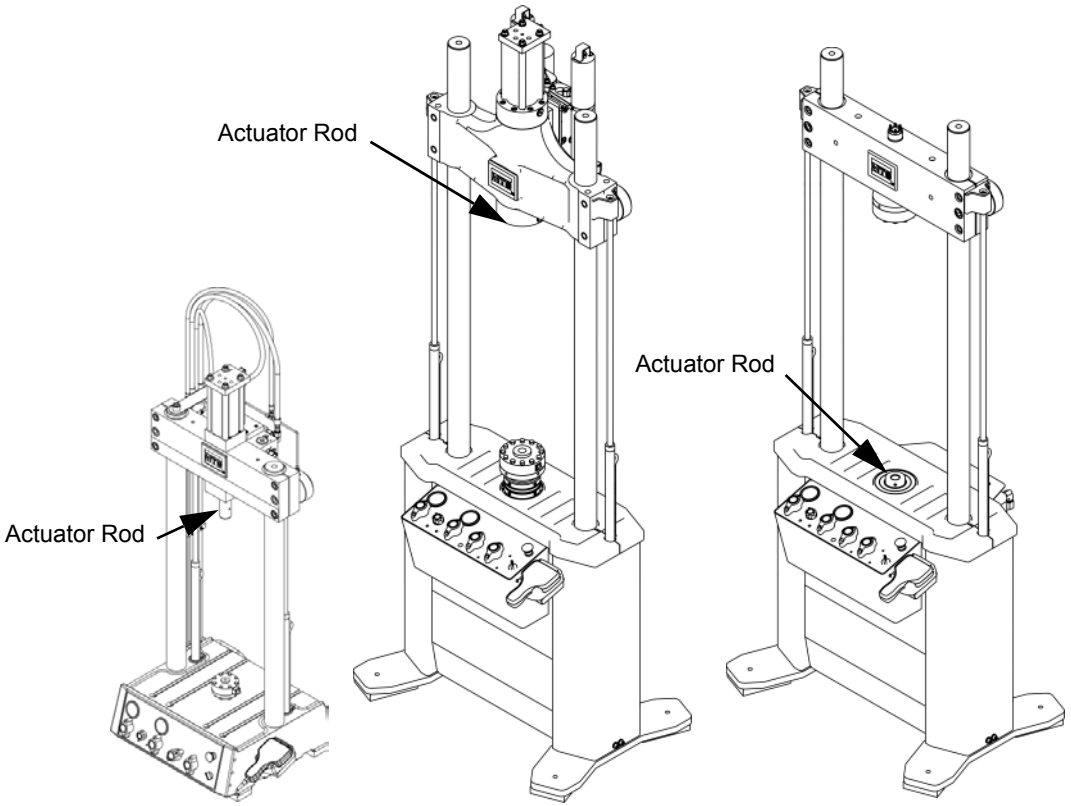
Important *The test table (driven by the actuator), upper crosshead, and columns are the moving and force generating components during setup and testing.*



Servohydraulic (SH) Systems

The servohydraulic (SH) load frame is a stand-alone testing unit. The load unit consists of the load frame plus additional parts: actuator, hydraulic service manifold with servovalve, hydraulic crosshead lifts, and control modules. Load units come in different sizes and shapes to accommodate a variety of testing requirements.

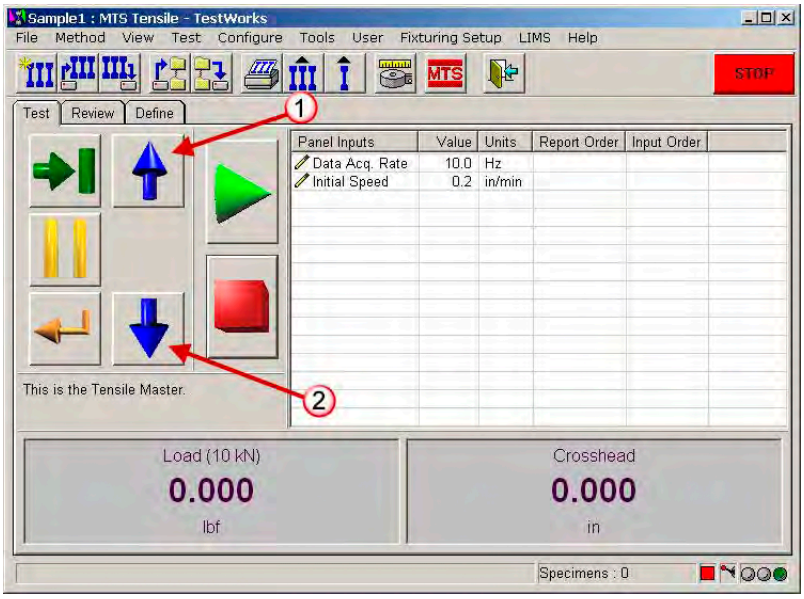
Important *The actuator rod is the moving and force generating component during setup and testing.*



What Happens When You Send a Command

It is important to know what will happen when you send a command to the crosshead or actuator. This is critical during setup and specimen installation.

For most EM systems, the up arrow (item 1 in the figure below) corresponds to crosshead up and the down arrow (item 2 in the figure below) corresponds to crosshead down. For most StH and SH systems, the up arrow corresponds to actuator rod retract and the down arrow corresponds to actuator rod extend.



The generalizations above are dependant on system polarity, the type of test being performed, the orientation of the load frame, the orientation of the actuator in SH load units, etc. For example, if the EM frame is configured horizontally, up and down become left and right.

Safety Notice

⚠ WARNING

You can not equate arrow indicators on the buttons with up and down direction of travel of the crosshead or the actuator rod.

Unexpected crosshead or actuator rod movement can cause equipment damage and personal injury.

Direction of crosshead or actuator rod travel depends on system polarity, the type of test being performed, the orientation of the load frame, the orientation of the actuator in SH load units, etc.

It is the customer's responsibility to know what will happen when a command is given to the frame either by the TestWorks main display controls or test program.

You can not necessarily equate arrow indicators on the buttons with up and down direction of travel of the crosshead or actuator rod. For example, in a load unit with baseplate mounted actuator, pressing the up arrow button retracts the actuator rod causing it to go down. But in a crosshead mounted actuator, pressing the up arrow button retracts the actuator rod causing the actuator rod to go up. Polarity of the valve driver could also affect actuator rod direction.

It is recommended that you try out the TestWorks controls without a specimen installed and observe what happens when the up or down arrow is pressed. It is your responsibility to know how your system performs.

Installation

This section explains how to install the MTS TestWorks 4 application and its associated software and package options. The application, options, and packages are installed using one common setup program, which lets you select which options and packages you want to install. There are three primary versions of the software:

- TW4 Essentials
- TW4 Advanced
- Reanalysis

Depending on which primary version you install, the TestWorks 4 software options can include:

- Product Editing Level
- One or more strain signals
- Reference Material Configuration Item
- Advanced Rate Control
- Multi-Channel

And depending on which primary version you install and which software options you install, the TestWorks 4 package options can include:

- SQC/SPC Package
- N, R, and K Package
- Seam Slippage Package
- Creep Stress Package
- Plastic Package
- Foam Package
- MultiCycle Package
- Multihead Package
- Bi-Directional LIMS Package

Install TestWorks

TestWorks 4 software is distributed on a CD-ROM that includes an auto run feature and a program that will lead you through the installation process. This latest version uses a software key to enable the main application. Additional software keys are used to enable the purchased options.

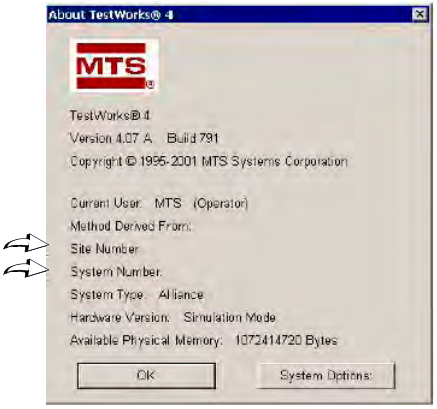
Note *If you are running Windows NT, 2000, or XP you must be logged in as an "Administrator" in order to install TestWorks 4 software.*

Before You Start

If you are upgrading a previous version of TestWorks, you are going to need the site number and system number later in the "Installation Procedure" on page 35. Before you start installing the TestWorks 4 software:

1. Start your current version of TestWorks 4.
2. Select the **About** option from the **Help** menu.

3. Record the **Site Number** and **System Number** for later reference.



4. Click **OK** and exit TestWorks 4.

Things You Need to Know

During the software installation, you will need to make selections or fill in required fields depending on the options you purchased, frame type, number of data acquisition boards, and so forth. Following, is a list of things you should make note of before starting the software installation.

- Customer name, site number, and system number.
  - If you are upgrading TestWorks, this is the information you noted in "Before You Start" on page 34.
- The keys for the software options you purchased.
- The number of stations located on you frame.
  - Typically this will be 1. Multi-head frames could have additional stations.
- The number of National Instruments' data acquisition boards.
  - This will be the number of additional data acquisition boards you have installed in your PC.
- The frame category.
  - This will be the general frame type such as MTS Insight or MTS Criterion 42.
- The frame type/
  - This will be the frame model such as MTS Insight 5.
- The National Instruments data acquisition board type.
  - This will typically be M-Series or E-Series.

Installation Procedure

In many cases, an MTS representative will have already installed your application software. Use this procedure if you need to make changes to your system.

1. Place the TestWorks 4 Master CD-ROM into your CD-ROM drive. If your drive is set up to support the auto run feature, allow a few seconds for the program to run.

   If the install program does not load automatically, click the start button typically located in the lower left-hand corner of the screen and click **Run**. In the Open box, type *D*:\Setup.exe, where *D* is the letter of your CD-ROM drive. Click **OK**.

2. Follow the onscreen prompts to complete the software installation.

   Refer to the information you made note of in the previous section to complete some of the fields that require your input. See "Things You Need to Know" on page 35.

Running a Test

This section is a brief description on executing a simple test within TestWorks 4 software. Depending on the method and physical setup, there can be additional steps to be taken not mentioned in this section. Please review the General Information Section to familiarize yourself with all the icons and options within the software before running your first test.

Use the following steps as a guide when running a test.

Launching TestWorks 4

To launch TestWorks 4, double-click on the TestWorks 4 icon placed on your computer's desktop during software installation. Or:

1. Click on the **Start** button located in the lower left-hand corner of your screen.
2. Select **Programs**.
3. Point to **MTS TestWorks 4**.
4. Select **TestWorks 4**.

Logging on to TestWorks 4

Once the program has been launched, the **User Login** window appears.

1. Either type your user name in the **Name** edit box or select the appropriate user name with the pull down list.

Note *Passwords are case sensitive.*

2. Type your password into the **Password** edit box.
3. Click OK.

Opening a method

Once you have logged in, the **Open Method** dialog appears.

1. Use the pull-down arrow to find the specific method you want to run.
2. The filename of the method will appear in the Filename edit box, if this is the correct method then click OK.

Note *To verify that you loaded the correct method, the method filename is displayed on the title bar at the top left-hand portion of the screen.*

Starting a test

After the specific method has been loaded into the program, you are then ready to begin testing.

Note *It might be necessary to calibrate the load cell, refer to "Calibration Method Description" on page 195.*

1. Load the specimen to be tested in the fixturing and click on the Green Arrow icon button. This will start the program.

Note *By default, the Green Arrow icon button is available on all views of the software, so a test can be executed from the Test, Review, and Define pages.*

2. Depending on the configuration of the method, you might be prompted for required inputs (for example, Sample ID, Width, and Thickness of the specimen, etc.). Edit the appropriate information and click OK.

After all the required inputs are edited, the physical execution of the test begins (the crosshead or actuator rod will move until the specified method conditions are met).

Post-test actions

Once the test is over, the Review page will be displayed. From here, you will be able to review the testing data (refer to "Reviewing Data" on page 131 for more information). The following section describes some options available once a test is complete:

Run another Specimen

Load another specimen into the testing system and click on the Green Arrow - this will execute the program again.

Save a Sample

After you have completed your testing, you might want to save the data. To save a sample, click on the File menu option and selecting either Save or Save As. (Another option is to click on the Save icon on the toolbar).

Create a New Sample

After all the specimens have been tested, you might want to test another set of specimens using the same method. To create a new sample, click on the File menu option and select New Sample (or click on the New Sample toolbar icon).

Print a Report

To print a report of the data collected during testing, click on the File menu option, highlight Print, and select either Sample (prints the sample report) or Specimen (prints the specimen report of the specimen highlighted on the Review page).

Export the data

To export the data collected during the test, click on the **File** menu option, highlight Export, and select either Sample (export the sample data), Specimen (exports the highlighted specimen on the Review Page data), or All Specimens (exports all the specimen's data within the sample) or click on the Sample or Specimen toolbar icon button.

Load another Method

You might want to change the method to test different types of specimens. To change the Method, click on the Method menu option and select Open. This step will display the Open Method dialog screen. Select the new method for your next test and click OK.

Printing and Exporting Data

Printing a report

TestWorks 4 enables you to print your results in a customized report format.

TestWorks 4 also allows the ability to preview the **Report**, depending on your word processor, the report can be edited before printing. This can be done by clicking on the **File** menu option, highlighting **Print Preview**, and selecting either **Sample** or **Specimen**.

Note *The report will be printed according to the specifications made in the* ***Report Configuration Items*** *of the current test method.*

There are several ways to print a report:

1. Press the **<F3>** key on your keyboard.

Or,

1. Click on **File** menu option.
2. Click on **Print**.
3. Select either **Specimen** or **Sample**.

Or,

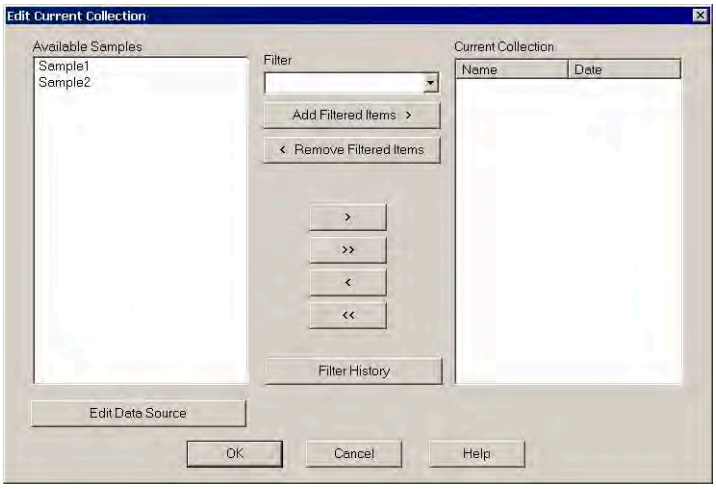
1. Click on the **Print Sample** or icon on the Toolbar.

   Print Sample - This item prints a sample report for the current sample. The report is printed based on the settings within the Sample Report configuration item of the current test method.

   Print Specimen - This item prints a specimen report for the last specimen tested. The report is printed based on the settings within the Specimen Report configuration item of the current test method.

Batch print

Another option available in TestWorks 4 is the **Batch Print** function. To access this option, click on the **File** menu option and select **Batch Print**. This will initialize the function and display the **Edit Current Collection** dialog box.



The **Edit Current Collection** dialog box displays the samples found in the specified data source path(s). These samples are displayed under the **Available Samples** list box. The samples used in the analysis are added to the **Current Collection** on the right. This is done through manual selection of **Available Samples** or applying a **Filter** to search for specific samples.

If the data source for the available samples is incorrect, you can click on the **Edit Data Source** to browse for the correct path.

There are two ways to add sample groupings to the **Current Collection**:

Manually add

Highlight the samples to be added in the **Available Samples** list box and click on the **>** button (to add one sample at a time) or the **>>** button (to add all samples available).

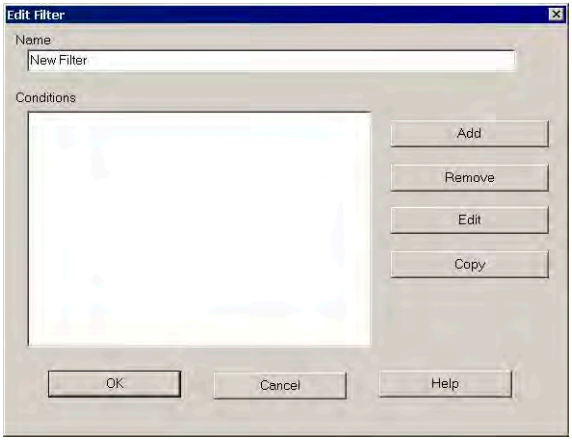
Once all specific samples to be printed have been added, click **OK**. TestWorks 4 will then print the reports for all selected samples.

Applying a filter

A Filter will allow you to search a data path for specific samples. Any sample satisfying the Filter configuration can be added or removed from the *Current Collection* list box.

To add a New Filter:

1. Select [**New Filter…**] from the **Filter** pull-down box. This will display the **Edit Filter** dialog box.



2. Click on the **Add** button. This will display the **Select a Condition Type** screen. The following options are available:

   Sample Name Condition - This allows you to search for a specific Sample Name or any sample name containing certain prefixes, suffixes, or characters. Enter the **Sample Filter Condition** in the box beneath Sample Name. For more Advanced searching, click on the arrow at the end of the dialog box.

Note *When using the advanced search - the * is a wildcard character that allows for any number of characters before or after a set of Sample Name characters. For example, Te* will search Sample Names beginning with the letters Te. The ? is a DOS wildcard character that allows for searches with a specific number of characters occurring in the Sample Name search. For example, Te?s? will search Sample Names beginning with Te followed by a single character (denoted by ?) followed by s and another single character (denoted by the second ?).*

Data Range Condition

The **Date Range Condition** allows for filter Samples by the beginning and ending date when the Sample(s) were created or most recently modified.

Result Comparison Conditions

This condition will add any Samples that contain a result that satisfies the **Result Comparison** condition to the **Current Collection**. The Samples are added to the **Current Collection** independent of the Method from which they were created. The **Result** box will contain results found in the selected Method.

User Name Condition

The **User Name** filter condition is used to locate Samples based on the User that created them and adding these Samples to the **Current Collection**. Enter the **User Name Filter** Condition in the box beneath User Name or select from the pull-down list. For more advanced searching, click on the arrow at the end of the dialog box.

Method Condition

This condition filters based on the **Method** that was used to generate the Sample. The Samples found are added to the **Current Collection**. Enter the **Method Filter Condition** in the box beneath Method Name or select from the pull-down list. For more Advanced searching, click on the arrow at the end of the dialog box.

Last N Samples Condition

The **Last *N* Samples Conditions** searches for Samples based on their Creation Date.

Once a **Filter** has been added, you can then select it on the **Filter** combo box, click on the **Add Filter Items >** button and the samples meeting the filter condition will be added to the *Current Collection*. Additionally, you can remove specific samples by clicking on **Remove Filtered Items**.

The **Edit Filter** dialog also gives you the ability to *Edit*, *Copy* or *Delete* existing filters.

Exporting data

TestWorks 4 gives you the ability to Export test data to a file that can then be used to analyze the data within a spreadsheet or other type of program. Depending on the configuration of the Export file, you can export test results, test information, or the raw data collected during the tests.

TestWorks 4 also gives you the ability to preview the Export file before the actual exporting of the data has been executed. This can be done by clicking on the File menu option, highlighting Export Preview, and selecting either *Sample* or *Specimen*.

Note *The report will be printed according to the specifications made in the* ***Report Configuration Items*** *of the current test method. The Export File will be stored to the path configured within TestWorks 4.*

Follow these steps to export a file:

1. Select the **File** menu option.
2. Click on **Export**.
3. Select either **Specimen** or **Sample** or **All Specimens**.

   Specimen - This item writes a specimen Export file for the last specimen tested. The file is written according to the settings made in the **Specimen Export** configuration item of the current test method.

   Sample - This item writes a sample **Export** file for the current sample. The file is written according to the settings made in the **Sample Export** configuration item of the current test method.

   All Specimens - This item exports all specimens in the current sample according to the settings in the **Specimen Export** configuration item. Once started, the **Export All Specimens** function can not be aborted. Make sure you want to export all the specimens before choosing this item.

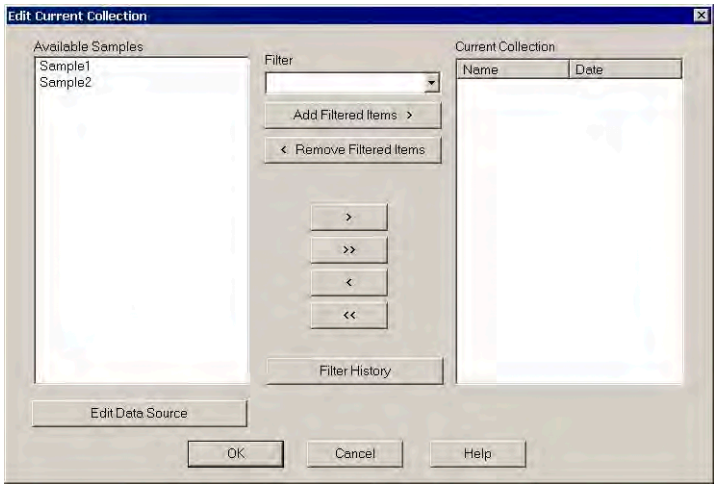
Note *This feature will not function if the file mode is set to Overwrite on the Specimen Export configuration item.*

Or,

1. Click on the **Export Sample** or **Export Specimen** icon button on the Toolbar.

Batch export

Another option available in TestWorks 4 is the **Batch Export** function: To access this option, click on the **File** menu option and select Batch Print. This will initialize the function and display the **Edit Current Collection** dialog box. When a **Batch Export** is executed, TestWorks 4 creates an Export file for each sample selected and automatically sends the file to the Export file destination directory.



The **Edit Current Collection** dialog box displays the **Samples** found in the specified data source path(s). These Samples are displayed under the *Available Samples* list box. The Samples used in the analysis are added to the *Current Collection* on the right. This is done through manual selection of *Available Samples* or applying a **Filter** to search for specific Samples.

If the data source for the available samples is incorrect, you can click on the **Edit Data Source** to browse for the correct path.

There are two ways to add sample groupings to the *Current Collection*:

Manually add

1. Highlight the samples to be added in the *Available Samples* list box and click on the **>** (to add one sample at a time) or **>>** (to add all samples available) button.

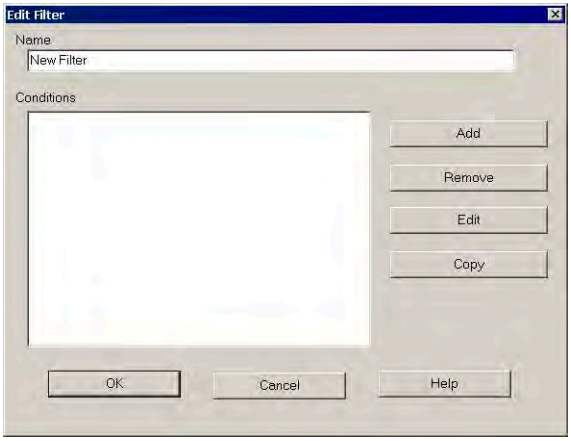
2. Once all specific samples to be printed have been added, click OK. TestWorks 4 will then print the reports for all selected samples.

Applying a filter

A Filter will allow you to search a data path for specific samples. Any sample satisfying the Filter configuration can be added or removed from the *Current Collection* list box.

To add a New Filter:

1. Select [**New Filter…**] from the **Filter** pull-down box. This will display the **Edit Filter** dialog box.



2. Click on the **Add** button. This will display the **Select a Condition Type** screen. The following options are available:

   Sample Name Condition - This allows you to search for a specific Sample Name or any sample name containing certain prefixes, suffixes or characters. Enter the Sample Filter Condition in the box beneath Sample Name. For more Advanced searching, click on the arrow at the end of the dialog box.

Note *When using the advanced search - the * is a wildcard character that allows for any number of characters before or after a set of Sample Name characters. For example, Te* will search Sample Names beginning with the letters Te. The ? is a DOS wildcard character that allows for searches with a specific number of characters occurring in the Sample Name search. For example, Te?s? will search Sample Names beginning with Te followed by a single character (denoted by ?) followed by s and another single character (denoted by the second ?).*

Data Range Condition

The **Date Range Condition** allows for filter Samples by the beginning and ending date when the Sample(s) were created or most recently modified.

Result Comparison Conditions

This condition will add any Samples that contain a result that satisfies the **Result Comparison** condition to the **Current Collection**. The Samples are added to the Current Collection independent of the Method from which they were created. The **Result** box will be populated with results found in the selected Method.

User Name Condition

The **User Name** filter condition is used to locate Samples based on the User that created them and adding these Samples to the **Current Collection**. Enter the **User Name Filter Condition** in the box beneath **User Name** or select from the pulldown list. For more Advanced searching, click on the arrow at the end of the dialog box.

Method Condition

This condition filters based on the **Method** that was used to generate the Sample. The Samples found are added to the **Current Collection**. Enter the **Method Filter Condition** in the box beneath Method Name or select from the pull-down list. For more Advanced searching, click on the arrow at the end of the dialog box.

Last N Samples Condition

The **Last *N* Samples Conditions** searches for Samples based on their Creation Date.

Once a **Filter** has been added, you can then select it on the **Filter** combo box, click on the **Add Filter Items >** button and the samples meeting the filter condition will be added to the *Current Collection*. Additionally, you can remove specific samples by clicking on **<Remove Filtered Items**.

The **Edit Filter** dialog also gives you the ability to *Edit*, *Copy* or *Delete* existing filters.

Creating a Method - Using Edit Method

TestWorks 4 allows you to create your own test methods to conform with your specific testing needs. This section will briefly describe the essential options within the Edit Method menu option. It is important to note that the Edit Method option is not the only way to configure a method. MTS offers the Define Page for advanced configurations as well.

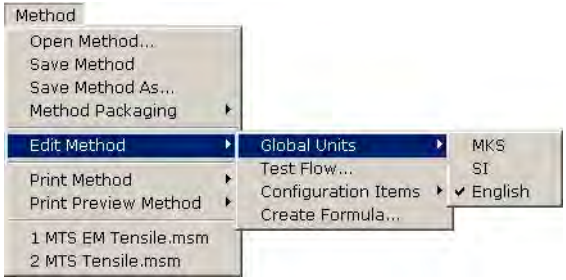
Before you start configuring a method, MTS has provided you with *Master Methods*. These methods provide a "starting point." Depending on the test needing to be performed, load in the *Master Method* that best suits your testing purpose. Once the method is loaded into the program, edit the necessary parameters to configure the *Master Method* to your specification. After you have written your custom method, save under a name that describes your test procedure to ensure testing repeatability. In order to access the **Edit Method** option, the software must display the Test Page. Select the **Method** menu option and highlight **Edit Method**. This will display the following options.

- Global Units
- Test Flow
- Configuration Items
- Create Formula

Edit global units

The Global Units Submenu, can be located by clicking on Method, highlighting Edit Method, and then highlighting Global Units. This allows the user to change the unit category throughout the entire program. You can select from English units (such as pounds, inches, p.s.i.), SI units (such as Newtons, millimeters, MPa), and MKS units (such as kilograms force, millimeters, kgf/mm2). When you change the Units category of a test method, TestWorks 4 will automatically convert all channel, formula and input values into the new units. For instance, if a test method has been set up to use English units you can change the test method into SI units. In such an example, an Extension input of 2 inches would be automatically converted to 50.8 mm.

If the current unit category is one of the three built-in categories (as opposed to a user definer category), then a check mark will appear on the menu next to the currently selected category. The following illustration shows the current selected category displayed in English units.

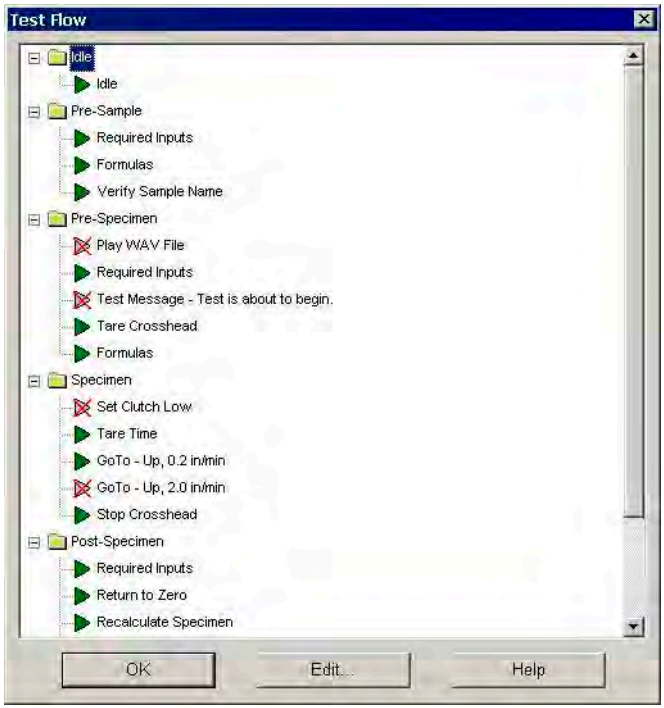


Edit test flow

The Test Flow Dialog displays the order of all the test segments in the current method. The Test Flow is similar to the directory tree within *Microsoft Explorer®* or *File Manager®*. To access the Test Flow, click on the menu option Method, highlight Edit Method, then select (highlight) Test Flow. This will display the Test Flow dialog. In TestWorks 4, each folder in the test flow is called a *Test Section*. A *Test Section* can contain *test segments*, which drive the program to execute a test.

In such a case, a plus (+) sign will appear in front of its name, as shown below:

- To *view* the contents of the test section, simply double-click on its folder or single-click on the plus (+) sign in front of its name.
- To *close* a test section, click on the minus (-) sign in front of its name.



The Test Flow is divided into the following sections:

Idle This section contains only the Idle test segment, which has no settings. It is active whenever your system is not running a test. Although the Idle test segment has no settings, the tasks associated with this test segment are active.

Pre-Sample This section contains the test segments that will be performed when the first specimen in a new sample is run.

Pre-Specimen This section contains test segments that will be performed for each specimen that is tested. It is commonly used to prompt you for information about the specimen that you are testing.

Specimen This section contains the test segments that perform the physical testing of the specimen.

Note *Special attention should be paid to the test segments contained in this section. These test segments typically control the crosshead or actuator rod movement of your machine and test segments not properly set up can result in damage or injury.*

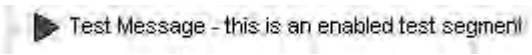
Post-Specimen This section contains test segments that will be performed *after* the test segments inside the Specimen section have been completed or when they are called by a test segment or task.

Post-Sample This section contains test segments to be performed *after* the test segments inside the Post-Specimen section have been completed, and the maximum number of specimens have been tested or when they are called by a test segment or task.

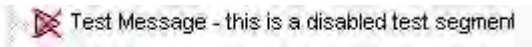
Each Test Section contains test segments that are performed when a test is run. Test segments are individual commands used to perform a test. A wide variety of test segments are used in a TestWorks 4 method. Some perform hardware functions, such as moving the crosshead or actuator rod. Other test segments perform software functions such as printing a report or calculating a formula result. The number of test segments and order or test segments is defined by the current method.

Only test segments that are enabled will be performed when a test is run. Disabled test segments are skipped.

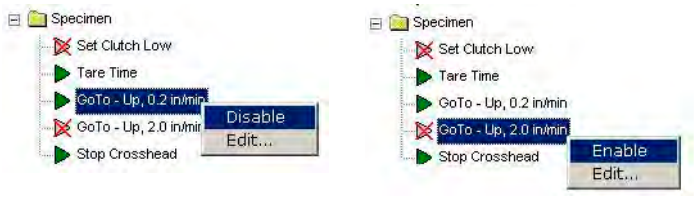
An *enabled* test segment displays the following arrow icon:



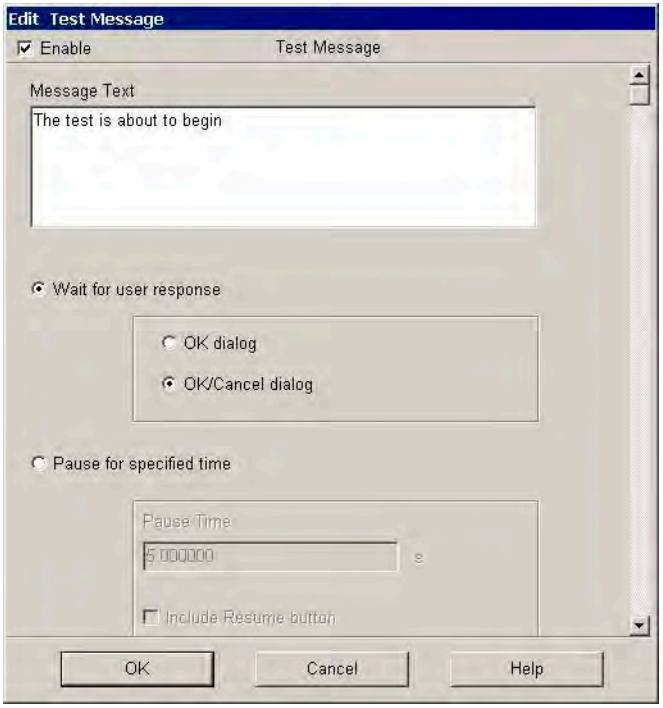
A *disabled* test segment displays the following icon:



You can disable an enabled test segment or enable a disabled test segment by right-clicking on that test segment. A popup menu will appear. If a test segment is enabled, a Disable option will appear on the menu. You can disable the test segment by selecting the Disable option from the popup menu. Likewise, if a test segment is disabled, an Enable option will appear on the menu. You can enable the test segment by selecting the Enable option from the popup menu.



You can edit a test segment's configuration by right-clicking on a test segment and selecting the Edit… option from the popup menu. You can also edit a test segment by selecting the test segment and clicking the Edit button at the bottom of the dialog. Editing a test segment will pop up another dialog and contain the fields you can edit for the selected test segment. An example of the dialog which will pop up is shown on the following page.



Note *To close the test segment dialog and save your changes, click the OK button. To close the test segment dialog without saving changes, click the* ***Cancel*** *button.*

Some controls on the test segment dialog can require a certain level to be accessed. If your user level is not high enough to access these controls, then these controls will be disabled or hidden.

