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Advanced Software For Material Testing

QTest Software Guide

Version 1.0

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This User's Manual is a representation of the QTest system for aid in its use. Due to constant software updates, the manual may vary slightly from the software version you are working with. If you find any discrepancies, inaccuracies, or typographical errors, please contact us so that we may correct it in future versions of this manual.

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Chapter 1: QTest Overview

QTest is a complete materials testing software application. Its unique design allows you to accomplish, with greater ease and accuracy, almost all functions that are typically performed in a materials testing lab.

QTest's rich functionality provides capabilities to enhance and improve the productivity and quality of materials testing. The design of this advanced product is based on many years of application engineering experience.

QTest provides complete functionality to accomplish your material testing goals. QTest:

- Allows you to produce test data.
- Allows you to convert and compile data into useful information.
- Allows you to configure the test instrument to the unique requirements of your test procedures or the skill levels of your operators.
- Assists you while testing is in progress, warning you of potential errors, displaying data in different formats and allowing you to correct mistakes.
- Provides a consistent and logical method of interacting with users, providing greater control and improved testing performance.

QTest is a total software package providing all the features you need to perform and analyze your most important testing procedures. QTest's features reflect the requirements of today's materials testing industry. All are designed for ease-of-use, flexibility, productivity and precision.

QTest includes:

- The capability to easily define a number of test methods that are unique to your test procedures and tailored to the skill level of different users.
- A complete, built-in database management system that is both powerful and transparent to the user.

About This Manual

The QTest manual is divided into the following three sections:

- OVERVIEW and QUICK REFERENCE — Chapters 1 provides a complete overview of the QTest software, showing you how to set up and operate the QTest software. Chapter 2 describes each menu option in QTest.
- OPERATOR'S GUIDE — This section is made up of Chapters 3 through 11, and offers detailed descriptions of each menu option in QTest.
- APPENDICES — You will find details on QTest's calculations, calibration problems, machine differences, a glossary and an index.

You can easily learn QTest by reading this documentation to set up and operate your system. The format of this manual is very user friendly. It is sub-divided into logical units to help you build and tailor your system according to your company's requirements.

- l, 2, 3 — You will find step-by-step instructions to set up and use your system.
- Notes and Warnings — Notes appear throughout to highlight important issues and to offer helpful hints. Warnings highlight important information that could either result in physical injury or damage to your system if ignored.

Re-Installing and Configuring the QTest Software

Although your QTest system software will come pre-configured, it may be necessary to re-install or upgrade the software.

Computer Requirements

Your QTest system has been supplied with a computer. In the event that this computer is replaced, check with your QTest Sales Representative for the proper computer configuration.

Although PC manufacturers claim that their computers are 100% IBM compatible, this is not always the case. It is important to use

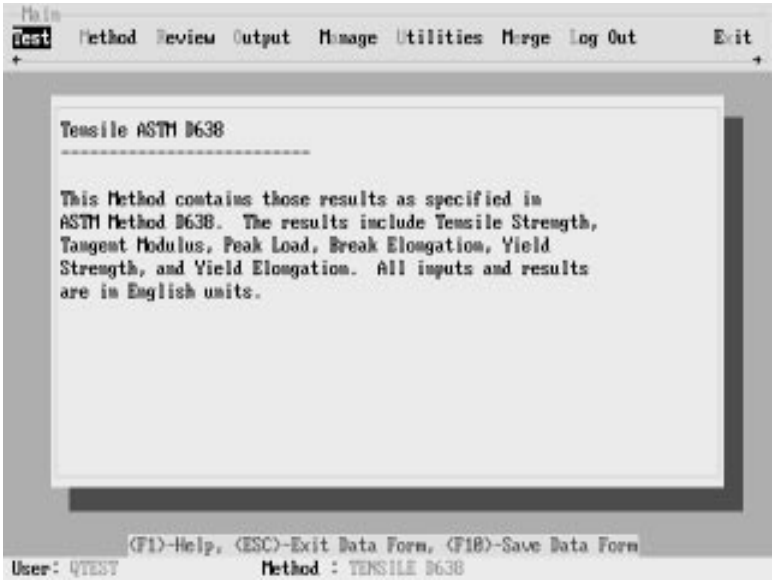


Figure 1.1. QTest Main Screen with Tensile D638 Method.

the QTest-supplied computer for running the system.

Using Other Software On Your QTest System

There are many software products that do not free allocated memory after a user exits the program. These programs are called TSRs (Terminate and Stay Resident Software) and even though the user may have finished using the software, it may still remain in memory.

Some TSRs take less memory than others so it is possible to use QTest with a TSR. However, should you see errors such as “Out of Memory” errors when you have a TSR loaded, note that this software may have robbed QTest of its needed low memory.

To install the QTest files,

To install QTest from the distribution disks to the hard disk, follow these steps:

1. Insert the QTest Install Disk One into the floppy drive. If you have two floppy drives, you can pick either one. At the DOS prompt type:

[drive]QT\INSTAL and press ENTER.

Example: A:\QTINSTAL

2. The system prompts you to specify which floppy drive will be used for the installation. Even if you have only one floppy drive, you will still need to confirm the drive by pressing ENTER (see Figure 1.2).

3. The system also prompts you for a target directory on the hard drive. If the directory you specify does not exist, the system prompts you to confirm its creation. If the directory does exist, the system prompts you to confirm an overwrite of the files in that directory (see Figure 1.3).

   Type: [disk][directory]and press ENTER.

   Examples: C:\QTEST or D:\QTEST

Note: You must specify a hard disk as the target. QTest recommends using the default setting of "C:\QTEST."

4. The system then prompts you for the three QTest disks in succession. The process should take no longer than five minutes. As the system prompts you, insert the appropriate disk. The system will then indicate a successful installation when the copying of all files is complete (see Figure 1.4).

When you turn the computer on, it boots directly into the QTest software and the QTest Login screen (see Figure 1.6). However, there may be occasions when you need to boot QTest yourself.

To start QTest from the "C:\QTEST" prompt,

1. Enter QT to start the QTest program. The system opens the QTest program and brings you to the first screen.

Note: If this is the first time you have logged into QTest, you will be prompted with the Environment option from the Configure Menu. Here you will specify the printer and maximum file size (see the section on Defining Environment for more details). Your system will be delivered with the Environment pre-configured. The directions for Defining Environment will only be needed if re-installing the software or if a new printer or



Figure 1.2. Installation Step 2



Figure 1.3. Installation Step 3



Figure 1.4. Installation Step 4

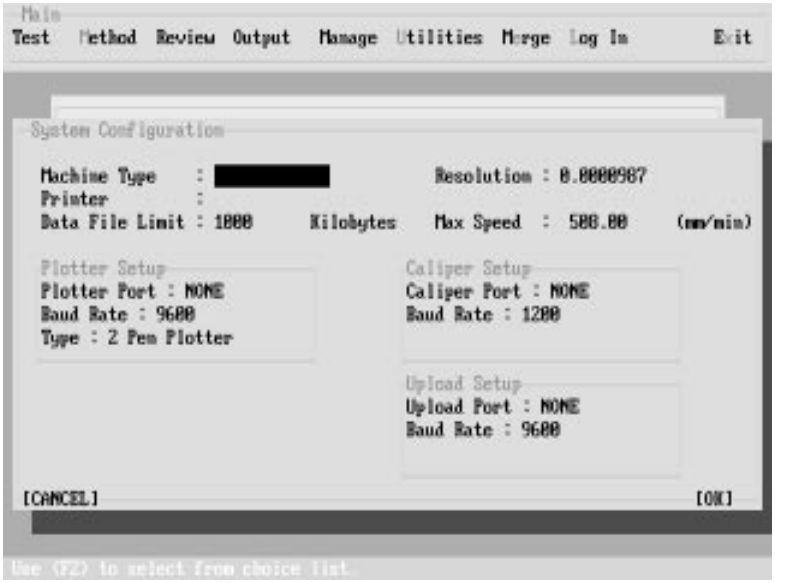


Figure 5. System Configuration



Figure 1.6. QTest Login

accessory has been added. See Figures 1.5 and 1.7.

2. Enter your Operator ID and press ENTER. The system displays the main menu and copyright notice as shown in Figure 1.6.

Note: When logging into QTest for the first time, type "QTest" as the Operator ID You will not need a password for the first log in.

Defining the Environment

To set up your Environment File,

1. Select Manage from the Main menu.
2. Select Configure from the Manage menu.
3. Select Environment from the Configure menu. The system displays the System Setup and Configuration form. This information tells QTest the type of hardware connected.
4. Enter data for each field. Press F2 for a choice list of entries.

The fields are as follows:

- MACHINE — Use the choice list (F2) to select your QTest load frame. “Demo” is used to run the software without a QTest load frame.
- RESOLUTION — The resolution is a motor dependent number that allows the software to perform accurate calculations. This number is preset by QTest and under normal circumstances should not be changed.

Note: Please make a note of the Resolution number, just in case it is accidentally deleted. This number is also located on the frame’s label.

- PRINTER — Use the choice list (F2) to select a printer. Your options are QTEST STANDARD, EPSON COMPATIBLE, and HP LASER.
- PLOTTER — Allows you to select the serial port to which your plotter is attached. Be sure to select the appropriate port using the F2 key for your choices. Also, specify the baud rate in the adjacent field called “BAUD RATE” and the

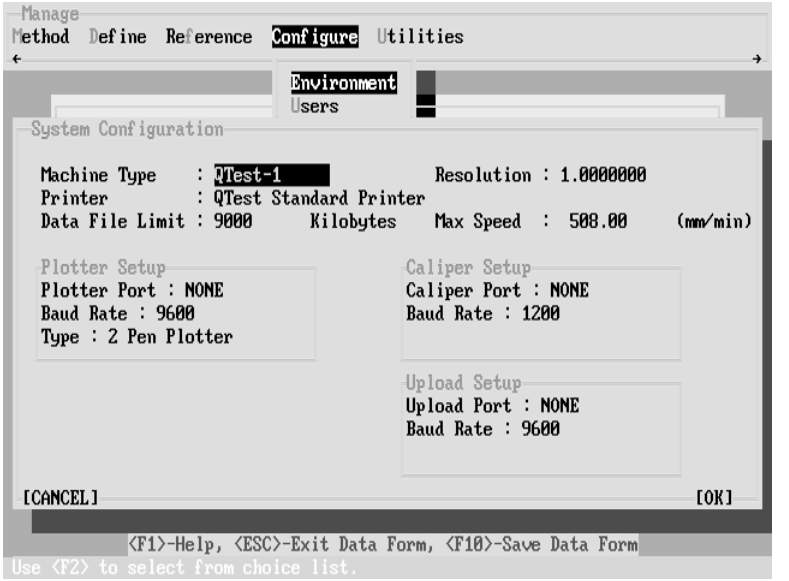


Figure 1.7. Configuring the Environment

type of plotter in the field TYPE.

- CALIPER PORT — Allows you to select the serial port to which your digital caliper is attached. Be certain to specify the baud rate in the field called “BAUD RATE.” Again, you may press F2 for a choice list.
- DATA FILE LIMIT — This value limits the size of each user’s database. For instance, a value of 9,000 KB limits a user’s TENSILE, FLEX, COMPRESSION, etc. database to 9,000 KB. The database must be backed up then erased to proceed with testing. We suggest a database size of 9,000 KB. This leaves room for plenty of tests, yet is not so big that it takes a large number of disks to back up. It also leaves 999 KB free so that if you reach the maximum database limit while testing, you can change the database size to 9999 and finish the specimen or sample you are testing before breaking up the database.

Entering and Maintaining User IDs

You can set up an identification (ID) for each operator. For each ID you can control access to various menu options. The operator ID also is shown on reports and the sample directory.

To add a User ID,

1. Select the Users option from the Configure menu.
2. Select Add from the User IDs menu to create a new user name. The system displays the Add User form.
3. Enter data for the following fields (see Figure 1.8):

   USER NAME — Enter the name of the user to be used at login.

   PASSWORD — Create a unique password for each user for security purposes.

   DATA PATH — Enter the path for data to be stored, if different from the default path. You may create a different path directory for each user.

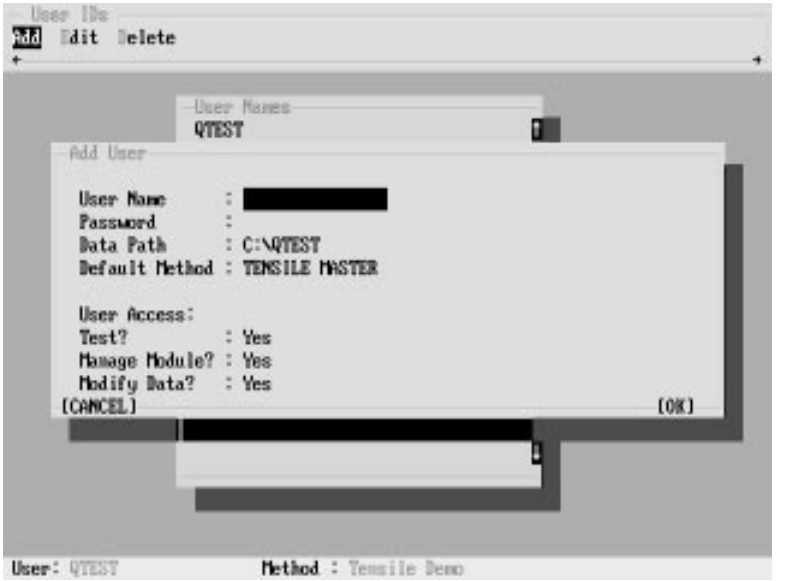


Figure 1.8. Adding A User

DEFAULT METHOD — This is the method that will be automatically selected for this user when they log in.

4. In the User Access fields, enter Yes or No for the following Main menu items (use the space bar to toggle between choices):

   TEST — Restricting a user from TEST allows them to only OUPUT and REVIEW stored data. Generally, you will only want to restrict a user from “Manage Module” and “Modify Data.” You may restrict a user from Test by specifying No.

   MANAGE MODULE? — You may restrict a person from making any changes to the methods, references or environments by specifying No.

   MODIFY DATA? — You may restrict the operator from editing the specimen inputs in the Review menu by specifying No.

You can set up a Quick Start for a user by only giving access to the Test module. When the user signs on to the system, they will be taken directly to the Select Method form. After choosing a method, they can then go to Test.

Note: **The system initially has an Operator ID of QTEST. You can delete this name, but first make sure you have created another operator ID with supervisor privileges.**

To edit a User ID,

1. Select the Users option from the Configure menu.
2. Select Edit to change an existing name from the User Names menu.
3. Select name of the User whose User ID you wish to change and press ENTER. The Edit User form will appear showing that User's information.
4. Make the desired changes as described in the paragraph on adding a user.
5. Press ENTER to confirm the changes.

To delete a User ID,

1. Select Delete from the User IDs menu.
2. Highlight the Operator ID you wish to delete and press ENTER.

Adding Sensors

A Sensor is a measuring device such as a load cell or an extensometer. You can add, change, delete, or reset sensors. To add a sensor, you need to tell the system the name of the sensor and specify its characteristics (see Figure 1.8).

To add a Sensor,

1. Select Configure from the Manage menu.
2. Select Sensors from the Configure menu. The system displays the Sensors menu with a list of sensors already in the system.
3. Select Add from the Sensors menu. The system displays the Add Sensor form.

4. Modify the parameters as described:

   SENSOR NAME — Enter the name of the sensor device you are adding in this field. You can call the device any name you want.

   SENSOR CHANNEL — Enter the channel that you are connecting the device to in this field. You have to select this channel from the choice list you see when you press F2. It is important to know from what channel the signal will be received. There are three channels available for calibration: LOAD, EXTENSOMETER, or DXL.

   CALIBRATION METHOD — In this field enter the method you want to use to calibrate the device you are adding. Press F2 for the two choices you can use manual or automatic. QTest load cells can be calibrated manually or automatically. Extensometers must be calibrated manually.

Note: You will need calibrated weights to manually calibrate a load cell.

   CALIBRATION UNITS — Enter the measurement units for

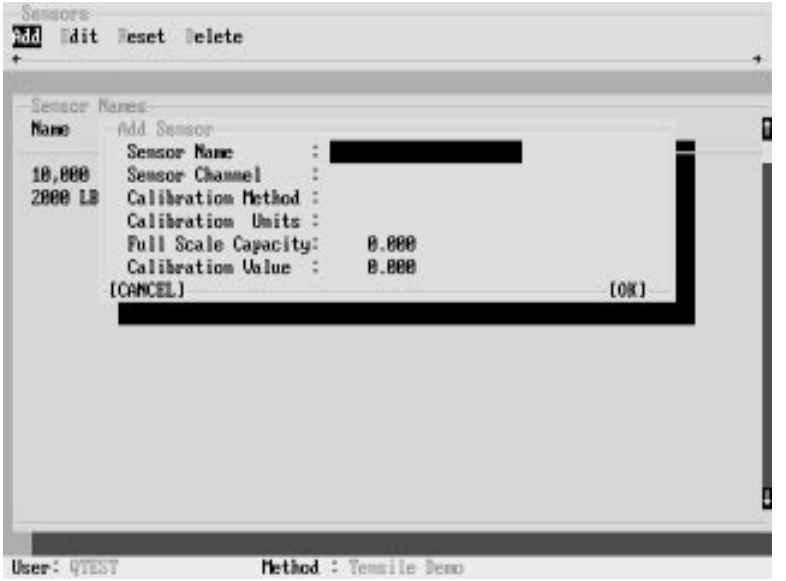


Figure 1.8. Adding A Sensor

calibration in this field. Press F2 to choose from a list of available units. Select the appropriate units for the particular device you are adding.

FULL SCALE CAPACITY — In this field, enter the maximum capacity of the transducer device. For a load cell, the full scale capacity is the maximum limit of the load cell (i.e., 100 lbs., 500 lbs, 1000 lbs, etc.). For an extensometer, the full scale capacity is the maximum extension range of the device.

CALIBRATION VALUE — Enter the load or length that you can use in the calibration procedure in this field. The calibration value for a load cell varies, depending on if you perform the calibration automatically or manually. If you calibrate the load cell automatically, the calibration value is the number shown on the load cell or calibration sheets. If you calibrate the load cell manually, the calibration value is the value of the weight you hang from the load cell. The calibration value for extensometers is the actual extension value at which you calibrate.

Note: Be sure to use FI Help for more detail on the previous fields.

5. Press F10 to save your changes.
6. Now you can add another sensor or press ESC to return to the Sensors menu.

Modifying or Deleting Sensors

You can change the characteristics of a sensor at any time by selecting the Edit option from the Sensors menu.

To edit a sensor,

1. Select the Configure option from the Manage menu.
2. Select the Sensors option from the Configure menu. The system displays the Sensors menu with a list of all sensors currently in the system.
3. Select the Edit option from the Sensors menu. Highlight the



Figure 1.9. Editing A Sensor

sensor you want to modify. Press ENTER. The system displays the Sensors form with all the fields as they were previously defined (see Figure 1.9).

4. Change any of the fields you want.
5. Press F10 to save your changes and return to the Sensors menu.

To delete a sensor,

1. Select the Sensors option from the Configure menu. The system displays the Sensors menu with a list of all sensors currently in the system.
2. Select the Delete option from the Sensors menu. Highlight the sensor you want to delete. Press ENTER. The system deletes the sensor.
3. Now you can delete another sensor or press ESC to return to the Sensors menu.

Resetting Sensors

When you first calibrate a sensor, the system stores the calibration factor in the database. All subsequent calibration factors are then compared to that stored value. If a calibration factor deviates ± 2% from the stored factor, a warning message appears after the calibration is performed. You can use the reset option in case you want to delete the first calibration value stored in the database. A few purposes for doing this are:

- The previous calibrations were performed incorrectly.
- The sensor was just returned from repair.

To reset a sensor,

1. Select Manage from the Main menu.
2. Select Configure from the Manage menu. A drop-down list will appear.
3. Select Sensors from the Configure menu. The Sensors page will appear.
4. Select Reset from the Sensors menu.
5. Select the sensor to be rest from the Sensor Names window.
6. Press ENTER to reset the sensor.

Operating the QTest System

QTest is an easy-to-use materials testing application. It is important for you to understand how to access and use screens, menus, forms and lists to move throughout the system. It is also critical that you learn how to control the system through the keyboard function keys and the online Help feature.

The QTest Screen

The basic screen is divided into the following three areas: the Application Area, the Message/Help Line, and the Status Line (see Figure 1.10).

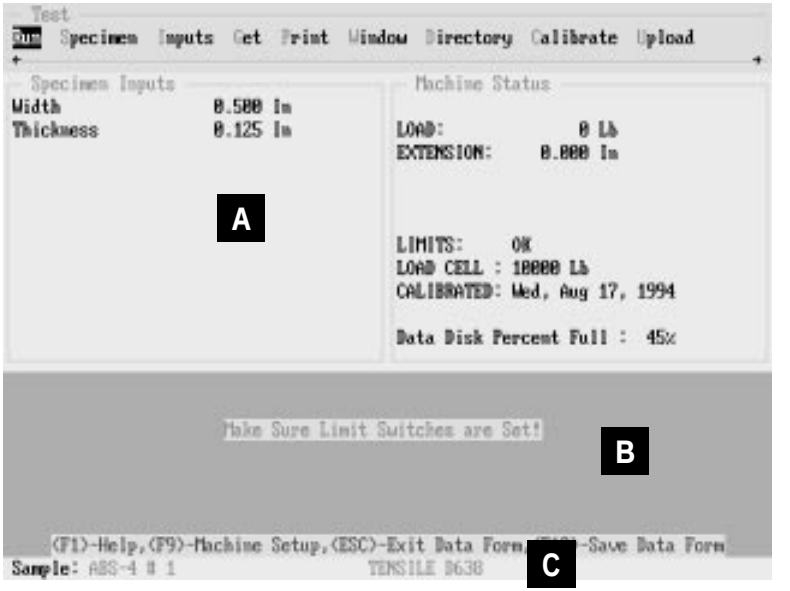


Figure 10. The Basic QTest Screen

The **Application Area** (**A**) is the portion of the screen above the status line and the message line. Here you can view menus, forms and choice lists of the system.

The **Message/Help Line** (**B**) appears over the status line. When the system communicates messages to the operator, this line displays two types of messages — warning and information. Both types of messages automatically disappear on the very next keystroke. You do not need to acknowledge the message with any special keystrokes. The remainder of the time, this line displays the current applicable hot keys and their uses.

- Warning messages appear in bright red. The computer beeps when displaying a warning message. Warning messages alert the operator of incorrect actions, procedures or values.
- Information messages update the operator of system progress. They appear in bright green.

The **Status Line** (**C**) is the bottom line shown on the screen while the system is running. The line is visible in every mode except the Graphics mode. The User field indicates which user is logged into the system. The three modes the system displays

when you select them are Sample, Method and Status.

- Sample — When you are in the “Test” or “Review” menu, the system displays the sample name and specimen number you select. If you do not select a sample, <None> appears on the status line in this location. While the system is testing, the specimen number indicates the NEXT specimen number that you use. For example, if you test specimens 1 through 4, the status line displays the number 5, the next specimen number to test. If you analyze stored specimen data, the system displays the specimen number of the data you are viewing.
- Method — This field shows the current method which you have selected. When you first login, this field will show to which method you default.
- Status — This field displays the current state of the program and indicates what operation is in progress.

  For example:

READY	The system requires operator input.
DISK I/O	A disk operation is in progress.
PROCESSING	The system is processing and cannot accept input.
PRINTING	Output is sent to the printer.

Using QTest Menus

You can select operations and initiate actions by using menus. The system normally displays menus at the top of the screen. Some menu selections automatically display a popdown submenu with several more choices.

There are three methods you can use to select items from normal and popdown menus:

- Use the cursor keys to position the highlight bar over the desired item and press the ENTER key to select the item. You can use the left arrow, right arrow, home and end keys to position the highlight bar.

- Select a menu item by pressing the letter key that corresponds to the hi-lighted character of the item you want. For example, if you want to select the Test option on the Main menu, just press t or T. You can use an upper or lower case letter when selecting.
- Use the mouse.

To escape from normal and popdown menus,

- Use the ESC key to move backwards to the previous or higher menu level.

Entering Information Into Forms

When you enter information, the system provides forms. Forms are different from menus. They are made up of one or more fields in which you can enter either numeric or alpha numeric information.

Use the keys shown in the table below to edit and move between fields within a form. Alpha fields can accept any character for input. Numeric fields can accept the numbers 0 through 9, one decimal point, a plus or minus sign and an optional “E” when entering numbers in scientific notation. Text and numeric data must fit entirely within the field. Also, numbers must fit within the field when displayed with the shown precision.

Using Choice Lists

Some fields allow you to select an entry from a list of items. You can type in the field value if you know it. If you do not know the field value, you can use the choice list to display a list of items from which to choose. The choice lists appear in magenta.

You can use the following steps to access a choice list from a form.

1. Press F2 to display the choice list for the current field. If no list is available, the system displays a warning message (see Figure 1.11 for an example of a choice list).



Figure 1.11. Example of a Choice List

2. Select the item of your choice by positioning the highlight bar using the up arrow and down arrow keys or the mouse.

3. Press ENTER to move the item you select into the current field and remove the choice list. Once you transfer your selection, you can now continue editing the other fields on the form. In some cases, you can edit your selection from the choice list.

Note: **There are some fields you MUST use the choice list to enter a value. You cannot type in a value, nor edit the choice you select. The message "No Edit Privileges" will appear when this is the case.**

Exiting Forms

There are three ways to leave a form when you are finished editing or viewing the form contents.

- Press F10 — You can press F10 at any time to leave a form. Your changes will be retained.

- Press RETURN — If you press RETURN while the cursor is positioned in the last field on the form, you will exit the form. Any changes will be retained.
- Press ESC — You can press ESC at any time to leave a form. However, if you use ESC, any changes you have made will not be retained. Pressing ESC is useful if you want to discard the changes you just entered.

Accessing Help

The system provides complete, online Help to assist you as necessary. You can find help on two levels. The first level corresponds to the specific item or input you select. The second level is a general Help screen. You can access HELP by implementing the following keystrokes (see Figure 1.12):

1. Press F1 when processing a menu. If Help is available, the system will display information corresponding to the item or input you select. If a Help description exceeds one page, the word “MORE” indicates additional pages exist. “END” appears when you reach the last page.

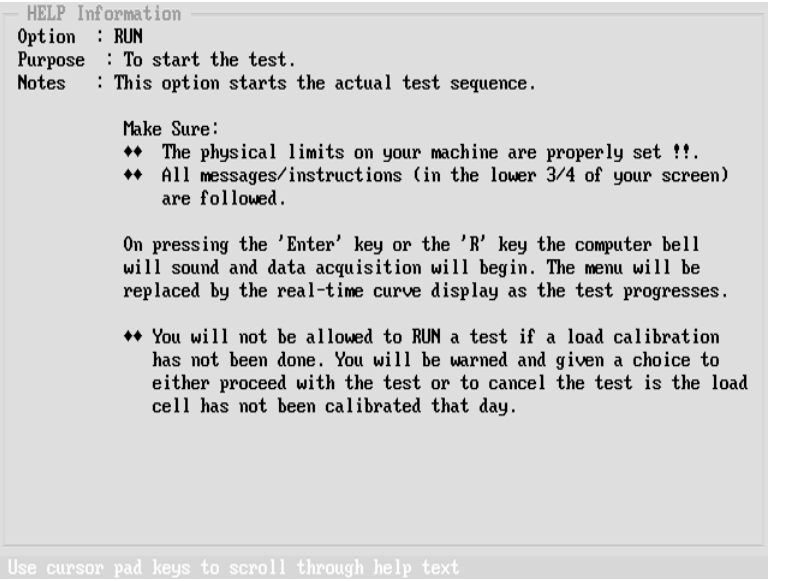


Figure 1.12. QTest Help Screen

The following keys are used to view different sections of Help:

PgDn	View the next page (if any)
PgUp	View the previous page (if any)
End	View the last page
Home	View the first page
Esc	Exit HELP system
F1	View general HELP for Forms and Menus

2. Press F1 again to access the second level, which is a general Help screen.
3. Press ESC to leave HELP and return to where you were when Help was initially invoked.

Note: **If you have any questions while you are operating QTest, be sure to access HELP by pressing F1.**

Moving through Menus and Forms

It is important for you to understand how easily you can move through the menus and forms on the system. The following steps give you an example of the keys you can use to modify sample information.

To select a method,

1. Select Method from the Main menu. The Select Method window will appear, displaying all available methods and method types.
2. Select the desired method by highlighting it and press ENTER. The system displays the description for the method you select.

To modify sample information,

1. Select Manage from the Main menu.
2. Select Define from the Manage menu.

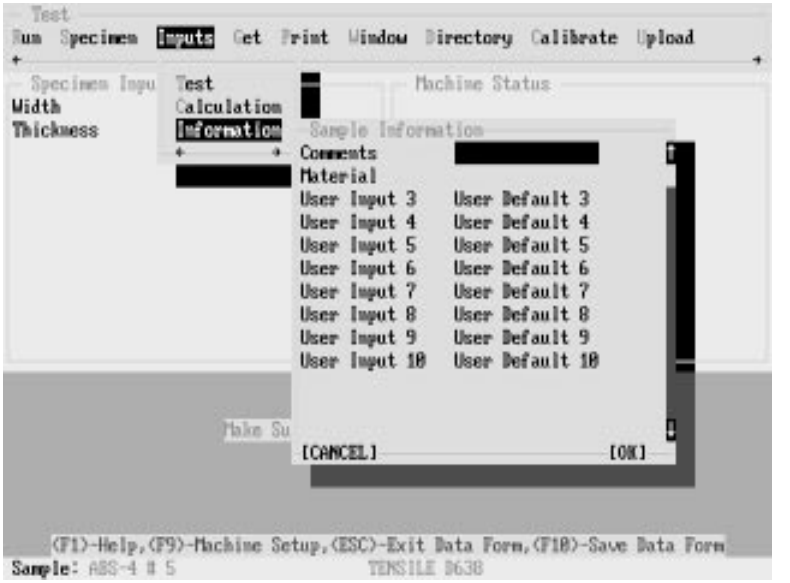


Figure 13. Sample Information Form

3. Select Inputs from the Define menu. A popdown menu will appear.
4. Select Information from the Inputs popdown menu. The Sample Inputs window will appear.
5. Select the Input you want to change and press ENTER. The system displays sample information with four fields which you can modify. These fields are as follows:

   Label — The name of the material or any label you wish to assign.

   Default — Standard value assigned by the system.

   Length — The length of the field.

   Attribute — The attribute can be Optional, Display Only, Hidden, or Required.
6. Highlight the field you want to change.

Note: Only the Attribute field has a choice list, which you can access by pressing F2. The system will display a choice

list. If you need general Help, press F1.

7. Edit the fields as necessary. Press F10 to record your changes and go back to the sample information display.

Note: While you are implementing these steps, if you need to return to a previous menu, press ESC.

Chapter 2: Quick Reference

Hot Keys

Use the keys shown in the table below to edit and move between fields within a form.

<F1>	Loads Help Screen
<F2>	Activates Choice List, if one is available
<F6>	Clears Field
Shift <F6>	Clears Field to the right of cursor
<F9>	Machine Control Panel
<F10>	Saves entered data and changes and Exits the form
ESC	Exits the form and discards entered data and changes
Backspace	Deletes character to left of cursor
Delete	Deletes character at the cursor position
Insert	Toggles insert or overwrite character entry modes
Left Arrow	Moves cursor to the left, or to the previous field
Right Arrow	Moves cursor to the right, or to the next field
Home	Moves to the first field on the form
End	Moves to the last field on the form
ENTER	Moves to next field, or exits form and saves changes if current field is the last field on the form
Down Arrow	Moves to next field on the form
Up Arrow	Moves to the previous field on the form

Test **Invokes the start of the Test menu that allows you to collect specimen data.**

Run Start the test. Used to start the actual test sequence.

Next	Select this option to save numerical specimen results only (not curves) after the test.
File	Select File to save both the numerical results and the curve data.
Reject	Reject the test results. Use this option to discard the test results of the specimen just tested.
Graph	View the specimen curve. Use this option to view the curve for the specimen just tested. What you will see depends on the settings of the Window selection. It is from here that you can move markers to see the effect on the numerical results.
Scan	Allows you to scroll up and down the list of specimen results.
Compare	View the specimen results. This selection will allow you to view the results of all the specimens in the current sample, including the one just tested and compare these results with the statistics of the sample.
Window	Allows you to change your plot parameters. You can set the axes labels, units and initial scale values for the post-test curve using this selection.
Print	Print a specimen's numeric results. Allows you to print the numeric results for the single specimen just tested (not available if using the laser printer option).
Comment	Enter a comment for descriptive purposes. You can enter a single line of text or comment, which will be stored with the test results for that specimen.
Tag/Untag	Exclude the specimen from statistical calculations. Toggle between tag and untag using this option.
AutoCalc	Restores the graphic markers and calculations to their original state from when the test was first completed (specimen level).

Specimen Enter specimen input values (typically specimen dimensions). Specimen input values are parameters which vary with each specimen.

Inputs View/edit Test inputs, Calculation inputs and Sample information.

Get Allows you to choose current Sample I.D.

Print Prints the Standard report.

Window Allows you to change your plot parameters. You can set axes labels, units and initial scale values for the real-time curve (shown while the test is in progress).

Directory You can list all sample names for display. Displays a sample directory — a listing of all the samples in the entire database for the chosen standard.

Calibrate Calibrate load and strain transducers. All the calibration numbers, units, and the transducer name must have been previously entered using the Sensors option off the Manage - Configure menu.

Upload Upload a Standard report to host computer in an ASCII string.

Method Select the type of test to be performed. This selection allows you to choose the "master" and "method" to use for the current testing. Select from any of the methods created previously using the Define option on the Manage menu.

Review Allows you to review and work with any existing data stored under current standard.

Get Allows you to choose the current sample name.

View Allows you to choose the specimen with which you want to work. When you choose this option, a list of the specimens within the current sample will appear along with any comment that you entered.

Compare View the specimen results. This selection will allow you to view the results of all the specimens in the current sample and compare these results with the statistics of sample.

Scan Scan across and down the screen for specimen results. Allows you to move the cursor on the specimen results page so that you can view information that does not appear on the original screen.

Graph	View the specimen curve. Use this option to view the curve for the specimen. What you will see depends on the settings of the Window selection.
Edit	Lets you edit specimen inputs. All calculations that are dependent on these specimen inputs will be automatically recalculated.
Comment	Enter a comment for descriptive purposes. The operator can enter a single line of text, which will be stored with the test results.
Tag/Untag	Exclude the specimen from statistical calculations. Also deletes all tagged specimens from the sample using the Delete option on the Review menu.
Window	Allows you to change your plot parameters. Plot parameters like axes variables, units and initial scale values for the post-test curve can be set using this selection.
Autocalc	Restores original graphics markers and calculations to the original state (e.g., if you used the Edit function to change specimen inputs and new results were calculated).
Next	Changes current specimen to next one in sample.
Previous	Changes current specimen to previous one in sample.

Inputs Calculation inputs are parameters which are specific to the calculations of a particular test method. Results will be automatically recalculated.

Info Allows you to change any of the sample information inputs.

Delete Permanently remove unwanted data from working database. This option will remove unwanted curve, specimen or sample data from the working disk. Once removed, this data can not be retrieved unless it has already been copied to a back up disk.

Rename Rename the current sample I.D.

AutoCalc Restore original graphics markers and re-calculates data. Use this choice to return the graphics markers to the original state. Also, any new calculation inputs will be updated ACROSS THE ENTIRE SAMPLE.