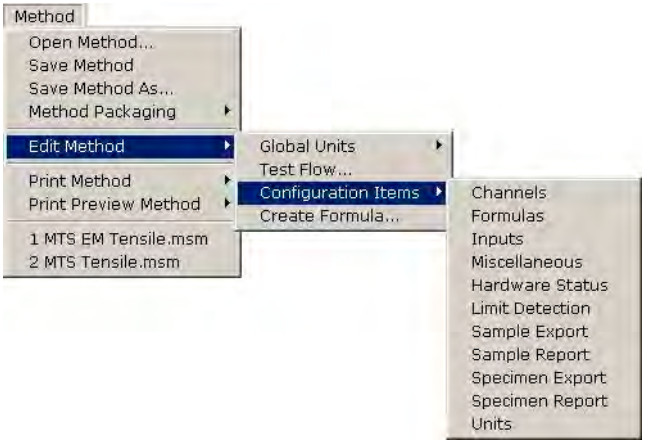
Editing a test segment from the ***Test Flow*** *dialog is equivalent to editing a test segment on the Define page.*

You can not add or remove test segments from the ***Test Flow*** *dialog. You must have access to the Define Page to add or remove test segments. (This dictates being a Definer Level User.).*

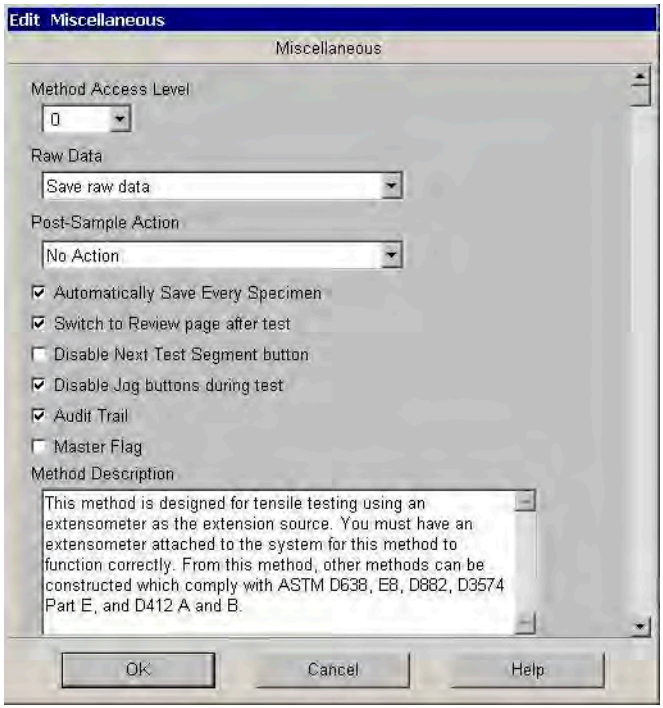
To close the ***Test Flow*** *dialog, click the* ***OK*** *button at the bottom of the dialog.*

Edit configuration items

To access the Configuration Items, click on the menu option Method, highlight Edit Method, select (highlight) Configuration Items, and highlight the desired item from the displayed list.



From this Menu you can select a Configuration Item for editing. All Configuration Items currently in the method will appear in this menu. When you select one of these Configuration Items from the menu, a dialog will pop up which will contain the fields you can edit for the selected Configuration Item. An example of the dialog which will pop up is displayed on the following page.



Note *To close the dialog and save your changes, click the OK button. To close the dialog without saving changes, click the Cancel button.*

Some controls on the dialog can require a certain level to be accessed. If your user level is not high enough to access these controls, then these controls will be disabled or hidden.

Editing a Configuration Item from this menu is equivalent to editing a configuration item on the Define Page.

Creating formulas (Formula builder)

The Formula Builder provides a quick and easy way to create formulas for use in your TestWorks 4 methods. To access the Formula Builder, click on the menu option Method, highlight Edit Method, select (highlight) Create Formula and the dialog will appear.

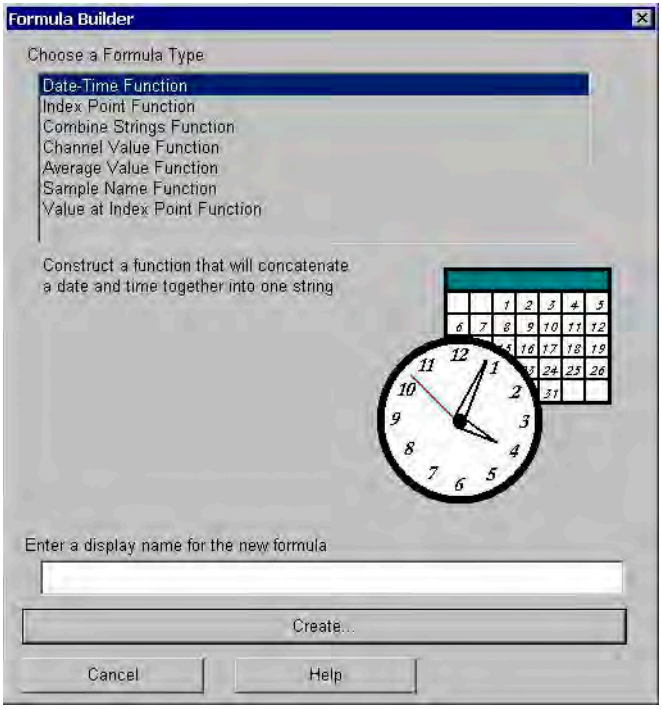
To use the Formula Builder, select the type of formula you wish to create in the “Choose a Formula Type” list box. A description of the formula type you have chosen will appear below the list box. For most types of formulas you will also need to enter a name for the new formula in the edit box near the bottom of the dialog. To start building your formula, click the Create button.

Next, a dialog specific to the type of formula you have chosen will appear. By making selections on this dialog, you can customize the formula to meet your needs. Then simply click on the OK button to add the new formula to your method.

The standard formula types that you can build are listed below. To see more detailed information on the different types of formula builders, click on a formula type.

Standard Formula Builder types:

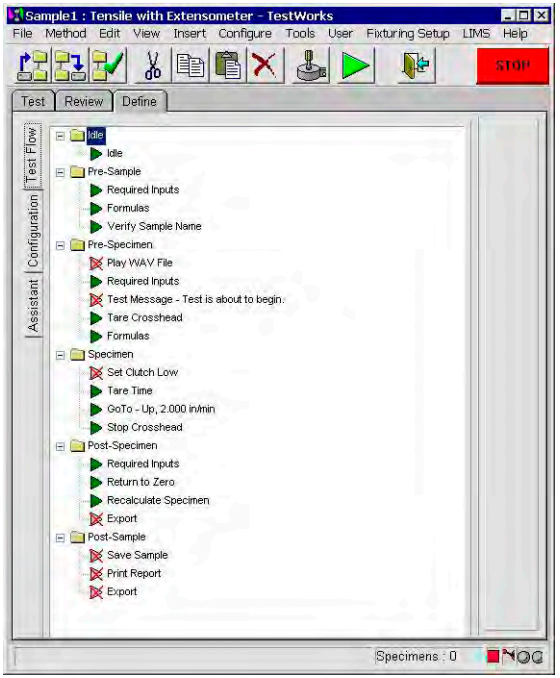
- Date - Time
- Index Point
- Combine Strings
- Channel Value
- Average Value
- Sample Name
- Value at Index Point


Formula Builder
Choose a Formula Type
Date-Time Function
Index Point Function
Combine Strings Function
Channel Value Function
Average Value Function
Sample Name Function
Value at Index Point Function
Construct a function that will concatenate
a date and time together into one string
Enter a display name for the new formula
Create...
Cancel
Help

Test Flow / Test Segment Configuration

This section covers the **Edit Method - Test Flow** option. The **Test Flow** is a list of commands that will be performed when a test is run. This section will step you through the basic configuration of each test segment.

Note *This section describes the basic test segments available within TestWorks 4. Depending on the method, other test segments can be displayed. This should be used as a guide to familiarize yourself with the basic configuration.*



Idle

This section contains only the **Idle** test segment, which has no settings. It is active whenever your system is not running a test. Although the Idle test segment has no settings, the tasks associated with this test segment are active.

Idle

This test segment is located solely within the **Idle** Test Flow folder. It becomes operational whenever a test is not being performed. No settings or any physical action is required. However, a test can be triggered by an incoming signal through the Digital Input task of this test segment.

Pre-Sample

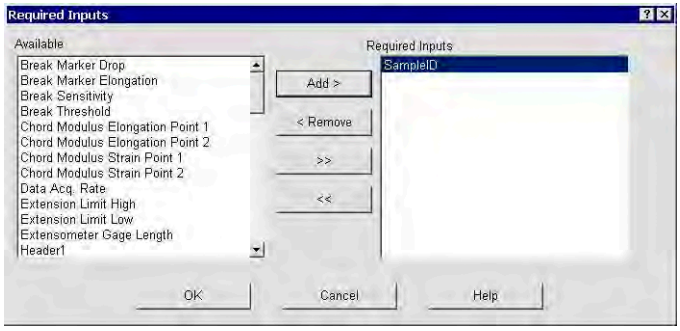
This section contains the test segments that will be performed when the first specimen is run in a new sample.

Required inputs

This test segment will prompt you for the inputs that are listed in the table. However, in the MTS templates (methods provided with software), the are no inputs listed. To add an input to the table, you must edit the desired input and change its When setting to Pre-Sample and place a check mark beside the Required Input option. These inputs deal with information pertaining to the sample. For example, Sample ID.

To modify this test segment, either double-click on an existing **Required Inputs Test Segment** (or right-click and select **Edit**) or right-click and select **Add/Remove** or **Create New**. Complete the following steps:

1. Place a check mark inside the **Enable** box to activate the required inputs test segment. You can also select **Enable/Disable** by right-clicking on the **Required Inputs Test Flow** parameter.
2. To add inputs within this test segment, right-click within the **Required Inputs Test Segment** dialog and select **Add/Remove Required Input**. The following dialog enables you add or remove required inputs from this test segment. Just select the inputs desired to be added or removed from choice list for the method.



3. To create an input please refer to “Inputs” on page 87.

Note *The **Unattended** check box is for **Robot Systems** only.*

Note *If applicable, the **Strings Cannot Be Empty** checkbox when checked indicates that a value (text) must be entered.*

Formulas

This test segment will calculate the formulas that are listed in the table. To add a formula to the table, you must edit the desired formula and change its When setting to Pre-Sample. A typical formula used in this section would be the SampleName formula. This configures the test method to utilize the SampleID sample information input to automatically name your sample file when you test the first specimen in the sample.

To modify this test segment, either double-click on the Formulas or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Formulas test segment.
2. To add inputs within this test segment, right click within the Edit Formulas dialog and select Add/Remove Formula. The following dialog enables you Add or Remove formulas from this test segment. Just select the inputs desired to be added or removed from the choice list for the method.
3. To create a custom formula, please refer to “Formula Builder - (Creating Formulas)” on page 111.

Verify sample name

This test segment evaluates the sample name entered by the user and provides a warning message if the file already exists on disk or if the sample name contains an invalid character that will cause an error when saving the file. This segment is only useful if the test method has been set up so that the formula whose internal name is SampleName has been enabled.

This test segment is only valid in the Pre-Sample section of the test flow. It is typically executed after the pre-sample formulas have been calculated.

To modify this test segment, either double-click on the Verify Sample Name or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Verify Sample Name test segment.
2. Type a run-time message into the Run-Time Message text box.

Pre-Specimen

This section contains test segments that will be performed for each specimen that is tested.

Play WAV file

This test segment plays the WAV file that is specified. A WAV test segment can be used to play a file that provides verbal instructions for a test procedure.

To modify this test segment, either double-click on the Play WAV File or right click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the WAV File test segment.
2. Click on the Browse button to load the specific WAV file.
3. Type a run-time message into the Run-Time Message text box.

Required inputs

This test segment will prompt you for the inputs that are listed in the table. These inputs are generally used to describe each specimen within a sample. For example, Width and Thickness would be required inputs (Pre-Specimen) because these inputs would vary from specimen to specimen.

To modify this test segment, either double-click on an existing **Required Inputs Test Segment** (or right-click and select **Edit**) or right-click and select **Add/Remove** or **Create New**. Complete the following steps:

1. Place a check mark inside the **Enable** box to activate the required inputs test segment. You can also select **Enable/Disable** by right-clicking on the **Required Inputs Test Flow** parameter.
2. To add inputs within this test segment, right-click within the **Required Inputs Test Segment** dialog and select **Add/Remove Required Input**. The resultant dialog allows you to add or remove required inputs from this test segment. Just select the inputs desired to be added or removed from choice list for the method.
3. To create a custom input please refer to "Inputs" on page 87.

Note *The **Unattended** check box is for **Robot Systems** only.*

Note *If applicable, the **Strings Cannot Be Empty** checkbox when checked indicates that a value (text) must be entered.*

Test message

This test segment displays a message dialog that can be customized to display until you respond to it or to display for a fixed amount of time. Typically, this segment is used to convey instructions to the user who is running a test. For instance, you might create a message that says *"Have you calibrated your load cell? Click Cancel if you have not."*

To modify this test segment, complete the following steps:

1. Place a check mark inside the **Enable** box to activate the **Test Message Test Segment**.
2. Type the desired message into the **Message Text** box.
3. Click on the **Wait for user response** option if you want TestWorks 4 to display your message until you respond to it.
   - Click on the **OK dialog** option if you want merely an OK response available within the test message.
   - Click on the **OK/Cancel dialog** option if you want OK and Cancel responses available within the test message.
4. Click on the **Pause for specified time** option if you want TestWorks 4 to display the message for a specified amount of time.
   - Type the desired amount of display time into the **Pause Time** text box.
   - Place a check mark inside the **Include Resume button** box if you want a Resume button to appear within the message box. This button allows you to force the test to continue before the display time has expired.

Tare *(channel)*

This test segment resets your selected *data channel* to 0. It is commonly used to zero the crosshead or actuator rod position, or the time before a test begins.

To modify this test segment, complete the following steps:

1. Place a check mark inside the **Enable** box to activate the **Tare Test Segment**.
2. Click on the **Channel** combo-box to select the data channel that will be reset to 0.
3. Type a run-time message into the **Run-Time Message** text box.

Formulas

This test segment will calculate the formulas that are listed in the Edit Formula table. To add a formula to the table, you must edit the desired formula and change its When setting to Pre-Specimen. Some typical formulas used in this section would be Area, Load Cell Capacity, and Adjusted Gage Length.

To modify this test segment, either double-click on the **Formulas Display Name** or right-click and select **Edit**. Complete the following steps:

1. Place a check mark inside the **Enable** box to activate the **Formulas Test Segment**.
2. To add formulas within this test segment, right-click within the **Formulas** dialog and select **Add/Remove Formula**. The resultant dialog allows you to add or remove formulas from this test segment. Just select the inputs desired to be added or removed from choice list for the method.
3. To create a custom formula, please refer to"Formula Builder - (Creating Formulas)" on page 111.

Specimen

This section contains the test segments that perform the physical testing of the specimen. Data can only be collected within this section.

Note *Please note that some test segments can appear within your method. This manual covers the typical method settings. If you need help configuring a test segment not covered, please consult MTS.*

Set clutch

This test segment changes the machine clutch to the setting that you have selected.

Note *Some EM machines and all servohydraulic and static hydraulic machines will not have a clutch. To verify a clutch machine, check for the lever icon in the lower right-hand corner of the TestWorks software.*

To modify this test segment, complete the following steps:

1. Place a check mark inside the **Enable** box to activate the **Set Clutch Test Segment**.
2. Click on the **Clutch Value** combo-box to select the clutch to be set.
3. Type a run-time message into the **Run-Time Message** text box.

Tare *(channel)*

To configure refer to "Tare (channel)" on page 64 in the Pre-Specimen section. For MTS method templates, the Tare is defaulted to zero the Time channel. This should not be altered – so each specimen run will have accurate time values.

GoTo

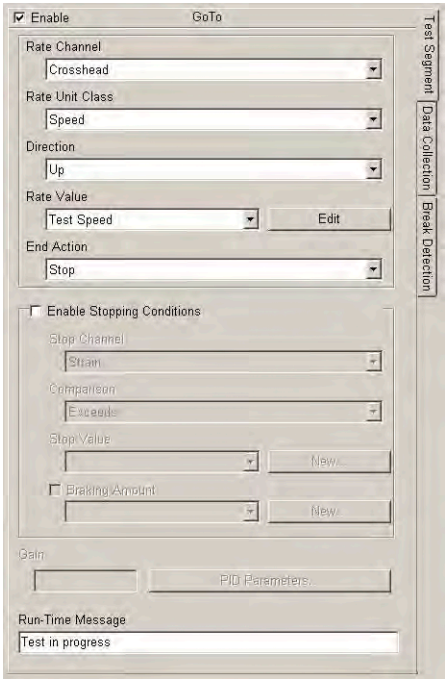
These are the instructions for Editor/Definer/Creator Level Users using the Edit Method Menu Option.

Test Segment

This test segment is designed to move the crosshead or actuator rod at a specified rate. The segment can stop at a specified value or go forever until break (or some other limit) is detected. The dialog is divided into a few portions:

- The **Rate Value** will always appear.
- The **Stop Value** will only appear if the test segment has been configured by a Definer/Creator-Level user to use a Stop Value.

To modify this test segment, double-click on the **GoTo** segment or right-click and select **Edit**. Complete the following steps:



1. Place a check mark inside the Enable box to activate the GoTo tests segment (or right-click on **GoTo** and select Enable).

2. Type in the desired speed of the crosshead or actuator rod for this **GoTo** test segment in the Rate Value edit box. Use the Units combo box to assign the correct units.

Important *The GoTo command moves the crosshead or actuator rod to a position that is an absolute distance from the user defined zero position; not a distance relative to the current crosshead or actuator rod position.*

3. If the Stop Value section is displayed, then type in the desired stopping condition for the **GoTo** test segment in the edit box and select the appropriate units using the Units combo box. Keep in mind that **Stop Value** is an absolute value relative to the user defined zero position; not a distance value relative to the current crosshead or actuator rod position.

4. If the **GoTo** test segment has been configured to use a rate control channel other than **Crosshead/Actuator rod**, the segment might require PID parameters to be tuned. PID parameters are parameters which govern how the testing equipment moves to control based on an Advanced Rate Control channel. If PID tuning is required, a **Gain** edit box and an edit **PID Parameters** button are enabled. To tune the kP factor of the PID parameters, enter a value into the Gain edit box. To adjust the rest of the PID parameters, click the edit **PID Parameters** button. This is for advanced testing and should be altered by advanced users.

Data collection

By clicking on the Data Collection button, a dialog is displayed that allows you to configure how TestWorks 4 collects data. You can not change how TestWorks 4 collects data (e.g. Data Rate vs. Level Crossing), but you can change the particulars of the collection method (e.g. the data rate or the magnitude of level change). You can have up to five tabs to collect data for a method. Each tab can collect data in a different manner (e.g. one tab for Data Rate and one tab for Level Crossing).

*Quick Tip: In Data Rate mode, to decrease the amount of data TestWorks 4 collects during a test segment, decrease the Data Acquisition Rate.

There are three types of data collection in TestWorks 4. They are as follows:

Data Rate - TestWorks 4 will continuously collect data at a rate you specify. The rate is in units of Hertz, or points per second. For example, if your Data Rate Value is set 10 Hertz, then TestWorks 4 will collect 10 data points per second while the test segment is executed.

Peak/Valley - TestWorks 4 will collect any data point that is a minimum or a maximum. A change in data direction determines if the point is a minimum or a maximum value. Consider the following set of points: S1={10,11,10,9,10}. Point 2 (value of 11) is considered a maximum, because it is greater than the points on either side of it. Point 4 (value of 9) is considered a minimum, because it is less than the points on either side of it. Any change in direction denotes a minimum or maximum, regardless of how big the change.

Level Crossing - TestWorks 4 will collect a data point when a channel increases or decreases by a certain amount. For example, if the Level Crossing channel is Load and the Delta Value is 10 lbf, then TestWorks 4 will collect a data point every time the Load channel increases or decreases by 10 lbf.

Also, at the bottom, you can enable the Take Data on Pause check box to continue collecting data when you have manually paused the crosshead or actuator rod with the Pause button.

Break detection

By clicking on Break Detection, you are allowed to edit the break detection task which allows TestWorks 4 to determine when a specimen has broken. It looks for a drop in load that is a certain percentage of peak load. When the load drops below that level, TestWorks 4 assumes the specimen has failed and performs the commanded action.

Drop Value - Allows you to configure the magnitude of drop from peak that TestWorks 4 looks for to determine break. The higher the number, the more the load has to drop from peak before TestWorks 4 recognizes the break. The display name of the variable used to determine the Drop Value is displayed in the Drop Value section. To change the value of the Drop Value variable, simply type in the value in the edit box. You can also change the units of the Drop Value variable by using the Units combo box.

Note *If TestWorks 4 recognizes specimen failure before the specimen is physically broken, then increase the* ***Drop Value****.*

Action - Determines what action TestWorks 4 will take when it detects specimen failure. There are three choices:

- Abort Test - will end the current test with no more test segments being executed.
- Next Test Segment - executes the next test segment in the Test Flow.
- Post-Specimen - will cause TestWorks 4 to skip all remaining test segments in the Specimen section of the Test Flow and to then execute the test segments in the Post-Specimen section of the Test Flow.

Threshold Value - Allows you to configure what load value must be reached before TestWorks 4 will start looking for break. This allows the “noisy” region at the beginning of the test to be excluded from break detection. For instance, if the Threshold Value is set to 5 lbf, then the load must become greater than 5 lbf before TestWorks 4 will begin looking for specimen failure. The display name of the Threshold Value variable appears in the Threshold Value section. To change the value of the Threshold Value variable, simply type the value into the edit box. You can also change the units of the Threshold Value variable by using the Units combo box.

Note *If TestWorks 4 detects specimen failure before there is significant load on the specimen, then increase the* ***Threshold Value****.*

Hold

This test segment is designed to move the crosshead or actuator rod to maintain a specified value on a channel. The test segment can be configured to hold a channel value for a specific time limit or until break (or some other limit) is detected.

To modify this test segment, double-click on the Hold test segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Hold test segment.
2. The Hold Value group will always appear. The display name of the control channel will be displayed in this group. If this Hold test segment has been configured to hold the current value of the control channel, then no edit box will appear. In this case, the text “Hold Current Value” will appear in the Hold Value group. If an edit box is visible, then the value of the control channel that TestWorks 4 will hold, can be changed by typing the value into the edit box. The units of the Hold Value variable can be changed by using the Units combo box.

*Quick Tip: To change the value that TestWorks 4 will hold while this test segment is executed, change the number in the Hold Value group's edit box.

3. If the hold test segment has been configured, by a *Define-Level User*, to stop holding the channel value at a certain limit, then the Stop Value group will appear. The display name of the Stop Value variable will appear in this group. To change the value of the Stop Value variable, simply type the value into the edit box. You can change the units of the Stop Value variable by using the Units combo box.
4. If the control channel is one other than the primary control channel for the system (usually the crosshead/actuator channel) then PID Parameter tuning is required. The first level of PID tuning is to adjust the Gain Factor (kP) by typing a number into the Gain edit box. The higher the Gain Factor, TestWorks 4 will react more quickly to changes in the control channel. If adequate control can not be attained by adjusting the Gain Factor, then the other PID parameters must be tuned.
5. To change how TestWorks 4 collects data while this hold test segment is executed, click the Data Collection button. (Refer to the *GoTo “Test Segment” on page 66* for these instructions.)
6. To change how TestWorks 4 detects break (specimen failure) while this hold test segment is executed, click the Break Detection button. (Refer to the *GoTo “Test Segment” on page 66* for these instructions.)
7. Type a run-time message into the Run-Time Message text box.

Stop crosshead/ actuator rod

This test segment sends a Stop command to the test machine. You can enable this test segment by placing a check mark inside the check box or you can disable this test segment by leaving the check box empty.

To modify this test segment, double-click on the Stop Crosshead/Actuator segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Stop Crosshead/Actuator test.
2. Type a run-time message into the Run-Time Message text box.

Post Specimen

This section contains test segments that will be performed after the test segments inside the Specimen section have been completed or where they are by the end action of a test segment or task.

Note *The **Unattended** check box is for **Robot Systems** only.*

Note *The Strings Cannot Be Empty checkbox when checked indicates that a value (text) must be entered.*

Required inputs

This test segment will prompt you for the inputs that are listed in the table. These inputs are generally used to describe each specimen within a sample. For example, Measured Elongation or Specimen Comment would be required inputs (Post-Specimen) because these inputs would vary from specimen to specimen.

To modify this test segment, either double-click on the Required Inputs or right-click and select Edit window. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Required Inputs test segment.
2. To add inputs within this test segment, right-click within the Edit Required Inputs dialog and select Add/Remove Required Inputs. The following dialog enables you to Add or Remove required inputs from this test segment. Just select the inputs desired to be added or removed from choice list for the method.
3. To create a custom input please refer to “Inputs” on page 87.

Note *The **Unattended** check box is for **Robot Systems** only.*

Note *The Strings Cannot Be Empty checkbox when checked indicates that a value (text) must be entered.*

Return to zero

This test segment returns the crosshead or actuator rod to its zero position at the maximum speed of your machine. You can set the test segment to return immediately or have it wait for your response.

To modify this test segment, double-click on the Return to Zero segment or right click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Return test segment.
2. Place a check mark inside the Prompted box if you want the crosshead or actuator rod to wait until you respond to an OK/Cancel prompt.
   - If you select “Prompted,” a text box will appear. You can edit the prompt message by typing the desired text into the text box.

Note *If a test is aborted, the return to zero will automatically become a prompted return.*

3. For electromechanical (EM) systems with a clutch, place a check mark inside the Use High Clutch box if you want the crosshead to return using high clutch, regardless of the clutch setting that was used to run the test. For all other systems, this does not apply.
4. Place a check mark inside the Wait Until Return is Complete box if you want the software to ignore user input until the crosshead or actuator rod has returned to zero.

Important *If the Wait Until Return is Complete checkbox is unchecked the software limits defined in the Limit Detection panel under the Define tab are not active during the return to zero movement. To avoid damage to the machine or injury to the operator, these limits can be set as appropriate but you must also have the Wait Until Return is Complete checkbox checked.*

5. Type a run-time message into the Run-Time Message text box.

Recalculate specimen

This test segment finds all of the formulas and inputs that have been marked as “Recalculate Post-Specimen,” sorts the collection into the appropriate calculation order and performs all of the calculations. This segment is only valid in the Post-Specimen section of the test flow.

This segment should always be enabled if you have a test segment for exporting or reporting specimen data. It is usually safe to disable this segment if no automatic exporting or reporting is performed.

To modify this test segment, double-click on the Recalculate Specimen segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Recalculate Specimen test segment.
2. Type a run-time message into the Run-Time Message text box.

Export

This test segment saves either a Sample Export file or Specimen Export file. It creates the file based on the settings made in the Sample Export or Specimen Export configuration item.

To modify this test segment, double-click on the Export segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Export test segment.
2. Click on the Export Type combo-box to select the type of file to be exported. You can select from the following:

   Sample: - This selection utilizes the Export file that is defined within the Sample Export Configuration Item.

   Specimen: -This selection utilizes the Export file that is defined within the Specimen Export Configuration Item.
3. Place a check mark inside the Preview box if you want the user to view the export file before saving it.
4. Type a run-time message into the Run-Time Message text box.

Post Sample

This section contains test segments to be performed after the test segments inside the Post-Specimen section have been completed, and the maximum number of specimens have been tested, or when they are called by a test segment or task.

Save sample

This test segment saves the current sample.

To modify this test segment, double-click on the Save Sample segment or right-click and select Edit. Complete the following steps:

Note *This test segment must be placed inside the "Post-Sample" test section.*

1. Place a check mark inside the Enable box to activate the Save Sample test segment.
2. If desired, place a check mark inside the Append filename if file already exists box. When this box is checked, TestWorks 4 will add new information to the file instead of writing over it.
3. Type a run-time message into the Run-Time Message text box.

Print report

This test segment prints the report that you have selected.

To modify this test segment, double-click on the Print Report segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Print Report test segment.
2. Click on the Report combo-box to select the type of report to be printed. You can select either Sample or Specimen.
3. Type a run-time message into the Run-Time Message text box.

Export

This test segment saves either a Sample Export file or Specimen Export file. It creates the file based on the settings made in the Sample Export or Specimen Export Configuration Item.

To modify this test segment, double-click on the Export segment or right-click and select Edit. Complete the following steps:

1. Place a check mark inside the Enable box to activate the Export test segment.
2. Click on the Report combo-box to select the type of file to be exported. You can select either Sample or Specimen.
3. Place a check mark inside the Preview box if you want the user to view the export file before saving it.
4. Type a run-time message into the Run-Time Message text box.

Editing Configuration Items

Configuration items control all software functions that are active during an entire test. Each configuration item contains specific settings. This section will provide instructions on how to edit the Configuration Items settings.

There are 11 standard configuration items within every test method.

- Channels
- Formulas
- Inputs
- Miscellaneous
- Hardware Status
- Limit Detection
- Sample Export
- Sample Report
- Specimen Export
- Specimen Report
- Units

Channels

This section will cover configuring Channels within a defined method.

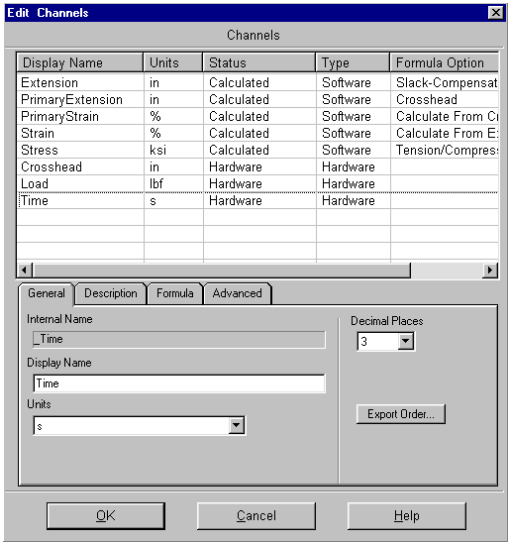
The Channel Configuration Item contains the settings for all data channels that are within a test method. There are two types of channels -hardware and software.

Hardware Channel A channel whose value is equal to the value of the device it is connected to. For example, the crosshead or actuator channel is a hardware channel. The value of the crosshead or actuator channel is equal to the signal coming from the machine's sensor.

Software Channel A channel whose value is calculated via the formula provided. For example, the strain channel is a software channel. The value of the strain channel is usually equal to the extension channel divided by the gage length of the specimen.

To access the Edit Channel dialog:

1. Click on the menu option Method, highlight Edit Method, highlight Configuration Items, and select Channels (by highlighting this option). An example of Edit Channel dialog is displayed on the following page.



The Edit Channel dialog can be broken down into two major sections. The Upper half of the dialog box allows the user to view the *Display Name* (channel), *Units*, *Status*, *Type*, and *Formula Option* of the channels defined in the selected method.

Display Name

This column lists all of the channels by their display name. Click on the column header to sort the list by the appropriate display name.

Units

This column displays the default units of the channels.

Channel Status

There are three possible entries in the Channel Table status column**:**

- *Calculated* - the software channel is enabled and will be calculated.
- *Not Calculated* - the software channel is disabled and will NOT be calculated.
- *Hardware* - this is a hardware channel and is always enabled.

Type

There are only two types - *hardware* and *software*.

Formula Option

The Formula Option displays the type of formula being used to calculate the channel. For some channels, TestWorks 4 will allow you to alter the formula by selecting from the different options.

Formula Options are provided in TestWorks 4 to help the user define the formula of a channel without having to manually configure a formula.

The Lower half of the dialog contains all of the settings necessary to define a channel. The dialog is broken down into four tabs: *General*, *Description*, *Formula*, and *Advanced*. The Advanced tab might not appear – Definer and Creator User only). You can change many of the channel characteristics such as the display name, units, and how TestWorks 4 handles the channel's raw data (data collected used to produce specimen results and graph). If the channel is a formula channel, you can also edit how the channel is calculated.

Follow these steps to change channel settings:

General tab

1. Type a display name in the Display Name text box.
2. Click on the Units combo-box to select the type of units.

Note *If you need Units that do not appear, click on the "Unit Class" button to select a different Unit Class. Be Careful not to use an incorrect Unit Class. This will result in inaccurate results.*

3. Click on the Decimal Places combo-box to select the number of decimal places for the channel data. This will configure the value of the channel's data points seen when exporting data.
4. Click on the Export Order button to display the Export Order dialog. This dialog allows you to select the numerical order in which the channel data will be exported. If a channel does not have an Export Order, then it will show up on an export file.
5. If this is a hardware channel, you can invert the polarity of the channel by clicking the Invert Polarity checkbox. When the polarity of the channel is inverted, all values coming from the channel's device are multiplied by –1.

Description tab

6. To view or edit the description for this channel, edit the text in the Description text box.

Formula tab

7. The Formula Tab allows you to view or edit the software channel formula.

If the channel being edited has an assistant associated with it, the Formula Assistant dialog will appear. You can then select from the Formula Options shown.

If the channel has no assistant, you must click the Edit button next to the Formula text box to edit the formula. This will bring up the Formula Editor dialog – *Definer/Creator* users only.

Advanced tab

8. To switch between *Fixed* and *Scientific* notation when reporting the channel values, change the selection in the Notation combo-box.
9. The Effect of Increasing Extension combo-box sets the relationship between the crosshead/actuator channel and the current channel (*Option only available to *Definer/Creator* level users).

Note *This setting only applies if "Auto" has been selected as the crosshead or actuator rod direction for a "GoTo" test segment. It determines which direction, crosshead up/actuator rod retract or crosshead down/actuator rod extend, that the crosshead or actuator rod must move in order to complete the test segment.*

10. The Advanced tab also contains the following settings for the channel:

Calculate During Test A check mark inside this box indicates that the channel data will be calculated while a test is being performed.

Recalculate Post-Test A check mark inside this box indicates that the channel will be recalculated immediately after each test has been completed. A formula with this option selected will be calculated at the end of the test regardless of its When setting.

Never Recalculate A check mark inside this box indicates that the variable will only be calculated once and cannot be recalculated.

Hidden A check mark inside this box indicates that the variable will be hidden from view on the Test and Review pages.

Locked A checkmark inside this box indicates that the variable will be locked. The variable can only be deleted by a user with the *Definer/Creator* privilege level.

Allow Formula Editor A check mark inside this box indicates that the Formula Assistant for the channel or formula that you are editing will have an Edit button available. The Edit button gives you access to the Formula Editor.

Adding a hardware channel

A hardware channel is inserted into a test method by:

1. Right-click within the Channels table view and select Add Hardware Channel. A menu of available hardware channels will appear. Select the desired channel within the Insert Hardware Channel option dialog and click OK. This will insert the channel into the method.
2. Refer to the above instructions on editing the channel.