Directory List all sample names for display. Displays the list of all the samples in the entire database for the chosen standard

Output **Set up and execute report options. Samples created within the currently selected standard are available for inclusion in the report collection.**

Collection Allows you to Add, Remove, and Clear a group of samples for output.

Directory Print or display a sample directory.

Report Output a report to screen, printer or a file.

Export Create ASCII file with collection test results. Create a file using either test results for the collection or raw test data from one or more specimens.

Trend Calculates the statistical process controls on the sample or specimen level.

Manage **Setup system and testing parameters. The manage module is used for configuration of the physical test system, test methods, and display formats.**

Method Select the test method to be modified, or to act as a base for making a new method.

Define Define a test method. A method is a way of performing a test. More specifically, it is a user definable subset of a standard test, and choosing this selection allows you to define your own method and, hence, your own test.

Method Select a test method.

Inputs Define inputs for samples and specimens. Determines how the user interfaces with the system to provide information necessary for calculations and for sample identification.

Calcs Set which results are shown and how they are calculated. The two

options available, Required and Results, combine to provide the appropriate calculations at the end of each test.

Execution	Select option that will determine how the test will run. Determines how the test will execute and how the software will interpret the incoming data. Also allows you to set and remove a reference database.
Window	Setup graphics window. Sets up your initial data, units, and scaling for the graphics window.
Messages	Allows you to edit messages that appear before the start of the test, the description of the test, and the messages that appear before each specimen is tested.
Report	Set the default attributes for the standard report.
Print	Generate a printout describing the current test.
Save	Save test method.

Reference Execute “reference material “ related functions. Select, Create, Edit, Set up and View the reference material data from the currently selected test standard.

Edit	Edit reference material information. Allows you to view and/or edit the upper, lower, and target values of your reference materials.
Make	Create a new reference material.
Delete	Delete an existing reference material. Once deleted, you can not get the reference material information back, but you can recreate the same reference material using Make.

Configure Allows users to setup Environment, Users, and Sensors.

Environment	Allows you to change the computer configuration and test frame parameters with which you are working.
Users	Allow access privileges to program segments. Allows you to enter the user names and the level of access privileges associated with each name.
Sensors	Any analog transducer device used for measurement. Defines the measurement of equipment you will be using with your test machine.

Utilities Perform various housekeeping functions. This option is designed for the storage and retrieval of the customers METHODS, REFERENCE MATERIAL and TEST DATA. It is not intended for the backup of the User’s hard disk.

Restore	Restore Data, Reference Materials, or Methods from the target diskette.
Backup	Save Data, Reference materials, or individual Methods to a target path.
Erase	Delete test data from default data path.
Catalog	List the contents of the target drive.
Path	View/change target drive and path. This option lets you change the target drive and path specified for the Backup and Restore operations.
Directory	View listing of data, reference and method files in the default paths. This selection will provide the user with a directory of files that can be saved using the Backup option.

Utilities **Perform various housekeeping functions. This option is designed for the storage and retrieval of the customers MASTERS, METHODS, REFERENCE MATERIAL and TEST DATA. This option is not intended for the backup of the user's hard disk.**

Restore Restore from the target diskette. Data, Reference, and Methods are available.

Backup Save data to a target path. Data, Reference materials, individual Methods, and all Methods are available for backup.

Erase Delete data, reference data, and methods from the default data path.

Catalog List the contents of the target drive.

Path View/Change target drive and path. Lets you change the target drive and path specified for the Backup and Restore operations. Do not set the target path to be the same as the default path.

Directory View listing of data, reference and method files in the default paths. Provides the user with a directory of files that can be saved by using the Backup option.

Merge **Add samples from another database file to the existing one.**

Source Name input file for merging operation. It will prompt the

user to input the path and name of the file containing the samples which are to be merged with the existing database file.

Collection — Add, remove, select, view, or clear samples from a collection to be merged into another data file.

Do — Perform the actual merging of database files. The source database file will remain unchanged by this operation.

Log Out — **Log off the QTest system.**

Exit — **Exit the QTest software.**

Chapter 3: Preparing Data For The Test

There are very few required steps you must take before running a test. The following are brief descriptions of the required steps to take before running a test:

- You must start each QTest session by first logging in. Then you must select a method according to the type of test you want to run. A default method is loaded when you login. This method is set up in your user file, which means you only need to select another method if you want to change to another test.
- You need to identify a Sample I.D. for the specimens you are going to test by entering a new I.D., selecting an existing I.D. (by using the F2 choice list) or editing an existing I.D.
- You must calibrate the sensors at the beginning of the test session. See Chapter 4, “Preparing The Machine For The Test,” for more information.

Optional Steps

The following steps are optional. You will be prompted to enter specimen, test and/or calculation inputs only if they were set up in Define as required.

- Modifying the X and Y axis, using the window option, allows you to define the plot parameters of the real-time curve. For example, you can specify whether the values for the Y axis are displayed as load or stress. This option also allows you to setup the maximum and minimum scales.
- You can modify certain test and calculation inputs using the input options. These inputs affect the actual test and post-test results. Test inputs include any factors that will affect the executions of the test (i.e., speed, load limit, gage length and calculation inputs), and will affect how the data is interpreted after the test is completed.
- You can modify the specimen inputs after you have measured the specimen. You can enter the measurements using the keyboard or a device such as a digital gage or micrometer.

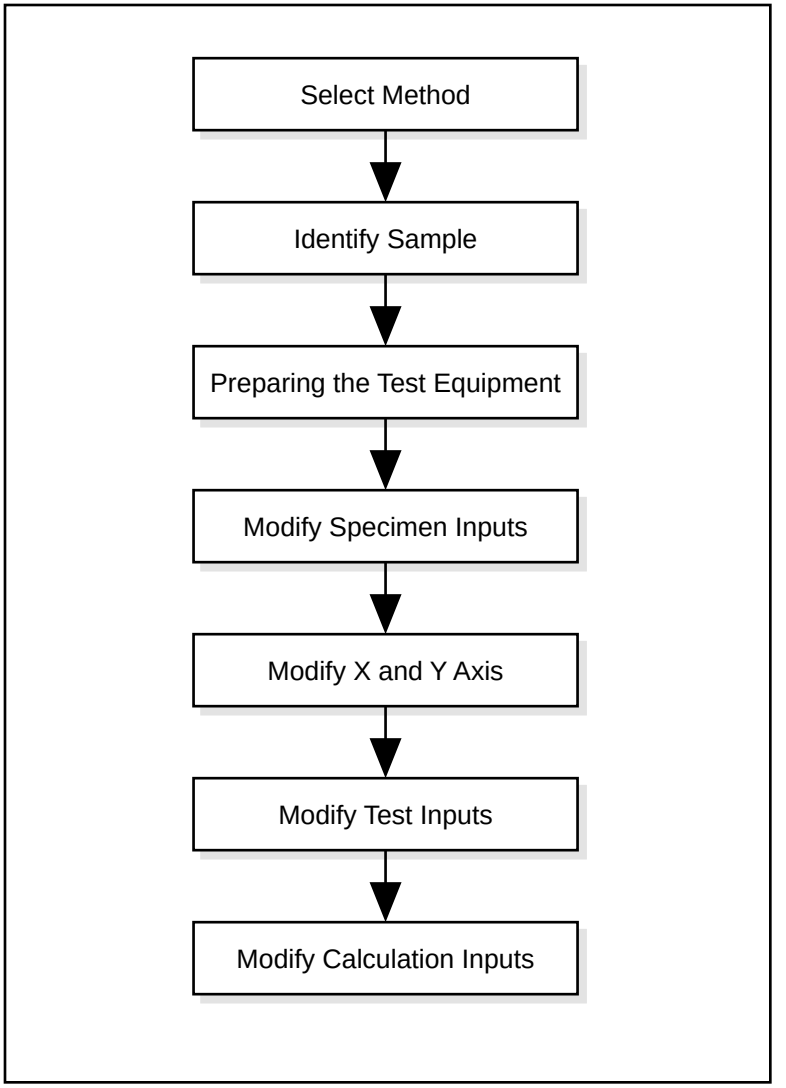


Figure 3.1. Flow of Test Preparation

Basic Concepts of Test Preparation

There are some important concepts that you need to understand before running a test. Here, we are just going to give you a brief summary of the terms used in this chapter. Many of the terms are based on defaults that were established in Define. You will find details on the original set up of these defaults in Chapter 8, "Defining Calculations and Inputs for a Method."

Sample I.D. and Specimen Numbers

You enter a Sample I.D. to identify a group of specimens you are testing. As you run tests, the system assigns specimen numbers in numerical sequence.

The system always displays the sample and specimen you are currently working with in the bottom left hand corner of your screen (i.e., Lot 564 #1, Lot 564 #2, etc.). On the Pretest Menu, the specimen number displayed is the next specimen you are going to test (see Figure 3-2.).

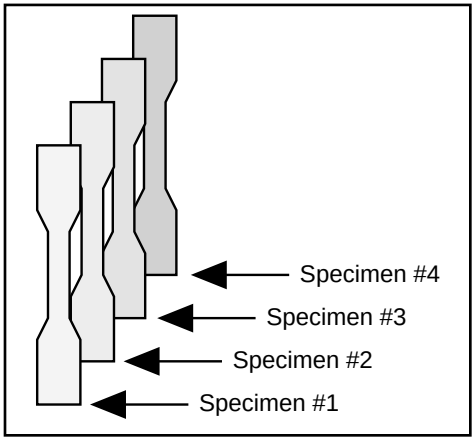


Figure 3-2. Sample: Lot 564

Information Inputs

You can also enter sample information such as operator I.D., material color, etc. The type of information the

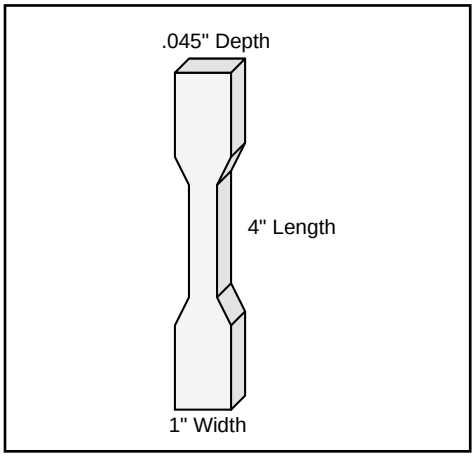


Figure 3-3. Specimen Inputs for Lot 564 #3

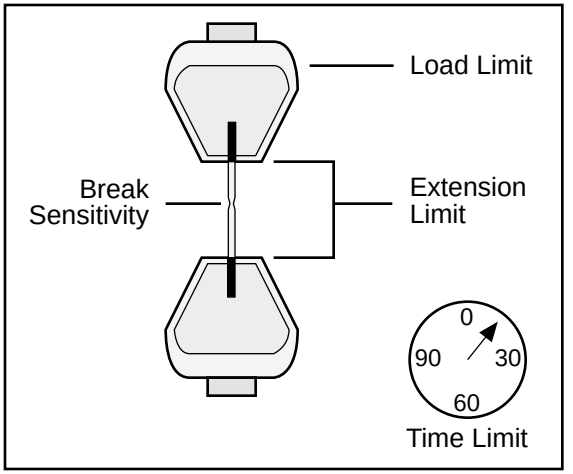


Figure 3-4. Test Inputs

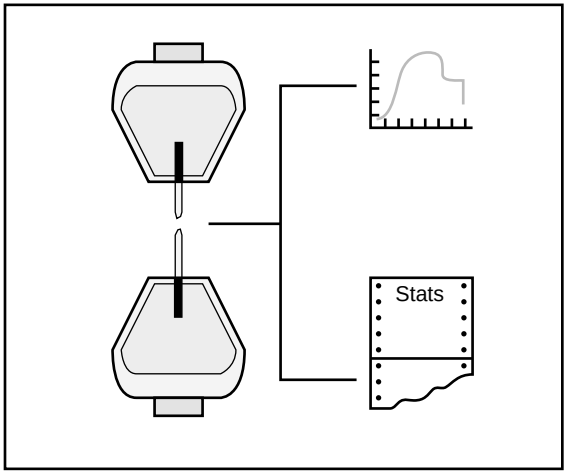


Figure 3-5. Calculation Inputs

system prompts you for depends on your company's set up in Define.

Specimen Inputs

Specimen inputs are the dimensions of each individual specimen (see Figure 3-3 for example). The system displays these default dimensions on the Start of Test screen and you have the opportunity and are sometimes required to modify the inputs.

The specimen dimensions that the system prompts you for depends on your company's set up in Define.

Test Inputs

The test inputs allow you to control speed, when the system should stop the test, when specimen break is detected, and where the crosshead should return after the test (see Figure 3-4).

Characteristics you can enter include a load limit, an extension limit, break sensitivity, a crosshead return point, and a time limit for the test. The test inputs the system prompts you for depends on your company's set up in Define.

Calculation Inputs

Calculation inputs are parameters which determine how the results will be derived (i.e., gage length affects strain calculations). The system needs these inputs before testing starts so that post-test calculated results that you see in the form of

graphs, stats and reports can occur (see Figure 3-5). Most calculation inputs are not needed for actual execution.

Examples of calculations include gage length, strain, load, elongation, stress points, etc. The calculation inputs the system prompts you for depends on your company's set up in Define.

Selecting a Method and Sample

When you want to begin a test, the first thing you need to do is select a method and a Sample I.D. (you do not have to select a method if you are testing under the default method displayed at the bottom of the screen). Choose Test from the Main menu; the system prompts you for a Sample I.D. if you have not done so already. You can select an existing sample, add a new one or edit an existing Sample I.D.

To select a method and Sample I.D.,

1. Select the Method option from the Main menu. The system displays a menu with the methods and their type. For example, tensile, compression or flex are types of tests.
2. Select the method you want to use to run this test. The system displays a description of the method you select.
3. Select the Test option from the Main menu. The system displays the Test menu with a form prompting you for a Sample I.D. The Sample I.D. is made up of one field of up to 20 characters, depending on how your system is set up in Define.
4. Enter a new I.D., select an existing I.D. (by using the F2 choice list), or edit an existing I.D. (see Figure 3-6 for Sample Selection Form).

4a. To enter a new Sample I.D., simply type the Sample I.D. that you want to use for this test and press ENTER. The I.D. you enter should be an identification of the group of specimens you are testing.

4b. To select an existing Sample I.D., press F2 and select the Sample I.D. you want for this test. The system displays the

existing samples. You can choose an existing sample and the system automatically displays the Sample I.D. at the bottom of the screen incrementing to the next available specimen number.

4c. To edit an existing Sample I.D., press F2 and select the sample you want to edit. The system displays the existing samples as it did above. After you choose a Sample I.D., make any changes and press ENTER.

5. Calibrate the machine and then you are ready to enter specimen information (see Section on Calibration for more information).

Note: **If you change your method, you will have to select a new Sample I.D. or you will default back to the sample's old inputs.**

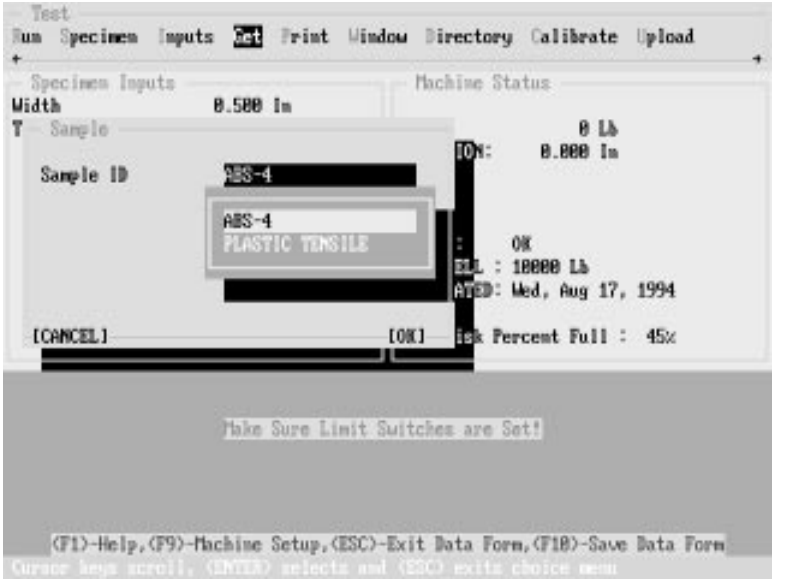


Figure 3-6. Sample Selection Form

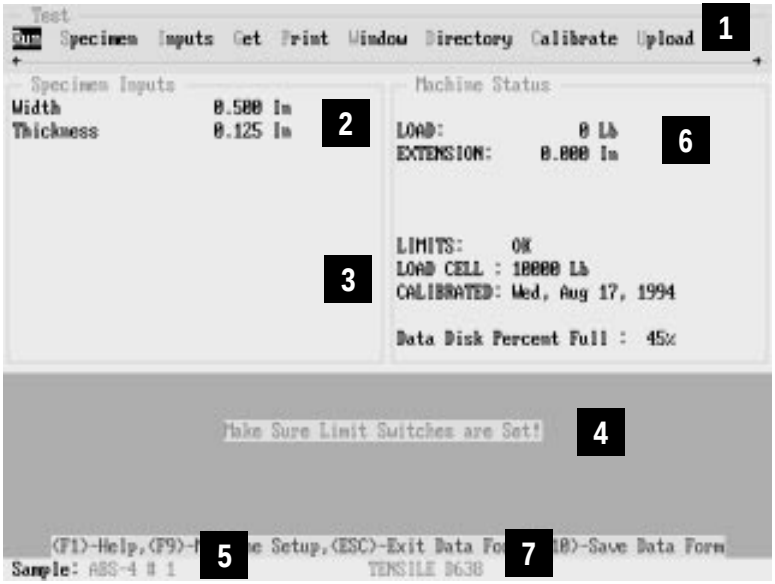


Figure 3-7. Start of Test Screen

The Start of Test Screen

The system displays various informational fields to assist you in preparing for the test. You have the ability to change certain fields but others you can only view. You can see the areas highlighted on the screen which are explained in more detail below.

The following numbers correspond to and identify sections of the Start of Test screen (see Figure 3-7):

1. The titles that go across the top of the Start of Test screen are menu selections. This menu is referred to in the manual as the Pretest menu. You can find documentation on each of these menu selections in this chapter.
2. The system displays the current specimen inputs. You can change these inputs by selecting Specimen from the Pretest menu.
3. If you have not previously selected a sample, the system displays the Sample I.D. Selection form. The system also displays this form if you select the Get option from the

Pretest menu.

4. The system displays the messages in this part of the screen that provide information for test preparation. You can set up these messages in Define. Refer to the section in this book titled Manage for more information.

5. Next to the word SAMPLE, the system displays the current sample and specimen number. When you change the sample using Get, the system displays the new Sample I.D. here. The system increments the specimen numbers automatically when you complete a test or when you select a sample that already has completed specimens. The specimen number the system displays is the NEXT specimen to be tested.

6. The Machine Status consists of display only fields that provide you with information concerning the test equipment. The system displays the current load and crosshead extension values. The system also displays the machine limit status: OK is no limit active, UPPER means top safety limit active, LOWER means bottom safety limit active and E-STOP specifies that the machine is not turned on or the Emergency stop is active. The system also displays the load cell currently mounted and the last time a load cell was calibrated.

7. The system displays the method you have currently selected.

Displaying Existing Samples

You can display existing samples by selecting Directory from the Test menu. Here you can view useful summary information concerning all the samples in your directory.

To display existing samples,

l. Select the Directory option from the Test menu. The system displays the samples in your directory, the date created, operator I.D. and number of specimens in each sample (see Figure 3-8 for Sample Directory screen).

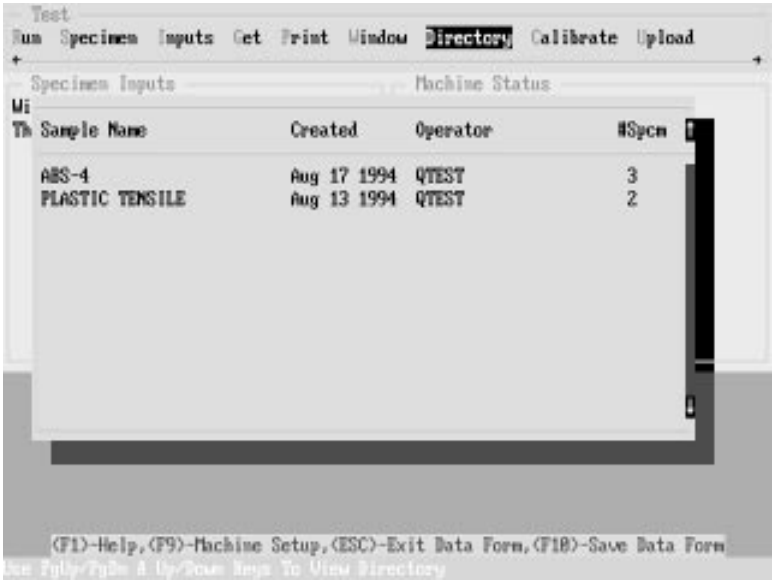


Figure 3-8. Sample Directory Screen

2. Use the up arrow, down arrow, page up and page down keys to see more than the system displays on the first screen.
3. Press ESC to return to the Test menu.

Retrieving a Different Sample

You can retrieve a different sample by choosing Get from the Test menu. You can then retrieve an existing sample or enter a new Sample I.D. to create a new sample.

To retrieve a different sample,

1. Select the Get option from the Test menu. The system displays the Sample Selection form with the sample you are currently working on.
2. Enter or select a sample I.D (see Figure 3-9 for Sample Selection Form).

2a. To enter a new Sample I.D., simply type in the name of the sample you want.

2b. To retrieve an existing sample, you can either type in the Sample I.D. if you know it, or you can press F2 to view the choice list of samples and select the sample you want.

3. Press ENTER. Once you select or enter your Sample I.D., the system saves your choice and displays it on the status line.

When To Retrieve A Different Sample

You need to create a sample in QTest any time you want to test a new group of specimens. The system adds all test results for each specimen to the current sample. Everything you request to process, display or print applies to the current sample. The current sample is the sample that you see in the bottom left hand corner of your screen on the status line.

When you first start QTest, if you create a new sample without first selecting an existing sample, then the test calculation and information input values for the new sample are set to the default values as entered in Define.

If you have already selected a current sample and then want to create a new sample using Get, the input values will be the same as those of the previously selected sample (not the default values entered in Define). You can modify any of the input values for a new sample if you want.

Entering Sample Information

Depending on how your company defines sample information, the system prompts you for various inputs. Examples of information you might be prompted to enter can include operator I.D., material color, submitter, material process number, etc. The prompts for sample information are set up in Define.

To enter sample information,

1. Select the Inputs option from the Test menu. The system displays a popdown menu with options including test,

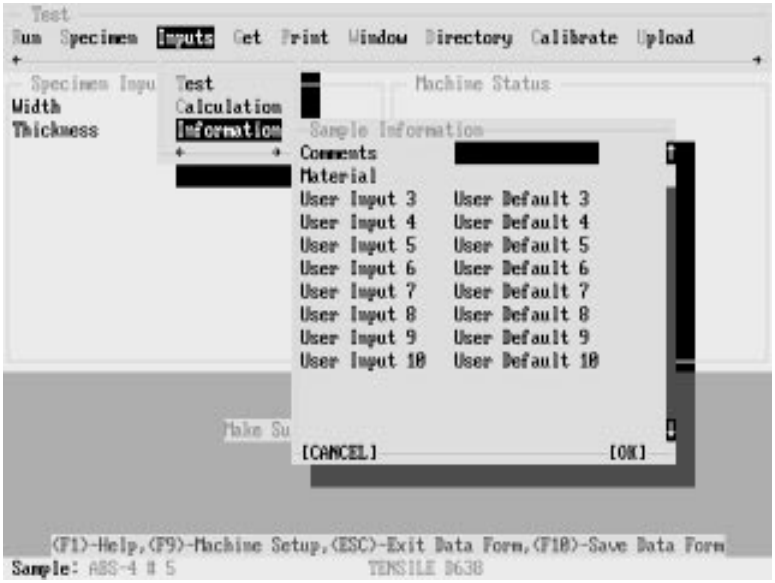


Figure 3-10. Sample Information Screen

calculation and information.

2. Select the Information option from the Inputs menu. The system displays the Sample Information form, prompting you to enter data about your sample (see Figure 3-10 for Sample Information Screen). The information you enter here applies to all specimens within the current sample.

   The system stores the information you enter and presents the data with test results on printed reports. You can choose to have this information appear on various reports. This does not affect the test or calculations directly.

3. Enter information in each line of the Sample Information form next to each heading. The system displays up to 10 headings prompting you to enter appropriate data for each heading.

Note: **Some fields might be "display only" and the system will not allow you to edit those fields.**



Figure 3-11. Specimen Inputs Screen

Entering Sample Information

You might be prompted to enter data, such as product code, batch number, curing temperature, etc. You can enter data in up to 10 fields, not to exceed 20 characters each. These fields are tailored in Define.

Unlike your sample name, sample information cannot be used to sort the database. See Chapter 9, “Defining Miscellaneous Information for a Method,” for more details.

Generally, you do not have to enter sample information. However, this depends on how sample information inputs are set up in Define. It is possible to define certain sample information fields as Required, which means you must enter the information when you create a new sample.

Entering Specimen Dimensions

After selecting a method and Sample I.D., you can choose Specimen from the Pretest menu. Here, the system prompts you

to enter specimen dimensions.

To enter specimen dimensions,

1. Select the Specimen option from the Test menu. The system displays the Specimen Inputs form on the Start of Test screen, prompting you to enter information in each established field (see Figure 3-11 for Specimen Input screen). You are prompted for inputs based on the following:

2a. The type of test you are performing. For example, if you are performing a tensile test, the system might prompt you for different inputs than if you are performing a flex test. The number you enter must be within the limits previously set up in Define or the system will display an error message.

2b. The way specimen inputs are set up in Define. It is in Define that you control which specimen inputs the system displays and whether you can or must input information. Each field can be made up of a total of nine numeric characters, which can include from 0 to 5 decimal places with units as set up in Define.

3. Enter each of these specimen dimensions required.

Using A Digital Caliper Or Micrometer

You also have the option to input specimen dimensions using a digital caliper or micrometer. In Define you specify whether the input is using the keyboard or using a caliper.

To setup a Digital Caliper or Micrometer,

1. Select Manage from the Main menu.
2. Select Define from the Manage menu.
3. Select Inputs from the Define menu. A popdown menu will appear.
4. Select Specimen from the popdown menu. The Specimen Inputs window will appear.

5. Select the input whose attributes you wish to change and press ENTER. Another Specimen Inputs window will appear where you can edit the inputs.
6. Using the down arrow key or TAB key, move down to the field labeled “Source.”
7. Press the F2 key for a choice list.
8. Select “Caliper” from the choice list and press ENTER to confirm.
9. Press ENTER to confirm and exit the edit Specimen Inputs window.
10. Press ESC to exit the Specimen Inputs window.
11. Select Save from the Define menu to save changes to your method.



Figure 3-12. Graphics Window

Modifying the X and Y Axis

You can modify the X and Y axis before you run a test. The window option selects the plot parameters of the real-time curve that the system shows while the test is in progress. The system prompts you for axis values and units you want to display on the curve. You can also choose minimum and maximum scale values.

To modify the X and Y axis selection,

1. Select the Window option from the Test menu. The system displays a Graphics form which shows axis variables, axis units and minimum and maximum scale values (see Figure 3-12 for graphics window).
2. To modify axis types, press F2 and select the type you want for the test. The system displays the selections. Choose the desired type and press ENTER. The system displays your choice in the Graphics Window form.
3. To modify axis units, move the highlight using arrow keys, press F2 and select the units you want for each axis. Press ENTER to continue. The system displays a list of axis units from which to choose. These units correspond to the axis variable you just selected.
4. To choose initial scale values for your axis, highlight minimum or maximum field, enter a value and press ENTER to continue. The system prompts you to enter minimum or maximum scale values of up to nine characters in length, including decimal places as set up in Define.

   If the actual data values from the test exceed the maximum scale values, the program will automatically rescale and redraw the curve so the curve will be visible at all times (if auto scaling is activated).

Note: **The graph scaling will not shrink from the initial setting. You might, therefore, set the initial maximum values to somewhat less than what you expect the full scale value to be. Subsequent tests use the maximum scales from the previous test as initial values if you do not change them prior to the next test.**

5. Press ENTER to confirm any changes.

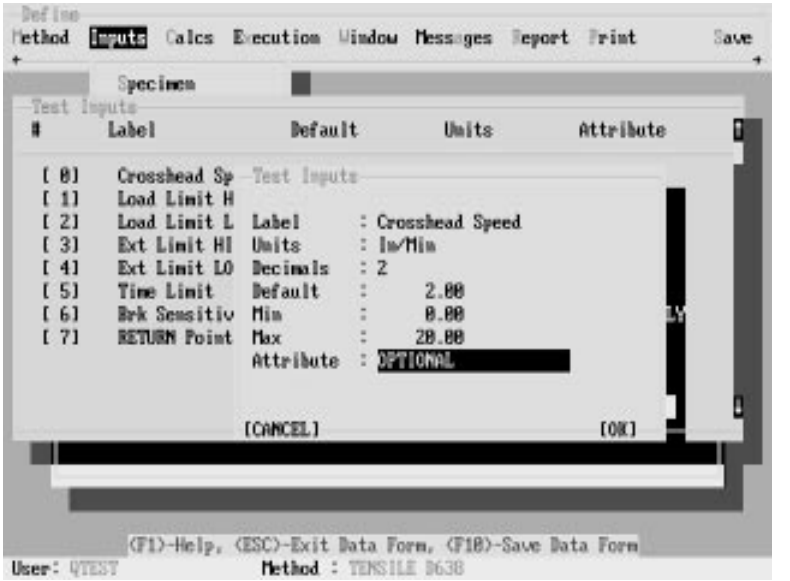


Figure 3-14. Test Inputs Form

Entering or Modifying Test Inputs

Test inputs are inputs that the system uses to determine when to stop the test, identify the break, and tell the crosshead where to return after the test.

To enter or modify test inputs,

1. Select the Inputs option from the Test menu.
2. Select Test from the popdown menu. The system displays the Test Inputs form prompting you to enter information (see Figure 3-14 for Test Inputs form). Some of the most commonly used test inputs are:
   - Speed
   - Load Limit
   - Extension Limit
   - Break Sensitivity

- Return Point

Note: **Break sensitivity only determines when the crosshead will stop, not how the data will later be interpreted for calculations.**

Each field cannot exceed nine numeric characters, depending on how your system was set up in Define.

3. You can now enter test inputs. The system displays the test inputs. Test inputs are always numeric, stored on a per sample basis and have upper and lower allowable limits as set up in Define.

4. Press ENTER to confirm your changes.

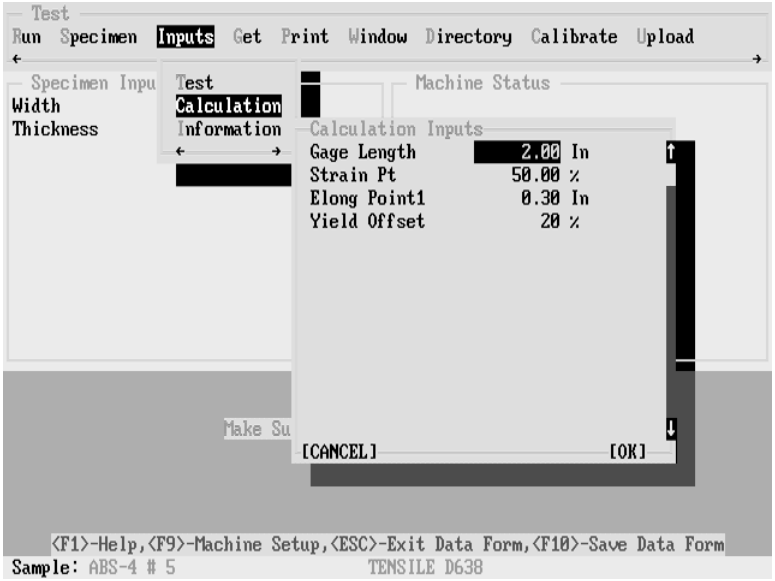


Figure 3-15. Calculation Inputs Form

Entering or Modifying Calculation Inputs

Depending on how your software was set up in Define, the system will prompt you to enter or modify calculation inputs. The system uses these inputs for calculation of post-test results.

To enter or modify calculation inputs,

1. Select the Inputs option from the Test menu.
2. Select the Calculation option from the Inputs menu. The system displays the Calculation Inputs form, prompting you to enter data for the calculation inputs displayed (see Figure 3-15 for Calculations Input form).
3. Enter or modify calculation inputs.

   Calculation inputs are calculation parameters which are specific to the calculations of a particular test type. They are inputs needed before testing starts so that post-test calculations can occur. Examples of calculation inputs include gage length, strain, load, elongation or stress points.

   Calculation inputs are always numeric, stored on a per sample basis and have upper and lower allowable limits. All calculation inputs, allowable limits, units and default values have already been set up in Define.
4. Press ENTER to confirm your changes.

Changing Calculation Inputs For A Particular Test

The following applies to changing calculation inputs:

- You can change calculation inputs at any time during the test prior to each specimen test.
- The system stores calculation inputs on a per sample basis. This means the last value you enter for each calculation input will be saved and replaces the prior test calculation inputs. While the system saves the results of each prior test, you will no longer have the original calculation input values for that test.
- You can change calculation inputs for a test, but these changes are not permanently stored in the method. The

system will tell that the values were different during testing, but will default to the method.

Note: **Even if you change any inputs for a sample during testing, each time you retrieve that sample the inputs will default to the sample.**

Printing Sample Reports

You may print the current sample information and results in the report format that was setup in Define. Please see the Report portion of the Manage section of this manual. To print your sample information and results, simply select the Print option.

Chapter 4: Preparing the Machine For The Test

Automatic Calibration

You MUST calibrate when you change the load cell or if you change the setting of your load cell magnification switch. You must also recalibrate the load cell on a daily basis, even if you have not changed it. Calibrating the load cell automatically means that the software will control the shunt circuitry in a load cell. The equipment is set up such that the software can do this.

To calibrate the load cell automatically,

1. Put the X10 switch on the frame into the X1 position.
2. Select Calibrate from the Test menu.
3. Select Load from the Calibrate menu. The Select Sensor



Figure 4-1. Select Sensor Screen

window will appear.

4. Select the load cell that you are going to use and press ENTER. The system displays a message to remove all load, except for grips and fixtures (see Figure 4-1).

5. Remove all load from the system except for grips and fixtures and press any key to continue the calibration process. The Load Range window will appear.

6. Press the F2 key for a choice list (X1 or X10). X10 multiplies the signal by 10 and increases the resolution of your load cell (e.g., 100# load cell will be a 10# load cell).

7. Select the desired load range and press ENTER. A message window will appear, reminding you to make sure the X1/X10 switch on the machine is in the proper position, and that no load is on the load cell.

Note: If using the X10 Switch make sure you wait until the software prompts you to change the switch on the machine.

8. When calibration is complete (as indicated by the Status Line at the bottom of the screen), press ENTER to return to the Select Sensor window.

Note: The system displays warning messages if the program cannot successfully complete the calibration process. See the Appendix for reasons why this might occur.

Defining The Load Cell And Parameters

We have previously defined the load cell you are going to use by using Configure Sensors, which is under the Manage menu. It is there that you can specify all calibration parameters such as the calibration method indicating whether the load cell is to be calibrated automatically or manually. You must also specify the units of calibration and the full scale capacity of the load cell.

Recalibrating The Load Cell

The system displays a warning message that you have not calibrated that day. If you are using a different load cell from

when you have last calibrated, then you must go through the calibration procedure or you will get incorrect readings.

Note: Every time you press Run, the system will prompt you to calibrate if you have not done so that day.