Adding a software channel

Note *Only Definer/Creator Level Users can add software channels.*

1. Right-click within the Channels table view and select Add Software Channel. Select Add Software Channel. The Insert New Variable dialog will appear.
2. Type the *Internal Name* of the new variable into the Internal Name text box. The *Internal Name* is the name that is used by TestWorks 4 to identify channels. It cannot contain spaces. Although each TestWorks 4 channel must have an internal name, a channel can also have a display name that contains spaces.
3. Specify what the new formula will be Added To. Select either the Sample or Specimen option.

   Sample — Makes the formula contain one value for an entire sample. Each specimen in the sample will have the same value for the formula.

   Specimen — Makes the formula contain one value for each specimen. Each specimen will have a unique value for the formula.
4. Refer to the above instructions on editing the channel.

Note *Adding a software channel will require the knowledge of formula writing. This manual does not cover formula writing. Please contact the* ***MTS HelpLine*** *for further information.*

Deleting a channel

Note *Only Definer/Creator Level Users can delete hardware channels.*

1. By accessing the Edit Channel dialog, highlight the channel you wish to delete. Right-click and select Delete. This will remove the channel from the method.

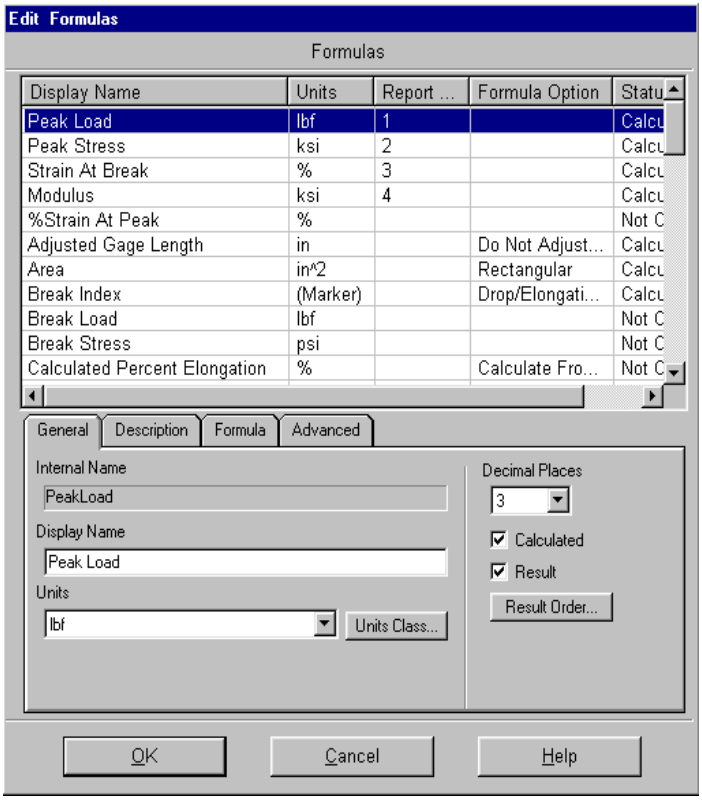
Formulas

The Formula Configuration Item displays the formulas available to you for each specific method. To access the Edit Formula dialog:

2. Click on the menu option Method, highlight Edit Method, highlight Configuration Items, and select Formulas (by highlighting).

The following components of the Formula table appear when the Formula configuration item has been selected:

Note *You can sort a table based on any column in the table. To sort the table, click on the heading for the column you want to sort by. Click on the heading a second time to sort in the opposite direction. For example, to sort the table by display name, click on the* ***Display Name*** *column.*



Display Name

This column lists all of the formulas by their display name.

Units

This column displays the units of the variables.

Report Order

This column within the table displays the order in which the variable will be reported in relation to the other variables of the same type.

Formula Option

The Formula Option displays the type of formula being used to calculate the result formula. For some formulas, TestWorks 4 will allow you to alter the formula by selecting from the different options.

Formula Options are provided in TestWorks 4 to help the user define the formula option of a formula without having to manually configure a formula.

Status

There are two possible entries in the Formula table status column:

- *Calculated* The formula is enabled and will be calculated.
- *Not Calculated* The formula is disabled and will therefore NOT be calculated.

The Formula Configuration Item contains the settings for all formulas available within the test method. The Formula Settings dialog is a tabled dialog located beneath the Formula Table window. This dialog allows you to define formula characteristics, such as *display name*, *units*, and the manner in which TestWorks 4 will handle the results.

Note *The type of changes you can make to the formula are based on your user privilege level.*

Follow these steps to define your formula characteristics:

General tab

1. Place a check mark in the Calculated box to activate the formula.
2. Type a display name in the Display Name text box.
3. Click on the Units combo-box to select the type of unit to be used by the formula.

Note *If you need **Units** that do not appear, click on the **"Unit Class"** button to select a different **Unit Class.** Be careful not to use the incorrect Unit Class. This will result in inaccurate results.*

4. Click on the Decimal Places combo-box to select the number of decimal places that the formula result will display.

5. Place a check mark in the Result checkbox if you want this formula to be displayed as a result on the Review Page and on your Reports and your Export files. Click the Result Order button to bring the Result Order dialog (this will set the order in which the results are seen).

Description tab

6. Type a description in the Description text box.

Formula tab

7. To view or edit the formula, click on the Formula tab.

   If the formula being edited has an assistant associated with it, the Formula Assistant dialog will appear. You can then select from the Formula Options shown. If the formula has no assistant, you must click the Edit button next to the Formula text box to edit the formula.

Advanced tab

8. The Advanced tab allows the set up of advanced properties in the formula, such as:

   A. Click on the Category combo-box to select a category. A category allows you to organize formulas for easier accessibility.

   B. Click on the When combo-box to select when the formula will be calculated.

   C. Click on the Notation combo-box to select the format in which your data will appear. You can select either Fixed or Scientific notations.

   D. Enter a default value in the Default Value text box. (In most cases, the default value of the formula is irrelevant). The default value is used when the formula has not yet been calculated. It is also used when the Reset to Default option has been selected.

   E. Place a check mark in the Recalculate Post-Test box if you want the formula to calculate itself after the test is completed.

   F. Place a check mark in the Never Recalculate box if you do NOT want the formula to calculate itself when the user chooses the “Recalculate Sample” or “Recalculate Specimen” menu item.

   G. Place a check mark in the Sample Level if this formula should be stored at the sample level (i.e. all specimens will have the same formula value).

   H. Place a check mark in the Reset to the Default Values box if you want this formula to reset to its default values before each test is run.

I. Place a check mark in the Hidden box if you want to make sure this formula does not appear on any TestWorks 4 user screens or report printouts.

J. Place a check mark in the Locked box if you want to make sure this formula will not be deleted.

K. Place a check mark in the Allow Formula Editor box if you want the Edit button on the Formula tab to be enabled for users with Definer privileges.

9. If the unit class of the formula is an Integer, a Marker tab will be available.

   A. Place a check mark in the Marker box if you want a marker to appear on the Review Graph at the index value calculated by the formula.

   B. Place a check mark in the Movable Marker box if you want the marker to be movable by the user. If the marker is moved on the review graph, the formula will be updated to reflect the new value.

   C. In the Symbol text box, type the test that will be used as the marker symbol.

Inserting a formula

A formula can be inserted into a test method by the following:

1. Access the Edit Formula dialog screen by clicking on the Method menu option, highlighting Edit Method, selecting Configuration Items, and highlighting Formulas.
2. Place the cursor within the Formula table section and right-click. This displays a menu dialog. Highlight either Add Formula (to add a result calculation) or Add Marker Formula (to add a marker to the review graph).
3. Once selected, the Formula Builder will be displayed. Refer to"Formula Builder - (Creating Formulas)" on page 111, for instructions.

Deleting a formula

A formula can be deleted from a method by the following:

1. Highlight the formula, within the Formula table, to be deleted by clicking on it.
2. Right-click and select Delete. This will erase the formula from the method.

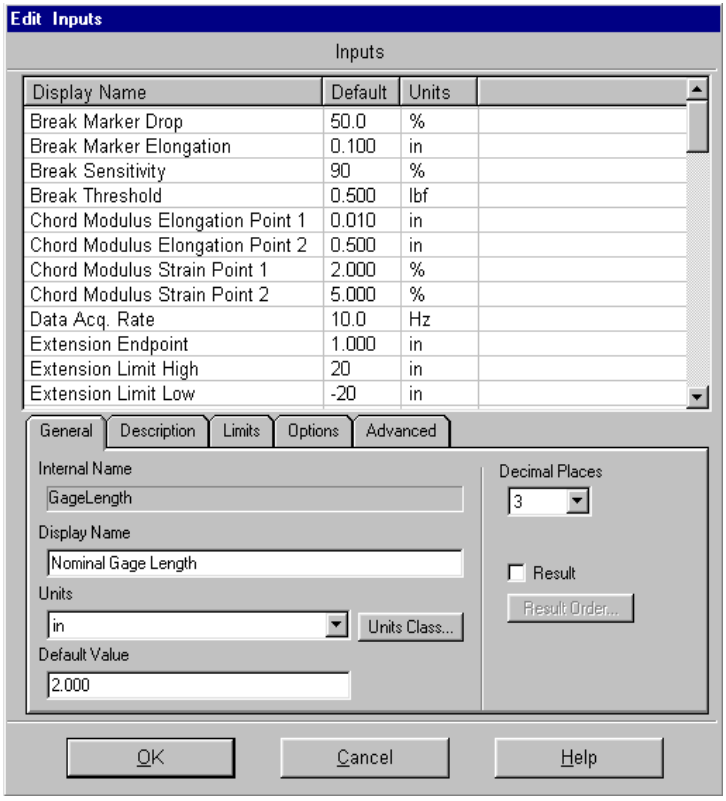
Inputs

The Input Configuration Item displays the inputs available to you for each specific method. To access the Edit Input dialog:

1. Click on the menu option Method, highlight Edit Method, highlight Configuration Items, and select Inputs (by highlighting this option).

The following components of the Input Table appear when the Input Configuration Item has been selected:

Note *You can sort a table based on any column in the table. To sort the table, click on the heading for the column you want to sort by. Click on the heading a second time to sort in the opposite direction. For example, to sort the table by display name, click on the Display Name column.*



Display Name This column lists all of the variables by their display name(s).

Default Value This column lists the default values for each input within the Inputs table. The default value is the initial value and can be changed by the user or in the test flow.

Units This column displays the default units of the variables.

The Input Settings dialog is a tabbed dialog located beneath the Input Table window. This dialog allows you to define input characteristics such as *display* name, *units*, and *default value*.

Note *The type of changes you can make to the input are based on your user privilege level.*

Follow these steps to define your input characteristics:

General tab

1. Type a display name into the Display Name text box.
2. Click on the Units combo-box to select the type of units. If you need a unit that does not appear, select the Unit Class button to change the unit class.

Note *If you need **Units** that do not appear, click on the **"Unit Class"** button to select a different **Unit Class.** Be careful not to use incorrect Unit Class. This will result in inaccurate results.*

3. Type a default value in the Default Value text box.
4. Click on the Decimal Places combo-box to indicate the number of decimal places to be used by the input.
5. Place a check mark in the Result checkbox if you want this input to be displayed as a result on the Review page and on your Reports and in your Export files. Click the Result Order button to bring the Result Order dialog.

Description tab

6. Type a description into the Description text box.

Limits tab

7. Click on the Limits tab to enter minimum and maximum values for the input. Place a check mark in the Minimum box and enter the minimum value for the input into the text box to specify a minimum value. Place a check mark in the Maximum box and enter the maximum value for the input into the text box to specify a maximum value for the input. Limits will allow you to lock in a range, reducing the chance of entering incorrect values.

Options tab

8. The Options tab allows the setting of the following options:

Input Required

A check mark inside this box indicates that a value will be requested for this input during the test. The input will be requested by the Required Inputs test segment that is in the test section specified by the input's *WHEN* setting.

For example, if the *WHEN* setting of an input is Pre-Specimen, the input value will be requested by the Required Inputs test segment inside the Pre-Specimen test section.

Panel Input

A check mark inside this box indicates that the input will be listed within the Input panel of the Test page. This makes the input easy to view and edit.

Display Only

A check mark inside this box indicates that the input will only be displayed when it appears on the Test page or the Review page. You will not be able to edit or change the value of the input from these locations.

To edit a Display Only input, you must edit it from the Define page or the Edit Method menu option.

Editable Post-Test

A check mark inside this box indicates that you can edit the input after a specimen has been tested.

Reset to Default Values

A check mark inside this box indicates that the formula or input will be automatically reset to its default value for the next test.

Hidden

A check mark inside this box indicates that the variable will be hidden from view on the Test and Review pages.

Choice List

A check mark inside this box indicates that a list of default values is available for the input. When you enter a value for the input, you can select from this list of values through the Choice List combo-box.

To modify the choice list of an input, click on the Edit button that appears beside the input's default value.

Only Allow Choices

A check mark inside this box indicates that you can only select a value from the choice list of the input. You cannot enter a unique value.

Advanced tab

9. Click on the When combo-box to select when the input will be requested.
10. Select an item in the Category combo-box to change the input's category.
11. Click on the Notation combo-box to select the notation of the input. Select either Fixed or Scientific.
12. Set the following options as desired:
    - *Locked* A check mark inside this box indicates that the variable will be locked. A user will need sufficient privileges to delete the input.
    - *Sample-Level* A check mark inside this box indicates that the formula or input will be a sample-level formula or input and will have the same value for every specimen in the sample.
13. If you have *System Channels* enabled on your system, you will have a Source tab on the Input Settings dialog. On this tab, you can click on the Source combo-box to select the source of the input value. *Keyboard Only* is the typical setting.
    - In the Statistics combo-box, select the statistic that will be applied to the incoming values.
    - In the Number of Readings box, type the number of readings that are expected.

Inserting an input

An input can be inserted into a test method by the following:

1. Access the Edit Input dialog screen by clicking on Method menu option, highlight Edit Method, select Configuration Items and highlight Inputs.
2. Right-click within the Input table and select Add Input. This will display the Insert New Variable dialog.
3. Type in the *Internal Name* into the Internal Name text box. The *Internal Name* is the name used by TestWorks 4 to identify inputs. It cannot contain spaces, although the display name can contain spaces.
4. If you are inserting a formula or input, specify what the new variable will be Added To. Select either the Sample or Specimen option.
   - When added to Sample makes the input contain one value for an entire sample.
   - When added to Specimen makes the input contain one value for each specimen.
5. Click the OK button to insert the new variable.
6. Refer to the"Inputs" on page 87 to configure the input.

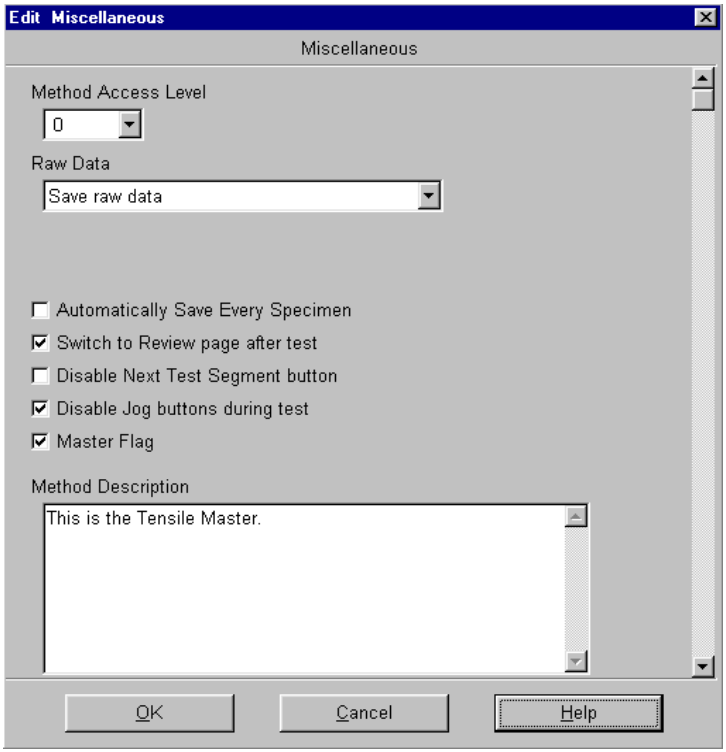
Deleting an input

An input can be deleted from a method by the following:

1. Highlight the input, within the Input table, to be deleted by clicking on it.
2. Right-click and select Delete. This will erase the input from the method.

Miscellaneous

To access the Edit Miscellaneous, click on the menu option Method, highlight Edit Method, select Configuration Items, highlight Miscellaneous. This will display the following screen:



The Miscellaneous configuration item allows you to configure one or more of the following settings:

Method Access Level

To access this test method, your user login ID must specify a method access level equal to or greater than this number. Select a method access level from 0 to 9 within the Method Access Level combo-box. This enables a upper level user (supervisor) the ability to “lock out” other operators from gaining access to methods.

Raw Data

Allows for the option to save the raw data, to not save the raw data, or prompt to save the raw data per sample.

Automatically Save Every Specimen

A check mark inside this box of the Miscellaneous configuration item indicates that each specimen will be saved as soon as its test has ended. This adds protection against losing test data.

Switch to Review

A check mark inside this box indicates that the focus will be shifted to the Review Page after the completion of the test.

Disable Next Test Segment Button

A check mark inside this box disables the Next Test Segment button. This button appears below the Real Time Graph during a test. The Next Test Segment button can be used to manually proceed the test flow to the next test segment.

Disable Jog Buttons During Test

A check mark inside this box indicates that the *Up* and *Down* machine control buttons will be disabled while a test is running.

Master Flag

A check mark inside the Master Flag box indicates that the method is a Master Template. You will be unable to overwrite a test method that has Master template status. *Note: *You must have a Creator user privilege level to change this setting*.

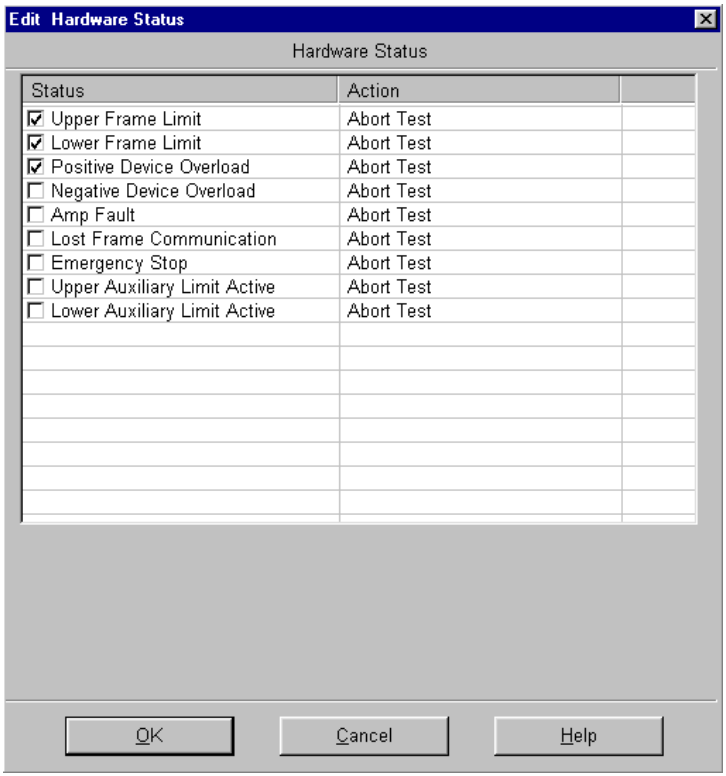
Method Description

The words displayed within this text box are visible inside the Method Description area of the Test page. You can enter any text that you choose, however, we recommend that your text describes the purpose and proper use of the test method.

Hardware Status

This configuration item specifies the action that will be taken if a hardware limit or error is detected during a test segment. For instance, if you specify that the test should be aborted when the upper frame limit is activated, you can enable the Upper Frame Hardware Limit item in the dialog.

To access the Edit Hardware Status, click on the menu option Method, highlight Edit Method, select Configuration Items, highlight Hardware Status and this will display the following screen:



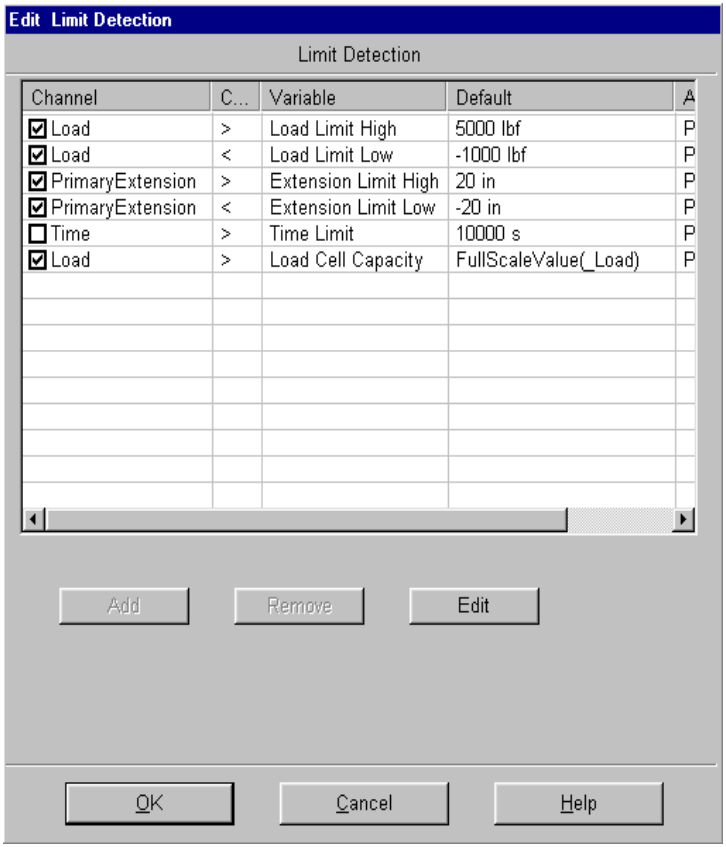
To edit this dialog:

1. Place a check mark beside each hardware status item that you want to monitor during a test. Uncheck any item you do not want to monitor.

Limit Detection

This configuration item monitors the enabled limits when any of the data channels exceed the *minimum* or *maximum* value that you have preset. Common limits are low/high load limits, and low/high extension limits. Use the load limits and extension limits to prevent damage to your hardware during a test.

Note *Limit Detection is active for the entire test.*

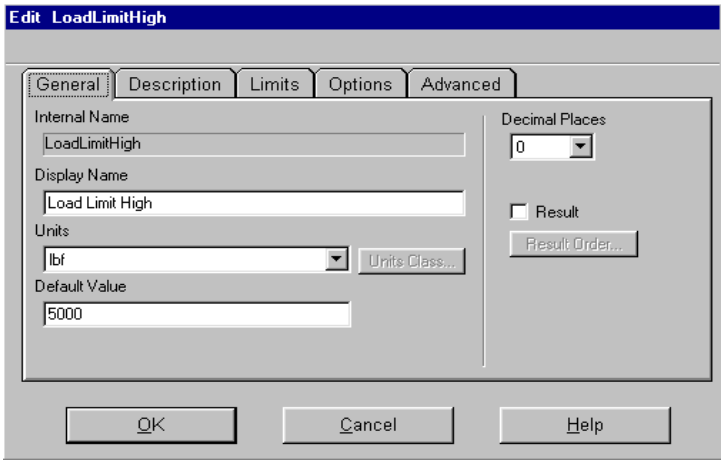


To edit this dialog:

1. Place a check mark inside the box to the left of the specific channel to activate the Limit Detection.
2. Complete the configuration of this item by performing one or more of the following:
   A. To add a Limit condition, click on the Add button. The Limit Detection dialog will open. *(Only available for Definer/Creator Level Users).*
   B. To edit a condition, highlight it, and click on the Edit button.
   C. To delete a condition, highlight it, and click on the Remove button. *(Only available for Definer/Creator Level Users).*

Editing a limit

1. Highlight the Limit to be edited by clicking on the selection.
2. Next, click on the Edit button. This will display the following dialog screen.



3. Type in the appropriate value in the Default Value edit box to describe the selected Limit Detection.

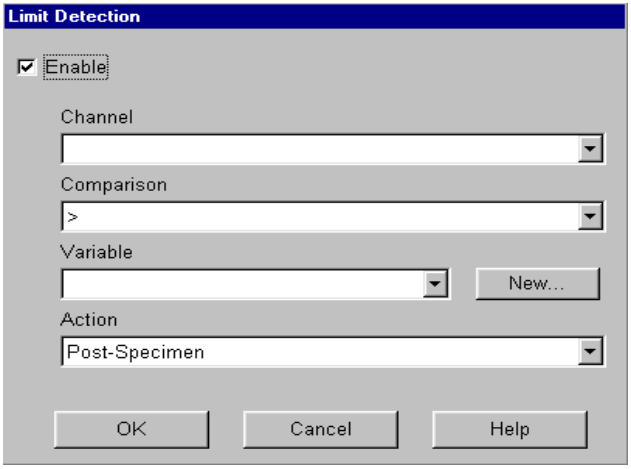
Adding a limit

Note *This option exists for Definer/Creator Level Users only.*

1. Click on the Add button on the Edit Limit Detection display.
2. Place a check mark in the Enable box to activate the condition.
3. Click on the Channel combo-box to select the channel to be monitored by the new limit.
4. Click on the Comparison combo-box to select the comparison to be made between the data channel and the limit value. Select either **>** or **<**.
5. Click on the Variable combo-box to select the input for the value to be compared to the data channel. If you need an input that does not exist, click on the New button to create it.

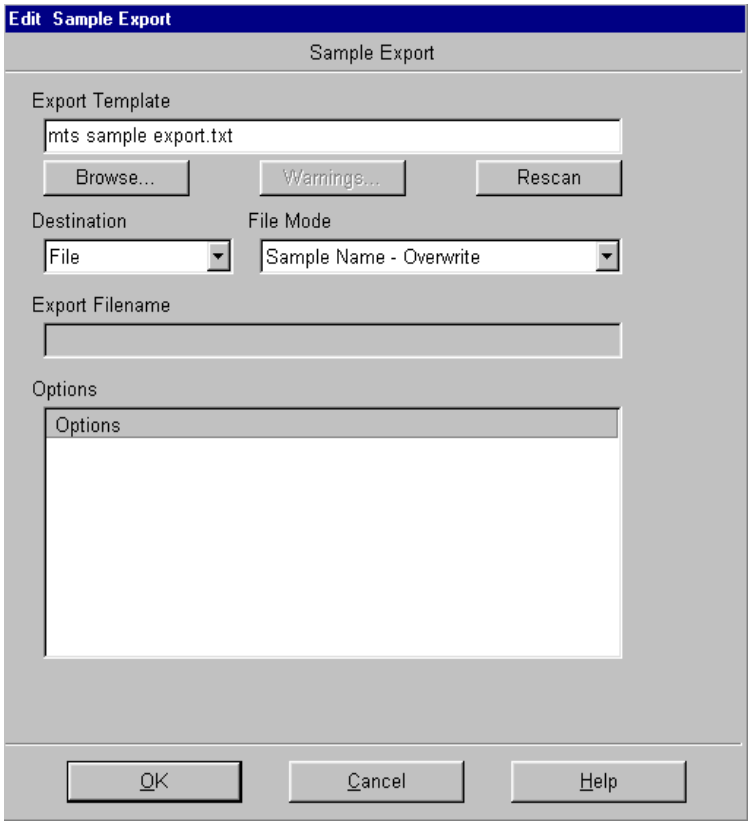
Note *The combo-box only displays inputs that contain the same unit class as the data channel selected.*

6. If necessary, click on the Edit button to make changes to the limit value.
7. Click on the Action combo-box to select the action to be taken when the Limit condition has been triggered. Select Abort Test or Post-Specimen.



Sample/Specimen Export

This configuration item contains the settings for either a sample or a specimen export file. If Sample Export is highlighted, the settings for your sample file will be changed. If Specimen Export is highlighted, the settings for your specimen file will be changed. The Export settings determine how your export file will be saved. MTS has provided default templates for your use, located in the *Report Template* folder within the *TestWorks 4 Directory*.



To complete the Sample or Specimen Export Configuration dialog, follow these steps:

1. Depending on the Report you would like to configure, either Sample or Specimen, click on the Menu option Method, highlight Edit Method, select (highlight) Configuration Items, and select either Sample Export or Specimen Export.
2. Type the path and filename of the Export template in the Export Template box. Click on the Browse button to locate an existing template.
3. If available, click on the Warnings button. The Warnings dialog will open and allow you to view messages about the export file that has been selected.
4. Click on the Rescan button to update the selected Export template. This must be done each time the Export template is edited.
5. The Destination combo-box typically specifies that the export will be a file. (*If the system channels are enabled, the destination could be a Com Port.)
6. The File Mode combo-box selects the manner in which the export file will be written. Select one of the following:

Sample Name – Overwrite

When this option is selected, TestWorks 4 will save the export file using the current sample name and the extension of the template (i.e. *.txt). This option will replace the existing export file with the new file each time you choose Export.

Sample Name - Append

hen this option is selected, TestWorks 4 will save the export file using the current sample name and the extension of the template (i.e. *.txt). This option will add the new export information to the end of the file each time that you choose Export.

Overwrite

When this option is selected, TestWorks 4 replaces the existing export file with the new file each time you choose Export.

Append

When this option is selected, TestWorks 4 opens the existing export file, and adds the new export information to the end of the file each time that you choose Export.

Auto-Increment

When this option is selected, TestWorks 4 sequentially changes the last character of the export filename each time you choose Export. If your filename is Sample 1, TestWorks 4 will name the file Sample 2 the next time it is exported.

Sample Name+Specimen # - Overwrite

When this option is selected, TestWorks 4 will save the export file using the current sample name plus the current specimen number (separated by an underscore) and the extension of the template (i.e *.txt). This option will replace he existing export file with the new file each time you choose Export.

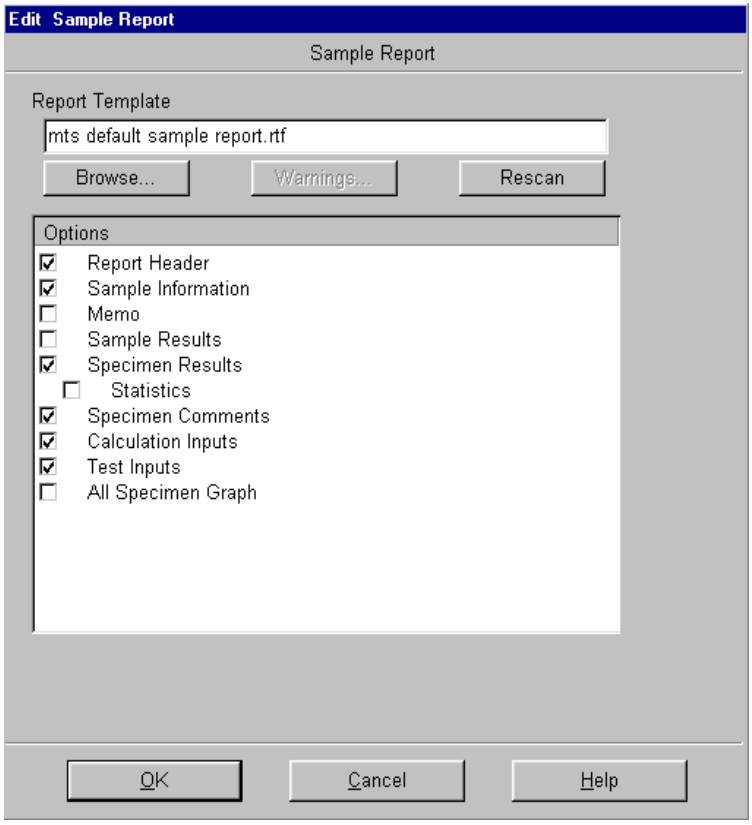
7. Type a filename in the Export Filename box.

Note *If you have chosen "Sample Name" as your file mode, you will not be able to enter a filename.*

8. If you have selected optional features for the Export template, check boxes will appear with the Options box. Place a check mark next to each option that you want to include within your export file.

Sample/Specimen Report

There are two Report configuration items, one for *Samples* and one for *Specimens*. Your settings control how the report will be printed once you have selected either Print Sample or Print Specimen, respectively. MTS has provided report templates for both the sample and specimen levels -meaning that you can print either sample reports or specimen reports.



To edit the Sample or Specimen Report Configuration dialog, complete the following steps:

1. Depending on the Report you would like to configure, either Sample or Specimen, click on the Menu option Method, highlight Edit Method, select (highlight) Configuration Items, and select either Sample Report or Specimen Report.
2. Type the path and filename for the Report template into the Report Template box. Click on the Browse button to help you locate a template.

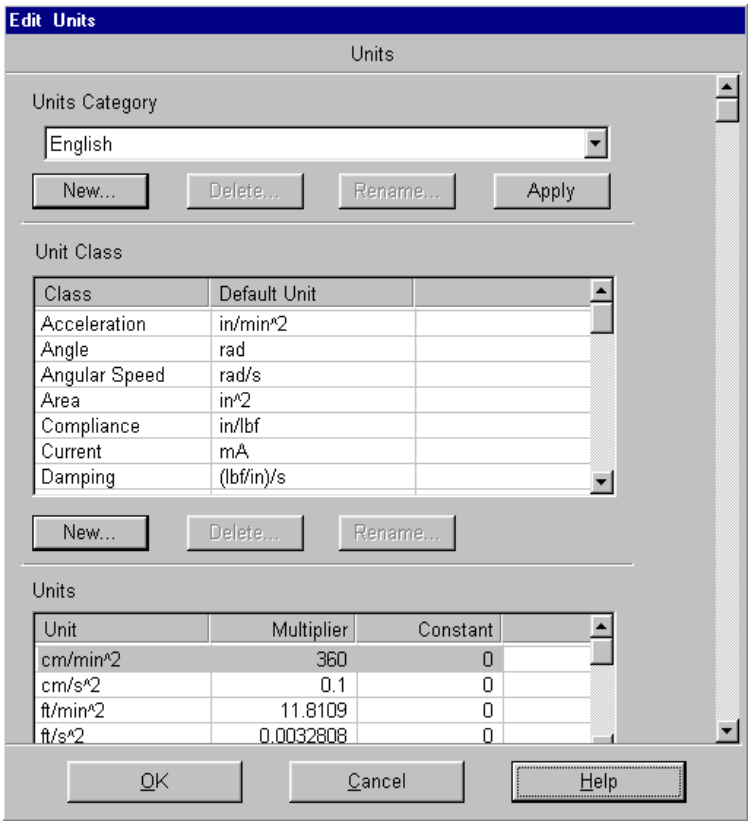
Note *Leave the Report Template field blank if you want to specify how the report should be printed each time that you choose Print.*

3. If available, click on the Warnings button to open the Warnings dialog and view messages concerning the report file that you have selected.
4. Select the Rescan button to prompt TestWorks 4 to reload and update the selected Report template. Rescan is only needed if a new option has been externally added or removed from the templates while editing the configuration item.
5. If there are optional features within the Report template that you have selected, check boxes will appear in the Options box. Place a check mark next to each of the options that you want included in the printed report.