A Warning Message After Calibrating

QTest keeps track of the calibration factors the system calculates each time you perform a calibration operation. The system compares these factors each time you calibrate and gives a warning each time it finds unexpected results, greater than a 2% deviation from the original calibration value. If the system displays a warning message, check for an operator mistake, such as using an incorrect reference weight to manually calibrate a load cell. See the Appendix for other common problems. You may reset this initial calibration value of the sensor. See Modifying or Deleting Sensors in the Manage section of this manual for details.

Manual Calibration

Calibrating the load cell manually cannot be done automatically by the software. This is done by using a dead weight hang.

Note: This is recommended when testing in the X10 position.

To calibrate the load cell manually,

1. Select Calibrate from the Test menu.
2. Select Load from the Calibrate menu. The Select Sensor window will appear.
3. Put the X10 switch into the desired position.
4. Select the load cell that you are going to use and press ENTER. The system displays a message to remove all load, except for grips and fixtures.
5. Remove all load from the system except for grips and fixtures and press any key to continue the calibration

process or press ESC to cancel.

6. Since you are calibrating manually, the Load Calibration window will then instruct you to “Set Calibration load to [load calibration value].” This is the reference weight for calibration.
7. Hang the specified reference weight on the load cell. Make sure the weight is stable and not swaying. Do not remove the weight until the system informs you that calibration is complete.
8. The Load Range window will appear. Press the ESC key to to complete the calibration.
9. Remove the reference weight.

Note: The system displays warning messages if the program cannot successfully complete the calibration process. See the Appendix for reasons why this might occur and for other information about calibrating different machine types.

Calibrating Other Devices

Calibrating other devices, such as an extensometer, is a manual procedure and MUST be done each time you change the device. This allows QTest to accurately measure strain data. While you only need to calibrate each instrument a single time, you should calibrate on a daily basis to ensure the most accurate measurements and results.

To calibrate other devices,

1. Select the Calibrate option from the Test menu.
2. Select Extensometer or DXL Extensometer, or Pipper if you plan to calibrate a Pipper. The Select Sensor window will appear.
3. Select the Sensor to be calibrated and press ENTER. The Calibration Value window will appear.

4. Enter a new calibration value if desired. A message window will appear, instructing you to set the device to zero reading.
5. Set the device to zero reading and press any key to continue. The message window will then instruct you to set the device to the desired calibration value.
6. Set the device to the calibration value instructed and press any key to continue. If you are using an extensometer, open the device to the exact distance using a gage piece calibration block or dial-type calibrator. Do not remove the gage piece or calibrator until QTest informs you that the calibration is complete.
7. When calibration is complete (as indicated by the Status Line at the bottom of the screen), press ENTER to return to the Select Sensor window.
8. Remove the gage piece or dial calibrator. Press ENTER to select another channel or ESC to go back to the Test menu.

If the device that you wish to calibrate does not appear, you have either not added the sensor when you configured your system or you did not assign it to the particular channel that you are calibrating. In either case, see the section on Configuring Sensors under the Manage menu for more details.

Note: **The system displays warning messages if the program cannot successfully complete the calibration process. See the Appendix for reasons why this might occur.**

Displaying Calibration Information

You can display calibration information about the sensors listed in your current database by choosing Display from the Calibration menu. This information will tell you when calibration last took place (see Figure 4-2).

To display calibration information,

1. Select Calibrate from the Test menu.
2. Select Display from the Calibrate menu.

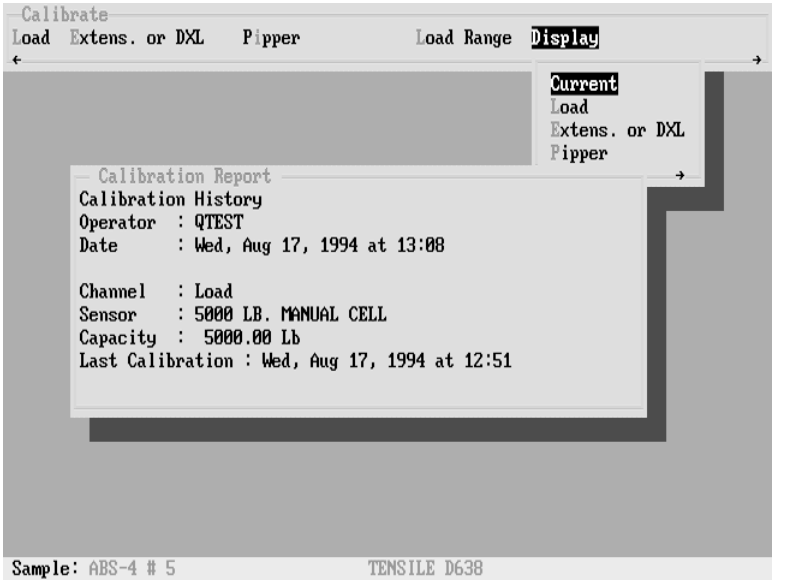


Figure 4-2. Calibration Display

3. Select Current if you want to show what sensors are presently calibrated for the present test. The system displays the operator, date, current sensors, their capacity and their calibration date.

4. Press ESC to return to the Calibrate menu or P to print the Calibration report.

Setting Up the Machine

To set up the machine, you must implement a series of steps at the computer keyboard. To get you started, this section displays the machine control panel (see Figure 4-3). The following steps allow you to utilize the crosshead control functions, the load indicators and controls (explained on the following pages).

To set up the machine,

- Go to the Test menu and press F9. The system displays the machine control panel on the screen. Manual control

functions include the following:

- Crosshead Control Features (up/down)
- Crosshead Speed Controls
- Extension Reset
- Extension Indications
- Precise Extension Control Commands
- Extension Limit Indicators
- Load Tare
- Load Indications
- Load Limit Indicators
- Peak Load & Extension Indicators
- Reset Peaks
- Set Speed
- Run Up/Run Down

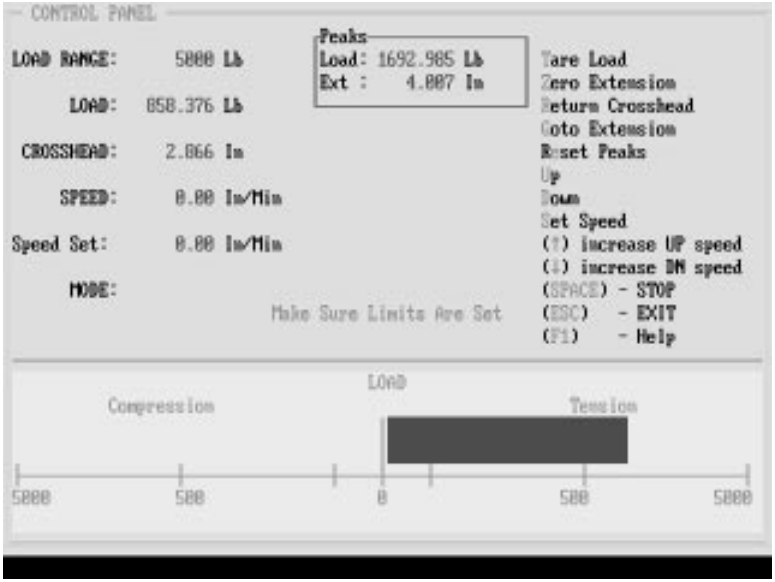


Figure 4-3. Control Panel

The machine control panel will display units depending on how your system was set up in Define.

Safety Features

The QTest system comes with extension and load safety features. The extension safety feature is in the form of contact sensors located on the test frame and crosshead (see Figure 4-4 for Extension Safety Features). If the crosshead comes in contact with either the upper or lower limit, the crosshead will stop and a warning message appears on the bottom of the page. You cannot move the crosshead in this direction any further. You can move the crosshead in the opposite direction. Once the sensor is cleared, the warning display disappears and you can move the control functions in both directions again. However, these only work if they are set up properly!

The load safety feature is determined by the load cell capacity. Whenever you change the load cell, you must calibrate the new one. By calibrating the load cell, you specify the load cell capacity. If the machine senses a load in excess of the load cell capacity during a test, the testing stops and a message appears on the bottom of the display. You cannot move in this direction any further. You can move in the opposite direction until the overload condition subsides. This condition can also happen if the load cell cable becomes disconnected.

Note: **Set the limit switches. Whenever you change grips or change the configuration of the test setup, you must change the limit stops. This will guarantee that the load cell or grips are not damaged.**

Controlling the Crosshead Functions

Crosshead functions are controlled by using specific keys on the computer keyboard. The crosshead functions provide you with the capability to set the initial jaw separation allowing you to place the specimen in the grips or fixtures.

To control crosshead functions,

1. Go to the Test menu and press F9. The system displays the

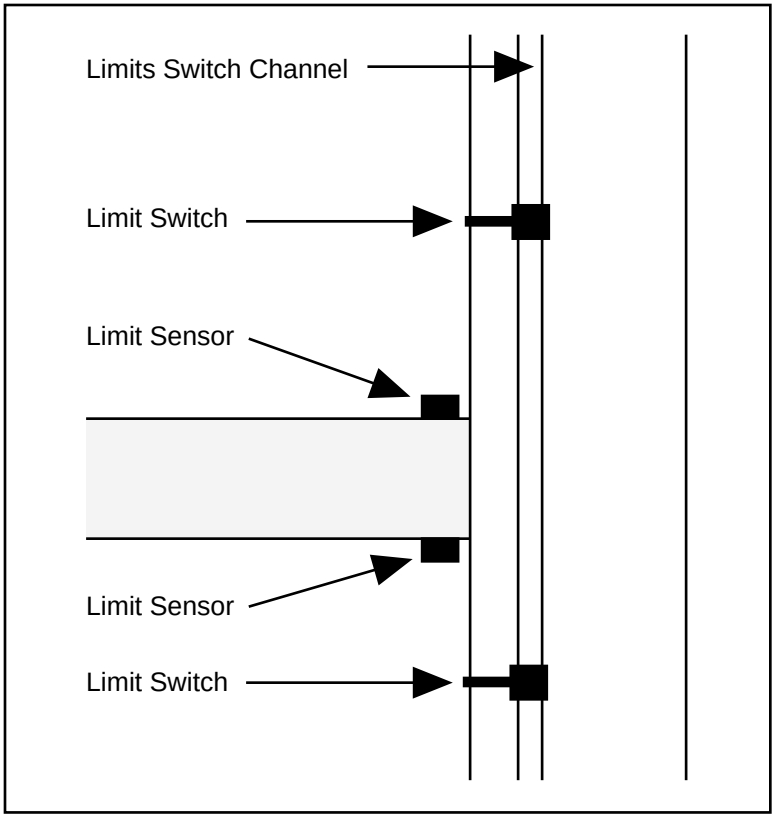


Figure 4-4. Extension Safety Features

machine control panel. You can press F9 at any point after you select Test from the main menu. This includes the Calibration menu, any forms, the Specimen Results menu, etc., except when the system is displaying the graph.

2. You can now select any of the functions on the control panel. The system displays the current crosshead speed in the left corner of the screen, above the mode indicator. The following keys control crosshead movement:

   - Press the up arrow key to place the crosshead in the up mode. You will notice the mode indicator is set to UP. By striking the up arrow key a number of times, you can increase the speed of the crosshead. To decrease the speed of the crosshead, you can strike the down arrow

key. By striking the down arrow key a number of times the crosshead continues to slow down until reaching zero speed. By striking the down arrow key one more time, the crosshead is placed in the down mode.

- Press the down arrow key to place the crosshead in the down mode. You will notice the mode indicator is set to DOWN. By striking the down arrow key a number of times, you can increase the speed of the crosshead. To decrease the speed of the crosshead, strike the up arrow key. Similarly, any further depressions of the up arrow key will continue to slow the crosshead down until you reach the zero speed transition point. Striking the up arrow key again will place the crosshead in the up mode.

Warning: **The amount that the speed increase each time the arrow is hit will vary. The increments will become larger as the speed increases!**

Note: **Make sure the NUMLOCK function of the keyboard is not active.**

- Anytime you press the space bar, the crosshead instantly stops, regardless of the direction the crosshead is currently traveling. You will notice the mode indicator is set to STOP.
- Press Z to execute the zero extension function. This option resets the zero extension point for the crosshead. All extension readings are from this zero reference point. Displacement above this point is measured as positive extension while displacement below this point is measured as negative (see Figure 2-5 Crosshead Position).
- Press R to return the crosshead. This option will return the crosshead to the zero extension point.
- Press G to execute the GOTO extension function. This command requires you to enter the position you want. The GOTO command tells the crosshead to go to a precise extension value in reference to the zero point.

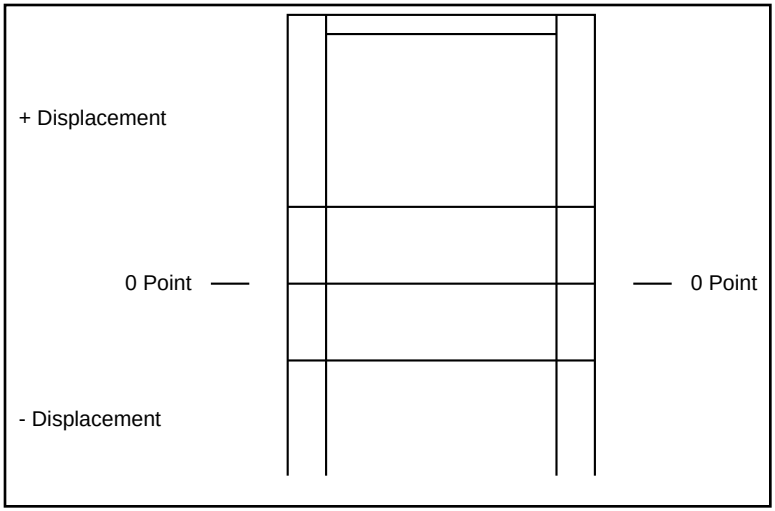


Figure 4-5. Crosshead Position

Using Load Indications And Controls

Using load indications and controls is accomplished by utilizing the tare load function and is necessary when changing grips on the machine.

To use load indications and controls,

1. Select F9 from the Test menu. The system displays the machine control panel on the monitor (see Figure 4-3).
2. Press T to execute the tare load function. This command will zero the load indicator. It tares out any load indication and sets the load reading to a zero value.

Note: **This option is useful when you change the grips on the machine. The new grips may be heavier or lighter than the previous ones. This option tares out the difference between the grips and zeros out the load indication on the machine control panel.**

Warning: **Do not tare the load if there is a specimen in the grips. This will lead to false load indications and destroy the**

integrity of your results.

Warning: **Whenever you change grips or the test setup configuration, you must also change the limit switches. This will guarantee that the load cell or grips are never damaged.**

To use Peak Load and Extension Indicators,

1. Select F9 from the Test menu.
2. Press E to execute the reset peaks function. This command will zero the load and extension peak indicators.
3. The indicators will then track the maximum loads and extensions. This feature can be utilized to perform simple tests.

Using Set Speed and Run Commands

Simple tests may be run from the Machine Control Panel. To do this, first select Set Speed by pressing S. Type in the desired speed and press Enter. Now select Up or Down by pressing either U or D. The crosshead will begin the test in the desired direction at the chosen speed. THE TEST MUST BE STOPPED MANUALLY! THERE IS NO BREAK DETECTION!

Load and Extension Indications

While in the F9 screen, the system displays the current load in two places. The most obvious display is the log bar graph on the bottom of the screen. Please note that this graph is in log scale. The maximum limits are determined by the load cell capacity. The load capacity is determined by the last load cell calibrated. The system also displays the current load and extension in numeric format in the top left corner of the display and the peak load and extension in the center of the display.

Chapter 5: Running the Test and Post-Test

After you have completed preparing for the test, you are now ready to run the test. The crosshead movements during the test depend on how the move segments are defined for the method in use. After the test is finished, the system displays the test Results and Post-Test menu. You are required to save or reject your test results.

It is important to carefully follow the steps detailed in Chapter 3 and Chapter 4 prior to running the test to ensure accurate results. During the test sequence, the system displays the test curve and then displays the Post-Test menu. There are a number of things you can do from the Post-Test menu to analyze your specimen. You can find more detail on these menu options in the latter part of this chapter.

Figure 5-2 outlines the required and optional steps involved in running a test.

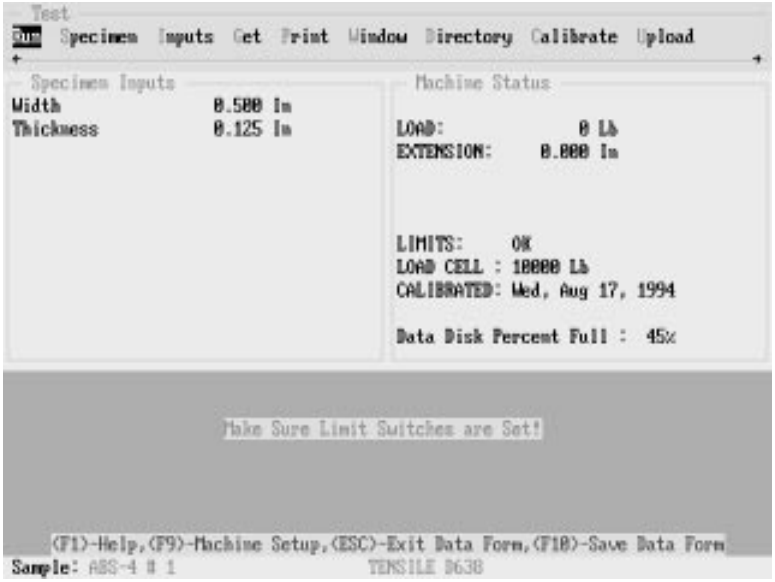


Figure 5-1. Start of Test Screen

When you select Run, the actual test will start and the crosshead will begin to move. It is important to be ready for this before you select Run. Before starting the test, you should go through the following procedures to be sure the system is properly set up:

- Make sure the specimen is properly mounted in the grips or fixtures.
- Make sure the machine safety limits are set up correctly.
- If applicable, make sure any accessories are properly attached and already calibrated.
- Check the start of test messages on the Start of Test screen to make sure you follow all procedures set up by the person who created the method.

Running the Test

After you complete the test preparations, actually running the test can be accomplished by selecting the Run option.

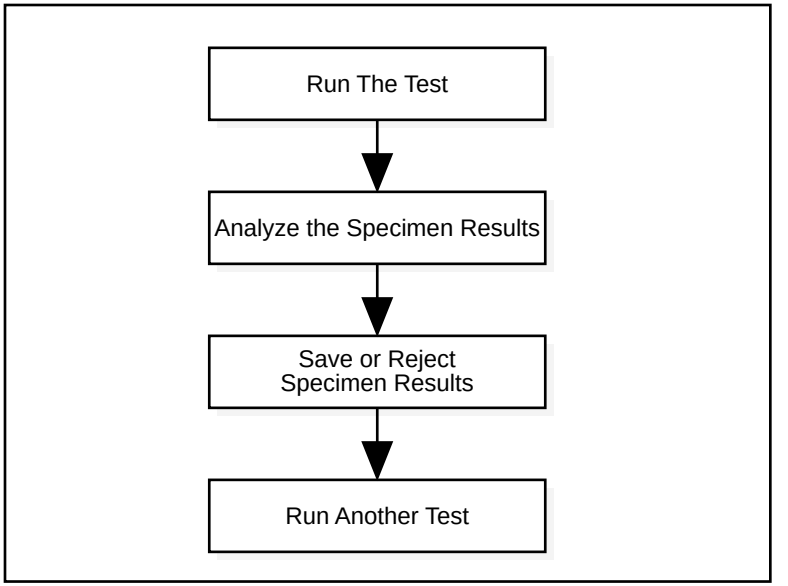


Figure 5-2. The Flow of Running the Test

To run the test,

1. Select Run from the Test menu (see Figure 5-1 for start of Test screen).
2. Depending upon how your method is set up, there may be some functions which need to be executed, such as Specimen Inputs.
3. The system starts the actual test sequence. The computer beeps, the crosshead begins to move and data acquisition begins. You can stop the test at any time by pressing the space bar.

   The system replaces the Test menu with a real-time curve display as the test progresses. As soon as the test is complete, the system displays the Post-Test menu.

Note: **You cannot run a test without first selecting a current sample. Also, the system displays a warning message if you have not calibrated the load cell or if you have selected an old sample since starting this QTest session.**

Start of Test Operations

After you select Run, the crosshead and display operate in the following ways:

Crosshead Direction and Movement — The initial direction of crosshead movement and subsequent changes in direction (if any) are determined by settings in Define. The move segments are pre-defined and dependent on the method you select. You can view the control parameters for each segment and change the direction (UP and DOWN) in Define.

Note: **You should exercise extreme caution before changing these parameters. There should be no reason to change them under normal circumstances.**

Real-Time Display — When the test starts, the real-time display appears on the screen (see Figure 5-3 for Real-Time Graph). The axis variables, units, and scale values are those you select from Window on the Test menu or in Define. The system displays the curve on the screen and the test proceeds.

If the graph is set to auto rescale and either the X or Y axis maximum scales are exceeded, then the scales will double and the system redraws the curve while the test continues. Any time during the test, you can press the <space bar> to immediately stop the crosshead and terminate the test. If you do this, you cannot restart the test.

Stopping The Test

The test can stop as a result of several reasons. They are:

1. You press the space bar while the test is in progress.
2. The load limit, extension limit, or time limits are exceeded during the course of testing. High refers to positive polarity and low refers to negative polarity. These limit values are all entered as test inputs.
3. Specimen Break is detected. The sensitivity of the break detection algorithm can be adjusted by changing the test input value. This allows the break to be reliably detected for many types of materials that have different breaking characteristics. Break sensitivity only affects real time.
4. The last segment is completed and is defined to terminate the test.
5. A safety limit is activated, or the load reading exceeds the full scale value of the load cell in use. These are not normal stop conditions and are provided as protection against damage to the load cell, fixturing, and the machine itself.

Post-Test Crosshead Movement

After the test has terminated (due to any of the above conditions), the crosshead may either stop and remain stationary, or return to zero. The return action is specified in Define as either STOP, RETURN, OR RETURN (PROMPT). If RETURN (Prompt) is selected, the operator will be prompted to remove the broken specimen prior to the crosshead returning.

However, if you terminate the test by pressing the space bar or a safety limit is hit, then the crosshead is immediately stopped and

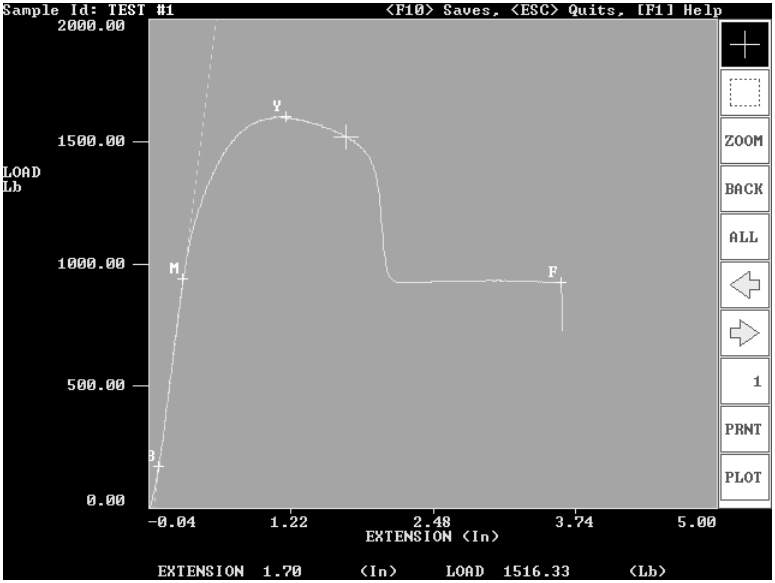


Figure 5-3. Real-Time Graph

the return action definition is ignored. The operator must invoke the machine control panel (use F9) and manually return the crosshead to the desired position using the crosshead control keys.

Saving Test Results

After the test is complete, you can save both numeric results and curve data, save numeric data only, or discard the results of the specimen you just tested. You cannot return to the Pretest menu until you select an option that deals with the results.

To save the specimen results,

1. Select Next, Reject or File from the Post-Test menu (see Figure 5-4 for Specimen Results menu).

1a. If you select Next, the system only saves the numeric results of the specimen you just tested. The system does not save any curve information. Saving numeric values requires far

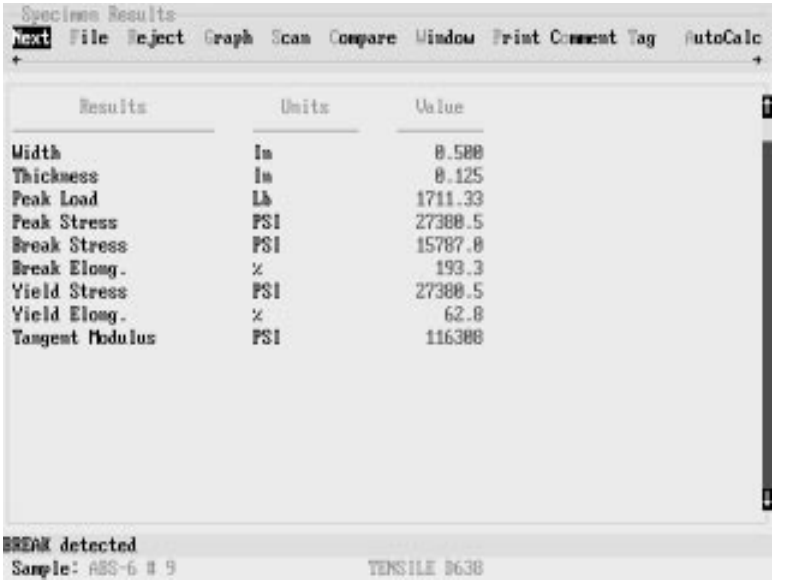


Figure 5-4. Specimen Results Screen

less disk space for storage. Keep in mind, however, that if you do not save curve information, you cannot view the curve or recalculate the results using different input values.

Warning: If you do not save curve data, it is gone forever.

1b. If you select File, the system saves BOTH the numerical results of the specimen and the curve data. You MUST use this selection if you want to view the graph again at a later time or if you want to recalculate the results using different calculation or specimen input values.

Saving the curve data takes up more room on your data disk, usually anywhere up to 10KB more than just storing the numerical data alone. You can, however, go back and delete the curve at a later time through the Review menu.

1c. If you select Reject, the system discards the test results of the specimen you just tested.

The Discard on Reject option in Define can be used to modify the action of the Reject selection. If you specify in Define that there is no discard on reject, the system stores

the results but tags them.

2. After you select Next, File or Reject, the system returns to the Test menu and you are ready to run the next test. If you select File or Next, the system increments the specimen number.

3. You can now test another piece, get a different sample, use any of the Pretest menu selections or leave the Test menu by pressing ESC.

Additional Options

After the test is complete, you have a number of options for reviewing the specimen you just tested. You can also access these options from the Review menu. For more detail on these options proceed to Chapter 6, “Reviewing Test Results.” The following is a brief description of each and its functionality:

Comment

You can enter a single line of text as a post-test comment to store with this specimen. You can view or edit this comment at a later time from the Review menu or print it on a report.

Tag/Untag

If you select Tag, the specimen you just tested is excluded from statistical calculations. In Review, you can tag or untag specimen results to evaluate statistical changes. While in Review you can also delete all tagged specimens.

Compare

You can compare the results of all specimens in the sample by selecting this option. The system displays the results in a spreadsheet format.

Graph

You can display the graph of the specimen again and perform a number of analysis functions, such as moving markers and expanding or shrinking portions of the curve.

Window

You can modify the X and Y axis so you can view the graph using different measurements.

AutoCalc

Restores the graphic marks and result calculations to their original state as when the test was first completed.

Print

The system prints the results for this specimen as they are displayed below the Specimen Results menu.

Scan

If you select this option, you can scroll through the results on the Specimen Results menu that do not fit on the screen.

Graphing Results

QTest allows you to analyze your data graphically. As you are running a test, the system plots the test results on a graph. If you save the curve information, you can display and analyze the curve at a later time. There are many features that you can use to analyze and customize your graph. Some of these features include:

- Moving markers and evaluating the changes in the results.
- Expanding or shrinking the display for a closer look at critical regions on the curve.
- Displaying other curves in the sample.

Viewing A Specimen Graph

You can view the graph of a specimen from the Specimen Results or Review Sample submenus. For information on viewing a graph from the Review Sample Menu, see Chapter 6, “Reviewing Test Results.”

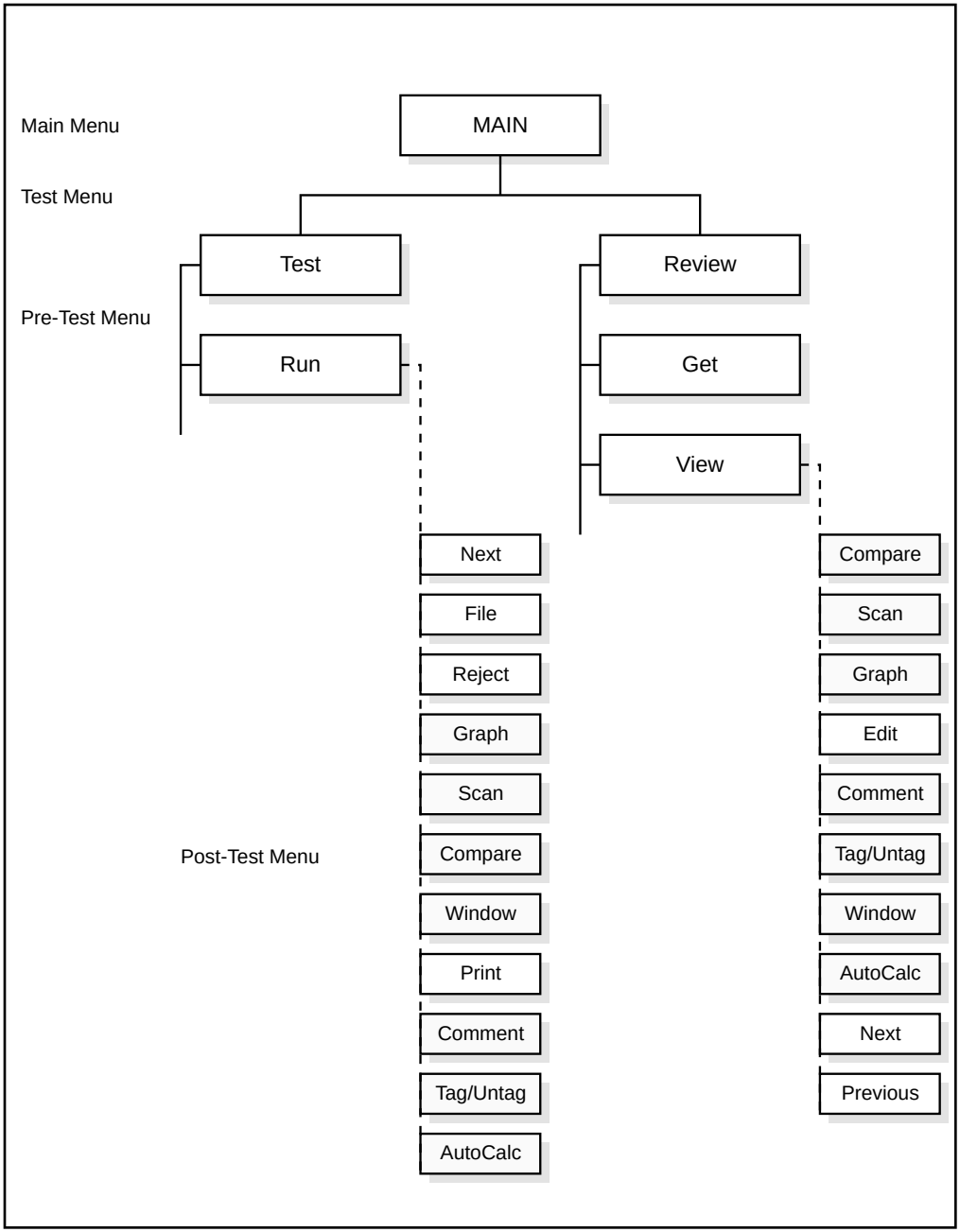


Figure 5-5. Specimen Analysis in the QTest System

To view a graph from the Specimen Results menu,

1. Select Graph from the Specimen Results menu.
2. Press ESC to return to the Specimen Results menu.

You can see in Figure 5-3 the graph that the system displays when you choose to view a graph. Along the Y axis the system displays LOAD in LB which is the selection that was made using the Window option. EXTENSION is the axis label and In is the unit that was also selected using the Window option for the X axis.

You can also see the markers and crosshair cursor in the above diagram. Later in this chapter, you will understand how to move these markers and move the cursor around the graph.

The figure also shows a menu next to the graph which you can use to customize your graph. For more information on this menu, see the section on Using the Graphics Menu.

Changing the Label and Unit on the Graph

You can choose the axis labels and units before you display a curve. You select a label for the X axis such as extension. You can then select a unit for extension to be measured in units such as inches. You can also modify the Y axis labels and units in the same way.

To modify the X and Y axis,

l. While in the View menu of Review Specimen or in the Specimen Results menu, select Window or Define (see Figure 5-6 for Modifying the X and Y axis form).

2. Select Auto if you want scaling to be done automatically or Manual if you want to set the scale manually.

3. Select the channels for the X and Y axis in the graphics window form. Press F2 for a list of available channels.

4. Select the X or Y units on the graphics window form and press F2 for a list of the unit variables.

5. Select and input the minimum and maximum initial scale values for the X and Y axis.

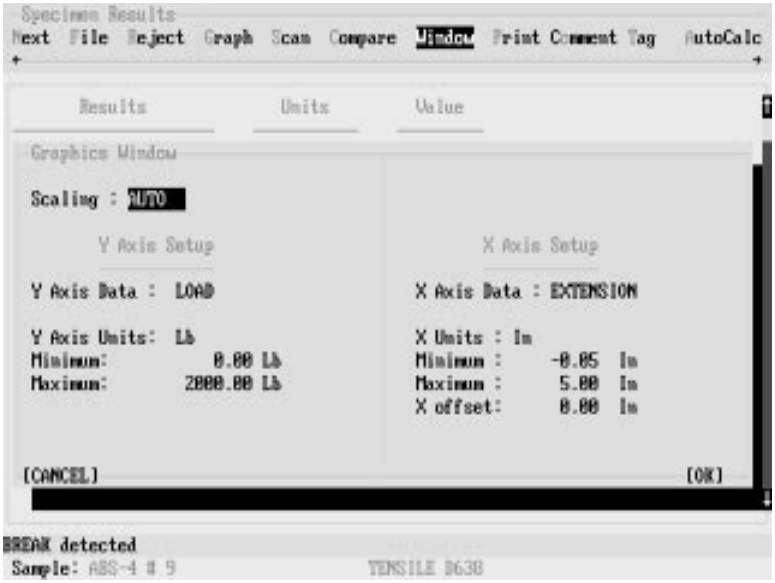


Figure 5-6. Changing the Graph Window from Results

6. Select the X OFFSET. When viewing all of the specimen curves, this feature allows the option of having a horizontal offset between each curve so that they are not stacked on top of each other. By putting in a value for X OFFSET, the curves will be placed side by side at whatever offset you specify. If you wish to see all the curves stacked on top of each other, then enter 0 in this field.
7. Press F10 to save your changes and return to the menu, or press ESC to discard.

Making Changes To The Window Settings

The changes you make in the Window option allows you to compare and contrast specimen test results. They will not affect the calculations. All calculations will be displayed and reported in the units set up in Define.

The settings in Window control what you see on the graph. For example, if you see load versus elongation but want to quickly view the stress/strain curve, set the Window axis and unit options

for stress and strain and choose Graph again. The display will now show the new axis labels and units. You can change the units or axis labels and then review the curve as often as you want. QTest automatically scales the axis to fit the entire curve on the screen if you have selected auto re-scale. You will later learn how to zoom, center and move the cursor around the curve.

When a curve is shown, the computer places the screen into graphics mode. The resolution of your graph will depend on the type of graphics hardware card you have in your computer.

Using Markers On The Graph

The system displays markers on the graph (see Figure 5-3 for a Specimen Curve). Markers reflect how a calculation has been done or its result. When moved, they change the numeric test results. You can use the markers to identify sections of critical regions on the curve.

Markers are method dependent. To view the markers defined for your method, go to Manage/Define/Inputs and choose Required Markers.

Moving The Cursor And Markers On The Curve

As you move your cursor, the data values for the crosshair cursor position are shown on the bottom line of the display. This allows you to position the cursor to a particular point and see accurate values, rather than trying to get values from the graph. You can use the left and right arrow keys between successive data points.

To move a marker, position the crosshair cursor to the new location and press the key corresponding to the marker code shown on the screen. For example, to move the “F” marker (which stands for Break) to a 10 lb. load value, first position the cursor to the appropriate point on the curve. Then press the “F” key. The screen is redrawn and the marker is in the new position. Remember that some markers are fixed and cannot be moved.

Note: To view the new test results, you have to press F10 to save that position.

Movement Keys Summary

Home	Move cursor to left most part of curve.
End	Move cursor to right most part of curve.
Right Arrow	Move cursor 1 data point to the RIGHT.
Control Right Arrow	Move cursor 20 data points to the RIGHT.
Left Arrow	Move cursor 1 data point to the LEFT.
Control Left Arrow	Move cursor 20 data points to the LEFT.
Up Arrow/Down Arrow	Moves your selection in the graphics menu up or down.

Restoring Markers To Their Original Position

You can recalculate data by executing the Autocalc function on the Specimen Results and Review Sample menus. This allows you to reset all markers and numeric values to original positions and values. You can return to the original positions and values no matter how many times you move and/or save the markers.

If you move your markers and save the changes with F10, you can restore these to their original location with Autocalc. Autocalc will reinterpret the data according to the method.

Using the Graphics Keys

While viewing your graph, there are keys that may be used to manipulate your graph in addition to the marker keys previously mentioned. See the summary below for a description of keys used in Graphics mode).

For instance, you can zoom into or shrink out of portions of the graph in which you may be interested. To do this, you use one or more of the following keys:

• PAGE UP — Use the PAGE UP key to zoom or expand the display. Each time you press the key, you increase the magnification by a factor of two.

• PAGE DOWN — Use the PAGE DOWN key to shrink the display. Each time you press the key, you decrease the magnification by a factor of two.

• DELETE — Use the DELETE key to restore the curve to the original full view picture.

Summary of Keys Used In Graphics Mode

PgUp	Expand (ZOOM) display around current cursor position.
PgDn	Shrink display around current cursor position.
F1	HELP screen - shows all key assignments.
F10	Exit graphics mode, retain any changes to markers.
ESC	Exit graphics mode, discard any changes to markers.

Other Keys Available For Viewing A Graph

Other keys that help you while in graphics mode include Help, Exit, Save and Menu.

- Press F1 to view the help screen. This selection allows you to see the active keys while viewing the curve.
- Press F10 only to exit the graphics mode and retain any changes to the markers. After you return to the results display, you will see all calculated values, dependent on marker position, updated to reflect the change.
- Press ESC to exit the graphics mode and discard any changes to the markers. Upon returning to the results display, numerical values are not changed because the markers are reset to the original position. You can use the Graph option as many times as you want to view the effects of marker placement on the numerical value results. You can

also use the Graph option to set the new marker position, exit with F10, and watch the marker dependent result values update.

Using the Graphics Menu

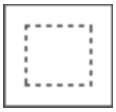
When you enter the graph, you will see the side menu of various functions that you may use to manipulate your graph. You may select a function by either using the up and down arrow keys and entering your choice or by using a mouse and clicking on your choice.

Note: **There are some functions that require the use of the mouse and are only accessible when a mouse is used. An asterisk (*) denotes Mouse dependent functions.**



Crosshair*

This is used to move the active crosshair to a particular position on any given curve. Instead of using the left and right arrow keys, you can use this function to position the crosshair.



Selection Tool*

Used to box in a section of the graph. After the box has been created, use the ZOOM tool to increase the size of the designated area.



Zoom

Used to zoom the graph at the current crosshair location or current area boxed in by option 2. You may use this option in place of the PAGE UP key.



Back

Sets the graphics scales back to their original state. You may use this function in place of the DELETE key.



All

Shows all curves for the current sample. If the X-offset is greater than zero then the curves will be offset that amount. See the section called “To Modify the X and Y Axis” for more details on X-offset.



Previous

Displays the previous specimen curve (if the graph is being displayed from Review).



Next

Displays the next specimen curve (if the graph is being displayed from Review).



Number

Shows the number of the specimen that you are viewing.



Print

Prints the graphics screen on the printer.



Plot

Plots the graphics screen on the plotter.

After Viewing A Graph

Press either ESC or F10 to return to the previous menu. Remember ESC will discard any changes to marker positions, while F10 will save the new marker locations.

Using a Reference Material

The QTest software allows you to compare your results with a reference material. In order to do so, you must first create the

reference material. See Chapter 10, “Defining Reference Materials,” for details. Then, you must select the particular reference material you want to use.

With a reference material, you can immediately check for standards conformance while you are testing. When you view results after a test, the percent difference between the specimen results and the reference material is also shown. If the test results fall outside the limits that you set for the reference material, the value of the percent difference will change color on your screen.

You may also compare your results to the reference material when you use Compare in the Review menu or when you print a report. When you execute Compare or print statistical information for a sample, the system also displays percent difference between the sample and the reference material. You will learn more on Review and on printing a statistical report when you read Chapter 6, “Reviewing Test Results.”

Chapter 6: Reviewing Test Results

The main objective of Review is to provide you with an opportunity to review the test results at your convenience and optionally change the sample and specimen inputs.

When you enter Review, you will be on the Sample level. You begin by selecting a sample. Once you have selected a sample, you may perform many functions on the Sample level. These functions are listed in the figure below.

You can also choose to go to the specimen level and perform functions that affect a particular specimen only. The diagram below depicts the review functions that are available at the specimen level.

If you review the functions listed at the sample and specimen level, you will recognize the majority of these items from other sections in the manual.

Warning: **When you perform functions in Review, be sure that you are at the specimen level (Review Specimen menu) if you want to affect just a specimen. If you want to affect the entire sample, please be sure you are at the sample level (Review Sample menu).**

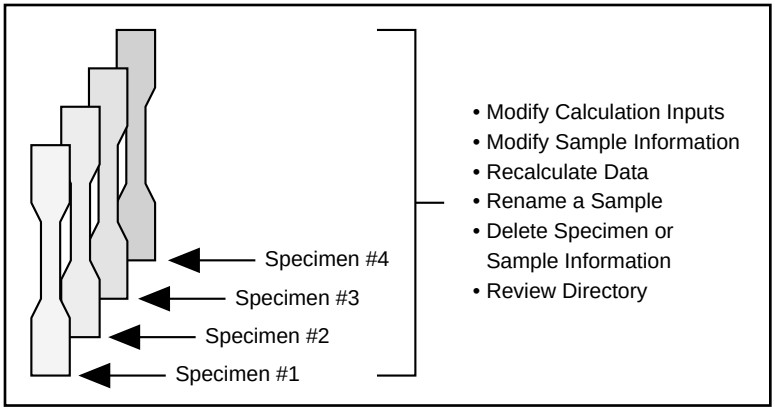


Figure 6-1. Sample Level Functionality In Review

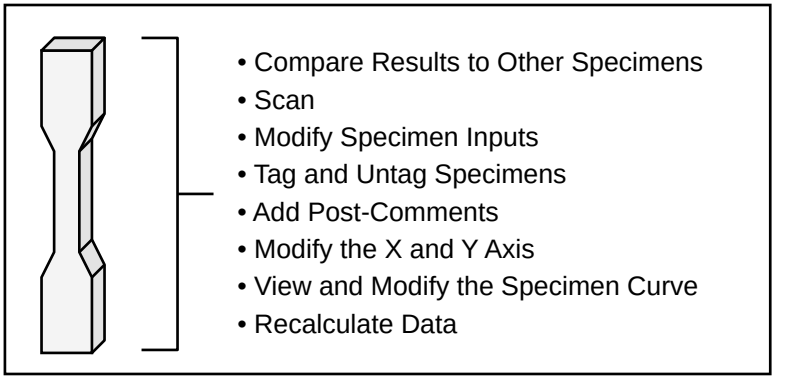


Figure 6-2. Specimen Level Functions In Review

Selecting a Sample

Before you use any of the options from the Review menu you must select a sample. This allows you to perform functions such as viewing a graph or changing calculation inputs for a sample.

To select a sample to analyze,

1. Select Review from the Main menu.
2. Select Get from the Review Sample menu. The system displays a Sample Selection form where you can choose the current sample you want to analyze. The system will load information according to the sample you select.

Note: If you have already selected a sample, the current sample name will be displayed in the Get Sample window. If you have not already selected a sample, the Get Sample window will appear automatically.

3. Press F2 for a list of samples from which you can choose.
4. Select the sample you want to analyze by pressing ENTER. The system displays the sample you are working with on the bottom left hand corner of the screen.



Figure 6-3. Modifying Calculation Inputs

Modifying Calculation Inputs

You have the option of modifying the specimen and calculation inputs during post-test analysis just as you did during test preparation.

To modify calculation inputs,

1. Select Inputs from the Review Sample menu. The system displays the Calculation Inputs form.
2. Enter or modify calculation inputs.

Note: **See Chapter 3, "Preparing Data for the Test," for a more detailed explanation of these inputs.**

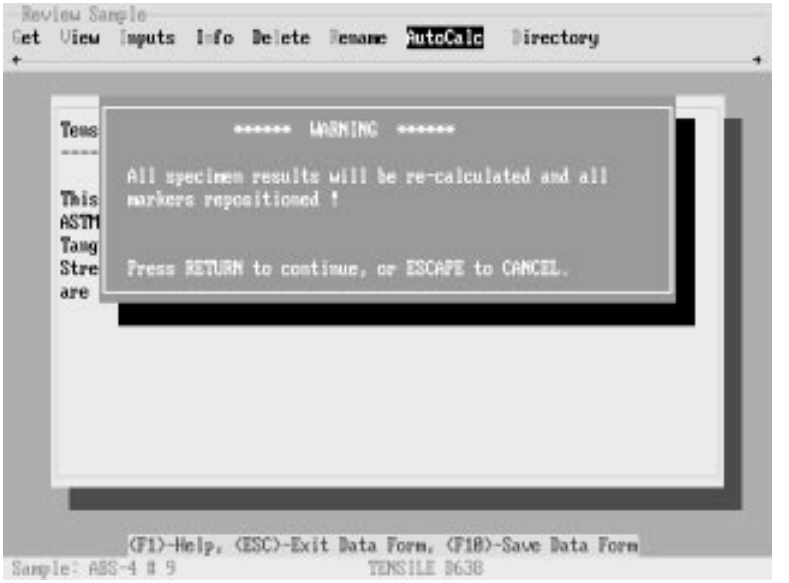


Figure 6-4. AutoCalc Warning Message

Recalculating Results

After you have modified your calculation inputs, you may recalculate the results for your entire sample. The software will not automatically change your results without recalculating.

To recalculate sample data,

1. Select the AutoCalc option from the Review Sample menu. The system displays the following:
2. Press ENTER if you want to complete this function.

Specimen AutoCalc vs. Sample AutoCalc

When you select AutoCalc on the specimen level the system recalculates data for just that specimen in the sample. When you select AutoCalc on the sample level, however, the system recalculates data for the entire sample. In other words, selecting AutoCalc on the sample level is like selecting AutoCalc on the specimen level once for each specimen in the entire sample.

Modifying or Viewing Sample Information

You can view, modify or add the sample information inputs after the test is complete. This is helpful when you note differences in samples. If you have a problem with the sample, you may also note it here.

To modify or view sample information,

1. Select the Info option from the Review menu.
2. Modify or view the Information for the sample that is selected. When modifying, use the TAB key to navigate between fields.

Deleting Specimens and Samples

While on the sample level, you have the option of deleting a specimen from the sample, all tagged specimens from the sample, any curve information from the current sample, or any sample from the current database.

To delete a specimen,

1. Select the Delete option from the Review sample menu.
2. Select Specimen(s) from the Delete submenu. The Select Specimen window will appear, displaying the names of the current specimens.
3. Select the specimens that you want to delete by highlighting them and pressing the <SPACE BAR>. A checkmark will appear beside each specimen name.
4. Press ENTER to delete the specimens. A warning message will appear, asking if you really want to delete the specimens.
5. Press ENTER to confirm.

To delete a sample,

1. Select the Delete option from the Review sample menu.
2. Select Sample(s) from the Delete submenu. The Select Samples window will appear, displaying the names of the current samples.
3. Select the samples that you want to delete by highlighting them and pressing the <SPACE BAR>. A checkmark will appear beside each sample name.
4. Press ENTER to delete the samples. A warning message will appear, asking if you really want to delete the samples.
5. Press ENTER to confirm.

To delete all tagged specimens,

1. Select the Delete option from the Review sample menu.
2. Select Tagged from the Delete submenu. A warning message will appear, asking if you really want to delete all tagged specimens.
3. Press ENTER to confirm.

To delete curve information,

1. Select the Delete option from the Review sample menu.
2. Select Curve(s) from the Delete submenu. The Select Samples window will appear, displaying the names of the current samples.
3. Select the samples whose curves you want to delete by highlighting them and pressing the <SPACE BAR>. A checkmark will appear beside each sample name.
4. Press ENTER to delete the curves. A warning message will appear, asking if you really want to delete the curves.
5. Press ENTER to confirm.

Note: This option deletes only the raw data, but will not delete the calculated results. You may, however, not perform new calculation and get results without the raw data.

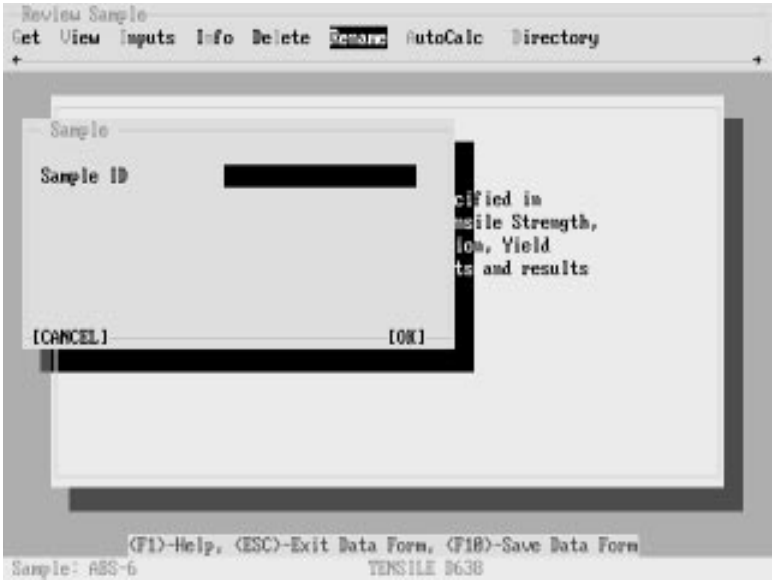


Figure 6-5. Renaming a Sample

Renaming a Sample

By renaming a sample, the system replaces the previous name of the sample with the new name you enter. Anytime you want to refer to this sample, you can find it under the new name.

To rename a sample,

1. Select Get from the Review Sample menu. The Sample window will appear.
2. Press F2 to display a choice list of available samples.
3. Select the sample you wish to rename and press ENTER.
4. Press ENTER to exit the Sample window.
5. Select Rename from the Review Sample menu. The Sample window will appear.
6. Enter a new name for the sample. The system changes the previous I.D. of the sample to the new I.D., and displays the new name in the bottom left hand corner of the screen. The

renamed sample will become the current sample.

Note: **You cannot enter a sample name that is already being used by another sample. An error message appears if you attempt to do this.**

Displaying A Directory

You can display a sample directory by selecting Directory from the Review Sample menu.

To display a directory,

1. Select Directory from the Review Sample menu. The system displays a listing of all the samples in the entire database for the current method type. The sample I.D., sample creation date, operator I.D. and number of specimens are displayed for each sample. The system displays Sample I.D.'s in ascending alphabetical order.

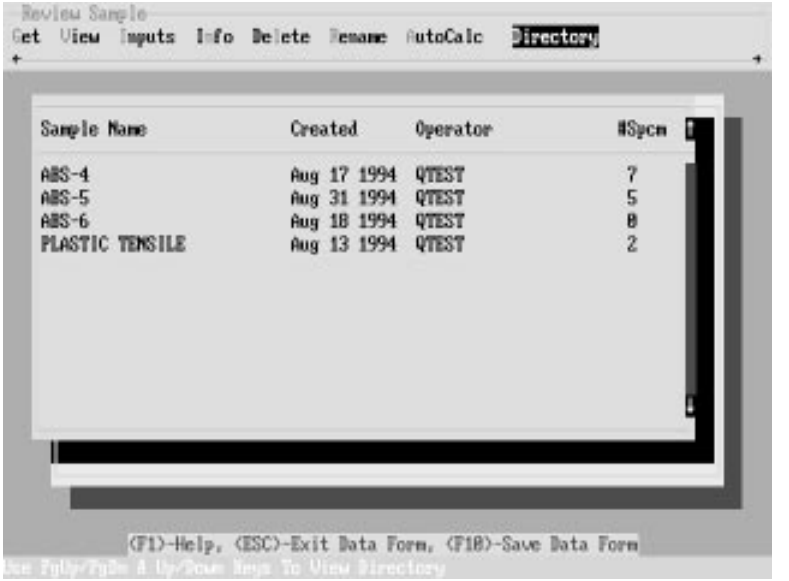


Figure 6-6. Sample Directory in Review

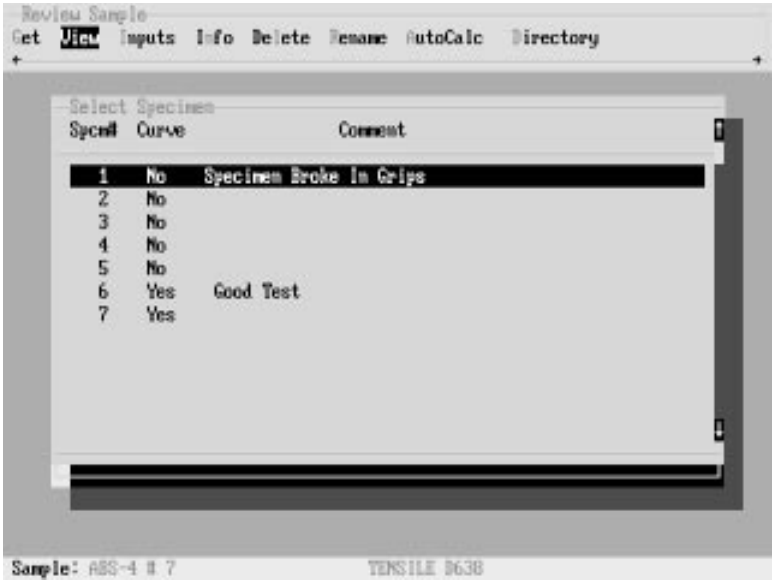


Figure 6-7. Specimen Selection Form

2. Scroll through the directory by using the following active keys:

   Pg Up/Dn — Show previous/next page of Sample I.D.'s if present

   Up/Dn Arrow — Scroll up/down one line at a time

   Home/End — Moves cursor to the left or right

3. Press ESC to return to the Review Sample menu.

Viewing a Specimen

By using the view option, you can single out a particular specimen and view that specimen only. Once you select a specimen, any changes you make affect only the specimen and not the sample.

To view a specimen,

1. Select View from the Review Sample menu. The Select Samples window will appear, displaying the names of the current samples.
2. Select the specimen you wish to view by using the Up and Down arrows to highlight the specimen number and press ENTER. The system displays the Review Specimen menu containing detailed information about the particular specimen. Once on the specimen level, any changes that you make will only affect the particular specimen you have chosen.

Note: **A number of Review options depend on having a previously saved curve (File option on the Specimen Results menu). If you try to do an operation on a specimen that requires curve data and data was NOT saved, the system displays a message indicating that the curve was not saved.**

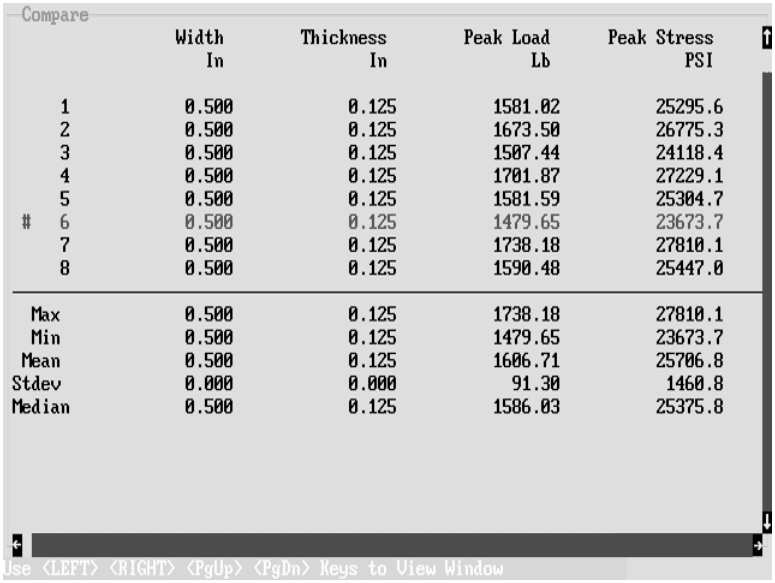
Note: **An asterisk (*) after a specimen number indicates that the specimen is tagged. Yes/No indicates whether or not curve has been saved, which determines whether you can view graph, etc.**

Comparing Results To Other Specimens

When you are reviewing specimens, you have the option of comparing the specimen results with other specimens in the sample or to the statistics of the sample. This option is also used in the Specimen Results menu in the Test submenu. In order to compare your specimen results, just select the Compare option under the Review Specimen menu.

To compare specimen results,

1. Select Compare from the Review Specimen menu. The Compare screen will display all specimens in the current sample and their results.



	Width In	Thickness In	Peak Load Lb	Peak Stress PSI
1	0.500	0.125	1581.02	25295.6
2	0.500	0.125	1673.50	26775.3
3	0.500	0.125	1507.44	24118.4
4	0.500	0.125	1701.87	27229.1
5	0.500	0.125	1581.59	25304.7
# 6	0.500	0.125	1479.65	23673.7
7	0.500	0.125	1738.18	27810.1
8	0.500	0.125	1590.48	25447.0
Max	0.500	0.125	1738.18	27810.1
Min	0.500	0.125	1479.65	23673.7
Mean	0.500	0.125	1606.71	25706.8
Stdev	0.000	0.000	91.30	1460.8
Median	0.500	0.125	1586.03	25375.8

Figure 6-8. Comparing Specimens

2. Press ESC to exit.

Scanning Specimen Results

After you select View from the Review Sample menu, the system displays the results for the specimen you selected below the Review Specimen menu. By using the Scan option you can scroll through the specimen results that are not displayed.

To scan through specimen results,

1. Select Scan from the Review Specimen menu. The system sets the cursor at the top of the Specimen Results list.
2. Press the up and down arrow keys or PgUp and PgDn to scroll through the specimen results.
3. Press ESC to exit.

Viewing the Specimen Graph

You may view or modify the specimen curve by selecting Graph from the Review Specimen menu. Refer to the section in this manual on graphs for more detailed information on viewing and modifying curves.

To view the specimen graph,

1. Select Graph from the Review Specimen menu. The system displays the graph for the current specimen.
2. Press ESC to exit.

Note: **You cannot view the curve of a specimen if this curve was not previously saved. Curves are saved by selecting the File option in the Specimen Results menu after running a test.**

Editing Specimen Inputs

You can change individual specimen input values, if you want. These input values are unique for each specimen (i.e., thickness, width, area) This is useful if an operator had originally made an incorrect entry, such as l inch instead of 0.1 inch.

To modify specimen inputs,

l. Select Edit from the Review Specimen menu. The system displays the Specimen Inputs form.

2. Modify the specimen inputs you want to change. The system displays a message on the lower left hand portion of your screen indicating that specimen values are updated. The value is changed and stored at this point. The results that depend on this value will be changed.

3. Press ENTER to confirm your changes.

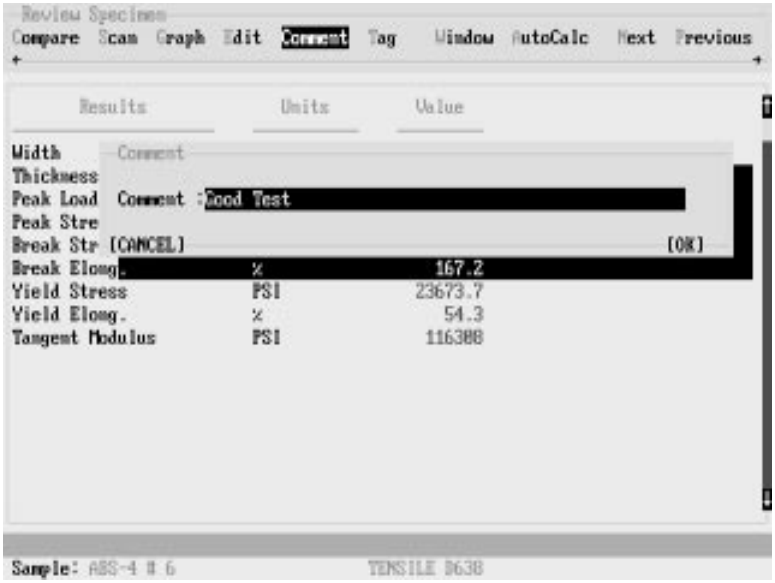


Figure 6-9. Post-Test Comments Form

Adding A Specimen Comment

If you did not add comments immediately after the test, you can still add comments using the Comment menu option. You may also change the original text.

To add a specimen comment,

1. Select Comment from the Review Specimen menu. The system displays the Comment form.
2. Enter your notes on the Comment form and press ENTER. The system updates the comment and indicates completion on the lower left hand portion of the screen. The system automatically saves this data with the specimen.

Note: **If you just want to look at the comment, just press ESC when you are done.**

Tagging And Untagging A Specimen

By tagging a specimen that was tested, you can exclude it from statistical calculations.

To tag a specimen,

- Select Tag from the Review Specimen menu. The system identifies a tagged specimen by an asterisk (*) next to the specimen number on the bottom of the screen and in the specimen list.

To untag a specimen,

- Select Untag from the Review Specimen menu. The specimen will then be included in statistical calculations, and no asterisk (*) will appear by its number.

The tag temporarily hides the specimen from the statistics. From the Review Specimen menu, you can tag or untag specimen results to evaluate statistical changes. From the Review Sample menu, you can also delete all tagged specimens.

Changing the Graph Scales

You may change the scales that are used when you view a graph by selecting the Window option from the Review Specimen menu. See Chapter 5, “Running the Test and Post-Test,” for more detailed information.

Restoring Graphic Markers and Test Results

If you have moved your markers in graphics mode and saved them by pressing F10, you may reset them to their computer calculated positions by using the AutoCalc option. The AutoCalc option will also change your results on the specimen level if you made any changes to the Inputs on the sample level and did not AutoCalc in that menu.

To recalculate specimen data,

1. Select View from the Review Sample menu. The system displays the Select Specimen window.
2. Select the specimen to be recalculated and press ENTER. The system displays the Specimen Results.
3. Select AutoCalc from the Review Specimen menu. The system recalculates the results for your current specimen.

Moving Among Specimens

The Review Specimen menu allows you to select another specimen number by using Next or Previous menu options, without going back to the Select Specimen window. For the sample you originally selected, you can go through all of the specimens for that sample by using Next and Previous.

To move from one specimen to another,

- Select Next or Previous from the Review Specimen menu. The system moves to the next or previous specimen in the sample. Note that the specimen number changes in the lower left hand portion of the screen and the test values are updated. If there are no other specimens, the system displays a message to that effect.

Chapter 7: Outputting Test Results

QTest provides you with the capability to output your data in several ways and forms. You are not limited to just one specimen or sample when you output; you may output a batch of samples or specimens. With the Output option, you have the capability of the following:

- Viewing or printing a directory of all the samples in the database.
- Viewing, exporting, or printing the results in a report form.
- Exporting results to an ASCII file.
- Reviewing and printing a variety of statistical trends for the samples in the collection.

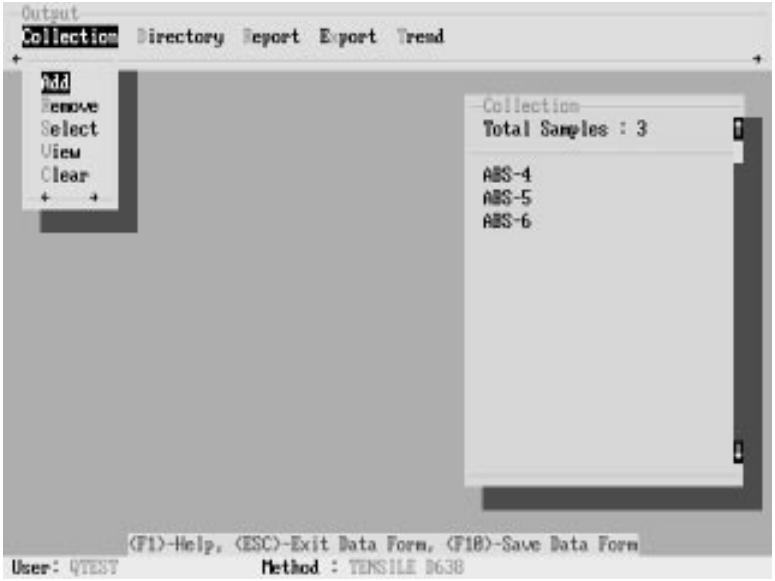


Figure 7-1. Collection Popdown Menu and Window

Working With Collections

A collection is a group of one or more samples that will print on the report you select. You can add samples to the collection, remove samples from the collection, or clear the entire collection.

Adding Samples to a Collection

There are two ways to add samples to a collection. You can use the Add option and type in the name of the sample or select from the choice list. You can also use the Select option and select from a directory.

To add individual samples to a collection,

1. Select Collection from the Output menu.
2. Select Add from the Collection popdown menu. The system displays the Get Sample window.
3. Press F2 to display the list of existing samples.
4. Highlight the sample you want to add to the collection and press ENTER.
5. Press ENTER to add the sample to the collection. The system adds the sample you selected to the collection box on the right hand side of the screen.

Note: You may also enter sample names by in the Get Sample window by typing the sample name. Be sure to type the name correctly, or you will get a warning message that the sample was not found.

To add all samples to a collection,

1. Select Collection from the Output menu.
2. Select Add from the Collection popdown menu. The system displays the Get Sample window.
3. Press F2 to display the list of existing samples.
4. Highlight "??????????????????????" and press ENTER.
5. Press ENTER to add the samples to the collection. The

system adds all samples to the collection box on the right hand side of the screen.

Adding Multiple Samples To A Collection

You can also add multiple samples with similar names to the collection at once by using the question mark (?) in the sample name. For example, if you type in "ABS-?," the system will add all matching samples to the collection (e.g., ABS-4, ABS-5, ABS-6) The question mark (?) acts as a wildcard character.

To scroll through samples in a collection,

1. Select View from the Collection popdown menu. The system highlights the first sample in the collection.
2. You can now use the up and down arrows to scroll through all the samples in the collection. You can also use the page up, page down, home and end keys for scrolling through the collection.
3. Press ESC to return to the Collection popdown menu.

Removing Samples from a Collection

You may remove unwanted samples from the collection as easily as you added them.

To remove samples from a collection,

1. Select Remove from the Collection popdown menu. The system highlights the first sample in the collection.
2. Select the sample you want to remove by using the Up and Down arrows and press ENTER. The system removes the sample name from the Collection display.
3. Remove as many samples as you want and then press ESC to return to the Collection menu.

To clear all samples from the collection,

- Select Clear from the Collection popdown menu. The system removes all samples previously added to the collection.

Note: **When you exit from the Output menu to the Main menu, the system also removes all samples from the collection.**

Displaying the Directory In Output

You can display and print a Directory of samples from the Output menu. This directory displays sample name, date created, operator I.D., and the number of specimens contained in the sample.

To display the Directory,

1. Select Directory from the Output menu. The Directory popdown menu will appear.
2. Select Display from the Directory submenu. The system will display a directory of samples for the current method type.
3. Press ESC to exit the directory.

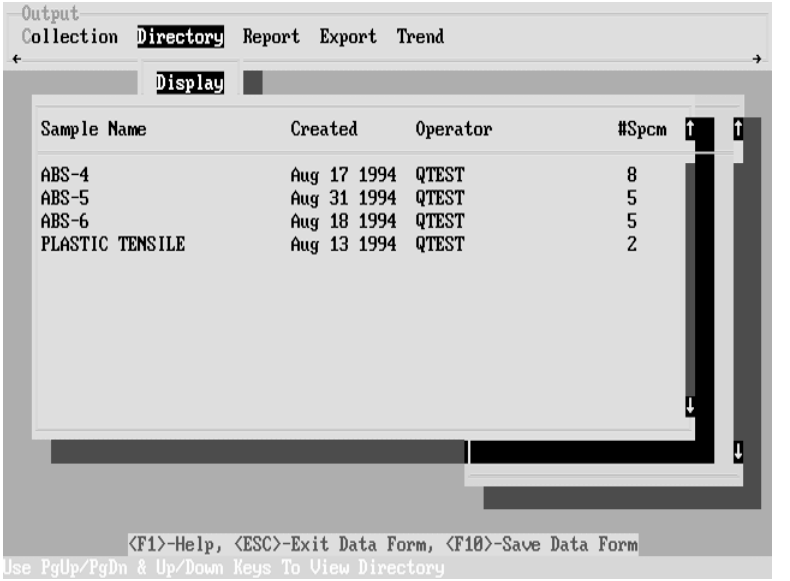


Figure 7-2. Directory in Ouput

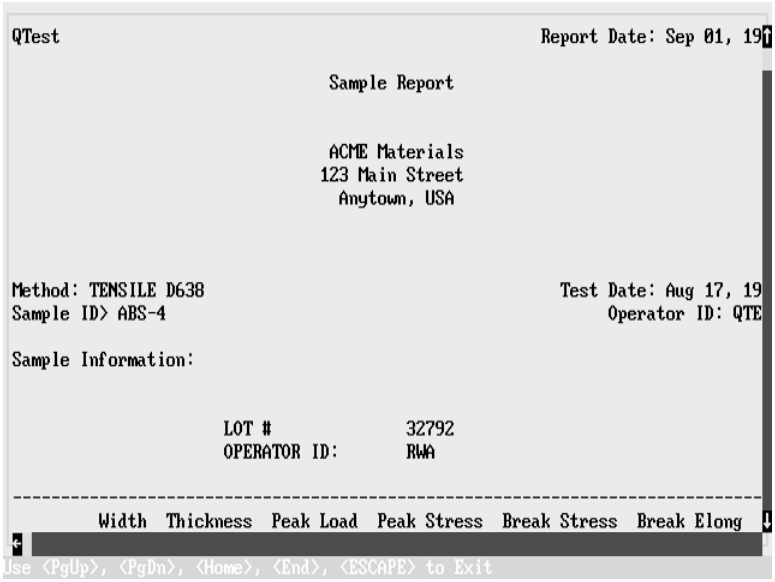


Figure 7-3. Viewing a Sample Report

To print the Directory,

1. Select Directory from the Output menu. The Directory popdown menu will appear.
2. Select Print from the Directory submenu. The system will print the current directory of samples.