Units

The Units dialog allows you to customize the Units category (such as *SI*, *MKS*, or *English*) that will be used for all channels, formulas, and inputs within a test method.

Note *Use the side scroll bar to view the entire dialog window.*



The following tasks are performed through this dialog, provided that you have the necessary user privilege level:

Change the current units category

When you change the Units category of a test method, TestWorks 4 will automatically convert all channel, formula, and input values into new units. For instance, if a test method has been set up to use *English* units (such as pounds, inches, p.s.i.), you can change the test method into *SI* units (such as newtons, millimeters, MPa). In such an example, an Extension input of 2 inches would be automatically converted to 50.8 mm.

Note *Changing the unit category only affects new inputs, formulas, and channels unless the* ***Apply*** *button is executed.*

Follow these steps to change the Units Category:

1. Click on the Units Category combo-box to select the desired category of units.
2. Review the unit classes and default units that appear to ensure that they are the units that you want to use.
3. Click on the Apply button to convert every channel, formula, and input to the new units.

Creating your own units category

A Units category can be customized and applied to test methods. TestWorks 4 will accept Units categories that combine standard units, such as inches and kilograms. A Units category can be modified by adding, editing, or deleting unit classes and units. In addition, you can even create a unit class with its own unique set of units.

Follow these steps to customize your new Units category:

1. Click on the Units Category combo-box to select the Units category most similar to the one that you want to create. Initially, your new category will be identical to the category that you selected.
2. Click on the New button, located below the Units Category combo-box. The Category Description dialog will appear.
3. Type the name of your new category in the Caption box.
4. Click OK to create your new category.
5. Modify your new category by setting default units.

Editing a units category

Note *You cannot delete the Standard Units categories, such as English, MKS, and SI.*

1. Click on the Units Category combo-box to select the Units category name that you want to edit.
2. Click on the Edit button, which is located below the Units Category combo-box. The Category Description dialog will be displayed.
3. Type the new name for the selected category in the Caption box.
4. Click OK to edit the Units category.

Deleting a units category

Note *You cannot change the name of the Standard Units categories such as English, MKS, and SI.*

1. Click on the Units Category combo-box to select the Units category to be deleted.
2. Click on the Delete button, located below the Units Category combo-box. The Delete Category? prompt will be displayed.
3. Click OK to delete the Units category.

Creating a new unit class

A unit class is a specific set of units. For instance, the unit class of Dimension is the set of all units that measure a dimension. This set can include such units as inches, feet, yards, millimeters, or micrometers.

If the Units category that you have selected does not contain the Unit class that you need, a new unit class can be created. For example, you might want to add units of power to the *English Units* category. This unit class might contain watts, kilowatts, Btu/hr, or cal/s.

1. Locate the Class table. This table contains all of the unit classes available within the current Units category.
2. Be sure that the unit class you want is not already included.
3. Click on the New button located below the Unit Class table. The Class Description dialog will appear.
4. Type the name of your new unit class in the Caption box.
5. Click OK to create your new unit class.

Once the new unit class has been created, a base unit is automatically created with name given to the class just created ([Class Name]).

6. Click on your new unit class from the Unit Class table.

7. Click on the new base unit from the Units table.
8. Select the Edit button located below the Units table. The Edit Unit Type dialog will appear.
9. In the Description text box, type the desired name of the new base unit.
10. In the Calculation Type combo-box, select No conversion.
11. Click OK.

Editing a unit class description

You can edit the name of a unit class by following these steps:

Note *You cannot change the name of a unit class supplied by MTS. You can only change the name of unit classes that have been added to your system.*

1. From the Unit Class table, click on the unit class name that you want to edit.
2. Click on the Edit button located below the Unit Class table. The Class Description dialog will appear.
3. Type the new name of the selected unit class into the Caption box.
4. Click OK to rename the unit class.

Deleting a unit class

You can delete a unit class that is no longer needed by following these steps:

Note *You cannot delete a unit class supplied by MTS. You can only delete unit classes that have been added to your system.*

1. Click on the unit class name that you want to delete. You will find the unit classes within the Unit Class table.
2. Click on the Delete button located immediately below the Unit Class table.
3. The Delete Class? prompt will appear.
4. Click OK to delete the unit class.

Adding a new unit

A unit is the smallest element within a Units category. The unit, millimeter, can be located within the unit class of *Dimension* which can then be part of the Units category, SI.

If the Units category that you have selected does not contain the unit that you require, a new unit can be created. For instance, you might want to add the unit, miles, to the *Dimension* unit class within the *English Units* category. Because you cannot reassign the default units in the units categories supplied by MTS, you must first create your own unit category and then create the new units by implementing the following steps:

1. Select the unit class that will contain your new unit. Units that are already included in this unit class will appear in the Units table.
2. Notice the first unit listed at the top of the Units table. This is the base unit for the unit class. You must specify the factors that will convert this base unit to your new unit.
3. Click on the New button located below the Units table. This will display the New Unit Type dialog.

This dialog allows you to specify the settings of a new unit. A unit is the smallest element within a Units category.

4. Type the name of the new unit in the Description box.
5. In the Calculation Type combo-box, select the type of calculation that will be used to convert the base unit to the new unit. You can select from the following:

No Conversion This selection indicates that the only difference between the base unit and the new unit is their description or name. No conversion will be done between the units.

Multiplier Only This selection will convert the new unit into the base unit by multiplying the new unit by the specified multiplier.

Base Unit = New Unit * Multiplier

Example: millimeters = meters * 0.001

Multiplier and Constant This selection will convert the new unit into the base unit by multiplying the new unit by the specified multiplier, and then adding the constant.

Base Unit = (New Unit * Multiplier) + Constant

Example: Kelvin = (Celsius * 1.0) + 273.15

6. If required, enter the value of the multiplier in the Multiplier box.
7. If required, enter the value of the constant in the Constant box.

8. Click OK to create the new unit.

Editing a new unit

Note *You cannot edit unit types supplied by MTS. You can only edit units that have been added to your system.*

1. From the Unit Class table, highlight to select the unit class containing the unit that you want to edit.
2. From the Units table, highlight the unit to be edited.
3. Notice the unit at the top of the Units table. This is the base unit of the unit class. You must specify the factors that will convert this unit to the unit that you are editing.
4. Click on the Edit button located below the Units table. The Edit Unit Type dialog will appear. Then edit the appropriate fields (refer to "Adding a new unit" on page 106).

Deleting a new unit

You can delete a unit that is no longer needed by following these steps:

Note *You cannot delete unit types supplied by MTS. You can only edit units that have been added to your system.*

1. In the Unit Class table, highlight to select the unit class that contains the unit to be deleted.
2. In the Units table, highlight the unit that you want to delete.
3. Click on the Delete button located below the Units table.
4. The Delete Unit? prompt will appear.
5. Click OK to delete the unit.

Exporting a user-defined unit category, class or type

Exported Units are saved as a separate file. After it is saved, you can import it into another test method, share it with another system or archive it for future use.

Follow these steps to export a Units Category, Class or Type:

1. Click on the Units Category combo-box, Unit Class or Type to select the file that you want to export.
2. Click on the Export button located at the very bottom of the Units dialog. The Export User-Defined Units dialog will appear.
3. From the Export User-Defined Units dialog, select a name and destination for the exported Units file.

Importing a user-defined unit category, class or type

A new set of units can be added to a test method by importing a Units category. The imported Units usually originates from another test method or another TestWorks 4 system.

Note *All currently user-defined units categories, classes, and/or types are removed prior to importing a new units file.*

Follow these steps to import a Units Category, Class or Type:

1. Click on the Import button, located at the very bottom of the Units dialog. The User-Defined Units dialog will appear.
2. From the User-Defined Units dialog, locate and select the Units file that you want to import.

Assigning default units

Each unit class within a Units category has a default unit type. This unit type will be automatically used for the unit class. For example, if the unit, millimeters, is specified as the default, the value of all Dimension inputs will be recorded in millimeters. However, you can manually select a different unit for individual variables. When a Units category is applied to a test method, all of the variables are converted to the default units.

Note *Changing the unit category only affects new inputs, formulas, and channels unless the **Apply** button is executed.*

Follow these steps to set a unit as the default unit:

1. In the Unit Class table, highlight the class that contains the unit that will be the default unit.
2. In the Units table, highlight the unit that will be the default unit.
3. Click on the Default button located below the Units table.

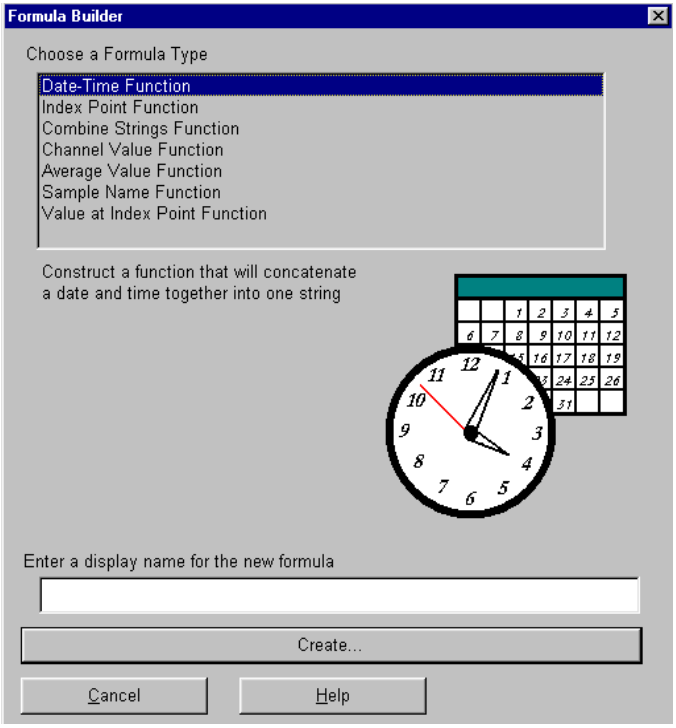
The Unit Class table will be updated to display the selected unit as the default.

Note *Default units can only be assigned to user-created unit categories.*

Formula Builder - (Creating Formulas)

The Formula Builder provides a quick and easy way to create formulas for use in your TestWorks 4 methods. This section can be used as a guide to creating formulas using the Formula Builder.

Note *If you are a Definer or Creator Level User, the illustration below appears initially when creating a formula on the Define Page. To bypass this, click on the Advanced tab to create a formula with the* ***Insert New Variable*** *dialog.*



There are several ways to access the Formula Builder (User Level):

1. On the Test Page, click on the menu option Method, highlight Edit Method, and then highlight Create Formula, (Editor, Definer, and Creator).

2. On the Test Page, click on the menu option Method, highlight Edit Method, highlight Configuration Items, and then select Formulas. This will display the Edit Formula dialog. Within the formula table, right-click and select Add Formula, (Editor, Definer, and Creator).

3. On the Define Page, click on the Configuration Tab, select Formulas on the configuration tree. A list of formulas will be displayed in a table form on the right-hand side of the screen. Right-click within this table and select Add Formula, (Definer and Creator).

4. On the Define Page, click on the menu option Insert and select Formula. (Definer and Creator).

Once the Formula Builder has been launched (using one of the procedures above), you will then be able to begin the process of adding a custom formula to a method. To add a formula, follow these simple steps.

1. Select the appropriate formula type from the Choose a Formula Type window. This is done by clicking on the appropriate function.

Note *A brief description is available under this window to help you decide on the correct formula function.*

2. Once the correct formula function has been selected, type in the name of the formula in the Enter a Display Name for the New Formula window and click on Create.

Note *Not all formula types require you to enter in a name.*

3. Depending on the type of formula selected, a specific dialog will be displayed. This information should be edited appropriately.

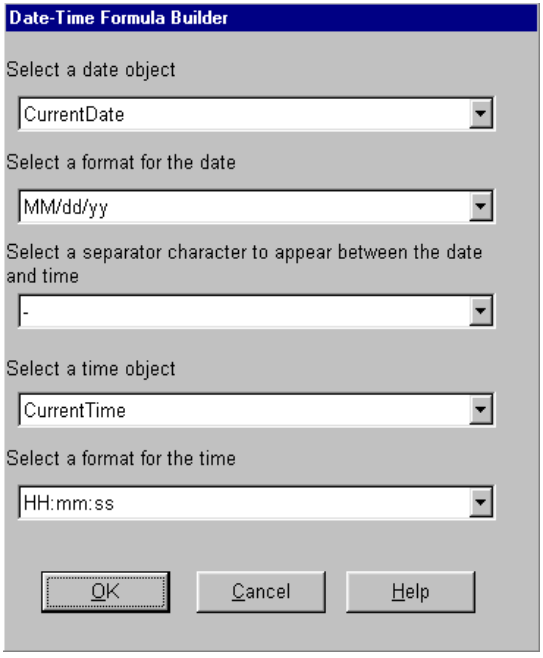
The standard formula types that you can build are listed below.

- Date - Time
- Index Point
- Combine Strings
- Channel Value
- Average Value
- Sample Name
- Value at Index Point

The following sections will help guide you through each formula builder type:

Date and time function formula builder

This formula builder is designed to aid in the construction of formulas that construct a string containing a *date* and time. For example, this formula builder allows you to create a formula that would report the date and time the current sample was created. The date and time strings can be separated by an optional separator character. The calculated string could appear "06-21-02, 10:30 AM."



1. Select a date for the new formula in the Select a Date Object combo box. The date objects that appear are the Date-Time functions available in TestWorks 4. If you do not wish to have a date appear in the formula, then select the None option in the combo box.

2. If you have chosen to have a date object in the formula, then you can also select a format for the date in the Select A Format for the Date combo box. The date format strings are like the standard Microsoft Windows date format strings.

3. If you wish to have a separator character to appear between the date and time objects in the formula, then select a separator character in the Select a Separator combo box. There are currently 8 possible separator characters:

    - a dash “-”
    - a comma “,”
    - a comma and a space “, “
    - a period “.”
    - a colon “:”
    - an underscore “_”
    - a space “ “
    - a space, a dash and a space “ - “

If you do not want a separator you can choose the None option. If you want to create a date/time string that can be used in the sample name, then you must select either the dash “-“ or the underscore “_” (or None). The other characters listed are not acceptable as file names.

4. Select a time for the new formula in the Select a Time Object combo box. The time objects that appear here are the Date-Time functions available in TestWorks 4. If you do not wish to have a time appear in the formula, then select the None option in the combo box.

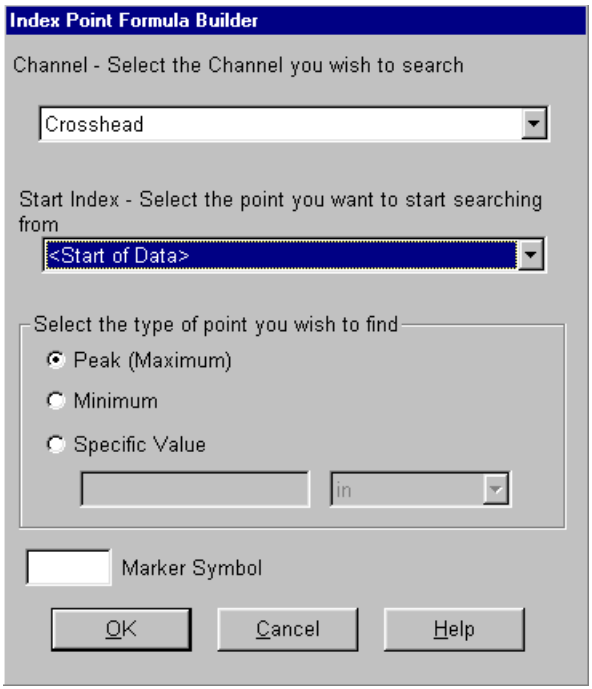
5. If you have chosen to have a time object in the formula, then you can also select a format for the time in the Select A Format for the Time combo box. The time format strings are like the standard Microsoft Windows time format strings.

The completed formula will be a sample-level result unless one of the *specimen-level Date-Time* functions were chosen as either the date or time object. In that case, the completed formula will be made a specimen-level result.

Finally, click the OK button to have the formula builder create your new formula. You can exit the formula builder without creating any new formulas by clicking the Cancel button.

Index point formula builder

This formula builder assists you in creating formulas *to find specific points on the data curve*. For example, you can find the point where the load is at its maximum value. When you create an index point, a marker will appear on the review graph to show you the location of the index point. You can also use this index point in other formulas. You might wish to find the value of a channel at this point, or you might wish to use this point as a starting point when you search the data for other values.



1. The first step in creating an index point formula is to choose a *channel* to search. This is the channel that defines the point you are looking for. For instance, if you want to find the point where the load is at its maximum value, choose *Load* from the first combo box.

2. The next combo box allows you to select an *index point* to start the search. For example, to consider only data after yield, choose *Yield Index*. To search all the data in the specified channel, choose *<Start of Data>* here. Any previous index points you have created with this formula builder will appear in the list that you can select from.

3. Next, you must type the point you wish to find. Simply click on the option of your choice. There are three types of points to choose from.

   - *Peak* - you find the point where the search channel reaches its maximum value.
   - *Minimum* - you find the point where the search channel reaches its minimum value.
   - *Specified Point* - you find the point where the search channel reaches a value you specify. When you select this type, you must enter a value and select the units for that value. For example, to find the point where extension is one inch, Select Extension as the channel to search. Then select Specific Value for the type of point. Enter "1" in the edit box and choose "in" from the Units combo box. The unit class of the available units will always match the unit class of the search channel.

4. You can give your formula a marker symbol by typing a letter or series of letters in the Marker Symbol edit box near the bottom of the dialog. This marker symbol will appear as a label for the marker of your new index point on the Review Graph.

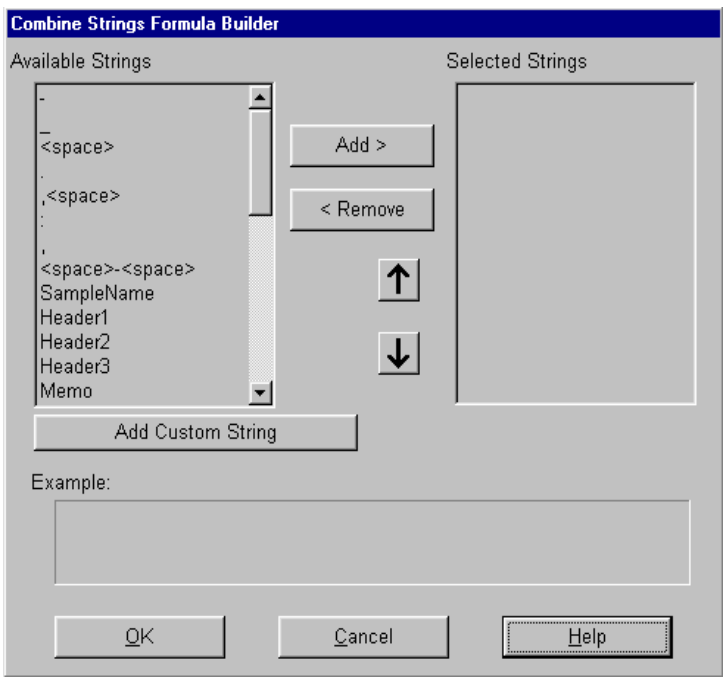
Finally, click the OK button to have the formula builder create your new formula. You can exit the formula builder without creating any new formulas by clicking the Cancel button.

Combined strings formula builder

This formula builder assists you in creating formulas *that will combine a number of strings into a single string*. A *String* is simply a series of characters (letters, digits, and punctuation symbols). A *String* can be a single character, a word or even a sentence. By combining several strings into one you can create a meaningful comment or memo for your specimens or samples.

Some functions built into TestWorks 4, the *UserName( )* function for example, return string values. The formula builder can use the values returned by some of these functions to construct strings. Likewise, some formulas and inputs produce string values that can be used by this formula builder. In fact, the formulas created by this formula builder can also be used.

As an example, you can use the combine strings formula builder to create a comment for each specimen which contains your company name, the operator's name and the date and time the specimen was run. (You can use the Date Time Formula Builder to create strings containing the date and time the specimen was run.).



Note *The list box on the left side of the dialog contains the objects available to you with which you can build your strings. At the top of the list you will find some commonly used separators, which are useful for placing between the various parts of your string. Further down the list, you will find formulas that produce strings and then a list of inputs that are strings. Still further down the list, you will find several TestWorks functions which return strings.*

1. You can add any of these objects to the string you are building by clicking on that object in the left side list box and then clicking the Add button. That object will then appear in the list box on the right side of the dialog. The right side list box contains all the objects you have selected to combine into your string. These objects appear in the order in which they will be in the new string. The first item in the list will be the first item in the string. The second item in the list will be the second item in the string and so on. You can change this order by clicking on the object in the right side list box and then clicking on the *up arrow button* or *down arrow button* and move the object up or down in the list. You can remove an object form the right side list by clicking on that object and then clicking the Remove button.

2. You can add your own strings to the new string by clicking on the Add Custom String button. You will be prompted to type in your string and when you click the OK button, your custom string will be added to the right side list with the other objects you have chosen to be in the string you are building.

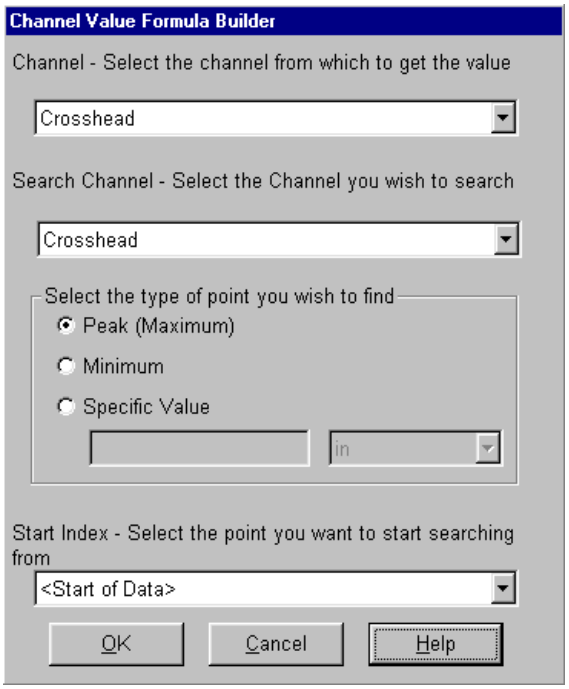
Note *You can not use quotation marks in your custom string.*

3. The Example box near the bottom of the dialog displays a rough example of what your new string will look like. As you add strings to the right side list (or remove or move them), the example string is updated automatically. Because the formulas, inputs, and functions can not return actual values until a specimen is run, their return values are not used in the example string. Instead the name of the formula, input or function is surrounded by square brackets [ ] and inserted into the example string where the return value would be. When your formula is calculated, "[UserName( )]" will be replaced with "Fred" (assuming, of course, that your user's name is Fred).

Finally, click the OK button to have the formula builder create your new formula. You can exit the formula builder without creating any new formulas by clicking the Cancel button.

Channel value formula builder

This formula builder assists you in creating formulas *to find the value of a channel at a specific point*. For example, you can create a formula that will return the load when the extension is at two inches or you can create a formula that will return the load when the load is at its maximum.



1. To build your formula you must first go to the top combo box and choose the *channel* you want to get the value from. If, for instance, you want to find the load when the extension is at two inches, you should select *Load*.

2. The remainder of the dialog looks very similar to the dialog for the Index Point formula builder. This is because defining a point to get the value is similar to defining an index point. To define the point at which you want your value you must select the channel to search. This is the channel used to define the point. For example, if you want to find the load when the extension is at two inches, you select Extension in the Search Channel combo box.

3. Next, you must select the type of point where you intend to find the value. Simply click on the option you desire. There are three types of points to choose from.

    - *Peak* - you find the point where the search channel reaches its maximum value.
    - *Minimum* - you find the point where the search channel reaches its minimum value.
    - *Specified Point* - you find the point where the search channel reaches a value you specify. When you select this type, you must enter a value and select the units for that value. For example, to find the point where extension is one inch, Select Extension as the channel to search. Then select Specific Value for the type of point. Enter "1" in the edit box and choose "in" from the Units combo box. The unit class of the available units will always match the unit class of the search channel.

4. Next, you can use the Start Index combo box to select an index point to start the search. For example, to consider only data after yield, choose Yield Index. To search all the data in the specified channel, choose *<Start of Data>* here. Any index points that you created with the Index Points formula builder will appear in the list that you can select from.

Finally, click the OK button to have the formula builder create your new formula. You can exit the formula builder without creating any new formulas by clicking the Cancel button.

Average value formula builder

This formula builder assists you in creating *formulas to find the average value of a channel over a range that you specify.*

1. To build your formula you must first go to the Result Channel combo box and choose the channel you want to get an average value for. If, for instance, you want to find the average load over a certain range, you should select *Load*.

2. Next, you need to specify the range. There are three ways to specify the range you want.

   - Choosing all data as your range is easy. Simply click on the Use All Data option. There is nothing else to configure.

   - To choose a range of data between two specific values, click on the Use Specified Values option. You will be presented with a set of controls which ask you to choose a search channel and enter values. The search channel is the channel you use to define the range. For example, if you wish find the average load over the range that goes from an extension or 1 inch to an extension of 2 inches, you would select extension as you search the channel and enter 1 in the *Value 1* edit box and 2 in the *Value 2* edit box. Select "in" for the units for both values. The units class of the Value 1 and Value 2 edit boxes will always be the same as the unit class for the search channel. If you leave the Value 1 edit box blank, the range will start at the beginning of the data. Likewise, if you leave the Value 2 edit box blank, the range will end at the end of data.

   - To choose a range of data between two index points, click on the Use Index Points option. You will be presented with two combo boxes that ask you to select two index points. Select an index point for *Point 1* and another index point for *Point 2*. For Point 1 you can select *<Start of Data>* to have the range begin at the start of the data. Likewise, for Point 2 you can select *<End of Data>* to have the range end at the end of the data. Any index points that you have created with the Index Point Formula Builder will be available for you to choose.

Sample name formula builder

This formula builder assists you in building a meaningful string that can be used as the sample name. A string is simply a series of characters (letters, digits, and punctuation symbols). A string can be a single character, a word or even a sentence. By combining several strings into one, you can create a meaningful name for your sample.

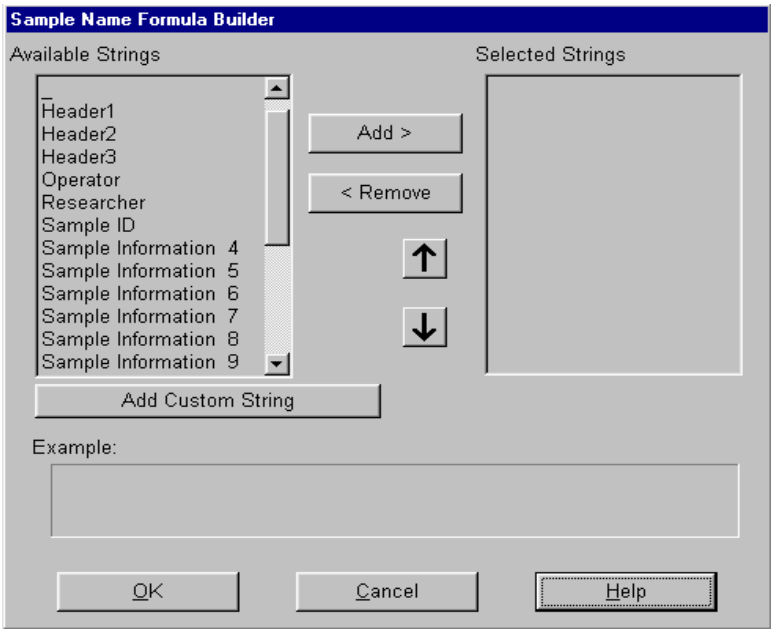
The Sample Name formula builder is almost identical to the Combine Strings formula builder. After all, this formula builder does pretty much the same thing. It combines smaller strings into a larger string. *The difference between the two is that while the Combine Strings formula builder creates a new formula to build your string, the Sample Name formula builder modifies a formula named *"SampleName"* that already exists in all methods. Once the SampleName formula is updated, calculation of the formula will be turned on and the file name of the sample will be updated when the formula is actually calculated.

Like the Combine Strings formula builder, the Sample Name formula builder can use the results of formulas and inputs that return strings to build the new sample name. However, Sample Name formula builder places limitations on which formulas and inputs you can use. By default, the SampleName formula is a calculated pre-sample, which means it is calculated just before the first specimen is run. Unless your user level is *Definer or above*, you will not be able to change it. This means that you must only use formulas and inputs which are sample level and are also calculated pre-samples. Therefore, only pre-sample formulas and inputs will appear in the list of formulas and inputs you can choose from.

Similarly, the Combine Strings formula builder and the Sample Name formula builder allows you to use some of the functions built into TestWorks 4, the UserName( ) function for example, that return string values to construct the sample name. As an example, you can create a name for your sample which contains your company name, the operator's name and the date and time the specimen was run. (You can use the Date Time Formula Builder to create string containing the date and time the specimen was run. Remember to use no specimen level information in the formula so that the formula will be sample level.)

Note *The list box on the left side of the dialog contains the objects available to you with which you can build your strings. At the top of the list you will find some commonly used separators, which are useful for placing between the various parts of your string. Further down the list you will find pre-sample formulas that produce strings and then a list of pre-sample inputs that are strings. Still further down the list you will find several TestWorks 4 functions which return strings.*

Many of the separators available to the Combine Strings formula builder are not allowed by the Sample Name formula builder because they are not legal characters in Windows file names. Make sure that your strings only contain characters that are legal in Windows file names.



1. You add any of these objects to the string you are building by clicking on that object in the left side list box and then clicking the Add button. That object will then appear in the list box on the right side of the dialog. The right side list box contains all the objects you have selected to combine into your string. These objects appear in the order in which they will be in the new string. The first item in the list will be the first item in the string. The second item in the list will be the second item in the string and so on. You can change this order by clicking on the object in the right side list box and then clicking on the up arrow button or down arrow button and move the object up or down in the list. You can remove an object form the right side list by clicking on that object and then clicking the Remove button.

2. You can add your own strings to the new sample name by clicking on the Add Custom String button. You will be prompted to type in your string and when you press the OK button, your custom string will be added to the right side list with the other objects you have chosen to be in the string you are building.

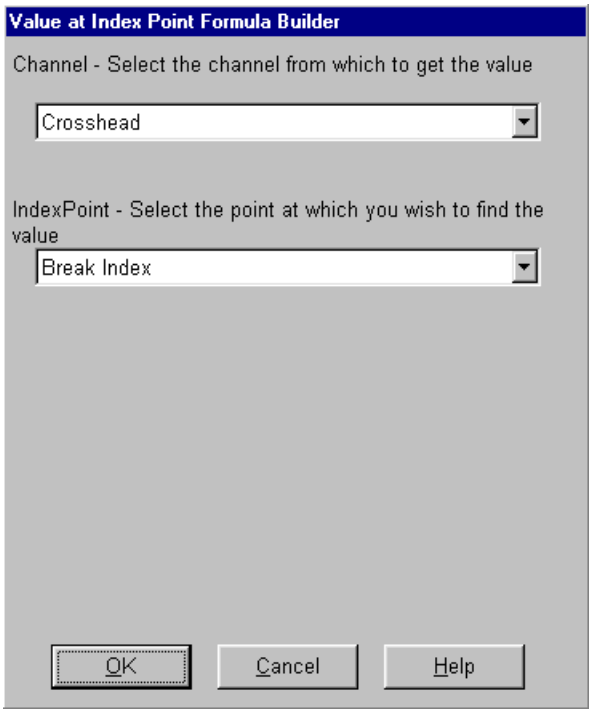
Note *You can not use quotation marks in your custom string.*

3. The Example box near the bottom of the dialog displays a rough example of what your new sample name will look like. As you add strings to the right side list (or remove or move them), the example string is updated automatically. Because the formulas, inputs and functions can not return actual values until a specimen is run, their return values are not used in the example string. Instead, the name of the formula, input or function is surrounded by square brackets [ ] and inserted into the example string where the return value would appear. When your formula is calculated, "[UserName( )]" will be replaced with "Fred" (assuming, of course, that your user's name is Fred).

Finally, click the OK button to have the formula builder update the SampleName formula. You can exit the formula builder without updating the SampleName formula by clicking the Cancel button.

Value at index formula builder

This formula builder assists you in creating formulas *to find the value of a channel at an index point*. For example, if you have an index point defined which indicates the location of the peak (maximum) load, you can have this formula builder create a formula that will return the extension at that point.



1. To build your formula, you must first go to the Channel combo box and choose the channel you want to get the value from. If, for instance, you want to find the extension at peak load, you should select Extension.

2. Next, go to the Index Point combo box and select the index point at which you wish to find the value. For example, if you have defined an index point at peak load, you can select that index. Any index point that is a marker will show up in the list for you to select from. This includes any index points you might have created with the Index Point formula builder.

Note *If an index point you are expecting to appear is not displayed, that index point can not be a marker. An index point must be a marker in order to show up in this list. To see whether or not an index point is a marker, go to the Formulas configuration item and find your formula in the list. Next, click on the Marker tab that appears below the list. If the Marker check box is not checked, check it to make that formula a marker. If the marker tab does not appear, then the formula has the wrong units class and cannot be a marker.*

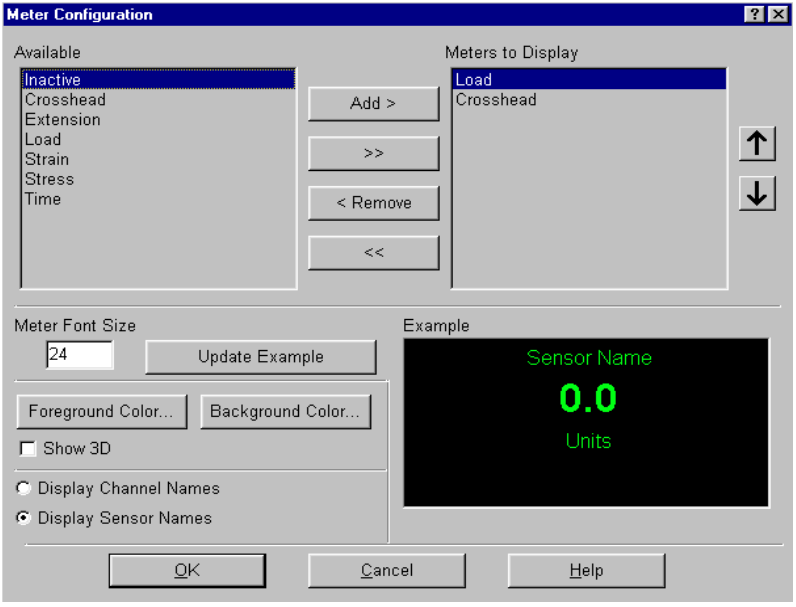
After you have selected your channel and index point, you can click the OK button to have the formula builder create your new formula. You can exit the formula builder without creating any new formulas by clicking the Cancel button.