Viewing, Saving, and Printing Reports

Once you select the samples that you wish to report, you can now determine how to output the information. You can do the following:

- View a report on the screen.
- Print a report.
- Write it to a disk file.
- Save it in ASCII formal for importing into a spreadsheet program such as Lotus 1-2-3 or Microsoft® Excel.

QTest Report Date: Nov 08, 1995

Sample Report

Material Testing Company
Quality Assurance Lab
123 Main Street
Productown, NC 12345

Method: ASTM D-638 Tensile Test Test Date: Oct 14, 1995
Sample ID> JADE-123 Operator ID: QTEST

Sample Information:

Supplier Code
Material

	Width In	Thickess In	Break Stress PSI	Break Elong. %	Yield Stress PSI	Yield Elong. %	Modulus PSI
1	0.500	0.100	163.4	193.3	283.4	62.8	1201
2	0.500	0.100	153.7	181.8	266.5	59.1	1201
3	0.500	0.110	121.1	170.3	210.1	55.4	1011
4	0.500	0.120	135.4	192.3	234.8	62.5	1001
5	0.500	0.100	143.5	169.8	248.8	55.2	1201

Comments:

1 : Good Test
2 : Broke inside Gage Length
3 : Broke outside Gage Length
4 : Good Test
5 : Flaw in specimen at break

Mean	0.508	0.106	143.4	181.5	248.7	59.0	1123
Min	0.500	0.100	121.1	169.8	210.1	55.2	1001
Max	0.540	0.120	163.4	19.3	283.4	62.8	1201
StDv	0.018	0.009	16.3	11.4	28.3	3.7	107
%Cov	3.521	8.438	1l.4	6.3	11.4	6.3	10
Medn	0.500	0.100	143.5	181.8	248.8	59.1	1201

Calculation Input(s):

Gage Length	2.00	In
Brk % Drop	10	%
Yield Angle	0.00	deg

Figure 7-4. Sample Report

Before viewing or printing a report, its parameters should be defined. For information on defining reports, see “Chapter 9: Defining Miscellaneous Information for a Method.”

Viewing A Report

One of your options for output is viewing the report on the screen. To ensure the format is correct, you can view the report on the screen before printing.

To view the report,

1. Select Report from the Output menu. The system displays the Report popdown menu.
2. Select View from the Report popdown menu. The system displays the report you have selected on the screen. To scroll vertically through the report, use the up/down arrows, page up/down, and the home/end keys. You can also scroll horizontally beyond 80 columns by using the control right/left arrow keys.
3. Press ESC to return to the Output menu.

Writing The Report To Disk

By selecting the Disk option from the Report popdown menu, you can give the report a file name and write it to a disk file. You can also enter a drive and path for the file, if you want. The file can then be printed later, or printed on another system.

To write a report to disk,

1. Select Disk from the Report menu. The Output File Name form appears.
2. Enter the file name for the output. If you want to save the report to a location other than the default (the QTest directory), enter the desired drive and path. This step is optional.

Printing A Report

If you want to print a report, select the Print option from the



Figure 7-5. Outputting A Report

Report menu. For information on setting up the printer, see the section in this manual on Environment.

To print a report,

1. Select Report from the Output menu. The system displays the Report popdown menu.

Note: Make sure your printer is powered up, on-line, and loaded with paper before you select Print.

2. Select the Print option from the Report popdown menu. The system begins printing the report when you execute the command.

Creating an ASCII File

You can create an ASCII file that can be loaded into a spreadsheet by using the Export option. You must provide the file name. This file will have text delimited by quotation marks

and numbers delimited by a blank. When you import the ASCII file into your spreadsheet program, make sure you import it as numbers.

To create an ASCII file,

1. Select Export from the Output popdown menu. A popdown menu appears where you can choose Collection.
2. Select Collection. This will export only the calculated results of specimens.
3. Enter file name for your output. The drive and path are optional.
4. Press ENTER and the system will execute the export. A message appears on the bottom of the screen after the export is complete.

Refer to the Appendix for more detailed information on ASCII file formats for collections.

Viewing Statistical Trends

When you have created a collection of samples, you may statistically compare either the average result values of all the samples, or the individual results of all the specimens in each sample. To compute these statistics, select the Trend option in the Output menu. The options that are available for the statistical comparison of your sample means or specimens are as follows:

- VIEW. This option will show information on either the sample means or the specimen results depending on the type of analysis that you perform. When you analyze the Sample Means, you see the Sample Name, the Sample's Averages (X-Bar), the Range (R) and the Standard Deviation (S). When analyzing Specimens, this option yields the Specimen Name, the individual Specimen Results and the Range (R).
- STATS. This option will display the various statistics that are being computed for the Sample Means. The statistics displayed are the mean values of the sample averages (X-

Bar), mean values of the sample ranges (R) and mean values of the sample standard deviations (S) as well as the Upper and Lower Control Limits. When comparing specimens, the mean of the individual results (X-Bar) and the range (R) are shown, as well as their Control Limits.

- CHARTS. This option will display the control charts with their Upper and Lower Control Limits and Average Values. Depending on the type of analysis that you perform (Sample Means or Specimens), the charts graphically portray either the sample mean values or the individual specimen values that are displayed in VIEW. While analyzing the Sample Means, you may select one of three charts, the sample Averages (X-Bar), the Averages (X-Bar) and the Ranges (R) or the Averages (X-Bar) and the Standard Deviations when comparing specimens, this option gives you the ability to view the Individual Specimens' Results in a chart or the Individual Results and their Ranges (R).
- PRINT. This option will send the statistics to the printer.

Computing Statistical Information

When Analyzing Sample Means

When you select the option of viewing the Sample Means the sample average is found by summing the individual specimen results together and dividing by the number of specimens. This single numerical average is used as the only input per sample in the collection. The mean of the Average (X-Bar) is calculated by summing all of the sample averages and dividing that sum by the number of sample.

The Range (R) of the sample is the difference between the highest results value and the lowest results value of all the specimens in the sample. The average Range (R) is computed by summing all of the sample ranges and dividing that sum by the number of samples.

The Standard Deviation (S) of the sample is calculated by taking the square root of the variance. The average Standard Deviation

(S) is computed by summing all of the sample standard deviations and dividing that sum by the number of samples.

The Control Limits are calculated using standard statistical procedures. These will not be covered in this manual. For your reference, you may review *Evaluating the Measurement Process.* 2nd Ed. by Donald J. Wheeler and Richard W. Lyday (SPC Press, Inc., Knoxville, TN, Copyright 1984.)

When Analyzing Specimens

Each specimen shares equal weight throughout all the samples in the collection. The Average is computed by summing all the results values and dividing that sum by the total number of specimens. The Range for specimens is the difference between the particular specimen result value and the previous specimen value. The Control Limits are calculated using the same method.

Viewing the Individual Sample or Specimen Statistical Information (VIEW)

When you select the View option, the system will display information on the various samples or specimens in the collection. You may scroll through this information by using the arrow keys. The information displayed when you analyze Sample Means is as follows:

- The value of the selected property.
- The Sample Name.
- The Average Value (X-Bar) for the Sample.
- The Range (R) for the Sample.
- The Standard Deviation (S) for the Sample.

When you compare the Specimens, the information displayed is:

- The value of the selected property.
- The Sample Name for each Specimen.
- The Specimen Number.
- The individual specimen results.
- The Range (R) of each specimen.

To view the sample or specimen statistical information,

1. Select the Trends option in the Output Menu. The Trends popdown menu will appear.
2. Select either Sample Means or Specimen from the Trends popdown menu. The Select Property window will appear.
3. Select the test result that you wish to analyze and press ENTER. The Assign Sigma window will appear.
4. Enter the sigma multiplier. This number is used to compute the Control Limits. The Trends window will appear, displaying the information you requested.

Displaying the Statistical Collection Information (STATS)

QTest allows you to display the statistics of the selected property for the various samples or specimens in the collection. In order to view the statistics, select the Stats option from the Trends menu. When analyzing the Sample Means, the values displayed are as follows:

- The Mean Value of the Averages (X-Bar) of all the samples.
- The Upper and Lower Control Limits for the Averages (X-Bar) of all the samples.
- The Mean Value of the Ranges (R) of all samples.
- The Upper and Lower Control Limits for the Ranges (R) of all the samples.
- The Mean Value of the Standard Deviation (S) of all the Samples.
- The Upper and Lower Control Limits for the Std Deviations (S) of all the Samples.

When comparing the individual Specimens, the values displayed are as follows:

- The Mean (X-Bar) of all the specimens in the Collection.
- The Mean Value of the Range (R) for all of the specimens.
- The Upper and Lower Control Limits for the actual result values of the specimen.

- The Upper and Lower Control Limits for the Range (R) of all the specimens.

Note: **You may change any of the Control Limits, if you wish, by going to the appropriate field and inputting the new limit value.**

Viewing the Statistics Graphically (CHARTS)

You have the option of viewing the statistics graphically. This can be used to see any abnormal samples or specimens that may exist or to view the actual trend of the samples or specimens. To view the statistics graphically, select the Chart option from the Trends menu. Then, select the appropriate type of chart you wish to view.

Note: **While you are viewing the chart, you may print or plot the chart by pressing P for print or O for plot.**

When you review the statistics of your Sample Means, you may choose from the following types of charts:

- X-BAR. This control chart will display the Averages(X\) along with the Upper and Lower Control Limits.
- X-BAR AND RANGE. This Control Chart will display the Averages and Range of the Samples with their Upper and Lower Control Limits. The two plots are displayed simultaneously.
- X-BAR AND STDEV. This Control Chart will display the Averages and Standard Deviations of the Samples with their Upper and Lower Control Limits. The two plots are displayed simultaneously.

When you review the statistics of individual Specimens, you may choose from the following types of charts:

- INDIVIDUAL. This chart will display the individual result values of the specimens with the Upper and Lower Control Limits.
- INDIVIDUAL AND RANGE. This chart will display the individual result and range value of the specimens with their Upper and Lower Control Limits. The two plots are

displayed simultaneously.

Printing the Statistical Information

You may print the statistical information. To do this, select the Print option in the Trends menu. This option will send the following information to the printer:

- Report Title
- Date
- Report Header
- Selected Property
- Sample Names
- Averages (X-Bar)
- Range (R)
- Standard Deviation (S)
- Individual specimen results
- Statistics of all Samples
- Upper and Lower Control values for Averages (X-Bar) Range (R) Std. Dev. (S)

Chapter 8: Defining Calculations and Inputs for a Method

Masters and Methods

A Master is a broad grouping of tests that have similar executions and results. For example, Tensile, Flex, and Compression are kinds of Masters.

A Method is a specific test made from a Master. For example, Tensile D638 and Tensile D412 are from the Tensile Master. Flex D790 is from the Flex Master, and Compression D695 is from the Compression Master.

Creating A Method

You create a method by going through a number of steps to define the characteristics of the test. In this chapter you will learn how to define required and results calculations, required and optional markers, test execution, configuration, and inputs.

You cannot actually add or remove calculations, markers, execution segments, or inputs from the method. You can, however, control the characteristics so that the system does not display these quantities. You can also set default values and limits for numeric entries.

The inputs available for each calculation and the way in which the system performs these calculations depend on the master. You cannot change which calculations and inputs are available for the master. You can only change whether or not you want the calculations and inputs to display.

In Chapter 9, “Defining Miscellaneous Information for a Method,” you will find miscellaneous steps required to define a method. You can, for example, define the format for the sample I.D., enter start of test messages, enter a description for your new method and save the new method. You can use an existing method, make changes to the method and save it as a new method. See Chapter

9, “Defining Miscellaneous Information for a Method,” for a more detailed discussion of these steps.

The last step in creating a method is setting up a report format. When you print reports these defaults allow you to suppress or hide information.

Chapter 10, “Defining Reference Materials,” details how to define a reference material.

Setting up a Test Method

In Figure 8-1 you can see the steps required to set up a test method and their order. The shaded boxes are required steps and the boxes that are not shaded are optional. This is a recommended order of doing things, however, it is possible to complete these steps in a different order.

The following are brief descriptions of each step and the topics detailed in this section:

- Required Calculations are not quite the same for all test masters. You can define the way in which each required calculation is determined by selecting a procedure for each calculation.
- Results Calculations vary depending on which test master you have selected. The system prompts you with a list of results calculations from which to choose.
- Required Markers are characters that the system places on the test curve. You can define which letter or number corresponds to the marker and whether or not it is fixed, moveable or hidden. The system places required markers as a result of the above mentioned calculations. You can have the markers recalculated after the test based on different calculations.

Note: **QTest strongly advises that you do not change the letter designations of Required Markers (i.e., “F” = Break Point, “Y” = Yield Point, etc.). This may confuse the Applications Engineer if you require assistance from QTest.**

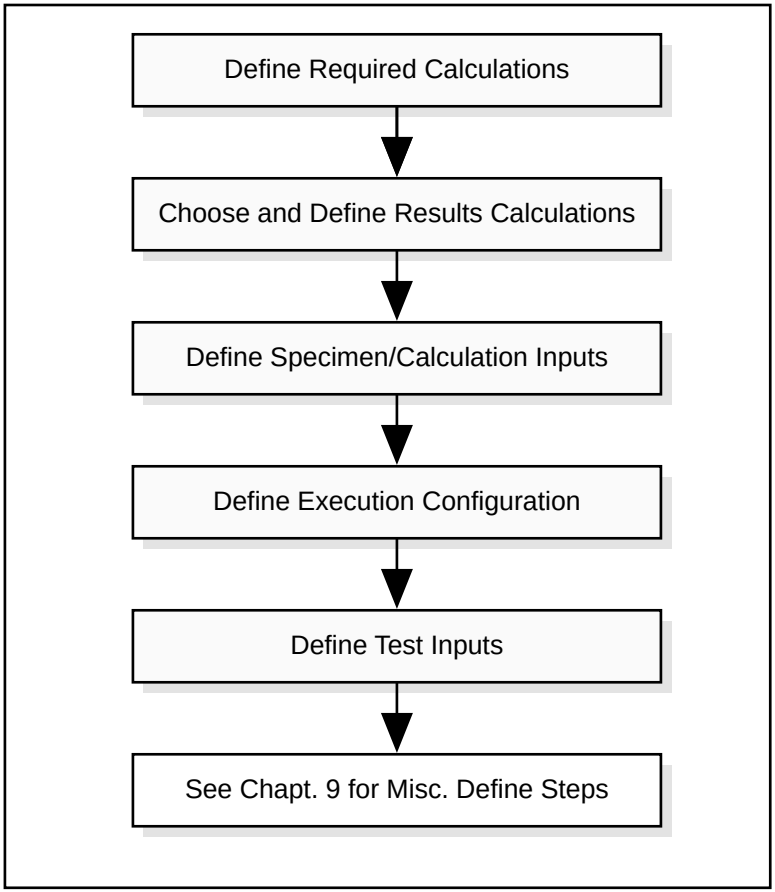


Figure 8-1. The Flow of Creating a Test Method

- Execution Configuration controls where the crosshead returns after the test.
- Specimen Inputs vary depending on which test master you select. The system uses the specimen inputs you enter here to calculate certain results relating to specimen dimension, such as area.
- Calculation Inputs are used in required

and results calculations. Calculation inputs vary, depending on which test master you select.

- Test Inputs are defined by selecting options pertinent to the test you are performing. These include initial speed, load limits, extension limits, and return point. You will also select appropriate units for each option you choose, as well as whether or not you want operator interaction.
- Required Markers are used to indicate certain positions on the graph pertaining to certain calculations. You can specify the marker code that is displayed on the graph and whether the markers are moveable, fixed or hidden.

As you can see in this diagram, the last step is miscellaneous Define information that is detailed in Section 2. Refer to Chapter 9 for the remaining steps required to create a method.

Defining Required Calculations

Required Calculations control how QTest determines the following:

Basic Properties. QTest must know how to calculate cross-sectional area, stress, and strain. This is needed in order to provide real-time displays of these items, and create numerical arrays used for Result Calculations.

Fundamental Calculations. The required calculations also determine how fundamental calculations such as break, yield, and modulus are calculated.

Slack Removal. Required calculations provide procedures for removing curve slack after the test execution.

Miscellaneous. Whether an offset yield line will be drawn on the curve after the test is determined in Required Calculations for particular masters.

When defining a test method, you must select procedure for each required calculation. This determines how that particular calculation will be performed. After you select a procedure for each calculation, you will need to configure any Inputs (e.g., Specimen or Calculation) associated with that procedure.

To view required calculations,

1. Select Manage from the Main menu.
2. Select Define from the Manage menu.
3. Select Calcs from the Define menu. A popdown menu will appear.
4. Select Required from the Calculation submenu. The Required Calculations window will appear.

The Required Calculations window displays a list of six required calculation categories, plus their current procedures. They are as follows:

CALCULATION	PROCEDURE
[0] AREA	RECTANGULAR
[1] BREAK	%DROP/ELONG
[2] YIELD	ZERO SLOPE
[3] PRIMARY SLOPE	PEAK SLOPE TO LOAD
[4] SLACK COMPENSATION	SLOPE METHOD
[5] OFFSET YIELD	ACTIVE

To define a required calculation,

1. Scroll down the list of required calculations and select one by pressing ENTER. The system displays all inputs you need for the required calculation category, the calculation formula used and a description of the calculation. The system then prompts you to enter the calculation procedure.
2. Press F2 to display a list of procedure options for the calculation. Make your selection and press ENTER.

   The procedure options allow you to select an algorithm which specifies how the calculation is performed. The option list differs according to test Master.

   Any changes you make to a procedure do not take effect until you return to the Required Calculations menu.
3. Press ENTER to return to the Required Calculations window.

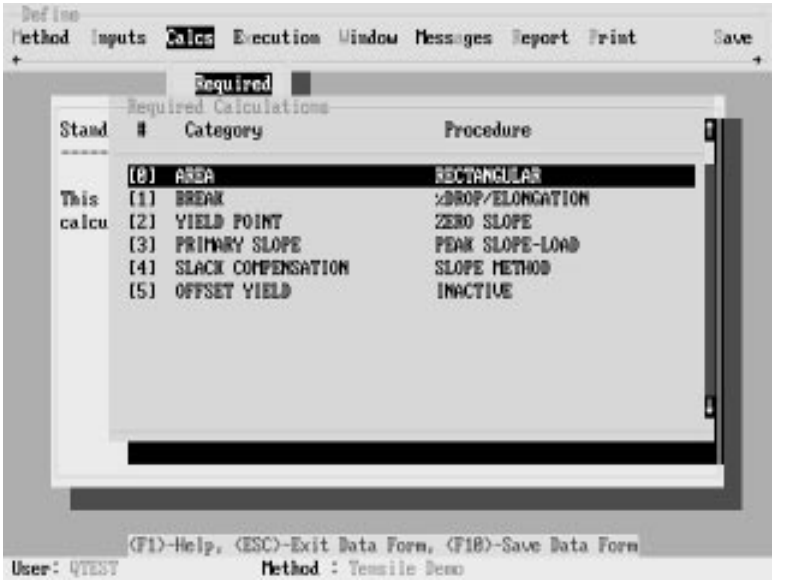


Figure 8-2. Required Calculations Form

The system displays the procedure you just accepted next to the required calculation field.

4. You will need to note all of the inputs that are required for the result you just changed. So, get into the Result again by pressing ENTER, and write down which inputs are needed. Eventually, you will need to specify these inputs when you are done. Press ESC to return to the Define menu.

Required Calculations

Area

This calculation determines how cross-sectional area of the specimen will be calculated.

Using the choice list (F2). In most cases, the provided choice list in the procedure field will contain an option that adequately describes specimen geometry. This choice list is shown below for a Tensile test.

PIPE W ID/OD

RECTANGULAR

INACTIVE

CONSTANT

ROUND

Required Calculations Specifying Algorithms

The next three Required Calculations specify algorithms for determining break, yield, and primary slope (modulus). These algorithms are discussed in greater detail in the Appendix.

Break

QTest provides three algorithms for placing the Break marker on the curve.

1. %Drop/Elong. This algorithm attempts to find a section of curve that experiences a certain percentage drop in load per elongation. It is by far the most robust and frequently used algorithm in determining break point.
2. %Drop from Peak. This places the break marker at the datapoint corresponding to the specified percent drop in load after the peakload.
3. Load Absolute. The Load Absolute procedure places the break marker at the nearest datapoint corresponding to the specified load.

Yield

In QTest, there are two algorithms for determining where to place the Yield marker on the curve. These algorithms exist in the choice list (F2) in the procedure field.

1. Zero Slope. This algorithm examines the entire curve and attempts to find a section of curve that has zero slope.
2. Peak. This procedure defaults the yield point to the peak load datapoint of the curve.

Primary Slope (Modulus)

QTest calculates modulus in one basic manner. There are a few variations in the starting and ending points on the curve where the algorithm searches for modulus.

QTest searches the curve from a specified starting point, to a specified end point for the peak slope. It returns to the section of curve that had the steepest slope and plants the “B” and “M” markers on the curve indicating the beginning (“B”) and end (“M”) of this steepest section. QTest then attempts to move these markers apart from each other until the new line between them has a slope that deviates more than a specified amount from the original slope.

Note: All slopes in the modulus calculation are determined using a least squared curve fitting algorithm.

1. Peak Slope to Yield. This variation searches for the steepest slope from a specified minimum load to the yield point. By definition, it needs a yield point in order to be calculated. Absence of a yield point results in modulus not being determined.
2. Peak Slope to Load. This variation searches for the steepest slope from a specified minimum load to a specified maximum load. If the curve data does not exceed the maximum load, then the entire curve after the minimum load is used.
3. Peak Slope to Stress (Flex Tests Only). This algorithm is much the same as the Peak Slope to Load algorithm. However, instead of specifying a minimum and maximum load, the programmer specifies minimum and maximum stress.

Removing Slack

There are two methods for removing specimen slack, Slope Method and Pre-Load Method.

Slack Compensation

This is an “after the fact” method of removing slack from the specimen curve.

1. Slope Method. This method notes where the tangent modulus line intersects the horizontal axis. The intersection point then becomes the point of zero elongation. All extensions are measured from that point. All calculations that are strain dependent are affected.

Note: QTest does not incorporate slack compensation for energy calculations.

2. Preload Method. The preload method finds the first point on the curve matching a specified load. The extension at this load point is then considered zero.

Other Fields in Required Calculations

Offset Yield

This is set as either Active or Inactive. It simply determines if an offset yield line will be drawn on the curve parallel to the modulus line. In order to calculate offset yield, a couple of conditions must be met.

1. A modulus must be calculated for the specimen. The definition of offset yield is dependent on the modulus line.
2. The offset line must intersect the specimen curve.
3. You must specify an offset value (calculation input).

Defining Calculations and Inputs for a Method

Result Calculations

Result Calculations are the ultimate objective of QTest. These are the displayed and printed test results. In each Master, QTest

provides a list of common calculations that the user chooses to include in a test method.

The following are terms used in Result Calculations and their definitions:

Units. This field determines the unit of the displayed result. The user chooses the desired unit from a choice list (F2). QTest does the necessary conversions to insure that displayed result is in the selected unit.

Attribute. This determines if a result is calculated. There are three attribute options as follows:

DISPLAY. These results are calculated and displayed.

HIDDEN. These results are calculated but not displayed.

INACTIVE. These results are not calculated nor displayed.

Decimals. This field determines how many numerals will be displayed to the right of the decimal point.

To Select Result Calculations,

1. Select Calcs from the Define menu. The Calcs popdown menu will appear.
2. Select Results from the Calcs submenu. The Results window will appear. The Results window displays a list of result calculations. The contents of this list is dependent upon the test standard.

3. Choose the results you want calculated for a test. As a shortcut, you may perform the following:

3a. The easiest way to accomplish this is to place the scroll bar on a particular result, and then press the space bar. This places a check mark next to that result.

3b. Scroll down the list and check those results you wish to have calculated.

3c. Press F2 to see the Attribute choice list. Choose the attribute for the checked calculations (e.g., Display or Hidden).

3d. Set the attribute of all unwanted calculations to Inactive or Hidden using the same shortcut.

Note: Unused calculations should be Inactive to help reduce post-test processing times.

4. Modify the label, attribute, units, and decimals of the displayed calculations.

Note: Check to see if a result requires any arguments (inputs). You will need to specify these inputs.

4a. Position the highlight bar over the result and press ENTER. The data form for that result will be displayed.

Label : Peak Load

Attribute : Display

Units : lbs

Decimals : 2

Note: Remember that the label has nothing to do with the formula. You can change the label to terminology with which you are familiar.

4b. Save any changes you make to the form using the Save & Exit key (F10).

5. Save the changes you make to the test method by choosing the Save option in the Define menu. Unless you save the new method, the changes you make to Result Calculations will be lost.

Required Markers

Required markers are characters that the system places on critical regions of your test curve (see Figure l-4 for a specimen curve and markers). Required markers vary, depending on which test master you select. You can define which letter or number corresponds to the required marker and whether or not it is fixed, moveable or hidden. The system places required markers as a result of required calculations.

For master tensile, flex, and compression tests, there are four required markers. They are as follows:

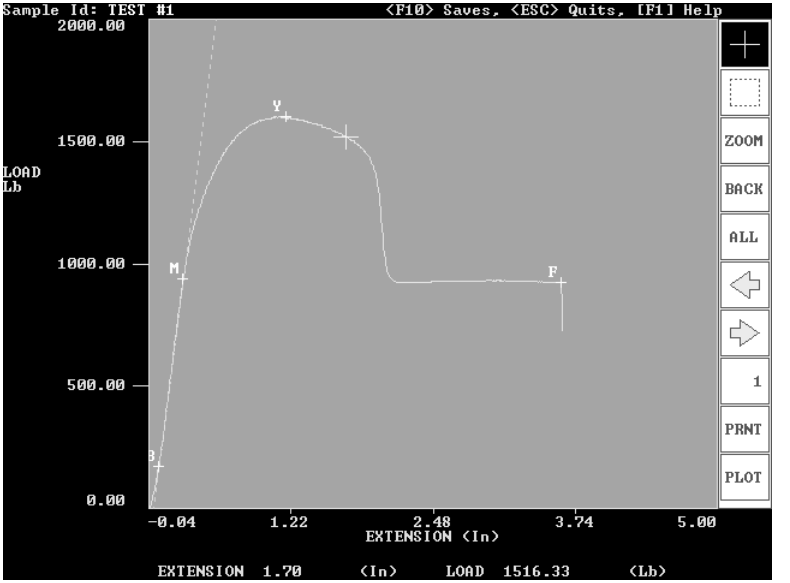


Figure 8-3. A Specimen Curve and Markers

Break Point (F)

Yield Point (Y)

Modulus Begin (B)

Modulus End (M)

Viewing or Changing Markers

The following steps outline how to actually view required markers. You can refer to the previous pages for detail on the fields you must enter to define required markers.

To view or change required markers,

1. Select Inputs from the Define menu. The system displays the Inputs popdown menu.
2. Select Required Markers from the Inputs popdown menu. The system displays a list of markers. The number of

markers is dependent on the standard you choose (see Figure 8-4 for required markers form).

3. Select the desired marker. The system displays an Input form prompting you to view or change marker information.

4. Change the necessary inputs, and press F10 to save changes or ESC to return to the Inputs menu.

Markers are not always placed, however. The presence of a marker indicates that the required calculation was completed correctly. Some calculations are dependent upon the successful completion of a previous calculation. For example, offset yield needs modulus markers “B” and “M.” Markers can be moved later to change the calculated results.

Note: **QTest strongly advises that you do not change the letter designations of Required Markers (i.e., “F” = Break Point, “Y” = Yield Point, etc.). This may confuse the Applications Engineer if you require assistance from QTest.**

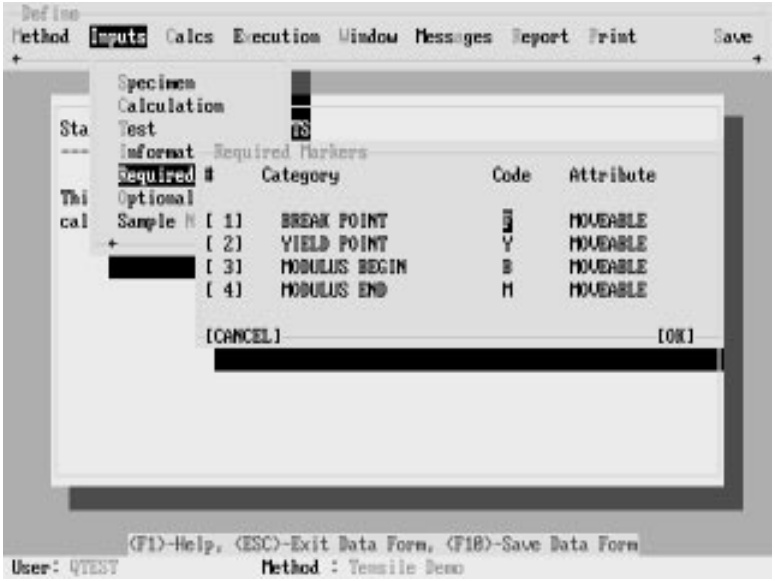


Figure 8-4. Required Markers Form

Defining an Execution Configuration

By selecting particular parameters. you can define where the crosshead returns after the test.

To define the execution configuration,

1. Select Execution from the Define menu. The Execution popdown menu appears with a list of selections.
2. Select Configuration from the Execution popdown menu. The system displays the Configuration window for the End of Test Action. This allows you to choose one of the following actions at the end of a test (press F2 for a choice list):

   STOP. Stops the crosshead after the test (you will have to return the crosshead from the F9 screen).

   RETURN. Return to zero.

   RETURN (PROMPT). Return to zero after prompting the operator.

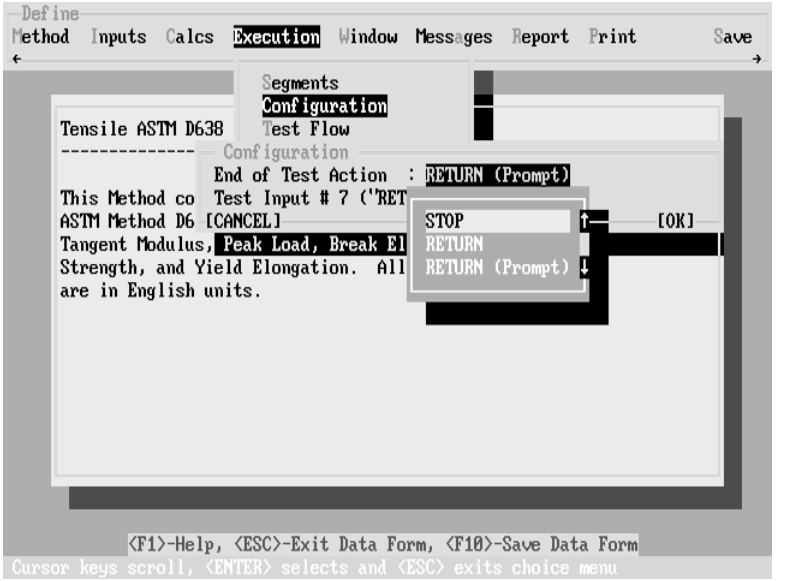


Figure 8-5. Execution Configuration

3. Press ENTER or F10 to return to the Execution popdown menu.

Defining Specimen Inputs

Specimen inputs vary, depending on which test master you select. The software controls the entry of specimen inputs which in turn are used in calculating results.

You will work with the following fields to define specimen inputs:

LABEL. This specifies the name of the specimen input field and can be up to 15 alphanumeric characters long.

UNITS. This specifies various field units (i.e., inches for diameter.) You can select the available units from an existing list by pressing F2, choosing the unit of your choice and pressing ENTER.

DEFAULT. Once you define this number, the system uses it as an automatic default value for the specimen input. If you know that a specimen input will always have a static value, use this default. You can use up to nine numeric characters in this field.

MIN VALUE. This is the lower limit for the specimen input. If the operator tries to input a value less than the minimum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

MAX VALUE. This is the upper limit for the specimen input. If the operator tries to input a value greater than the maximum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

DECIMALS. What you enter in the decimal field identifies the number of decimal places for the specimen input value. Decimal places must be between 0 and 5.

Note: **If you change the number of decimals to a larger or smaller number, you must save your changes and then re-enter the input to see the effect.**



Figure 8-6. Specimen Inputs Form

ATTRIBUTE. The attribute determines how the system uses the specimen input during the test. You can select one of the following attributes:

Optional. The system displays the specimen input before the test. While this number automatically defaults to the value you establish for the field, the operator has the option to change it, if necessary.

Display Only. Allows the operator to view the specimen input but the operator cannot make changes at this time. The default value is displayed.

Hidden. The operator cannot see the specimen input, but it is included in the calculations.

Required (Pre). The operator must enter a value for each specimen prior to running the actual test.

Required (Post). The operator must enter a value for each specimen after running the actual test.

Optional (Post). The system displays the specimen input after the test is complete. While this number automatically

defaults to the value you establish for the field, the operator can change it, if necessary. No calculations will be done until the operator enters a correct value.

During Test. The system allows the operator to enter a value for each specimen while the test is running.

SOURCE. Select the way in which you are entering specimen inputs. Select keyboard if you are going to type in specimen inputs and caliper if you are using a caliper for direct input. See the Appendix for more information.

Viewing or Changing Specimen Inputs

You can view or change specimen inputs by following these steps. Fields include label, units, min/max/default values decimals, attributes and specimen inputs.

To view or change specimen inputs,

1. Select Inputs from the Define menu. The system displays a popdown menu containing seven input options.
2. Select Specimen from the Inputs popdown menu. The system displays the available inputs and their associated labels, units and attributes. The total number of inputs is master dependent.
3. Enter or maintain inputs by selecting the input of your choice. The system displays an Input form allowing you to view or change specimen inputs (see Figure 8-6 for Specimen Inputs form).
4. Press ENTER to save changes or press ESC to return to the Inputs popdown menu.

Defining Calculation Inputs

Calculation inputs vary, depending on which test master you select. You will select the inputs to work with based on the required calculations, as well as optional calculations you

selected (see Figure 8-7 for Calculation Inputs selection).

You will work with the following fields to define calculation inputs:

LABEL. This specifies the name of the calculation input and can be up to 15 alphanumeric characters long.

UNITS. This specifies various field units (i.e., inches for diameter.) You can select the available units from an existing list by pressing F2, choosing the unit of your choice and pressing ENTER.

DEFAULT. Once you define this number, it will be used as an automatic default for the calculation input. If you know that a calculation input will always have a static value, use this default. You can use up to nine numeric characters in this field.

MIN VALUE. This is the lower limit for the calculation input. If the operator tries to input a value less than the minimum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

MAX VALUE. This is the upper limit for the calculation input. If

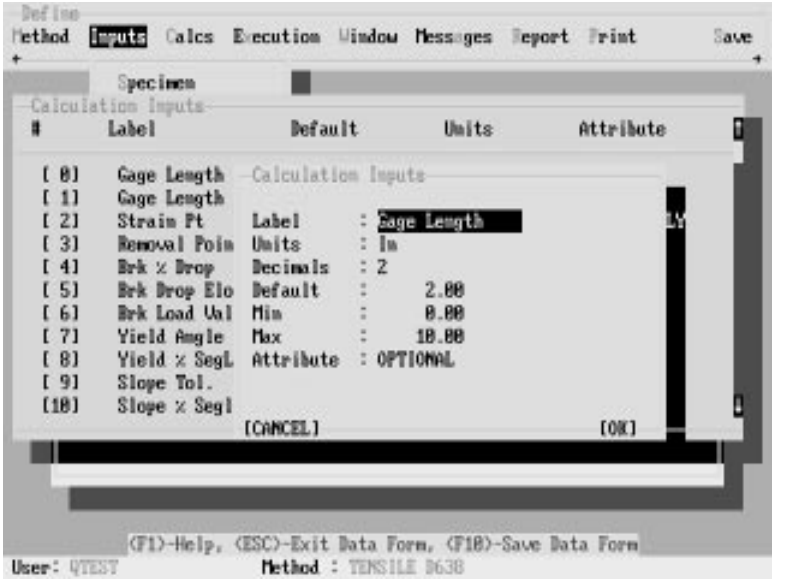


Figure 8-7. Calculation Inputs Selection

the operator tries to input a value greater than the maximum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

DECIMALS. What you enter in the decimal field identifies the number of decimal places for the calculation input value. Decimal places must be between 0 and 5.

Note: If you change the number of decimals to a larger or smaller number, you must save your changes and then re-enter the input to see the effect.

ATTRIBUTE. The attribute determines how the system uses the calculation input during the test. You can select an available attribute from an existing list by pressing F2, choosing the attribute of your choice and pressing ENTER.

Optional. Allows the operator to see and change the calculation information.

Display Only. The operator can view the calculation information but cannot change it at this time.

Hidden. The operator cannot see the label.

Required. The operator must enter the information for this calculation input whenever a new sample is created.

Viewing or Changing Calculation Inputs

Calculation inputs consist of fields defined according to the procedure below. Fields include label, units, min/max/default values, decimals and attributes. The number of calculation inputs you have depends on which master you selected.

To view or change calculation inputs,

1. Select Inputs from the Define menu. The system displays a popdown menu containing seven input options.
2. Select Calculation from the Inputs popdown menu. The system displays a list of calculation inputs and their

associated labels, units and attributes.

3. Enter or maintain calculation inputs by selecting the input of your choice. The system displays an Input form allowing you to view or change calculation inputs.
4. Press ENTER to save changes or press ESC to return to the Inputs popdown menu.

Defining Test Inputs

You can define test inputs by selecting options pertinent to the test you are performing. These include initial speed, load limits, extension limits, return point, etc. You should select appropriate units for each option you choose as well as whether or not you want operator interaction.

You will work with the following fields to define test inputs:

LABEL. This specifies the name of the test input and can be up to 15 alphanumeric characters long.

UNITS. This specifies various field units (e.g., inches for diameter). You can select the available units from an existing list by pressing F2, choosing the unit of your choice and pressing ENTER.

DEFAULT. Once you define this number, the system uses it as an automatic default for the test input. If you know that the test input will always have a static value, use this default. You can use up to nine numeric characters in this field.

MIN VALUE. This is the lower limit for the test input. If the operator tries to input a value less than the minimum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

MAX VALUE. This is the upper limit for the test input. If the operator tries to input a value greater than the maximum, a beep sounds, indicating that the system is rejecting the number and the operator must enter a new value. You can use up to nine numeric characters in this field.

DECIMALS. What you enter in the decimal field identifies the number of decimal places for the test input value. Decimal places must be between 0 and 5.

Note: **If you change the number of decimals to a larger or smaller number, you must save your changes and then re-enter the input to see the effect.**

ATTRIBUTE. The attribute determines how the system uses the test input during the test. You can select an available attribute from an existing list by pressing F2, choosing the attribute of your choice and pressing ENTER.

Optional. Allows the operator to see and change the test input information.

Display Only. The operator can view the test information, but cannot change it at this time.

Hidden. The operator cannot see the test input.

Required. The operator must enter a new value for the test input whenever a new sample is created.

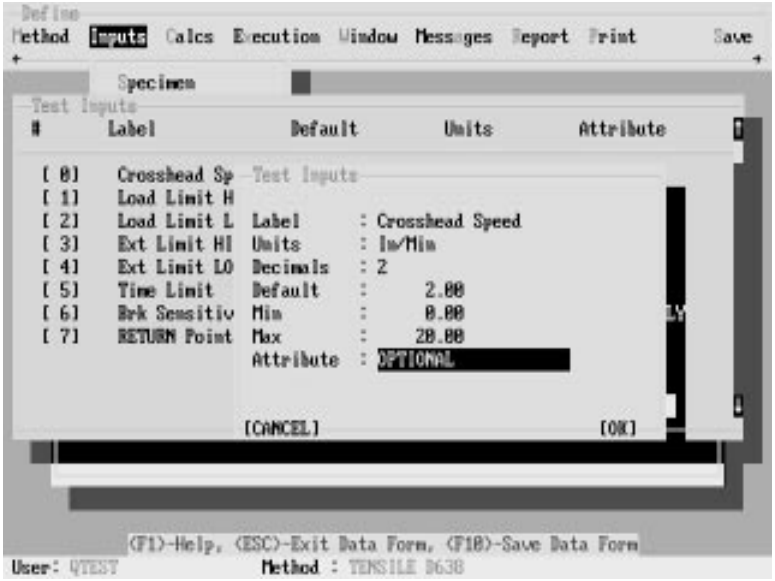


Figure 8-8. Test Inputs Form

Viewing or Changing Test Inputs

Follow the steps below to view or change test inputs. Viewing or changing test inputs functions just like viewing or changing specimen and calculation inputs.

To view or change test inputs,

1. Select Inputs from the Define menu. The system displays a popdown menu containing seven input options.
2. Select Test from the Inputs popdown menu. The system displays a list of inputs and their associated labels, units and attributes. The number of inputs is standard dependent.
3. View or change inputs by selecting the input of your choice. The system displays an Input form prompting you to begin entering or maintaining test inputs (see Figure 8-8 for Test Inputs Form).
4. Press ENTER to save changes or press ESC to return to the Inputs popdown menu.

Chapter 9: Defining Miscellaneous Information for a Method

The information on the Start of Test screen is largely controlled in Define (see Figure 2-1 for Start of Test Screen). You can also control to a certain extent the operator's actions during the test.

You can define the following miscellaneous characteristics for your method:

Inputs

Information. After creating a sample, you can specify and control what the operator types in as sample information.

Sample Naming. You can define the length and alias for the Sample ID. The length may not exceed 20 characters.

Execution

Test Flow. You have the ability to control certain characteristics of the test, such as how many specimens are allowed per sample. You use this to modify the flow of the program.

Display Units. Display units are units that you establish here for load extension and speed indicators. The operator sees these units on the Start of Test and Machine Control Panel screens.

Reference. You can specify a reference material that automatically becomes the current reference material when the operator selects a method.

Window

The operator has the option to change the graphics window prior to running the test. You can set up a default for the operator.

Messages

You can define messages to display for the operator on the Start of Test screen prior to starting a sample, as well as pre-sample messages. You can also enter a description for the method that

the operator sees on the main QTest screen.

Report

You can set the report title and formats for the standard report.

Print

You can print a hard copy record of the method you define.

Save

You can enter a new name to create a new method or you can enter the same name to modify the current method. You may not overwrite a master.

The Start of Test Screen

In this chapter you will see in many cases the Start of Test screen, along with the form where you are inputting the information in Define. This will help you understand how what you are doing in Define affects the actual testing process.

Defining Sample Information

Sample information is text information that is entered to identify each sample. You might require information such as lot number, warehouse, shift, etc. This information is printed on reports, but cannot be used for sorting purposes as can the Sample name.

The system displays a list of up to 10 sample information labels, along with defaults, character lengths and attributes. You can modify each of the above variables to control what the operator enters (see Figure 2-2 for Sample Information Screen).

You will work with the following fields to define sample information:

LABEL. Enter here the name you want to give to this field. It can be up to 15 alphanumeric characters. For example, the label

might be Shift.

FIELD LENGTH. The field length is the number of alphanumeric characters you can use for sample information. It can be up to 20 alphanumeric characters. For example, the field length for shift might be 1.

DEFAULT. This option sets the information that appears to the operator while preparing for the test. For example, the default for shift might be 1.

ATTRIBUTE. The attribute determines how the system uses the sample information prior to the test. You can select an available attribute from an existing list by pressing F2, choosing the attribute of your choice and pressing ENTER.

Optional. Allows the operator to see and change the sample information.

Display Only. The operator can view the sample information, but cannot change it at this time.

Hidden. The system hides the input field from the operator at all times.



Figure 9-1. Sample Information Screen

Required. Will not allow the operator to finish creating a sample without entering information in the field.

Defining Sample Names and Their Format

You have the capability to determine the length and alias for the sample name. You may define the field so that it does not exceed 20 characters in total length.

To define sample names,

1. Select Inputs from the Define menu.
2. Select Sample Naming from the Inputs menu. The system displays the Sample Naming form and prompts you to enter the field label and length.
3. Enter or modify sample I.D. field label and length.

Defining Test Flow

Test Flow is a set of options that allows you to control certain characteristics of the test, such as what actually happens when the operator saves or rejects data.

You will work with the following fields to define test flow:

SPECIMENS PER SAMPLE. The number you enter here defines the maximum number of specimens within a sample. You cannot add more than the maximum number of specimens to any single sample.

AUTO SAMPLE INCREMENT. This automatically prompts for a new sample I.D. after you reach the limit of specimens per sample in a given method.

AUTO RAW DATA SAVE. If you specify Yes, the system automatically saves test curves under the test method even if the operator specifies NEXT.

AUTO SPECIMEN PRINT. If you choose to activate this feature, the system automatically prints the results of each specimen immediately after each test. The system prints a header prior to

the first specimen.

DISCARD ON REJECT. If you specify no and the operator rejects a specimen after the test, the system will still save the results but will tag this specimen data. You can untag or delete the specimen results later if you want.

AUTO COMMENT. When you set this feature for a test, the system automatically prompts the operator for a comment following the testing of each specimen. This is a particularly useful feature when you require information about break locations or failure modes.

You have the capability of selecting what will happen during the testing process through the Execution menu in Define.

To define a test flow,

1. Select Execution from the Define menu.
2. Select Test Flow from the Execution menu. The system displays the Test Flow form (see Figure 2-7 for Test Flow Control form).



Figure 9-2. Test Flow

3. Move the up and down arrow keys to highlight the option you want to change. Use the space bar to toggle between yes and no.
4. Press F10 when all selections are made.

Defining Display Units

Display units are units that you establish in Define (i.e., lb, kg, etc.) and use when setting up the machine. The units you select appear on the machine control panel and start of test display.

You have the capability of selecting the units used for display purposes by identifying them through the Execution menu in Define.

To define display units,

1. Select Execution from the Define menu.
2. Select Display Units from the Execution menu. The system

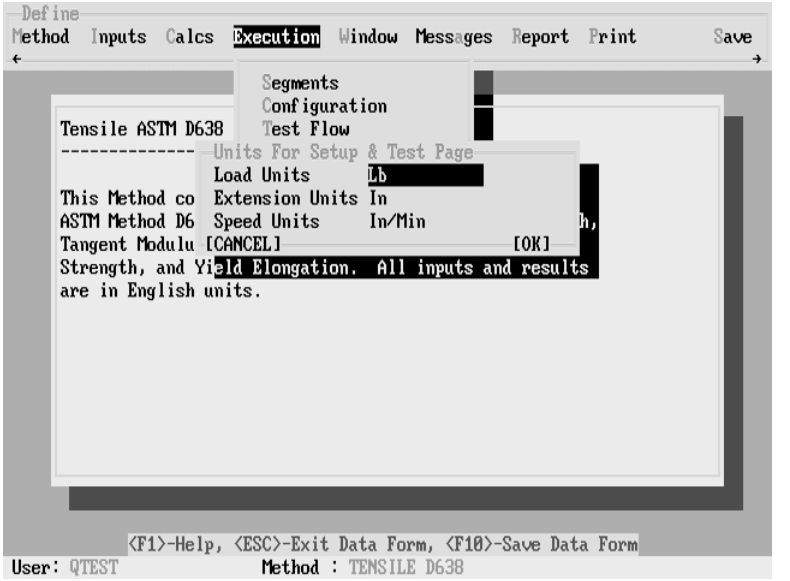


Figure 9-3. Defining Display Units



Figure 9-4. Setting a Default Reference Material

displays a form called Display Units for Start of Test and Setup.

3. Move the up and down arrow keys to highlight the indicator you want to change. Press F2. The system displays a list showing the various units you can choose for the indicator.
4. Move the up and down arrow keys to highlight the unit of your choice. Press ENTER to make your selection.
5. Press F10 when all selections are made.

Defining a Default Reference Material

By setting up a default reference material for a method, you can control which reference material the operator is using as a means of comparison for test results. The reference material will be automatically set when you select this method.

To define a default reference material,

1. Select Execution from the Define menu.
2. Select Reference from the Execution menu.
3. Select Set Reference from the Reference menu. The system displays the Select Reference list. Here you can choose any of the reference materials listed to use as your default. You originally set up the reference material selections in this list in Reference.
4. Select the reference material you want to use as a default and press ENTER. The system will now use your default as a means of comparison when testing or reviewing results. The percentage reference values will automatically appear beside the displayed specimen results. You can reselect a new reference material whenever you wish.

Defining the Graphics Window

You define the graphics window by choosing what variables the X and Y axis will display. You select the units, scale values and decimal precision of the display. You may define either axis of the graph with one of six different labels. They are Extension, Time, Load, Stress, Strain, and %Strain.

To define the graphics window,

1. Select Window from the Define menu. The system displays the Graphics Window form prompting you to enter information about the axis and units of your graph.
2. Select AUTO if you want scaling to be done automatically or MANUAL if you want to set the scale manually.

   AUTO. The software will fit the curve as much as possible on the graph by alternating x+y values. In real time this means rescaling occurs.

   MANUAL. The graph will be placed according to the specific values with no auto scaling.
3. Select the channels for the X and Y axis in the graphics

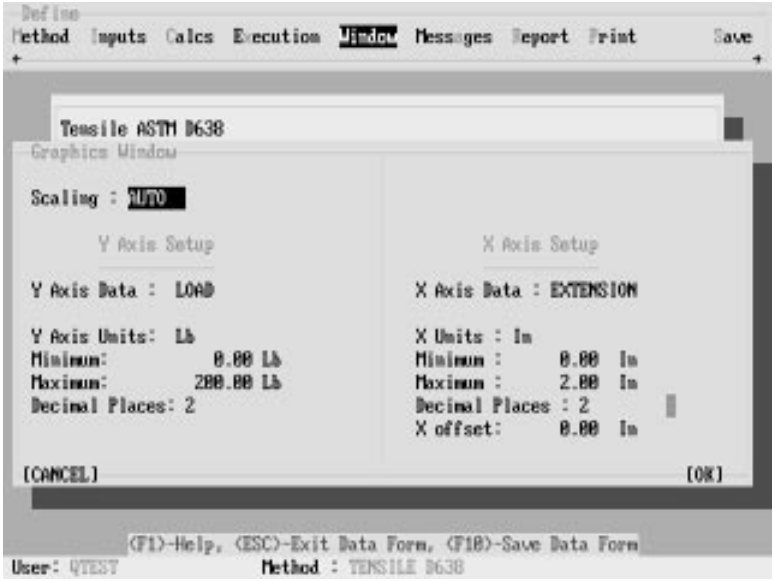


Figure 9-5. Defining the Graphics Window

window form. Press F2 for a list of available channels. The system displays the following choices for both the X axis and the Y axis: Extension, Time, Load, Ext/DXL, Stress, Strain, and %Strain.

4. Select the X or Y units on the graphics window form and press F2 for a list of the unit variables. Make your selection and press RETURN. The system displays a list of variables according to the axis variable you select in Step 3. The operator can, however, select different units for viewing purposes later if necessary.

5. Select and input the minimum and maximum initial scale values for the X and Y axis.

   If the scaling is set to AUTO and the actual data values exceed the maximum scale values, the program automatically rescales and redraws the curve, so the curve is visible at all times. However, the graph scaling does not shrink from the initial setting. At the time of the test the operator can change the scale values.

Note: Set the initial scale values to less than what you expect the full scale values will be.

The windows in Pre-Test, Post-Test and Review are independent window settings. They just choose their original settings from Define.

6. Enter the number of decimal places you want to see for scale values displayed on each axis. The operator can only modify decimals in Define.
7. Select the X OFFSET. When viewing all of the specimen curves, this feature allows the option of having a horizontal offset between each curve so that they are not stacked on top of each other. By putting in a value for X OFFSET, the curves will be placed side by side at whatever offset you specify. If you wish to see all the curves stacked on top of each other, then enter 0 in this field.
8. Press F10 to save your changes and return to the Define menu, or press ESC to discard your changes.

Defining Start of Test Messages

You define start of test messages that the system displays on the Start of Test screen to remind the operator to check certain conditions before or during the test. You have the capability to draw attention to the messages using highlight and reverse image.

To define start of test messages,

1. Select Messages from the Define menu.
2. Select Start of Test from the popdown menu. The system displays a form prompting you for test messages 1 through 4 and how you want to display each message.
3. Enter up to 4 messages that you want to display for the operator. An example of a message might be: “Make sure limits are set before starting test.”
4. Enter the Video option in accordance with the start of test

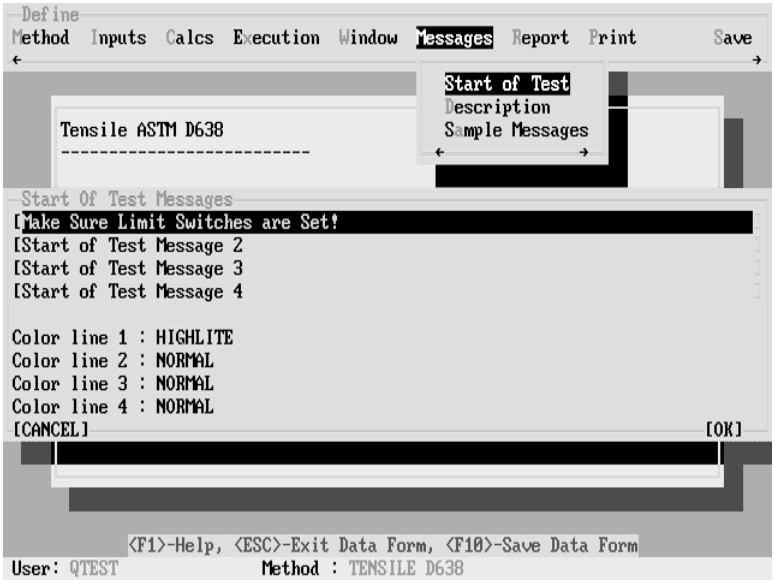


Figure 9-6. Defining Start of Test Messages

message you enter. Press F2 to display the available options. The system displays a window with the following color line options: highlight, reverse and normal. These options allow you to display each message in normal, highlighted or reverse video mode.

Defining Pre-Sample Messages

You define start of test messages that the system displays on the Start of Test screen to remind the operator to check certain conditions before or during the test. You have the added capability to flash messages on a per sample basis. For example a sample message would be: “Make Sure Limits are Set.”

Pre-Sample messages are only shown once per sample before the run begins.

To define pre-sample messages,

1. Select Messages from the Define menu.

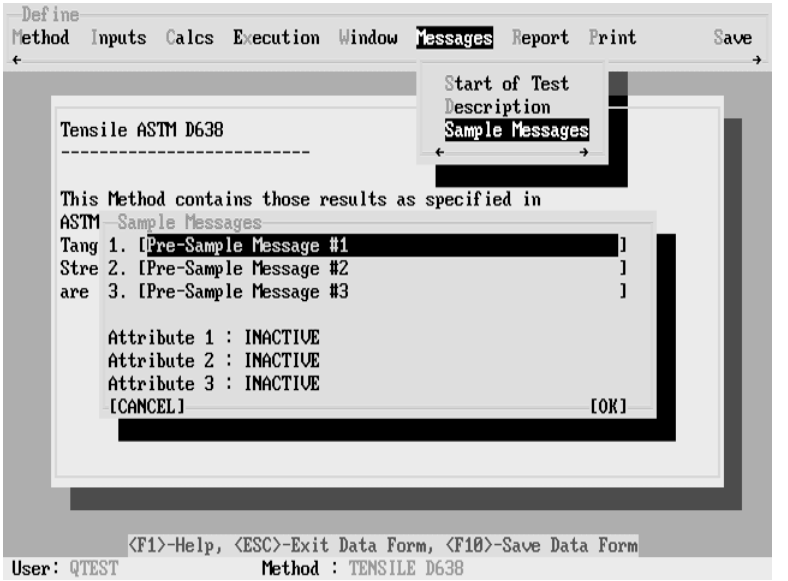


Figure 9-7. Pre-Sample Messages

2. Select Pre-Sample from the popdown menu. The system displays a form prompting you for messages 1 through 3.
3. Enter up to three lines of messages that you want to display for the operator to see prior to running the first specimen in a sample.
4. Enter the attribute in accordance with the message you enter. You can make the line either active or inactive. Press F2 to display the available options. The system displays a window with active or inactive. This allows you to select which message you want to display.
5. Press F10 to return to the Define menu and save your changes, or press ESC to discard your changes.

Describing a Method

Entering a method description allows you to describe in 11 lines or less the test method you are creating. You can also include the

test method creator's name and date of creation.

To define method descriptions,

1. Select Messages from the Define menu.
2. Select Description from the Messages popdown menu. The system displays the Method Description form prompting you to enter a message describing in 11 lines or less the test method which you are creating.
3. Enter a method description. This description can give a general overview of the test method as well as the creator and date of creation and will be saved under the name of the test method. The description appears on the main screen of QTest next to the Main menu.
4. Press F10 to return to the Define menu.

Creating a Standard Report

The Report function allows you to define a standard report



Figure 9-8. Method Description Form

showing your company name and address (or whatever header information you choose), as well as Sample Information, Calculation Inputs, Test Inputs, and other items, including various results. Each of these items can be turned on or off, so that your report contains only the information that you need.

To define a report,

1. Select Report from the Define menu. The Report Setup form will appear. Most fields in the Report Setup form can toggle between “Yes” and “No” by using the space bar. Use the TAB key to move from field to field.
2. In the Print Header Info? field, decide whether or not you want to print the Header Information.
3. In the Print Form Feed At End? field, decide whether or not you want the paper to advance to the next sheet when the report is finished printing.
4. In the Header Line fields, enter your report header information.



Figure 9-9. Setting Up a Report

5. For the rest of the fields, use the space bar to decide what information you wish to appear on your report.

Printing a Method

You may print the entire method by selecting Print from the Define menu. The system generates a print out that includes all of the inputs you define. This provides you with a hard copy record of the method you are creating to review and file. Make sure your printer is powered up, on-line and loaded with paper before selecting this option.

Saving a Method

Select Save from the Define menu and the system prompts you for a method name. If you save your changes with an existing method name, the system verifies that you want to replace the existing method. You can enter a new name to create a new method, or an existing name to modify an existing method.

Note: **Any changes you make in Define are temporary unless you save the method. If you do not save the method, your changes will be lost when you exit from Define or choose another method.**

Chapter 10: Defining Reference Materials

If you have selected a reference material when defining your test method, it is used when you review specimen results.

Statistical Comparison

When you view the results of your test for a specimen, the system displays the percent deviation from the reference target value. The system indicates whether the current specimen result is above or below the reference upper and lower limit values.

If the specimen result is greater than the upper reference limit, the percent difference value is displayed in green. If the specimen result is below the lower reference limit, the value is displayed in red. Neither attribute is used if the specimen value is within the upper and lower reference limits.

A reference material is a collection of data produced by manual input. Once you create a reference material, you can select it as a reference to compare with test data. For example, when you display or print statistical information for a sample, the system also displays percent difference between the sample and the reference material.

Note: **You can use a reference material created with one method with other methods derived from the same master. However, you cannot use this reference with methods created from a different master method.**

Creating a New Reference Material

To create a new reference material,

1. Select Reference from the Manage menu.
2. Select Make from the Reference menu. The system displays the Reference form for editing reference values.
3. Enter the reference material name and press ENTER.

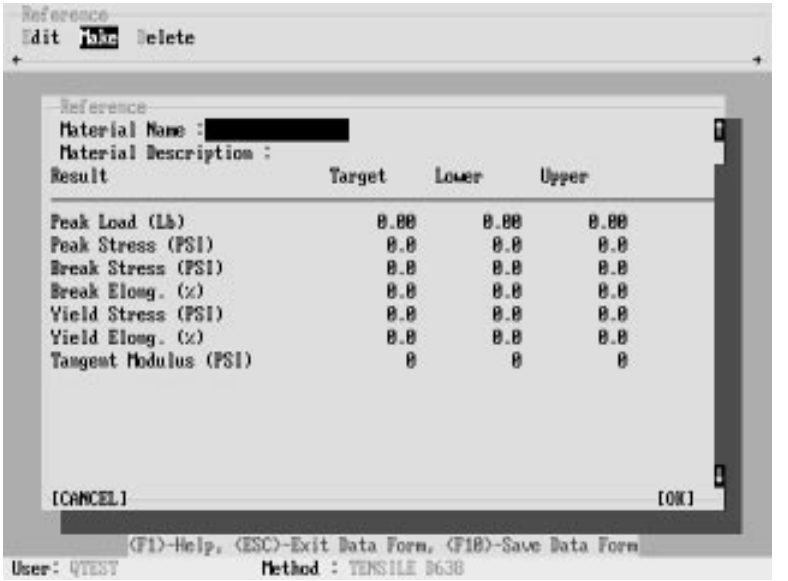


Figure 10-1. Make Reference Material

4. Enter a brief description or comment about the material and press ENTER.
5. Enter the target values and upper and lower limit values that you want.
6. Press ENTER to exit the form and confirm your changes.

Editing A Reference Material

You can edit a reference material through the Reference menu. This option allows you to view and edit upper, lower and target values of a reference material. You cannot change the material name.

To edit a reference material,

1. Select Edit from the Reference menu. The Edit Reference Material window will appear.
2. Using the arrow keys, select the reference material you wish

to edit and then press ENTER. The Reference form will appear, displaying the values for the reference material selected.

3. Edit the values that you wish to change.
4. Press ENTER to exit the form and confirm your changes.

Deleting A Reference Material

You can delete a reference material through the Reference menu. Once deleted, the reference material information cannot be retrieved. However, you can recreate the same reference material using Make.

To delete a reference material,

1. Select Delete from the Reference menu. The Delete Reference Material window will appear.
2. Using the arrow keys, select the reference material you wish to delete and then press ENTER. The message bar at the bottom of the screen will confirm that the selected material was deleted.

Defining A Default Reference Material

When you are defining a method, you can select a default reference material for that method. Each time you select that method, the current reference is automatically established. Refer to Chapter 9 for more detail on selecting a default.

Chapter 11: Utilities

QTest provides utilities to help you control and manage your system files. These utilities help you to backup, restore and erase test data, reference data, or a method. You can also display a catalog of your target drive and a directory of the files on your hard drive.

Saving And Archiving Files

The ability to transfer data in or out of your system is helpful for archiving files to free up disk space. These abilities are also useful for sharing data or methods with other QTest systems. Basically, these utilities provide you with a way to get data in and out of your system. Prior to utilizing these tools, you should understand how to save and archive data for later use.

When saving files, QTest safeguards against accidental loss due to overwriting, by providing the Backup function. When you

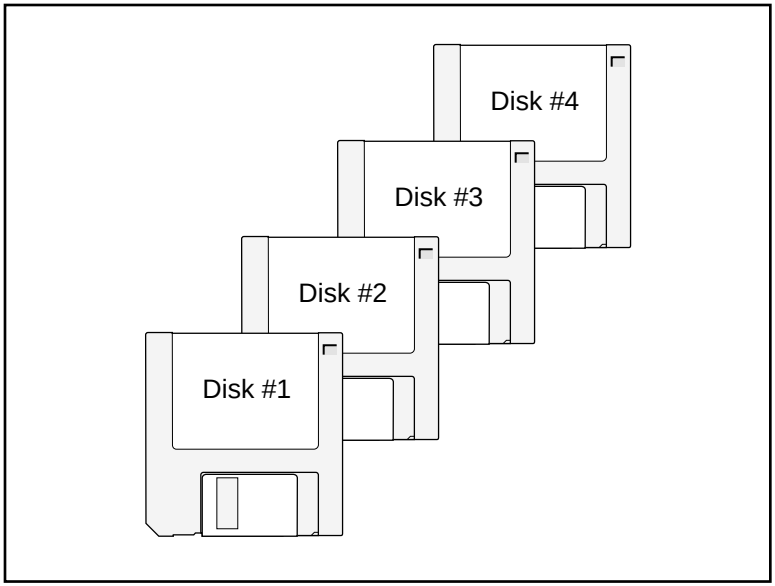


Figure 11-1. Target Diskettes

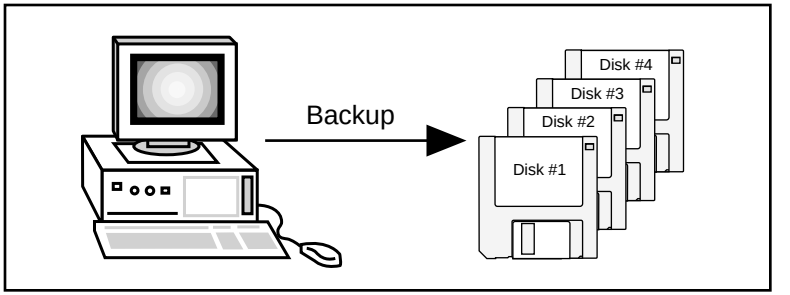


Figure 11-2. Backing Up Files

backup files, use one set of diskettes for each masters' test data, reference data, or method. The system prompts you for additional formatted diskettes if the data file is too large. Be sure to label diskettes properly (diskette # 1, diskette #2, etc.).

Since all of your QTest files can reside on your hard disk, the Utilities option provides you with an easy way to transfer files to or from a diskette drive. The diskette drive that you use to transfer these files is called the target drive. A Catalog option is provided to allow you to see the files contained on the diskette. Normally the target drive will be set to your computer's "A" drive. You can use other designators if you have more than one drive.

There are three types of files you backup, restore and erase selectively. The following are the file types and their extensions:

- Test Data .DBF
- Reference Data .MDB
- Methods .001-.099

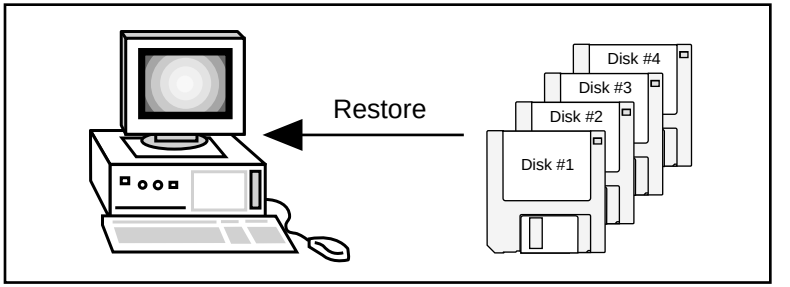


Figure 11-3. Restoring Files

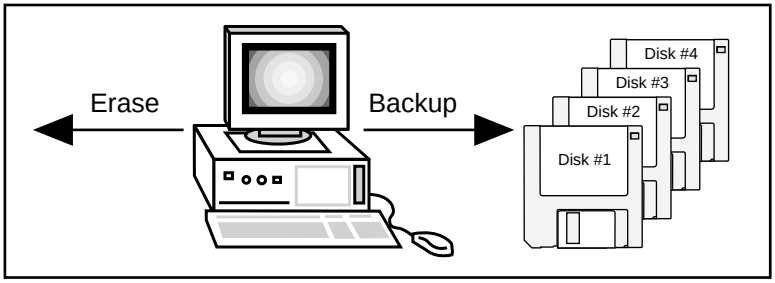


Figure 11-4. QTest Main Screen

You can transfer data from the hard disk to a target diskette by selecting the Backup option. Be sure to label formatted diskettes properly (diskette # 1, diskette #2, etc.) when saving files.

Once you save your data, you can at a later date selectively restore it from the target diskette to the hard disk. Be sure to insert diskettes in sequence when retrieving files.

After backing up your data, the system allows you to erase it from your hard disk.

Warning: It is recommended that you backup your data before you erase it.

Backing Up

You can backup test data, reference data, or a method from the data drive to a target diskette. The test data requires a great deal of disk space. Whereas, the methods and reference data require considerably less.

To save test data, reference data, or a method,

1. Select the Utilities option from the Main menu. The system displays the Utilities menu.
2. Select Backup from the Utilities menu. The system displays a popdown menu with a selection of items you can transfer out of your system from your hard disk to a target diskette.
3. Select Data, Reference, or Method from the Backup menu.



Figure 11-5. Backing Up Data

The system displays a list of files that apply to the option you selected. For example, if you selected Data, the system displays the test databases on the hard drive that you can choose from to backup.

4. Select one of the files that the system displays. The system prompts you to enter a comment that describes what you are backing up. When you later view a catalog of what is on this diskette, you will see this comment.

5. Enter a comment that identifies what you are backing up.

6. Insert diskette #1 in the target drive and press any key to continue. Insert other diskettes in sequence, or press ESC to cancel. If a disk is not in the target drive, an operating system error results. Insert diskette #l in the target drive and press R to retry, or press “C” to cancel. When continuing to save your data, the system displays a message while backup is in progress and after it is complete.

The system only saves the data you selected. This procedure does not take the place of backing up your hard disk drive. Be sure to back up your hard disk drive periodically.

Restoring Data

Once you back up your data, you can restore it from the target diskette to your hard disk drive. You can only restore files you have previously saved using QTest.

To restore test data, reference data, or a method,

1. Select the Utilities option from the Main menu. The system displays the Utilities menu.
2. Insert the diskette in the target drive. You can use Catalog if you want to know what is on the diskette in the target drive.
3. Select Restore from the Utilities menu. The system displays a popdown menu with a selection of items you can restore from the target diskette to your hard drive.
4. Select Data, Reference, or Method, from the Restore menu. The system displays a selection list of the files you can restore from the diskette. To restore test or reference data, you should first save the test or reference data for the

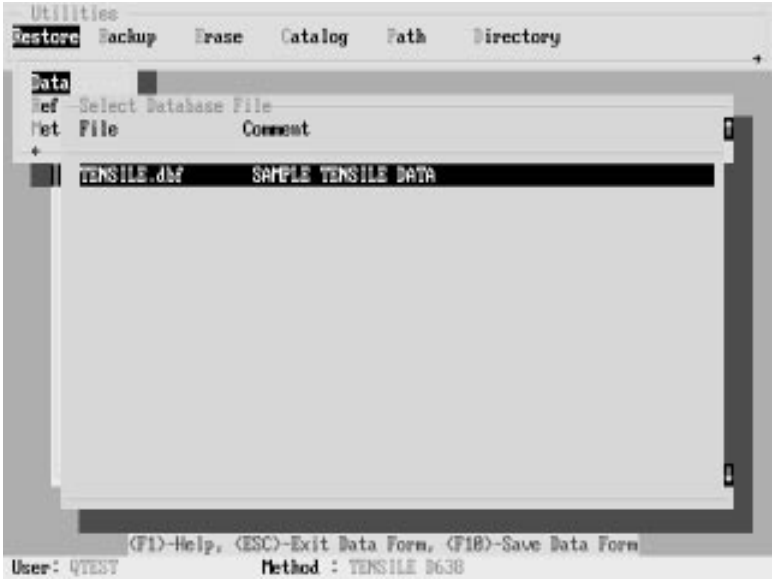


Figure 11-6. Restoring Data

standard from your hard drive.

5. Select the file you want to restore. If the item you are restoring already exists on your hard disk, the system displays a warning message reminding you that the file is already on the hard disk and that the system is going to overwrite what is on the hard disk with what you are restoring from the target diskette.