Meter Configuration

Meters are located at the bottom of the Test Page and digitally display the signals coming from your data channels. Basic channels such as *load* and *crosshead/actuator rod position*, update in real-time, whether or not a test is running. TestWorks 4 allows the ability to *add*, *delete*, and *change the meter settings* from the Test Page view.

Configuring the meter view

To access the Meter Configuration dialog, click on the Configure menu option and select *Meters* or you can place the mouse cursor in the meter window, right-click, and select Properties.



You can perform the following tasks from this dialog:

Add a meter

1. Locate the Available list in the upper left-hand corner of the Meter Configuration dialog.
2. Click to highlight the meter that you desire.
3. Click on the Add button to add it to the Meters to Display window.

Note *The >> button will add all the meters.*

Remove a meter

1. Locate the Meters to Display list in the upper right-hand corner of the Meter Configuration dialog.
2. Click to highlight the meter that you want to remove.
3. Click on the Remove button to remove the meter from the Meters to Display list.

Note *Click on the << button to select and remove all of the meters at the same time.*

Changing the order of the meters

1. Locate the Meters to Display list in the upper right-hand corner of the Meter Configuration dialog.
2. Click to highlight the meter that you want to move.
3. Click on the Up Arrow button to move the selected meter higher within the list.
4. Click on the Down Arrow button to move the selected meter lower within the list.

Change the style of the meter display

1. Select the Meter Font Size text box located near the middle of the Meter Configuration dialog.
2. Type a number for the font size of the meter text.
3. Click on the Foreground Color button to select the color of the meter text.
4. Click on the Background Color button to select the color of the meter.
5. Place a check mark inside the 3-D Display check box to display the meter as a three-dimensional image.
6. Click on the Update Example button to preview the meter based on your style selections.

Channel and sensor names

A *channel* is a type or source of data. Therefore, your force or load readings are collected through a load channel. The name of the channel is displayed above the meter when the Display Channel Name option button has been selected.

A *sensor name* is the name of the device that is calibrated on a channel. Therefore, if the load cell that you have calibrated is called and labeled a 200 lb. load cell. Your load meter will display a 200 lb. load cell when the Display Sensor Name option button has been selected.

Follow these steps to name your meters:

1. Locate the Display Name option buttons in the lower left-hand corner of the dialog.
2. Click on the type of name to be used in your meters by selecting either the Display Channel Name or Display Sensor Name option buttons.

By right-clicking within the Meters window you can perform certain tasks. The following describes the options available:

Zero the channel

When you zero a channel, you are resetting it. TestWorks 4 reassigns the current value that is being read to zero. You should zero or tare, a data channel before running a test so that your test begins with the value of zero. For example, if you reposition your crosshead or actuator rod before you run a test, your meter will probably no longer read zero.

Follow these steps to zero or tare a channel:

1. Locate the meter for the channel you want to zero.
2. Right-click within the meter and select Zero Channel.

Note *Never zero or tare, a load channel after you have inserted a test specimen into your grips or other fixturing. Doing so can result in artificially low readings.*

Handset display

Depending on the testing frame that you have purchased, the Handset Display option will be shown. This gives you the ability to display the Meter values on the Handset display.

Calibrate device

This option allows the user to calibrate the specified device. When selected, the calibration routine within the software will be initialized.

Configure channel or device

Please refer to"Channels" on page 78.

Decimals The Decimals option allows you to configure to the decimal places for the meter view. The number of decimal places is limited from 0 to 5 places.

Units Selecting units will allow you to change the unit type for the specified meter. For example, you can change the Load Cell value from pounds to newton.

Remove This will remove the specified meter from the Test page view.

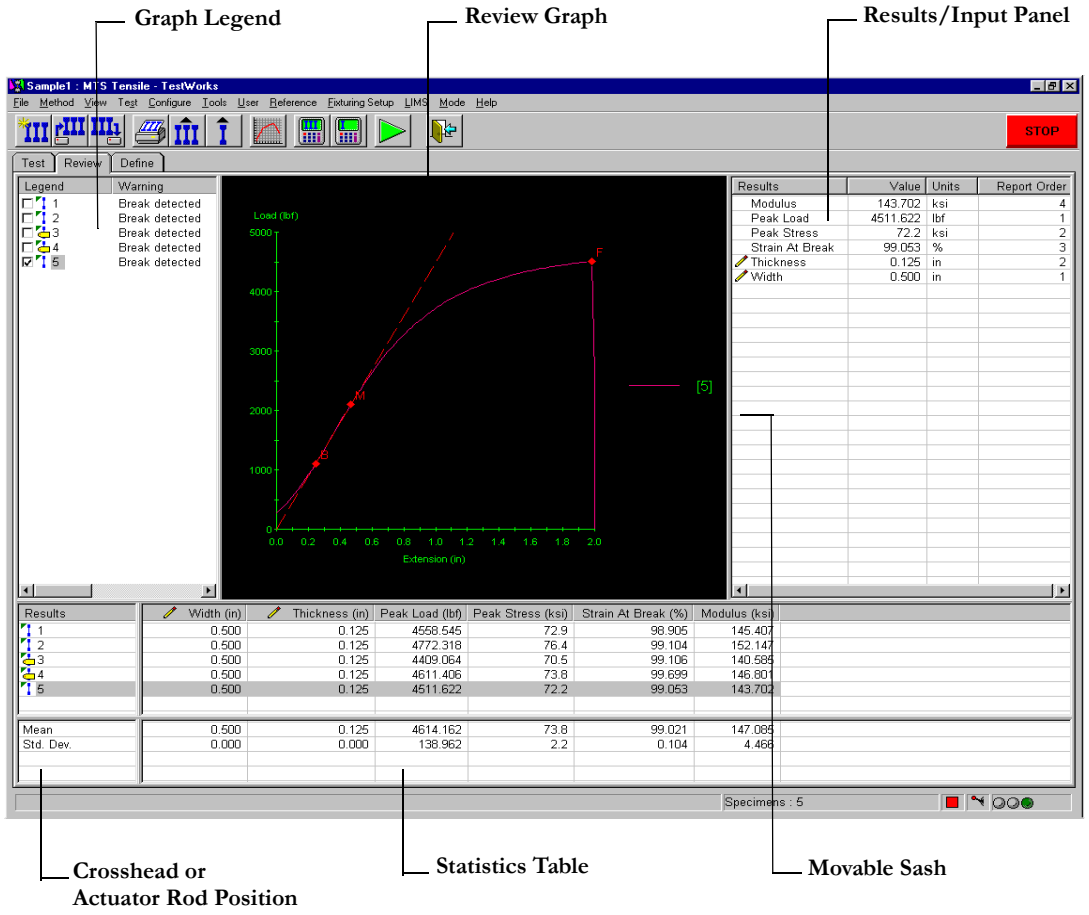
Add The Add option will display all the meters available within the method. Just highlight the meter you want to display and the meter will be added.

Properties Refer to "Review Graph" on page 139.

Reviewing Data

Introduction of review page

Now that you have finished running a test, you will want to review the data generated by that test. You can do that on the Review page. Usually, TestWorks 4 will be set up to switch to the Review Page when a test is completed. If not, you can easily show the review page by clicking the Review tab just under the toolbar or by selecting View and then View Page from the menu. Below is an example the Review Page.



Notice that the Review Page has four major areas: the Graph Legend, the Review Graph, the Results/Inputs Panel, and the Statistics Table. You can use the Graph Legend to select which specimens to display on the graph. From this view, you can also tag and delete specimens. Also, if a specimen has any warnings, the first warning for that specimen will appear on this view.

The Review Graph will display pictorially the data gathered for one or more specimens. If you have the correct permissions, you can configure the Review Graph to your liking. You can specify which channels to plot, the scale of the graph, and even the colors. You can also add objects such as text and lines to your graph to make it more descriptive. The graph can be printed or saved to a bitmap file.

The Results/Inputs Panel can display a wide variety of data. By default, it displays the values of formulas and inputs that are designated as results. However, you can also set this panel to display all of the required inputs, all of the inputs that can be edited after the test, and even the raw channel data. If the crosshairs on the review graph are active and the Results/Inputs Panel is showing the raw channel data, the raw channel values will update to display the data that correlates to the position of the crosshairs on the graph. From this panel, if you have the correct permissions, you can also edit formulas and inputs as well as edit the reporting orders for formulas and inputs.

The Statistics Table displays the results for each specimen in the sample as well as certain statistical data, such as average and standard deviation, based on these results. If you have the correct permissions, you can specify which statistics to display.

As with the Test Page, the sashes (the lines between the different panels) on the Review Page are movable. If you have the correct permissions, then you can use these sashes to change the size of the various panels.

Let’s look at each part of the Review Page in more detail.

Movable sashes

If you have permission to change the user interface, then you can use your mouse to drag a sash and change the size of the panels affecting the overall size. The sashes work just like they do on the Test Page. To move a sash, you first move the mouse pointer directly over the sash you wish to move. Watch for the mouse pointer to change from the normal pointer to a short line with arrowheads at each end. If the line is horizontal, then you will be able to move the sash to the left or right. If the line is vertical, you will be able to move the sash up and down. Once the mouse pointer has changed, press the left mouse button and hold it down. Drag the sash to the location you desire. You will see a shadow of the sash following your mouse and indicating your position. Once this shadow is in the location you desire, release the mouse button. The sash will move to this new position and the windows on either side of the sash will be resized accordingly. If the mouse cursor does not change when you move the mouse over a sash, then you do not have permission to change the user interface and will not be able to move the sash.

Graph legend

The Graph Legend allows you to select which specimens to display on the review graph. It also allows you to tag specimens, delete specimens and view specimen warnings. The Graph Legend lists each specimen that has been run in the order in which they where run. The legend also lists any pre-allocated specimens that have not yet been run. The selected (highlighted) specimen is the active specimen. The active specimen is always displayed on the Review Graph, and the values displayed in the Results/Inputs Panel always pertain to the active specimen. Usually the last specimen run will be the active specimen. You can select any specimen as the active specimen by clicking on that specimen with the mouse.

Check boxes

Each listing in the legend contains a check box, an icon and the number of the specimen. The check box is used to indicate whether or not a given specimen should appear on the Review Graph. To display a specimen on the Review Graph, place a check in this check box. Each specimen whose check box is checked will appear on the Review Graph along with the active specimen. To remove a specimen from the Review Graph simply uncheck this check box. The active specimen always appears on the Review Graph regardless of whether or not this box is checked.

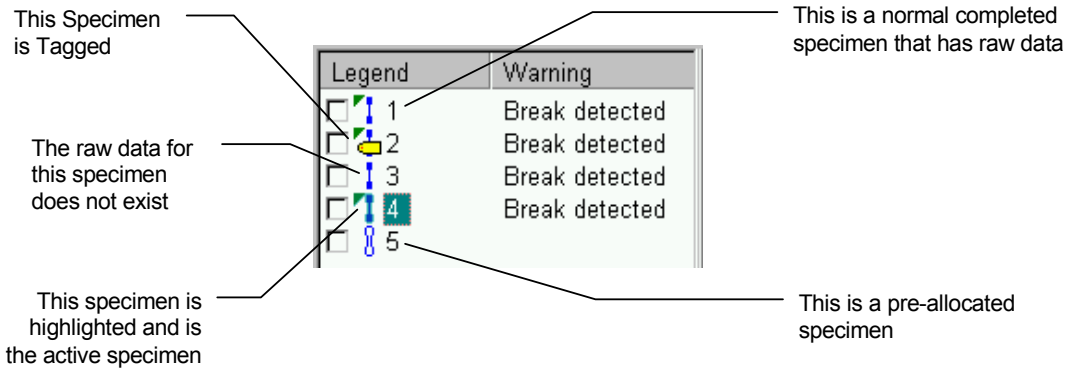
Specimen icons

The appearance of the icon displayed in a specimen listing changes according to the characteristics of the specimen. This icon includes the shape of a traditional “dogbone” specimen. For completed specimens, this specimen shape will be solid. For pre-allocated specimens that have not yet been run, this shape will be hollow.

A little green triangle in the upper left-hand corner of the specimen icon indicates that the raw data associated with this specimen exists. If this little triangle is not present on the icon, then the raw data associated with this specimen was not saved or has been deleted. Because the Review Graph needs a specimen's raw data to create the specimen curve, a specimen without raw data cannot be displayed on the Review Graph.

The yellow tag symbol on a specimen icon indicates that the specimen has been tagged. A specimen can be tagged either manually by the user or automatically by the Tag Limits configuration item. The results of a tagged specimen are not included in statistical comparisons performed by TestWorks 4. Also, tagged specimens do not count toward the maximum number of specimens in a sample. You can tag (or untag) a specimen manually by right-clicking on that specimen entry in the legend and then selecting Tag Specimen from the pop up menu. Tagged specimens can also be deleted from the sample as a group. To quickly delete all tagged specimens right-click anywhere on the legend and select Delete all Tagged Specimens from the right-click menu.

The following illustration demonstrates the various specimen icons that can appear on the Graph Legend.



Specimen warnings

Some specimens will have warnings associated with them. A warning is not necessarily a bad thing. It just indicates that there is something about this specimen that you might want to notice. For instance, a warning will be associated with the specimen if the specimen breaks or if the user stopped the test. If a specimen has a warning associated with it, the Warning column in the Graph Legend will display that warning. If a specimen has multiple warnings associated with it, the Warning column will display the first warning associated with that specimen. You can view the remaining warnings by right-clicking on the specimen and selecting View Warnings from the pop up menu. You will be presented with a dialog that displays all the warnings associated with that specimen.

Right-click menu

When you right-click on a specimen listing in the Graph Legend, a menu will pop up that lets you select from a variety of actions that you can perform on a specimen. Let's take a closer look at each of these actions.

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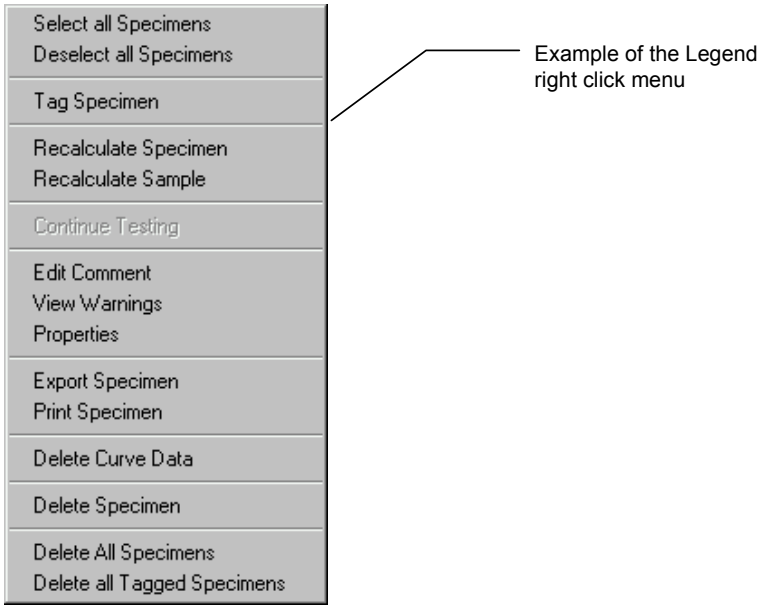


Select All Specimens

This command places a check in the check boxes of all specimens in the list so that all the specimens will be displayed on the Review Graph. This command does not affect which specimen is the active specimen.

Deselect All Specimens

This command removes the checks in the check boxes of all specimens in the list so that none of the specimens (except for the active specimen) will be displayed on the Review Graph. This command does not affect which specimen is the active specimen.

Tag Specimen

This command tags or untags a specimen. This command affects the specimen that was right-clicked on. If the specimen is not already tagged, then this command will tag the specimen. If the specimen is already tagged, then a check will appear next to this menu item indicating that the specimen is currently tagged. In this case, this command will untag the specimen. The results of a tagged specimen are not included in statistical comparisons performed by TestWorks 4. Also, tagged specimens do not count toward the maximum number of specimens in a sample.

Recalculate Specimen

This command recalculates all the results for this specimen (the specimen that was right-clicked on). For example, if you added a new result formula to your method after this specimen had been run, you can use this command to force a value to be calculated for this new result.

Recalculate Sample

This command recalculates the results for all specimens in the sample. You can use this command to update all of the specimen results within a sample after you have made changes to a test method. For example, if you change the formula for the strain channel, this command will update the results to reflect this new formula.

Continue Testing/Begin Test

The Continue Testing command restarts a test that has been stopped prematurely. For example, if you accidentally aborted a test by pressing the spacebar, you can use this command to restart the test. For pre-allocated specimens, this menu item becomes the Begin Test command which starts a new test. This action is the same as pressing the start button on the Test Page. The data and calculations from this test will be inserted into the first pre-allocated specimen that has not yet been run.

Edit Comment

This command allows you to enter a comment for the given specimen (the specimen that was right-clicked on) or if a comment already exists for the specimen to edit that comment. When you choose this command, a dialog pops up that allows you to enter the text for your comment. The text you enter is stored in the Specimen Comment input for the given specimen. Your comment can be included on reports that you print. You must have permission to edit specimens on the Review Page for this command to be enabled. (This is a flag in your user profile set by your supervisor.)

View Warnings

This command enables you to view all the warnings associated with a specimen. Normally, only the first warning associated with a specimen is displayed in the Warnings column of the legend. Selecting this command will present you with a dialog that displays all the warnings associated with this specimen.

Properties

This command displays the Sample Properties dialog, which allows the user to see the “traceability” information for a sample and its specimens. The “traceability” of a sample or specimen is a time stamp that contains the date, time, customer name, system and site numbers, user name, and software version under which a sample or specimen was either created or modified. For more information on the Sample Properties dialog refer to “Sample Properties Dialog” on page 159

Export Specimen

This command writes a specimen Export file for the given specimen (the specimen that was right-clicked on). The file is written according to the settings made in the Specimen Export configuration item of the current test method.

Print Specimen

This command prints a specimen report for the given specimen (the specimen that was right-clicked on). The report is based on the settings made in the Specimen Report configuration item of the test method.

Delete Curve Data

This command will delete the raw data from the given specimen (the specimen that was right-clicked on). TestWorks 4 uses a specimen's raw data to create the specimen curve on the Review Graph and to calculate results. Therefore, if you delete the raw data for a specimen, you will not be able to display that specimen on the Review Graph nor will you be able to recalculate the specimen's results. However, if you decide not to do either of these things, you can reduce the amount of disk space required by the sample file if you delete the raw data. You must have permission to delete specimens for this command to be enabled. (This is a flag in your user profile set by your supervisor.).

Delete Specimen

This command will delete the given specimen (the specimen that was right-clicked on) from the sample. You must have permission to delete specimens for this command to be enabled.

Delete All Specimens

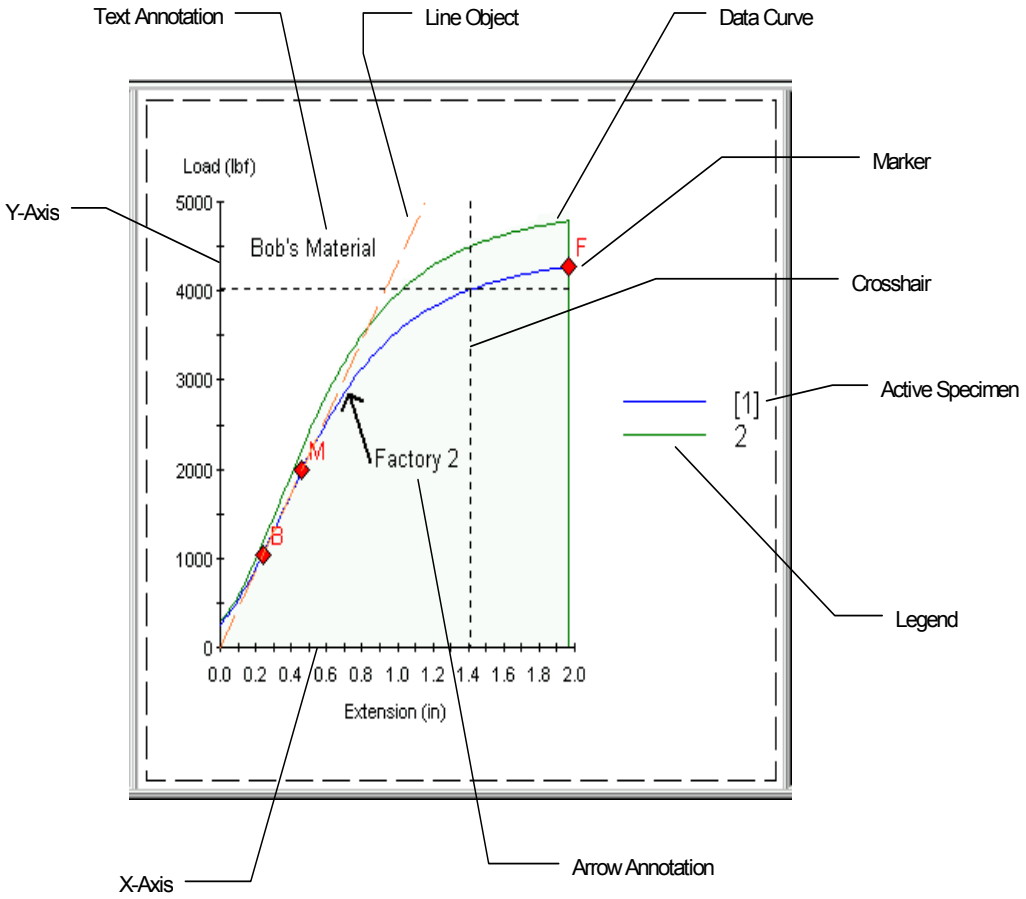
This command will delete all specimens from the current sample. A dialog will appear asking, “Are you sure you want to do this?” You must have permission to delete specimens for this command to be enabled.

Delete all Tagged Specimens

This command will delete all specimens that have been tagged (either manually by the user or automatically by TestWorks 4) from the current sample. You must have permission to delete specimens for this command to be enabled.

Review Graph

The Review Graph will plot the data from one or more of your specimens in a graphical format. Below is an example of what the Review Graph might look like



This graph shows a plot of Load on the Y-Axis, versus Extension on the X-Axis. There are two data curves on the graph. The legend tells us that these data curves correspond to specimens 1 and 2. Specimen number 1 is the active specimen, as indicated by the brackets around the number 1 in the legend. Also present on this graph are examples of markers, a line object, a text annotation, and an arrow annotation. Let's look at the various parts of the review graph in more detail.

X-axis and Y-axis

The X-Axis is the horizontal axis of the graph, and the Y-Axis is the vertical axis. You can select any channel or per point formula to use for either axis. In the above example, Load is used for the Y-Axis and Extension is used for the X-Axis. If you prefer, you plot Time on the X-Axis rather than Extension to create a Load versus Time plot. Or you could plot Stress on the Y-Axis and Strain on the X-Axis for a Stress-Strain curve.

You can select the channel to display on the Y-Axis by right-clicking on the Review Graph and selecting Y-Axis Channel from the pop up menu. A fly out menu will list the channels you can choose from. Select the channel you desire from the fly out menu. Likewise, you can set the X-Axis channel by right-clicking on the Review Graph and selecting X-Axis Channel from the pop up menu and then selecting the channel you want from the fly out menu.

You can also select the units to use for plotting the X-Axis or Y-Axis channels. For example, let's say you are doing some low force testing and you want a graph with Load on the Y-Axis. You might want to change the Y-Axis units from pounds to ounces. To do this, right-click on the Review Graph and select Y-Axis Units from the popup menu. A fly out menu will list all the available units in the unit class used by the Y-Axis channel. Select the unit you want from this menu. Likewise, you can set the units for X-Axis channel by right-clicking on the Review Graph and selecting X-Axis Units from the pop up menu and then selecting the unit you want from the fly out menu.

The scales of the X and Y Axes are normally set automatically by the Review Graph. You can, however, set the scales manually through the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog refer to "Review Graph Setup" on page 163.

Note *In order to change the channel or unit for either axis, you must have permission to change the user interface. (This is a flag in your user profile set by your supervisor). You must also have permission to change the user interface in order to set axis scales through the Review Graph Setup Dialog.*

Data curves

The data curves are the actual plots of channel data. The data curves for several specimens can be shown on the Review Graph and one time so that you can easily compare specimen data. For example, you can show any number of specimens within the sample on the graph. You add curves to the Review Graph by placing a check in the check box next to the specimen in the Graph Legend panel. Likewise, unchecking the check box next to a specimen in the Graph Legend panel will remove that curve from the Review Graph.

It does not matter how many data curves appear on the Review Graph; only one will correspond to the active specimen. The active specimen is the one indicated by brackets around the number in the legend. Knowing which curve belongs to the active specimen is important because any markers or line objects that are showing pertain only to the active specimen.

In the example Review Graph, the two data curves have different colors. The colors and line styles (for example, solid line or dashed line) are adjustable and can be set through the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog, refer to "Review Graph Setup" on page 163. You must also have permission to change the user interface in order access the Review Graph Setup Dialog.

Legend

The legend shows you which data curve goes with which specimen. Each data curve that appears on the Review Graph has an entry in the legend. The legend entry consists of the specimen number and an example of the color and line style used for that data curve. An example of the Review Graph on your computer screen will show that the blue data curve corresponds to specimen number 1 and the green data curve corresponds to specimen number 2. You also can tell that specimen 1 is the active specimen because the active specimen will always be indicated by brackets around the specimen number.

The maximum number of entries the Legend can hold is sixteen. More than sixteen specimens can be displayed on the Review Graph at once but only the first sixteen will have entries in the Legend.

The legend can easily be hidden. To hide the Legend (or show it if it is hidden) right-click on the Review Graph and select Legend from the pop up menu. If the Legend is currently visible, a check will appear next to the "Legend" menu item. Then when you select this menu item, the legend will be hidden. If the legend is already hidden, no check will appear next to the "Legend" menu item. Then when you select this menu item, the Legend will be made visible. You do not need any special permission to be able to hide or show the Legend.

The Legend has other properties which can be adjusted as well. In the example Review Graph, the legend appears to the right of the graph, but the Legend position can be moved to the top, left, bottom, top-right, etc. You can also display a border around the Legend. These options are set via the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog, refer to "Review Graph Setup" on page 163. You must have permission to change the user interface in order access the Review Graph Setup Dialog.

Crosshair/tracking

When the tracking feature is enabled and you move the mouse over the Review Graph, the crosshair will follow the mouse as closely as possible while remaining centered on the active specimen curve. As the crosshair moves along the specimen curve, you will be able to see the crosshair position indicator (located in the status bar at the bottom left of the TestWorks 4 window) update automatically to reflect the current position of the crosshairs. Also, if the Results/Inputs Panel is set to show raw channel data, the data displayed in the Results/Inputs Panel will update automatically to show the values of the channels at the current crosshair position. The crosshair only follows the active specimen curve.

You can also move the crosshair along the specimen curve with left and right arrow keys. The crosshair must be visible for the arrow keys to work. If the crosshair is not visible, click on the Review Graph with the mouse and the crosshair should appear.

You can disable the tracking feature, but if tracking is disabled the crosshair will not move with the mouse and the values in the crosshair position indicator and the raw channel data will not be updated. To disable (or enable) the tracking feature, right-click on the Review Graph and select Tracking from the pop up menu. If tracking is currently visible, a check will appear next to the Tracking menu item. Then, when you select this menu item, tracking will be disabled. If tracking is already disabled, no check will appear next to the Tracking menu item. Then, when you select this menu item, tracking will be enabled. Likewise, you can hide (or show) the crosshair by selecting Crosshair from the right-click menu. You do not need any special permission to enable/disable tracking or show/hide the crosshair.

Markers

A marker is a unique data point that is derived from a formula calculation. Markers are used to indicate important data points such as yield or break. They are also used with other calculations such as the calculations used to determine the Modulus line. When the data curves are plotted on the Review Graph, a special marker point indicator is placed on the data point as determined by the marker formula. Each marker has a Marker Symbol; a letter or letters used to identify the marker. Markers only appear on the active specimen curve.

A marker's Symbol and its color are determined by its Formula and can be changed if you have the ability to edit Formulas.

Some markers are movable. If a marker is movable you can override its formula calculation and place anywhere you wish along the data curve. To move a marker, you must first position the crosshair where you want to place the marker. Next, type the letter corresponding to the Marker Symbol or the first letter of the Marker Symbol. The marker will jump to the new position. When you move a marker, TestWorks 4 automatically updates all results that are associated with the marker. If you recalculate the specimen, or sample, the marker will jump back to its calculated position (unless the marker formula is set to Never Recalculate). Whether or not a marker is movable is determined by the marker formula. In order to move markers you must have permission to edit specimens. (This is a flag in your user profile set by your supervisor).

Line objects

Line Objects can be placed on the Review Graph to indicate important lines such as the Modulus line. Line Objects are always based on the active specimen. Line objects are defined on the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog, refer to "Review Graph Setup" on page 163. You must have permission to change the user interface in order access the Review Graph Setup Dialog.

Text annotations

Text annotations are short bits of text that can be placed on the Review Graph. You can use a text annotation to display some important information about a specimen or sample. To add a text annotation, right- click on the Review Graph and select Add from the pop up menu. When the fly out menu appears, select Text. A simple dialog will now appear. Type in the text you want and click OK. The text will appear on the Review Graph.

You can move the text by clicking on it and while holding the mouse button down dragging it to the desired location. The text color will always be the same as the foreground color of the graph. You can edit the text in the text annotation by right-clicking on the text annotation and selecting Edit from the pop up menu. The same simple dialog will appear again. Change the text and click OK. The text in the text annotation will update to reflect your changes. You can delete a text annotation by right-clicking on the text annotation and selecting Delete from the pop up menu. You do not need any special permissions to work with text annotations

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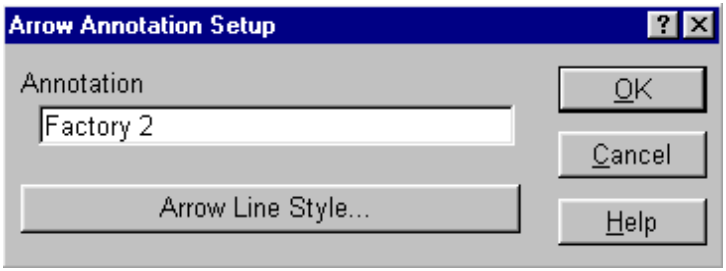

Arrow annotations

Arrow annotations combine a text annotation and an arrow. Arrow annotations can be used to point out important features on the Review Graph. To add an arrow annotation, right-click on the Review Graph and select Add from the pop up menu. When the fly out menu appears, select Arrow. A simple dialog will now appear. Type in the text you want. Next, click on the Arrow Line Style button to change the characteristics of the arrow. You can choose the line thickness, the line style (solid, dashed, etc.) and the line color. Click OK and the arrow annotation will appear on the Review Graph.

You can move the text by clicking on it and while holding the mouse button down dragging it to the desired location. If you click on the text portion of the arrow annotation, you will only move the location of the text in relation to the position of the arrowhead. If you click on the arrow portion, you will move the entire arrow annotation.

The text color will always be the same as the foreground color of the graph. You can edit the text in the text annotation by right-clicking on the text annotation and selecting Edit from the pop up menu. The same simple dialog will appear again. You can change the text as well as the line thickness, style, and color. The text color will always be the same as the foreground color of the graph. Click OK to update the arrow annotation to reflect your changes. You can delete an arrow annotation by right- clicking on the arrow annotation and selecting Delete from the pop up menu. You do not need any special permissions to work with arrow annotations.

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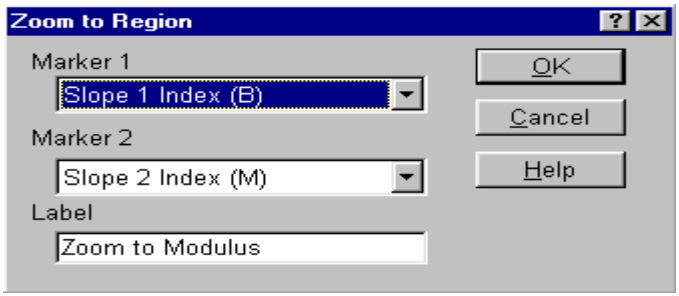

Zooming

You can easily zoom in areas of the graph that are of interest to you. Perhaps the current scale of the graph makes it difficult to see an area where there are small but important fluctuations. You can zoom in and make that area appear larger.

To zoom, simply click on an area of the graph that is not an object of some kind - like a text annotation. While holding the mouse button down, drag the mouse. You will see a rectangular box form and size itself with the movement of the mouse. Drag the mouse so that the box encloses the area you wish to zoom in on. When you let go of the mouse button the area inside the box will expand to fill the entire graph. The smaller the box is drawn, the greater the amount the zoom will be. Once you have zoomed in on an area you can repeat the zoom procedure to zoom in even more.

To cancel the zoom and return the graph to its original scale, right-click on the Review Graph and choose Reset from the pop up window.

No data available

If you see the words No Data Available on the Review Graph in place of the graph and data curves, this means that none of the specimens selected for display on the review graph, including the active specimen, have raw data associated with them. The raw data for these specimens was either deleted or was not saved. If you opened a previously saved sample and get this message on the Review Graph then the raw data was probably not saved. Whether or not no raw data is saved is controlled by a check box on the Miscellaneous Configuration Item.

Right-click menu

When you right-click on the Review Graph, a menu will pop up that gives you a variety of options for configuring the Review Graph. Let's take a closer look at each of these options.