6. Press ENTER to continue. Insert other diskettes in sequence, if required. Or press ESC to cancel. When continuing to restore test data, reference data, or a method, the system displays a message while Restore is in progress and after it is complete.

Erasing Data from the Hard Drive

The system allows you to erase data from the hard disk.

Warning: It is a good practice to save data to a diskette before erasing it.

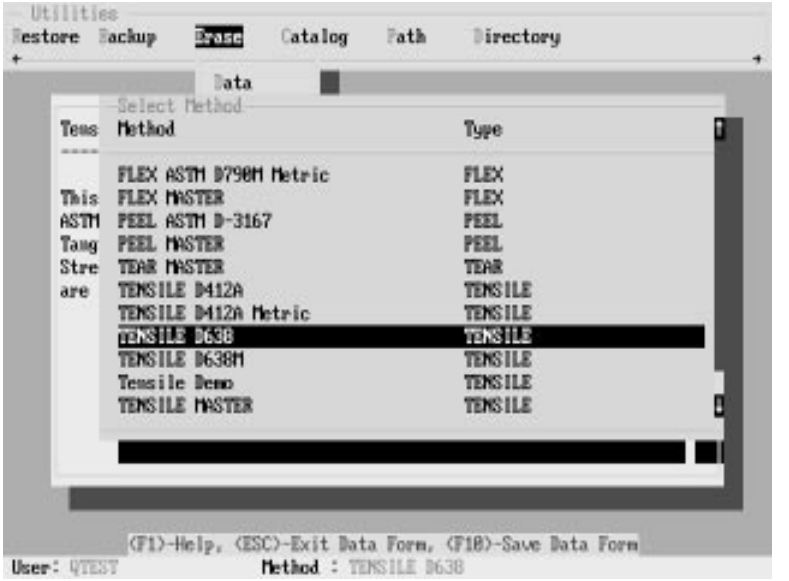


Figure 11-7. Erasing a Method

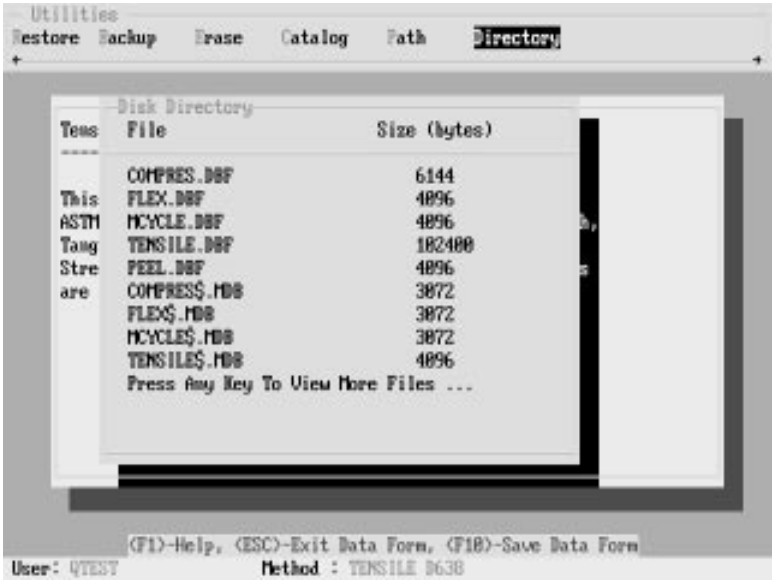


Figure 11-8. Displaying A Directory

To erase test data, reference data, or a method,

1. Select the Utilities option from the Main menu. The system displays the Utilities menu.
2. Select Erase from the Utilities menu. The system displays a popdown menu with a selection of items you can erase from the hard drive. As a safeguard, you should save data to a target diskette before the system allows you to erase it.
3. Select Data, Reference, or a Method from the Erase menu. The system displays a popdown menu listing the actual files you can select to erase.
4. Choose one of the files.
5. Press RETURN to continue or ESC to cancel. The system erases the file and displays a message when complete, if you press return to continue.

Displaying a Catalog or Directory

You can display a catalog of the target disk drive to see what has been previously saved on your target diskette. You can also display a directory of the hard drive to see what has been created by QTest.

To display a catalog or a directory,

1. Select the Utilities option from the Main menu.
2. Select Catalog or Directory from the Utilities menu. Press ENTER. The system displays a catalog of details of QTest related files on the target diskette or a directory of files on the hard drive.

Changing the Target Drive

You would change the target drive if you want to save test data to a different drive. For example, if your computer has drive “A” as a 5 1/4 inch diskette drive, and drive “B” as a 3 1/2 inch diskette drive, you might want to change the target disk drive, depending on which one you want to work with.

To change the target disk drive,

1. Select the Utilities option from the Main menu.
2. Select the Path option from the Utilities menu. The system displays the Set Target Disk Drive form. Here, you can change the drive.
3. Enter the letter for the target disk drive.

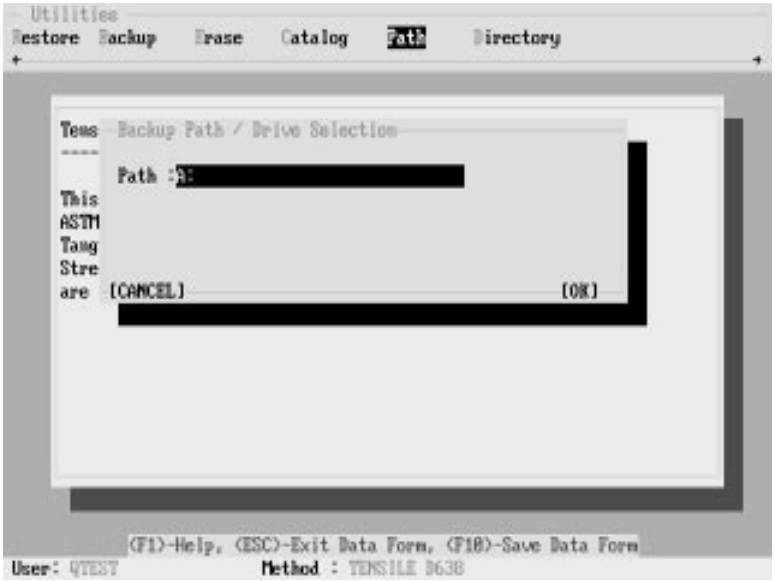


Figure 11-9. Changing the Path of the Target Diskette

Appendix A: Glossary

Attribute

Characteristics assigned to an input, marker, or result in the program. The attribute will control whether the value will be displayed on the screen, and whether it can, or must be moved or changed by the user. The following are possible attributes.

Display Only - The value will be displayed on the screen, but cannot be changed or moved.

Fixed - The marker will appear on the graph but will not be moveable by the operator.

Hidden - The marker or value will not be displayed on the screen, but will be calculated.

Moveable - Markers will be moveable on the test curve and affect calculated results.

Optional - The operator will have the choice of changing or not changing values.

Required (pre) - Operators will be forced to enter these values prior to the testing of each specimen. This attribute is usually associated with specimen dimensions.

Required (Post) - Operators will be forced to enter these values immediately upon the completion of testing each specimen. This is useful when failure modes or post test dimensions are desired.

Optional (Post) - The operator will have the choice of inputting information after the test for values with this attribute. The operator may choose to enter this information on occasion and use default values during other tests.

Auto Comment

Feature that, when set for a test, will automatically prompt the operator for a comment following the testing of each specimen. This is a particularly useful feature when information about break locations or failure modes is required. This can be selected as part of the Test-Flow Control functions in the Define/Execution

Option.

Auto Sample Increment

As part of the Test-Flow Control function in the Define option, this feature will allow the operator to have the sample number automatically incremented when the specimens per sample limit has been reached in a given method. This is very useful when testing samples with consecutive numbers and with a constant number of specimens.

Auto Raw Data Save

Automatically saves test curves and results for all specimens tested under the test method. This feature can be set as part of the Test-Flow Control functions in the Define/Execution option.

Auto Specimen Print

Part of Test Flow Control functions in the Define/Execution option. Test methods utilizing this feature will automatically print the results of each specimen immediately after testing. A header will be printed prior to the first specimen.

AutoCalc

Appears in two areas of the program. At the sample level it is used to restore markers to original post test positions. This function will also re-compute results for an entire sample if calculation inputs have been changed. At the specimen level, entered by using the VIEW option, it allows the above changes to affect only a single specimen at a time.

Break %Drop/Elongation

Used as an input in the required calculation for break %drop/ elongation. Distance over which the load must drop by a user input percent for the computer to determine break. Refer to Figure 8.3 in Chapter 8, “Defining Calculations and Inputs for a Method,” to see an example of a graph.

Break Sensitivity

Used for real-time break detection. It is the amount, in percent, that the load must drop from the measured peak load to terminate the test.

Breaking Load

Load which causes fracture in a tension, compression, or flexure test. In tension tests of yarns and textiles, breaking load also is called breaking strength. It is difficult to distinguish between breaking load and the maximum load developed, so the latter is considered the breaking load in tensile tests of thin sheet materials or materials in the form of small diameter wire.

Calculation Inputs

Values used in testing and computation of results that do not change across a sample. These values include such items as gage length, inputs for break determination, offset and pre-load points.

Calibration

Manner of checking the load cell or extensometer against a standard or known value. This can be done electronically (automatically) or physically (physically). The QTest software can calibrate load cells and extensometers electronically.

Calibration Value

Value to which measuring instrument will be compared. Usually, a known load or distance. Often traceable to the National Bureau of Standards.

Caliper Port

Communications channel across which caliper will communicate with computer. Can be Com l-Com 4 designating the RS-232 asynchronous serial interface.

Catalog

Utility that will list the directory of QTest's related files on the

"Target Disk" as set up in the Environment function.

Collection

Group of samples put together to obtain information. This is useful for printouts, trend analysis, and histograms. The operator may create, add to, delete from, or delete entire collections.

Comment

Non-calculated information that can be input by the operator after a test. Up to 60 Characters are provided to be used for items such as type of failure, position of failure, etc.

Compression Test

Method for determining behavior of materials under crushing loads. When specimen is compressed, deformation at various loads is recorded. Compressive stress and strain are calculated and plotted as a stress-strain diagram, which is used to determine proportional limit, elastic limit, yield point, yield strength and (for some materials) compressive strength.

Compressive Deformation

Extent to which a material deforms under a crushing load.

Compressive Strength

Maximum stress a material can sustain under crush loading. The compressive strength of a material that fails by shattering fracture can be defined within fairly narrow limits as an independent property. The compressive strength of materials that do not shatter in compression must be defined as the amount of stress required to distort the material an arbitrary amount. Compressive strength is calculated by dividing the maximum load by the original cross-sectional area of a specimen in a compression test.

Compressive Yield Strength

Stress which causes a material to exhibit a specified deformation. This is usually determined from the stress-strain diagram obtained

in a compression test. Also see Yield Strength.

Cursor

General term that shows the current location at which a keyboard input will appear on the display. During graphics, the cursor appears as a small “+” sign on the curve. Elsewhere, the cursor is shown as a highlighted bar.

Database

Place where all collected data is stored. Capable of searching, additions and deletions. Consists of special files stored on data disk.

Default

Values that are pre-set and appear automatically in the software. In some cases, these values may be changed.

Define

Used to create or change a test method. Inputs, calculations to be performed, type of data acquisition, graphics, and units may all be selected to create unique test methods.

Directory

This function will list all of the samples in the database for the chosen Test Type. The Sample I.D., creation date, operator I.D., and number of specimens will be displayed for each sample. Sample I.D.s will be listed in alphabetical order, with a colon separating multiple Sample I.D. fields.

Discard on Reject

Part of Test-Flow Control functions found in the Define/Execution option. Test methods utilizing this feature will automatically purge all data for a specimen when the REJECT command is given. The data will not be stored and, therefore, will not ever be retrievable.

Disk I/O

This is a message that will appear in the lower right hand corner of the screen periodically. It will appear when the program is writing to, or reading from, the data disk.

Display Unit

Units for load, extension and speed that will be used in the machine setup portion of the program. The user is given the opportunity to select the units to be used in the define section of the program.

DOS

Disk Operating System. QTest is run from DOS. DOS contains many functions for file and disk management.

Drive

Disk drive that is to be used. Can be either a hard disk, tape or floppy medium.

Elastic Limit

Greatest stress that can be applied to a material without causing permanent deformation. Elastic limit is approximately equal to proportional limit for metals and other materials that have significant straight line portion in their stress/strain diagram. For metals that do not exhibit a significant proportional limit, elastic limit is an arbitrary approximation (the apparent elastic limit).

Elasticity

Ability of a material to return to its original shape when load causing deformation is removed.

Elongation/Strain

The procedure used and device utilized to obtain data from which elongation/extension/deformation/deflection/strain will be calculated. The data obtained may be from one or a combination of the following: time, crosshead travel, extensometer,

deflectometer, strain gage extensometer, or bonded strain gages.

Engineering Strain

Load applied to a specimen in a tension or compression test divided by a cross-sectional area of the specimen. In computing engineering stress, the change in cross-sectional area that occurs with increases and decreases in applied load is disregarded. It is also called conventional stress.

Environment

Function in program that contains and allows change in the configuration used.

Execution

Function found within the DEFINE option that allows move profiles, test-flow, and end of test parameters to be set. Controls manner in which test method will physically be run.

Exit

Option found on the Main Page that will allow the User to Exit from the QTest Program. Upon termination, the program will exit to the DOS Environment.

Export

Allows transfer of data from the QTest database to a file that may later be utilized by a commercially available spreadsheet application. Only the sample results may be transferred.

Extension Limit

Test input that can be set to limit the crosshead travel. Should be used to protect load cells, chambers, fixtures, and the frame from damage that can be caused by moving the crosshead too far.

Extensometer

Instrument for measuring changes in linear dimensions. Also

called a strain gage.

Fiber Stress

Stress through a point in a part in which stress distribution is not uniform. The stress in a beam, for example, under bending load varies from compression to tension across the beam. It is more important in determining the properties of the beam material to consider the maximum stress generated in the outer fibers of the beam.

Fields

Item of information in program. Usually highlighted by cursor when information may be entered.

Flexural Modulus of Elasticity

Alternate term for modulus in bending.

Flexural Strength

Maximum fiber stress developed in a specimen just before it cracks or breaks in a flexure test. For materials that do not crack in the flexure test, flexural yield strength is reported instead of flexural strength. An alternate term is Modulus of Rupture (MOR).

Flexure Test

Method for measuring behavior of materials subjected to simple beam loading. It may also be called a transverse beam test with some materials. The Specimen is supported on two knife edges as a simple beam and load is applied at its midpoint. Maximum strain and maximum fiber stress are calculated for increments of load. Results are plotted in a stress-strain diagram. Maximum fiber stress at failure is flexural strength. Flexural yield strength is reported for materials that do not crack.

Full Scale Capacity

Maximum allowable value that measuring device can handle. Always specified with the device. This would be full scale load

for load cells, maximum travel distance for extensometer, etc. The full scale capacity is necessary for calibration.

Get

Allows the operator to select a sample to analyze. A sample name may either be typed in or chosen from the list (seen by pressing F2).

Hooke's Law

Stress is directly proportional to strain. Hooke's Law assumes perfectly elastic behavior and does not take into account plastic or dynamic loss properties.

Inactive

Attribute meaning not used or calculated. Certain required calculations may be set to type Inactive if they are not desired.

Information Inputs

Sample information that may be entered by the operator and/or displayed for each sample. These inputs contain information about a sample that will be stored and presented with the test results but do not affect the test or calculations directly. Examples of this type of information include operator I.D., material color, submitter, material process number, etc.

Inputs

Any information that is entered into the program. These may include calculation, test, specimen, and sample inputs.

Load Absolute

Type of procedure to find the break point. Often used for fiber and fabric testing. The break point will be defined as the point where the material returns to a specified load after passing its peak load value.

Load-Deflection Diagram

Plot of load vs. corresponding deflection.

Load Frame Type

Found in Environment section of QTest. Used to select the model of universal load frame to which the system is connected.

Load Limit

Test input that can be set to limit the load during a test. This feature can be used to effectively protect load cells, grips/fixtures, and specimens from being over loaded.

Make

Option in Reference Section of QTest that allows user to create a new reference material. This creation process includes the naming of the material, the input of the upper, lower and target values for the material, and entering of a brief description or comment. This information will be stored and can be recalled anytime in the future.

Markers

Letters or numbers placed on the test curve designating critical areas of the curve. The placement of these markers will effect the results and calculations. Depending upon the attribute set for each marker, it will be fixed, hidden or moveable. By moving markers human judgment can be introduced in the determination of the test results. Two types of markers can be set for each test method, required and optional.

Maximum Fiber Stress

Maximum tensile or compressive stress in a homogeneous flexure or torsion test specimen. For a specimen loaded as a simple beam at its midpoint, maximum fiber stress occurs at mid-span and for rectangular specimens may be calculated by the formula:
$S = 3PL/2bd^2$
S is the maximum fiber stress; P, load; L, span; b, width of beam; and d, depth of the beam.

Messages

Set while defining a test method. This information includes up to four lines of text to be displayed on the start of test page, up to a fifteen line description of the test method, and the units to be displayed in the machine set-up portion of the program.

Method

Allows user to select the type of test to be performed. The following is a list of master methods:
Tensile
Flex
Compression
Peel
Tear

Through the Define function, test methods may be created. Each method will be a subset of one of the above masters and can be tailored to satisfy a unique testing application. The Method function will allow the operator to first choose the standard to be run and then present a list of the methods defined for that standard.

Modulus

Alternate term for modulus of elasticity, often used in connection with rubber.

Modulus of Elasticity

Rate of change of strain as a function of stress. The slope of the straight line portion of a stress-strain diagram. Tangent modulus of elasticity is the slope of the stress-strain diagram at any point. Secant modulus of elasticity is stress divided by strain at any given value of stress or strain. It is also called stress-strain ratio. Tangent and secant modulus of elasticity are equal up to the proportional limit of material.

Depending on the type of loading represented by the stress-strain diagram, modulus of elasticity may be reported as: compressive modulus of elasticity (or modulus of elasticity in compression); flexural modulus of elasticity (or modulus of elasticity in flexure;

shear modulus of elasticity (or modulus of elasticity in shear); tensile modulus of elasticity (or modulus of elasticity in tension); or torsional modulus of elasticity (or modulus of elasticity in torsion). Modulus of elasticity may be determined by dynamic sample or specimen, depending on the area of the program.

Offset Yield Strength

Arbitrary approximation of elastic limit. It is the stress that corresponds to the point of intersection of a stress-strain diagram and a line parallel to the straight line portion of the diagram. Offset refers to the distance between the origin of the stress-strain diagram, and the point of intersection of the parallel line and the 0 stress axis. Offset is expressed in terms of strain (often 0.2%).

Operator ID

Login name or password used to enter program. These I.D.s, or names, are set along with the associated privileges in the Names option on the main page.

Optional Marker

Letters or numbers that can be placed on the test curve in specific locations in addition to those which are required. These markers may then be used in calculations allowing for human interpretation to be reflected in the test results. Depending on the standard in use, these optional markers may be set to appear at the midpoint of the curve, at the point of first tear, at a specified load, elongation, stress, or strain, etc. The attributes of these markers can be defined as Moveable, Hidden or Fixed, which will determine if the operator can move the markers from their initial locations. The letter or number that will represent the markers, known as the marker code, can also be set.

Output

Option on main page that allows user to obtain information about data collected in various formats. The layout of the information, samples to be included, type of report, and destination of the report can all be selected. A report can be sent to the display for review, to the printer, or exported to a disk file.

Peak Slope-Load

One type of required calculation procedure used to determine the primary slope of a test curve. Finds the maximum slope of the curve up to a given load point defined by the user. This procedure also uses a tolerance and segment length set by the user.

Peel Strength

Measure of the strength of an adhesive bond. It is the average load per unit width of bond line required to part bonded materials where the angle of separation is 180 degrees and separation rate is 6 in/min. (ASTM D-903).

% Strain

Optional calculation based on strain information and will take slack into consideration if slack compensation is active. (% strain = strain*100)

% Reference

Shown as last column on Results page. Calculates percent difference between specimen values and sample statistics to the reference material target values. A reference material must first be selected before calculations are performed. If the specimen's numerical result is less than the minimum value of the reference material, then the % reference value will be shown in a green colored box. If the specimen result is greater than the maximum reference, value then the % reference value will be shown in a red colored box.

% Drop/Elongation

A procedure for the required calculation of break. Determines the break point (after test) by finding a point where there is a given percentage drop in load per specified elongation.

% Drop from Peak

A procedure for the required calculation of break. Determines the break point (after test) by finding a point where there is a given

percentage drop in load from the recorded peak load.

Plastic Deformation

Deformation that remains after the load causing it is removed. It is the permanent part of the deformation beyond the elastic limit of a material. It is also called plastic flow and plastic strain.

Plotter Port

Communications channel across which the computer will interface to a plotter. This can be set to COM 1 - COM 4 or None, designating the RS-232 Asynchronous serial interface to utilize. The plotter port is selected as part of the Computer Configuration within The Environment Option on the main page.

Pre-Load Method

Type of slack compensation procedure found in Required calculations. Designates the slack to be that region of the test curve prior to a user specified “pre-load.” All measurements of extension/elongation/strain will be taken in reference to this point. This type of method is most often used when testing films, filaments, and fibers.

Previous

Decrements to the prior sample or specimen depending upon the context of its use. If used when in Review/Sample, the prior sample that exists in the directory for that Standard will be displayed. In Review/Specimen, Previous will decrement the specimen number being reviewed in the selected sample.

Primary Slope

One of the required Calculations. Used to determine the initial, steepest, straight line portion of the test curve. Used in calculation of modulus and in the Slope Method calculation for Slack compensation. Required Markers Modulus Begin and Modulus End will be placed at either end of the Primary Slope Region.

Processing

Highlighted message that occasionally appears in the lower right hand corner of the display screen. Message is present while computer is calculating data and/or processing other types of information.

Reference

Allows operator to select, create, edit, set-up or view a “Reference Material” for the currently selected test type. A reference material will be a collection of data manually input, against which future data will be compared. Various functions within Reference will allow materials to be named, edited, viewed, and stored for later retrieval and comparison.

Reject

Option after test that allows operator to delete, or “throw away,” unwanted test data. Can only be used to delete data of “just completed” test. Usually used when test is improperly run or terminated early.

Required Calculations

Calculations that must be performed by the system regardless of the type of test run. These calculations determine how such things as Stress, Strain, and Area should be calculated. Required Calculations also provide procedures used for determining slack, modulus, yield, and break. All other calculations (optional), are dependent upon these Required Calculations. The type, or procedure, for each required calculation may be selected through the DEFINE function.

Required Markers

Character, letter, or number that will appear on the test curve representing critical portions of the test curve. These essential marker positions will be calculated, regardless of the type of test performed and are based upon the Required Calculations. The Required Markers include the Break and Yield Points, Modulus Begin and End Points. The character to be displayed and the

associated attribute, moveable, hidden, or fixed, may be set as part of the define options.

Return Point

Place where crosshead will return to at the conclusion of a test. Usually set to the zero or origin point, but may be set elsewhere. Always set in reference to the defined Zero Point. Useful in compression when it is desirable to return the crosshead to a point above that at which the test begins for easier specimen loading.

Reset

Found as a function in the SENSORS option on the Main Page. When selected, reset will eliminate previous calibration data for a particular sensor. This will ensure that a calibration is not biased by the information obtained during previous calibration procedures.

Run

Begins a test. This will include the display of a real-time curve and the starting of the crosshead.

Sample

A group of specimens; usually identical in material, size, and structure, tested together so statistics describing their performance qualities may be obtained.

Sample Naming Inputs

A sample name is the key under which data will be stored. The sample name may not contain more than 20 characters. The field may be named and the length set in Define.

Segment

Also known as a move profile, it is used to define how the test will be executed. Segment items include the direction and termination point of the crosshead movement and the action of

the crosshead upon completion of the segments.

Sensors

An analog transducer device used for measurement. These devices include load cells, extensometers, and strain gages. The Sensor option on the main page will allow the user to define and store the information and characteristics of each device that will later be necessary for their calibration and use. These transducers will be named and can be added to or deleted from the sensor library.

Slack

Beginning portion of test curve, usually having little or no load, that is disregarded when calculations are performed. Associated with the tightening of gripping mechanisms and/or the poor loading of specimen in grips, Slack can be calculated in a variety of ways and is dependent upon the type of material being tested.

Slack Compensation

Required calculation that, when set to active, effectively will eliminate the slack portion of the curve when calculating test results. One of two “Active” methods may be selected when a test method is being defined:

1) Pre-Load Method - eliminates that area of the curve below a certain load level.

2) Slope Method - eliminates that portion of the curve prior to the X-intercept of the Primary Slope line.

Slope % Segment Length

Minimum length of the test curve that should be used when calculating the peak, or primary, slope. This is necessary to avoid finding unrealistically high values of slope over very short distances. This can happen when electrical noise is present, or materials or grips behave in an abnormal manner.

Slope Load

Load point that is Input when the required Calculation Primary Slope Procedure is set to Peak slope-Load. In this procedure, the peak slope before a user-selected load point will be determined. Slope-Load is that load point.

Slope Method

Type of Slack compensation procedure found in required calculations. Designates the slack to be that region of the test curve prior to the X-intercept of the line of Primary Slope. This method is used for most testing involving plastics, metals, and composites. All measurements of extension/elongation/strain will be taken from the point of this intercept.

Slope Tolerance

Input necessary in Primary Slope Required Calculation. While searching for the Primary slope, the slopes of contiguous sections of the test curve are calculated. These slopes are compared to one another. The primary slope is found when the slopes do not vary by more than the tolerance amount.

Specimen

A single piece of a material that is tested. One or more specimens will make up a sample.

Specimen Graph

Test curve of an individual specimen. Can be a load or stress versus elongation, strain % strain, or time display. The units for each axis are selectable.

Specimen Inputs

Input Values for a test that may change for different specimens in a sample. Usually reserved for specimen dimensions. The attribute for each input may be set so that the value is required to be entered by the user before or after the test, so that the user has the option of entering it before or after the test, the value stays fixed or the value is not displayed at all. The minimum,

maximum, default, and number of decimal places for each input may also be set in the Define Section.

Specimens Per Sample

Found in the Test-Flow Control section of the Define Option. This allows the maximum number of specimens allowed in each sample tested to be set.

Set Reference

Automatically selects a pre-defined “Reference Material” for a given test method. When The operator selects the test method, the proper “Reference Material” will automatically be selected.

Stats

Calculates the statistics of the Sample or across Samples. Tagged specimens will be excluded from the statistical calculations. The statistical display normally shows the mean, minimum, and maximum value along with the standard deviation and % coefficient of variation. Cross sample statistics arc found in the Output/Report Option.

Start of Test Messages

These are messages that will be placed on screen at the beginning of a test. They can be created by you and can appear in either normal, highlight or reverse video. They are created in Define/Messages.

Stress

Engineering related term interrelating the load and cross sectional area of the specimen. Normally described as the load applied to a specimen divided by the perpendicular cross sectional area. Flexural stress is slightly different in that it is a function of the span, width, and depth of the specimen.

Strain

Engineering-related term that describes the elongation or

compression of a material in relation to its original length. Normally described as the change in length divided by the original length (elongation/gage length). Flexural strain is slightly different in that it is a function of the span and depth of a specimen.

Tagged

Tagged specimens are excluded from the statistical calculations and average curves functions. You may tag/untag specimens as often as you wish to temporarily hide them from the statistical calculations.

Test Inputs

Inputs that effect the real-time test while in progress. These include primary and secondary speeds, break sensitivity, load and Extension limits. Testing is segregated into two distinct families, real-time and post-test, Performs all the calculations and places markers in their appropriated positions after the test is completed. “Real-time” uses the test inputs to determine speeds and bleak criterion while the test is in progress.

Test Flow

Controls or modifies the execution of the test flow. Found in Define/Execution, test flow can be used to change the functions that the operator will perform. Functions such as “Auto Raw Data Save,” “Auto Specimen Print” and “Discard on Reject” can be modified using this option.

Transducer

Device used to convert one form of energy to another. Typically the energy conversion is from load to volts (load cell) or from displacement to volts (extensometer).

Trend

Output option that allows the user to perform SPC/SQC type analysis on sample result properties, and their deviation through time.

Untag

See tag. Untag will include previously tagged specimens in the Sample Statistics and average curve calculations.

Utilities

Performs various file management functions. Save/Delete/Retrieve methods, reference materials and test data to or from diskette or file.

View

An option in the Review Section that will allow movement from the Sample level to the Specimen level. When analyzing a Sample, use the view option to analyze a particular Specimen within that sample. Once on the specimen level, any changes incurred will only effect that particular specimen.

Window

Allows the user to select the scale and the units for viewing the curve. Scale choices include load or stress for the y-axis, Elongation/Strain/% Strain/ time for the x- axis. The appropriate units can also be selected for each scale.

Yield Tolerance

A calculation input used for the required calculation of a zero slope yield point. The yield tolerance is a percentage increase from zero slope used in the calculation for the placement of the yield point. Graphically, the curve may look flat, however, numerically, the data may not fit the requirements for zero slope. An input “tolerance” value allows the placement of the yield point at a position where the curve flattens to near zero slope.

Yield % Segment Length

A calculation input used for the required calculation of a zero slope yield point. The yield % segment length determines the amount of curve to be used in the search for the zero slope yield point. The % segment length is used in an algorithm that performs successive least-squares curve fits until the zero slope

point is found.

Zero Slope

A procedure for the required calculation of yield point. Determines the yield point by finding the first point on the curve where the slope becomes zero. This can be adjusted by using the yield tolerance value in cases where zero slope is not encountered.

Appendix B: QTest Calculations

Definitions

%Drop

A percentage decrease in the value of a variable (typically load). %Drop is measured as the relative decrease in the value of the variable from its present value. For example, if the present value of load is 100 lbf, a %drop of 10 would represent a decrease in load to 90 lbf.

%Tolerance

A percentage range of acceptable tolerance in value of a variable measured relative to a specified target value. Used to calculate Required Calculation Primary Slope.

%Segment

Specifies a section of load-elongation curve to be used for calculation purposes. In actuality, the segment is a percentage block of the load-elongation raw data arrays. Used to calculate Required Calculation Primary Slope.

Marker

A symbol used to mark a point of interest on the graphical representation of the load-elongation curve.

Note: **The last two definitions refer to the load-elongation curve. Note that this implies the stress-strain curve as well since this former curve is created from the load-elongation arrays by dividing load by area and elongation by gage length. In the case of flex testing, stress and strain are calculated with more complex formulas, however, these curves are created from formulas that are based upon load and elongation.**

Stress Conversion Factor

Normally stress is calculated as load/area. This is not the case for flexural testing, but QTest provides the necessary choices for correct stress calculations in flex. The Stress Conversion Factor is a number that when multiplied times the load, results in stress. Using a multiplication factor is simpler from a programming standpoint and decreases the chance of floating point error caused by zero division.

Strain/Elongation

Elongation

In QTest, you have a number of options for sources of elongation data:

- Crosshead Displacement
- Extensometer/High Elongation Extensometer
- Pipper

Choose what type of device will be used for testing.

Strain

Strain in QTest is the elongation value divided by the gage length of the specimen. This is commonly known as engineering strain. Once again, strain for flex testing is a different formula but is selectable in QTest for D790 three and four point testing.

Inputs

Gage Length - The original length of a specimen. Note that most specimens, especially some types of tensile specimens, do not elongate uniformly over the entire length. The gage length is often considered the original portion of a specimen that will experience elongation.

Algorithm

Strain = Extension/Gage Length

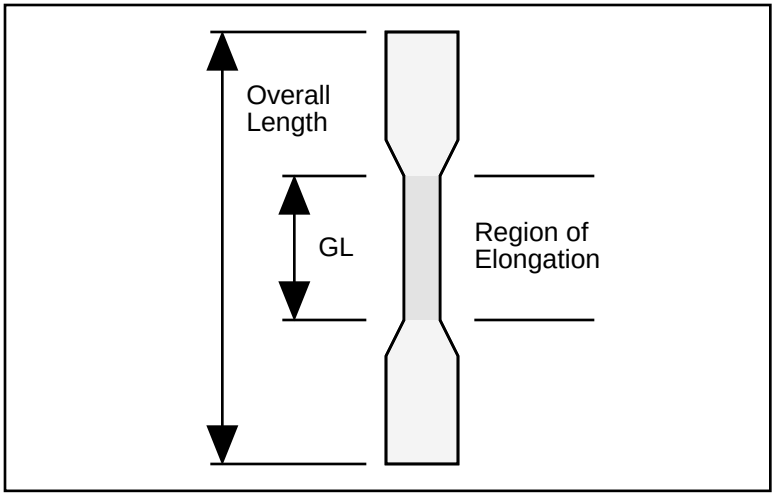


Figure B-1. Strain and Elongation

Break Point

QTest provides a number of different algorithms for determining break.

%Drop/Elongation Method

This algorithm will be used with most rigid and semi-rigid materials. The algorithm requires the determination of the first point on the load elongation curve after peak where the load drops more than a specified percent per a specified elongation.

Inputs

%Drop - The specified drop in load between the beginning and end of a comparison segment.

Drop Elong. - The elongation value in either inches or mm in which this drop in load must occur.

Algorithm

Start at the peak load index.

Increment by one data point (called index point). If the difference in elongation between the peak load (anchor point)

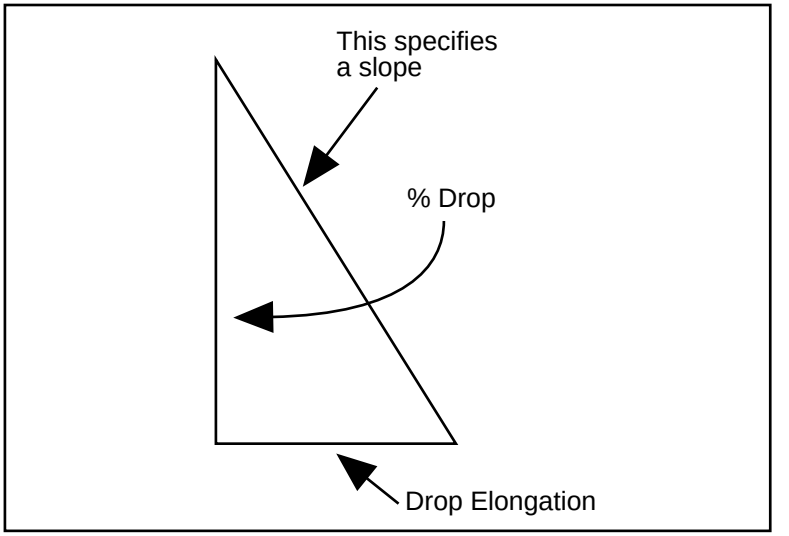


Figure B-2. Drop Elongation

and the current data point (index point) is greater than the drop elongation, then check for a %drop in load. If the drop in load is not greater than % drop, increment the index point one data point and try again.

If the drop in load between the anchor point and the index point is greater than the %drop elongation, then a break has been found. Otherwise, increment the anchor point by one and start over.

If no break is found by the last datapoint, then show stars at the result.

Tuning

You can change the values of the inputs, therefore, affecting the algorithm. Below are two common cases and how to cure them.

Break Marker Too Far Up On Curve

- Drop Elongation Too Large - Chances are the drop elongation is too large. Try reducing this value and AUTOCALCing. A number of tries may be necessary.