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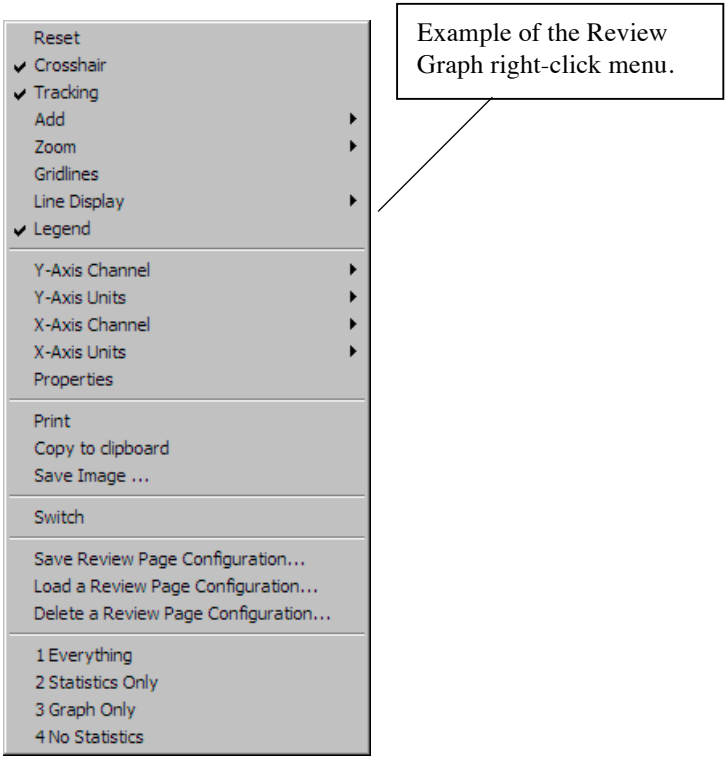

Reset

This is a useful command to remember. The Reset command restores the graph to its original scale after you have zoomed in to an area. Because zooming is so easy, it is possible to zoom in on an area by mistake. The Reset command will put you back to your original position. If the graph suddenly looks different from what you expect, try the Reset command to get you back to your original position.

Crosshair

This command will show or hide the crosshair. If the crosshair is currently showing, a check will appear next to this menu item and this command will hide the crosshair. If the crosshair is currently hidden, a check will not appear next to this menu item and this command will show the crosshair.

Tracking

When tracking is enabled, the crosshair will follow the mouse along the specimen curve, and the crosshair position indicator (located in the status bar at the bottom left of the TestWorks 4 window) will update automatically to reflect the current position of the crosshairs. Also, if the Results/Inputs Panel is set to show raw channel data, the data displayed in the Results/Inputs Panel will update automatically to show the values of the channels at the current crosshair position. If tracking is disabled the crosshair will not move with the mouse and the values in the crosshair position indicator and the raw channel data will not be updated. Tracking only works for the active specimen curve.

If tracking is currently enabled, a check will appear next to this menu item, and this command will disable tracking. If tracking is currently disabled, a check will not appear next to this menu item, and this command will enable tracking.

Add

This command allows you to add a text annotation or arrow annotation. When you select this menu item a fly out menu will appear. To add a text annotation, choose Text from this fly out menu. To add an arrow annotation, select Arrow from the fly out menu. For more information on text annotations refer to the previous section titled “Text Annotations.” For more information on arrow annotations refer to the previous section titled “Arrow Annotations.”

Zoom

This command causes the Review Graph to automatically zoom to a previously defined Zoom object. These zoom objects use one or two markers to define an area to zoom into. For example, the Tensile Master contains a zoom object named “Zoom To Modulus” which allows you to zoom in on the area of the graph between the two markers that define the Modulus line.

When you select this menu item a fly out menu will appear. This menu will list all the previously defined zoom objects. To zoom, select the zoom object you wish to use from this menu. TestWorks 4 will zoom the Review Graph to the area defined by the zoom object.

Zoom objects are defined on the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog refer to the section titled “Review Graph Setup.” You must have permission to change the user interface in order access the Review Graph Setup Dialog.

Gridlines

This command will show or hide gridlines on the Review Graph. If the gridlines are currently showing, a check will appear next to this menu item and this command will hide the gridlines. If the gridlines are currently hidden, a check will not appear next to this menu item and this command will show the gridlines

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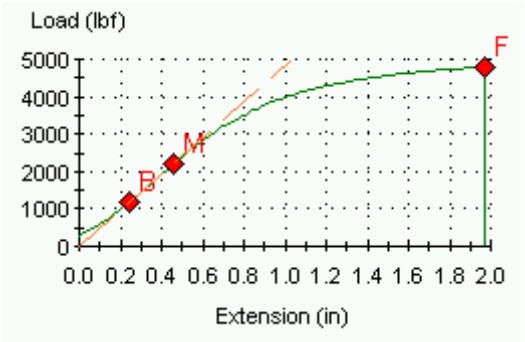
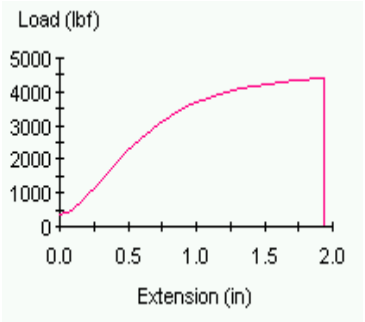


Example of a graph with gridlines

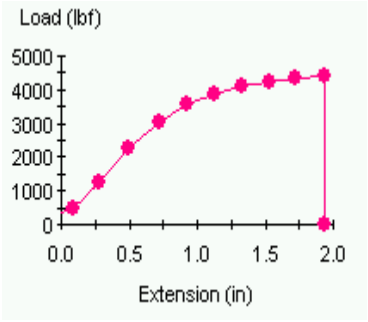
Line Display

By default, when the data curves are plotted, you do not see the individual data points. You just see the line connecting the points. That can be changed, however, with this command. You can use this command to display the data points on the line, the data points only or the line only (default).

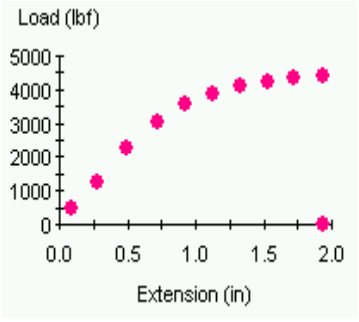
When you select the Line Display item, a fly out menu appears which contains your three choices. The “Lines Only” option shows only the lines connecting the points and hides the individual points. The “Lines and Points” option shows both the individual points and the lines that connect the points. The “Points Only” option shows only the individual points with no lines connecting them. The current line display type is indicated by a check next to the choice. Usually you will not want to show the individual data points because at typical data collection rates, there will be so many points, you will not be able to distinguish the individual points.



Lines Only Example



Lines and Points Example



Points Only Example

Legend

This command will show or hide the legend. If the legend is currently showing, a check will appear next to this menu item, and this command will hide the legend. If the legend is currently hidden, a check will not appear next to this menu item and this command will show the legend.

Truncate Data

This command allows you to delete a portion of the specimen data. To truncate data, first place the crosshair where you want the truncation to occur. Then right-click and select this menu item. If you have not yet truncated any data for this specimen, the fly out menu that appears should have only one option, “At Crosshair.” When you select this option, all specimen data after the crosshair will be deleted. You can also truncate data by placing the crosshair where you want the truncation to occur and pressing the Ctrl/F key combination. Please note that in order for this command to be available to you, you must have permission to truncate data. (This is a flag in your user profile set by your supervisor.)

After you have truncated data from a specimen, other options become available to you on the fly out menu. You can restore truncated data by right-clicking, selecting Truncate Data, and then selecting Restore from the fly out menu. The truncated data will be added back to the specimen. You can also restore data by pressing the Shift-F key combination.

If you have permission to truncate data permanently (another flag in your user profile set by your supervisor), then you will have the option of making a data truncation permanent so that the data cannot be restored. After you have truncated the data, right-click and select Truncate Data. Then select Make Permanent from the fly out menu. You will no longer be able to restore the truncated data.

Y-Axis Channel

This command allows you to set the *channel* to be used on the Y-Axis (vertical axis) of the Review Graph. When you select this menu item a fly out menu will appear that lists all the channels and per point formulas available for you to use. The current channel will have a check next to it. Select the channel or per point formula you want from this list and the graph will be updated to reflect your change. You must have permission to change the user interface for this command to be available to you.

Y-Axis Units

This command allows you to choose the *units* that will be used on the Y-Axis (vertical axis) of the Review Graph. When you select this menu item, a fly out menu will appear that lists all the units belonging to the unit class of the Y-Axis channel. For example, if the Y-Axis channel is Load, you will have units like pounds, kilograms, and Newtons available to you. The current unit will have a check next to it. Select the unit you want from the list and the graph will be updated to reflect your change. You must have permission to change the user interface for this command to be available to you.

X-Axis Channel

This command allows you to set the *channel* to be used on the X-Axis (vertical axis) of the Review Graph. When you select this menu item, a fly out menu will appear that lists all the channels and per point formulas available for you to use. The current channel will have a check next to it. Select the channel or per point formula you want from this list and the graph will be updated to reflect your change. You must have permission to change the user interface for this command to be available to you.

X-Axis Units

This command allows you to choose the *units* that will be used on the X-Axis (vertical axis) of the Review Graph. When you select this menu item, a fly out menu will appear that lists all the units belonging to the unit class of the X-Axis channel. For example, if the X-Axis channel is Extension, you will have units like inches, centimeters, and millimeters available to you. The current unit will have a check next to it. Select the unit you want from the list and the graph will be updated to reflect your change. You must have permission to change the user interface for this command to be available to you.

Properties This command opens the Review Graph Setup Dialog which provides more comprehensive setup options for the Review Graph. For more information on the Review Graph Setup Dialog, refer to "Review Graph Setup" on page 163. You must have permission to change the user interface in order to access the Review Graph Setup Dialog.

Print This command will print out a copy of the Review Graph image. Usually the graph will be set up to print a black and white version of the graph (black foreground on white background). This is convenient because many office printers are still black and white. This option can be changed via the Review Graph Setup Dialog. For more information on the Review Graph Setup Dialog, refer to "Review Graph Setup" on page 163. You must have permission to change the user interface in order to access the Review Graph Setup Dialog.

Copy to Clipboard This command will create a bitmap image of the Review Graph and place it on the clipboard. You can then paste the image into other programs such as Microsoft Word or Microsoft Paint.

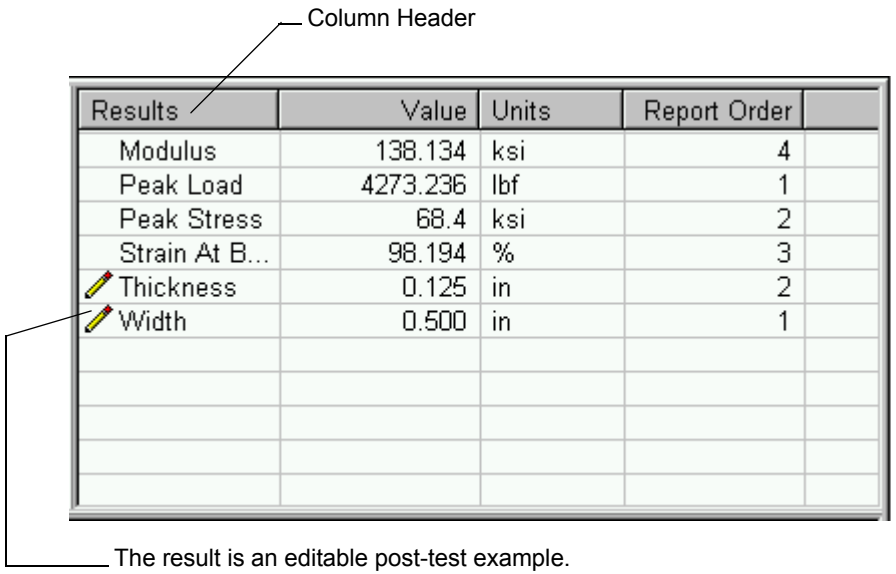
Save Image This command will create a bitmap image of the Review Graph and save it in a Windows Bitmap (.bmp) file. When you select this option you will be presented with a standard Windows save dialog where you can choose a name and a location for your file. The saved file can be opened in most image editing programs.

Switch Switch allows toggling between graph and table.

Results/Inputs Panel

The Results/Inputs Panel is used to display data from your test. By default, it displays the values of formulas and inputs that are designated as results. However, you can also set this panel to display all of the required inputs, all of the inputs that can be edited after the test, and even the raw channel data. Here is an example of what the Results/Inputs Panel might look like.

This example shows the Results/Inputs Panel in Results mode. That means it is displaying the Formulas and Inputs that are designated as results.



Column headers / sorting

As you can see from the example, this panel is a table divided into columns. Each column has a column header that identifies the contents of that column. The column headers are also used for sorting the data. If you click on a column header with the mouse, the data in the table will be sorted by the values in that column. The sort is in ascending order by either numerical or alphabetical order. Click on the column header a second time to sort in reverse order.

The example shows the data sorted by Result name. However, you could sort the data by the Value column by clicking on the Value column header. When you do this, the Thickness result will move to the first row because it has the lowest numerical value. Width will be next, followed by Peak Stress and so on, until finally, Peak Load. Click on the Value column header again to sort in reverse order which would put Peak Load first and Thickness last.

Another feature you can use the column headers for is to change the widths on the columns in the table. When you move the mouse pointer over the line between two column headers the mouse pointer will change shape to a figure with arrows on each side. At this point, you can click the mouse button and while holding the mouse button down, drag the line to the location you desire. When you let go of the mouse button, the column to the left of the line will snap to the new column size.

Post-test editable inputs

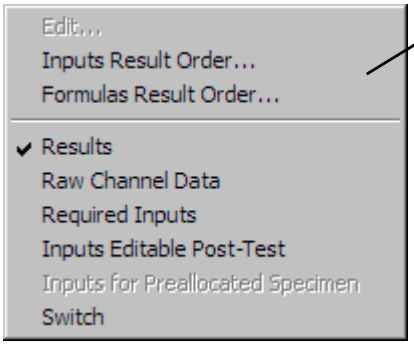
Some inputs are set up as editable post-test inputs. This means that the value of the input can be changed after the test is run. Inputs that are editable post-test are indicated by a small pencil icon beside the input name. To edit one of these inputs, click on the value in the Value column for that input. The field will change into an editable field and you will be able to type in the new value. When you have finished typing the new value, press the enter key or click somewhere else on the table. Any calculations that depend on the value of this input will be recalculated automatically.

**** Values

Occasionally, you might see a result value that consists of four asterisks (****) rather then a number. This means that there is no data for that value. This will be the case if a formula has not been or cannot be calculated. For example, if a test is aborted before the specimen breaks, then the Strain at Break result will display as **** because if there is no break then there can be no value for Strain at Break. If you are looking at a preallocated specimen, then all result formulas will display as **** because there is no data to produce the calculation. In this case, inputs will usually display their default values.

Right-click menu

Right-clicking on the Results/Inputs Panel will produce a pop up menu that will allow you to perform several activities such as editing formulas and inputs or changing what is displayed on the panel. Let's take a closer look at each of the available options.



Example of the Results/Inputs panel right-click menu

Edit

If you right-click on a variable (formula, input, or channel) this command will be enabled. When you select this command, a setup dialog for that variable will pop up. This dialog allows you to configure various aspects of the variable such as whether or not the variable should be listed as a result or the units used for this variable. The actual options that will be available for you to configure will depend upon your user level. For more information about configuring variables, refer to the section on Editing Variables.

Inputs Result Order

This command brings up the Results Order Dialog which allows you to define the report order for inputs. The report order is the order in which inputs will print out on a report going from lowest to highest order. For more information on the Results Order Dialog refer to "Results Order Setup" on page 161.

Formulas Result Order

This command brings up the Results Order Dialog which allows you to define the report order for formulas. The report order is the order in which formulas will print out on a report going from lowest to highest order. For more information on the Results Order Dialog, refer to "Results Order Setup" on page 161.

Display Modes

The last five items on the right-click menu control what the Results/Inputs Panel displays. By default, the Results/Inputs Panel is in Results mode which means that it displays the Formulas and Inputs that are designated as results. You can change what the Results/Inputs Panel displays by selecting the display mode you want from the right-click menu. The right-click menu will show a check next to the current mode. There are five different display modes to choose from.

- Results

  The Results mode displays the Formulas and Inputs that are designated as results. This is the default mode.

- Raw Channel Data

  This mode displays the raw data from each channel for the active specimen. The value displayed for each channel corresponds to the data point marked by the Review Graph crosshair. If tracking is turned on for the Review Graph, the values displayed for each channel will update automatically as the crosshair is moved.

- Required Inputs

  This mode displays only the inputs that are designated by the input setup as being required inputs. Required inputs require the user to enter a value for the input prior to running a specimen rather that using the inputs default value.

- Inputs Editable Post-Test

  This mode displays only the inputs that can be edited after the test run.

- Inputs for Preallocated Specimen

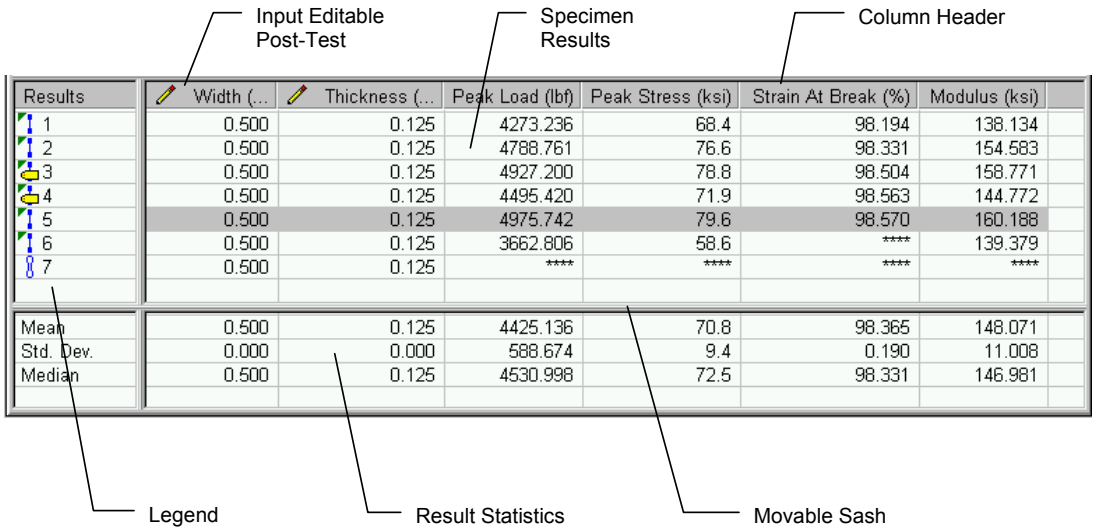
  This mode displays all of the inputs for a preallocated specimen as editable inputs. This display mode option is only enabled if you right-click on a preallocated specimen.

Switch

Switch allows toggling between graph and table.

Statistics Table

The Statistics Table displays the results for each specimen in the sample as well as certain statistical data such as average and standard deviation based on these results. Below is an example of what the statistics table might look like.



Results	Width (...	Thickness (...	Peak Load (lbf)	Peak Stress (ksi)	Strain At Break (%)	Modulus (ksi)
1	0.500	0.125	4273.236	68.4	98.194	138.134
2	0.500	0.125	4788.761	76.6	98.331	154.583
3	0.500	0.125	4927.200	78.8	98.504	158.771
4	0.500	0.125	4495.420	71.9	98.563	144.772
5	0.500	0.125	4975.742	79.6	98.570	160.188
6	0.500	0.125	3662.806	58.6	****	139.379
7	0.500	0.125	****	****	****	****
Mean	0.500	0.125	4425.136	70.8	98.365	148.071
Std. Dev.	0.000	0.000	588.674	9.4	0.190	11.008
Median	0.500	0.125	4530.998	72.5	98.331	146.981

The Statistics Table is broken down into three main areas - the Specimen Results area, the Result Statistics area, and the Legend - which is divided into two parts. The sashes between these areas are movable and allow you to resize the areas. Let's take a look at the various parts of the Statistics Table.

Specimen results

This area displays the result values for each specimen. These results are Formulas and Inputs that are designated as results in their configuration. The results form the columns while the individual specimens form the rows.

Result statistics

This area displays statistical calculations (such as average and standard deviation) based on the result values. The statistics for a particular result appear in the same column as the specimen values for that result. You can choose which statistical calculations appear in this area. For information on how proceed, refer to "Statistics Table" on page 156.

Legend

The top part of the legend lists all the specimens in the sample. Each specimen listing corresponds to a row in the Specimen Results area. Each specimen listing contains a specimen icon identical to the specimen icons found in the Graph Legend panel of the Review Page. For more information on these specimen icons refer to the “Specimen Icons” section under “Graph Legend.”

The bottom part of the legend lists the statistical calculations selected to appear on the Statistics Table. Each statistical calculation listing corresponds to a row in the Result Statistics area.

Column headers

The column headers specify which results appear in which columns. Unlike those on the Results/Inputs panel, these column headers are not used for sorting, so you cannot click on a column header to sort the specimen results. This area is not user sortable. You can, however, use the column headers to resize the column widths. Just like with the Results/Inputs panel, you can resize a column by clicking on the line between columns and dragging it to a new location.

Post-test editable inputs

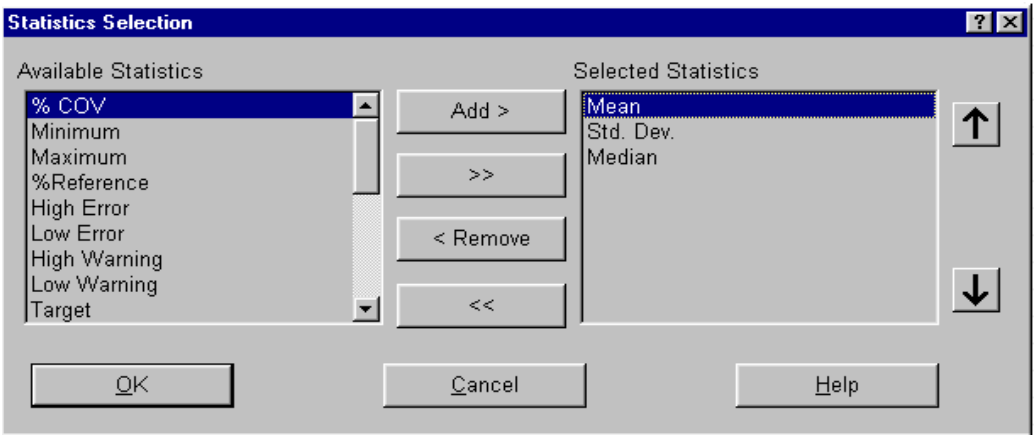
Some inputs are editable post-test inputs. This means that the value of the input can be changed after the test is run. Inputs that are editable post-test are indicated by a small pencil icon beside the result name in the column header. To edit one of these inputs, click on the value you wish to change. The field will change into an editable field and you will be able to type in the new value. When you have finished typing the new value, press the enter key or click somewhere else on the table. Any calculations that depend on the value of this input will be recalculated automatically.

**** Values

Occasionally, you might see a result value that consists of four asterisks (****) rather then a number. This means that there is no data for that value. This will be the case if a formula has not been or cannot be calculated. For example, if you have a standard deviation displayed in the Result Statistics area and have only one specimen in the sample, **** will be displayed for all standard deviation values because you must have at least two specimens to calculate standard deviation.

Selecting statistics

You can choose which statistical calculations appear in the Result Statistics area of the Statistics Table. To do this, click in the Configure menu and choose Statistics or right-click on the Result Statistics area and choose Configure Statistics from the pop up menu. (This is the only item in the pop up menu.) Either way, you will be presented with the Statistics Selection Dialog as displayed on the following page.



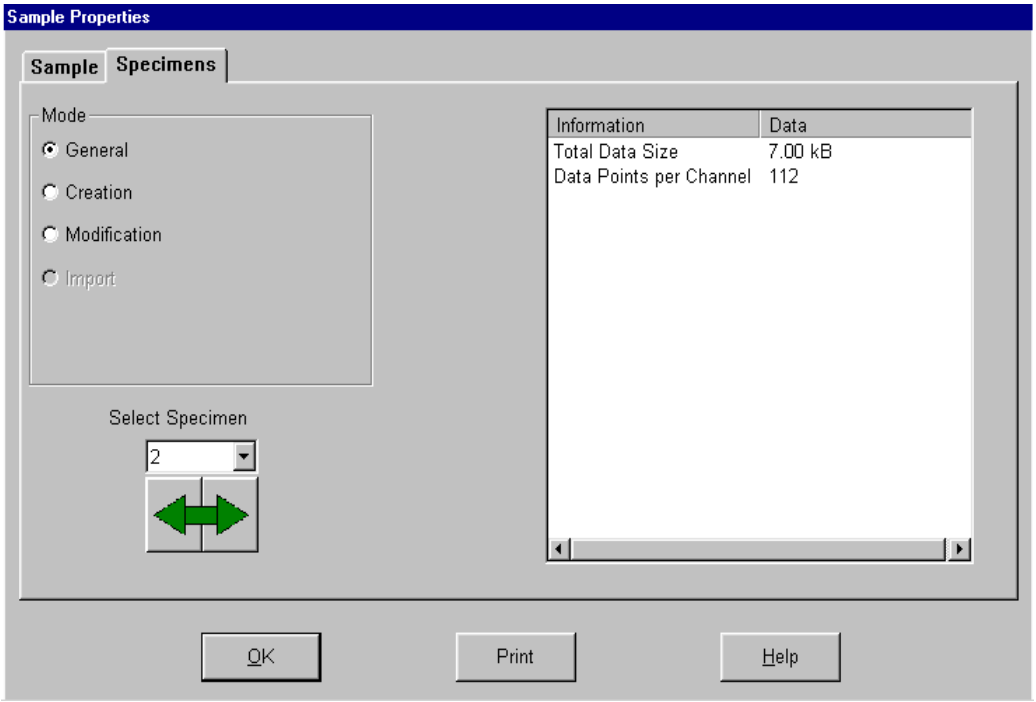
The list box on the left contains all the statistical calculations that are available to you while the list box on the right contains all the statistical calculations that you have chosen to appear in the statistics table. To add a statistic to the table, click on that statistic in the left list box to highlight it and click the Add > button. The selected statistic will be moved to the right side list box. The ">>" button will add all statistics to the right side list box. To Remove a statistic from the table, click on that statistic in the right side list box and click the < Remove button. The statistic will be moved from the right side list box back to the left side. The << button removes all statistics from the right side list box.

The order in which the statistics are listed in the right side list box is the same order in which they will appear on the statistics table. You can, however, change this order. To move the position of a statistic in the list, click on that statistic to highlight it and use the up and down arrow buttons on the right side to move the statistic up or down in the list.

Once you are satisfied with the selected statistics and their order, click the OK button to close this dialog and update the statistics table with your choices. Clicking the Cancel button will close this dialog without updating the statistics table.

Sample Properties Dialog

The Sample Properties dialog allows the user to see the “traceability” information for a sample and its specimens. The “traceability” of an sample or specimen is a time stamp that contains the date, time, customer name, system and site numbers, user name, and software version under which a sample or specimen was either created or modified. To view this dialog, right-click on a specimen entry in the Graph Legend panel and select Properties from the pop up menu. An example of the dialog is shown below.



The dialog has two tabs labeled “Sample” and “Specimens.” The Sample tab allows the user to view the time stamps for the currently loaded sample. The Specimens tab allows the user to view the time stamps for all specimens within the currently loaded sample. To switch between tabs, simply click on the name of the tab. The Specimen tab is shown on the preceding page. The Sample tab looks identical to the Specimen tab except that it does not have the Select Specimen combo box and arrow buttons. When the dialog initially opens, it shows specimen information for the specimen that you right-clicked on.

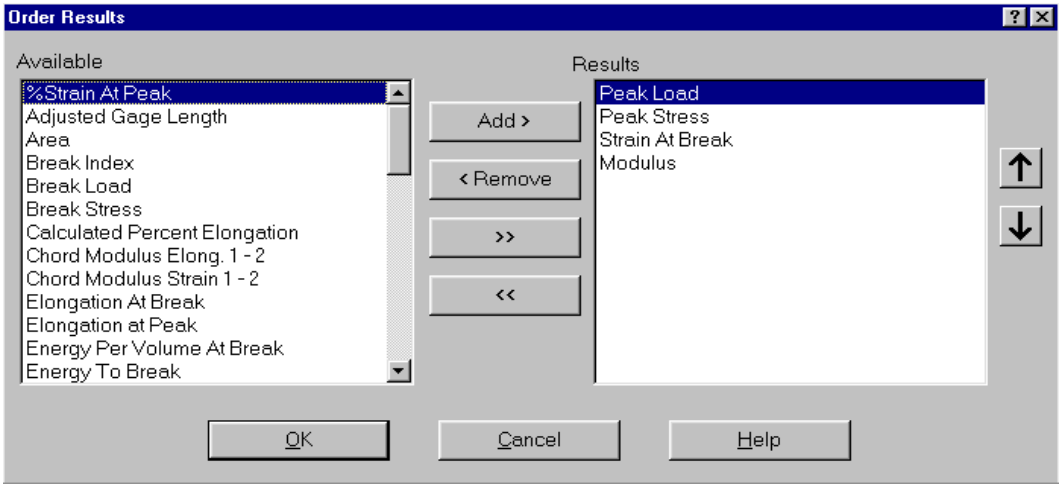
You can change the specimen being viewed by selecting a specimen number from the Select Specimen combo box. You can also change the specimen by clicking on one of the arrow buttons just below the Select Specimen combo box. Clicking the left arrow will take you to the previous specimen, while clicking the right arrow will take you to the next specimen.

You can change the type of information being shown by using the option buttons in the Mode group. The data is viewed in the list box on the right-hand side of the dialog. For a sample, the General mode reports the amount of computer memory used by the numeric data stored in all specimens of the sample. The number reported is in either MB (megabytes) of kB (kilobytes). For a specimen, the General mode reports the amount of computer memory consumed by the specimen's numeric data and the number of data points stored per channel in that particular specimen. The Creation mode reports the time stamp information for when the sample or specimen was created. This time stamp information includes Customer Name, Site Number, System Number, User Name, TestWorks 4 Version, Date and Time. The Modification mode reports the time stamp information for when the sample or specimen was last modified. The Import mode reports the time stamp information for when the specimen was imported into the current sample. Import mode information is only available for specimens that have been imported into the current sample and is not available at the sample level.

The Print button will print a report of all the time stamp information for both the specimens and the sample. To display the report in a text editor instead of printing it, hold the Shift key down while clicking the Print button. Click the OK button.

Results Order Setup

The report order for Inputs or Formulas determines the order in which the Inputs or Formulas will print out on a report. This report order can be changed with the Results Order Dialog. An easy way to get to this dialog is to right-click on a result in the Results/Inputs Panel. From the pop up menu, choose Inputs Result Order to change the result order for Inputs or Formulas Result Order to change the result order for Formulas. The same dialog is used for both Inputs and Formulas. An example of the Results Order Dialog is shown below.



The Available list (the list box on the left) contains all the formulas or inputs that are currently available to you. The Results list contains those formulas or inputs that are defined as results. By moving a formula or input from the Available list to the Results list, the formula or input is made a result. When a formula or input is moved from the Results list to the Available list, the formula or input is no longer a result.

To add a formula or input to the Results list, click on the formula or input in the Available list. To highlight it, click the Add > button. The selected formula or input will be moved to the Results list. The >> button will add all formulas or inputs to the Results list. To remove a formula or input from the Results list, click on that formula or input in the Results list and click the < Remove button. The formula or input will be moved from Results list back to the Available list. The << button removes all formulas or inputs from the Results list.

The order the formulas or inputs appear in the Results list determines the result order. You can change the result order with the up and down arrow buttons to the right of the Results list. To move a result in the order click on the result in the Results list to highlight it. Use the up arrow button to move the result up in the list and the down arrow button to move the result down in the list.

Once you are satisfied with the result order, press the OK button to close this dialog and make the changes active.

Note *When you are editing the result order for Formulas and the **OK** button is selected, you will be prompted as to whether each formula removed from the Results list should remain calculated. Answering No to this question will cause that formula to be inactive and could result in method validation errors. Be careful when choosing to deactivate a formula. Clicking the Cancel button will close this dialog without updating the report order.*

Review Graph Setup

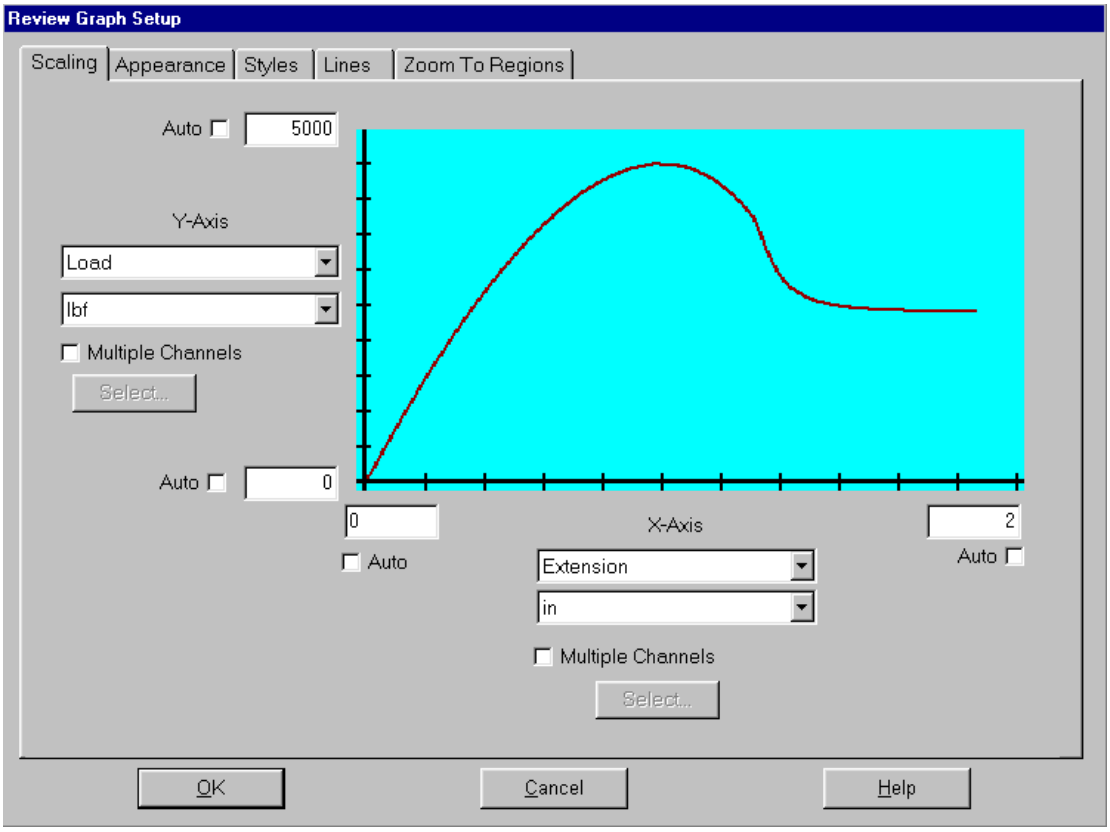
Most of the details of the Review Graph configuration are handled by The Review Graph Setup Dialog. To open the Review Graph Setup Dialog, you can right-click on the Review Graph and select Properties from the pop up menu, or you can click on the Configure menu and select Review Graph. You must have permission to change the user interface (a flag in your user profile set by your supervisor) to be able to access the Review Graph Setup Dialog.