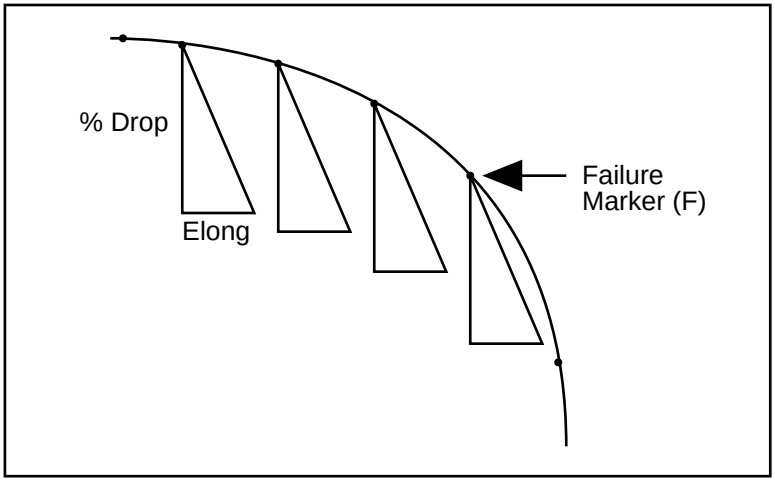


Figure B-3. Figuring Drop Elongation

- %Drop Incorrect - The %drop may be too small. Try slowly increasing this value and watch for a change.

Note: Change only one input at a time so the effects of a change can be attributed to one change.

Result Shows Stars - In this case, the algorithm went down the curve and did not find one case that matched the inputs.

- Increase %Drop Elongation - Try boosting the value of %drop elongation in order to “loosen” the algorithm.

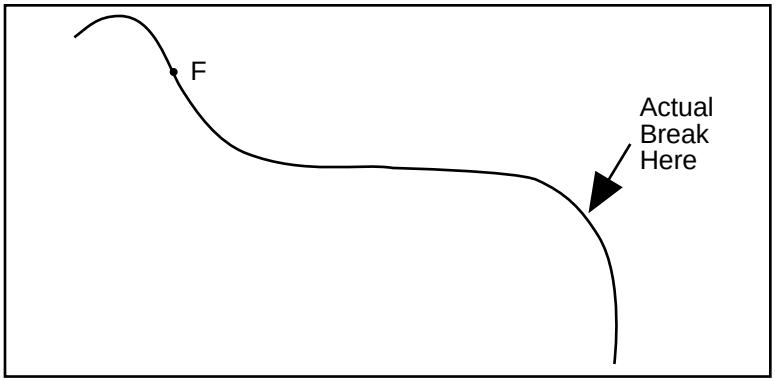


Figure B-4. Drop Elongation Too Large

- Decrease %Drop - f increasing the previous input does not help, try decreasing the %drop in order to further loosen the algorithm.

Recommended Values

%Drop 10-20%

%Drop Elongation 0.02in-0.002in

% Drop From Peak Method

This algorithm is useful for some elastomeric, fibrous or fabric-type materials which do not exhibit well defined or sharp break points. Instead, the load drops off gradually or in a step-wise fashion. The break point is defined as the first point after peak load at which the load drops by a value greater than or equal to the pre specified amount from the peak load.

Inputs % Drop

The specified drop in load from peak load.

Algorithm

Start at peak load

Move down the curve and compare that datapoint's load with peak load. If the difference is greater than or equal to the %drop then a break is found.

If after moving down the curve from peak and no break is found, report stars.

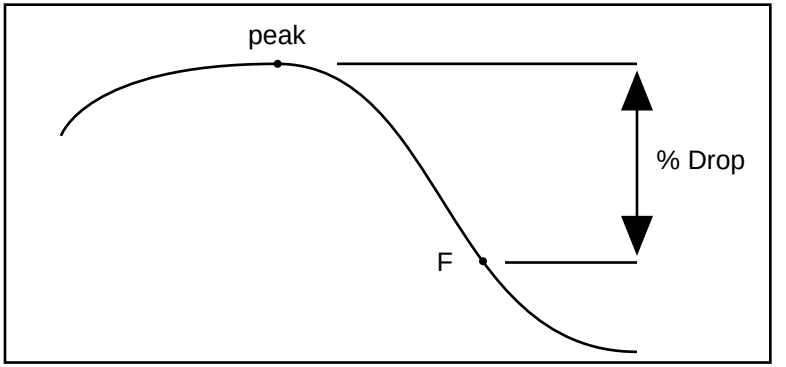


Figure B-5. % Drop Elongation

Tuning

Stars Reported - If the calculation shows stars for break, then the %drop is too large. Reduce this value until break is found.

Typical Values

%Drop 5-10%

Tricks - Sometimes users like to report the peak load as the break load. In this case, select this method for break and specify a 0% drop from peak. Break is then put a peak load.

The other option is to report peak values as break. The danger in this option is that some other calculations need a break marker. In particular the offset yield calculations need the break marker to make sure the user has not specified an offset larger than the length of the curve.

Load Absolute Method

This algorithm is useful for soft, fibrous or fabric-type materials which do not exhibit well-defined or sharp break points. Instead, the load drops off gradually or in a gradual or step-wise fashion. The break point is defined as the first point after peak load at which the load drops below a pre-specified absolute load.

Inputs

Break Load - The load value after peak that is designated as breakload.

Algorithm

Start at peak load

Step down the curve point by point until the load is equal to or less than the break load. Once the point is found, place a break marker there.

Report stars if end of curve occurs before break is found at the results.

Tuning

Stars Reported - Increase Break Load - Simply increase the break load value so the point is found earlier.

Yield Point

The definition of yield varies from person to person, lab to lab. QTest provides two methods of determining the yield of a curve.

Note: **Yield is a somewhat arbitrary term and definition. For some, yield is the first point that a material deviates from linear behavior (sometimes called proportional limit). For others, yield is a point of uniform elongation (elongation with no increase in load). QTest provides two means of reporting yield. Find the method that is suitable for your lab's testing.**

Note: **The ASTM definition of yield is the first occurrence of an increase in strain without an increase in stress.**

Zero Slope Yield Method

The zero-slope yield point is the point at which the stress-strain curve becomes "flat." QTest provides this method that finds yield by measuring the relative difference in slope between a section of curve and zero-slope.

Inputs

Yield % Segment - This value specifies the section of curve to be

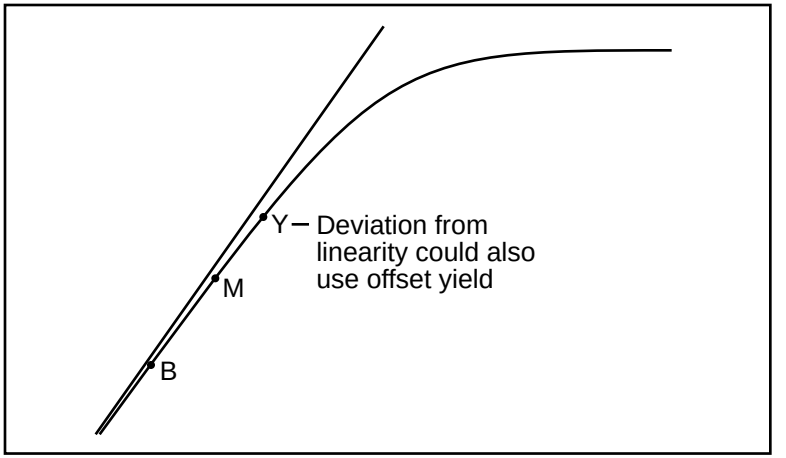


Figure B-6. Computing Yield Point

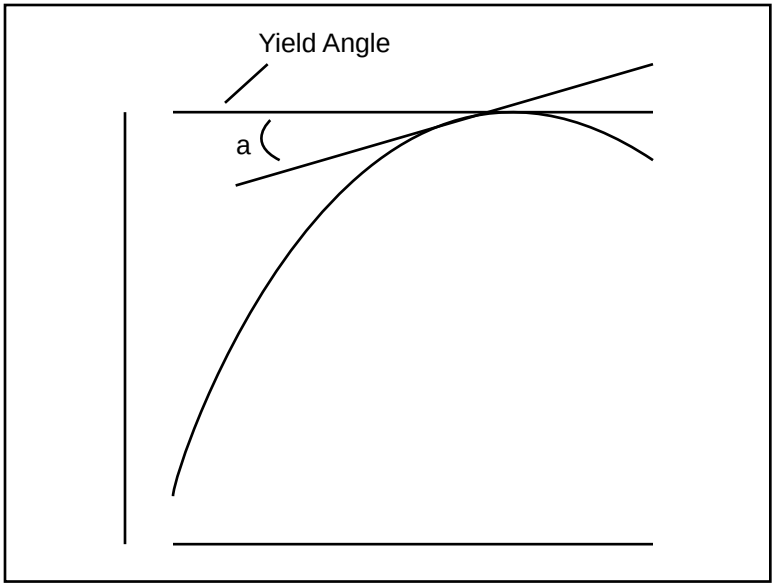


Figure B-7. Zero Slope Yield Method

used in creating a straight line that represents the slope of that particular section.

Yield Angle - This value specifies the allowable difference between the slope for a section of curve when compared against zero-slope normalized to maximum stress and maximum strain.

Algorithm

Work Up Curve First - Starting from the threshold index (2% of load cell capacity), determine the slope of a line for a section of curve of size yield % segment length. If the slope angle is less than the yield angle, then a yield has been found. Otherwise, increment the segment length and examine the next block of data.

Find Peak Load - Go back to the block in the previous part that had a slope that differed less than yield angle. Find the peak load in this section and call that yield.

No Yield Found - In this case, place the yield marker and the peak load on the curve.

Tuning

Yield is Reported as Stars - This means the algorithm could not find a yield. Try changing the yield angle to “loosen” the algorithm. A yield angle of zero can cause problems in some cases. Try increasing this value.

Another culprit might be specifying a yield % segment length that is so large it destroys the sensitivity of the algorithm - i.e., creating best curve fits for huge sections of curve. Try the yield angle first.

Recommended Values

Yield % Segment Length	10-20%
Yield Angle	0%

Peak

This method is quite simple — make yield point equal to the peak load point.

Inputs - None

Algorithm - None

Tuning - None

Note: This method is simple and easy. It is particularly useful for curves with a break at peak load. Often QTest users wish to report this point as yield.

Primary Slope

Peak Slope (Young’s Modulus)

QTest provides a robust algorithm for determining peak slope. The user has the choice of three slopping and starting variations of the same algorithm. A basic knowledge of this algorithm is all that is needed to effectively use these variations.

General Algorithm

Inputs

Minimum Slope Load - This value instructs the algorithm to begin looking for peak slope after this load.

Slope % segment length - This percentage of the total curve is the block of data used in the algorithm. In essence, it is the length of The “yardstick” or “straight-edge” that is placed against the curve when comparing for peak slope.

Slope Tolerance - Once the peak slope is found, this value determines how much variation can occur between the modulus line and the peak slope.

Note: The peak slope of a curve is usually a very small region depending upon slope % segment length. This slope tolerance value allows the algorithm to expand this region by moving The “B” and “M” markers outwards.

Marker “B” - This marker signifies the beginning of the modulus region on the curve.

Marker “M” - This marker signifies the end of the modulus region on the curve.

Algorithm

Find Peak Slope First - The algorithm is relatively simple. Using a collection of data points the size of the slope % segment length, the algorithm successively moves this “block” up the curve and determines a slope for the data in each block. By completing a best curve fit for each block, the algorithm notes the block with peak slope and plants the “B” and “M” markers at the beginning and endpoints of this block.

Expanding Peak Slope - As mentioned previously, the “B” and “M” markers will usually be relatively close together when first planted (actually one slope % segment length apart). In order to report a peak slope that includes more curve, these two markers need to be expanded in opposite directions. The slope tolerance governs just how far apart the markers are moved.

As the markers are moved apart, a new best curve fit is generated for the data between them. This line is compared with the original peak slope line. Once the new line deviates more than the specified tolerance from the original peak slope, the algorithm stops and plants the “B” and “M” at their respective previous positions.

Tuning

Markers “B” “M” Too Close Together - One solution is to enlarge the value of the slope % segment length so the initial peak slope section is larger than it is currently. However, increasing this value too much destroys the sensitivity of the algorithm since this value specifies the block of data used for comparison. A large block will include possible turns in the curve that then will be averaged into a straight line through a curve fitting formula.

The other solution is to “loosen” the slope tolerance value, hence, allowing the markers to expand further along the curve. This is preferred to the first method although the two values are of equal importance.

Markers “B” & “M” Too Far Apart - For this case, do exactly the opposite a discussed above.

Recommended Values

Minimum Slope Load	11b
Slope % segment length	5-10%
Slope Tolerance	99%

Peak Slope to Yield Method

This first method instructs the algorithm to search the curve for peak slope up to and including the yield point.

Note: This method does not work if a yield point is not found. Yield point was discussed in a previous section.

Inputs

Same as the general algorithm; however, yield must be found.

Algorithm

Same as the general algorithm. The algorithm only searches for peak slope between the minimum slope load and the yield point.

Tuning

See discussion for general algorithm.

Peak Slope to Load Method

This method is the same as the previous method though, instead of searching for peak slope between the minimum slope load and yield, this searches for peak slope between minimum slope load and maximum slope load.

New Inputs

Maximum Slope Load - This value specifies the maximum load value the algorithm will use when searching for peak slope.

Algorithm

Same as above with search only occurring between specified loads.

Tuning

Same as above.

Note: **An improperly specified maximum slope load can cause havoc with The algorithm by limiting the search for peak slope to a region smaller than the slope % segment length. The algorithm still works, but may not truly represent the modulus.**

Slack Compensation

Slack compensation is a means of accounting for pre-load or slack in the specimen curve. All elongation values and results, depending upon elongation, are recalculated according to the new curve that has slack compensation active. The QTest Software provides two methods for slack compensation.

Note: **By activating slack compensation, all values of elongation/strain will be corrected. Although the graph of the data will reflect this compensation, the raw data will not be changed. This allows for later suppression of slack compensation.**

Note: **Energy calculations are not affected by slack compensation.**

Slope Method

This method uses the modulus line. Where this line intersects the X axis becomes zero elongation. The difference between this value and the original zero will be subtracted from all values of elongation.

Inputs

None.

Algorithm

The intersection point of the modulus line with the X-Axis becomes zero elongation.

Tuning

None.

Pre-Load

This method needs an input that designates preload value. All data Method with loads less than this value is ignored. The first data point with a load equal to or greater than the preload becomes zero elongation. This is often used for films and fibers.

Inputs

Slack Preload - This value specifies the first load value that will be zero elongation.

Algorithm

All data with loads less than this value is ignored. The first data point with a load equal to or greater than the preload becomes zero elongation.

Tuning

None.

Offset Yield

In order to calculate any offset values, the following conditions must be met:

Primary Slope (Modulus) exists

Break Point exists

Offset Value is specified

You can make offset yield active or inactive.

Inputs

Offset - This value specifies the offset amount from the modulus line measured in percent strain.

Algorithm

- Find Peak Slope - Find the primary slope and note the intersection of that line with the X-Axis.
- Indent from Intersection - Indent outwards from that intersection by the offset amount. Remember that the offset is measured in percent strain.
- Draw Parallel Line - From the offset elongation point (i.e., intersection of modulus/X-Axis plus offset), draw a line parallel to the modulus line.
- Note Break Point - If this offset line does not intersect the curve because the offset is too large, report stars. If the offset line does intersect the curve, that intersection is the point of interest.

Note: This algorithm needs break to prevent a false search for the offset point when a break occurred before that point.

Tuning

If you get stars for any offset calculation check the following conditions:

- Check Modulus - Is there a modulus line on the curve? If not, you must correct this first.
- Check Break - If there is no break found, then the algorithm can't check to make sure the offset value is too large. Try manually planting a break marker or, better yet, correct the break calculation.
- Check Offset Value - Is this value larger than the curve?

Miscellaneous Calculations

Energy

Energy calculations sum the area under the curve up to a specified point (i.e., energy to break). The formula for determining energy is the integral:

$$\textbf{energy} = \sum_{i=a}^{b-1}\{(E_{i+1} - E_i)(L_{i+1} + L_i)/2\}$$

where a = start data point

b = end data point

E = elongation at a data point

L = load at a data point

i = data point

Secant Modulus

Secant modulus is the slope of the stress strain curve between the origin of the curve and some specified point of interest on the curve. Usually, this interest point is a strain point.

Interpolation

In the QTest Software, many calculations are based upon finding a dependent variable at a given value for the independent variable. For example, it may be required to find stress at 5% strain. Since the stress-strain curve is not represented by a mathematical function, but an array of discrete data pairs, the data pair for which strain is exactly equal to 5% may not exist. In these calculations, QTest interpolates between the two adjacent pairs that straddle the desired datapoint.

Appendix C: Calibration Problems

The primary purpose of this section is to describe the interaction of the QTest software with the QTest testing frame. This section will explain some technical details about the frame and how the software interacts with the hardware. For more information about QTest testing frames, call QTest.

Load Cell Calibration

QTest provides a number of different load cells. These load cells are calibrated by either an electronic shunt, or a deadweight hang.

Electronic Calibration

Electronic calibration is what QTest terms autocalibrating. In essence, it is a circuitry test that insures the quality of the load electronics. Note, however, that it is not a true calibration, but is considered a suitable substitute by the materials testing industry. Remember that once a year the load cells in your system need to be officially calibrated (contact your Regional QTest Sales Representative for more details about this service).

SENSORS

The SENSORS information for an autocalibrating load cell must include the following information:

TRANSDUCER NAME:	<arbitrary>
CHANNEL:	LOAD
METHOD:	AUTO
UNITS:	<arbitrary>
FULL SCALE LOAD:	<full scale load>
CALIBRATION VALUE:	<calibration value>

- The TRANSDUCER NAME is arbitrary, although it should be descriptive (i.e., 10001b autocalibrating, 20001b manual).
- The channel is selected using the choice list (F2) key. You

have a choice of LOAD, EXTENS/DXL, or PIPPER.

- Method should be set to AUTO using the (F2) choice list. This field instructs QTest to activate a shunt resistance during calibration.
- The units class is arbitrary, but must be selected from the choice list (F2) key (i.e., you can calibrate a 10001b capacity cell as a 454Kg capacity cell).
- Full scale load is normally the maximum capacity of the load cell.
- Calibration value is the load that the shunting process will duplicate. This value is indicated on the exterior of the load cell. Remember that each load cell has an individual calibration value.

Technical Description

For in-depth details, call QTest. This section gives a general overview.

The load cell is only one part of the load cell circuitry. The load cell plus the QFCC board (QTest proprietary board in the test frame) act in unison to create a circuitry that generates a voltage per load. If the load is tensile, the system generates positive voltage. If the load is compressive, the system generates negative voltage. The QMCC card in the computer then “talks” to the

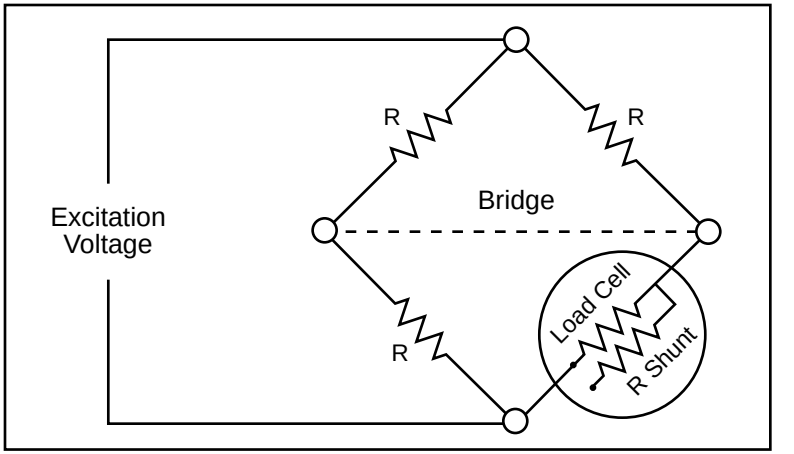


Figure C-1. Automatic Shunt Calibration

QFCC to convert this analog voltage into digital for use in the software.

The load cell acts as a variable resistor in one branch of a Wheatstone Bridge. The other three legs are equal resistance. When there is no load, all four sides of the bridge have equal resistance, thus, creating zero voltage. Any change in the cell's resistance causes a voltage across the bridge. This voltage indicates load since the cell changes resistance under load.

The autocalibration process causes a shunt relay to close, hence replacing the load cell with a finite resistance. This then causes the bridge to generate a set voltage. This voltage is then detected in the software. Because the shunt resistance is nearly always the same, the voltage from the bridge is the same.

Accounting for Variation

The description before describes in loose detail the autocalibrating technology. One flaw in the description is that the shunt resistance repeatedly yields identical bridge voltage. This is indeed not the case, but the variation is slight and QTest accounts for this variation. When you autocalibrate, QTest notes the difference between the actual slope of the load vs. voltage line, and then corrects this to match the desired slope. This correction factor is saved in the SENSORs database and is referred to after each successive calibration.

Industry Standard

This electric process greatly simplifies load cell circuitry verification and has become the industry standard. Please remember, however, that load cell certification needs to occur once a year. QTest offers a service plan that includes this certification. Contact your QTest Sales Representative.

Manual Calibration

Manual calibration of QTest system load cells accomplishes the same task as autocalibrating, however, it is done by suspending a deadweight from the sensor to duplicate a desired load.

SENSORS

The SENSORS information for manually calibrating must include the following information:

TRANSDUCER NAME:	<arbitrary>
CHANNEL:	LOAD
METHOD:	MANUAL
UNITS:	<arbitrary>
FULL SCALE LOAD:	<full scale load>
CALIBRATION VALUE:	<deadweight value>

- The TRANSDUCER NAME is arbitrary, although it should be descriptive (i.e., 10001b autocalibrating, 20001b manual).
- The channel is selected using the choice list (F2) key. You have a choice of LOAD, EXTENS/DXL, or PIPPER.
- Method should be set to MANUAL using the (F2) choice list. This field instructs QTest not to activate a shunt resistance during calibration.
- The units class is arbitrary, but must be selected from the choice list (F2) key (i.e., you can calibrate a 10001b capacity cell as a 454Kg capacity cell).
- Full scale load is normally the maximum capacity of the load cell.
- Calibration value is load that the deadweight will duplicate.

Differences from Electron Shunt

The predominant difference is that instead of an electron shunt to generate a voltage, a deadweight is used to generate a desired load. Once again, the software makes amends for differences between real vs. desired.

Typical Calibration Problems

This section describes typical calibration problems starting with most simple to the more complex. If you try the following, and the calibration error persists, call QTest for help.

Often, the indication of a faulty calibration is the message "Warning, Calibration Value Deviates XX% from Expected Value!" Consider the following:

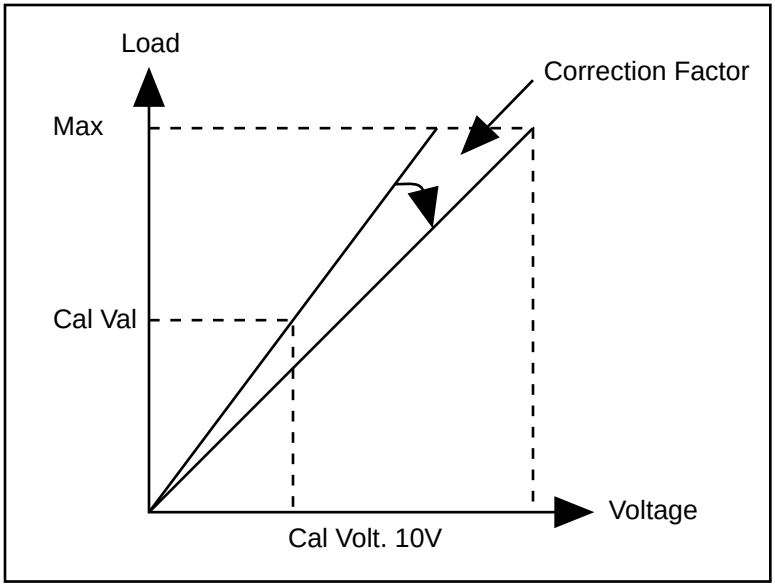


Figure C-3. Calibration Value

Connections

Check to make sure all connections are secure.

- Is the load cell cable connected to the cell?
- Is the load cell cable connected to the QFCC at the port labeled LOAD?
- Is the QFCC cable connected to the QMCC?

Physically reconnect these cables to insure the integrity of the connection.

Selection

- Did you correctly select the sensor from the list of load cells?
- Is the connected load cell the correct load cell? (Did you change cells, but forget to calibrate the newly installed cell?)

Note: **Please refer to the Calibration section of the QTest Customer Support Guide for additional help on auto and manual calibration.**

Calibration

- Is the load cell upside down?
- Are more than grips and fixtures attached (i.e., is there a load)?

Machine Differences

This section describes some features of QTest systems that might not be obvious.

Polarity

Load cells on QTest systems generate positive load in tension and negative load in compression when they are mounted correctly. QTest software contains a feature that allows you to change the polarity of the load signal in the software, thus, resulting in positive load while under compressive load, or conversely, negative load when in tension.

This polarity switch is in MANAGE-DEFINE-EXECUTION-CONFIGURATION-LOAD-DIRECTION. If you specify DOWN and the cell generates negative load, the switch will make this load positive (i.e., DOWN means to multiply the current load by -1 factor. Conversely, UP means to multiply the current load by 1 factor).

Load Cell Amplifiers

The QTest load frames contain the sensor amplifiers. As long as the system is connected to an outlet and the load cell light is on, the amplifiers will be powered. This fact, therefore, negates load cell warm-up time to nearly zero.

Limits & Emergency Stop

QTest employs a number of systems to help users prevent unwanted damage to their equipment. Although you assume responsibility for the operation of the testing equipment, QTest uses a combination of hardware/software limits to help prevent the most common damage.

Emergency Stop Button

The emergency stop button is a feature on all QTest machines. Pressing it results in the crosshead being disabled. Pulling the button out will reactive the machine, allowing for further testing.

If in the PRETEST menu or the (F9) screen you see both limits active or an emergency stop indication, then reset the stop button.

Limit Sensors

The limit switches stop the crosshead in the direction it is moving (i.e., if the crosshead is moving up then the sensor on the top of the crosshead will stop the crosshead when it comes near the limit switch). Likewise, the converse is true when the crosshead is moving down (i.e., the lower sensor will stop the crosshead).

Always be certain to adjust the limit stops in the switch track before you test. It's very easy to forget this and very costly to replace damaged equipment. Whenever anyone changes their load cell and fixtures, the limit stops need to be reset.

Load Cell Protection

The software will generate a stop command the instant the load is greater than or equal to the load cell capacity. However, if the crosshead is moving fast, the stop may not be completed before the damage has occurred.

Always remember to calibrate a load cell as soon as the operator installs the device. This will then inform the software which load cell you are using and what its full scale value is.

Appendix D: ASCII File Formats

This appendix details the file format of an ASCII file exported from QTest. This information is supplied to assist you in setting up a spreadsheet program that will allow you to further analyze the QTest data. QTest can export the results for a collection of samples (Collection Export). Files should be imported into your spreadsheet program using the Numbers option of your spreadsheet. That is, alphabetic information will be delimited by quotation marks, while numeric information will be separated by blanks.

Collection Export File Format

For a collection export, the first five rows provide the method, property titles and units. Information is only exported for non-hidden optional results. The remaining rows provide the numeric data, each identified by the sample name and specimen number in columns 1 and 2, respectively. There will be a worksheet row for every specimen in each sample specified by the collection. Numeric results that have not been calculated will be represented by a string of asterisks (*). An example of the file formal is shown in Figure D-1.

```
"Test Method:""TENSILE D638"

"Sample""Spcmn""Width""Thickness""Peak Load""Peak Stress""Break Stress""Break Elong.""Yield Stress""Yield
Elong.""Tangent Modulus"
"I. D."" No.""In""In""Lb""PSI""PSI""%""PSI""%""PSI"

"ABS-4""  1*"    0.500     0.125   1581.02   25295.6   14584.8     178.6   25295.6      58.1    116308
" ""  2 "    0.500     0.125   1673.50   26775.3   15438.0     189.1   26775.3      61.5    116308
" ""  3 "    0.500     0.125   1507.44   24118.4   13906.1     170.3   24118.4      55.4    116309
" ""  4 "    0.500     0.125   1701.87   27229.1   15699.7     192.3   27229.1      62.5    116308
" ""  5 "    0.500     0.125   1581.59   25304.7   14590.1     178.7   25304.7      58.1    116308
" ""  6 "    0.500     0.125   1479.65   23673.7   13649.7     167.2   23673.7      54.3    116308
" ""  7 "    0.500     0.125   1738.18   27810.1   16034.7     196.4   27810.1      63.8    116308
" ""  8 "    0.500     0.125   1590.48   25447.0   14672.1     179.7   25447.0      58.4    116308
"ABS-5""  1 "    0.500     0.125   1507.44   24118.4   13906.1     170.3   24118.4      55.4    116309
" ""  2 "    0.500     0.125   1701.87   27229.1   15699.7     192.3   27229.1      62.5    116308
" ""  3 "    0.500     0.125   1599.93   25598.2   14759.3     180.8   25598.2      58.8    116308
" ""  4 "    0.500     0.125   1497.99   23967.2   13818.9     169.2   23967.2      55.0    116308
" ""  5 "    0.500     0.125   1692.42   27077.9   15612.5     191.2   27077.9      62.2    116308
"ABS-6""  1 "    0.500     0.125   1711.33   27380.5   15787.0     193.3   27380.5      62.8    116308
" ""  2 "    0.500     0.125   1609.39   25749.5   14846.6     181.8   25749.5      59.1    116308
" ""  3 "    0.500     0.125   1507.44   24118.4   13906.1     170.3   24118.4      55.4    116309
" ""  4 "    0.500     0.125   1701.87   27229.1   15699.7     192.3   27229.1      62.5    116308
" ""  5 "    0.500     0.125   1599.93   25598.2   14759.3     180.8   25598.2      58.8    116308
" ""  6 "    0.500     0.125   1497.99   23967.2   13818.9     169.2   23967.2      55.0    116308
" ""  7 "    0.500     0.125   1711.33   27380.5   15787.0     193.3   27380.5      62.8    116308
" ""  8 "    0.500     0.125   1711.33   27380.5   15787.0     193.3   27380.5      62.8    116308
" ""  9 "    0.500     0.125   1711.33   27380.5   15787.0     193.3   27380.5      62.8    116308
" "" 10 "    0.500     0.125   1711.33   27380.5   15787.0     193.3   27380.5      62.8    116308
```

Figure D-1. Collection Export File Format

Appendix E: Using a Digital Caliper

QTest allows direct entry of specimen input values, such as specimen dimensions, from an electronic digital caliper or micrometer.

Hardware Installation

The digital caliper or micrometer connects to the computer via a serial port. Refer to your computer's hardware manual to see if you already have an available port, or how to install one, if required. QTest can use a serial port configured to be either COM 1 or COM2. Connect the caliper or micrometer cable to the computer's serial port connector.

Configuring the QTest Software

First, start up QTest and use the Environment selection in MANAGE/CONFIGURE/ENVIRONMENT to invoke the System Setup and Configuration form. Use the cursor keys to highlight the Caliper Port field in the Computer Configuration section. Press F2 to show a list of available COMM ports; select the port which you have connected to the digital caliper. Then, press F10 to save your changes and return to the main menu. Now, go to Define, Specimen Inputs and select one or more specimen inputs for use with the digital caliper.

Select Caliper for the Source field.

For The Caliper mode field, select Minimum if you want the QTest Software to retain the minimum caliper reading. Select Average if you want QTest to calculate the average value of all readings, or Minimum Area if you want QTest to save the value that corresponds to the minimum cross-sectional area.

Operation

When you want to enter a specimen input value from the digital calipers, first activate the Specimen Input form and use the cursor keys to highlight one of the values defined to have Caliper as the source. (The caliper source.) Then, measure the dimension of your specimen and press the Load button on the digital caliper or

micrometer multi-plexor. The compute bell will sound, and you will see the number measured by the caliper reflected on the computer screen. If you have specified the Number of Readings to be more than one, continue to take the additional readings, pressing the Load button each time. After the last reading has been taken, the computer will update the input field with either the minimum or average value of all the readings, as specified. You can enter other dimensions from either the keyboard or caliper, or begin the test. Note that at any time while entering values from the caliper, you can override caliper operation and directly enter a value using the keyboard. This will prevent caliper operation on this field only, until the highlight bar is moved to a different field and then back again.

Appendix F: Error Messages

The following are a list of fatal errors that prevent QTest from executing.

BTRIEVE Record Manager Not Loaded!

The database manager BTRIEVE is not loaded which means QTest can not execute. Check for BTRIEVE.EXE in the QTest directory.

BTRIEVE.EXE not Found!

The database manager BTRIEVE is not found in the QTest directory. Copy this file (BTRIEVE.EXE) from the distribution disks into the directory.

BTRIEVE Record Manager Already Loaded!! Please Re-Boot.

QTest has attempted to reload the database manager into system memory. Simply reboot your computer using a warm reboot (CTRL+ALT+DEL), and run QTest.

Database Init Error!

Due to an unknown reason, QTest can not open this database. Please call QTest immediately. Do not shut off the computer or reboot until receiving further instructions.

Error in Initializing Hardware

When QTest enters the Test Module, it checks and initializes the MCC board . QTest could not initialize the interface hardware.

Check:

1. Machine Type in Environment QMCC.
2. MCCTEST.EXE passes all tests.

If these quick checks do not correct the problem, please call QTest.

Firmware File Not Found!

QTest can not find the machine configuration file in the QTest directory. Check this directory for the presence of these files (DOS extension .Z80). Otherwise copy these files from the distribution disks to your working QTest directory.

Hardware Failure

For an unknown reason, the QMCC Board has failed in an operation. For the QMCC board, quit QTest and connect the loopback module to the QMCC connector at the computer. Then run DMCCTEST.EXE in the QTest directory.

Please Restart QTest With New Data Disk.

The current storage disk no longer has sufficient media space. Please Backup and Erase the current database using Utilities, or Quit QTest and then start a new storage disk.

Reference Database Init Error!

Due to an unknown reason, QTest can not open this database. Please call QTest immediately. Do not shut off the computer or reboot until receiving further instructions.

System Definition file not found!

The configuration file created by the Configure/Environment option in Manage can not be found in the QTest directory. Either recreate this information in Manage or copy the file from backup disk into the QTest directory.

QTest Needs At Least 300 KBytes Of Memory! Please Remove Any TSRs & Re-Boot.

Although QTest resides in Extended Memory (Above 1 MB). it still needs a portions of Low DOS memory (Below 640 KB) for those programs that can not be loaded above 640 KB. Be certain your system has at least 300 KB of memory below 640 KB. This might require a reduction in the number of Terminate and Stay Resident programs (TSRs) you load upon booting. Also, the

following programs will interfere with QTest:

- 386Max
- QEMM
- HIMEM
- Windows

QTest Must Have Security Module to Operate.

To use QTest you must have a security module (Activator) that attaches to the LPT1 port on your computer. QTest continually checks for the presence of this module.

Unexpected Database Error!

A database error has occurred for an unknown reason. Please call QTest immediately. Do not shut off the computer or reboot until receiving further instructions.

Warning Messages

This section describes the warning messages the user may encounter in the QTest software that might need further clarification.

Warning! Sample Test Inputs differ from Default Test Inputs

This message occurs when the operator has loaded a previously run Sample with Test Inputs that do not match those of the current method. Frequently, this is seen when an operator updates a method and then returns to test using the same sample name. The default values in these inputs will be those of the sample's and not the method's.

Warning! Sample Calculation Inputs differ from Default Calculation Inputs.

This message occurs when the operator loads a Sample with values for Calculation Inputs that do not match those of the current method. Read the previous description for more information.

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QTest Software Guide

By Doug Albert, Roger Alford, Phyllis Gray, Christine Longaker, and Shawn Ryan

QTest Material Testing Software designed by Michael Andrade, Shawn Harris, and Paul Williams

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