The Review Graph Setup Dialog is divided into five pages, each of which handles a different aspect of the configuration of the Review Graph. The Scaling page deals with the setup of the graph axes and the scales of the axes. The Appearance page handles general aspects of the graph's appearance, while the Styles page handles the line styles and colors of the data curves. The Lines page is used to setup line objects and the Zoom To Regions page is used to setup zoom regions.

You can switch from page to page by clicking on the tab at the top of the dialog that corresponds to the page you want. When you have finished configuring all the items you want on each page, click on the OK button to close the dialog and put your changes into effect. You can Click on the Cancel button at any time to close the dialog and abandon any changes you have made. Let's look at each page in more detail.

Scaling page

The Scaling page is used to setup the graph axes and the scales of the axes. Below is an example of the scaling page.



Channel Selection

To select a channel (or per point formula) to use for an axis, go to the combo box directly beneath the axis name (Y-Axis or X-Axis) and select the channel you want from the list. When you select a channel, the units combo box (directly below the channel selection combo box) will update itself to display the default unit from the unit class used by the channel you just selected. For instance, if you selected the Load channel, the unit pounds force (lbf.) will appear (if you are using English units). You can now choose the unit you desire from the units combo box. The combo box will only list units that belong to the unit class used by the channel you selected.

Setting the Axis Scale

Having the proper scale for you axes is important for the graph to be sized properly. If the scale is too large the data curves will be too small to distinguish details. Likewise, if the scale is too small, the data curves will not fit on the graph. TestWorks 4 allows you to set the scale of an axis by specifying the maximum and minimum values for that axis.

The easiest way to determine the best scale for an axis is to let TestWorks 4 do it for you. Near each end (max and min) of each axis on the example graph you will find a check box labeled “Auto.” If this box is checked, TestWorks 4 will automatically set the scale for that end (max or min) of the axis to produce a proportionally sized graph. The scale value (max and/or min) will change depending on the data plotted in the data curves.

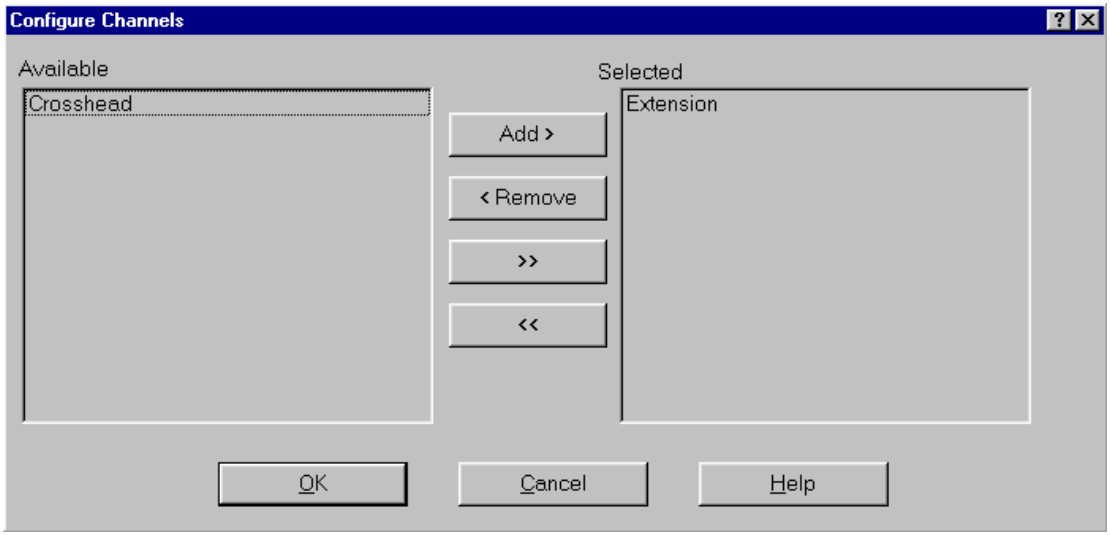
You can set the scale values manually to fixed values. To do this, uncheck the Auto check box at the place you want to set the scale. The edit box next to the Auto check box will become enabled. Enter the scale value you want in this edit box. For example, if you are plotting Load in pounds force on the Y-Axis, you could set the minimum scale value for the Y-Axis to 0 and the maximum scale value for the Y-Axis to 5000. In this case, your Y-Axis will be fixed at a range of 0 lbf. to 5000 lbf.

Multiple Channels

It is possible to plot more than one channel along a single axis. All channels you plot on a single axis must use the same unit class. For example, you can plot two channels that measure a force on the same axis but not a channel that measures force and one that measures distance.

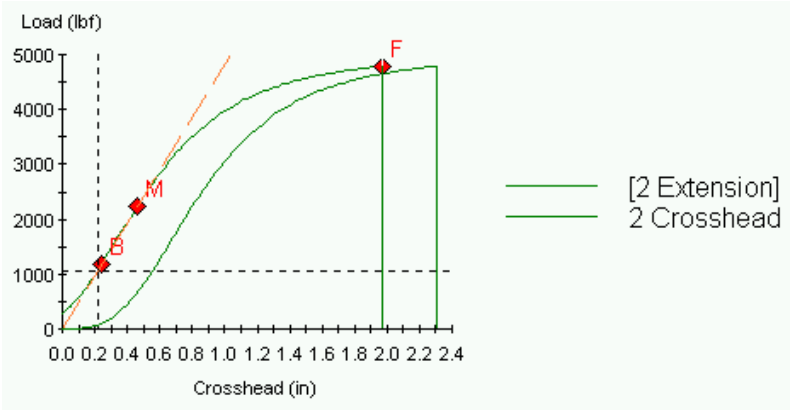
To plot multiple channels on the same axis, first select one of the channels you want just like you normally would. Then select the channel selection combo box for the axis you wish to use. Select the unit you want from the units combo box. Place a check in the Multiple Channels check box. This will cause the Select button just below the check box to be enabled. It will also cause the Multiple Channels check box for the other axis to become disabled. You can only use one axis for plotting multiple channels.

Press the Select button to bring up a dialog for selecting the channels you prefer.



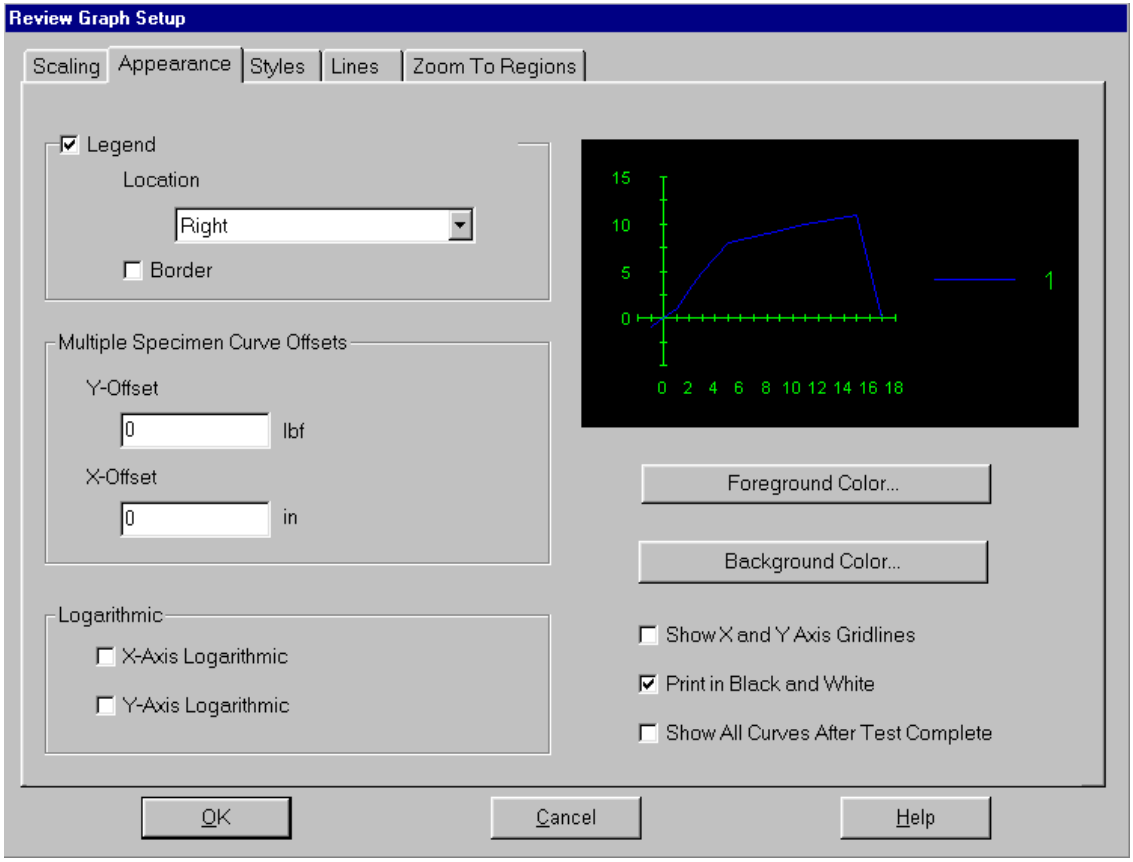
The channels (and per point formulas) available to you will be in the Available list box on the left side of the dialog. The channels selected for display will appear in the Selected list box on the right. Click on a channel in the Available list box and click the Add > button to move it to the Selected list box. The >> button will move all the available channels to the Selected list box. To remove a channel from the Selected list box, click on that channel and click the < Remove button. The << button will remove all channels from the Selected list box. Once you have all the channels you want to display in the Selected list box, click OK.

When multiple channels are plotted on a single axis on the Review Graph, multiple data curves for a specimen will be present on the graph. Each channel plots one of the multiple channels versus the channel on the other axis. The legend will contain entries for each data curve. The text in each legend entry will consist of the specimen number and the name of the channel. The channel you selected first is considered the *active channel*. The data curve for this channel is indicated by brackets around the legend entry and has all the properties of the active specimen curve. An example of a Review Graph with multiple channels plotted on the same axis is shown below.



Appearance page

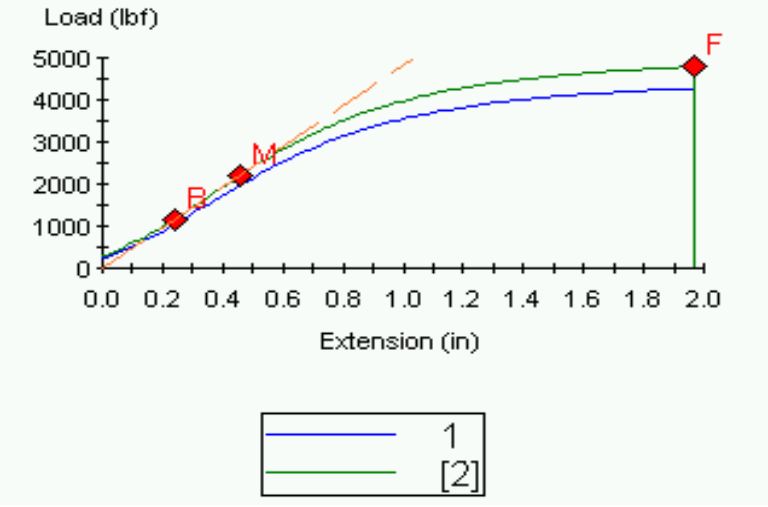
The Appearance page is used to setup general aspects of the graph's appearance. Below is an example of the appearance page.



When you change some of the items on this page, the example graph in upper right-hand corner will update to show you the effect your change will have. Let's look at each of the items on this page in more detail.

Legend

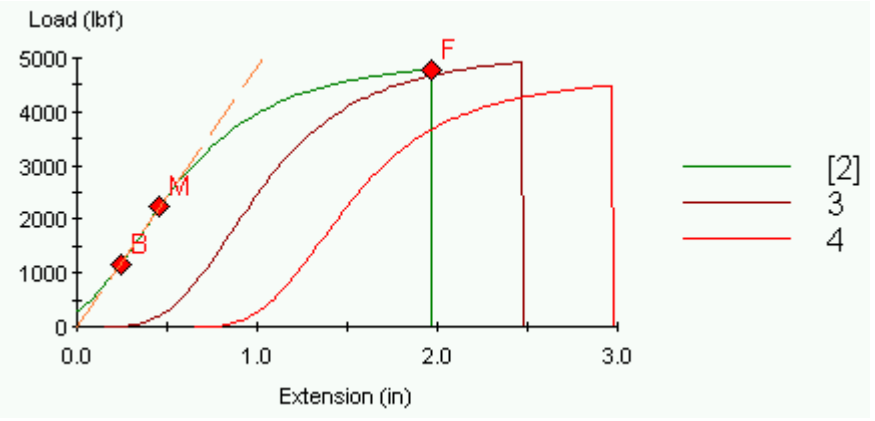
The Legend check box controls whether or not the legend is displayed on the Review Graph. Place a check in the check box to display the legend or uncheck the check box to hide the legend. If you choose to display the legend then you can choose at what location the legend should appear and whether or not the legend should have a border. Select a location from the Location Combo box. You can choose Right, Bottom-Right, Bottom, Bottom-Left, Left, Top-Left, Top, or Top-Right. Place a check in the Border check box to have a border drawn around the legend. Leave the box unchecked to omit a border around the legend.



Example of a legend with a border at the Bottom position.

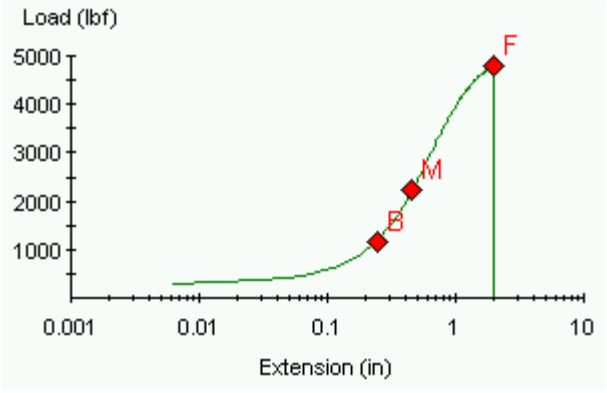
Multiple Specimen Curve Offsets

Sometimes when you are showing several specimens on the Review Graph, the data curves can overlap each other making it difficult to pick out the individual curves. TestWorks 4 allows you to offset the data curves from one another by a value that you specify. To specify an offset value, simply enter the value in either the Y-Offset (vertical) edit box or the X-Offset (horizontal) edit box. Notice that the units displayed for an offset are the same units used by the channel for that axis. The value you enter will be in those units. When the data curves are plotted, each subsequent curve will be offset by the amount you entered. To specify no offset for an axis, enter 0 in the offset edit box. The following example shows data curves offset by 0.5 inches in the X-direction with no offset in the Y-direction.



Logarithmic

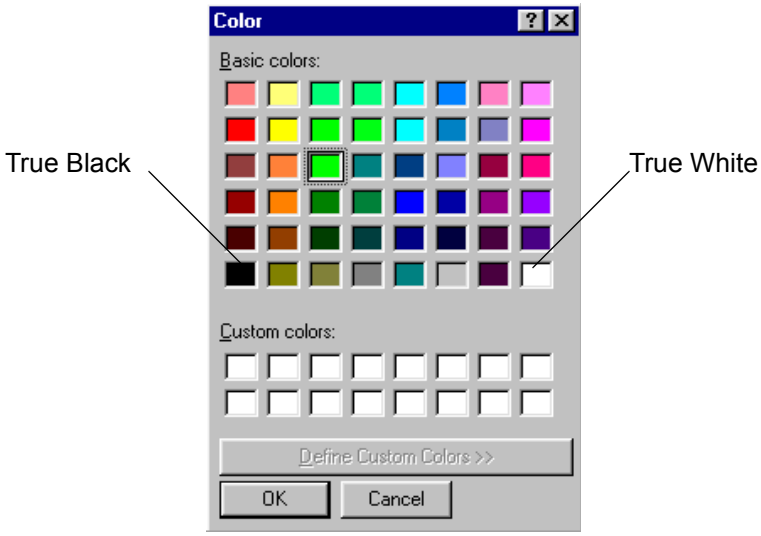
Checking one of the check boxes in the Logarithmic group will cause the graph to display the X-Axis or Y-Axis on a logarithmic scale. The following example shows a graph with the X-Axis on a logarithmic scale and the Y-Axis on a normal scale.



Foreground Color

The foreground color of the Review Graph is the color used for axes of the graph as well as the numbering along the axes and the axis titles. The foreground color is also the color used for text annotations and the text in arrow annotations. The text in the legend and the legend border (if there is one) also use the foreground color. To change the foreground color, click the Foreground Color button. You will be presented with a standard color selection dialog. Simply click on the color you want and click OK. The example graph will automatically update to give you a preview of the effect of your change. The option to define custom colors will not be available. You must choose one of the predefined colors.

TIP – Sometimes it can be difficult to distinguish between the colors. It is often helpful to know that true black is the bottom left corner and true white is the bottom right color.



Standard Selection Color Dialog

Background Color

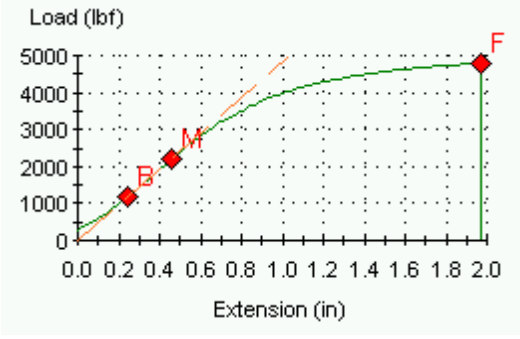
The background color of the graph can also be changed. To do this, click the Background Color button. You will be presented with the same Standard Color Selection Dialog used to set the foreground color. Click on your color choice and click OK. The example graph will automatically update to give you a preview of the effect of your change. Again, the option to define custom colors will not be available. You must choose one of the predefined colors.

When you click the OK button of the Review Graph Setup Dialog, TestWorks 4 checks the graph background color against the colors used for the data curves as defined on the Styles page. If the background color matches any of the data curve colors, you would not be able to see that data curve on the graph. If this happens, TestWorks 4 will not close the Review Graph Setup Dialog. Instead, it will display the Styles page and prompt you to change the data curve color that matches the background color.

- Show X and Y Axis Gridlines

This option allows you to show or hide the gridlines on the Review Graph. Place a check in the check box to show the gridlines or leave it unchecked to hide the gridlines.

.



Example of a graph with gridlines

Printing in Black and White

Because many office printers still print black ink, some color combinations do not look good when printed out on a black and white printer. TestWorks 4 gives you the option of printing the Review Graph in a black and white format designed to work with black and white printers.

If you have this option checked when you print the Review Graph, TestWorks 4 will use black for the foreground color and data curves and white for the background color. This produces better printouts on a black and white printer than the black background and light color foreground that are often used for displaying the Review Graph on the screen.

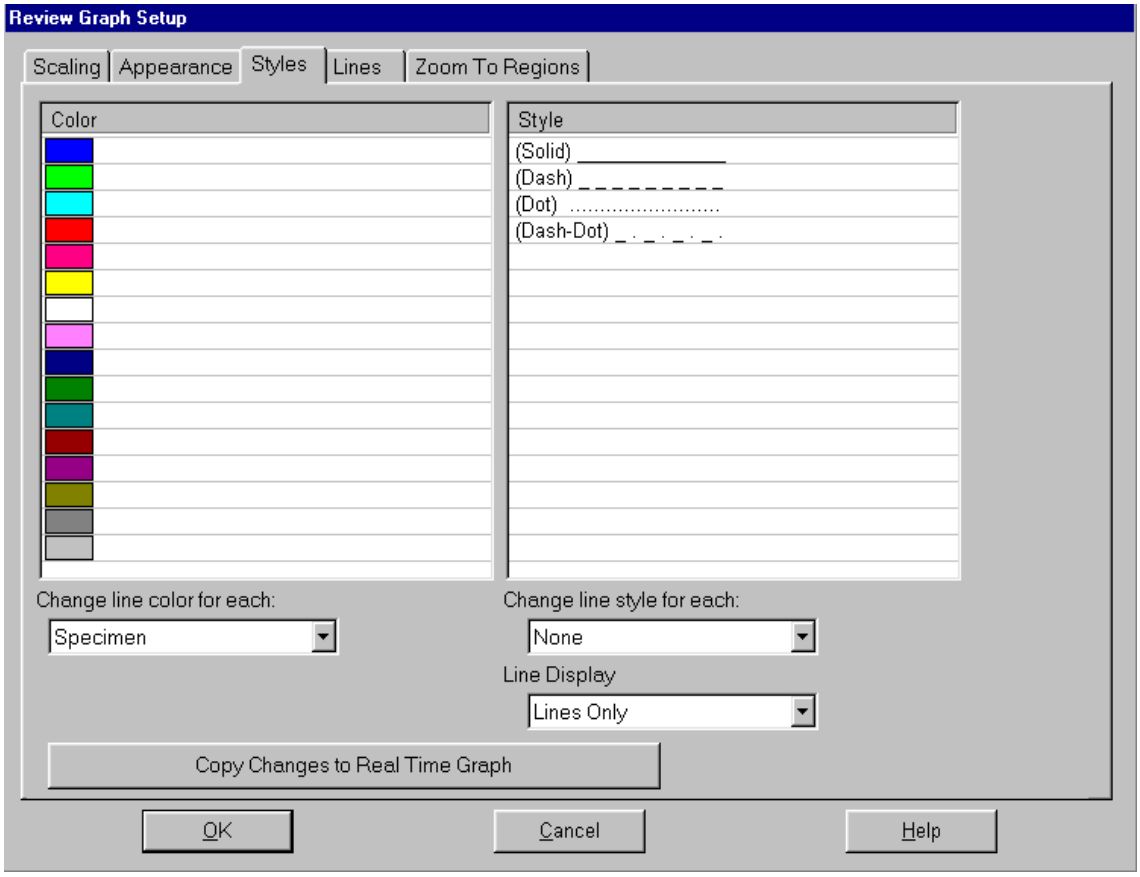
If you use a color printer and want your graph to print out in color, leave this check box unchecked.

Show All Curves After Test Complete

If you place a check in this check box, TestWorks 4 will automatically select every specimen for display on the Review Graph after a test is completed. This way you can instantly compare the test you just ran with the previous tests in the sample. Leave this box unchecked if you wish to show only the specimen that was just run when testing is complete.

Styles page

The Styles Page lets you setup the line styles and colors used for the data curves. Below is an example of the Styles Page.



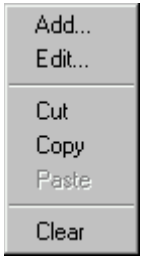
Colors

The left side of this dialog deals primarily with the line colors. The large “Color list box” displays the colors that will be used to display the data curves. The “Change line color for each” combo box below allows you to select when the line color changes. For example, this combo box is often set to “Specimen,” which will cause the line color to vary from specimen to specimen. Therefore, if the color list is set up as in the example displayed on your computer monitor, the first specimen will have a blue data curve. The second specimen will have a green data curve. The third specimen will have a cyan data curve; the fourth a red data curve and so on. Once all the colors in the color list have been displayed, the list will repeat from the top. Because there are sixteen colors in this list the seventeenth specimen will displayed in the first color, blue.

Other options in the “Change line color for each” combo box include “Channel” and “None.” The “Channel” option will change the line color every channel. This is useful for when you are plotting multiple channels on a single axis. Each channel will have a different color. However, the colors will not change from specimen to specimen. With the “None” option, the data curve colors will not change at all. Only one color, the first color in the color list, will be used for all specimens.

If you are running a multicycle method, a new option will be added to the “Change line color for each” combo box. The “Cycle” option will cause the line color to vary from cycle to cycle.

The list of colors can be modified to fit your needs. You can add colors to the list, delete colors from the list, and modify colors already in the list. When you right-click on a color in the “Color” list box, you get the following pop up menu, which lists several commands available to you for modifying the color list.



Let's look at each item on this menu.

- Add

  This command will add another color entry to the color list. When you select this menu item, you will be presented with the same Standard Color Selection Dialog used to set the graph foreground color. Select the color you want for the new color entry and click OK. A new color entry containing the color you just selected will be inserted into the color list immediately below the color that was right-clicked on.

- Edit

  This command will change a color entry in the color list to a color you select. When you choose this menu item, you will be presented with the same Standard Color Selection Dialog used to set the graph foreground color. Select the color you want and click OK. The color that you right-clicked on will be changed to the new color you have chosen.

- Cut

  This command will delete a color from the color list and put it on the clipboard. The deleted color is available for pasting into another location in the list. You can use this command for deleting individual colors from the color list.

- Copy

  This command copies the selected color to the clipboard. The copied color is available for pasting into another location in the list.

- Paste

  If a color has been cut or copied to the clipboard, then you can use this command to insert the color on the clipboard into the color list. The color is inserted directly below the color that you right-clicked on before choosing this command.

- Clear

  Be careful with this command. It will delete all the colors in the color list!

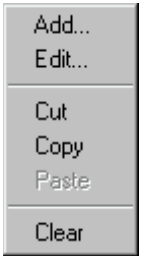
Line Styles

The right side of the Styles Page is primarily devoted to line styles. The line styles work the same way the colors work. There is a “Styles” list box that displays the line styles that will be used for the data curves. The “Change line style for each” combo box just below allows you to select when the line style changes. For example, this combo box is often set to “Specimen,” which will cause the line style to vary from specimen to specimen. Therefore, if the line styles list is set up as in the example shown, the first specimen curve will have a solid line. The second specimen will have a dashed line. The third specimen will have dotted line, and the fourth will have a line style with the dash-dot pattern. Once all the line styles in the line style list have been displayed, the list will repeat from the top. Because there are four line styles in this list the fifth specimen will displayed with the first line style; solid.

- Other options in the “Change line style for each” combo box include “Channel” and “None.” The “Channel” option will change the line style every channel. This is useful for when you are plotting multiple channels on a single axis. Each channel will have a different line style. However, the line styles will not change from specimen to specimen. With the “None” option, the data curve line styles will not change at all. Only one style, the first style in the line styles list, will be used for all specimens.

If you are running a multicycle method, a new option will be added to the “Change line color for each” combo box. The “Cycle” option will cause the line style to vary from cycle to cycle.

The list of line styles can be modified to fit your needs. You can add styles to the list, delete styles from the list and modify styles already in the list. When you right-click on a line style in the “Styles” list box, you get the following pop up menu, which lists several commands available to you for modifying the line styles list.



Let's look at each item on this menu.

- Add

  This command will add another line style entry to the line style list. When you select this menu item, a fly out menu will present you with a list of the available line style choices. Select the line style you want from the fly out menu. A new line style entry containing the style you just selected will be inserted into the line style list immediately below the line style that was right- clicked on.

- Edit

  This command will change a line style entry in the line style list to a style you select. When you choose this menu item, a fly out menu will present you with a list of the available line style choices. Select the line style you want from the fly out menu. The line style that you right-clicked on will be changed to the new style you have chosen.

- Cut

  This command will delete a line style from the line style list and put it on the clipboard. The deleted style is available for pasting into another location in the list. You can use this command for deleting individual line styles from the line style list.

- Copy

  This command copies the selected line style to the clipboard. The copied line style is available for pasting into another location in the list.

- Paste

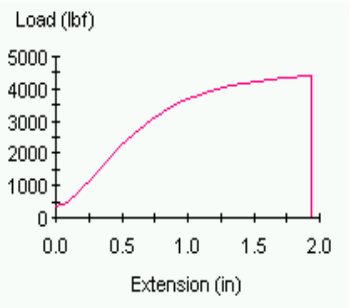
  If a line style has been cut or copied to the clipboard, then you can use this command to insert the line style on the clipboard into the line style list. The style is inserted directly below the line style that you right-clicked on before choosing this command.

- Clear

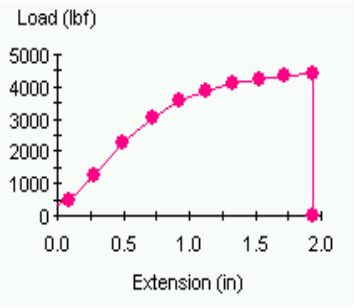
  Be careful with this command. It will delete all the line styles in the line style list!

Line Display

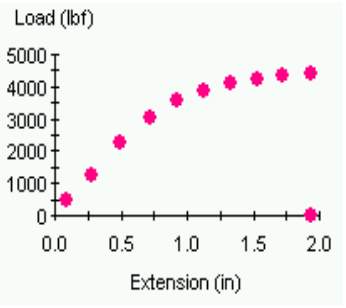
By default, when the data curves are plotted, you do not see the individual data points. You just see the line connecting the points. This can be changed, however, using the “Line Display” combo box. This combo box gives you three choices. The “Lines Only” option shows only the lines connecting the points and hides the individual points. The “Lines and Points” option shows both the individual points and the lines that connect the points. The “Points Only” option shows only the individual points with no lines connecting them. Usually, you will not want to show the individual data points because at typical data collection rates, there will be so many points, you will not be able to distinguish the individual points.



Lines Only Example



Lines and Points Example



Points Only Example

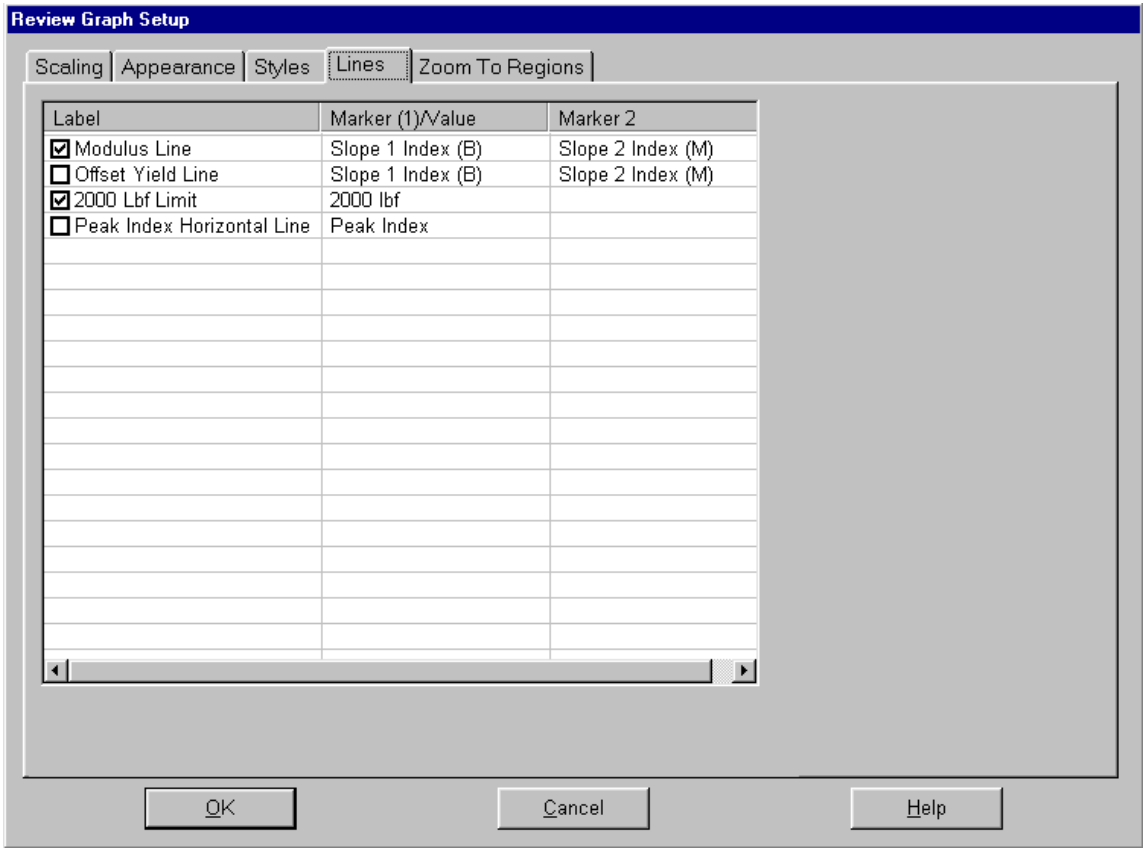
Copy Changes to Real Time Graph

The Real Time Graph uses a data curve style and color set up very much like that of the Review Graph. Many users like to use the same line colors and styles on the Real Time Graph that they do on the Review Graph. To make this easier, TestWorks 4 provides the “Copy Changes to Real Time Graph” button. When you click on this button, TestWorks 4 will copy the entire color and line style lists to the Real Time Graph. The Real Time Graph will now have color and line style lists identical to the Review Graph. The options chosen with the “Change line color for each” and “Change line style for each” combo boxes are also copied to the Real Time Graph.

Note *When you click the **OK** button of the Review Graph Setup Dialog, TestWorks 4 checks the graph background color against the colors in the color list. If the background color matches any color in the color list, you will not be able to see a data curve with that color on the graph. If this happens, TestWorks 4 will not close the Review Graph Setup Dialog. Instead, it will prompt you to change the color in the color list that matches the background color.*

Lines page

The Lines Page is used to set up Line Objects. Line Objects can be placed on the Review Graph to display important lines such as the Modulus line. Below is an example of the Lines Page.



This page is composed entirely of a list view that displays all of the currently defined line objects. The Label column of the list view displays the name of the line and check box, the pounds per force limit check box, and the peak index horizontal line check box which shows the line from the peak to the y axis. These check boxes are used to enable (show) and disable (hide) the line objects. Place a check in any of these check boxes to have these line objects displayed on the graph. Leave the check boxes unchecked to hide the line objects. The Marker 1 and Marker 2 columns of the list view display the names of the marker formulas used to define the line object.

Lines Page Right-Click Menu

To add, edit or delete line objects from the Lines Page, use the right-click menu. When you right-click on a line object or on an empty area of the list view, a menu like the following will pop up.

Let's look at each item on this menu.

- Add

  This menu item will add a new line object to the list of line objects. When you select any of these items, the “Line defined by two markers,” “Lines defined by one marker,” or “Lines defined by a value,” the dialog will pop up. Set the configuration you desire for your new line object and click OK. Your new line object will be added to the list of line objects and will appear in the list view.

- Edit

  This menu item, which is only available if you right-click on a line object, allows you to change the configuration of the line object you right-clicked on. When you select this item, the “Line defined by two markers” dialog will pop up. Make the changes you want and click OK. The line object that you right-clicked on will be updated with the changes you made.

- Cut

  This command will delete the line object that you right-clicked on and place a copy of it on the clipboard. The deleted line object is available for later pasting into the line objects list. You can use this command for deleting individual line objects from the line objects list.

- Copy

  This command copies the selected line object to the clipboard. The copied line object is available for pasting into the line objects list.

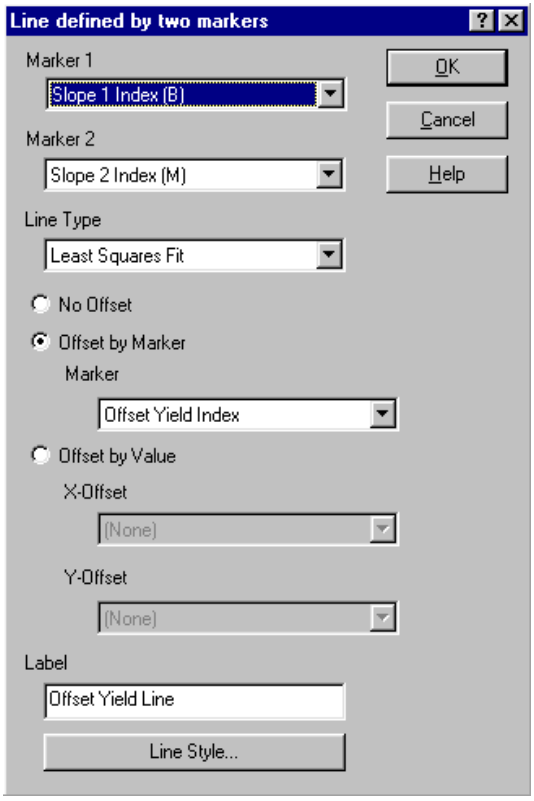
- Paste

  If a line object has been cut or copied to the clipboard, then you can use this command to insert the line object on the clipboard into the line objects list.

- Clear

  Be careful with this command. It will delete all the line objects in the line objects list!

Line defined by two markers



This example shows how the Offset Yield Line object is configured. Let's look at the various controls on this dialog and see how they are used.

Marker 1 and Marker 2

These combo boxes list the available marker formulas. Select a marker in the Marker 1 combo box to use as the first point in the line and select a marker in the Marker 2 combo box to use as the second point in the line. Notice that the Offset Yield Line uses the Slope 1 Index (B) and Slope 2 Index (M) markers. These are the same markers used by the Modulus Line. As a result, the Offset Yield Line has the same slope as the Modulus Line. The difference between the two lines is that the Offset Yield Line is offset by a value from the Modulus line. (We will discuss offsets in more detail later).

Line Type

The Line Type combo-box is used to select how the line will be drawn between the two points. TestWorks 4 can draw the line directly or draw it based on a least-squares curve fit.

Offset

There are three types of offset you can choose from: No Offset, Offset by Marker, and Offset by Value. Select the type of offset by clicking on the option button of your choice.

- No Offset

  Use this option when your line is completely defined by the two markers and you do not need any offset.

- Offset by Marker

  This option will run the line through a third marker. The slope of the line does not change. It is still defined by Marker 1 and Marker 2, but the line will be offset by the distance to the third marker. Click on the Marker combo-box to select the marker formula that you want your line to go through.

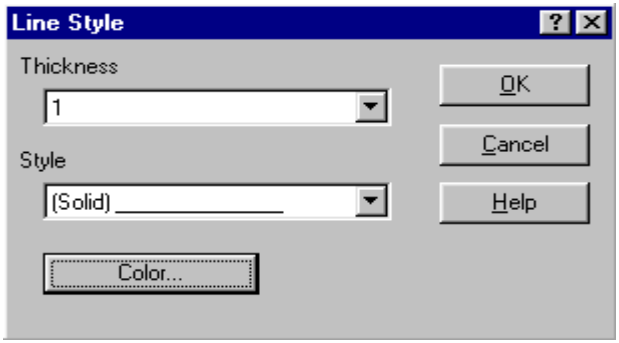
- Offset by Value

  This option will offset a line (from the position defined by Marker 1 and Marker 2) in either the X direction (horizontal) or the Y direction (vertical) or both by values that you specify. You must specify these values with inputs or formulas. Use the X-Offset combo-box to select the input or formula that will specify the amount your line will be offset in the X direction. Use the Y-Offset combo-box to select the input or formula that will specify the amount your line will be offset in the Y direction.

Label

Enter a descriptive name for your line object in the Label edit box. This is the name displayed in the first column of the Lines Page list view.

Line Style



You can use the Thickness combo box to change the thickness of the line. The higher the number you choose, the thicker the line will be. You can use the Style combo box to change the style of the line. You can choose between solid, dashed, dotted or dash-dot. Note that you must choose a thickness of 1 in order to choose any line style other than solid.

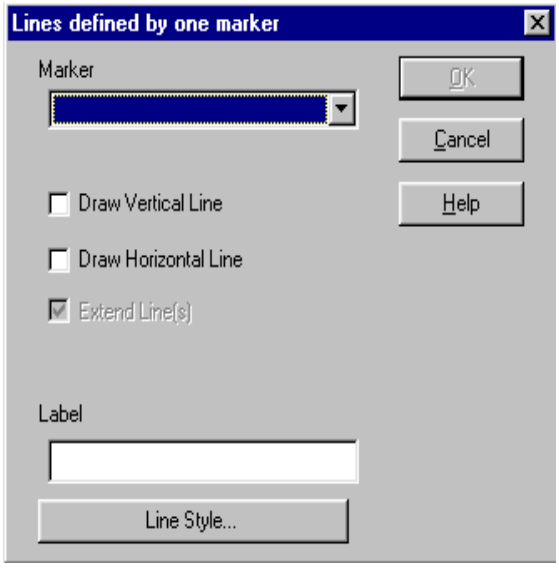
To change the color of the line, click the color button. The standard color selection dialog will appear.

This is the same dialog used to select the foreground color of the graph. Select the color you want and click OK.

Once you have finished making your line style selections, click OK to close the line style dialog and update the line object. Click Cancel to close the line style dialog and discard any changes.

When you have finished configuring your line object, click OK to close the "Line defined by two markers" dialog and update the line object with your changes. Clicking Cancel will close the "Line defined by two markers" dialog and discard any changes.

Lines defined by one marker



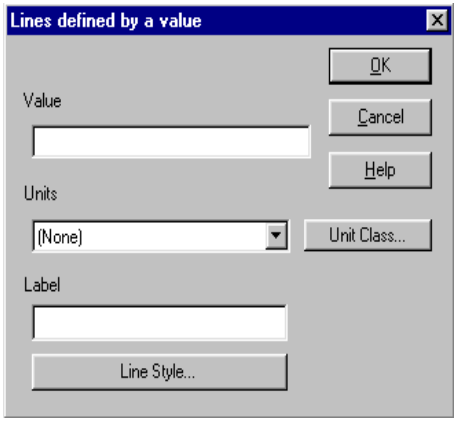
This dialog is used when extending a line to each axis from a particular marker on the Review Graph. Use it to draw lines on your specimen that will help you determine and display what the values are of a particular marker on the Review graph. The line will only appear for the active curve in your Review graph.

Follow these steps to specify a line on your graph:

1. Click on the Marker combo-box to select the marker formula that identifies the point of your lines.
2. If you want to draw a vertical line from the marker to the X-axis, placed a check on the Draw Vertical Line check box.

3. If you want to draw a horizontal line from the marker to the Y-axis, placed a check on the Draw Horizontal Line check box.
4. If you want to extend the lines you selected from the marker to the end of the graph, placed a check on the Extend Line(s) check box.
5. Type a name for your line into the Label text box.
6. Click on the Line Style… button to specify the line type and color for the line.

Lines defined by a value



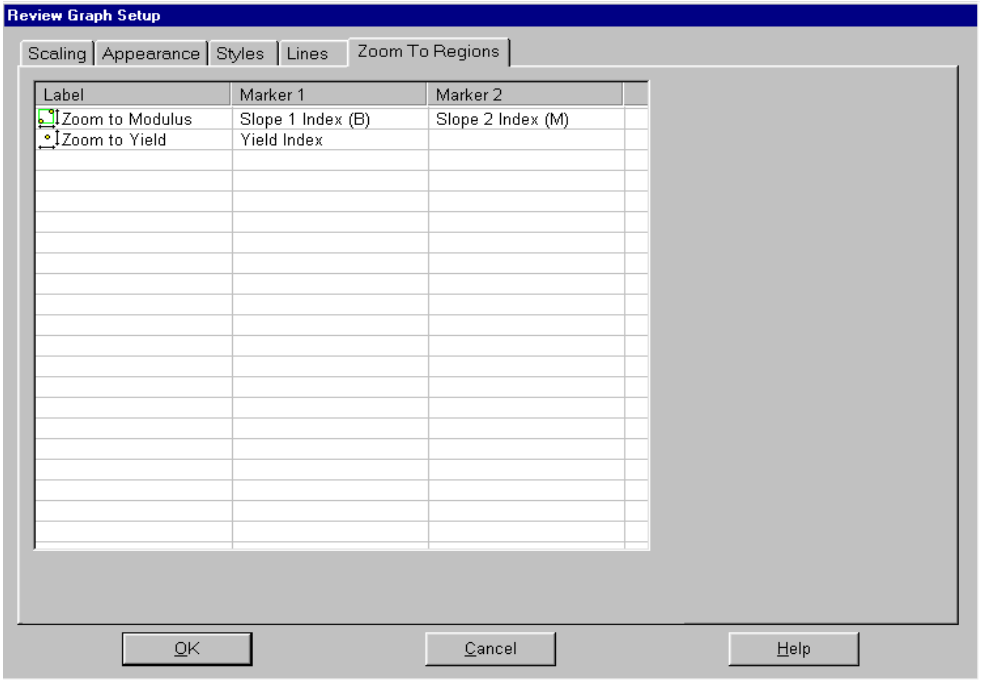
This dialog is used when extending a line across the graph at a particular value on the Review Graph. Use it to draw a line at a particular value on your specimen. The line will only appear based on the unit class displayed on the Review Graph match of the one you select.

Follow these steps to specify a line on your graph:

1. Type in the number in the Value edit-box to display the line at the value you select.
2. Click on the Unit Class button to select the unit class that will identify your line.
3. Click on the Unit combo-box to change the actual units.
4. Type a name for your line into the Label text box.
5. Click on the Line Style… button to specify the line type and color for the line.

Zoom to regions page

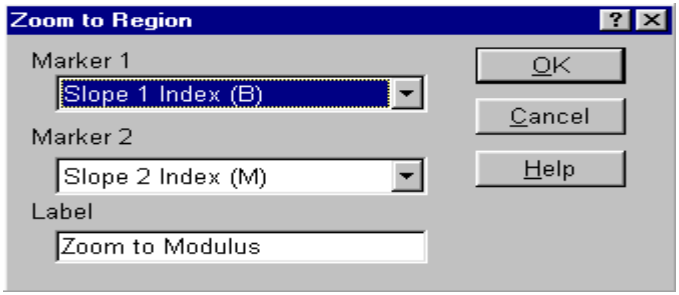
The Zoom To Regions Page is used to setup zoom objects for use on the Review Graph. These zoom objects use one or two markers to define an area to zoom into. They can be quickly accessed from the Review Graph right-click menu and allow you to instantly zoom into an area of interest. Below is an example of the Zoom To Regions Page.



This page is composed entirely of a list view that lists all of the currently defined zoom objects. The Label column of the list view displays the name of the zoom object and an icon. The icon identifies the zoom object as either a zoom to region, defined by two markers, or a zoom to marker, defined by a single marker. The example shows two zoom objects. The first is a zoom to region object, and the second is a zoom to marker object. The other two columns of the list view display the names of the marker formulas used to define the zoom object.

Zoom to Region Objects

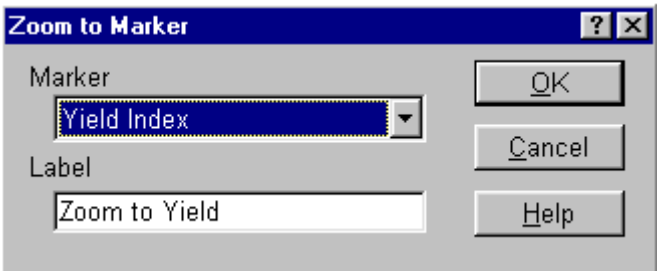
A zoom to region object uses two markers to define the boundaries of a region to zoom into. When you add or edit a zoom to region object, you will use the following dialog.



Use the Marker 1 combo-box to select a marker to use as the left side of your zoom to region. Use the Marker 2 combo-box to select a marker to use as the right side of your zoom to region. In the Label text box, type a name for the zoom to region. This is the name you will select from the Review Graph's right-click menu whenever you want to use this zoom object. Click OK to close the dialog and update the zoom object or click Cancel to close the dialog and discard any changes.

Zoom to Marker Objects

A zoom to marker object allows you to focus your graph on a specific point within the Review Graph. This point is defined by a marker. When you add or edit a zoom to marker object, you will use the following dialog.



Use the Marker combo-box to select the point of the graph that you prefer as a focus point. In the Label text box, type a name for the zoom to marker object. This is the name you will select from the Review Graph's right-click menu whenever you want to use this zoom object. Click OK to close the dialog and update the zoom object or click Cancel to close the dialog and discard any changes.

Zoom To Regions Page Right-Click Menu

To add, edit or delete zoom objects from the Zoom To Regions Page, use the right-click menu. When you right-click on a zoom object or on an empty area of the list view, a menu similar to the following will pop up.

Let's look at each item on this menu.

- Add

  This menu item will add a new zoom object to the list of zoom objects. When you select this item, a fly out menu will appear offering you two choices, Zoom to Region and Zoom to Marker. Select the type of zoom object you want and the appropriate dialog will pop up. Set the configuration you desire for your new zoom object and click OK. Your new zoom object will be added to the list of zoom objects and will appear in the list view.

- Edit

  This menu item, which is only available if you right-click on a zoom object, allows you to change the configuration of the zoom object you right-clicked on. When you select this item, the appropriate dialog will pop up. Make the changes you want and click OK. The zoom object that you right-clicked on will be updated with the changes you made.

- Cut

  This command will delete the zoom object that you right-clicked on and place a copy of it on the clipboard. The deleted zoom object is available for later pasting into the zoom objects list. You can use this command for deleting individual zoom objects from the zoom objects list.

- Copy

  This command copies the selected zoom object to the clipboard. The copied zoom object is available for pasting into the zoom objects list.

- Paste

  If a zoom object has been cut or copied to the clipboard, then you can use this command to insert the zoom object on the clipboard into the zoom objects list.

- Clear

  Be careful with this command. It will delete all the zoom objects in the zoom objects list!

Appendix

Calibration Method Description

Three methods are available to calibrate an analog device. They are *Auto*, *Manual*, and *None*. Each of these methods uses a two-point calibration procedure to calculate the calibration factor of the device. The difference between the methods is the manner in which the two calibration points are obtained. Whichever method is used, the calibration factor is the slope of the line between the two calibration points. The following chart explains how the calibration points are obtained for each of the methods.

Auto

Point	How the point is obtained for load cells
1st	You will be asked to place your device in its original position. If your device is a load cell, TestWorks 4 will prompt you to be sure that no load is on the load cell other than your grips/fixtures. TestWorks 4 will then set a reading of zero equal to the signal voltage coming from your device.
2nd	TestWorks 4 will activate a shunt resistor that is inside your device. This resistor will simulate a voltage that corresponds to a known reading. The known reading is also called the calibration value. It should be entered as part of your device's configuration, and it is also printed on your device. TestWorks 4 will set the calibration value equal to the voltage that is simulated by the shunt resistor.

Manual

1st — You will be asked to place your device in its original position. If your device is a load cell, TestWorks 4 will prompt you to be sure that no load is on the load cell other than your grips/fixtures. TestWorks 4 will then set a reading of zero equal to the signal voltage coming from your device.

2nd — Next, you will be prompted to manually simulate a reading on your device. If your device is a load cell, this is accomplished by hanging weights from the device or by depressing a manual calibration button. If your device is an extensometer, you can simulate a reading by opening and closing the device. TestWorks 4 will set the calibration value equal to the voltage that is created when your device is in this position.

None

1st — TestWorks 4 assumes that a zero voltage signal equals a zero reading.

2nd — TestWorks 4 assumes that a X (typically 10) volt signal equals the full-scale value that has been entered in the device's configuration.

TestWorks 4 Conversion Program

The TestWorks 3 to TestWorks 4 Converter Program is a tool that will help you convert your existing TestWorks 3 methods and samples into new methods and samples for use with TestWorks 4. This program will use the samples and methods that you select to create new TestWorks 4 samples and methods. The new TestWorks 4 methods will allow you to run tests in TestWorks 4 that approximate the tests you used to run in TestWorks 3. The new TestWorks 4 samples will allow you to access data you had previously stored in TestWorks 3 sample databases.

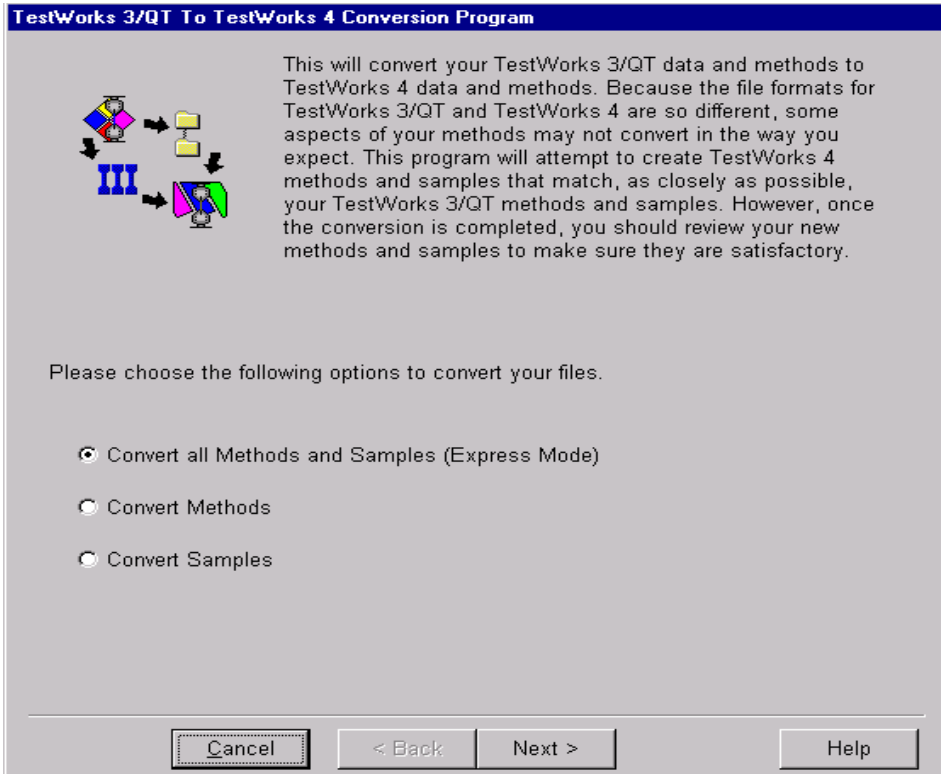
Note *Because the file formats for TestWorks 3 and TestWorks 4 are so different, some aspects of your methods might not convert in the way you expect. This program will attempt to create TestWorks 4 methods and samples that match, as closely as possible, your TestWorks 3 methods and samples. However, once the conversion is completed, you should review your new methods and samples to make sure they are satisfactory.*

To access the Converter Program follow the steps below.

1. Click on Start (Lower left-hand corner on the screen).
2. Select Programs.
3. Highlight MTS TestWorks 4.
4. Select Convert TestWorks 3 & QT to 4.
5. Choose Converter.

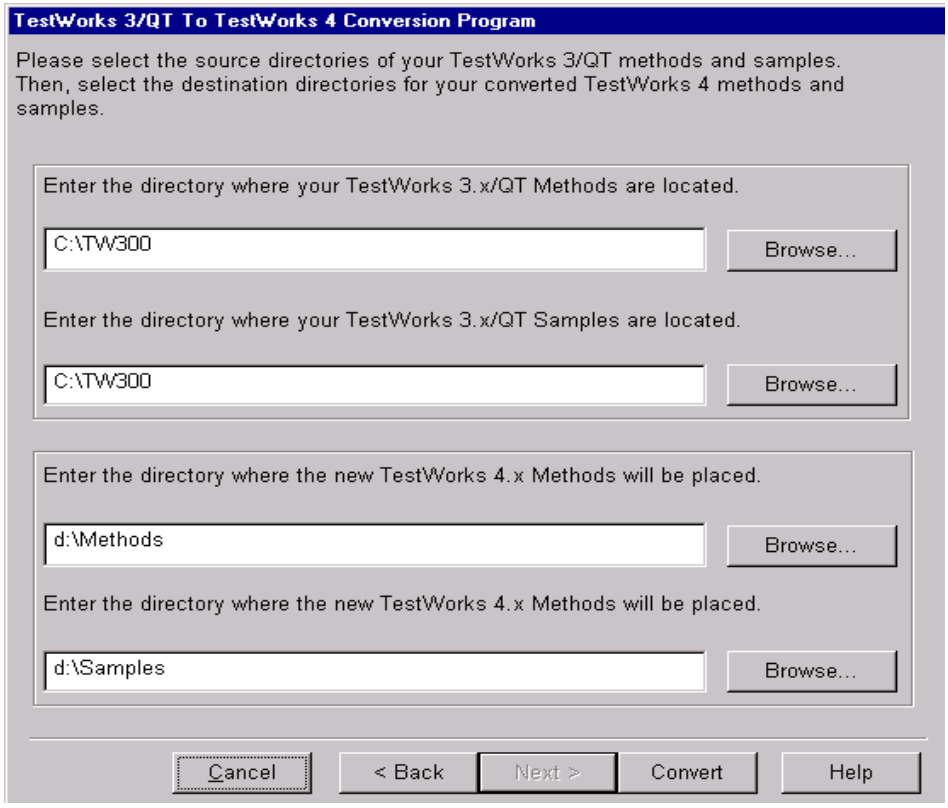
When you start the TestWorks 3 To TestWorks 4 Converter program, you will see the first page of the converter wizard. This wizard will guide you through the steps of converting your methods and samples.

Setup Window for TestWorks 3 to TestWorks 4 Conversion



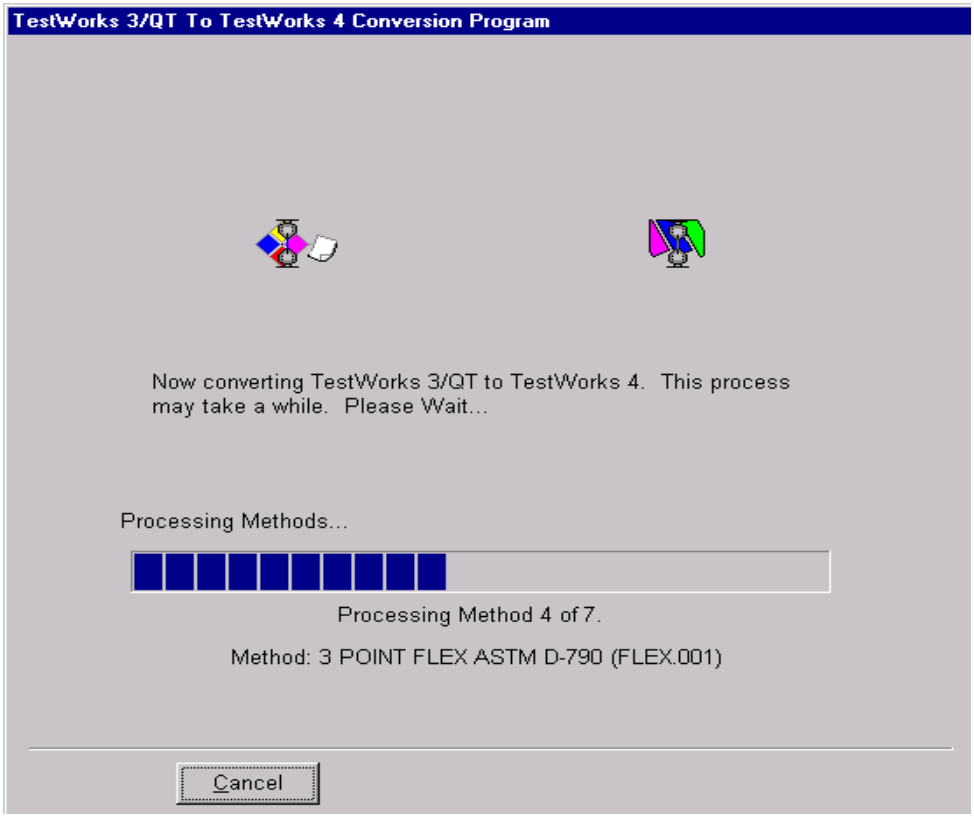
Select the appropriate option to convert your files. Choose from one of the following: 1) Convert all methods and samples (express mode), 2) convert methods, and 3) convert samples. Click Next.

Source Directories Window for TestWorks 3 to TestWorks 4 Conversion



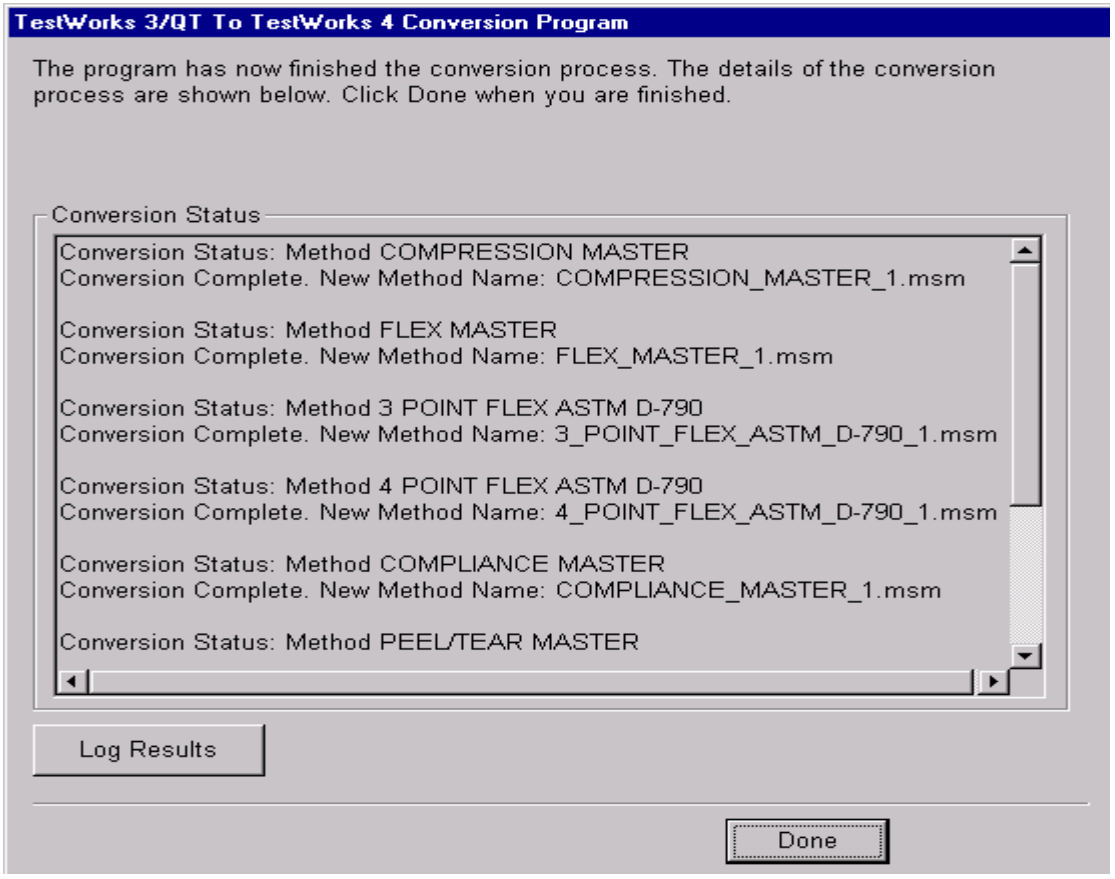
Once you select your source directories for your TestWorks 3 methods and samples, select the destination directories for your converted TestWorks 4 methods and samples. Click Convert.

Conversion Window for TestWorks 3 to TestWorks 4 Conversion



When this window appears, your TestWorks 3 methods and samples are being converted to TestWorks 4 methods and samples. Please wait for the conversion to take place.

Conversion Window Displaying Completion of TestWorks 3 to TestWorks 4 Conversion



When this window appears, the conversion is complete. The details of the conversion are within the window. Click Done.

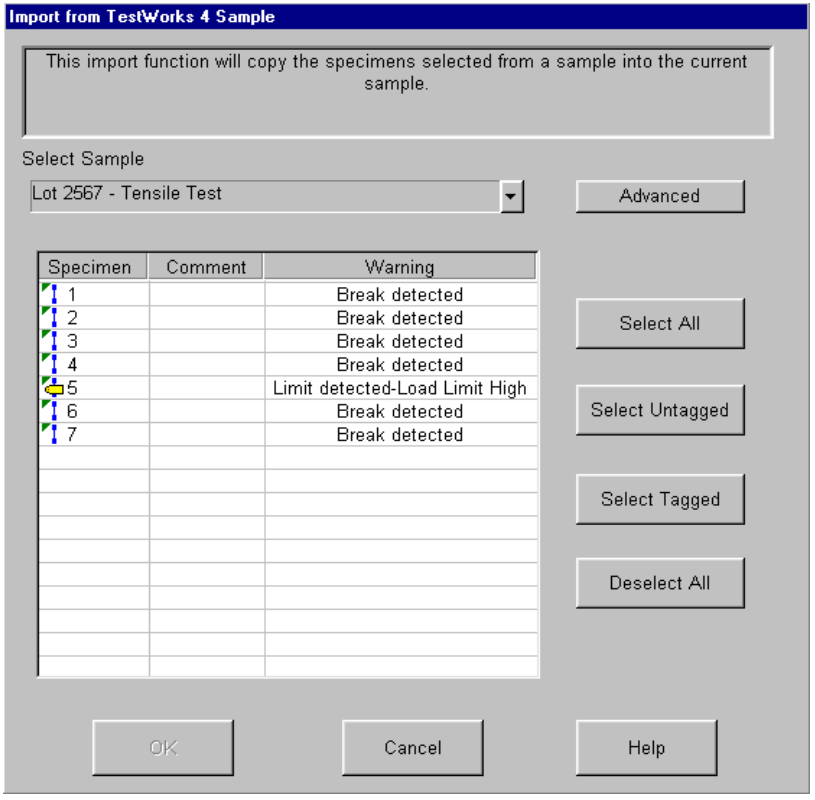
Note *Any errors encountered during the conversion will be listed in the Conversion Status window.*

Import From TestWorks 4 Sample

This feature allows the user to copy specimens from a TestWorks 4 Sample file into the currently loaded sample. This can be useful in moving a specimen that was tested in an incorrect sample or when the data collected for a specimen needs to be analyzed under a new method. To access this function follow the steps below:

1. Click on the Menu option File.
2. Select Import … Import from TestWorks Sample…
   The following dialog will appear.

Configuration Dialog for Import from TestWorks Sample



To import specimens or a complete sample into a currently loaded sample (or method), follow the instructions below:

1. The first step is to select a sample in the Select Sample box. To select a sample, click on the button with the down arrow. This menu displays all Sample files found in the current user's data directory.

Note *All of the subdirectories under the data directory are also searched but will only be displayed if any Samples are found in them. If the Sample to be imported is not found in the menu, then a user with the correct privileges can use the* ***Advanced*** *button to select a Sample file located in a different directory.*

2. When a Sample is selected, the specimens in the Sample will be displayed in the list. Also, the comment and first warning of the specimen will be displayed. The icon to the left of the specimen number will denote if the specimen has been tagged. When a Sample has been selected, the list will appear similar to the list in the illustration above.

3. The specimens can be individually selected by clicking on the list (by holding the Ctrl button and clicking on a specimen – multiple specimens can be selected for importing). The buttons to the right of the list can be used to select all the specimens, select only the tagged specimens, select only the untagged specimens, or to deselect all specimens. The OK button will be disabled unless at least one specimen is selected.

4. When all the specimens to be imported are selected, press the OK button to begin the import process. During the import, TestWorks will keep a list of any warnings generated. An import warning is generated when a channel, formula or input is detected in the specimen being imported that is not present in the currently loaded method. If TestWorks detects any warnings, any warnings will be written to a text file named "ImportErrors.txt." This file is placed in the current user's data directory. TestWorks will display a message asking the user if they would like to view this file.

Note *The import error file is overwritten each time an Import from Sample operation is performed.*

5. When a specimen is imported, a warning will be permanently placed in that specimen stating what Sample it was imported from, what user imported it, and the date and time of the import. This is useful to track where specimens have been moved.

Hint: *The warnings of a specimen can be viewed by right-clicking the specimen on the Review Page Legend and choosing "View Warnings."*

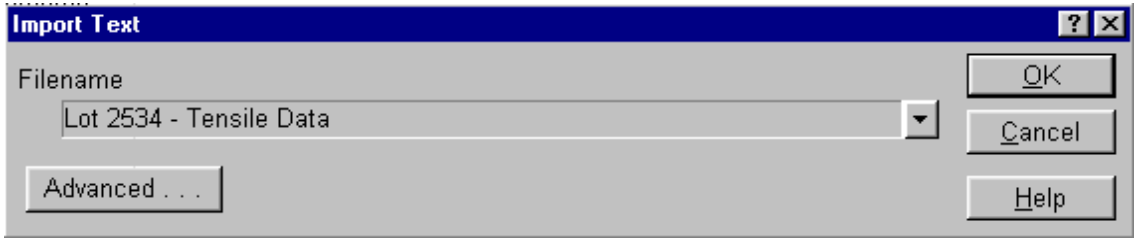
Import a text file

This item displays the Import Specimen dialog, which allows you to bring specimen data into TestWorks 4 from other sources.

Note *The imported file must be an ASCII (text only) file and must be formatted with TestWorks 4 import conventions. Please contact MTS for more specific information.*

When you select this Menu item (File, select Import…, highlight Import Text File…). The Import Text dialog will appear. Select the file you wish to import from the drop down list and click OK. All specimens in the selected file will be imported for you. If you need to search outside of your Import directory, you can click the Advanced button to bring up the common file open dialog.

Import Test Dialog



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